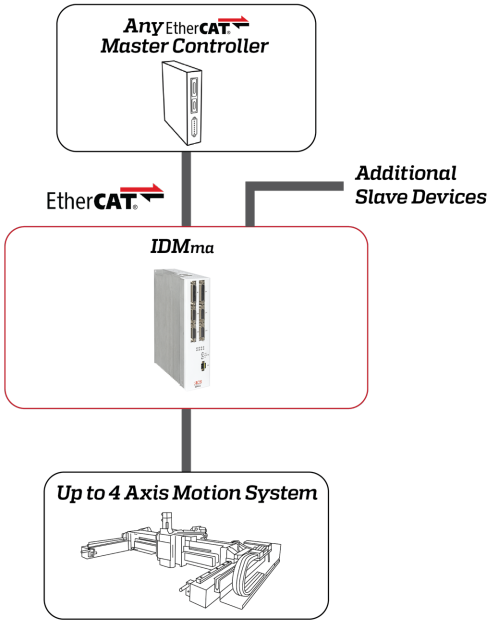
IDMma

2 or 4 Axis EtherCAT® DS402 Drive

EtherCAT® Conformance tested

The **IDMma** is a member of the Intelligent Drive Module (IDM) series of EtherCAT® DS402 drives designed to meet the needs of OEMs employing EtherCAT-based control systems with high-precision motion stages. Controllable by any EtherCAT master, its unique multi-processor architecture leverages powerful control algorithms to maximize motion system performance, while its universal servo drive technology enables the system designer to easily control most any type of motor or stage.



Product Highlights

- Advanced Servo Control Algorithms for Maximum Motion Performance
  - Non-Linear Control
  - Cascaded Dual Loop Control
  - Customized Algorithms (Contact ACS)
  - Gantry Control
  - Many more
- Universal Motor and Encoder Support for Maximum Motor/Stage Flexibility
- High Power Output Range for power stages
- Max Drive Current: 10/20A at 150VDC, 15/30A at 100VDC
- Drive Supply Input: 24-150VDC
- Feedback Channels: 4 (AqB, SinCos, or Absolute)
- Analog I/O: 4/2
- Digital I/O: 12/12
  - Any can be used as general purpose
  - 4 High-Speed Position Capture (MARK) Inputs
  - 8 Limit Sensor Inputs (2 per axis)
  - 4 Mechanical Brake Outputs
  - 4 High-Speed Position Event Generation (PEG) Outputs
  - 4 General Purpose Digital Outputs
- Functional Safety: STO, SS1

CONFIDENCE
Leverage 30+ years of high-performance motion control expertise

FLEXIBILITY
Control various motion stage technologies

PERFORMANCE
Achieve a competitive advantage with higher throughput and accuracy

For the latest version of this document visit our website at www.acsmotioncontrol.com

Smarter Motion

ACS MOTION CONTROL

Specifications

Logic Supply Input
- Voltage range: 24 VDC +/-5%
- Maximum Input Current: 2A @ 22.8VDC
- Protections: Reverse Polarity

Drive Supply Input
- Voltage Range: 24-150 VDC
- Maximum Input Current: Load dependent
- Regeneration Resistor: Not included

Amplifiers
- Number of Axes: 2 or 4
- Type: PWM 3-phase power bridge
- Motor Support
  - DC brush
  - 2 and 3 phase DC Brushless
  - 2 and 3 phase stepper: Open or closed loop, up to 1024 microsteps per step, dynamic current adjustment
- Output current:
  - 5/10A, 10/20A at 150VDC
  - 15/30A at 100VDC (continuous/peak, sine amplitude)
- Peak Current Time: 1 second
- PWM Switching Frequency: 20 kHz
- Minimum Load Inductance: 150 µH per phase at 150VDC bus (contact ACS to discuss applications with lower phase inductance motors)
- Max Output Voltage: 94% of Drive Supply input voltage
- Max Output Continuous / Peak Power Per Axis:
  - 633/1258W (continuous/peak) for 5/10A
  - 1266/2517W (continuous/peak) for 10/20A
  - 1208/2393W (continuous/peak) for 15/30A
- Protections: Short Circuit, Overcurrent, Drive Overtemperature, Motor Overtemperature, Overvoltage, Undervoltage

EtherCAT
- Interface: Dual RJ-45, 100BASE-TX
- Communication Profiles: CoE, FoE
- Device Profiles: DS402 (CiA402)
- Modes of Operation: CSP, CSV, CST, Homing, Profile Position, Profile Velocity Mode
- PDO Mapping: User-configurable, up to 128 bytes
- Max Cycle Rate: 4 kHz
- May operate as a slave under any EtherCAT master using the DS402 protocol

Communication Interfaces
- SPI:
  - Clock frequency up to 4 MHz
  - Can operate as Master or Slave
  - Up to 8 X SPI words per MPU Cycle
  - SPI word length is user configurable up to 16 bits
- Ethernet: 100/100 Mbps TCP/IP, Modbus, Ethernet/IP
- RS-232: Up to 115200 bps

Real-Time Programming
- Language: ACSPL+ object-oriented multi-threading
- Number of User-Programmable Buffers (Threads): 4
- Max Program (MPU) Cycle Rate: 4 kHz
- Max Data Collection Rate: 20 kHz up to 4 variables
- RAM: 256MB
- Flash: 1GB

Profile Generation
- 3rd order with smooth on-the-fly endpoint modification

Servo Control Algorithms
- Standard
  - Cascaded PIVFF with loop shaping filters
  - Advanced feedforward
  - Multi-input multi-output (MIMO) gantry
  - Dual loop
  - Disturbance rejection
  - Gain Scheduling
  - Field-oriented control
  - Space vector modulation
- Optional
  - Non-Linear Control
  - Custom algorithms to meet demands of unique applications (contact ACS)
- Servo Sampling and Update Rate: 20 kHz position, 20 kHz velocity, 20 kHz current

Feedback
- Total Number of Channels: 4
- Incremental
  - AqB Encoders (Default type)
    - Max Frequency: 50 MHz
    - Electrical Interface: RS-422
    - Error Detection: Encoder not connected, illegal transition
  - SinCos Encoders / Analog Hall Sensors (Optional)
    - Max Frequency: 500 kHz
    - Electrical Interface: 1 V peak to peak ±10%
    - Max Multiplication: 4,096 (per full signal period)
    - Error Detection: Not connected, Encoder Error
    - Compensation: Phase, Gain, Offset
    - Note: The drive automatically generates a digital quadrature echo of the SinCos encoder signal and sends it as an output to the AqB encoder pins
  - Digital Hall Sensor Inputs
    - Qty: 1 set per axis
    - Electrical Interface: 5V, Single-ended, source, opto isolated
    - Note: Used for initial commutation, not for position servo feedback
  - Limit Sensor Inputs (Usable as general purpose)
    - Qty: 2 per axis (8 total)
    - Electrical Interface: 5/24V ±20%, opto-isolated, sink or source (jumper selectable)
- Absolute (Optional)
  - Types: BiSS-C, EnDat 2.1 & 2.2, Smart-Abs, SSI, Sanyo Denki, Panasonic A6
  - Max Frequency: EnDat- 8MHz, Smart-Abs- 2.5MHz, Biss-C- 10MHz, Panasonic- 2.5MHz, Sanyo- 2.5MHz
  - Electrical Interface: RS-485
  - Error Detection: CRC, timeout, encoder not ready
- Supply Output: 5.1V. Total available current 1.5A for all analog encoders and 1.5A for all digital encoders
- ID Chip Interface: 1 per axis. For identification of compatible stages' configuration parameters.

Specifications Continued

Digital I/O (All are useable as general purpose)

- Total Quantity: 12/12
- High-Speed Position Capture (MARK) Inputs
  - Qty: 4 (can be used as general purpose digital inputs)
  - Electrical Interface: 5/24V ±20%, Opto-isolated, two terminals
  - Max Capture Frequency: 1 per 2 MPU cycles
- Limit Sensor Inputs
  - Qty: 2 per axis (can be used as general purpose digital inputs)
- High-Speed Position Event Generation (PEG) Outputs
  - Qty: 1 per axis (can be used as general purpose digital inputs)
  - Electrical Interface: RS-422
  - Max Pulse Frequency: 10 MHz
  - Pulse Width Range: 40 ns to 671 ms
- Mechanical Brake Outputs
  - Qty: 1 per axis
  - Electrical Interface: 5/24V ±20%, opto-isolated, sink or source (jumper selectable)
  - Output Current: 100 mA (2 of the 4 support 0.5A)
- General Purpose Outputs
  - Qty: 4
  - Max Update Frequency: 1 kHz
  - Propagation Delay: 1ms
  - Electrical Interface: 5/24V ±20%, opto-isolated, sink or source (jumper selectable).
  - Output current: 100mA

Analog I/O (All are useable as general purpose)

- Analog Inputs
  - Qty: 4
  - Electrical Interface: ±10V differential or 0-10V single ended
  - Resolution: 12 bit
  - Max Sampling Frequency: 5 kHz
- Analog Outputs
  - Quantity: 2
  - Electrical Interface: ±10V differential or 0-5V single ended
  - Resolution: 10 bit
  - Max Ripple: <25 mV
  - Max Load: 10 kΩ
  - Max Update Frequency: 1 per MPU cycle

Functional Safety I/O (Optional)

- Safe Torque Off (STO) Input
  - Electrical Interface: Dual-channel 24V isolated
  - Safety Standards: See Standards and Certifications Section
- Safe Stop 1 (SS1) Feature
  - Exact deceleration time value is fixed and depends on product configuration (see Safety Manual for more details).

Standards and Certifications (Pending)

- CE
  - Self Declaration: Yes
  - Electrical Safety: IEC61800-5-1
  - EMC: IEC 61326-3-1, IEC 61800-3, IEC 61500-5-2
- UL
  - Electrical Safety: UL 61800-5-1
- TUV
  - STO & SS1 Functional Safety: IEC 61508, ISO13849, IEC 61800-5-2

Physical

- Dimensions: 246 x 177 x 55 mm
- Weight: 2kg
- Environmental
  - Rated Operational Temperature: 0° to 50°C. See user manual for more details.
  - Humidity: 5 to 90% non-condensing humidity
  - Storage and Transportation Temperature Range: -25° to 60°C
  - Shock: 50 m/s^2 (5 G)
  - Vibration: 10 m/s^2 (1 G)

Optional Accessory Products

- XDMma-ACC1: Mating Connector Kit
- STO-ACC1: STO Breakout Cable
- SPI-ACC1: SPI Breakout Cable
- RS232-ACC1: RS232 Adapter Cable

Ordering Options

	Field	Example selection by user	Optional Values
Number of Axes	1	4	2,4
Current Rating (Amps peak of sine)	2	B	A = (Reserved) B = All axes 5/10A up to 150Vdc C = All axes 10/20A up to 150Vdc D = All axes 15/30A up to 100Vdc
Number of 500 kHz SinCos Encoders[1]	3	1	0,1,2,3,4
Reserved	4	0	0
Number of Absolute Encoders Channels[1]	5	1	0,1,2,3,4
Functional Safety	6	T	N=None, T=STO & SS1
Non-Linear Control	7	N	N = No, C = Non Linear Control
Autofocus	8	N	N = No A = Autofocus
Reserved	9	N	N = N/A
Reserved	10	N	N = N/A

[1] Multi-Channel feedback requires both a digital (incremental or absolute) and an analog feedback device.

Example: **IDMma-4B101-TNNNN** Description: **4 axis 5/10A, 1x SinCos 500kHz encoder, 1x Absolute encoder , STO & SS1**

Field		1	2	3	4	5	6	7	8	9	10
PN	**IDMma**	4	B	1	0	1	T	N	N	N	N

EtherCAT® Conformance tested

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany