



Motion Control

Digital Servo Drives & Technical Data



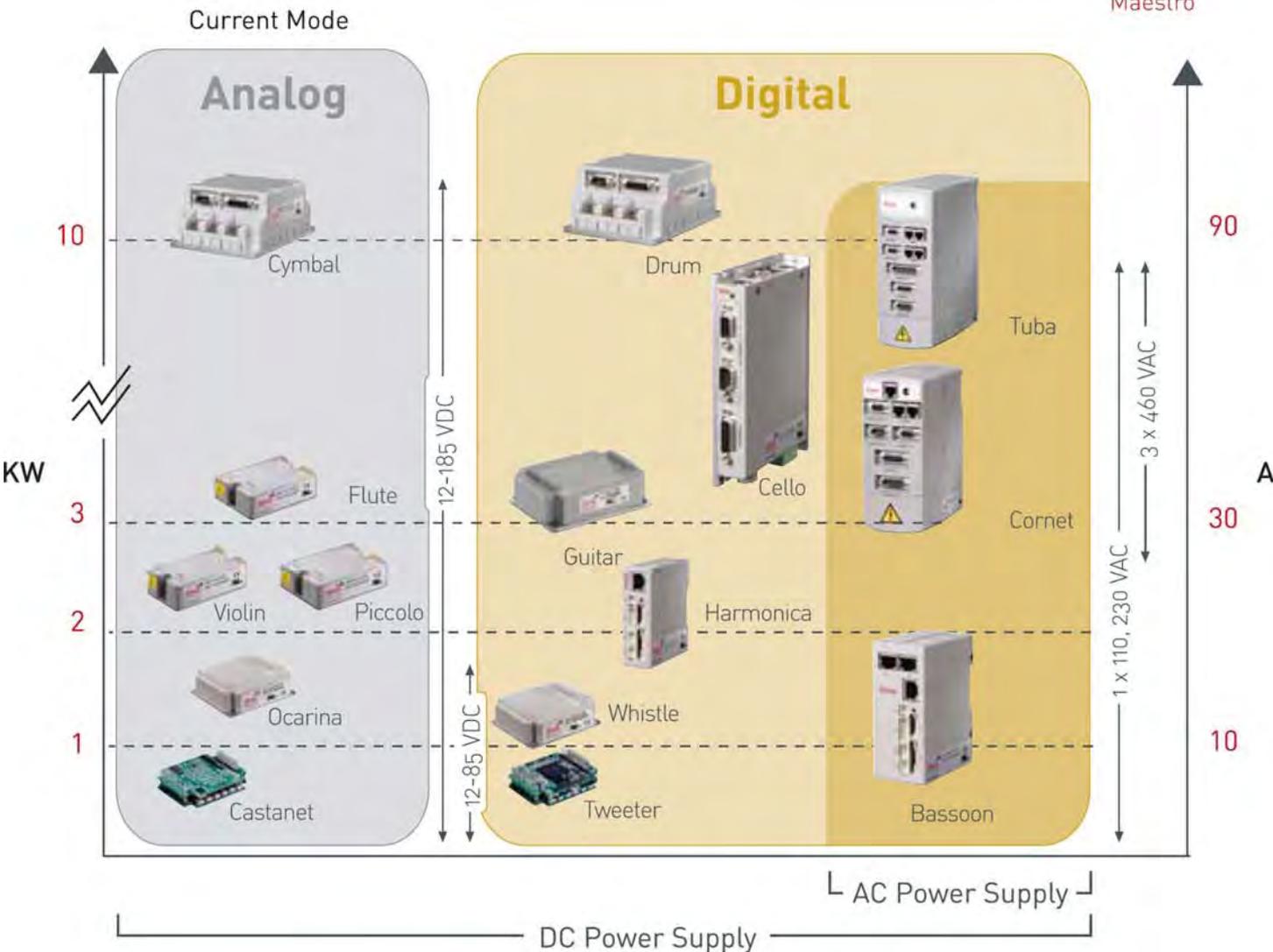
SimplIQ

Superior Servo Technology Products



www.motiontech.com.au

SimpliQ Product Range



Elmo manufactures a wide range of analog amplifiers and digital servo drives. Our digital and analog servo drives can provide up to 14KW continuous power. Elmo's digital servo drives are available in AC input and DC input models. The pages that follow describe our drives and amplifiers in more detail.

Table of Contents

A) **SimplIQ**

For general purpose, industrial applications:

• Features	4
• Tweeter , 7.5~95VDC, 2.5~3.3A	5
• Whistle Family , 7.5~95VDC, 1~20A	6
• Solo Guitar , 11~195VDC, 3~45A	7
• Guitar , 11~195VDC, 3~45A	11
• Harmonica , 10~195VDC, 2.0~13.3A	14
• Cello , 10~195VDC, 2.25~30A	15
• Drum , 11~390VDC, 18~90A	16
• Bassoon , 1x30~270VAC, 1~6A	17
• Cornet , 1x60~3x505VAC, 1.4~9A	18
• Tuba , 1x60~3x505VAC, 12~20A	19
• Current Mode Servo Amplifiers for use with brush or brushless motors (overview)	20

B) **ExtrIQ**

1. Extreme Environmental Servo Drives Ruggedised drives for extreme environmental conditions such as shock and vibration.	21
2. Extreme Environment Motion Controller	21-23

Common Features for all SimplIQ and ExtriQ drives

Feature	Unit	Specification
Servo Modes		Current, Velocity, Position, Advanced Position
Programming		SimplIQ
Communication		RS-232, CANopen: DS402, DS305
Commands		Analog, PWM, Pulse and Direction, Software Commands
Feedbacks		Incremental Encoder, Resolver, Digital Halls, Analog SIN-COS, Absolute Hall, Tachometer, Potentiometer
Software		Composer
PWM switching frequency	KHz	22 ± 5% default on the Motor
Switching method		Advanced Unipolar PWM
Current Loop Bandwidth	KHz	<2.5
Current Sampling Rate	KHz	Up to 16, default 11
Velocity Loop Bandwidth	Hz	<350
Velocity Sampling Rate	KHz	Up to 8, default 5.5
Position Loop Bandwidth	Hz	<80
Position Sampling Rate	KHz	Up to 4, default 2.75
Maximum heat sink temperature	°C (°F)	85°C - 88°C (185°F - 190°F)
Ambient operating temperature	°C (°F)	0° ~ 40°C (32° ~ 104°F)
Storage temperature	°C (°F)	-20° ~ 85°C (-4° ~ +185°F)
Maximum humidity	%	90% non-condensing
Maximum Operating Altitude	m (ft)	up to 10,000 (30,000)

Feature	Standard Models	Advanced Models (adds an "A" to model number)
CANopen interface (DS 301, DS 402)	Yes	Yes
Current mode	Yes	Yes
Velocity mode, follower	Yes	Yes
Position jog, follower, point-to-point	Yes	Yes
Pulse and direction input	Yes	Yes
Dual loop, velocity and position	No	Yes
PT position versus time mode	Yes	Yes
PVT position and velocity versus time	Yes	Yes
ECAM / Follower	No	Yes
Overall user program size	2 KB	32 KB

Drive Evaluation Boards

Whistle, Bell & Guitar Evaluation Board

The combined Evaluation Board has the following advantages:

1. It can evaluate three different types of drives:
 - Whistle Servo Drive Controller
 - Guitar Servo Drive Controller
 - Bell Stepper Drive
2. D-type for logic, RJ for communication and Phoenix connectors for power can be easily connected to the Evaluation Board.
3. The Evaluation Board has the following additional features:
 - Main buffered output.
 - Differential ports for auxiliary feedback input/output.
 - Powerful digital outputs (I_{out} ≤ 250 mA).
 - Flexibility for digital inputs (from 5 V ≤ V_{in} ≤ 24 V).
 - Powerful output for the brake (I_{out} ≤ 500 mA - separate output via a Phoenix connector).
 - Support for CAN Communication in daisy chain mode.
 - Visual indication for all the digital outputs and the brake.
 - Intelligent power supply coupling.



Tweeter



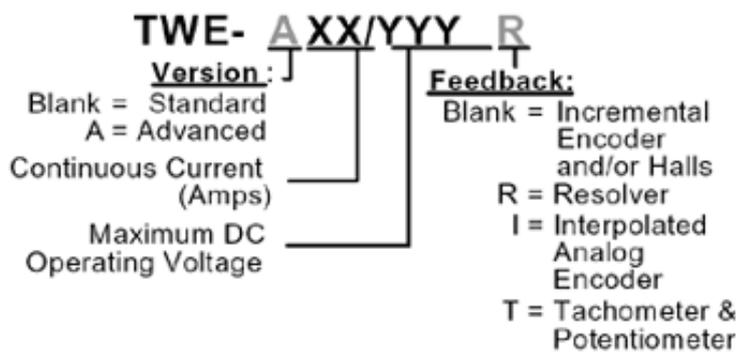
Miniature DC-Powered Digital Servo Drive

Ultra-light and intelligent digital servo drive

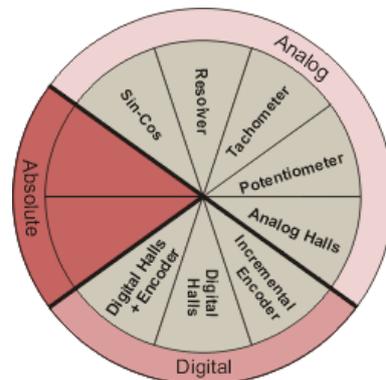
The Tweeter is a series of ultra-light intelligent digital servo drives for DC brush and brushless motors, linear motors and voice coils. Despite weighing only 0.95 oz (27 g) the Tweeter can support up to 3.3 amps continuous current. Its high density allows the drive to deliver a peak of 400 W of power and 200 W of continuous power. Based on Elmo's *SimpliQ* technology, the Tweeter is capable of operating in position, velocity and current modes and contains a wide range of feedback and I/O options. With Elmo's Composer software, users can easily perform drive setup, configuration, tuning, analysis and programming. The drive operates on DC power. The Tweeter is a PCB mounted device which enables an efficient, cost saving implementation.

Feature	Units	3/60	2.5/100
Minimum supply voltage	VDC	7.5	12
Nominal supply voltage	VDC	50	85
Maximum supply voltage	VDC	59	95
Maximum continuous power output	W	160	200
Efficiency at rated power (at nominal conditions)	%	> 99	
Maximum output voltage		> 95% of DC bus voltage at f=22 kHz	
Auxiliary power supply	VDC	11 – 95 VDC (up to 2.5 VA inc. 5 V/200 mA for encoder)	
Amplitude sinusoidal/DC continuous current	A	3.3	2.5
Sinusoidal continuous RMS current limit (Ic)	A	2.3	1.8
Peak current limit	A	2 x Ic	
Weight	g (oz)	27 g (0.95 oz)	
Dimensions	mm (in)	51 x 12.5 x 42 (2" x 0.49" x 1.65")	
Digital in/Digital out/Analog in		6/2/1	
Mounting method		PCB mount or soldered pins	

Product Catalogue Numbering



Feedbacks Supported



Accessories

Evaluation Board

An evaluation board that uses standard terminal plugs, RJ-45 and D-sub connectors is available. It is accompanied by documentation that describes how to set up the board, and by a complete set of cables.



Whistle Family

The Unmatched Space Saver
Highly compact and intelligent digital servo drive



The Whistle is a series of intelligent miniature digital servo drives for DC brush and brushless motors, linear motors and voice coils. The matchbox-sized servo drive weighs only 1.8 oz (50 g) and supports up to 20 amps continuous current. Its high density allows the drive to deliver a peak of 2400 W of power and 1600 W of continuous power. Based on Elmo's **SimpliO** Motion Control technology, the Whistle is capable of operating in position, velocity and current modes and contains a wide range of feedback and I/O options. The drive operates on DC power. The Whistle is a PCB mounted device that enables efficient and cost saving implementation.

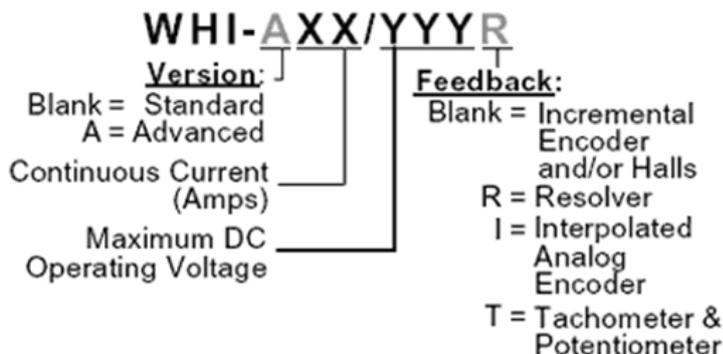
Elmo also offers a range of Whistle-based products including:

- The DUO and TRIO - integrated Whistle solutions that provide the power of two and three Whistle servo drives, respectively, in a single board
- The Whistle Evaluation Board

Feature	Units	15/48	20/48	1/60	2.5/60	5/60	10/60	15/60	20/60	1/100	2.5/100	5/100	10/100	15/100	20/100	
Minimum supply voltage	VDC	6			7.5						12					
Nominal supply voltage	VDC	42			50						85					
Maximum supply voltage	VDC	48			59						95					
Maximum continuous power output	W	600	800	50	120	240	480	720	960	80	200	400	800	1200	1600	
Efficiency at rated power (at nominal conditions)	%	> 99														
Maximum output voltage		> 95% of DC bus voltage at f = 22 kHz														
Auxiliary power supply	VDC	11-95 VDC (up to 2.5 VA inc. 5 V/200 mA for encoder)														
Amplitude sinusoidal/DC continuous current	A	15	20	1	2.5	5	10	15	20	1	2.5	5	10	15	20	
Sinusoidal continuous RMS current limit (Ic)	A	10.6	14.1	0.7	1.8	3.5	7	10.6	14.1	0.7	1.8	3.5	7	10.6	14.1	
Peak current limit	A	2 x Ic														
Weight	g(oz)	50 g (1.8 ounces)														
Dimensions	mm(in)	55 x 15 x 46.5 mm (2" x 0.6" x 1.8")														
Digital in/Digital out/Analog in		6/2/1														
Mounting method		PCB Mount														

Feature	Units	3/200	6/200	10/200
Minimum supply voltage	VDC	24		
Nominal supply voltage	VDC	170		
Maximum supply voltage	VDC	195		
Maximum continuous power output	W	480	960	1600
Efficiency at rated power (at nominal conditions)	%	> 99		
Maximum output voltage		> 95% of DC bus voltage at f = 22 kHz		
Auxiliary power supply	VDC	12 to 95 VDC (up to 6 VA inc. 5 V/2 x 200 mA for encoder)		
Amplitude sinusoidal/DC continuous current	A	3	6	10
Sinusoidal continuous RMS current limit (Ic)	A	2.12	4.24	7.07
Peak current limit	A	2 x Ic		
Weight	g (oz)	55 g (1.94 oz)		
Dimensions	mm (in)	55 x 15 x 46.5 (2" x 0.6" x 1.8")		
Digital in/Digital out/Analog in		6/2/1		
Mounting method		PCB mount		

Product Catalogue Numbering



Solo Whistle



Integrated Whistle Solution

Ideal for DC brush & brushless, sinusoidal & trapezoidal motors.
 Integrated Whistle solution, DC voltage input for DC brush, sinusoidal & trapezoidal motors

The **Solo Whistle** is an integrated solution designed to simply and efficiently connect Elmo's Whistle Servo Drive directly to the application. The solution consists of the Whistle, plus a helpful connection interface that can either eliminate or reduce the development time and resources required to design the PCB for an application

Solo Whistle Highlights:

- Advanced motion control capabilities in a highly compact package
- Supports a wide variety of feedbacks
- High level programming environment
- Highest power density incorporated with Elmo's *SimpliQ* core servo and motion rich capabilities
- Mountable anywhere-in the motor, in the machine, on the load, attached to the moving part, etc.
- Ready-to-use, no need for PCB design

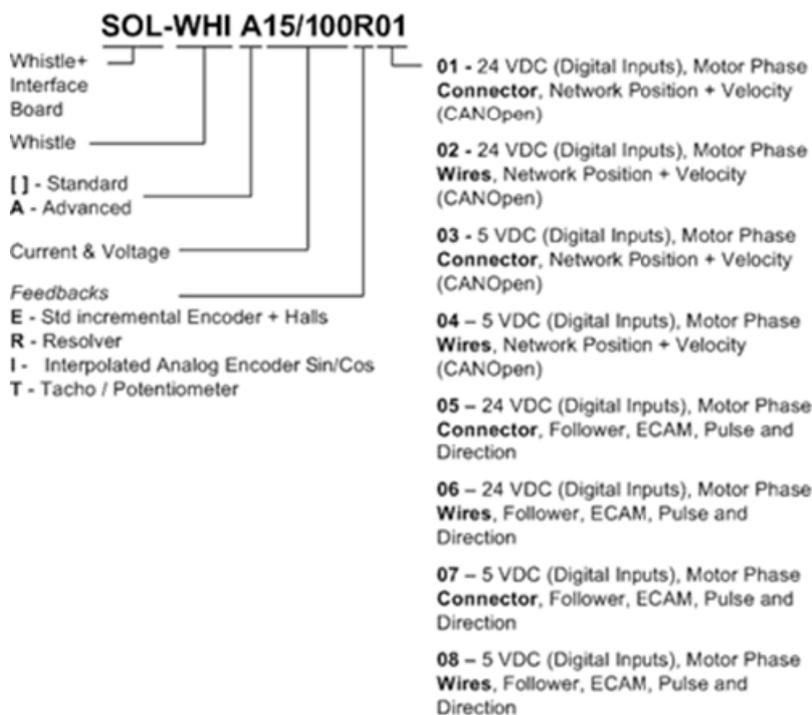
The Solo Whistle is available in two auxiliary feedback configurations.

The Solo Whistle with Auxiliary Input Feedback is an integrated solution that receives either the position command data of the master encoder (in follower or ECAM mode), or a pulse and direction command. The input feedback configuration is indicated by the last two digits of the product part number: 05 up to 08.

- The Solo Whistle with Auxiliary Output Feedback provides the main or emulated differential buffered auxiliary incremental encoder signals. This configuration is indicated by the last two digits of the product part number: 01 up to 04.

As with other Elmo *SimpliQ* digital products, the Solo Whistle can be easily set up and tuned with Elmo's Composer software tools.

Product Catalogue Numbering



Duo Whistle

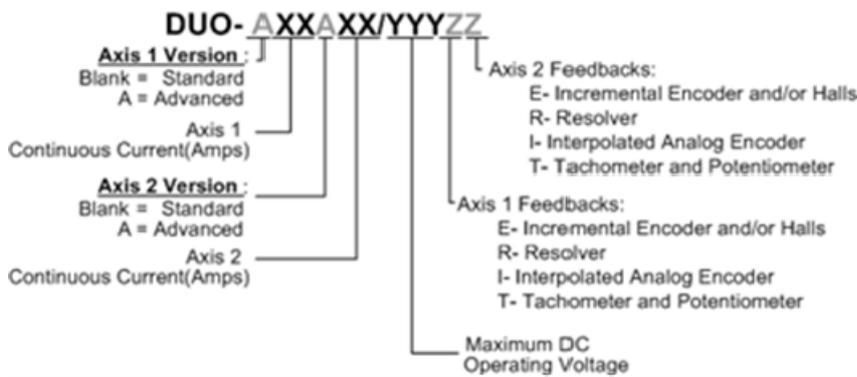


Integrated Dual Whistle Solution:

The power of two Whistle servo drives in a single board solution

Elmo's Duo is an integrated solution for X, Y applications. Highly compact, it combines two Whistle servo drives in one package and operates using a single DC power supply. The Duo is offered as two different models to provide maximum DC voltage of either 60 or 100 V. Both models support up to 15 amps continuous current. The Duo can operate in current, velocity, position and advanced position modes with permanent-magnet synchronous brushless motors, DC brush motors, linear motors or voice coils. The solution is designed for use with any type of sinusoidal and trapezoidal commutation with vector control. As with other Elmo **SimpliQ** digital products, the Duo can be easily set up and tuned using Elmo's Composer software tools.

Product Catalogue Numbering



Trio Whistle

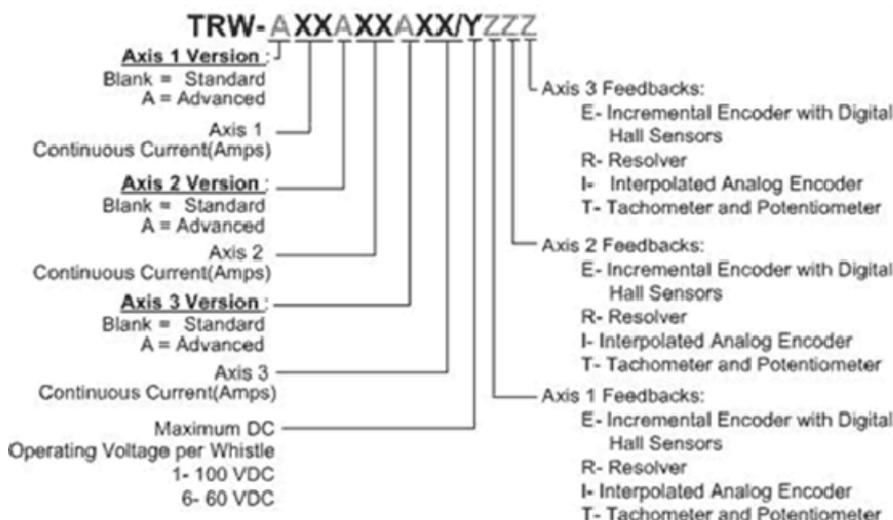
Integrated Triple Whistle Solution

The power of multiple Whistle servo drives in a single solution

Elmo's TRW-WHI (TRW) is an integrated solution for X, Y, Z applications. A highly compact product, it combines three Whistle servo drive controllers in one package and operates using a single AC/DC power supply with a shunt regulator. The TRW-WHI is offered as two different models to provide maximum DC voltage of either 60 or 100 V. Both models support up to 20 amps continuous current.

The TRW-WHI operates from an AC/DC power source in current, velocity, position and advanced position modes, with permanent-magnet synchronous brushless motors, DC brush motors, linear motors or voice coils. The solution is designed for use with any type of sinusoidal and trapezoidal commutation with vector control. As with other Elmo **SimpliQ** digital products, the TRW-WHI can be easily set up and tuned using Elmo's Composer software tools.

Product Catalogue Numbering



DC Whistle

DC Whistle Digital Servo Drive



Ultra-compact panel-mounted drive

The DC Whistle is a super compact OEM panel mounted version of the [Whistle](#), which enables fast and easy mounting and implementation. This [intelligent, digital servo drive](#) is designed for DC brush and brushless motors, linear motors and voice coils. It weighs just 273 g (only 9.6 oz) and supports up to 20 A of continuous current. Its high density enables the drive to deliver 3.3 kW of peak power and 1.6 kW of continuous power. Based on Elmo's [SimpliQ Motion Control technology](#), the DC Whistle is capable of operating in position, velocity and current modes and it offers a wide range of feedback and I/O options. With Elmo's [Composer software](#), users can easily perform drive setup, configuration, tuning, analysis and programming. The drive operates on DC power.

DC Whistle's Environmental Conditions

Feature	Value
Ambient operating temperature	0° to 40°C (32° to 104°)
Maximum operating altitude	2,000m (6562 feed)
Maximum relative humidity	90% non-condensing
Operating area atmosphere	Non flammable gasses or vapors permitted in area

Models for extended environmental conditions are available

Electrical Specifications

The following Whistle models (on previous page) are available in this panel mounted version

Feature	Units	1/60	2.5/60	5/60	10/60	15/60	1/100	2.5/100	5/100	10/100	15/100	20/100	
Minimum supply voltage	VDC	8.5						12					
Nominal supply voltage	VDC	48						85					
Maximum supply voltage	VDC	59						95					
Auxiliary power supply	VDC	12 to 95 VDC (up to 2.5 Va inc. 5V/200mA for the encoder)											
Max. output power from the drive without heatsink	W	50	120	240	480	720	75	180	400	800	1200	1600	
Efficiency at rate power	%	> 99											
Output voltage	%	> 95% of supply VDC at f = 22 kHz											
DC and Trapezoidal Commutation Continuous Current Limit (Ic)	A	1	2.5	5	10	15	1	2.5	5	10	15	20	
Sinusoidal Commutation Continuous RMA Current Limit (Ic)	A	0.7	1.8	3.6	7	10.7	0.7	1.8	3.6	7	10.7	14.1	
Peak current limit (RMS)	A	2 x Ic											
Pulse Width Modulation (PWM) switching frequency	kHz	22 ± 5% default on the motor											
Switching method		Advanced unipolar PWM											

Feature	Units	3/200	6/200	10/200
Minimum supply voltage	VDC	24		
Nominal supply voltage	VDC	170		
Maximum supply voltage	VDC	195		
Maximum continuous power output	W	480	960	1600
Efficiency at rated power (at nominal conditions)	%	> 99		
Maximum output voltage		> 95% of DC bus voltage at f = 22 kHz		
Auxiliary power supply	VDC	12 to 95 VDC (up to 6 VA inc. 5 V/2 x 200 mA for encoder)		
Amplitude sinusoidal/DC continuous current	A	3	6	10
Sinusoidal continuous RMS current limit (Ic)	A	2.12	4.24	7.07
Peak current limit	A	2 x Ic		
Weight	g (oz)	55 g (1.94 oz)		
Dimensions	mm (in)	115 x 75 x 25.8 mm (4.53" x 2.95" x 1")		
Digital in/Digital out/Analog in		6/2/1		
Mounting method		PCB mount		

Whistle Family Features

Current Control

- Fully digital
- Sinusoidal commutation with vector control or trapezoidal commutation with encoder and/or digital Hall sensors
- 12-bit current loop resolution
- Automatic gain scheduling, to compensate for variations in the DC bus power supply

Velocity Control

- Fully digital
- Programmable PI and FFW (feed forward) control filters
- Sample rate two times current loop sample time
- On-the-fly gain scheduling
- Automatic, manual and advanced manual tuning and determination of optimal gain and phase margins

Position Control

- Programmable PIP control filter
- Programmable notch and low-pass filters
- Position follower mode for monitoring the motion of the slave axis relative to a master axis, via an auxiliary encoder input
- Pulse-and-direction inputs
- Sample rate four times current loop sample time

Advanced Position Control (in Advanced model only)

- Position-based and time-based ECAM mode that supports a non-linear follower mode, in which the motor tracks the master motion using an ECAM table stored in flash memory
- PT and PVT motion modes
- Dual (position/velocity) loop
- Fast output compare OC

Communication Options

- RS-232 serial communication
- CANopen for fast communication in a multi-axis distributed environment

Feedback Options

- Incremental Encoder - up to 20 Mega-Counts (5 Mega-Pulse) per second
- Digital Halls - up to 2 KHz
- Incremental Encoder with Digital Halls for commutation - up to 20 Mega-Counts per second for encoder
- Interpolated Analog Sine/Cosine Encoder - up to 250 KHz (analog signal)
- Internal Interpolation - up to x4096
- Automatic Correction of amplitude mismatch, phase mismatch, signals offset
- Auxiliary emulated, unbuffered, single-ended, encoder output
- Resolver
- Programmable Evaluation Boards
- Elmo Servo Drive Evaluation Boards 10~15 bit resolution
- Up to 512 Revolution Per Second (RPS)
- Auxiliary emulated, unbuffered, single-ended, encoder output
- Tachometer, Potentiometer
- Elmo drives provide supply voltage for all the feedback options

Fault Protection

- Software error handling
- Status reporting for a large number of possible fault conditions
- Protection against conditions such as excessive temperature, under/over voltage, loss of commutation signal, short circuits between the motor power outputs and between each output and power input return
- Recovery from loss of commutation signals and from communication errors

Dimensions

- 8.25 x 28.5 x 46.5 mm (2.29" x 1.12" x 1.83")

Guitar

The Unique Servo Drive



High power density and intelligence in an ultra compact package

The Guitar, the newest member of Elmo's SimplIQ Motion Control Core family, offers the identical characteristics and functionalities common to all members of the *SimplIQ* family.

The Guitar goes one step further in incorporating Elmo's highly efficient and super compact power density. It suits every motion control application, especially where servo performance and compactness are issues.

The Guitar is a PCB mounted servo drive that provides top servo performance, networking and intelligence capabilities within a high level-programming environment.

- The Guitar operates with a single DC bus of **11 VDC -195 VDC** (three voltage ranges) with built-in smart control to supply back up capabilities.
- The Guitar delivers up to 45 amps of continuous current and 70 amps of peak current.

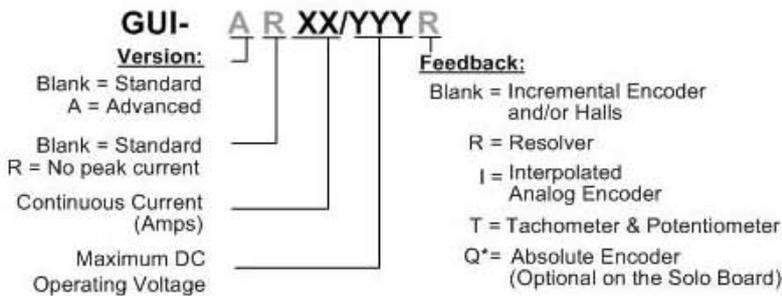
The Guitar features sinusoidal full vector control as well as trapezoidal and DC motor commutation methods.

The Guitar has an auxiliary feedback port for ECAM, follower, dual loop and pulse-and-direction applications. Digital and analog ports are also available.

The combination of the PCB mount ability, high power capabilities, rich motion features, programming flexibility, a wide variety of feedbacks and CANopen networking makes the Guitar the most ideal and effective solution.

		Guitar - Full Digital Servo Drive													
Feature	Units	35/48	26/60	25/60	35/60	10/100	25/100	3/200	6/200	10/200	17/200	R45/48	R45/60	R35/100	R30/200
Minimum supply voltage	VDC	11	14			23		46				11	14	23	46
Nominal supply voltage	VDC	42	50			85		170				42	50	85	170
Maximum supply voltage	VDC	48	59			95		195				48	59	95	195
Maximum continuous power output	W	1300	960	1200	1700	1600	2000	480	960	1600	2700	1700	2200	2800	4800
Efficiency at rated power (at nominal conditions)	%	>97													
Maximum output voltage		>97% of DC bus voltage at f=22 kHz													
Amplitude sinusoidal/DC continuous current	A	35	20	25	35	20	25	3	6	10	17	45	45	35	30
Sinusoidal continuous RMS continuous current	A	25	14.1	17.7	25	14.1	17.1	2.12	4.2	7	12	32	31.8	24.8	21.2
Peak current limit	A	2 x I _c										No Peak			
Weight	g(oz)	165g (5.8 oz)													
Dimensions	mm (in)	80 x 61 x 24.5 (3.15" x 2.4" x 0.965")													
Digital in/Digital out/Analog in		6/4/1													
Mounting method		PCB mounted													

Product Catalogue Numbering



Feedbacks Supported



Solo Guitar



**Ready-to-use Servo Drive Controller:
High power and superior intelligence in a small package**

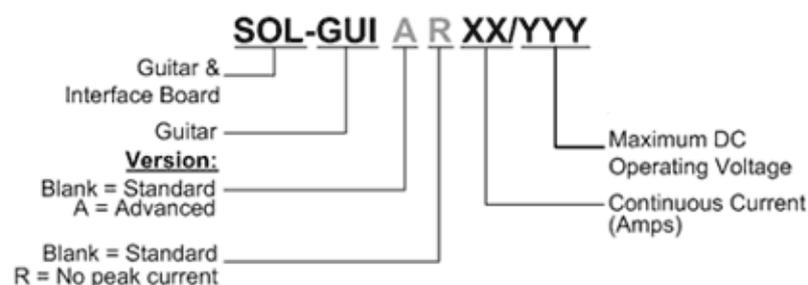
The Integrated Guitar Solution: DC input for DC brush, sinusoidal and trapezoidal motors

The Solo Guitar is an integrated solution designed to simply and efficiently connect Elmo's Guitar servo drive directly to an application. The solution consists of the Guitar together with a convenient connection interface that either reduces or eliminates development time and resources when designing the PCB board for an application.

Solo Guitar Highlights:

- The Solo Guitar series of digital servo drives is designed to deliver the highest density of power and intelligence.
- The Solo Guitar is designed for OEMs. It operates from a DC power source in current, velocity, position and advanced position modes, in conjunction with a permanent-magnet synchronous brushless motor, DC brush motor, linear motor or voice coil.
- The Solo Guitar can operate as a stand-alone device or as part of a multi-axis system in a distributed configuration on a real-time network.
- The Solo Guitar is equipped with four powerful digital outputs. It is designed to deliver up to 250 mA in each output when it is defined as general purpose applications or up to 500 mA when it is defined for braking applications.
- The Solo Guitar provides two differential ports for Auxiliary feedback. The relevant functionality of Feedback B port is configured via the user interface.
- The Solo Guitar provides an input for thermal motor protection. Digital input 1 is allocated for that purpose.
- The Solo Guitar provides a "main differential buffered output" (not available for the Solo Guitar absolute feedback model).
- The Solo Guitar drive is easy to set up and tune with Elmo's Composer software tools.
- This Windows-based application enables users to quickly and simply configure the servo drive for optimal use with their motor.
- The Solo Guitar, as part of the *SimplIQ* product line, is fully programmable with the Elmo *Metronome* motion control language.
- The Solo Guitar delivers up to 4.8 kW of continuous power or 5.4 kW of peak power, package (46.7 x 61 x 80 mm or 1.84" x 2.4" x 3.15").
- The Solo Guitar uses a 12 ~ 195 VDC isolated DC power source (not included with the Solo Guitar).
- A "smart" control-supply algorithm enables the Solo Guitar to operate with only one power supply, with no need for an auxiliary power supply for the logic.
- To back up and store control parameters in the event of a power outage, an external 12 ~ 195 VDC isolated supply can be connected to the Solo Guitar to maintain maximum flexibility and backup functionality when needed.

Product Catalogue Numbering



Guitar Continued

Current Control

- Fully digital
- Sinusoidal commutation with vector control or trapezoidal commutation with encoder and/or digital Hall sensors
- 12-bit current loop resolution
- Automatic gain scheduling, to compensate for variations in the DC bus power supply

Velocity Control

- Fully digital
- Programmable PI and FFW (feed forward) control filters
- Sample rate two times current loop sample time
- "On-the-fly" gain scheduling
- Automatic, manual and advanced manual tuning and determination of optimal gain and phase margins

Position Control

- Programmable PIP control filter
- Programmable notch and low-pass filters
- Position follower mode for monitoring the motion of the slave axis relative to a master axis, via an auxiliary encoder input
- Pulse-and-direction inputs
- Sample time: four times that of the current loop
- Fast event capturing inputs
- PT and PVT motion modes
- Fast output compare (OC)

Advanced Position Control (in Advanced model only)

- Position-based and time-based ECAM mode that supports a non-linear follower mode, in which the motor tracks the master motion using an ECAM table stored in flash memory
- Dual (position/velocity) loop

Communication Options (Depending on the application, Solo Guitar users can select from two communication options)

- RS-232 serial communication
- CANopen for fast communication in a multi-axis distributed environment

Feedback Options

- Incremental Encoder - up to 20 Mega-Counts (5 Mega-Pulse) per second
- Digital Halls - up to 2 KHz
- Incremental Encoder with Digital Halls for commutation - up to 20 Mega-Counts per second for encoder
- Interpolated Analog Sine/Cosine Encoder - up to 250 KHz (Analog signal)
- Internal Interpolation - up to x4096
- Automatic Correction of amplitude mismatch, phase mismatch, signals offset
- Auxiliary emulated, un-buffered, single-ended, encoder output
- Resolver
- Programmable 10~15 bit resolution
- Up to 512 Revolution Per Second (RPS)
- Auxiliary emulated, un-buffered, single-ended, encoder output
- Tachometer, Potentiometer
- Elmo drives provide supply voltage for all the feedback options

Feedback Options for Solo Guitar Absolute

- Absolute Encoder
- Heidenhain EnDat 2.1
- Heidenhain EnDat 2.2 VER 01
- Sick - Stegmann Hiperface

Fault Protection (The Solo Guitar includes built-in protection against possible fault conditions, including)

- Software error handling
- Status reporting for a large number of possible fault conditions
- Protection against conditions such as excessive temperature, under/over voltage, loss of commutation signal, short circuits between the motor power outputs and between each output and power input return
- Recovery from loss of commutation signals and from communication errors

Harmonica

Compact and Smart Digital Servo Drive

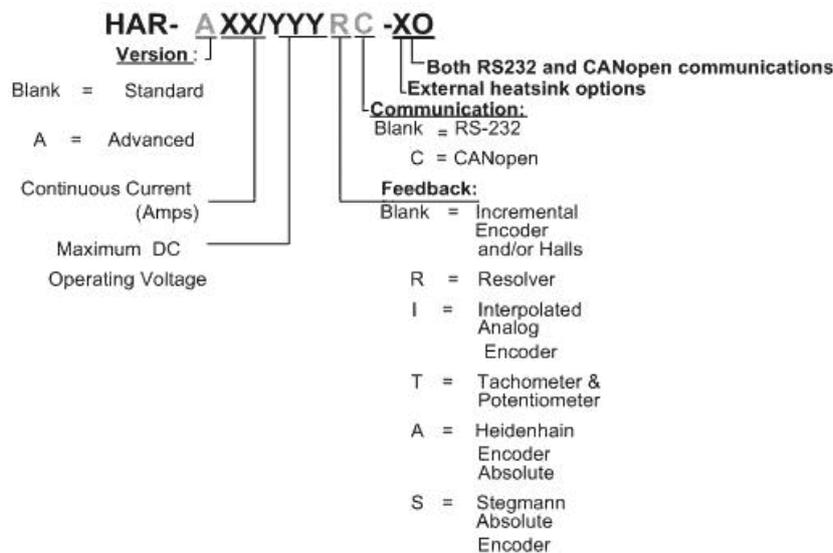
Operating in Position, Dual Loop, Velocity and Current Mode



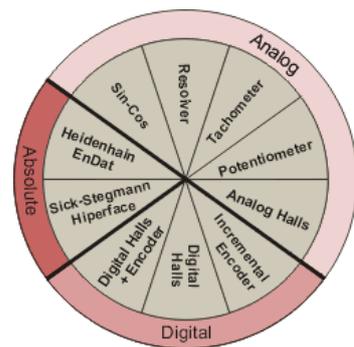
The Harmonica is a series of intelligent compact digital servo drives for DC brush, brushless motors and linear motors. The compact servo drive supports up to 13.3 amps continuous current. The Harmonica is capable of delivering a peak of 2200 W of power and 1100 W of continuous power. Based on Elmo's **SimpliQ** motion control technology, the Harmonica is capable of operating in position, velocity and current modes and contains a wide range of feedback and I/O options. With Elmo's Composer software, users can easily perform drive setup, configuration, tuning, analysis and programming. The drive operates on DC power. The Harmonica's small case enables efficient, cost saving implementation.

Feature	Units	5/60	8/60	12/60	2/100	4/100	8/100	12/100	1/200	2/200	4/200	6/200
Minimum supply voltage	VDC	10			20				40			
Nominal supply voltage	VDC	50			85				170			
Maximum supply voltage	VDC	59			95				195			
Maximum continuous power output	W	250	400	650	200	320	640	1100	200	320	640	1100
Efficiency at rated power (at nominal conditions)	%	> 97										
Maximum output voltage		> 97% of DC bus voltage at f=22 kHz										
Auxiliary supply voltage	VDC	24 ± 20%										
Auxiliary power supply	VA	8										
Amplitude sinusoidal/DC continuous current	A	5	8	13.3	2.5	4	8	13.3	1.25	2	4	6.6
Sinusoidal continuous RMS current limit (Ic)	A	3.5	5.7	9.4	1.8	2.8	5.7	9.4	0.9	1.4	2.8	4.7
Peak current limit	A	2 x Ic										
RMS output power without heatsink	%	100	50	20	100	50	20	20	100	50	20	20
Weight	g (oz)	150 g (5.3 ounces)										
Dimensions	mm (in)	82 x 25.4 x 75 (3.2" x 1.0" x 3.0")										
Digital in/Digital out/Analog in		6/2/1										
Mounting method		Wall mount ("Bookshelf") or DIN rail										

Product Catalogue Numbering



Feedbacks Supported



Cello

Smart and Slim Digital Servo Drive for Brush and Brushless Motors

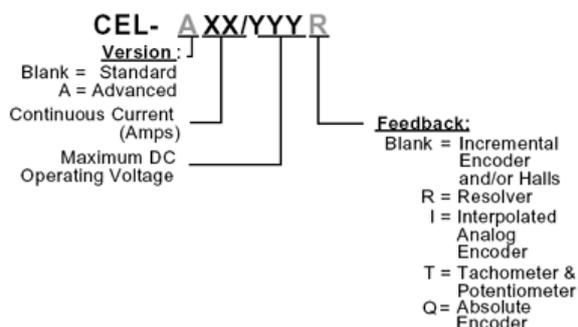


Operates in current, velocity, position and advanced position modes

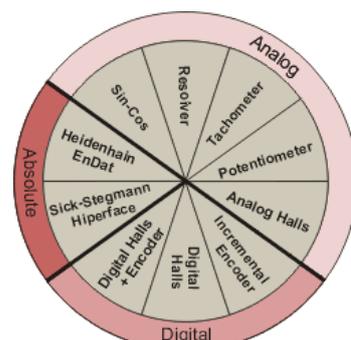
The Cello is a series of intelligent, slender digital servo drives for DC brush, brushless motors and linear motors. The slim servo drive supports up to 30 amps continuous current. Its high density allows the drive to deliver a peak of 6800 W of power and 3400 W of continuous power. Based on Elmo's **SimpliQ** Motion Control technology, the Cello is capable of operating in position, velocity and current modes and contains a wide range of feedback and I/O options. When using Elmo's Composer software, users can easily perform drive setup, configuration, tuning, analysis and programming. The drive operates on DC power. The Cello's slender case enables an efficient and cost saving implementation.

Feature	Units	5/60	10/60	15/60	15RMS/60	30/60	3/100	10/100	15/100	15RMS/100	30/100	2/200	6/200	10/200	15/200	15RMS/200	
Minimum supply voltage	VDC	10					20					40					
Nominal supply voltage	VDC	50					85					170					
Maximum supply voltage	VDC	59					95					195					
Maximum continuous power output	W	240	480	720	1000	1440	260	800	1200	1700	2400	360	960	1600	2400	3400	
Efficiency at rated power (at nominal conditions)	%	> 97															
Maximum output voltage		97% of DC bus voltage at f=22 kHz															
Auxiliary supply voltage	VDC	24 ± 20%															
Auxiliary power supply	VA	12															
Amplitude sinusoidal/DC continuous current	A	5	10	15	21	30	3.3	10	15	21	30	2.3	6	10	15	21	
Sinusoidal continuous RMS current limit (Ic)	A	3.5	7.1	11	15	21.2	2.3	7.1	10.6	15	21.2	1.6	4.2	7.1	10.6	15	
Peak current limit	A	2 x Ic															
Output power without additional heatsink	%	100					75	100					100			75	50
Weight	g (oz)	640 g (22.6 ounces)															
Dimensions	mm (in)	150 x 25.4 x 105 (5.9" x 1.0" x 4.1")															
Digital in/Digital out/Analog in		10/5/2															
Mounting method		Wall Mount (on back or on side)															

Product Catalogue Numbering



Feedbacks Supported



Drum



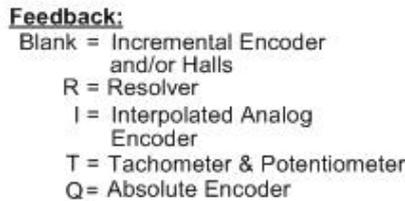
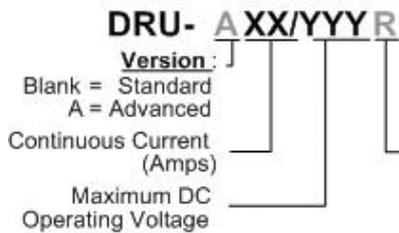
Digital Servo Drive Controller

Ideal for DC brush and DC brushless, sinusoidal and trapezoidal winding motors

The Drum is a series of intelligent digital servo drives for DC brush, brushless motors and linear motors. The powerful servo drive supports up to 90 amps continuous current. Its high density allows the drive to deliver a peak of 11,200 W of power and 9,600 W of continuous power. Based on Elmo's **SimpliQ** Motion Control technology, the Drum is capable of operating in position, velocity and current modes and contains a wide range of feedback and I/O options. With Elmo's Composer software, users can easily perform drive setup, configuration, tuning, analysis and programming. The drive operates on DC power.

Feature	Units	Drum - Full Digital Servo Drive							
		70/48	70/60	R90/60	50/100	R75/100	35/200	R60/200	18/400
Minimum supply voltage	VDC	11	14		23		46		92
Nominal supply voltage	VDC	42	50		85		170		340
Maximum supply voltage	VDC	48	59		94		195		390
Maximum continuous power output	W	2700	3400	4300	4000	6000	5600	9600	5600
Efficiency at rated power (at nominal conditions)	%	> 97							
Maximum output voltage		97% of DC bus voltage at f=22 kHz							
Amplitude sinusoidal/DC continuous current	A	70	70	90	50	75	35	60	18
Sinusoidal continuous RMS continuous current	A	50	50	63	35	53	25	42	12.7
Peak current limit	A	2 x I _c	2 x I _c	No Peak	2 x I _c	No Peak	2 x I _c	No Peak	2 x I _c
Weight	Kg (Ibs)	700g (24.7oz)							
Dimensions	mm (in)	134 x 95 x 60 (5.3" x 3.7" x 2.4")							
Digital in/Digital out/Analog in		6/2/1							
Mounting method		Panel mounted							

Product Catalogue Numbering



Feedbacks Supported



Bassoon



The Smallest Power-Packed Servo Drive Controller

AC powered for DC, rotary, linear and brush or brushless motors

Up to 1.9 kW of continuous power compressed into a compact 12 oz (350 gr) case

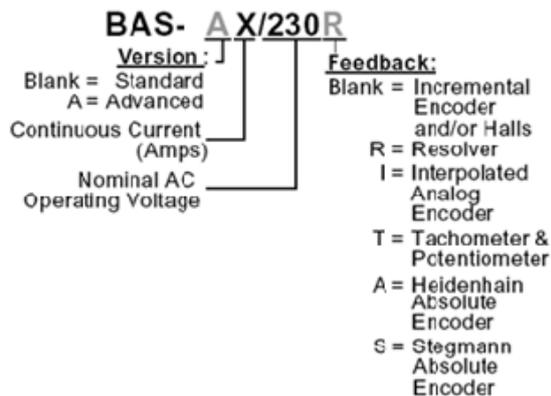
The Bassoon is a series of intelligent digital servo drives for DC brush, brushless motors and linear motors. The servo drive supports up to 6 amps continuous current. Its high density allows the drive to deliver 1900 W continuous power and 3800 W peak power. Based on Elmo's **SimpliQ** Motion Control technology, the Bassoon is capable of operating in position, velocity and current modes and contains a wide range of feedback and I/O options.

With Elmo's Composer software, users can easily perform drive setup, configuration, tuning, analysis and programming.

The drive operates on AC power. The Bassoon's compact case enables efficient and cost saving implementation.

Feature	Units	1/230	3/230	5/230	6/230
Minimum supply voltage	VAC	30			
Nominal supply voltage	VAC	230			
Maximum supply voltage	VAC	270			
Maximum continuous power output	W	320	1050	1600	1900
Efficiency at rated power (at nominal conditions)	%	> 97			
Auxiliary supply voltage	VDC	24 ± 20%			
Auxiliary power supply	VA	8			
Amplitude sinusoidal/DC continuous current	A	1	3.3	5	6
Sinusoidal continuous RMS current limit (Ic)	A	0.7	2.3	3.5	4.2
Peak current limit	A	2 x Ic			
Supplied with heat sink		No	#2 (fins)	#4 (fins and fan)	
Built-in shunt (peak power)	W	400			
Weight	g (oz)	350 g (12.35)	490 g (17.28)	505 g (17.81)	
Dimensions	mm (in)	105 x 44 x 76	105 x 56 x 76	105 x 66.5 x 76	
		(4.13" x 1.73" x 3.00")	(4.13" x 2.20" x 3.00")	(4.13" x 2.60" x 3.00")	
Digital in/Digital out/Analog in		6/2/1			
Mounting method		Wall mount ("Bookshelf") or DIN rail			

Product Catalogue Numbering



Feedbacks Supported



Cornet

AC-powered PWM Digital Servo Drive-Servo Controller

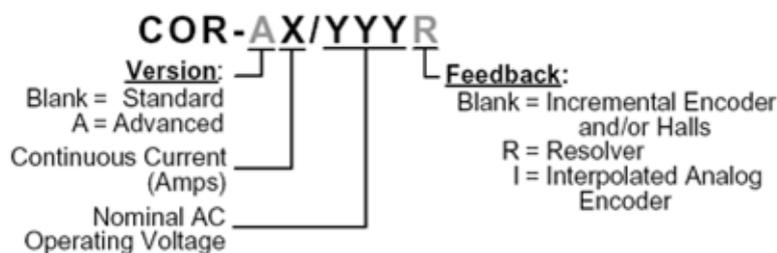


Includes built in resolver feedback support for brush and brushless motors

The Cornet is a series of intelligent digital servo drives for DC brush, brushless motors and linear motors. The servo drive supports up to 9 amps continuous current. Its high density allows the drive to deliver 3400 W continuous power and 6800 W peak power. Based on Elmo's **SimpliQ** Motion Control technology, the Cornet is capable of operating in position, velocity and current modes, and contains a wide range of feedback and I/O options. When using Elmo's Composer software, users can easily perform drive setup, configuration, tuning, analysis and programming. The Cornet operates on AC power.

Feature	Units	1/230	3/230	5/230	7/230	9/230	1/460	3/460	6/460	
Minimum supply voltage	VAC	60						140		
Nominal supply voltage	VAC	1x115, 1x230, 3x230						3x400, 3x460		
Maximum supply voltage	VAC	1x270 or 3x270						3x505		
Maximum continuous power output	W	420	1050	1500	2100	2700	800	2000	3400	
Efficiency at rated power (at nominal conditions)	%	> 93								
Auxiliary supply voltage	VDC	24 ± 15%								
Auxiliary power supply	VA	20								
Amplitude sinusoidal/DC continuous current	A	1.4	3.5	5	7	9	1.4	3.5	6	
Sinusoidal continuous RMS current limit (Ic)	A	1	2.5	3.5	5	6.4	1	2.5	4.3	
Peak current limit	A	2 x Ic								
Built-in shunt (peak power)	kW	2.4					1.1	3.4		
Weight	g (oz)	1.1kg (2.4 lbs)								
Dimensions	mm (in)	180 x 123 x 75 (7.1" x 4.8" x 3")								
Digital in/Digital out/Analog in		10/6/2								
Mounting method		Wall Mount (bookshelf) or DIN rail								

Product Catalogue Numbering



Feedbacks Supported



Tuba

AC-Powered Digital Servo Drive-Servo Controller - with Resolver Feedback, RS-232-CANopen Communication

Intelligent digital servo drive that offers improved dynamics and increased precision for brush, sinusoidal and trapezoidal servo motors

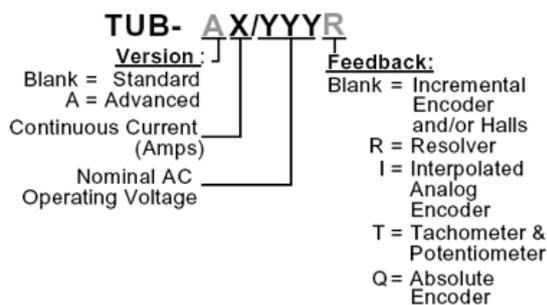
The servo drive supports up to 20 Amps continuous current. Its high density allows the drive to deliver 11.3 kW continuous power and 22.6 kW peak power intelligent digital servo drive controllers for DC brush, brushless & linear motors.

Based on Elmo's *SimpliQ* technology, the Tuba is capable of operating in position, velocity and current modes and contains a wide range of feedback and I/O options.

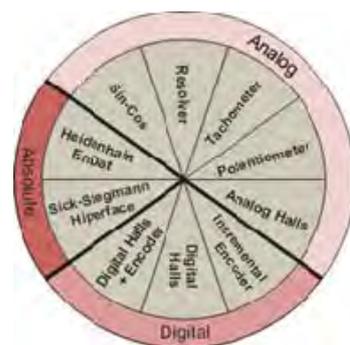
The Tuba operates on AC power.

Feature	Units	12/230	15/230	20/230	12/460	15/460	20/460
Minimum supply voltage	VAC	60			140		
Nominal supply voltage	VAC	1x115, 1x230, 3x230			3x400, 3x460		
Maximum supply voltage	VAC	1x270 or 3x270			3x505		
Maximum continuous power output	W	3600	4500	6000	6800	8500	11300
Efficiency at rated power (at nominal conditions)	%	> 93					
Auxiliary supply voltage	VDC	24 ± 15%					
Auxiliary power supply	VA	20					
Amplitude sinusoidal/DC continuous current	A	12	15	20	12	15	20
Sinusoidal continuous RMS current limit (Ic)	A	8.5	10.6	14.1	8.5	10.6	14.1
Peak current limit	A	2 x Ic					
Built-in shunt (peak power)	kW	6			11		
Weight	kg (lbs)	2.7kg (5.9 lbs)					
Dimensions	mm (in)	247x190x92 (9.7"x7.5"x3.6")					
Digital in/Digital out/Analog in		10/6/2					
Mounting method		Wall mount (Bookshelf) or DIN rail					

Product Catalogue Numbering



Feedbacks Supported



DC Input Current Mode PWM Servo Amplifiers for Brush and/or Brushless Servo Motors

- Elmo's analog servo amplifier family is a set of powerful servo amplifiers receiving analog commands and operating in current mode only.
- The amplifiers are designed to address the needs of brush and brushless DC motors.
- Each amplifier exhibits excellent servo performance, top efficiency, high quality and reliability - all in sleek and compact, high-density power packages.
- Outstanding motion control is achieved through the implementation of Elmo's proprietary switching and control methods enabled by fully customized, dedicated ICs and advanced heat transfer and dissipation methods

Brush & Brushless Motors for Trapezoidal Commutation

DC Input:
11~95VDC



Ocarina
0.05~1.40kW
Amps output: 1to15

DC Input:
11~95VDC



Castanet
0.19~0.24kW
Amps output: upto 3.3

DC Input:
10~195VDC



Piccolo
0.29~2.90kW
Amps output 5 to 25

Brushless Motors for Sinusoidal Commutation

DC Input:
11~390VDC



Cymbal
3.20~11.3kW
Amps output 18 to 90

DC Input:
10~196VDC



Flute
0.24~2.40kW
Amps output 2.2 to 25

Brush Motors

DC Input:
10~196VDC



Violin
0.29~2.90kW
Amps output 5 to 25

Feature	Unit	Model name					
		Ocarina	Castanet	Piccolo	Cymbal	Flute	Violin
DC input	VDC	11 - 95	11 - 95	10 - 195	12 - 196	10 - 195	10 - 195
PWM switching frequency	KHz	32 +/-5% (on the motor)					
Switching method		Advanced Unipolar PWM					
Servo Modes		Current					
Commands		+/- 10 VDC					
Feedbacks		Halls only				None	
Current loop bandwidth	KHz	Up to 4					
Output voltage	%VIN	93%				100%	
Ambient temperature	°C (°F)	0° ~ 50°C (32° ~ 122°F) models for extended environmental conditions are available					
Maximum case temperature	°C (°F)	87°C (188°F)					
Storage temperature	°C (°F)	-40° ~ 100°C (-40° ~ 212°F)					
Maximum humidity	%	90% non-condensing					
Maximum operating altitude	m (ft)	up to 10,000 (30,000)					

Accessories

Evaluation Board for Ocarina

An evaluation board that uses standard terminal plugs and D-sub connectors is available.

It is accompanied by documentation that describes how to set up the board.





Extreme Environment Products

1. Servo Drives

Intelligent DC Digital Servo Drives Controllers with incremental Encoder, Resolver, Digital Halls, Analog SIN-COS, Absolute, Analog Halls, Tacho, Potentiometer Feedbacks with the same features at SimplIQ range (see page 4).

The ExtrIQ product family is designed and tested to withstand extreme environmental conditions. Testing methods and procedures are in according to MIL-STD-810 and provide:

- Ambient temperature range, non-operating = -50°C to +100°C
- Ambient temperature range, operating = -40°C to +70°C
- Temperature shock, non-operating = -40°C to +70°C within 3 minutes
- Altitude, non-operating = unlimited
- Altitude, operating = -400m to +150Km
- Relative Humidity, non-operating = Up to 95% non-condensing at 35°C
- Relative Humidity, operating = Up to 95%/90% non-condensing at 25°C/42°C
- Vibration = 20Hz to 2000Hz, 14.6g
- Mechanical shock, non-operating = ±40g half sine, 11ms
- Mechanical shock, operating = ±20g half sine, 11ms



		Model Number					
Feature	Unit	Bee	Hornet	Falcon	Eagle	Hawk	Panther
Power range	Kw	0.16 to 0.2	0.2 to 1.6	0.72 to 1.4	2.7 to 9.6	0.96 to 4.8	4 to 7
Supply Voltage range	VDC	11-95	11-95	10-195	11-390	11-195	80-750
Motor		DC Brush, Sinusoidal, Trapezoidal, Brushless					
Operating Modes		Current, Velocity, Position & Advance Position					
Cont. Output Current	A	2.5-3.3	1-20	2.25-30	40-90	10-45	8-7
Output Power Range	KW	0.16-0.2	0.2-1.6	0.72-2.4	2.7-9.6	0.96-4.8	4-7
Digital In, Out Analog In		6/2/1	6/2/1	10/5/2	6/2/1	6/4/1	6/4/1
Commands		Analog Pulse and Direction, PWM Software Commands					
Feedbacks		Incremental Encoder, Resolver, Digital Halls, Analog SIN-COS, Absolute, Analoge Halls, Tacho, Potentiometer					
Programming		SimplIQ Programming					
Communications		RS-232, CANopen DS 301, DSP 305 & DSP 402					
Software		Composer					
Program Memory		Up to 32KB					

2. Motion Controller for Harsh Environment

-40°C to +70°C, Vibrations up to 14GRMS

Design Your Own Extreme Motion Control Solution

Elmo's Gold LION is an advanced network based, multi-axis machine motion controller.

The Gold LION can control any multi axis scenario. From simple Point-To-Point to complete multi-axis coordinated / synchronized motion.

The GOLD LION Module is a "ready to use" complete motion controller to be embedded in user's printed board, thus resulting high-level of customization, most advance motion solution with tremendous design flexibility, richness with functionalities and huge space saving.

The Ultimate Network Motion Controller

- Delta Robot and Kinematics Support
- Motion blending and superimposed motion
- Coordinated group motion, blending and transitions
- Polynomial motion segments, PVT and Spline support
- Real-time updates of target positions ('flying vision™')
- 1D, 2D and 3D error correction
- EtherCAT master for distributed networking, with distributed clock management
- CANopen master for distributed networking
- Host communications and protocols:
Ethernet, TCP/IP, UDP (Fast Binary Protocols, Modbus, Ethernet/ IP)
USB 2.0
- Rich, high-level, multi-axis programming environment:
Microsoft .NET
IEC 61131-3, PLCopen
Native C/C++ programming using the PLCopen for Motion
Win32 C/C++
Network statistics for diagnostics

Gold Lion Functionality

Operating System	<ul style="list-style-type: none"> • Linux, with Elmo's RT extensions for real-time motion control support
Number of Axes	<ul style="list-style-type: none"> • Up to 100 axes, allowing the following types of motion: mixed single axis, multi-axis
Axis Types	<ul style="list-style-type: none"> • Intelligent servo drives support both the SimplIQ and Gold Line product families • Operates in Numeric Control (NC, real-time master synchronisation) and non-NC modes • Standard DS 402 drive for CANopen, and DS 402 CoE for EtherCAT
Control System Update Rate and Jitter	<ul style="list-style-type: none"> • EtherCAT <ul style="list-style-type: none"> – Cycle Update Rate: 500 μs (up to 16 axes can be updated simultaneously at a rate of 500 μs). – Drive Cycle Clock Jitter: < 1 μs, based on Master Distributed Clock support, for the full network. • CAN <ul style="list-style-type: none"> – Cycle Update Rate: 1ms (CAN physical network limitations only) – Cycle Jitter: < 10 μs for CAN Sync message initiation (actual jitter dependent on the CAN network's physical limitations).
Supported Motion Modes and Capabilities	<ul style="list-style-type: none"> • The Gold Lion motion interfaces use the PLCopen standard. • 64 bit, real-time, double precision profile calculations, allowing full on-the-fly control over speed, acceleration, deceleration and jerk. • Complex motion schemes, including look-ahead optimizing of trajectory speed calculations for complex vector motions. • New kinematics and Delta Robot support, with linear, circle, polynomial, table spline and table PVT; both axis (ACS) and machine (MCS) limits handling. o Additional Kinematic Transformation Function definitions Full implementation of IEC • Memory for 1,000 function blocks (a buffer for 1,000 motion segments). Beyond this the buffer is cyclic, so there is no practical limit on the buffer size. • Advanced support for administrative function blocks. • Advanced position, velocity and time (PVT) modes and capabilities, with up to 5th order interpolations for up to 16 axes. • Real-time superimposed motion profiles, enabling target position changes on-the-fly. • Real-time position referencing of one axis to a different axis on the network (EtherCAT)
Motion Programming and Debugging	<ul style="list-style-type: none"> • Native 'C' Programming, running on target. Compiling and debugging. Supplied with the PLCopen Motion Library API. • Full IEC 61131-3 with the PLCopen Motion Library extension using Elmo's IDE. The following languages are supported: <ul style="list-style-type: none"> – Structured text (ST): textual – Function block diagram (FBD): graphical – Ladder diagram (LD): graphical • Sequential function chart (SFC) has elements to organize programs for sequential and parallel control processing
Programming Execution Time, Threads, and I/O Layer Synchronization	<ul style="list-style-type: none"> • Minimal thread resolution timing: 1 ms • Number of program execution threads: 10 • Typical programming execution time (IEC): 10 μs per command • 'C' code programming: Running as native code on the target CPU • I/O layer synchronization timing linked to the master controller sync time (EtherCAT/CAN). I/O level synchronization deterministic over control cycles
Communications Hardware	<ul style="list-style-type: none"> • Host • Ethernet: 1 port, Standard Ethernet, 10/100 Mbps, automatically detected • USB: 1 port, USB 2.0, 12 Mbps • RS-232 can be supported in an embedded configuration • Device Networks • EtherCAT: 2 EtherCAT master ports, with redundancy support • CAN: CANopen master port
Communications Protocols	<ul style="list-style-type: none"> • Host <ul style="list-style-type: none"> – Ethernet, TCP-IP/UDP for operational modes

	<ul style="list-style-type: none"> - Telnet/FTP/HTTP communication for setup and configuration - USB: Using binary protocol (maintenance). Application level: Ethernet-IP/Modbus • Device Network EtherCAT: <ul style="list-style-type: none"> - CoE/EoE/FoE, supports distributed clock master - CAN: CANopen device profiles, e.g. DS 301, DS2305, DS 401 (I/O Device Profile), DS 402
Host and Internal Software Interface	<ul style="list-style-type: none"> • TCP/IP and UDP interface from the host computer. A software library provides a convenient TCP/IP or UDP communications interface. • Future versions will support Ethernet/IP and Modbus over TCP/IP. • Internal software libraries, for 'C' user programs are provided, to write user code running on the Gold Lion's target processor (native mode).
Miscellaneous and Special Features	<ul style="list-style-type: none"> • Data recording (4 MB); up to 32 vectors can be recorded simultaneously. • Supporting over 10 triggering options and real-time scope capabilities. • Very fast data upload/download support via Ethernet link. • Firmware update support (Gold Lion and drives). • Support for asynchronous operations with end-of-operation notification; eliminates need to constantly poll System status for some operations. • Axis parameter files. • Drive communication bridge support. • Support for mapped PDOs. • Supports full communications with any specific drive (CAN and EtherCAT) for purposes of basic tuning or configuration at the drive level (i.e., no need for direct communication with the drive). • Provides spatial position-based pulse generation, required for generation of along-the-path events in 3D scanning systems. • When used with Gold Line servo drives, can support single axis and spatially-enhanced position-based "compare" functions to trigger output signals, accurate to 1 encoder count along the trajectory path. • Network encoders: Supports master-based motion on network encoders. • Position error mapping: Supports 1D, 2D and 3D position-based error mapping compensation. • System boot-up time: < 30 sec • Uses internal built-in-test (BIT) procedures to ensure system integrity on each power-up.
I/Os	<ul style="list-style-type: none"> • The Gold Lion is a fully networked controller. All I/O interfaces are carried out via the device network.



51.9 x 40.6 x 18.1mm
(2.04" x 1.6" x 0.7")



Distributors for Australia & New Zealand

MOTION TECHNOLOGIES PTY LTD

24/22-30 Northumberland Road
Caringbah NSW 2229 Australia

Phone: (02) 9524 4782

Fax: (02) 9525 3878

sales@motiontech.com.au

www.motiontech.com.au

© 20/03/19