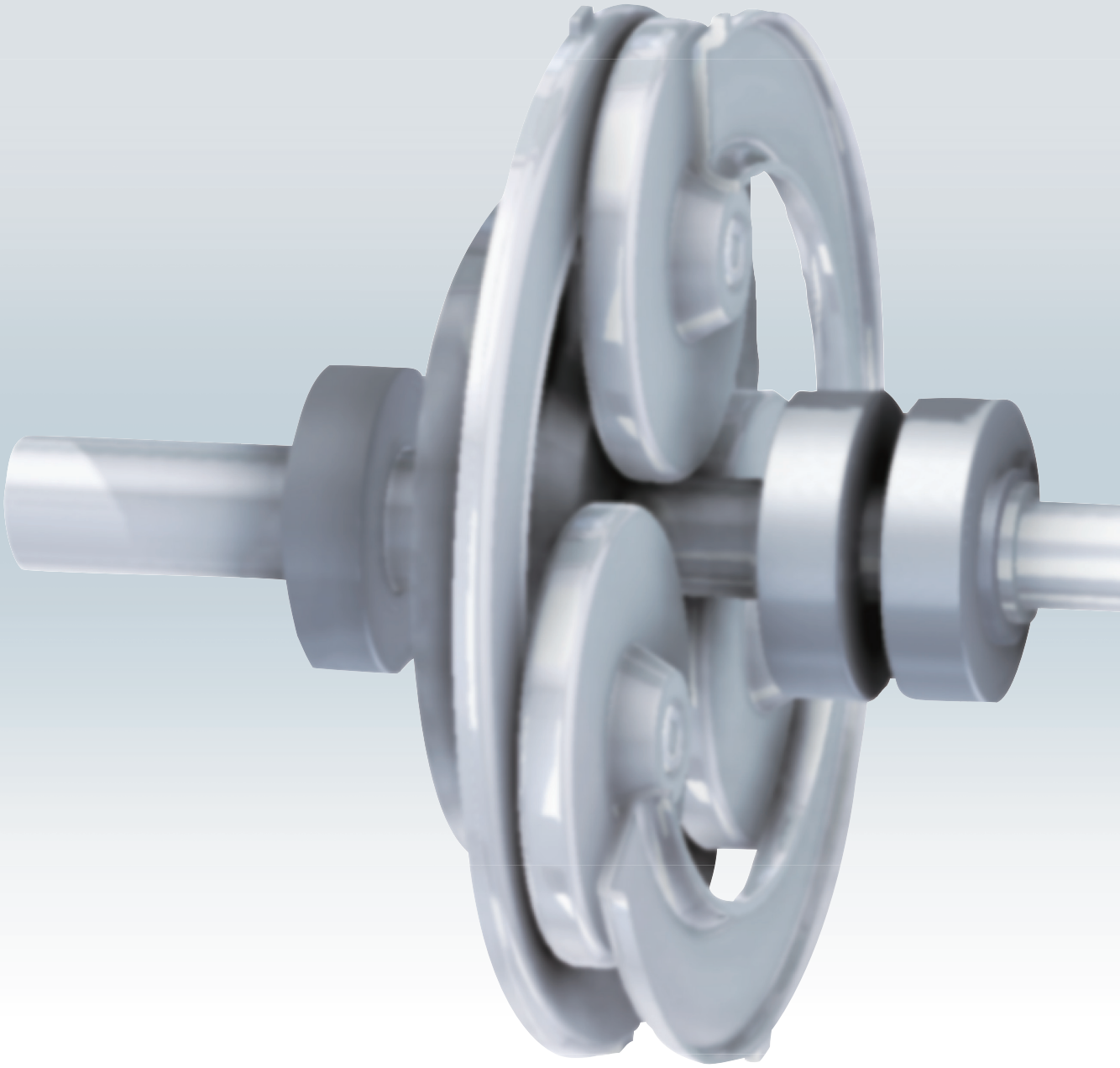
Nidec

TRACTION DRIVE

Breaking Through the Limitations of Gear Technology



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Why is the technology referred to as the "gearless gearbox?

The traction drive is a non-gear reduction technology that minimizes vibration and noise. The negligible transmission error makes it the smoothest and most quiet method to mechanical adjust speed and torque. The following a brief explanation.

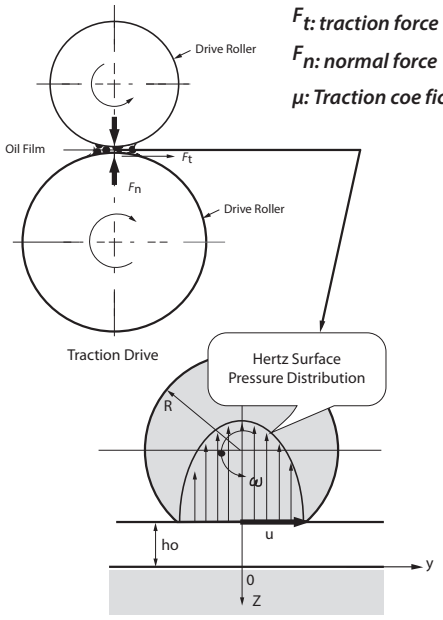
- *The traction drive assembly consists of two smooth rollers held in fixed position with mechanical properties that include high hardness*
- *(Fn) Power is transmitted from the driven roller to the passive roller through viscous film*
- *When under pressure, this oil film will have a higher friction coefficient*
- *The speed differential between the rollers creates a tangential force (traction force, Ft) that shears the oil film*
- *The reduction ratio is determined by diameter of inner ring that contains the roller assembly and the number of planetary rollers, among other minor factors*
- *When the normal force (Fn) is deficient slippage can occur; we can control through close loop feedback*

$$F_t = \mu \cdot F_n$$

F_t: *traction force*

F_n: *normal force*

μ: *Traction coe ficient*



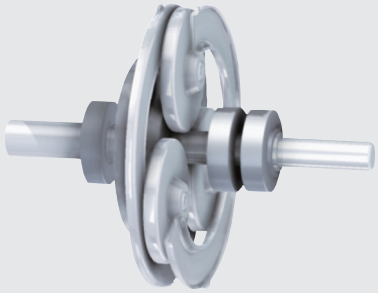
Primary Advantages of the Traction Drive

Negligible Transmission Error

- *Smooth rolling contact allows for negligible transmission error*
- *Eliminates speed irregularity inherent in gear transmissions*
- *Great fit in application where the angular velocity ratio is important*

Minimal Noise Generated

- *Removal of the gear mesh minimizes noise and vibration*
- *The noise generated will be in the 40–50 dB-A range*
- *In comparison to gear transmissions which generally fall in the 60–80 dB-A range*



Well Suited for Fine Precision

- *Very low noise and vibration for input speeds up to 10,000rpm*
- *Exceptional rotation al accuracy and fine precision of <5 arc-sec*
- *Extremely compact and achieves up to a 20:1 reduction ratio in a single stage*
- *Currently available in frame sizes up to 1kW; all designs are customized for the OEM*
- *A potential technological improvement in many applications such as the following;*
  - *Collaborative or mobile service robots*
  - *High quality imaging, or high speed printing*
  - *3D printing or precision measurement*
  - *Medical equipment, or mobility assist*

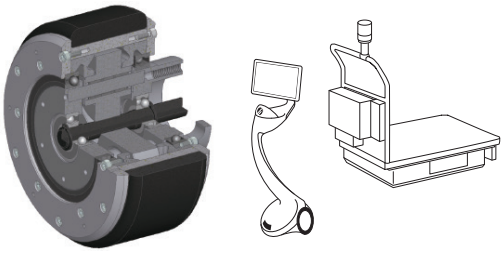
Comparison between the Traction Drive and a Planetary Gearbox

Characteristic		
Noise	Excessive	Quiet
Backlash	≥ 1 arc-min	≤ .08 arc-min
Vibration	Unavoidable	Negligible
Input Rotation Speed	"≤ 6,000 rpm	10,000 rpm
Allowable Torque	Large	Moderate

Examples of Applications

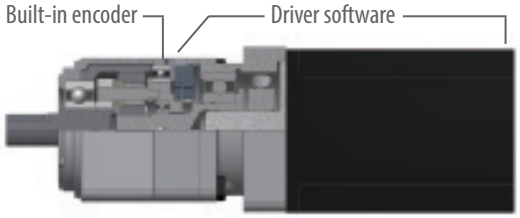
A Type

For a wheel drive assembly



B Type

For high speed, industrial application



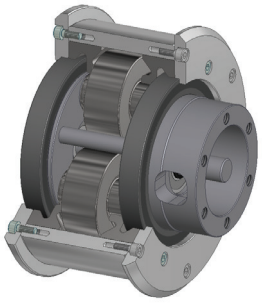
Traction Drive AC Servomotor for traction

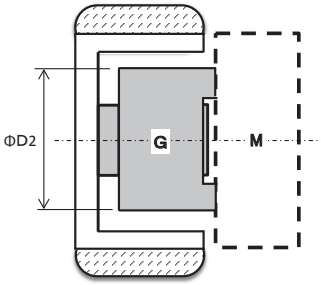
Corresponding range

	200W	400W	750W
1/5	B □52	C □78	
1/9			D □98

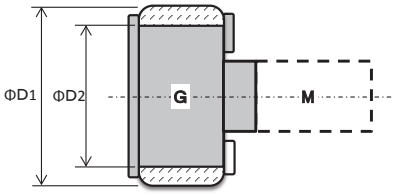
A Type

Frame	Capacity [W]	Type	Wheel diameter mm	Drive outer dia mm	Reduction ratio	Rated output torque [Nm]	Peak output torque [Nm]
A200	200	Output from gear holder	130	100	1/17	9.74	19.5
		Output from internal gear	–		1/16	9.16	18.3
A100	100	--	--	--	--	--	--
A50	50	--	--	--	--	--	--





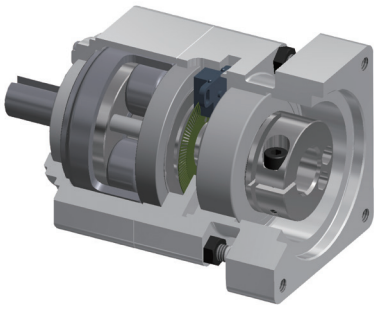
Output from gear holder



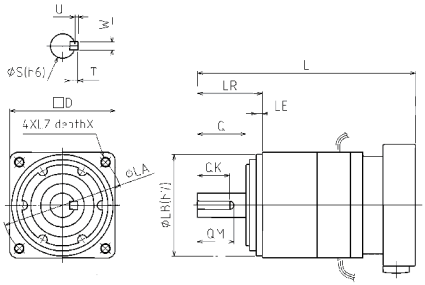
Output from internal gear

B Type

Reduction ratio	Frame	Motor capacity [W]	Rated output torque [Nm]	Peak output torque [Nm]	Maximum output torque [Nm]
5:1	B	200	2.65	8.04	2.84
	C	400	5.39	16.2	6.57
	C	750	10.7	32.1	11.5
9:1	C	200	3.72	11.3	9.70
	C	400	9.51	28.5	9.70
	D	750	18.2	54.7	18.2



Frame	Reduction ratio	Motor capacity	Length	Output shaft							Flange					
		[W]	L	LR	S	Q	QM	QK	W×U	T	D	LB	LE	LA	LZ	X
B	5	200	107.5	32	12	20	18	16	4×2.5	4	52	50	3	60	M5	12
C	5・9	200	140	50	19	30	26	22	6×3.5	6	6 78	70	3	90	M6	20
		400	140													
		750	156													
D	9	750	171	61	24	40	35	30	8×4	7	98	90	5	115	M8	20



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NIDEC-SHIMPO CORPORATION
175 Wall Street, Glendale Heights, IL 60139 USA
Phone: (800) 842-1479 • Fax: (630) 924-7382