1.0 OBJECTIVE

This specification provides information and requirements for customer application of the Bergstak® connectors. It also defines the placement of connectors when used in group of two or more per PCB, mating tolerances, wipe distance and requirement for BTB system restraint.

2.0 SCOPE

This specification provides information and requirements regarding the application of FCI Bergstak® Plug and Receptacles family of product.

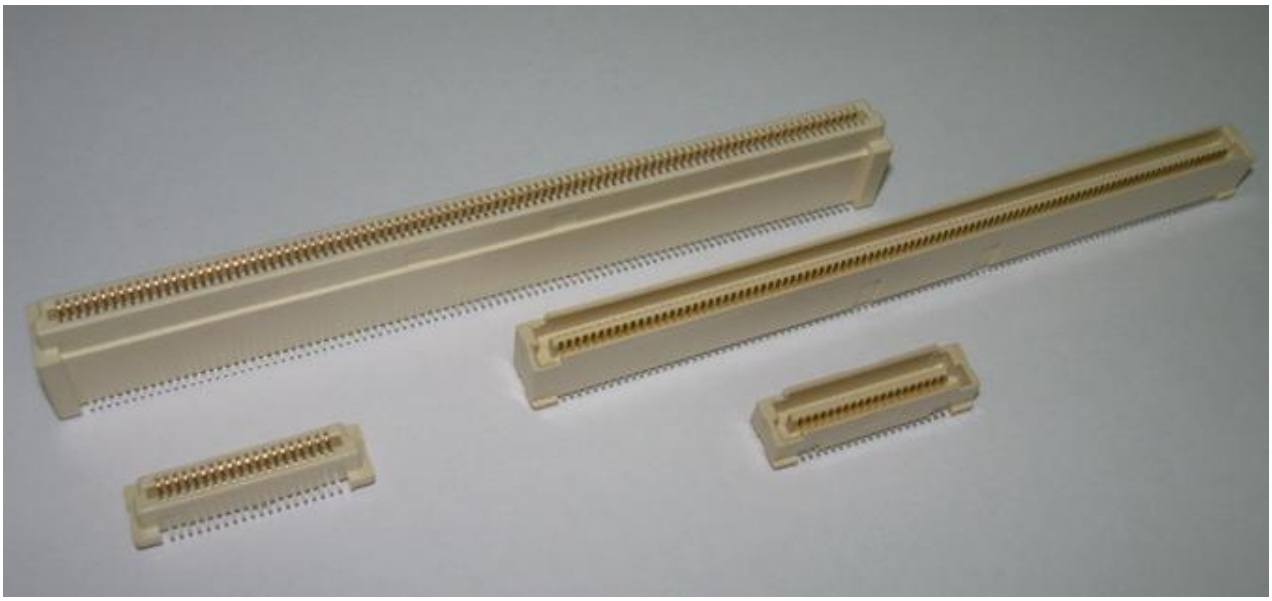


Figure 1: Showing Bergstak® family of product.

3.0 GENERAL

Bergstak® connectors are surface mounted to PCB. When one Plug and one Receptacles are soldered to their respective PCB, these connectors establish and control their mating alignment. However, when design calls for the application of two or more these connectors on each PCB, the positional relationship of the connectors takes on more importance. Any resulting variation of connector placement from their ideal nominal locations produce higher mechanical stress to some part of one or more of the connectors.
The amount of clearance between the physical plastic features of these connectors for mating is very limited by design. The metal terminals are very compliant by design, and able to withstand stress beyond what the plastic housing can endure.

4.0 PRODUCT DRAWINGS AND APPLICABLE DOCUMENTS

4.1 This document is a general application guide. If there is a conflict between the product drawings and this specification, the drawings take precedence.

Bergstak® Plug and Receptacles are offered from 20 to 100 positions, with every 20 position incremental.
The receptacles will only mates with plug with the same number of positions.
Please refer to drawings for detailed partnumbers.
All dimensions/ measurements in this document are in units of millimeters.

Bergstak® Receptacle	No. of position**	Pitch	Configuration Height
61082	20 to 200pos	0.8mm	1 to 4

Bergstak® Plug	No. of position**	Pitch	Configuration Height
61083	20 to 200pos	0.8mm	1 to 4

** with every 20 position incremental
Table 1: Showing Bergstak® Plug and Receptacle offering.

4.2 Bergstak® family of product is available in 5 different plating options.

Plating option	Plating chemistry	Lead free
4	Gold 0.2 um / Pure Tin 2 um min on solder tail Nickel underplate over 1.27um min	Yes
5	Gold 0.38 um / Pure Tin 2 um min on solder tail Nickel underplate over 1.27um min	Yes
6	Gold 0.065 um min over Palladium-nickel 0.69 um min/ Pure Tin 2 um on solder tail Nickel underplate over 1.27um min	Yes
7	Gold 0.76 um / Pure Tin 2 um min on solder tail Nickel underplate over 1.27um min	Yes
9	Gold flash 0.2 um / Gold 0.05um min on solder tail Nickel underplate over 1.27um min	Yes

Table 2 : Showing the Plating options

4.3 Packaging availability

Packaging option	Packaging
0	Tube without metal cap
2	Tape & reel with metal cap
6	Tape & reel with Kapton tape
7	Tape & reel with plastic cap
9	Tube with metal cap

Table 3: Showing the Packaging option

4.4 Stack height and BTB restraint

Stacked height dimension is dependant on the component tolerances but does not include the solder paste thickness on the PCB.

Proper system application of Bergstak® BTB requires the use ‘stand-off’ with 2 bolts. These ensure the total stack height, and prevent the system from ‘rocking’ if the PCBs are disturbed.
Stand-off also mandates the BTB must be bolted together during installation and system operation.

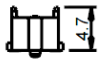
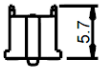
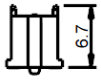
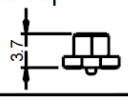
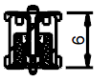
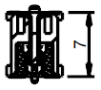
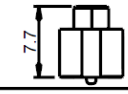
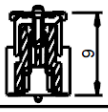
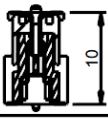
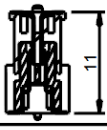
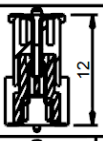
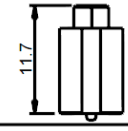
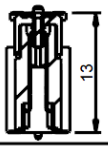
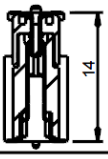
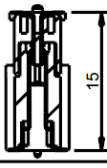
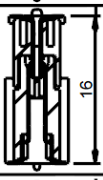
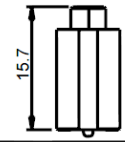
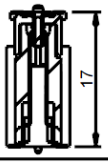
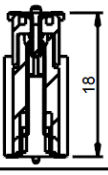
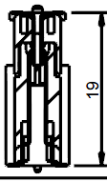
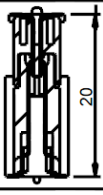
	FOR PLUG, SEE DWG. NO. 61083			
COMBINATION OF MATED HEIGHT	Plug 1 	Plug 2 	Plug 3 	Plug 4 
Recep 1 				
Recep 2 				
Recep 3 				
Recep 4 				

Table 4: Showing Bergstak® stack height

4.5 PCB layout and Stencil thickness

PCB thickness should be based on the intended purposes.
Figure 1 & 2 showing the recommended PCB layout for different plug and receptacle heights and positions.
The minimum thickness for solder paste stencil is 0.15mm.

4.5.1 The position less than 120pin, recommend using solder paste thickness 0.15mm Min.

4.5.2 The position greater than or equal to 120pin, recommend using solder paste thickness 0.18mm Min.

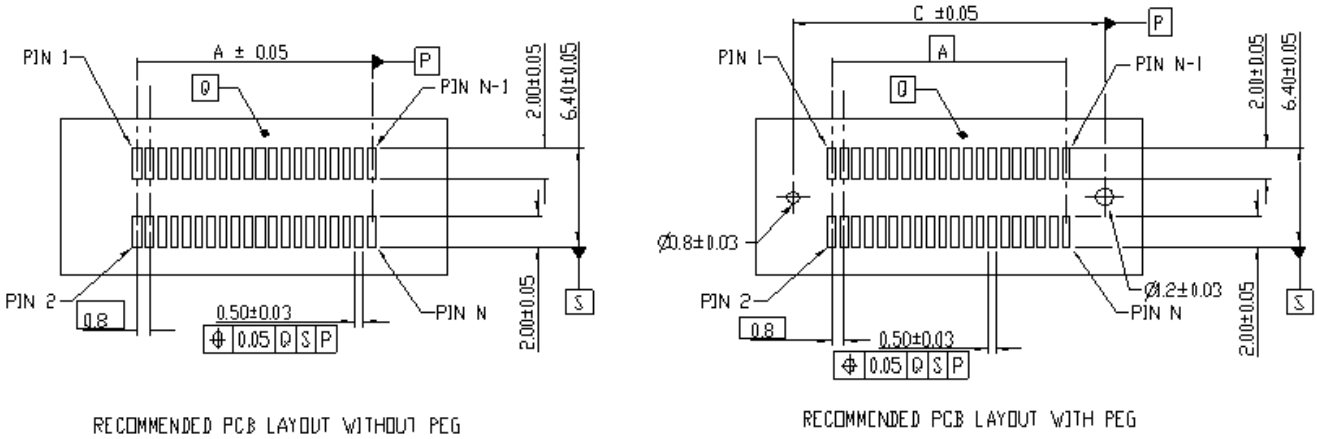


Figure 1: Recommended PCB layout for Receptacles 1 and Plug 1 to 4.

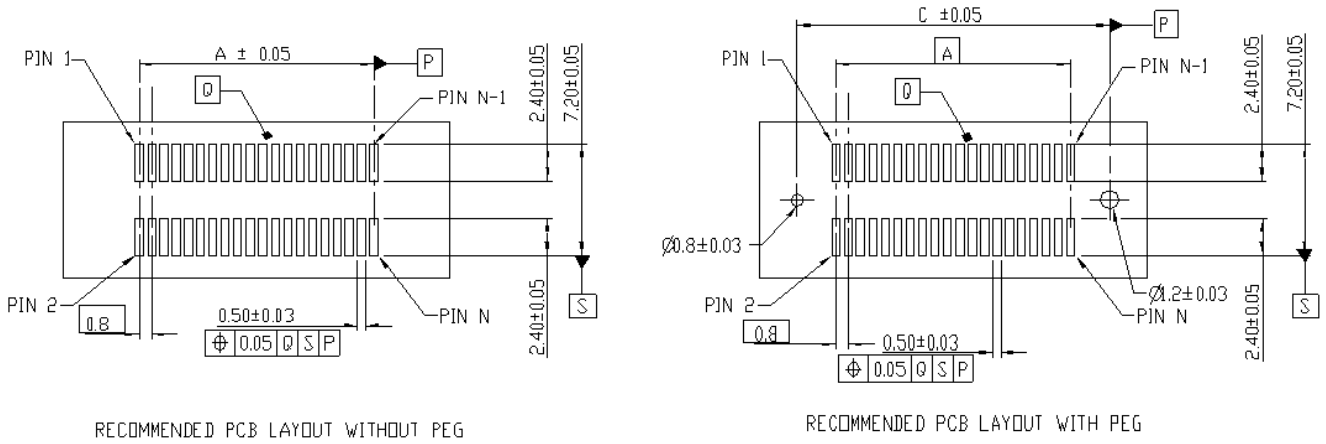


Figure 2: Recommended PCB layout for Receptacles 2 to 4.

4.6 Requirement for 1st reflow and 2nd reflow.

4.6.1 Special reflow carrier is needed if the position more than 120pins and PCB thickness less than 1.6 mm at 1st or 2nd reflow , to prevent PCB deforming issue which lead to solder open issue.

4.6.2 Due to other variables involved (connector orientation, reflow temperature, PCB thickness and PCB size) during the 2nd (inverted) reflow, it is recommended for the user to conduct trial under actual

manufacturing condition. These are to ensure the product and process capability.

4.7 Reflow profile recommendations.

No specific reflow profile is recommended, please just follow the reflow profile specification recommended by solder paste supplier. Normally, all products designed for reflow processing will withstand the normal IPC/ JEDEC Thermal profile range below.

Table 5-2 Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (Tsmax to Tp)	3° C/second max.	3° C/second max.
Preheat		
- Temperature Min (Ts_{min})	100 °C	150 °C
- Temperature Max (Ts_{max})	150 °C	200 °C
- Time (Ts_{min} to Ts_{max}) (ts)	60-120 seconds	60-180 seconds
Time maintained above:		
- Temperature (T_L)	183 °C	217 °C
- Time (t_L)	60-150 seconds	60-150 seconds
Peak Temperature (Tp)	See Table 4.1	See Table 4.2
Time within 5°C of actual Peak Temperature (tp)[2]	10-30 seconds	20-40 seconds
Ramp-down Rate	6 °C/second max.	6 °C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Note 1: All temperatures refer to topside of the package, measured on the package body surface.
Note 2: Time within 5 °C of actual peak temperature (tp) specified for the reflow profiles is a "supplier" minimum and "user" maximum.

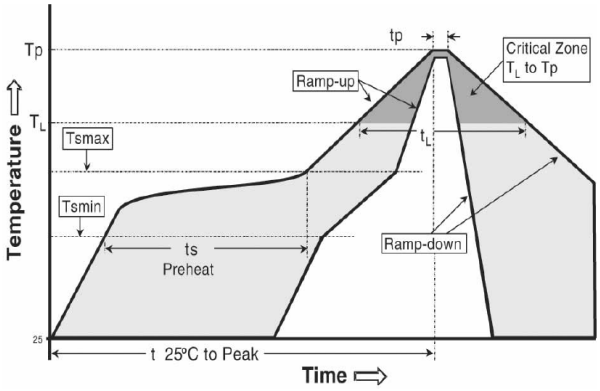


Figure 5-1 Classification Reflow Profile

Table 4-1 SnPb Eutectic Process - Package Peak Reflow Temperatures

Package Thickness	Volume mm^3 <350	Volume mm^3 ≥ 350
<2.5 mm	240 +0/-5 °C	225 +0/-5°C
≥ 2.5 mm	225 +0/-5°C	225 +0/-5°C

Table 4-2 Pb-free Process - Package Peak Reflow Temperatures

Package Thickness	Volume mm^3 < 350	Volume mm^3 350 - 2000	Volume mm^3 > 2000
< 1.6 mm	260 °C *	260 °C *	260 °C *
1.6 mm - 2.5 mm	260 °C *	250 °C *	245 °C *
> 2.5 mm	250 °C *	245 °C *	245 °C *
* Tolerance: The device manufacturer/supplier shall assure process compatibility up to and including the stated classification temperature at the rated MSL level			

Note 1: Package volume excludes external terminals (balls, bumps, lands, leads) and/or non-integral heat sinks.

Note 2: The maximum component temperature reached during reflow depends on package thickness and volume. The use of convection reflow processes reduces the thermal gradients between packages. However, thermal gradients due to differences in thermal mass of SMD packages may still exist.

Note 3: Components intended for use in a ''lead-free'' assembly process shall be evaluated using the ''lead free'' peak temperature and profiles defined in Tables 4-1, 4.2 and 5-2 whether or not lead free.

4.8 Consideration for alignment tolerances.

It is recommended that multiple connectors are to be parallel to each other or in the same orientation in Figure 3. Orientation shown in Figure 4 is not recommended.

Each connector must be aligned in both directions to within 0.20 true position with respect to every other connector of the same type, on the same PCB, and any other feature of the assembly that affects the mating alignment.

Required placement tolerance for each connector, length-wise or width-wise is 0.00 +/- 0.10

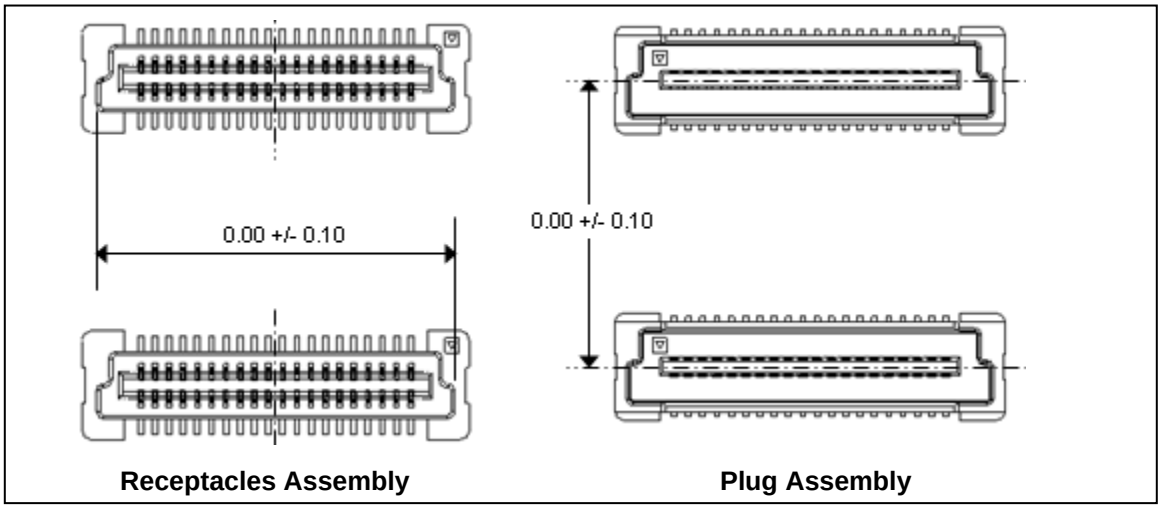


Figure 3: Recommended multiple connectors orientation

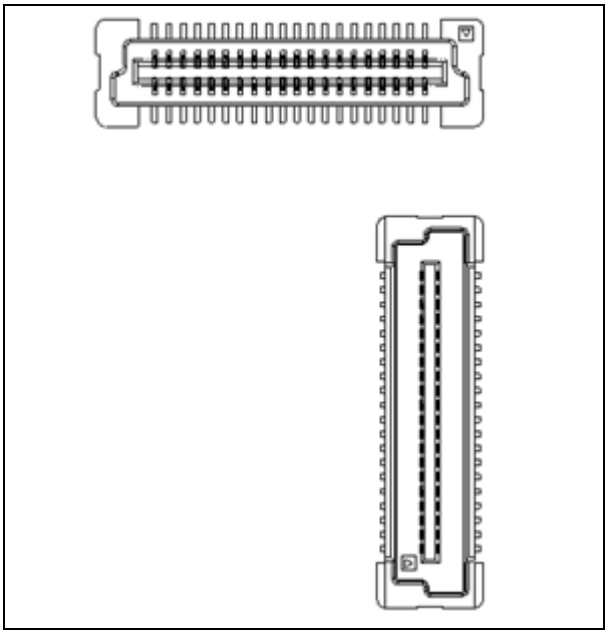
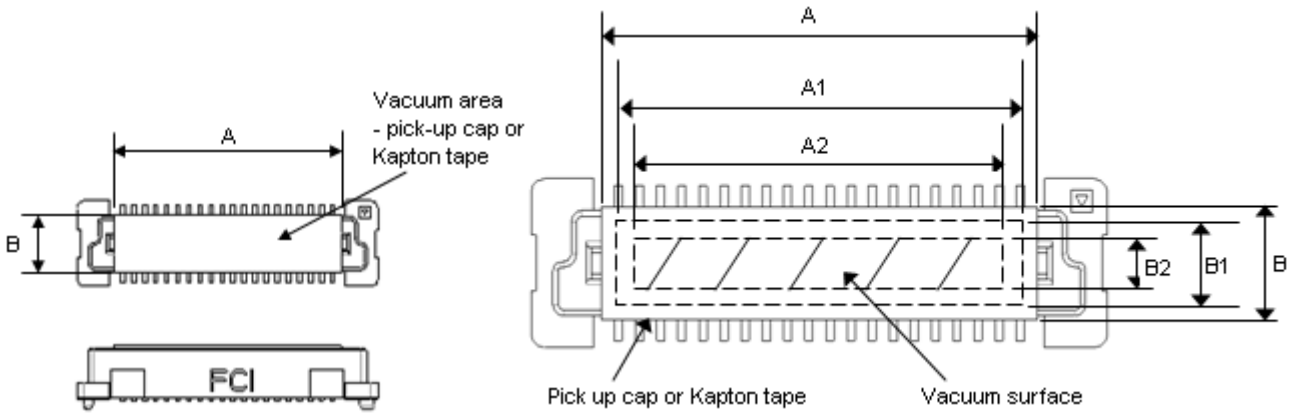


Figure 4: Not recommended

4.9 Pick and Place Equipment consideration

Vacuum Pick & Place Equipment. Ensure adequate vacuum area on the pick-up cap or Kapton tape. Part weight, equipment speed and relative travel of the connector with respect to the vacuum pad may require minimum different pick up zone.



Force of Vacuum, F = (A2) x (B2) x 6.78 gf (gram-force)

Mass of Applicable Component, m = F x μ (G x fs)
= F x 0.07 (1.0 x 2.0)
= F/30 g (gram)

Note: Maximum acceleration at Horizontal Transfer
- (low speed) G : 1.0G
- Function coefficient, μ : 0.07
- Safety factor, fs = 2.0

5.0 ANALYSIS

5.1 Area of clearance between aligning features.

Area of Clearance	Description	Tolerance	Remarks
CL 1	Clearance between end of center rib (Plug) and inside of the end wall (Receptacle)	**0.135 min OR 0.295 max**	See Figure 7 (full connector)
CL 2	Clearance along the length of the center rib (Plug) and along the length of the inside of the outer wall (Receptacle)	**-0.015 min OR 0.135 max**	See Figure 6 (half connector)
CL 3	Clearance between the inside of the outer wall, length-wise (Plug) and the between the outside of the outer wall, length-wise (Receptacle)	**0.085 min OR 0.165 max**	See Figure 5 (half connector)
CL 4	Clearance between the center rib (Plug) and bottom of the housing (Receptacle)	**0.035 min OR 0.185 max**	See Figure 4 & 5 (half connector)
CL 5	Similar with CL 2, with lead-in taken in account	**0.19 min OR 0.3 max**	See Figure 7 (half connector)
CL 6	Clearance between the inside end wall (Plug) and outer end wall (Receptacle) at the shorter side of the jog,	**0.005 min OR 0.115 max**	See Figure 4 & 7 (full connector)
CL 7	Clearance between the inside end wall (Plug) and outer end wall (Receptacle) at the longer side of the jog,	**0 min OR 0.08 max**	See Figure 4 & 7 (full connector)
CL 8	Nominal contact wipe	**1.25**	See Figure 8

Table 5: Tolerances of aligning features.

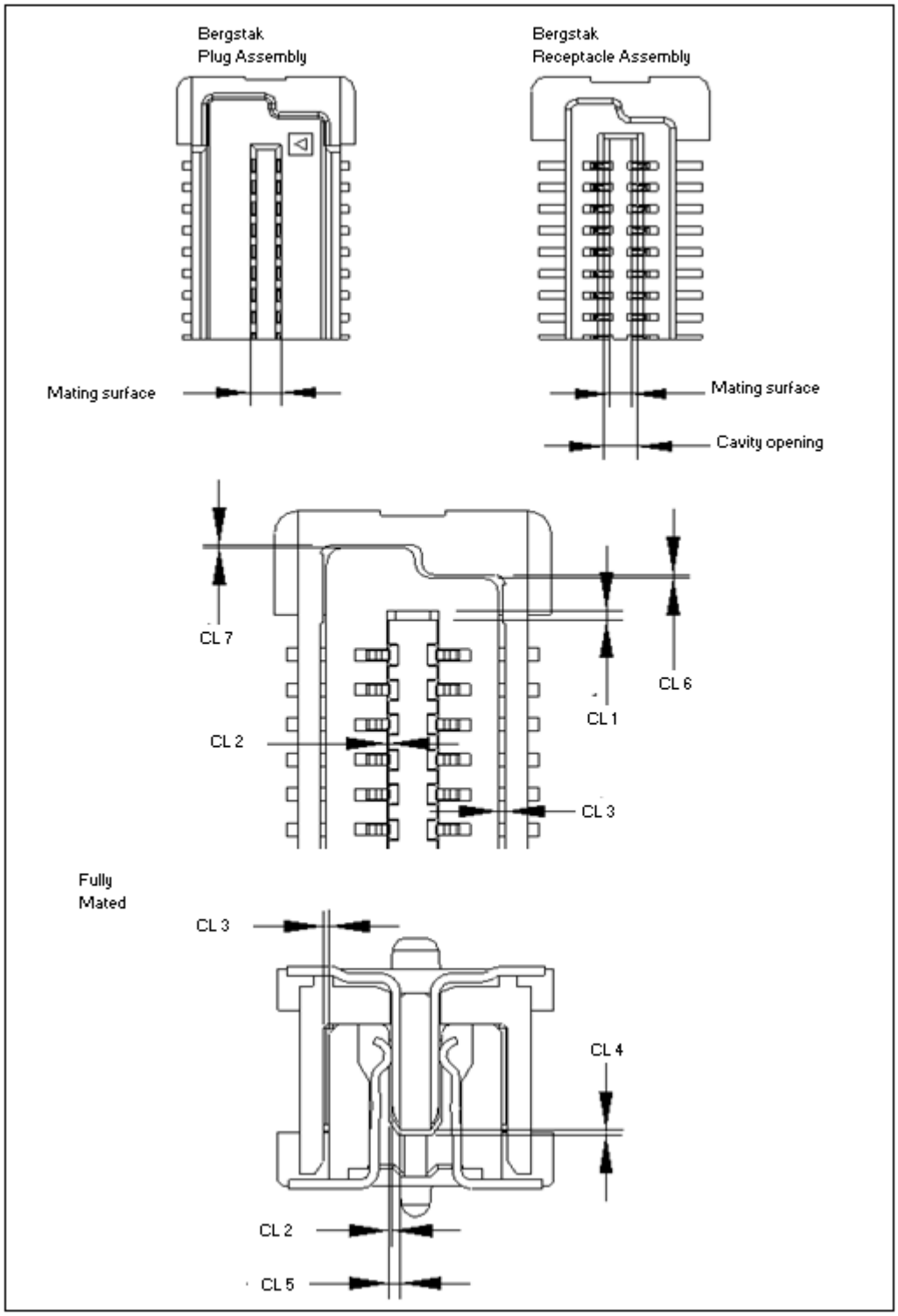
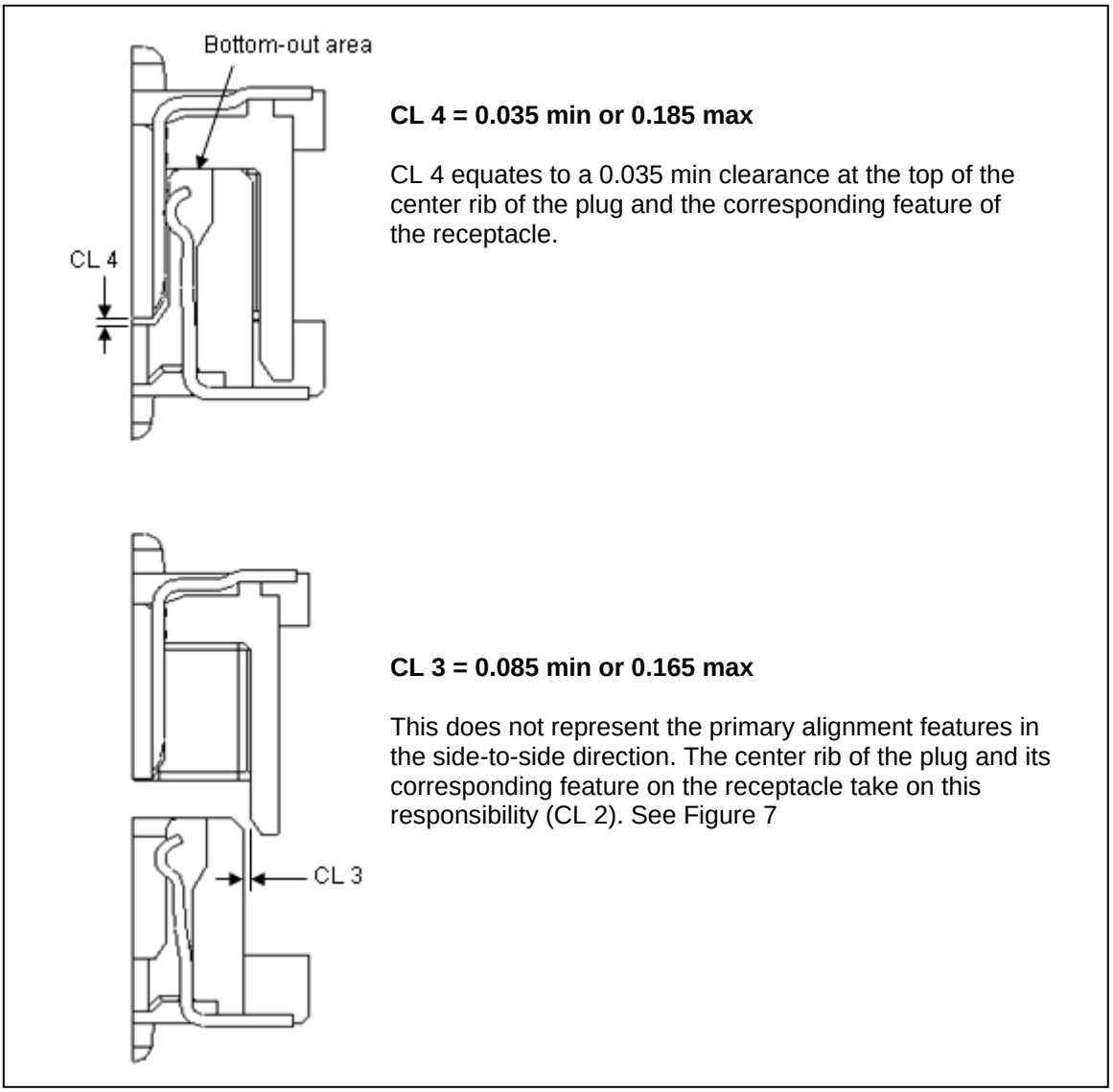


Figure 5: Area of clearance between aligning features

5.2 Physical point where the mating connectors bottom out AND the amount of clearance at the outer walls.



CL 4 = 0.035 min or 0.185 max

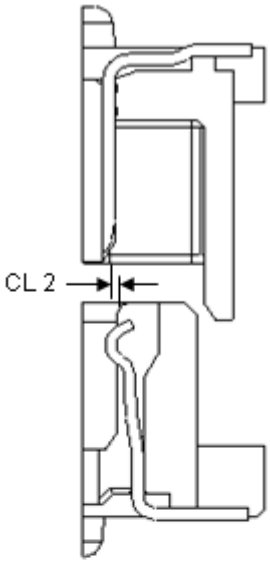
CL 4 equates to a 0.035 min clearance at the top of the center rib of the plug and the corresponding feature of the receptacle.

CL 3 = 0.085 min or 0.165 max

This does not represent the primary alignment features in the side-to-side direction. The center rib of the plug and its corresponding feature on the receptacle take on this responsibility (CL 2). See Figure 7

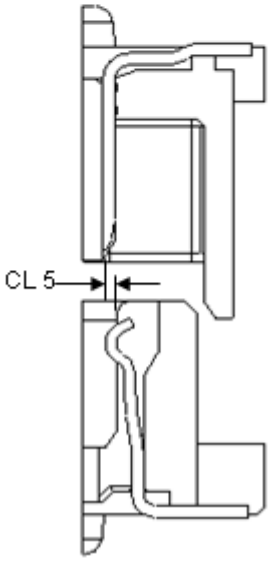
Figure 6: Cross sectional view of connector mating system.

5.3 Side clearance between the center rib of the plug, and the sidewall of the receptacle's center slot.



CL 2 = -0.015 min (interference) or 0.295 max

In a single mating pair application, the mating connector would be free to shift into a clearance alignment.
But in a multi-connector application, these possible positional relationships could exist.



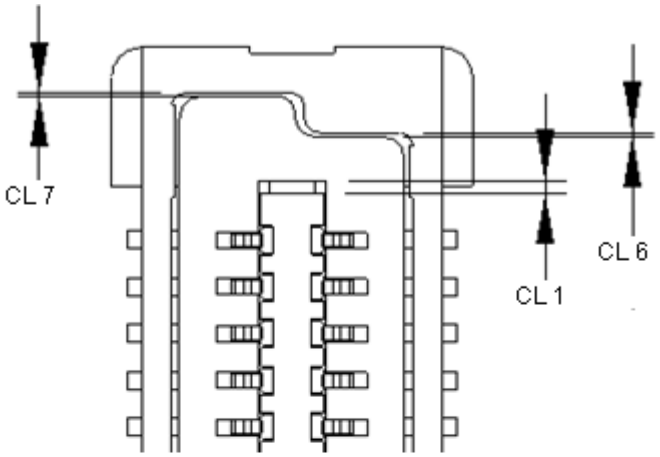
CL 5 = 0.19 min or 0.3 max

Similar to CL 2, with Plug lead-in taken in account.

Figure 7: Cross sectional view, side clearance.

5.4 Mating clearances in the longitudinal direction and Zippering effect

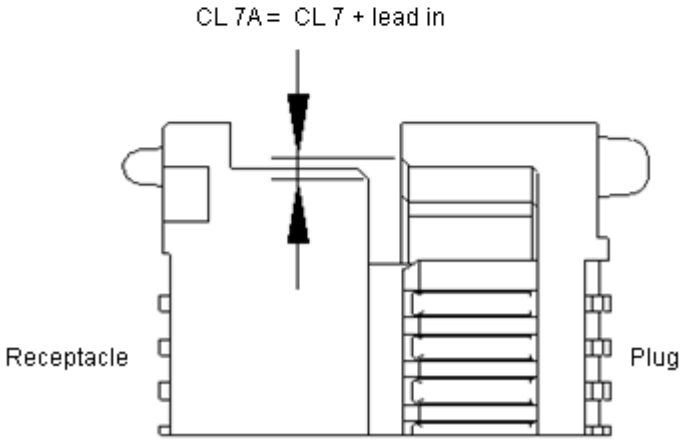
To eliminate possible “zippering”, there should be zero clearance in this direction.
Zippering of a connector system occurs when the terminals (contacts), are “angled” during mating approach, straddle each other instead of aligning with each other.



CL 1 = 0.135 min or 0.295 max

CL 6 = 0.005min or 0.115 max

CL 7 = 0 min or 0.08max

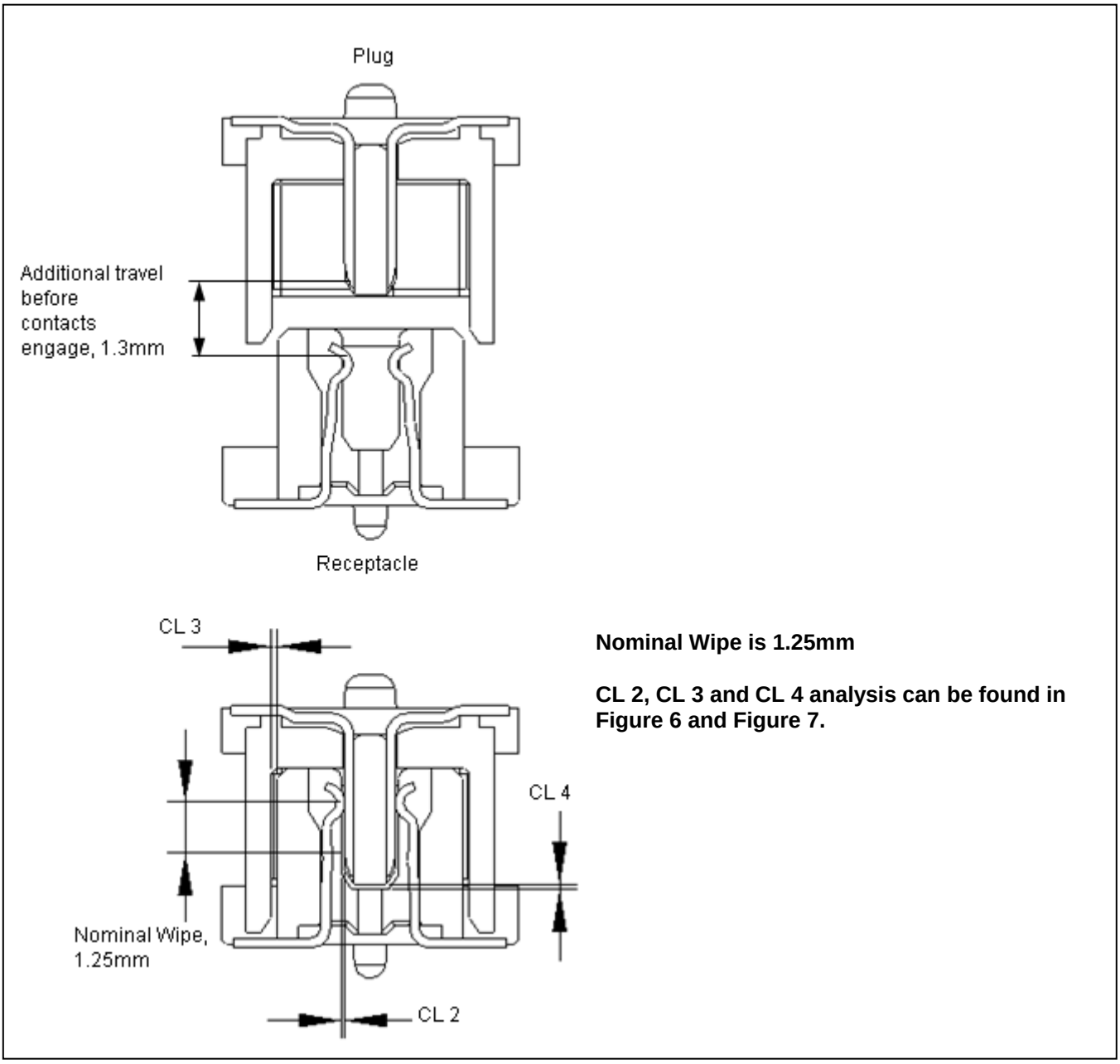


CL 7A = 0.3 min

With both connectors lead-in taken into account. The most permissible amount of misalignment in this direction would be 0.3 min.

Figure 8: Mating clearance in the longitudinal direction.

5.5 Cross section view of the connector pair that is approaching mating, and of a fully mated connection.



Nominal Wipe is 1.25mm

CL 2, CL 3 and CL 4 analysis can be found in Figure 6 and Figure 7.

Figure 9: Cross sectional view, approaching mating and mated connection

6.0 REFERENCE DOCUMENTS

FCI drawings, 61082 and 61083.

7.0 NOTES

Nil

8.0 RECORD RETENTION

Revision	Page	Description	ECR no.	Date
1	All	Preliminary	---	08/06/2018
A	All	First Release	---	03/21/2019