

# Oscillating Mirror PZ 20/X

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Please note:

Unless otherwise stated in this instruction manual, technical alterations, particularly those serving technical progress, may be made without notice.

Warranty can only be assumed if the instrument has not been tampered with and is returned intact to KELLER HCW GmbH for repair and / or service.

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## Safety Instructions

### General Instructions

The oscillating mirror is designed according to state-of-the-art technology, complies with commonly accepted safety rules and is highly reliable. Improper handling however, may cause damage to the device or to other goods involved.

All persons involved with operation and maintenance of the oscillating mirror must first read the instruction manual.

The oscillating mirror may only be used when it is in good order and condition and under the observance of all local safety regulations. In case the device malfunctions, it is imperative that operation be ceased immediately.

### Intended Use

The oscillating mirror is exclusively intended for the applications described in this instruction manual. Any other use is not intended. The manufacturer is not liable for any damages resulting from such unintended use; in this case the risk is solely borne by the user.

Only persons who are familiar with the use of the oscillating mirror and who have been informed of possible dangers are allowed to operate and maintain them.

The common regulations for the prevention of accidents must be observed.

**Arbitrary alterations to the oscillating mirror or use of the device beyond the permitted operating conditions exclude the liability of the manufacturer for any damages resulting thereof.**

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## 1 General Description

The PZ 20/X is a compact accessory to be employed with the pyrometers of the CellaTemp PQ, PK, PZ and PA series. The microprocessor controlled electronics enable temperature profile recording depending on the adjustable scan angle and scan speed parameters.

### Features of the PZ 20/X Oscillating Mirror

- Temperature measurements are represented and plotted as a curve
- For use with any of the CellaTemp PQ, PK, PZ and PA pyrometers
- Adjustable scan angle
- Adjustable scan speed
- Automatic rotation function provides periodic lubrication to minimize wear and ensure a long service life
- Status signal output to monitor operation status
- Serial interface RS-422 for fail-safe data transmission
- CellaScan software to create temperature profiles

The PZ 20/X corresponds to the protection requirements of EG Directive 89/336/EEC amended by 91/263/EEC; 92/31/EEC; 93/68/EEC relating to electromagnetic compatibility (EMC Law).

European Standards:



EN 61000 - 6 - 4  
EN 61000 - 6 - 2  
EN 55011

The KELLER HCW Quality Management System meets the DIN EN ISO 9001/ 14001 standards for design, manufacture, repairs and service of non-contact infrared temperature measuring equipment.



## 2 Installation Instructions

### 2.1 Cleaning and Maintenance

Install the PZ 20/X in a location at which it is least likely to be exposed to dust, smoke or other pollutants which might soil the protective window. A false reading will be given when the protective window is dirty. Therefore check the window periodically and clean it, if necessary. Dust can be removed by simply blowing it away or by using a soft brush. A commercially available lens cloth or any other soft, lint-free cloth can be used.

The PZ 20/X must be protected against high ambient temperatures, high air humidity, high voltage and strong electro-magnetic fields. Never point the instrument directly towards the sun.

### 2.2 Ground

The ground for the control inputs and outputs is the same as for the 24 V power supply.

#### RS-422 Interface (optional)

The RS-422 serial interface is galvanic isolated from the analogue output.

#### RS-232 Interface PZ-Pyrometer

When the pyrometer's analogue output is connected to the input of the oscillating mirror with simultaneous use of the RS 232 interface, then the interface ground is connected to the 24V power supply ground.

### 2.3 Mounting / Positioning

The PZ 20/X is designed to be used with pyrometers of the PQ, OK, PZ or PA Series.

#### PQ/PK Pyrometers

The PQ/PK pyrometer can simply be mounted by means of the M30 screw thread.

#### PZ Pyrometer

A mounting ring (PZ 20/E) as shown in Fig. 2.1 is required to attach a PZ pyrometer to the oscillating mirror. The entire assembly can be installed by means of the clamping collar for mounting devices (PZ 20/L AF2)

## PA Pyrometer

A intermediate tube (PZ 20/J) as shown in Fig. 2.2 is required to attach a PA pyrometer to the oscillating mirror. The entire assembly can be installed by means of the clamping collar for mounting devices (PZ 20/L AF2)

### 2.4 Transmission loss through mirror and protective Window

An allowance must be made to compensate for the transmission loss through the oscillating mirror together with the protective window prior to initial use. This transmittance value must be multiplied with the emissivity of the target object.

#### Example:

Transmittance of the oscillating mirror with protective window 94 %

Emissivity of target 93 %

Emissivity value to be set at pyrometer = 87 %

( $0.94 \times 0.93 = 0.87 = 87 \%$ )

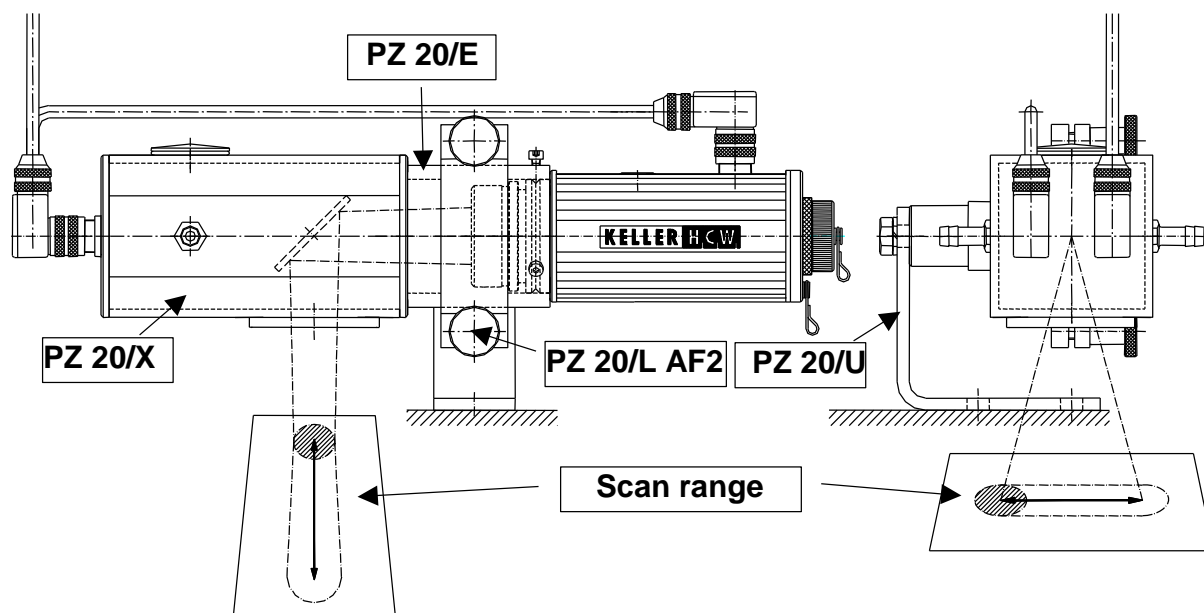
Various transmittance values are shown in the following table.

#### Transmittance Values of the Mirror in %

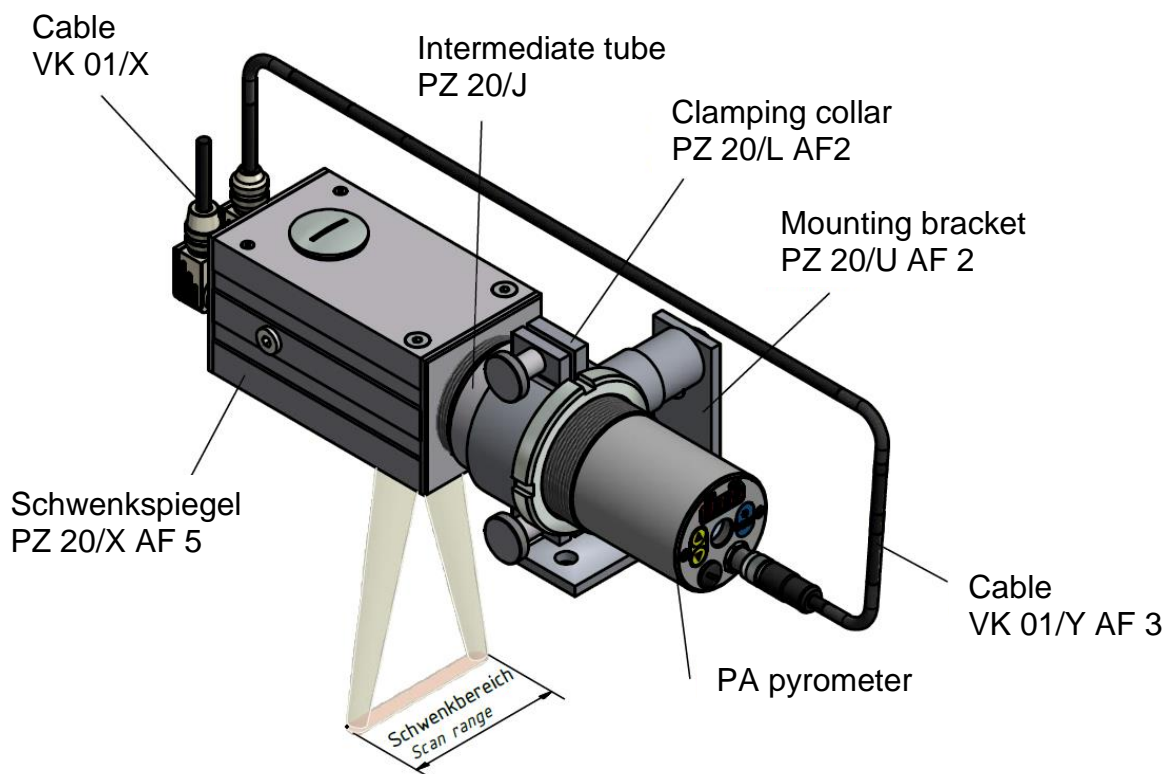
Instrument	Mirror	Mirror + UV Filter
PZ/PA 10/15	92	67 (incl. ZnS Filter)
PZ/PA 20	96	94
PZ/PA 35	96	94
PZ/PA 40 $\lambda_1 / \lambda_2$	100	100
PZ/PA 40 $\lambda_1$	96	94
PZ/PA 40 $\lambda_2$	96	94

## 2.5 Alignment

The mirror always oscillates symmetrically around a middle axis line. Align the instrument assembly by turning it at the mounting ring. To obtain the most accurate measurement readings make sure to align the pyrometer and oscillating mirror perpendicular to the target object.



**Fig. 2.1: Example of Mounting Assembly with PZ Pyrometer**

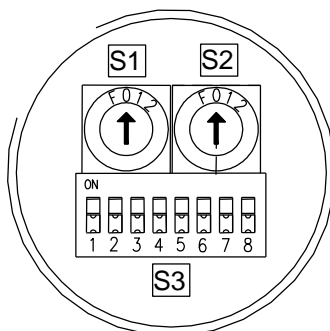


**Fig. 2.2: Example of Mounting Assembly with PA Pyrometer**



### 3 Settings and Adjustments

Prior to initial use the desired scan angle and an appropriate scan speed must be selected. Make this adjustment at the two rotary switches which are to be found underneath a dummy plug on the exterior of the PZ 20/X.



**Fig. 3.1: Switch for Settings**

#### 3.1 Scan Speed

The scan speed is defined in degrees per second. Set this speed at **switch 1**:

<b>S1</b>	<b>Speed</b>	<b>S1</b>	<b>Speed</b>
<b>0</b>	1.1°/sec.	<b>8</b>	4.9°/sec.
<b>1</b>	1.3°/sec.	<b>9</b>	6.4°/sec.
<b>2</b>	1.5°/sec.	<b>A</b>	9.0°/sec.
<b>3</b>	1.8°/sec.	<b>B</b>	13°/sec.
<b>4</b>	2.1°/sec.	<b>C</b>	21°/sec.
<b>5</b>	2.5°/sec.	<b>D</b>	40°/sec.
<b>6</b>	3.1°/sec.	<b>E</b>	90°/sec.
<b>7</b>	3.8°/sec.	<b>F</b>	220°/sec.

### 3.2 Scan Angle AF 5

The scan angle can be adjusted in 16 steps using rotary **switch S2**:

<b>S2</b>	<b>Angle</b>	<b>S2</b>	<b>Angle</b>
<b>0</b>	$\pm 0.9^\circ$	<b>8</b>	$\pm 8.1^\circ$
<b>1</b>	$\pm 1.8^\circ$	<b>9</b>	$\pm 9.0^\circ$
<b>2</b>	$\pm 2.7^\circ$	<b>A</b>	$\pm 9.9^\circ$
<b>3</b>	$\pm 3.6^\circ$	<b>B</b>	$\pm 10.8^\circ$
<b>4</b>	$\pm 4.5^\circ$	<b>C</b>	$\pm 11.7^\circ$
<b>5</b>	$\pm 5.4^\circ$	<b>D</b>	$\pm 12.6^\circ$
<b>6</b>	$\pm 6.3^\circ$	<b>E</b>	$\pm 13.5^\circ$
<b>7</b>	$\pm 7.2^\circ$	<b>F</b>	$\pm 14.4^\circ$

### 3.3 Scan Angle AF 6

The scan angle can be adjusted in 16 steps using rotary **switch S2**:

<b>S2</b>	<b>Winkel</b>	<b>S2</b>	<b>Winkel</b>
<b>0</b>	$\pm 1,8^\circ$	<b>8</b>	$\pm 16,2^\circ$
<b>1</b>	$\pm 3,6^\circ$	<b>9</b>	$\pm 18,0^\circ$
<b>2</b>	$\pm 5,4^\circ$	<b>A</b>	$\pm 19,8^\circ$
<b>3</b>	$\pm 7,2^\circ$	<b>B</b>	$\pm 21,6^\circ$
<b>4</b>	$\pm 9,0^\circ$	<b>C</b>	$\pm 23,4^\circ$
<b>5</b>	$\pm 10,8^\circ$	<b>D</b>	$\pm 25,2^\circ$
<b>6</b>	$\pm 12,6^\circ$	<b>E</b>	$\pm 27,0^\circ$
<b>7</b>	$\pm 14,4^\circ$	<b>F</b>	$\pm 28,8^\circ$

### 3.4 Connection Configuration Pyrometer / Oscillating Mirror

When a PQ, PK, PZ or PA pyrometer is employed together with the PZ 20/X oscillating mirror the configuration settings must be made using S3.1 and S3.2 as described below:

	<b>S3.1</b>	<b>S3.2</b>	<b>Configuration</b>
<b>A</b>	Off	Off	<b>PQ, PK, PZ and PA Pyrometers (Standard)</b> The cable for the pyrometer's current signal is spliced.
<b>B</b>	Off	On	<b>PQ, PK, PA Pyrometer (RS-422)</b> The PZ 20/X electronics converts the pyrometers's current signal to an RS422 signal; the signal can no longer be accessed as an analog signal.
<b>C</b>	On	On	<b>PZ – Pyrometer (RS-422)</b> The PZ 20/X electronics converts the pyrometers's current signal to an RS422 signal; the signal can no longer be accessed as an analog signal.

**Note:**

With configurations “B” and “C” the D pin (mA-output) of the 19-pin connector shall not be connected because the output current cannot be accessed!

### 3.5 Rotation Feature

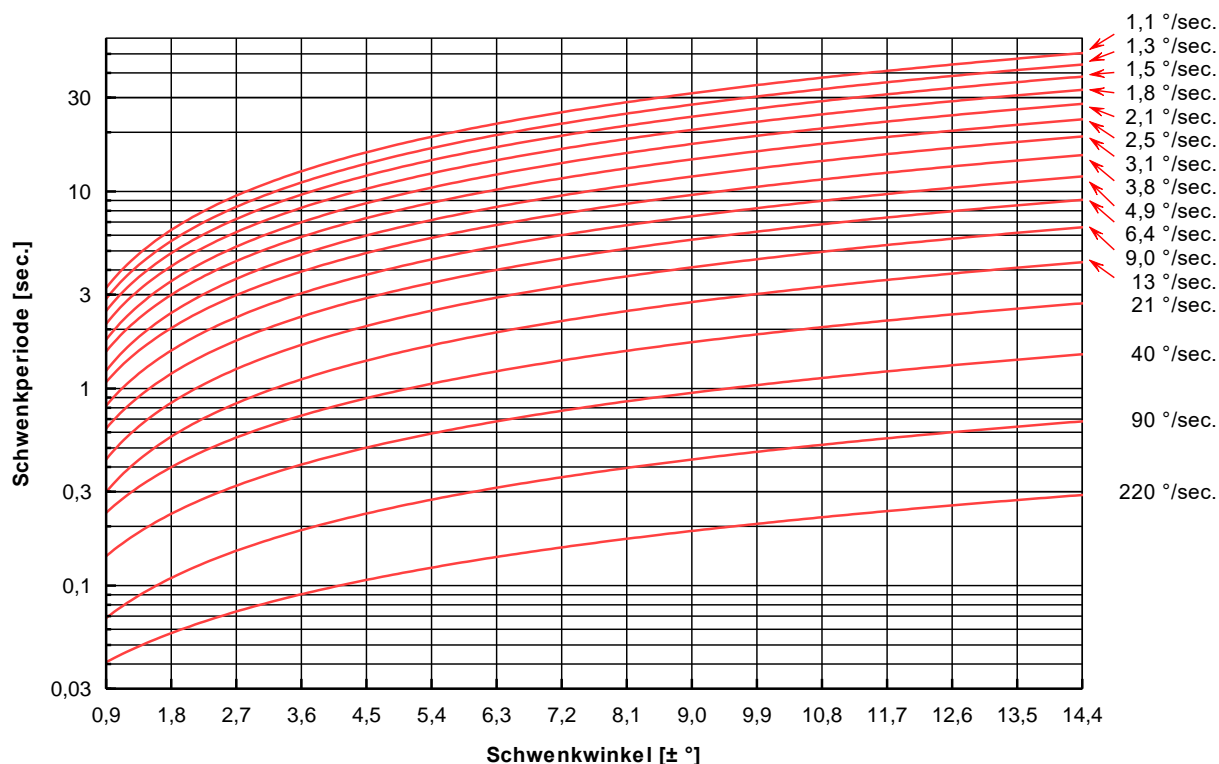
The PZ 20/X Oscillating Mirror can carry out an axial rotation once every 24 hours. The mirror makes a complete rotation around the rotation axis and then continues with its oscillation function. We recommend activating this function to provide the motor bearing with sufficient lubrication. This will increase the service life of the device. A complete rotation takes 1.6 seconds and a measurement is not possible during this time. Automatic operation can be switched off using the S3.3 switch or controlled by an external input.

<b>Switch</b>	<b>Input “Rotation“</b>	<b>Function</b>
<b>S3.3</b>		
Off	---	No automatic rotation
On	0 V or open	Automatic rotation once every 24 hours
On	24 V	No automatic rotation
On	Impulse 24->0 V	When impulse is applied rotation starts and the 24-hour cycle begins.

## 4 Graphs and Charts

### 4.1 Oscillation Period

The duration of an oscillation (bi-directional) depends on the selected scan angle and scan speed, as shown in the following graph:



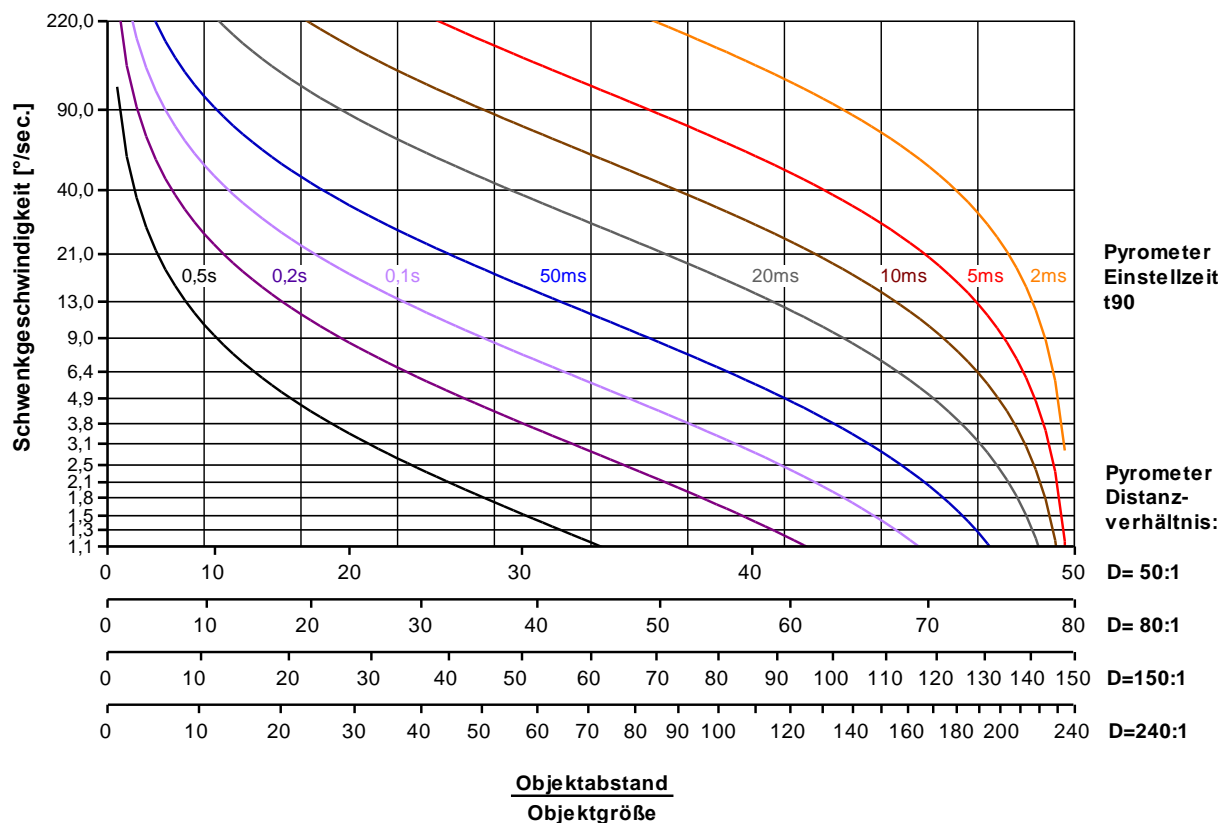
**Fig. 4.1: Oscillation Period depending on scan angle and scan speed**

## 4.2 Maximum Acceptable Scan Speed

The maximum scan speed for a proper measurement depends on the following factors:

- a) Ratio of the distance from the pyrometer to the target compared to the size of the measured target (spot) at that distance.
- b) Response time of the pyrometer

The following graph shows the maximum acceptable scan speed subject to the factors described above:



**Fig. 4.2: Maximum scan speed**

#### 4.3 Cooling Air-Flow Rate Relative to Ambient Temperature

Cooling is necessary in ambient temperatures above 60 °C.

The required airflow rate depends on the specific ambient temperature as well as the temperature of the forced air as shown in the following table.

<b>Ambient temperature</b>	<b>Air flow rate</b>
< 60 °C	Cooling unnecessary
60 – 90 °C	1000 l / h
90 – 120 °C	3000 l / h
120 – 150 °C	9000 l / h

These values apply to a forced air temperature of approx. 23 °C.

#### 4.4 Pin Assignment

Pin		Assign- ment	VK 01/X 19-wire	Description
19 pin	12 pin			
J	J	+24V	red	24V DC supply voltage and pyrometer connection Pin J and M
M	M	Ground	black	
A	A	Pyrom.	pink	Pyrometer connection Pin A
B	B	Pyrom.	white	Pyrometer connection Pin B
C	C	Pyrom.	grey	Pyrometer connection Pin C
D	D	Pyrom.	yellow	Pyrometer connection Pin D <b>Do not connect for config. „B“ and „C“ ! (see Chap. 3.3)</b>
E	E	Pyrom.	violet	Pyrometer connection Pin E
F	F	Pyrom.	brown	Pyrometer connection Pin F
G	G	Pyrom.	green	Pyrometer connection Pin G
H	H	Pyrom.	red-blue	Pyrometer connection Pin H
K	K	Pyrom.	grey-pink	Pyrometer connection Pin K
L	L	Pyrom.	blue	Pyrometer connection Pin L
R		T(A)_2	white-green	RS-422 Transmit Data (PZ 20/X)
P		T(B)_2	brown-green	
T		R(A)_2	white-yellow	RS-422 Receive Data (PZ 20/X) Terminating resistor integrated within the device (150 Ω)
S		R(B)_2	yellow-brown	
N		GND_2	white-pink	RS-422 signal ground
O		Rotation	grey-brown	Input for rotation (see Chapter 3.4)
U		Status	white-grey	Output signal indicates: 0V mirror does not oscillate 22V mirror oscillates The output is switched as an „Open Collector“ to 24V. A “Pull Down“ resistance can be connected to the ground of the supply voltage. I OUT = max. 25 mA

**Note:** The pins of the 12-pin socket are internally connected with the 19-pin flange plug (Pins A to M). The assignment and the wire color are identical with the specifications made in the operating instructions of the pyrometer employed.

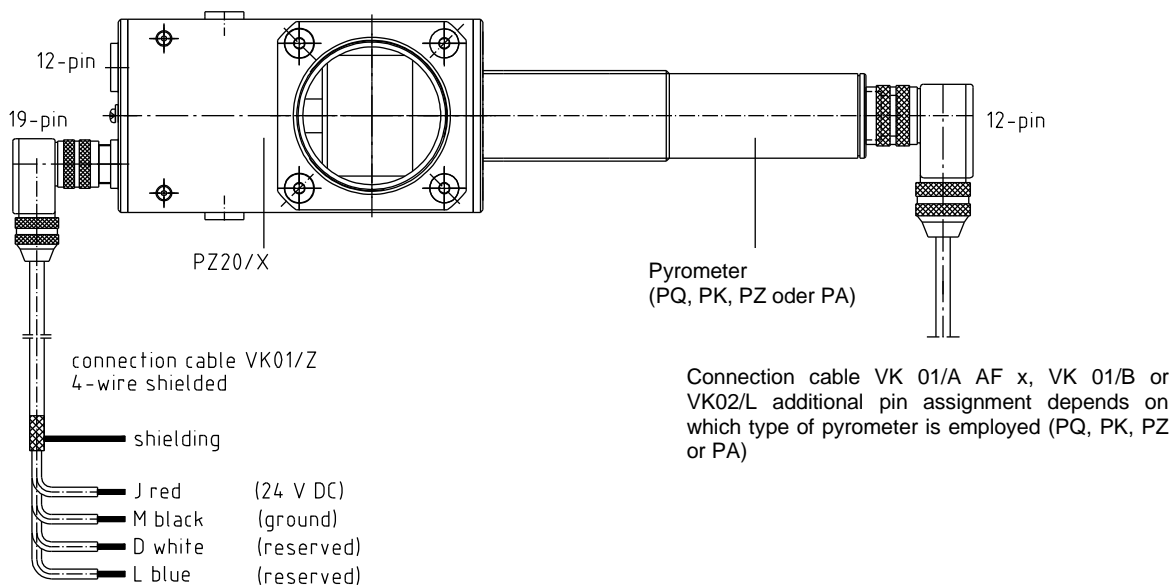


Pin layouts (PZ 20/X exterior view): 19-pin flange plug and 12-pin socket (Binder Series 723)

## 5 Connection Diagrams

All signals can be transmitted via one single line. Alternatively the two instruments can be connected separately.

### 5.1 Separate Connection of Oscillating Mirror and PQ/ PK/ PZ and PA Pyrometer

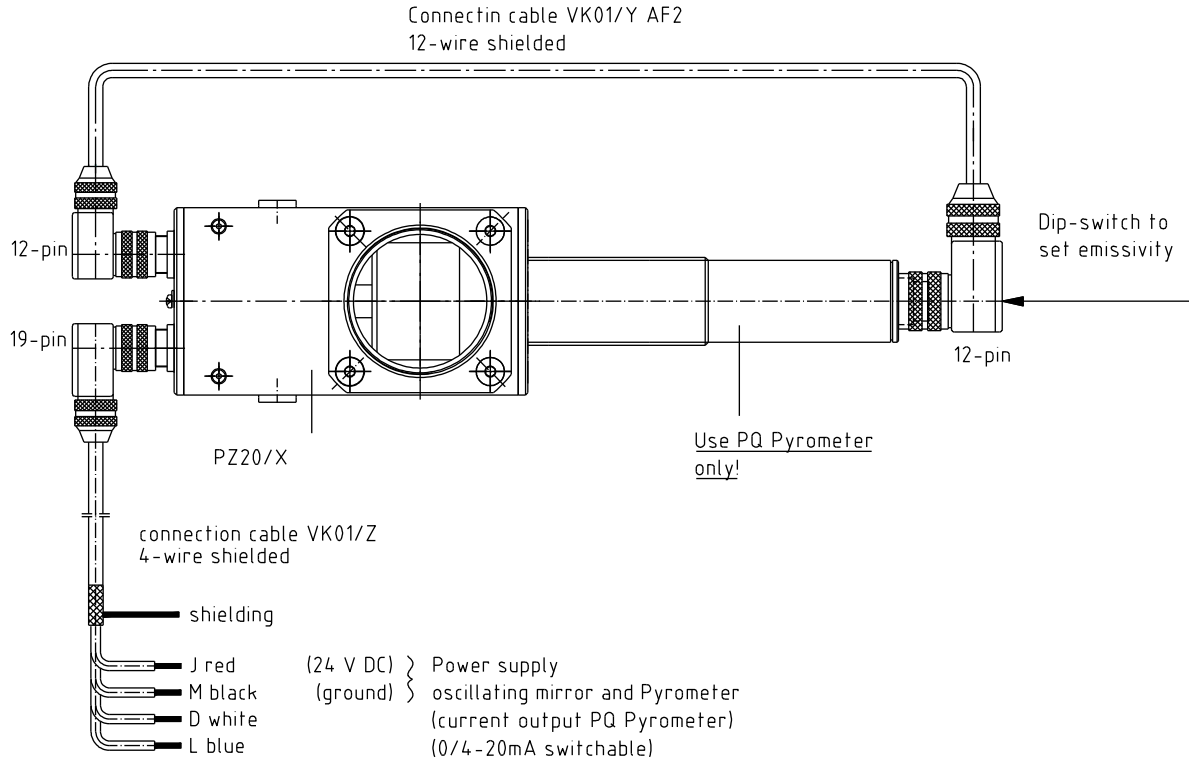


24 V DC connecting cable for PZ20/X

cable for pyrometer power supply and temperature data transmission

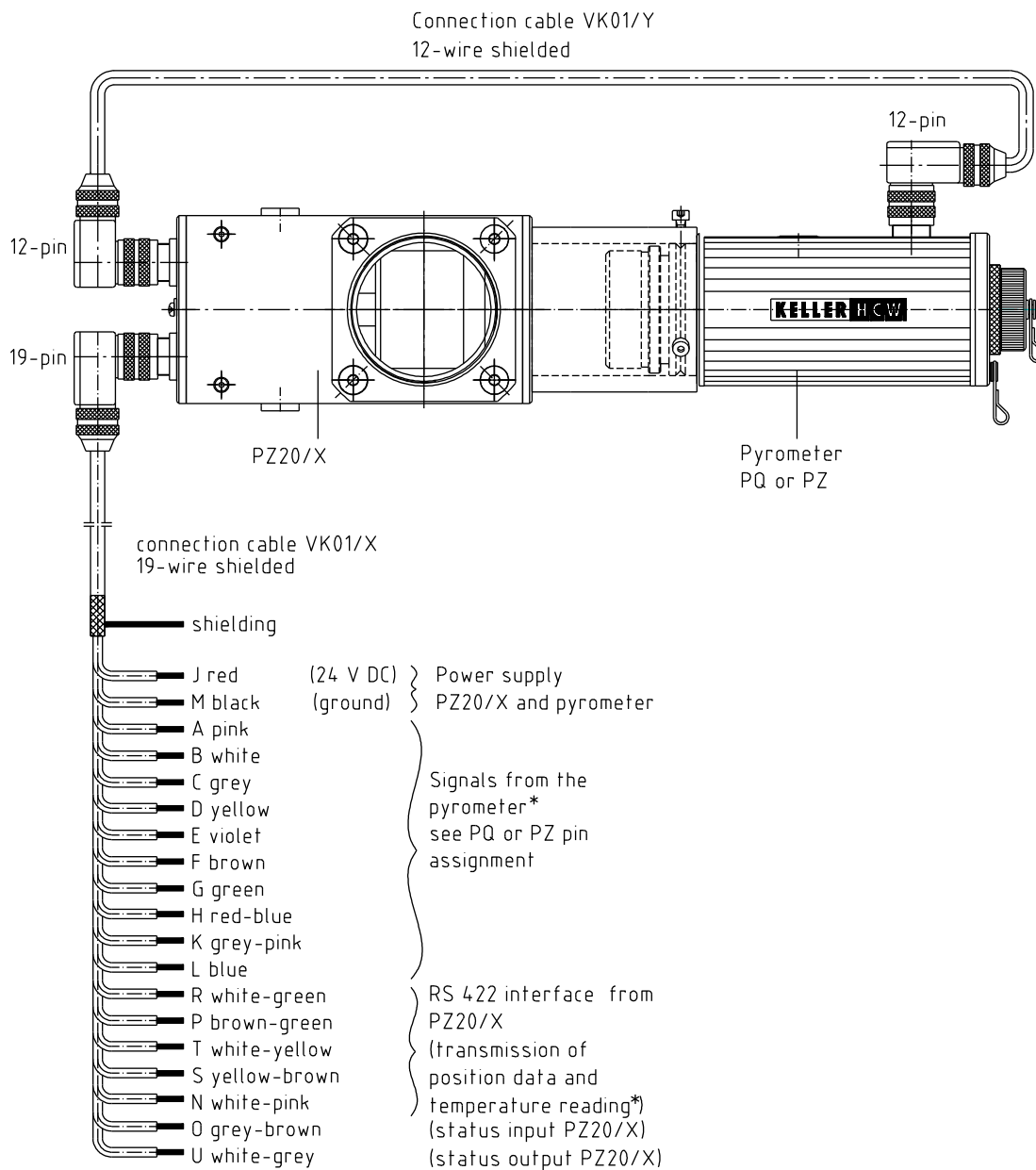


## 5.2 Combined Connection of Oscillating Mirror and PQ Pyrometer (with emissivity setting and current output)



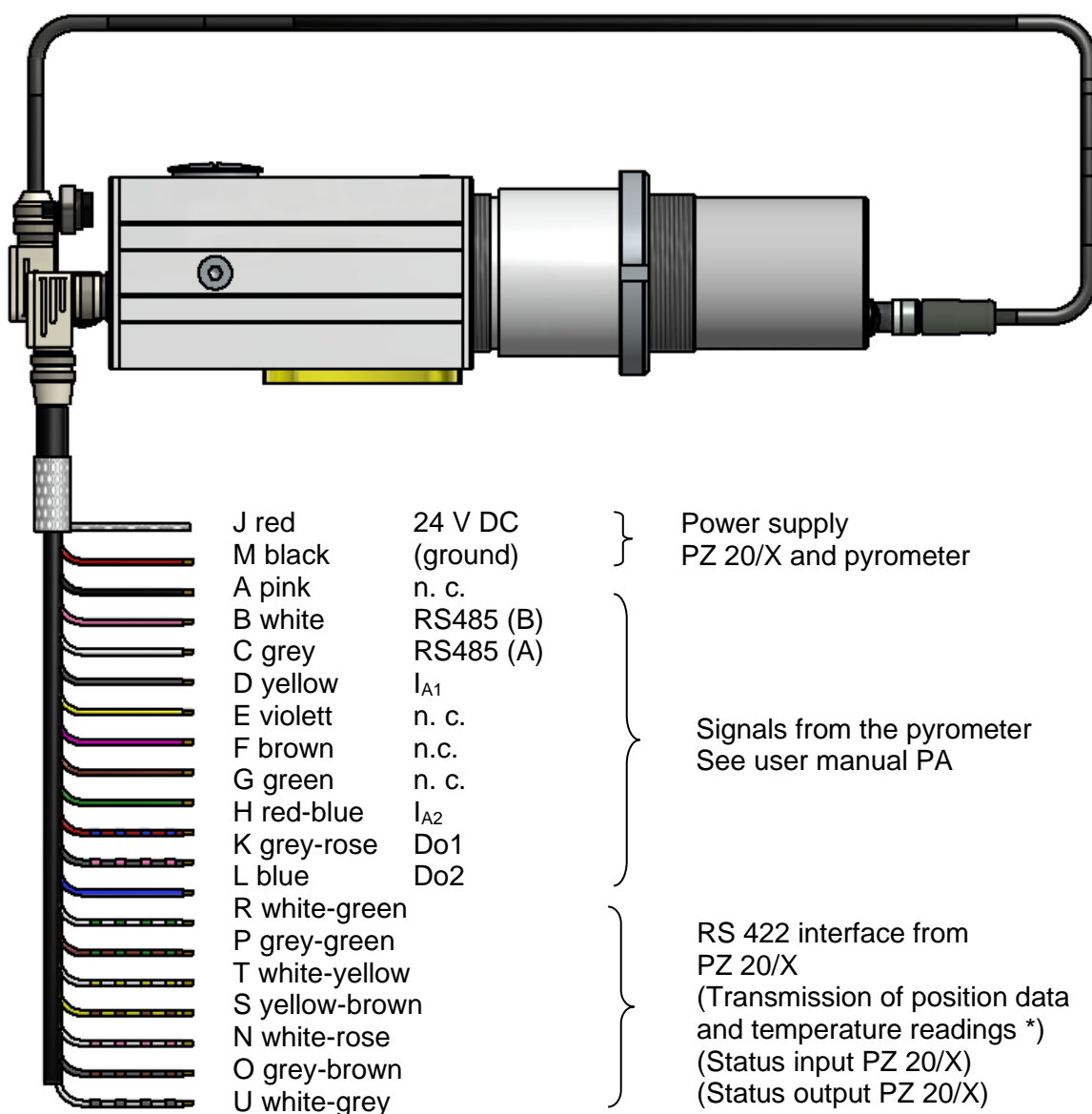
- operates only with PQ-Series pyrometers.
- PZ20/X setting:  
S3.1=off S3.2=off

### 5.3 Combined Connection of Oscillating Mirror + PQ or PZ Pyrometer



Connection for PZ 20/X and pyrometer.  
Unused pins must be isolated

### 5.4 Combined Connection of Oscillating Mirror + PA Pyrometer



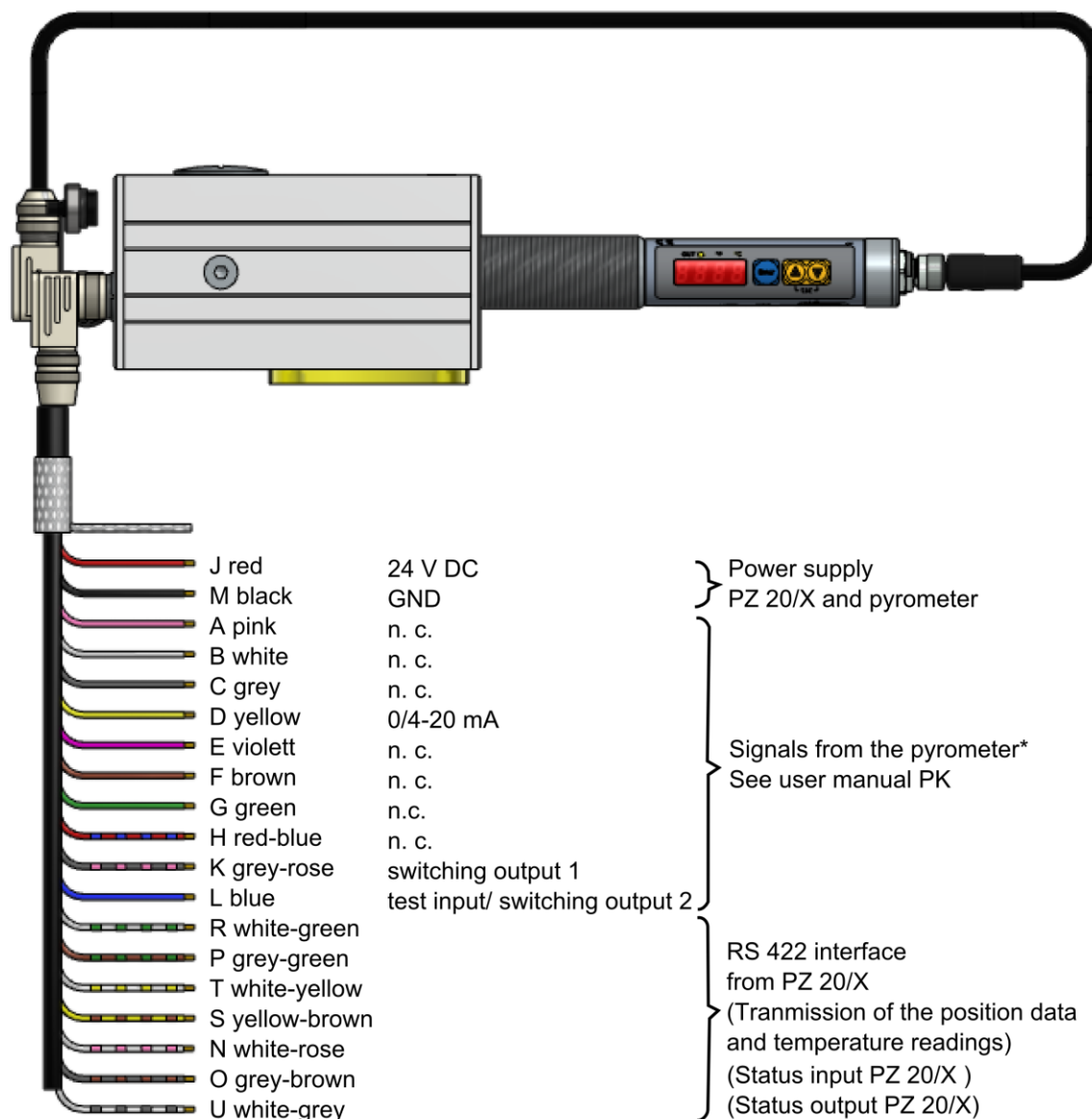
Connection for PZ 20/X and pyrometer.  
Unused pins must be insulated

\* The current output of the pyrometer is directly connected within the PZ 20/X Oscillating Mirror and is then accessible at the VK 01/X connection cable.

Alternatively the current signal is digitized within the PZ 20/X and can be accessed via the RS 422 interface.

Select the desired configuration setting using switch S3.1 or switch S3.2.

### 5.5 Combined Connection of Oscillating Mirror + PK Pyrometer



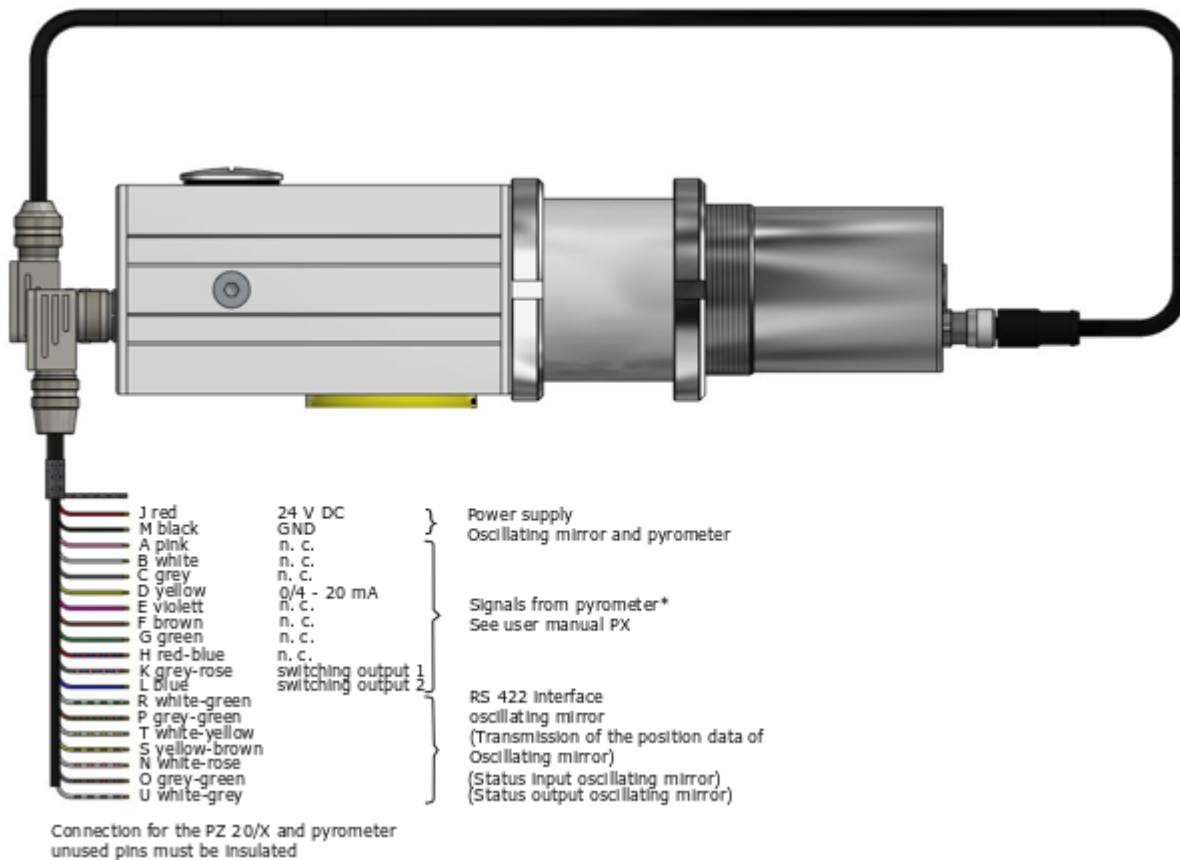
Connection for the PZ 20/X and pyrometer.  
Unused pins must be insulated.

\* The current output of the pyrometer is directly connected within the PZ 20/X Oscillating Mirror and is then accessible at the VK 01/X connection cable.

Alternatively the current signal is digitized within the PZ 20/X and can be accessed via the RS 422 interface.

Select the desired configuration setting using switch S3.1 or switch S3.2.

### 5.6 Combined Connection of Oscillating Mirror + PX Pyrometer

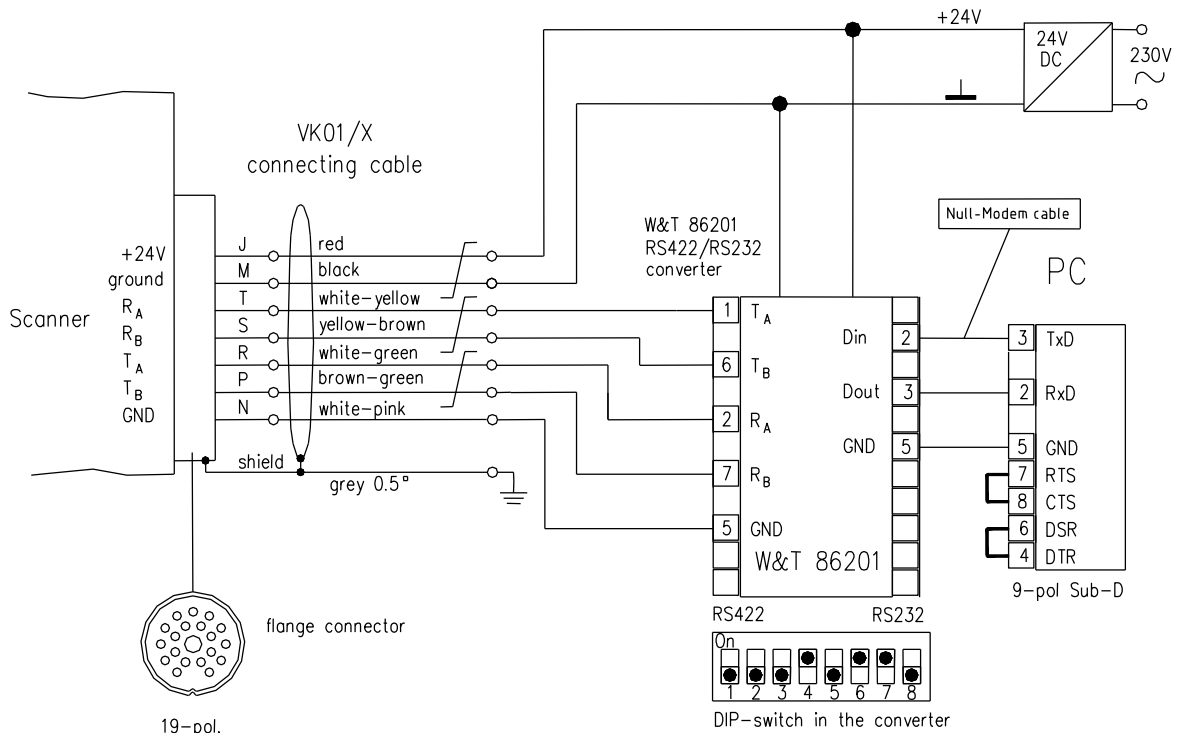


\* The current output of the pyrometer is directly connected within the PZ 20/X Oscillating Mirror and is then accessible at the VK 01/X connection cable.

Alternatively the current signal is digitized within the PZ 20/X and can be accessed via the RS 422 interface.

Select the desired configuration setting using switch S3.1 or switch S3.2.

### 5.7 Connection Diagram RS 422 < -- > RS 232 Converter



#### Serial Interface RS422

The PZ 20/X is equipped with an RS 422 compatible interface. Both the receive and transmit channels are based on the RS 485 standard. Communication to the CellaScan software is only permissible with a single point-to-point connection. The connection is fail-safe and may be up to 1200 m\* long. An RS422 interface card or an RS232 – RS422 converter is necessary for connection to a PC. For rather long transmission paths we recommend using a converter with integrated galvanic isolation to prevent ground loop problems. The pin assignment is as shown in the diagram above.

\*The RS485 standard allows transmission path lengths of up to 1200m (at 4800 Baud). Bear in mind that if the line is longer than 100 m and also carries the supply voltage or the current output, a voltage drop may occur. The wire cross section of the VK 01/X standard cable is 0.14 mm<sup>2</sup> which results in a voltage drop of approx. 1.5 volt per 100 meters. This increases to 4 volt per 100 meter for pyrometers with a spotlight. If necessary a cable with a greater wire cross section can be employed to prevent voltage drop.

## 6 Technical Data

**Scan angle AF5:**

Max.  $\pm 14.4^\circ$  (without flange)  
 Max.  $\pm 10^\circ$  (with flange)  
 When additional accessories  
 e.g. an air purge are mount-  
 ed the scan range will be  
 reduced.

**Scan angle AF6:**

Max.  $\pm 27^\circ$  with protective  
 Window (in conjunction with  
 lens PZ20.01)

**Angle resolution:**

0.014  $^\circ$

**Scan speed:**

1.1 to 220  $^\circ$ /sec. adjustable

**Optical clearance:**

max. 28.5 mm diameter

**Status signal output:**

Open collector output to  
 monitor operation status

**Trigger input:**

Activates periodic mirror  
 rotation to prolong service  
 life of the motor

**Transmittance of pro-  
 tective glass:**

0.6 to 2.2  $\mu\text{m}$  (quartz)  
 1 to 14  $\mu\text{m}$  (ZnS)  
 (Transmittance values see  
 Chapter 2.5)

**Analogue input  
 (optional):**

0 to 20 mA  
 (to connect the pyrometer  
 and for conversion to ena-  
 ble serial data transmis-  
 sion)

**Interface (optional):**

RS 422 to transfer temper-  
 ature reading and position  
 data  
 galvanic isolation  
 19200 Baud 8N1

**Operating temperature:**

0 to 60  $^\circ\text{C}$

**Cooling:**

Air cooling with oil-free  
 compressed air;  
 hose nozzle R1/8" for hose  
 with 8 to 9 mm bore.

**Storage temperature:**

-20 to 70  $^\circ\text{C}$

**Power supply:**

20 - 27 V DC / ca. 300 mA  
 Ripple:  $\leq 200$  mV  
 (without pyrometer)

**Dimensions:**

80 x 80 x 151 mm

**Enclosure material:**

Aluminium

**Connections:**

19-pin flange connector for  
 supply voltage and inter-  
 faces

12-pin flange socket for  
 mounted PQ, PK, PA, PZ  
 pyrometer

**Weight:**

1.2 kg

**Protection rating:**

IP 65 according to  
 DIN 40050 with protective  
 window and screwed-on  
 connectors

**Adjustable parameters:**

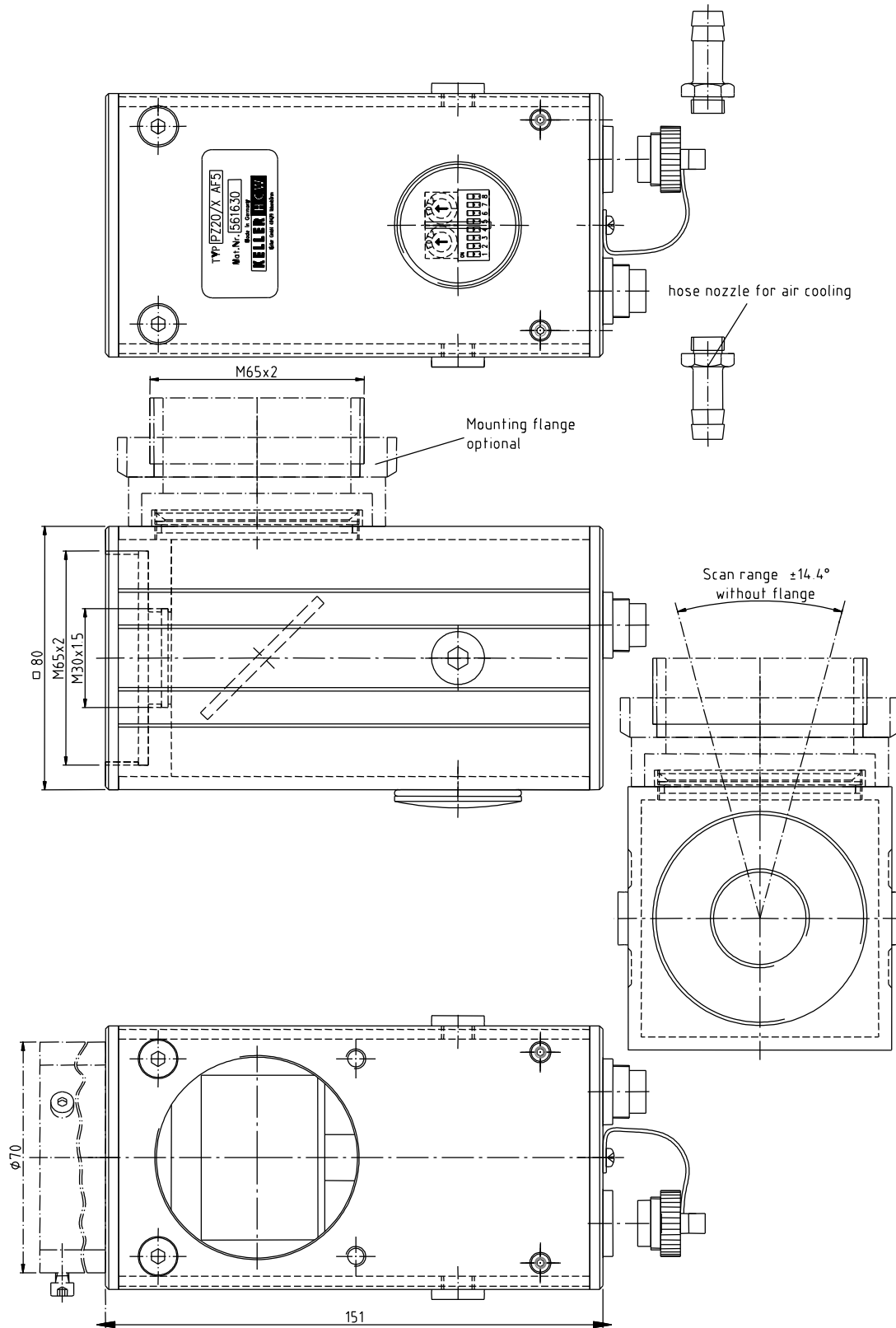
**Scan angle**  
**Scan speed**

## 7 Accessories

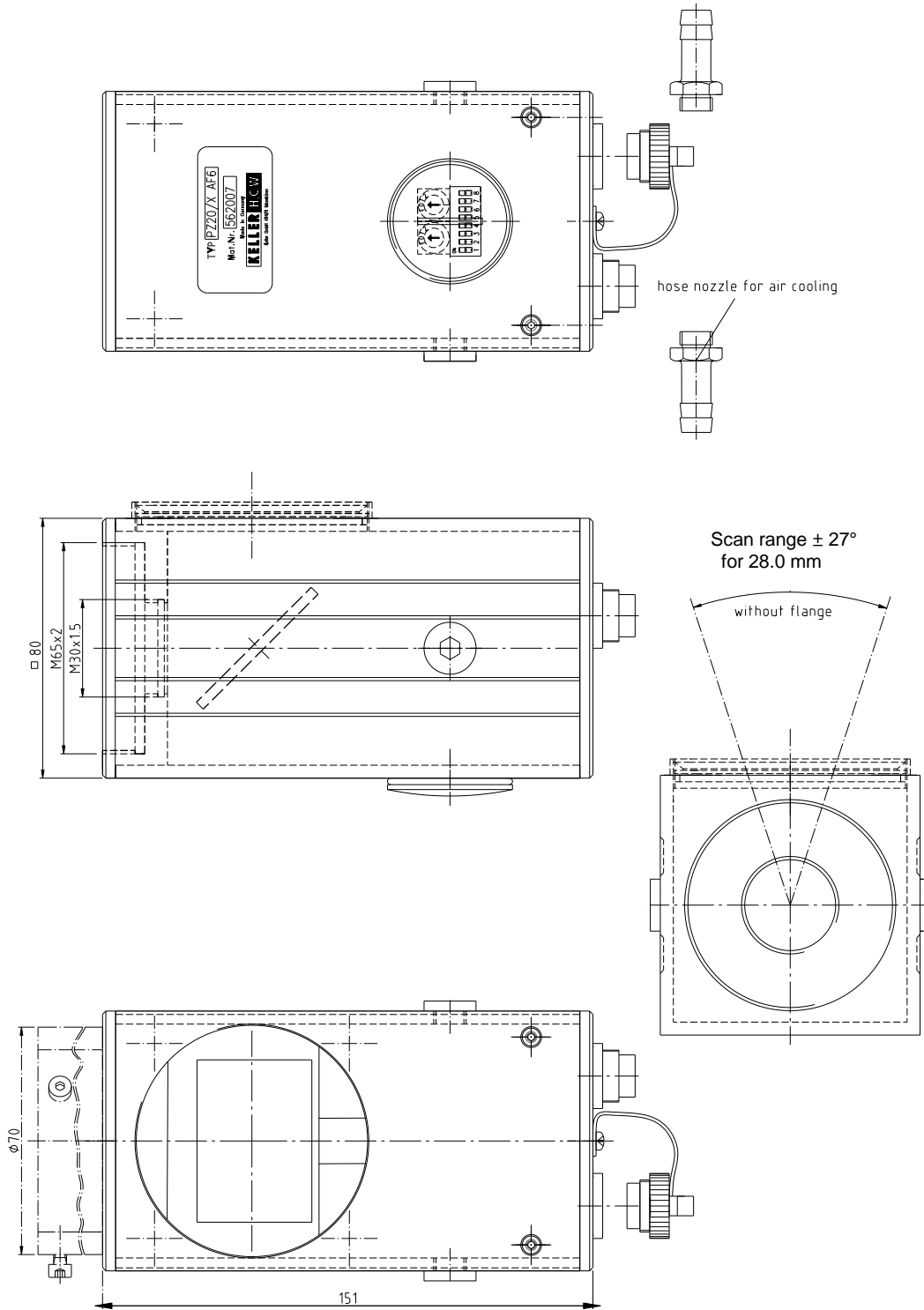
	Item	ID No.
VK 01/Z	<b>Connection cable for oscillating mirror</b> 4-wire, length 2.5 m, other lengths available upon request, 4 x 0.22mm <sup>2</sup> , with 19-pin angled plug socket Pin assignment: 24V supply + mA current output	515 154
VK 01/X	<b>Connection cable for oscillating mirror</b> 19-wire, length 2.5 m, other lengths available upon request, 19 x 0.14mm <sup>2</sup> , with 19-pin angled plug socket Pin assignment: 24V supply + PZ20/X control line + PZ20/X- RS422 +pyrometer signals	515 152
VK 01/Y	<b>Connection cable PZ 20/X ↔ pyrometer</b> Length approx. 800 mm 12 x 0.14mm <sup>2</sup> , with 12-pin angled plug and 12-pin angled socket. Suitable for PQ und PZ pyrometers	515 153
VK 01/Y AF2	<b>Connection cable PZ 20/X ↔ pyrometer</b> Length approx. 800 mm 12 x 0.14mm <sup>2</sup> , with 12-pin angled plug and 12-pin angled socket. <b>Only for PQ pyrometers.</b> With built-in DIP switch to set emissivity	515 180
VK 01/Y AF3	<b>Connection cable PZ 20/X ↔ pyrometer PA</b> Length approx. 800 mm	1024914
VK 01/Y AF4	<b>Connection cable PZ 20/X ↔ pyrometer PK/PX</b> Length approx. 800 mm	1064729
70162	<b>Protective window M 62 x 0,75</b> Suitable for pyrometers with spectral range 0.6 to 2.2 μm. To be screwed on at the M62 threaded opening of the PZ 20/X	1048533
70172	<b>Protective window M 72 x 0,75</b> Suitable for pyrometers with spectral range 0.6 to 2.2 μm. To be screwed on at the M72 threaded opening of the PZ 20/X AF 6	1048534
PZ 10/I AF 3	<b>ZnS protective window</b> Suitable for pyrometers with spectral range 1 to 14 μm. To be screwed on at the M62 threaded opening of the PZ 20/X	515 166
PZ 40/D	<b>Mounting flange</b> To connect additional accessories to the PZ 20/X	515 165
PZ 20/J	<b>Intermediate tube</b> Required to connect a PA pyrometer to the PZ 20/X	514814
PZ 20/E	<b>Mounting ring</b> Required to connect a PZ pyrometer to the PZ 20/X	561 177
PZ 20/L AF2	<b>Clamping Collar</b> For attachment to the PZ 20/E mounting ring or PZ 20/J	561 541
PZ 20/U	<b>Mounting Bracket</b> To mount the entire assembly	561 574
Software	<b>CellaScan software</b> To set parameters and create temperature profiles	515 273
	<b>Interface converter W&amp;T 86201</b> (RS422 < -- > RS232)	120 243



## 8 Dimensioned Drawings AF 5



## 9 Dimensioned Drawings AF 6



## 10 Shipping, Packaging and Disposal

### 10.1 Inspecting your shipment

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

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

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

### 10.2 Packaging

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

### 10.3 Disposal of used apparatus

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

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











