确　认　书

APPROVAL　SHEET

TO

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贵公司安装机型：

(USER MODEL.)

贵公司零件编号：

(USER SPEC NO.)

本公司制品名称：

(MAKER SPEC NO.) 摇杆电位器

本公司制品编号：

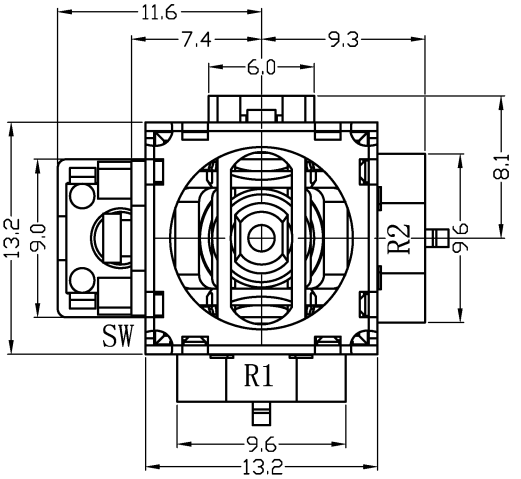
(MAKER MODEL.) 胶杆3D13A1-B10K-55°/60°

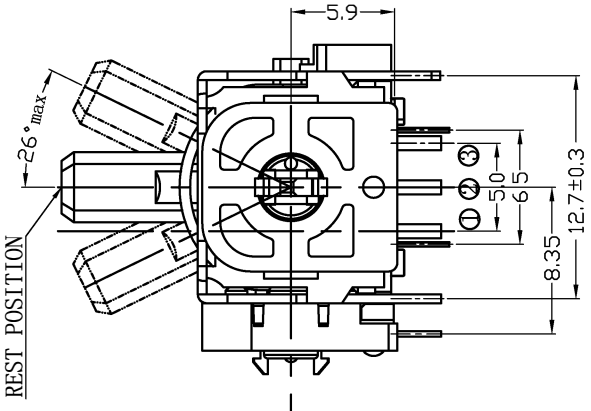
确　认　日　期：

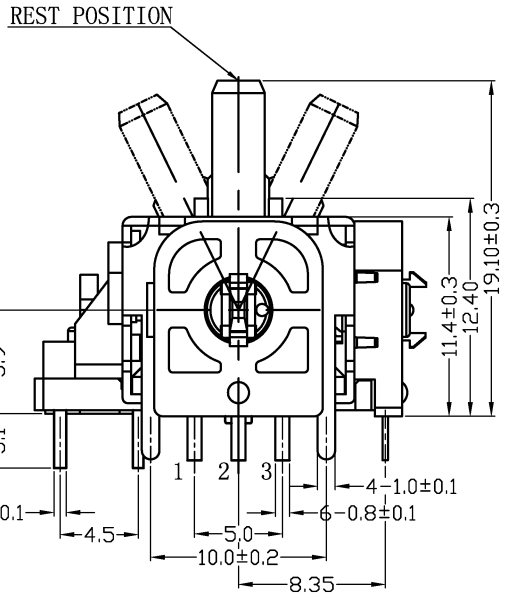
(DRAFT DATE) 2021-5-18

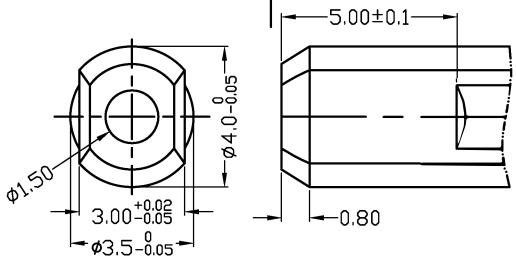
经　办 Designed	审　核 Check	批　准 Approved

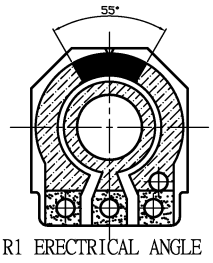
客　户　承　认 APPROVED		



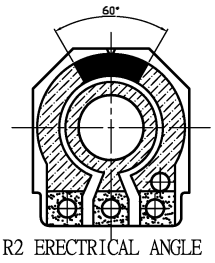








V.R1 ERECTRICAL ANGLE

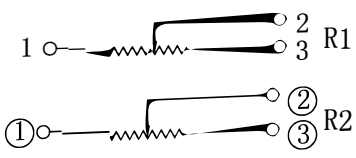


V.R2 ERECTRICAL ANGLE

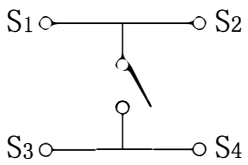
轴心部尺寸详图

2:1

V.R ERECTRICAL ANGLE

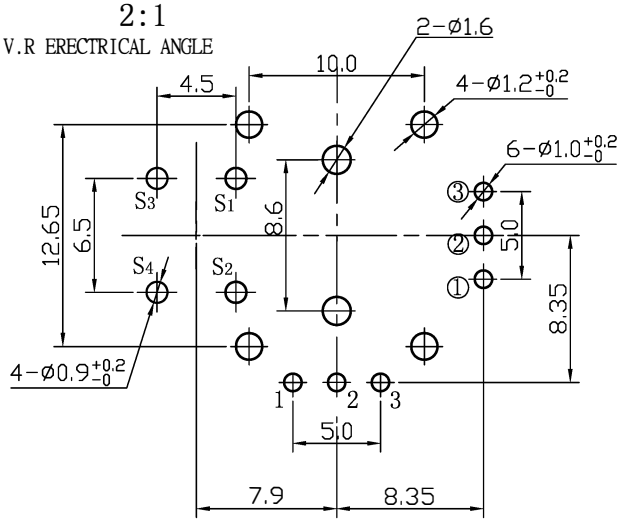


CIRCUIT:VR



CIRCUIT:SW

注意：1.基板板厚=1.2
RECOMMENDATORY THICKNESS OF P.W.B.IS 1.2mm
2.VR端子厚 t=0.3mm
POT.TERMINAL THICKNESS
SW 端子板厚 t=0.3mm
SWITCH TERMINAL THICKNESS
外壳厚度 t=0.5mm
FPAME THICKNESS



P.C.B MOUNTING HOLE DETAIL

VERSION			MODEL: 3D1 3A1-B10K-55° /60°		DRAW	SCALE
A0			DRAWING NO:			3:1
.ISSU.	DATE	REVISION	Design	TOL.UNLESS OTHERWISE SPEC.	CHKD	UNIT
00	2018.7.31	初始发行		BASIC DIMENSIONS TOL.		
01				L≤10 ±0.3		mm
02				10<L ±0.5	APPD	
03				100≤L ±0.8		
04				ANGLE ±5°		第 1 页

3D13系列规格书

3D13 SERIES SPECIFICATION

适用机型：3D13系列　　日期:2020 年 4 月 9 日

1.General　一般事项

1-1 Scope　适用范围

This specification applies to the joystick which carbon composition resister, used in electronic equipment.

本规格书适用于电子设备使用之碳素抵抗体用摇杆。

1-2 Standard atmospheric conditions　标准大气状态

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows:

除另有规定外，量测应在以下大气条件下进行:

Ambient temperature 温度	: 15℃ ~ 35℃
Relative humidity 相对湿度	: 25% ~ 85%
Air pressure 气压	: 86 KPa~ 106 KPa

If there is any doubt about the results, measurements should be made within the following limits:

如有任何疑虑时，量测应在以下条件下进行:

Ambient temperature 温度	: 20℃ ± 1℃
Relative humidity 相对湿度	: 63% ~ 67%
Air pressure 气压	: 86 KPa~ 106 KPa

1-3 Operating temperature range 适用温度范围　: -10℃ ~ +70℃

1-4 Storage temperature range 保存温度范围　: -30℃ ~+80℃

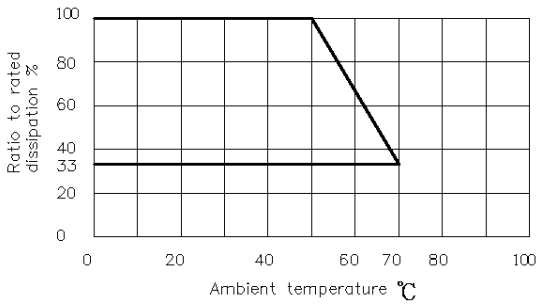
2. Construction　构造

2-1 Dimension　尺寸　: Refer to attached drawing　参见成品图

3.Mechanical characteristics
机械性能

NO. 序号	ITEM 项 目	CONDITIONS 条件	SPECIFICATION 规格
1	Figure of lever operation 摇杆动作形式	/	Circular operating 圆形式
2	Operation angle of lever 摇杆使用有效角度	Add a fit force on the lever top to push it to max. angle of each direction when lever is released and reset position. 当摇杆处于自由复归位置时,在摇杆顶部施加一定力将摇杆推向任意方向最大角度。	26° max 最大26°
3	Operating force of lever 摇杆作用力	Test position is at more than 10 degrees deflection of lever. 摇杆偏斜10度以上之位置测定。	12±10mN·m(120±40 gf)
4	Accuracy of reset position of lever 摇杆复归精度	Measure the angle between the lever and the axial center line after the lever pushed to the direction of X-X(Y-Y) and resets. 摇杆推向X-X(Y-Y)方向自由复归后测量摇杆与垂直中心线的角度。	±3°
5	Knob strength 扭曲强度	/	3 Kgf.cm Min
6	The stopper strength of the lever 摇杆止动强度	Apply side force on the lever perpendicular to the lever’s axial direction. 垂直于摇杆的力作用于摇杆上。	More than 0.3N·m(3Kgf) 3 seconds min 大于0.3N·m(3Kgf)，至少3秒钟
7	Pull strength of lever 摇杆拉拔强度	Crust without damage, lever without abnormality . Electrical characteristics shall be satisfied with with specification . 外壳无破损，摇杆无异常，电气性能符合规定要求。	More than 50N(5Kgf) 3 seconds min 大于50N (5 Kgf)，至少3秒钟
	Push Strength of lever 摇杆推强度		More than 98N （10kgf） 3 seconds min 大于98N (10 Kgf)，至少3秒钟

4. Electrical characteristics
电气特性

NO. 序号	ITEM 项　目	CONDITIONS 条件	SPECIFICATION 规格
1	Total resistance 总阻值	Between terminal 1 and terminal 3. 1-3 端子间。	10K±20%
2	Resistance taper 阻抗特性型式	Percentage of the voltage of terminal 1-2 to the voltage of terminal 1-3. 端子1-2电压对端子1-3电压的百分比。	LinearType 直线性
3	Rated power 额定功率	The rated power should be changed according to the following chart when the ambient temperature changed. 它随环境温度按以下曲线变化。 Derating curve of rated dissipation  	0.0125W
4	Rated voltage 额定电压	E=√PR E:额定电压 Rated voltage(V) P:额定功率 Rated power(W) R:公称全阻值 Nominal total resistance(Ω) The rated voltage is calculated by above formula. When the rated voltage exceeds the maximum operating voltage, the maximum operating voltage should be the rated voltage. 额定电压按以上公式计算，当额定电压超过最大工作电压时，最大工作电压即为额定电压。	AC 50V or DC 5V

5	Temperature characteristic 阻抗温度特性	The without electrical load V.R should be stored at temperature of 70±3℃ for 5hrs and measure immediately. 将产品置于在70±3℃的恒温槽内以无负荷的条件下放置5小时后马上测量。	Variation of total resistance shall be within +5%/-20%. 总阻值相对于测试前变化率为+5%/-20%。
6	Voltage Divider Error 分压误差值	Voltage divider error is defined the ratio of the voltage terminals 1-2 to terminals 1-3 after the drive arm rested. 5V D.C. shall be applied to the terminals between 1and 3 and then voltage divider error shall be measured with the drive arm operation on the line X-X and Y-Y. (Terminal 1-2/Terminal 1-3×100%) 分压误差值是摇杆自由复归后端子1-2与端子1-3电压比例.将5V D.C电压加在端子1-3之间，分压误差值在摇杆运作于X-X和Y-Y方向到底复归后测试.(端子1-2/端子1-3 ×100%)	40%～60%
7	Noise 杂音	Rated voltage shall be applied(D.C.)to the terminals between 1 and 3.And then the noise shall be measured by circular operation with lever operated 26° Speed of circular operation:1 cycel/sec. For other procedures,refer to IEC pub.393-1-6,test method A. 在端子1脚和3脚间施加额定的直流电压，将摇杆推至26°位置进行圆周旋转测试。 圆周旋转测试速度：1来回/1秒 其他方法和步骤请参考IEC pub.393-1-6测试方法A。	300m Vp-p less than 杂音300mv以下
8	Insulation resistance 绝缘阻抗值	Apply one minute 250VDC to the individual terminals and case. 金属外壳与端子间加DC250V电压1分钟。	More than 100 MΩ. 100 MΩ以上。

9	Withstand voltage 耐电压特性	Apply one minute of 250VAC 50Hzto the individual terminals and case. 在特定端子与外壳间加 AC250V 50Hz 电压 1 分钟 。	Without arc or breakdown. 无损坏或弧光。

5. Endurance characteristics
耐久性能

NO. 序号	ITEM 项 目	CONDITIONS 条件	SPECIFICATION 规格
1	Resistance to soldering heat 焊锡耐热性	Manual Soldering: Less than 350℃ and quicker than 3 seconds. 手焊: 350℃以下, 3 秒以内。	Variation of total resistance shall be within ±5%, and terminals shall not work loose to injure electric performance after test.Be satisfied with 4.6 to 4.7. 总阻值变化±5%以内,测试后无端子松动,不会损坏电气性能(符合第4.6～4.7 条)。
2	Dry heat 耐热性	Temperature:80±2℃ Time: 96 hours The controller shall be subjected to standard atmospheric conditions for 2 hours , after which measurement shall be made. 在温度 80±2℃恒温槽中放置 96 小时, 取出后在正常状态下放置 2 小时后测试。	Variation of total resistance should be within $^{+5\%}_{-30\%}$, Should be satified clause 3.3.a mechanical characterritic and clause 4.6～4.7 an electrical characteristic. 全阻值变化要在 $^{+5\%}_{-30\%}$以内, 同时应满足第 3.3 条机械性能和第 4.6～4.7 条电气性能。
3	Cold 耐寒性	Temperature:-30 ±2℃ Time: 96 hours Surface moisture shall be removed, and then the controller shall be subjected to standard atmospheric conditions for 2 hours, after which measurement shall be made. 在温度-30±2℃恒温槽中放置 96 小时, 表面水份摄取后在正常状态下放置 2 小时后测试。	Variation of total resistance should be within±20%, Should be satified clause 3.3.a mechanical characterritic and clause 4.6～4.7 an electrical characteristic. 总阻值变化要在±20%以内, 同时应满足第 3.3 条机械性能和第 4.6～4.7 条电气性能。

4	Damp heat 耐湿性	Temperature: 60 ± 2℃ Humidity: 90~95%RH Time: 96 hours Surface moisture shall be removed. And then the controller shall be subjected to standard atmospheric conditions for 2hours, after which measurement shall be made. 在温度60±2℃ 90%~95%RH恒温槽中放置96小时，表面水份摄取后在正常状态下放置2小时后测试。	Variation of total resistance should be within+35%/-5%, Should be satified clause 3.3.a mechanical characterritic and clause 4.6～4.7 an electrical characteristic. 总阻值变化要在+35%/-5%以内，同时应满足第3.3条机械性能和第4.6～4.7条电气性能。
5	Temperature cycling test 温度循环测试	Low temperature : -20±3℃ 30 minutes High temperature: +60±3℃ 30 minutes Number of cycles: 5 Surface moisture shall be removed, and then the controller shall be subjected to standard atmospheric conditions for 2 hours , after which measurement shall be made. 在低温为-20±3℃恒温槽放置30分钟,高温60±3℃放置30分钟,测试5次，表面水份摄取后在正常状态下放置2小时后测试。	Variation of total resistance should be within±20%, Should be satified clause 3.3.a mechanical characterritic and clause 4.6～4.7 an electrical characteristic. 总阻值变化要在±20%以内，同时应满足第3.3条机械性能和第4.6～4.7条电气性能。
6	Free falling 自由落下试验	Height: 75cm. Number of falls: 3 times 从高度为75厘米落下测试3次后。	Without damage and lever deformation, but deformations of terminals and molded parts are allowed. Without the looseness and failing function of witch. 无不良性能产生,无松动及开关性能损坏,端子变形除外。

7	Number of cycles 耐久寿命	Mechanical life should be tested 1,000,000 cycles at the the speed of one cycle per second without electrical load when joystick rotate 360° at 26° position. 无负载状态下以1个来回/秒速度将摇杆推至26.0°位置进行360°旋转测试，寿命1,000,000圈。	Variation of total resistance should be within ±30%, Sliding noise should be within 300 mV, Voltage divider error be 40～60%. Accuracy of reset positionshould be within 8%.without mechanical malfunction.Be satisfied with 3.1 to 3.4. 总阻值变化±20%以内，杂音300mV以内，分压误差为40～60%，复归值为6%以内，机械性能无异常(符合第3.3条)。
	Switch number of cycles 开关寿命	Under electrical load DC5V/5mA, compress 7.4N (750gf) force to the lever which is released and reset to vertical position. Switch life should be tested more than 100,000 cycles at the the speed of 2 to 3 cycles per second. 负载状态下(DC5V/5mA)，在摇杆自由复归后的垂直方向施加7.4N(750gf)的按压力,以2-3次/秒的速度对开关进行测试,寿命100,000次以上。	Contact resistance 200mΩ Max, No mechanical malfunction.Be satisfied with 6.1 and 6.2 接触阻抗最大200mΩ, 机械方面能动作(符合第6.1条和第6.2条)。

6.Switch characteristics (FOR WITH-SWITCH TYPE)
开关规格(适用于带开关机种)

NO. 序号	ITEM 项　目	CONDITIONS 条件	SPECIFICATION 规格
1	Operating force 作动力	Apply side force perpendicular to the lever's axial direction on the lever until the lever stops, measure the max force value. 将一个轴向力施加于摇杆上直到其不动为止,量取施力期间之最大值。	7.4±3N (750±300 gf)

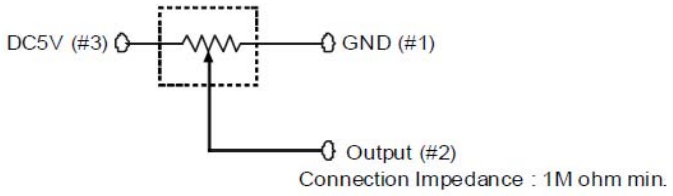
2	Travel 移动量	Put the switch lever upward, apply 2 times of the static operating force over the lever’s axial direction of the lever, measure the variance of the switch stroke. 将开关操作部位(摇杆)置于静止位置,并在操作柄中央施加两倍于作动力之静负荷测量柄被压到不动时之移动距离。	$0.4^{+0.5}_{-0.3}$ mm
3	Maximum Ratings 最大定格电压	Within 70℃ 70℃以内。	12 V DC 50 mA
4	Contact resistance 接触阻抗	Apply 2 times of the operating force of the static load on the vertical direction of the lever, measure the resistance by using the Contact Resistance Tester with 1KHZ, 20mV, 5~50mA of current. 将两倍于作动力之静负荷加于操作柄之中央以(1KHZ,20mV, 5~50mA)微电流接触阻抗计测定。	Less than 100 mΩ 低于 100 mΩ
5	Insulation resistance 绝缘阻抗	A voltage of DC100V is applied between terminals. 以DC100V之电压加于端子间测定。	More than 100 MΩ 100 MΩ以上
6	Withstand voltage 耐电压	A voltage of AC 250V/2mA (50~60HZ) shall be applied for 1min between terminals. 以AC250V/2mA (50~60HZ)电压施加于端子间1分钟。	Without breakdown. 无绝缘破坏之现象。

7.注意事项
Matters needing attention

NO. 序号	ITEM 项 目	Content 内容

1	Use and storage environment 使用及储存环境	Resistors of potentiometers are mostly made of polycarbonate synthetic resins. They should avoid contact with ammonia, other amines, alkali aqueous solutions, aromatic hydrocarbons, ketones, lipid hydrocarbons, strong chemicals (high acid-base value), etc. Otherwise, their performance will be affected. 电位器之电阻体大多采用多碳酸类的合成树脂制成，应避免与以下物品接触：氨水，其它胺类，碱水溶液，芳香族碳氢化合物，酮类，脂类的碳氢化合物，强烈化学品（酸碱值过高）等，否则会影响其性能。 The surface of potentiometer should avoid condensation or water droplets, avoid using in wet places, in order to prevent insulation deterioration or short circuit. 电位器表面应避免结露或有水滴存在，避免在潮湿地方使用，以防止绝缘劣化或造成短路。 The power of the carbon film of potentiometer can withstand the ambient temperature of 70℃, and it may lose its function when the temperature is higher than 70℃ 电位器碳膜的功率能承受周围的温度为 70℃，当使用温度高于 70℃时可能会丧失其功能。 The rotary operation force (rotation or sliding) of potentiometer will become lighter with the increase of temperature and tighter with the decrease of temperature. If the potentiometer is used in low temperature environment, it should be explained in order to use special low temperature resistant grease. 电位器回转操作力（旋转或滑动）会随温度的升高而变轻，随温度降低而变紧。若电位器在低温环境下使用时需说明，以便采用特制的耐低温油脂。 In order to ensure the weldability of the terminals, the storage temperature is - 10 C ~ + 40 C, and the relative temperature and humidity are 30 - 85%. It will be used within 6 months after delivery. If the product has been stored for more than six months, please check its solderability beforehand. 为保证端子的可焊性，储存温度为-10° C~+40° C，相对温湿度为30~85%，交货后 6 个月内使用。如果产品已存放六个月以上，请事先检查其可焊性。

2	Welding conditions 焊接条件	The terminal of potentiometer should avoid using water capacitive flux when welding, otherwise it will promote metal oxidation and material mildew; avoid using inferior flux, poor soldering may cause tin difficulty, lead to poor contact or circuit break. 电位器之端子在焊接时应避免使用水溶性助焊剂，否则将助长金属氧化与材料发霉;避免使用劣质焊剂,焊锡不良可能造成上锡困难,导致接触不良或者断路。 If the welding temperature is too high or the welding time is too long, the terminal of the potentiometer may cause damage to the potentiometer. Welding of pin-type terminals should be completed in 235±5℃ within 3 seconds. Welding should be over 1.5mm of the potentiometer body. No solder should be used to flow through the circuit board during welding. Welding of wire-type terminals should be completed in 350±10℃ within 3 seconds. And the terminal should avoid heavy pressure, otherwise it is easy to cause bad contact. 电位器之端子在焊接时若焊接温度过高或时间过长可能导致对电位器的损坏。插脚式端子焊接时应在 235℃±5℃，3 秒钟内完成，焊接应离电位器本体 1.5mm 以上，焊接时勿使用焊锡流穿线路板；焊线式端子焊接时应在 350℃±10℃，3 秒钟内完成。且端子应避免重压，否则易造成接触不良。 When welding, the height of rosin (flux) entering the printing press plate should be adjusted properly, so flux should be avoided from intruding into the potentiometer, otherwise it will cause bad contact between brush and resistor, resulting in INT and bad noise. 焊接时，松香（助焊剂）进入印刷机板之高度调整恰当，应避免助焊剂侵入电位器内部，否则将造成电刷与电阻体接触不良，产生 INT，杂音不良现象。
3	Assembly conditions 装配条件	In the process of putting knob on potentiometer sleeve, the thrust force used should not be too large (not exceeding the parameters of the pulling force of axis in Specification), otherwise it may cause damage to potentiometer. 在电位器套上旋钮的过程中，所用推力不能过大（不能超过《规格书》中轴的推拉力的参数指标），否则将可能造成对电位器的损坏。

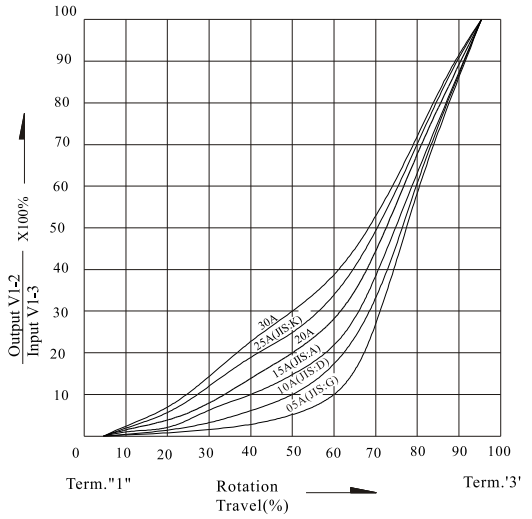
4	wiring method 接线方法	Potentiometer is best used in voltage adjustment structure, and the connection mode should choose "1" foot grounding; current adjustment structure should be avoided, because the contact resistance between resistance and contact plate is not conducive to the passage of large current. 电位器最好应用于电压调整结构，且接线方式宜选择“1”脚接地；应避免使用电流调整式结构，因为电阻与接触片间的接触电阻不利于大电流的通过。 The design condition of rocker potentiometer is shown in the figure, that is, connecting the output terminal directly to the A/D port of the microprocessor. Make sure the connection impedance is greater than 1 megaohm. 摇杆电位器的设计条件如图所示，即连接输出终端直接连接微处理器的A/D端口。请确保连接阻抗大于1兆欧。 

Approved 核 准	Check 审 查	Design dept. 经 办 者

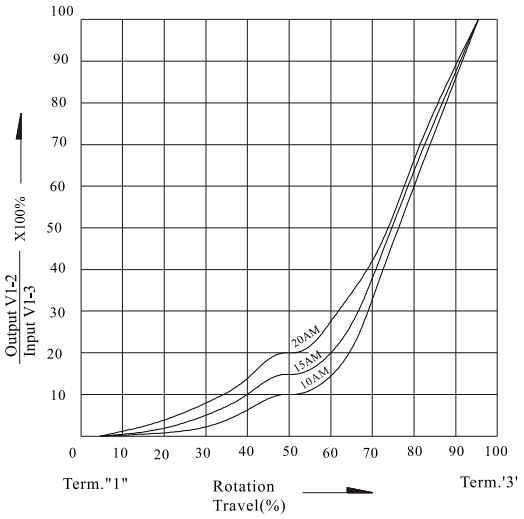
電阻規律特徵表

RESISTANCE TAPER CHARACTERISTICS

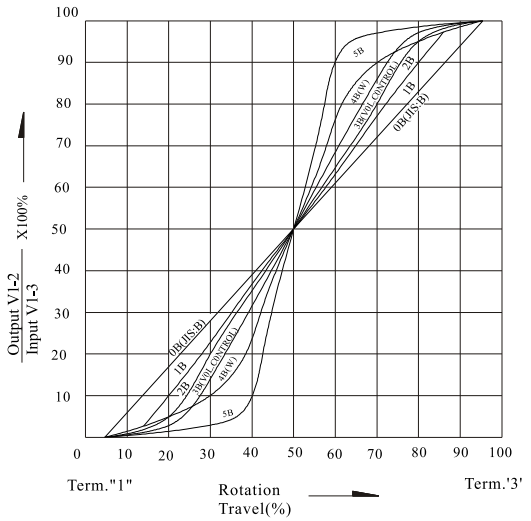
TAPERS (A) SERIES



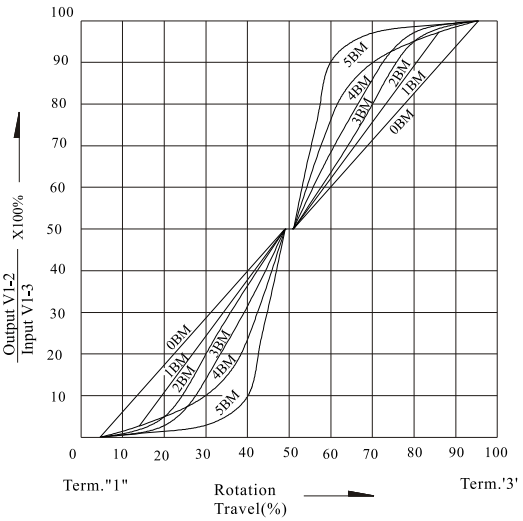
TAPERS (A) WITH 50% TAP



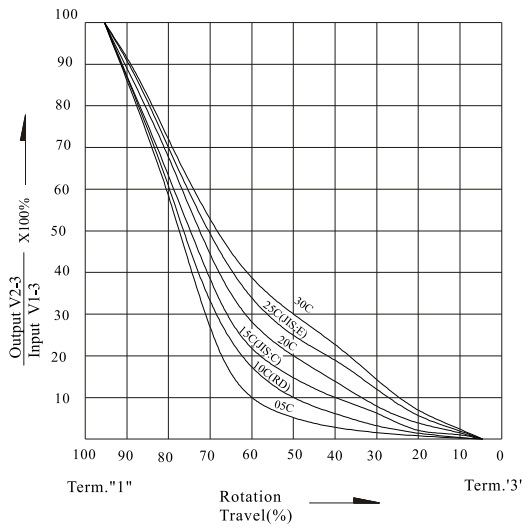
TAPERS (B) SERIES



TAPERS (B) WITH 50% TAP



TAPERS (C) SERIES



TAPERS (M) & (N)