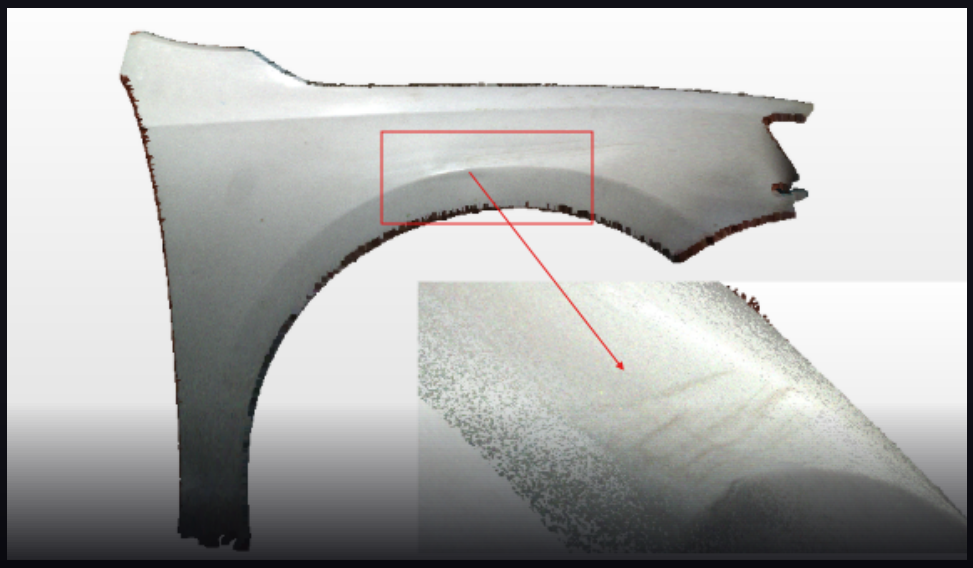

APPLICATION NOTE

Near/Far Autofocus Multi-Resolution Inspection

Full-part coverage at long range. High-detail capture on regions of interest at close range. One sensor, no lens changes, no recalibration. The DepthScan Auto Focus model switches working distances electronically.

1.6m	57um	4M	~1s
FOV width at 2m WD	XY resolution at 250mm WD	Points at every WD	Focus switching time

For robot-mounted inspection of large parts, the autofocus workflow solves the resolution-vs-coverage tradeoff. Scan the full part at 2 m for overall shape and deviation, identify areas that need closer inspection, then move the robot in to 25 cm for sub-60 um detail - all from the same sensor with zero recalibration.

THE CHALLENGE

Resolution vs. Coverage

Every 3D measurement system faces a fundamental tradeoff: at a long working distance, you see the whole part but at lower resolution. At a short working distance, you get fine detail but only on a small area.

Traditional approaches force a choice:

Fixed-Focus Scanners

One WD, one resolution. Changing requires lens swap + recalibration (hours of downtime).

Handheld / Robot-Mounted Line Scanners

Single resolution across a narrow WD envelope (typical 200-750 mm). No dedicated wide or close-up mode - one rated spec. Available as robot-mounted cells, but still bound by that one WD envelope.

Multiple Sensors

Separate cameras for wide and close-up. Doubles hardware cost and integration complexity.

THE SOLUTION

Electronic Working Distance Switching

The DepthScan Auto Focus model stores multiple factory-calibrated working distances on the device. Switching between them is software-controlled - lenses move to pre-calibrated focus positions in ~1 second, no operator intervention, no recalibration.

1
Wide Scan
Robot at 2m WD. Full part in one shot. 1.6 × 1.0 m FOV.

→

2
Analyze
Compare to CAD. Identify regions near tolerance limits.

→

3
Close-Up
Robot moves to 25cm. 112 × 57 um resolution on ROI.

→

4
Combine
Both scans registered. Full coverage + high detail.

> *One sensor. Two resolutions. Zero recalibration. The robot simply moves closer.*

WORKING DISTANCE CAPABILITY

Resolution at Each Working Distance

A single DepthScan Auto Focus sensor covers the full range below. Customers specify the WDs they need at order; each is factory-calibrated. FOV and pixel pitch scale linearly with WD (sensor geometry). Accuracy is currently validated at 500 mm; other WDs follow the same validation protocol on request.

WORKING DISTANCE	FOV (W X H)	XY RES X	XY RES Y	BEST FOR
2,000 mm	1,636 × 1,034 mm	896 um	454 um	**Large parts, full-assembly coverage, overall shape**
1,000 mm	818 × 517 mm	448 um	227 um	**Body panels, robot-mounted wide scan**
750 mm	614 × 388 mm	336 um	170 um	**Mid-range inspection, feature positions, hole patterns**
500 mm	409 × 258 mm	224 um	114 um	**Validated accuracy reference, feature inspection**
250 mm	205 × 129 mm	112 um	57 um	**Fine detail, weld beads, surface features**

All working distances produce 4 million 3D points per scan (1824 × 2280). Point density increases as FOV narrows.

Far position (1 m WD) - robot pulls back for full-part coverage scan of the automotive fender

Close position (50 cm WD) - robot moves in for higher-resolution capture on the region of interest

SPECIFICATIONS

Auto Focus Model

PARAMETER	VALUE
Focus switching	**Software-controlled - multiple pre-calibrated WDs on device**
Switching time	**~1 second (lens positioning, no operator intervention)**
Points per scan	4 million (1824 × 2280) at every WD
Sphere distance error (SD)	**28 um at 500 mm WD (VDI/VDE 2634 Part 2, n=5)**
Sphere size error (P_S)	32 um at 500 mm WD (VDI/VDE 2634 Part 2, n=10)
Sphere form error (P_F)	151 um at 500 mm WD (VDI/VDE 2634 Part 2, n=10)
Validation scope	Independently validated at 500 mm WD; other WDs pending the same protocol
Capture time	400 ms per scan (full resolution mode)
Color options	Mono (standard) or full color
Recalibration	**None - factory calibrated at each WD**
WD range	Customer-specified WDs, factory calibrated at order

COMPARISON

Why Auto Focus

ALTERNATIVE	LIMITATION	DEPTHSCAN AUTO FOCUS
Fixed-focus scanner	One WD, one resolution. Lens swap + recal to change.	**Multiple pre-calibrated WDs on device. Software-controlled switch, ~1 second.**
Handheld scanner	Single resolution, narrow WD envelope (~200-750 mm). No wide or close-up mode. Operator-dependent.	**Multi-WD range (250-2000 mm), automated, repeatable every time.**
Dual sensor setup	Two cameras, two calibrations, doubled cost.	**One sensor does both wide and close-up.**
Zoom lens scanner	Mechanical zoom degrades calibration. Requires recal.	**No zoom mechanism. Each WD independently calibrated.**

APPLICATIONS

Where Multi-Resolution Inspection Fits

Large Automotive Body Panels

Wide scan captures full panel profile (spring-back, twist, bow). Close-up scans verify hole positions, edge trim, and surface features at high resolution.

Aerospace Skin Panels

Overall contour inspection at long range, then detailed fastener hole and edge inspection at close range. Covers panels too large for a single close-up scan.

Castings and Forgings

Overall dimensional check at wide FOV, then targeted inspection of gate areas, parting lines, or critical machined surfaces.

Weldment Inspection

Full-part distortion scan at 1 m to characterize overall warp. Then detailed weld bead profile, toe angle, and undercut measurement on specific joints.

Multi-Feature Prismatic Parts

Overall dimensional verification at wide FOV, then high-resolution passes on tight-tolerance features - bores, dowel holes, datum surfaces. Eliminates the need for a separate close-up sensor.

GETTING STARTED

From Evaluation to Deployment

1 Define
Part size, features, which need close-up

→

2 Specify WDs
Factory calibrate at your needed distances

→

3 Plan Robot Path
Wide positions + close-up positions

→

4 Evaluate
Send parts, we demo the workflow

→

5 Deploy
Pilot then full deployment

Ready to explore multi-resolution inspection?

Contact us for a workflow assessment. We'll recommend the right Auto Focus configuration and demonstrate the near/far workflow with your parts.

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