**N°1** in terms of
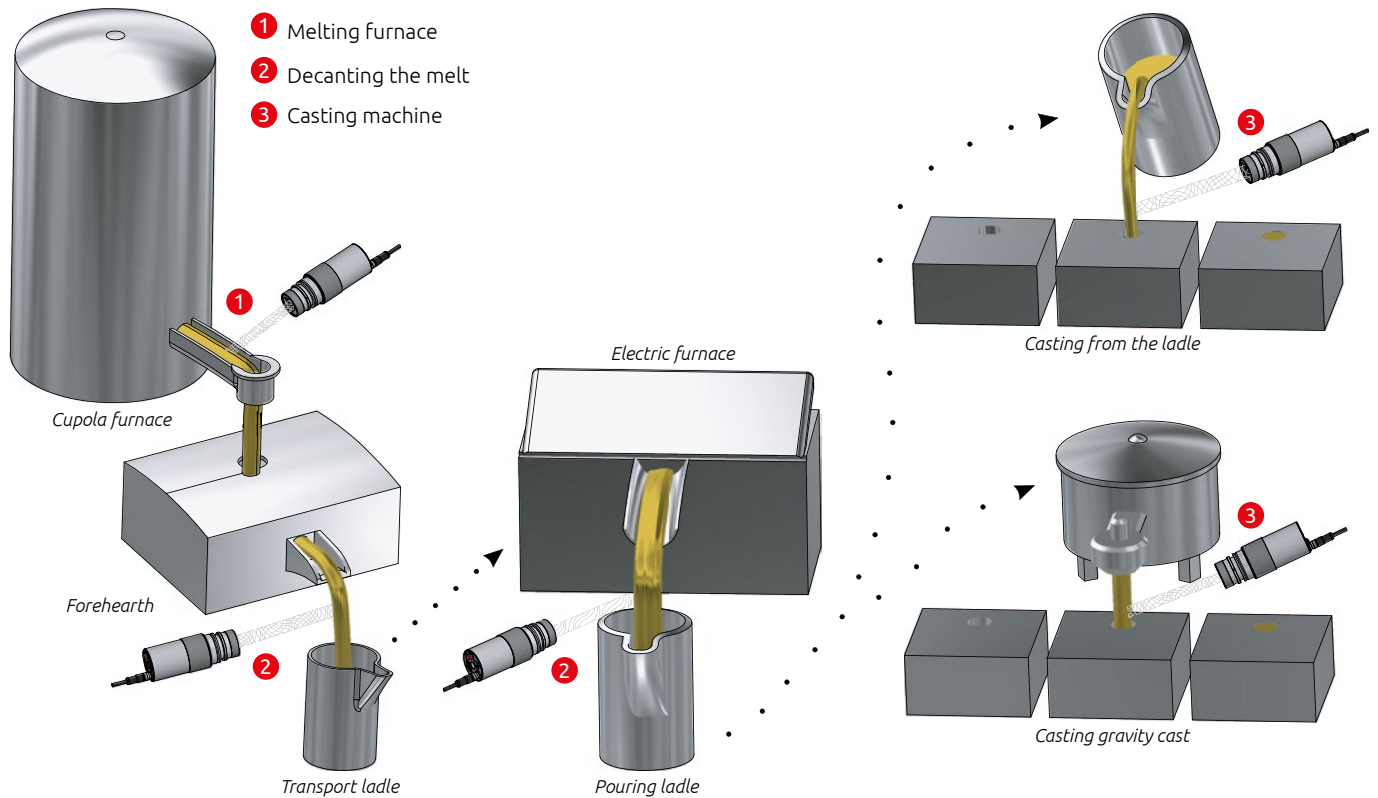ACCURACY
RELIABILITY
INNOVATION

# Measuring system
## CellaCast

for non-contact temperature measurement
of molten metal

KELLER A DIVISION OF GROUPE LEGRIS INDUSTRIES

**5** years warranty ★★★★★

**QUALITY** made in Germany

## Measuring points in a casting plant



1 Melting furnace
2 Decanting the melt
3 Casting machine

Cupola furnace

Forehearth

Transport ladle

Electric furnace

Pouring ladle

Casting from the ladle

Casting gravity cast

## Measurement of molten metal

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.

The temperature of molten metal is most commonly measured using immersion probes. The probe is dipped into the liquid metal after the ladle is filled, that is before pouring even begins. 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.

The CellaCast pyrometer is an optical non-contact temperature measurement device. It is a wear and maintenance-free measurement system to measure the temperature in melting, holding, cupola and blast furnaces, and in automatic casting machines.

Liquid metal presents a unique characteristic due to the composition of its surface which is particularly susceptible to slag and oxides. To obtain accurate temperature data, it is essential that the pyrometer only detects and processes the infrared radiation emitted from the clean metal surface. CellaCast is equipped with a special CSD function (Clean Surface Detection) which filters out the signal obtained from the metal surface which is free of slag and oxides.

The two-colour measurement technique provides reliable data in harsh industrial environments, even when dust or steam is in the field of view.

The pyrometer requires virtually no maintenance and does not contain parts subject to wear. Foundries eliminate the need for expendable thermocouple and thus reduce their operating costs.

## Measuring point melting furnace  1

The pyrometer continuously measures the temperature in a runner of the blast furnace, the cupola furnace or the automatic casting machine. It is therefore easy to react to temperature changes immediately and to reach a constant material temperature.

## Solution

The CellaCast PA 80 is used to measure the temperature of liquid metal in runners. It has a very high-resolution optical system and therefore safely detects slag and oxide-free spots within the running melt even from a great distance. The temperature is measured and displayed periodically.

The measurement readings can be displayed online, recorded and archived either with a data logger available on site or with the PC software CellaView that comes with the CellaCast system.

For optical alignment and control of the target area the devices are equipped with through-the-lens sighting, a laser or a video camera to check the measuring spot from the control centre at any time.

The portable pyrometer CellaPort PT 180 can be used for mobile temperature checks.

## Measuring point decanting the melt ❷

Temperature is of crucial importance as the molten metal passes from the melting furnace or forehearth to the transport ladle or pouring ladle. The liquid metal must be poured into the mold within a limited time to minimize heat loss. When cooling exceeds 10 °C per minute, the minimum permissible pouring temperature might be violated.

## Measuring point casting machine ❸

With optical temperature detection at metal casting operations, a pyrometer is focused on the free falling liquid metal stream. The pyrometer detects the temperature of the molten metal of each cast directly when the moulds are filled. In this process, the position of the pouring stream may vary depending on the pouring nozzle size and shape or the tilting angle of the ladle.

## Solution

CellaCast PA 83 was specially designed to measure the temperature of liquid metal poured from a foundry ladle or discharged from a bottom-pour ladle.

The unique feature of the CellaCast PA 83 is a rectangular measurement area. As long as the moving stream remains some-where within this rectangular area, CellaCast PA 83 captures the pour and produces an accurate temperature reading.
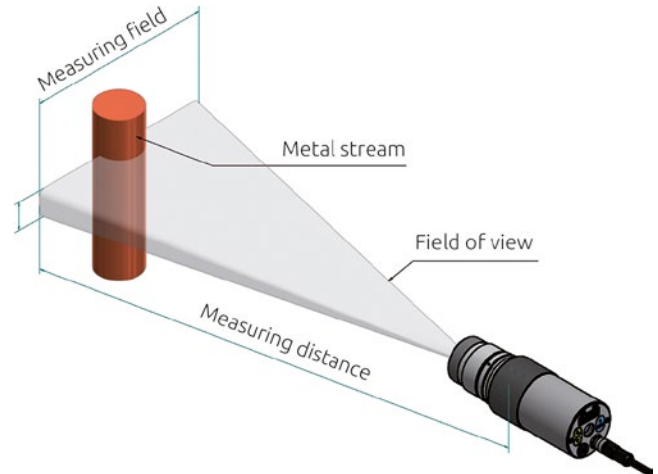


CellaCast features an intelligent ATD function (automatic temperature detection) which automatically produces a temperature reading for each mould. Thanks to ATD, the pyrometer starts measuring just as the ladle starts pouring. Interferences such as flames or molten metal drip (as opposed to a pour stream) will not impact the measurement. The temperature reading will remain very accurate despite such disturbances. When the measurement process is finished, CellaCast displays the temperature reading for each poured mould. Data is transmitted via analogue output and serial interface. This value can also be viewed at a large external digital display so that the foundry operator can instantly see the temperature reading. As an option, a visual alarm signal can be connected so that temperature limit violations can be seen. The temperature data can be saved in a PC or recorded via a data acquisition system. This system ensures full control and documentation of the temperature of all cast workpieces.

## 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 interpupillary distance, making it suitable for users who wear glasses or a helmet. The target marker in the viewfinder indicates the exact position and size of the measured target spot.

### Laser spot light

Another sighting option available for CellaCast PA 80 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.
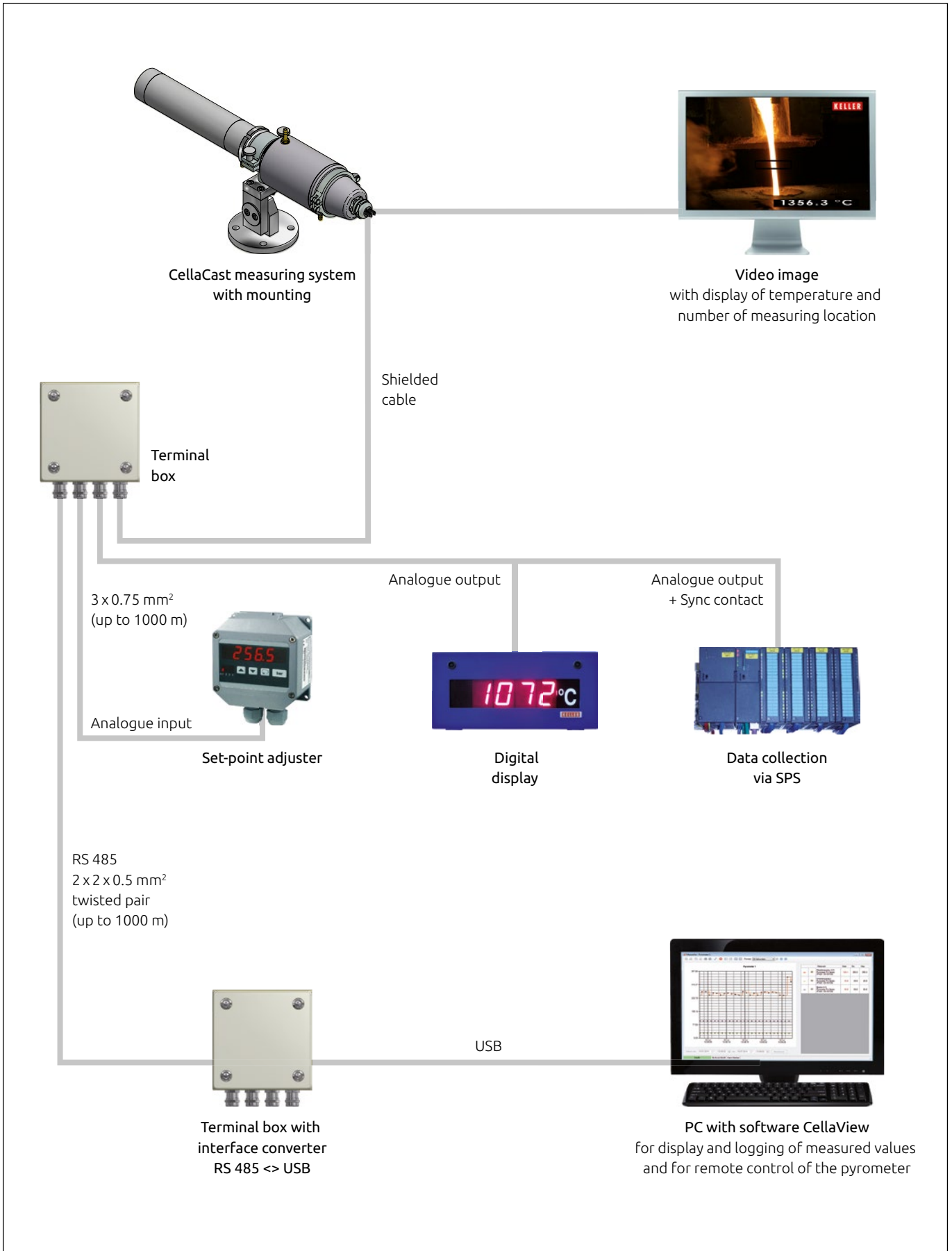
## Measuring system

| Model | stationary | portable |
|---|---|---|
| Type | PA 80 / PA 83 | PT 180 / PT 183 |
| In- and outputs | 2 switching inputs / outputs<br>2 Analogue outputs 0(4) - 20 mA<br>Analogue input 0 - 10 V | |
| Digital interface | USB and RS 485 | USB |
| Adjustable parameters | Scaling of the analogue in- and outputs, Smoothing filter, min/max memory, Alarm contacts (mode and limits), Sensitivity of the dirty window monitoring, TBC Target Brightness Control, White balance of the camera, Simulation of current and temperature | Table for up to 10 emissivity ratio values |
| | Emissivity, ATD function parameters, Function of LEDs | |
| Power supply | 24 V DC | Built-in battery, Mains adapter for continuous operation |
| LED display | 4-digit (digit height 8 mm) | |
| Protection | IP 65 according to DIN 40050 | IP 40 according to DIN 40050 |
| Housing | Stainless steel | Housing: aluminium Handhold: polyamide |

## Range of models

| Model | | | | Technical data | | | | |
|---|---|---|---|---|---|---|---|---|
| stationary | | | portable | | | | | |
| Sighting options | | | | 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 | ◯ |
| PA 83 … | | | PT 183 … | | | | | |
| AF 1 | AF 1 / C | AF 1 / L | AF 1 | 650 - 1700 °C 1202 - 3092 °F | PZ 20.01 | 0.40 m - ∞ | $D_v$ = 230 : 1 $D_h$ = 45 : 1 | ▭ |
| AF 3 | AF 3 / C | AF 3 / L | AF 3 | | 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 | AF 13 | | PZ 20.08 | 0.30 m - ∞ | $D_v$ = 150 : 1 $D_h$ = 30 : 1 | ▭ |
| AF 11 | AF 11 / C | AF 11 / L | ✕ | 750 - 2400 °C 1382 - 4352 °F | PZ 20.05 | 0.20 m - ∞ | $D_v$ = 85 : 1 $D_h$ = 11 : 1 | ▭ |

## 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

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
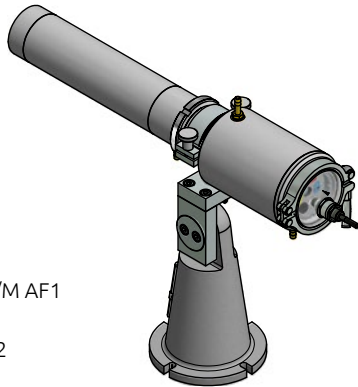and for remote control of the pyrometer

## 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
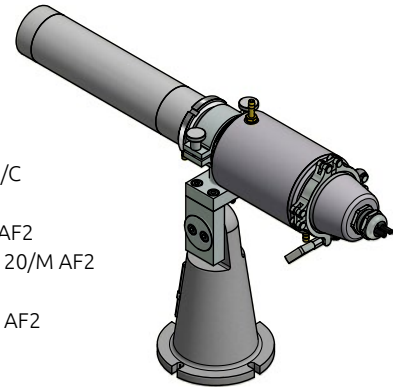
## Accessories

Terminal box
VK 30.02

Set-point adjuster
VK 30.03

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

Terminal box with interface
converter RS 485 <-> USB
VK 30.05

Interface converter /
video encoder SU 01
Video <-> Ethernet

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

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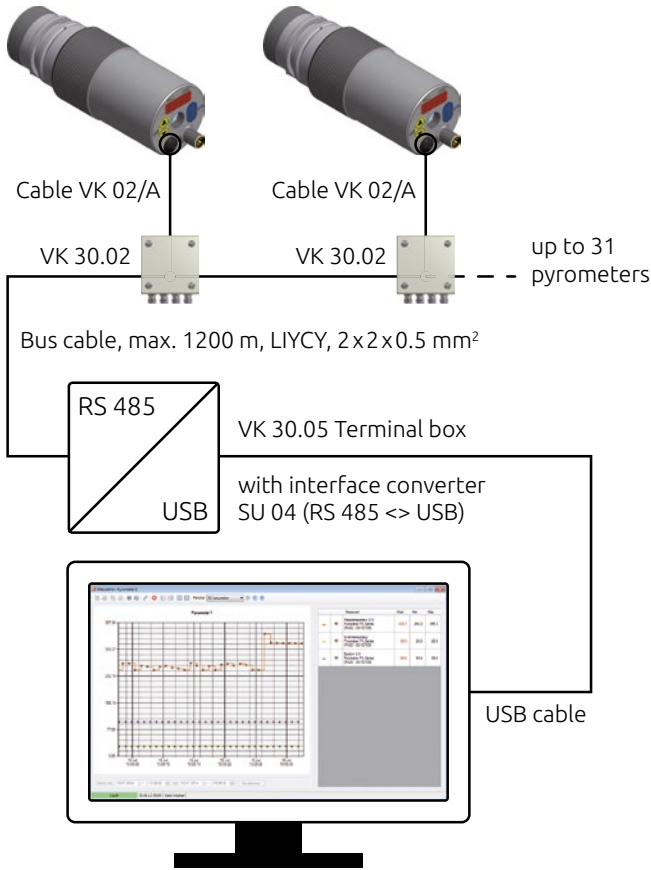up to 25 meters still legible

## Software CellaView

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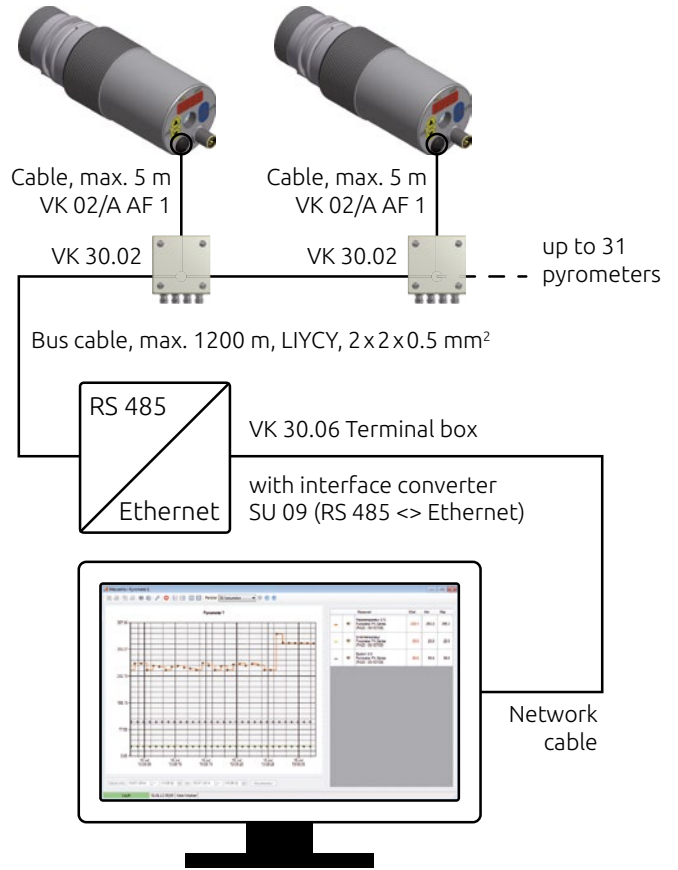of the measure-
ment readings.
Monitoring, remote
control and configuration of the pyrometer are additional features of
this software. The modern MDI-based user interface makes it possible
to open multiple graphs at the same time. The series of measure-
ments of up to 31 instruments can be recorded simultaneously.

* 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
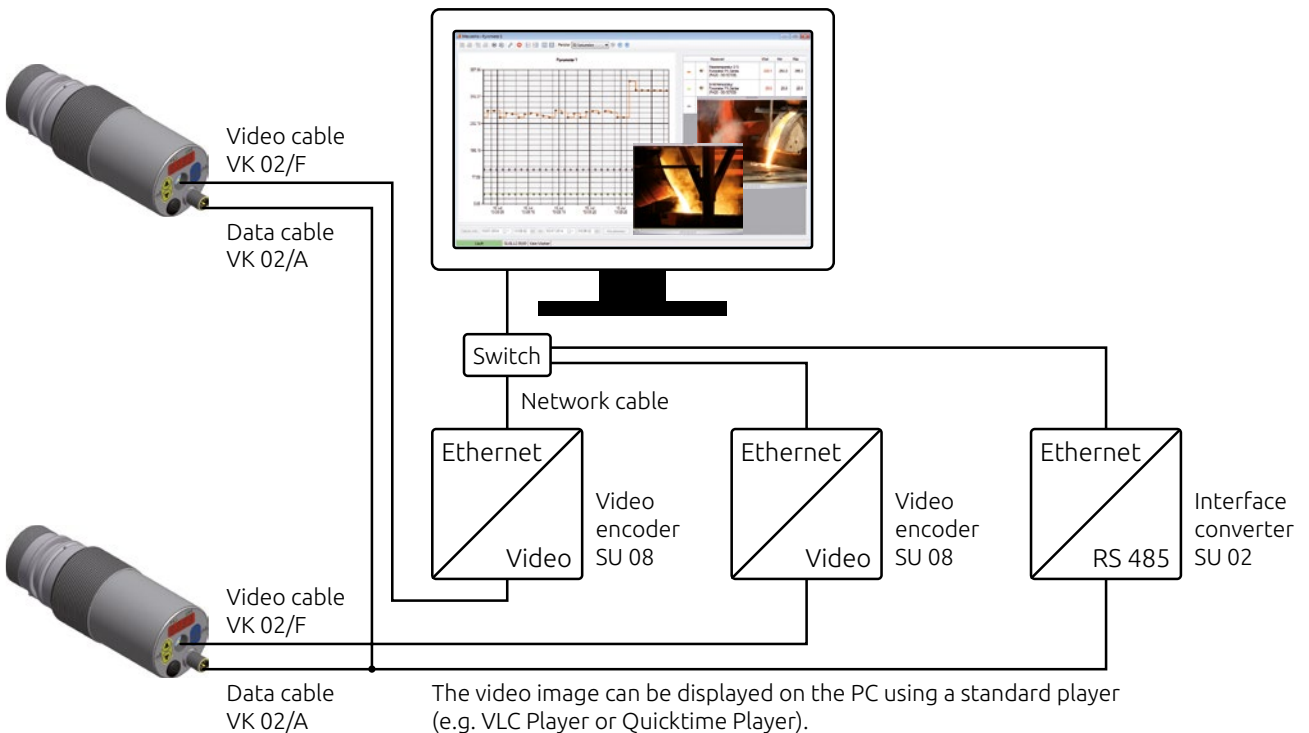* Generating a measurement protocol per production batch

## 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 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
VK 02/A AF 1

Cable, max. 5 m
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 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

Video cable
VK 02/F

Data cable
VK 02/A

Switch

Network cable

Ethernet / Video

Video encoder
SU 08

Ethernet / Video

Video encoder
SU 08

Ethernet / RS 485

Interface converter
SU 02

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

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

**N⁰1** in terms of
ACCURACY
RELIABILITY
INNOVATION

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