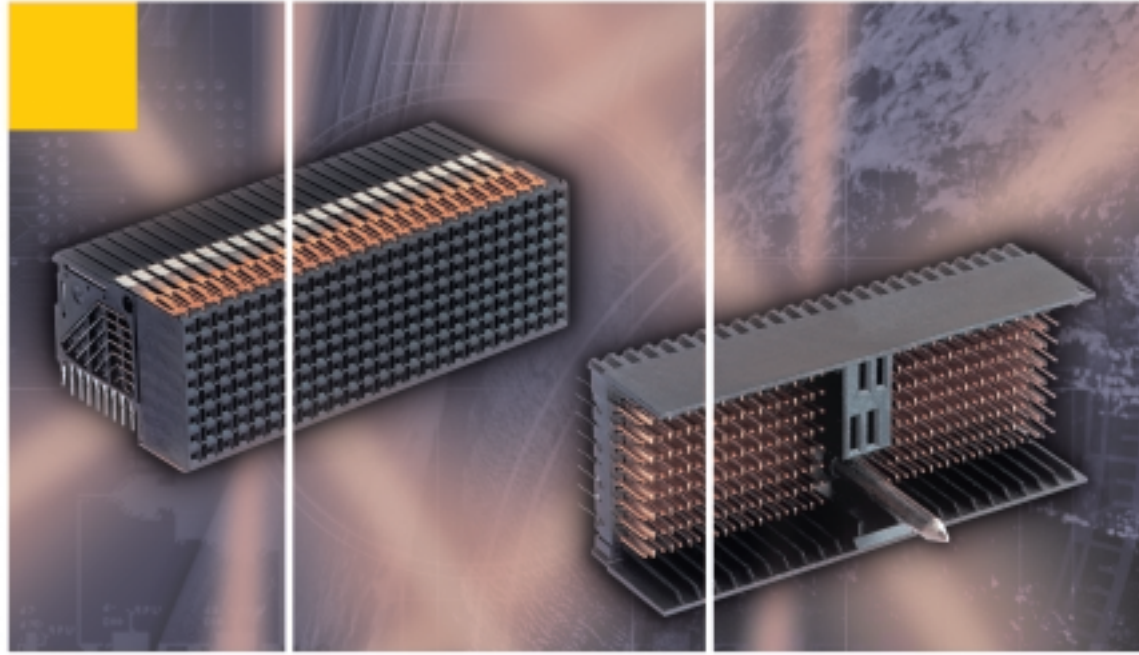


harbus[®] HSHM



2.0 mm High Speed Hard Metric connectors



People | Power | Partnership

High-density

50 differential pairs or 100 fully shielded single ended contacts per 25 mm system unit.

High-speed

harbus® HSHM offers very low crosstalk, tight impedance and skew control.

High-flexibility

Signal contacts can be shielded individually or by pairs in rows or columns.

2.00 mm hard metric format

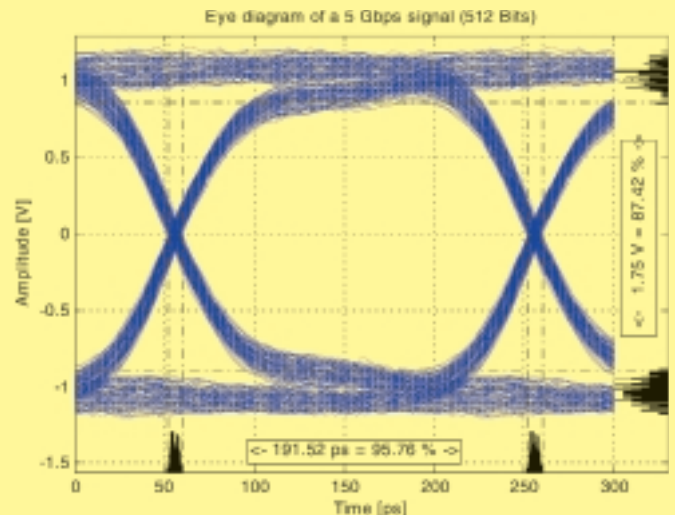
Designed as an extension to the IEC 61076-4-101 standard on 2.0 mm hard metric connectors, harbus® HSHM modules can easily be combined with other popular hard metric products like 2.0 mm hard metric and Mini Coax modules.

2.00 mm hard metric compatibility

The mating compatibility of harbus® HSHM with unshielded 5 row and 8 row connectors allows for an easy integration of legacy boards in new systems.

Low insertion force

The use of unique asymmetric dual beam contacts reduces the force while applying a high normal force on the pins for higher reliability.



Number of contacts : 55 – 220

Signal contact spacing : 2.00 mm

Working current : 1.0 ADC (Signal) max.

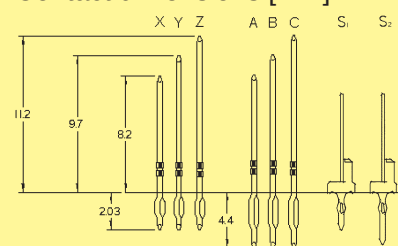
Test voltage $U_{r.m.s.}$: 750 V min.

Contact resistance : 20 m Ω max.

Insulation resistance : 10 G Ω min.

Temperature range : - 55 °C ... + 125 °C

Contact dimensions [mm]



Durability as per IEC 61076-4-101 : Performance level 2 = 250 mating cycles in total.
First 125 mating cycles, then 4 days gas test using 0.5 ppm SO₂ and 0.1 ppm H₂S (at 25 ± 2 °C and 75 ± 3 % humidity). Measurement of contact resistance. The remaining 125 mating cycles are subject to measurement of contact resistance and visual inspection. No abrasion of the contact finish through to the base material. No functional impairment.

Performance level 1 = 500 mating cycles in total.
First 250 mating cycles, then 10 days gas test using 0.5 ppm SO₂ and 0.1 ppm H₂S (at 25 ± 2 °C and 75 ± 3 % humidity). Measurement of contact resistance. The remaining 250 mating cycles are subject to measurement of contact resistance and visual inspection. No abrasion of the contact finish through to the base material. No functional impairment.

Press-in force : 50 N/pin max.

Retention force : 9 N/pin min.

Mating force signal : 0.4 N/pin max.

Mating force ground : 0.3 N/pin max.

Withdrawal force signal : 0.2 N/pin min.

Withdrawal force ground : 0.05 N/pin min.

Materials

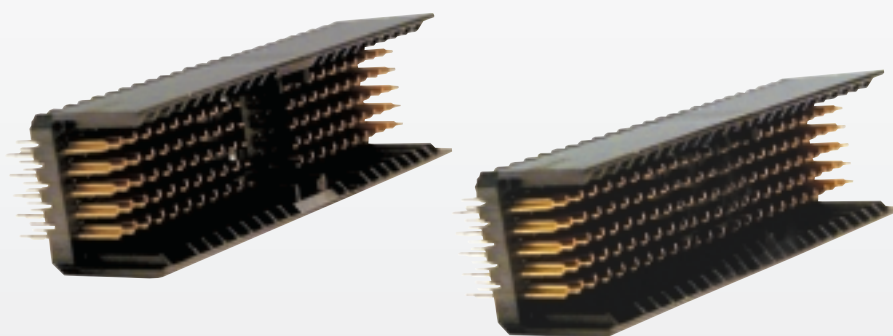
Mouldings : LCP

Contacts : Copper alloy

Contact surface : AuPd/Ni or Au/Ni

Electrical performance

Single ended configurations									
Connector style	Fully shielded		Stripline shielded		Stripline shielded		Stripline shielded		
S:G ratio	1:0		1:0		1:0		1:1		
Signal density (signals/inch)	101		101		101		50		
Peak single ended impedance	50 system		50 system		75 system		50 system		
$T_{rise} = 150$ ps	54.0 Ω		73.0 Ω		53.5 Ω		72.5 Ω		
$T_{rise} = 250$ ps	53.5 Ω		64.5 Ω		56.5 Ω		63.5 Ω		
$T_{rise} = 500$ ps	53.2 Ω				63.0 Ω				
Peak single ended crosstalk	Near end	Far end	Near end	Far end	Near end	Far end	Near end	Far end	
$T_{rise} = 150$ ps	6.6 %	- 4.2 %	9.8 %		14.1 %	- 5.3 %	0.6 %		
$T_{rise} = 250$ ps	5.3 %	- 2.5 %	7.8 %		12.2 %	- 2.9 %	0.4 %		
$T_{rise} = 500$ ps	3.6 %	- 1.3 %			9.2 %	- 1.2 %			
Differential configurations									
Connector style	Row differential shields		Stripline shielded column pairs		Stripline shielded column pairs		Stripline shielded pairs, C&F rows Gnd		
S:G ratio	1:0		1:0		1:0		3:1		
Signal density (pairs/inch)	50		50		50		38		
Peak differential impedance	100 system		100 system		150 system		100 system		
$T_{rise} = 100$ ps	112.4 Ω		133.5 Ω		103.0 Ω		135.0 Ω		
$T_{rise} = 150$ ps	108.0 Ω		128.0 Ω		107.0 Ω		128.0 Ω		
$T_{rise} = 250$ ps	107.0 Ω		120.0 Ω		111.5 Ω		120.0 Ω		
Peak differential crosstalk	Near end	Far end	Near end	Far end	Near end	Far end	Near end	Far end	
$T_{rise} = 100$ ps	4.1 %	- 1.8 %	4.4 %		- 5.8 %	- 10.5 %	3.8 %		
$T_{rise} = 150$ ps	3.1 %	- 1.2 %	3.8 %		- 4.1 %	- 8.8 %	2.4 %		
$T_{rise} = 250$ ps	1.8 %	- 0.8 %	2.8 %		- 2.9 %	- 6.8 %	1.4 %		



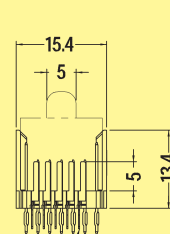
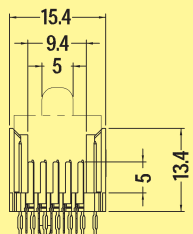
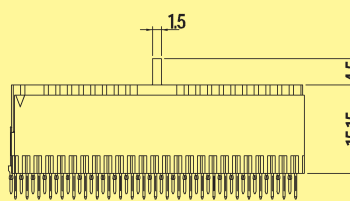
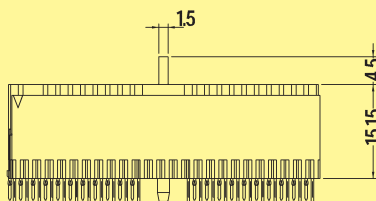
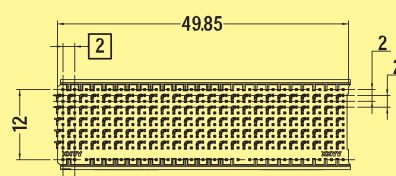
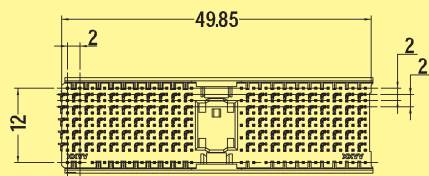
Male connectors, straight

Identification	Number of contacts	Termination length [mm]	Shielding arrangement	Part number	Contact configuration*
Type A	110	Signal 4.4 mm Ground 3.5 mm	Single ended	16 01 423 2001 16 01 423 5001	
			Differential in rows	16 01 433 2001 16 01 433 5001	
Type A			Single ended	16 01 323 2001 16 01 323 5001	
			Differential in rows	16 01 333 2001 16 01 333 5001	
Type B	125	Signal 4.4 mm Ground 3.5 mm	Single ended	16 02 423 2001 16 02 423 5001	
			Differential in rows	16 02 433 2001 16 02 433 5001	
Type B			Single ended	16 02 323 2001 16 02 323 5001	
			Differential in rows	16 02 333 2001 16 02 333 5001	

Type A

Type B

Dimensions [mm]

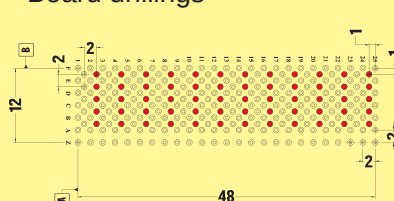
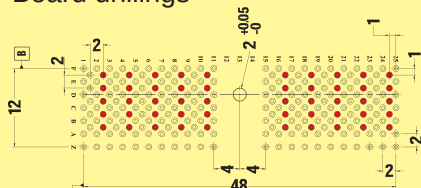


Interstitial ground contacts
Signal contacts

Interstitial ground contacts
Signal contacts

Board drillings

Board drillings



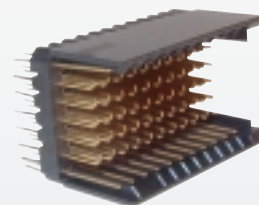
● = do not drill for differential pairs pcb

Thin print part numbers: 0.76 µm (30 µinch) Gold on contact area

= performance level 1

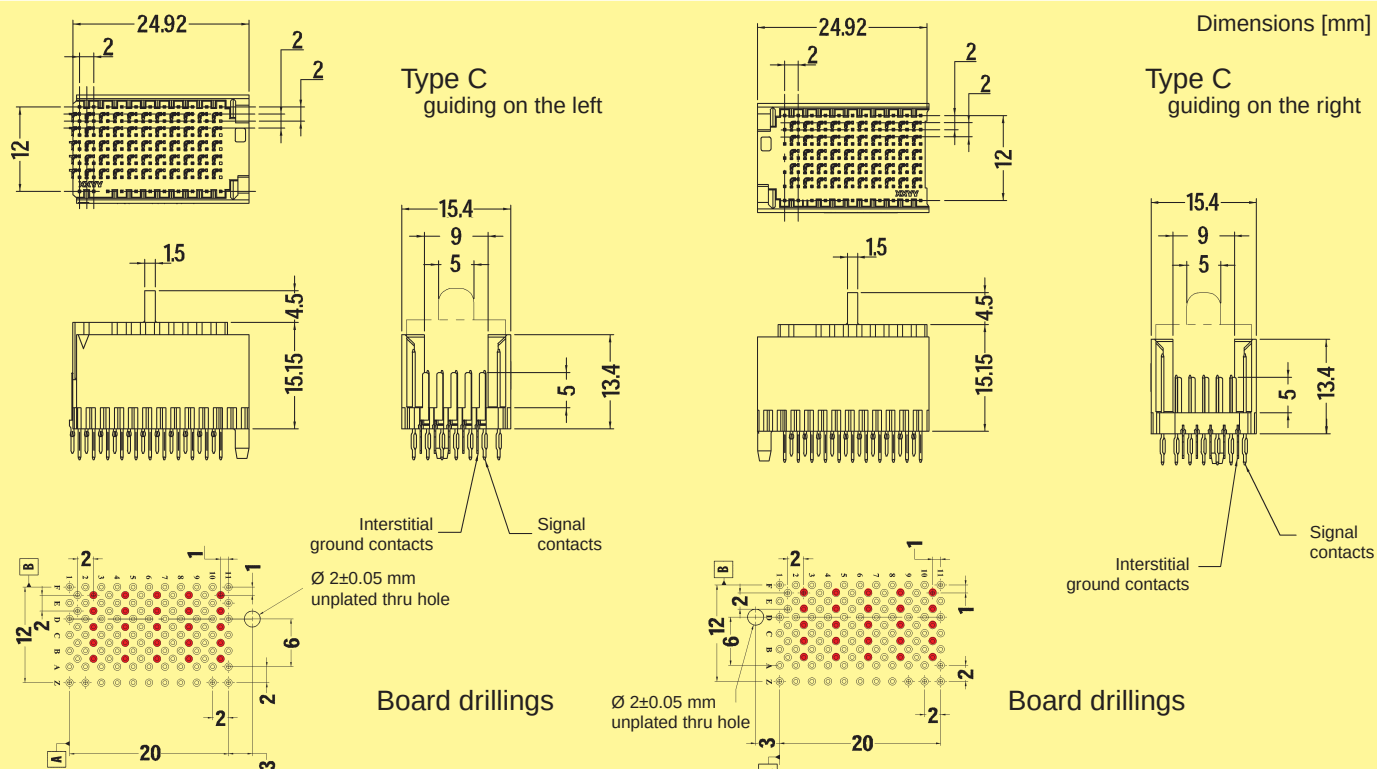
Bold print part numbers: Gold flash over 1.02 µm (40 µinch) Palladium-Nickel on contact area = performance level 2

* Additional information see page 3



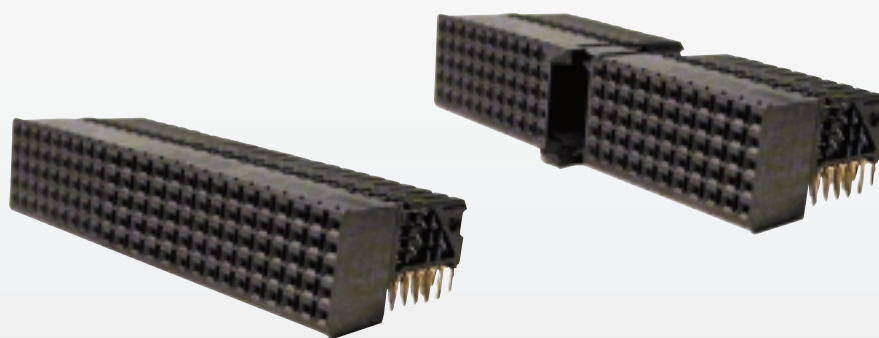
Male connectors, straight

Identification	Number of contacts	Termination length [mm]	Shielding arrangement	Part number	Contact configuration*
Type C guiding on the left	55	Signal 4.4 mm Ground 3.5 mm	Single ended	16 03 423 2001 16 03 423 5001	
			Differential in rows	16 03 433 2001 16 03 433 5001	
Type C guiding on the left	77	Signal 4.4 mm Ground 3.5 mm	Single ended	16 03 323 2001 16 03 323 5001	
			Differential in rows	16 03 333 2001 16 03 333 5001	
Type C guiding on the right	55	Signal 4.4 mm Ground 3.5 mm	Single ended	16 07 423 2001 16 07 423 5001	
			Differential in rows	16 07 433 2001 16 07 433 5001	
Type C guiding on the right	77	Signal 4.4 mm Ground 3.5 mm	Single ended	16 07 323 2001 16 07 323 5001	
			Differential in rows	16 07 333 2001 16 07 333 5001	



● = do not drill for differential pairs pcb

Thin print part numbers: 0.76 µm (30 µinch) Gold on contact area = performance level 1
Bold print part numbers: Gold flash over 1.02 µm (40 µinch) Palladium-Nickel on contact area = performance level 2
 * Additional information see page 3



Female connectors, angled

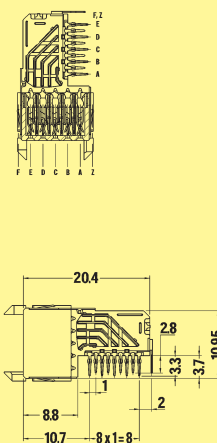
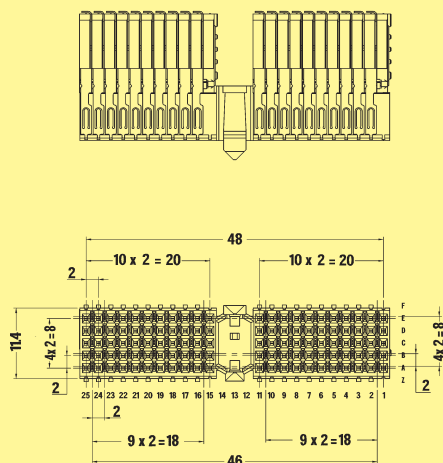
Identification	Number of contacts	Shielding arrangement	Part number
Type A	110	Single ended	16 21 421 2001 16 21 421 5001
		Differential pairs in rows	16 21 431 2001 16 21 431 5001
Type A with pre-installed shield	110	Single ended	16 21 221 2001 16 21 221 5001
		Differential pairs in rows	16 21 231 2001 16 21 231 5001
Type B	125	Single ended	16 22 421 2001 16 22 421 5001
		Differential pairs in rows	16 22 431 2001 16 22 431 5001
Type B with pre-installed shield	125	Single ended	16 22 221 2001 16 22 221 5001
		Differential pairs in rows	16 22 231 2001 16 22 231 5001

Type A

Type B

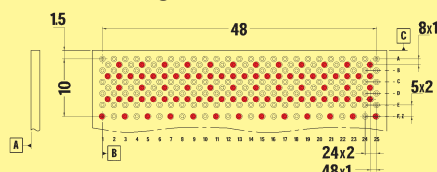
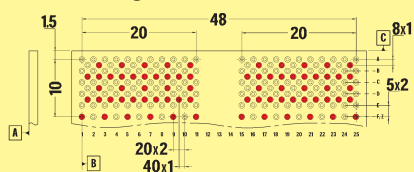
Dimensions [mm]

for dimensions please contact us



Board drillings

Board drillings

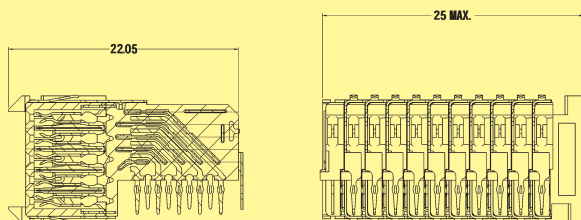




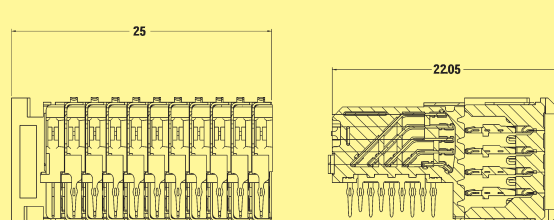
Female connectors, angled

Identification	Number of contacts	Shielding arrangement	Part number
Type C guiding on the left	55	Single ended	16 23 421 2001 16 23 421 5001
		Differential pairs in rows	16 23 431 2001 16 23 431 5001
Type C guiding on the left with pre-installed shield	55	Single ended	16 23 221 2001 16 23 221 5001
		Differential pairs in rows	16 23 231 2001 16 23 231 5001
Type C guiding on the right	55	Single ended	16 27 421 2001 16 27 421 5001
		Differential pairs in rows	16 27 431 2001 16 27 431 5001
Type C guiding on the right with pre-installed shield	55	Single ended	16 27 221 2001 16 27 221 5001
		Differential pairs in rows	16 27 231 2001 16 27 231 5001

Type C
guiding on the left

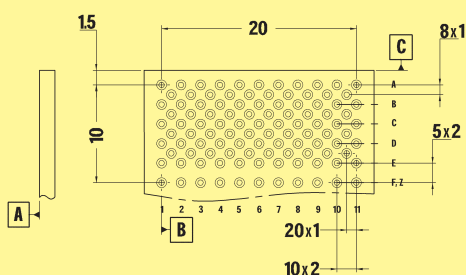


Type C
guiding on the right

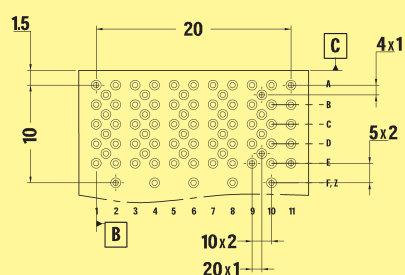


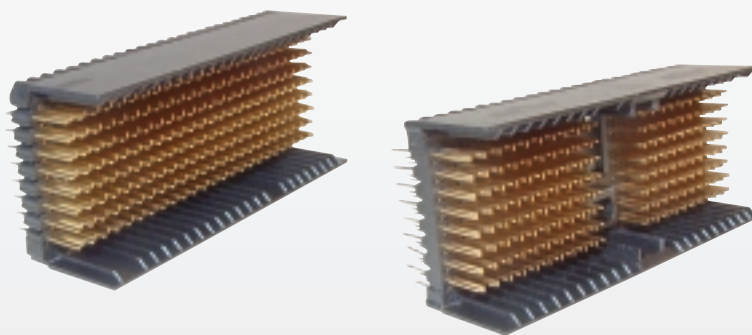
Dimensions [mm]

Board drillings
single ended



Board drillings
differential pairs in row





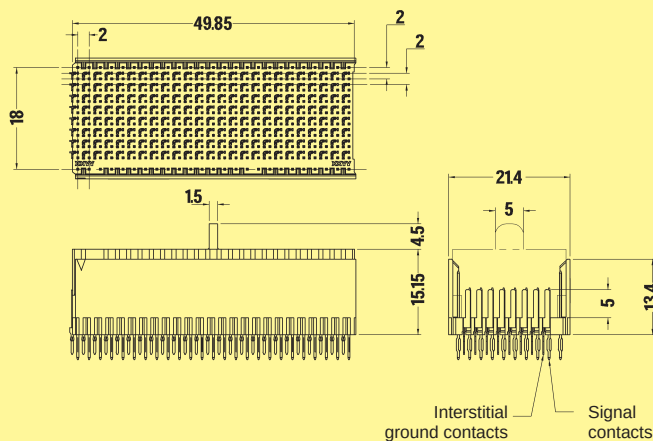
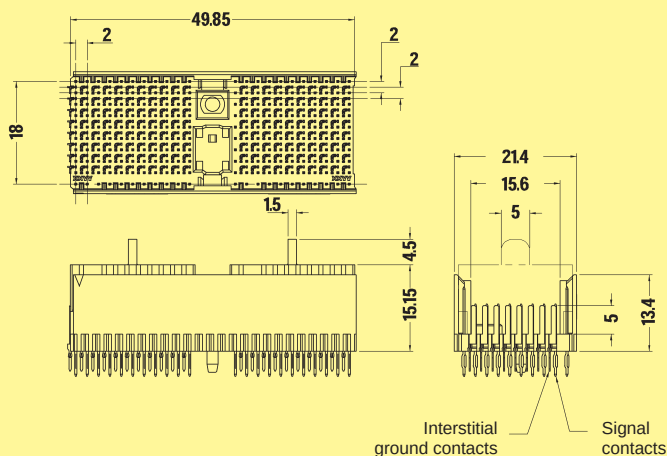
Male connectors, straight

Identification	Number of contacts	Termination length [mm]	Shielding arrangement	Part number	Contact configuration*
Type D	176	Signal 4.4 mm Ground 3.5 mm	Single ended	16 11 423 2001 16 11 423 5001	
			Differential in rows	16 11 433 2001 16 11 433 5001	
Type D	220	Signal 4.4 mm Ground 3.5 mm	Single ended	16 11 323 2001 16 11 323 5001	
			Differential in rows	16 11 333 2001 16 11 333 5001	
Type E	200	Signal 4.4 mm Ground 3.5 mm	Single ended	16 12 423 2001 16 12 423 5001	
			Differential in rows	16 12 433 2001 16 12 433 5001	
Type E	250	Signal 4.4 mm Ground 3.5 mm	Single ended	16 12 323 2001 16 12 323 5001	
			Differential in rows	16 12 333 2001 16 12 333 5001	

Type D

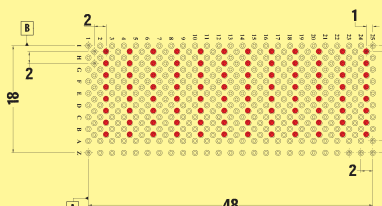
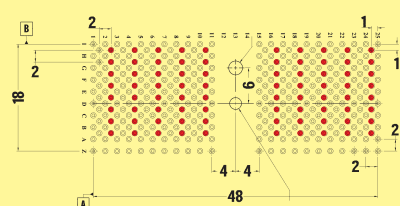
Type E

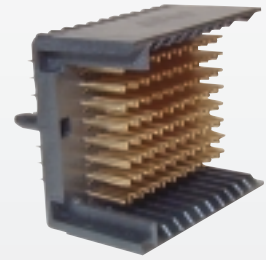
Dimensions [mm]



Board drillings

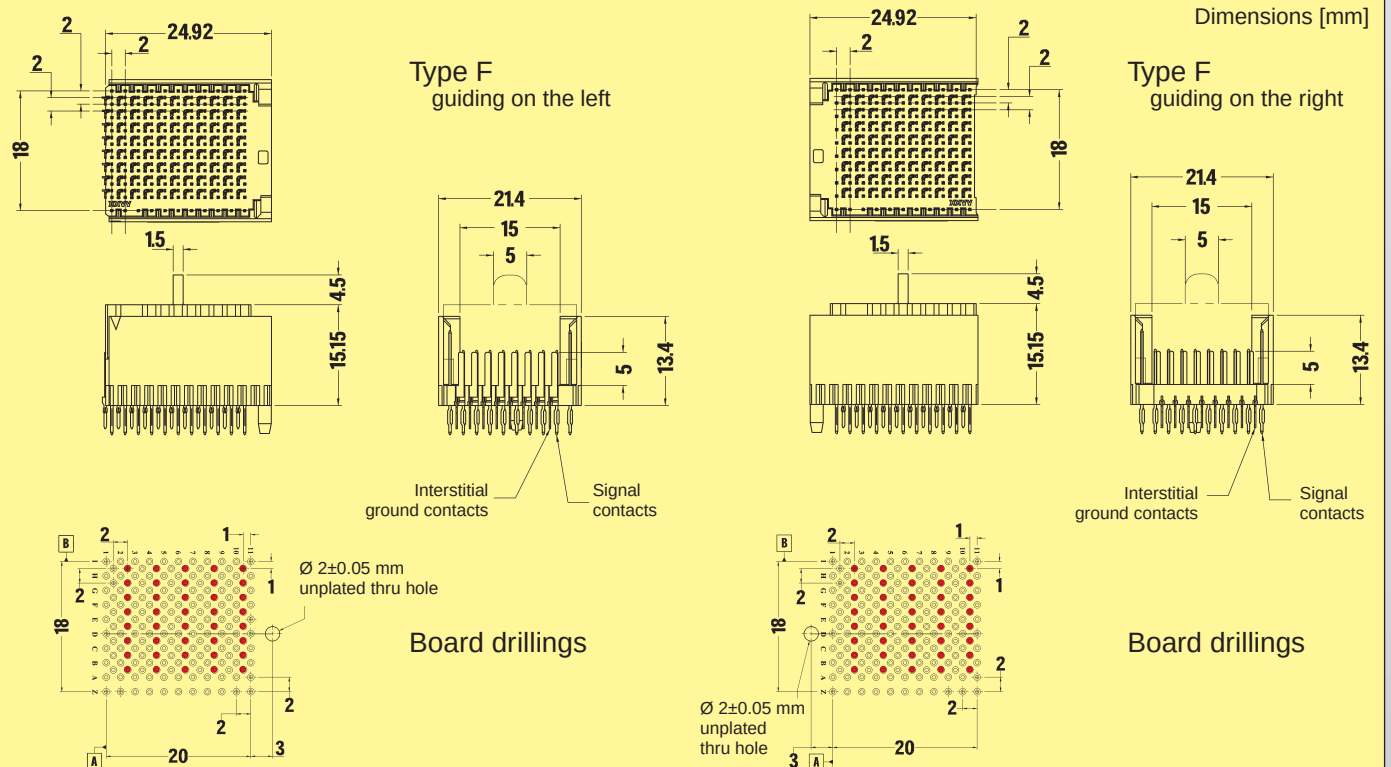
Board drillings





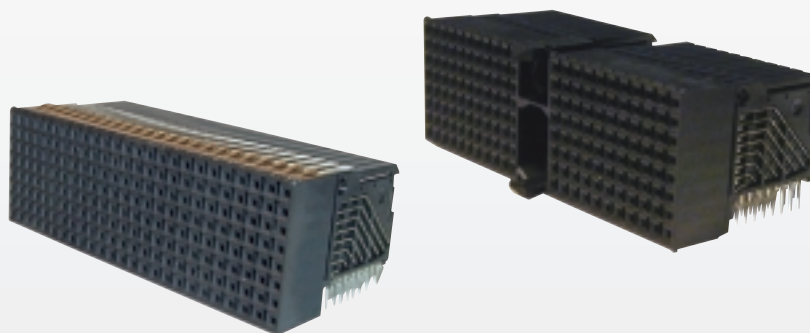
Male connectors, straight

Identification	Number of contacts	Termination length [mm]	Shielding arrangement	Part number	Contact configuration*
Type F guiding on the left	88	Signal 4.4 mm Ground 3.5 mm	Single ended	16 13 423 2001 16 13 423 5001	
			Differential in rows	16 13 433 2001 16 13 433 5001	
Type F guiding on the left	110	Signal 4.4 mm Ground 3.5 mm	Single ended	16 13 323 2001 16 13 323 5001	
			Differential in rows	16 13 333 2001 16 13 333 5001	
Type F guiding on the right	88	Signal 4.4 mm Ground 3.5 mm	Single ended	16 17 423 2001 16 17 423 5001	
			Differential in rows	16 17 433 2001 16 17 433 5001	
Type F guiding on the right	110	Signal 4.4 mm Ground 3.5 mm	Single ended	16 17 323 2001 16 17 323 5001	
			Differential in rows	16 17 333 2001 16 17 333 5001	



● = do not drill for differential pairs pcb

Thin print part numbers: 0.76 µm (30 µinch) Gold on contact area = performance level 1
Bold print part numbers: Gold flash over 1.02 µm (40 µinch) Palladium-Nickel on contact area = performance level 2
 * Additional information see page 3



Female connectors, angled

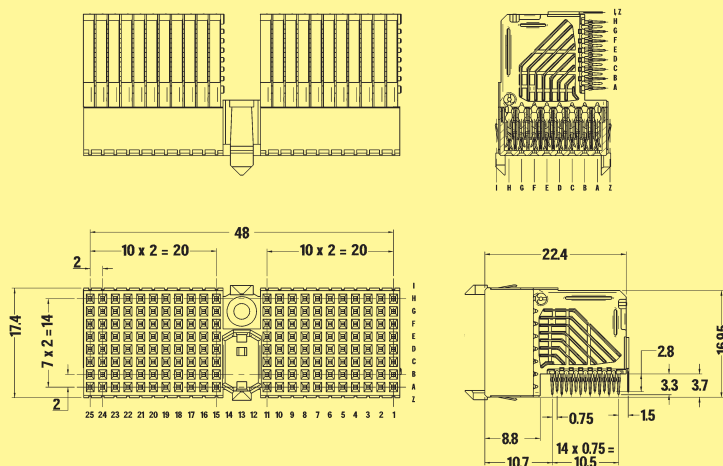
Identification	Number of contacts	Shielding arrangement	Part number
Type D	176	Single ended	16 31 421 2001 16 31 421 5001
		Differential pairs in rows	16 31 431 2001 16 31 431 5001
Type D with pre-installed shield	176	Single ended	16 31 221 2001 16 31 221 5001
		Differential pairs in rows	16 31 231 2001 16 31 231 5001
Type E	200	Single ended	16 32 421 2001 16 32 421 5001
		Differential pairs in rows	16 32 431 2001 16 32 431 5001
Type E with pre-installed shield	200	Single ended	16 32 221 2001 16 32 221 5001
		Differential pairs in rows	16 32 231 2001 16 32 231 5001

Type D

Type E

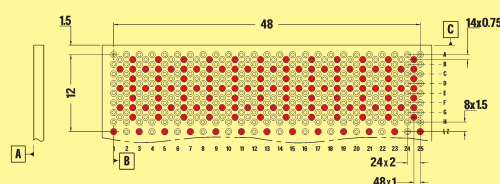
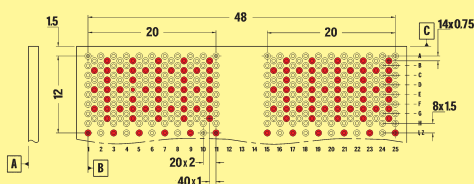
Dimensions [mm]

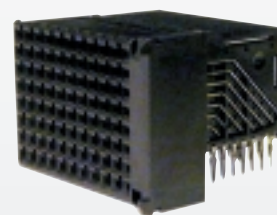
for dimensions please contact us



Board drillings

Board drillings

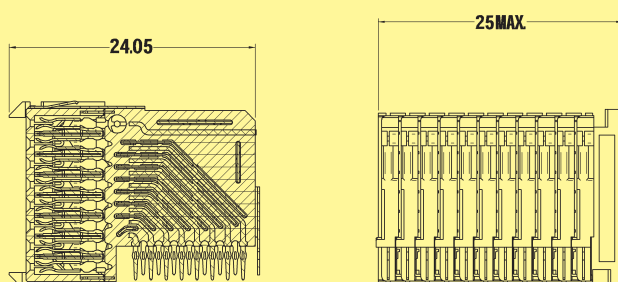




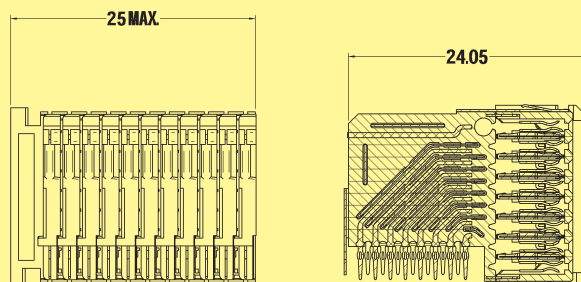
Female connectors, angled

Identification	Number of contacts	Shielding arrangement	Part number
Type F guiding on the left	88	Single ended	16 33 421 2001 16 33 421 5001
		Differential pairs in rows	16 33 431 2001 16 33 431 5001
Type F guiding on the left with pre-installed shield	88	Single ended	16 33 221 2001 16 33 221 5001
		Differential pairs in rows	16 33 231 2001 16 33 231 5001
Type F guiding on the right	88	Single ended	16 37 421 2001 16 37 421 5001
		Differential pairs in rows	16 37 431 2001 16 37 431 5001
Type F guiding on the right with pre-installed shield	88	Single ended	16 37 221 2001 16 37 221 5001
		Differential pairs in rows	16 37 231 2001 16 37 231 5001

Type F
guiding on the left

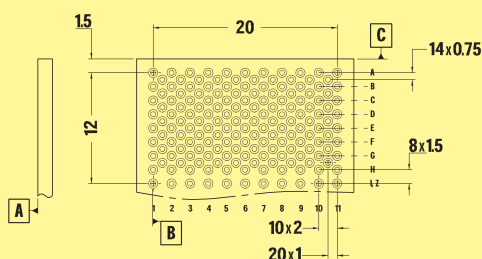


Type F
guiding on the right

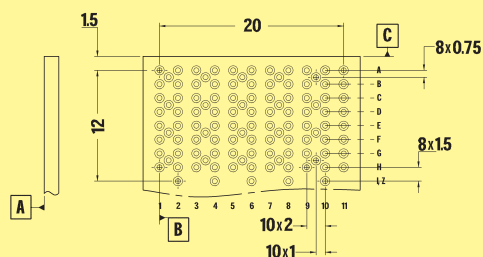


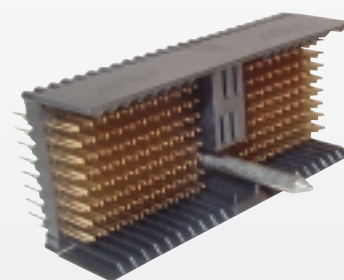
Dimensions [mm]

Board drillings
single ended



Board drillings
differential pairs in row



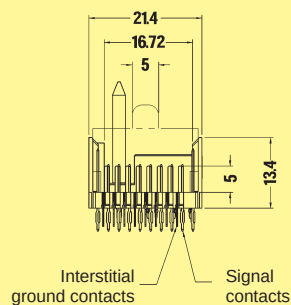
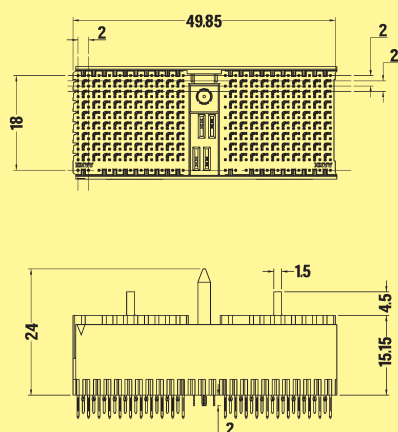


Male connectors, straight

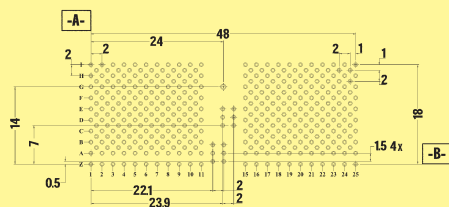
Identification	Number of contacts	Termination length [mm]	Shielding arrangement	Part number	Contact configuration*
Type D power	176	Signal 4.4 mm Ground 3.5 mm	Single ended	16 18 423 2001 16 18 423 5001	
			Differential in rows	16 18 433 2001 16 18 433 5001	
Type D power	220	Signal 4.4 mm Ground 3.5 mm	Single ended	16 18 323 2001 16 18 323 5001	
			Differential in rows	16 18 333 2001 16 18 333 5001	

Type D power

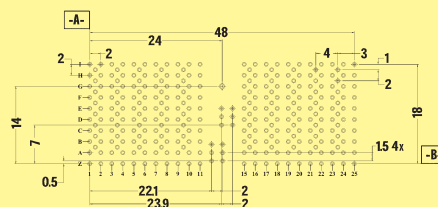
Dimensions [mm]

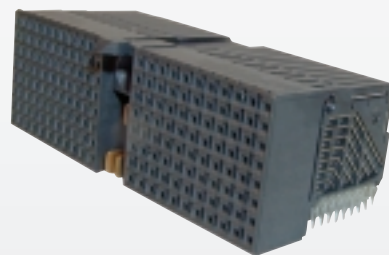


Board drillings single ended



Board drillings differential pairs in row



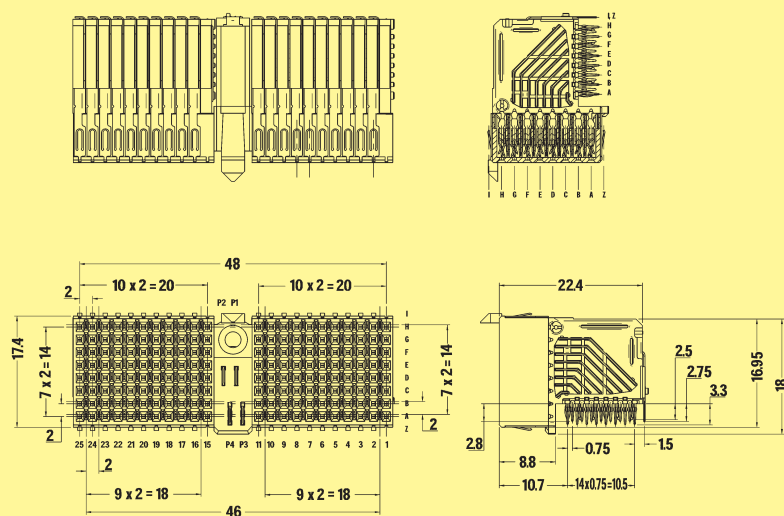


Female connectors, angled

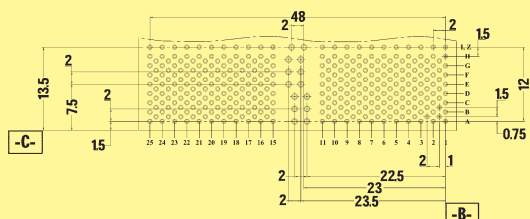
Identification	Number of contacts	Shielding arrangement	Part number
Type D power	176	Single ended	16 38 421 2001 16 38 421 5001
		Differential pairs in rows	16 38 431 2001 16 38 431 5001
Type D power with pre-installed shield	176	Single ended	16 38 221 2001 16 38 221 5001
		Differential pairs in rows	16 38 231 2001 16 38 231 5001

Type D power

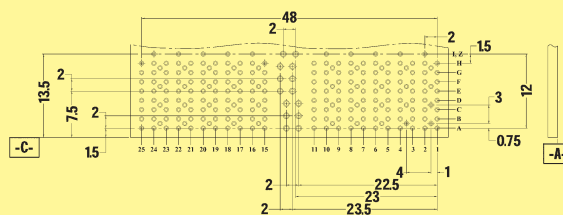
Dimensions [mm]



Board drillings
single ended



Board drillings
differential pairs in row



Part No.	Page	Part No.	Page	Part No.	Page
16 01 323 2001	4	16 13 323 2001	9	16 27 221 2001	7
16 01 323 5001	4	16 13 323 5001	9	16 27 221 5001	7
16 01 333 2001	4	16 13 333 2001	9	16 27 231 2001	7
16 01 333 5001	4	16 13 333 5001	9	16 27 231 5001	7
16 01 423 2001	4	16 13 423 2001	9	16 27 421 2001	7
16 01 423 5001	4	16 13 423 5001	9	16 27 421 5001	7
16 01 433 2001	4	16 13 433 2001	9	16 27 431 2001	7
16 01 433 5001	4	16 13 433 5001	9	16 27 431 5001	7
16 02 323 2001	4	16 17 323 2001	9	16 31 221 2001	10
16 02 323 5001	4	16 17 323 5001	9	16 31 221 5001	10
16 02 333 2001	4	16 17 333 2001	9	16 31 231 2001	10
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16 02 423 2001	4	16 17 423 2001	9	16 31 421 2001	10
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16 02 433 5001	4	16 17 433 5001	9	16 31 431 5001	10
16 03 323 2001	5	16 18 323 2001	12	16 32 221 2001	10
16 03 323 5001	5	16 18 323 5001	12	16 32 221 5001	10
16 03 333 2001	5	16 18 333 2001	12	16 32 231 2001	10
16 03 333 5001	5	16 18 333 5001	12	16 32 231 5001	10
16 03 423 2001	5	16 18 423 2001	12	16 32 421 2001	10
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16 03 433 2001	5	16 18 433 2001	12	16 32 431 2001	10
16 03 433 5001	5	16 18 433 5001	12	16 32 431 5001	10
16 07 323 2001	5	16 21 221 2001	6	16 33 221 2001	11
16 07 323 5001	5	16 21 221 5001	6	16 33 221 5001	11
16 07 333 2001	5	16 21 231 2001	6	16 33 231 2001	11
16 07 333 5001	5	16 21 231 5001	6	16 33 231 5001	11
16 07 423 2001	5	16 21 421 2001	6	16 33 421 2001	11
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16 07 433 2001	5	16 21 431 2001	6	16 33 431 2001	11
16 07 433 5001	5	16 21 431 5001	6	16 33 431 5001	11
16 11 323 2001	8	16 22 221 2001	6	16 37 221 2001	11
16 11 323 5001	8	16 22 221 5001	6	16 37 221 5001	11
16 11 333 2001	8	16 22 231 2001	6	16 37 231 2001	11
16 11 333 5001	8	16 22 231 5001	6	16 37 231 5001	11
16 11 423 2001	8	16 22 421 2001	6	16 37 421 2001	11
16 11 423 5001	8	16 22 421 5001	6	16 37 421 5001	11
16 11 433 2001	8	16 22 431 2001	6	16 37 431 2001	11
16 11 433 5001	8	16 22 431 5001	6	16 37 431 5001	11
16 12 323 2001	8	16 23 221 2001	7	16 38 221 2001	13
16 12 323 5001	8	16 23 221 5001	7	16 38 221 5001	13
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16 12 423 5001	8	16 23 421 5001	7	16 38 421 5001	13
16 12 433 2001	8	16 23 431 2001	7	16 38 431 2001	13
16 12 433 5001	8	16 23 431 5001	7	16 38 431 5001	13

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