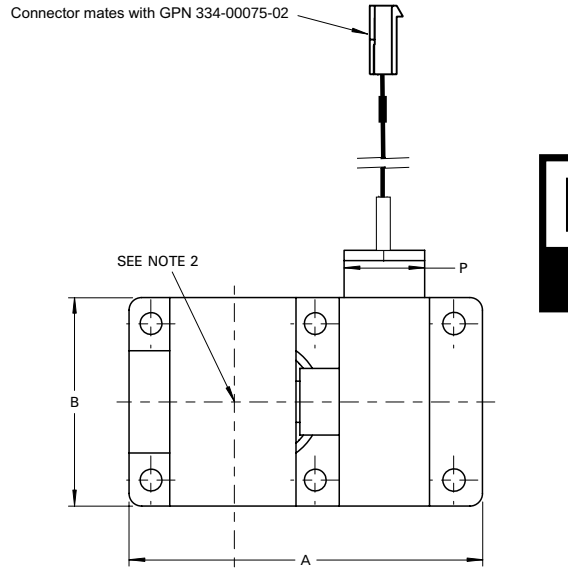
SPECIFICATION CONTROL DRAWING

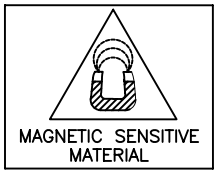
DWG. NO. 690-A0005-01

REVISIONS

REV.	DATE	DESCRIPTION	ECO NO.
A	1/24/08	INITIAL RELEASE	----
B	1/13/09	ADD CONNECTOR, NOTES AND BOM	58976



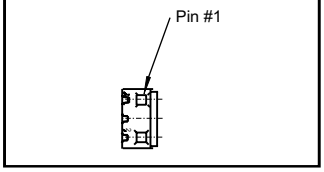
RoHS Compatible

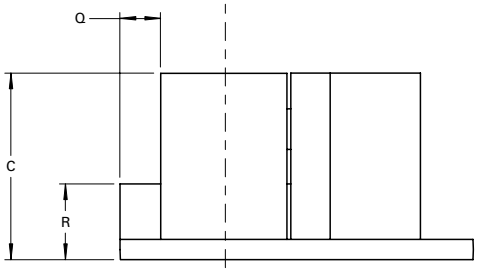


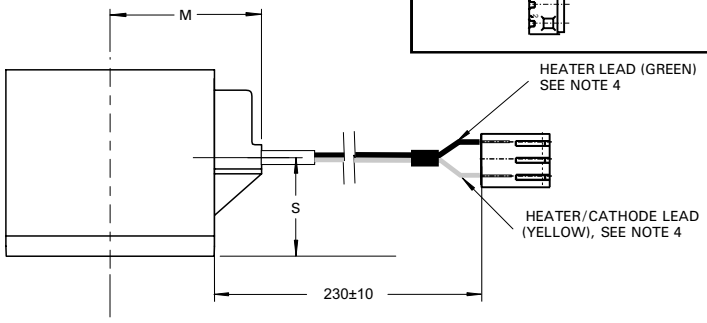
(All dimensions without limits are nominal)

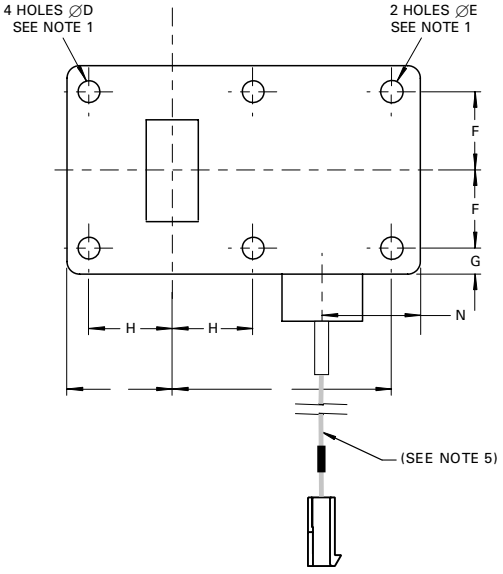
Ref	Millimetres	Ref	Millimetres
A	73.0 max	H	16.26
B	42.0 max	J	20.2 max
C	40.0 max	K	43.74
D	4.39 max 4.24 min	M	30.0 max
		N	19.0
E	4.52 max 4.37 min	P	16.0
		Q	8.0 min
F	15.5	R	15.5 max
G	5.2	S	19.0 ± 1.0

Color	Element	Connector Pin #
Green	Heater	1
Yellow	Heater, Cathode	2









Warning!

A minimum clearance of 25 mm must be maintained between the magnetron and any magnetic materials.

A clearance of at least 50 mm is needed to prevent mutual attraction between magnetrons when removed from protective packaging.

Outline Notes

1. Positional tolerance 0.4 mm diameter.
2. Anode temperature measured at this point.
3. The mating surface of the magnetron baseplate will be flat to within 0.2 mm.
4. Silicone rubber insulated leads, 3.2mm diameter, contained within dimension P.
5. Wires to be secured together with shrink tubing.

		DATE
TOLERANCE (UNLESS NOTED OTHERWISE)	DRWN SC	1/24/08
.XX ±.010", 0.25mm .XXX ±.005", 0.13mm HOLES ±.003", 0.08mm ANGLES ±0 DEG./30 MIN.	CHKD. SR	2/22/08
	PROJ. MGR. TDS	2/25/08
	RLS BY MKD	2/26/08

GARMIN®
Garmin Ltd. or its subsidiaries
c/o Garmin International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

TITLE: Magnetron, 12kW, MG4010

SIZE	DWG. NO.	REV.
A	690-A0005-01	B

SCALE	SHT.	OF
NONE	1	5

ABRIDGED DATA

Compact, rugged, lightweight, fixed frequency pulse magnetron with very low levels of unwanted emissions.

Operating frequency	9410 ± 30	MHz
Typical peak output power	12.5	kW
Magnet		integral
Cooling		conduction and natural

GENERAL

Electrical

Cathode		indirectly heated
Heater voltage (see note 1)	6.3	V
Heater current at 6.3 V (see note 2)	0.55	A
Cathode pre-heating time (minimum) (see note 3)	60	s
Input capacitance	8.0	pF max
Temperature coefficient of frequency		see note 4
Frequency stability under mechanical shock		see note 5

Mechanical

Overall dimensions		see outline
Net weight	250 g approx	
Mounting position		any
Output		no. 16 waveguide
Coupler		IEC UBR/PBR/CBR 100

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Cooling . . . . . conduction and natural

MAXIMUM AND MINIMUM RATINGS
(Absolute values)

These ratings cannot necessarily be used simultaneously, and no individual rating should be exceeded.

	Min	Max	
Heater voltage (see note 1)	5.7	6.9	V
Heater starting current (peak)	–	3.0	A
Anode voltage (peak)	5.4	6.4	kV
Anode current (peak)	3.0	6.0	A
Input power (mean) (see note 6)	–	70	W
Duty cycle	–	0.0025	
Pulse duration	–	2.5	µs
Rate of rise of voltage pulse (see notes 7 and 8)	–	150	kV/µs
VSWR at the output coupler	–	1.5:1	
Anode temperature	−55	120	°C

TYPICAL OPERATION
Operating Conditions

Heater voltage (for operation)	6.3	V
Anode current (peak)	5.0	A
Pulse duration	1.0	µs
Pulse repetition rate	1000	pps
Rate of rise of voltage pulse	60	kV/µs

Typical Performance

Anode voltage (peak)	5.8	kV
Output power (peak)	12.5	kW
Output power (mean)	12.5	W

TEST CONDITIONS AND LIMITS

The magnetron is tested to comply with the following electrical specification.

Test Conditions

Heater voltage (for test)	6.3	V
Anode current (mean)	5.0	mA
Duty cycle	0.001	
Pulse duration (see note 9)	1.0	µs
VSWR at the output coupler	1.15:1	max
Rate of rise of voltage pulse (see note 7):		
using hard tube pulser	150	kV/µs min
alternatively using line type pulser	75	kV/µs min

Limits

	Min	Max	
Anode voltage (peak) (see note 10)	5.4	6.0	kV
Output power (mean)	10	–	W
Frequency (see note 11)	9380	9440	MHz
RF bandwidth at $^1/_4$ power (see note 12)	–	2.5	MHz
Frequency pulling (VSWR not less than 1.5:1) (see note 12)	–	30	MHz
Stability (see note 13)	–	0.1	%
Heater current		see note 2	

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SCALE NONE		SHT. 2 OF 5

NOTES

1. No reduction of heater voltage is required at any value of mean input power. For optimum performance a value within the specified ratings must be maintained.

   The magnetron heater must be protected against arcing by the use of a minimum capacitance of 4000 pF shunted across the heater directly at the input terminals; in some cases a capacitance as high as 2 µF may be necessary depending on the equipment design. For further details see the Magnetron Preamble.
2. Measured with heater voltage of 6.3 V and no anode input power, the heater current limits are 0.5 A minimum, 0.6 A maximum.
3. For ambient temperatures above 0 °C. For ambient temperatures between 0 and −55 °C, cathode pre-heating time is 75 seconds minimum.
4. Design test only. The maximum frequency change with anode temperature change (after warming) is −0.25 MHz/°C.
5. Design test only. No permanent frequency shift will occur when the magnetron baseplate is subjected to an impulse of peak acceleration ⩽50 g for 2 ms in any direction.
6. The various parameters are related by the following formula:

   $$Pi = i_{apk} \times v_{apk} \times Du$$

   where Pi = mean input power in watts

   i_{apk} = peak anode current in amperes

   v_{apk} = peak anode voltage in volts

   and Du = duty cycle.
7. Defined as the steepest tangent to the leading edge of the voltage pulse above 80% amplitude. Any capacitance in the viewing system must not exceed 6.0 pF.
8. The maximum rate of rise of voltage for stable operation depends upon detailed characteristics of the applied pulse and the pulser design. The specified maximum rating applies to typical hard tube pulsers. For minimum starting jitter and optimum operation, the recommended rate of rise of voltage for most line type pulsers is from 50 to 65 kV/µs.
9. Tolerance ± 10%.
10. Measurements taken 'as read' using suitably calibrated equipment.
11. Measured at factory ambient. Anode temperature 40 °C approx.
12. Design test only.
13. Design test only. With the magnetron operating into a VSWR of 1.15:1 over a peak anode current range of 3.0 to 6.0 A. Pulses are defined as missing when the RF energy level is less than 70% of the normal energy level in a 0.5% frequency range. Missing pulses are expressed as a percentage of the number of input pulses applied during a two minute period of observation.

High Voltage

Equipment must be designed so that personnel cannot come into contact with high voltage circuits. All high voltage circuits and terminals must be enclosed and fail-safe interlock switches must be fitted to disconnect the primary power supply and discharge all high voltage capacitors and other stored charges before allowing access. Interlock switches must not be bypassed to allow operation with access doors open.

RF Radiation

Personnel must not be exposed to excessive RF radiation. All RF connectors must be correctly fitted before operation so that no leakage of RF energy can occur and the RF output must be coupled efficiently to the load. It is particularly dangerous to look into open waveguide or coaxial feeders while the device is energised. Screening of the cathode sidearm of high power magnetrons may be necessary.

X-Ray Radiation

High voltage magnetrons emit a significant intensity of X-rays not only from the cathode sidearm but also from the output waveguide. These rays can constitute a health hazard unless adequate shielding for X-ray radiation is provided. This is a characteristic of all magnetrons and the X-rays emitted correspond to a voltage much higher than that of the anode.

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SIZE	DWG. NO.	REV.
A	690-A0005-01	B
SCALE NONE		SHT. 3 OF 5

APPROVED MANUFACTURERS LIST

MANUFACTURER	E2V	
CODE	7403	
GARMIN P/N	P/N	
690-A0005-01	MG4010	

DWG. NO. 690-A0005-01

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SIZE	DWG. NO.	REV.
A	690-A0005-01	B
SCALE NONE		SHT. 4 OF 5

		Parent Item:	690-A0005-01						
		Description:	Magnetron,12kw,MG4010						
		Revision:	B						
		Method:							
Lev	**Bub**	**Ref Des**	**Comment**	**Item**	**Description**	**Qty**	**U/M**	**EFF DT**	**DIS DT**
				335-00093-02	Conn,Hsg,Wire to Bd,.156",2	1	EA	13-Jan-09	99/99/9999
			PURCH SEL,336-00047-02	336-00047-00	Cont,Terminal,Crimp,22~26 AWG	0	EA	13-Jan-09	99/99/9999
			PURCH SEL,336-00047-02	336-00047-01	Cont,Terminal,Crimp,18~22 AWG	0	EA	13-Jan-09	99/99/9999
			PURCH SEL,336-00047-02	336-00047-02	Cont,Terminal,Crimp,18~24 AWG	1	EA	13-Jan-09	99/99/9999
									ENDBOM