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REPORT

on

ELECTRICAL SYSTEMS FOR E-BIKES
(QGNS)

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HUNAN, CHINA

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DESCRIPTION

PRODUCT COVERED:

USL - electric bicycles: both EPAC function and non-pedal assist function electric bicycles.

Models: Bolt pro X, BOLT PRO MAX, BOLT PRO X(JBLTPX-BLK).

MODEL DIFFERENCES:

Device Model	Device Type	Model Difference Details
Bolt pro X, BOLT PRO MAX, BOLT PRO X(JBLTPX-BLK)	electric bicycles	The models BOLT PRO MAX, BOLT PRO X(JBLTPX-BLK) are identical to model Bolt pro X except for model name.

GENERAL:

These products covered by this report are electric bicycles including both EPAC function and non-pedal assist function which use lithium ion batteries as their power sources.

ELECTRICAL AND OTHER RATINGS AND SPECIFICATIONS OF ELECTRIC BICYCLES:

Device Model	Device Type	Input Voltage Vdc (Max.)	Input Current (Max.) A	Maximum Load Weight Kg/lbs	Maximum speed km/h or mph	Charging ambient Temperature Range °C	Operating ambient Temperature Range °C	Enclosure IP Rating
Bolt pro X, BOLT PRO MAX, BOLT PRO X (JBLTPX-BLK)	EPAC and Non-EPAC	42.0	1.5	100kg/220lbs	EPAC: 25km/h, 15.5mph; NO-EPAC: 25km/h, 15.5mph	0~40	0~40	IPX4

POWER SUPPLIES FOR CHARGING

Device Model	Manufacturer	Input			Output, (dc)		Max Ambient Temperature, °C
		Vac	A	Hz	V	A	
Bolt pro X, BOLT PRO MAX, BOLT PRO X (JBLTPX-BLK)	COMING DATA CO LTD (QQGQ. E253376)/ CP4215	100~240	3.0	50/60	42.0	1.5	40
	SHENZHEN FUYUANDIAN POWER CO LTD (QQGQ. E350715)/ FY0634201500	100~240	1.8	50/60	42.0	1.5	40
	Guangzhou Ji Yin Power Electronics Co Ltd (QQGQ. E480338)/ JY-420150	100~240	2.0	50/60	42.0	1.5	40

BATTERY PACK

Device Model	Battery pack Manufacturer/ Model	UL File Information	Nominal Voltage Vdc	Capacity (Nominal) Ah/ Wh	User Removable or detachable, Y / N
Bolt pro X, BOLT PRO MAX, BOLT PRO X (JBLTPX-BLK)	Dongguan Longtech NewEnergy Co., Ltd/LT3606-A	MH66506, BBKA2	36	6.0	N
	Anhui BAK New Power Technology Co, Ltd/ ADCN100342123	MH65351, BBKA2	36	6.0	N

MOTOR

Device Model	Motor Manufacturer/ Model	Motor Type/No. of Motors Used	Input Voltage (Rated), Vdc	Input Current (normal), A	Output Power (Rated), W	Rated Speed, rpm
Bolt pro X, BOLT PRO MAX, BOLT PRO X (JBLTPX-BLK)	Changzhou Hongyu Mechanical & Electrical Technology Co., Ltd / 36V350	Brushless dc motor/ one	36	11.5	350	450

BATTERY MANUFACTURER'S RECOMMENDED CHARGING PARAMETERS:

Battery Pack Model	Ambient Temperature Range, °C	Normal Charging Voltage, Vdc	Normal Charging Current, A	Maximum Charging Voltage, Vdc	Maximum Charging Current, A
LT3606-A	0~45	42.0	1.2	42.0	3.0
ADCN100342123	0~45	42.0	1.2	42.0	3.0

BATTERY MANUFACTURER'S RECOMMENDED DISCHARGING PARAMETERS:

Battery Pack Model	Ambient Temperature Range, °C	End of discharge Voltage, Vdc	Normal Continuous Discharging Current, A	Maximum Continuous Discharging Current, A
LT3606-A	0~45	27.5	1.2	18.0
ADCN100342123	-20~60	27.5	1.2	12.0

MANUFACTURER'S SPECIFIED OPERATING REGION FOR CELL:

Battery Pack Model	Cell Mfg/Model	Operating Ambient Temperature Range, °C	Upper Limit of Charging Voltage, Vdc	Upper Limit of Charging Current, A	Upper Limit of Dis-charge Current, Vdc	Dis-charge Voltage Cutoff, Vdc	Upper Limit of Cell Temperature, °C
LT3606-A	@	@	@	@	@	@	@
ADCN100342123	@	@	@	@	@	@	@
@ - LT3606-A and ADCN100342123 were evaluated to ANSI/CAN/UL 2271. Additional cell information not required.							

Cell/Mfg/Model	Operating Transient Values Information*
N/A	N/A
* - These are values of voltage, current and temperature that are allowed by the manufacturer during charging or discharging under specified limited conditions	

TECHNICAL CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):

1. USL - Products designated USL have been investigated using US requirements as noted in the Test Record.
2. Products covered have been evaluated for its safety of the electrical system including the electrical drive train system and battery and charger combination for fire, explosion and if applicable electrical shock hazards. No evaluation has been conducted regarding hazards arising from physical operation or braking of the e-bike by the rider, or to a passenger or pedestrians.
3. The E-bike controller model ESA-A1.0 had been evaluated in accordance with the Standard for Safety of Machinery - Safety Related Parts of Control Systems - Part 1: General Principles for Design, ISO 13849-1.
4. The electronic circuits of the Battery Pack model LT3606-A and ADCN100342123 were relied upon as one of the primary safety protection, which had been evaluated in accordance with the standard for Tests for Safety-Related Controls Employing solid-State Devices, UL991.
5. The following component is considered the equipment disconnect device for the eBike: Charger.
6. The battery pack model LT3606-A and ADCN100342123 have a charger connect-interlock so that the drive system cannot be activated when the charger is plugged in.

MARKINGS:

See Also Section General for details.

For eBikes intended for Canada, the CAUTION, WARNING, and DANGER markings are to be in both French and English language.

All required markings shall be legible and permanent such as ink stamped, etched, adhesive labels, etc.

Nameplate Marking -

1. The listed Company, manufacturer's name, trade name, trademark or other descriptive marking;
2. Part number or model number;
3. Electrical ratings in voltage "Vdc", and Ah or Wh;
4. Maximum weight in lbs or kg and speed in mph or km/h;
5. Listed Holographic Marking;
6. Date of Manufacturer Marking that does not repeat within 10 years, refer section general for detailed date code;
7. The device may be or may not be marked with the IPX4 rating.

EBikes (or Battery Pack) are marked with charging instructions, such as "Use Only Charger (___)" or equivalent.

[] In French: "Utiliser exclusivement le chargeur (____)" or equivalent.

E-bike employing plastic enclosure materials not evaluated for exposure to UV Resistance test per 13.2.1.7 shall be marked with the following or equivalent: "Store Indoors When Not in Use" ([] In French).

INSTRUCTIONS:

See Also Section General for details.

For eBikes intended for Canada, the CAUTION, WARNING, and DANGER instructions shall be provided in both French and English language.

The eBikes are provided with instructions for the proper use including charging and operating, storage and disposal, instructions for temperature limits, appropriate charger and weight limits (maximum), see electrical ratings of this report for detailed values.

The eBikes are provided with the information on water and other environmental exposures limitation as below:

Leave it indoors when charging or not riding.

The user removable battery pack is provided with instructions for the safe handling including removal and insertion into the eBike System, instructions for the safe charging and instructions for storage outside of the eBike.

Warning markings such as "WARNING - Risk of Fire - No User Serviceable Parts" or equivalent.

Contact information for servicing or other information for the eBike system.

The eBikes not intended for use in high altitude locations, which may require increased electrical spacings in electrical circuits, shall indicate that they are not intended for use at elevations greater than 2000 m above sea level.

The eBikes intended to be stored indoors to protect against prolonged exposure to UV rays or the elements that may damage enclosure materials per 13.2.1.7, shall have the following or equivalent included in the instruction manual: "Prolonged Exposure to UV Rays, Rain and the Elements May Damage the Enclosure Materials, Store Indoors When Not in Use".

A eBike is to be provided with a set of instructions as noted below:

Installation instructions shall contain all the information needed to install the product for use as intended, and shall be preceded by the heading, "INSTALLATION INSTRUCTIONS [] In French: INSTRUCTIONS D'INSTALLATION" or the equivalent.

Operating instructions are contain all the information needed to operate the product as intended, and are preceded by the heading "OPERATING INSTRUCTIONS [] In French: INSTRUCTIONS D'UTILISATION" or the equivalent. The instruction manual shall contain the following information:

- a) Instructions regarding battery charging, temperature limits for equipment use and storage, battery use and storage, and the recommended temperature range for charging.
- b) A warning are provided against modifying or attempting to repair the eBike system except as indicated in the instructions for use and care.
- c) Instructions are indicate that charging of the eBike shall only be performed with the manufacturer's recommended charger.

Instructions for user maintenance are include explicit instructions for all cleaning and servicing that are intended to be performed by the user, and are preceded by the heading, "USER MAINTENANCE INSTRUCTIONS [] In French: INSTRUCTIONS D'ENTRETIEN À L'INTENTION DE L'UTILISATEUR" or the equivalent.

Moving and storage instructions are describe the proper moving and storage procedure, and are preceded by the heading, "MOVING AND STORAGE INSTRUCTIONS [] In French: INSTRUCTIONS VISANT LE DÉPLACEMENT ET L'ENTREPOSAGE" or the equivalent.

The instructions pertaining to a risk of fire, electric shock, or injury to persons include those items in the following list that are applicable to the product.

IMPORTANT SAFETY INSTRUCTIONS

WARNING - When using this product, basic precautions should always be followed, including the following:

- a) Read all the instructions before using the product.
- b) To reduce the risk of injury, close supervision is necessary when the product is used near children.
- c) Do not put fingers or hands into the product.
- d) Do not use this product if the flexible power cord or output cable is frayed, has broken insulation, or any other signs of damage.
- e) For all equipment, the instructions shall indicate "This equipment is not intended to be used at ambient temperatures less than ____°C (____°F) or above ambient temperatures of ____°C (____°F)." The blanks are to be filled in with the manufacturer's specified ambient temperature ratings.
- f) For all equipment, the instructions shall indicate "The battery is intended to be charged when the ambient temperature is between ____°C (____°F) and ____°C (____°F). Never charge the battery when ambient temperatures are outside this range." The blanks are to be filled in with the manufacturer's specified ambient temperature range for charging.

SAVE THESE INSTRUCTIONS

The user removable battery pack is provided with instructions for the safe handling including removal and insertion into the eBike System, instructions for the safe charging and instructions for storage outside of the eBike.

CONSTRUCTION DETAILS:

[X] Spacings - These devices only involve maximum working voltage of 42Vdc, which is considered as non-hazardous voltage circuit, thus no spacings is required for these devices.

Illustrations - The following illustrations and Figures are included in this Report.

Model No.	Parts	Nos.	Description
Bolt pro X, BOLT PRO MAX, BOLT PRO X (JBLTPX- BLK)	Figs.	Fig. 1-4	eBike overview
		Fig. 5-6	Driving wheel overview
		Fig. 7	Front Wheel overview
		Fig. 8-9	Battery pack overview of Model LT3606-A
		Fig. 10-11	Battery pack overview of Model ADCN100342123
		Fig. 12-13	Motor internal view
		Fig. 14	Main Controller overview
		Fig. 15-16	Pedal Speed sensor
		Fig. 17-18	Throttle overview
		Fig. 19	Start Switch
		Fig. 20	Charger overview of CP4215
		Fig. 21	Charger overview of FY0634201500
		Fig. 22	Charger overview of JY-420150
	Ills.	Ill. 1	e-Bike dimension
		Ill. 2	Battery box dimension
		Ill. 3	Main frame dimension
		Ill. 4	Front Fork dimension
		Ill. 5	Handlebar dimension
		Ill. 6	Axis Adjustable Stem dimension
		Ill. 7	light cover dimensions
		Ill. 8	Operator Interface dimension
		Ill. 9	Motor Spec
		Ill. 10	Input terminal dimension
		Ill. 11	Pedal Speed sensor spec
		Ill. 12	e-Bike draft marking plate
		ILL. 13	Rear Rack dimension

Electric Bicycle, Bolt pro X, BOLT PRO MAX, BOLT PRO X(JBLTPX-BLK)

Fig. 1 to Fig. 22

See Ill(s). 1~13 for additional views of overall Electric bicycle constructions.

1. Overall dimensions - refer to ILL.1 for detailed dimensions.
2. Battery Pack - R/C(BBCA2) See tables and information noted above regarding ratings and specifications as well as information noted below.

Device Model	Battery Pack Manufacturer	Battery Pack Model No.	File No	Report Information
Bolt pro X, BOLT PRO MAX, BOLT PRO X(JBLTPX-BLK)	Dongguan Longtech NewEnergy Co.,Ltd	LT3606-A	MH66506	Vol.1, Sec.1
	Anhui BAK New Power Technology Co,Ltd	ADCN100342123	MH65351	Vol.1, Sec.4

Cells - See tables and information above:

Device Model	Cell Mfg.	File No	Cell Model	Nominal Voltage, Vdc	Nominal Capacity, Ah
Bolt pro X, BOLT PRO MAX, BOLT PRO X(JBLTPX-BLK)	**	**	**	**	**
Note: See Cell Chemistry and Configuration Table at beginning of report for information on type of cells, number of cells and their configuration in the battery pack circuit.					

**Battery Pack was evaluated to ANSI/UL 2271. All parameters regarding cells are addressed in the ANSI/UL 2271 follow-up inspections of the battery pack.

3. Charger - Listed (QQGQ. E253376), Mfr. COMING DATA CO LTD / CP4215, input rated 100~240Vac, 50/60Hz, 3.0A, output rated 42Vdc, 1.5A.

Supply Cord - R/C (ELBZ), SPT-2, 18AWG, 300V, 105°C, VW-1, one end with WS-001 plug, the other end with WS-202 type appliance coupler rated 125V, 10A.
- 3a. Charger (alternate) - Listed (QQGQ. E350715), Mfr. SHENZHEN FUYUANDIAN POWER CO LTD / FY0634201500, input rated 100~240Vac, 50/60Hz, 1.8A, output rated 42Vdc, 1.5A.

Supply Cord - R/C (ELBZ), NISPT-2, 18AWG, 300V, 105°C, VW-1, one end with KNC-005 plug, the other end with KNC-001 type appliance coupler rated 125V, 10A.
- 3b. Charger (alternate) - Listed (QQGQ. E480338), Mfr. Guangzhou Ji Yin Power Electronics Co Ltd / JY-420150, input rated 100~240Vac, 50/60Hz, 2.0A, output rated 42Vdc, 1.5A.

Supply Cord - R/C (ELBZ), SPT-2, 18AWG, 300V, 105°C, VW-1, one end with HFW-201 plug, the other end with HFW-202 type appliance coupler rated 250V, 2.5A.
4. Battery box - R/C (QMFZ2. E67171), Mfr. LG CHEMICAL LTD, type LUPOY GN-5001RF(T), Min. thickness 1.5 mm, rated V-0, RTI Electric =80°C, RTI Impact = 80°C, RTI Strength = 85°C. All Color. See ILL. 2 for detailed dimensions.
5. Main Frame - Consists of steel with Organic Coating, refer to Ill. 3 for detailed dimension.
6. Front Fork - one provided, consisted of steel with Organic Coating, mounted with Main Frame and Handlebar by Axis Adjustable Stem. Refer to Ill.4 for detailed dimensions.
7. Handlebar - One provided, consisted of Iron with Organic Coating, Min. thickness 1.4mm, mounted with front fork by Axis Adjustable Stem. Refer to Ill.5 for detailed dimensions.
8. Axis Adjustable Stem - Consisted of Iron with Organic Coating, Refer to Ill.6 for detailed dimensions.
9. Throttle - Located in LVLE circuit, Mfr. Dongguan Zhong'en Electronic Technology Co., Ltd, type DX-F-078, mounted on right side of handle bar and connected to Controller for accelerate use, see Fig. 17~18 for details.
10. Cutoff brake levers - Located in LVLE circuit, two provided, Mfr. CIXI DAFENG BICYCLE CO.,LTD, type JY-BE553A, mounted on right/left side of handlebar and locked by screw.

11. Operator Interface / Start Switch - R/C (QMFZ2. E171666), Mfr. KINGFA SCI & TECH CO LTD, type JH8-R20T05 (ddd), Min. thickness 1.5 mm, rated V-0, RTI Electric = 80°C, RTI Impact = 80°C, RTI Strength = 80°C. All Color, refer to Ill.8 for dimension, refer Fig. 19.
12. Pedal sensor - Mfr. Nanjing Hongyao(W&S) ElectronicTechnology Co., LTD, Type: WSPAS-Q24GL, fixed in Crank for pedal, Refer to Fig.15~16, ILL. 11.
13. Wheel - Wheel diameter, refer to Ill. 1 for detailed dimensions.
14. Saddle - one provided.
15. Pedals - Two provided.
16. Freewheel - 1-speed freewheel, 16T, consists of carbon steel, used to drive the rear wheel.
17. Light Cover - R/C (QMFZ2. E171666), Mfr. KINGFA SCI & TECH CO LTD, type JH830T (ccc)overall dimension Min thickness 2.0 mm, Rated V-0, RTI Electric = 80°C, RTI Impact = 80°C, RTI Strength = 80°C, Refer to Ill.7 for detail dimensions.
18. Charger Input Terminal - Terminal constructed of copper alloy and R/C (QMFZ2. E41871) plastic, type A3X2G5(f1), by BASF SE, Min. thickness 1.6mm, RTI Electric = 120°C, RTI Impact = 115°C, RTI Strength = 130°C, BK, rated V-0. See ILL. 10 for detailed dimensions.

Inside Input power Connector connected with battery pack - R/C (ECBT2), rated Min. 60V, 3A, 105 °C. Or copper pin housed in plastic base of R/C (QMFZ2), rated min V-2, 80 °C.
19. Printed Wiring Board - Unless otherwise noted, R/C (ZPMV2), rated Min. V-1, 105°C.
20. Main Controller - one provided, R/C (QGNS2, E536928), Type ESA-A1.0, Software version: TRE458, unique identifier: 0x00227ACC. Mfr. CHANGZHOU TAOCHEN ELECTRONIC TECHNOLOGY CO., LTD, rated 36V,15±1A. Fixed inside Battery box, refer to Fig. 14.
21. Rear Rack - Consists of aluminum alloy, Fixed to the main frame by screws. refer to Ill. 13 for detailed dimensions.

22. Motor - One employed, non-R/C, Mfr. Changzhou Hongyu Mechanical & Electrical Technology Co., Ltd, Model: 36V350, type: brushless DC motor, input rated 36Vdc, 11.5A, operating temperature range of -20~55 °C, see Ill.9 for motor spec.

Consist of the following items.

- a) Complete Assembly - Overall dimension show as below:

Motor Lamination (Stack) Dimensions, mm			
Rotor		Stator	
Internal Diameter	Height	Outside Diameter	Height&
107.5	35	105	35
* ID of Rotor includes magnet steel.			
& The Height of stator excludes motor winding.			
% The height of Rotor includes total height.			

- b) Side Cover - Aluminum alloy, Min. thickness 3mm, mounted to Wheel Hub by screws, 128.5 mm OD, provided the 25mm ID opening for Motor Axle, refer to Ill. 9 for detailed dimensions.
- c) Wheel Hub - Aluminum alloy, Min. thickness 3mm, refer to Ill. 9 for detailed dimensions.
- d) Motor Axle - One provided, made of Steel, M12*1.25 thread was provided on both sides, refer to Ill. 9 for detail dimensions.
- e) Motor Winding - R/C (OBMW2), ANSI Type MW 79-C. Temp. 155°C, winding diameter 0.51mm, 6*10 Turns winding DC resistance 0.785ohms.
- f) Slot Liner/Wedge/End Spider - R/C (QMFZ2), rated Min. V-2, Min. Elec str 105°C.
- g) Motor Connector and wire - R/C (CYJV2), Min. 75Vdc, 15A for power/ 1A for signal, rated minimum 15 AWG for power wiring, 24AWG for signal wiring.
- h) Hall - Three Hall provided, Mfr. Changzhou Meihuo Electronic Technology Co., LTD, type MH41F.
- i) NTC - R/C (XGPU2, E240991), model name MF52B 103Y3950.
- j) Printed Wiring Board - R/C (ZPMV2), rated Min. V-1, 130°C.
- k) Insulation Tube - R/C (YDPU2 or UZFT2), Min. rated 60V, 105°C, VW-1, except for less than 2cm³.
- l) Insulation board - R/C (QMFZ2), rated Min. V-2, Min. Elec str 105°C. located between Printed Wiring Board and motor winding.
- m) Cable Tie - R/C (ZODZ2), operating temperature minimum 105°C, except for less than 2cm³.

- n) Glue - R/C (QMFZ2/8), rated Min. V-2 flame class, 105°C, located on PWB and motor axle, except for less or equal to 2cm³.