ZIVID

Accurate and high-speed 3D vision for collaborative robotics

Industry 4.0 robotics and 3D vision

Symbiotic and synergistic relationship

Advancements in 3D vision drives increased productivity and growth

Speed and reliability for existing applications

Enabling new applications

Ease of deployment, operation and flexibility

Image: ABB

Bigger robots

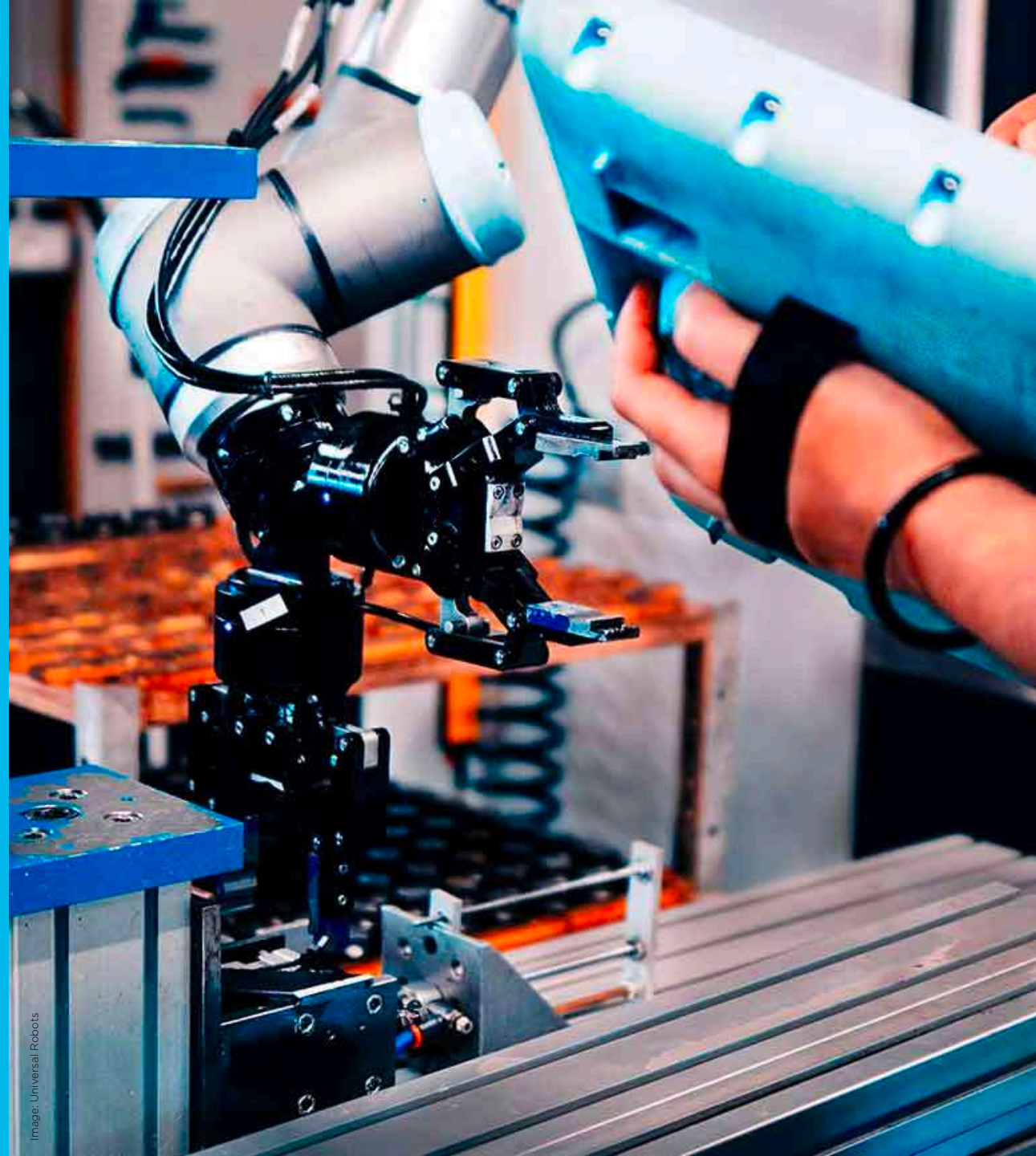
- bigger objects

bigger objects

- less accurate vision

Smaller robots
- smaller objects

smaller objects
- more accurate vision



Smaller robots – lots of smaller parts

The need for highly accurate 3D vision in collaborative robotics

detecting | picking | placing

Question #1

How accurate 3D vision do I need?

Question #2

Which of these 3D cameras meet my needs?

Question #2

Which of these 3D cameras meet my needs?

Understanding accuracy of 3D vision is tricky...

... really tricky

Lack of common terminology

Lack of conditions

Lack of technique

3D cameras are measurement instruments

We need to step up our game...

ISO 5725

Common terminology on accuracy

Precision

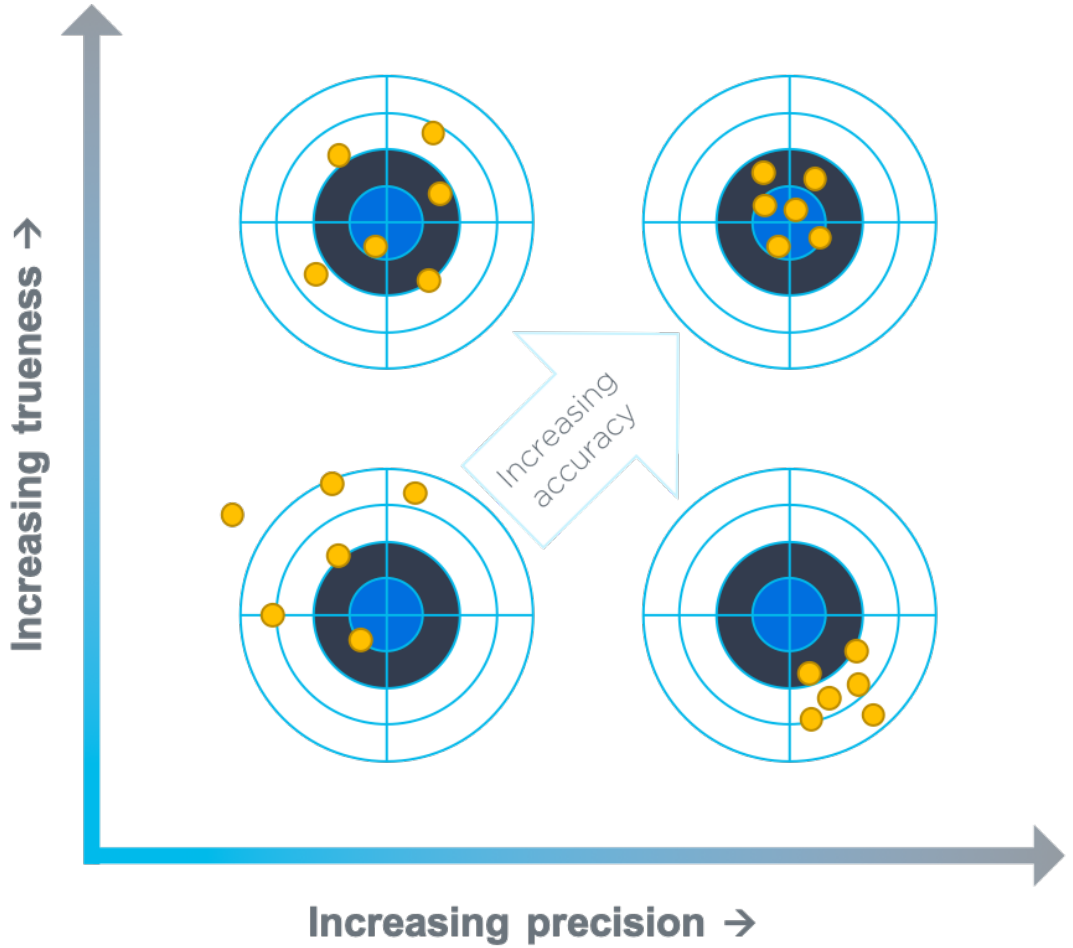
Describing random errors,
a measure of statistical variability.

Trueness

Describing systematic errors,
a measure of statistical bias.

Accuracy

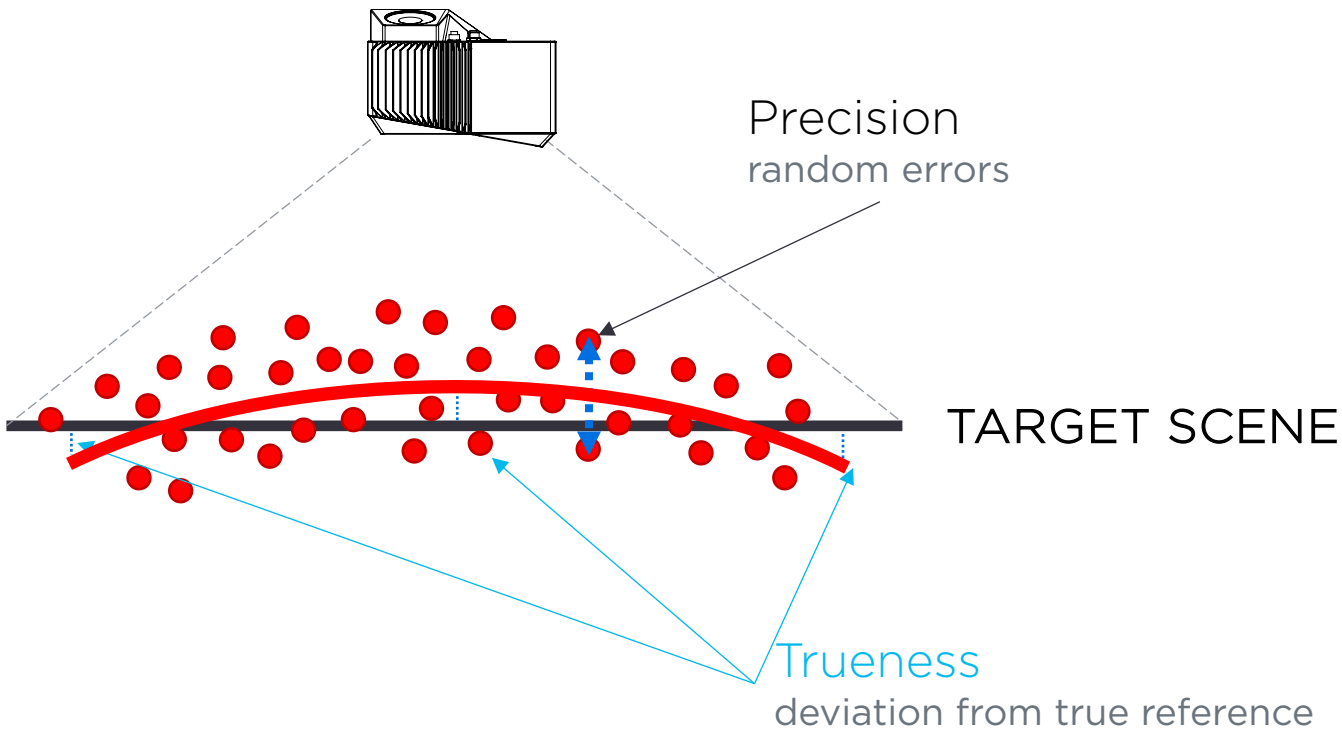
Describing a the combination of
random and systematic errors.
Sum of Precision and Trueness.



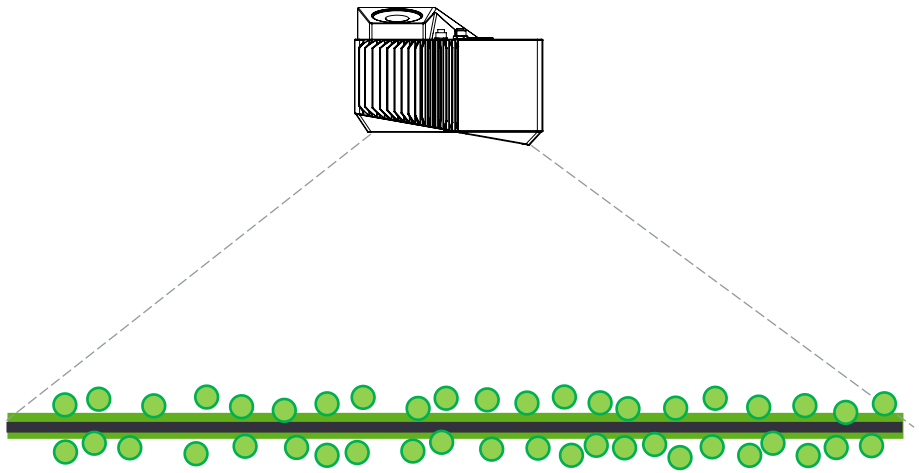
ISO 5725 and 3D cameras

Precision, trueness and accuracy applied

Lower accuracy



Higher accuracy

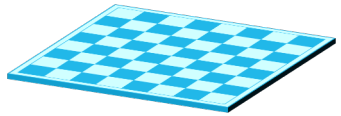


Common terminology on metrics

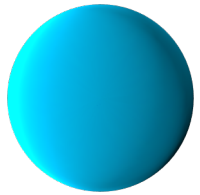
Accuracy on what?

Point

Plane



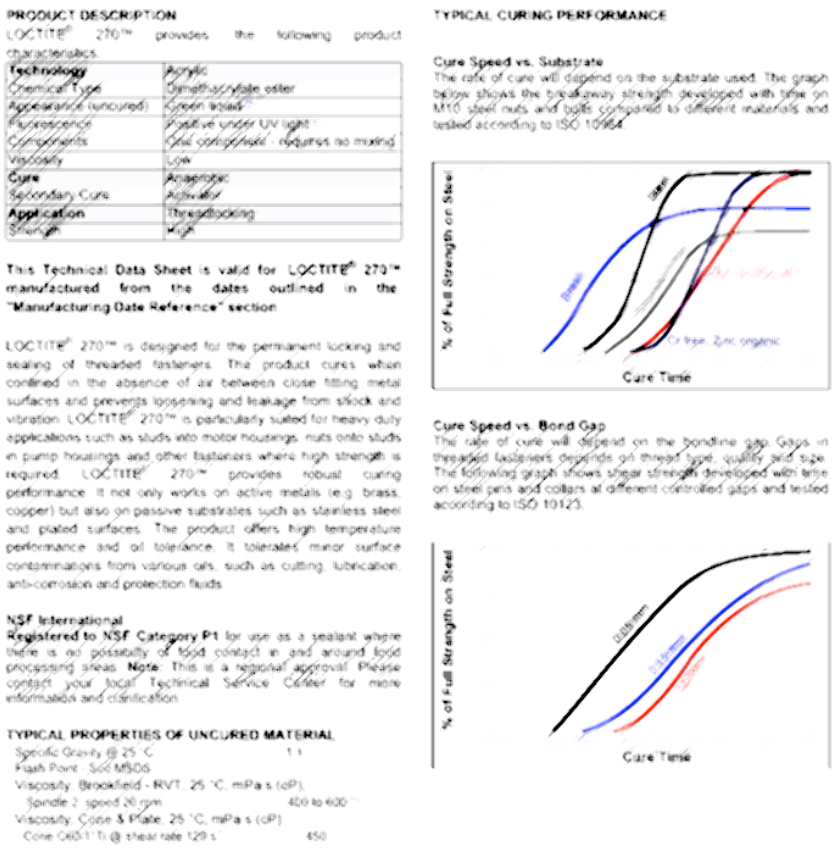
Dimension



Sphere

Industry standard technical specifications

Reproduceable specifications



PRODUCT DESCRIPTION

LOCTITE® 270™ provides the following product characteristics.

Technology	Acrylic
Chemical Type	Dimethacrylate ester
Appearance (uncured)	Green liquid
Fluorescence	Positive under UV light
Components	One component - requires no mixing
Viscosity	Low
Cure	Anaerobic
Secondary Cure	Activator
Application	Threadlocking
Strength	High

This Technical Data Sheet is valid for LOCTITE® 270™ manufactured from the dates outlined in the "Manufacturing Date Reference" section

LOCTITE® 270™ is designed for the permanent locking and sealing of threaded fasteners. The product cures when confined in the absence of air between close fitting metal surfaces and prevents loosening and leakage from shock and vibration. LOCTITE® 270™ is particularly suited for heavy duty applications such as studs into motor housings, nuts onto studs in pump housings and other fasteners where high strength is required. LOCTITE® 270™ provides robust curing performance. It not only works on active metals (e.g. brass, copper) but also on passive substrates such as stainless steel and plated surfaces. The product offers high temperature performance and oil tolerance. It tolerates minor surface contaminations from various oils, such as cutting, lubrication, anti-corrosion and protection fluids.

NSF International
Registered to NSF Category P1 for use as a sealant where there is no possibility of food contact in and around food processing areas. **Note:** This is a regional approval. Please contact your local Technical Service Center for more information and clarification.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.1
Flash Point - See MSDS	
Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP)	
Spindle 2, speed 20 rpm	400 to 600
Viscosity, Cone & Plate, 25 °C, mPa·s (cP)	
Cone CP50-1 Ti @ shear rate 129 s	450

TYPICAL CURING PERFORMANCE

Cure Speed vs. Substrate
The rate of cure will depend on the substrate used. The graph below shows the breakaway strength developed with time on M10 steel nuts and bolts compared to different materials and tested according to ISO 10964.

Cure Speed vs. Bond Gap
The rate of cure will depend on the bondline gap. Gaps in threaded fasteners depends on thread type, quality and size. The following graph shows shear strength developed with time on steel pins and collars at different controlled gaps and tested according to ISO 10123.

Conditions

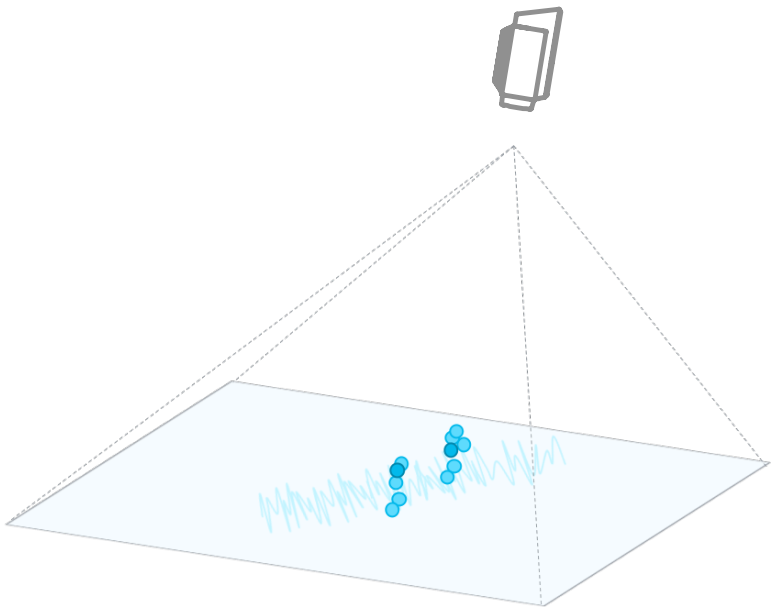
- Camera settings
- Working distance
- Ambient light
- Ambient temperature

Technique

- Test-setup
- Test procedure
- Calculations of result

Point metrics

Zivid One+ M - typical specifications



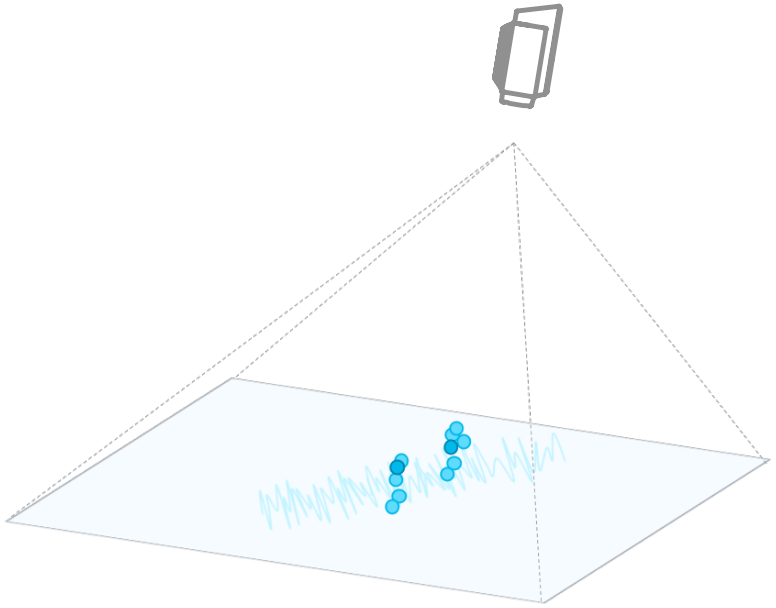
Point precision	60 um
La = 750 lux	70 um
D = 1600mm	570 um
D = 1600mm, Pb = 1.8x	480 um

Conditions, unless otherwise specified:

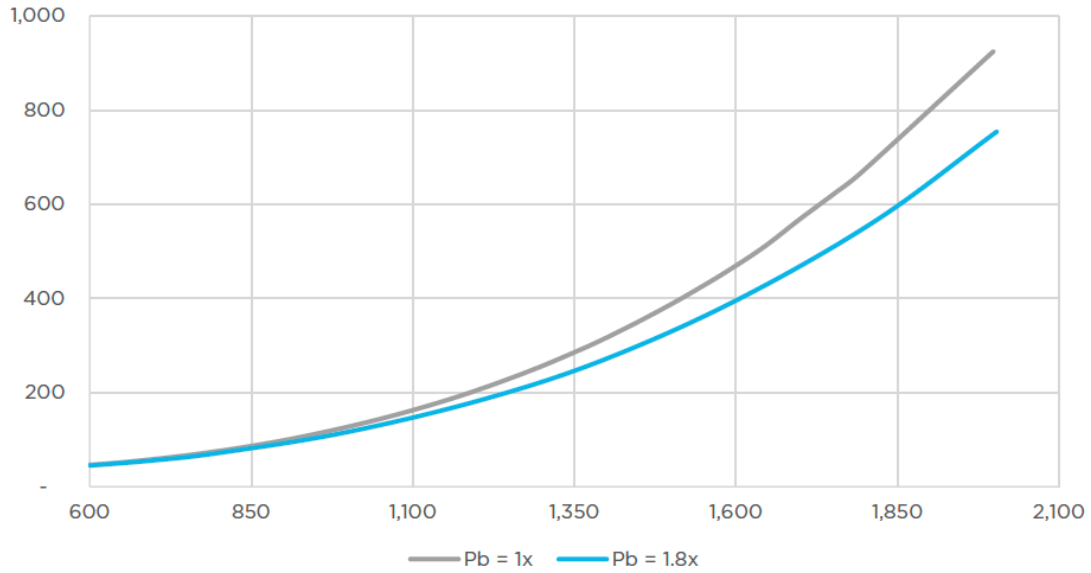
Ambient temperature (Ta) = 25C
Ambient light (La) = 200 lux
Aperture (A) = f/5.6
Projector brightness (Pb) = 1x
Imager gain (Ig) = 1x

Point metrics

Zivid One+ M - typical specifications



Point precision vs. working distance



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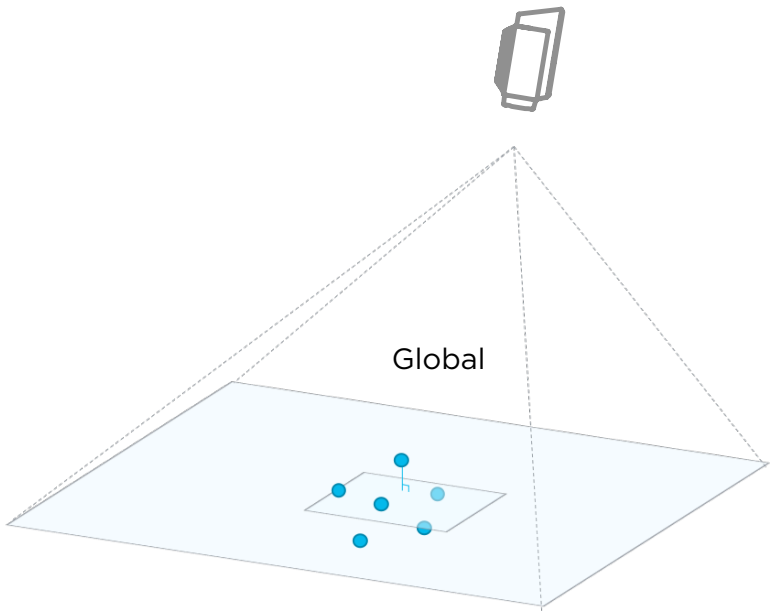
Imager gain (Ig) = 1x

Global planarity metrics

Zivid One+ M - typical specifications



Global planarity trueness	**90**	**um**
D = 1600mm	670	um
D = 1600mm, Pb = 1.8x	690	um
Global planarity accuracy	**140**	**um**
D = 1600mm	1030	um
D = 1600mm, Pb = 1.8x	1000	um

Conditions, unless otherwise specified:

Ambient temperature (Ta) = 25C
Ambient light (La) = 200 lux
Aperture (A) = f/5.6
Projector brightness (Pb) = 1x
Imager gain (Ig) = 1x

Need for highly accurate 3D vision in collaborative robotics

Small robots – many small object – highly accurate vision for detection, picking and placing

- Understanding accuracy of a camera is tricky
- Lack of common terminology, conditions, set-up and technique
- 3D cameras are measurement instruments

We need to step up our game on specifying accuracy

Enabling a system developer asses whether a 3D camera meets the accuracy requirements of the application

- ISO 5725 framework for Precision, Trueness and Accuracy
- Point, plane, dimension and sphere metrics
- Reproducible specifications with industry standard specifications with conditions, set-up and technique

Next steps

Zivid One+ datasheet	zivid.com/downloads
See for yourself!	
• Small	zivid.com/zivid-one-plus-small-3d-camera
• Medium	zivid.com/zivid-one-plus-medium-3d-camera
• Large	zivid.com/zivid-one-plus-large-3d-camera
Free 1:1 online demo	zivid.com/schedule-a-free-zivid-demo

ORDER

Learn more at

www.zivid.com

Human-like vision for robots