# Motion Controls and Drives

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Agito has many years of experience designing high-performance motion control products and systems. Agito (Agito means "to put in motion" in Latin) main activity is development and sales of motion control products (Controllers, Amplifiers, Drives, Integrated controls, I/O modules and more). Agito supports its customers during the entire development process of the product or machine. From the design stage to the serial production, to support industrial machinery performance demands, Agito developed a distributed control fieldbus known as Central-i. Central-i is an innovative, patented topology for motion control systems. At the center of a Central-i system, there is a multi-axes master controller and remote amplifiers. The involvement and responsibility of the company start when the control system is defined, and continues through selecting the various system components, simulations if needed, system assembly, tuning, programming, testing, documentation and support during serial production.
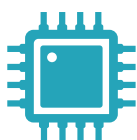
Industries That We Serve

Or simply anything that needs to move ...
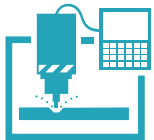
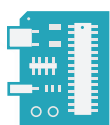|					
Machine tools	Robots	Semiconductors	Communication	Display	EV
Renewable energy	Printed circuit board assembly & testing	Pharmaceuticals & biomedical	Additive Manufacturing	LED,lasers & photonics	Storage

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About Agito Control Solutions

The state-of-the-art and innovative control technology from Agito provides a comprehensive list of features, that allow to meet the most demanding performance applications in the markets.

The control solution is ideal for controlling direct drive and servo motors, providing highly coordinated multi-axis motion with excellent position/velocity tracking and settling performance. The controllers support many advanced features like active yaw gantry control, force control, CNC modes, user programs and 2D/3D error compensation as standard features, having user friendly configuration tools for easy implementation.

The high-performance motion controllers are designed to operate standalone without external host controller. They can also be working under an external HMI, possibly with a PC or PLC, through standard communication network, like Ethernet, CAN, RS232, RS485 or USB (all supported simultaneously).

The centralized control unit products come with integrated amplifiers, resulted in a very cost-effective solution for standalone low axis-count application like XYZ or XY-Theta stage for semi-automated microscopes or inspection systems.

To support industrial machinery performance demands, Agito developed a distributed control fieldbus known as Central-i. Central-i is an innovative, patented topology for motion control systems. At the center of a Central-i system, there is a multi-axes master controller. All the control algorithms are performed by the master controller including trajectory planning, position, velocity and current loops (all in 16kHz). The remote units receive the results of the algorithms via a simple and highly efficient digital protocol. All remote units do not require any computational resources or configuration/setup memory, so they are very cost effective and easy to use/maintain. All communication with remote devices, as well as their power PWM signals are synchronized down to 8 nano-seconds due to the nature of the Central-i's star communication topology.

Setting up a Central-i system is as easy as plugging in the cables. The system adapts itself to the connected remote devices, without the need to learn complex networking protocols, object items, etc. Although the hardware is distributed, the entire system behaves as a centralized control architecture, where the master controller has access to all signals at the remote devices at each of the 16kHz sampling cycles. The system designer designs the system as a distributed system (flexible location and type of remote units) while the system integrator configures, tunes and programs the system as it was a full centralized control unit, with all configuration, data and calculations stored and executed at a single unit (the master).

In addition to Central-i, we also offer the EtherCAT series, starting with the AGD155-EC, a 240 VAC intelligent drive featuring an EtherCAT (CoE) interface compliant with the CiA 402 drive profile. The AGD155 can also serve as a full-featured single-axis standalone controller. Stay tuned for upcoming EtherCAT products that will continue to enhance our high-performance motion control solutions.

Standalone Controller Units

The AGC, AGD series of products provide an extremely high-performance motion control platform for highly coordinated applications with demanding control performance in terms of position and velocity tracking, fast settling time and low jitter. The controller is running at 16kHz for position, velocity and current loops and the built-in amplifiers output their PWM at 32kHz. While best performance is achieved by using the integrated amplifiers, these products can also control external drives with different power ratings and connector interfaces that are necessary for certain applications.

A common software and firmware platform for the AGC, AGD series of products means it is easy to scale the hardware configuration to move between external drive and integrated amplifiers, or when adding more axes or controllers to the host network.

The standalone user program is running directly on the controller DSP, it has full access to the controller's low-level signals and parameters. resulting in a highly flexible and responsive controller. The user program is written in a simple script-based language, it is easy for any engineer to program, even for non-software-trained engineers. Covered features are: multi-tasking, functions, if/while/for/switch blocks, event functions, expressions, single step, break-points, watch window and much more.

In addition to executing the standalone program in the DSP, the PC based AAMotion API library provides an easy interface for Microsoft .Net environment users. These products support a wide variety of communication protocols like Ethernet TCP/IP, CAN bus, USB, RS232 and RS485, users can easily program the controller in various operating systems.

The products are packaged with a rich collection of functional features, like auto tuning, closed-loop force control, active-yaw gantry control, CNC/ECAM/Gear/Vector motions and the innovative Ultra Precision Mode (UPM) algorithms and much more. This series of products are also designed with many safety protections, such as current limit (Incl. I2T), over-temperature, ESD protection and even reversed-polarity protection in the main power supply connection.

AGM800 Series						EtherCAT master controllers & drives		Controllers & Drive	Multi-axis Drives
	AGA110	AGA101	AGA102	AGA103	AGA155	AGD101-EC	AGD156-EC	AGD155-AF	AGC301
AGM800	AGIO01	AGIO02	AGL101	AGL102		AGD155-EC		AGD200 AGD301	AGC300
								Multi-axis Stages	
								Motors	

Controllers & Drive

Controllers & Drive

EtherCAT (CoE)

EtherCAT

AGD155-EC AGD156-EC AGD101-EC

Pulse/Direction,
±10V Analog Command
Ethernet - TCP/IP (API)

AGD155-AF AGD200 AGD301

AGM800 Series

AGA110 AGA101 AGA102

PC

Ethernet - TCP/IP (API)

AGM800

AGIO01 AGIO02 AGA155 AGA103

AGL101 AGL102

Standalone Controller Units

AGC Series – Multi-axis Controllers

AGC series is a family of high performance, standalone 3-axis controllers with Ethernet, USB, CAN bus, RS232 and RS485 communication ports to interface with any kind of host devices. It can control any external drivers, either in analog ±10V format or digital Pulse & Direction format. It has 18 digital inputs, 17 digital outputs, 4 analog inputs, 4 analog outputs and 8 bi-directional differential I/Os. Supporting 3-axis coordinated motion, this controller is very suitable to control XYZ stages, XY-Theta stages, flexible-link gantry, SCARA robot, tip-tilt stages, etc.

AGC300   AGC301

General Specifications

Description	AGC300-ET	AGC301-ET
Number of Axes	3	
Power Supply	9–36VDC	
Isolated Inputs[1]	11	18
Isolated Outputs[2]	4	17
Differential Input (RS422)	8	8 Bi-Directional Differential I/Os (Software configurable as input or output)
Differential Output (RS422)	4	
Analog Inputs[3]	4 (12-bit or 16-bit)	
Analog Outputs	4 (16-bit)	
Encoder Input	3 Ports (Each port is software configurable as AquadB, Absolute Biss-C or EnDat2.2[4]). Ports 1 and 2 support also Sin/Cos 1Vpp encoders.	3 Ports (Each port is software configurable as AquadB, Sin/Cos 1Vpp, Absolute Biss-C or EnDat2.2).
Communication to Host	Ethernet, CAN bus, RS232, USB, RS485, Modbus-RTU/TCP	
Control Filter Sampling Rate	16kHz (Position, Velocity, Optional Force, Current)	
Operational Modes	Position, Velocity, Force or Current (Torque) modes	
Motion Modes	Point-to-Point, Repetitive, Jog, ECAM, Gearing, Joystick, Handwheel, Pulse & Direction, Gantry, CNC sequential contour (G-codes) , Vector and Tracking motion modes. Motion parameters, such as speed, acceleration, deceleration, and target position can be all modified on-the-fly.	
Features	Encoder Error Mapping: 1D, 2D or 3D, Auto-Loop Shaping (Auto-tuning), Frequency Domain System Identification and Modelling, Flexible Gain Scheduling, Position Lock and Event, Ultra-Precision Mode (UPM), Input-Shaping, Profile-Shaping, Machine Vibration Control, Spring and Friction Compensation, Complex-Kinematics (Robot kinematics), etc.	
Programming Interfaces	Standalone User Program – high level script-based program executed in the controller (Up to 8 multi-threading programs with priority setting for each thread). IDE integrated in PCSuite Windows .Net API – available in NuGet Manager. Standard TCP/IP communication – ASCII string commands or binary CAN format.	

1. Digital isolated input can be configured as NPN or PNP, in groups of 3 or 4.

2. Digital isolated output can sink up to 500mA or source up to 300mA.

3. 16-bit analog inputs available in some product options. Consult your sales channel.

4. EnDat 2.2 supported by dedicated FPGA version (Consult with sales engineer).

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AGD155 Pulse and Direction Series – Single-axis Intelligent 240VAC Drives

AGD155 is an AC powered single-axis intelligent drive. While it is a fully featured single-axis standalone controller, it also comes with analog input to receive ±10V current or velocity command, and Pulse & Direction input as position command. It can drive various types of motors like voice coil, brushed or brushless motor, including direct-drive linear and rotary motors. AGD155 can also synchronize with other axes in an Ethernet, CAN or RS485 network. The internal standalone program supports up to 8 multi-threading tasks, each can be configured with different priority. With an external PC or PLC as a system level controller, AGD155 can be used in a synchronized, multi-axis environment.

AGD155-AF

General Specifications

Description	AGD155-AF-2A06	AGD155-AF-2A10
Number of Axes	1	
Power Supply (1-φ or 3-φ)	110-240VAC	
Continuous Current	6Arms	10Arms
Peak Current	18Arms	20Arms
Isolated Inputs[1]	16	
Isolated Outputs[2]	6	
Differential Inputs (RS422)	3	
Differential Outputs (RS422)	4	
Bi-Directional Differential I/Os (RS422)	1	
Analog Inputs	2 (16-bit)	
Analog Outputs	2 (16-bit)	
PT100 Input	1 (0-130°C)	
Brake Output[3]	1	
Regeneration Output	1	
Encoder Inputs	2 Ports (Each port is software configurable as AquadB, Absolute Biss-C or EnDat2.2. Main port supports sin/cos encoder type as well).	
Motor Types	Voice Coil, Brushed or Brushless Linear or Rotary Motor, Steppers (Open and Closed Loop, Microstepping)	
Communication	Ethernet, RS232, CAN, USB, RS485, Modbus-RTU/TCP	
Control Sampling Rate	16kHz (Profiler, Position, Velocity, Optional force, Current)	
Operational Modes	Position, Velocity, Force or Current (Torque) modes	
Motion Modes	Point-to-Point, Repetitive, Jog, ECAM, Gearing, Joystick, Handwheel, Pulse & Direction, Gantry, CNC sequential contour (G-codes) , Vector and Tracking motion modes. Motion parameters, such as speed, acceleration, deceleration, and target position can be all modified on-the-fly.	
Features	Encoder Error Mapping: 1D, Auto-Loop Shaping (Auto-tuning), Frequency Domain System Identification and Modelling, Flexible Gain Scheduling, Position Lock and Event, Ultra-Precision Mode (UPM), Input-Shaping, Profile-Shaping, Machine Vibration Control, Spring and Friction Compensation, Complex-Kinematics (Robot kinematics), etc.	
Programming Interfaces	Standalone User Program – high level script-based program executed in the controller(Up to 8 multi-threading programs with priority setting for each thread). IDE integrated in PCSuite Windows .Net API – available in NuGet Manager. Standard TCP/IP communication – ASCII string commands or binary CAN format.	

1. Digital isolated input can be configured as NPN or PNP, in groups of 3 or 4.

2. Digital isolated output can sink up to 500mA or source up to 300mA.

3. Brake output up to 48VDC, 3A.

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AGD200 Series – Motion Controller with Integrated Drives

AGD200 series is a family of compact, high performance motion control units with 2 integrated servo amplifiers, allowing it driving 2 motors and control third axis through an external drive. It is equipped with Ethernet, USB, CAN bus, RS232 and RS485 communication ports to interface with any host devices. With 16kHz sampling frequency, this product is ideal for any tightly coordinated motion systems. It supports a very wide range of bus-voltage from 12VDC to 90VDC and each axis can supply up to 5.6Arms continuous current and 11.2Arms peak current concurrently.

Equipped with a plethora of I/Os: 11 isolated digital inputs, 4 isolated digital output, 4 analog inputs, 4 analog outputs and 8 differential inputs, this product is fully capable of handling standalone applications. The typical use case of this product is in 3D printers, security surveillance camera systems, mobile robots, and factory automations.

AGD200

General Specifications

Description	AGD200-ET-2D01	AGD200-ET-2D02	AGD200-ET-2D05
Number of Axes	2 (3rd axis with external drive)		
Power Supply	12–90VDC		
Logic Power Supply (Optional)	12–36VDC		
Continuous Current	1.4Arms	2.8Arms	5.6Arms
Peak Current	2.8Arms	5.6Arms	11.2Arms
Isolated Inputs[1]	11		
Isolated Outputs[2]	4		
Differential Inputs	8		
Differential Outputs	4		
Analog Inputs[3]	4 (12-bit, 16-bits analog input with extension board)		
Analog Outputs	4 (16-bit)		
Brake Output[4]	2		
Encoder Inputs	3 Ports (Each port is software configurable as AquadB, Absolute Biss-C or EnDat2.2[5]). Ports 1 and 2 support also Sin/Cos 1Vpp encoders		
Motor Types	Voice Coil, Brushed or Brushless Linear or Rotary Motor, Steppers (Open and Closed Loop, Microstepping)		
Communication	Ethernet, CAN bus, RS232, USB, RS485, Modbus-RTU/TCP		
Control Sampling Rate	16kHz (Profiler, Position, Velocity, Optional force, Current)		
Operational Modes	Position, Velocity, Force or Current (Torque) modes		
Motion Modes	Point-to-Point, Repetitive, Jog, ECAM, Gearing, Joystick, Handwheel, Pulse & Direction, Gantry, CNC sequential contour (G-codes) , Vector and Tracking motion modes. Motion parameters, such as speed, acceleration, deceleration, and target position can be all modified on-the-fly.		
Features	Encoder Error Mapping: 1D, 2D or 3D, Auto-Loop Shaping (Auto-tuning), Frequency Domain System Identification and Modelling, Flexible Gain Scheduling, Position Lock and Event, Ultra-Precision Mode (UPM), Input-Shaping, Profile-Shaping, Machine Vibration Control, Spring and Friction Compensation, Complex-Kinematics (Robot kinematics), etc.		
Programming Interfaces	Standalone User Program – high level script-based program executed in the controller (Up to 8 multi-threading programs with priority setting for each thread). IDE integrated in PCSuite Windows .Net API – available in NuGet Manager. Standard TCP/IP communication – ASCII string commands or binary CAN format.		

1. Digital isolated input can be configured as NPN or PNP, in groups of 3 or 4.

2. Digital isolated output can sink up to 500mA or source up to 300mA.

3. 16-bit analog inputs available in some product options. Consult your sales channel.

4. Brake output up to 48VDC, 3A each.

5. EnDat 2.2 supported by dedicated FPGA version (Consult with sales engineer).

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AGD301 Series – Motion Controller with Integrated Drives

AGD301 series is a family of standalone, high performance 3-axis motion control units with integrated servo amplifiers, It is equipped with Ethernet, USB, CAN bus, RS232 and RS485 communication ports to interface with any host devices such as PC, PLC, HMI, etc. With 16kHz sampling (Profiler, Position, Velocity, Optional force and current control loops) frequency, this product is ideal for any tightly coordinated motion systems, such as XYZ or XY-Theta stage, flexible-link gantry stages, Z-Theta or XZ-Theta pick and place modules, etc.

AGD301 can drive up to 3 voice coils, brushed or brushless servo motors or stepper motors, allowing very flexible configuration of the motors in the multi-axis system. It supports a very wide range of bus-voltage from 12VDC to 90VDC and each axis can supply up to 9Arms continuous current and 18.2Arms peak current concurrently. It is suitable to drive very small voice coil or brushed motors at 12VDC, and is also capable drive 3 big motors with 0.5KW continuous power each.

AGD301

General Specifications

Description	AGD301-ET-2D05	AGD301-ET-2D09-001
Number of Axes	3	
Power Supply	12-90VDC	
Logic Power (optional)	12-36VDC	
Continuous Current	5.6Arms per axis	9Arms per axis[7]
Peak Current	11.2Arms per axis	18.2Arms per axis
Isolated Inputs[1]	27	
Isolated Outputs[2]	17	
Bi-Directional Differential I/Os (RS422)	8	
Analog Inputs[3]	4 (12-bit)	4 (16-bit)
Analog Outputs	4 (16-bit)	
PT100/PT1000 Inputs[4]	3	
Brake Output[5]	3	
Hall Sensors Inputs[6]	3	
Regeneration Output	1	
Encoder Inputs	3 Ports (Each port is software configurable as AquadB, Sin/Cos 1Vpp, Absolute BiSS-C or EnDat2.2).	
Motor Types	Voice Coil, Brushed or Brushless Linear or Rotary Motor, Steppers (Open and Closed Loop, Microstepping)	
Communication	Ethernet, RS232, CAN, USB, RS485, Modbus-RTU/TCP	
Control Sampling Rate	16kHz sampling rate for current, velocity and position control loops	
Operational Modes	Position, Velocity, Optional force or current modes	
Motion Modes	Point-to-Point, Repetitive, Jog, ECAM, Gearing, Joystick, Handwheel, Pulse & Direction, Gantry, CNC sequential contour (G-codes), Vector and Tracking motion modes. Motion parameters, such as speed, acceleration, deceleration, and target position can be all modified on-the-fly.	
Features	Encoder Error Mapping: 1D, 2D or 3D, Auto-Loop Shaping (Auto-tuning), Frequency Domain System Identification and Modelling, Flexible Gain Scheduling, Position Lock and Event, Ultra-Precision Mode (UPM), Input-Shaping, Profile-Shaping, Machine Vibration Control, Spring and Friction Compensation, Complex-Kinematics (Robot kinematics), etc.	
Programming Interfaces	Standalone User Program – script-based program executed in the controller (Up to 8 multi-threading programs with priority setting for each thread). IDE integrated in PCSuite Windows .Net API – available in NuGet Manager. Standard TCP/IP communication – ASCII string commands or binary CAN format.	

1. Digital isolated input can be configured as NPN or PNP, in groups of 3 or 4.
2. Digital isolated output can sink up to 500mA or source up to 300mA.
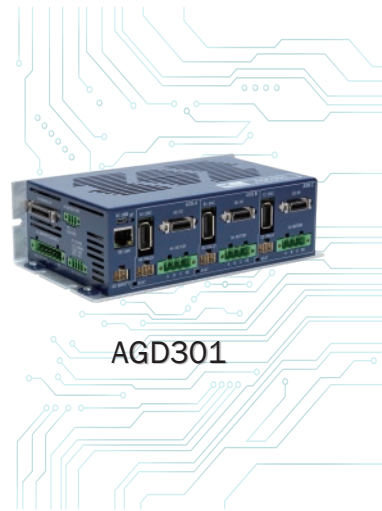3. 16-bit analog inputs available in some product options. Consult your sales channel.
4. Hardware switch to select between PT100 and PT1000.
5. Brake output up to 48VDC, 3A each.
6. Part of general purpose inputs with internal 5V power supply.
7. Limited to 20Arms for 3axes in total.

AGD101 EtherCAT Series – Single Axis Intelligent 90VDC Drive

AGD101 is a high-performance, low voltage EtherCAT servo drive and single axis motion controller. An EtherCAT (CoE) interface compliant with CiA 402 drive profile.

The AGD101 can drive many types of motors, such as voice coil, brushed, and brushless, including direct-drive linear and rotary motors. The drive provides numerous digital and analog inputs and outputs for application interfaces. It also supports various incremental and absolute encoders.

AGD101-EC

General Specifications

Description	AGD101- EC-2D05	AGD101- EC-2D10
Number of Axes	1	
Power Supply	12-90VDC	
Logic Power Supply	12-36VDC	
Output Power @ 90 VDC	0.636kVA	1.273kVA
Continuous Current	5Arms	10Arms
Peak Current	10Arms	20Arms
Peak Current Time	2sec	
Output Frequency	0–599Hz	
Isolated Inputs[1]	8 *	
Isolated Outputs[2]	4	
Differential Digtial Inputs/Outputs	N/A	
Bi-Directional Differential I/Os (RS422)	4	
Analog Inputs	1 (16-bit)	
Analog Outputs	N/A	
PT100 Input	1 (Configurable)	
Brake Output	N/A	
Regeneration Output	Supports external regeneration resistor up to 10A	
Encoder Port	2 ports (Each port is software configurable as AquadB, Absolute Biss-C or EnDat2.2. Main port supports sin/cos encoder type as well) The bi-directional differential IO can be used for auxiliary encoder connection	
Motor Types	Voice Coil, Brushed or Brushless Linear or Rotary Motor, 2-Phase Steppers (Open and Closed Loop, Microstepping)	
Communication	Ethernet, EtherCAT (CoE), Modbus-TCP	
Control Sampling Rate	16kHz (Profiler, Position, Velocity, Optional Force, Current)	
Operational Modes	Position, Velocity, Force or Current (Torque) modes	
Motion Modes	Point-to-Point, Repetitive, Jog, ECAM, Gearing, Joystick, Handwheel, Pulse and direction, Motion parameters, such as speed, acceleration, deceleration, and target position can be all modified on-the-fly.	
Features	Encoder error mapping: 1D, Auto-loop shaping (auto-tuning), Frequency domain system identification and modeling, Flexible gain scheduling based on motion conditions, Position lock and event, Advanced Auto-tuning algorithm in frequency domain, Force control and mode switching, Ultra Precision Mode (UPM), Input-shaping, Profile-shaping, Machine vibration control with external sensor, Spring and friction compensation	
Programming Interfaces	Standalone user programs - High level script-based program integrated in Agito PCSuite (up to 8 Multi-threaded with priority setting environment) IDE integrated in PCSuite Windows .NET API - available in NuGet package manager; Linux .NET API Standard TCP/IP communication - ASCII string commands or binary CAN format	

1. Digital isolated input can be configured as NPN or PNP, in groups of 3 or 4. (*can also be utilized for 3 Hall sensor inputs.)

2. Digital isolated output can sink up to 500mA or source up to 300mA.

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AGD155 EtherCAT Series – Single-axis Intelligent 240VAC Drives

The AGD155 is a 240VAC intelligent drive with an EtherCAT (CoE) interface compliant with CiA 402 drive profile.

The AGD155 can drive many types of motors, such as voice coil, brushed, and brushless, including direct-drive linear and rotary motors. The drive provides numerous digital and analog inputs and outputs for application interfaces. It also supports various incremental and absolute encoders. Advanced features include position event, position lock (capture), error mapping, dual-loop control, closed-loop force mode, and ultra-precision modes. The AGD155 includes programing capabilities, and supports up to 8 multi threading tasks, each of which can be configured with a different priority. It can also serve as a full-featured single-axis standalone controller.

AGD155-EC

General Specifications

Description	AGD155-EC-2A06	AGD155-EC-2A10
Number of Axes	1	
Power Supply (1-φ or 3-φ)	110–240VAC	
Continuous Current	6Arms	10Arms
Peak Current	18Arms	20Arms
Peak Current Time	1.5sec	
Output Frequency	0–599Hz	
Isolated Inputs[1]	16 (2 fast IO)	
Isolated Outputs[2]	6 (2 fast IO)	
Differential Inputs (RS422)	3	
Differential Outputs (RS422)	4	
Bi-Directional Differential I/Os (RS422)	1	
Analog Inputs	2 (16-bit)	
Analog Outputs	N/A	
PT100 Input	1 (0-130°C)	
Brake Output[3]	1	
Regeneration Output	1	
Encoder Inputs	2 Ports (Each port is software configurable as AquadB, Absolute Biss-C or EnDat2.2. Main port supports sin/cos encoder type as well)	
Motor Types	Voice Coil, Brushed or Brushless Linear or Rotary Motor, 2-phase Steppers (Open and Closed Loop, Microstepping)	
Communication	Ethernet, USB, Modbus-TCP	
Fieldbus	EthreCAT (CoE)	
Control Sampling Rate	16kHz (Profiler, Position, Velocity, Optional Force, Current)	
Operational Modes	Position, Velocity, Force or Current (Torque) modes	
Motion Modes	Point-to-Point, Repetitive, Jog, ECAM, Gearing, Joystick, Handwheel, Pulse & Direction, Gantry, CNC sequential contour (G-codes), Vector and Tracking motion modes. Motion parameters, such as speed, acceleration, deceleration, and target position can be all modified on-the-fly.	
Features	Encoder Error Mapping: 1D, Auto-Loop Shaping (Auto-tuning), Frequency Domain System Identification and Modelling, Flexible Gain Scheduling, Position Lock and Event, Ultra-Precision Mode (UPM), Input-Shaping, Profile-Shaping, Machine Vibration Control, Spring and Friction Compensation, Complex-Kinematics (Robot kinematics), etc.	
Programming Interfaces	Standalone User Program – high level script-based program executed in the controller (Up to 8 multi-threading programs with priority setting for each thread). IDE integrated in PCSuite Windows .Net API – available in NuGet Manager. Standard TCP/IP communication – ASCII string commands or binary CAN format.	

1. Digital isolated input can be configured as NPN or PNP, in groups of 3 or 4.
2. Digital isolated output can sink up to 500mA or source up to 300mA.
3. Brake output up to 48VDC, 3A.

AGD156 EtherCAT Series – Single Axis Intelligent 240VDC Drive

The AGD156 is a 240VAC intelligent drive with an EtherCAT (CoE) interface compliant with CiA 402 drive profile. The AGD156 can drive many types of motors, such as voice coil, brushed, and brushless, including direct-drive linear and rotary motors. The drive provides numerous digital and analog inputs and outputs for application interfaces. It also supports various incremental and absolute encoders. Advanced features include position event, position lock (capture), error mapping, dual-loop control, closed-loop force mode, and ultra-precision modes. The AGD156 includes programing capabilities, and supports up to 8 multi threading tasks, each of which can be configured with a different priority. It can also serve as a full-featured single-axis standalone controller.

AGD156-EC

General Specifications

Description	AGD156-EC-2A03
Number of Axes	1
Power Supply (1-φ or 3-φ)	110-240VAC
Logic Power Supply	110-240VAC
Continuous Current	3Arms
Peak Current	9Arms
Peak Current Time	1.5sec
Output Frequency	0–599Hz
Isolated Digital Inputs 1	8 *
Isolated Digital Outputs 2	4
Differential Digtial Inputs/Outputs	N/A
Bi-Directional Differential I/Os (RS422)	4
Analog Inputs	1 (16-bit)
Analog Outputs	N/A
PT100/PT1000 Input	1 (Configurable)
Brake Output	N/A
Regeneration Output	1
Encoder Port	1 port (The bi-directional differential IO can be used for auxiliary encoder connection)
Motor Types	Voice coil, brushed or brushless linear or rotary motor, 2-phase steppers (open and closed loop, micro-stepping)
Communication	Ethernet, Modbus-TCP
Fieldbus	EtherCAT (CoE)
Control Sampling Rate	16 kHz (profiler, position, velocity, optional force, current)
Operational Modes	Position, Velocity, Force, Current (torque) modes
Motion Modes	Point-to-point, Repetitive, Jog, ECAM, Gearing, Joystick, Handwheel, Pulse and direction. Motion parameters, such as speed, acceleration, deceleration, and target position can be all modified on-the-fly
Features	Encoder error mapping: 1D, Auto-loop shaping (auto-tuning), Frequency domain system identification and modeling, Flexible gain scheduling based on motion conditions, Position lock and event, Advanced Auto-tuning algorithm in frequency domain, Force control and mode switching, Ultra Precision Mode (UPM), Input-shaping, Profile-shaping, Machine vibration control with external sensor, Spring and friction compensation
Programming Interfaces	Standalone user programs - High level script-based program integrated in Agito PCSuite (up to 8 Multi-threaded with priority setting environment) IDE integrated in PCSuite Windows .NET API - available in NuGet package manager; Linux .NET API Standard TCP/IP communication - ASCII string commands or binary CAN format

1. Digital isolated input can be configured as NPN or PNP, in groups of 3 or 4. (*can also be utilized for 3 Hall sensor inputs.)

2. Digital isolated output can sink up to 500mA or source up to 300mA.
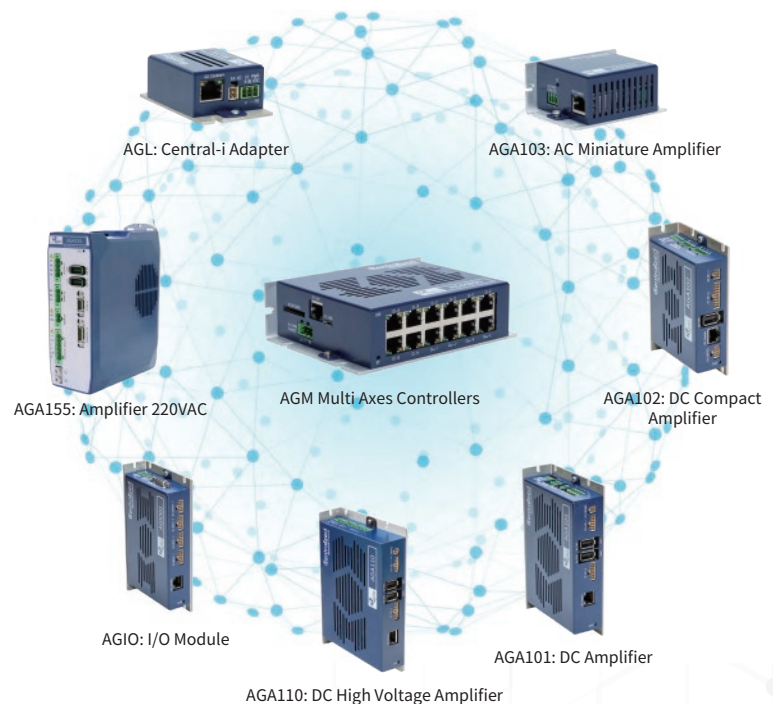
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There are many applications that prefer to have amplifiers near the motors, while the controller can be located near the host PC, PLC or HMI. In such cases, the solution is to use a networked (Distributed) motion control architecture.

The Central-i network topology is invented and designed to complement existing industrial protocols by distributing the amplifier hardware from the centralized controller unit while keeping the machine control, as well as all control algorithms in a centralized processing unit. This topology harnesses the advantages of centralized control, providing excellent multi-axis coordination and control, while simplifying the electrical interface by placing the amplifiers near each motor. Furthermore, Central-i's adaptability ensures seamless integration with both legacy and cutting-edge systems, making it a universally compatible solution that enhances operational efficiency without necessitating the overhaul of existing setups.

The Central-i controller, such as AGM800, connects to remote amplifier or I/O circuit by a standard CAT5 cable instead of hard-connection within the PCB assembly. This design allows the AGM800 to connect up to 8 amplifiers and 4 I/O modules separately, up to 100 meters away, from the controller. While enjoying the simple connection to the amplifier and I/O circuits, the controller continues to sample all hardware signals at 16 kHz, as if the remote hardware circuits are printed on the same PCB as the controller. The controller can close all four servo loops, position, velocity, force and current loops, and fulfill complex and advanced MIMO algorithms at 16kHz.

The Central-i design allows a very flexible configuration of different amplifiers. For example, the first amplifier axis can be powered by a 12VDC power supply to drive a small voice coil motor, the second amplifier can be powered at 80VDC for an ironless linear motor, the next amplifier can be a 230VAC amplifier to drive a big DDR motor. Depending on the number of I/O required, there can be multiple I/O modules connected to the master controller. All I/Os signal are updated at the master controller every sampling interrupt or about 61 micro-seconds, there is no communication delay like a distributed network.

If there is a need to use any third-party drive, the Central-i product family has a series of adapters to output current command in ±10V signal and position command in pulse and direction format. These are standard interfaces supported by many off-the-shelf drives available in the market.

AGL: Central-i Adapter

AGA103: AC Miniature Amplifier

AGA155: Amplifier 220VAC

AGM Multi Axes Controllers

AGA102: DC Compact Amplifier

AGIO: I/O Module

AGA101: DC Amplifier

AGA110: DC High Voltage Amplifier

Central-i Family Control

AGM Series – Central-i Multi-axis Master Controllers

AGM series is a family of high performance 8-axes Central-i master controllers, which are equipped with up to 12 Central-i ports. 8 ports can be connected to any remote Central-i amplifier, while the remaining ports can be connected to any remote I/O module. AGM series is equipped with large flash/RAM memories to support complex applications and features, such as CNC motion and 3D error mapping. AGM is centralized motion controller and executes motion profiler and all servo control loops internally at 16kHz sampling rate, that allow perfect multi-axis synchronization at better than 1 microsecond level. That make AGM series perfectly fit to high precision coordinated motion applications, such as CNC, Semiconductors,Electronic Assembly, and robotics.

AGM800

General Specifications

Description	AGM800-CI
Number of Central-i Ports	12
Number of Axes	8
Power Supply	9-36VDC
CPU	ARM Cortex A9, 900MHz dual core
Flash Memory	128MB (+SD card)
RAM	8GB
Communication	Ethernet, RS232, RS485, Modbus-RTU/TCP
Fieldbus to Amplifiers and I/O	Central-i
Control Sampling Rate	16kHz (Position, Velocity, Optional Force, Current)
Operational Modes	Position, Velocity, Force or Current (Torque) modes
Motion Modes	Point-to-Point, Repetitive, Jog, ECAM, Gearing, Joystick, Handwheel, Pulse & Direction, Gantry, Vector and Tracking motion modes. Motion parameters, such as speed, acceleration, deceleration, and target position can be all modified on-the-fly.
Features	Encoder Error Mapping: 1D, 2D or 3D, Auto-Loop Shaping (Auto-tuning), Frequency Domain System Identification and Modelling, Flexible Gain Scheduling, Position Lock and Event, Ultra-Precision Mode (UPM), Input-Shaping, Profile-Shaping, Machine Vibration Control, Spring and Friction Compensation, Complex-Kinematics (Robot kinematics), etc.
Interface to Camera/Laser	Via fast differential or optically isolated I/O in remote AGIO: Event – position output event (1D or 2D) , Lock – position capture , User programmable PWM output via remote unit with 1MHz frequency
CNC Mode	CNC sequential contour (G-codes) support, FIFO buffering, Corners compensation, Linear, Circular and Helical interpolations
Homing Modes	User programmable: on encoder index, home switch, limit switch and hard stop. (Easily configurable to any sequence)
Commutation	Motor learning, Auto phasing (for incremental encoders), by halls, by abs encoder
Programming Interfaces	Standalone multi-tasking user programs – high level script-based program executed in the controller (Up to 8 multi-threading programs with priority setting for each thread. More than 300 commands per 1msec). IDE integrated in PCSuite Windows .Net API – available in NuGet Manager. Standard TCP/IP communication – ASCII string commands or binary CAN format.

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AGA10x Series – DC Remote Amplifiers

The AGA10x series is family of Central-i remote power amplifiers. AGA amplifiers are controlled by AGM series Central-i master, which gets encoder reading and current samples from each amplifier, performs control loops calculation and generate PWM commands to each amplifier. Fast Central-i fieldbus is used to communicate between AGA amplifiers and AGM master, that allows 16kHz sample rate motion profiler and all servo loops. Amplifiers are powered by 12-90V DC power supply. To support remote operation and minimize cables length from the actuator, each remote amplifier is equipped with variety of digital and analog I/Os.

AGA110   AGA101   AGA102   AGA103

The isolated digital outputs are capable of sourcing up to 300mA or sinking up 500mA. This is sufficient to drive most external devices, end effectors, etc., hence, eliminated the need to have an external relay circuit. The compact form factor of the DC amplifiers is ideal for them to be mounted close to the actuator, such as the link in an articulated robot arm.

General Specifications

Description	AGA110-CI-5D07	AGA101-CI-2D01/2D02/2D05	AGA102-CI-1D01/1D02/1D05	AGA103-CI-1D03
Number of Axes	1			
Power Supply	80-190VDC	12-90VDC	12-48VDC	
Continuous Current	7Arms	1.4/2.8/5.6Arms	1.4/2.8/5.6Arms	2.8Arms
Peak Current	14Arms	2.8/5.6/11.2 Arms	2.8/5.6/11.2Arms	5.6Arms
Isolated Inputs[1]	11		7	5
Isolated Outputs[2]	3			2[3]
Bi-Directional Differential I/Os (RS422)	1			2
Analog Inputs	2 (12-bit)	1 (12-bit)		
Analog Outputs	N/A			
PT100/PT1000	N/A			
Brake Output	1		N/A	
Regeneration Output	1		N/A	
Encoder Port AUX	Configurable as AquadB, Absolute Biss-C or EnDat2.2		N/A	
Encoder Port Main	Configurable as AquadB, Sin/Cos 1Vpp, Absolute Biss-C or EnDat2.2			
Motor Types	Voice Coil, Brushed or Brushless Linear or Rotary Motor, 2-Phase Steppers (Open and Closed Loop, Microstepping)			
Communication	Central-i			
Sampling Rate	16kHz			

1. Isolated digital inputs can be configured as NPN or PNP, in groups of 3 or 4.
2. Isolated digital outputs can sink up to 500mA or source up to 300mA.
3. AGA103: Digital isolated outputs can be configured only as NPN (sink).

AGA155 Series – Central-i 220VAC Remote Amplifiers

The AGA155 series is a family of 220VAC Central-i remote power amplifiers. AGA amplifiers are controlled by AGM series Central-i master, which gets encoder reading and current samples from each amplifier, performs control loops calculation and generate PWM commands to each amplifier. Fast Central-i fieldbus is used to communicate between AGA amplifiers and AGM master, that allows 16kHz sample rate motion profiler and all servo loops. The AC powered remote amplifier is capable of driving motor up to 10Arms continuous and 20Arms peak current. The amplifier comes with heat sink and cooling fan, is ideal for high power motors, including big direct drive linear and rotary motors. Similar to the DC powered AGA10x amplifiers, the AGA155 amplifier also comes with digital and analog I/Os sufficient for a typical actuator and application. The digital outputs are capable of sourcing up to 300mA or sinking up 500mA, which is sufficient for driving most external devices and end effectors, and eliminates the need for an external relay circuit.

AGA155

General Specifications

Description	AGA155-CI-2A03	AGA155-CI-2A06	AGA155-CI-2A10
Number of Axes	1		
Power Supply	110-240VAC		
Continuous Current	3Arms	6Arms	10Arms
Peak Current	9Arms	18Arms	20Arms
Isolated Inputs[1]	8		
Isolated Outputs[2]	2		
Bi-Directional Differential I/Os (RS422)	1		
Analog Inputs	1 (12-bit, 16-bit optional)		
Analog Outputs	N/A		
PT100/PT1000 Inputs[3]	1		
Brake Output	1		
Regeneration Output	1		
Encoder Inputs	2 Ports (Each port is software configurable as AquadB, Absolute Biss-C or EnDat2.2. Main port supports sin/cos encoder type as well)		
Motor Types	Voice Coil, Brushed or Brushless Linear or Rotary Motor, Steppers (Open and Closed Loop, Microstepping)		
Communication	Central-i		
Sampling Rate	16kHz		

1. Digital isolated input can be configured as NPN or PNP, in groups of 3 or 4.
2. Digital isolated output can sink up to 500mA or source up to 300mA.
3. Wiring of PT1000 different from PT100, refer to manual for details.

AGIO Series – Central-i Remote I/O Units

The AGIO is a series of Central-i remote I/O modules. used to expand the number of I/O interfaces in the Central-i network.

Since all the I/O modules are updated at the master controller every sampling cycle, there is no difference between connecting, for example, an axis limit sensor to the axis amplifier's digital input or to a separate AGIO module. The master controller receives the AGIO digital input signal at the same time as the AGA amplifier's digital input, at 61 micro-second interval.

Most of the inputs are configurable to connect NPN or PNP sensors. And most of the outputs are software configurable to sink or source current. Typically, each output can sink down to 500mA and source up to 300mA of current. This is sufficient to drive most relays and solenoids directly.

AGIO01   AGIO02

General Specifications

Description	AGIO01-CI-1608	AGIO02-CI-3216
Communication	Central-i	
Power Supply	9-36VDC	
Sampling Rate	16kHz	
Differential Bi-Directional I/O	3	N/A
Isolated Inputs[1]	16	32
Isolated Outputs[2]	8	16
Analog Inputs	4 (12-bit resolution)	4 (12-bit resolution)
Analog Outputs	N/A	2 (16-bit resolution)

1. Digital isolated input can be configured as NPN or PNP, in groups of 3 or 4.

2. Digital isolated output can sink up to 500mA or source up to 300mA.

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AGL Series – Central-i Remote Adapter

The AGL is a series of Central-i remote adapters to interface the Central-i network with external devices, such as drives. The AGL adapters can convert the current command into analog ±10V signal or convert position command into pulse and direction format. This will allow the Central-i master to control any third-party drives in analog current mode or digital pulse and direction mode; hence, extending the Central-i network to work with any servo drives.

AGL101   AGL102

General Specifications
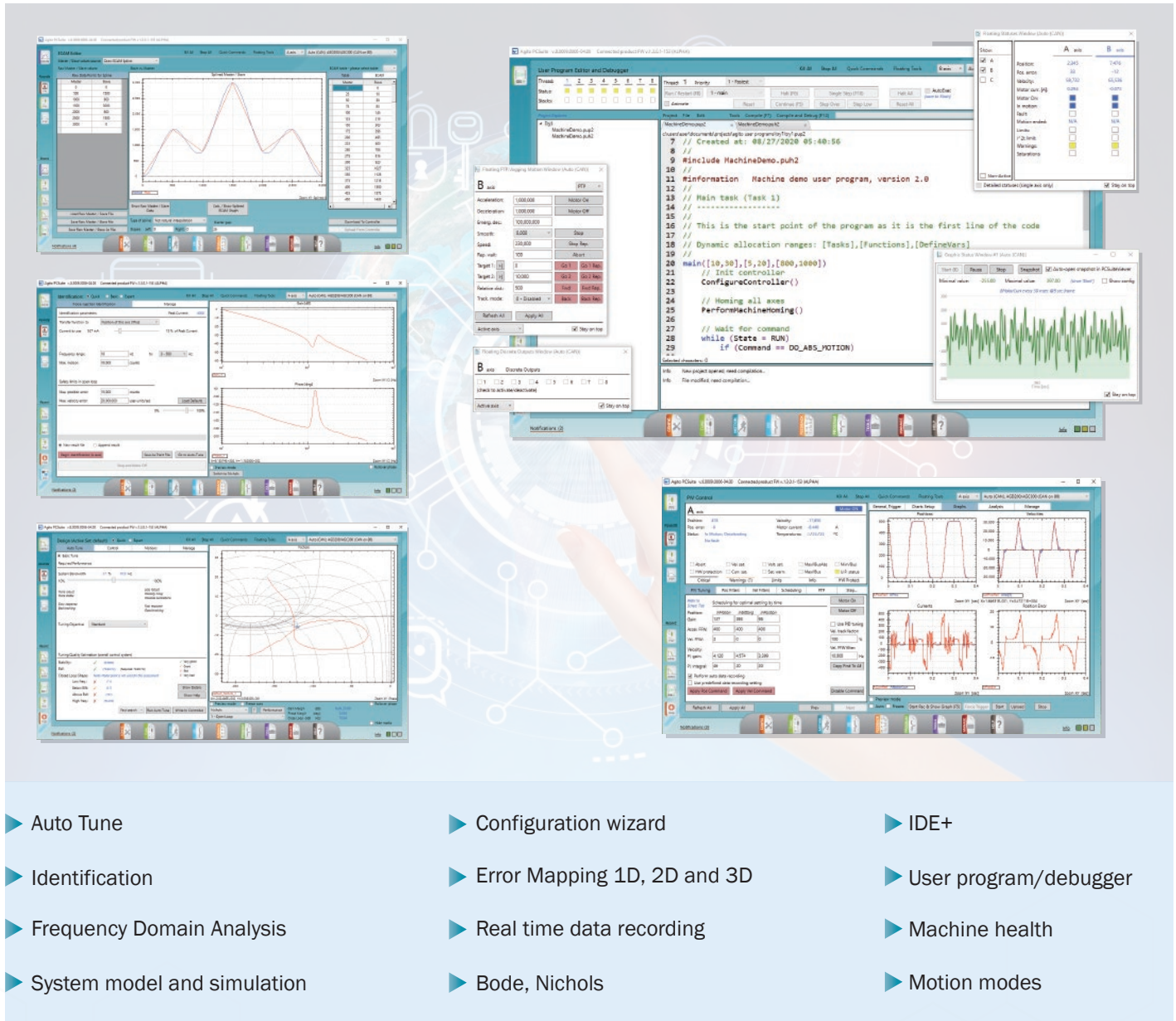
Description	AGL101-CI	AGL102-CI
Number of Axis	1	
Power Supply	9–36VDC	
Communication	Central-i	
Supported Encoder Type	1 AquadB	1 AquadB
Isolated Inputs[1]	5	4
Isolated Outputs	6[2]	4 (Sinking, down to 50mA)
Differential Outputs	1	N/A
Differential Bidirectional I/Os	2	N/A
Analog Inputs	2 (16-bit resolution)	1 (12-bit resolution)
Analog Outputs	1 (16-bit resolution)	1 (16-bit resolution)

1. Digital isolated input can be configured as NPN or PNP, in groups of 2 or 3.

2. AGL101-CI provides 3 digital output that can sink up to 500mA or source up to 300mA. The other 3 outputs are sink only.

PCSuite Software and Libraries

All Agito controllers are provided with the comprehensive, market leading, PCSuite software. The PCSuite is a Windows® based software environment to configure, tune, program and operate all controllers, drives and Central-i master units in this catalog.


- ▶ Auto Tune
- ▶ Identification
- ▶ Frequency Domain Analysis
- ▶ System model and simulation

- ▶ Configuration wizard
- ▶ Error Mapping 1D, 2D and 3D
- ▶ Real time data recording
- ▶ Bode, Nichols

- ▶ IDE+
- ▶ User program/debugger
- ▶ Machine health
- ▶ Motion modes

The PCSuite is uniquely providing a graphic interface to configure, tune and experiment every motion and control feature of Agito controllers, including (partial list): configuration wizards, time domain tuning, plant identification, frequency domain design, auto tuning and much more. Each feature has a dedicated GUI tool (page) that is optimally designed to provide ease of use together with access to every related parameter and feature's options. At the same time, variety of floating windows, including user defined GUI elements are provided to enable access to any status/control parameter, from anywhere within the PCSuite.

Navigation between the various tools is made easy by an icons-based menu, together with variety of shortcuts and ability to one click access to recent and favourite tools.

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PCSuite Software and Libraries

Flexibility and Programmability

Most controller features are fully flexible and programmable. This covers, for example: Special functionalities of digital inputs, digital outputs, analog inputs, analog outputs, master of ECAM motion, source of current/force command, Halls connections, motor phases connections, Homing behaviour and much more. The PC Suite provides intuitive GUI to control and setup all this flexibility.
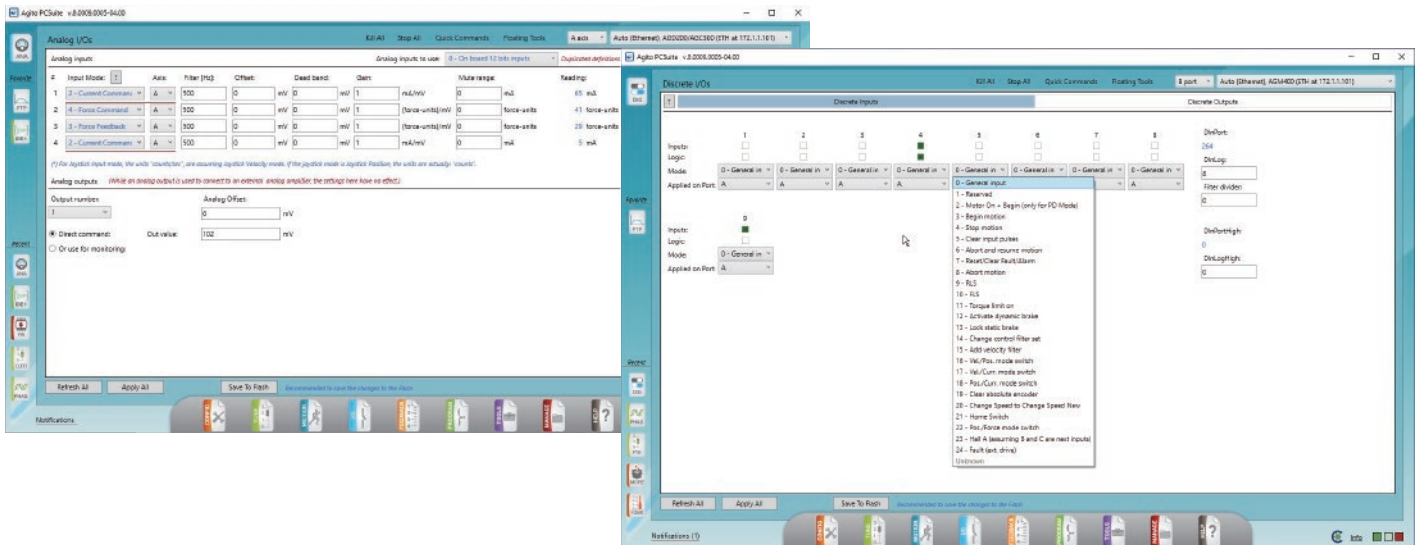

Graphic Display

The PCSuite is equipped with a comprehensive tool to display graphs (Recorded data in the time domain, Plant, Open loop and closed loop in the frequency domain), consisting of: multiple zoom methods, analysis of displayed data (RMS,Tolerance,Amplitude, Frequency...), markers, riders, FFT and much more...

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PCSuite Software and Libraries
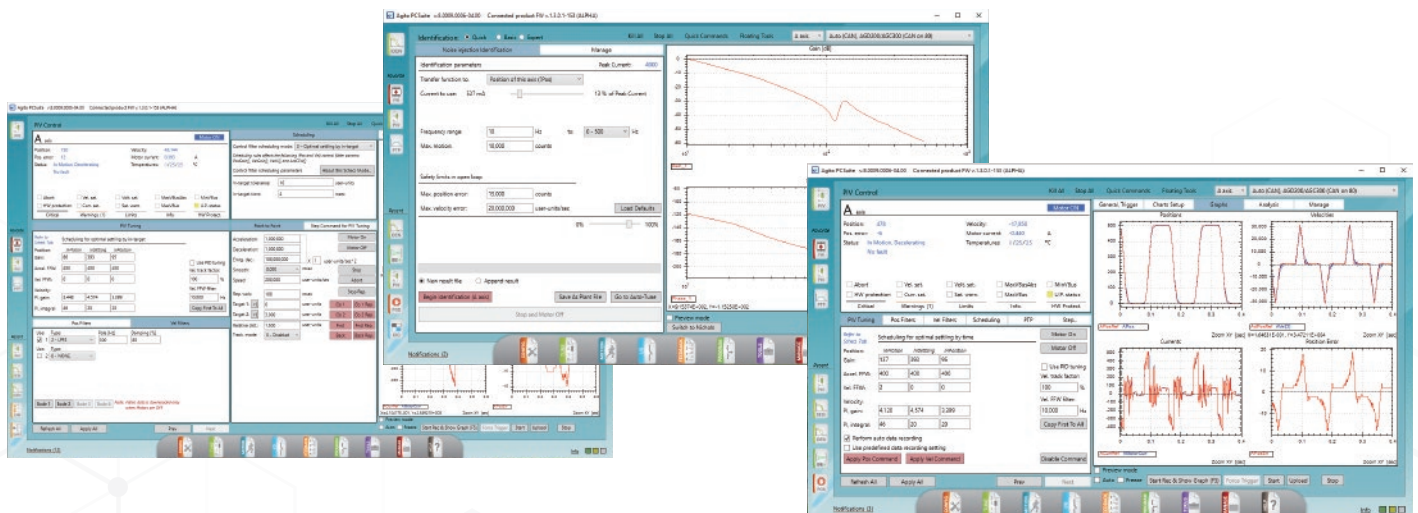
Standalone User Program (Multi-threaded)

The PCSuite includes a powerful and comprehensive integrated development environment, IDE+, for user to develop machine sequences and to enable standalone operation of the control unit.

It supports multi-threading of up to 8 tasks simultaneously, using intuitive script language to manage program flow using if/for/while/switch-case flow control blocks. User can create variables and expressions, setup interrupt event functions and even use C-language-like pointers to access variable by memory addresses.
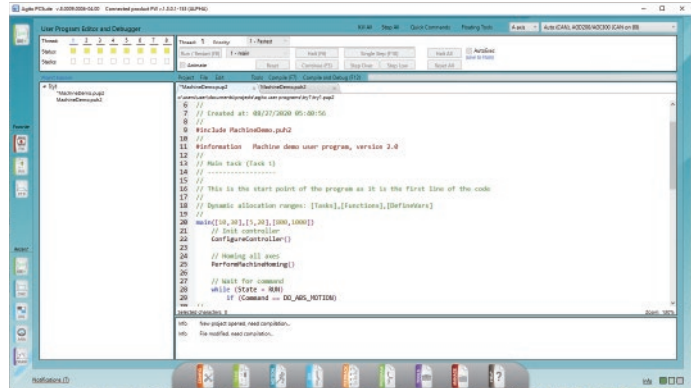
Depending on product/application, the control unit can execute up to 500 low level command in 1 milliseconds. The IDE+ supports multiple project files, allow user to group commonly used functions in a separate file that can be reused by many projects. The IDE+ debugger also supports single-step execution, break-points and watch windows for easy debugging of the user program.

Communication and Library

▶ PCSuite is provided with a low-level and high-level communication library (API) for users to develop their Application software. The libraries are provided in native Windows' .NET environment, it has been extended to .NET Core Environment. The API can also be used in MATLAB, Labview and other environment compatible with Windows' .NET framework.

▶ The PCSuite (and its library) supports Ethernet, CAN Bus, RS-232 and USB. It can auto detect connected controllers and auto-connect to the first controller.

▶ In other environment, the external host can communicate with the control units by standard TCP/IP socket programming, CAN or RS-232 communication protocols.

Examples of the PCSuite variety of interfaces are presented in subsequent section about common control and application features of Agito controller.

Common Control and Application Features

Frequency Domain Analysis

Modern control theory focused mainly in frequency domain. Agito controllers support frequency domain plant identification, allowing easy identification of the plant characteristics and mechanical resonances (from a single click Quick mode, to intensive Expert mode for difficult systems and expert users). The PCSuite software can even automatically and accurately estimate the parametric model of the plant, allowing advanced users to perform in-depth analysis and optimization of the system.
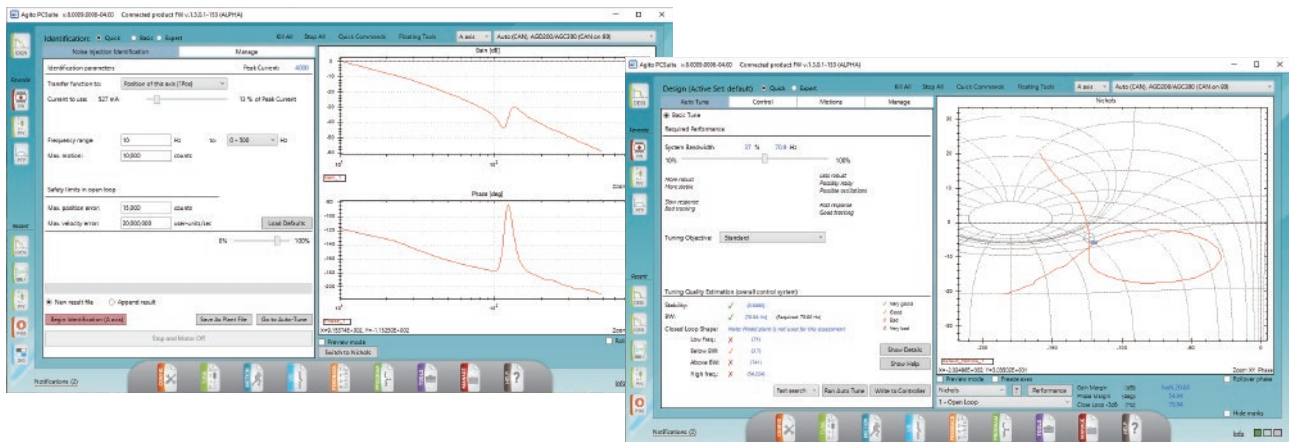
Advanced Auto-tuning Algorithm

Advanced auto-loop-shaping algorithm in the frequency domain is used to calculate the most optimized gains and filters for the identified plant(s). The basic mode allows user to auto-tune the system with a click of a button, while the expert mode provides all the controls to the user to fully optimize the calculation of control loops gains and filters. The result could out-perform most manual tuning. User can inspect the plant bode, open loop, closed loop and disturbance rejection, as well as the automatically calculated gain/phase margins, crossing frequency, -3dB frequency, peak gain and other open loop and closed loop characteristics. Bode and Nichols chart are supported, and the user can store and compare up to 6 different control filters designs.

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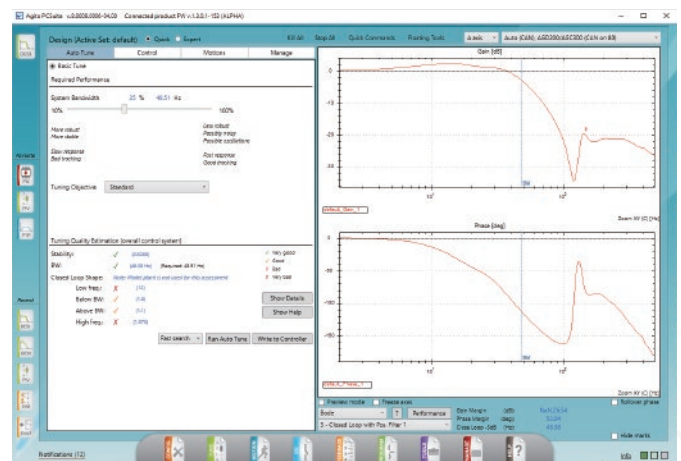
Force Control and Mode Switching

Smooth transition between high speed motion to low speed searching for contact point and finally switch automatically to force mode or current mode to press with multiple step or ramp force profile. Upon completing the force profile, automatically switching back to position mode to move back to start point at high speed.

This feature is commonly used in semiconductor die-attach, pick and place, glass/touch panel processing, etc.
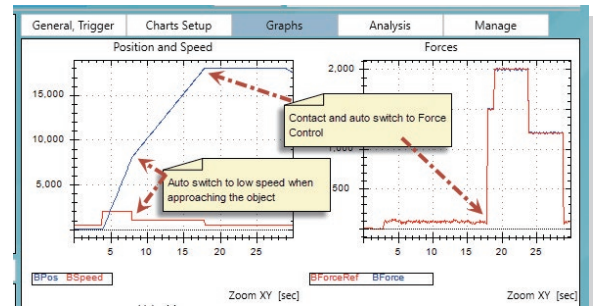

The controller achieved high accuracy closed-loop force control at 16kHz with force sensor feedback via the high resolution analog input. If force sensor is not used, the controller controls the current loop with the built-in high resolution current feedback sensor.

Draw Control

Draw Control is a powerful and intuitive feature that empowers users to implement custom real-time control logic/algorithms using a fully graphical environment—no low-level coding or firmware access required. While the controller's built-in firmware handles most standard applications, some advanced or application-specific scenarios require more flexibility and/or customization than conventional user programs can offer, especially when timing precision and synchronization with control algorithms are critical.
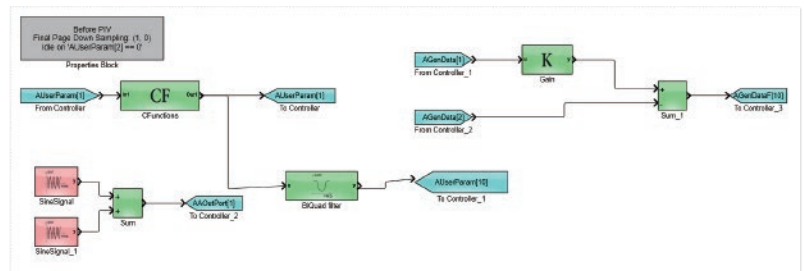
Draw Control addresses this gap by enabling users to easily design and run their own algorithms with high determinism and fast execution cycles. More specifically, it allows users to convert their graphical representations into sequences that are executed directly inside the control interrupt, in real time.

Integrated seamlessly into the PCSuite (currently available on AGM800), Draw Control eliminates the need for external development environments or source code access. Users can drag and drop from a rich library of blocks—including math, control, filters, and S/Z domain functions—create hierarchical schemes, integrate C code, and tune parameters on the fly. With support for independent execution from firmware, quick compilation-to-deployment in under 20 seconds, and built-in debugging tools, Draw Control dramatically reduces development time while unlocking sophisticated applications like MIMO systems, robotics, and adaptive control strategies.

Ultra-Precision Mode

Agito's Ultra-Precision Mode (UPM), is a series of state-of-the-art algorithms to automatically improve the system performance. The Ultra Precision Mode covers the following optimization algorithms: Constant-Velocity, Repeated-Motion and Disturbance-Rejection. The Ultra Precision Mode algorithms are automatic and self-learning. The Ultra Precision Mode algorithms do not affect the bandwidth of the system (Thus, do not affect its stability!). Yet, it significantly improves the system performance.

For example, the Constant-Velocity UPM improves the performance during constant velocity motion. The tool monitors the motion signals during constant velocity motion and automatically configure the relevant parameters to optimize position and velocity tracking error during such motions.
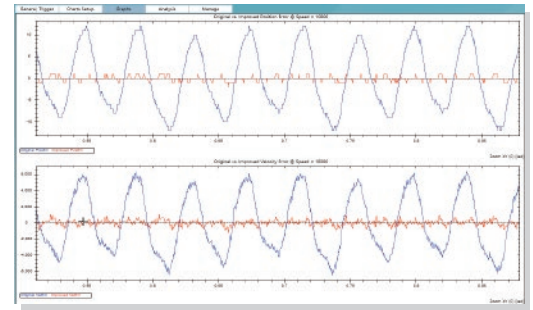
The Repeated-Motion UPM, on the other hand, optimizes the settling time for a repetitive motion. The algorithm will learn the same motion in iterations and results in better performance (less overshoot, shorter settling time), lower position tracking error, and even reject external periodical disturbance.
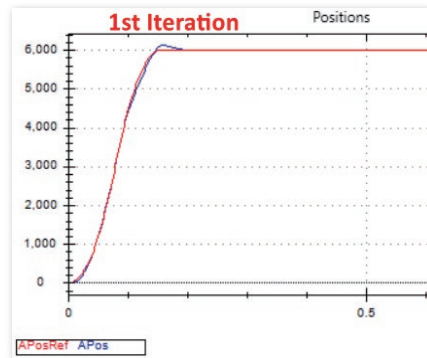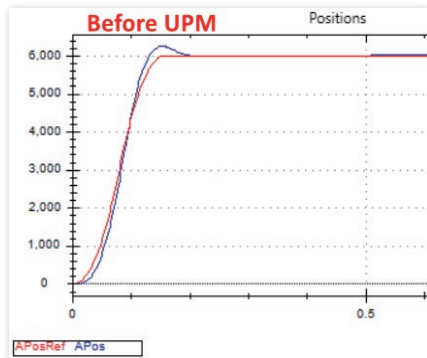

In Disturbance Rejection UPM, any disturbance, whether a result of the motion itself (like a machine with a flexible base), or external disturbance, is significantly rejected when the algorithm is activated, with minimal effect on the system stability and the response to the motion trajectory. The algorithm is optimally performing at frequencies from a few Hertz to tens of Hertz (the typical range of vibrations due to shock absorbers and other system flexibilities).

In the picture on the right, it shows the Bode plot of plant that is mounted on a flexible base (refer to frequencies 15-20Hz that shows the base flexibility).
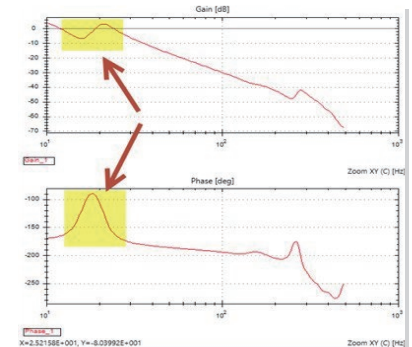
This plant is commanded, in closed loop, to perform an aggressive point to point motion, which, even with the high bandwidth of the closed loop, creates long time oscillations at the end of the motion, due to the base flexibility, that results with a very long settling time.

In the picture on the right, it shows a zoom in at the end of this point to point motion, showing the position reference and the actual position (upper chart) as well as the position error (lower chart).
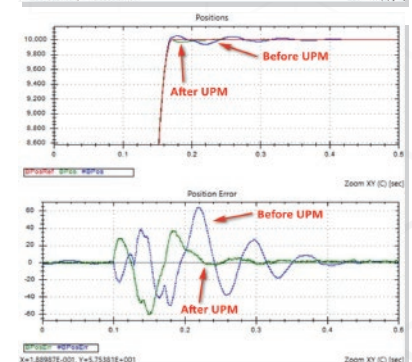
The blue lines are the position and the position error without the Ultra Precision Mode while the green lines are once the mode is activated.

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Advanced Gain Scheduling

In cases when one set of control gains cannot fulfil the servo performance due to changing conditions, the controller can be configured to switch automatically between up to 5 sets of control gains based on different motion status, positions, speeds, temperature and many other conditions.

Input Shaping, Profile Shaping and Machine Vibration Control

Input shaping works by convolving additional signals to the desired motion profile to reduce machine vibration. Profile shaping works by automatically changing the acceleration and deceleration setting at different distance to the target position. This can be more effective than setting a constant jerk parameter or a constant smoothing factor. Machine Vibration Control is a feature to use an external MVC sensor to measure machine vibration, allowing the controller to improve servo performance based on the sensor input. All the 3 features are highly effective in tackling machine vibration issue, especially when acceleration is very high.
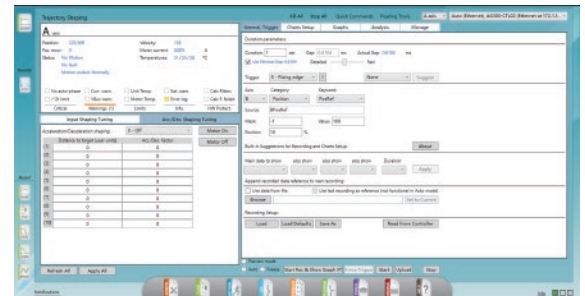
Active-Yaw Gantry Control
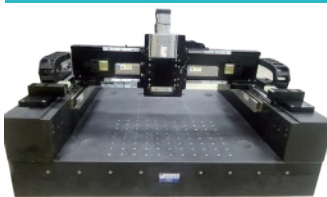
Active Yaw gantry control allows servo control in the yaw direction to constantly maintain a consistent orthogonality for the gantry. Together with error mapping, this feature provides the best control performance for flexible gantry stage, ideal for any high precision XY applications.

Spring and Friction Compensation

Systems with spring force exerted on the motor can use this feature to automatically compensate the varying spring force at different position. This eliminate the difference in performance at different position for the same control gains. Friction compensation helps to eliminate the high error at the start of motion due to static friction.

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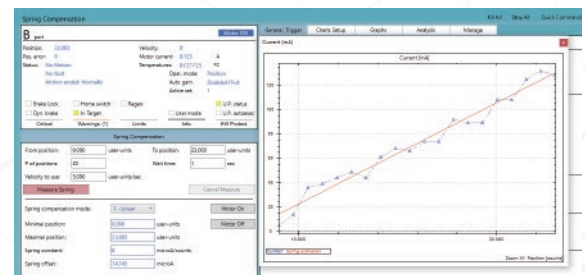
General Motion Modes

Almost all motion parameters can be ultimately modified on-the-fly during the motion and the motion will automatically respond to the change.

▶ Point to Point, absolute or relative, single or repetitive, tracking mode

▶ Homing: easily building complex Homing scenarios or to load predefined scenarios

▶ Jogging

▶ Gearing (direct and indirect)

▶ ECAM (see below)

▶ Joystick, position and velocity, direct and indirect

▶ Pulse/Direction, direct and indirect

▶ FIFO

▶ Vector

▶ Comprehensive CNC motion mode (see below)

CNC and Contour Motion (G-codes)

Commonly used in laser and 3D printing applications, the controller supports a few types of CNC-like motions (e.g. continuous linear and circular segments). The PCSuite software includes a G-codes parser to convert some of the G-codes commands into the controller's commands. The parser can, at the same time, add arc corners between segments, adjusting corner speed according to axes' acceleration limitations.

With the CNC engine, the controller is capable to control and drive a 3D printer and laser marking/cutting machine easily. For example, a 3D printer typically consists of an XY stage with an extruder motor and a Z-axis table. The PCSuite G-codes parser could import the G-codes from a slicer software and map the extruder command to the respective extruder axis. The controller can also close the temperature PID loops of the heaters with RTD feedback sensors and control the cooling fans with PWM speed commands.
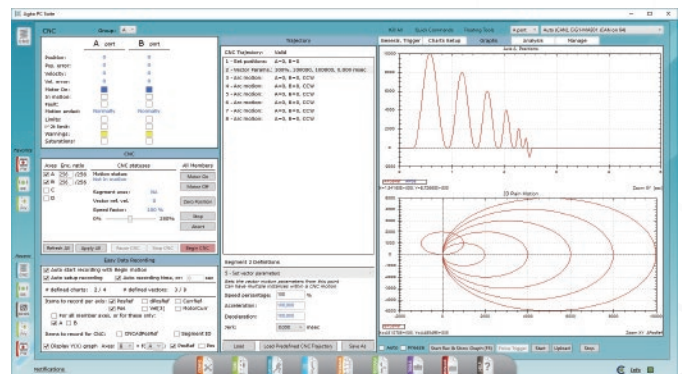

The controller can communicate with the HMI, PC or other devices like Raspberry Pi over Ethernet to receive the CNC motion segments into a circular buffer, the controller will be able to print object of any size and complexity without memory limitation.

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ECAM / Gearing / Joystick / Handwheel

Gearing is a feature where the slave axis follows a master axis' position command or feedback position in a simple scaling factor. For a more complex following profile, like a mechanical cam system, the feature is known as ECAM. Agito ECAM supports single, multiple and infinite cycles, with blending and with dedicated profiles to accelerate into or decelerate from the cyclic ECAM profile. These features provide a flexible and easy way to define multi-axis coordinated motion. For external manual profiler, machine operator can use a Joystick or Handwheel to manually move the motor to any position at any speed.
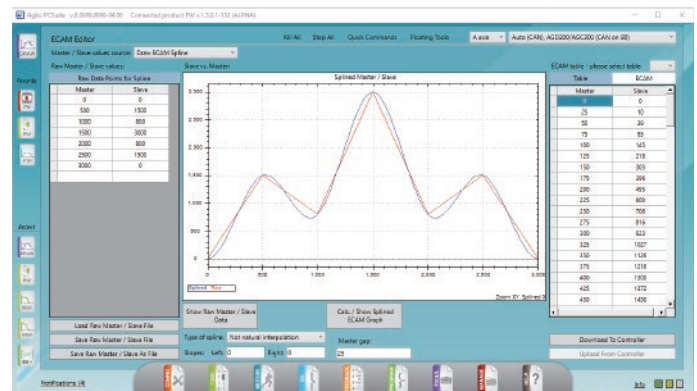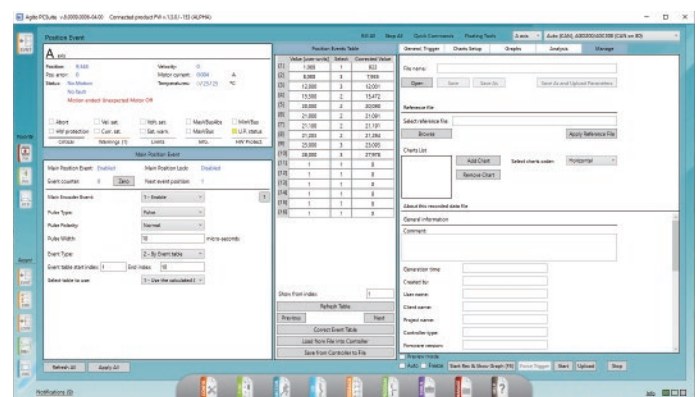
Position Lock and Event

Position Lock refers to locking the encoder feedback value when an external event, connected to a digital input or encoder index, occurred. This feature is also commonly known as "position capture". Locked values, as well as their time, are collected in arrays for offline analysis by the user, if needed.

Position Event, on the other hand, is to have the controller generate an event by outputting a digital pulse to one or a few digital outputs. This feature is also commonly known as "position compare" or PEG. The controller can trigger the events based on fixed position interval or based on a user defined table. By supporting multiple digital outputs, multiple external devices such as camera, dispenser and laser can be triggered at their respective positions in a single pass of motion. For example, in a single move from 0 count to 4000 count, the controller can trigger a dispenser at 100 and the camera at 200 to inspect the quality of dispensing in a single move. This would improve the machine throughput significantly.

Both Position Lock and Position Events, for incremental encoders, are handled by the hardware with an accuracy of 1 encoder count.

For Position Events, the table of values can be inversed-corrected using the (1D, 2D or 3D) error mapping table, to ensure the events will occur at the exact physical location of the load.

PCSuite Software and Libraries

Error Mapping: 1D, 2D or 3D

Agito controllers can compensate encoder feedback errors based on the error mapping tables, starting with the simplest one-dimensional (1D) error correction table and up to 2D and 3D tables for overall system mapping. The controller will do linear interpolation between the given points. Position Events can be configured to use the compensated position.
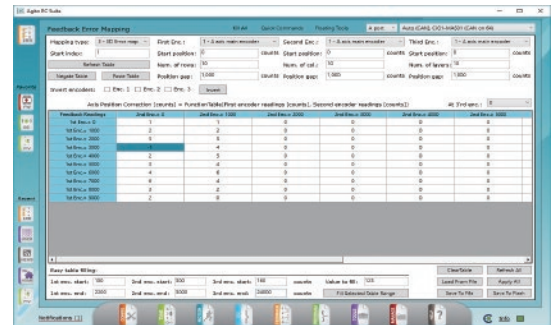
Complex Kinematics DSP Functions

Advanced user can program complex kinematics equations into the real-time DSP interrupt routines, known as DSP User Functions, to perform non-standard kinematic transformation. For example, a miniature tripod stage, shown in the picture on the right, with 3 vertical linear axes can be transformed into roll, pitch and Z-axis motion. Since the tripod stage is actuated by 3 direct-drive voice coil motors, the force control feature can also be used to ensure the contact force acting on the object carried by the tripod can be controlled precisely.

Another example of complex kinematics is Akribis' Parallel SCARA robot where 2 rotary joints are transformed into XY motion. Optionally, a secondary arm can be installed at the opposite side to copy the same XY motion as the primary arm. Together with a Z and Theta axes, user can send position commands in XYZ and Theta coordinates.

Customized DSP Functions

In additional to writing complex kinematics functions in the DSP User Functions, user can access all the I/Os from the DSP User Functions. The picture on the right shows a Medical Robot to assist inpatient rehabilitation from strokes and other neurological disorders. The system includes the AGD301 drive, with 6 feedback encoders (including 3 encoders read by DSP User Functions over differential inputs) on robot arm and 5 force sensors. With the data from these feedback sensors, the additional codes could be added to the DSP User Functions to compensate the robot arm's weight and inertia, while applying the required torque on the motors.
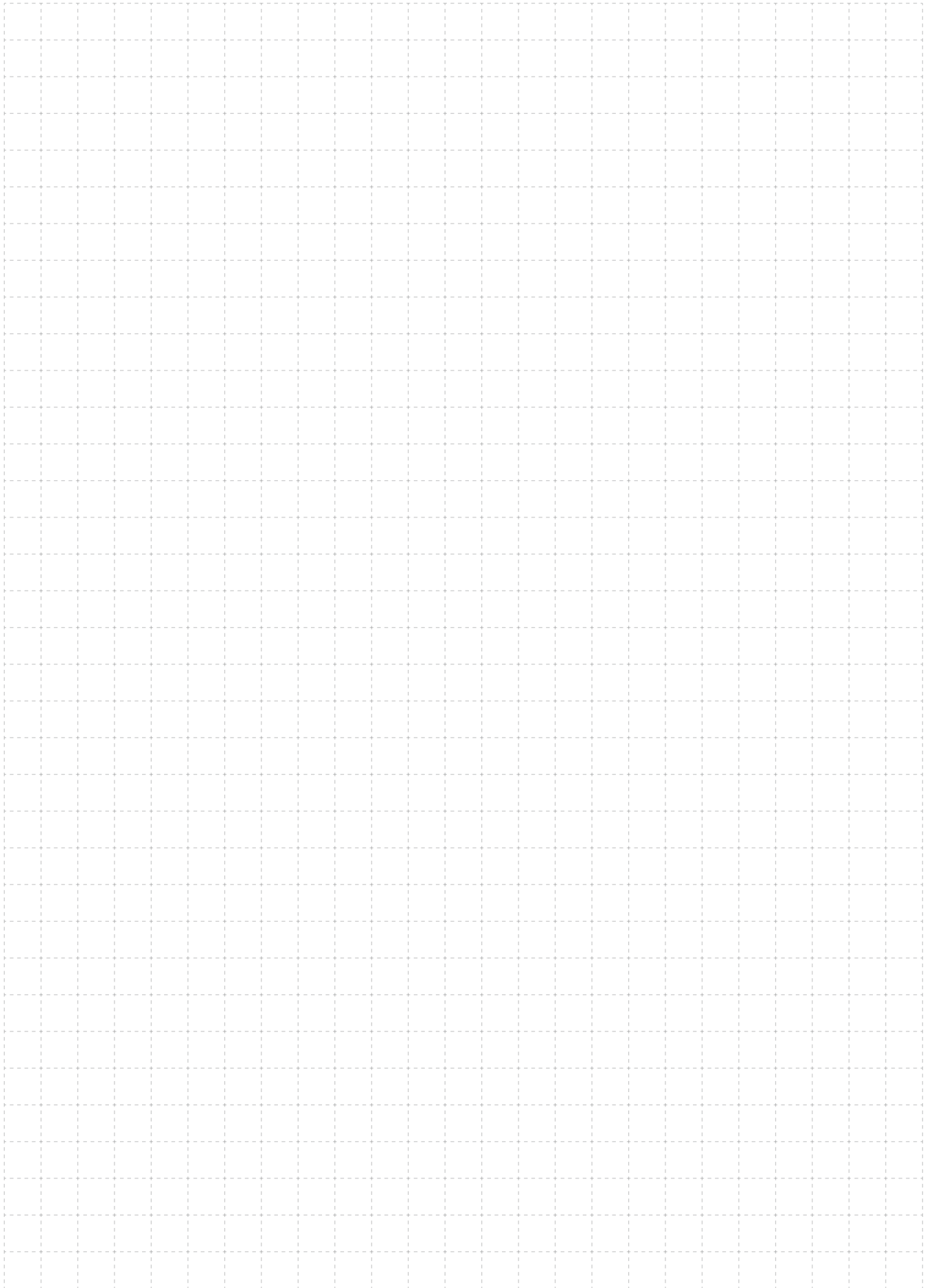
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| Product Part Number	Description	Optional Accessories	Accessories Description
AGC300-ET	3-axis Controller (Gen1)	AGC300-ET-CKS2	AGC300-ET Connector Kit (Interface Connectors)
		IC-AGD200-DB15F-04	D-Sub Interface Cable for AGC300/AGD200-X6/7/8
		IC-AGC300-DB44M-04	D-Sub Interface Cable for AGC300/AGD200-X9
		IC-AGC300-DB37M-04	D-Sub Interface Cable for AGC300/AGD200-X10
AGC301-ET	3-axis Controller (Gen2) with 12-bit Analog Input	AGC301-ET-CKS2	AGC301-ET Connector Kit (Interface Connectors)
		IC-AGC301-ASD-xx-yy	Interface Cable for AGC301 to ASD Driver (xx=PQ, FRLS-RFLS)(yy=05,10)
		IC-AGC301-AGD155-xx-yy	Interface Cable for AGC301 to AGD155 Driver (xx=PQ, FRLS-RFLS)(yy=05,10)
		IC-AGD301-DB25F-04	D-Sub Interface Cable for AGD/AGC301-ABC3, AGD/AGA155-X5
		IC-AGD301-DB37F-04	D-Sub Interface Cable for AGD/AGC301-X4, AGD/AGA155-X6
AGD101-EC-2D05	Single-axis Driver (EtherCAT) - 90VDC, 5Arms Continuous, 10Arms Peak	AGD101-EC-CKS2	AGD101-EC Connector Kit (Interface Connectors)
		YC-AGC301-xxxx-NH	Encoder Cable for AGD301/155/101, AGA101/102/155 (xxxx=R41D, R41A, AB11D, AB22A, AB51D, ABA50E, ERA)*
		YC-AGD155-HALL-x	Hall Cable for AGD155/101, AGA155 (x=J, K)
AGD101-EC-2D10	Single-axis Driver (EtherCAT) - 90VDC,, 10Arms Continuous, 20Arms Peak	LC-AGD101-xx	Limit Cable for AGD101 (xx=PQ, FRLS-RFLS)
		IC-AGD101-HD26F-04	D-Sub Interface Cable for AGD101-X6
		C-AGD301-SFT	Safety Bypass for AGD301/155/101, AGA101/102/155
AGD155-AF-2A06	Single-axis Driver - 230VAC, 6Arms Continuous, 18Arms Peak	AGD155-AF-CKS2	AGD155-AF Connector Kit (Interface Connectors)
		YC-AGC301-xxxx-NH	Encoder Cable for AGD301/155, AGA101/102/155 (xxxx=R41D, R41A, AB11D, AB22A, AB51D, ABA50E, ERA)*
AGD155-AF-2A10	Single-axis Driver - 230VAC, 10Arms Continuous, 20Arms Peak	YC-AGD155-HALL-x	Hall Cable for AGD/AGA155 (x=J, K)
		LC-AGD155-xx	Limit Cable for AGD/AGA155 (xx=PQ, FRLS-RFLS)
AGD155-EC-2A06	Single-axis Driver (EtherCAT) - 230VAC, 6Arms Continuous, 18Arms Peak	IC-AGD155-DB15F-04	D-Sub Interface Cable for AGD/AGA155-X4
		IC-AGD301-DB25F-04	D-Sub Interface Cable for AGD/AGC301-ABC3, AGD/AGA155-X5
AGD155-EC-2A10	Single-axis Driver (EtherCAT) - 230VAC, 10Arms Continuous, 20Arms Peak	IC-AGD301-DB37F-04	D-Sub Interface Cable for AGD/AGC301-X4, AGD/AGA155-X6
		C-AGD301-SFT	Safety Bypass for AGD301/155, AGA101/102/155
AGD156-EC-2A03	Single-axis Driver (EtherCAT) - 230VAC, 3Arms continuous, 9Arms peak	AGD156-EC-CKS2	AGD156-EC Connector Kit (Interface Connectors)
		YC-AGC301-xxxx-NH	Encoder cable for AGD301/155/101, AGA101/102/155 (xxxx = R41D, R41A, AB11D, AB22A, AB51D, ABA50E, ERA)
		YC-AGD155-HALL-x	Hall cable for AGD155/101, AGA155 (x=J, K)
		LC-AGD101-xx	Limit cable for AGD101 (xx=PQ, FRLS-RFLS)
		IC-AGD101-HD26F-04	D-Sub Interface cable for AGD101-X6
		C-AGD156-SFT	Safety Bypass for AGD156
AGD200-ET-2D02	Dual-axis Drive - 90VDC, 2.8Arms Continuous Current	AGD200-ET-CKS2	AGD200-ET Connector Kit (Interface Connectors)
		YC-AGC300-xxxx-NH	Encoder Cable for AGD200 (xxxx=R41D, R41A, AB11D, AB22A, AB51D, ABA50E, ERA)*
		YC-AGD200-HALL-xx	Hall+Limit Cable for AGD200 (xx=PQ, FRLS-RFLS)
AGD200-ET-2D05	Dual-axis Drive - 90VDC, 5.6Arms Continuous Current	IC-AGD200-DB15F-04	Interface Cable for AGC300/AGD200-X6/7/8
		IC-AGC300-DB44M-04	Interface Cable for AGC300/AGD200-X9
		IC-AGC300-DB37M-04	Interface Cable for AGC300/AGD200-X10
		C-AGD200-SFT	Safety Bypass for AGD200
AGD301-ET-2D05	3-axis Drive - 90VDC, 5.6Arms Continuous Current	AGD301-ET-CKS2	AGD301-ET Connector Kit (Interface Connectors)
		YC-AGC301-xxxx-NH	Encoder Cable for AGD301/155, AGA101/102/155 (xxxx=R41D, R41A, AB11D, AB22A, AB51D, ABA50E, ERA)*
		LC-AGD301-xx	Limit Cable for AGD301 (xx=PQ, FRLS-RFLS)
		YC-AGD301-HALL-K	Hall Cable for AGD301 (PT100)
AGD301-ET-2D09-001	3-axis Drive - 90VDC, 9Arms Continuous Current, with 16-bit Analog Input	YC-AGD301-HALL-K-BRK	Hall Cable for AGD301 (PT100, Brake)
		IC-AGD301-DB37F-04	D-Sub Interface Cable for AGD/AGC301-X4, AGD/AGA155-X6
		IC-AGD301-DB25F-04	D-Sub Interface Cable for AGD/AGC301-ABC3, AGD/AGA155-X5
		C-AGD301-SFT	Safety Bypass for AGD301/155, AGA101/102/155
AGA101-CI-2D01	Central-i Remote Amplifier - 90VDC, 1.4Arms Continuous Current	AGA101-CI-CKS2	AGA101-CI Connector Kit (Interface Connectors)
		YC-AGC301-xxxx-NH	Encoder Cable for AGD301/155, AGA101/102/155 (xxxx=R41D, R41A, AB11D, AB22A, AB51D, ABA50E, ERA)*
AGA101-CI-2D02	Central-i Remote Amplifier - 90VDC, 2.8Arms Continuous Current	YC-AGA101-HALL-J	Hall Cable for AGA101
		LC-AGA101-xx	Limit Cable for AGA101 (xx=PQ, FRLS-RFLS)
AGA101-CI-2D05	Central-i Remote Amplifier - 90VDC, 5.6Arms Continuous Current	LC-AGA101-BRK	Brake Cable for AGA101
		IC-AGA101-DB15F	D-Sub Interface Cable for AGA101-X7
AGA110-CI-5D07	Central-i Remote Amplifier - 190VDC, 7Arms Continuous Current	IC-AGA101-HD15F	D-Sub Interface Cable for AGA101-X10/12, AGA103-X2, AGIO001-X3/4/5/8
		C-AGD301-SFT	Safety Bypass for AGD301/155, AGA101/102/155

Product Part Number	Description	Optional Accessories	Accessories Description
AGA102-CI-1D01	Central-i Remote Amplifier - 48VDC, 1.4Arms Continuous Current	AGA102-CI-CKS2	AGA102-CI Connector Kit (Interface Connectors)
		YC-AGC301-xxxx-NH	Encoder Cable for AGD301/155, AGA101/102/155 (xxxx=R41D, R41A, AB11D, AB22A, AB51D, ABA50E, ERA)*
AGA102-CI-1D02	Central-i Remote Amplifier - 48VDC, 2.8Arms Continuous Current	YC-AGA102-HALL	Hall Cable for AGA102
		LC-AGA102-xx	Limit Cable for AGA102 (xx=PQ, FRLS-RFLS)
		IC-AGA102-DB9F-04	D-Sub Interface Cable for AGA102-X8
AGA102-CI-1D05	Central-i Remote Amplifier - 48VDC, 5.6Arms Continuous Current	IC-AGA102-DB25F-04	D-Sub Interface Cable for AGA102-X7, AGL101-X3
		C-AGD301-SFT	Safety Bypass for AGD301/155, AGA101/102/155
AGA103-CI-1D03	Central-i Remote Amplifier - 48VDC, 2.8Arms Continuous Current	AGA103-CI-CKS2	AGA103-CI Connector Kit (Interface Connectors)
		YC-AGA103-xxxx-NH	Encoder Cable for AGA103 (xxxx=R41D, R41A, AB11D, AB22A, AB51D, ABA50E, ERA)*
		YC-AGA103-HALL-K-xx	Hall + Limit Cable for AGA103 (xx=PQ, FRLS-RFLS)
		IC-AGA103-DB25F-04	D-Sub Interface Cable for AGA103-X1
		IC-AGA101-HD15F-04	D-Sub Interface Cable for AGA101-X10/12, AGA103-X2, AGIO001-X3/4/5/8
		C-AGA103-SFT	Safety Bypass for AGA103
AGA155-CI-2A03	Central-i Remote Amplifier - 230VAC, 3Arms Continuous, 9Arms Peak	AGA155-CI-CKS2	AGA155-CI Connector Kit (Interface Connectors)
		YC-AGC301-xxxx-NH	Encoder Cable for AGD301/155, AGA101/102/155 (xxxx=R41D, R41A, AB11D, AB22A, AB51D, ABA50E, ERA)*
AGA155-CI-2A06	Central-i Remote Amplifier - 230VAC, 6Arms Continuous, 18Arms Peak	YC-AGD155-HALL-x	Hall Cable for AGD/AGA155 (x=J, K)
		LC-AGD155-xx	Limit Cable for AGD/AGA155 (xx=PQ, FRLS-RFLS)
		IC-AGD155-DB15F-04	D-Sub Interface Cable for AGD/AGA155-X4
AGA155-CI-2A10	Central-i Remote Amplifier - 230VAC, 10Arms Continuous, 20Arms Peak	IC-AGD301-DB25F-04	D-Sub Interface Cable for AGD/AGC301-ABC3, AGD/AGA155-X5
		C-AGD301-SFT	Safety Bypass for AGD301/155, AGA101/102/155
AGIO001-CI-1608	Central-i Remote I/O Module - 16 Input, 8 Output	AGIO001-CI-CKS2	AGIO001-CI Connector Kit (Interface Connectors)
		IC-AGA101-HD15F-04	D-Sub Interface Cable for AGA101-X10/12, AGA103-X2, AGIO001-X3/4/5/8
		IC-AGIO001-DB15F-04	D-Sub Interface Cable for AGIO001-X6/9
		EC-DB9-10	D-Sub Extension Cable (D-Sub Interface Cable for AGIO001-X7)
AGIO002-CI-3216	Central-i Remote I/O Module - 32 Input, 16 Output	AGIO002-CI-CKS2	AGIO002-CI Connector Kit (Interface Connectors)
		IC-AGIO002-HD44F-04	D-Sub Interface Cable for AGIO002-X3/4
		EC-HD15-10	D-Sub Extension Cable (D-Sub Interface Cable for AGIO002-X1/2)
AGL101-CI	Central-i Remote Third-party Drive Adapter	AGL101-CI-CKS2	AGL101-CI Connector Kit (Interface Connectors)
		LC-AGL101-PQ-08	Limit Cable for AGL101 (PQ)
		LC-AGL101-FRLS-RFLS-09	Limit Cable for AGL101 (FRLS-RFLS)
		IC-AGL101-HD26F-04	D-Sub Interface Cable for AGL101-X2
		IC-AGA102-DB25F-04	D-Sub Interface Cable for AGA102-X7, AGL101-X3
		IC-AGL101-ASD-xx	Interface Cable for AGL101 to ASD (xx=05, 10)
		IC-AGL101-AGD155-xx	Interface Cable for AGL101 to AGD155 (xx=05, 10)
AGL102-CI	Central-i Remote Third-party Drive Adapter Lite	AGL102-CI-CKS2	AGL102-CI Connector Kit (Interface Connectors)
		LC-AGL102-PQ-08	Limit Cable for AGL102 (PQ)
		LC-AGL102-FRLS-RFLS-09	Limit Cable for AGL102 (FRLS-RFLS)
		IC-AGL102-DB25F-04	D-Sub Interface Cable for AGL102-X3
		IC-AGL102-DB9F-04	D-Sub Interface Cable for AGL102-X4
		IC-AGL102-ASD-xx	Interface Cable for AGL102 to ASD (xx=05, 10)
		IC-AGL102-AGD155-xx	Interface Cable for AGL102 to AGD155 (xx=05, 10)
General	General Accessories	CC-AG-ETHERNET-03	SSTP CAT6 Shielded Ethernet Cable 0.3m (Recommended Length for Daisy Chaining of EtherCAT Slaves)
		CC-AG-ETHERNET-05	SSTP CAT6 Shielded Ethernet Cable 0.5m (Recommended Length for Central-i Master-slave Connection)
		CC-AG-ETHERNET-15	SSTP CAT6 Shielded Ethernet Cable 1.5m (Recommended Length for master/controller to PC/PLC connection)
		CC-AG-ETHERNET-30	SSTP CAT6 Shielded Ethernet Cable 3.0m (Recommended Length for Master/Controller to PC/PLC Connection)

*See List of encoder models for standard cables for more information on encoder code.

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Code	Encoder Models (D-Sub 15)
R41D	RH100, RGH41-D, RGH22-D, TONIC-D, VIONIC-D, ATOM-D, RGH24-D, RGH25-D, RGH200-D, Q4-D, Q101, Q100, ABI-51GD, ABI-51XD
R41A	RGH41-A, RGH22-A, ATOM-A, RGH24-A, TONIC-A, RGH45-A, Q4-L, ABI-52A, ABI-51GA, ABI-51XA
AB11D	AB11D, AB21D, EBI11, EBI1102
AB22A	AB22A
AB51D	ABI-51D, ABI-51GD, ABI-51XD
AB50E	ABA-50E, ABA-50B, ABA-20B
ERA	ERA

Worldwide Sales Network
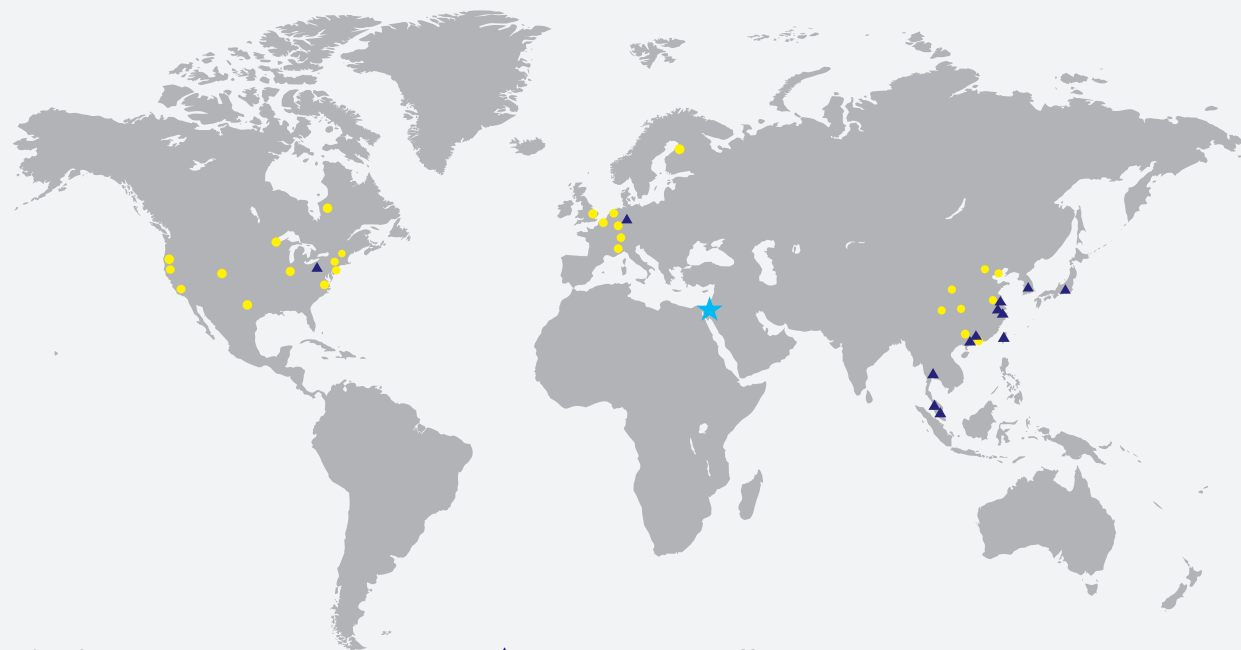
★ R&D Center   ▲ Regional sales office   ● Distributor

R&D Center

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Agito Akribis Systems reserves the right to change the specifications of the product
described in this manual without notice at any time.