### X/Y axis

- **Power**
  - 1, 2, 3, Meter
  - 6, 7, 8, Meter
  - GND

- **Signal**
  - 1. +5 V
  - 2. Limit ±
  - 3. Limit ±
  - 4. GND
  - 5. A±
  - 6. B±

### Z axis

- **Power**
  - 1, 2, 3, Meter
  - 6, 7, 8, Meter
  - GND

- **Signal**
  - 1. GND
  - 2. +5 V
  - 3. B±
  - 4. A±

### RX, RY axis

- **HOA14504-3**
- 9310

#### Encoder

- **Looking at pins**
  - Left to right
  - 1. GND
  - 2. Cl. I
  - 3. Cl. II
  - 4. Vcc
  - 5. GND

- **Signal**
  - 2, 6, 11, Limit ±
  - 3, 4, Limit ±
  - 5, A±

---

### Board Connection

- **Bottom**
  - 15, JAI/JBI
  - 31/37, J2 A-D

- **Middle**
  - 1, Wire
  - 3, orange
  - 2, green

- **Top**
  - 5, JAI/JBI

---

### Controller

- **Bottom**
  - 15, JAI/JBI
  - 31/37, J2 A-D

- **Middle**
  - 1, Wire
  - 3, green
  - 2, JCI

- **Top**
  - 5, JAI/JBI
  - 3, JCI

---

### Notes

- **HOA14504-3**
- 9310

- **Signal**
  - 2, 6, 11, Limit ±
  - 3, 4, Limit ±
  - 5, A±
Power Supply Procedure

1. Attach power on side with fan
   [Diagram of power supply]

2. Plug in 1 to E-stop
   [Diagram of plug connection]

3. On other side to controller
   [Diagram of controller connection]

4. Connect
   - 6 to 15 in the E-H limit connector and A-B limit connector
   - 17 to 30 on A-B
   - 5 and 31 to limit switch
   [Diagram of connections]
- Rx and Ry
- Limit switches
- Encoder shaft
- Play in axes
- Z' and θ
- Figure out motor pin outs

Overall
- Test each axis
- Box with vent for power supply 14" x 8" x 3" -> Side panels in acrylic
- Wiring to the controller
- 2 DB94 HDM
- 7 DB15 HDM
- Power converters
- Wiring for the power supply
- PS output 1 -> Molex
- PS output 2 -> Molex
- E-stop -> Install NC? block
  -> Wire to pin 7 (see sketch)

- Connect F/T sensor
- Collet 10mm to match endoscope
Qty: 2
Units: mm (unless otherwise noted)
Material: AL 2024/7075
Name: LARS Motor Shaft Extension
Product Description

The DMC-40x0 motion controller is Galil's highest performance, stand-alone motion controller. It belongs to Galil's latest generation motion controller family: the Accelera Series, which accepts encoder inputs up to 22 MHz, provides servo update rates as high as 32 kHz, and processes commands in as fast as 40 microseconds — 10 times faster than prior generation controllers.

The DMC-40x0 is a full-featured motion controller packaged with optional multi-axis drives in a compact, metal enclosure. The unit operates stand-alone or interfaces to a PC with Ethernet 10/100Base-T or RS232. The controller includes optically isolated I/O, high-power outputs capable of driving brakes or relays, and analog inputs for interfacing to analog sensors. The DMC-40x0 controller and drive unit accepts power from a single 20—80 VDC source.

The DMC-40x0 is available in one through eight axis formats, and each axis is user-configurable for stepper or servo motor operation. Standard programming features include PID compensation with velocity and acceleration feedforward, multitasking for simultaneously running up to eight programs, and I/O processing for synchronizing motion with external events. Modes of motion include point-to-point positioning, position tracking, jogging, linear and circular interpolation, contouring, electronic gearing and ECAM. Like all Galil controllers, the DMC-40x0 controllers use Galil's popular, intuitive command language, making them very easy to program. GalilTools servo design software further simplifies system set-up with "one-button" servo tuning and real-time display of position and velocity information.

Packaged controller in 1 through 8 axis versions:
DMC-40x0 where x=1,2,3,4,5,6,7,8 axes
(1) 10/100BASE-T Ethernet port with Auto MDIX
(2) RS232 ports up to 115 kbaud
User-configurable for stepper or servo motors on any combination of axes. Optional sinusoidal commutation signals for brushless servo motors.
Accepts up to 22 MHz encoder frequencies for servos.
Outputs pulses up to 6 MHz for steppers
PID compensation with velocity and acceleration feedforward, integration limits, notch filter and low-pass filter
Modes of motion include jogging, point-to-point positioning, contouring, linear and circular interpolation, electronic gearing and ECAM. Features ellipse scaling, slow-down around corners, infinite segment feed and feedrate override
Over 200 English-like commands including conditional statements and event triggers
Non-volatile memory for programs, variables and arrays.
Multitasking for concurrent execution of up to eight programs
Optically isolated home input and forward and reverse limits for every axis.
Uncommitted, isolated inputs and isolated outputs
1- through 4-axis models: 8 inputs and 8 outputs
5- through 8-axis models: 16 inputs and 16 outputs
Isolated, high-power outputs for driving brakes or relays
High speed position latch for each axis and output compare
8 uncommitted analog inputs
32 additional 3.3 V I/O (5 V option)
2 line x 8 character programmable LCD
Dual encoder inputs for each servo axis
Accepts single 20—80 VDC input
Available with internal stepper and servo drives.
Or, connect to external drives of any power range
Communication drivers for Windows and Linux
Custom hardware and firmware options available
DMC-40x0 has CE certification. Specify DMC-40x0-ETL for ETL certification
Product Description

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Features

- Packaged controller in 1 through 8 axis versions: DMC-40x0 where x=1,2,3,4,5,6,7,8 axes
- (1) 10/100BASE-T Ethernet port with Auto MDIX
- (2) RS232 ports up to 115 kbaud
- User-configurable for stepper or servo motors on any combination of axes. Optional sinusoidal commutation signals for brushless servo motors.
- Accepts up to 22 MHz encoder frequencies for servos. Outputs pulses up to 6 MHz for steppers
- PID compensation with velocity and acceleration feedforward, integration limits, notch filter and low-pass filter
- Modes of motion include jogging, point-to-point positioning, contouring, linear and circular interpolation, electronic gearing and ECAM. Features ellipse scaling, slow-down around corners, infinite segment feed and feedrate override
- Over 200 English-like commands including conditional statements and event triggers
- Non-volatile memory for programs, variables and arrays. Multitasking for concurrent execution of up to eight programs
- Optically isolated home input and forward and reverse limits for every axis.
- Uncommitted, isolated inputs and isolated outputs 1- through 4-axis models: 8 inputs and 8 outputs 5- through 8-axis models: 16 inputs and 16 outputs
- Isolated, high-power outputs for driving brakes or relays
- High speed position latch for each axis and output compare
- 8 uncommitted analog inputs
- 32 additional 3.3 V I/O (5 V option)
- 2 line x 8 character programmable LCD
- Dual encoder inputs for each servo axis
- Accepts single 20–80 VDC input
- Available with internal stepper and servo drives. Or, connect to external drives of any power range
- Communication drivers for Windows and Linux
- Custom hardware and firmware options available
- DMC-40x0 has CE certification. Specify DMC-40x0-ETL for ETL certification

www.galilmc.com / Galil Motion Control, Inc. 1
## Instruction Set

### Servo Motor
- AF: Analog feedback
- AG: Set amplifier gain
- AU: Set current loop gain
- AW: Report AMP-43040 bandwidth
- DV: Dual loop operation
- FA: Acceleration feedforward
- FV: Velocity feedforward
- IL: Integrator limit
- IT: Independent time constant
- KO: Derivative constant
- KR: Integrator constant
- KP: Proportional constant
- NB: Notch bandwidth
- NF: Notch frequency
- NZ: Notch zero
- OF: Offset
- PL: Pol
- SH: Servo here
- TL: Torque limit
- TM: Sample time

### Stepper Motor
- DE: Define encoder position
- DP: Define reference position
- KS: Stepper motor smoothing
- MT: Motor type
- QS: Error magnitude
- RP: Report commanded position
- TD: Step counts output
- TP: Tp output position of encoder
- YA: Step drive resolution
- YB: Step motor resolution
- YC: Encoder resolution
- YR: Error correction
- YS: Step resolution maintenance

### Brushless Motor
- BA: Brushless axis
- BB: Brushless phase
- BC: Brushless calibration
- BD: Brushless degrees
- BI: Brushless inputs
- BM: Brushless module
- BO: Brushless offset
- BS: Brushless setup
- BZ: Brushless zero

### System Configuration
- BH: Burn parameters
- BP: Burn program
- BR: Brush motor enable
- BS: Brushless set-up
- BV: Burn variables and arrays
- CE: Configure encoder type
- CN: Configure switches
- CO: Configure I/O points
- CW: Data adjustment bit
- DE: Define dual encoder position
- DI: DHCP configuration
- DP: Define position
- DR: Data record update rate
- EO: Echo off
- HS: Handle switch
- IA: Set IP address
- IH: Internet handle
- IK: Ethernet port blocking
- IT: Independent smoothing
- "LK": Program protect
- LZ: Limiting zones format
- MB: ModBus
- MO: Motor off
- MT: Motor type
- PF: Position format
- PW: Password
- QO: Download array
- QU: Upload array
- RS: Reset
- "RS": Master reset
- SM: Subnet mask
- VF: Variable format

### Math Functions
- @SIN(x): Sine of x
- @COS(x): Cosine of x
- @COM(x): Y's complement of x
- @ASIN(x): Arc sine of x
- @ACOS(x): Arc cosine of x
- @ATAN(x): Arc tangent of x
- @ABS(x): Absolute value of x
- @FAC(x): Fractional portion of x
- @INT(x): Integer portion of x
- @RND(x): Round of x
- @SQRT(x): Square root of x
- @MOD(x): Modulus operator

### Interrogation
- IB: Interrogation bit
- ID: Interrogation data
- IA: Interrogation array
- IL: Interrogation label
- IS: Interrogation string
- IV: Interrogation variable
- MG: Message command
- QH: Query halt state
- QR: Query record
- RQ: Report record information
- RP: Report command position
- RL: Report latch
- "R"V: Firmware revision information
- SC: Stop code
- TA: Tell amplifier status

### Interrogation (cont.)
- TB: Tell status
- TC: Tell error code
- TD: Tell dual encoder
- TE: Tell error
- TI: Tell input
- TP: Tell position
- TR: Trace program
- TS: Tell switches
- TT: Tell torque
- TV: Tell velocity

### Programming
- BK: Breakpoint
- DA: Deallocate variables/arrays
- DL: Download program
- DM: Dimension arrays
- ED: Edit program
- ELSE: Conditional statement
- ENDIF: End of cond. statement
- EN: End program
- EX: Exit program
- IF: If statement
- IN: Input variable
- JP: Jump
- JS: Jump to subroutine
- NO: No-operation—for comments
- RA: Record array
- RC: Record string
- RD: Record data
- REM: Remark program
- SL: Single step
- UL: Upload program
- ZA: Data record variables
- ZS: Zero stack

### Error Control
- BL: Backward software limit
- ER: Error limit
- FL: Forward software limit
- LD: Limit disable
- OA: Encoder failure
- OE: Off-on error function
- OT: Encoder failure period
- OV: Encoder failure voltage
- SD: Limit deceleration

### Contour Mode
- CD: Contour data
- CM: Contour mode
- DT: Contour time interval

### ECM/Gearing
- EA: ECM master
- EB: Enable ECM
- EC: ECM table index
- EG: ECM go
- EM: ECM cycle
- EP: ECM interval
- EQ: Divergence ECM
- ET: ECM table entry
- EW: ECM widen
- EY: ECM cycle counter
- GA: Master axis for gearing
- GD: Engagement distance for gearing
- GM: Gantry mode
- GP: Correction for gearing
- GR: Gear ratio for gearing

### Vector/Linear Interpolation
- CA: Define vector plane
- CR: Circular interpolation move
- CS: Clear motion sequence
- ES: Ellipse scaling
- IT: Smoothing time constant
- LE: Linear Interpolation end
- LI: Linear Interpolation segment
- LM: Linear interpolation mode
- ST: Step motion
- TN: Tangent
- VA: Vector acceleration
- YD: Vector deceleration
- YE: Vector sequence end
- VM: Coordinated motion mode
- VP: Vector position
- VR: Vector speed ratio
- VS: Vector speed
- VV: Vector Velocity

---

**Independent Motion**
- AB: Abort motion
- AC: Acceleration
- BG: Begin motion
- DC: Deceleration
- FE: Find edge
- FI: Find index
- HM: Home
- HV: Home speed
- IP: Increment position
- IT: Smoothing time constant
- JG: Jog mode
- PA: Position absolute
- PR: Position relative
- PT: Position tracking
- SD: Switch deceleration
- SP: Speed
- ST: Stop
# Ethernet/RS232 Accelera Series, 1–8 axes

## DMC-40x0 Series

### Connectors — Communications

**RS-232 Main Port**
- 9-pin; Male connector and cable
  - 1 NC
  - 2 Transmit data-output
  - 3 Receive data-input
  - 4 NC
  - 5 Ground
  - 6 NC
  - 7 Clear to send-input
  - 8 Request to send-output
  - 9 NC

**RS232 Auxiliary Port**
- 5-pin; Female connector and cable
  - 1 NC
  - 2 Receive data-input
  - 3 Transmit data-output
  - 4 NC
  - 5 Ground
  - 6 NC
  - 7 Request to send-output
  - 8 Clear to send-input
  - 9 5V

**Ethernet 10/100Base-T**
- RJ-45 connector

### Connectors — I/O

#### J1 Amplifier I/O Axes A thru D (ICM-42000)
- 44-pin Hi-density Male D-sub
  - 1 Reserved
  - 2 PWM C/Step C
  - 3 Reserved
  - 4 Reserved
  - 5 Sign C/Dir C
  - 6 Reserved
  - 7 Amp enable A
  - 8 Amp enable D
  - 9 NC
  - 10 -12V out
  - 11 Motor command B
  - 12 Reserved
  - 13 NC
  - 14 NC
  - 15 +5V out
  - 16 PWM A/Step A
  - 17 Reserved
  - 18 PWM D/Step D
  - 19 Sign A/Dir A
  - 20 Reserved
  - 21 Sign B/Dir B
  - 22 Amp enable common-1
  - 23 Amp enable C
  - 24 NC
  - 25 +12V out
  - 26 Reserved
  - 27 Motor command C
  - 28 Reserved
  - 29 NC
  - 30 NC
  - 31 PWM B/Step B
  - 32 Reserved
  - 33 Ground
  - 34 Sign B/Dir B
  - 35 Reserved
  - 36 Ground
  - 37 Amp enable D
  - 38 Amp enable common-2
  - 39 Ground
  - 40 Motor command A
  - 41 Reserved
  - 42 Motor command D
  - 43 Ground
  - 44 NC

#### J1 Amplifier I/O Axes E thru H (ICM-42000)
- 44-pin Hi-density Male D-sub
  - 1 Reserved
  - 2 PWM G/Step G
  - 3 Reserved
  - 4 Reserved
  - 5 Sign G/Dir G
  - 6 Reserved
  - 7 Amp enable E
  - 8 Amp enable H
  - 9 NC
  - 10 -12V out
  - 11 Motor command F
  - 12 Reserved
  - 13 NC
  - 14 NC
  - 15 +5V out
  - 16 PWM E/Step E
  - 17 Reserved
  - 18 PWM H/Step H
  - 19 Sign E/Dir E
  - 20 Reserved
  - 21 Sign H/Dir H
  - 22 Amp enable common-1
  - 23 Amp enable G
  - 24 NC
  - 25 +12V out
  - 26 Reserved
  - 27 Motor command G
  - 28 Reserved
  - 29 NC
  - 30 NC
  - 31 PWM F/Step F
  - 32 Reserved
  - 33 Ground
  - 34 Sign F/Dir F
  - 35 Reserved
  - 36 Ground
  - 37 Amp enable F
  - 38 Amp enable common-2
  - 39 Ground
  - 40 Motor command E
  - 41 Reserved
  - 42 Motor command H
  - 43 Ground
  - 44 NC

---

*Note: Power can be input through either of the amplifier connectors to power the entire unit due to power pass-thru connectors that connect input power to all modules. For 5- through 8-axis units with two different types of amplifiers, the lower of the maximum voltages is the maximum rating for the unit. However, if you need different voltages, you can specify the ISAMP and/or ISCLNT option to separate the various power inputs.

When using the AMP-43140 with a power supply lower than +/-20 Volts, a separate supply of 20—80 VDC must be input to the 2-pin connector on the side of the DMC-40X0 or, specify the 12V option for the DMC controller.
### Ethernet/RS232 Accelera Series, 1–8 axes

#### DMC-40x0 Series

**Connectors — I/O**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>44-pin Hi-density Female D-sub</td>
<td>44-pin Hi-density Female D-sub</td>
</tr>
<tr>
<td>1. Error output*</td>
<td>1. Error output*</td>
</tr>
<tr>
<td>2. Input 1-isolated</td>
<td>2. Input 9-isolated</td>
</tr>
<tr>
<td>3. Input 4-isolated</td>
<td>3. Input 12-isolated</td>
</tr>
<tr>
<td>4. Input 7-isolated</td>
<td>4. Input 15-isolated</td>
</tr>
<tr>
<td>5. Electronic Lockout-isolated input*</td>
<td>5. Electronic lockout-isolated input*</td>
</tr>
<tr>
<td>11. Output power+</td>
<td>11. Output power+</td>
</tr>
<tr>
<td>12. Output 3-isolated</td>
<td>12. Output 11-isolated</td>
</tr>
<tr>
<td>14. Output return-</td>
<td>14. Output return-</td>
</tr>
<tr>
<td>15. +5 V out</td>
<td>15. +5 V out</td>
</tr>
<tr>
<td>16. Reset-isolated*</td>
<td>16. Reset-isolated*</td>
</tr>
<tr>
<td>17. Input common</td>
<td>17. Input common</td>
</tr>
<tr>
<td>18. Input 3-isolated</td>
<td>18. Input 11-isolated</td>
</tr>
<tr>
<td>20. Abort-isolated*</td>
<td>20. Abort-isolated*</td>
</tr>
<tr>
<td>21. NC</td>
<td>21 NC</td>
</tr>
<tr>
<td>22. Reverse limit A-isolated f</td>
<td>22 Reverse limit E-isolated f</td>
</tr>
<tr>
<td>23. Reverse limit B-isolated f</td>
<td>23. Reverse limit F-isolated f</td>
</tr>
<tr>
<td>26. NC</td>
<td>26 NC</td>
</tr>
<tr>
<td>27. Output 2-isolated</td>
<td>27 Output 10-isolated</td>
</tr>
<tr>
<td>28. Output 5-isolated</td>
<td>28 Output 13-isolated</td>
</tr>
<tr>
<td>29. Output 8-isolated</td>
<td>29 Output 16-isolated</td>
</tr>
<tr>
<td>30. +5 V out</td>
<td>30. +5 V out</td>
</tr>
<tr>
<td>31. Ground</td>
<td>31 Ground</td>
</tr>
<tr>
<td>32. Input 2-isolated</td>
<td>32. Input 10-isolated</td>
</tr>
<tr>
<td>33. Input 5-isolated</td>
<td>33. Input 13-isolated</td>
</tr>
<tr>
<td>34. Input 8-isolated</td>
<td>34. Input 16-isolated</td>
</tr>
<tr>
<td>35. NC</td>
<td>35 NC</td>
</tr>
<tr>
<td>36. Forward limit A-isolated f</td>
<td>36 Forward limit E-isolated f</td>
</tr>
<tr>
<td>37. Forward limit B-isolated f</td>
<td>37 Forward limit F-isolated f</td>
</tr>
<tr>
<td>38. Forward limit C-isolated f</td>
<td>38 Forward limit G-isolated f</td>
</tr>
<tr>
<td>39. Forward limit D-isolated f</td>
<td>39 Forward limit H-isolated f</td>
</tr>
<tr>
<td>40. Ground</td>
<td>40 Ground</td>
</tr>
<tr>
<td>41. Output 1-isolated</td>
<td>41 Output 9-isolated</td>
</tr>
<tr>
<td>42. Output 4-isolated</td>
<td>42 Output 12-isolated</td>
</tr>
<tr>
<td>43. Output 7-isolated</td>
<td>43 Output 15-isolated</td>
</tr>
<tr>
<td>44. Output Compare A-D</td>
<td>44 Output Compare A-D</td>
</tr>
</tbody>
</table>

**Axis Connectors Axes A thru H (ICM-42200)**

<table>
<thead>
<tr>
<th>26-pin Hi-density Female D-sub</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reserved</td>
</tr>
<tr>
<td>2. Amp Enable</td>
</tr>
<tr>
<td>3. Direction</td>
</tr>
<tr>
<td>4. Home</td>
</tr>
<tr>
<td>5. Limit switch common</td>
</tr>
<tr>
<td>6. Aux A-</td>
</tr>
<tr>
<td>7. index+</td>
</tr>
<tr>
<td>8. A-</td>
</tr>
<tr>
<td>9. +5 V</td>
</tr>
<tr>
<td>10. Ground</td>
</tr>
<tr>
<td>11. Amp Enable Return</td>
</tr>
<tr>
<td>12. Reserved</td>
</tr>
<tr>
<td>13. Step</td>
</tr>
<tr>
<td>14. Forward limit</td>
</tr>
<tr>
<td>15. Aux B+</td>
</tr>
<tr>
<td>16. index-</td>
</tr>
<tr>
<td>17. B+</td>
</tr>
<tr>
<td>18. Ground</td>
</tr>
<tr>
<td>19. Motor command</td>
</tr>
<tr>
<td>20. Amp Enable Power</td>
</tr>
<tr>
<td>21. Reserved</td>
</tr>
<tr>
<td>22. Reverse limit</td>
</tr>
<tr>
<td>23. Aux B-</td>
</tr>
<tr>
<td>24. Aux A+</td>
</tr>
<tr>
<td>25. B-</td>
</tr>
<tr>
<td>26. A+</td>
</tr>
</tbody>
</table>

**JA1, JB1, JC1, JD1 Encoder Axes A thru D (ICM-42000)**

- 1 Index+
- 2 B+
- 3 A+
- 4 Aux B+
- 5 Ground
- 6 Index-
- 7 B-
- 8 A-
- 9 Aux A-
- 10 Hall A
- Aux A+
- Aux B-
- 13 Hall B
- 14 Hall C
- 15 +5 V out

**JE1, JF1, JG1, JH1 Encoder Axes E thru H (ICM-42000)**

<table>
<thead>
<tr>
<th>15-pin Hi-density Female D-sub</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Index+</td>
</tr>
<tr>
<td>2. B+</td>
</tr>
<tr>
<td>3. A+</td>
</tr>
<tr>
<td>4. Aux B+</td>
</tr>
<tr>
<td>5. Ground</td>
</tr>
<tr>
<td>6. Index-</td>
</tr>
<tr>
<td>7. B-</td>
</tr>
<tr>
<td>8. A-</td>
</tr>
</tbody>
</table>

**J3 Analog Inputs (ICM-42000 & -42200)**

<table>
<thead>
<tr>
<th>15-pin Low-density Male D-sub</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Analog Ground</td>
</tr>
<tr>
<td>2. Analog input 1</td>
</tr>
<tr>
<td>3. Analog input 3</td>
</tr>
<tr>
<td>4. Analog input 5</td>
</tr>
<tr>
<td>5. Analog input 7</td>
</tr>
<tr>
<td>6. Analog Ground</td>
</tr>
<tr>
<td>7. +12 V</td>
</tr>
<tr>
<td>8. +5 V In</td>
</tr>
<tr>
<td>9. Analog Ground</td>
</tr>
<tr>
<td>10. Analog input 2</td>
</tr>
<tr>
<td>11. Analog input 4</td>
</tr>
<tr>
<td>12. Analog input 6</td>
</tr>
<tr>
<td>13. Analog input 8</td>
</tr>
<tr>
<td>14. NC</td>
</tr>
<tr>
<td>15. +12 V</td>
</tr>
</tbody>
</table>

*Active low
≠Programmable for Active high or Active low

www.gailimc.com / Galil Motion Control, Inc. 5
## Ethernet/RS232 Accelera Series, 1–8 axes

### DMC-40x0 Series

#### Ordering Information

**1- through 4-axis Models:**

<table>
<thead>
<tr>
<th>Number of Axes</th>
<th>Interconnect</th>
<th>Shunt Regulator (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: 1-axis</td>
<td>000: Digital encoder</td>
<td></td>
</tr>
<tr>
<td>2: 2-axes</td>
<td>100: Sinusoidal encoder</td>
<td></td>
</tr>
<tr>
<td>3: 3-axes</td>
<td>200: Separate Axes Connectors</td>
<td></td>
</tr>
<tr>
<td>4: 4-axes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Communication**

012: one Ethernet port and two RS232 ports

**Drive: Axes 1–4 (optional)**

- 3020: two 500 Watt servo drives
- 3040: four 500 Watt servo drives
- 3140: four 20 Watt servo drives
- 4040: four 1.4 A stepper drives — Full, Half, 1/4, 1/16
- 4140: four microstep drives

**Example: DMC-4030-C012-I000-D3040**

**5- through 8-axis Models:**

<table>
<thead>
<tr>
<th>Number of Axes</th>
<th>Interconnect (1st four axes)</th>
<th>Shunt Regulator (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5: 5-axes</td>
<td>000: Digital encoder</td>
<td></td>
</tr>
<tr>
<td>6: 6-axes</td>
<td>100: Sinusoidal encoder</td>
<td></td>
</tr>
<tr>
<td>7: 7-axes</td>
<td>200: Separate Axes Connectors</td>
<td></td>
</tr>
<tr>
<td>8: 8-axes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Communication**

012: one Ethernet port and two RS232 ports

**Drive — Axes 5–8 (optional)**

- 3020: two 500 Watt servo drives
- 3040: four 500 Watt servo drives
- 3140: four 20 Watt servo drives
- 4040: four 1.4 A stepper drives — Full, Half, 1/4, 1/16
- 4140: four microstep drives

**Example: DMC-4080-C012-I000-I000-D3040-D3040**

*Ordering Information continued on the next page.*
# Ethernet/RS232 Accelera Series, 1–8 axes

## DMC-40x0 Series

### Ordering Information — continued

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QUANTITY 1</th>
<th>QUANTITY 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMC-4010-C012-I000</td>
<td>1-axis Ethernet/RS232 controller with ICM-42000</td>
<td>$1595</td>
<td>$945</td>
</tr>
<tr>
<td>DMC-4020-C012-I000</td>
<td>2-axis Ethernet/RS232 controller with ICM-42000</td>
<td>$1695</td>
<td>$995</td>
</tr>
<tr>
<td>DMC-4030-C012-I000</td>
<td>3-axis Ethernet/RS232 controller with ICM-42000</td>
<td>$1995</td>
<td>$1095</td>
</tr>
<tr>
<td>DMC-4040-C012-I000</td>
<td>4-axis Ethernet/RS232 controller with ICM-42000</td>
<td>$2295</td>
<td>$1195</td>
</tr>
<tr>
<td>DMC-4050-C012-I000-I000</td>
<td>5-axis Ethernet/RS232 controller with ICM-42000</td>
<td>$2695</td>
<td>$1495</td>
</tr>
<tr>
<td>DMC-4060-C012-I000-I000</td>
<td>6-axis Ethernet/RS232 controller with ICM-42000</td>
<td>$2895</td>
<td>$1595</td>
</tr>
<tr>
<td>DMC-4070-C012-I000-I000</td>
<td>7-axis Ethernet/RS232 controller with ICM-42000</td>
<td>$3045</td>
<td>$1695</td>
</tr>
<tr>
<td>DMC-4080-C012-I000-I000</td>
<td>8-axis Ethernet/RS232 controller with ICM-42000</td>
<td>$3195</td>
<td>$1795</td>
</tr>
<tr>
<td>ICM-42100 (-I100)</td>
<td>Specify sinusoidal encoder inputs instead of digital encoder inputs. Replace -I000 with -I1000</td>
<td>$100 adder</td>
<td>$60 adder</td>
</tr>
<tr>
<td>ICM-42200 (-I200)</td>
<td>Specify individual 26-pin HD connectors for each axis. Replace -I000 with -I2000</td>
<td>$ no adder</td>
<td>$ no adder</td>
</tr>
<tr>
<td>AMP-43040 (-D3040)</td>
<td>Four 500 W servo drives (use one for 1–4 axis models; Two for 5–8 axes models). Add to above</td>
<td>$700</td>
<td>$400</td>
</tr>
<tr>
<td>AMP-43020 (-D3020)</td>
<td>Two 500 Watt servo drives</td>
<td>$450</td>
<td>$275</td>
</tr>
<tr>
<td>AMP-43140 (-D3140)</td>
<td>Four 20 Watt servo drives</td>
<td>$175</td>
<td>$155</td>
</tr>
<tr>
<td>SDM-44040 (-D4040)</td>
<td>Four 1.4 A stepper drives: Full, Half, 1/4, 1/16</td>
<td>$175</td>
<td>$155</td>
</tr>
<tr>
<td>SDM-44140 (-D4140)</td>
<td>Four microstep drives</td>
<td>$600</td>
<td>$400</td>
</tr>
<tr>
<td>SR-49000 (-SR90)</td>
<td>Shunt regulator (90 Volts). Add to above</td>
<td>$50</td>
<td>$35</td>
</tr>
<tr>
<td>PSR-12-24</td>
<td>Power supply, 12 A, 24 VDC. Includes shunt regulator</td>
<td>$250</td>
<td>$175</td>
</tr>
<tr>
<td>PSR-6-48</td>
<td>Power supply, 6 A, 48 VDC. Includes shunt regulator</td>
<td>$250</td>
<td>$175</td>
</tr>
<tr>
<td>ICS-48015-M</td>
<td>15-pin D HD male to screw terminals — for encoder signals</td>
<td>$50</td>
<td>$35</td>
</tr>
<tr>
<td>ICS-48115-F</td>
<td>15-pin D LD female to screw terminals — for analog inputs</td>
<td>$50</td>
<td>$35</td>
</tr>
<tr>
<td>ICS-48044-M</td>
<td>44-pin D HD male to screw terminals — for general I/O</td>
<td>$75</td>
<td>$50</td>
</tr>
<tr>
<td>ICS-48044-F</td>
<td>44-pin D HD female to screw terminals — for external drive signals</td>
<td>$75</td>
<td>$50</td>
</tr>
<tr>
<td>ICS-48032-F*</td>
<td>44-pin D HD female to screw terminals — for extended I/O. Provides optical isolation of 32 extended I/O points</td>
<td>$125</td>
<td>$80</td>
</tr>
<tr>
<td>ICS-48026-M</td>
<td>26-pin D HD male to screw terminals — for axis connectors on ICM-42200</td>
<td>$75</td>
<td>$50</td>
</tr>
<tr>
<td>RIO-47xxx</td>
<td>Remote I/O controller, Pocket PLC</td>
<td>Starts at $295</td>
<td>$195</td>
</tr>
<tr>
<td>-ETL</td>
<td>Option for ETL certification and documentation</td>
<td>$50 adder</td>
<td></td>
</tr>
<tr>
<td>GalliTTools-Lite</td>
<td>Editor, Terminal, Watch Tools. Includes communication library for developers-supports C++, VB, C#, LabVIEW and more</td>
<td>Free download</td>
<td></td>
</tr>
<tr>
<td>GalliTTools</td>
<td>Above with Scope and Tuner</td>
<td>$195</td>
<td></td>
</tr>
<tr>
<td>ActiveX Tool Kit</td>
<td>Custom ActiveX controls for Microsoft platforms</td>
<td>$595</td>
<td></td>
</tr>
</tbody>
</table>

*ICS-48032-F Options:

ICS-48032-F-xxxx: Bank 4 (ln=In, o=Out(default=sink))

ICS-48032-F-0000: Source All 4 banks configured as outputs, outputs sourcing

ICS-48032-F-0011: First 2 banks outputs, second 2 banks inputs, outputs sinking

ICS-48032-F-0011: Source First 2 banks outputs, second 2 banks inputs, outputs sourcing

Galil offers additional quantity discounts for purchases between 1 and 100. Consult Galil for a quotation.
Application Note #5465

High resolution linear stage tuning

Introduction

Many industries today, such as biotechnology and semiconductor, are introducing machines that require an ever increasing amount of accuracy and performance. Many of these applications are being designed around sub-micron positioning accuracy, with very demanding move and settle criteria. With these stringent requirements, it is up to the motion controller to be able to accurately position and settle these moves.

This application note details an actual customer application in the biotechnology industry and demonstrates the performance that can be achieved with the Galil motion controller and amplifier. This particular three axis application was based on a 0.1µm resolution feedback, with very demanding move and settle times. Both the X and Y axes consisted of linear motors with cross rolled slides. The Z axis was a vertical axis, also with linear motor and slides.

In the following sections, we investigate the design specifications of the X and Y axes, the selection of the components and finally the performance that was achieved. The Z axis had less demanding specifications and is not addressed in this note.

Design criteria

The X and Y axes on this machine are the critical axes, with very strict time and position criteria. Each axis was required to perform an incremental step move, pause for a short duration (<2msec) to analyze a sample, and then continue to the next step move. Total throughput of the machine, therefore, was dependent on how quickly the controller could perform the move, and settle within the position window for the sample to be analyzed.

Two tests were run to demonstrate the final performance of the system. The first performed a single ‘step and settle’ move, and measured the total time. The second performed multiple step and settle moves over the full travel of the machine. These tests gave the customer the total time required to complete ‘n’ number of cycles.

Below are the customer specifications for the stages, as well as the move length and settle time specifications.

X axis stage

Total stage travel: 23mm
X axis payload: 750g
Encoder resolution: 0.1µm
L Series

The L series power entry modules are compact units that combine a multi-function power entry module and high-performance RFI filtering capabilities. They are available with either a four-voltage selector or a DPST on/off switch. Both variations can be specified with North American or European fusing capabilities and are available in either flange or snap-in mounting.

These filters are UL recognized, CSA certified, and VDE approved. The L series modules offer a choice of filters for general or medical applications.

EDL Models

The RFI filter is for general purpose applications where line-to-line and line-to-ground noise must be controlled. The filter is designed to meet the very low leakage requirements of VDE portable equipment. They are available in three current ratings.

EHL Models

This medical filter provides susceptibility protection without the leakage current associated with line-to-ground capacitors. Designed to allow equipment to meet UL544 for patient care and non-patient care equipment, the EHL filter has a maximum leakage current of 2 μA at 120 VAC 60 Hz. See Appendix C for more information on medical applications and UL standards.

Voltage Selection

To change selected voltage: disconnect the power cord; open cover using a small blade screwdriver or similar tool; insert the tool into the voltage selection slot and remove wheel from unit; select desired voltage; replace wheel into unit and close cover; making sure the selected voltage appears in connector window.

Note: All models have North American or dual European fusing capability and are available in either flange or snap-in mounting.

Note: When using the models with an IEC connector, remember that the leakage current of the companion line cord, GA400, is more significant than that of the filter - which may disqualify this line cord from use in patient care applications.
# L Series

## Case Styles — Unfiltered Models

### Flange Models

![Flange Model Diagram]

**Back View**  
Recommended Panel Cutout

**Typical dimensions:**  
- Mounting holes: 126 [3.20] Dia. (2)  

### Snap-In Models

![Snap-In Model Diagram]

**Back View**  
Recommended Panel Cutout

(1) For panel thickness of .031-.079 [0.8-2.0]  
(2) For panel thickness of .083-.126 [2.1-3.2]  
(3) For snap-in application the 1 22 [28.5] sides of the cutout must have a .02 [.508] radius on the installation side.  
All backplate terminals: 110 [2.79] terminals, except for switch. Switch terminals are .187 [4.75] Note: Snap-in models allow front mounting only.

## Case Styles — Filtered Models

### Flange Models

![Flange Model Diagram]

**Snap-In Models**

Note: Metric fuse models have additional jumper from filter-to-module.

### Case Dimensions

<table>
<thead>
<tr>
<th>Part No.</th>
<th>A (max)</th>
<th>B (max)</th>
<th>C (max)</th>
<th>D (max)</th>
<th>E (max)</th>
<th>F (max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange</td>
<td>1.98</td>
<td>1.575</td>
<td>2.3</td>
<td>2.14</td>
<td>1.66</td>
<td>1.11</td>
</tr>
<tr>
<td>Unfiltered</td>
<td>50.29</td>
<td>40.0</td>
<td>58.42</td>
<td>54.36</td>
<td>42.16</td>
<td>28.19</td>
</tr>
<tr>
<td>Snap-in</td>
<td>1.28</td>
<td>—</td>
<td>2.3</td>
<td>2.14</td>
<td>1.66</td>
<td>1.11</td>
</tr>
<tr>
<td>Unfiltered</td>
<td>32.51</td>
<td>58.42</td>
<td>54.36</td>
<td>42.16</td>
<td>28.19</td>
<td></td>
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<tr>
<td>Flange</td>
<td>1.98</td>
<td>1.575</td>
<td>2.3</td>
<td>2.14</td>
<td>2.01</td>
<td>1.11</td>
</tr>
<tr>
<td>Filtered</td>
<td>50.29</td>
<td>40.0</td>
<td>58.42</td>
<td>54.36</td>
<td>51.05</td>
<td>28.19</td>
</tr>
<tr>
<td>Snap-in</td>
<td>1.28</td>
<td>—</td>
<td>2.3</td>
<td>2.14</td>
<td>2.01</td>
<td>1.11</td>
</tr>
<tr>
<td>Filtered</td>
<td>32.51</td>
<td>58.42</td>
<td>54.36</td>
<td>51.05</td>
<td>28.19</td>
<td></td>
</tr>
</tbody>
</table>

Dimensions are in inches and millimeters unless otherwise specified. Values in italics are metric equivalents. Dimensions are shown for reference purposes only. Specifications subject to change.