W SERIES – NEW GENERATION OF SPINEA HIGH PRECISION GEAR REDUCERS

Executive Summary

This white paper introduces the new W series of high-precision gear reducers developed by SPINEA, bringing a revolutionary approach to industrial robotics and automation. The W series offers both hollow shaft (W-H) and standard (W-S) variants, both featuring exceptional technical parameters that push the boundaries of modern robotic systems in Industry 4.0.

Introduction

SPINEA, a recognized manufacturer of high-precision gear reducers, presents its latest innovation – the W- series, designed to meet the most demanding requirements of today's industry. In an environment where precision, reliability, and performance play a key role, the W series brings optimized heritage design combined with the latest technological enhancements.

Design Philosophy of W Series

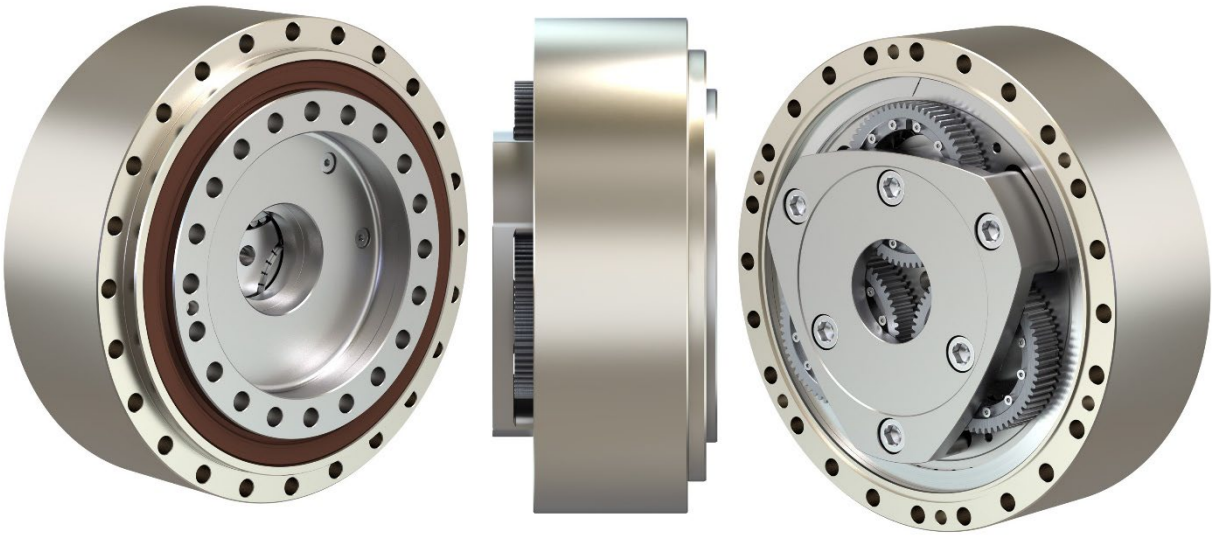
The W- series is available in two main versions that share a common design philosophy:

W-H Series – Hollow Shaft Design

- Optimized heritage gear reducer design with W-S series
- Fully integrated powerful heritage output bearing
- Integrated output bearing capable of receiving a high load in any direction
- Allows passage of cables and shafts through the central holeIdeal for applications requiring compact dimensions & powerful parameters

W-S Series – Standard (Non-hollow shaft) Design

- Optimized heritage gear reducer design with W-H series
- Very high torque capacity compared to W-H series
- Fully integrated powerful heritage output bearing
- Integrated output bearing capable of receiving a high load in any direction
- Enhanced performance while maintaining compact dimensions



Common Design Features:

- Output bearing located only on the output side of the gear reducers
- "Open" design from the input side of the gear reducers
- Same basic gear ratios and large range of total ratios of the gear reducers
- Heritage gear reducers installation possibilities
- Same output seals of the gear reducers
- Very high gear reducers power density

Main Technical Parameters of W-H Series (Hollow Shaft)

Model	Max. diameter [mm]	Rated output torque [Nm]	Acceleration & deceleration torque [Nm]	Emergency torque [Nm]	Central hole diameter/in tube [mm]
W-320H	320	2000	5000	10000	80.5/72.5
W-350H	350	3050	7625	15250	90/81
W-400H	400	4450	11125	22250	120/110
W-440H	440	5250	13125	26250	140/130
W-495H	495	8100	20250	40500	150/140

All W-H series models achieve:

- lost motion & hysteresis loss: <1 arcmin
- rated output speed: 15 rpm
- rated life (L10): 6 000 hrs

Detailed Parameters for W-350H:

- Rated output torque: 3050 Nm
- Torsional rigidity: 1750-2000 Nm/arcmin
- Maximum output speed: 30 rpm (at max. case temperature 65°C)
- Basic gear ratio: 38.14
- Supported overall speed ratios with 1st & 2nd stage wheels: 106.39; 158.02; 205.98; 243.52
- Weight of gear reducer: 62.1 kg (basic version), 66.1 kg (with 1st & 2nd stage)
- Power density: 49.1 Nm/kg (basic version), 46.1 Nm/kg (with 1st & 2nd stage)

Main Technical Parameters of W-S Series (Standard Design)

Model	Max. diameter [mm]	Rated output torque [Nm]	Acceleration & deceleration torque [Nm]	Emergency torque [Nm]
W-250S	250	2000	5000	10 000
W-295S	295	3800	9500	19 000
W-320S	320	4900	12250	24 500
W-350S	350	6000	15000	30 000
W-400S	400	8000	20000	40 000
W-440S	440	10500	26250	52 500
W-495S	495	14400	36000	72 000

All W-S series models achieve:

- lost motion & hysteresis loss: <1 arcmin
- rated output speed :15 rpm
- rated life (L10): 6 000 hrs

Output Bearings of W Series

One of the key features of the W series are the high-performance of output bearings, which are located exclusively on the output side of the gear reducers.

Model	Rated radial force Fr [N] (at Fa=0, Mt=0)	Rated axial force Fa [N] (at Fr=0, Mt=0)	Rated tilting moment Mc [Nm] (at Fa=0, Fr=0)
W-250	56 400	84 000	5 630
W-295	61 000	91 000	7 250
W-320	80 000	120 000	10 400
W-350	85 000	127 000	12 400
W-400	92 000	138 000	15 700
W-440	98 000	146 000	18 600
W-495	135 000	201 000	29 000

All output bearings of W-S and W-H series achieve:

- Output bearing rated life L10 (at load factor fw=1): 12 000 hrs
- Rated output speed: 15 rpm

Detailed Parameters of Output Bearing for W-350H:

- Rated tilting moment: 12 400 Nm (at Fr=0, Fa=0)
- Allowable moment during starting & stopping: 24 800 Nm
- Moment rigidity (tilting stiffness): 13 000 Nm/arcmin
- Rated radial force: 85 000 N (at Fa=0, Mt=0)
- Rated axial force: 127 000 N (at Fr=0, Mt=0)
- Output bearing rated life **L10**: 12 000 hours (at load factor fw=1)

Variants and Integrated Solutions

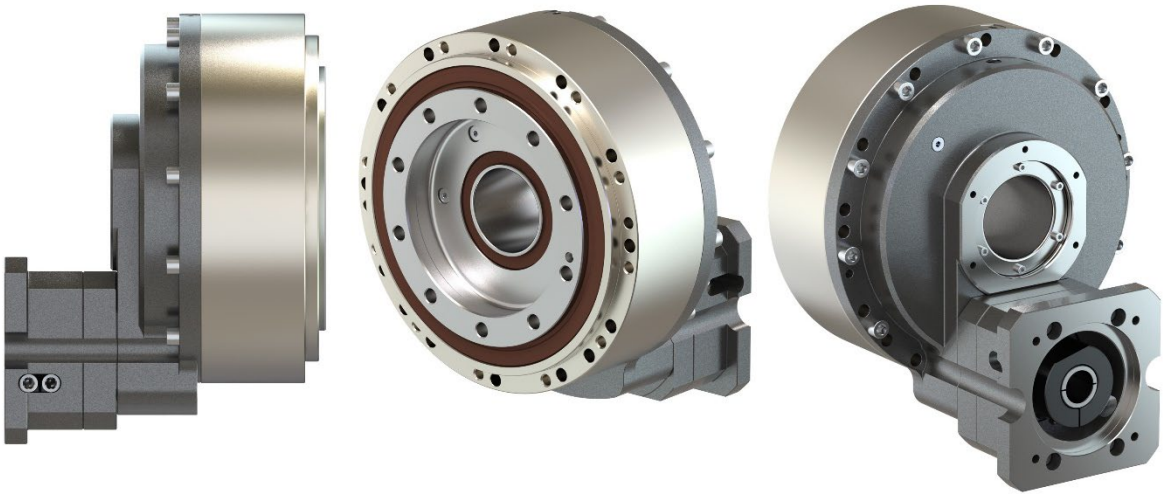
The W series offers a wide range of configuration options for various applications:

Basic Gear Reducer

- Available with installation through holes or threaded holes in the case
- Option to use pre-stage wheels to achieve higher gear ratios

Gearhead Solutions (Fully sealed)

- **W-HSS**: **H**ollow shaft, fully **S**ealed gearhead, with **S**traight input motor flange connection
- **W-HSP**: **H**ollow shaft, fully **S**ealed gearhead, with **P**ulley connection



Installation Options

- Installation through holes in the case
- Installation using threaded holes from the output side of the case
- Optimal installation for maximum tilting stiffness: fitting the case on the fitting diameter on the output side of the case and fixing the case with screws using threaded holes

Main Advantages of W Series

Performance Advantages

- Very high torque capacity
- Excellent very high torsional rigidity
- Excellent very high power density
- Very high precision

Output Bearing Advantages

- Very high moment rigidity
- Very high axial & radial load capacity
- Very high precision
- Robustness (with double row angular contact roller output bearing)

Design Concept Benefits

- Better cover or motor flange connectivity from the open input side of the gear reducers due to the internal fitting diameter on the input side of case
- Better lubrication ratios due to the fact that the gear reducers are open from the input side
- Open construction on input side delivers better heat dissipation from the gear reducers

Applications of W- Series

Thanks to its exceptional properties, the W series is ideal for a wide range of applications in industrial robotics, automation, machine tools and heavy-duty application.

Robotic Handling

- High torsional rigidity ensures precise positioning
- Ability to handle high loads with minimal backlash
- Long service life even under demanding operating cycles

Machine Tools

- High precision required for accurate machining
- Robustness in handling shock loads
- High stiffness ensuring stability of the machining process

Rotary Tables and Positioning Systems

- Precise positioning with minimal backlash
- Ability to handle high tilting moments
- Long service life reducing the need for maintenance

Special Applications for W-H Series (with Hollow Shaft)

- Robot arms requiring cable passage through the central hole
- Optical systems with the need for laser beam passage
- Rotary tables with the need for media or cable passage through the axis of rotation

Comparison with Competitive Solutions

Advantages over Harmonic Drives:

- Bigger (Middle & Large) sizes of gear reducers
- Higher torsional rigidity
- Higher nominal torque at the same size
- Better resistance to shock loads
- Longer service life under full load

Advantages over Traditional Planetary Gearboxes:

- Higher positioning accuracy (backlash <1 arcmin)
- More compact dimensions with the same torque
- Better integration possibilities thanks to robust output bearing
- Higher power density

Advantages over Other RV Gear Reducer Manufacturers:

- Up to 100% higher torsional rigidity for equivalent hollow shaft sizes
- Up to 50% higher torque capacity for equivalent hollow shaft sizes
- Improved torsional rigidity offering better precision during dynamic movements
- Enhanced design with "open" input side for better thermal management
- More efficient lubrication system due to form input side open design
- Greater flexibility with hollow shaft options (W-H series) while maintaining high torque ratings
- Lower lost motion (<1 arcmin vs. typical 1-3 arcmin)
- Superior positioning accuracy and repeatability
- Higher power density in compact designs
- Advanced output bearing integration providing better load support
- Pre-stage wheel options offering greater ratio flexibility
- More robust output bearing solution with significantly higher tilting moment capacity
- Better durability under continuous operation with rated life of 6000+ hours
- Superior emergency torque handling capabilities
- Enhanced resistance to shock loads
- More efficient heat dissipation through innovative "open" design concept

General Competitive Advantages of SPINEA W Series:

- Best-in-class tilting moment rigidity across the entire product range
- Superior integration capabilities with both hollow and standard shaft options
- Optimized design for industrial robotics with exceptional positioning accuracy
- More flexible mounting options with both through holes and threaded holes
- Higher overall system rigidity contributing to better end-effector stability
- Unique heritage design with proven reliability in demanding applications

Installation and Recommendations

To maximize the benefits of SPINEA W series gear reducers, it is recommended to:

1. **Installation Method**: Fit the case on the fitting diameter on the output side of the case to obtain maximum tilting stiffness
2. **Case Fixation**: Use screws with through holes or better by using threaded holes (to obtain gear reducers with higher case strength)
3. **Use of Threaded Holes**: Threaded holes on the input side of the gear reducer case are for cover or motor flange installation

Conclusion

The W series of high-precision gear reducers by SPINEA represents a new generation of transmission mechanisms that combines innovative design with exceptional performance parameters. Whether it's the hollow shaft version (W-H) or the standard version (W-S), the W series offers a complete solution for the most demanding applications in industrial robotics and automation.
Thanks to its very high torque capacity, exceptional torsional and moment rigidity, minimal backlash, and robust output bearing, the W series represents an ideal choice for applications requiring precision, reliability, and long service life.

Contact Information

For more information about the W series of high-precision gear reducers, technical documentation, price quotation, or consultation of your specific needs, please contact our sales and technical team:

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