MICROWAVE TUNING COMPONENTS

EXXELIA

MICROWAVE TUNING ELEMENTS

RoHS Compliant

DESCRIPTION

Economical means of introducing a variable reactance to microwave circuits such as waveguides, filters, cavities and other resonant structures. High resolution tuning, Self-locking constant torque drive mechanism, Excellent tuning stability, Low dynamic noise, One handed adjusting/tuning, no need for locking nut. Available with Gold, Silver plating and passivated finish, Metallic, dielectric, resistive types available. Adjustments in applications from L to Ka band and beyond.

High Reliability versions are available on special order

Custom design upon request

RoHS compliant

APPLICATIONS

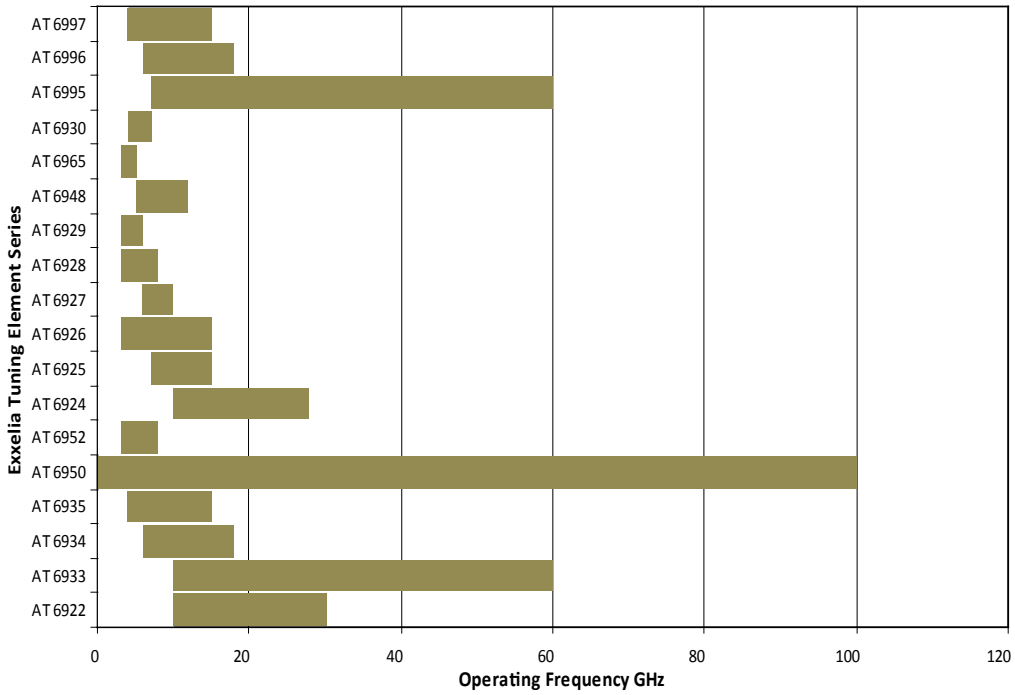
Comb-line and inter-digital filters

Coaxial structures

Waveguide circuitry

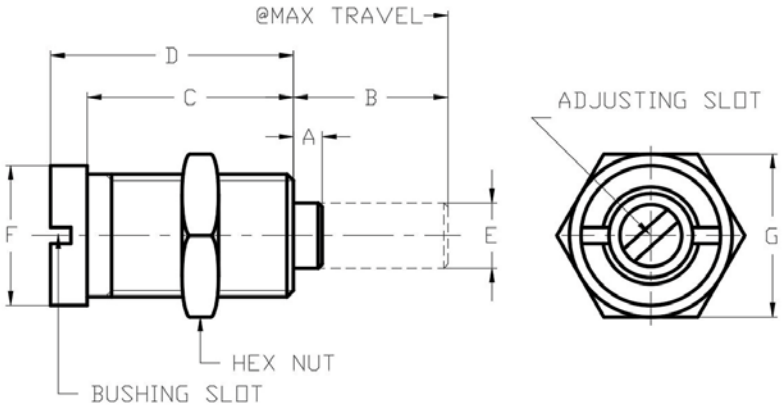
Gunn oscillators

Impedance transformers Space applications



I. MICROWAVE TUNING ELEMENTS

Tuning Elements consist of a brass mounting bushing with a rotor of the same material including a tuning rod made of metallic or dielectric or absorbent material and a nut.



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MICROWAVE TUNING ELEMENTS

I.1 METALLIC TUNING ELEMENTS

Metallic Tuning Elements consist of a brass mounting bushing with an integral tuning rotor of the same material and a nut. Bushing is gold plated, rotor and nut are passivated.

Optional materials and plating are available upon request.

Designation	Frequency Band	Bushing Thread UNS	A		B		C		D		ØE		ØF		G	
			mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
AT 6924-0 SL RoHS	X to K	.120-80	0	(0.000)	3.8	(0.150)	5.1	(0.201)	6.0	(0.236)	1.8	(0.071)	3.4	(0.134)	4.0	(0.157)
AT 6924-1 SL RoHS			1.2	(0.047)	1.9	(0.075)	2.2	(0.087)	3.1	(0.122)						
AT 6924-2 SL RoHS			0	(0.000)	1.9	(0.075)	5.1	(0.201)	6.0	(0.236)						
AT 6924-3 SL RoHS			0	(0.000)	0.8	(0.031)	2.2	(0.087)	3.1	(0.122)						
AT 6925-0 SL RoHS	C and X	.190-64	0	(0.000)	3.8	(0.150)	5.4	(0.213)	6.4	(0.252)	3.2	(0.161)	5.3	(0.209)	5.5	(0.217)
AT 6925-1 SL RoHS			0	(0.000)	0.6	(0.024)	2.2	(0.087)	3.2	(0.126)						
AT 6925-3 SL RoHS			3.3	(0.130)	7.1	(0.280)	5.4	(0.213)	6.4	(0.252)						
AT 6925-7 SL RoHS			1.1	(0.043)	4.9	(0.193)	5.4	(0.213)	6.4	(0.252)						
AT 6925-8 SL RoHS			0.2	(0.008)	2.0	(0.079)	3.2	(0.126)	4.3	(0.169)						
AT 6925-9 SL RoHS			0	(0.000)	2.3	(0.091)	6.5	(0.256)	7.5	(0.295)						
AT 6926-0 SL RoHS	C and X	.234-64	0	(0.000)	2.7	(0.106)	4.6	(0.181)	5.3	(0.209)	4.1	(0.209)	6.8	(0.268)	7.0	(0.276)
AT 6926-1 SL RoHS			0	(0.000)	0.7	(0.028)	2.4	(0.094)	3.2	(0.126)						
AT 6926-4 SL RoHS			2.3	(0.091)	8.8	(0.346)	5.5	(0.217)	9.1	(0.358)						
AT 6926-5 SL RoHS			0.6	(0.024)	2.7	(0.106)	4.0	(0.157)	4.8	(0.189)						
AT 6926-6 SL RoHS			2.6	(0.102)	11.5	(0.453)	5.4	(0.213)	11.5	(0.453)						
AT 6926-7 SL RoHS			1.9	(0.075)	4.6	(0.181)	4.6	(0.181)	5.3	(0.209)						
AT 6926-9 SL RoHS			0	(0.000)	2.7	(0.106)	5.5	(0.217)	9.1	(0.358)						
AT 6926-10 SL RoHS			0	(0.000)	4.6	(0.181)	5.5	(0.217)	9.1	(0.358)						
AT 6927-0 SL RoHS	C and X	.234-64	0	(0.000)	6.5	(0.256)	5.5	(0.217)	9.1	(0.358)	4.1	(0.268)	6.8	(0.268)	7.0	(0.276)
AT 6928-0 SL RoHS	C		0	(0.000)	8.8	(0.346)	5.4	(0.213)	11.5	(0.453)	4.1	(0.268)	6.8	(0.268)	7.0	(0.276)
AT 6928-2 SL RoHS	C		6.1	(0.240)	8.8	(0.346)	4.6	(0.181)	5.3	(0.209)	4.1	(0.268)	6.8	(0.268)	7.0	(0.276)
AT 6929-0 SL RoHS	C	.190-64	0	(0.000)	11.4	(0.449)	13	(0.512)	14	(0.551)	3.2	(0.209)	5.3	(0.209)	5.5	(0.217)
AT 6948-0 SL RoHS	C and X	.312-64	0	(0.000)	5.9	(0.232)	8.2	(0.323)	9.2	(0.362)	5.3	(0.374)	9.5	(0.374)	10.0	(0.394)
AT 6965-0 SL RoHS	L and S	.469-32	0	(0.000)	12.7	(0.500)	17.3	(0.681)	18.3	(0.720)	8.8	(0.531)	13.5	(0.531)	14.3	(0.563)

CUSTOM DESIGN upon request

I.2 DIELECTRIC TUNING ELEMENTS

Dielectric Tuning Elements are used whenever the lowest loss tuning for high frequency applications is required. When dielectric rod is introduced into a cavity, the self resonant frequency is lowered due to the cavity “appearing” larger.

The basic dielectrics used in **EXXELIA** Microwave Tuning Elements are sapphire, quartz and alumina.

MICROWAVE TUNING ELEMENTS

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Electrical properties of each dielectric material are:

Dielectric Material	Approximate Dielectric Constant @ 10 GHz	Approximate Dissipation Factor @ 10 GHz
Sapphire	9.9	0.0001
Quartz	3.8	0.0001
Alumina	9.7	0.0002

Designation	Rod Material	Frequency Band	Bushing Thread UNS	A		B		C		D		ØE		ØF		G	
				mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
AT 6933-0 SL RoHS	Sapphire	X and K	.120-80	0.6	(0.024)	4.3	(0.169)	5.1	(0.201)	6.0	(0.236)	1.6	(0.063)	3.4	(0.134)	4.0	(0.157)
AT 6933-1 SL RoHS	Sapphire			0	(0.000)	3.3	(0.130)	5.1	(0.201)	6.0	(0.236)	0.9	(0.035)				
AT 6933-2 SL RoHS	Quartz	K		0.6	(0.024)	4.3	(0.169)	5.1	(0.201)	6.0	(0.236)	1.6	(0.063)				
AT 6934-0 SL RoHS	Sapphire	C. X and K	.234-64	0.3	(0.012)	3.0	(0.118)	4.6	(0.181)	5.3	(0.209)	3.9	(0.154)	6.8	(0.268)	7.0	(0.276)
AT 6935-0 SL RoHS	Sapphire	X and K		0.3	(0.012)	6.8	(0.268)	5.5	(0.217)	9.1	(0.358)	3.9	(0.154)				

Custom dimensions are available upon request

I.3 RESISTIVE TUNING ELEMENTS

Resistive Tuning Elements provide a consistent and accurate means of attenuating microwave energy. Rod made of magnetically loaded epoxy exhibits broadband lossy properties.

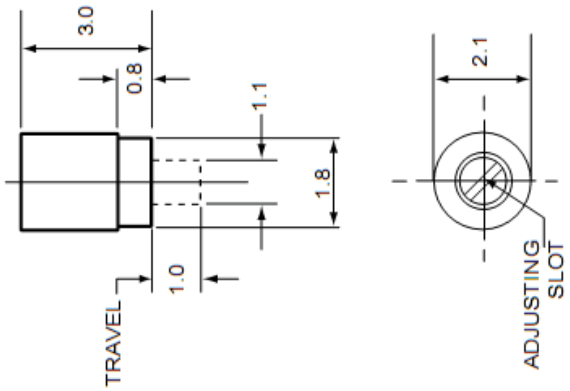
Designation	Frequency Band	Bushing Thread UNS	A		B		C		D		ØE		ØF		G	
			mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
AT 6950-0 SL RoHS	Broad Band	.120-80	0.6	(0.024)	4.3	(0.169)	5.1	(0.201)	6.0	(0.236)	1.6	(0.063)	3.4	(0.134)	4.0	(0.157)
AT 6950-1 SL RoHS			0	(0.000)	3.3	(0.130)	5.1	(0.201)	6.0	(0.236)	2.0	(0.079)	3.4	(0.134)	4.0	(0.157)
AT 6952-0 SL RoHS		.234-64	0	(0.000)	6.4	(0.252)	5.5	(0.217)	9.1	(0.358)	3.9	(0.154)	6.8	(0.268)	7.0	(0.276)

Custom dimensions are available upon request

I.4 mm WAVE TUNING ELEMENTS

The millimeter Wave Tuning Elements are higher frequency versions of both Tuning Elements described in this data sheet.

Part number: **AT 6922 RoHS**, Bushing and rotor are made of brass gold plated. Usage in the frequency bands X to K. Bushing can be mounted with solder, epoxy or press-fit.



RoHS Compliant

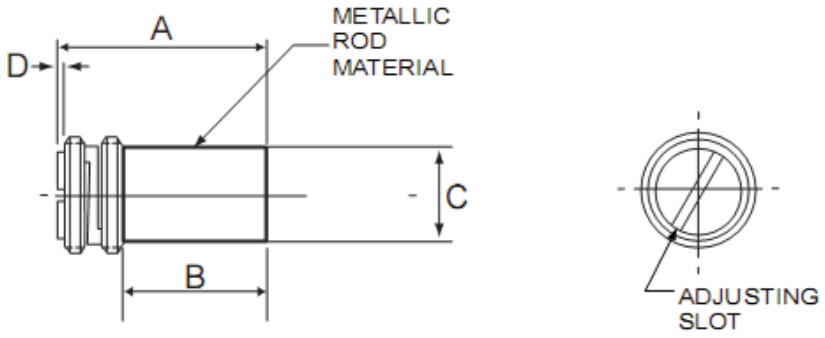
MICROWAVE TUNING ELEMENTS

II. TUNING ROTORS

Extended range metallic and dielectric rotors are used where direct insertion of the tuning element is desired.

Taps designed specifically to insure proper fit are available

II.1 METALLIC TUNING ROTORS



Models made of brass

Designation	Thread	A		B		Ø C		D		Slot W x L
		mm	inches	mm	inches	mm	inches	mm	inches	
AT 6501-3 RoHS	M 1.5 x 0.25	4.4	(0.173)	2.3	(0.091)	1.1	(0.043)	0.4	(0.016)	0.25 x 1.1
AT 6501-0 RoHS	M 2.5 x 0.25	5.4	(0.213)	3.3	(0.130)	2.1	(0.083)			0.4 x 1.9
AT 6501-1 RoHS		4.4	(0.173)	2.3	(0.091)					
AT 6501-2 RoHS		7.7	(0.303)	5.6	(0.220)					
AT 6995-0 RoHS	.094-80 UNS	3.1	(0.122)	0.8	(0.031)	1.8	(0.071)	0.5	(0.020)	0.4 x 1.5
AT 6995-1 RoHS		4.2	(0.165)	1.9	(0.075)					
AT 6995-2 RoHS		6.1	(0.240)	3.8	(0.150)					
AT 6996-1 RoHS	.156-64 UNS	6.4	(0.252)	3.8	(0.150)	3.2	(0.126)	0.25	(0.010)	0.5 x 3.0
AT 6996-2 RoHS		9.7	(0.382)	7.1	(0.280)					
AT 6996-3 RoHS		14.0	(0.551)	11.4	(0.449)					
AT 6996-4 RoHS		3.2	(0.126)	0.6	(0.024)					
AT 6996-5 RoHS		7.5	(0.295)	4.9	(0.193)					
AT 6996-6 RoHS		4.6	(0.181)	2.0	(0.079)					
AT 6996-8 RoHS		4.9	(0.193)	2.3	(0.091)					
AT 6997-0 RoHS	.190-64 UNS	14.1	(0.555)	11.5	(0.453)	4.1	(0.161)	0.25	(0.010)	0.5 x 3.7
AT 6997-1 RoHS		5.3	(0.209)	2.7	(0.106)					
AT 6997-2 RoHS		9.1	(0.358)	6.5	(0.256)					
AT 6997-3 RoHS		11.4	(0.449)	8.8	(0.346)					
AT 6997-4 RoHS		3.3	(0.130)	0.7	(0.028)					
AT 6997-5 RoHS		7.2	(0.283)	4.6	(0.181)					

CUSTOM DESIGN upon request

MICROWAVE TUNING ELEMENTS

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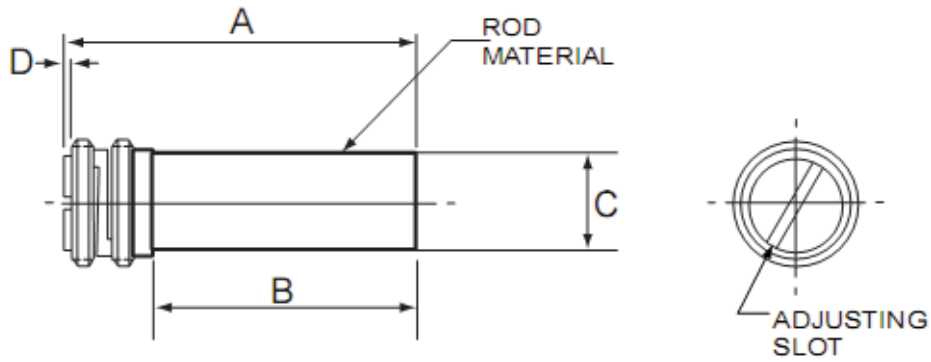
II.2 DIELECTRIC TUNING ROTORS



Models with dielectric rod

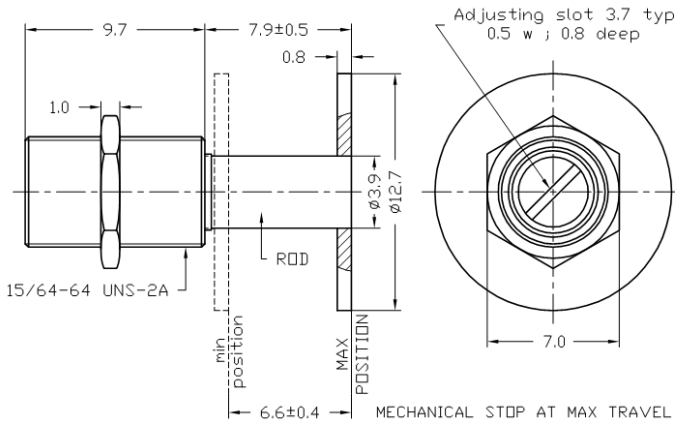
Designation	Rod material	Thread	A		B		Ø C		D		Slot W x L
			mm	inches	mm	inches	mm	inches	mm	inches	
AT 6930-4 RoHS	Sapphire	.094-80 UNS	5.8	(0.228)	2.5	(0.098)	0.9	(0.035)	0.5	(0.020)	0.4 x 1.5
AT 6930-8 RoHS			6.6	(0.260)	3.5	(0.138)	1.6	(0.063)	0.5	(0.020)	

CUSTOM DESIGN upon request

III. DRO TUNERS

DRO tuners are precision components designed exclusively for tuning dielectric resonator devices such as filters and oscillators.

Rod is made of Invar silver plated and disk made of brass silver plated. Different disk diameters are available.



Designation	Nominal Frequency	Disk diameter	
		mm	inches
AT 4010-1 RoHS	2 GHz	24.6	(0.969)
AT 4011-1 RoHS	3 GHz	19.0	(0.748)
AT 4012-1 RoHS	4 GHz[2]	12.7	(0.500)
AT 4012-2 RoHS		15.9	(0.626)

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MICROWAVE TUNING ELEMENTS

IV. MECHANICAL AND GENERAL SPECIFICATIONS

SERIES	Bushing Thread	Tap Designation	Recommended Tap Drill		Rotational Rotor Torque		Max Mounting Torque		Max Nut Mounting Torque	
			mm	inches	cm.N	inches.N	cm.N	inches.N	cm.N	inches.N
AT 6924 RoHS	.120- 80 UNS	AT 7060	2.75	(0.108)	2 to 20	(0.079) to (0.787)	7.0	(0.276)	10.0	(0.394)
AT 6925 RoHS	.190-64 UNS	AT 7061	4.45	(0.175)	3 to 28	(0.118) to (1.102)	21.0	(0.827)	30.0	(1.181)
AT 6926 RoHS	.234-64 UNS	AT 7062	5.50	(0.217)	7 to 35	(0.276) to (1.378)	35.0	(1.378)	50.0	(1.969)
AT 6927 RoHS	.234-64 UNS	AT 7062	5.50	(0.217)	7 to 35	(0.276) to (1.378)	35.0	(1.378)	50.0	(1.969)
AT 6928 RoHS	.234-64 UNS	AT 7062	5.50	(0.217)	7 to 35	(0.276) to (1.378)	35.0	(1.378)	50.0	(1.969)
AT 6929 RoHS	.190-64 UNS	AT 7061	4.45	(0.175)	3 to 28	(0.118) to (1.102)	21.0	(0.827)	30.0	(1.181)
AT 6933 RoHS	.120- 80 UNS	AT 7060	2.75	(0.108)	2 to 20	(0.079) to (0.787)	7.0	(0.276)	10.0	(0.394)
AT 6934 RoHS	.234-64 UNS	AT 7062	5.50	(0.217)	7 to 35	(0.276) to (1.378)	35.0	(1.378)	50.0	(1.969)
AT 6935 ROKS	.234-64 UNS	AT 7062	5.50	(0.217)	7 to 35	(0.276) to (1.378)	35.0	(1.378)	50.0	(1.969)
AT 6948 RoHS	.312-64 UNS	AT 7065	7.55	(0.297)	7 to 50	(0.276) to (1.969)	84.0	(3.307)	70.0	(2.756)
AT 6950 RoHS	.120- 80 UNS	AT 7060	2.75	(0.108)	2 to 20	(0.079) to (0.787)	7.0	(0.276)	10.0	(0.394)
AT 6952 RoHS	.234-64 UNS	AT 7062	5.50	(0.217)	7 to 35	(0.276) to (1.378)	35.0	(1.378)	50.0	(1.969)
AT 6965 RoHS	.469-32 UNS	AT 7066	11.1	(0.437)	7 to 56	(0.276) to (2.205)	168.0	(6.614)	140.0	(5.512)

Recommended rotor tuning tool: AT 8777

SERIES	Rotor Thread	Tap Designation	Recommended Tap Drill		Recommended Tuning Tool Designation
			mm	inches	
AT 6501-3 RoHS	M1.5 x 0.25	**AT 7071**	1.25	(0.049)	**AT 8762**
AT 6501-0, -1, -2 RoHS	M2.5 x 0.25	**AT 7070**	2.25	(0.089)	**AT 8777**
AT 6995 RoHS	.094-80 UNS	**AT 7064**	2.05	(0.081)	
AT 6996 RoHS	.156-64 UNS	**AT 7059**	3.55	(0.140)	
AT 6997 RoHS	.190-64 UNS	**AT 7061**	4.45	(0.175)	

Precautions to use rotor tunings:

- Typical drilling diameter is the tap core diameter + 0,1 mm
- Flange of machined threads has to be perfect, very smooth, without metallic burrs
- Use recommended tuning tool
- Before screwing the rotor, find the first thread by turning the anti-clockwise

V. PACKAGING

Parts are delivered in bulk.

VI. HOW TO ORDER

Tuning elements

Examples

Designation	RoHS
AT 6924-3 SL	RoHS
AT 6922	RoHS

Tuning rotors

Examples

Designation	RoHS
AT 6995-2	RoHS
AT 6501-3	RoHS

DRO tuners

Example

Designation	RoHS
AT 4011-1	RoHS