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# VID23 Transparent Shaft Motor

## Description

▶ VID23 is a precise stepper motor with patent design. It is specially designed with transparent pointer shaft , pointer illumination intensity is superior to the motor which is in traditional way. It also brings cost reduction by saving LEDs.
▶ VID23 has a gear reduction ratio of 180:1. It's mainly used in dashboard instrumentation or other digital indicator equipments, transfer digital signals directly and accurately to analog display.
▶ VID23 is driven by 2 sequent logic pulse signals. It can be driven in 3.5V - 10V providing shaft stepping angle reso--lution 1/12° The pointer can move with a speed no more than 400Hz(degree/s).
▶ VID 23 Transparent Shaft Motors have two model series which differed by mounting mode, Front mounting model series VID23-01 and VID23-03, Rear mounting model VID23-05 .

## Main Features

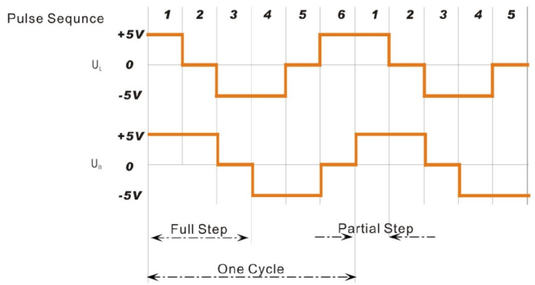
★Transparent Pointer Shaft
★Excellent illumination intensity
★Compatible with LED PLCC-2/4/6 Package
★High speed rotation: 400°/s
★Precise μ-step resolution: 1/12°
★Wide working temperature: -40℃~105℃
★Low current consumption: less than 20mA, 5V, 2X100mW
★Extremely robust construction: Φ30mmX7.6mm
★Long lifetime design
★Directly driven by a μ-controller

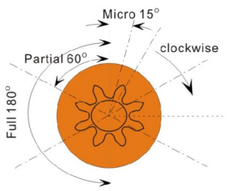

Front Mount VID23-01


Rear Mount VID23-05

## Step Definition and Rotor Movement

VID23 series is a 4-gear design stepper motor, it can be driven by 2 groups of sequent logic pulse signals,Including full step mode and partial step mode. The driving diagram can be refered as following:



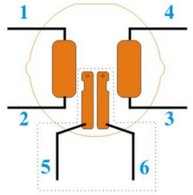



Rotor

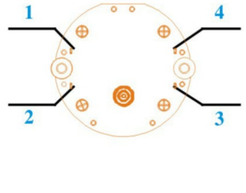

Gears

Gear ration 180:1

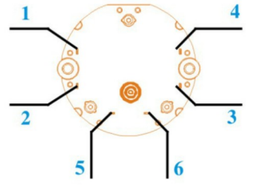
## Pin connection



Schematic



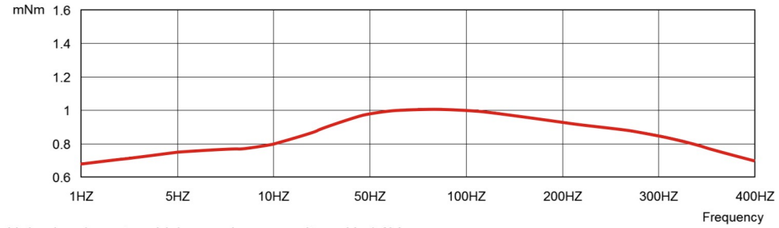
Front Mount (VID23-01/VID23-03)



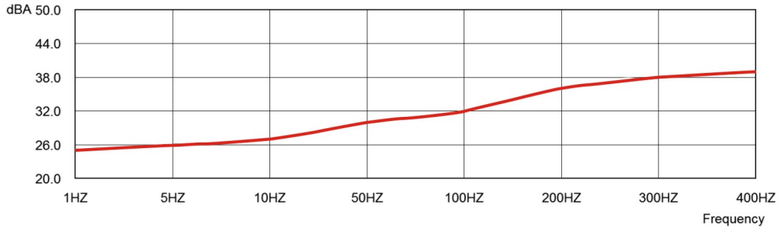
Rear Mount (VID23-05)

## Typical Torque And Noise

Torque in micro step driving mode, max voltage U=4.3V
Typical Torque




Noise in micro step driving mode, max voltage U=4.3V
Noise



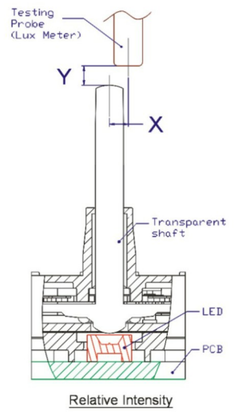

## Relative Intensity

Red LED Relative Intensity

| Y(mm) | X(mm) | | | |
|---|---|---|---|---|
| | 0.00 | 0.25 | 0.50 | 0.75 |
| 1.40 | 118% | 114% | 84% | 46% |
| 1.00 | 146% | 134% | 94% | 48% |
| 0.60 | 138% | 151% | 101% | 53% |

White LED Relative Intensity

| Y(mm) | X(mm) | | | |
|---|---|---|---|---|
| | 0.00 | 0.25 | 0.50 | 0.75 |
| 1.40 | 94% | 93% | 78% | 54% |
| 1.00 | 100% | 98% | 79% | 59% |
| 0.60 | 92% | 93% | 82% | 63% |



Relative Intensity

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## Absolute Maximum Ratings

| Parameter | Symbol | Max |
|---|---|---|
| Drving Voltage | $U_b$ | 10V |
| ESD Tolerance | $U_{ESD}$ | 10'000V |
| EMI Tolerance(1kHz; AM 80%; 100kHz-2GHz) | E | 80V/M |
| Storage Temperature | $T_{stg}$ | 95℃ |
| Solder Temperature(<3s) | $T_s$ | 290℃ |

Warning:

The parameter over max will bring permanent damage to VID23 stepper motor. And the parameter exceeded the arranged parameter will effect the reliability of the stepper motor.

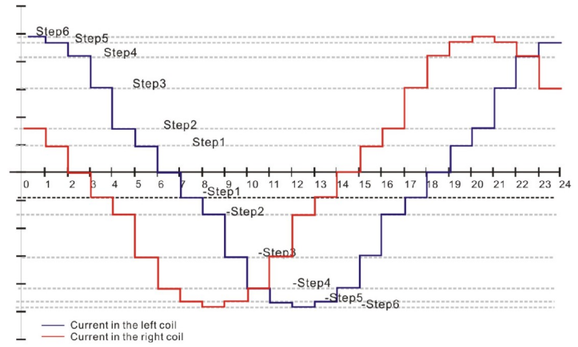
## Electrical and Mechanical Characteristics

Symbol Definition: $f_a$- testing frequency, $J_L$-testing pointer inertia, $U_b$-Driving Voltage Testing Conditions: Tamb=25℃ , In micro step mode @ Max. voltage 4.3V, unless other specified.

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Electrical Characteristics** | | | | | | |
| Operating Temperature | $T_a$ | | -40 | | 105 | ºC |
| Coil Resistance | $R_b$ | | 260 | 280 | 300 | Ω |
| Operating Current | $I_m$ | $f_a$=200Hz | | 15.4 | 30 | mA |
| Start-Stop Frequency | $f_{ss}$ | $J_L$=0.2x10-6Kgm² | | | 125 | Hz |
| Maximum Driving Frequency | $f_{mm}$ | $J_L$=0.2x10-6Kgm² | | | 400 | Hz |
| **Mechanical Characteristics** | | | | | | |
| Dynamic Torque | M200<br>M400 | $f_a$=200Hz<br>$f_a$=400Hz | 0.8<br>0.6 | 0.93<br>0.70 | | mNm<br>mNm |
| Holding Torque | $M_s$ | $U_b$=5V | 3.5 | 4.0 | | mNm |
| Equivalent Motor Inertia @ Output | $J_m$ | | | 4.225 E-7 | | Kgm² |
| Gear ratio | | | | 180:1 | | |
| Step size in full step mode | | | | 1 | | Degree |
| Step size in partial step mode | | | | 1/3 | | Degree |
| Step size in micro step mode | | | | 1/12 | | Degree |
| Backlash | | | | 1.3 | 1.8 | Degree |
| **Noise** | | | | | | |
| Noise Level | SPL | @ 100 °/sec<br>@ 200 °/sec<br>@ 400 °/sec | | 32<br>36<br>39 | | dBA |
| **Others** | | | | | | |
| Angle of Rotation | fl | Motors with internal Stop | | | 315 | Degree |
| | fl | Motors without internal Stop | | | 360 | Degree |
| Force allowed on the pointer shaft:<br>Axial force (push)<br>Axial force (pull)<br>Perpendicular force<br>Imposed acceleration | <br>Fa<br>Fa<br>Fq<br>$\alpha_p$ | | | | <br>100<br>60<br>5<br>800 | <br>N<br>N<br>N<br>Rad/s² |

## Driving Pulse And control Circuit

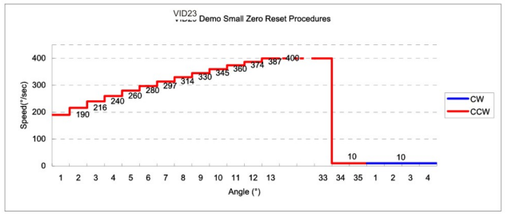
**Driving Pulses in Micro-step**

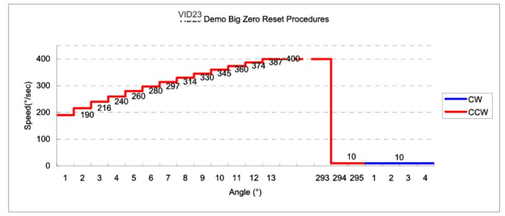



In general the peak amplitude should be between 12.9mA and 16.07mA.

## Motor Resetting Program

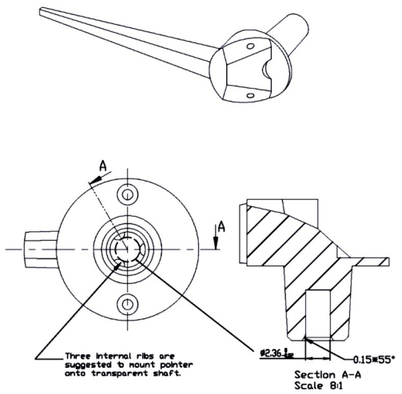
In most of the VID23 series applications, the angular range of the instrument dial is less than 300°. This needs a mechanical stop to define the pointer´s zero position. Generally the pointer will be reset to zero position at each power-up process. During the power-up of instrument, to bring the pointer at this initial stop position without creating any visible and audible jitter of the pointer, we suggest frequency accelerate process to speed up VID23stepping motor at a high speed. Right is an example:

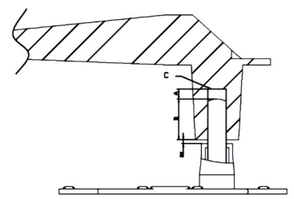



## Recommended Parameter for The pointer

Pointer design can influence the final illumination result of VID23. The following Pointer Design Guide is recommended to obtain the optimum illumination result.




| Dimension | Advice Value | |
|---|---|---|
| | Min | Max |
| A | 0.7mm | 1.3mm |
| B | 4.0mm | 5.2mm |
| C | FLAT | |
| D | 0.5mm MIN. | |

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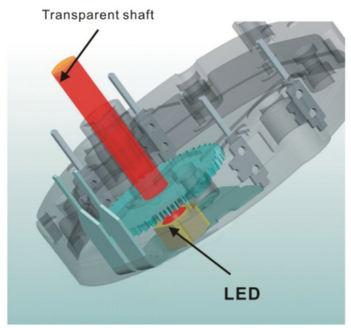
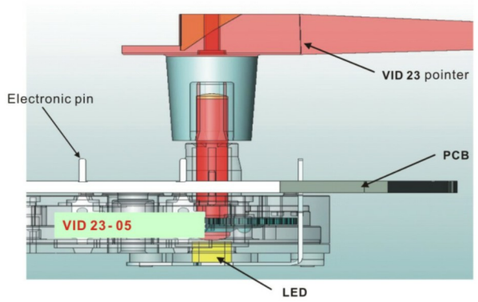
## VID 23-05 Installation



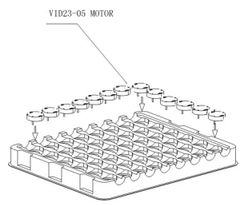
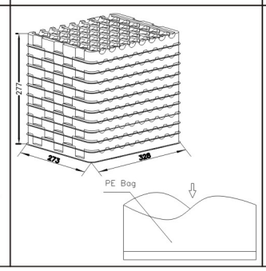
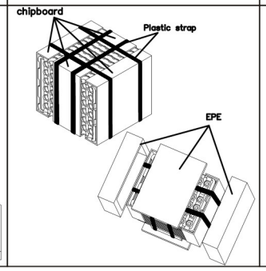
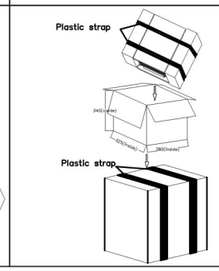




## pointer Design Reference

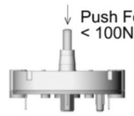
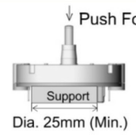
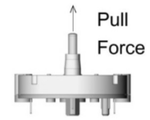
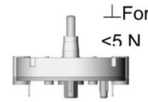
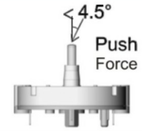
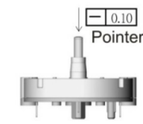
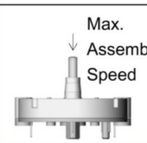
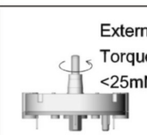
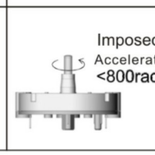
### The parameter of the pointer

| | Min. | |
|---|---|---|
| **Size** | | **50mm** |
| **Weight** | | **2.5g** |
| **Intertia moment** | | **$2x10^{-7}Kgm^2$** |
| **Unbalance** | | **0.01mNm** |

## VID 23 Transparent Shaft Motor Package

| | | | |
|---|---|---|---|
| Tray for 6×7=42Car motor VID23<br>Material: PS<br>Weight:<br>Tray 1×124g=124g<br>Motor 42×7g=294g<br>Total =418g | Stack for 42×10=420 VID23 motor<br>Material: 10 Trays(including cover) strapped together with plastic band<br>Weight:<br>Trays 10×418g=4180g<br>Cover Tray 1×124g=124g<br>PE bag 1×50g=50g<br>Tatol =4804g | Master-carton for 42×10=420 VID23 motor<br>Weight:<br>Master-Carton 1×850g=850g<br>Production 1×4804g=4804g<br>Chipboard1 2×120g=240g<br>Chipboard2 2×100g=200g<br>EPE1 2×80g=160g<br>EPE2 2×130g=260g<br>Plastic strap 4×20g=80g<br>Tatol =6594g | Weight:<br>Stacks 1×6594g=6594g<br>Plastic strap 4×25g=100g<br>Tatol =6694g |
|  |  |  |  |

## Precaution of pointer Assembly

| Description | Diagram | Specification | | | Remarks |
|---|---|---|---|---|---|
| | | Limit | Unit | | |
| Maximum Push On Force |  | 100 max. | N | Wire damaged/ Wire broken/ Gear damage/ Abnormal Noise | Proper fixing motor on PCB. Proper supporting during assembly. |
| Minimum Assembly Support |  | Dia.25 min. | mm | Wire damaged/ Wire broken/ Gear damage/ Abnormal Noise/ Gear &shaft mounting is damaged | Concrete base support should be located within +/- 1.0mm concentricity to the motor |
| Maximum Pull Out Force |  | 60 max. | N | Wire damaged/ Wire broken/ Gear damage/ Abnormal Noise | Repetitive push & pull force should also be avoided. This could deform gear and shaft. |
| Maximum Perpendicular Force |  | 5 max. | N | Output shaft bend/ Non-concentric rotation of output shaft | Excess perpendicular force should be avoided to bend the shaft. |
| Maximum Force Inclination |  | 4.5 max. | degree | Output shaft bend/ Non-concentric rotation of output shaft | Excess inclination of applied force should be avoided to bend the shaft. |
| Maximum Straightness Deviation of Pointer Assembly |  | 0.10 max. | mm | Output shaft bend/ Non-concentric rotation of output shaft | Pointer straightness should be maintained within 0.3mm during assembly. Excess inclination could induce excess perpendicular force and bend the shaft. |
| Maximum Assembly Speed |  | 2 max. | mm/sec | Gear damage/ Gear & shaft deform | Excess assembly speed could induce excess force on gears. |
| Maximum External Torque |  | 25 max. | mNm | Gear damage/ Gear & shaft deform/Stopper damage (if 360° Rotate) | Excess external torque applied on shaft would weaken overmoulding force between gear and shaft. It induce low pull out force. Repetitive external torque, even less than 35mNm, could also damage the overmoulding force, it should be avoided. Zero reset should be done before assembly, then pointer is assembled while pointing to zero. Zero reset manually should be avoided. |
| Maximum Imposed Acceleration |  | 800 max. | rad/s² | Gear damage | Excessive external turning speed would induce excessive force on gears, it must be avoided. |