QUBIG

Test Data Sheet

PM8 - UV

(old: EO-T80D3-UV)

S/N: K5928

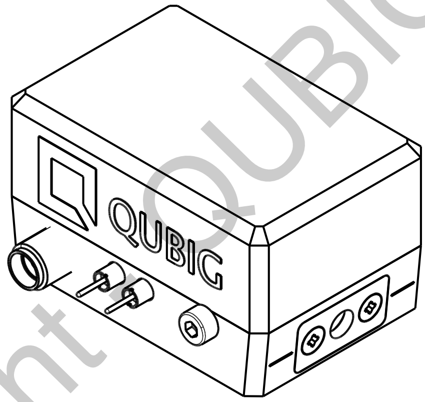
Resonant electro-optic phase modulator

with

- hermetically dry-sealed housing

- tunable resonance frequency

- TXC option



RF properties	Value	Unit
Resonance frequency: f_0 [1)]	76.4 - 85.4	MHz
Preset frequency: f_{set} [1)]	84.2	MHz
Bandwidth: Δν	755	kHz
Quality factor: Q	109	
Required RF power for 1rad @ 313nm	26.1	dBm
max. RF power: RF_{max} [3)]	2	W

Optical properties		
EO crystal	DKDP	
Aperture	3x3	mm²
Wavefront distortion (633nm)	λ/8	nm
recommended optical intensity (350nm)	<1	W/mm²
AR coating (R<0.5%)	200 - 400	nm

[1)] at 30°C [2)] with 50Ω termination [3)] no damage with RF_{in} < 3W

Measured modulation

Fig. 1: Oscilloscope trace

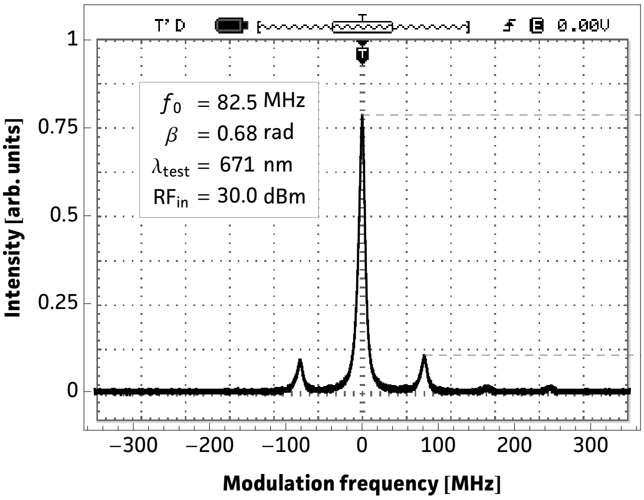


Fig. 2: Carrier/sideband ratio

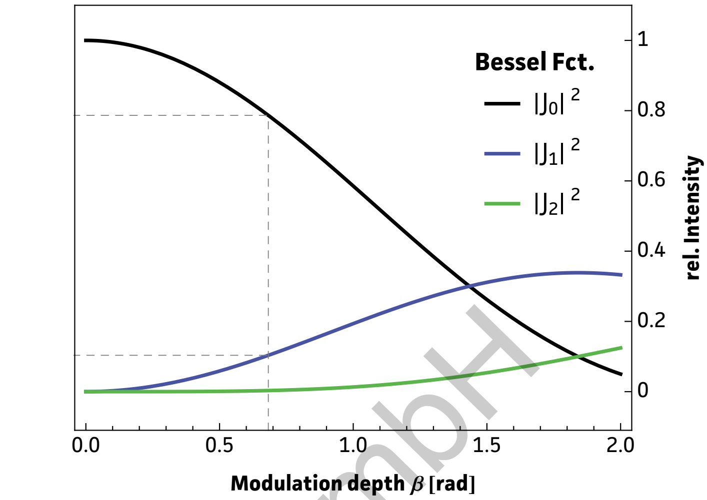


Table 1: Expected modulation

$\beta = 1$ rad	unit	λ_1	λ_2
λ	nm	**313**	**671**
P	dBm	26.1	33.3
P	W	0.41	2.15
U	V_p	6.4	14.6
U_π	V_p	20.1	46.
β / U	rad / V	0.16	0.07

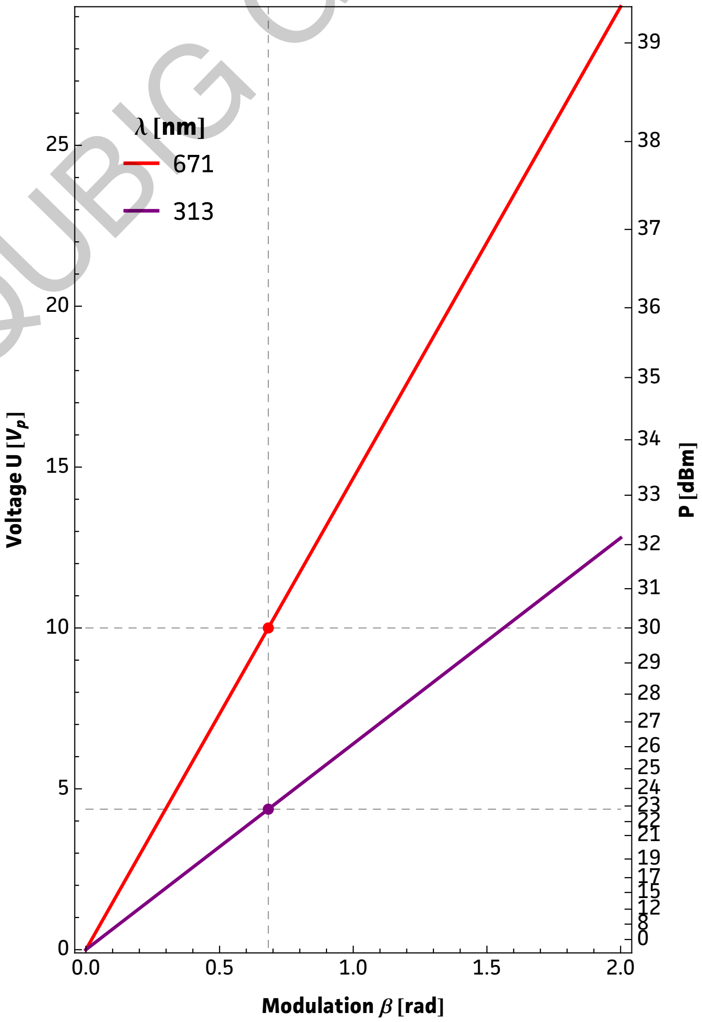


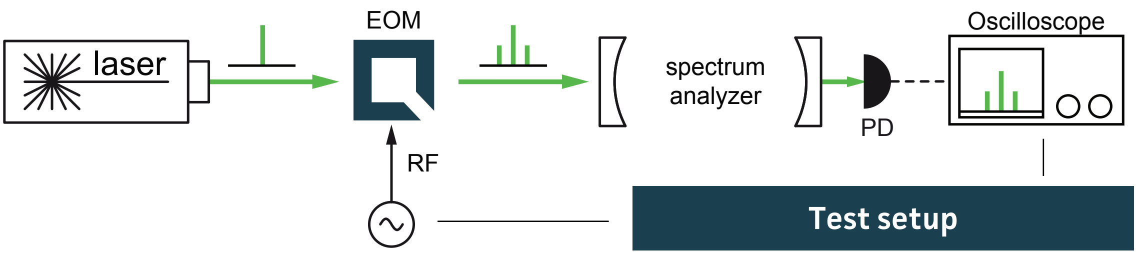
Fig. 3: RF–signal amplitude vs. modulation depth

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

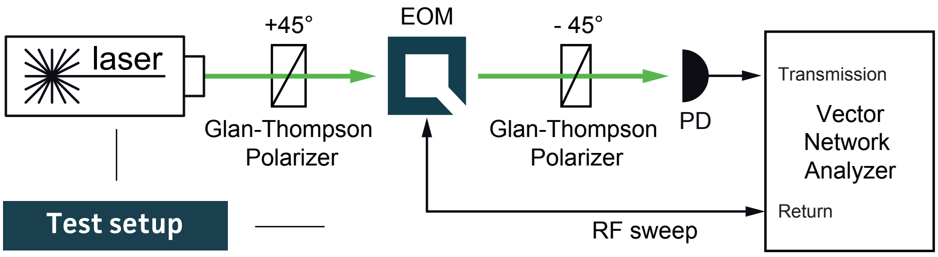
Fig.2: Squared absolute values of first-kind Bessel functions vs. modulation depth. Vertical lines reveal the ratio between the carrier $|J_0|^2$ and the i^{th} sideband $|J_i|^2$ at a specific ß.

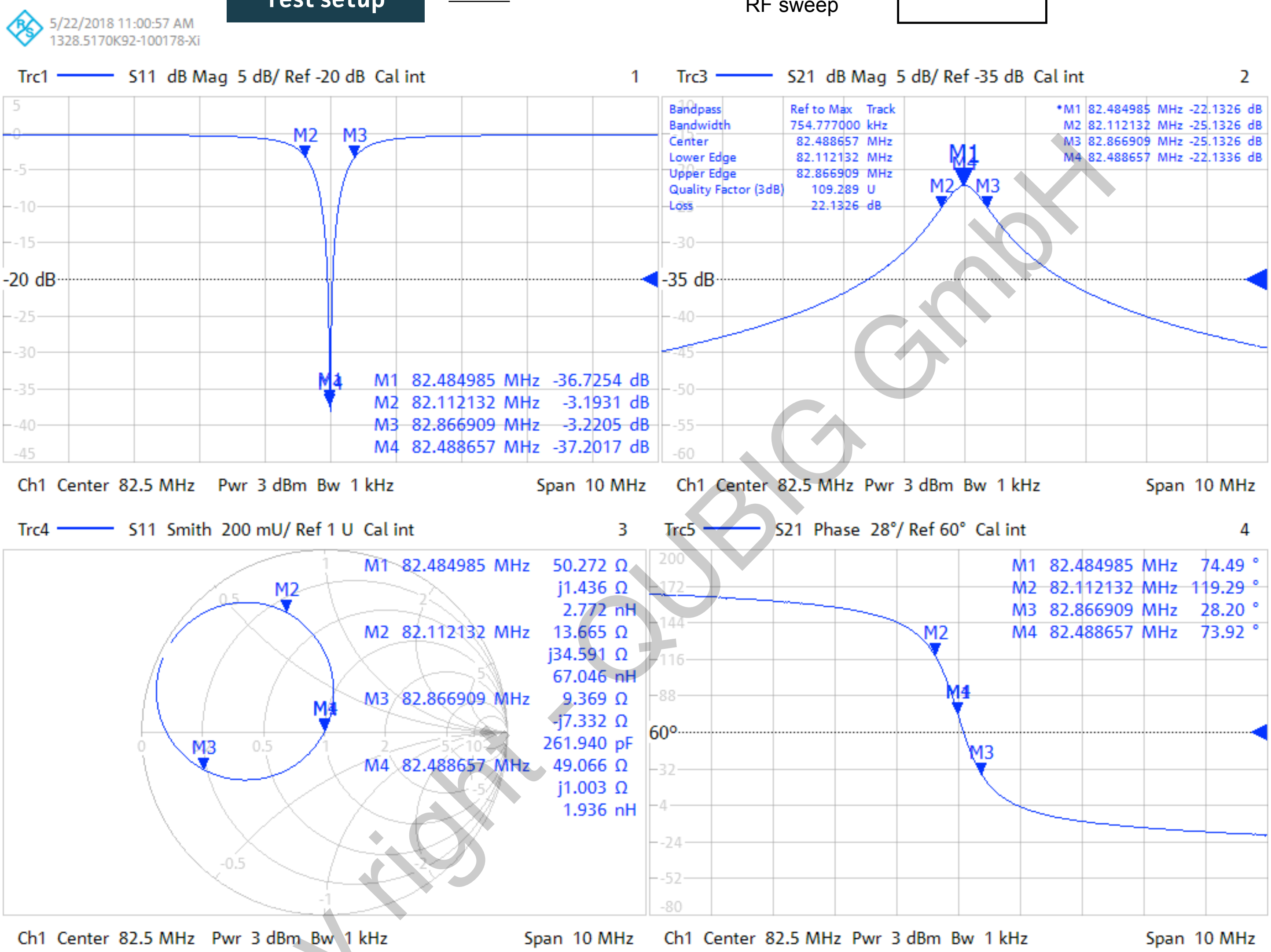
Fig.3: Dependency between RF amplitude and modulation depth for different wavelengths. Points on the curve allow to retrieve either the required RF amplitude for a specific/desired ß or the max. achievable modulation depth for a given/available RF power.

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.



Resonance characteristics

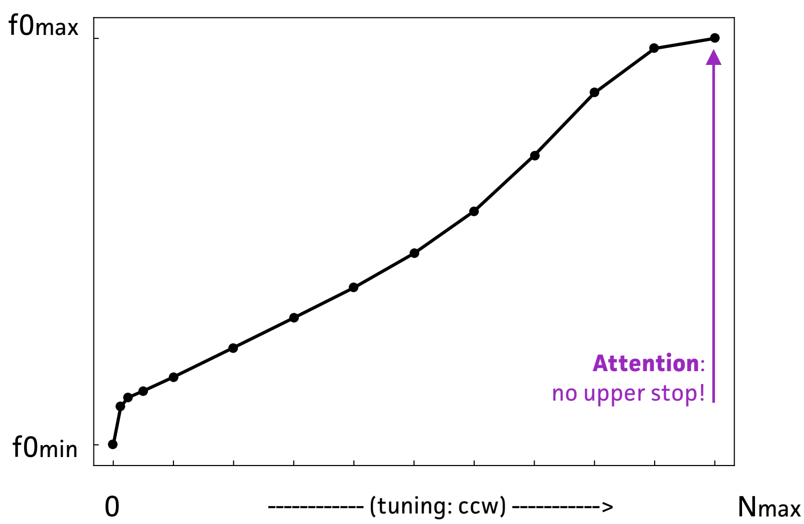




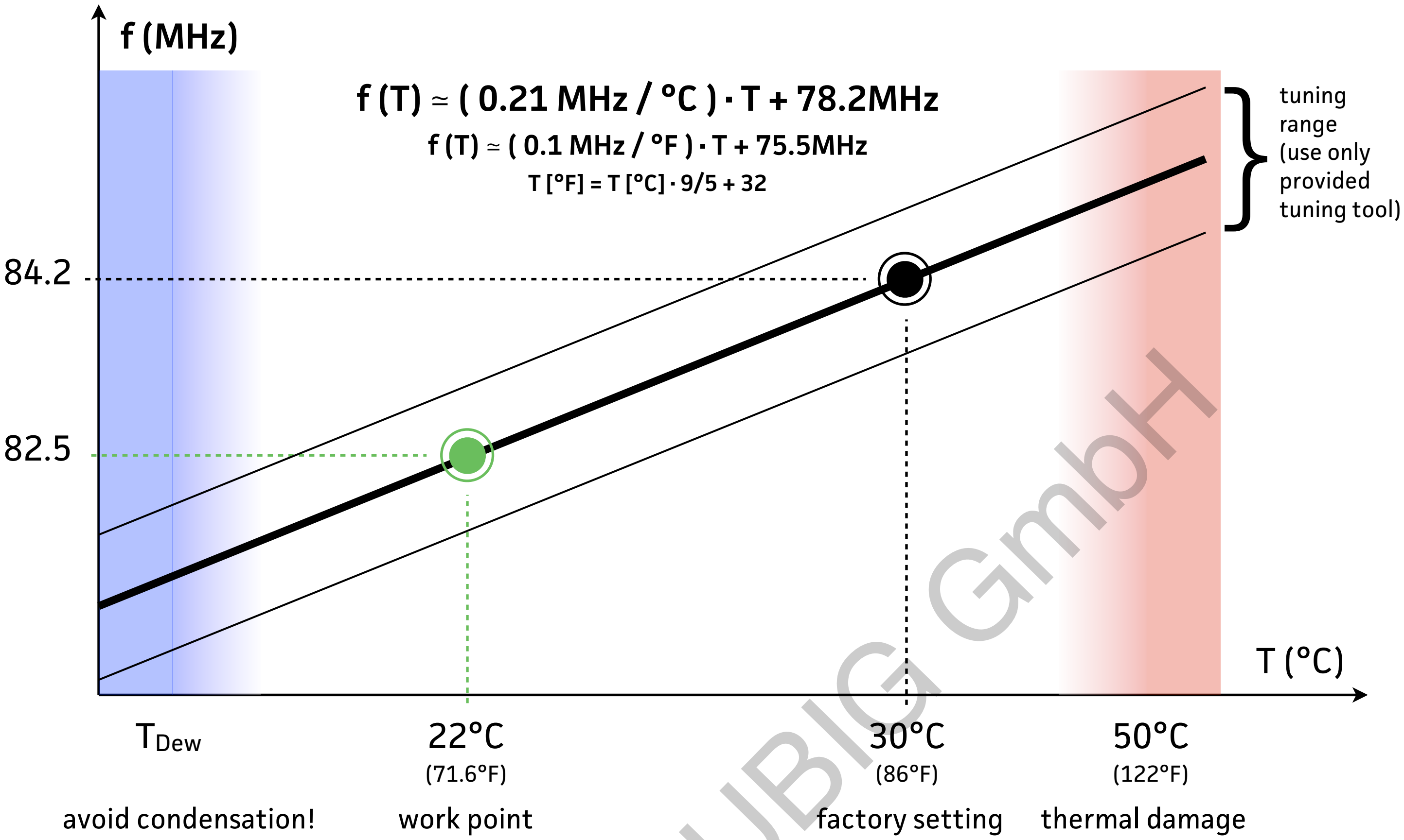
Tuning performance

MAX resonance frequency	f_0 max	85.4	MHz
MIN resonance frequency	f_0 min	76.4	MHz
number of turns	N_{max}	~5	
counter clock-wise turns ↗	higher f_0 ↑		
clock-wise turns ↘	lower f_0 ↓		
temperature dependence	~ 210 kHz/K		

- **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**



Temperature control



Important notes:

- The slope itself is temperature dependent. Use the provided formula for coarse frequency adjustments. Precision frequency settings might require small subsequent temperature corrections.
- Avoid condensation. The work point should always be at least 5°C above the dew point.
- The tuning range stated under „Tuning performance" (page 3) is not fixed but temperature dependent. You might be not able to reach your desired frequency set point below a certain temperature.

Operation instructions

The resonance frequency (and the modulation depth) of the EOM are temperature dependent and is currently adjusted to 82.5MHz at 22°C. When the EOM is operated at a different temperature, mind the drift of the temperature dependent tuning range to avoid damage at the upper frequency limit. In order to reach a thermal equilibrium, we recommend the following procedure:

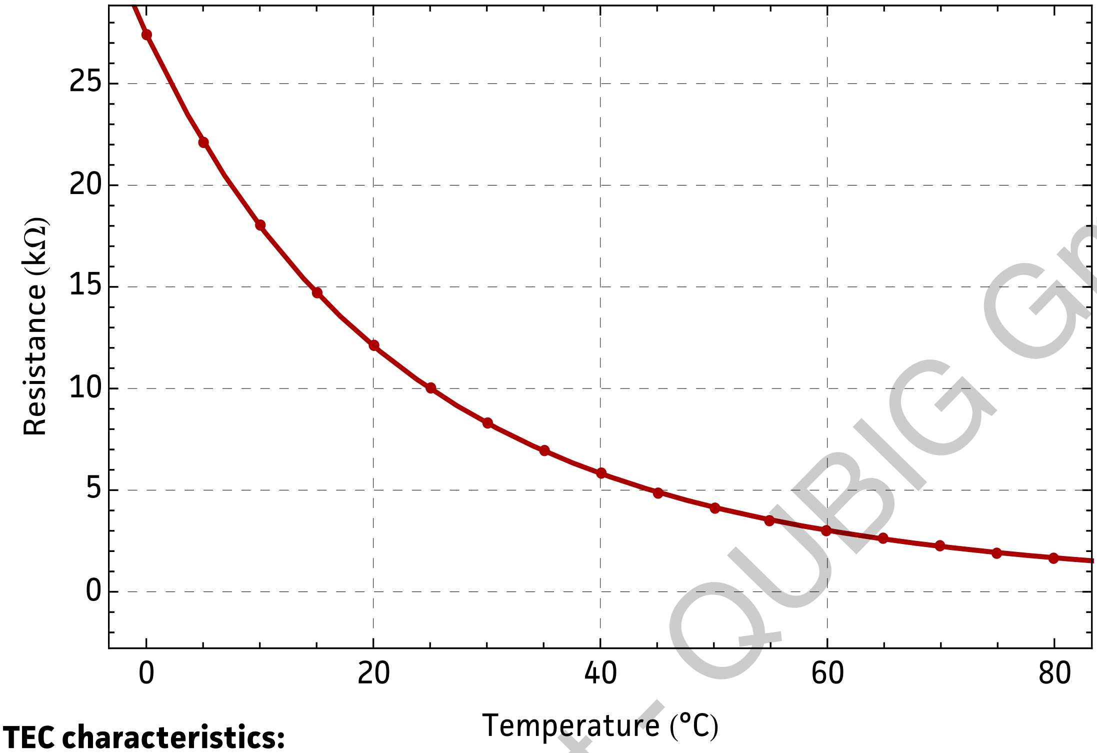
1. Put the EOM together with a TEC on a properly dimensioned heatsink.
2. Connect the EOM to the ADU and activate the resonance lock at a low RF output level (~20%). The frequency/ temperature drifts can be monitored on the ADU display.
3. Note down the current temperature (T1) of the EOM. Do not active the temperature stabilization yet.
4. Adjust the resonance frequency of the EOM to the desired value with the provided tuning tool. **ATTENTION!** The ADU might lose track of the resonance (frequency encoder knob turns red). A new activation of the resonance lock might be necessary. Do the previous steps iteratively until the required resonance frequency is achieved.
5. Increase the RF power gradually until the desired modulation depth is reached. The temperature of the EOM will increase by a few degrees (T2) and cause a frequency drift of 1-2MHz.
6. Activate the temperature stabilization and cool down the EOM to the initial temperature T1, which corresponds to the desired resonance frequency.
7. In thermal equilibrium the EOM can be taken out of the resonance lock, if necessary. Be aware, that the EOM is in a fragile state and needs to be protected from external disturbances (temperature fluctuations).

TXC-option information

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

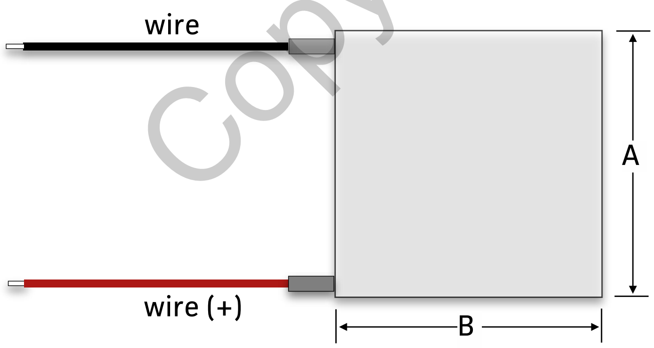
- Operating Current for Sensor rises Thermistor's temperature by 0.1°C
- Rated Electric Power shows the required electric power that causes Thermistors's temperature to rise to 30°C by self heating, at ambient temperature of 25°C.

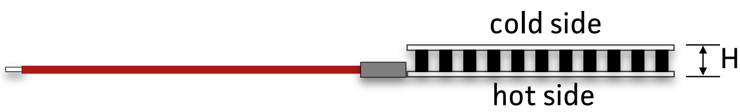


Part Number	NXFT15XH103
Resistance	10kΩ
B-Constant	3380K
Temp. (°C)	Resistance (kΩ)
-40	197.388
-35	149.395
-30	114.345
-25	88.381
-20	68.915
-15	54.166
-10	42.889
-5	34.196
0	27.445
5	22.165
10	18.010
15	14.720
20	12.099
25	10.000
30	8.309
35	6.939
40	5.824
45	4.911
50	4.160
55	3.539
60	3.024
65	2.593
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-130-127 -040M125	4.0	15.2	37.7	66	125	30.0	30.0	3.1	w/o	Silicon



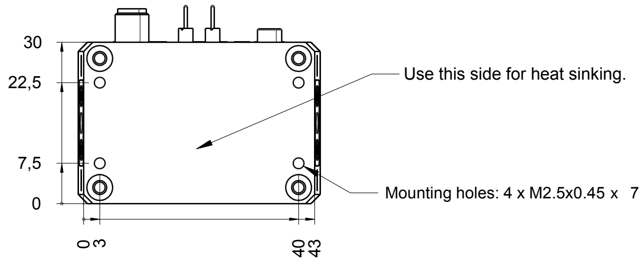


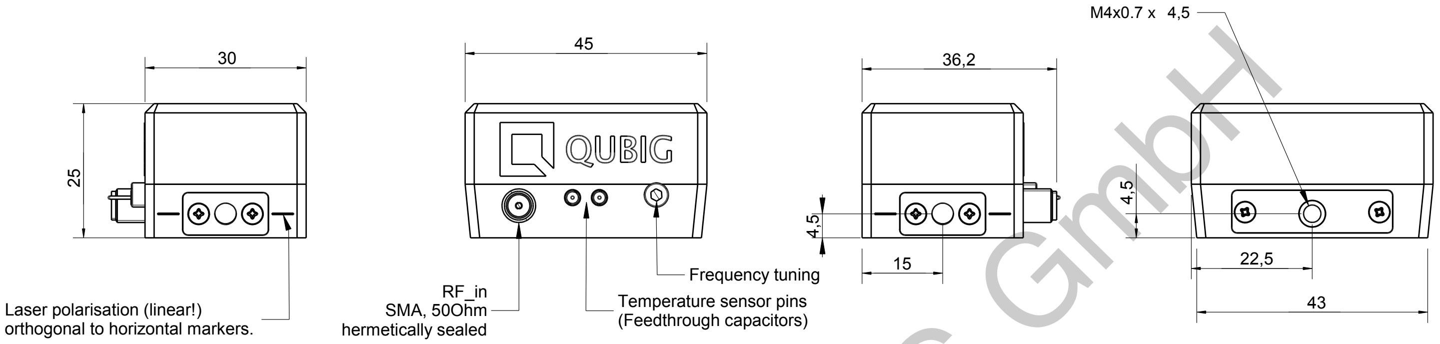
Handling instructions

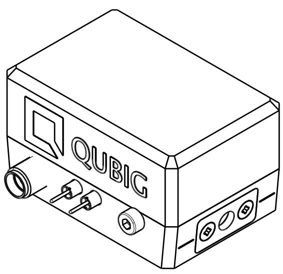
- The EOM housing is hermetically sealed. There are no user serviceable parts inside. None of the screws, except the one for frequency tuning, must be loosened at any time! Crystal will be damaged otherwise.
- Input laser polarization must be aligned orthogonal to the white markers on the housing
- Please handle device carefully. Avoid shock. Don't drop.
- Slight angle adjustment can reduce unwanted residual amplitude modulation (RAM)

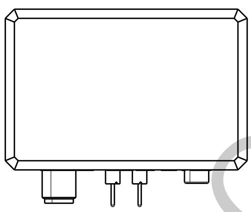
Package drawing

- 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









Attention!!!

M2.5 screw protects the inside from humidity. To adjust the resonance frequency remove the screw and use the provided tuning tool. After the adjustments don’t forget to seal the housing again. The crystal will get damaged otherwise.

Tested by:

____

Tel: +49 89 2302 9101
Fax: +49 89 2302 9102
eMail: mail@qubig.com
web: www.qubig.com

Qubig GmbH
Balanstr. 57
81541 Munich
Germany