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LIGHT POWER & PRECISION

DRIVE DESIGN MANUAL



POWERING PROGRESS™



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Introduction

Gates belt drive systems offer more advantages at lower cost than other methods of motion transfer or power transmission.

The popularity of Gates drive systems can be attributed to our commitment to customer satisfaction and quality.

Gates continually makes strides in specialized research, product development, testing and overnight availability of products. The team of your design engineers and Gates application engineers assures an efficient, low-cost and quality drive system.

Total quality support

Gates offers professional support from conceptual design to delivery of the finished product. We make sure you...

- use the best product for the application
- minimize drive package size and cost
- minimize testing time using our experience

Experienced technical support

Our seasoned Application Engineering Group is waiting for you to tap their knowledge. They are armed with the latest in design software and are ready to make your ideas a reality.

Continuous engineering support is available for complex drive layouts including hardware design and specifications.

MADE-TO-ORDER METALS

(800) 709-6001

CUSTOMER SERVICE

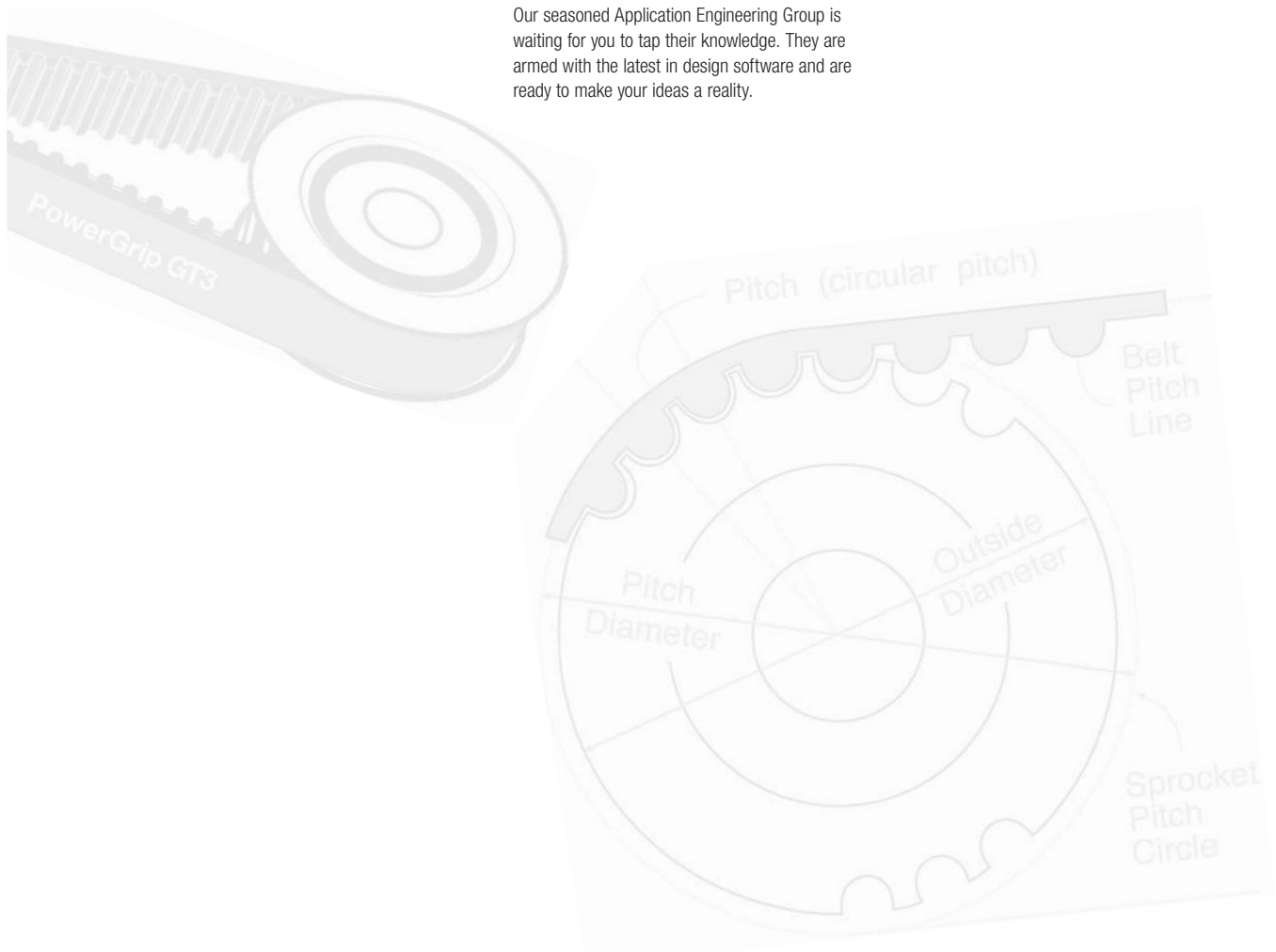
(877) 782-3587

PRODUCT APPLICATION ENGINEERING

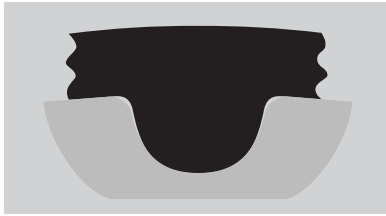
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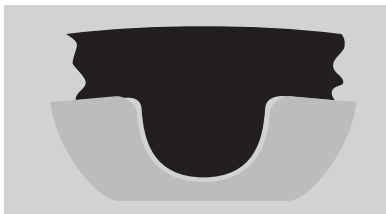
ptpasupport@gates.com



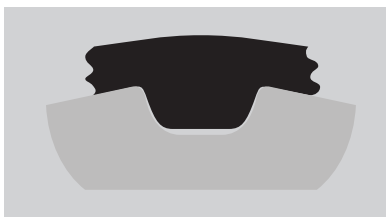
Introduction – PowerGrip® GT®3 Belt Drives



**PowerGrip® GT® 3 Belt
Tooth/Groove Contact**



**PowerGrip® HTD® Belt
Tooth/Groove Contact**



**PowerGrip® Timing Belt
Tooth/Groove Contact**

PowerGrip® GT®3 Belts are an advanced design of Gates HTD® system and feature:

- a modified curvilinear belt tooth profile with mating sprocket groove.
- registration and indexing accuracy equivalent to the conventional PowerGrip Timing Belt System.
- a higher load-carrying capacity and longer belt life than either PowerGrip HTD or Timing belts.

It's difficult to make a true quantitative comparison between the backlash of a trapezoidal tooth drive and PowerGrip® GT®3 tooth drive due to the difference in "sprocket to belt tooth" fit. (See illustrations at left). Trapezoidal belts contact the sprocket in the root radius — upper flank area only, while the PowerGrip® GT®3 system permits full flank contact.

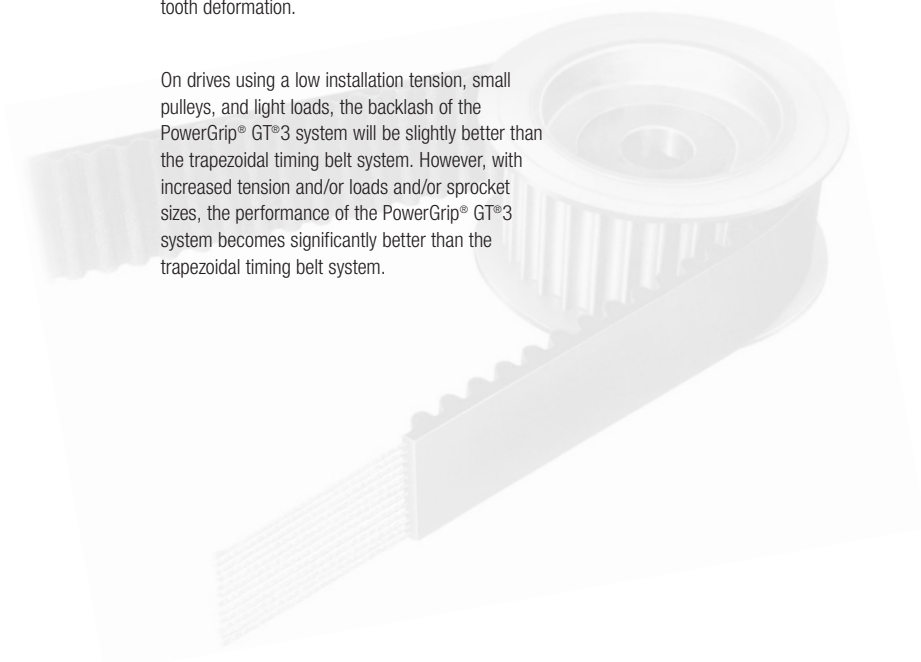
The main stress line in a trapezoidal tooth timing belt is at the tooth base. During operation stress greatly reduces belt life. The PowerGrip® GT®3 system overcomes this with complete tooth flank contact...which eliminates the tooth stress line area. This greatly increases belt life and prevents tooth distortion caused by drive torque. In addition, the conventional timing belt has a chordal effect as it wraps small sprockets. This is significantly reduced in the PowerGrip® GT®3 system due to full tooth support along the sprocket. Full support improves meshing, reduces vibration and minimizes tooth deformation.

On drives using a low installation tension, small pulleys, and light loads, the backlash of the PowerGrip® GT®3 system will be slightly better than the trapezoidal timing belt system. However, with increased tension and/or loads and/or sprocket sizes, the performance of the PowerGrip® GT®3 system becomes significantly better than the trapezoidal timing belt system.

HTD was developed for high torque drive applications, but is not acceptable for most precision indexing or registration applications. The HTD design requires substantial belt tooth to sprocket groove clearance (backlash) to perform. As smaller diameter sprockets are used, the clearance required to operate properly is increased. HTD drive clearance, using small diameter sprockets, is approximately four times greater than an equivalent timing belt drive.

The PowerGrip® GT®3 deep tooth profile provides...

- increased contact area and improves resistance to ratcheting.
- easy, clean entering and exiting the sprocket grooves...resulting in reduced vibration.
- parallel contact with the groove and eliminates stress concentrations and tooth deformation under load.
- improved registration characteristics and maintains high torque carrying capability.





Introduction – PowerGrip® GT®3 Belt Drives

This PowerGrip® GT®3 synchronous belt fits in tight, hard to fit applications with room to spare.

Lasts longer than competitive belts

PowerGrip® GT®3 belts outlast the competition in these ways:

- Deep tooth profile provides superior load-carrying strength and reduces ratcheting when using Gates sprockets.
- A durable nylon fabric tooth covering increases tooth strength and provides wear and abrasion resistance.
- Fiberglass tensile cords wrapped in a durable neoprene body provide flexibility and increase service life.

Precision registration

PowerGrip® GT®3 belts provide timing and synchronization accuracy for flawless registration, with no loss of torque carrying capability.

Increases load-carrying capacity

Load capacities exceed HTD and trapezoidal belt capabilities...making PowerGrip® GT®3 the choice for accurate registration, heavy loads and small sprockets. Smaller and tougher than HTD or trapezoidal belts, PowerGrip® GT®3 belts give engineers more space-saving flexibility for micro-technology.

Sounds this quiet ...

PowerGrip® GT®3 belt's specially engineered teeth reduce noise and vibration. Clean meshing and reduced belt width results in noise reduction when compared to PowerGrip Timing and HTD belts.

When precision is critical, depend on PowerGrip®GT®3 belts

PowerGrip® GT®3 belts are designed for precision applications. Custom-built constructions are available for applications requiring maximum performance. Worldwide manufacturing capabilities assure you of prompt service for important markets.

PowerGrip® GT® 3 belts are available in 2mm, 3mm and 5mm pitches. Larger 8mm and 14mm pitch belts are also available. See Catalog 17195 - PowerGrip® GT® 3 Belt Drive Design Manual.

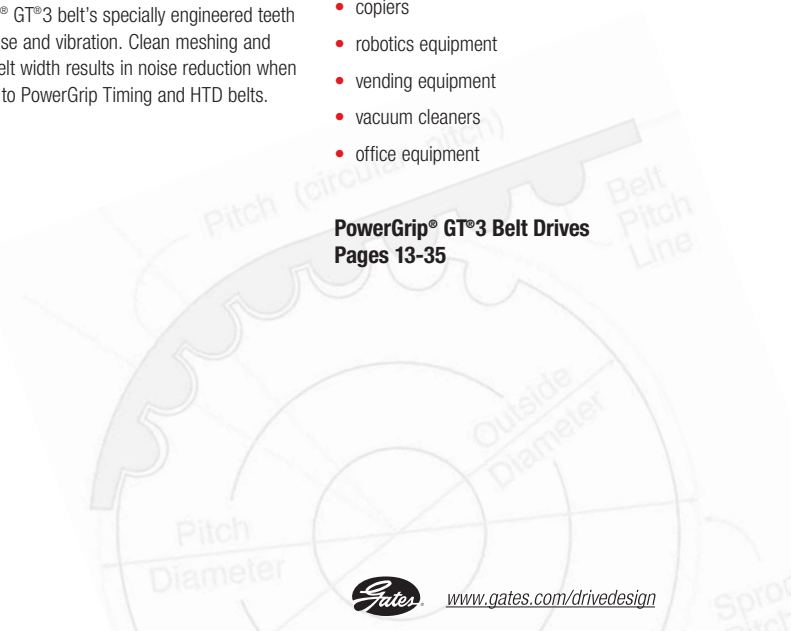
Here are some of the many PowerGrip® GT®3 belt applications:

- data storage equipment
- machine tools
- hand power tools
- postage handling equipment
- DC stepper/servo applications
- food processors
- centrifuges
- printers
- floor care equipment
- money handling equipment
- medical diagnostic equipment
- sewing machines
- automated teller machines
- ticket dispensers
- plotters
- copiers
- robotics equipment
- vending equipment
- vacuum cleaners
- office equipment



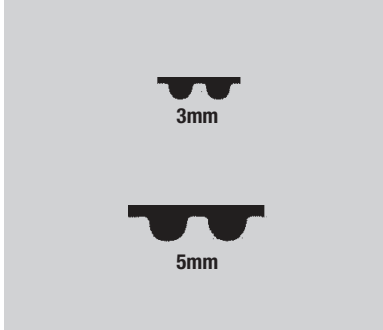
PowerGrip® GT®3 Belt Profiles/Pitches

PowerGrip® GT®3 Belt Drives
Pages 13-35



www.gates.com/drivedesign

Introduction – PowerGrip® HTD® Belt Drives



PowerGrip® HTD® Belt Profiles/Pitches

Good torque carrying capability and design versatility

PowerGrip HTD drives provide advantages over conventional gear and chain type drives...

- run quiet
- do not need lubricating
- require virtually zero maintenance
- high reliability and low operating costs

Gates 3mm and 5mm pitch HTD belts are capable of operating at both low and high speeds while carrying heavy loads. They can provide higher speed ratios than comparable XL and L pitch timing belts in the same space. Compared to conventional timing belts, they transmit the same power in a more compact drive package.

HTD belts have the same characteristics as larger 8mm and 14mm pitch belts, but are designed for smaller horsepower and higher speed requirements.

3mm and 5mm pitch HTD belts provide positive non-slip power transmission with many advantages over conventional drive systems. They can handle tough applications, even those subject to sudden shock and overloading.

Some PowerGrip HTD Belt Applications are:

- floor polishers
- vacuum cleaners
- sewing machines
- sanders
- office equipment
- planers
- centrifuges
- diagnostic equipment
- power tools
- vending machines
- juicers

PowerGrip HTD Drives Pages 36-45

PowerGrip® Timing Belt Drives



PowerGrip® Timing Belt Profiles/Pitches

Provide positive, non-slip power transmission

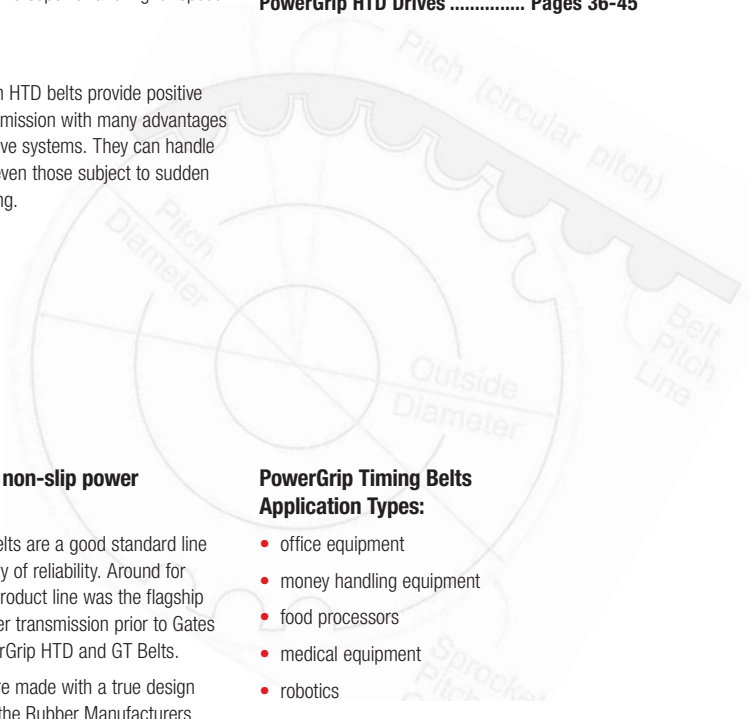
PowerGrip Timing Belts are a good standard line product with a history of reliability. Around for over 60 years, this product line was the flagship of synchronous power transmission prior to Gates introduction of PowerGrip HTD and GT Belts.

Gates timing belts are made with a true design pitch, a standard of the Rubber Manufacturers Association and the International Standards Organization.

PowerGrip Timing Belts Application Types:

- office equipment
- money handling equipment
- food processors
- medical equipment
- robotics
- data processing equipment
- miniaturized applications
- mailing equipment
- printers/plotters

PowerGrip Timing Drives Pages 46-50





Introduction – PowerGrip® Twin Power® Belt Drives



0.200" (1/5") pitch extra light (XL)

PowerGrip Twin Power Timing Belt Profile/Pitch



3mm



5mm

PowerGrip Twin Power HTD Timing Belt Profile/Pitch



3mm



5mm

PowerGrip Twin Power GT2 Timing Belt Profile/Pitch

Dual driving surfaces allow for unique, problem solving drive designs

Gates Twin Power Belts have teeth on both sides to provide synchronization from both driving surfaces. This feature makes possible drive designs such as multi-point drives, rotation reversal with one belt, serpentine drives, etc. Twin Power belts provide solutions to difficult design problems.

Twin Power Belts are similar in construction to regular synchronous belts, including nylon-faced teeth on both sides. This construction uses essentially the same design parameters as standard synchronous belts. They are rated at the same horsepower capacity as conventional PowerGrip Belts of identical pitch and width on either side of the belt.

NOTE: Twin Power Belts are available in GT2, HTD and Timing Belt configurations, so designers can use them in a wide variety of applications.

Some typical PowerGrip Twin Power applications are:

- copiers
- serpentine drives
- reversing rotations

PowerGrip GT2 Twin Power BeltsPages 22-23

PowerGrip HTD Twin Power Belts....Pages 42-43

PowerGrip Twin Power BeltsPages 51-52

PowerGrip® Long Length Belting

For drives that require belt lengths longer than can be produced in the conventional endless form

PowerGrip Long-length Belting has the same basic construction as conventional Gates timing belts. Gates can make continuous belting in spiral cut form on a made-to-order basis.

For information or assistance on any long length belt problem, contact Gates Product Application Engineering.

Typical PowerGrip Long Length Belting uses are:

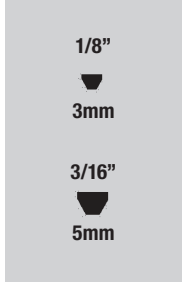
- reciprocating carriage drives
- rack and pinion drives
- large plotters

PowerGrip Long Length BeltingPage 54

Clamp Plate SpecificationsPage 55



Introduction – Polyflex® JB® Belt Drives



Standard Polyflex® Belt Profile



Polyflex® JB Belt Profile

Gates Polyflex® JB® is a joined belt with a different angle

“High Power Density” is what you get from this high-precision belt. Developed by Gates and produced using patented manufacturing processes, Polyflex JB belts provide load-carrying capacity at higher speeds on precision applications. Polyflex JB belts can operate at shaft speeds well in excess of 10,000 rpm.

Polyflex JB features joined belt construction for stability. Backside ribs relieve bending stress on small sheaves and provide lateral rigidity. The 60° angle provides more undercord support to the tensile section and distributes the load evenly.

The small cross-section allows belts to be used on short centers and small diameter sheaves for “cleaner” machine designs. It virtually eliminates the need for double-reduction drives and lets you use more cost-effective single-reduction drives.

Gates Polyflex JB belts are a homogenous product. State-of-the-art manufacturing processes assure uniformity of construction, resulting in minimal vibration and smooth operation on precision applications.

Gates special high modulus polyurethane compound has a high coefficient of friction that resists fatigue, wear, ozone and most adverse environmental conditions.

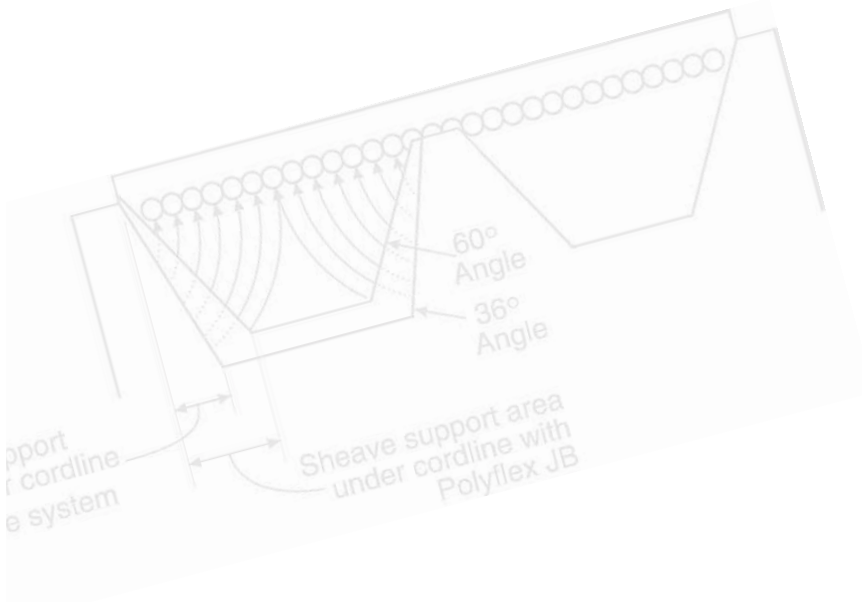
Cost Savings — PLUS! Polyflex JB belts bring V-belt economy and simplicity to applications where conventional V-belts are not feasible, resulting in cost savings and design freedom never before possible.

Typical Polyflex JB applications are:

- computer peripherals
- bench-type milling machines
- glass blowing lathes
- valve grinding machines
- crankshaft grinding machines
- woodworking spindle drives
- horizontal milling machines
- dental grinders
- floor care equipment
- microfiche readers
- drilling machines
- lathe drives
- knife grinders
- scissor sharpeners
- centrifuges
- blowers
- wheelchairs
- optical lens grinders
- fans
- metalworking spindle drives

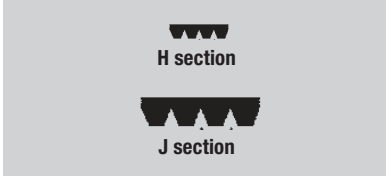
Polyflex JB Drives Pages..... 77-81

For additional Polyflex belt data refer to Gates Heavy Duty V-Belt Drive Design Manual #14995-A





Introduction – Micro-V® Belt Drives



Micro-V Belt Profiles

For the best ribs around, look no further than Gates Micro-V® Belts

Truncated tooth profile increases flexibility and reduces heat

Gates Micro-V Belts outperform other V-ribbed belts because the Vees are shorter. The truncated (shortened) profile of the Vees give Gates Micro-V Belts increased flexibility, reduced heat buildup and lets them perform at extra high speeds on smaller diameter sheaves.

Gates exclusive truncated design gives you...

- 80% higher horsepower capacity than RMA standards.
- extra load-carrying capacity for extra long life.
- Truncated belt ribs for improved wedging in the pulley grooves and greater load capacity.

Micro-V Belts are smooth running and resistant to oil, heat and other adverse conditions. Plus, undercords are static conductive.

Just some of the applications for Micro-V Belts are:

- high speed machine tools
- milling lathes
- washing machines
- precision surface grinders
- floor polishers
- tool grinders
- high-speed printing presses
- centrifuges
- agitators
- precision center lathes
- pumps
- high-speed atomizers
- trash compactors
- planers and molders
- dryers
- food slicers
- electric massagers
- lawn mowers
- juice mixers
- industrial vacuum cleaners
- microwave ovens
- bakery equipment
- compressors
- fans

Micro-V Drives Pages 82-83

For additional Micro-V belt data refer to Gates Heavy Duty V-Belt Drive Design Manual 14995-A.

