
# Contents

## Geared ECI Drive Series



DSM EC drivers feature a compact structure of speed/positioning controllers, sensors and Smart EC motors.

Various operating modes allow an adaptable use in a wide range of drive systems.

Smart EC driver features extensive analog and digital I/O functionality and are being configured via RS485 interface using the graphical user interface "uSMART" for Windows PCs.

A wide range of operating modes allows flexible use in a variety of fields in drive systems, automation, and mechatronics.

Smart EC motors can be configured and ordered online. Fast , easy and online : **www.dnj.co.kr (dnj@dnj.co.kr)**



No. 2003C V10. 2020 DNJWITH

# ECI Selection Guide

| ECI Model No. | Shaft type | Voltage | Interface | INPUT (speed set) | Output | | | Drawing No. |
|---|---|---|---|---|---|---|---|---|
| | | | | | (FG) | (alarm) | (encoder) | |
| **IA 00** | Standard Hollow | 24 | TTL | Analog (5V) | X | LED | X | DSM-701-24V-HG-A-M-ECD |
| **IA 01** | Hollow Disk | 24 | TTL | Analog (5V) | X | LED | X | DSM-701H-24V-HG-A-DI-ECD |
| **IA 04** | Hollow Disk (F) | 24 | TTL | Analog (5V) | X | LED | Incremental (10 bit, A,B,Z, OPD) | DSM-701H-24V-HG-A-DI-ECD(ENC) |
| **ID 00** | Standard Hollow | 24 | TTL | PWM (5V) | O | O | X | DSM-701-24V-HG-A-M-ECD |
| **ID 01** | Hollow Disk | 24 | TTL | PWM (5V) | O | O | X | DSM-701H-24V-HG-A-DI-ECD |
| **ID 04** | Hollow Disk (F) | 24 | TTL | PWM (5V) | X | O | Incremental (10 bit, A,B,Z, OPD) | DSM-701H-24V-HG-A-DI-ECD(ENC) |
| **IP 00** | Standard Hollow | 24 | TTL | PULSE | O | O | X | DSM-701-24V-HG-A-M-ECD |
| **IP 01** | Hollow Disk | 24 | TTL | PULSE | O | O | X | DSM-701H-24V-HG-A-DI-ECD |
| **IP 04** | Hollow Disk (F)* | 24 | TTL | PULSE | X | O | Incremental (10 bit, A,B,Z, OPD) | DSM-701H-24V-HG-A-DI-ECD(ENC) |
| **IC2 00** | Standard Hollow | 24 | RS232 | PWM | O | O | X | DSM-701-24V-HG-A-M-ECD |
| **IC2 01** | Hollow Disk | 24 | RS232 | PWM | O | O | X | DSM-701H-24V-HG-A-DI-ECD |
| **IC2 04** | Hollow Disk (F) | 24 | RS232 | PWM | X | O | Incremental (12 bit, A,B,Z, OPD) | DSM-701H-24V-HG-A-DI-ECD(ENC) |
| **IC4 00** | Standard Hollow | 24 | RS485 | PWM | O | O | X | DSM-701-24V-A-HG-M-ECD |
| **IC4 01** | Hollow Disk | 24 | RS485 | PWM | O | O | X | DSM-701H-24V-HG-A-DI-ECD |
| **IC4 04** | Hollow Disk (F) | 24 | RS485 | PWM | X | O | Incremental (12 bit, A,B,Z, OPD) | DSM-701H-24V-HG-A-DI-ECD(ENC) |

| ECI Model No. | Shaft type | Voltage | Interface | INPUT (speed set) | Output | | | Drawing No. |
|---|---|---|---|---|---|---|---|---|
| | | | | | (FG) | (alarm) | (encoder) | |
| **IA 00** | IG52 | 24 | TTL | Analog (5V) | X | LED | X | DSM-701-24V-A-IG52-ECD |
| **IA 03** | IG52 | 24 | TTL | Analog (5V) | X | LED | Incremental (10 bit, A,B,Z, OPD) | DSM-701-24V-A-IG52-ECD |
| **ID 00** | IG52 | 24 | TTL | PWM (5V) | O | O | X | DSM-701-24V-A-IG52-ECD |
| **ID 03** | IG52 | 24 | TTL | PWM (5V) | X | O | Incremental (10 bit, A,B,Z, OPD) | DSM-701-24V-A-IG52-ECD |
| **IP 00** | IG52 | 24 | TTL | PULSE | O | O | X | DSM-701-24V-A-IG52-ECD |
| **IP 03** | IG52 | 24 | TTL | PULSE | X | O | Incremental (10 bit, A,B,Z, OPD) | DSM-701-24V-A-IG52-ECD |
| **IC2 00** | IG52 | 24 | RS232 | PWM | O | O | X | DSM-701-24V-A-IG52-ECD |
| **IC2 03** | IG52 | 24 | RS232 | PWM | X | O | Incremental (12 bit, A,B,Z, OPD) | DSM-701-24V-A-IG52-ECD |
| **IC4 00** | IG52 | 24 | RS485 | PWM | O | O | X | DSM-701-24V-A-IG52-ECD |
| **IC4 03** | IG52 | 24 | RS485 | PWM | X | O | Incremental (12 bit, A,B,Z, OPD) | DSM-701-24V-A-IG52-ECD |

| ECI Model No. | Shaft type | Voltage | Interface | INPUT (speed set) | Output | | | Drawing No. |
|---|---|---|---|---|---|---|---|---|
| | | | | | (FG) | (alarm) | (encoder) | |
| **IA 00** | IG71 | 24 | TTL | Analog (5V) | X | LED | X | DSM-701-24V-A-IG71-ECD |
| **IA 03** | IG71 | 24 | TTL | Analog (5V) | X | LED | Incremental (10 bit, A,B,Z, OPD) | DSM-701-24V-A-IG71-ECD |
| **ID 00** | IG71 | 24 | TTL | PWM (5V) | O | O | X | DSM-701-24V-A-IG71-ECD |
| **ID 03** | IG71 | 24 | TTL | PWM (5V) | X | O | Incremental (10 bit, A,B,Z, OPD) | DSM-701-24V-A-IG71-ECD |
| **IP 00** | IG71 | 24 | TTL | PULSE | O | O | X | DSM-701-24V-A-IG52-ECD |
| **IP 03** | IG71 | 24 | TTL | PULSE | X | O | Incremental (10 bit, A,B,Z, OPD) | DSM-701-24V-A-IG52-ECD |
| **IC2 00** | IG71 | 24 | RS232 | PWM | O | O | X | DSM-701-24V-A-IG71-ECD |
| **IC2 03** | IG71 | 24 | RS232 | PWM | X | O | Incremental (12 bit, A,B,Z, OPD) | DSM-701-24V-A-IG71-ECD |
| **IC4 00** | IG71 | 24 | RS485 | PWM | O | O | X | DSM-701-24V-A-IG71-ECD |
| **IC4 03** | IG71 | 24 | RS485 | PWM | X | O | Incremental (12 bit, A,B,Z, OPD) | DSM-701-24V-A-IG71-ECD |

**DSM Intelligent compact ECI drivers (speed control)**

DSM EC Drivers feature a compact structure of speed/positioning controllers, sensors and Smart EC Motors.

The use of existing DSM products with an adapted design results in robust, space-saving drive solution with high power density.

EC drive solution is the key to production machinery with many years of maintenance-free operatio in a variety of applications.

- Speed control mode : IA(Analog), ID(PWM), IL(Pulse), IC2(RS232), IC4(RS485)
- Control IO : TTL, RS232, RS485
- Protocol : MODBUS-RTU
- Protection (over voltage, over current, motor lock detection, under voltage, thermal shutdown)
- Overcurrent protection circuit
- Blockage protection : Detect a motor lock if motor shaft is blocked
- Switching frequency of power stage : 20kHz
- FG gen, Alarm output
- Incremental Encoder output (10-bit, 12-bit, A/B/Z, open drain)
- Customizing

| | | |
|---|---|---|
| **Standard Hollow** | | Standard hollow shaft type. The front and rear hollow shafts rotate equally. (Dual hollow shaft) |
| **Hollow Disk** | | A hollow disc flange (optional) is assembled to the hollow shaft.<br>The inside of the hollow shaft is fixed with a pipe and does not rotate. |
| **Hollow Disk (F)** | | The rear shaft of the motor is blocked. (Encoder output type). The motor front consists of a hollow disc flange. |
| **Solid shaft** | | It is assembled as a solid shaft on the front shaft of the hollow standard type smart motor. |
| **Control Input Mode** | **IA** | Analog 5V input type (Potentiometer) |
| | **ID** | Pulse Width Modulation(PWM) input type |
| | **IP** | Pulse input type |
| | **IC2** | RS232 interface type |
| | **IC4** | RS485 interface type |
| **FG** | | FG(Frequency Generator) signal output. FG is the abbreviation of Frequency Generator. It is called square wave.<br>It is a square waveform generated while the motor rotates one cycle. Its signal frequency follows the motor rotating.<br>With this function, your electric control circuit can always read the motor rotation, and then monitor the motor operation.<br>FG = Motor pole number x motor phase<br>( DSM701 series FG = 8 [poles] x 3 [phase] = 24 [pulse] ) |
| **OPD** | | Open drain output |

## [ DSM 701 24V 40P HG ECI ]

## Speed control Smart geared EC motor

**Ø70 mm, 24V, 40 Watt, Cycloid gear, Brushless, Standard hollow shaft, Speed control**

GEARED EC MOTOR

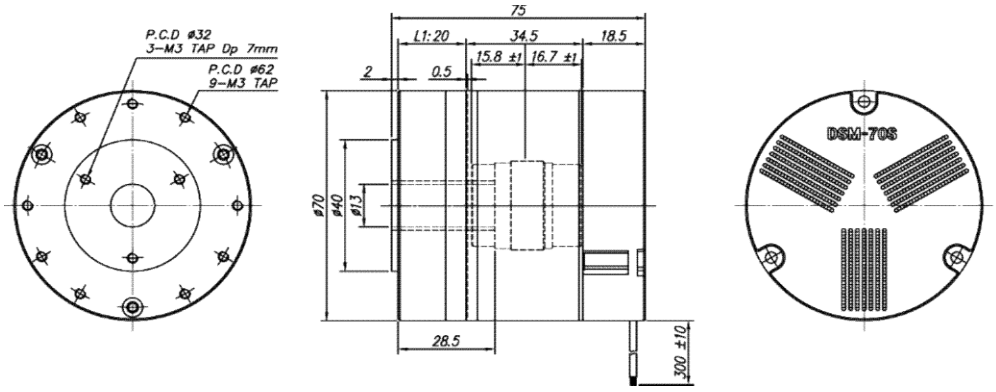
**Built in Speed Control ECI drivers**

- Cycloid gear train.
- Output shaft : Free cutting steel
- Speed control mode : IA(Analog), ID(PWM), IP(Pulse), IC2(RS232), IC4(RS485)
- Control IO : TTL, RS232, RS485
- Protection (UVLO, OVP, OCP, TSD, LOCK)
- Blockage protection : Detect a motor lock if motor shaft is blocked
- Switching frequency of power stage : 20kHz
- Hall sensor (5~24Vdc, open-collector)

| Nominal data [ Geared motor ] | | DSM 701 -24V -40P - HG [ Reduction Ratio ] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reduction Ratio | | 22.8 | 51.3 | 98.7 | 203.0 | | | | |
| Exact Reduction Ratio | | 187/4275 | 187/9595 | 51/5035 | 51/10355 | | | | |
| Gearhead Length L1 | mm | 20.0 | 20.0 | 20.0 | 20.0 | | | | |
| Rated Torque | N.m | 2.4 | 5.1 | 9.8 | 18.3 | | | | |
| Rated Speed | RPM | 95.8 | 42.6 | 22.1 | 10.8 | | | | |
| Max. Momentary Tolerance torque | N.m | 20 | 20 | 40 | 40 | | | | |
| Average Backlash (no load) | min | 10 | 10 | 10 | 10 | | | | |
| No load Speed | RPM | 116.2 | 51.7 | 26.8 | 13.1 | | | | |
| No load Current | mA | 570 | 570 | 570 | 570 | | | | |
| Weight | g | 870 | 880 | 910 | 940 | | | | |
| * Noise | dB | 50 | 50 | 50 | 50 | | | | |
| * Condition of measurement : DC24V, Rad.30[cm], With no load, Fix on sponge | | | | | | | | | |
| Max. permissible axial load | Nm | 45 | 45 | 45 | 45 | | | | |
| Max. permissible force for press fits | Nm | 59 | 59 | 59 | 59 | | | | |
| Protection class | | IP50 | | | | | | | |
| Temperature ratings (Operation) | | Dry bulb temp (-10~50℃), Relative humidity ( 0~85%) | | | | | | | |
| Temperature ratings (Storage) | | Dry bulb temp (-10~60℃), Relative humidity (10~90%) | | | | | | | |

| Motor specification | | 701-24V-40P | Pin No, | Color | IA | ID | IC | Wire |
|---|---|---|---|---|---|---|---|---|
| Rated Voltage | V | 24 | 1 | Red | VM(24V) | VM(24V) | VM(24V) | UL1061 AWG22 |
| Rated Speed | RPM | 2300 | 2 | Black | GND | GND | GND | |
| Rated Torque | N.m | 0.18 | 3 | White | VR(SPEED) | PWM | D- / Rx | |
| Rated Current | A | 2.5 | 4 | Blue | CW/CCW | CW/CCW | - | |
| Rated Power | W | 40 | 5 | Orange | BRAKE | BRAKE | D+ / Tx | UL1061 AWG28 |
| No load speed | RPM | 2650 | 6 | Black | V0(GND) | GND | GND | |
| No load current | mA | 320 | 7 | Green | V5(5Vo) | FG GEN | FG GEN | |
| | | | 8 | Gray | - | ALARM | - | |
| | | | 9 | Brown | ENC A OUT | ENC A OUT | ENC A OUT | UL1061 AWG28 |
| | | | 10 | Gray | ENC B OUT | ENC B OUT | ENC B OUT | |
| | | | 11 | yellow | ENC Z OUT | ENC Z OUT | ENC Z OUT | |

Dimensions in [mm]



## [ DSM 701H 24V 40P HG ECI ]

## Speed control Smart geared EC motor

**Ø70 mm, 24V, 40 Watt, Cycloid gear, Brushless, Hollow disc flange option, Speed control**

GEARED EC MOTOR

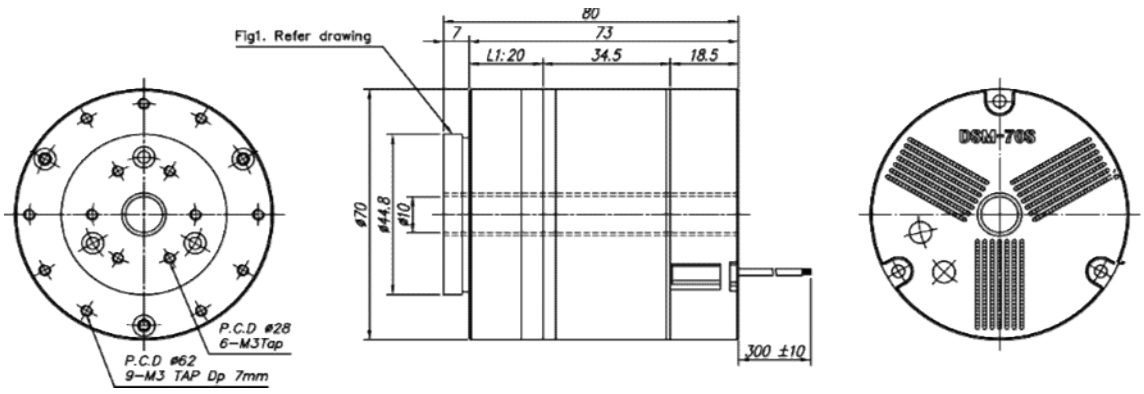
**Built in Speed Control ECI drivers**

- Cycloid gear train.
- Output shaft : Free cutting steel
- Speed control mode : IA(Analog), ID(PWM), IP(Pulse), IC2(RS232), IC4(RS485)
- Control IO : TTL, RS232, RS485
- Protection (UVLO, OVP, OCP, TSD, LOCK)
- Blockage protection : Detect a motor lock if motor shaft is blocked
- Switching frequency of power stage : 20kHz
- Hall sensor (5~24Vdc, open-collector)

| Nominal data [ Geared motor ] | | DSM 701 -24V -40P - HG [ Reduction Ratio ] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reduction Ratio | | 22.8 | 51.3 | 98.7 | 203.0 | | | | |
| Exact Reduction Ratio | | 187/4275 | 187/9595 | 51/5035 | 51/10355 | | | | |
| Gearhead Length L1 | mm | 20.0 | 20.0 | 20.0 | 20.0 | | | | |
| Rated Torque | N.m | 2.4 | 5.1 | 9.8 | 18.3 | | | | |
| Rated Speed | RPM | 95.8 | 42.6 | 22.1 | 10.8 | | | | |
| Max. Momentary Tolerance torque | N.m | 20 | 20 | 40 | 40 | | | | |
| Average Backlash (no load) | min | 10 | 10 | 10 | 10 | | | | |
| No load Speed | RPM | 116.2 | 51.7 | 26.8 | 13.1 | | | | |
| No load Current | mA | 570 | 570 | 570 | 570 | | | | |
| Weight | g | 930 | 940 | 970 | 1000 | | | | |
| * Noise | dB | 50 | 50 | 50 | 50 | | | | |
| * Condition of measurement : DC24V, Rad.30[cm], With no load, Fix on sponge | | | | | | | | | |
| Max. permissible axial load | Nm | 45 | 45 | 45 | 45 | | | | |
| Max. permissible force for press fits | Nm | 59 | 59 | 59 | 59 | | | | |
| Protection class | | IP50 | | | | | | | |
| Temperature ratings (Operation) | | Dry bulb temp (-10~50℃), Relative humidity ( 0~85%) | | | | | | | |
| Temperature ratings (Storage) | | Dry bulb temp (-10~60℃), Relative humidity (10~90%) | | | | | | | |

| Motor specification | | 701-24V-40P | Pin No, | Color | IA | ID | IC | Wire |
|---|---|---|---|---|---|---|---|---|
| Rated Voltage | V | 24 | 1 | Red | VM(24V) | VM(24V) | VM(24V) | UL1061 AWG22 |
| Rated Speed | RPM | 2300 | 2 | Black | GND | GND | GND | |
| Rated Torque | N.m | 0.18 | 3 | White | VR(SPEED) | PWM | D- / Rx | |
| Rated Current | A | 2.5 | 4 | Blue | CW/CCW | CW/CCW | - | |
| Rated Power | W | 40 | 5 | Orange | BRAKE | BRAKE | D+ / Tx | UL1061 AWG28 |
| No load speed | RPM | 2650 | 6 | Black | V0(GND) | GND | GND | |
| No load current | mA | 320 | 7 | Green | V5(5Vo) | FG GEN | FG GEN | |
| | | | 8 | Gray | - | ALARM | - | |
| | | | 9 | Brown | ENC A OUT | ENC A OUT | ENC A OUT | UL1061 AWG28 |
| | | | 10 | Gray | ENC B OUT | ENC B OUT | ENC B OUT | |
| | | | 11 | yellow | ENC Z OUT | ENC Z OUT | ENC Z OUT | |

Dimensions in [mm]



## [ DSM 701 24V 60P HG ECI ]

## Speed control Smart geared EC motor

**Ø70 mm, 24V, 60 Watt, Cycloid gear, Brushless, Standard hollow shaft, Speed control**

GEARED EC MOTOR

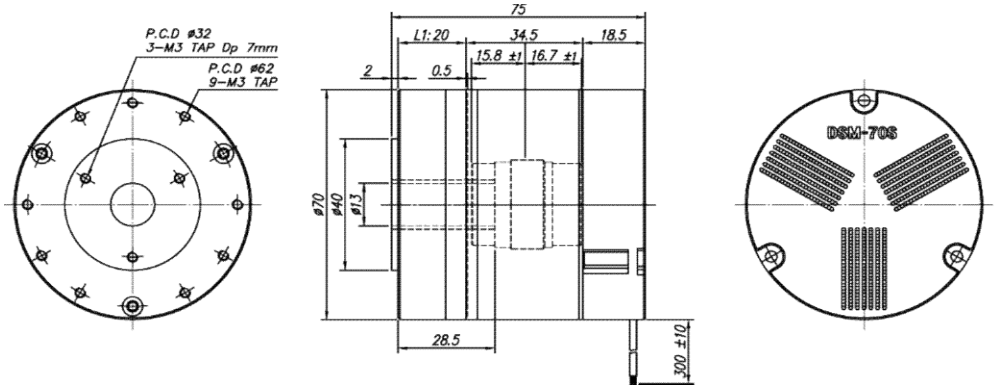
**Built in Speed Control ECI drivers**

- Cycloid gear train.
- Output shaft : Free cutting steel
- Speed control mode : IA(Analog), ID(PWM), IP(Pulse), IC2(RS232), IC4(RS485)
- Control IO : TTL, RS232, RS485
- Protection (UVLO, OVP, OCP, TSD, LOCK)
- Blockage protection : Detect a motor lock if motor shaft is blocked
- Switching frequency of power stage : 20kHz
- Hall sensor (5~24Vdc, open-collector)

| Nominal data [ Geared motor ] | | DSM 701 -24V -60P - HG [ Reduction Ratio ] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reduction Ratio | | 22.8 | 51.3 | 98.7 | 203.0 | | | | |
| Exact Reduction Ratio | | 187/4275 | 187/9595 | 51/5035 | 51/10355 | | | | |
| Gearhead Length L1 | mm | 20.0 | 20.0 | 20.0 | 20.0 | | | | |
| Rated Torque | N.m | 2.5 | 5.4 | 10.3 | 19.3 | | | | |
| Rated Speed | RPM | 125.0 | 55.6 | 28.9 | 14.0 | | | | |
| Max. Momentary Tolerance torque | N.m | 20 | 20 | 40 | 40 | | | | |
| Average Backlash (no load) | min | 10 | 10 | 10 | 10 | | | | |
| No load Speed | RPM | 153.5 | 68.2 | 35.5 | 17.2 | | | | |
| No load Current | mA | 700 | 700 | 700 | 700 | | | | |
| Weight | g | 865 | 875 | 905 | 935 | | | | |
| * Noise | dB | 50 | 50 | 50 | 50 | | | | |
| * Condition of measurement : DC24V, Rad.30[cm], With no load, Fix on sponge | | | | | | | | | |
| Max. permissible axial load | Nm | 45 | 45 | 45 | 45 | | | | |
| Max. permissible force for press fits | Nm | 59 | 59 | 59 | 59 | | | | |
| Protection class | | IP50 | | | | | | | |
| Temperature ratings (Operation) | | Dry bulb temp (-10~50℃), Relative humidity ( 0~85%) | | | | | | | |
| Temperature ratings (Storage) | | Dry bulb temp (-10~60℃), Relative humidity (10~90%) | | | | | | | |

| Motor specification | | 701-24V-60P | Pin No, | Color | IA | ID | IC | Wire |
|---|---|---|---|---|---|---|---|---|
| Rated Voltage | V | 24 | 1 | Red | VM(24V) | VM(24V) | VM(24V) | UL1061 AWG22 |
| Rated Speed | RPM | 3000 | 2 | Black | GND | GND | GND | |
| Rated Torque | N.m | 0.19 | 3 | White | VR(SPEED) | PWM | D- / Rx | |
| Rated Current | A | 3.5 | 4 | Blue | CW/CCW | CW/CCW | - | |
| Rated Power | W | 60 | 5 | Orange | BRAKE | BRAKE | D+ / Tx | UL1061 AWG28 |
| No load speed | RPM | 3500 | 6 | Black | V0(GND) | GND | GND | |
| No load current | mA | 450 | 7 | Green | V5(5Vo) | FG GEN | FG GEN | |
| | | | 8 | Gray | - | ALARM | - | |
| | | | 9 | Brown | ENC A OUT | ENC A OUT | ENC A OUT | UL1061 AWG28 |
| | | | 10 | Gray | ENC B OUT | ENC B OUT | ENC B OUT | |
| | | | 11 | yellow | ENC Z OUT | ENC Z OUT | ENC Z OUT | |

Dimensions in [mm]



## [ DSM 701 24V 60P HG ECI ]

## Speed control Smart geared EC motor

**Ø70 mm, 24V, 60 Watt, Cycloid gear, Brushless, Hollow disc flange option, Speed control**

GEARED EC MOTOR

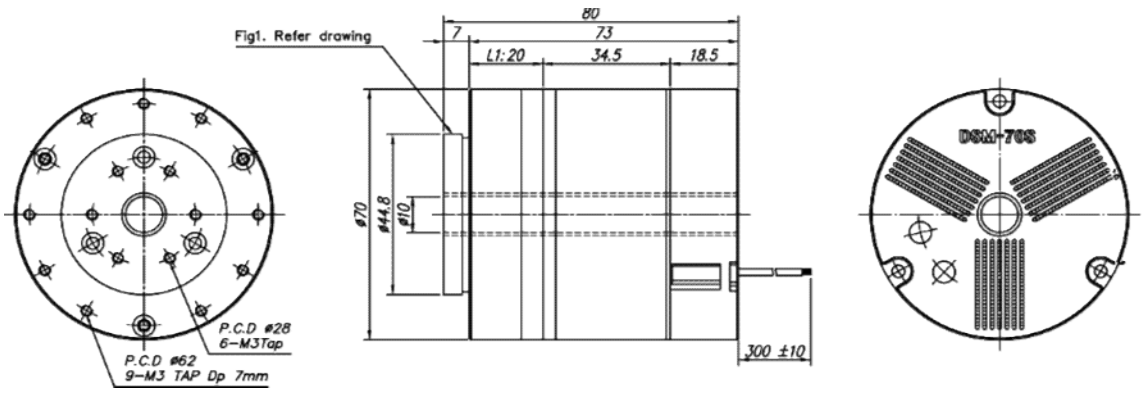
**Built in Speed Control ECI drivers**

- Cycloid gear train.
- Output shaft : Free cutting steel
- Speed control mode : IA(Analog), ID(PWM), IP(Pulse), IC2(RS232), IC4(RS485)
- Control IO : TTL, RS232, RS485
- Protection (UVLO, OVP, OCP, TSD, LOCK)
- Blockage protection : Detect a motor lock if motor shaft is blocked
- Switching frequency of power stage : 20kHz
- Hall sensor (5~24Vdc, open-collector)

| Nominal data [ Geared motor ] | | DSM 701 -24V -60P - HG [ Reduction Ratio ] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reduction Ratio | | 22.8 | 51.3 | 98.7 | 203.0 | | | | |
| Exact Reduction Ratio | | 187/4275 | 187/9595 | 51/5035 | 51/10355 | | | | |
| Gearhead Length L1 | mm | 20.0 | 20.0 | 20.0 | 20.0 | | | | |
| Rated Torque | N.m | 2.5 | 5.4 | 10.3 | 19.3 | | | | |
| Rated Speed | RPM | 125.0 | 55.6 | 28.9 | 14.0 | | | | |
| Max. Momentary Tolerance torque | N.m | 20 | 20 | 40 | 40 | | | | |
| Average Backlash (no load) | min | 10 | 10 | 10 | 10 | | | | |
| No load Speed | RPM | 153.5 | 68.2 | 35.5 | 17.2 | | | | |
| No load Current | mA | 700 | 700 | 700 | 700 | | | | |
| Weight | g | 925 | 935 | 965 | 995 | | | | |
| * Noise | dB | 50 | 50 | 50 | 50 | | | | |
| * Condition of measurement : DC24V, Rad.30[cm], With no load, Fix on sponge | | | | | | | | | |
| Max. permissible axial load | Nm | 45 | 45 | 45 | 45 | | | | |
| Max. permissible force for press fits | Nm | 59 | 59 | 59 | 59 | | | | |
| Protection class | | IP50 | | | | | | | |
| Temperature ratings (Operation) | | Dry bulb temp (-10~50℃), Relative humidity ( 0~85%) | | | | | | | |
| Temperature ratings (Storage) | | Dry bulb temp (-10~60℃), Relative humidity (10~90%) | | | | | | | |

| Motor specification | | 701-24V-60P | Pin No, | Color | IA | ID | IC | Wire |
|---|---|---|---|---|---|---|---|---|
| Rated Voltage | V | 24 | 1 | Red | VM(24V) | VM(24V) | VM(24V) | UL1061 AWG22 |
| Rated Speed | RPM | 3000 | 2 | Black | GND | GND | GND | |
| Rated Torque | N.m | 0.19 | 3 | White | VR(SPEED) | PWM | D- / Rx | |
| Rated Current | A | 3.5 | 4 | Blue | CW/CCW | CW/CCW | - | |
| Rated Power | W | 60 | 5 | Orange | BRAKE | BRAKE | D+ / Tx | UL1061 AWG28 |
| No load speed | RPM | 3500 | 6 | Black | V0(GND) | GND | GND | |
| No load current | mA | 450 | 7 | Green | V5(5Vo) | FG GEN | FG GEN | |
| | | | 8 | Gray | - | ALARM | - | |
| | | | 9 | Brown | ENC A OUT | ENC A OUT | ENC A OUT | UL1061 AWG28 |
| | | | 10 | Gray | ENC B OUT | ENC B OUT | ENC B OUT | |
| | | | 11 | yellow | ENC Z OUT | ENC Z OUT | ENC Z OUT | |

Dimensions in [mm]



## [ DSM 701 24V 40P IG52 ECI ]

## Speed control Smart geared EC motor

**DSM701, 24V, 40 Watt, IG52 Planetary Gearhead, Brushless, Speed control**

GEARED EC MOTOR

### Built in Speed Control ECI drivers

- Planetary Gearhead : straight teeth
- Bearing at output : ball bearing
- Speed control mode : IA(Analog), ID(PWM), IP(Pulse), IC2(RS232), IC4(RS485)
- Control IO : TTL, RS232, RS485
- Protection (UVLO, OVP, OCP, TSD, LOCK)
- Blockage protection : Detect a motor lock if motor shaft is blocked
- Switching frequency of power stage : 20kHz
- Hall sensor (5~24Vdc, open-collector)

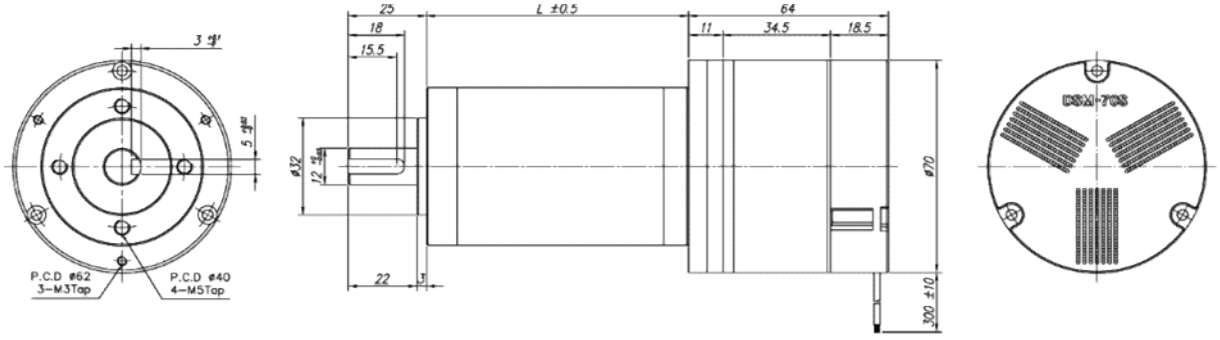
| Nominal data [ Geared motor ] | | DSM 701 -24V -40P - IG52 [ Reduction Ratio ] | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reduction Ratio | | 3 | 4 | 12 | 15 | 19 | 21 | 26 | 43 | 53 | 66 | 81 | 100 | 113 | 126 | 150 | 230 |
| | | 285 | 353 | 488 | 546 | 676 | 756 | 936 | | | | | | | | | |
| Gearhead Length L | mm | 53.0 | 53.0 | 68.5 | 68.5 | 68.5 | 68.5 | 68.5 | 84.0 | 84.0 | 84.0 | 84.0 | 84.0 | 84.0 | 84.0 | 99.5 | 99.5 |
| | | 99.5 | 99.5 | 99.5 | 99.5 | 99.5 | 99.5 | 99.5 | | | | | | | | | |
| Rated Torque | N.m | 0.43 | 0.58 | 1.51 | 1.89 | 2.39 | 2.65 | 3.28 | 4.64 | 5.72 | 7.13 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 |
| | | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | | | | | | | | | |
| Max. momentary tolerance torque | N.m | 2.94 | 2.94 | 8.83 | 8.83 | 14.7 | 14.7 | 14.7 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 |
| | | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | | | | | | | | | |
| Efficiency | % | 80 | 80 | 70 | 70 | 70 | 70 | 70 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 50 | 50 |
| | | 50 | 50 | 50 | 50 | 50 | 50 | 50 | | | | | | | | | |
| Rated Speed | rpm | 743.7 | 557.8 | 184.0 | 147.2 | 116.2 | 105.1 | 84.9 | 50.8 | 41.2 | 33.1 | 27.0 | 21.9 | 19.3 | 17.3 | 14.6 | 9.5 |
| | | 7.7 | 6.2 | 4.5 | 4.0 | 3.2 | 2.9 | 2.3 | | | | | | | | | |
| No load speed | rpm | 883.3 | 662.5 | 220.8 | 176.7 | 139.5 | 126.2 | 101.9 | 61.6 | 50.0 | 40.2 | 32.7 | 26.5 | 23.5 | 21.0 | 17.7 | 11.5 |
| | | 9.3 | 7.5 | 5.4 | 4.9 | 3.9 | 3.5 | 2.8 | | | | | | | | | |
| Weigth | g | 1140 | 1140 | 1325 | 1325 | 1325 | 1325 | 1325 | 1515 | 1515 | 1515 | 1515 | 1515 | 1515 | 1515 | 1685 | 1685 |
| | | 1685 | 1685 | 1685 | 1685 | 1685 | 1685 | 1685 | | | | | | | | | |

| | |
|---|---|
| Temperature ratings (Operation) | Dry bulb temp (-10~50℃), Relative humidity ( 0~85%) |
| Temperature ratings (Storage) | Dry bulb temp (-10~60℃), Relative humidity (10~90%) |

| Motor specification | | 701-24V-40P |
|---|---|---|
| Rated Voltage | V | 24 |
| Rated Speed | RPM | 2300 |
| Rated Torque | N.m | 0.18 |
| Rated Current | A | 2.5 |
| Rated Power | W | 40 |
| No load speed | RPM | 2650 |
| No load current | mA | 320 |

| Pin No, | Color | IA | ID | IC | Wire |
|---|---|---|---|---|---|
| 1 | Red | VM(24V) | VM(24V) | VM(24V) | UL1061 AWG22 |
| 2 | Black | GND | GND | GND | |
| 3 | White | VR(SPEED) | PWM | D- / Rx | UL1061 AWG28 |
| 4 | Blue | CW/CCW | CW/CCW | - | |
| 5 | Orange | BRAKE | BRAKE | D+ / Tx | |
| 6 | Black | V0(GND) | GND | GND | |
| 7 | Green | V5(5Vo) | FG GEN | FG GEN | |
| 8 | Gray | - | ALARM | - | |
| 9 | Brown | ENC A OUT | ENC A OUT | ENC A OUT | UL1061 AWG28 |
| 10 | Gray | ENC B OUT | ENC B OUT | ENC B OUT | |
| 11 | yellow | ENC Z OUT | ENC Z OUT | ENC Z OUT | |

Dimensions in [mm]



## [ DSM 701 24V 60P IG52 ECI ]

## Speed control Smart geared EC motor

**DSM701, 24V, 60 Watt, IG52 Planetary Gearhead, Brushless, Speed control**

GEARED EC MOTOR

### Built in Speed Control ECI drivers

- Planetary Gearhead : straight teeth
- Bearing at output : ball bearing
- Speed control mode : IA(Analog), ID(PWM), IP(Pulse), IC2(RS232), IC4(RS485)
- Control IO : TTL, RS232, RS485
- Protection (UVLO, OVP, OCP, TSD, LOCK)
- Blockage protection : Detect a motor lock if motor shaft is blocked
- Switching frequency of power stage : 20kHz
- Hall sensor (5~24Vdc, open-collector)

| Nominal data [ Geared motor ] | | DSM 701 -24V -60P - IG52 [ Reduction Ratio ] | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reduction Ratio | | 3 | 4 | 12 | 15 | 19 | 21 | 26 | 43 | 53 | 66 | 81 | 100 | 113 | 126 | 150 | 230 |
| | | 285 | 353 | 488 | 546 | 676 | 756 | 936 | | | | | | | | | |
| Gearhead Length L | mm | 53.0 | 53.0 | 68.5 | 68.5 | 68.5 | 68.5 | 68.5 | 84.0 | 84.0 | 84.0 | 84.0 | 84.0 | 84.0 | 84.0 | 99.5 | 99.5 |
| | | 99.5 | 99.5 | 99.5 | 99.5 | 99.5 | 99.5 | 99.5 | | | | | | | | | |
| Rated Torque | N.m | 0.46 | 0.61 | 1.60 | 2.00 | 2.53 | 2.79 | 3.46 | 4.90 | 6.04 | 7.52 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 |
| | | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | | | | | | | | | |
| Max. momentary tolerance torque | N.m | 2.94 | 2.94 | 8.83 | 8.83 | 14.7 | 14.7 | 14.7 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 |
| | | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | | | | | | | | | |
| Efficiency | % | 80 | 80 | 70 | 70 | 70 | 70 | 70 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 50 | 50 |
| | | 50 | 50 | 50 | 50 | 50 | 50 | 50 | | | | | | | | | |
| Rated Speed | rpm | 970.0 | 727.5 | 240.0 | 192.0 | 151.6 | 137.1 | 110.8 | 66.3 | 53.8 | 43.2 | 35.2 | 28.5 | 25.2 | 22.6 | 19.0 | 12.4 |
| | | 10.0 | 8.1 | 5.8 | 5.2 | 4.2 | 3.8 | 3.0 | | | | | | | | | |
| No load speed | rpm | 1166.7 | 875.0 | 291.7 | 233.3 | 184.2 | 166.7 | 134.6 | 81.4 | 66.0 | 53.0 | 43.2 | 35.0 | 31.0 | 27.8 | 23.3 | 15.2 |
| | | 12.3 | 9.9 | 7.2 | 6.4 | 5.2 | 4.6 | 3.7 | | | | | | | | | |
| Weigth | g | 1135 | 1135 | 1320 | 1320 | 1320 | 1320 | 1320 | 1510 | 1510 | 1510 | 1510 | 1510 | 1510 | 1510 | 1680 | 1680 |
| | | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | 1680 | | | | | | | | | |

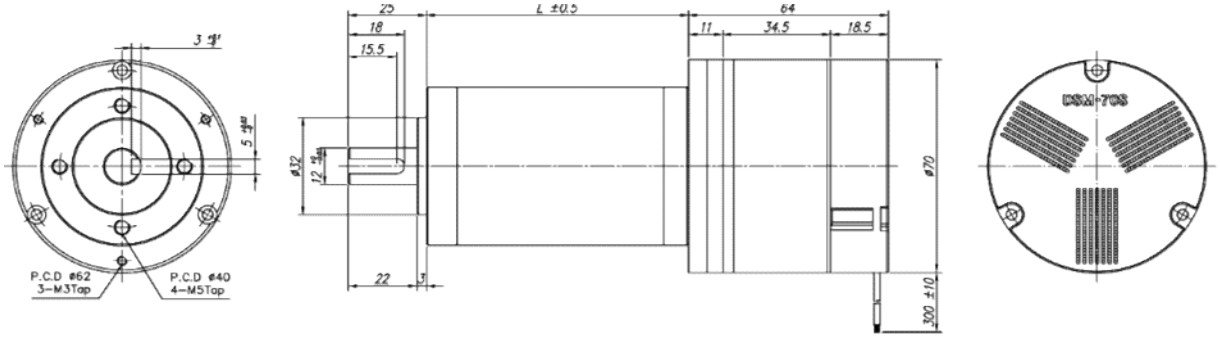
Temperature ratings (Operation) Dry bulb temp (-10~50℃), Relative humidity ( 0~85%)

Temperature ratings (Storage) Dry bulb temp (-10~60℃), Relative humidity (10~90%)

| Motor specification | | 701-24V-60P |
|---|---|---|
| Rated Voltage | V | 24 |
| Rated Speed | RPM | 3000 |
| Rated Torque | N.m | 0.19 |
| Rated Current | A | 3.5 |
| Rated Power | W | 60 |
| No load speed | RPM | 3500 |
| No load current | mA | 450 |

| Pin No, | Color | IA | ID | IC | Wire |
|---|---|---|---|---|---|
| 1 | Red | VM(24V) | VM(24V) | VM(24V) | UL1061 AWG22 |
| 2 | Black | GND | GND | GND | |
| 3 | White | VR(SPEED) | PWM | D- / Rx | UL1061 AWG28 |
| 4 | Blue | CW/CCW | CW/CCW | - | |
| 5 | Orange | BRAKE | BRAKE | D+ / Tx | |
| 6 | Black | V0(GND) | GND | GND | |
| 7 | Green | V5(5Vo) | FG GEN | FG GEN | |
| 8 | Gray | - | ALARM | - | |
| 9 | Brown | ENC A OUT | ENC A OUT | ENC A OUT | UL1061 AWG28 |
| 10 | Gray | ENC B OUT | ENC B OUT | ENC B OUT | |
| 11 | yellow | ENC Z OUT | ENC Z OUT | ENC Z OUT | |

Dimensions in [mm]



## [ DSM 701 24V 40P IG71 ECI ]

## Speed control Smart geared EC motor

**DSM701, 24V, 40 Watt, IG71 Planetary Gearhead, Brushless, Speed control**

GEARED EC MOTOR

### Built in Speed Control ECI drivers

- Planetary Gearhead : straight teeth
- Bearing at output : ball bearing
- Speed control mode : IA(Analog), ID(PWM), IP(Pulse), IC2(RS232), IC4(RS485)
- Control IO : TTL, RS232, RS485
- Protection (UVLO, OVP, OCP, TSD, LOCK)
- Blockage protection : Detect a motor lock if motor shaft is blocked
- Switching frequency of power stage : 20kHz
- Hall sensor (5~24Vdc, open-collector)

| Nominal data [ Geared motor ] | | DSM 701 -24V -40P - IG71 [ Reduction Ratio ] | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reduction Ratio | | 4 | 13 | 16 | 20 | 50 | 60 | 75 | 91 | 102 | 126 | 189 | 242 | 300 | 363 | 414 | 493 |
| | | 543 | 611 | | | | | | | | | | | | | | |
| Gearhead Length L | mm | 49.3 | 65.8 | 65.8 | 65.8 | 82.3 | 82.3 | 82.3 | 82.3 | 82.3 | 82.3 | 98.8 | 98.8 | 98.8 | 98.8 | 98.8 | 98.8 |
| | | 98.8 | 98.8 | | | | | | | | | | | | | | |
| Rated Torque | N.m | 0.58 | 1.64 | 2.02 | 2.52 | 5.40 | 6.48 | 8.10 | 9.83 | 12.26 | 12.26 | 12.26 | 12.26 | 12.26 | 12.26 | 12.26 | 12.26 |
| | | 12.26 | 12.26 | | | | | | | | | | | | | | |
| Max. momentary tolerance torque | N.m | 4.4 | 20.6 | 20.6 | 20.6 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 |
| | | 36.8 | 36.8 | | | | | | | | | | | | | | |
| Efficiency | % | 80 | 70 | 70 | 70 | 60 | 60 | 60 | 60 | 60 | 60 | 50 | 50 | 50 | 50 | 50 | 50 |
| | | 50 | 50 | | | | | | | | | | | | | | |
| Rated Speed | rpm | 557.8 | 169.8 | 138.0 | 110.4 | 44.2 | 36.8 | 29.4 | 24.3 | 21.4 | 17.3 | 11.6 | 9.0 | 7.3 | 6.0 | 5.3 | 4.4 |
| | | 4.0 | 3.6 | | | | | | | | | | | | | | |
| No load speed | rpm | 662.5 | 203.8 | 165.6 | 132.5 | 53.0 | 44.2 | 35.3 | 29.1 | 26.0 | 21.0 | 14.0 | 11.0 | 8.8 | 7.3 | 6.4 | 5.4 |
| | | 4.9 | 4.3 | | | | | | | | | | | | | | |
| Weigth | g | 1555 | 1885 | 1885 | 1885 | 1885 | 1885 | 1885 | 1885 | 1885 | 1885 | 2555 | 2555 | 2555 | 2555 | 2555 | 2555 |
| | | 2555 | 2555 | | | | | | | | | | | | | | |

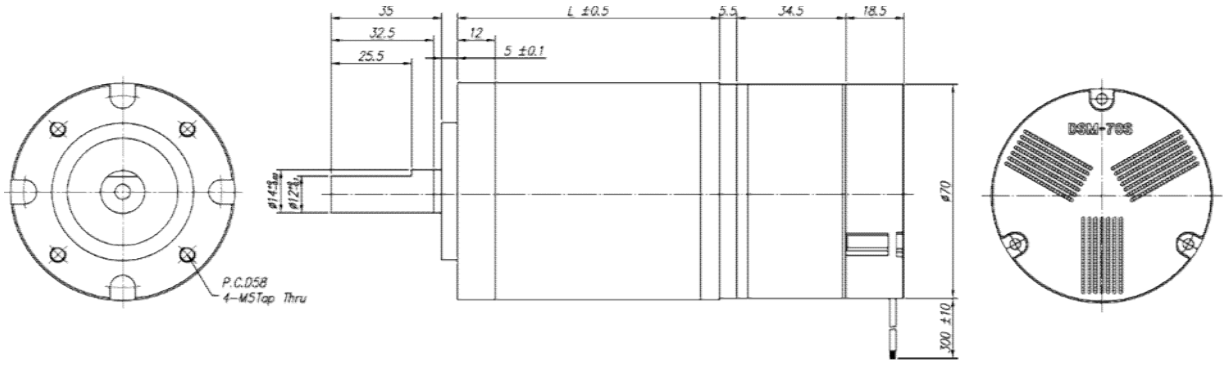
Temperature ratings (Operation) Dry bulb temp (-10~50℃), Relative humidity ( 0~85%)

Temperature ratings (Storage) Dry bulb temp (-10~60℃), Relative humidity (10~90%)

| Motor specification | | 701-24V-40P |
|---|---|---|
| Rated Voltage | V | 24 |
| Rated Speed | RPM | 2300 |
| Rated Torque | N.m | 0.18 |
| Rated Current | A | 2.5 |
| Rated Power | W | 40 |
| No load speed | RPM | 2650 |
| No load current | mA | 320 |
| | | 0 |

| Pin No, | Color | IA | ID | IC | Wire |
|---|---|---|---|---|---|
| 1 | Red | VM(24V) | VM(24V) | VM(24V) | UL1061 AWG22 |
| 2 | Black | GND | GND | GND | |
| 3 | White | VR(SPEED) | PWM | D- / Rx | UL1061 AWG28 |
| 4 | Blue | CW/CCW | CW/CCW | - | |
| 5 | Orange | BRAKE | BRAKE | D+ / Tx | |
| 6 | Black | V0(GND) | GND | GND | |
| 7 | Green | V5(5Vo) | FG GEN | FG GEN | |
| 8 | Gray | - | ALARM | - | |
| 9 | Brown | ENC A OUT | ENC A OUT | ENC A OUT | UL1061 AWG28 |
| 10 | Gray | ENC B OUT | ENC B OUT | ENC B OUT | |
| 11 | yellow | ENC Z OUT | ENC Z OUT | ENC Z OUT | |

Dimensions in [mm]



## [ DSM 701 24V 60P IG71 ECI ]

## Speed control Smart geared EC motor

**DSM701, 24V, 60 Watt, IG71 Planetary Gearhead, Brushless, Speed control**

GEARED EC MOTOR

### Built in Speed Control ECI drivers

- Planetary Gearhead : straight teeth
- Bearing at output : ball bearing
- Speed control mode : IA(Analog), ID(PWM), IP(Pulse), IC2(RS232), IC4(RS485)
- Control IO : TTL, RS232, RS485
- Protection (UVLO, OVP, OCP, TSD, LOCK)
- Blockage protection : Detect a motor lock if motor shaft is blocked
- Switching frequency of power stage : 20kHz
- Hall sensor (5~24Vdc, open-collector)

| Nominal data [ Geared motor ] | | DSM 701 -24V -60P - IG71 [ Reduction Ratio ] | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reduction Ratio | | 4 | 13 | 16 | 20 | 50 | 60 | 75 | 91 | 102 | 126 | 189 | 242 | 300 | 363 | 414 | 493 |
| | | 543 | 611 | | | | | | | | | | | | | | |
| Gearhead Length L | mm | 49.3 | 65.8 | 65.8 | 65.8 | 82.3 | 82.3 | 82.3 | 82.3 | 82.3 | 82.3 | 98.8 | 98.8 | 98.8 | 98.8 | 98.8 | 98.8 |
| | | 98.8 | 98.8 | | | | | | | | | | | | | | |
| Rated Torque | N.m | 0.61 | 1.73 | 2.13 | 2.66 | 5.70 | 6.84 | 8.55 | 10.37 | 12.26 | 12.26 | 12.26 | 12.26 | 12.26 | 12.26 | 12.26 | 12.26 |
| | | 12.26 | 12.26 | | | | | | | | | | | | | | |
| Max. momentary tolerance torque | N.m | 4.4 | 20.6 | 20.6 | 20.6 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 |
| | | 36.8 | 36.8 | | | | | | | | | | | | | | |
| Efficiency | % | 80 | 70 | 70 | 70 | 60 | 60 | 60 | 60 | 60 | 60 | 50 | 50 | 50 | 50 | 50 | 50 |
| | | 50 | 50 | | | | | | | | | | | | | | |
| Rated Speed | rpm | 727.5 | 221.5 | 180.0 | 144.0 | 57.6 | 48.0 | 38.4 | 31.6 | 27.9 | 22.6 | 15.1 | 11.8 | 9.5 | 7.9 | 6.9 | 5.8 |
| | | 5.2 | 4.7 | | | | | | | | | | | | | | |
| No load speed | rpm | 875.0 | 269.2 | 218.8 | 175.0 | 70.0 | 58.3 | 46.7 | 38.5 | 34.3 | 27.8 | 18.5 | 14.5 | 11.7 | 9.6 | 8.5 | 7.1 |
| | | 6.4 | 5.7 | | | | | | | | | | | | | | |
| Weigth | g | 1550 | 1880 | 1880 | 1880 | 2210 | 2210 | 2210 | 2210 | 2210 | 2210 | 2550 | 2550 | 2550 | 2550 | 2550 | 2550 |
| | | 2550 | 2550 | | | | | | | | | | | | | | |

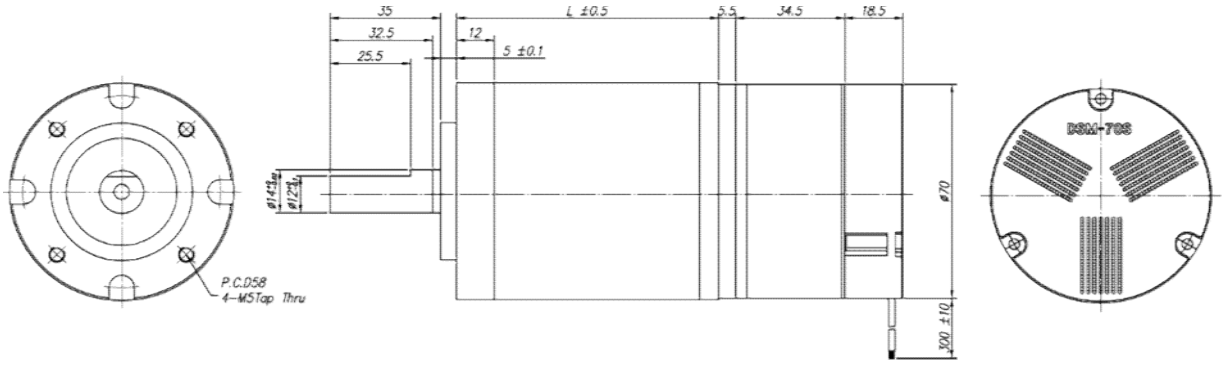
Temperature ratings (Operation) Dry bulb temp (-10~50℃), Relative humidity ( 0~85%)

Temperature ratings (Storage) Dry bulb temp (-10~60℃), Relative humidity (10~90%)

| Motor specification | | 701-24V-60P |
|---|---|---|
| Rated Voltage | V | 24 |
| Rated Speed | RPM | 3000 |
| Rated Torque | N.m | 0.19 |
| Rated Current | A | 3.5 |
| Rated Power | W | 60 |
| No load speed | RPM | 3500 |
| No load current | mA | 450 |
| | | 0 |

| Pin No, | Color | IA | ID | IC | Wire |
|---|---|---|---|---|---|
| 1 | Red | VM(24V) | VM(24V) | VM(24V) | UL1061 AWG22 |
| 2 | Black | GND | GND | GND | |
| 3 | White | VR(SPEED) | PWM | D- / Rx | UL1061 AWG28 |
| 4 | Blue | CW/CCW | CW/CCW | - | |
| 5 | Orange | BRAKE | BRAKE | D+ / Tx | |
| 6 | Black | V0(GND) | GND | GND | |
| 7 | Green | V5(5Vo) | FG GEN | FG GEN | |
| 8 | Gray | - | ALARM | - | |
| 9 | Brown | ENC A OUT | ENC A OUT | ENC A OUT | UL1061 AWG28 |
| 10 | Gray | ENC B OUT | ENC B OUT | ENC B OUT | |
| 11 | yellow | ENC Z OUT | ENC Z OUT | ENC Z OUT | |

Dimensions in [mm]



**Analog input type built in speed control driver ECI series**

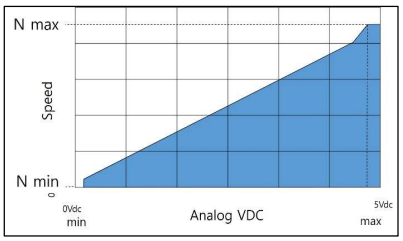
- DSM EC Drivers feature a compact structure of speed & positioning controllers, sensors and Smart EC motors.
- The use of existing DSM products with an adapted design results in robust, space-saving drive solution with high power density.
- EC drive solution is the key to production machinery with many years of maintenance-free operatio in a variety of applications.
- Speed set value (analog) : The value is defined by an analog voltage set(5Vdc) via external potentiometer(10kΩ).

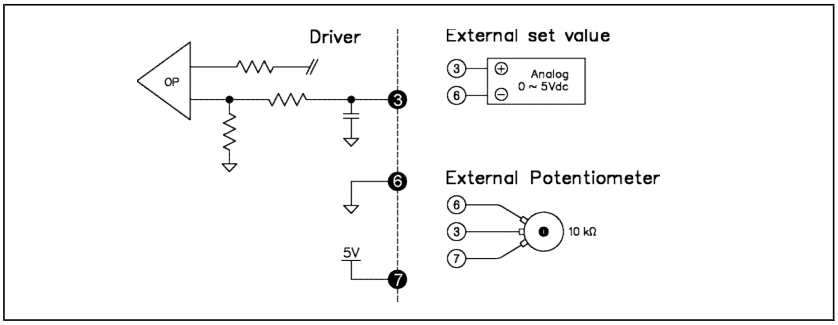
## Interface

**[ VM ]** (red)
**[ GND ]** (black)

| | | |
|---|---|---|
| **VM** | 24 [Vdc] ± 25% | Operating Voltage |
| **GND** | Power Ground | DC power ground |

**[ Speed set ]** (white)
Speed set value : Analog 5Vdc

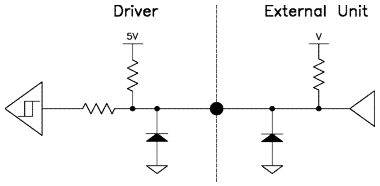



**[ Brake in ]** (orange)

The motor shaft slows down in an uncontrolled fashion to a standstill by short-circuiting the motor windings.

| | | |
|---|---|---|
| **High (1)** | 3.3 to 5 V or Input OPEN | Motor OFF (Brake function active) |
| **Low (0)** | 0 to 0.8 V or Input to GND | Motor ON (Brake function not active) |

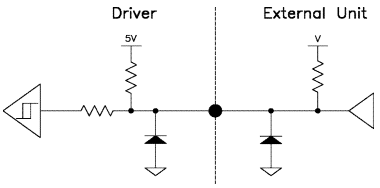



**[ Direction in ]** (blue)

When the level changes, motors shaft slows down in an uncontrolled fashion to a standstill by short-circuiting the motor windings, andaccelerates in the opposite direction, until the nominal speed reaches again.

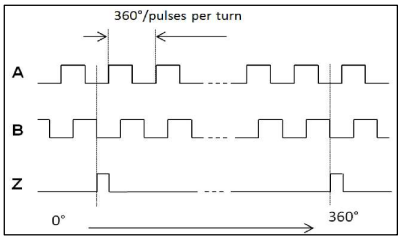
* Change CW/CCW input signal after motor had stopped completely.
If you change the CW/CCW signal during motor running, there is a danger of the damage of electronic parts inside motor.

| | | |
|---|---|---|
| **High (1)** | 3.3 to 5 V or Input OPEN | Counter-clockwise rotation (CCW) |
| **Low (0)** | 0 to 0.8 V or Input to GND | Clockwise rotation (CW) |



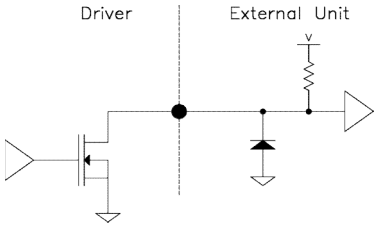

**[ Encoder out ]** (A: brown, B: gray, Z: yellow)
**Optional Model : IA03, IA04**

Incremental quadrature signals A, B
Reference mark(index) Z
Cycles per Shaft Turn
: 10 bit ( 1024 Steps / 0.35° )
Open drain output




**Open Drain**

VH : 30Vdc max
VL : 0.5Vdc max
Sink current : 100mA max




You need to pull up for encoder terminal, so that the terminal is open-drain output.

## Motor protection

* Fault output : Red LED (OCP, LOCK, TSD, UVLO)

* Fault reset 1. Turn on power again
2. Set logic of brake pin to brake ('H')
3. Switch logic of direction pin.

* Maximum permissive IC surface temperature 110 [℃]
* Maximum permissive FET temperature 110 [℃]

| Parameters | Typ. | Description |
|---|---|---|
| PWM peak currnet limit (OCP) | 10 [A] | This controls peak current flowing through the motor coil. After overcurrent is detected, output is OFF for certain time, and then auto-restarts. |
| Motor lock detection (LOCK) | $t_L$=2±1 [sec] | When the motor locks, the motor current automatically cuts off within the defined time.<br><br>Can only be cleared by any one of the following actions.<br>① Power up again.<br>② Speed set value held high for t > $t_L$ / 2 |
| Thermal shutdown (TSD) | 160±15 [℃] | (IC temperature/Design specification)<br>When the driver IC and MOSFET reaches the defined temperature, the motor current automatically cuts off.<br><br>Component reliability can't be ensured when motor is used in exceeded 150[℃].<br>There is no guarantee of proper operation when thermal shutdown motor is reused. |
| Undervoltage Lockout (UVLO) | 8.5 [Vdc] | Driver protects when the power state reaches down to normally operable voltage value or less.<br>Normal operation resumes when the VM undervoltage condition is removed. |
| Over-voltage protection (OVP) | | Built-in ceramic surge absorbers (varistor 7D-470K) |

## Service life and product safety

1. Bearings and service life
   - Service life is affected by maximum speed, residual imbalance and bearing load.
   - Exceeding maximum torque can lead to excessive wear.
   - Bearings designed for ones of thousands of hours (more than 5000[hrs], no load, rated, 20±5℃)
   - Exposure of bearing to corrosive gas may cause corrosion, which may affect the motor's characteristics and durability
2. Locked motor
   - No burning after locked rotor condition at rated voltage by using a specified drive circuit
3. Circuit Protect
   - This motor does not have the protect circuit for surge voltage and wrong connection. So, don't apply surge voltage such as over rated voltage and wrong connection.
   - You should connect a Schottky barrier diode betweene ach signal line to ground to prevent IC from damage.

**PWM input type built in speed control driver ECI series**

- DSM EC Drivers feature a compact structure of speed & positioning controllers, sensors and Smart EC motors.
- The use of existing DSM products with an adapted design results in robust, space-saving drive solution with high power density.
- EC drive solution is the key to production machinery with many years of maintenance-free operatio in a variety of applications.
- Speed set value (PWM) : The value is defined by fixed frequency and amplitude.

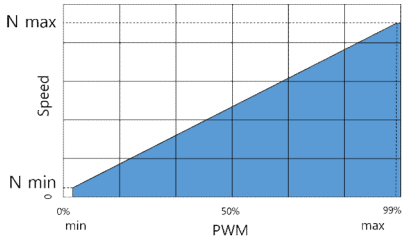
  The desired change is achieved by variation of the duty cycle of 5~95%.

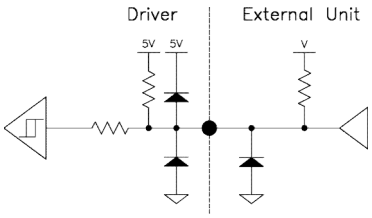
## Interface

**[ VM ]** (red)
**[ GND ]** (black)

| | | |
|---|---|---|
| **VM** | 24 [Vdc] ± 25% | Operating Voltage |
| **GND** | Power Ground | DC power ground |

**[ SPEED set ]** (white)
Speed set value : PWM

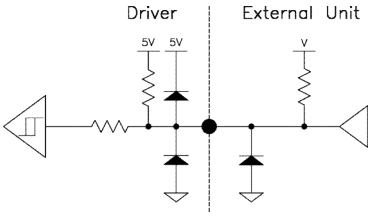



| | | | |
|---|---|---|---|
| **Input voltage range** | **High (1)** | 3.3 to 5 V or Input OPEN | Motor OFF |
| | **Low (0)** | 0 to 0.8 V or Input to GND | Motor ON |
| Frequency | | PWM frequency range is 25kHz (between 20 ~ 30 [kHz]) | |
| Set value input | | Speed setting for speed control via PWM duty 5~95% | |
| Interface | |  | |



**[ BRAKE in ]** (orange)

The motor shaft slows down in an uncontrolled fashion to a standstill by short-circuiting the motor windings.

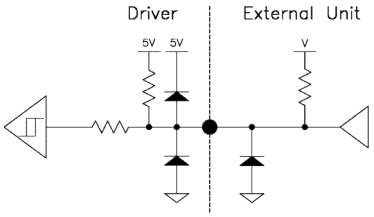
| | | | |
|---|---|---|---|
| **Input voltage range** | **High (1)** | 3.3 to 5 V or Input OPEN | Motor OFF (Brake function active) |
| | **Low (0)** | 0 to 0.8 V or Input to GND | Motor ON (Brake function not active) |
| Interface | |  | |



**[ Direction in ]** (blue)

When the level changes, motors shaft slows down in an uncontrolled fashion to a standstill by short-circuiting the motor windings, and accelerates in the opposite direction, until the nominal speed reaches again.

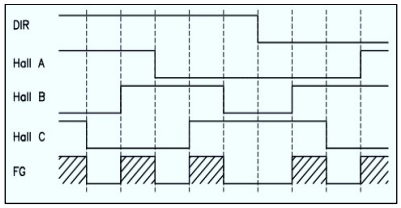
* Change CW/CCW input signal after motor had stopped completely.
If you change the CW/CCW signal during motor running, there is a danger of the damage of electronic parts inside motor.

| | | | |
|---|---|---|---|
| **Input voltage range** | **High (1)** | 3.3 to 5 V or Input OPEN | Counter-clockwise rotation (CCW) |
| | **Low (0)** | 0 to 0.8 V or Input to GND | Clockwise rotation (CW) |
| Interface | |  | |



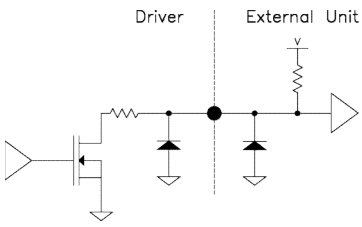
**[ FG GEN out ]** (green)

1FG puts into toggle-operation in which the logic reverses every time when excitation phase is switched by hall input.
* FG output pulse (DSM701) = 24 pulse / round




**Open Drain**

VH : 5.5Vdc max
VL : 0.4Vdc max
Sink current : 2mA max




You need to pull up for FG terminal, so that the terminal is open-drain output.

**[ Alarm out ]** (gray)

**Fault output**

UVLO (undervoltage lockout)

TSD (thermal shutdown)

OCP (overcurrent protection-PWM peak currnet limit )

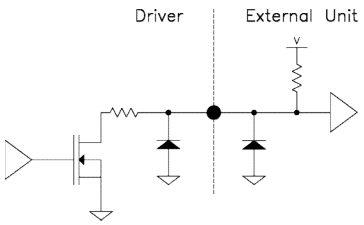
LOCK (motor lock detection)

**Fault reset**

1. Turn on power again
2. Set logic of brake pin to brake ('H')
3. Switch logic of direction pin.

**Open Drain**

VH : 5.5Vdc max
VL : 0.4Vdc max
Sink current : 2mA max




You need to pull up for alarm terminal, so that the terminal is open-drain output.

**[ Encoder out ]** (A: brown, B: gray, Z: yellow)

**Optional Model : ID03, ID04**

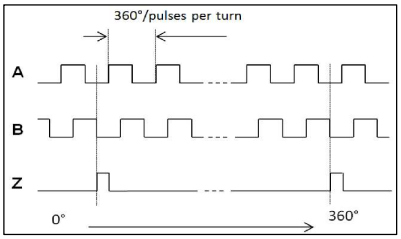
Incremental quadrature signals A, B

Reference mark(index) Z

Cycles per Shaft Turn

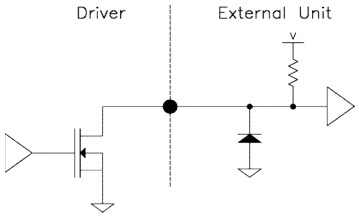
: 10 bit ( 1024 Steps / 0.35° )

Open drain output



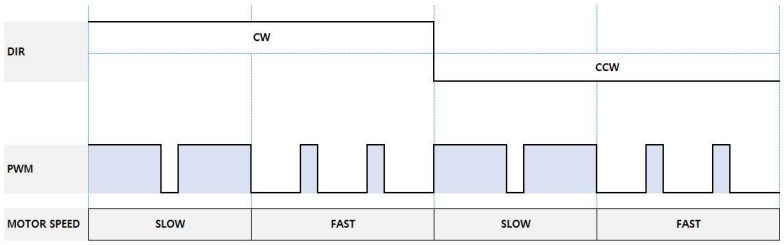

**Open Drain**

VH : 30Vdc max
VL : 0.5Vdc max
Sink current : 100mA max




You need to pull up for encoder terminal, so that the terminal is open-drain output.

## Control sequence timing chart




## Motor protection

| Parameters | Typ. | Description |
|---|---|---|
| PWM peak currnet limit (OCP) | 10 [A] | This controls peak current flowing through the motor coil. After overcurrent is detected, output is OFF for certain time, and then auto-restarts. |
| Motor lock detection (LOCK) | tL=2±1 [sec] | When the motor locks, the motor current automatically cuts off within the defined time.<br>Can only be cleared by any one of the following actions.<br>① Power up again.<br>② Speed set value held high for t > tL / 2 |
| Thermal shutdown (TSD) | 160±15 [℃] | (IC temperature/Design specification)<br>When the driver IC and MOSFET reaches the defined temperature, the motor current automatically cuts off.<br>Component reliability can't be ensured when motor is used in exceeded 150[℃].<br>There is no guarantee of proper operation when thermal shutdown motor is reused. |
| Undervoltage Lockout (UVLO) | 8.5 [Vdc] | Driver protects when the power state reaches down to normally operable voltage value or less.<br>Normal operation resumes when the VM undervoltage condition is removed. |
| Over-voltage protection (OVP) | | Built-in ceramic surge absorbers (varistor 7D-470K) |

* Maximum permissive IC surface temperature 110 [℃]
* Maximum permissive FET temperature 110 [℃]

## Service life and product safety

1. Bearings and service life
   - Service life is affected by maximum speed, residual imbalance and bearing load.
   - Exceeding maximum torque can lead to excessive wear.
   - Bearings designed for ones of thousands of hours (more than 5000[hrs], no load, rated, 20±5℃)
   - Exposure of bearing to corrosive gas may cause corrosion, which may affect the motor's characteristics and durability
2. Locked motor
   - No burning after locked rotor condition at rated voltage by using a specified drive circuit
3. Circuit Protect
   - This motor does not have the protect circuit for surge voltage and wrong connection. So, don't apply surge voltage such as over rated voltage and wrong connection.
   - You should connect a Schottky barrier diode betweene ach signal line to ground to prevent IC from damage.

**RS485 type built in speed control driver ECI series**

- DSM EC Drivers feature a compact structure of speed & positioning controllers, sensors and Smart EC motors.
- The use of existing DSM products with an adapted design results in robust, space-saving drive solution with high power density.
- EC drive solution is the key to production machinery with many years of maintenance-free operatio in a variety of applications.
- Interface I/O protocol : RS485 (MODBUS RTU)

## Interface

**[ VM ]** (red)
**[ GND ]** (black)

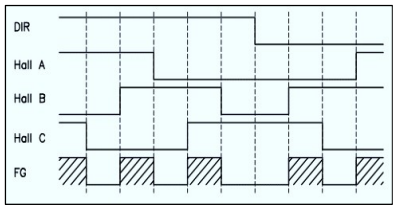
| | | |
|---|---|---|
| **VM** | 24 [Vdc] ± 25% | Operating Voltage |
| **GND** | Power Ground | DC power ground |

**[ RS485 ]** (D+ : orange, D- : white)
MODBUS RTU

| | |
|---|---|
| Baudrate | 115,200 bps |
| Data | 8 bit |
| Parity bit | None |
| Stop bit | 1 |
| Flow control | None |
| Address No. | Current Direction : 0x0008<br>Current Speed : 0x007 |
| Read | 0x03 (Read holding resisters) |
| Write | 0x06 (Write single resisters) |

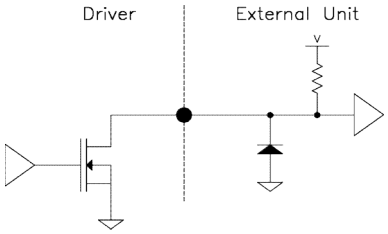
**[ FG GEN out ]** (green)

1FG puts into toggle-operation in which the logic reverses every time when excitation phase is switched by hall input.
* FG output pulse (DSM701) = 24 pulse / round




**Open Drain**

VH : 30Vdc max
VL : 0.5Vdc max
Sink current : 100mA max




You need to pull up for FG terminal, so that the terminal is open-drain output.

**[ Alarm out ]**

**Fault output : RS485**
Error status ( 0: Normal / 1: Fault )

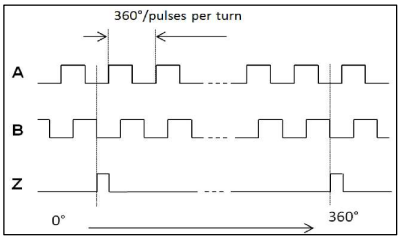
UVLO (undervoltage lockout)
TSD (thermal shutdown)
OCP (overcurrent protection-peak currnet limit)
LOCK (motor lock detection)

**Fault reset**
See the protocol data

Control set, Start & brake ON (SET_ENABLE_REMOTE: 1 & SET_BRAKE_REMOTE: 1)
Control set, Stop (SET_ENABLE_REMOTE: 0)
Control set, Start (SET_ENABLE_REMOTE: 1)

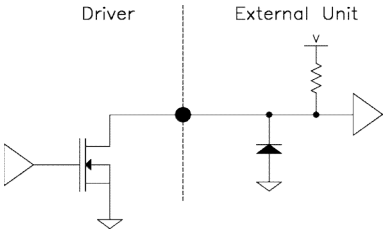
**[ Encoder out ]** (A: brown, B: gray, Z: yellow)
**Optional Model : IC403, IC404**

Incremental quadrature signals A, B
Reference mark(index) Z
Cycles per Shaft Turn
: 12 bit ( 4096 Steps / 0.0879° )
Open drain output




**Open Drain**

VH : 30Vdc max
VL : 0.5Vdc max
Sink current : 100mA max




You need to pull up for encoder terminal, so that the terminal is open-drain output.

## Motor protection

* Maximum permissive IC surface temperature 110 [℃]
* Maximum permissive FET temperature 110 [℃]

| Parameters | Typ. | Description |
|---|---|---|
| Currnet limit (OCP) | 10 [A] | |
| Motor lock detection (LOCK) | $t_L$=2±1 [sec] | When the motor locks, the motor current automatically cuts off within the defined time.<br><br>Can only be cleared by any one of the following actions.<br>① Power up again.<br>② Speed set value held high for t > $t_L$ / 2 |
| Thermal shutdown (TSD) | 160±15 [℃] | (IC temperature/Design specification)<br>When the driver IC and MOSFET reaches the defined temperature, the motor current automatically cuts off.<br><br>Component reliability can't be ensured when motor is used in exceeded 150[℃].<br>There is no guarantee of proper operation when thermal shutdown motor is reused. |
| Undervoltage Lockout (UVLO) | 8.5 [Vdc] | Driver protects when the power state reaches down to normally operable voltage value or less.<br>Normal operation resumes when the VM undervoltage condition is removed. |
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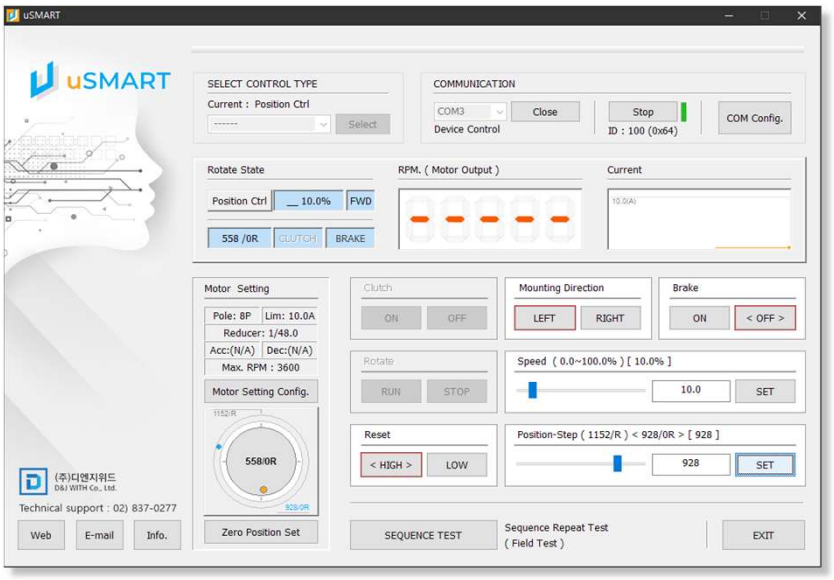
   - Exposure of bearing to corrosive gas may cause corrosion, which may affect the motor's characteristics and durability
2. Locked motor
   - No burning after locked rotor condition at rated voltage by using a specified drive circuit
3. Circuit Protect
   - This motor does not have the protect circuit for surge voltage and wrong connection.

     So, don't apply surge voltage such as over rated voltage and wrong connection.

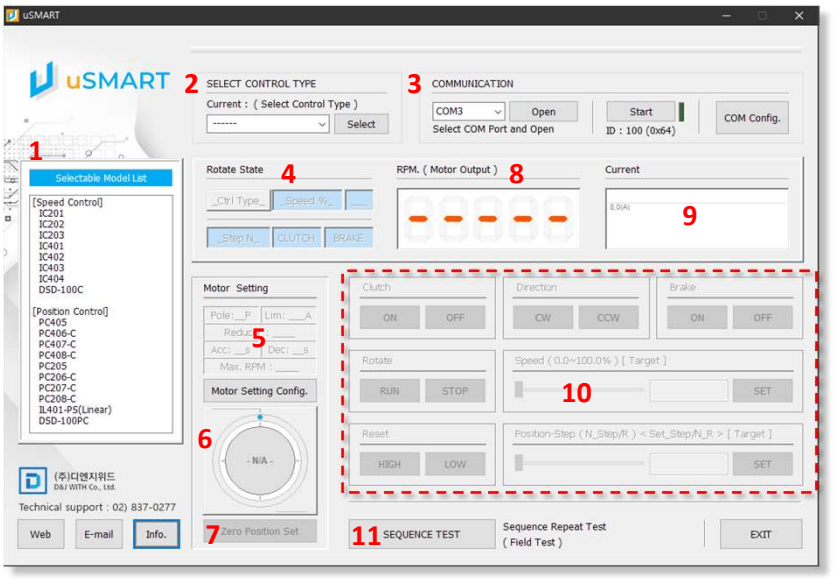
The Smart EC drivers are features extensive analog and digital I/O functionality and are being configured via RS485 interface using the graphical user interface "uSMART" for Windows PCs.

Installation Program : uSMART
Language : English
Operating System : Window 10, Windiw 8, Window 7
Communication interface : Serial (use USB to serial converter)

**Program – Layout**



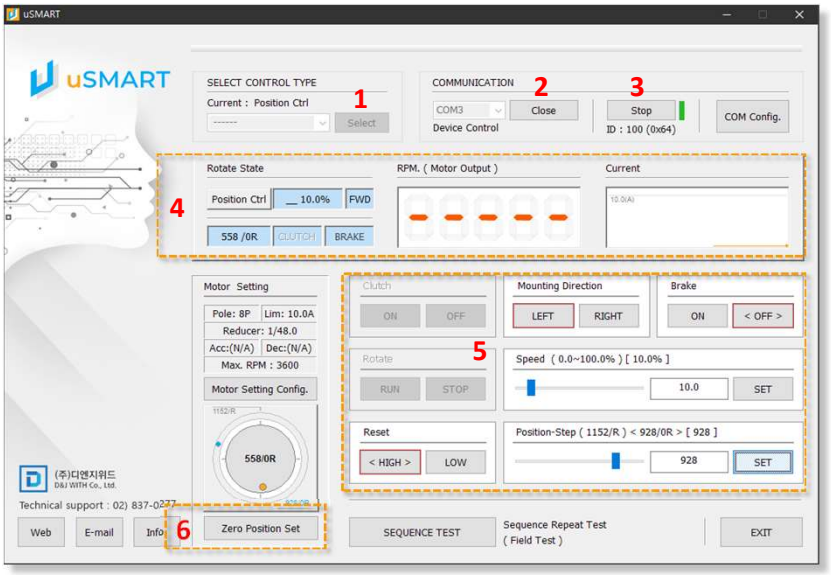

**Program – Component**




| | | |
|---|---|---|
| 1 | [ Info ] | Displays model information of the motor that can be controlled. |
| 2 | [ Select control type ] | Select the control mode of the motor. You can check the model information of the product in [Info.]. The control items for the selected mode are activatec |
| 3 | [ Communication ] | Set the COM(serial) port for communication. |
| | [ Start ] | Start communication with the motor. |
| | [ Com Config ] | Set the device ID, COM Port Baudrate |
| 4 | [ Rotate State ] | The control status of the connected motor is displayed. |
| 5 | [ Motor Setting ] | The set value of the motor is displayed. (Number of poles, current limit, reduction ratio, acceleration / deceleration time, maximum rotation speed) |
| | [ Motor Setting Config ] | Change motor settings. |
| 6 | [ Jog & shuttle ] | The position control angle of the motor can be set directly. |
| 7 | [ Zero Position Set ] | Zero position value of positioning control motor can be set. You can change the current position to the zero position. |
| 8 | [ RPM ] | Displays the rotation speed of the motor. |
| 9 | [ Current ] | The current of the motor is displayed. |
| 10 | [ Control set value ] | Set the control value of the motor. The input button is activated according to the selected mode. The selected control item is indicated by a red border. |
| 11 | [ Sequence test ] | The motor can be operated repeatedly with the set value. |

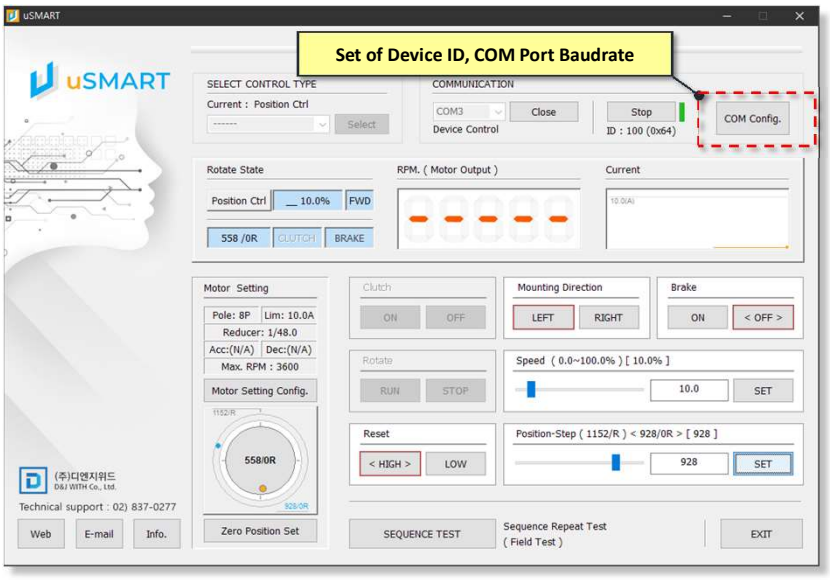
**Program – Usage**

Basic use of the control program



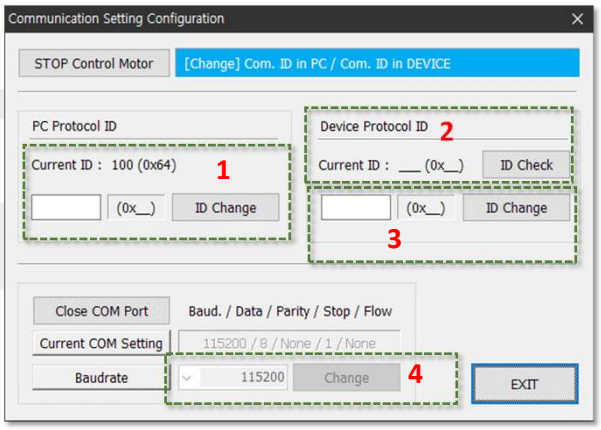

| | | |
|---|---|---|
| 1 | [ Select ] | Select the control mode. |
| 2 | [ Open / Close ] | Open COM Port (Serial) |
| 3 | [ Start / Stop ] | Start communication with motor |
| 4 | [ Monitoring ] | Check connected motor status, rotation speed, current graph |
| 5 | [ Control Setting ] | Input setting value to control the motor<br>Input button activated (depends on selection mode)<br>The selected control item is indicated by a red border on the button |
| 6 | [ Zero Position Set ] | home position return<br>Set the zero position value of the control motor.<br>Change current position to zero position. |

**Program – Setting**




**Program – Setting**
**/ COM Config.**

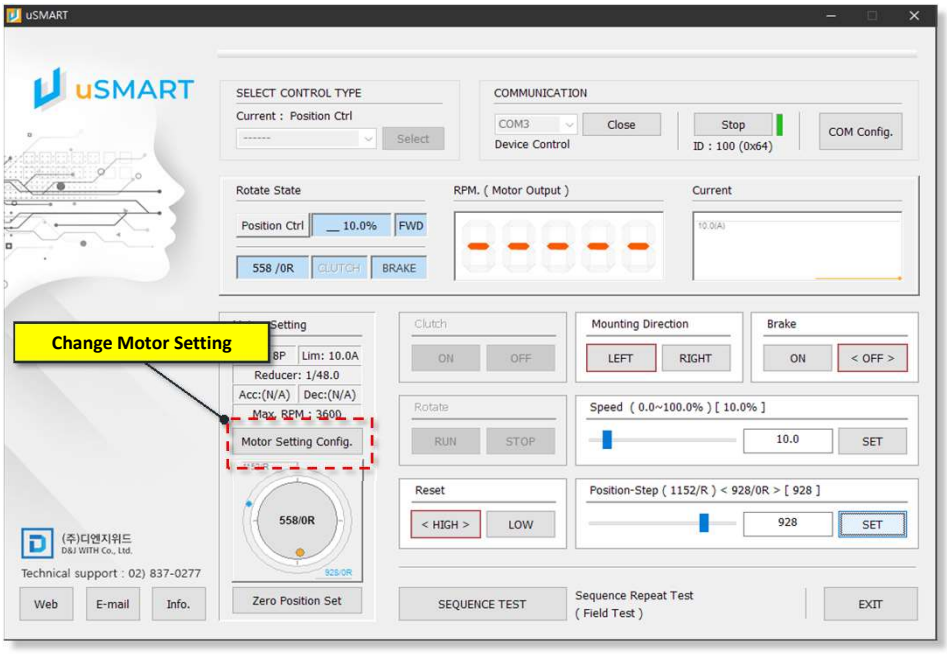
| | |
|---|---|
| 1 | Communication ID set in the PC program.<br>1) Enter ID to change<br>2) "ID Change" button |
| 2 | Check the device ID of the connected motor |
| 3 | Change device ID.<br>1) Enter ID to change<br>2) "ID Change" button |
| 4 | Change communication speed<br>1) Select speed to change<br>2) "Change" button |



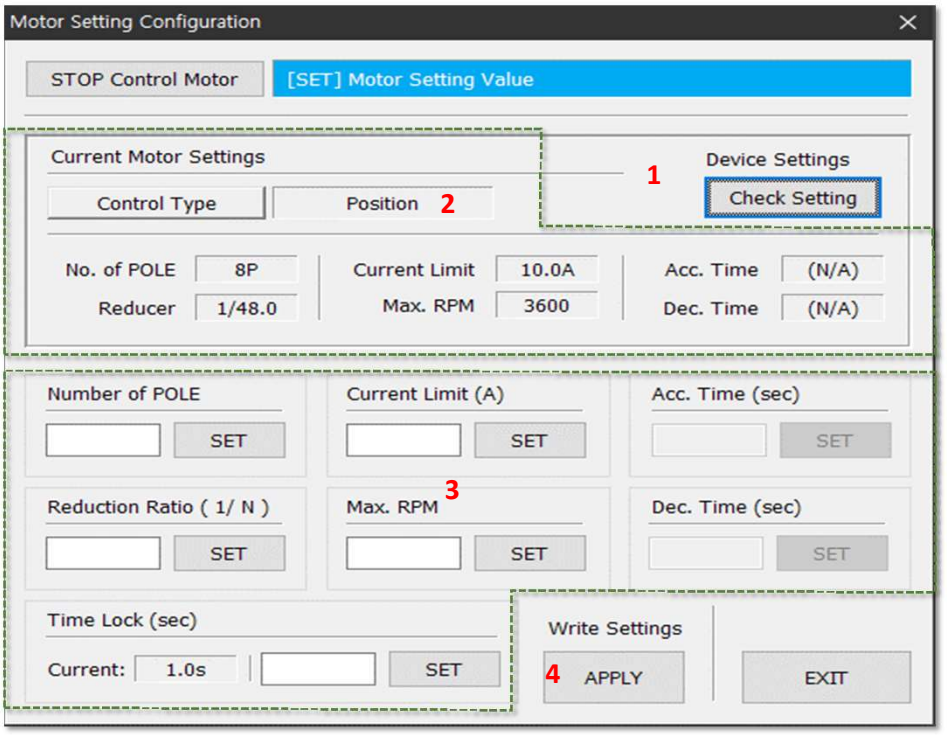

Caution

| | |
|---|---|
| 1 | ID can be changed while communication is connected. |
| 2 | It cannot be changed while the motor is running. |
| 3 | Baudrate can be changed only when the port is "Close". |

**Program – Setting**



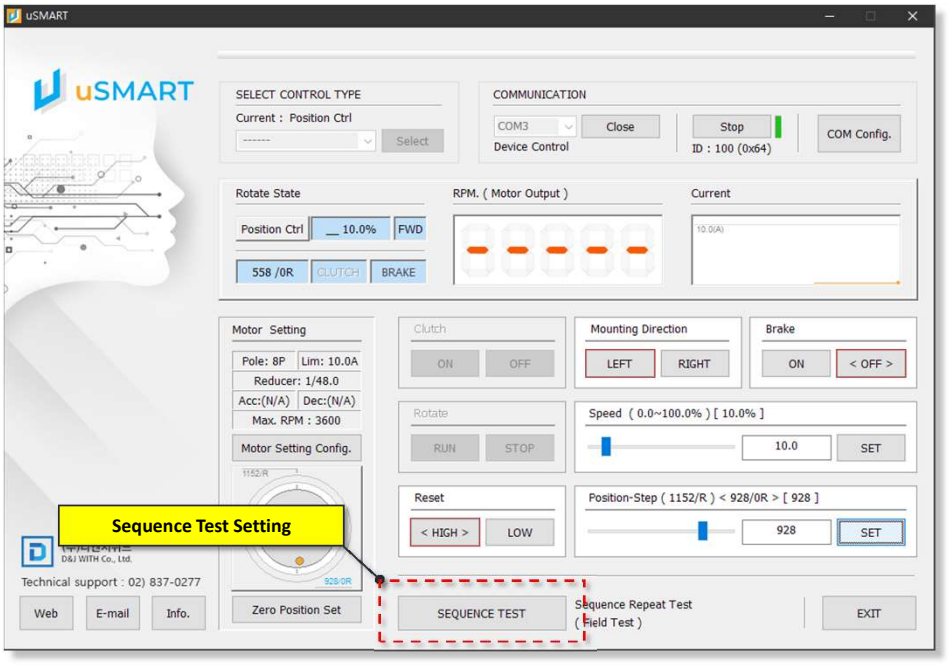

**Program – Setting**
**/ Motor setting config.**




1 Check default setting of connected motor
2 Display of control settings
3 Control settings
4 Apply settings

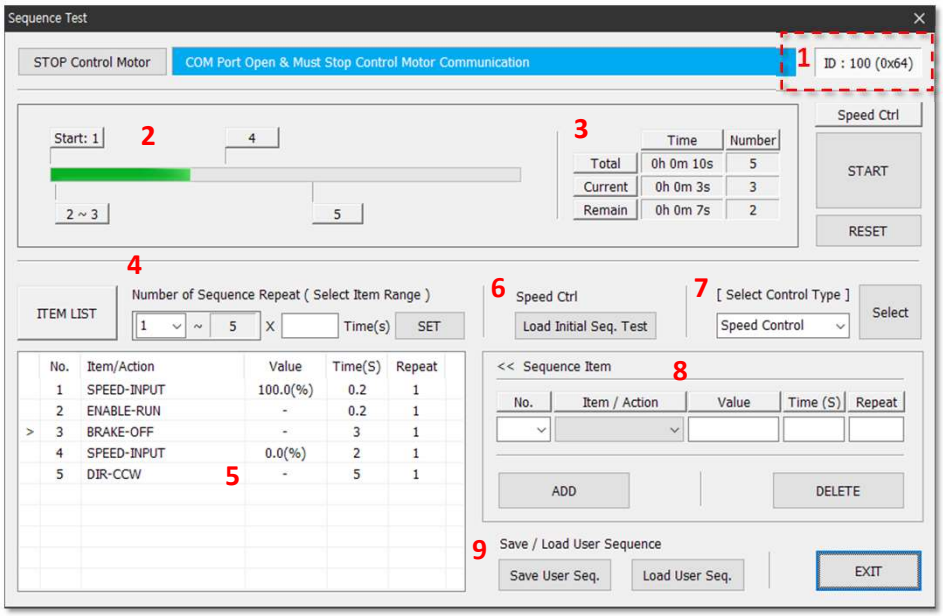
Caution
1 The set value can be changed only when communication is connected.
2 It cannot be changed while the motor is running.

**Program – Setting**




**Program – Setting**

**/ Sequence Test Setting**




1 Display the set communication ID
2 Display the set test item order and progress
3 Display setting time and test repeat count
4 Set the number of test repetitions
5 Sequential display of test setting items
6 Load default settings
7 Control mode selection
8 Test Item Settings
  1) Run / Time / Repeat: Setting
    "Add" Button : Add Item
  2) Sequential Selection
    "Delete" Button : Delete Item
9 Save the setting items
  Load saved setting items

Caution
1 Sequence test item can be changed only when communication is connected.
2 It cannot be changed while the motor is running.