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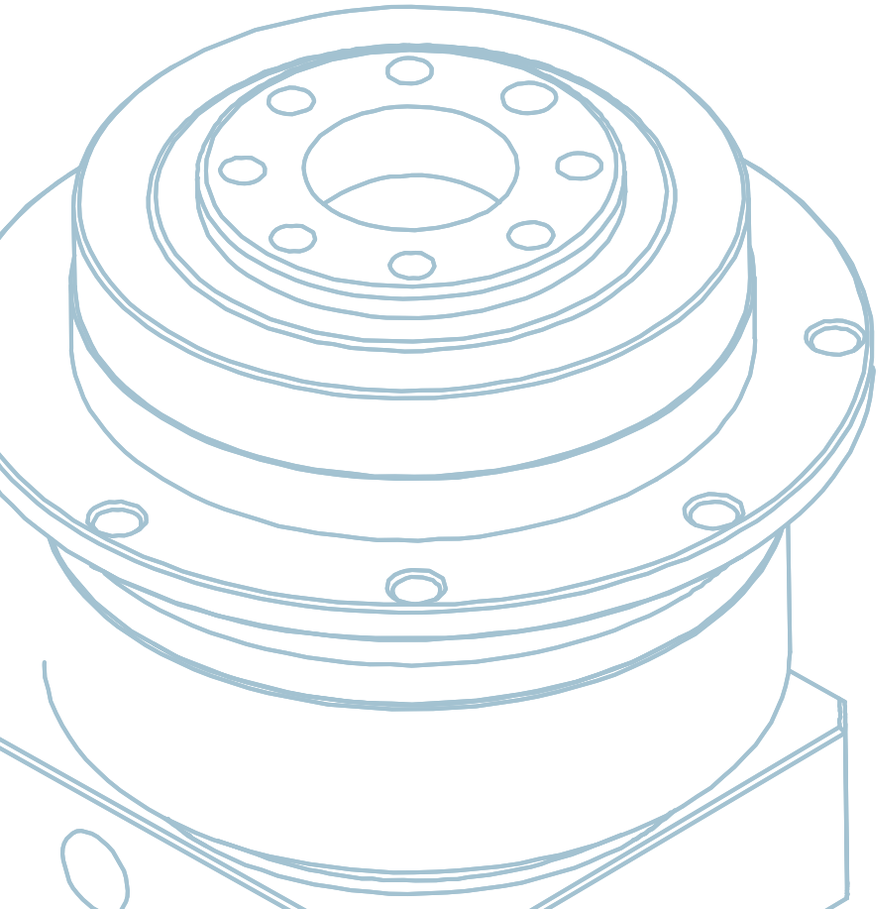

GHA/GHG 系列減速機

—Delta 機器人專用減速機
—Gearbox for Delta Robots

GEARKO®

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GEARKO® 2025 TW REV 1.0

GEARKO®

伺服馬達 減速機
一體式設計

Servo Motor-Gearbox Integrated Design

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GEARKO
DRIVES THE PRECISION

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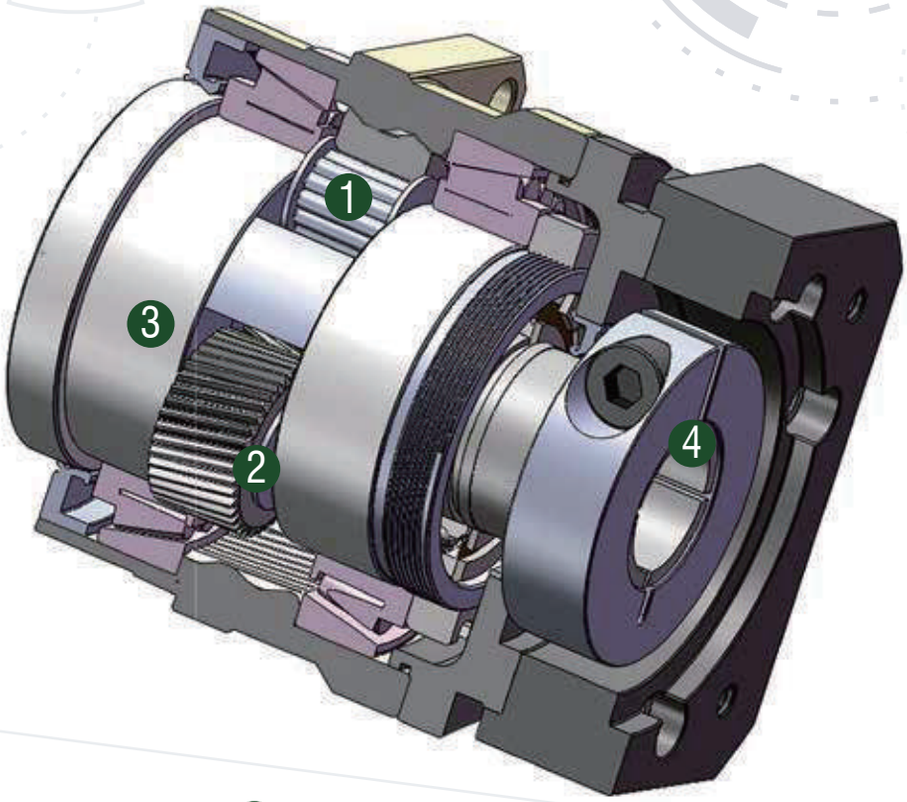


1

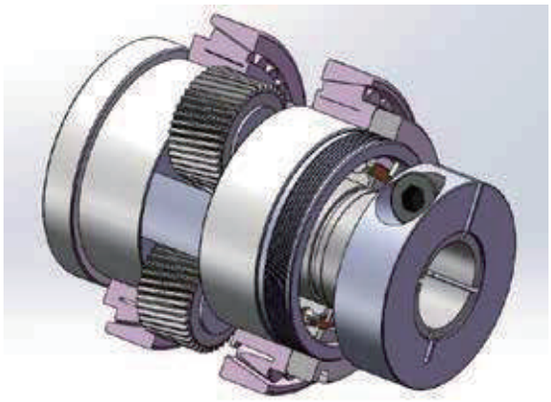
齒輪傳動介面採用滿滾針軸承, 增加接觸面積以提高結構剛性;
齒輪兩端採用耐磨墊片, 防止輸出軸窗壁磨損, 有效延長滾針軸承使用壽命。

The gear drive interface adopts full needle roller bearings to increase contact area and enhance structural rigidity.
Wear-resistant spacers are installed at both ends of the gears to prevent abrasion of the output shaft window walls, thereby extending the service life of the needle bearings.

2

齒圈材料採用優質氮化 42CrMo, 齒輪材料選用 30CrNiMoA 高級鉻鉬合金鋼,
經調質處理至 30–32 HRC, 再利用義大利進口的 RUBIG 等離子氮化設備,
將齒面硬度提升至 900 HV, 以獲得最佳耐磨性能, 確保減速機在壽命週期內精度不衰減。

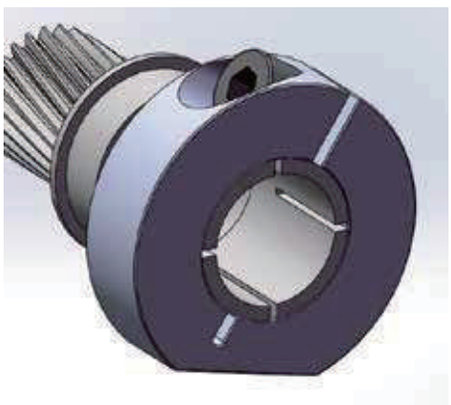
The ring gear is manufactured from premium nitrided 42CrMo, while the gear material utilizes high-grade 30CrNiMoA chromium-molybdenum alloy steel.
After quenching and tempering to 30–32 HRC, the gears undergo plasma nitriding using imported Italian RUBIG equipment, increasing surface hardness to 900 HV.
This process ensures optimal wear resistance and maintains precision throughout the gearbox's entire service life.



3

輸出軸採用臂架一體式、雙支撐結構設計,
前、後端搭配承載能力更高的軸承配置, 並結合雙螺帽一體式鎖固,
透過螺紋結構消除軸向間隙, 形成整體式機構,
以確保高精度、高負載能力與高剛性特性。

The output shaft features an integrated arm-frame design with a dual-support structure.
High-load-capacity bearings are arranged at both the front and rear, combined with integrated dual lock nuts to eliminate axial clearance through threaded locking.
This monolithic structure ensures high precision, high load capacity, and high rigidity.



4

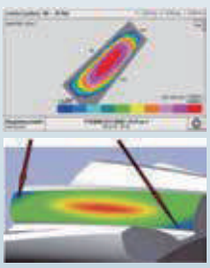
太陽輪與軸孔採一體化設計, 軸孔內採用彈簧夾頭式鎖緊結構,
並透過動態平衡分析, 確保高速運轉下輸入端與結合介面的同心度,
實現高轉速條件下的零背隙動力傳遞。

The sun gear and shaft bore are designed as an integrated structure.
A collet-type locking mechanism is applied inside the bore, combined with dynamic balance analysis, to ensure perfect concentricity at the input and mating interfaces and achieve zero-backlash power transmission under high-speed operation.

製程與設計能力 Process & Engineering Capability

奧地利 RUBIG 等離子氮化爐
Austrian RUBIG Plasma Nitriding Furnace

義大利 FIRBIMATIC 齒輪清洗設備
Italian FIRBIMATIC Gear Cleaning Equipment



利用專業行星齒輪系統設計軟體, 分別對齒向與齒形進行修整, 以降低齒輪在負載時的嚙合噪音, 同時消除齒輪在負載下的干涉區域, 從而提升齒輪系統的整體使用壽命。

Professional planetary gear system design software is used to optimize both lead and tooth profile modifications.
This reduces meshing noise under load while eliminating interference zones during tooth engagement, thereby extending the overall service life of the gear system.

性能優勢 Performance Advantages

在並聯式機器人的應用工況下, 對行星減速機的性能要求較傳統應用更為嚴格,
必須同時滿足高速運轉、高精度定位、高動態響應與輕量化設計等關鍵條件。
In parallel robot applications, planetary gearboxes are subject to more stringent performance requirements than conventional uses. They must deliver high-speed operation, high positioning accuracy, fast dynamic response, and lightweight design simultaneously.

GHA/GHAM 與 GHG/GHGM 系列減速機, 即是針對 Delta 機械手 的應用需求所量身打造。
The GHA/GHAM and GHG/GHGM series gearboxes are specifically engineered for Delta robot applications.

高精度 (低背隙)
High Precision (Low Backlash)

採用預壓結構設計, 搭配精密研磨齒輪與軸向消隙技術, 有效降低背隙;
背隙規格:一段 ≤ 1 arcmin, 二段 ≤ 2 arcmin。
The preloaded structural design incorporates precision-ground gears and axial backlash compensation, effectively minimizing backlash.
Backlash performance: single-stage ≤ 1 arcmin, two-stage ≤ 2 arcmin.

高剛性
High Rigidity

減速機採用高強度材料, 齒輪組經等離子氮化處理, 並結合高度緊湊的一體化結構設計, 使整體具備優異的扭轉剛性與軸向剛性。
The gearbox is manufactured using high-strength materials, with the gear set treated by plasma nitriding. Combined with a highly compact integrated structure, it delivers excellent torsional rigidity and axial rigidity.

緊湊性與輕量化
Compactness and Lightweight Design

採用極為緊湊的結構設計, 使減速機兼具小體積、輕重量與高扭矩密度, 有效降低系統慣性, 提升加速度與動態性能。
The extremely compact structural design enables a small footprint, reduced weight, and high torque density, effectively minimizing system inertia and enhancing acceleration and dynamic performance.

高動態響應
High Dynamic Response

採用輕量化轉子設計, 並結合齒形優化技術, 在低慣量與高扭矩密度的條件下, 可提供瞬時過載能力 ≥ 200%, 滿足並聯式機器人高速啟停的應用需求。

Featuring a lightweight rotor design combined with optimized tooth geometry, the gearbox achieves low inertia and high torque density, with an instantaneous overload capacity of ≥ 200%, meeting the rapid start-stop requirements of parallel robots.

高可靠性與長壽命
High Reliability and Long Service Life

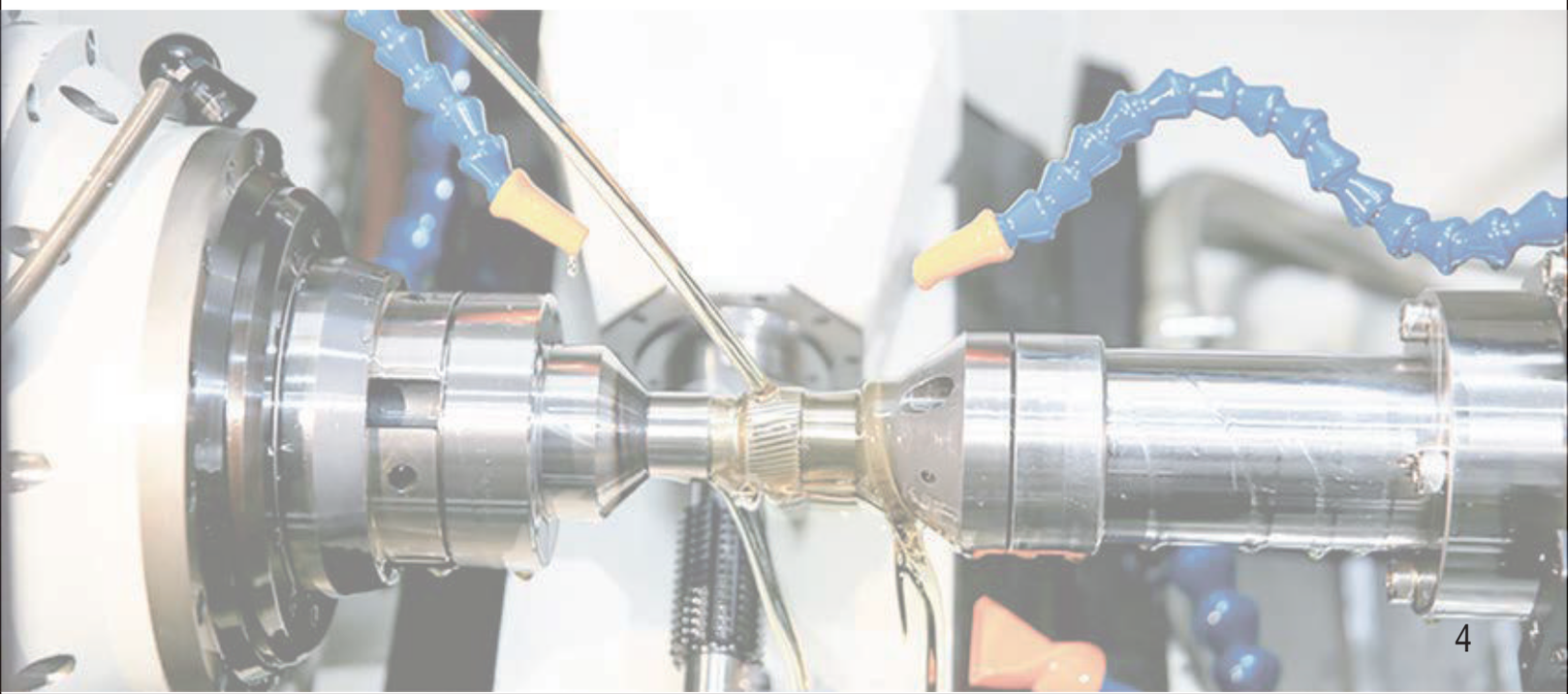
設計壽命 ≥ 20,000 小時, 免維護設計, 可滿足連續運轉與高維護成本工況下的應用需求。

Designed for a service life of ≥ 20,000 hours, the maintenance-free design is well suited for continuous operation and applications with high maintenance cost requirements.

抗衝擊與過載保護
Impact Resistance and Overload Protection

強化軸承與齒輪組強度, 使減速機具備瞬時抗衝擊能力 ≥ 3 倍額定扭矩, 可因應並聯式機器人在抓取不規則物體或緊急停止時所產生的突發負載。

With reinforced bearings and gear sets, the gearbox provides an instantaneous impact resistance capacity of ≥ 3 times the rated torque, effectively accommodating sudden load changes during irregular object handling or emergency stops in parallel robot applications.



運行更卓越　More Outstanding in Operation

我們的伺服執行器憑藉
超高功率密度、極致轉動慣量比、卓越剛性及近乎零背隙的特性，
實現突破性的性能表現。
Our servo actuators rely on ultra-high power density, an exceptional inertia ratio, outstanding rigidity, and near-zero backlash to deliver breakthrough performance.

效能躍升 **Performance Leap**

在同等能耗下提升 30% 生產節拍
Achieves 30% faster cycle time at identical energy consumption.

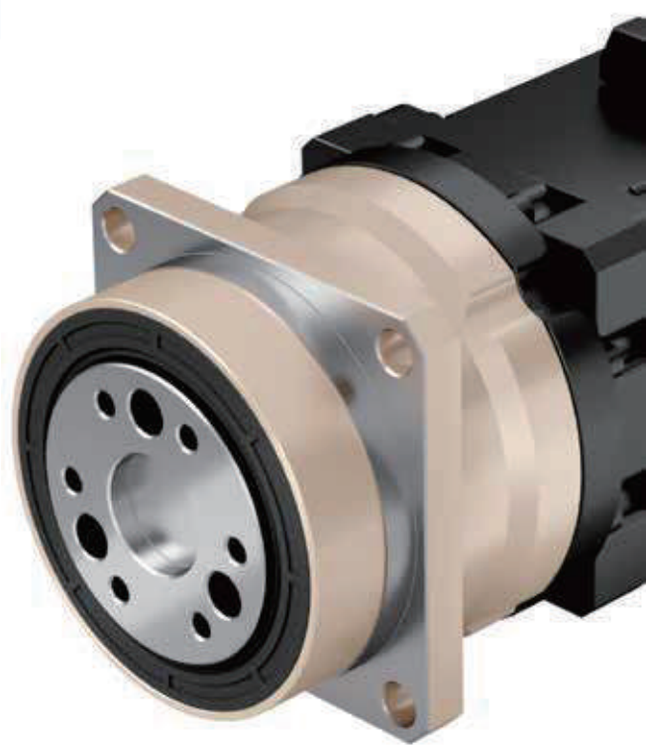
節能革命 Energy Revolution

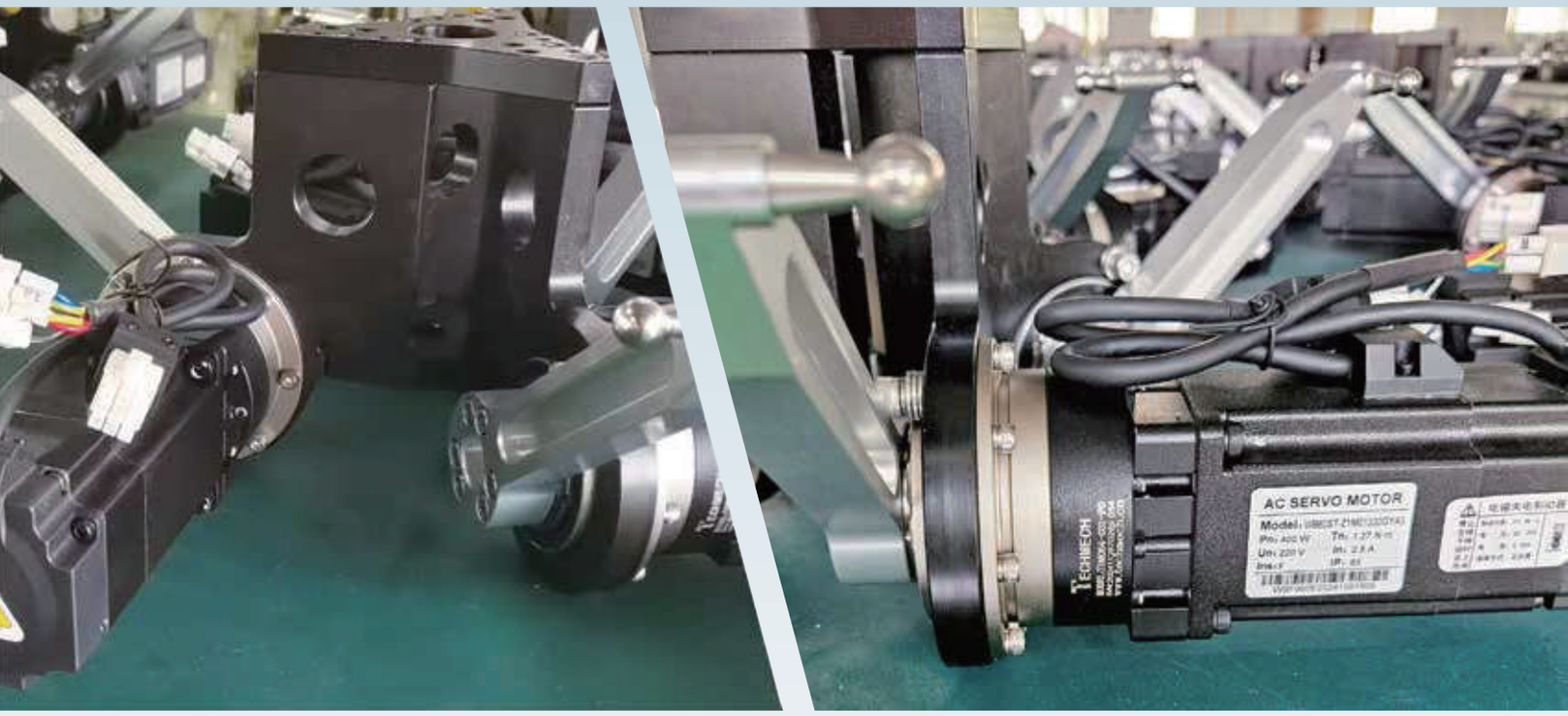
節省 15% 電力損耗而保持產能表現
Cuts 15% power consumption without compromising productivity.

我們的伺服技術
讓生產效率與良率雙提升

Our Servo Technology Enhances Both Production Efficiency and Yield Rate

降低系統複雜性，同時最大化效率、可靠性、連接性能與創新能力。
Reduce system complexity while maximizing efficiency, reliability, connectivity, and innovation.





以機電一體化為核心
驅動創新邊界

Our Servo Technology Enhances Both Production Efficiency and Yield Rate

在高速、高精度的自動化領域，我們深知每一個細節都關乎整體性能表現。
因此，我們以機電一體化思維為核心，強化效能，
深度整合精密傳動技術、智慧控制演算法及高性能伺服驅動，
同時持續推動能效、動態精度與可擴展性的創新高度。

In the field of high-speed and high-precision automation, we understand that every detail affects overall performance.
Therefore, we place mechatronics at the core of our design philosophy to enhance efficiency.
By deeply integrating precision transmission technology, intelligent control algorithms,
and high-performance servo drives,
we continuously push new boundaries in energy efficiency, dynamic accuracy, and scalability.

品質保證　Quality Assurance

精度保證
Accuracy Guarantee

出貨前每台進行≤ 1 arcmin反向間隙測試。
採用ISO 9288標準進行300小時加速壽命試驗。
Each unit is tested for backlash ≤ 1 arcmin before shipment.
A 300-hour accelerated lifetime test is performed in compliance with ISO 9288.

過程控制
Process Control

核心齒輪組依據 VDI 2736 標準設計與執行
裝配線配備高精度雷射對中儀, 對中精度可達 ±0.005 mm
The core gear set is designed and manufactured in accordance with VDI 2736 standards.
The assembly line is equipped with high-precision laser alignment systems, achieving an alignment accuracy of ±0.005 mm.

可靠性驗證
Eliability Verification

通過 10＾7 次動態負載循環測試, 驗證長期運轉可靠性。
溫升試驗顯示於額定扭矩條件下, ΔT ≤ 45 K。
Passed 10＾7 dynamic load cycle tests, validating long-term operational reliability.
Temperature rise testing confirms that ΔT ≤ 45 K under rated torque conditions.

訂制化服務
Customized Services

提供運動學仿真分析報告與固有頻率 (Natural Frequency) 分析數據。
支援客戶現場動平衡校正服務, 協助系統達成最佳運轉穩定性。
Kinematic simulation reports and natural frequency analysis data are provided.
On-site dynamic balancing support is available to assist customers in achieving optimal system stability.

GDS Series

GearKo Drives The Future

高剛性
High Rigidity

高扭矩密度
High Torque Density

高功率密度
High Power Density

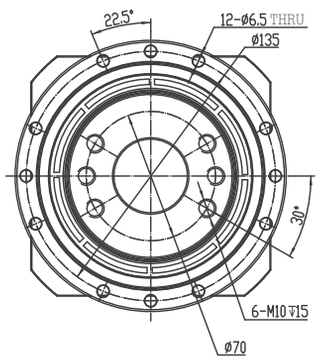
高精度
High Precision

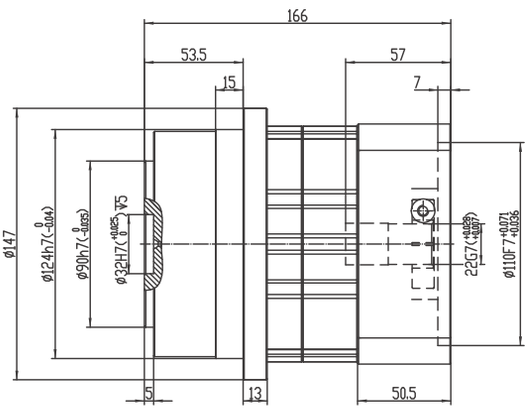
高效率
High Efficiency

低慣量高動態響應
Low Inertia High Dynamic Response

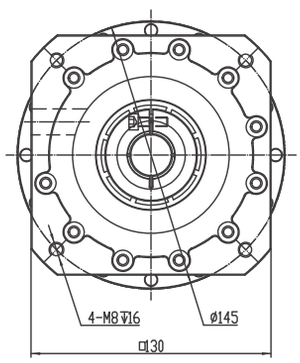
GDS140-L2 Series

Output





Input



GDS140		雙節 Double Stage (L2)	
減速比 Speed Ratio		20	40
額定輸出力矩 Nominal Output Torque	Nm	420	420
轉動慣量 Moment of Inertia	$Kg.cm^2$	2.74	2.47
急停扭矩 Emergent Stop Toruqe	Nm	3 倍額定輸出力矩 3 times of nominal output torque	
額定輸入轉速 Nominal Input Speed	rpm	3000	
最大輸入轉速 Maximum Input Speed	rpm	6000	
最大側傾力矩 Maximum tilting Moment	Nm	450	
容許軸向力 Allowable Axial Force	N	4270	
效率 Efficiency	%	≥95	
使用溫度 Operating Temperature	℃	-20～90	
安裝位置 Mounting Position	-	任意方向 Any Direction	
潤滑 Lubrication		合成潤滑油脂 Synthetic Grease	
重量 Weight±3%	Kg	10.2	
使用壽命 Service Life	hr	20000	
背隙 Backlash	P0	≤1.5 arcmin	
	P1	≤3 arcmin	
防護等級 Protection Class	-	IP65	
噪音值 Noise	dB	60	

1. Speed ratio 減速比 ($i=S_{in} / S_{out}$)
2. When the output speed is 100 rpm, it acts on the center of the output shaft. 輸出轉速 100rpm 時，作用於輸出軸中心
3. For Continuous operation, the service life is no less than 10,000 hours. 連續運轉時，壽命為 10,000 小時
4. The noise value was measured based on the input rotational speed of 3000 rpm, i=10. 噪音值為輸入轉速 3000rpm，i=10 所得