KELLER
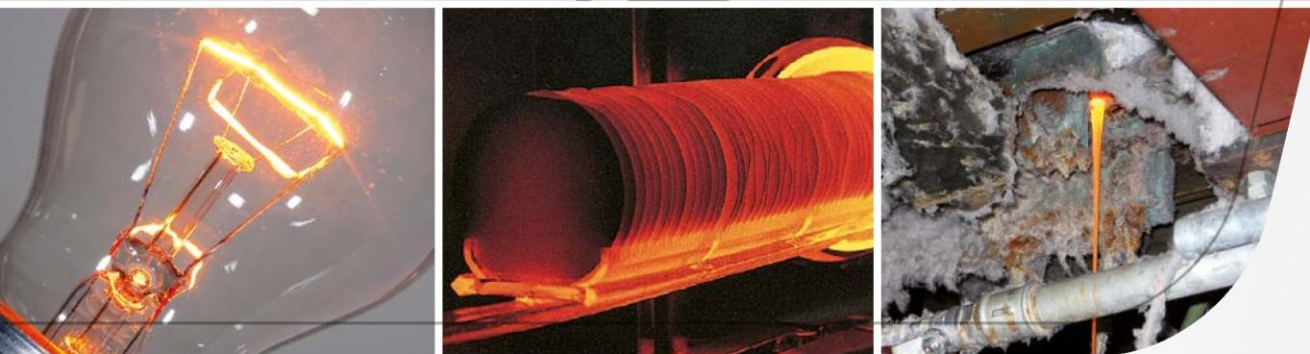infrared temperature solutions
ITS

No1 in terms of
ACCURACY
RELIABILITY
INNOVATION

Intensity Comparison Pyrometer
Mikro Type PV 11
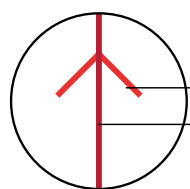
for very precise temperature measurement from
+700 °C to +3500 °C of objects starting at 0.1 mm diameter

with a high-resolution multi-turn potentiometer allow for precise intensity adjustment of the reference radiation source.

Examples of application

Intensity Comparison Pyrometer Mikro PV 11

Special features

- Measuring range from 700 °C to 3500 °C • Easy adjustment in case of variable measuring distances
- Large field of view for the recognition of the measuring object • Measurement of very small objects starting at 0.1 mm
- Sharply defined picture of the measuring object • Extremely high optical resolution
- Very high accuracy • The brightness of the comparing light source is continuously
- Very small influence of the emissivity factor due to the short measured by a patented process, thereby aging effects are spectral sensitivity compensated.

The principle of measurement

Comparison marker

Measuring object

View through the optics

The intensity comparison pyrometer PV 11 is based on the visual intensity comparison of the measuring object with a calibrated reference lamp situated in the instrument. The measuring object is observed through the optic.

A comparison marking is reflected into the picture of the measuring object. By manual alteration of the radiation intensity of the reference lamp the brightness of the comparison marking is harmonized with that of the measuring object until both are identical. Then the temperature value can be read off from an integrated digital display.

Thanks to the very high sensitivity of the human eye and the instrument's short-wave spectral sensitivity this measuring method is in fact one of the oldest but nevertheless one of the most accurate ones in the field of non-contact temperature measurements and clearly superior to today's modern electronic devices.

The comparison marker is a purely visual creation. The intensity of the light source is continuously checked and electronically held at a constant level. Thus the device is not subject to ageing and supplies stable measurement readings for many years without needing recalibration.

Another advantage of the intensity comparison method is the quasi independence of the measurement from the size of the measuring object. This allows for temperature measurements of object sizes starting at 0.1 mm.

Another asset of the Micro is its optical resolution of 5000 : 1 that is far superior to electronic devices. For example, objects of 1 mm can still be measured from a distance of 5 m.

The lens with screw thread is focusable with a very high accuracy to measuring distances from 1 m - ∞. A set of supplementary lenses is optionally available for distances between 0.2 – 1 m. The large viewing angle facilitates an alignment to the measuring object. 6 filter stages together

- Laboratory instrument manufacturers – atomic absorption spectrometers
  Exact temperature determination on graphite cells.
- Vacuum furnaces – metal samples
  Temperature determination on small metal samples.
- Nuclear research – metal and ceramic samples
  Temperature determination during the sintering of uranium tablets.
- Manufacturers of incandescent bulbs
  For the determination of the temperature limit of filaments out of different metal alloys.
- Production of glass fibers
  Reliable measurement from a great distance, independent of the diameter.
- Universities
  Many institutes of physics, chemistry and material science use the Mikro as reference pyrometer.

Scope of delivery

- Pyrometer
- Cross head
- Power pack
- Carrying case
- PC connection cable
- Spare lamp
- Software for transmitting and saving the measured values on a PC

Accessoires

- Close lens set D1 / D2 / D4
  lens D1 for 0.5 - 1.0 m lens D2 for 0.33 - 0.55 m lens D1 + D2 for 0.25 - 0.33 m lens D4 for 0.2 - 0.25 mm
- Grey filter NDx4 (D 0.60) M43 thread, transmission approx. 25% (for extending the measuring range up to 3500 °C)
- Grey filter NDx8 (D 0.90) M43 thread, transmission approx. 12.5%
- Protective glass for PV 11 with M43 thread • Floor stand PT 50/B

Technical data

Measuring range
- +700 to +3500 °C, sub-divided into 6 partial ranges
- up to +3500 °C with attachable filter

Resolution of display
- 1 K

Accuracy
- 1.5 % of reading (+700 to +800 °C)
- 0.6 % of reading (+800 to +2000 °C)
- 2.0 % of reading (+2000 to +3500 °C)

Accuracy of adjustment
(at $\varepsilon = 1$ and $T_a = 23$ °C)
The accuracy depends on the sensitivity of the eye of the measuring person. On average it is
- at +1000 °C: ± 1.5 °C
- at +2000 °C: ± 5.0 °C
- at +3000 °C: ± 10.0 °C

Repeatability
- 3 K

Measuring distances
- Without supplementary lens: 1 m to ∞
- With supplementary lenses: 0.2 m to 1 m

Optical resolution
- 5000 : 1

Min. target diameter
- 0.3 mm at a distance of 1 m
- 0.1 mm at a distance of 0.2 m (with supplementary lens)

Sighting device
- True sided through-the-lens sighting with dioptric compensation, faded-in comparison marking, focussable optic

Display
- 4-digit digital, LCD

Aiming support
- cross head: horizontally: 360° vertically: 90°

Interface
- RS 232 to transfer the readings to the PC
- PC software included in the scope of delivery

Adjustable parameter
- Emissivity 10 to 100%

Power supply
- 15 V DC or 230 V AC via plug power supply unit (included in the scope of delivery)

Spectral sensitivity
- partial range I: 500 - 670 nm
- partial range II: 620 - 670 nm
- partial range III - VI: 650 - 670 nm

Max. ambient temperature
- +10 °C to +45 °C

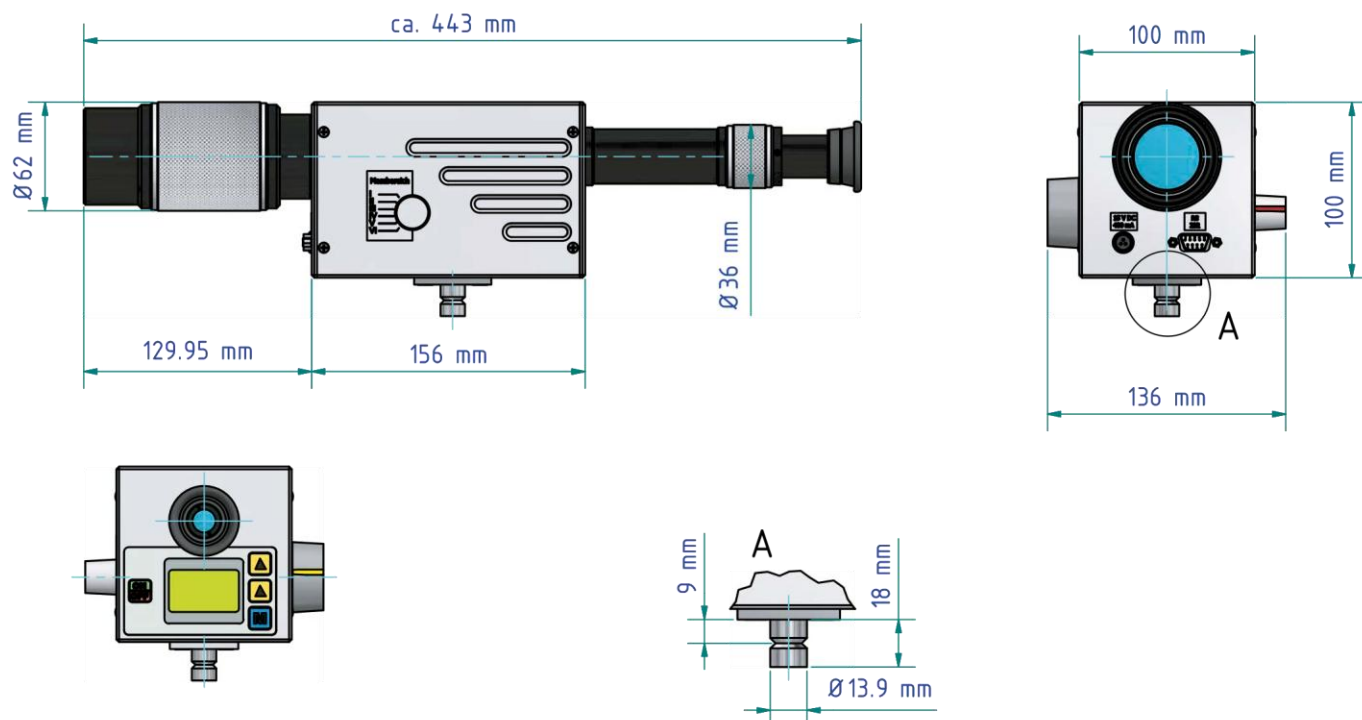**Storage temperature**
- 0 °C to +55 °C

Housing
- Aluminium

Dimensions
- 100 x 100 x 450 mm

Dimensions

ca. 443 mm
Ø 62 mm
129.95 mm
156 mm
Ø 36 mm
100 mm
100 mm
136 mm
A
9 mm
A
18 mm
Ø 13.9 mm

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- ■ Sales and Service Center
- □ Sales abroad

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PROCESS FIELD BUS

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KELLER
infrared temperature solutions
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ACCURACY
RELIABILITY
INNOVATION

Pyrometer
CellaPort PT

for non-contact temperature measurement
from 0 °C to + 3000 °C

5 years warranty

QUALITY made in Germany

Range of models

Compact pyrometer

CellaPort Series

With 10 models, the CellaPort series covers a wide range of industrial applications where high-presision non-contact temperature measurement is required.

The CellaPort series is based on a modular concept consisting of the following components: optics, signal acquisition and processing, data output and sighting aid. The optical system (1) comes with one of five available lenses. The selection depends on the target size and measuring distance of the application. It is infinitely adjustable to ensure high precision across a wide focusing range.

The aperture (2) determines the shape of the measuring field. A circular area is the standard shape. A rectangular target area is optionally available for two-colour pyrometers.

Two-colour pyrometer			
Model	Temperature range	Application	Shot shape
PT 140	500 - 1400 °C		○
	650 - 1700 °C	Metals, cement, lime, graphite, crystal growing	○
	750 - 2400 °C		○
	850 - 3000 °C		○
PT 143	600 - 1400 °C		▭
	650 - 1700 °C	Wires, rods, heating coils, heating tapes, glass gobs	▭
	750 - 2400 °C		▭

PT 147	700 - 1700 °C	Sooty flames	○
PT 180	750 - 2400 °C	Molten metals	○
PT 183	650 - 1700 °C	Molten metals	▢

sensor) and two-colour (two-channel sensor) model.

The CellaPort's special signal processing unit (4) combined with a high-analogue-to-digital conversion enables a wide measuring span while the temperature resolution remains uniformly high across the entire measuring range.

The temperature value (5) is displayed on the LED screen and transmitted through the USB output.

The parallax-free reflex optics used as a sighting aid (6) ensures perfect targeting, focusing and aligning to the measuring area. A diopter correction compensates bad eyesight and a polarization filter protects the eye from very bright measuring objects.

A laser spot light for long distance alignment is optionally available to replace the ocular lens.

Thanks to the aluminum housing, the CellaPort is designed for extreme industrial environments.

A DC-based sensor (3) without moving parts detects the infrared radiation emitted from the measuring object. The CellaPort is available as one (single-channel

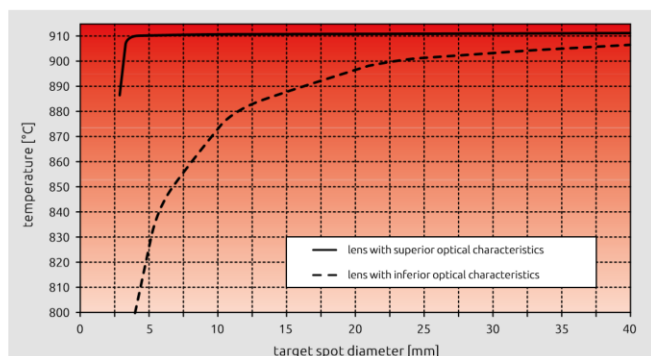| Single-colour pyrometer			
Model	Temperature range	Application	Shot shape
PT 110	0 - 1000 °C	Non metallic, oxidized metal surfaces	○
PT 113	500 - 1600 °C	Furnace with flames	○
PT 115	300 - 1300 °C	Glass surface	○
	500 - 2500 °C		
PT 117	400 - 2000 °C	hot CO_2 containing gases	○
PT 118	500 - 2500 °C	hot CO containing gases	○
PT 120	250 - 2000 °C	Metals, ceramics, molten glass	○
PT 128	75 - 650 °C	Metals, ceramics, molten glass	○
PT 129	150 - 800 °C	Aluminium, reflective metals, laser applications	○
	180 - 1200 °C		
PT 130	500 - 2500 °C	Metals, ceramics at high temperature	○
PT 135	600 - 3000 °C	Ultra accurate measurement of metals, semi-conductors	○
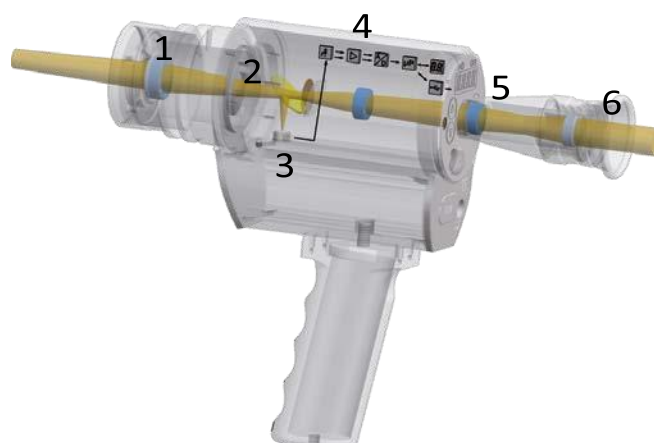
Pyrometer CellaPort PT

Special Features

- Ranges 0 - 3000 °C / 32 - 5432 °F
- Parallax-free and through-the-lens sighting with diopter correction and widened interpupillary distance
- Reflex optics with large field of view and target marking to visualize the exact measuring area
- Premium quality focusable optics with precise lenses for high optical resolution

- 10 models to match with all applications
- ATD function for automatic detection of objects
- One and two-colour pyrometers
- Robust aluminium housing
- Patented SSI traffic light function in the through-the-lens sighting for displaying the signal strength and the optimum measuring distance

Optics

Pyrometry is an optical process to measure temperatures. The quality of the optics greatly influences the accuracy of the measurement.

The "size of source effect" is a factor which affects the uncertainty of the measurement. Light scattered into the optical path will result in false temperature data. When the target size or the distance to the target changes, as shown in the chart, the temperature reading will change as well, depending on the quality of the optical system.

Legend:
— lens with superior optical characteristics
-- lens with inferior optical characteristics

The lower the quality of the optical system of a pyrometer, the larger is the reading error when the size of the measuring object changes.

The CellaPort features an optical system optimized for the visible and infrared range. Its superior glass lens is covered with an anti-reflective coating. Due to its superior imaging properties, the high-precision lens provides consistently high optical resolution across the entire focussing range.

In addition, the patented optic and apertures are mechanically designed to minimize sensitivity to light scattered into the sight path. The lens is infinitely adjustable and can be precisely set to the required distance between pyrometer and target.

Its anti-reflective coating makes it extremely durable, easy to clean and perfectly suitable for harsh industrial environments. Five lenses are available for different target distances and measuring object sizes.

PZ 20.08
PZ 20.03
PZ 20.06
PZ 20.01
PZ 20.05

Through-the-lens-sighting

Adjustable ocular with dioptric correction and polarizing filter

The wide field of view makes it easy to focus on the target object. The ocular features a widened interpupillary distance to accommodate users who wear glasses or a helmet. A built-in diopter compensation allows users to compensate for bad eyesight.
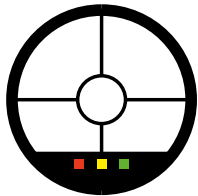
Models with a temperature range larger than 2000 °C have a built-in polarizing filter which attenuates the brightness of the target to protect the user's eye.

Housing

The aluminium housing is very robust and is perfectly suited for the use in harsh industrial environments. The CellaPort does not require extra protection.

Patented SSI traffic light function

A traffic light status indicator is integrated in the viewfinder. It informs the user of a single-colour pyrometer that the measurement is in progress, and it indicates whether the object temperature is within range.

For two-colour pyrometers, the colour of the traffic light indicates the signal strength (SSI – Signal Strength Indicator). A green LED confirms that the signal is sufficient for a reliable measurement. If the distance-to-target ratio is too large or when dust, vapour or smoke disturb the signal, the red LED lights up and the measurement is stopped.

Target marker
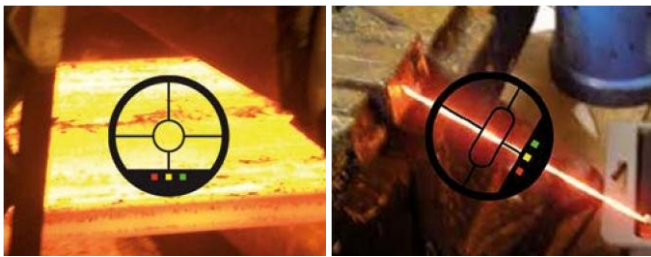
A single-colour pyrometer needs a fully illuminated target area to provide a correct measurement. The CellaPort has a target marker reflected in the optical path showing the exact size and position of the measuring area.

Instruments with a rectangular target area have a rectangular marker. With a two-colour pyrometer, the measurement area may be smaller than the object, thus allowing a measurement of thin wires.

USB Output
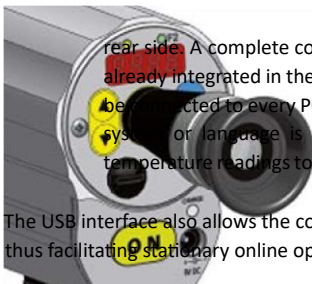
The CellaPort has a USB port on its rear side. A complete communication and operation software is already integrated in the CellaPort. The pyrometer can therefore be connected to every PC or terminal no matter which operating system or language is used. The USB interface transfers the temperature readings to a PC *Rear USB port* where they are stored.

The USB interface also allows the configuration of all parameters from a PC, thus facilitating stationary online operation.

Software CellaView

The CellaView software is included in the scope of delivery. It is a Microsoft SQL server-based database software running under Windows designed for real-time graphic display, analysis and storage of the measurement readings. Monitoring, remote control and configuration of the pyrometer are additional features of this software. The modern MDI-based user interface makes it possible to open multiple graphs at the same time. The series of measurements of up to 31 instruments can be recorded simultaneously.

- Windows-based multiple-document interface (MDI)
- Graphic display, recording and logging of measurement data • Free selection and combination of the measurement readings and status information of up to 31
- Simultaneous start of any number of diagrams to record series of measurements in parallel
- Configuration of the cycle duration for data logging and independent archiving
- Parameter setting, calibration and remote control of the pyrometers
- Saving, loading and transferring of configuration profiles of the devices
- Filtering function to reduce data volume
- Automatic device search
- Permanent connection monitoring
- Automatic archiving of the series of measurements
- Tamper-proof storage of the series of measurements
- Optional data storage in CSV format for subsequent handling in Excel
- Zoom, scroll and analysis functions
- Cursor to display the temperature and the time on the measurement curve
- Very fast data recording (milliseconds)
- Logging of user entries in a log file to check for configuration changes
- Download and software update via Internet
- No license restriction
- Runs under Windows XP, Vista, 7, 8, 10

ATD function

The CellaPort offers an ATD function (Automatic Temperature Detection).

ATD automatically recognizes the presence of the hot object and starts measuring the temperature. The measuring cycle either adapts dynamically to the duration of the object in the sight path, or it can be configured to a fixed value. An audible alarm signals the end of the measurement. The reading is displayed and, if required, transferred via interface.
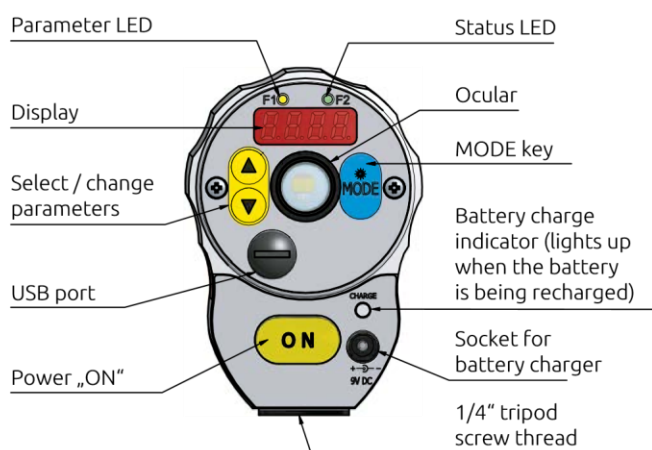
With many applications, this operating mode facilitates measurements for the user.

Audible alarm

The CellaPort is equipped with a buzzer. When using the ATD function, the signal indicates the end of the automatic temperature detection.

Control keys

The large control keys on the keypad are easy to access and operate. All parameters can be configured during running operation using the rear keypad.

Parameter LED

Display

Select / change parameters

USB port

Power „ON"

Status LED

Ocular

MODE key

Battery charge indicator (lights up when the battery is being recharged)

Socket for battery charger

1/4" tripod screw thread

LED display

The CellaPort features a brightly lit 8 mm LED display showing temperature readings, configuration and function parameters and the battery status. During stationary operation the LED display is readable from large distances. Two status LEDs can be custom-configured to indicate operating conditions.

Adjustable parameters

- Number of storage positions for material emissivities
- Smoothing filter
- Memory mode and hold time
- Measuring mode
- Emissivity / emissivity ratio
- Transmittance of windows
- Background radiation correction
- Alarm contacts (mode and limits)
- ATD function parameters
- Linearization
- LED status display
- Temperature scale °C / °F
- User calibration
- Automatic shut off

In addition, for two-colour pyrometers
- Measuring channel: two-colour – one colour
- Signal strength threshold
- Soot factor (at the CellaCombustion PT 147)

Background correction

The radiation of a hot furnace wall reflected on a colder object may cause false measurements. The CellaPort uses a correction function to eliminated this stray radiation.

Emissivity correction

The heat radiation of a measuring object depends on the material and its surface. Adjust the material constant, i.e. the emissivity (or the emissivity ratio with a two-colour pyrometer) on the CellaPort for the material you want to measure. When the object temperature is known, enter it into the pyrometer which automatically defines the emissivity.

The CellaPort proposes up to 10 pre-defined material emissivities to be selected with the corresponding keys.

Max. value storage

A maximum value storage supplies safe measuring results for discontinuing processes or inhomogeneous measuring objects.

Measuring area

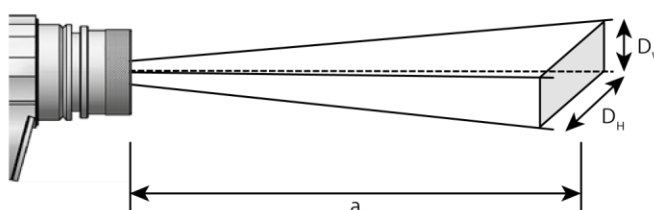For pyrometers with focusable optics, the optical ratio D is defined as ratio of the measurement field over the measuring distance.

The diameter of the measurement area at the focus distance results from the formula:
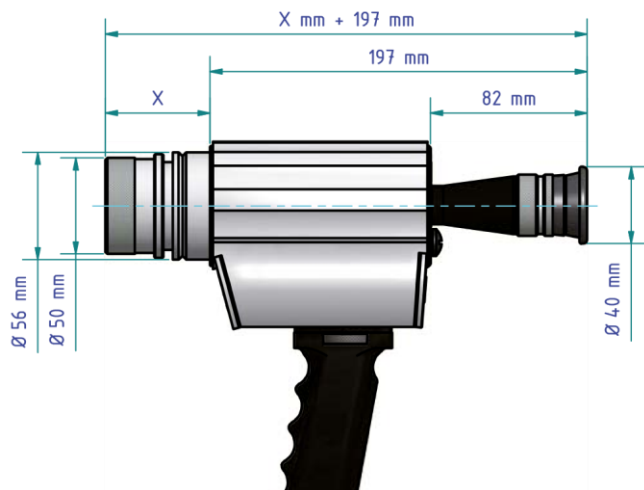
$$d = \frac{a}{D}$$
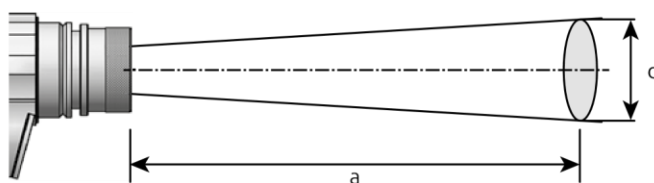
For models with rectangular field of view, the definition is extended to the horizontal D_H and vertical D_V optical ratio.

EMV standard

- DIN EN IEC 61000-6-2:11/2019
- DIN EN IEC 61000-6-4:09/2020
- BS EN IEC 61000-6-2:2019
- BS EN IEC 61000-6-4:2019

Technical data *

Temperature ranges
- A s per table of models

Resolution display
- 1 K

Resolution USB port
- 0.1 K

Temperature coefficient • ≤ 0.05 %/K
    Referenced to 23 °C

Response time t_{98}
- As per table of models

LED display (7 segments)
- 4-digit
    (digit height 8 mm)

Power supply •
Rechargeable
        battery
pack

Battery life
- approx. 15 hours
    (based on continuous
    operation at Ta = 23°C)

Permissible humidity
- 9 5 % r.h. max.
    (non-condensing)

Ambient operating temperature
- 0 - +50 °C

Storage temperature
- -20 - +60°C

Material
- housing: aluminium
    handle: polyamide

Protection
- IP 40 according to
    DIN 40050

Weight
- approx. 1.1 kg

Sighting
- T rue-sided through-the-lens
    sighting, parallax free, target
    spot indicator, diopter
    compensation, polarizing filter

Diopter range
- -3 - +1 diopters,   adjustable

Digital output
- USB

Buzzer alarm
- Highly configurable

Tripod
- 3/8" for housing and
    handle

Memory modes
- Current, maximum,
        average values

ATD function
- A utomatically identifies the
    target and detects its
    temperature

SSI traffic light function
- f or displaying the signal
    strength

CSD filter function
- f or measuring the oxide- and
    slag-free molten metal (PT
    180 / PT 183)

Protective glass   Supplementary lens

Shipment includes

- Pyrometer CellaPort
- Battery charger
- USB cable VK 11/D (1.8 m)
- CellaView software
- Protective carrying case
- Instruction manual
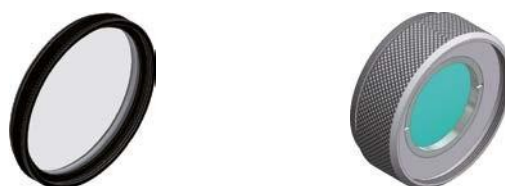- Calibration certificate according to ISO 9001

In addition for CellaCast PT 183
- Protective glass 70146

* Specifications of the technical data according to DIN IEC TS 62492-1 and DIN IEC TS 62492-2

Calibration of the pyrometers according to VDI / VDE 3511 sheet 4.4
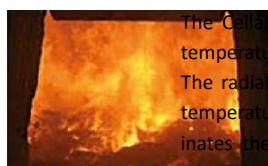
Accessories

Single-colour pyrometer

Technical data									
Model	Range	Spectral range	Lense	Focus range	Distance ratio	FOV	Response time t_{98}	Precision*	Repro-ducibility
PT 110 ...	For non-metal materials, such as ceramics, wood, rubber, synthetic materials, textiles, paper								
AF 1	0 - 1000 °C		PZ 10.01	0.30 m - ∞	50 : 1	10.8°	≤ 30 ms	1 % of reading, min. 2 K	1 K
AF 2	32 - 1832 °F	8 - 14 µm	PZ 10.05	0.15 m - 0.30 m	48 : 1	10.8°			
PT 120 ...	For metallic surfaces, ceramics, liquid glass at medium temperature range								
AF 1			PZ 20.01	0.40 m - ∞	175 : 1	7.1°	≤ 50 ms (T>250 °C)	0.3 % of reading, min. 4 K	1 K
AF 2	250 - 2000 °C	1.1 - 1.7 µm	PZ 20.03	0.20 m - 0.40 m	150 : 1	7.0°			
AF 3	482 - 3632 °F		PZ 20.06	1.20 m - ∞	275 : 1	4.5°	≤ 2 ms		
AF 4			PZ 20.05	0.20 m - ∞	40 : 1	27.0°	(T>750 °C)		
PT 130 ...	For metallic surfaces, ceramics, liquid glass at high temperature range								
AF 1			PZ 20.01	0.40 m - ∞	210 : 1	7.1°	≤ 50 ms (T>550 °C)	0.3 % of reading, min. 4 K	1 K
AF 2	500 - 2500 °C	0.78 - 1.06 µm	PZ 20.03	0.20 m - 0.40 m	200 : 1	7.0°			
AF 3	932 - 4532 °F		PZ 20.06	1.20 m - ∞	310 : 1	4.5°	≤ 2 ms		
AF 4			PZ 20.05	0.20 m - ∞	55 : 1	27.0°	(T>750 °C)		

*(at ε = 1 and Ta = +23 °C)

Pyrometers for special applications

CellaPort PT 113

The CellaPort PT 113 is specially designed for temperature measurement. The radiation properties. The pyrometers are used to measure the exhaust temperature in gas-fired boilers and small combustion plants. inates the influence on the reading caused by water vapour and CO2 in the detector's field of view even at

large target distances. This allows an accurate measurement through flames and combustion gases. With this instrument, stray radiation emitted from a hot background affects a measurement of a colder object in a hot furnace environment to a much lesser extent than with pyrometers working in a short-wave range. This CellaPort model is configurable to compensate the reflected background radiation and to determine the true temperature.

CellaCombustion PT 117

The CellaCombustion PT 117 uses a specific wavelength, in which hot carbonaceous gases have a high optical density and therefore good measurements in flame-heated furnaces. The narrow spectral range of 3.9 µm eliminates gas

CellaCombustion PT 118

The CellaCombustion PT 118 uses a specific wavelength, in which the emitted from a hot background affects a measurement of a colder chemical components of the hot combustion gas have a high optical density. The devices are used in large combustion plants such as thermal waste-disposal plants and coal power plants.

CellaPort PT 128

The CellaPort PT 128 is equipped with a light-intense lens and a special sensor for the reliable low temperature measuring of metals.

CellaPort PT 115

Glass is transparent in the visible spec-

tral range and in the near infrared range. Its emissivity is a function of

CellaPort PT 129

the temperature, the wavelength, the colour, the type and the thickness of The CellaPort PT 129 uses a special blocking filter which prevents the glass. Glass has an emissivity of daylight influences on the reading. It is considerably less sensitive nearly 100 % in the spectral band to reflecting stray radiation caused by hot objects in the pyrometer from 4.6 - 4.9 µm. Atmospheric influences such as humidity and environment than traditional short-wave models. Thus, the CellaPort vapour have an effect on the measurement above 5 µm. PT 129 works perfectly for a large variety of applications in the metal-working industry and specially for the temperature measurement The CellaPort PT 115 uses a blocking filter with a spectral sensitivity of aluminium and polished metals at low temperatures. The blocking of 4.6 - 4.9 µm, thus capturing the temperature from the near surface filter facility makes it also ideal for the measurement of processes of the glass. With this wavelength, varying thicknesses or types of using diodes, Nd:YAG or CO2 lasers for heating. The high energy laser glass or changing humidity do not affect the temperature reading. radiation does not affect the temperature reading.

Pyrometers for special applications

CellaPort PT 135
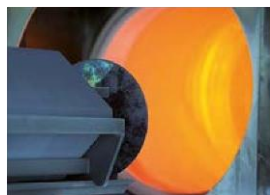
The CellaPort PT 135 features a narrow-band, short wavelength spectral response to minimize the effect of interferences which lead to measurement errors. Detectors which respond

to narrow wavebands at short wavelengths are far less susceptible to fluctuating emissivity or signal atten-

uation due to sight path obstructions such as dust, steam, smoke or a dirty lens. Metal surfaces, for example, exhibit higher emissivity at shorter wavelengths and at higher temperatures.

Due to the special wavelength, CellaPort PT 135 is especially suitable for temperature detection of metals and high-temperature applications. The pyrometer's specific spectral sensitivity is also ideal for the silicon wafer production process. Silicon is transparent at wavelengths > 1µm. Standard pyrometers will see through the silicon surface and detect the temperature of the material below it.

CellaCombustion PT 147

The CellaCombustion PT 147 is a special pyrometer for non-contact temperature measurement of sooty flames in coal power plants or waste incineration plants. The measurement and signal processing based on the two-colour method detects the heat radiation of the sooty particles of the flame in the near infrared range at two wavelengths. The burn-out operation can be controlled by the flame temperature to reduce the pollutant emission and to minimize the slagging of the walls in the combustion chamber.

Technical data									
Model	Range	Spectral range	Lense	Focus range	Distance ratio	FOV	Response time t_{98}	Precision*	Repro-ducibility
PT 113 ...	For measurements in combustion plants and flame-heated furnaces								
AF 1	500 - 1600 °C 932 - 2912 °F	3.9 µm	PZ 15.03	0.60 m - ∞	45 : 1	7.1°	≤ 100 ms	1 % of reading	2 K
PT 115 ...	For glass surfaces								
AF 1	500 - 2500 °C 932 - 4532 °F	4.6 - 4.9 µm	PZ 15.03	0.80 m - ∞	70 : 1	7.1°	≤ 100 ms	0.75 % of reading	2 K
AF 2	300 - 1300 °C 572 - 2372 °F		PZ 15.03	0.80 m - ∞	45 : 1	7.1°		0.75 % of reading, min. 3 K	
PT 117 ...	For measurements in environments with hot, CO_2-containing gases (e.g. in gas-fired boilers and small combustion plants)								
AF 1	400 - 2000 °C 752 - 3632 °F	CO_2 range	PZ 15.03	0.80 m - ∞	75 : 1	7.1°	≤ 100 ms	0.75 % of reading + 1 K	2 K
PT 118 ...	For measurements in environments with hot combustion gases (e.g. in thermal waste-disposal plants and coal power plants)								
AF 1	500 - 2500 °C 932 - 4532 °F	CO range	PZ 15.03	0.80 m - ∞	70 : 1	7.1°	≤ 100 ms	0.75 % of reading	2 K
PT 128 ...	For measurements of aluminium, polished metal surfaces and laser applications at low temperatures								
AF 10	75 - 650 °C 167 - 1202 °F	1.8 - 2.4 µm	PZ 20.08	0.30 m - ∞	48 : 1	10.8°	≤ 50 ms (T>150 °C) ≤ 2 ms (T>350 °C)	0.75 % of reading, min. 5 K	1 K
PT 129 ...	For measurements of aluminium, polished metal surfaces and laser applications								
AF 10	150 - 800 °C 302 - 1472 °F	1.8 - 2.2 µm	PZ 20.08	0.30 m - ∞	48 : 1	10.8°	≤ 50 ms (T>150 °C) ≤ 2 ms (T>350 °C)	0.75 % of reading, min. 5 K	1 K
AF 21			PZ 20.01	0.40 m - ∞	60 : 1	7.1°	≤ 75 ms		
AF 22	180 - 1200 °C 356 - 2192 °F		PZ 20.03	0.20 m - 0.40 m	56 : 1	7.0°	(T>180 °C) ≤ 2 ms (T>600 °C)		
AF 23			PZ 20.06	1.20 m - ∞	96 : 1	4.5°			
PT 135 ...	For the precise measurement of metals, very high temperatures and semiconductors								
AF 11	600 - 3500 °C 1112 - 5432 °F	0.82 - 0.93 µm	PZ 20.01	0.40 m - ∞	210 : 1	7.1°	≤ 50 ms (T>650 °C) ≤ 2 ms (T>850 °C)	0.3 % of reading, min. 4 K	1 K
AF 12			PZ 20.03	0.20 m - 0.40 m	200 : 1	7.0°			
AF 13			PZ 20.06	1.20 m - ∞	310 : 1	4.5°			
AF 14			PZ 20.05	0.20 m - ∞	55 : 1	27.0°			

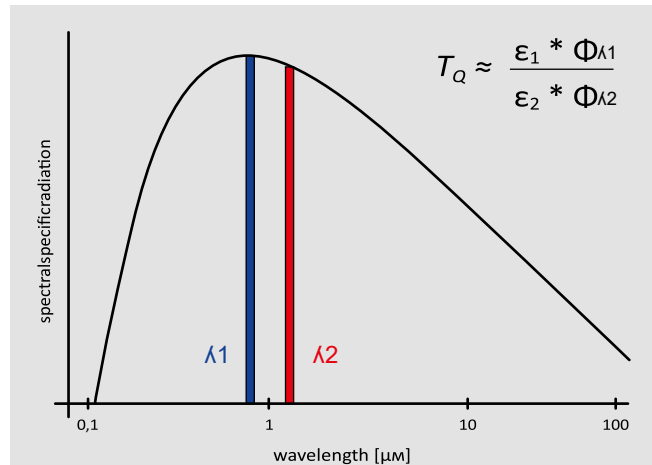| PT 147 ...	For the measurement of sooty flames (e.g. in power plants or incineration plants)								
AF 1	700 - 1700 °C 1292 - 3092 °F	0.8 / 1.05 µm	PZ 20.01	0.40 m - ∞	80 : 1	7.1°	≤ 10 ms (T>750 °C)	1 % of reading	2 K

*(at ε = 1 and Ta = +23 °C)

Two-colour pyrometer

CellaPort PT 140 / CellaCast PT 180

A two-colour or ratio pyrometer is far less sensitive to contaminants in the line of sight such as steam, dust or smoke than a standard sinThe two-colour pyrometers CellaPort PT 140 and CellaCast PT 180 gle-colour pyrometer. The same holds true for other sources of visidetect the infrared radiation emitted from the measuring object, bility impairment such as dirt on the pyrometer lens or sediment and using a two-element photodiode to capture both radiation intensities debris buildup within the sight tube of the furnace. simultaneously from the exact same spot.

The two-colour method enables the pyrometer to correct for measThe advantage of the two-colour or dual wavelength technique is urement errors which would otherwise occur when a material's emisthat the pyrometer will still produce highly accurate temperature sivity varies as a function of temperature or surface properties, or data, even at signal attenuation of up to 90%. when the pyrometer is used at a production line which produces a variety of products having different emissivities.

The

An online analysis of of the

object can

The liquid equipped correct

$$T_Q \approx \frac{\varepsilon_1 * \Phi_{\lambda 1}}{\varepsilon_2 * \Phi_{\lambda 2}}$$

λ1   λ2

spectralspecificradiation

wavelength [μm]

0,1   1   10   100

CellaPort PT 140 not only captures the two-colour temperature but independently also the two single-colour temperatures.

measurement with temperature recording thus provides an these three readings and allows conclusions regarding the quality readings and of the radiation behaviour of the measured object.

Information on the radiation characteristics of the measuring be displayed on the pyrometer.

CellaCast PT 180 is designed for temperature measurement of metals in the runner of blast furnaces and cupola furnaces. It is with a CSD (Clean Surface Detection) function to measure the temperature of the oxide- and slag-free molten metal.

| Technical data									
Model	Range	Spectral range	Lense	Focus range	Distance ratio	FOV	Response time t_{98}	Precision*	Repro-ducibility
PT 140 ...	For use in these industries: steel, ceramics or cement in harsh environments								
AF 20	500 - 1400 °C 932 - 2552 °F	0.95 / 1.05 μm	PZ 20.08	0.30 m - ∞	55 : 1	10.8°	≤ 10 ms (T>650 °C)	1 % of reading	2 K
AF 1	650 - 1700 °C 1202 - 3092 °F		PZ 20.01	0.40 m - ∞	80 : 1	7.1°	≤ 10 ms (T>750 °C)		
AF 2			PZ 20.03	0.20 m - 0.40 m	75 : 1	7.0°			
AF 3			PZ 20.06	1.20 m - ∞	120 : 1	4.5°			
AF 4	750 - 2400 °C 1382 - 4532 °F		PZ 20.01	0.40 m - ∞	150 : 1	7.1°	≤ 10 ms (T>950 °C)		
AF 5			PZ 20.03	0.20 m - 0.40 m	140 : 1	7.0°			
AF 6			PZ 20.06	1.20 m - ∞	240 : 1	4.5°			
AF 7	850 - 3000 °C 1562 - 5432 °F		PZ 20.01	0.40 m - ∞	150 : 1	7.1°	≤ 10 ms (T>1050 °C)		
AF 8			PZ 20.03	0.20 m - 0.40 m	140 : 1	7.0°			
AF 9			PZ 20.06	1.20 m - ∞	240 : 1	4.5°			
PT 180 ...	For measurement of molten metals								
AF 4	750 - 2400 °C 1382 - 4532 °F	0.95 / 1.05 μm	PZ 20.01	0.40 m - ∞	150 : 1	7.1°	≤ 10 ms (T>950 °C)	1 % of reading	2 K
AF 6			PZ 20.06	1.20 m - ∞	240 : 1	4.5°			

*(at ε = 1 and Ta = +23 °C)

Two-colour pyrometer with rectangular field of view

CellaPort PT 143

The CellaWire PT 143 features a rectangular measurement area. The target object can move freely within this area.
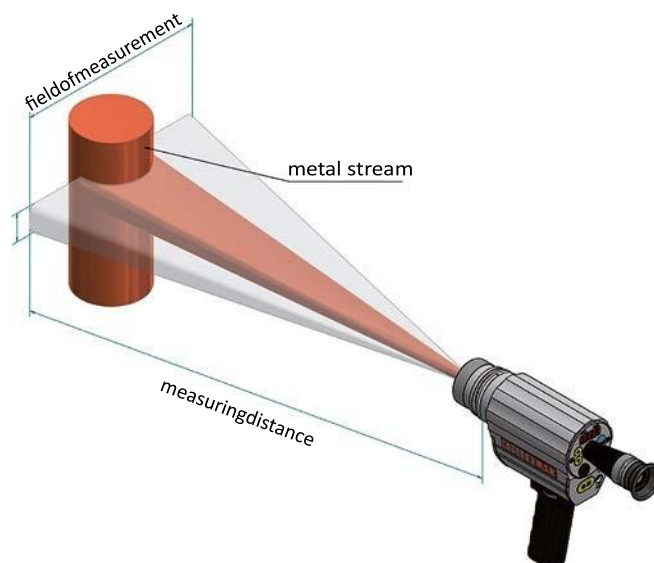
CellaPort with rectangular measuring area

Therefore, the temperature of moving objects, such as swaying wires can be reliably captured. The rectangular area is also ideal when the position of the object tends to vary during the production process. Such objects include billets or metal rods at a roller table.

Even with very small objects, such as filament wires, it is much easier with a mobile pyrometer to aim at a target when the measurement area is rectangular instead of circular.

Technical data									
Model	Range	Spectral range	Lense	Focus range	Distance ratio	FOV	Response time t_{98}	Precision*	Repro-ducibility
PT 143 ...	For use in these industries: steel, ceramics, or cement in harsh environments								
AF 20	600 - 1400 °C 1112 - 2552 °F		PZ 20.08	0.30 m - ∞	D_v= 150 : 1 D_h= 30 : 1	10.8°	≤ 10 ms (T>650 °C)		
AF 1	650 - 1700 °C 1202 - 3092 °F	0.95 / 1.05 µm	PZ 20.01	0.40 m - ∞	D_v= 230 : 1 D_h= 45 : 1	7.1°	≤ 10 ms (T>750 °C)	1.5 % of reading	3 K
AF 2			PZ 20.03	0.20 m - 0.40 m	D_v= 215 : 1 D_h= 40 : 1	7.0°			
AF 3			PZ 20.06	1.20 m - ∞	D_v= 375 : 1 D_h= 75 : 1	4.5°			
AF 10			PZ 20.05	0.20 m - ∞	D_v= 55 : 1 D_h= 10 : 1	27.0°			
AF 13			PZ 20.08	0.30 m - ∞	D_v= 150 : 1 D_h= 30 : 1	10.8°			
AF 4	750 - 2400 °C 1382 - 4532 °F		PZ 20.01	0.40 m - ∞	D_v= 350 : 1 D_h= 50 : 1	7.1°	≤ 10 ms (T>950 °C)		
AF 5			PZ 20.03	0.20 m - 0.40 m	D_v= 330 : 1 D_h= 45 : 1	7.0°			
AF 6			PZ 20.06	1.20 m - ∞	D_v= 580 : 1 D_h= 85 : 1	4.5°			

| AF 11 | | | PZ 20.05 | 0.20 m - ∞ | D_v= 85 : 1
D_h= 11 : 1 | 27.0° | | | |
| AF 14 | | | PZ 20.08 | 0.30 m - ∞ | D_v= 230 : 1
D_h= 34 : 1 | 10.8° | | | |

*(at ε = 1 and Ta = +23 °C)

Two-colour pyrometer for molten metals

CellaCast PT 183

The CellaCast PT 183 was specially designed for mobile temperature detection of molten metal. This pyrometer can capture the temperature of a metal stream poured from a foundry ladle or discharged from a bottom-pour ladle into the moulds.The challenge of this temperature measurement application: the position of the pour stream varies with the tilt angle or pouring nozzle of the ladle. The CellaCast PT 183 features a rectangular measurement area.

As long as the moving target remains somewhere within this rectangular area, the pyrometer captures the pour and produces an accurate temperature reading.

The pyrometer is also ideal for temperature detection when molten metal is transferred from the melting furnace to the transfer or pouring ladles.

Measuring molten metal

Liquid metal presents a unique challenge due to the composition of its surface which is particularly susceptible to slag and oxides which have a significant effect on the radiation properties of the material. To obtain accurate temperature data, it is essential that the pyrometer only detects the IR energy emitted from the metal surface. The PT 183 is equipped with a special algorithm which filters out the signal obtained from the metal surface which is free of slag and oxides.

Only a pyrometer can detect temperature at the crucial moment in the casting process: just as the mould is being filled, and the pyrometer verifies the temperature of each individual workpiece.

Immersion probes can only detect molten metal temperature at the furnace or ladle but they cannot capture the molten metal steam as it pours into the mould. Therefore, it is impossible to verify the temperature of each individual workpiece.

Another disadvantage: data accuracy is subject to the precision with which the foundry operator performs the measurement. Temperature readings will vary, depending on immersion depth and position of the probe. The pyrometer requires virtually no maintenance and does not contain parts subject to wear. Foundries eliminate the need for expendable thermocouple tips and thus reduce their operating costs.

Technical data									
Model	Range	Spectral range	Lense	Focus range	Distance ratio	FOV	Response time t_{98}	Precision*	Repro-duci-bility
PT 183 ...	For measurement of molten metals								
AF 1	500 - 1700 °C 1202 - 3092 °F	0.95 / 1.05 μm	PZ 20.01	0.40 m - ∞	D_v = 230 : 1 D_h = 45 : 1	7.1°	≤ 10 ms (T>750 °C)	1.5 % of reading	3 K
AF 3			PZ 20.06	1.20 m - ∞	D_v = 375 : 1 D_h = 75 : 1	4.5°			
AF 13			PZ 20.08	0.30 m - ∞	D_v = 150 : 1 D_h = 30 : 1	10.8°			

*(at ε = 1 and Ta = +23 °C)

Measuring spot size														
Model		Distance [m]												
		0.3	0.4	1	1.2	2	3	4	5	6	7	8	9	10
PT 183 AF 1	Measuring spot size [mm]		9	22	27	44	67	89	111	133	156	178	200	222
PT 183 AF 3					13	27	40	53	67	80	98	107	120	147
PT 183 AF 13		10	13	33	40	66	100	133	166	200	233	266	300	330

Supplementary lenses

An additional lens can be mounted onto the pyrometer's lens system to capture target spots as small as Ø 0.4 mm.

The pyrometer models can be combined with four supplementary lenses, providing additional optical resolutions for maximum versatility as shown in the chart below.

Electronics

Lens system

Supplementary lens
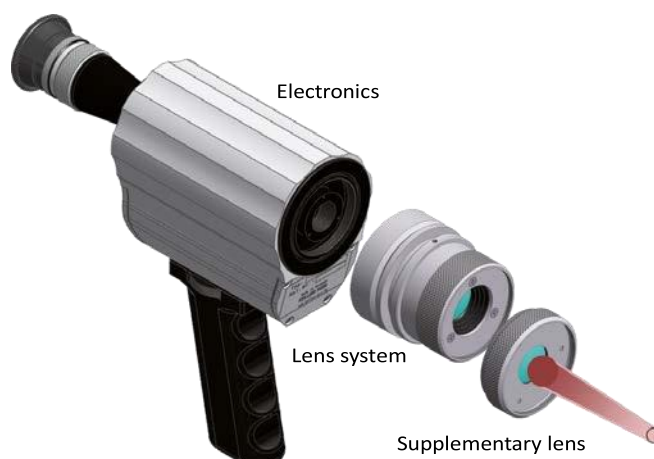
Pyrometer	Supplementary lenses							
Typ	PZ 20/O-50		PZ 20/O-63		PZ 20/O-75		PZ 20/O-120	
	distance [mm]	spot size Ø in mm	distance [mm]	spot size Ø in mm	distance [mm]	spot size Ø in mm	distance [mm]	spot size Ø in mm
PT 120 AF 1 / 5 PT 129 AF 1 PT 130 AF 1 PT 135 AF 1 PT 140 AF 4	36 - 41	0.35 - 0.45	45 - 54	0.40 - 0.60	52 - 63	0.45 - 0.70	84 - 112	0.70 - 1.10
PT 120 AF 2 / 6 PT 129 AF 2 PT 130 AF 2 PT 135 AF 2 PT 140 AF 5	31 - 36	0.30 - 0.40	38 - 45	0.35 - 0.50	43 - 52	0.40 - 0.60	66 - 84	0.55 - 0.90
PT 120 AF 3 / 7 PT 129 AF 3 PT 130 AF 3 PT 135 AF 6 PT 140 AF	41	0.30					101 - 112	0.55 - 0.67
PT 128 AF 10	34 - 41	1.28 - 1.75						
PT 129 AF 10	34 - 41	1.28 - 1.75						
PT 129 AF 21 / 22			45 - 54	1.05 - 1.5	52 - 63	1.2 - 1.75		
PT 129 AF 23							101 - 112	1.43 - 1.75
PT 40 AF 1	36 - 41	0.65 - 0.90	45 - 54	0.80 - 1.10	52 - 63	0.90 - 1.40	84 - 112	1.30 - 2.10
PT 40 AF 2	31 - 36	0.60 - 0.80	38 - 45	0.70 - 1.00	43 - 52	0.80 - 1.10	66 - 84	1.10 - 1.70
PT 40 AF 3	41	0.55					101 - 112	1.10 - 1.40

Supplementary lenses

Pyrometer		Supplementary lenses							
		PZ 20/O-50		PZ 20/O-63		PZ 20/O-75		PZ 20/O-120	
Typ		distance [mm]	spot size Ø in mm	distance [mm]	spot size Ø in mm	distance [mm]	spot size Ø in mm	distance [mm]	spot size Ø in mm
PT 143 AF 1	h	36 - 41	1.2 - 1.6	45 - 54	1.4 - 2	52 - 63	1.6 - 2.4	84 - 112	2.4 - 3.8
	v		0.2 - 0.3		0.3 - 0.4		0.5		0.5 - 0.8
PT 143 AF 2	h	31 - 36	1.1 - 1.4	38 - 45	1.3 - 1.7	43 - 52	1.4 - 2	66 - 84	2 - 2.9
	v		0.2 - 0.3		0.3		0.3 - 0.4		0.6
PT 143 AF 3	h	41	1					101 - 112	1.9 - 2.4
	v		0.2						0.4 - 0.5
PT 143 AF 13	h	34 - 41	1.7 - 2.4					77 - 112	3.5 - 5.7
	v		0.3 - 0.5						0.7 - 1.1
PT 143 AF 4	h	35 - 41	1.0 - 1.4	45 - 54	1.3 - 1.8	52 - 63	1.4 - 2.1	84 - 112	2.1 - 3.4
	v		0.2		0.2 - 0.3		0.3 - 0.4		0.4 - 0.6
PT 143 AF 5	h	31 - 35	0.9 - 1.2	38 - 45	1.1 - 1.5	43 - 52	1.3 - 1.8	66 - 84	1.8 - 2.6
	v		0.2		0.2 - 0.3		0.2 - 0.3		0.4
PT 143 AF 6	h	41	0.9					101 - 112	1.7 - 2.1
	v		0.1						0.3
PT 143 AF 14	h	34 - 41	1.5 - 2.1					77 - 112	3.1 - 5
	v		0.3						0.5 - 0.8

Applications

Asphalt and concrete mixing

Crystal growing

Coke oven

Wires, tubes and rods

Filaments / Metal bands

Runner

Incineration plant

Rolling mill

Blast furnace / stove dome

Power plant

Continuous casting

Rotary kiln

Sinter plant

Glass production

Induction heating

Other products

CellaTemp PA
Versatile pyrometers with focusable lens, through-the-lens sighting/ laser spotlight or video camera.

CellaTemp PA-LWL
Versatile fiber optics pyrometers with focusable head and laser spotlight.

CellaTemp PK(L)
Compact infrared thermometer for cramped environments. Optional with LED spot light.

CellaTemp PKF
Compact infrared thermometer with optical fibre and optical sensor head.

CellaTemp PZ
Profibus pyrometers with focusable lens, through the lens sighting or laser spotlight.

CellaTemp® PZ-LWL
Pyrometer with Profibus interface, fibre optics, focusable measuring heads and laser spot light.

Mikro PV
Intensity comparison pyrometer for ultra accurate measurement.

CellaSwitch
Compact infrared switch with LED display and auto-diagnostics.

Since 1967, the Division Infrared Thermometer Solutions (ITS) of KELLER HCW GmbH develops and manufactures precision instruments and systems solutions for non-contact temperature measurements. Thanks to the continuous development of its range, KELLER ITS now is one of the leading providers for infrared thermometers and pyrometers worldwide.

With its very large product range of more than 250 models and systems KELLER ITS offers solutions for all standard applications and a variety of special measuring tasks.

Following the KELLER philosophy, the key focus in the development and production of the devices is set to the high measuring accuracy and reliability. Therefore, KELLER grants a warranty of 5 years on its products.

A global network of distributors and service points ensures competent and personal consultation on site.

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infrared
temperature
solutions
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No1 in terms of
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1350

MODE

Pyrometer
CellaTemp® PA

for non-contact temperature measurement
from 0 °C to + 3500 °C

Range of models

Compact pyrometer

Pyrometer with fibre optic cable and optical head

Single-colour pyrometer

Model	Temperature range	Application	Shot shape
PA 10	0 - 1000 °C	nonmetals	○
PA 13	500 - 1600 °C	flame heating	○
PA 15	300 - 1300 °C	glass surfaces	○
	500 - 2500 °C		
PA 17	400 - 2000 °C	hot CO_2 containing gases	○
PA 18	500 - 2500 °C	hot CO containing gases	○
PA 20	250 - 2000 °C	metals, ceramics, molten glass	○
	350 - 2500 °C		
PA 28	75 - 650 °C	aluminium; bright, shiny metal surfaces; laser applications	○
PA 29	150 - 800 °C	aluminium; bright, shiny metal surfaces; laser applications PVD coating process	○
	180 - 1200 °C		
	250 - 2000 °C		
	350 - 2500 °C		
PA 30	500 - 2500 °C	metals, ceramics, high temperatures	○
PA 35	600 - 3500 °C	precise measurement of metals, semiconductors	○
PA 38	450 - 1800 °C	coating and heat treatment of semiconductor wafers	○

Single-colour pyrometer

Model	Temperature range	Application
PA 21	300 - 2000 °C	metals, ceramics, molten glass
	450 - 2500 °C	
PA 31	550 - 2500 °C	metals, ceramics, high temperatures
	700 - 3000 °C	
PA 36	650 - 3000 °C	precise measurement of metals, semiconductors

Two-colour pyrometer			
Model	Temperature range	Application	Shot shape
PA 40	500 - 1400 °C	metals, cement, lime, graphite, glass gobs, crystal pulling	○
	650 - 1700 °C		○
	750 - 2400 °C		○
	850 - 3000 °C		○
PA 43	600 - 1400 °C	wires, rods, heating coils, filaments	▢
	650 - 1700 °C		▢
	750 - 2400 °C		▢
	850 - 3000 °C		▢
PA 44	750 - 2400 °C	silicon, silicon carbide	○
	850 - 3000 °C		
PA 45	900 - 3200 °C	Graphite production, Crystal growing	○
PA 47	700 - 1700 °C	sooty flames	○
PA 50	500 - 1400 °C	metals at low temperatures	○
PA 60	300 - 800 °C	metals at very low temperatures	○
	400 - 1000 °C		
PA 64	500 - 1400 °C	CVD coating process	○

Two-colour pyrometer		
Model	Temperature range	Application
PA 41	700 - 1800 °C	metals, cement, lime, graphite, glass gobs, crystal pulling
	800 - 2400 °C	
	900 - 3000 °C	
	1100 - 3000 °C	

Pyrometer CellaTemp® PA

Special Features

- Wide measuring ranges with high resolution
- Modular design: Electronics and optionally up to 5 optics
- Focusable optics • Parameters adjustable via control keys
- 3 target sighting options: through-the-lens, colour video camera or laser spot light
- 2 analogue outputs, 2 switching outputs, inputs provide options

- Compact models and fibre optic models
- Two-colour and single-colour pyrometers

- USB and RS-485 bus interface
  - SCM function for dirty window monitoring (two-color pyrometer)
- Option: ATD function (automatic temperature detection) versatile configuration

CellaTemp® PA Series
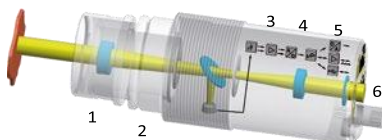
The CellaTemp ® PA Pyrometer Series is based on a modular concept consisting of the following components: optics, sensor and signal processing, data output and target sighting.

electronics

interchangeable lenses

PZ 20.08
PZ 20.03
PZ 20.06
PZ 20.01
PZ 20.05

The optical system (1) comprises one of five available objective lenses. Select the one most suitable, depending on the required target size and measuring distance. The pyrometer is infinitely adjustable to ensure superior precision across a wide focusing range. The aperture (2) determines the shape of the measurement area. As a standard, the pyrometer features a circular measurement spot. As an option, the two-colour pyrometer models can be equipped with a rectangular measurement area.

Analogue output 1 can be assigned to the current temperature reading, whereas output 2 can be programmed to perform another signal processing task such as maximum value, average value or to monitor the device's internal temperature.

A sensor (3) detects the IR radiation emitted by an object's surface. It is based on the latest DC technology and does not involve any moving parts. Depending on the specific model, CellaTemp® pyrometers are available either in a single-colour version (single wavelength detector) or in a two-colour version (dual wavelength detector). Special signal processing (4) combined with high-resolution analogue-to-digital conversion enables a wide measuring span. The temperature resolution remains uniformly high across the entire measuring range.

For measurement data output (5), CellaTemp® PA features 2 analogue outputs, a USB interface and a network compatible RS-485 interface as well as two switching outputs.

Three target sighting (6) systems are available to facilitate focusing, alignment and indication of spot size: through-the-lens sighting, laser spot light or an integrated video camera.

Analogue input

Alternatively, the second analogue output can be configured as a signal input. This enables remote emissivity adjustment during running operations, either via PLC or when used together with the material selection switch VK 30.01. Another possible use: to feed in the temperature signal from the radiation emitted by another source (as measured by another sensor). CellaTemp® PA can correct for the effect of this interfering radiation and thus produce readings of the true object temperature.

Switching outputs

CellaTemp® PA's two switching outputs provide a variety of configuration possibilities. They can be assigned to monitor a specific process temperature such as the device's internal temperature.

- The outputs function as a normally open or normally closed contacts
- This results in different application possibilities
- Monitor compliance with configured limit values
- Trigger a status indicator
- Synchronize data communication to the PLC

Analogue outputs

CellaTemp® PA features two analogue outputs which the user can custom configure. Two-colour pyrometers allow you to record the temperatures detected at each of the separate wavebands in addition to the ratio from these two signals (the two-colour temperature). Examining this data affords an analysis of the measured object's emissivity behaviour.

Both switching outputs can also be operated as switching inputs for:

* Control memory reset command
* Activate the laser spot light

Switching inputs

Data communication

The CellaTemp® PA features a USB interface and a network compatible RS-485 interface to enable remote pyrometer configuration. Beyond that, the RS-485 also provides network communication capabilities and permits long distance data transmission.

Because of its integrated software, the CellaTemp® PA can communicate with all commonly used operating systems at any PC or terminal, regardless of language.

The shipment includes the multilingual software CellaView for remote control, online display of the measurement curve, measurement analysis and storage of measured values.

Electronics

Lens system

The CellaTemp® PA can capture target spots as small as Ø 0.3 mm when an additional lens is mounted. The pyrometer models can be combined with sup-

CellaTemp® PA pyrometers feature an optical system which is optimized for the visible and infrared range. The superior glass lens features an antireflective coating. Due to its superior imaging properties, the high-precision lens provides consistently high optical resolution across the entire focusing range and a very small „size of source effect".

In addition, the patented optics and apertures are mechanically designed to minimize sensitivity to light scattered into the sight path, so that the devices measure the same values even at different measuring distances.

Supplementary lenses

Supplementary lens

plementary lenses in a variety of ways, enabling additional optical resolutions for maximum versatility.

Dirty window monitor

Two-colour pyrometers feature SCM (Smart Contamination Monitoring), a function which indicates when the pyrometer lens or the protective quartz window are dirty. The pyrometer identifies when the emitted IR energy does not completely reach the sensor due to obstructions in the line of sight or dirt buildup in the furnace port hole. The

Optics

A pyrometer is an optical means of measuring temperature. The quality of the optics greatly influences the the accuracy of the measurement. The „size of source effect" is a factor which affects the uncertainty of the measurement. Light scattered into the optical path will result in false temperature data. When the target size or the distance to the target change, as shown in the chart, the temperature reading will change as well, depending on the quality of the optical system.

Influence of the size of the measured object on the temperature display with good and bad error correction of the optics of the pyrometer

user can adjust the sensitivity of this function to a tolerated amount of signal attenuation.

distance, making it suitable for users who wear glasses or a helmet.

The circle in the viewfinder indicates the exact position and size of the measured target spot. If the target is especially bright, the polarizing filter PA 20/P can be mounted on the lens to protect the user's eye. For devices with a measuring range over 2000 °C, the filter is included as standard.
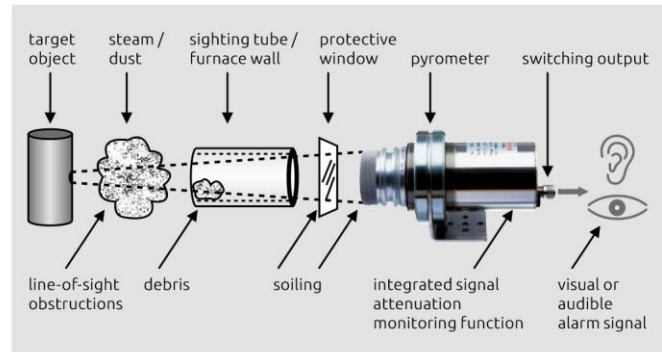
Indication of field-of-view obstruction

Sighting options for compact models

Through-the-lens

The CellaTemp® PA compact models can be supplied with through-the-lens, parallax-free sighting. The wide field of view makes it easy to focus on the target object. The ocular features a widened interpupillary

Laser spot light

The third sighting option availa-
ble for CellaTemp ® PA is an inte-
grated laser spot light. The laser
dot marks the center of the target
spot and is well visible even from
a distance of up to 10 m. The
laser is activated either directly by
push-button or remote by means of an external switch or via interface.

Video camera

As an option, the pyrometer
can be equipped with a built-in
colour video camera to view
the target. Based on the latest
HDR (High Dynamic Range) tech-
nology, the camera provides a
higher dynamic range from the
imaging process and automatic exposure control. The video image
appears without over-exposure and glare.

Another special feature is TBC (target brightness control). The light
sensitivity adapts dynamically to the target object captured within
the measurement spot to produce a high-contrast image of the
target, re-gardless of whether the object focused on is cooler or
hotter than the background.

The white balance can be switched to either „automatic" or „daylight"
mode. The video signal also transmits the measurement data. The
temperature reading is superimposed onto the screen. A separate PC
is not required. A video image allows you to observe possible changes
in the microstructure of the measured object relative to temper-
ature. Because the video recording captures the temperature data
in conjunction with the visible surface behaviour, it enables in-depth
data analysis and process optimisation.

The target marker shown on the screen indicates the exact size of the
measuring field. With a resolution of 5.6 µm / pixel, even the tiniest
target objects are visible. The video signal is electrically isolated from
the supply voltage to prevent noise that may interfere with the image
signal. The camera provides reliable performance and a sharp image
in ambient temperatures up to 65 °C.

Thanks to the automatic expo-
sure control and the TBC feature,
the target always appears in
optimum exposure. The temper-
ature reading and the circled
target spot are superimposed
onto the image.

Without TBC, the light exposure
would be averaged over the
total illumination. A bright target
object in front of a dark back-
ground would appear overex-
posed as shown above.

Control keys

Parameters can be configured during running operations using the
rear keypad. The large control keys are easy to access and operate.
The brightly lit 8 mm digits on the LED display are visible from a great
distance. Two status LEDs can be custom configured to indicate oper-
ating conditions.

Parameter LED · Status LED · Display · Select / change parameters · Mode key / laser switch · USB port · Connector socket
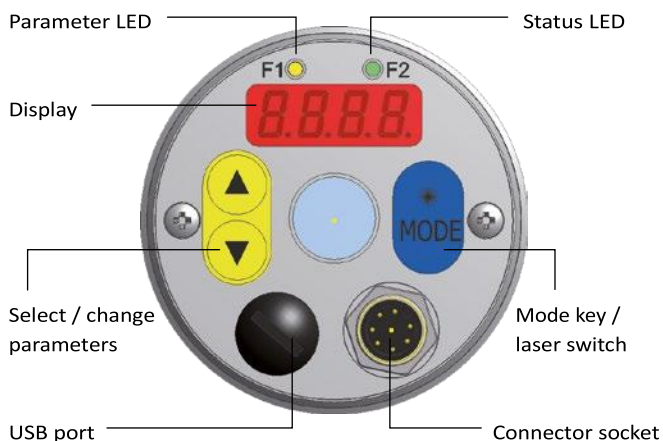
Adjustable parameters

* Temperature range
* Measured variable and scale of analog input and output signals
* Smoothing filter
* Min/max memory
* Hold time
* Emissivity
* Transmittance
* Background radiation correction
* Alarm contacts (mode and limits)
* ATD function parameters
* Linearization
* Function of LEDs
* Temperature scale °C / °F
* Simulation of current and temperature

In addition, for two-colour pyrometers
* One-colour/two-colour mode
* Signal attenuation threshold level
* Soot factor (at the CellaCombustion PA 47)

In addition, for model with camera
* TBC target brightness control
* White balance

Shipment includes

* Pyrometer CellaTemp˙ PA
* Connection cable VK 02/A (5 m)*
* Video cable VK 02/F (5 m)* for model with built-in camera
* USB cable VK 11/D (1.8 m)
* CellaView software
* Instruction manual

ⓘ * other lengths must be ordered separately

ATD function

ATD (Automatic Temperature Detection) is an optional feature especially useful for temperature control at discontinuous processes.

With ATD, objects moving across the pyrometer's field of view at undefined intervals are automatically detected. Examples include rolled steel slabs at a rolling mill stand or billets discharged from an induction heating system.

With ATD, CellaTemp® PA automatically recognizes a hot object and starts measuring the temperature. The measuring cycle either adapts dynamically to the duration of the object in the sight path, or it can be custom configured by the user. At the end of each measurement, a tem-perature reading is generated for each object.

Diagnostics feature

During setup and running operations, a test current or a temperature can be applied to perform diagnostic and simulation functions.

Without requiring a hot object in the field of view, it is possible to test the entire signal path to the transducer and to the control system.

Calibration for tungsten

Due to the physical properties of tungsten, its emissivity changes as a function of its temperature.

For tungsten filament applications, the CellaTemp® PA 40 can be calibrated with a special response curve for the behaviour of tungsten. This calibration option enables the pyrometer to correct for any temperature-induced emissivity changes.

Connection diagram

PA 41.01

PZ 41.18 / PA 41.05

Dimensions

$$d = \frac{a}{D}$$

Measuring area

For pyrometers with focusable optics, the optical ratio D is defined as ratio of the measurement field over the measuring distance. The diameter of the measurement area at the focus distance results from the formula:

For models with rectangular field of view, the definition is extended to the horizontal D_H and vertical D_V optical ratio.

EMV standard

- DIN EN IEC 61000-6-2:11/2019
- DIN EN IEC 61000-6-4:09/2020
- BS EN IEC 61000-6-2:2019
- BS EN IEC 61000-6-4:2019

Technical data *

Pyrometer

2 Analogue outputs	**Resolution current output**
• 0 (4) - 20 mA linear, scalable	• 0 .2 K + 0.03% of selected range
Load	
• max. 500 Ω	**Resolution**
	temperature reading
Voltage input	• 1 K
• 0 - 10 V linear, scalable	
	Resolution USB / RS 485
2 Switching outputs	• 0.1 K in terminal mode
• O pen Collector 24 V,	
≤ 30 mA	**Operating voltage**
• 24 V DC +10% / -20%	
2 Switching inputs	
• to 24 V	**Current consumption**
• ≤ 135 mA	
Data communication	• ≤ 150 mA
• USB	with laser sighting
• R S 485	• ≤ 175 mA
Integrated user interface	with video camera
• Ripple ≤ 200 mV	
LED Display	
• 4 -digit (digit height 8 mm)	

Permissible humidity	**Protection**
• 95% r.H. max.	• I P65 according to (non-condensing) DIN
40050	
Ambient temperature	**Connectivity**
• 0 - 65 °C (without cooling)	• M 12 thread,
	8-pin connection
Storage temperature	
• -20 - +80 °C	**Weight**
• approx. 0.9 kg	
Housing material	
• Stainless steel	

Camera specifications

Video signal	**TBC exposure control**
• C omposite PAL,	• A utomatic, across the 1Vpp, 75 Ohm pyro
meter's entire	
	measuring range
Resolution	
• 7 22 x 576 pixels	**Connectivity**
• T NC connector	
Screen display	
• Target size and position	
• Temperature reading	

* Specifications of the technical data according to DIN IEC TS 62492-1 and DIN IEC TS 62492-2 Calibration of the pyrometers according to VDI / VDE 3511 sheet 4.4

Software CellaView

The CellaView software is included in the scope of delivery. It is based database software running under
Windows designed for real-time graphic display, analysis and storage readings. Monitoring, remote control and con-
figuration of the pyrometer are additional features of this software.
The modern MDI-based user interface makes it possible to open mul-
time. The series of measurements of up to
31 instruments can be recorded simultaneously.
• No license restriction
• Windows-based multiple-document interface (MDI)
• Microsoft SQL Server Compact-based database

• Optional data storage in CSV or Excel format a Microsoft SQL server-
• Zoom, scroll and analysis functions
• Cursor to display the temperature and the time on the of the measurement
measurement curve
• Very fast data recording (milliseconds)
• Logging of user entries in a log file to check for configuration tiple graphs at the same changes
• Download and software update via Internet
• Runs under Windows XP, Vista, 7, 8, 10
• 9 languages selectable

- Graphic display, recording and logging of measurement data • Free selection and combination of the measurement readings and status information of up to 31 devices in one or more diagrams
- Simultaneous start of any number of diagrams to record series of measurements in parallel
- Configuration of the cycle duration for data logging and independent archiving
- Parameter setting, calibration and remote control of the pyrometers
- Saving, loading and transferring of configuration profiles of the devices
- Filtering function to reduce data volume
- Automatic device search
- Permanent connection monitoring
- Automatic archiving of the series of measurements
- Tamper-proof storage of the series of measurements

CELLAVIEW

Single-colour pyrometer

Model			Technical data							
Target sighting Throughthe-lens	Video camera	Laser spot light	Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Response time t_{98}	Precision*	Repro-ducibility
PA 10 ...	For non-metal materials, such as ceramics, wood, rubber, synthetic materials, textiles, paper									
AF 1	AF 1 / C	AF 1 / L	0 - 1000 °C 32 - 1832 °F	8 - 14 µm	PZ 10.01	0.30 m - ∞	50 : 1	≤ 30 ms	1% of reading, min. 2 K based on 30 ms	1 K
AF 2	AF 2 / C	AF 2 / L			PZ 10.05	0.15 m - 0.30 m	48 : 1			
PA 20 ...	For metallic surfaces, ceramics, liquid glass at medium temperature range									
AF 1	AF 1 / C	AF 1 / L	250 - 2000 °C 482 - 3632 °F	1.1 - 1.7 µm	PZ 20.01	0.40 m - ∞	175 : 1	≤ 50 ms (T>250 °C) ≤ 2 ms (T>750 °C)	0.3% of reading, min. 4 K	1 K
AF 2	AF 2 / C	AF 2 / L			PZ 20.03	0.20 m - 0.40 m	150 : 1			
AF 3	AF 3 / C	AF 3 / L			PZ 20.06	1.20 m - ∞	275 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.05	0.20 m - ∞	40 : 1			
AF 9	AF 9 / C	AF 9 / L			PA 20.06	0.60 m - ∞	380 : 1			
AF 5	AF 5 / C	AF 5 / L	350 - 2500 °C 662 - 4532 °F		PZ 20.01	0.40 m - ∞	175 : 1	≤ 50 ms (T>350 °C) ≤ 2 ms (T>900 °C)		
AF 6	AF 6 / C	AF 6 / L			PZ 20.03	0.20 m - 0.40 m	150 : 1			
AF 7	AF 7 / C	AF 7 / L			PZ 20.06	1.20 m - ∞	275 : 1			
AF 8	AF 8 / C	AF 8 / L			PZ 20.05	0.20 m - ∞	40 : 1			
PA 30 ...	For metallic surfaces, ceramics, liquid glass at high temperature range									
AF 1	AF 1 / C	AF 1 / L	500 - 2500 °C 932 - 4532 °F	0.78 - 1.06 µm	PZ 20.01	0.40 m - ∞	210 : 1	≤ 50 ms (T>550 °C) ≤ 2 ms (T>750 °C)	0.3% of reading, min. 4 K	1 K
AF 2	AF 2 / C	AF 2 / L			PZ 20.03	0.20 m - 0.40 m	200 : 1			
AF 3	AF 3 / C	AF 3 / L			PZ 20.06	1.20 m - ∞	310 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.05	0.20 m - ∞	55 : 1			
AF 5	AF 5 / C	AF 5 / L			PA 20.06	0.60 m - ∞	430 : 1			

*(at ε = 1 and Ta = +23 °C)

Pyrometers for special applications

CellaTemp® PA 13

The CellaTemp® PA 13 was especially developed for temperature measurements in flame heated furnaces. Thanks to the selective spectral range of 3.9 µm, water vapour and CO_2 existing in the pyrometer's field of vision have no effect on the measuring results, even when measuring from large distances. This allows precise measurements through flames and combustion gases.

CellaTemp® PA 15

CellaCombustion PA 18

In the range of 4.6 - 4.9 µm glass has an emissivity of almost 100%. Above 5 µm, atmospheric influences, such as humidity or water vapour, affect the measurement. The CellaTemp® PA 15 is provided
with a blocking filter with a spectral sensitivity of 4.6 - 4.9 µm, thus measuring the temperature from the near surface area of the glass. Owing to the wavelength used, changes in thickness, different types of glass or varying moisture contents in the atmosphere do not affect the measurement reading.

CellaCombustion PA 17

The CellaCombustion PA 17 uses a specific wavelength, in which hot carbonaceous gases have a high optical density and therefore good radiation properties. The pyrometers are used to measure the exhaust gas temperature in gas-fired boilers and small combustion plants.

The CellaCombustion PA 18 uses a specific wavelength, in which the chemical components of the hot combustion gas have a high optical density. The devices are used in large combustion plants such as thermal waste-disposal plants and coal power plants.

CellaTemp® PA 28

The CellaTemp® PA 28 is equipped with a light-intense lens and a

special sensor for the reliable low temperature measuring of metals.

CellaTemp® PA 29

CellaTemp® PA 29 was designed with a special band-stop filter and sensor which ignore interfering IR radiation from sources such as daylight or laser beams. CellaTemp® PA 29 features a response spectrum which is far less sensitive to incidental light reflections from nearby hot objects than most commonly available pyrometers which are responsive at short wavelengths. In combination the with supplementary lenses the CellaTemp® PA 29 can capture target spots as small as

$\emptyset$ 0.3 mm. It is suitable for measuring reflective metals and aluminium at low temperatures. In addition, the CellaTemp® PA 29 is used in PVD (physical vapour deposition) coating processes or in processes in which diode, Nd:YAG or CO_2 lasers are used for heating.

CellaTemp® PA 35

The CellaTemp PA 35 features a narrow-band, short wavelength spectral response to minimize the effect of interferences which lead to measurement errors. Detectors which respond to narrow wavebands at short wavelengths are far less susceptible to dust, steam, smoke or a dirty lens. Metal surfaces, for example, exhibit higher emissivity at shorter wave-lengths and at higher temperatures. Due to the special wavelength, it is especially suitable for temperature detection of metals and high-temperature applications or thin semiconductors.

CellaWafer PA 38

The CellaWafer PA 38 is used for temperature measurement during the coating and heat treatment of semiconductor wafers. Due to its short-wave and narrow-band measuring wavelength, the device is used for measurements in MOCVD and RTP processes.

CellaCrystal PA 44

The Cella Crystal PA 44 has been developed for optical temperature measurement in the production of Si and SiC crystals. The calibration is especially adapted to the growth process. Due to the special signal evaluation with a constantly high resolution of < 0.1 K over the entire measuring range and the very high long-term stability of the uniform light sensor technology, the instruments meet the high demands on the required measuring accuracy.

CellaCrystal PA 45

The CellaCrystal PA 45 two-colour pyrometer is characterised by a very wide measuring range of 900 - 3200 °C. Thanks to hybrid signal processing, it has a consistently high signal resolution and extremely high long-term stability over the entire measuring range. This makes it ideal for carbonising, graphitising and crystal growing.

CellaCombustion PA 47

The CellaCombustion PA 47 is a special pyrometer for non-contact temperature measurement of sooty flames in coal power plants or waste incineration plants. The measurement and signal processing based on the two-colour method detects the heat radiation of the sooty particles of the flame in the near infrared range at two wavelengths. The burn-out operation can be controlled by the temperature to reduce the pollutant emission and to minimize the slagging of the walls in the combustion chamber.

CellaCrystal PA 64

The CellaCrystal PA 64 is used for temperature measurement in CVD (chemical vapour deposition) coating processes. Because of the hybrid wavelength, the pyrometer can also be used for plasma-assisted vapour deposition.

Pyrometers for special applications

Model			Technical data							
Target sighting: Through-the-lens	Video camera	Laser spot light	Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Response time t_{98}	Precision*	Reproduci-bility
PA 13 ...	For measurements in combustion plants and flame-heated furnaces									
AF 1	AF 1 / C	AF 1 / L	500 - 1600 °C 932 - 2912 °F	3.9 µm	PZ 15.03	0.80 m - ∞	45 : 1	≤ 100 ms	1% of reading	2 K
PA 15 ...	For glass surfaces									
AF 1	AF 1 / C	AF 1 / L	500 - 2500 °C 932 - 4532 °F	4.6 - 4.9 µm	PZ 15.03	0.80 m - ∞	70 : 1	≤ 100 ms	0.75% of reading	2 K
AF 2	AF 2 / C	AF 2 / L	300 - 1300 °C 572 - 2372 °F		PZ 15.03	0.80 m - ∞	45 : 1		0.75% of reading, min. 3 K	
PA 17 ...	For measurements in environments with hot, CO_2-containing gases (e.g. in gas-fired boilers and small combustion plants)									
AF 1	AF 1 / C	–	400 - 2000 °C 752 - 3632 °F	CO2 range	PZ 15.03	0.80 m - ∞	75 : 1	≤ 100 ms	0.75% of reading + 1 K	2 K
PA 18 ...	For measurements in environments with hot, CO-containing gases (e.g. in thermal waste-disposal plants and coal power plants)									
AF 1	AF 1 / C	–	500 - 2500 °C 932 - 4532 °F	CO range	PZ 15.03	0.80 m - ∞	70 : 1	≤ 100 ms	0.75% of reading	2 K
PA 28 ...	For measurements of aluminium, polished metal surfaces and laser applications									

| AF 10 | AF 10 / C | AF 10 / L | 75 - 650 °C
167 - 1202 °F | 1.8 - 2.4 µm | PZ 20.08 | 0.30 m - ∞ | 48 : 1 | ≤ 200 ms (T>75 °C)
≤ 50 ms (T>100 °C)
≤ 15 ms (T>125 °C)
≤ 2 ms (T>200 °C) | 0.75% of reading, min. 3 K | 1 K |

Pyrometers for special applications

Model			Technical data							
Target sighting Through-the-lens	Video camera	Laser spot light	Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Response time t$_{98}$	Precision*	Reproducibility
PA 29 ...	For measurements of aluminium, polished metal surfaces, at laser applications and in PVD coating processes									
AF 10	AF 10 / C	AF 10 / L	150 - 800 °C 302 - 1472 °F	1.8 - 2.2 µm	PZ 20.08	0.30 m - ∞	48 : 1	≤ 50 ms (T>150 °C) ≤ 15 ms (T>200 °C) ≤ 2 ms (T>350 °C)	0.75% of reading, min. 5 K	1 K
AF 21	AF 21 / C	AF 21 / L	180 - 1200 °C 356 - 2192 °F		PZ 20.01	0.40 m - ∞	60 : 1	≤ 75 ms (T>180 °C)		
AF 22	AF 22 / C	AF 22 / L			PZ 20.03	0.20 m - 0.40 m	56 : 1	≤ 35 ms (T>200 °C) ≤ 5 ms (T>300 °C)		
AF 23	AF 23 / C	AF 23 / L			PZ 20.06	1.20 m - ∞	96 : 1	≤ 2 ms (T>600 °C)		
AF 1	AF 1 / C	AF 1 / L	250 - 2000 °C 482 - 3632 °F		PZ 20.01	0.40 m - ∞	210 : 1		0.5% of reading, min. 4 K	
AF 2	AF 2 / C	AF 2 / L			PZ 20.03	0.20 m - 0.40 m	200 : 1	≤ 50 ms (T>250 °C) ≤ 2 ms (T>750 °C)		
AF 3	AF 3 / C	AF 3 / L			PZ 20.06	1.20 m - ∞	310 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.05	0.20 m - ∞	55 : 1			
AF 5	AF 5 / C	AF 5 / L	350 - 2500 °C 662 - 4532 °F		PZ 20.01	0.40 m - ∞	210 : 1	≤ 50 ms (T>350 °C) ≤ 2 ms (T>900 °C)		
AF 6	AF 6 / C	AF 6 / L			PZ 20.03	0.20 m - 0.40 m	200 : 1			
PA 35 ...	For the precise measurement of metals, very high temperatures and semiconductors									
AF 11	AF 11 / C	AF 11 / L	600 - 3500 °C 1112 - 6332 °F	0.82 - 0.93 µm	PZ 20.01	0.40 m - ∞	210 : 1	≤ 50 ms (T>650 °C) ≤ 2 ms (T>850 °C)	0.3% of reading, min. 4 K	1 K
AF 12	AF 12 / C	AF 12 / L			PZ 20.03	0.20 m - 0.40 m	200 : 1			
AF 13	AF 13 / C	AF 13 / L			PZ 20.06	1.20 m - ∞	310 : 1			
AF 14	AF 14 / C	AF 14 / L			PZ 20.05	0.20 m - ∞	55 : 1			
AF 15	AF 15 / C	AF 15 / L			PA 20.06	0.60 m - ∞	430 : 1			
PA 38 ...	For measurement during the coating and heat treatment of semiconductor wafers									
AF 10	AF 10 / C	AF 10 / L	450 - 1800 °C 842 - 3272 °F	0.88 µm	PZ 20.08	0.30 m - ∞	60 : 1	≤ 50 ms (T>500 °C) ≤ 2 ms (T>650 °C)	0.3% of reading, min. 4 K	1 K
PA 44 ...	For the precise measurement of Si and SiC crystals									
AF 4	AF 4 / C	AF 4 / L	750 - 2400 °C 1382 - 4352 °F	0.95 / 1.05 µm	PZ 20.01	0.40 m - ∞	150 : 1	≤ 10 ms (T>950 °C)	6K (< 850°C) 0.35% + 2K (850..1500°C) 0.5% + 2K (> 1500°C)	2 K
AF 5	AF 5 / C	AF 5 / L			PZ 20.03	0.20 m - 0.40 m	140 : 1			
AF 7	AF 7 / C	AF 7 / L	850 - 3000 °C 1562 - 5432 °F		PZ 20.01	0.40 m - ∞	150 : 1	≤ 10 ms (T>1050 °C)	0.35% + 2K (< 1500°C) 0.5% + 2K (1500..2400°C) 1.0% (> 2400°C)	
PA 45 ...	for measurement in graphite production and crystal growth									
AF 1	AF 1 / C	AF 1 / L	900 - 3200 °C 1652 - 5792 °F	0.9 / 1.05 µm	PZ 20.01	0.40 m - ∞	210 : 1	≤ 10 ms	0.35% + 2K (< 1500°C) 0.5% + 2K (1500..2400°C) 1.0% (> 2400°C)	2 K
AF 2	AF 2 / C	AF 2 / L			PZ 20.03	0.20 m - 0.40 m	200 : 1			
PA 47 ...	For the measurement of sooty flames (e.g. in power plants or incineration plants)									

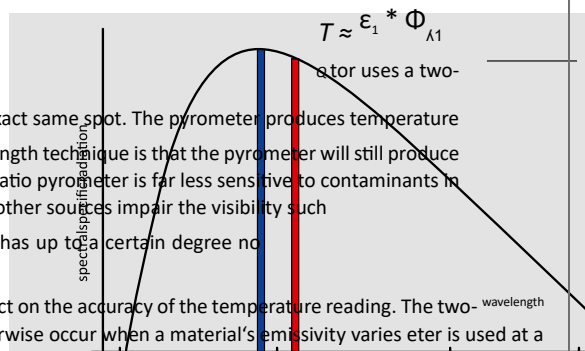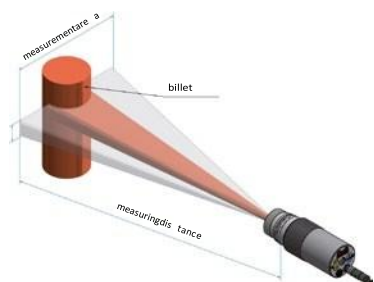| AF 1 | AF 1 / C | – | 700 - 1700 °C 1292 - 3092 °F | 0.9 / 1.05 µm | PZ 20.01 | 0.40 m - ∞ | 80 : 1 | ≤ 20 ms (T>650 °C) ≤ 10 ms (T>750 °C) | 1% of reading | 2 K |
| PA 64 … | For the measurement in CVD coating processes | | | | | | | | | |
| AF 2 | AF 2 / C | AF 2 / L | 500 - 1400 °C 932 - 2552 °F | 1.5 / 1.9 µm | PZ 20.03 | 0.20 m - 0.40 m | 75 : 1 | ≤ 30 ms | 0.75% of reading, min. 4 K | 2 K |

*(at ε = 1 and Ta = +23 °C)

Compact two-colour pyrometer

The two-colour pyrometer detects the infrared radiation emitted from an object's surface at two separate wavelengths. The dual sandwich detector uses a two-element photo-diode to capture both radiation intensities $\varepsilon_2 * \Phi_{\lambda 2}$ simultaneously from the exact same spot. The pyrometer produces temperature data based on the ratio of these two intensities. The advantage of the two-colour or dual wavelength technique is that the pyrometer will still produce highly accurate temperature data, even at signal attentuation of up to 90%. The two-colour or ratio pyrometer is far less sensitive to contaminants in the line of sight such as steam, dust or smoke than a standard single-colour pyrometer. Even if other sources impair the visibility such as dirt on the pyrometer lens or sediment and debris buildup within the $\lambda 1$ $\lambda 2$ sight tube, it has up to a certain degree no influence on the measurement value. When the signal is equally attenuated at both wavelengths, this will have no impact on the accuracy of the temperature reading. The two-colour method enables the pyrometer to correct for measurement errors which would otherwise occur when a material's emissivity varies eter is used at a production line which produces a variety of products as a function of temperature or surface properties, or when the pyrom- having different emissivities.

$$T \approx \varepsilon_1 * \Phi_{\lambda 1}$$

Model	Technical data									
Target sightin			Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Response time t_{98}	Precision*	Repro-ducibility
Throughthe-lens	Video camera	Laser spot light								
PA 40 ...	For use in these industries: steel, ceramics or cement in harsh environments									
AF 20	AF 20 / C	AF 20 / L	500 - 1400 °C 932 - 2552 °F		PZ 20.08	0.30 m - ∞	55 : 1	≤ 10 ms (T>650 °C)		
AF 1	AF 1 / C	AF 1 / L			PZ 20.01	0.40 m - ∞	80 : 1			
AF 2	AF 2 / C	AF 2 / L	650 - 1700 °C 1202 - 3092 °F		PZ 20.03	0.20 m - 0.40 m	75 : 1	≤ 20 ms (T>650 °C) ≤ 10 ms (T>750 °C)		
AF 3	AF 3 / C	AF 3 / L			PZ 20.06	1.20 m - ∞	120 : 1			
AF 10	AF 10 / C	AF 10 / L			PZ 20.05	0.20 m - ∞	20 : 1			
AF 13	AF 13 / C	AF 13 / L			PZ 20.08	0,30 m - ∞	55 : 1			
AF 21	AF 21 / C	AF 21 / L			PA 20.06	0.60 m - ∞	190 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.01	0.40 m - ∞	150 : 1			
AF 5	AF 5 / C	AF 5 / L			PZ 20.03	0.20 m - 0.40 m	140 : 1			
AF 6	AF 6 / C	AF 6 / L	750 - 2400 °C 1382 - 4532 °F	0.95 / 1.05 μm	PZ 20.06	1.20 m - ∞	240 : 1	≤ 10 ms (T>950 °C)	1% of reading	2 K
AF 11	AF 11 / C	AF 11 / L			PZ 20.05	0.20 m - ∞	35 : 1			
AF 14	AF 14 / C	AF 14 / L			PZ 20.08	0,30 m - ∞				
AF 22	AF 22 / C	AF 22 / L			PA 20.06	0.60 m - ∞				
AF 7	AF 7 / C	AF 7 / L			PZ 20.01	0.40 m - ∞	100 : 1 370 : 1 150 : 1 140 : 1			
AF 8	AF 8 / C	AF 8 / L			PZ 20.03	0.20 m - 0.40 m				
AF 9	AF 9 / C	AF 9 / L			PZ 20.06	1.20 m - ∞	240 : 1			
AF 12	AF 12 / C	AF 12 / L	850 - 3000 °C 1562 - 5432 °F		PZ 20.05	0.20 m - ∞	35 : 1	≤ 10 ms (T>1050 °C)		
AF 15	AF 15 / C	AF 15 / L			PZ 20.08	0,30 m - ∞	100 : 1			
AF 18	AF 18 / C	AF 18 / L			PA 40.01	86 mm - 115 mm	250 : 1			
AF 23	AF 23 / C	AF 23 / L			PA 20.06	0.60 m - ∞	370 : 1			
PA 50 ...	For measurements of materials with varying emissivity									
AF 1	AF 1 / C	AF 1 / L			PZ 20.01	0.40 m - ∞	80 : 1	≤ 30 ms	1% of reading	2 K

AF 2	AF 2 / C	AF 2 / L	500 - 1400 °C	0.95 /	PZ 20.03	0.20 m - 0.40 m	75 : 1			
AF 3	AF 3 / C	AF 3 / L	932 - 2552 °F	1.55 µm	PZ 20.06	1.20 m - ∞	120 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.05	0.20 m - ∞	20 : 1			
PA 60 ...	For measurements at low temperatures from 300 °C									
AF 1	AF 1 / C	AF 1 / L	300 - 800 °C 572 - 1472 °F	1.5 / 1.9 µm	PZ 20.08	0.30 m - ∞	39 : 1	≤ 30 ms	1% of reading	2 K
AF 11	AF 11 / C	AF 11 / L	400 - 1000 °C 752 - 1832 °F		PZ 20.01	0.40 m - ∞	80 : 1			

*(at ε = 1 and Ta = +23 °C)

Panorama pyrometer® with rectangular measurement area

The CellaTemp® PA 43, a panorama pyrometer®, features a rectangular measurement area. The unique design enables the pyrometer to detect the temperature of target objects which move within the rectangular area. This is accomplished without requiring any moving parts. The CellaTemp® PA 43 reliably captures objects which typically show fluctuating behaviour (such as swaying wires). The rectangular area is also ideal when measuring objects whose position tends to vary during the production process. Such objects include billets or metal rods at a roller table.

A rectangular measurement field simplifies pyrometer alignment and focusing in applications which involve small measurement objects. The pyrometer models can be combined with supplementary lenses for very small targets such as filaments.

Model			Technical data							
Target sighting			Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Response time t_{98}	Precision*	Repro-ducibility
Through-the-lens	Video camera	Laser spot light								
PA 43 ...	For use in these industries: steel, ceramics, or cement in harsh environments									
AF 20	AF 20 / C	AF 20 / L	600 - 1400 °C 1112 - 2552 °F		PZ 20.08	0.30 m - ∞	D_v = 150 : 1 D_h = 30 : 1	≤ 10 ms (T>650 °C)		
AF 1	AF 1 / C	AF 1 / L			PZ 20.01	0.40 m - ∞	D_v = 230 : 1 D_h = 45 : 1			
AF 2	AF 2 / C	AF 2 / L			PZ 20.03	0.20 m - 0.40 m	D_v = 215 : 1 D_h = 40 : 1			
AF 3	AF 3 / C	AF 3 / L	650 - 1700 °C 1202 - 3092 °F		PZ 20.06	1.20 m - ∞	D_v = 375 : 1 D_h = 75 : 1	≤ 10 ms (T>750 °C)		
AF 10	AF 10 / C	AF 10 / L			PZ 20.05	0.20 m - ∞	D_v = 55 : 1 D_h = 10 : 1			
AF 13	AF 13 / C	AF 13 / L			PZ 20.08	0.30 m - ∞	D_v = 150 : 1 D_h = 30 : 1			
AF 21	AF 21 / C	AF 21 / L			PA 20.06	0.60 m - ∞	D_v = 500 : 1 D_h = 95 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.01	0.40 m - ∞	D_v = 350 : 1 D_h = 50 : 1		1.5% of reading	3 K
AF 5	AF 5 / C	AF 5 / L			PZ 20.03	0.20 m - 0.40 m	D_v = 330 : 1 D_h = 45 : 1			
AF 6	AF 6 / C	AF 6 / L		0.95 / 1.05 µm	PZ 20.06	1.20 m - ∞	D_v = 580 : 1 D_h = 85 : 1			
AF 11	AF 11 / C	AF 11 / L	750 - 2400 °C 1382 - 4532 °F		PZ 20.05	0.20 m - ∞	D_v = 85 : 1 D_h = 11 : 1	≤ 10 ms (T>950 °C)		
AF 14	AF 14 / C	AF 14 / L			PZ 20.08	0.30 m - ∞	D_v = 230 : 1 D_h = 34 : 1			
AF 17	AF 17 / C	AF 17 / L			PA 40.01	86 mm - 115 mm	D_v = 380 : 1 D_h = 80 : 1			
AF 22	AF 22 / C	AF 22 / L			PA 20.06	0.60 m - ∞	D_v = 730 : 1 D_h = 105 : 1			
AF 7	AF 7 / C	AF 7 / L			PZ 20.01	0.40 m - ∞	D_v = 350 : 1 D_h = 50 : 1			
AF 8	AF 8 / C	AF 8 / L			PZ 20.03	0.20 m - 0.40 m	D_v = 330 : 1 D_h = 45 : 1			
AF 9	AF 9 / C	AF 9 / L	850 - 3000 °C 1562 - 5432 °F		PZ 20.06	1.20 m - ∞	D_v = 580 : 1 D_h = 85 : 1	≤ 10 ms (T>1050 °C)		
AF 12	AF 12 / C	AF 12 / L			PZ 20.05	0.20 m - ∞	D_v = 85 : 1 D_h = 11 : 1			
AF 15	AF 15 / C	AF 15 / L			PZ 20.08	0.30 m - ∞	D_v = 230 : 1 D_h = 34 : 1			

| AF 18 | AF 18 / C | AF 18 / L | | | PA 40.01 | 86 mm - 115 mm | D_v = 380 : 1 D_h = 80 : 1 | | |
| AF 23 | AF 23 / C | AF 23 / L | | | PA 20.06 | 0.60 m - ∞ | D_v = 730 : 1 D_h = 105 : 1 | | |

*(at ε = 1 and Ta = +23 °C)

Single-colour / two-colour fibre optics pyrometer

A pyrometer with fibre optics For target sighting and focussing, the pyrometer features a built-in has the sensor head housed laser spot light. Laser sighting can be activated either by remote separately from the electronics switch, using the control keys on the instrument, or via interface.

assembly. A fibre optic cable transmits the detected infrared The optical fibre can be supplied at a length of up to 50 m, ensuring energy to the electronics. The that the electronics can be installed at a safe distance. The fibre optic optical sensor head can with- cable is equipped with a screw connector at each end to ease instal- stand ambient temperatures up lation and detachment. Metallic armouring provides the optical fibre

to 250 °C without cooling. Both the sensor head and the fibre optic with a high degree of mechanical protection.

cable are unsusceptible to electromagnetic radiation. Pyrometers with fibre optics are ideal for cramped, hard-to-access locations. Three different focusable optical heads are available. Select the one

most suitable, depending on the required target size and measuring *PA 41.../ V devices with two* optical distance. *fibers and vacuum feedthrough*

Model	Technical data									
Type	Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Method	Response time t_{98}	Precision*	Reproduci-bility
PA 21 ...	For metallic surfaces, ceramics, liquid glass at medium temperature range								
AF 11	300 - 2000 °C 572 - 3632 °F	1.1 - 1.7 µm	PA 41.01	0.20 m - ∞	180 : 1	single-colour	≤ 50 ms (T>300 °C) ≤ 2 ms (T>800 °C)	0.75% of reading, min. 4 K	2 K
AF 21			PZ 41.05	0.12 m - ∞	100 : 1				
AF 22			PZ 41.18	33 mm - 45 mm	50 : 1				
AF 901	450 - 2500 °C 842 - 4532 °F		PA 41.02	0.50 m - ∞	320 : 1		≤ 50 ms (T>450 °C) ≤ 2 ms (T>900 °C)		
PA 31 ...	For metallic surfaces, ceramics, liquid glass at high temperature range								
AF 11	550 - 2500 °C 1022 - 4532 °F	0.78 - 1.06 µm	PA 41.01	0.20 m - ∞	190 : 1	single-colour	≤ 50 ms (T>600 °C) ≤ 2 ms (T>800 °C)	0.75% of reading	2 K
AF 21			PZ 41.05	0.12 m - ∞	100 : 1				
AF 22			PZ 41.18	33 mm - 45 mm	50 : 1				
AF 901	700 - 3000 °C 1292 - 5432 °F		PA 41.02	0.50 m - ∞	340 : 1		≤ 50 ms (T>750 °C) ≤ 2 ms (T>950 °C)		
PA 36 ...	For the precise measurement of metals, very high temperatures and semiconductors								
AF 11	650 - 3000 °C 1202 - 5432 °F	0.82 - 0.93 µm	PA 41.01	0.20 m - ∞	190 : 1	single-colour	≤ 50 ms (T>680 °C) ≤ 2 ms (T>900 °C)	0.75% of reading	2 K
AF 21			PZ 41.05	0.12 m - ∞	100 : 1				
AF 22			PZ 41.18	33 mm - 45 mm	50 : 1				
PA 41 ...	For use in these industries: steel, ceramics or cement in harsh environments								
AF 211	700 - 1800 °C 1292 - 3272 °F	0.95 - 1.05 µm	PA 41.01	0.20 m - ∞		two-colour	≤ 20 ms (T>850 °C)	1.5% of reading	3 K
AF 221			PZ 41.05	0.12 m - ∞					
AF 222			PZ 41.18	33 mm - 45 mm					
AF 222 / V			PZ 41.18	33 mm - 45 mm					
AF 11	800 - 2400 °C		PA 41.01	0.20 m - ∞			≤ 20 ms (T>950 °C)		
AF 21			PZ 41.05	0.12 m - ∞					

AF 22	1472 - 4352 °F		PZ 41.18	33 mm - 45 mm	110 : 1					
					50 : 1					
					36 : 1					
					36 : 1					
					190 : 1					
					100 : 1					
					50 : 1					
					50 : 1					
					190 : 1					
					190 : 1					
					100 : 1					
					50 : 1					
AF 22 / V			PZ 41.18	33 mm - 45 mm						
AF 111			PA 41.01	0.20 m - ∞						
AF 111 / V	900 - 3000 °C		PA 41.01	0.20 m - ∞				≤ 20 ms (T>1050 °C)		
AF 121	1652 - 5432 °F		PZ 41.05	0.12 m - ∞						
AF 122			PZ 41.18	33 mm - 45 mm						
AF 901	1100 - 3000 °C 2012 - 5432 °F		PA 41.02	0.50 m - ∞	340 : 1			≤ 20 ms (T>1350 °C)		

*(at ε = 1 and Ta = +23 °C)

Accessories

Shielded cable
VK 02 / A AF 1: 5 m
VK 02 / A AF 2: 10 m
VK 02 / A AF 3: 20 m

Mounting bracket
with 2 shaft nuts
PA 11/U

Air purge
PZ 20/A

ZnS window PA 10/I
Sapphire window PA 15/I
Quartz window PA 20/I

Illumination ring
PZ 10/P

Ball flange
PB 08/I

Protective enclosure closed
PA 40/M

Cooling jacket, open
PA 20/B

Protective glass
PZ 10/I AF 1 (ZnS)
70146 (Quartz)

Junction box with
material selection switch
VK 30.01

Mirror attachment 90°
PA 20/E

Dust stop
PZ 10/T (35 mm)
PZ 20/T (20 mm)

Mounting angle, adjustable
PA 11/K

Clamping collar
PZ 20/L: Ø 70 mm
PZ 20/N: Ø 65 mm

Pedestal mount
PB 08/K
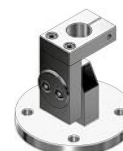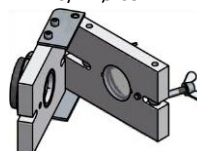
Quick connector with window
PA 10/C (ZnS)
PA 15/C (Sapphire)
PA 20/C (Quartz)

Window with hinge
PZ 10/I (ZnS)
PZ 15/I (CaF2)
PZ 20/I (Quartz)
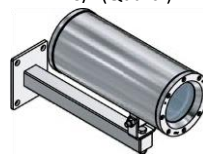
Mounting with flange
PB 08/Q AF1 (Mounting)
PB 08/R AF1 (Flange)

Intermediate tube
PZ 20/C

Ex proof enclosure
PZ 40/N AF1

Protective enclosure,
open PA 40/B

Cooling jacket, closed
PA 20/M

Cooling jacket PA 20/M
AF2 for pyrometer with
camera
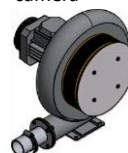
Supplementary lens
PZ 20/O

Flange tube

PB 08/M AF1

Fan
PB 08/F AF4

Connection head
PB 08/N
Intermediate tube
Intermediate tube

with socket
PZ 40/C

PZ 20/J

Flange
PZ 20/F

Mountings

Mounting PA 20-006

consisting of:
- Air purge PZ 20/A
- Intermediate tube PZ 20/J
- Mounting bracket PA 11/U
- Mounting angle, adjustable PA 11/K
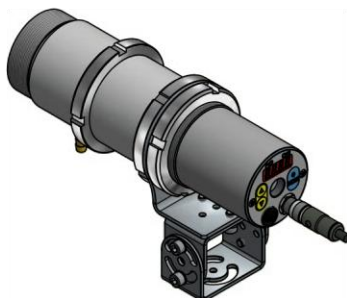
Mounting PA 83-010 for pedestal mount

consisting of:
- Dust stop PZ 10/T
- Intermediate tube PZ 20/C
- Air purge PZ 20/A
- Clamping collar PZ 20/L AF 2
- Cooling jacket, closed PA 20/I
- Hose nozzle G1/8"
- Mounting PB 08/Q AF 1
- Flange PB 08/R AF 1
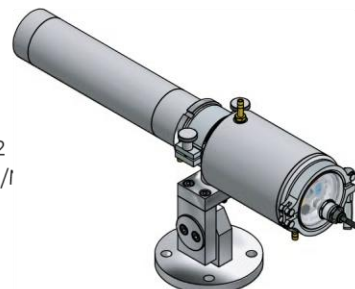
Mounting PA 20-027 for furnace installation

consisting of:
- Cooling jacket PA 20/M AF 1
- Quartz window with hinge PZ 20/I
- Air purge PZ 20/A
- Intermediate tube PZ 20/C
- Mounting flange PZ 20/F
- Dust stop PZ 20/S
- Ball flange PB 08/I
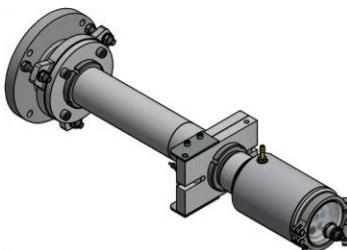
Mounting PA 20-077 for hot blast stoves

consisting of:
- Cooling jacket, closed PA 20/M AF 2
- Flange PB 08/O
- Flange tube PB 08/M AF 1

Mounting PA 20-065 for compressed air for the cement industry

consisting of:
- Cooling jacket PA 20/M AF 1
- Quartz window with hinge PZ 20/I
- Air purge PZ 20/A
- Intermediate tube PZ 20/C
- Flange PZ 20/F
- Dust stop PZ 20/S
- Ball flange PB 08/I
- Hose clamp 10 - 16 mm
- Industrial hose GP40
- Mounting plate in wall housing SK 613 with flow monitor
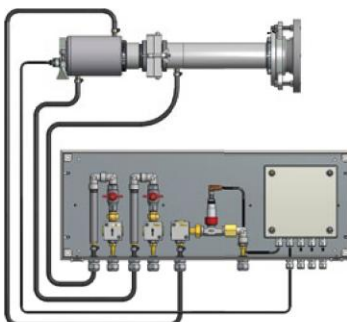
Mounting PA 20-066 fan air for the cement industry

consisting of:
- Cooling jacket PA 20/M AF 1
- Quartz window with hinge PZ 20/I
- Intermediate tube with socket PZ 40/C
- Flange PZ 20/F
- Ball flange PB 08/I
- Fan PB 08/F AF 3
- Aluminium hose PB 08/L
- Hose clamps 10 - 16 mm and 50 - 70 mm
- Industrial hose GP40
- Mounting plate in wall housing SK 749 with flow monitor
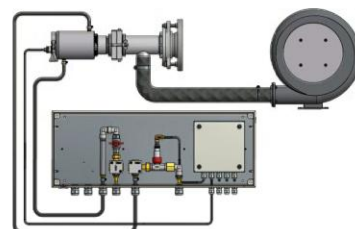
Mounting of the fibre optics version PA 21-001 for furncace installation

consisting of:
- Quartz window PS 01/I AF 2
- Bayonet coupling PS 11/N AF 5
- Air purge PS 01/A AF 1
- Shim Ø 35 mm
- Flange PS 01/N
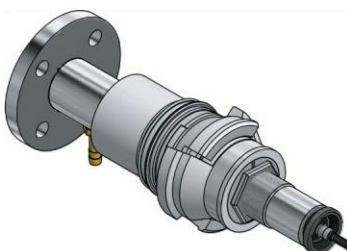
Mounting PA 20-004 with oscillating mirror for pedestal mount

consisting of:
- Cable VK 01/X
- Oscillating mirror PZ 20/X AF 6
- Intermediate tube PZ 20/J
- Clamping collar PZ 20/L AF 2
- Cable VK 01/Y AF 3
- Pedestal mount PB 08/K AF 2

Networking and communication via the USB interface

Cable VK 02/A   Cable VK 02/A

VK 30.02   VK 30.02   up to 31 pyrometers

Bus cable, max. 1200 m, LIYCY, 2x2x0.5 mm ^{2}

RS 485

USB   VK 30.05 Terminal box

with interface converter
SU 04 (RS 485 <> USB)

USB cable
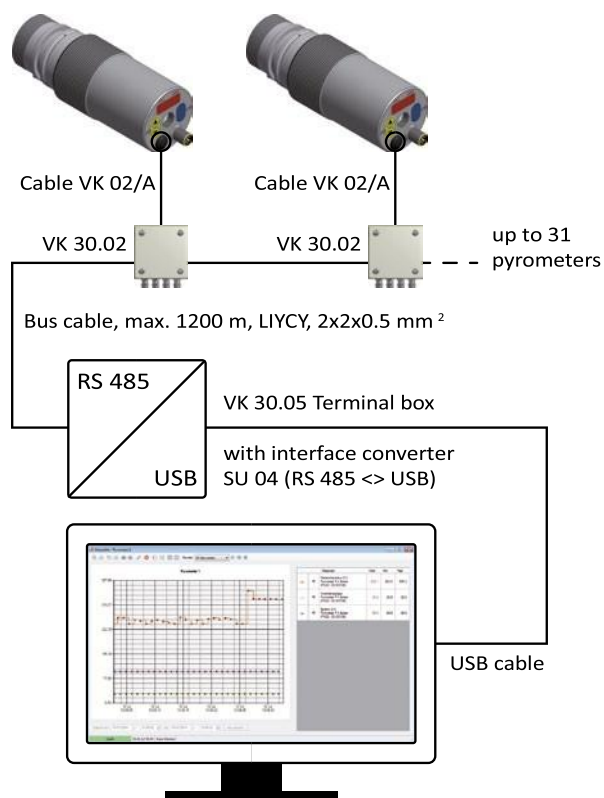
Networking and communication via Ethernet interface

Cable, max. 5 m   Cable, max. 5 m
VK 02/A AF 1   VK 02/A AF 1

VK 30.02   VK 30.02   up to 31 pyrometers

Bus cable, max. 1200 m, LIYCY, 2x2x0.5 mm ^{2}

RS 485

Ethernet   VK 30.06 Terminal box

with interface converter
SU 09 (RS 485 <> Ethernet)

Network cable
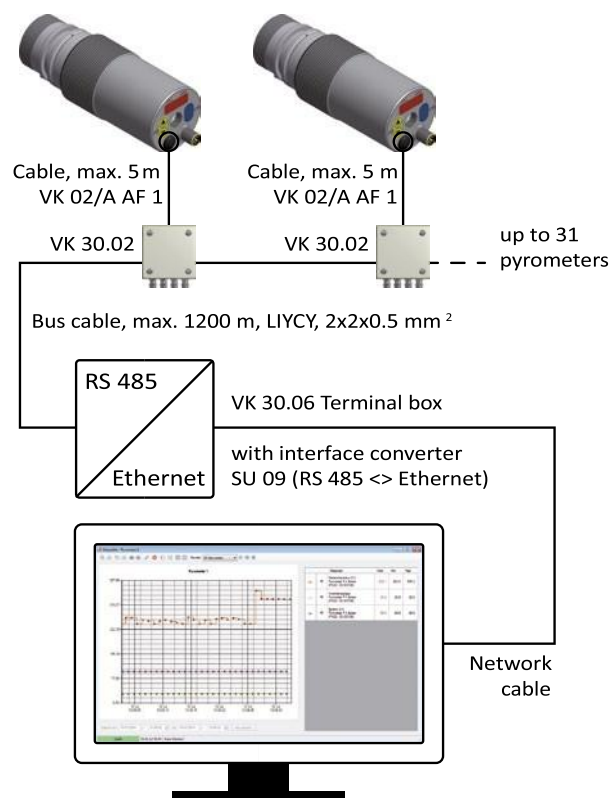
Networking, communication and video transmission via Ethernet
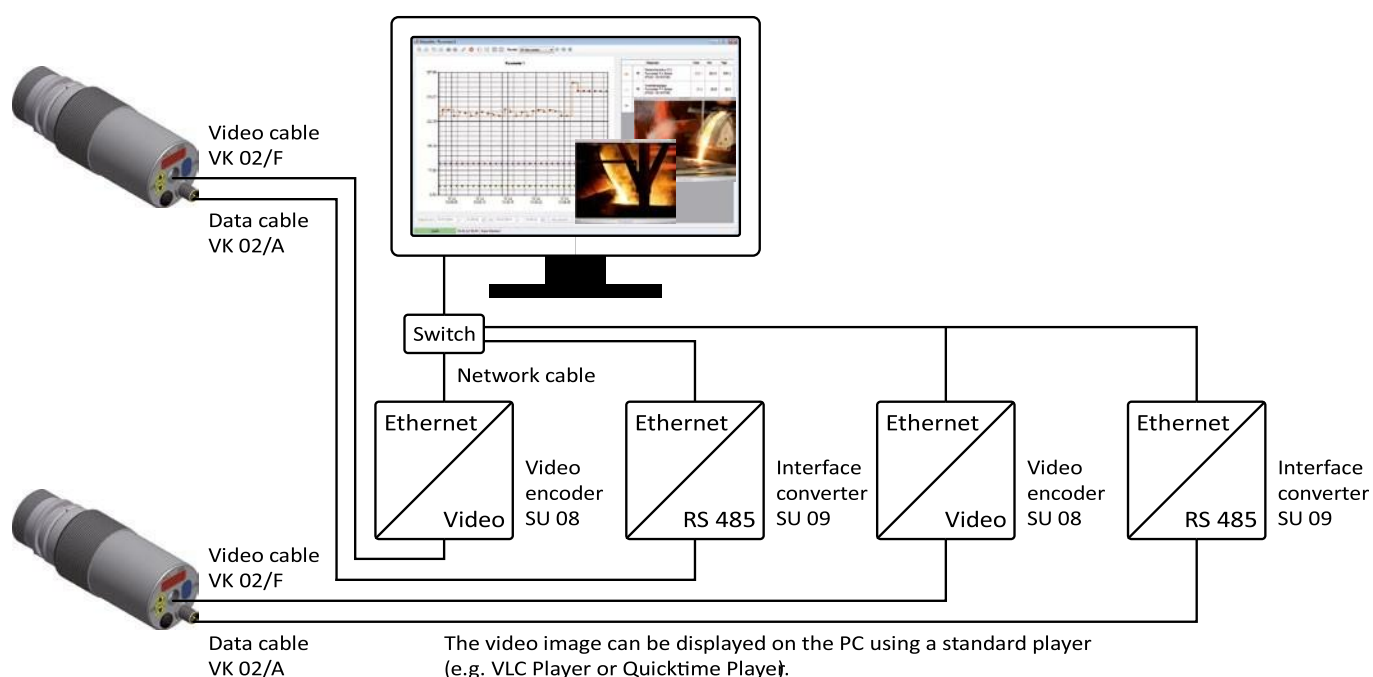
Video cable
VK 02/F

Data cable
VK 02/A

Switch

Network cable

Ethernet   Ethernet   Ethernet   Ethernet

Video   RS 485   Video   RS 485

Video encoder SU 08   Interface converter SU 09   Video encoder SU 08   Interface converter SU 09

Video cable
VK 02/F

Data cable
VK 02/A

The video image can be displayed on the PC using a standard player (e.g. VLC Player or Quicktime Player).

Special Accessories

Oscillating mirror PZ 20/X

An oscillating mirror with scanner function can be mounted to a CellaTemp® PA pyrometer. The measurement field is deflected to capture the target object. Use the analogue output in conjunction with a RS-422 interface to collect temperature readings together with target position.

With the PZ/20 X you can:

- Detect „hot spots" at belt conveyors
- Capture swaying wires
- Generate temperature profiles of sheet metals and steel slabs
- Measure the temperature of objects at a roller table whose size and position are not constant

The PZ 20/X accessory is supplied with CellaScan software to generate graphic images showing temperature data plotted against the scan angle.

Illumination ring PZ 10/P

In dark furnaces, it is often impossible to see the target. Installing an auxiliary light source in a second porthole can be quite difficult and costly. Thus, in actual practice, pyrometers are often focused at the target only at the time of installation. Verification of correct focusing during running operations will not be possible.

The PZ 10/P illuminates the target spot in a closed furnace, utilizing the same furnace opening in which the pyrometer is installed. This built-in accessory is part of the pyrometer's mounting assembly.

The illumination ring helps you align and focus the pyrometer to the measurement spot at the time of initial setup. What's more, this accessory lets you view the target area anytime later, such as during routine spot checks, and make adjustments if necessary.

When used in conjunction with a pyrometer featuring a built-in video camera, you can view a live image of the illuminated target at a control room monitor.

Display unit DA 230

- Input: 0(4)–20 mA / 0(2)–10 V
  Thermocouples type K, S, J, T
  PT 100
- Analogue output: 0(4)–20 mA
- User-configurable ranges
- Panel mounting: 48 x 96 mm
- Supply voltage:
  115–230 V/50–60 Hz
- Source voltage: 24 V DC
- RS-485 interface
- Data communication in ASCII format
- CellaMevis software for online imaging and archiving of temperature data

Interface converter/Video encoder

Interface converter SU 04
RS 485 <-> USB

Video encoder SU 08
Video <-> Ethernet

Interface converter SU 09
RS 485 <-> Ethernet

Applications

Asphalt and concrete mixing

Crystal growing

Coke oven

Wires, tubes and rods

Filaments / Metal bands

Runner

Incineration plant

Rolling mill

Blast furnace / stove dome

Power plant

Continuous casting

Rotary kiln

Sinter plant

Glass production
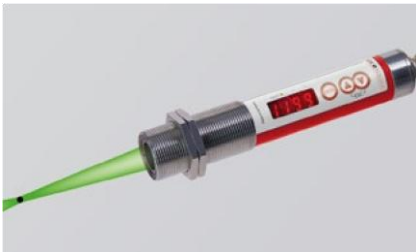

Induction heating

Other products

CellaPort PT
Portable single-colour and two-colour pyro-meters with through-the-lens sighting and USB interface.

CellaCast PT
Portable pyrometer for non-contact temper-ature measurement of molten metal at auto-mated casting machines and blast furnaces.

CellaTemp® PK(L)
Compact infrared thermometer for cramped environments. Optional with LED spot light.

CellaTemp® PKF
Compact infrared thermometer with optical fibre and optical sensor head.

CellaTemp® PX
Pyrometers with IO-Link interface, focusable lens, through the lens sighting or laser spot-light.

CellaTemp® PX-LWL
Pyrometers with IO-Link interface, fibre optics, focusable measuring heads and laser spot light.

Mikro PV
Intensity comparison pyrometer for ultra accurate measurement.

CellaSwitch
Compact infrared switch with LED display and auto-diagnostics.

Since 1967, the Division Infrared Ther-mometer Solutions (ITS) of KELLER HCW GmbH develops and manu-factures precision instruments and systems solutions for non-contact temperature measurements. Thanks to the continuous development of its range, KELLER ITS now is one of the leading providers for infrared ther-mometers and pyrometers world-wide.

With its very large product range of more than 250 models and systems KELLER ITS offers solutions for all standard applications and a variety of special measuring tasks.

Following the KELLER philosophy, the key focus in the development and production of the devices is set to the high measuring accuracy and reliability. Therefore, KELLER grants a warranty of 5 years on its products.

A global network of distributors and service points ensures competent and personal consultation on site.

KELLER
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No1 in terms of
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KELLER A DIVISION OF **GROUPE LEGRIS INDUSTRIES**

Smart pyrometer
CellaTemp® PX

for precise optical temperature measurement
from 0 °C to + 3000 °C

Range of models

Compact pyrometer

Single-colour pyrometer			
Type	Temperature range	Application	Mess-feld
PX 10	0 - 1000 °C	nonmetals	◯
PX 13	500 - 1600 °C	flame heating	◯
PX 15	300 - 1300 °C	glass surfaces	◯
	500 - 2500 °C		
PX 17	400 - 2000 °C	hot CO_2 containing gases	◯
PX 18	500 - 2500 °C	hot CO containing gases	◯
PX 20	210 - 2000 °C	metals, ceramics, molten glass	◯
	350 - 2500 °C		
PX 28	75 - 650 °C	aluminium; bright, shiny metal surfaces; laser applications	◯
PX 29	150 - 800 °C	aluminium; bright, shiny metal surfaces, laser applications, PVD coating process	◯
	180 - 1200 °C		
	250 - 2000 °C		
PX 30	500 - 2500 °C	metals, ceramics, high temperatures	◯
PX 35	600 - 3000 °C	precise measurement of metals, semiconductors	◯

Pyrometer with fibre optic cable and optical head

Single-colour pyrometer		
Type	Temperature range	Application
PX 21	250 - 2000 °C	metals, ceramics, molten glass
PX 31	550 - 2500 °C	metals, ceramics, high temperatures
PX 36	650 - 3000 °C	precise measurement of metals, semiconductors

Two-colour pyrometer			
Type	Temperature range	Application	Mess-feld
PX 40	500 - 1400 °C	Metals, cement, lime, graphite, glass gobs, crystal pulling	○
	650 - 1700 °C		○
	750 - 2400 °C		○
	850 - 3000 °C		○
PX 43	600 - 1400 °C	wires, rods, heating coils, filaments	▢
	650 - 1700 °C		▢
	750 - 2400 °C		▢
	850 - 3000 °C		▢
PX 44	750 - 3000 °C	silicon, silicon carbide	○
PX 45	900 - 3200 °C	Graphite production, Crystal growing	○
PX 47	700 - 1700 °C	sooty flames	○
PX 50	500 - 1400 °C	metals at low temperatures	○
PX 60	300 - 800 °C	metals at very low temperatures	○
	400 - 1000 °C		
PX 64	500 - 1400 °C	CVD coating process	○

Two-colour pyrometer		
Type	Temperature range	Application
PX 41	700 - 1800 °C	metals, cement, lime, graphite, glass gobs, crystal pulling
	800 - 2400 °C	
	900 - 3000 °C	

electronics

interchangeable lenses

PZ 20.03

PZ 20.06

PZ 20.01

Smart pyrometer CellaTemp® PX

Special Features

- Wide measuring ranges with high resolution
- Modular design: Electronics and optionally up to 5 optics
- Focusable optics • Parameters and functions adjustable via control keys
- 3 target sighting options: through-the-lens, colour video camera or laser spot light
- Compact models and fibre optic models (two-colour pyromter)
- Single-colour and two-colour pyrometers

- 1 Analogue output, 2 switching outputs
- Source freely configurable

- Modern IO-Link interface
- SCM function for dirty window monitoring

- ATD function (automatic temperature detection)

CellaTemp® PX Series

The CellaTemp® PX Pyromter Series is based on a modular concept consisting of the following components: optics, sensor and signal processing, data output and target sighting.

PZ 20.08

The optical system (1) comprises one of five available objective lenses. Select the one most suitable, depending on the required target size and measuring distance. The pyrometer is infinitely adjustable to ensure superior precision across a wide focusing range.

The aperture (2) determines the shape of the measurement area. As a standard, the pyrometer features a circular measurement spot. As an option, the two-colour pyrometer models can be equipped with a rectangular measurement area.

A sensor (3) detects the IR radiation emitted by an object's surface. It is based on the latest DC technology and does not involve any moving PZ 20.05 parts. Depending on the specific model, CellaTemp® PX pyrometers are available either in a single-colour version (single wavelength detector) or in a two-colour version (dual wavelength detector).

Analogue outputs

Special signal processing (4) combined with high-resolution analogue-to-digital conversion in the CellaTemp® PX enables a wide CellaTemp® PX features one analogue output. The user can configure measuring span. The temperature resolution remains uniformly high the scaling of the output within the basic measuring range (Δ > 50 k).
across the entire measuring range.

For measurement data output (5), CellaTemp® PX features 1 ana-

logue output, two switching output and an IO-Link network interface

latest technology.

target sighting (6) systems are available to facilitate focusing, alignment and indication of spot size: through-the-lens sighting, laser spot light or an integrated video camera.

•   This results in different application possibilities.

the

Switching outputs based on the

CellaTemp® PX's two switching outputs provide a variety of configu- Three ration possibilities.

• The outputs function as a normally open or normally closed
   contacts and window function.
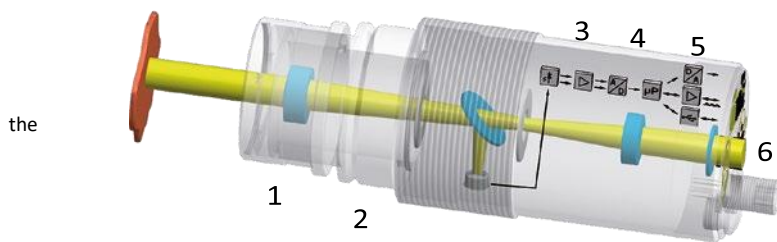
•   Monitor compliance with configured limit values or temperature   ranges.
•   Trigger a status indicator.
•   Synchronize data communication to the PLC when using
        ATD function.

1 2 3 4 5 6

IO-Link Interface

All devices of the CellaTemp® PX series are equipped with the new IO-Link communication interface according to IEC 61131-9.

Advantages of IO-Link interface
- Standardized manufacturer and fieldbus independent interface • Cost-effective and simple point-to-point connection with standard cable
- Low wiring costs
- Simple commissioning
- Interference-free data transmission
- Automatic parameterization with central data backup
- Full transparency down to the lowest field level
- Systematic diagnostic concepts
- Device exchange by plug and play

Optics
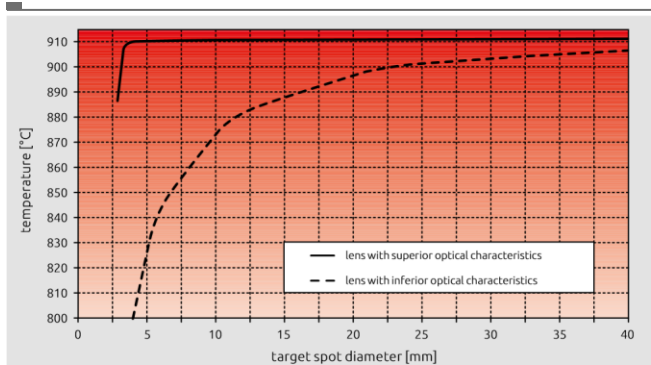
Influence of the size of the measured object on the temperature display with good and bad error correction of the optics of the pyrometer.

CellaTemp® PX pyrometers feature an optical system which is optimized for the visible and infrared range. The superior glass lens features an antireflective coating. In addition, the patented optics and apertures are mechanically designed to minimize sensitivity to light scattered into the sight path.

A pyrometer is an optical means of measuring temperature. The quality of the optics greatly influences the accuracy of the meas- urement. The „size of source effect" is a factor which affects the uncer- tainty of the measurement. Light scattered into the optical path will result in false temperature data. When the target size or the distance to the target change, as shown in the chart, the temperature reading will change as well, depending on the quality of the optical system.

Due to its superior imaging properties, the high-precision lens provides consistently high optical resolution across the entire focusing range and a very small „size of source effect". This ensures a constant high measuring accuracy independent of the size of the object and the measuring distance.

Supplementary lenses

The CellaTemp® PX can capture target spots as small as Ø 0.3 mm when an additional lens is mounted.

The pyrometer models can be combined with 4 supplementary lenses in a variety of ways, enabling additional optical resolutions for maximum versatility.

Elektronics

Lens system

Supplementary lens

The pyrometer identifies when the emitted IR energy does not completely reach the sensor due to obstructions in the line of sight or dirt buildup in the furnace port hole. The user can adjust the sensitivity of this function to a tolerated amount of signal attenuation.
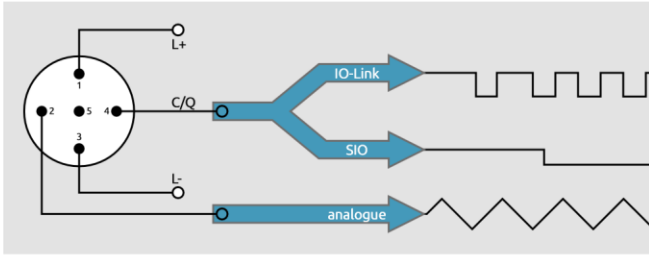

Dirty window monitor

Two-colour pyrometers feature SCM (Smart Contamination Monitor- ing), a function which indicates when the pyrometer lens or the protective quartz window are dirty.

IO-Link Interface

High operational safety

- Tamper-proof, as incorrect settings by the operator can be excluded
- Immediate, central fault diagnosis (wire breakage, short circuit etc.)
- Retrieval of diagnostic data for preventive maintenance and repair and therefore reduced risk of failure

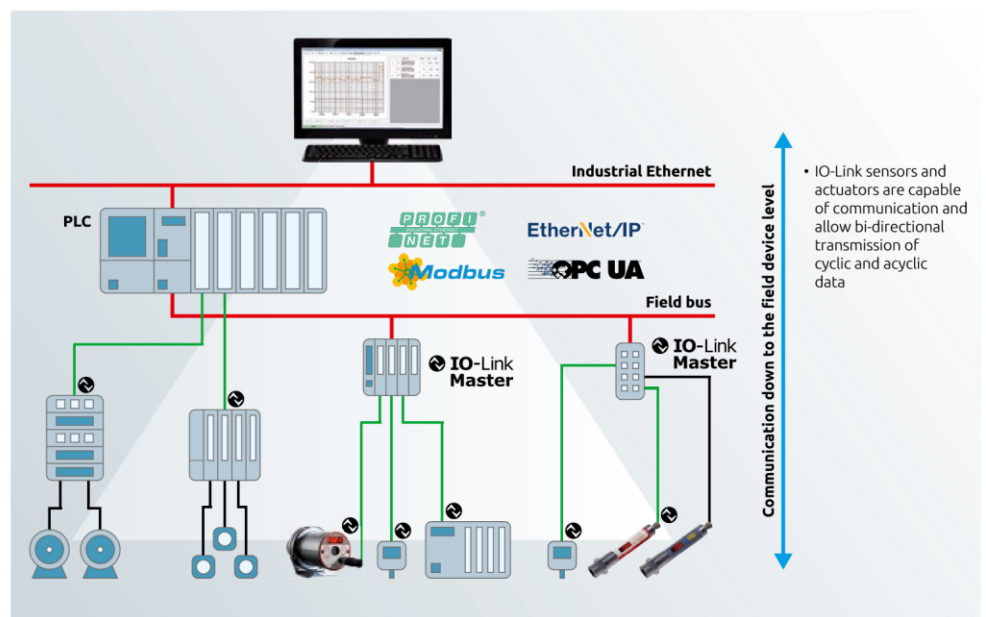## Open, system and company independent communication interface

- Internationally approved standard according to IEC 61131-9
- IO-Link consortium with all leading manufacturers of control systems
- Uniform system description of communication and device properties in the IODD device description file
- Certified IO-Link hardware components

Simple parameterisation

- Central parameterisation and storage of configuration data
- Dynamic parameterisation during operation for adaptive system control during recipe, material or tool changes reduces downtimes and increases flexibility and production diversity
- Automatic sensor parameterisation, plug and play on device exchange
- Simple duplication of parameters

Easy project planning and integration

- Can be integrated in all common field bus and automation systems
- Fast project planning and easy system documentation
- Any combination of analogue and IO-Link device in one system control system
- Downward compatible – IO-Link devices can also be operated in standard mode (SIO) as conventional sensors with switching or analogue output
- Existing wiring can continue to be used.

Safe and continuous digital communication

- Process data, diagnostic data, device information and configuration parameters
- EMC-technically interference-free transmission of measured values with 2 V signal level and protection by checksum
- Continuous communication from the lowest field level up to the ERP system
- One sensor for several measured values and switching points
- Worldwide remote maintenance and teleservice down to the lowest field level

Simple, fast and safe installation and maintenance

- Simple point-to-point connection – low wiring time
- Uniform and „correct" wiring by standard cable with M12 plug (plug & play)
- Easy and accurate replacement of sensors
  - Avoidance of incorrect exchange thanks to clear device identification in the vendor and device ID
  - Avoidance of incorrect settings, as parameters are stored in the master and transferred automatically on device exchange
- Condition-oriented maintenance and targeted service
- Minimum effort for troubleshooting
- Modern, manufacturer-independent tools for commissioning
- Minimum variety of types and stock-keeping

Cost saving

- Reduced installation and cabline costs
- Saving of analogue input cards by using standardized fieldbus switching groups

Sighting options for compact models

The CellaTemp® PX compact models can be supplied with through-the-lens, parallax-free sighting. The wide field of view makes it easy to focus on the target object. The ocular features a widened interpupillary distance, making it suitable for users who wear glasses or a helmet.

The circle in the viewfinder indicates the exact position and size of the measured target spot. If the target is especially bright, the polarizing filter PA 20/P can be mounted on the lens to protect the user's eye. For devices with a measuring range over 2000 °C, the filter is included as standard.

Laser spot light

The third sighting option available for CellaTemp® PX is an inte- grated laser spot light. The laser dot marks the center of the target spot and is well visible even from a distance of up to 10 m. The laser is activated either directly by push-button or remote by means of an external switch or via interface.

Video camera

As an option, the pyrometer can be equipped with a built-in colour video camera to view the target. Based on the latest HDR (High Dynamic Range) technology, the camera provides a higher dynamic range from the imaging process and automatic exposure control. The video image appears without over-exposure and glare.

Another special feature is TBC (target brightness control). The light sensitivity adapts dynamically to the target object captured within the measurement spot to produce a high-contrast image of the target, re-gardless of whether the object focused on is cooler or hotter than the background.

The white balance can be switched to either „automatic" or „daylight" mode. The video signal also transmits the measurement data. The temperature reading is superimposed onto the screen. A separate PC is not required.

A video image allows you to observe possible changes in the micro- structure of the measured object relative to temperature. Because the video recording captures the temperature data in conjunction with the visible surface behaviour, it enables in-depth data analysis and process optimisation.

The target marker shown on the screen indicates the exact size of the measuring field. With a resolution of 5.6 µm / pixel, even the tiniest target objects are visible. The video signal is electrically isolated from the supply voltage to prevent noise that may interfere with the image signal. The camera provides reliable performance and a sharp image in ambient temperatures up to 65 °C.

Thanks to the automatic exposure control and the TBC feature, the target always appears in optimum exposure. The temperature reading and the circled target spot are superimposed onto the image.
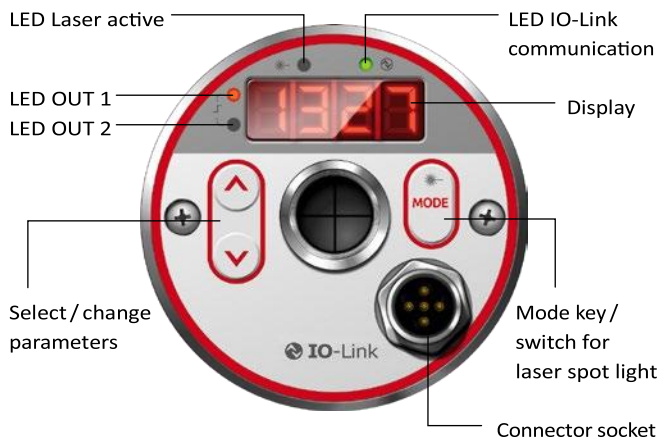

Without TBC, the light exposure would be averaged over the total illumination. A bright target object in front of a dark background would appear overexposed as shown above.

Control keys

Parameters can be configured during running operations using the rear keypad. The large control keys are easy to access and operate. The brightly lit 8 mm digits on the LED display are visible from a great distance. Four LEDs indicate the operating conditions.

LED Laser active

LED IO-Link communication

LED OUT 1
LED OUT 2

Display

Select / change parameters

Mode key / switch for laser spot light

Connector socket

Adjustable parameters

* Measured variable and scale of analogue output signals
* Smoothing filter
* Memory mode Peak Hold, ATD
* Hold time
* Emissivity
* Transmittance
* Configuration of switching contacts
* Configuration of ATD function
* Simulation of temperature
* Temperature scale °C / °F
* Display control

In addition, for two-colour pyrometers
* One-colour/two-colour mode
* Threshold value of contamination monitoring
* Soot factor (at the CellaCombustion PX 47)

In addition, for model with camera
* TBC target brightness control
* White balance
* Measuring point number

Shipment includes

* Pyrometer CellaTemp® PX
* Connection cable VK 02/L (5 m)*
* Video cable VK 02/F (5 m)* for model with built-in camera
* Instruction manual

ⓘ * other lengths must be ordered separately

ATD function

ATD (Automatic Temperature Detection) is a feature especially useful for temperature control at discontinuous processes. With ATD, objects moving across the pyrometer's field of view at undefined intervals are automatically detected. Examples include roller steel slabs at a rolling mill stand or billets discharged from an induction heating system.

With ATD, CellaTemp® PX automatically recognizes a hot object and starts measuring the temperature. The measuring cycle either adapts dynamically to the duration of the object in the sight path, or it can be custom configured by the user. At the end of each measurement, a temperature reading is generated for each object.

Diagnostics feature

During setup and running operations, a test current or a temperature can be applied to perform diagnostic and simulation functions.

Without requiring a hot object in the field of view, it is possible to test the entire signal path to the transducer and to the control system.
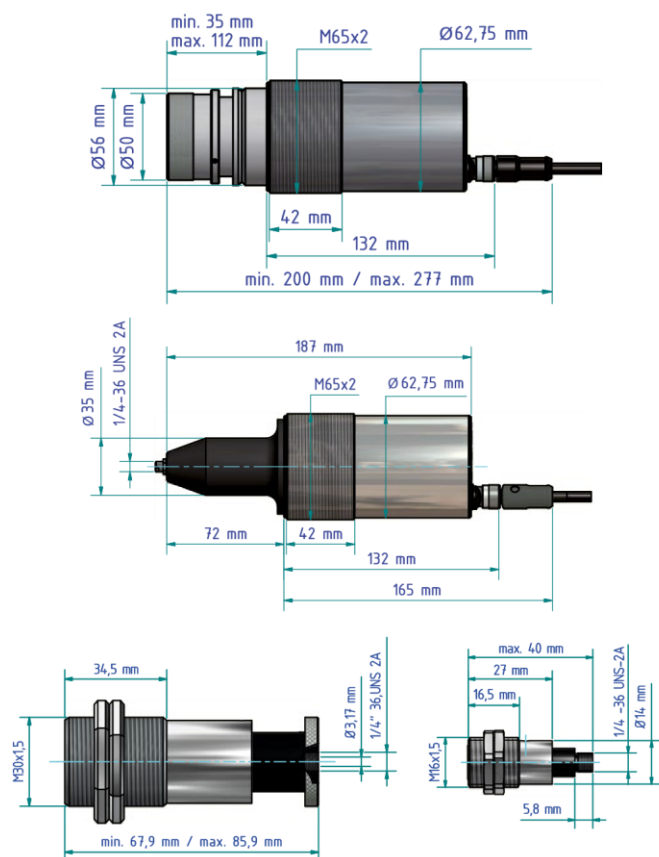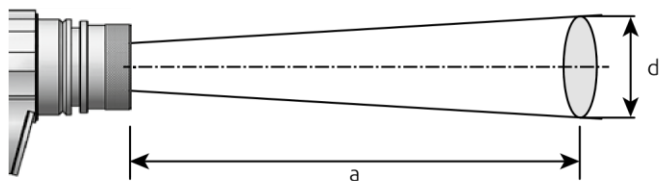
Connection diagram
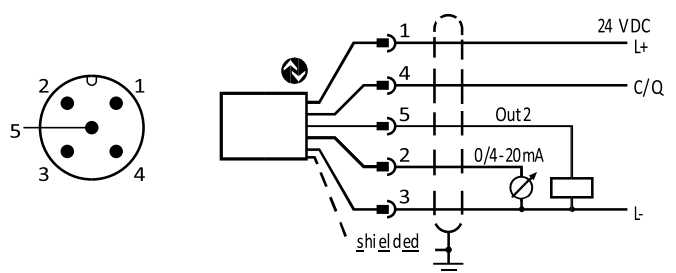
	24 VDC
1	L+
4	C/Q
5	Out 2
2	0/4-20mA
3	L-

shielded

EMV standard

* DIN EN IEC 61000-6-2:11/2019
* DIN EN IEC 61000-6-4:09/2020
* BS EN IEC 61000-6-2:2019
* BS EN IEC 61000-6-4:2019

Dimensions

$$d = \frac{a}{D}$$

For models with rectangular field of view, the definition is extended to the horizontal DH and verti-cal DV optical ratio.

PA 41.01   PZ 41.18 / PA 41.05

Measuring area

For pyrometers with focusable optics, the optical ratio D is defined as ratio of the measurement field over the measuring distance. The diameter of the measurement area at the focus distance results from the formula:

Technical Data *

Pyrometer

Analogue output
- 0/4 - 20 mA linear according to NAMUR 43, scalable
- load max. 500 Ω

Switching outputs
- PNP Open Collector active by plus supply voltage
- NC or NO contact
- Current carrying capacity 150 mA
- Safety switch-off at overload ≥ 250 mA

Interface
- IO-Link V1.1 (transmission rate 38400 Baud)

LED Display
- 4-digit (digit height 8 mm)

Resolution current output
- 0.2 K + 0.03 % of selected range

Resolution display
- 0.1 K for T < 200 °C
- 1 K for T ≥ 200 °C

Resolution IO-Link
- 0.1 K

Operating voltage
- 18 - 32 V DC
- ripple ≤ 200 mV

Current consumption
- ≤ 135 mA
- ≤ 150 mA with laser sighting
- ≤ 175 mA with video camera

Permissible humidity
- 95 % r.H. max. (non- condensating)

Ambient temperature
- 0 - 65 °C (without cooling)

Storage temperature
- -20 - +80 °C

Housing material
- Stainless steel

Protective class
- IP65 acc. to DIN 40050

Connectivity
- M12 thread, 5-pin connection

Weight
- approx. 1 kg (depending on the model)

Camera

Video signal
- Composite PAL, 1Vpp, 75 Ohm

Resolution
- 722 x 576 Pixel

TBC exposure control
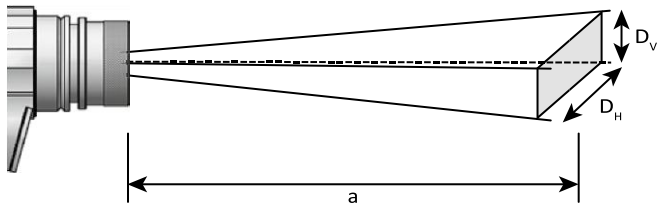- automatic, across the pyrometer's entire measuring range

Screen display
- Target size and position
- Temperature reading

Connectivity
- TNC connector

* Specifications of the technical data according to DIN IEC TS 62492-1 and DIN IEC TS 62492-2

Calibration of the pyrometers according to VDI / VDE 3511 sheet 4.4

Single-colour pyrometer

Model			Technical data							
Target sighting			Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Response time t_{98}	Precision*	Repro-ducibility
Through-the-lens	Video camera	Laser spot light								
PX 10 ...	For non-metal materials, such as ceramics, wood, rubber, synthetic materials, textiles, paper									
AF 1	AF 1 / C	AF 1 / L	0 - 1000 °C 32 - 1832 °F	8 - 14 µm	PZ 10.01	0.30 m - ∞	50 : 1	≤ 30 ms	1 % of reading, min. 2 K based on 30 ms	1 K
AF 2	AF 2 / C	AF 2 / L			PZ 10.05	0.15 m - 0.30 m	48 : 1			
PX 20 ...	For metallic surfaces, ceramics, liquid glass at medium temperature range									
AF 1	AF 1 / C	AF 1 / L	210 - 2000 °C 410 - 3632 °F	1.1 - 1.7 µm	PZ 20.01	0.40 m - ∞	175 : 1	≤ 50 ms (T>250 °C) ≤ 2 ms (T>750 °C)	0.3 % of reading, min. 4 K	1 K
AF 2	AF 2 / C	AF 2 / L			PZ 20.03	0.20 m - 0.40 m	150 : 1			
AF 3	AF 3 / C	AF 3 / L			PZ 20.06	1.20 m - ∞	275 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.05	0.20 m - ∞	40 : 1			
AF 9	AF 9 / C	AF 9 / L			PA 20.06	0.60 m - ∞	380 : 1			
AF 5	AF 5 / C	AF 5 / L	350 - 2500 °C 662 - 4532 °F		PZ 20.01	0.40 m - ∞	175 : 1			
AF 6	AF 6 / C	AF 6 / L			PZ 20.03	0.20 m - 0.40 m	150 : 1			
AF 7	AF 7 / C	AF 7 / L			PZ 20.06	1.20 m - ∞	275 : 1			
AF 8	AF 8 / C	AF 8 / L			PZ 20.05	0.20 m - ∞	40 : 1			
AF 11	AF 11 / C	AF 11 / L			PA 20.06	0,60 m - ∞	380 : 1			
PX 30 ...	For metallic surfaces, ceramics, liquid glass at high temperature range									
AF 1	AF 1 / C	AF 1 / L	500 - 2500 °C 932 - 4532 °F	0.78 - 1.06 µm	PZ 20.01	0.40 m - ∞	210 : 1	≤ 50 ms (T>550 °C) ≤ 2 ms (T>750 °C)	0.3 % of reading, min. 4 K	1 K
AF 2	AF 2 / C	AF 2 / L			PZ 20.03	0.20 m - 0.40 m	200 : 1			
AF 3	AF 3 / C	AF 3 / L			PZ 20.06	1.20 m - ∞	310 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.05	0.20 m - ∞	55 : 1			
AF 5	AF 5 / C	AF 5 / L			PA 20.06	0.60 m - ∞	430 : 1			

*(at ε = 1 and Ta = +23 °C)

CellaTemp® PX 13
Pyrometers for special applications

The CellaTemp® PX 13 was especially developed for temperature measurements in flame heated furnaces. Thanks to the selective spectral range of 3.9 µm, water vapour and CO_2 existing in the pyrom-

eter's field of vision have no effect on the measuring results, even when measuring from large distances. This allows precise measurements through flames and combustion gases.

exhaust gas temperature in gas-fired boilers and small combustion plants.

CellaCombustion PX 18

The CellaCombustion PX 18 uses a specific wavelength, in which the chemical components of the hot combustion gas have a high optical density. The devices are used in large combustion plants such as thermal waste-disposal plants and coal power plants.

CellaTemp® PX 15

In the range of 4.6 - 4.9 μm glass has an emissivity of almost 100%.

Above 5 μm, atmospheric influences, such as humidity or water vapour, affect the measurement The CellaTemp® PX 15 is provided equipped with a light-intense lens and a with a blocking filter with a spectral sensitivity of 4.6 - 4.9 μm, thus the reliable low measuring the temperature from the near surface area of the glass. pyrometer is used for low temperature measuring of metals.

CellaCombustion PX 17

The CellaCombustion PX 17 uses a specific wavelength, in which hot carbonaceous gases have a high optical density and therefore designed with a special band-stop filter and good radiation properties. The pyrometers are used to measure the from sources such as day-

CellaTemp® PX 28

The CellaTemp® PX 28 is special sensor and a patented signal evaluation for temperature measuring even with extremely low infrared radiation. The

CellaTemp® PX 29

CellaTemp® PX 29 was sensor which ignore interfering IR radiation

light or laser beams. CellaTemp® PX 29 features a response spectrum

which is far less sensitive to incidental light reflections from nearby hot objects than most commonly available pyrometers which are responsive at short wavelengths. The individual components and subassemblies can be combined in different ways, yielding 24 instrument variants. In com- bination the with supplementary lenses the CellaTemp® PX 29 can capture target spots as small as Ø 0.3 mm. Due to the wide temperature ranges and the numerous varieties of available optics, the CellaTemp® PX 29 provides maximum versatility. It is suitable for various applications in the metalworking industry, and is ideal for measuring reflective metals and aluminium at low temperatures. With its band-stop filter, the CellaTemp® PX 29 is highly

accurate in capturing the temperature of metal surfaces which are heat-treated by diode, Nd:YAG or CO_2 lasers without being effected by the extremely high laser energy. This means that the pyrometer can be used for PVD (physical vapour deposition) coating processes.

CellaTemp® PX 35

The CellaTemp® PX 35 features a narrow-band, short wavelength

spec- tral response to minimize the effect of interferences which lead to measurement errors. Detectors which respond to narrow wavebands at short wavelengths are far less susceptible to fluctuating emissivity or signal attenuation due to sight path obstructions such as dust, steam, smoke or a dirty lens. Metal surfaces, for example, exhibit higher emissivity at shorter wave-lengths and at higher temperatures. Due to the special wavelength, CellaTemp® PX 35 is especially suitable for temperature detection of metals and high-temperature applications. The pyrometer's specific spectral sensitivity is also ideal for the silicon wafer production process. Silicon is transparent at wavelengths > 1μm. Standard pyrometers will see through the silicon surface and detect the temperature of the material behind it.

CellaCrystal PX 44

The Cella Crystal PX 44 has been developed for optical temperature measurement in the production of Si and SiC crystals. The calibration is especially adapted to the growth process. Because of the hybrid signal evaluation with a constantly high resolution of < 0.1 K over the entire measuring range and the very high long-term stability of the uniform light sensor technology, the instruments meet the high demands on the required measuring accuracy.

CellaCrystal PX 45

The CellaCrystal PX 45 two-colour pyrometer is characterised by a very wide measuring range of 900 - 3200 °C. Thanks to hybrid signal processing, it has a consistently high signal resolution and extremely high long-term stability over the entire measuring range. This makes it ideal for carbonising, graphitising and crystal growing.

CellaCombustion PX 47

The CellaCombustion PX 47 is a special pyrometer for non-contact temperature measurement of sooty flames in coal power plants or waste incineration plants. The measurement and signal processing based on the two-colour method detects the heat radiation of the sooty particles of the flame in the near infrared range at two wavelengths. The burn-out operation can be controlled by the flame temperature to reduce the pollutant emission and to minimize the slagging of the walls in the combustion chamber.

The CellaCrystal PX 64 is used for temperature measurement in CVD (chemical vapour deposition) coating processes. Due to the special wavelength, the pyrometer can also be used for plasma-assisted vapour deposition.

Pyrometers for special applications

Model			Technical data							
Target sighting Throughthe-lens	Video camera	Laser spot light	Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Response time t_{98}	Precision*	Reproduci-bility
PX 13 ...	For measurements in combustion plants and flame-heated furnaces									
AF 1	AF 1 / C	AF 1 / L	- 1600 °C 932 - 2912 °F	3.9 µm	PZ 15.03	0.80 m - ∞	: 1	≤ 100 ms	% of reading	K
PX 15 ...	For glass surfaces									
AF 1	AF 1 / C	AF 1 / L	- 2500 °C - 4532 °F	4.6 - 4.9 µm	PZ 15.03	0.80 m - ∞	: 1	≤ 100 ms	0.75 % of reading	K
AF 2	AF 2 / C	AF 2 / L	- 1300 °C 572 - 2372 °F		PZ 15.03	0.80 m - ∞	: 1		0.75 % of reading, min. 3 K	
PX 17 ...	For measurements in environments with hot, CO_2-containing gases (e.g. in gas-fired boilers and small combustion plants)									
AF 1	AF 1 / C	–	- 2000 °C 752 - 3632 °F	CO2 range	PZ 15.03	0.80 m - ∞	: 1	≤ 100 ms	0.75 % of reading + 1 K	K
PX 18 ...	For measurements in environments with hot, CO-containing gases (e.g. in thermal waste-disposal plants and coal power plants)									
AF 1	AF 1 / C	–	- 2500 °C - 4532 °F	CO range	PZ 15.03	0.80 m - ∞	: 1	≤ 100 ms	0.75 % of reading	K
CellaCrystal PX 64										

Pyrometers for special applications

Model			Technical data							
Target sighting			Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Response time t$_{98}$	Precision*	Reproduci-bility
Throughthe-lens	Video camera	Laser spot light								
PX 28 ...	For measurements of aluminium, polished metal surfaces and laser applications									
AF 10	AF 10 / C	AF 10 / L	75 - 650 °C 167 - 1202 °F	1.8 - 2.4 µm	PZ 20.08	0.30 m - ∞	48 : 1	≤ 200 ms (T>75 °C) ≤ 50 ms (T>100 °C) ≤ 15 ms (T>125 °C) ≤ 2 ms (T>200 °C)	0.75 % of reading, min. 3 K	1 K
PX 29 ...	For measurements of aluminium, polished metal surfaces, at laser applications and in PVD coating processes									
AF 10	AF 10 / C	AF 10 / L	150 - 800 °C 302 - 1472 °F	1.8 - 2.2 µm	PZ 20.08	0.30 m - ∞	48 : 1	≤ 50 ms (T>150 °C) ≤ 15 ms (T>200 °C) ≤ 2 ms (T>350 °C)	0.75 % of reading, min. 5 K	1 K
AF 21	AF 21 / C	AF 21 / L	180 - 1200 °C 356 - 2192 °F		PZ 20.01	0.40 m - ∞	60 : 1	≤ 75 ms (T>180 °C) ≤ 35 ms (T>200 °C) ≤ 5 ms (T>300 °C) ≤ 2 ms (T>600 °C)		
AF 22	AF 22 / C	AF 22 / L			PZ 20.03	0.20 m - 0.40 m	56 : 1			
AF 23	AF 23 / C	AF 23 / L			PZ 20.06	1.20 m - ∞	96 : 1			
AF 1	AF 1 / C	AF 1 / L	250 - 2000 °C 482 - 3632 °F		PZ 20.01	0.40 m - ∞	210 : 1	≤ 50 ms (T>250 °C) ≤ 2 ms (T>750 °C)	0.5 % of reading, min. 4 K	
AF 2	AF 2 / C	AF 2 / L			PZ 20.03	0.20 m - 0.40 m	200 : 1			
AF 3	AF 3 / C	AF 3 / L			PZ 20.06	1.20 m - ∞	310 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.05	0.20 m - ∞	55 : 1			
PX 35 ...	For the precise measurement of metals, very high temperatures and semiconductors									
AF 1	AF 1 / C	AF 1 / L	600 - 3000 °C 1112 - 5432 °F	0.82 - 0.93 µm	PZ 20.01	0.40 m - ∞	210 : 1	≤ 50 ms (T>650 °C) ≤ 2 ms (T>850 °C)	0.3 % of reading, min. 4 K	1 K
AF 2	AF 2 / C	AF 2 / L			PZ 20.03	0.20 m - 0.40 m	200 : 1			
AF 3	AF 3 / C	AF 3 / L			PZ 20.06	1.20 m - ∞	310 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.05	0.20 m - ∞	55 : 1			
AF 5	AF 5 / C	AF 5 / L			PA 20.06	0.60 m - ∞	430 : 1			
PX 44 ...	For the precise measurement of Si and SiC crystals									
AF 4	AF 4 / C	AF 4 / L	750 - 2400 °C 1382 - 4352 °F	0.95 / 1.05 µm	PZ 20.01	0.40 m - ∞	150 : 1	≤ 10 ms (T>950 °C)	6K (< 850°C) 0.35% + 2K (850..1500°C) 0.5% + 2K (> 1500°C)	2 K
AF 7	AF 7 / C	AF 7 / L	850 - 3000 °C 1562 - 5432 °F		PZ 20.01	0.40 m - ∞	150 : 1	≤ 10 ms (T>1050 °C)	0.35% + 2K (< 1500°C) 0.5% + 2K (1500..2400°C) 1.0% (> 2400°C)	
PX 45 ...	For measurement in graphite production and crystal growth									
AF 1	AF 1 / C	–	900 - 3200 °C 1652 - 5792 °F	0.9 / 1.05 µm	PZ 20.01	0.40 m - ∞	210 : 1	≤ 10 ms	as with the PX 44 AF 7	2 K
PX 47 ...	For the measurement of sooty flames (e.g. in power plants or incineration plants)									
AF 1	AF 1 / C	–	700 - 1700 °C 1292 - 3092 °F	0.8 / 1.05 µm	PZ 20.01	0.40 m - ∞	80 : 1	≤ 20 ms (T>650 °C) ≤ 10 ms (T>750 °C)	1 % of reading	2 K
PX 64 ...	For the measurement in CVD coating processes									

| AF 2 | AF 2 / C | AF 2 / L | 500 - 1400 °C 932 - 2552 °F | 1.5 / 1.9 µm | PZ 20.03 | 0.20 m - 0.40 m | 75 : 1 | ≤ 30 ms | 0.75 % of reading, min. 4 K | 2 K |

*(at ε = 1 and Ta = +23 °C)

Compact two-colour pyrometer

The two-colour pyrometers of the PX series detect the infrared radiation emitted from an object's surface at two separate wavelengths. The dual sandwich detector uses a two-element photo-diode to capture both radiation intensities simultaneously from the exact same spot. The pyrometer produces tem perature data based on the ratio of these two intensities. The advantage of the two-colour or dual wavelength technique is that the pyrometer will still produce highly accurate temperature data, even at signal attentuation of up to 90%. The two-colour or ratio pyrometer is far less sensitive to con-taminants in the line of sight such as steam, dust or smoke than a standard single-colour pyrometer. Even if other sources impair the visibility such as dirt on the pyrometer lens or sediment and debris buildup within the sight tube, it has up to a certain degree no influence on the measurement value. When the signal is equally attenuated at both wavelengths, this will have no impact on the accuracy of the temperature reading. The two-colour method enables the pyrometer to correct for measurement errors which would otherwise occur when a material's emissivity varies as a function of temperature or surface

$$T_Q \approx \frac{\varepsilon_1 * \Phi_{\lambda 1}}{\varepsilon_2 * \Phi_{\lambda 2}}$$
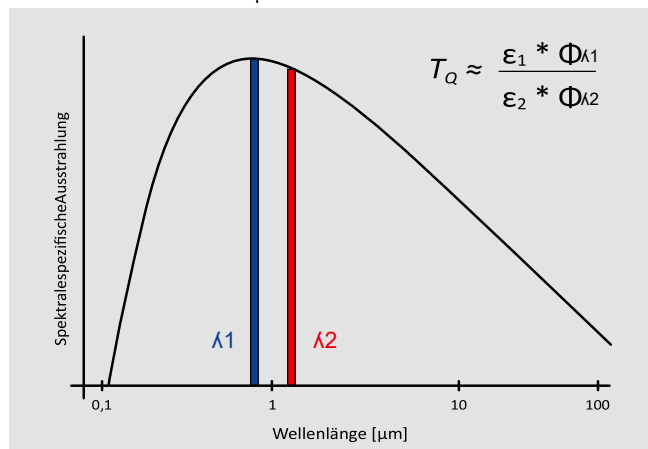
properties, or when the pyrometer is used at a production line which produces a variety of products having different emissivities.

Model			Technical data							
Target sighting Throughthe-lens	Video camera	Laser spot light	Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Response time t_{98}	Precision*	Repro-ducibility
PX 40 ... For use in these industries: steel, ceramics or cement in harsh environments										
AF 20	AF 20 / C	AF 20 / L	500 - 1400 °C 932 - 2552 °F		PZ 20.08	0.30 m - ∞	55 : 1	≤ 10 ms (T>650 °C)		
AF 1	AF 1 / C	AF 1 / L			PZ 20.01	0.40 m - ∞	80 : 1			
AF 2	AF 2 / C	AF 2 / L			PZ 20.03	0.20 m - 0.40 m	75 : 1			
AF 3	AF 3 / C	AF 3 / L	650 - 1700 °C 1202 - 3092 °F		PZ 20.06	1.20 m - ∞	120 : 1	≤ 20 ms (T>650 °C) ≤ 10 ms (T>750 °C)		
AF 10	AF 10 / C	AF 10 / L			PZ 20.05	0.20 m - ∞	20 : 1			
AF 13	AF 13 / C	AF 13 / L			PZ 20.08	0,30 m - ∞	55 : 1			
AF 21	AF 21 / C	AF 21 / L			PA 20.06	0.60 m - ∞	190 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.01	0.40 m - ∞	150 : 1			
AF 5	AF 5 / C	AF 5 / L			PZ 20.03	0.20 m - 0.40 m	140 : 1			
AF 6	AF 6 / C	AF 6 / L	750 - 2400 °C 1382 - 4532 °F	0.95 / 1.05 µm	PZ 20.06	1.20 m - ∞	240 : 1	≤ 10 ms (T>950 °C)	1 % of reading	2 K
AF 11	AF 11 / C	AF 11 / L			PZ 20.05	0.20 m - ∞	35 : 1			
AF 14	AF 14 / C	AF 14 / L			PZ 20.08	0,30 m - ∞				
AF 22	AF 22 / C	AF 22 / L			PA 20.06	0.60 m - ∞				
AF 7	AF 7 / C	AF 7 / L			PZ 20.01	0.40 m - ∞	100 : 1 370 : 1 150 : 1 140 : 1			
AF 8	AF 8 / C	AF 8 / L			PZ 20.03	0.20 m - 0.40 m				
AF 9	AF 9 / C	AF 9 / L			PZ 20.06	1.20 m - ∞	240 : 1			
AF 12	AF 12 / C	AF 12 / L	850 - 3000 °C 1562 - 5432 °F		PZ 20.05	0.20 m - ∞	35 : 1	≤ 10 ms (T>1050 °C)		

AF 15	AF 15 / C	AF 15 / L			PZ 20.08	0,30 m - ∞	100 : 1			
AF 18	AF 18 / C	AF 18 / L			PA 40.01	86 mm - 115 mm				
AF 23	AF 23 / C	AF 23 / L			PA 20.06	0.60 m - ∞	250 : 1 / 370 : 1			
PX 50 ...	For measurements of materials with varying emissivity									
AF 1	AF 1 / C	AF 1 / L			PZ 20.01	0.40 m - ∞	80 : 1			
AF 2	AF 2 / C	AF 2 / L	500 - 1400 °C	0.95 /	PZ 20.03	0.20 m - 0.40 m	75 : 1	≤ 30 ms	1 % of reading	2 K
AF 3	AF 3 / C	AF 3 / L	932 - 2552 °F	1.55 µm	PZ 20.06	1.20 m - ∞	120 : 1			
AF 4	AF 4 / C	AF 4 / L			PZ 20.05	0.20 m - ∞	20 : 1			
PX 60 ...	For measurements at low temperatures from 300 °C									
AF 1	AF 1 / C	AF 1 / L	300 - 800 °C / 572 - 1472 °F	1.5 /	PZ 20.08	0.30 m - ∞	39 : 1	≤ 30 ms	1 % of reading	2 K
AF 11	AF 11 / C	AF 11 / L	400 - 1000 °C / 752 - 1832 °F	1.9 µm	PZ 20.01	0.40 m - ∞	80 : 1			

*(at ε = 1 and Ta = +23 °C)

Panorama pyrometer® with rectangular measurement area

The CellaTemp® PX 43, a pan- pyrometer®, features fluctuating measurement is also ideal

area. The unique design to rods at a roller table.

detect the temperature of target objects which move alignment and within the rectangular area. is accomplished without The pyrometer models can be combined with supplementary lenses requiring any moving parts. for very small targets such as filaments.

The CellaTemp® PX 43 reliably captures objects which typically show orama behaviour (such as swaying wires). The rectangular area a rectangular when measuring objects whose position tends to vary

during the production process. Such objects include billets or metal enables the pyrometer

A rectangular measurement field simplifies pyrometer focusing in applications which involve small measurement objects. This

Model			Technical data								
Target sighting Throughthelens	Video camera	Laser spot light	Temp. range		Wave-length	Lens system	Focus range	Distance ratio	Response time t_{98}	Precision*	Repro-ducibility
PX 43 ...			For use in these industries: steel, ceramics, or cement in harsh environments								
AF 20	AF 20 / C	AF 20 / L	600 - 1400 °C	1112 - 2552 °F		PZ 20.08	0.30 m - ∞	D_v = 150 : 1 D_h = 30 : 1	≤ 10 ms (T>650 °C)		
AF 1	AF 1 / C	AF 1 / L	650 - 1700 °C	1202 - 3092 °F		PZ 20.01	0.40 m - ∞	D_v = 230 : 1 D_h = 45 : 1	≤ 10 ms (T>750 °C)		
AF 2	AF 2 / C	AF 2 / L				PZ 20.03	0.20 m - 0.40 m	D_v = 215 : 1 D_h = 40 : 1			
AF 3	AF 3 / C	AF 3 / L				PZ 20.06	1.20 m - ∞	D_v = 375 : 1 D_h = 75 : 1			
AF 10	AF 10 / C	AF 10 / L				PZ 20.05	0.20 m - ∞	D_v = 55 : 1 D_h = 10 : 1			
AF 13	AF 13 / C	AF 13 / L				PZ 20.08	0.30 m - ∞	D_v = 150 : 1 D_h = 30 : 1			
AF 21	AF 21 / C	AF 21 / L				PA 20.06	0.60 m - ∞	D_v = 500 : 1 D_h = 95 : 1		1.5 % of reading	3 K
AF 4	AF 4 / C	AF 4 / L	750 - 2400 °C	1382 - 4532 °F	0.95 / 1.05 µm	PZ 20.01	0.40 m - ∞	D_v = 350 : 1 D_h = 50 : 1			
AF 5	AF 5 / C	AF 5 / L				PZ 20.03	0.20 m - 0.40 m	D_v = 330 : 1 D_h = 45 : 1			
AF 6	AF 6 / C	AF 6 / L				PZ 20.06	1.20 m - ∞	D_v = 580 : 1 D_h = 85 : 1			
AF 11	AF 11 / C	AF 11 / L				PZ 20.05	0.20 m - ∞	D_v = 85 : 1 D_h = 11 : 1	≤ 10 ms (T>950 °C)		
AF 14	AF 14 / C	AF 14 / L				PZ 20.08	0.30 m - ∞	D_v = 230 : 1 D_h = 34 : 1			
AF 17	AF 17 / C	AF 17 / L				PA 40.01	86 mm - 115 mm	D_v = 380 : 1 D_h = 80 : 1			
AF 22	AF 22 / C	AF 22 / L				PA 20.06	0.60 m - ∞	D_v = 730 : 1 D_h = 105 : 1			
AF 7	AF 7 / C	AF 7 / L				PZ 20.01	0.40 m - ∞	D_v = 350 : 1 D_h = 50 : 1			
AF 8	AF 8 / C	AF 8 / L				PZ 20.03	0.20 m - 0.40 m	D_v = 330 : 1 D_h = 45 : 1	≤ 10 ms (T>1050 °C)		
AF 9	AF 9 / C	AF 9 / L				PZ 20.06	1.20 m - ∞	D_v = 580 : 1 D_h = 85 : 1			

AF 12	AF 12 / C	AF 12 / L	850 - 3000 °C 1562 - 5432 °F		PZ 20.05	0.20 m - ∞	D_v = 85 : 1 D_h = 11 : 1			
AF 15	AF 15 / C	AF 15 / L			PZ 20.08	0.30 m - ∞	D_v = 230 : 1 D_h = 34 : 1			
AF 18	AF 18 / C	AF 18 / L			PA 40.01	86 mm - 115 mm	D_v = 380 : 1 D_h = 80 : 1			
AF 23	AF 23 / C	AF 23 / L			PA 20.06	0.60 m - ∞	D_v = 730 : 1 D_h = 105 : 1			

*(at ε = 1 and Ta = +23 °C)

Single-colour / two-colour fibre optics pyrometer

A pyrometer with fibre optics has the sensor head housed separately from the electronics assembly. A fibre optic cable transmits the detected infrared energy to the electronics. The optical sensor head can with- stand ambient temperatures up to 250 °C without cooling.

Both the sensor head and the fibre optic cable are unsusceptible to electromagnetic radiation. Pyrometers with fibre optics are ideal for cramped, hard-to-access locations. Three different focusable optical heads are available. Select the one most suitable, depending on the required target size and measuring distance.

For target sighting and focussing, the pyrometer features a built-in laser spot light. At the focal distance, the laser spot light indicates the exact size of the measuring area. This allows the measurement position and focus setting to be checked exactly.

The optical fibre can be supplied at a length of up to 50 m, ensuring that the electronics can be installed at a safe distance. The fibre optic cable is equipped with a screw connector at each end to ease instal- lation and detachment. Metallic armouring provides the optical fibre with a high degree of mechanical protection.

Model	Technical data								
Type	Temp. range	Wave-length	Lens system	Focus range	Distance ratio	Method	Response time t_{98}	Precision*	Reproduci-bility
PX 21 ...	For metallic surfaces, ceramics, liquid glass at medium temperature range								
AF 11	250 - 2000 °C 482 - 3632 °F	1.1 - 1.7 µm	PA 41.01	0.20 m - ∞	180 : 1	single-colour	≤ 50 ms (T>300 °C) ≤ 2 ms (T>800 °C)	0.75 % of reading, min. 4 K	2 K
AF 21			PA 41.05	0.12 m - ∞	100 : 1				
AF 22			PZ 41.18	33 mm - 45 mm	50 : 1				
PX 31 ...	For metallic surfaces, ceramics, liquid glass at high temperature range								
AF 11	550 - 2500 °C 1022 - 4532 °F	0.78 - 1.06 µm	PA 41.01	0.20 m - ∞	190 : 1	single-colour	≤ 50 ms (T>600 °C) ≤ 2 ms (T>800 °C)	0.75 % of reading	2 K
AF 21			PA 41.05	0.12 m - ∞	100 : 1				
AF 22			PZ 41.18	33 mm - 45 mm	50 : 1				
PX 36 ...	For the precise measurement of metals, very high temperatures and semiconductors								
AF 11	650 - 3000 °C 1202 - 5432 °F	0.82 - 0.93 µm	PA 41.01	0.20 m - ∞	190 : 1	single-colour	≤ 50 ms (T>680 °C) ≤ 2 ms (T>900 °C)	0.75 % of reading	2 K
AF 21			PA 41.05	0.12 m - ∞	100 : 1				
AF 22			PZ 41.18	33 mm - 45 mm	50 : 1				
PX 41 ...	For use in these industries: steel, ceramics or cement in harsh environments								
AF 211	700 - 1800 °C 1292 - 3272 °F	0.95 - 1.05 µm	PA 41.01	0.20 m - ∞		two- colour	≤ 20 ms (T>850 °C)	1.5 % of reading	3 K
AF 221			PA 41.05	0.12 m - ∞					
AF 222			PZ 41.18	33 mm - 45 mm	110 : 1 50 : 1 36 : 1 190 : 1 100 : 1				
AF 11	800 - 2400 °C 1472 - 4352 °F		PA 41.01	0.20 m - ∞			≤ 20 ms (T>950 °C)		
AF 21			PA 41.05	0.12 m - ∞					
AF 22			PZ 41.18	33 mm - 45 mm					
AF 111	900 - 3000 °C 1652 - 5432 °F		PA 41.01	0.20 m - ∞	50 : 1 190 : 1 100 : 1 50 : 1		≤ 20 ms (T>1050 °C)		

| AF 121 | | | PA 41.05 | 0.12 m - ∞ | | | | | |
| AF 122 | | | PZ 41.18 | 33 mm - 45 mm | | | | | |

*(at ε = 1 and Ta = +23 °C)

Accessories
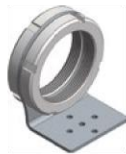
Shielded cable VK 02 / L AF 1: 5 m VK 02 / L AF 2: 10 m	Mounting bracket with 2 shaft nuts PA 11/U	Mounting angle PA 11/K
Clamping collar PZ 20/L: Ø 70 mm PZ 20/N: Ø 65 mm	Air purge PZ 20/A	
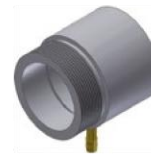
ZnS window PA 10/I
Sapphire window PA 15/I
Quartz window PA 20/I

Quick connector
ZnS window PA 10/C
Sapphire window PA 15/C
Quartz window PA 20/C
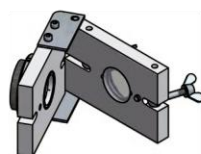
Window with hinge
PZ 10/I (ZnS-window)
PZ 15/I (CaF2-window)
PZ 20/I (Quartz-window)

Mounting with flange
PB 08/Q AF1 (mounting)
PB 08/R AF1 (flange)
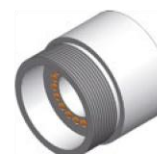
Illumination ring
PZ 10/P

Ball flange
PB 08/I

Intermediate tube
PZ 20/C

Protective enclosure,
closed PA 40/M

Cooling jacket open
PA 20/B

Cooling jacket closed
PA 20/M

Cooling jacket
PA 20/M AF2 for
pyrometer with camera

Supplementary lens
PZ 20/O

Protective glass
PZ 10/I AF 1 (ZnS)
70146 (Quartz)

Flange tube
PB 08/M AF1

Connection head
PB 08/N
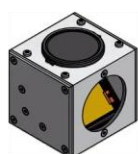
Mirror attachment
PA 20/E

Dust stop
PZ 10/T (35 mm)
PZ 20/T (20 mm)

Intermediate tube
with socket
PZ 40/C

Intermediate tube
PZ 20/J

Mounting flange
PZ 20/F

Mountings

Mounting PA 20-006

consisting of: • Air purge PZ 20/A
- Intermediate tube PZ 20/J
- Mounting bracket PA 11/U
- Mounting angle, adjustable PA 11/K
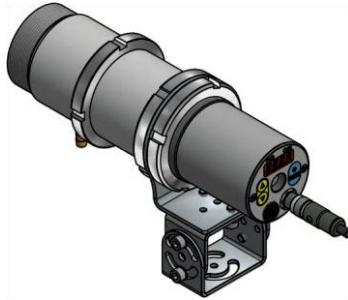
Mounting PA 20-027 for furnace installation

consisting of: • Cooling jacket PA 20/M AF 1
- Quartz window with hinge PZ 20/I
- Air purge PZ 20/A
- Intermediate flange PZ 20/C
- Mounting flange PZ 20/F
- Dust stop PZ 20/S • Ball flange PB 08/I
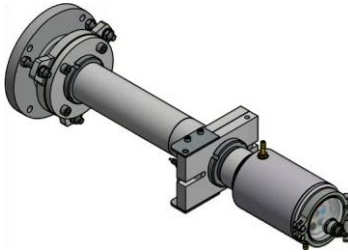
Mounting PA 20-065 for compressed air e.g. for cement industry

consisting of: • Cooling jacket PA 20/M AF 1
- Quartz window with hinge PZ 20/I
- Air purge PZ 20/A
- Intermedite tube PZ 20/C
- Mounting flange PZ 20/F
- Dust stop PZ 20/S
- Ball flange PB 08/I
- Hose clamp 10 - 16 mm
- Industrial hose GP40
- Mounting plate in wall housing SK 613   with flow monitor
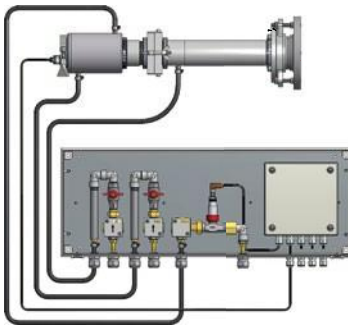
Mounting of the fibre optics version PA 21-001 for furnace installation
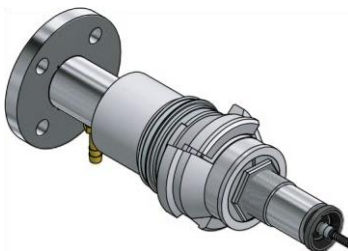
consisting   of: •   Quartz window

PS 01/I AF 2
- Bayonet coupling PS 11/N AF 5
- Air purge PS 01/A AF 1
- Shim Ø 35 mm
- Flange PS 01/N

Mounting PA 83-010 for pedestal mount

consisting of:
- Dust stop PZ 10/T
- Intermediate tube PZ 20/C
- Air purge PZ 20/A
- Clamping collar PZ 20/L AF 2
- Cooling jacket, closed PA 20/M AF 1
- Hose nozzle G1/8"
- Mounting PB 08/Q AF 1
- Flange PB 08/R AF 1
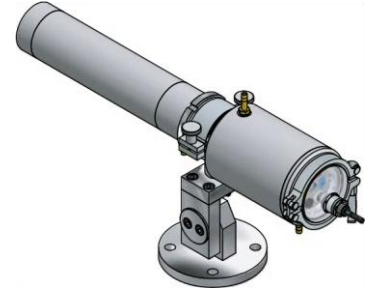
Mounting PA 20-077 for hot blast stoves

consisting of: • Cooling jacket, closed PA 20/M AF 2
- Flange PB 08/O AF 1
- Flange tube PB 08/M AF 1

Mounting PA 20-066 for fan air e.g. for cement industry

consisting of: • Cooling jacket PA 20/M AF 1
- Quartz window with hinge PZ 20/I
- Intermediate   tube   with socket PZ 40/C • Mounting flange PZ 20/F
- Ball flange PB 08/I
- Fan PB 08/F AF 3
- Aluminium hose PB 08/L
- Hose clamps 10 - 16 mm and 50 - 70 mm
- Industrial hose GP40
- Mounting plate in wall housing SK 749 with flow monitor
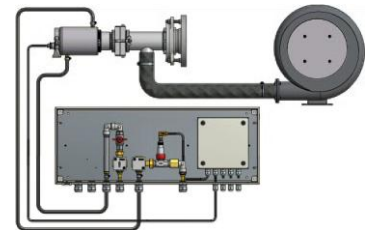
Mounting PA 20-001 with oscillating mirror for pedestl mount

consisting of: • Oscillating mirror
  PZ 20/X AF 5
- Intermediate tube PZ 20/J
- Clamping collar PZ 20/L AF 2
- Mounting bracket
  PZ 20/U AF 2
- Protective glass M62x0,75

Special Accessories

Oscillating mirror PZ 20/X

An oscillating mirror with scanner function can be mounted to a CellaTemp® PX pyrometer.

The measurement field is deflected to capture the target object. Use the analogue output in conjunction with a RS-422 interface to collect temperature readings together with target position.

With the PZ/20 X you can:
- Detect „hot spots" at belt conveyors
- Capture swaying wires
- Generate temperature profiles of sheet metals and steel slabs
- Measure the temperature of objects at a roller table whose size and position are not constant

The PZ 20/X accessory is supplied with CellaScan software to generate graphic images showing temperature data plotted against the scan angle.

Interface converter / Video encoder

Video encoder SU 08
Video <-> Ethernet

Illumination ring PZ 10/P

In dark furnaces, it is often impossible to see the target. Installing an auxiliary light source in a second porthole can be quite dif- ficult and costly. Thus, in actual practice, pyrometers are often focused at the target only at the time of installation. Verification of correct focusing during running operations will not be possible.

The PZ 10/P illuminates the target spot in a closed furnace, utilizing the same furnace opening in which the pyrometer is installed.

This built-in accessory is part of the pyrometer's mounting assembly.

The illumination ring helps you align and focus the pyrometer to the measurement spot at the time of initial setup. What's more, this accessory lets you view the target area anytime later, such as during routine spot checks, and make adjustments if necessary.

When used in conjunction with a pyrometer featuring a built-in video camera, you can view a live image of the illuminated target at a control room monitor.

Applications

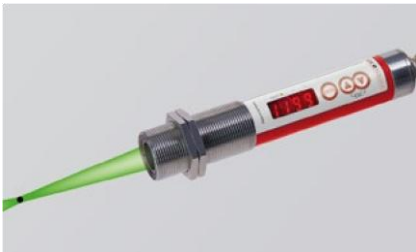|		
Asphalt and concrete mixing	Crystal growing	Coke oven
Wires, tubes and rods	Filaments / Metal bands	Runner
Incineration plant	Rolling mill	Blast furnace / stove dome
Power plant	Continuous casting	Rotary kiln
Sinter plant	Glass production	Induction heating

Other products

CellaPort PT
Portable single-colour and two-colour pyro-meters with through-the-lens sighting and USB interface.

CellaCast PT
Portable pyrometer for non-contact temper-ature measurement of molten metal at auto-mated casting machines and blast furnaces.

CellaTemp® PK(L)
Compact infrared thermometer for cramped environments. Optional with LED spot light.

CellaTemp® PKF
Compact infrared thermometer with optical fibre and optical sensor head.

Mikro PV
Intensity comparison pyrometer for ultra accurate measurement.

CellaSwitch
Compact infrared switch with LED display and auto-diagnostics.

Since 1967, the Division Infrared Ther-mometer Solutions (ITS) of KELLER HCW GmbH develops and manu-factures precision instruments and systems solutions for non-contact temperature measurements. Thanks to the continuous development of its range, KELLER ITS now is one of the leading providers for infrared ther-mometers and pyrometers world-wide.

With its very large product range of more than 250 models and systems KELLER ITS offers solutions for all standard applications and a variety of special measuring tasks.

Following the KELLER philosophy, the key focus in the development and production of the devices is set to the high measuring accuracy and reliability. Therefore, KELLER grants a warranty of 5 years on its products.

A global network of distributors and service points ensures competent and personal consultation on site.

KELLER
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KELLER A DIVISION OF GROUPE LEGRIS INDUSTRIES

Infrared thermometer
CellaTemp® PK / PKF / PKL

for non-contact temperature measurements
from -30 °C to +2500 °C

Two-colour infrared thermometer

PKL 68	- 1600 °C	Metals (small measuring objects), induction heating at difficult measuring conditions like dust, steam, smoke

Compact infrared thermometer

Compact infrared thermometer with LED spot light

Two-colour infrared thermometer

PK 62	- 1700 °C	Sooty flames
PK 68	- 1400 °C	Metals, ceramics, molten glass at difficult measuring conditions like dust, steam, smoke

Infrared thermometer with optical fibre and optical sensor head

Type	Measuring range	Application
Single-colour infrared thermometer with fibre optic and sensor head		
PKF 26	- 1600 °C	Metals, ceramics, molten glass
PKF 36	- 2500 °C	Metals, ceramics large objects
Two-colour infrared thermometer with fibre optic and sensor head		
PKF 66	- 1800 °C	Metals, ceramics, molten glass at difficult measuring conditions
PKF 67	- 1400 °C	like dust, steam, smoke

Type	Measuring range	Application
Single-colour infrared thermometer		
PK 11	0 - 1000 °C	Non metals
PK 12	-30 - 300 °C	Non metals at l... temperatures
PK 14	0 - 500 °C	Non metals larg... objects
PK 18	0 - 500 °C	Non-metals in aggressive me...
PK 21	250 - 1600 °C	Metals, ceramic...
PK 24	250 - 1600 °C	Metals, ceramic... objects
PK 25	75 - 650 °C	Metals at very l...
PK 29	150 - 800 °C	Aluminum, brigh... applications
PK 31	500 - 2500 °C	Metal, ceramics... high temperatur...
PK 35	450 - 1400 °C	Wafer productio...
PK 41	300 - 1300 °C	
PK 42	500 - 2500 °C	Glass surfaces
PK 51	400 - 1400 °C	
PK 52	500 - 2000 °C	Flame-heated fu...
PK 72	400 - 2000 °C	Hot CO$_2$ contain...
PK 73	500 - 2500 °C	Hot CO containi...
PK 74	250 - 1700 °C	Hot CO$_2$ contain...

Type	Measuring range	Application
Single-colour infrared thermometer		
PKL 11	0 - 1000 °C	Non metals, coated metals
PKL 28	250 - 1600 °C	Metals (small measuring objects), induction heating
PKL 29	180 - 1200 °C	Metals (small measuring objects), induction heating at low temperatures
PKL 38	500 - 2500 °C	Metals (small measuring objects), induction heating at high temperatures

Type	Measuring range	Application
Panorama infrared thermometer		
PKL 63	650 - 1600 °C	Metals (oscillating measuring objects), production and heat treatment of wires, rods, bolts

Infrared thermometer CellaTemp® PK / PKF / PKL

Special features

- Compact infrared thermometer with large, bright LED display and control panel
- All parameters adjustable with control keys on the sensor head and digital interface
- Vitality indicator for self-monitoring service display
- Supply voltage monitor
- SCM function for pollution monitoring
- Wide band anti-reflective precision lenses

- Large measuring ranges with high temperature resolution over the entire temperature range
- Analogue output 0/4 - 20 mA and modern IO-Link communication interface according to the latest standard
- 2 universally configurable switching outputs
- PKL version with patented LED spotlight
- PKF version with fibre-optic cable and separate optical measuring head

Serie CellaTemp® PK

LED status switching   LED status switching

output OUT 1

M30 thread

output OUT 2

Operating mode

M12 connector

The infrared thermometer CellaTemp® PK records the infrared radiation emitted by an object and converts it into an electrical signal. The detected temperature is displayed and transmitted to the analogue output and the digital interface for further processing.

Thanks to a unique combination of analogue and digital linearisation, the CellaTemp® PK has consistently high-resolution signal processing over the entire measuring range. Therefore, even with wide measuring ranges, the infrared thermometer has a very high temperature Robust lens with 7 segment Operator resolution while its noise equivalent temperature difference (NETD) anti-reflective coating display control keys is extremely low. The pyrometer thus supplies stable measurement readings even when the response times are extremely short (from 2 ms) and the measured temperatures are very low.

CellaTemp® PK 41 / 42 for measuring glass

The bright and energy-efficient display unit is based on state-of-the- Since glass is a volume radiator, devices that operate at a wavelength art LED technology. Even from a great distance it is easy to read. between 4.6 - 4.9 µm are required to measure the temperature near the surface. In this range, glass has an emissivity of almost 100 %.

CellaTemp® PK 18 for asphalt and concrete mixing plants

The CellaTemp® PK 41/42 are equipped with the appropriate wave-

length filters. This enables precise temperature measurement The CellaTemp® PK 18 is equipped with an especially resilient lens, regardless of the colour, type and thickness of the glass. allowing its use even in extreme environmental conditions, such as in asphalt and concrete mixing plants, preventing the lens from damage by aggressive vapours and dust.

CellaTemp® PK 51 / 52 for flame-heated furnaces

The CellaTemp® PK 51 was especially developed for temperature

CellaTemp® PK 25 / 29 for metals at low temperatures

measurements in flame heated furnaces. Thanks to the selective and for laser applications spectral range of 3.9 µm, water vapour and CO_2 existing in the pyro-

meter´s field of vision have no effect on the measuring results. This With conventional short-wavelength pyrometers, daylight or extra- allows precise measurements of the firebed through flames and comneous radiation from the surrounding area can interfere with the bustion gases.
measurement at low temperatures and objects with low emissivity.

The CellaTemp® PK 25 / 29 pyrometers are therefore equipped with a special blocking filter to avoid such influences. **CellaCombustion PK 62**

for flame measurement

The devices are used for a wide range of applications in the metal- The CellaCombustion PK 62 is a special infrared thermometer for working industry, and in particular for measuring the temperature of non-contact temperature measurement of sooty flames in coal aluminium and shiny metals. power plants or waste

incineration plants. The measurement and signal processing based on the two-colour method detects the heat The optical filters also block the high-energy laser radiation used in radiation of the sooty particles of the flame at two wavelengths. The heat treatment processes that involve diode, Nd:YAG or CO2 lasers. flame temperature can be used to control the burnout during firing operation in order to minimise pollutant emissions and slagging of the combustion chamber walls.

the chemical components of the hot CO-containing combustion gas have a high optical density. The devices are used in large combustion plants such as thermal waste-disposal plants and coal power plants.

CellaCombustion PK 72 / 74 for small combustion plants with optical fibre and optical sensor head

The CellaCombustion PK 72 / 74 uses a specific wavelength, in which hot CO₂-containing gases have a high optical density and provide good radiation properties. The pyrometers are used to measure the exhaust gas temperature in gas-fired boilers and small combustion plants.

CellaCombustion PK 73 for large combustion plants

The CellaCombustion PK 73 uses a specific wavelength, in which

CellaTemp® PKF 26 / 36 / 66 / 67

The electronic elements of the CellaTemp® PKF 26/36/66/67 version are separated from the measuring head. A fibre optics cable transmits the infrared radiation to the electronic unit where it is transformed into an electric signal. The measuring head is entirely composed of mechanical and optical components, enabling its use at ambient temperatures up to 250 °C without auxiliary cooling systems. The fibre optics version is also used in confined spaces or in powerful electromagnetic fields. The fibre optics cable is detachable both from the measuring head and the electronic unit using a screw-in FSMA connector which makes the cable easy to install. The length of the fibre optics cable can be up to 50 m.

Laser pointer

The laser pointer PK 01/E has to be attached to the end of the optical fibre to set the focal distance and to check the alignment during setup of the fibre-optic pyrometers Cella Temp® PKF 26 / 36 / 66 / 67. The spotlight indicates the exact position and size of the measuring field.

Thanks to the high-precision mechanical and optical design the geometric and optical axes are identical, thus the CellaTemp® PKL is parallax-free. As a

*   lights up permanently
*   shows exactly the size and position of the target as well as the focal point
*   is absolutely safe
*   innovative, bright LED technology with low power consumption

Infrared thermometer CellaTemp® PKL with LED pilot light

*   it does not come into contact with the optical axis to exclude soiling or dirt
*   green spotlight is bright and clearly visible to the eye

CellaTemp® PKL 11 / 28 / 29 / 38 / 68

The CellaTemp® PKL comes with an integrated LED spot light. The spot light is an indispensable aid for precisely aligning the infrared thermometer to the focal distance and the hot zone, especially when measuring small objects. The LED spot light is continuously illu-

## Special features of the LED spotlight function it offers a high degree of operational safety.

result, the patented spot light indicates the exact position and true size of the measuring point. This ensures precise measurement, especially for small objects and small viewing openings.

The optical system of the CellaTemp® PK features a high-quality glass lens optimised for the visible and infrared range. This ensures that within the focal range both the infrared radiation on the sensor and the spot light are reproduced in an equally sharp way.

The LED light is technically safe and there is no risk of injury to the human eye. Unlike a laser, it is not subject to aging and, regardless of the ambient temperature, it always works with a constant luminous intensity. The maximum permissible ambient temperature is 65 ° C , even with spotlight.

The latest LED technology provides bright light spot with low power consumption. Due to the high sensitivity of the human eye to this wavelength, the green LED light is still clearly visible even on red glowing objects.

Panorama pyrometer CellaTemp® PKL 63

The two-colour infrared thermometer CellaTemp® PKL 63 features a rectangular measuring field. The unique design enables the pyrometer to detect the temperature of target objects which move within the rectangular field. This is accomplished without requiring any moving parts. The CellaTemp® PKL 63 reliably captures objects which

measuring object

measurement area

measuring distance
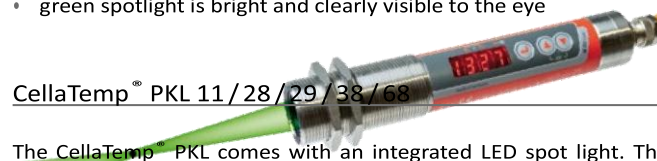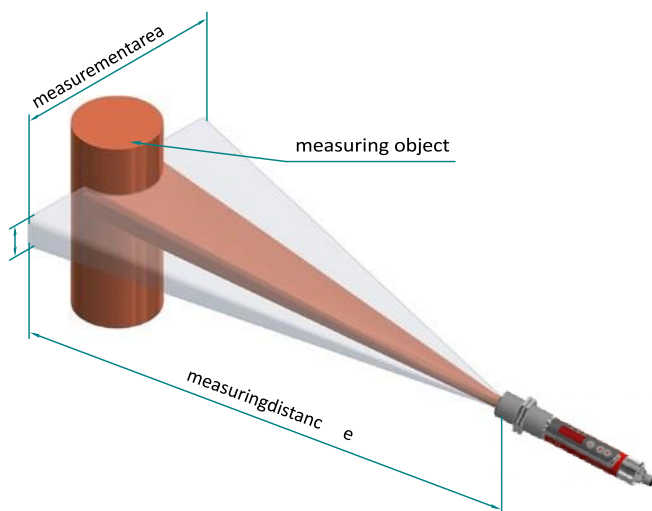
typically show fluctuating behaviour (such as swaying wires). The rectangular field is also ideal when measuring objects whose position tends to vary during the production process. Such objects include billets or metal rods at a roller table.

Two-colour pyrometer

The two-colour pyrometers CellaTemp® PKL 63, PK(L) 68 and PKF 66 capture the infrared radiation of the object at two wavelengths at the same time and spot using a photodiode in sandwich design. The temperature is then defined by the ratio of these two signals.

The advantage of a two-colour measuring procedure is that it produces a correct reading even when the infrared radiation picked up by the sensor is weakened by up to 90%. The two-colour pyrometer reacts substantially less sensitive than a single-colour pyrometer to visual obstructions in the target area caused by steam, dust and smoke . The same applies if the optical system of the device or the inspection glass of the furnace is dirty or inspection openings are clogged. Therefore, two-colour pyrometers are preferably used for industrial applications in harsh ambient environments and under difficult measuring conditions, such as rotating kilns in the cement industry or rolling mills in the steel industry.

The ratio principle also compensates for changes in the radiation characteristics of the measuring object. The emissivity, i.e. the radiation characteristics of the object to be measured may change due to the nature of the surface or in relation to the temperature, but with simultaneous changes over both wavelengths there is no influence on the measurement.

Another advantage of the two-colour infrared thermometers is that the measuring object may even be smaller than the target field of the device. Therefore, with smaller measuring objects, such as in inductive heating installations, a two-colour infrared thermometer is less sensitive to an imperfect alignment than a single-channel thermometer.

Analogue output

The analogue output supplies a signal linear to the temperature; 0/4 – 20 mA are optionally available. The range setting can be con-

figured with the control keys according to the needs of the user. The outputs deactivate and a warning appears on the display when the internal temperature reaches > 75 °C.

Switching outputs

With a hot object in the sensor's field of view, a switching contact is triggered when a pre-defined temperature threshold is exceeded. An LED indicates this switching status. Optionally, the switch can operate as a normally closed or normally open contact.

This configurable switch on/switch off delay permits a suppression of short interference pulses and for the adaptation of the switching outputs to the response time of a PLC.

A variety of possible applications includes:
- Monitoring of limit temperatures or temperature ranges
- Signalisation of soiling of the lens or viewing window
- Signalisation of status information of the DTD function (Discontinuous Temperature Detection)
- Determination of the measuring time
- Synchronisation of the measurement value transmission to a PLC

Optical system

An infrared thermometer uses an optical measuring method for non-contact temperature measurements. The quality of the optical system has a great influence on the measurement accuracy of the device as a whole.

This influence is defined as "size of source effect". Light scattered into the optical path will result in false temperature data. When the distance to the target or the size of the object change, the temperature reading may change as well depending on the quality of the optical system.

The precision lenses used in the CellaTemp PK® pyrometer provide excellent imaging characteristics, high optical resolution and a minimum sensitivity to stray light. The anti-reflective coated lenses are extremely durable, easy to clean and therefore suitable for rough industrial applications.

Vitality indicator

VITALITY INDICATOR

Due to physical and chemical processes, electronic components are subject to ageing effects. These are extremely dependent on the operating temperature.

The new generation of the CellaTemp® PK pyrometer series is equipped with a new, smart function, the vitality indicator. This is a Self-Monitoring, Analysis and Reporting Technology (SMART), i.e. a function for self-monitoring, analysis and status reporting.

The vitality monitor continuously collects the relevant operating data in order to monitor the progress of any ageing effects depending on the operating temperature and operating time. The current status

can be shown on the display at any time and read out by a PLC via the IO-Link interface. The pyrometer independently determines and signals the optimum time for a service check and calibration.

The vitality monitor also records the operating time. This allows the quality assurance and calibration department to configure a service and calibration interval for preventive maintenance itself. The device then automatically reminds the user of the next inspection date.

Monitor for the supply voltage

The availability of a stable power supply is not always guaranteed in all regions. External interference in particular can lead to fluctuations or temporary failures. Operating electronic devices with an unstable, short or long-term unacceptable power supply can lead to malfunctions or even destruction of the devices.

The monitor function in the pyrometer permanently monitors the supply voltage and records the duration for which the sensor was operated with an undervoltage and overvoltage. If necessary, this information can be used to take measures to stabilise the supply voltage and thus prevent incorrect measurements and device failure.

Contamination monitoring

The two-colour infrared thermometers CellaTemp® PKL 63, PK(L) 68 and PKF 66 / 67 are equipped with a SCM (Smart Contamination Monitoring) function that continuously monitors the signal intensity. If the infrared radiation decreases to a critical value due to a contamination of the lens or the protective window, this condition is recorded, visually displayed on the device and transmitted via a switching contact. Visual obstructions in the target area or deposits in the furnace opening are also detected. The sensitivity to detect the contamination level is adjustable.
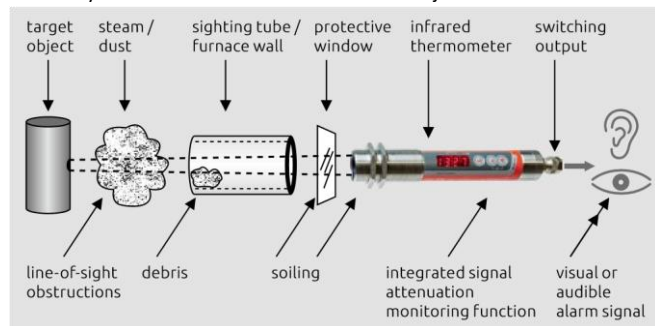
DTD function

The two-colour infrared thermometers CellaTemp® PKL 63, PK(L) 68 and PKF 66 / 67 are equipped with a DTD (Discontinuous Temperature Detection) function. In discontinuous processes it is used for the auto matic detection of the temperature.

The measurement starts automatically when this function detects a hot object. It ends when the temperature is below the threshold and the maximum value is displayed. A switching contact may be activated during the measurement for synchronisation with a PLC. The duration of measurement can thus also be recorded.

Technical data *

Analogue output
- 0/4 - 20 mA linear according to NAMUR 43, scalable
- max. burden 500 Ω

2 switching outputs
- PNP open collector active from positive supply voltage
- NC or NO
- current-carrying capacity 150 mA
- clocked overload safety shut-off ≥ 250 mA

Interface
- IO-Link V1.1
- T ransmission speed COM 3 (230.4 kbit/s)

Display
- 4 x 7 segment red, character height 8 mm

Resolution of power output
- 0 .1 K + 0.005 % of the set span

Resolution of display
- 0.1 K for T < 200 °C
- 1 K for T ≥ 200 °C

Power supply
- 1 8 - 32 V DC

Power consumption
- ≤ 50 mA (≤ 75 mA with spot light) at 24 V DC without load current

Ambient temperature
- 0 - 65 °C

Storage temperature
- -20 - +80 °C

Housing material
- Stainless steel V2A (1.4305)

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

Protection
- I P65 acc. to DIN 40050 protection class III

Connection
- M 12 connector, 5-pole A coding (DIN EN 61076-2-101)

Weight
- approx. 0.4 kg

Shock resistance (EN60068-2-27)
- 30 g (11 mg)

Vibration resistance (EN60068-2-6)
- 5 g (10 - 2000 Hz)

* Specifications of the technical data according to DIN IEC TS 62492-1 and DIN IEC TS 62492-2
Calibration of the pyrometers according to VDI / VDE 3511 sheet 4.4

Diagnostic function

The diagnostic function ensures a high operational reliability. Incorrect supply voltages, reverse polarities of connections, overloads at the switching output, unacceptable ambient temperatures or out-ofrange object temperatures appear on the display as error messages.

Service function

The service function is used during setup or running operation to key in a simulated temperature value that is displayed and transmitted via the analogue and digital output. This feature checks the correct functioning and range setting for the downstream signal processing units (display, controller, PLC) quickly and safely even without a hot object.

Reverse polarity protection

- for the power supply voltage
- for the analogue output

Operating elements

- 3 buttons

Troubleshooting

- Output overload
- Excess temperature in the sensor
- Measuring range too high/too low
- incorrect supply voltage
- Temperature unit °C / °F
- Emissivity (quick set) with temperature display

EMC standard

- DIN EN IEC 61000-6-2:11/2019
- DIN EN IEC 61000-6-4:09/2020
- BS EN IEC 61000-6-2:2019
- Key lock
- Temperature simulation
- Temperature display

Fibre optic cable for CellaTemp® PKF

Type	Length	Weight
LWL-2HT	2 m	0.08 kg
LWL-5HT	5 m	0.19 kg
LWL-10HT	10 m	0.38 kg

monitoring

DTD function other lengths PK 62)

Ambient temperature
- -40 - +250 °C

Material
- brass, nickel-plated

Scope of delivery

- Infrared thermometer
- Short manual • for the switching output • 2 fastening nuts

The full manual and the KITS app are available via the KELLER homepage as a download.

LED display

Additionally for CellaTemp® PKF

- Display of the switching status, in the event of overloading and in • Measuring head, depending on model the event of incorrect connection of the supply voltage • Fibre optic cable (please specify length)
- Display of the signal power in two-colour infrared thermometer
- Display of the operating mode The connecting cable VK 02/L (length as required) must be ordered separately.

Adjustable parameters

Analogue output

- Analogue output 0 / 4 – 20 mA
- Scaling of the analogue output

Switching output

- ON and reset
- Source of the switching signal
- Switching function: NC and NO contacts • Incorrect supply voltage connection • Switch-on and switch-off delay

General parameters

- Temperature correction for up to 5 interpolation points
- Signal threshold of the vitality indicator
- Operating time of the service interval • BS EN IEC 61000-6-4:2019 • Reset to factory setting
- Smoothing time constant
- Hold time for peak value

Additionally for the two-colour thermometerr
- Emissivity ratio
- Measuring method single-colour / two-colour
- Alarm and shut down threshold for contamination
- Source of the analogue output
- Source of the second switching contact • Threshold for the

up to 50 m on request • Soot factor (at the CellaCombustion

Connector pin assignment

1 — 24 VDC / L+
4 — C/Q
5 — Out 2
2 — 0/4-20 mA
3 — L-

shielded

ℹ It is imperative to use a cable with shielding.

Dimensions

Compact infrared thermometer

x mm (see table)
16,5 mm
M30x1,5
60 mm
Ø 28 mm

Length of the compact infrared thermometer	
Type	Length
PK 11, PK 12, PK 14, PK 18	189 mm
PK 21, PK 24, PK 25, PK 29, PK 31, PK 35, PK 62, PK 68	213.5 mm
PK 41, PK 42, PK 51, PK 52, PK 72, PK 73, PK 74, PKL 11	205.5 mm
PKL 28, PKL 29, PKL 38, PKL 63, PKL 68	239 mm

Infrared thermometer with fibre optic PKF 26, PKF 36, PKF 66

PA 41.01 / PA 41.03   PKS 21.01   PA 41.05 / PZ 41.18   electronics

Supplementary lenses

A lens can be screw-mounted on the sensor of the infrared thermometer CellaTemp® PK for the measurement of very small objects.

Infrared thermometer	Supplementary lens	Distance to target	Target Ø
PK 21 / 31	PK 21/E AF 2	500 mm	5 mm
PKL 29	PS 27/E AF 6	150 mm	3,5 mm

Vorsatzlinse

Infrarot-
Thermometer PK

113

Technical data - Compact infrared thermometer CellaTemp® PK

Type	Measuring range	Spectral sensitivity	Focal distance	Target size	Measurement uncertainty*1	Response time t_{90}	Repeatability	Temperature coefficient*2
Single-colour infrared thermometer								
PK 11 BF 1	0 - 1000 °C 32 - 1832 °F	8 - 14 µm	0.3 m	Ø 11 mm	0.75 % of measured value [°C] plus 2.0 K	≤ 60 ms	1 K	0.1 K/K (for T < 250 °C) 0.04 %/K (for T > 250 °C)
PK 11 BF 2			0.9 m	Ø 33 mm		≤ 60 ms		
PK 12 BF 1	-30 - 300 °C -22 - 572 °F		0.3 m	Ø 18 mm		≤ 90 ms		
PK 14 BF 1	0 - 500 °C 32 - 932 °F		1.0 m	Ø 0.42 m		≤ 60 ms		
PK 18 BF 1			0.3 m	Ø 11 mm				
PK 21 BF 1	250 - 1600 °C 482 - 2912 °F	1.0 - 1.7 µm	1.5 m	Ø 10 mm	0.3 % of measured value [°C] plus 2.5 K	≤ 2 ms for T > 600 °C		0.07 %/K
PK 24 BF 1			1.0 m	Ø 0.2 m				
PK 25 BF 1	75 - 650 °C 167 - 1202 °F	1.8 - 2.4 µm	0.3 m	Ø 7 mm	0.3 % of measured value [°C] plus 4.0 K	≤ 2 ms for T > 200 °C ≤ 15 ms for T > 125 °C ≤ 50 ms for T > 100 °C ≤ 200 ms for T > 75 °C	2 K	0.25 K/K (for T < 500 °C) 0.05 %/K (for T > 500 °C)
PK 29 BF 1	150 - 800 °C 302 - 1472 °F	1.8 - 2.2 µm	0.3 m	Ø 7 mm		≤ 2 ms for T > 300 °C ≤ 15 ms for T > 200 °C ≤ 45 ms for T > 150 °C		
PK 31 BF 1	500 - 2500 °C 932 - 4532 °F	0.78 - 1.06 µm	1.5 m	Ø 8 mm	0.2 % of measured value [°C] plus 2.5 K	≤ 2 ms for T > 900 °C	1 K	0.07 %/K
PK 35 BF 1	450 - 1400 °C 842 - 2552 °F	0.82 - 0.93 µm	0.3 m	Ø 6.5 mm	0.3 % of measured value [°C] plus 3.0 K	≤ 25 ms for T > 500 °C ≤ 2 ms for T > 650 °C	2 K	
PK 41 BF 1	300 - 1300 °C 572 - 2372 °F	4.6 - 4.9 µm	0.4 m	Ø 11 mm	0.5 % of measured value [°C] plus 2.5 K	≤ 90 ms	2 K	0.04 %/K
PK 42 BF 1	500 - 2500 °C 932 - 4532 °F		0.4 m	Ø 7 mm	1.0 % of measured value [°C]	≤ 60 ms	4 K	
PK 51 BF 1	400 - 1400 °C 752 - 2552 °F	3.8 - 4.0 µm	0.4 m	Ø 11 mm		≤ 90 ms	2 K	
PK 52 BF 1	500 - 2000 °C 932 - 3632 °F		0.4 m	Ø 7 mm			4 K	
PK 72 BF 1	400 - 2000 °C 752 - 3632 °F	CO2 range	0.4 m	Ø 7 mm		≤ 60 ms	2 K	
PK 73 BF 1	500 - 2500 °C 932 - 4532 °F	CO range	0.4 m	Ø 7 mm			4 K	
PK 74 BF 1	250 - 1700 °C 482 - 3092 °F	CO2 range	0.4 m	Ø 7 mm	1.0 % of measured value [°C] *3		4 K	0.04 %/K *3
Two-colour infrared thermometer								
PK 62 BF 1	700 - 1700 °C 1292 - 3092 °F	0,80 / 1,05 µm	1,5 m	Ø 20,5 mm	1.0 % of measured value [°C]	≤ 10 ms	2 K	0.05 %/K
PK 68 BF 1	550 - 1400 °C 1022 - 2552 °F	0,95 / 1,05 µm	1,5 m	Ø 21 mm		≤ 10 ms for T > 650 °C		

*1 at ε = 1 and Ta = +23 °C   *2 deviation to Ta = +23 °C   *3 for T >= 400 °C, below that possibly less accurate

Technical data - Infrared thermometer with fibre optic CellaTemp® PKF

Type	Measuring range	Spectral sensitivity	Measuring head	Focal distance	Target size	Measurement uncertainty[1]	Response time t_{90}	Repea-tability	Temperature coefficient[2]
Single-colour infrared thermometer with fibre optic and sensor head									
PKF 26 BF 1	300 - 1600 °C 572 - 2912 °F	1.0 - 1.7 µm	PA 41.01	0.2 m - ∞	180 : 1	0.3 % of measured value [°C] plus 2.5 K	≤ 2 ms for T > 600 °C	2 K	0.07 %/K
PKF 26 BF 2			PKS 21.01	1.5 m	Ø 7.2 mm				
PKF 26 BF 3			PA 41.05	0.12 m - ∞	100 : 1				
PKF 26 BF 4			PZ 41.18	33 - 45 mm	50 : 1				
PKF 36 BF 1	550 - 2500 °C 1022 - 4532 °F	0.78 - 1.06 µm	PA 41.01	0.2 m - ∞	190 : 1		≤ 2 ms for T > 900 °C		
PKF 36 BF 2			PKS 21.01	1.08 m	Ø 6.9 mm				
PKF 36 BF 3			PA 41.05	0.12 m - ∞	100 : 1				
PKF 36 BF 4			PZ 41.18	33 - 45 mm	50 : 1				
Two-colour infrared thermometer with fibre optic and sensor head									
PKF 66 BF 1	700 - 1800 °C 1022 - 4532 °F	0.95 / 1.05 µm	PA 41.01	0.2 m - ∞	190 : 1	1.0 % of measured value [°C] plus 3.0 K	≤ 10 ms for T > 800 °C	2 K	0.05 %/K
PKF 66 BF 2			PKS 21.01	1.08 m	Ø 6.9 mm				
PKF 66 BF 3			PA 41.05	0.12 m - ∞	100 : 1				
PKF 66 BF 4			PZ 41.18	33 - 45 mm	50 : 1				
PKF 66 BF 5			PA 41.03	1.8 m	Ø 8 mm				
PKF 67 BF 5	600 - 1400 °C 1112 - 2552 °F		PA 41.03	1.8 m	Ø 16 mm				

Technical data - Compact infrared thermometer with LED spot light CellaTemp® PKL

Type	Measuring range	Spectral sensitivity	Focal distance	Target size	Measurement uncertainty[1]	Response time t_{90}	Repea-tability	Temperature coefficient[2]
Single-colour infrared thermometer								
PKL 11 BF 1	0 - 1000 °C 32 - 1832 °F	8 - 14 µm	0.295 m	Ø 9 mm	0.75 % of measured value [°C] plus 2.0 K	≤ 60 ms	1 K	0.1 K/K (for T < 250 °C) 0.04 %/K (for T > 250 °C)
PKL 11 BF 2			0.089 m	Ø 3.2 mm				
PKL 28 BF 1	250 - 1600 °C 482 - 2912 °F	1.0 - 1.7 µm	0.21 m	Ø 1.4 mm	0.3 % of measured value [°C] plus 2.5 K	≤ 2 ms for T > 600 °C		0.07 %/K
PKL 28 BF 2			1.0 m	Ø 6.7 mm				
PKL 29 BF 1	180 - 1200 °C 356 - 2192 °F	1.8 - 2.2 µm	0.29 m	Ø 6.2 mm	0.3 % of measured value [°C] plus 4.0 K	≤ 2 ms for T > 300 °C ≤ 10 ms for T > 250 °C ≤ 25 ms for T > 180 °C		0.25 K/K (for T < 500 °C) 0.05 %/K (for T > 500 °C)
PKL 38 BF 1	500 - 2500 °C 932 - 4532 °F	0.78 - 1.06 µm	0.21 m	Ø 1.2 mm	0.2 % of measured value [°C] plus 2.5 K	≤ 2 ms for T > 900 °C		0.07 %/K
PKL 38 BF 2			1.0 m	Ø 5.6 mm				
Panorama infrared thermometer with rectangular measuring field								
PKL 63 BF 1	650 - 1600 °C	0.95 / 1.05 µm	0.21 m	4.1 x 0.6 mm	1.5 % of measured value [°C]	≤ 10 ms for T > 750 °C	3 K	0.05 %/K

PKL 63 BF 2		1202 - 2912 °F		1.0 m	18.5 x 2.7 mm			
Two-colour infrared thermometer								
PKL 68 BF 1	650 - 1600 °C	1202 - 2912 °F	0.95 / 1.05 µm	0.21 m	Ø 1.2 mm	1.0 % of measured value [°C]	≤ 10 ms for T > 750 °C	2 K	0.05 %/K
PKL 68 BF 2				1.0 m	Ø 5.6 mm				

*[1] at ε = 1 and Ta = +23 °C   *[2] deviation to Ta = +23 °C

IO Link interface

All devices of the CellaTemp® PK series are equipped with the new IO-Link communication interface according to IEC 61131-9.

Advantages of the IO-Link interface
- Standardised non-proprietary and field-bus- independent interface
- Cost-effective and simple point-to- point connection with a standard cable

- Low wiring costs
- Setting to work is easy
- Data transmission without interference
- Automatic parameter setting with central data backup
- Full transparency down to the lowest field level
- Systematic diagnostic concepts
- Device exchange by plug & play

- IO-Link sensors and actuators are capable of communication and allow bi-directional transmission of cyclic and acyclic data
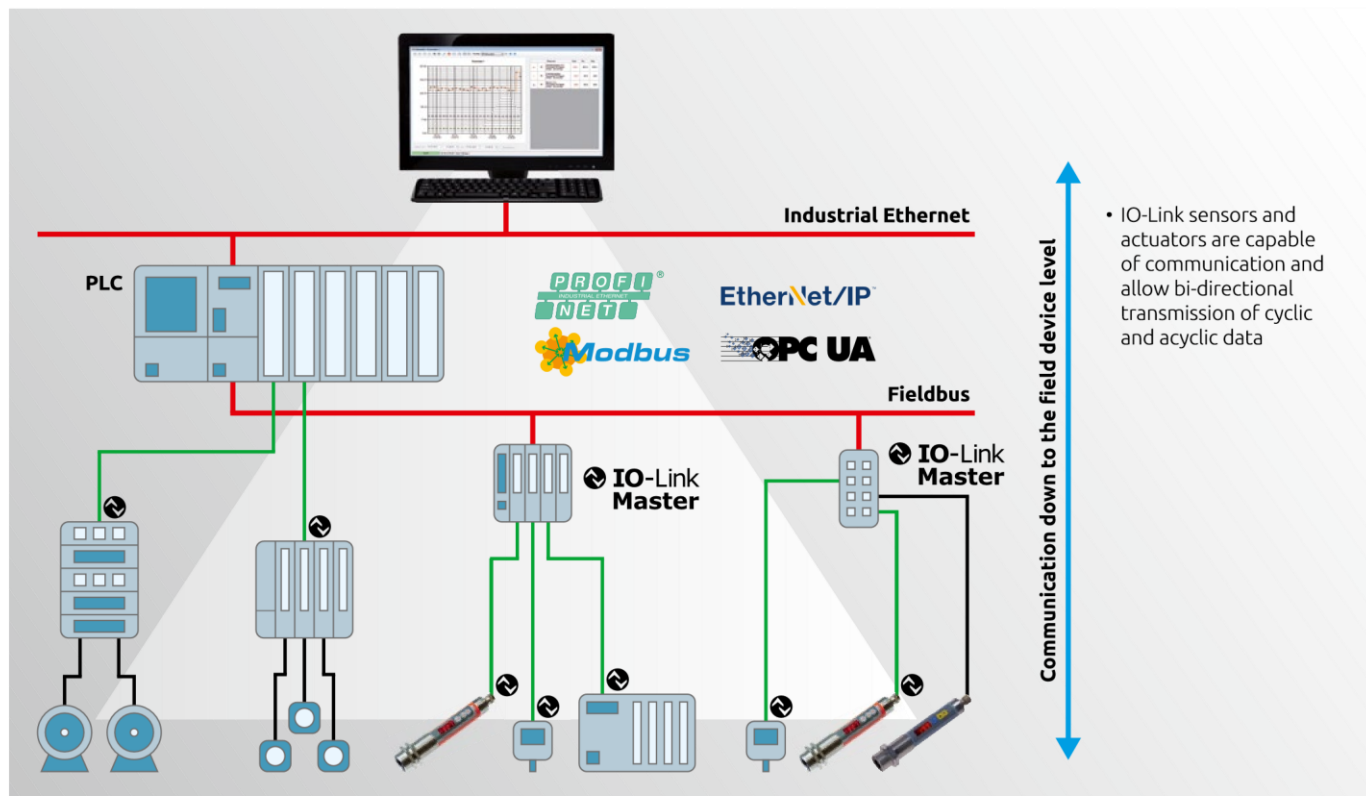
Operating the pyrometer on the PC via the USB interface

The CellaTemp® PK can also be operated via a PC using an IO-Link USB master.
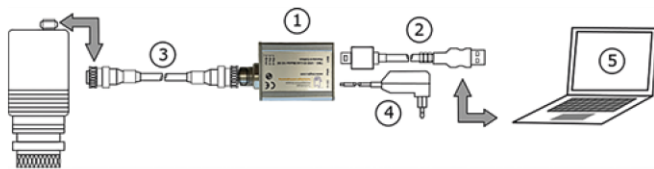
The VK 03/C communication set includes:
① IO-Link USB master
② USB cable
③ Connection cable
④ Plug-in power supply
⑤ Communication software SW 50
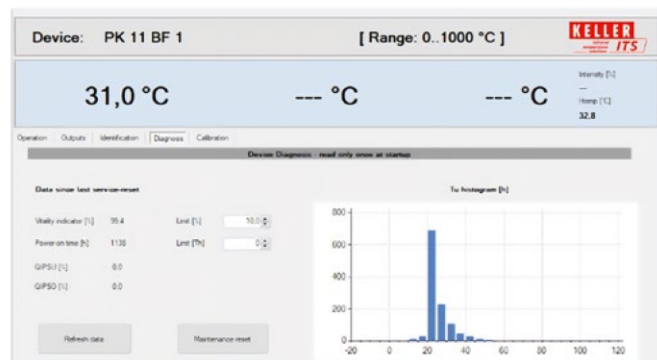
The software can be used to parameterise the pyrometer externally, read out all data, perform a user calibration and record measured values.

KITS App

The KELLER KITS App is a digital information and communication platform for the service. It meets the various possibilities of a modern digital service management to provide assistance quickly and easily, at any time and anywhere in the world.

The app provides all the necessary information such as operating manuals, technical drawings, commissioning and maintenance instructions online via tablet or smartphone in 24 languages.

The Troubleshooting Guide supports systematic troubleshooting and finding solutions to technical problems. The ticket system enables quick and easy communication with the KELLER service team.

Accessories

Shielded cable
VK 02 / L AF 1: 5 m
VK 02 / L AF 2: 10 m
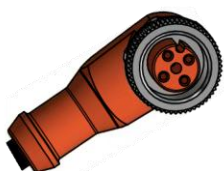
Shielded cable VK
02/R AF 1: 5 m

Thermal insulating tube
PS 01/K

Laser pointer
PK 01/E

Axial air nozzle
PS 01/A AF 1 (M30)
PS 01/A AF 2 (1 1/4")

Oscillating mirror
PZ 20 / X AF 5 (± 14.4 °)
PZ 20 / X AF 6 (± 28°)

Set of mounting brackets
PS 11/U
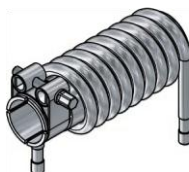
Cooling jacket
PK 01/B AF 1

Cooling jacket, sealed
PK 01/C AF 1 (M30)
PK 01/C AF 2 (M65)
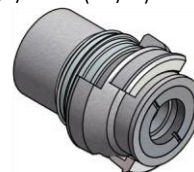
Bayonet coupling
PS 11/N AF 4 (G1.1/4")
PS 11/N AF 5 (M30)

90 ° deflection mirror
PS 11/W

Clamping collar
with angle
PS 11/K-35 AF 2
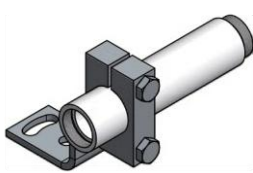
Mounting bracket
PS 11/P

Supplementary lens
PK 11/E (for PK 11)
PK 21/E (for PK 21 / 31)
PS 41/E (for PK 41 / 42)
PS 42/E (for PK 41 / 42)
PS 27/E AF 1
(for PKL 28 / 38 / 68)

Quartz window
PS 01/I AF 2
Sapphire window
PS 15/I
ZnS window adapter
PS 11/D AF 2

Further details on accessories at www.keller.de/its

Mounting combinations and measuring systems

In addition to the extensive range of accessories, various mounting combinations up to complex measuring systems are available. Details can be found using the 'Mounting combinations' tool on the KELLER homepage.

Examples of mounting combinations

Mounting combination PK 21-001
consisting of:
- Air purge PS 01/A AF 1
- Tube cap ZA 01/A AF 1
- Dust stop ZA 01/C AF 1
- Ball flange ZA 01/D AF 1
- Thermal insulation tube PS 01/K AF 1
- Quartz window PS 01/I AF 2
- Intermediate tube ZA 01/M AF 1
- Clamp ZA 01/E AF 1
- Flange ZA 01/I AF 1

Mounting combination PK 21-004
consisting of:
- Air purge PS 01/A AF 1
- Quartz window PS 01/I AF 2
- Bayonet coupling PS 11/N AF 5
- Washer Ø 35 mm
- Flange PK 20/F-70/I AF 1

Mounting combination PK 01-027
consisting of:
- Cooling jacket, closed PK 01/C AF 2
- Air purge PZ 20/A AF 1
- Clamping collar PZ 20/L AF 2
- Dust stop PZ 20/T
- Intermediate tube PZ 20/J
- Mounting PB 08/Q AF 1
- Flange PB 08/R AF 1
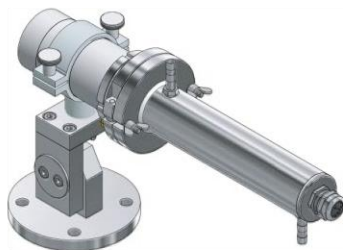
Examples of measuring systems

DN65 PN6
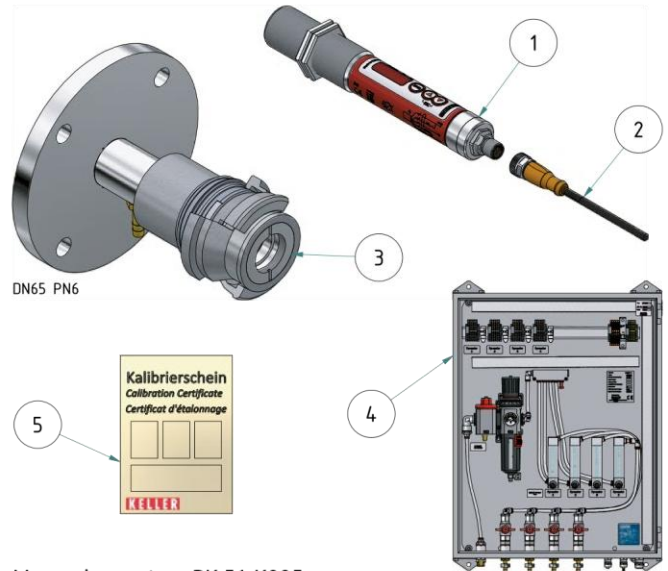
Measuring system PK 51-K005
consisting of:
① Pyrometer CellaTemp PK 51 AF 1/IO
② Cable VK 02/L AF 2
③ Mounting combination PK 15-009, consisting of:
  - Sapphire protective window PS 15/I AF 1
  - Air purge PS 01/A AF 1
  - Bayonet coupling PS 11/N AF 5
  - Washer Ø 35 mm
  - Flange PK 20/F-130
④ Pneumatic connection box VP 20.08
⑤ Calibration certificate
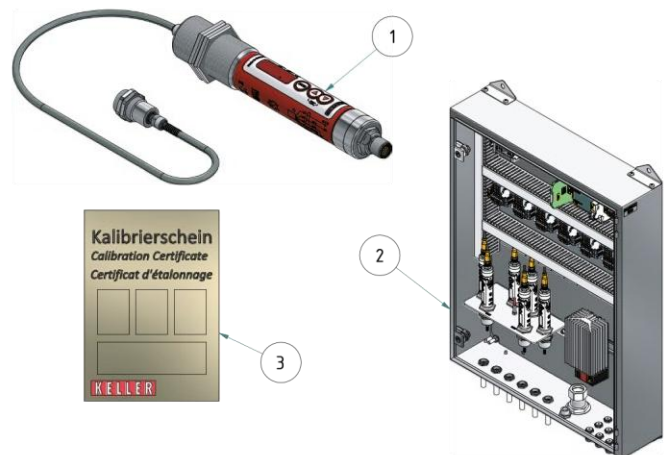
Measuring system PKF 66-K011
consisting of:
① • Pyrometer CellaTemp PKF 66 AF 3/IO
  - Fibre optic cable
  - Fibre optic measuring head PA 41.05
② Connection box SK 842
③ Calibration certificate

Aluminium

Building materials

Combustion plant
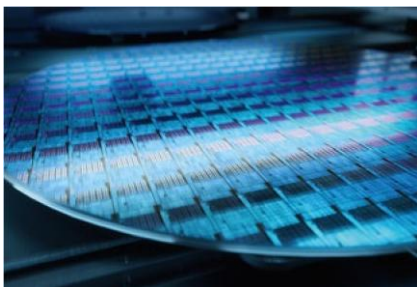

Research and Development

Foundry
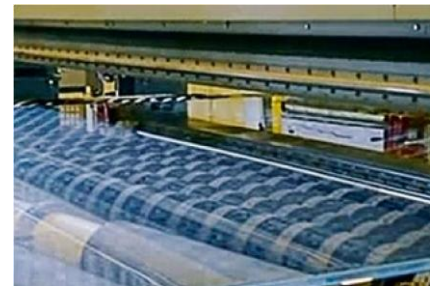
Glass
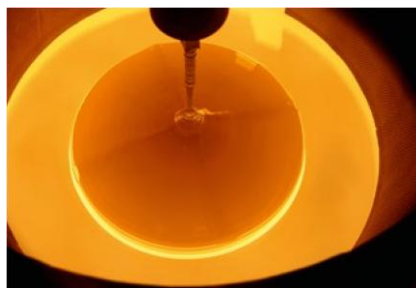

Semiconductor manufacturing

Blast furnace / Hot-blast stove

Induction

Coking plant

Crystal growing

Furnace

Forge

Continuous casting

Rolling mill

Other products

CellaTemp® PA
Versatile pyrometers with focusable lens, through-the-lens sighting/ laser spotlight or video camera.

CellaTemp® PA-LWL
Versatile fiber optics pyrometers with focusable head and laser spotlight.

CellaCast PT
Portable pyrometer for non-contact temperature measurement of molten metal at automated casting machines and blast furnaces.

CellaPort PT
Portable single-colour and two-colour pyrometers with through-the-lens sighting and USB interface.

CellaTemp® PX
Pyrometers with IO-Link interface, focusable lens, through the lens sighting or laser spotlight.

CellaTemp® PX-LWL
Pyrometers with IO-Link interface, fibre optics, focusable measuring heads and laser spot light.

Mikro PV
Intensity comparison pyrometer for ultra accurate measurement.

CellaTemp® PR
Compact infrared thermometer with analogue output and IO-Link interface.

Since 1967, the Division Infrared Thermometer Solutions (ITS) of KELLER HCW GmbH develops and manufactures precision instruments and systems solutions for non-contact temperature measurements. Thanks to the continuous development of its range, KELLER ITS now is one of the leading providers for infrared thermometers and pyrometers worldwide.

With its very large product range of more than 350 models and measuring systems KELLER ITS offers solutions for all standard applications and a variety of special measuring tasks.

Following the KELLER philosophy, the key focus in the development and production of the devices is set to the high measuring accuracy and reliability. Therefore, KELLER grants a warranty of 5 years on its products.

A global network of distributors and service points ensures competent and personal consultation on site.

No1 in terms of ACCURACY RELIABILITY INNOVATION

KELLER
Creating Solutions

infrared temperature solutions **ITS**

- ● Headquarters
- ■ Sales and Service Center
- □ Sales abroad

No1 in terms of
ACCURACY
RELIABILITY
INNOVATION

IO-Link

PROFIBUS

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sales@pyrometer.com

KELLER A DIVISION OF **GROUPE LEGRIS INDUSTRIES**

Pyrometer
CellaTemp® PK / PKF / PKL / PX

The world's first pyrometers with the
industry 4.0 interface 🔗 IO-Link

Industrial Ethernet

PLC

PROFI **NET**®

EtherNet/IP™

Modbus

OPC UA

Field bus

IO-Link Master

IO-Link Master

Communication down to the field device level

• IO-Link sensors and actuators are capable of communication and allow bi-directional transmission of cyclic and acyclic data
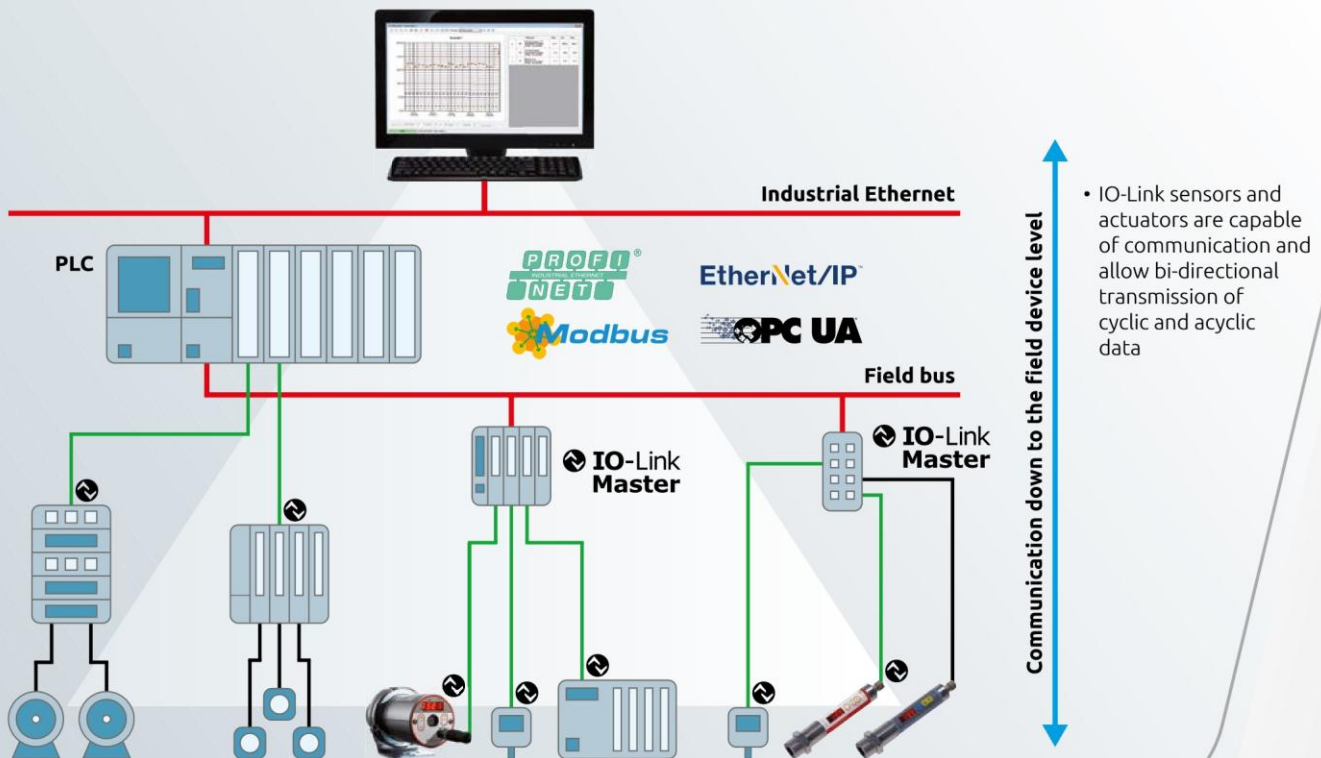
Why actually IO-Link?

IO-Link is a standardized communication technology. You let the sensors and actuators do the "talking". Simply plug in the cable and off you go. IO-Link is a digital point-to-point communication device that can "understand" any fieldbus. Sounds simple? It is!

IO-Link is a long-term investment, innovative and economical!

Shorten commissioning times

IO-Link communication runs using unshielded cables and uses industry-standard connection plugs. This saves time and hassle when replacing a device.

Reduce your costs

Configurable sensors and actuators reduce the variety of types required. This cuts back on complexity when purchasing and saves space in your warehouse.

Increase the productivity of your machinery

IO-Link devices identify and configure themselves automatically. This simplifies replacement of defective components and reduces downtime to repair machinery and systems.

Realize innovative machine concepts

Smart devices need continuous communication with each sensor and actuator to realize their full potential. This expands the possibilities for developing more innovative machinery and systems.

Revolutionize your maintenance and repairs

Intelligent IO-Link devices provide functions for self-diagnosis. This enables new, predictive repair and maintenance concepts.

N°1
in terms of
ACCURACY
RELIABILITY
INNOVATION

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its@keller.de

PROFI BUS

TÜV NORD
ISO 9001

TÜV NORD
ISO 14001

KELLER A DIVISION OF GROUPE LEGRIS INDUSTRIES

Infrared thermometer
CellaTemp® PR

for optical temperature measurements
from 0 °C to + 1600 °C

Range of models

Compact infrared thermometer			
		Measuring range	Application
Single-colour infrared thermometer			
		0 - 1000 °C	Non metals
		0 - 500 °C	Non metals in aggressive measuring environment
		250 - 1600 °C	Metals, ceramics, molten en

CellaTemp® PR series

The infrared thermometer CellaTemp® PR records the infrared radiation emitted by an object and converts it into an electrical signal. The detected temperature is output via the digital IO-Link interface.

A unique combination of analogue and digital linearisation features provides the CellaTemp® PR with a high-resolution signal processing unit. Therefore, even with wide measuring ranges, the infrared thermometer has a very high temperature resolution while its noise equivalent temperature difference (NETD) is extremely low. The pyrometer thus supplies stable measurement readings even when the response times are extremely short (from 2 ms) and the measured temperatures are very low.

CellaTemp® PR 18

The CellaTemp® PR 18 comes with an especially resilient lens, allowing its use even in extreme environmental conditions, such as in asphalt and concrete mixing plants, preventing the lens from damage by aggressive vapours and dust.

Analogue output

The analogue output supplies a signal linear to the temperature; 0/4 – 20 mA are optionally available. The range setting can be configured via IO-Link. The outputs deactivate and a warning appears on the display when the internal temperature reaches > 75 °C.

M30 thread

Robust lens with anti-reflective coating   M12 connector

Infrared thermometer
CellaTemp® PR

Special features

- Compact infrared thermometer
- Standardized PLC and fieldbus-independent IO-Link interface
- Analogue output 0/4 - 20 mA
- Large measuring ranges with high temperature resolution at the same time
- High optical resolution and accuracy due to wide band anti-reflective precision lenses
- Configurable switching output
- Easy mounting thanks to the M30 screw thread

Switching output

With a hot object in the sensor's field of vision, a switching contact is triggered when a pre-defined temperature threshold is exceeded. Optionally, the switch can operate as a normally closed or normally open contact. This configurable switch on/switch off delay permits a suppression of short interference pulses and for the adaptation of the switching output to the response time of a PLC.

A variety of possible applications includes:

- Monitoring of limit temperatures
- Determination of temperature peak values

Optical system

An infrared thermometer uses an optical measuring method for non-contact temperature measurements. The quality of the optical system has a great influence on the measurement accuracy of the device as a whole.

This influence is defined as "size of source effect". Light scattered into the optical path will result in false temperature data. When the distance to the target or the size of the object change, the temperature reading may change as well depending on the quality of the optical system.

The excellent imaging characteristics of the precision lenses provide a high optical resolution and a minimum sensitivity to stray light. The anti-reflective coated lenses are extremely durable, easy to clean and therefore suitable for rough industrial applications.

Diagnostic function

The diagnostic function ensures a high operational reliability. Unstable supply voltages, unacceptable ambient temperatures or out-ofrange object temperatures are indicated via the IO-Link.

Service function

The service function is used to output a temperature value during setup or running operation via the analogue output for simulation. This feature checks the correct functioning and range setting for the downstream signal processing units (display, controller, PLC) quickly and safely even without a hot object.

Reverse polarity protection

- for the power supply voltage
- for the analogue output
- for the switching output

Troubleshooting

- Excess temperature in the sensor
- Measuring range too high/too low
- Unstable supply voltage

EMV standard

- DIN EN IEC 61000-6-2:11/2019
- DIN EN IEC 61000-6-4:09/2020
- BS EN IEC 61000-6-2:2019
- BS EN IEC 61000-6-4:2019

Scope of delivery

- Infrared thermometer
- Operating manual
- 2 fastening nuts

⬤ The connecting cable VK 02/L (length as required) must be ordered separately.

Adjustable parameters (via IO-Link)

Analogue output
- Analogue output 0/4 - 20 mA
- Scaling of the analogue output

Switching output * Specifications of the technical data according to DIN 62492-1
- ON and reset and DIN IEC TS 62492-2
- Switching function: NC and NO contacts Calibration of the pyrometers according to VDI / 3511 sheet 4.4
- Switch-on and switch-off delay

General parameters
- Emissivity
- Smoothing function
- Hold time for peak value
- Reset to factory setting
- Temperature simulation for diagnostic purposes

Connector pin assignment

CellaTemp® PR Infrared thermometer
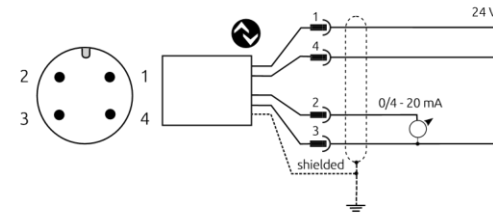
ⓘ It is imperative to use a cable with shielding.

Analogue output
- 0/4 - 20 mA linear according to NAMUR 43, scalable
- max. burden 500 Ω

Switching output
- PNP open collector active from positive supply voltage
- NC or NO
- current-carrying capacity 150 mA
- clocked overload safety shut-off ≥ 250 mA

Interface
- IO-Link V1.1 (COM 2)

Resolution of power output
- 0 .2 K + 0.03 % of the set span

Power supply
- 1 8 - 32 V DC

Power consumption
- ≤ 50 mA (≤ 75 mA with spot light) at 24 V DC without load current

Ambient temperature
- 0 - 65 °C

Storage temperature
- -20 - +80 °C

Housing material
- Stainless steel V2A (1.4305)

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

Protection
- I P65 acc. to DIN 40050 protection class III

Connection
- M 12 connector, 5-pole A coding (DIN EN 61076-2-101)

Weight
- approx. 0.4 kg

Shock resistance (EN60068-2-27)
- 30 g (11 mg)

Vibration resistance (EN60068-2-6)
- 5 g (10 - 2000 Hz)

Technical data - Compact infrared thermometer CellaTemp® PR

Type	Measuring range	Spectral sensitivity	Focal distance	Target size	
Single-colour infrared thermometer					
PR 11 AF 1	0 - 1000 °C 32 - 1832 °F	8 - 14 µm	0.3 m	Ø 11 mm	
PR 18 AF 1	0 - 500 °C 32 - 932 °F				
PR 21 AF 1	250 - 1600 °C 482 - 2912 °F	1.0 - 1.7 µm	1.5 m	Ø 10 mm	

*[1] at ε = 1 and Ta = +23 °C   *[2] deviation to Ta = +23 °C

service management to get the necessary information quickly and easily via the app in 16 languages using a tablet or smartphone.

Dimensions
Compact infrared thermometer

60 mm   ø 28 mm   11 mm

M30x1,5

16 mm

PR 11 / PR 18: 144,5 mm
PR 21:   165,5 mm

KITS – The digital Service App

Modern information and communication technology offers innovative solutions for the location-independent provision of data and information far beyond common practice. Thus, digitisation provides interesting new fields of action for companies, especially in the service sector. For this purpose, KELLER ITS follows this development and has developed the KITS App. It meets the various possibilities of a modern digital

Functions of the service app
KITS at a glance

• Field-of-view calculator

The field-of-view calculator is a useful tool for determining the complete field-of-view, the size of the measuring area in relation to the distance, the maximum measuring distance and the minimum spot size depending on the optical properties of the device when selecting and commissioning the device.

• Applications

The Industrial Solution Guide is used to select the appropriate measuring system for the conditions and measuring location in the production plant after selecting the industry and application.

• Mediacenter

Here you'll find application and technical reports on optical temperature measurement in addition to product information.

• Contacts

Service hotline for support with the installation and commissioning of the devices or other technical questions.

Here you will find all and the operating instructions.

important tool pyrometer. It determines value to be set on the the emissivity preset the measured referenc

IO-Link Interface

All devices of the CellaTemp® PR series are equipped with the new IO-Link communication interface according to IEC 61131-9.

Advantages of IO-Link interface
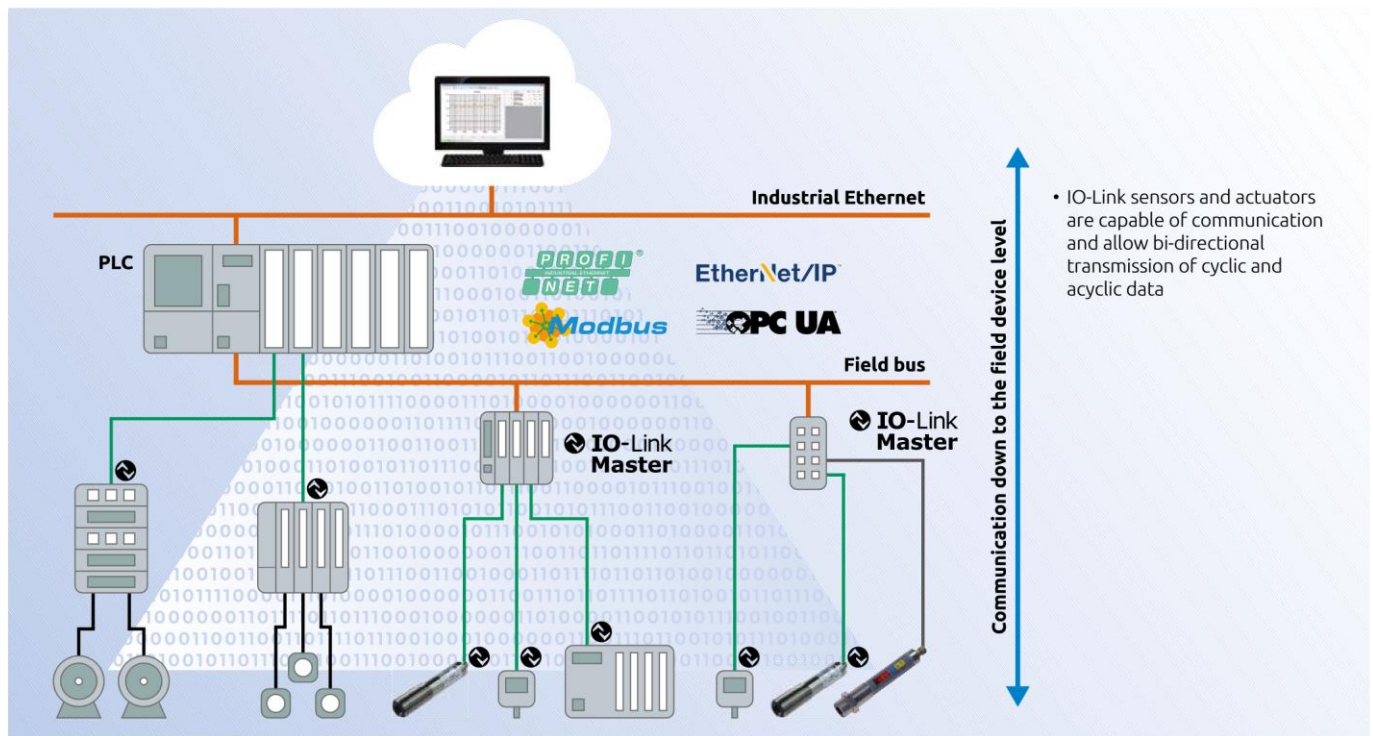• Standardized manufacturer and fieldbus independent interface • Cost-effective and simple point-to-point connection with standard cable
• Low wiring costs
• Simple commissioning
• Interference-free data transmission
• Automatic parameterization with central data backup
• Full transparency down to the lowest field level
• Systematic diagnostic concepts
• Device exchange by plug and play

Open, system and company independent communication interface

- Internationally approved standard according to IEC 61131-9
- IO-Link consortium with all leading manufacturers of control systems • Uniform system description of communication and device properties in the IODD device description file • Certified IO-Link hardware components

Industrial Ethernet

PLC

PROFI NET®

EtherNet/IP™

Modbus

OPC UA

Field bus

IO-Link Master

IO-Link Master

Communication down to the field device level

- IO-Link sensors and actuators are capable of communication and allow bi-directional transmission of cyclic and acyclic data

Easy project planning and integration

- Can be integrated in all common field bus and automation systems
- Fast project planning and easy system documentation
- Any combination of analogue and IO-Link device in one system control system
- Downward compatible – IO-Link devices can also be operated in standard mode (SIO) as conventional sensors with switching or analogue output
- Existing wiring can continue to be used

Simple, fast and safe installation and maintenance

- Simple point-to-point connection – low wiring time
- Uniform and „correct" wiring by standard cable with M12 plug (plug & play)
- Easy and accurate replacement of sensors
  - Avoidance of incorrect exchange thanks to clear device identification in the vendor and device ID
  - Avoidance of incorrect settings, as parameters are stored in the master and transferred automatically on device exchange
- Condition-oriented maintenance and targeted service
- Minimum effort for troubleshooting
- Modern, manufacturer-independent tools for commissioning
- Minimum variety of types and stock-keeping

High operational safety

- Tamper-proof, as incorrect settings by the operator can be excluded
- Immediate, central fault diagnosis (wire breakage, short circuit etc.)
- Retrieval of diagnostic data for preventive maintenance and repair and therefore reduced risk of failure
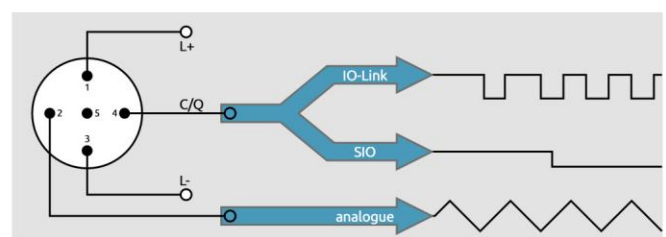
Simple parameterisation

- Central parameterisation and storage of configuration data
- Dynamic parameterisation during operation for adaptive system control during recipe, material or tool changes reduces downtimes and increases flexibility and production diversity
- Automatic sensor parameterisation, plug and play on device exchange
- Simple duplication of parameters

Safe and continuous digital communication

- Process data, diagnostic data, device information and configuration parameters
- EMC-technically interference-free transmission of measured values with 2 V signal level and protection by checksum
- Continuous communication from the lowest field level up to the ERP system
- One sensor for several measured values and switching points
- Worldwide remote maintenance and teleservice down to the lowest field level

Cost saving

- Reduced installation and cabline costs
- Saving of analogue input cards by using standardized fieldbus switching groups

Accessories

Shielded cable
VK 02 / L AF 1: 5 m
VK 02 / L AF 2: 10 m

Clamping collar with angle
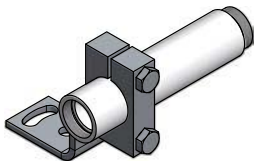PS 11/K-35 AF 2

Bayonet coupling
PS 11/N AF 4 (G1.1/4")
PS 11/N AF 5 (M30)

Bluetooth adapter EIO330
Shielded cable

VK 02/R AF 1: 5 m

Set of mounting brackets
PS 11/U

Mounting bracket PS 11/P
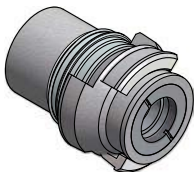
IO-Link master Field bus AL1100
Thermal insulating tube
PS 01/K

PK 01/B AF 1

Quartz window
PS 01/I AF 2

ZnS window adapter

PS 11/D AF 2

IO-Link master USB AL1060
Axial air nozzle
PS 01/A AF 1 (M30)

PS 01

AAF 2 (1 1/4")

Cooling jacket, sealed
PK 01/C AF 1 (M30)
PK 01/C AF 2 (M65)

Ball flange ZA 01/D
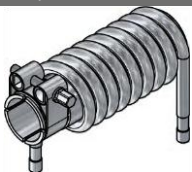
Software moneo

Further details on accessories at www.keller.de/its

The **KITS** app is available for Android users in the Google Play Store and for iOS users in the Apple App Store. Scanning the QR codes shown below will take you directly to the respective installation menu.

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