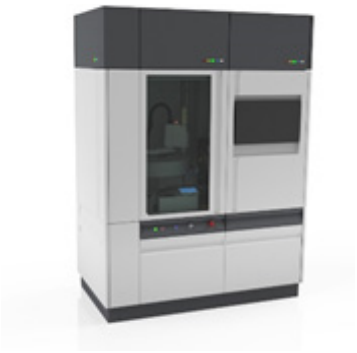
Active Alignment

Assembly and Test Platform

2D and 3D component alignment and positioning are critical for product performance. Use a semi or fully automated **active alignment solution** to quickly assemble **camera & LiDAR modules, MEMS devices, die based sensors, LED and laser-based headlights** and other high-end products with supreme accuracy. Work with Averna to discover which automated **quality solution** best fits your manufacturing requirements.

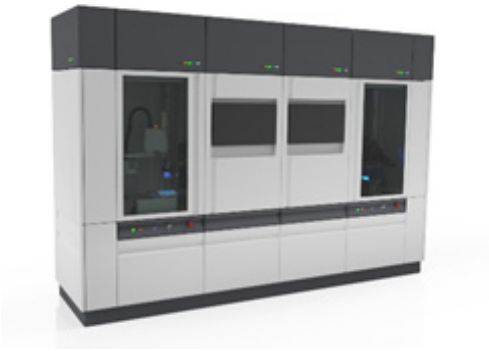
ACTIVE ALIGNMENT ASSEMBLY SYSTEM

DESCRIPTION



Entry-level active alignment systems are ideal for:

- A/B/C-samples.
- Prototypes, pilot projects, full production setup.
- Low to medium volume production.
- Offers optional functionalities.
- Manual to semi-automated processes.



Grow-as-you-go active alignment systems are ideal for:

- A/B/C-samples.
- Pilot projects, full production setup.
- Medium to high volume production.
- Flexibility and futureproofing with scalable & modular fixtures.
- Semi to fully automated processes.

Full production active alignment systems are ideal for:

- Validated products.
- Pilot projects, full production setup.
- High volume.
- Flexibility and futureproofing with modular fixtures.
- Semi to fully automated processes.

	Entry-level Active Alignment system	Grow-as-you-go Active Alignment system	Full production Active Alignment system
Alignment degrees of freedom	up to 6 degrees of freedom		
Linear alignment resolution X & Y (along sensor pixel rows & columns)	0.2 µm		
Assembled product linear alignment accuracy X & Y [1] (along sensor pixel rows & columns)	‹ 4 µm @ Cpk 1.67		
Linear alignment resolution Z (along optical axis)	0.1 µm		
Assembled product linear alignment accuracy Z [1] (along optical axis)	‹ 1 µm @ Cpk 1.67		
Pitch/yaw alignment resolution (rotation around X & Y)	0.6 arcsec		
Assembled product pitch/yaw alignment accuracy [1] (rotation around X & Y)	‹ ±0.05° @ Cpk 1.67		
Roll alignment resolution (rotation around Z)	1.2 arcsec		
Assembled product roll alignment accuracy [1] (rotation around Z)	‹ ±0.05° @ Cpk 1.67		
Product Field of View [1]	chart: ≤75° FOV collimators: ≤180° FOV		
Product effective focal length [2]	1 - 12mm		
Product interface [2]	MIPI, GMSL, FPD Link, APIX, BroadR Reach, HDMI, USB, GigE, FireWire, CamLink		
Product dimensions [2]	lens diameter ≤ 40mm sensor board / housing ≤ 50 x 50 x 50mm		
Cycle time / throughput (Units Per Hour) [3]	30 seconds / 120 UPH	Single process: 15 seconds / 240 UPH Parallel processes: ‹10 seconds / ›360 UPH	10 seconds / 360 UPH
Loading / unloading	**Manual by operator**: 1 product per cycle	**Manual by operator:** 1 product per cycle Optional robot loading from/to tray / magazine / conveyor	**Fully automated:** Robot loading from/to tray / magazine / conveyor
Included processes	Dispensing Active alignment	Dispensing Active alignment	Robot handling Chip test Dispensing Active alignment Integrated clean room ISO5
Optional processes	Chip test MTF / through-focus scan	Robot handling JEDEC tray loading Conveyor loading CO2 / N2 cleaning Atmospheric plasma Chip test MTF / through-focus scan Integrated clean room ISO5	JEDEC tray loading Conveyor loading CO2 / N2 cleaning Atmospheric plasma MTF / through-focus scan
External data interfaces	MES, OPC UA (TSN), TCP-IP, PLC connectors		

SPECIFICATION SHEET / ACTIVE ALIGNMENT

Notes	Entry-level system	Grow-as-you-go system	Full production system
[1] process capabilities	Process capabilities are dependent on product design and parts quality.		
[2] product specifications	Deviations are possible, contact us for more information.		
[3] constraints for cycle time / throuhput	Manual loading/unloading not included. Replacing consumables not included. Parts within agreed upon tolerances. Parts correctly loaded. Sensor start-up time ≤ 1s. Camera frame rate ≥ 30 fps. Scan range ≤ 500µm. Max. 2 scans. UV curing ≤ 2s.	Manual loading/unloading included as parallel process (< 15s) OR automatic loading has constant supply. Replacing consumables not included. Parts within agreed upon tolerances. Parts correctly loaded. Sensor start-up time ≤ 1s. Camera frame rate ≥ 30 fps. Scan range ≤ 300µm. Max. 2 scans. UV curing ≤ 2s.	Automatic loading has constant supply. Replacing consumables not included. Parts within agreed upon tolerances. Parts correctly loaded. Sensor start-up time ≤ 1s. Camera frame rate ≥ 30 fps. Scan range ≤ 300µm. Max. 2 scans. UV curing ≤ 2s.

Optional processes	Description
Robot handling	Robotic handing of parts for loading & unloading. Removes operator variability from loading / unloading process. Controlled, smooth motion of UV cured parts before going through thermal curing (if applicable). Depending on application: SCARA or 6-axis robot. Optional: Quick-exchange grippers for different product types.
(JEDEC) tray loading	Single tray or magazine of trays for input/output of parts. Automatic scanning of tray IDs for traceability. Capable of custom trays or JEDEC format trays.
Conveyor loading	Continuous transport of parts into & out of machine for highly automated cleanroom facilities. Automatic scanning of conveyor trays / carriers for traceability. SMEMA handshaking or PLC communication for upstream/downstream line flow control.
Atmospheric plasma treatment	Surface cleaning and activation for downstream adhesive processes. Process and cooling using CDA. Optional: combine CO2 & plasma in 1 step.
CO2 cleaning	Versatile and powerful surface cleaning. Leaves no residue, does not need drying. Capable of removing adhesive residues from peel-off tapes. Optional: combine CO2 & plasma in 1 step.
N2 / CDA cleaning	N2/CDA blow-off for large particle removal. Optional: ionized nozzle.
Chip test	**Functional testing of sensor chip:** Communication test (start-up, read, write, image read-out). Hot/cold/stuck pixels. Defective clusters. Contamination (larger than single pixel). OETF Dark signal testing. Optional: color response testing.
MTF / through-focus scan measurement	Capable of determining focal point & alignment parameters (6DOF) of assembled camera unit. Provide immediate process feedback. Can be used in development and prototyping phases to verify processes (effects of curing, thermal cycling, vibration testing...).
Integrated clean room system ISO5	Integrating a clean air system into the machine with internal air recirculation makes the machine's internal air quality independent from the outside environment's air quality. This feature, combined with integrated CO2/N2/CDA cleaning allows the machine to be placed outside of a cleanroom or in a less strict cleanroom environment, decreasing CAPEX and OPEX for the critical assembly process.

TEST PLATFORM

DESCRIPTION

Stand-alone test systems are ideal for:

- Individual modules.
- Offers optional functionalities.
- Manual to semi-automated processes.

Grow-as-you-go test systems are ideal for:

- Flexible module selection.
- Offers optional functionalities.
- Semi to fully automated processes.

Full production test systems are ideal for:

- Complete testing capabilities.
- High volume production.
- Semi to fully automated processes.

SPECIFICATION SHEET / TEST PLATFORM

	Stand-alone test system	Grow-as-you-go test system	Full production test system
Product interface [1]	MIPI, GMSL, FPD Link, APIX, BroadR Reach, HDMI, USB, GigE, FireWire, CamLink, etc.		
Product dimensions [1]	lens diameter ≤ 40mm sensor board / housing ≤ 50 x 50 x 50mm		
Cycle time / throughput (Units Per Hour) [2]	Depending on performed test: 20 – 60 seconds / 180 - 60 UPH	Depending on tests & transport system: ‹10 - 60 seconds / ›360 - 60 UPH	Depending on tests & transport system: ≥10 seconds / ≤360 UPH
Loading / unloading	**Manual by operator:** 1 product per cycle	**Manual by operator:** 1 product per cycle Optional robot loading from/to tray / magazine / conveyor	**Fully automated:** Robot loading from/to tray / magazine / conveyor
Test capabilities	One test process per stand-alone test cell	Multiple test processes per machine	Multiple test processes per machine
Options	HEPA air filtration Air extraction for use in cleanroom	Robot handling Tray loading Conveyor loading HEPA air filtration Air extraction for use in cleanroom	Tray loading Conveyor loading HEPA air filtration Air extraction for use in cleanroom
Internal transport system options	N/A	**Linear axis:** Serial processes Longest cycle time **Dial table:** Parallel processes Shorter cycle time Not flexible towards expansion **Roller conveyor:** Parallel processes Shorter cycle time Flexible towards expansion **Direct drive track:** Parallel processes Shortest cycle time Most flexible Allows batch size 1, adaptive machine	**Dial table:** Parallel processes shorter cycle time Not flexible towards expansion **Roller conveyor:** Parallel processes Shorter cycle time Flexible towards expansion **Direct drive track:** Parallel processes Shortest cycle time Most flexible Allows batch size 1, adaptive machine
External data interfaces	MES, OPC UA (TSN), TCP-IP, PLC connectors		

Notes	Entry-level test system	Grow-as-you-go test system	Full production test system
[1] product specifications	Deviations are possible, contact us for more information.		
[2] constraints for cycle time / throughput	Manual loading/unloading not included Parts within agreed upon tolerances. Parts correctly loaded. Sensor start-up time ≤ 1s. Camera frame rate ≥ 25 fps.	Manual loading/unloading included as parallel process (‹ 15s) OR automatic loading has constant supply. Parts within agreed upon tolerances. Parts correctly loaded. Sensor start-up time ≤ 1s Camera frame rate ≥ 25 fps	Automatic loading has constant supply. Parts within agreed upon tolerances. Parts correctly loaded. Sensor start-up time ≤ 1s. Camera frame rate ≥ 25 fps.

Test processes	Description
Chip test & spectral measurement	**Functional testing of sensor chip:** Communication test (start-up, read, write, image read-out). Hot/cold/stuck pixels. Defective clusters. OETF Color response testing. Uniformity testing. Dark signal testing.
MTF / through-focus scan measurement	Capable of determining focal point & alignment parameters (6DOF) of assembled camera unit. Modulation Transfer Function measurement. Provide immediate process feedback for assembly & active alignment processes. Can be used in development and prototyping phases to verify processes (effects of curing, thermal cycling, vibration testing...).
Camera parameters & distortion measurement	Capable of determining distortion parameters of assembled camera unit. Capable of determining extrinsic / intrinsic camera parameters. Can be used in development and prototyping phases to verify processes (effects of curing, thermal cycling, vibration testing...).
Specialty measurements & custom modules	Contact us for specific testing requirements not covered by the above test processes.
Optional processes	**Description**
Robot handling	Robotic handing of parts for loading & unloading. Removes operator variability from loading / unloading process. Controlled, smooth motion of UV cured parts before going through thermal curing (if applicable). Depending on application: SCARA or 6-axis robot. Optional: Quick-exchange grippers for different product types.
Tray loading	Single tray or magazine of trays for input/output of parts. Automatic scanning of tray IDs for traceability. Capable of custom trays or JEDEC format trays.
Conveyor loading	Continuous transport of parts into & out of machine for highly automated cleanroom facilities. Automatic scanning of conveyor trays / carriers for traceability. SMEMA handshaking or PLC communication for upstream/downstream line flow control.
HEPA air filtration	Provide clear air inside the machine enclosure. Overpressure will inhibit external contamination from entering the enclosure.
Air extraction for use in cleanroom	If used in a cleanroom environment, warm air will rise and spread particles throughout the machine / cleanroom. Air extraction prevents uncontrolled spread of contaminating particles.

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