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TMC 188/40-TQ

Four Axis Linear And Rotary Motion Control Module

The TMC 188/40-TQ motion control module is a high performance linear and rotary motion controller for the Simatic TI 505 series Programmable Controllers. Each axis can be independently programmed to use either a quadrature encoder or magnetostrictive linear displacement transducer (Temposonics™) as a position sensing device. Drive outputs can be configured to work with either current or voltage servo drive inputs.

Features

- Quadrature and magnetostrictive (Temposonics) inputs in a single module
- Four axes of independent or coordinated control
- Simatic-TI 505 series compatible
- Motion profiles can be changed on the fly
- Optically isolated inputs and outputs
- Full PID loop control
- Two millisecond control loop
- Front panel status indicators
- Special Function Interface
- Programmed using V Memory
- Direct connection to magnetostrictive transducers (Temposonics)

Applications

- Palletizers/Stackers
- Laser positioning
- Tube forging machines
- Pinch roller positioning
- Robotics
- Headrigs, carriages, and other Forest industry machinery
- Hydraulic actuators
- Servo Motors

Quadrature Encoder Inputs

- Frequency response up to 200 KHz (800,000 Quadrature counts per second)
- 24 bit internal counters
- Position control and Velocity control
- HOME and LIMIT signal inputs
- Input voltage range: 3.5 VDC to 24 VDC
- Encoder output Compatibility: Open collector, TTL and Differential

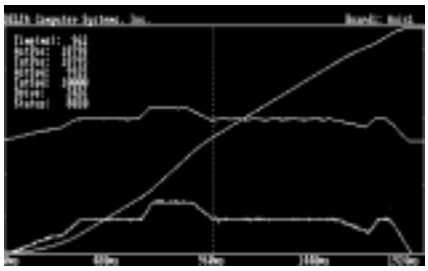
Magnetostrictive Inputs

- Resolution to 0.001 inches
- 1,2 or 4 recirculations
- Positive or negative interrogation pulses
- Maximum speeds up to 60 inches per second (240 ips at 0.004" resolution)
- Transducer lengths up to 240 inches (0.004" resolution)

DCSMON Diagnostic Program

(requires PC or compatible)

- Provides graphic display of latest motion profile position and velocity information



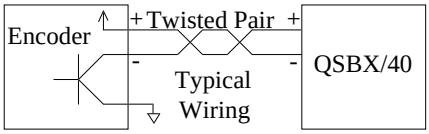
- Calculates motion parameters SCALE, OFFSET & DIRECTION
- Provides access to auto tuning function
- Allows user to activate simple motion profiles from a keyboard
- Permits user to change control parameters from a keyboard
- Displays parameter and status information for multiple axes
- Saves and retrieves graphic diagnostic information to and from disk

Delta Computer Systems, Inc., 11719 NE 95th St., Vancouver, WA 98682 (360) 254-8688

TMC 188/40-TQ

Hardware Information

Quadrature Encoder Interface



Phases	A, B and HOME (Z)
Input Isolation	2500 VAC (optical)
Input Voltage Threshold	1.5 VDC min, 1.8 VDC typ, 3.25 VDC max
Input Current Threshold	5 mA typ, 9.5 mA max
Maximum Input Voltage	24 VDC
Encoder Compatibility	Open collector 5 to 24 VDC, TTL and Differential
Frequency Response	200 KHz, 800,000 edges per second using TTL drive

Four Digital Inputs for HOME qualification or LIMIT

Inputs	4 HOME and 4 LIMIT inputs
Input Isolation	2500 VAC (optical)
Input Voltage Threshold	1.5 VDC min, 1.8 VDC typ, 3.25 VDC max
Input Current Threshold	5 mA typ, 9.5 mA max
Maximum Input Voltage	24 VDC

Magnetostrictive Interface

Interface Type	Start/Stop digital pulse
Temposonics I and II	Direct connection
Temposonics II & RPM module	One differential driver board per axis (AMP 10)
Norstat	Direct connection
Balluff	One differential driver board per axis with BTL-2-P
T&R Electronics	One recirculation only (Consult Delta before using)
Input Isolation	2500 VAC optically isolated
Recirculations	Provided by module: 1, 2 or 4 (positive or negative pulse)
Counters	27.75 MHz
Position update rate	Two milliseconds
Sensor protection	4.7 and 15 ohm resistors for sensor power

Drive Outputs

Output Isolation	2500 VAC optically isolated
Current Mode	±25, ±50, ±100 milliamps
Voltage Mode	±2.5, ±5, ±10 Volts
Resolution	12 bit

Simatic TI 505 Interface

WY register requirements	8 WY registers
V Memory requirements	Up to 148 locations
Typical 525 scan times	10 milliseconds per module (plus remote I/O overhead)
Typical 535 scan times	1.6 milliseconds per module (plus remote I/O overhead)
Typical 545 scan times	0.8 milliseconds per module (plus remote I/O overhead)
505 Bus Interface	Special Function Interface Hardware

Power Requirements

TI bus	+ 5 VDC @ 1.500 Amps maximum
External Magnetostrictive sensor	±15 VDC @ 500 mA, +5 VDC @ 500 mA
External drive	±15 VDC @ 500 mA

Mechanical Specifications

Dimensions (WxHxD)	1.6 x 10.5 x 7.5 in (41 x 266 x 191 mm)
Weight	1.3 lb. (592g)
Connectors:	
Backplane	Direct connection to Simatic TI 505 series backplane
Quadrature	DB-37S
Magnetostrictive Sensor	DB-25S
Drive	DB-15S

Environment

Operating Temperature	+32 to +140 F (0 to +60C)
Non-Operating Temperature	-40 to +185 F (-40 to +85C)
Humidity	0 to 95% non-condensing

Programming Parameters

Axis Setup Parameters

Direction	Sign of position units with respect to Transducer Counts
Scale	Conversion from transducer counts to user position units
Offset	Displacement of user zero from transducer zero
Extend Limit	Maximum length allowed
Retract Limit	Minimum length allowed
Static Gain	Proportional gain at rest
Extend Gain	Proportional gain when extending
Retract Gain	Proportional gain when retracting
Extend Feed Forward	Feed forward drive when extending
Retract Feed Forward	Feed forward drive when retracting
Feed Forward Advance	Time shift in milliseconds for Feed Forward term
Hysteresis	Drive deadband compensation
Dither	Static friction compensation
Differential Gain	Differential gain
Integral Gain	Integral gain while in motion
Null Update	Null calculation interval in milliseconds
New Null	Preset drive offset value
Maximum Position Error	Set point for position error indication
Halt Mask	Disable for ramped stop on errors
Emergency Stop Mask	Disable for quick stop on errors
At Commanded Position	Window around requested position for status bit
Near Commanded Position	Window around requested position for status bit

Axis Dynamic Control Parameters

Mode Bits	Function selection bits
Acceleration	Acceleration rate or distance
Deceleration	Deceleration rate or distance
Maximum Speed	Maximum speed during a move
Requested Position	Destination position in position units
Command	Command to be executed (F, G, H, P, R, S, Z, @) F Auto adjustment of Feed Forward G Move axis H Halt axis O Override/Open loop control P Initialize axis setup parameters R Restore previously saved drive null S Save current drive null Z Preset quadrature position @ Find HOME position (Move axis and check LIMIT)

Axis Status Information (Read only)

Command Position	Requested position with limits checked
Target Position	Calculated position of axis
Actual Position	Measured position
Transducer Counts	Raw transducer counts
Drive Level	Output drive in raw A/D counts
Status Word	Axis error and status bits Bit 01 - Parameters initialized Bit 02 - Lag error Bit 03 - Lead error Bit 04 - Overdrive error Bit 05 - Valve out of null Bit 06 - Transducer not responding Bit 07 - Position overflow (HIT LIMIT- quad mode) Bit 08 - Parameter error Bit 09 - Active (Axis one only) Bit 10 - Stopped Bit 11 - Decelerating Bit 12 - At maximum speed Bit 13 - Accelerating Bit 14 - Halted Bit 15 - Near commanded position Bit 16 - At commanded position

TMC 188/40-TQ

Wiring Information

DB15P to pigtail cable (6 feet) for Drive outputs. Cable uses Alpha 1181/15 or equiv.

Pin	Function	Wire Color
1	+15 input	RED
2	Power Supply Common	BLACK
3	-15 input	WHITE
4	Common	GREEN
5	Drive Out 1	ORANGE
6	Common	BLUE
7	Common	BROWN
8	Drive Out 2	YELLOW
9	Common	RED/BLACK
10	Drive Out 4	RED/YELLOW
11	Common	RED/GREEN
12	Common	TAN
13	Drive Out 3	PINK
14	Common	GRAY
15	Common	VIOLET

DB37P to pigtail cable (10 feet) for quadrature inputs . Cable uses Alpha 5480/19 or equiv.

Pin	Function	Wire Color
1	Axis 1 Phase A+ input	BLACK pair 1
20	Axis 1 Phase A- input	RED pair 1
2	Axis 1 Phase B+ input	BLACK pair 2
21	Axis 1 Phase B- input	WHITE pair 2
3	Axis 2 Phase A+ input	BLACK pair 3
22	Axis 2 Phase A- input	GREEN pair 3
4	Axis 2 Phase B+ input	BLACK pair 4
23	Axis 2 Phase B- input	BLUE pair 4
5	Axis 3 Phase A+ input	BLACK pair 5
24	Axis 3 Phase A- input	YELLOW pair 5
6	Axis 3 Phase B+ input	BLACK pair 6
25	Axis 3 Phase B- input	BROWN pair 6
7	Axis 4 Phase A+ input	BLACK pair 7
26	Axis 4 Phase A- input	ORANGE pair 7
8	Axis 4 Phase B+ input	RED pair 8
27	Axis 4 Phase B- input	WHITE pair 8
9	Axis 1 Home Z+ input	RED pair 9
28	Axis 1 Home Z- input	GREEN pair 9
10	Axis 2 Home Z+ input	RED pair 10
29	Axis 2 Home Z- input	BLUE pair 10
11	Axis 3 Home Z+ input	RED pair 11
30	Axis 3 Home Z- input	YELLOW pair 11
12	Axis 4 Home Z+ input	RED pair 12
31	Axis 4 Home Z- input	BROWN pair 12
13	Axis 1 Limit + input	RED pair 13
32	Axis 1 Limit - input	ORANGE pair 13
14	Axis 2 Limit + input	GREEN pair 14
33	Axis 2 Limit - input	WHITE pair 14
15	Axis 3 Limit + input	GREEN pair 15
34	Axis 3 Limit - input	BLUE pair 15
16	Axis 4 Limit + input	GREEN pair 16
35	Axis 4 Limit - input	YELLOW pair 16
17	N/C	GREEN pair 17
36	N/C	BROWN pair 17
18	N/C	GREEN pair 18
37	N/C	ORANGE pair 18

DB25P to pigtail cable (6 feet) for magnetostrictive sensor inputs . Cable uses Alpha 1181/25 or equiv.

Pin	Function	Wire Color
1	+15 input	RED
2	Power supply common	BLACK
3	-15 input	WHITE
4	+5 input	GREEN
5	+12 output	ORANGE
6	Common	GRAY
7	Interrogation pulse 1	BROWN
8	+15v axis 1	PINK
9	Return pulse 1	YELLOW
10	-15v axis 1	VIOLET
11	Common	TAN
12	Interrogation pulse 2	BLUE
13	+15v axis 2	RED/BLACK
14	Return pulse 2	RED/YELLOW
15	-15v axis 2	RED/GREEN
16	Common	WHITE/BLACK
17	Interrogation pulse 3	WHITE/BLUE
18	+15v axis 3	WHITE/RED
19	Return pulse 3	WHITE/YELLOW
20	-15v axis 3	WHITE/GREEN
21	Common	WHITE/GRAY
22	Interrogation pulse 4	WHITE/BROWN
23	+15v axis 4	WHITE/ORANGE
24	Return pulse 4	WHITE/BLACK/RED
25	-15v axis 4	WHITE/VIOLET

Ordering Information

Part Number: TMC 188/40-TQ.
One set of cables is provided with each module.
Contact: Herb Johanson at (206) 254 8688

Accessories and Products for the 505

Part Number	Description
TMC 188/40	Motion controller using magnetostrictive sensors
TMC 188/40-Q	Motion controller using quadrature sensors
TMC 188/40-TA	Motion controller coordinated with analog sensors (i.e., pressure control applications using magnetostrictive sensors)
TMC 188/40-QA	Quadrature Encoder motion controller coordinated with analog sensors.
SSS/10	1 axis Servo System Simulator
AMP/10	1 axis RS422 converter(two required)
MCCBS	6 ft cable set (DB15P and DB25P with pigtails)
MCCBS-01	6 ft DB15P cable with pigtails
MCCBS-02	6 ft DB25P cable with pigtails
MCCBS-03	10 ft DB37P-Q cable with pigtails
MCCBS-04	10 ft DB37P-A cable with pigtails

Company Profile

Delta Computer Systems, Inc. manufactures motion controllers and other industrial controls providing high performance automation solutions to a wide range of industries.

Temposonics is a trademark of MTS Systems, Inc.

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