Understanding Your Precision Measurement Needs

Northern Gauge is distributed by :

Newman Tools Inc.
185 Iber Rd.
Ottawa, Ontario, Canada K2S 1E7
Tel 613-836-6776 Fax 613-836-9070

WHAT TO LOOK FOR IN PRECISION THREAD GAUGING

- **Raw Material and the heat treatment stabilization process**

  Gauge material and heat treatment plays a very important role in obtaining a dimensionally stable and long life gauge. We use an OHNS Tungsten quality oil hardened non shrinking steel or a 20MnCr5 steel (for small thread rings). The gauge material is duly carburized hardened and tempered. A cryogenic treatment is carried out to increase the performance of the material. This cryogenic treatment is not a substitute for heat treatment, but rather an extension of the heating, quenching and tempering cycle. The process involves a slow controlled cooling, holding at cryogenic temperature for a specific hold time and then allowing to return to room temperature slowly. This process transforms all retained austenite to martensite. The end result is a very stable material which is 100% martensite and very hard RC 58-62. Without cryogenic treatment these steels may contain significant amounts of retained austenite which is a weak, soft, easily abraded micro constituent of steel.

- **Precision hand lapping**

  Lapping is the finishing process that removes small amounts of material from the gauge surface to bring it within its final tolerance limits. It is the final procedure in gauge manufacture and of paramount importance. This process of feeling a millionth's of inch is a true art. All Northern Gauge, gauges are made to the high end of the tolerance (unless otherwise specified) to ensure longer gauge life.

- **Temperature control and Traceability**

  All our gauges go through final inspection in a temperature controlled (20 degrees +/- .5 degree C) metrology lab. All master gauges are fully traceable to a registered national or international standard. Our long form certificate of inspection provides as much detail as possible showing evidence of dimensional compliance. We understand quality system documentation as well as the value associated with it; and as a result we provide long form certificates FREE with every gauge we sell regardless of price.

- **Solid ring design**

  At Northern Gauge we provide a solid ring design because we feel in many ways it is superior to AGD (American Gauge Design) for the following reasons:
  - Dimensionally more accurate. Stay's round for its entire life.
  - No setting plug needed for calibration or inspection.
  - More care-free, if dropped it doesn't have to be re-calibrated. With the price of AGD setting plugs it make's good economical sense to go with a solid ring and perform your periodic calibration based on usage.
  - Our solid rings are economically priced in comparison to AGD style.
  - Once you try using our solid rings you'll never go back to AGD.

- **Coated and Uncoated threaded components/parts**

  If the threaded components like nuts and bolts have to be coated then it is necessary to check them prior to coating. The gauge can be suitably designed to check the before coating size depending upon the coating thickness. Normally it is only the go limit gauge which is necessary to be used for checking before coating. The component near to nogo limit automatically falls within the tolerance limit after coating.

  Normally coating thickness is 0.001". Here the thickness is considered as either an increase or decrease in the pitch diameter. If the coating thickness is considered normal to the thread flanks, the variation in diameter is four times the thickness, for threads with 60 degree angle and slightly less for 55 degree.

- **Maintenance & Preservation of Gauges**
  - Gauge need to be thoroughly cleaned before and after use with either Alcohol or suitable solvent which do not contain water or leave an oil buildup.
  - Petroleum jelly or Starrett M1 oil should be used when gauges are not in use. Do not use WD40 as it leaves a greasy buildup; really bad on gauge blocks.
  - The component must also be clean and free of metal particles.
  - Do not use thread gauge forcefully; like a tap or die.
  - Do not allow the gauge to be dropped on the shop floor; these gauges are brittle and may break.
  - Please note that the limit gauge is a precision tool and should be handled carefully.

- **Gauge Life**

  It is very difficult to predict gauge life. Gauges used against cast iron, aluminum and stainless/duplex steels have faster wear due to lapping effect of these material . However, gauge life can certainly be improved by proper use and care of the gauges as defined above. A calibration interval of one year to start and adjust after a history is established.

- **Trouble Shooting**

  A working gauge answers/enters the components but the inspection gauge doesn't answer: This is normally due to the size of the inspection go gauge slightly above the working go gauge. In such case the working gauge dimensions may be worn out. For future use, interchange the working and inspection gauges; and decrease your calibration interval.

  Go gauge doesn't enter but the nogo answers freely; This occurs due to major diameter of nut i.e internal thread or minor diameter of bolt i.e. external thread is not maintained properly. The major diameter of the go plug and minor diameter of the go ring gauge is sharp and hence obstructs with the corresponding diameter on the component. Hence the operator takes more material without correcting the tool sharpness. The nogo major diameter/minor diameter being more truncated than the go gauge, enters the component. The go gauge controls all the thread parameters and will not enter if any of these are incorrect. If there is no control on the actual point of error, the effective diameter of the component becomes oversized and the nogo gauge enters.

TAPERLOCK THREAD WORKING PLUG GAUGES
IMPERIAL - INCHES

All Northern Gauge thread plug gauges are manufactured in accordance with ASME/ANSI B1.2 or B1.16M. Taperlock style is standard for plug gauges up to 1.5 inches. Above 1.5 inches a Trilock design is used (call or email for Trilock thread plug gauge pricing).

Titanium Nitriding also available as a special quotation

REVERSIBLE THREAD PLUG GAUGES AVAILABLE ADD 30% TO ABOVE PRICE

NOMINAL SIZE	THREAD PER INCH (TPI)			DOUBLE ENDED PRICE $Cdn
	UNC	UNF	UNEF	
# 0		80		PLEASE CALL FOR CURRENT 2006 PRICE LIST
# 1	64	72		
# 2	56	64		
# 3	48	56		
# 4	40	48		
# 5	40	44		
# 6	32	40		
# 8	32	36		
# 10	24	32		
# 12	24	28		
# 12			32	
1/4	20	28		
1/4			32	
5/16	18	24		
5/16			32	
3/8	16	24		
3/8			32	
7/16	14	20		
7/16			28	
1/2	13	20		
1/2			28	
9/16	12	18		
9/16			24	
5/8	11	18		
5/8			24	
11/16			24	
3/4	10	16		
3/4			20	
13/16			20	
7/8	9	14		
7/8			20	
15/16			20	
1	8	12,14		
1			20	
1.1/16		12	18	
1.1/8	7	12		
1.1/8			18	
1.3/16		12	18	
1.1/4	7	12		
1.1/4			18	
1.5/16		12	18	
1.3/8	6	12		
1.3/8			18	
1.7/16		12	18	
1.1/2	6	12		
1.1/2			18	

TAPERLOCK THREAD WORKING PLUG GAUGES
METRIC - MILLIMETERS

All Northern Gauge thread plug gauges are manufactured in accordance with ASME/ANSI B1.2 or B1.16M. Taperlock style is standard for plug gauges up to 1.5 inches. Above 1.5 inches a Trilock design is used.

NOMINAL SIZE	PITCH COARSE	PITCH FINE	DOUBLE ENDED PRICE $CDN
M1.6	.35		PLEASE CALL FOR CURRENT 2006 PRICE LIST
M1.8	.35		
M2	.4		
M2.2	.45		
M2.5	.45		
M3	.5		
M3.5	.6		
M4	.7		
M4.5	.75		
M5	.8		
M6	1.0		
M7	1.0		
M8	1.25	1.0	
M10	1.5	1.25	
M12	1.75	1.25	
M12	1.5		
M12		1.0	
M14	2.0	1.5,1.0	
M16	2.0	1.5	
M18	2.5	1.5	
M20	2.5	1.5	
M22	2.5	1.5	
M24	3.0	2.0	
M27	3.0	2.0	
M30	3.5	2.0	
M33	3.5	2.0	
M36	4.0	3.0	
M39	4.0	3.0	

*** REVERSIBLE THREAD PLUG GAUGES AVAILABLE – ADDED 30% TO ABOVE PRICE

SOLID STYLE THREAD RING GAUGES
IMPERIAL – INCHES

All Northern Gauge thread ring gauges are manufactured in accordance with ASME/ANSI B1.2 or B1.16M. Solid style ring gauges are dimensionally true in all aspects.

NOMINAL SIZE	THREAD PER INCH (TPI)			GO OR NOGO PRICE $Cdn
	UNC	UNF	UNEF	
# 0		80		PLEASE
# 1	64	72		
# 2	56	64		
# 3	48	56		
# 4	40	48		
# 5	40	44		
# 6	32	40		
# 8	32	36		
# 10	24	32		CALL
# 12	24	28		
# 12			32	
1/4	20	28		FOR
1/4			32	
5/16	18	24		
5/16			32	CURRENT
3/8	16	24		
3/8			32	
7/16	14	20		
7/16			28	
1/2	13	20		2006
1/2			28	
9/16	12	18		
9/16			24	
5/8	11	18		
5/8			24	
11/16			24	
3/4	10	16		
3/4			20	
13/16			20	
7/8	9	14		
7/8			20	
15/16			20	
1	8	12,14		
1			20	
1.1/16		12	18	PRICE
1.1/8	7	12		
1.1/8			18	
1.3/16		12	18	
1.1/4	7	12		
1.1/4			18	
1.5/16		12	18	
1.3/8	6	12		LIST
1.3/8			18	
1.7/16		12	18	
1.1/2	6	12		
1.1/2			18	

SOLID STYLE THREAD RING GAUGES
METRIC – MILLIMETERS

All Northern Gauge thread ring gauges are manufactured in accordance with ASME/ANSI B1.2 or B1.16M. Solid style ring gauges are dimensionally true in all aspects.

NOMINAL SIZE	PITCH COARSE	PITCH FINE	6G MEMBER GO OR NOGO $Cdn
M1.6	.35		PLEASE CALL FOR CURRENT 2006 PRICE LIST
M1.8	.35		
M2	.4		
M2.2	.45		
M2.5	.45		
M3	.5		
M3.5	.6		
M4	.7		
M4.5	.75		
M5	.8		
M6	1.0		
M7	1.0		
M8	1.25	1.0	
M10	1.5	1.25	
M12	1.75	1.25	
M12	1.5	1.0	
M14	2.0	1.5,1.0	
M16	2.0	1.5	
M18	2.5	1.5	
M20	2.5	1.5	
M22	2.5	1.5	
M24	3.0	2.0	
M27	3.0	2.0	
M30	3.5	2.0	
M33	3.5	2.0	
M36	4.0	3.0	
M39	4.0	3.0	

TAPERED PIPE THREAD GAUGES – WORKING

All Northern Gauge pipe thread gauges are manufactured in accordance with ASME/ANSI B1.20.1 or B1.16M.

TAPER PIPE THREAD GAUGES - NPT AND NPTF						
SIZE	**NPT PLUG L1**	**NPT RING L1**	**NPTF PLUG L1 OR L3**	**NPTF RING L1**	**NPTF RING L2**	**NPTF 6 STEP PLAIN RING**
1/16 - 27						
1/8 - 27						
1/4 -18						
3/8 - 18						
1/2 - 14						
3/4 - 14						
1.0 - 11.5						
1.1/4 - 11.5						
1. 1/2 - 11.5						
2.0 - 11.5						
2.1/2 - 8						
3.0 - 8						

PLEASE CALL FOR CURRENT 2006 PRICE LIST

*******ALL PLUGS PRICES INCLUDE HANDLE AND LONG FORM CERTIFICATION AT NO EXTRA COST*******
*** All prices in $Cdn ***

TAPER PIPE THREAD GAUGES - ANPT						
SIZE	**L1 RING BASIC STEP**	**L2 RING BASIC STEP**	**PLAIN TAPER RING 6 STEP**	**L1 PLUG BASIC STEP**	**L3 PLUG BASIC STEP**	**PLAIN TAPER PLUG 6 STEP**
1/16 - 27						
1/8 - 27						
1/4 -18						
3/8 - 18						
1/2 - 14						
3/4 - 14						
1.0 - 11.5						
1.1/4 - 11.5						
1. 1/2 - 11.5						
2.0 - 11.5						
2.1/2 - 8						
3.0 - 8						

PLEASE CALL FOR CURRENT 2006 PRICE LIST

*******ALL PLUGS PRICES INCLUDE HANDLE AND LONG FORM CERTIFICATION AT NO EXTRA COST*******
*** All prices in $Cdn ***

API 5B – CASING, TUBING AND LINE PIPE
THREAD GAUGING - WORKING

All Northern Gauge 5B thread gauges are manufactured in accordance with API 5B and 5B 1latest edition requirements.

API ROUND THREAD CASING GAUGES

SIZE	WORKING PLUG $cdn	WORKING RING $cdn
4.1/2" 8	PLEASE CALL FOR	
5" 8		
5.1/2" 8	CURRENT 2006	
6.5/8" 8		
7" 8	PRICE LIST	

Casing Gauges are .0625" included taper per inch (3/4" T.P.F.)

API TUBING EUE AND NUE GAUGES

SIZE	WORKING PLUG $cdn	WORKING RING $cdn
1.050" X 10		
1.315 X 10		
1.660 X 10	PLEASE CALL FOR	
1.900 X 10		
2.3/8" X 10 NUE		
2.3/8" X 8 EUE		
2.7/8" X 10 NUE	CURRENT 2006	
2.7/8" X 8 EUE		
3.1/2" X 10 NUE		
3.1/2" X 8 EUE	PRICE LIST	
4" X 8 NUE/EUE		
4.1/2" X 8 NUE/EUE		

Non-Upset and External Upset are .0625" included taper per inch (3/4" T.P.F.)

API LINE PIPE GAUGES

SIZE	WORKING PLUG $cdn	WORKING RING $cdn
1/8" X 27		
_" X 18		
3/8" X 18		
_" X 14		
_" X 14		
1" X 11.5		
1.1/4" X 11.5		
1.1/2" X 11.5		
2" X 11.5		
2.1/2" X 8		
3" X 8		
3.1/2" X 8		
4" X 8		
5" X 8		
6" X 8		

PLEASE CALL FOR

CURRENT 2006

PRICE LIST

Line Pipe Gauges are .0625" included taper per inch (3/4" T.P.F.)

Northern Gauge also offers the following Oil Patch related thread gauges:

- API 6A / ISO 10423 Valve-removal Plug Thread Gauges
- Back Pressure Valve 90 Degree Threads Gauges
- API 11B Sucker Rods
- API Specification 7 Rotary Drill Stem Elements
- API 5A 1944 Sharp Vee Non-Upset Casing and Tubing Thread Gauges
- Specialty Gauging. We can custom design a gauge for your product.
- Automated Inspection systems.
- Cylindrical Gauging
- Plain and Progressive plug and ring ID/OD to 7 inches.
  Class XX, X, Y & Z available.

GAGEMAKER'S TOLERANCE CHART					
Above	**To & incld.**	**Class XX**	**Class X**	**Class Y**	**Class Z**
0.010" .254mm	0.825" 20.95mm	0.000020" 0.5μm	0.00040" 1.0μm	0.00040" 1.0μm	0.0001" 2.5μm
0.825" 20.95mm	1.510" 38.35 mm	0.000030" 0.75μm	0.000060" 1.5μm	0.000060" 1.5μm	0.00012" 3.0μm
1.510" 38.35mm	2.510" 63.75mm	0.000040" 1.0μm	0.000080" 2.0μm	0.000080" 2.0μm	0.00016" 4.0μm
2.510" 63.75mm	4.510" 114.55mm	0.000050" 1.25μm	0.0001" 2.5μm	0.0001" 2.5μm	0.00020" 5.0μm
4.510" 114.5mm	6.510" 165.35mm	0.000065" 1.625μm	0.00013" 3.25μm	0.00013" 3.25μm	0.00025" 6.25μm
6.510" 16.35mm	9.010" 228.85mm	0.000080" 2.0μm	0.00016" 4.0μm	0.00016" 4.0μm	0.00032" 8.0μm

How to Determine and Select the Proper Tolerance for Your Gauging Application

The normal rule of practice requires 10% of product tolerance to be divided between the "GO and NOGO" gauges. For plug gauges, a plus tolerance is applied to the GO member and a minus tolerance to the NOGO member. Ring gauges receive reverse tolerance direction so that the GO member is minus an the NOGO is plus tolerance. Applying this practice results in gauge tolerance always being included in the part tolerance by up to 10%. This results in the possibility that 10% of good product could fail inspection that no bad product would ever pass.

Proper Care and Usage of Gauges

- Parts dimensions to be gauged should be free of burrs to prevent gauging interference.
- Gauges should be turned or pushed slowly and gently. Forcing gauges will result in faulty gauging and possibility of damaging both the gauge and the part.

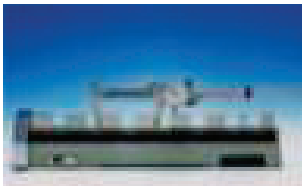
Plug and Ring Gauge Classes for Product Tolerances

The below chart of product tolerances for plain plug and ring gauges may be used as a guide for recommended gauge tolerance. This assumes a given product tolerance. Wear allowances and other similar concerns should be included when gauge specifications are being defined. These are left for the user to determine. Plain plug gauges normally use a plug tolerance to be considered "go" and a minus tolerance constitutes a "nogo" status. Ring gauges normally use a minus tolerance to be considered "go" and a plus tolerance for "nogo". These descriptions are fitting with normal practice that allows 10% of the product tolerance to be equally divided between go and nogo conditions.

Product	Class of Gauge for Size Range			
Tolerances	0.10 - .825"	.825 – 1.510"	1.510 – 2.510"	2.510 – 4.510"
0.0004"	XX	XX		
0.0005"	XX	XX		
0.0006"	XX	XX	XX	
0.0007"	X	XX	XX	
0.0008"	X	XX	XX	XX
0.0009"	X	XX	XX	XX
0.0010"	X	X	XX	XX
0.0012"	Y	X	XX	XX
0.0014"	Y	X	X	XX
0.0016"	Y	Y	X	X
0.0018"	Z	Y	X	X
0.0020"		Y	X	X
0.0022"		Z	Y	X
0.0024"			Y	X
0.0026"			Y	Y
0.0028"			Y	Y
0.0030"			Z	X
0.0032"				Y
0.0034"				Y
0.0036"				Z

Snap Gauging

- A variety of snap gauging is available depending on customer and product size, shape and tolerance.



Caliper and Height Gauge Checker

- The instrument is sufficiently rigid and consists of stepped slip gauges permanently fixed in inner casing. The Caliper Checker is ideal for in-house periodic calibration of measuring instruments i.e. Vernier/Dial/Digital Calipers & Height Gauges

Technical Specification

Range	Height Measurement	External Measurement	Internal Measurement
0-300 mm	370 mm	300 mm	300 mm
0-600 mm	670 mm	600 mm	600 mm
0-1000 mm	1070 mm	1000 mm	1000 mm

Note: Also available in 0-12 inch and 0-24 inch.

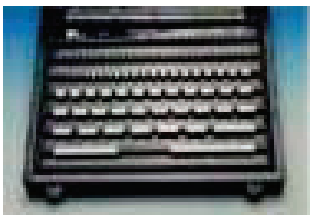
Micrometer Checking Set (Setting Rods)

- We offer Setting Rods for the calibration of Micrometers from 25 -100mm range. The Setting rods are manufactured in high quality steel. The standard 31 piece Setting Rods are sufficient for calibration of 25 to 100 mm range.

Depth Micrometer Checker

- This instrument is specially designed for the calibration of Depth Micrometers. Gauge Blocks are built in the rigid frame to provide measuring in 25 mm or 1 inch steps in accordance with the travel range of the micrometer head.

- An anvil of 25 mm or 1" is supplied to provide a reference point for calibration at desired step within the measuring range of the Checker. The instrument is an ideal master gauge for calibration of depth micrometers. Range 0-150 mm and 0-300 mm or 0-6 inch and 0-12 inch, accuracy +/- (1+L/150μm).



Precision Slip Gauge Blocks

- Gauge Slip Block in Tungsten, Steel and Zirconia Ceramic from the UK in accordance with DIN 861 and BS 888 or any gauge standard you require.

- Northern Gauge only carries on the best Slip Gauge Blocks. These blocks are manufactured from specially selected grades of Carbide with hardness values of 1500 Vickers. Rigid attention is paid throughout the entire manufacturing process for flatness and parallelism. Every slip gauge block is rigorously checked and calibrated in an accredited laboratory.

Angle Gauge Blocks

- Precision angle blocks can be used to obtain any angle between 0 and 360 degrees in steps of 6 seconds.

Why Tungsten Carbide Gauges Are Preferred

Tungsten Carbide Slip Gauge Blocks should outlast steel by at least ten times and in certain conditions even 100 times. The use of Tungsten Carbide for Slip Gauge Blocks has increased tremendously in recent years and is now rapidly supplanting tool steel in this application.

- **Dimensional Stability**
  Tungsten Carbide is a stable material, which gives an obvious and accepted advantage over more conventional materials. Dimensional Stability is of prime importance.

- **Ability to Wring**
  Tungsten Carbide is a very dense material. This allows the production of high quality geometrically accurate surface giving superior wring quality to the Slip Gauge Blocks.

- **Resistance to Wear**
  Tungsten Carbide is highly resistant to wear. The Slip Gauge Blocks will retain its accuracy for an extremely long time.

- **Resistance to Corrosion**
  This is one of the major advantages with Tungsten Carbide Blocks, which makes it ideal for continuous handling.

- **Economy**
  The economics of using Tungsten Carbide Blocks is immediately apparent when we consider its longer life and also the substantial reduction on re-calibration costs. The durability of these gauges gives an ultimate return on the investment.

Calibration Laboratory Price List

(Prices effective January 1, 2005)

Dimensional Calibration

The measurement capability of our laboratory and the traceability of our measurements are traceable to NIST and NRC in Ottawa; Labmaster's exclusive Digital interferometer based sensor, accurately measures length by comparing the measurement probe position to the absolute wavelength of a laser light source.

Temperature Control

Northern Gauge contracted the Canadian National Research Council (NRC) in Ottawa to design our temperature control system. Our temperature control is state of the art and proprietary to the NRC in Ottawa (we signed a non-disclosure agreement). Without adequate temperature control, accurate measurement is not achieved. We understand metrology, accurate measurement and measurement error/uncertainty. This is why we have spent great expense in temperature control of +/- .2 degrees C. We are working on improving this control to .1 degrees C. Basically the more accurate your temperature control the lower your measurement uncertainty is.

Pratt & Whitney LABMASTER UNIVERSAL

Northern Gauge uses a Pratt & Whitney LABMASTER UNIVERSAL with stated repeatability of 1.6 mircoinches +/_ 2 standard deviations (based on environmental stable at 20 degrees C +/- .2 degree and humidity between 15% - 25%)

Measurement Range - internal 0.02" to 14" and external 0 to 13"

Inspection and Calibration

Gauges should be periodically inspected and calibrated to ensure accuracy. Go members tend to wear quicker with normal use. NOGO gauges will wear on the ends. Frequency of inspection and calibration should be dependent on such factors as the amount of usage, part and gauge material, tolerance, and quality procedure.

Calipers		Thread Plug Gauges 60°	Price Per End
6-8 inch	PLEASE	0 – 1 inch	PLEASE
12 inch		1 – 2 inch	
24 inch		2 – 4 inch	
6 inch		4 – 6 inch	
	CALL	6 - 10 inch	CALL

Micrometers Inside and Outside		Thread Ring Gauge 60°	
6-8 inch	FOR	0 – 1 inch	FOR
12 inch		1 – 2 inch	
18 inch	CURRENT	2 – 4 inch	CURRENT
24 inch		4 – 6 inch	
	2006	6 - 10 inch	2006

Calipers 0- 8 inch	PRICE	Calipers 0-24 inch	PRICE
Calipers 0 – 12 inch		Calipers 0 – 48 inch	

Micrometer Setting Standards	LIST	Thread Wires - Set of 3 Wires	LIST
0 – 12 inch			
12 – 18 inch		Length Standards	
18 – 24 inch		12 inch	
		18 inch	
Depth Micrometers		36 inch	
Dial Indicators			
81 piece of gauge blocks		This includes cleaning, removing any gross scratches and calibration	

Plain Cylindrical Plug	Price Per End	Plain Cylindrical Ring	Price Per Ring
0 -1 inch		0 -1 inch	
1 – 2 inch	PLEASE	1 – 2 inch	PLEASE
2 – 3 inch		2 – 3 inch	
3 – 4 inch	CALL	3 – 4 inch	CALL
4 – 5 inch		4 – 5 inch	
5 – 6 inch	FOR	5 – 6 inch	FOR
6 – 7 inch	CURRENT	6 – 7 inch	CURRENT
7 – 8 inch		7 – 8 inch	
8 – 9 inch	2006	8 – 9 inch	2006
9 – 10 inch		9 – 10 inch	
10 – 11 inch	PRICE	10 – 11 inch	PRICE
11 – 12 inch	LIST	11 – 12 inch	LIST
12 – 14 inch		12 – 13 inch	