ENGINEERING DOCUMENTATION

# High-Torque Hat Unit Type I

Dimensional & Integration Guide

| DOCUMENT | REVISION / ISSUE | STATUS |
|---|---|---|
| DIG-ES-HG-S07-F40-R50 | DRAFT-08 / 28 Aug 2026 | Engineering Integration Reference |

## Integration Overview

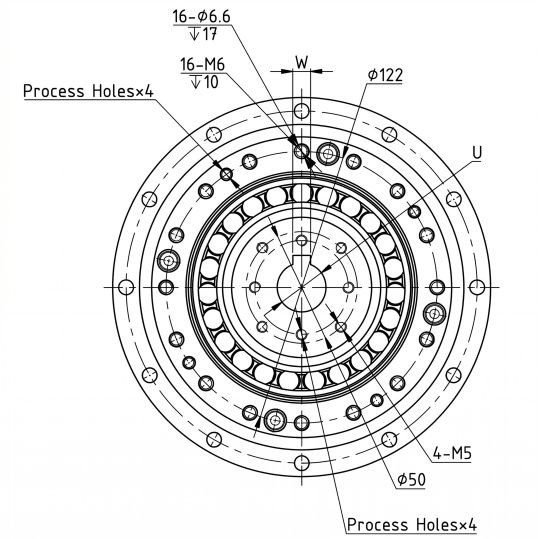
High-Torque Hat Unit Type I for compact, coaxial, high-ratio rotary-axis integration. This guide supports interface planning, mounting alignment, duty validation, torsional behavior, lubrication, sealing and commissioning for ES-HG-S07-F40-R50.

## Key Integration Facts

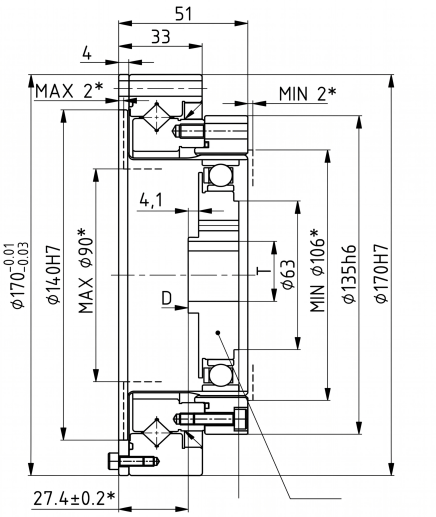
| INTEGRATION ITEM | VALUE |
|---|---|
| Rated Torque | 178 N·m |
| Instantaneous Maximum Torque | 892 N·m |
| Start/Stop Peak Torque | 523 N·m |
| Reduction Ratio | 50 |
| Maximum Input Speed | 4000 r/min |
| Frame Size | 40 |
| Weight | 4.4 kg |

# Product Structure & Views

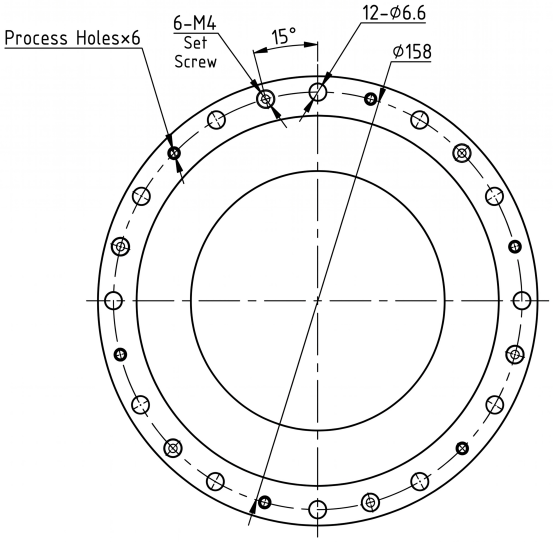
These views present the selected product structure, mounting interfaces and relevant integration geometry for this SKU.



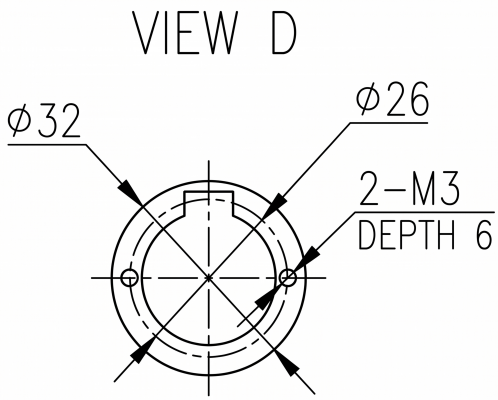

Mechanical View 1




Mechanical View 2




Mechanical View 3




Mechanical View 4

| VIEW | FIELD | VALUE |
| --- | --- | --- |
| Mechanical View 1 | 16-hole diameter and depth | 16 holes, diameter 6.6, depth 17 |
| | 16 M6 threaded holes and depth | 16 threaded holes M6, depth 10 |
| | Width label W | W dimension label, value not specified in this crop |
| | Pitch or outer circular diameter | Diameter 122 |
| | Process holes quantity | Process holes, quantity 4 |
| | Label U | U label, value not specified in this crop |
| | 4 M5 threaded holes | 4 threaded holes M5 |
| | Diameter 50 | Diameter 50 |

| VIEW | FIELD | VALUE |
|---|---|---|
| Mechanical View 2 | Overall width | 51 |
| | Inner width | 33 |
| | Left side maximum offset | MAX 2* |
| | Right side minimum offset | MIN 2* |
| | Maximum diameter | MAX diameter 90* |
| | Minimum diameter | MIN diameter 106* |
| | Diameter 170 limit deviations | Diameter 170, upper deviation -0.01, lower deviation -0.03 |
| | Diameter 140 H7 fit | Diameter 140 H7 |
| | Diameter 63 | Diameter 63 |
| | Diameter 170 H7 fit | Diameter 170 H7 |
| | Diameter 135 h6 fit | Diameter 135 h6 |
| | Bottom axial dimension | 27.4 ±0.2* |
| | Datum D | Datum D |
| | Middle Axial Face Distance | 4.1 |
| | Upper Left Step Width | 4 |
| | Label D | D |
| Mechanical View 3 | Process hole quantity | 6 process holes; hole size not specified in this crop |
| | M4 set screw holes | 6 × M4 set screw holes |
| | Angular spacing or angular offset | 15 degrees |
| | Mounting hole quantity and diameter | 12 × Ø6.6 holes |
| | Mounting hole pitch circle diameter | Ø158 pitch circle diameter |
| Mechanical View 4 | View direction | View D |
| | Outer mounting circle diameter | Diameter 32 mm |
| | Inner mounting circle diameter | Diameter 26 mm |
| | Threaded hole specification and depth | 2 × M3 threaded holes, depth 6 mm |

# Housing and Input Interface Dimensions

**Housing Size:** 40 **Reduction Ratio:** 50 **Weight:** 4.4 kg

| WAVE GENERATOR | T (MM) | U | W |
|---|---|---|---|
| **A14** | 16.3 +0.10 | 14 H7 | 5 JS9/P9 |
| **A19** | 21.8 +0.10 | 19 H7 | 6 JS9/P9 |
| **A22** | 24.8 +0.10 | 22 H7 | |
| | 25.3 +0.10 | | 8 JS9/P9 |

**Note:** Dimensions in mm unless otherwise specified. Refer to the dimensional drawing for feature locations and datum definitions.

# Input Interface Design Guidance

- Confirm the selected series, frame size, ratio and product form before using dimensions or interface geometry.
- Design the input shaft, key, engagement and axial retention for the verified torque and assembly state.
- Reserve assembly, sealing, inspection and removal access around input, housing and output interfaces.

# Mounting, Alignment and Fastener Control

- Keep mounting faces flat, clean and free of burrs, debris and coating buildup.
- Control concentricity, tilt and axial position of input and housing datums.
- Tighten fasteners in a staged diagonal sequence and verify free, even rotation during assembly.

# Torque, Speed and Duty Boundaries

| PARAMETER | VALUE | UNIT |
|---|---|---|
| Rated Torque | 178 | N·m |
| Allowable Average Torque | 255 | |
| Start/Stop Peak Torque | 523 | |
| Instantaneous Maximum Torque | 892 | |
| Starting Torque | 61 | |
| Maximum Input Speed | 4000 | r/min |
| Average Input Speed | 3000 | |
| Design Life | 10000 | h |

- Calculate torque and speed from acceleration, constant-speed, deceleration, dwell and reversal portions of the complete cycle.
- Treat start/stop peak and instantaneous maximum torque as transient boundaries.
- Validate life against actual torque, speed, shock frequency, lubrication, temperature, alignment and external loading.

### Torque, Speed and Life Boundaries

| PARAMETER | VALUE | INTEGRATION REQUIREMENT |
|---|---|---|
| Rated Torque | 178 N·m | Use as the selected continuous output rating under validated duty and thermal conditions. |
| Allowable Average Torque | 255 N·m | Calculate the actual time-weighted output torque over the complete cycle. |
| Start/Stop Peak Torque | 523 N·m | Transient start/stop boundary; include acceleration and deceleration events. |
| Instantaneous Maximum Torque | 892 N·m | Short-duration shock boundary only; do not use as a normal operating point. |
| Maximum Input Speed | 4000 r/min | Maximum input-speed boundary; also verify motor and thermal limits. |
| Average Input Speed | 3000 r/min | Validate the time-weighted average input speed over the complete duty cycle. |
| Design Life | 10000 h | Design reference only; actual life depends on torque, speed, shock, lubrication and installation. |

## Transmission Accuracy and Torsional Rigidity

| PARAMETER | VALUE | UNIT |
|---|---|---|
| Angle Transmission Accuracy | 1 | arcmin |
| Hysteresis Loss | 2 | |
| Torsional Rigidity K1 | 10 | ×10⁴N·m/rad |
| Torsional Rigidity K2 | 14 | |
| Torsional Rigidity K3 | 18 | |
| Torsional Rigidity T1 | 54 | N·m |
| Torsional Rigidity T2 | 196 | |

- Installed positioning depends on reducer behavior, datum control, structural stiffness, motor and encoder errors and thermal growth.
- Use stiffness regions and transition torques when evaluating compliance, resonance, control gain and reversal.

## Lubrication, Sealing and Thermal Control

- Use the specified lubricant, fill method and quantity for the exact configuration; do not mix incompatible lubricants.
- Provide compatible sealing at input, output and housing interfaces without distorting the reducer.
- Validate lubricant distribution and temperature for orientation, speed, load cycle and enclosure.
- Prevent chips, fibers, residue and moisture from entering gear or bearing cavities.

# Output Bearing and External Load Path

- Calculate radial, axial and moment loads including offset, acceleration, gravity, process force, impact and emergency stops.
- Do not infer permissible external load from reducer torque capacity or frame size.
- Avoid forcing, impact, misalignment or host distortion through the output support during installation and operation.

# Integration Checklist

| | |
|---|---|
| 01 | Confirm the selected series, frame size, ratio and product form for this SKU. |
| 02 | Verify available dimensions and interface geometry without substituting a nearby configuration. |
| 03 | Check mounting-face flatness, concentricity, tilt, reliefs, cleanliness and support stiffness. |
| 04 | Verify input shaft, key, engagement length and axial retention. |
| 05 | Use staged diagonal tightening and verify free, even rotation. |
| 06 | Calculate average, start/stop peak and shock torque over the complete cycle. |
| 07 | Validate average and maximum input speed, design life and thermal condition. |
| 08 | Evaluate backlash, angular accuracy, hysteresis and stiffness for the control system. |
| 09 | Confirm lubricant, fill quantity, orientation, sealing and contamination controls. |
| 10 | Validate output radial, axial and moment loads using applicable bearing data. |

**View SKU Product Datasheet** **Request controlled 2D drawing** **Request controlled STEP review** **Request a Quote**

### Engineering Use and Verification Notice

**01.** This Dimensional & Integration Guide applies only to EmbodyStack SKU ES-HG-S07-F40-R50 and supports preliminary dimensional evaluation and integration. It is not a manufacturing drawing, reducer selection approval, bearing-load approval, lubrication specification, machinery risk assessment, safety validation or integration planning document. Before design freeze, assembly or commissioning, verify all dimensions, datum geometry, fits, interfaces, retention, fasteners, torque and speed duty, shock cases, torsional behavior, external loads, lubrication, sealing, temperature, contamination and maintenance requirements against the current EmbodyStack engineering data for this exact SKU. Validate the complete reducer, motor, host structure, output load, motion cycle, guarding, fault cases and applicable regulatory requirements under intended operating conditions.