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3.
HOW TO PROPERLY INSTALL A BELT DRIVE

Correct installation is crucial to ensure optimum performance and life span of your belt drives, and this can only be obtained when the belts drives are correctly designed and installed. The information on the following pages will help you become familiar with the belt types used in industry.

V-BELTS

Narrow section

- High power capacity V belt used to substantially reduce drive costs and minimize space requirements.
- Capable across the complete range of drive Kilowatt ratings, with fewer belts required compared to Classical section.
- Belt sizes are specified as: SPZ/3V, SPA, SPB/5V, SPC and 8V.
- These belts are found in the following Gates products: Gates Predator®, Gates Super HC® and Delta Narrow™ V-belts.

Classical section

- Original style V belts used in heavy duty applications.
- Belt sizes are specified as: Z, A, B, C, D or E.
- These belts are found in the following Gates products: Hi-Power® and Delta Classic™ V-belts.

Wrapped and Raw edge belt

- Wrapped belts, also called enveloped or covered belts, have a fabric cover with concave sidewalls, rounded bottom corners and arched tops.
- Raw edge belts have no fabric cover, straight ground sidewalls and special molded notches on the inside. The notches reduce bending stress which allows belts to run in smaller diameter pulleys comparable to wrapped belts. Raw Edge belts offer improved efficiency compared to wrapped belts.

Gates offers raw edge V belts in both the classical and narrow sections:

- Tri-Power® is a classical section raw edge, molded notch belt, available in AX, BX and CX profiles. Its length is specified by the same standard belt number as other classical section belts.
- Quad-Power® 4 Service-Free is a narrow section raw edge belt available in XPZ/3VX, XPA, XPB/5VX and XPC profiles.
- Super HC® MN in also a narrow section raw edge belt available in SPZ-MN, SPA-MN, SPB-MN and SPC-MN profiels.

In all cases, an “X” is used in the belt description to designate a molded notch construction. For example: AX26 is a raw edge, molded notch classical section belt and XPB2990/5VX1180 is a narrow section, raw edge, molded notch belt with a datum length of 2990 mm or 118” outside circumference.

Joined belts/PowerBand®

- PowerBand® belts were developed by Gates for drives subjected to pulsating loads, shock loads or extreme vibrations where single belts could flip over on the pulleys. A high-strength tie band permanently joins two or more belts to provide lateral rigidity. This keeps the belts running in a straight line in the pulley grooves.
- Gates PowerBand® construction is offered in:
  - Hi-Power® classical section wrapped B, C, D profiles.
  - Super HC® narrow section wrapped SPB, SPC, 3V/9J, 5V/15J, 8V/25J profiles.
  - Predator® PB narrow section wrapped SPBP/5VP, SPCP, 8VP profiles.
  - Quad-Power® 4 PowerBand® Service-Free narrow section raw edge XPZ, XPA, XPB, 3VX, 5VX profiles.
- Service-Free V-belt products available from Gates, in single and PowerBand®:
  - Predator®
  - Quad-Power® 4

Light duty belts

- These are used on heavy duty drives and are designed for use with backside idlers.
- Belt sizes are specified as: 3L, 4L, 5L profiles.
- These belts are found in the Gates PoweRated® range.
- PoweRated® V-belts specified by cross section and outside circumference, and is available in 3L, 4L & 5L profiles. This special belt is designed for clutching, heavier shock-load and backside idler drives, and is recognized by its distinct green colour. Reinforced with an aramid fibre tensile cord (weight for weight stronger than steel).
- PoweRated® belts can be interchange with Truflex®, but Truflex® cannot interchange with PoweRated®.

Dubl-V belts

This is a special version of Gates Hi-Power® for serpentine drives where power is transmitted by both the top and bottom of the belt. Dubl-V belts are specified by AA, BB, CC or DD cross sections, and by effective length.

PolyFlex® JB™ belts

- Polyflex® is a unique belt with a distinctive 60° belt angle and ribbed top specifically designed for long life in small diameter sheave drives. Polyflex® JB™ is ideal for compact drives, drives with high speed ratios, and drives requiring especially smooth operation.
- The "JB" refers to the belt's configuration: two, three or more belts joined together to provide extra stability and improved performance. This joined belt style should be used instead of matched single belts whenever possible.
- Polyflex® JB™ belts are ideal for these applications:
  - Milling, grinding or drilling machines
  - Lathes
  - Machine spindle drives
  - Centrifuges
  - Blowers
  - High speed compressors

Polyflex® JB™ belts are specified by top width and effective length and available in 3M (JB), 5M(JB), 7M(JB) and 11M(JB).

V-ribbed belts or Micro-V®

- Gates Micro-V® belts outperform other V-ribbed belts because the tips of the "V" are truncated (shorter). This shorter profile gives the new Micro-V® belts increased flexibility, reduced heat build-up and allows them to operate at extra high speeds on smaller diameter sheaves.

  Additional advantages of the truncated tips are:

  1. belt does not bottom in the sheave; therefore providing a higher degree of wedging
  2. belt can better tolerate debris in the sheave groove
  3. belt can be used on flat DriveN pulleys.
- Gates Micro-V® are extremely smooth running and highly resistant to oil, heat and other adverse conditions.
- Gates Micro-V® are belts are available for industrial applications in the following profiles: PJ, PK, PL and PM.

Multi- Speed belts (Variable Speed Drives)

Multi-Speed belts have a distinct shape. Multi-Speed belt top widths are usually greater than their thicknesses. This permits a greater range of speed ratios than standard belts. Usually cogged or notched on the underside, Multi-Speed belts are specified for equipment which requires changes in DriveN speed during operation.

Gates Multi-Speed belts are specified by top width, outside circumference, and the required groove angle. The groove angle can be measured from the drive pulleys.

SYNCHRONOUS BELTS

These belts are also known as timing or positive drive belts and are used where DriveN shaft speeds must be synchronized to the rotation of the DriveR shafts. They can also be used to eliminate noise and maintenance problems caused by chain drives.

PowerGrip® and Poly Chain®

Synchronous belts, such as Gates Poly Chain® Carbon™ Volt®, can be used in high Kilowatt, high torque drives, drives where space is severely limited and where there is limited take up.

Synchronous drives are extremely efficient - typically 98% with properly maintained Poly Chain® Carbon™ Volt® or PowerGrip® GT3 systems. By contrast, chain drives are in the 91-98% efficiency range, while V-belts average in the 93-98% range.

Synchronous belts are available in a range of distinctive tooth profiles, various sizes and constructions to meet a wide range of application requirements. The important dimensions of synchronous belts are: belt pitch, belt pitch length, width and tooth profile.

- Belt Pitch - Distance in millimetres or inches between two adjacent tooth centers as measured on the belt's pitch line.
- Belt Pitch Length - Circumference in millimetres or inches as measured along the pitch line.
- Width - Top width in millimetres or inches.
- Tooth Profile - See the Belt Identification section for the easiest way to identify tooth profile. Synchronous belts run on pulley, which are specified by the following:
- Pitch - Distance between groove centres, measured on the pulley pitch circle. The pitch circle coincides with the pitch line of the mating belt.

Gates synchronous belts are available in Poly Chain® Carbon™ Volt®, PowerGrip® GTX, PowerGrip® GT3, PowerGrip® HTD®, PowerGrip®, Twin Power®, Long Length.

POLYURETHANE BELTS

Gates' standard Synchro-Power® product range covers a multitude of applications. If your process requires a belt design that meets very specific application needs, Gates offers you a variety of customised polyurethane belt products next to the standard belt range. These polyurethane belt products, tailor-made to fulfil your most challenging requirements, meet the same quality levels as their standard counterparts. Our applications engineers can work with you to design any belt catering to your specific needs in various applications. Nearly every belt type can be customised by adding backings, profiles or special machining. This makes them the perfect supplement to the Gates' standard Synchro-Power® product offering.

STATIC CONDUCTIVE BELTS

Static discharge can pose a hazard on belt drives that operate in potentially explosive environments. Static conductivity is a required belt characteristic in order to prevent static discharge and to comply with the ATEX directive for use of belts in explosive environments.

V-belts are generally manufactured to be static conductive in accordance with the ISO1813. Gates Hi-Power® (PowerBand®), Tri-Power®, Super HC® (PowerBand®), Super HC® MN, Quad-Power® 4 (PowerBand®), Predator® (PowerBand®), Micro-V®, are all static conductive when new as defined by ISO1813 and can be used in conditions as described in the directive 2014/34/EU-ATEX.

Synchronous belts Poly Chain® Carbon™ Volt® 8MGTV and 14MGTV, PowerGrip® GTX 8MX and 14MX, PowerGrip® GT3 8MGT and 14MGT, and PowerGrip® HTD® 14M belts are conductive as defined by ISO9563 and can be as such used in conditions as described in the directive 2014/34/EU-ATEX.

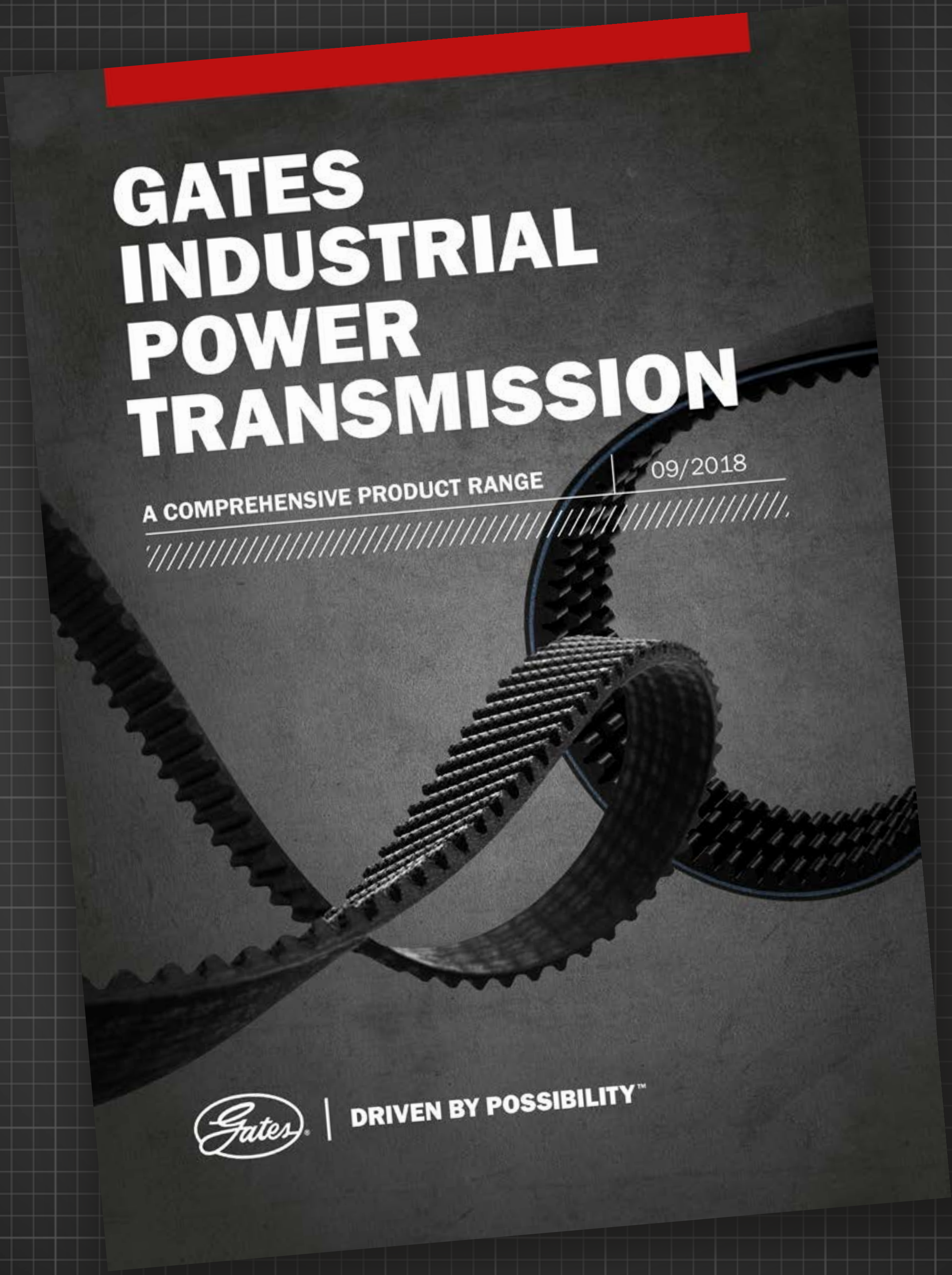
PowerGrip® HTD® 3M, 5M, 8M, 20M, PowerGrip® Timing, Poly Chain® GT, Poly Chain® GT2, Poly Chain® GT Carbon™, Mini Poly Chain® GT Carbon™, Polyflex®, Polyflex® JB™, PoweRated®, Micro-V® PK and Predator® (PowerBand®) 8VP belts are not considered to be static conductive.

When a belt is used in a hazardous environment, additional protection must be employed to assure that there are no accidental static spark discharges. The portion of the belt that contacts the sheave or sprocket must be conductive to ensure that static charge is conducted into the drive hardware. V-belts must have a static conductive sidewall in contact with a conductive sheave. Synchronous belts must have a static conductive tooth surface in contact with a conductive sprocket.

Unusual or excessive debris or contaminant on the belt contact surface or sheave or sprocket grooves should be cleaned and removed. Wrapped V-belts (V-belts with a fabric bandply on the driving surface) should be inspected for bandply wear. If the fabric bandply on the belt sidewall has worn away, the belts should be replaced immediately. Raw edge V-belts do not have to be replaced if wear is evident on the belt sidewall. If there are any doubts about the belt's physical condition and its static conductivity characteristics, replace the belt.

Any belt drive system, whether it uses a synchronous belt or V-belt, that operates in a potentially hazardous environment must be properly grounded. A continuous conductive path to ground is necessary to bleed off the static charge. This path includes a static conductive belt, a conductive sheave or sprocket, a conductive bushing, a conductive shaft, conductive bearings, and the ground.

DISCOVER THE ENTIRE PRODUCT RANGE IN
THE GATES INDUSTRIAL POWER TRANSMISSION CATALOGUE
(E2/20211)



DRIVEN BY POSSIBILITY™

PREDATOR®

Wrapped, narrow section/classical section V-belt

	WIDTH mm	HEIGHT mm
SPBP/5VP	16	13
SPCP	22	18
8VP	26	23

QUAD-POWER® 4

EPDM, raw edge, moulded notch, narrow section V-belt

	WIDTH mm	HEIGHT mm
XPZ/3VX	10	8
XPA	13	10
XPB/5VX	16	13
XPC	22	18

SUPER HC® MN

Raw edge, moulded notch, narrow section V-belt

	WIDTH mm	HEIGHT mm
SPZ-MN	10	8
SPA-MN	13	10
SPB-MN	16	13
SPC-MN	22	18

SUPER HC®

Wrapped, narrow section V-belt

	WIDTH mm	HEIGHT mm
SPZ/3V	10	8
SPA	13	10
SPB/5V	16	13
SPC	22	18
8V	26	23

TRI-POWER®

EPDM, raw edge, moulded notch, classical V-belt

	WIDTH mm	HEIGHT mm
AX	13	8
BX	17	11
CX	22	14

HI-POWER®

Wrapped, classical section V-belt

	WIDTH mm	HEIGHT mm
Z	10	6
A	13	8
B	17	11
C	22	14
D	32	19
E	38	23

DELTA CLASSIC™

Wrapped, classical section V-belt

	WIDTH mm	HEIGHT mm
Z	10	6
A	13	8
B	17	11
C	22	14
D	32	19

DELTA NARROW™

Wrapped, narrow section V-belt

	WIDTH mm	HEIGHT mm
SPZ/3V	10	8
SPA	13	10
SPB/5V	16	13
SPC	22	18

PREDATOR® POWERBAND®

Wrapped, narrow section multiple V-belt

	WIDTH mm	HEIGHT mm	PITCH mm
SPBP	16	13	19.00
SPCP	22	18	25.50
5VP/15JP	16	13	17.50
8VP/25JP	26	23	28.60

QUAD-POWER® 4 POWERBAND®

Raw edge, moulded notch, narrow section multiple V-belt

	WIDTH mm	HEIGHT mm	PITCH mm
XPZ	10	8	12.00
XPA	13	10	15.00
XPB	16	13	19.00
3VX	10	8	10.30
5VX	16	13	17.50

SUPER HC® AND HI-POWER® POWERBAND®

Wrapped, narrow section/classical section multipleV-belt

	WIDTH mm	HEIGHT mm	PITCH mm
SPB	16	13	19.00
SPC	22	18	25.50
3V/9J	10	8	10.30
5V/15J	16	13	17.50
8V/25J	26	23	28.60
B	17	10	19.05
C	22	12	25.40
D	32	19	36.50

HI-POWER® DUBL-V

Wrapped, classical section double sided V-belt

Wrapped, narrow section/classical section multiple V-belt

	WIDTH mm	HEIGHT mm
AA	13	10
BB	17	14
CC	22	18
DD	32	25

POWERATED®

Wrapped, green textile V-belt

	WIDTH mm	HEIGHT mm
3L	3/8	7/32
4L	1/2	5/16
5L	21/32	3/8

POLYFLEX®

Polyurethane V-belt

	WIDTH mm	HEIGHT mm
3M	3	2.28
5M	5	3.30
7M	7	5.33
11M	11	6.85

POLYFLEX® JB™

Polyurethane multiple V-belt

	WIDTH mm	HEIGHT mm	PITCH mm
3M-JB	3	2.28	3.35
5M-JB	5	3.30	5.30
7M-JB	7	5.33	8.50
11M-JB	11	7.06	13.20

MICRO-V®

Multi-ribbed V-belt

	HEIGHT mm	PITCH mm
PJ	3.50	2.34
PK	4.45	3.56
PL	9.50	4.70
PM	16.50	9.40

As described in the ISO standards, nominal dimensions define the pulleys for which these belts are suitable.

They do not represent the exact belt size. These are determined by the belt construction and are Gates proprietary.

POLY CHAIN® CARBON™ VOLT®

Anti-static polyurethane synchronous belt with patented carbon tensile cords and an optimised curvilinear tooth

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
8MGTV	8	5.90	3.40
14MGTV	14	10.20	6.00

POLY CHAIN® CARBON GT

Polyurethane synchronous belt with patented carbon tensile cords

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
5MGT	5	3.81	1.93

POLY CHAIN® GT2

Polyurethane synchronous belt

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
8MGT	8	5.90	3.40
14MGT	14	10.20	6.00

POWERGRIP® GTX

Rubber synchronous belt with high strength glass cord

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
8MX	8	5.6	3.4
14MX	14	10	6

POWERGRIP® GT3

Rubber synchronous belt with optimised GT tooth profile

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
2MGT	2	1.52	0.71
3MGT	3	2.41	1.12
5MGT	5	3.81	1.92
8MGT	8	5.60	3.40
14MGT	14	10.00	6.00

POWERGRIP® HTD®

Rubber synchronous belt with HTD® tooth profile

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
3M	3	2.40	1.20
5M	5	3.80	2.10
8M	8	5.6	3.40
14M	14	10.00	6.10
20M	20	13.20	8.40

POWERGRIP®

Classical synchronous belt

	PITCH Inches	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
MXL	2/25 (0.080")	2.032	1.14	0.51
XL	1/5 (0.200")	5.08	2.30	1.27
L	3/8 (0.375")	9.525	3.50	1.91
H	1/2 (0.500")	12.7	4.00	2.29
XH	7/8 (0.875")	22.225	11.40	6.36
XXH	1 1/4 (1.250")	31.75	15.20	9.53

TWIN POWER®

Double-sided synchronous belt

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
PowerGrip® GT2			
8MGT	8	8.80	3.40
14MGT	14	14.42	5.82
PowerGrip® HTD®			
5M	5	5.70	2.10
PowerGrip® CTB			
XL	1/5 inch	3.05	1.27
L	3/8 inch	4.58	1.91
H	1/2 inch	5.95	2.29

LONG LENGTH

Open-end synchronous belt

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
Poly Chain® GT Carbon™			
8MGT	8	5.90	3.40
14MGT	14	10.20	6.00
PowerGrip® GT			
2MR	2	1.52	0.71
3MR	3	2.41	1.12
5MR	5	3.81	1.92
8MR	8	5.60	3.34
PowerGrip® HTD®			
3M	3	2.40	1.10
5M	5	3.80	2.10
8M	8	6.00	3.40
14M	14	10.00	6.00
PowerGrip® CTB			
MXL	2.032	1.14	0.51
XL	5.08	2.30	1.27
L	9.525	3.60	1.91
H	12.7	4.30	2.29

SYNCHRO-POWER®

Open-end/endless polyurethane synchronous belt

T SERIES

Standard synchronous belts for conveying and moderate power transmission applications

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
T2.5	2.5	1.30	0.70
T5	5	2.20	1.20
T10	10	4.50	2.50
T20	20	8.00	5.00
DL-T5	5	3.30	1.20
DL-T10	10	6.80	2.50

AT SERIES

High strength synchronous belts for power transmission and high accuracy positioning applications

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
AT5	5	2.70	1.20
AT10	10	4.50	2.50
AT20	20	8.00	5.00

ATL SERIES

Special linear drive belts with extra reinforced steel tensile cords designed for the highest strength and accuracy

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
ATL5	5	2.70	1.20
ATL10	10	4.80	2.50
ATL20	20	8.00	5.00

TRAPEZOIDAL SERIES

Standard synchronous belts with trapezoidal tooth profile for driving and conveying applications

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
XL	5.08	2.29	1.27
L	9.525	3.56	1.90
H	12.7	4.06	2.29
XH	22.225	11.18	6.35

HTD® SERIES

HTD® belts with curvilinear tooth profile with the benefits of advanced polyurethane and steel tensile cords

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
HTD 5M	5	3.60	2.10
HTD 8M	8	5.60	3.40
HTD 14M	14	10.00	6.00

STD SERIES

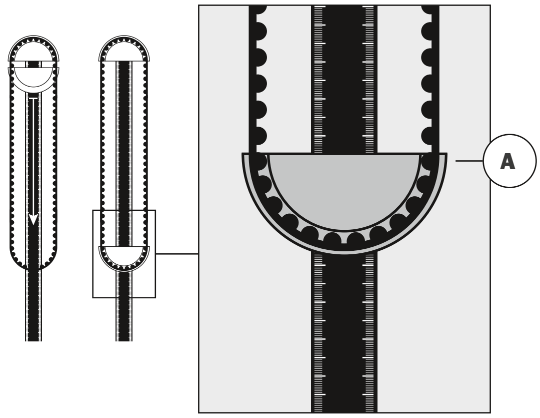
High strength open-end belts with the benefits of advanced polyurethane and steel tensile cords

	PITCH mm	TOTAL HEIGHT mm	TOOTH HEIGHT mm
STD 5M	5	3.30	1.90
STD 8M	8	5.10	3.00

BLACK FLAT SERIES

Polyurethane flat belt with steel reinforcement for conveying applications

	TOTAL HEIGHT mm
BFL20	2.00
BFL32	3.20
BFL38	3.80
BFL48	4.80



MEASURING RANGE

The length measuring instrument can be used for V-belts, Micro-V®-belts and timing belts. The inside length (Li) of the belt is to be measured each time (profile side inwards). Using the Length Conversion Table (page 23), the nominal length of the belt can be calculated from the measured inside length. The measuring range is from 600 to 4100 mm inside length.

MEASURING ACCURACY

The measured inside length only gives an indication of the length. The measurement is not suitable for precision length definition nor for length tolerance definition.

MEASURING PROCESS

A driving belt, which is to be measured, must be laid on the fixed metal dish and the movable part is to be moved until both belt stands are stretched. While doing this, the profile side of the belt must lie inwards (or side with the belt marking lays outwards). The inside length of the belt is to be read from the scale on the straight edge of the movable semicircle (**Point A**).

Profile	Dimension (width x height)	Standard	Length Definition	Pitch Width (mm)	Outside length La	Datum length Ld
Predator®						
SPBP	16 x 13	ISO	Datum Length, Ld	14	La ~ Ld + 22	Ld ~ Li + 60
SPCP	22 x 18			19	La ~ Ld + 30	Ld ~ Li + 83
Quad-Power® 4						
XPZ	10 x 8	ISO	Datum Length, Ld	8.5	La ~ Ld + 10	Ld ~ Li + 38
XPA	13 x 10			11	La ~ Ld + 15	Ld ~ Li + 45
XPB	16 x 13			14	La ~ Ld + 18	Ld ~ Li + 60
XPC	22 x 18			19	La ~ Ld + 30	Ld ~ Li + 83
Super HC® MN						
3VX	10 x 8	RMA	Effective Length, EL	-	EL	Li + 50
5VX	16 x 13				EL	Li + 80
Super HC® / Super HC® MN						
SPZ	10 x 8	ISO	Datum Length, Ld	8.5	La ~ Ld + 13	Ld ~ Li + 38
SPZ-MN					La ~ Ld + 10	Ld ~ Li + 38
SPA	13 x 10			11	La ~ Ld + 18	Ld ~ Li + 45
SPA-MN					La ~ Ld + 15	Ld ~ Li + 45
SPB	16 x 13			14	La ~ Ld + 22	Ld ~ Li + 60
SPB-MN					La ~ Ld + 18	Ld ~ Li + 60
SPC	22 x 18			19	La ~ Ld + 30	Ld ~ Li + 83
SPC-MN					La ~ Ld + 25	Ld ~ Li + 83
Super HC® / Delta Narrow™						
3V	10 x 8	RMA	Effective Length, EL	-	EL	Li + 50
5V	16 x 13				EL	Li + 80
8V	26 x 23				EL	Li + 145

Profile	Dimension (width x height)	Standard	Length Definition	Pitch Width (mm)	Outside length La	Datum length Ld
Tri-Power®						
AX	13 x 8	RMA	Effective Length, EL	-	La ~ Ld + 15	Ld ~ Li + 30
BX	17 x 11				La ~ Ld + 24	Ld ~ Li + 40
CX	22 x 14				La ~ Ld + 34	Ld ~ Li + 58
Hi-Power® / Delta Classic™						
Z	10 x 6	ISO	Datum Length, Ld	8.5	La ~ Ld + 19	Ld ~ Li + 22
10 mm		DIN	Inside Length, Li		La ~ Li + 40	Ld ~ Li + 22
A	13 x 8	ISO	Datum Length, Ld	11	La ~ Ld + 23	Ld ~ Li + 30
13 mm		DIN	Inside Length, Li		La ~ Li + 53	Ld ~ Li + 30
B	17 x 11	ISO	Datum Length, Ld	14	La ~ Ld + 32	Ld ~ Li + 40
17 mm		DIN	Inside Length, Li		La ~ Li + 70	Ld ~ Li + 40
C	22 x 14	ISO	Datum Length, Ld	19	La ~ Ld + 42	Ld ~ Li + 58
22 mm		DIN	Inside Length, Li		La ~ Li + 90	Ld ~ Li + 58
D	32 x 19	ISO	Datum Length, Ld	27	La ~ Ld + 59	Ld ~ Li + 75
32 mm		DIN	Inside Length, Li		La ~ Li + 120	Ld ~ Li + 58
Predator® PowerBand®						
SPBP-PB	16 x 15	ISO	Datum Length, Ld	14	La ~ Ld + 38	Ld ~ Li + 60
SPCP-PB	22 x 20			19	La ~ Ld + 46	Ld ~ Li + 83
Predator® PowerBand®						
5VP-PB	16 x 15	RMA	Effective length, EL	15.24	EL + 31	Ld ~ Li + 70
15JP		ISO			EL + 31	Ld ~ Li + 70
8VP-PB	26 x 26	RMA		25.4	EL + 38	Ld ~ Li + 125
25JP		ISO			EL + 38	Ld ~ Li + 125
Quad-Power® 4 PowerBand®						
XPZ-PB	10 x 8	ISO	Datum Length, Ld	8.5	La ~ Ld + 31	Ld ~ Li + 38
XPA-PB	13 x 10			11	La ~ Ld + 39	Ld ~ Li + 45
XPB-PB	16 x 13			14	La ~ Ld + 42	Ld ~ Li + 60
Super HC® MN PowerBand®						
3VX-PB	10 x 10	RMA	Effective Length, EL	8.89	EL + 16	Ld ~ Li + 45
5VX-PB	16 x 15			15.24	EL + 26	Ld ~ Li + 70
Super HC® PowerBand®						
SPB-PB	16 x 15	ISO	Datum Length, Ld	14	La ~ Ld + 38	Ld ~ Li + 60
SPC-PB	22 x 20			19	La ~ Ld + 46	Ld ~ Li + 83
Super HC® PowerBand®						
3V-PB	10 x 10	RMA	Effective Length, EL	8.89	EL + 20	Ld ~ Li + 45
9J		ISO			EL + 20	Ld ~ Li + 45
5V-PB	16 x 15	RMA		15.24	EL + 31	Ld ~ Li + 70
15J		ISO			EL + 31	Ld ~ Li + 70
8V-PB	26 x 26	RMA		25.4	EL + 38	Ld ~ Li + 125
25J		ISO			EL + 38	Ld ~ Li + 125
Hi-Power® PowerBand®						
B	17 x 11	RMA	Inside Length, Li	-	La ~ Ld + 32	Ld ~ Li + 40
C	22 x 14				La ~ Ld + 42	Ld ~ Li + 58
D	32 x 19				La ~ Ld + 59	Ld ~ Li + 75

At times, premature belt failure can be traced to improper belt storage that damaged the belt before it was installed on the drive. Therefore, good preventive maintenance should not be limited to the actual belt drive operating on equipment, but should also include proper storage procedures.

Good quality belts retain their initial serviceability and dimensions under favourable storage conditions. On the other hand, unfavourable conditions can adversely affect performance and cause dimensional changes. By following a few common sense steps, good quality belts will retain their initial serviceability.

RECOMMENDED

- Store your belts in a cool and dry environment (5°C to 30°C and Relative Humidity <70%) and not in direct sunlight.
- When stacked on shelves, the stacks should be small enough to prevent distortion of the bottom belts.
- When stored in containers, the container size should be sufficiently limited for the same reason.

NOT RECOMMENDED

- Do not store belts on floors unless a suitable container is provided. They may be exposed to water leaks or moisture or be damaged due to traffic.
- Do not store belts near windows (sunlight / moisture).
- Do not store belts near radiators or heaters or in the air flow from heating devices.
- Do not store belts in the vicinity of transformers, electric motors, or other electric devices that may generate ozone.
- Avoid areas where evaporating solvents or other chemicals are present in the atmosphere.
- Do not store belts in a configuration that would result in bend diameters less than the minimum recommended pulley diameter for normal bends and less than 1.2 times the minimum recommended diameters for reverse bends (**see page 70 for minimum recommended diameters**).

Storage procedures are different depending on the belt type. Below suggestions will help you retain serviceability and dimensions for all belt types.

V-BELTS

V-belts are often stored on pegs. Very long belts should be stored on sufficiently large pins (of not less than the minimum bend diameter (**see page 70**), or crescent-shaped “saddles”, to prevent their weight from causing distortion. Long V-belts may be coiled in loops for easy distortion-free storage.

JOINED V-BELTS AND MULTI-RIBBED BELTS

Like V-belts, these belts may be stored on pins or saddles with precaution to avoid distortion. However, belts of this type up to approx. 3000 mm are normally shipped in a “nested” configuration, and it is necessary that especially joined V-belts be stored in a naturally relaxed form, and only nested or rolled up for transportation.

SYNCHRONOUS BELTS

For synchronous belts, nests are formed by laying a belt on its side on a flat surface and placing as many belts inside the first belt as possible without undue force, providing the belt bend radius is no smaller than the minimum recommended pulley size for that belt (**see page 72**). When tight, the nests can be stacked on a flat shelf, up to 8 nests high, without damage. Belts over approx. 3000 mm may be “rolled up” and tied for shipment, providing and bend radius is no smaller than the minimum recommended pulley for that belt. These rolls may be stacked for easy storage. Avoid small bend radii by inserting card tubes, the size of minimum bend radius for the belt, at the point where the bend is in the belt.

VARIABLE SPEED BELTS

These belts are more sensitive to distortion than most other belts. Hanging them from pins or racks is not recommended. These belts should be stored on shelves. Variable speed belts are often shipped in “sleeves” slipped over the belt. They should be stored on shelves in these sleeves. If they are shipped “nested”, untie the nests and store them in a relaxed position.

The quality of belts has not been found to change significantly within 7 years of proper storage at temperatures up to 30°C (86°F) and relative humidity below 70%. Also there must be no exposure to direct sunlight. Ideal storage conditions are between 5°C (41°F) and 30°C (86°F).

If storage temperature exceeds 30°C (86°F), the storage time will be reduced and belt service levels could also be significantly reduced. Under no circumstances should storage temperatures be allowed to exceed 46°C (115°F).

If there is a significant increase in humidity levels, it is possible for fungus or mildew to form on stored belts. This does not appear to cause serious belt damage but should be avoided if possible.

For equipment fitted with a belt drive that is left idle for long periods, i.e. 6 months or more, it is recommended that the tension on the belts is relaxed during such periods. Equipment storage conditions should be consistent with the guidelines for belt storage. If this is impossible, remove the belts and store them separately.

Belt cross section	Belt length (mm)	Coils	Loops
Z, A, B; SPZ/3V; XPZ/3VX; XPA; AX; AA; 3L, 4L, 5L	<1500	0	1
	1500-3000	1	3
	3000-4600	2	5
	>4600	3	7
C; SPB/5V; SPC; XPB/5VX; CX; BB	<1900	0	1
	1900-3700	1	3
	3700-6000	2	5
	>6000	3	7
D; CC	<3000	0	1
	3000-6100	1	3
	6100-8400	2	5
	8400-10 600	3	7
	>10 600	4	9
8V	<4600	0	1
	4600-6900	1	3
	6900-9900	2	5
	9900-12 200	3	7
	>12 200	4	9

V-belt drives run longer and perform better if they are given the proper care and attention during installation, and in particular, during the following 24-hour running-in period. This is a most critical time for V-belts. The best practices provided here give you a standardised procedure for correctly installing a V-belt. This procedure provides general guidelines and is intended to support any technical literature that may have been supplied by the equipment manufacturer.

STEP 1 - SECURE THE DRIVE

After the power has been turned off, then remove the guard, isolate the drive (Lock Out / Tag Out), loosen the motor mounting bolts. Move the motor until the belt is slack and it can be removed without prising. Never prise off a belt!

STEP 2 - REMOVE OLD BELTS

Check them for unusual wear. Excessive wear may indicate problems with drive design or maintenance procedures.

STEP 3 - SELECT CORRECT REPLACEMENT BELT

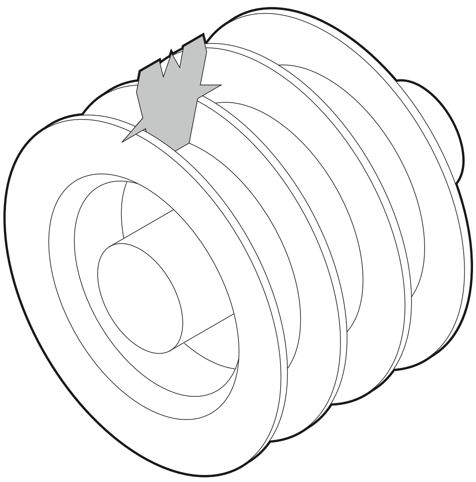
Refer to the belt identification section (**see page 19**) for belt selection information.

STEP 4 - CLEAN THE PULLEYS

Use a rag slightly dampened with a light, non-volatile solvent. Avoid soaking or brushing the solvent on the belt. Do not sand or scrape the pulley with a sharp object to remove grease or debris. Pulleys must be dry before using on a drive.

STEP 5 - INSPECT PULLEYS FOR WEAR AND DAMAGE

Gates sheave gauges* make it easy to see if grooves are worn. If more than 0.4 mm of wear can be seen, the pulley should be replaced. Make sure the pulleys are properly aligned.



(*available from Gates - page 49)

STEP 6 - INSPECT OTHER DRIVE COMPONENTS

Always examine other drive components such as bearings and shafts for alignment, wear, lubrication,...

STEP 7 - INSTALL A NEW BELT OR BELT SET

Replace all belts on multiple belt drives. Never mix old and new belts. Older belts do not retain tension as well as new belts. If you mix belts, the load may be carried only by the new belts. This can result in premature failure. Also, never mix belts from different manufacturers. Belts with different origins may have different characteristics that can cause the belts to work against each other, resulting in unusual strain and short service life.

STEP 8 - CHECK BELT TENSION

Take up centre distance on the drive until belt tension obtained on the tension tester being used (*) is at the specified tension value for the belts. Rotate the drive for a few revolutions to bed the belts into the pulleys and recheck tension. Some long belts may appear to hang unevenly when installed. It is normal for belts within match tolerances to create noticeable differences in deflection. This “catenary effect” is a curve made by a cord of uniform weight suspended between two points. This appearance will change with proper run-in and tensioning.

(* available from Gates - page 86)

STEP 9 - SECURE MOTOR MOUNTING BOLTS TO CORRECT TORQUE AND RECHECK BELT TENSION

STEP 10 - REPLACE GUARD

STEP 11 - RUN-IN PERIOD

Let the belts run in for a while. This process consists of starting the drive, letting it run under full load, and then stopping, checking and retensioning to recommended values. Running the belts under full load allows them to seat themselves in the grooves.

If possible, let the drive run for about 24 hours. Even letting them run overnight, or over a lunch break, is better than nothing. This run-in period will reduce the future need for retensioning. Gates premium V-belts Quad-Power® 4 and Predator®, when correctly installed to the specified Gates tension, do not require a run in period.

STEP 12 -START-UP

During start-up, look and listen for unusual noise or vibration. It is a good idea to shut down the machine and check the bearings and motor. If they measure higher temperatures, the belt tension may be too tight. Or the bearing may be misaligned or improperly lubricated.

Synchronous belt drives provide many maintenance advantages that help in your daily struggle to reduce equipment repairs and hold downtime to the lowest possible level if they are given the proper care and attention during installation.

The best practices provided here give you a standardised procedure for correctly installing a synchronous belt. This procedure provides general guidelines and is intended to support any technical literature that may have been supplied by the equipment manufacturer.

STEP 1 - SECURE THE DRIVE

After the power has been turned off, drive isolated (Lock Out / Tag Out), and the guard removed, loosen the motor mounting bolts. Move the motor until the belt is slack and it can be removed without prising. Never prise off a belt!

STEP 2 - REMOVE OLD BELT

Check it for unusual wear. Excessive wear may indicate problems with drive design or maintenance procedures.

STEP 3 - SELECT CORRECT REPLACEMENT BELT

Refer to the belt identification section (**see page 19**) for belt selection information.

STEP 4 - CLEAN THE PULLEYS

Pulleys can be cleaned with a rag slightly dampened with a light, non-volatile solvent. Do not sand or scrape the pulley with a sharp object to remove grease or debris. Pulleys must be dry before using on a drive.

STEP 5 - INSPECT PULLEYS

Perform a visual inspection of the pulleys for unusual or excessive wear. In addition, always check pulley alignment - correct alignment is more critical with synchronous belt drives.

STEP 6 - INSPECT OTHER DRIVE COMPONENTS

Always examine other drive components such as bearings and shafts for alignment, wear and lubrication.

STEP 7 - INSTALL NEW BELT OVER PULLEYS

Never prise belts onto pulleys or use excessive force during belt installation.

STEP 8 - CHECK BELT TENSION

Take up centre distance on the drive until belt tension obtained on the tension tester being used (*) is at the specified tension value for the belt. Rotate the drives for a few revolutions and recheck tension. As the drive is rotating, check the belt tracking. The belt must not track over the edge of unflanged pulleys or run hard against the inside edge of flanged pulleys, and if either of these two scenarios occur the drive alignment must be improved so the rotating belt remains on the pulleys. If the drive alignment need readjusting, the belt tension must be rechecked.

(*) available from Gates - page 86)

STEP 9 - SECURE MOTOR MOUNTING BOLTS TO CORRECT TORQUE AND RECHECK BELT TENSION

Be sure all drive components are secure since any change in drive centres during operation will result in poor belt performance.

STEP 10 - START-UP

Although synchronous belts will not require further tensioning, we recommend starting up the drive and observing performance. Look and listen for any unusual noise or vibration and if either is present, shut down the drive and investigate potential causes.

Improper belt tension, either too low or too high, can cause belt drive problems. If V-belts are under-tensioned, they can slip. Slippage generates heat and will result in cracking and belt failure. If synchronous belts are under tensioned, they can jump teeth resulting in loss of synchronisation. For both types of belts, a tension that is set too high will shorten belt life due to overstretching of the tensile member and accelerated belt wear. Therefore, the correct tension of a belt in a drive is critical – whether it's a V-belt or a synchronous belt.

TOOLS TO HELP YOU CHECK BELT TENSION

Ensuring correct belt tension may seem a difficult task but in fact the opposite is true. Gates offers easy to use tools to facilitate tension measurement: Sonic Tension Meter Model 508C and Gates conventional force / deflection tension testers.

Sonic Tension Meter Model 508C - page 86

Single barrel/Double barrel Tension Tester - page 86

Sonic Tension Meter Model 508C

Double barrel Tension Tester

The Gates Sonic Tension Meter can be used with all Gates belts. The Sonic Tension Meter measures the vibration in the belt span, and converts that measurement into a reading of the actual static tension in the belt. The hand-held tension meter, running on batteries, is supplied with flexible sensor which is quickly attached.

Sonic Tension Meter Model 508C - page 86

Important note: when using the Sonic Tension Meter Model 508C, the drive must be switched off. The Gates Sonic Tension meter is not certified for use in explosion risk areas.

STEP 1 - ENTER DATA

Enter belt unit weight (provided with operating instructions), belt width for synchronous belts or number of ribs or strands for V-belts and belt span (provided by Gates software) on keypad. This data remains in the meter even after shut-off.

STEP 2 - POSITION MICROPHONE END

Hold the microphone end of the flexible sensor about 10mm above the belt span, press the “Measure” button, and strum the belt lightly to make it vibrate.

STEP 3 – DETERMINE STATIC TENSION

The computer processes the variations in sound pressure emanating from the belt span. The belt tension values are displayed on the panel in Newtons. If desired, the belt span frequencies can be displayed directly in Hz.

STEP 4 - CHECK RECOMMENDED TENSION

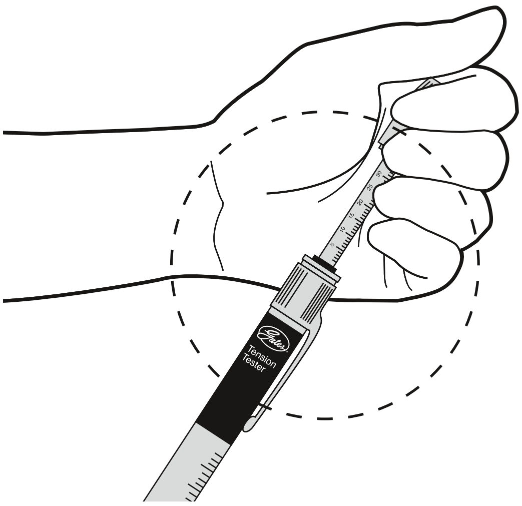
Since the span vibration method is intended to be a very accurate method of measuring actual tension in a belt, it is important that the proper recommended tension is calculated for the specific belt drive. To determine the belt tension recommended for specific drive applications, download the Gates belt drive selection program DesignFlex® Pro™ at **www.gates.com/drivedesign**. Alternatively, Gates Power Transmission Product Application engineers can be contacted at **pteusupport@gates.com** or the local application engineer to answer additional belt tensioning questions.

The force deflection tension method does not directly measure belt span tension or static tension. The deflection force is a calculated value that is based on the amount of static tension required in the belt. Static tension is the tension force that is actually in the belt, while deflection force is simply a measurement to check how much static tension is in the belt.

The tension testers used for the force deflection tension method are available in one or two barrel configurations. The one barrel tension tester can measure up to ± 120 N / 15 kg (30 lb.) of force; the two barrel tension tester can measure up to ± 300 N / 30 kg (66 lb.) of force. Add the force readings from each barrel to determine the total force being measured.

Single barrel/Double barrel Tension Tester - page 86

STEP 1 - POSITION THE LOWER OF THE TWO O-RINGS TO THE DEFLECTION DISTANCE GIVEN BY GATES SOFTWARE FOR TENSION SETTINGS FOR THE BELT BEING CHECKED.



STEP 2 - DEFLECT THE BELT

Put the Gates tension tester perpendicular to the span and in the centre of the belt span. If the belt is a wide synchronous belt or a PowerBand® belt, place a piece of steel or angle iron across the belt width and deflect the entire width of the belt evenly.

Exercise enough pressure to the tension tester to deflect the belt until the bottom edge of the lower O-Ring is at the correct deflection distance. If multiple individual V-belts are used on the drive, the deflection distance can be measured against an adjacent belt. For drives with only one belt, use a straightedge or string pulled tight across the sheaves, sprockets, or top of the belt to establish a reference line.

When the belt is deflected, determine the deflection distance by measuring from the belt to the straight edge or string reference line.

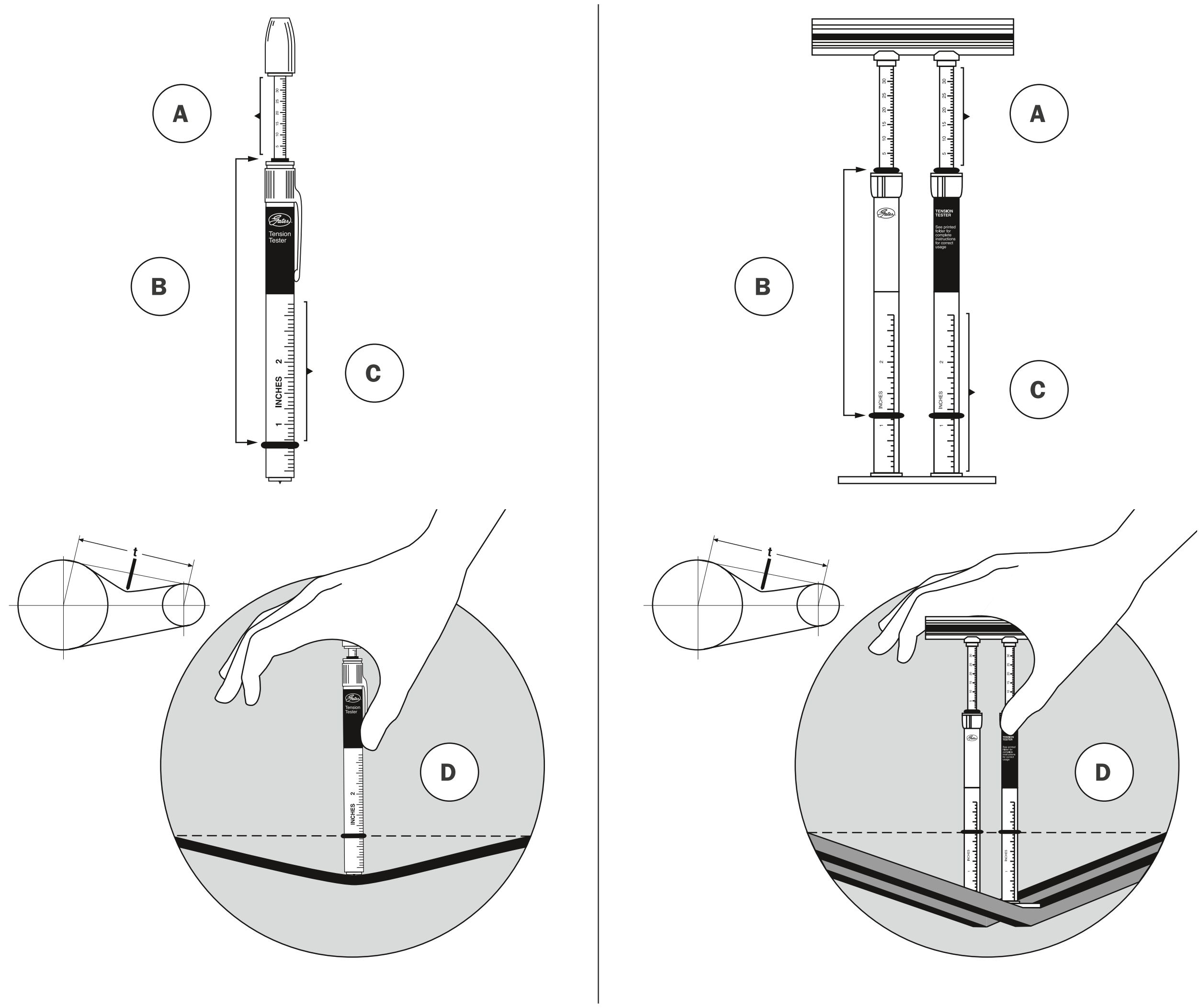
STEP 3 - DETERMINE DEFLECTION FORCE

Find the amount of deflection force on the upper scale of the tension tester. The sliding rubber O-ring slides up the scale as the tool compresses and stays up for a reading of the deflection force. Read at the bottom edge of the ring. Remember to slide the O-ring down before using again. When you use the double tension tester you can read the values just underneath the rings and calculate the sum of both values.

STEP 4 - CHECK MIN./MAX. TENSION FORCES

Installation tension forces should ideally be calculated for each specific drive. The tension calculations are included, in the Gates drive design and selection computer program, Design Flex® Pro™ which can be used to quickly calculate the proper installation tensions. Design Flex® Pro™ and Design Flex Web® are available at **www.gates.com/drivedesign**.

Compare the deflection force with the range of forces recommended. If less than the minimum recommended deflection force, the belts are too loose and should be tightened. If more than the maximum recommended deflection force, the belts are too tight and should be loosened.



A. Deflection force scale

B. Sliding rubber “O” rings

C. Deflection distance scale (read up)

D. Read just underneath the ring. Before using the tension tester again, slide the ring downwards again

When the cross-section and number of individual belts become so large that tensioning by deflection cannot reasonably be done, another method will be used.

This alternative method of checking PowerBand® tension is the elongation method. The principle is simple. Each tension value corresponds with a given amount of elongation. Therefore the elongation of a PowerBand® as it is installed and tensioned on a drive is a measure of the static tension in the belt.

Determine the amount to elongate the belt (on the drive) to obtain the tension.

Important note: if you are retensioning a used drive, slack off on the drive until there is no tension, then tape the outside circumference of the belt while it is still on the drive.

STEP 1 - MEASURE THE BELT

Measure the outside circumference of the belt at no tension. This can be done with the belt either on or off the drive.

STEP 2 - DETERMINE BELT LENGTH MULTIPLIER

Determine the correct belt length multiplier from the table below for each of the static tensions you calculated.

STEP 3 - CALCULATE ELONGATED OUTSIDE CIRCUMFERENCE

Multiply the taped outside circumference of the PowerBand® by each of the length multipliers. This gives the elongated outside circumference of the PowerBand® corresponding to each of the calculated tensions.

Minimum tension = Ts

Maximum tension = 1.5 x Ts

Section	Type	Modulus lb/in/in
Predator® SPBP	PowerBand®	75 000
Predator® SPCP	PowerBand®	150 000

Ts (N)	SPBP / 5VP	Predator® SPCP
300	1.000899	1.000450
350	1.001049	1.000524554
400	1.001199	1.00059949
450	1.001349	1.000674427
500	1.001499	1.000749363
550	1.001649	1.000824299
600	1.001798	1.000899236
650	1.001948	1.000974172
700	1.002098	1.001049108
750	1.002248	1.001124045
800	1.002398	1.001198981
900	1.002698	1.001348854
1000	1.002997	1.001498726
1200	1.003597	1.001798471

Ts (N)	SPBP / 5VP	Predator® SPCP
1400	1.004196	1.002098217
1600	1.004796	1.002397962
1800	1.005395	1.002697707
2000	1.005995	1.002997452
2250	1.006744	1.003372134
2500	1.007494	1.003746815
2750	1.008243	1.004121497
3000	1.008992	1.004496178
3250	1.009742	1.00487086
3500	1.010491	1.005245542
3750	1.011240	1.005620
4000	1.011990	1.005994905
4250	1.012739	1.006370
4500	1.013489	1.006744268
4750	1.014238	1.007118949
5000	1.014987	1.007493631
5250	1.015737	1.007868312
5500	1.016486	1.008242994
6000	1.017985	1.008992357

BELT LENGTH MULTIPLIERS FOR POWERBAND®

Ts (N)	3V / 9J	SPB / 5V (15J)	SPC	8V (25J)	3VX	5VX	A	B		C		D
								< 3250	> 3250	< 3250	> 3250	
300	1.00821				1.00613							
350	1.00957				1.00715							
400	1.01094				1.00817							
450	1.01231	1.00532			1.00919	1.00337	1.00481					
500	1.01367	1.00591			1.01021	1.00374	1.00535					
550	1.01504	1.00650			1.01124	1.00412	1.00588					
600	1.01641	1.00709	1.00481		1.01226	1.00449	1.00642	1.00562	1.00674			
650	1.01778	1.00769	1.00515		1.01328	1.00487	1.00695	1.00608	1.00730			
700	1.01915	1.00828	1.00549	1.00449	1.01430	1.00524	1.00749	1.00655	1.00786	1.00393	1.00524	
750	1.02051	1.00887	1.00584	1.00481	1.01532	1.00561	1.00802	1.00702	1.00843	1.00421	1.00561	
800	1.02188	1.00946	1.00618	1.00513	1.01634	1.00599	1.00856	1.00749	1.00899	1.00449	1.00599	1.00310
900	1.02462	1.01064	1.00686	1.00578	1.01839	1.00674	1.00963	1.00843	1.01011	1.00505	1.00674	1.00348
1000	1.02735	1.01183	1.00754	1.00642	1.02043	1.00749	1.01070	1.00936	1.01124	1.00562	1.00749	1.00387
1200		1.01419	1.00891	1.00770		1.00899	1.01284	1.01124	1.01348	1.00674	1.00899	1.00465
1400		1.01656	1.01028	1.00899		1.01049	1.01498	1.01311	1.01573	1.00786	1.01049	1.00542
1600		1.01893	1.01164	1.01027		1.01198		1.01498	1.01798	1.00899	1.01198	1.00620
1800		1.02129	1.01301	1.01156		1.01348		1.01686	1.02023	1.01011	1.01348	1.00697
2000		1.02366	1.01438	1.01284		1.01498		1.01873	1.02248	1.01124	1.01498	1.00775
2250		1.02662	1.01608	1.01445		1.01685		1.02107	1.02529	1.01264	1.01685	1.00872
2500		1.02957	1.01779	1.01605		1.01873		1.02341	1.02810	1.01405	1.01873	1.00968
2750			1.01950	1.01766						1.01545	1.02060	1.01065
3000			1.02121	1.01926						1.01686	1.02247	1.01162
3250			1.02292	1.02087						1.01826	1.02435	1.01259
3500			1.02462	1.02247						1.01967	1.02622	1.01356
3750			1.02633	1.02408						1.02107	1.02809	1.01453
4000			1.02804	1.02569						1.02248	1.02997	1.01550
4250			1.02975	1.02729						1.02388	1.03184	1.01647
4500			1.03146	1.02890						1.02529	1.03371	1.01744
4750			1.03316	1.03050						1.02669	1.03559	1.01840
5000			1.03487	1.03211						1.02810	1.03746	1.01937
5250				1.03371								1.02034
5500				1.03532								1.02131
6000				1.03853								1.02325

It is extremely important that pulleys are installed and aligned properly. Any pulley must be correctly assembled, and bolts or setscrews tightened to the correct torque.

Most pulleys are attached to the shaft with a tapered bushing which fits a mating tapered bore in the pulley. This type of system consists of a bushing, a pulley and often a setscrew and key. Bushings come in several diameters. This allows a reduction in the parts inventory required in your plant because one bushing can be used with a number of different size pulleys.

TAPER BUSHES

To install, insert the bushing into the pulley. Match holes (not threads) and slip the entire unit onto the shaft. Put screws into the holes that are threaded in the pulley only. Align the pulleys and tighten the screws. As the bushing is wedged inward, it contacts and grips the shaft.

Bushing no.	Screw tightening torque (Nm)
1008	5.6
1108	5.6
1210	20.0
1215	20.0
1310	20.0
1610	20.0
1615	20
2012	30
2517	50.0
2525	50
3020	90.0
3030	90
3525	115.0
3535	115
4030	170.0
4040	170.0
4535	190.0
4545	190.0
5040	270.0
5050	270.0

PULLEY ALIGNMENT

Noise, wear on pulleys, belts and bearings, vibrations and in the end ... machine downtime may all be caused by pulley misalignment. Properly aligned pulleys have a lot of advantages:

- Lower energy consumption
- Less wear and tear on pulleys, belts and bearings
- Less noise and vibrations
- Increased belt, pulley and bearing life
- Higher reliability of the entire belt drive

Therefore, correct pulley alignment is a major element of belt drive installation and preventive maintenance. As a general rule, the deviation on pulley alignment on V-belt drives should not exceed 1/2° or 5 mm per 500 mm of drive centre distance. Alignment for synchronous, Polyflex® and Micro-V® belts should be controlled within 1/4° or 2.5 mm per 500 mm of drive centre distance.

The greater the misalignment is; the greater the chance of belt instability, increased belt wear and the greater risk of V-belt turnover.

Max deviation of pulley alignment	Per 500 mm of drive centre distance	
	(°)	(mm)
V-belts	1/2	5
Polyflex®	1/4	2.5
Micro-V®	1/4	2.5
Synchronous belts	1/4	2.5

The maximum deviation values given are the total allowable for both angular and parrallel misalignment.

If a pulley shows obvious signs of wear or damage, it will need to be replaced.

LASER AT-1 laser alignment device - page 87

To provide proper maintenance, you need to understand the nature of the belt drives in your plant. You may know the capabilities and limitations of your equipment, but are you aware of how your belt drive contributes to these performance levels?

Sometimes it is necessary to give some thought to belt service life. When belt life is below the expected performance level, for example, the situation must be improved. Belt service life might be meeting expectations, but you may be looking for opportunities to reduce existing maintenance and downtime, and this can be achieved by upgraded existing belt drives.

The first step to upgrading a belt drive is to see if simple improvements can be made at minimal costs. This involves checking the drive design for adequate capacity.

Here are examples of minor changes that could improve performance:

- Correct belt tension;
- Increase pulley diameters;
- Increase the number of belts, or use wider belt;
- Add vibration dampening to the system;
- Improve guard ventilation to reduce operating temperature;
- Make sure pulley and back idler diameters are above the minimum recommended diameters;
- Use premium belts rather than general purpose types;
- Replace worn pulleys;
- Keep pulleys properly aligned;
- Always place idler on span with lowest tension, also known as the “slack side” when the drive is running;
- Retension newly installed standard friction belts after a 24 hour run-in period;
- Review proper belt installation and maintenance procedures.

If further improvement is needed, the next step is to upgrade the drive to a higher performance belt system. Your local Gates distributor or representative can help you upgrade your existing drives in order to reduce your maintenance and downtime costs.

You may have a problem or excessive maintenance costs with a non-belt drive, such as a gear or chain drive. Your local Gates representative can offer you excellent advice as to whether or not a belt drive could solve the problem and reduce your maintenance costs.

If your belt drive is correctly designed, installed and maintained it will need very little attention. Occasionally, however, a drive may be accidentally damaged or knocked, which can alter the drive set up. Changing operating requirements or environmental conditions can also create problems. The troubleshooting guide on page 47 is designed to help you identify and correct poor drive performance problems.

All types of drives generate noise while transmitting power and each type of system has its own characteristic sound. Synchronous belt drives are much quieter than roller chain drives and V-belt drives tend to be the quietest belt drives. When noise is an issue, there are several design and maintenance tips that should be followed to achieve the quietest possible belt drive.

NOISE: DECIBEL AND FREQUENCY

- Noise is an unwanted or unpleasant sound that can be described with two criteria - frequency and decibel (dBA) levels. Frequency is measured in Hertz. The human ear is capable of distinguishing frequencies typically from 20 to 20,000 Hertz. The human ear generally does not perceive frequencies higher than 20,000 Hertz.
- The noise level or intensity of noise is measured in terms of decibels (dBA). The decibel has become the basic unit of measure since it is an objective measurement that approximately corresponds to the subjective measurement made by the human ear. Since sound is composed of several distinct and measurable parts and the human ear doesn't differentiate between these parts, measuring scales that approximate the human ear's reaction have been adopted. Three scales - A, B, and C are used to duplicate the ear's response over the scale's ranges. The A scale is most commonly used in industry because of its adoption as the standard in OSHA regulations.
- Noise described in decibels (dBA) is generally perceived as the loudness or intensity of the noise.
- While the human ear can distinguish frequencies from 20 to 20,000 Hertz, the ear is most sensitive in the range of normal speech - 500 to 2000 Hertz. As a consequence, this range is the most common concern for noise control. Frequency is most closely related to what the ear hears as pitch. High frequency sounds are perceived as whining or piercing, while low frequency sounds are perceived as rumbling.
- The combination of decibel and frequency describes the overall level of loudness to the human ear. One without the other does not adequately describe the loudness potential of the noise. For example, an 85 dBA noise at 3000 Hertz is going to be perceived as much louder than an 85 dBA noise at 500 Hertz.

For comparison, some typical noise levels and their sources are listed below.

Normal Speech	60 dBA
Busy Office	80 dBA
Textile Weaving Plant	90 dBA
Canning Plant	100 dBA
Heavy City Traffic	100 dBA
Punch Press	110 dBA
Air Raid Siren	130 dBA
Jet Engine	160 dBA

REDUCING NOISE

- Following proper installation and maintenance procedures, as well as some simple design alternatives can reduce belt drive noise.

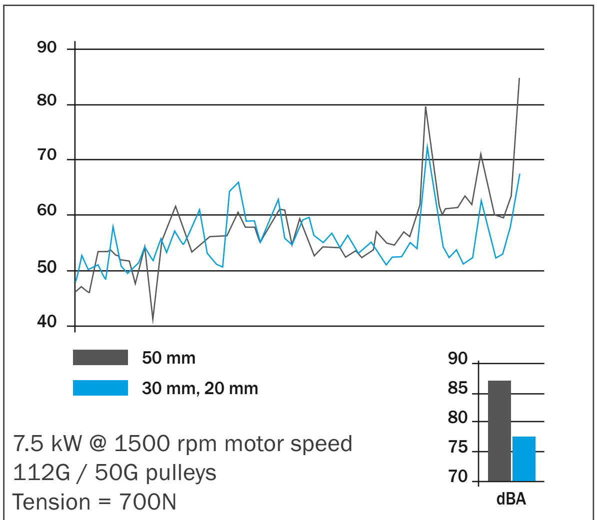
BELT DRIVE TENSION AND ALIGNMENT

- Properly tensioning and aligning a belt drive will allow the belt drive to perform at its quietest level.
- Improperly tensioned V-belt drives can slip and squeal.
- Improper tension in synchronous belt drives can affect how the belt fits in the sprocket grooves. Proper tension

- minimizes tooth to groove interference, and thereby reduces belt noise. Check to make sure that the drive is properly tensioned by using Gates tension measurement gauges.
- Misaligned V-belt drives will be noisier than properly aligned drives since interference is created at the belt's entry point into the sheave. Misaligned synchronous belt drives tend to be much noisier than properly aligned drives due to the even greater amount of interference that is created between the belt teeth and the sprocket grooves. Misaligned synchronous belt drives may cause belt tracking that forces the edge of the belt to ride hard against a sprocket flange. Misalignment causing belt contact with a flange will generate noise that is easily detected. Follow the guidelines discussed in the installation section of this manual for checking and correcting alignment.

SYNCHRONOUS SPLIT BELTS

- Wide belts can be cut into 2 or 3 narrower belts, preferably of unequal widths and this will often give a significant noise reduction.



NOISE BARRIERS AND ABSORBERS

- Sometimes, even properly aligned and tensioned belt drives may be too noisy for a work environment. When this occurs, steps can be taken to modify the drive guard to reduce the noise level.
- Noise barriers are used to block and reflect noise. Noise barriers do not absorb or deaden the noise; they block the noise and generally reflect most of the noise back towards its point of origin. Good noise barriers are dense, and should not vibrate. A sheet metal belt guard is a noise barrier. The more complete the enclosure is, the more effective it is as a noise barrier. Noise barrier belt guards can be as sophisticated as a completely enclosed case, or as simple as sheet metal covering the front of the guard to prevent direct sound transmission. Depending on the application, care must be taken to ensure that the noise dampening measures implemented do not adversely affect the belt performance, i.e. by increasing the temperature within the guarded area to a point where the belt construction is affected.
- Noise absorbers are used to reduce noise reflections and to dissipate noise energy. Noise absorbers should be used in combination with a noise barrier. Noise absorbers are commonly referred to as acoustic insulation. Acoustic insulation (the noise absorber) is used inside of belt guards (the noise barrier) where necessary. A large variety of acoustic insulation manufacturers are available who can provide appropriate products for various applications.
- A combination of noise barrier (solid belt guard) and noise absorber (acoustic insulation) will provide the largest reduction in belt drive noise. While the noise reduction cannot be predicted, field experience has shown that noise levels have been reduced by 10 to 20 dBA when using complete belt guards with acoustic insulation.