



More Precision

ELTROTEC // Industrial Endoscopes



For more than 35 years, Micro-Epsilon Eltrotec has specialised in the field of technical endoscopy and is market leader for industrial applications.

The name Eltrotec stands for high quality endoscopes.

Our wide range of standard endoscopes offers flexible options for use in many different applications. Often, it isn't necessary to resort to expensive special solutions, as our product portfolio includes virtually every conceivable type of endoscope. However, should you not find a suitable endoscope to meet your needs, we can custom engineer an endoscope quickly and efficiently.

Our high quality standards and innovative production techniques enable sharper imaging of objects compared to conventional endoscopes. In an individual consultation with our application engineers at your premises, we can find the most appropriate solution for your application. We offer special solutions on request for virtually all products – tailored to meet your precise requirements.

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

Scope of services:

Endoscopes, repair services, OEM endoscope design and associated project planning



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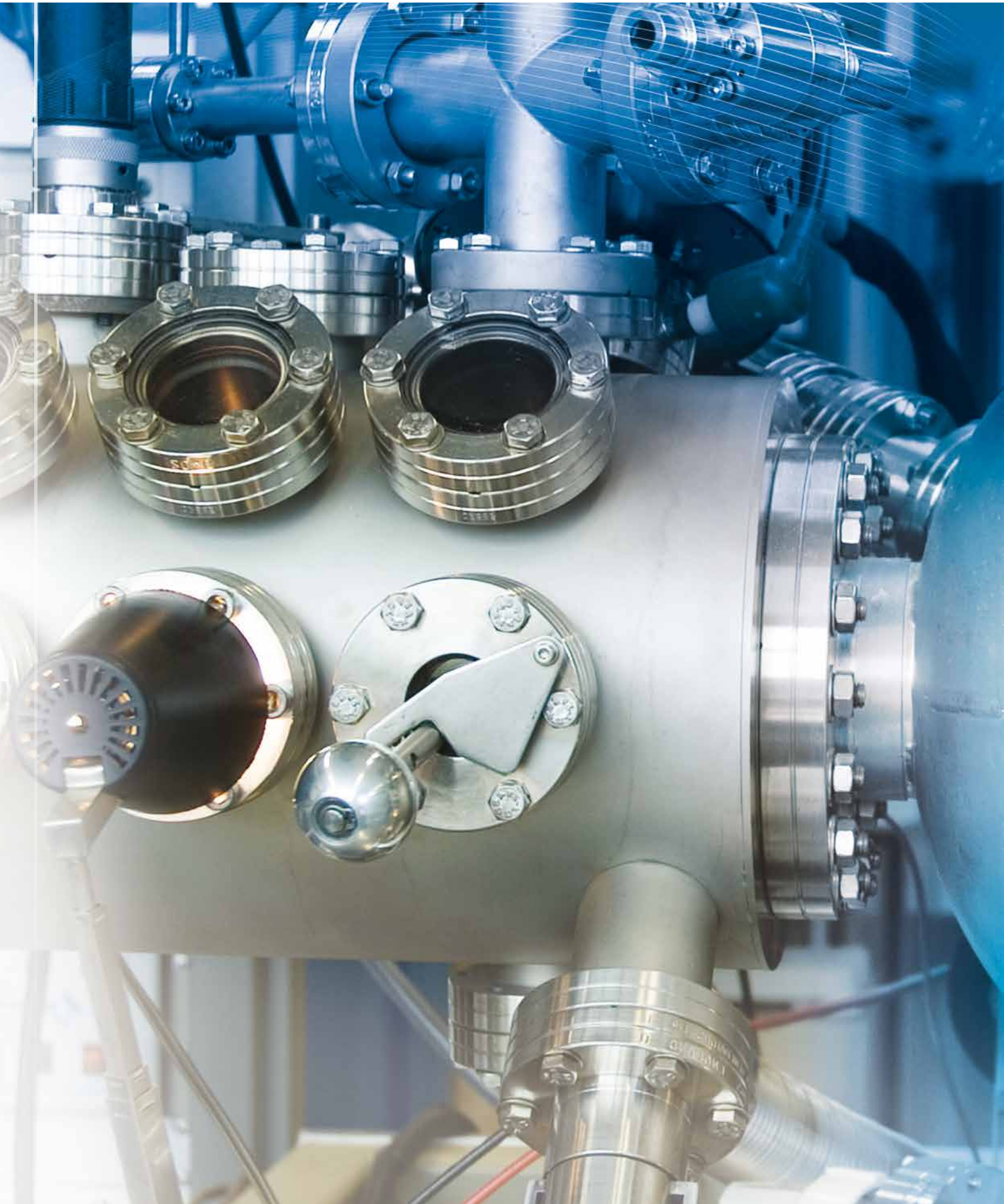
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ELTROTEC Borescopes

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-fibre component responsible for lighting and the diameter of the lens, facilitating an optimal illumination of the inspection area. A special fibre 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.





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

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	
			135		20081187	
5.8	0°	40°	275	no	20081188	yes
			415		20081189	
			555		20081190	
5.8	0°	100°	146	no	20081191	no
			286		20081192	
			426		20081193	
			566		20081194	
5.8	45°	65°	135	yes	20081195	no
			205		20081196	
			275		20081197	
			345		20081198	
5.8	70°	65°	135	yes	20081199	no
			205		20082000	
			275		20082001	
			345		20082002	
5.8	90°	65°	135	yes	20082003	no
			205		20082004	
			275		20082005	
			345		20082006	

Type SKF-D						
Outer Ø mm	Direction of view	Field of view	Length mm	Rotating tube	Article no.	90°-Mirror tube
8.0	0°	40°	225	no	20081135	yes
			425		20082007	
			625		20082008	
			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	Rotating 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:

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

- 6mm to 14mm
- Lengths: 175mm to 1,505mm
- Direction of view -7° to $+133^{\circ}$
- 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

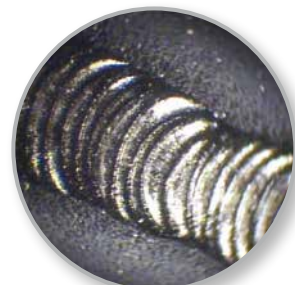
Operating conditions:

- Temperature in air:
 - Endoscope probe: -20°C to $+100^{\circ}\text{C}$
 - Complete endoscope: -20°C to $+50^{\circ}\text{C}$
- 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 ptube	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

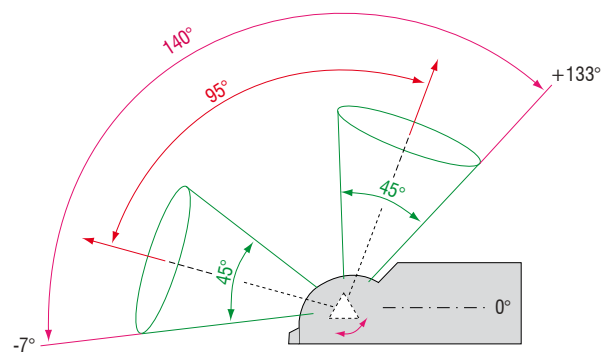
(Further dimensions on request!)



Now also available with 4.3 mm outer diameter



Swing-prism of the MKF-D



Accessories:

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



- 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%

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:

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



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

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 fibres (semi-rigid)
- Focussing ring
- Cold light illumination
- TV applications possible with accessories

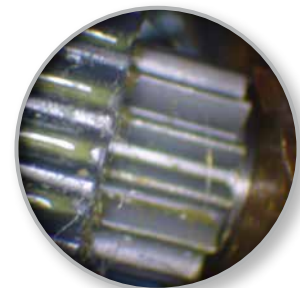
Benefit:

Robust due to high break resistance

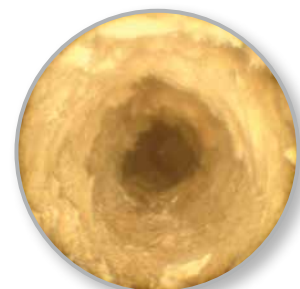
Application examples:



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
				400	20531957
1.4 - 2.0	0°	60°	30,000	450	20531958
				20	20530958
				60	20531959
				100	20531960
				140	20531961
				180	20530308
				220	20531962
				260	20531963
				300	20531964
				350	20531965
1.5 - 2.0	90°	70°	10,000	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 fibre	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:

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



- 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.

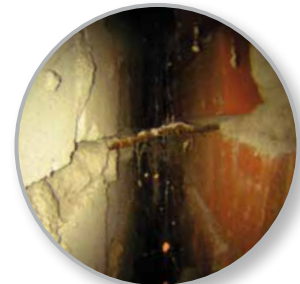
Features:

- Light source in probe tip
- 12 Watt warm light source
- 90° Angle attachment (option)

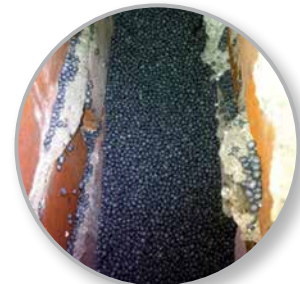
Benefit:

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

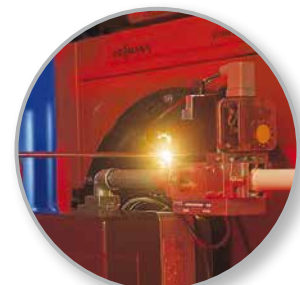
Application examples:



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, 90° angle	20751227
Charging device	Operating voltage: 220V / 50Hz	21100483
Power supply	220 VAC	21100485
Halogen lamp	7.2V, 12W	21100484



- Ø 2.4mm to 6.35mm
- Lengths: 102mm to 560mm
- Focal range from 2mm to ∞
- Bright image
- Multi-coated objective lenses
- As complete set in case
- Temperature Range - 20° to 120° C



Description:

Top-line endoscopes are highly sophisticated endoscopy devices. This mature technology provides a high light yield and sharply defined objects.

The scope of supply consists of a complete set with a 90° mirror tube and a light source in a robust metal case. No additional equipment is required.

This low cost endoscope is perfectly suitable for mobile applications.

Features:

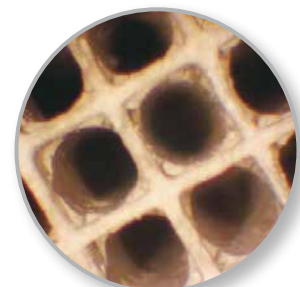
- For mobile use
- Supplied in a complete set, no additional accessories required
- Gradient index lenses for image transmission (GRIN)
- Connection to an external light source is possible
- TV applications via adapter is possible

As complete set in a case:

- Top-Line endoscope
- Mini Maglite or SuperNova
- 90° mirror tube
- Cleaning set
- Robust carry 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.
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°	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 8.0 mm

* Standard kit plus xenon lamp SuperNova and charging device

Accessories	Article no.
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 fibre optic cable	21061030



Mini Maglite hand light source

LED hand light source

SuperNova

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	560	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

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
- Fire arms
- Forensic
- Police

Can be adapted to:

TV accessories, video camera Flexcam

ELTROTEC Pro Superslim/Slim/Hardy/SuperHardy



- Ø 1.85mm to 7.2mm
- Lengths: 50mm to 940mm
- Focal range from 2mm to ∞
- Latest endoGRINs® image relay lenses
- Multicoated objective lens
- Independent focusing ring for convenient video and still photography
- Temperature Range - 20° to 120° C, optional up to 300°

Description:

Rigid ELTROTEC Pro precision endoscopes complete the proven advantages of the Top-Line series by first-class quality of the special multi-coated lenses and modern GRIN lens technology. These endoscopes are designed for the professional user.

Other high quality characteristics include a focus ring and an optimised fibre optic connector for high light yield. This is why these endoscopes are ideal for adapting to a camera.

Features:

- Focus ring
- Brighter images with greater contrast
- For mobile use and connection to external light sources
- TV applications via adapter is possible



Independent focusing ring



Classic fibre optic connector



Pro fibre optic connector

Type	Outer-Ø mm	Direction of view	Field of view	Length mm	Article no.
ProMicroslim	1.85	0°	42°	80	20752184
	1.85	0°	42°	120	20752221
	1.85	0°	42°	178	20752222
ProSuperslim	2.4	0°	42°	102	20751409
	2.4	0°	42°	185	20751481
	2.8	0°	42°	265	20752224
	2.8	0°	42°	350	20751381
	2.8	0°	42°	435	20752226
ProSlim	4.2	0°	42°	50	20752205
	4.2	0°	42°	180	20752195
	4.2	0°	42°	305	20752202
	4.2	0°	42°	435	20752230
	4.2	0°	42°	560	20752215
ProHardy	6.35	0°	42°	180	20752231
	6.35	0°	42°	305	20752232
	6.35	0°	42°	435	20752233
	6.35	0°	42°	560	20752234
ProSuperHardy	7.2	0°	42°	711	20752194
	7.2	0°	42°	940	20752191

Mirror tubes for Eltrotec Pro endoscopes

- Direction of view 90°
- 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
2.2	90°	20751389	1.85	80	20752184
		20752096		120	20752221
		20752223		178	20752222
2.77	90°	20751392	2.4	102	20751409
		20751393		185	20751481
3.8	90°	20752227	2.8	265	20752224
		20752228		350	20751381
		20752229		435	20752226
4.8	90°	20752236	4.2	50	20752205
		20750838		180	20752195
		20751091		305	20752202
		20751397		435	20752230
		20751765		560	20752215
8.0	90°	20751401	6.35	180	20752231
		20751402		305	20752232
		20751143		435	20752233
		20752235		560	20752234
8.0	90°	20752193	7.2	711	20752194
		20752192		940	20752191

Accessories	Article no.
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 fibre optic cable	21061030



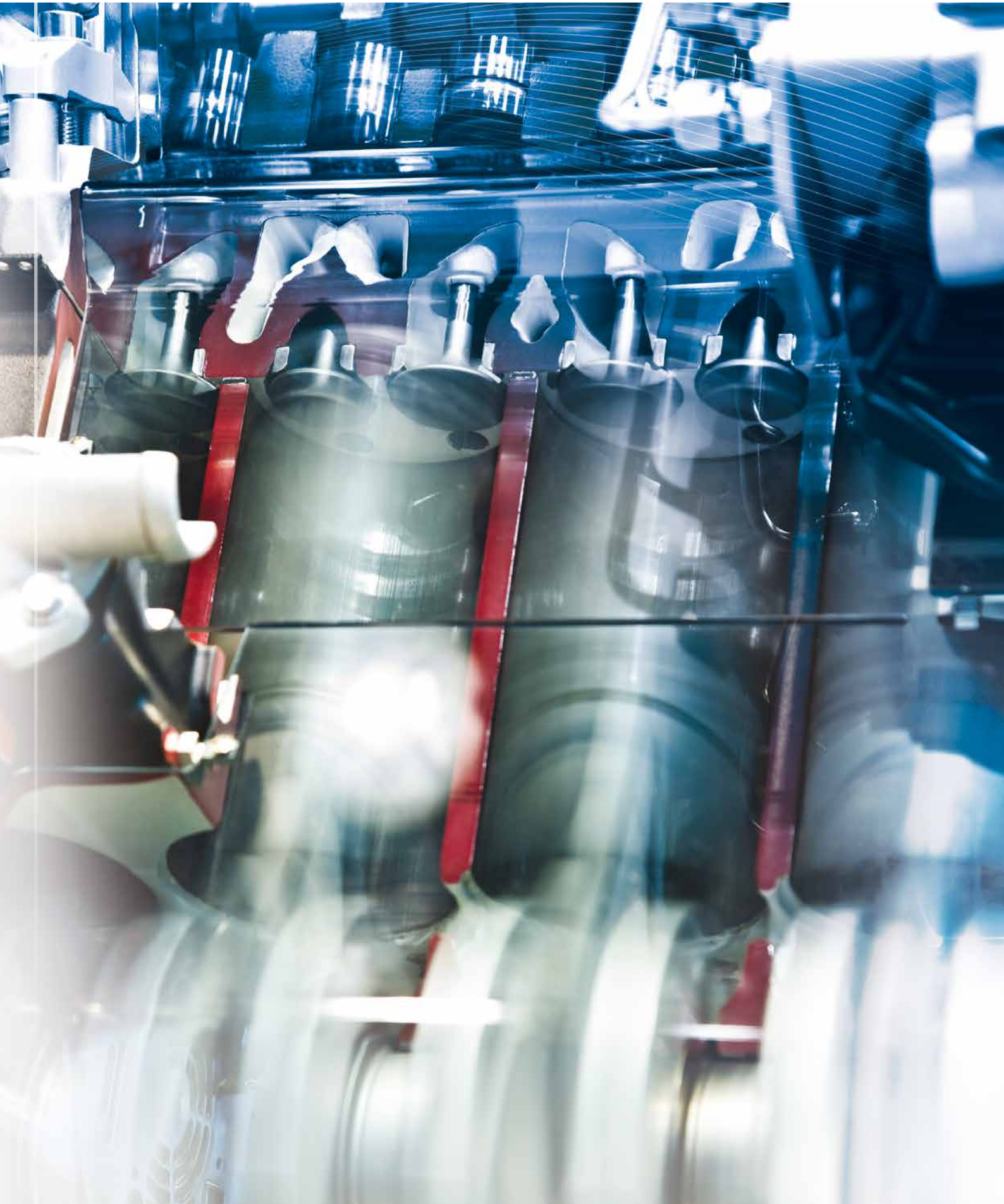
Mini Maglite hand light source



LED hand light source



SuperNova



ELTROTEC Flex

Flexible Endoscopes - ELTROTEC Flex

Features and benefits

Eltrotec Flex endoscopes are flexible fibre-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 homogeneous illumination via light conducting fibres 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 fibres are used for the image transmission. Glass fibres 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 fibres, glass fibres have greater contrast and a smaller bend radius which facilitates probe tip angles of up to 180°. Silica fibres 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 fibre 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 EltrotecFlexcam (p. 39) with monitor and image





- 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

Description:

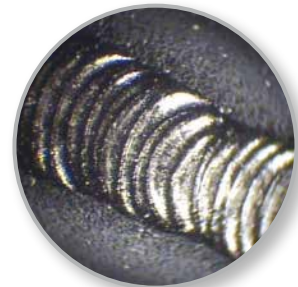
The flexible Eltrotec TFS endoscope is available up to a length of 6 m. Due to the integrated bowden cable the probe tip can be angled up to 180°, enabling the desired viewing position to be reached in a few movements.

Light coupling losses are prevented by using a permanently connected fibre optic cable. The use of A-sorted optical fibres 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. 25mm	approx. 25mm	approx. 25mm	approx. 25mm
Illumination	permanently connected fibre 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	Length	Articulation				Article no.
		up	down	left	right	
3.5	400	180°	90°	-	-	20460311
3.5	600	180°	90°	-	-	20460312
3.5	1000	150°	90°	-	-	20460890
3.5	1400	120°	90°	-	-	20460325
6.0	600	180°	90°	-	-	20460971
6.0	1000	180°	100°	-	-	20461083
6.0	1470	180°	100°	-	-	20460313
6.0	2000	150°	90°	-	-	20460326
6.0	3000	150°	90°	-	-	20461926
8.0	1000	140°	90°	90°	90°	20460314
8.0	1600	140°	90°	90°	90°	20460315
8.0	2000	140°	90°	90°	90°	20460316
8.0	3000	90°	90°	90°	90°	20460317
8.0	4000	90°	90°	-	-	20461797
8.0	5200	90°	90°	-	-	20460327
10.0	1000	140°	140°	140°	140°	20461018
10.0	1600	140°	140°	140°	140°	20460888
10.0	2000	140°	140°	140°	140°	20461927
10.0	3000	140°	140°	140°	140°	20460318
10.0	4000	140°	140°	140°	140°	20461802
10.0	5200	140°	140°	140°	140°	20461830
10.0	6000	90°	90°	-	-	20460807
11.0	1000	120°	120°	120°	120°	20461871
11.0	1600	120°	120°	120°	120°	20461581
11.0	2000	120°	120°	120°	120°	20460923
11.0	3000	120°	120°	120°	120°	20460806
11.0	4000	120°	120°	120°	120°	20461872
11.0	5200	120°	120°	90°	90°	20461876
11.0	6000	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:

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



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

Description:

The Eltrotec Flex endoscope NG, equipped with silica fibres, 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 fibre 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

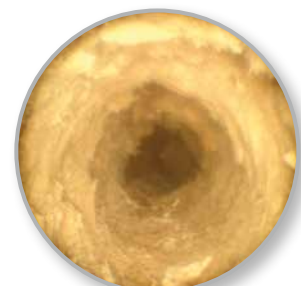
Application examples:



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
Probe tip length	45mm	85mm
Impermeability	probe and lens head are watertight	
Illumination	permanently connected fibre 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	1000	20571665
6	2000	20571714
6	3000	20571715
8	1000	20571712
8	2000	20571666
8	3000	20571680
8	4000	20571713

Accessories:

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



- 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

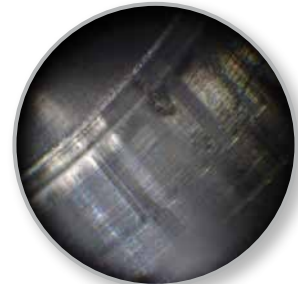
Description:

Eltrotec Flex MTFS are miniature flexible fibre-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.

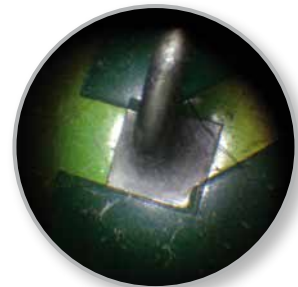
Features:

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

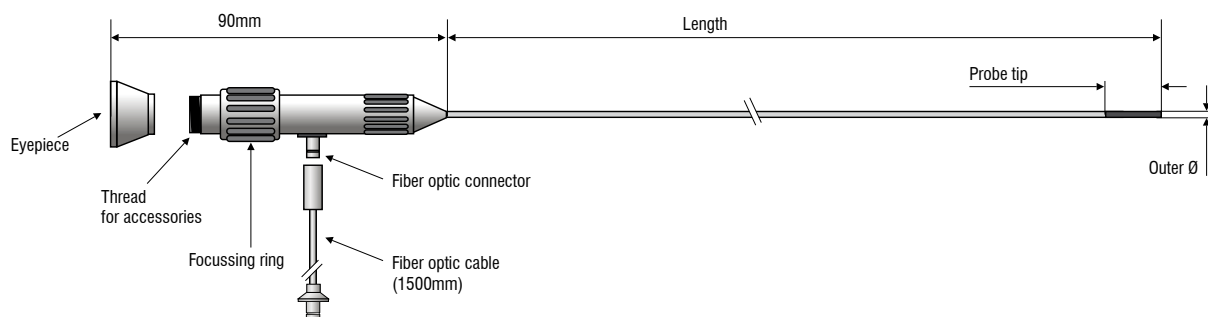
Application examples:



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	4000 image points	6000 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 bis 50mm			10mm bis ∞		
Dioptré 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 fibre 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	1000	0°	20561733
0,5	1500	0°	20561734
0,5	2000	0°	20561880
0,75	500	0°	20561004
0,75	1000	0°	20560321
0,75	1500	0°	20561732
0,75	2000	0°	20560939
1,0	500	0°	20560854
1,0	1000	0°	20560322
1,0	1500	0°	20561731
1,0	2000	0°	20560895
1,5	500	0°	20561000
1,5	1000	0°	20561589
1,5	1500	0°	20561584
1,5	2000	0°	20560896
2,0	500	0°	20561985
2,0	1000	0°	20561986
2,0	1500	0°	20561987
2,0	2000	0°	20561988
2,0	3000	0°	20561989
2,0	4000	0°	20561990
2,0	5000	0°	20561827
2,5	500	0°	20560336
2,5	1000	0°	20561983
2,5	1500	0°	20561984
2,5	2000	0°	20561689
2,5	5000	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 fibre optic cable

Accessories:	Article no.
Fibre optic cable for MTFS (1,500mm, Ø 2mm fibre 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:

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



- 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:

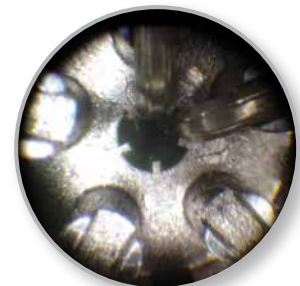
- Top-Line flexible endoscope
- 90° mirror head (with Flexibel Pro ø 5mm, optional 90° prism head)
- Top-Line SuperNova light source
- Robust aluminium case
- Li-Ion battery with charging device



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*
Length	1000mm	700mm	1200mm	850mm		
Resolution	18,000 image points	7000 image points		18.000 image points		
Direction of view	0° / 90°	0° / 90°		0°		
Field of view	40°	60°		45°		
Focal range	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°					
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 fibre optic cable EL 1/4 1800 MEP	21061030



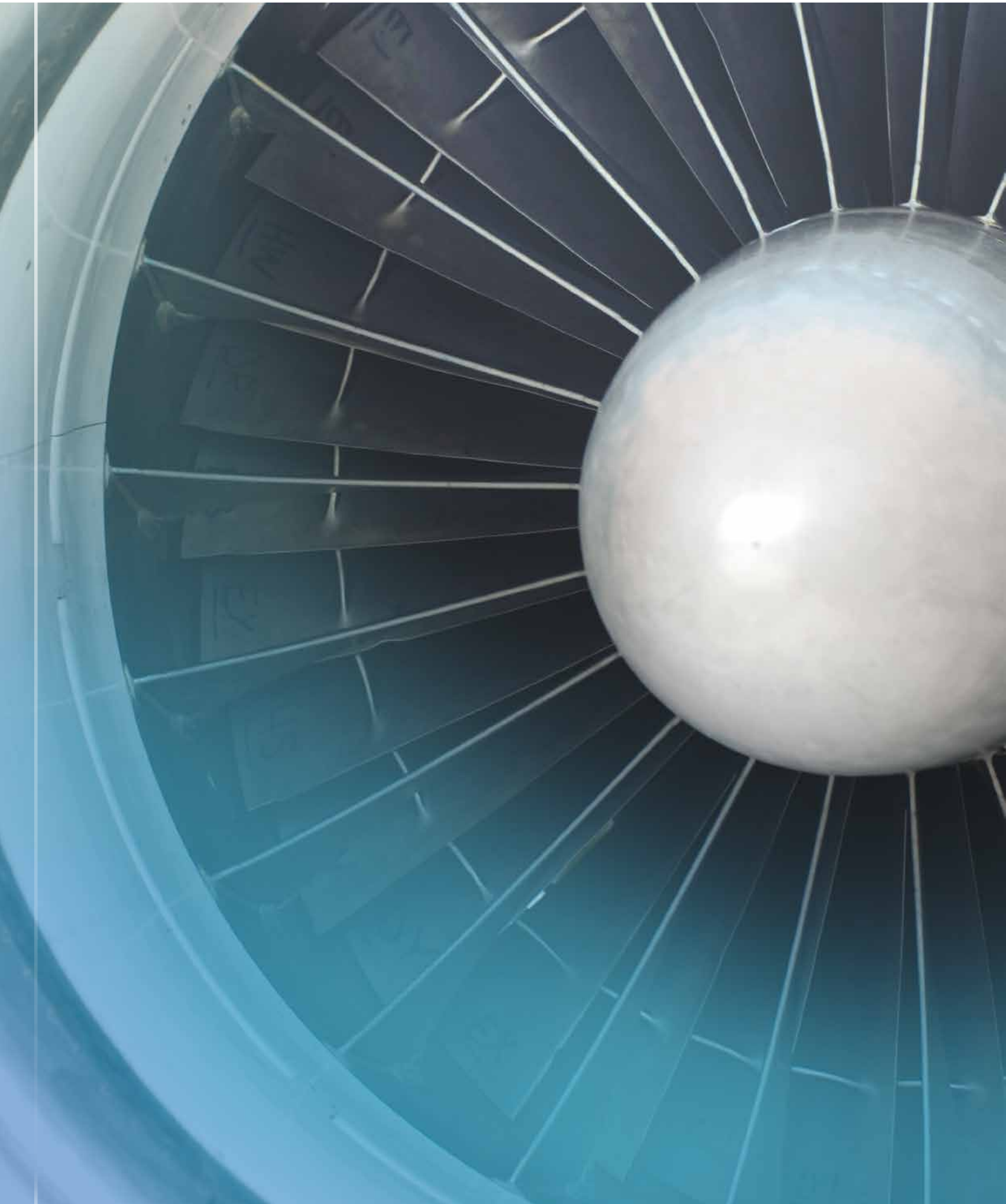
90° mirror head



90° prism head (optional)

Accessories:

Fibre 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





(Not available in USA)



- 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
- Flexible probe tip with lock brake
- Wide range of optional accessories

Complete set:

- Top-Line video endoscope
- + LED hand light source
- + Battery charger
- + Spare battery for LED hand light source
- + Spare monitor battery
- + Car battery charger cigarette lighter
- + Robust aluminium case



Application examples weld seam inspection:



Box



Pipeline

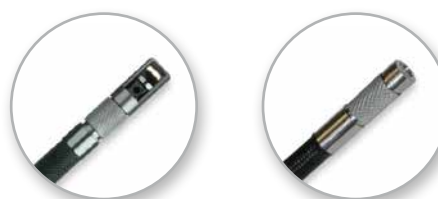


Plant engineering

Model	Top-Line Video Endoscope	
Outer-Ø	4mm	6mm
Length	1.5m / 3m	1.5m / 3m / 6m
Direction of view	0°	
Field of view	70°	
Focal range	15mm - ∞	
Articulation	2 times 150° up/down; 4 times 150° up/down; right/left	4 times 150° up/down; right/left
Length of probe tip	14mm	18.3mm
Min. bend radius	32mm	45mm
Image sensor	CMOS	
Illumination	mobile adjustable LED light source, Li-Ion accumulator, approx. 2.5 hours operating time	
Display	5" TFT/LCD display; rubber coating for shock absorption	
Interface	USB 1.1 / AV output	
Image storage	SD card (incl.)	
Image resolution	300,000 pixels	
Image format	JPEG (640x480)	
Video format	ASF (640x480) playback with Windows Media Player	
Firmware	text generator; digital zoom 2x, image rotation; image mirroring, connection for external monitor, date/time; language selection; automatic switch-off	
Power supply	5VDC (power supply included)	
Operating temperature	-25°C to +80°C; in water +10°C to +30°C	
Storage temperature	-30°C to +60°C	
Pressure resistance in air	up to 1bar	
Humidity	5 - 95 % relative humidity	
Fluid resistance	resistant to water up to 5% salinity and most oils (except hydraulic fluid)	
Water resistance	probe IP54 handle/ monitor IP53	
Weight	Length 1.5m = 0.9kg Length 3.0m = 1.0kg	Length 1.5m = 0.9kg Length 3.0m = 1.0kg Length 6.0m = 1.3kg
Protective sheathing	protective tube from tungsten braid 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
6	1500	4-times	20751756
6	3000	4-times	20751757
6	6000	4-times	20751768

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



Prism head 90°

Interchangeable close-focus head

Accessories

Prism head 90°		
Outer-Ø mm	Focal range	Article no.
4	12mm - ∞	20752113
6	12mm - ∞	20752104

Interchangeable close-focus head		
Outer-Ø mm	Focal range	Article no.
4	4mm - 22mm	20752170
6	4mm - 22mm	20752171

Rigidizer		
Outer-Ø mm	Ø/length mm	Article no.
4	4.8/432	20752245
6	8.0/432	20752246

Further accessories	Article no.
Stand	20752241
LED hand light source	20752242
Battery charger	20752243
Spare batteries for LED hand light source	20752244
Spare monitor battery	20752136



Rigidizer



LED light source



Stand



(Not available in USA)

- 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.

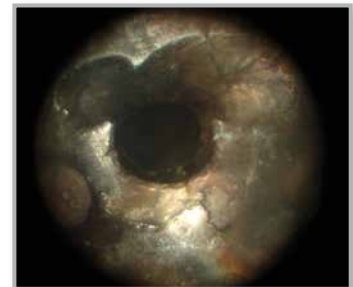
Features:

- 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:



Schweißnahtkontrolle



Korrosionskontrolle



Ablagerungen

Model	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	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

Outer-Ø mm	Length mm	Article no.
8	1500	20751758
8	3000	20751795
8	6000	20752088
8	12,000	20752089

Halogen High Performance Light Sources ELTROTEC Endlight FOT Halogen

- Universal light source
- Fibre-optic adaption
- FOT/VOLPI light conductor connection

Endlight 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 colour temperature of the light source

FOT Halogen	20	100	150
Power of lamp	20W	100W	150W
Max fibre Ø	5mm	13mm	13mm
Operating life type	~ 100h	1500h	100h
with economy mode	–	> 3000h	~ 210h
Weight	1.4kg	3.3kg	5.9kg
Power supply	230V / 50Hz	110V / 230V / 50Hz	
Light source	6V / 20W	12V / 100W	15V / 150W
Osram HLX type	64250	64637	64634
Colour temperature		3050K	3400K
Dimensions	90x65x150mm	130x190x280mm	180x180x230mm
Accessories		power cable 1.5m/	
Special feature		Iris and economy mode	
Article no.	20910382	20910403	20910384
Replacement lamp article no.	21322075	21310404	21320385



FOT 20



FOT 100



FOT 150

Fibre Optics for Light Sources

Type EL 1/4 1800 MEP/S

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

Liquid fibre 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 fibre lighting cables

Article	Article no.
Fibre optic EL 1/4 1800 MEP with Lemo 1 adapter	20710831/S
Fibre optic EL 1/4 1800 MEP/S with universal adapter	20711767
Fibre optic FL 1/4 1800 MEP with Lemo 1 adapter	20710446
Liquid fibre optic cable FL 1/4 1800 MEP/S with universal adapter	20711803
Liquid fibre optic cable FL 1/4 2500 MEP/S with universal adapter	20711899
Lemo 1 to fibre optic	21061030



Fibre optic cable EL

High Performance LED Light Source ELTROTEC Endolight FOT LED

- Low heat development
- Very long service life
- Strong white light LED



FOT LED	12
Optical output*	800lm
Light conductor adapter Ø	15mm
Operating life type	approx. 50.000h
Weight	1.6kg (without power supply)
Power supply	24VDC
Light source	white high power LED
Colour 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 fibre optic cable with
an active fibre 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	analogue input	0-10V, max. 10.5V
Pin 2	analogue 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



Endolight FOT Xenon	
Output	24W
Light output*	590lm
Operating life type	~ 500h
Weight	0.8kg
Power supply	100 - 240V, 50 - 60Hz
Light source	Xenon
Colour temperature	5000K
Dimensions	147.3 x 88.9 x 68 mm
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

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

Application examples with the use of our special fibre optic cables and systems:

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

Fibre-Optic Lighting Units

ELTROTEC components for visual inspections

Fibre 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.

Fibre optic cable*	Article no.
Fibre optic cable, UL1 - 1200	20710424
Fibre optic cable, UL1 - 1800	20710425

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



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



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

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



Mirror deflection	Article no.
US1 mirror on fixture, \varnothing 21mm	21060432
US2 mirror on fixture, \varnothing 25mm	21060433
USP mirror fixture	21060431



Focussing lens	Article no.
Focussing lens*, UFL	21060438

*attachable to UL light conductor



Top-Line Flexible Top Piece Camera 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 handheld 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!



Connection to Ø 32mm eyepiece



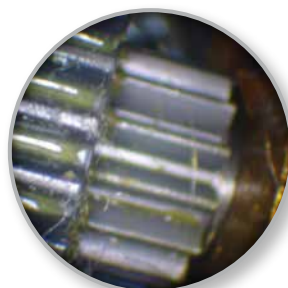
3,5" PVM video monitor (p.43)

Eltrotec Flexcam	
Video chip	1/4" colour 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. analogue monitors, NTSC	20751929

Application examples:



Inspecting screw threads



Inspecting cogs

Analogue Colour 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

Model	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	12VDC	12VDC
Dimensions	43.5x44x64.5mm	43.5x44x64.5mm
Weight	160g	160g
Article number	20961577	20961419

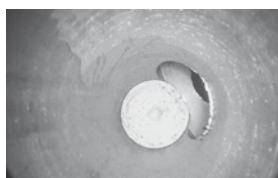
USB 2.0 Colour Camera Endo CU1/3, Endo CU1/2

- For endoscope coupling
- 1/3" CCD or 1/2" CMOS sensor
- 1024 x 768/ 1280 x 1024 pixels
- Up to 30 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

Model	Endo CU1/3	Endo CU1/3
Image sensor	1/3 CCD	1/3 CMOS
Resolution	1024x768 pixels	1280x1024 pixels
Resolution	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	12VDC	12VDC
Dimensions	34x32x34.4mm	34x32x27.4mm
Weight	75g	62g
Article number	20961703	20961601

Adapters

C-mount TV lens (zoom)	Article no.
Type f: Zoom with quick-release (f: 32 - 47mm) For all endoscope types with eyepiece \varnothing of 32mm	20961001
Type f: Focussing and zoom with quick-release (f: 18 - 35mm) For all endoscope types with eyepiece \varnothing of 32mm	20962209

C-mount TV lens (fixed focal length)	Article no.
Type f: 32mm, M14x1 For rigid endoscopes SKF-D and MKF-D with a \varnothing from 5.8mm	20961426
Type f: 47mm, M14x1 For rigid endoscopes SKF-D up to a \varnothing 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 \varnothing of 32mm ¹⁾	20751998
Type VC-25 For rigid endoscopes from 5.8mm, with eyepieces with a \varnothing of 32mm ²⁾	20751488
Type VC-35 For rigid endoscopes up to 4mm, with eyepieces with a \varnothing 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 \varnothing 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 \varnothing 32mm eyepiece	20751227

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



Monitors

- Visualisation of results
- Robust industrial monitors
- High colour brilliance

10" colour monitor:

- Automatic PAL / NTSC selection
- Automatic adjustment to monitor

17" colour monitor:

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



Model	Monitor 10"	Monitor 17"
Resolution in pixels	800x800	1280x1024
Display element	Colour TFT/LCD, 480,000 pixels	Colour TFT/LCD
Viewing angle	horizontal 110°, vertikal 80°	horizontal 160°, vertikal 160°
Screen diagonal	10.4", 26.4cm	17", 43cm
Typical brightness	220cd/m ²	250cd/m ²
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
Colour 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

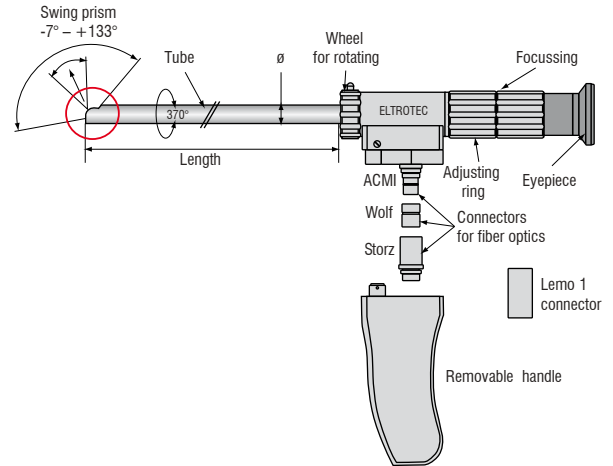
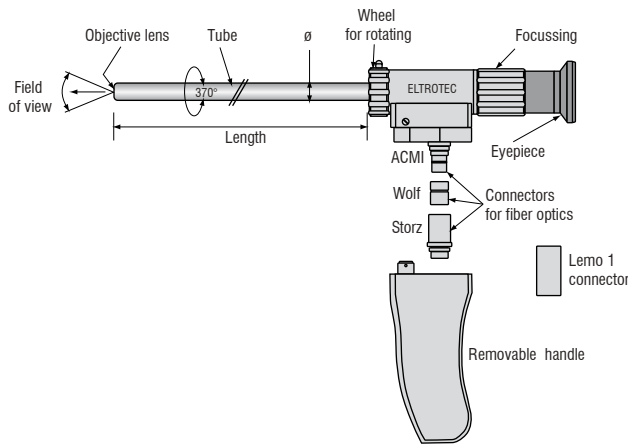
Description:

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).

Model	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



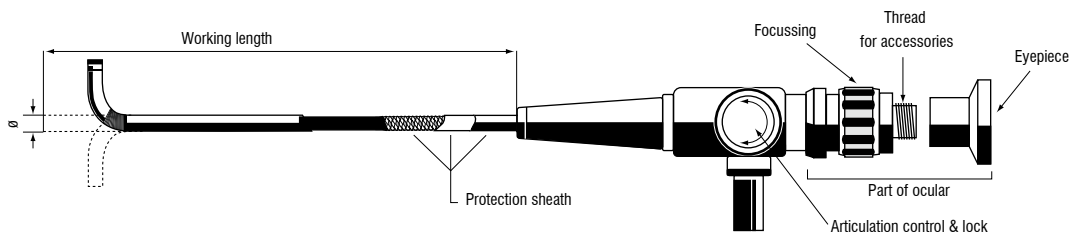
1 Components of rigid endoscopes



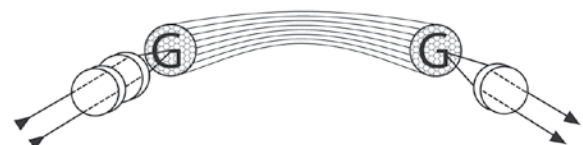
- The complete metal construction composed of a stainless steel tube, main section, eyepiece and handle from hardened, anodised aluminium, guarantee a long service life
- High quality and low maintenance due to precision mechanism

- 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 flexible endoscopes



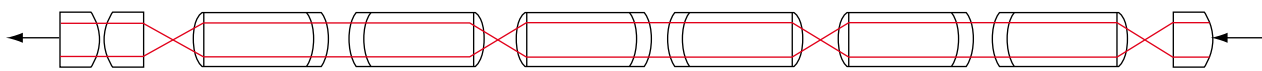
With flexible endoscopes the fibre bundle comprises up to 30,000 individual fibres. Each fibre transmits one pixel from the lens to the eyepiece. Here the light points are combined to form the final image. In order to do this the fibres must have the same geometrical arrangement at the start and finish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



3 Optical systems

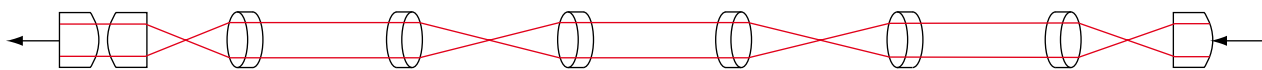
- Each endoscope employs special lens systems calculated by the aid of a computer software
- Optimal optical values and the best image quality due to GRIN lenses, achromatic or mixed systems
- In order to compensate for the disadvantage of low light conduction at small diameters, GRIN lens systems are 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

Rod lens system



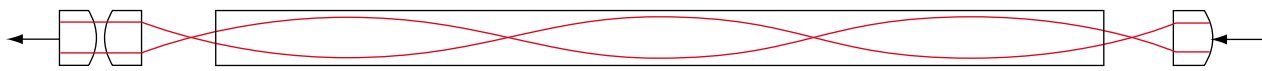
Objective

Achromatic system



Objective

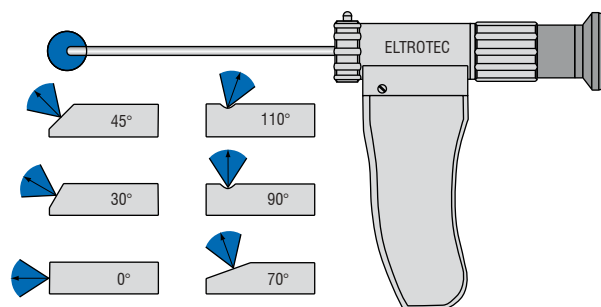
GRIN lens system



Objective

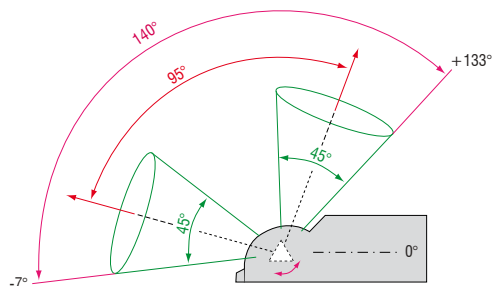
4 Direction of view

- 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



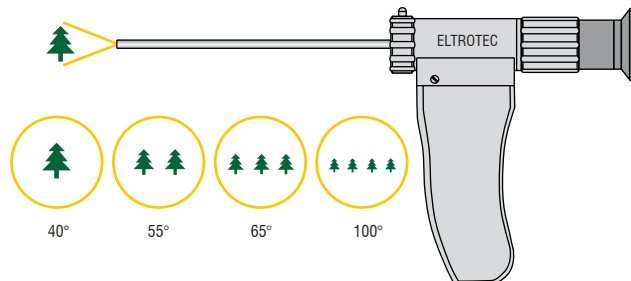
Swing-prism:

- 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.



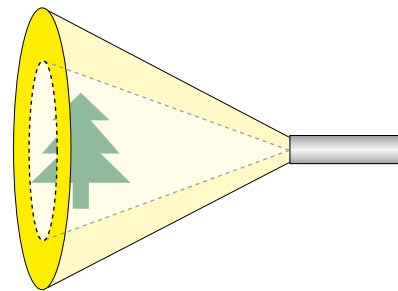
5 Field of View

- 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 fibre 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 fibres the light is transported without loss.

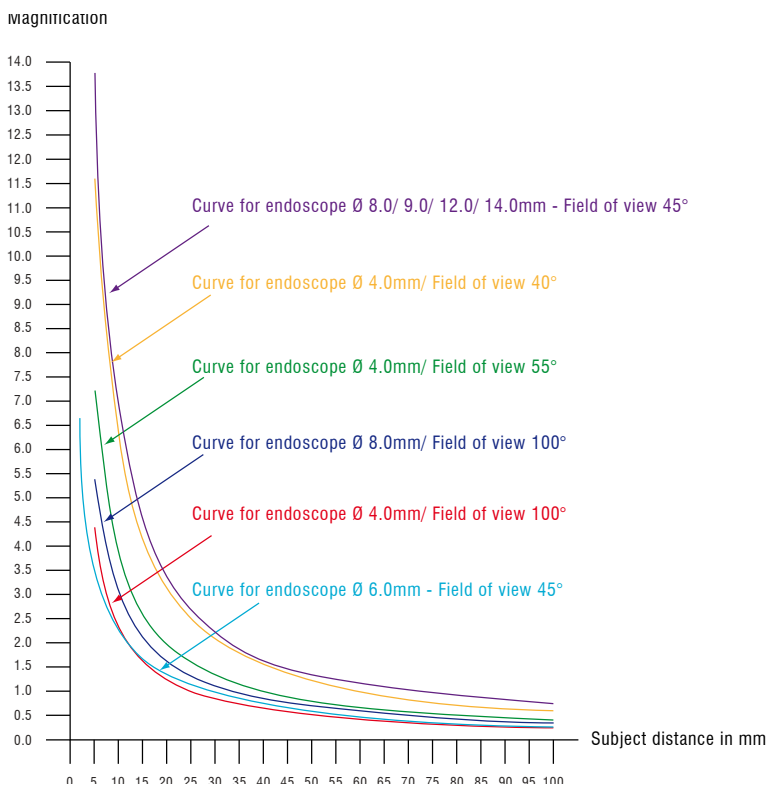


For warm light sources the following applies:

- 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 \varnothing of 15mm)
- Through the use of incandescent light sources it is possible to illuminate larger cavities than with glass fibre 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



Sensors and measurement devices for non-contact temperature measurement



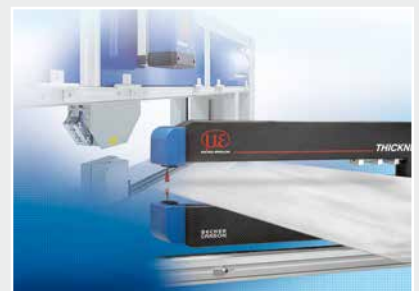
2D/3D profile sensors (laser scanner)



Optical micrometers, fibre optic sensors and fibre optics



Colour recognition sensors, LED analyzers and colour online spectrometer



Measurement and inspection systems



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