

ENGINEERING DOCUMENTATION

Hat Component Set

Dimensional & Integration Guide

DOCUMENT	REVISION / ISSUE	STATUS
DIG-ES-HG-S02-F20-R120	DRAFT-08 / 28 Aug 2026	Engineering Integration Reference

Integration Overview

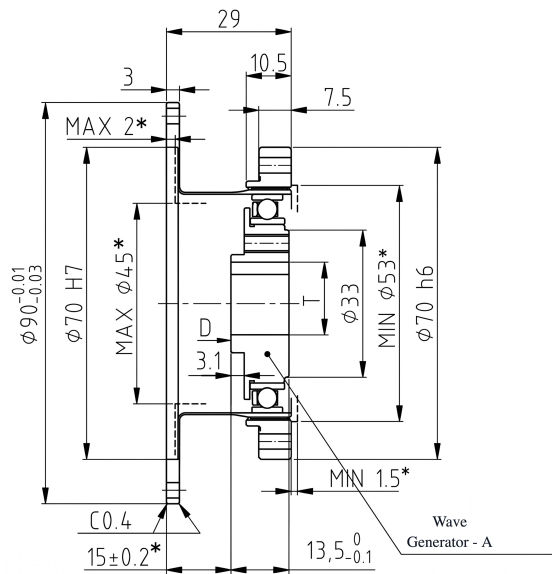
Hat Component Set for compact, coaxial, high-ratio rotary-axis integration. This guide supports interface planning, mounting alignment, duty validation, torsional behavior, lubrication, sealing and commissioning for ES-HG-S02-F20-R120.

Key Integration Facts

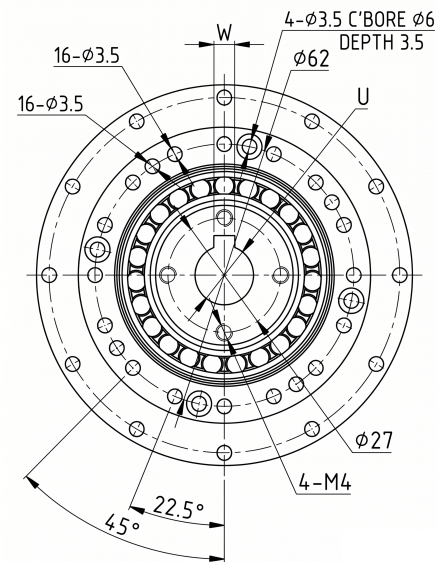
INTEGRATION ITEM	VALUE
Rated Torque	40 Nm
Instantaneous Maximum Torque	147 Nm
Start/Stop Peak Torque	87 Nm
Backlash	±0 arc sec
Reduction Ratio	120
Maximum Input Speed	6500 r/min
Frame Size	20
Weight	0.27 kg

Product Structure & Views

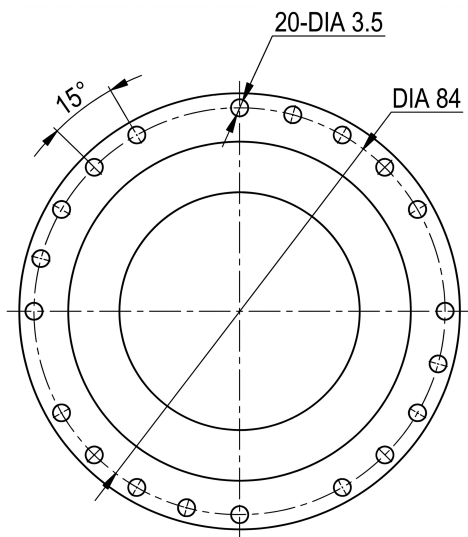
These views present the selected product structure, mounting interfaces and relevant integration geometry for this SKU.



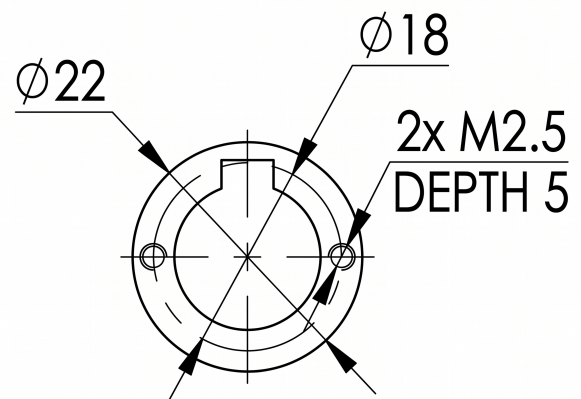
Mechanical View 1



Mechanical View 2



Mechanical View 3



Mechanical View 4

VIEW	FIELD	VALUE
Mechanical View 1	Overall width	29 mm
	Right section length	10.5 mm
	Right end section length	7.5 mm
	Left boss length	3 mm
	Left boss maximum height	MAX 2* mm
	Left outer diameter	Ø0 -0.01/-0.03 mm
	Left inner diameter fit	Ø0 H7
	Left inner bore maximum diameter	MAX Ø5* mm
	Datum D	Datum D
	Center feature dimension	3.1 mm
	Middle section diameter	Ø3 mm
	Right inner bore minimum diameter	MIN Ø3* mm
	Right inner diameter fit	Ø0 h6
	Bottom minimum clearance	MIN 1.5* mm
	Chamfer	C0.4 mm
	Bottom section length	15±0.2* mm
	Bottom right section length	13.5 0/-0.1 mm
	Wave generator reference	Wave generator-Datum A
	Datum T	Datum T
Mechanical View 2	Counterbore hole specification	4 holes: Ø5mm counterbore Ø6mm depth 3.5mm
	Width W	W (not specified numerically on drawing)
	Mounting circle diameter	Ø2mm
	Parameter U	U (not specified numerically on drawing)
	Outer circle through holes	16 holes Ø5mm
	Inner circle through holes	16 holes Ø5mm
	Central bore diameter	Ø7mm
	Threaded holes	4 threaded holes M4
	Angular spacing	22.5°
	Angular spacing	45°
Mechanical View 3	Bolt circle diameter and hole diameter	20 holes equally spaced on bolt circle, hole diameter Ø5
	Hole angular spacing	15° angular spacing between adjacent holes
	Bolt circle diameter	Ø4
Mechanical View 4	Mounting hole diameter	Ø8
	Outer diameter	Ø2
	Threaded hole specification and quantity	2×M2.5
	Hole depth	Depth 5

Housing and Input Interface Dimensions

Housing Size: 20 Reduction Ratio: 120 Weight: 0.27 kg

WAVE GENERATOR	T (MM)	U	W
A8	9.4 +0.10	8 H7	3 JS9/P9
A11	12.8 +0.10	11 H7	4 JS9/P9
A14	16.3 +0.10	14 H7	5 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	40	Nm
Allowable Average Torque	49	
Start/Stop Peak Torque	87	
Instantaneous Maximum Torque	147	
Maximum Input Speed	6500	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	40 Nm	Use as the selected continuous output rating under validated duty and thermal conditions.
Allowable Average Torque	49 Nm	Calculate the actual time-weighted output torque over the complete cycle.
Start/Stop Peak Torque	87 Nm	Transient start/stop boundary; include acceleration and deceleration events.
Instantaneous Maximum Torque	147 Nm	Short-duration shock boundary only; do not use as a normal operating point.
Maximum Input Speed	6500 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-F20-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.