

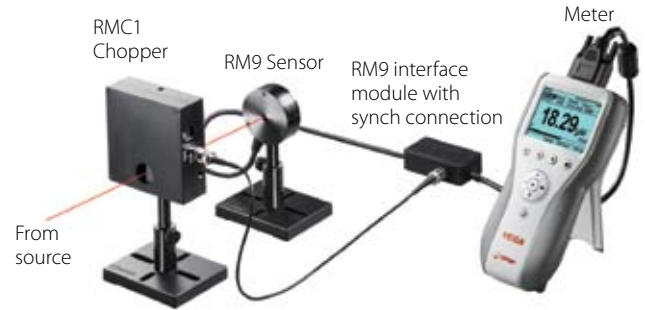
## 1.1.2 Thermal Power Sensors

### 1.1.2.1 Low Noise Lock In Power Sensors

#### 300fW to 100mW

##### Features

- Chopper and lock in amplifier for lowest noise and drift
- Wavelength range from UV to deep IR including Terahertz
- RM9 pyro is not sensitive to background radiation



The RM9 series Radiometers use a pyroelectric or photodiode sensor in conjunction with chopped CW or quasi CW radiation, using a digitally synthesized lock-in amplifier to reduce external noise to a minimum. The signal is passed through the 18Hz chopper and the chopped signal is detected by the sensor. All signals not at this 18Hz frequency are suppressed. The output of the sensor is displayed on a standard Ophir meter or PC interface. The chopper may be placed at any convenient location but preferably close to the signal source so as to eliminate interference from all unchopped radiation.

##### Specifications

| Model   | RM9                              | RM9-THz                    | RM9-PD                           |
|---|----------------------------------|----------------------------|----------------------------------|
| Use   | Low level signals                | Low level Terahertz        | Very low level signals           |
| Detector Type   | Pyroelectric                     | Pyro with THz absorber     | Si Photodiode                    |
| Spectral Range  | 0.15 - 12 $\mu$ m <sup>(a)</sup> | 0.7 - 10THz <sup>(h)</sup> | 0.2 - 1.1 $\mu$ m <sup>(b)</sup> |
| Aperture mm   | Ø8mm                             | Ø8mm                       | Ø8mm                             |
| Surface Reflectivity % approx.  | 50                               | 40 - 70                    | 50                               |
| Power Range <sup>(c)</sup>  | 100nW - 100mW                    | 100nW - 100mW              | 300fW - 300nW                    |
| Power Scales  | 100mW to 3 $\mu$ W               | 100mW to 3 $\mu$ W         | 300nW to 3pW                     |
| Power Noise Level <sup>(d)</sup>  | ~30nW                            | ~20nW                      | 30fW                             |
| Minimum Frequency for Pulsed Sources  | 200Hz                            | 200Hz                      | 200Hz                            |
| Thermal Drift (20min) <sup>(e)</sup>  | ~30nW                            | ~15nW                      | N.A.                             |
| Power Accuracy  | ±5% <sup>(a)</sup>               | ±10% <sup>(g)</sup>        | ±5% <sup>(b)</sup>               |
| Damage Threshold W/cm <sup>2</sup>  | 5                                | 5                          | 5                                |
| Response Time with Display (0-95%) s  | 3.5s                             | 3.5s                       | 3.6s                             |
| Linearity with Power  | ±2%                              | ±2%                        | ±2.5%                            |
| Connections:  |                                  |                            |                                  |
| 1. 1.5 meter cable hard wired to interface module.  |                                  |                            |                                  |
| 2. BNC connector on module for connection to chopper (2 meter BNC to BNC cable included). Perform zeroing with BNC cable removed. |                                  |                            |                                  |
| 3. 0.5 meter cable from module terminated in DB15 connector.  |                                  |                            |                                  |
| Cooling   | convection                       | convection                 | convection                       |
| Weight kg   | 0.37                             | 0.37                       | 0.37                             |
| Version   |                                  |                            |                                  |
| <b>Part Number for RM9 Series with RMC1 Chopper <sup>(f)</sup></b>  | <b>7Y70669</b>                   | <b>7Y70678</b>             | <b>7Y70672</b>                   |
| <b>Part Number for RM9 Series Sensors</b>   | <b>7Z02952</b>                   | <b>7Z02956</b>             | <b>7Z02953</b>                   |

Notes: (a) At calibrated wavelengths 500 - 1100nm. At other wavelengths, there is an additional error as follows: <500nm add ±8%, 1100 - 3000nm add ±5%, 10.6 $\mu$ m add ±15%

Notes: (b) At calibrated wavelengths 200 - 1100nm. For <700nm add ±2% additional error

Notes: (c) For LaserStar, Pulsar, USBI, Quasar and Nova/Orion, upper limit is 1mW for RM9/RM9-THz and 90nW for RM9-PD. For these models, accuracy may also be less than values given above

Notes: (d) Averaged over 10s

Notes: (e) In a typical laboratory environment

Notes: (f) The RMC1 or another chopper unit that can be set to 18Hz is required for operation of the RM9 series sensors

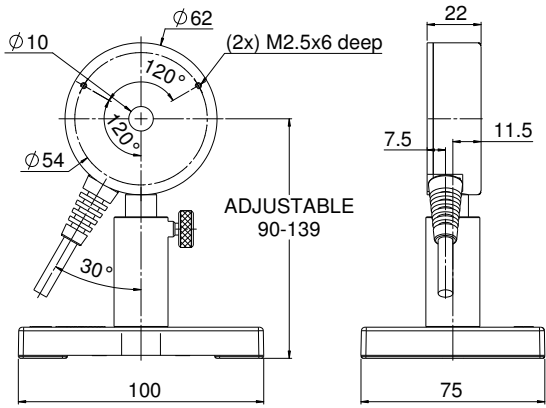
Notes: (g) Over the range 0.7 - 4.5THz. Error is 15% for 5 - 10THz

Notes: (h) Sensor is calibrated for 0.7, 1.5, 2.5, 4 and 10THz. Response at other frequencies can be interpolated from graph on page 38A

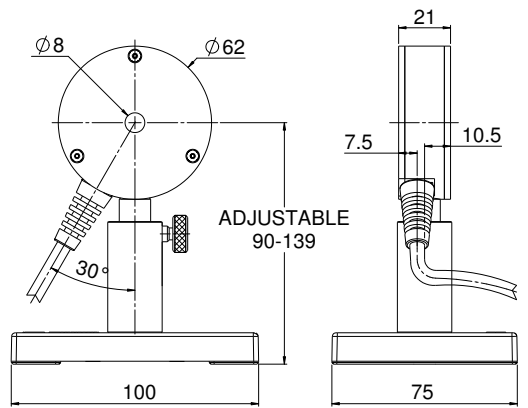
\* For drawings please see page 38A

| Model                                    | RMC1 Chopper           |
|--|------------------------|
| Use                                      | Chopper for RM9 Series |
| Aperture                                 | Ø22mm                  |
| Chopping Frequency <sup>(a)</sup>        | 18Hz                   |
| Power Consumption                        | 85mA                   |
| Connections:                             |                        |
| 1. BNC to interface module               |                        |
| 2. 12V wall cube power supply (included) |                        |
| 3. Mini USB connector (factory use only) |                        |
| Notes: (a) not adjustable by user.       |                        |

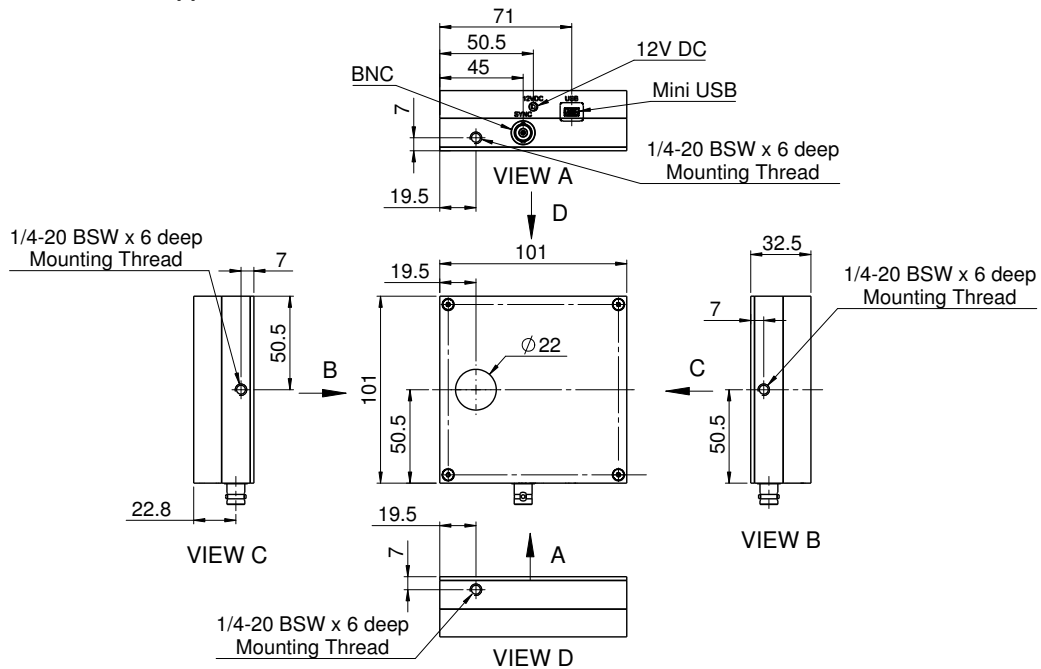
**RM9-PD Sensor**



**RM9 / RM9-THz Sensors**



**Radiometer-Chopper**



**Interface Module**

