

# Other Mechanics Issues

# Detector Integration

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# Issues

- Several open issues on mechanics design/consolidation
- Assembly and Commissioning meetings
  - <https://indico.cern.ch/event/832269/>
- Topics:
  - Space within flex cable area
  - Connections to periphery boards, and mechanics of periphery boards
  - Layout of modules on stave plates
  - Rings in the periphery and corresponding connectors



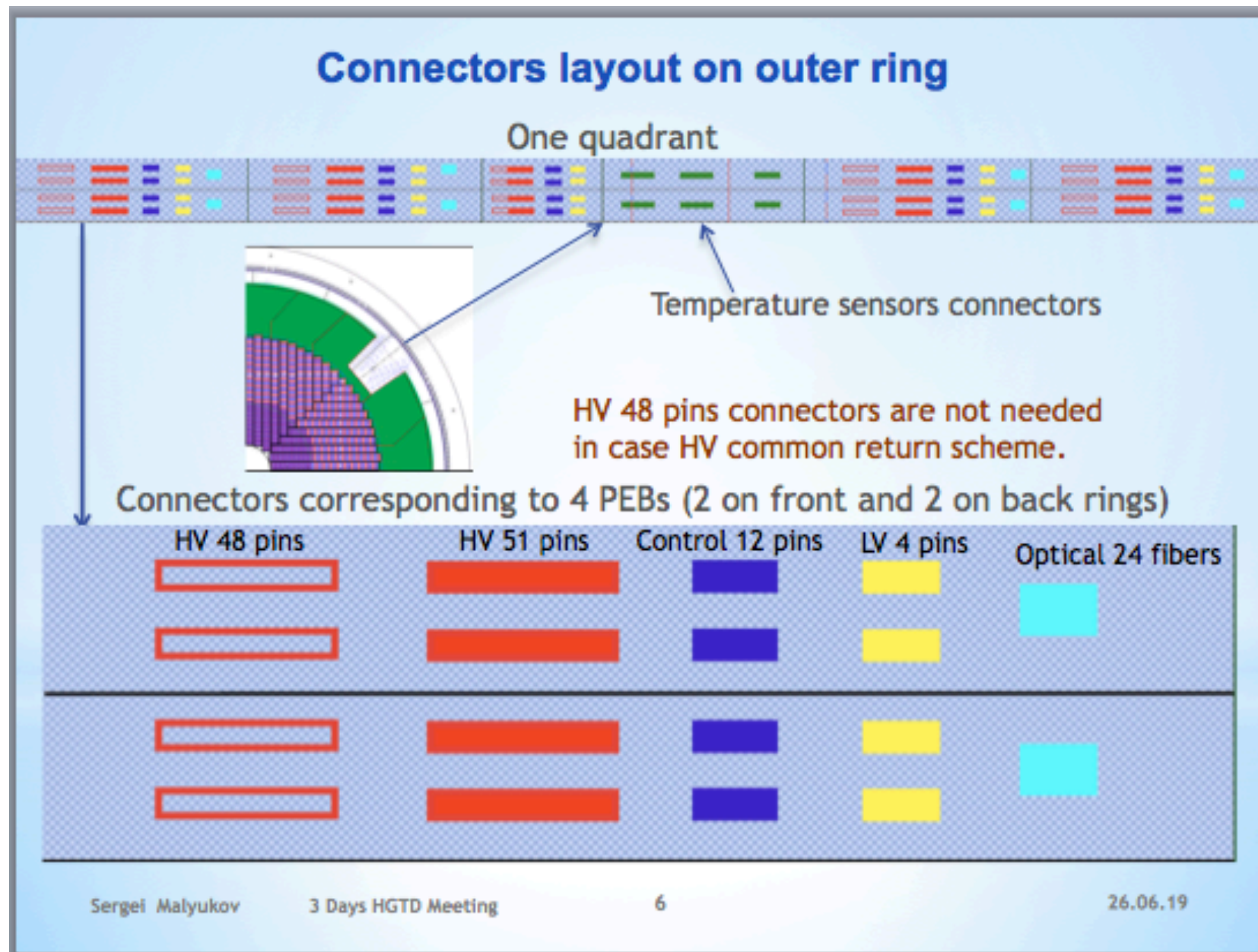
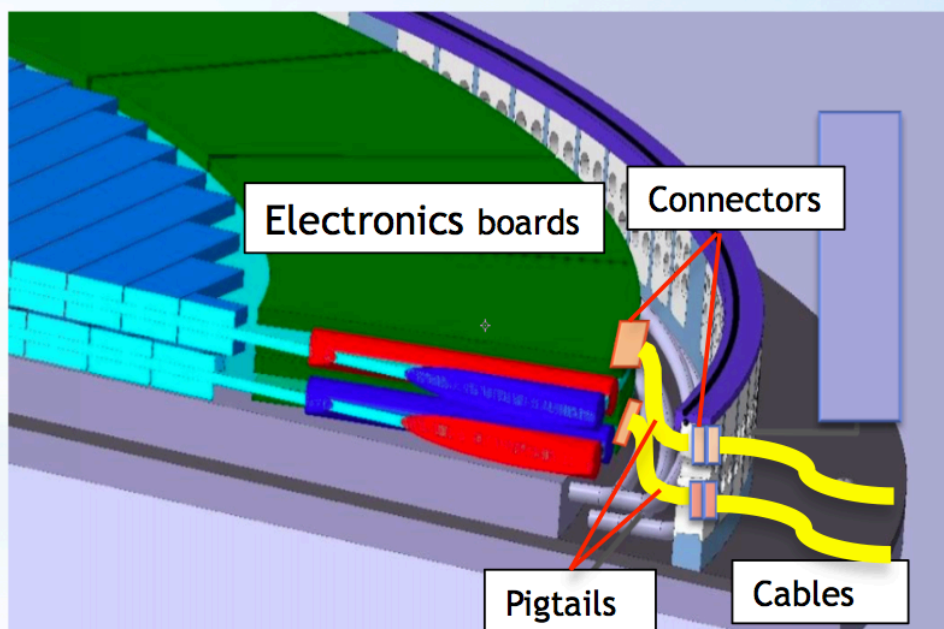
# Wheel Mechanics

## Proposed connection layout

The cables are connected to connectors incorporated into outer ring.

Connection between outer ring and PEB is done using pigtails.

This will allow to mount all connectors and pigtails at surface, close the vessel, test the assembled detector at surface and install it closed, only connecting the cables to outer ring in the pit.







# Wheel Mechanics

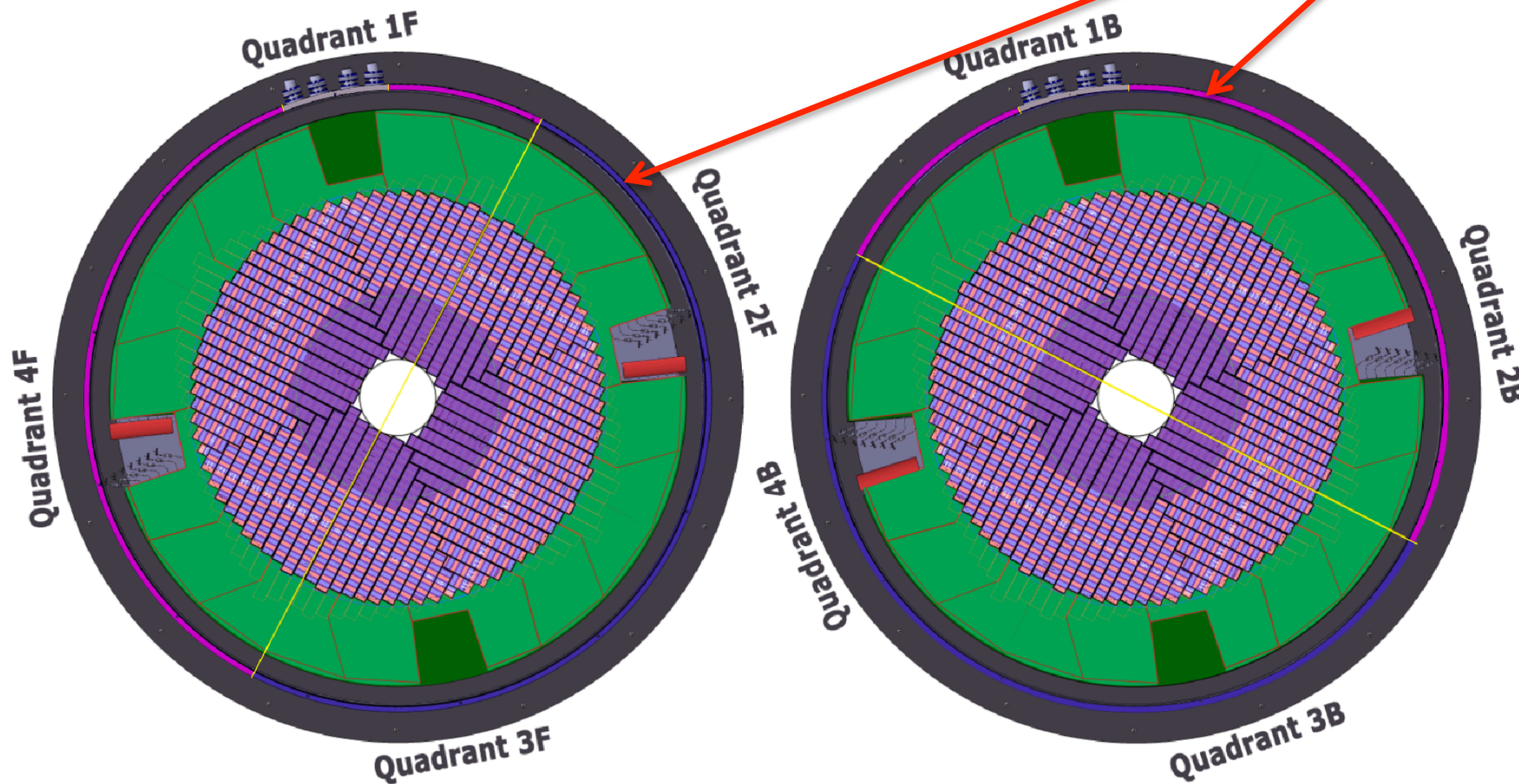
It would allow easier installation of second disk in YETS and easier removal of half-disks for maintenance at surface.



CO2 transfer lines

Outer ring is split in Z to 2 independent rings, one per disk.

Each such ring is split to segments, belonging to half-disks



Such design will allow to remove/install each half-disk for maintenance together with section of outer ring, only disconnecting the cables from the ring (and cooling manifolds)

A dedicated tooling for removal/installation to be used

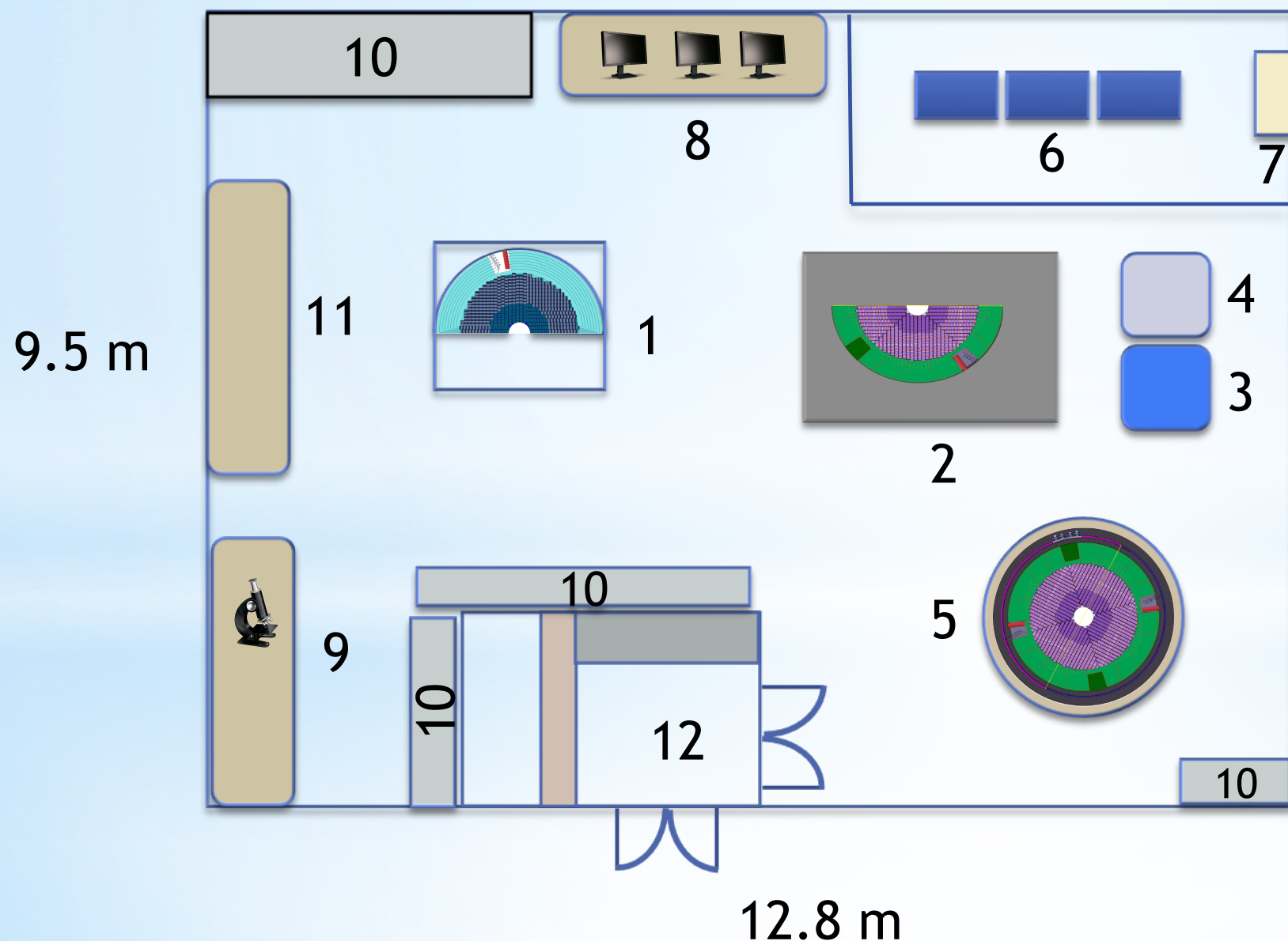




# Clean room for assembly

## Clean room for HGTD final assembly and tests

ISO 7 (class 10 000) clean room, about 120 m<sup>2</sup>



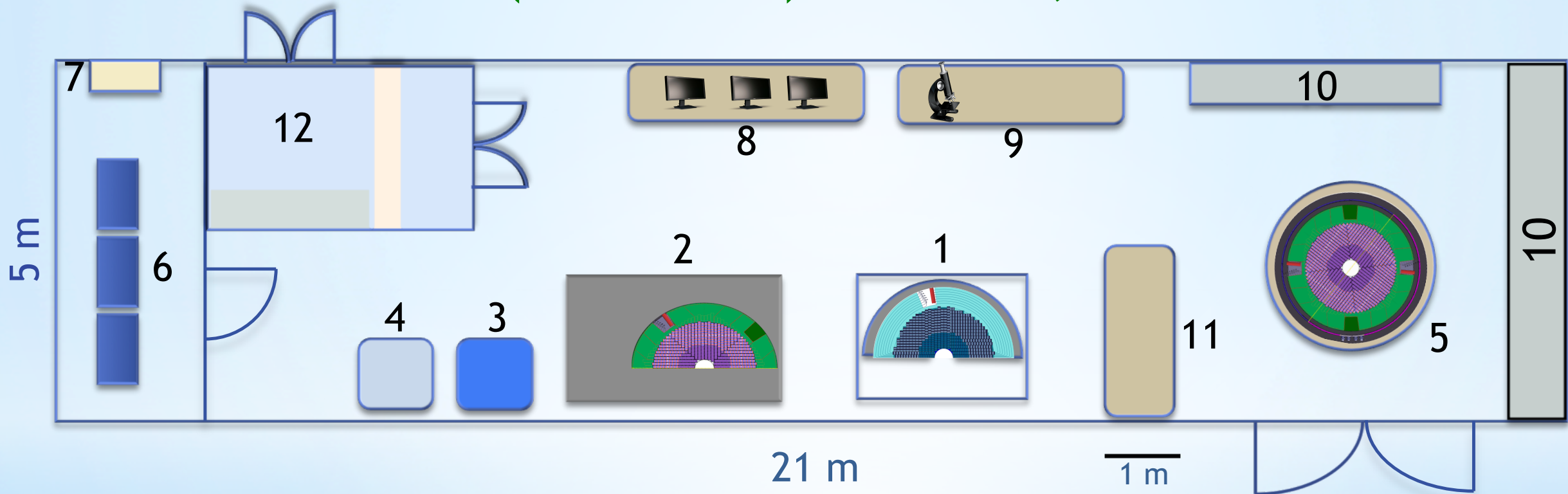
- 1 - rotating assembly support
- 2 - cold box
- 3 - cooling manifolds
- 4 - dry air supply
- 5 - round vessel assembly desk
- 6 - racks with back-end
- 7 - electrical cabinet
- 8 - computer desk
- 9 - desk for debugging
- 10 - cabinet, storage
- 11 - desk for HGTD components
- 12 - gowning room



# Clean room for assembly

## Clean room for HGTD final assembly and tests

ISO 7 (class 10 000) clean room, 105 m<sup>2</sup>



- |                               |                               |
|-------------------------------|-------------------------------|
| 1 – rotating assembly support | 7 – electrical cabinet        |
| 2 – cold box                  | 8 – computer desk             |
| 3 – cooling manifolds         | 9 – desk for debugging        |
| 4 – dry air supply            | 10 – cabinet, storage         |
| 5 – round assembly desk       | 11 – desk for HGTD components |
| 6 – racks with back-end       | 12 – gowning room             |







# Connectors

## Connectors candidates for connecting flex cables to PEB

To be checked if can be used in HGTD environment



<https://www.samtec.com/>

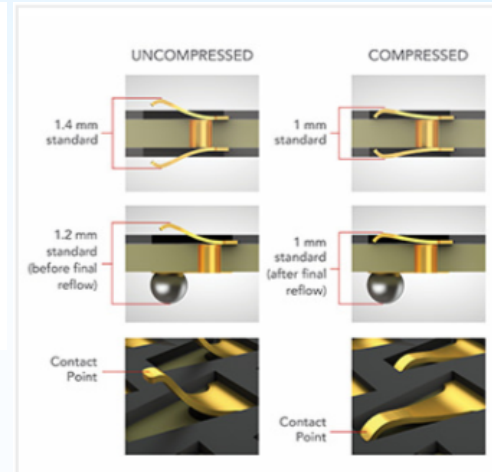
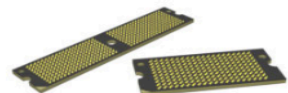
### Z-RAY® ULTRA-LOW PROFILE ARRAYS

Z-Ray® High-Density, Ultra-Low Profile, Highly Customizable Arrays

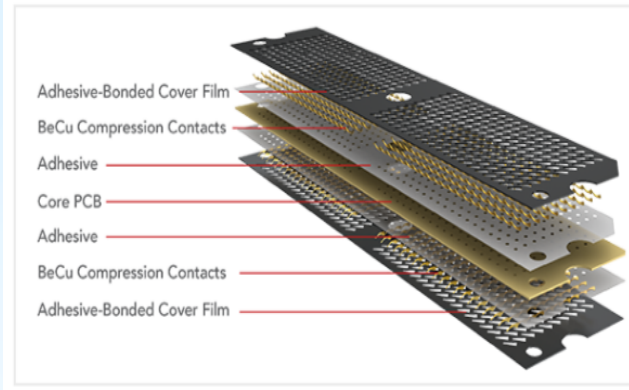
#### Features

- 1 mm standard body height
- Dual compression contacts
- Single compression with solder ball
- Performance up to 20 GHz / 40 Gbps
- 0.80 mm or 1.00 mm pitch standard
- Highly customizable system

#### Series

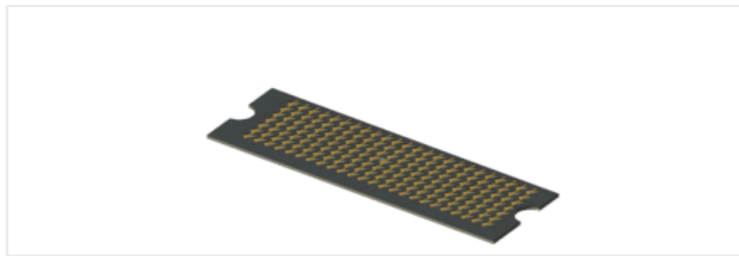


#### Construction



### ZA8H [Back To Top](#)

0.80 mm High-Speed Dual Compression Array

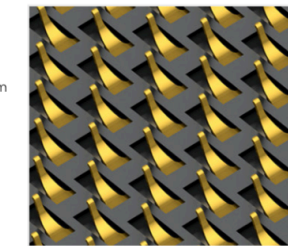


#### Features

- Performance up to 56 Gbps NRZ
- 0.33 mm height provides shortest signal path
- Dual compression BeCu contacts
- Up to 168 contacts: 4 or 7 rows with 3, 12 or 24 pairs per row
- 30 g normal force with .008" (0.20 mm) contact deflection

#### High Density

- Customer-specific pin counts for ultimate high density and speed flexibility
- Choice of 0.80 mm or 1.00 mm pitch grid
- Up to 400 I/Os standard with custom capabilities to 3,000+ I/Os
- Also Available: 1.00 mm pitch system with up to 400 I/Os, 1.27 mm and 2 mm standard heights, and up to 56 Gbps performance (GMI Series)



#### Specifications

- Performance up to 14 Gbps (ZA8, ZA1 Series) and 56 Gbps NRZ (ZA8H Series) with a migration path to 100 Gbps
- Up to 1,000 cycles, with alternate contact design for up to 3,000 cycles also available (tested to 85°C)
- Low 30 g normal force with .008" contact deflection
- 500 mA per line
- Differential Vias™ PCB routing available
- Also Available: 1.00 mm pitch system with up to 400 I/Os, 1.27 mm and 2 mm standard heights, and up to 56 Gbps performance (GMI Series)
- Also Available: Ultra-low profile Z-Ray® Cable Assembly designed for high-speed, micro pitch applications (ZRDP Series)

	Single Compression w/ Solder Balls		Dual Compression				
Series	ZA8	ZA1	ZA8	ZA1	Custom	ZA8H	
Pitch	0.80 mm	1.00 mm	0.80 mm	1.00 mm	1.27 mm	0.80 mm	
Max Row	25	20	50	58	58	14	
Max Column	25	20	50	58	37	50	
Thickness	Kapton Core	N/A	N/A	0.33 to 0.5 mm	0.33 to 0.5 mm	0.33 to 0.5 mm	0.33 mm
	FR4 Core	1.00 to 4 mm	1.00 to 4 mm	0.5 to 4 mm	0.5 to 4 mm	0.5 to 4 mm	N/A
Thickness Tolerance	Kapton Core	N/A	N/A	±5%	±5%	±5%	±5%
	FR4 Core	±10%	±10%	±10%	±10%	±10%	N/A
Deflection / Normal Force per Pin	0.20 mm / 30g			0.20 mm / 25-50g		0.20 mm / 30g	
Operating Temperature	-55°C to +105°C (85°C Single Cycle)						

#### Compression Hardware Systems

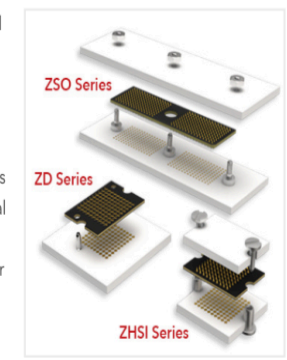
Engineered to provide precise alignment, compression and retention of dual compression (LGA) or single compression with solder balls (BGA) Z-Ray® Interposers

Z-Ray® hardware systems are ultra-low profile and designed to reduce risk of damage to the interposer

ZSO Series provides alignment for single compression solder ball interposers

ZHSI Series provides alignment and ensures proper contact retention for dual compression interposers

ZD Series press-in hardware provides proper PCB to interposer alignment for dual compression interposers

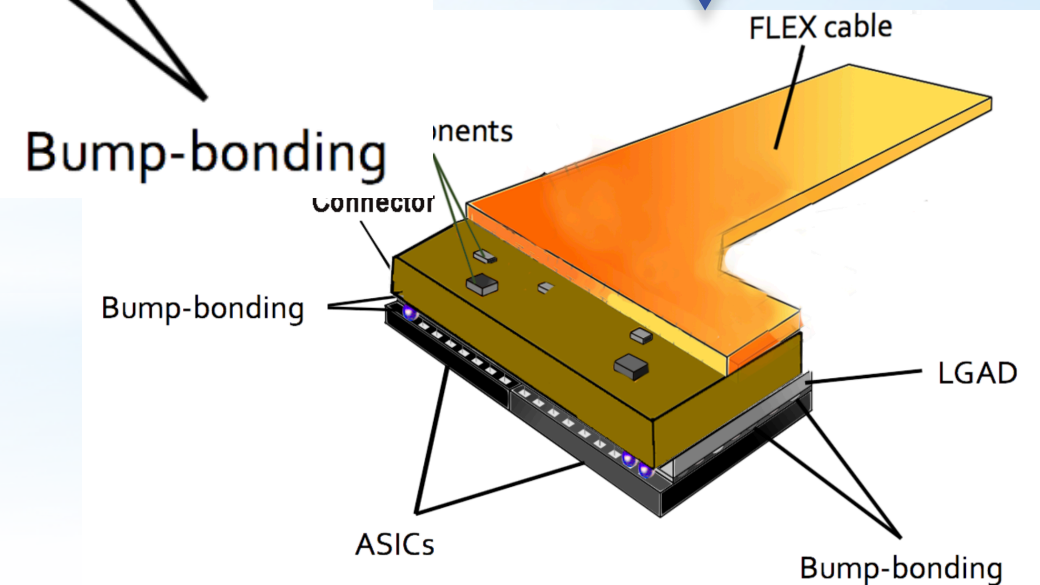
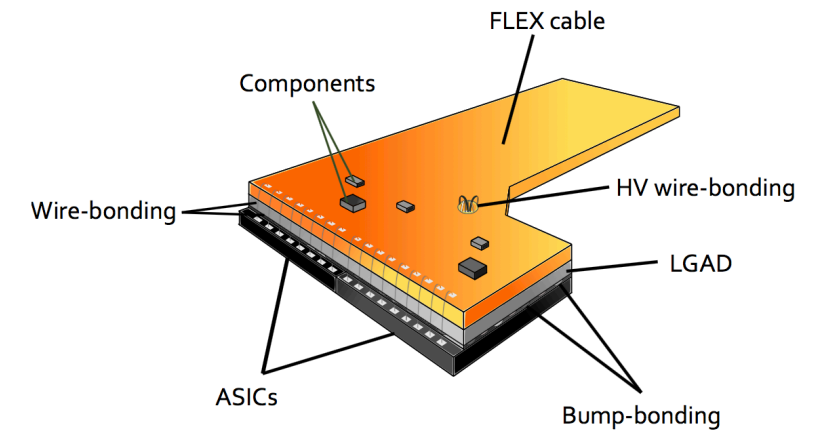
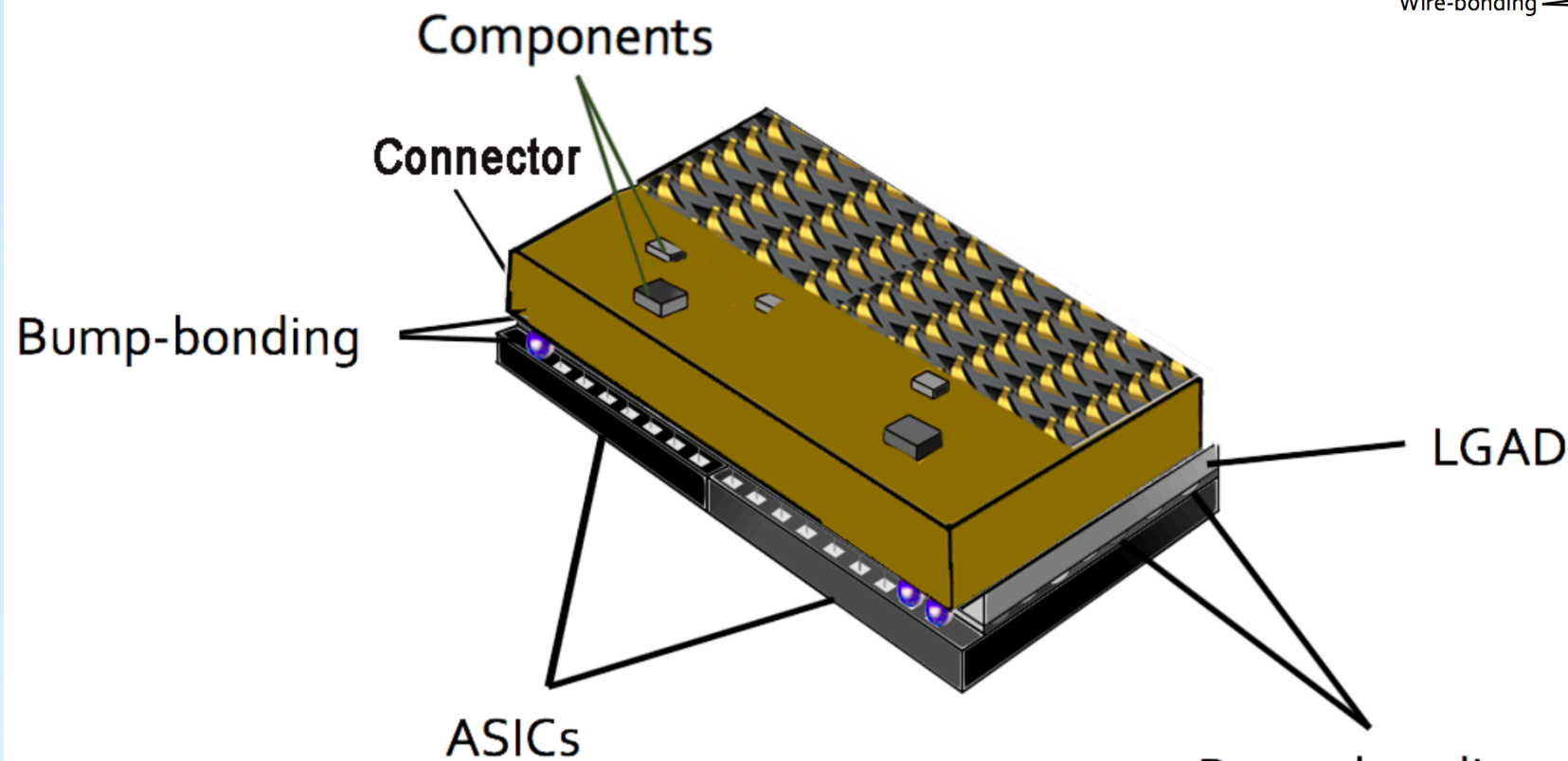






# Connectors

## Connectors candidates for connecting flex cables to PEB



Price, space, feasibility to make bump bonding = ?

Wire bonding → bump bonding = more robust

Flexes without connectors on both sides

Flexes can be reused

Possibility to adjust to flexes length difference

...



# Connectors

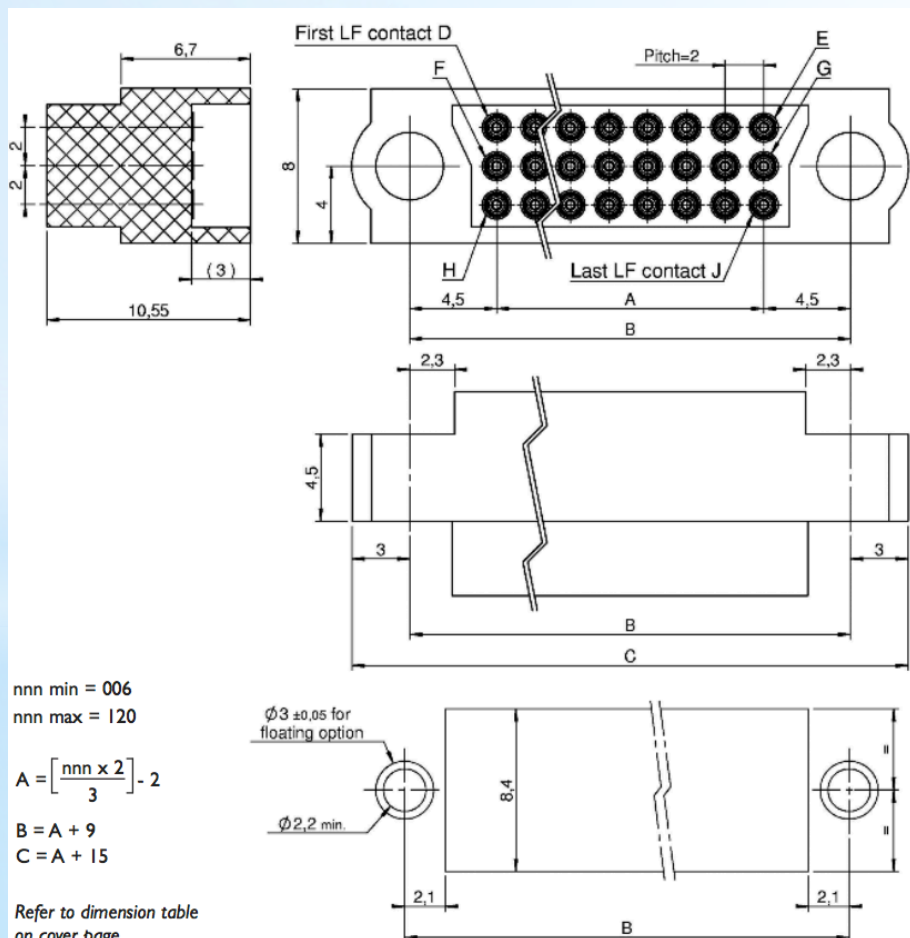
## Connector candidates for outer ring and proximity cables

### CMM 320 SERIES in male & female styles for HV(800A), control, signals

CMM	LF contacts number	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120	
	Distance between axis	A	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
		B	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87
Length in mm	C	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	

### CMM 340 SERIES in male & female styles for LV (20A) contacts

CMM 340 Male & Female Special contacts only	Special contacts number	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	
	Distance between axis	A	2,5	5	7,5	10	12,5	15	17,5	20	22,5	25	27,5	30	32,5	35	37,5	40	42,5	45	47,5	50	52,5	55	57,5	60	62,5	65	67,5	70	72,5	75	77,5
		B	12,5	15	17,5	20	22,5	25	27,5	30	32,5	35	37,5	40	42,5	45	47,5	50	52,5	55	57,5	60	62,5	65	67,5	70	72,5	75	77,5	80	82,5	85	87,5
Length in mm	C	18,5	21	23,5	26	28,5	31	33,5	36	38,5	41	43,5	46	48,5	51	53,5	56	58,5	61	63,5	66	68,5	71	73,5	76	78,5	81	83,5	86	88,5	91	93,5	

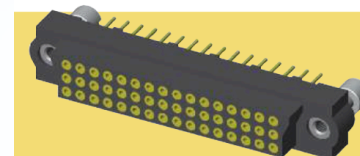


$nnn \text{ min} = 006$   
 $nnn \text{ max} = 120$   
 $A = \left[ \frac{nnn \times 2}{3} \right] - 2$   
 $B = A + 9$   
 $C = A + 15$

Refer to dimension table on cover page

Male connectors for outer ring, cable connectors are similar

HV(800V) and signal



LV (20A)

