Current LV design

Cable :

Novacavi “8x0.75 FMOH2M1-300V IEC 332-3-24 CERN IS23", ref. 8R3141
Novacavi “12x0.75 FMOH2M1-300V IEC 332-3-24 CERN IS23", ref. 12R3117
IS23 certified (excluding radiation resistance for sheath)

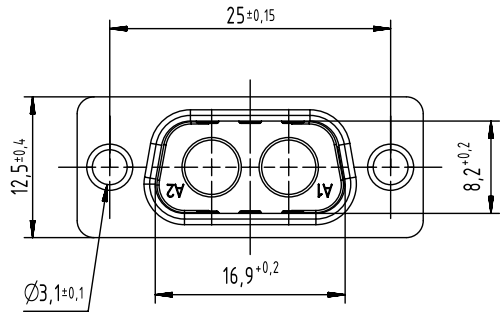
Connector at detector side :

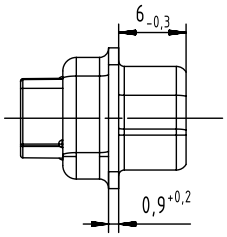
MOLEX p.n.43025-1200 (6 pins in 2 rows), approx 10 x7 mm
flamability : UL94V-0

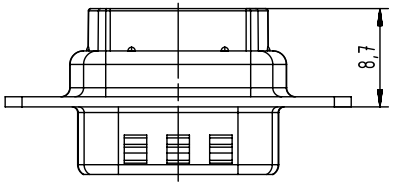
Connector at tower side :

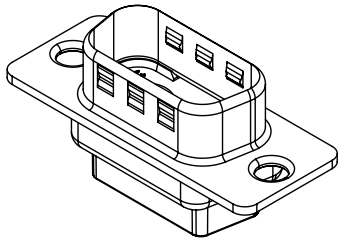
CAEN EASY complient connector

2W2 form factor connector







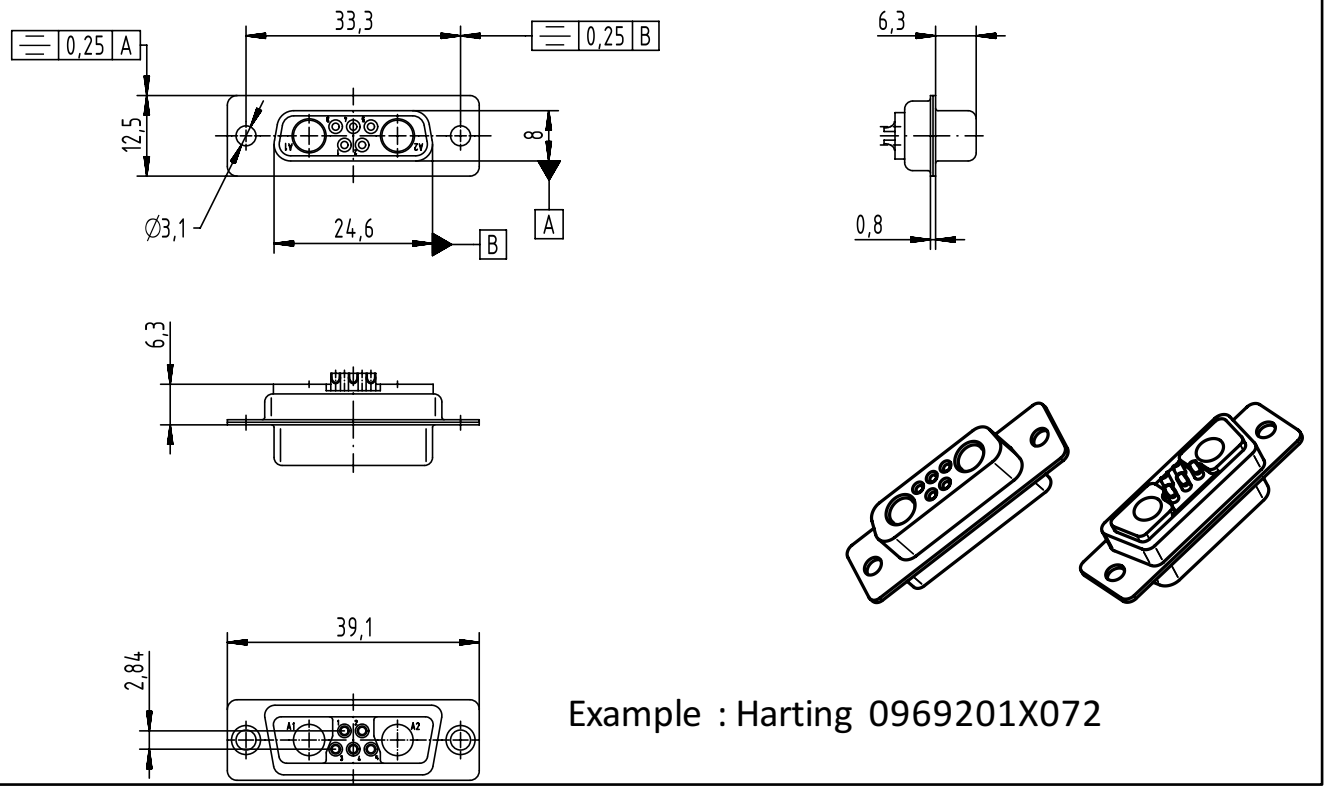


Example : Harting 09691100522

Pros : Rather compact and reliable

Cons : no dedicated pins for power supply sensing, has to solder sensing cable and power cable on the same pin

7W2 form factor connector



Example : Harting 0969201X072

Pros : 5 signal pins for power supply sensing
Cons : Larger than 2W2

Connector on detector side

2W2 or 7W2 connector body :

Most of connectors manufacturer provide corresponding references (Molex, ITT, Harting, Amphenol …)

Power pins exist in this standard up to 40A

Rated : at leastUL94V-0

Power contacts	**Solder termination** • Rating: 20, 30, 40 A • Plating: 0.76 µm Au over Ni **Press-in termination** • Rating: 30 A • Plating: 0.76 µm Au over Ni

Contacts (example FCI C01-8638-0334-1) :

		Core range					
8638PPS4005	8638PPS4005LF	40	8	Section 8.98 mm² Ø Ame 3.90 mm	4.40	5.50	blue
8638PPS2005	8638PPS2005LF	20	12	Section 3.18 mm² Ø Ame 2.40 mm	2.80	3.65	red
8638PPS1005	8638PPS1005LF	10	16	Section 1.34 mm² Ø Ame 1.50 mm	1.70	2.60	black
TIN LEAD PART NUMBER	LEAD FREE PART NUMBER	CURRENT max A	AWG / WIRE AREA	mm² / WIRE AREA	ØA $^{+0.10}_{-0}$	ØB $^{\pm 0.10}$	COLOUR CLIP

Cable (1)

What we used at Gif++ in may :

LAPP KABEL 0012660 (farnell 1503987), 2 conductors shielded

Conductors nb: 2
Conductor diameter : 16AWG (1,29mm)
Conductor organization: 2 x 1.5mm^2
voltage: 50VAC
Sheaf material: PVC (polyvinil chloride)
Conductor material: copper
Outer diameter: 7.1mm
Compliance :IEC 60332-1-2

But no sense wires

Cable (2)

What is currently used in CMS muons
NOVACAVI 8x0.75 FMOH2M1-300V
NOVACAVI 12x0.75 FMOH2M1-300V

Conductors nb: 8 and 12
Conductor diameter: 19AWG (0,912mm)
Conductor organization: 8 x 0.75mm
Voltage: 300VAC
Sheaf material: Polyester
Conductor material: Cuivre
Outer diameter: 8.4mm
Compliance: CERN IS 23 , IEC 603321-3-24, IEC60332-1

But 8 connectors is not usefull here.

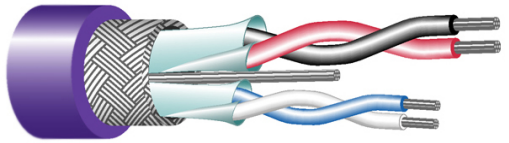
Cable (3)

Wish list :

2 power conductors
2 sense conductors
Shielded but non magnetic…
Halogen free and Flame retardant, complient with todays cern standards (prefered EPR or EPDM) :
IS23 rev3 , maybe IS41 rev 1 (latest available on EDMS)
Temperature range : 0/+70°C (?)
Fit in 20A/40A version of 2W2 pins :
20A pins : 12 AWG for power and sense together -> 1mm max per wire (18 AWG)
40A pins : 8 AGW for power ans sense together -> 1.65mm max per wire (13-14 AWG)

GBT Fibers

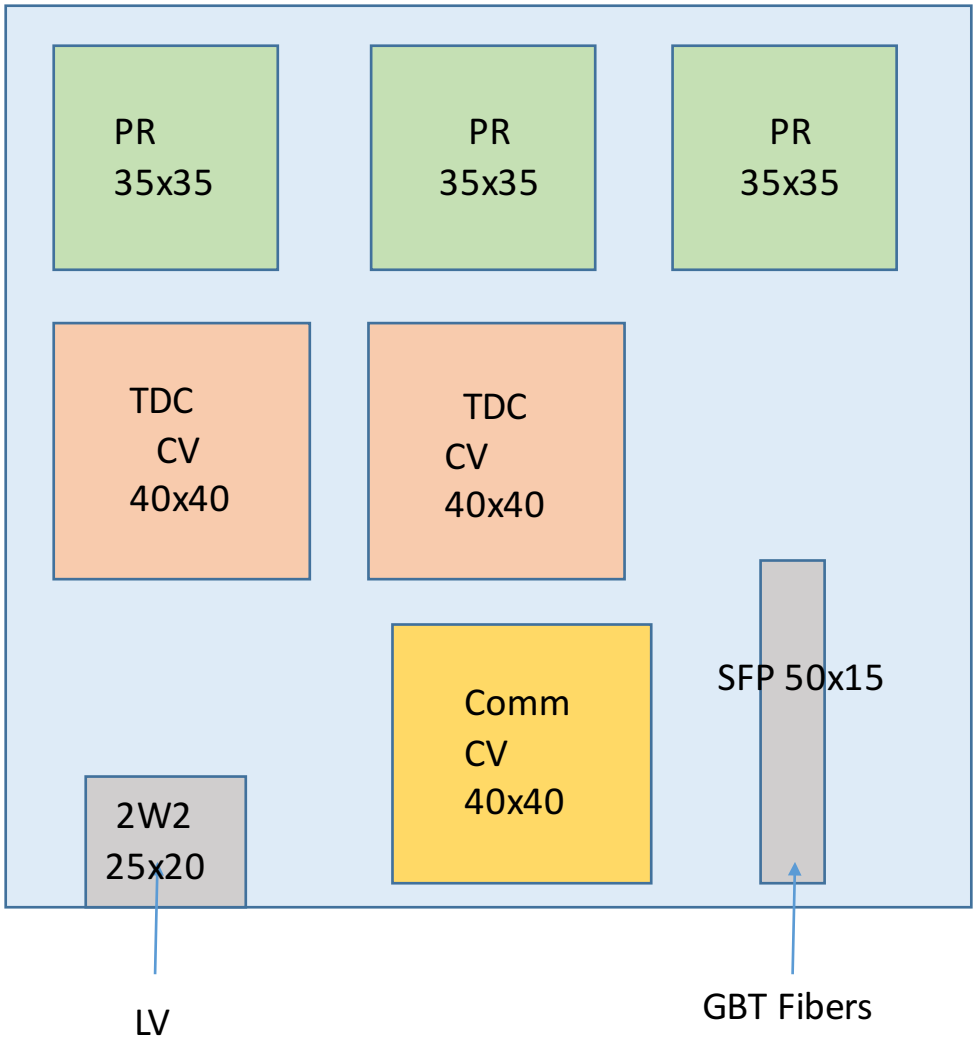
Maybe somethiong like cables for DeviceBus (2 cond+2cond shielded)



Possible easily available ref :

BELDEN 8424 (20AWG, EPDM), available at Farnell
LAPP OLOFLEX 1123269 (17 AWG, conforme IEC 60332), available Radiospares

Board tentative layout & cabling



Petiroc :
TQFP (28mmx28mm), BGA (12mmx12mm)
→ keep 35mmx35 or 20mmx20mm for aditional components
Cyclone5 FPGA :
1152 FBGA (35mmx35mm)
→ keep 40mmx40mm for decoupling and
Aditional components :
SFP cage : 48mmx14mm
LV connector : 25mmx20mm

FE board -> approx 150mmx150mm

PR : 3x40mm+ spare

PR(40)+2xCV(50)+Connectors(10

Tentative LV cabling

Reference: CAEN A3016 datasheet

Shielding must be connected to refgnd on A3016 side and on GND (LV-) at FEB side

Sense wires should be shielded (independant or not of OUT+ and OUT-?)

Estimated power consumption of FE

Location	Unit Power(W)	Number	Total Power (W)	Note
Petiroc @32ch	0.2	3	0.6	Includes digital readout power (not used in our case)
TDC cyclone 5 FPGA	5	2	10	Based on Altera and current ressources
Communication cyclone 5 FPGA	10	1	10	Based on Altera and current ressources
Optical transceiver for GBT	1	1	1	Based on 4.25Gbps SFP+ module
Misc	1	1	1	Sensors, jitter cleaner, misc circuits
			TOTAL ≃23W	

Meeting summary

FEB : 3PR@32ch, 2 CV (TDC) , 1 CV (communication), 1 GBT
Chamber : 2 FEBs
Power consumption limit per FEB : 25W max.
Cables :
Lyon orders cables to perform tests
904 provides ont Caen A3016 module and corresponding connectors for tests at lyon