


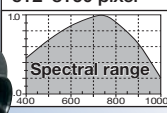
Line Scan Cameras

from 512 to 8160 pixels,
monochrome, color or **TDi**

Interfaces:

monochrome
512-8160 pixel

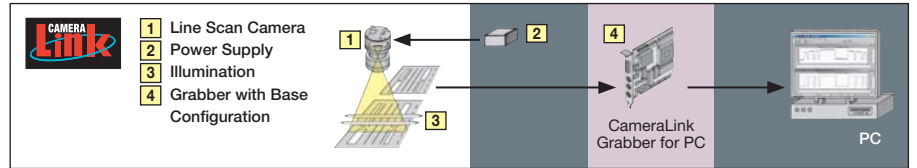



Spectral range

See Table 1, line 9 See Table 1, lines 1-8

- Industry-common standard for machine vision
- Very high transfer rates by CameraLink grabber
- Each grabber with Base Configuration is suitable

- Camera configuration files for selected grabber
- SKLConfig tool for camera configuration
- SkLineScan program for selected grabber





TDi Cameras
96x4096 pixel

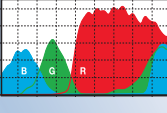


See Table 1, line 9 See Table 1, lines 1-8

Features	
Line frequency	max. 83 kHz
Shading correction	X
External synchronization	X
Data cable length	10 m
Frame grabber specification	Base Configuration
Software / SDK	from grabber manufacturer



Color
3x7600 pixel



See Table 1, line 9

SK1024CSD with mounting bracket SK5105 and CCTV lens









SK2048CPD with mounting bracket SK5105 and photo lens SK1.4/50-40 (integrated focus/aperture adjustment)

SK4096CTDI-XL (Camera body CG5) with focus adapter FA26-S45, extension ring ZR-L..., adapter M39-45 and macro lens Apo-Rodagon D1x4.0/75 mm for 1:1 depictions of the scanned object



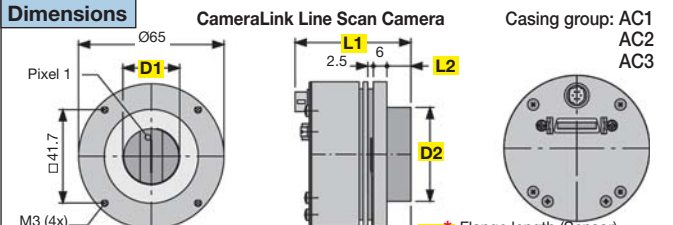
Accessories:

Lenses and lens adapters	Page 39-43
Extension rings	Page 39-43
Camera mounting brackets	Page 43
Connection cables, external power supplies	Page 38

Table 1		Line scan camera	Pixels	Pixel frequency, max.	Line frequency, max.	Video signal	Pixel size	Active length	Anti-Bloom	Integr. Ctrl.	Dynamic range (RMS)	Power supply	Camera casing	Lens thread
Interface		Order code	1	2	3	4	5	6	7	8	9	10	11	12
	1	SK512CPD	512	50 MHz	83.0 kHz	8/12 Bit	10 x 10 µm	5.12 mm	x	x	1:1500	+5V, +15V	AC1	C-Mount
	2	SK512CSD	512	30 MHz	53.5 kHz	8/12 Bit	14 x 14 µm	7.17 mm	x	x	1:2500	+5V, +15V	AC1	C-Mount
	3	SK1024CPD	1024	50 MHz	45.0 kHz	8/12 Bit	10 x 10 µm	10.24 mm	x	x	1:1500	+5V, +15V	AC1	C-Mount
	4	SK1024CSD	1024	30 MHz	28.0 kHz	8/12 Bit	14 x 14 µm	14.30 mm	x	x	1:2500	+5V, +15V	AC1	C-Mount
	5	SK2048CJR	2048	10 MHz	4.73 kHz	8 Bit	14 x 14 µm	28.70 mm	-	x	1: 625	+5V, +15V	AC2	M40 x 0.75
	6	SK2048CPD	2048	50 MHz	23.0 kHz	8/12 Bit	10 x 10 µm	20.50 mm	x	x	1:1500	+5V, +15V	AC2	M40 x 0.75
	7	SK2048CSD	2048	30 MHz	14.3 kHz	8/12 Bit	14 x 14 µm	28.70 mm	x	x	1:2500	+5V, +15V	AC2	M40 x 0.75
	8	SK4096CPD-L	4096	50 MHz	11.90 kHz	8/12 Bit	10 x 10 µm	41.00 mm	x	x	1:2500	+5V, +15V	AC3	M45 x 0.75
	9	SK5150CJR	5148	40 MHz	7.56 kHz	8 Bit	7 x 7 µm	36.00 mm	-	-	1: 500	+5V, +15V	AC2	M40 x 0.75
	10	SK7500CTF-XB	7500	80 MHz	10.1 kHz	8/12 Bit	7 x 7 µm	52.50 mm	-	-	1:1000	+5V, +15V	EC5	M72 x 0.75
	11	SK8160CKO-LB	8160	100 MHz	11.90 kHz	8/12 Bit	5 x 5 µm	40.80 mm	x	x	1:2500	+5V, +15V	AC3	M45 x 0.75
	12	 SK1024CTDI	96 x 1024	50 MHz	43.4 kHz	8/12 Bit	13 x 13 µm	13.30 mm	x	-	1:2500	+5V, +15V	AC2	M40 x 0.75
	13	 SK2048CTDI	96 x 2048	100 MHz	43.4 kHz	2*8 Bit	13 x 13 µm	26.60 mm	x	-	1:2500	+5V, +15V	AC2	M40 x 0.75
	14	 SK4096CTDI-XL	96 x 4096	100 MHz	22.30 kHz	2*8 Bit	13 x 13 µm	53.20 mm	x	-	1:2500	+5V, +15V	CC5	M72 x 0.75
	15	 SK6288CKOC	3 x 2096	60 MHz	9.28 kHz	8/12 Bit	14 x 14 µm	29.30 mm	-	x	1:2500	+5V, +15V	AC2	M40 x 0.75
	16	 SK12240CKOC-LB	3 x 4080	60 MHz	4.8 kHz	8/12 Bit	10 x 10 µm	40.80 mm	x	x	1:2500	+5V, +15V	AC3	M45 x 0.75
	17	 SK22500CNEC-XC	3 x 7504	70 MHz	8.93 kHz	3*8 Bit	9.3 x 9.3 µm	69.97 mm	-	-	1:1000	+5V, +15V	FC7	M72 x 0.75
	18	 SK22800CJRC-XC	3 x 7600	50 MHz	6.17 kHz	3*8 Bit	9.3 x 9.3 µm	70.87 mm	-	-	1:1000	+5V, +15V	FC7	M72 x 0.75

Dimensions

CameraLink Line Scan Camera Casing group: AC1, AC2, AC3



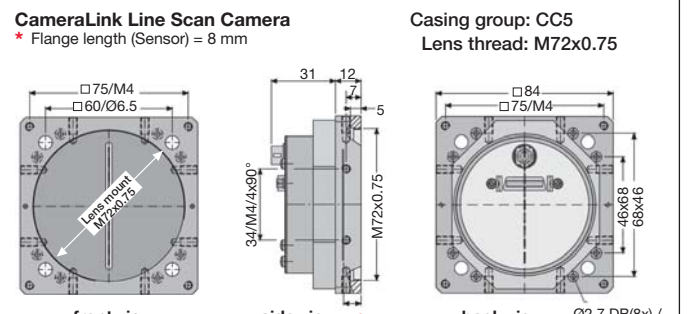
Pixel 1 D1 L1 L2 D2 L3* Flange length (Sensor)

Body type	D1 (Lens mount)	L1 (mm)	L2 (mm)	D2 (mm)	L3 (mm)
AC1	C-Mount	52.40	11.10	42.00	17.54
AC2	M40x0.75	54.00	12.70	42.00	19.50
AC3	M45x0.75	53.70	12.70	47.50	19.50

CameraLink Line Scan Camera

* Flange length (Sensor) = 8 mm

Casing group: CC5 Lens thread: M72x0.75

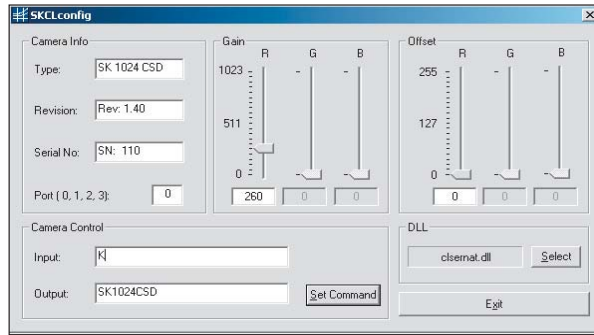


front view side view 8* back view

75/M4 60/Ø6.5 31 12 5 84 75/M4 46x68 68x46 Ø2.7 DB(8x) / Ø5x7

Configuration program SkCLconfig

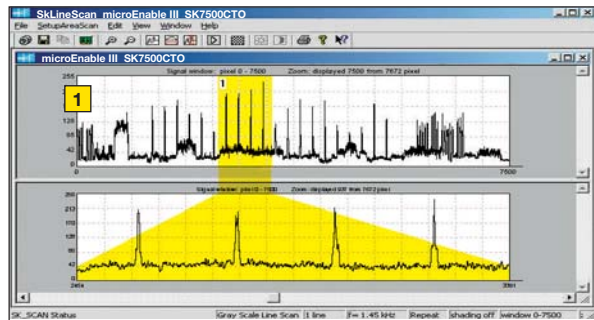
The configuration program **SkCLConfig** is shipped with all Schäfter+Kirchhoff cameras and enables the adjustment of line scan camera parameters, such as gain, offset, and pixel frequency, via the serial connector of the CameraLink interface. The software uses the *clser***.dll* supplied with the CameraLink grabber board or a choice is made from the installed *clser*.dll* list using **Select**. The parameter settings are stored within the camera board and are retained for immediate subsequent use even after a complete shut down.



Operating program SkLineScan: oscilloscope display

Any grabber board with a CameraLink Base Configuration can be used for controlling the line scan cameras from Schäfter+Kirchhoff and the SDK of the grabber manufacturer must be used for developing application software. Unfortunately, CameraLink grabber boards and their associated software are designed for area cameras and usually do not support line scan formats. For selected grabber boards, including Matrox Solios, National Instruments PCI-1428, DALSA X64 Xcelera-CL and microEnable III, Schäfter+Kirchhoff provides the **SkLineScan** operating program. The oscilloscope display provides a plot of the line scan signals, which can be fully zoomed to individual pixels over a selected area, and enables the parameterization and set up of the camera and optical system.

1 Oscilloscope display:
A highly convenient tool for the adjustment of focus, aperture settings and the evaluation of field flattening of the lens. The zoom function can display the signal for individual pixels over a freely selectable sensor length. The software can be adapted for other standard specification CameraLink grabber boards.

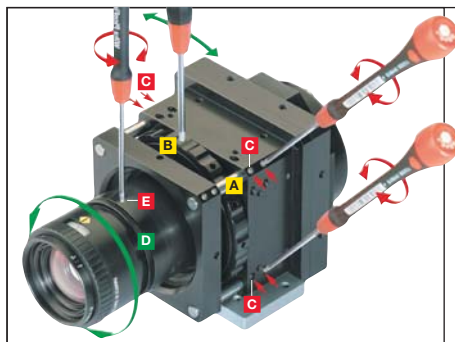


Camera commands

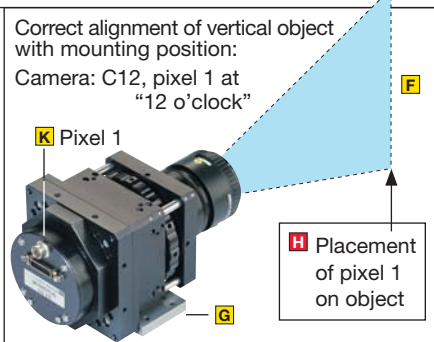
Operation	Description
Gnnnn<CR>	Set Gain Chan1 (Red) 0-24 dB
Bnnnn<CR>	Set Gain Chan2 (Green) 0-24 dB
Hnnnn<CR>	Set Gain Chan3 (Blue) 0-24 dB
Jnnnn<CR>	Set Gain Chan4 0-24 dB
Ommm<CR>	Set Offset Chan1 (Red)
Pmmm<CR>	Set Offset Chan2 (Green)
Qmmm<CR>	Set Offset Chan3 (Blue)
Ummm<CR>	Set Offset Chan4
F8<CR>	Output Format: 8-bit data
F12<CR>	Output Format: 12-bit data
C30<CR>	Camera Clock: 30 MHz
C60<CR>	Camera Clock: 60 MHz
CC3<CR>	Camera Clock external at CC3 (max. 60 MHz / optional)
T0<CR>	Test pattern off
T1<CR>	Test pattern on,
M1<CR>	Trigger Mode: External Trigger CC1
M2<CR>	Free Run with maximum line rate
M3<CR>	External Trigger & Integration CC1-input, optional
M4<CR>	External Trigger CC1, Integration CC2- input, optional
I<CR>	returns camera identification
K<CR>	returns SK type number
R<CR>	returns Revision number
S<CR>	returns Serial number
I4<CR>	returns Camera Clock Low Freq.
I5<CR>	returns Camera Clock High Freq.
I6<CR>	Ga1:xxxxx<CR> ret.Gain Chan1
I7<CR>	Ga2:xxxxx<CR> ret.Gain Chan2
I10<CR>	Ga3:xxxxx<CR> ret.Gain Chan3
I11<CR>	Ga4:xxxxx<CR> ret.Gain Chan4
I8<CR>	Of1:xxxxx<CR> ret.Offset Chan1
I9<CR>	Of2:xxxxx<CR> ret.Offset Chan2
I12<CR>	Of3:xxxxx<CR> ret.Offset Chan3
I13<CR>	Of4:xxxxx<CR> ret.Offset Chan4
Range	nnnn = 0...1023,
of values:	mmm = 0...255.

Camera commands are entered into the 'Input' field of the configuration tool and executed with the 'Set Command'

Line scan camera series ...-XL: lens focussing and measurement area alignments



- A** Linear tracking rods for precise travel of focussing encasement
- B** Focussing ring, ±15 mm (1 turn = 10 mm)
- C** Screw for locking the focussing encasement, hex Allen Key SW 1.5
- D** Rotatable lens extension ring for correct alignment of azimuth, lens thread M39x1/26"
- E** Screw for locking the lens housing, hex Allen Key SW 1.5



- Correct alignment of vertical object with mounting position:
Camera: C12, pixel 1 at "12 o'clock"
- K** Pixel 1
- F** Measurement area
- G** Placement of pixel 1 on object
- Correct alignment of the measurement area **F** can be achieved in four possible positions of the mounting plate **G**
- H** For a measurement area vertical to the mounted camera. The lens captures the lowest point of the scanned object at sensor pixel 1
- I** A measurement area parallel to the mounted camera. The lens captures the extreme right point of the object at sensor pixel 1

Camera back view

2 **Power**
Hirose series 10A, male 6-pin
5V DC/430 mA
15V DC/ 35 mA

1 Data: Mini D Ribbon, female 26-pin			
Pin	Signal	Pin	Signal
1	+15V	4	+5V
2	+15V	5	GND
3	+5V	6	GND

Correct alignment of horizontal object and camera placement:
Camera: C09, pixel 1 at "9 o'clock"

K Pixel 1

I Placement of pixel 1 on object

The position of the power input **K** indicates the location of sensor pixel 1 for cameras with a CameraLink interface

Accessories for Line Scan Cameras with CameraLink interface

<p>Control cable SK9018... for line scan cameras with CameraLink interface</p> <p>26-pin shielded cable, both ends with mini-ribbon connector (male 26-pin)</p> <p>SK9018.5-MM Order-Code</p> <ul style="list-style-type: none"> MM = Connector both ends (male) 3 = 3 m cable length 5 = 5 m (standard cable length) x = chosen length (maximum = 10 m) 	<p>Cable for power supply SK9015... for line scan cameras with CameraLink interface</p> <p>Shielded cable with connectors: Lumberg SV60 (male 6-pin) and Hirose HR10A (female 6-pin)</p> <p>SK9015.15MF Order-Code</p> <ul style="list-style-type: none"> MF = Connector (male /female) 1.5 = 1.5 m (standard) 3 = 3 m x = chosen length 	<p>Power Supply PS051515</p> <p>Order-Code</p> <p>Input:</p> <ul style="list-style-type: none"> • 100-240V AC • 0.8A • 50/60 Hz <p>3-pin input connector (IEC 320)</p> <p>Output:</p> <ul style="list-style-type: none"> • 5VDC/2.5A • 15VDC/0.5A • -15VDC/0.3A <p>output connector: Lumberg KV60, female 6-pin, length 1 m</p>	<p>Software SK91CL-WIN</p> <p>Order-Code</p> <ol style="list-style-type: none"> 1. Configuration tool SkCLConfig (supplied with camera) 2. SkLineScan for selected grabber boards: <ul style="list-style-type: none"> - DALSA X64 Xcelera-CL - PCI-1428, National Instruments - Matrox Solios - microEnable III SiliconSoftware - other grabber boards on request
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