



# SONIC TENSION METER MANUAL

## MODEL 508C



### GMGA MEASURING

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# Sonic Tension Meter Components



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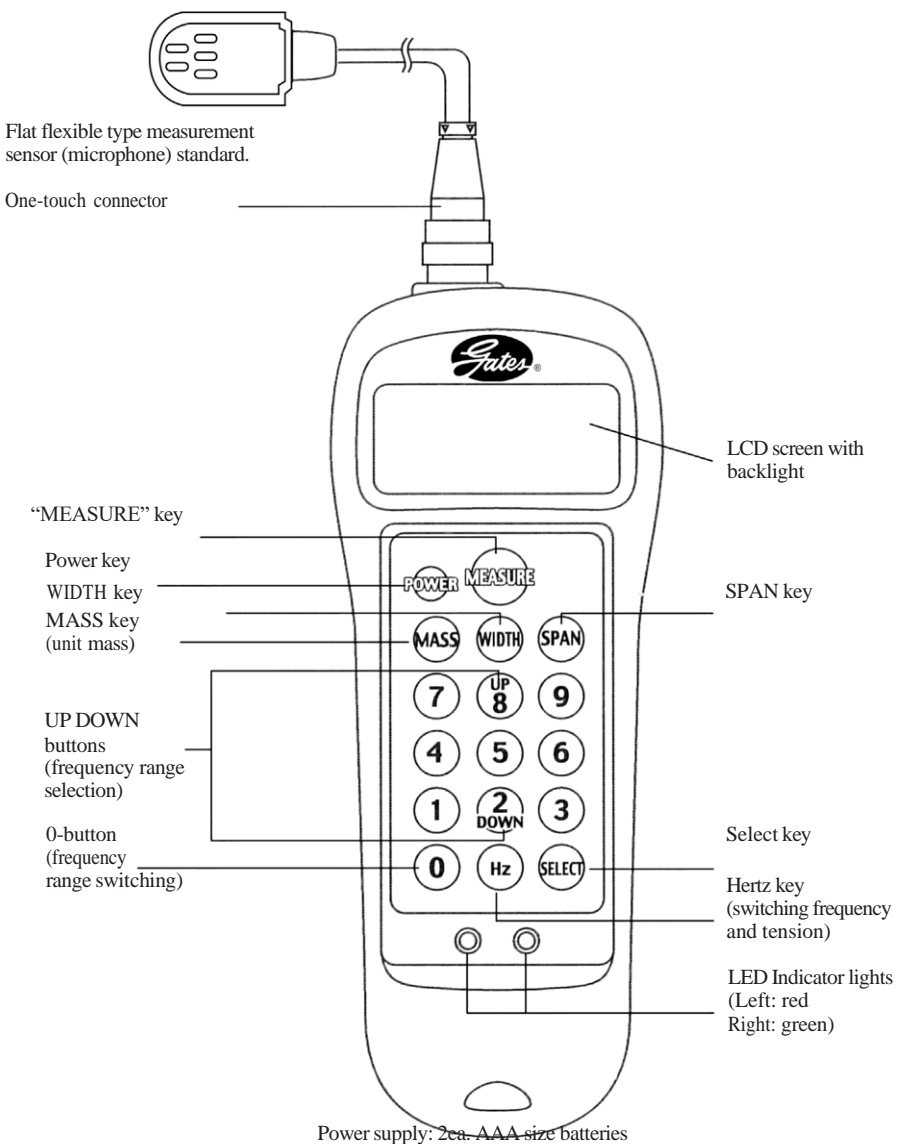
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Thank you for purchasing the Gates  
Sonic Tension Meter.

Please read this manual thoroughly to fully  
utilize all the functions of this meter.

### **Important Warnings**

- **Do not** drop this unit. Impact of any kind can result in damage.
- **Do not** put water, solvent or any other liquids on this unit.
- **Do not** leave this unit in a dusty environment.
- **Do not** leave this unit where it will get hot, such as in a car or in direct sunlight.
- **Do not** use volatile solvents to clean this unit.
- **Do not** use this in an area where a spark could cause an explosion.
- **Do not** pull hard on the cord of the sensor (microphone) from either end.
- **Do not** use this unit outside during a thunderstorm, turn off power and seek a safe place. Non-compliance could result in electric shock from thunderbolt.
- **Do not** bend the flexible arm sensor (microphone) within 20 mm (3/4 inch) of either end, because the construction is tubular, and the flexible arm sensor should not be bent at sharp angles.



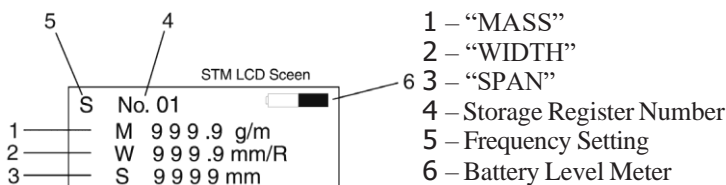
# Operating Instructions

## Attaching Sensor

Each of the male and female connectors has a notch on the surface. Fit the connectors together at the notch and push them together. To disconnect, hold the collar on the sensor and pull out.

## Turn on the power

Press the “Power” key and the LCD screen display appears as follows:



The LCD screen is backlit for use in low light conditions. The screen and backlight remain on for up to five minutes of inactivity, then the unit automatically turns off.

The opening screen displays the contents of the data storage register that was last being used when the STM was turned off. Values for (1) “MASS” (Belt Mass Constant), (2) “WIDTH” (Belt Width), and (3) “SPAN” (Belt Span Length) are all displayed simultaneously.

**Important Note:** Reasonable non-zero belt constant values must be used in the storage registers in order to receive belt tension readings. The unit will display span frequency values regardless of the belt constants entered, but will display “Error” and the red light will remain on if the calculated belt tension value is beyond the display range of the screen.

Pointer (4) indicates the data storage register number where current belt data is saved. To change the data or storage register number, refer to “Input Data Storage and Retrieval” on page 6.

Pointer (5) represents the current frequency filter setting. To change, refer to “Frequency Filter Settings” on page 6.

Pointer (6) indicates the battery level meter. A dark battery symbol indicates a full charge. When the battery level becomes critically low, the meter indicator as well as a “Low Batt” message both blink.

## Enter belt mass

$M = \square\square\square.\square \text{ g/m}$

Belt mass constants are provided on pages 11, 12, and 13 of this manual. Capacity available for input is from 000.1 to 999.9 grams/meter. Press the “MASS” key and enter numbers on the keypad. Make sure the decimal is placed correctly in the display panel. If your entry is incorrect, press “MASS” again and the cursor returns to the original position. Enter belt width or number of rib/strands

$W = \square\square\square.\square \text{ mm/\#R}$

Capacity available for input is from 000.1 to 999.9 millimeters or number of ribs or strands.

For a Synchronous belt, enter the belt width in millimeters.

For an Industrial V-belt, enter the number of strands being measured. For a PolyFlex® JB® belt, enter the number of strands being measured. For a Micro-V® belt, enter the total number of ribs.

For a 21 mm wide Poly Chain® belt, enter “021.0”; For a 1” wide PowerGrip® timing belt, enter “025.4”; For a single strand Industrial V-belt, enter “001.0”.

When using the Sonic Tension Meter on drives with multiple single or PowerBand® belts, be sure to use the appropriate mass constant and enter the correct number of belt strands being measured. There is no need to multiply the mass constant by the number of ribs/strands, as the Sonic Tension Meter will calculate the correct total belt mass.

### Example:

For a V-belt drive using four individual 3V belts enter “1” for the belt width (“Width” key). The Sonic Tension Meter will display the static belt tension per individual belt. When measuring the belt tension in the V-belt drive, make sure the V-belts do not interfere with each other while vibrating.

If the same drive used a 4-strand 3V PowerBand® belt instead of single belts enter “4” for the belt width (“Width” key). The total belt tension for all four belts is measured as the entire belt vibrates. The Sonic Tension Meter will display the total static belt tension for the PowerBand® belt (for all strands within belt).

## Enter the span length

S = □ □ □ □ mm

Capacity available for input is from 0001 to 9999 millimeters. The span length represents the distance between the contact points on adjacent sprockets/pulleys/sheaves. This distance may be measured directly, or it may be calculated from the formula below. Calculating the span length provides the most accurate results.

## Span Length Formula

$$S = \sqrt{CD^2 - \frac{(D-d)^2}{4}}$$

Where: S = Span Length (mm)  
CD = Center Distance (mm)  
D = Large Pulley Diameter (mm)  
d = Small Pulley Diameter (mm)

## Input Data Storage and Retrieval

Mass, width, and span values can be stored for up to 40 different drive systems. Press the “SELECT” key to toggle through the 40 storage registers. Storage registers can also be recalled by simply pressing the “Select” key and the number that corresponds to the storage register. The storage register number is displayed in the upper left hand corner of the LCD screen; Pointer (4) on page 4.

The contents of all three data registers is displayed simultaneously. The contents of a register can be changed by simply pressing the mass, width, or span key and entering a new value. The new value is automatically saved if the storage register is changed, or the meter is turned off.

## Frequency Filter Settings and Ranges

A frequency filtering feature is available to focus the meter frequency measurement response to a narrower range. This can be useful in improving the response of the meter and in filtering out potentially interfering background noise.



**Holding down the “0” button for 1-2 seconds will display a menu that allows the frequency measurement range to be changed.**

The available ranges are as follows:

High	500 – 5000 Hz
Standard	10 – 600 Hz

The default setting is the “Standard” range and can be changed by pressing the “UP” and “DOWN” keys. To accept the highlighted range, press the “MEASURE” key. Note the letter in the upper left hand corner of the LCD display indicates the frequency range setting Pointer (5) on page 4; H - High, S - Standard.

### **Microphone Gain Setting**

The microphone gain level is set automatically when the unit is turned on, based upon environmental background noise. If maximum microphone sensitivity is desired, turn the meter on without the microphone attached and wait for the meter to power up. Then connect the microphone so tension measurements can be taken.

### **Measurement**

Press the “MEASURE” key; the green LED light will begin flashing. Tap the belt span to make the belt span vibrate. Hold the sensor approximately 1 cm (0.4 inch) from the belt or closer without touching the belt. The green LED light will continue to flash until a signal is received by the sensor, then the green LED light will turn off and a wave-form graphic will appear on the LCD screen. After the signal is processed, the measured belt tension is displayed, the meter beeps three times, and the green LED light turns on indicating a successful tension measurement.

After a tension reading has been obtained, pressing the “Hz” key toggles the LCD display output between tension, frequency, or both.

If the belt signal cannot be measured, or the measured frequency of the calculated belt tension is out of the range of the meter, the red LED light will turn on. When this occurs, either the tension or frequency fields may also display ERROR.

To make another tension reading, simply tap the belt again. The auto-trigger feature will automatically re-activate the meter without pressing the “MEASURE” key.

## Tension Display

$T = \square\square\square\square\square \text{ Kg}_f \text{ or lb}_f \text{ or N}$

The displayed output of measured force can be switched between units of Kilograms force, Pounds force, and Newtons. This can be accomplished as follows:

**With the unit powered off, press the “0” and “9” and “Power” keys at the same time.** The meter will then turn on with the current unit of measure displayed. Units can then be changed by pressing the “SELECT” key until the desired unit appears. Press and hold down the “POWER” key again until the meter turns off. Now turn the meter on for normal operation. Data entered into the unit must still be in SI units of millimeters and grams.

The capacity available for output is 99,999 Pounds force, Kilograms force, or Newtons.

## Frequency Display

$F = \square\square\square\square \text{ Hz}$

Pressing the “Hz” key toggles the LCD display output between tension, frequency, or both.

## Measurement Errors

If either the calculated belt tension or measured frequency cannot be displayed the red LED light will turn on and the LCD screen may display “ERROR”. If an error has been made in the measurement, “ERROR” will be displayed. Check the accuracy of the mass constants, width and span values and retry the measurement until a tension or frequency value is displayed. With the auto-trigger feature it is not necessary to press the “Measure” key again.

When a tension or frequency reading is obtained, take at least two additional readings for comparison. Three readings in relative close proximity indicate reasonably accurate belt tension readings.

Tension measurements made on belts at very low tensions may yield greater variability and a greater probability for errors. If a tension reading cannot be obtained, the belt may be too loose to generate a clear harmonic frequency signal. If this is the case, the belt may need to be tightened in order to obtain a tension reading. The optional Inductive Sensor is more effective at very low frequencies than the conventional microphone sensors, and may provide better results.

NOTE: Frequency only readings must have data values in the storage registers or the meter’s red LED light will stay on.

## **Battery Gauge**

A battery graphic is located in the upper-right hand corner of the LCD screen. This gauge provides an estimate of the remaining battery power.

A dark filled graphic indicates a full charge. When the battery level becomes critically low, the meter indicator as well as a “Low Batt” message both blink.

## **Optional Sensors**

The 508C Sonic Tension Meter comes equipped with a flat flexible type sensor that allows one hand operation.

An optional cord type sensor allows access to areas that the flexible type sensor may not fit.

An optional cord type inductive sensor relies on a magnetic field rather than on sound waves. This allows tension measurements to be taken in both noisy and windy environments. In order for the inductive sensor to function, a magnetic field must be present on the belt. This can be easily accomplished by taping a small magnet to the back of the belt.

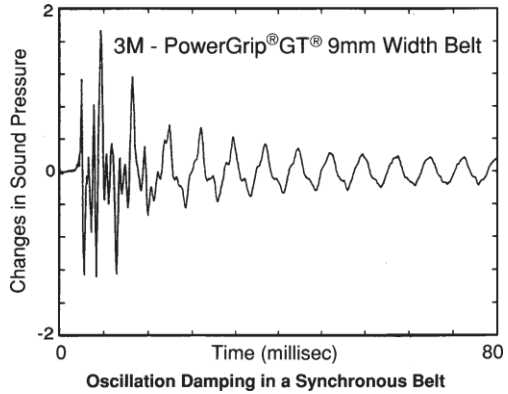
# Sonic Tension Meter Operating Theory

When an impulse is applied to a belt span, it first oscillates in all modes of vibration, but the higher frequency modes decay faster than the fundamental mode.

This leaves a continuous sinusoidal wave that is related to a specific belt tension; note diagram.

Using a microcomputer, a data processing method to capture a belt's natural oscillation frequency was developed. Using this method, the wave form frequency can be determined easily.

The new system uses special sensors to detect belt oscillation wave forms. Data from these sensors is sent to the microcomputer inside the Sonic Tension Meter for processing and conversion into the natural frequency. To calculate belt tension, the Sonic Tension Meter system uses the "transverse vibration of strings theory." To operate the meter, the belt mass, span length and width of the belt must be entered.



Formula:

$$T = 4 \times M \times W \times S^2 \times f^2 \times 10^{-9}$$

Where:

T = Belt span tension (Newtons)

M\* = Belt mass constant (g/m)

W = Belt width (mm) or number of belt strands S =

Length of the span to be measured (mm) f =

Natural frequency of the belt (Hz)

\*Units of mass constant M for synchronous belts is g/(m)(mm) or g/10 cm<sup>2</sup> along the belt pitch line. Constant M for V-belts represents the weight in grams of a 1 meter length of belting with a correction factor applied to compensate for internal bending resistance.

Unlike a string, belts have cross-sectional rigidity. Therefore, tension values measured by the meter may be higher than the actual belt tension, depending on the operating conditions under which the effects of rigidity arise. When the actual belt tension must be more precisely measured, a simple calibration test may be necessary.

# Belt Mass Constants

Adjusted mass constants are for standard stock belts only. Non-standard belt constructions may yield inaccurate results and may require special adjusted mass constants or special calibration procedures. Units are grams/meter per mm of width. TP denotes Twin Power®.

<b>POLY CHAIN® GT® CARBON™ (POLY CHAIN)</b>	
5M (aramid)* . 3.0	14M..... 7.9
5M (carbon)**.3.5	19M.....10.5
8M..... 4.7	
<b>POWERGRIP® GT®2/ GT3 AND TRUMOTION®</b>	
2M..... 1.4	14M GT2 ..... 9.6
3M..... 2.8	14M GT3 ..... 9.7
5M..... 4.1	TP 3M.....2.8
8M GT2..... 5.5	TP 5M..... 4.1
8M GT3..... 5.8	TP 8M.....6.9
	TP 14M..... 11.4
<b>POWERGRIP HTD® AND TRUMOTION®</b>	
3M..... 2.4	TP 3M.....2.7
5M..... 3.9	TP 5M..... 4.6
8M..... 6.2	TP 8M.....7.2
14M..... 9.9	TP 14M..... 12.3
20M..... 12.8	

\* Gates product numbers beginning with 9270-5 denote aramid tensile cord.

\*\* Gates product numbers beginning with 9270-6 denote carbon tensile cord.

<b>POWERGRIP TIMING AND TRUMOTION</b>	
MXL (0.080") 1.3	XXH (1.25")..14.9
XL (0.200")..... 2.4	TP XL ..... 1.9
L (0.375") ..... 3.2	TP L..... 3.2
H (0.500") ..... 3.9	TP H..... 4.6
XH (0.875")..11.3	
<b>GATES TPU (MECTROL®) LONG LENGTH (STEEL)</b>	
XL ..... 2.1	ATL10..... 6.7
L ..... 3.5	ATL10-HF ..... 6.9
H..... 3.9	T20 ..... 7.3
H-HF ..... 4.2	AT20 ..... 9.9
XH..... 10.5	ATL20..... 10.8
T5 ..... 2.2	HTD5 ..... 4.1
AT5 ..... 3.2	HTD8 ..... 5.9
ATL5 ..... 3.6	HTD14 ..... 10.7
T10 ..... 4.3	HTDL14 ..... 12.3
T10-HF..... 4.6	STD5 ..... 3.9
AT10..... 5.6	STD8 ..... 5.1
<b>GATES TPU (MECTROL®) LONG LENGTH (ARAMID)</b>	
XL ..... 1.9	WT10 ..... 3.9
L ..... 3.0	AT10 ..... 4.2
H..... 3.2	T20 ..... 5.9
WH..... 3.3	AT20 ..... 7.3
XH..... 9.1	HTD8 ..... 4.7
T5 ..... 2.0	HTD14 ..... 8.4
AT5 ..... 2.7	STD5 ..... 2.9
T10 ..... 3.6	STD8 ..... 4.33

For a single V-belt, enter 1 rib/strand. When measuring a PowerBand® (multiple) rib/ strand belt, enter the number of ribs/strands per belt.  
Units are grams/meter per rib or strand.

#### **SUPER HC® & SUPER HC XP™**

3V .....	72	5VX .....	140
5V .....	200	5VXP .....	140
8V .....	510	8VX .....	383
3VX.....	53		

#### **SUPER HC & XP POWERBAND®**

3V .....	96	3VX .....	65
5V .....	241	5VX .....	157
8V .....	579	5VXP .....	160

#### **PREDATOR® SINGLES**

5VP .....	217	CP .....	323
8VP .....	528	SPBP .....	208
AP .....	114	SPCP .....	375
BP .....	174		

#### **PREDATOR POWERBAND**

3VP .....	89	BP .....	212
5VP .....	217	CP .....	332
8VP .....	528		

#### **HI POWER® II**

A .....	95	D .....	553
B.....	168	E .....	965
C.....	275		

#### **HI POWER II POWERBAND**

A .....	151	C .....	342
B.....	200	D.....	663

#### **TRI-POWER®**

AX.....	79	CX .....	216
BX.....	136		

#### **TRI-POWER POWERBAND**

BX.....	163	CX .....	281
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#### **HI POWER II DUBL-V**

AA .....	.125	CC .....	354
BB .....	.194	DD .....	750

#### **METRIC POWER™ LENGTHS ≤ 3000MM**

XPZ.....	51	10X.....	44
XPA .....	87	13X.....	82
XPB .....	156	17X.....	138
XPC .....	249		

#### **METRIC POWER LENGTHS > 3000MM**

SPZ .....	72	SPC.....	337
SPA.....	115	13X.....	77
SPB .....	186	17X.....	138

#### **MICRO-V®**

H .....	5.3	L .....	29
J.....	7.0	M .....	109
K.....	18		

#### **TRUFLEX®**

2L.....	19	4L.....	66
3L.....	38	5L.....	108

#### **POWERATED®**

67 (3L) .....	45	69 (5L).....	119
68 (4L) .....	71		

#### **POLYFLEX® AND POLYFLEX JB®**

3M.....	3.5	3MJB .....	5.2
5M.....	9.9	5MJB .....	11
7M.....	24	7MJB .....	30
11M.....	49	11MJB .....	64

# Belt Installation Tension

Proper belt installation tension is essential in V-belt and synchronous drives for optimum performance and reliability. The correct installation tension for a belt, or set of belts, depends upon the drive geometry and load conditions and must be calculated. Procedures for calculating belt tension are included in the appropriate drive design manual. To determine the belt tension recommended for specific drive applications, either refer to the appropriate belt drive design manual or to the DesignFlex® Pro™ belt drive selection program located at: <http://www.gates.com/designflex>

The following belt drive design manuals listed below may be helpful: *Poly Chain® GT® Carbon™ Belt Drive Design Manual #17595 Light Power and Precision Drive Design Manual #17183 Heavy-Duty V-Belt Drive Design Manual #14995-A PowerGrip® GT®3 Belt Drive Design Manual #17195*

These catalogs can be downloaded from [www.gates.com/catalogs](http://www.gates.com/catalogs) or contact Gates Application Engineering at (303) 744-5800.

## Tips on Using the Sonic Tension Meter

The Gates Sonic Tension Meter is capable of measuring belt tension with greater accuracy and consistency than traditional methods. It should not, however, be expected to produce exacting results in every case. While numerous factors can be found to influence the accuracy of the meter's output, one must remember that traditional methods of belt tensioning such as force/deflection or belt elongation are approximate.

The following suggestions are provided to help you achieve a high level of accuracy with the Gates Sonic Tension Meter:

### Consistent Readings

- After the correct constants have been entered into the meter, take at least three readings to confirm that results are consistent and the meter is not erroneously reading background noise.

### Minimum Belt Span Length

- When measuring the tension in synchronous belts, use spans that are more than 20 times the length of the tooth pitch. Using spans shorter than this may result in readings that are higher than the actual tension due to belt cross-sectional stiffness.
- When measuring the tension in V-belts, use spans that are more than 30 times the belt top width. Using spans shorter than this may result in readings that are higher than the actual tension due to belt cross-sectional stiffness.

## **Minimum Belt Tension**

- There are limits as to how low a span tension value the meter can measure depending upon the belt type and cross section. Minimum recommended installation tension values are available for all belt sections from either drive design manuals or Gates Product Application Engineering. Attempting to measure belt tensions below these minimum recommended values should be avoided, as the meter may display “Error” or provide inaccurate results. If the belt span tension is low, and a tension reading cannot be obtained, try increasing the belt tension and then take another reading.

## **New Belt Installation**

- Before measuring belt installation tension, turn the drive over by hand for several revolutions to fully seat the belt and equalize tension in all of the belt spans. Factors such as sprocket/shaft eccentricity, belt/sheave groove irregularity, etc., can influence belt tension as the sprockets or sheaves rotate. If the measured belt tension changes significantly as the drive is rotated, and accurate measurements are needed, determine the low and high values and average them together.

## **Windy Environment**

- Wind can adversely affect the ability of the meter to make a reading by creating excessive background noise. If measuring in a windy location, the Inductive Sensor should be used instead of a microphone sensor.

## **Inductive Sensor**

- An optional Inductive Sensor should be utilized in noisy or windy environments for optimal results. The Inductive Sensor uses a magnetic field rather than sound waves.

A simple way to use this sensor is with a magnet taped to the backside of the belt. Small “rare earth” magnets provide excellent results with minimal influence on the belt span frequency due to the added weight.

## **Using Frequency Mode**

- If an assembly process is used to set belt tension in a particular application, and the meter is used only to monitor belt installation tensions, the frequency mode can be used rather than displaying an absolute measured tension value. Belt span frequencies for minimum and maximum tension conditions can be measured so assemblers/ technicians can use the meter to verify that belt installation tension is within an acceptable range.



## **Re-calibration for Non-Standard Belts**

Measuring the tension of special belts with extra thick backings, alternate materials, etc., may yield less than accurate results using belt mass constants for standard belts. In these cases, a simple calibration process may be used. The belting can be placed on a fixture with a known span length under various known tensions (hanging weights can be used). By taking frequency measurements at various tensions, span frequency vs. tension data can be collected.

This data can then be used in a graphical format or in equation form to convert measured span vibration frequencies to accurate belt tensions. Data of this type is specific to each application and cannot be applied to drives with different span lengths. Because the resulting data may not be linear, it is best to measure the tension of non-standard belts in terms of frequency rather than deriving new belt mass constants to measure in terms of absolute tension.

## **Summary of Features**

- Model 508C - Product No. 7420-0508
- Includes flexible type sensor - Product No. 7420-0205.
- 40 Memory Registers for Belt Constants
- Max Frequency of 5000 Hz
- Auto Microphone Gain Control
- Variable Frequency Range Filters
- Auto Shut Off - The meter will automatically shut off after 5 minutes of inactivity. Power can be shut off manually by pressing and holding the power button for 1-2 seconds.
- Batteries - 2 each; AAA. The battery compartment can be found on the backside of the meter.

## **Optional Accessories**

- Cord Type Sensor -  
Product No. 7420-0206  
Fits in difficult to access areas.
- Inductive Sensor -  
Product No. 7420-0212  
Recommended for noisy or windy environments.  
Magnets included.
- Replacement Magnets (set of 10) -  
Product No. 7420-1212  
For use with Inductive Sensor.

# Sonic Tension Meter

## Troubleshooting Guide

SYMPTOM	CAUSE	TO CORRECT
METER WON'T TURN ON		
	Batteries are dead	Replace Batteries
	Battery contacts are corroded	Clean contacts and replace batteries
	Meter has sustained damage	Consider meter repair or replacement
		Gates certification / evaluation / repair service
DON'T KNOW WHAT READING IS CORRECT FOR BELT DRIVE		
	Meter measures belt tension but does not indicate if it is correct	Determine correct belt tension level using the Design Flex Pro, Design Flex Mobile, or Design IQ applications
		Determine correct belt tension level from engineering equations in Gates Drive Design Manual
		Establish proper belt tension level based on knowledge and experience
		All Gates design tools are available at <a href="http://www.gates.com/drivedesign">www.gates.com/drivedesign</a>
DON'T KNOW WHAT CONSTANTS TO ENTER		
	Mass Constant	Mass constants for all Gates belt sections are available on the data card and Users Manual provided with the Sonic Tension Meter
		The appropriate Mass constant is provided on drive design printouts
	Width Constant	Width represents the width of synchronous belts in mm or the number of V-belt strands/ribs being measured at once (enter "1" if the tension of only one belt within a set is being measured at a time)
		The appropriate Width constant is provided on drive design printouts
	Span Constant	Span represents the length of the belt span being measured in mm
		The appropriate Span constant is provided on drive design printouts

SYMPTOM	CAUSE	TO CORRECT
<b>CAN'T OBTAIN A BELT TENSION READING</b>		
	Sensor is too far away from belt surface	Move sensor as close as possible without interfering with vibrating belt span
	Belt is too loose to generate frequency signal	Tighten belt
	Background noise is excessive	Temporarily eliminate background noise
		Use inductive sensor instead of microphone
Meter is set in the incorrect frequency range		“Standard” frequency range is generally best
		With meter on, press “0” for 2 sec and select “Standard” or “High” frequency range
		Standard (S) = 10 – 600 Hz High (H) = 500 – 5000 Hz
Belt span frequency is less than 30 Hz		Microphone performance is reduced considerably at frequencies less than 30 Hz
		Use the inductive sensor for frequencies down to 10 Hz
Excessive wind is blowing across Microphone		Shield or shelter microphone
		Use inductive sensor
Belt span is long and frequency very low		Tighten belt
		Check to see if calculated belt frequency is below 30 Hz
		Artificially reduce belt span length using a block, etc.
		Use inductive sensor for span frequencies below 30 Hz
Incorrect belt constants have been entered		Use correct mass, width, and span constants for drive
		Press “Select” to toggle through data memory registers

SYMPTOM	CAUSE	TO CORRECT
	Sensor or connections have been damaged	Confirm sensor damage and replace
	Iron or magnet is not present when using inductive sensor	Tape a small magnet to the belt at mid span for the inductive sensor to read (furnished with inductive sensor)

#### **CAN'T SEE BELT SPAN FREQUENCY ON DISPLAY**

	Meter is set in the wrong display mode	Press “Hz” to display belt span frequency
		Press “Hz” again to display both belt span frequency and tension

#### **METER DISPLAYS “ERROR” WHEN TAKING TENSION READINGS AND RED LIGHT ILLUMINATES**

	Belt tension reading is outside of meter display capability	<p>Confirm that correct mass, width, and span constants have been entered</p> <p>Press “Select” and toggle through data memory registers to select another data set</p> <p>Non-zero constants must be entered even with the meter in the frequency only mode</p> <p>If using meter in frequency only mode while disregarding tension output, enter a value of 1.0 for Mass, Width and Span constants</p>
	An error has been made in reading the belt tension	Take another tension reading
	Belt is too loose to generate frequency signal	Tighten belt

#### **MULTIPLE BELT TENSION READINGS ARE SIGNIFICANTLY DIFFERENT**

	Belt tension is near absolute minimum threshold	Tighten belt and see if reading variation is reduced
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SYMPTOM	CAUSE	TO CORRECT
	Some tension reading variation is normal	<p>It is normal for the meter to detect slightly different fundamental span frequencies</p> <p>Take at least three tension readings and average the results</p>
	The drive has been rotated between readings	<p>Belts must fully seat on pulleys / sheaves and equalize for tension to stabilize</p> <p>Pulley / shaft eccentricity can change belt tension significantly; establish minimum / average / maximum tension level limits and set belt tension accordingly</p>

#### METER DISPLAYS TENSION IN WRONG UNITS

	Meter is set if incorrect unit mode	With the meter powered off, press “0” and “9” and “Power” at the same time and then select the desired display unit (N / kg / lb) by pressing “SELECT”
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#### METER READINGS SEEM INCORRECT

	Incorrect belt constants may have been entered	<p>Use correct mass, width, and span constants</p> <p>Press “Select” and toggle through data memory registers to select another data set</p>
	The tension of a non-Gates belt is being measured	Mass constants for non-Gates belts must be derived experimentally
	An unrelated competing frequency signal may be picked up	<p>Temporarily eliminate noise</p> <p>Try using low or high frequency settings to filter out background noise</p> <p>Use inductive sensor</p>
	Batteries are weak	<p>Check battery strength meter on display</p> <p>Replace weak batteries with new alkaline cells</p>

SYMPTOM	CAUSE	TO CORRECT
	Non-alkaline type batteries are being used	Use only alkaline type batteries for full 1.5 volt output required by meter
	Meter accuracy can be verified / certified	Generate an accurate frequency signal for the meter to read using a tuning fork
		Generate an accurate frequency signal for the meter to read using a signal generator
		Send meter to Gates for evaluation (for a fee)
	Belt span length may be too short	The minimum span length recommended for synchronous belts is 20X the belt pitch
		The minimum span length recommended for V-type belts is 30X the belt or rib top width

#### **METER BATTERY LIFE IS SHORT**

	Meter usage is heavy	Fresh alkaline batteries provide approximately 20 – 24 hours of continuous meter usage
	Non-alkaline type batteries are being used	Use only alkaline type batteries for full 1.5 volt output required by meter

#### **NEED EXTRA SENSORS OR INDUCTIVE SENSOR MAGNETS**

	Flat Flexible Sensor	Gates Product # 7420-0205
	Cord Sensor	Gates Product # 7420-0206
	Inductive Sensor	Gates Product # 7420-0212
	Inductive Sensor Magnets	Gates Product # 7420-1212 (sets of 10 each)

## Unit Conversion Formulas

$$\text{lb}_f \times 4.4482 = \text{N}$$

$$\text{lb}_f \times 0.4536 = \text{kg}_f$$

$$\text{N} \times 0.1020 = \text{kg}_f$$

$$\text{N} \times 0.2248 = \text{lb}_f$$

$$\text{kg}_f \times 2.2046 = \text{lb}_f$$

$$\text{kg}_f \times 9.8067 = \text{N}$$

$\text{lb}_f$  = Pounds force

$\text{N}$  = Newtons force

$\text{kg}_f$  = Kilograms force

$$\text{Inches} \times 25.4000 = \text{mm}$$

$$\text{mm} \times 0.0394 = \text{inches}$$

$\text{mm}$  = Millimeters

## Span Length Formula

$$S = \sqrt{CD^2 - \frac{(D-d)^2}{4}}$$

Where:

$S$  = Span Length (mm)

$CD$  = Center Distance (mm)

$D$  = Large Pulley Diameter (mm)  $d$

= Small Pulley Diameter (mm)

## Warranty, Service, and Certification

Gates warrants the meter to successfully operate for a period of two years from the date of manufacture:

- Gates will repair or replace meters, at our discretion, at no charge within the warranty period.
- Sensors are not warranted.
- Meters damaged by misuses or abuse, at Gates discretion, are not covered by the warranty.

For repairs outside of the warranty period, Gates offers a meter repair service:

- Repair estimates are available before work is completed, but Gates must evaluate the meters in-house.

Meter accuracy certification (traceable) is available:

- Upon certification, meters will be returned with a sticker and certificate verifying accuracy.
- Meter certification is not covered under the warranty. Contact an authorized Gates distributor for the current certification rates.

In order to return meters for warranty repair, non-warranty repair, or accuracy verification:

- Contact an authorized Gates distributor for assistance.
- Do not return meters to Gates without prior approval and an RMA (Return Materials Authorization) in the box.
- Gates takes no responsibility for any meters returned to the wrong address or without an RMA issued by a Gates authorized distributor.
- [www.gates.com/distributors](http://www.gates.com/distributors)