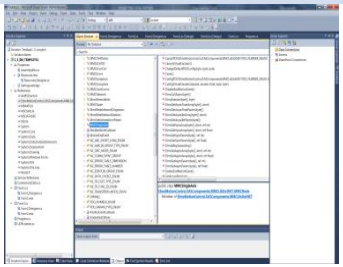
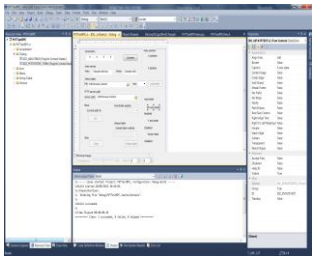
HOST Programming Environment Options

GMAS .NET API



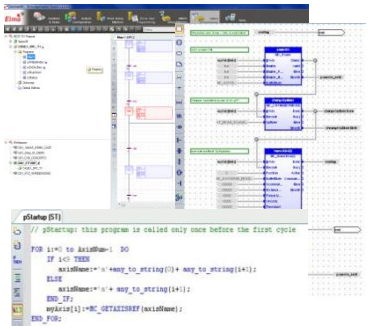
GMAS .NET API libraries using Standardized PLC Open motion and administrative functionality to program your application on Microsoft Visual Studio IDE Environment.

GMAS Windows Library



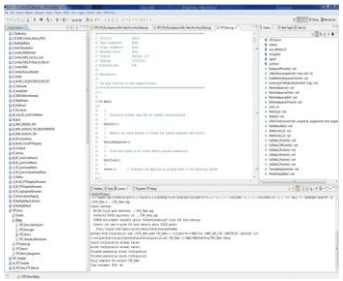
GMAS Win32 libraries for RPC (Remote Process Control) using C/C++ Microsoft visual Studio environment programing, based on standard PLC Open motion and administrative functions.

PLC Open IEC 61131-3 programing



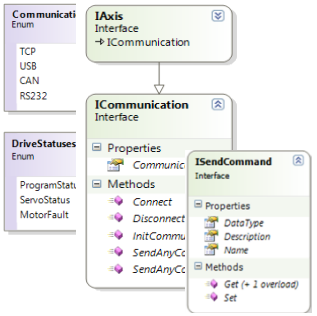
Built-in EAS IDE for IEC6113-1 Standardized PLC Open Programming that supports all 5 languages: SFC, FBD, LD, ST, IL.

GMAS Developer Studio C/C++ IDE



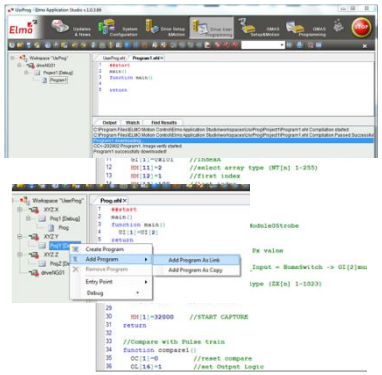
GMAS Developer Studio (Eclipse Based) IDE for Native C/C++ Programming languages , based on standard PLC Open motion and administrative functions.

Drive .NET API



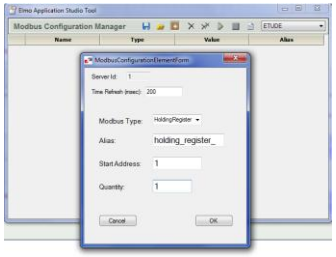
.NET API for Drive level functions such as Download FW, Send/Get drive Commands, Error Handling etc. for direct communication between the Host computer and the drive.

Drive User program IDE



Built-in EAS IDE with up to 48Kbyte for local drive level user programing.

Modbus TCP protocol



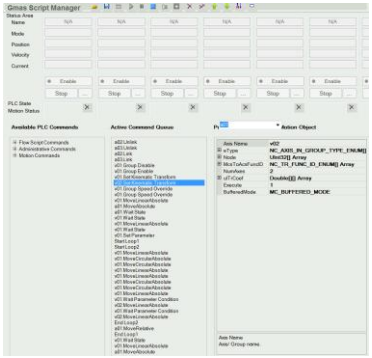
Standardized Modbus-UDP protocol for communication with Host Computers, HMI and PLC...

Ethernet IP protocol

EtherNet/IP™

Standardized Ethernet-IP protocol for communication with Host Computers, HMI, and PLC...

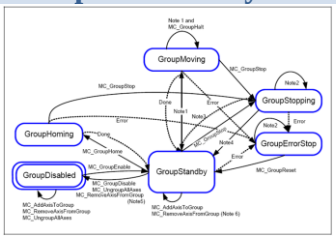
GMAS Script Manager



Built-in In EAS (Elmo Application Studio) GSM tool for writing fast machine motion sequences.

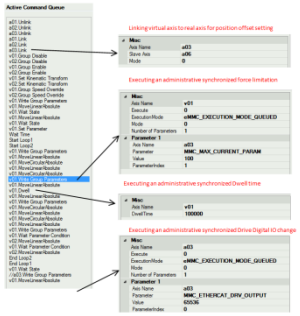
Network Group Axis Motion

Group motion - By the book PLCopen



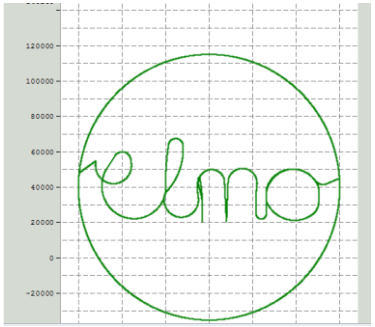
Group motion and API is performed according to the PLCopen Group State machine.

Huge Motion and Administrative Buffers



User can insert up to 1000 Group axis motion blocks in advance, while defining real time scenarios to occur between function blocks (Speed Changes, Torque Changes, IO Changes etc.)

Coordinated Motion

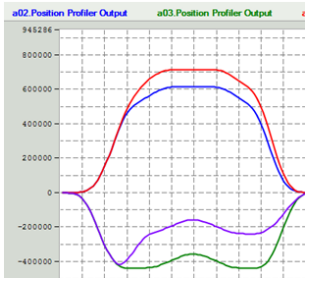


PLCopen standard Linear and Circular motions

Synchronized Groups Up to 16 axes

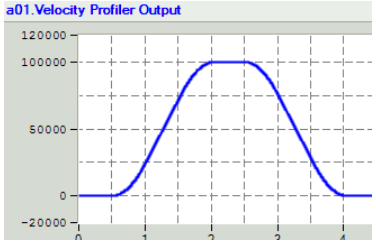
User can define up to 16 groups with up to 16 axes (physical or virtual) per group, for synchronized motions.

On The Fly End point modification



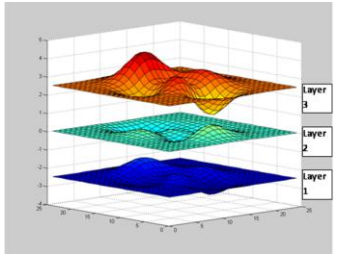
User can modify the endpoint of ongoing motion blocks

Full Jerk Support



64 bit, real-time, double precision profile calculations, allowing full on-the-fly control over speed, acceleration, deceleration and jerk

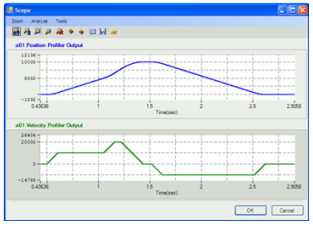
2D, 3D Error Correction Support



Error Correction

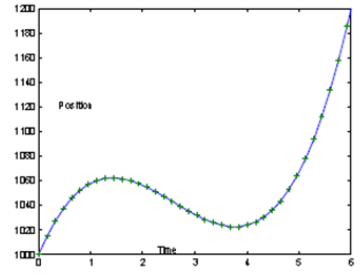
Compensates for pitch variations, stage bowing and misalignment. The feature allows position corrections for 1D, 2D and 3D systems such as XY tables, etc.

Motion Blending



Velocity change on the fly to specific velocity command (Previous, Next, High, Low command) without stopping the motion

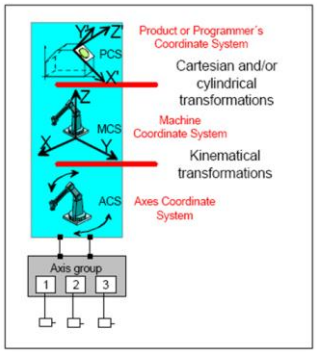
Arbitrary Path Generation (PVT)



User can specify a prepared or on the fly path, up to 16 axes - with discrete position, velocity and time. The GMAS will interpolate (5th order) to create a smooth and contiguous path

Network Group Axis Motion

PLCopen Coordinate Systems

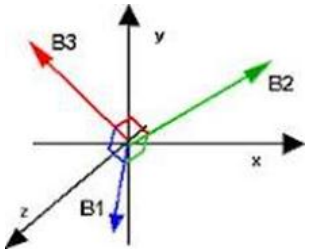


GMAS supports the following PLCopen coordinate systems:

ACS – Axis-related coordinate system

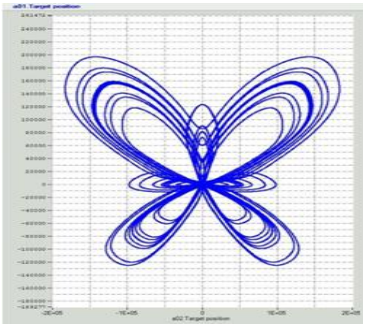
MCS – Machine-related coordinate system

Network Group Limits (Safe Zones) Support



Safe Zones can be set to avoid entering prohibited areas.

Spline Support

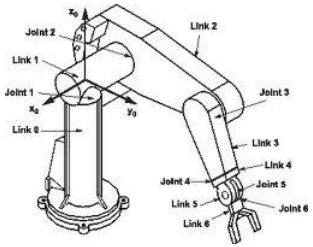


User can define either to work in Fixed time or Constant Velocity spline modes.

"On the fly" position and velocity offset setting

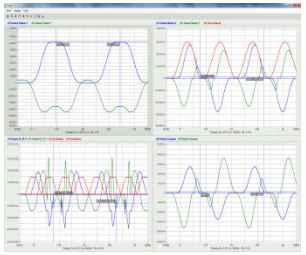
Link/Unlink a virtual profile to your real motion profile "On the Fly" during motion trajectory running time.

Kinematics



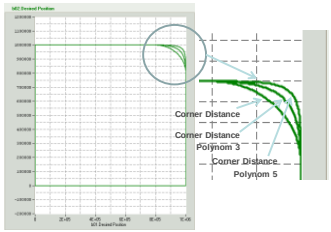
GMAS can execute complex defined real time Kinematic Transformations for machine related coordinated systems.

Powerful wire and die bonding solutions



Extremely fast and smooth operation in position, velocity, acceleration and deceleration using special transitions between segmented motion function blocks.

Transition Curves



Arc segments that are inserted automatically by the GMAS pre-profiler module to guarantee that every two consecutive motions are contentiously and smoothly mandated. GMAS supports

3rd, 5th and 6th polynomial order calculations to promise smooth continuity in velocity and accelerations.

Network Single Axis Motion

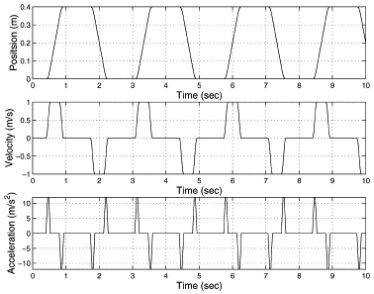
Axis motion - By the book PLCopen

Single axis motion and API is performed according to the PLCopen Single Axis State machine.

Huge Motion and Administrative Buffers

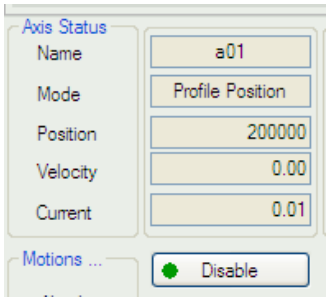
User can insert up to 1000 Single axis motion blocks in advance, while defining real time scenarios to occur between function blocks (Speed Changes, Torque Changes, IO Changes etc.).

Simple Point to Point motion



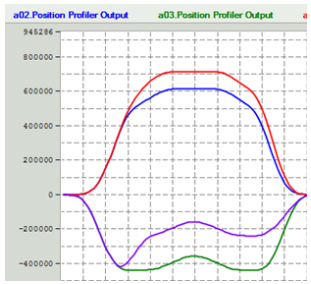
User can perform any motion. From simple point to point motions to complex synchronized motions

Using the Drive Profiler - Distributed Motion



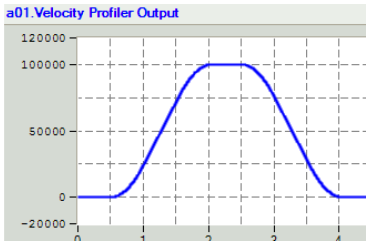
User can choose to use the drives profiler while the GMAS only controls the beginning and end of motion commands.

On The Fly End point modification



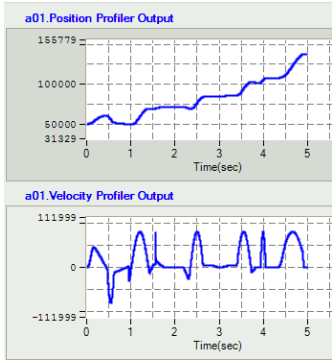
User can modify the endpoint of ongoing motion blocks

Full Jerk Support



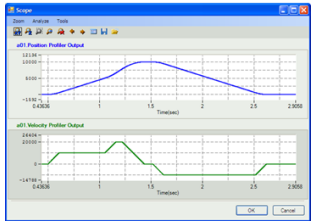
64 bit, real-time, double precision profile calculations, allowing full on-the-fly control over speed, acceleration, deceleration and jerk

Using the GMAS Profiler - Numerical Control (NC) motion



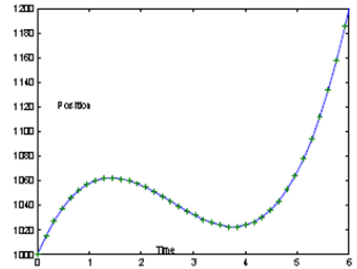
User can choose to use the motion profiles generated by the GMAS. The GMAS will download the target point every defined cycle time.

Motion Blending



Velocity change on the fly to specific velocity command (Previous, Next, High, Low command) without stopping the motion

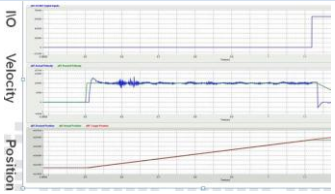
Arbitrary Path Generation (PVT)



User can specify a prepared or on the fly path with discrete position, velocity and time. The GMAS will interpolate (5th order) to create a smooth and contiguous path

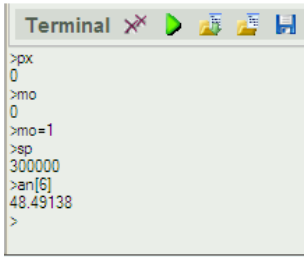
Network Single Axis Motion

Network Limits Support



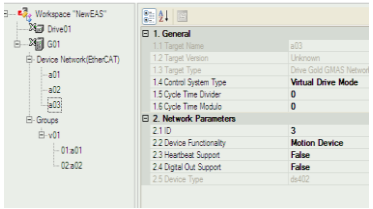
Software and Hardware Limits are handled by the GMAS Network Controller.

Optimized Methods for Communicating with native drive protocol over gateway



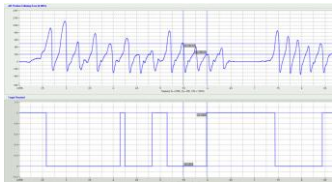
Optimized Communication methods with drives with the native drive protocol

Virtual Axis Support



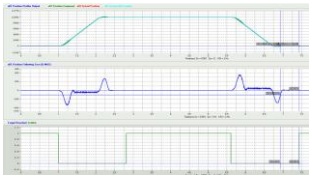
User can define and emulate a full motion system without actual drives or mechanics by defining an axis a "Virtual Axis"

In Target Support



In Target is handles by the GMAS network controller

Network based Following Error Support



User can modify the endpoint of ongoing motion blocks

Communication To Devices

Number of Axes

GMAS supports up to 100 devices on CAN or Ether CAT fieldbuses

DS401 - IO Devices Protocol Support

Standard CAN Open DS 401 IO Protocols supported.

Ether CAT Protocols

CoE - CAN Over Ethercat. Standard DS402 over the Ethercat Network

EoE - Ethernet Over Ethercat. Ability to communicate with drives with native drive language.

FoE - Ability to download firmware to FULL Ethercat network simultaneously.

Standard CANopen

CANopen

Whether the device is a motion device, Encoder, or IO - The GMAS can be configured to communicate with the selected device

DS402 -Drive Motion Protocol Support

Protocol to drives is strict DS402 supporting the following protocols:

- Cyclic Position
- Cyclic Velocity
- Cyclic Torque
- Interpolated Position
- Profile Position
- Profile Velocity
- Profile Torque
- Homing

DS406 -CAN Encoder

Ability to configure and read position of CanOpen Encoders on the CAN Network

3rd Party EtherCAT IO modules support

Support 3rd party EtherCAT IO modules for controlling and monitoring analog and digital IO's.

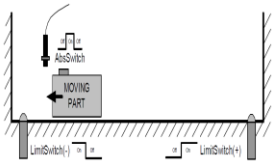
Virtual CAN Encoder

CANopen

GMAS can simulate a CAN encoder on the network, thus saving on expensive CAN device.

Special Functionality

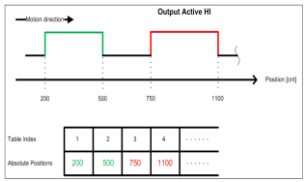
Homing



Support all DS402 and PLC Open Homing methods such

- RLS, FLS
- Home Switch
- Index mark
- Home On Block
- Immediate Homing
- Absolute encoder home

OC (Output Compare, Pegs) functionality



Trigger fast digital output as a function of socket position

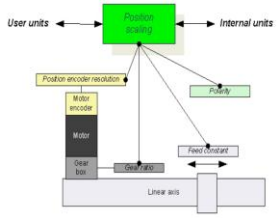
- Tabulated Absolute Position
- Tabulated Time Duration
- Absolute Position + Delta Position
- Absolute Position + time duration

Master - Slave Follower

Elmo Gold servo drivers provide built-in capabilities for Master-Slave follower configurations

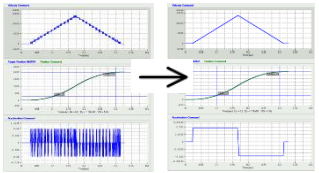
- Position follower
- Velocity Follower
- Current follower

Scaling factors



Scaling factors using DS 402 UU (User Units) for position, Velocity and acceleration scaling.

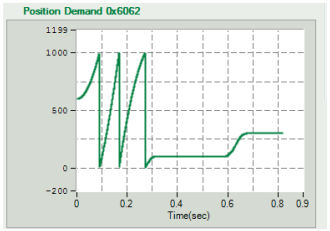
Cyclic Modes position/Velocity/Torque offsets



Position/Velocity & Torque Offset support.

Velocity offset (DS402 object 0x60B1) mapping for smooth velocity and acceleration profiles

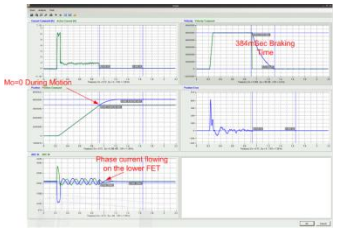
Modulo



32 bit modulo with special RADO (Rotary Axis Direction Option)

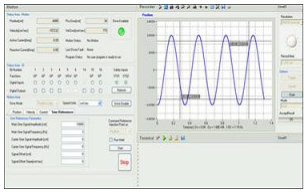
- Normal positioning
- Negative movement
- Positive movement
- Positioning with shortest way

Dynamic Braking



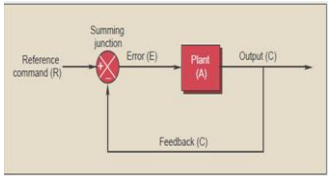
Logical Braking for reduced braking time.

Sine Sweep Emulation



Simple BW test by the user using EAS sine sweep interface.

Reference commands

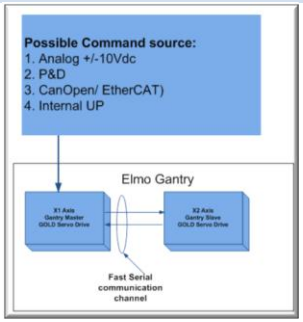


Wide range of profiler reference commands

- CanOpen/Ether-CAT DS402 based standard
- Analog (+-10V)
- P&D
- User Program

Special Functionality

MIMO Based Gantry solution



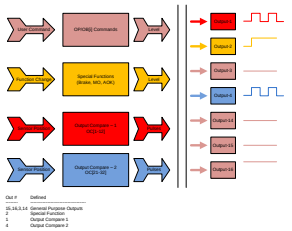
Gold Drives' powerful control enables true synchronization between 2 gold drive without the need to designate, and thus waste, an entire motion controller exclusively on Gantry Realization.

Gantry Absolute and differential 1D error correction

Differential and Absolute 1 Dimension error correction implementation on the drive level.

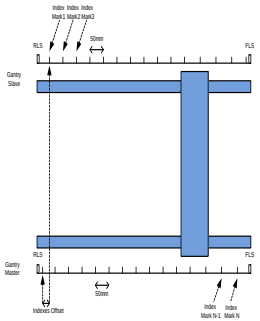
In both Master and slave axes the error correction mechanism is active.

OC function in Gantry system



Output compare functionality for triggering external equipment as a function of the Master axis position is supported in Gantry system

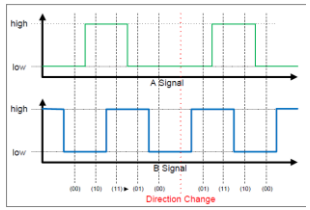
Gantry Home Offset Measurement



Special procedure for measuring the offset between two indexes located on separate linear scales of a Gantry system.

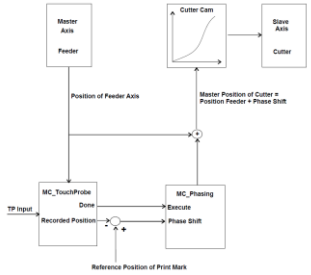
Both Master and Slave motors are powered on and operating in Gantry mode during the whole measurement time.

Feedback Emulation in Gantry system



Quadrature/Analog/ absolute feedback emulation in a standalone or network based Gantry system

ECAM and Gearing

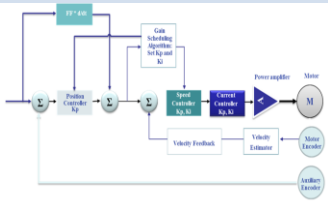


Standardized PLC Open ECAM and Gearing functionality.

Linear and cyclical ECAM with fixed or different segment gaps.

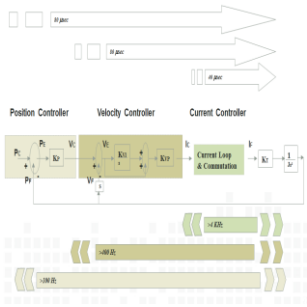
Servo capabilities

PIP cascaded Vector control



Advanced and extremely fast vector control

1:2:2 servo control topology

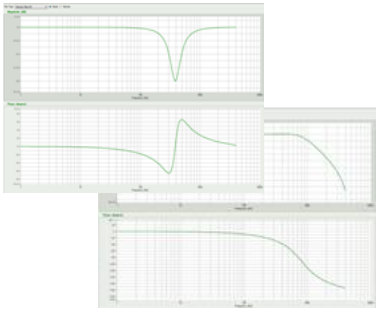


Current Control Loop sampling time down to 40 us (25 kHz)

Velocity Loop sampling time down to 80 us (12.5 kHz)

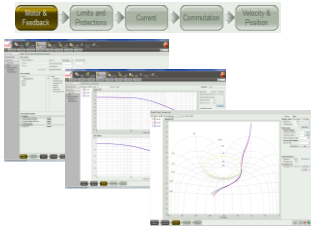
Position Loop sampling time down to 80 us (12.5 kHz)

High order filters



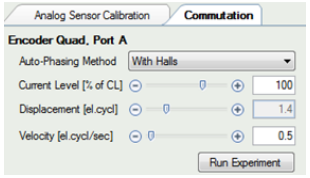
Low Pass, High Pass , Notch ,Anti-Notch , Lead lag and 2nd order general filters for overcoming “defects” of the mechanical system

Advanced Tuning



Fast, easy and efficient advanced Automatic Tuning tool.

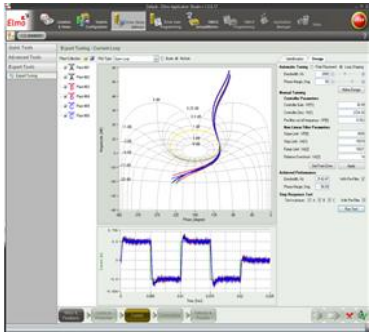
Commutation options



Choose your most application suitable commutation method:

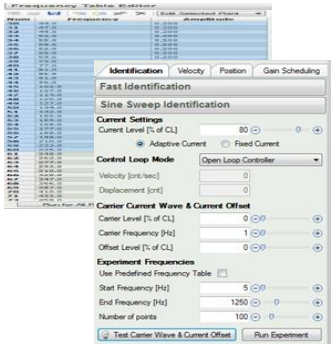
- Stepper
- Digital halls
- Analog halls
- Binary search
- Auto phasing

System analysis



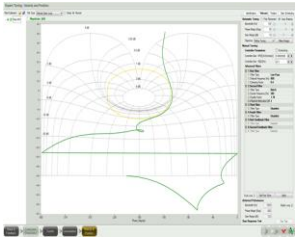
System analysis in the time domain (Step Response) and frequency domain (Nichols, Bode)

Plant Identification methods



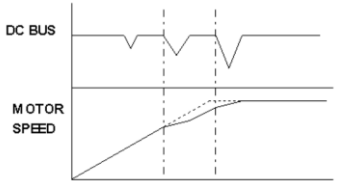
Multiple plant, fast identification or Sine sweep Identification

Controller Design methods



Automatic Controller design methods or Manual design for the advanced control engineer

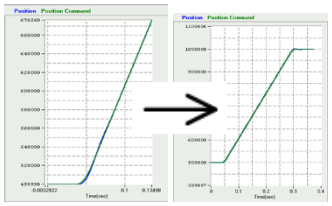
Current Gain Scheduling



Current gain scheduling to compensate for the motor's non-linear characteristics and for bus voltage variations

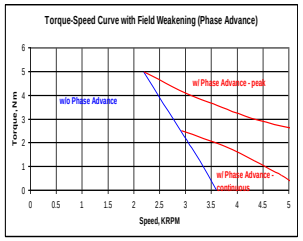
Servo capabilities

Friction Compensation



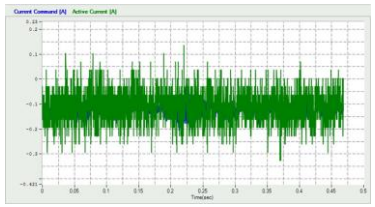
- Using nonlinear compensation method to overcome friction by adding an offset command to the integral filter of the velocity loop
- velocity GS table

Field weakening (Phase advance)



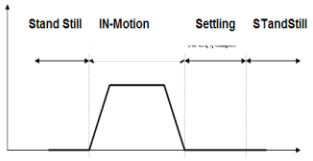
Enhanced torque-speed operation using advanced field weakening.

2000:1 Current dynamic range



Highest current (Torque/ Force) dynamic range of >2000

3 step Gain scheduling

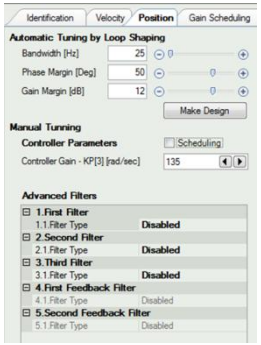


Using 3 controller gain sets before, during and after motion.

1 Dimension Error correction

Error Mapping for high system accuracy.

Velocity and position Gain scheduling



Velocity and Position gain scheduling for ultimate servo loop performance.

Any Servo Motor Control

- Brush and Brushless
- AC Servo
- Rotary & Linear
- Torques (DDR)
- Voice Coil (DC)

Stepper motor control

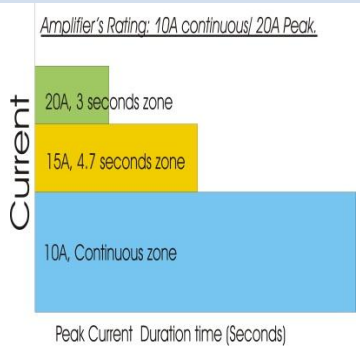
High speed 2 Phase, 3 Phases open and close loop stepper motor control.

Planar stage control

MIMO (Multi Input Multi Output) control solution structure for Planar X/Y systems.

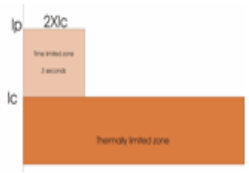
Servo capabilities

I2t Protection



Keeping constant Thermal Stress (I^2t) for all peak currents and thus avoiding the amplifier from "over stressing" and keeping it within the safety limits.

Current Limits

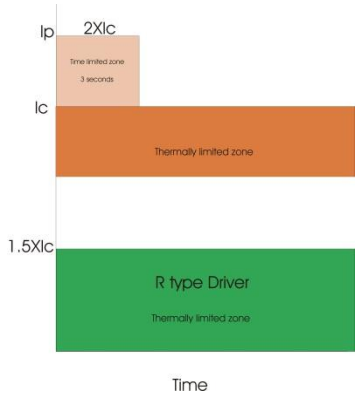


In Elmo Amplifiers & Drives:

- $I_P = 2X\ I_C$

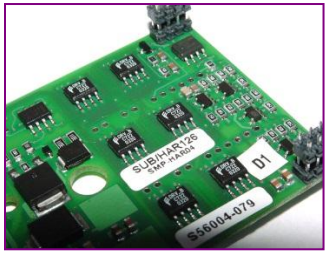
Peak Duration for rated I_P ≈ Typical 3 seconds

"R" Type current limits



stead of having "fuse" I^2t limits to the I_P, the R type has not I_P capabilities, but only continuous current capabilities that is higher than the "traditional" I_C (by 1.5) and is only thermally limited.

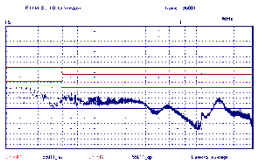
Power Switching- FASST



The FASST Technology is realized in the FID, Elmo's fully customized analog/digital IC designed to "Optimum Drive" of power MosFETs and IGBTs

- Provides fast and highly efficient switching
- Keeps process "soft" with no stress on power device with very low EMI

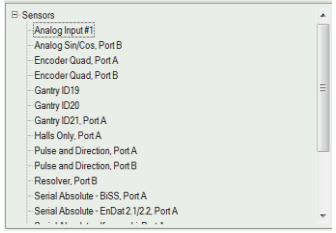
Power Switching- FASST- Low EMI



Low EMI below the conductive medical standard.

Advanced Feedback Technology

Simplicity in Feedback Configuration

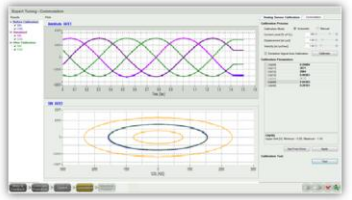


Elmo's "**Socket Technology**" embedded in Gold Drives and supported by the EAS, enables the quick and simple set-up of any type or configuration of encoders.

Dual loop options

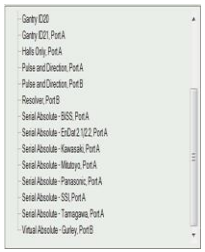
Gold Servo Drives support Port A and Port B manipulations. This also applies to Dual Loop applications, dual sensor motors, etc.

Analog Encoder Sin/Cos, Port B



Using internal Programmable multipliers: x4 to x8192 to achieve high analog encoder resolutions.

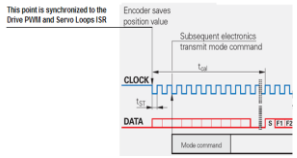
Absolute position sensors



Gold Drive Absolute Position Sensors support:

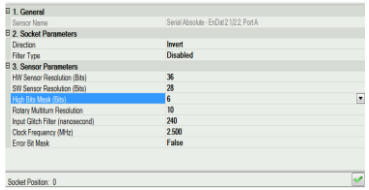
- Serial Absolute - EnDat 2.1/2.2
- Serial Absolute – BiSS
- Serial Absolute – Panasonic
- Serial Absolute – Tamagawa
- Serial Absolute – Mitutoyo
- Serial Absolute – SSI
- Virtual Absolute – Gurley

Up to 32 bit absolute resolution



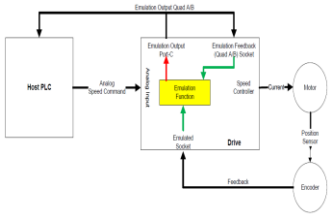
Gold absolute encoders can reach up to 32 bits per revolution, up to 2.5 MHz clock frequencies and automatic propagation delay compensation.

Absolute encoder masking



For operating higher-resolution absolute encoders, the user can mask both upper and lower bits via the EAS without any performance degradation.

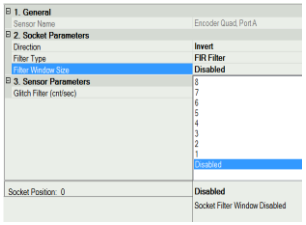
Emulation , Port C



Feedback Emulation (socket) into one of the following signals format:

- A & B quadrature
- Pulse & direction
- Up & down
- Hall signals

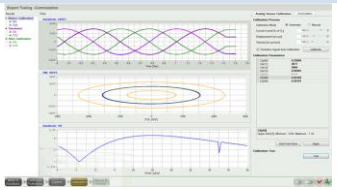
FIR and Glitch Filters



For "smoother" operation and improved noise immunity, the FIR (Finite Impulse Response) filter and "Glitch" filters can be used.

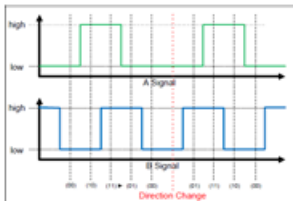
Advanced Feedback Technology

Resolver



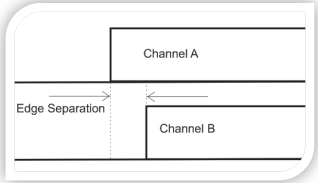
Programmable reference frequency: 1/(2*TS*N), N=1/2,1, 2, 4 (Ts = sample time in micro seconds)

Max encoder frequency



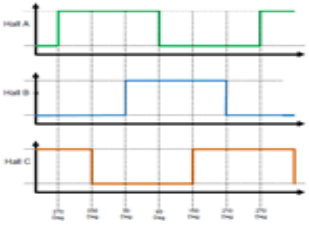
Up to 18 MHz PPR (Pulses Per Revolution) Maximum incremental encoder frequency.

Edge Separation



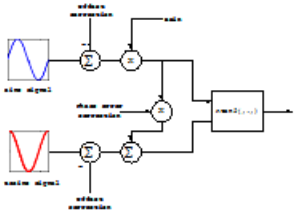
Quadrature Edge Separation

Digital halls



The “Halls Only” feedback application is used to control the commutation, current loop, velocity loop and position loop.

Analog signal corrections



Correction for offset, amplitude and phase mismatch in analog sensors (Resolver, Analog Hals, Analog Sin/Cos)

Hardware solutions

Gold product family Servo Drives

Sophisticated Motion Control Solutions for Modern Industrial Automation.

DC Input: 7.5 to 750 VDC - for DC brush, sinusoidal and trapezoidal motors

Drive Motor solutions

"All in One" solutions of motor Drive and feedback combined in one package.

SimplIQ product family servo drives

Elmo Motion Control's SimplIQ product family is a set of sophisticated AC and DC input voltage based, network-based motion control products for brush, brushless and linear motors

Power supplies

Compact, cost effective, direct-to-mains power supplies, designed for multiple servo drives solutions.

ExtrIQ Line Servo Control Products

Digital Servo Drives, and Analog Servo Amplifiers suit military and Extreme Environmental Conditions

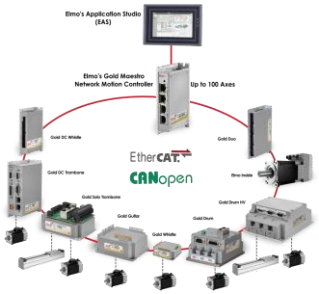
Network Motion Controller

Elmo's Gold Maestro leads the market when it comes to advanced, fast, precise, easy-to-use, and cost-effective distributed networking motion controllers.

Military Motion Controller

Elmo's Military Motion Controller, the Puma, has a compact rugged, MIL-style casing, that contains an advanced, easy-to-use, and cost-effective multi-axis Network Motion Controller and 2 extremely powerful Gold Hornet servo drives of up to 20 A/100V (3.3 Kw) each

One Solution, Any Application



- The Elmo Application Studio (EAS) – a multi-functional and friendly design environment
- The Gold Maestro - a true network-based, machine motion controller that can handle up to 100 axes
- High-performance, advanced and intelligent Servo Drives