

ENGINEERING DOCUMENTATION

High-Torque Hat Component Set

Dimensional & Integration Guide

DOCUMENT	REVISION / ISSUE	STATUS
DIG-ES-HG-S04-F40-R120	DRAFT-08 / 28 Aug 2026	Engineering Integration Reference

Integration Overview

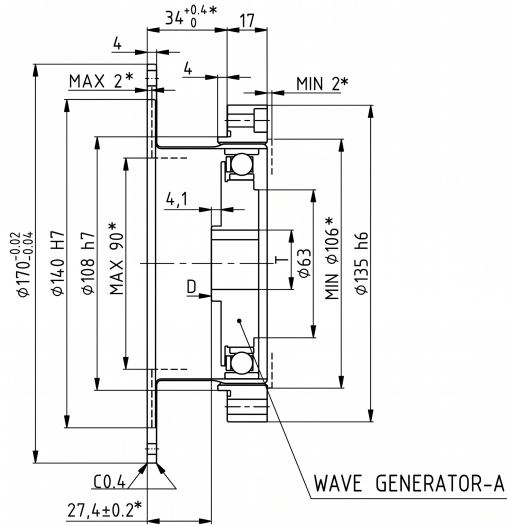
High-Torque Hat Component Set for compact, coaxial, high-ratio rotary-axis integration. This guide supports interface planning, mounting alignment, duty validation, torsional behavior, lubrication, sealing and commissioning for ES-HG-S04-F40-R120.

Key Integration Facts

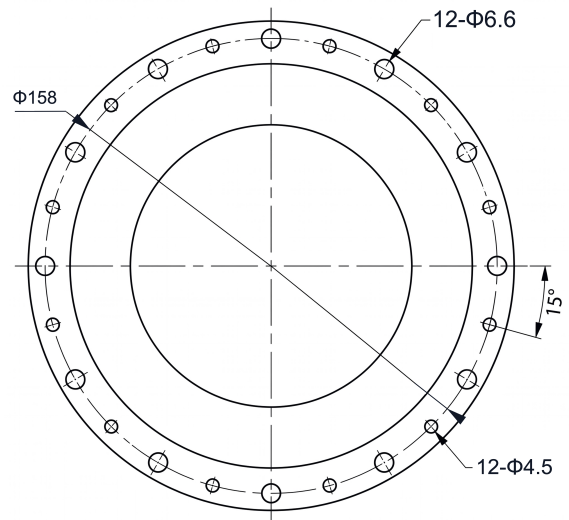
INTEGRATION ITEM	VALUE
Rated Torque	382 Nm
Instantaneous Maximum Torque	1530 Nm
Start/Stop Peak Torque	802 Nm
Backlash	±0 arc sec
Reduction Ratio	120
Maximum Input Speed	4000 r/min
Frame Size	40
Weight	1.87 kg

Product Structure & Views

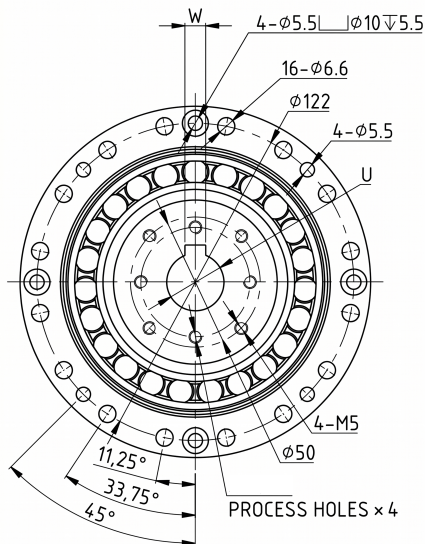
These views present the selected product structure, mounting interfaces and relevant integration geometry for this SKU.



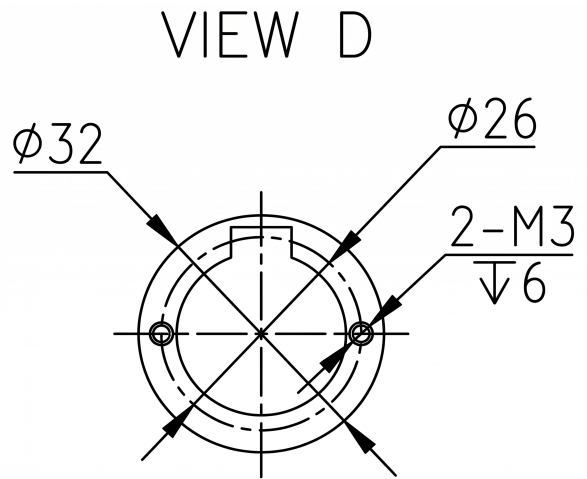
Mechanical View 1



Mechanical View 2



Mechanical View 3



Mechanical View 4

VIEW	FIELD	VALUE
Mechanical View 1	Axial length with adjacent segment length	Length 34 mm with +0.4/0 tolerance; adjacent length 17 mm
	Maximum clearance	Maximum 2 mm
	Minimum clearance	Minimum 2 mm
	Local offset distance	4.1 mm
	Maximum envelope height	Maximum 90 mm
	Minimum diameter	Minimum diameter 106 mm
	Mounting locating diameter	Diameter 140 H7
	Mounting fit diameter	Diameter 108 h7
	Mounting fit diameter	Diameter 135 h6
	Outside diameter with tolerance	Diameter 170 mm with -0.02/-0.04 tolerance
	Local height	63 mm
	Datum T	Datum T
	Datum D	Datum D
	Chamfer	Chamfer C0.4 mm
	Component label	Wave generator A
	Axial length	27.4 mm ±0.2
	Upper Left Axial Face Distance	4
	Upper Middle Axial Face Distance	4
Mechanical View 2	Outer circle hole diameter and quantity	12 holes, $\varnothing 6$
	Inner circle hole diameter and quantity	12 holes, $\varnothing 5$
	Overall diameter	$\varnothing 58$
	Hole angular spacing	15°
Mechanical View 3	Mounting hole diameter	4 holes, $\varnothing 5$ mm
	Counterbore diameter	$\varnothing 0$ mm
	Surface roughness	Ra 5.5 μ m (max)
	Hole quantity and diameter	16 holes, $\varnothing 6$ mm
	Outer diameter	$\varnothing 22$ mm
	Mounting hole diameter (outer)	4 holes, $\varnothing 5$ mm
	Datum reference	Datum U
	Threaded hole specification	4 threaded holes, M5
	Center bore diameter	$\varnothing 0$ mm
	Hole angular position	11.25°
	Hole angular position	33.75°
	Hole angular position	45°
	Process holes note	4 process holes
	Datum reference	Datum W
Mechanical View 4	Hole Diameter	$\varnothing 2$
	Hole Diameter	$\varnothing 6$
	Threaded Hole Specification and Quantity	2-M3
	Surface Roughness	6

Housing and Input Interface Dimensions

Housing Size: 40 Reduction Ratio: 120 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	382	Nm
Allowable Average Torque	586	
Start/Stop Peak Torque	802	
Instantaneous Maximum Torque	1530	
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	382 Nm	Use as the selected continuous output rating under validated duty and thermal conditions.
Allowable Average Torque	586 Nm	Calculate the actual time-weighted output torque over the complete cycle.
Start/Stop Peak Torque	802 Nm	Transient start/stop boundary; include acceleration and deceleration events.
Instantaneous Maximum Torque	1530 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-S04-F40-R120 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.