



## SCORPION 3D STINGER™ CAMERA

### SCOPE

Scorpion Stinger™ is a family of machine vision components and products. They provide building blocks for OEM and system integrators.

Scorpion 3D Stinger™ products have focus on:

- industrial strength
- flexibility
- functionality

The Scorpion 3D Stinger™ Camera is carefully manufactured and designed using the finest components available. It is unique providing the following features:

#### Superior Projector Options

- Power from 1mW to 500mW
- Red Laser or Infrared projectors
- Single Line, Multiple Line and Random Pattern Projection Pattern
- Built in Strobing for Laser and LEDs

#### Industrial Housing IP-64

- 24 Volt power supply
- 30 mm and 200 mm baseline versions

#### High Quality Image Sensors

- CMOS or CDD Image Sensor
- VGA to 5MP Resolution
- Monochrome or Color

#### Proven software support

- Compatible with Scorpion Vision Software
- Scorpion 3D Stinger Dense Image Creator Application

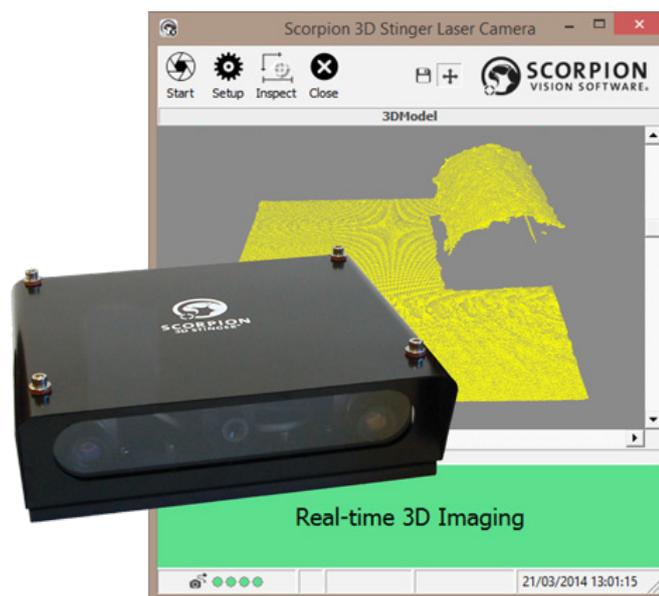
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The Scorpion 3D Stinger Camera is designed to be used in cutting-edge 3D Stereo Vision applications with or without structured light. It is compatible with the latest 3D version of Scorpion Vision Software and locates moving objects in 3D in real-time. The unit is designed to be used in 3D Robot Vision, 3D Laser Triangulation, 3D Gauging, 3D Assembly Verification and other advanced Machine Vision Solutions.



The components are selected with the highest quality. The unit's design will save man-hours when creating and deploying 3D Machine Vision Solutions. The 200 mm baseline unit, with a nominal weight of 3,5 kg, can be mounted on a robot.

The 30 mm baseline unit can replace a standard 2D camera where a sense of 3D is needed for object location, measurement or assembly verification.

The 3D Camera is the perfect companion for Scorpion Stinger for Robot Vision. Scorpion Vision Software can control multiple 3D cameras from a single Scorpion Compact PC. Combining multiple 3D cameras can be used to provide multiple viewing angles and to extend 3D FOV without losing resolution. The state-of-art multi-core support ensures the fastest and most robust 3D Stereo Vision solutions.

The unique one-push 3D calibration technology provided by Scorpion secures optimal performance and easy maintenance. The 3D - z resolution is by rule-of-thumb equal to the pixel resolution in 2D. This means that a cube of 1 m x 1 m x 0,5 mm can be resolved by 1 mm with a 1.3 MPixel 3D Camera.

The Scorpion Stinger Control Card provides the ability to capture one 3D images with a laser projection and then capturing a 2D image set.

The 3D images are used to locate objects in 3D. In the 2D image, the 3D references from the 3D image is used to do 3D measurements in 2D images with the highest possible accuracy.

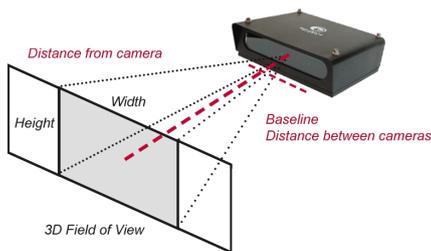


## SCORPION CAMERA STINGER™ FEATURES

**Stereo Vision** is the extraction of 3D information from digital images, such as obtained by a Scorpion 3D Stinger Camera.

By comparing information about a scene from two vantage points, 3D information can be extracted by examination of the relative positions of objects in the two panels.

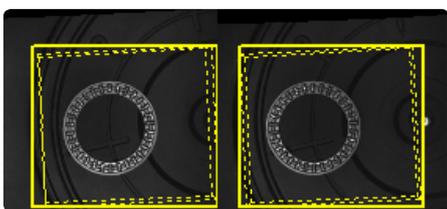
The Scorpion Vision Software tool # 97 - Locate3D calculates the 3D position x,y,z of two corresponding points from two 3D Calibrated Images.



*The Scorpion 3D Stinger Stereo Vision Calculator calculates the 3D FOV*

**Image Rectification** - Image rectification is supported by tool component STC-0084 StereoRectify3D.

This transforms two 3D Calibrated images into two stereo rectified images where all epipolar lines are parallel to the horizontal axis and the corresponding points have identical vertical coordinates.



*Image rectification*

**2D Image Calibration** is performed by the Scorpion tool # 15- Calibrator.

**One Push 3D Calibration** is a concept for automatic fast, accurate and reproducible multiple 3D camera calibration using one single image and a Scorpion Stinger 3D Calibration object.



*One Push 3D Calibration Status Panel*

**Active Stereo Vision** signified that energy in the form of light is projected into the scene.

The Scorpion 3D Stinger Camera is an industrial stereo vision camera in an IP-64 enclosure. The camera is supporting passive and active stereo vision. The camera is supplied with 24 volt and an ethernet connection. **Active Stereo Vision** is supported by the means of integrated white or IR high power leds, structured illumination with different pattern based on red or IR lasers.

The **Stinger Control Card** strobes the laser and the LED illumination. This is important to meet the Laser Safety requirements for machine vision system.

Strobing also improves the ambient light protection and the Signal to Noise ratio of the projected pattern.



*Scorpion Stinger control card*

**Structured Illumination** - the Scorpion 3D Stinger Camera supports multiple projection patterns to solve the following challenges: create features on featureless surfaces, solve the basic feature correspondence problem.

The following patterns are supported: Single Line, Multiple Lines and RPP - Random Projection Pattern. The user can choose Red or IR laser projection from 1 mW to 500 mW.

Standard **High Quality GigE Cameras** from Sony and Basler is used as image sensors in the Scorpion 3D Stinger Camera.

Resolution from VGA to 5MP is supported with monochrome or color CMOS or CCD sensors optimized for price, speed or image quality.



*Scorpion 3D Stinger™ Camera is designed for 3D Bin Picking*



**30 mm and 200 mm Baseline** - the Scorpion 3D Stinger Camera is manufactured in two different baseline models.

The 200 mm baseline version is designed for Robot Vision and Gauging applications.

The typical 3D FOV is a Euro Pallet - W = 800 x H = 1200 mm x D = 500 mm.

The 1.3 MPixel model has a 2D x,y resolution of 0.1 mm and a typical depth resolution 1.0 mm with a good 3D Calibration.

The 30 mm baseline is to be used at a typical 3D FOV distance from 200 to 600 mm and an area from 100 x 100 mm to 350 x 350 mm. Depth resolution from 0.1 mm.



*Scorpion 3D Stinger™ 30mm Camera and Scorpion 3D Stinger™ Camera*



*The Scorpion ExtractMap3D converts a Point Cloud to 2D Image where the intensity represents Z or the height*

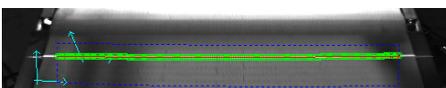
**Sparse 3D Image Creation** - Scorpion Vision can accumulate single, multiple 3D feature points into a 3D Point cloud.

The 3D images are often used to locate an object plane with tool 121 - PlaneFit3D.



*The 3D edge points from a circular object. Can be located by PlaneFit3D*

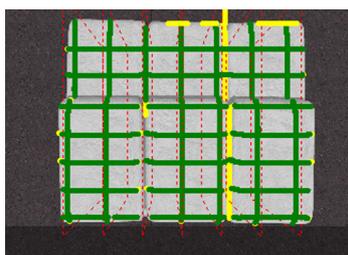
**Single Line Projection** is normally used for Laser Triangulation. Scorpion 3D Stinger Cameras for standard Laser Triangulation are available. The Scorpion tool # 166 - LaserProfiler3D provides an easy means to create point clouds from a sequence of images with a single line laser projection.



*Single Laser Line Projection from a Scorpion 3D Scanner*

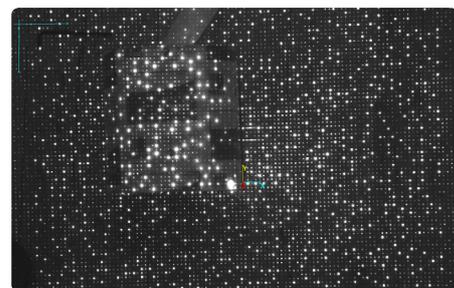
**Multiple Line Projection** - a laser with a multiple line projector is used to project structured light on an object or on a plane. This projection provides superior accuracy in measurement application.

The projected lines can be located in 3D with the advanced tool component STC-0064-LocatePaths3D. The sparse 3D information from multiple 3D points generators is moved into a 3D Image for further processing.



*Multiple Lines are suitable for 3D Sack Picking from a pallet*

**RPP - Random Pattern Projection** - a laser with a random pattern projector is used to project random texture onto the two images. The disparity of the projected pattern is ideal for BlockMatching.



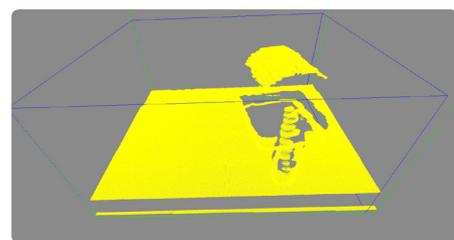
*Random Pattern Projection*

**Dense 3D Image Creation** - Scorpion Vision Software supports different means of Dense 3D Image Creation. 3D scanning using 3D Laser Triangulation with a Scorpion 3D Stinger Camera and a Single Line Laser is a basic and proven method when the object or the camera is moving.

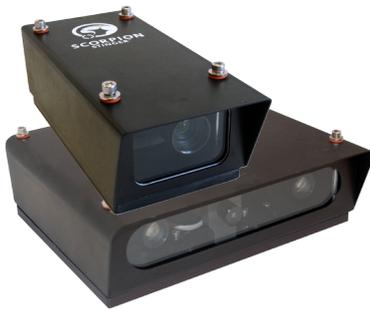
The tool component STC-0083 Disparity-Map3D produces a dense 3D image within a 3D FOV from two stereo rectified images. The method can be used with passive and active stereo vision.

A RPP - Random Pattern Projection laser will guarantee features on a featureless surface and improve the applicability of block matching. The STC supports multiple Block Matcher to handle different block matching scenarios.

**3D Point Cloud** - A 3D image or 3D point cloud is an ordered or unordered sequence of 3 points.



*3D point cloud*



## HARDWARE CONFIGURATION

The typical system contains two cameras with lenses, power and easy mounting. The standard unit is ready for GigE vision with an internal switch, a termination panel and an internal DC-DC conversion. The unit is fed with 24 volts. Internally 5V and 12V are available to power cameras, laser and other internal and external components.

ARTICLE #	C=CAMERA	BL= BASELINE MM	N=CAMERA LENS	M=LED TYPE <sup>1)</sup>	O=LED LENS	COMMENT
STG-3D-C-N-M-O-BL	2 x GigE camera	30 mm   200 mm	6   8   12   N mm	White   IR	24,2°   33,5°	Passive Stereo
STG-LASER-C-N-M-O-BL	1 x GigE camera	200 mm	6   8   12   N mm	White	24,2°   33,5°	Red laser 660 nm
STG-LASER-DUO-C-N-M-O-BL	2 x GigE camera	30 mm   200 mm	6   8   12   N mm	White	24,2°   33,5°	Red laser 660 nm
STG-MLASER-C-N-M-O-BL	2 x GigE camera	30 mm   200 mm	6   8   12   N mm	White   IR	24,2°   33,5°	Multiline laser
STG-RPP-C-N-M-O-BL	2 x GigE camera	30 mm   200 mm	6   8   12   N mm	White   IR	24,2°   33,5°	Random Pattern Projection laser

1) LED is optional. All other configuration available upon request.

### CAMERAS 200MM VERSION

CAMERAS	TYPE	SENSOR
VGA	Sony XCG-V60E	1/3" CCD 640 x 480
VGA-640gm	Basler acA640-120gm	1/4" CCD 640 x 480
SXGA	Sony XCG-SX99E	2/3" CCD 1280 x 1024
SXGA-1300gc	Basler acA1300-60gc	1/2" CMOS 1280 x 1024 Color
SXGA-1300gm	Basler acA1300-60gm	1/2" CMOS 1280 x 1024
2MP	Sony XCG-U100E	1/1.8" CCD 1600 x 1200
3MP-IR	Sony XCG-H280	2/3" CCD 1920 x 1280
5MP	Sony XCG-5005E	2/3" CCD 2500 x 2000
2MP-C	Sony XCG-U100CR	1/1.8" CCD 1600 x 1200 Color

### TRIGGERING

There are two trigger inputs on the Scorpion Stinger Interface Board inside the Scorpion 3D Stinger Camera. The standard input is straight via an opto-coupler: +A4 and -A5. An input with debounce circuitry is also available: +A1 and -A2.

### RELAY MODE

The standard Trigger Input used is through an opto-coupler where the +input (A4 or A1) is connected to 5 volt (A3) through a pullup resistor and the -input (A5 or A2) is connected to GND (A6).

### 24 V TRIGGER INPUT

By removing the pullup resistor (A3) and the GND connection (A6) the relay input is turned to a 24 volt input.

The default configuration for the trigger input is with a pullup resistor.

### CAMERAS 30MM VERSION

CAMERAS	TYPE	SENSOR
VGA-640gm	Basler acA640-120gm	1/4" CCD 640 x 480
SXGA-1300gc	Basler acA1300-60gc	1/2" CMOS 1280 x 1024 Color
SXGA-1300gm	Basler acA1300-60gm	1/2" CMOS 1280 x 1024

### INTERFACE BOARD SWITCH SETUP

SWITCH	DEFAULT	OFF MEANS	ON MEANS
SW 1.1	On	No boost charge	Boost charge during LED pulse
SW 1.2	On	Capacitor charge current 190 mA	Capacitor charge current 480 mA
SW 2.1	On	Select timeout 1,7 sec	Select timeout 163 ms
SW 2.2	Off	LED current 3A	LED current 1A
SW 3.1	Off	LED pulse limit 75 ms	LED pulse limit 6,3 ms
SW 3.2	Off	Laser pulse limit 75 ms	Laser pulse limit 6,3 ms
SW 4.1	Off	LED pulse every 2nd image capture	LED pulse every image capture
SW 4.2	Off	Laser pulse every 2nd image capture	Laser pulse every image capture



## SCORPION 3D STINGER 200 MM BASELINE CAMERA



Scorpion 3D Stinger 200 mm Camera

The Scorpion 3D Stinger Camera™ is a high performance industrial camera enclosed in an IP rated industrialised housing which contains electronics for illumination, camera connectivity and power distribution. The 200 mm baseline version is designed to be mounted on a robot or placed over a pallet.

CONNECTOR	A
1	INPUT 24V +
2	INPUT 24V GND
3	Expo Out
4	LED DIM Out
5	Out 5V+
6	Out 5V GND
7	Laser On
8	Laser On GND

CONNECTOR	B
1	OUT 12V+
2	OUT 12V GND
3	Trig +
4	Trig -
5	LED +
6	LED -

### POWER CONSUMPTION

The units is powered with 24 Volt Type typical power consumption is 12-18 Watts. The actual power consumption depends on camera configuration.

The Scorpion 3D Stinger™ Camera consists of:

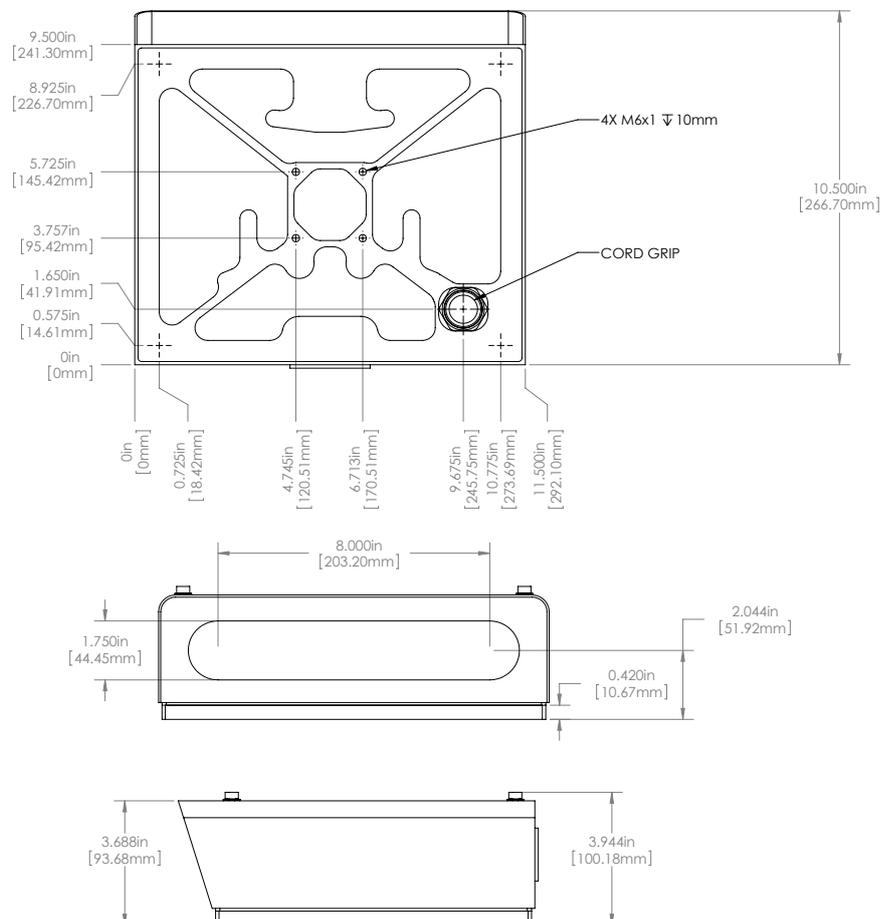
- an IP-64 aluminium enclosure
- typically two cameras with lenses
- optional LEDs and Laser
- termination panel & cables
- Scorpion Stinger Control Card
  - strobing
  - 24v input, 5v and 12v output
- GigE switch

The 200 mm baseline version is designed for Robot Vision and Gauging applications.

The typical 3D FOV is a Euro Pallet - W = 800 x H = 1200 mm x D = 500 mm.

The 1.3 MPixel model has a 2D x,y resolution of 0.1 mm and a typical depth resolution 1.0 mm with a good 3D calibration.

### DIMENSIONS - WEIGHT 3.5 KG





## SCORPION 3D STINGER 30 MM BASELINE CAMERA



*Scorpion 3D Stinger 30 mm Camera*

The Scorpion 3D Stinger Camera™ is a high performance industrial camera enclosed in an IP rated industrialised housing which contains electronics for illumination, camera connectivity and power distribution.

The camera is self-contained with integrated illumination and can replace a 2D Camera where a sense of 3D is needed or required.

The compact 30 mm version is provided in two basic versions with two GigE cameras:

- A stereo vision version with optional White or IR LED
- A RPP Camera version with a red 35 mW RPP laser.

The 30 mm baseline is to be used at a typical 3D FOV distance from 200 to 600 mm and an area from 100 x 100 mm to 350 x 350 mm. Depth resolution from 0.1 to 0.5 mm with 1.3 MegaPixel camera.

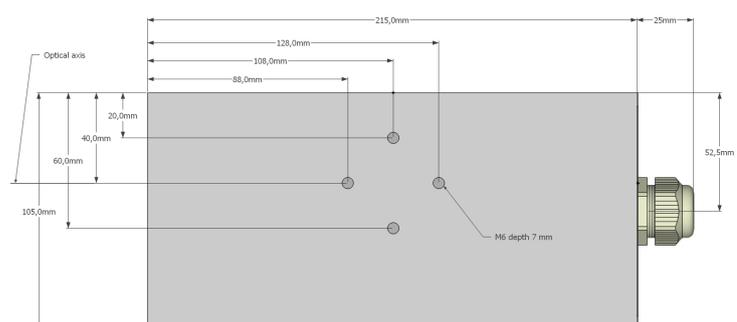
### POWER CONSUMPTION

The units is powered with 24 Volt  
Type typical power consumption is 12 Watts. The actual power consumption depends on camera configuration.

The Scorpion 3D Stinger™ Camera consists of:

- an IP-64 aluminium enclosure
- typically two cameras with lenses
- optional LEDs and Laser
- termination panel & cables
- Scorpion Stinger Control Card
  - strobing
  - 24v input, 5v and 12v output

### DIMENSIONS - WEIGHT 1.8 KG



CONNECTOR	
1	INPUT 24V +
2	INPUT 24V GND
3	Out 5V+
4	Out 5V GND
5	Laser On
6	Trig +
7	Trig -

*Housing dimensions 30mm baseline version: top view and back plane.*