QUBIG

Empowering Laser Technologies

Test Data Sheet

PM - 20L3 - NIR

(old: EO-20L3-NIR)

S/N:

Resonant electro-optic phase modulator

with

_TXC-option

_W-option

_DC-option

RF properties	Value	Unit
Resonance frequency: f_0 [1)]	20.0	MHz
Bandwidth: Δν	374	kHz
Quality factor: Q	53	
Required RF power for 1rad @ 780nm [2)]	15.4	dBm
max. RF power: RF_{max} [3)]	0.5	W

DC properties	Value	Unit
DC Bandwidth: Δν_DC (-3dB)	11	kHz
Required DC voltage for π rad (PM) @ 780nm	250	V
max. DC voltage: V_{max}	+/- 500	Vdc
Input capacitance (DC)	1.0	nF

Optical properties		
EO crystal	LN	
Aperture	3x3	mm^2
Wavefront distortion (633nm)	λ/6	nm
Recommended optical intensity (841nm)	<1	W/mm^2
AR coating (R_{avg}<0.5%)	630 - 1100	nm
wedged facets	0°/4°	

[1)] at 25°C [2)] with 50Ω termination [3)] no damage with RF_{in} < 1W

Fig. 1: Oscilloscope trace

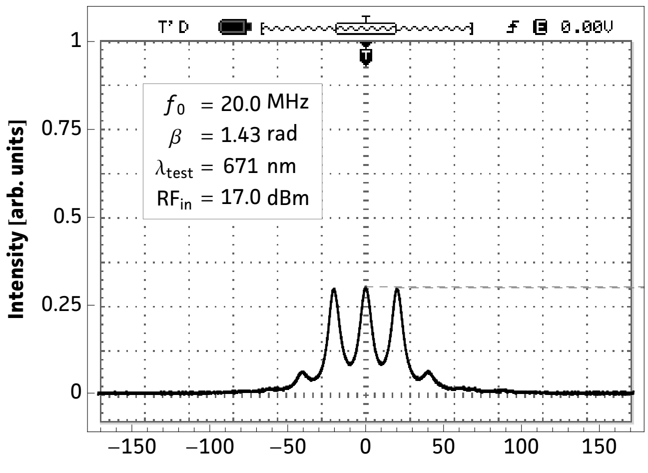


Fig. 2: Carrier/sideband ratio

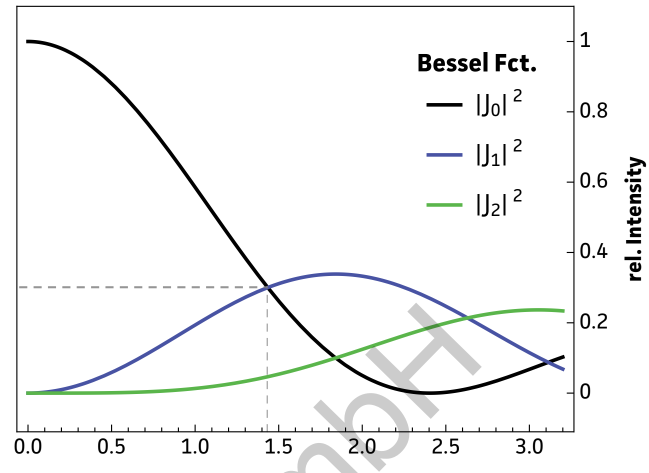


Table 1: Expected modulation

$\beta = 1$ rad	unit	λ_1	λ_2
λ	nm	**671**	**780**
P	dBm	13.9	15.4
P	mW	24	35
U	V_p	1.6	1.9
U_π	V_p	4.9	5.8
β / U	rad / V	0.64	0.54

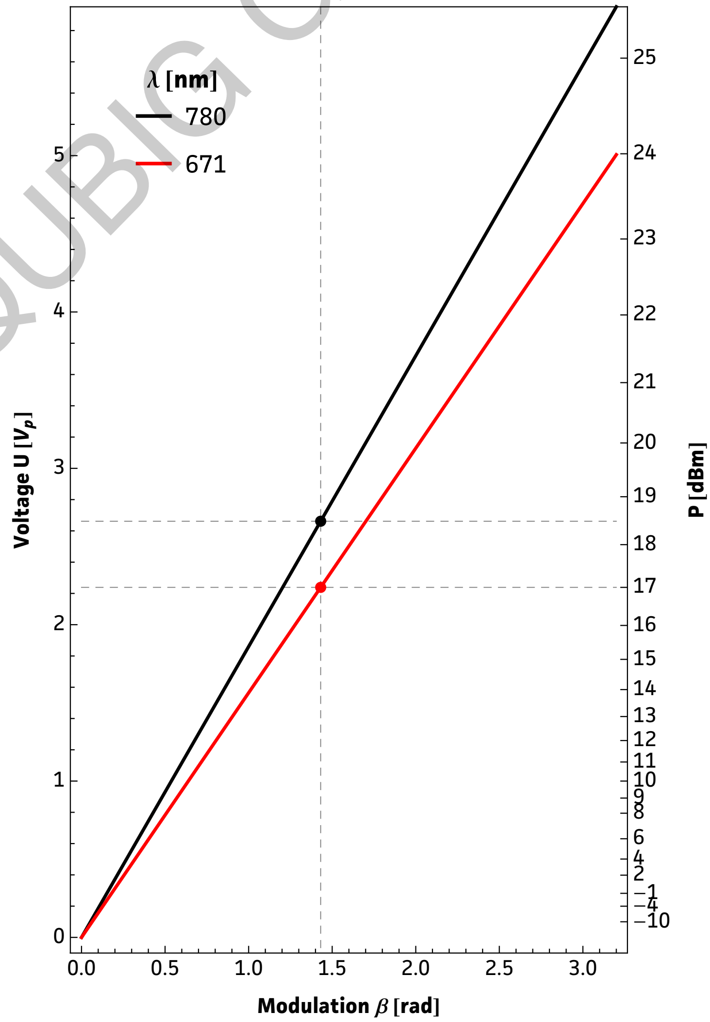


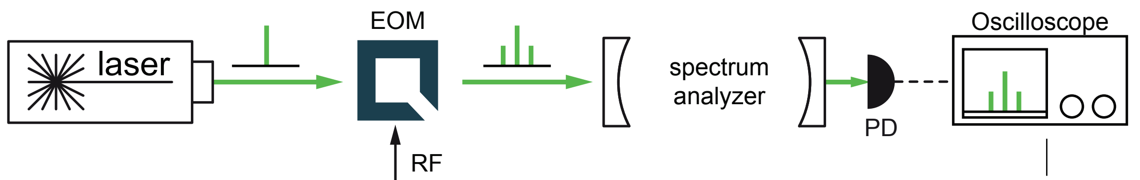
Fig. 3: RF–signal amplitude vs. modulation depth

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.

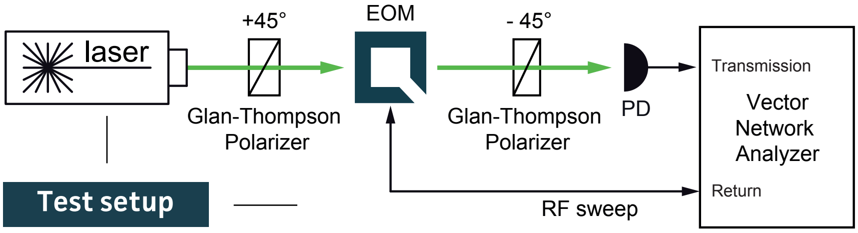
Fig.3: Dependency between RF amplitude and modulation depth for different wavelengths. Points on the curve allow to retrieve either the required RF amplitude for a specific/desired ß or the max. achievable modulation depth for a given/available RF power.

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.

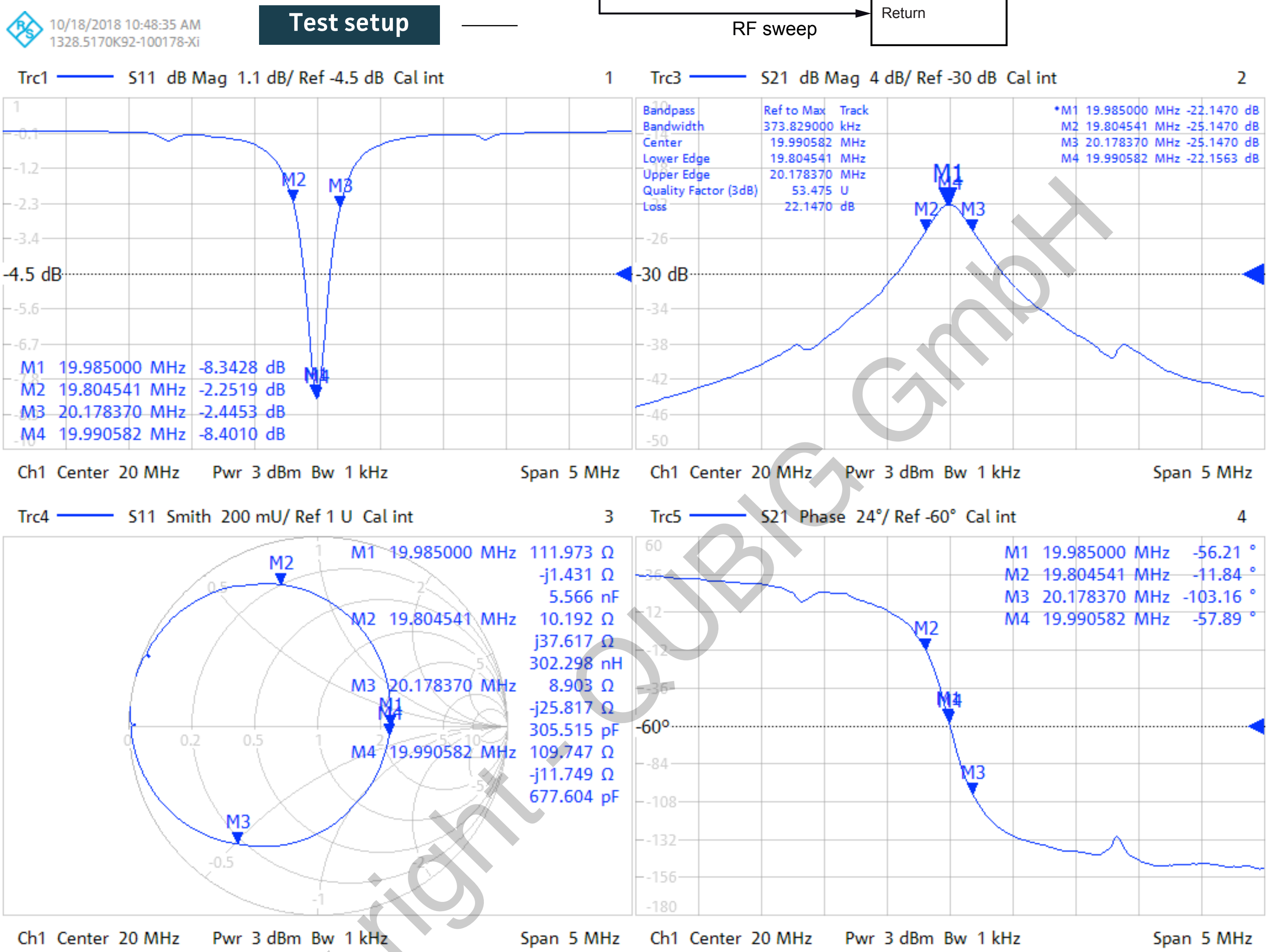


Test setup

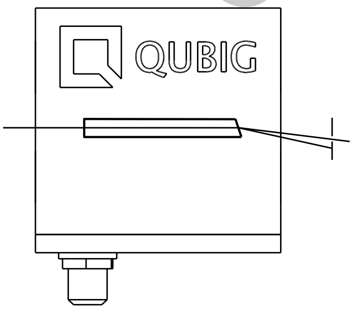
Resonance characteristics



Test setup

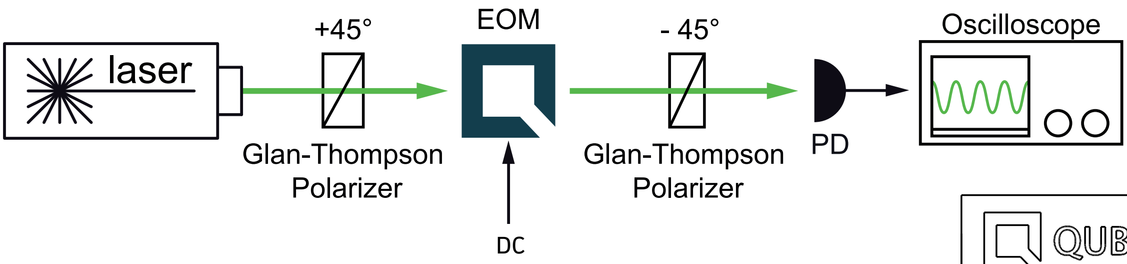


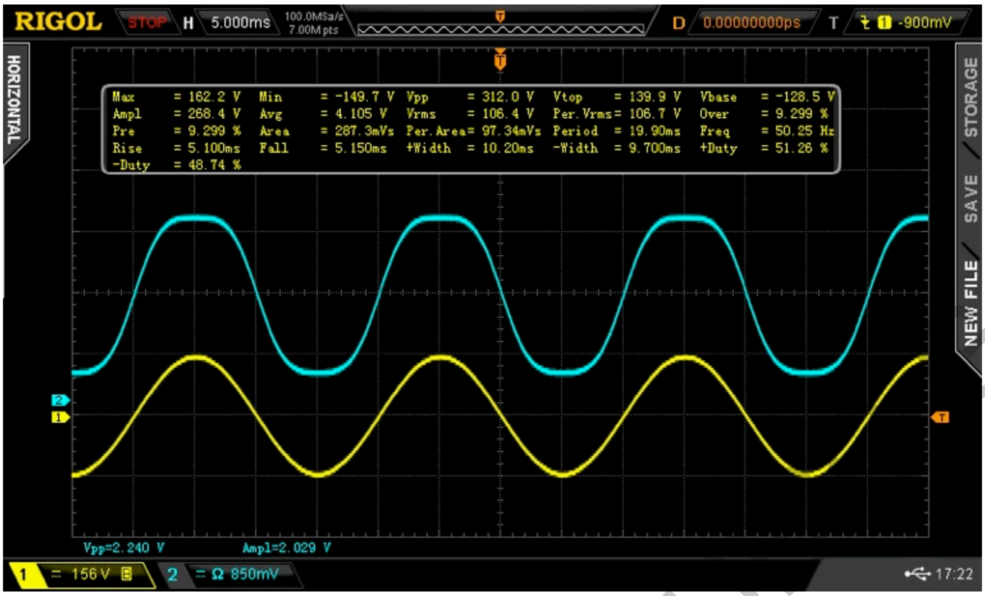
Alignment

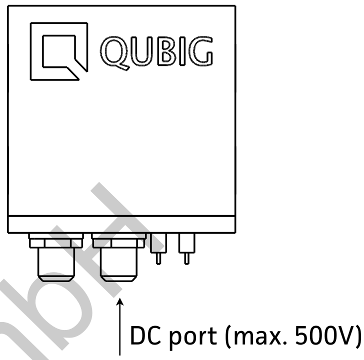


- Align the EOM in such a way, that the laser hits the unwedged surface perpendicular (AOI = 90°). The orientation of the crystal is pictured on the label on the EOM.
- The wedge deflects the beam and splits it up into different polarisations.
- Optimize the input polarisation by minimizing the optical power in the higher deflected spot.
- When it is impossible to remove the signal completely you have to block it with an iris to achieve minimum residual amplitude modulation (RAM). (Also see: Optics Letters Vol. 41, Issue 14, pp. 3331-3334 (2016), https://doi.org/10.1364/OL.41.003331)

DC characteristics







yellow:
DC Voltage input signal
(50Hz, 312Vpp)

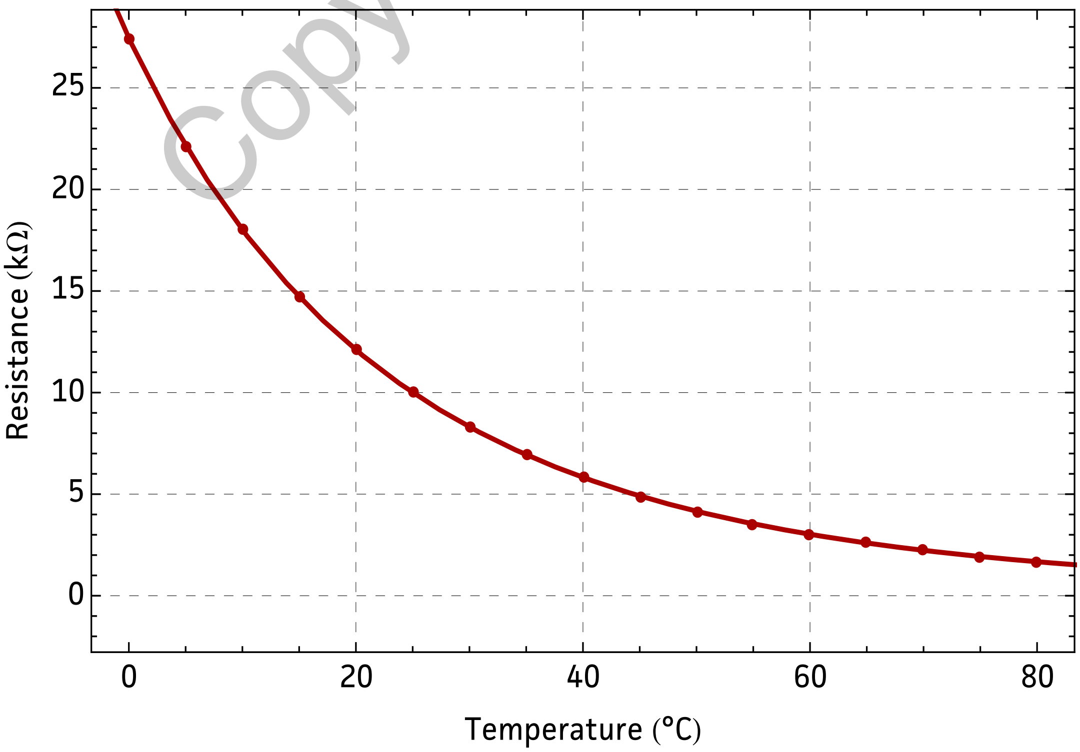
blue:
optical modulation
(achieved modulation depth: π)

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.

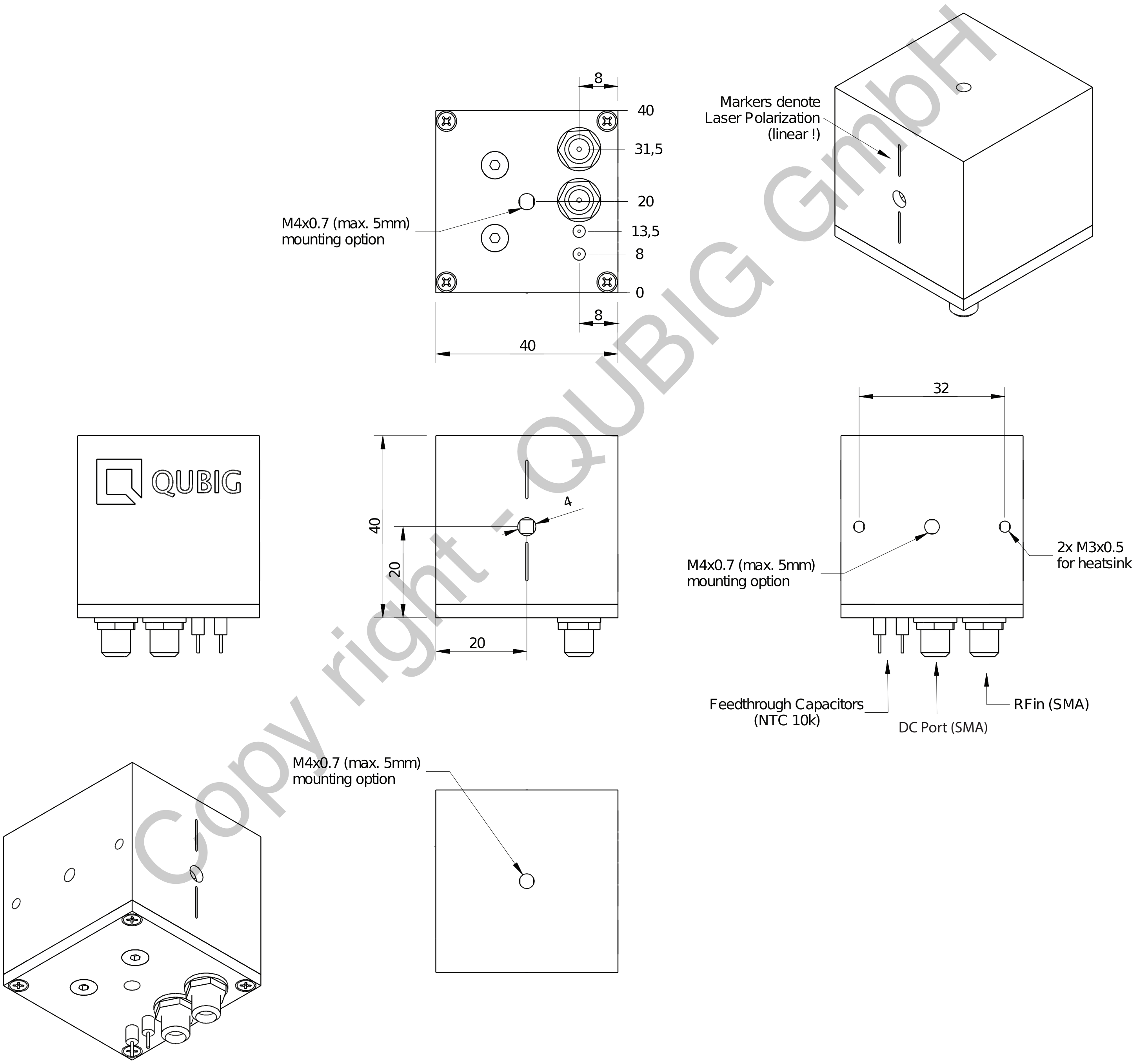


Part Number	NXFT15XH103
Resistance	10kΩ
B-Constant	3380K
Temp. (°C)	Resistance (kΩ)
-40	197.388
-35	149.395
-30	114.345
-25	88.381
-20	68.915
-15	54.166
-10	42.889
-5	34.196
0	27.445
5	22.165
10	18.010
15	14.720
20	12.099
25	10.000
30	8.309
35	6.939
40	5.824
45	4.911
50	4.160
55	3.539
60	3.024
65	2.593
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

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 might drift slightly with applied RF power. Please compensate by tuning the RF drive frequency until steady-state (~min).

Package drawing



Tested by:

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