

Test Data Sheet

PM7 - UV

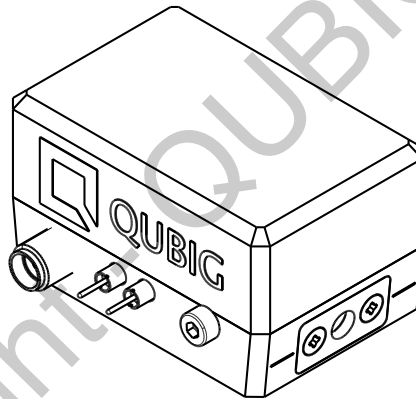
(old: EO-20D3-UV)

S/N:

Resonant electro-optic phase modulator

with

- hermetically dry-sealed housing
- temperature sensor (NTC)
- thermal crystal mount



| RF properties | Value | Unit |
|---|-------|------|
| Preset frequency: $f_{\text{set}}^{1)}$ | 20.0 | MHz |
| Bandwidth: $\Delta\nu$ | 279 | kHz |
| Quality factor: Q | 72 | |
| Required RF power for 1rad @ 242nm | 18.6 | dBm |
| max. RF power: $RF_{\text{max}}^{3)}$ | 0.5 | W |

| Optical properties | | |
|---------------------------------------|-------------|-------------------|
| EO crystal | DKDP | |
| Aperture | 3x3 | mm ² |
| Wavefront distortion (633nm) | $\lambda/8$ | nm |
| recommended optical intensity (355nm) | ≤ 5 | W/mm ² |
| AR coating (R<1%) | 200 - 400 | nm |

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

Measured modulation

Fig. 1: Oscilloscope trace

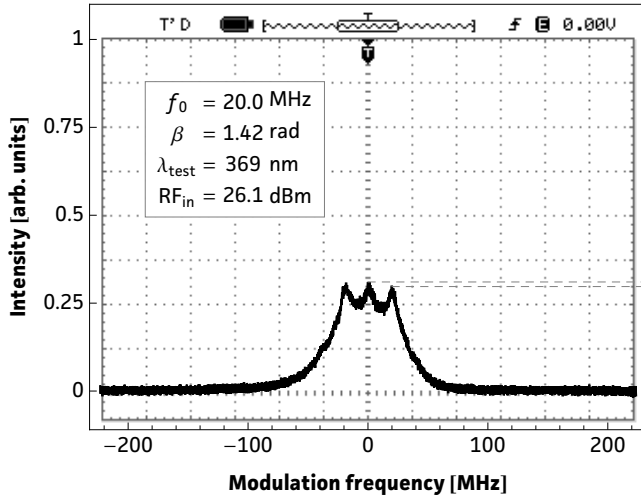


Fig. 2: Carrier/sideband ratio

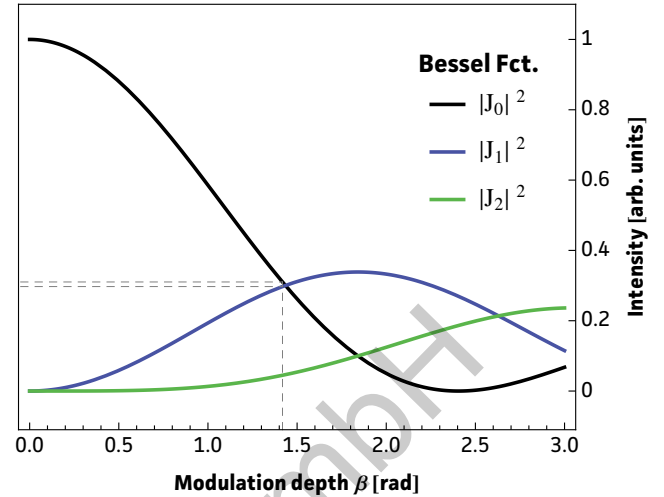


Table 1: Expected modulation

| $\beta = 1 \text{ rad}$ | unit | λ_1 | λ_2 | λ_3 |
|-------------------------|-------|-------------|-------------|-------------|
| λ | nm | 242 | 369 | 400 |
| P | dBm | 18.6 | 23.1 | 23.8 |
| P | mW | 72 | 202 | 242 |
| U | V_p | 2.7 | 4.5 | 4.9 |
| U_π | V_p | 8.5 | 14.1 | 15.5 |
| β/U | rad/V | 0.37 | 0.22 | 0.2 |

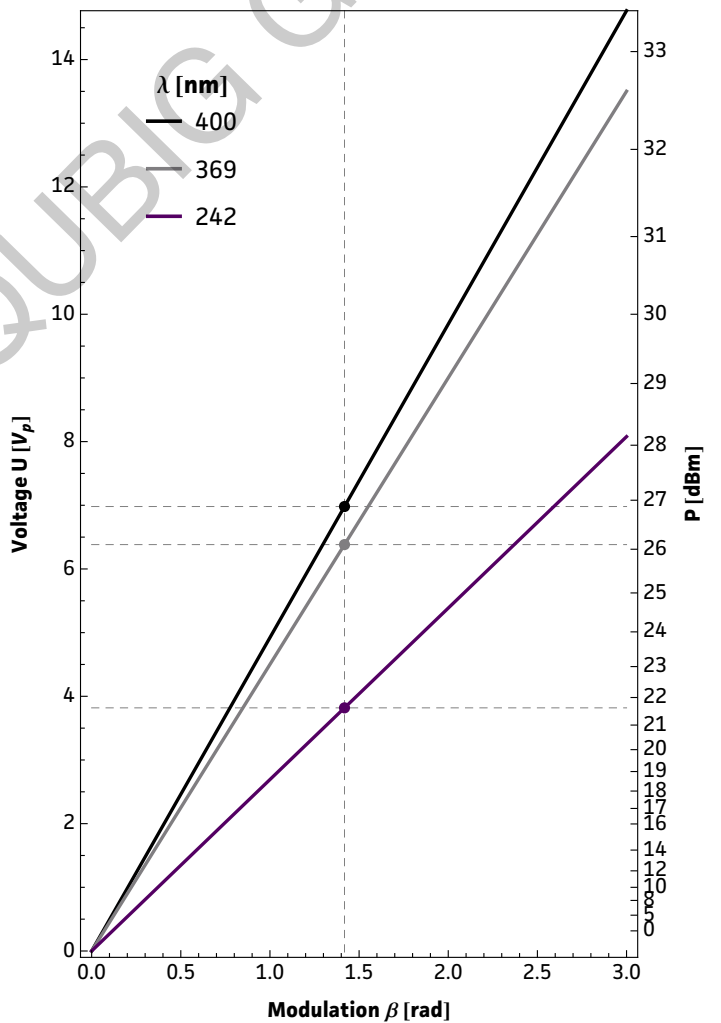


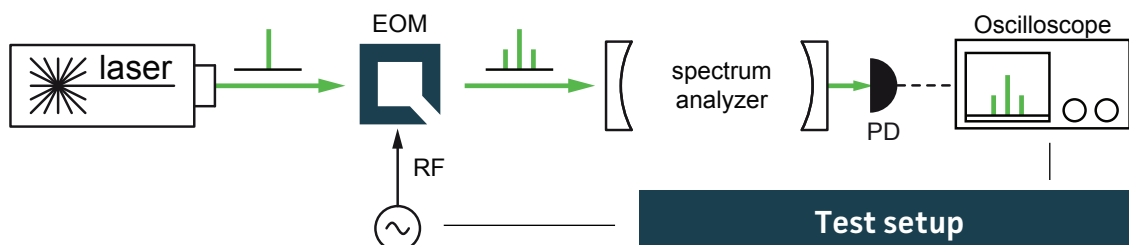
Fig.1: Recorded oscilloscope trace retrieved from a test setup as illustrated below.

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 β .

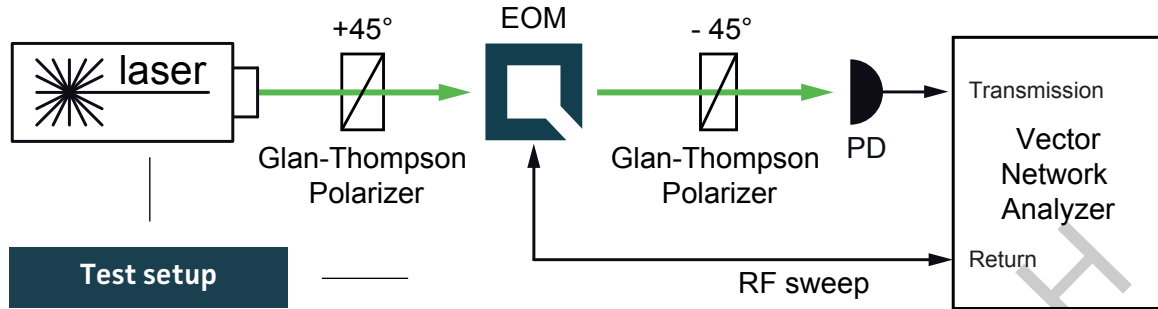
Fig.3: Dependency between RF amplitude and modulation depth for different wavelengths. Points on the curve allow to retrieve either the required RF amplitude for a specific/desired β or the max. achievable modulation depth for a given/available RF power.

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 ($\beta=1\text{rad}$) provided in the table.

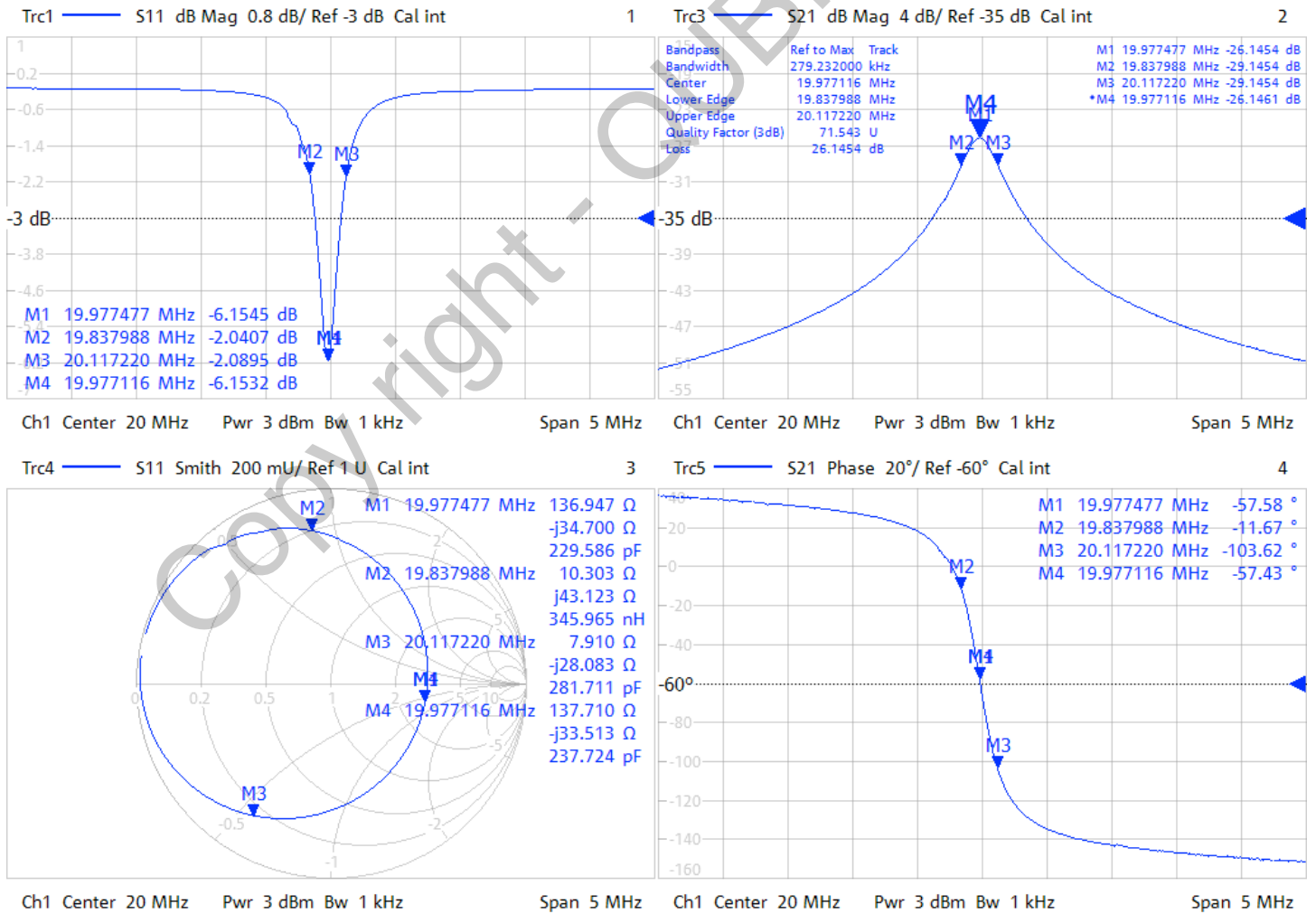
Fig. 3: RF-signal amplitude vs. modulation depth



Resonance characteristics



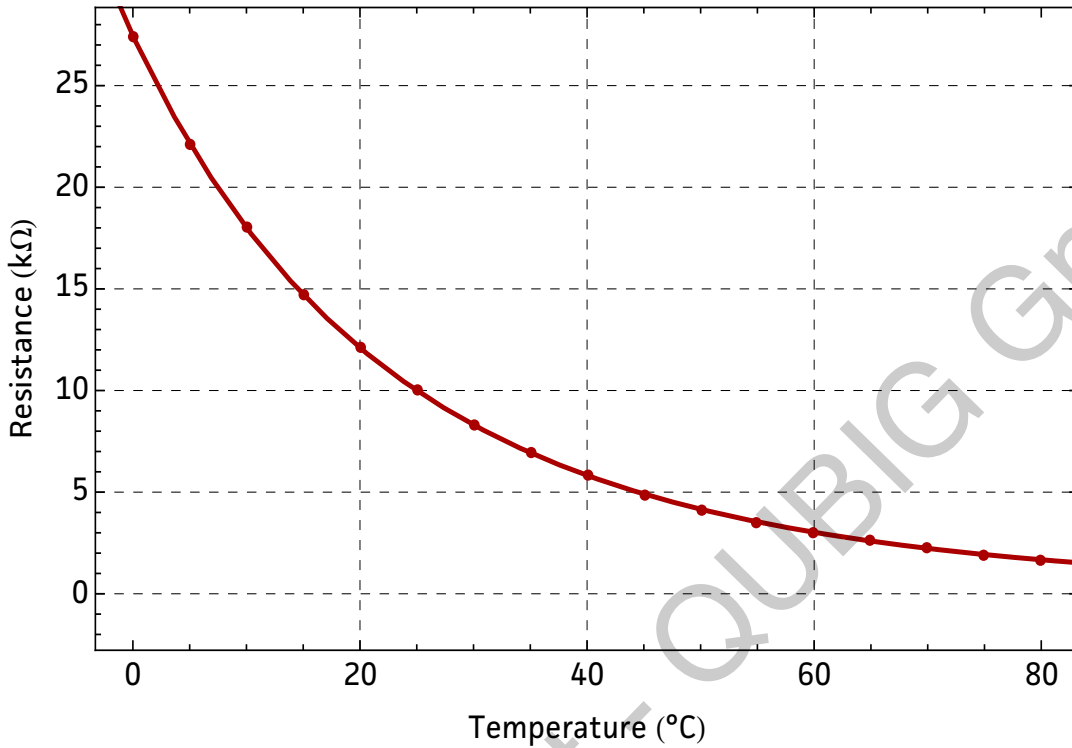
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1328.5170K92-100178-XI



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 |

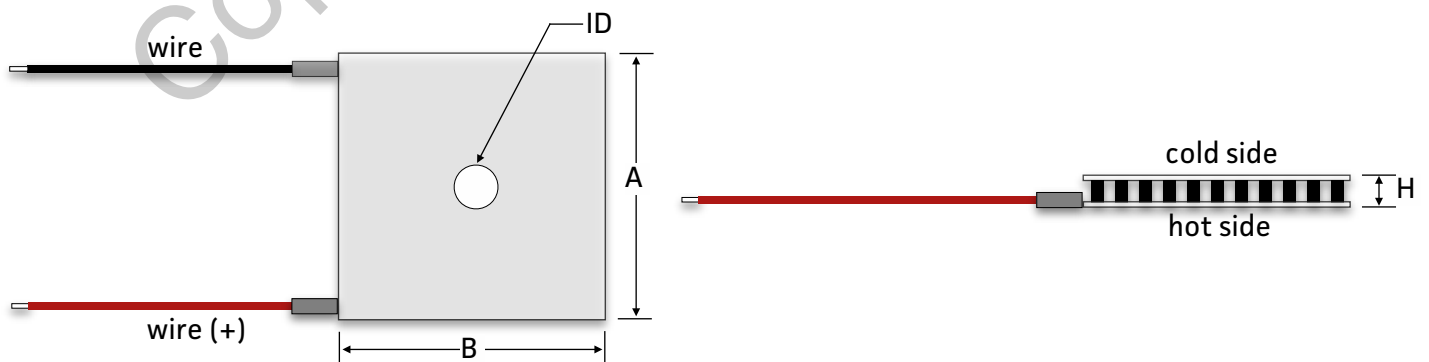
- Operating Current for Sensor rises Thermistor's temperature by 0.1°C
- Rated Electric Power shows the required electric power that causes Thermistors's temperature to rise to 30°C by self heating, at ambient temperature of 25°C.



| 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 | I _{max} (A) | U _{max} (V) | Q _{cmax} (W) | ΔT _{max} (K) | T _{max} (°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 |

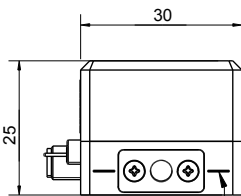
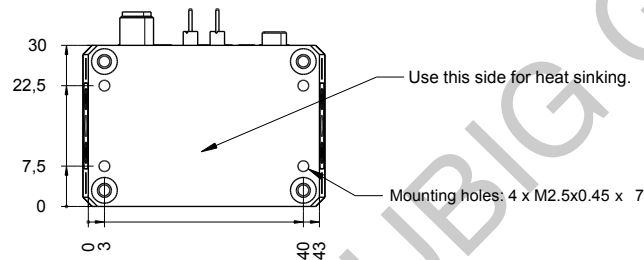


Handling instructions

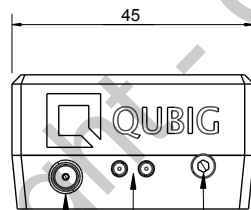
- The EOM housing is hermetically sealed. There are no user serviceable parts inside. None of the screws, accept the one for frequency tuning, must be loosened at any time! Crystal will be damaged otherwise.
- Input laser polarization must be aligned orthogonal to the white markers on the housing
- Please handle device carefully. Avoid shock. Don't drop.
- Slight angle adjustment can reduce unwanted residual amplitude modulation (RAM)
- After turn on the resonance frequency might drift slightly with applied RF power. Please compensate by tuning the RF drive frequency until steady-state (~min).

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



Laser polarisation (linear!) orthogonal to horizontal markers.



RF_in SMA, 500hm hermetically sealed

Frequency tuning Temperature sensor pins (Feedthrough capacitors)

