Cabling Collection for Silicon Detectors

When using silicon (strip) detectors in an accelerator environment, a sophisticated cabling system is necessary to achieve minimum noise and optimum signal quality. Therefore the mesytec cabling collection for silicon (strip) detectors consists of three main components:

- Shielded multipole cables for in- and outside the vacuum vessel
- Several types of selected vacuum feedthroughs
- Individually designed detector adapters

Fig. 1 shows a typical setup using components from the cabling collection:

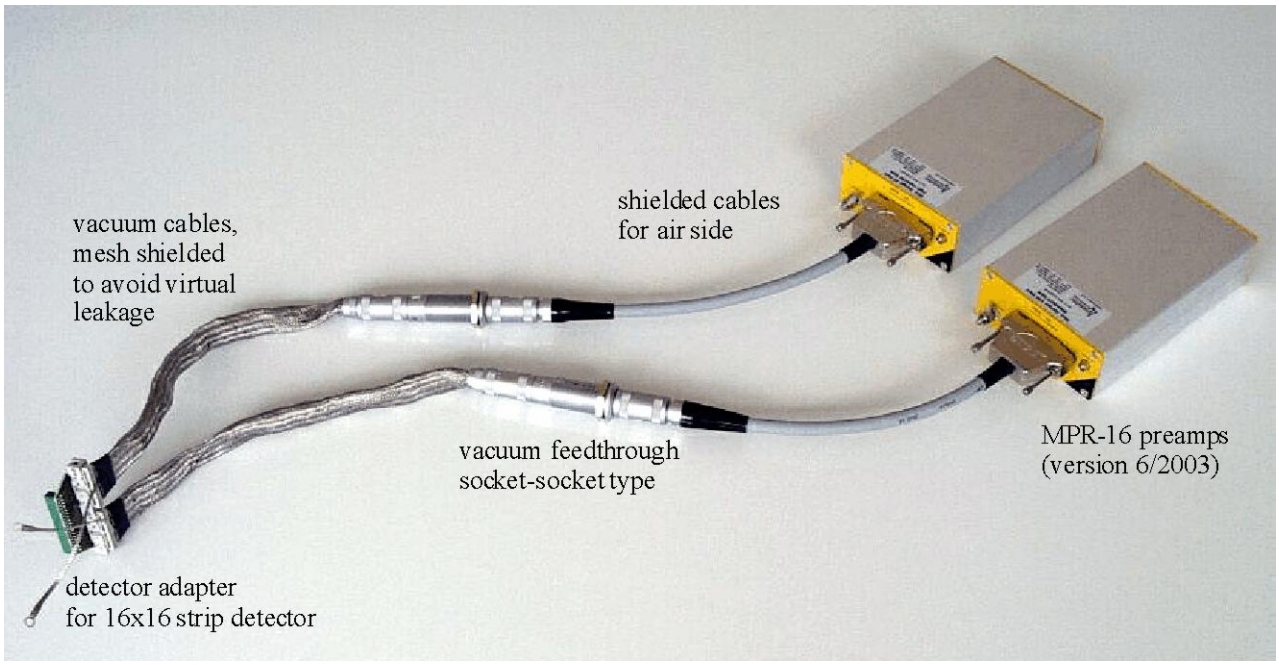

Fig.1: Example for a typical setup using parts of the mesytec cabling collection for silicon detectors.

Multipole shielded cables:

Outside the vacuum vesssel, excellent shielding and ground connections are of high importance for signal qualitiy.
We offer a cable specially designed for the MPR preamplifier series and selected LEMO vacuum feedthroughs.
Both connectors and the cable are fully shielded. Typical capacity is 30pF for 30cm total length (including connectors).
The shielding is completely separated from signal ground (see figure 2 below).

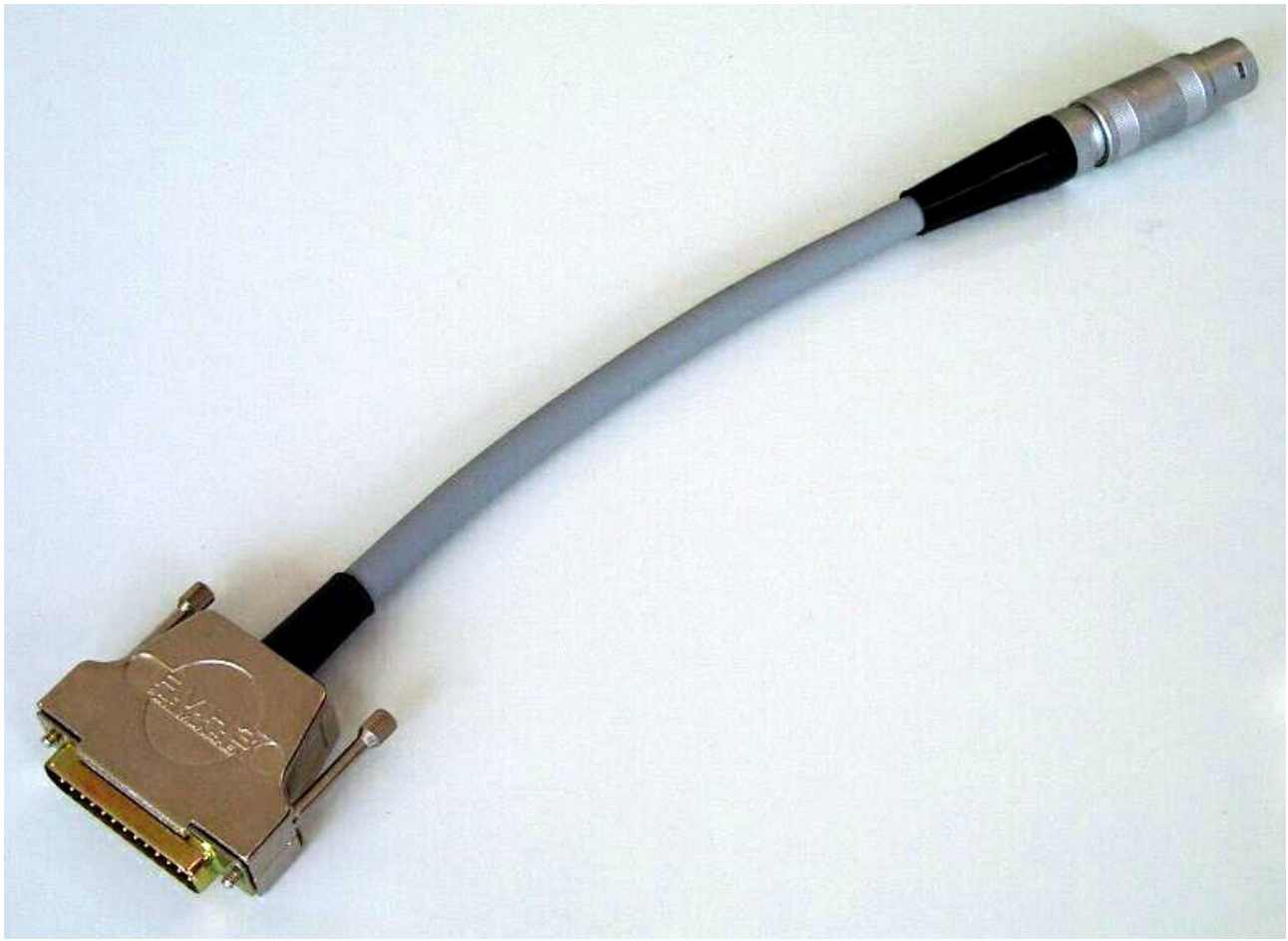

Fig 2: MPR-16 to feedthrough cable

Fig 3: connector with feedthrough (socket-solder type)

Inside the vacuum vesssel, shielding and ground connections are also important but not as critical as outside. Vacuum compatibility and connectivity to various detector types are further issues.
We offer a cable designed for the MPR preamplifier series and selected LEMO vacuum feedthroughs.
The Lemo connector and the cable are shielded. To avoid large virtual leakage, shielding is only a copper mesh that's tight coupled to the connector on one side and has a ground connector on the other side.
The connector on detector side is a 20 pole flat ribbon connector that can easily be matched with our individually designed detector adapters.
Typical capacity is 60pF for 40cm total length (including connectors). The shielding is completely separated from signal ground and might be connected to the detector hold structure.

Fig. 4 shows a cable of this type:

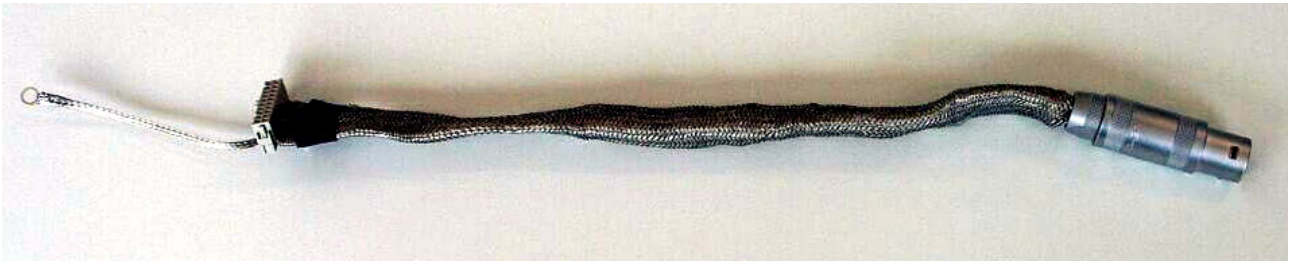

Fig. 4: Cable for connecting detector (adapter) and vacuum feedthrough

Although our standard cables are designed for the LEMO feedthroughs, we can also offer other designs on request. So please don't hesitate to contact us if you need cabling for another feedthrough.

Detector adapters:

Nearly each detector brings its own specialized connector. To reuse the same standard cable for various detectors, we offer individually designed detector adapters fitting your detector and the above mentioned cable.
Examples for SSDs and single pad detectors are shown in Fig. 5 and 6 below.

Fig.5: Adapter for a single pad detector

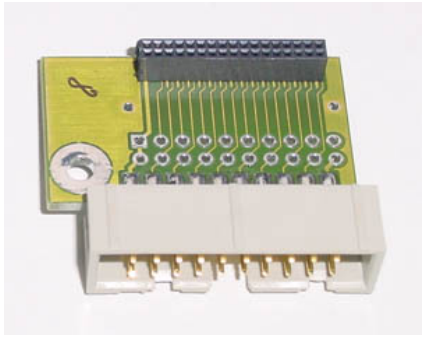

Fig. 6: Adapter for a 16 strip silicon detector

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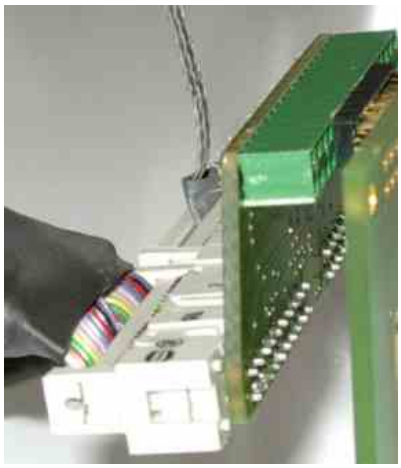
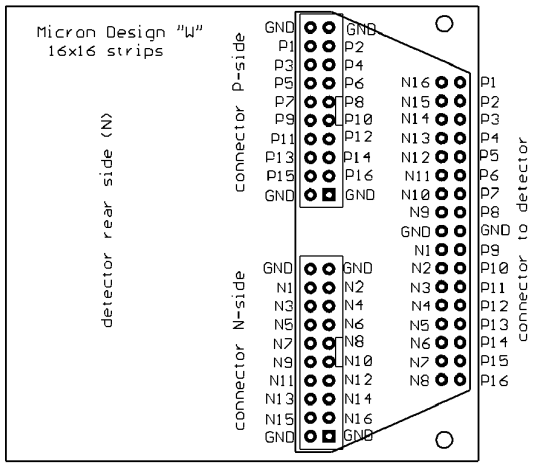
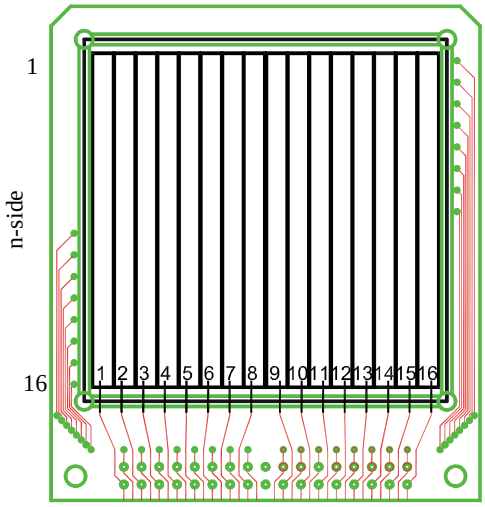
Adapter for Detector: **Micron design "W"**, a 16x16 strip double sided detector. It is read out with two cable sets , and two pairs of MPR16 and STM16.





Detector adapter for Micron Design "W". Right side seen on the rear side of detector (the 2 connectors to MPR16 cables visible)



Strip numbering of design "W"at STM16-output

Feedthroughs:

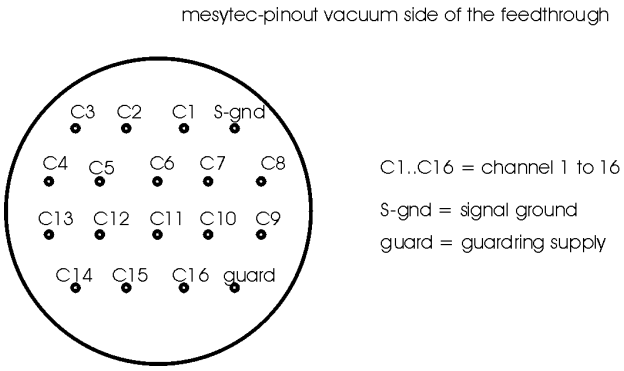
As preferable vacuum feedthroughs we selected vacuum tight models from LEMO:

For the multipole cables we selected a socket – socket version (Fig. 7) for use with a plug-equipped cable on both sides and a socket – solder version (Fig. 8) for use e.g. with your own cables:

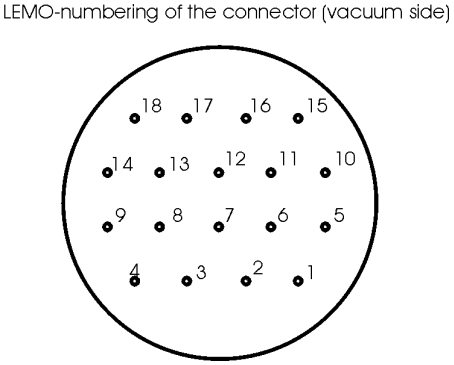
Fig. 7: socket-socket vacuum tight feedthrough LEMO SWH.3S.318.CLLSV

Fig. 8: socket-solder version LEMO HGP.3S.318.CLLSV

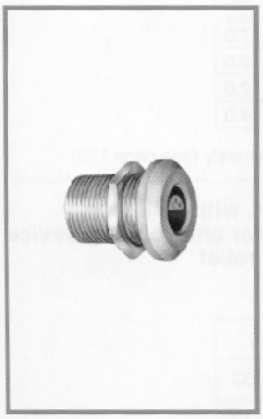
Pinouts:

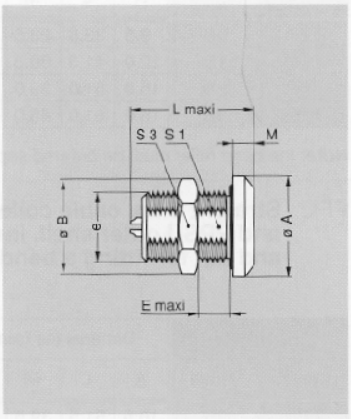


There is no pin marking on the vacuum side. Connect cable to the feedthrough and check with an Ohm meter for ground connection.



The LEMO plug connector name is FFA.3S.318.CLAC10ZN
Feedthrough socket solder is HGP.3S.318.CLLSV,
The feedthrough for socket-socket is SWH.3S.318.CLLSV
Feedthroughs are vacuum tested, leakage rate < 10^{-8} mb*l/s





HGP **Fixed socket, nut fixing, watertight or vacuumtight**

Reference		Dimensions (mm)								
Model	Series	A	B	e	E	L	L[1)]	M	S1	S3
HGP	0S	18	16.0	M12x1.0	11.5	22.0	20.5	4.0	10.5	14
HGP	1S	20	19.5	M14x1.0	15.5	25.5	25.5	4.0	12.5	17
HGP	2S	20	21.8	M16x1.0	17.0	28.0	28.0	4.0	14.5	19
HGP	3S	28	27.5	M20x1.0	19.0	35.5	34.5	6.0	18.5	24
HGP	4S	34	32.0	M25x1.0	22.5	41.0	42.0	6.5	23.5	30
HGP	5S	45	40.0	M35x1.0	28.0	54.5	78.5	7.5	33.5	–
HGP	6S	58	54.0	M48x1.5	20.0	57.0	–	6.0	45.5	–

Panel cut-out: P3

Note: 1) unipole model

Note: the 5S and 6S series are delivered with a round nut.

Connection for 18 pole signal cables with vacuum feedthroughs

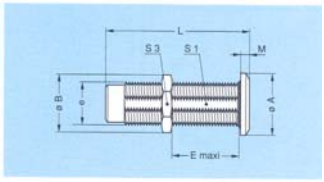
Function	**MPR connector 20pole connector** (until 8/2003)	**MPR connector Dsub25** (from 8/2003)	**Flat wire inside vacuum (20 pole)**	**Lemo feedthrough**
Signal ground	19,20	1, 7, 14,13	2,19,20	15
Channel 1	18	11	18	16
Channel 2	17	23	17	17
Channel 3	16	10	16	18
Channel 4	15	22	15	14
Channel 5	14	9	14	13
Channel 6	13	21	13	12
Channel 7	12	8	12	11
Channel 8	11	20	11	10
Channel 9	10	19	10	5
Channel 10	9	6	9	6
Channel 11	8	18	8	7
Channel 12	7	5	7	8
Channel 13	6	17	6	9
Channel 14	5	4	5	4
Channel 15	4	16	4	3
Channel 16	3	3	3	2
Signal ground	1,2	-	-	-
guardring	-	24	1 (option: NC)**	1

** For old mesytec design W detector adapter V1.0 wire 1 is not connected at vacuum side.

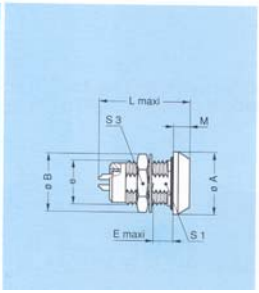
New cable type:

Due to new developments, a smaller plug, socket and feeedthrough type was introduced in 2006. The cross section is reduces – opening the possibility to use smaller flanges or get signals more densely packed.

The LEMO plug connector is FGG.2B.319.CLAD92ZN for the outer signal cable and FGJ.2B.319.CLLD92 for the inner (vacuum suitable) signal cable.
The feedthroughs are: SGJ.2B.319.CLLSV for the socket-socket type and HGG.2B.319.CLLSVfor the socket-solder type.



Reference		Contacts	Dimensions (mm)							
Model	Series	Type	A	B	e	E	L	M	S1	S3
SGJ	0B	female – male	14	13.8	M10x0.75	17	34	2.0	9.0	12
SJG		male – female								
SGJ	1B	female – male	17	16.0	M12x1.00	28	39	2.5	10.5	14
SJG		male – female								
SGJ	2B	female – male	20	21.8	M16x1.00	25	44	4.0	15.0	19
SJG		male – female								



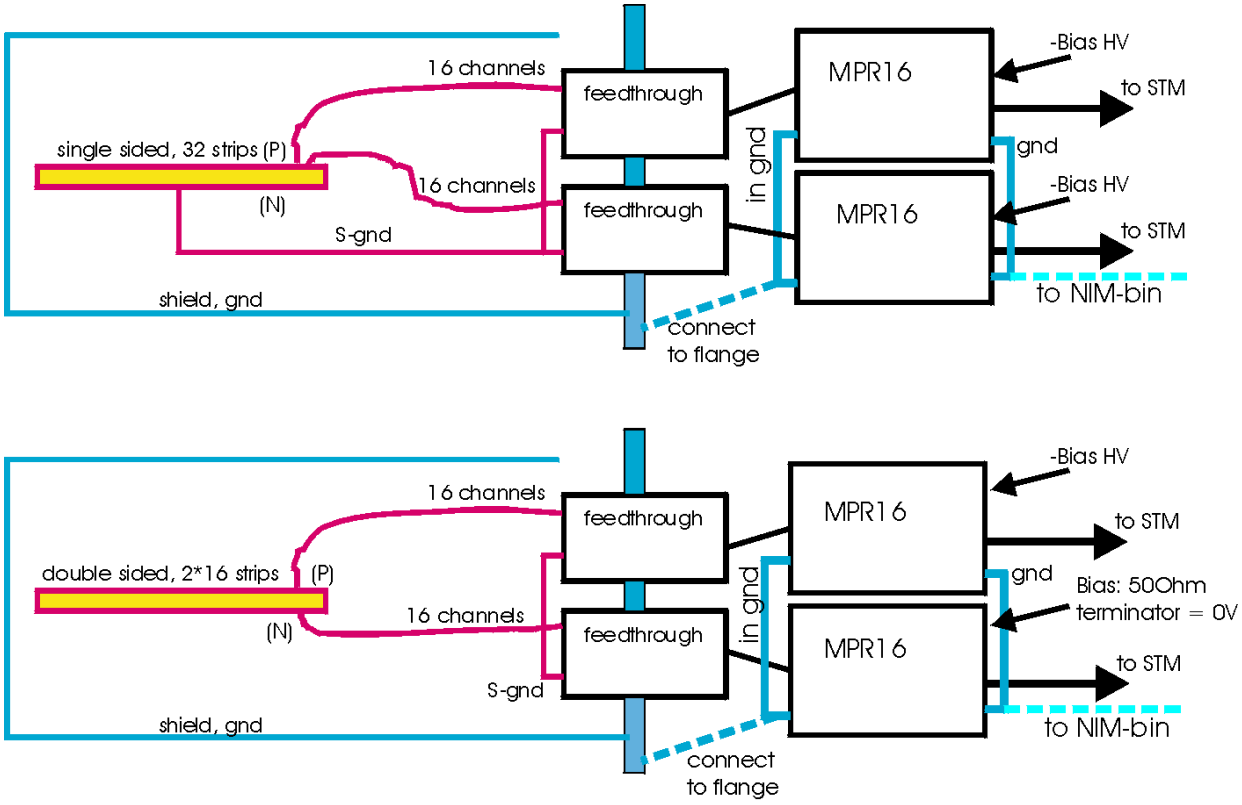
HGG Fixed socket, nut fixing, key (G) or keys (A…M and R), watertight or vacuumtight

Reference		Dimensions (mm)							
Model	Series	A	B	e	E	L	M	S1	S3
HGG	00	11	10.3	M7x0.5	8.0	18.3	1.5	–	9
HGG	0B	13	12.5	M9x0.6	7.0	20.7	3.0	8.2	11
HGG	1B	18	16.0	M12x1.0	7.0	26.0	4.5	10.5	14
HGG	2B	20	19.5	M15x1.0	8.0	29.7	4.0	13.5	17
HGG	3B	25	25.0	M18x1.0	11.5	36.2	4.0	16.5	22
HGG	4B	34	32.0	M25x1.0	11.0	44.7	4.0	23.5	30
HGG	5B	45	40.0	M35x1.0	11.0	51.7	5.0	33.5	–

Connection for 19 pole signal cables with vacuum feedthroughs

Function	**MPR connector Dsub25** (from 8/2003)	**Flat wire inside vacuum (20 pole)**	**Lemo feedthrough**
Signal ground	1, 7	2	1
Channel 1	11	18	2
Channel 2	23	17	3
Channel 3	10	16	4
Channel 4	22	15	5
Channel 5	9	14	6
Channel 6	21	13	7
Channel 7	8	12	8
Channel 8	20	11	9
Channel 9	19	10	10
Channel 10	6	9	11
Channel 11	18	8	12
Channel 12	5	7	13
Channel 13	17	6	14
Channel 14	4	5	15
Channel 15	16	4	16
Channel 16	3	3	17
Signal ground	14,13	19, 20	18
guardring	24	1	19

How to connect the detector



Sensitive lines are marked in red.

Connection instructions for Micron BB7WS: