



*Lead-in
Wires*

TUNGSRAM

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GENERAL

FUNCTIONS

Lead-in wires are essential components of vacuum engineering devices such as light sources, electron tubes, etc. They

- conduct current from the cap to the filament or other internal elements of lamps or devices and provide a hermetic seal with the glass envelopes;
- support the filament or other internal elements;
- may incorporate a fusible element to provide protection against overcurrent from shorts or arc discharges;
- extend from electron tubes to act as pins that can be plugged in the socket.

For most lead-in wire applications, no one single material can perform each of the necessary functions efficiently. Therefore, a typical lead-in wire is usually made of two, three, or more wire segments of dissimilar materials welded together in series.

MATERIALS

The portion contained within the stem press or lead seal is designed to provide a hermetic seal with the glass:

- the coefficient of thermal expansion of the material selected must closely match that of the stem glass at temperatures ranging from the lowest operating temperature to the softening temperature of the glass;
- the glass applied should adhere well to the metal, i.e. suitable wetting of the metal by the glass is required;
- the metal must not contain absorbed gases that might cause bubbles to appear in the melted glass in the sealing operation, impairing the continuity of the glass-to-metal seal.

Material used:

Dumets

are copper-clad wires made of iron-nickel alloy and provided with borax coating. They are used mainly for sailing in soft glasses, they feature an average thermal expansion coefficient of $90...95 \times 10^{-7}/K$ in the temperature range of $0...300\text{ }^{\circ}C$.

Tungsten wires

for hard glasses; they are products of the powder metallurgy and some qualities are processed by smooth grinding and are glassed-in, respectively.

Upon special order

wires can be furnished with any thermal expansion coefficient and of any material, respectively, i.e. iron-nickel-cobalt, iron-nickel-chromium and iron-chromium alloys.

The inner section conducts current and supports the filament and other internal elements. Purity requirements of vacuum engineering are met and high heat resistance featured by the standard materials free of impurities and absorbed gases as nickel wires containing manganese (e.g. 1.5...2%) or nickel-plated iron wires for general purposes.

The outer section conducts from the cap or socket to the other lead portions. The most common outer leads feature high electrical conductivity and good solderability to the cap (desoxydated copper wires).

Gas-filled incandescent lamps are provided with **fused leads**. These are four-part lead-in wires, in which one part is designed to act as a fuse inserted usually between the dumet and the outer lead. Material and dimensions of the fusible element incorporated are chosen to withstand switching transients but melt prior to the mains safety fuse in case of arc-short occurring when the lamp burns out. It is made of iron or copper alloy with 42% and 30% nickel content, respectively.

The outer leads of electron tubes act as plug-in connections. These pins are nickel wires with manganese content and finished with high accuracy.

Material symbols

Description	Symbol	Main application
nickel-manganese alloy (Mn 2%)	Ni	support wire
nickel plated iron	VB	support wire
dumet (copper-clad iron-nickel alloy)	Du	soft glass sealing
monel (copper-nickel alloy)	Mon	fusing element
copper, pure, oxygen-free	Cu	support or outer lead
iron-nickel alloy (Ni 42%)	Fe-Ni	fusing element
tungsten	W	hard glass sealing

Tolerances

Nominal diameter, mm	Tolerance, %
up to 1.0	± 0.01
above 1.0	± 0.02

Overall length, mm	Tolerance, %
up to 30	± 5
31...100	± 1
101...300	± 0.5
above 300	± 0.2

Part length, mm	Tolerance, %
up to 3	± 6
4...7	± 3
8...17	± 2
18...50	± 1.5
51...120	± 1.0
above 120	± 0.5

Note:

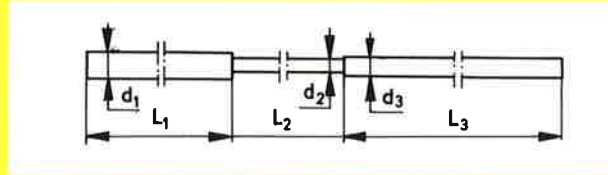
Weld dimensions should not exceed the diameter of the thicker wire by more than 50%.

How to order:

Please specify TUNGSRAM's lead-in wires by their type designation. Lead-in wires in dimensions and/or material differing from those listed in this catalogue are available upon request.

3-PART LEAD-IN WIRES FOR SEALING IN SOFT GLASS

for GLS, decorative, vehicle and fluorescent lamps

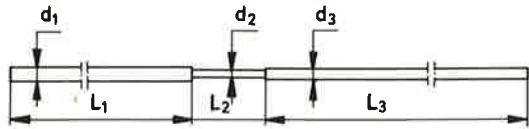


Type	Material		
	Ni	Du	Cu
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
04GA9	0.4/8	0.3/4	0.4/45
04GA10	0.4/6	0.3/13	0.4/25
04GA11	0.4/20	0.3/4	0.4/40
04GA12	0.4/10	0.35/4	0.4/35
05GA8	0.5/24	0.3/4	0.4/60
05GA15	0.5/25	0.3/4	0.4/60
05GA16	0.5/6	0.3/4	0.4/45
05GA20	0.5/20	0.35/4	0.4/40
05GA21	0.5/16	0.35/45	0.4/32
05GA22	0.5/18	0.35/4	0.4/62
05GA23	0.5/30	0.35/4	0.4/65
05GA24	0.5/25	0.35/4	0.4/45
05GA26	0.5/12	0.3/13	0.4/35
05GA27	0.5/12	0.3/13	0.4/30
05GA28	0.5/25	0.3/4	0.4/54
05GA30	0.5/25	0.3/4	0.4/56
05GA31	0.5/31	0.3/4	0.4/56
06GA2	0.6/12	0.35/4	0.4/45
06GA3	0.6/20	0.3/4	0.4/45
06GA12	0.6/8	0.3/4	0.4/45
06GA18	0.6/7	0.3/4	0.4/45
06GA20	0.6/16.5	0.3/4	0.4/66
06GA21	0.6/31	0.3/4	0.4/73
06GA29	0.6/30	0.3/4	0.4/75
06GA32	0.6/16	0.3/4	0.6/75
06GA33	0.6/30	0.3/4	0.4/60
06GA34	0.6/11	0.3/4	0.4/45
06GA35	0.6/30	0.3/8	0.4/75
06GA36	0.6/15	0.3/4	0.4/50
06GA37	0.6/31	0.3/4	0.4/70

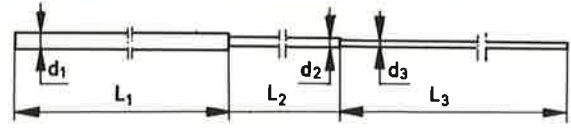
Type	Material		
	Ni	Du	Cu
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
06GA38	0.6/30	0.3/4.5	0.4/59
06GA39	0.6/16.5	0.3/4	0.6/76
06GA40	0.6/10	0.4/4	0.5/35
06GA41	0.6/30	0.35/4	0.4/55
06GA42	0.6/14	0.35/8	0.5/88
06GA43	0.6/40	0.35/8	0.4/62
06GA44	0.6/35	0.35/6	0.4/64
06GA45	0.6/30	0.35/8	0.4/57
06GA46	0.6/30	0.35/4	0.4/80
06GA47	0.6/13	0.35/4	0.4/40
06GA50	0.6/15	0.4/4	0.4/35
06GA51	0.6/40	0.4/4	0.4/75
07GA9	0.7/12	0.4/3.5	0.5/50
07GA10	0.7/11	0.35/8	0.4/21
07GA11	0.7/55	0.35/8	0.5/80
07GA12	0.7/21	0.4/20	0.5/60
07GA13	0.7/13	0.4/4	0.5/35
07GA14	0.7/16	0.4/4	0.5/35
07GA15	0.7/16.5	0.4/4	0.5/35
07GA16	0.7/11	0.35/8	0.4/36
07GA18	0.7/40	0.4/4	0.5/80
08GA1	0.8/10.5	0.4/4	0.6/45
08GA4	0.8/26	0.4/4	0.5/45
08GA29	0.8/20	0.4/4	0.5/45
08GA32	0.8/12	0.4/4	0.6/45
08GA33	0.8/8	0.4/4	0.6/45
08GA34	0.8/30	0.4/4	0.4/45
08GA35	0.8/15	0.4/4	0.4/45
08GA37	0.8/26	0.4/4	0.6/45
08GA40	0.8/26	0.4/4	0.5/45

Type	Material		
	Ni	Du	Cu
	d ₁ /L ₁	d ₂ /L ₂	d ₃ /L ₃
diameter, mm/length, mm			
08GA41	0.8/57	0.4/6	0.5/72
06GA42	0.8/14	0.5/4	0.6/55
08GA43	0.8/35	0.5/3.5	0.5/55
08GA44	0.8/74	0.4/6	0.6/130
08GA45	0.8/102	0.5/4	0.6/130
08GA46	0.8/102	0.5/4	0.6/140
08GA47	0.8/12	0.4/4	0.4/25
08GA48	0.8/25	0.4/4	0.5/35
08GA49	0.8/35	0.4/4	0.5/35
08GA51	0.8/11	0.3/5	0.4/80
08GA52	0.8/62	0.35/8	0.6/95
08GA53	0.8/50	0.35/8	0.6/80
08GA54	0.8/30	0.4/12	0.6/70
08GA55	0.8/9	0.35/8	0.4/30
08GA56	0.8/11.5	0.4/4	0.6/44.5
08GA57	0.8/30	0.4/4	0.6/61
08GA58	0.8/40	0.4/4	0.6/80
08GA62	0.8/60	0.4/4	0.5/90
08GA5	0.9/60	0.5/6	0.6/95
09GA6	0.9/60	0.5/6	0.6/85
10GA1	1/10.5	0.5/4	0.6/45
10GA2	1/12	0.5/4	0.6/45
10GA9	1/38	0.4/4	0.6/45
10GA10	1/30	0.5/5	0.6/70
10GA51	1/70	0.5/4	0.6/130
10GA52	1/90	0.5/4	0.6/140
10GA57	1/27.5	0.4/4	0.6/40
10GA67	1/40	0.4/4	0.4/45
10GA68	1/16	0.4/4	0.6/50
10GA71	1/50	0.5/4	0.6/80
10GA75	1/30	0.5/4	0.6/50
10GA76	1/20	0.5/4	0.6/50
10GA77	1/16	0.5/4	0.6/50
10GA78	1/95	0.5/5	0.6/137
10GA79	1/95	0.4/6	0.6/130
10GA80	1/46	0.4/3.5	0.5/37
10GA81	1/10	0.4/3.5	0.5/37
10GA82	1/24	0.5/3.5	0.5/41
10GA83	1/16	0.4/4	0.6/35
10GA84	1/12	0.4/4	0.6/35
10GA85	1/30	0.4/4	0.6/35

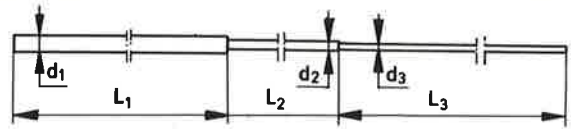
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	Ni	Du	Cu
	d ₁ /L ₁	d ₂ /L ₂	d ₃ /L ₃
diameter, mm/length, mm			
10GA91	1/40	0.4/6	0.6/100
10GA92	1/70	0.5/6	0.6/130
10GA93	1/40	0.5/6	0.6/80
10GA94	1/40	0.4/6	0.6/75
10GA95	1/60	0.4/6	0.6/100
10GA96	1/35	0.5/6	0.6/60
10GA97	1/35	0.5/6	0.6/75
10GA98	1/45	0.4/6	0.6/75
10GA99	1/50	0.5/6	0.6/80
10GA100	1/30	0.4/6	0.6/65
10GA101	1/60	0.5/6	0.6/125
10GA102	1/50	0.5/6	0.6/80
10GA103	1/60	0.5/6	0.6/90
10GA104	1/45	0.5/6	0.6/85
10GA105	1/50	0.5/6	0.6/85
10GA65	1/18	0.5/6	0.6/48
11GA1	1.1/26	0.5/6	0.6/43
11GA2	1.1/13	0.5/6	0.6/48
11GA4	1.1/24	0.5/4	0.6/45
11GA5	1.1/11	0.5/4	0.6/50
12GA13	1.2/50	0.6/6	0.8/90
12GA14	1.2/70	0.6/6	0.8/120
12GA22	1.2/50	0.6/6	0.8/80
12GA23	1.2/75	0.6/8	0.8/130
12GA24	1.2/105	0.6/8	0.8/130
12GA25	1.2/95	0.6/8	0.8/130
12GA26	1.2/95	0.6/8	0.8/120
12GA27	1.2/60	0.5/8	0.6/110
12GA28	1.2/14	0.5/6	0.6/65
12GA29	1.2/19	0.5/6	0.6/65
15GA16	1.5/135	0.8/8	0.8/147
15GA18	1.5/150	0.7/8	1/140
15GA19	1.5/125	0.7/8	1/145
15GA20	1.5/115	0.7/8	1/145
15GA21	1.5/155	0.7/8	1/140
15GA22	1.5/40	0.7/8	1/140
15GA23	1.5/65	0.5/6	0.6/65
15GA24	1.5/11	0.5/6	0.6/65
F06GA31	0.6/19	0.35/4	0.5/68
F06GA53	0.6/19	0.35/4	0.5/62
F07GA33	0.7/19	0.35/4	0.5/68



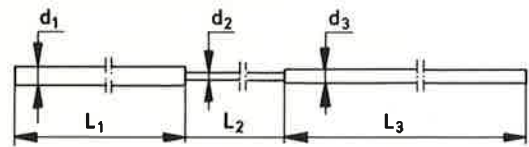
Type	Material		
	VB	Du	Cu
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
06GC9	0.6/30	0.3/4	0.4/65
06GC10	0.6/30	0.3/4	0.4/80
06GC11	0.6/30	0.35/4	0.4/75
06GC13	0.6/30	0.35/4	0.4/60
06GC14	0.6/30	0.35/4	0.4/55
06GC15	0.6/30	0.35/4	0.4/71
06GC17	0.6/40	0.35/4	0.4/68
06GC18	0.6/40	0.35/4	0.4/60
06GC19	0.6/35	0.3/4	0.4/71
06GC20	0.6/35	0.3/4	0.4/60
07GC8	0.7/40	0.4/4	0.4/60
08GC7	0.8/55	0.4/4	0.5/85
08GC11	0.8/60	0.4/4	0.5/100
08GC13	0.8/50	0.4/4	0.5/70
08GC14	0.8/50	0.4/4	0.5/75



Type	Material		
	VB	Du	Mon
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
06GDM2	0.6/30	0.3/12	0.15/63
06GDM3	0.6/30	0.3/12	0.22/50
06GDM5	0.6/35	0.3/12	0.22/50
06GDM6	0.6/35	0.3/12	0.22/52



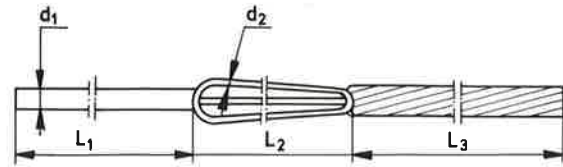
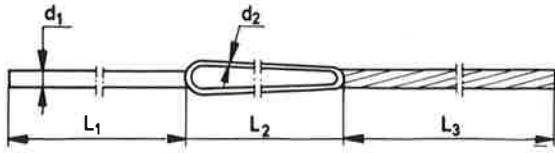
Type	Material		
	Ni	Du	FeNi
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
05GG7	0.5/25	0.3/12	0.2/50
05GG8	0.5/31	0.3/7	0.17/62
05GG9	0.5/25	0.3/12	0.2/60
06GG1	0.6/30	0.3/12	0.2/65
06GG2	0.6/30	0.3/14	0.2/45
06GG3	0.6/30	0.3/14	0.2/50
06GG4	0.6/30	0.3/11	0.2/66
06GG5	0.6/25	0.3/10	0.2/34
07GG1	0.7/55	0.35/8	0.2/77
08GG19	0.8/62	0.4/8	0.4/95
08GG20	0.8/40	0.4/4	0.25/45
09GG1	0.9/60	0.5/5	0.4/95
10GG18	1/40	0.5/20	0.5/65
10GG19	1/40	0.4/4	0.25/45
10GG22	1/45	0.5/20	0.4/70
10GG23	1/45	0.5/20	0.6/70
10GG24	1/50	0.5/20	0.4/70
10GG25	1/50	0.5/20	0.6/70
10GG26	1/60	0.5/20	0.5/110



Type	Material		
	Cu	Du	Cu
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
04VK9	0.4/14	0.3/3	0.4/65
04VK10	0.4/30	0.3/4	0.4/65
04VK11	0.4/23	0.3/5	0.4/57
04VK12	0.4/30	0.3/4	0.4/60
04VK13	0.4/11.5	0.3/4	0.4/40
05VK2	0.5/25	0.3/3	0.4/70

Type	Material		
	Ni	Du	Mon
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
06GGM1	0.6/32	0.3/14	0.2/44
06GGM2	0.6/48	0.35/14	0.2/44
10GGM1	1/50	0.5/4	0.3/40
10GGM2	1/50	0.5/4	0.4/40

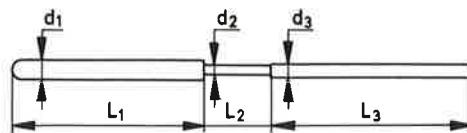
for high power incandescent lamps



Type	Material		
	Ni	Du	Cu
	d_1/L_1	d_2/L_2	twist/ L_3
diameter, mm/length, mm			
18KJ3	1.8/70	0.7/22	19×0.32/120
20KJ8	2/30	0.7/22	19×0.32/70
20KJ16	2/170	0.7/22	7×0.32/140
20KJ17	2/170	0.7/22	19×0.32/140
20KJ18	2/40	0.7/22	19×0.32/140
20KJ19	2/40	0.7/22	7×0.32/140

Type	Material		
	Ni	Du	Cu
	d_1/L_1	d_2/L_2	twist/ L_3
diameter, mm/length, mm			
25KN13	2.5/170	0.8/25	19×0.32/200
25KN14	2.5/170	0.8/25	32×0.32/200
30KN2	3/85	0.8/25	32×0.32/120

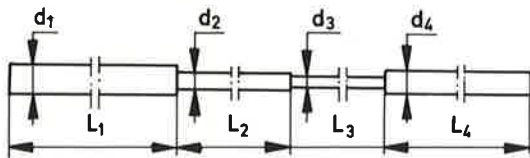
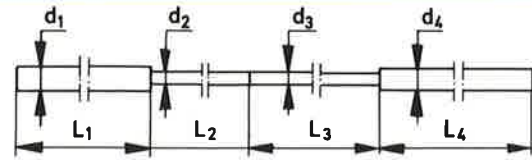
for electron tubes



Type	Material		
	Ni	Du	Ni
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
BV-K004	1.02/10.2	0.5/3.5	0.8/11
BV-M094	1.02/12	0.5/3.5	0.8/11
TD23H	1.0/16.6	0.5/2.2	0.7/17.7
TD28	1.02/8	0.5/2.5	0.5/13
TD52A	1.25/9.8	0.5/2.5	0.7/16.7
TD54	1.02/8	0.5/2.5	0.7/11

4-PART FUSED LEAD-IN WIRES FOR SEALING IN SOFT GLASS

for GLS and decorative lamps



Type	Material			
	Ni	Du	FeNi	Cu
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4
diameter, mm/length, mm				
05NA1	0.5/31	0.3/4	0.2/20	0.4/45
05NA5	0.5/24	0.3/12	0.18/17	0.4/20
05NA6	0.5/25	0.35/8	0.18/15	0.4/25
05NA8	0.5/25	0.3/8	0.18/15	0.4/35
05NA10	0.5/31	0.3/8	0.18/15	0.4/25
05NA11	0.5/31	0.3/8	0.18/15	0.4/37
06NA5	0.6/31	0.3/12	0.2/25	0.4/35
06NA7	0.6/30	0.3/12	0.18/14	0.4/50
06NA8	0.6/30	0.3/13	0.2/14	0.4/48
06NA9	0.6/40	0.3/13	0.2/14	0.4/43
06NA10	0.6/30	0.3/12	0.17/25	0.4/20
06NA11	0.6/35	0.35/15	0.3/12	0.4/44
06NA12	0.6/30	0.3/14	0.18/22	0.5/31
06NA13	0.6/30	0.3/14	0.18/22	0.5/36
07NA1	0.7/60	0.4/12	0.2/30	0.5/40
07NA2	0.7/60	0.4/15	0.2/30	0.5/40
07NA3	0.7/52	0.35/11	0.25/35	0.5/23
07NA5	0.7/40	0.4/12	0.3/30	0.5/40
08NA1	0.8/30	0.4/12	0.3/35	0.6/35
08NA2	0.8/30	0.4/12	0.4/35	0.6/35
08NA7	0.8/60	0.4/12	0.35/45	0.5/35
09NA3	0.9/60	0.5/20	0.4/40	0.6/40
09NA4	0.9/60	0.5/20	0.4/40	0.6/30
10NA2	1/70	0.5/20	0.4/70	0.6/45
10NA3	1/90	0.5/20	0.5/80	0.6/45
10NA5	1/60	0.5/20	0.5/70	0.6/40

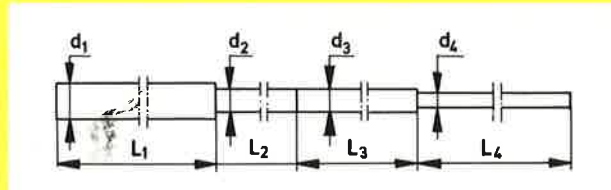
Type	Material			
	Ni	Du	Mon	Cu
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4
diameter, mm/length, mm				
05NAM1	0.6/40	0.4/12	0.25/30	0.4/35
06NAM2	0.6/40	0.4/12	0.2/30	0.4/35

Type	Material			
	VB	Du	FeNi	Cu
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4
diameter, mm/length, mm				
06ND25	0.6/30	0.35/12	0.18/30	0.4/35
06ND28	0.6/30	0.35/12	0.18/30	0.4/20
06ND30	0.6/30	0.3/12	0.18/28	0.4/40
06ND31	0.6/30	0.35/12	0.3/35	0.4/30
08ND11	0.8/55	0.4/12	0.4/45	0.5/40
08ND13	0.8/60	0.4/11	0.35/45	0.5/48
08ND14	0.8/60	0.4/12	0.35/45	0.5/45
08ND15	0.8/50	0.4/12	0.3/35	0.5/25
08ND16	0.8/50	0.4/12	0.4/35	0.5/25
08ND17	0.8/50	0.4/12	0.3/35	0.5/30
08ND18	0.8/50	0.4/12	0.4/35	0.5/30

Type	Material			
	VB	Du	Mon	Cu
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4
diameter, mm/length, mm				
06NDM2	0.6/40	0.35/12	0.17/30	0.4/30
06NDM3	0.6/30	0.35/10	0.18/25	0.4/25
06NDM4	0.6/30	0.30/10	0.18/25	0.4/35
06NDM5	0.6/40	0.35/12	0.17/30	0.4/23
06NDM6	0.6/40	0.30/12	0.17/25	0.4/27
07NDM1	0.7/40	0.40/12	0.17/30	0.5/35
07NDM6	0.7/40	0.40/12	0.2/30	0.4/23
08NDM1	0.8/50	0.40/12	0.2/35	0.5/40

Type	Material			
	VB	Du	Mon	FeNi
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4
diameter, mm/length, mm				
06NDM2/F	0.6/40	0.35/12	0.17/30	0.4/30
06NDM6/F	0.6/40	0.3/12	0.17/25	0.4/27

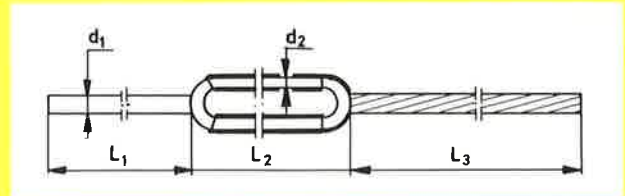
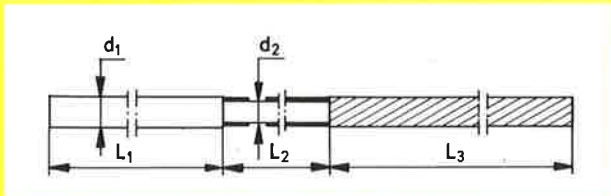
for special lamps



Type	Material			
	Ni	Du	Cu	FeNi
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4
diameter, mm/length, mm				
10NF32	1/40	0.6/20	0.6/30	0.6/40
10NF33	1/40	0.6/20	0.6/30	0.4/40
10NF37	1/45	0.4/6	0.6/45	0.2/30
10NF38	1/28	0.4/6	0.6/40	0.4/35
10NF39	1/30	0.4/6	0.6/30	0.2/30
10NF40	1/50	0.5/6	0.6/40	0.25/35
10NF41	1/17	0.4/5	0.6/40	0.25/35
15NF6	1.5/65	0.5/6	0.6/30	0.6/35
15NF7	1.5/65	0.5/6	0.6/30	0.4/35

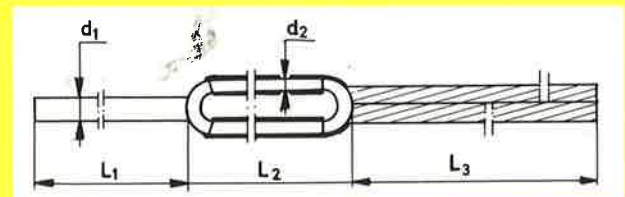
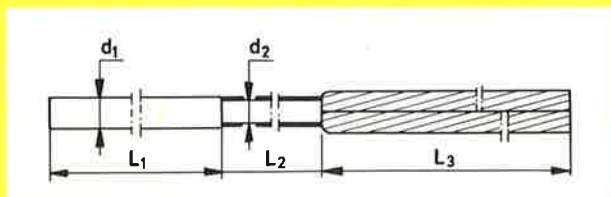
3-, 4- AND 5-PART LEAD-IN WIRES FOR SEALING IN HARD GLASS

for special lamps



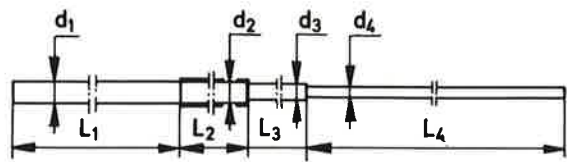
Type	Material		
	Ni	W	Cu
	d_1/L_1	d_2/L_2	twist/ L_3
diameter, mm/length, mm			
10KF5	1/105	1/16	7×0.32/100
12KF2	1.2/35	1/16	7×0.32/60
15KF9	1.5/16	1.5/16	19×0.32/65
15KF11	1.5/60	1/16	7×0.32/65
15KF18	1.5/95	1.0/16	19×0.32/75
15KF20	1.5/49	1/16	7×0.32/65
15KF21	1.5/49	1/16	19×0.32/65
18KF3	1.8/186	1.5/16	7×0.32/93
18KF4	1.8/230	1.5/16	7×0.32/135
25KF13	2.5/105	1.8/20	19×0.32/10
40KF6	4/95	3/30	32×0.32/280

Type	Material		
	Ni	W	Cu
	d_1/L_1	d_2/L_2	twist/ L_3
diameter, mm/length, mm			
25KK9	2.5/110	1.5/33	19×0.32/90
25KK10	2.5/110	1.5/33	32×0.32/90
35KK1	3.5/80	1.8/33	32×0.32/140

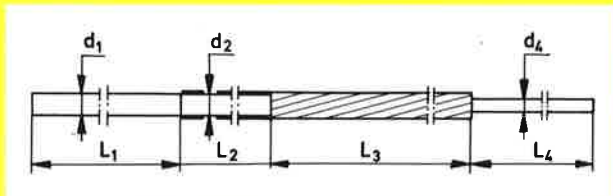


Type	Material		
	Ni	W	Cu
	d_1/L_1	d_2/L_2	twist/ L_3
diameter, mm/length, mm			
40KF5	4/96	3/30	32×0.32/280

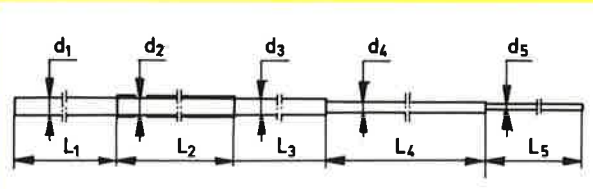
Type	Material		
	Ni	W	Cu
	d_1/L_1	d_2/L_2	twist/ L_3
diameter, mm/length, mm			
35KK2	3.5/80	1.8/33	32×0.32/140



Type	Material			
	Ni	W	Ni	Cu
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4
diameter, mm/length, mm				
10KX1	1.0/40	1.0/16	1.0/8	0.6/67



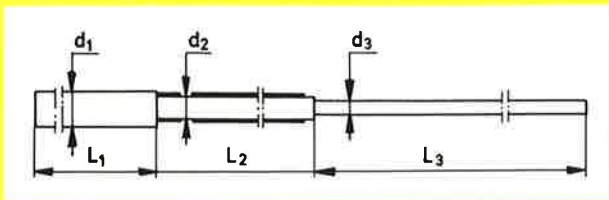
Type	Material			
	Ni	W	Cu	Ni
	d_1/L_1	d_2/L_2	twist/ L_3	d_4/L_4
diameter, mm/length, mm				
15KP19	1.5/49	1/16	19×0.32/24	0.4/40
15KP20	1.5/49	1/16	19×0.32/24	0.5/40



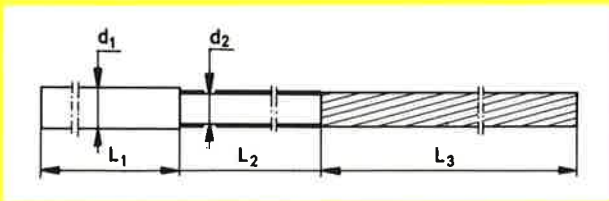
Type	Material			
	Ni	W	Cu	FeNi
	d_1/L_1	d_2/L_2	twist/ L_3	d_4/L_4
diameter, mm/length, mm				
15KS4K	1.5/49	1/16	7×0.32/24	0.4/40
15KS5K	1.5/49	1/16	7×0.32/24	0.6/40

Type	Material				
	Ni	W	Ni	Cu	FeNi
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4	d_5/L_5
diameter, mm/length, mm					
10KY1	1.0/40	1.0/16	1.0/8.0	0.6/26	0.4/40
10KY2	1.0/40	1.0/16	1.0/8.0	0.6/26	0.5/40

for gas discharge lamps

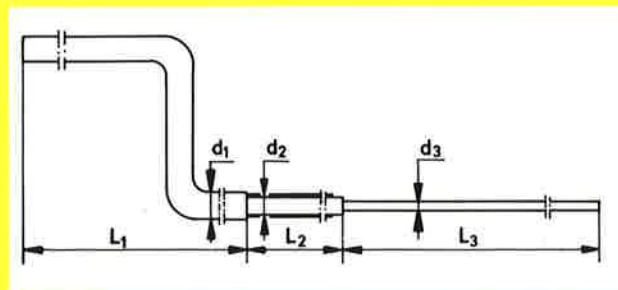


Type	Material		
	Ni	W	Ni
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
BV-H140	2/12	1.3/17	0.8/70

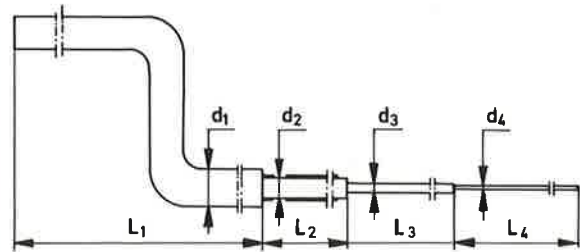


Type	Material		
	Ni	W	Ni
	d_1/L_1	d_2/L_2	twist/ L_3
diameter, mm/length, mm			
BV-MI007	2.5/20	1.8/20	$(3+7) \times 0.5/120$
BV-MI008	2.5/15	1.8/20	$(3+7) \times 0.5/80$

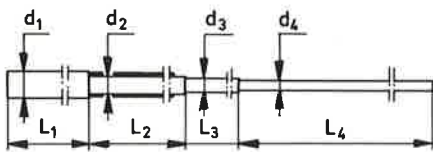
Type	Material		
	Ni	W	Cu
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
V-HO80/C	2/18	1.8/20	$19 \times 0.32/85$



Type	Material		
	Ni	W	Ni
	d_1/L_1	d_2/L_2	d_3/L_3
diameter, mm/length, mm			
BV-H107	2/158	1.3/17	0.8/70
BV-H108	2/49	1.3/17	0.8/70
BV-H115	2/36	1.3/17	0.8/70
BV-H120	2/55	1.3/17	0.8/70
BV-H121	2/190	1.3/17	0.8/70
BV-H122	2/53	1.3/17	0.8/70
BV-H123	2/133	1.3/17	0.8/70
BV-H124	2/147	1.3/17	0.8/70
BV-H125	2/36	1.3/17	0.8/50
BV-H135	2/200	1.3/17	0.8/70
BV-H145	2/252	1.3/17	0.8/75
BV-H147	2/195	1.3/17	0.8/70
BV-MIO14	2/38	1.3/17	0.8/70
BV-MIO15	2/32	1.3/17	0.8/70

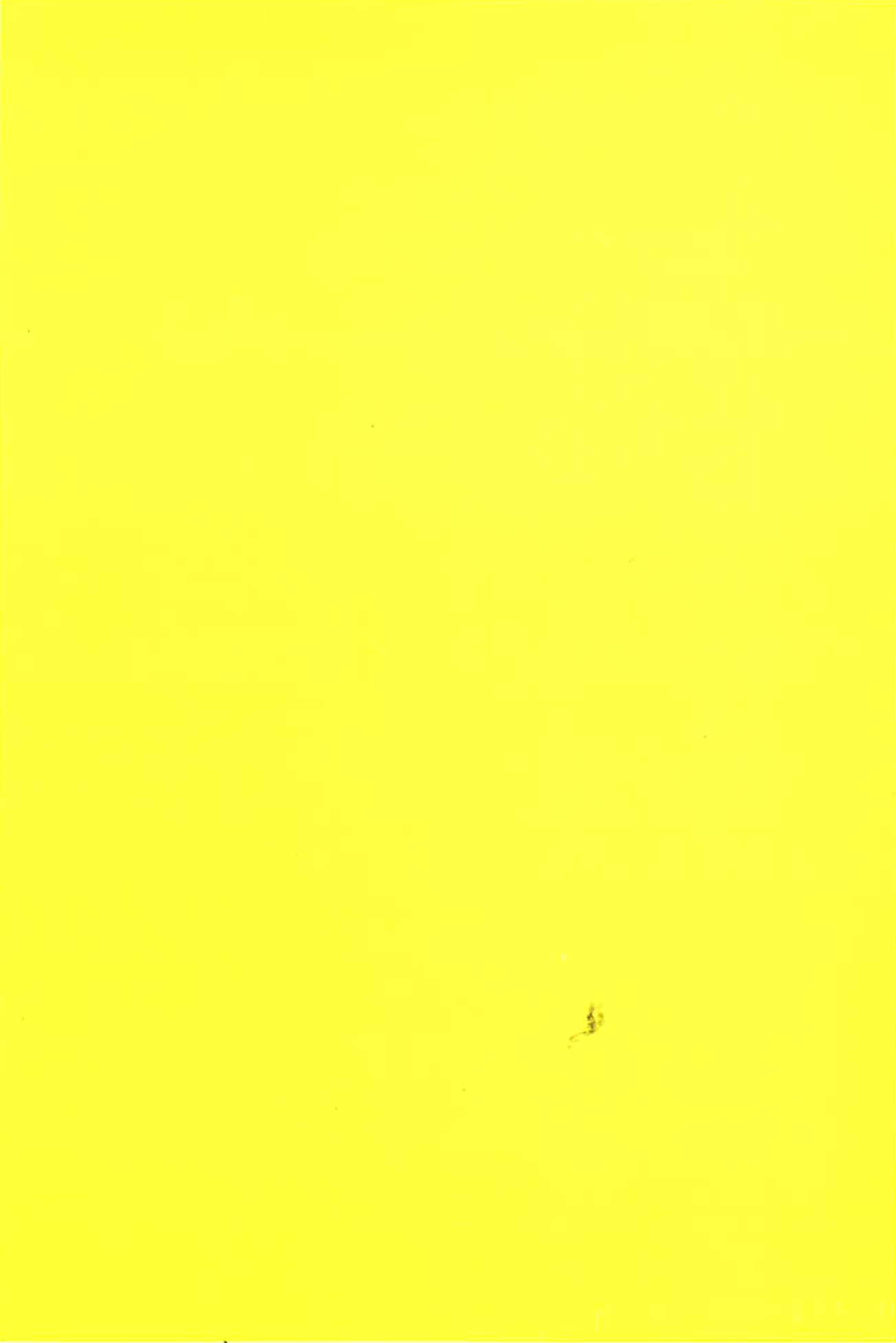


Type	Material			
	Ni	W	Ni	CuNi
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4
diameter, mm/length, mm				
BV-H105	2/36	1.3/17	0.8/18	0.25/55
BV-H109	2/~30	1.3/17	0.5/20	0.2/28
BV-H173	1.8/~30	1.3/17	0.6/20	0.2/40



Type	Material			
	Ni	W	Du	Cu
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4
diameter, mm/length, mm				
BV-MIO16	1.5/12	1.3/17	1/6	0.6/42
BV-MIO17	1.5/19	1.3/17	1/6	0.6/42

Type	Material			
	Ni	W	Du	Cu
	d_1/L_1	d_2/L_2	d_3/L_3	d_4/L_4
diameter, mm/length, mm				
BV-H131	1.8/~30	1.3/17	1/6	0.6/42
BV-H133	1.8/~141	1.3/17	1/6	0.6/42
BV-H171	1.8/~141	1.3/17	1/6	0.6/54
BV-H172	1.8/~30	1.3/17	1/6	0.6/54
BV-H175	1.8/~82	1.3/17	1/6	0.6/42



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