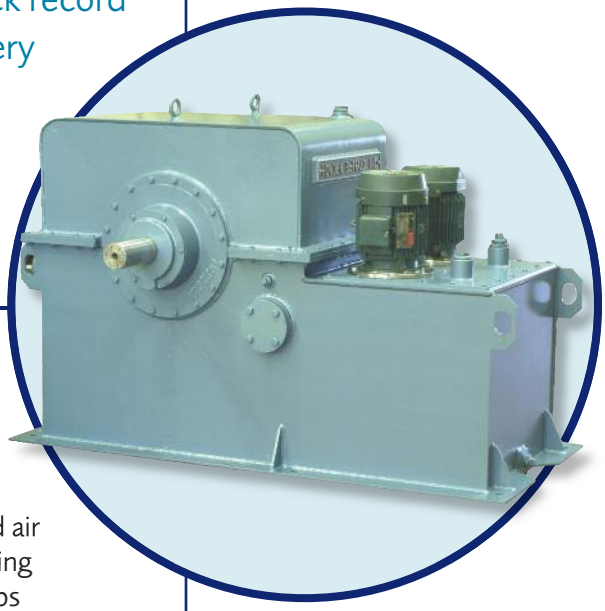
GÝROL® FLUID DRIVES

Howden

Howden Buffalo Inc.

Gýrol Fluid Drives are used to control speed and to absorb shock and torsional vibration. These extremely robust variable speed hydraulic drives provide a reliable, low maintenance, cost-effective alternative to high-horsepower, medium-voltage variable frequency drives. With over 12,000 units installed on more than 18 million horsepower in the US, Gýrol Fluid Drives have a proven track record of performance and reliability. They are used by virtually every industry— driving fans, pumps, conveyors, ball mills and many other types of equipment. Anywhere speed control or controlled starting are essential, indoors or out, Howden Buffalo Gýrol Fluid Drives are the reliable choice.



GÝROL FLUID DRIVES SAVE ENERGY

Gýrol Fluid Drives can help reduce your energy consumption by providing infinitely variable speed control and light load starting. By using Gýrol Fluid Drives on a fan it can be operated at the correct speed to achieve the desired air volume rather than operating at maximum speed and throttling the fan by using vanes or dampers. Similar power savings can be realized on centrifugal pumps and compressors or any other variable torque application.

HOW GÝROL FLUID DRIVES WORK

Gýrol Fluid Drives transmit power smoothly and without shock, using a vortex of hydraulic oil. Oil particles are rotationally accelerated in the impeller which is connected to the motor. The rotational energy of the oil from the higher speed input rotor is transferred to the output rotor as the oil circulates between them. There is no mechanical connection between the input and output shafts. By varying the amount of oil in the working circuit the Gýrol Fluid Drive provides infinitely variable speed control. This can be done while the machine is in operation and can be set for manual or automatic speed control.

A circulating pump in the Gýrol Fluid Drive moves oil from the housing reservoir through a heat exchanger to remove excess, heat then returns it to the working elements. Varying the quantity of oil in the working circuit through the use of a scoop tube varies the output speed.

All moving parts are either submerged in oil or pressure-lubricated. The same oil transmits power, removes heat and lubricates. Gýrol Fluid Drives are simple, dependable and can transmit energy from the motor to the load at 98% efficiency or better.

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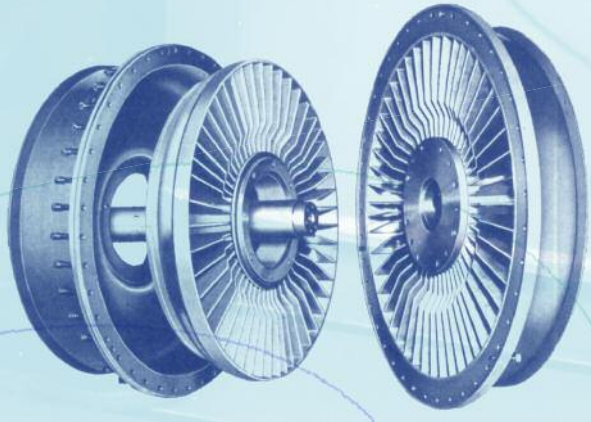
GÝROL® FLUID DRIVES

BENEFITS OF THE GÝROL FLUID DRIVE

- Provides infinitely variable speed control over a wide range, up to 5:1 on variable torque loads and 4:1 on constant torque loads
- Provides no load starting, making it possible to use the most economical motor and starter
- Enables the use of simple, normal starting torque induction motors
- Eliminates power waste. By matching speed to load you can operate your equipment at the proper speed for proper flow at any time
- Can transmit power at over 98% efficiency
- Naturally limits torque to protect equipment
- Controls acceleration and deceleration, saving wear and tear
- Isolates the load from the driver
- Reduces maintenance, wear and noise
- Absorbs shock and torsional vibration
- Suitable for variable or constant torque applications
- Can be used indoors or out, even in severe environments
- Lower cost of installation and operation than other types of variable speed controllers
- Does not require periodic software upgrades
- Small footprint

GÝROL FLUID DRIVE APPLICATIONS

- Fans and Blowers
- Pumps
- Conveyors
- Crushers and Ball Mills
- Mixers
- Extruders
- Centrifuges



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Gýrol® Fluid Drives

CLASS 2

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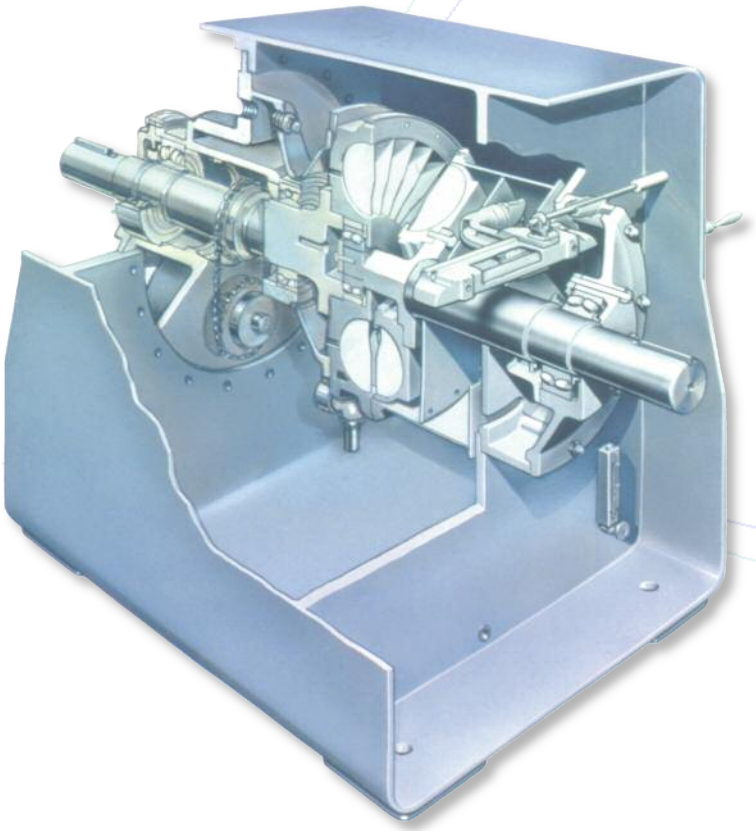


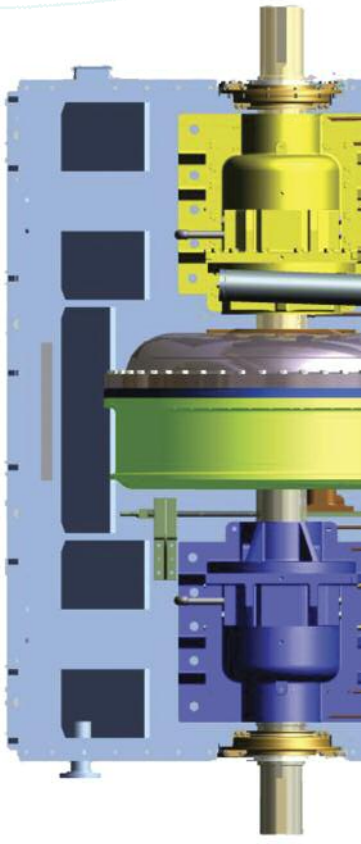
Class 2 Gýrol Fluid Drives are available in various standard arrangements, with horsepower ratings from 2 to 2,250. These drives work hard every day handling fans, conveyors, pumps and blowers in many industrial applications.

SIZES 126 TO 270
UP TO 1,800 RPM TO 1,500 HP (1,200 kW)

- Dual horizontal scoop tube, between inner and outer casing, gives stepless speed control for either direction of rotation.
- Four oil lubricated, anti-friction bearings provide support for the rotating assembly.
- End bell housing protects all working parts.
- Oil returns from heat exchanger to transmit power, remove heat and lubricate all working parts.
- Impeller and runner are precision cast from high-quality aluminum for long life.
- Oil exits to external heat exchanger for cooling.
- Oil supply pump is externally-mounted and driven from the input shaft. It supplies constant volume of oil for the working circuit regardless of output speed or direction of rotation.
- Rugged steel casing encloses rotating parts and serves as the oil circuit reservoir.

SIZES 315 TO 366
UP TO 1,200 RPM TO 2,250 HP (1,650 kW)

- Manual control lever adapts easily to automatic control.
- Steel output shaft is supported by anti-friction bearings designed to handle external thrust.
- Impeller and runner are cast aluminum for long life.
- Fabricated steel housing encloses working parts and holds oil. Rugged steel casing encloses cast aluminum impeller and runner.
- Chain-driven reversible pump supplies oil for the working circuit, for cooling and for lubrication, regardless of output speed.



Note: We offer shell-and-tube or plate-and-frame exchangers as standard equipment for oil cooling duty. If you need to cool with air, we can offer air/oil heat exchangers.

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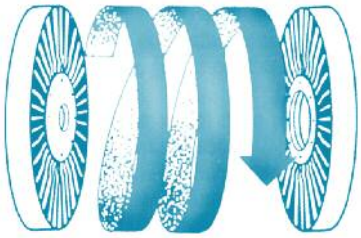
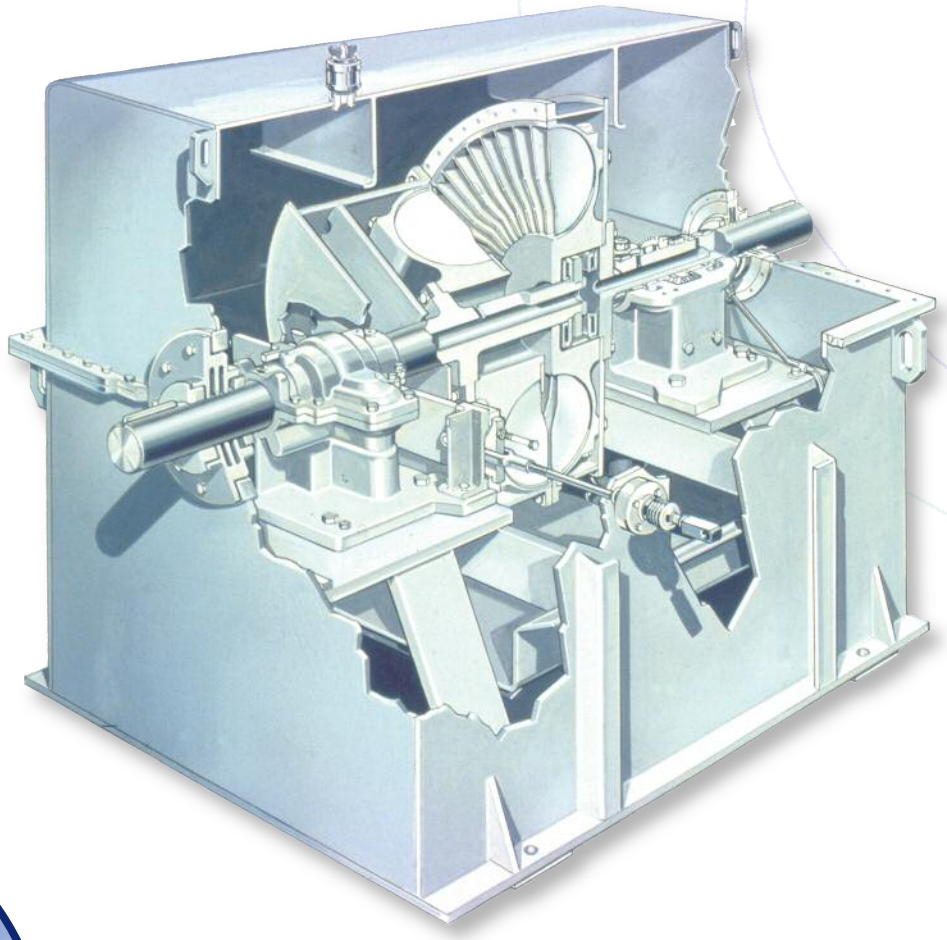
Gýrol® Fluid Drives

CLASS 4

Class 4 Gýrol Fluid Drives are frequently used in driving centrifugal and reciprocating pumps, fans, extruders and many other general industrial applications.





12 SIZES AND VARIATIONS (231-580) 100 TO 3,500 HORSEPOWER SPEEDS TO 1,800 RPM

- Static and dynamic-balanced, high-quality aluminum rotating assembly transmits power.
- Herringbone-gear pump (hidden) supplies oil flow for the working circuit and lubrication. Certain duties require use of an external motor driven oil pump in place of the standard pump.
- Four Babbitt-lined, bronze-backed precision sleeve bearings split for easier installation.
- One double Kingsbury thrust bearing between impeller and runner absorbs internal thrust.
- Housing holds oil, encloses and protects rotating assembly in rugged environments.
- Push-pull scoop tube control mounts on either side of unit, adapts easily to automatic control.
- Single-tipped scoop tube gives stepless speed control for rotation specified.
- Steel shafts with ground bearing surface give long operating life.
- Fabricated steel housing horizontally split for easy inspection and maintenance.
- Labyrinth seals keep contaminants out of unit.
- All bearings are force-lubricated for long life.

Note: We offer shell-and-tube or plate-and-frame exchangers as standard equipment for oil cooling duty. If you need to cool with air, we can offer air/oil heat exchangers.

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Gýrol® Fluid Drives

CLASS 5

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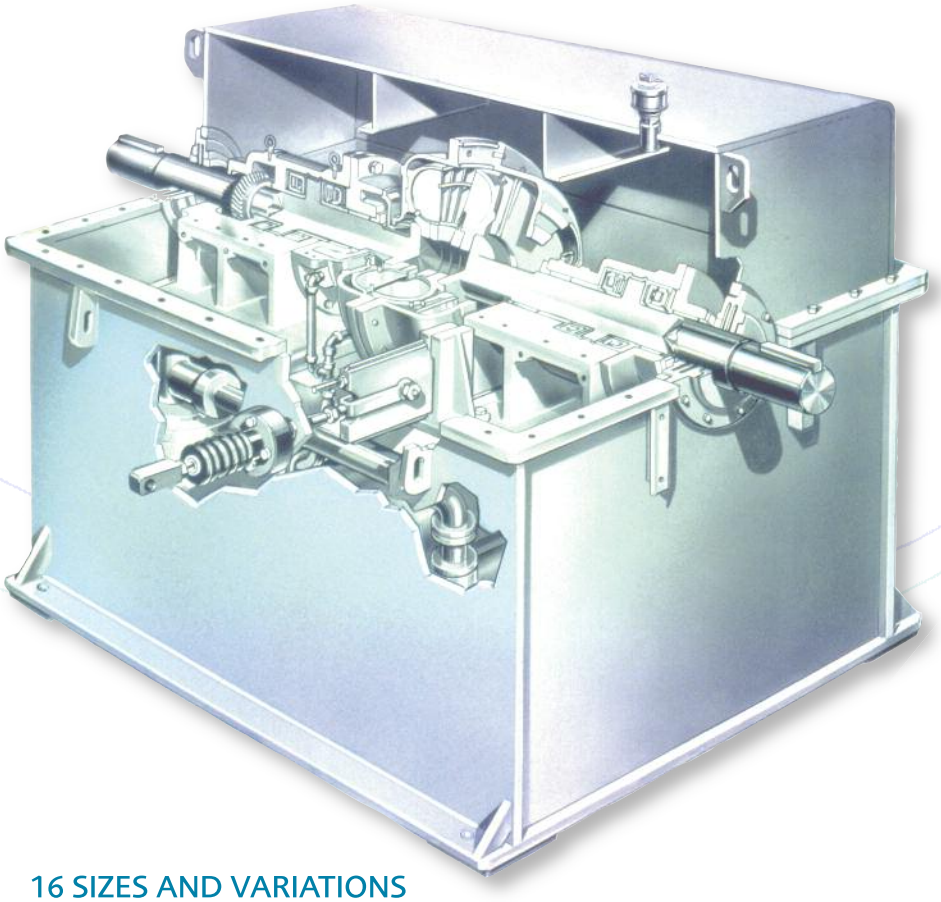
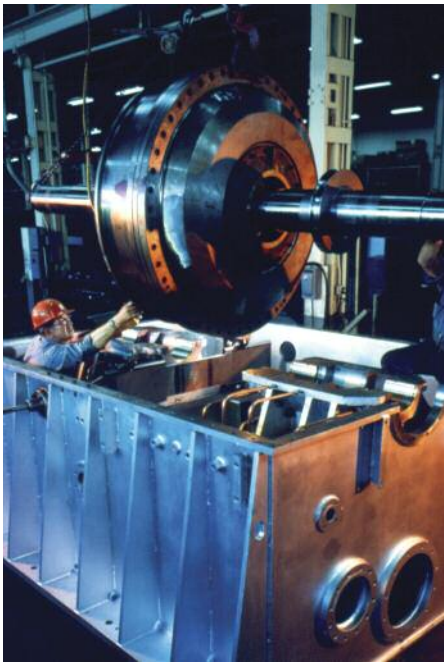


Class 5 Gýrol Fluid Drives are generally used in Heavy-duty pump and fan applications. They offer reliable, adjustable speed, which is critically important for systems of this magnitude.

16 SIZES AND VARIATIONS (231 TO 580) 500 TO 14,000 HORSEPOWER SPEEDS TO 1,800 RPM

- Herringbone-gear pump (hidden) supplies oil flow for the working circuit and lubrication (sizes up to 427). Certain duties require use of an external motor driven oil pump in place of the standard pump (sizes 427H and larger).
- Forged steel shafts have long life.
- Fabricated steel housing horizontally split for easy inspection and maintenance.
- Precision-fit bearing surfaces and bolting flanges give trouble-free operation.
- Static and dynamic-balanced rotating assembly, impeller and runner are cast aluminum, welded steel or machined steel forgings as needed for the specific application.
- Push-pull scoop tube control mounts on either side of unit, adapts easily to automatic control.
- Four Babbitt-lined, bronze-backed precision sleeve bearings are designed for long life.
- Rugged steel casings enclose the impeller and runner.
- A high tensile, single-tipped scoop tube provides stepless speed control for rotation specified.
- All bearings are force-lubricated for long life.
- Two double Kingsbury thrust bearings in each pillow block absorb internal and external thrust.
- Labyrinth seals keep contaminants out of unit.



Note: We offer shell-and-tube or plate-and-frame exchangers as standard equipment for oil cooling duty. If you need to cool with air, we can offer air/oil heat exchangers.

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Gýrol® Fluid Drives

CLASS 6

Class 6 Gýrol Fluid Drives were designed primarily for adjustable speed control for feed pump applications. They have proven reliable in utilities and pipelines in the most rugged duty for over half a century.

Note: We offer shell-and-tube or plate-and-frame exchangers as standard equipment for oil cooling duty. If you need to cool with air, we can offer air/oil heat exchangers. On sizes 171 through 212A, shell-and-tube heat exchangers used for oil cooling are normally mounted in the fluid drive houseing. Other sizes have side, or remote, mounted oil coolers, depending on specific duty requirements.

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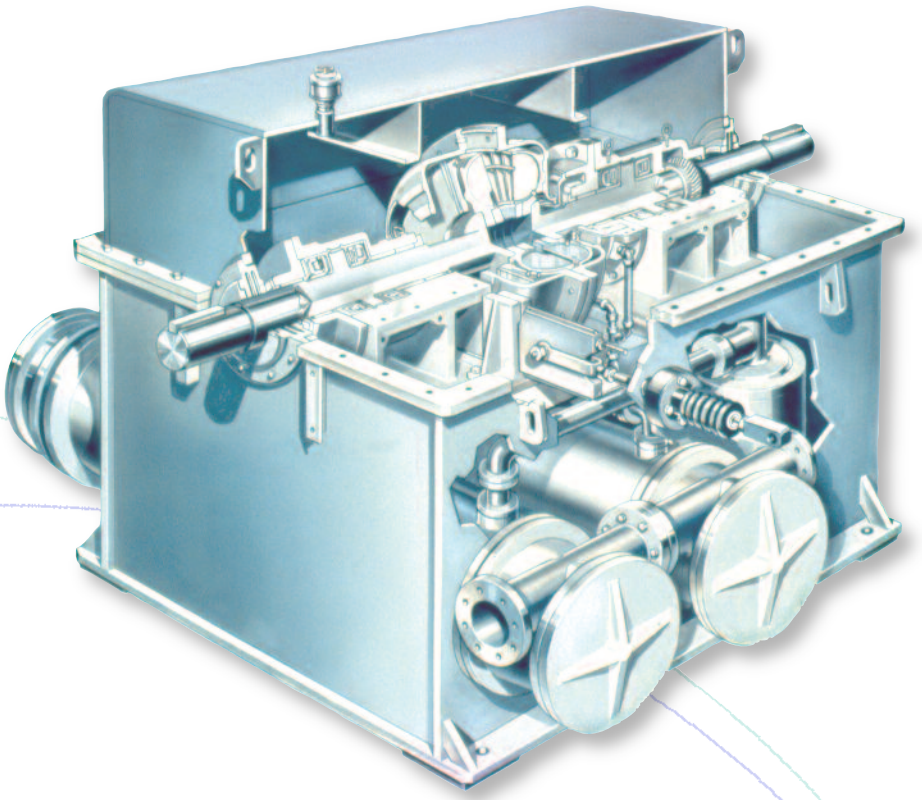

11 SIZES AND VARIATIONS (126-292 DUAL) 200 TO 40,000 HORSEPOWER SPEEDS TO 3,600 RPM

- Herringbone-gear pump (hidden) supplies oil flow for the working circuit and for lubrication, (sizes 126 to 231). Certain duties require use of an external motor driven oil pump in place of the standard pump.
- External sub-base mounted pump (sizes 250 and larger) supplies working circuit oil, lubrication and additional oil for driven equipment, if needed.
- Forged steel shafts have long life.
- Split housing assembly permits removal of upper housing for inspection and maintenance.
- Precision-fit bearing surfaces and bolting flanges give trouble-free operation.
- A high tensile, single-tipped scoop tube provides stepless speed control for rotation specified.
- Static and dynamic-balanced impeller and runner are high-quality, heat-treated cast aluminum (sizes 126 and 146) or machined from solid high-tensile steel forgings (sizes 171 and larger).
- Push-pull scoop tube control mounts on either side of unit, adapts easily to automatic control. (Rotary action on sizes 171 and 198)
- Four Babbitt-lined, bronzed-backed precision sleeve bearings are designed for long life.
- Rugged steel casings enclose the impeller and runner.
- All bearings are force-lubricated for long life.
- Two double Kingsbury thrust bearings in each pillow block absorb internal and external thrust.

Gýrol® Fluid Drives

RE CLASS 6

Howden

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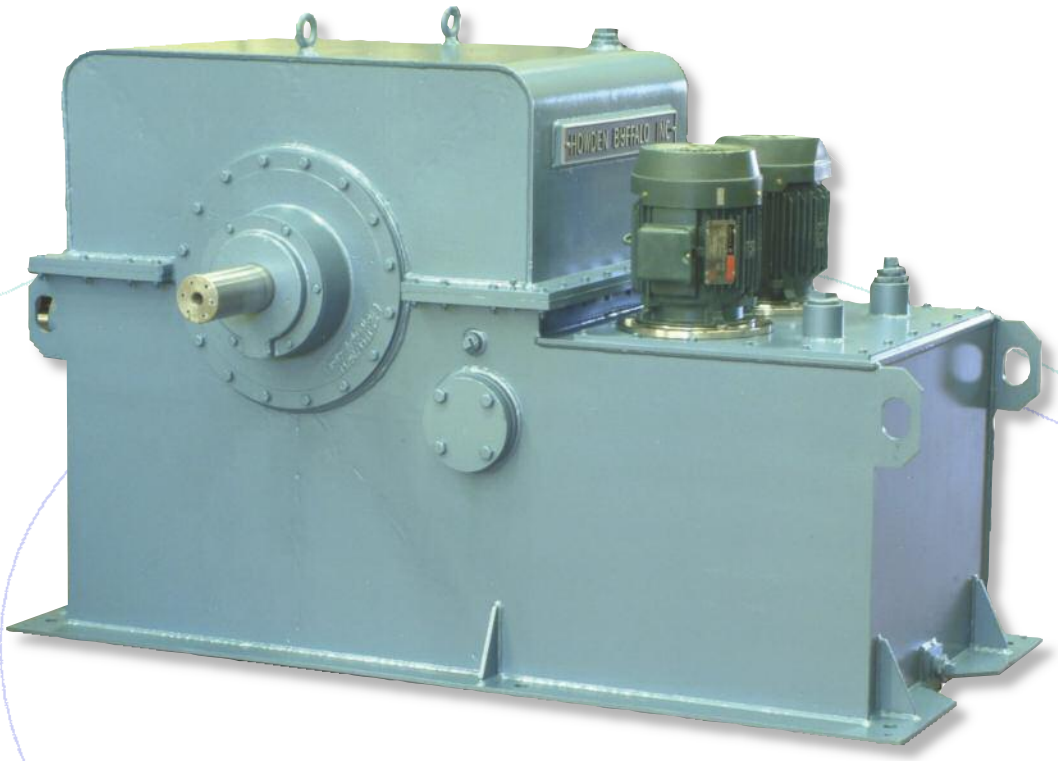
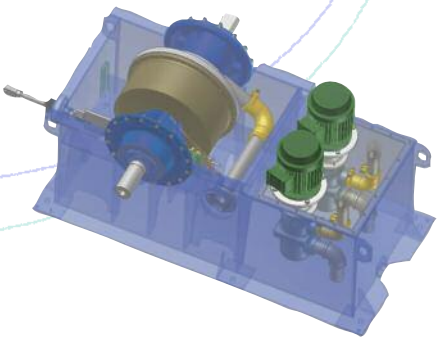


2 SIZES AVAILABLE (198 AND 212)
198 - 1,500 TO 3,500 HORSEPOWER - 3,600 RPM
212 - 3,000 TO 6,000 HORSEPOWER - 3,600 RPM

Howden Buffalo's newest design the RE Class Gýrol Fluid Drive has been specifically designed to provide an economical alternative to Variable Speed Drives for applications that require variable speed feed pumps, particularly boiler feed pumps. The use of a Gýrol Fluid Drive can help extend the life of motors and load equipment (pumps, fans, etc.) by creating soft starts and allowing the motor to run at its designed speed while using the hydrodynamic principle of a fluid drive to vary the speed.
It is the culmination of over 60 years experience in the design and manufacturing of hydrodynamic speed control equipment. And with no obsolescence, no software upgrades and an unmatched reliability record, you'll find that Gýrol Fluid Drives are an economical long-term investment in an increasingly disposable world.

- Up to 98% efficient and simple to maintain and operate
- Robust design for years of trouble-free operation
- Modular components for ease of maintenance and repair
- Can use normal starting torque motors
- Never requires software upgrades
- No harmonic issues
- Works well in harsh environments
- Anti-friction bearing for long life
- Rated from 1,500-6,000 HP
- Naturally torque-limiting

The RE Class 6 Gýrol Drives can be outfitted with a range of accessories that monitor operating conditions and provide speed and temperature control. The split housing design allows the rotating element removal without disturbing the drive mounting. It uses a direct-drive external oil pump for both the working and lubrication circuits. This is more efficient and reduces the drive's fixed losses. It can be equipped with a back up pump without increasing the drive's footprint.



Note: We offer shell-and-tube or plate-and-frame exchangers as standard equipment for oil cooling duty.

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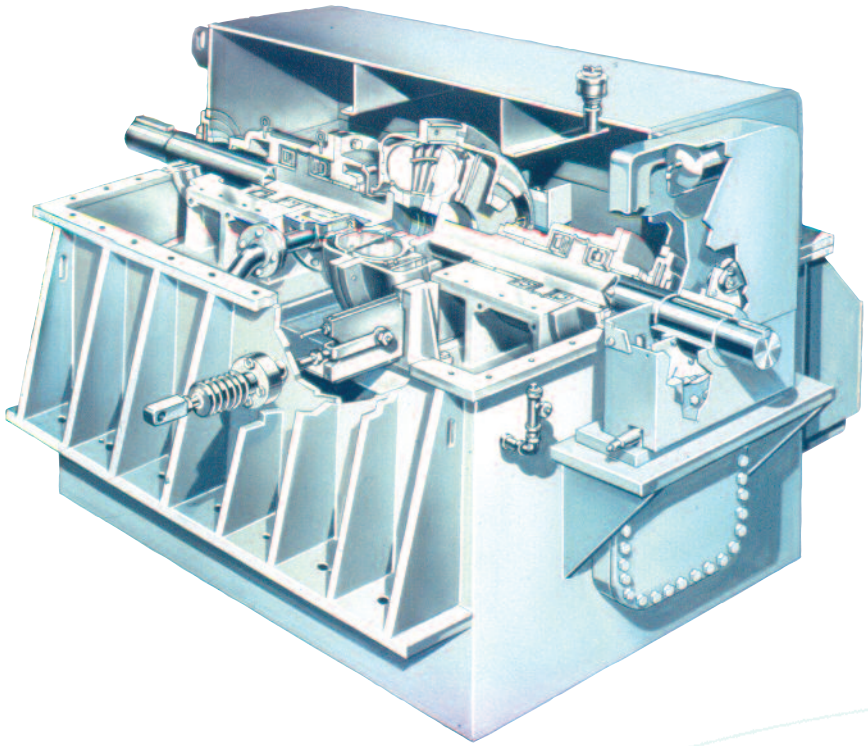
Gýrol® Fluid Drives

CLASS 7

Class 7 Gýrol Fluid Drives are widely used in power generation plants for driving boiler feed pumps which are direct-connected to main turbine generator shafts. Class 7 units have a shaft centerline height of 30 inches, to match the height of main turbine shafts.



Note: We offer shell-and-tube or plate-and-frame exchangers as standard equipment for oil cooling duty.

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8 SIZES AND VARIATIONS (198-292 DUAL) 1,500 TO 40,000 HORSEPOWER SPEEDS TO 3,600 RPM

- Herringbone-gear pump (hidden) supplies oil flow for the working circuit and lubrication (sizes 198 and 212).
- External sub-base mounted pumps (sizes 250 and larger) supply working circuit oil, lubrication and additional oil for driven equipment, if needed.
- Ground bearing surfaces and mounting hubs have precision-fit, for trouble-free operation.
- Shafts are machined steel forgings for long life.
- Split housing permits removal of upper housing for inspection and maintenance.
- Rotating assembly, impeller runner and casing are machined from high-tensile alloy steel forgings providing maximum strength.
- Rotating assembly, balanced both statically and dynamically, for trouble-free transmission of power.
- Push-pull scoop tube control mounts on either side of unit, adapts easily to automatic control.
- A high tensile, single-tipped scoop tube provides stepless speed control for rotation specified.
- Holding brake assembly on output shaft prevents wind-milling when the fluid drive is declutched and main turbine is operating.
- Two double Kingsbury thrust bearings absorb both internal thrust and external thrust from the turbine output shaft.
- All bearings are force-lubricated for long life.
- Four Babbitt-lined, bronze-backed precision sleeve bearings are designed for long life.
- Labyrinth seals keep contaminants out of unit.

CLASS SELECTION GUIDE

CLASS 2

Size	Min RPM	Max RPM	Min HP	Max HP
126	750	1,800	2	75
146	750	1,800	7.5	150
171	750	1,800	10	350
198	720	1,800	15	700
231	600	1,800	15	1,250
270	600	1,500	50	1,500
315	600	1,200	100	1,500
366	600	1,200	200	2,250

CLASS 4

Size	Min RPM	Max RPM	Min HP	Max HP
231	900	1,800	100	900
270	720	1,200	100	800
315D	1,800	1,800	600	1,250
315S	1,500	1,500	800	1,500
315	600	1,200	150	1,000
366S	1,200	1,200	1,500	1,500
366	514	900	150	1,250
427S	1,000	1,200	1,250	1,750
427	514	900	300	2,250
497S	600	900	800	2,500
497	514	720	700	2,500
580	514	600	1,500	3,500

CLASS 5

Size	Min RPM	Max RPM	Min HP	Max HP
231	1,800	1,800	500	1,250
270	1,800	1,800	1,250	2,500
315S	1,800	1,800	1,250	2,500
315	1,500	1,800	2,500	5,000
366S	1,200	1,800	1,500	4,500
366	100	1,500	1,500	4,500
366H	1,500	1,500	3,500	4,500
427S	100	1,800	2,000	4,500
427S-H	1,200	1,800	4,500	10,000
427	900	1,500	2,000	4,000
427-H	900	1,200	2,500	6,250
497D-H	1,800	1,800	10,000	14,000
497S-H	1,200	1,200	6,000	8,500
497	720	900	2,000	5,750
497-H	600	1,200	4,000	14,000
580	600	900	2,000	14,000

CLASS 6

Size	Min RPM	Max RPM	Min HP	Max HP
126	3,000	3,600	200	500
146	3,000	3,600	400	1,000
171	3,000	3,600	700	2,000
198	3,000	3,600	1,500	3,000
198 RE	3,000	3,600	1,500	3,500
212	3,000	3,600	3,000	6,000
212 RE	3,000	3,600	3,000	6,000
231	3,000	3,600	5,000	8,000
250	3,000	3,600	7,000	10,000
270	3,000	3,600	9,000	15,000
250 Dual	3,000	3,600	13,000	20,000
270 Dual	3,000	3,600	17,500	30,000
292 Dual	3,000	3,600	30,000	40,000

CLASS 7

Size	Min RPM	Max RPM	Min HP	Max HP
198	3,000	3,600	1,500	3,000
212	3,000	3,600	3,000	6,000
231	3,000	3,600	5,000	8,000
250	3,000	3,600	7,000	10,000
270	3,000	3,600	9,000	15,000
250 Dual	3,000	3,600	13,000	20,000
270 Dual	3,000	3,600	17,500	30,000
292 Dual	3,000	3,600	30,000	40,000

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