

## 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 <sup>1)</sup> V DC	Max. Current <sup>2)</sup> A	Conductor area mm <sup>2</sup>	Resistivity <sup>3)</sup> 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-170	Plain copper wire, dipped	14	1,7	1,85	12.000	17	2,2	8	Very high current and voltage
311-KAP-180	Plain copper wire, dipped	13	1,8	2,0	4.000	20	2,6	6,8	Very high current
<b>311-KAP2</b>	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
<b>311-KAPM-060</b>	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
<b>311-KAPM-025-SHIELD</b>	Multi-Strand coaxial wire, 7 x 0,08mm, outer <u>not</u> 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
<b>311-KAP-TCK</b>	Thermocouple wire, double insulation	32	2x 0,2		-	-	0,03	-	Thermocouple <b>Type K</b>
<b>312-KAP-TCK</b>	Thermocouple wire, <u>one</u> wire blank, with outer insulation	32	2x 0,2		-	-	0,03	-	Thermocouple <b>Type K</b>

1 Pressure < 1x 10<sup>-3</sup> 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 /mm<sup>2</sup> at 20°C

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312-KAP-TCN	Thermocouple wire, <u>one</u> wire blank, with outer insulation	32	2x 0,2		-	-	0,03	-	Thermocouple <b>Type N</b>



## RADIATION RESISTANT VERSIONS

301-KAP1	Silver plated copper wire, wrapped quality	30	0,25	0,58	7.500	0,6	0,05	360	General instrumentation Radiation Resistant, 300°C
301-KAPM-025	Multi Strand silver plated wire, 7x 0,08mm	32	0,24	0,6	7500	0,5	0,04	548	Multi Strand silver plated wire, 7x 0,08mm, Radiation Resistant, 300°C
301-KAPM-035	Multi Strand silver plated wire, 7x 0,12mm	28	0,35	0,7	7500	1	0,08	225	Multi Strand silver plated wire, 7x 0,12mm, Radiation Resistant, 300°C
301-KAPM-060	Multi Strand silver plated wire, 19x 0,127mm	24	0,64	1,1	7500	3	0,24	80	Multi Strand silver plated wire, 19x 0,1mm, Radiation Resistant, 300°C
301-KAPM-075	Multi Strand silver plated wire, 19x 0,15mm	21	0,75	0,95	7500	5	0,34	57,1	Multi Strand silver plated wire, 19x 0,1mm, Radiation Resistant, 300°C
301-KAPM-100	Multi Strand silver plated wire, 19x 0,2mm	18	1	1,35	7500	9	0,61	30	Multi Strand silver plated wire, 19x 0.2mm, Radiation Resistant, 300°C
301-KAPM-130	Multi Strand silver plated wire, 19x 0.25mm	16	1,3	1,65	7500	12	0,97	18	Multi Strand silver plated wire, 19x ???mm, Radiation Resistant, 300°C
301-KAPM-200	High flex. silver plated wire, 455x 0,07mm	12	1,9	2,35	7500	20	1,75	10,9	Ultra flexible thick Multi Strand wire, 455x0.07mm, silver plated
301-KAPM-410	High flex. silver plated wire, 133x 0,287mm, High Voltage	8	4,6	5	15000	70	8,4	2,16	Ultra flexible, 133x 0.287mm for high voltage
301-KAPM-460	Not yet available	8	4,6	5	7500	70	8,6	2	Ultra flexible, 273x 0.2mm
301-KAPM-025-COAX	Multi Strand silver plated wire, 7x 0,08mm, screened, coax	31	0,23	0,9	7500	0,5	0,04	508	Extra thin coaxial wire, conductor 7x 0,08mm, silver plated conductor +screen, Radiation Resistant, 300°C

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<b>301-KAPM-060-COAX</b>	Multi Strand silver plated wire, 19x 0,12mm, screened, coax	24	0,6	1,4	7500	3	0,15	119	Coaxial wire, conductor 19x 0,1mm, silver plated conductor +screen, Radiation Resistant, 300°C
<b>301-KAPM-025-PAIR1</b>	Shielded twisted pair cable, 2x 301KAPM-025	32	2x 0,24	1,65	7500	0,5	0,04	548	Thin Shielded Twisted Pair cable, 1 Pair
<b>301-KAPM-060-PAIR1</b>	Shielded twisted pair cable, 2x 301KAPM-060	24	2x 0,64	2,24	7500	2,5	0,24	80	Shielded Twisted Pair cable, 1 Pair
<b>301-KAPM-060-PAIR2</b>	Shielded twisted pair cable, 2 pairs 301KAPM-060 (4 wires)	24	4x 0,64	3,55	7500	2,5	0,24	80	Shielded Twisted Pair cable, 2 Pairs (4 conductors)
<b>301-KAP50</b>	50 Ohm coaxial wire, conductor 7x 0,127mm, silver plated conductor + screen	28	0,38	2,48	10000	1	0,09	209	50 Ohm coaxial wire, multi strand silver plated conductor 0.38mm ø, silver plated screen, Radiation Resistant, 300°C
301-KAP50-S	Thin 50 Ohm coaxial wire, conductor 7x 0,08mm	32	0,23	1,6	7500	0,5	0,12	508	Miniature 50 Ohm coaxial wire, conductor 7x 0,08mm, silver plated cond. + screen
<b>301-KAP-TCK</b>	<b>Thermocouple</b> Wire, double insulation, type K	30	2x 0.25	0,95	-	-	0,05	-	Thermocouple Wire, double insulation
<b>301-KAP-TCN</b>	<b>Thermocouple</b> Wire, double insulation, type N	30	2x 0.25	0,95	-	-	0,05	-	Thermocouple Wire, double insulation
<b>301-KAP-RIB4</b>	Ribbon cable 4 wires of 301KAPM-035	27	4x 0,35	1,8 x 6	1000/7500	1	0,08	225	Ribbon cable, Radiation Resistant, 260°C
<b>301-KAP-RIB10</b>	Ribbon cable 10 wires of 301KAPM-035	27	10x 0,35	1,8 x 11	1000/7500	1	0,08	225	Ribbon cable, Radiation Resistant, 260°C
<b>301-KAP-RIB15</b>	Ribbon cable 15wires of 301KAPM-035	27	15x 0,35	1,8 x 15	1000/7500	1	0,08	225	Ribbon cable, Radiation Resistant, 260°C
<b>301-KAP-RIB26</b>	Ribbon cable, 26 wires of 301KAPM-035	27	26x 0,35	1,8 x 25.5	1000/7500	1	0,08	225	Ribbon cable, Radiation Resistant, 260°C

## OTHER RADIATION RESISTANT VERSIONS

<b>311-KAPM-100-RAD</b>	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 <sup>9</sup> rad) and High Temperature (300°C) wire, higher voltage rating, high current
<b>311-KAPM-130-RAD</b>	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 <sup>9</sup> rad) and High Temperature (300°C) wire, higher voltage rating, high current

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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 <sup>9</sup> rad) and High Temperature (300°C) wire, higher voltage rating, high current
311-KAPM-075-PAIR1-S-RAD	Screened twisted pair, not insulated outer	22	2x0,75	2,7	4.000	5	0,38	46,5	Shielded twisted pair cable for higher current applications, screen blank
311-KAP50S-RAD	50 Ohm coaxial wire, conductor 7x 0,08mm, silver plated conductor + screen	32	0,24	1,45	4.000	0,5	0,12	640	Thin 50 Ohm cable, similar RG178
311-KAP-TCK-RAD	<b>Thermocouple</b> Wire, double insulation	32	2x 0.2		-	-	0,03	-	Radiation resistant (10 <sup>9</sup> rad) and High Temperature (300°C) wire, Thermocouple <b>Type K</b>
311-KAP-TCN-RAD	<b>Thermocouple</b> Wire, double ins., colour coded	30	2x 0.25	1,2	-	-	0,05	-	Radiation resistant (10 <sup>9</sup> rad) and High Temperature (300°C) wire, Thermocouple <b>Type N</b>
311-KAP-TCT-RAD	<b>Thermocouple</b> Wire, Twisted Pair type	32	2x 0.2		-	-	0,03	-	Radiation resistant (10 <sup>9</sup> rad) and High Temperature (300°C) wire, Thermocouple <b>Type T</b>

These green marked cables will run out and will be replaced by KAP-301 qualities in the future


## 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
312-KAP-MAN-025-PAIR1	Plain Manganin wire, dipped, Twisted Pair	30	2x 0,25	0,66	8.000	0,25	0,05	8760	Twisted Pair version of 312-KAP-MAN-025

## PEEK INSULATED WIRES

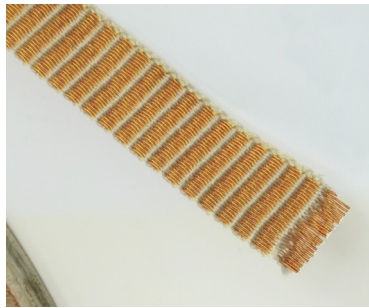
310-PEEKM-035	Multi Strand silver plated wire, 7x 0,12mm	27	0,35	0,7	10.000	1	0,08	225	High voltage applications, radiation resistant up to 10 <sup>9</sup> rad, max. 250°C
310-PEEK50-TRIAX	50 Ohm Triaxial cable, 2x >85% coverage, silver plated	27	0,35	2,8	4.000	1	0,08	225	Small signals, specially for use with triaxial feedthroughs and connectors

Bending Radii of the cables: The Overall diameter multiplied by factor 7.5 gives a safe 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.

	<i>Dipped Wire</i>	<i>Wrapped and Multi-Strand Wire</i>	<i>Radiation Resistant Wires</i>
Temperature range (vacuum)	4K to 260°C, up to 300°C for short periods <sup>4</sup>	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 <sup>-11</sup> mbar	UHV, <10 <sup>-11</sup> mbar	UHV, <10 <sup>-11</sup> mbar
Radiation resistance	10 <sup>9</sup> Rad = 10 <sup>7</sup> Gy	10 <sup>7</sup> Rad = 10 <sup>5</sup> Gy (non-flexing applications)	10 <sup>9</sup> Rad = 10 <sup>7</sup> Gy



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



26 pin Ribbon cable type 301-KAP-RIB26



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

Some help for choosing the right wire:

Dipped wire are a good choice, if the parts need no or little movement or if space is limited. Stripping is difficult.

For radiation environment and temperatures above 260°C, the KAP301 wires are first choice.

For higher voltage applications the Caburn UHV® qualities, the KAP301 qualities and PEEK wires can be used.

If flexibility is required, Multi Strand types are recommended. 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 min. 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.

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