Frequency Tuning Components

Trimmer Capacitors & Microwave Tuning

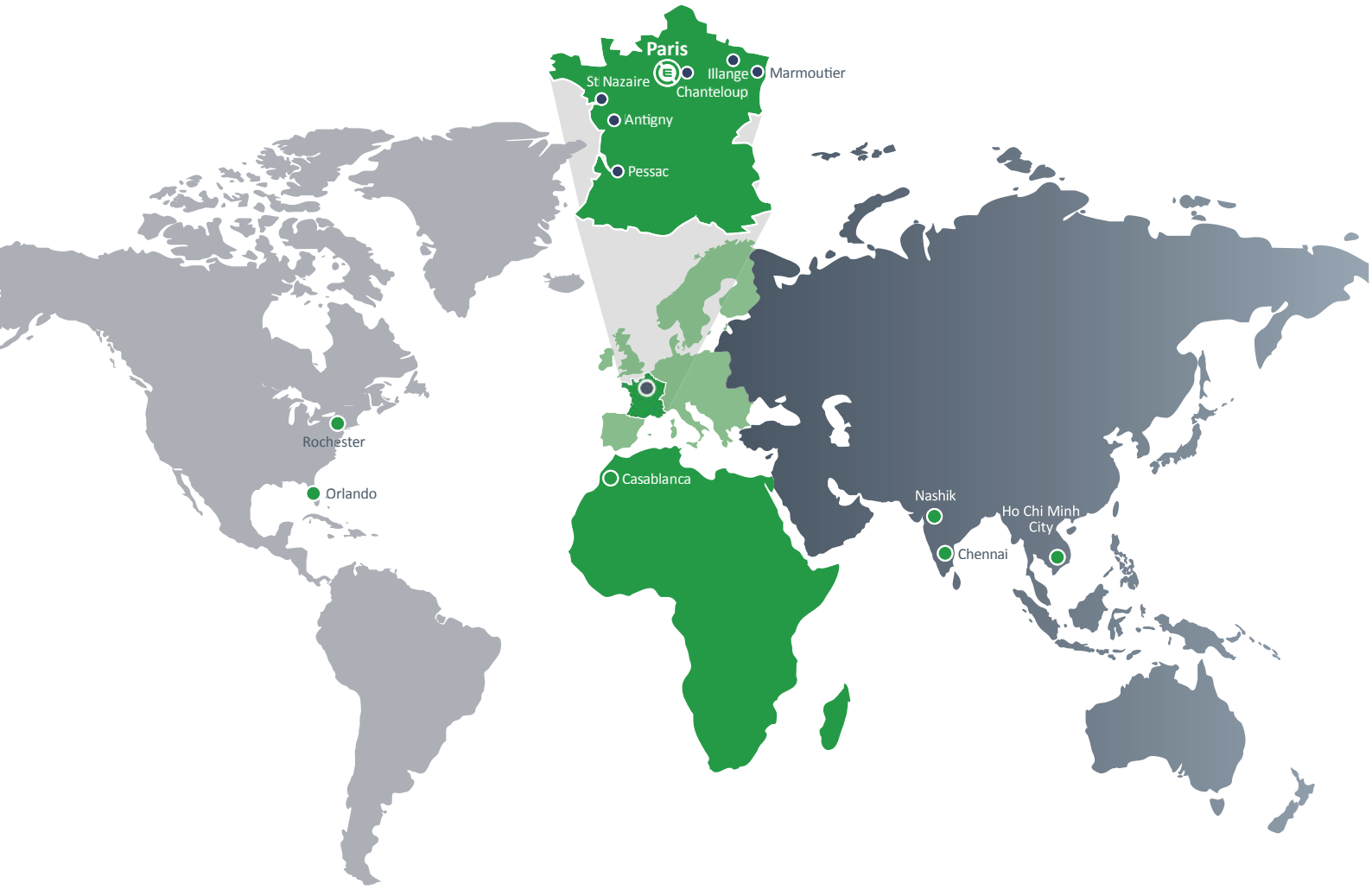
From Design
to Production

EXXELIA

Trimmer Capacitors & Microwave Tuning Elements

EXXELIA

A Worldwide presence



Specifications are subject to change without notice. All statements, information and data given herein are presented without guarantee,
warranty or responsibility of any kind, expressed or implied.

SELECTION GUIDE

RoHS Compliant

TRIMMER CAPACITORS

		Reference	Main characteristics	Page
STANDARD		**AIR TRIMMER CAPACITORS, MINIATURE, STANDARD & HIGH VOLTAGE SERIES**	Low temperature coefficient, Low capacitance drift, Very stable over time, High Q factor, High resolution	**6**
		GIGAHERTZ SAPPHIRE TRIMMER CAPACITORS	High self resonance frequency and very good Q, Very fine resolution, Low temperature coefficient, Low capacitance drift, Very stable over time	**15**
NON MAGNETIC		**NON MAGNETIC, SAPPHIRE DIELECTRIC TRIMMER CAPACITORS**	Non Magnetic structure, Low magnetic signature, Low temperature coefficient, Very stable over time, High Q factor, High resolution	**21**
		NON MAGNETIC, HIGH VOLTAGE PTFE DIELECTRIC TRIMMER CAPACITORS	Non Magnetic structure, Low temperature coefficient, Very stable over time, High Q factor	**24**
SURFACE MOUNT DEVICE		**SMD CHIP TRIM CERAMIC TRIMMER CAPACITORS AT 0300 RoHS & AT 1300 RoHS**	Very compact package type, Special design for reflow soldering use, Low temperature coefficient, Low capacitance drift, Very stable over time, High resonance frequency and very good Q	**27**
		SMD HIGH VOLTAGE CHIP TRIM CERAMIC TRIMMER CAPACITORS AT 03HV00 SERIES		**30**
		SMD THIN CERAMIC CAPACITORS AT 9401G RoHS SERIES	Miniaturized trimmers, Very small size and weight, Performance up to 2 GHz and beyond (AT 9401G), Low capacitance drift, Very stable over time, Extremely low ERS and ESL, High resonance frequency (AT 9401G), Very good Q	**32**
		SMD THIN CERAMIC TRIMMER CAPACITORS AT 9402G & AT 9410G RoHS SERIES		**36**
		SMD HERMETIC CERAMIC TRIMMER CAPACITORS AT 23XXG SERIES	Very compact package type, Withstand harsh environments, Resistant to solder fluxes & solvents, Low capacitance drift, very stable over time, High resonance frequency, Very good Q, Non magnetic component	**40**

MICROWAVE TUNING ELEMENTS

	Reference	Main characteristics	Page
	MICROWAVE TUNING ELEMENTS	Metallic, Dielectric, Resistive, Wave tuning elements Tuning rotors, DRO tuners	**44**
	HIGH FREQUENCY NARROW BANDWIDTH INVAR SCREW	High precision, High resolution tuning, Very low coefficient of thermal expansion	**50**

TRIMMER CAPACITORS
Standard, Non-Magnetic, SMD

EXXELIA

AIR TRIMMER CAPACITORS, MINIATURE, STANDARD & HIGH VOLTAGE SERIES

RoHS Compliant

DESCRIPTION

Air dielectric
Rated voltage 250 V_{DC} (500 V_{DC} for AT 5300's)
Low temperature coefficient
Low capacitance drift
Very stable over time
Terminations gold plated
High Q factor
Multi-turn
High resolution
Self-locking constant torque drive mechanism
Compliant to MIL-C-14409 and ESA/SCC 3010,
RoHS compliant
High Reliability versions are available on special order
Maximum Soldering Temperature 260°C, 3 s Max

APPLICATION

RF amplifiers and oscillators
Impedance matching
Crystal trimming
Filter tuning
Interstage coupling
Space application

AIR TRIMMERS SERIES

SERIES	FAMILIES	CAPACITANCE RANGE	MIN Q @ 100 MHz	WORKING VOLTAGE
MINIATURE AIR TRIMMER	AT 5800's RoHS	0,35 to 3,5 pF > 9 turns	> 10000	250 V_{DC}
	AT 5850's RoHS	0,5 to 5 pF > 12 turns	> 7500	
	AT 5700's RoHS	0,8 to 6 pF > 7 turns	> 10000	
	AT 5750's RoHS	0,8 to 10 pF > 6 turns	> 7500	
STANDARD AIR TRIMMER	AT 5200's RoHS	0,8 to 10 pF > 6 turns	> 5000	250 V_{DC}
	AT 5400's RoHS	1 to 14 pF > 6 turns	> 3000	
	AT 5450's RoHS	1 to 16 pF > 6 turns	> 3000	
	AT 5500's RoHS	1 to 20 pF > 12 turns	> 1500	
	AT 5600's RoHS	1 to 30 pF > 20 turns	> 800	
HIGH VOLTAGE AIR TRIMMER	AT 5300's RoHS	1 to 10 pF > 10 turns	> 2000	500 V_{DC}

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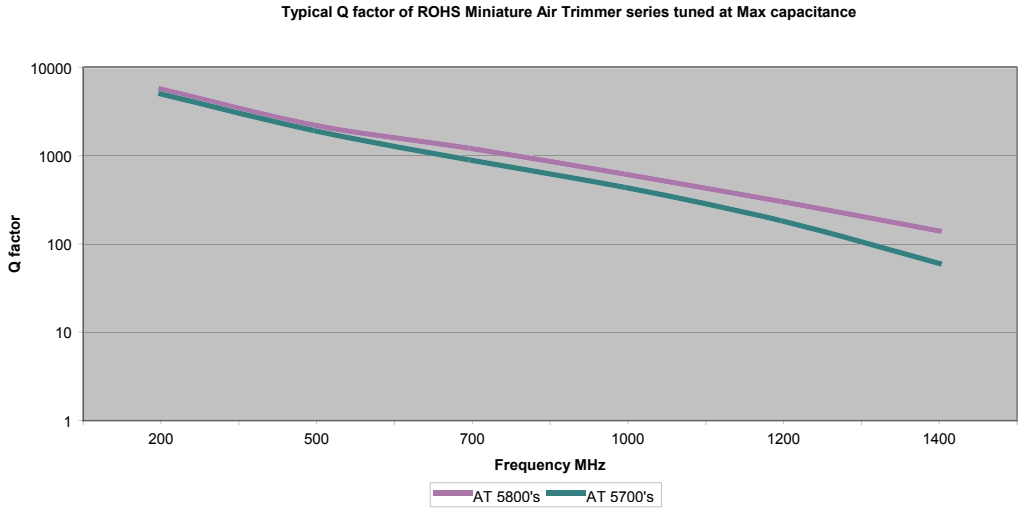
AIR TRIMMER CAPACITORS, MINIATURE, STANDARD & HIGH VOLTAGE SERIES

I. MINIATURE AIR TRIMMER SERIES

Designation	AT 5800 RoHS AT 5801 RoHS AT 5802 RoHS AT 8051 RoHS	AT 5850 RoHS AT 5851 RoHS AT 5852 RoHS AT 5858 RoHS	AT 5700 RoHS AT 5701 RoHS AT 5702 RoHS AT 8050 RoHS	AT 5750 RoHS AT 5751 RoHS AT 5752 RoHS AT 5753 RoHS
Capacitance range	0,35 to 3,5 pF >10 turns	0,5 to 5 pF >12 turns	0,8 to 6,0 pF pF >6 turns	0,8 to 10 pF >9 turns
Working voltage	250 V_{DC}			
Test voltage	500 V_{DC}			
Working Temp, range	-55°C to +125°C			
Temp, Coefficient	0±50 ppm/°C	0±50 ppm/°C	0±15 ppm/°C	0±50 ppm/°C
Q factor @ Max Capacitance	>10000	>7500	> 10000	> 7500
Insulation Resistance	$>10^6$ MΩ min			

Capacitance change is linear versus rotation of mobile rotor

I.1 MINIATURE AIR TRIMMER SERIES: QUALITY FACTOR



I.2 MINIATURE AIR TRIMMER SERIES: MECHANICAL AND GENERAL SPECIFICATIONS

Designation	AT 5800 RoHS AT 5801 RoHS AT 5802 RoHS AT 8051 RoHS	AT 5850 RoHS AT 5851 RoHS AT 5852 RoHS AT 5853 RoHS	AT 5700 RoHS AT 5701 RoHS AT 5702 RoHS AT 8050 RoHS	AT 5750 RoHS AT 5751 RoHS AT 5752 RoHS AT 5753 RoHS
Rotating torque	22 to 220 g.cm		30 to 290 g.cm	
Max torque on rotor stop	300 g.cm		400 g.cm	
Nut mounting torque	1000 g.cm		3000 g.cm	
Seal cap assembly torque	300 g.cm		600 g.cm	
Vibrations	60g, 10-2000 Hz			
Shocks	1500g, 0.5 ms			
	Brass and Invar structure			
	Glazed alumina insulation			
	306°C solder used in assembly			
	Silicone rubber seal washer			
	Gold, silver and passivated finish			

AIR TRIMMER CAPACITORS, MINIATURE, STANDARD & HIGH VOLTAGE SERIES

RoHS Compliant

I.3 MINIATURE AIR TRIMMER SERIES : MODELS

Figure 1

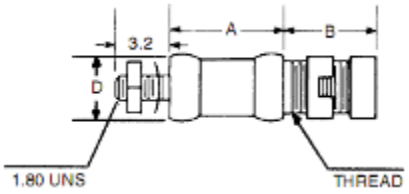


Figure 2

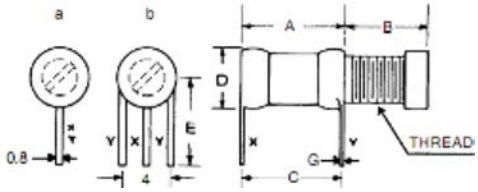


Figure 3

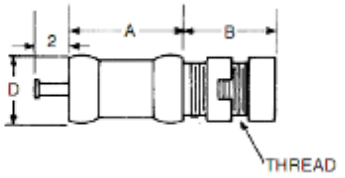


Figure 4

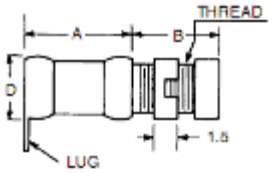
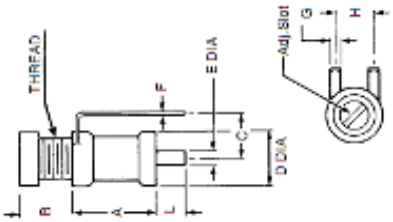


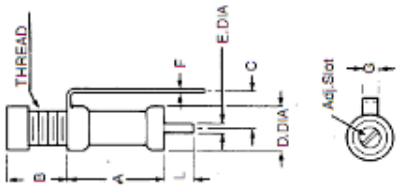
Figure 5



Terminals are gold plated

CUSTOM DESIGN upon request

Figure 6



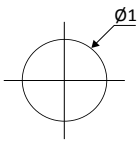
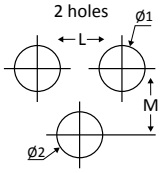
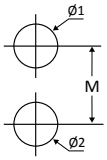
I.4 MINIATURE AIR TRIMMER SERIES

Designation	Fig.	A		B		C		D		E		F		G		H		L		Thread
		mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	
AT 5800 RoHS	1	6.7	(0.264)	5.9	(0.232)			4.6	(0.181)											
AT 5801 RoHS	2a	7.0	(0.276)	5.7	(0.224)	6.5	(0.256)	4.6	(0.181)	5.4	(0.213)			0.25	(0.010)					.120-80 UNS
AT 5802 RoHS	3	6.7	(0.264)	5.9	(0.232)			4.6	(0.181)											
AT 8051 RoHS	6	7.0	(0.276)	5.6	(0.220)	3.2	(0.126)	4.6	(0.181)	0.8	(0.031)	0.25	(0.010)	0.5				2.8	(0.110)	
AT 5850 RoHS	1	6.7	(0.264)	6.8	(0.268)			4.6	(0.181)											
AT 5851 RoHS	2a	7.0	(0.276)	6.6	(0.260)	6.5	(0.256)	4.6	(0.181)	5.4	(0.213)			0.25	(0.010)					.120-80 UNS
AT 5852 RoHS	3	6.7	(0.264)	6.8	(0.268)			4.6	(0.181)											
AT 5853 RoHS	6	7.0	(0.276)	6.6	(0.260)	3.2	(0.126)	4.6	(0.181)	0.8	(0.031)	0.25	(0.010)	0.5	(0.020)			2.8	(0.110)	
AT 5700 RoHS	4	7.0	(0.276)	5.6	(0.220)			6.2	(0.244)											
AT 5701 RoHS	2b	7.3	(0.287)	5.1	(0.201)	6.7	(0.264)	6.2	(0.244)	6.3	(0.248)			0.4	(0.016)					.190-64 UNS
AT 5702 RoHS	3	6.9	(0.272)	5.6	(0.220)			6.2	(0.244)											
AT 8050 RoHS	6	7.3	(0.287)	5.1	(0.201)	4.0	(0.157)	6.2	(0.244)	1.1	(0.043)	0.4	(0.016)	0.8	(0.031)			3.0	(0.118)	
AT 5750 RoHS	4	7.0	(0.276)	6.3	(0.248)			6.2	(0.244)											
AT 5751 RoHS	2b	7.3	(0.287)	6.0	(0.236)	6.7	(0.264)	6.2	(0.244)	6.3	(0.248)			0.4	(0.016)					.190-64 UNS
AT 5752 RoHS	3	6.9	(0.272)	6.3	(0.248)			6.2	(0.244)											
AT 5753 RoHS	5	7.3	(0.287)	5.8	(0.228)	4.0	(0.157)	6.2	(0.244)	1.1	(0.043)	0.4	(0.016)	0.8	(0.031)	4.0	(0.016)	3.0	(0.118)	

RoHS Compliant

AIR TRIMMER CAPACITORS, MINIATURE, STANDARD & HIGH VOLTAGE SERIES

I.5 MINIATURE AIR TRIMMER SERIES: SUGGESTED MOUNTING HOLE

Figure A	Figure B	Figure C
		

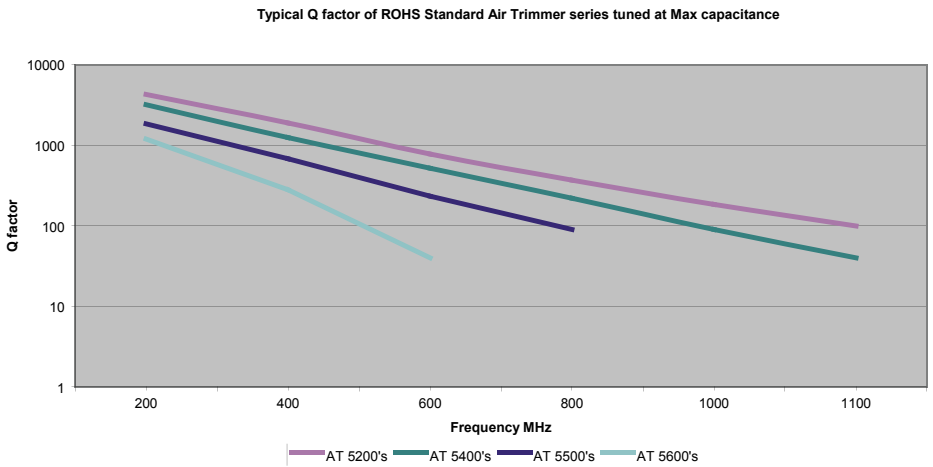
Designation	Fig.	Ø1		Ø2		L		M	
		mm	inches	mm	inches	mm	inches	mm	inches
AT 5800 RoHS, AT 5802 RoHS, AT 5850 RoHS, AT 5852 RoHS	A	3.2	(0.126)						
AT 5801 RoHS, AT 5851 RoHS	C	1.3	(0.051)	1.3	(0.051)			6.5	(0.256)
AT 8051 RoHS, AT 5853 RoHS	C	1.3	(0.051)	1.3	(0.051)			3.2	(0.126)
AT 5700 RoHS, AT 5702 RoHS, AT 5750 RoHS, AT 5752 RoHS	A	4.9	(0.193)						
AT 5701 RoHS, AT 5751 RoHS	B	1.3	(0.051)	1.3	(0.051)	4.0	(0.157)	6.7	(0.264)
AT 8050 RoHS	C	1.3	(0.051)	1.3	(0.051)			4.0	(0.157)
AT 5753 RoHS	B	1.3	(0.051)	1.3	(0.051)	4.0	(0.157)	4.0	(0.157)

II. STANDARD AIR TRIMMER SERIES

Designation	AT 5200 RoHS AT 5201 RoHS AT 5202 RoHS AT 8052 RoHS	AT 5400 RoHS AT 5401 RoHS AT 5402 RoHS AT 8053 RoHS	AT 5450 RoHS AT 5451 RoHS AT 5452 RoHS AT 5453 RoHS	AT 5500 RoHS AT 5501 RoHS AT 5502 RoHS AT 8054 RoHS	AT 5600 RoHS AT 5601 RoHS AT 5602 RoHS
Capacitance range	0.8 to 10 pF > 6 turns	1 to 14 pF > 6 turns	1 to 16 pF > 6 turns	1 to 20 pF > 14 turns	1 to 30 pF >20 turns
Working voltage	250 V_{DC}				
Test voltage	500 V_{DC}				
Working Temp. range	- 55°C to + 125°C				
Temp. Coefficient	0 ±15 ppm/°C	0 ±25 ppm/°C	0 ±50 ppm/°C	0 ±30 ppm/°C	0 ±30 ppm/°C
Q factor @ Max Cap.	> 5000	> 3000	> 3000	> 1000	> 800
Insulation Resistance	$>10^6$ MΩ min				

Capacitance change is linear versus rotation of mobile rotor.

II.1 STANDARD AIR TRIMMER SERIES: QUALITY FACTOR



AIR TRIMMER CAPACITORS, MINIATURE, STANDARD & HIGH VOLTAGE SERIES

RoHS Compliant

II.2 STANDARD AIR TRIMMER SERIES: MECHANICAL AND GENERAL SPECIFICATIONS

Designation	AT 5200 RoHS AT 5201 RoHS AT 5202 RoHS AT 8052 RoHS	AT 5400 RoHS AT 5401 RoHS AT 5402 RoHS AT 8053 RoHS	AT 5450 RoHS AT 5451 RoHS AT 5452 RoHS AT 5453 RoHS	AT 5500 RoHS AT 5501 RoHS AT 5502 RoHS AT 8054 RoHS	AT 5600 RoHS AT 5601 RoHS AT 5602 RoHS
Rotating torque	70 to 350 g.cm				
Max torque on rotor stop	500 g.cm				
Nut mounting torque	5000 g.cm				
Seal cap assemb. torque	800 g.cm				
Vibrations	60 g, 10-2000 Hz				
Shocks	1500 g, 0.5 ms				
	Brass and Invar structure				
	Glazed alumina insulation				
	306°C solder used in assembly				
	Silicone rubber seal washer				
	Gold, silver and passivated finish				

II.3 STANDARD AIR TRIMMER SERIES : MODELS

Figure 1

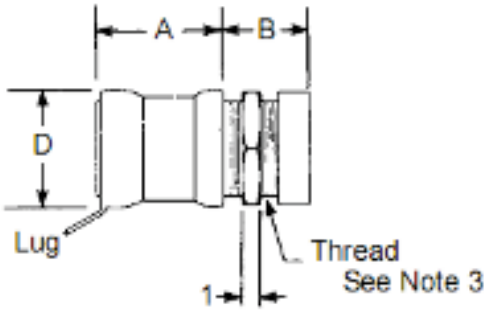


Figure 2

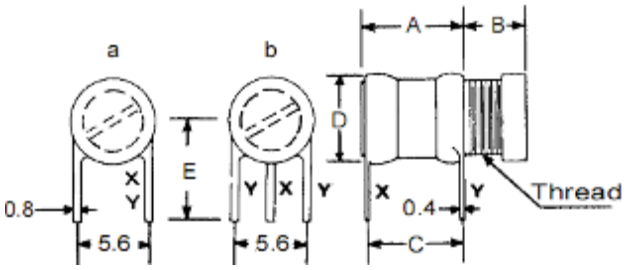


Figure 3

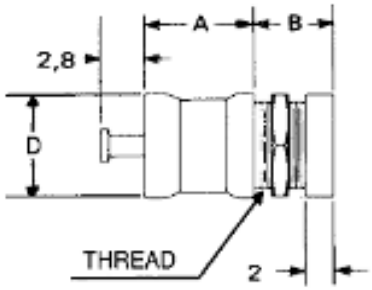


Figure 4

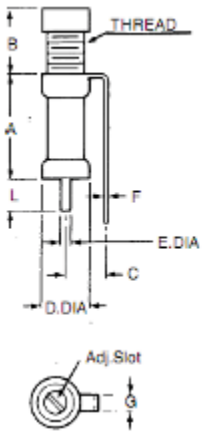
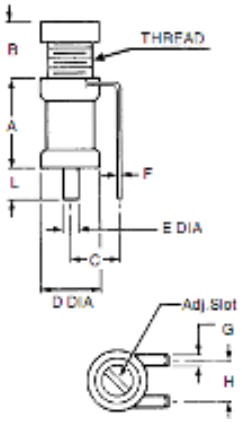


Figure 5



Terminals are gold plated.

CUSTOM DESIGN upon request

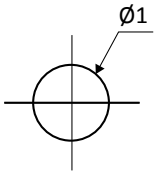
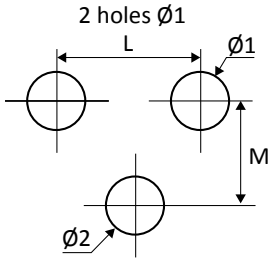
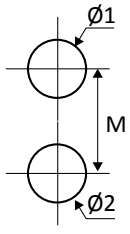
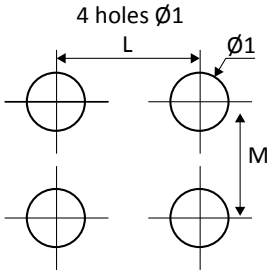
RoHS Compliant

AIR TRIMMER CAPACITORS, MINIATURE, STANDARD & HIGH VOLTAGE SERIES

II.4 STANDARD AIR TRIMMER SERIES:

Designation	Fig.	A		B		C		D		E		F		G		H		L		Thread
		mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	
AT 5200 RoHS	1	7.7	(0.303)	5.8	(0.228)			7.6	(0.299)											
AT 5201 RoHS	2b	8.0	(0.315)	5.4	(0.213)	7.2	(0.283)	7.6	(0.299)	7.9	(0.311)									
AT 5202 RoHS	3	7.2	(0.283)	5.8	(0.228)			7.6	(0.299)											
AT 8052 RoHS	4	7.5	(0.295)	5.6	(0.220)	5.2	(0.205)	7.6	(0.299)	1.6	(0.063)	0.4	(0.016)	1.0	(0.039)			2.8	(0.110)	
AT 5400 RoHS	1	7.7	(0.303)	5.8	(0.228)			7.6	(0.299)											
AT 5401 RoHS	2b	8.0	(0.315)	5.4	(0.213)	7.2	(0.283)	7.6	(0.299)	12.0	(0.472)									
AT 5402 RoHS	3	7.2	(0.283)	5.8	(0.228)			7.6	(0.299)											
AT 8053 RoHS	4	7.5	(0.295)	5.6	(0.220)	5.2	(0.205)	7.6	(0.299)	1.6	(0.063)	0.4	(0.016)	1.0	(0.039)			2.8	(0.110)	
AT 5450 RoHS	1	7.7	(0.303)	5.8	(0.228)			7.6	(0.299)											
AT 5451 RoHS	2b	8.0	(0.315)	5.4	(0.213)	7.2	(0.283)	7.6	(0.299)	12.0	(0.472)									.234-64 UNS
AT 5452 RoHS	3	7.2	(0.283)	5.8	(0.228)			7.6	(0.299)											
AT 5453 RoHS	5	7.5	(0.295)	5.6	(0.220)	5.2	(0.205)	7.6	(0.299)	1.6	(0.063)	0.4	(0.016)	1.0	(0.039)	5.6	(0.220)	2.8	(0.110)	
AT 5500 RoHS	1	12.5	(0.492)	6.7	(0.264)			8.0	(0.315)											
AT 5501 RoHS	2b	14.7	(0.579)	4.3	(0.169)	14.2	(0.559)	8.0	(0.315)	12.0	(0.472)									
AT 5502 RoHS	3	12.4	(0.488)	6.7	(0.264)			8.0	(0.315)											
AT 8054 RoHS	4	14.7	(0.579)	4.4	(0.173)	5.2	(0.205)	8.0	(0.315)	1.6	(0.063)	0.4	(0.016)	1.0	(0.039)			2.8	(0.110)	
AT 5600 RoHS	1	17.3	(0.681)	6.6	(0.260)			8.0	(0.315)											
AT 5601 RoHS	2a	19.4	(0.764)	4.4	(0.173)	18.8	(0.740)	8.0	(0.315)	12.0	(0.472)									
AT 5602 RoHS	3	17.3	(0.681)	6.6	(0.260)			8.0	(0.315)											

II.5 STANDARD AIR TRIMMER SERIES

Figure A	Figure B	Figure C	Figure D
			

AIR TRIMMER CAPACITORS, MINIATURE, STANDARD & HIGH VOLTAGE SERIES

RoHS Compliant

Models	Fig.	Ø1		Ø2		L		M	
		mm	inches	mm	inches	mm	inches	mm	inches
AT 5200 RoHS AT 5500 RoHS AT 5202 RoHS AT 5502 RoHS AT 5400 RoHS AT 5600 RoHS AT 5402 RoHS AT 5602 RoHS AT 5450 RoHS AT 5452 RoHS	A	6.2	(0.244)						
AT 5201 RoHS AT 5401 RoHS AT 5451 RoHS	B	1.3	(0.051)	1.3	(0.051)	5.6	(0.220)	7.2	(0.283)
AT 5501 RoHS	B	1.3	(0.051)	1.3	(0.051)	5.6	(0.220)	14.2	(0.559)
AT 5601 RoHS	D	1.3	(0.051)	1.3	(0.051)	5.6	(0.220)	18.8	(0.740)
AT 8052 RoHS AT 8053 RoHS AT 8054 RoHS	C	1.3	(0.051)	1.3	(0.051)			5.2	(0.205)
AT 5453 RoHS	B	1.3	(0.051)	1.7	(0.067)	5.6	(0.220)	5.2	(0.205)

III HIGH VOLTAGE AIR TRIMMER SERIES

Designation	AT 5301 RoHS AT 5302 RoHS
Capacitance range	0.8 to 10 pF > 10 turns
Working voltage	500 V_{DC}
Test voltage	1000 V_{DC}
Working Temp. range	-55°C to +125°C
Temp. Coefficient	0±20 ppm/°C
Q factor @ Max Cap.	> 2000
Insulation Resistance	> 10^6 MΩ

III.1 HIGH VOLTAGE AIR TRIMMER SERIES: MECHANICAL AND GENERAL SPECIFICATIONS

Designation	AT 5301 RoHS AT 5302 RoHS
Rotating torque	70 to 420 g.cm
Max torque on rotor stop	600 g.cm
Nut mounting torque	7000 g.cm
Seal cap assembly torque	1000 g.cm
Vibrations	60g, 10-2000 Hz
Glazed alumina insulation	
306°C solder used in assembly	
Silicone rubber seal washer	
Gold, silver and passivated finish	

III.2 HIGH VOLTAGE AIR TRIMMER SERIES: MODELS

Figure 1

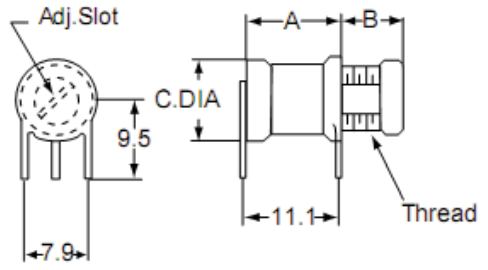
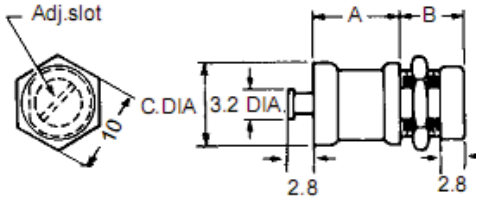


Figure 2



Terminals are gold plated

CUSTOM DESIGN upon request

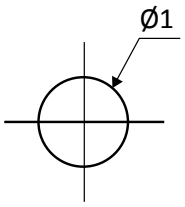
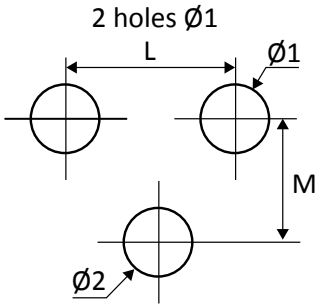
RoHS Compliant

AIR TRIMMER CAPACITORS, MINIATURE, STANDARD & HIGH VOLTAGE SERIES

III.3 HIGH VOLTAGE AIR TRIMMER SERIES

Designation	Fig.	A		B		C		Thread
		mm	inches	mm	inches	mm	inches	
AT 5301 RoHS	1	11.1	(0.437)	8.3	(0.327)	9.8	(0.386)	.312-64 UNS
AT 5302 RoHS	2	10.7	(0.421)	7.8	(0.307)	9.8	(0.386)	

III.4 HIGH VOLTAGE AIR TRIMMER SERIES: SUGGESTED MOUNTING HOLES

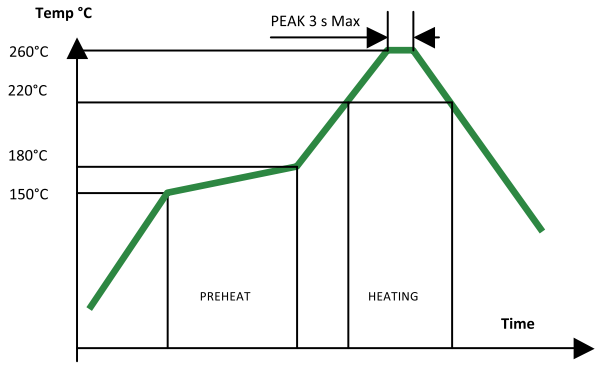
Figure A	Figure B
	

Designation	Figure	Ø1		Ø2		L		M	
		mm	inches	mm	inches	mm	inches	mm	inches
AT 5301 RoHS	B	1,3	(0.051)	1,3	(0.051)	11,1	(0.437)	7,9	(0.311)
AT 5302 RoHS	A	8,1	(0.319)						

IV. SOLDERING AND MOUNTING

Recommended reflow solder temperature profile

Maximum Soldering Temperature 260°C MAX



Hand soldering: Use a temperature controlled 40 watts iron set at 260°C maximum. The solder joint should be made on 3 seconds or less.

For panel mounting Air Trimmer capacitors (using a nut) minimum circuit thickness is 0.8 mm.

AIR TRIMMER CAPACITORS, MINIATURE, STANDARD & HIGH VOLTAGE SERIES

RoHS Compliant

V. RECOMMENDATIONS FOR CLEANING

Air Trimmer capacitors are compatible with a wide variety of cleaning process including those that utilize aqueous or semi-aqueous solutions, alcohol solutions, de-ionized water and numerous other cleaners.

However, due to the large variety of such processes, the customer through cleaning process evaluation in conjunction with **EXXELIA** product purchased must determine actual compatibility.

Capacitors without sealing caps should be protected from intrusion of cleaning solutions in the internal bushing thread. It is recommended these units be installed after circuit boards have been cleaned.

Units with seal caps may be immersed in liquid, vapour and ultrasonic system.

VI. PACKAGING

Parts are delivered in bulk and with a standard sealing cap

Special sealing caps with screwdriver slot are available except for AT 5300 series.

VII. HOW TO ORDER

Air trimmer capacitors with standard sealing cap

Examples

Designation	RoHS
AT 5202	RoHS
AT 5301	RoHS

Air trimmer capacitors with special sealing cap with screwdriver slot

Examples

Designation	S	RoHS
AT 5702	**S**	RoHS
AT 5801	**S**	RoHS

VIII. TUNING TOOLS

Recommended Tuning Tools references:

AT 8766 for AT 5800 RoHS and AT 5850 RoHS series

AT 8777 for all others series

Improper screwdriver may damage the internal bushing thread causing rotor binding.

IX. ADJUSTING

The maximum torque on rotor stop value should not be exceeded or damage to capacitor may result.

Always use the recommended tuning tool.

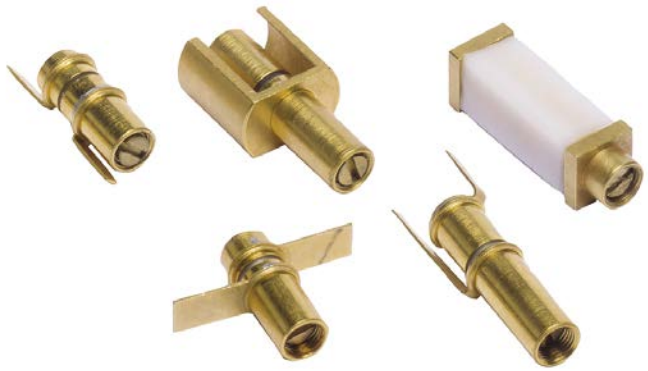
RoHS Compliant

GIGAHERTZ SAPPHIRE TRIMMER CAPACITORS

DESCRIPTION

Sapphire dielectric
High self resonance frequency and very good Q
Rated voltage 500 V_{DC}
Multi-turn, very fine resolution
Low temperature coefficient
Low capacitance drift and very stable over time
Self-locking constant torque drive mechanism
Surface mount models available on tape and reel
Meet MIL-C-144409
Compliant to ESA/SCC 3010
Terminations are **gold plated**
Non magnetic model
RoHS compliant
High Reliability versions available on special order
Custom design upon request

Maximum Soldering Temperature 260°C, 3 s Max



APPLICATIONS

RF power amplifier
Filter tuning
Crystal trimming
Impedance matching
Low power amplifiers
Medical applications

Dielectric constant of sapphire does not change with frequency and temperature. Sapphire is inert crystal, moisture resistant and mechanically strong.

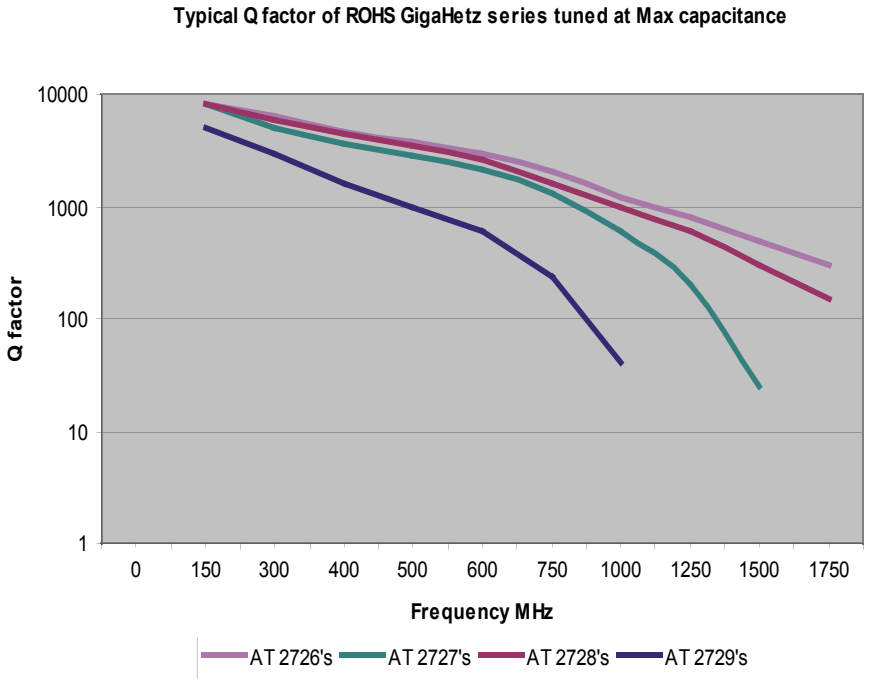
I. ELECTRICAL SPECIFICATIONS

Designation	AT 2726X RoHS AT SM260 RoHS	AT 2727X RoHS AT SM270 RoHS	AT 2728X RoHS AT SM280 RoHS	AT 2729X RoHS AT SM290 RoHS
Capacitance range **Standard models** **AT 272X8 models**	0.3 to 1.2 pF 0.35 to 1.2 pF > 4 turns	0.6 to 4.5 pF 0.65 to 4.5 pF > 8 turns	0.4 to 2.5 pF 0.45 to 2.5 pF > 4 turns	0.8 to 8.0 pF 0.85 to 8.0 pF > 16 turns
Working Voltage	500 V_{DC}			
Test Voltage	1000 V_{DC}			
Working Temp. range	-55°C to + 125°C			
Temp. Coeff. **Standard models** **AT 272X8 models**	0 ±50 ppm/°C -50 ±75 ppm/°C	0 ±50 ppm/°C -50 ±75 ppm/°C	0 ±50 ppm/°C -50 ±75 ppm/°C	0 ±75 ppm/°C -50 ±75 ppm/°C
Q factor @ Max Capacitance	>5000 @250 MHz	>3000 @250 MHz	>4000 @250 MHz	>3000 @100 MHz
Insulation Resistance	>10000 MΩ min @ 500 V_{DC}			

GIGAHERTZ SAPPHIRE TRIMMER CAPACITORS

RoHS Compliant

II. QUALITY FACTOR



III. MECHANICAL AND GENERAL SPECIFICATIONS

Designation	AT 2726X RoHS AT SM260 RoHS	AT 2727X RoHS AT SM270 RoHS	AT 2728X RoHS AT SM280 RoHS	AT 2729X RoHS AT SM290 RoHS
Rotating Torque	7 to 60 g.cm	10 to 100 g.cm	10 to 100 g.cm	10 to 100 g.cm
Max Torque on rotor stop	80 g.cm	150 g.cm	120 g.cm	150 g.cm
Rotational life	> 800 revolutions			
Vibration	60 g, 10-2000 Hz			
Shock	100 g, 6ms			

RoHS Compliant

GIGAHERTZ SAPPHIRE TRIMMER CAPACITORS

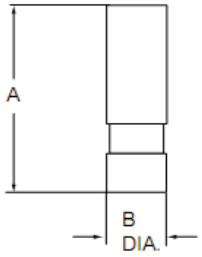
IV. SELF RESONANT FREQUENCY

For surface mount version, self resonant frequency is improving when width of terminal is increasing.

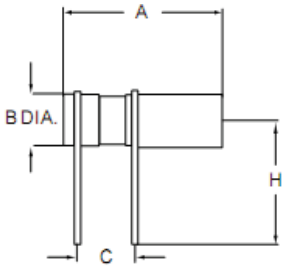
With more width terminal, Equivalent Serial Resistance (ESR) is lower.As example for the same capacity range, self resonant frequency of model 8 is higher than for model 3.

V. MODELS

Model 0

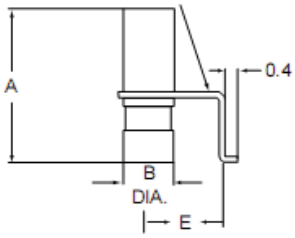


Model 1



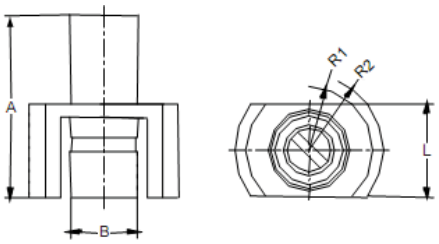
Terminal 1.0 mm width x 0.2 mm thickness

Model 3

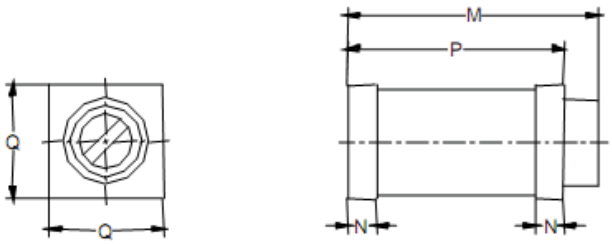


Terminal 1.0 mm width x 0.2 mm thickness

Model 8



AT SM Series



Terminals are gold plated

CUSTOM DESIGN upon request

GIGAHERTZ SAPPHIRE TRIMMER CAPACITORS

RoHS Compliant

VI. DIMENSIONS

X is the model

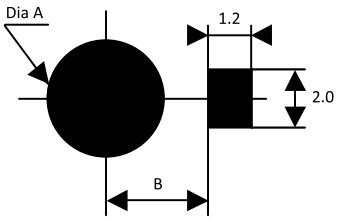
Designation	A		B		C		E		H		L		R1		R2	
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
AT 2726X RoHS	5.8	(0.228)	1.9	(0.075)	2.0	(0.079)	1.9	(0.075)	5.9	(0.232)	3.1	(0.122)	2.3	(0.091)	2.8	(0.110)
AT 2727X RoHS	8.0	(0.315)	3.0	(0.118)	3.2	(0.126)	2.8	(0.110)	5.9	(0.232)	4.1	(0.161)	2.8	(0.110)	3.3	(0.130)
AT 2728X RoHS	5.8	(0.228)	3.0	(0.118)	2.0	(0.079)	2.8	(0.110)	5.9	(0.232)	4.1	(0.161)	2.8	(0.110)	3.3	(0.130)
AT 2729X RoHS	12.3	(0.484)	3.0	(0.118)	6.4	(0.252)	2.8	(0.110)	5.9	(0.232)	4.1	(0.161)	2.8	(0.110)	3.3	(0.130)

Designation	M		N		P		Q	
	mm	inches	mm	inches	mm	inches	mm	inches
AT SM260 RoHS	6.4	(0.252)	0.8	(0.031)	5.1	(0.201)	3.0	(0.118)
AT SM270 RoHS	8.8	(0.346)	1.0	(0.039)	7.6	(0.299)	4.0	(0.157)
AT SM280 RoHS	6.6	(0.260)	1.0	(0.039)	5.1	(0.201)	4.0	(0.157)
AT SM290 RoHS	13.1	(0.516)	1.0	(0.039)	11.4	(0.449)	4.0	(0.157)

VII. SOLDERING

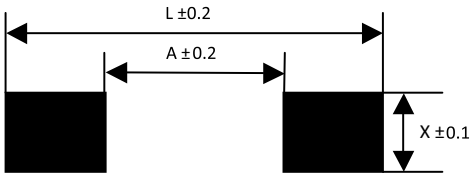
Typical solder pad layout

AT 27263 RoHS, AT 27273 RoHS, AT 27283 RoHS, AT 27293 RoHS models



Dimensions in mm (inches)	AT 27263 RoHS	AT 27273 RoHS AT 27283 RoHS AT 27293 RoHS
Dia A	2.4 (0.094)	3.6 (0.142)
B	1.7 (0.067)	2.3 (0.091)

AT SM Models

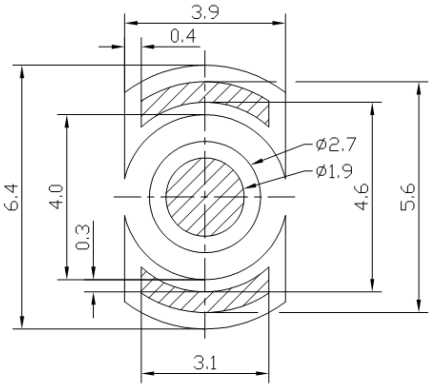


Dimensions in mm (inches)	AT SM260 RoHS	AT SM270 RoHS	AT SM280 RoHS	AT SM290 RoHS
L	6,2 (0.244)	8,7 (0.343)	6,2 (0.244)	12,5 (0.492)
A	3,2 (0.126)	5,2 (0.205)	2,8 (0.110)	9,0 (0.354)
X	3,4 (0.134)	4,4 (0.173)	4,4 (0.173)	4,4 (0.173)

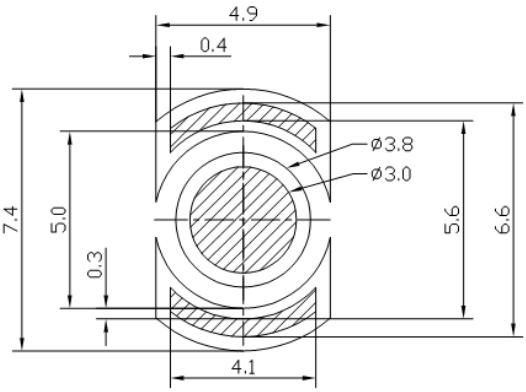
RoHS Compliant

GIGAHERTZ SAPPHIRE TRIMMER CAPACITORS

AT 27268 RoHS

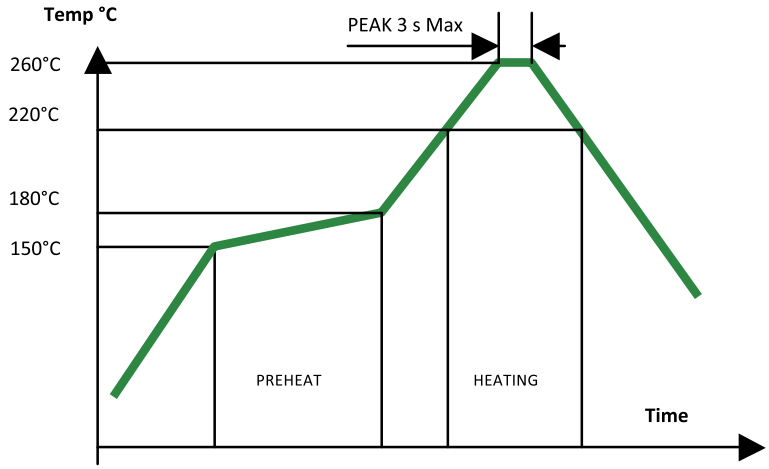


AT 27278 RoHS, AT 27288 RoHS, AT 27298 RoHS



Recommended reflow solder temperature profile

Maximum Soldering Temperature 260°C MAX



Hand soldering : Use a temperature controlled 40 Watts iron set at 260°C maximum. The solder joint should be made on 3 seconds or less.

VIII. RECOMMENDATIONS FOR CLEANING

GigaHertz Trimmer capacitors are compatible with a wide variety of cleaning process including those that utilize aqueous or semi-aqueous solutions, alcohol solutions, de-ionized water and numerous other cleaners. However, due to the large variety of such processes, the customer through cleaning process evaluation in conjunction with **EXXELIA** product purchased must determine actual compatibility. Capacitors without sealing caps should be protected from intrusion of cleaning solutions in the internal bushing thread. It is recommended these units be installed after circuit boards have been cleaned. Units with seal caps may be immersed in liquid, vapour and ultrasonic system.

IX. PACKAGING

Parts are delivered in bulk for quantity lower than 500 pcs.

GigaHertz trimmers AT 27263 RoHS, AT 27273 RoHS, AT 27283 RoHS, AT 27268 RoHS, AT 27278 RoHS, AT 27288 RoHS, AT 27298 RoHS (also available in band), AT SM270 RoHS and AT SM280 RoHS are available on tape and reel, quantity per reel 500 pcs.

Models 0 and 1, trimmers AT 27293 RoHS and AT SM290 RoHS are not available on tape.

GIGAHERTZ SAPPHIRE TRIMMER CAPACITORS

RoHS Compliant

When delivered on tape, GigaHertz trimmers include a permanent sealing cap which is moisture proof and resists intrusion of dirt, dust, solder flux and cleaning agents, and allows easy access, accurate tuning after assembly and cleaning. References of sealing caps are AT 69600 RoHS for AT 2726X RoHS family and AT 69700 for AT 2727X RoHS, AT 2728X RoHS and AT 2729X RoHS families. For sealing caps of AT SM series, contact **EXXELIA**.

Use of permanent sealing cap increases total length of the GigaHertz trimmer by 0.2 mm.

X. HOW TO ORDER

Parts in quantity < 500 pcs and for models 0 and 1, trimmers AT 27293 RoHS, AT 27298 RoHS and AT SM290 RoHS

Examples

Designation	RoHS
AT 27293	RoHS
AT SM270	RoHS
AT 27261	RoHS
AT 57290	RoHS

Parts with sealing cap, in quantity < 500 pcs

Example

Designation	+ CAP	RoHS
AT 27273	**+ CAP**	RoHS

Parts on tape and reel : (500 pcs/reel)

Examples

Designation	R1	RoHS
AT 27283	**R1**	RoHS
AT SM260	**R1**	RoHS

XI. TUNING TOOLS

Recommended Tuning Tools references:

AT 8762 for AT 2726X RoHS part numbers and AT SM260 RoHS

AT 8777 for AT 2727X RoHS, AT 2728X RoHS and AT 2729X RoHS part numbers and AT SM270 RoHS, AT SM280 RoHS and AT SM290 RoHS as well for AT 57290 RoHS.

Improper screwdriver may damage the internal bushing thread causing rotor binding.

XII. ADJUSTING

Sealing caps, available on GigaHertz trimmers delivered on tape and reel, are designed so that after assembly is complete they may be penetrated by the **EXXELIA** tuning tool and left in place.

The maximum torque on rotor stop value should not be exceeded or damage to the capacitor may result.

Always use the recommended tuning tool.

RoHS Compliant

NON MAGNETIC, SAPPHIRE DIELECTRIC TRIMMER CAPACITORS

DESCRIPTION

Sapphire dielectric
Non Magnetic structure
Rated voltage 500 V_{DC} to 5000 V_{DC}
Low magnetic signature, less than 10-12 Tesla
Low temperature coefficient
Very stable over time
High Q factor
Multi-turn, high resolution
Self-locking constant torque drive mechanism
Silver and passivated finish
RoHS compliant
Maximum Soldering Temperature 260°C, 3 s Max

APPLICATIONS

Magnetic Resonance Imaging
Nuclear Magnetic Resonance
Medical Applications
Non magnetic probes

I. ELECTRICAL SPECIFICATIONS

Designation	AT 57290 RoHS	AT 57250 RoHS	TG 091 RoHS	TG 092 RoHS	TG 094 RoHS
Capacitance range	0.8 to 8.0 pF >16 turns	1.0 to 13 pF > 8 turns	0.5 to 8.0 pF > 28 turns	0.5 to 10 pF > 28 turns	0.6 to 8.0 pF > 11 turns
Working Voltage	500 V_{DC}	1500 V_{DC}	1500 V_{DC}	1000 V_{DC}	5000 V_{DC}
Test Voltage	1000 V_{DC}	2250 V_{DC}	2500 V_{DC}	1600 V_{DC}	10000 V_{DC}
Working Temperature range	-55°C to + 125°C				-25°C to + 85°C
Temperature Coefficient	350±75 ppm/°C	350 ±75 ppm/°C	350 ±75 ppm/°C	350 ±75 ppm/°C	400 ±100 ppm/°C
Q factor	>3000@100 MHz	>1500@100 MHz	>2500@100 MHz	>2000@100 MHz	>1500@100 MHz
Insulation Resistance	$>10^4$ MΩ				

Capacitance change is linear versus rotation of mobile rotor.

NON MAGNETIC, SAPPHIRE DIELECTRIC TRIMMER CAPACITORS

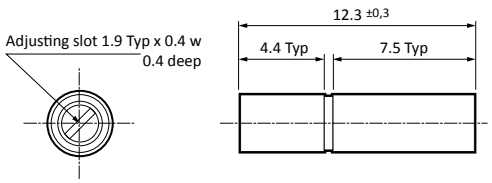
RoHS Compliant

II. MECHANICAL AND GENERAL SPECIFICATIONS

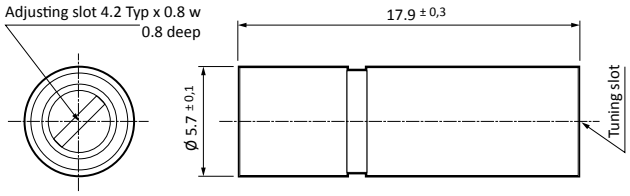
Designation	AT 57290 RoHS TG 091 RoHS TG 092 RoHS	AT 57250 RoHS TG 094 RoHS
Rotating torque	10 to 100 g.cm	50 to 500 g.cm
Max torque on rotor stop	150 g.cm	700 g.cm
Rotational life	> 400 revolutions	> 400 revolutions
Vibrations	60 g, 10-2000 Hz	60 g, 10-200 Hz
Shocks	100 g, 6 ms	100 g, 6 ms

III. MODELS AND DIMENSIONS in mm

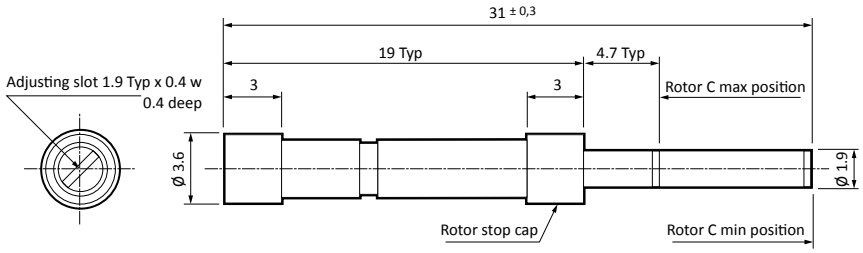
AT 57290 RoHS



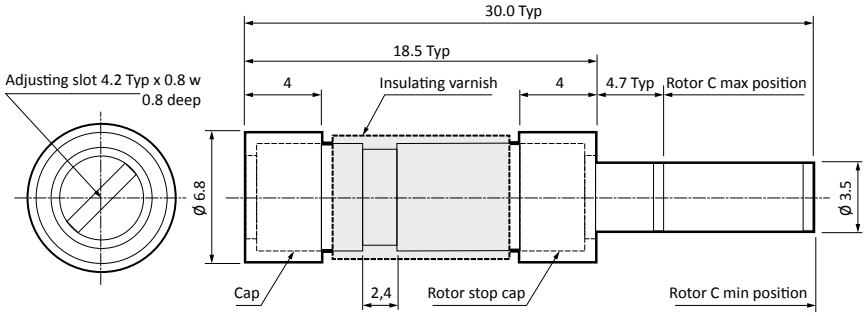
AT 57250 RoHS



TG 091 RoHS - TG 092 RoHS



TG 094 RoHS



NOTA: AT 57290 RoHS and AT 57250 RoHS can be delivered with extended shaft upon request.

RoHS Compliant

NON MAGNETIC, SAPPHIRE DIELECTRIC TRIMMER CAPACITORS

IV. SOLDERING

Hand soldering: Use a temperature controlled 40 watts iron set at 260°C maximum. The solder joint should be made on 3 seconds or less.

V. RECOMMENDATIONS FOR CLEANING

Delivered without sealing cap, these Trimmer Capacitors have to be installed after circuit board have been cleaned.

VI. PACKAGING

Parts are delivered in bulk.

VII. HOW TO ORDER

Non Magnetic High Voltage Sapphire Dielectric trimmer capacitors

Examples

Designation	RoHS
AT 57290	RoHS
AT 57250	RoHS

VIII. TUNING TOOL

Recommended Tuning Tool reference is AT 8777

Improper screwdriver size will cause internal thread damage.

IX. ADJUSTING

The maximum torque on rotor stop value should not be exceeded or damage to capacitor may result.

Always use the recommended tuning tool.

NON MAGNETIC, HIGH VOLTAGE PTFE DIELECTRIC TRIMMER CAPACITORS

RoHS Compliant

DESCRIPTION

PTFE dielectric
Non Magnetic structure
Rated voltage 1000 V_{DC} to 1250 V_{DC}
Low temperature coefficient
Very stable over time
High Q factor
Multi-turn, high resolution
Self-locking constant torque drive mechanism
Gold, silver and passivated finish
RoHS compliant
Maximum Soldering Temperature 260°C, 3 s Max

APPLICATIONS

Magnetic Resonance Imaging
Nuclear Magnetic Resonance
Medical Applications

I. ELECTRICAL SPECIFICATIONS

Designation	AT 52H01 AT 52H02	AT 55H01 AT 55H02
Capacitance range	1.5 to 10 pF >18 turns	1.5 to 19 pF > 18 turns
Working Voltage	1250 V_{DC}	1000 V_{DC}
Test Voltage	2500 V_{DC}	2000 V_{DC}
Working Temp. range	-55°C to + 125°C	
Temp. Coefficient	50 ±40 ppm/°C	0 ±50 ppm/°C
Q factor	>1400@195 MHz	>1000@175 MHz
Insulation Resistance	>10^6 MΩ	

Capacitance change is linear versus rotation of mobile rotor.

II. MECHANICAL AND GENERAL SPECIFICATIONS

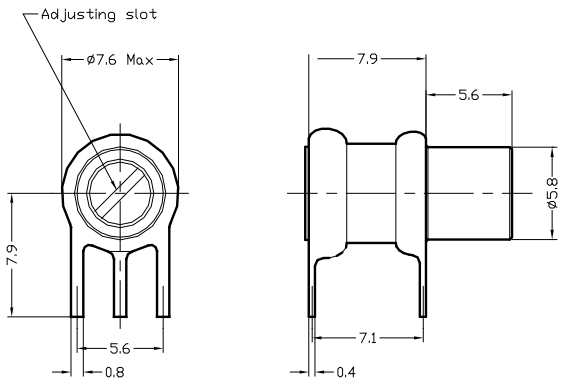
Designation	AT 52H01 AT 52H02	AT 55H01 AT 55H02
Rotating torque	70 to 350 g.cm	
Max torque on rotor stop	500 g.cm	
Rotational life	> 600 revolutions	
Vibrations	60 g, 10-2000 Hz	
Shocks	100 g, 6ms	

RoHS Compliant

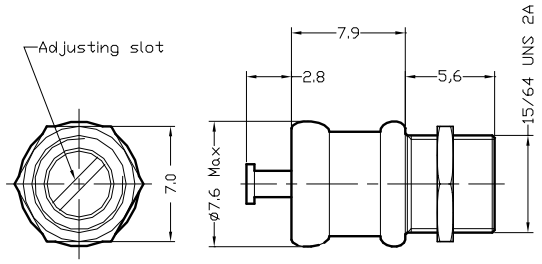
NON MAGNETIC, HIGH VOLTAGE PTFE DIELECTRIC TRIMMER CAPACITORS

III. MODELS AND DIMENSIONS in mm

AT 52H01 RoHS - AT 55H01 RoHS

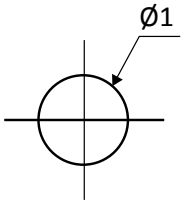
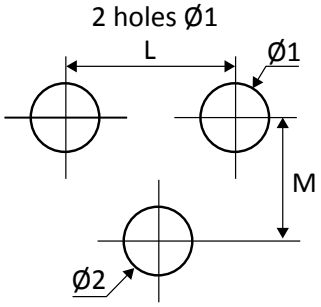


AT 52H02 RoHS - AT 55H02 RoHS



Terminal with two legs is in contact with tuning rotor

IV. SUGGESTED MOUNTING HOLES AND SOLDERING

Figure A	Figure B
	

Models	Figure	Ø1		L		M	
		mm	inches	mm	inches	mm	inches
AT 52H01 RoHS, AT 55H01 RoHS	B	1.3	(0.051)	5.6	(0.220)	7.1	(0.280)
AT 52H02 RoHS, AT 55H02 RoHS	A	6.2	(0.244)				

Hand soldering: Use a temperature controlled 40 watts iron set at 260°C maximum. The solder joint should be made on 3 seconds or less.

NON MAGNETIC, HIGH VOLTAGE PTFE DIELECTRIC TRIMMER CAPACITORS

RoHS Compliant

V. RECOMMENDATIONS FOR CLEANING

Delivered without sealing cap, these Trimmer Capacitors have to be installed after circuit board have been cleaned.

VI. PACKAGING

Parts are delivered in bulk.

VII. HOW TO ORDER

Non Magnetic High Voltage PTFE Dielectric trimmer capacitors

Examples

Designation	RoHS
AT 52H01	RoHS
AT 55H01	RoHS

VIII. TUNING TOOL

Recommended Tuning Tool reference is AT 8777

Improper screwdriver size will cause internal thread damage.

IX. ADJUSTING

The maximum torque on rotor stop value should not be exceeded or damage to capacitor may result.

Always use the recommended tuning tool.

RoHS Compliant

SMD CHIP TRIM CERAMIC TRIMMER CAPACITORS AT 0300 R2 RoHS & AT 1300 R2 RoHS

DESCRIPTION

Very compact package type
Ceramic dielectric
Special design for reflow soldering use
Rated voltage 100 V_{DC}
Low temperature coefficient
Low capacitance drift
Very stable over time
Terminals are pure tin plated
RoHS compliant
High resonance frequency and very good Q
Special design for easy vacuum pickup
Delivered on 12 mm tape and reel
Maximum Soldering Temperature 265°C, 3 s Max

APPLICATIONS

Mobile and Radio communications equipments :
Filters, Oscillators
TCXO, VCO
Control remote
Security systems
Low power amplifiers

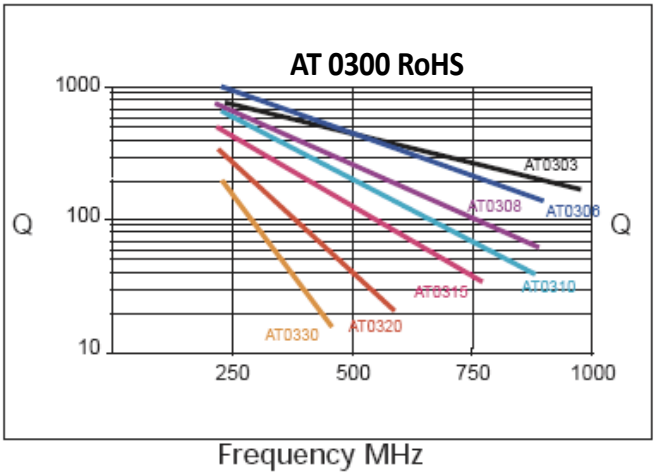
I. ELECTRICAL SPECIFICATIONS

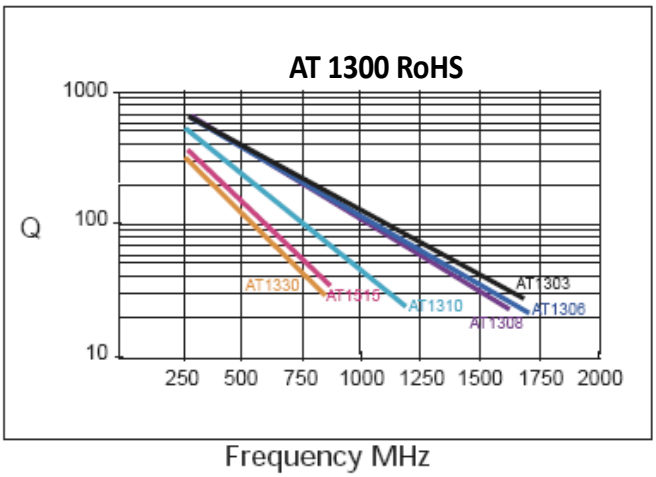
Designation	AT 0303 R2 RoHS AT 1303 R2 RoHS	AT 0306 R2 RoHS AT 1306 R2 RoHS	AT 0310 R2 RoHS AT 1310 R2 RoHS	AT 0315 R2 RoHS AT 1315 R2 RoHS	AT 0320 R2 RoHS AT 1320 R2 RoHS	AT 0330 R2 RoHS AT 1330 R2 RoHS	AT 0340 R2 RoHS AT 1340 R2 RoHS
From below Capacitance range (pF) To above +50%/-0	1.5 +50% 3.0_{-0}	2.0 +50% 6.0_{-0}	2.0 +50% 10.0_{-0}	3.0 +50% 15.0_{-0}	4.5 +50% 20.0_{-0}	5.5 +50% 30.0_{-0}	8.0 +50% 40.0_{-0}
Working Voltage (V_{DC})	100						
Withstanding Voltage (V_{DC})	220						
Working Temp. range	-40°C to +85°C						
Temp. Coeff. (ppm/°C)	0 ±200	0 ±300	0 ±300	0 ±300	0 ±500	-750 ±500	-750 ±500
Capacitance drift (pF)	0.1 Max		0.3 Max	0.4 Max	0.5 Max	1.0 Max	1.2 Max
Setting drift	< 1%						
Typical Self-Resonance Frequency at CMax (GHz)							
AT 0300 series	2.0	1.4	1.1	0.9	0.8	0.6	0.4
AT 1300 series	2.3	1.6	1.2	1.0	0.9	0.7	0.5
Insulation Resistance (MΩ)	10 000 min						

SMD CHIP TRIM CERAMIC TRIMMER CAPACITORS AT 0300 R2 RoHS & AT 1300 R2 RoHS

RoHS Compliant

II. QUALITY FACTOR



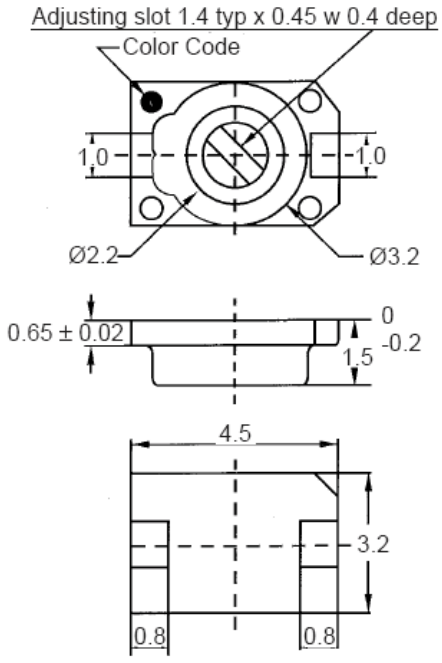


III. MECHANICAL AND GENERAL SPECIFICATIONS

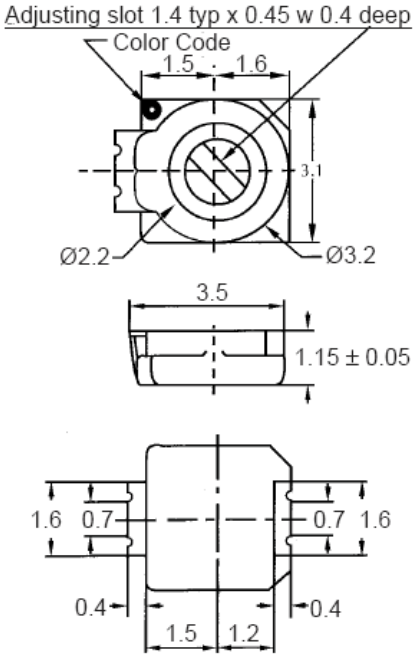
Designation	AT 1303 R2 RoHS AT 0303 R2 RoHS	AT 1306 R2 RoHS AT 0306 R2 RoHS	AT 1310 R2 RoHS AT 0310 R2 RoHS	AT 1315 R2 RoHS AT 0315 R2 RoHS	AT 1320 R2 RoHS AT 0320 R2 RoHS	AT 1330 R2 RoHS AT 0330 R2 RoHS	AT 1340 R2 RoHS AT 0340 R2 RoHS
Color Code	Black	Blue	White	Pink	Red	Orange	Yellow
Rotating Torque	10 to 70 g.cm						
Tensile strength of terminal	500 g						
Resistance to axial load	250 g min						

IV. OUTLINE DIMENSIONS

AT 0300 RoHS



AT 1300 RoHS

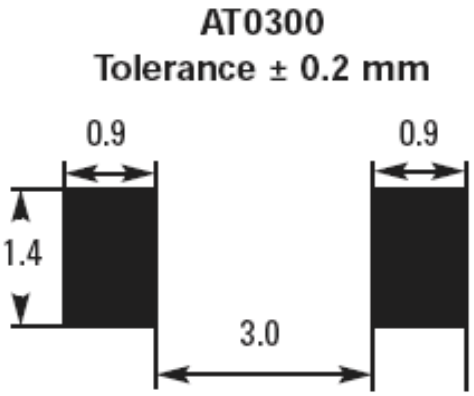


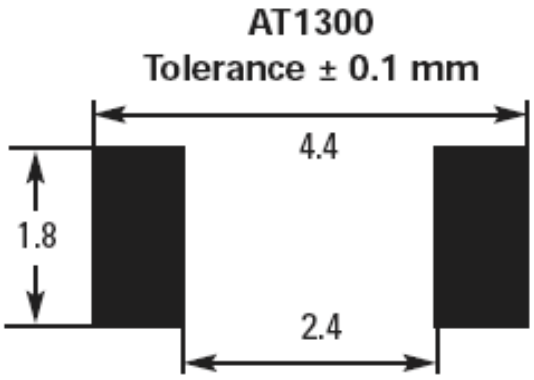
RoHS Compliant

SMD CHIP TRIM CERAMIC TRIMMER CAPACITORS AT 0300 R2 RoHS & AT 1300 R2 RoHS

V. SOLDERING

Typical solder pad layout

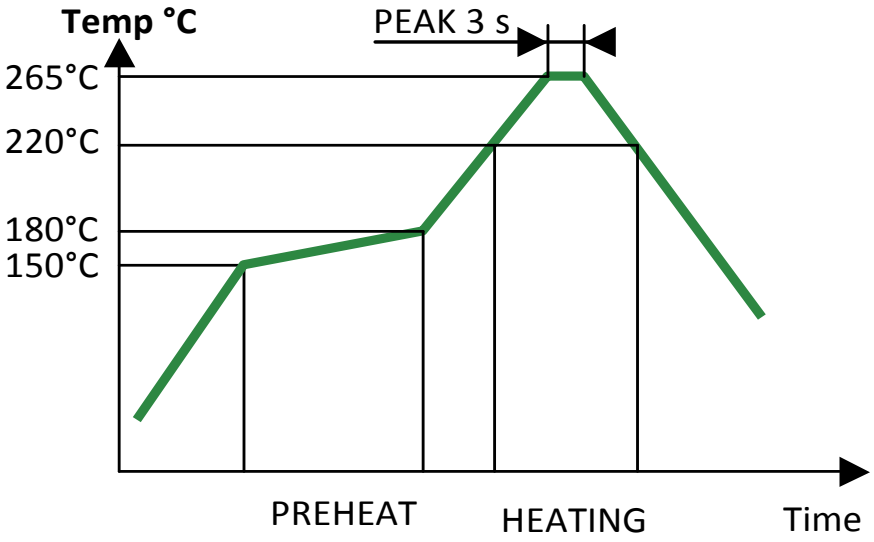




Thickness of printed solder: 0.15 mm

Recommended reflow solder temperature profile

Maximum Soldering Temperature 265°C MAX



VI. PACKAGING

Parts are delivered :

- on tape and reel in 12 mm width carrier tape in quantities of 1000 pcs on 7 inches reel

VII. HOW TO ORDER

Parts on tape and reel

Example

Designation	R2	RoHS
AT 0303	**R2**	RoHS

VIII. TUNING

Recommended Tuning Tool reference: AT 8777
When tuning, do not apply an axial force higher than 1.5 N (150 g)

IX. STORAGE CONDITIONS

Do not store components under direct sunlight or in dewy environment, and in corrosive condition.
Before use, store components under condition of -10°C to +40°C and humidity of 75% RH Max.
It is recommended to use components within 6 months after delivery

SMD HIGH VOLTAGE CHIP TRIM CERAMIC TRIMMER CAPACITORS AT 03HV00 R2 SERIES

RoHS Compliant

DESCRIPTION

Very compact package type
Ceramic dielectric
Special design for reflow soldering use
Rated voltage **350** V_{DC} (test **770** V_{DC}**)**
Low temperature coefficient
Low capacitance drift
Very stable over time
Terminals are **pure tin plated**
High resonance frequency and very good Q
Special design for easy vacuum pickup
Delivered on 12 mm tape and reel
RoHS compliant
Maximum Soldering Temperature 265°C, 3 s Max

APPLICATIONS

High power radio transmission
Power amplifier for cellular base station
Amplifier for cable TV

I. ELECTRICAL SPECIFICATIONS

Designation	AT 03HV03 R2 RoHS	AT 03HV06 R2 RoHS	AT 03HV10 R2 RoHS	AT 03HV15 R2 RoHS	AT 03HV20 R2 RoHS
From below Capacitance range (pF) To above	1.5 +50% 3.0-0	2.0 +50% 6.0-0	2.0 +50% 10.0-0	3.0 +50% 15.0-0	4.5 +50% 20.0-0
Working Voltage (V_{DC})	350				
Withstanding Voltage (V_{DC})	770				
Working Temp. range	-40°C to +85°C				
Temp. Coeff. (ppm/°C)	0 ±200	0 ±300	0 ±300	0 ±500	0 ±500
Capacitance drift (pF)	0.1 Max	0.1 Max	0.3 Max	0.4 Max	0.5 Max
Setting drift	<1%				
Typical Self-Resonance Frequency at CMax (GHz)	2.0	1.4	1.1	0.9	0.8
Insulation Resistance (MΩ)	10000 min				
Q @ 1 Mz, Cmax	500 min				

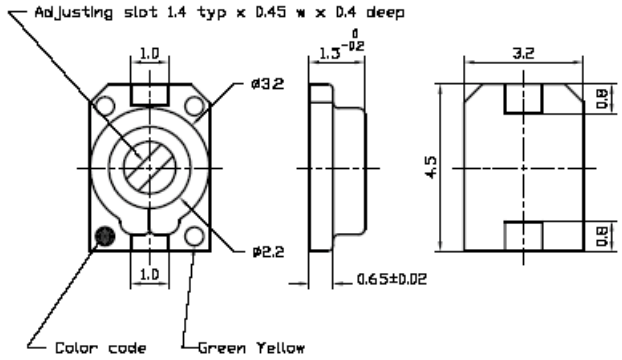
II. MECHANICAL AND GENERAL SPECIFICATIONS

Designation	AT 03HV03 R2 RoHS	AT 03HV06 R2 RoHS	AT 03HV10 R2 RoHS	AT 03HV15 R2 RoHS	AT 03HV20 R2 RoHS
Color Code	Black	Blue	None	Pink	Red
Rotating Torque	10 to 70 g.cm				
Tensile strength of terminaison	250 g				
Resistance to axial load	500 g				

RoHS Compliant

SMD HIGH VOLTAGE CHIP TRIM CERAMIC TRIMMER CAPACITORS AT 03HV00 R2 SERIES

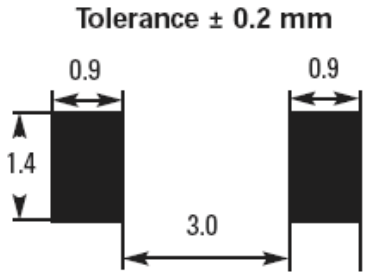
III. OUTLINE DIMENSIONS



Green Yellow dot means AT 03HV00 RoHS series, and color dot indicates reference of the model

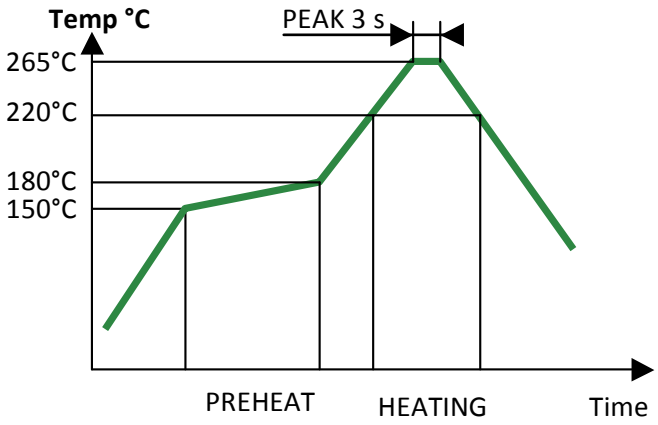
IV. SOLDERING

AT 03HV00 RoHS Series Typical solder pad layout



Recommended reflow solder temperature profile

Maximum Soldering Temperature 265°C MAX



V. PACKAGING

Parts are delivered :

- on tape and reel in 12 mm width carrier tape in quantities of 1000 pcs on 7 inches reel

VI. HOW TO ORDER

Parts on tape and reel:

Example

Designation	R2	RoHS
AT 03HV03	R2	RoHS

VII. TUNING

- Recommended Tuning Tool reference: AT 8777
- When tuning, do not apply an axial force higher than 1.5 N (150 g)

VIII. STORAGE CONDITIONS

Do not store components under direct sunlight or in dewy environment, and in corrosive condition.

Before use, store components under condition of -10°C to +40°C and humidity of 75% RH Max.

It is recommended to use components within 6 months after delivery.

SMD THIN CERAMIC TRIMMER CAPACITORS AT 9401G RoHS SERIES

RoHS Compliant

DESCRIPTION

Miniaturized trimmers

Performance up to 2 GHz and beyond
Very small size and weight
Ceramic dielectric
Rated voltage 250 V_{DC}
Low capacitance drift, very stable over time
Extremely low ERS and ESL
High resonance frequency and very good Q
Terminations are **gold plated**
Delivered on tape and reel (SL1 version)
RoHS compliant
Max Soldering Temperature 260°C, 10s Max

APPLICATIONS

RF amplifier, Filter networks
Military and Avionics equipment
Medical devices
DR/Crystal Oscillators
Broadband wireless LAN, Antenna tuning
Telemetry

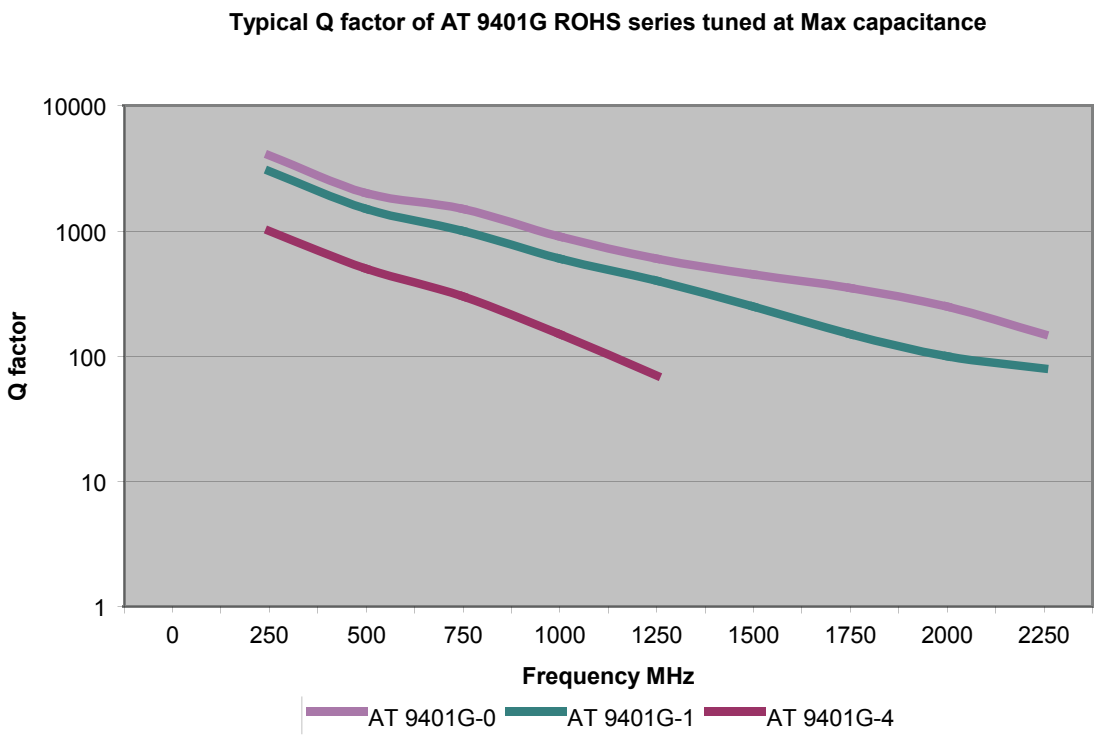
I. ELECTRICAL SPECIFICATIONS

Designation	AT 9401G-0 RoHS AT 9401G-0 SL1 RoHS	AT 9401G-1 RoHS AT 9401G-1 SL1RoHS	AT 9401G-2 RoHS AT 9401G-2 SL1 RoHS	AT 9401G-4 RoHS AT 9401G-4 SL1 RoHS
Capacitance range (pF)	0.25 => 0.7	0.5 => 1.3	0.6 => 2.0	1.5 => 4.0
Working Voltage (V_{DC})	250			
Withstanding Voltage (V_{DC})	500			
Working Temp. range	-55°C to +125°C			
Temp. Coeff. (ppm/°C)	50 ±50	NPO ±100	-400 ±200	-1100 ±300
Setting drift	< 1%			
Typical Q @ 100 MHz, CMax	>1000	>1000	>1000	>500
Insulation Resistance (MΩ)	10000 min			

RoHS Compliant

SMD THIN CERAMIC TRIMMER CAPACITORS AT 9401G RoHS SERIES

II. TYPICAL Q FACTOR



III. MECHANICAL AND GENERAL SPECIFICATIONS

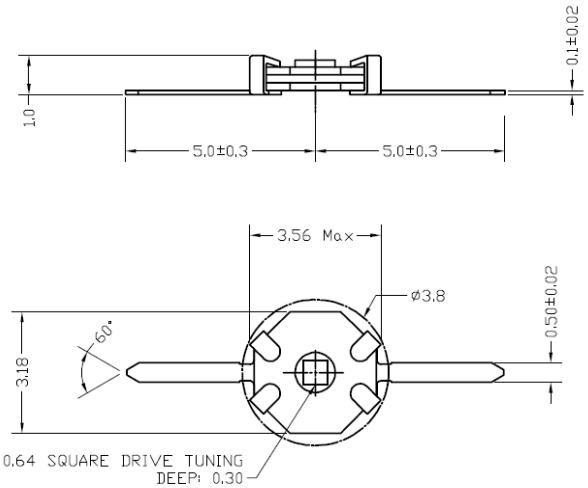
Designation	AT 9401G-0 RoHS AT 9401G-0 SL1 RoHS	AT 9401G-1 RoHS AT 9401G-1 SL1 RoHS	AT 9401G-2 RoHS AT 9401G-2 SL1 RoHS	AT 9401G-4 RoHS AT 9401G-4 SL1RoHS
Rotating torque (cN.cm)	5 to 70			
Shock	100g @ 6 ms			
Vibration	15g @ 10-2000 Hz			
Moisture resistance	MIL-STD-202, Method 106			

SMD THIN CERAMIC TRIMMER CAPACITORS AT 9401G RoHS SERIES

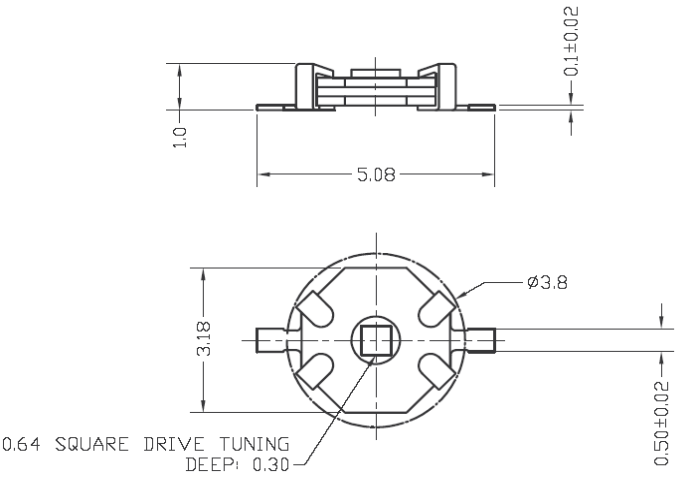
RoHS Compliant

IV. OUTLINE DIMENSIONS

Standard model

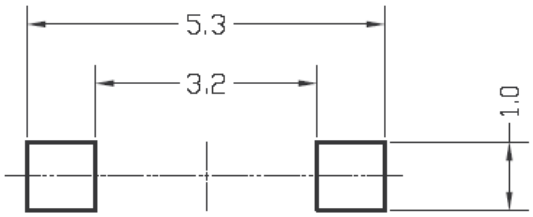


SL1 model



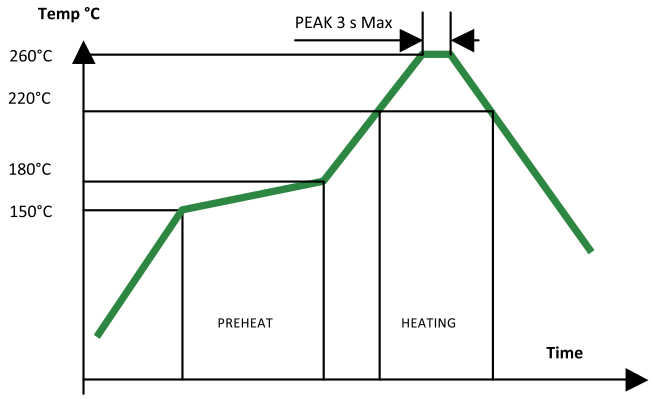
V. SOLDERING

Typical solder pad layout for SL1 model



Recommended reflow solder temperature profile

Maximum Soldering Temperature 260°C MAX



RoHS Compliant

SMD THIN CERAMIC TRIMMER CAPACITORS AT 9401G RoHS SERIES

VI. PACKAGING

Parts delivered :

Standard model: in bulk
SL1 model: in bulk for quantity lower than 1500 pcs
on tape and reel in 12 mm width carrier tape in quantities of 1500 pcs on 7 inches reel

VII. HOW TO ORDER

Standard model and SL1 model in qty < 1500 pcs

Examples

Designation	RoHS
AT 9401G-1	RoHS
AT 9401G-0 SL1	RoHS

SL1 model on tape and reel:

Example

Designation	R3	RoHS
AT 9401G-4 SL1	**R3**	RoHS

Qty 1500 pcs

VIII. TUNING TOOL

Tuning Tool reference: AT 4192

IX. RECOMMENDATION FOR CLEANING

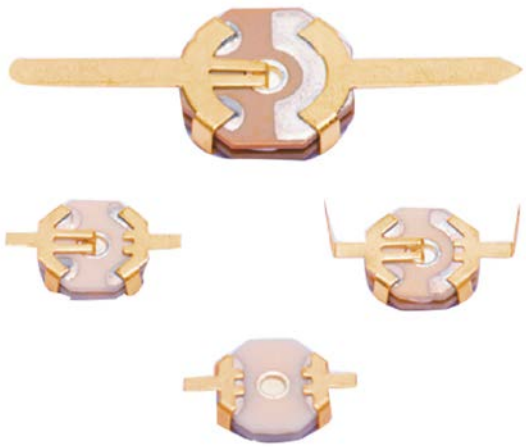
SMD Thin AT 9401G RoHS series are compatible with a wide variety of cleaning process including those that utilize aqueous or semi-aqueous solutions, alcohol solutions, de-ionized water and numerous other cleaners. However, due to the large variety of such processes, the customer through cleaning process evaluation in conjunction with **EXXELIA** product purchased must determine actual compatibility. SMD Thin AT 9401G RoHS series capacitors should be cleaned in contamination free solution. If rough torque occurs after cleaning, re-clean in fresh solution.

SMD THIN CERAMIC TRIMMER CAPACITORS AT 9402G & AT 9410G SERIES

RoHS Compliant

DESCRIPTION

Miniaturized trimmers
Thin profile
Very small size and weight
Ceramic dielectric
Rated voltage 250 V_{DC}
Low capacitance drift, very stable over time
Very good Q
Terminations are **gold plated**
Delivered on tape and reel (SL1 version)
RoHS compliant
Non magnetic models
Max Soldering Temperature 260°C, 10s Max



APPLICATIONS

RF amplifier, Filter networks
DR/Crystal Oscillators
Military and Avionics equipment
Broadband wireless LAN, Antenna tuning
Medical devices
Telemetry

I. ELECTRICAL SPECIFICATIONS

I.1 AT 9402G RoHS series

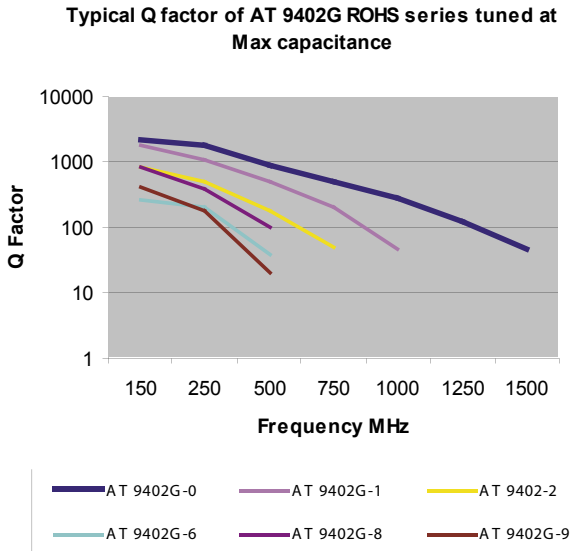
Designation	AT 9402G-0 RoHS AT 9402G-0 SL1 RoHS	AT 9402G-1 RoHS AT 9402G-1 SL1 RoHS	AT 9402G-2 RoHS AT 9402G-2 SL1 RoHS	AT 9402G-4 RoHS AT 9402G-4 SL1 RoHS	AT 9402G-6 RoHS AT 9402G-6 SL1 RoHS	AT 9402G-8 RoHS AT 9402G-8 SL1 RoHS	AT 9402G-9 RoHS AT 9402G-9 SL1 RoHS
From below Capacitance range (pF)	0.5	1.0	2.5	3.0	8.0	5.0	7.0
To above	2.5	5.0	10.0	12.0	25.0	15.0	18.0
Working Voltage (V_{DC})	250 V_{DC}						
Test Voltage (V_{DC})	500 V_{DC}						
Working Temp. range	-55°C to +125°C						
Temp. Coeff. (ppm/°C)	100 ±100	100 ±200	-50 ±100	-1100 ±300	-1100 ±300	-300 ±300	-450 ±300
Setting drift	< 1%						
Typical Q@100 MHz,CMax	3000	1000	1000	500	300	750	500
Insulation Resistance (MΩ)	10000 min						

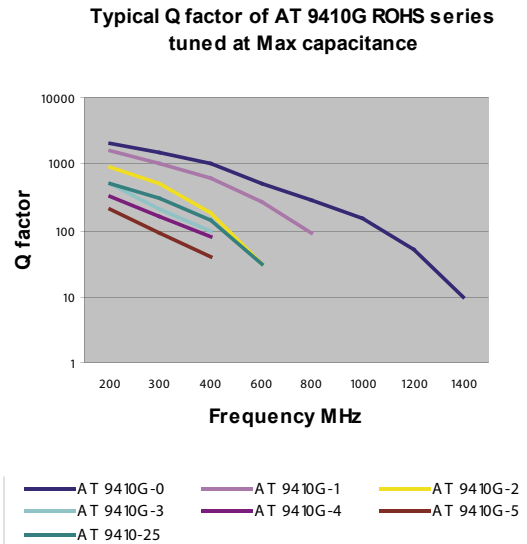
RoHS Compliant

SMD THIN CERAMIC TRIMMER CAPACITORS AT 9402G & AT 9410G SERIES

II. AT 9410G ROHS SERIES

Designation	AT 9410G-0 RoHS AT 9410G-0 SL1 RoHS	AT 9410G-1 RoHS AT 9410G-1 SL1 RoHS	AT 9410G-2 RoHS AT 9410G-2 SL1 RoHS	AT 9410G-3 RoHS AT 9410G-3 SL1 RoHS	AT 9410G-4 RoHS AT 9410G-4 SL1 RoHS	AT 9410G-5 RoHS AT 9410G-5 SL1 RoHS	AT 9410G-25 RoHS AT 9410G-25 SL1 RoHS
From below Capacitance range (pF) To above	1.0 4.5	2.5 10.0	4.0 18.0	6.0 35.0	7.0 40.0	10.0 50.0	5.0 25.0
Working Voltage (V_{DC})	250 V_{DC}						
Test Voltage (V_{DC})	500 V_{DC}						
Working Temp. range	-55°C to +125°C						
Temp. Coeff. (ppm/°C)	50±50	-100±200	-400±200	-1100±300	-1100±300	-1500±500	NPO±150
Setting drift	< 1%						
Typical Q@100 MHz,CMax	1000	1000	700	200	200	200	200
Insulation Resistance (MΩ)	10000 min						





III. MECHANICAL AND GENERAL SPECIFICATIONS

Designation	AT 9402G RoHS Series	AT 9410G RoHS Series
Rotating torque (cN.cm)	5 to 70	14 to 140
Shock	100 g @ 6ms	
Vibration	15 g @ 10-200 Hz	
Moisture resistance	MIL-STD-202, Method 106	

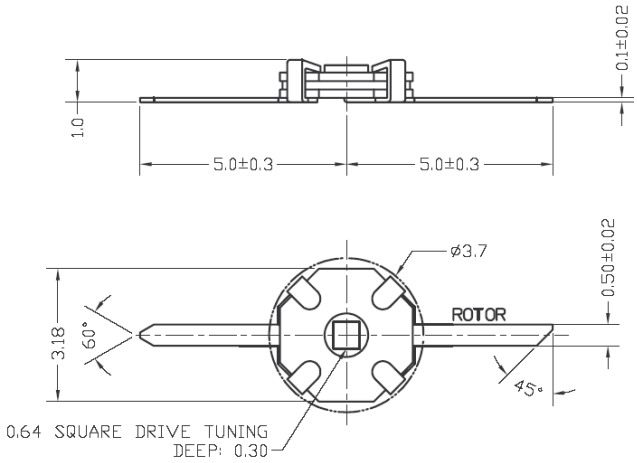
SMD THIN CERAMIC TRIMMER CAPACITORS AT 9402G & AT 9410G SERIES

RoHS Compliant

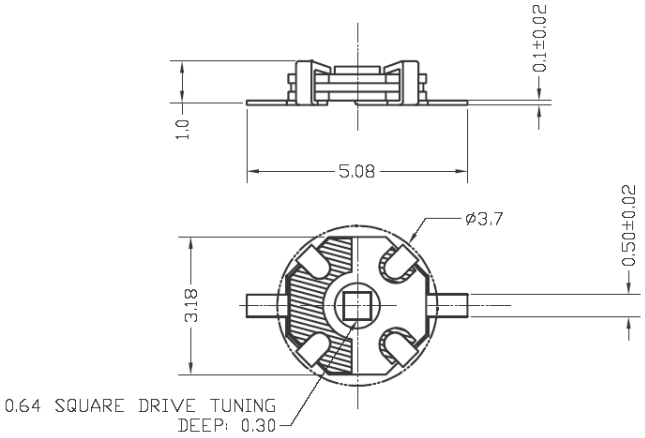
IV. OUTLINE DIMENSIONS

IV-1. AT 9402G series

Standard model

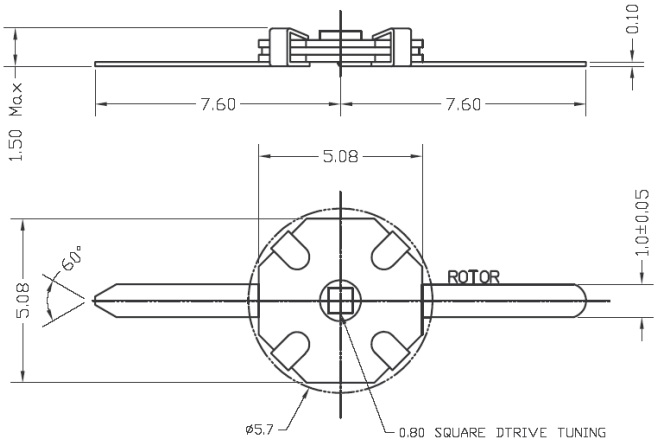


SL1 model

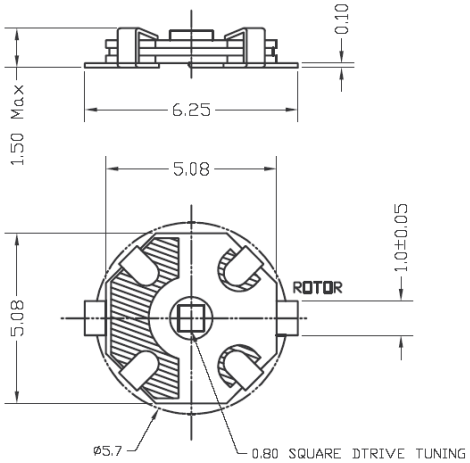


IV-1. AT 9410G SERIES

Standard model

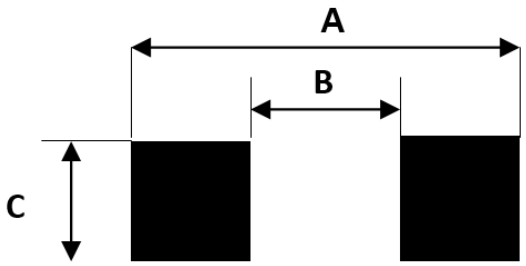


SL1 model



V. SOLDERING

Typical solder pad layout for SL1 model



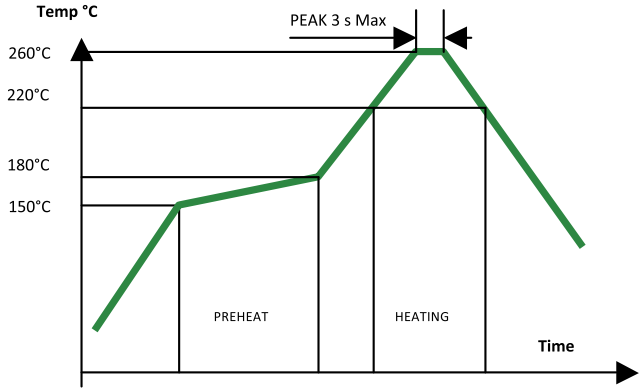
Dim in mm (inches)	AT 9402G SL1	AT 9410G SL1
A	5,3 (0,209)	6,6 (0,260)
B	3,2 (0,126)	5,3 (0,209)
C	1,0 (0,039)	1,5 (0,059)

RoHS Compliant

SMD THIN CERAMIC TRIMMER CAPACITORS AT 9402G & AT 9410G SERIES

Recommended reflow solder temperature profile

Maximum Soldering Temperature 260°C MAX



VI. PACKAGING

VI-1. AT 9402G series

Standard model: in bulk

SL1 model: in bulk for quantity lower than 1500 pcs

on tape and reel in 12 mm width carrier tape in quantities of 1500 pcs on 7 inches reel

VI-2. AT 9410G series

Standard model: in bulk

SL1 model: in bulk for quantity lower than 3000 pcs

on tape and reel in 24 mm width carrier tape in quantities of 3000 pcs on 13 inches reel

VII. HOW TO ORDER

Standard model and SL1 model in qty <1500 pcs for AT 9402G SL1 and qty < 3000 pcs for AT 9410G SL1

Examples

Designation	RoHS
AT 9402G-1	RoHS
AT 9410G-5 SL1	RoHS

AT 9402G SL1 model on tape and reel

Example for Qty 1500 pcs

Designation	R3	RoHS
AT 9402G-4 SL1	**R3**	RoHS

AT 9410G SL1 model on tape and reel

Example for Qty 3000 pcs

Designation	R7	RoHS
AT 9402G-4 SL1	**R7**	RoHS

VIII. TUNING TOOL

Tuning Tool reference: AT 4192 for AT 9402G series

AT 4193 for AT 9410G series

IX. RECOMMENDATIONS FOR CLEANING

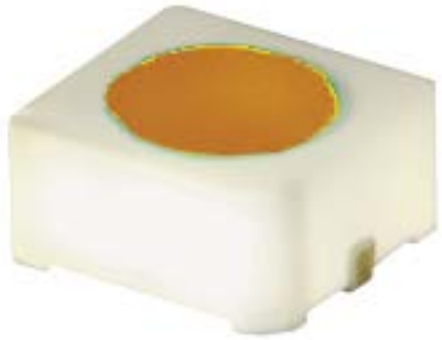
SMD Thin AT 9402G RoHS and AT 9410G RoHS series are compatible with a wide variety of cleaning process including those that utilize aqueous or semi-aqueous solutions, alcohol solutions, de-ionized water and numerous other cleaners. However, due to the large variety of such processes, the customer through cleaning process evaluation in conjunction with **EXXELIA** product purchased must determine actual compatibility. SMD Thin AT 9401G RoHS and AT 9410G RoHS series capacitors should be cleaned in contamination free solution. If rough torque occurs after cleaning, re-clean in fresh solution.

SMD HERMETIC CERAMIC TRIMMER CAPACITORS AT 23XXG SERIES

RoHS Compliant

DESCRIPTION

Ceramic dielectric
Very compact package type (alumina housing)
Withstand harsh environments
Resistant to penetration of solder fluxes and cleaning solvents
Rated voltage 250 V_{DC}
Low capacitance drift, very stable over time
Terminations are **gold plated**
RoHS compliant
High resonance frequency and very good Q
Non magnetic component
Delivered on 12 mm tape and reel
Max Soldering Temperature 260°C, 10s Max



APPLICATIONS

RF power amplifier, LC filters
Military and Avionics equipment
Medical devices
DR/Crystal Oscillators
Broadband wireless LAN
Telemetry
Medical devices

I. ELECTRICAL SPECIFICATIONS

Designation	AT 2320G-0 RoHS	AT 2320G-1 RoHS	AT 2320G-2 RoHS	AT 2320G-3 RoHS	AT 2340G-4 RoHS
From below Capacitance range (pF)	0.6	1.0	2.5	7.5	8.5
To above	2.5	5.0	10.0	18.0	22.0
Working Voltage (V_{DC})	250				
Withstanding Voltage (V_{DC})	500				
Working Temp. range	-55°C to +125°C				
Temp. Coeff. (ppm/°C)	100 ±200	100 ±200	100 ±200	-450 ±300	-1100 ±300
Setting drift	< 1%				
Typical Q @ 100 MHz, CMax	>3000	>1000	>1000	>500	>300
Insulation Resistance (MΩ)	10000 min				

RoHS Compliant

SMD HERMETIC CERAMIC TRIMMER CAPACITORS AT 23XXG SERIES

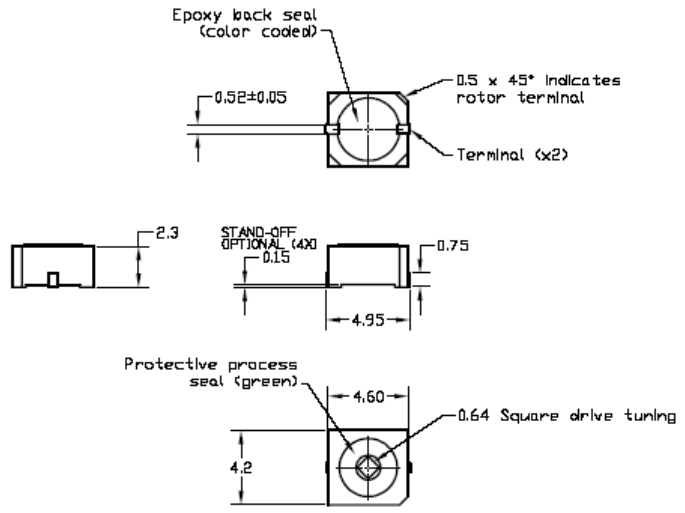
II. MECHANICAL AND GENERAL SPECIFICATIONS

Designation	AT 2320G-0 RoHS	AT 2320G-1 RoHS	AT 2320G-2 RoHS	AT 2320G-3 RoHS	AT 2340G-4 RoHS
Rotating torque	4 to 70 cN.cm				
Shock	100g @ 6 ms				
Vibration	15 g @ 10-2000 Hz				
Moisture resistance	MIL-STD-202, Method 106				

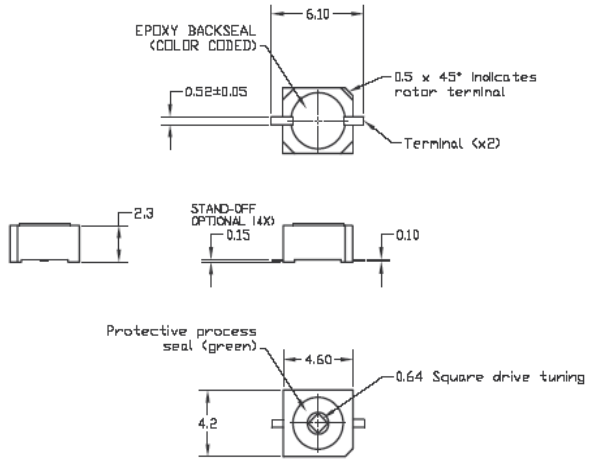
Color of epoxy back seal, on bottom side, is the color code

III. OUTLINE DIMENSIONS

Standard model



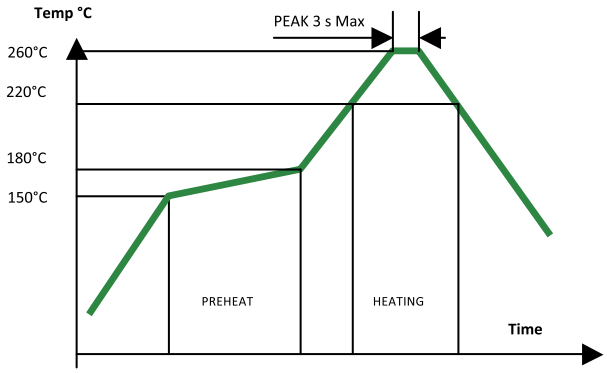
SL1 model



IV. SOLDERING

Recommended reflow solder temperature profile

Maximum Soldering Temperature 260°C MAX



SMD HERMETIC CERAMIC TRIMMER CAPACITORS AT 23XXG SERIES

RoHS Compliant

V. PACKAGING

Parts delivered :

- in bulk for quantity lower than 500 pcs
- on tape and reel in 12 mm width carrier tape in quantities of 500 pcs on 7 inches reel 7

VI. HOW TO ORDER

Parts in quantity < 500 pcs

Example

Designation	RoHS
AT 2320G-1	RoHS

Parts on tape and reel

Examples

Designation	R1	RoHS
AT 2320G-2	**R1**	RoHS
AT 2320G-1 SL	**R1**	RoHS

VII. TUNING TOOL

Tuning Tool reference: AT 4192-1

VIII. STORAGE INSTRUCTIONS

Hermetic Ceramic Trimmer Capacitors are packed with a 1/6 unit of desiccant and must remain in their original packing as long as possible before soldering. Care should be taken to make sure the re-sealable outer bag is completely sealed after each use.

All Hermetic Ceramic Trimmer Capacitors should be stored in a temperature and humidity controlled environment.

If Hermetic Ceramic Trimmer Capacitors need to be re-packed then they must be packed in a re-sealable poly/metal anti-static bag with a fresh 1/6 unit of desiccant.

If Hermetic Ceramic Trimmer Capacitors have been inadvertently left exposed to ambient humidity, then dry the units per the following procedure:

For units that are not in tape & reel packaging
Place units in an oven at 35°C for 8 hours minimum or faster drying may be done at 120°C-150°C for 60 to 90 minutes. Re-pack using fresh desiccant packs after drying.

For units that are in tape & reel packaging
Place units in an oven at 35°C for 8 hours minimum. Re-pack using fresh desiccant packs after drying

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

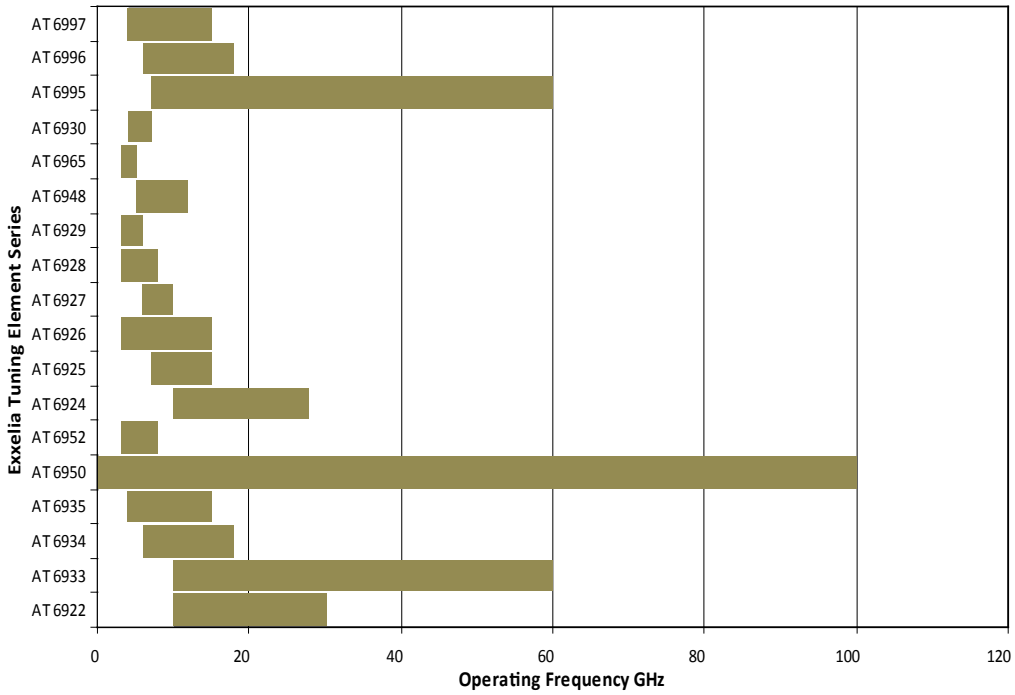
Comb-line and inter-digital filters

Coaxial structures

Waveguide circuitry

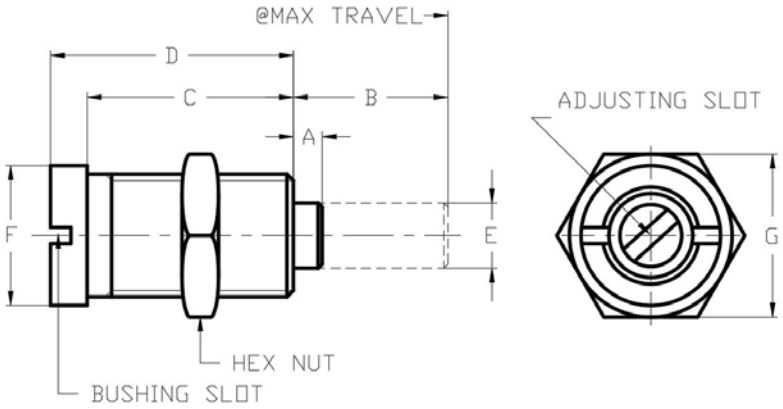
Gunn oscillators

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.



RoHS Compliant

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

RoHS Compliant

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.

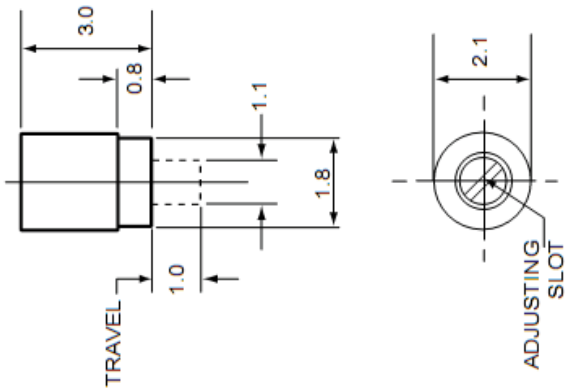
Designation	Frequency Band	Bushing Thread UNS	A		B		C		D		ØE		ØF		G	
			mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
AT 6950-0 SL RoHS	Broad Band	.120-80	0.6	(0.024)	4.3	(0.169)	5.1	(0.201)	6.0	(0.236)	1.6	(0.063)	3.4	(0.134)	4.0	(0.157)
AT 6950-1 SL RoHS			0	(0.000)	3.3	(0.130)	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

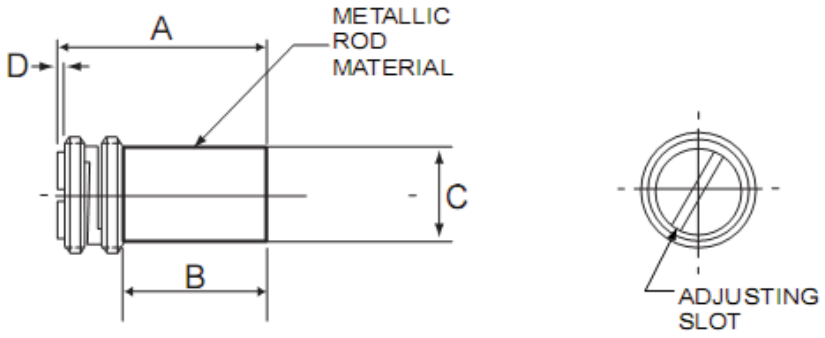
MICROWAVE TUNING ELEMENTS

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

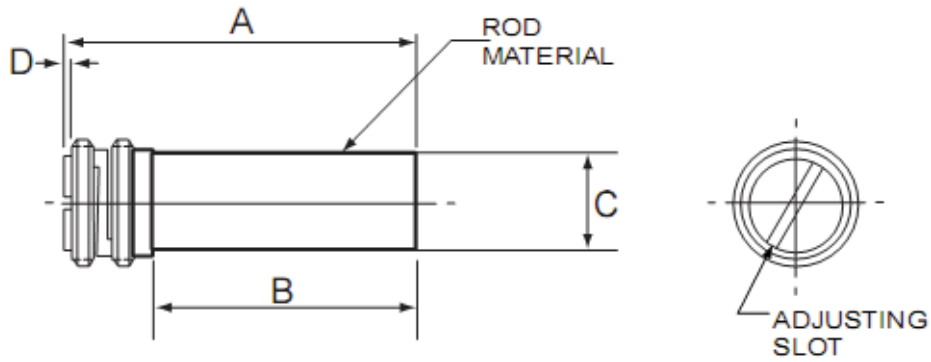
Designation	Thread	A		B		Ø C		D		Slot W x L
		mm	inches	mm	inches	mm	inches	mm	inches	
AT 6501-3 RoHS	M 1.5 x 0.25	4.4	(0.173)	2.3	(0.091)	1.1	(0.043)	0.4	(0.016)	0.25 x 1.1
AT 6501-0 RoHS	M 2.5 x 0.25	5.4	(0.213)	3.3	(0.130)	2.1	(0.083)			0.4 x 1.9
AT 6501-1 RoHS		4.4	(0.173)	2.3	(0.091)					
AT 6501-2 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

RoHS Compliant

II.2 DIELECTRIC TUNING ROTORS



Models with dielectric rod

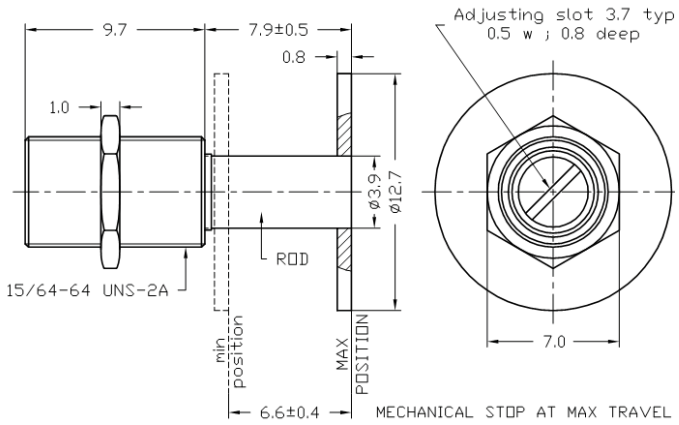
Designation	Rod material	Thread	A		B		Ø C		D		Slot W x L
			mm	inches	mm	inches	mm	inches	mm	inches	
AT 6930-4 RoHS	Sapphire	.094-80 UNS	5.8	(0.228)	2.5	(0.098)	0.9	(0.035)	0.5	(0.020)	0.4 x 1.5
AT 6930-8 RoHS			6.6	(0.260)	3.5	(0.138)	1.6	(0.063)	0.5	(0.020)	

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)

CUSTOM DESIGN upon request

RoHS Compliant

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

INVAR TUNING ELEMENTS AND SCREWS

RoHS Compliant

OBJECTIVES:

Increasing demands in Tuning Elements for high frequency Space Applications pushed us to develop a range of tuning elements based on Invar. Nowadays, and especially in space applications, working frequencies are shifting to higher values. This requires very precise tuning elements matching with smaller cavity filters working in Ka, Ku or even Q bands. In order to provide an efficient response to those constraints, **EXXELIA** has developed an innovative and unrivaled solution: Invar Tuning Elements with Self-Locking System.

STATEMENT

Invar-36 is a unique alloy Iron-Nickel which has for main properties a very low thermal coefficient of expansion at a precise composition (64 % Fe / 36 % Ni).

With 1.1 ppm. K^{-1} between 0°C and 100°C, Invar-36 is about 17 times more stable than Brass which is the traditional and most used alloy to make Tuning Elements.

The working range of temperatures is so wide in Space that this property becomes essential for a reliable and stable cavity filter tuning.

Self-locking system is a technology commonly used on Tuning Element made of Brass or other alloys easy to machine.

This mechanism consists of two threaded segments separated by two parallel slots. After cutting the both parallel slots, the rotor is compressed in its length in order to create a plastic deformation. Thus, we have induced an offset between both threaded segments that generates a constant tensile stress in the rotor as soon as both threaded segments are screwed.

The spring effect created by the self-locking system has several advantages: controlled torque (no need to add a locking nut), high electrical contacts, size reduction and precision of the setting by avoiding any slack while tuning.

Our wide range of customer in aerospace and defence application are using our screws.

ABILITIES

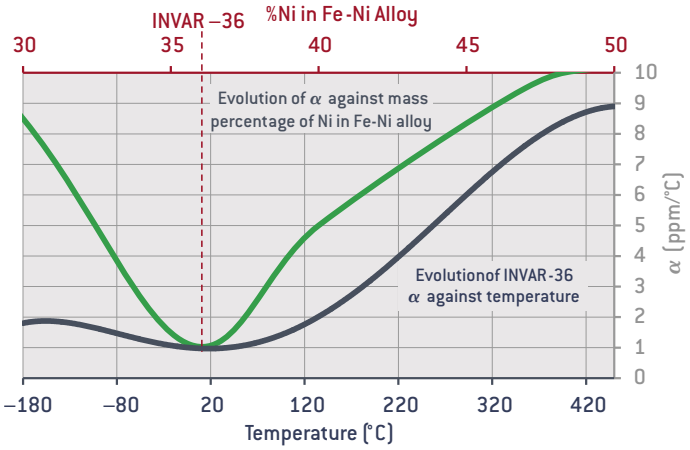
Despite the high difficulty to machine Invar, we are now able to manufacture a complete Invar rotor with self-locking system. All our Invar rotors are customized and made under specific request. Our flexibility and our experience with Invar allow us to now respond to almost every request.

Our common abilities are displayed in the below table, valid with or without self-locking system:

Beyond those values, we can make every intermediate diameters and even bigger than 2.0 mm. Given maximum lengths can be overtaken after a debug step.

If you need a complete Tuning Element with its bushing, we can design specific Brass or Invar bushing that will fit exactly with the Invar rotor. This will guarantee the best «setting drift» and therefore, the screwing torque will be perfectly controlled.

EXXELIA has a very long space history with numerous companies. This new range of product has already been qualified by some of them. We escort our customers from the earliest step of design-in to the industrialization and we are always ready to take up new challenges.



INVAR (ALLOY 36) TUNING ELEMENTS

The performance of a microwave filter over temperature is becoming more and more important, especially for narrow bandwidth high frequency filters.

Invar alloy offers very good Coefficient of Thermal Expansion (CTE) and can achieve the desired temperature characteristics.

This alloy can become difficult to machine especially with fine pitch threads. With more than 40 years experience, **EXXELIA** offers a complete range of standard products and is particularly able to work on specific request for custom designs with its prototyping dedicated team and R&D equipment.

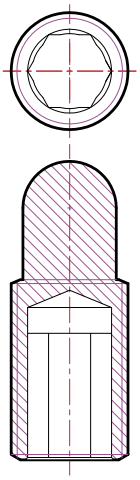
EXXELIA has designed several types of invar screws in order to answer to specific request from customers. These screws are now “space” qualified as flight model for KA and Ku band filters. In some cases, the fine pitch resolution has halved the technician tuning time.

INVAR 36 TUNING SCREWS

Invar tuning elements consist of an Invar screw and its brass nut. Screw can be gold or silver plated. We can offer different size, style and types of head (hex, slotted, pan). The array below is an example of Invar tuning elements already designed and qualified for space applications.

RoHS Compliant

EXAMPLES INVAR TUNING SCREWS



APPLICATION RANGE

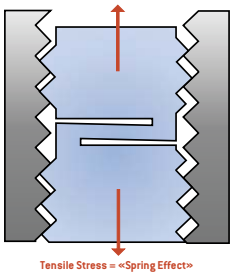
Diameter in mm (inches)	1.2- 3.5 (0.05- 0.14)
Thread in mm (inches)	0,25- 0.45 (0.01- 0.02)
Application	Microwave filters
Markets	Space Combine and inter-digital filters Coaxial structures Waveguide circuitry

CHARACTERISTICS

EXXELIA masters the challenging machining of Invar 36. This work of high precision allows you a fine tuning resolution with a high stability over the temperature and over the time (available with self-locking system). **EXXELIA** is able to produce customized design including options like gold or silver plating or Hi-Rel versions. Our Invar screws are “space” qualified as flight models for KA, Ku up to Q band filters.

FEATURES

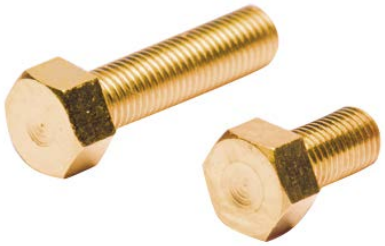
Very low coefficient of thermal expansion (CTE) for demanding applications



Self-Locking System operating principle

EXAMPLES INVAR TUNING SCREWS

RoHS Compliant



Can also be produced in aluminum

DESCRIPTION

High precision
High resolution tuning
Very low coefficient of thermal expansion
Available with gold or silver plating
Available with locking nut or “self locking system”
Adjustments in applications from Ka, KU, Q 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
Space applications

MODELS AND DIMENSIONS

Metric Screws mm (inches)			
Ø diameter	**thread**	**length**	**tolerances**
M1.5	0.25 (0.01)	up to 5 (0,197)	6H
M2	0.25 (0.01)	up to 9 (0,354)	6H
M2	0.4 (0,016)	up to 9 (0,354)	6H
M2.5	0.25 (0.01)	up to 11 (0,433)	6H
M2.3	0.25 (0.01)	up to 11 (0,433)	6H
M2.5	0.45 (0,018)	up to 11 (0,433)	6H
M3.5	0.35 (0,0138)	up to 11 (0,433)	6H

Rotor diameter	Finest Thread	Max. Length	Tolerances
mm (inches)			
1.2 (0.05)	0.25 (0.01)	8 (0.31)	6H
1.5 (0.06)	0.25 (0.01)	9 (0.35)	6H
2.0 (0.08)	0.25 (0.01)	11 (0.43)	6H

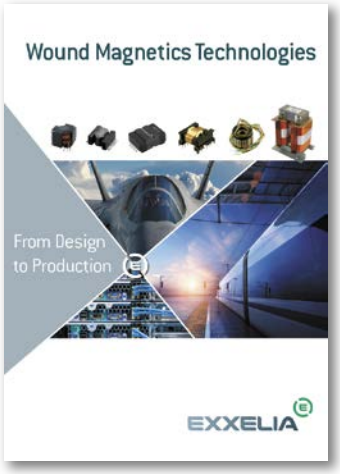
Custom dimensions are available upon request

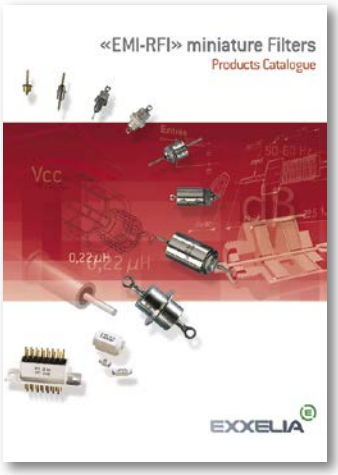
PACKAGING

Parts are delivered in bulk.

NOTES

EXXELIA Components Portfolio





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