PRIMES

Operating Manual

Translation of the original instructions

PocketMonitor PMT

PMT 01p, 01p sep, 01p sep/out
PMT 05p, 05p sep, 05p sep/out
PMT 30p, 30p sep, 30p sep/out
PMT 70iag, 70iag sep, 70iag sep/out
PMT 70icu, 70icu sep, 70icu sep/out
PMT 120iag, 120iag sep, 120iag sep/out
PMT 120icu, 120icu sep, 120icu sep/out

Revision 01/2020 EN

IMPORTANT!

READ CAREFULLY BEFORE USE.

KEEP FOR FUTURE USE.

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PRIMES - The Company

PRIMES manufactures measuring devices used to analyze laser beams. These devices are employed for the diagnostics of high-power lasers ranging from CO_2 lasers and solid-state lasers to diode lasers. A wavelength range from infrared through to near UV is covered, offering a wide variety of measuring devices to determine the following beam parameters:

- Laser power
- Beam dimensions and position of an unfocused beam
- Beam dimensions and position of a focused beam
- Beam quality factor M^2

Development, production and calibration of the measuring devices is performed at PRIMES. This guarantees optimum quality, excellent service, and a short reaction time, providing the basis for us to meet all of our customers' requirements quickly and reliably.

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1 Basic safety instructions

Intended use

The PocketMonitor PMT is used to measure power in the beam path of lasers. Please observe and adhere to the specifications and limit values given in chapter 16, „Technical data“, on page 33. Other forms of usage are improper. The information contained in this operating manual must be strictly observed to ensure proper use of the device. Measurements with the PocketMonitor PMT should be performed exclusively with a static (unmoving) laser beam. Moving beams can produce faulty power measurements.

Using the device for unspecified use is strictly prohibited by the manufacturer. By usage other than intended the device can be damaged or destroyed. This poses an increased health hazard up to fatal injuries. When operating the device, it must be ensured that there are no potential hazards to human health.

The device itself does not emit any laser radiation. During the measurement, however, the laser beam is guided onto the device which causes reflected radiation (**laser class 4**). That is why the applying safety regulations are to be observed and necessary protective measures need to be taken.

Observing applicable safety regulations

Startup is only permitted once it has been ensured that the entire machine into which the PocketMonitor PMT is installed meets the requirements of the EC Directive 2006/42/EC and laser beam protection regulations, including DIN EN ISO 12254, DIN EN 60825 and TROS laser beam (technical regulations for the occupational safety ordinance for artificial optical radiation) as well as the corresponding implementation regulations.

Taking necessary safety measures

If there are people present within the danger zone of visible or invisible laser radiation, for example near laser systems that are only partly covered, open beam guidance systems or laser processing areas, the following safety measures need to be taken:

- Please wear **safety goggles** adapted to the power, power density, laser wave length and operating mode of the laser beam source in use.
- Depending on the laser source, it may be necessary to wear suitable **protective clothing** or **protective gloves**.
- Please protect yourself from direct laser radiation, scattered radiation as well as from beams generated from laser radiation (e.g. by using appropriate shielding walls or by weakening the radiation to a harmless level).

- Please use beam guidance- or beam absorber elements which do not emit any hazardous particles as soon as they get in contact with laser radiation and which resist the beam sufficiently.
- Please install safety switches and/or emergency safety mechanisms which enable an immediate closure of the laser shutter.
- Please ensure a stable mounting of the device in order to prevent a relative motion of the device to the beam axis of the laser and thus to reduce the risk of stray radiation. This is the only way to ensure optimum performance during the measurement.

Employing qualified personnel

The device may only be operated by qualified personnel. The qualified personnel must have been instructed in the installation and operation of the device and must have a basic understanding of working with high-power lasers, beam guiding systems and focusing units.

Conversions, modifications and repairs

The device must not be modified, neither constructionally nor safety-related, without our explicit permission. The device must not be opened e.g. to carry out unauthorized repairs. Modifications of any kind will result in the exclusion of our liability for resulting damages.

Liability disclaimer

The manufacturer and the distributor of the measuring devices do not claim liability for damages or injuries of any kind resulting from an improper use or handling of the devices. Neither the manufacturer nor the distributor can be held liable by the buyer or the user for damages to people, material or financial losses due to a direct or indirect use of the measuring devices.

2 Symbol explanation

The following symbols and signal words indicate possible residual risks:

DANGER

means that death or serious physical injuries **will** occur if necessary safety precautions are not taken.

WARNING

means that death or serious physical injuries **can** occur if necessary safety precautions are not taken.

CAUTION

means that a slight physical injury **can** occur if necessary safety precautions are not taken.

NOTICE

means that property damages **can** occur if necessary safety precautions are not taken.

The device itself or the packing bears the following symbols to indicate requirements and possible dangers:

Read and observe the operating instructions and safety guidelines before startup!

The device contains a non-removable lithium ion battery. In order to prevent health hazards and damage to the environment, the battery must be disposed of as required by the applicable national and international laws.

Further symbols that are not safety-related:

Here you can find useful information and helpful hints.

With the CE marking the manufacturer guarantees that his product is in conformity with the EC guidelines.

Call for observing (visual feedback from the device).

▶ Call for action

3 About this operating manual

This documentation describes the installation and operation of the PocketMonitor PMT and performing measurements.

4 Conditions at the installation site

- The device must not be operated in a condensing atmosphere.
- The ambient air must be free of organic gases.
- Protect the device from splashes of water and dust.
- Operate the device in closed rooms only.

5 Important information for devices with lithium-ion battery

The device is equipped with a non-removable lithium ion battery. While operating the device, it is therefore essential to observe and adhere to the requirements of chapter 16, „Technical data“, on page 33 in regards to environmental conditions.

5.1 Storing the battery

Store the device in a cool, dry place. Do not expose the device to direct sunlight.

5.2 Replacing the battery

With the integrated lithium ion battery, approx. 10 000 measurements can be performed. The service life of the lithium ion battery is therefore approx. 2 years. The battery is checked at every service and replaced if necessary.

5.3 If the battery is damaged

Do not open the device to replace or remove the battery. When the battery is damaged, fluids (electrolytes) may leak out. These are flammable, contact with the eyes or skin may cause irritation. Vapors may irritate the eyes, respiratory organs, and skin. Fire or high temperatures can cause a serious explosion. Heating or fire can release poisonous gases. Hazardous smoke may be released when ignited.

5.4 Disposing of the battery

In order to prevent hazards to health and damage to the environment, the device must be disposed of as required by the applicable national and international laws. Please send the device to PRIMES as described in chapter 14, „Measures for the product disposal“, on page 31.
If you are located outside of the EU, please contact your PRIMES distribution partner for matters concerning device disposal.

6 Introduction

6.1 System description

The device consists of the absorber with operating unit. Both components are connected to each other either with a swivel joint or a cable.

For device types with swivel joint, the absorber protects the display and the operating elements from damage and soiling when folded up.
Device types with cable are optionally available with an analog current loop interface in the operating unit (device types sep/out).

The different device types and their type designation can be found in the chapter 6.3 on page 14.

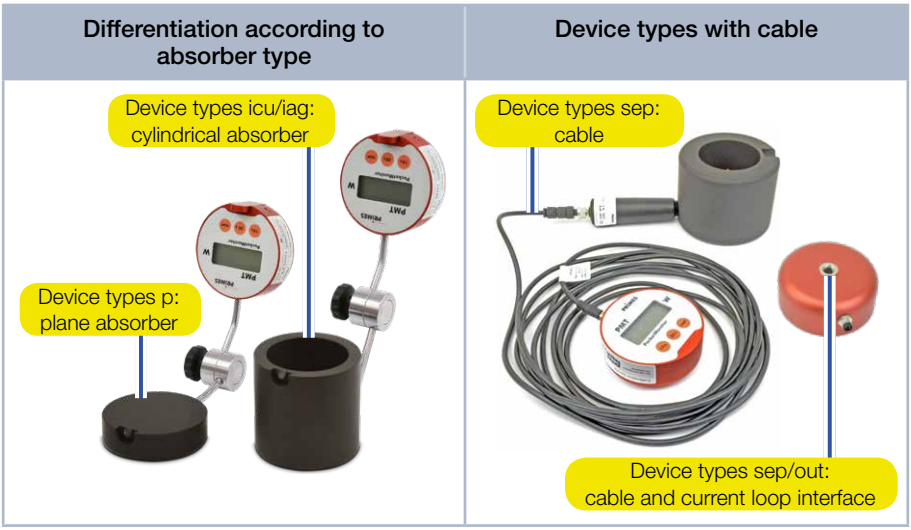


Fig. 6.1: Mechanical construction of the device

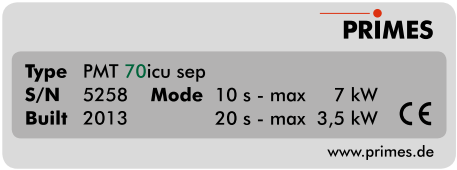
The display shows either the measured laser power in watts or the temperature of the absorber in degrees Celsius.
A non-removable lithium ion battery supplies the device with power for approx. 10 000 measurements.

6.2 Measuring principles

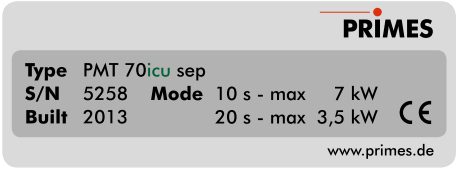
The device measures the laser power according to the calorimetric principle. The absorber of the device is irradiated with the laser for a short period of time. The temperature of the absorber is measured between the beginning and end of the irradiation. Based on the temperature rise and the thermal properties of the absorber, the microprocessor-based electronics are able to calculate the laser power with high accuracy.

6.3 Differentiation of device types by means of identification plates

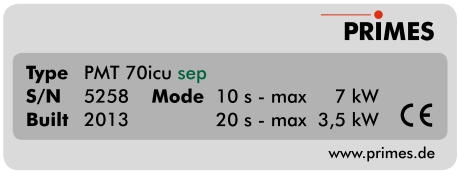
The devices differ by the maximum permissible laser power for which the device is designed, by the shape of the absorber, by the mechanical construction (swivel joint or cable) and by an optional analog current loop interface.

Example of identification plate	Designation	Maximum permissible laser power
	01	0.1 kW
	05	0.5 kW
	30	3 kW
	70	7 kW
	120	12 kW

Tab. 6.1: Differentiation by maximum permissible laser power

Example of identification plate	Designation	Absorber type
	p	Plane absorber
	icu	Cylindrical absorber with conical reflector
	iag	Cylindrical absorber with conical silver reflector

Tab. 6.2: Differentiation by absorber type

Example of identification plate	Designation	Construction
	without	With swivel joint, without current loop interface
	sep	With cable, without current loop interface
	sep/out	With cable, with current loop interface

Tab. 6.3: Differentiation by mechanical construction and analog current loop interface

7 Transportation

NOTICE

Damaging/Destruction of the device

Hard impacts or dropping the device can damage the electrical components.

Touching the absorber can lead to burn-in by the laser radiation at the points of contact. Burn-in lead to damage to the absorber and increase the scattered radiation.

- **Handle the device carefully when transporting or installing it.**
- **To avoid contamination, close and lock the unfolded operating unit (only device types with swivel joint).**
- **Do not touch the inlet aperture of the absorber.**
- **Only transport the device in the original PRIMES transport box.**

8 Connect the PocketMonitor PMT by cable

8.1 Connect device types sep or sep/out with suitable cable and operating unit

Absorber, operating unit and cable are calibrated together and marked on the identification plates with matching serial numbers S/N. Therefore only connect the matching components with matching serial numbers S/N.

1. Connect the cable to the matching absorber.
2. Connect the cable to the matching operating unit.
3. Check that the components are correctly assigned to each other using the serial numbers S/N.

Fig. 8.1: Connecting device types sep or sep/out with calibrated cable and operating unit

8.2 Connect device types sep/out with the cable of the analog current loop interface

With device types sep/out there is an analog current loop interface in the operating unit, via which you can control the device remotely and read out the measured values.

The interface is designed as a 5-pin socket with screw locking (pin assignment see Tab. 8.1 on page 17). A suitable angle plug is included in the scope of delivery.

1. Connect the cable to the plug (not shown).
2. Connect the plug to the analog current loop interface.
3. Tighten the screw to lock the connection.
4. Check the correct connection of the components.

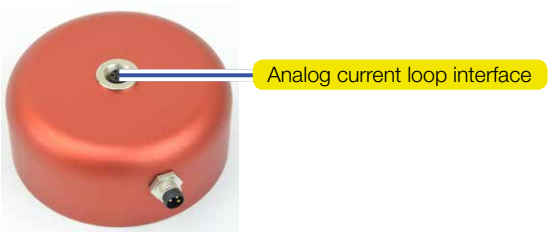
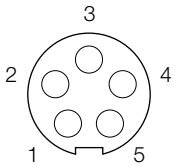


Fig. 8.2: Operating unit with analog current loop interface

Pin diagram socket (top view, plug-in side)	**Pin**	**Function**
	1	Ground
	2	Supply voltage input: 24 V, max. 30 mA
	3	Current output: 4 – 20 mA (load resistor: max. 500 Ohm)
	4	Input: pulse for setting a 20 s measurement: 24 V
	5	Input: pulse for setting a 10 s measurement: 24 V

Tab. 8.1: Socket assignment of the analog current loop interface

9 Installation/Removal

9.1 Prepare installation

1. Switch off the laser source.
2. Ensure that moving parts, e.g. robot arms, etc. are at a standstill and that they cannot be set in motion unintentionally.

DANGER

Serious eye or skin injury due to laser radiation

If the stability of the device is not guaranteed or the inlet aperture is not centered and mounted perpendicular to the laser beam, increased scattered or directed reflection of the laser beam will occur.

- ▶ **Place the device according to chapter 9.2 on page 18 in a way that ensures, that the device can not shift or fall.**
- ▶ **Align the device as described in chapter 9.3 on page 19.**

NOTICE

Damaging/Destruction of the device

Touching the absorber can lead to burn-in by the laser radiation at the points of contact. Burn-in lead to damage to the absorber and increase the scattered radiation.

- ▶ **Do not touch the inlet aperture of the absorber.**

9.2 Mounting position

Place the absorber of the PocketMonitor PMT on heat-insulating material so that the measurement result is not distorted. If the heat of the absorber is dissipated into the underground, then the display value is falsified (lower values).

Place the absorber of the PocketMonitor PMT on a horizontal, stable and vibration-free base. The absorber is fixed by the base without additional fixing material.

Avoid strong airflows, e.g. at a nozzle or at the output coupler, as these can lower the measured values.

9.3 Align the device

The absorber of the PocketMonitor PMT must be aligned to the laser beam. The laser beam must hit the inlet aperture in the middle (± 2 mm) and perpendicular. Please mind and adhere to the specifications and limit values given in chapter 16, „Technical data“, on page 33.

Normally, the device is positioned underneath the focus position of the beam path for power measurement (divergent laser radiation). If this is not possible, the device can be positioned above the focus.

Please note that the laser radiation is convergent and the permitted power density on the absorber is not exceeded.

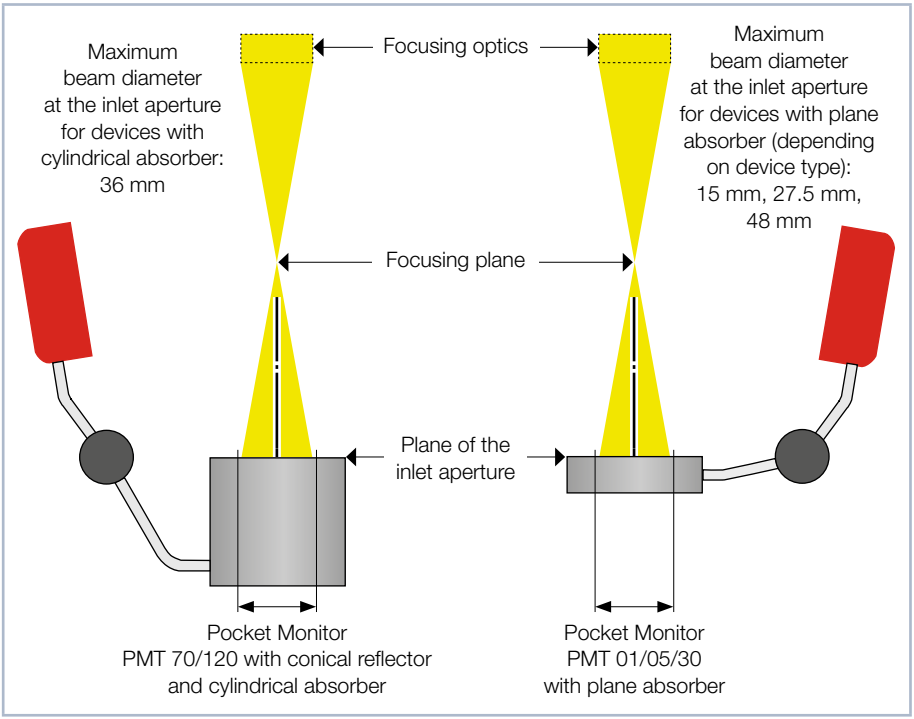


Fig. 9.1: Alignment to the laser beam

9.4 Position the device in the laser system

1. Only device types with swivel joint: Open the operating unit.
2. Position the device in the laser system.
- Please note the information in the chapter 9.2 on page 18.
3. Align the device with the laser beam as described in chapter 9.3 on page 19.

9.5 Remove the device from the laser system

CAUTION

Burns due to hot components

After a measurement the absorber is hot. Touching the absorber can lead to burns.

▶ **Let the device cool down for an adequate period of time. The cooling time varies depending on the laser power and the irradiation time.**

NOTICE

Damaging/Destruction of the device

Only device types with swivel joint: If the absorber is still hot, the control unit can be damaged after closing.

▶ **Do not close the folded-out control unit until the absorber has cooled down to below 60 °C.**

1. Switch off the laser source.
2. Ensure that moving parts, e.g. robot arms, etc. are at a standstill and that they cannot be set in motion unintentionally.
3. To check the temperature of the absorber, press the ***TEMP*** button.
- Do not continue until the absorber has cooled down to below 60 °C.
4. Remove the device from the laser system. To do this, grip the device by the absorber handle, the operating unit or the swivel joint.
5. Only device types with swivel joint: Close the control unit to protect the device from dirt.

10 Control Elements

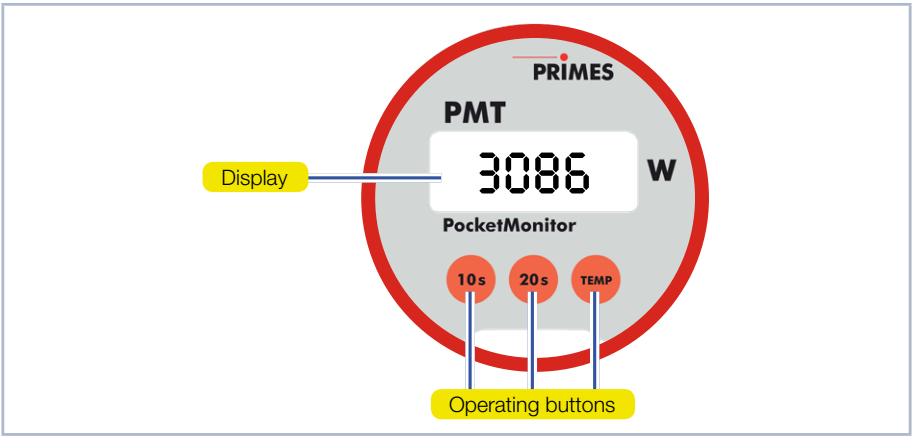


Fig. 10.1: Operating unit of the device

On the operating unit, you will find three operating buttons with which you can control the following functions:

Button	Function
10 s	Switch on the device
	Set irradiation time 10 s
20 s	Switch on the device
	Set irradiation time 20 s
TEMP	Check temperature of the absorber
	To switch off the device manually, keep this button pressed and simultaneously press the button 20 s for 1 s.

Tab. 10.1: Functions of the operating keys

11 Display on the device

The display on the device shows the measured power in watts. The device types are designed for different maximum permissible laser powers and have displays with different resolutions (see Tab. 11.1 on page 22).
A resolution of 0.1 W or 0.01 W means that the instrument measures in steps of 1/10 W or 1/100 W. The measured values are displayed precisely to the first or second decimal place. A resolution of 1 W means that the instrument measures in steps of 1 W. Decimal places are not displayed.

Device type	Maximum permissible laser power	Resolution	Measuring steps
PMT 01	100 W	0.01 W	1/100 W
PMT 05	500 W	0.1 W	1/10 W
PMT 30	3 000 W	1 W	1 W
PMT 70	7 000 W	1 W	1 W
PMT 120	12 000 W	1 W	1 W

Tab. 11.1: Display resolution depending on the device type

12 Measuring with the PocketMonitor PMT

12.1 Safety instructions

DANGER

Severe eye or skin injury due to laser radiation

During the measurement the laser beam is guided on the device, which causes scattered or directed reflection of the laser beam (laser class 4).

- Please wear safety goggles adapted to the power, power density, laser wave length and operating mode of the laser beam source in use.
- Wear suitable protective clothing and protective gloves.
- Protect yourself from laser radiation with separating devices (e.g. by using appropriate shielding).

CAUTION

Burns due to hot components

After a measurement the absorber is hot. Touching the absorber can lead to burns.

- Let the device cool down for an adequate period of time. The cooling time varies depending on the laser power and the irradiation time.
- To cool down the absorber you can immerse the absorber in cold water. To do this, grip the device by the absorber handle, the operating unit or the swivel joint.
- Do not immerse the operating unit and the swivel joint in water.

NOTICE

Damaging/Destruction of the device

The maximum permissible laser power of a device type applies to an irradiation time of 10 s. At an irradiation time of 20 s the maximum permissible laser power is divided in half.

- Observe the limit values in Tab. 12.1 on page 24.

12.2 Maximum permissible laser power

Device type	Maximum permissible laser power in W	
	Irradiation time 10 s	Irradiation time 20 s
PMT 01	100	50
PMT 05	500	250
PMT 30	3 000	1500
PMT 70	7 000	3500
PMT 120	12 000	6000

Tab. 12.1: Maximum permissible laser power depending on the irradiation time

12.3 Measure via the operating unit

12.3.1 Get ready for measurement

1. Observe the safety instructions in chapter 12.1 on page 23.

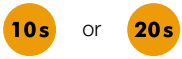
Only device types with swivel joint

1. Loosen the locknut screw at the swivel joint.
2. Press the lock button and fold the operating unit into the desired position.
3. Fasten the locknut at the swivel joint again.

For all device types

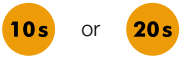
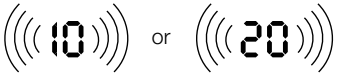
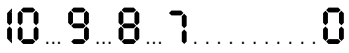
4. Remove any protective foil from the absorber.
5. To switch on the device, press the ***10 s*** or ***20 s*** button.

- The device is ready to measure after approx. 5 seconds.



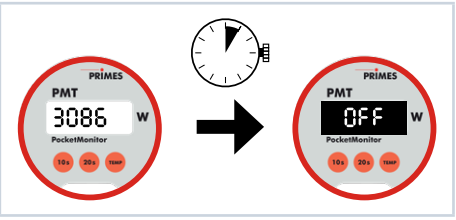
6. To check the temperature of the absorber, press the ***TEMP*** button. • Do not continue until the absorber has cooled down to room temperature (± 5 °C). This is an important requirement for accurate measurement results. • The absorber can remain hot for a long time after a measurement. You can prepare the absorber for the next measurement by cooling it in water according to chapter 12.5 on page 30.	

12.3.2 Perform measurement

1. Observe the safety instructions in chapter 12.1 on page 23.	
2. Set the laser to an on-time that corresponds to the desired irradiation time (10 s or 20 s). If you switch the laser on manually, the temporal inaccuracy is included in the measured value. • The device does not check the actual irradiation time.	
3. To set the desired irradiation time (10 s or 20 s), press the ***10 s*** or ***20 s*** button. The display shows a value drifting slightly around zero.	
4. Switch on the laser. • To do so, use the shutter if possible. The power control of lasers often causes overshooting, which distorts the measurement. • The radiation heats up the absorber. As soon as the temperature of the absorber rises above a pre-set threshold value, the measurement begins. The display flashes during the measurement.	
5. Switch off the laser. • After the irradiation time has run out the thermalization time begins (depending on the absorber type 10 s – 60 s). During the thermalization time a countdown is running. Afterwards the measured power is displayed.	

- After approx. 5 minutes the device switches off automatically.

6. To switch off the device manually, keep the ***TEMP*** button pressed and simultaneously press the ***20 s*** button for 1 s.



12.4 Measure via the analog current loop interface (only device types sep/out)

The device types sep/out have an analog current interface, which allows you to control the device remotely and read out the measured values.

The interface supplies the device with power and operates continuously. Therefore a measurement can be started at any time.

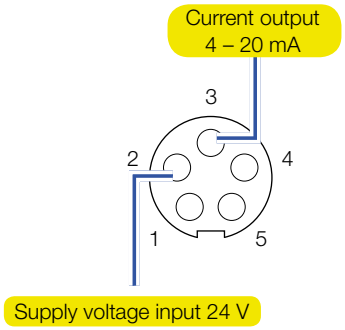
Using two formulas, the absorber temperature and laser power can be calculated from the direct current output. A current of 4 mA corresponds to the zero point. A current of 20 mA corresponds to the maximum display range.

12.4.1 Get ready for measurement

1. Observe the safety instructions in chapter 12.1 on page 23.
2. Remove any protective foil from the absorber.
3. Connect the current loop interface with the cable according to chapter 8.2 on page 17.

4. Switch on the supply voltage at pin 2 (24 V, max. 30 mA)
- While the supply voltage is applied, the device is in continuous operation.

5. Measure the output current at pin 3 with an ammeter.
6. Calculate the temperature of the absorber using the output current according to Tab. 12.2 on page 27.
- Do not continue until the absorber has cooled down to room temperature (± 5 °C). This is an important requirement for accurate measurement results.
- The absorber can remain hot for a long time after a measurement. You can prepare the absorber for the next measurement by cooling it in water according to chapter 12.5 on page 30.



Pin diagram socket (top view, plug-in side)

Device type	Formula for calculating the absorber temperature T (in degrees Celsius)
PMT 01	T = (I – 4 mA) × 13.652 °C/mA
PMT 05	T = (I – 4 mA) × 6.827 °C/mA
PMT 30	T = (I – 4 mA) × 6.827 °C/mA
PMT 70	T = (I – 4 mA) × 13.652 °C/mA
PMT 120	T = (I – 4 mA) × 27.307 °C/mA

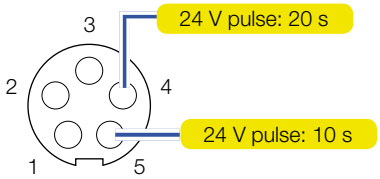
Tab. 12.2: Formula for calculating the absorber temperature (I = output current in mA)

12.4.2 Perform measurement of the laser power

1. Observe the safety instructions in chapter 12.1 on page 23.

2. Set the laser to an on-time that corresponds to the desired irradiation time (10 s or 20 s). If you switch the laser on manually, the temporal inaccuracy is included in the measured value.
- The device does not check the actual irradiation time.

3. To set the desired irradiation time (10 s or 20 s), set a 24 V pulse.
- at pin 4: setting of 20 s
- at pin 5: setting of 10 s



Pin diagram socket (top view, plug-in side)

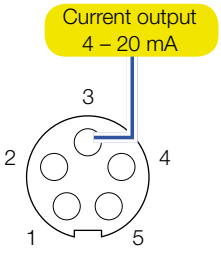
4. Switch on the laser.
- To do so, use the shutter if possible. The power control of lasers often causes overshooting, which distorts the measurement.
- The radiation heats up the absorber. As soon as the temperature of the absorber rises above a pre-set threshold value, the measurement begins.

5. Switch off the laser.
- After the irradiation time has run out the thermalization time begins (depending on the absorber type 10 s – 60 s).
- During thermalization time the output current is reset to 4 mA.

6. To determine an offset, measure the output current at pin 3 with an ammeter **during** the thermalization time.
- If the actual measured current deviates from the 4 mA value, you can use this measurement deviation to correct an offset.

7. To determine the laser power, measure the output current at pin 3 with an ammeter **after** the thermalization time.

8. Calculate the laser power from the output current according to Tab. 12.3 on page 29.
- The current output after the thermalization time remains constant until a new pulse is applied to pin 4 or pin 5.



Pin diagram socket (top view, plug-in side)

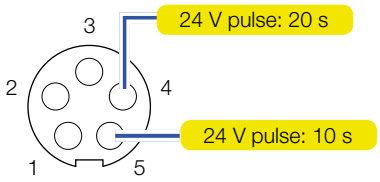
Device type	Formula for calculating the laser power P
PMT 01	P = (I – 4 mA) × 6.8268 W/mA
PMT 05	P = (I – 4 mA) × 34.134 W/mA
PMT 30	P = (I – 4 mA) × 341.34 W/mA
PMT 70	P = (I – 4 mA) × 682.68 W/mA
PMT 120	P = (I – 4 mA) × 1365.36 W/mA

Tab. 12.3: Formula for calculating the laser power
(I = output current after the thermalization time in mA)

12.4.3 Perform measurement of the absorber temperature

After measuring the laser power, the output current remains constant regardless of the current absorber temperature. If you want to read out the absorber temperature, proceed as follows:

1. Set a 24 V pulse at pin 4 or pin 5.
- Do not switch on the laser. As soon as the temperature of the absorber rises above a pre-set threshold value, the measurement of the laser power begins.
2. Measure the output current at pin 3.
3. Calculate the temperature of the absorber using the output current according to Tab. 12.2 on page 27.



Pin diagram socket (top view, plug-in side)

12.5 Cool the absorber in water for series measurements

The absorber can remain hot for a long time after a measurement. You can prepare the absorber for the next measurement by immersing it in cold water. Proceed as follows:

1. Grip the unit by the absorber handle, the operating unit or the swivel joint.
2. Immerse the absorber in cold water.

- Do not immerse the operating unit and the swivel joint in water.

3. Observe the temperature display. Remove the absorber from the water as soon as it has cooled down to room temperature (± 5 °C).
4. Dry the absorber with compressed air.

- After cooling with water, the absorber must be completely dry. Evaporating water would falsify the measurement result due to its high heat capacity.

12.6 Possible errors

Error	Possible cause
Measured values are lower than expected.	• The absorber is damp. • The absorber is placed in a strong air flow. • The absorber stands on a heat dissipating base. • The absorber was moved during the measurement.
Measured values are higher than expected.	• The irradiation time set on the device and the actual irradiation time by the laser are different.
The display shows 100 W instead of 3 000 W (expected value).	• The the ***TEMP*** button was accidentally pressed after the measurement. Now the temperature is displayed, usually about 70 °C to 120 °C.

Tab. 12.4: Possible errors

13 Maintenance and service

The operator is responsible for determining the maintenance intervals for the measuring device.
PRIMES recommends a maintenance interval of 12 months for inspection and validation or calibration.
If the device is used only sporadically, the maintenance interval can be extended up to 24 months.

14 Measures for the product disposal

Due to the Electrical and Electronic Equipment Act (“Elektro-G“) PRIMES is obliged to dispose PRIMES measuring devices manufactured after August, 2005, free of charge. PRIMES is a registered manufacturer in the German “Used Appliances Register“ (Elektro-Altgeräte-Register “EAR“) with the number WEEE-reg.-no. DE65549202.

Provided that you are located in the EU, you are welcome to send your PRIMES devices to the following address, where they will be disposed free of charge (this service does not include shipping costs):

PRIMES GmbH
Max-Planck-Str. 2
64319 Pfungstadt
Germany

15 Declaration of conformity

Original EG Declaration of Conformity

The manufacturer: PRIMES GmbH, Max-Planck-Straße 2, 64319 Pfungstadt, Germany,
hereby declares that the device with the designation:

PocketMonitor (PMT)

PMT 01p, 01p sep, 01p sep/out; PMT 05p, 05p sep, 05p sep/out; PMT 30p, 30p sep, 30p sep/out; PMT 70iag, 70iag sep, 70iag sep/out; PMT 70icu, 70icu sep, 70icu sep/out; PMT 120iag, 120iag sep, 120iag sep/out; PMT 120icu, 120icu sep, 120icu sep/out

is in conformity with the following relevant EC Directives:

- EMC Directive EMC 2014/30/EU
- Directive 2011/65/EC on the restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment

Authorized for the documentation:
PRIMES GmbH, Max-Planck-Straße 2, 64319 Pfungstadt, Germany

The manufacturer obligates himself to provide the national authority in charge with technical documents in response to a duly substantiated request within an adequate period of time.

Pfungstadt, February 4, 2020

Dr. Reinhard Kramer, CEO

16 Technical data

16.1 Device types p

Measurement parameters		PMT 01p [1]	PMT 05p [1]	PMT 30p [1]
Laser power range		5 – 100 W [2]	25 – 500 W [2]	150 – 3000 W [2]
Wavelength range		800 – 1100 nm oder 10,6 µm		
Max. beam diameter on the absorber (inlet aperture)		15 mm	27.5 mm	48 mm
Max. power density on the absorber (inlet aperture)	for < 1 kW	2.5 kW/cm²	2.5 kW/cm²	2.5 kW/cm²
	for < 3 kW	—	—	1.5 kW/cm²
Irradiation time		10 s (at maximum permissible laser power), 20 s (at 50 % of the maximum permissible laser power)		
Device parameters				
Max. angle of incidence perpendicular to inlet aperture		± 5 °		
Max. centered tolerance		± 2.0 mm		
Measuring accuracy		± 4 %		
Reproducibility		± 2 %		
Dimensions and Weight				
Absorber height		20 mm	15 mm	20 mm
Absorber diameter		25 mm	45 mm	79 mm
Weight (approx.)		530 g	560 g	670 g

Environmental Conditions	PMT 01p [1]	PMT 05p [1]	PMT 30p [1]
Operating temperature range	10 – 40 °C		
Storage temperature range	5 – 50 °C		
Reference temperature	22 °C		
Permissible relative humidity (non-condensing)	10 – 80 %		
Protection			
Degree of protection	IP 51		

[1] **Please refer to the specifications on the identification plate for the type of your device.**

[2] **The stated limit values are to be understood in correlation with the permitted maximum energy ($E = P \cdot t$).**

16.2 Device types icu/iag

Measurement parameters	PMT 70iag, 70icu [1]	PMT 120iag, 120icu [1]
Laser power range	350 – 7000 W [2]	500 – 12 000 W [2]
Wavelength range	800 – 1100 nm oder 10.6 µm	
Max. beam diameter on the absorber (inlet aperture)	36 mm	
Max. power density on the absorber (inlet aperture)	5 kW/cm² for 5 kW	
Irradiation time	10 s (at maximum permissible laser power), 20 s (at 50 % of the maximum permissible laser power)	
Device parameters		
Max. angle of incidence perpendicular to inlet aperture	± 5 °	
Max. centered tolerance	± 2.0 mm	
Measuring accuracy	± 4 %	
Reproducibility	± 2 %	
Dimensions and Weight		
Absorber height	75 mm	
Absorber diameter	79 mm	99 mm
Weight (approx.)	1110 g	1550 g

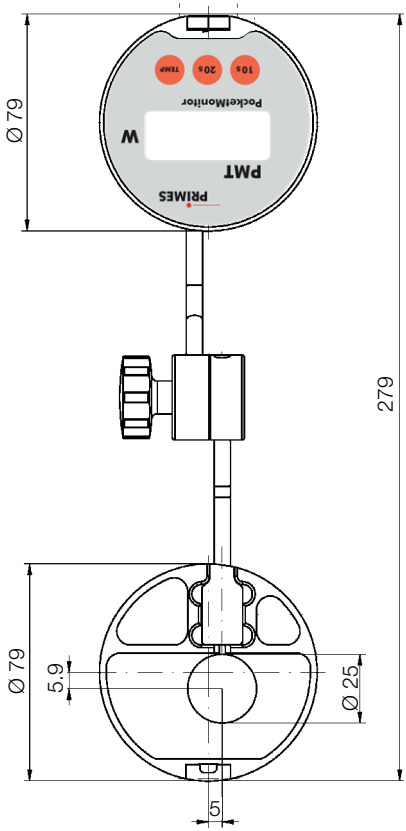
Environmental Conditions	PMT 70iag, 70icu [1]	PMT 120iag, 120icu [1]
Operating temperature range	10 – 40 °C	
Storage temperature range	5 – 50 °C	
Reference temperature	22 °C	
Permissible relative humidity (non-condensing)	10 – 80 %	
Protection		
Degree of protection	IP 51	

[1] **Please refer to the specifications on the identification plate for the type of your device.**

[2] **The stated limit values are to be understood in correlation with the permitted maximum energy (E = P · t).**

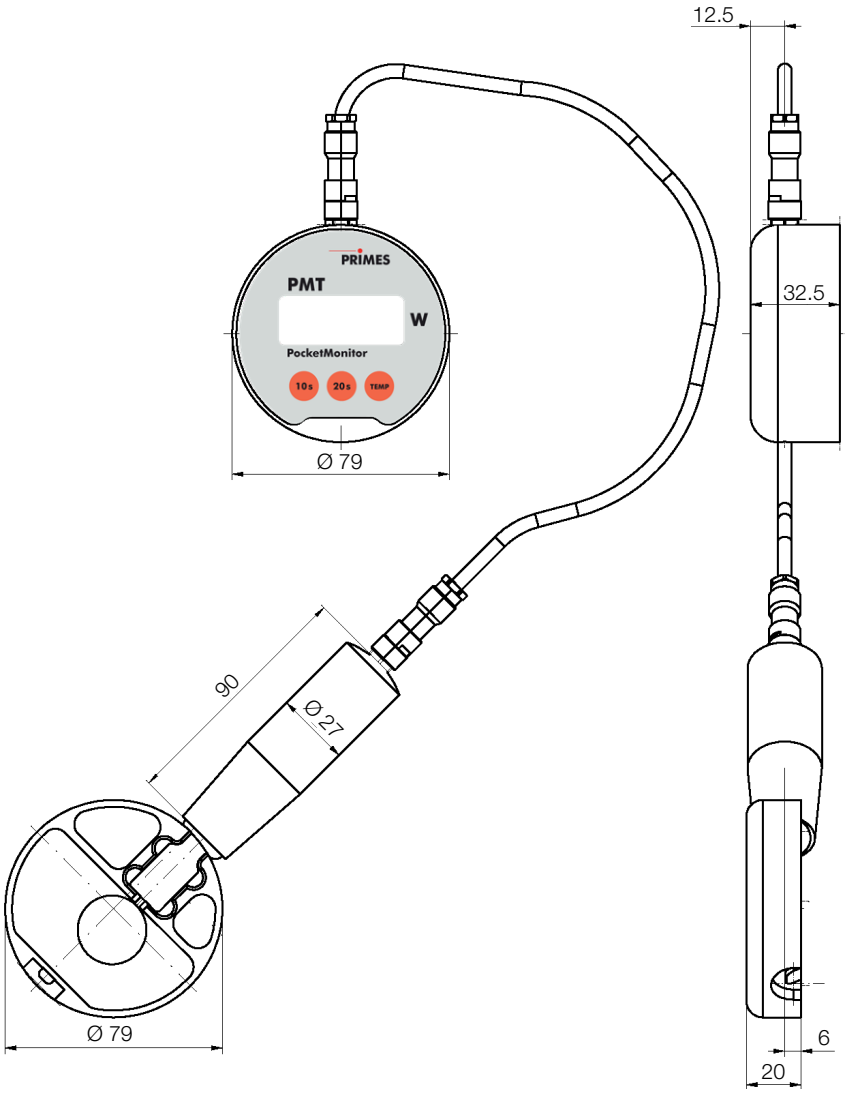
17 Dimensions

17.1 PMT 01p



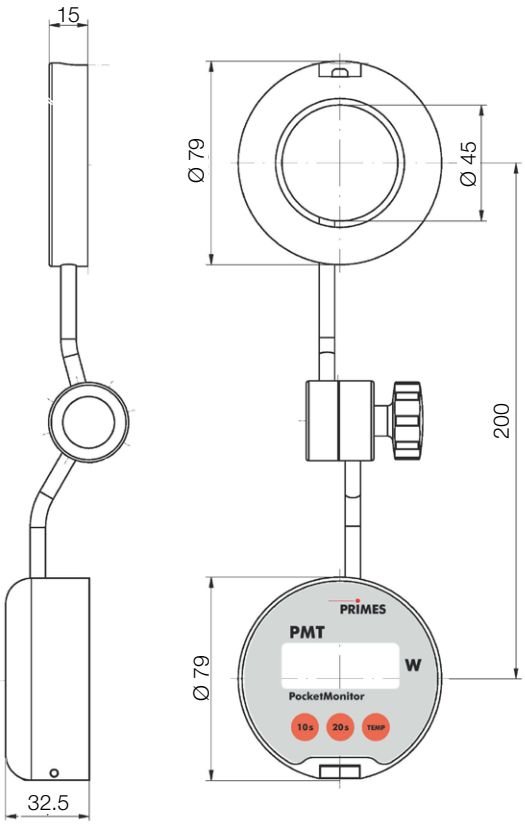
All dimensions in mm (general tolerance ISO 2768-v)

17.2 PMT 01p sep, 01p sep/out



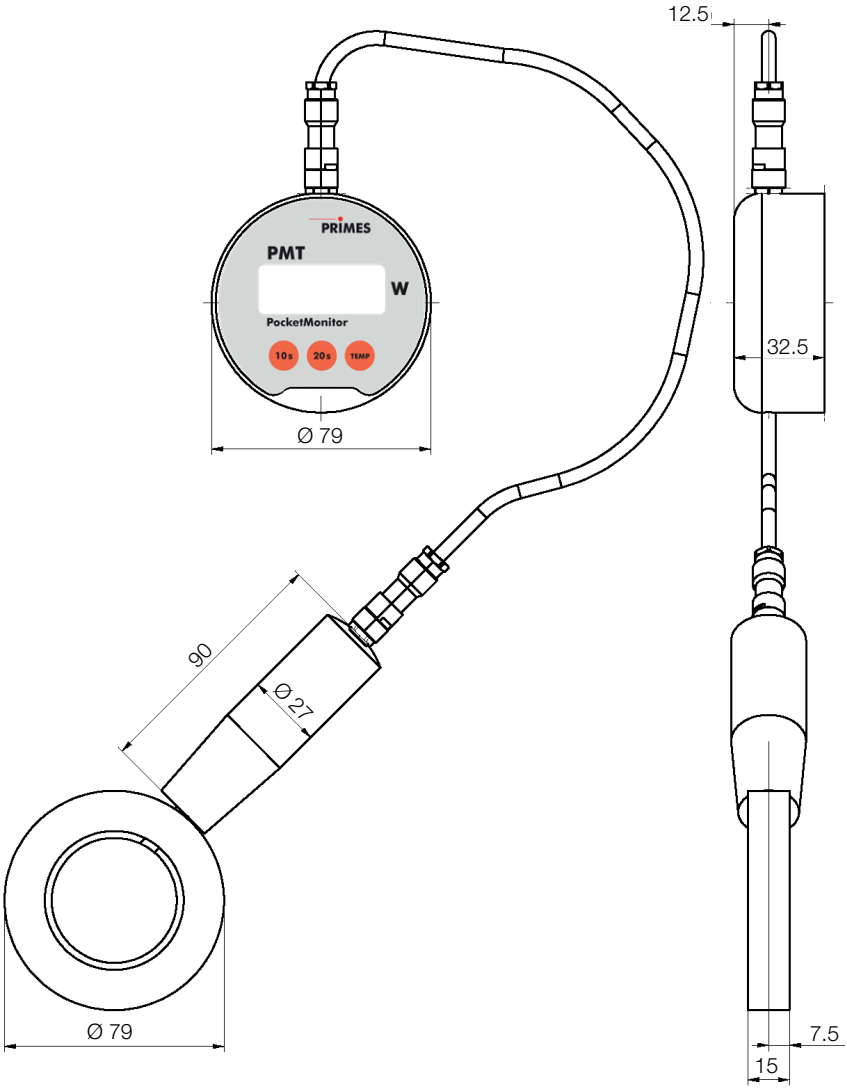
All dimensions in mm (general tolerance ISO 2768-v)

17.3 PMT 05p



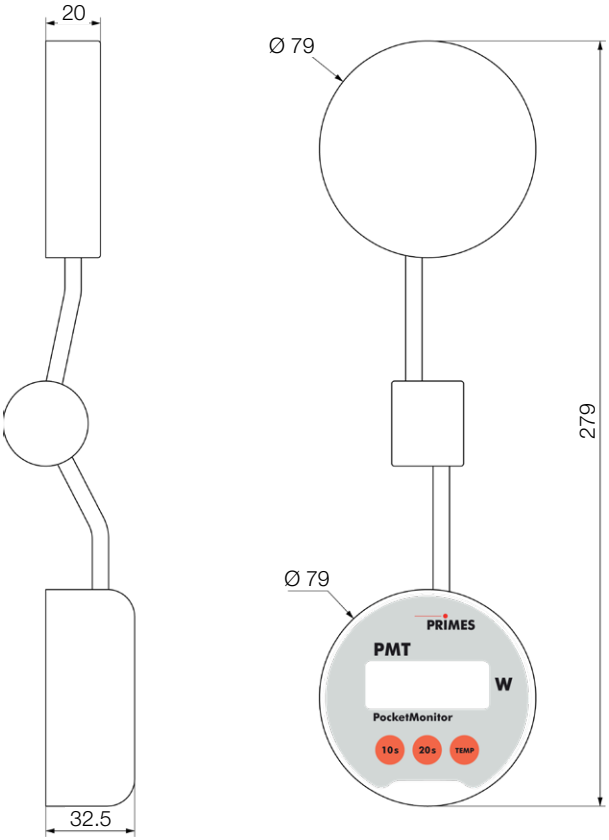
All dimensions in mm (general tolerance ISO 2768-v)

17.4 PMT 05p sep, 05p sep/out



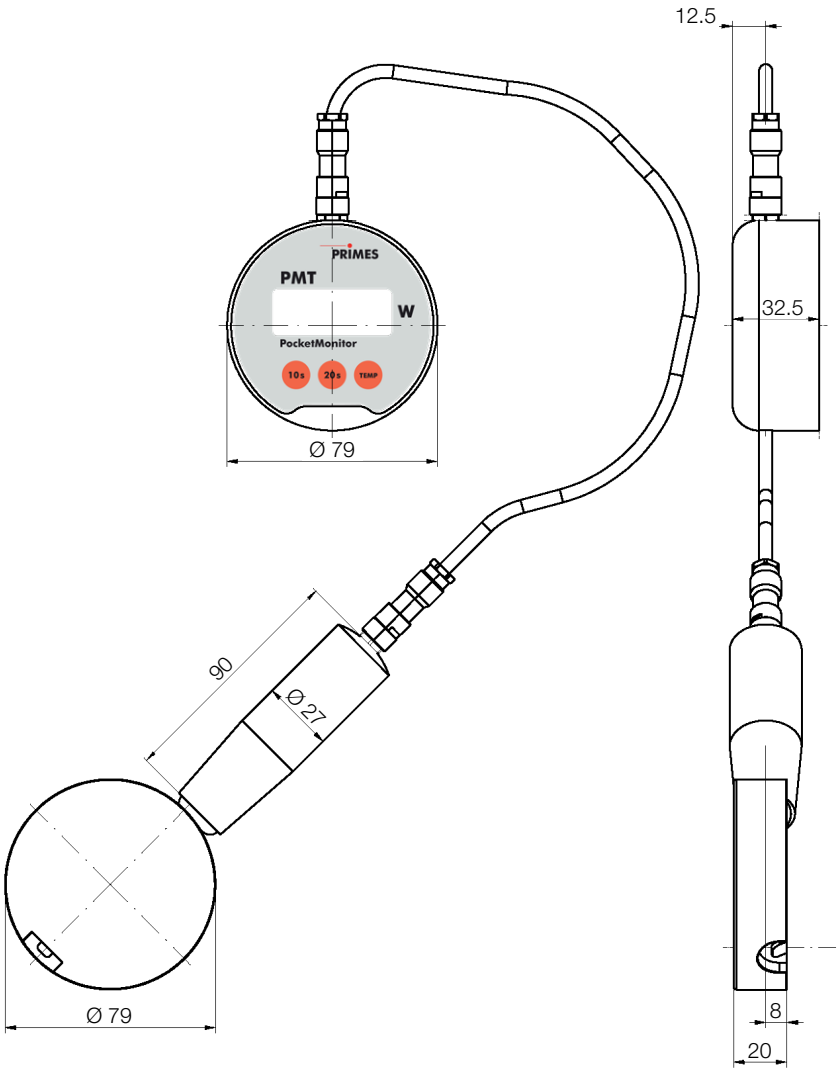
All dimensions in mm (general tolerance ISO 2768-v)

17.5 PMT 30p



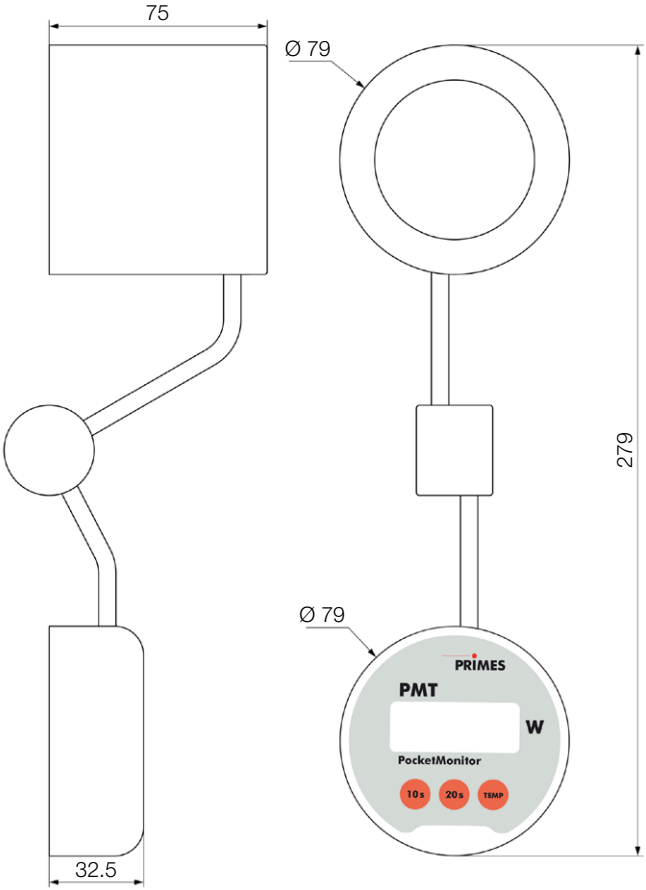
All dimensions in mm (general tolerance ISO 2768-v)

17.6 PMT 30p sep, 30p sep/out



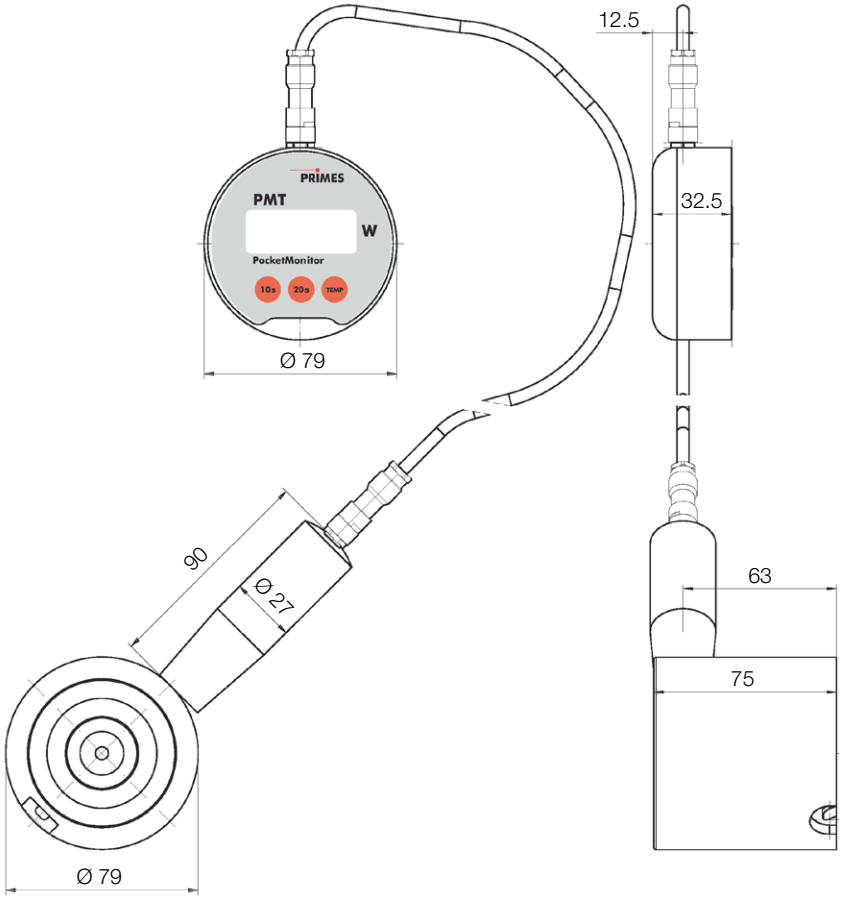
All dimensions in mm (general tolerance ISO 2768-v)

17.7 PMT 70icu, 70iag



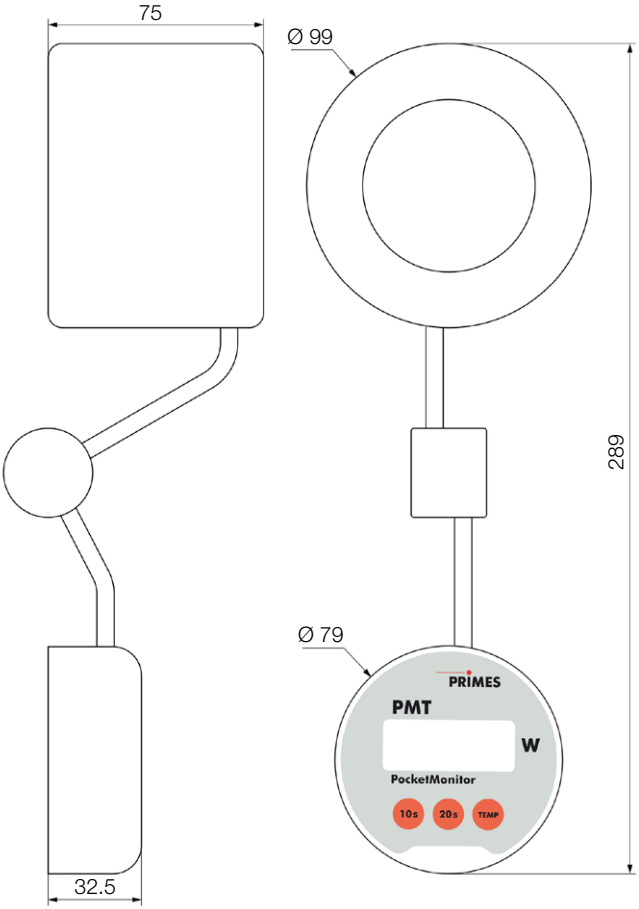
All dimensions in mm (general tolerance ISO 2768-v)

17.8 PMT 70iag sep, 70iag sep/out
PMT 70icu sep, 70icu sep/out



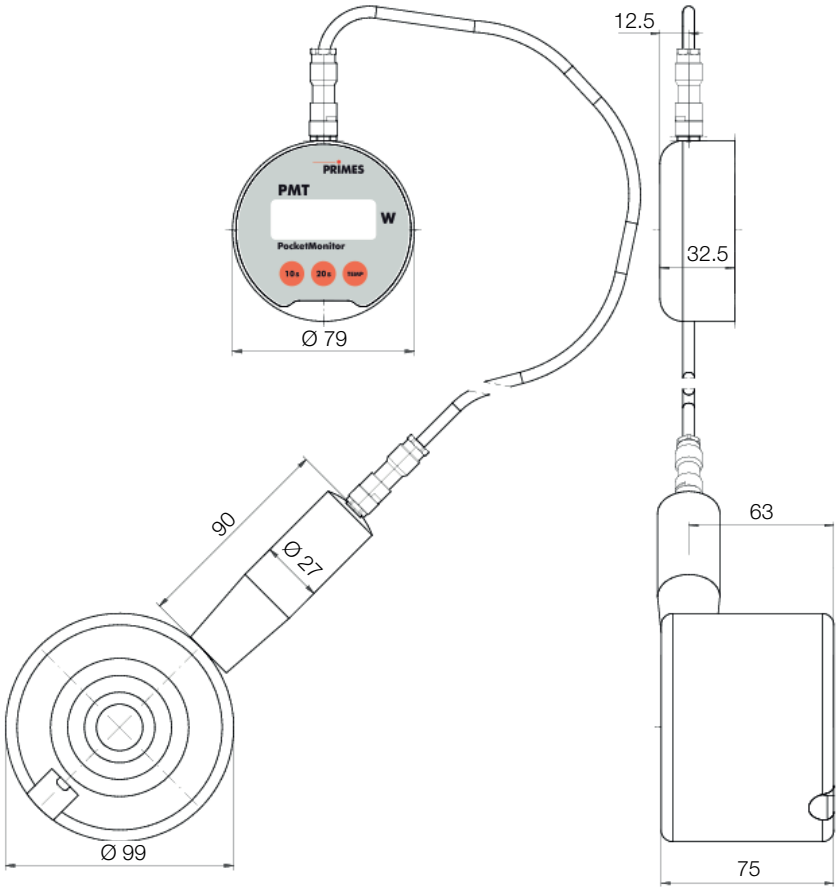
All dimensions in mm (general tolerance ISO 2768-v)

17.9 PMT 120icu, 120iag



All dimensions in mm (general tolerance ISO 2768-v)

17.10 PMT 120iag sep, 120iag sep/out
PMT 120icu sep, 120icu sep/out



All dimensions in mm (general tolerance ISO 2768-v)

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