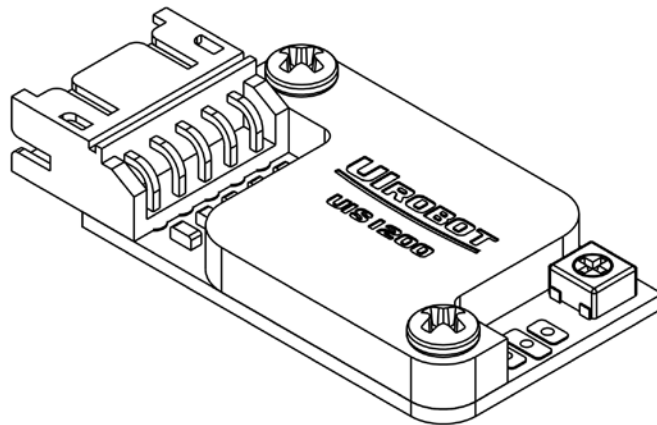




使用手册

UIS1200 系列 电容式传感器信号检测控制器



UIS1200C/D

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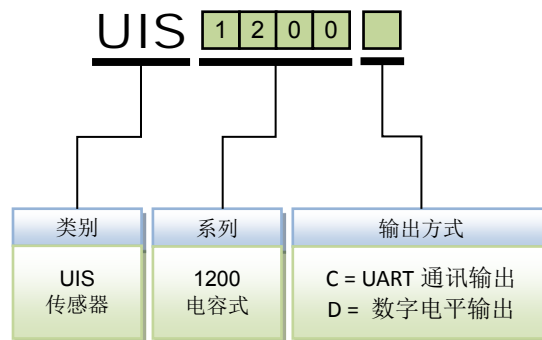
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UIROBOT的UIM24XXX系列步进电机（控制）驱动器和UIM25XX系列转换控制器外观设计均以申请专利保护。

[UIS1200 产品订购说明]

在订购 UIS1200 系列产品时请按以下格式提供产品号，以便我们准确及时地为您提供产品：

UIS1200 产品牌号



UIS1200 电容式传感器信号检测控制器

产品特征

- 微小体积：17mm×27mm×4mm（无接插件，控制端口直接焊线）
17mm×27mm×6mm（有接插件，2mm 2x5 连接器）
- 自动调整量程和精度
- 多档位数字输出
- UART 通讯输出
- 最小容值检测小于 1pf，适用于微电容变化场合

简介

UIS1200 是一款微型智能电容式传感器的检测控制器。其性价比高，安装非常简便灵活。

UIS1200 能产生激励波形然后将容式传感器（例如液位检测，接近开关）的反馈转化成 1 至 5 档数字电平输出。

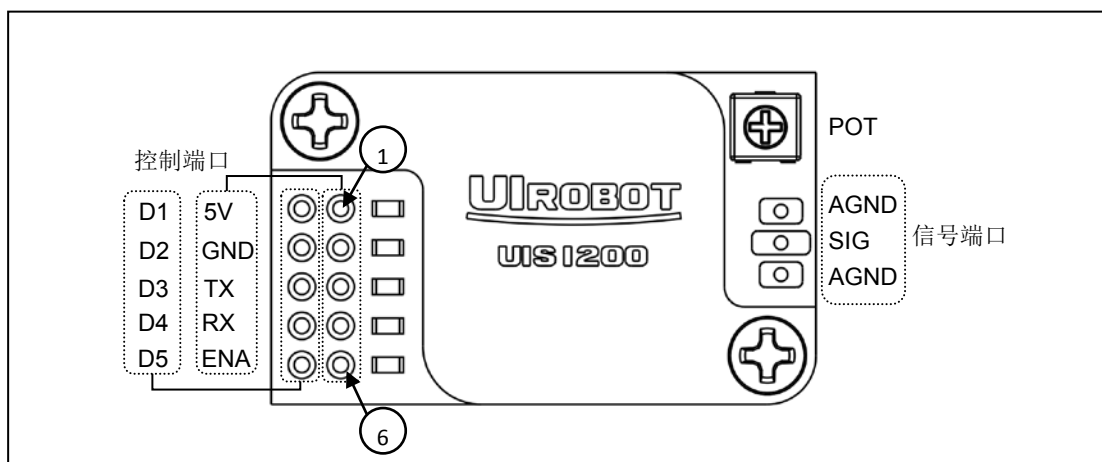
UIS1200 能够检测小于 1pf 的电容变化。采用智能自适应控制，能够根据所接入的电容传感器以及当前工况自动调整量程和灵敏度，取得最佳的检测精度。自带的精密电位器能够进一步调整。

UIS1200 体积小于 17mm×27mm。其金属屏蔽罩能够有效防止外界电场干扰以及为内部芯片提供机械上的保护。其与容式传感器的接口形式灵活，既可直接焊接，亦可使用同轴电缆连接器（附录 B）。

UIS1200C/D

接线端口

图 0-1: 接线端口



控制端口

表 0-1: 控制端口说明

端口	符号	说明
1	5V	工作电压正极。电压：5VDC。
2	GND	工作电压地线，即 0V（工作电压正负极不可接错）。
3	TX	UART 模块发送端，仅针对 UIS1200-C（未来产品）有效。
4	RX	UART 模块接收端，仅针对 UIS1200-C（未来产品）有效。
5	D1~D5	数字电平输出，仅针对 UIS1200-D 有效。
6	ENA	使能端。

信号端口

表 0-2: 信号端口说明

端口	说明
SIG	信号输入，连接被测电容一端。
AGND	模拟地，连接被测电容另一端。

注： SIG 端口电压不得高于 3.3V，否则会永久性损坏控制器。

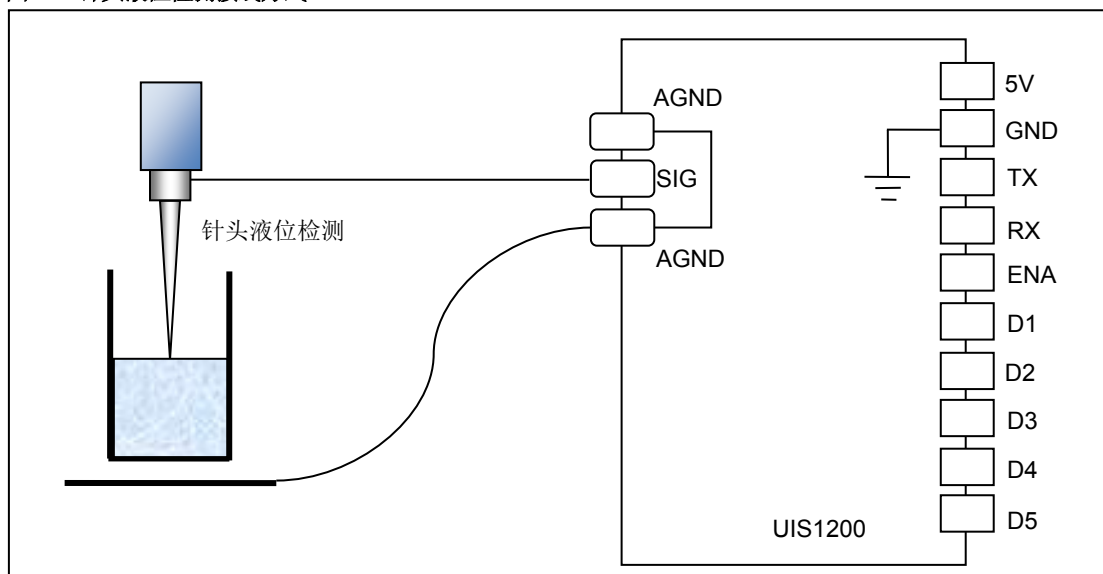
典型接线图例

UIS1200 电容式传感器信号检测控制器接线非常直观。用户只须将容式传感器接到控制器即可。UIS1200 常用场景包括：针头液位检测、容器液位检测及电容值检测等，接线方式如下所示。注：如果希望使用普通的导线来连接被测电容和 UIS1200 信号端口（不使用同轴电缆），则应将 UIS1200 放置于距离被测电容尽可能近的位置。距离远时必须使用同轴电缆连接，以避免信号传输过程中外界对信号干扰。

探针针头液位检测

对于加液针探测液面的应用，可将探针（导电材料制）接入 SIG 信号端，并且将液体容器的固定座（或者机架，或者位于液体容器近旁的任何导电物体）接入 AGND 信号端。

图 0-2: 针头液位检测接线方式

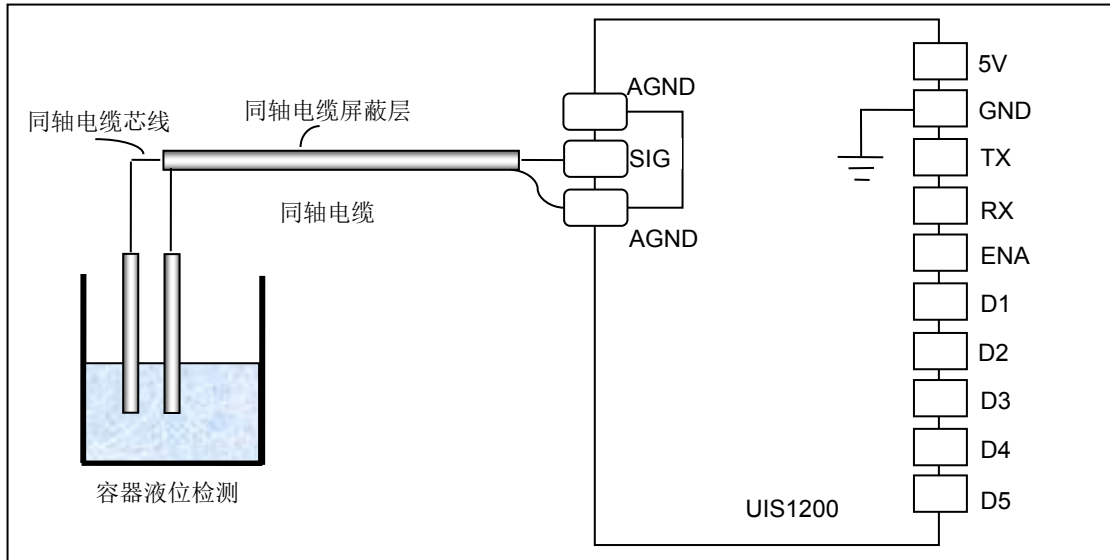


警告： SIG 端口电压不得高于 3.3V，否则会永久性损坏控制器。

容器液位检测

对于检测容器内液位的应用，可将两根外层涂敷绝缘层的导电棒分别与 SIG 和 AGND 信号端连接。

图 0-3: 容器液位检测接线方式

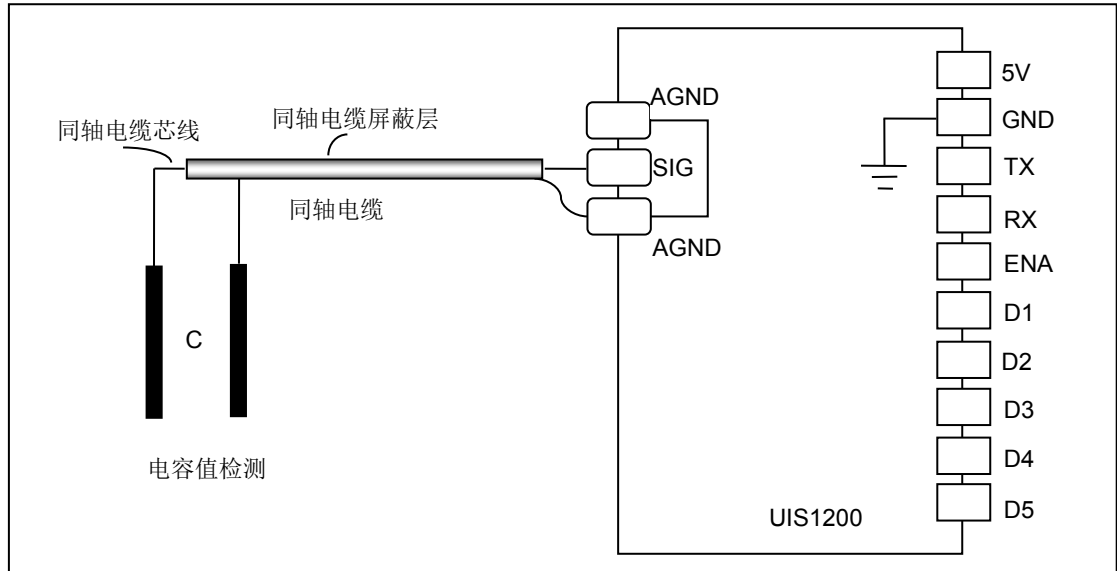


警告： SIG 端口电压不得高于 3.3V，否则会永久性损坏控制器。

电容值检测

对于一般的电容值变化检测应用,可将被测电容的导电体分别与 SIG 和 AGND 信号端连接。

图 0-4: 电容值检测接线方式



警告: SIG 端口电压不得高于 3.3V, 否则会永久性损坏控制器。

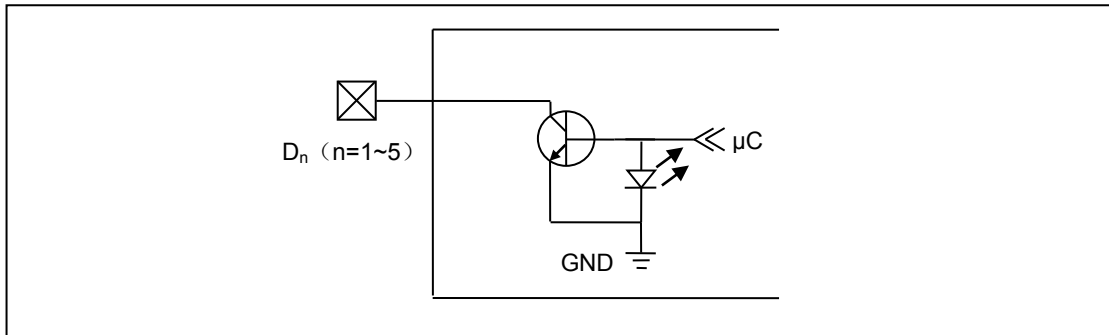
数字电平输出

UIS1200-D 在读取了被测电容值后，根据与阈值微调电阻 POT 的电压值进行比较，然后根据比较的结果在 D1-D5 的端口输出相应的状态(见表 0-3)。由于 UIS1200-D 采用了 OC(即开漏极输出)，当某个 LED 点亮时，其相应的端口就接地（如图 0-5 所示）。

数字电平输出电路

UIS1200-D 端口内部的驱动采用开漏极输出，如图 0-5 所示。当三极管开关为断路时，Dn 端口电压为 5V，LED 不亮，当三极管开关通路时，Dn 端子电压为 0V，LED 点亮。通过 D1~D5 对应 LED 的状态，可以得知 UIS1200 所连接电容传感器的容值变化状况。Dn 端口的驱动能力不低于（吸收电流）50mA。

图 0-5: 数字电平输出电路



工作原理和逻辑

UIS1200-D 内置高性能实时微处理器。能够将测得的电容变化值根据用户设定（由 POT 设定）的跳变阈值转化为相应的电平值，并通过 LED 和相应的开漏极端口输出。各端口 Dn 的状态以及相应的 LED 状态变化逻辑由图 0-6 给出。

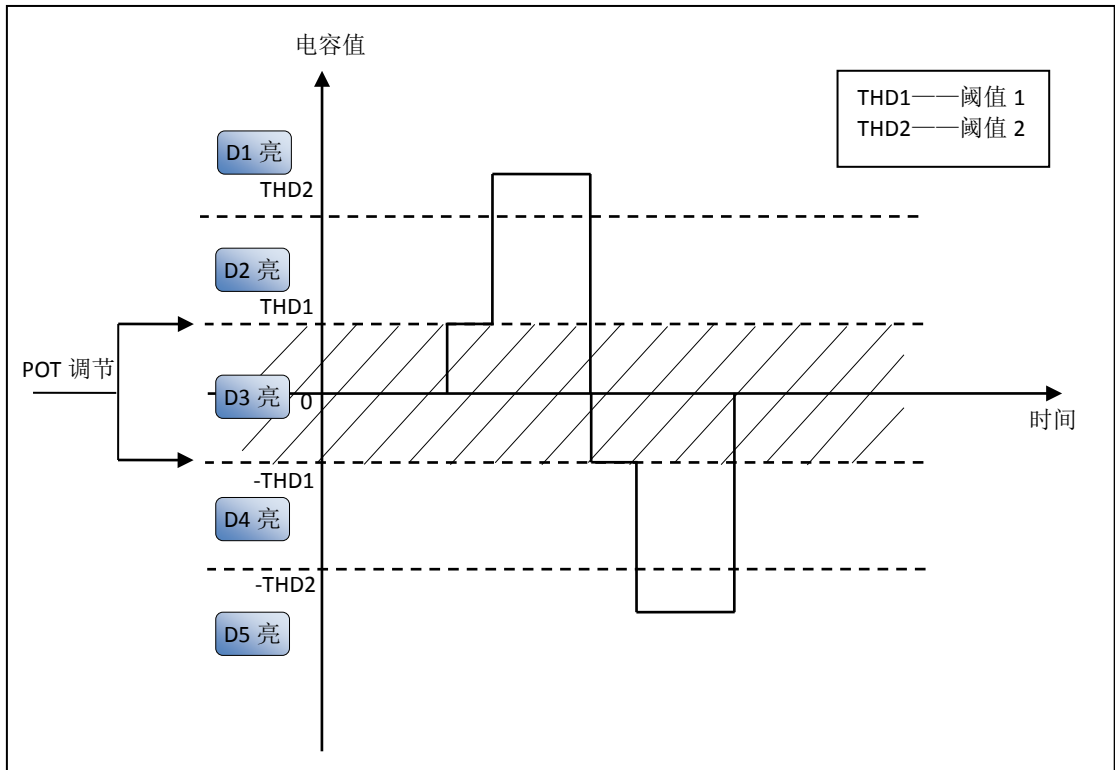
如果将电容值变化定义为 ΔC_{in} ，则各 LED 状态对应的电容值变化状态有如下对应关系：

表 0-3: 容值变化与 LED 状态关系

ΔC_{in}	LED 状态
$-THD1 < \Delta C_{in} < THD1$	D3 对应 LED 亮
$THD1 < \Delta C_{in} < THD2$	D2、D3 对应 LED 亮
$THD2 < \Delta C_{in} < +\infty$	D1、D2、D3 对应 LED 亮，表明电容值增大
$-THD2 < \Delta C_{in} < -THD1$	D3、D4 对应 LED 亮
$-\infty < \Delta C_{in} < -THD2$	D3、D4、D5 对应 LED 亮，表明电容值减小

注：THD1 用户可通过 POT 自行调节，THD2 由控制器内部根据 THD1 设定，用户无法更改。

图 0-6: Dn 对应 LED 状态示意图

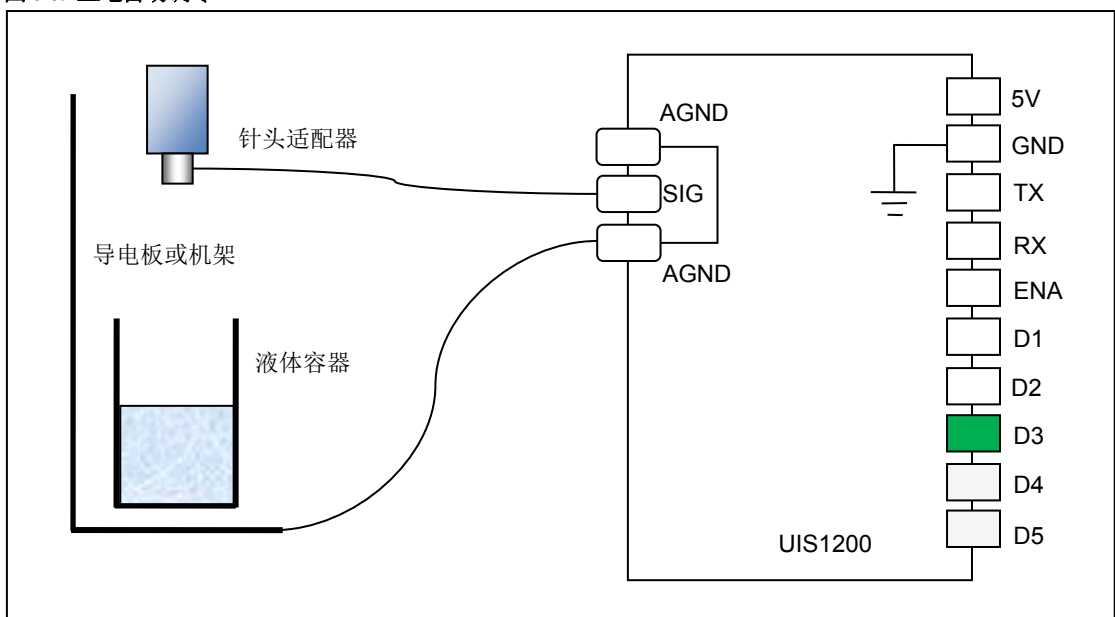


POT 调整流程

为了便于理解，在此以针头液位检测为例说明通过调整 POT 来设定 UIS1200-D 容值阈值的过程。

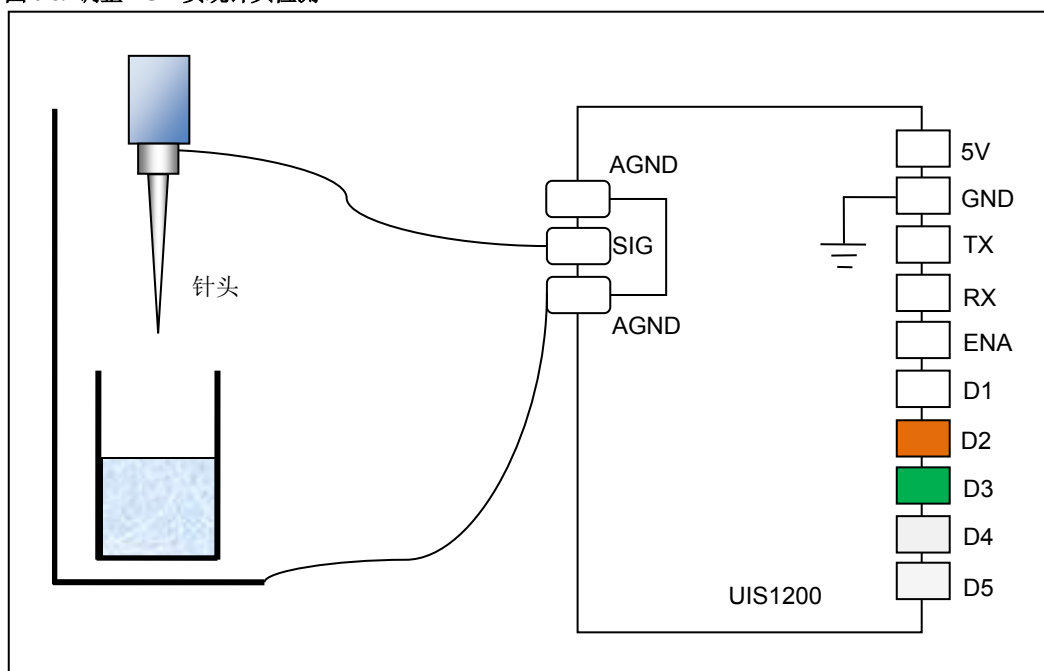
- **UIS1200-D 上电后，自动调零。**此时 D3 对应的 LED 亮，表明环境电容（例如针头适配器和左侧导电板间电容值）已设定为零。

图 0-7: 上电自动调零



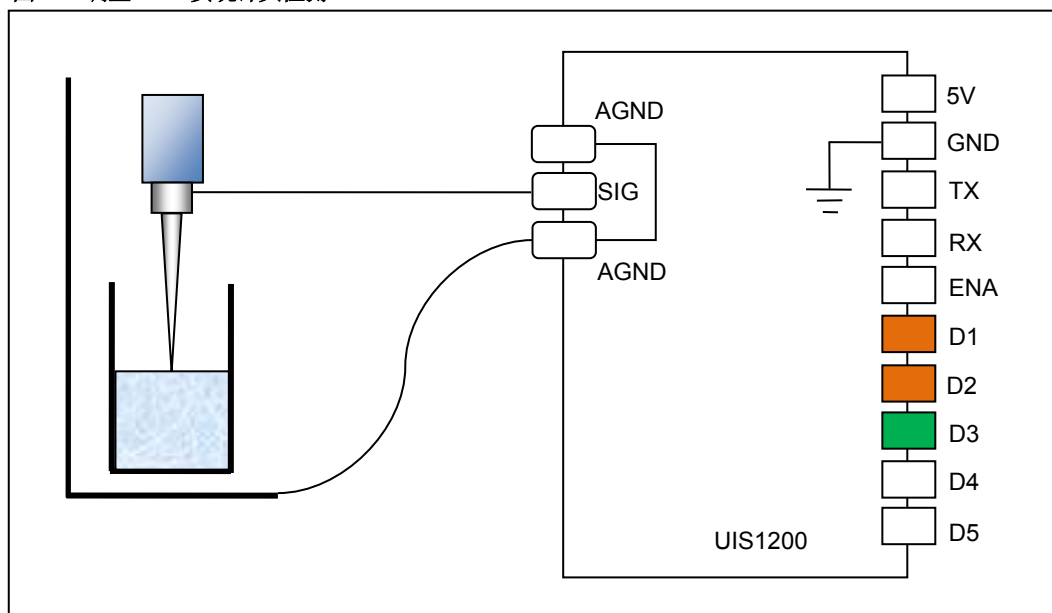
- 调节 POT（微调电阻），使控制器达到如下状态：一旦针头插上（电容值增大数个皮法 pF），D2 对应 LED 亮，一旦针头拔下，D2 对应 LED 灭。此时电容值即为 THD1。一旦调定 THD1，在实际工作中，由 D2 端口的状态即可稳定检测出针头存在和脱落。

图 0-8: 调整 POT 实现针头检测



- 设定了 THD1 后，UIS1200 会根据用户设定的 THD1 自行设定 THD2。在工作过程中，一旦针头接触到液面，将导致被测电容值急剧升高超过 THD2，从而导致 D1 对应的 LED 亮，D1 端子输出端接地。

图 0-9: 调整 POT 实现针头检测



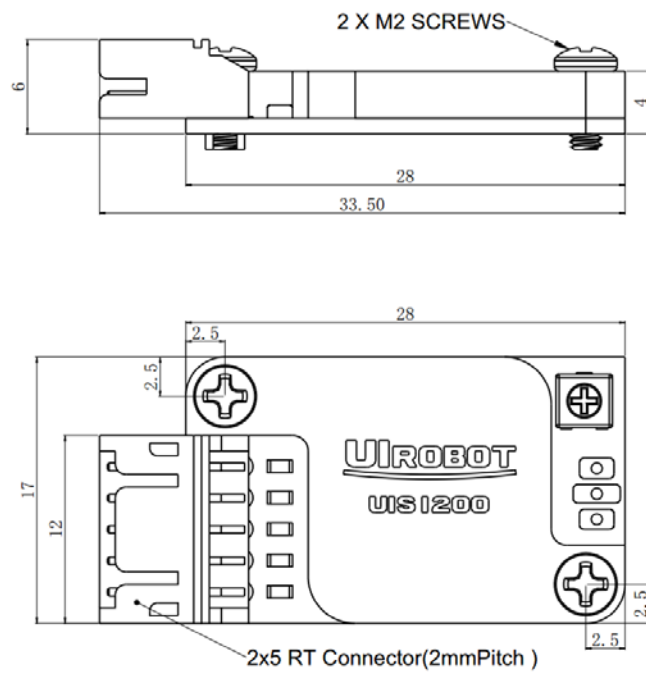
电容值降低检测原理与上述过程类似。

URAT通讯输出

后续将推出 URAT 通讯输出型产品 (UIS1200-C)，此文档中对此型号产品工作原理暂无描述。

性能指标

工作电压	4V – 5.5VDC
输出电平	0/4V-5.5VDC(工作电压) 或者 开漏极输出
输出档位	5 档
输出方式	数字电平 或者 UART 通讯
检测精度	1pf
检测量程	自动调整
响应频率	1KHz

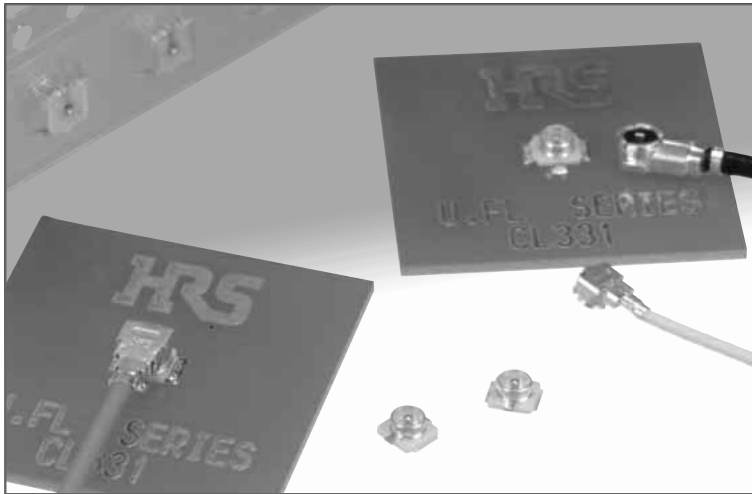


单位: mm

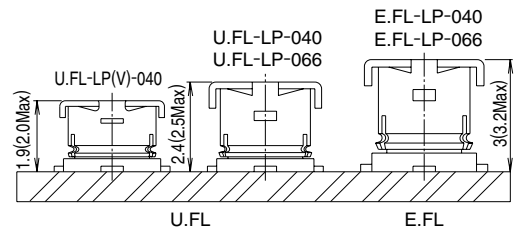
附录B 同轴电缆连接器

为保证测量精度，建议采用同轴电缆连接器将UIS1200与容式传感器连接。以下为广濂电机Hirose的同轴电缆连接器使用手册。

注：请根据所使用的同轴电缆直径来选择相应的连接器型号。



Mated height comparison (with E.FL series)



■ Features

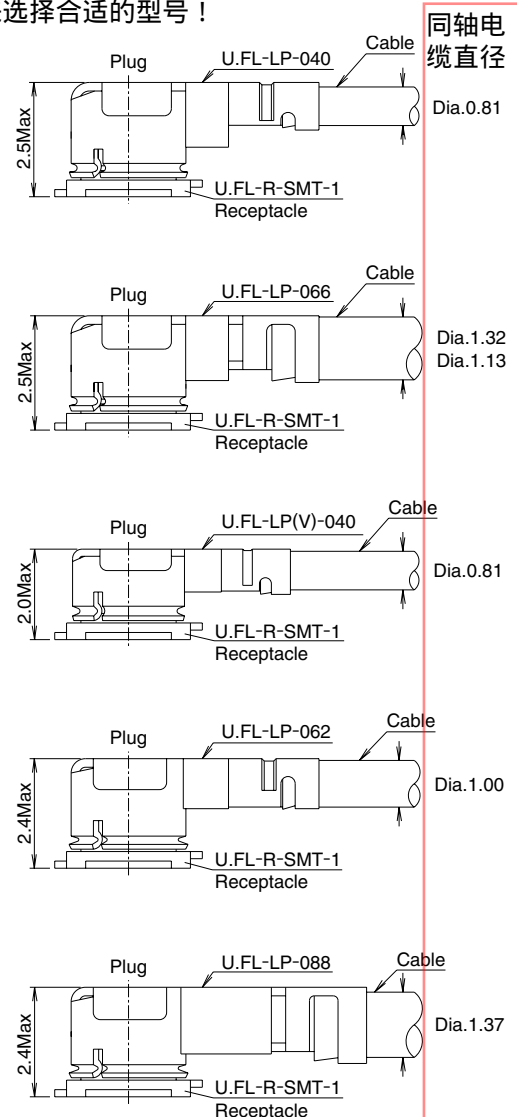
- Nominal mated height of 1.9 or 2.4mm (Max. 2.0 or 2.5mm)**
- Small mounting area**
The receptacle occupies an area of 7.7mm².
- Light weight**
Receptacle: 15.7mg
- Accepts high frequency transmission.**
To meet the frequency requirements of a wide variety of miniature devices, the connectors offer high frequency performance from DC to 6GHz, with a V.S.W.R. of 1.3 to 1.5 max.
- Automatic board placement**
Packaged on tape-and-reel the receptacles can be placed with vacuum nozzles of the automatic placement equipment.
- Plugs are terminated with ultra-fine coaxial (fluorinated resin insulated) cable**
Standard ultra-fine coaxial cable of 0.81mm diameter (single braid shielding) is used for the plug termination, assuring secure and stable connections.
- Simple connector mating / unmating**
Use of available extraction tool assures correct disconnection of the plug and receptacle.
- Verification of the fully mated condition**
Tactile click sensation confirms fully mated condition, assuring complete electrical and mechanical connection.

■ Applications

Cellular phones, PHS, mobile phones, wireless communication devices, electronic measuring instruments, GPS, wireless LAN, Bluetooth and any application requiring high frequency transmission using small coaxial connectors.

● Space Factor of Mated Connector.

注意：请根据所使用同轴电缆直径来选择合适的型号！



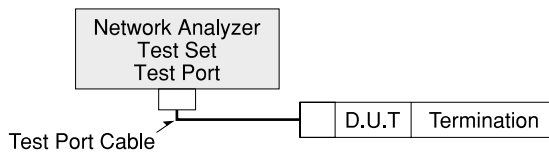
Product Specifications

Ratings	Nominal characteristic impedance	50 ohms	Operating temperature range	-40°C to +90°C	Storage temperature range	-30°C to +70°C
	Frequency range	DC to 6GHz	Operating humidity	90%RH max.	Storage humidity	90%RH max.

Item	Specification	Conditions	
1. Contact resistance	Center : 20 m ohms max. Outer : 10 m ohms max.	10 mA max.	
2. Insulation resistance	500 M ohms min.	100 V DC	
3. Withstanding voltage	No flashover or insulation breakdown.	200 V AC / 1 minute	
4. V.S.W.R.*	Part No.	Up to 3GHz	3 to 6GHz
	U.FL-LP-040 dia.0.81mm Coaxial Cable Assembly	1.3 Max	1.35 Max
	U.FL-LP(V)-040 dia.0.81mm Coaxial Cable Assembly	1.3 Max	1.3 Max
	U.FL-LP-066 dia.1.13mm Coaxial Cable Assembly	1.3 Max	1.4 Max
	U.FL-LP-066 dia.1.32mm Coaxial Cable Assembly	1.3 Max	1.5 Max
	U.FL-LP-062 dia.1mm Coaxial Cable Assembly	1.3 Max	1.3 Max
	U.FL-LP-088 dia.1.37mm Coaxial Cable Assembly	1.3 Max	1.4 Max
5. Durability (mating / un-mating, with corresponding plug)	Contact resistance Center : 25 m ohms max. Outer : 15 m ohms max.	30 cycles	
6. Vibration	No electrical discontinuity of 1μs min.	Frequency: 10 to 100 Hz, single amplitude of 1.5mm, acceleration of 59m/s ² , for 5 cycles in the direction of each of the 3 axis.	
7. Shock	No damage, cracks or parts dislocation.	Acceleration of 735 m/s ² , 11ms duration, sine half-wave waveform, 3 cycles in each of 3 axes.	
8. Humidity (Steady state)	No damage, cracks or parts dislocation. Insulation resistance 10 M ohms min.(humidity high) Insulation resistance 500 M ohms min.(dry)	96 hours at temperature of 40°C and humidity of 95%.	
9. Temperature cycle	No damage, cracks or parts dislocation. Contact resistance: 25 m ohms max. (Center) 15 m ohms max. (Outer)	Temperature: -40°C→+5 to +35°C→+90°C→+5 to +35°C Time: 30min.→ 3min. →30min.→ 3min. 5 cycles	
10. Salt spray	No excessive corrosion	5% salt water solution, 48 hours	

*V.S.W.R. Measurement System

The above V.S.W.R. standard values were measured using the measurement connection shown below.



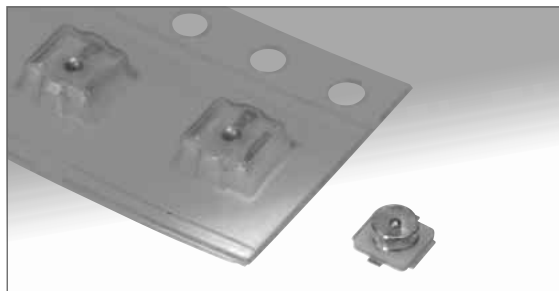
Note 1: Cable type connectors were measured with SMA conversion adapters attached to both ends of the harness product of a suitable 100cm cable.

Note 2: Board type connectors were mounted to a 50Ω glass epoxy board and measurements were conducted with SMA conversion adapters attached.

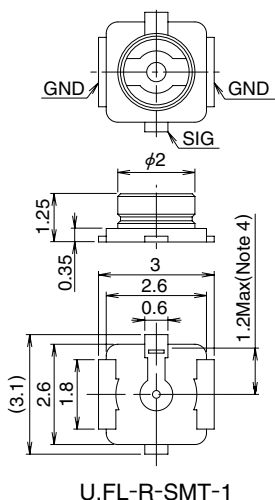
Material / Finishes

Part	Material		Finish	Remarks
Shell	Phosphor bronze		Silver plated	_____
Male center contact	Brass		Gold plated	_____
Female center contact	Phosphor bronze		Gold plated	_____
Insulator	Plug	PBT	Color: Black	UL94V-0
	Receptacle	LCP	Color: Beige	UL94V-0

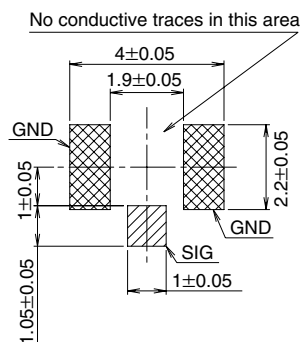
■Receptacles



- Note 1: Receptacles of (01) specification are sold by the bag with 100 pieces per bag. Please order in pack units.
- Note 2: Receptacles of (10) specification are sold by the reel (which contains 2,500 pieces). Please order in reel units.
- Note 3: Receptacles of (40) specification are sold by the reel (Which contains 4,000 pieces)
- Note 4: This area may be covered by insulating material.



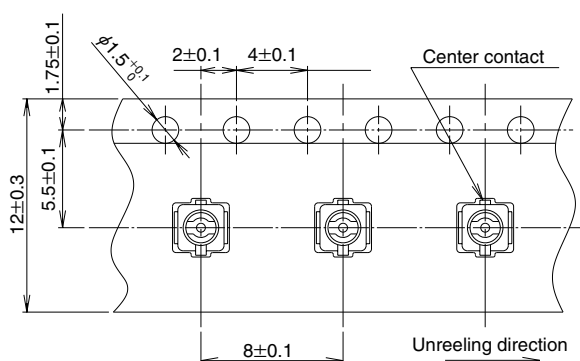
◆Recommended PCB Mounting Pattern



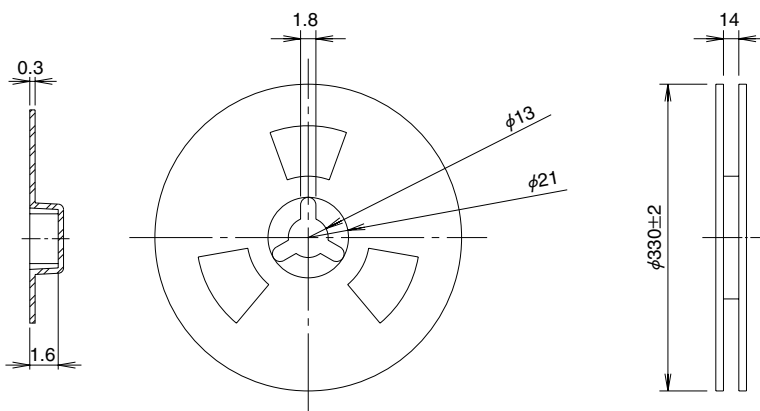
Part No.	CL No.	Packaging	Weight / EA	RoHS
U.FL-R-SMT-1(01)	331-0472-2-01	Bag packaging (100 pieces/bag)	15.7/mg	YES
U.FL-R-SMT-1(10)	331-0472-2-10	Reel packaging (2,500 pieces/reel)		
U.FL-R-SMT-1(40)	331-0472-2-40	Reel packaging (4,000 pieces/reel)		

●Packaging Specifications

Embossed Carrier Tape Dimensions



Reel Dimensions



■Cable Assembly (Plug)



	U.FL-LP-040	U.FL-LP-066	U.FL-LP(V)-040	U.FL-LP-062	U.FL-LP-088
Part No.					
Mated Height	2.5mm Max. (2.4mm Nom.)	2.5mm Max. (2.4mm Nom.)	2.0mm Max. (1.9mm Nom.)	2.4mm Max. (2.3mm Nom.)	2.4mm Max. (2.3mm Nom.)
Applicable cable	Dia. 0.81mm Coaxial cable	Dia. 1.13mm and Dia. 1.32mm Coaxial cable	Dia. 0.81mm Coaxial cable	Dia. 1mm Coaxial cable	Dia. 1.37mm Coaxial cable
Weight (mg)	53.7	59.1	34.8	45.5	71.7
RoHS	YES				

●Cable Guide

Description	Cable Type	Cable Specification						
		Inner Conductor*	Dielectric Diameter	Outer Conductor*	Jacket Diameter	Nominal Impedance	Nominal attenuation	
							At 3GHz	At 6GHz
Dia.0.81mm Coaxial Cable	04	7/0.05 SA (AWG36)	Dia.0.40 PFA	Single Shield TA[SA]	Dia.0.81 PFA	50 ohms	6.52dB/m [6.45dB/m]	9.52dB/m [9.42dB/m]
Dia.1.13mm Coaxial Cable	068	7/0.08 SA (AWG32)	Dia.0.68 FEP	Single Shield TA[SA]	Dia.1.13 FEP	50 ohms	3.73dB/m [3.43dB/m]	5.44dB/m [5.13dB/m]
Dia.1.32mm Coaxial Cable	066	7/0.08 SA (AWG32)	Dia.0.66 FEP	Double Shield TA	Dia.1.32 FEP	50 ohms	3.8dB/m	5.6dB/m
Dia.1mm Coaxial Cable	062	7/0.071 SA (AWG33)	Dia.0.62 FEP	Tape, single Shield TAT	Dia.1 FEP	50 ohms	3.1dB/m	4.4dB/m
Dia.1.37mm Coaxial Cable	088	7/0.102 SA (AWG30)	Dia.0.88 FEP	Single Shield TA	Dia.1.37 FEP	50 ohms	2.8dB/m	4.3dB/m

(data as provided by cable suppliers, for reference only)

* SA : Silver plated annealed copper wire, TA : Tin plated annealed copper wire, TAT : Tin plated copper wire alloyed with tin

How to Specify Plug Cable Assembly



Ordering Information

U.FL - [] LP - [] - A - (L)

①
②
③
④

① Series name	U.FL
② Assembly type	LP: Single ended 2LP: Double ended
③ Cable type	04 : Dia.0.81mm Coaxial Cable 068 : Dia.1.13mm Coaxial Cable 066 : Dia.1.32mm Coaxial Cable 062 : Dia.1 mm Coaxial Cable 088 : Dia.1.37mm Coaxial Cable
④ Total length(mm)	Length(L)

Standard Tolerances for (L)

L	Standard Tolerance
L=35 to 200mm	± 4mm
L=200 to 500mm	± 8mm
L=500 to 1000mm	±12mm
L=Longer than 1000mm	±1.5% of (L)

Note1: Minimum available length (L) is 35mm

Note2: Contact nearest HRS representative if different tolerances are required.

Note3: Contact Nearest HRS representative if one end requires preparation.

Part No. of Plug	Part No. of Cable Assembly	Description	RoHS
U.FL-LP-040	U.FL-2LP-04N1T-A-(L)	Dia. 0.81mm double ended coaxial cable, color: white	YES
	U.FL-2LP-04N2T-A-(L)	Dia. 0.81mm double ended coaxial cable, color: black	
	U.FL-LP-04N1T-A-(L)	Dia. 0.81mm single ended coaxial cable, color: white	
	U.FL-LP-04N2T-A-(L)	Dia. 0.81mm single ended coaxial cable, color: black	
U.FL-LP-066	U.FL-2LP-068N1T-A-(L)	Dia. 1.13mm double ended coaxial cable, color: gray	
	U.FL-2LP-068N2T-A-(L)	Dia. 1.13mm double ended coaxial cable, color: black	
	U.FL-LP-068N1T-A-(L)	Dia. 1.13mm single ended coaxial cable, color: gray	
	U.FL-LP-068N2T-A-(L)	Dia. 1.13mm single ended coaxial cable, color: black	
U.FL-LP-066	U.FL-2LP-066N1-A-(L)	Dia. 1.32mm double ended coaxial cable, color: gray	
	U.FL-2LP-066N2-A-(L)	Dia. 1.32mm double ended coaxial cable, color: black	
	U.FL-LP-066N1-A-(L)	Dia. 1.32mm single ended coaxial cable, color: gray	
	U.FL-LP-066N2-A-(L)	Dia. 1.32mm single ended coaxial cable, color: black	
U.FL-LP(V)-040	U.FL-2LP(V)-04N1T-A-(L)	Dia. 0.81mm double ended coaxial cable, color: white	
	U.FL-2LP(V)-04N2T-A-(L)	Dia. 0.81mm double ended coaxial cable, color: black	
	U.FL-LP(V)-04N1T-A-(L)	Dia. 0.81mm single ended coaxial cable, color: white	
	U.FL-LP(V)-04N2T-A-(L)	Dia. 0.81mm single ended coaxial cable, color: black	
U.FL-LP-062	U.FL-2LP-062N1D-A-(L)	Dia. 1mm double ended coaxial cable, color: gray	
	U.FL-2LP-062N2D-A-(L)	Dia. 1mm double ended coaxial cable, color: black	
	U.FL-LP-062N1D-A-(L)	Dia. 1mm single ended coaxial cable, color: gray	
	U.FL-LP-062N2D-A-(L)	Dia. 1mm single ended coaxial cable, color: black	
U.FL-LP-088	U.FL-2LP-088N1T-A-(L)	Dia. 1.37mm double ended coaxial cable, color: gray	
	U.FL-2LP-088N2T-A-(L)	Dia. 1.37mm double ended coaxial cable, color: black	
	U.FL-LP-088N1T-A-(L)	Dia. 1.37mm single ended coaxial cable, color: gray	
	U.FL-LP-088N2T-A-(L)	Dia. 1.37mm single ended coaxial cable, color: black	

Please contact Hirose Sales Representative for cable length and cable end treatment.

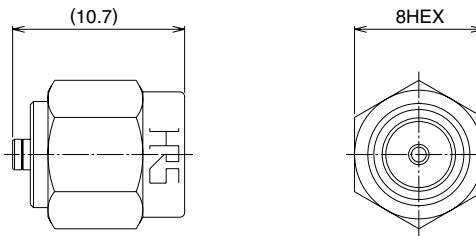
■Conversion Adapters

●SMA Conversion Adapter

(Mating portion: U.FL side jack - SMA side plug)



Note: The U.FL side mating portions has a lower lock retention force than the regular product, therefore, cannot be used for purposes other than performance measurements.



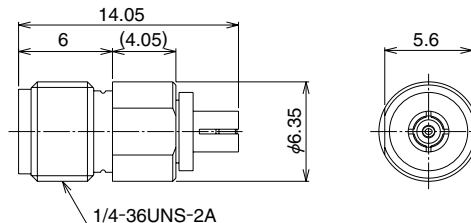
Part No.	CL No.	RoHS
HRMP-U.FLJ(40)	311-0300-2-40	YES

●SMA Conversion Adapter

(Mating portion: U.FL side plug - SMA side jack)



Note: The U.FL side mating portions has a lower lock retention force than the regular product, therefore, cannot be used for purposes other than performance measurements.



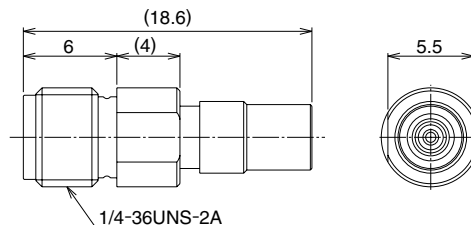
Part No.	CL No.	RoHS
HRMJ-U.FLP(40)	311-0301-5-40	YES

●SMA Conversion Adapter

(Mating portion: U.FL side plug - SMA side jack)



Note: This connector is used by compressing the mated portion of U.FL side onto the U.FL-R-SMT-1 portion.

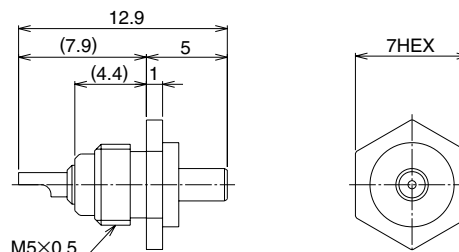


Part No.	CL No.	RoHS
HRMJ-U.FLP-ST1(40)	311-0385-5-40	YES

■Receptacle to Inspection



This receptacle is used for inspecting the continuity, withstand voltage, and other aspects of the harness product.



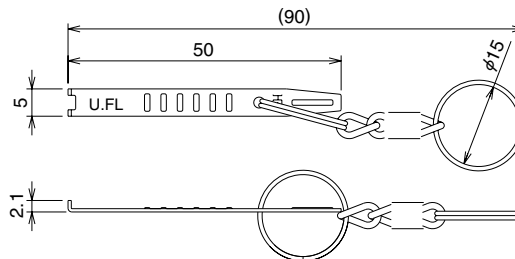
Part No.	CL No.	RoHS
U.FL-R-1	331-0466-0	YES

■Plug Extraction Tool

This jig is used for extraction from a mating condition.



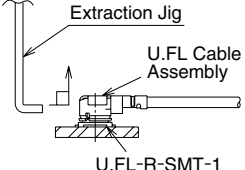
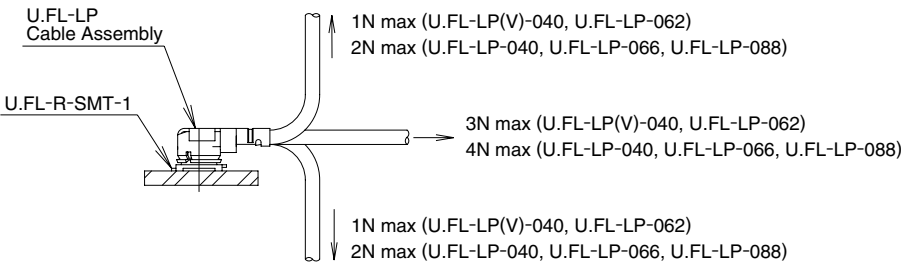
Note: Part No. U.FL-LP-N-2 for U.FL-LP-040/066/088.
Part No. U.FL-LP(V)-N-2 for U.FL-LP(V)-040/U.FL-LP-062.



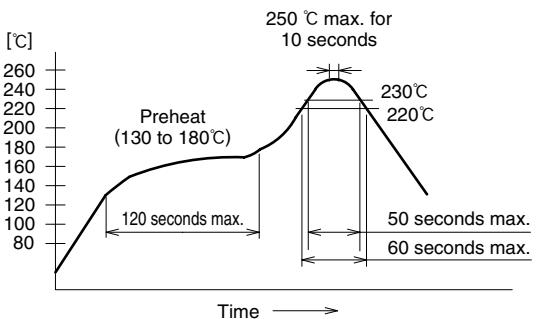
Part No.	CL No.	RoHS
U.FL-LP-N-2	331-0494-5	YES
U.FL-LP(V)-N-2	331-0493-2	

■ Usage Precautions

1. Plugs

<p>(1) Mating / unmating</p>	<p>1) To disconnect connectors, insert the end portion of U.FL-LP-N-2 and U.FL-LP(V)-N-2 under the connector flanges and pull off vertically, in the direction of the connector mating axis. 2) To mate the connectors, the mating axes of both connectors must be aligned and the connectors can be mated. The "click" will confirm fully mated connection. Do not attempt to insert on an extreme angle.</p> 
<p>(2) Pull forces on the cable after connectors are mated.</p>	<p>After the connectors are mating, do not apply a load to the cable in excess of the values indicated in the diagram below.</p> 
<p>(3) Precautions</p>	<p>Do NOT forcefully twist or deform wires.</p>

2. Receptacles

<p>(1) Recommended reflow temperature profile</p>	 <ol style="list-style-type: none"> ① The temperature of the printed circuit board surface temperature at the points of contact with the terminals. ② Reflow soldering should be performed at a printed circuit surface temperature of 250°C max. ③ In individual applications the actual temperature may vary, depending on the solder paste type, volume / thickness and board size / thickness. Consult your solder paste and equipment manufacturer for specific recommendations.
<p>(2) Recommended manual soldering</p>	<p>Manual soldering: 350°C for 5 seconds</p>
<p>(3) Recommended metal mask thickness</p>	<p>0.1 to 0.12 mm</p>
<p>(4) Reflow cycles</p>	<p>2 times</p>

3. Operating environment and storage conditions

<p>(1) Operating environment</p>	<p>The connectors are not designed to operate in the following environments:</p> <ul style="list-style-type: none"> • Exposed to a excessive amounts of fine particles and dust • Regions and places having a high density of sulfur dioxide, hydrogen sulfide, nitrogen dioxide or other corrosive gasses. • Environments having large rapid variations in temperature.
<p>(2) Storage conditions - Receptacle</p>	<p>Store in the Hirose Electric packaging. Temperature: -10 to +40°C, Humidity: 85% max. Use within 6 months of delivery. Receptacles for which the storage period has elapsed must be tested for solderability to the PC board mounting surface.</p>