

Cables for the CMS Pixel Detector

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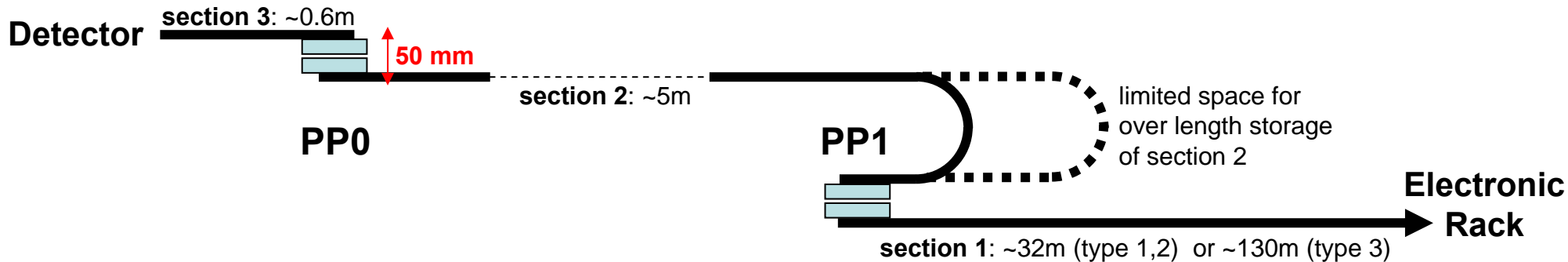
August 3, 2006

Summary of CMS Pixel Copper Cables

3 types:

- | | |
|--|------------------|
| 1. <u>Pixel Multi-Service Cables</u> for ROC power/sensor bias | 112 (3 sections) |
| 2. <u>Pixel Auxiliary Power Cables</u> for periferal electronics | 12 (3 sections) |
| 3. <u>Pixel Control Cables</u> for temperature/humidity sensors | 16 (3 sections) |
| | <hr/> |
| | 140 |

Need of special connectorization at patch panels PP0 and PP1,
due to limited space:



Bundling of pixel cables

The cables leave the detector in **4 bundles**, each consisting of:

- 28 cables type 1 (CMS PIXEL MSC)
- 3 cables type 2 (CMS PIXEL AUX)
- 4 cables type 3 (CMS PIXEL CONT)

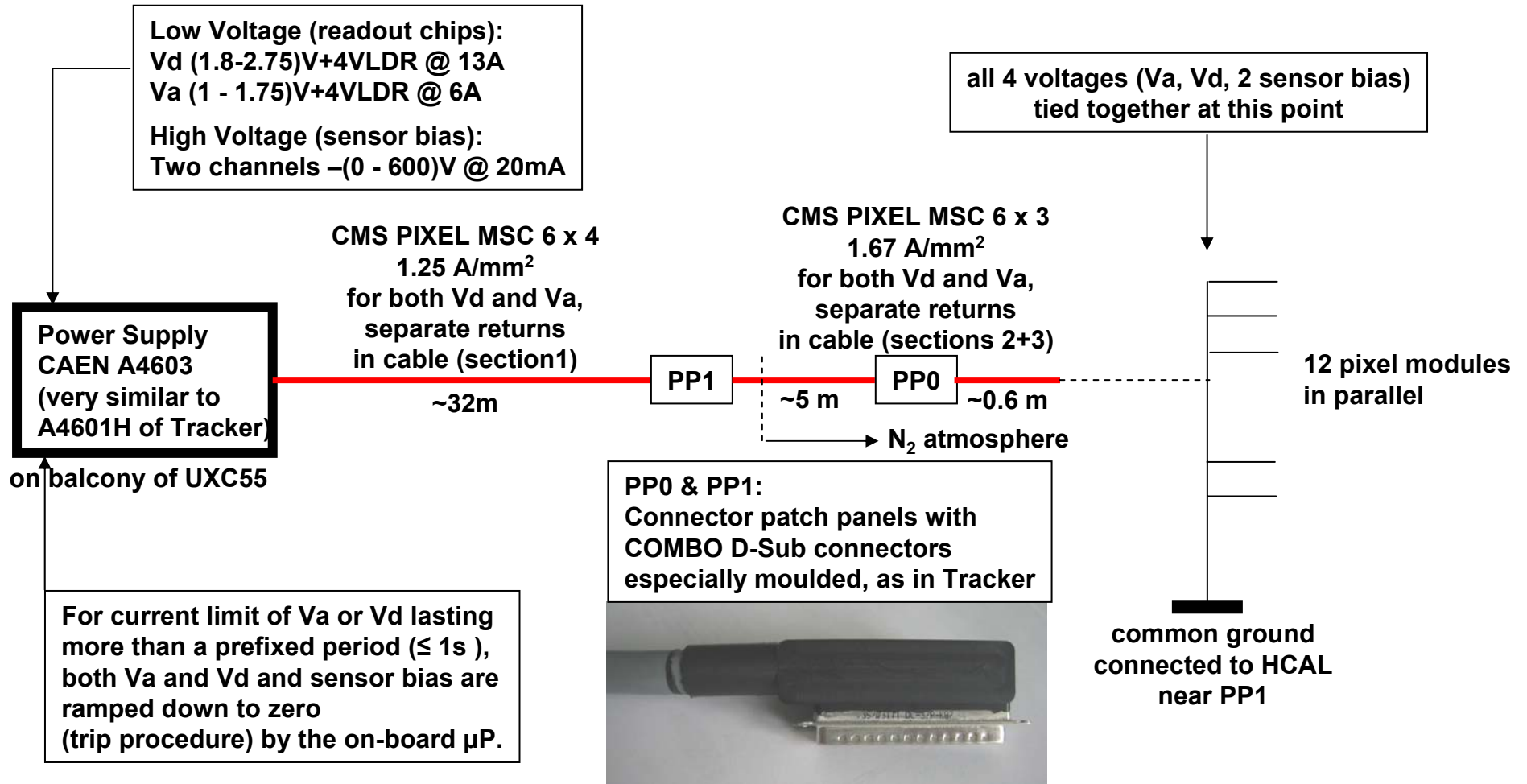
The power dissipated by the **bundle**:

- 15 W/m for section 1 over a length of 32 m
- 20 W/m for section 2 over a length of 5 m
(no bundling for section 3)

Cooling:

- indirect cooling in section 1
- indirect cooling in section 2, bundle partly surrounded by N₂-gas
- cables surrounded by N₂-gas in section 3

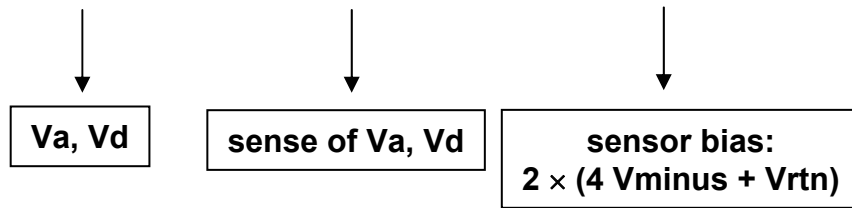
1) Pixel Multi Service Cable Branch (CMS PIXEL MSC - 6 x 4 und - 6 x 3)



Pixel Multi Service Cable

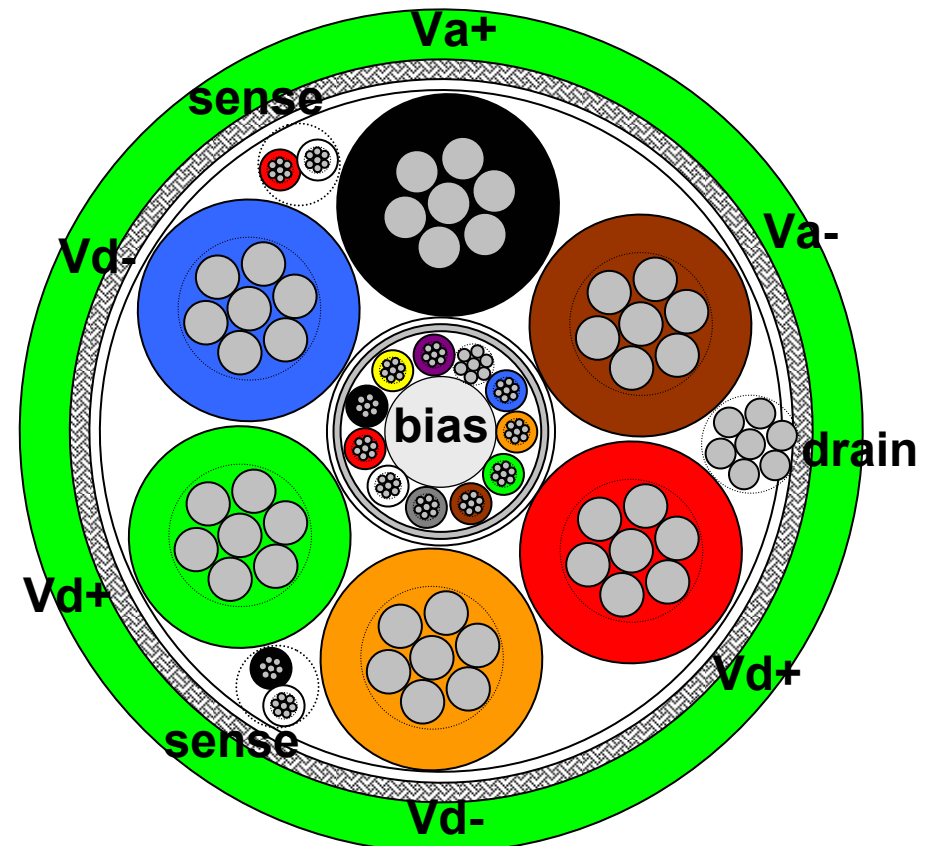
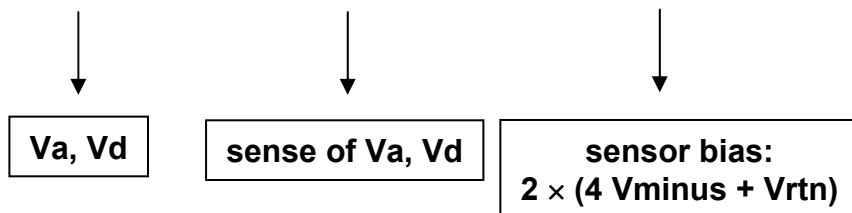
- section 1: **CMS PIXEL MSC 6 x 4**

6x4 mm² + 2x2xAWG28 + 10xAWG30



- sections 2+3: **CMS PIXEL MSC 6 x 3**

6x3 mm² + 2x2xAWG28 + 10xAWG30

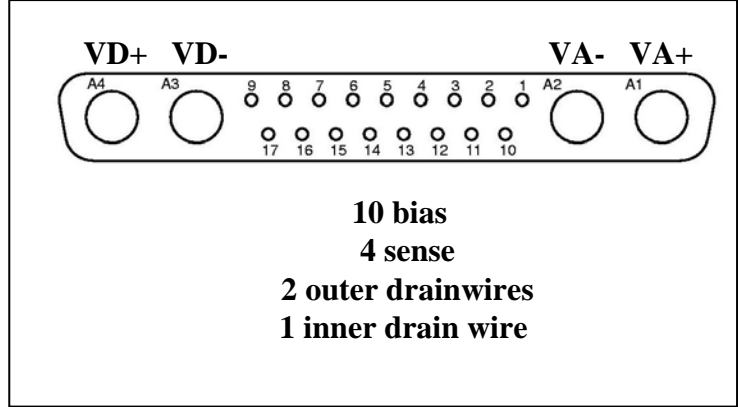


21WA4 Combo D-Sub Connector for CMS PIXEL MSC 6 x 4 and 6 x 3

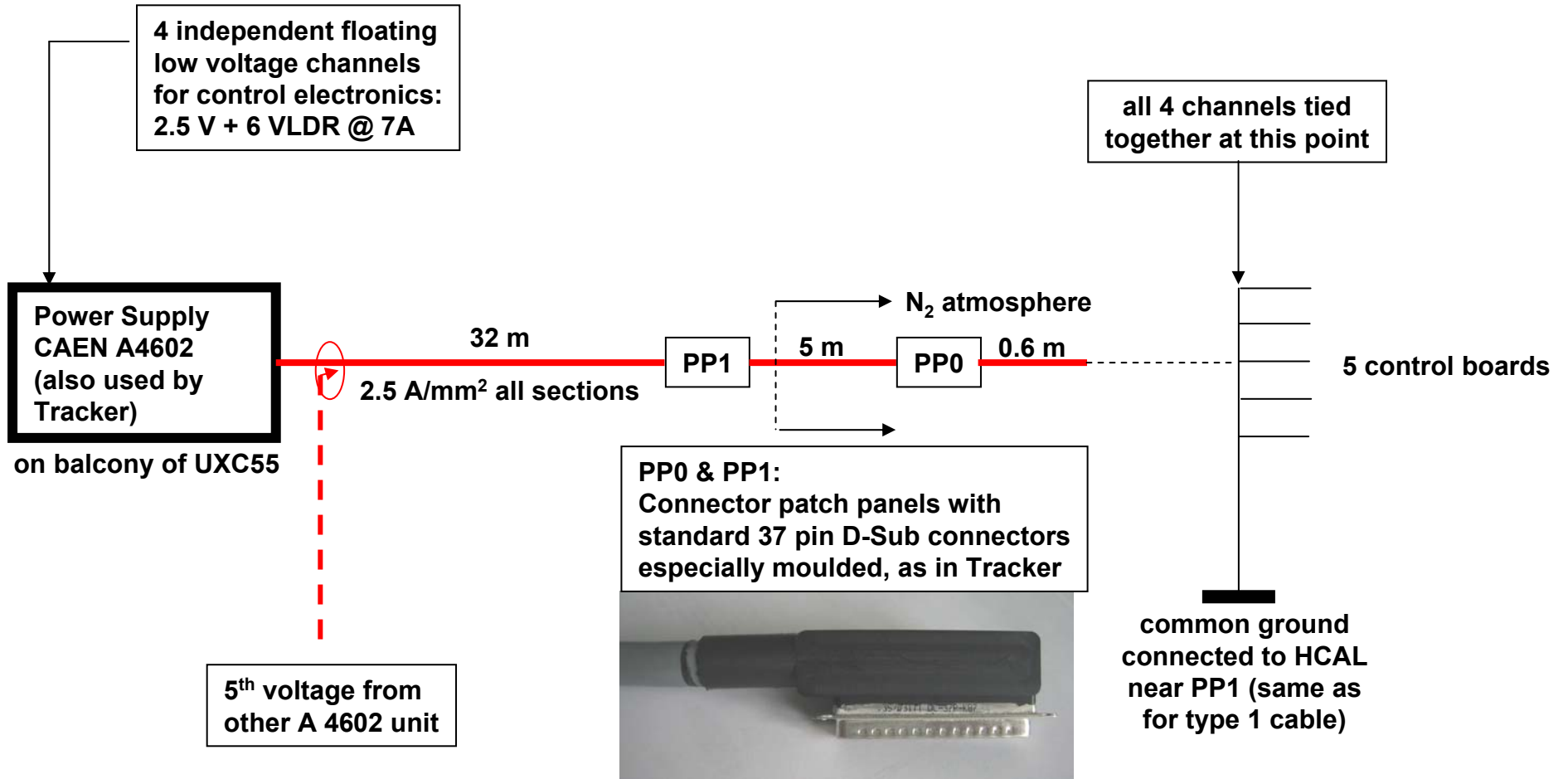
Cable type	connectors at PP0 and PP1	pin number	pins current rating	wire		voltage V	current A	
Pixel Multi Service Cable Power for pixel readout chips: 2 voltages with sense Bias voltage for pixel sensors: 2 channels Power supply: CAEN A4603	D-SUB mixed layout FCT electronic gmbh layout 21WA4 Combo 4x 40A high current pins 17x 5A standard pins solder cup shell size: DC (4) shell material: brass insulator: polyester glass filled moulded by ADAPT company as in the strip tracker	A1	40 A	4 (3) mm2 VA+ black		< 10	4.5	
		A2	40 A	4 (3) mm2 VA- brown		0	4.5	
		A3	40 A	2 x 4 (3) mm2 VD- orange+blue		0	2 x 4.5	
		A4	40 A	2 x 4 (3) mm2 VD+ red+green		< 10	2 x 4.5	
			10	5 A	AWG28 VA+ sense red	twisted pair	< 10	0
			1	5 A	AWG28 VA- sense white		0	0
			17	5 A	AWG28 VD+ sense black	twisted pair	< 10	0
			9	5 A	AWG28 VD- sense white		0	0
			4	5 A	inner drain AWG24		0	0
			5	5 A	1/2 outer drain AWG18	in parallel	0	0
			6	5 A	1/2 outer drain AWG18			
			7	5 A	AWG30 bias1 return violet		0	0
			3	5 A	AWG30 bias2 return blue		0	0
			8	5 A	AWG30 bias1 yellow		<600	0
			14	5 A	AWG30 bias1 black		<600	0
			15	5 A	AWG30 bias1 red		<600	0
			16	5 A	AWG30 bias1 white		<600	0
	2	5 A	AWG30 bias2 orange		<600	0		
	11	5 A	AWG30 bias2 green		<600	0		
	12	5 A	AWG30 bias2 brown		<600	0		
	13	5 A	AWG30 bias2 grey		<600	0		

Va
Vd
2 sense pairs

bias



2) Pixel Auxiliary Power Cable Branch (CMS PIXEL AUX)



Pixel Auxiliary Power Cable

All sections: **CMS PIXEL AUX**

5 x 2 x AWG28 + 26 x AWG20

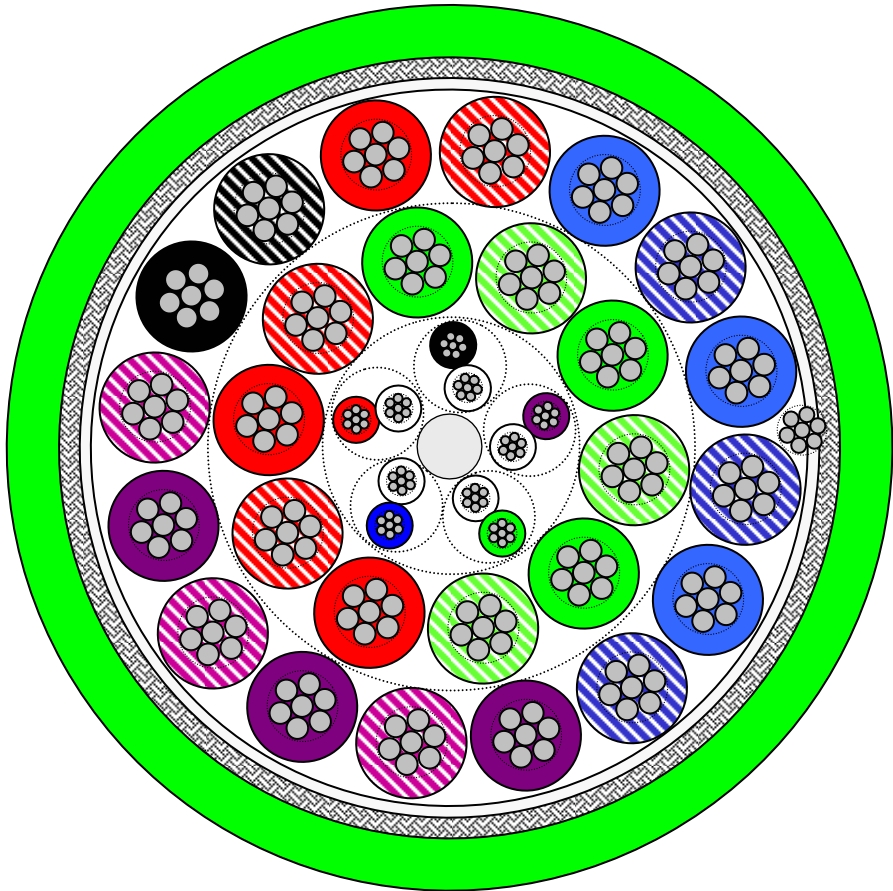


5 sense pairs



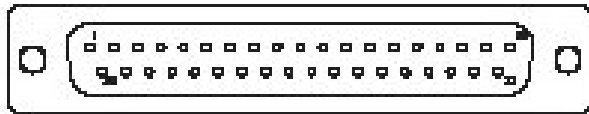
5 voltages
(4x3x2 + 1x1x2)

- red
- blue
- violet
- green
- black



37-contact D-Sub Connector (shell size 4) for Pixel Auxiliary Power Cable

Cable type	connectors at PP0 and PP1	pin number	pins current rating	wire		voltage V	current A		
Pixel auxiliary power-Cable Power for control electronics: 5 voltages with sense in one cable Power supply: CAEN A4602	D-SUB Standard FCT electronic gmbh layout 37 37x 5A standard pins solder cup shell size: DC (4) shell material: brass insulator: polyester glass filled moulded by ADAPT company as in the strip tracker	26	5 A	0.6 mm2 V1+ red	in parallel	< 10	1.5		
		27	5 A	0.6 mm2 V1+ red		< 10	1.5		
		28	5 A	0.6 mm2 V1+ red		< 10	1.5		
				8	5 A	0.6 mm2 V1- red/white	in parallel	0	1.5
				9	5 A	0.6 mm2 V1- red/white		0	1.5
				10	5 A	0.6 mm2 V1- red/white		0	1.5
				29	5 A	0.6 mm2 V2+ green	in parallel	< 10	1.5
				30	5 A	0.6 mm2 V2+ green		< 10	1.5
				31	5 A	0.6 mm2 V2+ green		< 10	1.5
				11	5 A	0.6 mm2 V2- green/white	in parallel	0	1.5
		12	5 A	0.6 mm2 V2- green/white	0	1.5			
		13	5 A	0.6 mm2 V2- green/white	0	1.5			
		32	5 A	0.6 mm2 V3+ blue	in parallel	< 10	1.5		
		33	5 A	0.6 mm2 V3+ blue		< 10	1.5		
		34	5 A	0.6 mm2 V3+ blue		< 10	1.5		
		14	5 A	0.6 mm2 V3- blue/white	in parallel	0	1.5		
		15	5 A	0.6 mm2 V3- blue/white		0	1.5		
		16	5 A	0.6 mm2 V3- blue/white		0	1.5		
		35	5 A	0.6 mm2 V4+ violet	in parallel	< 10	1.5		
		36	5 A	0.6 mm2 V4+ violet		< 10	1.5		
		37	5 A	0.6 mm2 V4+ violet		< 10	1.5		
		17	5 A	0.6 mm2 V4- violet/white	in parallel	0	1.5		
		18	5 A	0.6 mm2 V4- violet/white		0	1.5		
		19	5 A	0.6 mm2 V4- violet/white		0	1.5		
		25	5 A	0.6 mm2 V+ black		< 10	1.0		
		7	5 A	0.6 mm2 V- black/white		0	1.0		
		21	5 A	AWG28 V1+ sense red	twisted pair	< 10	0		
		3	5 A	AWG28 V1- sense white		0	0		
		22	5 A	AWG28 V2+ sense green	twisted pair	< 10	0		
		4	5 A	AWG28 V2- sense white		0	0		
		23	5 A	AWG28 V3+ sense blue	twisted pair	< 10	0		
		5	5 A	AWG28 V3- sense white		0	0		
		24	5 A	AWG28 V4+ sense violet	twisted pair	< 10	0		
		6	5 A	AWG28 V4- sense white		0	0		
		20	5 A	AWG28 V+ sense black	twisted pair	< 10	0		
		2	5 A	AWG28 V- sense white		0	0		
		1	5 A	drain AWG22		0	0		



V₁

V₂

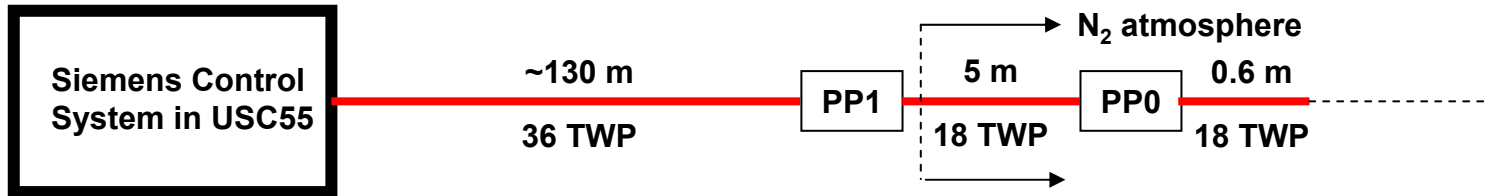
V₃

V₄

V₅

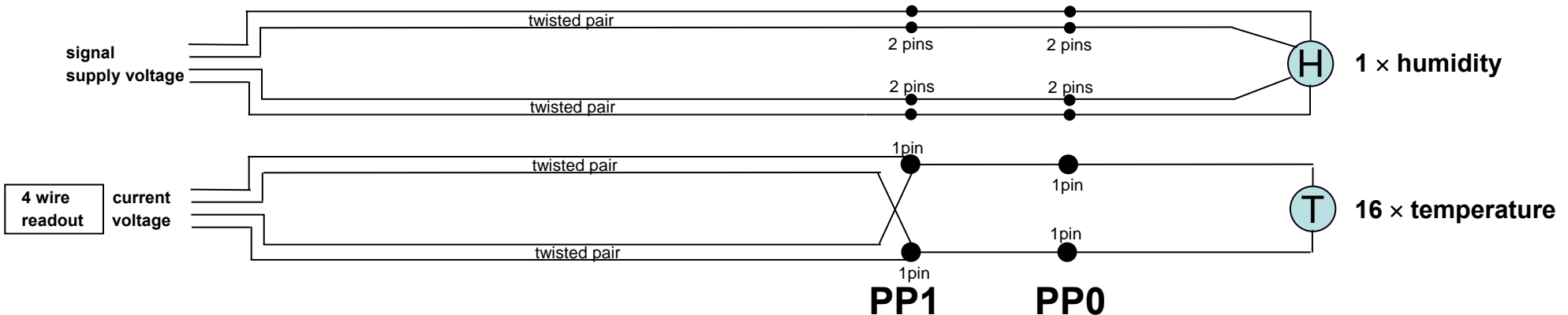
5 sense pairs

3) Pixel Control Cable Branch (CMS PIXEL CONT -36 and -18) (no power dissipation in these cables)



Siemens Control System:
 High Density D-Sub connector
 78 pins, shell size 5

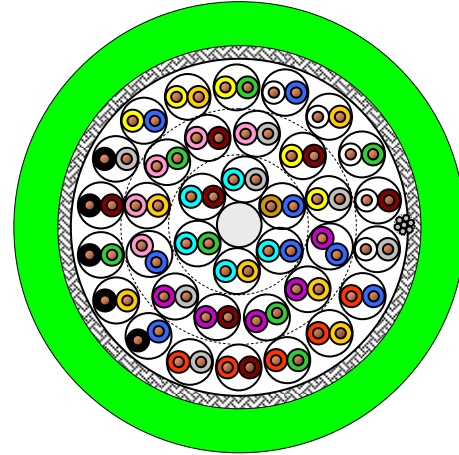
PP0 & PP1:
 Connector patch panels with
 standard 37 pin D-Sub connectors
 especially moulded, as in Tracker



Pixel Control Cable

- section 1: **CMS PIXEL CONT -36**

36 x 2 x AWG28



- section 2+3: **CMS PIXEL CONT -18**

18 x 2 x AWG28

