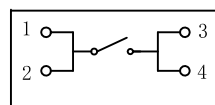
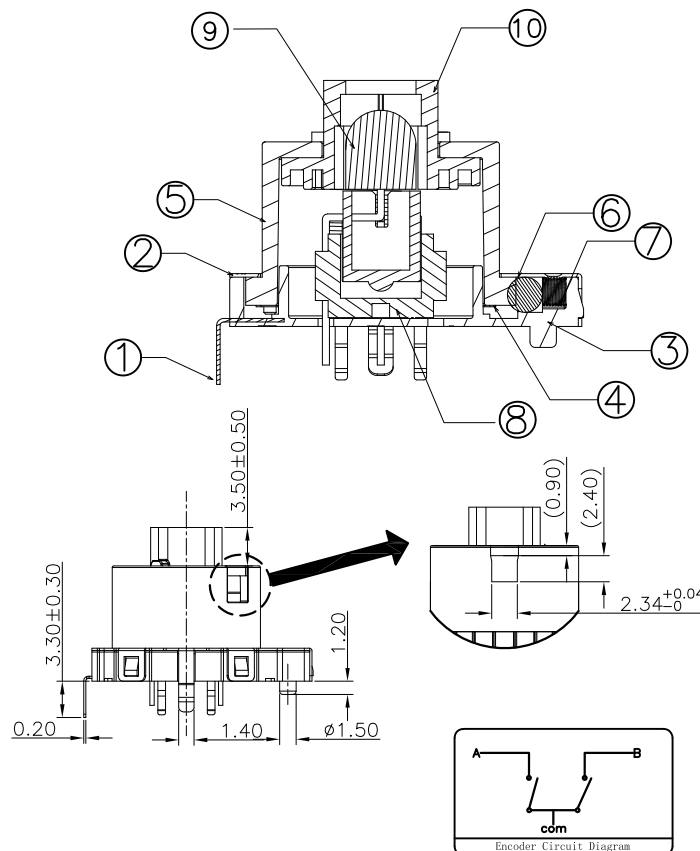
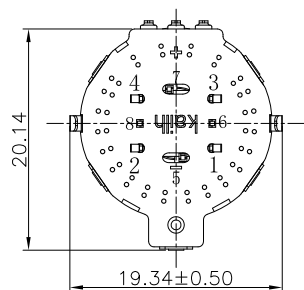
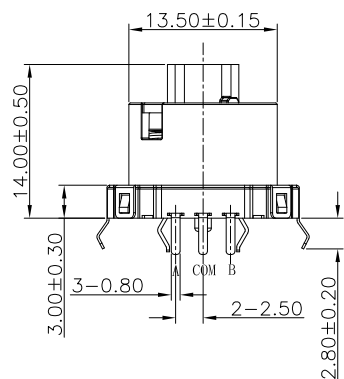
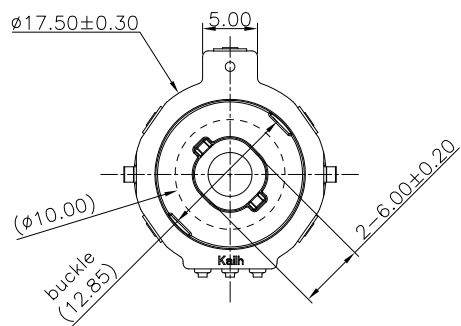
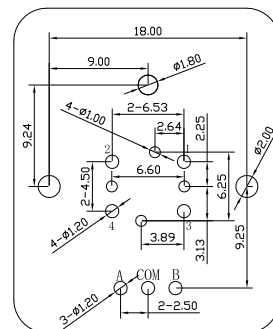


ABIDE BY WEEE & ROHS

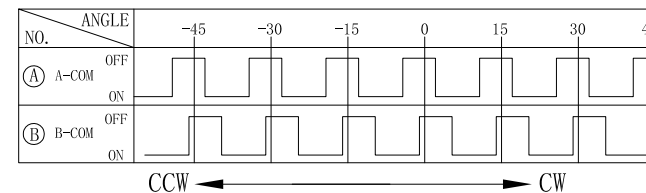


Circuit Diagram

5 6	red
5 7	green
5 8	blue



Recommended PCB Layout (Pattern side)
tolerance: $\pm 0.05\text{mm}$



Numbers of detent: 24

Pulse/Rotation: 24 Pulse/360° (reverse)

■ Specification :

- 1. Rated voltage: D.C. 5V
- 2. Maximum operating current(resistive load)
Each load :1mA
- 3. Resolution: 24 pulses/360° for each phase
- 4. Contact Resistance: 10 Ω (Max)
- 5. Insulation resistance: 50M Ω (Min) At DC50V
- 6. Dielectric strength: AC50V(50-60Hz) for 1
minute
- 7. Encoder detent torque: 60±20gf.cm
- 8. Switch operation force : 260±50gf
- 9. Switch total travel :0.25±0.10mm
- 9. Encoder life Test :30,000 Cycles(without load)
- 10. Switch life Test :100,000 Cycles

⑩	Keystoke	—	1	PC	Transparent	UL 94HB
⑨	RGB	—	1	—	—	—
⑧	Switch	—	1	—	—	—
⑦	Spring-1	—	1	SUS	—	—
⑥	Ball	—	1	SUS	—	—
⑤	Revolving Wheel	—	1	PA66	Brown	UL 94HB
④	Contact	—	1	Phosphor Bronze	—	—
③	Base	—	1	PA66	Black	UL 94HB
②	Shell	—	1	Stainless Steel		
①	Terminal COM	3	1	Copper Alloy	Plating Silver	—
	Terminal B	2	1	Copper Alloy	Plating Silver	—
	Terminal A	1	1	Copper Alloy	Plating Silver	—
ITEM	PART NAME	TER'NO.	QTY.	MATERIAL	FINISHING	REMARK

APPROVALS		DATE		 东莞市凯华电子有限公司 KAIHUA ELECTRONICS CO., LTD	
DRAWN	WUYU	2021.09.29		Kailh	
CHECKED				TITLE:	EN1730 Type Encoder
APPROVALS				PART NO:	CEN173024D05
TOLERANCES ARE	30<L	±0.30	ANGLE	UNIT: mm	SCALE: 1:1
	10<L≤30	±0.20		DRAWING NO.	SHEET: 1 OF
	5<L≤10	±0.15			
	L≤5	±0.10			
		±2'			

	C	2024.03.06	Increase size control	DAIVE		
	B	2023.07.26	Increase size control	LISHIJIE		
	A					
ECN NO.	REV.	DATE.	DESCRIPTION.	CHANGE.	CHECK.	APPRO.



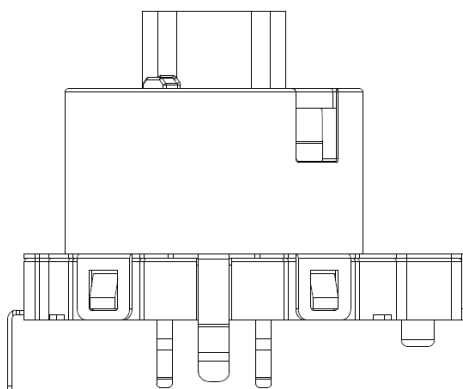
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KAIHUA EEELETRONICS

Document Number:

KH-PS2007-31

产品规格书

Product Specification



P/N:

CEN173024D05

Title :

Encoder Switch

Rev.	ECN	Release and Revision Description:	Prepared By/Date:	Checked By/Date:	Approved By/Date:
A	---	New releasing 初版发行	吴宇 2022.02.15	胡远锋 2022.02.15	郑建军 2022.02.15
B	---	Update 升版	李世杰/2023.08.14	文会来/2023.08.14	王小龙/2023.08.14
C	---	Update 升版	戴明辉/2024.03.14	吕攀豪/2024.03.14	李生勇/2024.03.14



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KAIHUA EEELECTRONICS

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1. Scope/范围:

This Product Specification covers the requirement of Encoder switch on product performance, test methods and quality assurance provisions.

本规格书内容涵盖编码器产品的要求，包括性能指标、测试方法及质量保证方面等。

2. Product Application/产品应用:

The Switch is applied in all types of Computer mouse. Please let us know before using any of the products in the application not described above.

该编码器产品适用于所有类型的电脑鼠标，如果用于本文中未提及的领域请在使用前告知。

3. Technology Parameters/技术参数

Ambient Humidity 工作湿度:	$\leq 85\%$ R.H.;
Operating Temperature Range 使用温度范围:	$-15^{\circ}\text{C} \sim +70^{\circ}\text{C}$;
Storage Temperature Range 保存温度范围:	$-20^{\circ}\text{C} \sim +80^{\circ}\text{C}$;
Normal Condition:	
Ambient temperature 环境温度:	$20 \pm 5^{\circ}\text{C}$
Relative humidity 相对湿度:	$65\% \pm 5\%$ R.H.;
Air pressure 气压:	86~101KPa;
Contact Resistance 接触阻抗:	10 Ω Max;
Encoder torque Force 扭矩:	$60 \pm 20\text{gf.cm}$;
Switch operation force 操作力:	$260 \pm 50\text{gf}$
Switch total travel 操作行程:	$0.25 \pm 0.10\text{mm}$
Solder Ability 可焊性（手工焊接）:	锡铅焊 245°C Max 5 $\pm$ 0.5s;
	无铅焊 255°C Max 5 $\pm$ 0.5s;
Pulse/Rotation 脉冲数	24Pulse/360 $^{\circ}$
Numbers of detent 制动数	24

4. Ratings/额定性能要求

Rating 额定负荷:	DC5V / 各导线 1mA;
Insulation Resistance 绝缘电阻:	$\geq 50\text{M}\Omega$ / DC 50V;
Withstand Voltage 耐电压:	50V AC 1 Minute;
Encoder mechanical Life 编码器机械寿命:	30,000 Cycles (Without load)
Switch mechanical Life 开关机械寿命:	100,000 Cycles

5. Profile Dimensions /外形尺寸

见成品图



6. Electrical Performance/电气性能

Item 项目	Description 项目描述	Test Condition 测试条件		Requirement 规格要求
6.1	Contact Resistance 接触电阻	Measured by a Voltage drop method at 1A , 5VDC. Any equipment with error not more than 5% can be used. Resistance after test in the average of 5 successive measurements(To measure after operated 5 to 10 times) 以1A,5V直流电, 采用误差不超过5%的仪器测量,实验后的电阻取5次测量的平均值。(转动5-10次测量)		10Ω Max 10Ω 以下
6.2	Insulation Resistance 绝缘电阻	Apply a Voltage of DC 50 V for 1 minute, according to the below method. (1) Between terminals. (2) Between terminal and Body. 输入 50V DC 电压 1 分钟, 按如下接触方法测试: (1) 端子与端子之间. (2) 端子与外壳之间.		50MΩ Min 50 兆欧以上
6.3	输出信号 Output signal Format	Shaft rotational Derection 轴的回转方向	Signal 信号	Output 输出波形
		C.W 顺时针方向	A(A-C 端子间 A(TerminalA-C) B(B-C 端子间) B(TerminalB-C)	
		C.C.W 逆时针方向	A(A-C 端子间 A(TerminalA-C) B(B-C 端子间) B(TerminalB-C)	



Item 项目	Description 项目描述	Test Condition 测试条件	Requirement 规格要求
6.4	Resolution 分析能力	Number of pulses in 360° rotation 回转一周的输出脉动数	24 pulses/360° for each phase 每 24 个脉动/360°
6.5	Switching Characteristics 开关特性	Measurement shall be made under the condition as follows. Shaft rotational speed :360° /S 下图所示回路，轴以360° /S的速度回转测定。  (NOTE) Code-ON area : The area which the voltage is 2.5V or less Code-OFF area : The area which the voltage is 2.5V or more (注) 编码器 ON 指输出电压2.5V以下的状态。 编码器 OFF 指输出电压2.5V以上的状态。	
6.6	Chattering 振荡	Specified by the signal's passage time from 2.5V of each switching position(code OFF→ON 或 ON→OFF) 编码器 OFF→ON 或 ON→OFF 时，输出 2.5V 的通过时间应符合规定。	$t1.t3 \leq 5ms$
6.7	Bounce 突跳	Specified by the time of voltage change exceed 2.5V in code-ON area. When the bounce has code-ON time less than 1ms between chattering($t1$ or $t3$),the voltage change shall be regarded as a part of chattering. When the code-ON time between 2 bounces is less than 1ms. They are regarded as 1 linked bounce.	$t2 \leq 3ms$



编码 ON 部分的 2.5V 以上的电压变动时间在振荡 t1.t3 之间会产生 1ms 以上 2.5V 以下的 ON 部分, 另外, 如果各突跳间 2.5V 以下的范围在 1ms 以上时, 则判定为另一个突跳。

Item 项目	Description 项目描述	Test Condition 测试条件	Requirement 规格要求
6.8	Dielectric withstanding voltage 耐电压	Apply a Voltage of AC 50 V (50~60Hz) for 1 minute, according to the below method. (1) Between terminals. (2) Between terminal and Body. 输入 50V AC 电压 1 分钟, 按如下接触方法测试: (1) 端子与端子之间. (2) 端子与外壳之间.	No evidence of breakdown 无瞬断、击穿等破坏

7. Mechanical Performance/机械性能

7.1	Encoder detent torque 编码器扭力矩	Account the test with the torque within the scope of at 5°C-35°C temperature. 在 5°C-35°C 温度范围内用扭力计测试	60±20gf.cm
7.2	Switch operation force 开关操作力	Operate the keystone of the switch and then increase press strength gradually, Measured maximum operation force while the travel of the switch is full. 逐渐施力操作开关按键, 测量开关到达全部工作行程时所需的最大操作力度。	260±50gf



7.3	Switch total travel 开关操作行程	Operate the keystroke of the switch vertically, the travel distance of keystroke moving from its free position to maximum moving distance shall be measurement. 垂直操作开关按键, 量测开关顶端最大移动距离	0.25±0.10mm
-----	-------------------------------	---	-------------

Item 项目	Description 项目描述	Test Condition 测试条件	Requirement 规格要求
7.4	Encoder number and position of detent 编码器定位点数及位置	N/A 不应用	24 detents(Step angle: 15° ±3°) 24 点定位 (间隔角度: 15° ±3°) -----
7.5	Encoder Rotational life 回转寿命	The shaft of encoder shall be rotated to 30,000 cycles at a speed of 30 cycles per minute without electrical load after which measurements shall be made. 在无负荷条件下轴以 30 次/分钟的速度回转 30, 000 次.	After test, 1) Contact resistance: 10ΩMax. 2) Insulation resistance: 50MΩ Min. 3) Bouncing: t1. t3: 3ms Max. t2:2ms Max. 4) Rotational torque: The variation of the torque shall be within 40% 5) Dielectric strength: 50V AC for 1minute Min. No dielectric breakdown. 试验后: 1) 接触电阻: 10Ω Max. 2) 绝缘电阻: 50MΩ Min. 3) 电气抖动: t1. t3: 3ms Max. t2:2ms Max.



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4) 旋转扭力矩: 扭力矩衰变在初始值的 $\pm 40\%$
5) 抗电强度: 50V AC 1分钟, 无击穿现象发生。

7.6

Switch life Test
寿命测试

(1) Operation speed: 30-40cycles/ min
操作速度: 30-40 次/分钟
(2) Push force: Maximum value of operation force.
按压力: 操作力规格值的上限.
(3) Cycles: 100,000 times Min
操作次数: 10 万次以上(最小)

Contact resistance:
10 Ω Max
接触电阻: 10欧以下
Bouncing: 10ms Max
触点抖动: 10 毫秒以下
Operation force:
Variation rate within $\pm 30\%$
操作力的变化范围在初始值的 $\pm 30\%$ 以内.

8. Environmental Performance/环境性能

Item 项目	Description 项目描述	Test Condition 测试条件	Requirement 规格要求
8.1	Cold test 耐寒性	(1) Temperature : - 20 $\pm$ 2 $^{\circ}$ C 温度: - 20 $\pm$ 2 $^{\circ}$ C (2) Duration of test: 96h 持续时间: 96 小时 (3) Take off a drop water 去掉水珠 (4) Standard conditions after test : 1h 试验后的放置条件: 1 小时	Contact resistance: 10 Ω Max Shall meet : No. 6.1 to 6.9 No. 7.1 to 7.3 接触电阻 10 Ω 以下 满足: No. 6.1 to 6.9 No. 7.1 to 7.3

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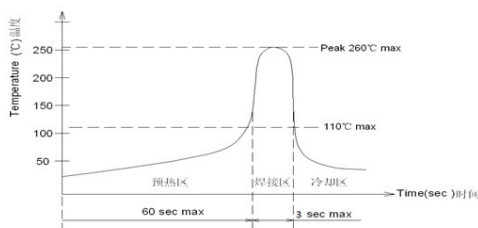
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8.2	Heat test 耐热性	(1) Temperature : 80±2℃ 温度: 80±2℃ (2) Duration of test: 96h 持续时间: 96 小时 (3) Take off a drop water 去掉水珠 (4) Standard conditions after test : 1h 试验后的放置条件: 1 小时	Contact resistance: 10 Ω Max Shall meet : No. 6.1 to 6.9 No. 7.1 to 7.3 接触电阻 10 Ω 以下 满足: No. 6.1 to 6.9 No. 7.1 to 7.3															
8.3	Temperature cycle 温度循环	(1) Test cycles: 5 cycles 试验周期: 5 个周期 (2) Standard condition after test:1h 试验后的放置条件: 1 小时 <table><tr><td></td><td>Temperature 温度</td><td>Duration of test 持续时间</td></tr><tr><td>1 cycle 一次循环</td><td>20±2℃</td><td>1h</td></tr><tr><td></td><td>-20±2℃</td><td>1h</td></tr><tr><td></td><td>20±2℃</td><td>1h</td></tr><tr><td></td><td>80±2℃</td><td>1h</td></tr></table>		Temperature 温度	Duration of test 持续时间	1 cycle 一次循环	20±2℃	1h		-20±2℃	1h		20±2℃	1h		80±2℃	1h	Contact resistance: 10 Ω Max Shall meet : No. 6.1 to 6.9 No. 7.1 to 7.3 接触电阻 10 Ω 以下 满足: No. 6.1 to 6.9 No. 7.1 to 7.3
	Temperature 温度	Duration of test 持续时间																
1 cycle 一次循环	20±2℃	1h																
	-20±2℃	1h																
	20±2℃	1h																
	80±2℃	1h																
8.4	Soldering heat test 耐焊接热(插 件编码器不 适用)	Soldering area: T/2 of PWB thickness. (PWB: T=1.6mm) 焊接面积: 印刷基板的 1/2 厚度处 Soldering temperature: 260+0/-5℃ Soldering time: 3s(max) 焊接温度: 260+0/-5℃ 焊接时间: 3 秒最大	Appearance: No abnormality. 外观无异常															
Item 项目	Description 项目描述	Test Condition 测试条件	Requirement 规格要求															
8.5	Solderability 可焊性	1. Hand soldering 手工焊接: Please practice according to below condition: (1) Soldering Temperature : 350±5℃ 焊接温度: 350±5℃ (2) Continual soldering time: 3s(max) 连续焊接时间: 3 秒最大 (1) Capacity of soldering iron: ≤20w 电烙铁功率: 20 瓦以下 2. Automatic PIP soldering 自动波峰焊接: For the product of T/H, according to below	At least 95% of surface area of immersed portion shall be covered by solder. 侵焊面积大于 95%以上.															



condition:



8.6

Humidity
test
耐湿性

- (1) Temperature : $60 \pm 2^{\circ}\text{C}$
温度: $60 \pm 2^{\circ}\text{C}$
- (2) relative humidity: 90~95% R.H.
相对湿度: 90~95% R.H.
- (3) Duration of test: 96h
持续时间: 96 小时
- (4) Take off a drop water
去掉水珠
- (5) Standard conditions after test: 1h
试验后的放置条件: 1 小时

Contact resistance:
 $10\ \Omega$ Max
Shall meet :
No. 6.1 to 6.9
No. 7.1 to 7.3
接触电阻 $10\ \Omega$ 以下
满足:
No. 6.1 to 6.9
No. 7.1 to 7.3

8.7

Salt Spray
盐雾测试

- Apply the following environment to test:
根据下列条件进行测试:
- (1) Temperature : $35 \pm 5^{\circ}\text{C}$
温度: $35 \pm 5^{\circ}\text{C}$;
- (2) Salt water density: $5 \pm 1\%$
盐水浓度: $5 \pm 1\%$;
- (3) Duration: 8 hours
持续时间: 8 小时;
- (4) After test, the salt deposit shall be removed by running water.
实验后将盐沉积物用水冲掉

Appearance:
No corrosion spot, no crack, no base plate naked.
外观: 无腐蚀点, 无裂纹, 无裸露基材.

Contact Resistance:
 $10\ \Omega$ Max
接触电阻: $10\ \Omega$ 以下

8.8

Withstand
 K_2S
硫化测试

- Apply the following environment to test:
根据下列条件进行测试
- (1) Temperature: room temperature
温度: 室温
- (2) K_2S Density: 2%;
硫化钾浓度: 2%
- (3) Duration: 2 minute.
持续时间: 2 分钟

Appearance:
No corrosion spot, no crack, no base plate naked.
外观: 无腐蚀点, 无裂纹, 无裸露基材.

Contact Resistance:
 $10\ \Omega$ Max
接触电阻: $10\ \Omega$ 以下



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[illegible]

Recommended PCB Layout (Pattern side)
tolerance: $\pm 0.05\text{mm}$

环保吸塑盒

环保外箱
材质：K=K

11.1 Immersion Soldering condition 浸焊条件

ITEM 项目	CONDITION 条 件
Preheat temperature 预热温度	110℃ Max (Ambient temperature of soldering surface of P.W.B) 110℃ 以下(印刷基板焊锡面周围的温度)
Preheat time 预热时间	60s, Max 60 秒以内
Area of flux 助焊剂面积	1/2 Max of PWB Thickness 印刷基板厚度的 1/2 以内
Temperature of solder 焊锡温度	260+0/-5℃ 260+0/-5℃
Time of immersion 浸焊时间	Within 3s 3 秒以内
Number of soldering 焊接次数	2time Max (But should down heat of the first soldering) 2 次以内
Printed wiring board 印刷基板	Single side copper-clad laminates 单面铜箔

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(1) After switches were soldered, please be careful not to clean switches with solvent
开关浸焊后, 注意不要用溶剂清洗.

(2) Under the condition of using soldering iron, soldering temperature shall be 350℃ max within 3 sec.

在使用铬铁的情况下, 焊锡温度应在350℃以下, 焊接时间3秒以内.

11.2 Notes 注意点

(1) Do not light any lubricating oil near the encoder or on the mouse support, prevent poor electrical function.

注意不要在编码器本体附近点任何润滑油, 防止油不兼容, 出现功能不良.

(2) Please be cautious not to give excessive static load or shock to switches.

注意不要施加超负荷的压力或晃动开关.

(3) Please be careful not to stack up P. W. B. after switches were soldered.

开关焊接以后, 印刷基板注意不要叠放.

(4) Preservation under high temperature and high humidity or corrosive gas should be avoided Especially. When you need to preserve for a long period, do not open the carton.

保管时尤其应注意避开高湿高温和有腐蚀性气体的环境. 如需长时间保存, 请不要打开包装箱.

(5) The standard storage period is 3 months, with maximum up to 6months, preferably to be used as soon as possible. After opening the package, you should put the remaining switches in a plastic bag

to prevent from damp and corrosive gas.

保存标准为3个月, 限度为6个月以内, 请尽早使用. 打开包装后, 有剩余品时, 应将剩余部分以胶袋包装好以同外界隔离, 请进行合适的防湿, 防腐蚀气体等处理后进行保管.

(6) This Product Specification is considered as the technical agreement on product between the receiving customer and Kailh. Any information on Product Catalogue which is in conflict with or different from the corresponding information of this document is considered as invalid.

该规格书为客户与凯华公司产品在技术方面的共识, 其他相关数据上与该规格书不一致的内容都是无效的.

(7) If customer issue purchase orders without confirmation of this specification, this will be considered customer already confirmed and accept this specification.

无论顾客收到规格书后有没有信息反馈直接向我公司订货, 我们将认为顾客对此产品已验证合格.

(8) If there is no order or no request for new specification after 1 year upon this specification is issued,

the specification will be regarded as invalid.

本产品规格书从生效日起1年后, 如果没有订货或再次申请最新规格书时请做无效处理.

(9) Products meet the ROHS & REACH environmental management substances control standards

产品满足 ROHS & REACH 环境管理物质管制标准