



More Precision.



ELTROTEC
Industrial Endoscopes



ELTROTEC Endoscopes

For over 35 years Micro-Epsilon Eltrotec has been active in the field of technical endoscopy and is market leader for industrial applications.

The name Eltrotec stands for high quality standards for endoscopes.

A wide range of standard endoscopes offers flexible options for many applications. Here it is not necessary to resort to an expensive one-off model. Nearly every endoscope can be found in our product range. However, should you be unable to find the right endoscope in our product portfolio we will make you your own individual endoscope - quickly and efficiently.

With our high quality standards and innovative production techniques you achieve a sharper imaging of objects than is possible with conventional endoscopes.

In an individual consultation with our application engineers at your premises we are able to find the most appropriate solution for your application.

On request we are able to offer special solutions for virtually all products - exactly in accordance with your requirements.

Micro-Epsilon Eltrotec - the inspection of non visible cavities is our strength!

Scope of services:

Endoscopes, repair service, OEM endoscope construction and the associated project planning.



R5.5

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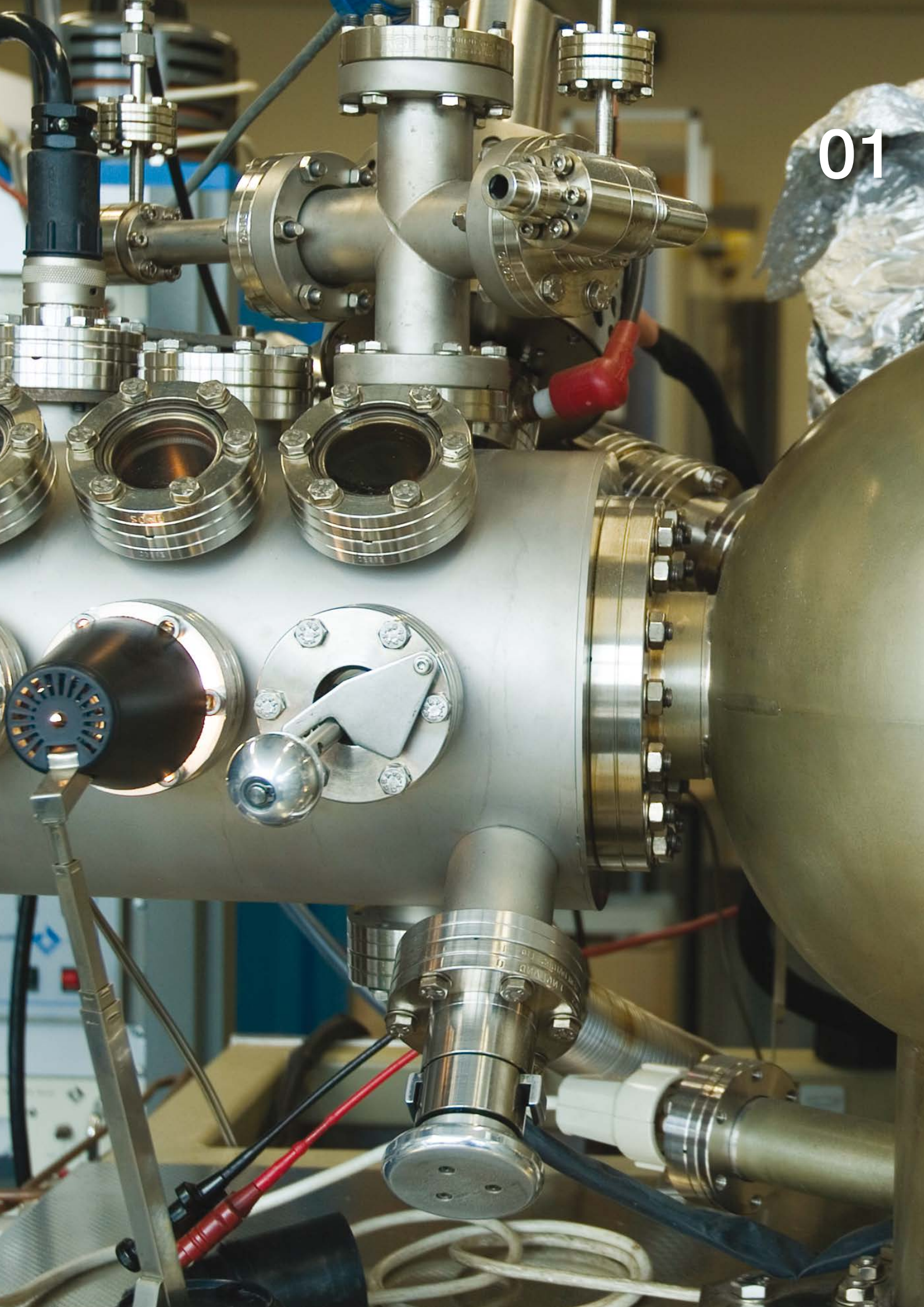
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01



ELTROTEC Borescopes

Rigid Endoscopes - ELTROTEC Borescopes

Features and benefits

Eltrotec Borescopes are highly developed optical devices that have been specially designed for use in the industrial field. The endoscopes comprise high precision optical and precision mechanical components. Due to their design, construction and special production techniques they are ideally suited for use in the industrial field. An almost limitless variety of inspection tasks can be carried out using the broad range of features of each individual device and the extensive product portfolio.

General applications:

Eltrotec's rigid borescopes were developed for the visual inspection of small drill holes and cavities. With diameters ranging from 0.7 to 25 mm, they offer excellent image reproduction and with their excellent resolution and brightness facilitate the inspection of the smallest details.

The **Top-Line** premium endoscopes are equipped with graded index lenses (GRIN lenses), providing the highest quality with no appreciable image loss.

During concept design each endoscope the lens system is calculated using special software in order to achieve the best optical values and high quality imaging. A range of lens technologies ensure a high image quality. Depending on the model, an achromatic system, gradient index lenses or a mixed system is employed.

With high quality endoscopes, the brightness of the recorded images is dependent on the relationship between the glass-fiber component responsible for lighting and the diameter of the lens, facilitating an optimal illumination of the inspection area. A special fiber coating enables light to be transported without loss.

The high quality stainless steel construction and anodised aluminium components ensure a long service life. The precisely aligned parts provide for a smooth mechanical operation of both the focussing and rotation of the probe, thus simplifying inspection.

Application examples:

- Inspecting nozzles and drill holes in pneumatic and hydraulic parts
- Inspecting injection nozzles for burrs
- Inspecting turbine blades for cracks
- Checking cylinder walls for scoring
- Assessing structural properties
- Identifying cartridge discharge residue/scoring in gun barrels
- Servicing of aircraft engines while operational
- Motor inspections in garages
- Inspecting drill holes, bearing shells and cast parts
- Identifying openings and burr formation in complex machine parts
- Welding inspection of tubes

Benefit:

All rigid endoscopes can be upgraded with the Eltrotec Flexcam (p. 39) with monitor and image storage to create a flexible video endoscope.

Standard Endoscopes

ELTROTEC SKF-D

- > Ø 2.8mm to 10mm
- > Lengths: 125mm to 1,036mm
- > Optimised light conductors
- > Ergonomic handle, removable
- > Dioptre adjustment



Description:

The Eltrotec SKF-D endoscope is the standard amongst the rigid endoscopes. The most appropriate model for a variety of applications can be selected from the wide product range.

With its integrated focussing, a clear image of the target object can be obtained from every distance. If a mirror tube is used the viewing direction can be adjusted by turning the hand wheel.

Even with an angled viewing direction large angular fields of view are possible.

The object is illuminated using an external light source from our range of accessories which can be attached to the endoscope. Depending on the required light intensity, halogen, LED or xenon light sources can be employed, which, due to optimised light conductors provide an optimal illumination of the field of view.

| Type SKF-D | | | | | | |
|------------|-------------------|---------------|-----------|---------------|-------------|-----------------|
| Outer Ø mm | Direction of view | Field of view | Length mm | Rotating tube | Article no. | 90°-Mirror tube |
| 2.8 | 0° | 40° | 125 | no | 20081160 | yes |
| | | | 254 | | 20081161 | |
| | | | 383 | | 20081162 | |
| 2.8 | 0° | 90° | 130 | no | 20081163 | no |
| | | | 254 | | 20081164 | |
| | | | 383 | | 20081165 | |
| 2.8 | 30° | 90° | 120 | yes | 20081166 | no |
| | | | 250 | | 20081167 | |
| | | | 379 | | 20081168 | |
| 2.8 | 90° | 55° | 185 | yes | 20081169 | no |
| | | | 245 | | 20081170 | |
| | | | 314 | | 20081171 | |
| 4.0 | 0° | 40° | 120 | no | 20081172 | yes |
| | | | 245 | | 20081173 | |
| | | | 370 | | 20081174 | |
| 4.0 | 0° | 100° | 120 | no | 20081175 | no |
| | | | 245 | | 20081176 | |
| | | | 370 | | 20081177 | |
| 4.0 | 30° | 55° | 120 | yes | 20081178 | no |
| | | | 245 | | 20081179 | |
| | | | 370 | | 20081180 | |
| 4.0 | 70° | 55° | 120 | yes | 20081181 | no |
| | | | 245 | | 20081182 | |
| | | | 370 | | 20081183 | |

| Type SKF-D | | | | | | |
|------------|-------------------|---------------|-----------|---------------|-------------|-----------------|
| Outer Ø mm | Direction of view | Field of view | Length mm | Rotating tube | Article no. | 90°-Mirror tube |
| 4.0 | 90° | 55° | 175 | yes | 20081184 | no |
| | | | 300 | | 20081185 | |
| | | | 425 | | 20081186 | |
| 5.8 | 0° | 40° | 135 | no | 20081187 | yes |
| | | | 275 | | 20081188 | |
| | | | 415 | | 20081189 | |
| 5.8 | 0° | 100° | 146 | no | 20081191 | no |
| | | | 286 | | 20081192 | |
| | | | 426 | | 20081193 | |
| 5.8 | 45° | 65° | 135 | yes | 20081195 | no |
| | | | 205 | | 20081196 | |
| | | | 275 | | 20081197 | |
| 5.8 | 70° | 65° | 135 | yes | 20081199 | no |
| | | | 205 | | 20082000 | |
| | | | 275 | | 20082001 | |
| 5.8 | 90° | 65° | 135 | yes | 20082003 | no |
| | | | 205 | | 20082004 | |
| | | | 275 | | 20082005 | |
| 5.8 | 90° | 65° | 135 | yes | 20082006 | no |
| | | | 205 | | 20082007 | |
| | | | 275 | | 20082008 | |

| Type SKF-D | | | | | | |
|---------------|-------------------------|---------------------|--------------|-----------------------|----------------|------------------------|
| Outer Ø mm | Direction of view | Field of view | Length mm | Rota- ting tube | Article no. | 90°- Mirror tube |
| 8.0 | 0° | 40° | 225 | no | 20081135 | yes |
| | | | 425 | | 20082007 | |
| | | | 625 | | 20 082008 | |
| | | | 825 | | 20082009 | |
| | | | 1025 | | 20081917 | |
| 8.0 | 0° | 100° | 236 | no | 20082010 | no |
| | | | 436 | | 20082011 | |
| | | | 636 | | 20082012 | |
| | | | 836 | | 20082013 | |
| | | | 1036 | | 20081918 | |
| 8.0 | 45° | 55° | 225 | yes | 20082014 | no |
| | | | 325 | | 20082015 | |
| | | | 425 | | 20082016 | |
| | | | 525 | | 20082017 | |
| | | | 625 | | 20082018 | |
| 8.0 | 70° | 65° | 225 | yes | 20082019 | no |
| | | | 325 | | 20082020 | |
| | | | 425 | | 20082021 | |
| | | | 525 | | 20082022 | |
| | | | 625 | | 20081612 | |
| 8.0 | 90° | 65° | 225 | yes | 20082023 | no |
| | | | 325 | | 20082024 | |
| | | | 425 | | 20082025 | |
| | | | 525 | | 20082026 | |
| | | | 625 | | 20082027 | |
| | | | 725 | | 20082028 | |

| Type SKF-D | | | | | | |
|---------------|-------------------------|---------------------|--------------|-----------------------|----------------|------------------------|
| Outer Ø mm | Direction of view | Field of view | Length mm | Rota- ting tube | Article no. | 90°- Mirror tube |
| 10.0 | 0° | 40° | 225 | no | 20082029 | yes |
| | | | 425 | | 20082030 | |
| | | | 625 | | 20082031 | |
| | | | 825 | | 20082032 | |
| | | | 1025 | | 20082033 | |
| 10.0 | 0° | 100° | 236 | no | 20082034 | no |
| | | | 436 | | 20082035 | |
| | | | 636 | | 20082036 | |
| | | | 836 | | 20082037 | |
| | | | 1036 | | 20082038 | |
| 10.0 | 45° | 55° | 225 | yes | 20082039 | no |
| | | | 325 | | 20082040 | |
| | | | 425 | | 20082041 | |
| | | | 525 | | 20082042 | |
| | | | 625 | | 20082043 | |
| 10.0 | 70° | 65° | 225 | yes | 20082044 | no |
| | | | 325 | | 20082045 | |
| | | | 425 | | 20082046 | |
| | | | 525 | | 20082047 | |
| | | | 625 | | 20082048 | |
| 10.0 | 90° | 65° | 225 | yes | 20082049 | no |
| | | | 325 | | 20082050 | |
| | | | 425 | | 20082051 | |
| | | | 525 | | 20082052 | |
| | | | 625 | | 20082053 | |
| | | | 725 | | 20082054 | |

(Further dimensions on request!)

Mirror tubes for standard endoscopes

- Direction of view 90° (65°/ 110° option)
- Rotatable stainless steel tube - 360°
- Mirror in the form of a prism



| Outer -Ø mm | Direction of view | Article no. mirror tube | for endoscope Ø mm | Length mm | Article no. endoscope |
|----------------|-------------------|----------------------------|-----------------------|--------------|--------------------------|
| 3.05 | 90° | 20092055 | 2.8 | 125 | 20081160 |
| | | 20092056 | | 254 | 20081161 |
| | | 20092057 | | 383 | 20081162 |
| 4.5 | 90° | 20092058 | 4.0 | 120 | 20081172 |
| | | 20092059 | | 245 | 20081173 |
| | | 20092060 | | 370 | 20081174 |
| 6.3 | 90° | 20092061 | 5.8 | 135 | 20081187 |
| | | 20092062 | | 275 | 20081188 |
| | | 20092063 | | 415 | 20081189 |
| | | 20092064 | | 555 | 20081190 |
| 8.5 | 90° | 20092065 | 8.0 | 225 | 20081135 |
| | | 20092066 | | 425 | 20082007 |
| | | 20092067 | | 625 | 20082008 |
| | | 20092068 | | 825 | 20082009 |
| | | 20092069 | | 1025 | 20081917 |
| 11.0 | 90° | 20092070 | 10.0 | 225 | 20082029 |
| | | 20092071 | | 425 | 20082030 |
| | | 20092072 | | 625 | 20082031 |
| | | 20092073 | | 825 | 20082032 |
| | | 20092074 | | 1025 | 20082033 |

Accessories:

Fiber optic cables, TV cameras, video processors and light sources

Endoscopes with Swing-Prism

ELTROTEC MKF-D

- > Ø 6mm to 14mm
- > Lengths: 175mm to 1,505mm
- > Direction of view -7° to +133°
- > Rotatable through 370°



Description:

The unique feature of the Eltrotec MKF-D is its integrated swing-prism enabling the viewing direction to be changed between -7° and 133° as desired. Using just one finger the viewing direction can be altered using the hand wheel on the control element. The angular field of view of 45° provides a sufficiently large visible region. The entire region in front of the endoscope can be inspected by moving the prism as the lens can also be rotated through 370°. With the MKF-D with a diameter of 6mm, a mixed optical system for the optimisation of light transport is used. The optical system of each endoscope is calculated by software, thus enabling a reduction in weight and greater durability.

Features:

- Variable viewing direction
- Entire region in front of the endoscope visible
- Large range of lengths for different tasks
- Robust construction
- Ergonomic design

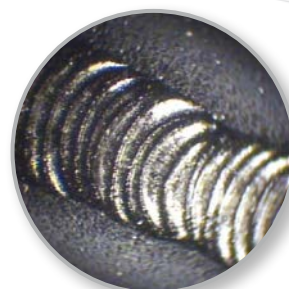
Operating conditions:

- Temperature in air:
Endoscope probe: -20°C to +100°C
Complete endoscope: -20°C to +50°C
- Pressure resistance in air: up to 2 bar
- Resistance to liquids:
The endoscope probe can be immersed in the following liquids for short periods: water, saline solution (5%), kerosene, petrol, diesel, 70% alcohol
- Humidity: up to 95% at 40° (no condensation)

Application examples:



Oil filter



Inspecting a weld seam



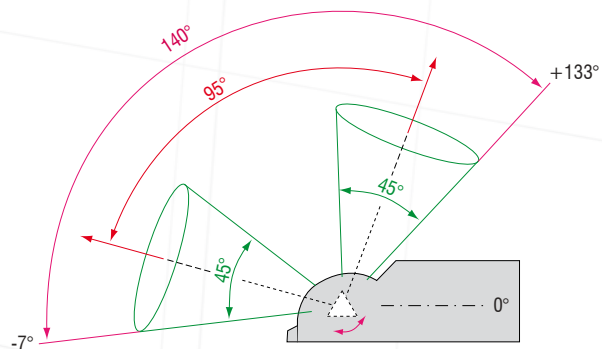
Checking brake cylinder for burrs

| Type MKF-D | | | | | |
|-------------|-------------------|---------------|-----------|---------------|-------------|
| Outer -Ø mm | Direction of view | Field of view | Length mm | Rotating tube | Article no. |
| 6 | -7° to +133° | 45° | 175 | yes | 20122075 |
| | | | 245 | | 20122076 |
| | | | 315 | | 20122077 |
| | | | 385 | | 20122078 |
| | | | 455 | | 20122079 |
| | | | 945 | | 20121368 |
| 8 | -7° to +133° | 45° | 115 | yes | 20122080 |
| | | | 185 | | 20122081 |
| | | | 255 | | 20122082 |
| | | | 325 | | 20122083 |
| | | | 395 | | 20122084 |
| | | | 465 | | 20121369 |
| 9 | -7° to +133° | 45° | 605 | yes | 20121370 |
| | | | 205 | | 20122085 |
| | | | 305 | | 20122086 |
| | | | 405 | | 20122087 |
| | | | 505 | | 20122088 |
| | | | 605 | | 20122089 |
| 12 | -7° to +133° | 45° | 705 | yes | 20121371 |
| | | | 1405 | | 20121372 |
| | | | 205 | | 20122090 |
| | | | 305 | | 20122091 |
| | | | 405 | | 20122092 |
| | | | 505 | | 20122093 |
| 14 | -7° to +133° | 45° | 605 | yes | 20122094 |
| | | | 1005 | | 20121373 |
| | | | 205 | | 20122095 |
| | | | 305 | | 20122096 |
| | | | 405 | | 20122097 |
| | | | 505 | | 20122098 |
| | | | 605 | | 20122099 |
| | | | 705 | | 20121374 |
| | | | 1505 | | 20121375 |

(Further dimensions on request!)



Swing-prism of the MKF-D



Accessories:

Fiber optic cables, TV cameras, video processors and light sources

Miniature Endoscopes

ELTROTEC PKF

- > Ø 0.7mm to 2.0mm
- > Lengths: 29.5mm to 234mm
- > Extremely small and versatile
- > High quality glass rod lens system
- > 50° Field of view



Description:

The miniature endoscope Eltrotec PKF is ideally suited for the inspection of miniature components and channels in the field of microelectronics and precision engineering. With only 0.7mm diameter it is one of the smallest rigid endoscopes. The low light transmission due to its small diameter is compensated for through the use of high quality graded index lenses (GRIN lenses). The PKF endoscope can be focussed on the desired object using the focus ring enabling the area of interest to be sharply defined.

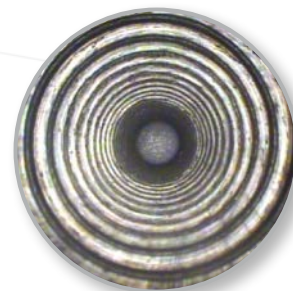
Features:

- Rigid construction using GRIN lenses
- Focussing ring
- Rotatable mirror tube, deflections of 65°, 90° and 110°
- Stationary cold light illumination
- TV applications possible with accessories

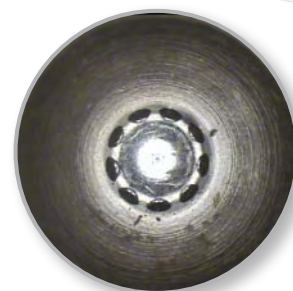
Operating conditions:

- Temperature in air:
Endoscope probe: -20°C to +100°C
Complete endoscope: -20°C to +50°C
- Pressure resistance in air: up to 2 bar
- Resistance to liquids:
The endoscope probe can be immersed in the following liquids for short periods: water, saline solution (5%), kerosene, petrol, diesel, 70% alcohol
- Humidity: up to 95% at 40°C
(no condensation)

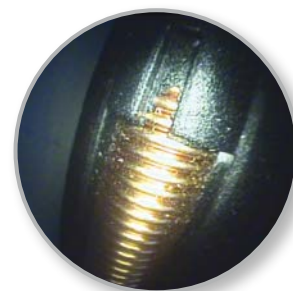
Application examples:



Inspection of thread turn



Inspection of injection nozzles



Installation position of spring

| Type PKF | | | | |
|-------------|-------------------|---------------|-----------|-------------|
| Outer -Ø mm | Direction of view | Field of view | Length mm | Article no. |
| 0.7 | 0° | approx. 50° | 29.5 | 20011227 |
| 1.0 | 0° | approx. 50° | 29.5 | 20010863 |
| | | | 60.3 | 20010039 |
| | | | 90.5 | 20010040 |
| 1.7 | 0° | approx. 50° | 60.3 | 20010024 |
| | | | 105.8 | 20010025 |
| 1.7 | 15° | approx. 50° | 60.3 | 20011366 |
| | | | 105.8 | 20010026 |
| 2.0 | 0° | approx. 50° | 105.8 | 20010772 |
| | | | 149.5 | 20010027 |
| | | | 234 | 20010028 |
| 2.0 | 15° | approx. 50° | 105.8 | 20011361 |
| | | | 149.5 | 20011362 |
| | | | 234 | 20011363 |

Mirror tube for the Eltrotec PKF

- Rotatable stainless steel tube 360°
- Mirror in the form of a prism
- Direction of view 65° / 90° and 110°



| Outer -Ø mm | Direction of view | Article no. mirror tube | for endoscope Ø mm | Length mm | Article no. endoscope |
|-------------|-------------------|-------------------------|--------------------|-----------|-----------------------|
| 1.0 | 65° | 20021228 | 0.7 | 29.5 | 20011227 |
| | 90° | 20021229 | | | |
| | 110° | 20021230 | | | |
| 1.3 | 65° | 20020873 | 1.0 | 29.5 | 20010863 |
| | 90° | 20020821 | | | |
| | 110° | 20021231 | | | |
| 1.3 | 65° | 20021232 | 1.0 | 60.3 | 20010039 |
| | 90° | 20020077 | | | |
| | 110° | 20021233 | | | |
| 1.3 | 65° | 20020078 | 1.0 | 90.5 | 20010040 |
| | 90° | 20020079 | | | |
| | 110° | 20020914 | | | |
| 2.0 | 65° | 20020081 | 1.7 | 60.3 | 20010024 |
| | 90° | 20020082 | | | |
| | 110° | 20020083 | | | |
| 2.0 | 65° | 20020817 | 1.7 | 105.8 | 20010025 |
| | 90° | 20020084 | | | |
| | 110° | 20021234 | | | |
| 2.3 | 65° | 20020766 | 2.0 | 105.8 | 20010772 |
| | 90° | 20020165 | | | |
| | 110° | 20020774 | | | |
| 2.3 | 65° | 20020085 | 2.0 | 149.5 | 20010027 |
| | 90° | 20020086 | | | |
| | 110° | 20021235 | | | |
| 2.3 | 65° | 20021236 | 2.0 | 234 | 20010028 |
| | 90° | 20020087 | | | |
| | 110° | 20021237 | | | |

Accessories:

Fiber optic cables, TV cameras, video processors and light sources

Semi-Rigid Miniature Endoscopes

ELTROTEC ME

- > Ø 0.9mm to 2.0mm
- > Lengths: 20mm to 450mm
- > Slightly bendable
- > High quality silica fibers



Description:

The miniature endoscope Eltrotec ME is ideally suited for the inspection of miniature components and channels in the field of microelectronics and precision engineering. In contrast to other miniature endoscopes with a gradient index lens, the ME can also be slightly bendable without suffering damage. The image quality is comparable to that of all conventional lens systems.

Features:

- Flexible due to special design using silica fibers (semi-rigid)
- Focussing ring
- Cold light illumination
- TV applications possible with accessories

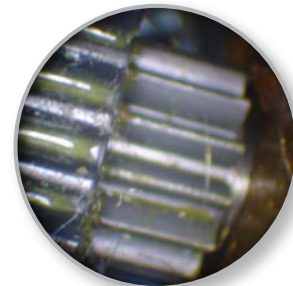
Benefit:

Robust due to high break resistance

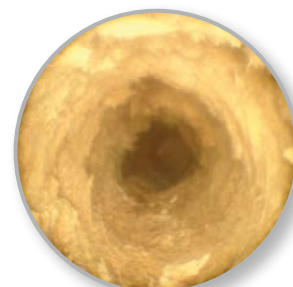
Application examples:



Deposits in pipe



Cog



Deposits in pipe

| Type ME | | | | | |
|-------------|-------------------|---------------|------------|-----------|-------------|
| Outer -Ø mm | Direction of view | Field of view | Resolution | Length mm | Article no. |
| 0.9 - 1.3 | 0° | 50° | 10,000 | 20 | 20531943 |
| | | | | 60 | 20531944 |
| | | | | 100 | 20531945 |
| | | | | 140 | 20531946 |
| | | | | 180 | 20531947 |
| 1.4 - 2.0 | 0° | 70° | 10,000 | 20 | 20531948 |
| | | | | 60 | 20531949 |
| | | | | 100 | 20531950 |
| | | | | 140 | 20531951 |
| | | | | 180 | 20531952 |
| | | | | 220 | 20531953 |
| | | | | 260 | 20531954 |
| | | | | 300 | 20531955 |
| | | | | 350 | 20531956 |
| 1.4 - 2.0 | 0° | 60° | 30,000 | 400 | 20531957 |
| | | | | 450 | 20531958 |
| | | | | 20 | 20530958 |
| | | | | 60 | 20531959 |
| | | | | 100 | 20531960 |
| | | | | 140 | 20531961 |
| | | | | 180 | 20530308 |
| | | | | 220 | 20531962 |
| | | | | 260 | 20531963 |
| 1.5 - 2.0 | 90° | 70° | 10,000 | 300 | 20531964 |
| | | | | 350 | 20531965 |
| | | | | 400 | 20531966 |
| | | | | 450 | 20531967 |
| | | | | 20 | 20531968 |
| | | | | 60 | 20531969 |
| | | | | 100 | 20531970 |
| | | | | 140 | 20531971 |
| | | | | 180 | 20530372 |
| | | | | 220 | 20531973 |
| | | | | 260 | 20531974 |
| | | | | 300 | 20531975 |
| | | | | 350 | 20531976 |
| | | | | 400 | 20531977 |
| | | | | 450 | 20531978 |

All endoscopes available with external Ø in increments of 0.1mm

| Accessories | | |
|-------------------------------|--|-------------|
| Article | | Article no. |
| Optical fiber | Length: 1,500mm, in PVC tube with FOT connection | 20541980 |
| 90° mirror tube, ≤ ø of 1.3mm | rotatable, outer ø = endoscope + 0.2mm | 20541979 |
| 90° mirror tube, ≥ ø of 1.4mm | rotatable, outer ø = endoscope + 0.3mm | 20540309 |
| Transport case | | 20541931 |

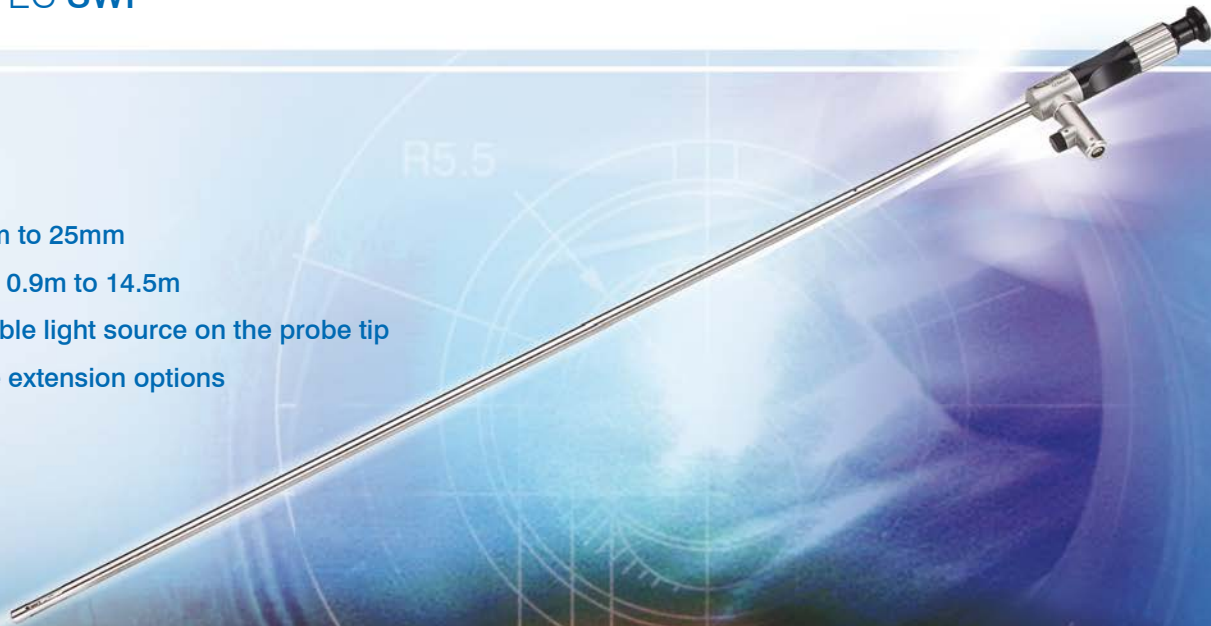
Accessories:

Fiber optic cables, TV cameras, video processors and light sources

Modular Endoscopes with Halogen Illumination

ELTROTEC SWF

- > Ø 12mm to 25mm
- > Length: 0.9m to 14.5m
- > Adjustable light source on the probe tip
- > Flexible extension options



Description:

The Eltrotec SWF endoscopes are equipped with a warm light source directly at the tip providing especially good illumination of the surroundings. The robust construction has been specially developed for use in industrial environments. e.g. for the inspection of larger and deep set cavities.

The endoscopes consist of high precision, robust optical, electrical and mechanical components.

Due to the light regulation on the endoscope adjustments can be made for different lighting conditions.

All Eltrotec SWF endoscopes are powered by a 12 Volt transformer. As a result the endoscope can also be operated independently of the mains supply using 12 V accumulators.

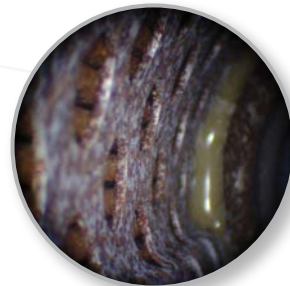
Features:

- Focussing using hand wheel
- Optimal illumination of the field of view using a warm light source at the tip of the probe
- Simple extension of the length from 0.9m to 14.5m with extension tubes
- Guidance through support rings possible
- Adaption to TV / or camera lenses

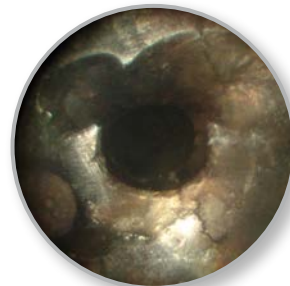
Operating conditions:

- Temperature in air:
 Lens head: -20°C to +150°C
 Complete endoscope: -20°C to +50°C
- Pressure resistance in air: Air pressure
- Resistance to liquids: none
- Humidity: up to 95% at 40°C
 (no condensation)

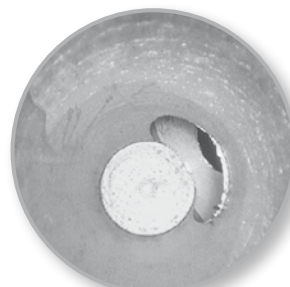
Application examples:



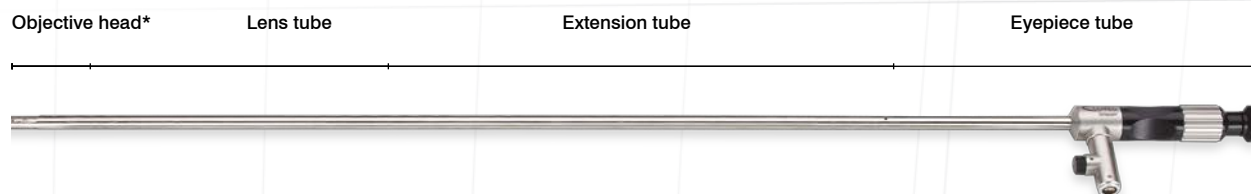
Identification of shrinkage holes



Inspecting a weld seam



Finding burrs or scoring



| Objective head with halogen light source* | | | | |
|---|-------------------|--------------|-----------------------|-------------|
| Outer -Ø mm | Direction of view | Light source | Angular Field of view | Article no. |
| 12.0 | 0° | 12V/ 20W | 90°-100° | 20411247 |
| 15.0 | 0° | 12V/ 50W | 90°-100° | 20410057 |
| 20.0 | 0° | 12V/ 100W | 90°-100° | 20411248 |
| 25.0 | 0° | 12V/ 100W | 90°-100° | 20411249 |
| 12.0 | 45° | 12V/ 20W | approx. 50° | 20411251 |
| 15.0 | 45° | 12V/ 50W | approx. 50° | 20411252 |
| 20.0 | 45° | 12V/ 100W | approx. 50° | 20411253 |
| 25.0 | 45° | 12V/ 100W | approx. 50° | 20411254 |
| 12.0 | 90° | 12V/ 20W | approx. 50° | 20411256 |
| 15.0 | 90° | 12V/ 50W | approx. 50° | 20411257 |
| 20.0 | 90° | 12V/ 100W | approx. 50° | 20411258 |
| 25.0 | 90° | 12V/ 100W | approx. 50° | 20411259 |

| Multi-lens head with adjustable viewing direction and halogen light source | | | | |
|--|----------|-----------|-------------|----------|
| 12.0 | 15°-135° | 12V/ 20W | approx. 50° | 20411261 |
| 15.0 | 15°-135° | 12V/ 50W | approx. 50° | 20411262 |
| 20.0 | 15°-135° | 12V/ 100W | approx. 50° | 20411263 |
| 25.0 | 15°-135° | 12V/ 100W | approx. 50° | 20411264 |

| Lens tube | | |
|-------------|-----------|-------------|
| Outer -Ø mm | Length mm | Article no. |
| 12.0 | 700 | 20410056 |
| 15.0 | 700 | 20410920 |
| 20.0 | 750 | 20411244 |
| 25.0 | 750 | 20411245 |

| Extension tube | | | |
|----------------|-----------|------------------------|-------------|
| Outer -Ø mm | Length mm | Max. no. of extensions | Article no. |
| 12.0 | 800 | 7 | 20410672 |
| 15.0 | 800 | 8 | 20411074 |
| 20.0 | 1,000 | 10 | 20411241 |
| 25.0 | 1,000 | 13 | 20411242 |

| Eyepiece tube with focussing and rotatable electrical connection | | |
|--|-----------|-------------|
| Outer -Ø mm | Length mm | Article no. |
| 12.0 | 200 | 20410055 |
| 15.0 | 200 | 20410058 |
| 20.0 | 620 | 20411238 |
| 25.0 | 620 | 20411239 |

| Accessories | | |
|-----------------------------|--|--|
| Article | | Article no. |
| Transport case | for endoscope with ø 12, 15 for endoscope with ø 20, 25 | 875 x 280 x 175 1,105 x 385 x 205 20411268 20411269 |
| Transformer TR 12 F | 2V - 12V/ 240V 2V - 12V/ 115V | 20411265 20411266 |
| Electrical connection cable | 4 pole 12V/ 20W | 20411377 21320102 |
| Spare lamps for lens head | 12V/ 50W 12V/ 100W | 20411271 20411272 |

* Picture of objective head see page 46!

Endoscope with Halogen Illumination

ELTROTEC **SWS** - Servicescope

- > Ø 8mm
- > Length: 400mm
- > Accumulator or mains operation
- > Warm light source in probe tip



Description:

The Eltrotec SWS is equipped with a light intensive halogen lamp on the probe tip. This enables large cavities to be effectively illuminated. It is used e.g. for inspecting insulation in cavity walls, beams and wooden constructions. This model is also frequently employed for building refurbishment, stone drill holes and for inspecting exhaust gas paths. The integrated accumulator allows the endoscope to be flexibly transported to all deployment sites. Alternatively mains operation is possible. Photographic documentation is possible with an optional adaptor and a suitable camera, i.e. video camera.

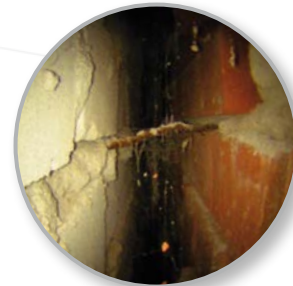
Features:

- Light source in probe tip
- 12 Watt warm light source
- 60° Angle attachment (option)

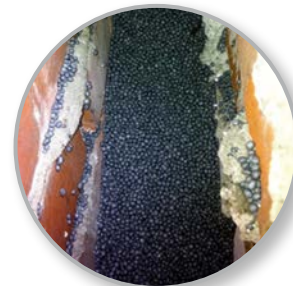
Benefit:

High light intensity as the light source is integrated in the probe tip.

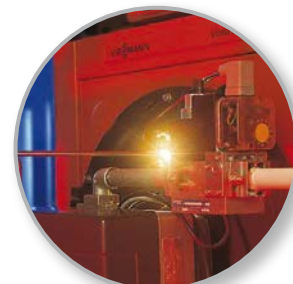
Application examples:



Inspection of brickwork



Fill level of insulation material



Inspection of heating system combustion chambers

| Type SWS | | | | |
|-------------|-------------------|---------------|-----------|-------------|
| Outer -Ø mm | Direction of view | Field of view | Length mm | Article no. |
| 8 | 90° | 55° | 400 | 21010481 |

| Accessories | | |
|------------------|--|-------------|
| Article | | Article no. |
| Accumulator | in genuine leather pouch; charging socket 1.2Ah; operating time: approx. 30 - 40min | 21100482 |
| Angle attachment | Length: 170mm; slide closure, 60° angle | 21060503 |
| Charging device | Operating voltage: 220V / 50Hz | 21100483 |
| Power supply | 220VAC | 21100485 |
| Halogen lamp | 7.2V, 12W | 21100484 |

Top-Line Rigid Endoscopes

ELTROTEC ProMicroslim / Superslim / Slim / Hardy



- > Ø 1.85mm to 6.35mm
- > Lengths: 50mm to 560mm
- > Sharper, brighter image
- > Multi-coated objective lenses
- > Easy to clean
- > As complete set in case
- > Focal range from 2mm to ∞



Description:

Top-line endoscopes are highly sophisticated endoscopy devices. The mature technology provides a high light yield and sharply defined objects. This is supported by a multi-coated objective lens and modern GRIN lens technology. It is therefore possible to generate better imaging with a smaller diameter endoscope. Top-Line endoscopes are supplied with a comprehensive range of accessories as standard in the form of a complete set. The ProMicroslim models operate with a separate focus ring and the xenon light source SuperNova. All other models are equipped with a Mini Maglite light source.

Features:

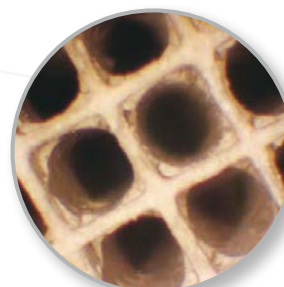
- For mobile use
- Battery powered illumination
- Attachable 90° mirror tube
- Connection to an external light source possible
- Gradient index lenses for image transmission (GRIN)
- Robust aluminium case
- TV applications via adapter possible

As complete set in case:

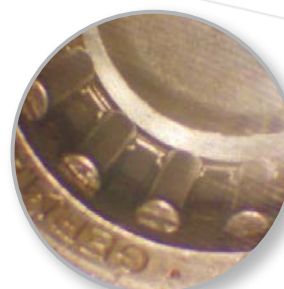
- Top-Line endoscope
- Mini Maglite i.e. SuperNova
- 90° mirror tube
- Cleaning set
- Robust transport case
- 2 x AA batteries



Application examples:



Catalytic converter inspection



Bearing inspection

| Type | Outer -Ø mm | Direction of view | Field of view | Length mm | Article no. |
|-----------------------------|-------------|-------------------|---------------|-----------|-------------|
| ProMicroslim* | 1.85 | 0° | 40° | 80 | 20751688 |
| | 1.85 | 0° | 40° | 120 | 20751751 |
| | 1.85 | 0° | 40° | 178 | 20751379 |
| Mirror tube diameter 2.2mm | | | | | |
| Superslim | 2.4 | 0° | 40° | 102 | 20750725 |
| | 2.4 | 0° | 40° | 185 | 20750733 |
| Superslim* | 2.4 | 0° | 40° | 102 | 20751380 |
| | 2.4 | 0° | 40° | 185 | 20751381 |
| Mirror tube diameter 2.77mm | | | | | |
| Slim | 4.2 | 0° | 42° | 50 | 20751892 |
| | 4.2 | 0° | 42° | 180 | 20750669 |
| | 4.2 | 0° | 42° | 305 | 20750732 |
| | 4.2 | 0° | 42° | 435 | 20750310 |
| | 4.2 | 0° | 42° | 560 | 20751667 |
| Slim* | 4.2 | 0° | 42° | 50 | 20751918 |
| | 4.2 | 0° | 42° | 180 | 20751382 |
| | 4.2 | 0° | 42° | 305 | 20751383 |
| | 4.2 | 0° | 42° | 435 | 20751384 |
| | 4.2 | 0° | 42° | 560 | 20751919 |
| Mirror tube diameter 4.8mm | | | | | |
| Hardy | 6.35 | 0° | 50° | 180 | 20750811 |
| | 6.35 | 0° | 50° | 305 | 20750307 |
| | 6.35 | 0° | 50° | 435 | 20751032 |
| | 6.35 | 0° | 50° | 560 | 20751878 |
| Hardy* | 6.35 | 0° | 50° | 180 | 20751385 |
| | 6.35 | 0° | 50° | 305 | 20751386 |
| | 6.35 | 0° | 50° | 435 | 20751387 |
| | 6.35 | 0° | 50° | 560 | 20751920 |

Mirror tube diameter 8.0mm

* Standard kit plus xenon lamp SuperNova and charging device

| Accessories | |
|---|----------|
| Mini Maglite hand light source | 20751054 |
| Replacement light source for Mini Maglite hand light source | 20750792 |
| LED hand light source | 20751761 |
| SuperNova | 20751491 |
| Spare accumulator for SuperNova | 20751825 |
| Spare light source for SuperNova | 20751373 |
| Adapter Lemo 1 to fiber optic cable | 21061030 |

Shot-Kit:

Top-Line endoscopes with a Ø of 4.2mm are ideal for inspecting **gun barrels** for rust, scoring, chatter marks and signs of abrasion.

Inspection equipment for:

- Hunters
- Forensic
- Fire arms
- Police

| Type | Outer -Ø mm | Length mm | Direction of view | Article no. |
|-----------------------------|-------------|-----------|-------------------|-------------|
| Shot-Kit | 4.2 | 435 | 0° | 20751759 |
| Shot-Kit with angle adapter | 4.2 | 435 | 0° | 20751760 |
| Shot-Kit | 4.2 | 560 | 0° | 20751762 |
| Shot-Kit with angle adapter | 4.2 | 435 | 0° | 20752103 |

incl. Mini Maglite, carrying case, 90° mirror tube, protective tube, 2x AA batteries and cleaning set



Signs of abrasion



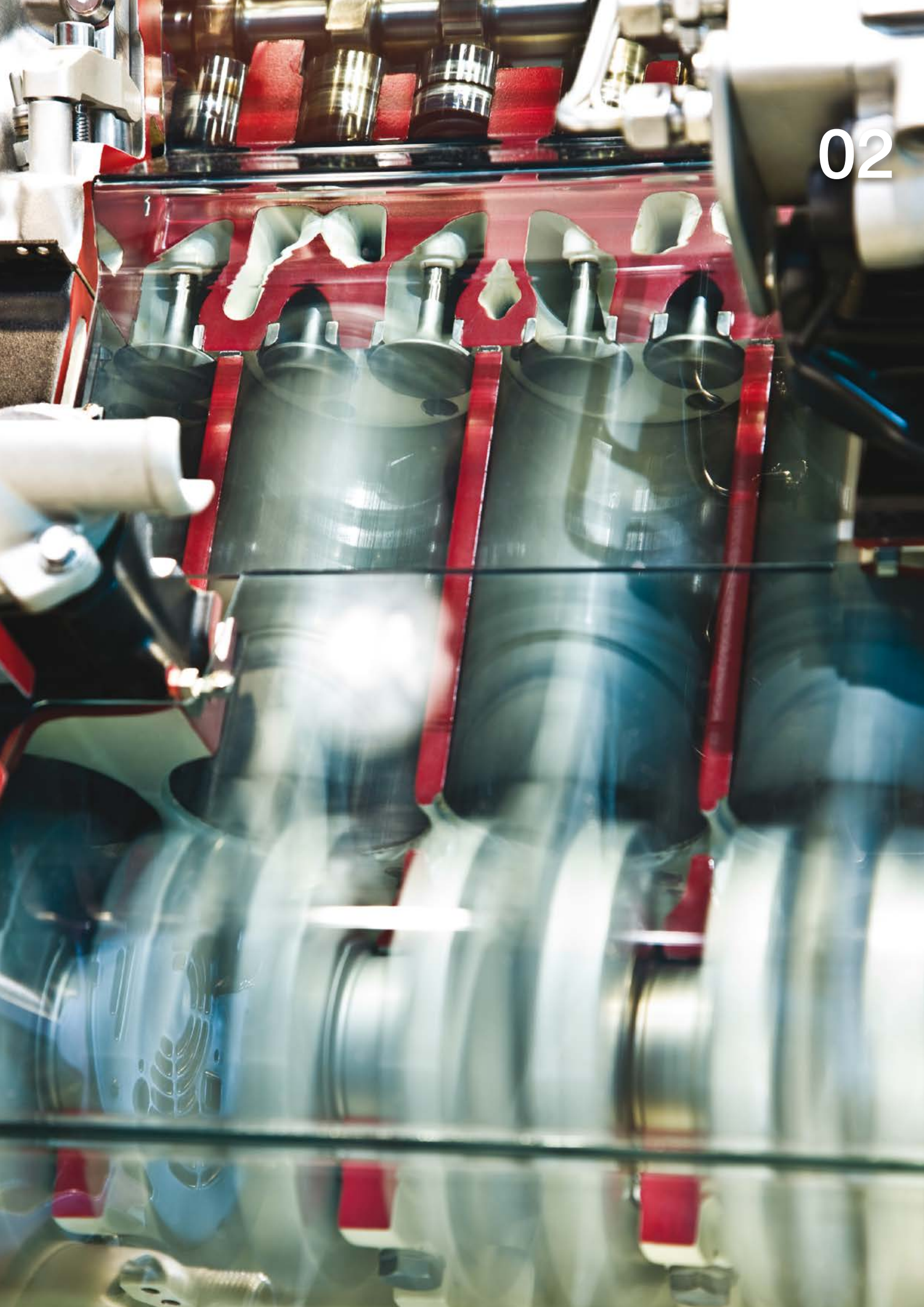
Scoring



Cracks due to heat

Can be adapted to:

TV accessories, video camera Flexcam



ELTROTEC Flex

Flexible Endoscopes - ELTROTEC Flex

Features and benefits

Eltrotec Flex endoscopes are flexible fiber-optical endoscopes which are deployed as valuable tools and inspection devices in many areas of quality assurance. Characteristics of Eltrotec Flex is high quality transmission of images system, the light intensive and homogenous illumination via light conducting fibers and its robust construction.

Endoscopic tasks often require flexible probes in order to access the desired point in concealed openings, interior cavities or in bent pipes or entrances.

Eltrotec Flex endoscopes are available in a range of lengths and diameters. Those with a diameter of 2.5 mm and above are equipped with a control mechanism for changing the angle of the probe tip.

With flexible endoscopes glass or silica fibers are used for the image transmission. Glass fibers have a resolution of up to 24,000 image points and need to have the same geometrical arrangement at the start and the end. Unlike to silica fibers, glass fibers have greater contrast and a smaller bend radius which facilitates probe tip angles of up to 180°. Silica fibers are easier to repair as the image bundles can be shortened at any time. Here lenses with an field of view of $> 110^\circ$ can be realised.

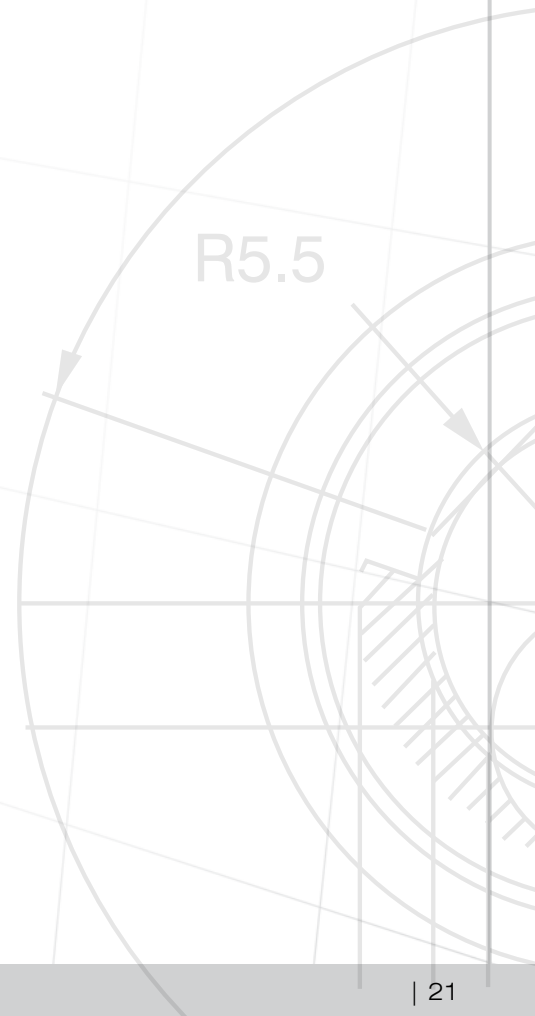
Both versions are presented on the following pages. Silica fiber endoscopes achieve a resolution of up to 30,000 image points.

Application fields:

- Mechanical engineering, engine construction
- Automobile industry
- Weld seam inspection in pipelines
- Aerospace technology
- Firearms inspection
- Plastics technology
- Foundry technology
- Construction industry
- Power plant inspection
- Heating and air conditioning technology
- Research and development
- Inspecting turbines for damage
- Inspection of hollow girders and machine parts
- Deployment in building and monument conservation

Benefit:

All flexible endoscopes can be upgraded with the Eltrotec Flexcam (p. 39) with monitor and image storage to create a flexible video endoscope.



Flexible Endoscopes with Articulation

ELTROTEC TFS

- > Ø 3.5mm to 11mm
- > Lengths: 400mm to 6,000mm
- > Resolution of up to 24,000 image points
- > Can be deployed in liquids
- > Environmental temperature of up to 60°C
- > 70° Field of view
- > 2/4 way articulation



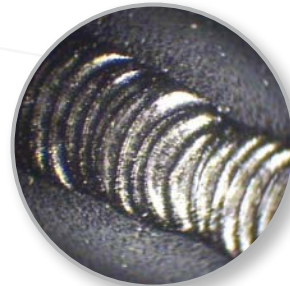
Description:

The flexible Eltrotec TFS endoscope is available up to a length of 6 m. Due to the integrated bowden cable the probe tip can be angled up to 180°, enabling the desired viewing position to be reached in a few movements. Light coupling losses are prevented by using a permanently connected fiber optic cable. The use of A-sorted optical fibers enables a very good image quality to be achieved. An external light source provides illumination. The probe with its triple protective sheathing is extremely durable.

Features:

- Maximum probe stability through spiral tube with steel braided cover
- Simple to operate
- Probe tips can be angled on 2/4 sides with locking brake
- Focusable eyepiece
- 90° prism head
- Liquid-tight
- Heat resistant to 60°C
- Incl. storage case

Application examples:



Weld seam inspection



Gearing inspection

| Model TFS | 3.5 | 6 | 8 | 10/11 |
|--|--|---------------------|---------------------|---------------------|
| Outer Ø | 3.5mm | 6mm | 8mm | 10mm / 11mm |
| Resolution | 10,000 image points | 14,000 image points | 22,000 image points | 24,000 image points |
| Focal range | 5 to 300mm | 7 to 300mm | 10mm to ∞ | 10mm to ∞ |
| Field of view | 70° | 70° | 70° | 70° |
| Bend radius | 10mm | 15mm | 20mm | 25mm |
| Probe tip length | 30mm | 40mm | 60mm | 70mm |
| Eyepiece enlargement | 25x | 20x | 12x | 12x |
| Lens enlargement 1:1 with an object distance of | approx. 45kg | approx. 45kg | approx. 45kg | approx. 45kg |
| Illumination | Permanently connected fiber optic cable with a length of 1,500mm for external light source | | | |
| Camera and TV connection | Eyepiece equipped for the attachment of a corresponding adapter | | | |
| Protective sheathing | Protective tube from braided stainless steel with additional special plastic tube | | | |

| Outer Ø mm | Length mm | Articulation | | | | Article no. |
|---------------|--------------|--------------|------|------|-------|-------------|
| | | up | down | left | right | |
| 3.5 | 400 | 180° | 90° | - | - | 20460311 |
| 3.5 | 600 | 180° | 90° | - | - | 20460312 |
| 3.5 | 1,000 | 150° | 90° | - | - | 20460890 |
| 3.5 | 1,400 | 120° | 90° | - | - | 20460325 |
| 6.0 | 600 | 180° | 90° | - | - | 20460971 |
| 6.0 | 1,000 | 180° | 100° | - | - | 20461083 |
| 6.0 | 1,470 | 180° | 100° | - | - | 20460313 |
| 6.0 | 2,000 | 150° | 90° | - | - | 20460326 |
| 6.0 | 3,000 | 150° | 90° | - | - | 20461926 |
| 8.0 | 1,000 | 140° | 90° | 90° | 90° | 20460314 |
| 8.0 | 1,600 | 140° | 90° | 90° | 90° | 20460315 |
| 8.0 | 2,000 | 140° | 90° | 90° | 90° | 20460316 |
| 8.0 | 3,000 | 90° | 90° | 90° | 90° | 20460317 |
| 8.0 | 4,000 | 90° | 90° | - | - | 20461797 |
| 8.0 | 5,200 | 90° | 90° | - | - | 20460327 |
| 10.0 | 1,000 | 140° | 140° | 140° | 140° | 20461018 |
| 10.0 | 1,600 | 140° | 140° | 140° | 140° | 20460888 |
| 10.0 | 2,000 | 140° | 140° | 140° | 140° | 20461927 |
| 10.0 | 3,000 | 140° | 140° | 140° | 140° | 20460318 |
| 10.0 | 4,000 | 140° | 140° | 140° | 140° | 20461802 |
| 10.0 | 5,200 | 140° | 140° | 140° | 140° | 20461830 |
| 10.0 | 6,000 | 90° | 90° | - | - | 20460807 |
| 11.0 | 1,000 | 120° | 120° | 120° | 120° | 20461871 |
| 11.0 | 1,600 | 120° | 120° | 120° | 120° | 20461581 |
| 11.0 | 2,000 | 120° | 120° | 120° | 120° | 20460923 |
| 11.0 | 3,000 | 120° | 120° | 120° | 120° | 20460806 |
| 11.0 | 4,000 | 120° | 120° | 120° | 120° | 20461872 |
| 11.0 | 5,200 | 120° | 120° | 90° | 90° | 20461876 |
| 11.0 | 6,000 | 120° | 120° | 90° | 90° | 20460785 |

Accessories:

| Screw on 90° mirror heads | | |
|---------------------------|------------|-------------|
| Type | Outer Ø mm | Article no. |
| SPK | 3.5 | 20470328 |
| SPK | 6 | 20470329 |

| Screw on 90° prism heads | | |
|--------------------------|------------|-------------|
| Type | Outer Ø mm | Article no. |
| PK-06 | 6 | 20470330 |
| PK-06 | 8 | 20470331 |
| PK-06 | 10 | 20470332 |
| PK-06 | 11 | 20470924 |



90° mirror head



90° prism head

Accessories:

Fiber optic cables, TV cameras, video processors and light sources

Robust Endoscope with Articulation

ELTROTEC NG

- > Ø 6mm / 8mm
- > Lengths: 1,000mm to 4,000mm
- > Resolution of up to 30,000 image points
- > 2/4 way articulation
- > 50° Field of view



Description:

The Eltrotec Flex endoscope NG, equipped with silica fibers, supplies a very high resolution of up to 30,000 image points. This enables the inspection of even the smallest objects up to a depth of 4m. With a diameter of 8 or 6mm, the endoscope is highly compact and suitable for numerous applications. A light source from our range of accessories provides the necessary illumination.

Features:

- Including 90° mirror head (screw attachment)
- Silica fiber technology
- 90° mirror head
- Protective sheathing from braided stainless steel cover (optionally with braided tungsten)
- Light conductor permanently connected to the endoscope
- Probe tip with 2/4 sided 90° angular offset
- Focusable eyepiece
- Including transport case

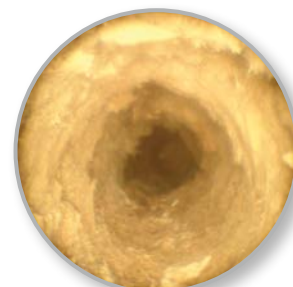
Application examples:



Inspecting screw threads



Checking for burrs



Identifying deposits

| Model NG | | |
|-----------------------|--|---------------------|
| Outer Ø | 6mm | 8mm |
| Length | 1 / 2 / 3m | 1 / 2 / 3 / 4m |
| Image resolution | 10,000 image points | 30,000 image points |
| Direction of view | 0° | 0° |
| Field of view | 50° | 50° |
| Focal range | 7mm to ∞ | 10mm to ∞ |
| Screw on mirror head | 90° side view | 90° side view |
| Probe articulation | 2 times 90° | 4 times 90° |
| Probe tip bend radius | 20mm | 35mm |
| Length of probe tip | 45mm | 85mm |
| Impermeability | Probe and lens head are watertight | |
| Illumination | Permanently connected fiber optic cable with a length of 1,500mm (no coupling loss) for external light source | |
| Heat resistance | up to 60 °C | |

| Outer Ø mm | Length mm | Article no. |
|---------------|--------------|-------------|
| 6 | 1,000 | 20571665 |
| 6 | 2,000 | 20571714 |
| 6 | 3,000 | 20571715 |
| 8 | 1,000 | 20571712 |
| 8 | 2,000 | 20571666 |
| 8 | 3,000 | 20571680 |
| 8 | 4,000 | 20571713 |

Accessories:

Fiber optic cables, TV cameras, video processors and light sources

Flexible Micro-Endoscope

ELTROTEC MTFS

- > Ø 0.5mm to 2.5mm
- > Lengths: 500mm to 15,000mm
- > Inspection of the smallest components
- > Resolution of up to 30,000 image points
- > 70° Field of view



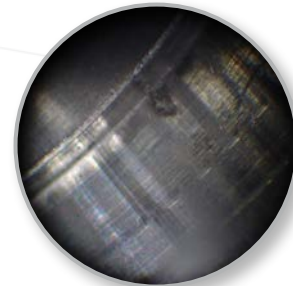
Description:

Eltrotec Flex MTFS are miniature flexible fiber-optical endoscopes which serve as valuable tools and inspection devices in many areas of quality assurance. Despite their extremely small outer diameter the flexible micro-endoscopes are high quality instruments with a resolution of up to 30,000 image points suitable for the inspection of miniature components and channels in the fields of microelectronics, precision mechanics and research.

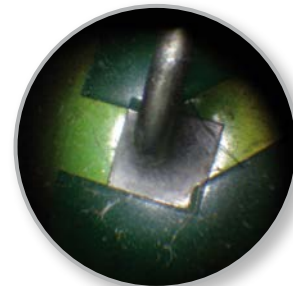
Features:

- Inspection in the smallest components and channels
- Silica fiber bundle
- Low friction vinyl protective tube
- 90° mirror head with a Ø from 1.0mm
- Liquid-tight
- Heat resistant up to 60 °C
- Focusable eyepiece

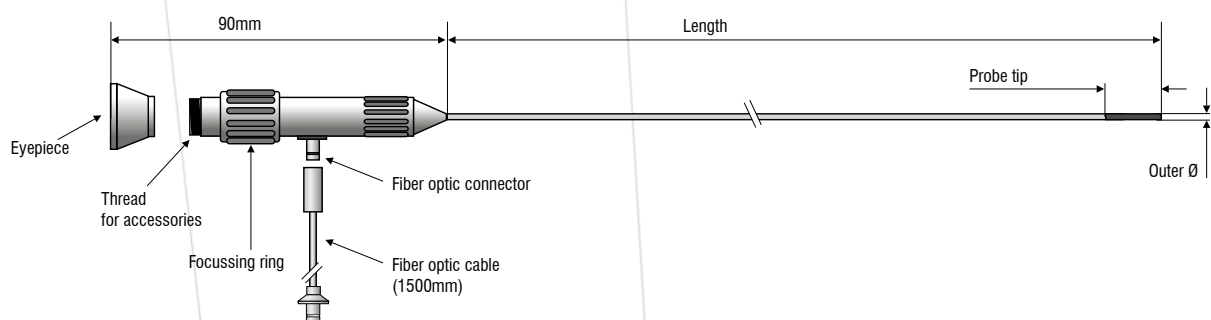
Application examples:



Chatter marks



Inspecting soldered joints



| Model MTFS | 050 | 075 | 100 | 150 | 200 | 250 |
|--------------------------|--|--------------------|---------------------|---------------------|----------------|------------------|
| Outer Ø | 0.5mm | 0.75mm | 1.0mm | 1.5mm | 2.0mm | 2.5mm |
| Length | 0.5 / 1.0 / 1.5 / 2.0m | | | | 2 / 3 / 4 / 5m | 2 / 5 / 10 / 15m |
| Resolution | 4,000 image points | 6,000 image points | 10,000 image points | 30,000 image points | | |
| Direction of view | Direct view 0° | | | | | |
| Field of view approx. | 70° | | 60° | | 70° | |
| Focal range | 3 to 50mm | | | | 10mm to ∞ | |
| Dioptrre compensation | Adjustable focussing | | | | | |
| Min. bend radius | 10mm | 15mm | 30mm | 50mm | 60mm | 80mm |
| Rigid part max. | 5mm | 5mm | 6mm | 7mm | 10mm | 12mm |
| Illumination | Separate or permanently connected fiber optic cable with a length of 1,500mm for external light source | | | | | |
| Camera and TV connection | Eyepiece equipped for the attachment of a corresponding adapter | | | | | |
| Heat resistance | up to 60°C | | | | | |

| Outer Ø mm | Length mm | Direction of view | Article no. |
|---------------|--------------|-------------------|-------------|
| 0.5 | 500 | 0° | 20560930 |
| 0.5 | 1,000 | 0° | 20561733 |
| 0.5 | 1,500 | 0° | 20561734 |
| 0.5 | 2,000 | 0° | 20561880 |
| 0.75 | 500 | 0° | 20561004 |
| 0.75 | 1,000 | 0° | 20560321 |
| 0.75 | 1,500 | 0° | 20561732 |
| 0.75 | 2,000 | 0° | 20560939 |
| 1.0 | 500 | 0° | 20560854 |
| 1.0 | 1,000 | 0° | 20560322 |
| 1.0 | 1,500 | 0° | 20561731 |
| 1.0 | 2,000 | 0° | 20560895 |
| 1.5 | 500 | 0° | 20561000 |
| 1.5 | 1,000 | 0° | 20561589 |
| 1.5 | 1,500 | 0° | 20561584 |
| 1.5 | 2,000 | 0° | 20560896 |
| 2.0 | 500 | 0° | 20561985 |
| 2.0 | 1,000 | 0° | 20561986 |
| 2.0 | 1,500 | 0° | 20561987 |
| 2.0 | 2,000 | 0° | 20561988 |
| 2.0 | 3,000 | 0° | 20561989 |
| 2.0 | 4,000 | 0° | 20561990 |
| 2.0 | 5,000 | 0° | 20561827 |
| 2.5 | 500 | 0° | 20560336 |
| 2.5 | 1,000 | 0° | 20561983 |
| 2.5 | 1,500 | 0° | 20561984 |
| 2.5 | 2,000 | 0° | 20561689 |
| 2.5 | 5,000 | 0° | 20561826 |
| 2.5 | 10,000 | 0° | 20561981 |
| 2.5 | 15,000 | 0° | 20561982 |

Endoscope with external ø of up to 2.0mm with permanently connected fiber optic cable, length 1,500mm fix

| Accessories: | Article no. |
|---|-------------|
| Fiber optic cable for MTFS (1,500mm, Ø 2mm fiber cross section) | 20560670 |
| Mirror head, d=1.4mm, viewing direction 90° | 20560897 |
| Mirror head, d=1.9mm, viewing direction 90° | 20560898 |
| Mirror head, d=2.4mm, viewing direction 90° | 20561413 |

Accessories:

Fiber optic cables, TV cameras, video processors and light sources

Top-Line Flexible Endoscopes

ELTROTEC Semi-Flexibel / Flexibel Pro



- > Ø 2.5mm to 7.9mm
- > Lengths: 700mm to 1,200mm
- > Resolution of 18,000 image points
- > Unique image brilliance in sharpness, detail and contrast



Description:

Flexible Top-Line endoscopes are equipped with a resolution of 18,000 image points. Above definition and stronger contrast is achieved using the compensated light conductor bundle.

The Top-Line Semi-Flexibel is 1m long and has a hand formable probe. A probe tip with angular offset and lengths of up to 1200mm characterise the Flexibel Pro model. Unique image brilliance, quality and functionality distinguish Flexibel Pro endoscopes.

Both endoscopes are available as a complete set with light source and mirror head.

Features:

- Easy handling
- Battery powered illumination
- Probe tips can be angled on 2/4 sides
- Locking brake with the Pro model
- Brilliant, high contrast images
- Battery powered xenon hand light source
- TV applications via adapter possible
- Protective sheathing from braided tungsten
- Probe tip from braided tungsten

Complete set:

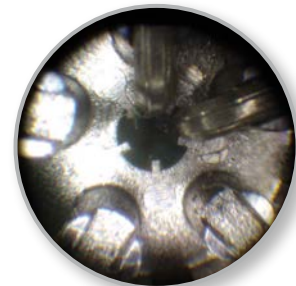
- Top-Line flexible endoscope
- 90° mirror head (with Flexibel Pro ø 5mm, optional 90° prism head)
- Top-Line SuperNova light source
- Robust aluminium case
- Li-Ion battery with charging device



Application examples:



Position of a screw



Bearing inspection

| Top-Line | Semi-Flexibel | Flexibel Pro | | | | |
|--------------------------------|---------------------|----------------------------|----------|---------------------|----------|-----------------|
| Outer ø | 7.9mm | 2.5mm | 2.5mm | 3.3mm | 4mm | 5mm* |
| Useful length | 1,000mm | 700mm | 1,200mm | 850mm | | |
| Resolution | 18,000 image points | 7,000 image points | | 18,000 image points | | |
| Viewing direction | 0° / 90° | 0° / 90° | | 0° | | |
| Field of view | 40° | 60° | | 45° | | |
| Focal range | 5mm to ∞ | 5mm to ∞ | | | | |
| Mirror head | 90° mirror head | - | | | | 90° mirror head |
| Probe tip angle (articulation) | - | 2 times, 120° respectively | | | | |
| Bend radius | 40mm | 35mm | 35mm | 40mm | | |
| Heat resistance | ≤ 60° | ≤ 60° | | | | |
| Article number | 20761227 | 20751770 | 20751771 | 20751886 | 20751893 | 20751639 |

*90° prism head available

| Accessories | Article no. |
|---|-------------|
| 90° mirror head for Flexibel Pro, only with ø 5mm (included) | 20751641 |
| 90° prism head for Flexibel Pro, only with ø 5mm (available) | 20751678 |
| 90° viewing adapter for Semi-Flexibel | 20751928 |
| SuperNova light source incl. power supply and accumulator | 20751491 |
| Spare light source for SuperNova | 20751373 |
| Lemo 1 adapter from Top-Line endoscope to fiber optic cable EL 1/4 1800 MEP | 21061030 |



90° mirror head



90° prism head
(optional)

Accessories:

Fiber optic cables, TV cameras, video processors and light sources



ELTROTEC Video

Video Endoscopes - ELTROTEC Video

Features and benefits

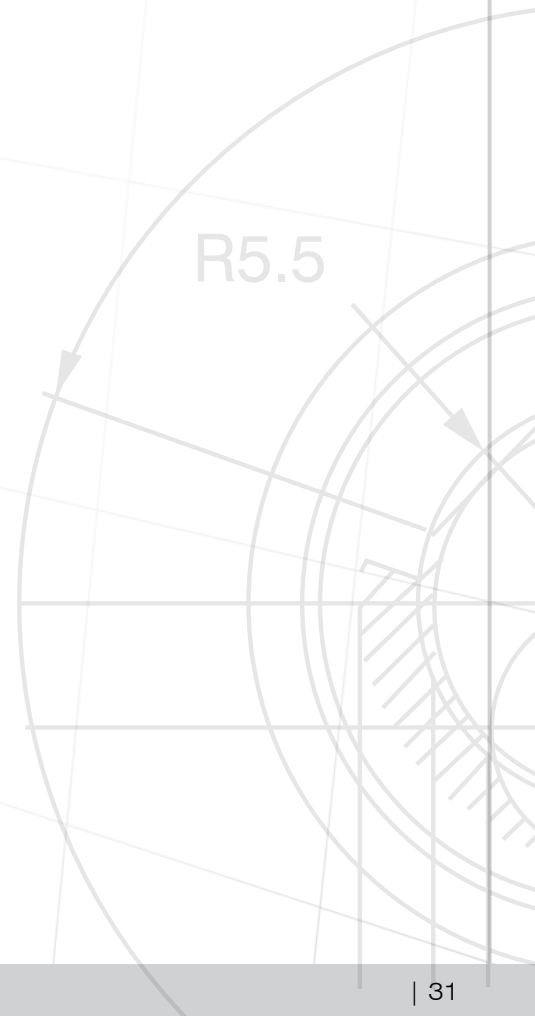
Eltrotec Video endoscopes are flexible endoscopes with integrated high resolution CCD / CMOS cameras with up to 470,000 image points. The imaging chip is situated on the tip of the probe facilitating a lossless image transmission.

Due to direct image transmission to a monitor or laptop, the inspection points can be examined effortlessly. Several people can view and assess the results directly during the inspection process. With video endoscopes the images can be stored and processed. Using a handheld display the image can be comfortably viewed as it is not necessary to look through the eyepiece.

The video endoscopes from Eltrotec are predestined for professional inspection and documentation work. They supply brilliant insights into the inner life of machines, plants and drill holes. Current images can be saved immediately and are also accessible post-inspection.

Application fields:

- Mechanical engineering, engine construction
- Automobile industry
- Weld seam inspection
- Aero industry
- Foundry technology
- Construction industry
- Power plant inspection
- Heating and air conditioning technology
- Research and development
- Tool making
- Hot channel inspection
- Large gear inspection



Fully portable Top-Line Video Endoscope

ELTROTEC Flexibel Video



- > Ø 4.0mm and 6.0mm
- > Lengths: 1,500mm to 6,000mm
- > Flexible articulation
- > For continuous industrial operation
- > Battery powered



Description:

The Top-Line video endoscope enables you to gain new insights into the inner life of machines, plants and cavities without the need to disassemble them.

Due to flexible insertion, articulation and the excellent optics, with the video endoscope you can identify weak points and problems easily and early, enabling you to take preventative measures in a targeted manner.

Illumination is provided by a battery powered adjustable LED light source with high light intensity.

Features:

- Effortless inspection of drill holes in series via monitor
- Easy to use with Teach buttons
- No cabling work
- Image and video stream mode
- Flexible probe tip with lock brake
- Double zoom
- Image reflection

Complete set:

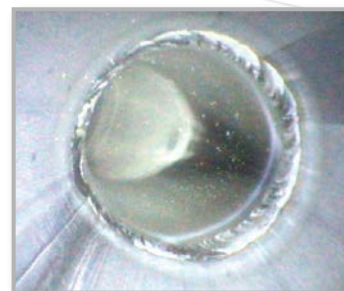
- Top-Line video endoscope
- Top-Line LED light source
- Robust aluminium case
- Li-Ion battery with charging device
- Replacement accumulator for the monitor + 2 replacement accumulators for the light source + charging station
- Option: prism head 90°



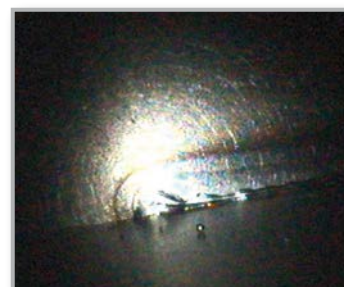
Application examples weld seam inspection:



Box



Pipeline



Plant engineering

Top-Line Video Endoscope

| | | |
|-----------------------|--|----------------|
| Outer Ø | 4mm | 6mm |
| Length | 1.5m / 3m | 1.5m / 3m / 6m |
| Min. bend radius | 32mm | 38mm |
| Direction of view | 0° | |
| Field of view | 70° | |
| Focal range | 15 to 50mm | |
| Articulation | 2 times 150° up/down; 4 times 150° up/down; right/left | |
| Image sensor | CMOS | |
| Image format | JPEG (400x400 High Resolution Camera) | |
| Video format | ASF (320x240) playback with Windows Media Player | |
| Display | 5" TFT/LCD display (double zoom/ image reflection) | |
| Interface | USB 1.1 / AV output | |
| Image storage | SD card (incl.) | |
| Image resolution | 300,000 pixels | |
| Illumination | Mobile adjustable LED light source, Li-Ion accumulator, approx. 2.5 hours operating time | |
| Power supply | 5VDC (power supply included) | |
| Operating temperature | -10°C to + 60°C | |
| Protective sheathing | Protective tube from braided stainless steel with additional special plastic tube | |

| Outer -Ø mm | Length mm | Articulation | Article no. |
|-------------|-----------|----------------|-------------|
| 4 | 1500 | 2-times | 20751776 |
| 4 | 1500 | 4-times | 20752111 |
| 4 | 3000 | 4-times | 20752112 |
| 4 | | prism head 90° | 20752113 |
| 6 | 1500 | 4-times | 20751756 |
| 6 | 3000 | 4-times | 20751757 |
| 6 | 6000 | 4-times | 20751768 |
| 6 | | prism head 90° | 20752104 |

Endoscopes with ø 4mm/6mm optional with 90° prism head

Top-Line Video-Endoscope

ELTROTEC Semi-Flexibel Video



- > Ø 8.0mm
- > Lengths: 1500mm to 12,000mm
- > For industrial operation
- > Battery powered



Description:

The Top-Line semi flexible video endoscope is the right choice for applications requiring easy operation and mobility. The robust semi flexible probe tip is sheathed with stainless steel and contains an adjustable LED light source at its tip. A 90°-prism head can be added for more flexibility. Images or video sequences can be stored on a SD-card.

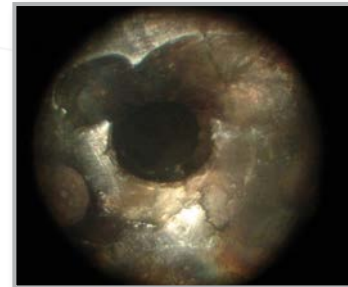
Features:

- Effortless inspection of drill holes
- Easy to use
- No cabling work
- Image and video stream mode

Complete set:

- Top-Line video endoscope
- 90° mirror head
- Integrated LED light source
- Robust aluminium case
- Power supply/charging device
- SD card

Application examples:



Weld seam inspection



Corrosion monitoring



Deposits

Top-Line Video Endoscope

| | |
|-----------------------|---|
| Outer Ø | 8mm |
| Length | 1.5m / 3m / 6m / 12m |
| Direction of view | 0° |
| Field of view | 50° |
| Mirror head | 90°, included |
| Focal range | 15 to 100mm |
| Image sensor | CMOS |
| Image format | JPEG (640x480) |
| Video format | ASF (320x240) playback with Windows Media Player |
| Display | 3,5" TFT/LCD display |
| Interface | USB 1.1 / AV output |
| Image storage | SD card (incl.) |
| Image resolution | 300,000 pixels |
| Illumination | Integrated LED light source, approx. 2 hours operating time |
| Power supply | 5VDC (power supply included) |
| Operating temperature | -10°C to + 60°C |
| Protective sheathing | Protective tube from braided stainless steel with additional special plastic tube |

| Außen-Ø mm | Nutzlänge mm | Artikel Nr. |
|------------|--------------|-------------|
| 8 | 1500 | 20751758 |
| 8 | 3000 | 20751795 |
| 8 | 6000 | 20752088 |
| 8 | 12,000 | 20752089 |

Light Sources

Halogen High Performance Light Sources

ELTROTEC Endolight FOT Halogen

- > Universal light source
- > Fiber-optic adaption
- > FOT/VOLPI light conductor connection

Endolight FOT halogen light sources are the universal solution when it comes to external light sources for endoscopic applications. The high light output and simple operation facilitate optimal inspection results. In the case of adjustable light sources the light intensity is continuously regulated by means of a mechanical iris, without influencing the color temperature of the light source.

| FOT Halogen | 20 | 100 | 150 |
|------------------------------|---------------------------|-----------------------|---------------|
| Power of lamp | 20W | 100W | 150W |
| Max fiber Ø | 5mm | 13mm | 13mm |
| Operating life type | ~ 100h | 1,500h | 100h |
| with economy mode | – | > 3,000h | ~ 210h |
| Weight | 1.4kg | 3.3kg | 5.9kg |
| Power supply | 220V / 50Hz | 110V / 220V / 50Hz | |
| Light source | 6V/ 20W | 12V/ 100W | 15V/ 150W |
| Osram HLX type | 64250 | 64637 | 64634 |
| Color temperature | | 3,050K | 3,400K |
| Dimensions | 90x65x150mm | 130x190x280mm | 180x180x230mm |
| Accessories | Power cable 1.5m/220 V AC | | |
| Special feature | | Iris and economy mode | |
| Article no. | 20910382 | 20910403 | 20910384 |
| Replacement lamp article no. | 21322075 | 21310404 | 21320385 |



FOT 20



FOT 100



FOT 150

Fiber Optic Cables for Light Sources

Type EL 1/4 1800 MEP

- Glass fibers with a high packing fraction
- Total fiber bundle 4mm/1,800mm long
- Metal protective tube with PVC coating

Liquid fiber optic cable type FL 1/4 1800

- Metal protective tube with PVC coating
- Lighting bundle Ø 4mm/higher transmission than glass
- Attention: greater bend radii as glass fiber lighting cables



Fiber optic cable EL

| | Article no. |
|---|-------------|
| Fiber optic cable EL 1/4 1800 MEP with Lemo 1 adapter | 20710831 |
| Fiber optic cable EL 1/4 1800 MEP/S with universal adapter | 20711767 |
| Fiber optic FL 1/4 1800 MEP with Lemo 1 adapter | 20710446 |
| Liquid fiber optic cable FL 1/4 1800 MEP/S with universal adapter | 20711803 |
| Lemo 1 to fiber optic cable | 21061030 |

Light Sources

High Performance LED Light Source

ELTROTEC Endolight FOT LED

- > Intensity 10/12Mlux
- > Low heat development
- > Very long service life
- > Strong white light LED



| FOT LED | 12 |
|---------------------------|--|
| Optical output | 335lm |
| Light conductor adapter Ø | 15mm |
| Operating life type | ~ 50,000h* |
| Weight | 1.6kg (without power supply) |
| Power supply | 24VDC |
| Light source | white high power LED |
| Color temperature | 6500K |
| Dimensions | 100x100x173mm |
| Operating temperature | -10°C to 40°C |
| Storage temperature | -25°C to 60°C |
| Protection class | IP20 |
| Interface | RS232, opt. USB |
| Accessories | FOT Ø 15mm adapter, wall mount power adapter |
| Article no. | 20912110 |

* measured by means of a 1800mm fiber optic cable with an active fiber optic cable interface diameter: 4mm

The light intensity can be regulated in increments using buttons or digitally via the RS232 interface (optional USB) in steps

Connection:

| Multiport | Pin assignment | Details |
|-----------|----------------|----------------------------------|
| Pin 1 | analog input | 0-10V, max. 10.5V |
| Pin 2 | analog GND | 0V |
| Pin 3 | trigger input | Low: 0 - 0.8V High: 2.0 - 24V |
| Pin 4 | digital GND | 0V |
| Pin 5 | n.c. | No connection |
| Pin 6 | Error output | |

Xenon Light Source

ELTROTEC Endolight FOT xenon

- > Compact design
- > Intensive, white light
- > Easy handling



| FOT xenon light source | |
|------------------------------|-----------------------|
| Output | 24W |
| Light output | 590 lm |
| Fiber Ø | 15mm |
| Operating life type | ~ 500h |
| Weight | 0.8kg |
| Power supply | 100 - 240V, 50 - 60Hz |
| Light source | Xenon |
| Color temperature | 5,600K |
| Dimensions | 81x114x64mm |
| Operating temperature | 0°C to 60°C |
| Storage temperature | -20°C to 49°C |
| Accessories | incl. power supply |
| Article no. | 20911638 |
| Replacement lamp article no. | 21320903 |

Application examples

With the use of our special fiber optic cables and systems:

- Endoscopy, microscopy
- Forensics, pharmaceuticals
- Image processing
- Measuring technology
- Industrial / technical lighting
- Automation technology

Fiber-Optic Lighting Units

ELTROTEC components for visual inspections

Fiber-optic lighting units are used to facilitate the static illumination of objects. A range of attachments enable inaccessible objects to be accessed and illuminated. Light source, light conducting cable and attachment produce an effective lighting unit.

| Fiber optic cable*/UL | Article no. |
|-------------------------------|-------------|
| Fiber optic cable, UL1 - 1200 | 20710424 |
| Fiber optic cable, UL1 - 1800 | 20710425 |

*in metal tube with PVC coating, outer ø 8mm, bundle ø 4mm, FOT adapter



| Gooseneck attachment | Article no. |
|---|-------------|
| Gooseneck attachment from semi-rigid metal tube, chrome plated. Diameter of fiber bundle 3mm. Attachable to cable type UL | 20710430 |



| Rigid probe*/UST | Article no. |
|------------------------------|-------------|
| Angled at 90°, UST/B, r=10mm | 21060547 |
| Lightly angled, UST/C | 21060436 |
| Straight model, UST/A | 21060435 |

* attachable to UL fiber optic cables, length 150mm, outer ø 3mm, bundle ø 2mm for the illumination of drill holes, specially for tool making



| Mirror deflection | Article no. |
|-------------------------------|-------------|
| US1 mirror on fixture, ø 21mm | 21060432 |
| US2 mirror on fixture, ø 25mm | 21060433 |
| USP mirror fixture | 21060431 |



| Focussing lens/UFL | Article no. |
|----------------------|-------------|
| Focussing lens*, UFL | 21060438 |

* attachable to UL light conductor



Cameras

Top-Line Flexible Color Camera Attachment

ELTROTEC Flexcam

- > For rigid and flexible endoscopes
- > Compatible with 32mm eyepiece
- > Complete flexibility of use
- > For upgrading to video endoscope

Description:

The Eltrotec Flexcam provides maximum flexibility for endoscopic applications. The camera is simply plugged onto any 32mm eyepiece and so can be used on flexible or rigid endoscopes. The Eltrotec Flexcam together with a compatible endoscope produces a powerful video endoscope which can be used in different combinations time and again. The stable spring hanger ensures a firm attachment of the camera to the eyepiece. In the Flexcam a CCD video chip records the image information and transmits it to a monitor. The camera is connected to the 3.5" PVM hand-held monitor (p. 43) by means of a 5 pole cable.

Option:

Together with the PVM handheld monitor virtually any endoscope can be upgraded to a video endoscope!

| Eltrotec Flexcam | |
|--|---|
| Video chip | 1/4" color CCD |
| Resolution | 768x494 pixels |
| Horizontal resolution | 520 lines horizontal |
| Video system | NTSC |
| Min. illumination | 0.2 lux/80mA |
| Shutter speed | 10µs - 20ms |
| Operating temperature | -10 - 45°C |
| Power supply | 5 - 12VDC |
| Connection cable to PVM monitor | 1.5m long incl. |
| Output | RCA, 12 Pin Hirose |
| Dimensions | Length 160mm, shaft ø 32mm, coupling ø 44.5mm |
| Article number | 20751900 |
| Connection cable including power supply for ext. analog monitors, NTSC | 20751929 |

Application examples:



Inspecting screw threads



Inspecting cogs



3.5" PVM video monitor (p. 43)



ELTROTEC Flexcam



Connection to Ø 32mm eyepiece

Cameras

Analog Color CCD Camera

Endo CA1/3, Endo CA1/2

- > 1/3" or 1/2" Interline transfer CCD sensor
- > 795 x 596 pixels
- > up to 30 images per second
- > 450 TV lines

Features:

- Sensor type: 1/3" or 1/2" Interline CCD
- TV standard: PAL
- Resolution in pixels: 795 (H) x 596 (V)
- Resolution in lines: > 450 TV lines
- Light sensitivity: 1 Lux, f 1.2
- Signal-to-noise ratio: 50db
- White balance: Auto/reset
- Lens connection: CS-mount
- Elect. iris: Auto 1/50 - 1/100,000 sec
- Shutter: off (1/50) - (1/4,000 sec)
- Output: FBAS i.e. Y/C
- Power supply: 12 VDC
- Dimensions: 42 x 42 x 55mm
- Weight: 160g



Checking for burrs



Identifying contamination

| Accessories | Article no. |
|-------------------------|-------------|
| Power supply for camera | 20960915 |
| BNC cable, 2m | 20970369 |
| S-VHS, 2m | 20970957 |
| BNC cable, angled, 2m | 20971877 |
| C-mount TV lens | 20961001 |

| | Endo CA1/3 | Endo CA1/2 |
|-----------------------|----------------|----------------|
| Image sensor | 1-3" CCD | 1-2" CCD |
| Resolution | 795x596 pixels | 795x596 pixels |
| Horizontal resolution | > 450 lines | > 450 lines |
| Shutter speed | 0.25 - 20ms | 0.25 - 20ms |
| Light sensitivity | min. 0.25Lux | min. 0.15Lux |
| White balance | auto / reset | auto / reset |
| Lens connection | CS-mount | CS-mount |
| Interface | FBAS, Y/C | FBAS, Y/C |
| Power supply | 12 VDC | 12 VDC |
| Dimensions | 43.5x44x64.5mm | 43.5x44x64.5mm |
| Weight | 160g | 160g |
| Article number | 20961577 | 20961419 |

Cameras

USB 2.0 Color Camera

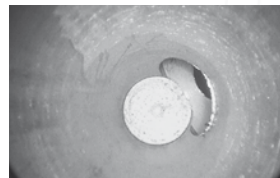
Endo CU1/3, Endo CU1/2

- > To endoscope coupling
- > 1/3" CCD or 1/2" CMOS sensor
- > 1024 x 768/ 1280 x 1024 pixels
- > More than 100 images/sec
- > USB 2.0 interface



Benefits:

- High quality sensors with quadratic pixels
- Global shutter
- Low weight, ultra-compact housing
- Industrial standard, screw attachment Micro SUB-D connector
- No frame grabber required
- Simple and inexpensive cabling
- Can be operated on notebooks
- Better image quality and resolution
- Standard USB und screw attachment Micro Sub-D with USB
- No switches or jumpers
- Incl. software



Checking for burrs



Identifying deposits

| Accessories | Article no. |
|--|-------------|
| USB industrial standard cable, 3m | 20971602 |
| USB industrial cable, 3m with angled connector | 20971611 |
| C-mount TV lens | 20961001 |

* Scope of supply: Camera, installation CD for Windows XP Windows 2000 and Linux, with drivers, demo program for display and storage with documentation

| | Endo CU1/3 | Endo CU1/2 |
|-------------------|-----------------|------------------|
| Image sensor | 1/3 CCD | 1/2 CMOS |
| Resolution | 1024x768 pixels | 1280x1024 pixels |
| Color | Bayer pattern | Bayer pattern |
| Shutter speed | 0.066 - 1040ms | 0.056 - 630ms |
| Images per second | 30 | 25 |
| White balance | yes | yes |
| Lens connection | C-mount | C-mount |
| Interface | USB 2.0 | USB 2.0 |
| Power supply | 12 VDC | 12 VDC |
| Dimensions | 34x32x34.4mm | 34x32x27.4mm |
| Weight | 75g | 62g |
| Article number | 20961703 | 20961601 |

TV Accessories

Adapters

| C-mount TV lens (zoom) | Article no. |
|--|-------------|
| Type f: Zoom with quick-release (f: 32 - 47mm) For all endoscope types with eyepiece ø of 32mm | 20961001 |



| C-mount TV lens (fixed focal length) | Article no. |
|--|-------------|
| Type f: 32mm, M14x1 For rigid endoscopes SKF-D and MKF-D with a ø from 5.8mm | 20961426 |
| Type f: 47mm, M14x1 For rigid endoscopes SKF-D up to a ø of 4.0mm | 20961055 |
| Type f: 32mm, M12x1 For endoscopes MTFS and ME | 20960088 |
| Type f: 47mm, M12x1 For endoscopes PKF | 20960099 |



| C-mount TV lens with quick release | Article no. |
|---|-------------|
| Type VC-20 For rigid endoscopes from 4mm, with eyepieces with a ø of 32mm ¹⁾ | 20751998 |
| Type VC-25 For rigid endoscopes from 5.8mm, with eyepieces with a ø of 32mm ²⁾ | 20751488 |
| Type VC-35 For rigid endoscopes up to 4mm, with eyepieces with a ø of 32mm ²⁾ | 20751225 |



¹⁾ Recommended with 1/3" Camera

²⁾ Recommended with 1/2" CCD chip

| Digital camera adapter with quick release for rigid and flexible endoscopes with eyepieces with a ø of 32mm | Article no. |
|--|-------------|
| Type DCC 37mm | 20751552 |
| Type DCC 58mm | 20751716 |



| Lens spacer rings (all standard sizes available) | Article no. |
|---|-------------|
| M37/M27 | 20970374 |
| M37/M34 | 20972076 |
| M37/M30 | 20972077 |
| M37/M28 | 20972078 |
| M58/M49 | 20971438 |
| M58/M52 | 20972079 |
| M58/M62 | 20972080 |
| M58/M68 | 20972081 |
| M58/M72 | 20972082 |



| Angled eyepiece / 90° AE9003 | Article no. |
|---|-------------|
| Attachable to all endoscope eyepieces of the Top-Line series with ø 32mm eyepiece | 20751227 |



| USB converter | Article no. |
|---|-------------|
| Video to USB2 converter, without cable | 20961747 |
| USB cable | 20971799 |



TV Accessories

Monitors

- > Visualisation of results
- > Robust industrial monitors
- > High color brilliance

10" color monitor:

- Automatic PAL / NTSC selection
- Automatic adjustment to monitor

17" color monitor:

- Professional PAL/NTSC LCD/TFT monitor
- 3D comb filter
- "Anti Burn" function (prevents pixel burning)
- Artefact, noise & in-motion unsharpness reduction



| | 10" monitor | 17" monitor |
|-------------------------|---|--|
| Resolution in pixels | 800x800 | 1280x1024 |
| Display element | Color TFT/LCD, 480,000 pixels | Color TFT/LCD |
| Viewing angle | Horizontal 110°, vertical 80° | Horizontal 160°, vertical 160° |
| Screen diagonal | 10.4", 26.4cm | 17", 43cm |
| Typical brightness | 220cd/m² | 250cd/m² |
| Contrast ratio | 440:1 | 1000:1 |
| PC inputs | VGA | VGA |
| Typical reaction time | 40ms | 5ms |
| Video input | VGA, composite video signal | Y/C, VGA, HDMI, composite video signal |
| Power supply | 12 VDC, 240VAC with power supply (supplied) | 12 VDC |
| Color of housing | Black | Anthracite |
| Housing material | Metal | Aluminium |
| Weight | 3kg | 6kg |
| Dimensions (incl. base) | 290x247x34.9mm | 416x398x49.5mm |
| Certifications | CE, E11 | CE |
| Article number | 20961873 | 20961887 |

Eltrotec 3.5" PVM video monitor

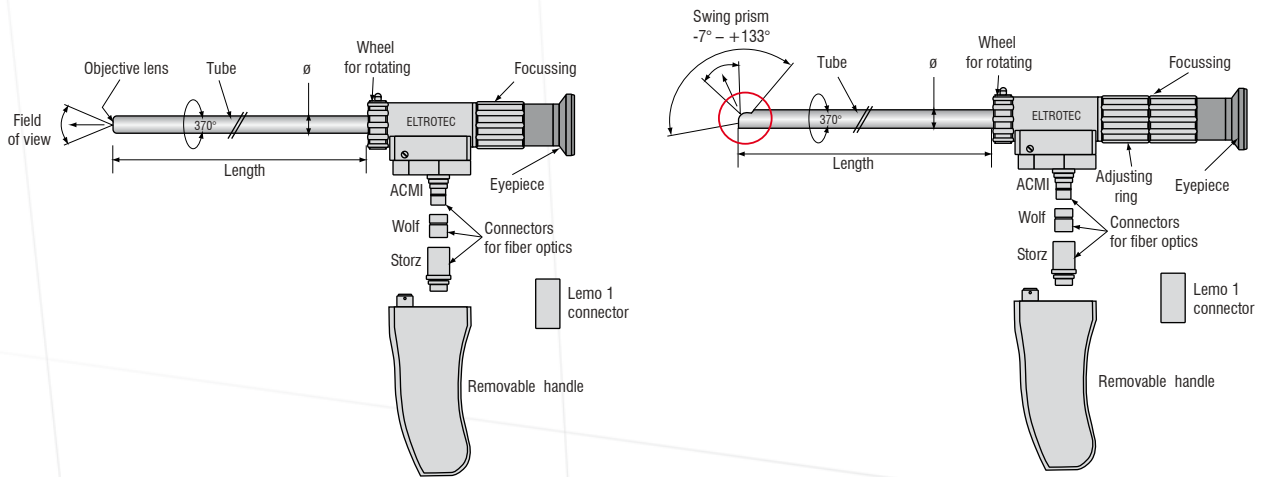
Description:

The monitor shows live video as well as recorded video images on the integrated LCD display. Stored images can be viewed and processed on a computer using the USB interface and the removable SD memory card supplied. Direct connection to the Eltrotec Flexcam (p. 39).

| | 3.5" PVM monitor |
|---------------------------------|---|
| Screen | 3.5" TFT/LCD |
| Interface | USB 1.1, 2 GB SD card incl. |
| Image format | Jpeg (640x480) |
| Video format | ASF (320x240) |
| Accumulator | Integrated Li-Ion accumulator incl. power supply |
| Operating time with accumulator | Type 2.5h |
| Article number | 20751856 |



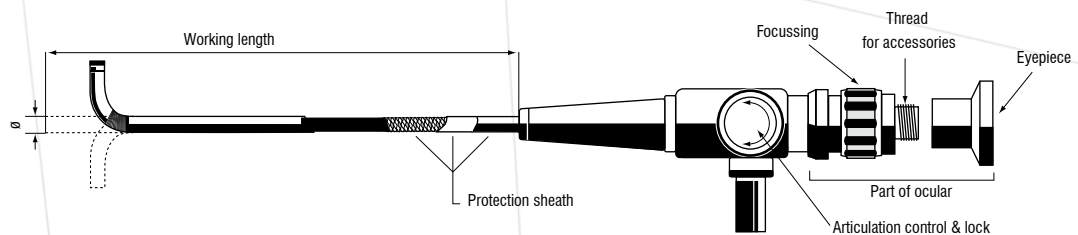
1 Components of ELTROTEC Rigid Endoscopes



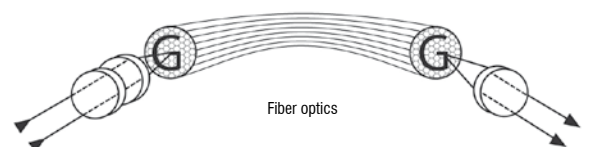
- The complete metal construction composed of a stainless steel tube, main section, eyepiece and handle from hardened, anodised aluminium, guarantee a long service life
- High quality and low maintenance due to precision mechanism

- Precisely coordinated components produce excellent focussing characteristics.
- With swing-prism endoscopes the prism is moved using a bowden cable system for different direction views.

2 Components of ELTROTEC Flexible Endoscopes

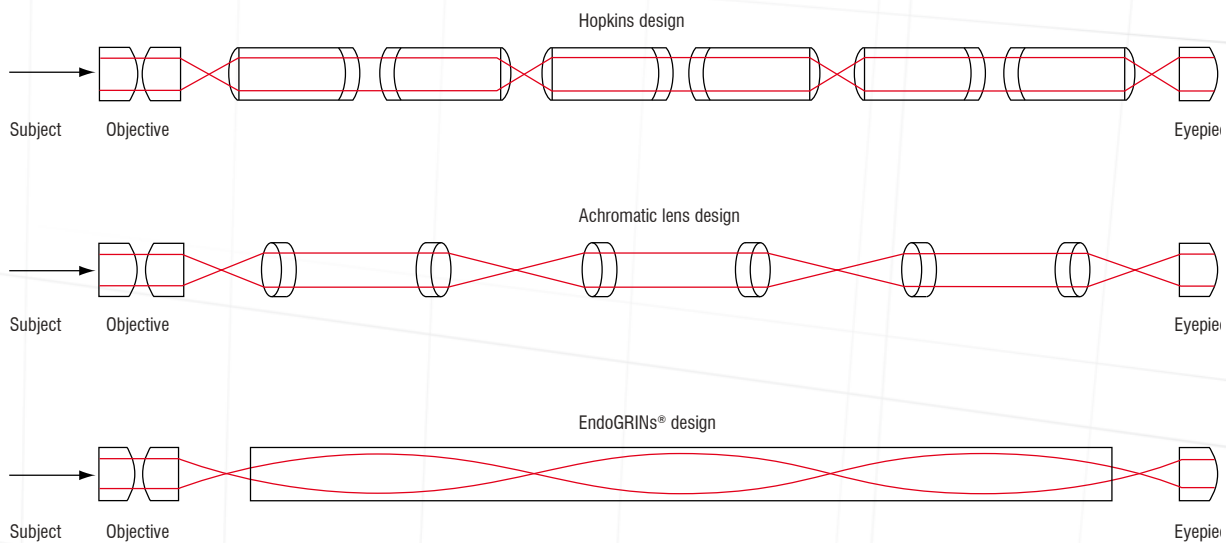


With flexible endoscopes the fiber bundle comprises up to 30,000 individual fibers. Each fiber transmits one pixel from the lens to the eyepiece. Here the light points are combined to form the final image. In order to do this the fibers must have the same geometrical arrangement at the start and finish in order to guarantee a distortion-free image. For an intensive and homogenous illumination of the objects glass fibers are arranged geometrically around the lens.



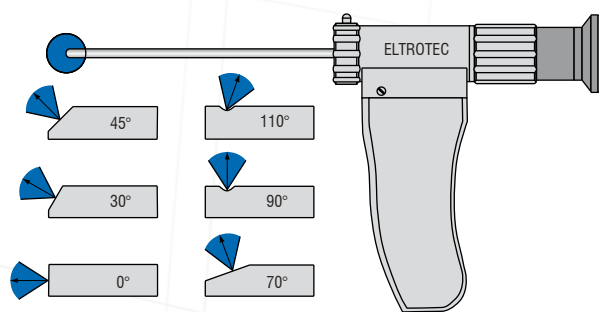
3 Optical Systems

- Each endoscope employs special lens systems calculated by the aid of a computer software
- Optimal optical values and the best image quality due to GRIN lenses, achromatic or mixed systems
- In order to compensate for the disadvantage of low light conduction at small diameters, GRIN lens systems are employed.
- With an outer diameter of 5.8 mm and higher, achromatic lens systems are employed. As a result the glass components in the endoscope can be optimised in favour of greater durability while maintaining the same optical characteristics.



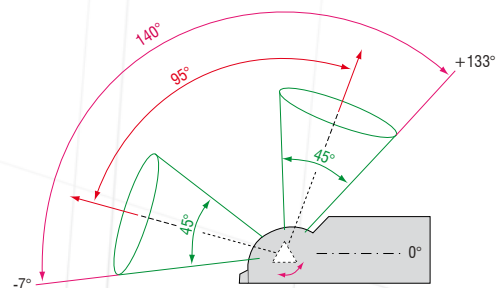
4 Direction of View

- All endoscopes are available in a variety of direction of view
- The direction of view is the deviation of the central ray from the axis of the optical system

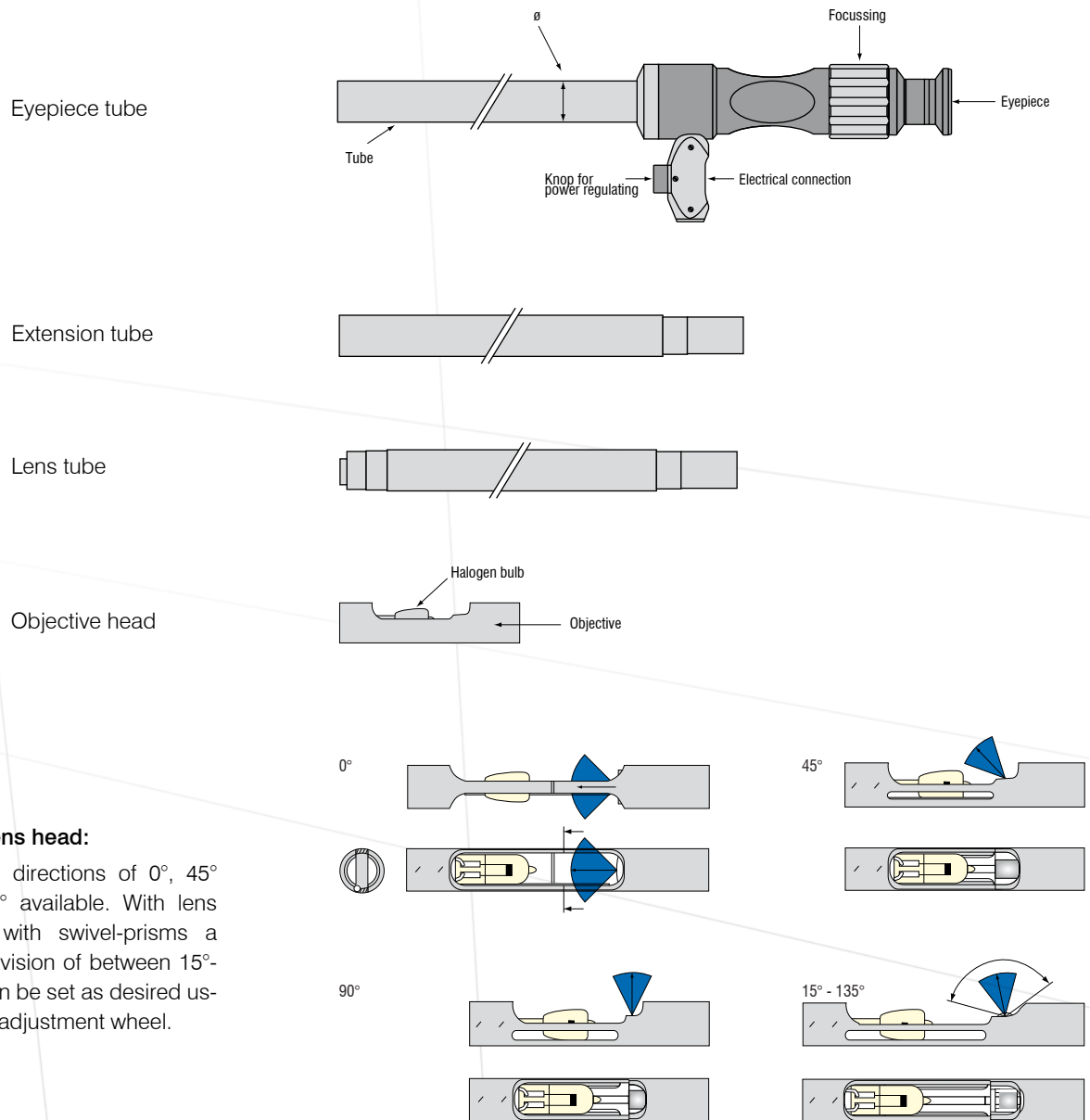


Swing-prism:

- Using a swing-prism an individually adjustable direction of view from -7° – $+133^\circ$ (incl. field of view) is possible
- Total swivel range of 140°
- Forward as well as retrograde view possible.



Construction of modular Endoscopes*



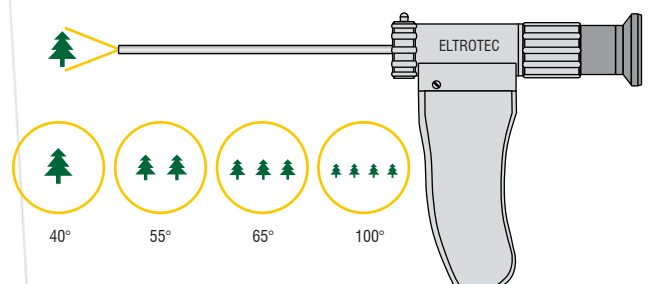
Multi-lens head:

Viewing directions of 0°, 45° and 90° available. With lens heads with swivel-prisms a field of vision of between 15°-135° can be set as desired using the adjustment wheel.

* Technical data see page 14 - 15

5 Field of View

- Depending on the endoscope different fields of view are available
- Wide angles are achieved with both straight and deflected viewing directions

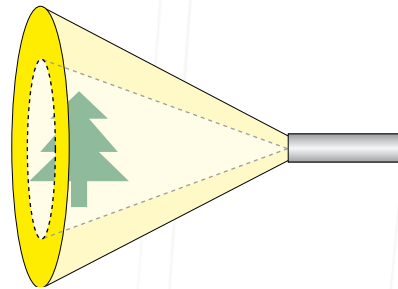


6 Illumination

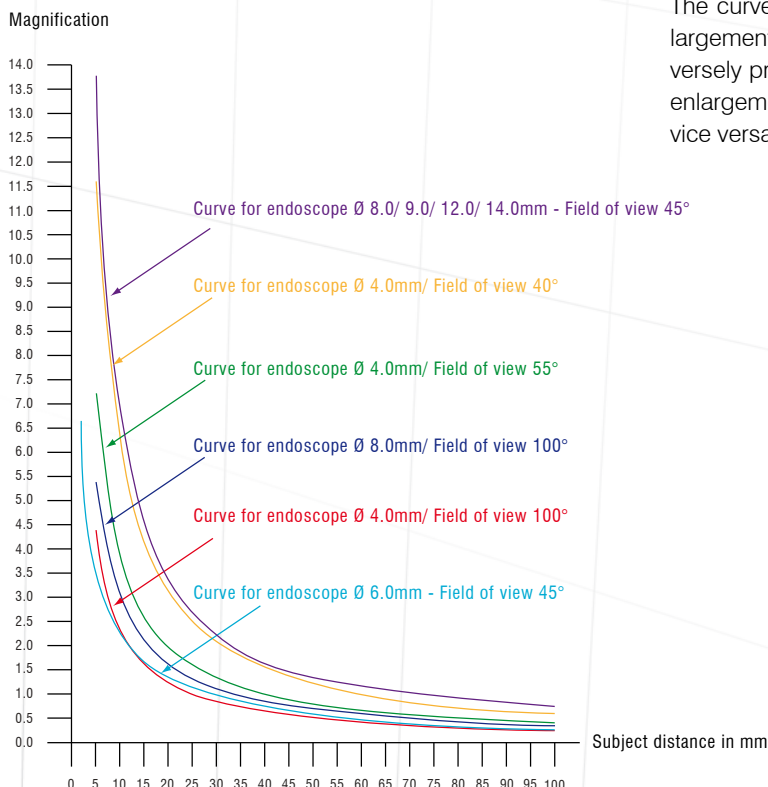
- In order to generate bright images the relationship between the glass fiber component and the diameter of the lens has been optimised guaranteeing the best possible illumination
- A universal connector for ACMI, Wolf, Storz or Lemo is included as standard
- Due to specially coated glass fibers the light is transported without loss.

For warm light sources the following applies:

- Illumination is provided by an incandescent light source (halogen) at the lens head. The output of the incandescent light source is dependent on the diameter, the greater the diameter the greater the light source output (as standard 100 watts at a Ø of 15mm)
- Through the use of incandescent light sources it is possible to illuminate larger cavities than with glass fiber illumination
- Possible to adjust the brightness on the eyepiece tube, i.e. directly on the device without interrupting an inspection
- With small cavities or poor air circulation there is a risk of excessive heat development as a result of the light source output. In individual cases damage to the endoscope can occur due to excessive illumination periods, or to the object due to low heat resistance.



7 Magnification versus Subject Distance



Due to the large depth of focus of Eltrotec borescopes the enlargement factor can only be calculated when the distance to the object is known.

The curves below illustrate the relationship between enlargement factor and distance. The enlargement is inversely proportional to the distance. This means that the enlargement is twice as great at half the distance and vice versa.

High performance sensors made by Micro-Epsilon



Sensors and systems for displacement and position



Measurement and inspection systems for quality assurance



Sensors and measurement devices for non-contact temperature measurement



Optical micrometers, fibre optic sensors and fibre optics



2D/3D profile sensors (laser scanner)



Colour recognition sensors, LED analyzers and colour online spectrometer