**Description**

The multi-turn absolute encoder allows the DYN2 and DYN4 servo drive to store and track the absolute position of the servo motor beyond one rotation, even when power is shut off to the servo drive. The standard DMM single-turn encoder tracks absolute position within 1 revolution, so positions outside 1 revolution are lost when power is shut off to the servo drive. With the multi-turn encoder, the encoder stores or continuously tracks the position when servo drive power is shut off. Allowing the servo drive to read the exact encoder position when powering up and starting operation immediately, without the need for homing.

The single-turn resolution is 16-bits (65,536 counts). Multi-turn resolution is 16-bits (65,536 turns). Combined resolution is 32-bits.

This multi-turn functionality is essential for high precision and extended movement applications such as machine tools and robotics.

**Encoder Option**

The multi-turn encoder is available in 2 models, with battery (MB1) and battery-less (ML1) type.

The MB1 type uses an external battery to track encoder position when the servo drive is shut off.

The ML1 type uses a super capacitor to delay encoder shut off, then stores multi-turn position in memory.

**Battery**

The MB1 battery type must use a rechargeable battery. Sample part numbers: Tadiran A4203, UltraFire 14500

**Operation**

With Battery MB1 type encoder:

- **Servo Drive Powered OFF, +5VDC main power to encoder OFF**
  - Encoder detects +5VDC power off, switches to low power operation to optimize battery lifetime
  - Encoder powered by 3.6V Battery, continues reading motor position

- **Servo Drive Powered ON, +5VDC main power to encoder ON**
  - Servo Drive reads current encoder position, start normal operation
  - External controller can read encoder position from servo drive via RS232, RS485, CAN

- **Uses 3.6VDC rechargeable battery, AA size.**
- **Max 4,000rpm motor rotation speed during battery powered (low power) encoder state.**
- **Typical 2000mAh 3.6V non-rechargeable battery lifetime = 3months continuous.**
- **Battery power shut off when main +5VDC power ON.**
Start-Up Operation

The motor position at start up can be defined in two ways. This is controlled by the **Start From ABS Zero** checkbox in the DMMDRV program.

- **No battery required**
- **Max 4,000rpm motor rotation speed during capacitor powered (low power) encoder state.**
- **During power off state, max ±180° motor rotation.**

The battery-less type encoder is useful for applications such as robotics and guided vehicles where a brake motor is normally used.

The existing brake can be used to lock the motor position. The super capacitor charge can maintain power to the encoder for approximately 20 seconds. During this 20 seconds, the motor can safely decelerate to stop and brake is engaged. Encoder stores multi-turn position and powers itself off.

By this method, the multi-turn position can be maintained indefinitely without the use of battery.

(October 2018) Battery-Less multi-turn encoder patent pending.

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Battery-Less ML1 type encoder:

- **Servo Drive Powered OFF, +5VDC main power to encoder OFF**
- **Encoder detects +5VDC power off, switches to low power operation to optimize battery lifetime**
- **Encoder powered by Super Capacitor, monitors super capacitor charge**
- **Motor Position Locked (e.g. with Brake)**
- **Encoder detects super capacitor low charge, reads multi-turn encoder position, saves position into memory**
- **Encoder powers down**
- **Servo Drive Powered ON, +5VDC main power to encoder ON**
- **Motor Position Open (e.g. Brake Disengaged)**
- **Servo Drive reads current encoder position, start normal operation**
- **External controller can read encoder position from servo drive via RS232, RS485, CAN**

- **No battery required**
- **Max 4,000rpm motor rotation speed during capacitor powered (low power) encoder state.**
- **During power off state, max ±180° motor rotation.**

By this method, the multi-turn position can be maintained indefinitely without the use of battery.

(October 2018) Battery-Less multi-turn encoder patent pending.
Absolute Zero Calibration

The absolute zero position can be calibrated using the DMMDRV program. Absolute zero can also be calibrated through serial command `Set_Origin`.

The system’s absolute zero position must be calibrated before proper operation of the multi-turn encoder. All multi-turn position is calculated in reference to the absolute zero position.

The DMMDRV program has a dedicated tool used to calibrate the multi-turn absolute zero. Use the various motion functions in the program to move the motor to the desired position, then click “Set Absolute Zero” to set.
Servo Drive Model Number

### DYN2 AC Servo System (24~75VDC Input)
Note: The same servo drive model is used for both Battery and Battery-Less multi-turn encoder options.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Motor Output</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>DYN2 - T1 A6S - MT1</td>
<td>50W~200W</td>
<td>RS232, Pulse/Analog</td>
</tr>
<tr>
<td>DYN2 - T1 B6S - MT1</td>
<td></td>
<td>RS232, RS485 Modbus RTU, Pulse/Analog</td>
</tr>
<tr>
<td>DYN2 - T1 C6S - MT1</td>
<td></td>
<td>RS232, CAN, Pulse/Analog</td>
</tr>
<tr>
<td>DYN2 - TL A6S - MT1</td>
<td></td>
<td>RS232, Pulse/Analog</td>
</tr>
<tr>
<td>DYN2 - TL B6S - MT1</td>
<td>400W~750W</td>
<td>RS232, RS485 Modbus RTU, Pulse/Analog</td>
</tr>
<tr>
<td>DYN2 - TL C6S - MT1</td>
<td></td>
<td>RS232, CAN, Pulse/Analog</td>
</tr>
</tbody>
</table>

### DYN4 AC Servo System (110~240VAC Input)
Note: The same servo drive model is used for both Battery and Battery-Less multi-turn encoder options.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Motor Output</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>DYN4- L01 A2 - MT1</td>
<td>50W~400W</td>
<td>RS232, Pulse/Analog</td>
</tr>
<tr>
<td>DYN4- L01 B2 - MT1</td>
<td></td>
<td>RS232, RS485 Modbus RTU, Pulse/Analog</td>
</tr>
<tr>
<td>DYN4- L01 C2 - MT1</td>
<td></td>
<td>RS232, CAN, Pulse/Analog</td>
</tr>
<tr>
<td>DYN4- H01 A2 - MT1</td>
<td></td>
<td>RS232, Pulse/Analog</td>
</tr>
<tr>
<td>DYN4- H01 B2 - MT1</td>
<td>750W~1.0kW</td>
<td>RS232, RS485 Modbus RTU, Pulse/Analog</td>
</tr>
<tr>
<td>DYN4- H01 C2 - MT1</td>
<td></td>
<td>RS232, CAN, Pulse/Analog</td>
</tr>
<tr>
<td>DYN4- T01 A2 - MT1</td>
<td></td>
<td>RS232, Pulse/Analog</td>
</tr>
<tr>
<td>DYN4- T01 B2 - MT1</td>
<td>1.3kW~1.8kW</td>
<td>RS232, RS485 Modbus RTU, Pulse/Analog</td>
</tr>
<tr>
<td>DYN4- T01 C2 - MT1</td>
<td></td>
<td>RS232, CAN, Pulse/Analog</td>
</tr>
</tbody>
</table>

Servo Motor Model Number

- **Output Capacity and Frame Size**
  - Model# | Rated Output | Flange | Shaft Diameter |
  - 405   | 50W         | 40mm   | 8mm            |
  - 410   | 100W        | 60mm   | 14mm           |
  - 620   | 200W        | 60mm   | 14mm           |
  - 640   | 400W        | 80mm   | 19mm           |
  - 880   | 750W        | 130mm  | 22mm           |
  - 11A   | 1.0kW       | NEMA23 | 6.35mm (1/4") |
  - 115   | 1.3kW       | NEMA34 | 12.7mm (1/2") |
  - 120   | 1.8kW       | NEMA42 | 15.87mm (5/8")|
  - 57N   | 400W        | NEMA23 | 6.35mm (1/4") |
  - 86L   | 220W        | NEMA34 | 12.7mm (1/2") |
  - 86N   | 750W        | NEMA34 | 14mm           |
  - 86M   | 750W        | 86mm   | 14mm           |
  - A15   | 1.3kW       | NEMA42 | 15.87mm (5/8")|

- **640 - DST - ML6 - H K 1**
  - Servo Motor Series
  - Encoder Option
    - A6  16-bits Single Turn
    - MB6 16-bits Single Turn, 16-bits Multi Turn with Battery
    - ML6 16-bits Single Turn, 16-bits Multi Turn Battery-Less
  - Voltage Class
    - T  60V  DYN2
    - M  150V DYN2 / DYN4
    - H  200V DYN4
  - Shaft Option
    - S  Straight
    - K  With Key
    - D  D-Cut
  - Other Options
    - 1  No Option
    - B  With 24VDC Brake
Battery Encoder Cable

Note: The Battery-Less multi-turn encoder uses the normal encoder cables. The Battery Encoder cables is used only for the Battery Multi-Turn encoder (MB1 Type).

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Length</th>
<th>Servo Drive / Motor Frame Pair</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAEN - MB LH3 - TSP</td>
<td>3m</td>
<td></td>
<td>DYN2</td>
</tr>
<tr>
<td>CAEN - MB LH5 - TSP</td>
<td>5m</td>
<td></td>
<td>All motors</td>
</tr>
<tr>
<td>CAEN - MB LH10 - TSP</td>
<td>10m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAEN - MB LH15 - TSP</td>
<td>15m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAEN - MB HL3 - TSP</td>
<td>3m</td>
<td></td>
<td>DYN4</td>
</tr>
<tr>
<td>CAEN - MB HL5 - TSP</td>
<td>5m</td>
<td></td>
<td>40mm, 60mm,</td>
</tr>
<tr>
<td>CAEN - MB HL10 - TSP</td>
<td>10m</td>
<td></td>
<td>80mm, 86mm,</td>
</tr>
<tr>
<td>CAEN - MB HL15 - TSP</td>
<td>15m</td>
<td></td>
<td>NEMA23, NEMA34</td>
</tr>
<tr>
<td>CAEN - MB HH3 - TSP</td>
<td>3m</td>
<td></td>
<td>DYN4</td>
</tr>
<tr>
<td>CAEN - MB HH5 - TSP</td>
<td>5m</td>
<td></td>
<td>130mm</td>
</tr>
<tr>
<td>CAEN - MB HH10 - TSP</td>
<td>10m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAEN - MB HH15 - TSP</td>
<td>15m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Battery Case Dimensions

Units: mm
Battery Size: AA
Battery Type: Rechargeable 3.6V