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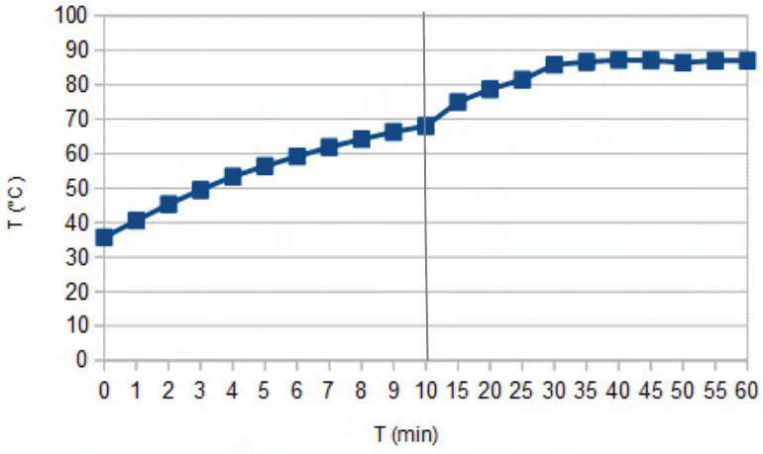
High Current Sub-D feedthroughs on CF and KF /ISO Flanges

The typical use of Sub-D feedthroughs are signal connections and low current applications.
With the HIGH CURRENT versions, Sub-D feedthroughs can replace power feedthroughs with minimal space requirements.

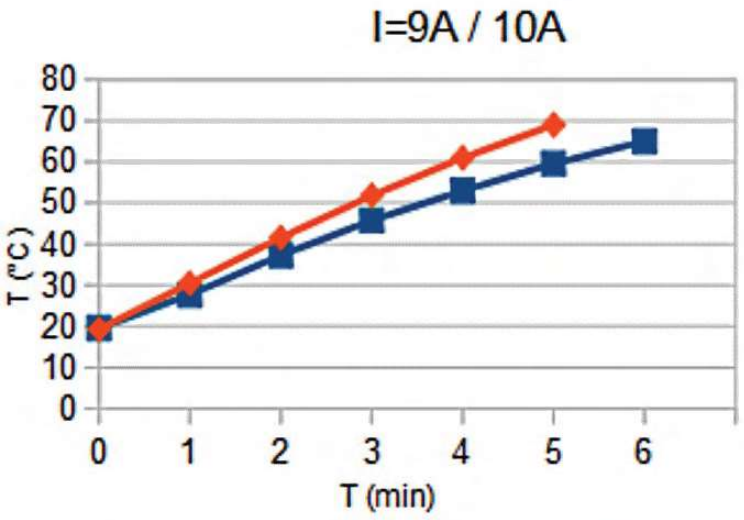
HC Sub-D feedthroughs allow:
- Continuous use with 6A, all pins loaded
- Short time use with 10A, all pins loaded

All dimensions are identical to Standard Sub-D types!
Allectra offers the full range (9 to 50 pins).

Pleases note, that also the cables and connectors must be chosen, who can handle the high current. Allectra offers all required components:
- Crimp pins for thicker wires
- UHV compatible wire
- Air side connectors with high current rating



*Temperature measured on a 25-pin Sub-D HC f/t at **7A** versus time (=1A more than specified, all pins loaded, so 175A in total).*
The max. reached temperature stays below 90°C.



Temperature versus time with 9 A (blue) and 10A (red) current per pin, all pins loaded. (225 / 250A in total)
All tests were done at room temperature of ~20°C

High Current Sub-D feedthroughs on CF and KF /ISO Flanges

The versions with one HIGH CURRENT (HC) feedthrough per flange are offered here.
Please ask for a quote, if you require more feedthroughs on one flange or if combinations with other types of feedthroughs are desired.

General Specifications High Current Sub-D

Compliance	DIN 41652, MIL-C-24308
Pin-ø	1.0 mm
Pin material	Gold plated proprietary metal
Seal	Glass Ceramic
Flange	Stainless Steel
Test Voltage	500V DC
Maximum Current	10A per pin for 5 min.
Cont. Current	6A per pin, all pins loaded
Temperature	-200°C to 250°C (UHV) -40°C to 200°C (HV)
Leak rate	$<5x10^{-10}$ mbar-l/s He (UHV) $<1x10^{-9}$ mbar-l/s He (HV)

Sub-D Feedthroughs on CF Flanges 500V, up to 10 Amps per Pin

SIZE	NO. OF PINS	PART NUMBER
40CF	9	210-D09-C40-HC
40CF	15	210-D15-C40-HC
63CF	15	210-D15-C63-HC
63CF	25	210-D25-C63-HC
63CF	50	210-D50-C63-HC
100CF	37	210-D37-C100-HC
100CF	50	210-D50-C100-HC

Not listed in the catalogue are flanges with multiple High Current Sub-D feedthroughs.
Please ask for a quote, we can do all kind of assemblies with High Current versions as well.

Sub-D Feedthroughs on KF/ISO-K Flanges 500V, up to 10 Amps per Pin

SIZE	NO. OF PINS	PART NUMBER
40KF	9	210-D09-K40-HC
40KF	15	210-D15-K40-HC
63ISO-K	15	210-D15-ISO63-HC
63ISO-K	25	210-D25-ISO63-HC
63ISO-K	50	210-D50-ISO63-HC
100ISO-K	37	210-D37-ISO100-HC
100ISO-K	50	210-D50-ISO100-HC

Please note:

To use the feedthrough with high current, also the **connectors, pins and cables** must be adjusted for the use with high current.
For the vacuum side the housings are identical to the standard versions, but we recommend the use of a cable with 1.3mm diameter and the fitting crimp pins (see next page)
For the air side, fitting high current connectors are offered as well on next page.

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Accessories for HC Sub-D feedthroughs

All components used with HC feedthroughs must be chosen for high current use. Here the fitting components are listed.

Please note, that the vacuum side connectors and housings are identical with the Standard Sub-D versions, only the pins have to be changed. These connectors and housings are listed on page 1.14 to 1.16

HC air side connectors have gold plated contacts. They come including a plastic housing with thumb screws

Specification HIGH CURRENT CRIMP PINS

Vacuum	High Vacuum and UHV
Material	Gold plated copper alloy
Pin diameter	1mm ø
Wire size	0.7 to 1.3mm ø max
Crimp tool	214-CTOOL-SUB-D
	214-CTOOL
	214-CTOOL-HQ

High Current Crimp Pins for Sub-D
Cable ø 1.3mm max, fits HV and UHV Sockets

TYPE/WIRE Ø	No. PER PKT.	PART NUMBER
female, 1.3mm ø	10	212-PINF-10-HC
female, 1.3mm ø	15	212-PINF-15-HC
female, 1.3mm ø	25	212-PINF-25-HC
male, 1.3mm ø	10	212-PINM-10-HC
male, 1.3mm ø	15	212-PINM-15-HC
male, 1.3mm ø	25	212-PINM-25-HC

Specification HIGH CURRENT AIR SIDE CONNECTORS

Pin diameter	1mm ø
Surface	fully Gold plated
Pins	Solder cup
Wire diameter	1.0mm ø max
Rated current	7.5A continuous

Air side connectors, solder pins
for up to 7.5A continuous current

TYPE	PINS	PART NUMBER
AIR, 7.5A	9	211-FS09-AIR-HC
AIR, 7.5A	15	211-FS15-AIR-HC
AIR, 7.5A	25	211-FS25-AIR-HC
AIR, 7.5A	37	211-FS37-AIR-HC
AIR, 7.5A	50	211-FS50-AIR-HC

Standard connectors are rated to 5A max. These special connectors can be used at up to 7.5A per pin continuously. Please note, that the typical ready made air side cables are only useable for approx. 1A

Air side connectors have gold plated solder cup pins for 1mm ø wires.
If you want to use thicker wires up to 1.3mm ø, use above listed crimp pins plus the Crimp pin housings 211-FSxx-ATC, see page 1.20

Accessories for HC Sub-D feedthroughs

All components used with HC feedthroughs must be chosen for high current use. Here the fitting components are listed.

Please note, that the vacuum side connectors and housings are identical with the Standard Sub-D versions, only the pins have to be changed. Connectors are listed on page 1.14-1.15
Housings are listed on page 1.14 and 1.16

Specification HIGH CURRENT WIRE

Vacuum	UHV, $<10^{-10}$ mbar
Construction	High flexible 1.3mm ø (19x0.25mm)
Material	Silver plated copper
Insulation	Kapton
Overall diameter	1.4mm
Temp. range	4K .... 300°C
Radiation	up to 10^9 rad

The HC pins allow the use of cable up to 1.3mm diameter with the Sub-D system. The pins fit to all standard connectors.
The cable 311-KAPM-130-RAD can be used for more than 10A and is so the ideal wire for the High Current Sub-D system (top left cable on the photo).

Pins and cables can be used with the standard feedthroughs as well.

For a full range of cables, see Sec. 6

UHV compatible Wire, Kapton insulated 1.3mm ø, radiation resistant

LENGTH	PART NUMBER
5m	311-KAPM-130-RAD-5M
10m	311-KAPM-130-RAD-10M
50m	311-KAPM-130-RAD-50M

Male pins for the different cable sizes. On the right, the High Current pins are shown, which accept cables up to 1.3mm diameter

The "HC" Logo on the feedthrough clearly marks the types for high current applications. Of course they can be used with standard pins as well.

Kapton® and PEEK insulated wires for UHV use

Allectra offers a wide variety of Kapton and PEEK insulated wires and cables for the use in High- and Ultra-High-Vacuum applications.

Type	*Construction*	*AWG*	*Conductor Diam. mm*	*Overall Diam max. mm*	*Max. Voltage in vacuum [1] V DC*	*Max. Current [2] A*	*Conductor area mm²*	*Resistivity [3] Ohm/km*	*Usage example*
311-KAP-010	Plain copper wire, dipped	38	0.1	0.13	2,000	0.1	0.01	2270	STM / AFM, radiation environment
311-KAP-012	Plain copper wire, dipped	36	0,12	0.16	2.000	0,15	0,01	1580	Fine instrumentation, radiation environment
311-KAP-014	Plain copper wire, dipped	35	0.14	0.18	2,000	0.2	0.02	1160	Fine instrumentation, radiation environment
311-KAP-025	Plain copper wire, dipped	30	0.25	0.3	2,000	1	0.05	360	Standard instrumentation, radiation environment
311-KAP-040	Plain copper wire, dipped	26	0.4	0.47	3,000	2	0.13	138	Standard medium current, radiation environment
311-KAP-060	Plain copper wire, dipped	22	0.64	0.71	4,000	5	0.31	58	Standard medium current, radiation environment
311-KAP-100	Plain copper wire, dipped	18	1.0	1.1	10,000	10	0.79	23	High current and high voltage applications, radiation environment
311-KAP-102	Plain copper wire, dipped	18	1.02	1.1	4,000	10	0.79	23	Like 311-KAP-100 but lower voltage applications
311-KAP-130	Plain copper wire, dipped	16	1,3	1,4	5.000	13	1,33	13,8	High current
311-KAP-180	Plain copper wire, dipped	13	1.8	2.0	4,000	20	2.6	6.8	Very high current
311-KAP1	Silver plated copper wire, wrapped quality	30	0.25	0.55	4,000	1	0.05	360	Caburn UHV© Type, easy to strip, general instrumentation
311-KAP2	Silver plated copper wire, wrapped quality	22	0.6	0.9	4,000	4.5	0.28	64	Caburn UHV© Type, easy to strip, medium current
311-KAPM-025	Multi Strand silver plated wire, 7x 0,08mm	31	0.23	0.39	1,000	0.5	0.04	508	High flexible instrumentation, low current and low voltage
311-KAPM-035	Multi Strand silver plated wire, 7x 0,12mm	27	0.35	0.5	1,000	1	0.08	225	High flexible, Sub-D connectors, low current and low voltage
311-KAPM-060	Multi Strand silver plated wire, 19x 0,1mm	23	0.6	0.67	1,000	2.5	0.15	119	High flexible, Sub-D connectors, medium current
311-KAPM-075	Multi Strand silver plated wire, 19x 0,15mm	21	0,75	0,8	1.000	5	0,33	53	High flexible, Sub-D connectors, higher current

1 *Pressure < 1x 10-3 mbar. Max. Voltage in air is significant lower. Allectra does not recommend these wires for air use according these data sheet.*

2 *Max. Current depends strongly on use, specially for vacuum applications. if a coil is formed, a temperature test should be done. As an approximation, 1/3 of the given current can be assumed to start with. As the heat dissipation is very low in vacuum, the cables will get hot by continuous use at the given values.*

3 *Calculated value with conductance of 56 S m /mm² at 20°C*

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Type	Construction	AWG	Conductor Diam. mm	Overall Diam max. mm	Max. Voltage in vacuum) V DC	Max. Current) A	Conductor area mm²	Resistivity) Ohm/km	Usage example
311-KAPM-100	Multi Strand silver plated wire, 19x 0,2mm	18	1.0	1.17	1,000	9	0.6	30	High flexible high current wire, up to 10A for short periods
311-KAPM-200	Ultra flexible thick Multi Strand wire, 400x0.08mm, silver plated	12	2.0	2,2	1.000	20	2,0	8,9	Heaters, ideal for use with COMBO Sub-D f/t's
311-KAP50	50 Ohm coaxial wire, conductor 7x 0,15mm, silver plated conductor + screen	26	0.45	2.3	5,000	1	0.12	144	All 50 Ohm connections, specially for SMA connectors, signals, which need shielding
311-KAP50S	Miniature 50 Ohm coaxial wire, conductor 7x 0,08mm, silver plated cond. + screen	32	0,23	1,45	1.000	0,5	0,12	508	Thin and high flexible 50Ohm wire, similar RG178
311-KAPM-025-SHIELD	Multi-Strand coaxial wire, 7 x 0,08mm, outer not insulated	32	0.23	1.0	1,000	0.5	0.04	508	For all connections, where shielding is required and shielding is on ground
311-KAPM-060-COAX	Multi-Strand coaxial wire, 19 x 0,1mm, outer insulated	23	0,6	1,4	1,000	2,5	0.15	119	For all connections, where shielding is required but no high frequency is involved
311-KAPM-060-PAIR1	Shielded Twisted Pair cable, 1 Pair	23	2x 0,6	1,7	1.000	2	0,15	119	Signals, High Frequency supplies, Limit Switches
311-KAPM-060-PAIR2	Shielded Twisted Pair cable, 2 Pairs (4 conductors)	23	4x 0,6	2,2	1.000	2	0,15	119	Signals, Stepper motor connection
311-KAP-RIB4	Ribbon cable	27	4x 0,35	1,2 x 4	1.000	1	0,08	225	Instrumentation
311-KAP-RIB10	Ribbon cable	27	10x 0,35	1,2 x 10	1.000	1	0,08	225	Sub-D connections
311-KAP-RIB15	Ribbon cable	27	15x 0,35	1,2 x 13	1.000	1	0,08	225	Sub-D connections
311-KAP-RIB25	Ribbon cable	27	25x 0,35	1,2x(10+13)	1.000	1	0,08	225	Sub-D connections, set of 10 and 15 wire version
311-KAP-RIB26	Ribbon cable	27	26x 0,35	1,2 x 21	1.000	1	0,08	225	Sub-D connections, ideal for HD26 and HD78
311-KAP-TCK	Thermocouple Wire, double insulation	32	2x 0,2		-	-	0,03	-	Thermocouple **Type K**
312-KAP-TCK	Thermocouple Wire, one Wire Blank, with outer insulation	32	2x 0,2		-	-	0,03	-	Thermocouple **Type K**
312-KAP-TCN	Thermocouple Wire, one Wire Blank. with outer insulation	32	2x 0,2		-	-	0,03	-	Thermocouple **Type N**

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Type	Construction	AWG	Conductor Diam. mm	Overall Diam max. mm	Max. Voltage in vacuum) V DC	Max. Current) A	Conductor area mm²	Resistivity) Ohm/km	Usage example
RADIATION RESISTANT VERSIONS									
311-KAPM-025-RAD	Multi Strand silver plated wire, 7x 0,08mm, Radiation Resistant, 300°C	31	0.23	0.39	2,000	0.5	0.04	508	Radiation resistant (10^9 rad) and High Temperature (300°C) wire, higher voltage rating, low current
311-KAPM-035-RAD	Multi Strand silver plated wire, 7x 0,12mm, Radiation Resistant, 300°C	27	0.35	0.5	4,000	1	0.08	225	Radiation resistant (10^9 rad) and High Temperature (300°C) wire, higher voltage rating, low current
311-KAPM-060-RAD	Multi Strand silver plated wire, 19x 0,1mm, Radiation Resistant, 300°C	23	0.6	0.67	4,000	2.5	0.15	119	Radiation resistant (10^9 rad) and High Temperature (300°C) wire, higher voltage rating, medium current
311-KAPM-100-RAD	Multi Strand silver plated wire, 19x 0,2mm, Radiation Resistant, 300°C	20	1.0	1.17	4,000	9	0.6	30	Radiation resistant (10^9 rad) and High Temperature (300°C) wire, higher voltage rating, high current
311-KAPM-130-RAD	Multi Strand silver plated wire, 19x 0,25mm, Radiation Resistant, 300°C	18	1.3	1.4	4,000	12	0.93	18	Radiation resistant (10^9 rad) and High Temperature (300°C) wire, higher voltage rating, high current
311-KAPM-150-RAD	Multi Strand silver plated wire, 19x 0,28mm, Radiation Resistant, 300°C	16	1.45	1.55	4,000	15	1.17	14.8	Radiation resistant (10^9 rad) and High Temperature (300°C) wire, higher voltage rating, high current
311-KAPM-025-COAX-RAD	**Extra thin** coaxial wire, conductor 7x 0,08mm, silver plated conductor +screen, Radiation Resistant, 300°C	31	0.23	0.85	2,000	0.5	0.04	508	Radiation resistant (10^9 rad) and High Temperature (300°C) coaxial wire, signals, for areas with space restrictions
311-KAP50-RAD	**50 Ohm** coaxial wire, multi strand silver plated conductor, 7x 0,15mm, silver plated screen, Radiation Resistant, 300°C	26	0.45	2.3	10,000	1	0.12	144	Radiation resistant (10^9 rad) and High Temperature (300°C) wire, higher voltage rating, 50 Ohm coaxial wire
311-KAP-TCK-RAD	**Thermocouple** Wire, double insulation	32	2x 0.2		-	-	0.03	-	Radiation resistant (10^9 rad) and High Temperature (300°C) wire, Thermocouple **Type K**
311-KAP-TCN-RAD	**Thermocouple** Wire, double insulation	32	2x 0.2		-	-	0.03	-	Radiation resistant (10^9 rad) and High Temperature (300°C) wire, Thermocouple **Type N**
311-KAP-TCT-RAD	**Thermocouple** Wire, Twisted Pair type	32	2x 0.2		-	-	0.03	-	Radiation resistant (10^9 rad) and High Temperature (300°C) wire, Thermocouple **Type T**

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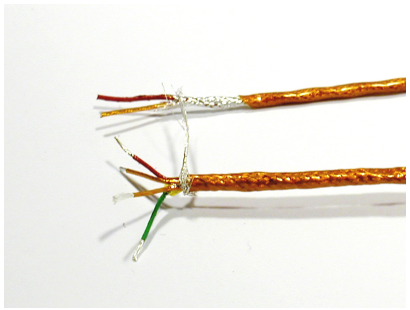
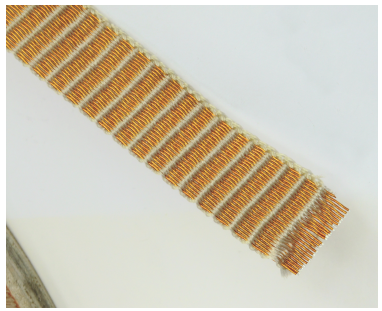
Type	Construction	AWG	Conductor Diam. mm	Overall Diam max. mm	Max. Voltage in vacuum) V DC	Max. Current) A	Conductor area mm²	Resistivity) Ohm/km	Usage example
MANGANIN WIRES FOR CRYOGENIC APPLICATIONS									
312-KAP-MAN-014	Plain Manganin wire, dipped	35	0,14	0,18	2.000	0,1	0.02	28K	Cryogenic applications, low thermal conductivity of 22 W/m K @23°C
312-KAP-MAN-025	Plain Manganin wire, dipped	30	0,25	0,33	8.000	0,25	0.05	8760	Cryogenic applications, low thermal conductivity of 22 W/m K @23°C
PEEK INSULATED WIRES									
310-PEEKM-035	Multi Strand silver plated wire, 7x 0,12mm	27	0.35	0.7	10,000	1	0.08	225	High voltage applications, radiation resistant up to 10^9 rad, max. 250°C
310-PEEK50-TRIAX	**50 Ohm** Triaxial cable, 2x >85% coverage, silver plated	27	0,35	2,8	4.000	1	0,08	225	Small signals, specially for use with triaxial feedthroughs and connectors

Bending Radii of the cables: The Overall diameter multiplied by factor 7.5 gives a save bend radius for all cables.
For single bends, the factor can be reduced to 5.
For continuous bends (~ 1.000 and more) the factor must be 10 or higher.
Allectra has no values for lifetime of the cables with bends above 1.000 times.

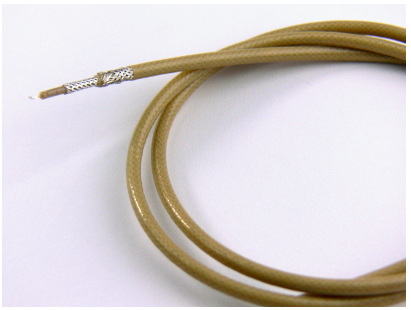
Various samples of radiation resistant wires, including 50 Ohm coaxial cable



Twisted Pair cables, 1 and 2 pairs, shielded



26 pin Ribbon cable type 311-KAP-RIB26



Triaxial PEEK insulated cable Type 310-PEEK50-TRIAX 50 Ohm impedance

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	Dipped Wire	*Wrapped and Multi-Strand Wire*	*Radiation Resistant Wires*
Temperature range (vacuum)	4K to 260°C, up to 300°C for short periods [4)]	4K to 260°C	4K to 300°C
Dielectric constant (1KHz)	~3.5	~3.1	~3.4
Dielectric strength (dry) kV/mm	>135	>135	>200
Dissipation factor	0.0015	0.0015	0.0018
Vacuum range	UHV, $<10^{-11}$ mbar	UHV, $<10^{-11}$ mbar	UHV, $<10^{-11}$ mbar
Radiation resistance	10^9 Rad = 10^7 Gy	10^7 Rad = 10^5 Gy (non-flexing applications)	10^9 Rad = 10^7 Gy

Additional values for 50 Ω Cables:

	311-KAP50	311-KAP50S	311-KAP50-RAD	310-PEEK-TRIAX
Impedance	50Ω +/-10%	50Ω +/-10%	50Ω +/-10%	50Ω +/-10%
Nom. Capacitance	115 pF/m	120pF/m		125pF/m pin - shield1 515pF/m shield1- shield2
Attenuation	0.1db/m at 100MHz 1.1db/m at 500MHz 1.9db/m at 1 GHz	~3db/m at 1GHz	0.1db/m at 100MHz 1.1db/m at 500MHz 1.9db/m at 1 GHz	---
Dimension similar to	RG174	RG178	RG174	--
Conductor	0.45mm	0.23mm	0.45mm	0,45mm
Dielectric	1.55mm	0.9mm	1.55mm	1,76mm
Shield	2.0mm	1.35mm	2,0mm	2,42mm
Max. Frequency	~17 GHz			

(measured with UHV-SMA connectors mounted)

Some help for choosing the right wire:
Dipped wire are a good choice, if the parts need no or little movement. These are the cheapest types. Stripping is difficult.
For radiation environment and temperatures above 260°C Radiation Resistant (-RAD) wires or dipped wires can be used
For higher voltage applications the Caburn UHV® qualities, the -RAD qualities and PEEK wires are best choice.
If flexibility is required, Multi Strand types should be used. These are the typical wires for connecting sensors, motors etc. Stripping is easy.

Kapton insulated wire in vacuum will outgas water on first use. A bake to 120° C for 4 to 5 hours will remove excess gas.
50 Ohm wire can be supplied ready fitted with 50 Ω SMA / SMB / BNC / MHV / SHV / N / Microdot vacuum connectors.

All values are given to best knowledge. Values might change without notice. Allectra does not guarantee the given figures.
Last revised: 06/02/16

4 *Temperatures above 260°C will change the electrical specs after some 100 hours, lifetime of cable is reduced.*

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