

# IMAGING OPTICS

2025



# IMAGING OPTICS

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## HIGH PERFORMANCE TELECENTRIC LENSES

- LOW F# AND HIGH RESOLUTION
- LOW DISTORTION <1%
- LOW TELECENTRIC ERROR <0.2°
- CUSTOM MODIFICATIONS



## NEW FOCUS TUNABLE LENS WITH 2X MAGNIFICATION

**Sill Optics has developed a telecentric lens with a 2 x magnification, large aperture, and integrated liquid lens for focus adjustment.**

The increasing demand for magnifying telecentric lenses, particularly with large apertures that accommodate a 2.74 μm pixel size and a 1.1-inch sensor diagonal while maintaining stable imaging performance across various wavelengths, has posed significant challenges. However, through collaboration between Sill Optics and Optotune, these requirements have been met.

The lens, named EL16-40, achieves a resolution of 90 lp/mm across the entire field of view, exhibiting the best wavefront specification in vertical align-

ment. This outstanding performance enables the lens to deliver exceptional results as a 2x magnification telecentric lens for sensors with 12-20 megapixels, along with an additional automated focus adjustment capability of at least 6 mm.

This groundbreaking product opens up new possibilities for the fields of semiconductor inspection and precision metrology, enabling them to achieve significant milestones.



# PORTFOLIO IMAGING LENSES

## BENEFIT FROM OUR EXPERIENCE



### OUR HIGHLIGHTS 2025

#### SILL OPTICS LAUNCHES FIRST RGB-NIR LENS FOR 8K LINE SCAN CAMERA

The S5LPJ4465 lens enables imaging with four color channels (RGB-NIR) for 8k resolution (pixel size up to 5  $\mu\text{m}$ ).

The ongoing development of camera technologies also requires modern lens designs. Different camera manufactures offer new line scan cameras that are sensitive to four color channels. While the chips of conventional cameras only detected light in the visible range, this new camera not only has a red, blue and green channel, but also a color channel in the near infrared range.

Conventional entocentric and telecentric lens designs are often unable to compensate the axial color shift. This results in at least one of the channels at the edge of the spectrum being blurred. Especially blue and NIR channel are affected.

In this context, Sill Optics has developed an innovative lens with a focal length of 65 mm for 8k resolution with a pixel size of 5  $\mu\text{m}$  (with a line length of 40 mm). This new development marks the beginning of a small series of lenses that meet customer requirements for color correction for all four wavelengths.

Until beginning of 2025, f'28 mm and f'40 mm will be available, too. In addition to the new series of color corrected lenses, Sill Optics also offers custom lens designs that are perfectly tailored to the individual requirements of a specific application. Furthermore, lenses from the series can be easily adapted to customized setup requirements by making small modifications, such as adjusting the camera mount.



#### NEW LENS SERIES FOR APS-C FORMAT SENSORS

In addition to the S5LPJ2607-M42, Sill Optics offers four other lenses for use with cameras with APS-C format sensors.

High End Resolution in telecentric imaging is our main motivation in development of our product portfolio. After introducing lenses with C-Mount and imaging diagonal up to 22.0 mm in the last years, we now go a step ahead and offer five different lenses for APS format sensors with Pixel size down to 2.74  $\mu\text{m}$ .

The lenses cover a sensor diagonal up to 32.6 mm and can be used with line and area sensors. Magnification range covers 0.2 x to 1.0 x. Additionally to standard imaging in visible range with small bandwidth, most of the lenses are color corrected for bayer pattern sensors and have a high transmission as well in near infrared (800- 900 nm). We offer two standard threads: M42x1 with BFD 12 mm and F-Mount. Other threads are available upon request.





# CUSTOMIZED IMAGING LENSES

## BENEFIT FROM OUR EXPERTISE

Sill Optics has been a trusted partner for customized imaging lens solutions for many years. We specialize in various areas of application and offer a wide range of design types. With our extensive experience, we have successfully completed numerous projects involving customized optical designs and unique mechanical layouts.

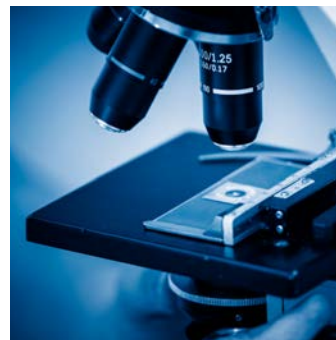
The key to our success lies in the close cooperation between our different internal departments, our vast manufacturing capabilities, and our commitment to high-quality production. These factors enable us to build your prototype in the shortest possible time.

In recent years, we have focused on developing nearly 80% of our imaging lens orders as individual development projects. We actively participate in public research projects and respond to specific inquiries from our customers. Our expertise has been particularly applied in high-precision measurement applications for mechanical engineering, as well as in biomedical applications and material processing.

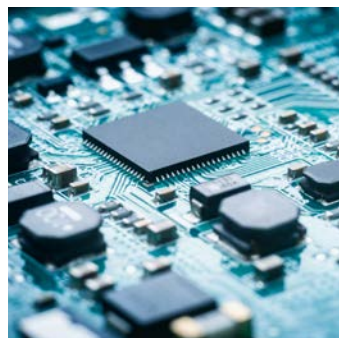
We take pride in our ability to deliver tailored solutions to meet your specific requirements. By choosing Sill Optics, you benefit from our experience, expertise, and dedication to providing top-notch imaging lens solutions.



MACHINE VISION



BIOMEDICAL  
IMAGING



SEMICONDUCTOR  
INSPECTION



OPTICAL  
METROLOGY

# CUSTOMIZED IMAGING LENSES

## BENEFIT FROM OUR EXPERTISE



## YOUR BENEFITS FROM SILL OPTICS DEVELOPMENT

### WHY SILL OPTICS?

- Development of specification sheets closely aligned with design and production capabilities
- Direct contact with optical designers and project managers
- Short distances between design, development, and production
- Quick turnaround for prototypes
- High quality in series production
- Customized quality assurance based on individual needs

### WHICH SPECIFICATIONS?

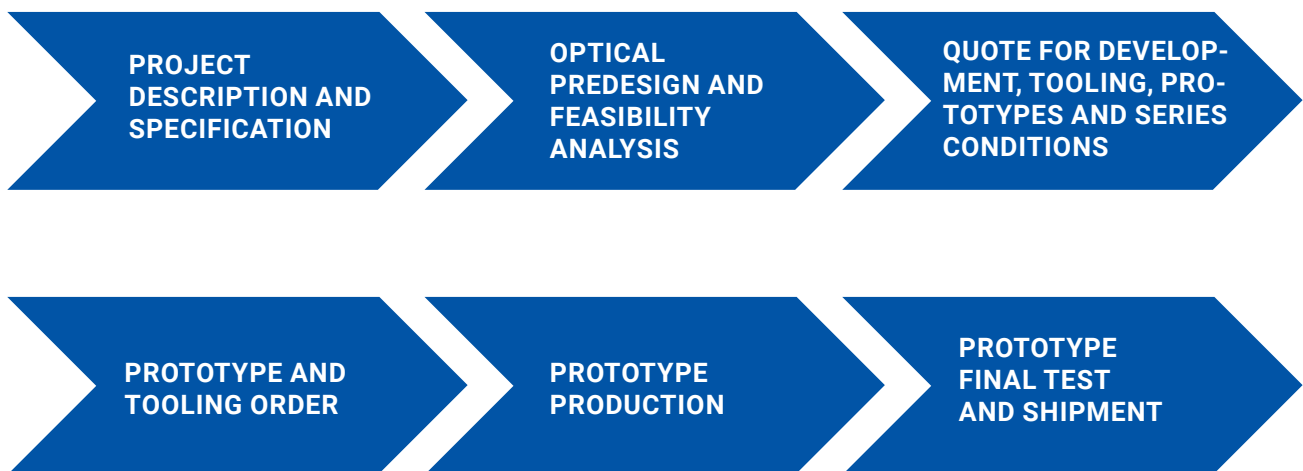
- Aperture
- Field size (FOV, sensor size)
- Waveband (UV, VIS, IR, bandwidth)
- Space constraints (total track, working distance, maximum length, maximum diameter, mounting)
- Camera specifications (sensor dimensions, pixel size, resolution, camera thread, back flange distance, maximum chief ray angle, color)
- Performance requirements (Strehl ratio, MTF, edge spread function, distortion, color correction)

### WHEN STARTING A PROJECT?

A typical starting point for a customized design, considering the overall benefit in terms of the price-performance ratio, is around 50-100 lenses per year. Sill Optics' production capacity is well-suited for up to 500 pieces per year.

However, the ideal number of lenses will vary depending on the size, number of elements, and complexity of the system. For highly complex designs with large elements, special glass types, high alignment demands and end test requirements, even as few as 5 pieces can be beneficial. Other designs may start with quantities of 20 or 50 pieces.

### WORKFLOW THROUGH OUR CUSTOM DESIGN PROCESS



## TELECENTRIC IMAGING LENSES

For nearly 40 years, Sill Optics has been manufacturing **high-end telecentric imaging lenses**. These lenses are specifically designed for measurement applications in industrial machine vision, aiming to eliminate magnification changes and measurement deviations caused by depth of field or defocus.

With the increasing data rates and sensor sizes, there is a clear trend towards larger sensor diagonals and smaller pixel sizes. As a result, our lens portfolio focuses on lenses optimized for small pixel sizes, supporting sensors up to APS format (with sensor diagonal of 32.6 mm).

- Telecentric FOV up to Ø150 mm
- Lens design for R,G,B illumination and monochrome sensor
- Variable iris for improved DOF (depth of focus)
- Available with integrated coaxial illumination upon request

Benefit from our extensive experience and expertise in telecentric imaging lenses. Contact Sill Optics today to discuss your specific requirements and discover the right lens solution for your measurement applications.

PART NUMBER	MAGNIFICATION	RECOMMENDED SENSOR DIAGONAL [mm]	WORKING DISTANCE [mm]	WAVELENGTH BAND MONO (RED, GREEN, BLUE) WHITE (COLOR/BAYER) NIR (800-900 nm)	RECOMMENDED PIXEL SIZE [µm]	THREAD	PART NUMBER FOR VERSION WITH INTEGR. COAXIAL ILLUMINATION
<b>LENSES FOR 1/3" AND 1/2" SENSORS</b>							
S5LPJ1823	0.044	6.0	300.0	R,G,B,NIR	2.20	C	S5LPL1823-LED
S5LPJ1514	0.054	6.0	284.0	R,G,B	2.20	C	S5LPL1514-LED
S5LPJ1824	0.056	8.0	300.0	R,G,B	2.20	C	S5LPL1824-LED
S5LPJ1522	0.068	8.0	284.0	R,G,B	2.20	C	S5LPL1522-LED
S5LPJ6014	0.079	6.0	180.0	R,G,B	2.00	C	S5LPL6014-LED
S5LPJ1523	0.082	8.0	284.0	R,G,B	3.45	C	S5LPL1523-LED
S5LPJ6022	0.100	8.0	180.0	R,G,B	2.20	C	S5LPL6022-LED
S5LPJ1224	0.110	6.0	190.0	R,G,B,W,NIR	2.20	C	S5LPL1224-LED
S5LPJ1201	0.132	6.0	190.0	R,G,B,W	2.20	C	S5LPL1201-LED
S5LPJ1223	0.158	8.0	190.0	R,G,B,NIR	2.00	C	S5LPL1223-LED
<b>LENSES FOR 1/1.8" AND 2/3" SENSORS</b>							
S5LPJ1832	0.065	8.9	300.0	R,G,B,NIR	2.00	C	S5LPL1832-LED
S5LPJ1533	0.098	11.0	284.0	R,G,B	2.00	C	S5LPL1533-LED
S5LPJ6024	0.121	8.9	180.0	R,G,B	2.20	C	S5LPL6024-LED
S5LPJ6033	0.145	11.0	180.0	R,G,B	2.50	C	S5LPL6033-LED
S5LPJ5015	0.160	8.9	88.0	R,G,B	2.80	C	S5LPL5015-LED
S5LPJ1299	0.200	11.0	92.0	R,G,B,NIR	2.80	C	S5LPL1299-LED
S5LPJ2298	0.244	11.0	92.0	R,G,B,W	4.60	C	S5LPL2298-LED
S5LPJ1252	0.265	11.0	190.0	R,G,B,W	2.50	C	S5LPL1252-LED
S5LPJ2893	0.292	11.0	92.0	R,G,B,W,NIR	2.50	C	S5LPL2893-LED
<b>LENSES FOR 1" AND 1.1" SENSORS</b>							
S5LPJ1852	0.112	16.0	300.0	R,G,B	2.20	C	S5LPL1852-LED
S5LPJ1860	0.134	17.6	300.0	R,G,B	3.45	C	S5LPL1860-LED
S5LPJ1551	0.165	16.0	284.0	R,G,B	3.45	C	S5LPL1551-LED
S5LPJ1565	0.195	16.0	284.0	R,G,B	4.20	C	S5LPL1565-LED
S5LPJ6050	0.246	16.0	180.0	R,G,B	3.45	C	S5LPL6050-LED
S5LPJ6060	0.292	16.0	180.0	R,G,B	3.45	C	S5LPL6060-LED
S5LPJ1260	0.313	16.0	190.0	R,G,B	4.60	C	S5LPL1260-LED
S5LPJ2499	0.492	17.6	92.0	R,G,B,W,NIR	3.45	C	S5LPL2499-LED
S5LPJ2898	0.581	17.6	92.0	R,G,B,W,NIR	4.60	C	S5LPL2898-LED

# PORTFOLIO IMAGING LENSES

## BENEFIT FROM OUR EXPERIENCE



### TELECENTRIC IMAGING LENSES FOR SMALLER FOV

- Low cost alternatives for pixel size 3.45 μm
- Lens design for R,G,B illumination and monochrome sensor

PART NUMBER	MAGNIFICATION	RECOMMENDED SENSOR DIAGONAL [mm]	WORKING DISTANCE [mm]	WAVELENGTH BAND MONO (RED, GREEN, BLUE) WHITE (COLOR/BAYER) NIR (800-900 nm)	RECOMMENDED PIXEL SIZE [μm]	THREAD
<b>LENSES FOR 1/3" AND 1/2" SENSORS</b>						
S5LPJ4425	1.000	8.0	107.5	R,G,B	3.45	C
<b>LENSES FOR 1" AND 1.1" SENSORS</b>						
S5LPJ4061-216	0.600	16.0	121.0	R,G,B,W	3.45	C
S5LPJ3208	0.770	16.0	119.5	R,G,B,W	3.45	C

### TELECENTRIC IMAGING LENSES WITH COLOR CORRECTION AND NIR USABILITY

- Telecentric FOV up to Ø120 mm
- Lens designs for white illumination with Bayer pattern color sensor
- Lens designs for NIR illumination with monochrome sensor
- Variable iris for improved DOF (depth of focus)

PART NUMBER	MAGNIFICATION	RECOMMENDED SENSOR DIAGONAL [mm]	WORKING DISTANCE [mm]	WAVELENGTH BAND MONO (RED, GREEN, BLUE) WHITE (COLOR/BAYER) NIR (800-900 nm)	RECOMMENDED PIXEL SIZE [μm]	THREAD
<b>LENSES FOR 1/3" AND 1/2" SENSORS</b>						
S5LPJ6122	0.100	8.0	180.0	R,G,B,W,NIR	2.00	C
S5LPJ1722	0.068	8.0	284.0	R,G,B,W,NIR	2.00	C
<b>LENSES FOR 1/1.8" AND 2/3" SENSORS</b>						
S5LPJ1733	0.098	11.0	284.0	R,G,B,W,NIR	2.00	C
S5LPJ6133	0.145	11.0	180.0	R,G,B,W,NIR	2.50	C
<b>LENSES FOR 1" AND 1.1" SENSORS</b>						
S5LPJ6150	0.246	17.6	180.0	R,G,B,W,NIR	3.45	C
S5LPJ1750	0.165	17.6	284.0	R,G,B,W,NIR	3.45	C



## TELECENTRIC IMAGING LENSES FOR SENSOR SIZE UP TO APS FORMAT

- High performance telecentric lenses for pixel size <math>< 3.45 \mu\text{m}</math>
- Large sensor diagonal for high resolution C-Mount cameras up to 25 MPx
- Large sensor diagonal for high resolution APS format cameras up to 60 MPx
- Excellent color correction for Bayer pattern color sensors with white illumination
- Excellent performance in NIR with small working distance adjustment

PART NUMBER	MAGNIFICATION	RECOMMENDED SENSOR DIAGONAL [mm]	WORKING DISTANCE [mm]	WAVELENGTH BAND MONO (RED, GREEN, BLUE) WHITE (COLOR/BAYER) NIR (800-900 nm)	RECOMMENDED PIXEL SIZE [ $\mu\text{m}$ ]	THREAD
<b>LENSES FOR 1.2" AND 1.5" SENSORS</b>						
S5LPJ1862	0.130	19.2	300.0	R,G,B,W,NIR	2.74	C
S5LPJ1762	0.200	19.2	284.0	R,G,B,W,NIR	2.74	C
S5LPJ1762-M42	0.200	24.0	284.0	R,G,B,W,NIR	2.74	M42x1
S5LPJ6162	0.300	19.2	180.0	R,G,B,W,NIR	2.74	C
S5LPJ6162-M42	0.300	24.0	180.0	R,G,B,W,NIR	2.74	M42x1
NEW S5LPJ6405	0.500	19.2	176.0	R,G,B,W,NIR	2.74	C
S5LPJ6406	0.600	22.0	155.0	R,G,B,W,NIR	2.74	C
S5LPJ6407	0.700	22.0	140.0	R,G,B,W,NIR	2.74	C
S5LPJ6408	0.800	22.0	131.0	R,G,B,W,NIR	2.74	C
NEW S5LPJ6409	0.900	19.2	127.0	R,G,B,W,NIR	2.74	C
S5LPJ7201	1.000	21.4	81.0	R,G,B,W,NIR	2.74	C
S5LPJ6415	1.500	21.4	80.2	R,G,B,W	2.40	C
S5LPJ6420	2.000	21.4	68.1	R,G,B,W	2.74	C
S5LPJ6425	2.500	19.2	61.4	R,G,B,W	3.10	C
S5LPJ6430	3.000	19.2	57.0	R,G,B,W	3.45	C
<b>LENSES FOR APS FORMAT SENSORS</b>						
HIGHLIGHT S5LPJ1894-FMO	0.200	28.2	300.0	R,G,B,W,NIR	2.74	F
HIGHLIGHT S5LPJ1894-M42	0.200	28.2	300.0	R,G,B,W,NIR	2.74	M42x1
HIGHLIGHT S5LPJ1794-FMO	0.310	32.6	284.0	R,G,B,W,NIR	2.74	F
HIGHLIGHT S5LPJ1794-M42	0.310	32.6	284.0	R,G,B,W,NIR	2.74	M42x1
HIGHLIGHT S5LPJ6194-FMO	0.450	32.6	180.0	R,G,B,W,NIR	2.74	F
HIGHLIGHT S5LPJ6194-M42	0.450	32.6	180.0	R,G,B,W,NIR	2.74	M42x1
HIGHLIGHT S5LPJ2607-FMO	0.710	35.0	140.0	R,G,B,W,NIR	2.74	F
HIGHLIGHT S5LPJ2607-M42	0.710	35.0	140.0	R,G,B,W,NIR	2.74	M42x1
HIGHLIGHT S5LPJ7201-FMO	1.000	32.6	81.0	R,G,B,W,NIR	2.74	F
HIGHLIGHT S5LPJ7201-M42	1.000	32.6	81.0	R,G,B,W,NIR	2.74	M42x1

# PORTFOLIO IMAGING LENSES

## BENEFIT FROM OUR EXPERIENCE



### TELECENTRIC LENSES WITH INTEGRATED TUNABLE LIQUID LENS

- High performance stability within specified tuning range.
- Constant telecentricity, small linear magnification change within tuning
- Good color correction and performance stability for 1.2" magnifying lenses in vertical orientation (gravity influence on liquid reduces performance in horizontal orientation)
- Good performance stability in both vertical and horizontal orientation for 1" demagnifying lenses.

PART NUMBER	MAGNIFICATION	RECOMMENDED SENSOR DIAGONAL [mm]	WORKING DISTANCE [mm]	TUNING RANGE [mm]	WAVELENGTH BAND MONO (RED, GREEN, BLUE) WHITE (COLOR/BAYER) NIR (800-900 nm)	RECOMMENDED PIXEL SIZE [μm]	THREAD	PART NUMBER FOR VERSION WITH INTEGR. COAXIAL ILLUMINATION
S5VPJ1565	0.193	16.0	284.0	+/-70.0	R,G,B	2.74	C	-
S5VPJ6060	0.289	16.0	180.0	+/-32.5	R,G,B	2.74	C	S5VPL6060-LED
S5VPJ1260	0.311	16.0	190.0	+/-27.5	R,G,B	3.10	C	-
S5VPJ2898	0.578	16.0	92.0	+/-8.5	R,G,B	3.10	C	S5VPL2898-LED
S5VPJ6415	1.500	19.2	80.2	+/-5	R,G,B,W	2.74	C	-
S5VPJ6420	2.000	19.2	68.2	+/-5	R,G,B,W	2.74	C	-
S5VPJ6425	2.500	19.2	61.4	+/-5	R,G,B,W	3.10	C	-



Besides our portfolio telecentric lenses, we also offer a variety of **telecentric and entocentric designs upon request**.

These special lenses are not manufactured regularly. We kindly ask you to send us your inquiry to check availability, lead time and price according your required quantity.

To enable a short lead-time for your test setup, we are going to build up a demo lens stock.

PART NUMBER	MAGNIFICATION	RECOMMENDED SENSOR DIAGONAL [mm]	WORKING DISTANCE [mm]	WAVELENGTH BAND MONO (RED, GREEN, BLUE) WHITE (COLOR/BAYER) NIR (800-900nm) SWIR (900-1700nm)	RECOMMENDED PIXEL SIZE [μm]	THREAD
<b>TELECENTRIC LENSES FOR APS FORMAT SENSORS</b>						
S5LPJ0492-M42	2.00	35.0	96.5	R,G,B,W	4.60	M42x1
<b>TELECENTRIC LENSES FOR FULL FORMAT AND LARGER SENSORS</b>						
S5LPJ3025-M58	0.25	43.3	310.0	R,G,B,W	3.45	M58x0.75
S5LPJ3005-M72	0.33	60.0	310.0	R,G,B	3.45	M72x0.75
S5LPJ1556-M58	0.46	43.3	332.3	R,G,B,W,NIR	3.30	M58x0.75
S5LPJ7207-M72	0.66	43.3	180.0	R,G,B	5.50	M72x0.75
S5LPJ7209-M72	0.80	43.3	180.0	R,G,B	4.00	M72x0.75
S5LPJ7255-M72	1.00	56.0	120.0	R,G,B	4.60	M72x0.75
S5LPJ7211-M90	1.00	70.0	180.0	R,G,B	5.00	M90x1
S5LPJ7212-M90	1.25	70.0	141.0	R,G,B	4.20	M90x1
S5LPJ7215-M90	1.51	70.0	111.0	R,G,B	6.00	M90x1
<b>HIGH-MAGNIFICATION TELECENTRIC LENSES</b>						
S5LPJ2533	3.00	16.0	100.4	R	3.45	C
S5LPJ2555	5.00	16.0	100.5	R	4.50	C
<b>TELECENTRIC SWIR LENSES</b>						
S5LPJ6835	0.33	16.0	147.0	SWIR	10.00	C
S5LPJ6837	0.50	24.0	147.0	SWIR	10.00	M42x1

PART NUMBER	FOCAL LENGTH [mm]	RECOMMENDED SENSOR DIAGONAL [mm]	MINIMUM F#	WORKING DISTANCE RANGE [mm]	WAVELENGTH BAND MONO (RED, GREEN, BLUE) WHITE (COLOR/BAYER) NIR (800-900nm) SWIR (900-1700nm)	RECOMMENDED PIXEL SIZE [μm]	THREAD
<b>ENTOCENTRIC LENSES FOR MULTILINE CAMERAS RGB-NIR</b>							
S5LPJ4429	28.0	40.96	4.0	450 - 1200	R,G,B,W,NIR	5.00	M58, optional M42
S5LPJ4440	40.0	40.96	4.0	350 - 1200	R,G,B,W,NIR	5.00	M58, optional M42
S5LPJ4465	65.0	40.96	4.0	500 - 1500	R,G,B,W,NIR	5.00	M58, optional M42
<b>ENTOCENTRIC SWIR LENSES</b>							
S5LPJ6805-216	50.0	16.0	1.8	400 - inf	SWIR	10.00	C
S5LPJ6807-M42	75.0	25.6	2.0	500 - inf	SWIR	10.00	M42x1
<b>ENTOCENTRIC TELE LENSES FOR LASER PROCESS IMAGING</b>							
S5LPJ0305	150.3	8.0	8.0	infinity	R	5.60	C
S5LPJ0303	305.3	11.0	16.0	infinity	R	5.00	C
<b>ENTOCENTRIC TELE LENSES FOR LASER PROCESS IMAGING WITH INTEGRATED LIQUID LENS</b>							
S5VPJ0305	150.0	11.0	8.0	infinity	R	5.60	C
S5VPJ0303	304.3	11.0	11.0	infinity	R	5.00	C

HIGHLIGHT  
HIGHLIGHT  
HIGHLIGHT

# PORTFOLIO LED CONDENSERS

## BENEFIT FROM OUR EXPERIENCE



Within our telecentric imaging lens portfolio, we have also developed LED condensers that complement our offerings. These condensers serve as collimated backlights for high-precision measurements in machine vision applications. Our main expertise lies in optical subassemblies that ensure the emitted light exhibits high homogeneity and parallelism.

In addition to the condensers available in our portfolio, we can provide other sizes (up to an illumination diameter of Ø150) and offer modifications or custom developments upon request. We are committed to meet your specific requirements and providing tailored solutions for your imaging needs.

PART NUMBER	CLEAR APERTURE/ ILLUMINATION DIAMETER [mm]	FOCAL LENGTH [mm]	LED	WAVELENGTH [nm]	MAX. CURRENT [mA]	CONNECTOR
<b>IR CONDENSER</b>						
S6IRI4530	30.0	30.0	SFH4770S	850	1000	M8 / 4-pin
S6IRI4540	55.0	76.0	SFH4770S	850	1000	M8 / 4-pin
S6IRI4550	73.0	100.0	SFH4770S	850	1000	M8 / 4-pin
<b>RED CONDENSER</b>						
S6IRI4531	30.0	30.0	GR QSSPA1.13	623	1000	M8 / 4-pin
S6IRI4541	55.0	76.0	GR QSSPA1.13	623	1000	M8 / 4-pin
S6IRI4551	73.0	100.0	GR QSSPA1.13	623	1000	M8 / 4-pin
<b>BLUE CONDENSER</b>						
S6IRI4532	30.0	30.0	GB QSSPA1.13	470	1000	M8 / 4-pin
S6IRI4542	55.0	76.0	GB QSSPA1.13	470	1000	M8 / 4-pin
S6IRI4552	73.0	100.0	GB QSSPA1.13	470	1000	M8 / 4-pin
<b>GREEN CONDENSER</b>						
S6IRI4533	30.0	30.0	GT QSSPA1.13	528	1000	M8 / 4-pin
S6IRI4543	55.0	76.0	GT QSSPA1.13	528	1000	M8 / 4-pin
S6IRI4553	73.0	100.0	GT QSSPA1.13	528	1000	M8 / 4-pin

### ACCESSORY FOR TELECENTRIC IMAGING LENSES AND LED CONDENSERS

PART NUMBER	DESCRIPTION
<b>LENS MOUNT SET</b>	
S5SET0020	Clamping Ø60/Ø75 for many telecentric lenses
S5SET0022	Clamping Ø47 for all LED condensers
<b>BEAMS SPLITTER CUBES FOR INTEGRATED COAXIAL ILLUMINATION</b>	
S0SET9125-000	Polarized beam splitter (standard condition)
S0SET9125-017	Non-polarized beam splitter
<b>RETARDATION PLATES FOR INTEGRATED COAXIAL ILLUMINATION</b>	
S5SET1150	half wave plate for 630nm, slide-in unit
S5SET8325-040	half wave plate for 630nm, add-on unit
<b>USB DRIVER FOR FOCUS TUNABLE OPTOTUNE LENSES</b>	
S5ZUB1640	Optotune USB Driver EL-E-4i
S5ZUB1641	Hirose 6-pin connection cable for USB Driver EL-E-4i

Other accessory upon request.

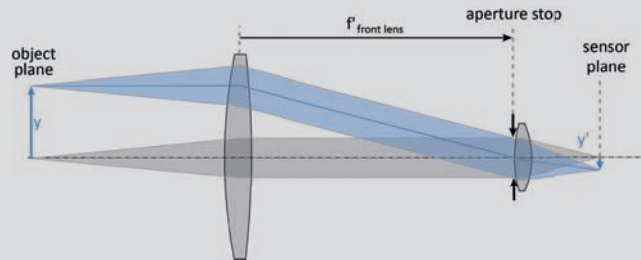
In case of demands on modifications, please contact our Customer Care Team.

**LENS DESIGNS – TELECENTRIC LENSES**

**OBJECT-SIDED TELECENTRIC LENS**

Object-sided telecentric lenses offer the highest measurement precision because the chief rays in the object space are parallel, and there is no magnification change with variations in working distance within the depth of field.

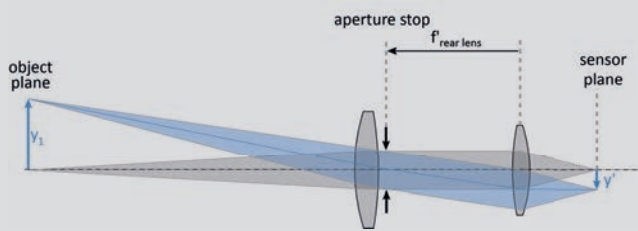
In addition to our portfolio of telecentric lenses, Sill Optics has successfully developed numerous customized telecentric designs for series production.



**IMAGE-SIDED TELECENTRIC LENS**

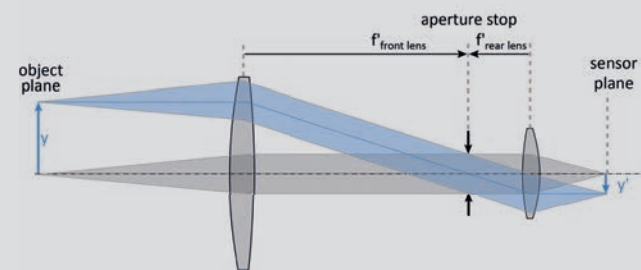
Image-sided telecentric lenses are essential for various specialized imaging purposes or specific camera types. These lenses are specifically designed for applications where intermediate images are required for follow-up systems (e.g., spectrometers) or for prism-based three-chip sensors.

In many applications with CMOS sensors, a small angle of incidence at the sensor side is adequate for optimal performance.



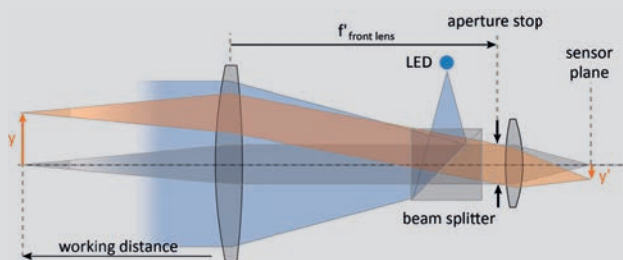
**BI-TELECENTRIC LENS**

Bi-telecentric lenses integrate both object-sided and image-sided telecentric beam paths into a single lens. These lenses offer significant advantages for high-spec imaging applications and provide minimal distortion.



**TELECENTRIC LENS WITH INTEGRATED COAXIAL ILLUMINATION**

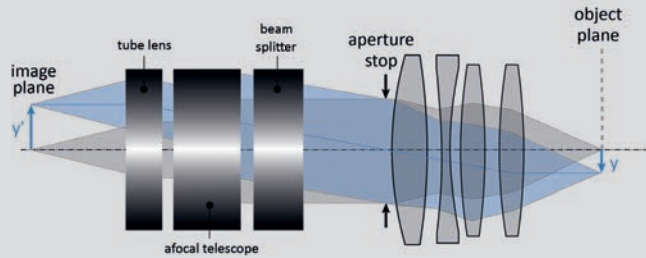
Telecentric lenses with integrated coaxial illumination offer a unique combination of telecentric imaging and coaxial collimated front illumination. This design incorporates a beam splitter to introduce the illumination path, while the front part of the telecentric lens collimates the light.



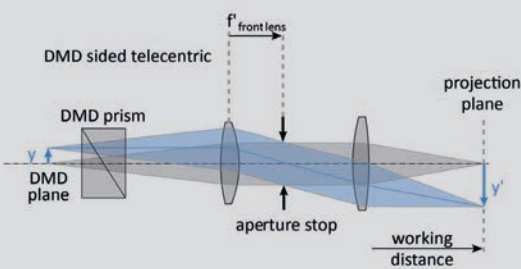
### LENS DESIGNS – TELECENTRIC LENSES

#### MICROSCOPE LENSES

Sill Optics is no typical microscope lens manufacturer for standards with small field of view (FOV) and high NA. Nevertheless, we have the manufacturing expertise to realize microscope lenses for applications with larger working distance ( $\geq 5$  mm) and  $NA \leq 0.5$  that require larger FOV or special waveband correction. We are your trusted partner in finding customized solutions to meet your individual requirements.



#### DMD LENSES



DMD lenses are specifically designed for the projection of a digital micromirror device. These lenses feature a telecentric design on the DMD side. When working with DMDs, it is essential to consider the prism material and internal distances to prevent axial color shift.

At Sill Optics, we are your trusted partner, especially when it comes to lenses for DMD manufacturing and precision measurement pattern projection. Our expertise in this area ensures that we can provide you with the optimal lens solutions tailored to your specific needs.

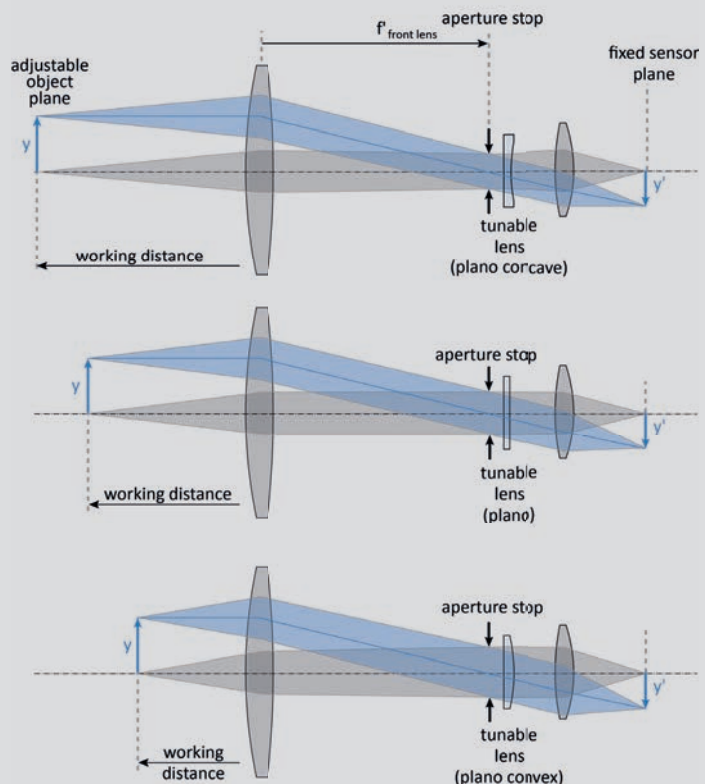
#### TELECENTRIC LENSES WITH INTEGRATED TUNABLE LIQUID LENS

Telecentric lenses with integrated tunable liquid lenses provide the capability for fast focus changes without the need for moving elements. While we offer a range of telecentric lenses in our portfolio, our true strength lies in designing custom lenses with integrated liquid lenses.

In our projects, we typically incorporate liquid lenses from Optotune, as we have had positive experiences with their reliable products.

However, it is worth noting that we can also develop entocentric designs with integrated liquid lenses if needed.

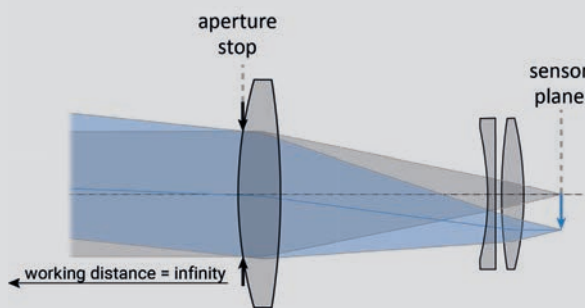
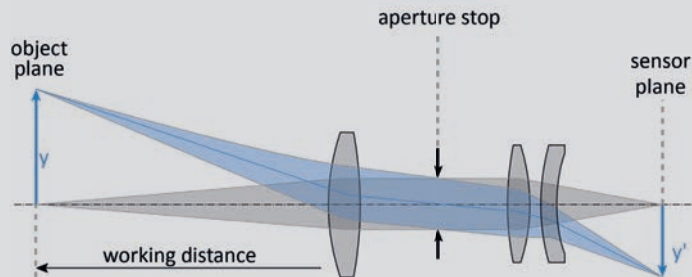
Count on Sill Optics to deliver the precise lens solution with integrated tunable liquid lenses that meets your specific requirements.



**LENS DESIGNS - ENTOCENTRIC LENSES**

**LARGE FIELD ENTOCENTRIC LENS**

Sill Optics defines "large field" as referring to lenses designed for use with sensors of a large diagonal size. When dealing with line scan cameras or large format area sensors with a length or diagonal size exceeding 43.3mm (full format), the complexity of entocentric lens design increases. These scenarios create a demand for custom development, particularly when high aperture, high resolution, and/or large bandwidth are required.



**TELEPHOTO LENS**

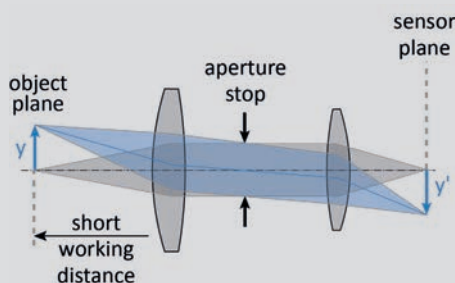
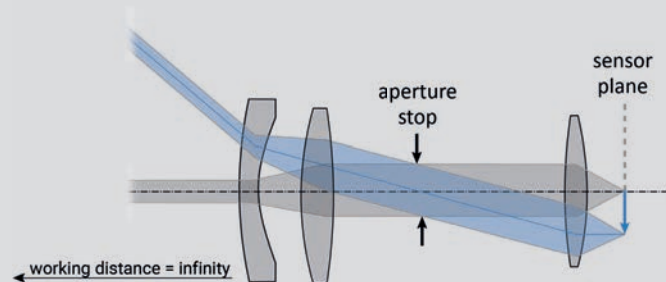
Telephoto lenses are characterized by their long focal length, which is typically greater than their physical length. These lenses are designed to capture images of distant objects with a specific magnification factor.

In telephoto lenses, the aperture stop is typically positioned at the front surface of the lens. When a larger aperture is desired, a correspondingly large front lens element is necessary to accommodate it.

**WIDE-ANGLE LENS**

Wide-angle lenses are commonly used for observation applications or imaging tasks that require capturing a large field of view at significant distances.

These lenses can be designed in two main configurations: fisheye lenses, which feature concave lens elements at the front, as shown; or pinhole lenses, where the aperture is positioned outside the lens assembly.



**MACRO LENS**

Macro lenses are entocentric lenses designed for capturing close-up shots with magnifications ranging from approximately 0.5x to 1.5x. These lenses feature a small optical transfer length and typically have a large aperture.

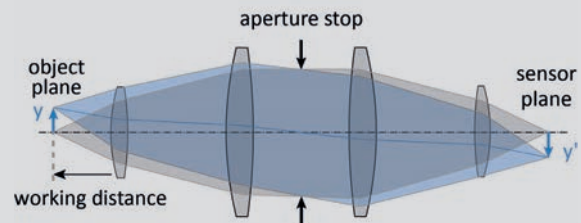
Due to the short transfer length, macro lenses require a short focal length and must be carefully designed to fit within the available space without compromising performance.

## LENS DESIGNS - ENTOCENTRIC LENSES

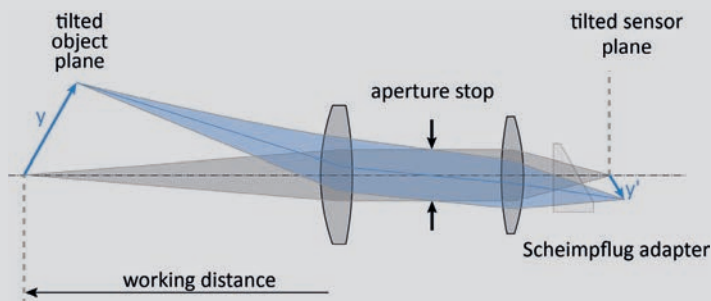
### RELAY LENS

Relay lenses are integral components of optical systems used to transfer an intermediate image plane to the pupil plane (Fourier plane) and/or back to a final image plane. They play a crucial role in various applications, such as refractive spectrometers.

Relay systems can be designed in a symmetric configuration, where the magnification is 1:1, or in an asymmetric configuration with a magnification ratio of 1:X. The choice of configuration depends on the specific requirements of the optical system.



Furthermore, relay lenses can also be utilized for pupil relays in specialized scanning setups. These setups allow for precise scanning and control of the beam path.



### SCHEIMPFLUG LENS FOR TILTED OBJECT PLANE

Scheimpflug lenses are designed to image a tilted object plane onto a tilted image plane while minimizing critical blur. This allows for capturing accurate measurements even when dealing with non-planar objects. The distortion can also be optimized for specific measurement purposes.

To accommodate standard imaging cameras, a tilting adapter can be used to meet the imaging performance requirements. This adapter ensures that the Scheimpflug imaging setup is compatible with the camera system being used.



**Field size (FOV, sensor size)**

**Camera specifications**  
(sensor dimensions, pixel size, resolution,  
camera thread, back flange distance,  
maximum chief ray angle, color)

**Aperture**

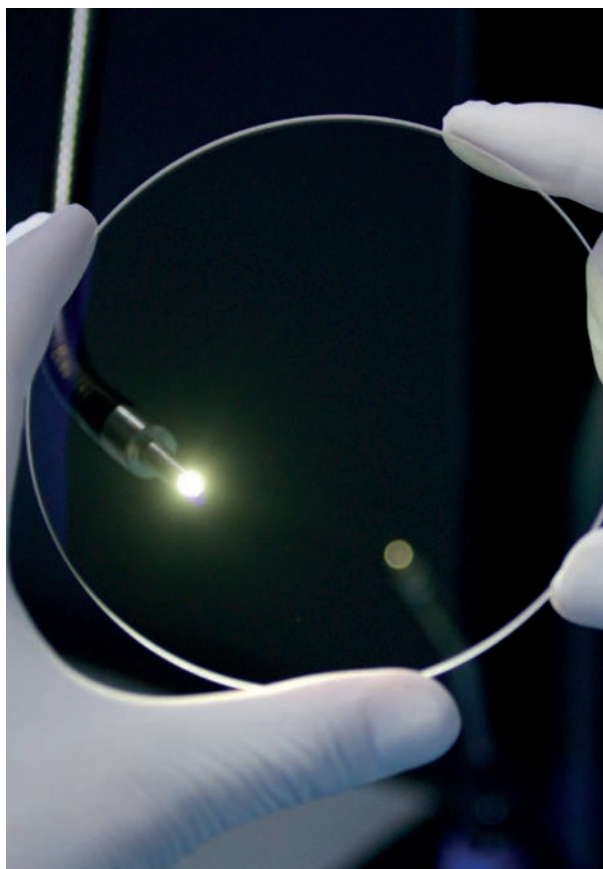
**Waveband**  
(UV, VIS, IR, bandwidth)

**Space constraints**  
(total track, working distance,  
maximum length, maximum diameter,  
mounting)

**Performance requirements**  
(Strehl ratio, MTF, edge spread  
function, distortion, color correction)

# NOTES

FOR YOUR INDIVIDUAL PROJECT





**Jürgen Stollhof**  
Director Sales  
& Marketing



**Bernhard Westerhoff**  
Global Key Account  
Manager



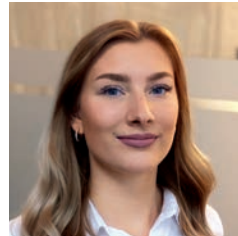
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Senior Sales Engineer



**Markus Klahr**  
Manager Internal Sales



**Karen Bloss**  
Customer Care



**Sophia Tillack**  
Customer Care



**Lenka Hightower**  
Customer Care



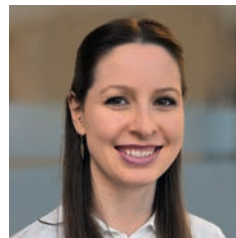
**Sabine Epner**  
Customer Care



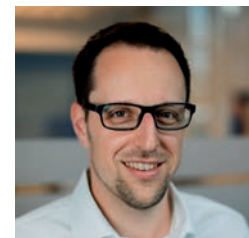
**Sabrina Rienesl**  
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**Sara Hildebrandt**  
Customer Care



**Raphaela Streit**  
Project Management



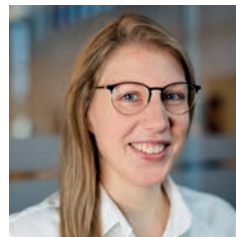
**Manuel Zenz**  
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**Julian Perlitz**  
Project Management



**Andreas Platz**  
Project Management



**Katharina Konerth**  
Project Management



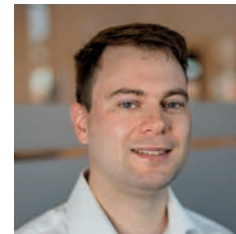
**Cornelia Halbhuber**  
Project Management



**Dr. Jonas Herbst**  
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**Thomas Schuffenhauer**  
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**Martin Kolb**  
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