

# Pyrometer CellaTemp **PA 4x, 5x, 6x**

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Unless otherwise stated in this instruction manual, the instruments described herein are subject to change without prior notice, particularly modifications for the sake of technological advancement.

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## 1 Miscellaneous


### 1.1 Information about this manual

The purpose of the Operating Manual is to provide the user with all necessary information to be able to install the pyrometer and any necessary accessories.

Before starting installation, be sure to read and understand this entire manual, in particular the chapter on safety! The instructions contained in this manual, especially those concerning safety, as well as site-specific regulations governing UV radiation must be always complied with!

### 1.2 Explanation of symbols

Important safety-related references in this manual are marked with a symbol.

 <b>Attention</b>
This symbol indicates important information which, if neglected, might result in pyrometer damage, malfunction or breakdown.



#### CAUTION

This symbol points out guidelines which should be followed for efficient and trouble-free operation.



#### Action

This symbol indicates the result of the action taken

### 1.3 Liability and Warranty

All information compiled in this manual is in accordance with applicable regulations. The statements made are based on state-of-the-art technology and reflect our extensive knowledge and many years of experience.



Always carefully read this Operating Manual before beginning any work on or with the instrument, especially prior to installation and initial setup! The Manufacturer shall not be held liable for any damages or malfunctions arising from a disregard of the warnings and instructions contained herein

This Operating Manual must be retained for future use. Please ensure that all persons who wish to operate the instrument have access to this manual.

## 1.4 Copyright

This Operating Manual should be treated as confidential. It is solely intended for use by persons involved with the instrument. This manual may not be made available to a third party without prior Manufacturer's consent. Please contact the Manufacturer if the need should arise.



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## 2 Safety

This chapter outlines all important safety aspects to be considered for optimum employee protection and to ensure safe and reliable operations.

### 2.1 Intended use

The pyrometer is solely intended for non-contact measurement of temperatures as described in this manual. Any other use is not intended. Operational safety can only be ensured when the instrument is used for its intended purpose.

#### Attention

It is prohibited to use the pyrometer for any other purpose beyond what is specified in this manual. Using the instrument in any other manner will be considered as improper.

The manufacturer is only liable for damage that occurs during correct use. The prerequisite for any liability, however, is that the cause of the damage is due to a defective product and the defect in the product was caused by the manufacturer.

## 2.2 User's responsibility

The pyrometer may only be used when it is in perfect working condition.

## 2.3 Safety requirements

- ▶ Read this document before using the device.
- ▶ Ensure that the product is fully suitable for the relevant applications.
- ▶ Do not try to open the module enclosure. There are no users-serviceable components inside.
- ▶ Do not use and disable the product if it is damaged.
- ▶ Do not use the product if it operates incorrectly

## 2.4 Electromagnetic Compatibility

The devices comply with the essential safety requirements of the Electromagnetic Compatibility Directive 2014/30/EU (EMC Act).

When connecting a power supply unit, make sure that it also conforms to these standards. Radio interference may arise if the pyrometer is interconnected with such peripheral devices which have not been properly interference-suppressed. This may necessitate additional interference suppression measures.

## 2.5 Safety instructions and protective measures




### 2.5.1 Laser radiation

#### Attention

Laser class II product, according to IEC 60825-1:2014

- ▶ Do not stare into the laser beam.
- ▶ Only switch on the laser to align the pyrometer and then switch it off again.
- ▶ Do not leave the device unattended when the laser is activated.
- ▶ Do not point the device's laser beam at people.
- ▶ When installing and aligning the pyrometer, avoid reflections of the laser beams from reflective surfaces.
- ▶ Do not look directly into the laser with optical tools (for example, binoculars, telescopes, microscopes).
- ▶ Observe the latest version of the applicable laser safety regulations.

## 2.5.2 Position of the product label

	 <p>Wavelength: 630 - 680 nm        Power: &lt; 1 mW        The arrow on the laser warning sign points in the direction of the laser's exit lens.</p>
<p> If the pyrometer is installed in such a way that the laser warning sign is covered, the enclosed laser warning sign (1 piece) must be attached to the mounting or machine next to the laser beam exit opening (so that the laser is not visible when reading the sign).</p>	

## 3 General Description

The two-colour pyrometer CellaTemp PA measures the intensity of infrared radiation at two different wavelengths. The ratio of these two intensities is proportional to the temperature. Thus, a two-colour pyrometer supplies a constant measurement signal even with weakened signals, caused, for example, by vapour and dirt in the sighting path, condensed optical lenses or changing surface properties of the target. These instruments serve a broad range of applications which include the iron and steel producing industry as well as the metal, glass, cement and chemical industries.

### Flame temperature measurement (only PA 47)

A key parameter for optimizing burnout and minimizing pollutant emissions in incinerators is the knowledge of the combustion chamber temperature, which can be determined in different ways. One of the possible methods is the measurement of the flame temperature. The pyrometer PA 47 detects the temperature of the soot particles in flames. The particle temperature of the flame is determined following the algorithm of Rössler: from the black body temperature of the spectral measured value and the colour temperature of the two-colour measurement value. This method has the advantage that the optical thickness of the flame and the penetration depth of the pyrometer are considered.

To indicate the exact measurement spot, CellaTemp PA pyrometers feature through-the-lens sighting or, as an alternative, laser sighting or an integrated camera.

The instruments have rugged stainless-steel housings which make them ideal for use in hostile industrial environments. PA pyrometers are splash waterproof according to IP65 (DIN 40050)

All PA pyrometers with through-the-lens sighting feature an interchangeable, focusable lens. Through-the-lens sighting with target marker facilitates easy alignment to the target. PA instruments with laser sighting feature an integrated laser which produces a laser dot image on the target object to indicate the precise measurement spot.

The adjustable emissivity factor makes it easy to adapt the pyrometer to the specific radiation characteristics of the material measured.

All pyrometers of the PA series have two analogue current outputs; each is switchable from 0 - 20 mA to 4 - 20 mA.

The output currents are linear to the measured temperature. The required temperature range can be set at the pyrometer.

When ambient temperatures are higher than the admissible working temperature, the output current is > 20.5 mA.

CellaTemp PA also features an analogue voltage input which can be used as an alternative to current output 2. The emissivity factor or a correction for reflected ambient temperature can be controlled using this voltage input.

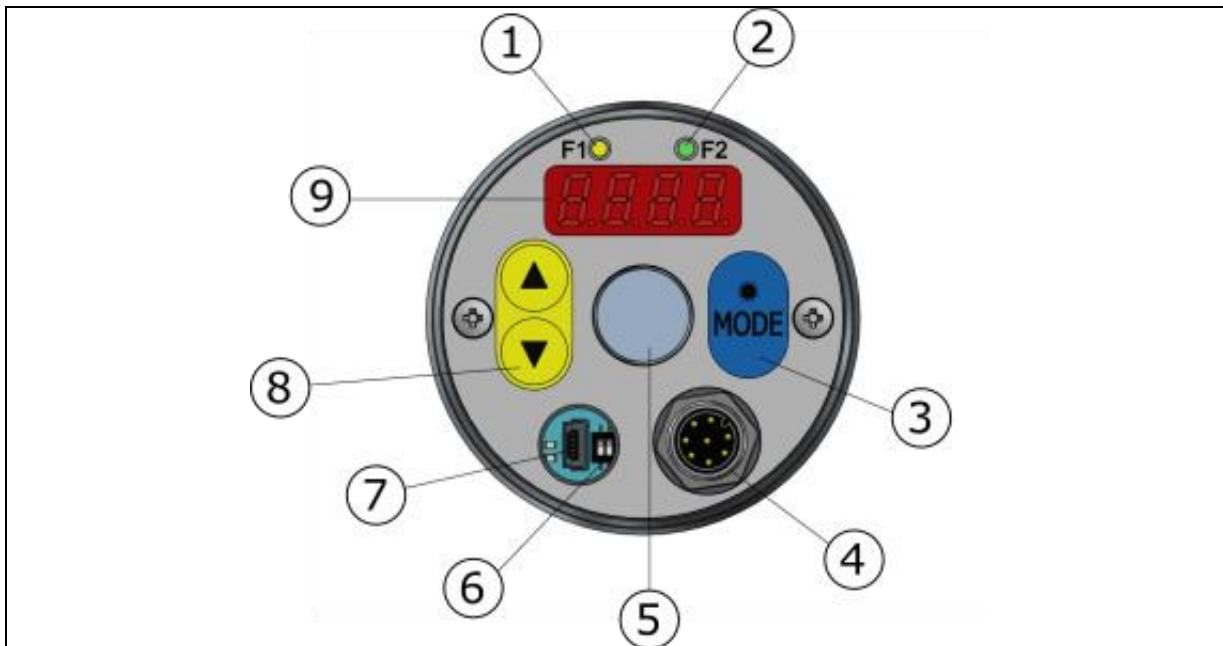
Two serial interfaces (USB and RS485) are available. They enable the user to change all operating parameters such as emissivity setting, temperature range, smoothing function or output current range during running operations.

CellaTemp PA allows for continuous temperature data output in a user-configured cycle time.

## **4 Operating Controls and Display**

The rear panel of the CellaTemp PA has a 4-digit display and 3 push-buttons. The display shows the current temperature or, during configuration using the pushbuttons, the display will show the corresponding parameter.

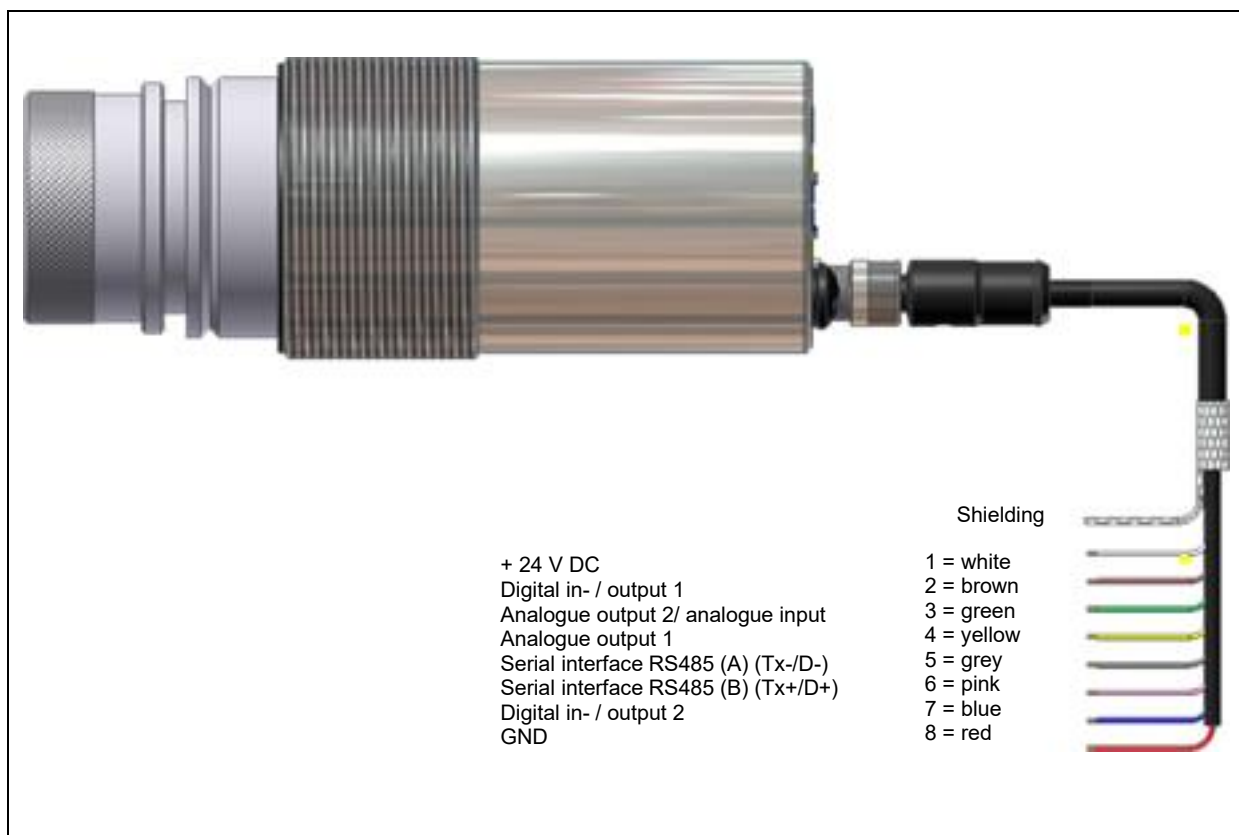
Whenever the display shows a parameter, the F1 Parameter LED (yellow) will light up. The function of the F2 Status LED (green) is user configurable. In its initial state when supplied to the customer the F2 LED indicates status for the switchable output Do1 as ready for operation.



1	Parameter-LED
2	Status-LED
3	Mode-key (switch for laser target marker)
4	Connector socket
5	Depending on the type: through-the-lens viewfinder, laser pilot light or camera
6	DIP switch for termination of the RS485 connection
7	USB-Port
8	Select / change parameters
9	Display

## 5 Quick Reference Guide

### 5.1 PA Connector Pin Assignment



### **⚠ Attention**

The pyrometer housing is connected to the signal ground via a 0.1µ F/50V capacitor. Isolate any unused wires to avoid the display of erroneous data

## 5.2 Power Requirement 24 V DC

The instrument works with an operating voltage of 24 V DC. The voltage required for operation must be supplied by a separate power supply. This power supply unit must conform to directive DIN IEC 61010.

The supply voltage is  $\leq 135$  mA for standard design,  $\leq 150$  mA for models with laser sighting and  $\leq 175$  mA for models with camera. CellaTemp PA is equipped with inverse polarity protection. The output currents and voltages share one ground connection via pin 8 of the connector.

A self-test is performed when the instrument is switched on. The display will briefly indicate the software version and after that the emissivity setting. When the self-test is completed, the pyrometer is ready for operation, and the display will show the current temperature reading.



To achieve a high degree of measurement accuracy and repeatability it is important to allow the pyrometer time to warm up. Turn the power supply on about 10 minutes before starting (camera version 20 min).

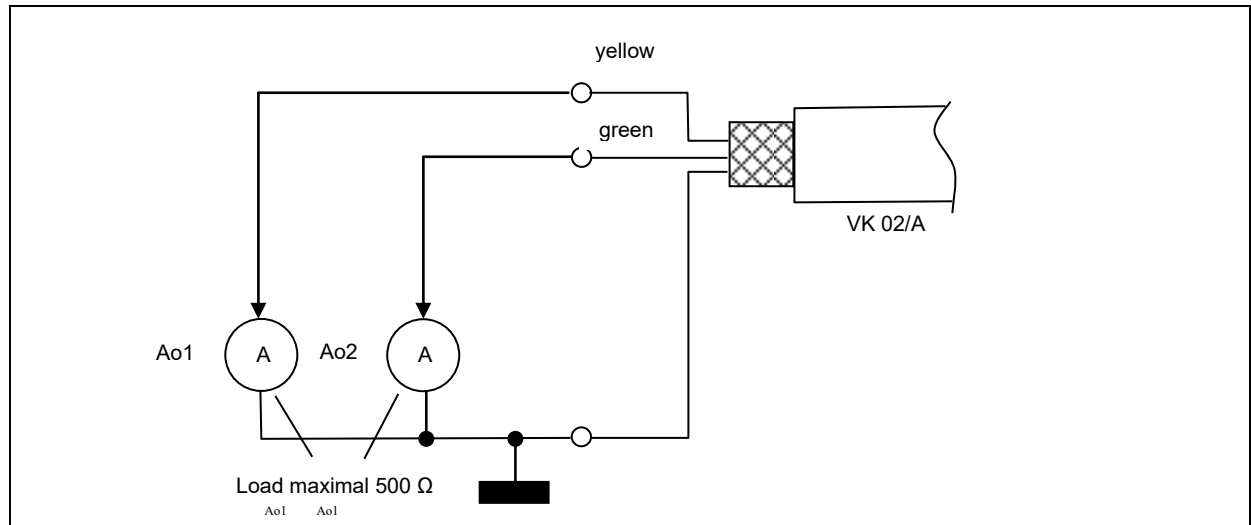


We recommend that you protect the feed line to the pyrometer against short circuit by using a 250-mA micro fuse.

## 5.3 Current Outputs 0/4 - 20mA

CellaTemp PA features two current outputs. Both outputs are active current sources which supply linear output current. The user can select between two scales: either 0 - 20 mA or 4 - 20 mA. Maximum load is 500  $\Omega$ .

**The two current outputs are factory preset to 4 - 20 mA!**

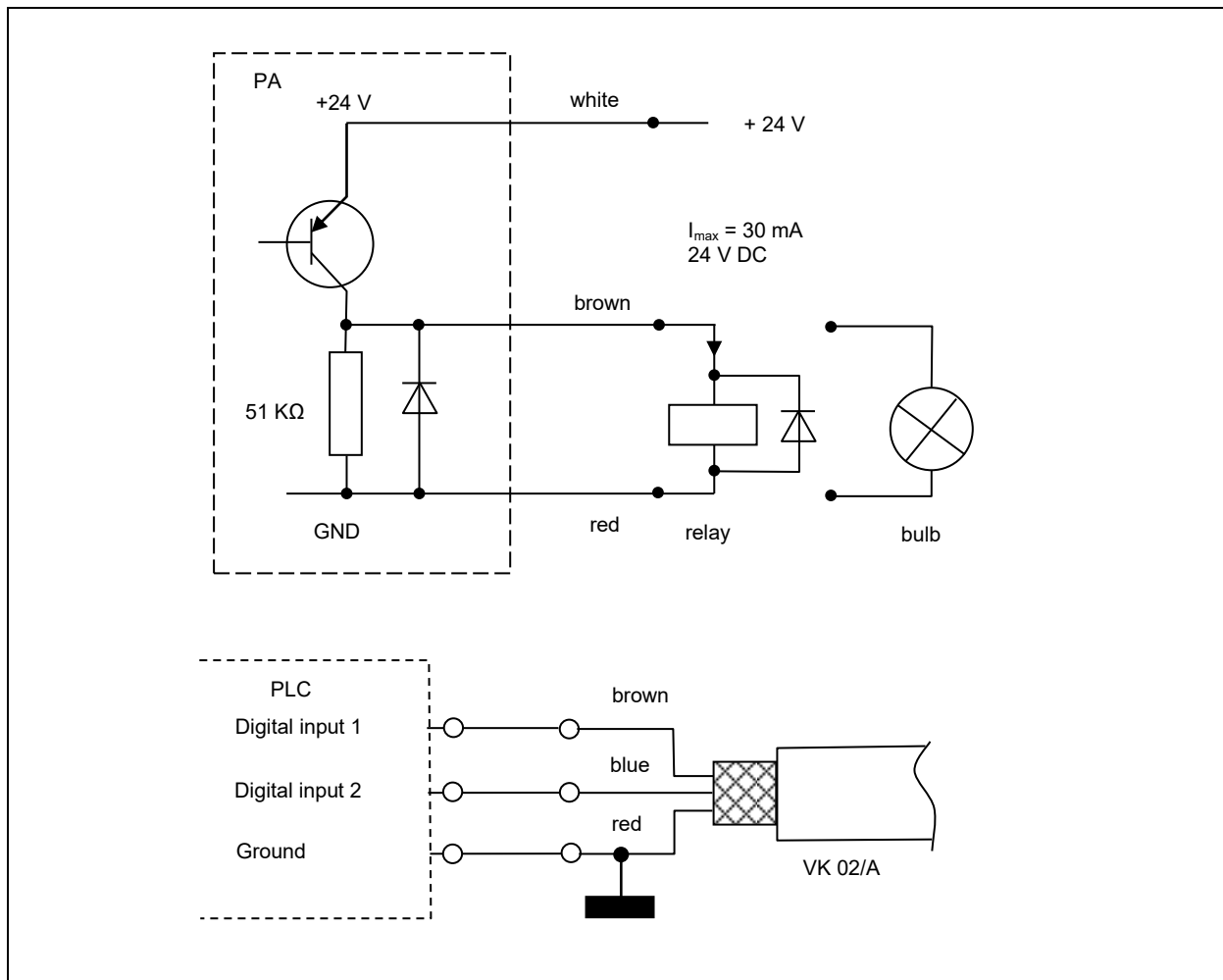


For all pyrometers of the PA Series the current outputs are short-circuit-proof and share one ground connection via pin 8 of the connector. Each current output can be individually scaled and can be set either at the display or via interface.

When only one current output is required, output 1 should be selected (Pin 4)

#### 5.4 Switching output

All pyrometers of the PA Series feature two switching outputs which can be configured as digital outputs or digital inputs. The open collector outputs allow for a voltage of +24 V DC. For signal processing a pull-down resistor can be applied to the ground connection of the supply voltage. The maximum current of each open collector output is 30 mA.



See Chapter 8.2.2 for more information on configuration.

## 6 Getting Started

### 6.1 General installation tips

Install the pyrometer in a location where it will not be unnecessarily exposed to smoke, ambient heat or water vapour.

A false reading (too low) will be displayed when the pyrometer lens is dirty. Therefore, always ensure that the lens is clean.

The pyrometer's optical path must remain unobstructed. Any interference or obstacle may lead to measurement errors.

### 6.2 Pyrometer Alignment to Target

For accurate temperature measurement, it is essential that the pyrometer is correctly aimed and focused on the target object. Make sure that the optical path is not obscured because this would most likely impair accuracy.

When aiming the pyrometer with through-the-lens sighting to a target, both the targeted object and the target marker (distinctly marked circled spot in the viewfinder) must appear in sharp focus simultaneously. The measured object must completely fill the target circle in the viewfinder.

A variable polarising filter is available to provide eye protection. This accessory can be screwed to the ocular lens to provide adjustable brightness control.

If the actual target spot is the same size as the minimum spot size required by the distance-to-target ratio, or only marginally larger, then we recommend that you check the maximum output current to verify proper focussing.

### 6.3 Pyrometers with laser sighting

The pyrometer model's PA xx AF xx L feature a laser spotlight which can be activated to facilitate instrument alignment to the target spot.

Under normal operating conditions the laser will be off. To activate the laser, press the MODE button on the rear panel for 2 seconds. Alternatively, the laser can be switch on via switching input or PC. The laser will automatically deactivate after 1- 15 minutes.

The pyrometer should be aimed and focused on such a way that—at the proper distance to the target object—the laser beam produces razor-sharp round dot to indicate the exact measurement spot.



For pyrometers featuring an integrated laser spotlight, the light may, when activated, influence the instrument's temperature reading. This influence will vary, depending on the instrument model and the temperature. To ensure an accurate and reliable temperature reading, the laser spotlight will automatically deactivate after 1- 15 minutes. The time is adjustable.

### 6.4 Pyrometer with camera

The model's PA xx AF xx C features an integrated camera.

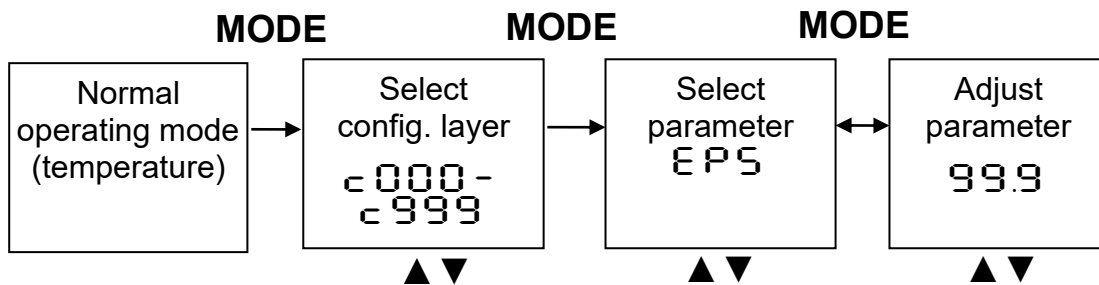
The video feed simplifies the optical alignment of the pyrometer and allows a continuous observation of the measuring point.

When aiming the pyrometer focus the sensing head until the video images is sharp. (Technical data chapter 37)

### 6.5 Setting parameters at the pyrometer (basic configuration)

Use the buttons ▲▼ and the „MODE" button on the rear panel to access and configure parameters. With these buttons you can view and adjust all settings required for operating the pyrometer. (See Chap. 3.1).

Menu structure:



1. Press the MODE button while in normal operating mode to switch to "configuration layer" mode.
2. Use ▲▼ to select the configuration layer for the parameter you wish to set.
3. Press MODE to confirm. Press ▲▼ to select the parameter.
4. Press MODE to confirm. Press ▲▼ to adjust the parameter value.
5. Press MODE again to end. Press ▲▼ to select E n d / S R U E .
6. Now use MODE to either apply the changes you have made to the settings [ S R U E ] or to close without saving these changes [ E n d ]. After that, the display panel will resume showing the temperature reading.

Parameter	configuration layer	Explanation
EPS.9	c 00 1	Ratio correction (see chapter 6.7)
Ao 1.~	c 0 10	Lower limit of temperature span analogue output Ao1(see chapter 6.11).
Ao 1.~	c 0 10	Upper limit of temperature span analogue output Ao1(see chapter 6.11).
Ao 1.4	c 0 10	Hardware configuration of the analogue output 0 - 20 mA, 4 - 20 mA (see chapter 6.11).
Ao 1.t	c 100	Temperature measurement simulation to verify signal transmission



Key lock may have been activated via interface. When selecting the configuration layer you will be prompted to enter an ac-

cess code with P 0000. To obtain full access to parameter settings, enter P 100 otherwise you will only be able to view parameters but not change them.

## 6.6 Setting Emissivity (Spectral mode)

A pyrometer measures temperature by detecting the radiant energy emitted from an object's surface in the form of electromagnetic waves. The temperature reading not only depends on the intensity of the object's thermal radiation (how hot the object is), but also on the material's particular surface characteristics and thus its specific ability to emit thermal energy. This is called emissivity. To obtain an accurate temperature reading, it is imperative that the pyrometer be adjusted for this emissivity prior to measurement.

Set the emissivity correction at configuration layer c 002 / c 003. See the Emissivity Coefficient Table in Chapter 12 to select the proper emissivity factor for your application. We recommend that you first perform a comparison temperature measurement with another device to determine the correct emissivity factor for the task.

## 6.7 Setting the Emissivity Ratio (two-colour/ratio mode)

When the radiation properties of the target object's surface (emissivity) differ at two different wavelengths, or when interferences in the field of view—such as dust or steam—do not weaken the signal to the same degree at each wavelength, the pyrometer can be adjusted by setting the ratio of these two emissivity coefficients.



During normal operating mode, emissivity can be set at the pyrometer using the ▲ ▼ buttons. When simultaneously pressing the MODE key, the display shows the current measuring temperature while the emissivity coefficient continues to be adjusted in the background. This is an easy way to determine the emissivity when the object temperature is known. The modified values are directly adopted

### Attention

Once you have configured the emissivity parameter, the pyrometer will maintain this specific setting. The pyrometer will always operate with this value unless you change the setting.

## 6.8 Internal temperature compensation (PA 45)

For special applications, primarily for processes  $> 2000$  °C, it may be necessary to adapt the pyrometer's internal temperature compensation (TC) to the process. For this purpose, the PA 45 offers a special function for internal TC correction. A detailed description of how it works can be found in the separate manual “CellaTemp PA Temperature Correction”.

## 6.9 Adjusting the soot factor (Flame temperature measurement)

By default, the PA 47 is configured for the two-colour measurement. For the flame measurement, the soot factor of the flame must be set. This factor is determined by the flame type. As a first approximation, the parameter should be set to 1.2. If necessary, the device can be set to the real flame type. For this purpose, a reference measurement is carried out, e.g. with a thermocouple, and the PA 47 is set to the reference temperature by way of the soot factor. The soot factor is set on the code page C001 parameter  $\text{drcn}$ .

When using protective windows, the transmission of the window must be adjusted for the spectral channel. The value to be set can be found in the specification of the window.

Code page  $\text{c003}$  parameter  $\text{tAU2}$

**! Attention**

It is strongly recommended to use only approved protective windows specified by the manufacturer, which remain neutral regarding the wavelengths. If you use commercial glass, there is a risk of a faulty measurement due to selective influences.

**6.10 Parameterisation PA 69 with AEP algorithm**

The AEP algorithm is used to measure non-grey rays, i.e. rays with a wavelength-dependent emissivity. The AEP algorithm calculates the weighted average of the spectral temperature and two-colour/ ratio temperatures. The AEP algorithm is set via the EERC parameter.

When the EERC parameter is set to 0 %, the spectral temperature is no longer included in the calculation. The device works like a normal ratio pyrometer.

If the EERC parameter is set to 100 %, the ratio temperature is no longer included in the calculation. The pyrometer works as a spectral pyrometer.

For a correct measurement, the following conditions must be fulfilled.

- If there is a protective pane in the viewing path of the pyrometer, the transmission of the pane must be set via the parameter transmittance  $\lambda_{2003} \text{ \&Auml; } 2$ .
- The object to be measured must be larger than the pyrometer's measuring spot.
- There must be no signal-weakening medium in the beam path. I.e. the protective screen or optics must be clean and the field of view free of dust vapour and smoke.

**6.10.1 Commissioning the AEP algorithm****1 Step: Setting the parameters**

Set the emissivity ratio parameter to 120 %, the relative limit min parameter to 5 % and the parameter EERC to 0%.

Configuration layer C001	EPS.9 = 120
	EERC = 0
	ch.r. = 5

Set the emissivity of lambda 2 to 30 %

Configuration layer C003	EPS.2 = 30
--------------------------	------------

## 2 Step: Determining the measured temperatures

The temperatures can be displayed directly on the pyrometer or via CellaView on a PC.

### Display the measured values on the pyrometer.

Switch to configuration level **C020**.

Note the following temperatures:

- Ratio temperature before EERC algorithm parameter **9Pr**.
- Lambda 2 temperature parameter **L2**.

### Displaying the measured values via CellaView

Start CellaView and create a new measurement series with the following temperatures:

Measurement temperature ( $\lambda 2$ ) and Measurement temperature Premem (quotient).

Selected measurement values		
	Pyrometer	Measurement value
▶	PA 69 AF 1/C 300-800C (PA69 - 02/04975)	Temperature reading ( $\lambda 2$ )
	PA 69 AF 1/C 300-800C (PA69 - 02/04975)	Temperature reading Premem (Quotient)

Start the measurement.

### Step 3: Evaluate the measured values

- If the Premem measurement temperature (quotient) and the measured value temperatures ( $\lambda 2$ ) behave in opposite directions (Premem measurement temperature quotient > Lambda 2 measurement temperature), weighting via the EERC parameter makes sense.

- If the fluctuation range of the temperature measured value ( $\lambda 2$ ) is less than that of the measured temperature premem (quotient), weighting makes sense.
- If the fluctuation range of the measured temperature value ( $\lambda 2$ ) is greater than that of the measured temperature premem (quotient), weighting does not make sense. The EERC parameter should be set to 0. I.e. the measurement is carried out in ratio mode.

#### **Step 4: Set the EERC parameter.**

Determine the true temperature by means of a contact measurement.

Set the premem (ratio) temperature via parameter `c 001 EPS.9` and the temperature ( $\lambda 2$ ) via parameter `c 003 EPS.2` to the determined object temperature.

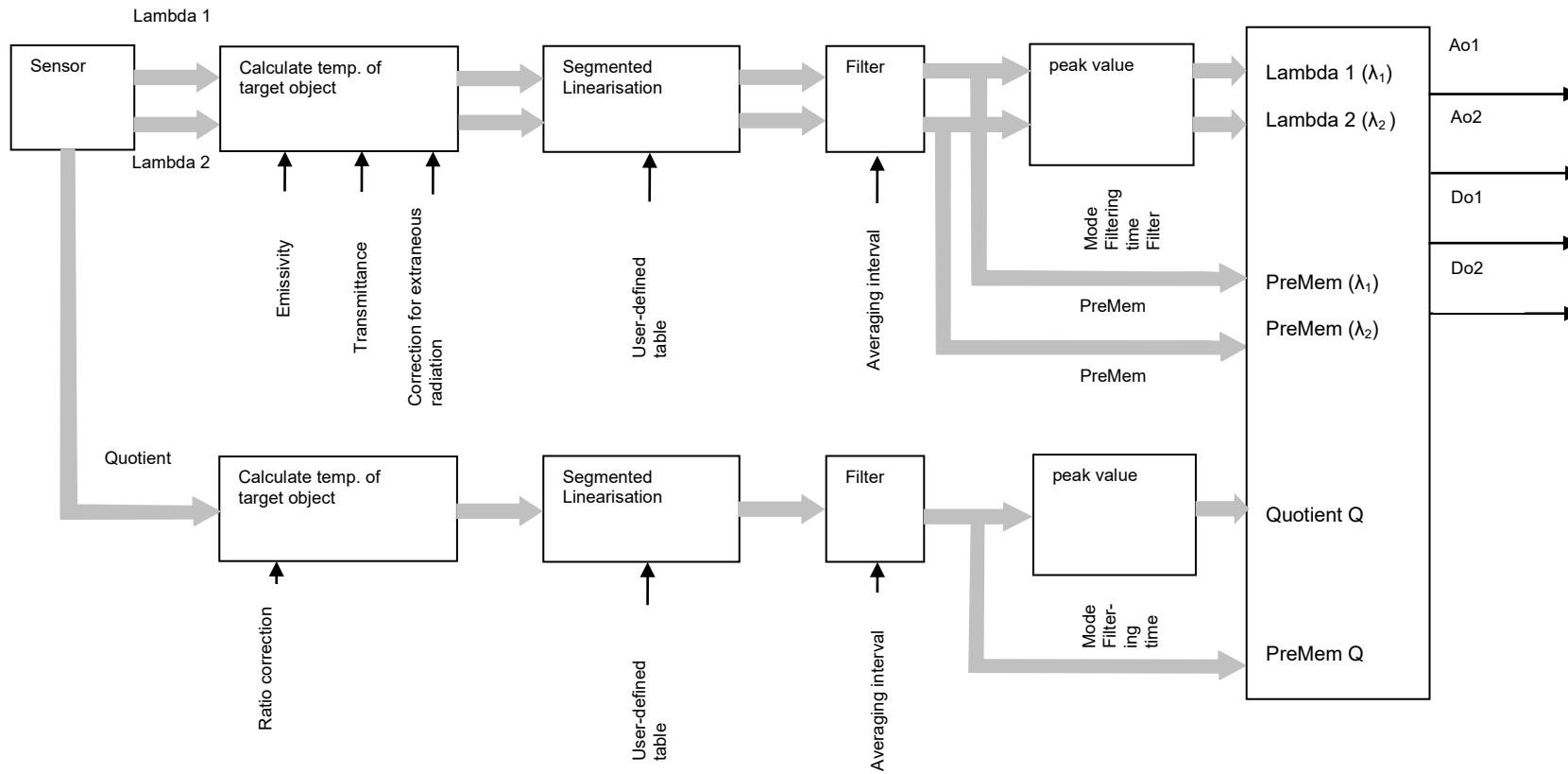
Then adjust the EERC parameter so that the measured temperature of the contact measurement is displayed and the fluctuation range is as small as possible.

#### **6.11 Output current range**

For the pyrometer's two analogue current outputs, select the current loop scale – (0 - 20 or 4 – 20 mA)—which matches that of the downstream signal processing equipment (PLC, display device, controller, etc.). At the pyrometer and at the controller, set the upper and lower limits of the temperature range and the current loop output signal. Access this setting using configuration layer `c 0 10`.

## 7 Functioning of the pyrometer

### 7.1 Internal signal processing



## 8 Configuration and Setup

### 8.1 Signal Conditioning

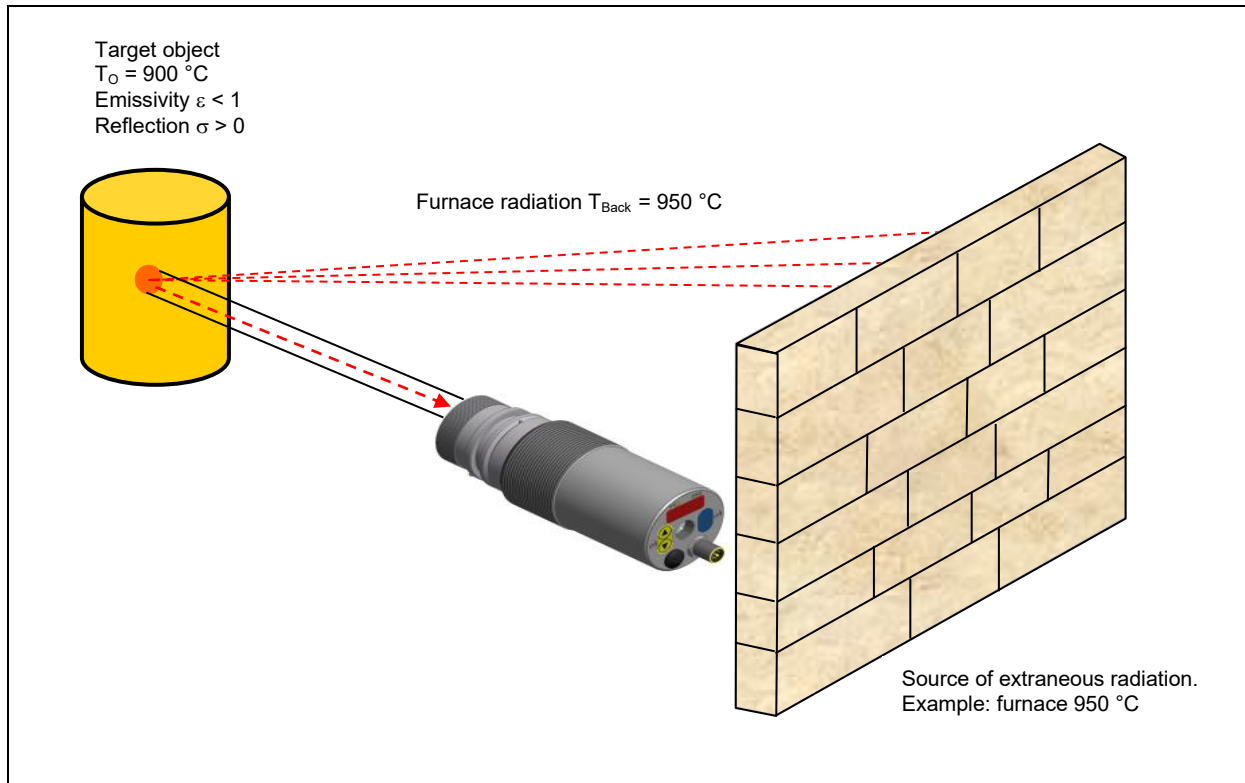
#### 8.1.1 Emissivity and Transmittance (Spectral mode)

Besides the emissivity correction (mentioned in Chapter 5.6), a pyrometer must be adjusted for the transmission properties of any supplementary lens and/or protective window screwed onto the pyrometer. Set the pyrometer for the specific transmission factor (a percentage value) which is indicated either in the products' data sheet or on the lens itself. This is parameter `TRU.1` and can be accessed at configuration layer `002/003`. If you are not using any auxiliary lens or protective window, set the parameter to 100.0. A Listing of the transmission values of the used glasses you find in chapter transmission values of protective glasses.

#### 8.1.2 Ambient Temperature Compensation (Spectral mode)

Under normal conditions, CellaTemp PA should produce highly accurate temperature readings once you have set the emissivity and transmittance factors. Certain conditions, however, will require that you make an additional correction. Object surfaces which have very low emissivity will reflect thermal radiation from their surroundings. If your target object is in surroundings which are hotter than the target itself, and the infrared radiation coming from extraneous sources reflects off the object, the sensor will collect this additional energy. To ensure that the measurement is not distorted and that temperature readings are completely accurate, you should activate „Ambient temperature compensation“ (switch on `002/003 / 6Ac.1`)

Now enter the temperature value of the ambient source of radiation and its influence as a percentage. You will have to determine these variables first.

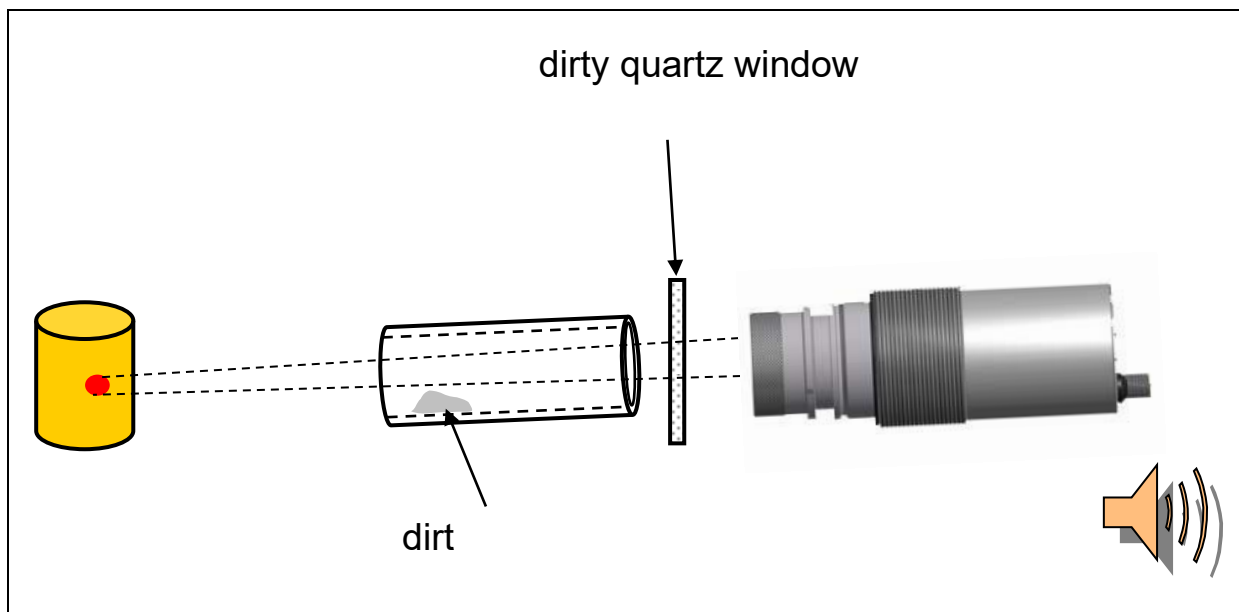


### 8.1.3 Dirt Alert (two-colour/ratio mode)

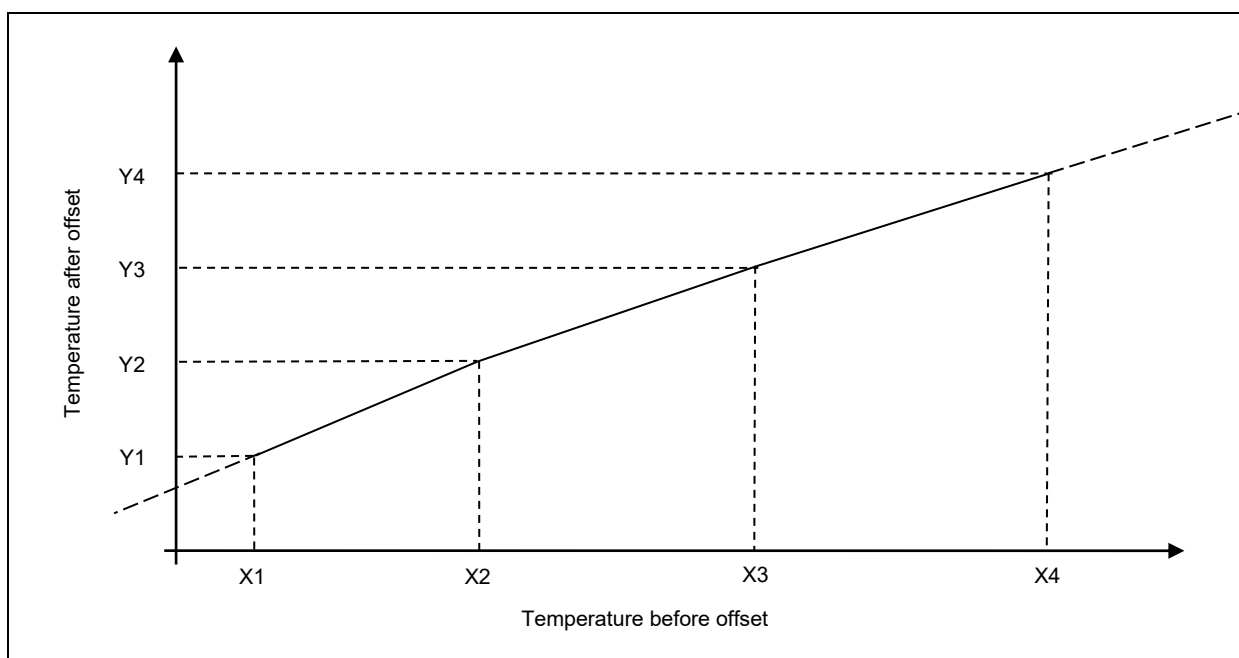
CellaTemp two colour pyrometers feature an integrated contamination detection function. The pyrometer detects when the lenses of the optical system become too dirty, or the field of view is impaired. Parameter  $\sigma_{\text{DA}}$  activates this function. (,Dirt Alert'). If signal attenuation exceeds a user-defined threshold, an alarm will trigger.



The ,Dirt Alert' parameter should be set to  $0.5 * \text{signal-intensity}$ .



### 8.1.4 Temperature offset using linear interpolation



When necessary, CellaTemp PA allows you to program an offset for the temperature reading reported. The offset correction can be configured individually with a minimum of 2 and a maximum of 10 interpolating points (X/Y nodes). This information is stored in a user-defined temperature-indexed lookup table and used for signal conditioning. For values lower than the 1st node and higher than the last node, the first and last linear segments are extrapolated. Enter the nodes in ascending order. Use the rear panel display to access this function via `c 00 1 / L 10.9`.



### ***Min/Max Memory***

In this mode—also called peak picker—the pyrometer determines the highest or lowest temperature reading and keep the temperature reading. As an option, one of the switching inputs can be configured to reset the min/max memory and to define the smoothing filter setting.

### ***Double Maximum Memory withhold time***

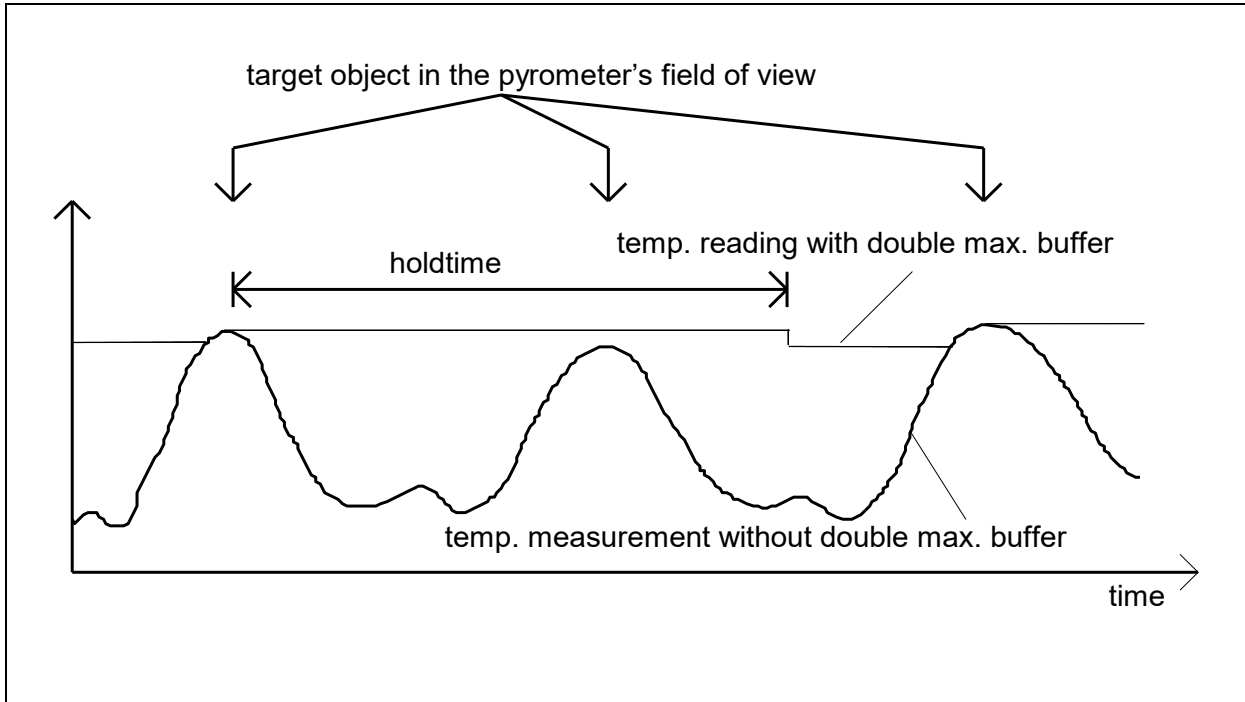
It might often be desirable to determine the peak temperature during a defined period, for example when the objects to be measured move past the pyrometer, resulting in temperature readings which would appear to be cyclical. In this mode, the displayed temperature reading will not drop between targeted objects. The peak temperature reading will be held for a preset period.

Configure a hold time between 0.01 to 999 sec. either from your PC terminal or using the pyrometer's rear panel buttons. The maximum temperature sampled during the defined hold time will be saved. This value is transmitted to the signal output. In mid-sequence-- after 50% lapse of the hold time—a second internal peak picker starts. When the hold time has expired, the output signal decreases to the value of the second peak temperature (if it turned out being lower than the first peak). It makes sense to choose a hold time which is approximately 1 ½ times as long as the cycle of the moving targets. This ensures that a temperature measurement gap is avoided and temperature changes are detected quickly.

As an option, one of the switching inputs can be configured to reset the min/max memory and to define the smoothing filter setting.

### ***Double peak picker combined***

The function of the double peak picker "combined" is like that of the double peak picker. However, the hold time starts when the spectral temperature is at its highest point. Displayed is the corresponding two-colour temperature. If the spectral temperature decreases during the hold time, the corresponding two-colour temperature is only displayed when the hold time has elapsed. If the spectral temperature rises during the hold time, the corresponding two-colour temperature is directly displayed.



**Automatic temperature detection (ATD) function\*\***

This function serves to automatically detect the temperature during manufacturing processes with discontinuous or intermittent material flow, for example molten metal casting at foundries. First, define the sampling time and the upper and lower temperature limits. These limits or thresholds define the temperature range within which you wish to detect the temperature. It is also possible to determine the average temperature value over the course of multiple measuring cycles.

The start of a measuring cycle is determined automatically and is dependent on the following variables.

<b>Limit 1 (L1):</b>	Before beginning the measurement, the temperature reading must have been lower than Limit 1 at least once. If Autoreset (Reset = on) the limit 1 will be ignored
<b>Limit 2 (L2):</b>	Limit 2 must be exceeded at least for the duration of the time delay (tDEL).
<b>Time Delay (tDEL):</b>	See above

When the conditions are fulfilled, the sampling time will begin ( $t_{RC}$ ).

<b>Sampling time</b> ( $t_{RC}$ )	During the sampling time the temperature is detected and stored as a temperature value.
-----------------------------------	---



If the parameter  $t_{RC} = 0$  the algorithm of the ATD function will detect automatically the end of the discontinuous process. At the parameter  $t_{RC}$  is shown "auto" instead of the time.

The configuration of the Normal Display Mode ( $R_{NO}$ ) determines which temperature value is saved during sampling

<b>Display mode</b> ( $R_{NO}$ )	„t=0“ displays the lower temperature range limit during the measurement. „t=HLd“ indicates the previous temperature reading during the current measurement.
----------------------------------	---

As an option, the green Status LED can light up, or the digital output can be used to indicate sampling.

When the sampling time has ended, an average value is calculated for recorded measuring cycles. The temperature reading is weighted with the previously saved average value and added.

<b>Weighted average</b> ( $F - P_r$ )	Factor for average weighting. If you choose 100%, averaging will be off.
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The smaller you set the  $F - P_r$  factor, the stronger the weighting will be. When the averaging function is activated ( $F - P_r < 100\%$ ) a plausibility check will be performed. The difference in temperature between the current reading and the previously stored average is established. If the difference is higher than the plausibility threshold  $t_{SP}$ , the transmitted data will be „0“ and the average value will remain unchanged.

<b>Plausibility</b> ( $t_{SP-}$ )	Threshold for plausibility check: lower limit which is acceptable for a valid measurement.
-----------------------------------	--

<b>Plausibility</b> ( $t_{SP+}$ )	Threshold for plausibility check: upper limit which is acceptable for a valid measurement.
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When sampling is completed, the average temperature value or „0“ will be output. At the same time, an impulse is generated which can be used

for the digital outputs. Enter  $R_{t,9}$  as the source and set the hold time to 0.5 second.

A cut-off interval (time lag) begins after the sampling time has ended. This cut-off interval must expire before the next measurement can start with the cycle starting conditions described above.

<b>Cut-off interval</b> ( $t_{d,5}$ )	The interval between one completed sampling and the start of a new sampling.
--	--

If a measuring cycle does not start during the period  $t_{d,5}$ , the saved average will be deleted and reinitialized when the next cycle begins.

<b>Timeout</b> ( $t_{d,5t}$ ):	Time cycle for deleting average value (in minutes)
--------------------------------	--

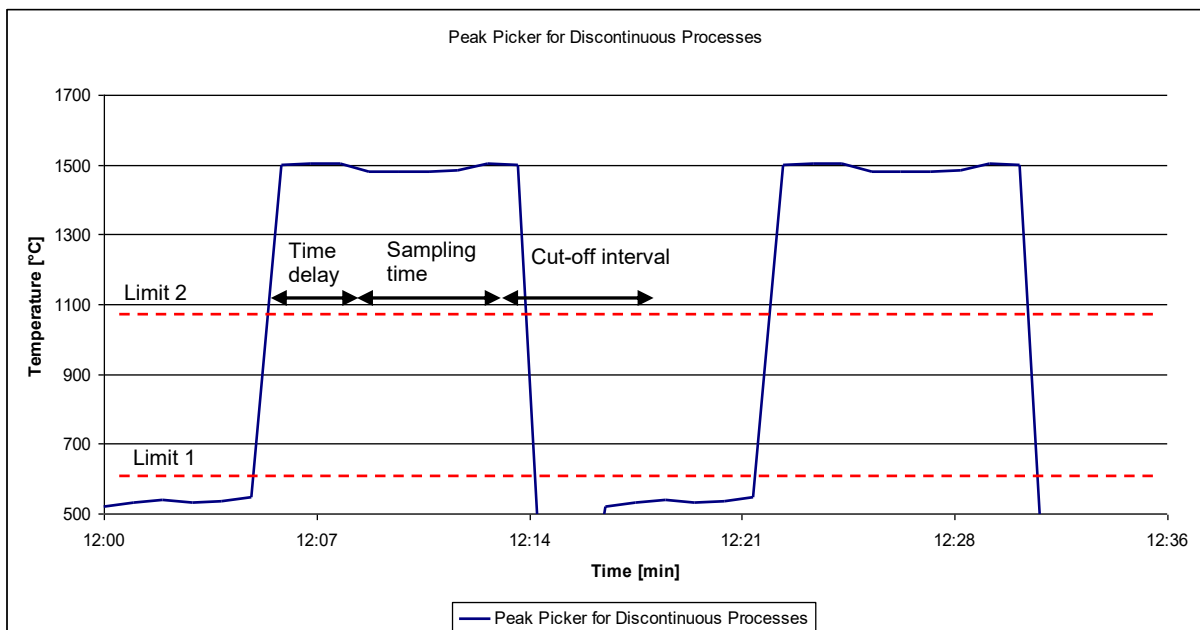
Activate auto reset for the ATD function to run cyclically. Limit 1 will then be ignored. Measurement continues when the Limit 2 is exceeded for the period configured with  $t_{d,EL}$ .

<b>Auto reset</b> ( $R_{r,5t}$ ):	Auto reset on/off
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If, during the measurement, the temperature reading falls below Limit 2, the measurement will be dismissed.

<b>Set Li2 check on tAct</b> ( $c_{h,2}$ )	on/off
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\*\* Only available with ATD function



## 8.2 I/O Configuration

### 8.2.1 Selectable current output range

You will need to define the current loop scale and define a source for an analogue output signal. For a spectral pyrometer, you can select one of the following signal sources for analogue output Ao1:

- Quotient
- Lambda 1
- Lambda 2

**In the normal operating mode, the selected source for Ao1 will be the current object temperature.**

The second analogue output Ao2 offers additional the following option:

- Quotient temperature before Min/Max memory
- Lambda 1 temperature before Min/Max memory
- Lambda 2 temperature before Min/Max memory
- Signal intensity
- Internal device temperature

Configure the scale of each of the two analogue outputs separately. Define the temperature span by adjusting the upper and lower limits of the measuring range. Select either 0 – 20 mA or 4 – 20 mA as the current output range. The temperature to current conversion is linear.

The desired current output range of either 0 – 20 mA or 4 – 20 mA can be configured as an absolute setting. Alternatively, the current range can be coupled to the specific voltages of Switching Output 1 or 2.

- 0 V -> 0 - 20 mA
- 24 V -> 4 - 20 mA

Make these settings in configuration layer `c0 i0` with parameters `R0 i.5`, `R0 i.-`, `R0 i.7` und `R0 i.4` for analogue output 1, and in the same manner for analogue output 2.

#### Configuration example PA 40:

Ao1: temperature reading of Lambda 1  
650 - 1700 °C ≙ 4 - 20 mA

Ao2: internal device temperature  
0 - 100 °C ≙ 4 - 20 mA

It is also possible to configure analogue output 2 with a sub-range which covers a portion of the temperature span assigned to analogue output 1:

#### Configuration example PA 40:

Ao1: temperature reading of Lambda 1  
650 - 1700 °C  $\equiv$  4 - 20 mA

Ao2: temperature reading of Lambda 1  
1000 - 1500 °C  $\equiv$  4 - 20 mA

### 8.2.2 Digital outputs

One of the following functions can be assigned to each of the digital outputs:

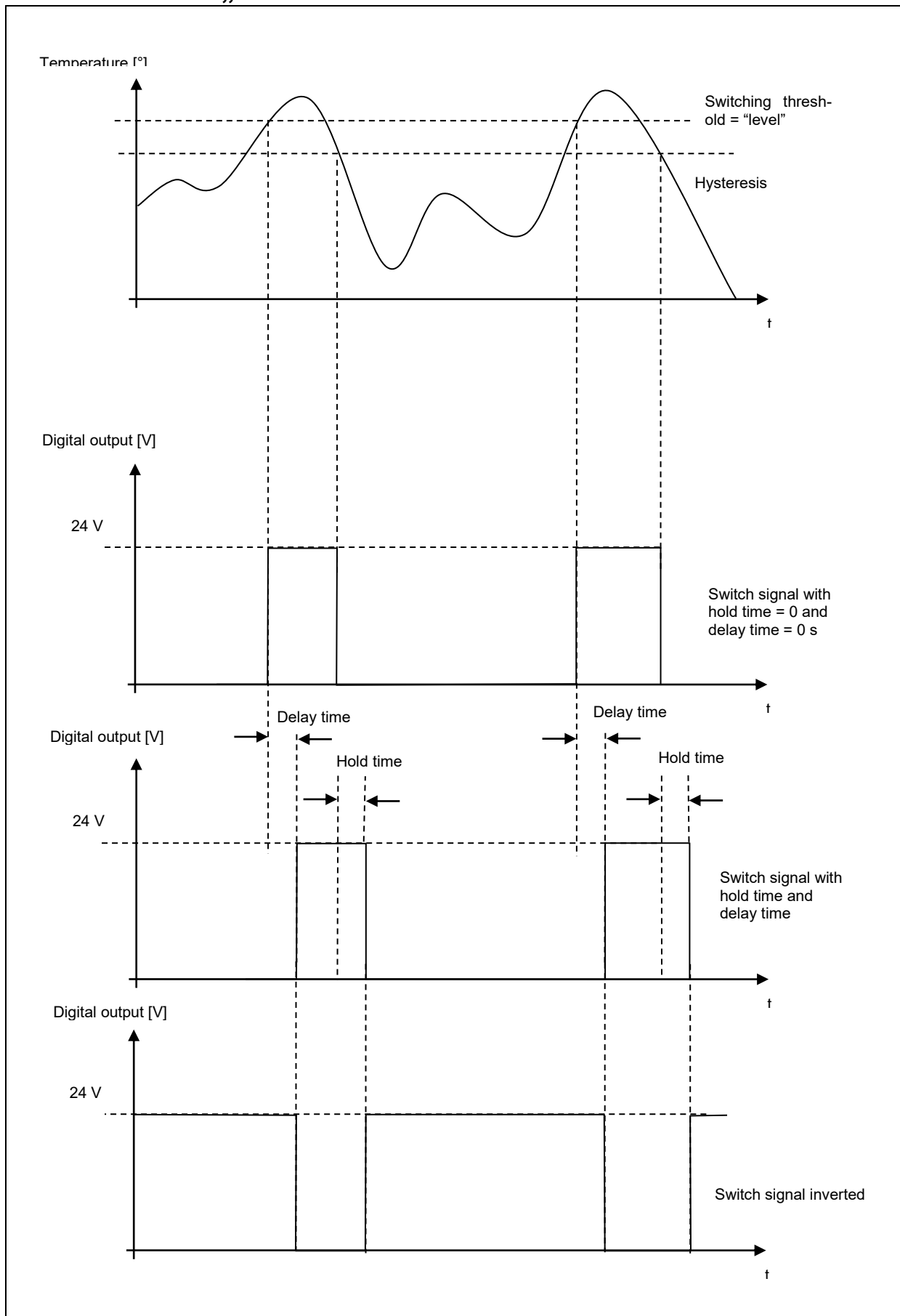
- **Deactivate** (This is required when you want to use the digital output as digital input).
- **Status LED** lights up to indicate that the temperature reading of Lambda 1 lies within the pyrometer's available temperature range.
- **Limit switch** with adjustable signal threshold:
  - Quotient
  - Quotient before Min/Max before memory
  - Lambda 1
  - Lambda 1 before Min/Max
  - Lambda 2
  - Lambda 2 before Min/Max
  - Dirt Alert
  - Signal intensity
  - Internal device temperature
- **Status Signal ATD function.**
  - Triggered by ATD function Lambda 1 at the end of the measuring time.
  - Triggered by ATD function Lambda 2 at the end of the measuring time.
  - Triggered by ATD function ratio mode at the end of the measuring time.
  - ATD function Lambda 1 indicate the measuring time
  - ATD function Lambda 2 indicate the measuring time.
  - ATD function ratio mode indicates the measuring time.

When the digital output is to be used as a limit switch, you can configure the following parameters:

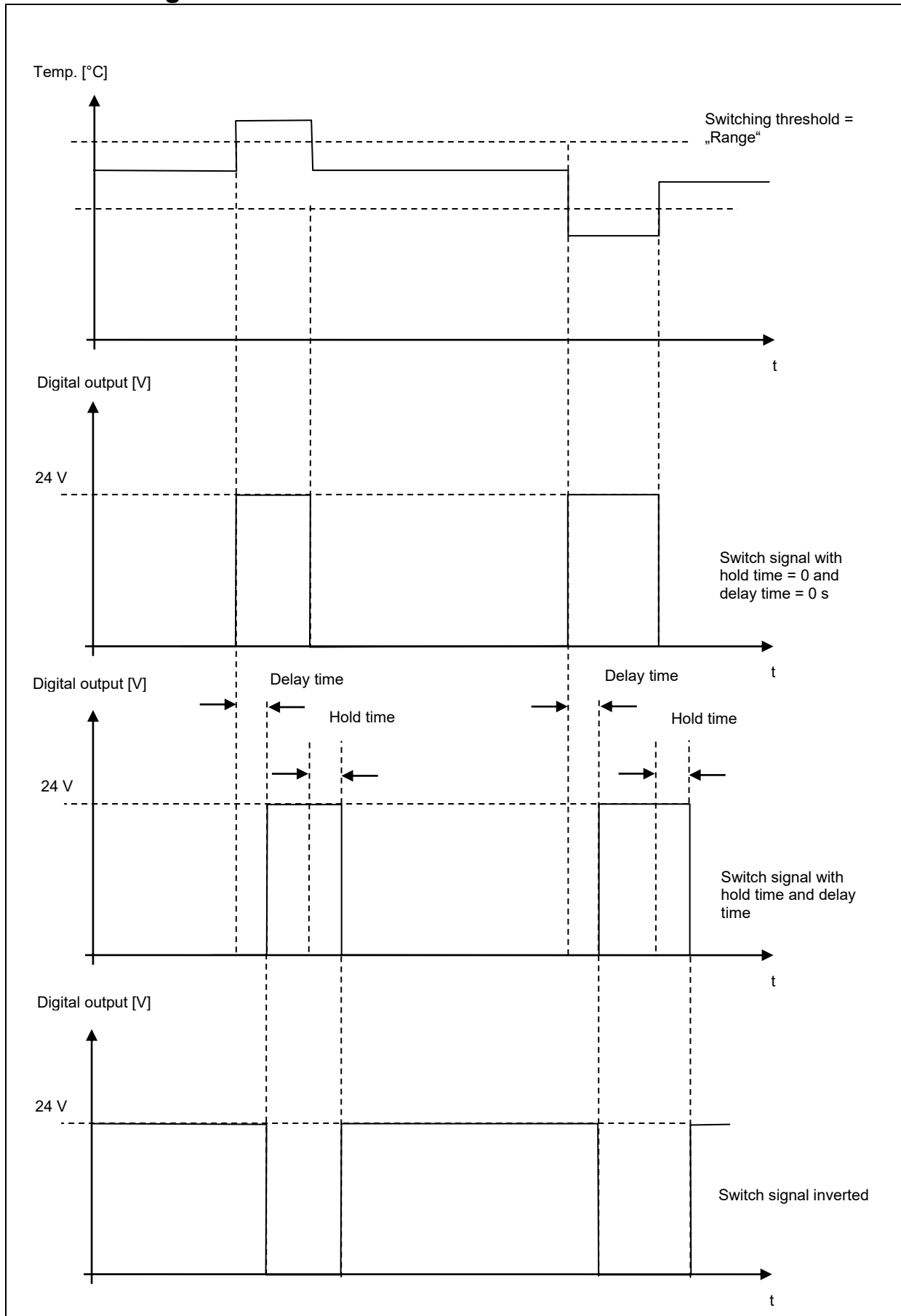
- Signal source
- Signal function and direction

- Limit and hysteresis at function „Level“
- Lower / upper limit at function = “Range”
- Delay time
- Hold time

### 8.2.3 Function „Level“



### 8.2.4 "Range" Function



### 8.3 Digital inputs

If you want to use the digital output as an input, you must first manually deactivate the digital output and configure the following parameters:

- Select a current output range (either 0 – 20 mA or 4 – 20 mA) for Ao1/Ao2
- Delete the temperature readings in Min/Max or DoubleMax
- Define whether the laser will event. This only applies to models with built-in laser.

#### 8.3.1 Extern emissivity correction or ambient temperature compensation

When desired, current output 2 (Pin 3) can function as a voltage input. Target object emissivity can be configured from another remote device. Alternatively, the input signal can be used to define the temperature of reflected radiation from surroundings for the ambient temperature compensation function.

First, manually deactivate current output 2. Then select one of these two correction functions at configuration layer  $\text{c} \rightarrow \text{i} \rightarrow \text{R} \rightarrow \text{F} \rightarrow \text{n}$ .

When this is activated, it will not be possible to configure the emissivity setting or the ambient temperature compensation using the rear panel buttons, nor will it be possible to change the settings from a PC. The pyrometer display will alternate between showing the currently used value and showing  $\text{E H E}$  to indicate that these parameters were set from an external source.

Define the upper and lower voltage values using parameter  $\text{R} \rightarrow \text{U}$ . Set the input variables using parameter  $\text{R} \rightarrow \text{v}$ .

Example for setting emissivity:

$\text{R} \rightarrow \text{U} \text{ 1} = 0 \text{ V}$

$\text{R} \rightarrow \text{U} \text{ 2} = 10 \text{ V}$

$\text{R} \rightarrow \text{v} \text{ 1} = 0$  (Epsilon 0 %)

$\text{R} \rightarrow \text{v} \text{ 2} = 100$  (Epsilon 100 %)

Example for configuring the ambient temperature compensation function:

$\text{R} \rightarrow \text{U} \text{ 1} = 2 \text{ V}$

$\text{R} \rightarrow \text{U} \text{ 2} = 10 \text{ V}$

$\text{R} \rightarrow \text{v} \text{ 1} = 700$  (temperature 700 °C)

$\text{R} \rightarrow \text{v} \text{ 2} = 1200$  (temperature 1200 °C)

### 8.3.2 Analogue input to control emissivity ratio (two-colour/ratio mode)

Sometimes particular process conditions will require that the ratio of the two emissivity be changed from a remote source such as by external control. This can be achieved using the analogue input. First, manually deactivate the current output 2. Then go to configuration layer  $\llcorner \square \text{!} \square$  and assign parameter  $\text{R } \text{.F } \square$  with your selected application.



If the analogue input is used, the parameters for analogue output 2 are not accessible. If analogue output 2 is active, the parameters from the analogue input are not available.

## 8.4 General functions

All parameter of the general function you find at configuration layer  $\llcorner \square \text{!} \text{!}$ .

### 8.4.1 Green Status LED

You can assign specific functions to the LED:

- LED is continuously lit to indicate 24 V operating voltage
- LED indicates status of switching output 1
- LED indicates status of switching output 2
- LED indicates the sampling time of the ATD function

Set the function using parameter  $\text{L E } \text{d } \text{E}$ .

### 8.4.2 Activate Laser

If your CellaTemp PA features a built-in laser, there are several ways in which it can be activated. Configure parameter  $\text{P } \text{.L } \square$  with the method you have selected:

- Activate using button on rear panel
- Permanently off
- Edge-triggered: based on signal input (0 -> 24V transition)



Do not attempt to operate the laser continuously. The built-in laser is not designed for continuous use. When the user-defined laser auto-shutoff time is reached (maximum programmable duration = 15 minutes) the laser will automatically switch off. When the ambient temperature exceeds 55°C the laser will automatically deactivate.

### 8.4.3 Video camera settings

Pyrometer models with an integrated video camera feature the following operating modes.

#### Target Brightness Control (TBC) settings

- Exposure control only applies to the measurement area. (c.t.b.c = on)
- Exposure control applies to the entire field of view. (c.t.b.c = off)

As a standard, the target brightness control feature works in the target area to show bright objects against a dark background or dark objects against a bright background with an ideal brightness.

#### White Balance

White balance basically means colour balance. It is a function which gives the camera a reference to "true white" — it tells the video camera what the colour white looks like, so the camera will record it correctly. Since white light is the sum of all other colours, the camera will then display all colours correctly. If the video camera does not find a neutral reference, it might produce an image with a colour imbalance. (setting c.c.o.L = „Automatic“).

The video camera can compensate for ambient illumination conditions. The camera's light sensitivity adapts dynamically to the brightness of the actual target object captured within the rectangular measurement area.

The user can manually select the colour temperature of the light source. In that case the video camera will not perform automatic white balance (c.c.o.L = dRyL daylight).

#### Superimposed Temperature Reading

The current temperature reading can be superimposed on the video camera's image. Use the setting c.o.u.L. to select or deselect this function.

### 8.5 Simulate current signals for analogue output Ao1 and Ao2

CellaTemp PA features a function to simulate a temperature reading. This is especially useful after initial setup to verify that temperature data is correctly transmitted to the controller. Use the pushbuttons on the pyrometer rear panel to simulate a temperature reading, which is applied

as an output current signal scaled to the selected current range. The appropriate parameter can be accessed via configuration layer `c 100`. If the pyrometer is set up correctly, the downstream controller should indicate the values you have entered (only within the scaled range). If there is a discrepancy, please check the current range scale or the cable connection. When you have completed the function test, exit by pressing "E 5 c" and return to normal operating mode.

## 9 Setting Parameters at the device

### 9.1 Configuration level

In addition to the configuration possibilities described in Chapter 7, many parameters can be adjusted at the rear panel using push buttons. These settings can be accessed via configuration layers. The configuration layers are structured as follows:

- `c 00 1` Temperature measurement via two-colour/ratio mode
- `c 00 2` Temperature measurement via Lambda 1
- `c 00 3` Temperature measurement via Lambda 2
- `c 0 10` I/O configuration
- `c 0 11` General functions
- `c 0 20` Display temperature readings
- `c 100` Simulated current signal for outputs Ao1 and Ao2

The following chart lists all parameters. Certain parameters will be suppressed at the rear panel display if the prerequisite function is deactivated. For example: the smoothing time cannot be configured when signal smoothing is not activated.

#### 9.1.1 Temperature measurement two-colour/ratio mode

(Configuration layer: `c 00 1`)

Parameter	Function	Explanation
<code>EPS.g</code>	Ratio correction	80 -120 % 80 – 140 % ****
<code>chr.g</code>	Plausibility check ratio mode	off off on on deactivation when below limit on on deactivation when below or above limit
<code>dr.cn</code>	Soot factor*	Value off, 0.5 – 2.5
<code>dr.cd</code>	Flame density*	Calculated flame density, 0 -10
<code>chr.-</code>	Relative limit min.	Relative lower limit [%], two-colour temp. reading invalid (signal intensity)
<code>chr.-</code>	Relative limit max.	Relative upper limit [%], two-colour temp. reading invalid (signal intensity)
<code>chr.t</code>	Absolute min. temp.	Absolute lower limit, two-colour temp. reading invalid
<code>chr.t</code>	Absolute minimum Emissivity	Absolute lower limit [%], two-colour temp. reading invalid

L i n 9	Temperature offset using linear interpolation (user configurable table)	o F F off 2 - 10: number of nodes used
L . H 1	Node x 1 - 10	Signal input (initial value) node n
L . Y 1	Node y 1 - 10	Signal output (resulting value) node n
F i L 9	Smoothing filter	o F F o n
F i L t	Smoothing time	Time in seconds t98
E E r c	EERC Algorithm	0,0 – 100 %****
n e n 9	Min/Max memory	o F F off n i n lowest (min.) temperature, single n M H highest (max.) temperature, single d b L n double maximum d b L c Double Peak Picker Combined d . 5 n ATD function **
n e n t	Hold time for Min/Max	Hold time in sec. (only available, if Double Maximum memory filter is active)
F i L n	Smoothing filter for min/max **	o F F off o n on
F i L t	Smoothing time **	Time in seconds t98
c L r n	external delete for Min/Max memory**	o F F no external deletion E H t . 1 delete when 0-24V for switching output 1 E H t . 2 delete when 0-24V for switching output 2
t d E L	Time delay***	For ATD function, see Chap. 8.1.6
t A c t	Sampling time***	For ATD function, see Chap. 8.1.6
t d . 5	Cut-off interval***	For ATD function, see Chap. 8.1.6
t o U t	Timeout***	For ATD function, see Chap. 8.1.6
L i . 1	Limit 1***	For ATD function, see Chap. 8.1.6
L i . 2	Limit 2***	For ATD function, see Chap. 8.1.6
F - P r	Average weighting***	For ATD function, see Chap 8.1.6
t S P -	Plausibility Threshold ***	For ATD function, see Chap. 8.1.6
t S P ^	Plausibility Threshold ***	For ATD function, see Chap. 8.1.6
A n o	Display mode during der Sampling time***	t = 0 show lower limit of temp. range during running measurement t h L d Hold previous temp. reading during running measurement
A r S t	Autoreset***	For ATD function, see Chap 8.1.6
c h L 2	Set Li2 check on tAct***	For ATD function, see Chap. 8.1.6
S A v E	Save	Save changes / exit menu
E S c	Escape	Discard changes / exit menu

\* Only available at the PA 47

\*\* Only available with Min/Max and Double Max modes

\*\*\* Only available with ATD function

\*\*\*\* Parameter or setting range only available with PA 69

### 9.1.2 Temperature measurement one-colour/spectral channel (configuration layer: c 002 /c 003)

Parameter	Function	Explanation
EPS.1	Emissivity factor L1	See Chap. 8.1.1
TRU.1	Transmission factor L1	See Chap. 8.1.1
BRc.1	Ambient temperature compensation	See Chap. 8.1.2
BRct	Temperature of ambient source of radiation	
BRc!	Influence of ambient IR radiation	The reflected thermal radiation from the surroundings as a portion of the total IR radiation collected by the sensor in %
L.in.1	Temperature offset using linear interpolation	OFF off 2-10: number of nodes used
L.H1	node x 1.-10	Signal input (initial value) node n
L.Y1	node y 1.-10	Signal output (resulting value) node n
F.L.1	Smoothing filter	OFF smoothing not activated ON simple smoothing RUTON subsequent smoothing (only model PA1x)
F.L.t	Smoothing time	time t98 in second. For simple smoothing
MEM.1	Min/Max memory	OFF off MIN lowest (min.) temperature, single MAX highest (max.) temperature, single DBLRN double maximum DISN ATD function
MEM.t	Hold time for Min/Max	Hold time in sec.
F.L.N	Smoothing filter for min/max *	OFF off ON ON
F.L.t	Smoothing time*	Time t98 in sec.
CLRN	external delete for Min/Max memory*	OFF no external deletion EHE.1 delete when 0-24V for switching output 1 EHE.2 delete when 0-24V for switching output 1
tdEL	time delay**	For ATD function, see Chap. 8.1.6
TRct	meas. time active**	For ATD function, see Chap. 8.1.6
td.S	cut-off interval**	For ATD function, see Chap. 8.1.6
toUt	timeout**	For ATD function, see Chap. 8.1.6
L.1	Limit 1**	For ATD function, see Chap. 8.1.6
L.2	Limit 2**	For ATD function, see Chap. 8.1.6
F-Pr	Average weighting**	For ATD function, see Chap. 8.1.6
tSP-	Threshold plausibility**	For ATD function, see Chap. 8.1.6
tSP-	Threshold plausibility**	For ATD function, see Chap. 8.1.6

<b>A<sub>no</sub></b>	Mode of display**	<ul style="list-style-type: none"> <li>↳ show lower limit of temp. range during running measurement</li> <li>↳ Hold previous temp. reading during running measurement</li> </ul>
<b>A<sub>rst</sub></b>	Autoreset**	For ATD function, see Chap 8.1.6
<b>chL2</b>	Set Li2 check on tAct**	For ATD function, see Chap. 8.1.6
<b>SA<sub>ve</sub></b>	Save	Save changes / exit menu
<b>ES<sub>c</sub></b>	Escape	Discard changes / exit menu

\* Only available with Min/Max and Double Max modes

\*\* Only available with ATD function



L1 stands for Lambda 1, meaning the temperature reading from spectral channel 1.

L2 stands for Lambda 2, meaning the temperature reading from spectral channel 2

### 9.1.3 Configuration I/O

(configuration layer: c 0 10)

Parameter	Function	Explanation
<b>Ao1.5</b>	Ao1 select source	<ul style="list-style-type: none"> <li>↳ Lambda 1</li> <li>↳ Lambda 2</li> <li>↳ ratio mode (quotient)</li> </ul> (the selected temp. reading source will be shown on the display)
<b>Ao1.-</b>	Ao1 define lower limit of temp. span	
<b>Ao1.-</b>	Ao1 define upper limit of temp. span	
<b>Ao1.4</b>	Ao1 - 0/4 - 20mA	<ul style="list-style-type: none"> <li>0 - 20 0 - 20 mA</li> <li>4 - 20 4 - 20 mA</li> <li>↳ digital input 1: 0V=0-20mA 24V=4-20mA</li> <li>↳ digital input 2: 0V=0-20mA 24V=4-20mA</li> </ul>
<b>Ao2.</b>	Analogue output 2	<ul style="list-style-type: none"> <li>off off</li> <li>on on</li> </ul>
<b>Ao2.5</b>	Ao2 select source	<ul style="list-style-type: none"> <li>↳ Lambda 1</li> <li>↳ L1.Pk. Lambda 1 without peak picker</li> <li>↳ Lambda 2</li> <li>↳ L2.Pk. Lambda 2 without peak picker</li> <li>↳ Two-colour/ratio mode</li> <li>↳ Pk. Two-colour/ratio mode without peak picker</li> <li>↳ internal device temperature</li> <li>↳ EPS Total Epsilon</li> </ul>
<b>Ao2.-</b>	Ao2 define lower limit of temp. span	
<b>Ao2.-</b>	Ao2 define upper limit of temp. span	
<b>Ao2.4</b>	Ao2 - 0 / 4 - 20mA	<ul style="list-style-type: none"> <li>0 - 20 0 - 20 mA</li> <li>4 - 20 4 - 20 mA</li> <li>↳ Switch. input 1: 0V=0-20mA 24V=4-20mA</li> </ul>

		<p>EE2 Switch. input 2: 0V=0-20mA 24V=4-20mA</p>
do 1.	Switching output 1	<p>OFF off ON ON</p>
do 1S	Do1 select source	<p>rdy Status LED indicates 'ready' L1 Lambda 1 L1Pr Lambda 1 without peak picker L2 Lambda 2 L2Pr Lambda 2 without peak picker R Two-colour/ratio mode RPr Two-colour/ratio mode without peak picker tU Internal device temperature intU Signal intensity nter1 Triggered by ATD function Lambda 1** nter2 Triggered by ATD function Lambda 2** nterR Triggered by ATD function two-colour/ratio mode** dirt Dirt Alert RRc1 Measuring time ATD Lamda 1** RRc2 Measuring time ATD Lamda 2** RRcR Measuring time ATD two colour/ratio mode**</p>
do 1F	Do1 function	<p>LUL Switch direction "Level" (output active if limit excess) LUL- Switch direction "Level" / output inverted rnb Switch direction "Range" (output active if limit excess) rnb- Switch direction "Range" / output inverted</p>
do 1t	Do 1 switching threshold	Switching threshold (only available at function "Level")
do 1h	Do1 signal threshold	Hysteresis +/- relative to signal threshold (only available at function "Level")
do 1_	Do1 lower limit of range	Lower limit of range for switch signal (only available function "range")
do 1^	Do1 upper limit of range	Upper limit of range for switch signal (only available function "range")
do 1L	Do1 delay time	See Chap. 8.2.2
do 1H	Do1 Hold time	See Chap. 8.2.2
do 2.	Switching output 2	<p>OFF off ON ON</p>
do 2S	Do2 select source	<p>rdy Status LED indicates 'ready' L1 Lambda 1 L1Pr Lambda 1 without peak picker L2 Lambda 2 L2Pr Lambda 2 without peak picker R Two-colour/ratio mode RPr Two-colour/ratio mode without peak picker tU Internal device temperature intU Signal intensity nter1 Triggered by ATD function Lambda 1* nter2 Triggered by ATD function Lambda 2* nterR Triggered by ATD function two-colour/ratio mode** dirt Dirt Alert RRc1 Measuring time ATD Lamda 1* RRc2 Measuring time ATD Lamda 2* RRcR Measuring time ATD two colour/ratio mode*</p>

do2f	Do2 function	L U L. Switch direction "Level" (output active if limit excess) L U -. Switch direction "Level" / output inverted r n B. Switch direction "Range" (output active if limit excess) r n B -. Switch direction "Range" / output inverted
do2t	Do 2 switching threshold	Switching threshold (only available at function "Level")
do2h	Do2 signal threshold	Hysteresis +/- relative to signal threshold (only available at function "Level")
do2_	Do2 lower limit of range	Lower limit of range for switch signal (only available function "range")
do2^	Do2 upper limit of range	Upper limit of range for switch signal (only available function "range")
do2L	Do2 delay time	See Chap. 8.2.2
do2H	Do2 Hold time	See Chap. 8.2.2
A .Fn	Analogue input function	OFF Analogue input deactivated EPS. Emissivity for Lambda 1 via analogue input BRCT. Temp. ambient radiation via analogue input EPS9 emissivity ratio
A .U 1	Analogue in upper and lower voltage values	Define lower limit of voltage for input voltage (0 - 10V)
A .U 2	Analogue in upper and lower voltage values	Define upper limit of voltage for input voltage (0 - 10V)
A .u 1	Analogue in upper and lower input variables	Input of lower voltage value (example 100% for emissivity ratio)
A .u 2	Analogue in upper and lower input variables	Input of upper voltage value (example 105% for emissivity ratio)
SAVE	Save	Save changes / exit menu
ESC	Escape	Discard changes / exit menu

\* Only available with ATD function



Ao1 and Ao2 stand for analogue output 1 and analogue output 2  
 Do1 and Do2 stand for switching output 1 and switching output 2  
 Ain stands for analogue Input.

### 9.1.4 General Functions (configuration layer: c 0 ! !)

Parameter	Function	Explanation
L E d 5	Green status LED	on LED indicates 24V do 1 LED indicates digital output 1 do 2 LED indicates digital output 2 t R c 1 LED indicates running measurement in ATD function L1** t R c 2 LED indicates running measurement in ATD function L2** t R c 9 LED indicates running measurement in ATD function Quotient**
P i L o .	Activate laser*	on keypress off laser disabled t d i 1 edge-triggered, switching input 1 t d i 2 edge-triggered, switching input 2
P i L t	Laser ON-time	1 - 15: select auto laser shut off in minutes
t E r n .	Assign Interface	off non-terminal mode u S b terminal mode at USB interface r S 4 8 5 Terminal mode at RS485 (Half duplex)
A S t r .	Automatic temperature data output	off automatic temp. data output is off. on temp. data output at PC terminal
A c y c .	Cycle for automatic temp. data output	Select cycle time in s
A d d r .	Device address	Enter address of device for non-terminal mode
d i s p .	Display panel	"on" the display panel indicates "on" , R i indicate temperature of source Ao1
U n i t	temperature scale	C degrees Celsius F degrees Fahrenheit
c o u l .	Screen insert temperature reading**	"on" "off"
c t b c .	TBC exposure metering**	"on" spot weighted "off" average
c c o l .	White balance**	"DAYL" daylight "AUTO" automatic
c . i d .	Measuring point number***	Shows the measuring point number in the camera images
S A v E	Save	Save changes / exit menu
E S c	Escape	Discard changes / exit menu

\* only available for models with laser sighting

\*\* only available with ATD function

\*\*\* only available with camera

### 9.1.5 Displayed temperature readings

(Configuration layer: **c 020**)

Parameter	Function	Explanation
9.	two-colour/ratio temp. reading	Shows current temperature reading in two-colour mode
L1.	Temp. reading Lambda1	Shows current temperature reading for L1
L2.	Temp. reading Lambda2	Shows current temperature reading L2
9.Pr.	Reading two-colour mode without peak picker	Shows current temperature reading in two-colour/ratio mode prior to peak picker
L1Pr.	Reading Lambda1 without peak picker	Shows current temperature reading for L1 prior to peak picker
L2Pr.	Reading Lambda2 without peak picker	Shows current temperature reading for L2 prior to peak picker
intY.	Signal-Intensity	Calculated signal intensity
t.int.	Inner temperature	Current internal temp. of device
A in	Initial value at analogue input	Current value of analogue input when activated
Esc	Escape	Exit menu

### 9.1.6 Simulated current signal for outputs Ao1 and Ao2

(configuration layer: **c 100**)

Parameter	Function	Explanation
Ao1.	Current output 1	Enter a value in mill ampere to simulate a current signal for Ao1
Ao1t	Current output 1 incl. scaled temperature	Enter a temperature value to simulate a temperature reading for Ao1 (based on linear scale).
Ao2.	Current output 2*	Enter a value in mill ampere to simulate a current signal for Ao2
Ao2t	Current output 2 incl. scaled temperature*	Enter a temperature value to simulate a temperature reading for Ao2 (based on linear scale).
Esc	Escape	Exit menu

\* Function only available when Current Output 2 is activated.

## 10 CellaView software

The CellaView software displays, evaluates and stores the temperature readings of your pyrometer.

Download the CellaView software here:

[www.keller.de/its/](http://www.keller.de/its/)

## 11 Installation of the USB driver

The PA pyrometer can be addressed via a special driver. On systems with Windows 10 or 11 the driver installs a virtual COM interface which allows access to the serial port of the pyrometer.

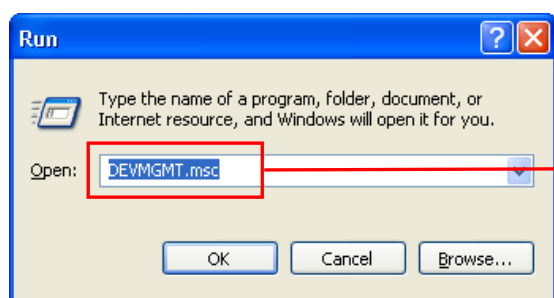
Use the link below to download the driver.

[www.prolific.com.tw](http://www.prolific.com.tw) (PL2303 Prolific Driverinstaller.zip)

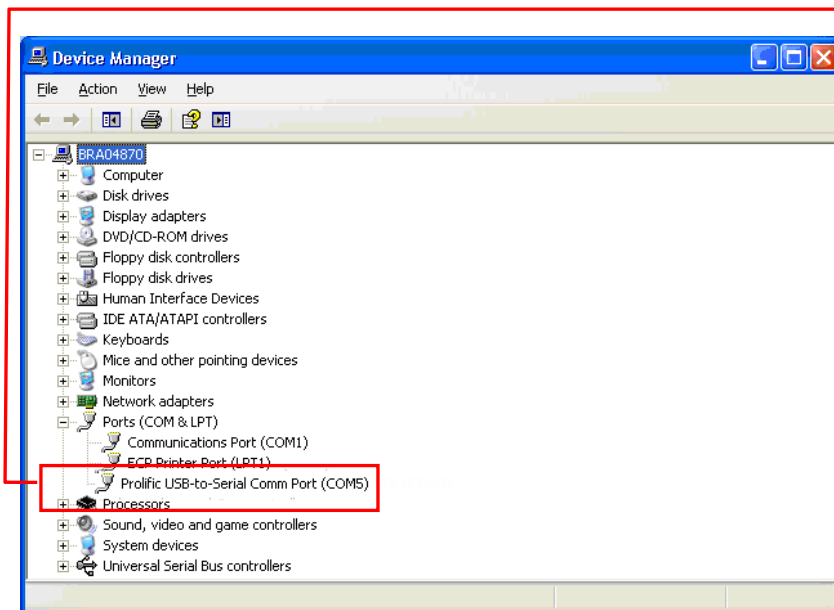
Alternatively, the USB driver can be downloaded from our website in the CellaView download area.

Install the driver and connect the pyrometer to the PC (USB cable is included in the scope of delivery). Windows will recognise the new hardware. Windows automatically assigns a virtual COM port. To determine the COM port number assigned to the adapter, check the Device Manager as follows:

First, open the Run dialog box by using the Windows key + R key combination. Then enter the command “devgmt.msc.”



and click OK to open the Device Manager. Then click



Ports (COM and LPT). You will see a listing of ports and should now be able to see which COM Port the PA USB connection assigned to. The PA USB connection will be indicated as a USB-to-Serial Comm Port. In this example, COM Port 5 has been assigned to the adapter. You will need to select this particular COM Port in the software settings.

## 12 How to operate the pyrometer with the CellaView software

It is not necessary to change settings when using the CellaView software. The CellaView software both works via USB and RS485 interface. The interface can be operated either as a point-to-point connection to connect a device or as a bus to connect to 31 pyrometers.

### 12.1 CellaView via USB point-to-point connection

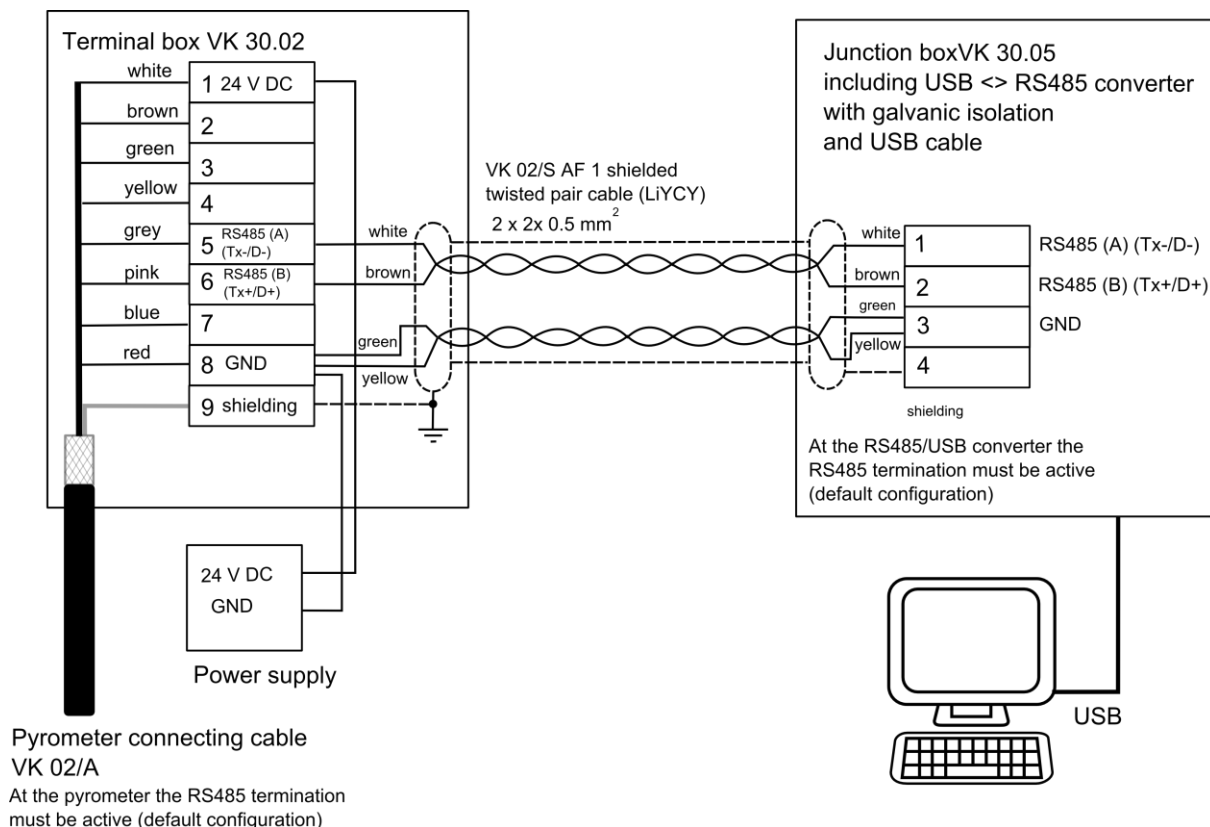
- ▶ Install the USB driver
- ▶ Connect the pyrometer to the PC
- ▶ Start CellaView
- ▶ Select the correct COM port or use the CellaView search function.

For more information on how to work with CellaView read the separate CellaView manual.

### 12.2 CellaView via RS485 point-to-point connection

A USB/RS485 converter is needed when working with the RS485 interface. The pyrometer can be directly connected if the PC has an integrated RS485 Interface board. The distance between pyrometer and PC can be up to 1200 m.

To prevent reflections on the RS485 connection, it is absolutely necessary to terminate the connection at the pyrometer and at the converter. The termination is integrated in the PA pyrometer and is active when delivered from the factory.



Moreover, use a converter with galvanic isolation (e.g. W&T 38211) to avoid problems with ground loops.

**⚠ Attention**

If the supply voltage or current output are conducted via this cable, then make sure to consider the voltage drop if the cable length is greater than 100 m.

- ▶ Disconnect the pyrometer from any voltage source
- ▶ Install all required electric connections
- ▶ Connect the converter with the PC
- ▶ Install the converter according to instructions
- ▶ Connect the voltage supply for the pyrometer
- ▶ Start CellaView
- ▶ Select the correct COM port or use the CellaView search function.

For more information on how to work with CellaView read the separate CellaView manual.

### 12.3 CellaView via RS485 bus connection

The RS485 two-wire bus consists of the bus cable itself with a maximum length of 1200 m. The participants are connected to this cable via a branch line with a length of 5 m max.

Up to 31 pyrometers can be connected to the RS485 bus. CellaView controls the communication on the bus and prompts allocated pyrometers to send or to receive data. Each participant will be addressed by a unique address. Configure this address during setup of each pyrometer using the keyboard.

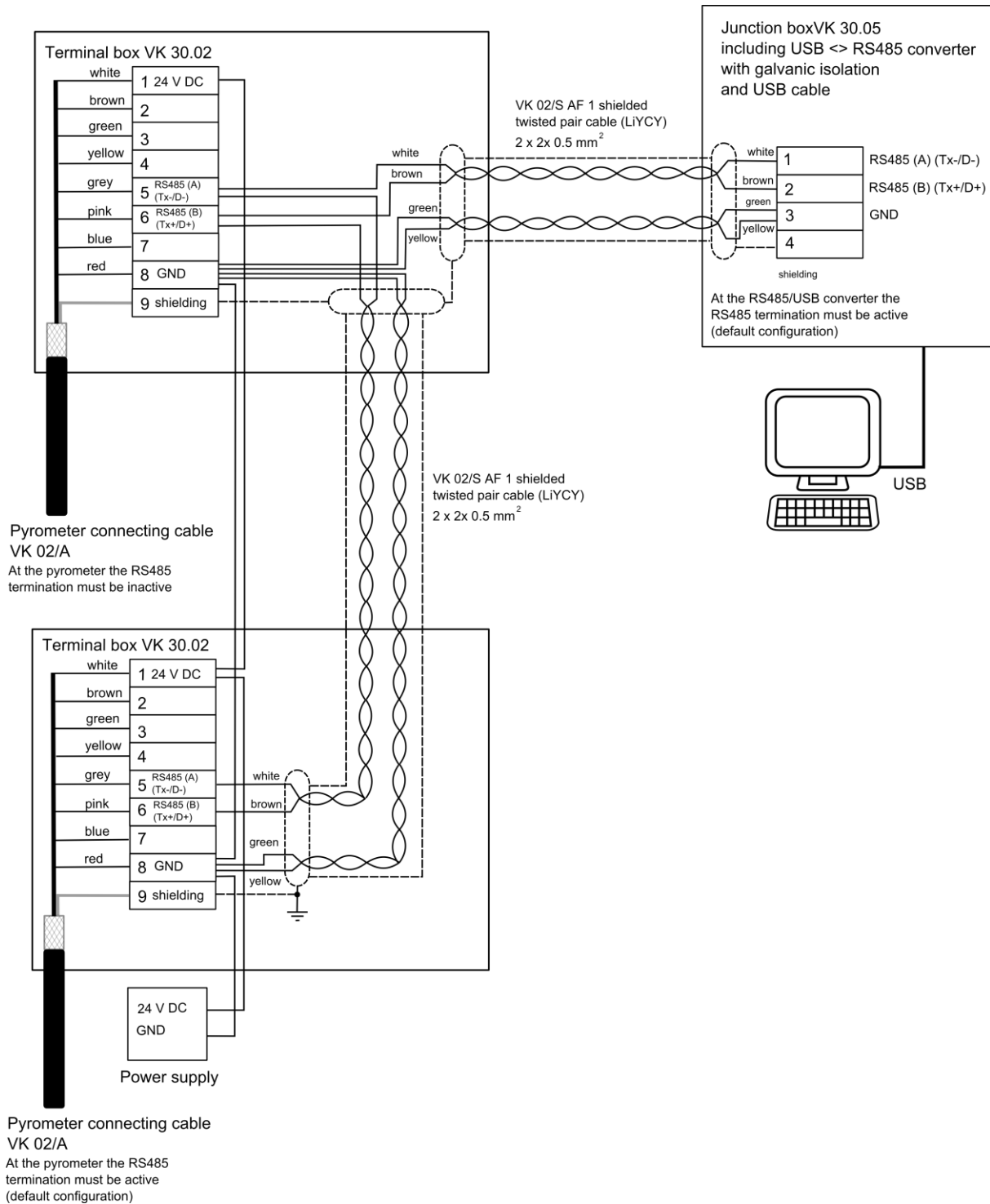
#### Configuration layer: `c 0 ! !`

Addr.	Device address	Enter address of device for protocol mode
-------	----------------	---

A USB/RS485 converter is needed when working with the RS485 interface. The pyrometer can be directly connected if the PC has an integrated RS485 Interface board.

To prevent reflections on the RS485 connection, it is absolutely necessary to terminate the bus system with termination network. The termination can be activated or deactivated by a DIP switch on the PA pyrometer. The termination is active when delivered from the factory.

Moreover, use a converter with galvanic isolation (e.g. W&T 38211) to avoid problems with ground loops.

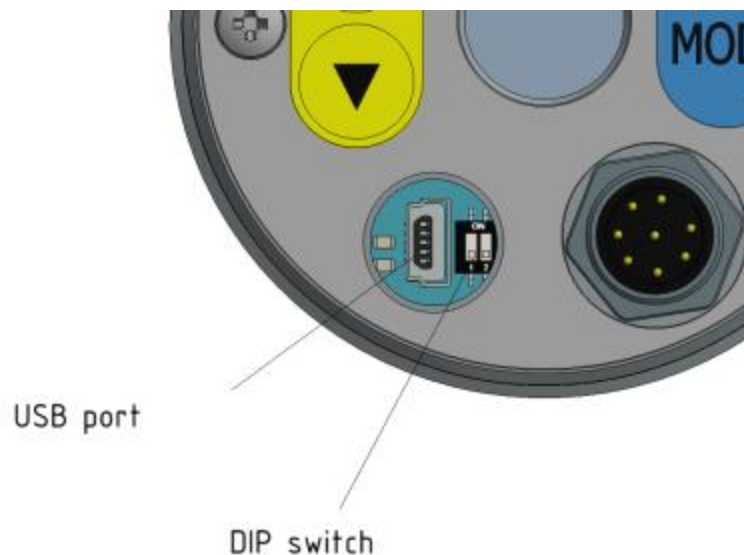


**⚠ Attention**  
All pyrometers must be connected to the same voltage supply. The maximum length of the branch lines to the pyrometer is 5 m

- ▶ Disconnect the pyrometer from any voltage source
- ▶ Activate or deactivate the termination of the respective participant (see termination of RS485 bus)
- ▶ Install all required electric connections
- ▶ Connect the converter with the PC
- ▶ Install the converter according to instructions
- ▶ Connect the voltage supply for the pyrometers
- ▶ Adapt the addresses of the participants
- ▶ Start CellaView
- ▶ Select the correct COM port or use the CellaView search function.

#### 12.4 Termination of RS485 bus

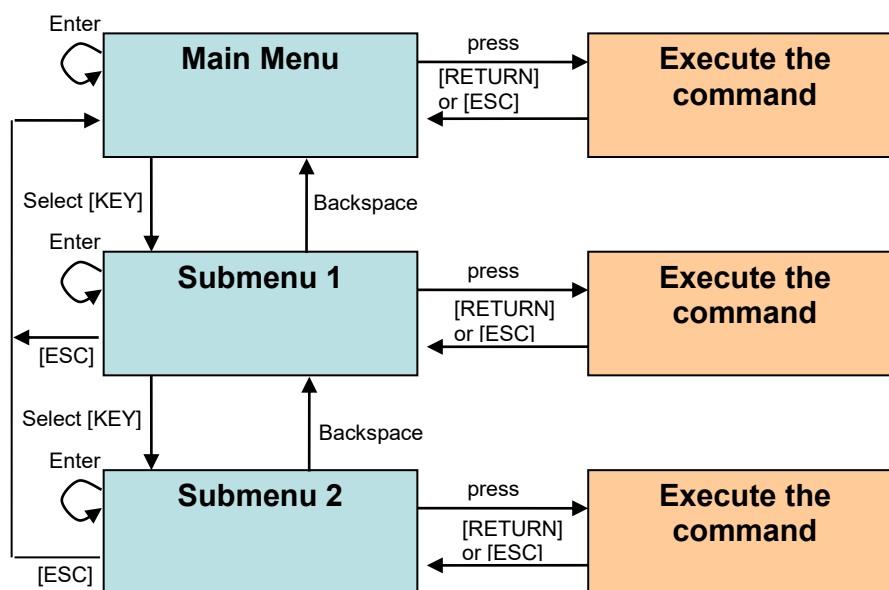
The terminal resistor of the pyrometer must be activated on the relevant bus end. For this purpose, set the DIP switches to ON. Deactivate the termination with the remaining pyrometers.



## 13 Operation of the pyrometer via terminal program

By default, the pyrometer has fully integrated communications software to the point-to-point connection with a PC. As an alternative to the CellaView software, all parameters that are required for a measurement data acquisition or a general configuration of the pyrometer can be configured via a simple terminal connection using the terminal program.

Most key parameters are directly available in the main menu. Further functions are contained in submenus. Navigation within the menus is explained in the following graphics:



To set the pyrometer to the terminal mode, simultaneously hold down the **Ctrl key** and press the **E key** twice in rapid succession.

Direct commands have an assigned key. Example: E for emissivity (epsilon). Submenu settings are shown in brackets. Example: [LAMBDA 1]

### 13.1 Serial Data Transmission of Temperature Data

Transmission parameters for the serial interface:

57600 Baud / 8 data bits / odd parity / 1 stop bit / no handshake

**two-colour/ratio Lambda 1 – Lambda 2 (one cycle):**

Byte	Negative Temperature	Positive Temperature	Temperature exceeds measuring range	Temperature falls below measuring range
1	Space	Space	Space	Space
2	Minus symbol -	Space	Minus symbol -	Minus symbol -
3	Digit 1000	Digit 1000	O	U
4	Digit 100	Digit 100	V	N
5	Digit 10	Digit 10	E	D
6	Digit 1	Digit 1	R	E
7	Decimal point .	Decimal point .	Space	R
8	Decimal place	Decimal place	Space	Space
9	Space	Space	Minus symbol -	Minus symbol -
10	Unit C or F	Unit C or F	Space	Space
11	Tabulator	Tabulator	Tabulator	Tabulator
12	Space	Space	Space	Space
13	Minus sign -	Space	Minus symbol -	Minus symbol -
14	Digit 1000	Digit 1000	O	U
15	Digit 100	Digit 100	V	N
16	Digit 10	Digit 10	E	D
17	Digit 1	Digit 1	R	E
18	Decimal point .	Decimal point .	Space	R
19	Decimal place	Decimal place	Space	Space
20	Space	Space	Minus symbol -	Minus symbol -
21	Unit C or F	Unit C or F	Space	Space
22	Tabulator	Tabulator	Tabulator	Tabulator
23	Space	Space	Space	Space
24	Minus sign -	Space	Minus symbol -	Minus symbol -
25	Digit 1000	Digit 1000	O	U
26	Digit 100	Digit 100	V	N
27	Digit 10	Digit 10	E	D
28	Digit 1	Digit 1	R	E
29	Decimal point .	Decimal point .	Space	R
30	Decimal place	Decimal place	Space	Space
31	Space	Space	Minus symbol -	Minus symbol -
32	Unit C or F	Unit C or F	Space	Space
33	Carriage Return	Carriage Return	Carriage Return	Carriage Return



All symbols are ASCII coded; preceding zeros will be included in the transmission

The cycle time in which the temperature reading is transmitted can be set at the PC terminal (minimum cycle duration is 0.1 second).

### 13.2 Terminal connection via USB

For communication through a terminal connection via USB set the parameter  $\text{E r n}$  on the pyrometer to USB (default setting).

The parameter  $\text{E r n}$  is available on configuration layer C011.

Parameter  $\text{E r n} = \text{USB}$

- ▶ Install the pyrometer's USB driver on the PC
- ▶ Connect the pyrometer with a USB cable to the PC
- ▶ Start a standard terminal program (e.g. Windows HyperTerminal or Putty)
- ▶ Select the correct COM port
- ▶ Set the interface parameters for the serial interface (see chapter transmission of measurement values)
- ▶ Open the connection

### 13.3 Terminal connection via RS485

For communication through a terminal connection via RS485 set the parameter  $\text{E r n}$  on the pyrometer to  $\text{r 485}$ .

The parameter  $\text{E r n}$  is available on configuration layer C011.

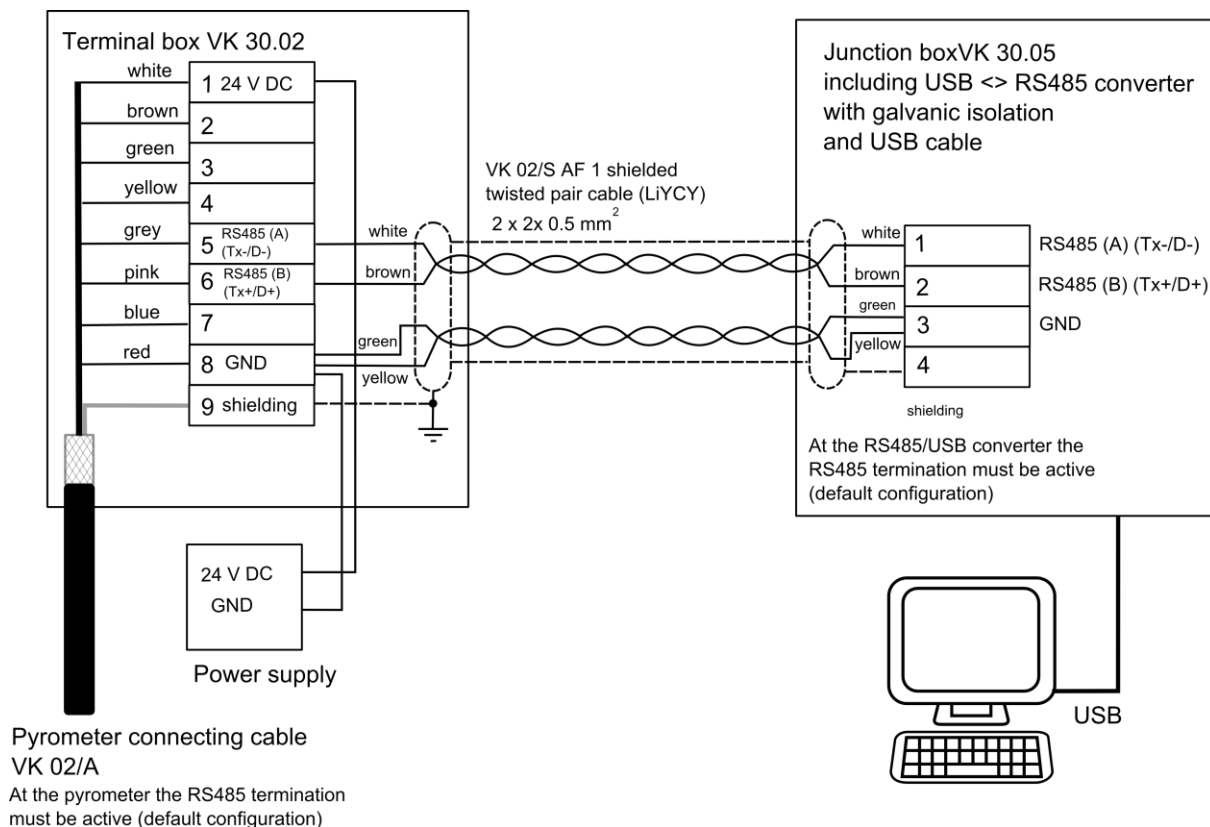
Parameter  $\text{E r n} = \text{r 485}$

#### Attention

When using a terminal connection via the RS485 interface, CellaView cannot be used via the RS485 interface any longer.

A USB/RS485 converter is needed when working with the RS485 interface. The distance between pyrometer and PC can be up to 1200 m.

To prevent reflections on the RS485 connection, it is necessary to terminate the connection at the pyrometer and at the converter. The termination is integrated in the PA pyrometer and is active when delivered from the factory.



Moreover, use a converter with galvanic isolation (e.g. W&T 38211) to avoid problems with ground loops.

**⚠ Attention**

If the supply voltage or current output are conducted via this cable, then make sure to consider the voltage drop if the cable length is greater than 100 m.

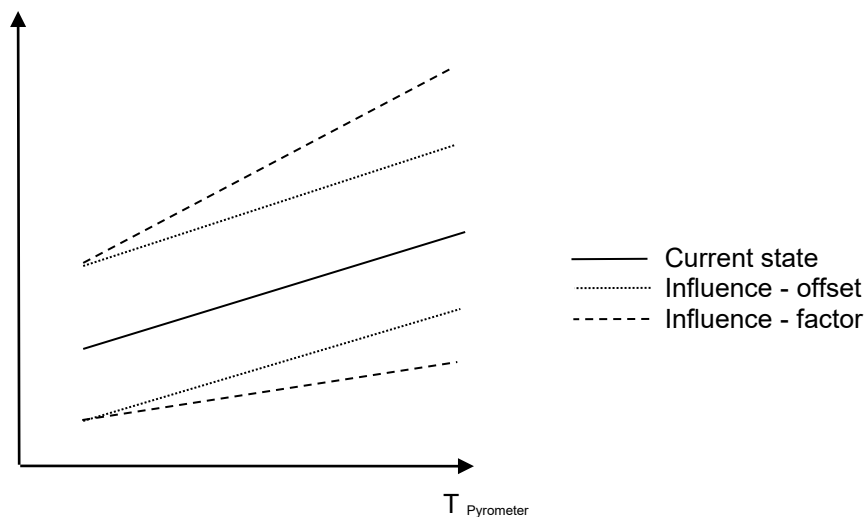
- ▶ Disconnect the pyrometer from any voltage source
- ▶ Install all required electric connections
- ▶ Connect the converter with the PC
- ▶ Install the converter according to instructions.
- ▶ Connect the voltage supply for the pyrometer
- ▶ Change the parameter `ETHER` to `r485`
- ▶ Start a terminal program such as HyperTerminal
- ▶ Select the correct COM port
- ▶ Set the correct parameters for the serial interface (see chapter transmission of measurement values)
- ▶ Open the connection

## 14 User-defined calibration / scaling of the current output

User-defined calibration / scaling of the current output

If necessary, the pyrometer can be adjusted with a user-defined calibration function. The following drawing explains the effects for offset and factor.

$T_{\text{shall}}$



### Attention

To recalibrate your CellaTemp PA, you will require a calibration furnace and a reference standard

In addition to a user-defined calibration, the user-defined range function can also be activated. With this function being active, scaling of the current output can be extended.



The measuring accuracy is not defined when the scaling is outside the pyrometer range.

## 14.1 Calibration/scaling via CellaView

To use the user-defined calibration function, activate it first in expert mode.

- ▶ Start CellaView
- ▶ Open the menu Settings Extras -> Settings
- ▶ Select expert mode and activate editable calibration
- ▶ Close the menu
- ▶ Open the menu Pyrometer settings

The parameters can now be edited under the tab Spectral channel 1.

## 14.2 Calibration/scaling via terminal connection

If ever required, the CellaTemp PA can be recalibrated using the sub-menu Calibration. Press command „K“ and then enter the password „100“ to access the calibration menu.

The calibration menu opens.

```

-----
-----
Submenu CALIBRATION
-----
Name .... "Pyrometer PA Series"

1: [LAMBDA 1 CALIBRATION]
A: Reset settings to factory default
S: Set pyrometer name
Z: End Calibration-Mode
ESC: Back to MAIN-MENU
-----
>CALIBRATION >

-----
-----
Submenu LAMBDA 1
-----
L1 range ....      0.0 - 1000.0 C
L1 User calibration ..... off
L1 User def. offset   +0.00000
L1 User def. factor   +1.00000

A: Set L1 - extended-range
B: Set L1 User-Cal. On/Off
C: Set L1 User-Cal. Offset
D: Set L1 User-Cal. Factor
ESC: Back to MAIN-MENU
-----
>CALIBRATION >LAMBDA 1 >

```

You can reset all configurations you have made to your CellaTemp PA and restore the factory default settings using Command „A“. This also applies to data acquisition parameters and input/output settings. Use keys "B", "C" and "D" for direct access to enable the adjustments.

If you make a mistake while making the adjustments, simply enter off-set=0.0 und factor=1.0, or set User Cal. to „off“.

Command "A" redefines the pyrometer's entire measuring range. This new temperature span may be smaller or larger than the range originally programmed by the manufacturer. When selecting a new temperature range for your CellaTemp PA, make absolutely sure that the temperature span you select is actually covered by the pyrometer model you have purchased. The only way to be certain is to perform measurement tests.

Press "S" to enter a short text to name the control point. View this text by selecting „Q“ in the Main Menu.

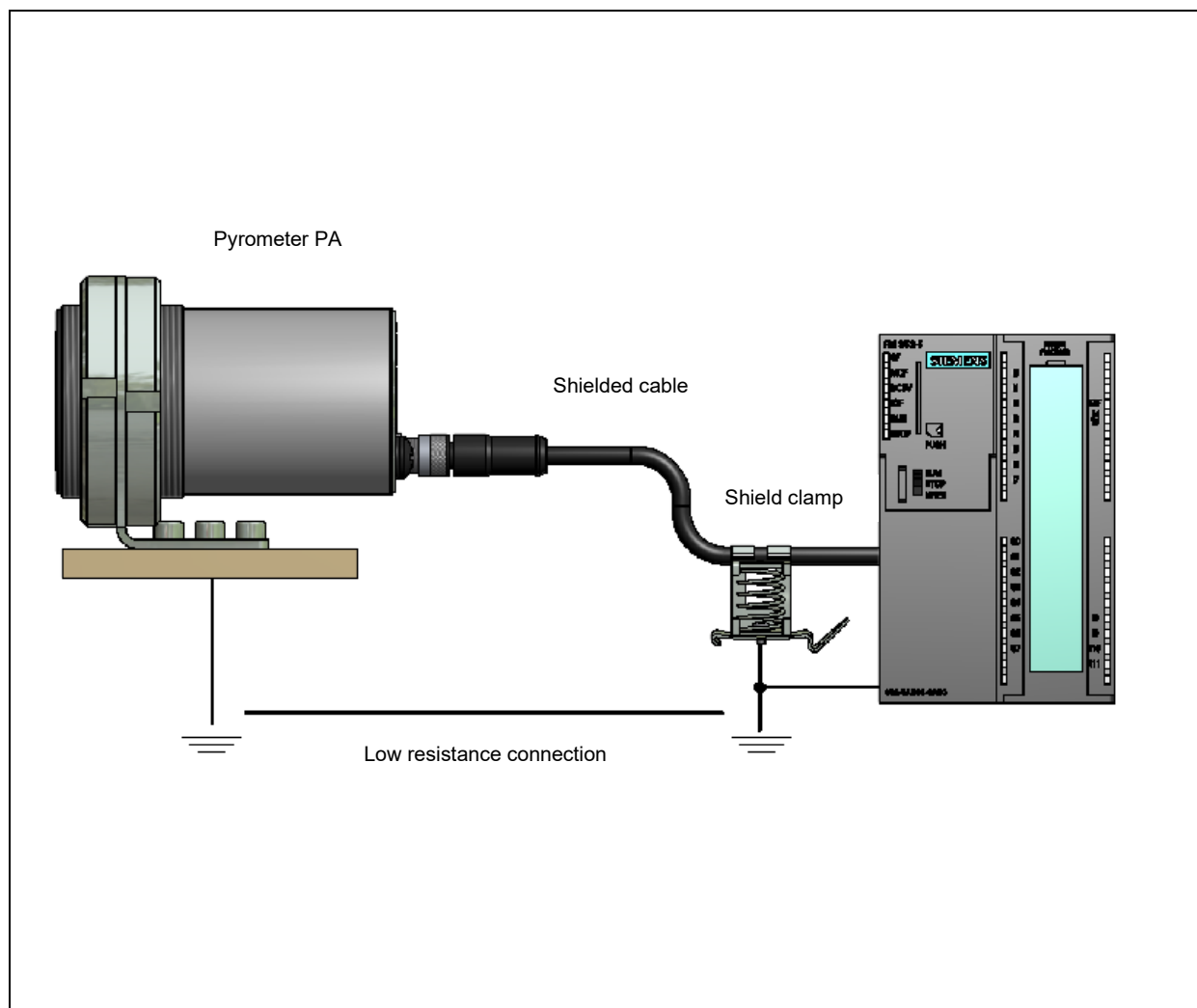
## 15 Shielding and Grounding

### 15.1 Potential equalisation

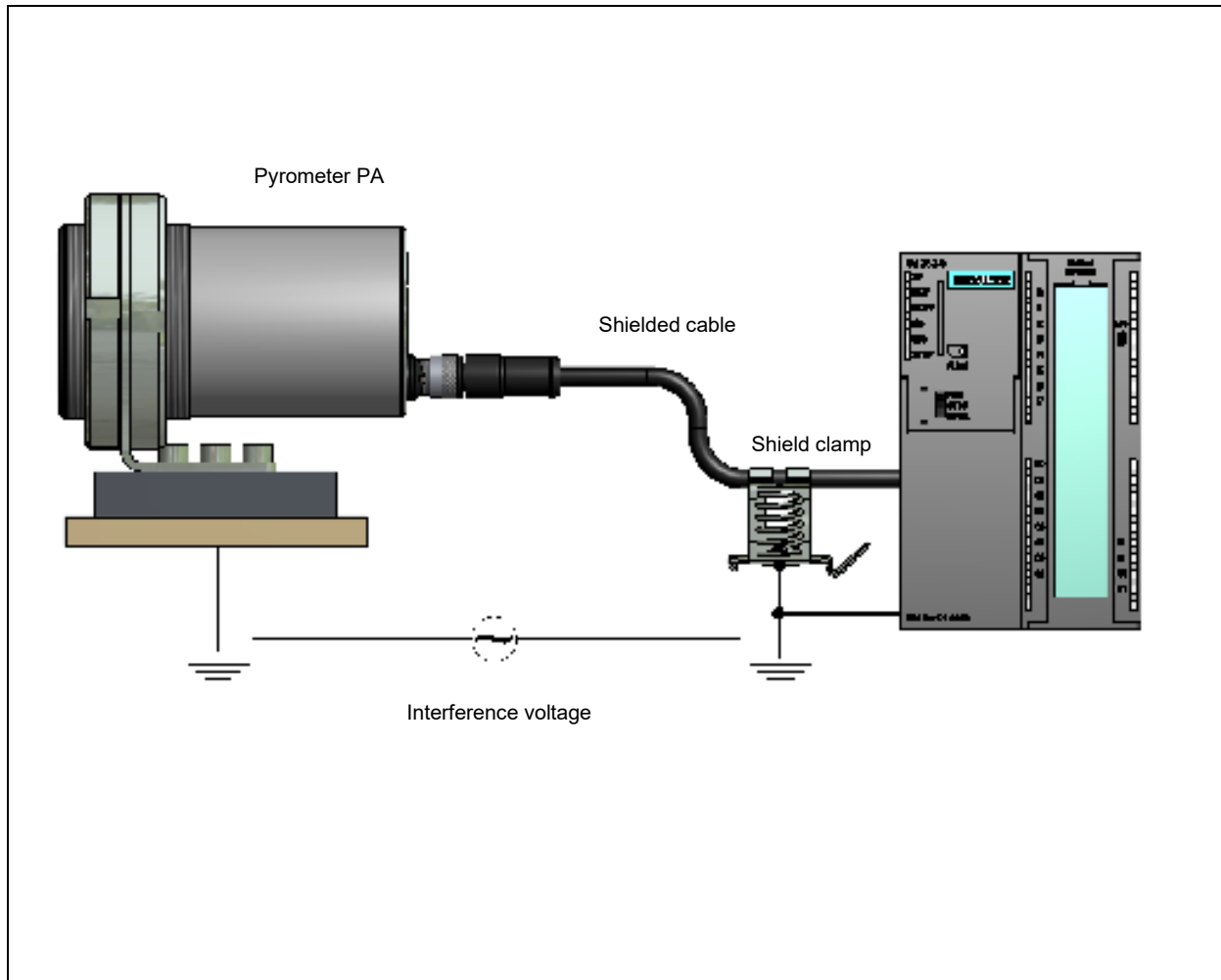
#### Attention

All applicable laws and codes must be complied with at all times

The pyrometer housing is connected to the shielding via the cable connector! Differences in ground potentials might cause an equalising current to flow between devices through a cable shielded at both ends.



In this case, be sure to install an additional potential equalisation line.



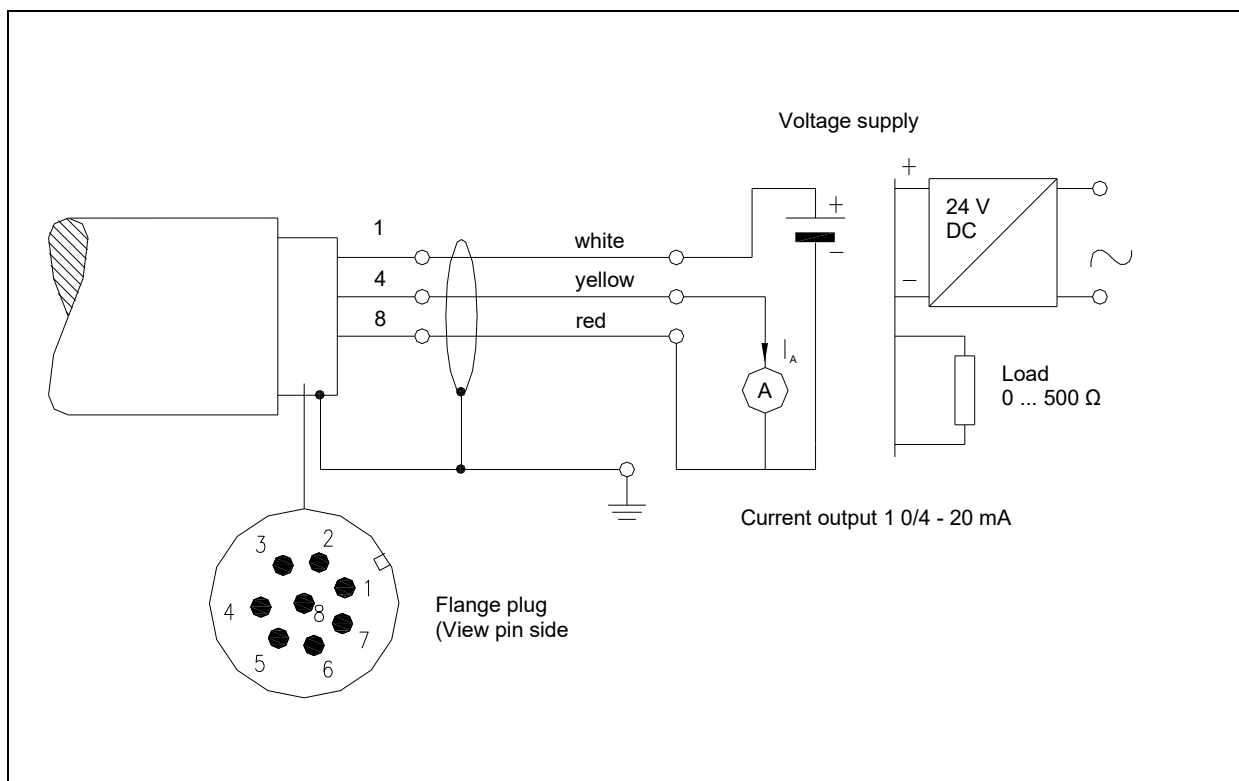
To avoid an equalising current, the pyrometer can be mounted electrically insulated. The shielding must be connected to the plant's earthing system.

**⚠ Attention**

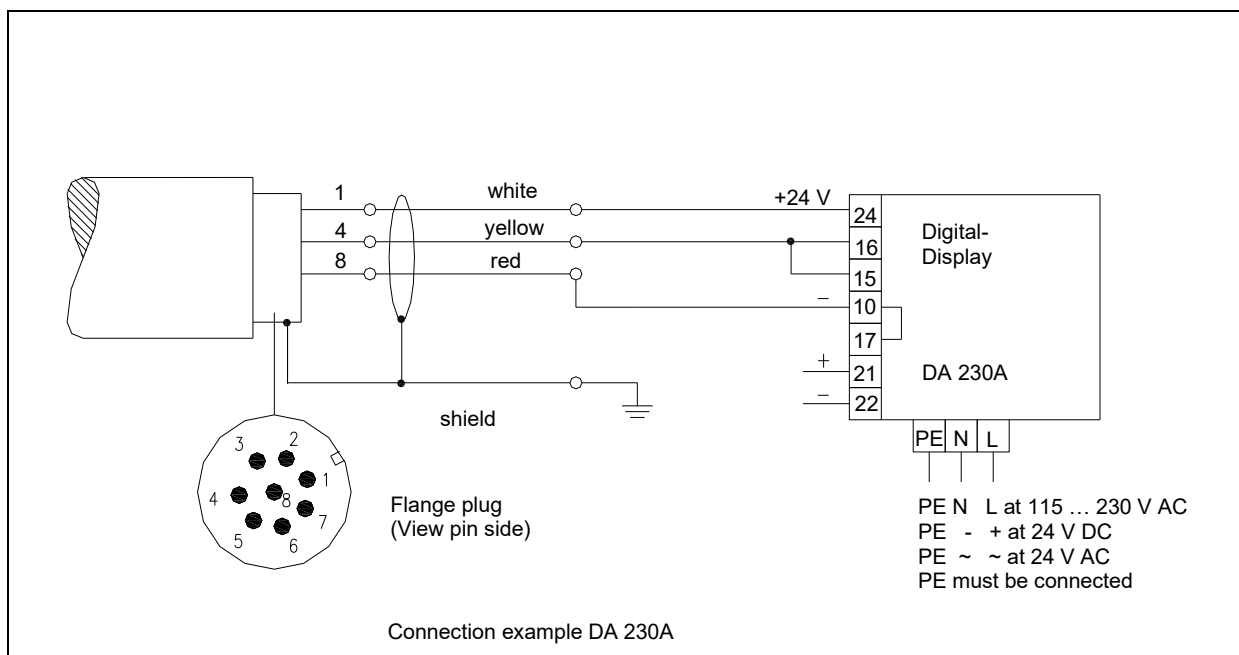
If the pyrometer is installed without an insulator and without potential equalisation, the interference voltage may not exceed 48V.

## 16 Connectivity Examples

### 16.1 Connection to VK 02/A Cable



### 16.2 Connection to DA 230 digital display unit



## 17 Theory of Non-Contact Temperature Measurements

All materials radiate thermal energy in all states of aggregation above absolute zero. This radiation is mainly caused by atomic or molecular oscillations. This temperature radiation is only a limited sector within the total electromagnetic radiation spectrum. It extends from the visible range starting at wavelengths of approx. 0.5  $\mu\text{m}$  to the infrared range with wavelengths of more than 40  $\mu\text{m}$ . The KELLER HCW PA radiation pyrometers detect infrared radiation for non-contact temperature measurement.

### 17.1 Advantages of Non-Contact Temperature Measurement

Non-contact temperature detection means cost-effective temperature measurement because this technique only requires a single investment in an instrument without any follow-up costs for consumables such as thermocouples. This method enables temperature detection of moving objects - quick temperature measurements within milliseconds - for example at automatic welding processes. Small objects with medium and high temperatures can also be easily and accurately measured. When measuring materials with low specific heat, a non-contact method does not induce heat loss which would distort the temperature reading (as is the case with contact temperature probes). Non-contact temperature detection is ideal with corrosive molten materials for which the use of thermocouples is hardly feasible. Finally, it is also possible to measure the temperature of voltage-carrying objects.

### 17.2 Measurements at Black Bodies (Cavity Radiators)

A black body or a black radiator is used to calibrate radiation pyrometers. This black body is designed in a way that its radiation does not depend on material characteristics, but only on its temperature. A black body emits at any wavelength the maximum energy possible for the specific temperature. Real bodies do not have this ability. In other words, a black body completely absorbs the radiation without reflection or transmission losses. The spectral emissivity coefficient  $\epsilon(\lambda)$  of a black body is equal to 1 or 100 %. The emissivity coefficient indicates the ratio of radiation of a real body (target) to the radiation of an ideal black body.

$$\varepsilon(\lambda) = \frac{M}{M_S}$$

$\varepsilon(\lambda)$ : Emissivity coefficient of the object's surface (targeted spot) at wavelength  $\lambda$

$M$ : radiant energy emitted by a real object

$M_S$ : radiant energy emitted by a black body (perfect radiator)

Most burning, annealing and hardening furnaces emit a radiation of nearly '1' which corresponds to the conditions of a black body if the aperture through which the measurement is made is relatively small.

### 17.3 Measurements of Real Radiators

Real radiation sources are characterized by the relation of the emitted radiation to the radiation of a black body with the same temperature. Measurements outside a furnace - which applies to all other self-contained targets - always, show a reading which is too low. Considerable errors can occur at targets with reflecting, polished or bright surfaces, e.g. molten steel and metal without oxide layer and ceramic materials. Exact results can only be obtained when the emissivity coefficient is correctly adjusted on the PA pyrometer.

The spectral emissivity coefficient of a body does not represent an exact material constant but is also largely dependent on the surface properties. For different materials the spectral emissivity coefficient  $\varepsilon$  for the spectral ranges  $\lambda = 0.95 / 1.05$  (PA 40) is shown in the following tables:

## 17.4 Emissivity Coefficient Table PA (Spectral mode)

List of emissivity coefficients of different materials in %

CellaTemp	PA 40 PA 50 $\lambda_1$	PA 50 $\lambda_2$
Wavelength $\lambda$	0.8 - 1,1 $\mu\text{m}$	1,1 - 1,7 $\mu\text{m}$
"Black Body"	100	100
Aluminium, polished	15	5
Aluminium, blackened	25	10
Asbestos cement	70	60
Bronze, polished	3	1
Bronze, blackened	30	15
Chromium, polished	30	15
Iron, heavily scaled	95	90
Iron, rolling skin	90	75
Iron, liquid	30	15
Gold and silver	2	1
Graphite, blackened	90	85
Copper, oxidized	90	70
Brass, oxidized (tarnished)	70	50
Nickel	20	8
Porcelain, glazed	60	50
Porcelain, rough	85	75
Soot	95	90
Fireclay	50	40
Slag	85	80
Pottery, glazed	90	85
Bricks	90	85
Zinc	60	40

### Attention

The emissivity coefficients are valid for lambda 1 and lambda 2 not for the ratio correction

## 18 Maintenance

### 18.1 Cleaning the pyrometer lens

A false temperature reading will be given when the lens is dirty. Therefore, check the lens periodically and clean it, if necessary.

Dust can be removed by simply blowing it away or by using a soft brush. A special lens cleaning cloth is ideal, but any soft, clean, lint-free cloth will be suitable.

If the lens is quite dirty, use a very mild liquid detergent and rinse carefully with clear water while holding the pyrometer down. Apply as little pressure as possible to avoid scratching the lens.

Make sure to turn off the pyrometer prior to connecting or disconnecting the coupler connector (e.g. when cleaning). Failure to do so may result in damage to the instrument!

#### Attention

Please note that the lens may only be mounted/removed when the pyrometer is switched off. Failure to observe this precaution may result in damage to the device!

#### Attention

For pyrometers with laser pilot lights, the objective lens may only be cleaned or mounted/dismounted when the pyrometer is switched off. Damage to the retina is possible.

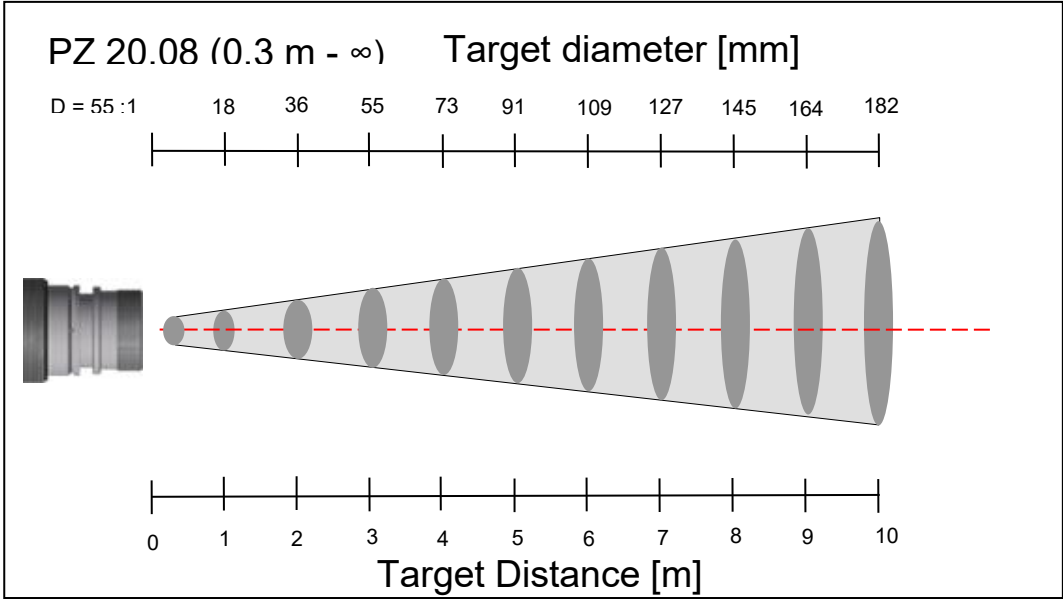


The pyrometer must be protected against high ambient temperatures, high air humidity, high voltage and strong electromagnetic fields. Never hold the lens directly into the sun.

## 19 Technical Data PA 40 AF 20

<p><b>Measuring range:</b> (adjustable in partial range): 500 - 1400 °C</p>	<p><b>Excess temperature signal:</b> When internal temperature exceeds &gt; 80 °C, the analogue output value will be &gt; 20.5 mA!</p>	<p><b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)</p>
<p><b>Sensor:</b> Photodiode</p>	<p><b>Storage temperature:</b> -20 - 80 °C</p>	<p><b>Adjustable parameters:</b></p>
<p><b>Spectral sensitivity:</b> 0.95/ 1.05 µm</p>	<p><b>Permissible humidity:</b> 95% r.H. max. (non-condensing)</p>	<p><b>Analogue output 1 &amp; 2:</b> source/ scaling</p>
<p><b>Focussing range:</b> 0.4 m - ∞ (F50-optic)</p>	<p><b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value</p>	<p><b>Digital input output 1 &amp; 2:</b> source/ switch-point</p>
<p><b>Distance to target size ratio:</b> 55 :1 at 300 mm (F50 optic 20.08)</p>	<p><b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC</p>	<p><b>Transmission factor</b> <math>\lambda_1</math> and <math>\lambda_2</math></p>
<p><b>Digital output:</b> Periodic output of measurement data with adjustable cycle time</p>	<p><b>Analogue input:</b> 0 – 10 V</p>	<p><b>Compensation of background radiation</b> <math>\lambda_1</math> and <math>\lambda_2</math></p>
<p><b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)</p>	<p><b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA</p>	<p><b>Look-up table for temperature alignment</b></p>
<p><b>Resistance:</b> max. 500 Ω</p>	<p><b>Digital input:</b> 2 to 24 V</p>	<p><b>Ratio correction:</b> <math>\frac{\varepsilon_1}{\varepsilon_2}</math> : 80 - 120 % increment size 0.1 %</p>
<p><b>Response time <math>t_{98}</math>:</b> ≤ 10 ms (T &gt; 650 °C)</p>	<p><b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA/ ≤175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV</p>	<p><b>Emissivity <math>\varepsilon</math>:</b> <math>\lambda_1</math> u. <math>\lambda_2</math>: 10 - 110 % increment size 0.1 %</p>
<p><b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span</p>	<p><b>Dimension:</b> φ 65 x 220 mm</p>	<p><b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s</p>
<p><b>Resolution Display:</b> 1 K</p>	<p><b>Housing material:</b> Stainless steel</p>	<p><b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time</p>
<p><b>Resolution USB / RS 485:</b> 0.1 K at terminal operation</p>	<p><b>Weight:</b> Approx. 0.9 kg</p>	<p><b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD</p>
<p><b>Measuring uncertainty:</b> 1 % of reading (at <math>\varepsilon = 1.0</math> and <math>T_A = 23</math> °C)</p>	<p><b>Mounting:</b> External thread M 65 x 2 length 40 mm</p>	<p>large variety of mounting devices, digital displays, software, etc.</p>
<p><b>Repeatability:</b> 2 K</p>	<p><b>Connection:</b> with 8-pin connector</p>	
<p><b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera</p>		
<p><b>Ambient operating temperature:</b> 0 - 65 °C</p>		

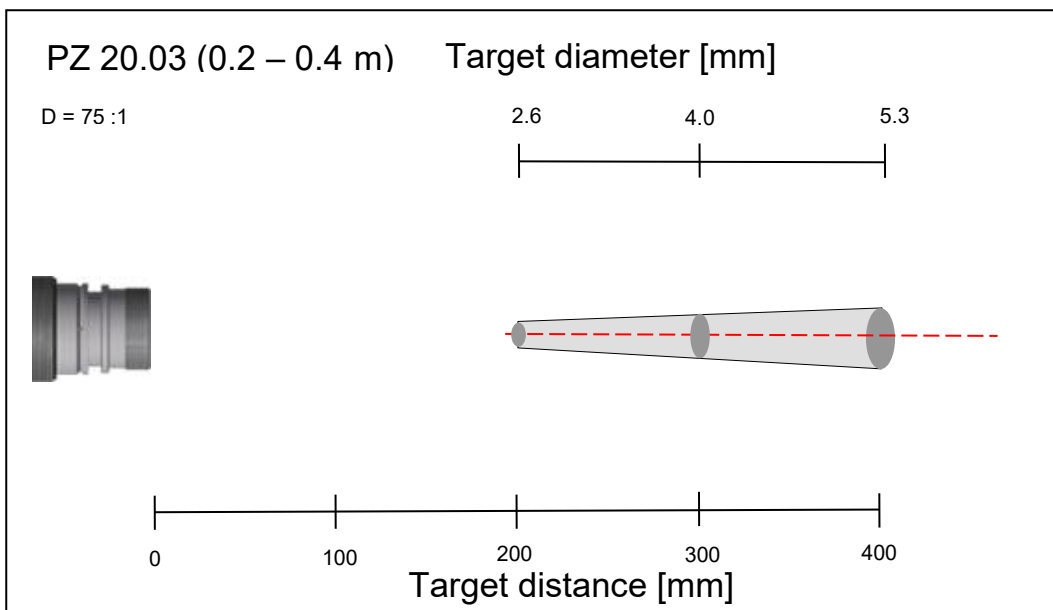
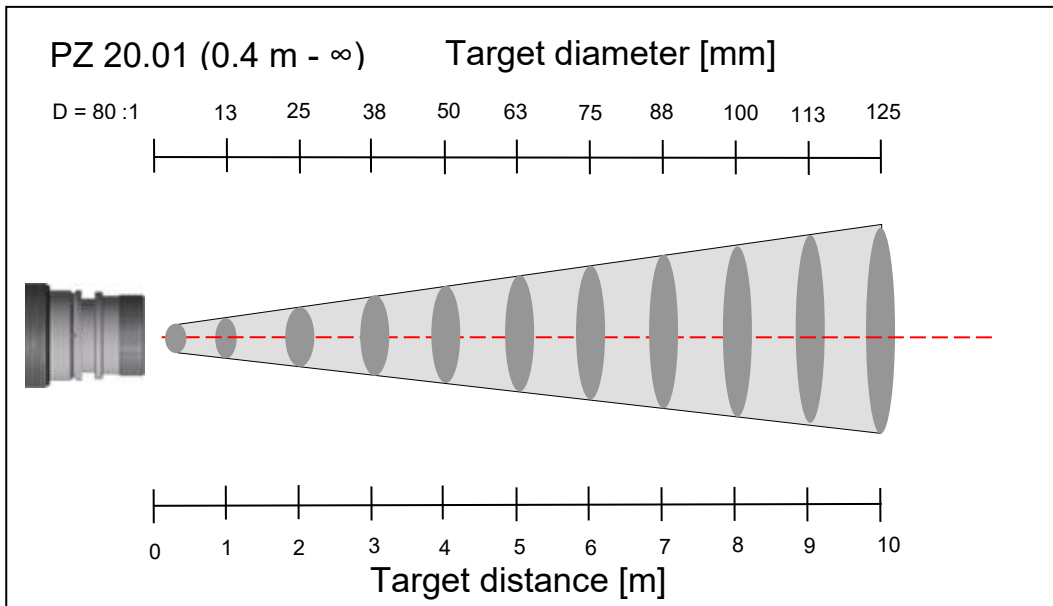
**19.1 Field of View Diagram PA 40 AF 20**

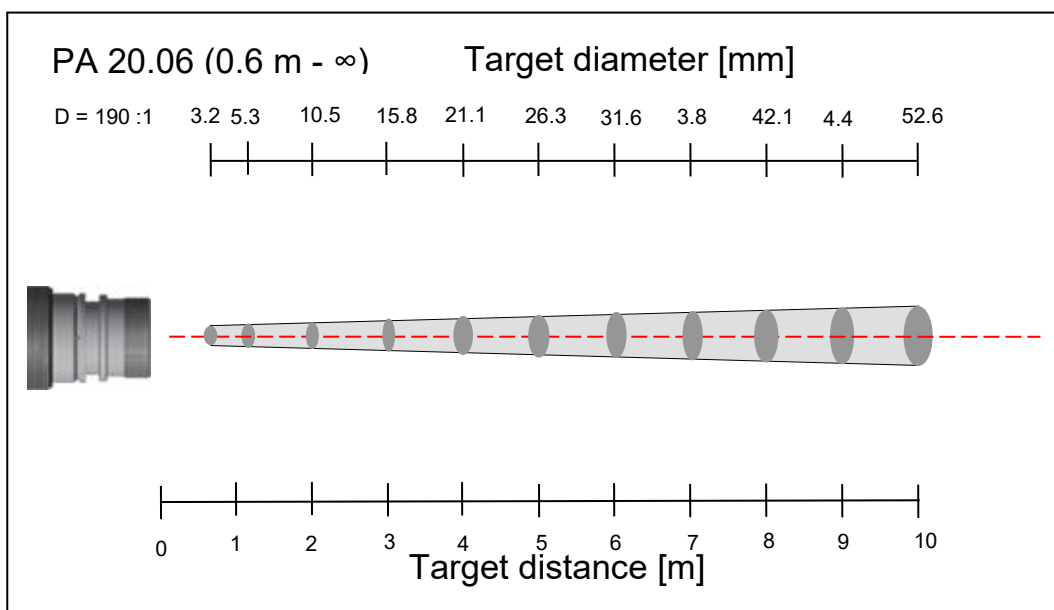
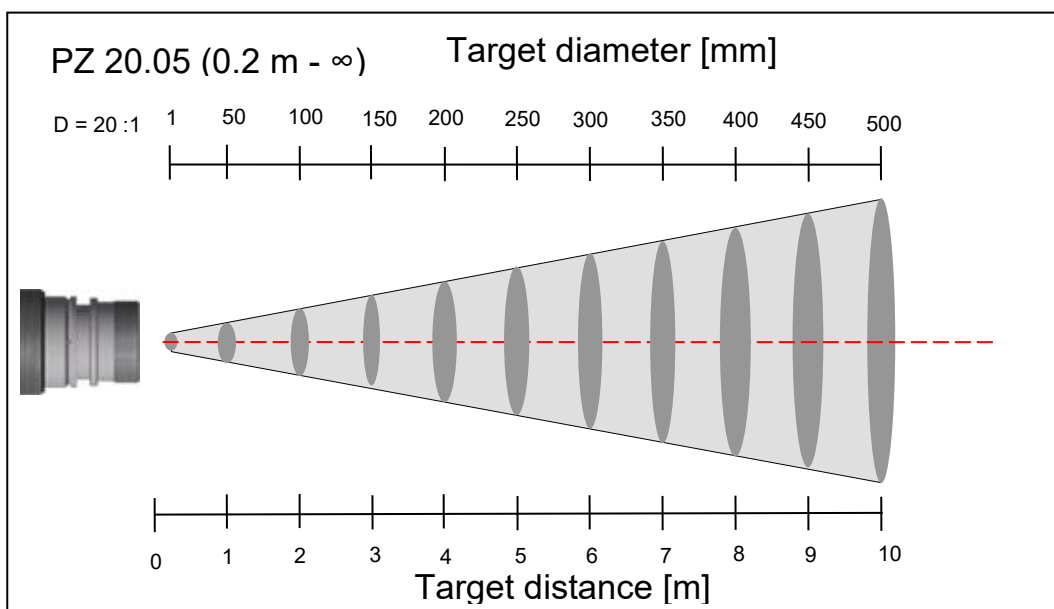
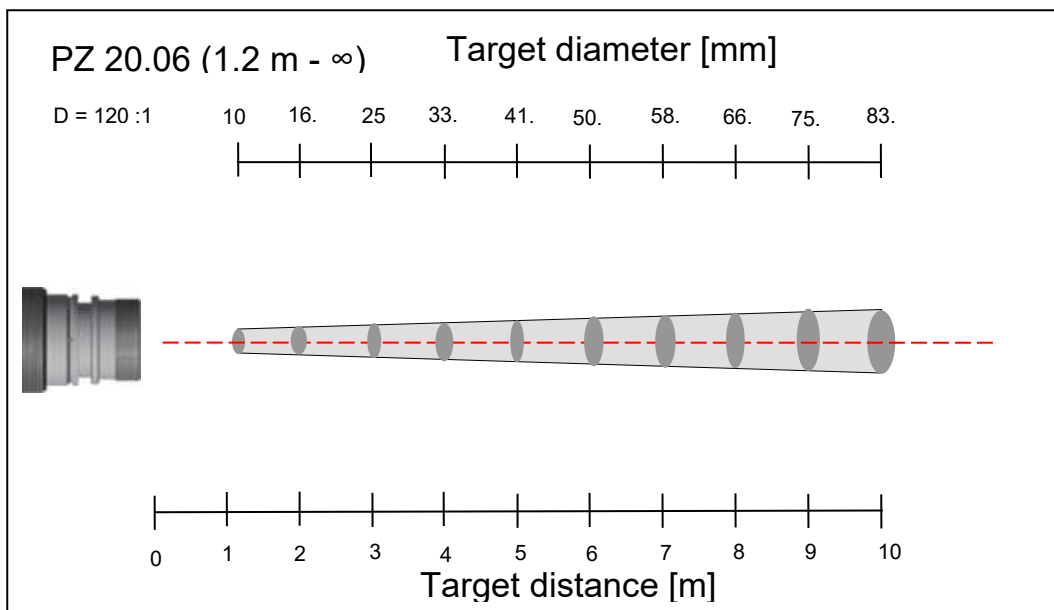


## 20 Technical Data PA 40 (650 – 1700 °C)

<b>Measuring range:</b> (adjustable in partial range): 650 - 1700 °C	<b>Repeatability:</b> 2 K	<b>Mounting:</b> External thread M 65 x 2 length 40 mm
<b>Sensor:</b> Photodiode	<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera	<b>Connection:</b> with 8-pin connector
<b>Spectral sensitivity:</b> 0.95/ 1.05 µm	<b>Ambient operating temperature:</b> 0 - 65 °C	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
<b>Focussing range:</b> 0.2 - 0.4 m (PZ 20.03 optic) 0.4 m - ∞ (PZ 20.01 optic) 1.2 m - ∞ (PZ 20.06 optic) 0.6 m - ∞ (PA 20.06 optic) 0.2 m - ∞ (PZ 20.05 optic)	<b>Excess temperature signal:</b> When internal temperature ex- ceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Adjustable parameters:</b>  <b>Analogue output 1 &amp; 2:</b> source/ scaling
<b>Distance to target size ratio:</b> 80 :1 at 400 mm (PZ 20.01 optic) 75 :1 at 200 mm (PZ 20.03 optic) 120:1 at 1200 mm (PZ 20.06 optic) 190:1 at 600 mm (PA 20.06 optic) 20 :1 at 200 mm (PZ 20.05 optic)	<b>Storage temperature:</b> -20 - 80 °C	<b>Digital input output 1 &amp; 2:</b> source/ switch-point
<b>Digital output:</b> Periodic output of measure- ment data with adjustable cycle time	<b>Permissible humidity:</b> 95% r.H. max. (non-condensing)	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
<b>Resistance:</b> max. 500 Ω	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC	<b>Look-up table for temperature alignment</b>
<b>Response time <math>t_{98}</math>:</b> ≤ 10 ms (T > 750 °C)	<b>Analogue input:</b> 0 – 10 V	<b>Ratio correction:</b> $\frac{\varepsilon_1}{\varepsilon_2}$ : 80 - 120 % increment size 0.1 %
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA	<b>Emissivity <math>\varepsilon</math>:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Resolution Display:</b> 1 K	<b>Digital input:</b> 2 to 24 V	<b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s
<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA/ ≤175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
<b>Measuring uncertainty:</b> 1 % of reading (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Dimension:</b> φ 65 x 220 mm	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD  large variety of mounting devices, digital displays, software, etc.
	<b>Housing material:</b> Stainless steel	
	<b>Weight:</b> Approx. 0.9 kg	

### 20.1 Field of View Diagrams PA 40

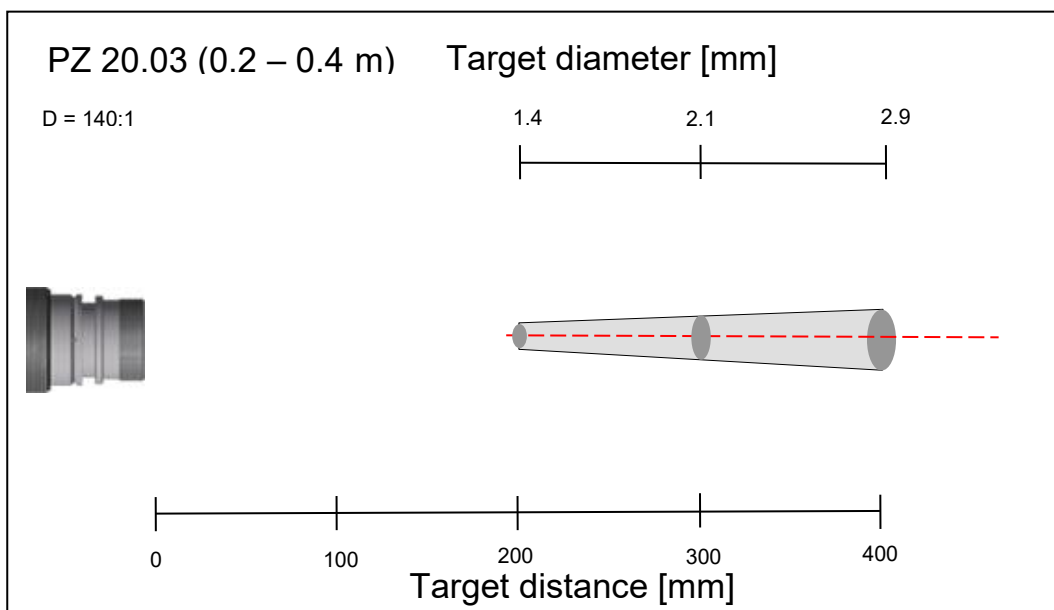
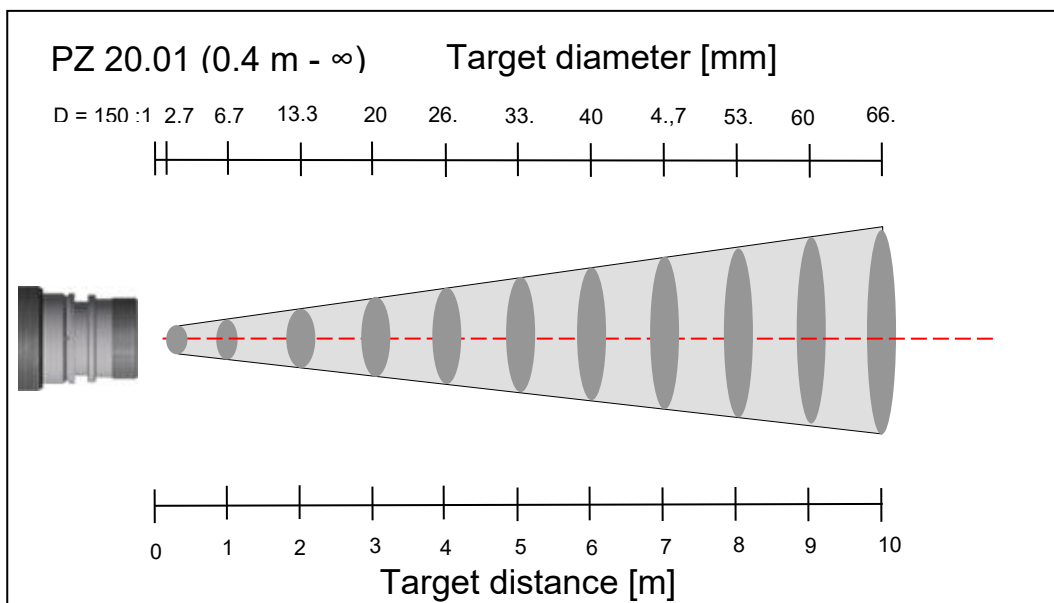


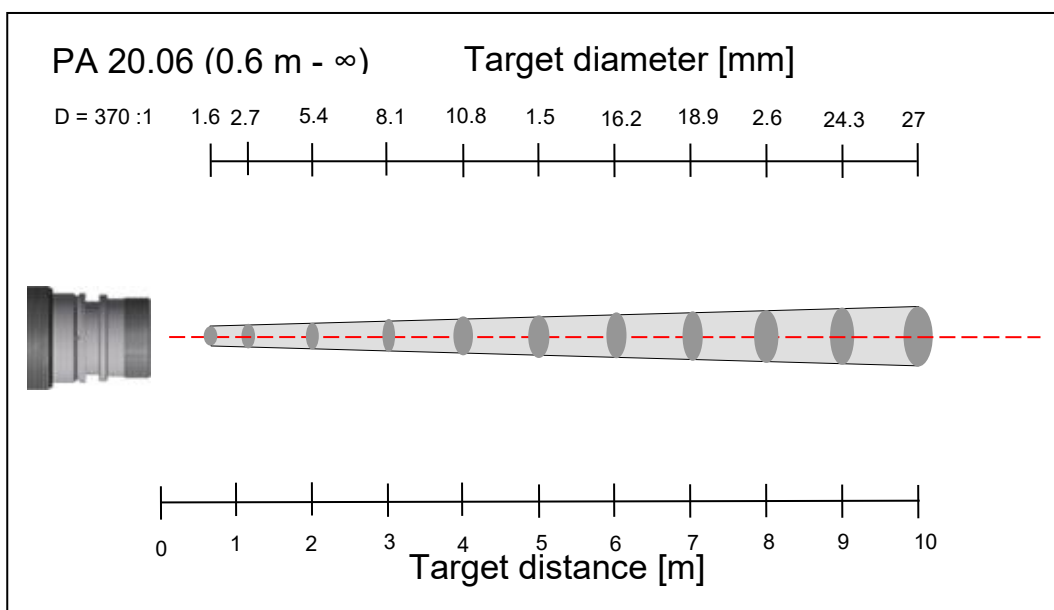
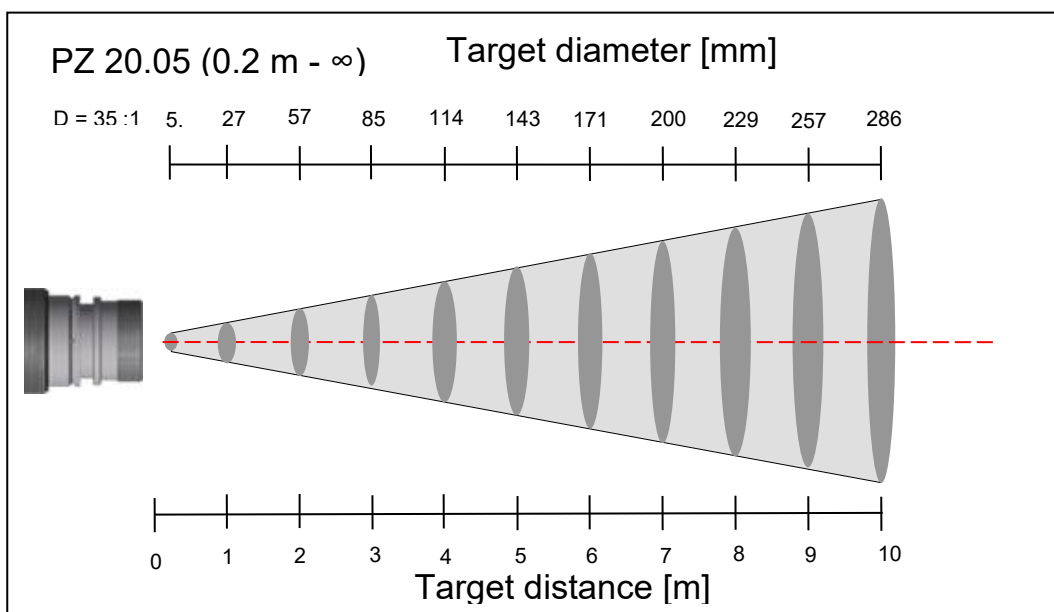
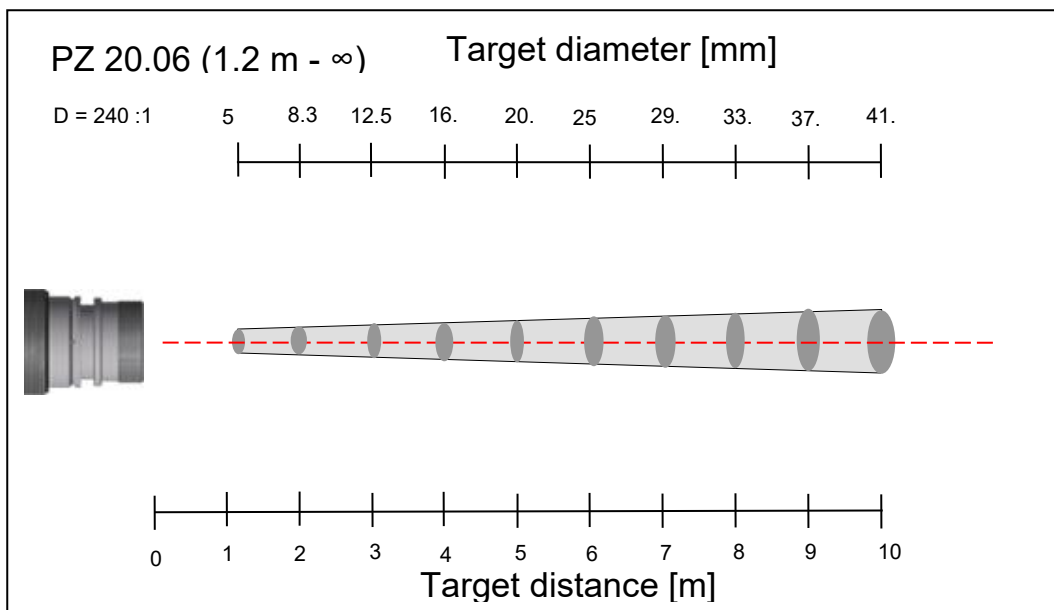


## 21 Technical Data PA 40 (750 – 2400 °C)

<b>Measuring range:</b> (adjustable in partial range): 750 - 2400 °C	<b>Repeatability:</b> 2 K	<b>Mounting:</b> External thread M 65 x 2 length 40 mm
<b>Sensor:</b> Photodiode	<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera	<b>Connection:</b> with 8-pin connector
<b>Spectral sensitivity:</b> 0.95/ 1.05 µm	<b>Ambient operating temperature:</b> 0 - 65 °C	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
<b>Focussing range:</b> 0.2 - 0,4 m (PZ 20.03 optic) 0.4 m - ∞ (PZ 20.01 optic) 1.2 m - ∞ (PZ 20.06 optic) 0.2 m - ∞ (PZ 20.05 optic)	<b>Excess temperature signal:</b> When internal temperature exceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Adjustable parameters:</b>  <b>Analogue output 1 &amp; 2:</b> source/ scaling
<b>Distance to target size ratio:</b> 150 :1 at 400 mm (PZ 20.01 optic) 140:1 at 200 mm (PZ 20.03 optic) 240:1 at 1200 mm (PZ 20.06 optic) 370:1 at 600 mm (PA 20.06 optic) 35:1 at 200 mm (PZ 20.05 optic)	<b>Storage temperature:</b> -20 - 80 °C	<b>Digital input output 1 &amp; 2:</b> source/ switch-point
<b>Digital output:</b> Periodic output of measurement data with adjustable cycle time	<b>Permissible humidity:</b> 95% r.H. max. (non-condensing)	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
<b>Resistance:</b> max. 500 Ω	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC	<b>Look-up table for temperature alignment</b>
<b>Response time <math>t_{98}</math>:</b> ≤ 10 ms (T > 950 °C)	<b>Analogue input:</b> 0 – 10 V	<b>Ratio correction:</b> $\frac{\varepsilon_1}{\varepsilon_2}$ : 80 - 120 % increment size 0.1 %
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA	<b>Emissivity <math>\varepsilon</math>:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Resolution Display:</b> 1 K	<b>Digital input:</b> 2 to 24 V	<b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s
<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA/ ≤175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
<b>Measuring uncertainty:</b> 1 % of reading (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Dimension:</b> φ 65 x 220 mm	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD  large variety of mounting devices, digital displays, software, etc.
	<b>Housing material:</b> Stainless steel	
	<b>Weight:</b> Approx. 0.9 kg	

## 21.1 Field of View Diagrams PA 40 (750 – 2400 °C)

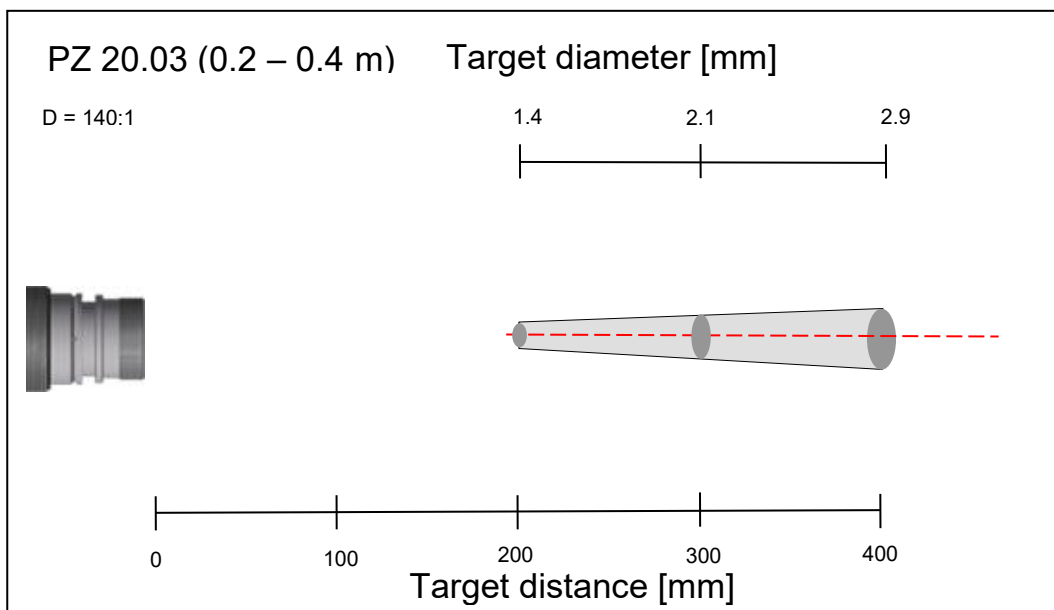
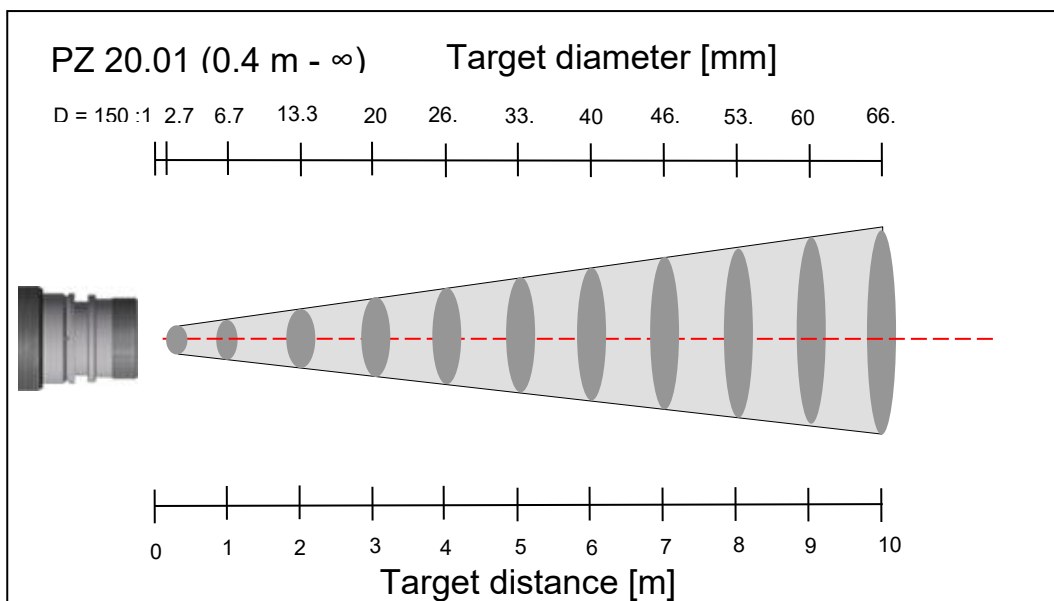


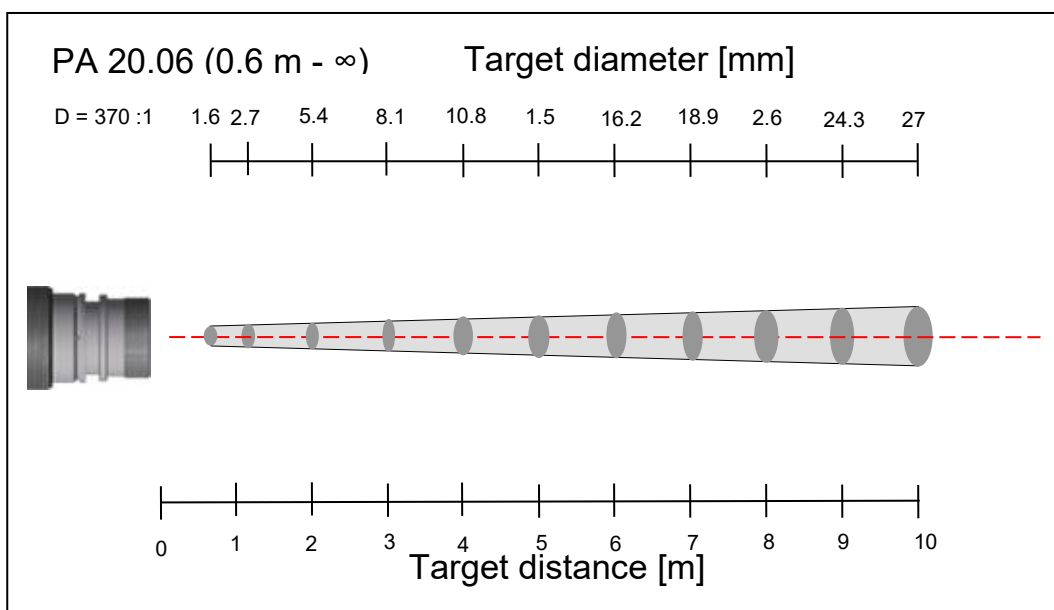
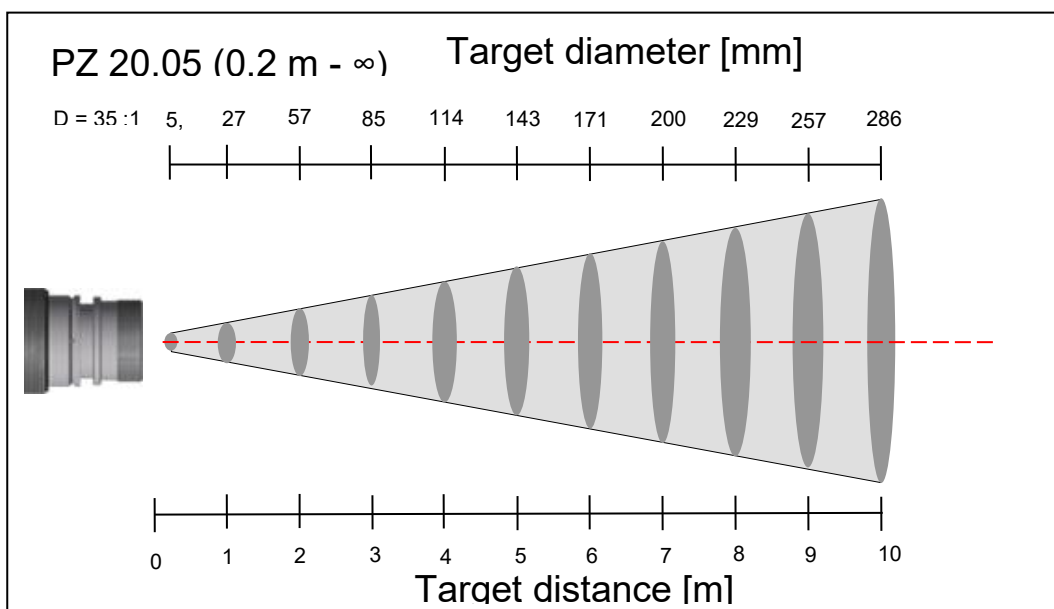
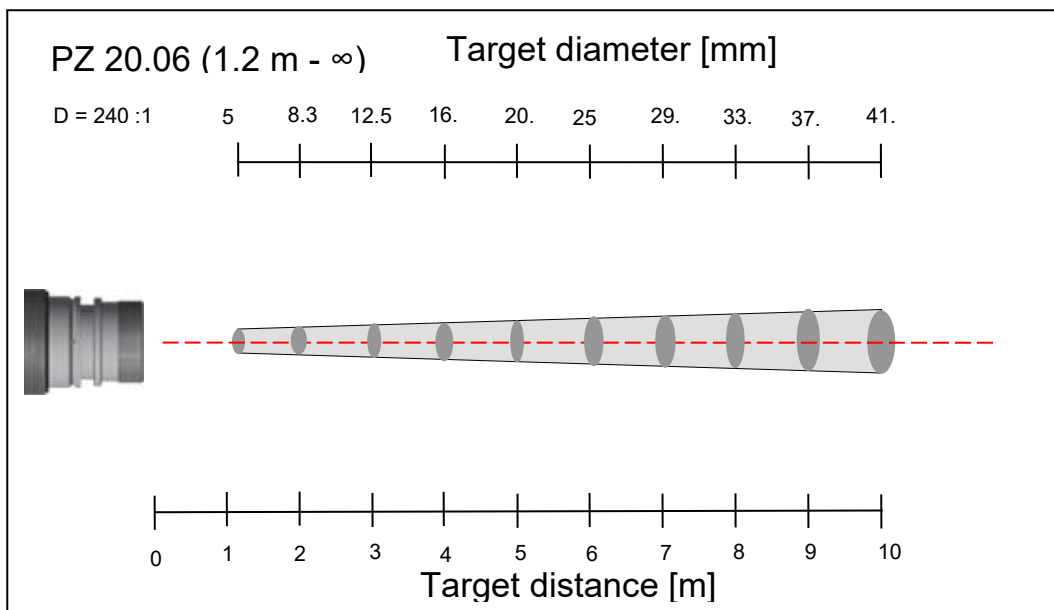


## 22 Technical Data PA 40 (850 –3000 °C)

<b>Measuring range:</b> (adjustable in partial range): 850 - 3000 °C	<b>Repeatability:</b> 2 K	<b>Mounting:</b> External thread M 65 x 2 length 40 mm
<b>Sensor:</b> Photodiode	<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera	<b>Connection:</b> with 8-pin connector
<b>Spectral sensitivity:</b> 0.95/ 1.05 µm	<b>Ambient operating temperature:</b> 0 - 65 °C	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
<b>Focussing range:</b> 0.2 - 0.4 m (PZ 20.03 optic) 0.4 m - ∞ (PZ 20.01 optic) 1.2 m - ∞ (PZ 20.06 optic) 0.2 m - ∞ (PZ 20.05 optic) 0.6 m - ∞ (PA 20.06 optic)	<b>Excess temperature signal:</b> When internal temperature exceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Adjustable parameters:</b>
<b>Distance to target size ratio:</b> 150 :1 at 400 mm (PZ 20.01 optic) 140:1 at 200 mm (PZ 20.03 optic) 240: 1 at 1200 mm (PZ 20.06 optic) 370:1 at 600 mm (PA 20.06 optic) 35 :1 at 200 mm (PZ 20.05 optic)	<b>Storage temperature:</b> -20 - 80 °C	<b>Analogue output 1 &amp; 2:</b> source/ scaling
<b>Digital output:</b> Periodic output of measurement data with adjustable cycle time	<b>Permissible humidity:</b> 95% r.H. max. (non-condensing)	<b>Digital input output 1 &amp; 2:</b> source/ switch-point
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
<b>Resistance:</b> max. 500 Ω	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
<b>Response time <math>t_{98}</math>:</b> ≤ 10 ms (T>1050 °C)	<b>Analogue input:</b> 0 – 10 V	<b>Look-up table for temperature alignment</b>
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA	<b>Ratio correction:</b> $\frac{\varepsilon_1}{\varepsilon_2}$ : 80 - 120 % increment size 0.1 %
<b>Resolution Display:</b> 1 K	<b>Digital input:</b> 2 to 24 V	<b>Emissivity <math>\varepsilon</math>:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA / ≤175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV	<b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s
<b>Measuring uncertainty:</b> 1 % of reading (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Dimension:</b> φ 65 x 220 mm	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
	<b>Housing material:</b> Stainless steel	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD  large variety of mounting devices, digital displays, software, etc.

## 22.1 Field of View Diagrams PA 40 (850 –3000 °C)

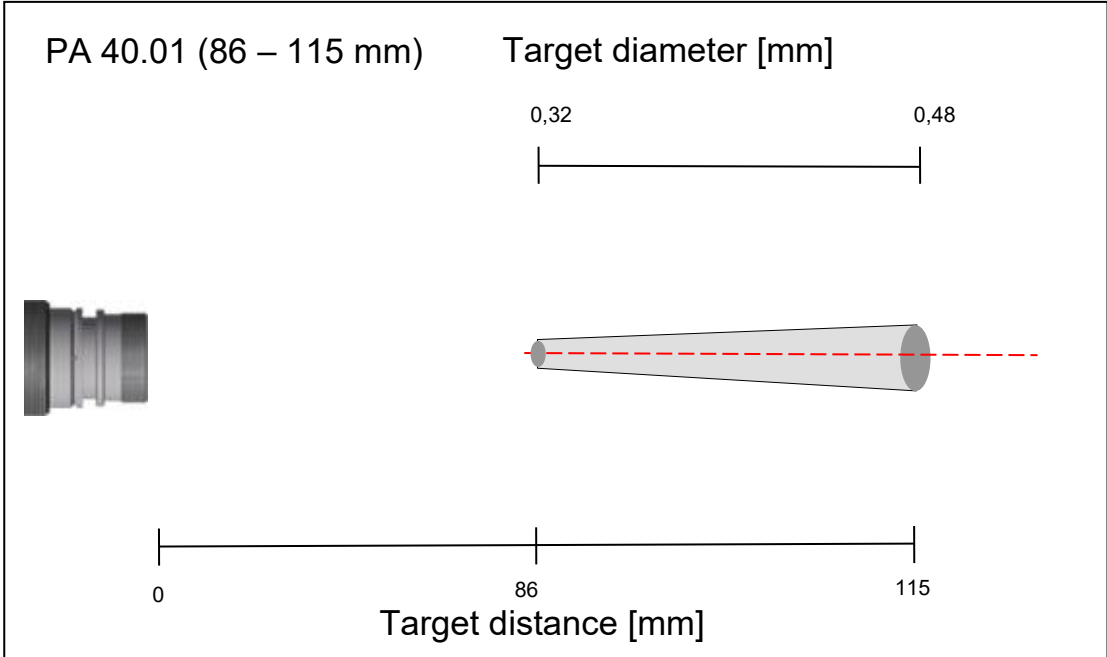




## 23 Technical Data PA 40 AF 18

<p><b>Measuring range:</b> (adjustable in partial range): 850 - 3000 °C</p> <p><b>Sensor:</b> Photodiode</p> <p><b>Spectral sensitivity:</b> 0.95/ 1.05 µm</p> <p><b>Focussing range:</b> 89 - 115 mm</p> <p><b>Optic PA 40.01:</b> 0.32 - 0,48 mm</p> <p><b>Digital output:</b> Periodic output of measurement data with adjustable cycle time</p> <p><b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)</p> <p><b>Resistance:</b> max. 500 Ω</p> <p><b>Response time t<sub>98</sub>:</b> ≤ 10 ms (T&gt;1050 °C)</p> <p><b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span</p> <p><b>Resolution Display:</b> 1 K</p> <p><b>Resolution USB / RS 485:</b> 0.1 K at terminal operation</p> <p><b>Measuring uncertainty:</b> 1 % of reading (at ε = 1.0 and T<sub>A</sub> = 23 °C)</p> <p><b>Repeatability:</b> 2 K</p> <p><b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera</p>	<p><b>Ambient operating temperature:</b> 0 - 65 °C</p> <p><b>Excess temperature signal:</b> When internal temperature exceeds &gt; 80 °C, the analogue output value will be &gt; 20.5 mA!</p> <p><b>Storage temperature:</b> -20 - 80 °C</p> <p><b>Permissible humidity:</b> 95% r.H. max. (non-condensing)</p> <p><b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value</p> <p><b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC</p> <p><b>Analogue input:</b> 0 – 10 V</p> <p><b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA</p> <p><b>Digital input:</b> 2 to 24 V</p> <p><b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA / ≤175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV</p> <p><b>Dimension:</b> φ 65 x 220 mm</p> <p><b>Housing material:</b> Stainless steel</p> <p><b>Weight:</b> Approx. 0.9 kg</p> <p><b>Mounting:</b> External thread M 65 x 2 length 40 mm</p>	<p><b>Connection:</b> with 8-pin connector</p> <p><b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)</p> <p><b>Adjustable parameters:</b></p> <p><b>Analogue output 1 &amp; 2:</b> source/ scaling</p> <p><b>Digital input output 1 &amp; 2:</b> source/ switch-point</p> <p><b>Transmission factor</b> λ<sub>1</sub> and λ<sub>2</sub></p> <p><b>Compensation of background radiation</b> λ<sub>1</sub> and λ<sub>2</sub></p> <p><b>Look-up table for temperature alignment</b></p> <p><b>Ratio correction:</b> <math>\frac{\varepsilon_1}{\varepsilon_2}</math> : 80 - 120 % increment size 0.1 %</p> <p><b>Emissivity ε:</b> λ<sub>1</sub> u. λ<sub>2</sub> : 10 - 110 % increment size 0.1 %</p> <p><b>Smoothing function t<sub>98</sub>:</b> 0 - 999 s</p> <p><b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time</p> <p><b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD  large variety of mounting devices, digital displays, software, etc.</p>
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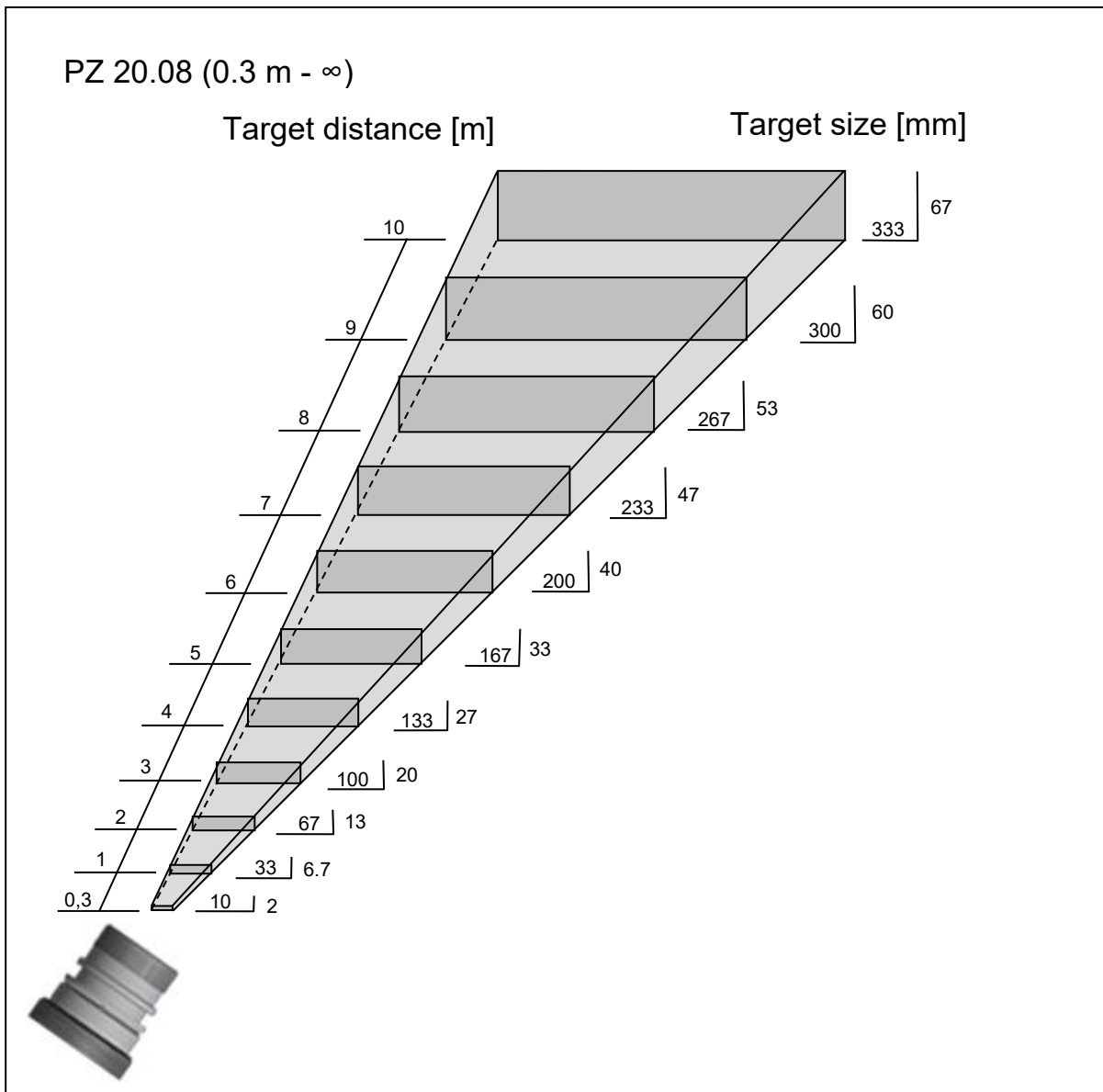
**23.1 Field of View Diagram PA 40 AF 18**



## 24 Technical Data PA 43 AF 20 (MR 600 -1400 °C)

<b>Measuring range:</b> (adjustable in partial range): 600 - 1400 °C	<b>Ambient operating temperature:</b> 0 - 65 °C	<b>Connection:</b> with 8-pin connector
<b>Sensor:</b> Photodiode	<b>Excess temperature signal:</b> When internal temperature exceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
<b>Spectral sensitivity:</b> 0.95/ 1.05 µm	<b>Storage temperature:</b> -20 - 80 °C	<b>Adjustable parameters:</b>
<b>Focussing range:</b> 0.3 m - ∞ (F50-optic)	<b>Permissible humidity:</b> 95% r.H. max. (non-condensing)	<b>Analogue output 1 &amp; 2:</b> source/ scaling
<b>Distance to target size ratio:</b> Optic F50 (PZ 20.08) horizontal: 30:1 vertical: 150:1	<b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value	<b>Digital input output 1 &amp; 2:</b> source/ switch-point
<b>Digital output:</b> Periodic output of measurement data with adjustable cycle time	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Analogue input:</b> 0 - 10 V	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
<b>Resistance:</b> max. 500 Ω	<b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA	<b>Look-up table for temperature alignment</b>
<b>Response time <math>t_{98}</math>:</b> ≤ 10 ms	<b>Digital input:</b> 2 to 24 V	<b>Ratio correction:</b> $\frac{\varepsilon_1}{\varepsilon_2}$ : 80 - 120 % increment size 0.1 %
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA/ ≤175 mA with camera, 250 mA with switched on spotlight Ripple: ≤ 200 mV	<b>Emissivity <math>\varepsilon</math>:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Resolution Display:</b> 1 K	<b>Dimension:</b> φ 65 x 220 mm	<b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s
<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation	<b>Housing material:</b> Stainless steel	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
<b>Measuring uncertainty:</b> 1.5 % of reading (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Weight:</b> Approx. 0.9 kg	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD
<b>Repeatability:</b> 3 K	<b>Mounting:</b> External thread M 65 x 2 length 40 mm	large variety of mounting devices, digital displays, software, etc.
<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera		

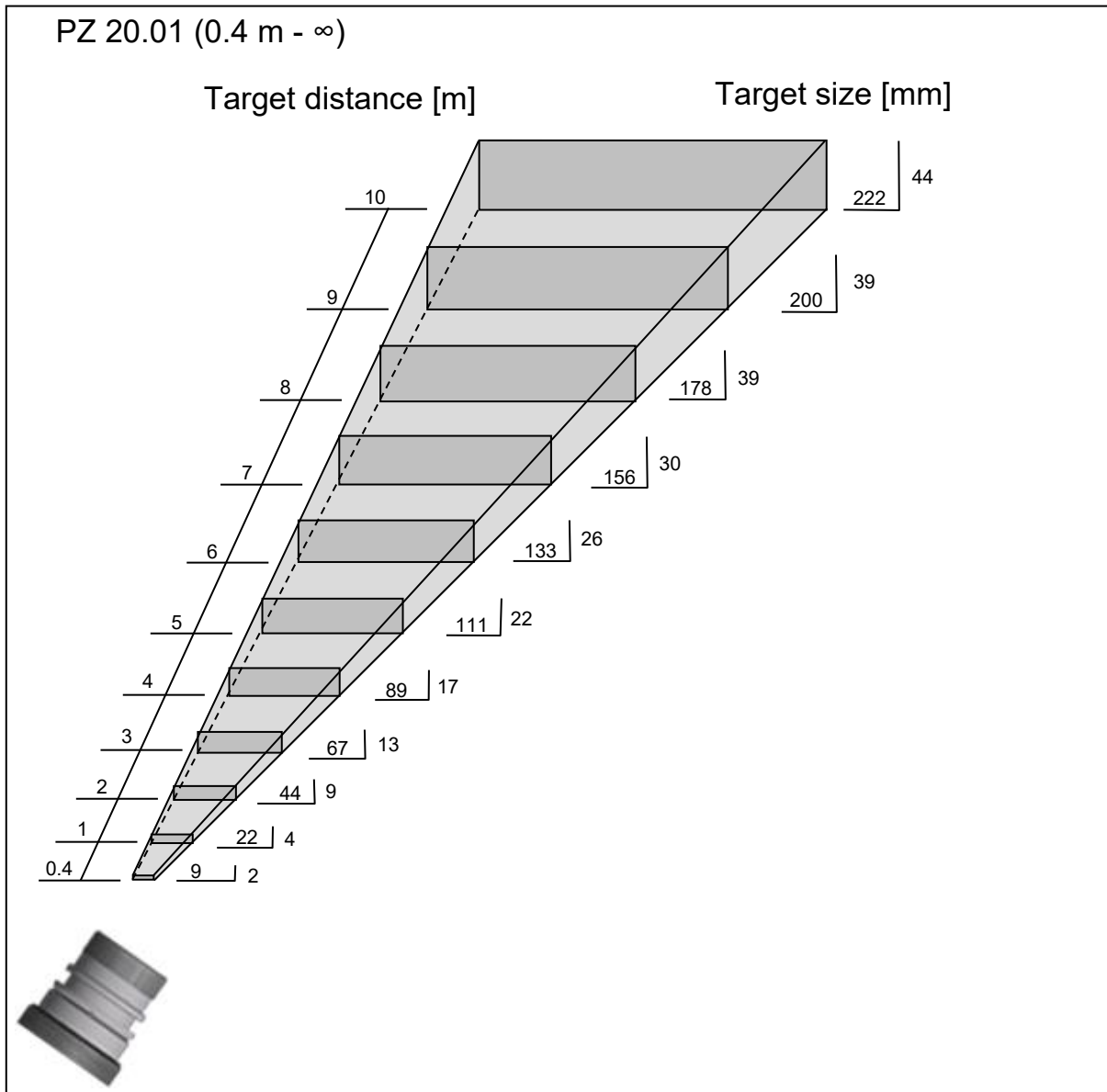
### 24.1 Field of View Diagram PA 43 AF 20



## 25 Technical Data PA 43 (MR 650 – 1700 °C)

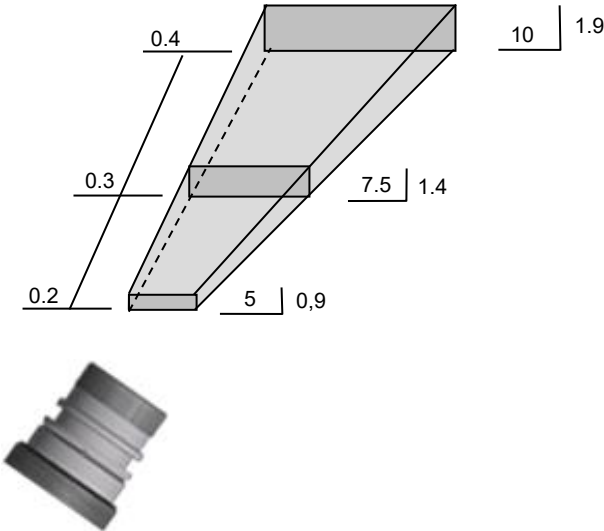
<b>Measuring range:</b> (adjustable in partial range): 650 - 1700 °C	<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation	<b>Weight:</b> Approx. 0.9 kg
<b>Sensor:</b> Photodiode	<b>Measuring uncertainty:</b> 1.5 % of reading (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Mounting:</b> External thread M 65 x 2 length 40 mm
<b>Spectral sensitivity:</b> 0.95/ 1.05 $\mu\text{m}$	<b>Repeatability:</b> 3 K	<b>Connection:</b> with 8-pin connector
<b>Focussing range:</b> 0.2 - 0,4 m (close-up optic) 0.4 m - $\infty$ (standard-optic) 1.2 m - $\infty$ (tele- optic) 0.2 m - $\infty$ (wide angle- optic) 0.6 m - $\infty$ (PA 20.06- optic) 0.3 m - $\infty$ (F50- optic)	<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
<b>Distance to target size ratio:</b> <b>Standard optic PZ 20.01</b> horizontal: 45:1 vertical: 230:1 <b>close-up optic PZ 20.03</b> horizontal: 40 vertical: 215 <b>Telephoto-optic PZ 20.06</b> horizontal: 75:1 vertical: 375:1 <b>Wide-angle optic PZ 20.05</b> horizontal: 10:1 vertical: 55:1 <b>Telephoto-optic PA 20.06</b> Horizontal: 95:1 Vertical: 500:1 <b>F50 optic PZ 20.8</b> horizontal: 30 vertical: 150:1	<b>Ambient operating temperature:</b> 0 - 65 °C	<b>Adjustable parameters:</b> <b>Analogue output 1 &amp; 2:</b> source/ scaling
	<b>Excess temperature signal:</b> When internal temperature ex- ceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Digital input output 1 &amp; 2:</b> source/ switch-point
	<b>Storage temperature:</b> -20 - 80 °C	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
	<b>Permissible humidity:</b> 95% r.H. max. (non-condensing)	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
	<b>Temperature coefficient with reference to 23 °C</b> $\leq 0.05$ %/K of measured value	<b>Look-up table for temperature alignment</b>
	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC	<b>Ratio correction:</b> $\frac{\varepsilon_1}{\varepsilon_2}$ : 80 - 120 % increment size 0.1 %
<b>Digital output:</b> Periodic output of measure- ment data with adjustable cycle time	<b>Analogue input:</b> 0 – 10 V	<b>Emissivity <math>\varepsilon</math>:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Digital output:</b> 2 Open collector outputs 24 V; $\leq 30$ mA	<b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s
<b>Resistance:</b> max. 500 $\Omega$	<b>Digital input:</b> 2 to 24 V	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
<b>Response time <math>t_{98}</math>:</b> $\leq 10$ ms	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input $\leq 135$ mA/ $\leq 175$ mA with camera, 250 mA with switched on spotlight Ripple: $\leq 200$ mV	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD  large variety of mounting devices, digital displays, software, etc.
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Dimension:</b> $\phi$ 65 x 220 mm	
<b>Resolution Display:</b> 1 K	<b>Housing material:</b> Stainless steel	

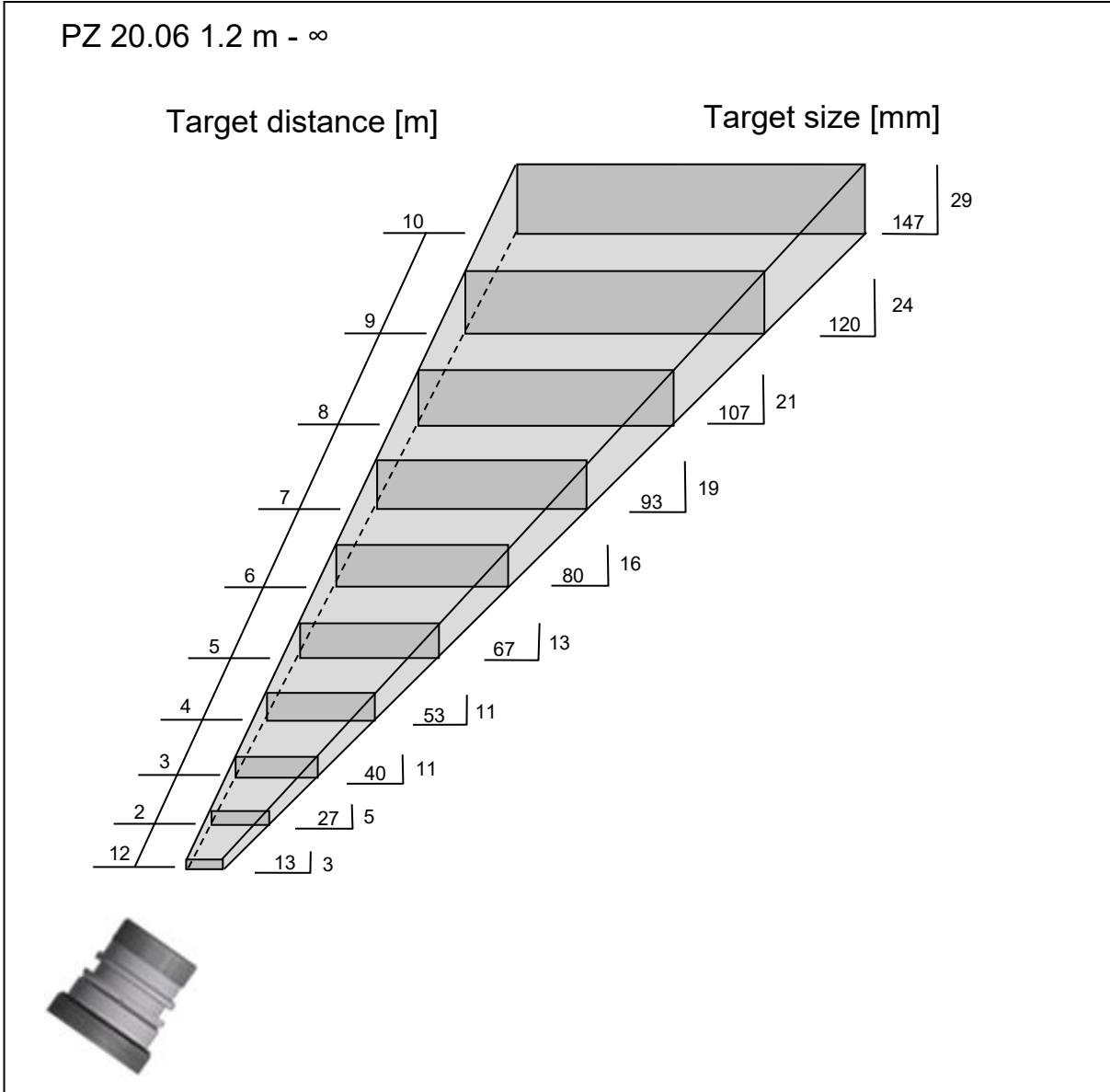
### 25.1 Field of View Diagram (MR 650 – 1700 °C)

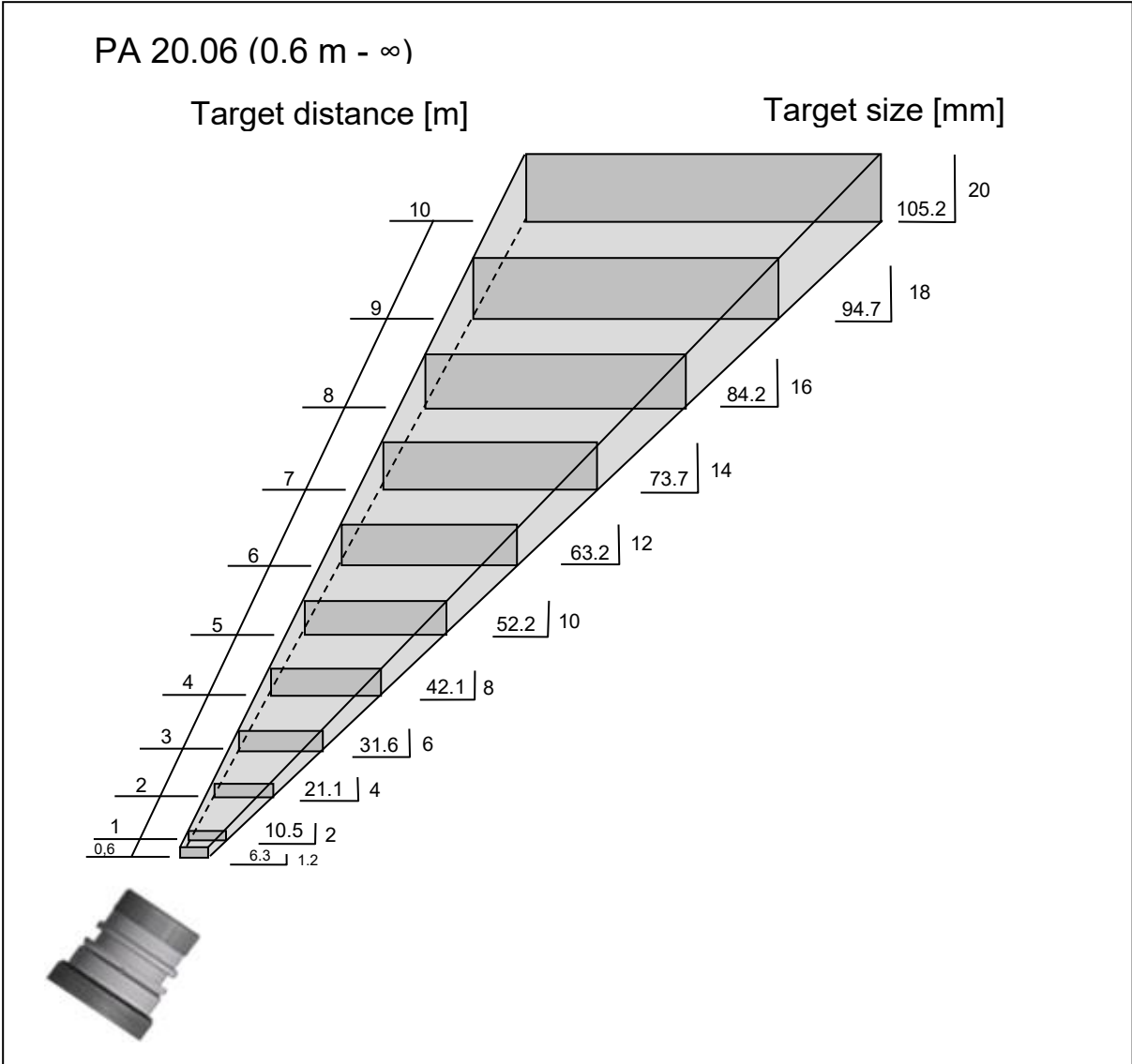


PZ 20.03 (200 – 400 mm)

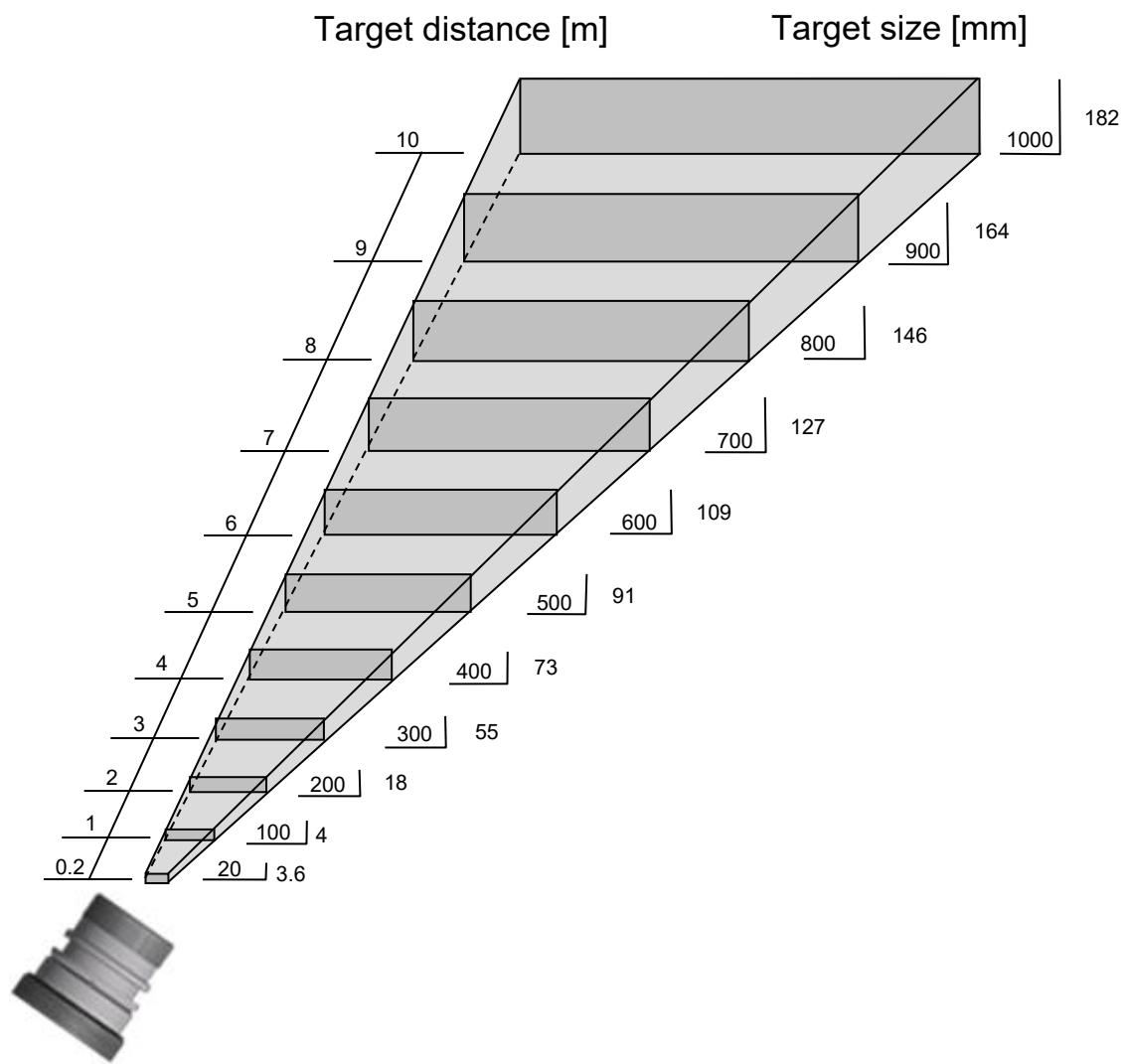
Target distance [m]                      Target size mm]



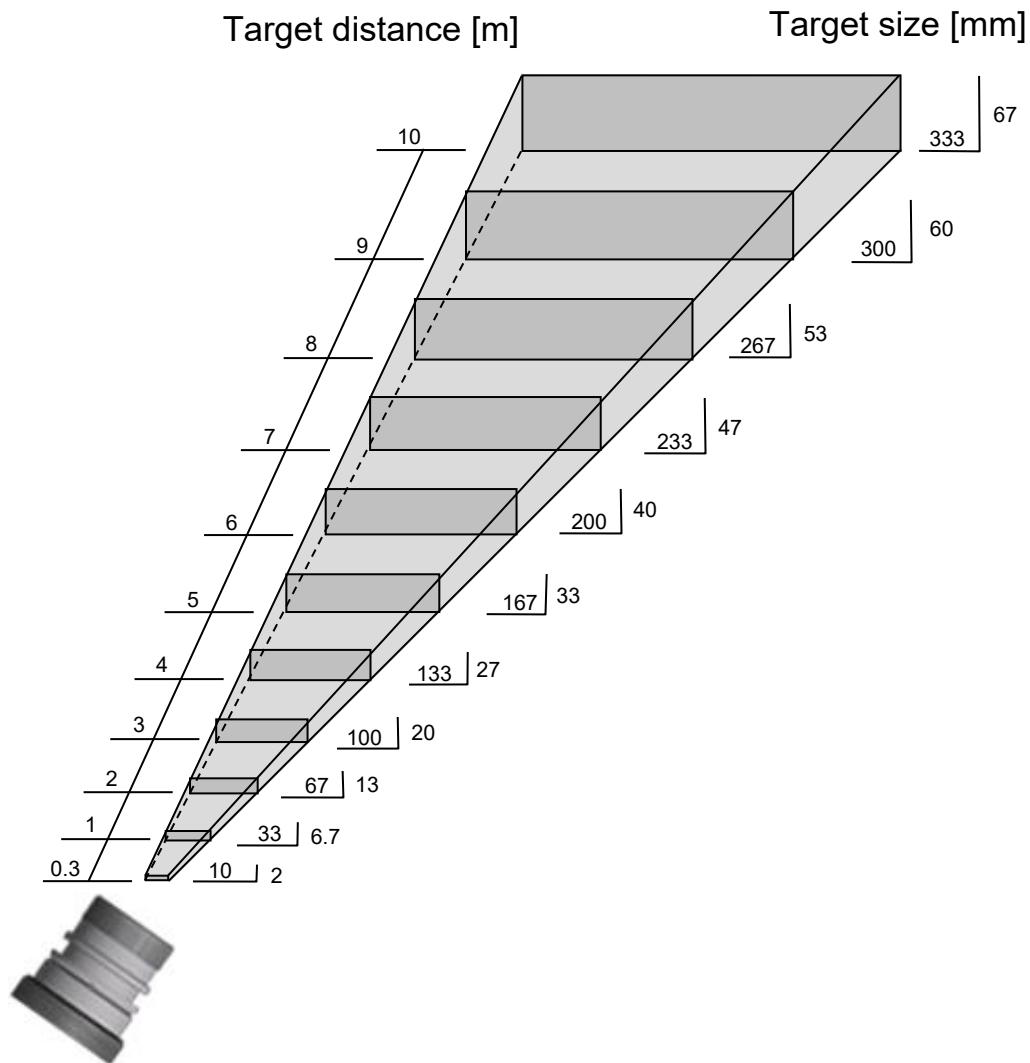




PZ 20.05 (0.2 m - ∞)



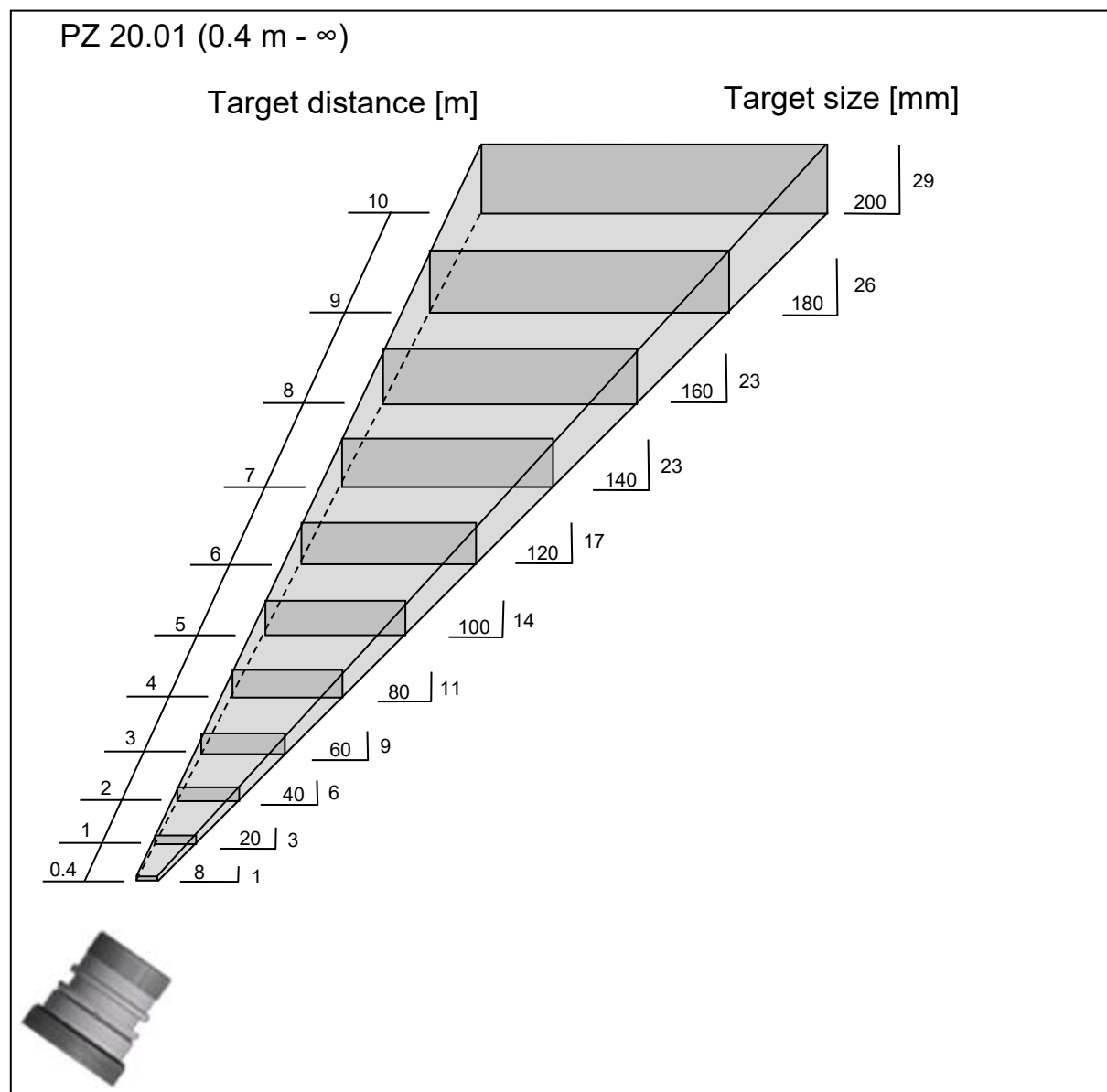
PZ 20.08 (0.3 m - ∞)



## 26 Technical Data PA 43 (MR 750 – 3000 °C)

<b>Measuring range (MR):</b> 750 - 2400 °C 850 - 3000 °C	<b>Measuring uncertainty:</b> 1.5 % (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Housing material:</b> Stainless steel
<b>Sensor:</b> Photodiode	<b>Measuring uncertainty:</b> 1.5 % of reading (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Weight:</b> Approx. 0.9 kg
<b>Spectral sensitivity:</b> 0.95/ 1.05 $\mu\text{m}$	<b>Repeatability:</b> 3 K	<b>Mounting:</b> External thread M 65 x 2 length 40 mm
<b>Focussing range:</b> 0.2 - 0,4 m (close-up optic) 0.4 m - $\infty$ (standard optic) 1.2 m - $\infty$ (tele optic) 0.6 m - $\infty$ (PA 20.06 optic) 0.2 m - $\infty$ (wide-angle optic) 0.3 m - $\infty$ (F50 optic)	<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera	<b>Connection:</b> with 8-pin connector
<b>Distance to target size ratio:</b> <b>Standard optic 20.01</b> horizontal: 50:1 vertical: 350:1 <b>close-up optic 20.03</b> horizontal: 45 vertical: 330 <b>Telephoto optic 20.06</b> horizontal: 85:1 vertical: 580:1 <b>Telephoto optic PA 20.06</b> horizontal: 105:1 vertical: 730:1 <b>Wide-angle optic 20.05</b> horizontal: 11:1 vertical: 85:1 <b>F50 optic 20.8</b> horizontal: 34 vertical: 230:1	<b>Ambient operating temperature:</b> 0 - 65 °C	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
	<b>Excess temperature signal:</b> When internal temperature ex- ceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Adjustable parameters:</b> <b>Analogue output 1 &amp; 2:</b> source/ scaling <b>Digital input output 1 &amp; 2:</b> source/ switch-point
	<b>Storage temperature:</b> -20 * 80 °C	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
	<b>Permissible humidity:</b> 95% r.H. max. (non-condensing)	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
	<b>Temperature coefficient with reference to 23 °C</b> $\leq 0.05$ %/K of measured value	<b>Look-up table for temperature alignment</b>
<b>Digital output:</b> Periodic output of measure- ment data with adjustable cycle time	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC	<b>Ratio correction:</b> $\frac{\varepsilon_1}{\varepsilon_2}$ : 80 - 120 % increment size 0.1 %
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Analogue input:</b> 0 – 10 V	<b>Emissivity <math>\varepsilon</math>:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Resistance:</b> max. 500 $\Omega$	<b>Digital output:</b> 2 Open collector outputs 24 V; $\leq 30$ mA	<b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s
<b>Response time <math>t_{98}</math>:</b> $\leq 10$ ms	<b>Digital input:</b> 2 to 24 V	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input $\leq 135$ mA/ $\leq 175$ mA with camera, 250 mA with switched on spotlight Ripple: $\leq 200$ mV	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD  large variety of mounting devices, digital displays, software, etc.
<b>Resolution Display:</b> 1 K	<b>Dimension:</b> $\phi$ 65 x 220 mm	
<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation		

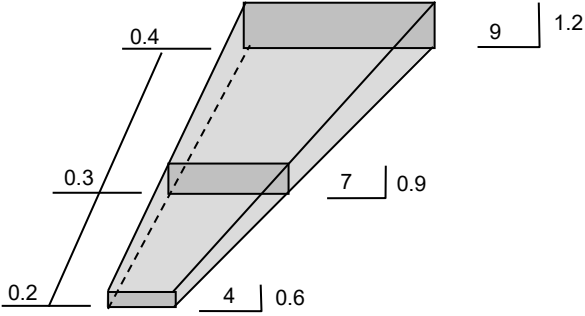
### 26.1 Field of View Diagram PA 43 (MR 750 – 3000 °C)

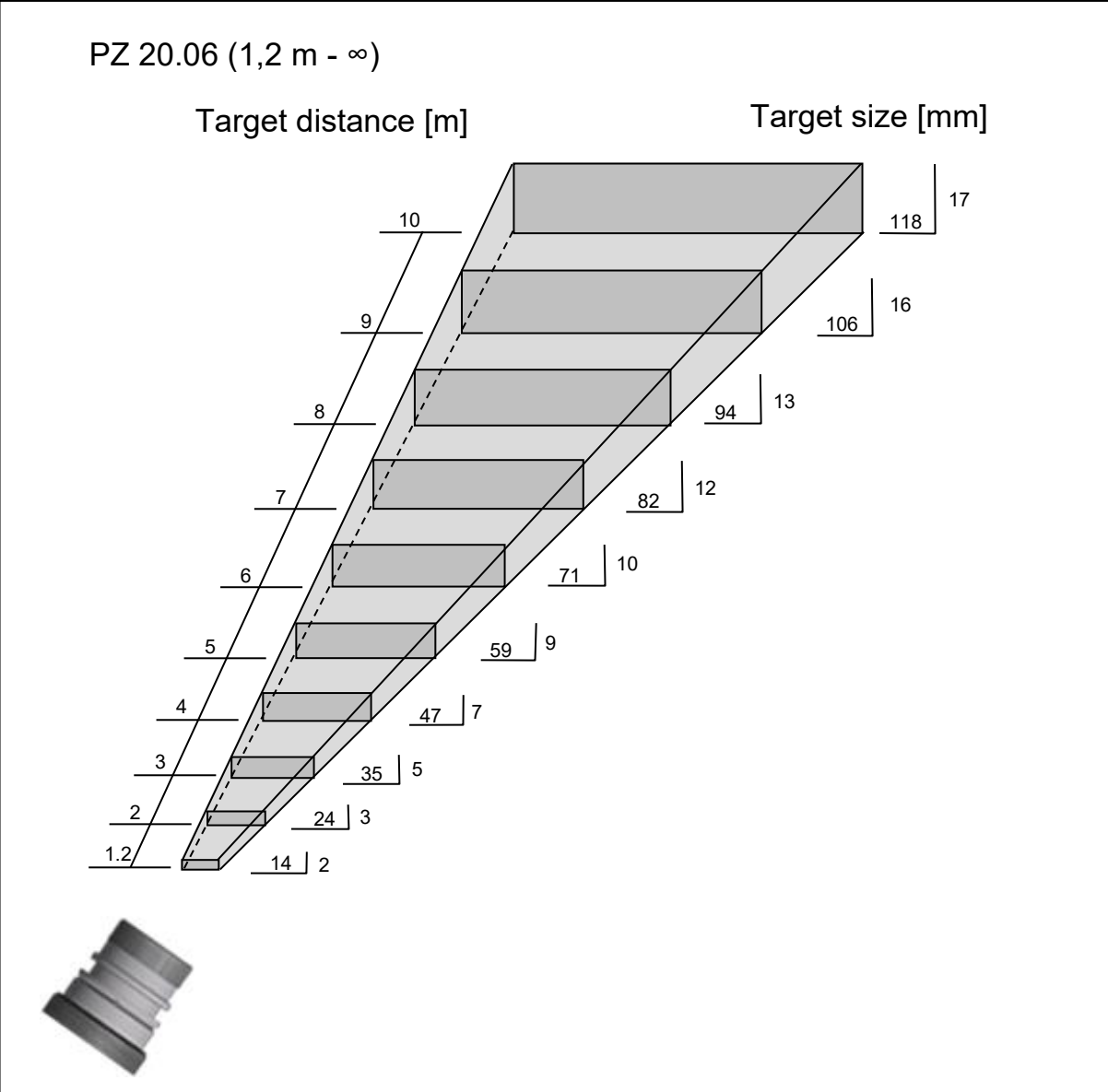


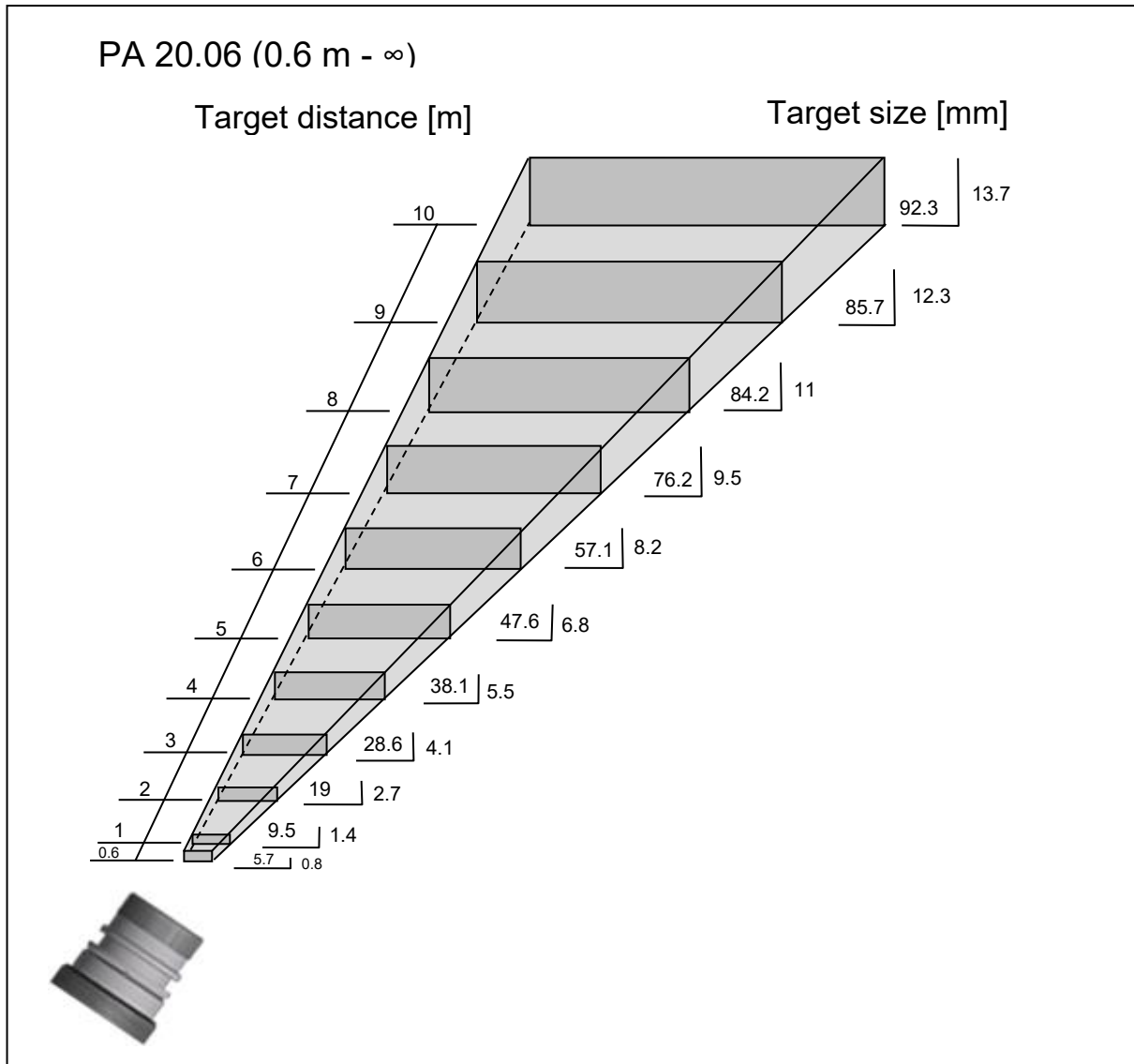
PZ 20.03 (200 – 400mm)

Target distance [m]

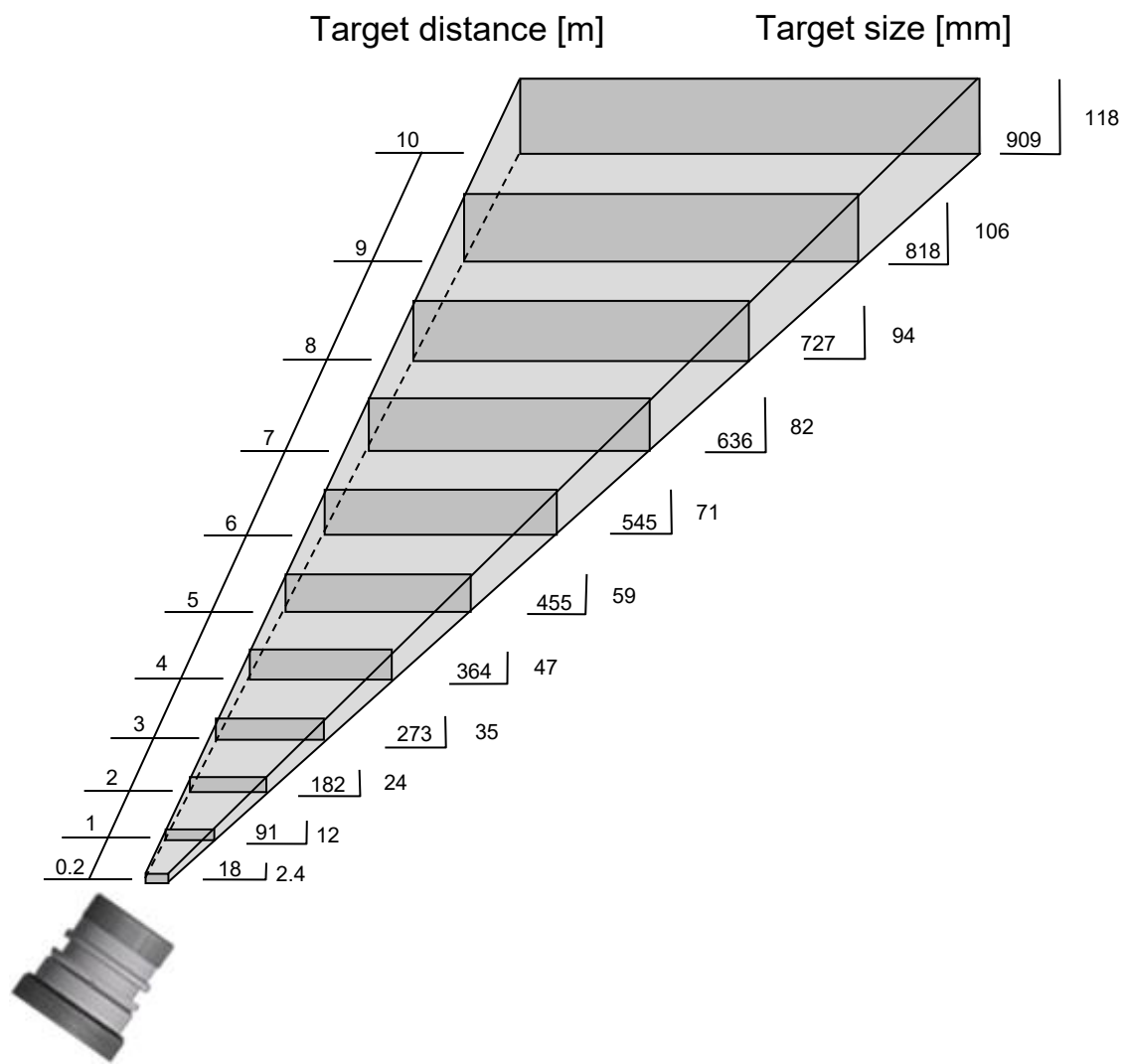
Target size [mm]

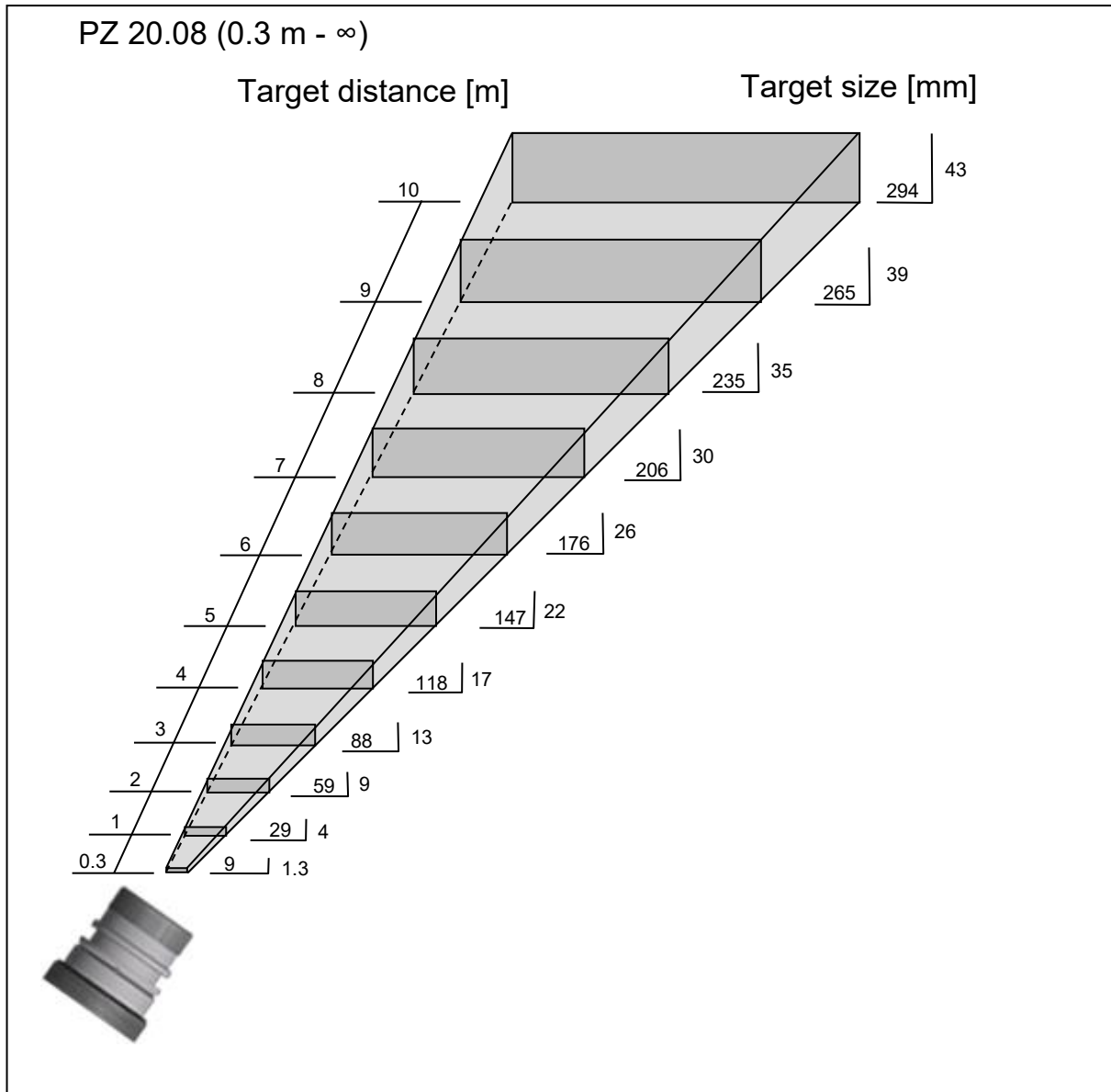






PZ 20.05 (0.2 m - ∞)





## 27 Technical Data PA 43 AF 17/ 18

### Measuring range (MR):

PA 43 AF 17  
750 - 2400 °C  
PA 43 AF 8  
850 - 3000 °C

### Sensor:

Photodiode

### Spectral sensitivity:

0.95/ 1.05 µm

### Focussing range:

86 - 115 mm

### Optic PA 40.01:

0.22 x 0.89 to  
0.29 x 1.57 mm

### Digital output:

Periodic output of measurement data with adjustable cycle time

### Analogue output 1 & 2:

0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)

### Resistance:

max. 500 Ω

### Response time $t_{98}$ :

≤ 10 ms

### Resolution Analogue output:

0.2 K + 0.03 % of the adjusted span

### Resolution Display:

1 K

### Resolution USB / RS 485:

0.1 K at terminal operation

### Measuring uncertainty:

1.5 %  
(at  $\varepsilon = 1.0$  and  $T_A = 23$  °C)

### Measuring uncertainty:

1.5 % of reading  
(at  $\varepsilon = 1.0$  and  $T_A = 23$  °C)

### Repeatability:

3 K

### Sighting device:

through-the-lens sighting with target marking

### Ambient operating temperature:

0 - 65 °C

### Excess temperature signal:

When internal temperature exceeds > 80 °C, the analogue output value will be > 20.5 mA!

### Storage temperature:

-20 - 80 °C

### Permissible humidity:

95% r.H. max.  
(non-condensing)

### Temperature coefficient with reference to 23 °C

≤ 0.05 %/K  
of measured value

### Data communication:

USB / RS485 with integrated software to set parameters and transmit measurement data to a PC

### Analogue input:

0 - 10 V

### Digital output:

2 Open collector outputs  
24 V; ≤ 30 mA

### Digital input:

2 to 24 V

### Power supply requirements:

24 V DC +10% / -20%  
current input ≤135 mA/ ≤175 mA with camera, 250 mA with switched on spotlight  
Ripple: ≤ 200 mV

### Dimension:

φ 65 x 220 mm

### Housing material:

Stainless steel

### Weight:

Approx. 0.9 kg

### Mounting:

External thread M 65 x 2  
length 40 mm

### Connection:

with 8-pin connector

### Protection:

IP 65 according to DIN 40050  
(with connector attached)

### Adjustable parameters:

### Analogue output 1 & 2:

source/ scaling

### Digital input output 1 & 2:

source/ switch-point

### Transmission factor

$\lambda_1$  and  $\lambda_2$

### Compensation of background radiation

$\lambda_1$  and  $\lambda_2$

### Look-up table for temperature alignment

### Ratio correction:

$\frac{\varepsilon_1}{\varepsilon_2}$  : 80 - 120 %

increment size 0.1 %

### Emissivity $\varepsilon$ :

$\lambda_1$  u.  $\lambda_2$  : 10 - 110 %  
increment size 0.1 %

### Smoothing function $t_{98}$ :

0 - 999 s

### Memory modes:

- Min./Max. (peak picker)  
- Double maximum with adjustable hold time

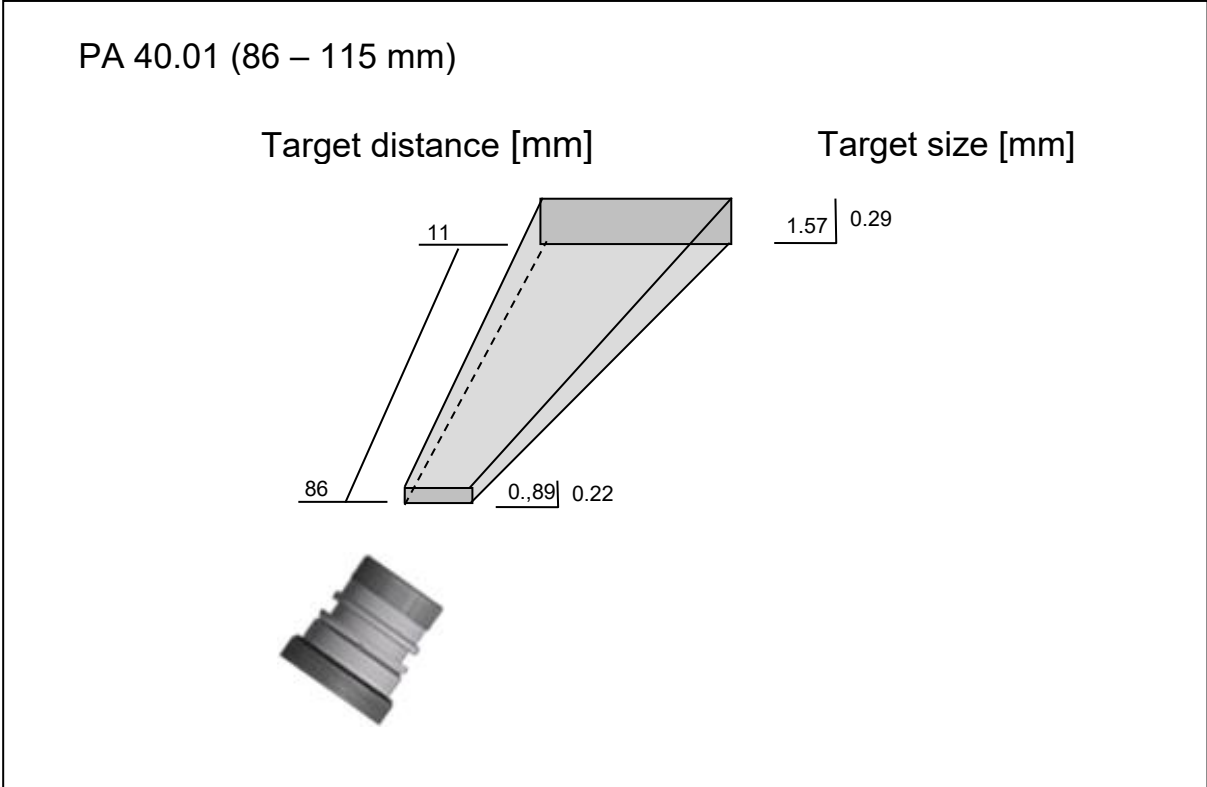
### Optional accessories:

calibration certificate according to ISO 9001

calibration certificate according to DKD

large variety of mounting devices, digital displays, software, etc.

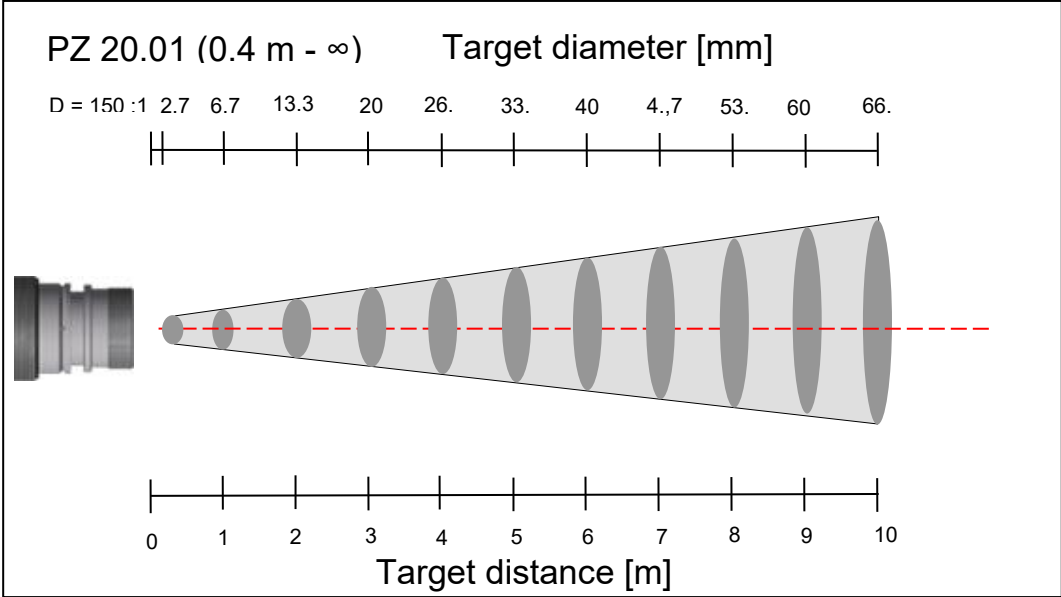
**27.1 Field of View Diagram PA 43 AF 17/ 18**



## 28 Technical Data PA 44

<b>Measuring range:</b> 750 - 2400 °C 850 - 3000 °C	<b>Repeatability:</b> 2 K	<b>Mounting:</b> External thread M 65 x 2 length 40 mm
<b>Sensor:</b> Photodiode	<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera	<b>Connection:</b> with 8-pin connector
<b>Spectral sensitivity:</b> 0.95/ 1.05 µm	<b>Ambient operating temperature:</b> 0 - 65 °C	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
<b>Focussing range:</b> 0.4 m - ∞ (PZ 20.01 optic)	<b>Excess temperature signal:</b> When internal temperature ex- ceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Adjustable parameters:</b>
<b>Distance to target size ratio:</b> 150: 1 at 400 mm (PZ 20.01 optic)	<b>Storage temperature:</b> -20 - 80 °C	<b>Analogue output 1 &amp; 2:</b> source/ scaling
<b>Digital output:</b> Periodic output of measure- ment data with adjustable cycle time	<b>Permissible humidity:</b> 95% r.H. max. (non-condensing)	<b>Digital input output 1 &amp; 2:</b> source/ switch-point
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
<b>Resistance:</b> max. 500 Ω	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
<b>Response time <math>t_{98}</math>:</b> Range 750 - 2400 °C: ≤ 10 ms (T > 950 °C) Range 850 - 3000 °C ≤ 10 ms (T > 1050 °C)	<b>Analogue input:</b> 0 - 10 V	<b>Look-up table for temperature alignment</b>
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA	<b>Ratio correction:</b> $\frac{\varepsilon_1}{\varepsilon_2}$ : 80 - 120 % increment size 0.1 %
<b>Resolution Display:</b> 1 K	<b>Digital input:</b> 2 to 24 V	<b>Emissivity <math>\varepsilon</math>:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA/ ≤175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV	<b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s
<b>Measuring uncertainty (750-2400 °C):</b> 750 - 850 °C: 6K 850 - 1500 °C: 0.35 % of reading [°C] + 2 K 1500 - 2400 °C: 0.5 % of reading [°C] + 2 K (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Dimension:</b> φ 65 x 220 mm	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
<b>Measuring uncertainty (850-3000 °C):</b> 850 - 1500 °C: 0.35 % of reading [°C] + 2 K 1500 - 2400 °C: 0.5 % of reading [°C] + 2 K 2400 - 3000 °C: 1 % of reading [°C] + 2 K (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Housing material:</b> Stainless steel	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD  large variety of mounting devices, digital displays, software, etc.
	<b>Weight:</b> Approx. 0.9 kg	

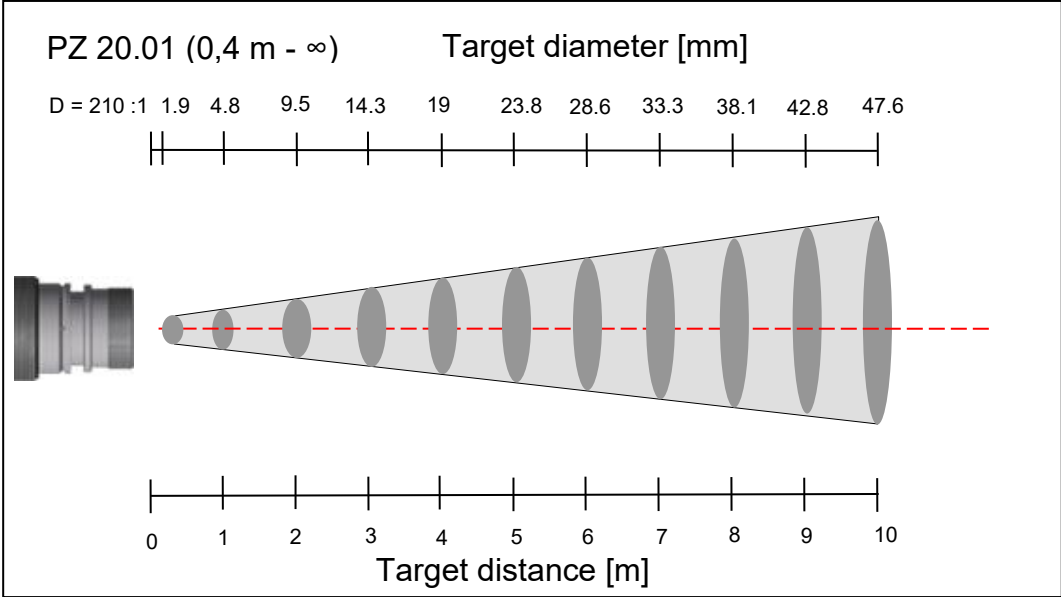
### 28.1 Field of View Diagram PA 44



## 29 Technical Data PA 45

<b>Measuring range:</b> (adjustable in partial range): 900 - 3200 °C	<b>Ambient operating temperature:</b> 0 - 65 °C	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
<b>Sensor:</b> Photodiode	<b>Excess temperature signal:</b> When internal temperature exceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Adjustable parameters:</b>
<b>Spectral sensitivity:</b> 0.9/ 1.05 µm	<b>Storage temperature:</b> -20 - 80 °C	<b>Analogue output 1 &amp; 2:</b> source/ scaling
<b>Focussing range:</b> 0.4 m - ∞ (PZ 20.01 optic)	<b>Permissible humidity:</b> 95% r.H. max. (non-condensing)	<b>Digital input output 1 &amp; 2:</b> source/ switch-point
<b>Distance to target size ratio:</b> 210: 1 at 400 mm (PZ 20.01 optic)	<b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
<b>Digital output:</b> Periodic output of measurement data with adjustable cycle time	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Analogue input:</b> 0 - 10 V	<b>Look-up table for temperature alignment</b>
<b>Resistance:</b> max. 500 Ω	<b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA	<b>Ratio correction:</b> $\frac{\epsilon_1}{\epsilon_2}$ : 80 - 120 % increment size 0.1 %
<b>Response time <math>t_{98}</math>:</b> ≤ 10 ms	<b>Digital input:</b> 2 to 24 V	<b>Emissivity <math>\epsilon</math>:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA/ ≤175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV	<b>Soot factor:</b> 0.5 - 2.5
<b>Resolution Display:</b> 1 K	<b>Dimension:</b> φ 65 x 220 mm	<b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s
<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation	<b>Housing material:</b> Stainless steel	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
<b>Measuring uncertainty:</b> 900 - 1500 °C: 0.35 % of reading [°C] + 2 K 1500 - 2400 °C: 0.5 % of reading [°C] + 2 K 2400 - 3200 °C: 1 % of reading [°C] + 2 K (at $\epsilon = 1.0$ and $T_A = 23$ °C)	<b>Weight:</b> Approx. 0.9 kg	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD
<b>Repeatability:</b> 2 K	<b>Mounting:</b> External thread M 65 x 2 length 40 mm	large variety of mounting devices, digital displays, software, etc.
<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera	<b>Connection:</b> with 8-pin connector	

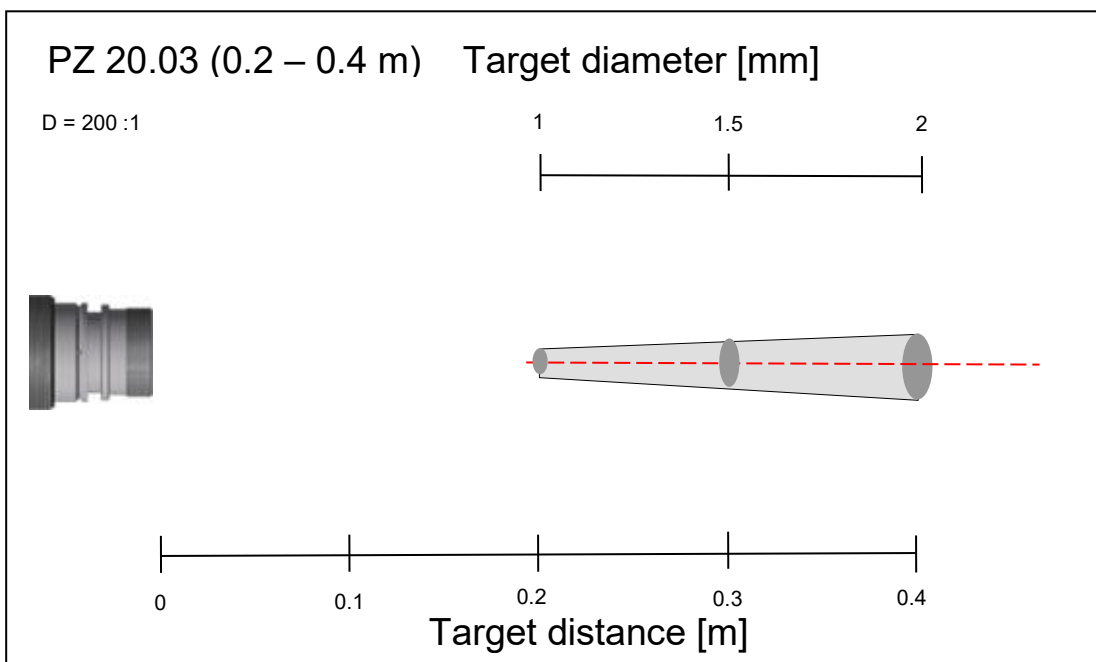
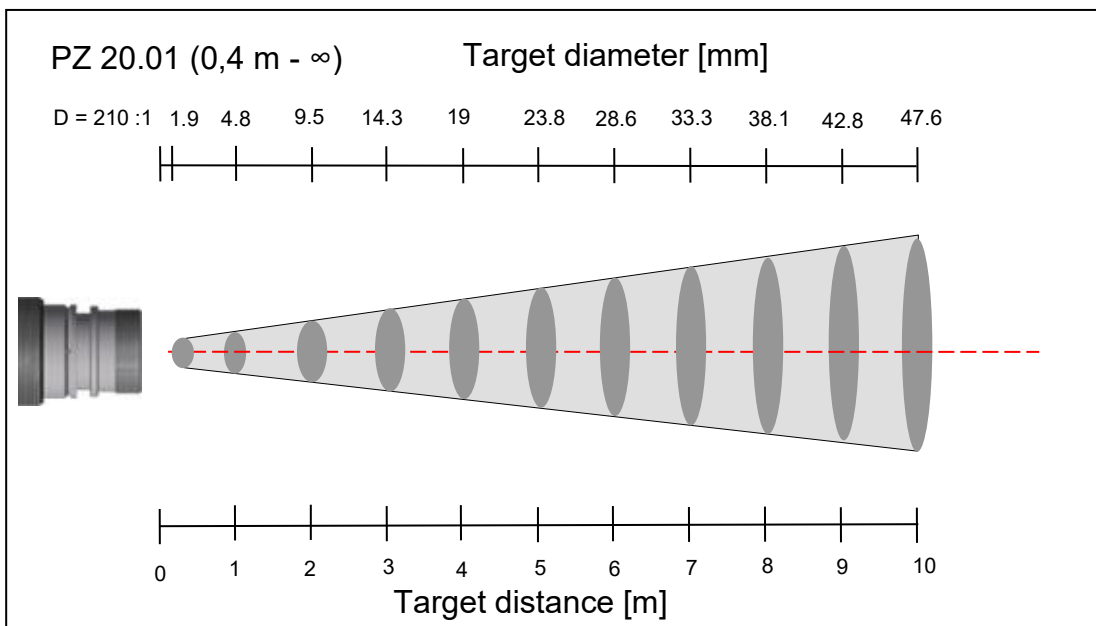
### 29.1 Field of View Diagrams PA 45

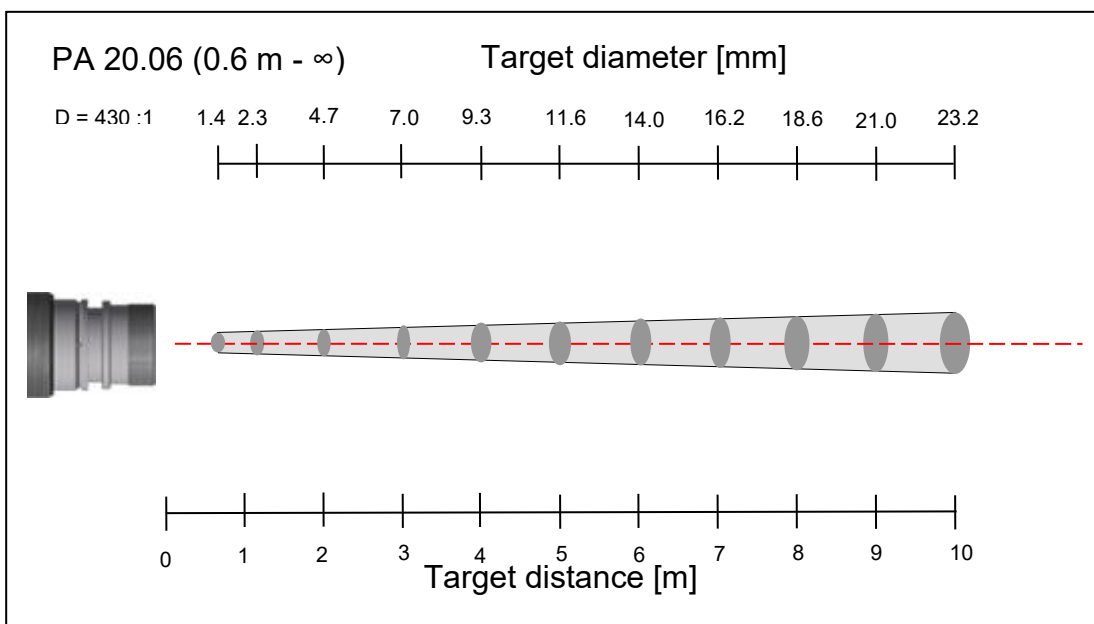
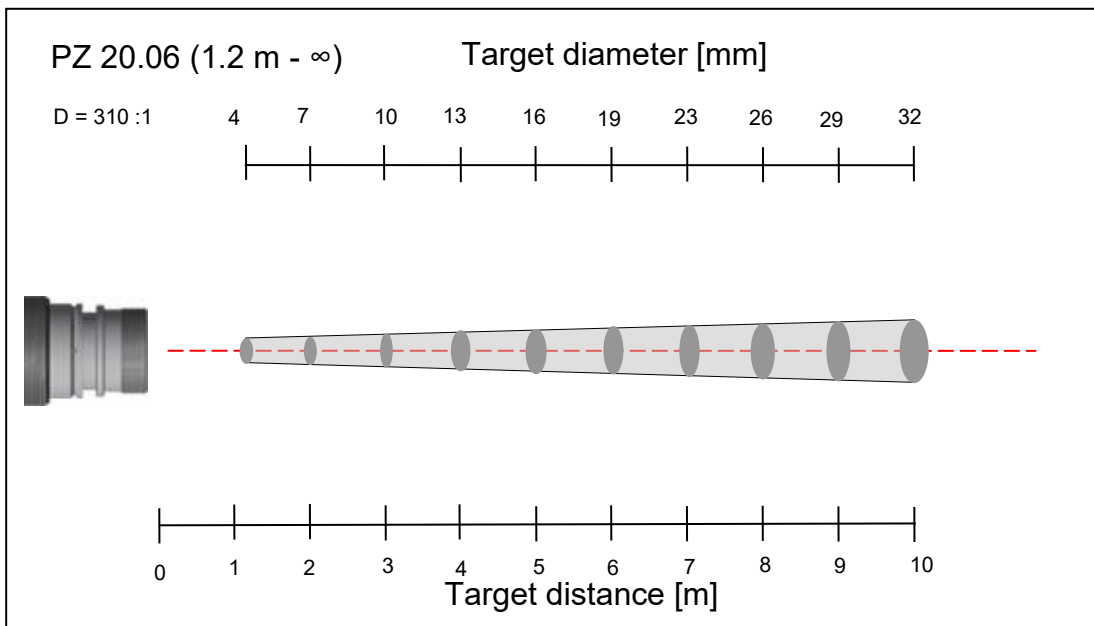


## 30 Technical Data PA 46

<p><b>Measuring range:</b> (adjustable in partial range): 900 - 3200 °C</p>	<p><b>Repeatability:</b> 2 K</p>	<p><b>Mounting:</b> External thread M 65 x 2 length 40 mm</p>
<p><b>Sensor:</b> Photodiode</p>	<p><b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera</p>	<p><b>Connection:</b> with 8-pin connector</p>
<p><b>Spectral sensitivity:</b> 0.9/ 1.05 µm</p>	<p><b>Ambient operating temperature:</b> 0 - 65 °C</p>	<p><b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)</p>
<p><b>Focussing range:</b> 0.4 m - ∞ (PZ 20.01 optic) 0.2 - 0.4 m (PZ 20.03 optic) 1.2 m - ∞ (PZ 20.06 optic) 0.6 m - ∞ (PA 20.06 optic)</p>	<p><b>Excess temperature signal:</b> When internal temperature ex- ceeds &gt; 80 °C, the analogue output value will be &gt; 20.5 mA!</p>	<p><b>Adjustable parameters:</b> <b>Analogue output 1 &amp; 2:</b> source/ scaling</p>
<p><b>Distance to target size ratio:</b> 200:1 at 400 mm (PZ 20.03 optic) 210:1 at 400 mm (PZ 20.01 optic) 310:1 at 1200 mm (PZ 20.06 optic) 430:1 at 600 mm (PA 20.06 optic)</p>	<p><b>Storage temperature:</b> -20 - 80 °C</p>	<p><b>Digital input output 1 &amp; 2:</b> source/ switch-point</p>
<p><b>Digital output:</b> Periodic output of measure- ment data with adjustable cycle time</p>	<p><b>Permissible humidity:</b> 95% r.H. max. (non-condensing)</p>	<p><b>Transmission factor</b> <math>\lambda_1</math> and <math>\lambda_2</math></p>
<p><b>Analogue output 1 &amp; 2:</b> 0(4) ... 20 mA linear, switchable, scalable (4...20 mA normally)</p>	<p><b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value</p>	<p><b>Compensation of background radiation</b> <math>\lambda_1</math> and <math>\lambda_2</math></p>
<p><b>Resistance:</b> max. 500 Ω</p>	<p><b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC</p>	<p><b>Look-up table for temperature alignment</b></p>
<p><b>Response time <math>t_{98}</math>:</b> ≤ 10 ms</p>	<p><b>Analogue input:</b> 0 – 10 V</p>	<p><b>Ratio correction:</b> <math>\frac{\varepsilon_1}{\varepsilon_2}</math> : 80 - 120 % increment size 0.1 %</p>
<p><b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span</p>	<p><b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA</p>	<p><b>Emissivity <math>\varepsilon</math>:</b> <math>\lambda_1</math> u. <math>\lambda_2</math> : 10 - 110 % increment size 0.1 %</p>
<p><b>Resolution Display:</b> 1 K</p>	<p><b>Digital input:</b> 2 to 24 V</p>	<p><b>Soot factor:</b> 0.5 – 2.5</p>
<p><b>Resolution USB / RS 485:</b> 0.1 K at terminal operation</p>	<p><b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA/ ≤175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV</p>	<p><b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s</p>
<p><b>Measuring uncertainty:</b> 900 - 1500 °C: 0.35 % of reading [°C] + 2 K 1500 - 2400 °C: 0.5 % of reading [°C] + 2 K 2400 - 3200 °C: 1 % of reading [°C] + 2 K (at <math>\varepsilon = 1.0</math> and <math>T_A = 23</math> °C)</p>	<p><b>Dimension:</b> φ 65 x 220 mm</p>	<p><b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time</p>
	<p><b>Housing material:</b> Stainless steel</p>	<p><b>Optional accessories:</b> calibration certificate according to ISO 9001</p>
	<p><b>Weight:</b> Approx. 0.9 kg</p>	<p>calibration certificate according to DKD</p> <p>large variety of mounting devices, digital displays, software, etc.</p>

### 30.1 Field of View Diagrams PA 46

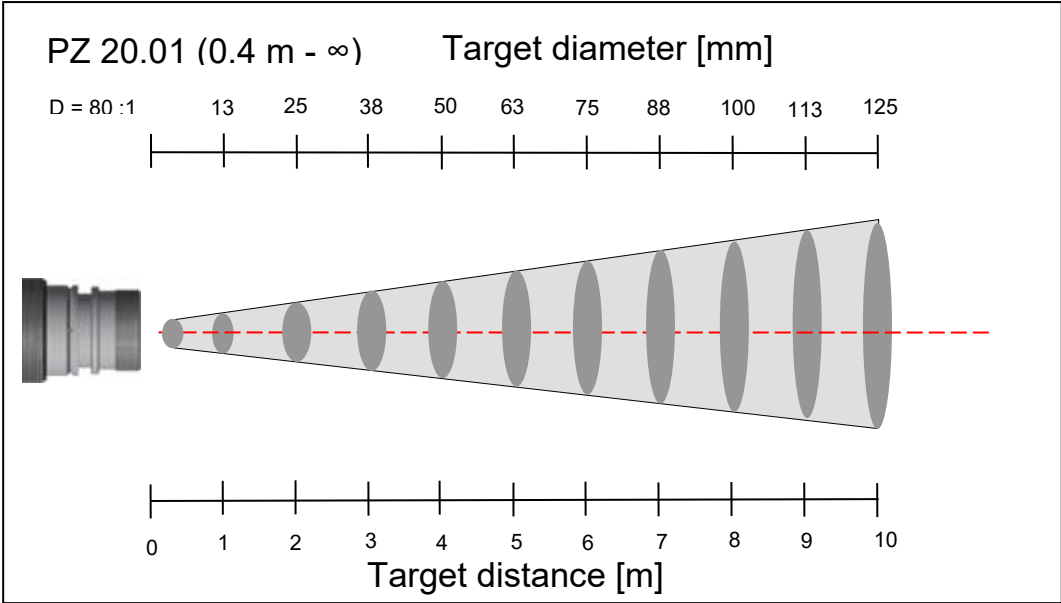




## 31 Technical Data PA 47

<b>Measuring range:</b> (adjustable in partial range): 700 - 1700 °C	<b>Excess temperature signal:</b> When internal temperature exceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
<b>Sensor:</b> Photodiode	<b>Storage temperature:</b> -20 - 80 °C	<b>Adjustable parameters:</b>
<b>Spectral sensitivity:</b> 0.8/ 1.05 µm	<b>Permissible humidity:</b> 95% r.H. max. (non-condensing)	<b>Analogue output 1 &amp; 2:</b> source/ scaling
<b>Focussing range:</b> 0.4 m - ∞ (PZ 20.01 I optic)	<b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value	<b>Digital input output 1 &amp; 2:</b> source/ switch-point
<b>Distance to target size ratio:</b> 80: 1 at 400 mm (PZ 20.01 optic)	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
<b>Digital output:</b> Periodic output of measurement data with adjustable cycle time	<b>Analogue input:</b> 0 – 10 V	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA	<b>Look-up table for temperature alignment</b>
<b>Resistance:</b> max. 500 Ω	<b>Digital input:</b> 2 to 24 V	<b>Ratio correction:</b> $\frac{\varepsilon_1}{\varepsilon_2}$ : 80 - 120 % increment size 0.1 %
<b>Response time <math>t_{98}</math>:</b> ≤ 10 ms (T > 750 °C)	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤ 135 mA / ≤ 175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV	<b>Emissivity <math>\varepsilon</math>:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Dimension:</b> φ 65 x 220 mm	<b>Soot factor:</b> 0.5 – 2.5
<b>Resolution Display:</b> 1 K	<b>Housing material:</b> Stainless steel	<b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s
<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation	<b>Weight:</b> Approx. 0.9 kg	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
<b>Measuring uncertainty:</b> 1 % of reading (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Mounting:</b> External thread M 65 x 2 length 40 mm	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD
<b>Repeatability:</b> 2 K	<b>Connection:</b> with 8-pin connector	large variety of mounting devices, digital displays, software, etc.
<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera		
<b>Ambient operating temperature:</b> 0 - 65 °C		

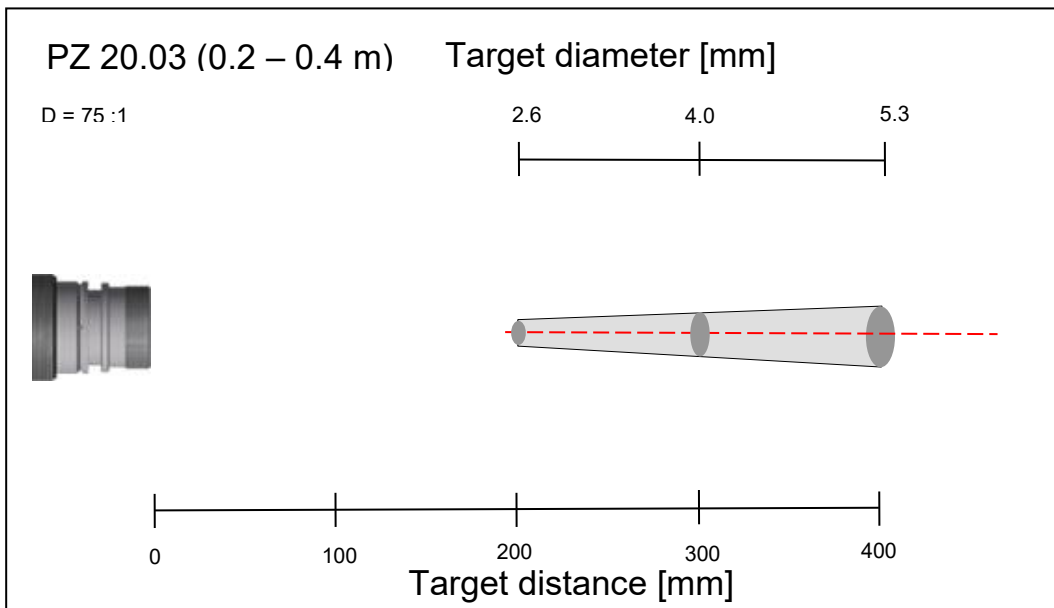
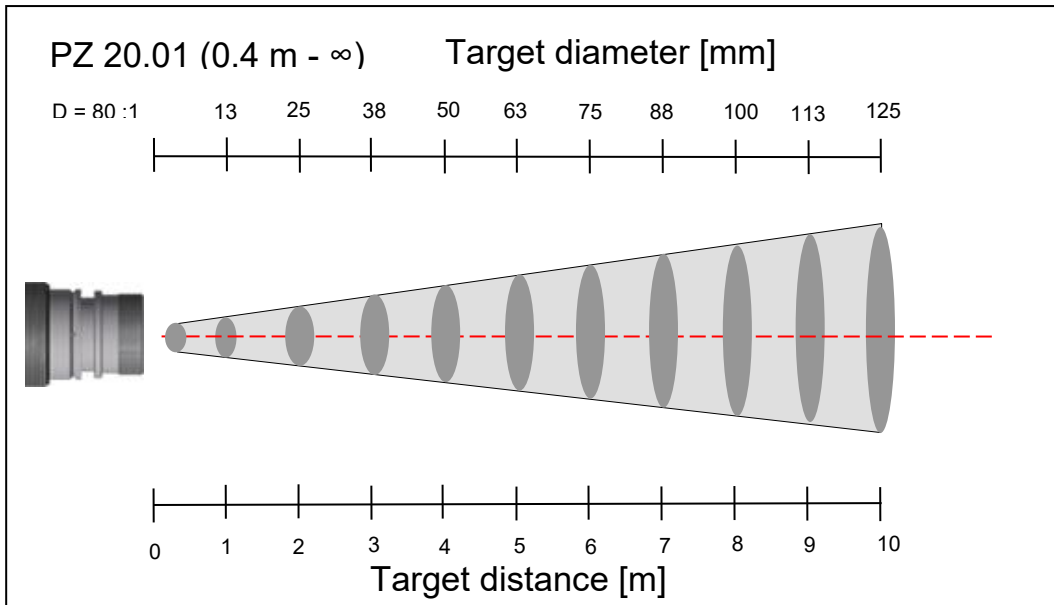
**31.1 Field of View Diagrams PA 47**

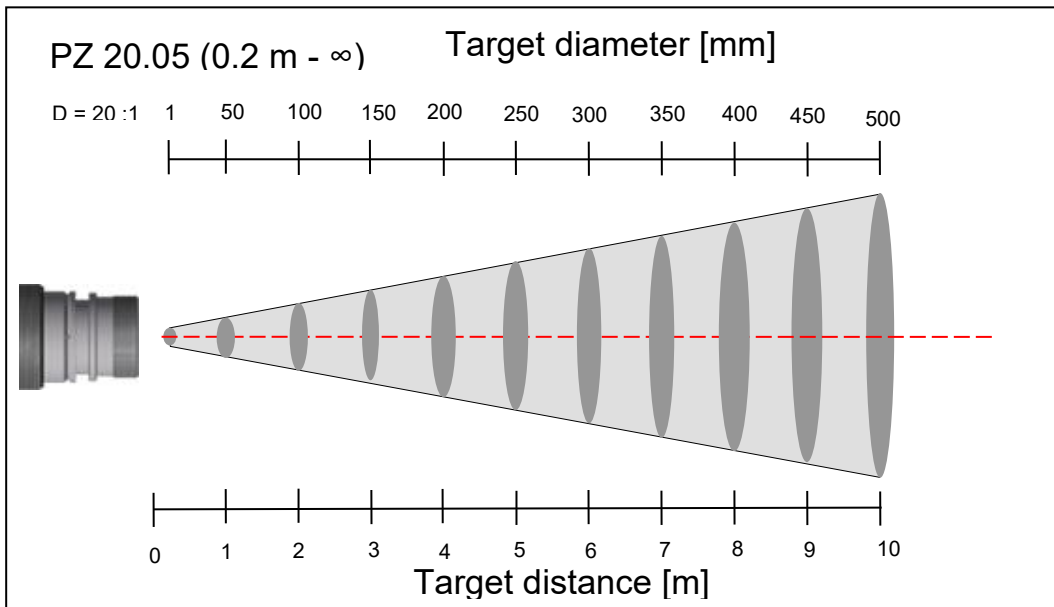
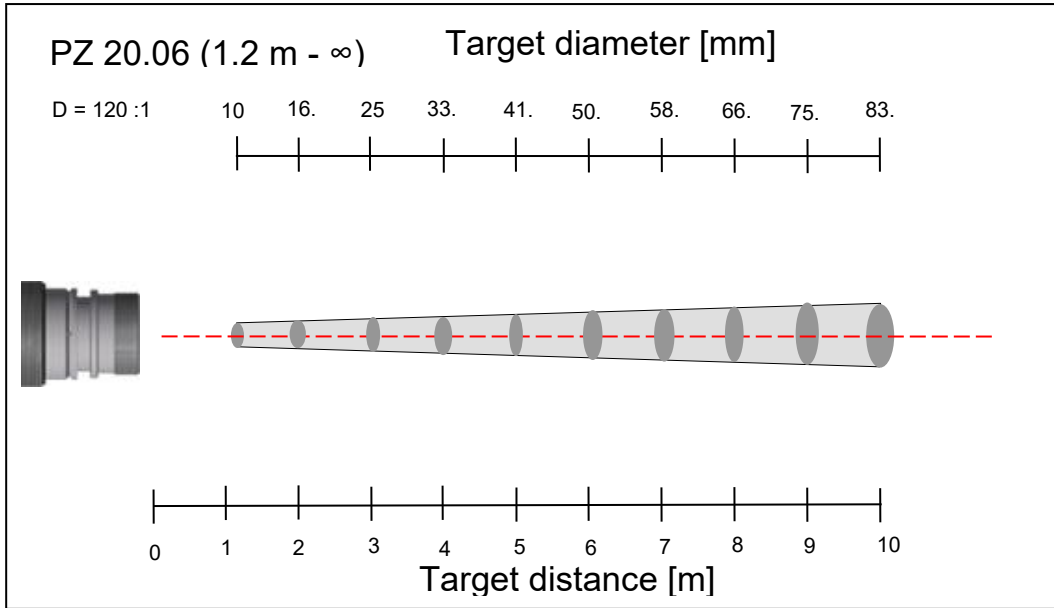


## 32 Technical Data PA 50

<p><b>Measuring range:</b> (adjustable in partial range): 500 ... 1400 °C</p>	<p><b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera</p>	<p><b>Mounting:</b> External thread M 65 x 2 length 40 mm</p>
<p><b>Sensor:</b> Photodiode</p>	<p><b>Ambient operating temperature:</b> 0 - 65 °C</p>	<p><b>Connection:</b> with 8-pin connector</p>
<p><b>Spectral sensitivity:</b> 0.95/ 1.55 µm</p>	<p><b>Excess temperature signal:</b> When internal temperature ex- ceeds &gt; 80 °C, the analogue output value will be &gt; 20.5 mA!</p>	<p><b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)</p>
<p><b>Focussing range:</b> 0.2 - 0,4 m (close-up optic) 0.4 m - ∞ (Standard optic) 1.2 m - ∞ (Tele optic) 0.2 m - ∞ (Wide-angle optic)</p>	<p><b>Storage temperature:</b> -20 - 80 °C</p>	<p><b>Adjustable parameters:</b>  <b>Analogue output 1 &amp; 2:</b> source/ scaling</p>
<p><b>Distance to target size ratio:</b> 75: 1 at 200 mm (PZ 20.03 close-up lens) 80: 1 at 400 mm (PZ 20.01 optic) 120: 1 at 1200 mm (Telephoto-optic PZ 20.06) 20: 1 at 200 mm (Wide-angle optic PZ 20.05)</p>	<p><b>Permissible humidity:</b> 95% r.H. max. (non-condensing)</p>	<p><b>Digital input output 1 &amp; 2:</b> source/ switch-point</p>
<p><b>Digital output:</b> Periodic output of measure- ment data with adjustable cycle time</p>	<p><b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value</p>	<p><b>Transmission factor</b> <math>\lambda_1</math> and <math>\lambda_2</math></p>
<p><b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)</p>	<p><b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC</p>	<p><b>Compensation of background radiation</b> <math>\lambda_1</math> and <math>\lambda_2</math></p>
<p><b>Resistance:</b> max. 500 Ω</p>	<p><b>Analogue input:</b> 0 - 10 V</p>	<p><b>Look-up table for temperature alignment</b></p>
<p><b>Response time <math>t_{98}</math>:</b> ≤ 10 ms (T &gt; 750 °C)</p>	<p><b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA</p>	<p><b>Ratio correction:</b> <math>\frac{\varepsilon_1}{\varepsilon_2}</math> : 80 - 120 % increment size 0.1 %</p>
<p><b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span</p>	<p><b>Digital input:</b> 2 to 24 V</p>	<p><b>Emissivity <math>\varepsilon</math>:</b> <math>\lambda_1</math> u. <math>\lambda_2</math> : 10 - 110 % increment size 0.1 %</p>
<p><b>Resolution Display:</b> 1 K</p>	<p><b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA/ ≤175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV</p>	<p><b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s</p>
<p><b>Resolution USB / RS 485:</b> 0.1 K at terminal operation</p>	<p><b>Dimension:</b> φ 65 x 220 mm</p>	<p><b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time</p>
<p><b>Measuring uncertainty:</b> 1 % of reading (at <math>\varepsilon = 1.0</math> and <math>T_A = 23</math> °C)</p>	<p><b>Housing material:</b> Stainless steel</p>	<p><b>Optional accessories:</b> calibration certificate according to ISO 9001</p>
<p><b>Repeatability:</b> 2 K</p>	<p><b>Weight:</b> Approx. 0.9 kg</p>	<p>calibration certificate according to DKD</p> <p>large variety of mounting devices, digital displays, software, etc.</p>

### 32.1 Field of View Diagram PA 50

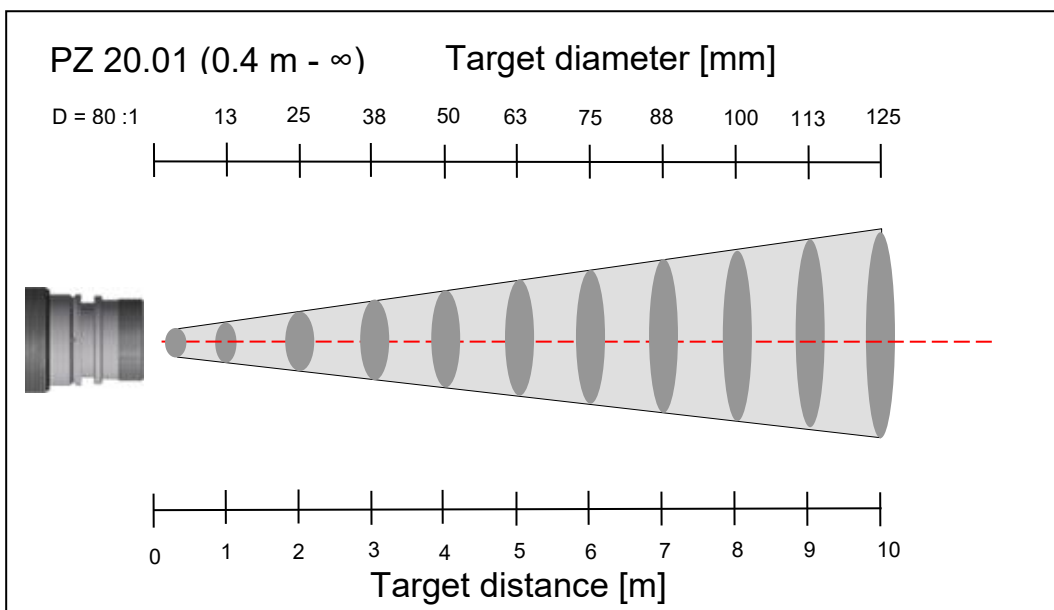
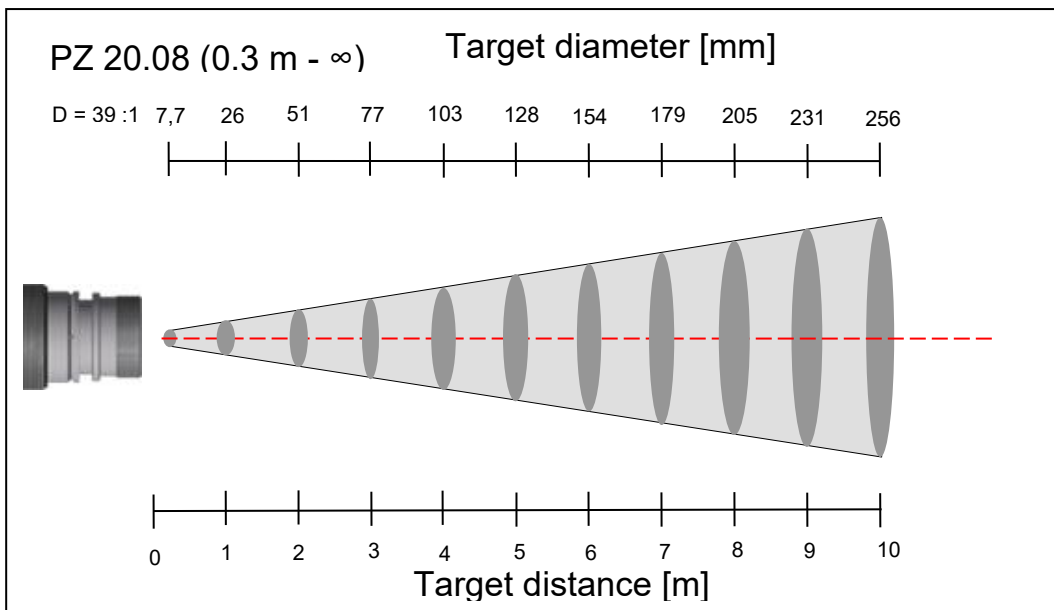




### 33 Technical Data PA 60

<b>Measuring range:</b> (adjustable in partial range): 300 - 800 °C 400 - 1000 °C	<b>Ambient operating temperature:</b> 0 - 65 °C	<b>Connection:</b> with 8-pin connector
<b>Sensor:</b> Photodiode	<b>Excess temperature signal:</b> When internal temperature exceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
<b>Spectral sensitivity:</b> 1.5/ 1.9 µm	<b>Storage temperature:</b> -20 - 80 °C	<b>Adjustable parameters:</b>
<b>Focussing range:</b> 0.3 m - ∞ (PZ 20.08 optic) 0.4 m - ∞ (PZ 20.01 optic)	<b>Permissible humidity:</b> 95% r.H. max. (non-condensing)	<b>Analogue output 1 &amp; 2:</b> source/ scaling
<b>Distance to target size ratio:</b> 39:1 (PZ 20.08 optic) 80:1 (PZ 20.01 optic)	<b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value	<b>Digital input output 1 &amp; 2:</b> source/ switch-point
<b>Digital output:</b> Periodic output of measurement data with adjustable cycle time	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Analogue input:</b> 0 - 10 V	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
<b>Resistance:</b> max. 500 Ω	<b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA	<b>Look-up table for temperature alignment</b>
<b>Response time <math>t_{98}</math>:</b> ≤ 30 ms (T > 750 °C)	<b>Digital input:</b> 2 to 24 V	<b>Ratio correction:</b> $\frac{\varepsilon_1}{\varepsilon_2}$ : 80 - 120 % increment size 0.1 %
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤ 135 mA / ≤ 175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV	<b>Emissivity <math>\varepsilon</math>:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Resolution Display:</b> 1 K	<b>Dimension:</b> φ 65 x 220 mm	<b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s
<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation	<b>Housing material:</b> Stainless steel	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
<b>Measuring uncertainty:</b> 1 % of reading (at $\varepsilon = 1.0$ and $T_A = 23$ °C)	<b>Weight:</b> Approx. 0.9 kg	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD
<b>Repeatability:</b> 2 K	<b>Mounting:</b> External thread M 65 x 2 length 40 mm	large variety of mounting devices, digital displays, software, etc.
<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera		

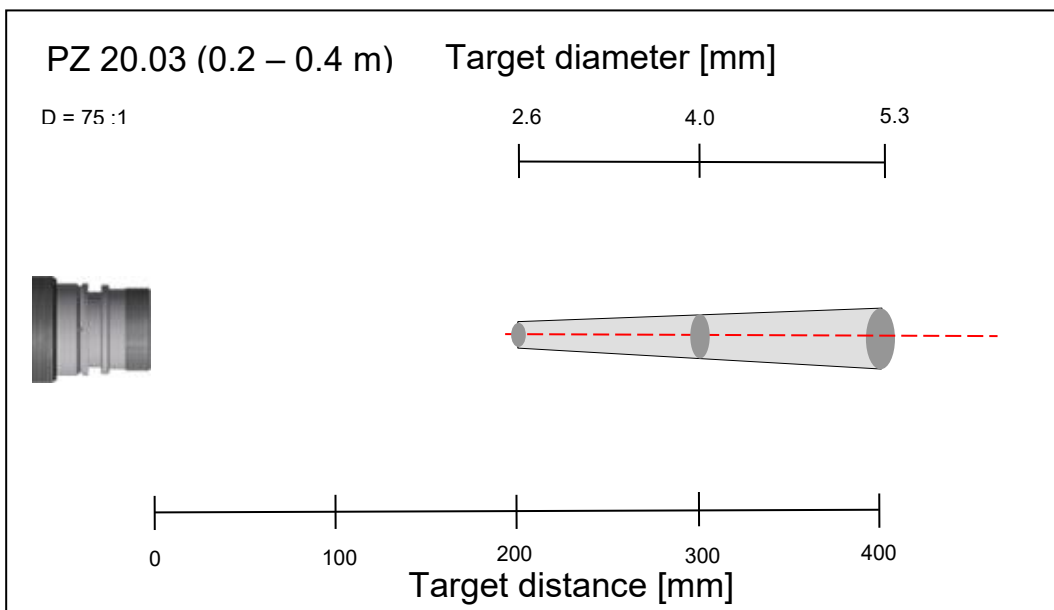
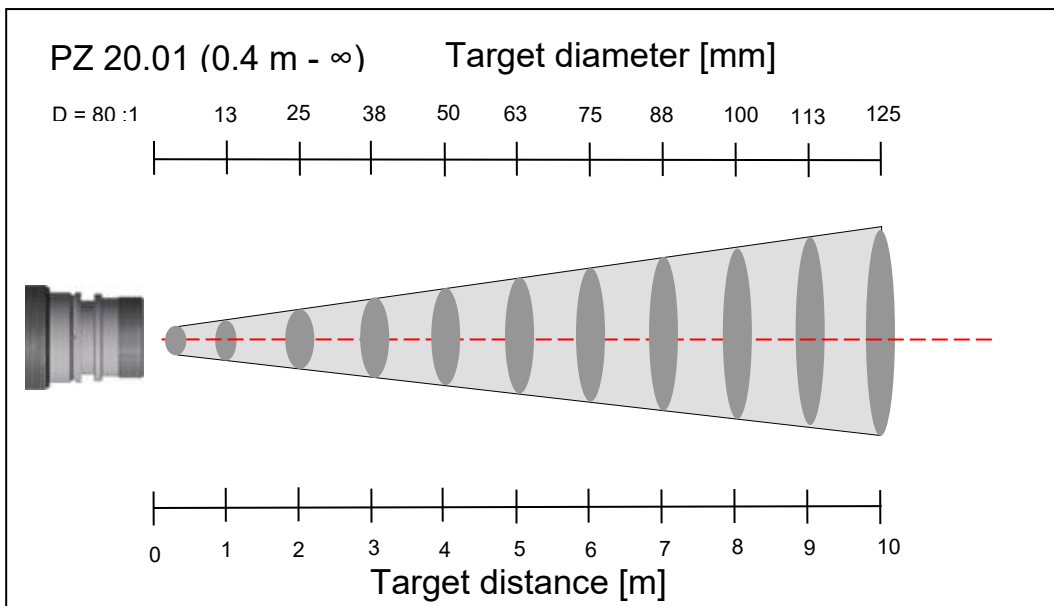
### 33.1 Field of View Diagrams PA 60

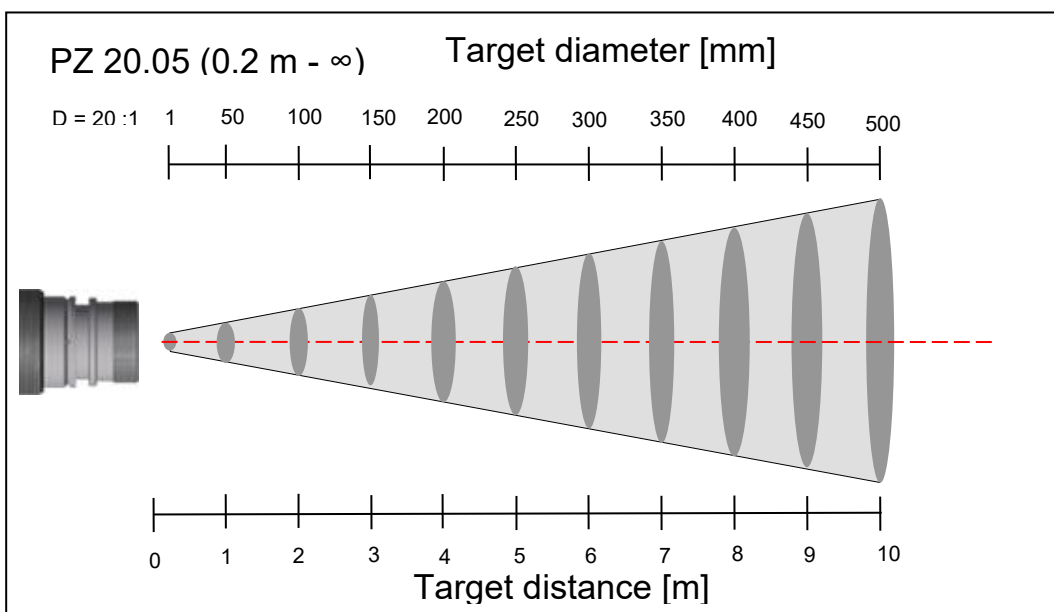
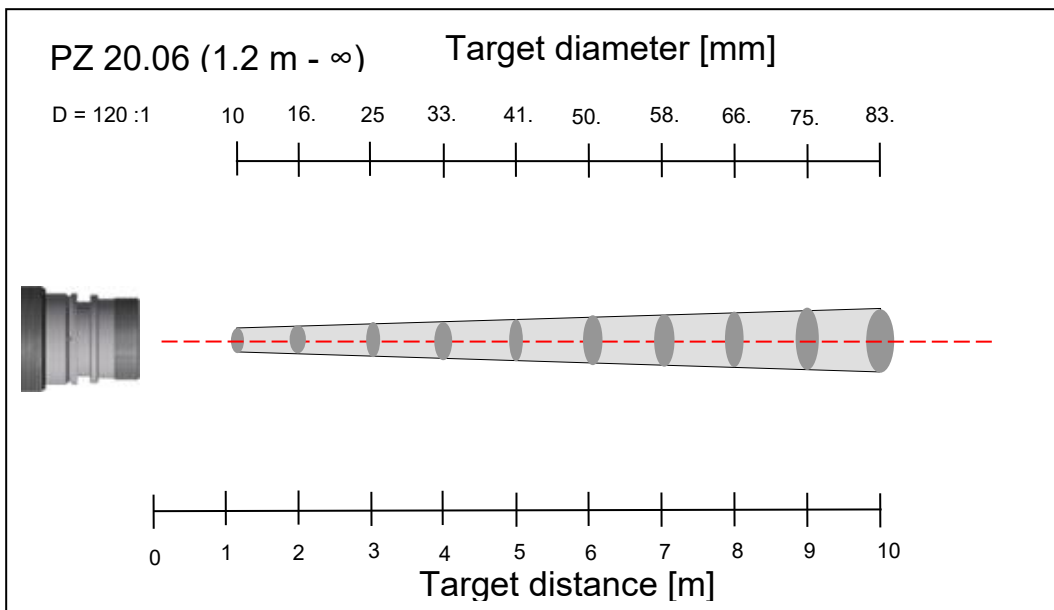


## 34 Technical Data PA 64

<p><b>Measuring range:</b> (adjustable in partial range): 500 - 1400 °C</p>	<p><b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera</p>	<p><b>Mounting:</b> External thread M 65 x 2 length 40 mm</p>
<p><b>Sensor:</b> Photodiode</p>	<p><b>Ambient operating temperature:</b> 0 - 65 °C</p>	<p><b>Connection:</b> with 8-pin connector</p>
<p><b>Spectral sensitivity:</b> 1.5/ 1.9 µm</p>	<p><b>Excess temperature signal:</b> When internal temperature ex- ceeds &gt; 80 °C, the analogue output value will be &gt; 20.5 mA!</p>	<p><b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)</p>
<p><b>Focussing range:</b> 0.2 ... 0.4 m (close-up optic) 0.4 m ... ∞ (Standard optic) 1.2 m ... ∞ (Tele optic) 0.2 m ... ∞ (Wide-angle optic)</p>	<p><b>Storage temperature:</b> -20 - 80 °C</p>	<p><b>Adjustable parameters:</b>  <b>Analogue output 1 &amp; 2:</b> source/ scaling</p>
<p><b>Distance to target size ratio:</b> 75: 1 at 200 mm (PZ 20.03 close-up optic) 80: 1 at 400 mm (PZ 20.01 standard optic) 120: 1 at 1200 mm (PZ 20.06 telephoto optic) 20: 1 at 200 mm (PZ 20.05 wide-angle optic)</p>	<p><b>Permissible humidity:</b> 95% rd. max. (non-condensing)</p>	<p><b>Digital input output 1 &amp; 2:</b> source/ switch-point</p>
<p><b>Digital output:</b> Periodic output of measure- ment data with adjustable cycle time</p>	<p><b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value</p>	<p><b>Transmission factor</b> <math>\lambda_1</math> and <math>\lambda_2</math></p>
<p><b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)</p>	<p><b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC</p>	<p><b>Compensation of background radiation</b> <math>\lambda_1</math> and <math>\lambda_2</math></p>
<p><b>Resistance:</b> max. 500 Ω</p>	<p><b>Analogue input:</b> 0 - 10 V</p>	<p><b>Look-up table for temperature alignment</b></p>
<p><b>Response time <math>t_{98}</math>:</b> ≤ 30 ms</p>	<p><b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA</p>	<p><b>Ratio correction:</b> <math>\frac{\varepsilon_1}{\varepsilon_2}</math> : 80 - 120 % increment size 0.1 %</p>
<p><b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span</p>	<p><b>Digital input:</b> 2 to 24 V</p>	<p><b>Emissivity <math>\varepsilon</math>:</b> <math>\lambda_1</math> u. <math>\lambda_2</math> : 10 - 110 % increment size 0.1 %</p>
<p><b>Resolution Display:</b> 1 K</p>	<p><b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤135 mA/ ≤175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV.</p>	<p><b>Smoothing function <math>t_{98}</math>:</b> 0 - 999 s</p>
<p><b>Resolution USB / RS 485:</b> 0.1 K at terminal operation</p>	<p><b>Dimension:</b> φ 65 x 220 mm</p>	<p><b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time</p>
<p><b>Measuring uncertainty:</b> 0.75 % of reading and but at least 4 K (at <math>\varepsilon = 1.0</math> and <math>T_A = 23</math> °C)</p>	<p><b>Housing material:</b> Stainless steel</p>	<p><b>Optional accessories:</b> calibration certificate according to ISO 9001</p>
<p><b>Repeatability:</b> 2 K</p>	<p><b>Weight:</b> Approx. 0.9 kg</p>	<p>calibration certificate according to DKD</p> <p>large variety of mounting devices, digital displays, software, etc.</p>

### 34.1 Field of View Diagram PA 64

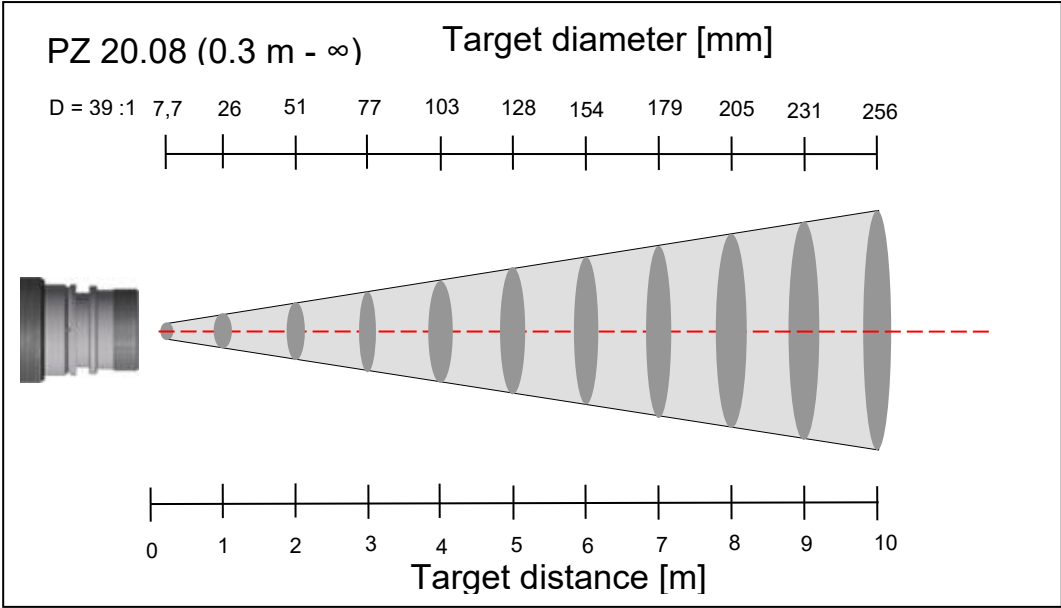




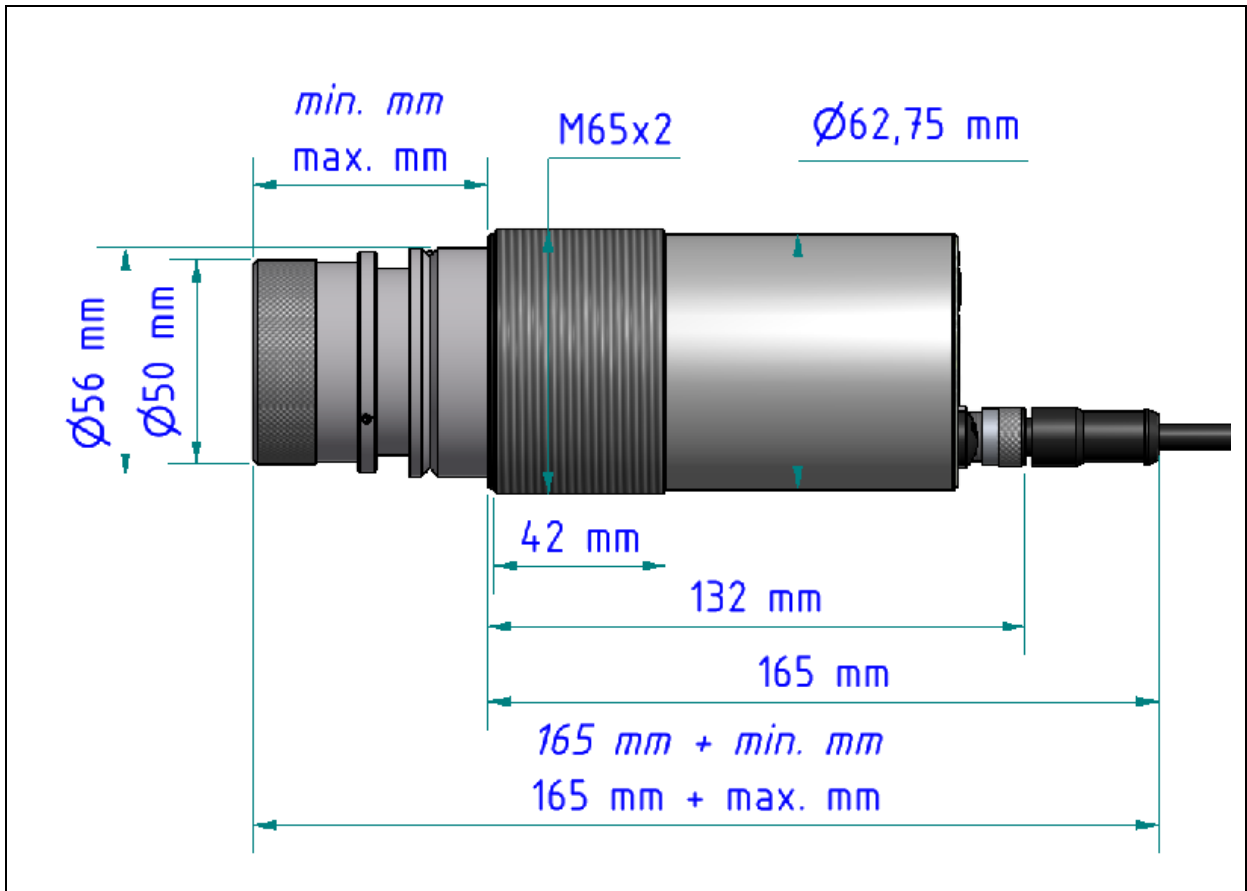
## 35 Technical Data PA 69

<b>Measuring range:</b> (adjustable in partial range): 300 - 800 °C	<b>Excess temperature signal:</b> When internal temperature exceeds > 80 °C, the analogue output value will be > 20.5 mA!	<b>Protection:</b> IP 65 according to DIN 40050 (with connector attached)
<b>Sensor:</b> Photodiode	<b>Storage temperature:</b> -20 - 80 °C	<b>Adjustable parameters:</b>
<b>Spectral sensitivity:</b> 1.5/ 1.9 µm	<b>Permissible humidity:</b> 95% rd. max. (non-condensing)	<b>Analogue output 1 &amp; 2:</b> source/ scaling
<b>Focussing range:</b> 0.3 m - ∞ (PZ 20.8 PZ 20.05)	<b>Temperature coefficient with reference to 23 °C</b> ≤ 0.05 %/K of measured value	<b>Digital input output 1 &amp; 2:</b> source/ switch-point
<b>Distance to target size ratio:</b> 39:1 (PZ 20.08 optic)	<b>Data communication:</b> USB / RS485 with integrated software to set parameters and transmit measurement data to a PC.	<b>Transmission factor</b> $\lambda_1$ and $\lambda_2$
<b>Digital output:</b> Periodic output of measure- mint data with adjustable cycle time	<b>Analogue input:</b> 0 - 10 V	<b>Compensation of background radiation</b> $\lambda_1$ and $\lambda_2$
<b>Analogue output 1 &amp; 2:</b> 0(4) - 20 mA linear, switchable, scalable (4 - 20 mA normally)	<b>Digital output:</b> 2 Open collector outputs 24 V; ≤ 30 mA	<b>Look-up table for temperature alignment</b>
<b>Resistance:</b> max. 500 Ω	<b>Digital input:</b> 2 to 24 V	<b>Ratio correction:</b> $\frac{\varepsilon_1}{\varepsilon_2}$ : 80 - 140 % increment size 0.1 %
<b>Response time t<sub>98</sub>:</b> ≤ 30 Ms (T > 750 °C)	<b>Power supply requirements:</b> 24 V DC +10% / -20% current input ≤ 135 mA/ ≤ 175 mA with camera, 150 mA with switched on spotlight Ripple: ≤ 200 mV	<b>Emissivity ε:</b> $\lambda_1$ u. $\lambda_2$ : 10 - 110 % increment size 0.1 %
<b>Resolution Analogue output:</b> 0.2 K + 0.03 % of the adjusted span	<b>Dimension:</b> φ 65 x 220 mm	<b>EERC parameter:</b> 0 - 100 %
<b>Resolution Display:</b> 1 K	<b>Housing material:</b> Stainless steel	<b>Smoothing function t<sub>98</sub>:</b> 0 - 999 s
<b>Resolution USB / RS 485:</b> 0.1 K at terminal operation	<b>Weight:</b> Approx. 0.9 kg	<b>Memory modes:</b> - Min./Max. (peak picker) - Double maximum with adjustable hold time
<b>Measuring uncertainty:</b> 1 % of reading (at ε = 1.0 and T <sub>A</sub> = 23 °C)	<b>Mounting:</b> External thread M 65 x 2 length 40 mm	<b>Optional accessories:</b> calibration certificate according to ISO 9001  calibration certificate according to DKD  large variety of mounting devices, digital displays, software, etc.
<b>Repeatability:</b> 2 K	<b>Connection:</b> with 8-pin connector	
<b>Sighting device:</b> through-the-lens sighting with target marking, laser spotlight or integrated camera		
<b>Ambient operating temperature:</b> 0 - 65 °C		

**35.1 Field of View Diagrams PA 69**

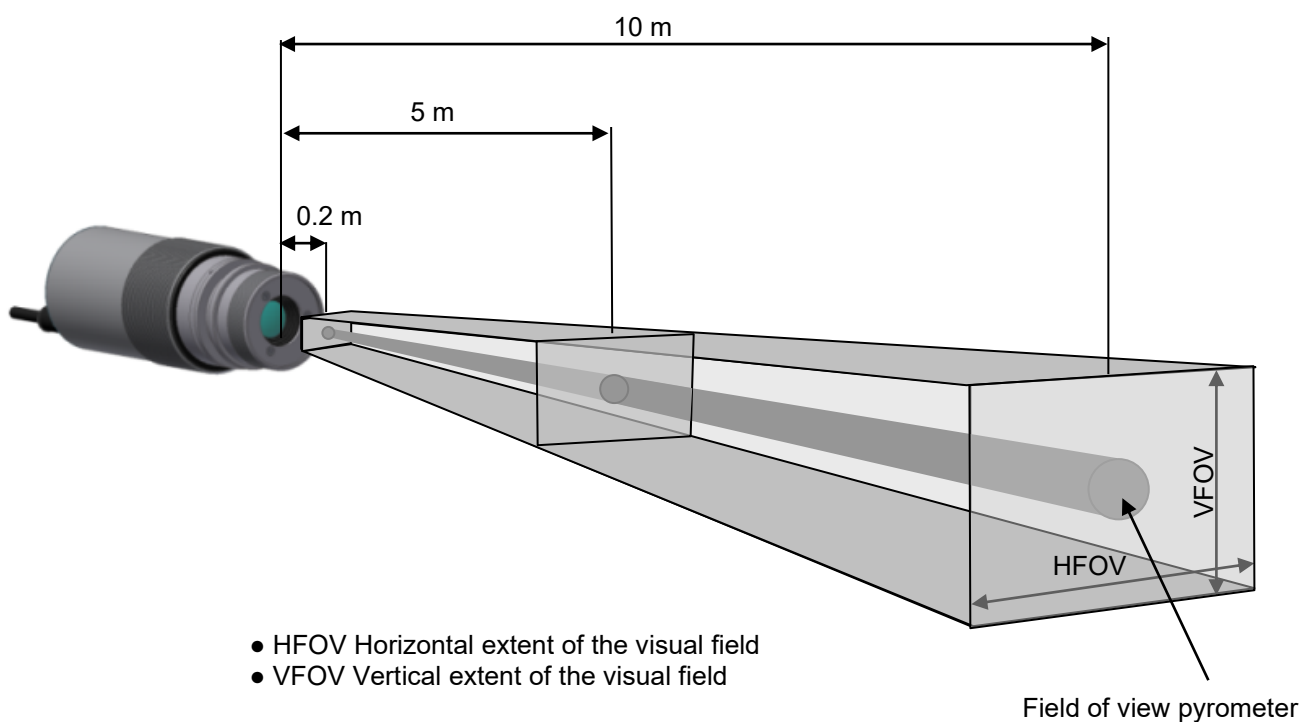


### 36 Dimensions



### 37 Technical data camera

- Video-System: Composite Video PAL, 1 Vpp, 75 Ohm
- Connection: Pyrometer -> TNC plug, monitor-> chinch or BNC (video cable VK 02/F), electrically isolated from the power supply of the pyrometer
- Resolution: 722 x 576 pixel
- Image overlay: target marker
- Target Brightness Control (TBC)



When connecting the video cable VK 02/F, make sure that the plug is tightened

Optic		Area target size [m]													
		0,2	0,3	0,4	1	1,2	2	3	4	5	6	7	8	9	10
<b>Standard 20.01</b>	HFOV [mm]			16.2	44.9	54.4	92.7	140	188	236	284	332	379	427	475
	VFOV [mm]			12.1	33.7	40.8	69.5	105	141	17	213	249	285	320	356
<b>Close-up 20.03</b>	HFOV [mm]	8.5	14.1	19.8											
	VFOV [mm]	6.4	10.6	14.8											
<b>Tele lens 20.06</b>	HFOV [mm]					32.5	56.4	86.3	116	146	176	206	236	266	295
	VFOV [mm]					24.4	42.3	64.7	87.1	110	132	154	177	199	222
<b>Wide angle 20.05</b>	HFOV [mm]	41.7		79.4	192.6	230.3	381	570	759	947	1136	1324	1513	1702	1890
	VFOV [mm]	31.3		59.6	144.4	172.7	286	427	569	710	852	993	1135	1276	1418
<b>Optic F50 20.08</b>	HFOV [mm]		19.6	26.8	69.8	84.2	142	213	285	357	428	500	572	643	715
	VFOV [mm]		14.7	20.1	52.4	63.1	106	160	214	267	321	375	429	482	536

### 38 Transmission values of protective glasses

In the table you find the transmission values of the used protective glasses. In the column types you find the mechanical accessories in which the glasses are used.

Article number	Description	Transmission (reflexion) [%]						Used in followings types
		0.85 µm	1.4 µm	2 µm	3.9 µm	4.7 µm	8-14 µm	
1057687	Quartz protective glass	94	94	94				PA 20/C
1077319	Quartz protective glass	94	94	94				PZ 20/I AF 1 PZ 20/I AF 2 PZ 20/I AF 4
1008177	Quartz protective glass	94	94	94				PA 20/I
1023961	Sapphire protective glass	87	87	87	86	76		PS 15/I AF 1 PS 15/I AF 2
1021133	Sapphire protective glass	86	86	87	86	76		PA 15/I AF 1
1066877	Sapphire protective glass	86	86	87	86	76		PZ 15/I AF 2 PZ 15/I AF 3
1048531	Protective glass	92	91	90				PV 11
120314	Protective glass	93	92	90				Serie CellaTemp PA, PT, PZ
1048533	Protective glass	92	91	90				PZ 20/X AF 5
1045534	Protective glass	92	91	90				PZ 20/X AF 6
295757	Mirror	95	96	97				PS 11/W
1021132	ZnS protective glass						71	PA 10/I
515164	ZnS protective glass						71	PZ 20/I AF 3
1057688	ZnS protective glass						71	PA 10/C
119394	ZnS protective glass						71	PS 11/D PS 11/D AF 2 PS 11/S PS 11/N AF 3
515089	ZnS protective glass						71	PZ 10/I AF 1
515167	ZnS protective glass						71	PZ 10/A F 4

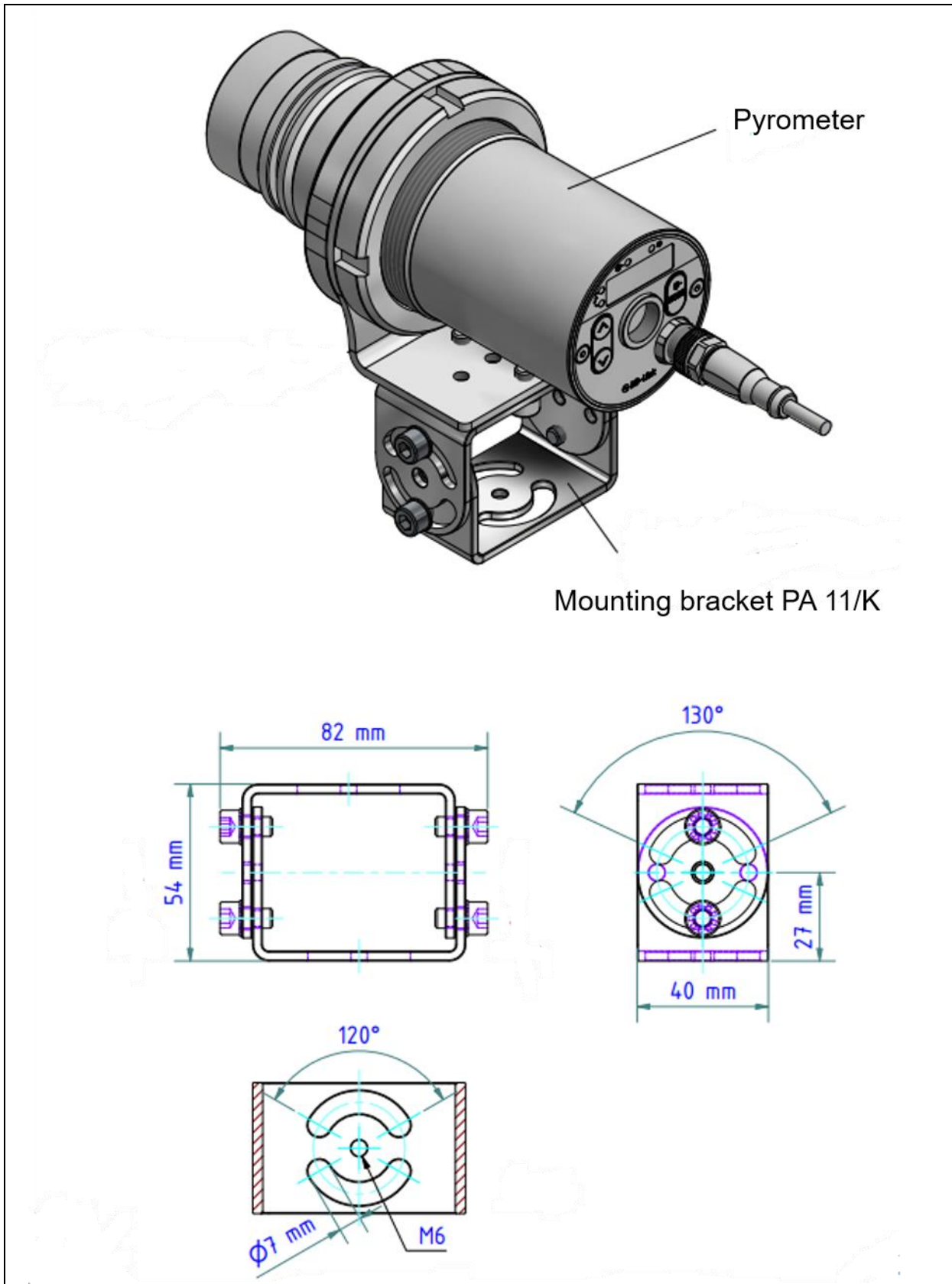


The specified transmission values are "typical values". When using the protective glass at the pyrometer, measurement deviations may occur. These may have to be corrected by the emissivity correction.

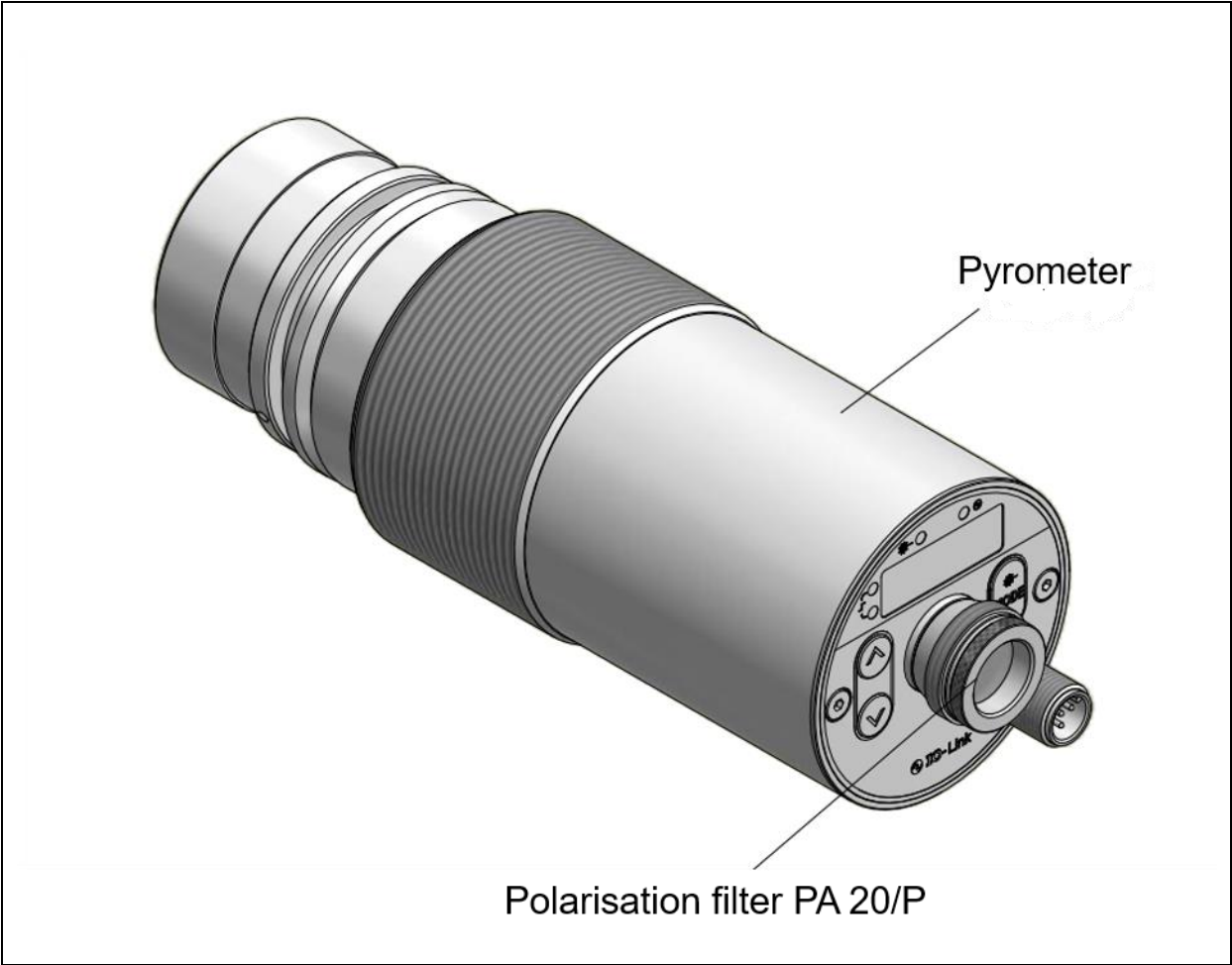
### 39 Accessories

<b>Description</b>	<b>Product Name</b>	<b>Article No.</b>
Cable length 5 m, 8 x 0.25 mm <sup>2</sup> , shielded	VK 02/A	101 3909
Video cable	VK 02/F	103 1446
Polarising filter	PA 20/P	100 9974
Mounting bracket	PA 11/U	100 9679
Quartz window	PA 20/I	1008144
Lock nut	KM 13	513 854
Mounting angle, adjustable	PA 11/K	100 7490
USB cable	VK 11/D	100 9677

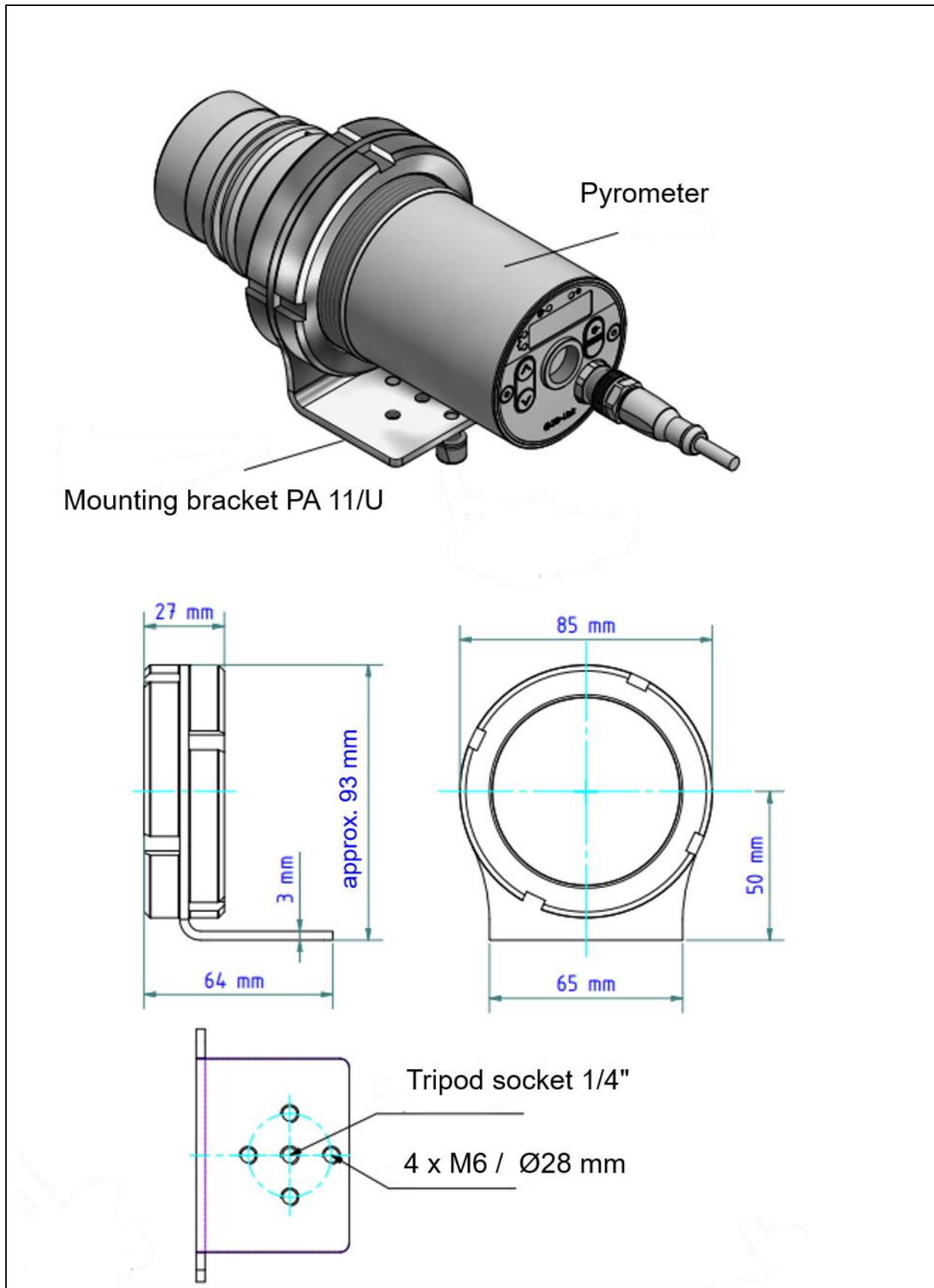
### 39.1 Mounting angle PA 11/K



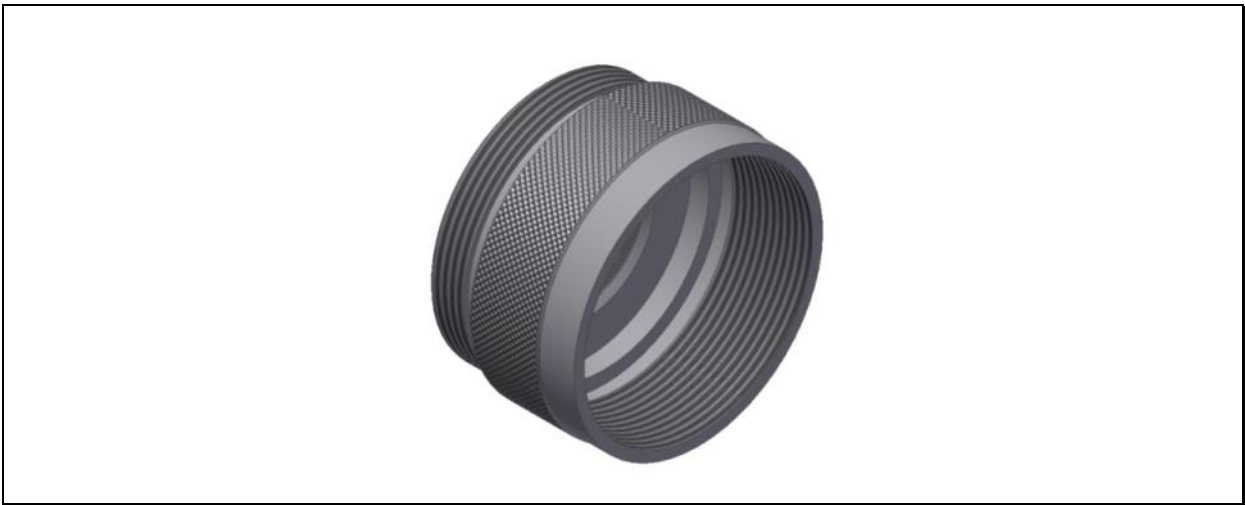
**39.2 Polarising filter PA 20/P**



### 39.3 Mounting bracket PA 11/U



### 39.4 Quartz-window PA 20/I



#### **⚠ Attention**

The replacement of the protection glass can be performed only by authorized person. When removing the protective screen, always wear protective glasses and -gloves.

### 39.5 Cable VK 02/A

Ident. - Nr. 101 3909

8 polig  
8 poles

Belegung <i>Configuration</i>	Pol <i>contacts</i>
weiß <i>white</i>	an 1 <i>at 1</i>
braun <i>brown</i>	an 2 <i>at 2</i>
grün <i>green</i>	an 3 <i>at 3</i>
gelb <i>yellow</i>	an 4 <i>at 4</i>
grau <i>grey</i>	an 5 <i>at 5</i>
rosa <i>pink</i>	an 6 <i>at 6</i>
blau <i>blue</i>	an 7 <i>at 7</i>
rot <i>red</i>	an 8 <i>at 8</i>

Schirm durchgängig an Verschraubung  
*Shield constantly at screw connection*

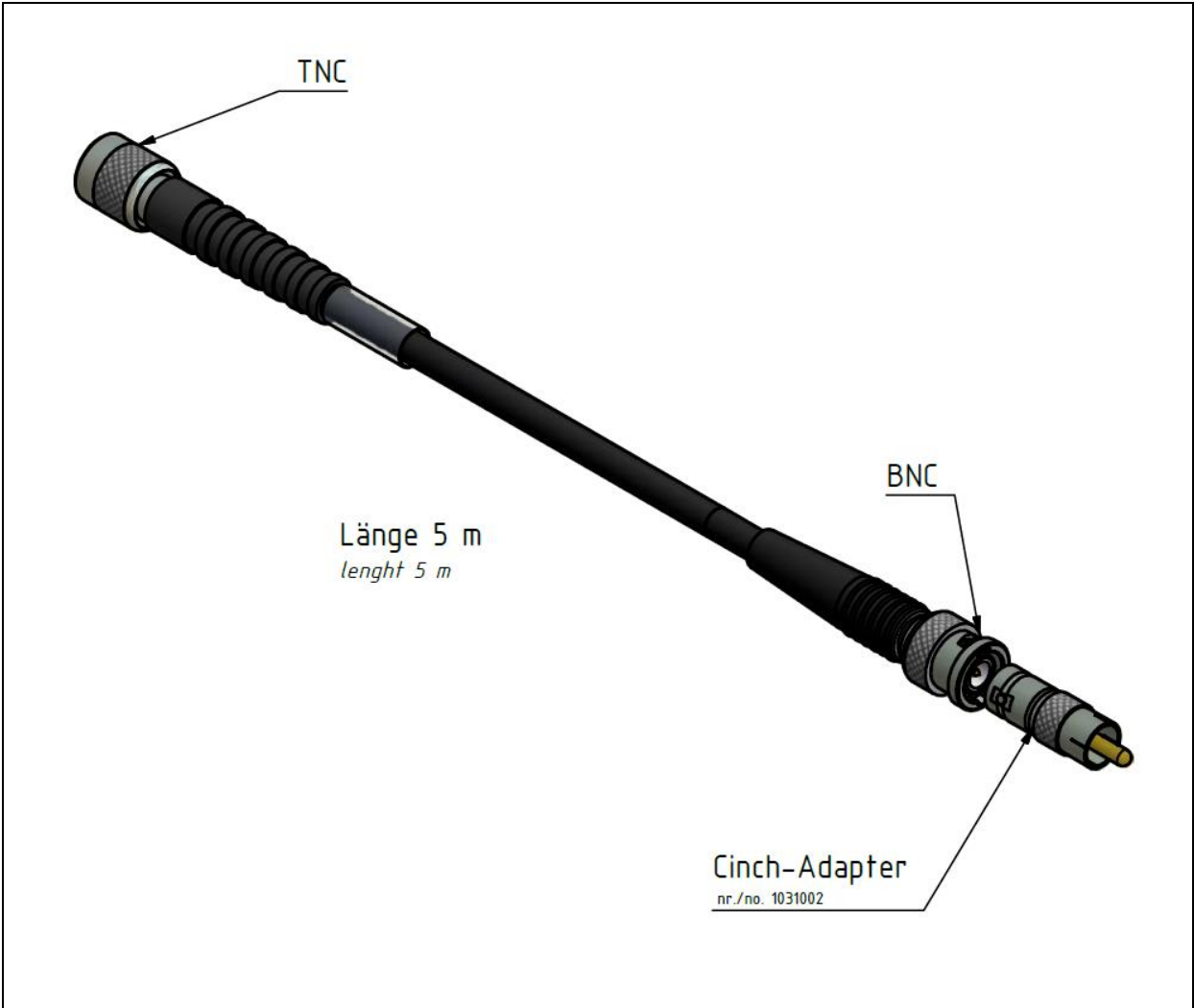
( Maßstab 3:1 )

Anschlussquerschnitt 0,25mm<sup>2</sup> (AWG 24)  
 Schutzart IP68 / IP67 geschirmt  
 Obere Grenztemperatur + 85°C  
 Untere Grenztemperatur - 25°C

*Wire gauge 0,25mm<sup>2</sup> (AWG 24)*  
*Degree of protection IP68 / IP67 shielded*  
*Upper temperature + 85°C*  
*Lower temperature - 25°C*

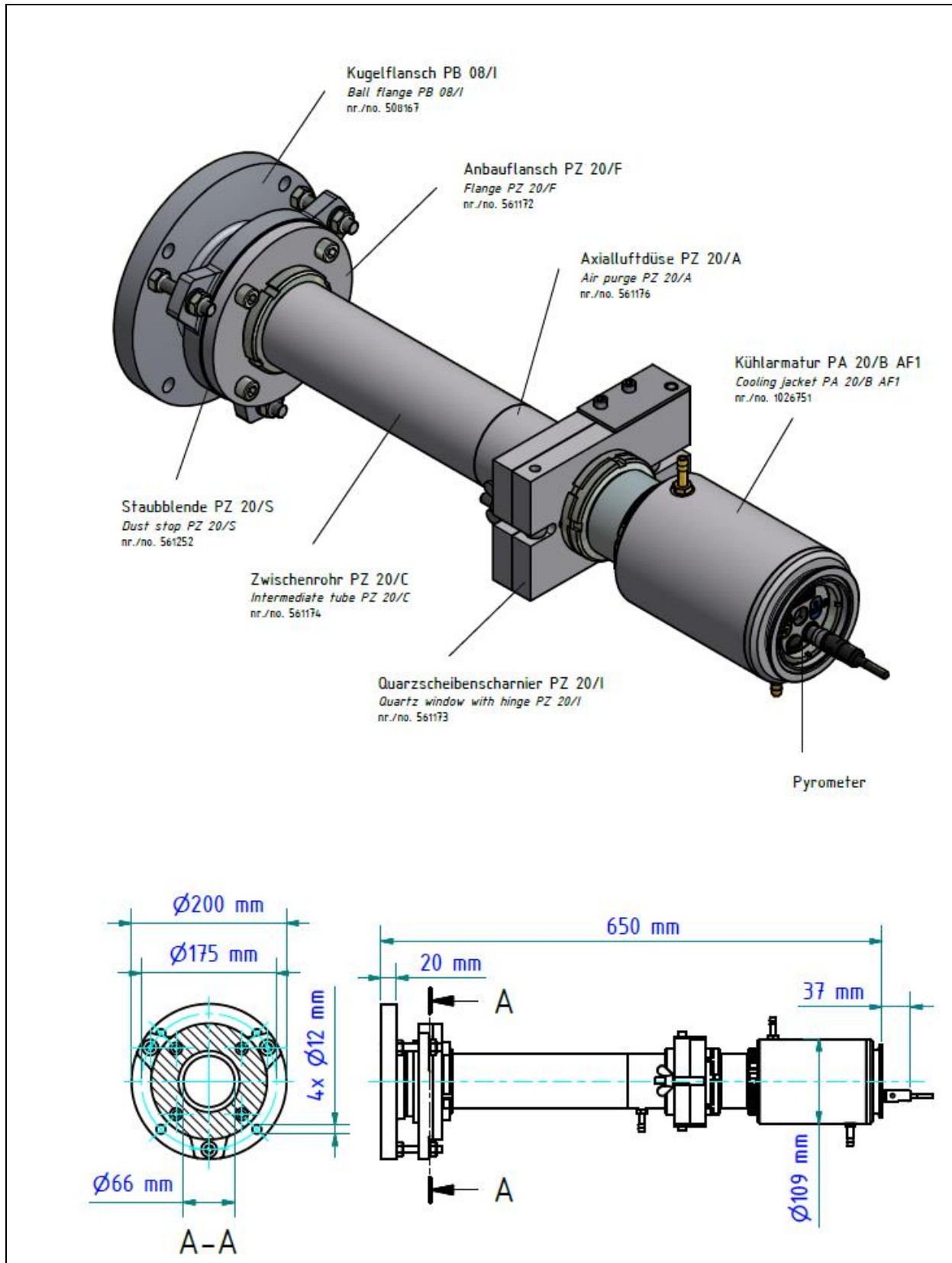
**39.6 Cable VK 02/F**

Ident. - Nr. 103 1446

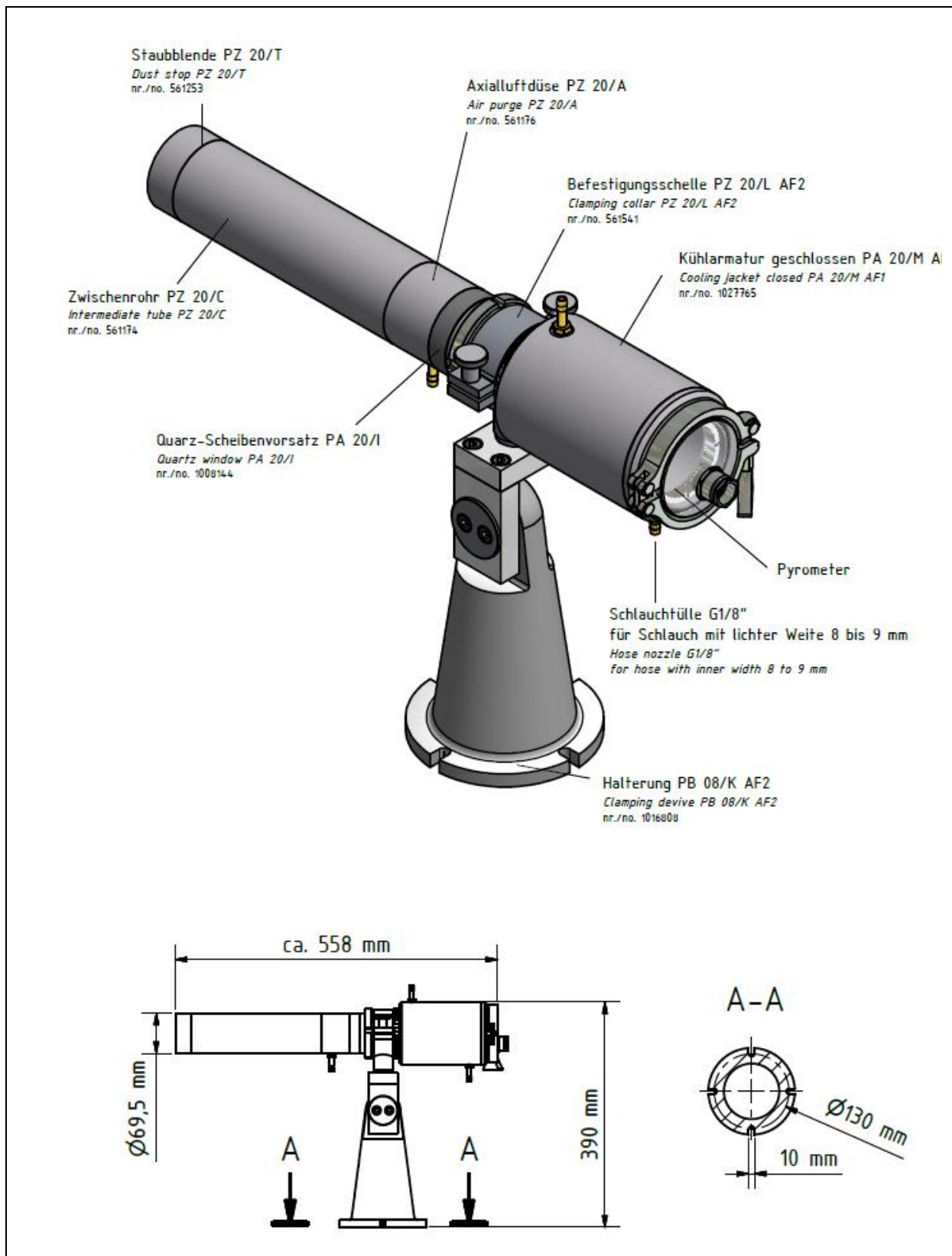


## 40 Mounting combinations

### 40.1 Mounting combination PA 20-007



## 40.2 Mounting combination PA 20-010



## 41 Glossary

<b>Auto print</b>	After connecting the power supply, the pyrometer automatically begins transmitting measurement data via the serial interface.
<b>Print cycle time</b>	The cycle time for the temperature data output via the serial interface.
<b>Distance to target size ratio</b>	Describes the ratio between the pyrometer-to-object distance and the target spot diameter.
<b>Double Max-Memory</b>	Brief temperature peaks will be held for an adjustable holding time.
<b>Emissivity</b>	A measure of a material's ability to emit energy by radiation. The emissivity value is the ratio of energy radiated by a particular material's surface to energy emitted by an ideal radiator (black body) at the same temperature. A pyrometer's emissivity setting must be adjusted for the specific material to be measured.
<b>Switching outputs</b>	The digital outputs can be used as digital inputs
<b>Two-colour pyrometer</b>	Detects infrared radiation at two different wavelengths at the same time. Based on that ratio, the pyrometer calculates the temperature value.
<b>Spectral pyrometer</b>	Detects infrared radiation at one wavelength and produces a temperature reading from that measurement.

## 42 Shipping, Packaging and Disposal

### 42.1 Inspecting your shipment

Unpack and inspect the entire shipment immediately upon receipt to make sure it is complete and undamaged.

If the container/package shows visible signs of damage, please refuse the shipment. If this is not possible, accept the shipment on the condition that the freight carrier's delivery record is noted with the extent of the damage to file a claim.

Should you discover a concealed loss or damage, report it to KELLER HCW and to the freight carrier immediately. If the period for filing claims has expired, you will no longer be able to make any claims for compensation of damage or loss.

### 42.2 Packaging

The packages used by KELLER HCW are made of carefully selected, environmentally compatible materials and are thus recyclable. We suggest you retain the packaging for possible future use; otherwise please ensure that they are disposed of in an ecologically sound manner.

### 42.3 Disposal of used apparatus

Used electrical and electronic equipment often contain valuable components. The owner/user may either return such an instrument to the manufacturer for disposal, or he must dispose of it himself in a professional and non-polluting manner.

KELLER HCW will not be held accountable for any inappropriate disposal carried out by the user/owner of KELLER HCW instruments.



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## 44 Default settings

### 44.1 Temperature measurement using two-colour/ratio mode

(Configuration layer: `< 00 !`)

Parameter	Function	Default	User settings
<code>EPS9</code>	Ratio correction	100 %	
<code>chr9</code>	Plausibility check ratio mode	<code>0 0</code>	
<code>drcn</code>	Soot factor n*	1.3	
<code>chr_</code>	Relative limit min.	10 %	
<code>chr^</code>	Relative limit max.	--	
<code>chr.t</code>	Absolute min. temp.	measuring range start	
<code>chr%.</code>	Absolute minimum Emissivity	50 %	
<code>L.in.9</code>	Temperature offset using linear interpolation (user configurable table)	Off	
<code>L.H1</code>	Node x 1 - 10	--	
<code>L.Y1</code>	Node y 1 - 10	--	
<code>F.L.9</code>	Smoothing filter	Off	
<code>F.L.t</code>	Smoothing time	0,1 s	
<code>EERC</code>	EERC Algorithm****	0	
<code>MEM.9</code>	Min/Max memory	Off	
<code>MEM.t</code>	Hold time for Min/Max	--	
<code>F.L.0</code>	Smoothing filter for min/max **	--	
<code>F.L.t</code>	Smoothing time **	--	
<code>clr.0</code>	external delete for Min/Max memory**	--	
<code>t.dEL</code>	Time delay***	--	
<code>tAct</code>	Sampling time***	--	
<code>t.d.S</code>	Cut-off interval***	--	
<code>t.out</code>	Timeout***	--	
<code>L.1</code>	Limit 1***	--	
<code>L.2</code>	Limit 2***	--	
<code>F-Pr</code>	Average weighting***	--	
<code>tSP_</code>	Plausibility Threshold ***	--	
<code>tSP^</code>	Plausibility Threshold ***	--	
<code>ANO</code>	Display mode during sampling time***	--	
<code>ARSt</code>	Autoreset***	--	
<code>chL2</code>	Set Li2 check on tAct***	--	
<code>SAVE</code>	Save		
<code>ESC</code>	Escape		

\* Only available at PA 47

\*\* Only available with Min/Max and Double Max modes

\*\*\* Only available with ATD function

\*\*\*\* Only available at PA 69

## 44.2 Temperature measurement using spectral mode

Configuration layer: C002, c 003)

Parameter	Function	Default	User settings
EPS.1	Emissivity factor L1	99.6%	
TRU.1	Transmission factor L1	100 %	
bAc.1	Ambient temperature compensation	Off	
bAc.t	Temperature of ambient source of radiation	Off	
bAc.l	Influence of ambient IR radiation	--	
L.in.1	Temperature offset using linear interpolation	Off	
L.H1	node x 1.-.10	--	
L.Y1	node y 1.-.10	--	
F.L.1	Smoothing filter	Off	
F.L.t	Smoothing time	0.1 s	
MEM.1	Min/Max memory	Off	
MEM.t	Hold time for Min/Max	--	
F.L.n	Smoothing filter for min/max *	--	
F.L.t	Smoothing time*	--	
CL.n	external delete for Min/Max memory*	--	
t.dEL	time delay**	--	
tAct	meas. time active**	--	
t.d.S	cut-off interval**	--	
t.out	timeout**	--	
L.1	Limit 1**	--	
L.2	Limit 2**	--	
F-Pr	Average weighting**	--	
tSP <sub>-</sub>	Threshold plausibility**	--	
tSP <sup>-</sup>	Plausibility Threshold **	--	
ANO	Mode of display**	--	
ARSt	Autoreset**	--	
ch.L2	Set Li2 check on tAct**	--	
SAVE	Save	--	
ESC	Escape	--	

\* Only available with Min/Max and Double Max modes

\*\* Only available with ATD function

### 44.3 Configuration I/O

(configuration layer: `c 0 10`)

Parameter	Function	Default	User settings
<code>Ao1S</code>	Ao1 select source	Quotient	
<code>Ao1_</code>	Ao1 define lower limit of temp. span	Measuring range begin	
<code>Ao1-</code>	Ao1 define upper limit of temp. span	Measuring range end	
<code>Ao14</code>	Ao1 - 0/4 - 20mA	4 – 20 mA	
<code>Ao2</code>	Analogue output 2	Off	
<code>Ao2S</code>	Ao2 - select source	--	
<code>Ao2_</code>	Ao2 define lower limit of temp. span	--	
<code>Ao2-</code>	Ao2 define upper limit of temp. span	--	
<code>Ao24</code>	Ao2 - 0 / 4 - 20mA	--	
<code>do1</code>	Switching output 1	On	
<code>do1S</code>	Do1 select source	Status Ready signal	
<code>do1F</code>	Do1 function	Level/signal	
<code>do1t</code>	Do 1 switching threshold	--	
<code>do1h</code>	Do1 signal threshold	--	
<code>do1_</code>	Do1 lower limit of range	--	
<code>do1-</code>	Do1 upper limit of range	--	
<code>do1L</code>	Do1 delay time	0.00 s	
<code>do1H</code>	Do1 Hold time	0.00 s	
<code>do2</code>	Switching output 2	Off	
<code>do2S</code>	Do2 select source	--	
<code>do2F</code>	Do2 function	--	
<code>do2t</code>	Do 2 switching threshold	--	
<code>do2h</code>	Do2 signal threshold	--	
<code>do2_</code>	Do2 lower limit of range	--	
<code>do2-</code>	Do2 upper limit of range	--	
<code>do2L</code>	Do2 delay time	--	
<code>do2H</code>	Do2 Hold time	--	
<code>AiFn</code>	Analogue input function	--	
<code>AiU1</code>	Analogue in upper and lower voltage values	--	
<code>AiU2</code>	Analogue in upper and lower voltage values	--	
<code>AiV1</code>	Analogue in upper and lower input variables	--	
<code>AiV2</code>	Analogue in upper and lower input variables	--	
<code>SAVE</code>	Save		
<code>ESC</code>	Escape		

### 44.4 General Functions

(configuration layer: c 0 ! !)

Parameter	Function	Default	User settings
LEd6	Green status LED	DO1	
PiLo.	Activate laser*	int	
PiLt	Laser ON-time	2 min	
tErn.	Assign Interface	USB	
AStr.	Automatic temperature data output	Off	
Acyc.	Cycle for automatic temp. data output	0.1 s	
Addr.	Device address	001	
d.SP.	Display panel	active	
Unit	temperature scale	Celsius	
coul.	Screen insert temperature reading**	on	
ctbc.	TBC exposure metering**	"on" spot weighted	
ccol.	White balance**	"DAYL" daylight	
c. id.	Measuring point number	1	
SAuE	Save		
ESc	Escape		

\* Only available at pyrometer with laser target spot indicator

\*\* Only available at pyrometer with camera

