



LEOPARD

IMAGING

**Global Leader in Embedded Vision System
Design and Manufacturing**

Established since 2008 in Fremont, CA

Competitive Advantages

**16 years of research
and engineering expertise
in intelligent vision system**

**USA and offshore
manufacturing capabilities**

**Silicon Valley headquartered state-
of-the-art technologies**

**One-stop-shop
for customization
and mass production
including driver/tuning service**



Our Camera Categories



Automotive



**Robotics/Drones
/Aerospace**



IoT



Automation/AgTech



AI Edge Devices



Metaverse



Automotive



Robo Taxi/
Last-mile
Delivery



EV Trucks/Buses



Automotive
Form Factor



Automotive
Processing Unit

Support wiring distance beyond 15 meters
Support CMS, front, side, rear, CMS and surround view
Support DMS and OMS applications
IP67 and IP69K waterproofing

Automotive grade solutions capability
Support 1MP - 8MP Cameras
Support AA, lowlight, HDR, and LFM
Support SerDes, A-PHY, ASA, GigaE, & C2B

In-cabin Solutions



Leopard Imaging Driver Monitoring System (DMS) Cameras and Occupant Monitoring System (OMS) Cameras

Applications



Gesture Recognition



Iris Scanning



Head Roll



Eye Tracking



Augmented Reality



Machine Vision

1M to 5M Mono and RGB-Ir In-cabin Cameras



VCSEL or NIR LED Integrated, wide angle available
Raw Bayer or YUV output

Truck Types



Pickup truck



Refrigerated truck



Dump truck



Semi-trailer truck



Tow truck



Road maintenance truck



Tank truck



Truck crane



Fire truck



Concrete truck



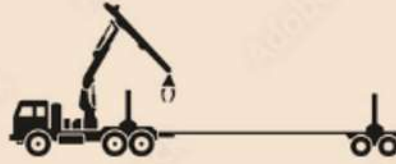
Sweeper truck



Flatbed truck



Garbage truck



Logging truck



Livestock truck



Car transporter



Mining truck



Road train



Loader crane

• Typical Camera Applications

- ADAS
- CMS
- Rearview
- Blind Spot Detection
- DMS

• LI Camera Offerings

- ADAS: 8M 30-60fps HDR/LFM SerDes
- CMS: $\geq 2M$ 60fps, wide angle, long transmission distance
- Rearview: $\geq 2M$ 30fps, wide angle, long transmission distance
- Blind Spot Detection: $\geq 2M$ 30fps, wide angle, long transmission distance
- DMS: $\geq 1M$ 30fps GS

Leadership in Latest Auto Transmission Technologies

GMSL2
FPDLINK 3



Latest GMSL3



Latest FPDLink IV



Automotive SerDes Alliance
Motion Link



Valens A-PHY



Multi-GigaE

2023

2024

9/23/24

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A-IoT



Smart Retails



Smart City/Smart Building



Supply Chain Automation

Support both monocular and stereo camera
Support multiple interfaces, MIPI, Ser/Des, etc

Support RAW, YUV etc.
Support 1MP - 20 MP Camera
Active Alignment available

Drones/Aerospace/Aviation



High-performing Video, Crash Avoidance Ultra-hi res hardened Camera

Small and low energy consuming
Support both monocular and stereo camera
Support multiple interfaces, MIPI, Ser/Des, etc

Support RAW, YUV etc.
Support 1MP - 20 MP Camera
Active Alignment available

Robotics/Automation/AgTech



Self-navigating Robots

Robotic Vision

Support both monocular and stereo camera
Support multiple interfaces, MIPI, Ser/Des, USB 3.0 etc
Support RAW, YUV etc.

Support 1MP - 45MP Camera
Active Alignment available

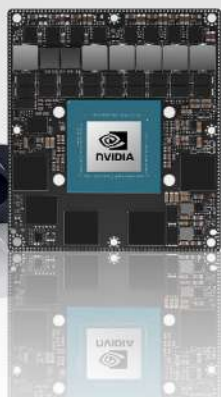
Stereoscopic 3D & Hi-Speed Robotics Vision



Owl



Hawk



NVIDIA JETSON AGX ORIN



Positional Tracking



2D/3D Imaging



Gesture Recognition



Machine Learning



2D/3D Scanning



Bar Code Scanner

	Hawk	Owl
Camera Type	Stereo	Monocular
Resolution	2.3M 1920(H)x1200(V)	2.3M 1920(H)x1200(V)
Frame Rate	60 fps	120 fps
Chromaticity	Color	Color
Shutter Type	Global Shutter	Global Shutter
Field of View	121° Horizontal	202° Horizontal
Interface	SerDes/GMSL2	SerDes/GMSL2
IP Rating	IP65	IP65
Special Features	Thermal/Vibration Proof Design, Avg. ~1% Accuracy	Hi-speed Imaging, Wide FOV
Applications	2D/3D Imaging, Robotic Vision, depth sensing, 3D scanning	Machine Vision, Hi-speed Surround View, Bar Code Scanning

NVIDIA NOVA Carter Robotics Ref Design

Sensors in Nova Carter

Type	Name	I/O	Part	Details	HFOV
Stereo Camera	Front Stereo	GMSL2	LI Hawk 1.1	2.3MP RGGB	120
Stereo Camera	Back Stereo	GMSL2	LI Hawk 1.1	2.3MP RGGB	120
Stereo Camera	Left Stereo	GMSL2	LI Hawk 1.1	2.3MP RGGB	120
Stereo Camera	Right Stereo	GMSL2	LI Hawk 1.1	2.3MP RGGB	120
Camera	Front Fisheye	GMSL2	LI Owl	2.3MP RGGB	202
Camera	Back Fisheye	GMSL2	LI Owl	2.3MP RGGB	202
Camera	Left Fisheye	GMSL2	LI Owl	2.3MP RGGB	202
Camera	Right Fisheye	GMSL2	LI Owl	2.3MP RGGB	202
IMU	Front Stereo IMU	I2C	Bosch BMI088	12.5-1600Hz	-
IMU	Chassis IMU	I2C	Bosch BMI088	12.5-1600Hz	-
Mag.	Chassis Magnetometer	I2C	Bosch BMM150	10Hz	-
Bar.	Chassis Barometer	I2C	Bosch BMP390	≤ 200Hz	-
2D Lidar	Front	Ethernet	Slamtec RPLIDAR S2E	1600 points/scan	360
2D Lidar	Back	Ethernet	Slamtec RPLIDAR S2E	1600 points/scan	360
3D Lidar	Top	Ethernet	Hesai PandarXT-32	120m range 1.28M points/s 1cm accuracy 0.5cm precision	360



NOVA DevKit



- Vision-only Enablement
- Subset of NOVA Carter
- More Cost-effective & Streamlined
- Available Starting Mid-Apr from Leopard Imaging



ToF 3D Depth Sensing



LI-KW33000-GMSL2-ToF

LI-USB30-TF-GMSL2-6M



Resolution : 640(H) x 480(V)
Optical Format : 1/4 inches
VCSEL Integrated
GMSL2 Serializer

Resolution: 640(H) x 480(V)
Optical Format: 1/4 inches
Connector: FAKRA Z TYPE
GMSL2 Serializer

Applications



Retail



Security Cameras



Drone



IoT



Healthcare



Robotics



Automotive



Industry 4.0



3D Depth Sensing

Venus AI Box



Venus AI Box is based on the Ambarella CV2 advanced computer chip with a wide range of applications: robotics, IoT, drones, ADAS, and many more.

Leopard Imaging successfully leveraged the Ambarella CV2 platform to achieve powerful computer vision performance and combined it cost-efficiently with full SoC functionality

Venus AI Box supports advanced computer vision, image processing, 4Kp60 video encoding, and stereovision in a single box. It delivers up to 20 times the deep neural network performance of Ambarella's first generation CV1 chip.

Applications



ADAS



Robotic



Drone



Security Cameras

NVIDIA AI Box/Carrier Boards/Adapters



NVIDIA® Jetson AGX Orin™ Camera Kits



NVIDIA® Jetson AGX Xavier™ NX GMSL2 Cameras



NVIDIA® Jetson™ TX2 AI Cam - TX2 Box Camera



NVIDIA® Jetson AGX Xavier™ Camera Kits



NVIDIA® Jetson AGX Xavier™ FPDLinkIII Camera Kits



NVIDIA® Jetson AGX Xavier™ GMSL2 Camera Kits



NVIDIA® Jetson Nano™ MIPI Camera Kits



NVIDIA® Jetson™ TX1/TX2 MIPI Camera Kits



NVIDIA® Jetson™ TX1/TX2 Carrier Cameras



NVIDIA® Jetson™ TX1/TX2 GMSL2 Cameras



Leopard Imaging Solutions Partners

Developer for
(Driver/IQ Tune)



Image Sensor
Partners



ISP/Processor
Partners



Lensing
Partners



Interface
Partners

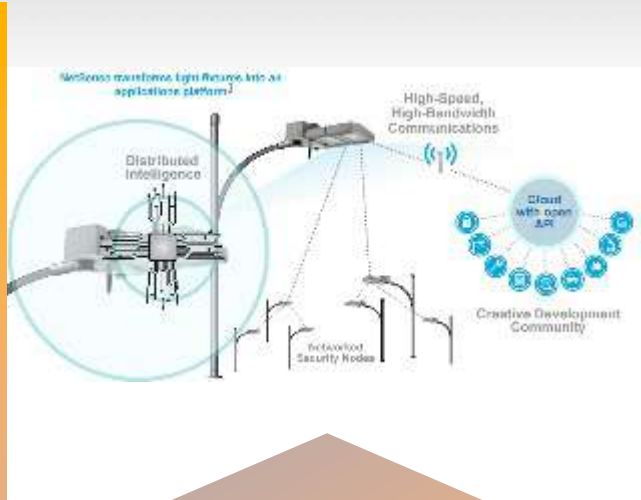


Business Model





**Professional Design Services
Driver Development/
Image Tuning Services**





Hi Growth/Hi Value Vision Solutions



Provide ODM / OEM Services for Global Customers



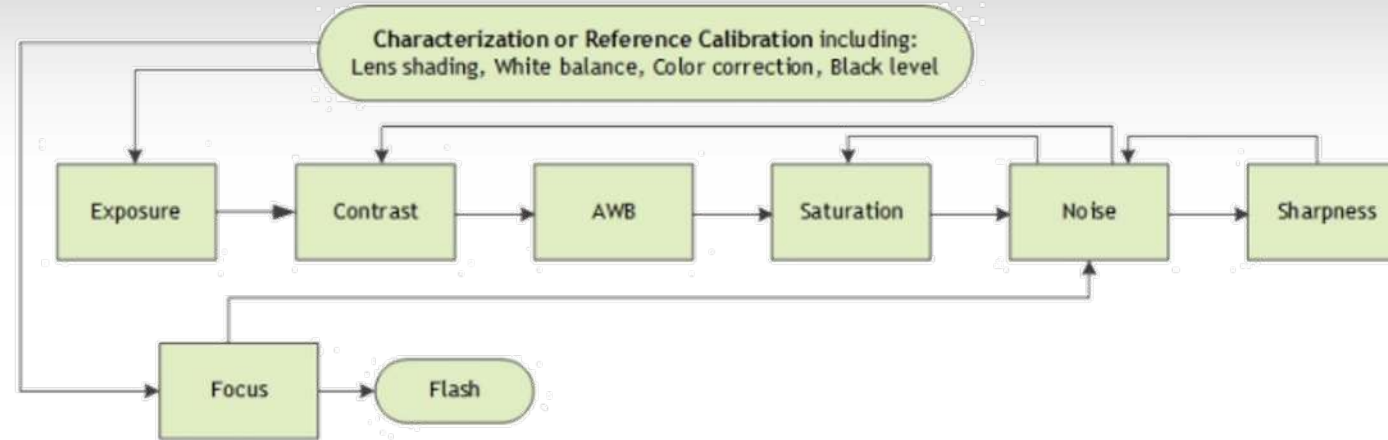


**Customized Products
Intelligent Vision Software**

- Auto-grade Cameras
- Aerospace/Drone Cameras
- Robotic/AgTech Cameras
- AI-enabled IOT Cameras
- Edge Computing Cameras
- 2D/3D Depth Cameras
- Metaverse Cameras
- Hi-performing Machine Vision
- Hi-performance AI Box

IQ (Image Quality) Tuning Specialist

Image Tuning Process Flow



Before and After Image Tuning

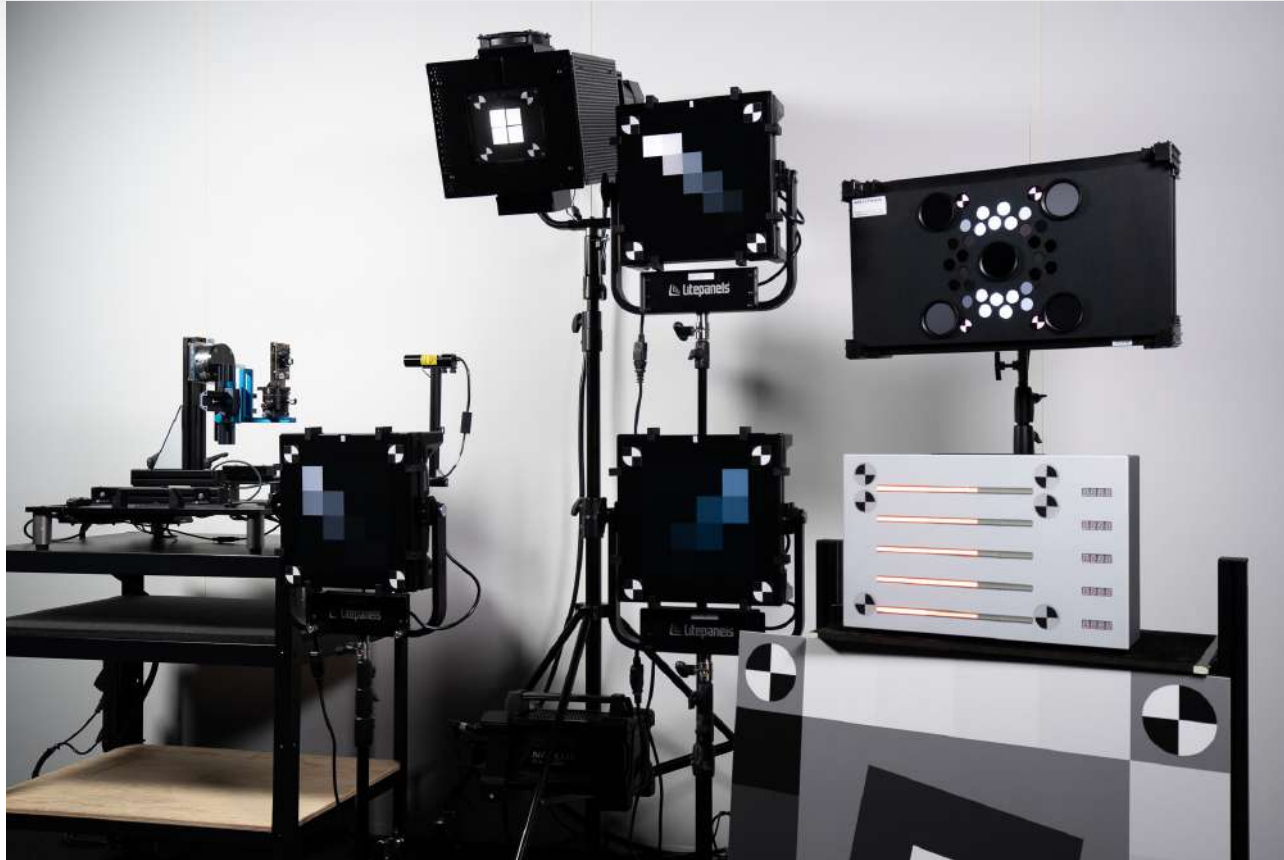


Road/outdoor Tests



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Image Quality Testing Lab with DXOMark



DXOMARK



2024/9/23 9/23/24

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Examples of IQ Tuning

8M
Camera



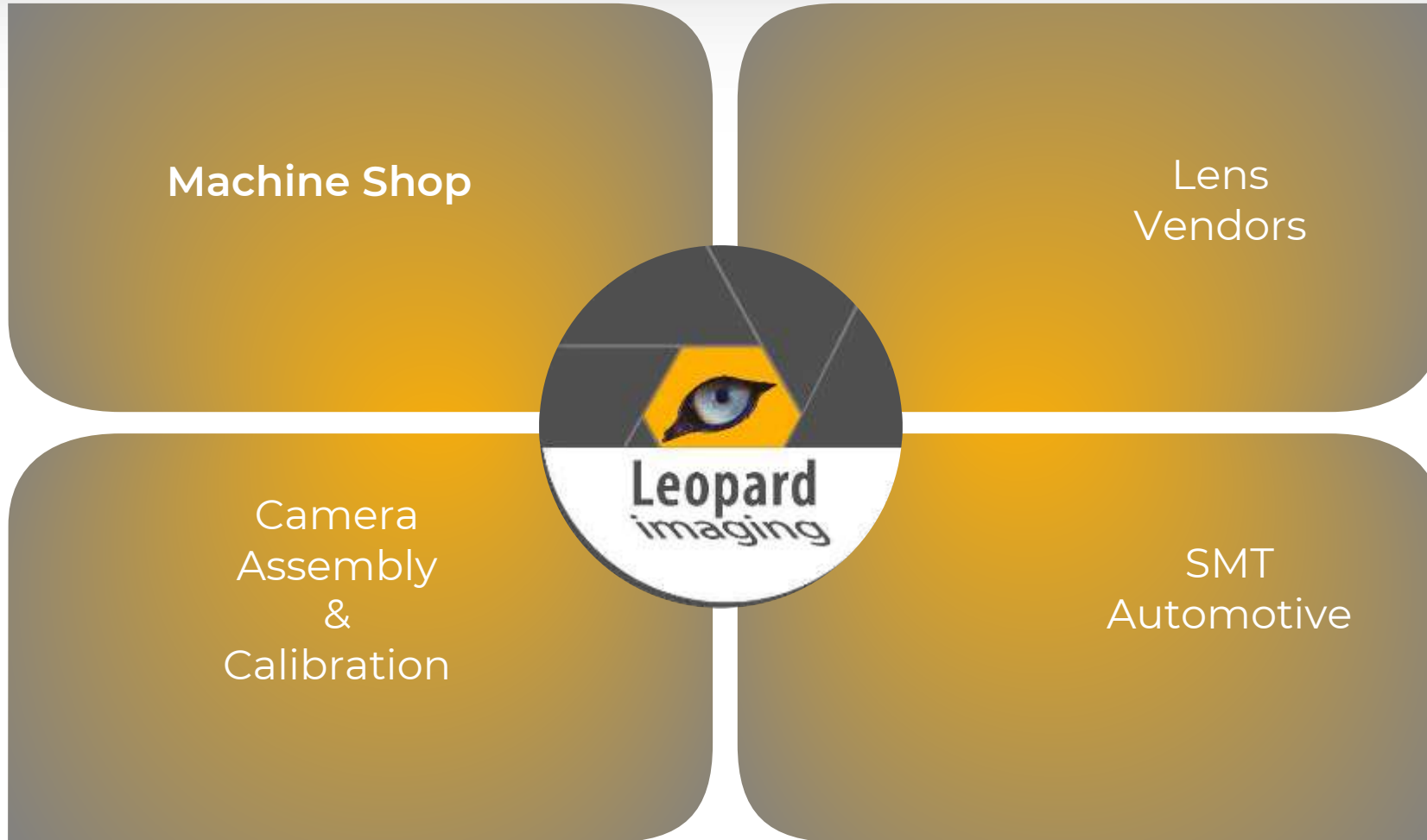
Examples of IQ Tuning



3M
Camera



World Class Manufacturing



Offshore Manufacturing

Mass Production Capacity

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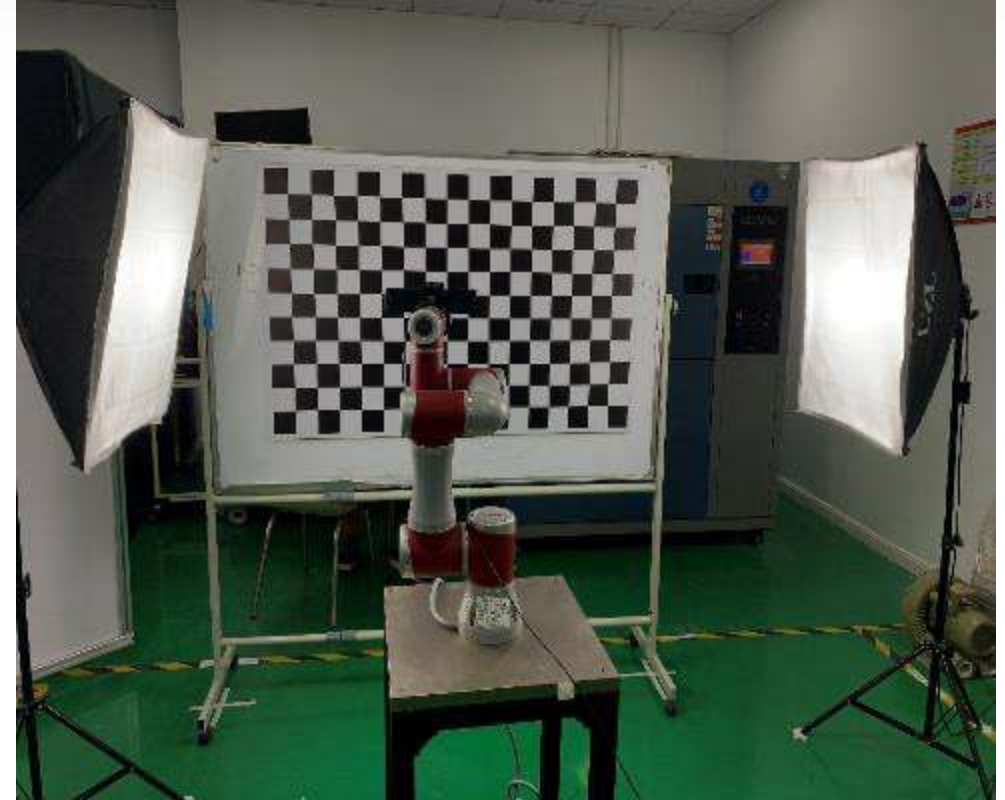
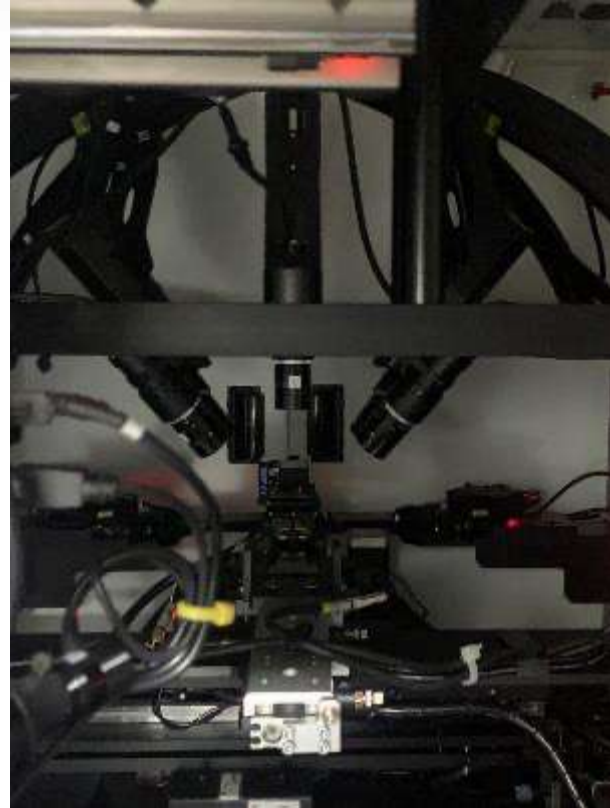
Class 1000 Clean Room
Active Alignment Machine



Camera Assembly, Focusing, Calibration

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Calibration and AA Machine



9/23/24

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Mass Production Capacity

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SMT Lines



Image Lab
Environment Testing Lab

Environmental Test Equipment of Leopard Imaging



Thermal shock test



Shock/Vibe & Temperature test



ESD test



Drop test



Leakage test

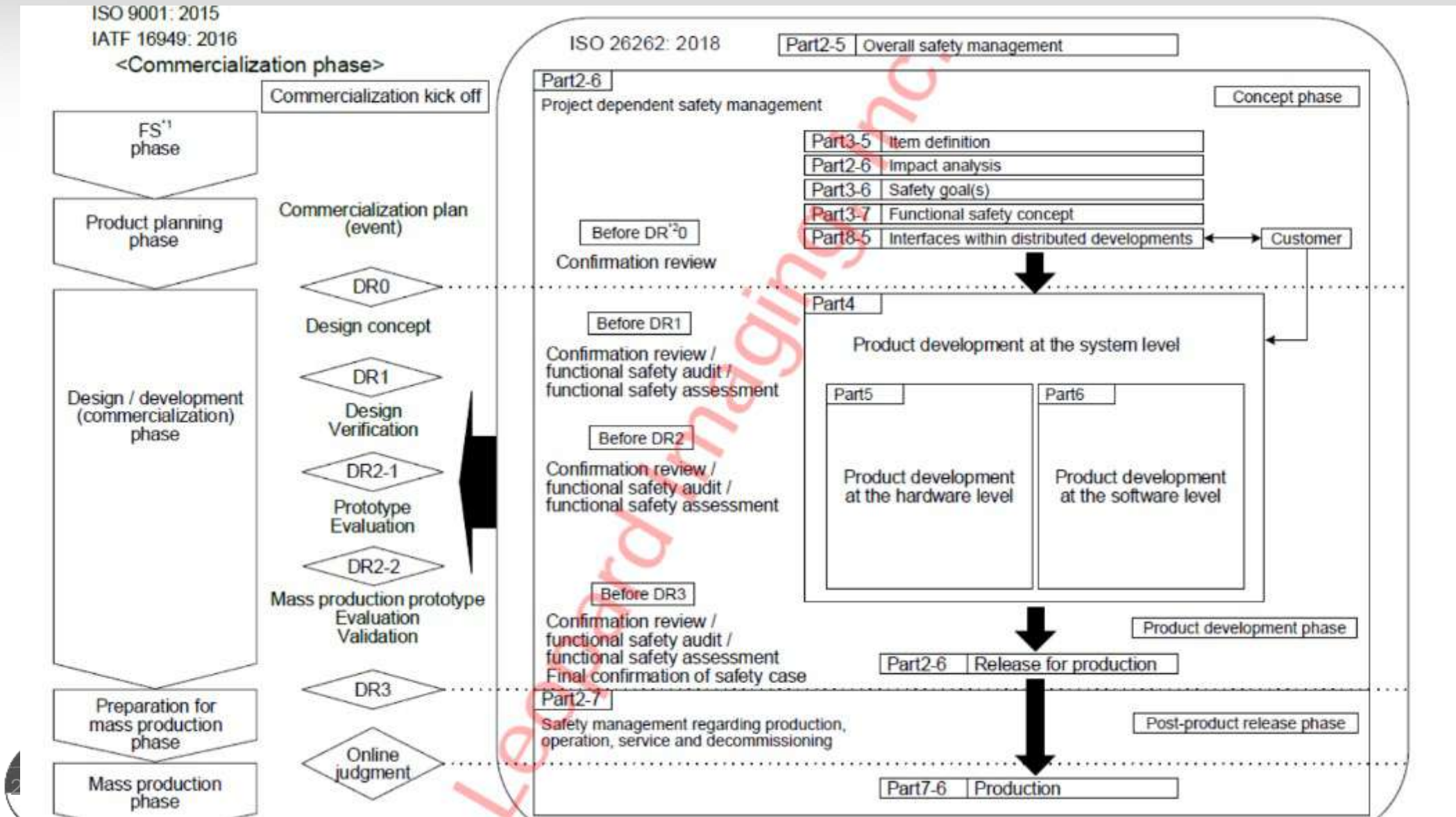


IP5X 6X dust ingress test



IPX9k water ingress test

Automotive Process



World Class Operations

Certified



Come to Visit Us Leopard Imaging Global Offices



California Office



Factory



Shanghai Office



New China Campus
(Coming Soon)



Nantong R&D Office

Thank You



Leopard Imaging Inc.

www.leopardimaging.com