ENGINEERING DOCUMENTATION

Hat Component Set

Dimensional & Integration Guide

DOCUMENT	REVISION / ISSUE	STATUS
DIG-ES-HG-S02-F32-R160	DRAFT-08 / 28 Aug 2026	Engineering Integration Reference

Integration Overview

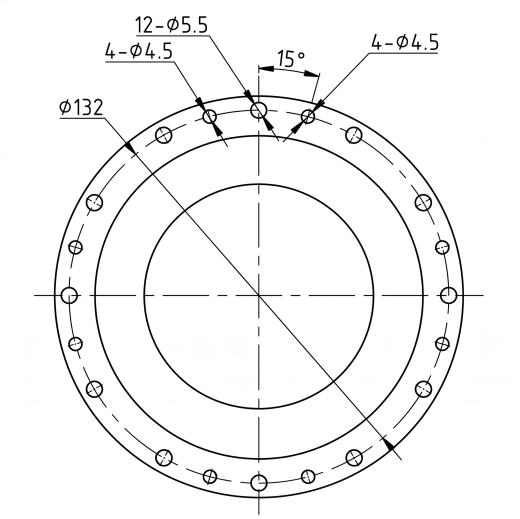
Hat Component Set for compact, coaxial, high-ratio rotary-axis integration. This guide supports interface planning, mounting alignment, duty validation, torsional behavior, lubrication, sealing and commissioning for ES-HG-S02-F32-R160.

Key Integration Facts

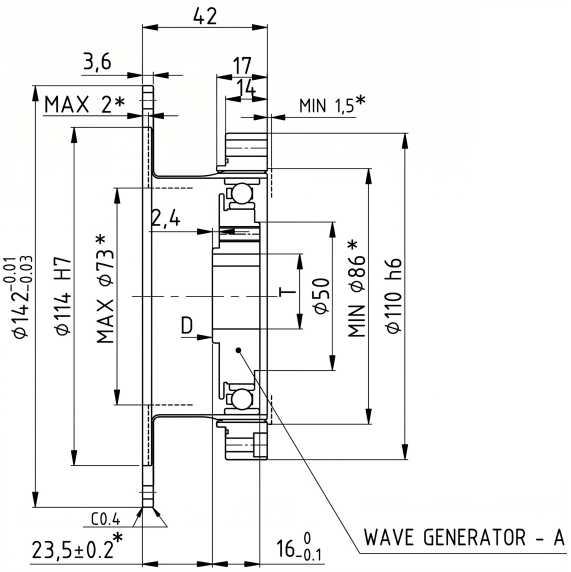
INTEGRATION ITEM	VALUE
Rated Torque	137 N·m
Instantaneous Maximum Torque	686 N·m
Start/Stop Peak Torque	372 N·m
Backlash	≤20 arc sec
Reduction Ratio	160
Maximum Input Speed	4800 r/min
Frame Size	32
Weight	1 kg

Product Structure & Views

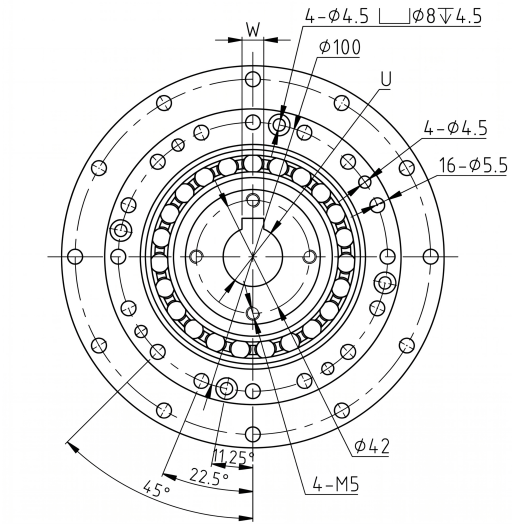
These views present the selected product structure, mounting interfaces and relevant integration geometry for this SKU.



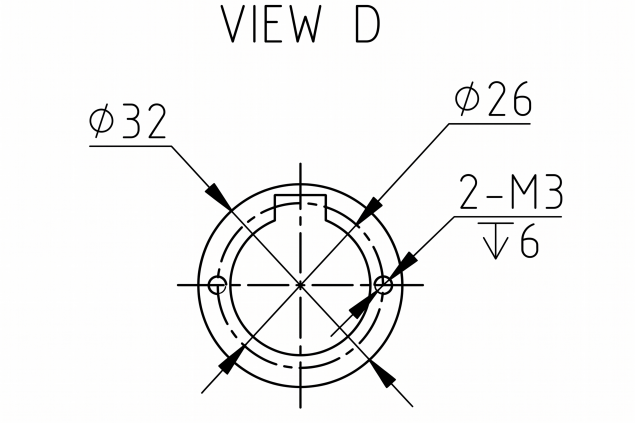
Mechanical View 1



Mechanical View 2



Mechanical View 3



Mechanical View 4

VIEW	FIELD	VALUE
Mechanical View 1	Outer bolt hole pattern	12 holes, Φ5.5mm diameter
	Middle bolt hole pattern (left annotation)	4 holes, Φ4.5mm diameter
	Middle bolt hole pattern (right annotation)	4 holes, Φ4.5mm diameter
	Angular spacing between holes	15° angular spacing
	Reference circle diameter	Φ132mm

VIEW	FIELD	VALUE
Mechanical View 2	Overall length	42 mm
	Mounting depth or boss dimension	3.6 mm
	Internal step width	17 mm
	Internal step depth	14 mm
	Left boss maximum height	≤2 mm
	Right groove minimum depth	≥1.5 mm
	Middle step height	2.4 mm
	Housing outer diameter	Φ42 -0.01/-0.03 mm
	Left side inner diameter	Φ14 H7
	Left cavity maximum diameter	≤Φ18 mm
	Center shaft diameter	Φ50 mm
	Right cavity minimum diameter	≥Φ36 mm
	Right side output shaft diameter	Φ10 h6
	Left end face chamfer	C0.4 mm
	Left end axial positioning dimension	23.5±0.2 mm
	Right boss width	16 0/-0.1 mm
	Tatum T	Tatum T
	Datum D	Datum D
	Wave generator reference	Wave generator - Datum A
Mechanical View 3	Mounting hole diameter	4 holes of Φ4.5 mm
	Countersink hole specification	Φ8 countersink depth 4.5 mm
	Flange outer diameter	Φ100 mm
	Width datum	Datum W
	Circular datum	Datum U
	Lower mounting holes	4 holes of Φ4.5 mm
	Peripheral mounting holes	16 holes of Φ5.5 mm
	Shaft diameter	Φ42 mm
	Threaded hole specification	4 × M5 threaded holes
	Angular positioning	11.25°
	Angular positioning	22.5°
	Angular positioning	45°
Mechanical View 4	Outer mounting circle diameter	Φ82
	Mounting hole circle diameter	Φ26
	Mounting threaded holes specification and quantity	2-M3
	Hole depth or counterbore depth	D6

Housing and Input Interface Dimensions

Housing Size: 32 **Reduction Ratio:** 160 **Weight:** 1 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	137	N·m
Allowable Average Torque	216	
Start/Stop Peak Torque	372	
Instantaneous Maximum Torque	686	
Maximum Input Speed	4800	r/min
Average Input Speed	3500	
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	137 N·m	Use as the selected continuous output rating under validated duty and thermal conditions.
Allowable Average Torque	216 N·m	Calculate the actual time-weighted output torque over the complete cycle.
Start/Stop Peak Torque	372 N·m	Transient start/stop boundary; include acceleration and deceleration events.
Instantaneous Maximum Torque	686 N·m	Short-duration shock boundary only; do not use as a normal operating point.
Maximum Input Speed	4800 r/min	Maximum input-speed boundary; also verify motor and thermal limits.
Average Input Speed	3500 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-F32-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.