Building Forward Together | ADLINK

Invigorate Applications with Powerful Functions

# Mobile Device Production Solution

Measurement and Automation Solution Guide



www.adlinktech.com

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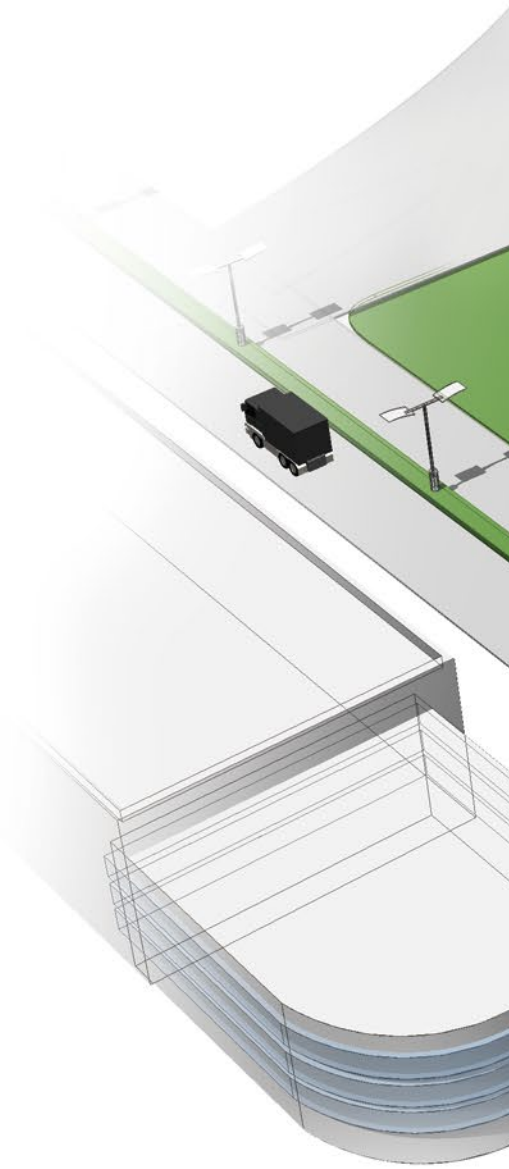
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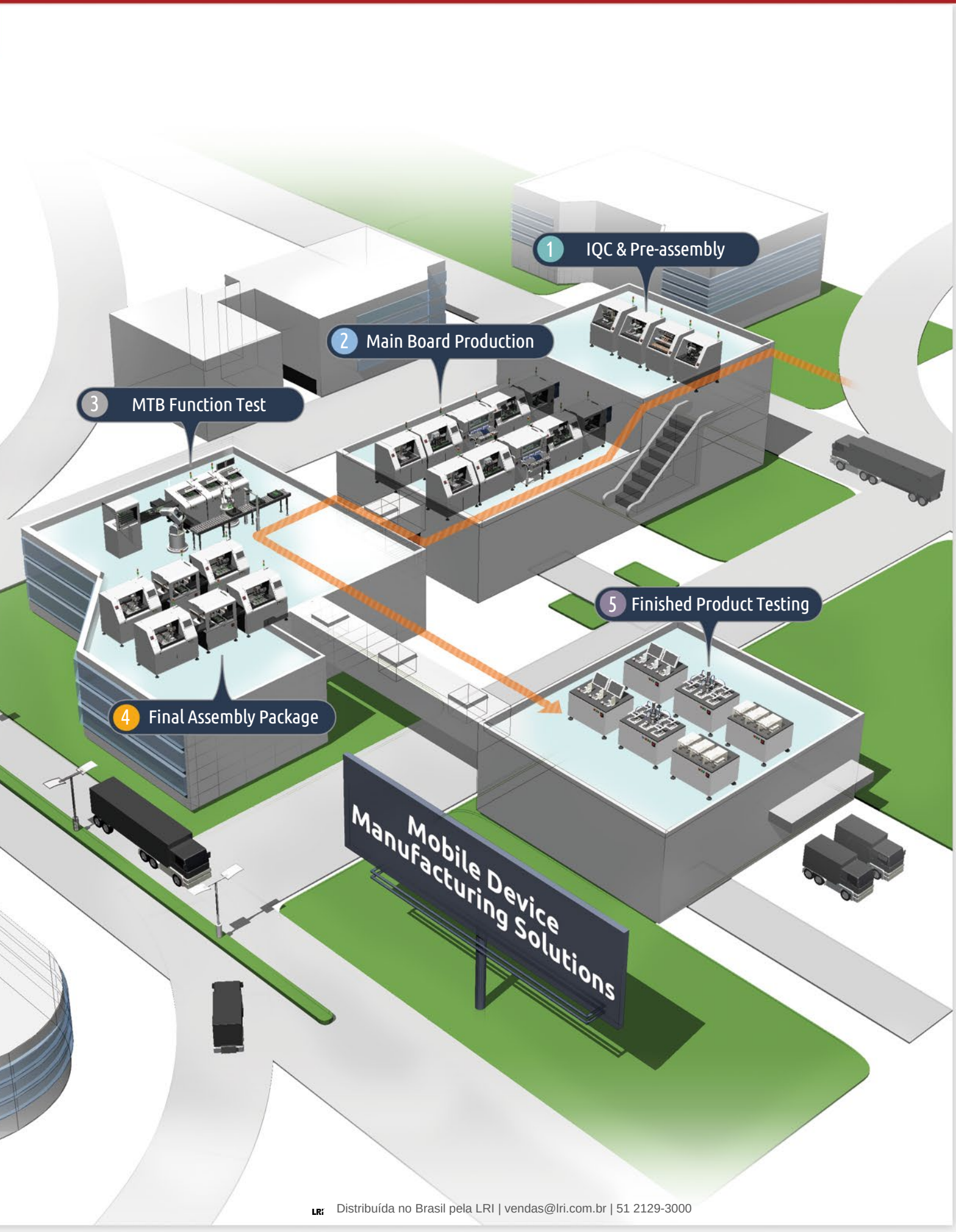
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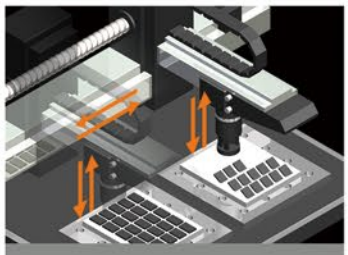
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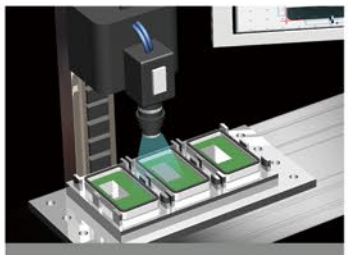

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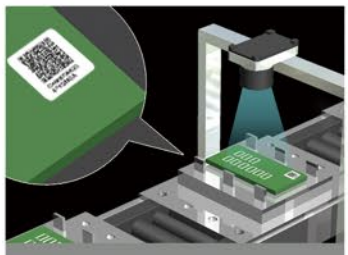
# Maximizing Success for Mobile Device Production

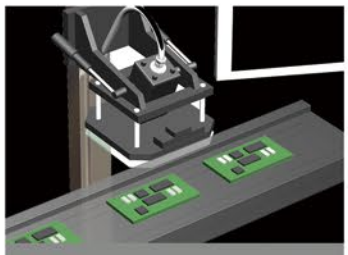

Pick and Place

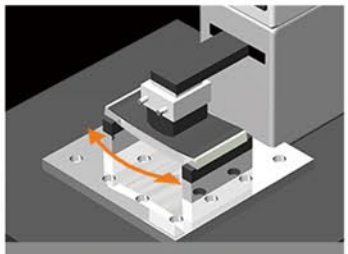

Contouring

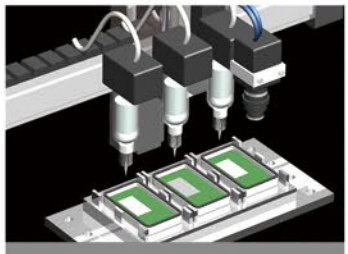

Alignment

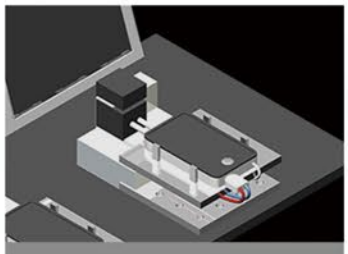

Gauge


OCR/Barcode


Inspection


Force Control


Comparison & Trigger


Audio/Video Testing

## Invigorate Applications with Powerful Functions

With the explosive popularity of mobile device use, supply chain deployment supporting highly efficient manufacturing of quality mobile products is being increasingly recognized as a critical factor in market dominance.

Accordingly, it has become more and more important for providers to introduce automated systems and quality assurance solutions across their production procedures, from material feeding, component production and functional testing, assembly, final product quality assurance, and inspection to shipping, to minimize defect rates while boosting quality and throughput. Intelligent precision manufacturing can easily be the deciding advantage in guaranteeing success and competitiveness for mobile device manufacturers.

The complex manufacturing procedures for mobile devices, from an automation perspective, can be organized into functional categories such as Pick & Place, Contouring, Alignment, Force Control, Inspection, and others.



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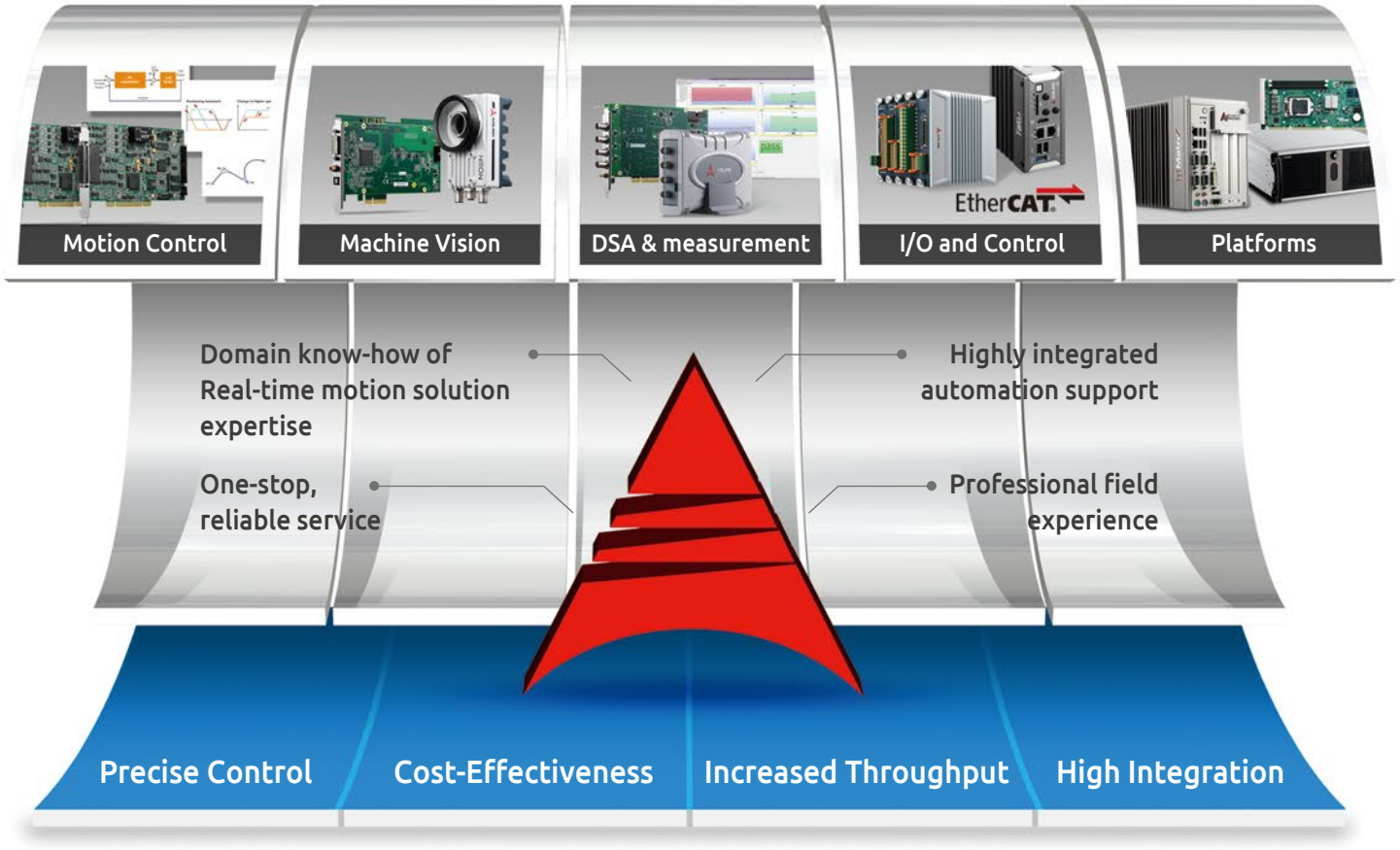





As an example, an automated dispenser unit can incorporate such functions as Position Comparison & Trigger and Contouring & Alignment, and, in the presence of automated function testing, Pick & Place as well, to enable robotic loading of workpieces onto the test equipment and Force Control to provide mobilization in lieu of manual function, achieving more consistent and precise test results.

Thus, if highly efficient and fully compatible solutions delivering such functionality are available to mobile manufacturers, system integrators will be able to effect customized organization of the solutions for their specific variety of equipment and applications, translating into quick and flexible satisfaction of production line requirements and timely support of product launches, guaranteeing vertical market success.

# The Measurement and Automation Experts




ADLINK Technology Inc., with years of market-proven expertise in measurement and automation technologies, provides a leading range of industrial automation products empowering motion control, machine vision, data acquisition, I/O control, and intelligent computing platforms.

To enhance competiveness and maximize return on investment, automatic system vendors and users require cost-effective and highly integrated solutions that can realize precise control and high throughput. ADLINK, with superior domain knowhow and field experience, meet and exceed customer needs, with a wealth of highly integrated automation solutions enabling real-time I/O and motion control, backed up with reliable one-stop service.

ADLINK has consistently delivered value by overcoming a wide variety of industrial challenges, with proven platforms optimizing operations, driven by a commitment to long-term sustainability and intelligent manufacturing design. ADLINK's flexible roster of system, platform-, and product-based solutions means customers can quickly deploy automated systems that can easily withstand the rigors of the most extreme manufacturing conditions, seamlessly meshing with enterprise-level management platforms to deliver fault-free performance on the front lines of the modern production environment.


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# Transforming Industry

Current manufacturing efforts face rapid changes in market demands and increasingly faster and more varied product launches. System integrators require flexible and expandable automation solutions that easily integrate into diverse applications with speedy deployment, allowing maximized output and cost-efficiency and generating tangible competitive value.

On the other hand, globalization of the manufacturing industry also prioritizes production efficiency and quality consistency, making it more important than ever to fully automate test and measurement to replace conventional manual function. Additionally, increasing miniaturization of components used demands higher performance platforms delivering precise motion control and sophisticated machine vision capabilities. Reliable connection and networking are required to support high performance manufacturing and meaningful integration into shop floor systems.




## Cornerstones for Manufacturing Success

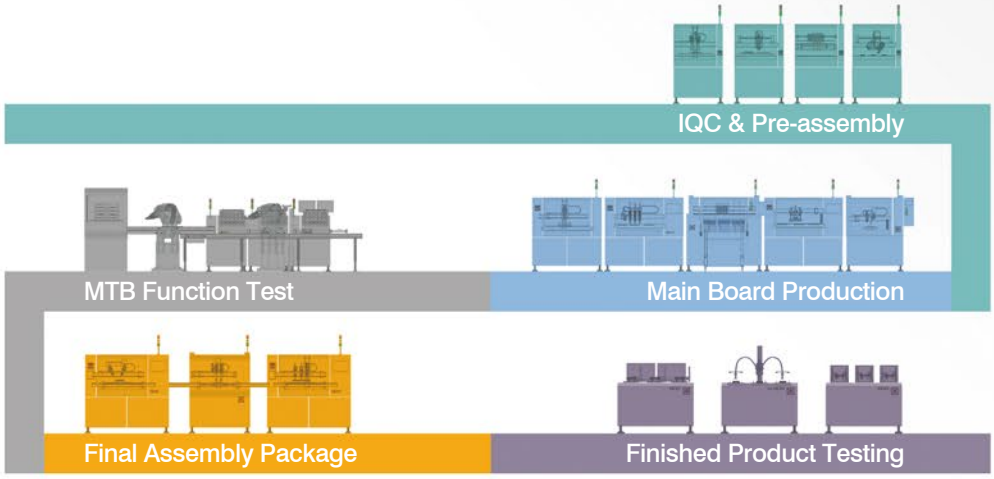
# ADLINK's Value Proposition

ADLINK has sustained a superior caliber of automation expertise by consistently keeping pace with the evolution of industry, offering highly flexible and well-rounded automation solutions that continue to meet the changing demands of current customer trends.

For the vertical mobile device market, ADLINK has provided a series of solutions built around specific functions involved in automated manufacturing and testing environments. These solutions have their foundation in the intensive field knowledge and experience crucial to the delivery of seamless integration and leading performance.

ADLINK mobile device production solutions are specifically engineered to meet and exceed the requirements for high precision, high efficiency, and high flexibility in the mobile device manufacturing arena, allowing system vendors to speed product time-to-market and enable faster deployment of production lines to keep pace with or even lead market changes.

# Mobile Device Manufacturing Solutions









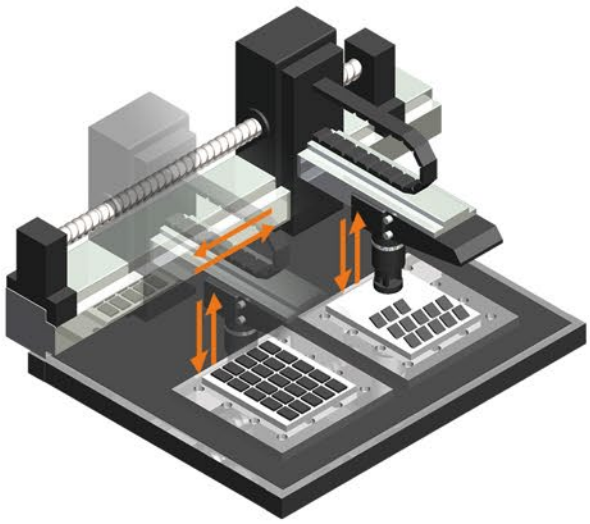
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OCA Laminating Machine
CCM Assembly Equipment
Roll to Roll Equipment
Battery Default Inspection
1
IQC & Pre-assembly
Synchronous Control, Image Quality, Force Control, Audio Testing
Solder Paste
Dispensing
SMT
AOI
Soldering
2
Main Board Production
Pick & Place, Alignment, Inspection
Leak Testing
Touch Panel Testing
MMI Testing / Audio Testing / Video Testing
5
Finished Product Testing
Load Cell, Motion Control, Audio Testing, Video Testing
MMI Testing for Camera
MMI Testing fro Panel
MMI Testing for button
Audio Testing
Lightning/MHL Port Testing

# Pick and Place

## Introduction

Pick-and-Place operations, largely implemented by multi-axis robotics, are important in automated manufacturing in scenarios such as retrieving parts from pallets for positioning in a conveyor system or placement of completed products into packaging. To meet the ever-changing demands of the dynamic mobile market, speed, accuracy and flexibility are prime requirements. Shorter cycle time for motion control is needed to increase throughput, and higher flexibility aids reorganization of production lines to accommodate new product launches.



## ADLINK Solution

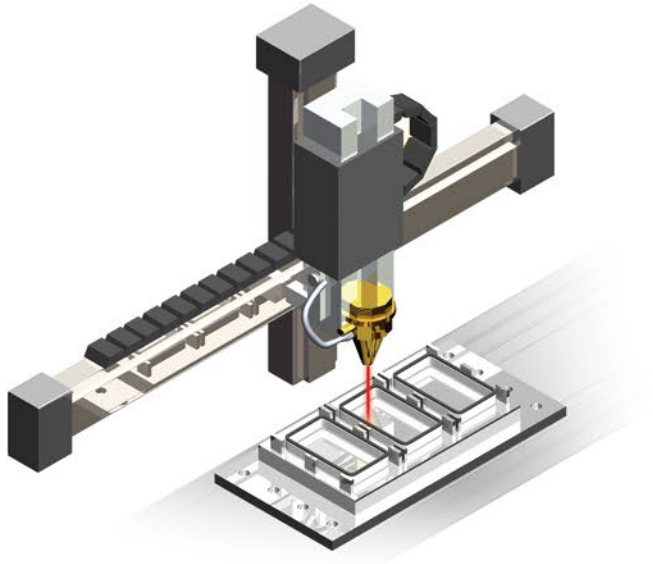
- ***ADLINK EtherCAT:***
  - **Talos-3012: Intel® Atom™ Processor E3845 1.9 GHz-based EtherCAT Master Controller**
  - **EPS Slave System and Modules**
- ***AMP-204C/208C: DSP-based 4/8-axis Advanced Pulse-Train Motion Controllers***



# Contouring

## Introduction

Precise contouring is an integral contributor to product aesthetics and functionality in mobile manufacturing. Used widely in glue dispensing and laser cutting, as well as CNC machining, the importance of Contouring function increases commensurately with miniaturization of mobile parts, with which machining requirements become stricter than ever to maintain quality. Compared to Pick & Place, Contouring performance relies more on powerful motion control that supplies precise on/off-line trajectory planning and curve-fitting, as well as velocity planning.



## ADLINK Solution

- ***PCI-8254/8258: DSP-based 4/8-axis Advanced Motion Controllers***



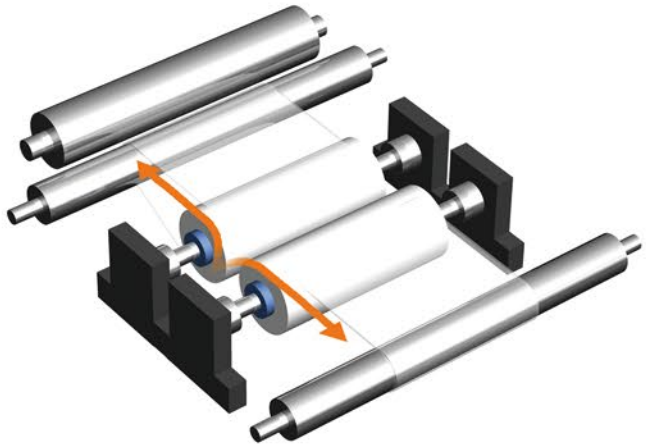


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# Synchronous Control

## Introduction

Speed, accuracy and precise movement are extremely important capabilities of manufacturing operations performed by components such as laminating, roll to roll, and screw fastening machinery, which often rely on high synchronization of multi-axis motion and various I/Os in complicated functional combinations. To ensure the absolute precision of motion behavior, ADLINK motion controllers provide multi-axis and mixed motion/IO synchronization with real-time cycle control within 1ms, precisely synching axis and I/O with near-zero time delay.



## ADLINK Solution

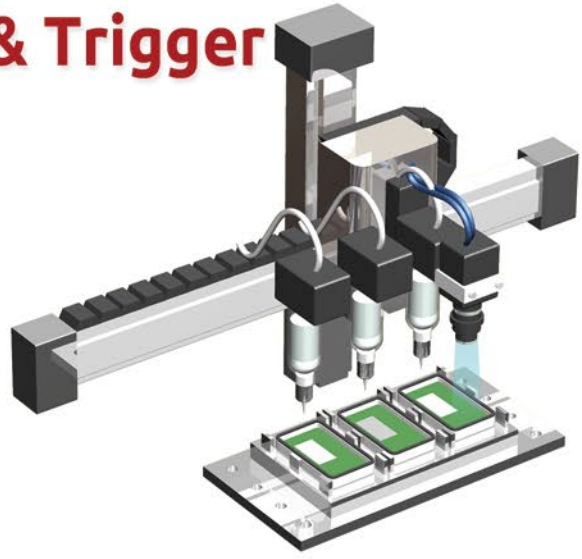
- ***AMP-204C/208C: DSP-based 4/8-axis Advanced Pulse-Train Motion Controllers***



# 3D Position Comparison & Trigger

## Introduction

In laser, dispensing, and AOI applications, Comparison & Trigger function refers to motion controllers triggering device activity (laser, camera, etc.) at specific positions during materials processing or inspection. When applied in 3D-equppied operations, precise multi-axis application of the function presents a challenge for automatic control engineering, effectively addressed by ADLINK's offering of controllers that provide on-the-fly triggering in 3D space.

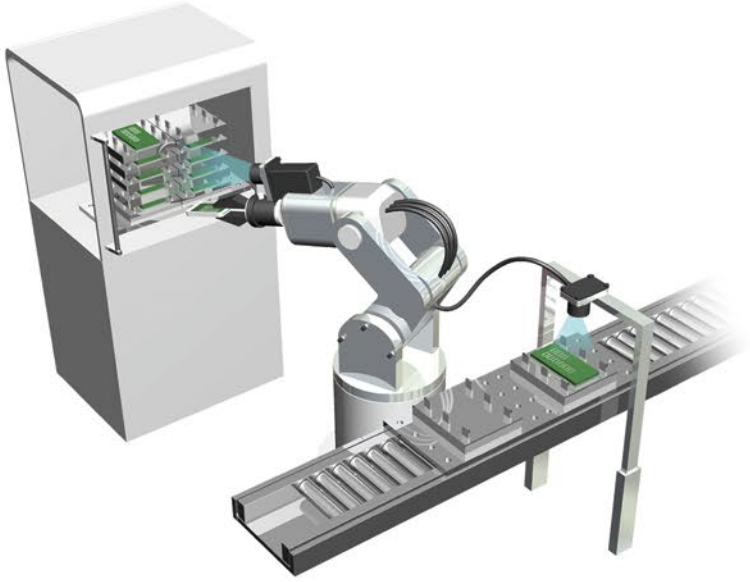


## ADLINK Solution

- ***AMP-204C/208C: DSP-based 4/8-axis Advanced Pulse-Train Motion Controllers***



# Alignment



## Introduction

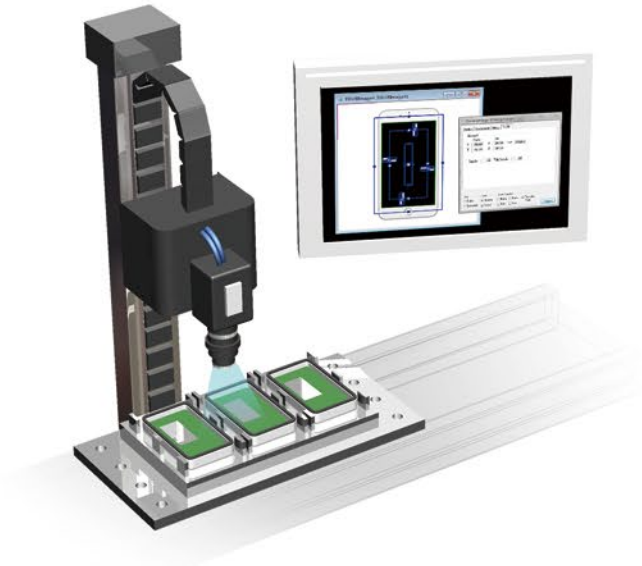
Alignment is the fundamental of all machining processes; generating all position information for the workpiece. Compared with conventional manual operations, machine vision alignment not only requires no problematic direct physical contact, but further provides benefits of increased accuracy, throughput, and efficiency. With the increasing miniaturization of mobile device components, high resolution, high computing power and fast capture speeds have become critical in vision-based alignment systems, in addition to presenting favorable compact system size.

## ADLINK Solution

- ***NEON-1040: Intel® Atom™ Quad-Core Processor E3845 1.9 GHz-based smart camera with 4MP, 60fps, global shutter sensor and IP67 rating***




# Gauge



## Introduction

One of the most critical dimension measurements, partly due to the necessity of up to micron-level precision, gauge is a key detection in product quality control. Machine vision-based Gauge function is non-contact, highly efficient, and optimally precise option, capable of measuring multiple objects simultaneously and ensuring higher throughput. With machine vision, users can implement uniform, automatic gauge measurement on production lines, minimizing human error and associated loss. As Gauge applications do not require high frame rates, the GigE interface is an optimal choice, especially for cost and cable length considerations.

## ADLINK Solution

- ***PCIe-GIE64+: 4-CH PCI Express® GigE Vision Power over Ethernet Frame Grabber***



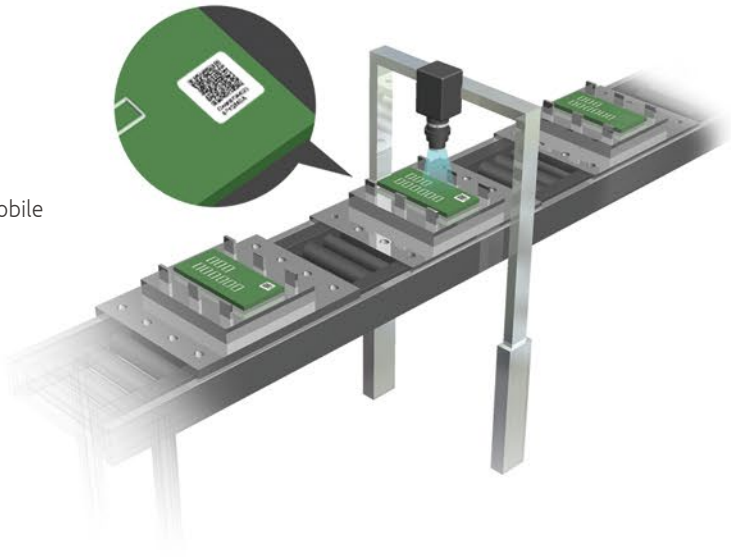


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# OCR/Barcode

## Introduction

OCR/Barcode scanning by machine vision is widely used in mobile device manufacture processing, often to support production records with data acquired from each workstation, ensuring quality consistency of products. With its straightforward and simple operation, cost-efficiency is usually a top concern in OCR/Barcode machine vision solution design, according to which GigE-based platforms present an excellent choice.



## ADLINK Solution

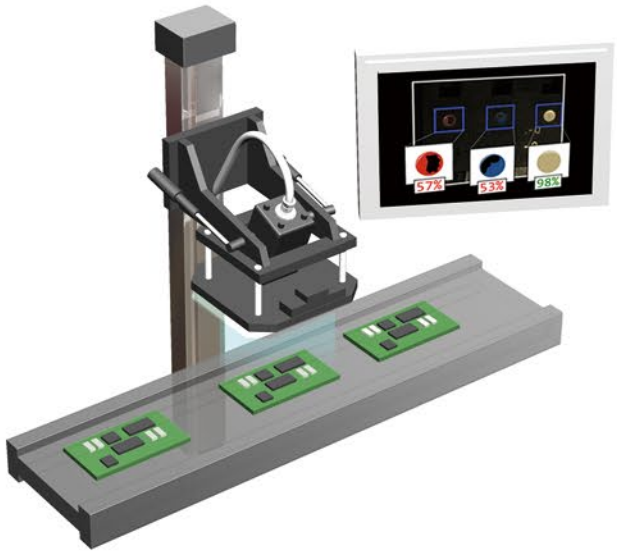
- ***PCIe-GIE64+: 4-CH PCI Express® GigE Vision Power over Ethernet Frame Grabber***



# Inspection

## Introduction

Detection and identification of product defects is one of the most prevalent machine vision applications. An inspection system usually uses a frame grabber to catch images and implements image pre-processing, algorithm computing, analyses and comparison, in order to detect defects or faults in products. Machine-based automatic inspection for product quality assurance purposes is replacing traditional manual practice due to higher precision, accuracy and throughput. Major components for an automatic inspection solution include lighting, camera, vision platform and easy-to-use image analysis software to ensure best results.




## ADLINK Solution

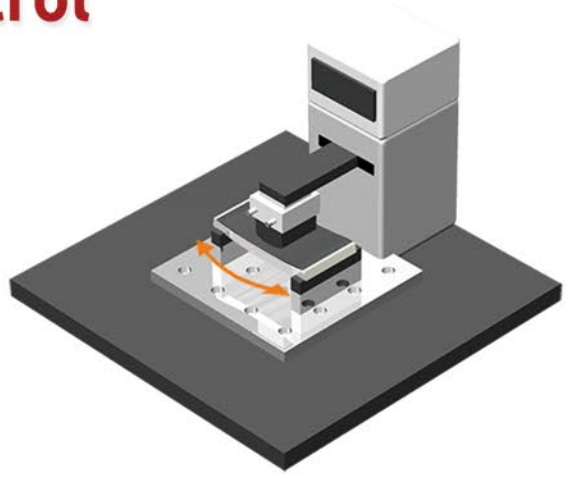
- ***PCIe-GIE64+: 4-CH PCI Express® GigE Vision Power over Ethernet Frame Grabber***



# Force Measurement & Control

## Introduction

Force measurement and control is often used in cell phone production and testing, and typically involves the use of a load cell to convert force into signals for measurement. Because the load cell's signal output is very low (normally in mV), conventional measurement solutions use an extra signal conditioning device to amplify the signals and measure with a general-purpose DAQ. ADLINK offers a better solution, using a 24-bit high-resolution DAQ with built in signal conditioning circuit, significantly improving convenience and accuracy.



## ADLINK Solution

- ***USB-2401: 4-CH 24-Bit Universal Input USB DAQ***
- ***PCI-9524: 24-Bit Precision Load Cell Input Card***



# Audio Testing

## Introduction

With multimedia capability established as a standard feature of mobile devices, the importance of audio and video quality testing has grown significantly. To minimize false detection, audio testing solutions must emphasize precision, accuracy, consistency and reliability. High flexibility and compatibility are also desirable to support speedy creation of applications quickly and to integrate systems with other test devices to streamline production lines.




## ADLINK Solution

- ***PCI/PXI-9527: High resolution 24-bit dynamic signal acquisition module with flexible input configuration and easy-to-use utility***



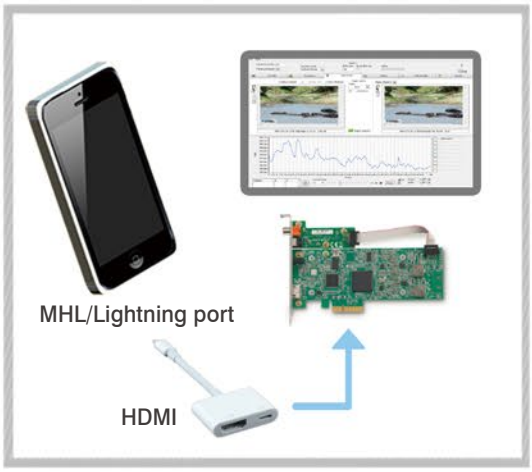


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# Video Testing

## Introduction

Mobile devices providing multimedia capability must undergo a full range of testing procedures from input interface and display resolution to color space adjustment. However, as some advanced video features are difficult for the human eye to discern precisely, automatic testing of multimedia devices can provide significant increases in consistency, accuracy and efficiency. ADLINK's video testing solution supports up to 4k2k resolution and can integrate with multi-source digital audio data capture in a streamlined system.




## ADLINK Solution

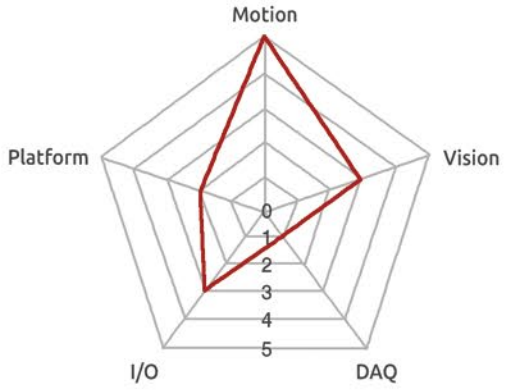
- ***PCIe-HDV72: 1-CH PCI Express 4k2k HMDI Video and Audio Capture Card***



# Laser Cutting

## Introduction

Precision laser processing and cutting are common in silicon wafer slicing operations for solar cells, cell phone screens, semiconductor wafer, and CNC machines, among others. High-end motion control products for laser equipment must accommodate micro-level precision in contour cutting and adjusting released energy to accommodate varying materials while maximizing yield.







## Requirement

- *Laser precision to μm scale*
- *Precision trajectory acquisition w/o vibration*
- *<1% resolution laser power adjustment*

## Function

- *Precise trajectory tracing*
- *Automatic velocity planning*
- *On-the-fly laser intensity control*

## ADLINK Solution

ADLINK's advanced PCI-8254/8258 successfully incorporates complex velocity planning and laser power calculation into a single motion controller, maximizing convenience and economy. State-of-the-art DSP and FPGA technologies support high-speed and high-efficiency hybrid analog and pulse commands. Servo updates up to 20 kHz are delivered through hardware-based PID-FF closed-loop control. With downloaded programs ADLINK motion controller can execute up to eight individual tasks simultaneously, and incorporation with PCIe-GIE64+ and vision analysis tool for object alignment enable precise laser cutting. Further, ADLINK's high performance motion controllers will continue to meet laser cutting demands as 3D processing is adopted more and more, with more complex surface treatments required.

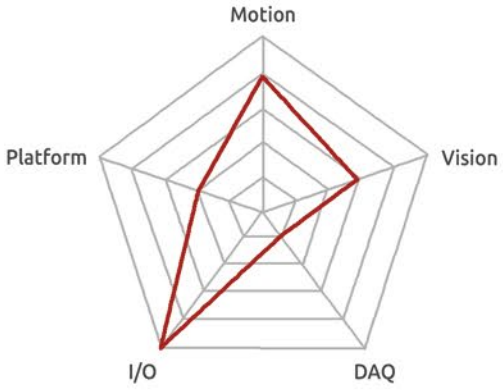


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# Dispensing

## Introduction

Dispensing machines are widely used in mobile device assembly. With increasing miniaturization of components, precise and efficient dispensing is crucial for quality and productivity. To implement precise dispensing, digital camera-based alignment of workpieces and high-performance motion control are needed to trigger dispensers according to planned trajectories. A well-rounded dispensing solution integrates vision, I/O motion control, and related software.







## Requirement

- *Precise control*
- *High productivity*

## Function

- *3D position comparison & trigger*
- *Contouring*
- *Pattern matching (alignment)*

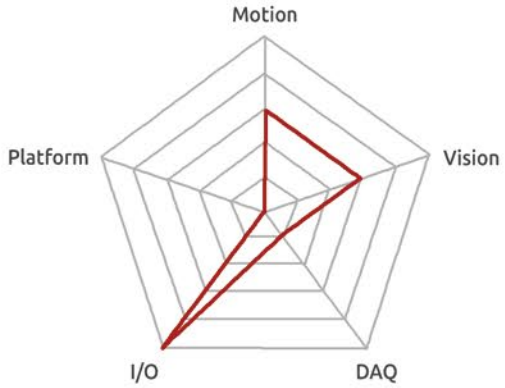
## ADLINK Solution

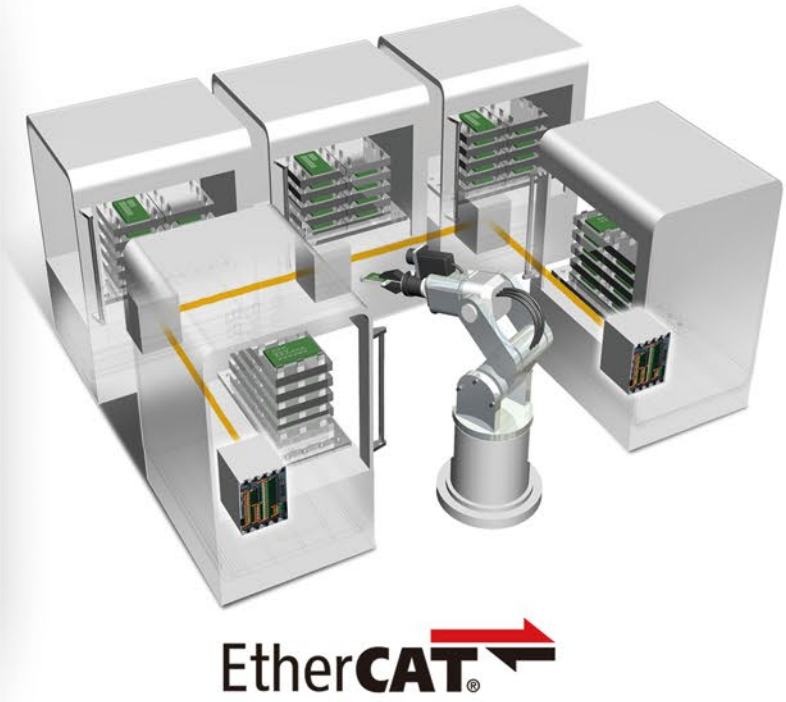
ADLINK incorporates a frame grabber (PCIe-GIE64+), vision analysis tool and motion controller (AMP-204C/208C), into its solution, supporting not only pattern matching and inspection, but overall system control. The AMP-204C/208C is an advanced pulse train motion controller that offers high speed multi-axis position comparison & trigger functions (1MHz), able to compare up to 4/8 axis command or encoder position counter at the same time. It is also useful in comparing specific positions of contouring in 3D applications. With its versatile trigger function, 4 trigger channels can be planned in one contouring path. With the ADLINK AMP-204C/208C, dispensing and inspection can be performed simultaneously, increasing throughput and improving productivity.

# Testing & Sorting

## Introduction

Testing and sorting is an important function to guarantee quality in the production of electronic devices (EDS). Subassemblies or final products are tested at the production line and defective or faulty items removed. Previously, testing and sorting have been conducted by discrete automated equipment. Recently, however, use of a single system combining two or more functions has gained popularity, to reduce costs, conserve space, and increase throughput.




## Requirement

- *High UPH up to 5K+*
- *Binning up to 6+ Trays*
- *Index time ≥ 0.5 sec*

## Function

- *Synchronous motion and I/O Control*
- *Position comparison & latch*
- *Electronic character measurement*
- *Pattern matching*

## ADLINK Solution

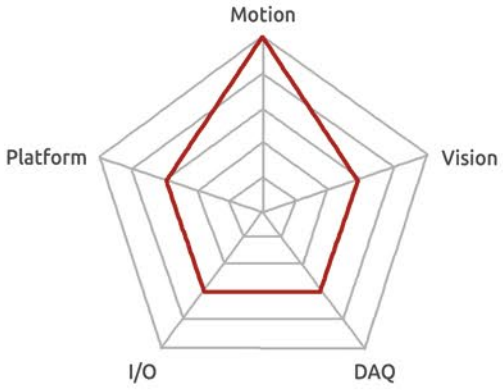
Two-in-one or multi-function machines require powerful and precise motion control that can support multiple handlers simultaneously. For Testing & Sorting machines, ADLINK provides an EtherCAT-based solution realizing time-deterministic control, comprising a Talos EtherCAT master controller to coordinate and control multiple EPS EtherCAT slaves, each connected to servos and digital or analog I/O devices for testing or sorting. The Talos controller has ADLINK's Softmotion package installed, enabling management of complicated motion function with simple and intuitive function blocks. Incorporating ADLINK vision and DSA products, the solution offers precise pattern matching and highly accurate results.

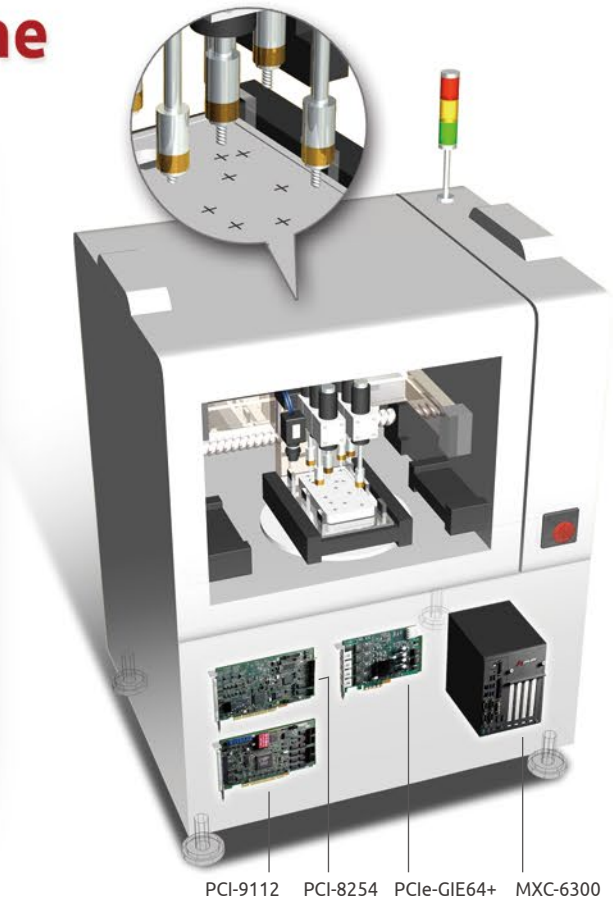

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# Screw Fastening Machine

## Introduction

Screw fastening machines are deployed on assembly lines to automatically fix component parts together. With increasing miniaturization of mobile devices, the machines require more precise position alignment, auto-adjusted torque, high-speed movement, and dynamic locking to flexibly and quickly perform from different heights and angles. A screw locking solution thus demands integration of motion, vision and I/O functions.




## Requirement

- ***Real-time force feedback measures screw torque in ms***
- ***Multi-axis synchronous control fastens multiple screws simultaneously***
- ***Vision alignment integration for precise positioning accuracy***

## Function

- ***Program download  synchronizes onboard analog input and motion in ms***
- ***E-gearing function maximizes motion control synch***
- ***Precise position comparison and high speed trigger functions***

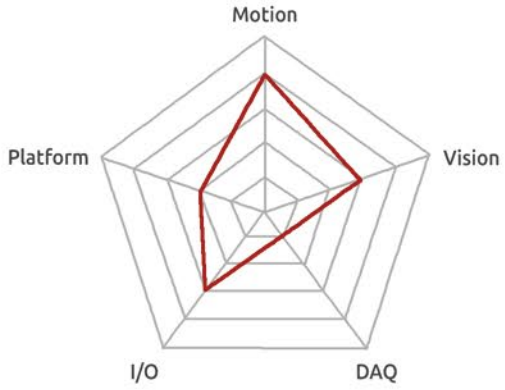
## ADLINK Solution

ADLINK's solution successfully incorporates complex vision, velocity planning, and data acquisition to help system integrators develop mobile device screw fastening trajectory applications. ADLINK's advanced Data Acquisition Card PCI-9112 supports automatic analog input scanning and offers a unique mode for 8-CH analog inputs and maximum noise elimination, as well as single-ended modes for 16-CH analog inputs. As well, to achieve highly efficient, precise motion control, ADLINK's advanced motion controller PCI-8254/8258 provides a Program Download feature that helps execute up to 8 tasks simultaneously while automatically controlling all onboard I/O, while generating motion trajectories at the same time. ADLINK's vision solution is based on the PCIe-GIE64+, featuring automatic detection for reliable connection between cameras and frame grabbers, and supporting multiple GigE Vision device connections with data transfer up to 1000 Mb/s.

# Laminating

## Introduction

OCA lamination in touch screen manufacturing is pivotal for optical performance and reliability but is also a major source of product defects. Automatic OCA laminator solutions usually combine machine vision, motion control, and I/O control in a single apparatus, requiring equipment vendors to integrate these functions in the most efficient way possible, to maximize performance. Precision in glue dispensing and OCA laminating is widely recognized as a key factor in manufacturing success.







## Requirement

- *Automatic vision positioning 0.005mm*
- *Position control over glue and OCR*
- *Glue dispensing trajectory control*

## Function

- *Pattern matching*
- *Synchronous control*
- *Contouring control*

## ADLINK Solution

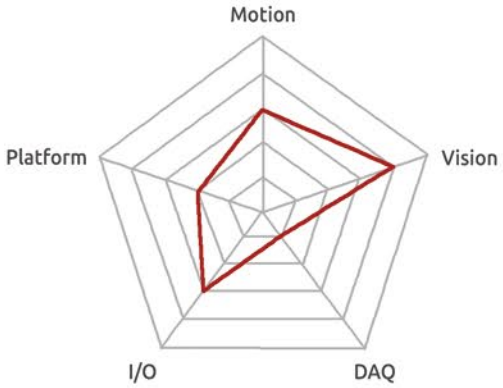
ADLINK provides a total solution for laminating machines that includes vision and motion controls. ADLINK's PCIe-GIE64+ frame grabber connects up to 4 GigE Vision cameras via Power over Ethernet (PoE). ADLINK's AMP-204C, a DSP-based 4-axis advanced pulse-train motion controller, provides high pulse output and fast encoder input and integrates multi-dimensional interpolation, completing the solution for high precision and complex motion control.

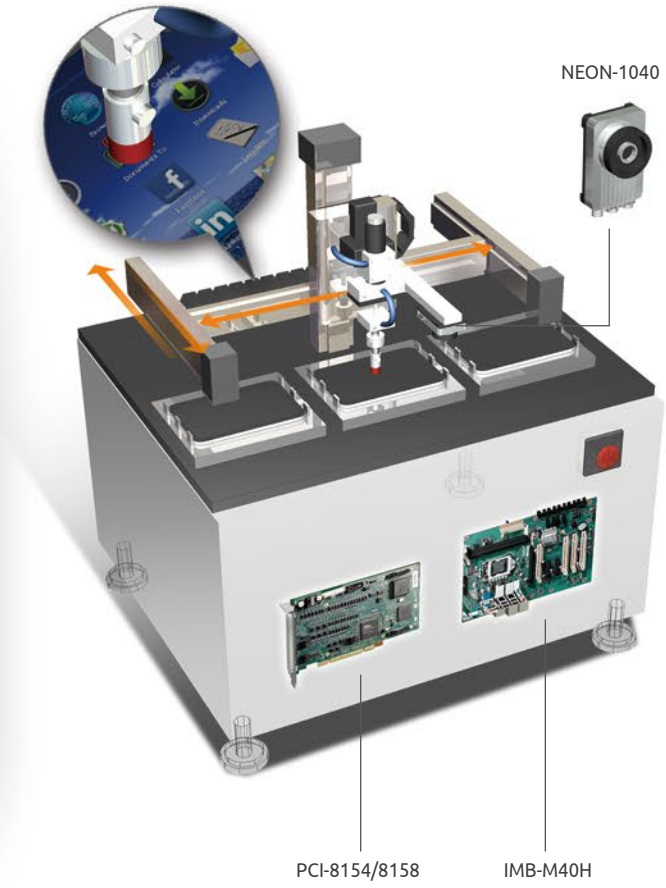

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# Touch Panel Testing

## Introduction

Automated touch panel testing calls for high integration and synergy among the major functions--vision, motion and measurement. Machine vision is used to detect the position of the workpiece (touch panel), and gives the position information to the motion system, so that the motion system can align the workpiece to the right position for the vision system to implement measurement and analysis. Meanwhile, Precision load cell input card is used to give pressing force instead of less precise manual practice.




## Requirement

- *Optical precision to µm scale*
- *Wide range field of view (FOV) and high resolution*
- *Maximum integration for reduced TCO*

## Function

- *High performance imaging efficiency*
- *Pattern matching*
- *Precise position control*
- *Position comparison & trigger*

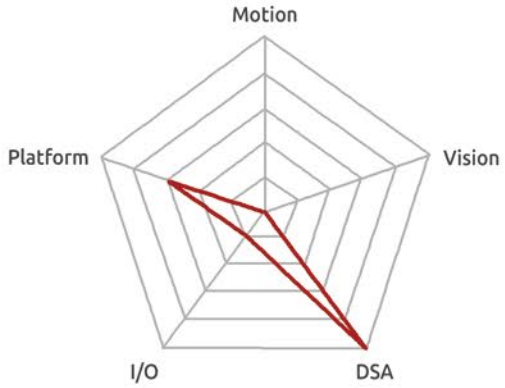
## ADLINK Solution

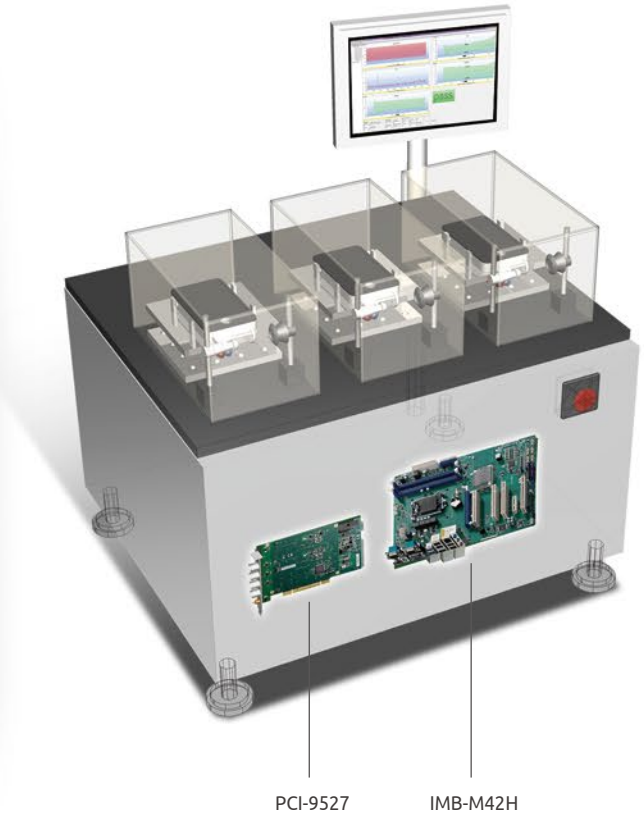
ADLINK's total solution for touch panel testing integrates vision, motion, and measurement. The NEON-1040 smart camera, at the heart of the solution, features an Intel quad-core Atom processor, 1" global shutter CMOS sensor, up to 4MP image resolution, and wide range field of view (FOV), and fully supports simultaneous testing of multiple touch panels for reduced testing cycle. The NEON-1040 accommodates a variety of 3rd party vision applications enabling fast and easy application development. For motion control, the ADLINK PCI-8154/8158 advanced pulse train motion controller generates high frequency pulses to drive stepper or servo motors, capable of simultaneously operating 4/8 axes.

# Audio Testing

## Introduction

Audio testing is often conducted at the end of production to verify acoustic quality of mobile phones or other handsets, and typically comprises measurement of frequency response and microphone sensitivity crosstalk, among others. To ensure HiFi quality of mobile devices, highly efficient and precise audio testing solutions are needed to generate consistent testing results. Audio testing equipment with multiple-channel inputs and shorter test cycle capabilities enables quick testing of multiple devices at the same time by a single machine, maximizing throughput.




## Requirement

- *Reduced audio test cycle time and higher test efficiency*
- *Precision and consistency of test results*
- *Quicker system development and installation*
- *Multi-channel capability integrating more tests*

## Function

- *Audio loop test*

## ADLINK Solution

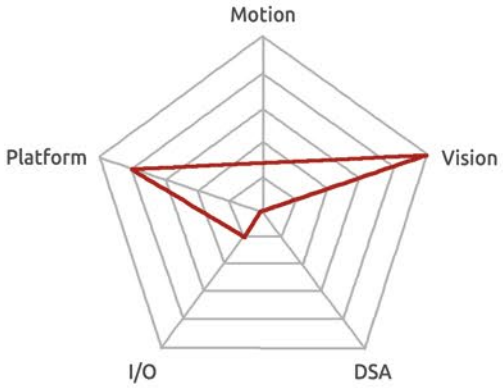
The ADLINK PCI-9527 24-bit high efficiency dynamic signal acquisition card is well suited for mobile device audio testing, incorporating multiple analog input/output channels in a single card to reduce cycle time and testing costs. With high resolution capability ensuring precision and consistency of test results, the ADLINK PCI-9527 is pre-installed with easy-to-use SDK and supports multiple programming languages including C/C++, .NET and LabVIEW, helping system integrators to quickly develop audio test systems and integrate other test applications (such as video test) flexibly. ADLINK even provides ready-to-use audio test software, further reducing system development time and speeding time to market.

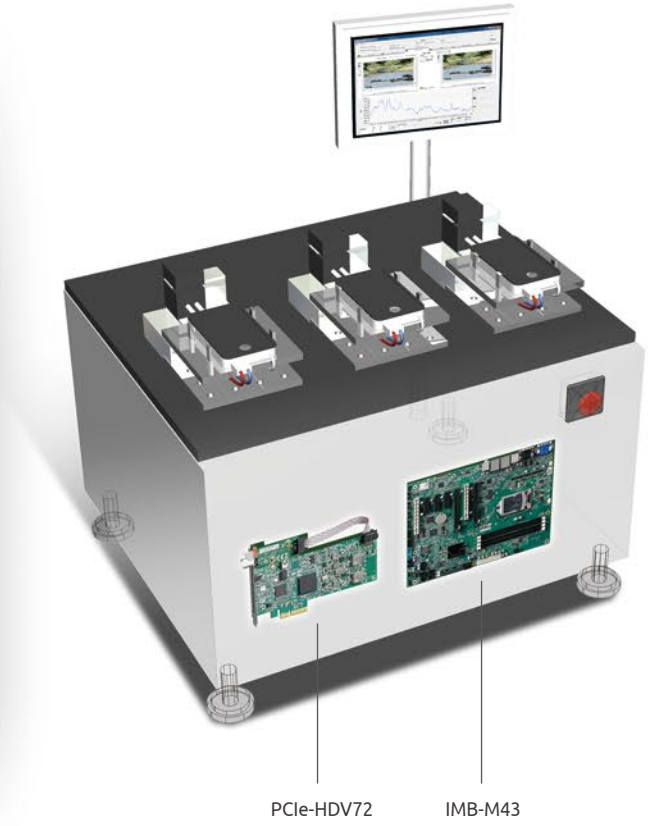

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# Video Testing

## Introduction

Quality requirements for video display in mobile devices are increasing constantly in step with the sophistication and performance of the devices themselves. Video testing must, accordingly, satisfy a full range of testing criteria, including input interface, display resolution, color space adjustment, and others. Increased complexity dictates that formerly acceptable manual-based testing can no longer meet testing requirements, such that automatic testing is becoming the standard, reducing costs while improving efficiency, consistency, accuracy and yield.




## Requirement

- ***Multiple standard and format support 1080P Full High Definition and 4K2K Ultra HD Resolution***
- ***Fast, accurate identification and location of dead pixels, abnormal colors, and other display faults***
- ***Included SDK speeds system integration and testing***

## Function

- ***Video Properties Detection, including Resolution, Frame Rate, Color Space, and others***
- ***Frozen or dropped Video Frame Detection***
- ***Video Content Analysis using SSIM (Structural Similarity Index) and PSNR (Peak Signal-to-Noise Ratio)***
- ***Video Malfunction Detection, including Macroblocking, Pixelation, Synch Failure***

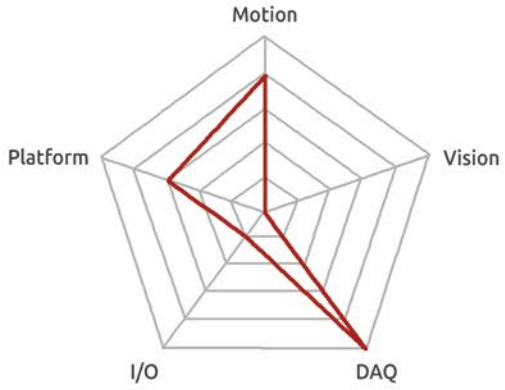
## ADLINK Solution

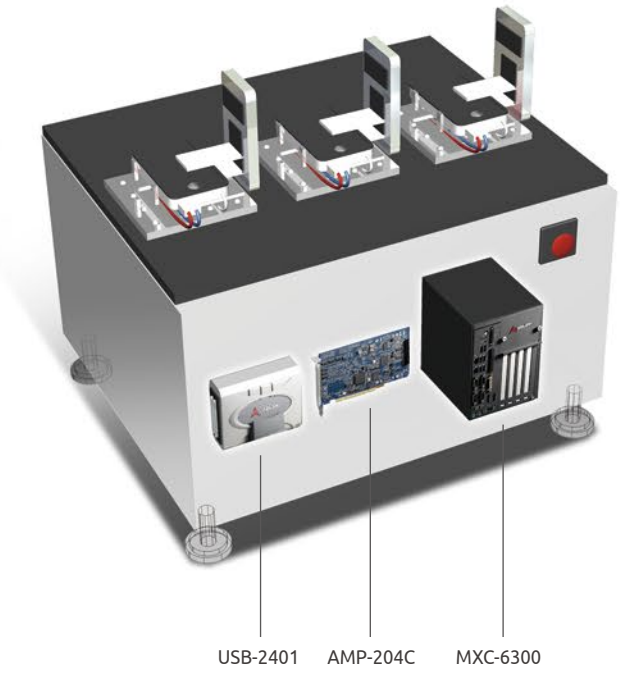
The ADLINK PCIe-HDV72 implements audio and video testing simultaneously in a single controller. It features uncompressed image support up to 4K2K, integrated multi-source digital audio data capture, HDMI, sRGB, YPbPr and SPDIF. The PCIe-HDV72 connects directly to multimedia devices, acquiring video and audio data for analysis using algorithms such as PSNR (peak signal to noise ratio), SSIM (Structural Similarity Index), and FFT (Fast Fourier Transform), and can also modify EDID content. The ADLINK PCIe-HDV72 ensures compatibility across multiple platforms, delivering superior accuracy in a cost-effective and highly integrated solution for automated multimedia testing.

# Leak Testing

## Introduction

Leak testing, often conducted at the end of portable device production to verify waterproofing, typically creates a testing hole in the device casing. Air is evacuated from the device interior, and if waterproofing is intact, an inner vacuum exerts a measurable reaction force on the exterior.




## Requirement

- *Precise (24-bit), high-speed (≧ 2kS/s)*
- *Ability to compensate for errors caused by different accelerometers*
- *Closed-loop motion control with force feedback*

## Function

- *Full-bridge sensor measurement with built-in excitation voltage and amplifier*
- *Ability to retrieve and read calibration data from sensors through TEDS interface for increased measurement accuracy*
- *Software-based force feedback Closed-loop motion control*

## ADLINK Solution

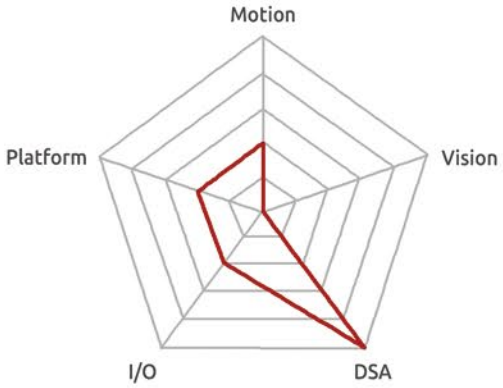
The ADLINK USB-2401 is a 4-CH, 24-bit, 2kS/s universal input USB module supporting high accuracy load cell (full-bridge) measurement without the need for extra signal conditioning or amplifier. It supports TEDS interface and can efficiently read back calibration data stored in the sensor to compensate for errors possibly caused by the sensor itself, ensuring consistent measurement results. Combined with the AMP-204C/208C DSP-based 4/8-axis advanced pulse-train motion controller, the USB-2401 enables effective leak testing for a wide range of mobile devices.

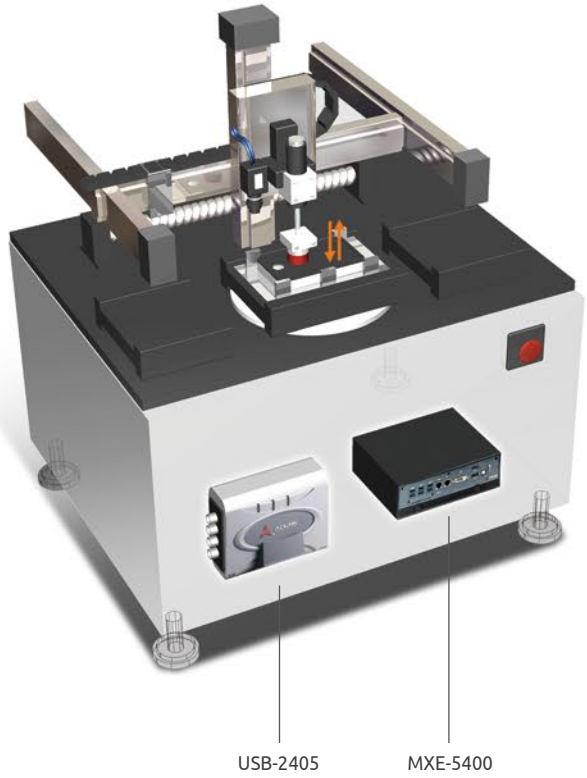

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# MMI Vibration Testing

## Introduction

Vibration units are standard features in mobile communication devices, deployed together with Vibration testing for portable device MMI (Man Machine Interface) is a basic part of the production process. In vibration tests, the device is fixed by springs and switched to engineering mode to enable vibration. An accelerometer then measures the generated vibration.




## Requirement

- *High accuracy (24-bit) IEPE/ICP accelerometer measurement*

## Function

- *High resolution analog input supporting AC coupling and anti-aliasing filter*
- *Built-in excitation current source*

## ADLINK Solution

The ADLINK USB-2405 is a 4-CH, 24-bit, 128kS/s dynamic signal acquisition USB module which can directly measure signals from accelerometers with no need for extra signal conditioning or amplification. The USB-2405 features built-in excitation power to drive IEPE/ICP accelerometers and anti-aliasing filters to eliminate unwanted noise to enable highly accurate measurement. The bus powered USB interface easily allows vibration test function to be integrated with other device MMI testing procedures.

## Pulse Train Motion Control

| | | PCI-8158 | PCI-8154 | PCI-8164 | PCI-8102 |
|---|---|---|---|---|---|
| | |  |  |  |  |
| *Number of Axes* | | 8 | 4 | 4 | 2 |
| *Support Motor* | | servo/ stepper | servo/ stepper | servo/ stepper | servo/ stepper |
| *Encoder Input Frequency (Max)* | | 6.55 MHz @ 1M, under 4 x AB phase | 6.55 MHz @ 1M, under 4 x AB phase | 6.55 MHz @ 1M, under 4 x AB phase | 6.55 MHz @ 1M, under 4 x AB phase |
| *Pulse Output Rate (Max)* | | 6.55 Mpps | 6.55 Mpps | 6.55 Mpps | 6.55 Mpps |
| *Motion Features* | *Linear Interpolation* | Any 2 to 4 of 4 axes | Any 2 to 4 of 4 axes | Any 2 to 4 of 4 axes | 2 axes |
| | *Circular Interpolation* | Any 2 axes | Any 2 axes | Any 2 axes | 2 axes |
| | *Helical Interpolation* | √ | √ | - | - |
| | *Home Return Mode* | 13 (including auto homing) | 13 (including auto homing) | 13 (including auto homing) | 13 (including auto homing) |
| | *Continuous Contouring* | by 3 command buffer | by 3 command buffer | by 3 command buffer | by 3 command buffer |
| *Motion Profile* | | T/S curve (Non-symmetric acceleration/deceleration settings are supported) | | | |
| *Dedicated Motion I/O* | | ±EL/ORG/SVON/INP/ALM/RDY for each axis | | | |
| *DI/O Channels* | | 8 DI / 8 DO | 4 DI / 4 DO | 6 TTL DO | 16 DI / 16 DO |
| *Card Index Switch* | | √ (0 to 15) | √ (0 to 15) | - | √ (0 to 15) |
| *Hardware Emergnecy Input* | | √ | √ | - | √ |
| *Advanced Motion Function* | *Position Compare & Triggering* | √ (with DB-8150, up to 1 MHz) | √ (with DB-8150, up to 2 MHz) | √ (up to 15 kHz) | √ (up to 1 kHz by interrupt function) |
| | *Backlash Compensation* | √ | √ | √ | √ |
| | *Simultanous Move* | √ | √ | √ | √ |
| | *Ring Counter Support* | √ | √ | √ | √ |

## DSP-based Advanced Motion Control

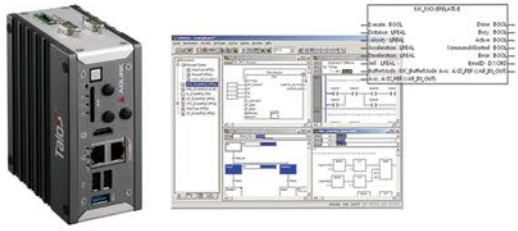
| | | PCI-8254 | PCI-8258 | AMP-204C | AMP-208C |
|---|---|---|---|---|---|
| | |  |  |  |  |
| *Number of Axes* | | 4 | 8 | 4 | 8 |
| *Support Motor* | | servo/ stepper | servo/ stepper | servo/ stepper | servo/ stepper |
| *Encoder Input Frequency (Max)* | | 20 MHz under 4 x AB phase | | 20 MHz@1M,under 4 x AB phase | |
| *Servo Update Rate* | | 20 KHz | | - | - |
| *Trajectory Update Rate* | | 1 KHz | | 1 KHz | |
| *Pulse Output Rate (Max)* | | - | - | 6.55 Mpps | 6.55 Mpps |
| *Motion Features* | *Linear Interpolation* | Any 2 to 4 of 4 axes | Any 2 to 6 of 8 axes | Any 2 to 4 of 4 axes | Any 2 to 6 of 8 axes |
| | *Circular Interpolation* | Any 3 axes | Any 3 axes | Any 3 axes | Any 3 axes |
| | *Helical Interpolation* | √ | √ | √ | √ |
| | *Home Return Mode* | √ | √ | √ | √ |
| | *Gearing* | √ | √ | √ | √ |
| | *Continuous Contouring* | √ | √ | √ | √ |
| *Motion Profile* | | User-defined | | User-defined | |
| *Dedicated Motion I/O* | | +/-EL/ORG/SVON/INP/ALM for each axis | | +/-EL/ORG/SVON/INP/ALM for each axis | |
| *AI Channels* | | 4 (12 bit garuantee) | 8 (12 bit garuantee) | - | - |
| *DI/O Channels* | | 20 DI / 20 DO | 24 DI / 24 DO | 20 DI / 20 DO | 24 DI / 24 DO |
| *Card ID* | | V (4-bit) | V (4-bit) | V (4-bit) | V (4-bit) |
| *Program Download* | | 8 tasks | 8 tasks | - | - |
| *Advanced Motion Function* | *Position Compare & Triggering* | up to 1 MHz | up to 1 MHz | up to 1 MHz | up to 1 MHz |
| | *PWM Control* | 2-CH | 4-CH | 2-CH | 4-CH |
| | *Simultanous Move* | √ | √ | √ | √ |
| | *E Gearing* | √ | √ | √ | √ |



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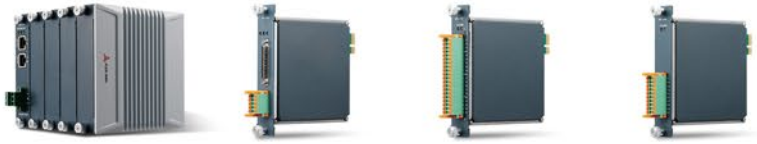
## EtherCAT Master Controller

| Model Name | | Talos-3012 |
|---|---|---|
| Processor | | Intel® Atom™ Processor E3845 1.9 GHz |
| Controllable Motion Axis | | 16/32/64 |
| Controllable I/O Points | | Up to 10,000 points |
| Control Cycle Time | | 250 us (min.) |
| Memory | RAM (Program & Data Memory) | 2GB DDR3 |
| | Retain Memory | Configurable on SD card |
| | Storage (Date Usage) | 16 GB SSD / SD Card |
| Field Bus Connectivity | | I for EtherCAT |
| Ethernet Connectivity I GbE | | I GbE |
| System Indicators | | 3 User-defined |
| Programming Environment | | CoDesys v3 |
| | | IEC 61131-3-Compliant |
| Supply Voltage | | 9-32 $V_{DC}$ wide-range DC input |
| Environment Certificate | | Vibration: 5 Grms, 5-500Hz |
| | | Shock: 50G, Half Sine II ms duration |
| | | EMC: EN 550111 class A |
| Operating Temperature | | -20 ° C~60 ° C (-4 °F to 140 °F) |
| Dimension | | 120 (W) x 100 (D) x 55 (H) mm (4.68" 3.9" x 2.17") |



Talos-3012

## EtherCAT Slave System and Modules



EPS-9905 with EPS-6000 | EPS-7002 | EPS-1132/ 2032/ 2132/ 2308/ 3216/ 3032/ 7002 | EPS-3504/ 4008

| Model Name | EPS-9905 with EPS-6000 |
|---|---|
| Installed Slots | 5 (max.) |
| Protection Type | IP31 |
| Hot Swap | Yes |
| Operating Temp. | -20~60Â° C |
| Dimension (mm) | 130 (L) x 110 (W) x 105 (H) |
| Weight (estimated) | < 1,000 gram |
| Power Consumption | 6.6W |
| Supply Voltage | 24Vdc (,Â±10%) |
| Environment Certificate | Vibration: 5 Grms, 5-500Hz |
| | Shock: 50G, Half Sine 11 ms duration |
| | EMC: EN 55011 class A |

| Model Name | EPS-1132 | EPS-2032 | EPS-2132 |
|---|---|---|---|
| I/O Type | Digital Input | Digital Output | Digital Output |
| Channel | 32 | 32 | 32 |
| Hot Swap | Yes | | |
| Input / Output Type | Sinking | Sourcing | Sinking |
| Input Range (by Voltag e/Current) | IEC 61131-2 Type 1/3, 2.3mA | -- | -- |
| Sampling Rate | <1ms | 4KHz | 4KHz |
| Resolution | -- | -- | -- |
| Output Current Capacity | -- | 300mA / ch | 300mA / ch |
| Connector Type | Phoenix Contact DFMC | | |

| Model Name | EPS-2308 | EPS-3216 | EPS-3032 | EPS-3504 | EPS-4008 | EPS-7002 |
|---|---|---|---|---|---|---|
| I/O Type | Relay Output | Analog Input | Analog Input | Terminal Input | Analog Output | Motion Control |
| Channel | 8 | 16 | 32 | 4 | 8 | 2 |
| Hot Swap | Yes | Yes | Yes | Yes | Yes | Yes |
| Input / Output Type | Relay | Differential | Single-ended /Differentia | RTD | Single-ended | Pulse-Train |
| Input Range (by Voltage/Current) | -- | 0~20mA | +/- 10V | RTD (PT100, 500, 1000) | ± 10V | PUS/DIR: 4MHz ENC: 20MHz |
| Sampling Rate | 5ms | 100KHz | 100KHz | 5-20Hz | 100KHz | -- |
| Resolution | -- | 16 bit | 16 bit | 24bit | 16bit | 32 bit |
| Output Current Capacity | AC: 125V @ 0.5A DC: 30V @ 2A | -- | -- | -- | 5mA | -- |
| Connector Type | Phoenix Contact DFMC | | | | | SCSI VHDCI 68p |

# Frame Grabber Selection Guide

| | PCIe-HDV72 | PCIe-2602 | PCIe-GIE64+ | PCIe-GIE62+ |
|---|---|---|---|---|
| **ADLINK Frame Grabber** |  |  |  |  |
| *Standard* | HDMI | SDI | Power over Ethernet | Power over Ethernet |
| *Configuration* | 4K, UHD | SDI | Gigabit Ethernet | Gigabit Ethernet |
| *Connector* | HDMI | BNC x 2 | RJ45 x 4 | RJ45 x 2 |
| *Resolution* | 4096 x 2160P, 3840 x 2160P | 1920 x 1080p | depends on camera specification | depends on camera specification |
| *Interface* | PCIe x4 (3.0) | PCIe x4 | PCIe x4 | PCIe x4 |
| *Max. Video Input* | 1 | 2 | 4 | 2 |
| *Max. Frame Rate* | up to 60 | 60 | depends on camera specification | depends on camera specification |
| *Audio Input* | √ | SDI embedded | - | - |
| *TTL I/O* | √ | √ | - | √ |
| *Area Scan Camera* | √ | √ | √ | √ |
| *Line Scan Camera* | - | - | √ | √ |
| *Monochrome Camera* | √ | √ | √ | √ |
| *Color Camera* | √ | √ | √ | √ |
| *Interlaced Scan* | √ | √ | √ | √ |
| *Progressive Scan* | √ | √ | √ | √ |
| *Camera Tap* | - | - | - | - |
| *Pixel Depth* | 8-bit, 10-bit | 8, 10, 12-bit | depends on camera specification | depends on camera specification |
| *Max. Clock Frequency* | - | - | - | - |
| *On-board memory* | 2 GB | - | - | - |

| | PCIe-HDV62A/PXIe-HDV62A | PCIe-CPL64 | PCIe-FIW64/PCIe-FIW62 | PCIe-RTV24/PCI-RTV24 |
|---|---|---|---|---|
| **ADLINK Frame Grabber** |  |  |  |  |
| *Standard* | HDMI | PoCL (Power over Camera Link) | IEEE 1394b | Color: PAL/NTSC Monochrome: CCIR/EIA (RS-170) |
| *Configuration* | Full HD | base, medium | - | - |
| *Connector Interface* | DVI-I | MDR26 | IEEE 1394b | BNC x 4 |
| *Resolution* | 1920 x 1080p | depends on camera specification | depends on camera specification | 640 x 480 (NTSC/RS170), 768 x 576 (PAL/CCIR) |
| *Interface Bus* | PCIe x4 | PCIe x4 | PCIe x4 / PCIe x1 | PCIe-RTV24: PCIe x1 PCI-RTV24: PCI |
| *Max. Video Input* | 1 | 2 | 4 / 2 | 4 to 16* |
| *Max. Frame Rate* | 60 | depends on camera specification | depends on camera specification | 30 fps / channel |
| *Audio Input* | √ | - | - | - |
| *TTL I/O* | √ | √ | √ (FIW64) | √ |
| *Area Scan Camera* | √ | √ | √ | √ |
| *Line Scan Camera* | - | √ | - | - |
| *Monochrome Camera* | √ | √ | √ | √ |
| *Color Camera* | √ | √ | √ | √ |
| *Interlaced Scan* | √ | √ | √ | √ |
| *Progressive Scan* | √ | √ | √ | - |
| *Camera Tap* | - | 1-tap, 2-tap, 3-tap, 4-tap | - | 1-tap (PCIe-RTV24) |
| *Pixel Depth* | 8-bit, 10-bit | 8-bit, 10-bit | depends on camera specification (FIW64) 8 to 10-bit (FIW62) | 8-bit |
| *Max. Clock Frequency* | - | 85 MHz | - | - |
| *On-board memory* | 512 MB | 128 MB | - | - |



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| Euresys Frame Grabber | Grablink Base | Grablink DualBase | Grablink Full | Grablink Full XR |
|---|---|---|---|---|
| |  |  |  |  |
| *Standard* | PoCL (Power over Camera Link) | PoCL (Power over Camera Link) | Camera Link | Camera Link |
| *Configuration* | Base | Dual Base | Base, Medium, Full | Base, Medium, Full |
| *Connector Interface* | HDR26 x 1 | HDR26 x 2 | HDR26 x 2 | HDR26 x 2 |
| *Resolution* | depends on camera specification | depends on camera specification | depends on camera specification | depends on camera specification |
| *Interface Bus* | PCIe x1 | PCIe x 4 | PCIe x 4 | PCIe x 4 |
| *Max. Video Input* | 1 | 2 | 1 | 1 |
| *Max. Frame Rate* | depends on camera specification | depends on camera specification | depends on camera specification | depends on camera specification |
| *TTL I/O* | √ | √ | √ | √ |
| *Area Scan Camera* | √ | √ | √ | √ |
| *Line Scan Camera* | √ | √ | √ | √ |
| *Monochrome Camera* | √ | √ | √ | √ |
| *Color Camera* | √ (Bayer, RGB) | √ (Bayer, RGB) | √ (Bayer, RGB) | √ (Bayer, RGB) |
| *Interlaced Scan* | - | - | - | - |
| *Progressive Scan* | √ | √ | √ | √ |
| *Camera Tap* | 3 - tap | 6 - tap | 10 - tap | 10 - tap |
| *Pixel Depth* | 8-bit, 10-bit or 12-bit | 8-bit, 10-bit or 12-bit | 8-bit, 10-bit | 8-bit, 10-bit |
| *Max. Clock Frequency* | 85 MHz | 85 MHz | 85 MHz | 85 MHz |
| *On-board memory* | 64 MB | 128 MB | 128 MB | 128 MB |

| Euresys Frame Grabber | COAXLINK Series | Picolo Series |
|---|---|---|
| |  |  |
| *Standard* | CoaXPress | Color (PAL/NTSC)<br>Monochrome (CCIR/EIA (RS-170) |
| *Configuration* | up to 4 | - |
| *Connector Interface* | DIN 1.0/2.3 | Picolo: BNC, DB9, S-video<br>Picolo Pro2: BNC x 4 |
| *Resolution* | depends on camera specification | 640 x 480 (NTSC/RS170), 768 x 576 (PAL/CCIR) |
| *Interface Bus* | PCIe x4 (2.0 and above) | 32-bit, 33 MHz PCI bus |
| *Max. Video Input* | up to 4 | Picolo: 1 to 3  Picolo Pro2: 4 |
| *Max. Frame Rate* | depends on camera specification | 30 fps |
| *TTL I/O* | √ | √ |
| *Area Scan Camera* | √ | √ |
| *Line Scan Camera* | √ | - |
| *Monochrome Camera* | √ | √ |
| *Color Camera* | √ | √ |
| *Interlaced Scan* | - | √ |
| *Progressive Scan* | √ | - |
| *Camera Tap* | - | 1-tap |
| *Pixel Depth* | depends on camera specification | 8-bit |
| *Max. Clock Frequency* | - | - |
| *On-board memory* | √ | - |

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PCI/ PCIe/ PXI Analog Input/ Output Cards

| Analog Input | | | | Analog Output | | | | Digital I/O | Model Number |
|---|---|---|---|---|---|---|---|---|---|
| No. of Cannels | Sampling Rate (Max.) | Resolution | | No. of Cannels | Update Rate (Max.) | Resolution | | No. of Channels | |
| 4-CH | 2MS/S | 14-Bit | Simultaneous Sampling | 2-CH | 1MS/S | 12-Bit | YES | 24 DI/24 DO | DAQ/DAQe-2010, PXI-2010 |
| | 500kS/S | 16-Bit | | | | | | | DAQ/DAQe-2005, PXI-2005 |
| | 250kS/S | | | | | | | | DAQ/DAQe-2006, PXI-2006 |
| 96-CH | 3MS/S | 12-Bit | | | | | | | DAQ/DAQe-2208, PXI-2208 |
| 64-CH | 500kS/S | 16-Bit | | 2-CH | 1MS/S | 12-Bit | YES | | DAQ/DAQe-2204, PXI-2204 |
| | 250kS/S | | | | | | | | DAQ/DAQe-2205, PXI-2205 |
| 16-CH | 250kS/S | 16-Bit | Encoder Inputs | | Static | 16-Bit | YES | 8 DI/4 DO | DAQ/DAQe-2206, PXI-2206 |
| 32-CH | 500kS/S | | | | 1MS/S | | | 16 DI/16 DO | PCI-9221 |
| | 250kS/S | | | | | | | | PCI-9222 |
| | | | | | | | | | PCI-9223 |
| | | | | | | | | | PCI-9114 Series |
| 16-CH | 100kS/S | 12-Bit | | | | | | 16 DI/ 16 DO | PCI-9113(3) |
| | 250kS/S | 16-Bit | | 2-CH | 1MS/S | 12-Bit | YES | 24 DI/24 DO | DAQ/DAQe-2213 |
| | 100kS/S | 12-Bit | | 1-CH | Static | 12-Bit | | 16 DI/16 DO | DAQ/DAQe-2214 |
| | | | | 2-CH | | | | | PCI-9111HR(1) |
| 8-CH | 400kS/S | 14-Bit | | 4-CH | 1MS/S | | YES | 24 DI/24 DO | PCI-9112 |
| 4-CH | | | | 8-CH | | | | | DAQ/DAQe-2501, PXI-2501 |
| | | | | | | | | | DAQ/DAQe-2502, PXI-2502 |
| | | | | 8-CH | Static | 12-Bit | | 4 DI/4 DO Isolated | PCI-6308V |
| | | | | | | | | | PCI-6308A(2) |
| | | | | | | 16-Bit | | 4 DI/4 DO Isolated | PCI/PCIe-6208V |
| | | | | | | | | | PCI-6208A(2) |
| | | | | 16-CH | | | | | PCI/PCIe-6216V |

Note: (1) HR: High gain (2) PCI-6x08A: Current Output available (3) Isolated analog input card

PCIe-9814



PXIe-9529

| Digitizer | | | | | |
|---|---|---|---|---|---|
| Channels | Sampling Rate | Input Resolution | Onboard Memory | Digital Input | Module Name |
| 8-CH | 14-Bit | 14-Bit | 512 MB | - | PXIe-9848/9848H |
| 4-CH | 40 MS/s | 16-Bit | | - | PCI-9846, PXI-9846 |
| | 20 MS/s | | | - | PCI-9826, PXI-9826 |
| | | 12-Bit | 128 k samples | 3-CH | PCI-9812A |
| | | | 32 k samples | | PCI-9812 |
| | | 10-Bit | 32 k samples | | PCI-9810 |
| | 10 MS/s | 16-Bit | 512 MB | - | PCI-9816, PXI-9816 |
| 2-CH | 65 MS/s(External) 60 MS/s (Internal) | 14-Bit | 512 MB | - | PCI-9820 |
| 4-CH | 80 MS/s | 12-Bit | 1 GB | 3-CH | PCIe-9814 |
| 2-CH | 200 MS/s | 14-Bit | 1 GB | - | PCIe-9852, PXIe-9852 |

| Dynamic Signal Analyzer | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Analog Input | | | | Analog Output | | | Digital IO | Module Name |
| Analog Input Channels | Max. Sampling Rates (S/s) | AD Resolution (bits) | FIFO Size (sample) | Voltage Output Channels | Update Rate (S/s) | DA Resolution (bits) | Digital IO | |
| 4+4 (4-ch load cell inputs & 4-ch general purpose AD) | Up to 30 kS/s | 24 | 256 K | 2 | 5 K | 16 | 8 DI, 8 DO (Isolated) | PCI-9524 |
| 2 | 432 kS/s | | 2048 | | 216 kS/s | 24 | - | PCI-9527<br>PXI-9527 |
| 8 | 192 kS/s | 24 | 2048 | no AO | - | - | - | PCIe-9529<br>PXIe-9529 |



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PCI/ PCIe/ PXI Digital Input/ Output Cards

| Digital Input | | | Digital Output | | | DIO Update | Tiemr/ Counter | Model Number |
|---|---|---|---|---|---|---|---|---|
| No. of Cannels | Sampling Rate (Max.) | Resolution | No. of Cannels | Resolution | Driver Type | Update Rate(Max.) | | |
| High-Density Isolated DIO | 0-28 V Isolated | 128-CH | | | | | | PCI-7443 |
| | | 64-CH | 64-CH | 5-40V | Power MOSFET | | | PCI-7442 |
| | | | 128-CH | | | | | PCI-7444 |
| Isolated DIO | 0-24 V Isolated | 64-CH | | | | | | PCI-7433 |
| | | 32-CH | | | | | | PCI-7233 |
| | | | 32-CH | 5-35V | Darlington | | | PCI/PCIe-7432 |
| | | 16-CH | 16-CH | | | | | PCI/LPCI/LPCIe-7230 |
| | 0-50 V Isolated | 64-CH | | | | | | PCI-7433HIR(2) |
| | | 32-CH | 32-CH | | | | | PCI/PCIe-7432HIR(2) |
| | | | 64-CH | 5-35V | Darlington | | | PCI-7434 |
| | | | 32-CH | | | | | PCI-7234 |
| Relay DO | 0-24 V Isolated | 2-CH | | 350 V, 0.12 A | PhotoMos Relay | | | PCI-7258 |
| | | 16-CH | 16-CH | 125 VAC, 0.5 A 30 VDC, 1 A | Latching Relay | | | PCI/PCIe-7256 |
| | | 8-CH | 8-CH | 250 VAC, 5 A 30 VDC, 5 A | High-Power Relay | | | PCI-7260 |
| | | | | 120 VAC, 0.5 A 24 VDC, 1 A | Relay | | | PCI/LPCI/LPCIe-7250 |
| High-Speed DIO | 1.8V/2.5V/3.3V SW Selectable | 32-CH S/W Programmable | | 1.8V/2.5V/3.3V SW Selectable | | 200 MB/s | | PCIe-7350 |
| | | | | | | 400 MB/s | | PCIe-7360 |
| TTL DIO | 5 V TTL | | | 5 V TTL | | 80 MB/s | | PCI/PCIe-7300A |
| | | 32-CH | 32-CH | | | 12 MB/s | | PCI/PCIe-7200 |
| | | 96-CH S/W Programmable | | | | | | PCI-7396 |
| | | | | | | | | PCI/PCIe-7296(1) |
| | | 48-CH S/W Programmable | | | | | | PCI/PCIe-7248(1) |
| | | 24-CH S/W Programmable | | | | | | PCI-7224(1) |
| Timer/ Counter | | 8-CH | 8-CH | | | | 10-CH/ 16-Bit | PCI-8554 |

Note: (1) Opto-22 compatible (2) HIR: High input range

## PXI and PXI Express Platform

ADLINK offers over 100 different PXI bus products for automation testing and measurement applications, including chassis, controllers and a variety of PXI modules, enabling easy integration of required test and measurement functions.

### PXI/PXIe Chassis

Available for 3U/6U 6-19 slot chassis, bench-top, integrated and portable chassis



PXES-2590

PXES-2780

### PXI/PXIe Controller

Controller options include high-performance embedded controllers and remote controllers



PCIe-PXIe-8638



PXIe-3985

PXIe-3975

## Expandable Embedded Computers

| | | Value Series | | | High Performance | | |
|---|---|---|---|---|---|---|---|
| | | MVP-6000 Series | | | MXC-6400 Series | | |
| | |  | | |  | | |
| Model Name | | MVP-6001 | MVP-6002 | MVP-6003 | MXC-6401D | MXC-6402D | MXC-6403D |
| System | Processor | Intel® Core™ i7-6700TE | Intel® Core™ i5-6500T | Intel® Core™ i3-6100TE | Intel® Core™ i7-6820EQ | Intel® Core™ i5-6440EQ | Intel® Core™ i3-6100E |
| | Chipset | Intel® H110 | | | Intel® QM170 | | |
| | Memory | 32 GB DDR4 2133 MHz 2 SODIMM module | | | 32 GB DDR4 2133 MHz 2 SODIMM module | | |
| | Video | 2 DisplayPort 1.2 (4096 x 2304)<br>1 DVI (4096x2160)<br>1 VGA | | | 2 DisplayPort 1.2 (4096 x 2304)<br>1 VGA+DVI Dual display output by DVI-I connector | | |
| I/O Interface | Expansion Slots | 1 PCI+ 1PCIe x 16 | | | 1 PCI + 2 PCIe x 8 slots or<br>1 PCI + 1 PCIe x16 slots | | |
| | Ethernet | 3 Intel® GbE ports | | | 3 Intel® GbE ports | | |
| | Serial Port COM1 & COM2 | 2 RS-232/422/485 | | | 2 RS-232/422/485 | | |
| | Serial Port COM3 & COM4 | 2 RS-232 | | | 2 RS-232 | | |
| | USB Port | 4 USB 3.0 + 2 USB2.0<br>1 internal USB 2.0 | | | 6 external USB 3.0 +<br>1 internal USB 2.0 | | |
| | CAN | - | | | - | | |
| | DIO | 8-CH DI + 8-CH DO | | | Isolated 16-CH DI + 16-CH DO | | |
| Manageability | Watchdog Timer | √ | | | √ | | |
| | SEMA | - | | | - | | |
| Storage | SATA HDD | One 2.5. onboard SATA III HDD/SSD | | | Two 2.5" hot-swappable SATA III drive bay<br>Two 2.5" onboard SATA III HDD/SSD | | |
| | CompactFlash | 1 type II CFAST socket | | | 1 type II CFAST socket | | |
| | Operating Temperature* | Standard: 0°C to 50°C | | | Standard: 0°C to 50°C (w/HDD)<br>Extended option*: -20°C to 70°C (w/industrial SSD or CFAST) | | |
| | Vibration | With CFast/SSD: 5 Grms<br>With HDD: 0.5 Grms | | | With CFast/SSD: 5 Grms<br>With HDD: 0.5 Grms | | |
| | ESD | Contact +/-4 KV and Air +/-8 KV | | | Contact +/-4 KV and Air +/-8 KV | | |
| | Shock | With CFast/SSD: 50 G | | | With CFast/SSD: 50 G | | |
| | EMC | CE and FCC Class A | | | CE and FCC Class A | | |
| | Safety | UL/cUL,CB | | | UL/cUL,CB | | |
| General | Power Supply | 12-24 VDC | | | 9-32 VDC | | |
| Mechanical | Dimensions | 220 (W) X 210 (D) X 170(H) mm<br>(8.66" x 8.27" x 6.69") | | | 170 (W) x 225 (D) x 200 (H) mm<br>(6.69" x 8.86" x 7.87") | | |
| Operation System | | Win 7/10/Embedded standard 7,<br>Linux Ubunto 12.04 and Fedora 18** | | | Win 7/Embedded standard 7/10,<br>Linux Ubunto 12.04 and Fedora 18** | | |



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## Expandable Embedded Computers

| | | | High Performance | | | | Entry Level | |
|---|---|---|---|---|---|---|---|---|
| | | | MXC-6300/6310/6320 Series | | | | MXC-2300 Series | |
| | | |  | | | |  | |
| *Model Name* | | | MXC-6301D/6311D /6321D | MXC-6302D/6312D /6322D | MXC-6303D /6313D /6323D | MXC-6305D/ 6315D / 6325D | MXC-2300(CD) -3E1 | MXC-2300(CD) -3S |
| *System* | *Processor* | | Intel® Core™ i7-3610QE | Intel® Core™ i5-3610ME | Intel® Core™ i3-3120ME | Intel® Celeron 1020E | Intel® Atom™ Processor E3845 | |
| | *Chipset* | | Intel® QM77 | | | | Intel® SoC | |
| | *Memory* | | 4 GB DDR3 1600 MHz SODIMM module | | | | 4 GB DDR3L 1333 MHz SODIMM module, (up to 8 GB) | |
| | *Video* | | 2 DisplayPort + 1 VGA or 2 DisplayPort + 1 DVI-D | | | | 1 DisplayPort (2560x1600) 1 VGA (2560x1600) 1 DVI (1920x1200) | |
| *I/O Interface* | *Expansion Slots* | | 1 PCI + 2 PCIe x 8 slots or 1 PCI + 1 PCIe x16 (MXC-6300 Series) 1 PCI + 1 PCIe x 16 (MXC-6310 Series) 3 PCI + 1 PCIe x1 6 (MXC-6320 Series) | | | | 2 PCI + 1 PCIe x4 | 3 PCI |
| | *Ethernet* | | 2 Intel® GbE ports | | | | 2 GbE Intel® ports | |
| | *Serial Port* | *COM1 & COM2* | 2 RS-232/422/485 | | | | 2 RS-232/422/485 | |
| | | *COM3 & COM4* | 2 RS-232 | | | | 2 RS-232 | |
| | *USB Port* | | 6 external USB ports (4 USB 3.0 + 2 USB 2.0) + 1 internal USB 2.0 | | | | 5 external USB ports (4 USB 2.0 + 1 USB 3.0) + 1 internal USB 2 .0 | |
| | *CAN* | | - | | | | DB9 isolated CAN port with SjA1000 CAN controller | |
| | *DIO* | | Isolated 16-CH DI + 16-CH DO | | | | Isolated 16-CH DI + 16-CH DO | |
| *Manageability* | *Watchdog Timer* | | √ | | | | √ | |
| | *SEMA* | | - | | | | SEMA support with BMC | |
| *Storage* | *SATA HDD* | | Two onboard 2.5" SATA III HDD/SSD | | | | One 2.5" HDD/SSD installation | |
| | *CompactFlash* | | 2 CFast socket (1 external + 1 internal) | | | | 1 Type II CF socket | |
| | *Operating Temperature** | | Standard: 0°C to 50°C (w/HDD) Extended option: -20°C to 55°C for MXC-63 x 1D, -20°C to 60°C for MXC-63x2D/63x3D/ 63x5D (w/ industrial SSD or CFast) | | | | Standard: 0°C to 50°C Extended option: -20°C to 70°C (w/industrial SSD or CF) | |
| | *Vibration* | | With CFast/SSD: 5 Grms With HDD: 0.5 Grms | | | | With CFast/SSD: 5 Grms With HDD: 0.5 Grms | |
| | *ESD* | | Contact +/-4 KV and Air +/-8 KV | | | | Contact +/-4 KV and Air +/-8 KV | |
| | *Shock* | | With CFast/SSD: 50 G | | | | With CFast/SSD: 50 G | |
| | *EMC* | | CE and FCC Class A | | | | CE and FCC Class A | |
| | *Safety* | | UL/cUL, CB, KCC | | | | UL/cUL | |
| *General* | *Power Supply* | | 9-32 $V_{DC}$ | | | | 9-32 $V_{DC}$ | |
| *Mechanical* | *Dimensions* | | MXC-6300/6320 Series: 172.5 (W) x 225 (D) x 213 (H) mm (6.9" x 9"x 8.52") MXC-6310 Series:154 (W) x 225 (D) x 213 (H) mm (6.16" x 9" x 8.52") | | | | 142 (W) x 219 (D) x 210 (H) mm (5.84"x 8.76" x 8.4") | |
| *Operation System* | | | Win 7/Embedded standard 7/XP/XP Embedded, Linux ** | | | | Win 7/Embedded standard 7/8/ Embedded standard 8, Linux Fedora 18** | |

* Heat Dissipation from inserted PCI/PCIe cards may affect thermal performance.
**Linux Distribution by request

## PICMG Single board Computers

| | | PICMG 1.3 SHB | | | | PICMG 1.0 SBC |
|---|---|---|---|---|---|---|
| | | NuPRO-E43 | NuPRO-E72 | NuPRO-E42 | NuPRO-E340 | NuPRO-A40H |
| | |  |  |  |  |  |
| *CPU* | *Socket* | LGA1151 | LGA1150 | LGA1150 | LGA1155 | LGA1155 |
| | *CPU Support* | Intel® Core™ i7/i5/i3/ Pentium® /Celeron® | Intel® Xeon® E3-1200 v3 Core™ i3/Pentium® /Celeron® | Intel® Core™ i7/i5/ i3/Pentium® | Intel® Core™ i7/i5/ i3/Pentium® /Celeron® | Intel® Core™ i7/i5/i3/Pentium®/ Celeron® |
| *Chipset* | *PCH* | Q170 | C226 | Q87 | Q67 | H61 |
| *Memory* | *DIMM Type* | DDR4 | DDR3 | DDR3 | DDR3 | DDR3 |
| | *Clock Speed* | 2133 MHz | 1600/1333 MHz | 1600/1333 MHz | 1600/1333 MHz | 1600/1333 MHz |
| | *DIMM* | 2 | 2 | 2 | 2 | 2 |
| | *Max. Capacity* | 32 GB | 16 GB | 16 GB | 16 GB | 16 GB |
| | *ECC/Reg* | – | YES | – | – | - |
| *Form Factor* | *Dimensions* | 338 mm x 126 mm (L x W) | 338 mm x 126 mm (L x W) | 338 mm x 126 mm (L x W) | 338 mm x 126 mm (L x W) | 338 mm x 122 mm (L x W) |
| *Display* | *Graphics* | Intel® HD Graphics | Intel® HD Graphics | Intel® HD Graphics | Intel® HD Graphics | Intel® HD Graphics |
| | *VGA support* | YES | YES | YES | YES | YES |
| | *DVI support* | YES | YES | YES | YES | YES |
| *Ethernet* | *Gigabit* | 2 | 2 | 2 | 2 | 2 |
| | *Controller* | Intel® I219LM and Intel® I211-AT | Intel® I217LM and Intel® I211-AT | Intel® I217LM and Intel® I211-AT | Intel® 82579LM and Intel® 82574L | Dual Intel® I211-AT |
| *Storage* | *Serial ATA* | 4x SATA 6 Gb/s (onboard) | 4x SATA ports 6 Gb/s (onboard) | 4x SATA ports 6 Gb/s (onboard) | 2x SATA 6 Gb/s 4x SATA 3 Gb/s (2x onboard + 2x backplane) | 4x SATA 3 Gb/s |
| *I/O Ports* | *USB* | 8x USB 3.0 (2x rear+6x pinheader) 4x USB 2.0 (backplane) | 6x USB 3.0 (2x rear+4x pinheader) 4x USB 2.0 (backplane) | 6x USB 3.0 (2x rear+4x pinheader) 4x USB 2.0 (backplane) | 2x USB 3.0 (rear) 12x USB 2.0 (8x pinheader+4x backplane) | 8x USB 2.0 (2x rear + 6x pinheader) |
| | *LPT* | YES | – | – | YES | YES |
| | *COM* | 2x RS-232 2x RS-232/422/485 auto flow onboard (pinheader) | 5x RS-232, 1x RS-232/422/485 auto flow onboard (pinheader) | 5x RS-232, 1x RS-232/422/485 auto flow onboard (pinheader) | 5x RS-232, 1x RS-232/422/485 (pinheader) | 5x RS-232, 1x RS-232/422/485 (pinheader) |
| | *PS/2 KB/MS* | YES (pinheader) | YES (pinheader) | YES (pinheader) | YES (pinheader) | Yes(pinheader) |
| | *Audio* | Realtek® ALC262 DB-Audio 2 (Option) | Realtek® ALC262 DB-Audio 2 (Option) | Realtek® ALC262 DB-Audio 2 (Option) | Realtek® ALC262 DB-Audio 2 (Option) | Realtek® ALC262 DB-Audio 2 (Option) |
| *Expansion* | | 1x PCIe x8, 3x PCIe x4 with WBP-13E4 | 1x PCIe x8, 3x PCIe x4 with WBP-13E4, 4x PCI | 1x PCIe x16 , 1x PCIe x4 or 4x PCIe x1, 4x PCI | 1x PCIe x16 , 1x PCIe x4 or 4x PCIe x1 , 4x PCI | - |
| *TPM* | | Option | YES | YES | YES | - |
| *Opearation System* | | Win 7 (32 bit), Win 7/8.1/10/Server 2012 R2 (64 bit), Fedora 21, Redhat Enterprise Linux 7, Ubuntu 14.04 | Win 7/8.1/Server 2008 R2 (64 bit), Fedora 17, Redhat Enterprise Linux 6, Ubuntu 13.10 | Win XP/7/8.1 (32 bit), Win 7/8.1/Server 2008 R2 (64 bit), Ubuntu 13.10 | Win XP/7/8.1 (32 bit), Win XP/7/8.1 (64 bit), Fedora 14, Redhat Enterprise Linux 5 | Win XP/7 (32/64 bit),Fedora 17, Redhat Enterprise Linux 6 |



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## Industrial Motherboard

| | | Extend ATX | ATX | | | |
|---|---|---|---|---|---|---|
| | | IMB-S90 | IMB-M43 | IMB-M42H | IMB-M40H | M-342 |
| | |  |  |  |  |  |
| CPU | Socket | LGA2011 | LGA1151 | LGA1150 | LGA1155 | LGA1155 |
| | CPU Support | Dual Intel® Xeon® E5-2658 v2 | Intel® Core™ i7/i5/i3/ Pentium® | Intel® Core™ i7/i5/i3/ Pentium® /Celeron® | Intel® Core™ i7/i5/i3/ Pentium® /Celeron® | Intel® Core™ i7/i5/i3/ Pentium® |
| Chipset | PCH | C604 | Q170 | H81 | H61 | Q67 |
| Memory | DIMM Type | DDR3 | DDR4 | DDR3 | DDR3 | DDR3 |
| | Clock Speed | 1600 MHz | 2133 MHz | 1333/1600 MHz (based on CPU) | 1333/1600 MHz (based on CPU) | 1333/1600 MHz (based on CPU) |
| | DIMM | 8 | 4 | 2 | 2 | 4 |
| | Max. Capacity | 128 GB | 64 GB | 16 GB | 16 GB | 32 GB |
| | ECC/Reg | YES | – | – | – | – |
| Form Factor | Dimensions | 305 mm x 330 mm(W x L) | 305 mm x 244 mm (W x L) | 305 mm x 244 mm (W x L) | 305 mm x 218 mm (W x L) | 305 mm x 244 mm (W x L) |
| Display | Graphics | Integrated in Aspeed® AS2300 | Intel® HD Graphics | Intel® HD Graphics | Intel® HD Graphics | Intel® HD Graphics |
| | VGA support | 1 | 1 | 1 | 1 | 1 |
| | DVI-D Support | – | – | – | 1 | 1 |
| | HDMI Support | – | – | 1 | – | 2 |
| | DisplayPort | – | 2 | 1 | – | – |
| | No. of Displays | 1 | 3 | 2 | 2 | 2/3 (based on CPU) |
| Ethernet | GbE port | 2 | 2 | 1 | 2 | 2 |
| | Controller | Intel® I210-AT | Intel® I219LM and Intel® I210-AT | Intel® I217V | Realtek® RTL8111E | Intel® 82579LM and Intel® 82574L |
| Storage | Serial ATA | 4x SATA 6 Gb/s from Marvell 88SE9230, 2x SATA 6 Gb/s from PCH, 2x SATA 3 Gb/s from PCH | 6x SATA 6 Gb/s ports | 2x Serial ATA 6Gb/s, 2x Serial ATA 3Gb/s | 4x SATA 3 Gb/s | 2x SATA 6 Gb/s ports, 4x SATA 3Gb/s ports |
| | RAID | RAID 0/1/10,Marvell (H/W) and PCH 0/1/5/10 (S/W) RAID groups are independent | SW RAID 0/1/5/10 | – | – | SW RAID 0/1/5/10 |
| I/O Ports | USB | 8x USB 2.0 (4x pin header + 4x rear) | 8x USB 3.0 (2x pin header + 6x rear), 4x USB 2.0 (pinheader), 2x USB 2.0 (Vertical Type A) | 8x USB 2.0 (4x pin header + 4x rear), 2x USB 3.0(rear) | 10x USB 2.0 (6x pin header + 4x rear) | 12x USB 2.0 (8x pin header + 4x rear) |
| | LPT | – | 1 | 1 | – | 1 |
| | COM | 1x RS-232 (pinheader), 1x RS-232/422/485 (rear) | 4x RS-232(pinheader), 2x RS-232/422/485 Auto flow control(rear) | 4x RD-232 (pinheader), 2x RS-232/422/485 one support 485 auto flow control (rear) | 5x RS-232 (1x rear + 4x pinheader), 1x RS-232/422/485 (pinheader) | 5x RS-232(pinheader), 1x RS-232/422/485 (pinheader) |
| | PS/2 KB/MS | – | 1x PS/2 combo port | 1x PS/2 combo port | 1x KB, 1x MS | 1x KB, 1x MS |
| | Audio | Realtek® ALC262 DB-Audio2 (optional) | Realtek® ALC262 | Realtek® ALC662 Audio Codec | Realtek® ALC892 | Realtek® ALC892 |
| Expansion | | 4x PCIe x16, 1x PCIe x8 and 1x PCIe x4 slots | 1x PCIe x8, 41x PCIe x4, 2x PCI slots | 1 X PCIe x16, 1 x PCIe x4, 4x PCI slots | 1x PCIe x16, 2x PCIe x1, 4x PCI slots | 1x PCIe x16, 1x PCIe x4, 5x PCI slots |
| Opearation System | | Win 7/Server 2008 R2 (64 bit), Redhat Enterprise Linux 6 | Win 7 (32 bit), Win 7/8.1/10 (64 bit), Ubuntu 15.10 | Win XP/7/8/ (32 bit), Win 7/8.1 (64 bit), Ubuntu 13.10, Fedora™ 19, Redhat Enterprise Linux 7.0 | Win XP/ 7 (32/64 bit), Fedora 17, Redhat Enterprise, Linux 6.2 | Win XP/ 7 (32/64 bit), Redhat Enterprise Linux 6.0 |

# WORLDWIDE OFFICES


## ADLINK Technology, Inc.

9F, No.166 Jian Yi Road, Zhonghe District
New Taipei City 235, Taiwan
新北市中和區建一路166號9樓
Tel: +886-2-8226-5877
Fax: +886-2-8226-5717
Email: service@adlinktech.com

## Ampro ADLINK Technology, Inc.

5215 Hellyer Avenue, #110 San Jose, CA 95138, USA
Tel: +1-408-360-0200
Toll Free: +1-800-966-5200 (USA only)
Fax: +1-408-360-0222
Email: info@adlinktech.com

## ADLINK Technology Singapore Pte. Ltd.

84 Genting Lane #07-02A, Cityneon Design Centre,
Singapore 349584
Tel: +65-6844-2261
Fax: +65-6844-2263
Email: singapore@adlinktech.com

## ADLINK Technology Singapore Pte Ltd. (Indian Liaison Office)

#50-56, First Floor, Spearhead Towers
Margosa Main Road (between 16th/17th Cross)
Malleswaram, Bangalore - 560 055, India
Tel: +91-80-65605817, +91-80-42246107
Fax: +91-80-23464606
Email: india@adlinktech.com

## ADLINK Technology Japan Corporation

〒101-0045 東京都千代田区神田鍛冶町3-7-4
神田374ビル4F
KANDA374 Bldg. 4F, 3-7-4 Kanda Kajicho,
Chiyoda-ku, Tokyo 101-0045, Japan
Tel: +81-3-4455-3722
Fax: +81-3-5209-6013
Email: japan@adlinktech.com

## ADLINK Technology, Inc. (Korean Liaison Office)

경기도 성남시 분당구 수내로46번길4 경동빌딩 2층
(수내동 4-4번지) (우) 463-825
2F, Kyungdong B/D, 4 Sunae-ro 46beon-gil, Bundang-gu,
Seongnam-si, Gyeonggi-do, Korea, 463-825
Toll Free: +82-80-800-0585
Tel: +82-31-786-0585
Fax: +82-31-786-0583
Email: korea@adlinktech.com

## PENTA ADLINK Technology GmbH

Ulrichsbergerstrasse 17
94469 Deggendorf, Germany
Tel: +49 (0) 991 290 94 – 10
Fax: +49 (0) 991 290 94 - 29
Email: emea@adlinktech.com

## ADLINK Technology (China) Co., Ltd.

上海市浦东新区张江高科技园区芳春路300号 (201203)
300 Fang Chun Rd., Zhangjiang Hi-Tech Park
Pudong New Area, Shanghai, 201203 China
Tel: +86-21-5132-8988
Fax: +86-21-5192-3588
Email: market@adlinktech.com

## ADLINK Technology Beijing

北京市海淀区上地东路1号盈创动力大厦E座801室(100085)
Rm. 801, Power Creative E, No. 1 Shang Di East Rd.
Beijing, 100085 China
Tel: +86-10-5885-8666
Fax: +86-10-5885-8626
Email: market@adlinktech.com

## ADLINK Technology Shenzhen

深圳市南山区科技园南区高新南七道数字技术园
A1栋2楼C区 (518057)
2F, C Block, Bldg. A1, Cyber-Tech Zone, Gao Xin Ave. Sec. 7
High-Tech Industrial Park S., Shenzhen, 518054 China
Tel: +86-755-2643-4858
Fax: +86-755-2664-6353
Email: market@adlinktech.com

## LiPPERT ADLINK Technology GmbH

Hans-Thoma-Strasse 11, D-68163 Mannheim, Germany
Tel: +49 621 43214-0
Fax: +49 621 43214-30
Email: emea@adlinktech.com

## ADLINK Technology, Inc. (French Liaison Office)

6 allée de Londres, Immeuble Ceylan 91940 Les Ulis, France
Tel: +33 (0) 1 60 12 35 66
Fax: +33 (0) 1 60 12 35 66
Email: france@adlinktech.com

## ADLINK Technology, Inc. (Israel Liaison Office)

27 Maskit St., Corex Building PO Box 12777
Herzliya 4673300, Israel
Tel: +972-54-632-5251
Fax: +972-77-208-0230
Email: israel@adlinktech.com

## ADLINK Technology, Inc. (UK Liaison Office)

Tel: +44 774 010 59 65
Email: UK@adlinktech.com


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