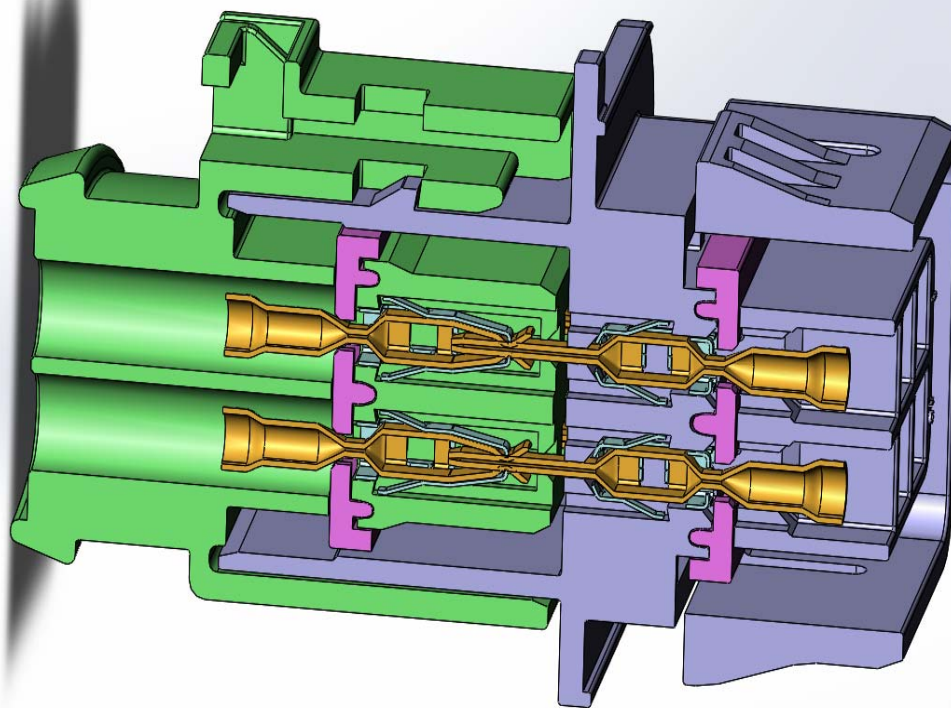
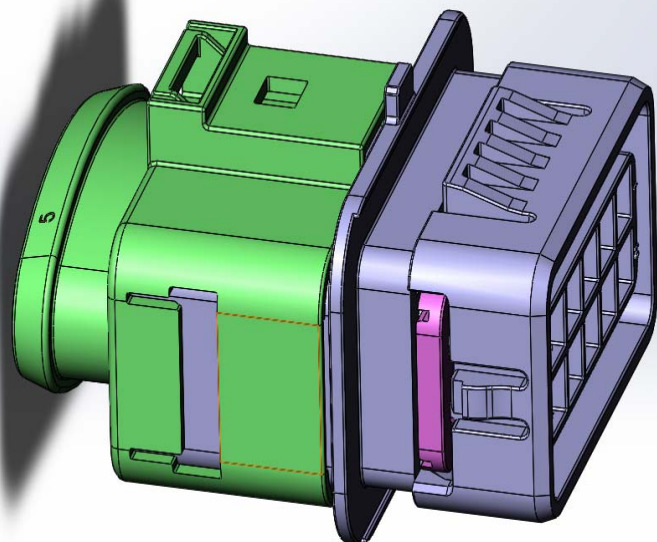


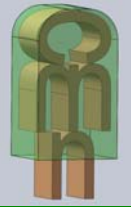
英康 (Encnn) 连接器有限公司
Encnn enables connection!

Encnn

车灯连接器设计评审



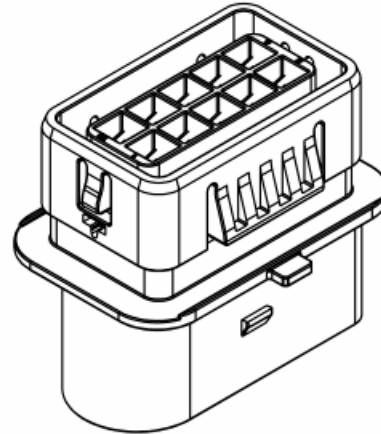
连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



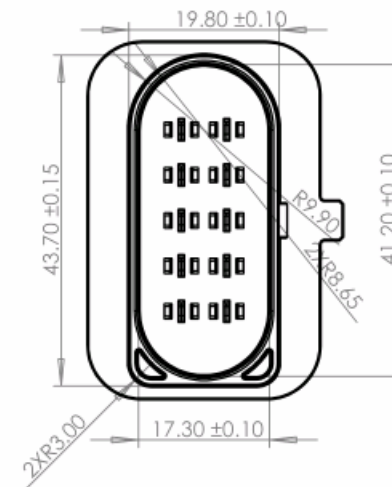
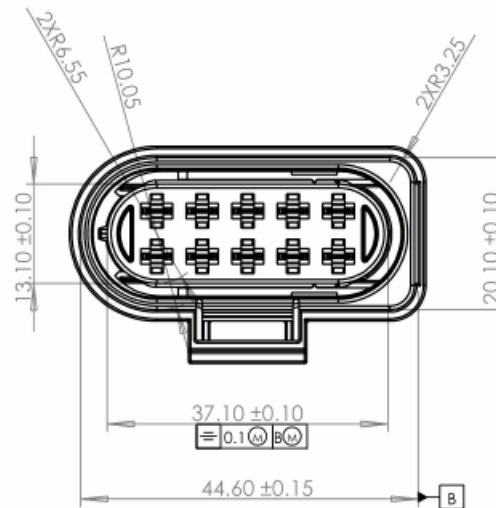
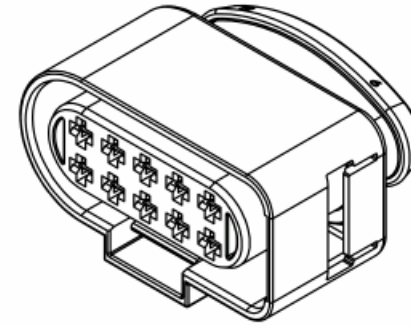
英康 (Encnn) 连接器有限公司
Encnn enables connection!

Encnn

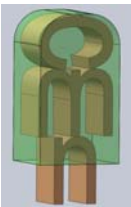
界面配合分析



● 矩形截图(R)



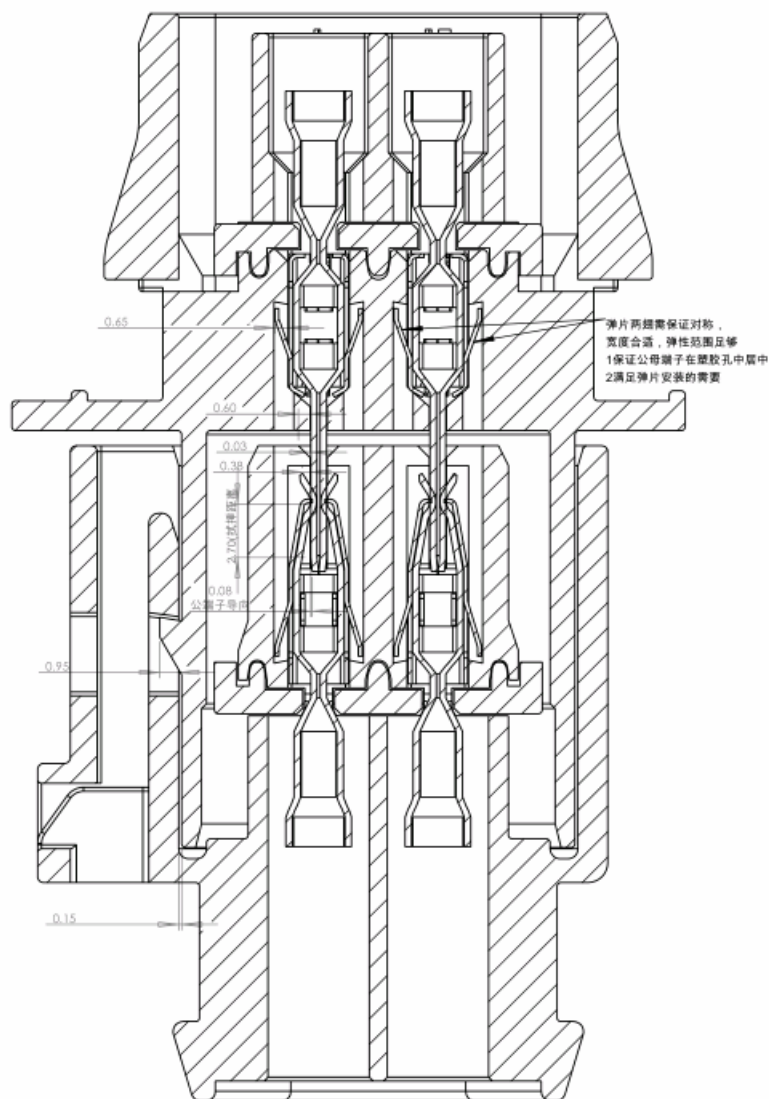
连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



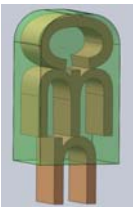
英康 (Encnn) 连接器有限公司
Encnn enables connection!

Encnn

界面配合分析



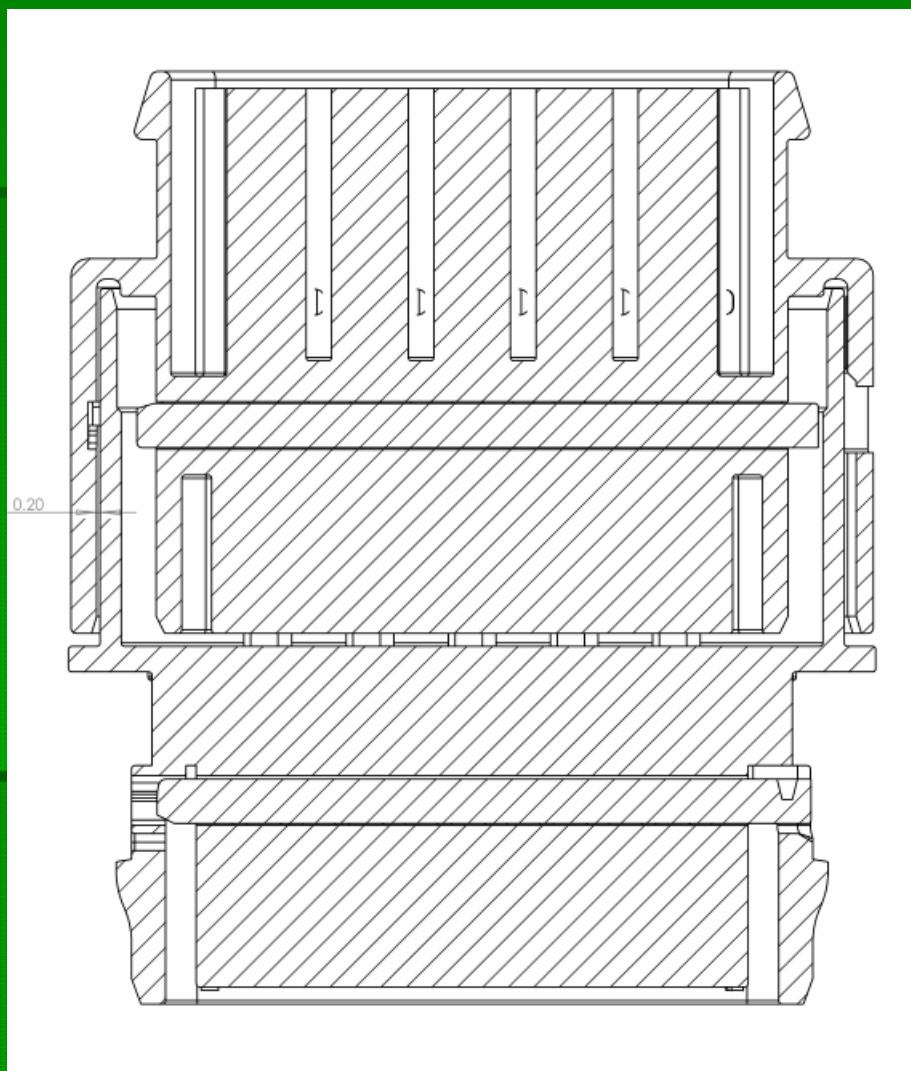
连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



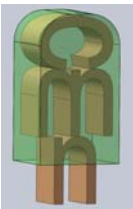
英康 (Encnn) 连接器有限公司
Encnn enables connection!

Encnn

界面配合分析



连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com

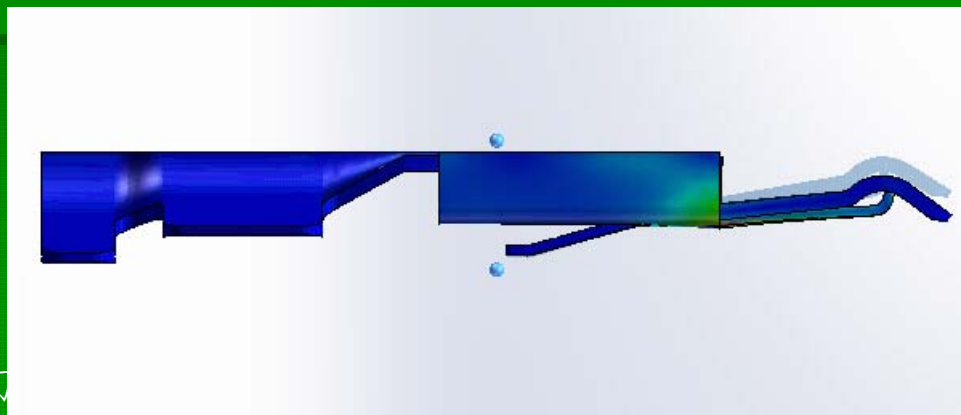


英康 (Encnn) 连接器有限公司
Encnn enables connection!

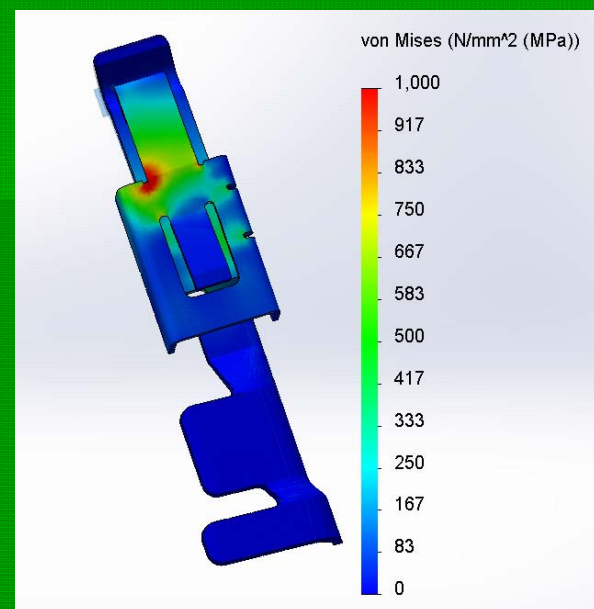
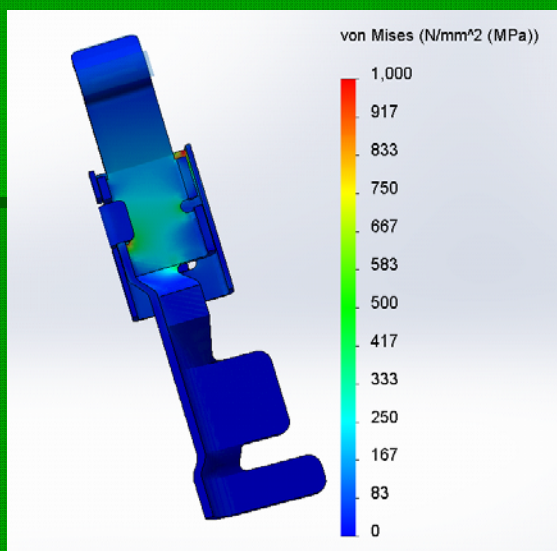


母端子组件正向力分析

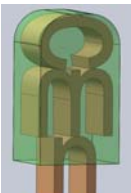
根据产品结构分析和公差分析确定, 公母接头互配时母端子的变形范围在 0.2-0.4 之间,



应力应变分析结果显示, 在 0.4 位移时, copper 的应力在 250MPa 以内, SST 的应力在 1200Mpa 以内, 故选用的 Copper 材料的屈服强度应不小于 250MPa, 该产品端子用的是 C19700 H04 SST 材料的屈服强度应不小于 1200Mpa. 该产品端子用的是 S30100 Spring



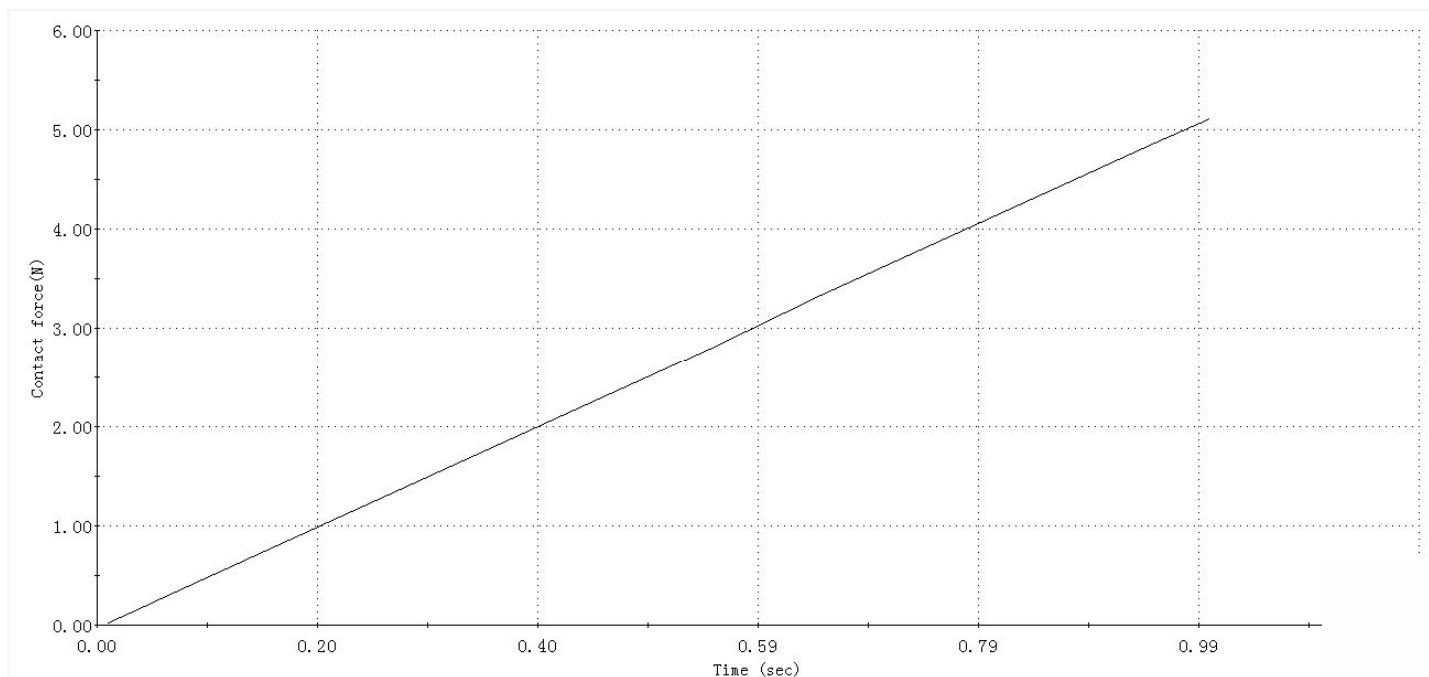
连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



英康 (Encnn) 连接器有限公司 Encnn enables connection!

ENCNN

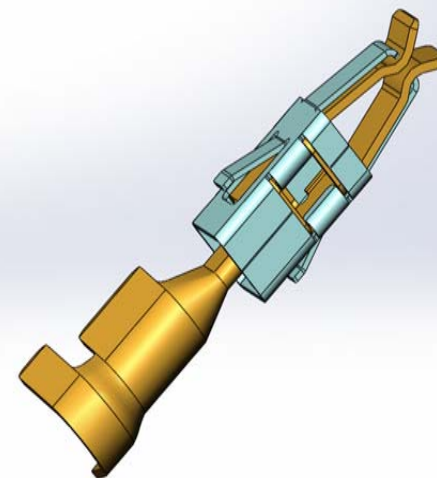
Study name: Study 1
Plot type: Contact/Friction force

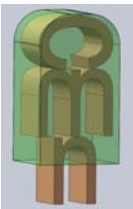


Resultant: (Selection)
0.05049, 6.21111

从位移与力关系图，可发现位移为0.4时正向力约为5.2N，位移为0.2时正向力约为2.6N，就设计目标的插拔次数和镀层规格来说正向力处于合理区间

连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



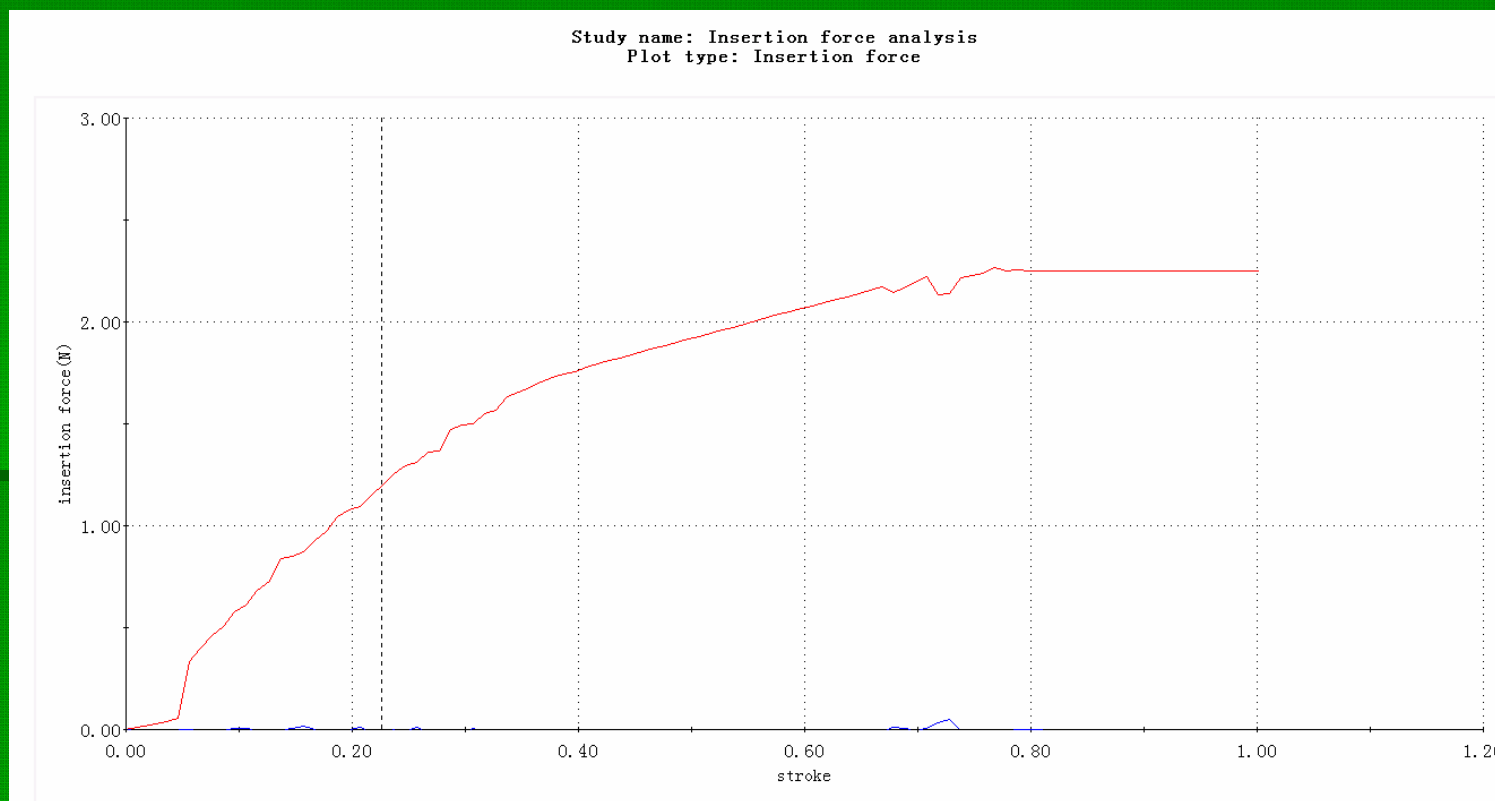


英康 (Encnn) 连接器有限公司
Encnn enables connection!

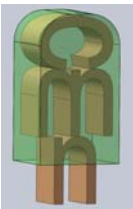


母端子组件插入力分析

插入力分析: 插入力峰值为2.3N---采用的是单个端子对称分析,故整个接头的插入力为 $2.3 \times 2 \times 10 = 46\text{N}$



连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



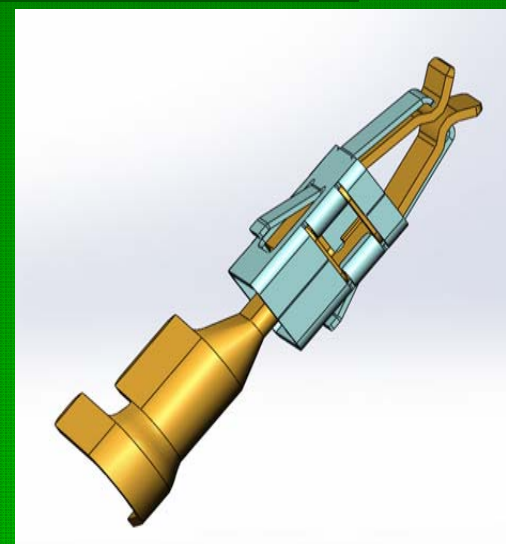
英康 (Encnn) 连接器有限公司
Encnn enables connection!



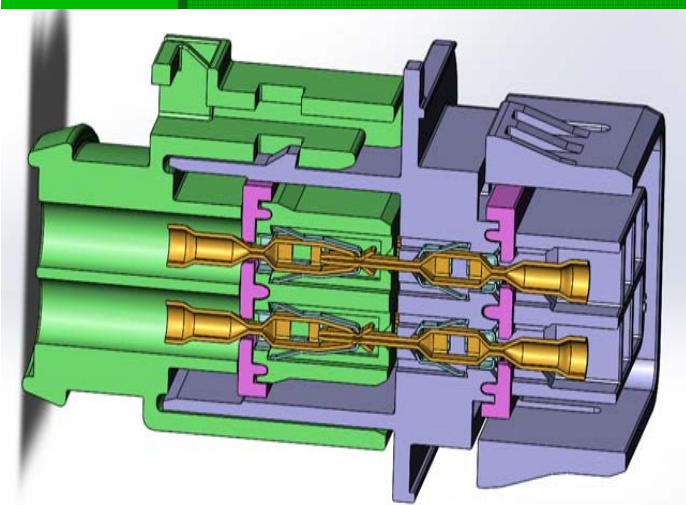
公母端子组件对插稳度分析---防跪pin

惯性矩 $I=bh^3/12$	b mm	h mm	E MPa	u	l mm
0.000866667	1.3	0.2	1.90E+04	0.7	2.8
$F_{per} = \frac{\pi^2 EI}{(ul)^2}$					
42.26227266					

42 >> 2.3



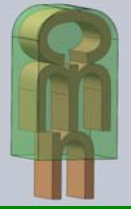
公母端子组件两翅卡槽稳度分析



惯性矩 $I=bh^3/12$	b mm	h mm	E MPa	u	l mm
0.001233333	1.85	0.2	1.90E+04	0.7	3.2
$F_{per} = \frac{\pi^2 EI}{(ul)^2}$					
46.04657472					

46 >> 2.3

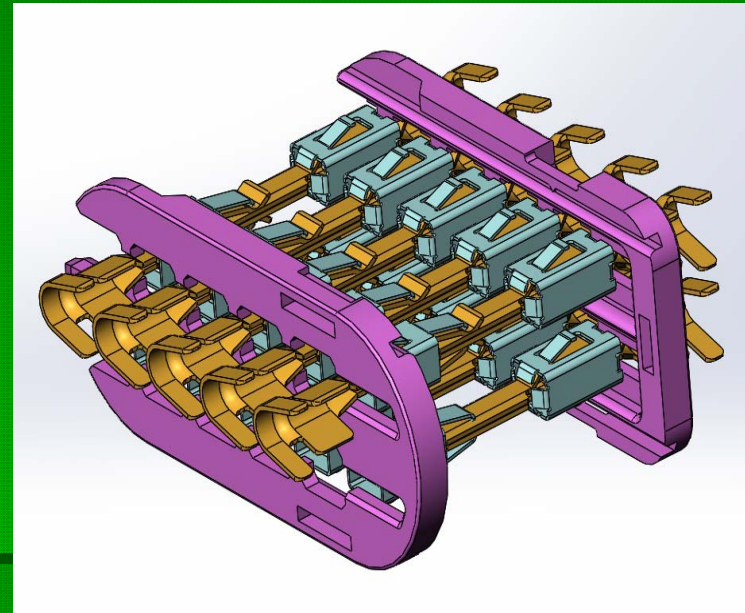
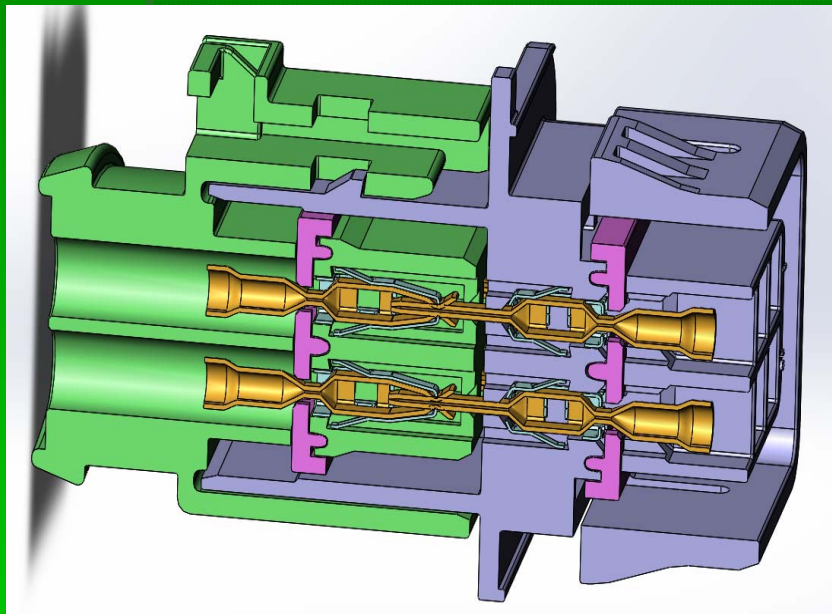
器专家顾问! www.encnn.com email: encnn@encnn.com



英康 (Encnn) 连接器有限公司
Encnn enables connection!

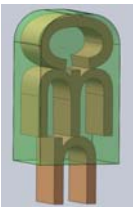
ENCNN

公母端子组件二次锁强度/保持力分析



$$1\text{mm} \times 1.2\text{mm} \times 40\text{Mpa} = 48\text{N}$$
$$48\text{N} \times 20 = 960\text{N}$$

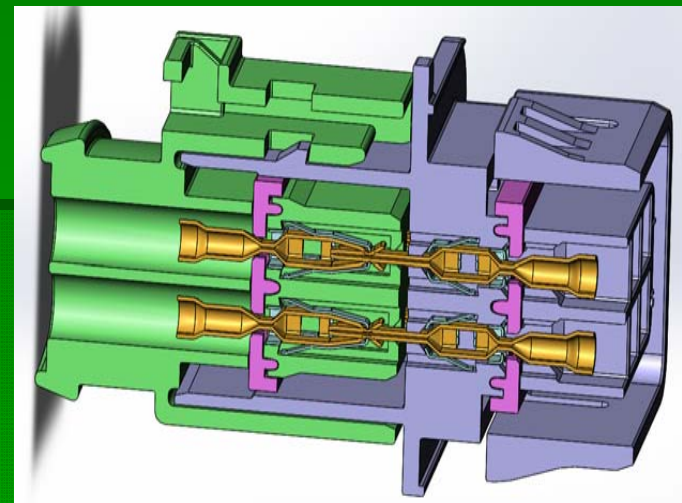
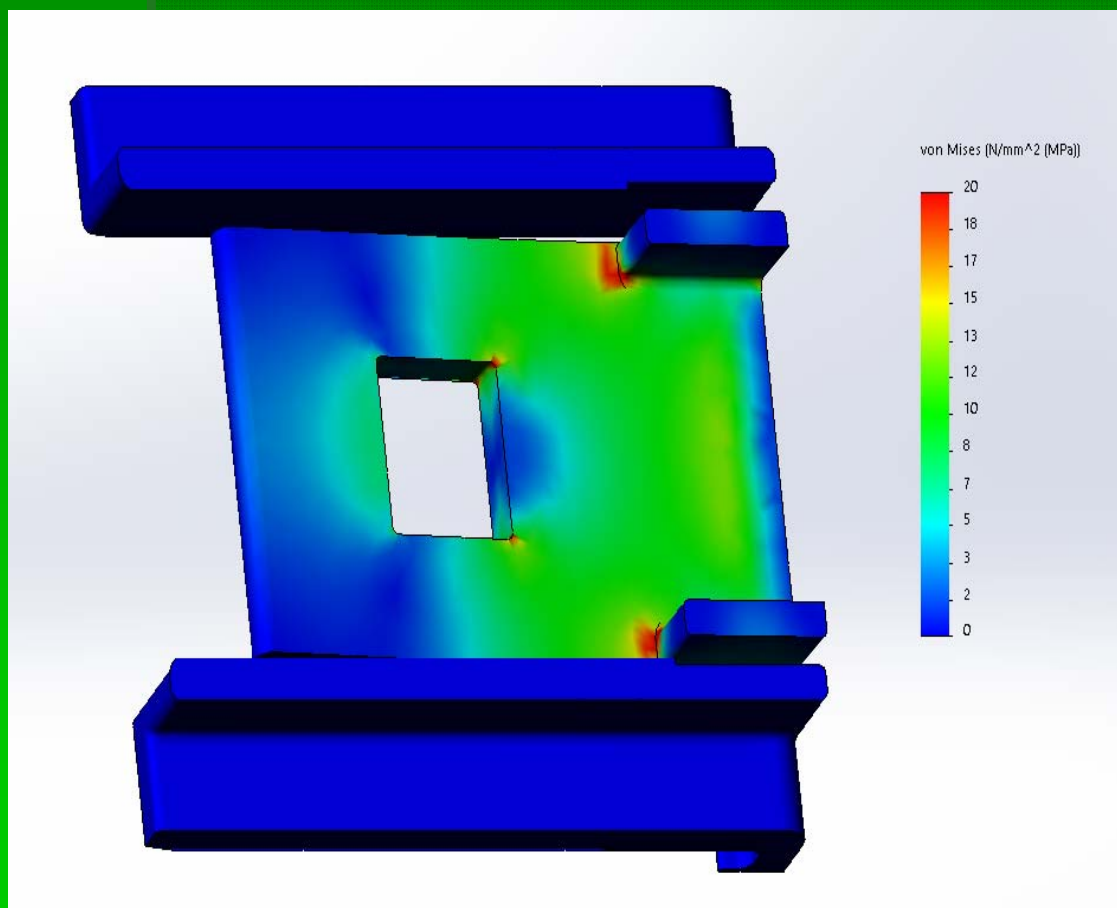
连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



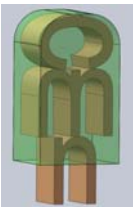
英康 (Encnn) 连接器有限公司
Encnn enables connection!

ENCNN

公母连接器连接方式-latch/Tab分析



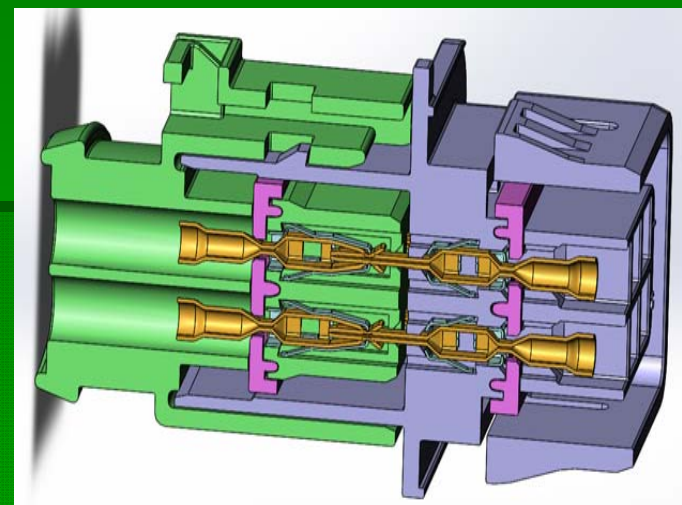
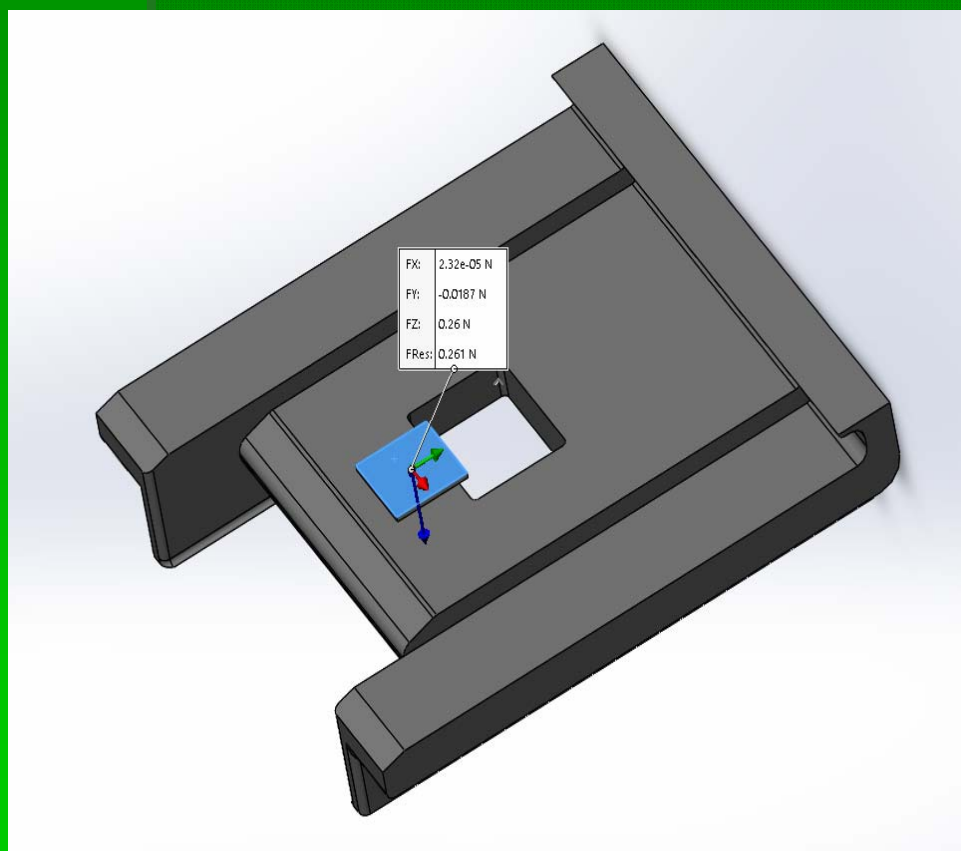
连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



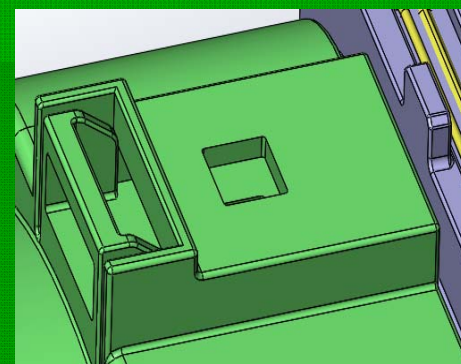
英康 (Encnn) 连接器有限公司
Encnn enables connection!

ENCNN

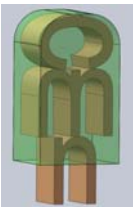
公母连接器连接方式-latch/Tab分析



扣入力---0.26N
加天井保护防止意外触碰



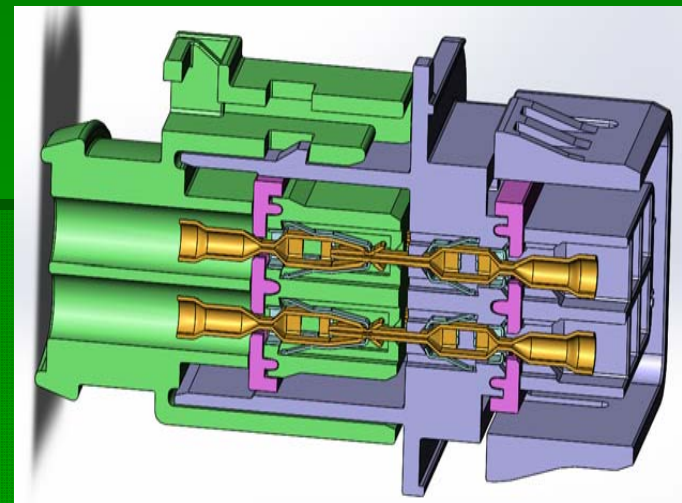
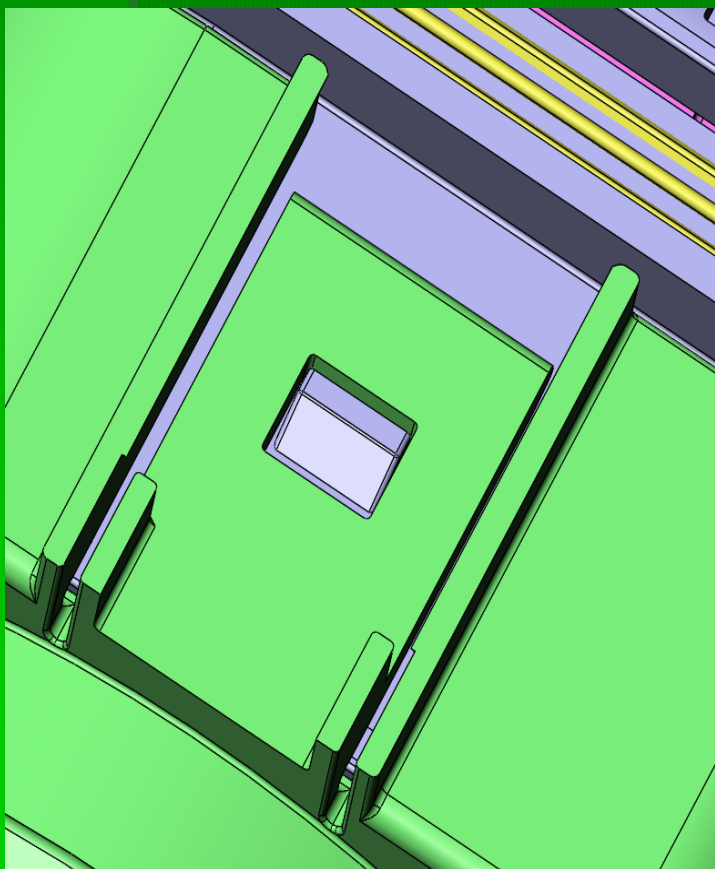
连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



英康 (Encnn) 连接器有限公司
Encnn enables connection!

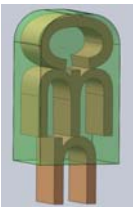
ENCNN

公母连接器连接方式-latch/Tab分析



抗拉强度：
 $7\text{mm} \times 1.5\text{mm} \times 40\text{Mpa} = 420\text{N}$

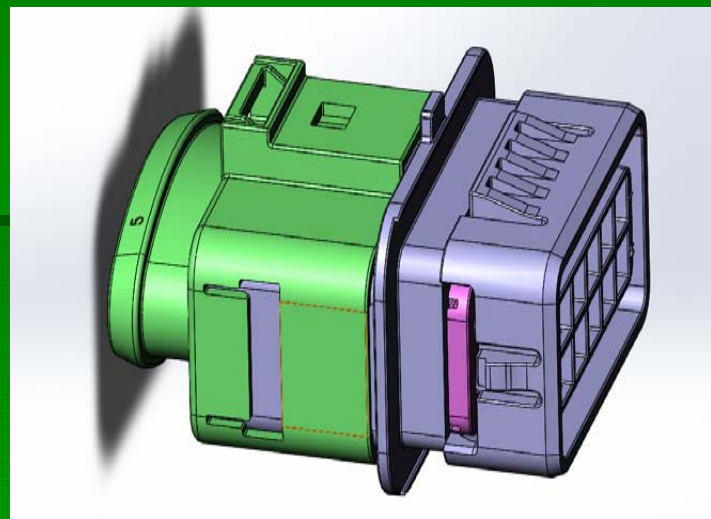
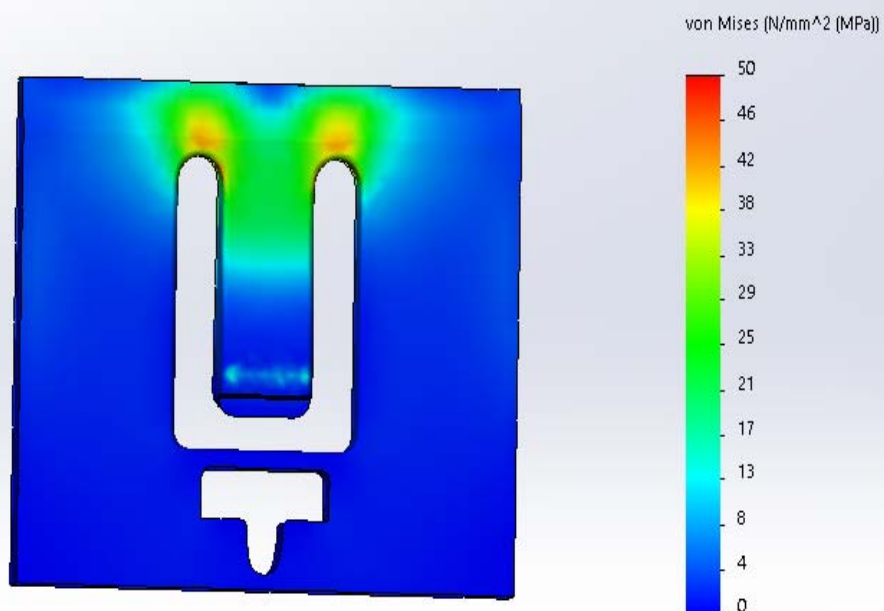
连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



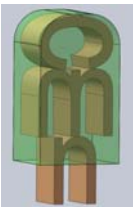
英康 (Encnn) 连接器有限公司
Encnn enables connection!

Encnn

面板安装Latch分析



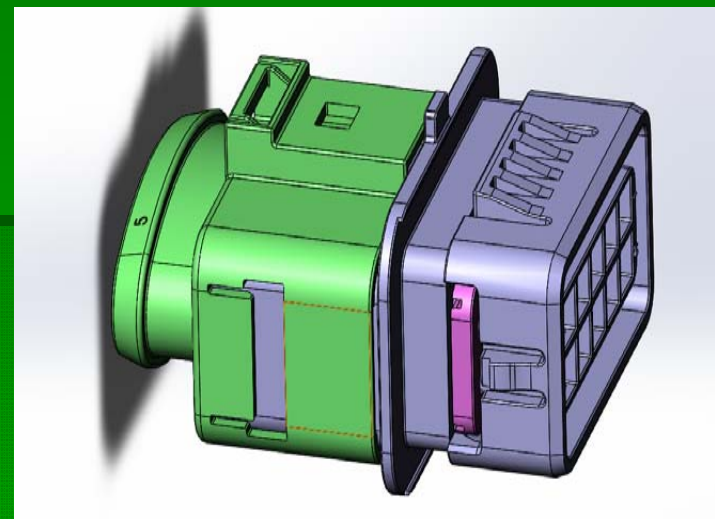
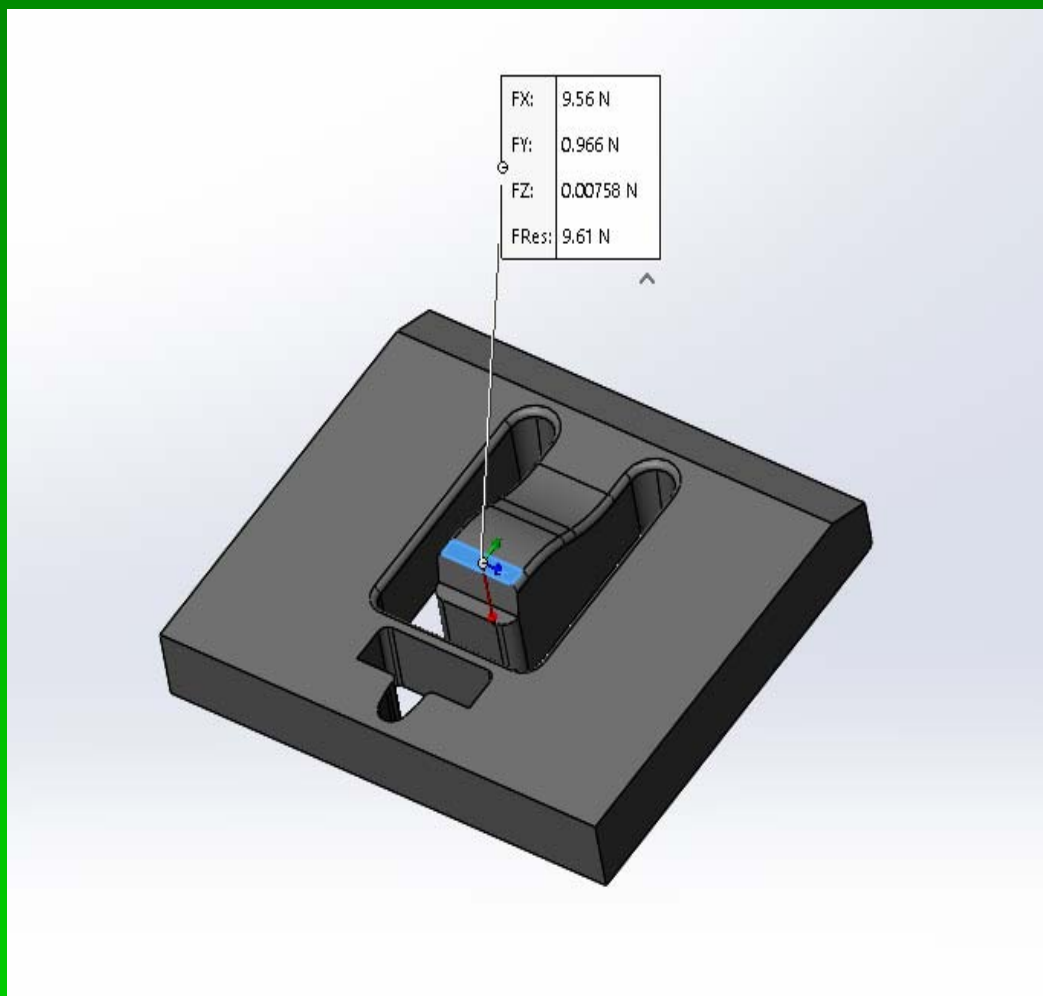
连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



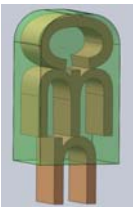
英康 (Encnn) 连接器有限公司
Encnn enables connection!

Encnn

面板安装Latch分析



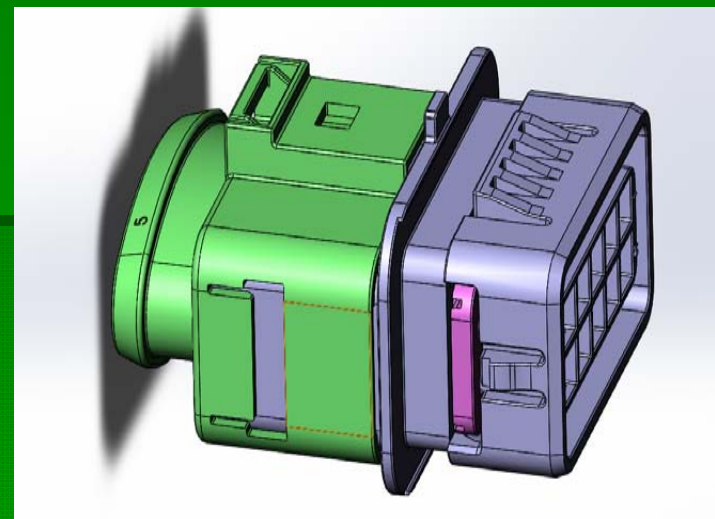
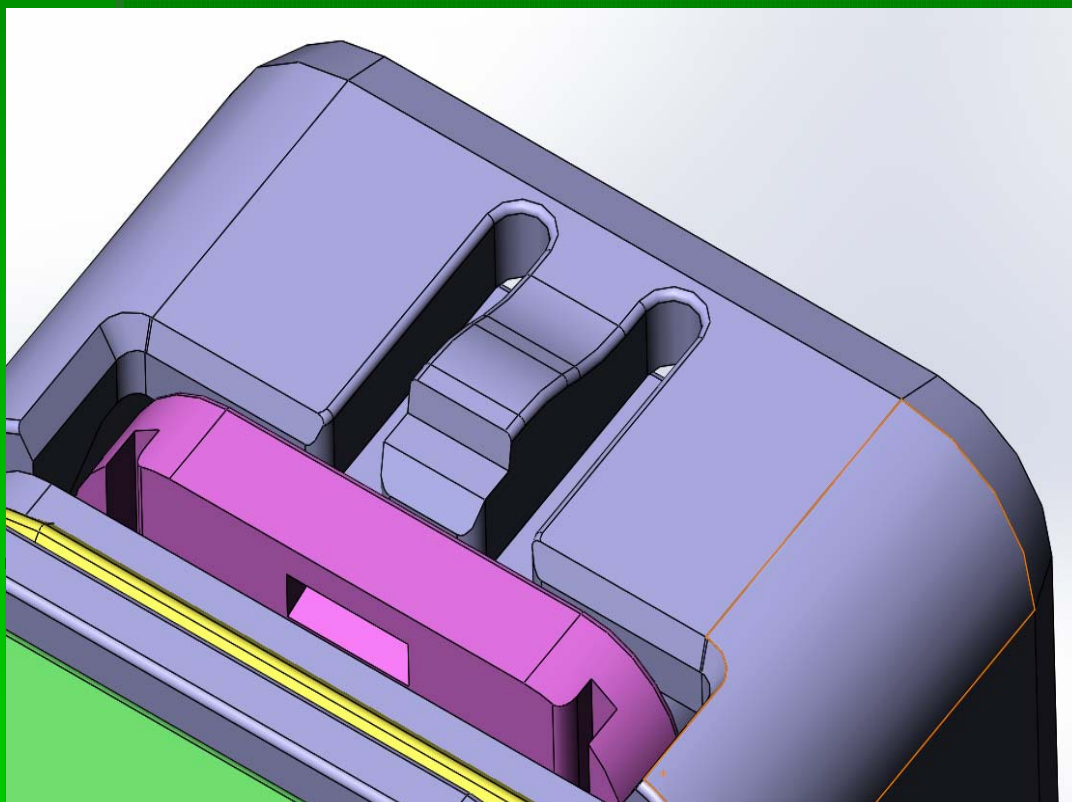
扣入力—9.6N



英康 (Encnn) 连接器有限公司
Encnn enables connection!

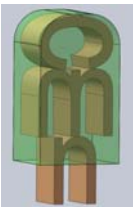
Encnn

面板安装Latch分析



抗拉强度：
 $3\text{mm} \times 4\text{mm} \times 40\text{Mpa} \times 2$
 $= 960\text{N}$

连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



英康 (Encnn) 连接器有限公司 Encnn enables connection!



载流/温升分析

$\Delta 55^{\circ}$ 以内---20A/pin
详见载流/温升报告

FULL REPORT

System Info

Product	Flow Simulation 2018 SP0.0, Build: 399
Computer name	NEW-PC
User name	Administrator
Processors	Intel(R) Core(TM) i7-6700 CPU @ 3.40GHz
Memory	32719 MB / 134217727 MB
Operating system	Windows 10 (or higher) (Version 10.0.17134.1)
CAD version	SOLIDWORKS 2018 SP0.0
CPU speed	3401 MHz

General Info

Model	mating.SLDPRT
Project name	Project1
Project path	D:\SW simulation\car lamp\current capac
Units system	SI (m-kg-s)
Analysis type	External (not exclude internal spaces)
Exclude cavities without flow conditions	Off
Coordinate system	Global coordinate system
Reference axis	X

INPUT DATA

Global Mesh Settings

Automatic initial mesh: On

Result resolution level: 3

Advanced narrow channel refinement: Off

Refinement in solid region: Off

Geometry Resolution

Evaluation of minimum gap size: Automatic

Evaluation of minimum wall thickness: Automatic

Computational Domain

Size

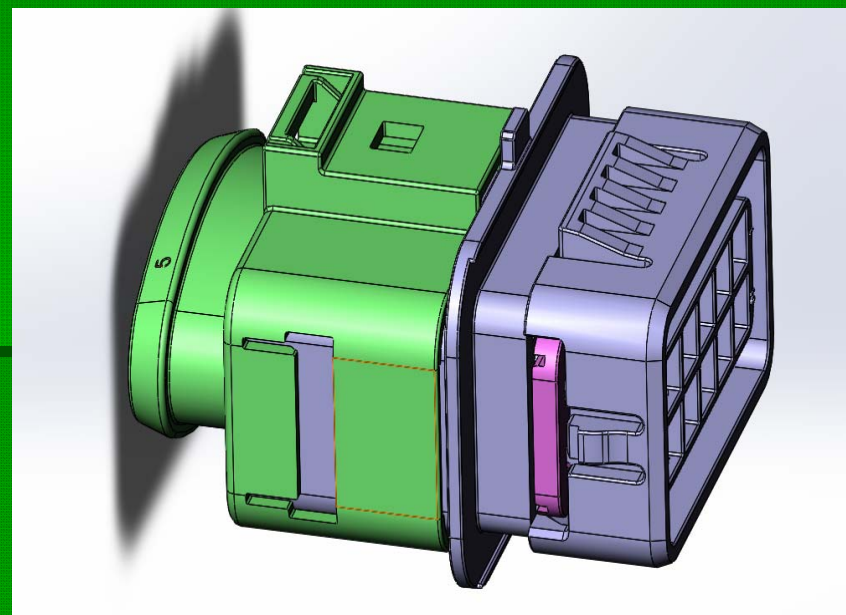
X min	-0.162 m
X max	0.162 m
Y min	-0.149 m
Y max	0.182 m
Z min	-0.154 m
Z max	0.157 m

Boundary Conditions

2D plane flow	None
At X min	Default
At X max	Default
At Y min	Default
At Y max	Default
At Z min	Default
At Z max	Default

Physical Features

Heat conduction in solids: On



连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



英康 (Encnn) 连接器有限公司
Encnn enables connection!

Encnn

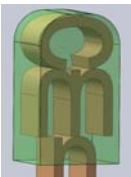
耐压分析

根据应用电压要求, 应用环境, 塑胶料电阻率数据, 查爬电距离及空气间隙可知, 满足耐压要求。

Table 4 – Creepage distances to avoid failure due to tracking

Voltage r.m.s. ¹⁾	Minimum creepage distances								
	Printed wiring material		Pollution degree 1	Pollution degree 2			Pollution degree 3		
	Pollution degree 1	2							
	All material groups	All material groups, except IIIb	All material groups	Material group I	Material group II	Material group III	Material group I	Material group II	Material group III ²⁾
V	mm	mm	mm	mm	mm	mm	mm	mm	mm
10	0,025	0,04	0,08	0,4	0,4	0,4	1	1	1
12,5	0,025	0,04	0,09	0,42	0,42	0,42	1,05	1,05	1,05
16	0,025	0,04	0,1	0,45	0,45	0,45	1,1	1,1	1,1
20	0,025	0,04	0,11	0,48	0,48	0,48	1,2	1,2	1,2
25	0,025	0,04	0,125	0,5	0,5	0,5	1,25	1,25	1,25
32	0,025	0,04	0,14	0,53	0,53	0,53	1,3	1,3	1,3
40	0,025	0,04	0,16	0,56	0,8	1,1	1,4	1,6	1,8
50	0,025	0,04	0,18	0,6	0,85	1,2	1,5	1,7	1,9
63	0,04	0,063	0,2	0,63	0,9	1,25	1,6	1,8	2

连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



英康 (Encnn) 连接器有限公司 Encnn enables connection!

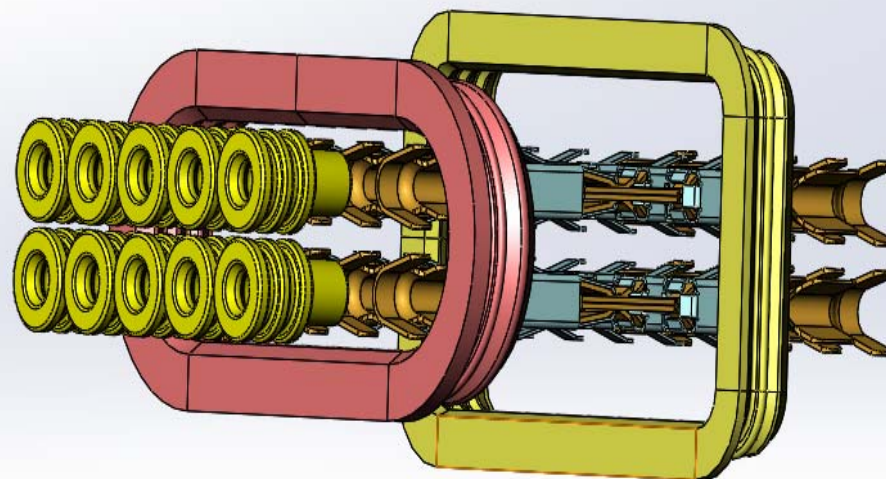


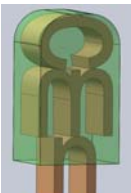
防水分析

TABLE 1

3.2.1	As Received		
3.2.1.1	Hardness, Durometer "A" or equivalent	40 ± 5	ASTM D 2240
3.2.1.2	Tensile Strength, minimum	700 psi (4.83 MPa)	ASTM D 412, Die B or C
3.2.1.3	Elongation, minimum	250%	ASTM D 412, Die B or C
3.2.1.4	Tensile Stress at 100% Elongation, maximum	200 psi (1.38 MPa)	ASTM D 412, Die B or C Stretch specimen to 125% elongation twice within 5 minutes before testing.
3.2.1.5	Tear Resistance, minimum	55 pounds force per inch (9.63 kN/m)	ASTM D 624, Die B
3.2.1.6	Specific Gravity	Preproduction Value ± 0.03	ASTM D 297
3.2.2	Petroleum Lubricating Oil Resistance (Immediate Deteriorated Properties)		ASTM D 471 Medium: ASTM Oil No. 1 Temperature: 302 °F ± 5 (150 °C ± 3) Time: 70 hours ± 0.5
3.2.2.1	Hardness Change, Durometer "A" or equivalent	-15 to +5	
3.2.2.2	Tensile Strength, Change, maximum	-25%	
3.2.2.3	Elongation Change, maximum	-20%	
3.2.2.4	Volume Change, maximum	0 to 15%	
3.2.2.5	Decomposition	None	
3.2.2.6	Surface Tackiness	None	
3.2.3	Dry Heat Resistance		ASTM D 573 Temperature: 437 °F ± 5 (225 °C ± 3) Time: 70 hours ± 0.5
3.2.3.1	Hardness Change, Durometer "A" or equivalent	±10	
3.2.3.2	Tensile Strength Change, maximum	-20%	
3.2.3.3	Elongation Change, maximum	-40%	
3.2.3.4	Bend (flat)	No cracking or checking	
3.2.4	Compression Set		ASTM D 395, Method B Temperature: 302 °F ± 5 (150 °C ± 3) Time: 70 hours ± 0.5
3.2.4.1	Percent of Original Deflection, maximum	25	
3.2.5	Low Temperature Resistance		
3.2.5.1	Brittleness	Pass	ASTM D 2137, Method A Temperature: -85 °F ± 5 (-65 °C ± 3) Time: 3 minutes ± 0.3

密封材料性能要求

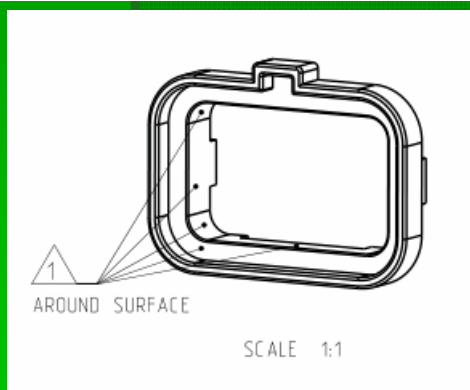
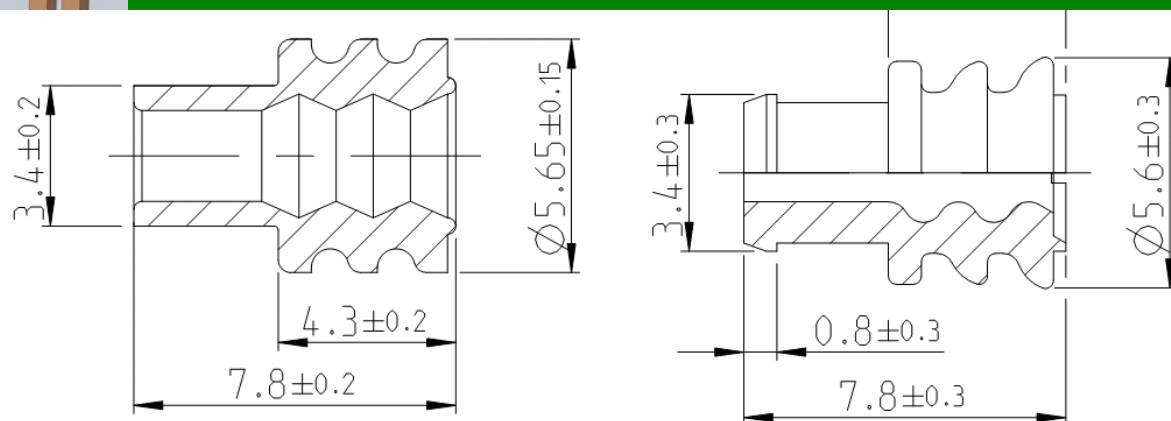




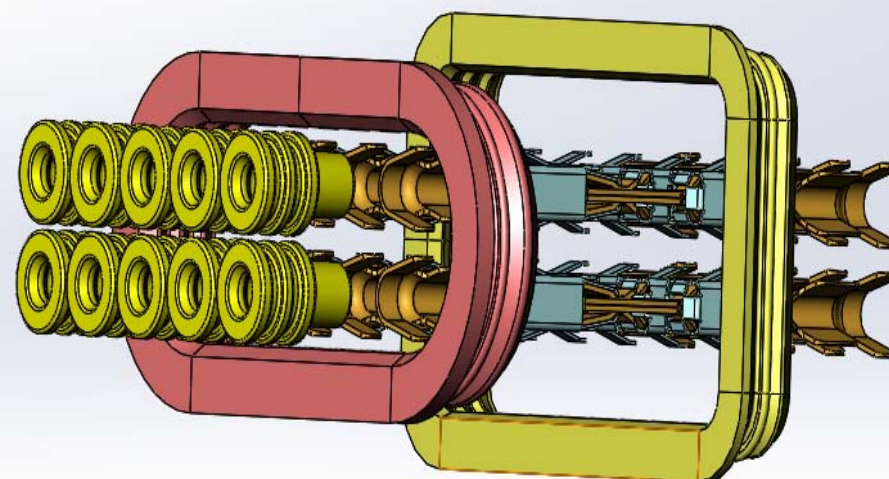
英康 (Encnn) 连接器有限公司
Encnn enables connection!

ENCNN

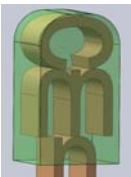
防水分析



1 SEALING SURFACE, NO PART LINES, DAMAGE AND FLASH/BURRS.
R/a ≤ 0.3 μm FOR MOLD SURFACE.
SEALING SURFACE MOLD PART SURFACE R/a ≤ 0.8 μm.
HOUSING SURFACE R/a ≤ 1.6 μm



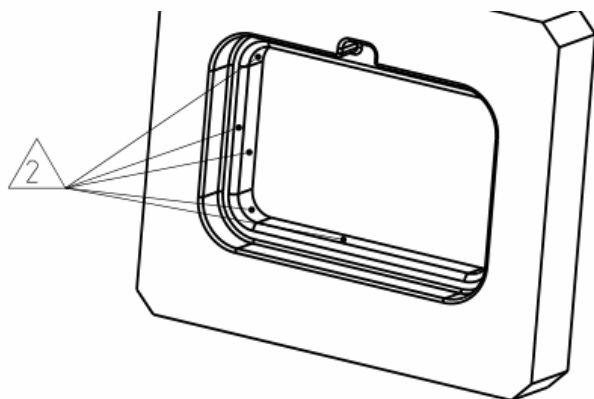
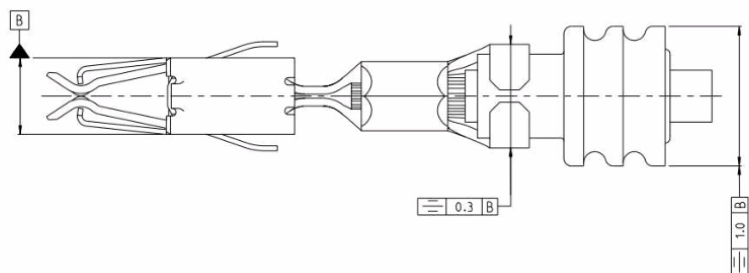
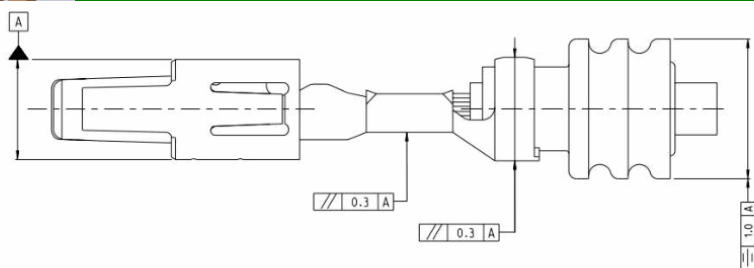
连接器培训大师/连接器专家顾问! www.encnn.com email: encnn@encnn.com



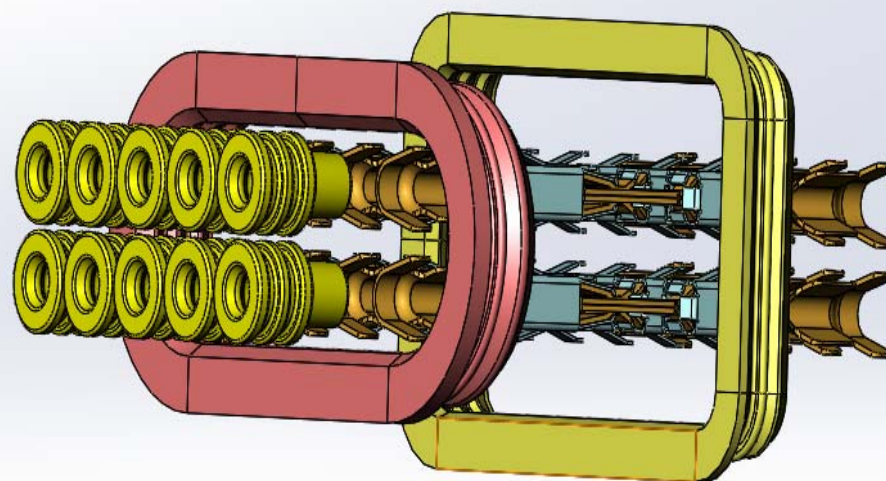
英康 (Encnn) 连接器有限公司 Encnn enables connection!

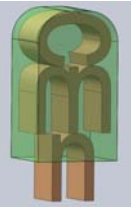


防水分析



2 SEALING SURFACE. NO PART LINES, DAMAGE AND FLASH/BURRS.
 $R/a \leq 0.3 \mu m$ FOR MOLD SURFACE.
 SEALING SURFACE MOLD PART SURFACE $R/a \leq 0.8 \mu m$,
 HOUSING SURFACE $R/a \leq 1.6 \mu m$





电接触可靠性分析

车灯连接器设计评审

电连接可靠性影响因素/失效是否会出现的
决定因素:

#应用环境:

- *机械环境---振动,微振动,冲击

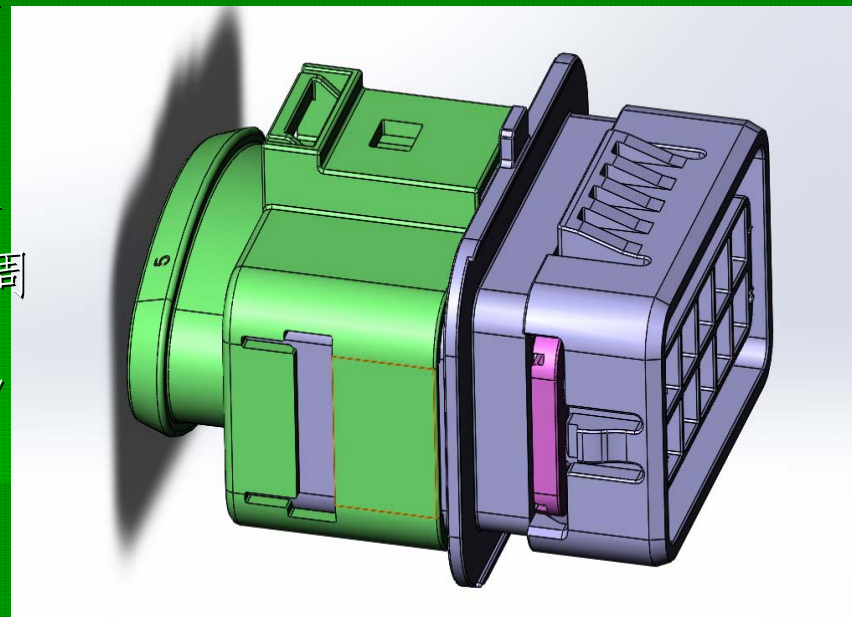
- *热环境---温度高低,温度变化周期和变化速度

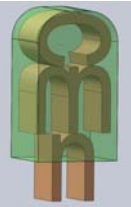
- *化学环境---湿度,腐蚀性颗粒/气体: C12, H2S, SO2, NO2...

#应用要求

- *机械性能要求---插拔力,插拔寿命

- *电气性能要求---电流,电压





电接触可靠性分析

车灯连接器设计评审

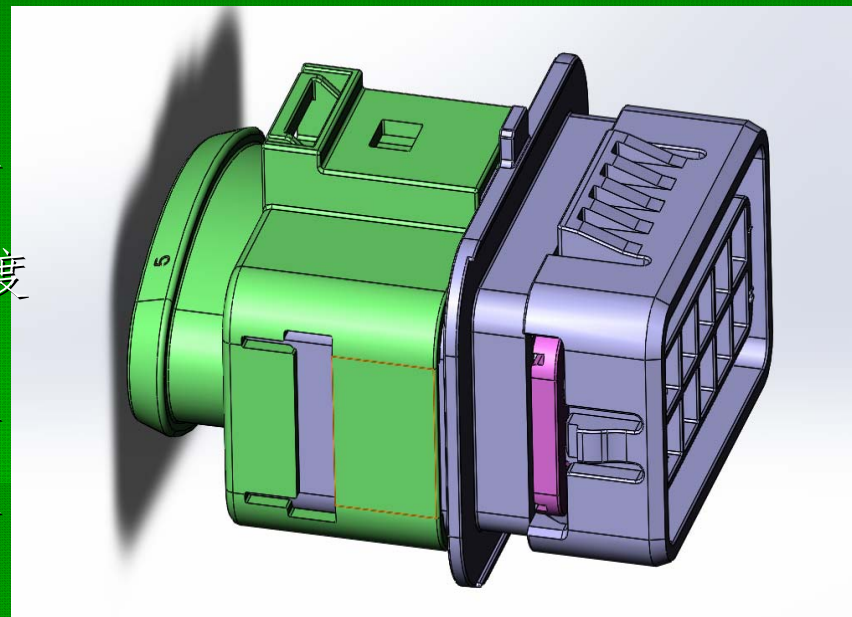
#设计/工艺相关的尺寸, 参数, 规格:

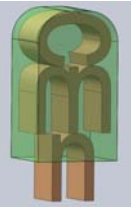
A, 端子方面: 正向力大小: 初始状态, 临终状态/端子材质: 硬度, 粗糙度, 导电率

B, 电镀方面: 镀层种类, 镀层硬度/纯度/厚度/光亮度/致密度;

C, 覆涂/涂层方面: 润滑剂(封孔剂)成分, 性能, 厚度;

D, 界面匹配性: 界面表面粗糙度, 界面几何形状, 拭擦距离, 界面兼容性(电化学, 机械, 高频性能)...





正向力衰减分析

车灯连接器设计评审

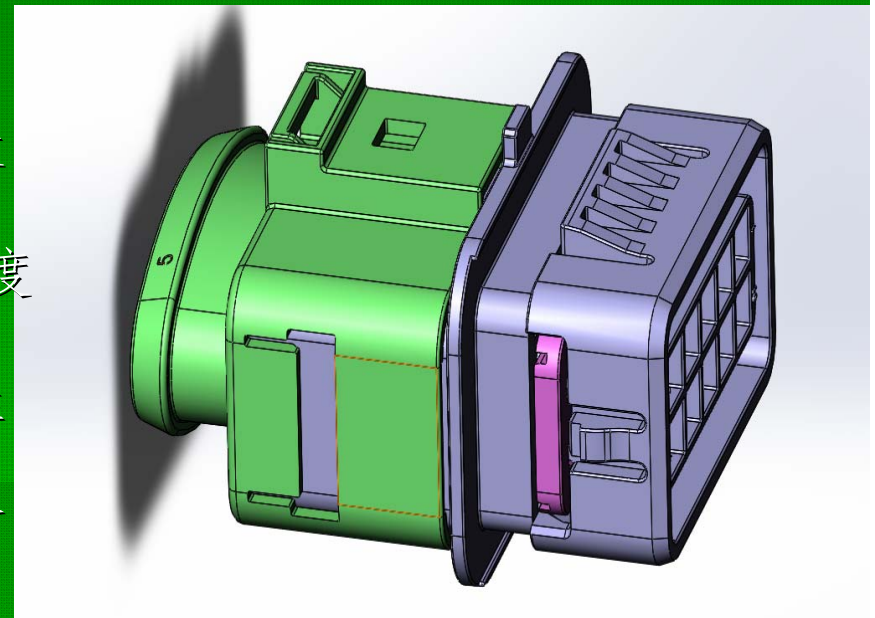
#设计/工艺相关的尺寸, 参数, 规格:

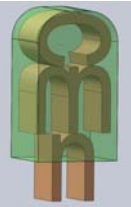
A, 端子方面: 正向力大小: 初始状态, 临终状态/端子材质: 硬度, 粗糙度, 导电率

B, 电镀方面: 镀层种类, 镀层硬度/纯度/厚度/光亮度/致密度;

C, 覆涂/涂层方面: 润滑剂(封孔剂)成分, 性能, 厚度;

D, 界面匹配性: 界面表面粗糙度, 界面几何形状, 拭擦距离, 界面兼容性(电化学, 机械, 高频性能)...





正向力衰减分析

从位移与力关系图，可发现位移为0.4时正向力约为5.2N（铜端子2.08N+不锈钢3.12N），位移为0.2时正向力约为2.6N（铜端子1.04N+不锈钢1.56N）。

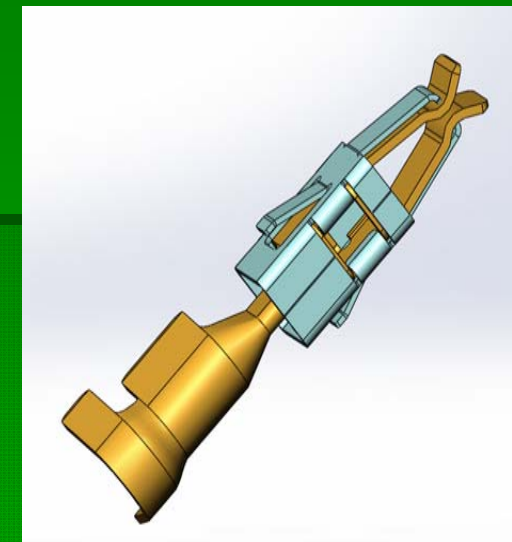
A, 屈服/yielding

从应力应变分析看，无论是铜合金端子还是不锈钢补强盒都不存在屈服现象。

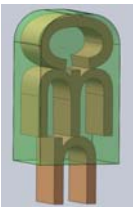
B, 疲劳

产品插拔次数不高，疲劳引起的正向力衰减可忽略不计

C, 应力松弛/stress relaxation



车灯连接器设计评审



正向力衰减分析

查得C19400铜合金和S30100不锈钢应力释放数据如下

C19400 10万小时应力释放29%, S30100
10万小时应力释放8%,
则10万小时后端子组件的最小正向力为:
 $1.04 \times 71\% + 1.56 \times 92\% = 2.17\text{N}$

2.17N对于该端子设计属于合理区间.

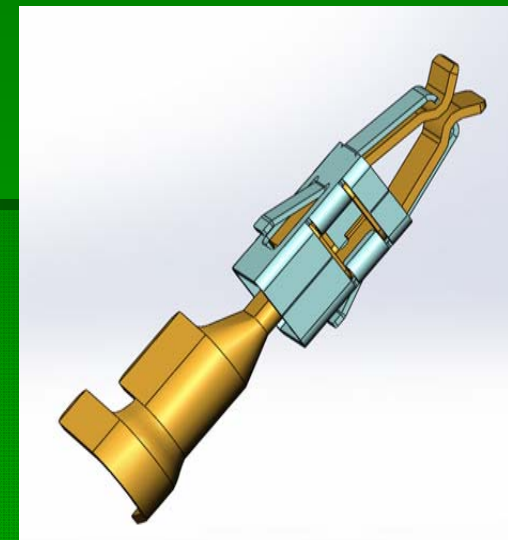


Table 6 Typical stress-relaxation values for selected copper alloys

Alloy	Temper	Percent of initial stress remaining after specified time at:									
		Room temperature		75 °C (170 °F)		105 °C (220 °F)		150 °C (300 °F)		200 °C (390 °F)	
		10 ³ h	10 ⁵ h	10 ³ h	10 ⁵ h	10 ³ h	10 ⁵ h	10 ³ h	10 ⁵ h	10 ³ h	10 ⁵ h
C15100	H02	97	95	...	...	86	81	84	80	...	...
	H04	93	89	...	...	80	76	...	...	...	...
	H06	94	92	...	...	78	71	...	...	...	...
C17200	AM	...	...	...	...	97(a)	...	...	...	67	...
	1/4 HM	...	...	...	...	97(a)	...	...	...	67	...
	1/2 HM	...	...	...	...	97(a)	...	...	...	67	...
	HM	...	...	...	...	98(a)	...	...	...	68	...
	SHM	...	...	...	...	98(a)	...	...	...	68	...
	XHM	...	...	...	...	98(a)	...	...	...	69	...
	XHMS	...	...	...	...	98(a)	...	...	...	69	...
C17410	1/2 HT	...	...	...	...	85(a)	...	...	...	...	...
	HT	...	...	...	...	80(a)	...	76	...	...	...
C19400	H02	95	93	...	...	78	71	...	...	...	...