

ENGINEERING DOCUMENTATION

Hat Component Set

Dimensional & Integration Guide

DOCUMENT	REVISION / ISSUE	STATUS
DIG-ES-HG-S02-F40-R160	DRAFT-08 / 28 Aug 2026	Engineering Integration Reference

Integration Overview

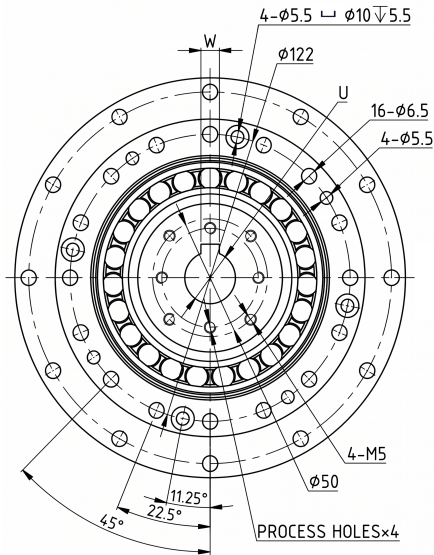
Hat Component Set for compact, coaxial, high-ratio rotary-axis integration. This guide supports interface planning, mounting alignment, duty validation, torsional behavior, lubrication, sealing and commissioning for ES-HG-S02-F40-R160.

Key Integration Facts

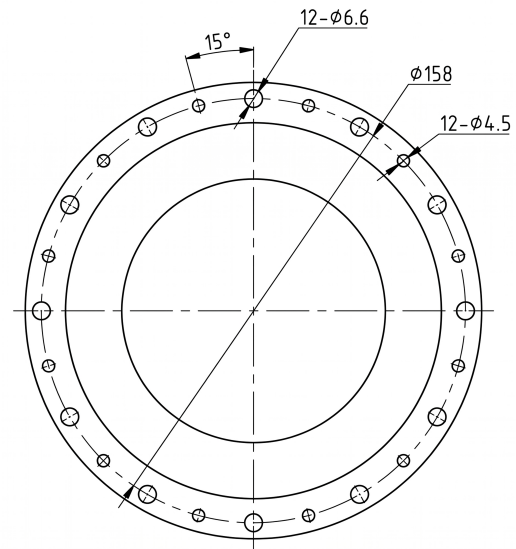
INTEGRATION ITEM	VALUE
Rated Torque	294 Nm
Instantaneous Maximum Torque	1180 Nm
Start/Stop Peak Torque	647 Nm
Backlash	±0 arc sec
Reduction Ratio	160
Maximum Input Speed	4000 r/min
Frame Size	40
Weight	1.87 kg

Product Structure & Views

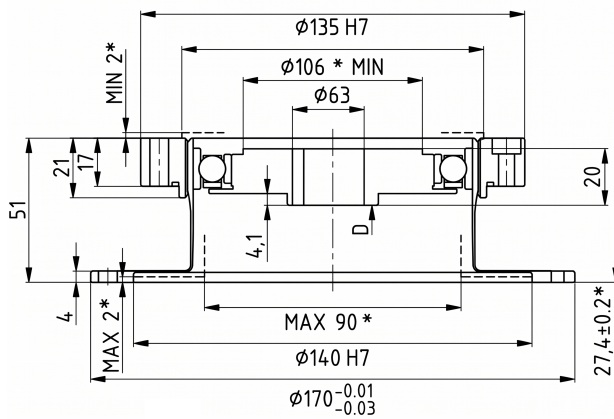
These views present the selected product structure, mounting interfaces and relevant integration geometry for this SKU.



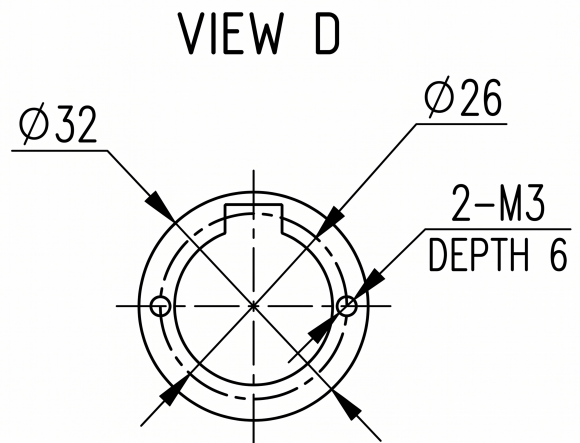
Mechanical View 1



Mechanical View 2



Mechanical View 3



Mechanical View 4

VIEW	FIELD	VALUE
Mechanical View 1	Four Ø5.5 holes	4 holes, diameter 5.5
	Ø10 counterbore/depth 5.5	Diameter 10 with depth-style value 5.5
	W dimension symbol	W, value not specified in this crop
	Ø122 pitch or reference circle diameter	Diameter 122
	U dimension symbol	U, value not specified in this crop
	Sixteen Ø6.5 holes	16 holes, diameter 6.5
	Four M5 threaded holes	4 threaded holes, M5
	Ø50 central bore or shaft interface diameter	Diameter 50
	11.25 degree angular spacing	Angle 11.25 degrees
	22.5 degree angular spacing	Angle 22.5 degrees
	45 degree angular spacing	Angle 45 degrees
	Process holes quantity four	Process holes x4; diameter not specified in this crop
	Mounting hole quantity and diameter	12 holes, diameter 6.6
Mechanical View 2	Hole angular spacing	15 degrees angular spacing
	Pitch or outer circle diameter	Diameter 158
	Mounting hole quantity and diameter	12 holes, diameter 4.5
	Upper mounting bore diameter fit	Diameter 135 H7
Mechanical View 3	Left minimum clearance	Minimum 2, marked with asterisk
	Minimum diameter	Minimum diameter 106, marked with asterisk
	Inner diameter	Diameter 63
	Left vertical dimension	21
	Left local vertical dimension	17
	Right vertical dimension	20
	Overall vertical dimension	51
	Datum or feature identifier D	D
	Local step dimension	4.1
	Maximum length	Maximum 90, marked with asterisk
	Right local vertical dimension with tolerance	27.4 ±0.2
	Maximum clearance	Maximum 2, marked with asterisk
	Lower mounting bore diameter fit	Diameter 140 H7
	Outer diameter with unilateral negative tolerance	Diameter 170, upper deviation -0.01, lower deviation -0.03
	Mechanical Dimension	4
Mechanical View 4	View identifier	View D
	Hole circle diameter	Diameter 26 mm
	Outer diameter	Diameter 32 mm
	Threaded hole quantity and size	2 × M3 threaded holes
	Thread depth	Depth 6 mm

Housing and Input Interface Dimensions

Housing Size: 40 Reduction Ratio: 160 Weight: 1.87 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	294	Nm
Allowable Average Torque	451	
Start/Stop Peak Torque	647	
Instantaneous Maximum Torque	1180	
Maximum Input Speed	4000	r/min
Average Input Speed	3000	
Design Life	15000	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	294 Nm	Use as the selected continuous output rating under validated duty and thermal conditions.
Allowable Average Torque	451 Nm	Calculate the actual time-weighted output torque over the complete cycle.
Start/Stop Peak Torque	647 Nm	Transient start/stop boundary; include acceleration and deceleration events.
Instantaneous Maximum Torque	1180 Nm	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	15000 h	Design reference only; actual life depends on torque, speed, shock, lubrication and installation.

Transmission Accuracy and Torsional Rigidity

PARAMETER	VALUE	UNIT
Backlash	20	arc sec

- 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-S02-F40-R160 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.