

ROBOT- GUIDANCE

.....
Robot Vision Systems



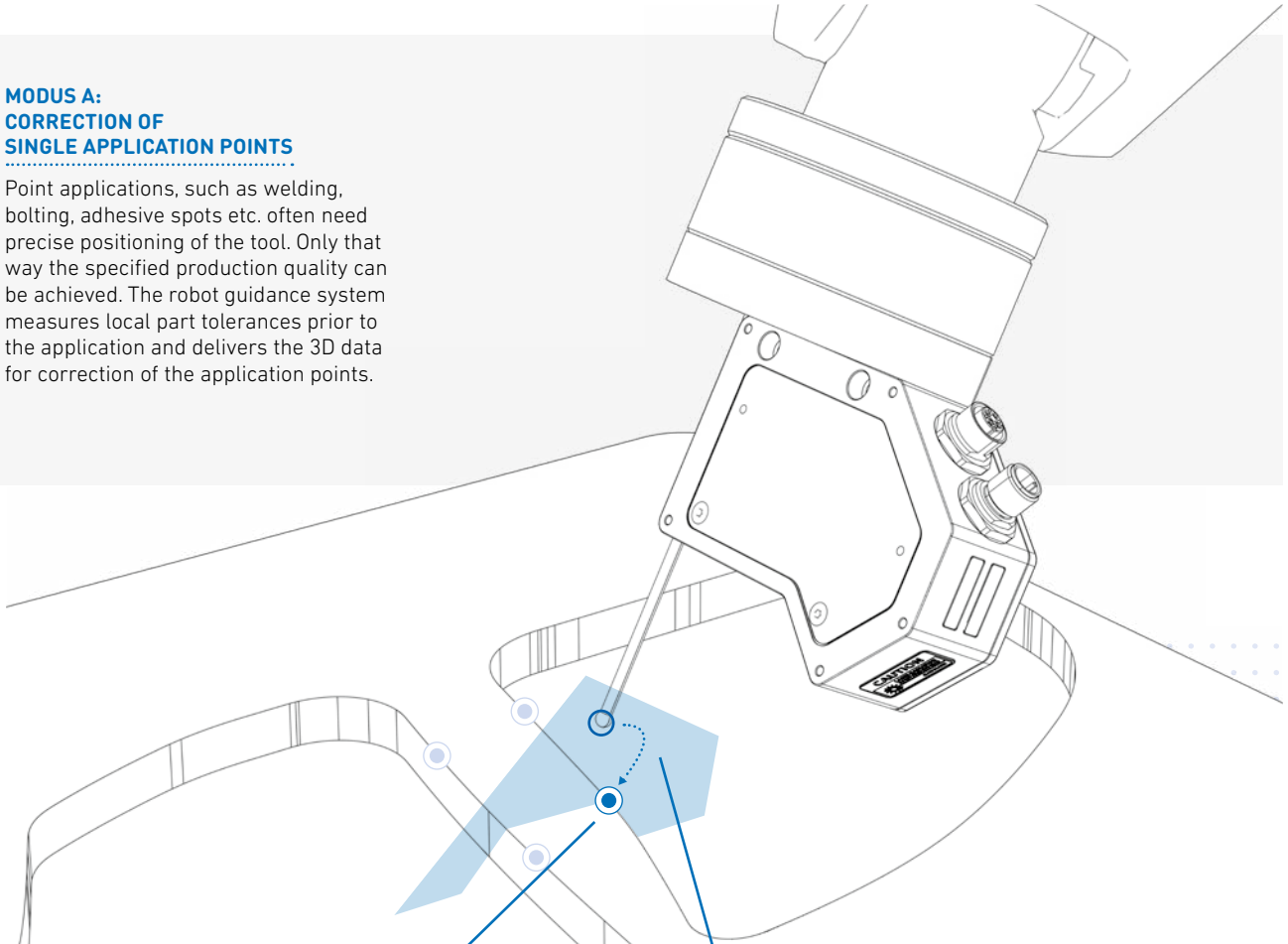
AI

Simple by Design

The ROBOT GUIDANCE SYSTEM can be operated in different modi. You can guide your tool independently per characteristic or adjust the complete position of the part. You will find the explanation for both modi on the following pages.

**MODUS A:
CORRECTION OF
SINGLE APPLICATION POINTS**

Point applications, such as welding, bolting, adhesive spots etc. often need precise positioning of the tool. Only that way the specified production quality can be achieved. The robot guidance system measures local part tolerances prior to the application and delivers the 3D data for correction of the application points.



**1.
MEASURING OF A
"CORRECTION VECTOR" FOR
EVERY APPLICATION POINT**

Through the measurement with VISIONSCANNER2 deviations of the application points are acquired. The specification of the ideal application points through calibration or CAD data enables the system to determine the "correction vectors".

**2.
USAGE OF THE CORRECTION VECTOR FOR
EACH POSITION OF THE APPLICATION**

The determined correction vectors can be used as TCP- or FRAME-corrections.

MODUS A OFFERS TWO PROCESS SEQUENCES:

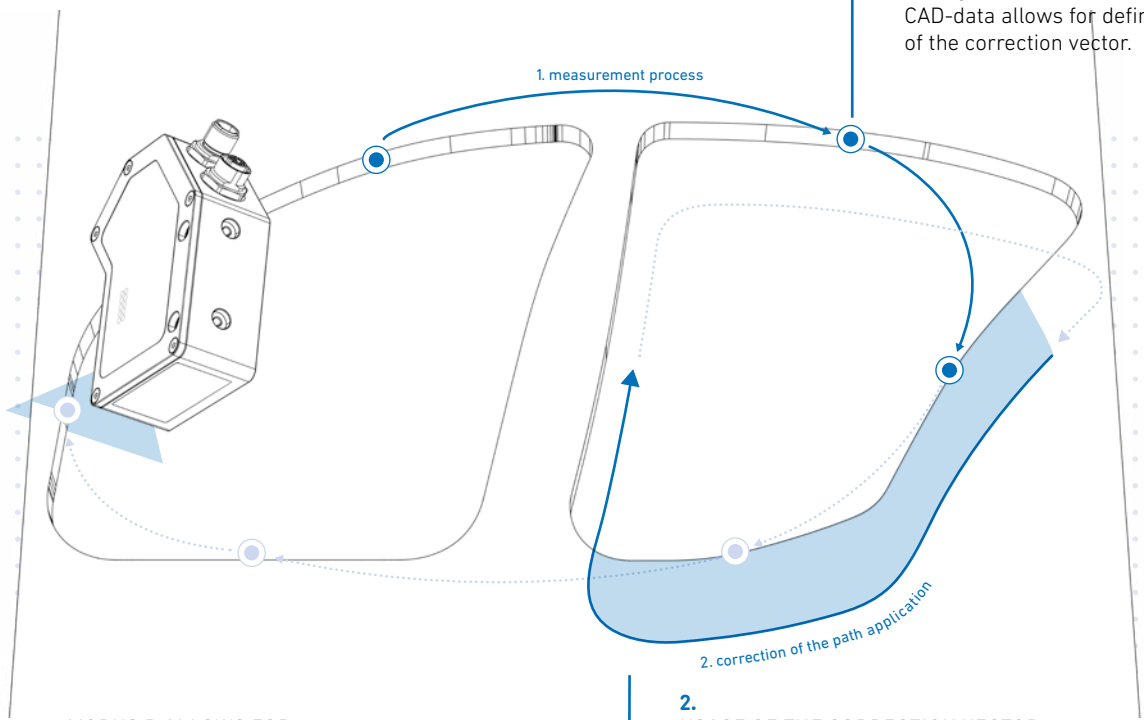
- measuring, measuring, ..., applying, applying, ...
- measuring, applying, measuring, applying, ...

**MODUS B:
CORRECTION OF THE COMPLETE APPLICATION PROGRAM**

Path and handling application such as adhesive applications, welding or assembly processes need a precise positioning of path or part. Thus, the mandatory production quality can be achieved. The ROBOTGUIDANCE System measures the part at several features and delivers a 6D correction vector for the complete part.

**1.
MEASURING OF THE CORRECTION VECTOR FOR THE COMPLETE PART**

Global deviations in part position are detected through measuring of several features of the part. The default ideal part position through measurement or CAD-data allows for definition of the correction vector.

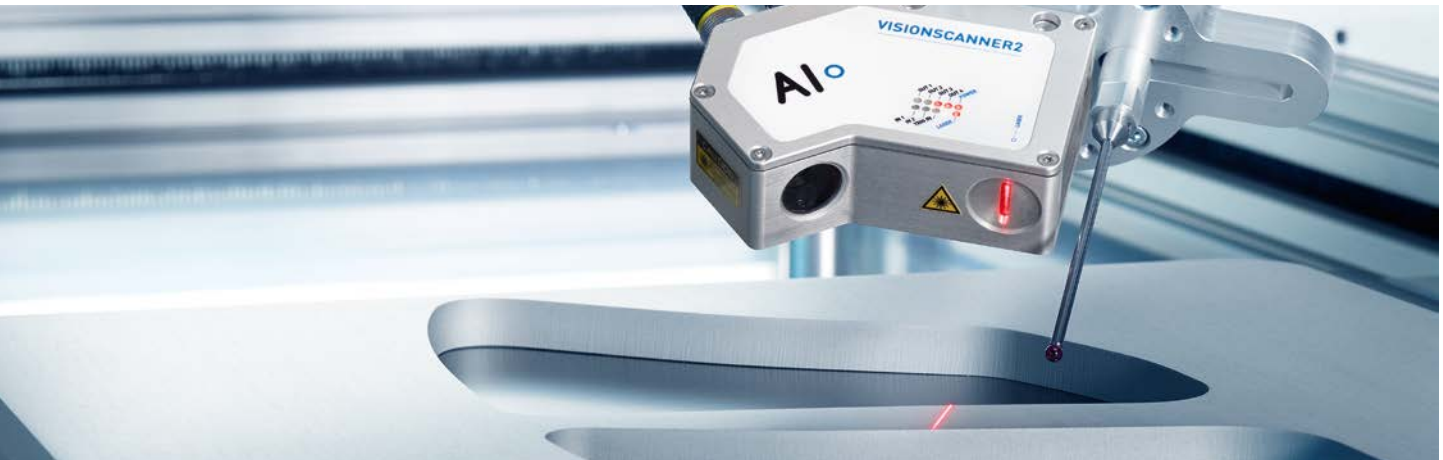


**MODUS B ALLOWS FOR
TWO PROCESS SEQUENCES AS WELL:**

- after each other with one sensor
- at the same time with multiple sensors

**2.
USAGE OF THE CORRECTION VECTOR FOR THE GLOBAL PART POSITION**

The determined correction vector is used as FRAME correction data. Thereby the global application program is being shifted.



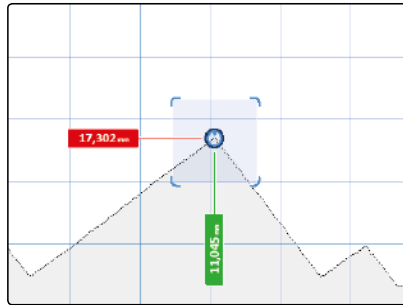
Positioning of your robot through AI◦ ROBOTGUIDANCE. We determine the pertaining correction for your robot to compensate tolerances in the part or system and guide your robot to the desired location.

- 3D local correction with one measurement. (2 translations, 1 rotation)
- 6D correction for the global part position through a combination of minimum 3 measurements. (3 translations, 3 rotations)
- Depending on the situation, sensors can be integrated into the production line in a stationary set up or can be attached to a robot.
- Delivery of a technology package for robot communication.
- Fast integration into the robot program through simple "Inline-Form-Commands".
- Short measuring time of 200 ms (example: 5 measuring points; 1.5s time for robot moves: $5 \times (0.2 \text{ s} + 1.5 \text{ s}) = 8.5 \text{ s}$ additional process time)
- High accuracy: 0.2 mm (assumption: 0.1 mm robot and 0.1 measurement inaccuracy. Multiple measurement points do not decrease accuracy)
- Low maintenance: Sensors are easy to exchange. (please see "commissioning and maintenance")

AI• VISIONSCANNER2 is being delivered with multiple measuring tools. Thereby it solves most of your measuring tasks already.

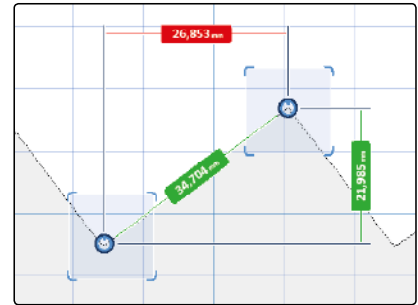
POSITION

E.g. increase the positioning accuracy of your production process.



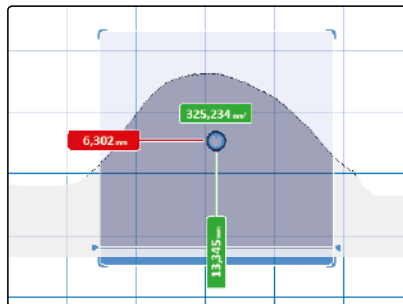
DISTANCE

100 % checks of important dimensions of your product.



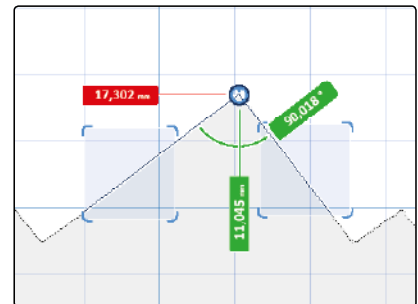
AREA

E.g. regulation of adhesive load during application.



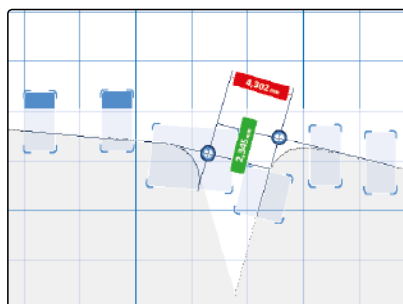
ANGLE

Secure e.g. the quality of your bending process.



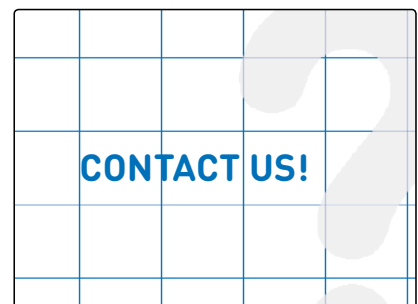
GAP

Track e.g. the accuracy of assembling automotive closures into a car body.



YOUR TASK

We develop customized solutions for your needs.



CONFIGURE, VISUALIZE & CONTROL TASKS ◦ ROBOTGUIDANCE ◦ AI

Put your measuring, control or robot guidance task in effect within shortest time. Therefore a fully integrated, graphical user interface is at your disposal. Programming skills are not required. Keep the system under control and use data from a previous period for analysis.

LIVE VIEW

Configure your measuring tasks online based on live data.

DATABASE OF DEFECT CHARACTERISTICS

Control and optimize your measuring tasks offline based on saved measuring data.



GRAPHICAL PARAMETER SETTING

Fast and precise system configuration through intuitive graphical setting of parameters.

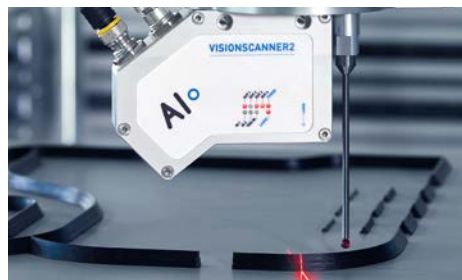
MEASURING AND CONTROL DATA

The graphical visualization offers a simple overview over measuring and control data.

AI◦ VISIONSCANNER2 uses multiple mechanisms to ensure a robust profile reading. Thereby it is perfectly applicable also to difficult measuring tasks in today's production environments.

1. BANDPASS FILTER

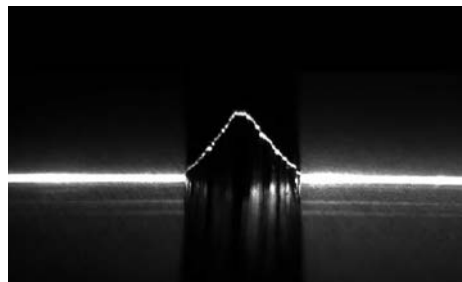
Reduction of system errors
incidence of extraneous light.



1.

2. ROBUST EXTRACTION OF LASER LINE

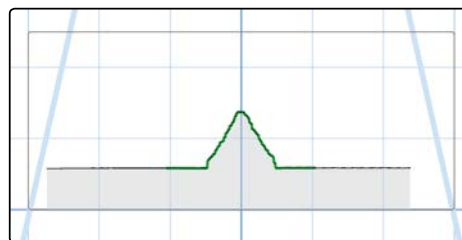
Automatic resolution of ambiguity by reflection or scattered light. Extraction of the laser line simultaneously between light and dark lines.



2.

3. PREPROCESSING OF PROFILES

Morphological filter
for elimination of flaw.



3.

4. DYNAMIC ADJUSTMENT OF LIGHT EXPOSURE

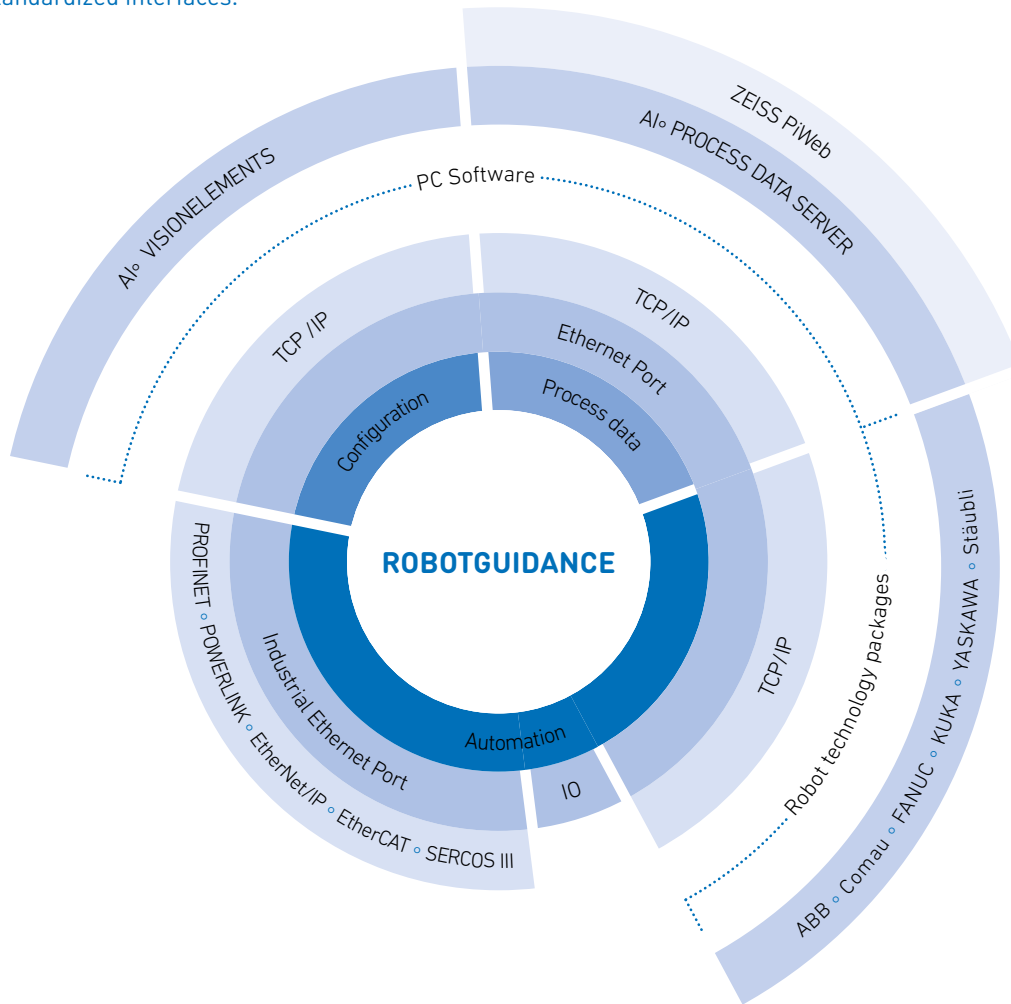
Verification of line intensity in a defined area of the measuring location. Adjustment to optimal illumination also for scanning processes.

Evaluation



THE INTERFACES ◦ ROBOTGUIDANCE ◦ AI

The strength of AI° VISIONSCANNER2 is its ability for integration. We offer multiple industrially standardized interfaces.



..... Software products or software options which need to be installed on a robot or PC.

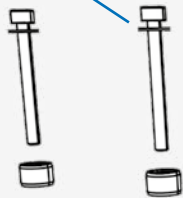
AUTOMATION INTERFACE TCP/IP ◦ INTERFACE

Robot Manufacturer	Supported Controllers	Mandatory Options
KUKA	KRC2, KRC4, VKRC2, VKRC4	KUKA.Ethernet KRL XML
Stäubli	CS7, CS8, CS9	-
FANUC	RJ3iB, R30iA, R30iB	SKMG Socket Messaging, R648 User Socket Messaging
ABB	IRC5	PC-Interface Option 616-1
YASKAWA	DX200	MotoPlus
Comau	C5G	PDL2 Read/Write on TCP/IP

Within only few steps AI° VISIONSCANNER2 is fully integrated into the automation environment. Next to simple mechanical and electrical setting, the development has been carried out specifically in regards to network configuration and creation of measuring programs.

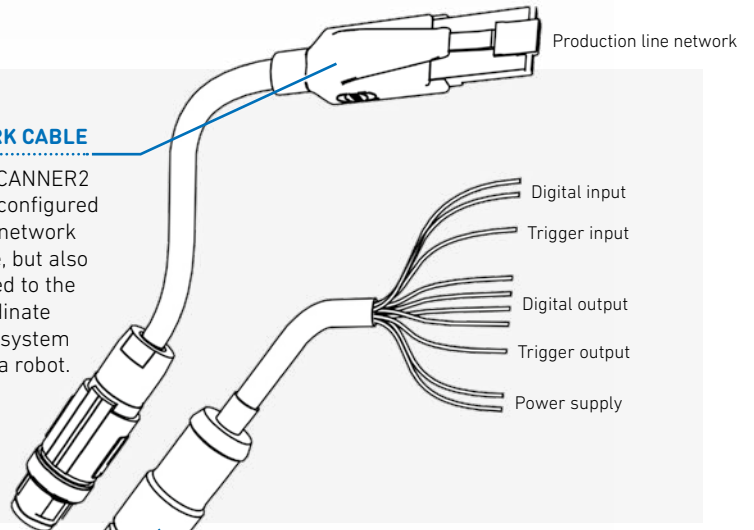
1. MECHANICAL INTEGRATION

For repeatable accurate mounting, VISIONSCANNER2 is positioned through two centered bushes.



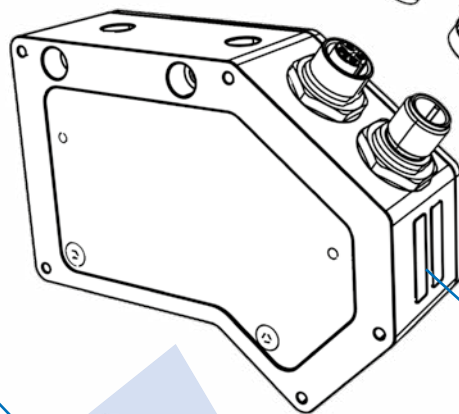
2. NETWORK CABLE

VISIONSCANNER2 is being configured through network interface, but also connected to the superordinate controls system (PLC) or a robot.



3. CONTROL CABLE

The sensor is being powered through a control cable. The digital input and output plugs ensure a very simple integration into the automation environment and the trigger inputs and outputs allow for a synchronized set up with multiple sensors.

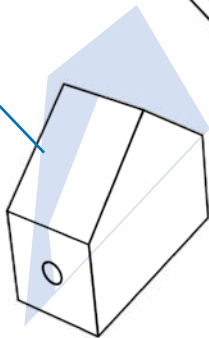


4. SERIAL NUMBER

At set up or exchange of the sensor, just select the sensor with its dedicated serial number. The network configuration of the specific sensor is automatically adjusted to preset configuration.

6. REFERENCING

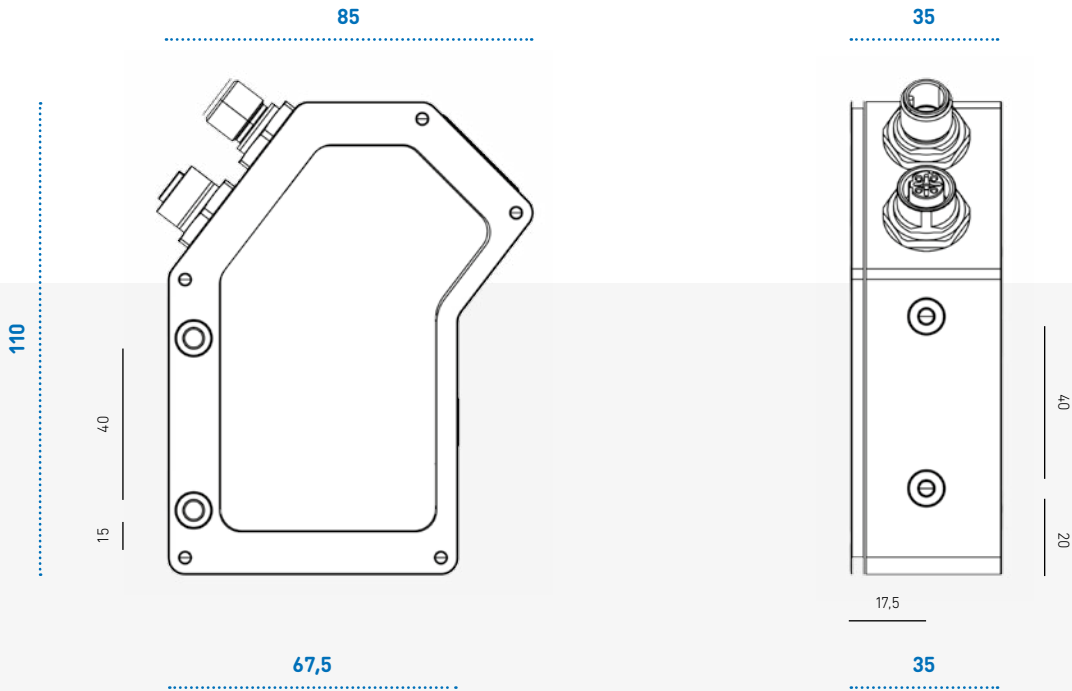
One important step during commissioning and exchange of the VISIONSCANNER2 is the referencing of the system. Thus, inaccuracy is equalized through this process. Referencing is mandatory, if VISIONSCANNER2 is set up to measure the position of an object or if multiple sensors are used for one coherent measuring system.



5. CONFIGURATION

After mechanical and electrical commissioning of the automation environment, measurement tasks can be created. The integrated automation interface can be configured. Now, measuring tasks can be triggered by the superordinate system and measuring and control data can be drawn. Extended feature is the process data interface, which allows for control of the measuring process and specifically the quality of the product being measured.

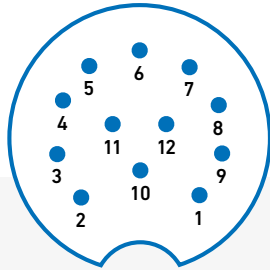
TECHNICAL DATA • ROBOTGUIDANCE • AI



Sensor Technology	CMOS Sensor
Reading speed	up to 200 Hz
Measuring accuracy	± 0,2% of measuring field, depending on feature and surface property
Laser	Laser Class 1 at 660 nm
Lifetime laser	40.000 h (independent from cycle of operation)
Interface	Fast Ethernet 10/100 Mbit, Half-/Full duplex, Auto negotiation
Power supply	24V DC, max. 400 mA

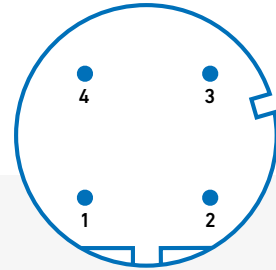
Size	110 x 85 x 35 mm
Weight	ca. 400 g
Protection class	IP 64
Housing	Aluminium, eloxated
Environmental conditions for warehousing	-20 up to 60 °C, humidity max. 90 %
Environmental conditions during operation	0 up to 55 °C, humidity max. 80 %
Registrations	CE, UL

CONNECTIONS TECHNICAL DATA



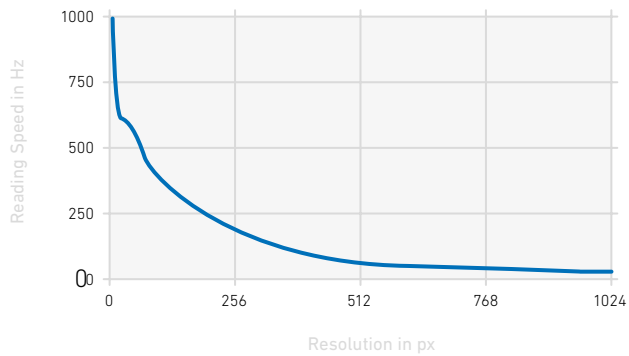
Pin-No.	Signal	Comment	Pin-No.	Signal	Comment
1	OUT 2	Digital output 2	8	IN 1	Digital input 1
2	TRIG IN	Trigger input	9	+ 24 V DC	Power supply
3	OUT 1	Digital output 1	10	TRIG OUT	Trigger output
4	OUT 3	Digital output 3	11	+ 24 V DC	Power supply
5	IN 2	Digital input 2	12	+ 24 V DC	Power supply
6	OUT 4	Digital output 4			
7	GND, 0V	Ground, 0V power supply	shield		Pin 7 = ground connected

For 4 and 8 pin control cable different pin may apply



Pin-No.	Signal	Comment
1	Tx+	Output data Ethernet +
2	Rx+	Input data Ethernet +
3	Tx-	Output data Ethernet -
4	Rx-	Input data Ethernet -

READING SPEED TECHNICAL DATA



Resolution in px	Reading Speed in Hz
1280 × 64	588
1280 × 128	336
1280 × 256	181
1280 × 512	93
1280 × 768	63
1280 × 1024	50

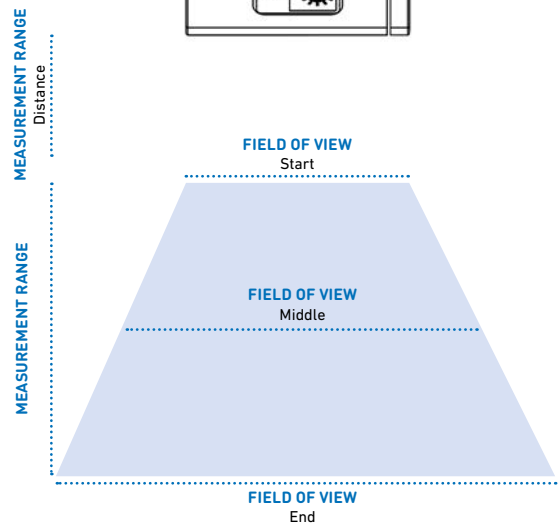
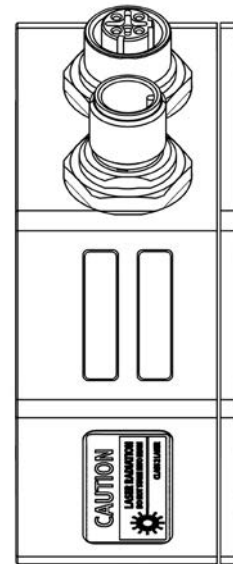
VS2-RFFAA-PPPWW-SSE



CAMERA		Code	Value
R	Resolution	L	752 × 480 px
		H	1280 × 1024 px
		U	2592 × 1944 px
F	Focal Distance	08	8 mm
		12	12 mm
		16	16 mm
A	Angle of Triangulation	30	30°
		37	37,5°
		45	45°

LASER		Code	Value
P	Power	100	100 mW
W	Wavelength	660	660 nm

INTERFACE		Code	Value
S	Control Cable	04	4-pin
		08	8-pin
		12	12-pin
E	Ethernet Cable	F	Fast Ethernet
		I	Industrial Ethernet



MODELL		VS2-H08			VS2-H12			VS2-H16			
		45°	37°	30°	45°	37°	30°	45°	37°	30°	
MEASUREMENT RANGE	Distance	mm	26	35	50	38	50	65	45	60	75
MEASUREMENT RANGE	Resolution	mm / px	0,10	0,14	0,25	0,05	0,08	0,12	0,035	0,05	0,08
FIELD OF VIEW	Start	mm	55	60	65	35	40	45	27	30	35
FIELD OF VIEW	Middle	mm	88	110	158	48	58	78	32	38	50
FIELD OF VIEW	End	mm	120	160	250	60	75	110	37	45	65
FIELD OF VIEW	Resolution	mm / px	0,07	0,09	0,13	0,04	0,05	0,06	0,025	0,03	0,04



VISIONSCANNER2

AIO

05.2016

No. 000 001

OUT 1
OUT 2
OUT 3
OUT 4
POWER
IN 1
IN 2
TRIG IN
LASER

LASER

THE ADVANTAGES ◦ ROBOTGUIDANCE ◦ AI

COMMUNICATIVE

Interface to robot or PLC through Industrial Ethernet, TCP/IP or IO

ROBUST

Automatic adjustment of illumination and reflexion compensation of the laser line for extreme conditions

SMART

No PC needed during operation

SIMPLE

Graphic configuration without programming skills

ALLROUNDER

Detection, measuring, verification and control on one device

FUNCTIONAL

User and change management, configuration and fault analysis using PC software VISIONELEMENTS.

POWERFUL

Laser triangulation is possible on almost any surface

SMALL BUT IMPRESSIVE

Suitable for industrial use, compact design



AUTOMATION INTERFACE

We know the challenges manufacturing companies have to handle complex production systems to enhance their own competitiveness. Our products offer the highest level of comfort and only need little specialist knowledge by using comfortable interfaces for various robots and control systems.

ADAPTIVE IMAGING

AI◦ stands out through optimal integration capability as well as highest user friendliness, specifically in regards to the requirements of today's complex production scenarios. The components can be integrated without special programming skills.

ARTIFICIAL INTELLIGENCE

Thanks to many years of experience in dealing with industrial robots in the automotive industry, we understand the requirements for quality and process optimization in production environments for various products. Therefore, we deliver sensors and pertaining intelligence in an integrated machine vision solution.

ALL INCLUSIVE

We offer various possibilities for our customers, from components to integrated solutions. AI◦ not only offers high value products, but also services and support for parameter setting and start up, training as well as software programming for your special requirements.

**AI◦ STANDS FOR NEXT LEVEL IMAGING AND ROBOT VISION SYSTEMS
OF ENGROTEC - SOLUTIONS GMBH.**

AI^o

EngRoTec-Solutions GmbH

Zum Wolfsgraben 5
36088 Hünfeld

+49 (0) 6652 0 79 39 48-0
info@ai-engrotec.de
www.ai-engrotec.de