QUBIG

Empowering Laser Technologies

Test Data Sheet

PM9 - MWIR

(EO-T500T3-MIR)

S/N:

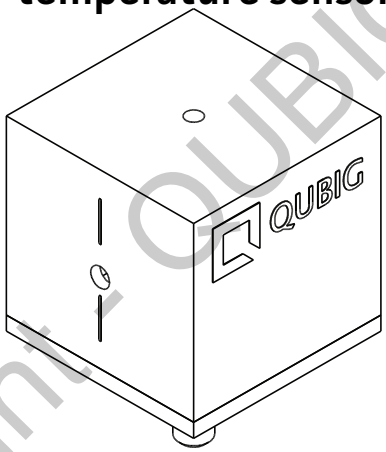
Resonant electro-optic phase modulator

with

- tunable resonance frequency

- thermal crystal mount

- temperature sensor



RF properties	Value	Unit
Resonance frequency: f_0 [1)]	475 - 545	MHz
Preset frequency: f_{set} [1)]	500	MHz
Bandwidth: Δν	2.25	MHz
Quality factor (BW): Q	222	
Required RF power for 1rad @ 4.5µm [2)]	42.1	dBm
max. RF power: RF_{max} [3)]	5	W

Optical properties		
EO crystal	LT	
Aperture	3x3	mm^2
Wavefront distortion (633nm)	λ/6	nm
recommended max. optical intensity (4.5µm)	<2	W/mm^2
AR coating (R_{avg}<0.5%)	2500 - 4000	nm

[1)] at 22.3°C [2)] with 50Ω termination [3)] no damage with RF_{in} < 10W

Measured modulation

Fig. 1: Oscilloscope trace

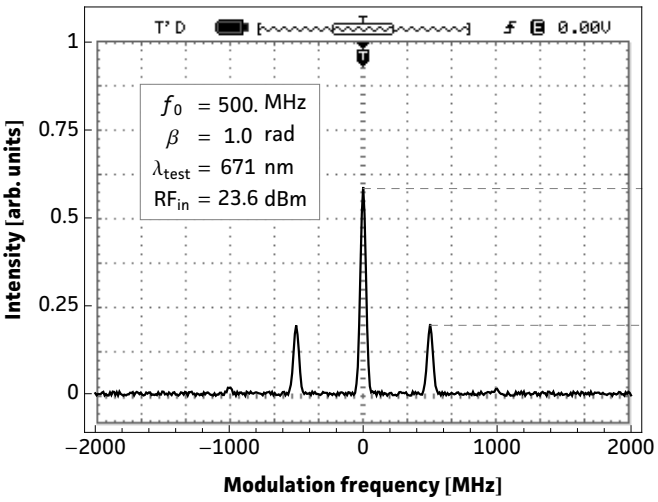


Fig. 2: Carrier/sideband ratio

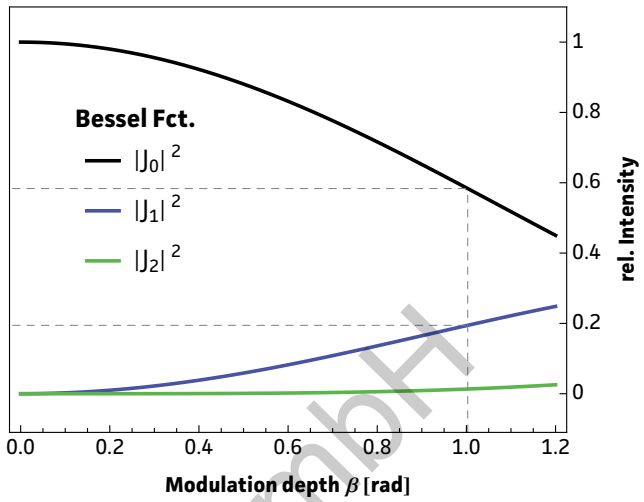


Table 1: Expected modulation

$\beta = 1$ rad	unit	λ_1	λ_2
λ	nm	**671**	**4500**
P	dBm	23.6	42.1
P	W	0.23	16.22
U	V_p	4.8	40.3
U_π	V_p	15.	126.5
β / U	rad / V	0.21	0.02

Fig.1: Recorded oscilloscope trace retrieved from a test setup as illustrated below.

Fig.2: Squared absolute values of first-kind Bessel functions vs. modulation depth. Vertical lines reveal the ratio between the carrier $|J_0|^2$ and the i^{th} sideband $|J_i|^2$ at a specific ß.

Fig.3: Dependency between RF amplitude and modulation depth for different wavelengths. Points on the curve allow to retrieve either the required RF amplitude for a specific/desired ß or the max. achievable modulation depth for a given/available RF power.

Table 1: Expected RF-amplitude/-power values and conversion factors for the required wavelength at the reference modulation depth of 1 rad. **Note:** Experimentally recorded modulation depth displayed in Fig.1 might vary from the respective values (ß=1rad) provided in the table.

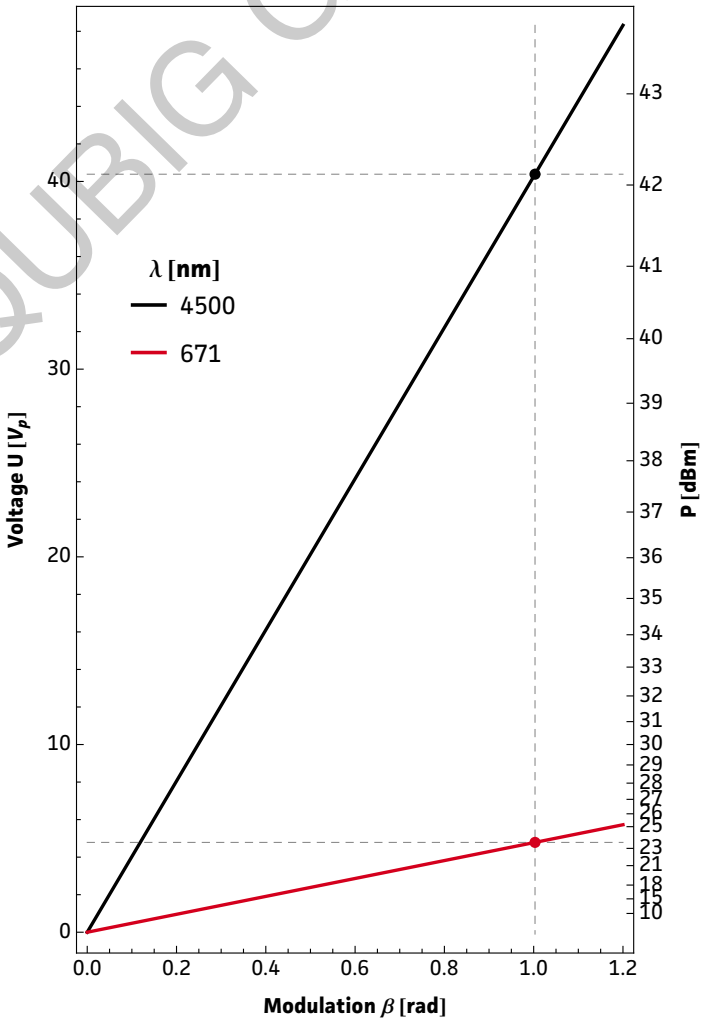
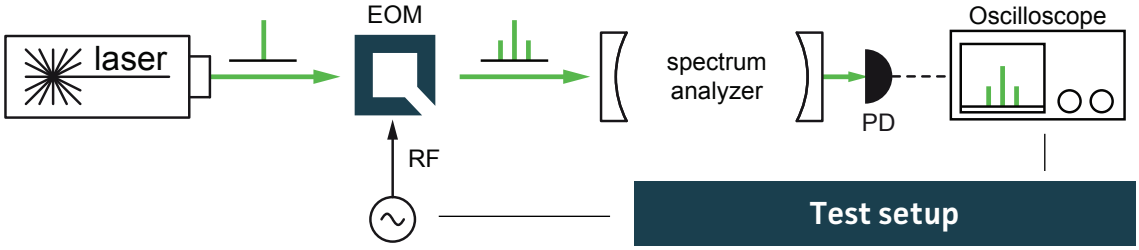
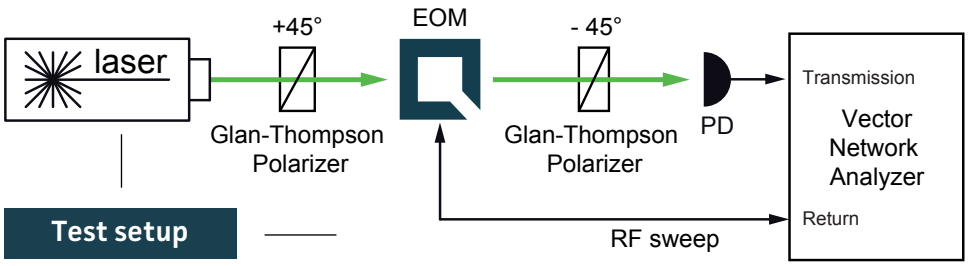
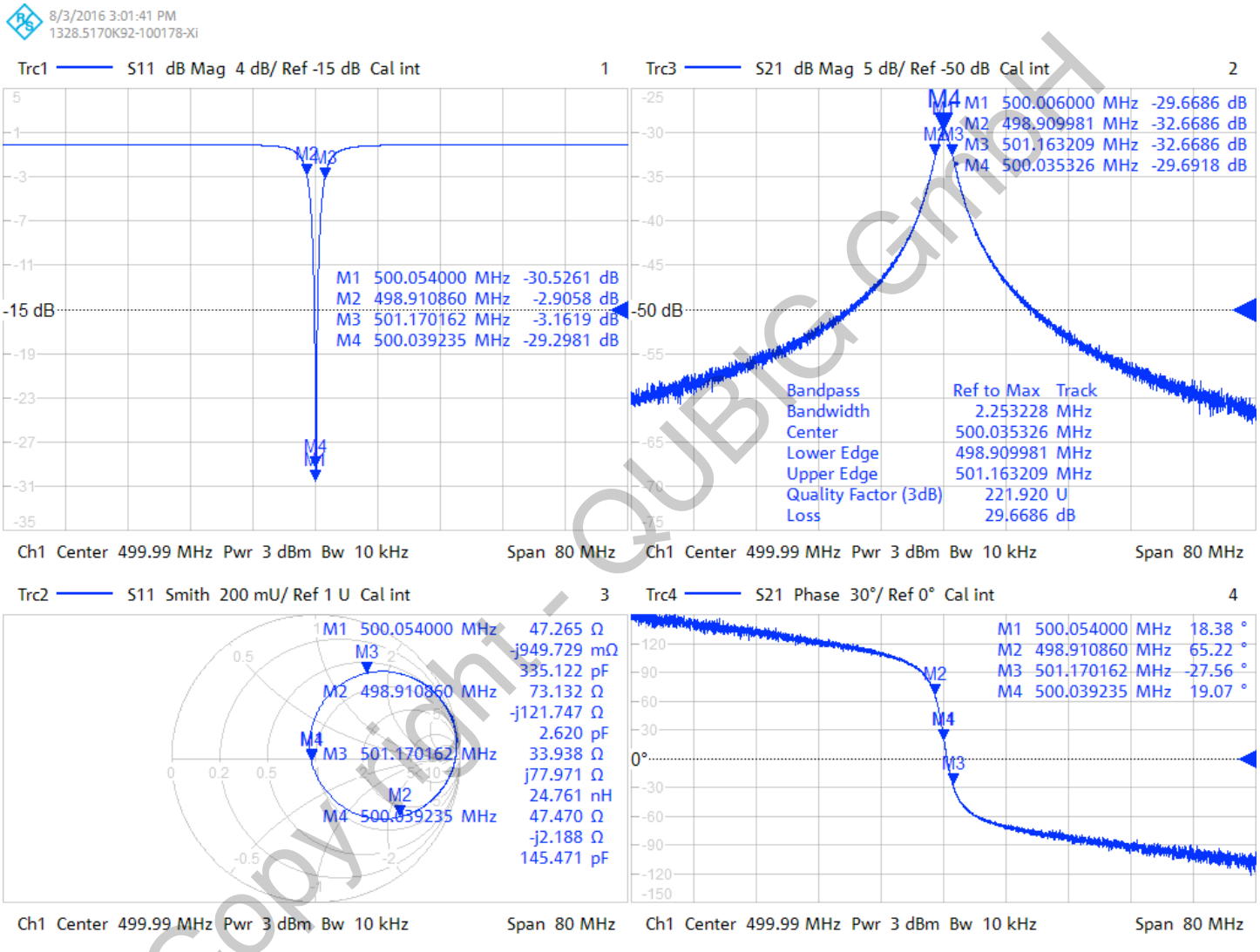


Fig. 3: RF–signal amplitude vs. modulation depth



Resonance characteristics

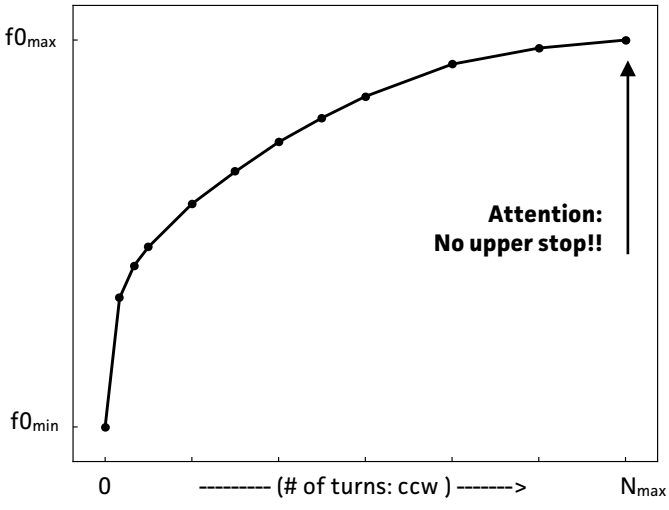




Tuning performance

MAX resonance frequency	f_0 max	545	MHz
MIN resonance frequency	f_0 min	475	MHz
number of turns	N_{max}	6	
counter clock-wise turns ⤴	higher f_0 ↑		
clock-wise turns ⤵	lower f_0 ↓		

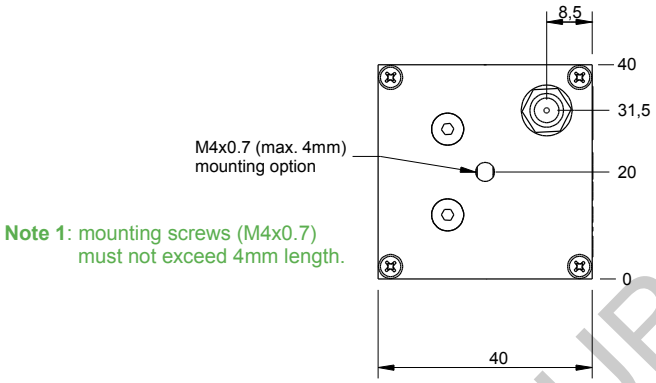
- actuate tuner carefully with supplied tuning tool
- tuner might not be perfectly perpendicular
- there might be no hard upper or lower stops (!)



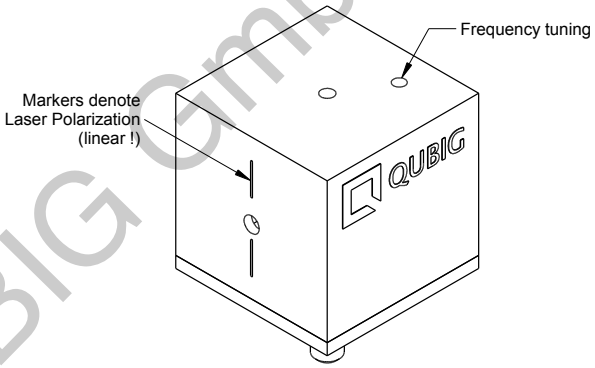
Handling instructions

- Input laser polarization must be aligned with respect to the white markers on the housing
- Please handle device carefully. Avoid shock. Don't drop.
- After turn on the resonance frequency drifts slightly with applied RF power. Please compensate by tuning the RF drive frequency until steady-state (~min).

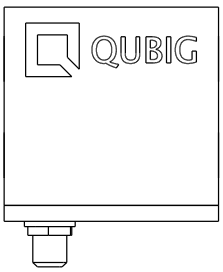
Package drawing

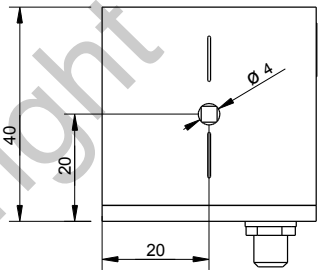


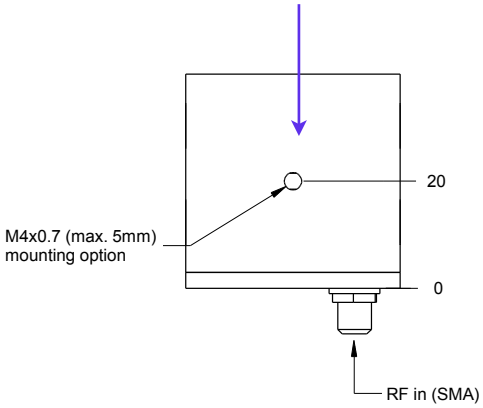
Note 1: mounting screws (M4x0.7) must not exceed 4mm length.



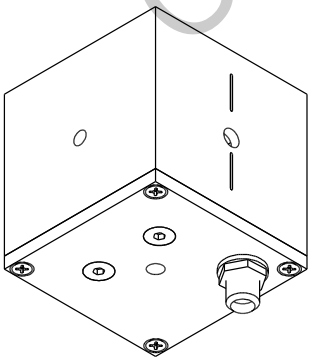
Use this side for heat sinking!

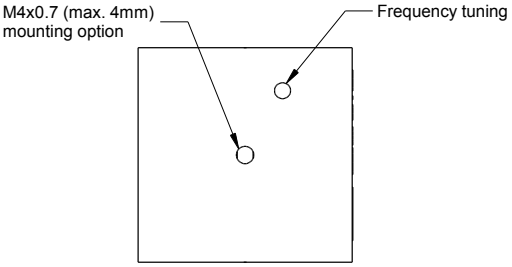






Note 2: crystal aperture is 3x3mm.





Attention!!

- use only supplied tuning tool
- actuate tuner carefully
- do not apply too much pressure or torque
- keep tuning tool coaxial
- tuner might not be perfectly orthogonal to box

TXC-option information

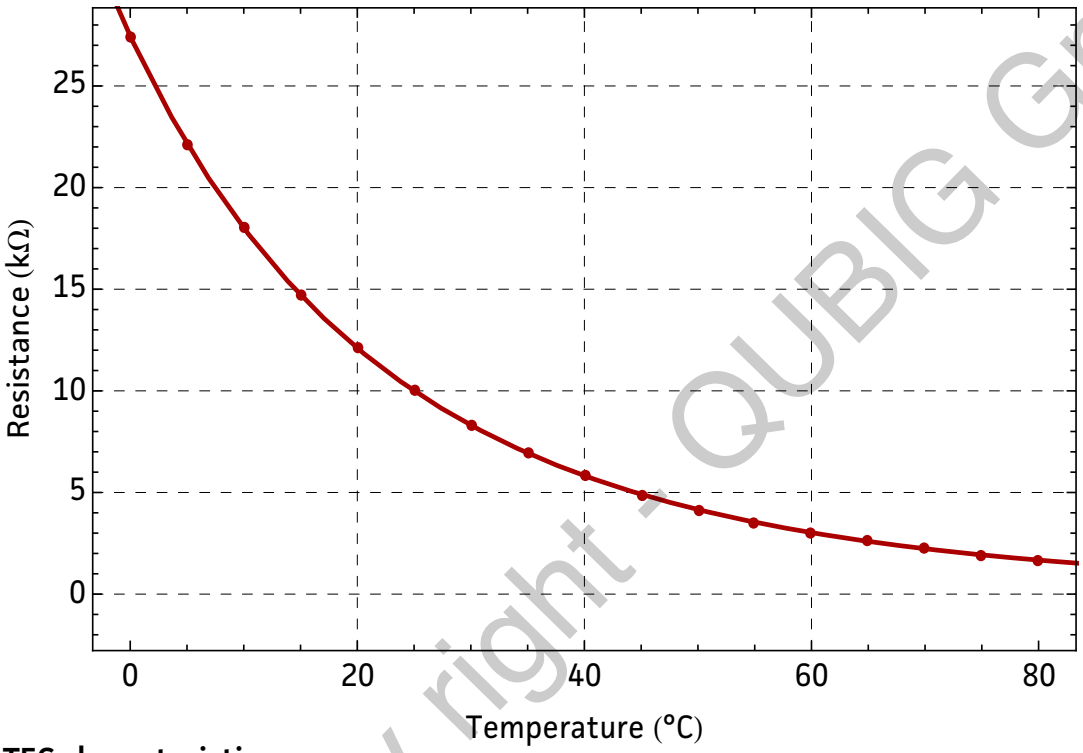
Delivery contents:

- TEC for active T-ctrl. (40W, UEPT-127-040M125S, additional T-controller required)
- Thermally insulating screw: M4, 1pc.
- Thermal pads: 2x, double sided adhesive (40x40mm²)
- 47uF SMD capacitor, 1210

NTC characteristics

NTC part number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	Operating Current for Sensor (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)	Thermal Time Constant (25°C) (s)
NXFT15XH103FA2B050	10k +/- 1%	3380 +/- 1%	0.12	7.5	1.5	4

- Operating Current for Sensor rises Thermistor's temperature by 0.1°C
- Rated Electric Power shows the required electric power that causes Thermistors's temperature to rise to 30°C by self heating, at ambient temperature of 25°C.



Part Number	NXFT15XH103
Resistance	10kΩ
B-Constant	3380K
Temp. (°C)	Resistance (kΩ)
-40	197.388
-35	149.395
-30	114.345
-25	88.381
-20	68.915
-15	54.166
-10	42.889
-5	34.196
0	27.445
5	22.165
10	18.010
15	14.720
20	12.099
25	10.000
30	8.309
35	6.939
40	5.824
45	4.911
50	4.160
55	3.539
60	3.024
65	2.593
70	2.233
75	1.929
80	1.673
85	1.455
90	1.270
95	1.112
100	0.976
105	0.860
110	0.759
115	0.673
120	0.598
125	0.532

TEC characteristics

TEC part number	Imax (A)	Umax (V)	Qcmax (W)	ΔTmax (K)	Tmax (°C)	A (mm)	B (mm)	H (mm)	ID (mm)	Sealing
UEPT-440-127-040M125S	4.0	15.2	40	67.0	125.0	40.0	40.0	4.6	4.5	Silicon