VISUAL INSPECTION
INDUSTRY AND PRODUCT SOLUTIONS

PRODUCT CATALOG

UPDATE: 01-Apr-2017

Schölly®
EXCELLENCE INSIDE

EXCELLENCE INSIDE
HAS JUST THE RIGHT SOLUTION FOR EVERY CHALLENGE.

Complex endoscopic visualization systems and modules for industrial inspection tasks.

There are increasing demands for flexible high-tech solutions when it comes to quality assurance in production as well as the inspection and maintenance of industrial machinery and equipment. Contributing factors for that are general cost pressure, the ever-decreasing size of the parts to be inspected, and growing regulatory requirements. The SCHÖLLY product portfolio ranges from optical components and image transmission to lighting, electronic components and complex visualization systems. It is our ability to assess and implement such complex systems that makes intelligent camera systems with associated controls possible in the first place, giving rise to many innovative products. Your specific application knowledge combined with our decades of experience in development and production as well as our technological capabilities are therefore at the heart of every individual customer solution.

In many industries and their specific fields of application, SCHÖLLY can implement these capabilities. Examples include the safety testing of parts in the automotive industry, applications in critical environments, and videoscope solutions for mobile applications. Many of our OEM customers present us with special challenges. In such cases, they benefit not only from the fact that SCHÖLLY is able to draw on in-house expertise, but also from its position in a professional network that includes research institutions and SMEs.

SCHÖLLY has an impressive network of production sites as well as sales and service offices spanning areas in Asia, Europe, the United States, and Brazil. Furthermore, SCHÖLLY has a reputation for being a company that understands how to combine superior technology, strategic foresight, and a strong sense of responsibility to achieve success.

EXCELLENCE INSIDE in Visual Inspection:

In terms of Visual Inspection we are, above all, the right partner in the following areas:

- Micro borescopes and videoscopes for quality control in the production of complex, miniaturized mechanical components
- MRO (maintenance, repair, and overhaul) and NDT (non-destructive testing) solutions
- Special borescopes for critical environments
- Customer-specific solutions based on the broad array of SCHÖLLY technologies
- Visual solutions to protect security forces in the fight against terrorism
- Country-specific technical service around the world

SCHÖLLY – PUTTING VISION INTO PRACTICE EVERYDAY.

ALWAYS THE SUITABLE SOLUTION

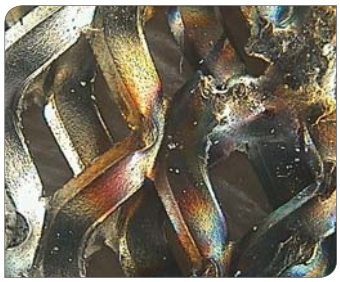
As specialist for endoscopic visualization solutions we combine profound application knowledge with the use of cutting-edge technologies. We define our scope of work depending on customers' requests and demands.

In this catalog you find our standard product program with a wide range of combination possibilities. Our standard products are of high-quality, competitive and available at short notice.

You do not find the best solution for your application? A lot of customized solutions can be realized individually through small adjustments of our standard products.

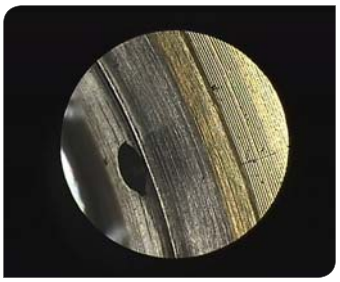
EXCELLENCE INSIDE DELIVERS PRECISE RESULTS FOR A WIDE RANGE OF VISUAL INSPECTIONS.

Visual inspection tasks in industrial fields for example in production processes or maintenance, are very versatile. You can find a small selection of these applications on the pictures below. Let you inspire by high quality images in small diameters!

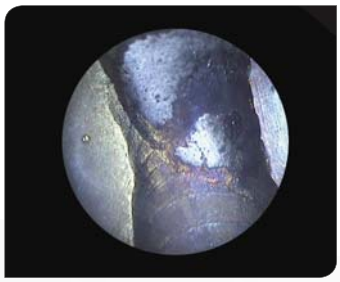


Production failure in soldering process

Examination of position and deburring in a noozle body in the production process



Checking for return holes in a nozzle

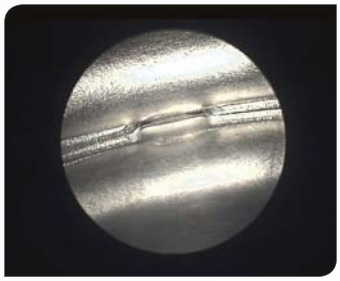


Run-out of a welded seam

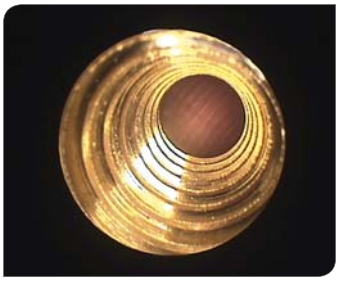
Borderline case of a steering rack for a steering gear

Inspection of a drill hole intersection for ensuring it is burr-free

Checking the position of the intersection of two holes in a heat exchanger



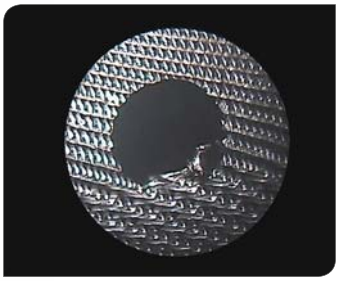
Interrupted weld seam due to erroneously positioned sheet metal parts



Well cutted inner threads in hollow shaft for precision clocks

Inspection of a drill hole for ensuring it is burr-free

Badly centered boring changeover in pump housing



Metal filter with material covering at the end part of the filter before beading

Do you have an inspection challenge or is the product you are looking for not featured on the next pages? Contact us. We are pleased to advise you on prospective inspection possibilities for your component and we will create an individual offer for you.

PRODUCTS

CONTENT

PRODUCT SELECTION

Straight access to inspection site

Selection of probe/borescope	Probe characteristics			Inspection criteria		Inspection results
	Working diameter ≤ 4 mm	Working diameter ≥ 4 mm	Version	Type of visual inspection	Product version	Desired quality
FlexiScope 2 and 3 probes (p. 20 ff)	1.0 - 4 mm		Rigid	💻	Stationary	HD
Micro borescopes (p. 34 ff)	1.8 - 4 mm		Rigid	💻	Stationary	Full HD/HD
						PAL
				👁	Mobile	Direct view through the human eye
Universal borescopes (p. 37 ff)		4 - 10 mm	Rigid	💻	Stationary	Full HD/HD
						PAL
				👁	Mobile	Direct view through the human eye

Bent access to inspection site

Selection of probe/borescope	Probe characteristics			Inspection criteria		Inspection results
	Working diameter ≤ 4 mm	Working diameter > 4 mm	Version	Type of visual inspection	Product version	Desired quality
Micro borescopes (p. 36 ff)	0.35 - 2.4 mm		Flexible	💻	Stationary	Full HD/HD
						PAL
				👁	Mobile	Direct view through the human eye
Fiberscopes (p. 45 ff)	3.4 mm	6 mm	Flexible	💻	Stationary	HD
						PAL
				👁	Mobile	Direct view through the human eye
FlexiScope 2 and 3 probes (p. 20 ff)	0.7 - 4 mm		Flexible	💻	Stationary	HD
EzyScope videoscope (p. 27 ff)	3.8 mm	4.1 mm	Flexible	💻	Mobile	PAL
					Stationary	PAL

Explanation

👁 = Inspection results are viewed directly by the human eye

💻 = Inspection results are digitalized and displayed on a monitor

Our product range offers systems for all different kinds of applications. For your inspection tasks, you can find devices with large or small diameters, flexible or rigid systems and solutions for variable tasks. The right inspection system for you depends on a number of factors. Is the inspection site easily accessible or is the access route bent? How big is the diameter of the access opening? Is the inspection a serial inspection or a spot check? Does the inspection system need to be integrated in the process in a fixed position or can it be used as a mobile application?

Find the product that fits your requirement in the table below. We will also be happy to advise you in person.

Required equipment			
Camera base unit	**Head / Handpiece**	**Light source / Light guide**	**Monitor / Software**
FlexiVision 100 (p. 17)	FlexiScope 3 (p. 19)	Not required, LED included	Required (p. 48 ff)
FlexiVision 100 (p. 17)	HD camera head (p. 18)	Required (p. 60 ff)	Required (p. 48 ff)
FlexiScope IQ101 (p. 29)	-		
-	-	Required (p. 59)	-
FlexiVision 100 (p. 17)	HD camera head (p. 18)	Required (p. 60 ff)	Required (p. 48 ff)
FlexiScope IQ101 (p. 29)	-		
-	-	Required (p. 59)	-

Required equipment			
Camera base unit	**Head / Handpiece**	**Light source / Light guide**	**Monitor / Software**
FlexiVision 100 (p. 17)	HD camera head (p. 18 ff)	Required (p. 60 ff)	Required (p. 48 ff)
FlexiScope IQ101 (p. 29)	-		
-	-	Required (p. 59)	-
FlexiVision 100 (p. 17)	HD camera head (p. 18)	Required (p. 60 ff)	Required (p. 48 ff)
FlexiScope IQ101 (p. 29)	-		
-	-	Required (p. 59)	-
FlexiVision 100 (p. 17)	FlexiScope 3 (p. 19)	Not required, LED included	Required (p. 48 ff)
EzyScope mobile (p. 25)	-	Not required, LED included	Not required, display included
EzyScope Set (p. 26)	-		


FlexiVision 100
Schölly

INSPECTION SYSTEMS

Compact, individual, modular and ideal aligned. For professional and secure but notwithstanding for easy executing your inspection task we offer you different inspection systems as full complete systems like mentioned below. Whether as stationary or portable version, for visual inspection in smaller or bigger diameters, flexible or rigid or for changing testing tasks, in this section you will find the ideal systems for your application.

Combine your inspection system in the way your inspection application requires.

FLEXIVISION® 100 - CAMERA BASE UNIT WITH CONNECTION OPTIONS FOR DIFFERENT DEVICES

The FlexiVision 100 is a new camera base unit that delivers brilliant full HD images for visual inspections. It is perfect for complex, frequently changing inspection tasks. The FlexiVision 100 connects to different devices, such as the FlexiScope 3 camera handpiece and the HD camera head. Combined with the FlexiScope 3 camera handpiece, it can be used with all FlexiScope 2 and 3 probes. With the HD camera head connected, borescopes and fiberscopes with DIN ocular can be used. During the inspection, video algorithms can be used to obtain further image information. The inspection recordings can be saved quickly and easily on a USB stick.

EZYSCOPE FAMILY - THE FAMILY OF VIDEOSCOPES

The EzyScope videoscope is available as a stationary or mobile variant. Both can be combined with the videoscope probes in different lengths and designs. The two-way deflecting videoscope tip is easily controlled by an adjusting lever on the camera head. The integrated camera technology in the probe tip generates full format images.

FLEXISCOPE IQ101 - COMPACT CCD CAMERA FOR SIMPLE INSPECTION TASKS

The FlexiScope IQ101 is a reasonably priced camera and the ideal choice for simple applications. With the integrated anti-moiré filter, the camera delivers good inspection results, even in combination with fiberscopes or borescopes with image bundles.


FlexiVision 100
Schölly
Germany

THE NEW **FLEXI**VISION® 100 - REVOLUTIONIZING VISUAL INSPECTIONS

Premium full HD image quality

With high resolution 1920 x 1080 pixel image rendering, every surface structure inspected with a borescope is sharp, high in contrast and true to its color on the monitor.

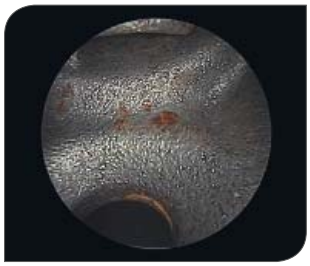
Compatible with different devices

The FlexiVision 100 can be combined with the FlexiScope 3 camera handpiece and the HD camera head*. All probes of the FlexiScope 2 and 3 system and all borescopes with a DIN ocular can therefore be used.

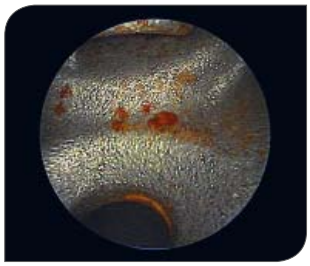
Clear defect identification

The use of video algorithms means defects can be identified more quickly and clearly. The algorithms can be selected and they visually point out surface abnormalities that need closer examination.

The video algorithm "Selective Color Enhancement" enhances a defined color shade e.g. corrosion brown.

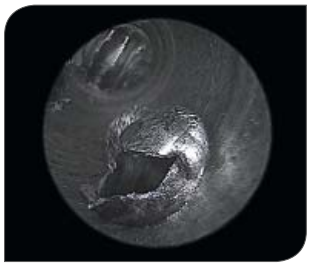


Original

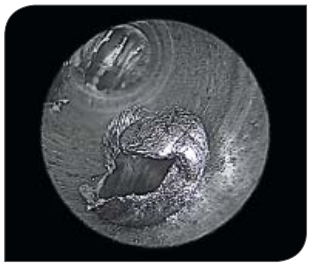


With video algorithm "Selective Color Enhancement"

With the video algorithm “Edge Enhancement“ edges can be highlighted, thus the operator detects uneven surfaces better.



Original



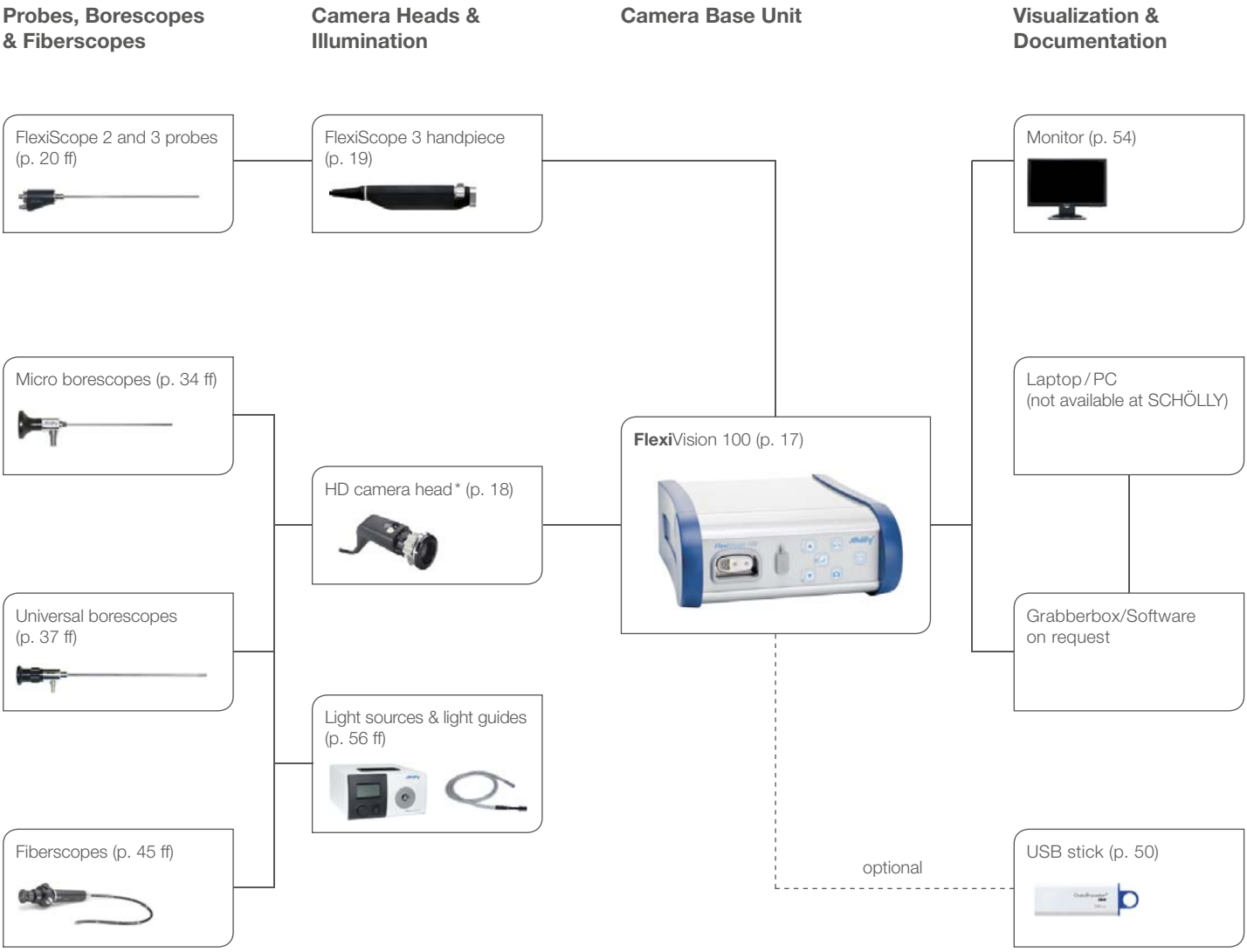
With video algorithm "Edge Enhancement"

The HD camera head will be available at the beginning of the 4th quarter 2017.

FLEXIVISION® 100

COMBINATION POSSIBILITIES

To get a fully functioning inspection system, please use the following overview. First choose the type of probe, fiberscope or borescope suitable for you in the first column, then follow the line to the right. By selecting the products from left to right, you will end up with the inspection equipment you require.



The HD camera head will be available at the beginning of the 4th quarter 2017.

FLEXIVISION® 100 Camera Base Unit

FLEXIVISION® 100 **CAMERA BASE UNIT**

The FlexiVision 100 is the new camera base unit for industrial applications. It can be combined with the FlexiScope 3 camera handpiece and the HD camera head. All FlexiScope 2 and 3 probes can be used with the FlexiScope 3 camera handpiece. Borescopes and fiberscopes with DIN ocular can be connected via the HD camera head. The useful features of the FlexiVision 100 mean relevant image information can be obtained during the inspection, making the inspection process more efficient and reliable. It can be used for a variety of complex visual inspections in production and maintenance.

Control elements on front panel	ON/OFF switch, menu, menu navigation, brightness +/-, image, white balance
Front connections	Socket for FlexiScope 3 camera handpiece and HD camera head, socket for USB
Outputs	2 x DVI, 2 x HD-SDI, 2 x 3.5 mm jack sockets for foot switch
Mains supply	100 - 240 V AC, 50/60 Hz
Dimensions	225 x 92 x 282 mm (W x H x D)
Weight	4 kg
Configuration	Pre-defined settings for different inspection applications Two freely configurable inspection applications Numerous software settings possible (algorithms, basic settings, file names, etc.)
Connecting devices	FlexiScope 3 camera handpiece (p. 19) HD camera head for FlexiVision 100 (p. 18)

Item no.	Description
95.4001	FlexiVision 100 camera base unit, including DVI cable, 16 GB USB stick, power supply unit and cleaning material
95.4001.XT	FlexiVision 100 camera base unit with extended software functions, including DVI cable, 16 GB USB stick, power supply unit and cleaning material
96.0040	FlexiVision 100 camera base unit with FlexiScope 3 camera handpiece, including DVI cable, 16 GB USB stick, power supply unit and cleaning material, set supplied in transport case
95.4110	FlexiVision 100 camera base unit with HD camera head, including DVI cable, 16 GB USB stick, power supply unit and cleaning material, set supplied in transport case

HD Camera Head

HD CAMERA HEAD

The HD camera head excels in HD capability, delivering brilliant results for visual inspections when combined with the necessary borescopes and the FlexiVision 100 camera base unit. Borescopes and fiberscopes with DIN ocular can be connected to the HD camera head.

Image sensor	1/3" CMOS
Image resolution	1920 x 1080 pixels, full HD
Image format	16:9
Control elements	3 individually programmable, illuminated buttons
Endocoupler	Integrated parfocal zoom for standard DIN ocular
Focal length	f = 14.25 - 28 mm
Camera cable	3.5 m
Weight	220 g (excl. cable)
Dimensions	135 mm (length), 50 mm (diameter)

Item no.	Description
95.4100	HD camera head for FlexiVision 100

The HD camera head can be combined with all borescopes and fiberscopes listed from page 30 onwards.
HD-capable borescopes are identified there.

The HD camera head will be available at the beginning of the 4th quarter 2017.

FLEXISCOPE 3 Camera Handpiece

FLEXISCOPE 3 **CAMERA HANDPIECE**

The FlexiScope 3 camera handpiece combines the advantages of the FlexiScope concept with the advantages of the FlexiVision 100 camera base unit. The quick coupling mechanism ensures that a variety of probes can be connected at any time and for new applications. Thanks to the easy-to-use ergonomic handpiece, the Flexiscope 3 ensures you can carry out your work even over longer periods without getting tired, for example when performing visual inspections in a production line. The integrated LED lighting ensures a bright illumination of the field of vision.

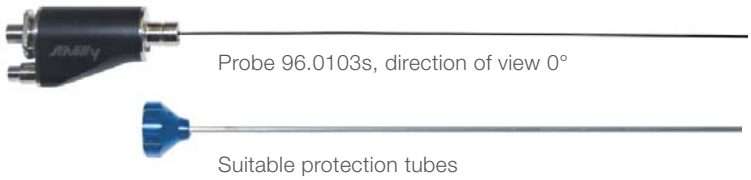
Image sensor	1/3" CMOS
Image resolution	1920 x 1080 pixels, full HD
Image format	16:9
Lighting	Integrated LED lighting in the handpiece
Camera cable	2.5 m
Weight	125 g (excl. cable)
Dimensions	155 x 19 x 29 mm (L x W x H)

Item no.	Description
96.0024	FlexiScope 3 camera handpiece with 2.5 m cable length

Can be combined with all FlexiScope 2 and 3 probes.

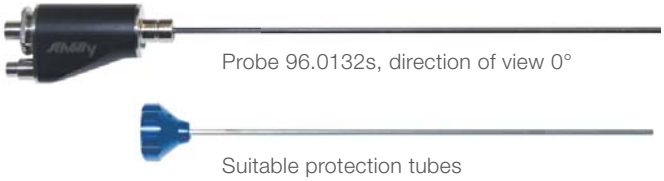
FLEXISCOPE **2** and **3** Probes and Protection Tubes

PROBES AND PROTECTION TUBES FOR FLEXISCOPE 2 AND FLEXISCOPE 3 SYSTEMS, Ø 0.7 MM AND 1.0 MM



Item number	Working Ø	Working length	Direction of view	Field of view	Image bundle (pixel)	Description
96.0103s	0.7 mm	150 mm	0°	70°	6,000	Synthetic tube
96.0124s	1.0 mm	150 mm	0°	60°	17,000	Nickel titan tube
MSP.10150	1.0 mm	150 mm	-	-	-	Protection tube for 96.0103s
MSP.12150	1.2 mm	150 mm	-	-	-	Protection tube for 96.0124s

PROBES AND PROTECTION TUBES FOR FLEXISCOPE 2 AND FLEXISCOPE 3 SYSTEMS, Ø 1.6 MM

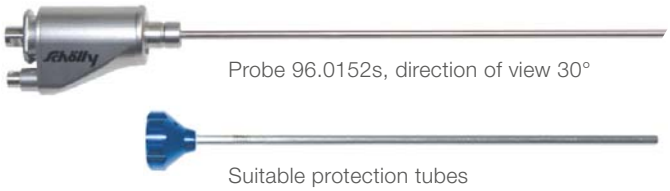


Item number	Working Ø	Working length	Direction of view	Field of view	Image bundle (pixel)	Description
96.0142s	1.6 mm	100 mm	0°	85°	30,000	Nickel titan tube
96.0132s	1.6 mm	135 mm	0°	85°	30,000	Nickel titan tube
96.0123s	1.6 mm	150 mm	0°	70°	17,000	Synthetic tube
96.0165s	1.6 mm	135 mm	0°	30°	17,000	Stainless steel tube
96.0166s	1.6 mm	150 mm	30°	75°	17,000	Synthetic tube
96.0167s	1.6 mm	150 mm	70°	75°	17,000	Synthetic tube
96.0168s	1.6 mm	150 mm	90°	75°	17,000	Synthetic tube
MSP.18100	1.8 mm	100 mm	-	-	-	Protection tube for 96.0142s
MSP.18135	1.8 mm	135 mm	-	-	-	Protection tube for 96.0132s
MSP.19150	1.9 mm	150 mm	-	-	-	Protection tube for 96.0123s

Probes in other lengths, diameters or materials will be verified on request.

FLEXISCOPE **2** and **3** Probes and Protection Tubes

PROBES AND PROTECTION TUBES FOR FLEXISCOPE **2 AND FLEXI**SCOPE **3 SYSTEMS, Ø 2.0 MM**



Probe 96.0152s, direction of view 30°

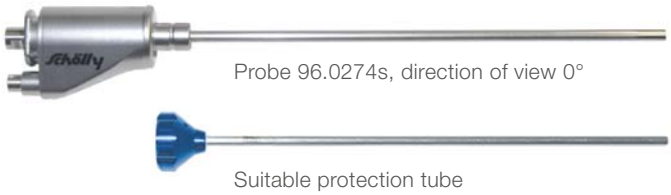
Suitable protection tubes

Item number	Working Ø	Working length	Direction of view	Field of view	Image bundle (pixel)	Description
96.0134s	2.0 mm	135 mm	0°	85°	30,000	Stainless steel tube
96.0158s	2.0 mm	135 mm	0°	90°	50,000	Stainless steel tube
96.0152s	2.0 mm	135 mm	30°	90°	50,000	Stainless steel tube
96.0172s	2.0 mm	135 mm	70°	75°	30,000	Stainless steel tube
96.0173s	2.0 mm	135 mm	90°	75°	30,000	Stainless steel tube
MSP.24135	2.4 mm	135 mm	-	-	-	Protection tube for 96.0134s and 96.0158s
MSP.24132	2.4 mm	132 mm	-	-	-	Protection tube for 96.0152s (exposed probe tip)

Probes in other lengths, diameters or materials will be verified on request.

FLEXISCOPE **2** and **3** Probes and Protection Tubes

PROBES AND PROTECTION TUBES FOR FLEXISCOPE **2 AND FLEXI**SCOPE **3 SYSTEMS, Ø 2.7 MM**



Probe 96.0274s, direction of view 0°

Suitable protection tube

Item number	Working Ø	Working length	Direction of view	Field of view	Description
96.0274s	2.7 mm	110 mm	0°	75°	Rod lenses /stainless steel tube
96.0273s	2.7 mm	110 mm	30°	75°	Rod lenses /stainless steel tube
96.0280s	2.7 mm	110 mm	30°	75°	Rod lenses /stainless steel tube direction of view 180° turned to 96.0273s
96.0275s	2.7 mm	110 mm	70°	75°	Rod lenses /stainless steel tube
96.0288s	2.7 mm	179 mm	0°	85°	Rod lenses /stainless steel tube
96.0297s	2.7 mm	179 mm	30°	85°	Rod lenses /stainless steel tube
96.0299s	2.7 mm	179 mm	70°	75°	Rod lenses /stainless steel tube
96.0293s	2.7 mm	290 mm	0°	75°	Rod lenses /stainless steel tube
96.0294s	2.7 mm	280 mm	30°	75°	Rod lenses /stainless steel tube
96.0298s	2.7 mm	290 mm	70°	75°	Rod lenses /stainless steel tube
MSP.30110	3.0 mm	100 mm	-	-	Protection tube for 96.0273s, 96.0275s, 96.0280s (exposed probe tip)
MSP.30118	3.0 mm	105 mm	-	-	Protection tube for 96.0273s, 96.0280s 0.1 mm protrusion with fixing screw
MSP.30111	3.0 mm	111 mm	-	-	Protection tube for 96.0274s 0.5 mm protrusion
MSP.30172	3.0 mm	172 mm	-	-	Protection tube for 96.0297s (exposed probe tip)
MSP.30174	3.0 mm	174 mm	-	-	Protection tube for 96.0288s 0.5 mm protrusion
MSP.30280.1	3.0 mm	293 mm	-	-	Protection tube for 96.0298s 3 mm protrusion with fixing screw

Probes in other lengths, diameters or materials will be verified on request.

FLEXISCOPE **2** and **3** Probes and Protection Tubes

PROBES AND PROTECTION TUBES FOR FLEXISCOPE 2 AND FLEXISCOPE 3 SYSTEMS, Ø 4.0 MM

Probe 96.0403s, direction of view 30°

Item number	Working Ø	Working length	Direction of view	Field of view	Description
96.0405s	4.0 mm	170 mm	0°	85°	Rod lenses/stainless steel tube
96.0403s	4.0 mm	170 mm	30°	85°	Rod lenses/stainless steel tube
96.0404s	4.0 mm	170 mm	45°	85°	Rod lenses/stainless steel tube
96.0406s	4.0 mm	170 mm	70°	85°	Rod lenses/stainless steel tube
96.0407s	4.0 mm	298 mm	0°	70°	Rod lenses/stainless steel tube
96.0408s	4.0 mm	298 mm	30°	70°	Rod lenses/stainless steel tube
96.0409s	4.0 mm	300 mm	65°	70°	Rod lenses/stainless steel tube
96.0410s	4.0 mm	425 mm	45°	65°	Rod lenses/stainless steel tube

Probes in other lengths, diameters or materials will be verified on request.

Inspection Systems

EZYSCOPE Family

COMBINATION POSSIBILITIES

To get a fully functioning inspection system, please use the following overview. First choose a videoscope in the first column and then follow the line to the right. By selecting the products from left to right, you will end up with the inspection equipment you require.

Videoscopes

Illumination, Visualization & Documentation

EzyScope mobile (p. 25)

EzyScope videoscope (p. 27)

EzyScope stationary (p. 26)

Monitors (p. 52 ff)

Software (p. 50)

Laptop / PC
(not available at SCHÖLLY)

EZYSCOPE Mobile

EZYSCOPE **MOBILE**

The EzyScope mobile is a modern videoscopy system designed especially for mobile use. Due to its compact and lightweight design, it is easy and transportable, making it usable in almost every application area. The integrated battery pack allows independent inspections for up to three hours. The clear and intuitive menu navigation guarantees quick and easy on-site inspections. The function buttons on the videoscope can be used to set the brightness directly and save image and video files. The additional audio function enables you to record comments to accompany the video recording.

Display	LCD with touch panel, 8,4", resolution 800 (H) x 600 (V) pixels
Inputs and outputs	2 x 3.5 mm jack sockets (microphone input, headset output)
Media	SD memory card (8 GB incl.), video in AVI format, image in JPEG format
Battery pack	LiFePO4 (lithium iron phosphate battery) 30 Wh Battery operating time: approx. 3 h (depending on the operation mode and the ambient conditions) Battery recharging time: approx. 2 h
Mains supply	100 - 240 V AC, 47/60 Hz
Dimensions	220 x 205 x 80 mm (W x H x D)
Weight controller	1.5 kg
Operation temperature	-10 °C up to +40 °C
Outer material probe	Tungsten braided
Probe length	2,000 mm
Probe Ø	4.1 mm
Field of view	120°
Image sensor	1/18" CMOS
Direction of view	0°
Deflection	2 x 160°

Item number	Description
EZ.412000.M	EzyScope mobile with 4.1 mm videoscope, tungsten braided and 2,000 mm working length, mobile controller and display device, mains supply unit, carrying strap and transport case

EzyScope mobile probes can also be used with the stationary camera controller EzyScope.
Further videoscopes can be found on page 27.

EZYSCOPE Set

EZYSCOPE **SET**

Visual inspections and documentation of test results are important for production processes. The increasing complexity during the manufacturing of sophisticated components and products like aluminum castings require new examination systems for visual inspection. The EzyScope Set consists of a videoscope with ergonomic camera head, an integrated high power LED light source, a stationary camera controller unit as well as a high-resolution 10.4” TFT monitor. MediaWorkStation, the additionally available software, easily documents and archives test results. EzyScope allows you to make quick and reliable inspections on a high level and guarantees a comfortable handling due to its optimal designed camera head.

Control panel	Brightness control (+/-), indication illumination, standby button
Video outputs	2 x Composite Video (CVBS), 2 x Remote
Digital output	1 x USB 2.0
Mains supply	100 - 240 V AC, 50/60 Hz
Power consumption	max. 30 VA
Dimensions	243 x 65.6 x 229.5 mm (W x H x D)
Weight camera controller	2.2 kg
Outer material probe	Tungsten braided
Probe Ø	4.1 mm
Field of view	120°
Image sensor	1/18" CMOS
Direction of view	0°
Deflection	2 x 160°

Item number	Description
EZ.411000.SET	Ezyscope Set: camera controller, videoscope Ø 4.1 mm, 1,000 mm working length, 10.4" TFT monitor and transport case; demo-software for image and video recording and storage (MediaWorkStation)
EZ.412000.SET	Ezyscope Set: camera controller, videoscope Ø 4.1 mm, 2,000 mm working length, 10.4" TFT monitor and transport case; demo-software for image and video recording and storage (MediaWorkStation)

EzyScope Set videoscopes can also be used with the camera controller EzyScope mobile.

Further videoscopes can be found on page 27.

EZYSCOPE Videoscopes

EZYSCOPE **VIDEOSCOPES**

The EzyScope videoscope is available in different working lengths and material designs. It is combinable with the EzyScope mobile and the stationary EzyScope. Thanks to the ergonomically shaped handpiece, the probe can be operated during the inspection in an easy and fatigue-proof manner. The adjusting lever can be used for two-way deflection of the probe tip.
The integrated LED technology provides homogeneous lighting of the field of vision. The videoscope is equipped with a 1/8" CMOS image sensor located directly in the probe tip (chip-in-tip video technology). This generates full format inspection images. A tungsten braid protects the probe from abrasion and wear in particular. This makes it ideal for rough applications.

Item number	Working Ø	Working length	External material	Tip deflection	Weight (excl. cable)
EZ.381000.CAM	3.8 mm	1,000 mm	Synthetic tube	2 x 160°	300 g
EZ.411000.CAM	4.1 mm	1,000 mm	Tungsten braided	2 x 160°	320 g
EZ.412000.CAM	4.1 mm	2,000 mm	Tungsten braided	2 x 160°	340 g

The EzyScope videoscopes can be combined with the stationary EzyScope and the EzyScope mobile.

FLEXISCOPE **IQ**101

COMBINATION POSSIBILITIES

To get a fully functioning inspection system, please use the following overview. First choose the type of borescope you want to use from the first column and then follow the line to the right. By selecting the products from left to right, you will end up with the inspection equipment you require.

Borescopes & Fiberscopes

Micro borescopes (p. 34 ff)

Universal borescopes (p. 37 ff)

Fiberscopes (p. 45 ff)

Camera & Illumination

FlexiScope IQ101 Compact (p. 29)

FTCO.CC.01

FlexiScope IQ101 Compact (p. 29)

FTCO.CC.03

Light source & Light guide (p. 56 ff)

Visualization & Documentation

Monitors (p. 52 ff)

Monitors (p. 52 ff)

Software (p. 50)

Laptop/PC
(not available at SCHÖLLY)

FLEXISCOPE **IQ**101 Compact CCD Camera

FLEXISCOPE **IQ**101 **COMPACT CAMERA**

The FlexiScope IQ101 Compact is a compact CCD camera system. The integrated electronics offer an optimized image quality and allow for control of several functions from the camera head directly. The ergonomic camera head design offers a comfortable and fatigue-free work over long periods of time. Thanks to the integrated anti-moiré filter, the FlexiScope IQ101 Compact provides clear images when used with rigid borescopes as well as flexible fiberscopes. The system comes with a smartbox which transmits images directly to a monitor or PC.

Operation control	White balance / automatic brightness control on/off, start/stop video recording on PC	
Outputs	Y-distributor cable	1 x Video (CVBS)
	Smartbox	1 x USB 2.0, 1 x Video (CVBS)
Camera head	Image sensor	1/3" CCD
	Image resolution	470 (H) x 420 (V) PAL
	Image resolution act. pixels	440,000 (PAL)
	Light sensitivity	2 Lx / f = 1.4
	Borescope coupler	for standard DIN ocular, detachable, C-mount
	Focal length TV adapter	f = 23 mm
System	Mains supply	100 - 240 V AC, 50/60 Hz
	Power consumption	2 VA
Dimensions	Smartbox	80 x 34 x 170 mm (W x H x D)
	Camera head	135 x 50 mm (L x Ø)
	Camera cable	3 m
Weight	Smartbox	200 g
	Camera head	300 g

Item number	Description
FTCO.CC.01	FlexiScope IQ101 Compact CCD Camera (PAL), anti-moiré, incl. Y-distributor cable and transport case
FTCO.CC.03	FlexiScope IQ101 Compact CCD Camera (PAL), anti-moiré, incl. Smartbox for USB 2.0 and transport case, demo version for image and video recording as well as archiving (MediaWorkStation)

A power cord is always included. Please specify plug type.


Schölly
FIBEROPTIC GMBH

BORESCOPES AND FIBERSCOPES

The range of borescopes and fiberscopes from SCHÖLLY offers you a variety of inspection instruments. For the smallest components and finest holes, choose one of our micro borescopes from the micrendo series, which are available from a working diameter of 0.35 mm and above. From a working diameter of 4 mm, choose one of our FlexiLux Universal borescopes, which have a modular design. With the interchangeable objectives and rotatable objective tubes, you just need one borescope to be able to carry out inspections with differing directions of view. If the inspection object has limited access options and rigid borescopes can't get to the inspection site, you can choose SCHÖLLY fiberscopes. These can be used for access points over 3.4 mm. The flexible design and deflecting tips make these fiberscopes ideal for inspection areas which need to be accessed via angled routes.

Via a light guide connected to a light source, borescopes and fiberscopes can be used for direct visual inspections with the eye. With the right equipment, the inspection results from the borescopes and fiberscopes can also be displayed on a monitor (see pages 16 and 28).

MICRO BORESCOPES micrendo®

- Flexible borescopes from 0.35 mm to 2.4 mm
- Rigid borescopes from 1.8 mm to 4.0 mm
- Wide angle objectives, side view versions, and 360° view possible with rotatable mirror tubes

UNIVERSAL BORESCOPES

- Rigid borescopes from 4 mm
- Interchangeable objectives with different directions of view
- 360° view possible thanks to rotatable objective and mirror tubes

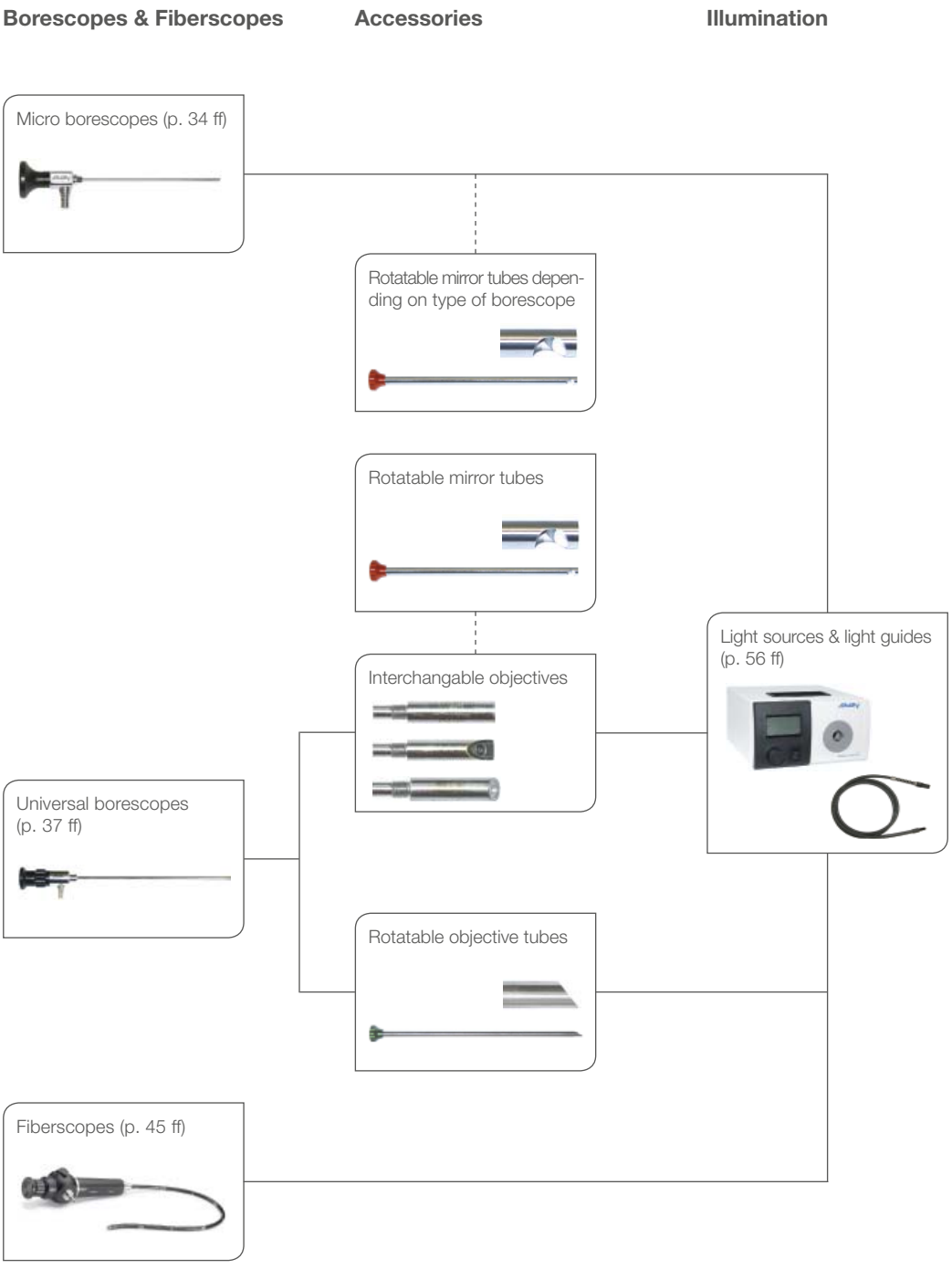
FIBERSCOPES

- Flexible borescopes for access points over 3.4 mm in diameter
- Liquid-tight, temperature- and pressure resistant
- Deflectable tips
- Abrasion resistant braid e. g. tungsten

Product Overview

COMBINATION POSSIBILITIES

To get a fully functioning inspection system, please use the following overview. First choose the type of borescope or fiberscope you want to use from the first column and then follow the line to the right. By selecting the products from left to right, you will end up with the inspection equipment you require.



Explanation

— required

- - - optional

CHARACTERISTICS OF BORESCOPES AND FIBERSCOPES

Direction of view

The inspection site inside the object is not always positioned opposite the borescope. This is why there are borescopes with different directions of view. This makes it possible, for example, to look to the side or to the front. The direction of view is specified in degrees in relation to the borescope shaft.
SCHÖLLY offers directions of view ranging from 0° - 110°.

Field of view and wide angle

The field of view, also called angle of view or aperture angle, indicates the visible image section. It is specified in degrees. As of 80° and above, it is called a wide angle. The field of view is independent of the direction of view of the borescope.
In its standard product range, SCHÖLLY offers fields of view ranging from 30° - 100°.

Interchangeable objectives and objective tubes

For its universal borescopes, SCHÖLLY offers a range of interchangeable objectives and rotatable objective tubes with different directions and fields of view. The rotatable objective tubes can be used to gain a 360-degree view inside the inspection object. The user only needs a basic device to use the interchangeable objectives and rotatable objective tubes to adapt their equipment to different requirements within the same diameter range.
Directions of view ranging from 0° - 90° are available.

Ocular and connection options

The ocular is the part of the borescope through which you look with the eye at the inspection site. For a digital display of the inspection, a camera/camera head (including an output device) can be connected to the ocular. Our borescopes and fiberscopes are equipped with a DIN ocular and these fit all SCHÖLLY camera heads. With a SCHÖLLY endocoupler, borescopes can also be connected to other endoscopic cameras.

Depth of field

The depth of field is the area between the objective and inspection site in which the borescope gives a focused image of the object.

Focusing

The focusing ring can be used to adjust the focus of the image within the defined working area.

Mirror tubes

Mirror tubes are attachments that the user can use to change the direction of view of the borescope. By turning the reflector tube during the inspection, the user can gain a 360-degree view. Mirror tubes are available with different directions of view. Directions of view of 70°, 90° or 110° are available.

Working diameter and working length

The working diameter is the outer diameter of the borescope shaft. In principle, the working diameter selected should be as large as possible. However, the depth of field range and direction of view of the particular borescope must also be taken into account. The working length is the length of the borescope shaft.

Light guide connection

Flexible and rigid borescopes have a light guide connection to illuminate the inspection site via an external light source. The light guide connects the light source to the borescope or fiberscope. The light guide connector used in our borescopes/fiberscopes is a SCHÖLLY standard connector.

Tip deflection

With a deflecting tip, flexible borescopes can be used to examine hollow cavities from various angles of view. The tip can be deflected in two-way or four-way direction via an adjusting lever on the device.

Image bundle

In flexible borescopes the transmission of images and light takes place via image bundles. Image bundles consist of individual fibers which have the same relative position to each other at the input and output. Each fiber transmits a pixel from the objective to the ocular. The quality of the image depends on the number of fibers and the size of each individual fiber (pixel). The image bundle systems ensure the flexibility and movability of the probe.

micrendo® Borescopes and Rotatable Mirror Tubes

micrendo® BORESCOPES Ø 1.8 MM AND 2.7 MM

micrendo borescopes are of highest image quality in the smallest diameters. The inspection and control of the finest bore holes or tubes are possible with the SCHÖLLY micrendo borescopes. For all around inspections, the borescopes can be equipped with rotatable mirror tubes.

Item number	Working Ø	Working length	Direction of view	Field of view
ME.18090.0035	1.8 mm	95 mm	0°	30°
ME.18155.0035	1.8 mm	160 mm	0°	30°
ME.27090.0035*	2.7 mm	95 mm	0°	35°
ME.27185.0035*	2.7 mm	185 mm	0°	35°

ROTATABLE MIRROR TUBES FOR micrendo® BORESCOPES Ø 1.8 MM AND 2.7 MM

For quick all around inspections inside of bore holes or tubes the rotatable mirror tubes can be fitted quickly and simply through an easy snap-lock connection. The directions of view are color-coded. Green = 70°, red = 90°

Item number	Working Ø	Working length	Direction of view	Color code
MS.20090.70	2.0 mm	95 mm	70°	green
MS.20090.90	2.0 mm	95 mm	90°	red
MS.20155.70	2.0 mm	160 mm	70°	green
MS.20155.90	2.0 mm	160 mm	90°	red
MSS.30090.70	3.0 mm	95 mm	70°	green
MSS.30090.90	3.0 mm	95 mm	90°	red
MSS.30185.70	3.0 mm	185 mm	70°	green
MSS.30185.90	3.0 mm	185 mm	90°	red

* HD-capable borescopes

micrendo® Borescopes Wide Angle

micrendo® BORESCOPES Ø 1.8 MM - 4.0 MM

micrendo borescopes with highest image quality are available in smallest diameters. Due to their wide angle view, SCHÖLLY micrendo wide angle borescopes work in the smallest diameters. They are especially useful if quick and clear visual inspections have to be done in a short time span – for example in the production control.

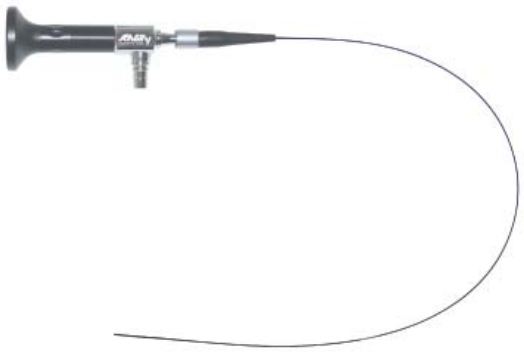
Item number	Working Ø	Working length	Direction of view	Field of view
ME.18090.0080	1.8 mm	95 mm	0°	80°
ME.18155.0080	1.8 mm	160 mm	0°	80°
ME.27120.0085*	2.7 mm	110 mm	0°	95°
ME.27120.3085*	2.7 mm	110 mm	30°	85°
ME.27120.7085*	2.7 mm	110 mm	70°	80°
ME.27210.0085*	2.7 mm	187 mm	0°	95°
ME.27210.3085*	2.7 mm	187 mm	30°	85°
ME.27210.7085*	2.7 mm	187 mm	70°	80°
ME.40175.00100*	4.0 mm	175 mm	0°	100°
ME.40175.30100*	4.0 mm	175 mm	30°	100°
ME.40175.70100*	4.0 mm	175 mm	70°	100°

* HD-capable borescopes

micrendo® Fiberscopes

micrendo® FIBERSCOPES Ø 0.35 MM - 2.4 MM

For inspections of small parts and fine bore holes without access for a rigid instrument, the flexibility of the micrendo fiberscope series offers a wide range of diameters starting from 0.35 mm



Item number	Working Ø	Working length	Direction of view	Field of view	Image bundle (pixels)
MO.0350500.0070	0.35 mm	500 mm	0°	70°	3,000
MO.050500.0070	0.5 mm	500 mm	0°	70°	3,000
MO.080500.0070	0.8 mm	500 mm	0°	70°	6,000
MO.100500.0070	1.0 mm	500 mm	0°	70°	6,000
MO.140500.0085	1.4 mm	500 mm	0°	85°	17,000
MO.141000.0085	1.4 mm	1,000 mm	0°	85°	17,000
MO.190500.0085	1.9 mm	500 mm	0°	85°	30,000
MO.191000.0085	1.9 mm	1,000 mm	0°	85°	30,000
MO.240500.0085	2.4 mm	500 mm	0°	85°	30,000
MO.241000.0085	2.4 mm	1,000 mm	0°	85°	30,000

Fiberscopes in other lengths or with side view (90°) on request.

FLEXILUX Universal Borescopes and Interchangeable Objectives

FLEXILUX **UNIVERSAL BORESCOPES Ø 4.0 MM**

Find the highest flexibility through the unique universality of the FlexiLux universal borescopes. All products of this series are equipped with the patented interchangeable objective system, making these instruments qualified for applications with changing requirements. The easy to snap-on and rotatable objectives and mirror tubes provide an all around view inside the test part. Inspect hydraulic valves, cutting and casting tools in best image quality easily and efficiently.

Item number	Working Ø	Working length
UE.04145	4.0 mm	145 mm
UE.04270	4.0 mm	270 mm

The basic unit provides an image only if an interchangeable objective or a rotatable objective tube is used.

INTERCHANGEABLE OBJECTIVES FOR FLEXILUX **UNIVERSAL BORESCOPES Ø 4.0 MM**

0°

30°

70°

90°

Item number	Direction of view	Field of view	Objective length	Description
UO.0400.35	0°	35°	16 mm	For mirror tubes
UO.0400.80	0°	80°	16 mm	Wide angle
UO.0430.80	30°	80°	17 mm	For oblique view 30°, Wide angle
UO.0470.80	70°	80°	17 mm	For oblique view 70°, Wide angle
UO.0490.80	90°	80°	17 mm	Side view 90°, Wide angle

Rotatable Objective and Mirror Tubes

ROTATABLE OBJECTIVE TUBES FOR UNIVERSAL BORESCOPES Ø 4.0 MM

For quick all around inspections rotatable objective tubes can be fitted quickly and easily through an easy snaplock connection.
Due to the usage of objective tubes the working diameter increases to 4.4 mm.
The directions of view are color-coded. Blue = 0°, green = 45° and 70°, red = 90°

Item number	Working Ø	Working length	Direction of view	Field of view	Color code
UD.04145.0080	4.4 mm	153 mm	0°	80°	blue
UD.04145.4580	4.4 mm	153 mm	45°	80°	green
UD.04145.7080	4.4 mm	153 mm	70°	80°	green
UD.04145.9080	4.4 mm	153 mm	90°	80°	red
UD.04270.0080	4.4 mm	278 mm	0°	80°	blue
UD.04270.4580	4.4 mm	278 mm	45°	80°	green
UD.04270.7080	4.4 mm	278 mm	70°	80°	green
UD.04270.9080	4.4 mm	278 mm	90°	80°	red

ROTATABLE MIRROR TUBES FOR UNIVERSAL BORESCOPES Ø 4.0 MM

The perfect accessories for changing inspections with short working distance in bore holes and tubes. The rotatable mirror tubes can be fitted quickly and easily through an easy snap-lock connection. The length of the mirror tubes is based on the working length of the borescope and the length of interchangeable objective.
The directions of view are color-coded. Green = 70°, red = 90°, yellow = 110°

Item number	Working Ø	Working length	Direction of view	Color code
US.04160.70	4.4 mm	161 mm	70°	green
US.04160.90	4.4 mm	161 mm	90°	red
US.04160.110	4.4 mm	161 mm	110°	yellow
US.04285.70	4.4 mm	286 mm	70°	green
US.04285.90	4.4 mm	286 mm	90°	red
US.04285.110	4.4 mm	286 mm	110°	yellow

FLEXILUX Universal Borescopes and Interchangeable Objectives

FLEXILUX **UNIVERSAL BORESCOPES Ø 5.5 MM**

Find the highest flexibility through the unique universality of the FlexiLux universal borescopes. All products of this series are equipped with the patented interchangeable objective system, making these instruments qualified for applications with changing requirements. The easy to snap-on and rotatable objectives and mirror tubes provide an all around view inside the test part. Inspect hydraulic valves, cutting and casting tools in best image quality easily and efficiently.

Item number	Working Ø	Working length
FE.55155	5.5 mm	155 mm
FE.55250	5.5 mm	250 mm
FE.55355	5.5 mm	355 mm

The basic unit provides an image only if an interchangeable objective or a rotatable objective tube is used.

INTERCHANGEABLE OBJECTIVES FOR FLEXILUX **UNIVERSAL BORESCOPES Ø 5.5 MM**

0°

45°

90°

Item number	Direction of view	Field of view	Objective length	Description
WO.5500.40	0°	40°	25 mm	For mirror tubes
WO.5500.85	0°	85°	22 mm	Wide an
WO.5545.45	45°	45°	17 mm	For oblique view 45°
WO.5590.45	90°	45°	21 mm	Side view 90°

Rotatable Objective and Mirror Tubes

ROTATABLE OBJECTIVE TUBES FOR UNIVERSAL BORESCOPES Ø 5.5 MM

For quick all around inspections rotatable objective tubes can be fitted quickly and easily through a snap-lock connection.
Due to the usage of objective tubes the working diameter increases to 5.9 mm.
The directions of view are color-coded. Green = 45°, red = 90°

Item number	Working Ø	Working length	Direction of view	Field of view	Color code
FD.55155.4545	5.9 mm	155 mm	45°	45°	green
FD.55155.9045	5.9 mm	155 mm	90°	45°	red
FD.55250.4545	5.9 mm	250 mm	45°	45°	green
FD.55250.9045	5.9 mm	250 mm	90°	45°	red
FD.55355.4545	5.9 mm	355 mm	45°	45°	green
FD.55355.9045	5.9 mm	355 mm	90°	45°	red

ROTATABLE MIRROR TUBES FOR UNIVERSAL BORESCOPES Ø 5.5 MM

The perfect accessories for changing inspections with short working distance in bore holes and tubes. The rotatable mirror tubes can be fitted quickly and easily through a snap-lock connection. The length of the mirror tubes is based on the working length of the borescope and the length of interchangeable objective.
The directions of view are color-coded. Green = 70°, red = 90°

Item number	Working Ø	Working length	Direction of view	Color code
FS.55180.70	5.9 mm	180 mm	70°	green
FS.55180.90	5.9 mm	180 mm	90°	red
FS.55275.70	5.9 mm	275 mm	70°	green
FS.55275.90	5.9 mm	275 mm	90°	red
FS.55380.70	5.9 mm	380 mm	70°	green
FS.55380.90	5.9 mm	380 mm	90°	red

FLEXILUX Universal Borescopes and Interchangeable Objectives

FLEXILUX **UNIVERSAL BORESCOPES Ø 8.0 MM**

Find the highest flexibility through the unique universality of the FlexiLux universal borescopes. All products of this series are equipped with the patented interchangeable objective system, making these instruments qualified for applications with changing requirements. The easy to snap-on and rotatable objectives and mirror tubes provide an all around view inside the test part. Inspect hydraulic valves, cutting and casting tools in best image quality easily and efficiently.

Item number	Working Ø	Working length
FE.08250	8.0 mm	250 mm
FE.08355	8.0 mm	355 mm
FE.08455	8.0 mm	455 mm

The basic unit provides an image only if an interchangeable objective or a rotatable objective tube is used.

INTERCHANGEABLE OBJECTIVES FOR FLEXILUX **UNIVERSAL BORESCOPES Ø 8.0 MM**

0°

45°

90°

Item number	Direction of view	Field of view	Objective length	Description
WO.0800.40	0°	40°	25 mm	For mirror tubes
WO.0800.85	0°	85°	23 mm	Wide an
WO.0845.60	45°	60°	27 mm	For oblique view 45°
WO.0890.60	90°	60°	26 mm	Side view 90°

Rotatable Objective Tubes and Mirror Tubes

ROTATABLE OBJECTIVE TUBES FOR UNIVERSAL BORESOPES Ø 8.0 MM

For quick all around inspections rotatable objective tubes can be fitted quickly and easily a snap-lock connection. Due to the usage of objective tubes the working diameter increases to 8.5 mm.

Item number	Working Ø	Working length	Direction of view	Field of view	Color code
FD.08250.9060	8.5 mm	250 mm	90°	60°	red
FD.08355.9060	8.5 mm	355 mm	90°	60°	red
FD.08455.9060	8.5 mm	455 mm	90°	60°	red

ROTATABLE MIRROR TUBES FOR UNIVERSAL BORESOPES Ø 8.0 MM

The perfect accessories for changing inspections with short working distance in bore holes and tubes. The rotatable mirror tubes can be fitted quickly and easily through a snap-lock connection. The length of the mirror tubes is based on the working length of the borescope and the length of interchangeable objective.
The directions of view are color-coded. Green = 70°, red = 90°

Item number	Working Ø	Working length	Direction of view	Color code
FS.08275.70	8.5 mm	275 mm	70°	green
FS.08275.90	8.5 mm	275 mm	90°	red
FS.08380.70	8.5 mm	380 mm	70°	green
FS.08380.90	8.5 mm	380 mm	90°	red
FS.08480.70	8.5 mm	480 mm	70°	green
FS.08480.90	8.5 mm	480 mm	90°	red

FLEXILUX Universal Borescopes and Interchangeable Objectives

FLEXILUX **UNIVERSAL BORESCOPES Ø 10.0 MM**

Find the highest flexibility through the unique universality of the FlexiLux universal borescopes. All products of this series are equipped with the patented interchangeable objective system, making these instruments qualified for applications with changing requirements. The easy to snap-on and rotatable objectives and mirror tubes provide an all around view inside the test part. Inspect hydraulic valves, cutting and casting tools in best image quality easily and efficiently.

Item number	Working Ø	Working length
FE.10355	10.0 mm	355 mm
FE.10455	10.0 mm	455 mm
FE.10950	10.0 mm	950 mm

The basic unit provides an image only if an interchangeable objective or a rotatable objective tube is used.

INTERCHANGEABLE OBJECTIVES FOR FLEXILUX **UNIVERSAL BORESCOPES Ø 10.0 MM**

0°

90°

Item number	Direction of view	Field of view	Objective length	Description
WO.1000.40	0°	40°	25 mm	For mirror tubes
WO.1000.85	0°	85°	23 mm	Wide angle
WO.1090.60	90°	60°	26 mm	Side view 90°

Rotatable Objective Tubes

ROTATABLE OBJECTIVE TUBES FOR UNIVERSAL BORESCOPES Ø 10.0 MM

For quick all around inspections rotatable objective tubes can be fitted quickly and easily through a snap-lock connection.
Due to the usage of objective tubes the working diameter increases to 10.5 mm.

Item number	Working Ø	Working length	Direction of view	Field of view	Color code
FD.10355.9060	10.5 mm	355 mm	90°	60°	red
FD.10455.9060	10.5 mm	455 mm	90°	60°	red
FD.10950.9060	10.5 mm	950 mm	90°	60°	red

VALUELINE Fiberscope

VALUELINE **FIBERSCOPE**

ValueLine offers cost-efficient fiberscopes solutions with an outstanding price-performance ratio for all applications without straight access for rigid instruments. This fiberscope is the perfect first-time user model for the examination and inspection of hard-to-access inside areas. Due to its high flexibility, visual inspections of complex components can be done easily. The two-way tip deflection with 90° visibility in each direction helps to find the way into the part to the inspection area easily and securely.

Item number	Working Ø	Working length	Tip deflection	Direction of view	Field of view	Image bundle (pixels)
FMFlex2	6.0 mm	1,470 mm	2 x 90°	0°	90°	6,000

Transport case included.

FLEXILUX **ECO** Fiberscopes

FLEXILUX **ECO FIBERSCOPES**

Fiberscopes for industrial use must have high flexibility and a high strength at the same time. The optimized construction in combination with very robust glass image bundles with 13,000 pixels makes the FlexiLux Eco fiberscope unique in the price-performance ratio.

Item number	Working Ø	Working length	Tip deflection	Direction of view	Field of view	Image bundle (pixels)
6018.00105.4X	6.0 mm	1,350 mm	4 x 120°	0°	105°	13,000
6023.00105.4X	6.0 mm	2,000 mm	4 x 120°	0°	105°	13,000

Light guide, transport case and cleaning material included.

FLEXILUX Universal Fiberscopes

FLEXILUX **UNIVERSAL FIBERSCOPES**

The FlexiLux universal fiberscopes are ideal for the examination and inspection of hard-to-access inside areas. The high flexibility allows complex visual inspections in small working diameters. Due to the stabilizing and protective tungsten braid the fiberscopes are very robust and abrasion-proof, even if the access is difficult and sharp-edged.

Item number	Working Ø	Working length	Tip deflection	Direction of view	Field of view	Image bundle (pixels)
34030.0070.PV2X.W	3.4 mm	300 mm	2 x 140°	0°	70°	7,000 glass
34100.0070.PV2X.W	3.4 mm	1,000 mm	2 x 140°	0°	70°	7,000 glass

Light guide, transport case and cleaning material included.


Unlock
Lock
Schölly
REF TVAD.Zoom02
Unlock
Lock

ACCESSORIES

For displaying inspection results on a monitor/PC, our inspection program is completed by different accessories suitable for micro and universal borescopes as well as fiberscopes.

MONITORS

A monitor size ideally chosen to the complete system as well as a number of monitor settings provide an optimized displaying of the inspection results and make the defect detection and analysis easier for you. On the next pages, you will find a selection of the most common monitor sizes for visual inspections.

Do you need a different monitor size or want to connect your own monitor to your inspection system? Contact us.

ENDOCOUPLERS

On the DIN ocular of the micro and universal borescopes as well as on fiberscopes, it is possible to connect endocoupler and also further C-mount compatible components. SCHÖLLY endocouplers are suitable for all cameras with C-mount thread. The endocouplers are available as fix focus model with a focal width of 30 mm or as vario zoom model with a focal width from 18 mm to 50 mm for infinitely adjustment of the image size.

Video Grabber and Documentation Software

VIDEO GRABBER SYSTEM FOR ALL CAMERAS WITHOUT USB 2.0 CONNECTION

Item number	Description
FSC.Videograbber.02	Smartbox, foot switch, video/foot pedal connection cable, USB 2.0 cable, driver software MediaWorkStation version Select Edition 2.7 (compatible with Windows 8 / 7 / Vista) For the usage of inspection systems with PAL resolution (stationary EzyScope and FlexiScope IQ101 Compact Camera)

DOCUMENTATION SOFTWARE

Item number	Description
CD005	MediaWorkStation Select Edition 2.7, image and video documentation for saving and archiving. For the usage of inspection systems with PAL resolution (stationary EzyScope and FlexiScope IQ101 Compact Camera). Compatible with Windows 8 / 7 / Vista

Software and video grabber for the FlexiVision 100 on request.

USB STICK

Item number	Description
95.4053	USB Stick with 16 GB storage capacity

Endocoupler

ENDOCOUPLER

All FlexiLux borescopes are supplied with a DIN ocular. Following endocouplers allow a quick snap-lock connection of FlexiLux borescopes and fiberscopes to camera systems with C-mount thread.

FOCUSABLE ENDOCOUPLER

Suitable for all borescopes without focusing and for cameras with C-mount thread.

Item number	Focal length
TVAD.FOK.F30	f = 30 mm

Endocouplers with another focal length will be verified on request.

VARIO ZOOM ENDOCOUPLER

This vario zoom endocoupler can be used for stepless image magnification and is suitable for all cameras with C-mount connection thread or borescopes with focusing device. A re-adjustment of the focus is not necessary if this endocoupler is used.

Item number	Focal length
TVAD.ZOOM02	f = 18 - 50 mm, parfocal

Accessories

TFT Color Monitor 10.4"

TFT COLOR MONITOR 10.4" WITH LED BACKLIGHTING

Especially if spaces are limited on-site this 10.4" monitor provides an optimal and sufficient display of the inspections results. This monitor can be used as video monitor (for direct connection of video cameras) as well as a PC monitor.

Mains supply	100 - 240 V AC, 50/60 Hz
Backlighting	LED
Resolution	1,024 x 768
Response time	45 ms
Contrast ratio	500 : 1
Brightness	400 cd / m^2
Viewing angle	140° (H) x 120° (V)
Input signal	2 x Composite (CVBS), VGA
Output signal	2 x Composite (CVBS)
Power supply	12 V DC
Switch PAL/NTSC	Automatic operating
Operating temperature	-20 °C up to +60 °C
Dimensions	247 x 208 x 34.9 mm (W x H x D)
Weight	2.6 kg incl. foot
Settings	Multilingual On-Screen-Display (OSD)

Item number	Description
FA.TVMON08.LED	TFT color monitor 10.4" incl. foot

LCD- /TFT Color Monitor 17.0"

LCD- /TFT COLOR MONITOR 17.0"

The monitor below can be used as video monitor (for the direct adaption of video cameras) as well as a computer monitor.

Mains supply	100 - 240 V AC, 50/60 Hz
Backlighting	LED
Resolution	1.280 x 1.024
Response time	5 ms
Contrast ratio	2,000,000 : 1 (DCR)
Brightness	250 cd / m^2
Viewing angle	170° (H) / 160° (V)
Input signal	BNC (CVBS), VGA, HDMI
Output signal	BNC (CVBS)
Power supply	12 V DC
Switch PAL/NTSC	Automatic operating
Operating temperature	+5 °C up to +35 °C
Dimensions	372 x 378 x 183 mm (W x H x D)
Weight	2,6 kg incl. foot
Settings	Multilingual On-Screen-Display (OSD)

Item number	Description
FA.TVMON12.1	LCD- /TFT-Farbmonitor 17"

Accessories

Full HD Monitor 21.5"

FULL HD MONITOR 21.5"

For the full HD / HD display of inspection results, we offer following monitor.

Mains supply	100 - 240 V AC, 50/60 Hz
Background lighting	LED
Resolution	1920 x 1080 Full HD
Image format	16 : 9
Reaction time	5 ms
Contrast	1,000 : 1
Brightness	250 cd / m^2
Viewing angle	170° (H) x 160° (V)
Input signal	HDMI, DVI, VGA, 3G / HD / SD-SDI
SDI Output signal	2 x BNC (CVBS)
Power supply	12 V DC
Operating temperature	-20 °C up to +60 °C
Dimensions	515 x 310 x 50 mm (W x H x D, without foot) 515 x 390 x 182 mm (W x H x D, with foot)
Weight	4.4 kg without foot) 5.1 kg (with foot)
Settings	Multilingual On-Screen-Display (OSD)

Item no.	Description
FA.TVMON21.HD	Full HD Monitor 21.5" including foot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FlexiLux 4000 LED

LIGHT SOURCES AND LIGHT GUIDES

To inspect hidden parts inside of components, machines or constructions efforts a sufficient light transport into the inside to guarantee an optimized illumination.

On the following pages you will find light sources and light guides from SCHÖLLY which are perfectly adjusted for visual inspections with borescopes or fiberscopes.

LIGHT SOURCES

Discover the variety of illumination possibilities. Regardless if you have to go on-site and need a small and lightweight handheld light source or if you need an extremely light intensive stationary light source for the illumination of bigger hollows or for use with very thin and simultaneously very long borescopes. On the following pages you will find suitable light sources according to your demands.

LIGHT GUIDES

To transfer the light from the light source to the borescope, you will find high temperature resistant glass fiber light guides for the use with high power light sources, as well as liquid light guides.

All light guides are equipped with a SCHÖLLY FlexiLux light source connection as well as a DIN ocular for the borescope as standard. On request, we offer different light guide lengths as well as a variety of adaption possibilities for light sources and borescopes of other brands.

You have an inspection challenge or is the product you are looking for not featured on the next pages? Contact us.

We are pleased to advise you on prospective inspection possibilities for your component and we will create an individual offer for you.

FLEXILUX LED Light Sources

COMBINATION POSSIBILITIES

FlexiLux LED light sources can be used with different end devices to suit your particular inspection task. For purely lighting purposes, e.g. general illumination of larger working areas or precise, detailed illumination of inspection objects, choose the lighting product (light guide) from column two and combine it with your light source.
For an inspection task using a borescope or fiberscope, first choose the type you want to use from the first column and then follow the line to the right. Choose from the different light guides in column two. By selecting the products from left to right, you will end up with the necessary equipment for the illumination of the working field with the borescope/fiberscope. The use of a light source with the borescopes given below is irrespective of whether you are visualizing the inspection with your own eyes or on a monitor.

Borescopes & Fiberscopes

Light Guides

Light Sources

Illumination and fiberoptics (p. 66 ff)

Micro borescopes (p. 34 ff)

Different glass fiber light guides (p. 62 ff)

Light sources (p. 60 ff)

Universal borescopes (p. 37 ff)

Liquid light guides (p. 64)

Mobile light source (p. 59)

Fiberscopes (p. 45 ff)

FLEXILUX LED Light Source

FLEXILUX **LED LIGHT SOURCE**

FlexiLux LED light source is a mains-independent, battery operated handheld light source for borescopes with common light guide connections according to DIN 58105. The light intensity can be adjusted by using the button on the front side of the handle.
The integrated LED module provides maximum light efficiency with low power consumption. The direct connection to the borescope leads to increased light output. Comfortable operation due to compact and ergonomic profile. Suitable for rough environment because of its robust design and long-lasting LED technology. FlexiLux LED light source is a mobile plug & play solution. It can be operated with commercial rechargeable batteries.

Color temperature	5,100 K
Max. light intensity	15,000 Lux
Lamp life	50,000 h LED typical (average)
Mains supply	3.0 V
Battery	Lithium ion 500 mAh
Mains supply battery charger	Input: 100 - 240 V AC, 50/60 Hz Output: 3.7 V / 7.3 V
Operating time	approx. 30 min. (at full power)
Recharging time	2.5 h
Light guide connection	M10 x 0.5 / according to DIN 58105
Dimension	108 x 25 mm (L x Ø)
Weight	approx. 100 g (with battery)

Item number	Description
FMLEDLQ3	Mobile LED light source, including 2 x batteries, battery charger, plug type Euro plug CEE 7/16
FMLEDLQ3.BAT	2 x replacement battery for mobile LED light source FMLEDLQ3
FMLEDLQ3.CHARGER	Replacement battery charger for batteries of the mobile LED Light source

FLEXILUX 4000 LED Light Source

FLEXILUX **4000 LED LIGHT SOURCE**

FlexiLux 4000 LED is a high-power LED light source for stationary use. With its low power consumption of LEDs, the FlexiLux 4000 LED is extremely economical in operation and much brighter than a conventional 150 W halogen light source. The use of the latest LED technology avoids time-consuming and expensive bulb exchanges.

Operation control panel	ON/OFF, LED brightness control
Outputs	1 x USB, 1 x Jack 2.5 mm, 1 x ESD
Nominal output	65 Watt
Lamps	High Power LEDs
Color temperature	approx. 5,800 Kelvin
Luminance	approx. 470 lm for fiber Ø 5 x 1,000 mm approx. 640 lm for fiber Ø 8 x 1,000 mm
Lamp life	30,000 h (70 % output luminance)
Mains supply	100 - 240 V, 12 V DC, 5,420 mA
System	Electromagnetic compatibility: 2004/108/EC, classification: C
Dimension	170 x 98 x 196 mm (W x H x D) without projecting parts
Weight	2.1 kg

Item number	Description
FX.4000.LED	LED light source FlexiLux 4000 LED
FXS.FS1	Color filter set for FlexiLux 4000 LED (red, yellow, green, blue)

A foot switch as well as color filters a e available separately on request.

A power cord is always included. Please specify plug type.

FLEXILUX 6000 LED Light Source

FLEXILUX **6000 LED LIGHT SOURCE**

The FlexiLux 6000 LED offers high light output despite economic power consumption. This light source is maintenance-free and brighter than a 180 Watt Xenon light source despite of a lower power consumption. FlexiLux 6000 LED is useful when inspection areas need a lot of illumination or if the light has to be transported through very thin and long borescopes.

Operation control panel	ON/OFF, LED brightness control
Outputs	1 x USB, 1 x Jack 2.5 mm, 1 x ESD
Nominal output	100 Watt
Lamps	High Power LEDs
Color temperature	approx. 6,200 Kelvin
Luminance	approx. 900 lm for fiber Ø 5 x 1,000 mm
Lamp life	30,000 h (70 % output luminance)
Mains supply	100 - 240 V, 12 V DC, 8,500 mA
System	Electromagnetic compatibility: 2004/108/EC, classification: C
Dimension	170 x 98 x 205 mm (W x H x D) without projecting parts
Weight	2.1 kg

Item number	Description
FX.6000.LED	LED light source FlexiLux 6000 LED

This light source may only be used with fused or pressed glass fiber light guides.
We recommend one of the SCHÖLLY standard light guides (see pages 62 + 63).

A foot switch is available on request.

A power cord is always included. Please specify plug type.

Glass Fiber Light Guide

LIGHT GUIDES FOR FLEXILUX **BORESCOPE/FIBERSCOPES**

All SCHÖLLY standard light guides that are made of glass fibers are always equipped with the FlexiLux light source adapter, suitable for all SCHÖLLY light sources and with all borescopes/fiberscopes with DIN ocular. Both connections can be removed. This allows to connect with other adaption possibilities and therefore with light sources and borescopes/fiberscopes of other brands.

GLASS FIBER LIGHT GUIDE

Item number	Working length	Active diameter	Light source connection
LL.48180.FX	1,800 mm	4.8 mm	Temperature resistant up to 300 °C
LL.48230.FX	2,300 mm	4.8 mm	Temperature resistant up to 300 °C

Glass Fiber Light Guide

GLASS FIBER LIGHT GUIDE, ANGLED

Working length	1,800 mm
Active diameter	4.8 mm
Light source connection	Temperature resistant up to 300 °C

Item number	Description
LL.48180.FX.ACMI.W	Glass fiber light guide, 90° angled, with bend protection on both sides

Liquid Light Guide

LIQUID LIGHT GUIDES FOR FLEXILUX **BORESCOPE/FIBERSCOPES**

Liquid light guide for strong light transmission.

Working length	1,800 mm
Active diameter	5.0 mm
Light source connection	Temperature resistant up to 60 °C

Item number	Description
FL 518.FXFXI	Liquid light guide with maximum light transmission


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FIBEROPTIC GMBH
FlexiLux 4000 LED

ILLUMINATION AND FIBEROPTICS

The standard program of fiberoptical illuminations contains a wide spectrum of illumination products as for example fiberoptical ring lights for homogenous and shadow-free illumination of a working field. Different kinds of flexible and semi-flexible illumination light guides for a focused illumination of smaller areas as well as a lot of different light probes to illuminate objects.

All articles mentioned in this chapter are produced order-related.

Beyond that, the fiberoptical range includes customized products for various customer specific applications. For example, fiberoptical products for liquid analysis in the field of spectroscopic applications, line illuminators for automated quality checks inside production lines or focused illumination-systems for image processing tasks.

You have an inspection challenge or is the product you are looking for not featured on the next pages? Contact us.

We are pleased to advise you on prospective inspection possibilities for your component and we will create an individual offer for you.

Product Overview

COMBINATION POSSIBILLITIES

Whether you need single-arm or double-arm illumination of a larger area or just a small detail, use our overview to find the right light guide and combine it with a light source.

Large-area Illumination

Ring lights (p. 69)

Detailed Illumination

Light guides made of optical glass, one- and two-armed (p. 70 ff)

FlexiLux 4000 LED light source (p. 60)

Universal light guides (p. 74)

Goose neck light guide (p. 73)

Diagnostic light guide (p. 73)

Light guides made of optical glass, single usage and combinable (p. 71)

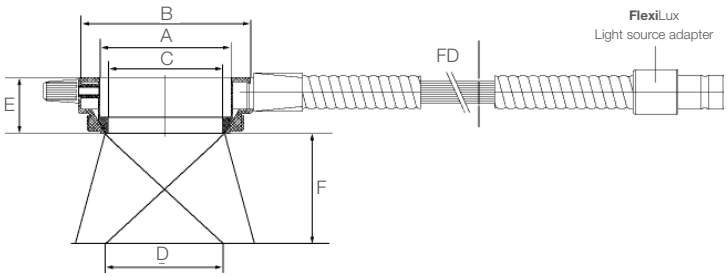
optional

Light probes (p. 72)

FLEXILUX Fiberoptical Ring Light

FLEXILUX **FIBEROPTICAL RING LIGHT**

The FlexiLux ring lights combine compact yet robust design using glass fibers, providing a homogenous and shadow-free illumination of the working area.



Item number	A Connection Ø	B Outer Ø	C Inner Ø	D Illumination field	E Height	F Working distance	FD Active Ø	Cable length
10.485	66.2 mm	93.0 mm	57.0 mm	50 - 100 mm	25.0 mm	45 - 125 mm	10.0 mm	750 mm
10.486*	58.2 mm	78.0 mm	51.0 mm	50 - 100 mm	25.0 mm	24 - 80 mm	9.1 mm	750 mm
RLRV.2238.1500	22.0 mm	38.0 mm	22.0 mm	25 - 50 mm	16.0 mm	5 - 80 mm	4.0 mm	1,500 mm

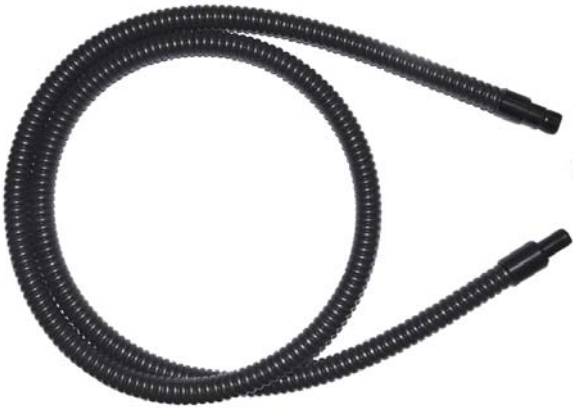
Further types will be verified on request.

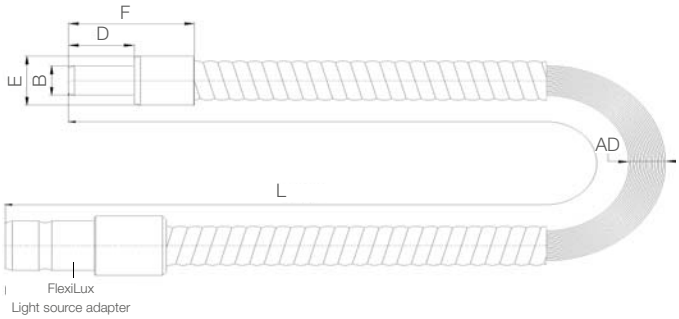
* integrated adaption possibility for ring mirror fixture

Light Guides Made of Optical Glass, One-Armed

LIGHT GUIDES MADE OF OPTICAL GLASS ONE-ARMED

These single-armed light guides are usable in numerous industrial applications. They are covered with a metal spiral hose with PVC coating and are fully flexible. At the end, where the light emerges, the light guide is equipped with an end sleeve for fixation.





Item number	AD Active Ø	L Length	B Ferrule Ø	D Ferrule length	E Max. outer Ø	F Length metal end
LOG2.401000.FX	4.0 mm	1,000 mm	6.0 mm	12.0 mm	10.0 mm	24.0 mm
LOG2.401500.FX	4.0 mm	1,500 mm	6.0 mm	12.0 mm	10.0 mm	24.0 mm
LOG2.402000.FX	4.0 mm	2,.000 mm	6.0 mm	12.0 mm	10.0 mm	24.0 mm
LOG2.501000.FX	5.0 mm	1,000 mm	7.0 mm	16.0 mm	12.0 mm	31.0 mm
LOG2.501500.FX	5.0 mm	1,500 mm	7.0 mm	16.0 mm	12.0 mm	31.0 mm
LOG2.502000.FX	5.0 mm	2,000 mm	7.0 mm	16.0 mm	12.0 mm	31.0 mm
LOG2.601000.FX	6.0 mm	1,000 mm	8.0 mm	16.0 mm	14.0 mm	30.7 mm
LOG2.601500.FX	6.0 mm	1,500 mm	8.0 mm	16.0 mm	14.0 mm	30.7 mm
LOG2.602000.FX	6.0 mm	2,000 mm	8.0 mm	16.0 mm	14.0 mm	30.7 mm
LOG2.801000.FX	8.0 mm	1,000 mm	10.0 mm	20.0 mm	17.0 mm	36.7 mm
LOG2.801500.FX	8.0 mm	1,500 mm	10.0 mm	20.0 mm	17.0 mm	36.7 mm
LOG2.802000.FX	8.0 mm	2,000 mm	10.0 mm	20.0 mm	17.0 mm	36.7 mm

Further types will be verified on request.

Light Guides

LIGHT GUIDE MADE OF OPTICAL GLASS – TWO-ARMED, FULLY FLEXIBLE

Two-armed light guides are used for applications in which two light outputs from one light source are needed. The light guide is covered with a metal spiral hose with PVC coating but is also fully flexible. At the end where the light emerges, the light guide is equipped with an end sleeve for fixation.

Item number	Active Ø arm	Arms	Active Ø common	Length
10.470	9.0 mm	2	12.7 mm	1,000 mm

LIGHT GUIDE MADE OF OPTICAL GLASS – SINGLE-ARMED, FULLY FLEXIBLE AND VERY ROBUST

These light guides are very robust, especially on the heavily stressed ends protected against fiber fracture. The flexible part is strengthened with a spiral spring for bend protection on the side of the light source and with an additional shrinking hose on the side of light output.

Item number	Active Ø	Length
12.578.002	4.0 mm	1,800 mm
12.580.001	6.0 mm	1,800 mm
12.581.001	6.0 mm	3,000 mm

Probe Handle and Light Probes

PROBE HANDLE

For illumination of the interior of objects, the SCHÖLLY light guide probes offer several possibilities. Connect your light guide with the probe handle and attach the required light probe.

Item number	Outer Ø	Length
12.606	15.0 mm	75 mm

1 - fits to probe light guide item no. 12.580.001 and 12.581.001
2 - fits to light probes and annular mirror probes (fixation via clamping nut inside handle)

LIGHT PROBES

Item number	Active Ø	Outer Ø	Length	Form
12.609	2.0 mm	3.0 mm	100 mm	straight
12.610	4.0 mm	5.0 mm	100 mm	straight
12.610.006	4.0 mm	5.0 mm	400 mm	straight
12.612	4.0 mm	5.0 mm	200 mm	straight
12.615	4.0 mm	5.0 mm	115 mm	45° angled

Goose Neck Light Guide, Diagnostic Light Guide

GOOSE NECK LIGHT GUIDE - TWO-ARMED, SEMI-FLEXIBLE

Illuminate your working area precisely with the SCHÖLLY goose neck light guide. Due to its semi-flexible construction, it is possible to adjust the light guide individually. The arms do not wear down due to their vertical set. The black color of the outer material reduces reflections from the light guide to the working area.

Item number	Active Ø arm	Arms	Active Ø common	Length
10.466	5.5 mm	2	7.8 mm	600 mm

DIAGNOSTIC LIGHT GUIDE MADE OF SYNTHETIC WITH PROBE

incl. handle, with FlexiLux light source adapter

Item number	Active Ø	Length	Probe Ø	Probe length
12.608	1.5 mm	2,000 mm	2.0 mm	50 mm

Universal Light Guides

UNIVERSAL LIGHT GUIDE MADE OF SYNTHETIC - FULLY FLEXIBLE WITH TEN SINGLE ARMS

Hard-to-access areas can be illuminated with this light guide. The ten single arms allow an illumination in several apertures. The arms can be bent under heat for an individual justification depending of your application. If required, synthetic fibers can be cut.

Item number	Arms	Length	Active Ø
12.592	10	2,000 mm	1.0 mm

UNIVERSAL LIGHT GUIDE MADE OF SYNTHETIC - FULLY FLEXIBLE WITH TEN SINGLE ARMS, ROBUST VERSION

Additional covering of each arm, robust version with additional bend protection.

Item number	Arms	Length	Active Ø
LGPM.1004200	10	2,000 mm	1.0 mm

EXCELLENCE INSIDE
IS PART OF OUR AFTER-SALES SERVICE.

Customer support and technical service worldwide.

We believe a consistent customer focus also means offering our customers high-quality services. Individual service packages that we define with our customers in the early stages of the development process along with the creativity, expertise, and the high standards of quality that our service professionals possess all guarantee our customers' satisfaction. Within our world-wide service network, we offer customers competent local assistance and support in their native language. As a result, we guarantee prompt and reliable service, uniform quality across the globe, and a matching price level.

Customers benefit from the process cycle in a modern company that operates in accordance with the highest standards. We not only repair and maintain SCHÖLLY products, but also offer an exchange program for borescopes from other manufacturers or otherwise attractive terms for an upgrade to the latest SCHÖLLY quality. We carry out all repairs using original parts. Functionality and safety are tested using the latest technologies, such as optical measuring stations, helium-leak test systems, and devices for measuring electrical safety according to DIN / ISO standards.

SCHÖLLY Service Europe

SCHÖLLY Service North America

SCHÖLLY Service Asia

SCHÖLLY Service South America

EXCELLENCE INSIDE
EXPLAINS WHAT SCHÖLLY IS ALL ABOUT.

A family business operating worldwide as a corporate group.

SCHÖLLY stands for the expertise to make concealed structures visible and accessible for minimal-invasive treatment or non-destructive inspection using micro-optics, fiberoptics, mechanics and electronics. We design, manufacture, and distribute all components dedicated to that purpose ourselves – from our classic endoscopes to highly complex visualization systems.

SCHÖLLY is active in the following business fields:

MEDICAL ENDOSCOPY

VISUAL INSPECTION

We are driven by the goal to use our experience and technology modules to develop the best products for our customers and their specific needs. In this context, what distinguishes us is a combination of superior technology, customer orientation and strategic foresight, along with the strong sense of responsibility of a family-owned company that actively puts its innovative spirit and enthusiasm into action.

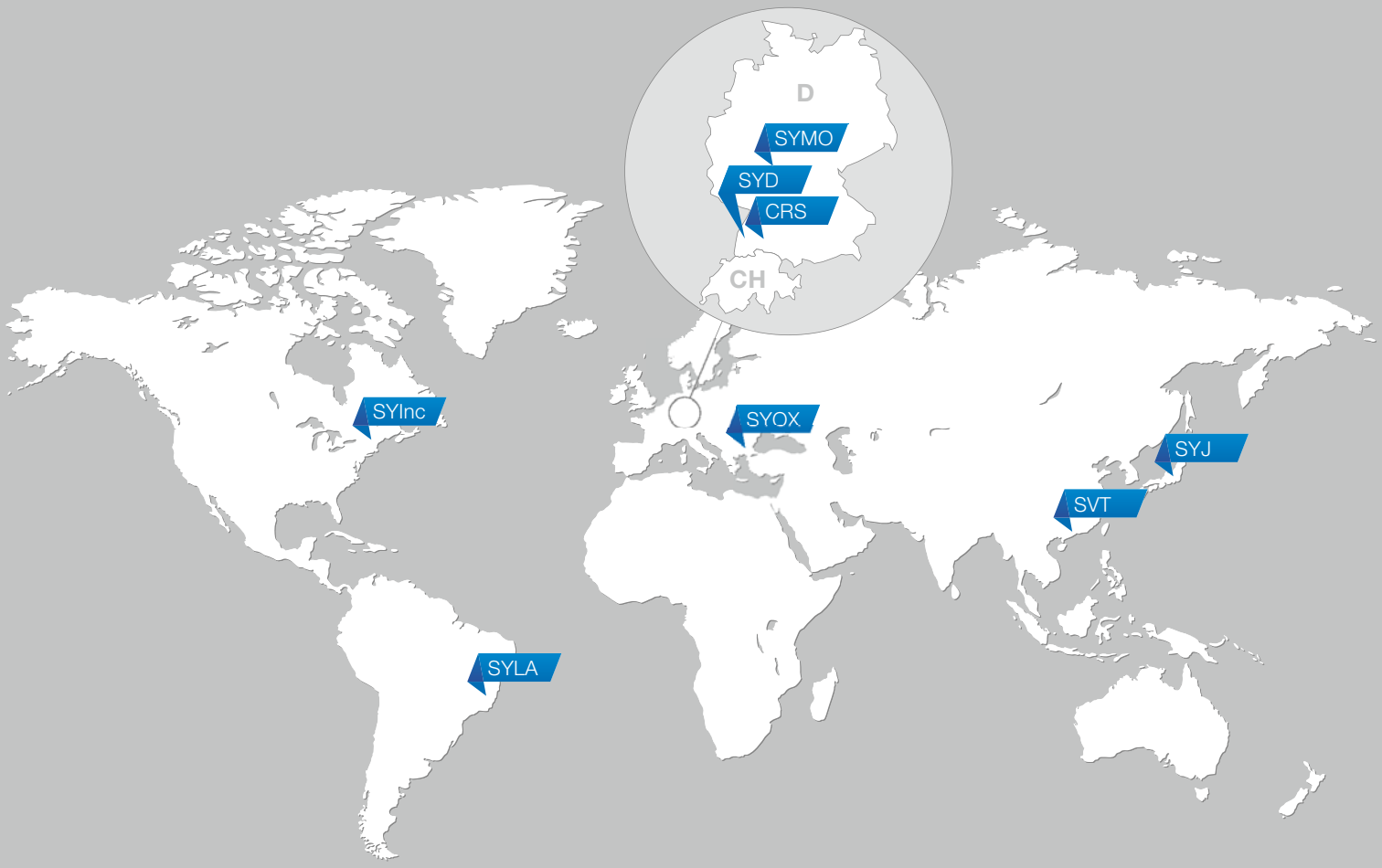
To optimize profit, not to maximize it, is our guiding economic principle.

Our philosophy is built on responsible corporate ethics when interacting with employees, customers, partners, suppliers, and our home city of Denzlingen.

Reliability, expertise, creativity, fairness, and an open, cooperative style when interacting with customers and employees have formed the foundation of our company's success for over 40 years. As a global family business, SCHÖLLY places great importance in these values and, in doing so, not only ensures sustainable growth for the company, but also preserves its own identity.

EXCELLENCE INSIDE stands for:

- Our high expectations towards ourselves, our products, and our services
- The area of application for our products
- The quality of our components
- Our enthusiasm for what we do
- The skills and motivation of our employees
- The implementation of our values in the family business
- The ability to understand the needs of our customers
- The way we do things, not what we do



SYD
SCHÖLLY FIBEROPTIC GMBH
Denzlingen, Germany

SYJ
SCHÖLLY CORPORATION
Saitama City, Japan

SYOX
SCHÖLLY OPTIX OOD
Panagyurishte, Bulgaria

SYInc
SCHÖLLY INC.
Worcester, USA

SYMO
SCHÖLLY MICRO OPTICS GMBH
Biebertal, Germany

SVT
SCHÖLLY VISUALIZATION TECHNOLOGIES CO. LTD.
Guangzhou, China

SYLA
SCHÖLLY LATIN AMERICA LTDA.
Belo Horizonte, Brazil

CRS
C.R.S. iiMotion GMBH
Villingen-Schwenningen, Germany

FUNCTIONS

- Research and Development
- Production
- Customer Support and Technical Service

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