Pyrometer
CellaCast PA 80 / PT 180

for non-contact temperature measurement
in the production of liquid metals

No1 in terms of
ACCURACY
RELIABILITY
INNOVATION

5 years warranty

QUALITY
made in Germany

Pyrometer CellaCast PA 80 / PT 180

Special features

- Maintenance-free, wear-free measuring system
- Temperature range: 750 – 2400 °C
- CSD filter to determine the correct temperature of the melt despite the presence of slag and oxides
- High optical resolution for safe measurement of the melt from a long distance
- Dual wavelength technique yields accurate readings despite smoke or dust in the sight path

- ATD function for automatic temperature detection
- Through-the-lens sighting, laser spot light or use of a video camera for perfect alignment and monitoring of the field of view
- Very large and bright LED display
- RS 485 bus interface to connect multiple units
- CellaView software for on-time presentation and logging of the measurement values

Range of models

Stationary pyrometer CellaCast PA 80

Portable pyrometer CellaCast PT 180

Model				Technical data				
stationary			portable					
Sighting device				Temperature range	Lens system	Focus range	Distance ratio	Measuring field
Through-the-lens	Video camera	Laser spot light	Through-the-lens					
PA 80 ...			PT 180 ...					
AF 4	AF 4/C	AF 4/L	AF 4	750 - 2400 °C 1382 - 4352 °F	PZ 20.01	0.40 m - ∞	150 : 1	◯
AF 6	AF 6/C	AF 6/L	AF 6		PZ 20.06	1.20 m - ∞	240 : 1	◯

Measurement of molten metals

Temperature is one of the most critical process parameters affecting the resulting quality, strength and working properties of a metal casting. Molten metal which is too hot will damage the sand moulds. A temperature which is too low will result in low fluidity.

Especially complex and thin-walled cast metal parts demand precisely controlled casting temperatures. A molten mass which is not hot enough will exhibit poor metal flow within the complex passages of the mould and may result in bubbles or cavities. Strict compliance with process parameters is therefore of utmost importance – and this requires precise temperature monitoring and control already during the production of the molten metal in the runner of the blast furnace, cupola furnace or pressurized pouring systems.

The temperature of molten metal is most commonly measured using immersion probes periodically. The probe is dipped into the liquid metal in the melting furnace or after the ladle is filled, that is before casting even begins. That does not enable a constant monitoring of the temperature. Data accuracy is subject to the precision with which the foundry operator performs the measurement. Depending on the immersion depth and the position of the probe, temperature readings can deviate.

At fully automated casting machines, temperature is commonly controlled by infrequent immersion of the probe into the melt. At semi-automated operations, the temperature of the liquid metal is usually only measured once for each newly filled ladle. The thermocouple is dipped into the ladle before pouring begins, that is, before the molds are filled. Depending on the number of castings poured from one ladle, there may be a considerable time offset between ladle temper-

achieve reliable and accurate temperature data, it is essential that a pyrometer only detects and processes the infrared radiation from the surface which is free of oxides and slag. The CSD function (Clean Surface Detection) of CellaCast ignores the slag and oxides floating on the surface and filters out the temperature detected from the pure liquid metal.

Different alloys (e.g. iron, steel, SG iron, grey iron) will feature slightly different infrared radiation properties. The specific emissivity can be determined by performing a comparison measurement using a thermocouple. This material constant is then set at the pyrometer.

The CellaCast's signal detection is based on the two-colour measuring principle. This means that the infrared radiation is measured simultaneously at two wavelengths. The temperature received is the calculated ratio of these two radiances. Due to the ratio principle, the CellaCast is also considerably more insensitive to interfering factors such as dust, vapour or smoke obstructing the field of view than conventional single colour pyrometers.

Measurement from large distance

The stationary CellaCast PA 80 and the portable PT 180 are specially designed for temperature measurement of liquid metals. They are used for the continuous monitoring of the temperature of the melt in the runner of a blast furnace, a cupola furnace or in casting machines. In such plants, measurements from a large distance are often the only option.

Thanks to the high resolution optics and the small measuring field of the PA 80 / PT 180, measurements from a distance up to 30 m are possible.

Determination of measured values

With optical temperature detection a pyrometer is aligned on the floating melt. CellaCast features an intelligent ATD function (Automatic Temperature Detection). In connection with the CSD feature (Clean Surface Detection), the temperature is detected at the slag and oxide-free spots and is evaluated periodically. Thus, the measured value is continuously displayed on the digital display and simultaneously transmitted via the analog output and digital interface. For better visibility, an external large-scale display unit can be used to show the temperature value.

As an option, a signal lamp lights up or a horn sounds an alarm when the reading is outside the permissible temperature range. The temperature data can be recorded and saved online in a PC or a data acquisition system. A complete control and documentation of temperature is ensured.

The portable pyrometer CellaCast PT 180 starts reading the temperature as soon as it targets a hot melt. A traffic light display in the visor helps to find the optimum measuring distance. After a few seconds, an audible alarm indicates the end of the measurement and the temperature is displayed when it was correctly determined.
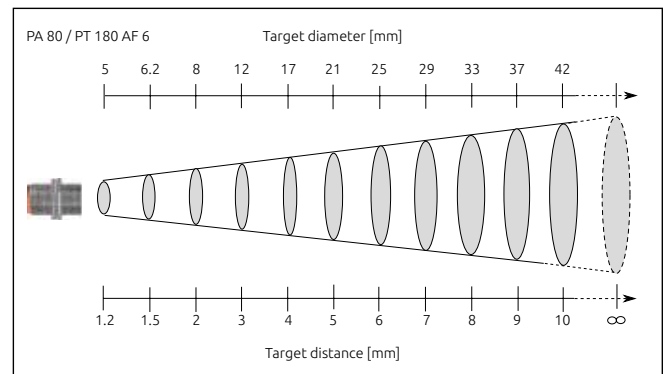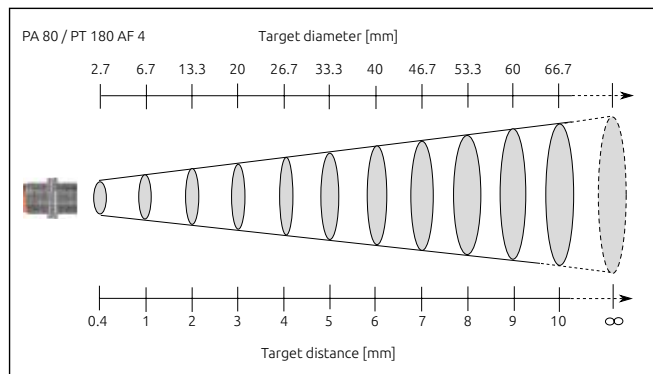
ature measurement and the last mold filled from the content of that ladle. The ladle operator decides how many castings can be poured from one ladle, basing his decision on the flow behavior of the melt and his empirical knowledge of heat loss and cooling time. Actual temperature tests using measurement instrumentation – to assure that the required process temperature is maintained right down to the last filled mold – is rarely performed.

A pyrometer can detect the temperature of the running smelting continuously and at the crucial moment in the casting process: just as the mould is being filled. This makes it possible to react immediately to changes in temperature and to establish constant production conditions. Measuring with pyrometers ensures full temperature control of each single workpiece.

A pyrometer has no parts subject to wear and tear, therefore a foundry does not incur any operating costs for expendable parts. The immersion method is subject to wear on parts.

How it works

The CellaCast pyrometer is an optical non-contact temperature measurements device. It detects the infrared radiation emitted from an object and determines the temperature from these values. The optical system is designed to measure the radiation within a defined field of view. Depending on the size of the measuring object and the selection of the optical system, the CellaCast covers measuring distances of up to several metres.

The problem of non-contact temperature detection is the development of slag and oxide on the molten metal surface. Changes to the surface characteristics will change the radiation properties. To

Optics

A pyrometer is an optical method of measuring temperature. The quality of the optics greatly influences the the accuracy of the measurement.

The lens system of the Cellacast consists of a high-quality glass lens that is optimized for the visible and infrared spectrum. The tempered anti-reflective coated lens is extremely durable, easy to clean and therefore suitable for rough industrial environments.

Due to its superior imaging properties, the high-precision lens provides consistently high optical resolution across the entire focusing range.

The lens is infinitely adjustable and can be precisely set to the required distance between pyrometer and target. Depending on the measuring distance, 4 objective lenses are available.

Field of view

PA 80 / PT 180 AF 4	Target diameter [mm]

| 2.7 | 6.7 | 13.3 | 20 | 26.7 | 33.3 | 40 | 46.7 | 53.3 | 60 | 66.7 |

| 0.4 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ∞ |

Target distance [mm]

PA 80 / PT 180 AF 6	Target diameter [mm]

| 5 | 6.2 | 8 | 12 | 17 | 21 | 25 | 29 | 33 | 37 | 42 |

| 1.2 | 1.5 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ∞ |

Target distance [mm]

Sighting options of the measuring system

Through-the-lens

The CellaCast 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 inter-pupillary 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.

Laser spot light

Another sighting option available for CellaCast is an integrated 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, regardless of whether the object focused on is cooler or hotter than the background.

The video signal also transmits the measurement data. The temperature reading is superimposed onto the screen. A separate PC is not required.

Stationary Pyrometer CellaCast PA 80

Analogue outputs

CellaCast PA 80 features two analogue outputs which the user can custom configure. The second analogue output can be used to monitor a specific process temperature such as the device's internal temperature. If this is too high, it could indicate that the permissible ambient temperature has been exceeded or the cooling jacket (if used) is malfunctioning. Alternatively, the second output can be configured as an input.

When used together with the material selection switch VK 30.01, you can choose one of the four custom-configured ratio settings for the specific material being cast.

Switching outputs

CellaCast PA 80 features two switching outputs which provide a variety of configuration possibilities. These outputs can be used to monitor compliance with configured limit values or to trigger a status indicator.

A switching output can also be used to synchronize data communication to the PLC in order to transmit one temperature reading per cast mold. Each of the switching outputs can be configured as gate inputs.

Data communication

The CellaCast PA 80 is equipped with a USB interface and RS 485. Both enable remote configuration and temperature data transmission to a data acquisition system.

The pyrometer comes with the multilingual CellaView software. It is used for remote control, online presentation of the measuring curve, and analyses and storage of the readings.

Diagnostics Feature

During commissioning and operation, 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.

Dirty window monitor

CellaCast PA 80 is equipped with a SCM function (Smart Contamination Monitoring) that detects a dirty lens or window or blind spots in the pyrometer's line-of-sight and signalizes it via switching contact. The sensitivity of this function is user-adjustable.

Device-specific technical data PA 80

2 analogue outputs
- 0(4) - 20 mA linear, switchable, scalable

Load
- max. 500

2 switching inputs / outputs
- Open Collector 24 V, ≤ 30 mA

Data communication
- USB
- RS 485 (integrated menu-driven user interface to set parameters and transmit data to a PC)

Current input
- ≤ 135 mA
- ≤ 150 mA with laser spot light
- ≤ 175 mA with video camera Ripple ≤ 200 mV

Power requirement
- 24 V DC +10% / -20%

Ambient operating temp.
- 0 - 65 °C (without cooling)

Storage temperature
- -20 - +80 °C

Housing
- Stainless steel

Protection rating
- IP65 acc. to DIN 40050

Connectivity
- 8-pin connection with screw thread

Weight
- approx. 0.9 kg

Camera

Video signal
- Composite PAL, 1Vpp, 75 Ohm

Resolution
- 722 x 576 pixels

TBC exposure control
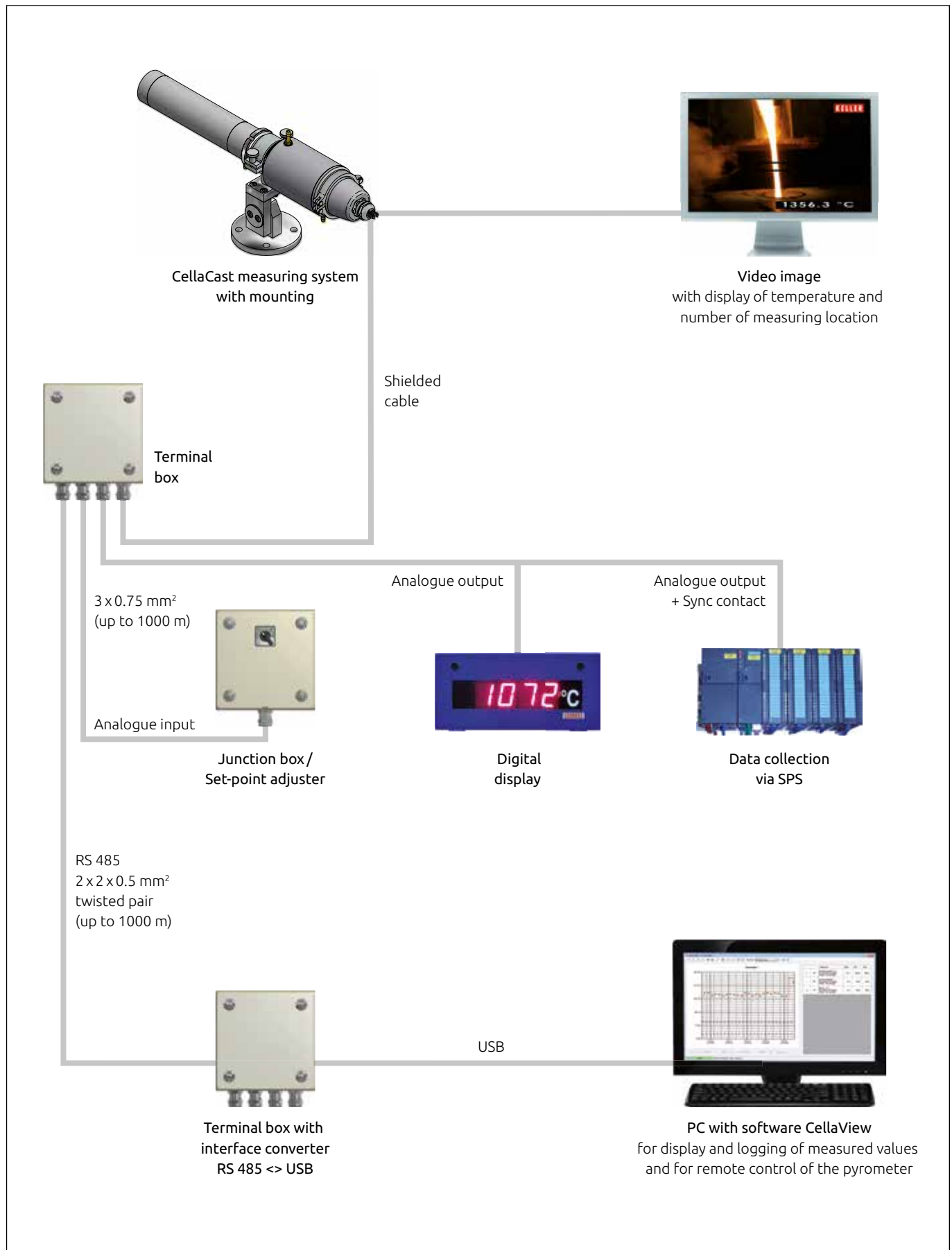- Automatic, across the entire measuring range

Screen display
- Indication of the measuring field
- temperature reading

Connectivity
- TNC connector

Components of the measuring system CellaCast

CellaCast measuring system
with mounting

Video image
with display of temperature and
number of measuring location

Shielded
cable

Terminal
box

3 x 0.75 mm²
(up to 1000 m)

Analogue output

Analogue output
+ Sync contact

Analogue input

Junction box /
Set-point adjuster

Digital
display

Data collection
via SPS

RS 485
2 x 2 x 0.5 mm²
twisted pair
(up to 1000 m)

USB

Terminal box with
interface converter
RS 485 <> USB

PC with software CellaView
for display and logging of measured values
and for remote control of the pyrometer

Mountings

Mounting for execution with through-the-lens sighting or laser spot light
PA 83-002

consisting of:
- Dust stop PZ 10/T
- Intermediate tube PZ 20/C
- Air purge PZ 20/A
- Clamping collar PZ 20/L AF2
- Cooling jacket closed PA 20/M AF1
- Hose nozzle G1/8"
- Pedestal mount PB 08/K AF2
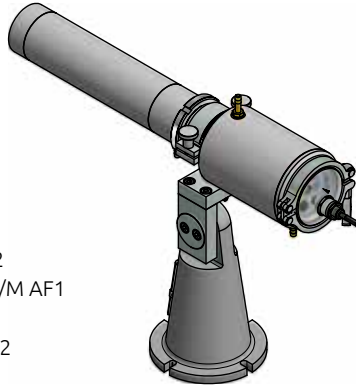
Mounting for execution with video camera
PA 83-003

consisting of:
- Dust stop PZ 10/T
- Intermediate tube PZ 20/C
- Air purge PZ 20/A
- Clamping collar PZ 20/L AF2
- Cooling jacket closed PA 20/M AF2
- Hose nozzle G1/8"
- Pedestal mount PB 08/K AF2
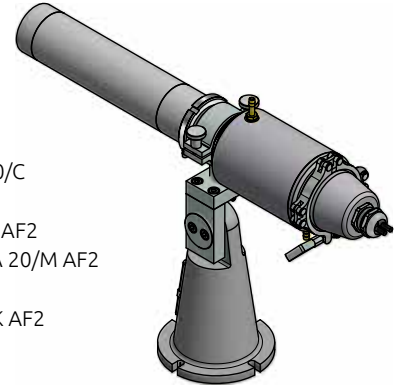
Protective accessories

The PZ 20/A air purge creates air flow to prevent dirt from settling on the lens. Used together with the PZ 20/C intermediate tube and the PZ 10/T dust stop, the system provides maximum efficiency with minimum air consumption.

The PA 20/M cooling jacket provides protection against dirt and high ambient temperatures. It can be operated with either water or air as a coolant.

The pyrometer is easy to install/remove without tools. The cooling jacket PA 20/M AF1 features a glass window on the back and thus does not obstruct the pyrometer's display panel.

Accessories

Terminal box
VK 30.02

Junction box with power supply
230 VAC / 24 VDC
VA 20.01

Junction box
VK 30.01

Set-point adjuster
VK 30.03

Interface converter /
video encoder SU 01
RS 485 and video <-> Ethernet

Interface converter
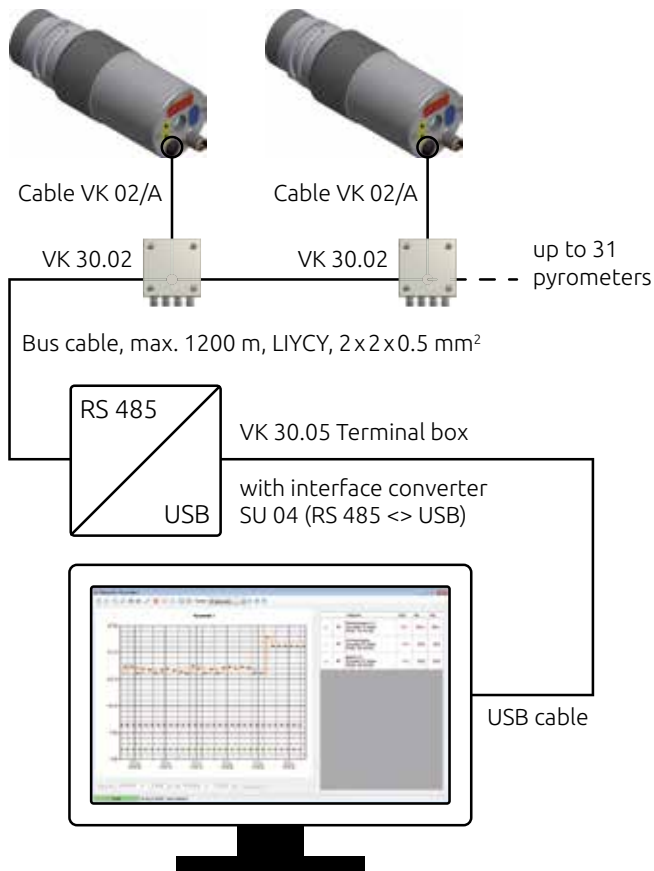SU 04: RS 485 <-> USB
SU 02: RS 485 <-> Ethernet

Digital display DA 570
digit height 50 mm,
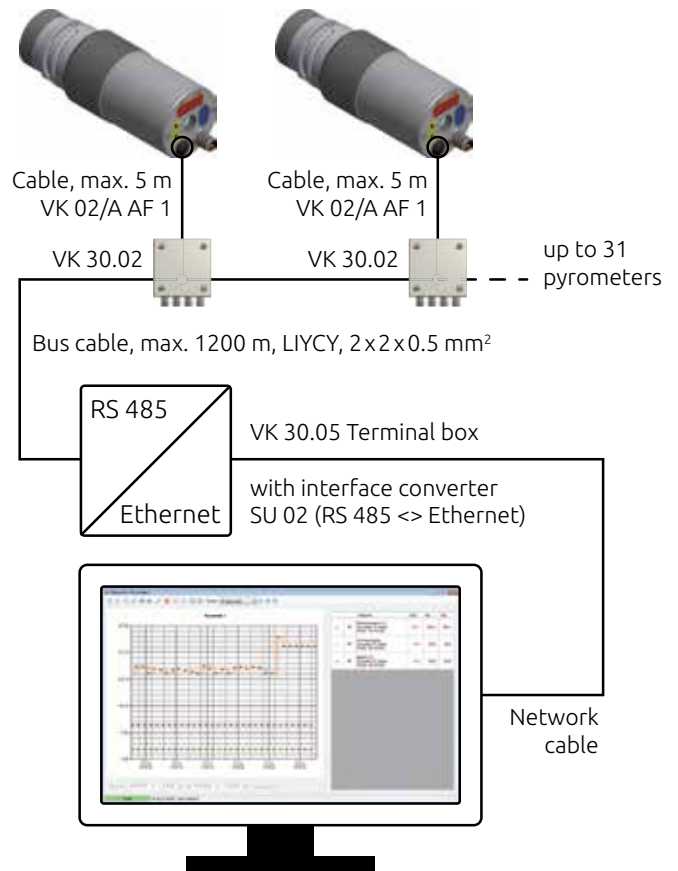up to 25 meters still legible
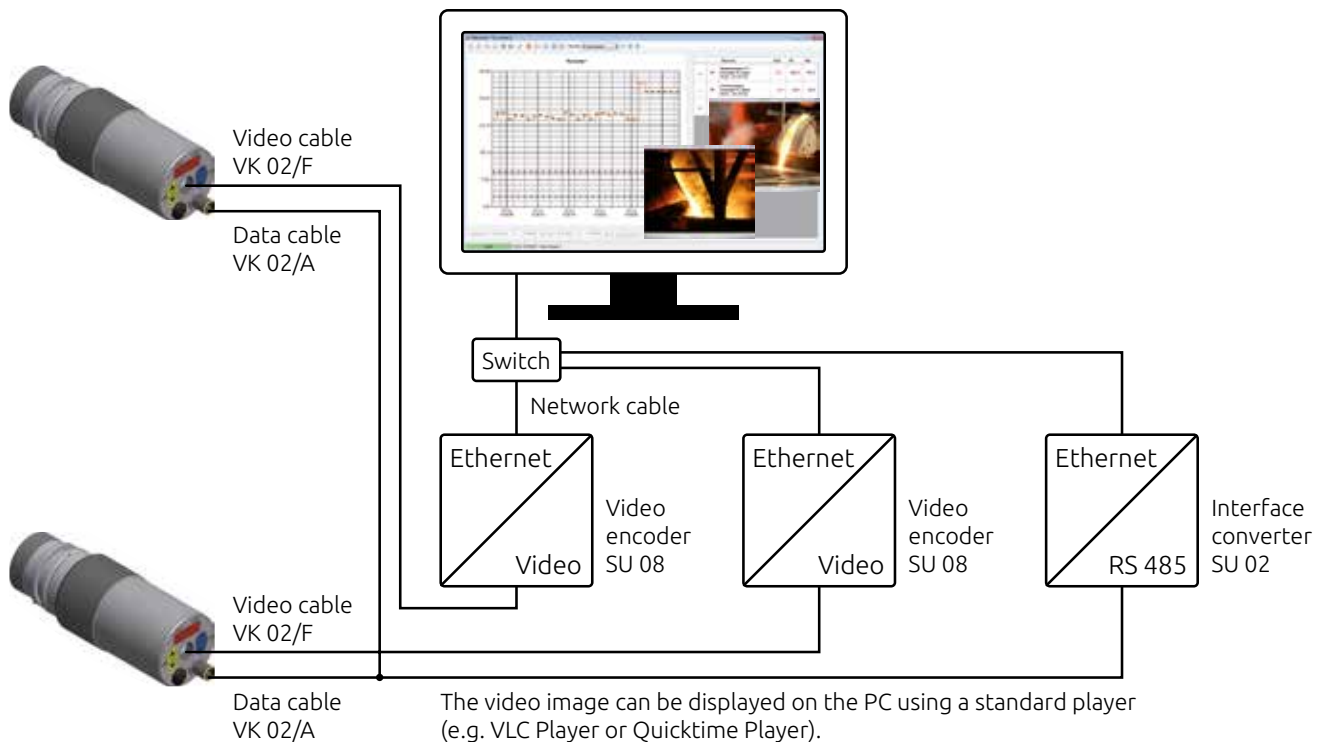
Protective glass
70146

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, 2 x 2 x 0.5 mm²

RS 485

VK 30.05 Terminal box

USB   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, 2 x 2 x 0.5 mm²

RS 485

VK 30.05 Terminal box

Ethernet   with interface converter
            SU 02 (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

Video   Video   Video   Video   RS 485   Interface
            encoder   encoder   converter
            SU 08   SU 08   SU 02

Video cable
VK 02/F

Data cable   The video image can be displayed on the PC using a standard player
VK 02/A   (e.g. VLC Player or Quicktime Player).

Portable pyrometer CellaCast PT 180

Through-the-lens-sighting
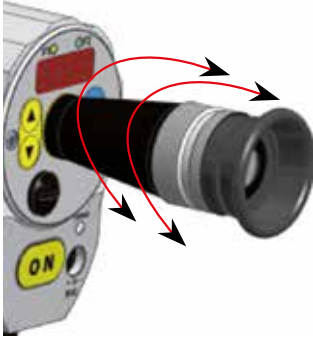
The wide field of view makes it easy to focus on the target object. The ocular features a widened interpupillary distance to accommodate users who wear glasses or a helmet.

A built-in diopter compensation allows users to compensate for bad eyesight.

To protect the user's eye, the built-in polarizing filter can be adjusted to the brightness of the target.

Signal strength indicator
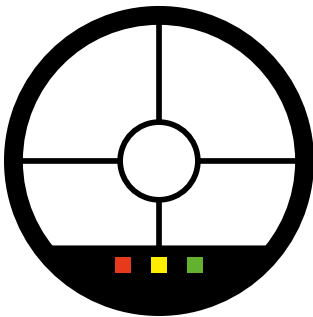
A traffic light status indicator is integrated in the viewfinder. When targeting on the measuring object, it indicates the user, if the signal strength is sufficient for a reliable measurement.

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.

Device-specific technical data PT 180

Data communication
- USB

Power supply
- rechargeable battery pack
- mains adapter

Battery life
- up to 12 hours of use (based on continous operation at Ta = 23 °C)

Ambient operating temperature
- 0 - 50 °C

Storage temperature
- -20 - +50 °C

Housing
- aluminium

Protection rating
- IP40 acc. to DIN 40050

Sighting
- Through-the-lens sighting, parallax-free imaging, target spot indicator, diopter compensation, polarizing filter

Weight
- approx. 1.1 kg

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.

Control keys

Parameters can be adjusted 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 operating conditions. The PT 180 can easily and fast be adjusted to the radiation characteristics of the target object using preconfigurable emissivity tables.

Parameter LED

Display

Select / Change parameters

USB port

Power „ON"
(PT 180)

Status LED

Ocular (PT 180)

MODE key

Connector socket
(PA 80)

Battery charge indicator (PT 180, lights up, when the battery is being recharged)

1/4" tripod screw thread (PT 180)
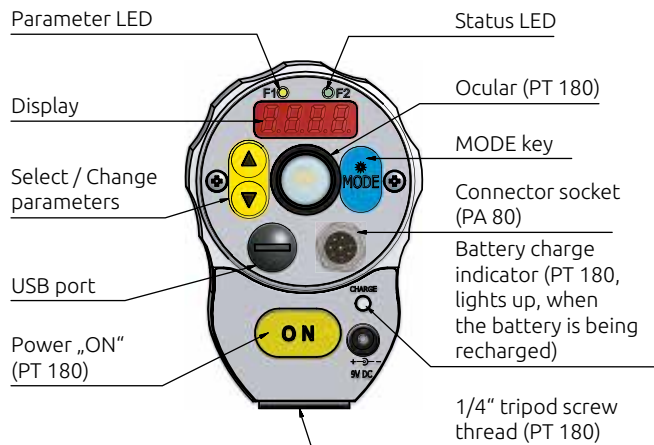
Adjustable parameters

*   Smoothing filter
*   Min/max memory
*   Emissivity ratio
*   Emissivity table (PT 180)
*   ATD function parameters
*   Sensitivity of the dirty window monitoring
*   Function of LEDs

Additionally at the CellaCast PA 80
*   Scale of analogue input and output signals
*   Function and limits of the switching contacts
*   TBC (Target Brightness Control)
*   White balance of the camera
*   Simulation of current and temperature

Shipment includes

CellaCast PA 80
*   CellaCast PA 80 pyrometer
*   Polarizing filter for ocular PA 20/P for model with through-the-lens sighting
*   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)
*   Software CellaView
*   Instruction manual

CellaCast PT 180
*   Pyrometer CellaCast PT 180
*   Carrying and protective case
*   Battery charger / mains adapter
*   Quartz protective glass 70146
*   USB cable VK 11/D (1.8 m)
*   Software CellaView
*   Instruction manual
*   Calibration certificate ISO 9001

Common technical data PA 80 / PT 180
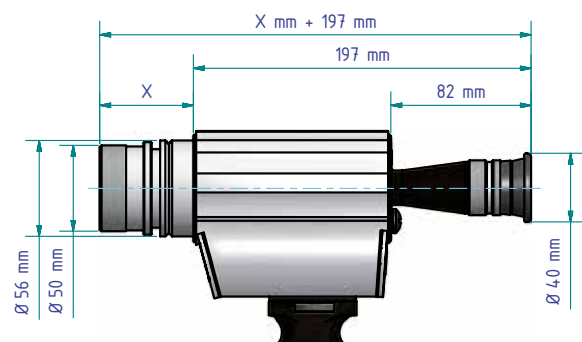
Sensor
*   Photodiode

Spectral sensitivity
*   0.95 / 1.05 μm

LED display
*   4-digit
    (digit height 8 mm)

Response time t_{98}
*   ≤ 10 ms (t > 750 °C)

Measurement uncertainty
*   1.5 % of temp. reading, at least 4 K (at e = 1 and Ta = 23 °C)

Repeatability
*   3 K

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

Resolution display
*   1 K

Resolution USB / RS 485
*   0.1 K in terminal mode

Temperature coefficient
*   ≤ 0.05 %/K of temp. reading [°C] (deviation to 23 °C)

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

Dimensions

CellaCast PA 80

min. 35 mm
max. 112 mm
M65x2
Ø 62,75 mm
Ø 56 mm
Ø 50 mm
42 mm
132 mm
min. 200 mm / max. 277 mm

CellaCast PT 180

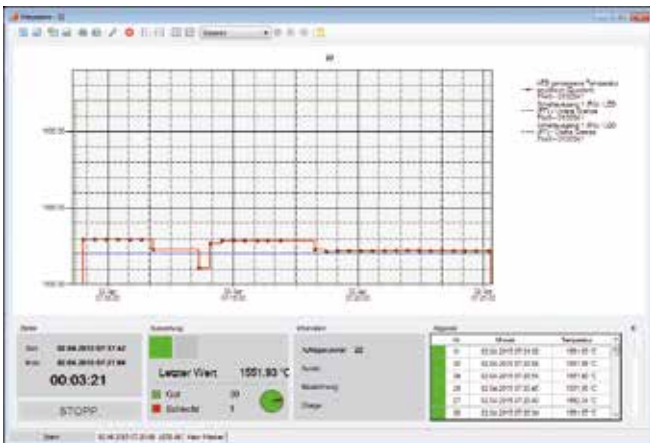X mm + 197 mm
197 mm
X
82 mm
Ø 56 mm
Ø 50 mm
Ø 40 mm
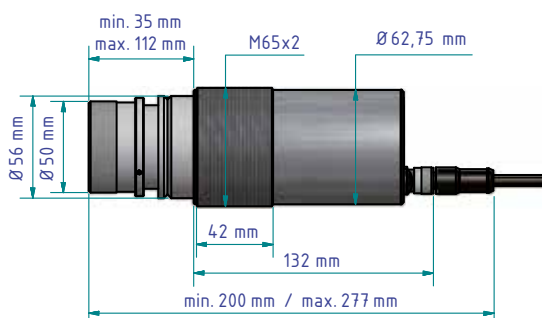
Software CellaView

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)

- Microsoft SQL Server Compact-based database

- 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

- Parameter setting and remote control of the pyrometers

- Saving, loading and transferring of configuration profiles of the devices

- 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

- Logging of user entries in a log file to check for configuration changes

- Entering the production parameters

- Archive with filter function

- Generating a measurement protocol per production batch

- No license restriction

- Compatible with Windows XP, Vista, 7, 8

- 9 languages selectable

KELLER ITS
infrared temperature solutions

● Headquarters
■ Sales and Service Center
□ Sales abroad

No1 in terms of
ACCURACY
RELIABILITY
INNOVATION

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