

MOREHOUSE



Figure 1. Model 5C; 5,000 lbs. capacity, compression Ring Force Gauge. All Ring Force Gauges are supplied with instrument cases.

RING FORCE GAUGE

The accurate measurement of mechanical forces is required in hundreds of applications from a simple weighing procedure to the calibration of testing machines and load cells. For many of these applications, high-accuracy proving rings are not required. But what other instrument offers the necessary dependability and accuracy?

The Morehouse Ring Force Gauge is the answer. It is direct reading and combines accuracy, simplicity and versatility at a modest cost, making it ideal for many common force measurement applications.

DESIGN AND PRINCIPLE OF OPERATION

The Ring Force Gauge is designed around an elastic steel ring similar to those used in the famous Morehouse Proving Rings, which set standards for accuracy the world over. An elastic steel ring, properly forged, carefully machined, and properly heat-treated, performs as a near perfect member. Every time a duplicate load is applied to the ring it will deflect exactly the same amount. Thus by measuring the amount of deflection, it is possible to determine the load applied.

To utilize the principle of the elastic steel ring, it is necessary to incorporate a means of measuring the deflection under load. In high-accuracy proving rings, the deflection measuring apparatus must be quite complex to achieve the highest possible degree of accuracy and maintain it over long periods of time. But in the Ring Force Gauge where convenience is the prime requisite, the deflection is sensed and indicated by a precision dial indicator mounted inside the ring. The load reading is shown directly in pounds, requiring no further operation or interpretation.

So, by combining the reliability of the elastic steel ring with a direct-reading precision dial indicator, Morehouse has produced a force gauge that is accurate, dependable and easy to use. No other force-measuring instrument offering the same degree of accuracy and versatility is available at such a low cost.

CERTIFIED ACCURACY

Ring Force Gauges are guaranteed and certified accurate to $\frac{1}{2}$ of 1% of capacity even through the great majority are accurate to $\frac{1}{4}$ of 1%. This understanding of actual accuracy is intended to provide the user with a high degree of confidence in his end result. Different variations of the standard ring force gauges have greater or less accuracy as described on the succeeding pages of this bulletin and are certified accordingly.

Each Ring Force Gauge is calibrated with standards traceable to the National Institute of Standards and Technology and a certificate of calibration showing the exact calibration results is issued accordingly.

MODELS AND CAPACITIES AVAILBLE

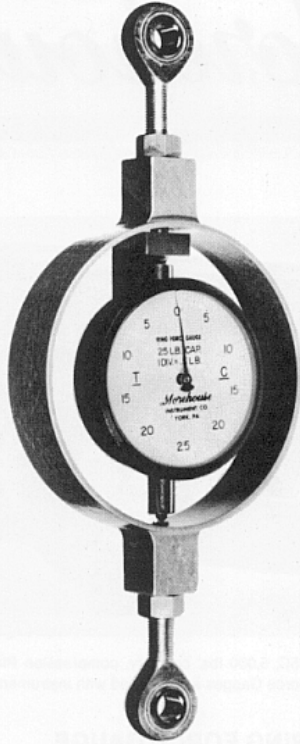


Model 5C; 500 lbs capacity Ring Force Gauge with maximum load pointer. Also Shown with spherical load button and the base supplied with capacities of 2,500 lbs. and less.

Model No. 5C: This model is available from 5lbs. to 1,000,000 lbs. for compression force measurements. Model No 5C, Ring Force Gauges having capacities of 2,000 lbs or less, are supplied with a base for the bottom boss to add stability when the force gauge is standing free. All model No. 5C force gauges with capacities through 2,500 lbs. are supplied with a spherical shaped loading button for the top boss. Higher capacities have a spherical radius machined directly on the top boss to aid in applying forces as nearly axially as possible. The Model No. 5C, Ring Force Gauge also has threaded ends on capacities through 100,000 lbs. for attachment of any special adaptors that may be designed for a specific application.

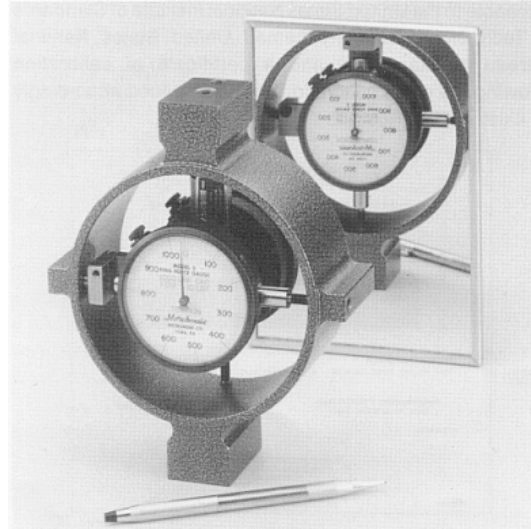
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Model 5BT; 50 lbs capacity Ring Force Gauge with push / pull calibration to 25 lbs. Maximum calibrated load with push / pull calibration is 1/2 capacity.

Model No. 5BT: This model is available in capacities from 5 lbs. to 200,000 lbs for tension force measurement. Larger capacities and specially designed capacities are available on request. Model No. 5BT, force gauges having capacities up to and including 50,000 lbs. are supplied with self aligning, ball end pull rods are supplied unless eye nuts may be removed for attaching special adaptors. Model No. 5BT, force gauges having capacities in excess of 50,000 lbs. are supplied with internally tapped bosses. All model No. 5BT, force gauges may be calibrated for both tension or compression force measurements by one of three different calibration methods.



Model 5TC; 5,000 lbs. capacity Ring Force Gauge . Indicators shown having maximum load pointers, which are available at extra costs.

Model No. 5TC: This model is available in capacities through 50,000 lbs. Special and larger capacities are available on request. Model No. 5TC, force gauges permit the measurement of compression forces or tension forces with the same gauge and are direct reading to 1/2 of 1%. They can also be used to measure forces in compression through zero to tension, or vice versa.

A Model No. 5TC, tension and compression Ring Force Gauge has two indicators mounted back to back and at right angles to each other as shown above, except a Model 5TC, tension and compression Ring Force Gauge has indicators calibrated for 360 degrees which affords normal readability.

Model No. 5TC, force gauges are supplied with internally threaded bosses for the attachment of any adapters the user may desire for his application.

All models of force gauges are supplied with instrument cases.

CALIBRATION OF MODEL NO. 5BT FOR TENSION/COMPRESSION LOADING.

Model No. 5BT, Ring Force Gauges are available so they can be used for compression or tension loading. This can be accomplished by any of the following three different methods.

PUSH/PULL Calibration: With this type of calibration the dial of the gauge is calibrated clockwise for 180 degrees for compression loading, and counter clockwise for 180 degrees tension loading. The accuracy of the Ring Force Gauge with this type of calibration is 1% of the maximum calibrated load instead of 1/2% because the readability is only 1/2 of the normal readability when the calibration is in one direction for 360 degrees. Since the maximum calibrated load represents only one-half capacity of two times the maximum calibrated load in one direction, plus the amount indicated for the push/pull calibration.

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Tension/Compression Calibration: With this type of calibration, the Ring Force Gauge is calibrated to read directly in tension. A separate calibration for compression is made in terms of divisions and that chart is used to convert the pointer reading to pounds. This type of calibration is recommended when the accuracy of ½ % must be maintained but direct reading in compression is not desired. The calibration can be reversed if specified; that is, the Ring Force Gauge can be calibrated to read directly in compression with the tension loads on the chart.

Two Calibrated Dial Indicators: With this type of calibration, the Ring Force Gauge is supplied with two different indicators. One dial indicator is calibrated in tension and one dial indicator is calibrated in compression. This type of calibration is recommended when the accuracy of ½% must be maintained and the convenience of direct reading in both directions is also desired. Changing from tension to compression is made by simply changing the dial indicators accordingly.

MAXIMUM LOAD POINTER

Ring Force Gauges are available with maximum load pointers as an optional extra. However, they are not recommended unless they are an absolute requirement because interference with the free movement of the hand of the indicator may cause a deterioration of accuracy-just as it does in all types of indicating mechanisms.

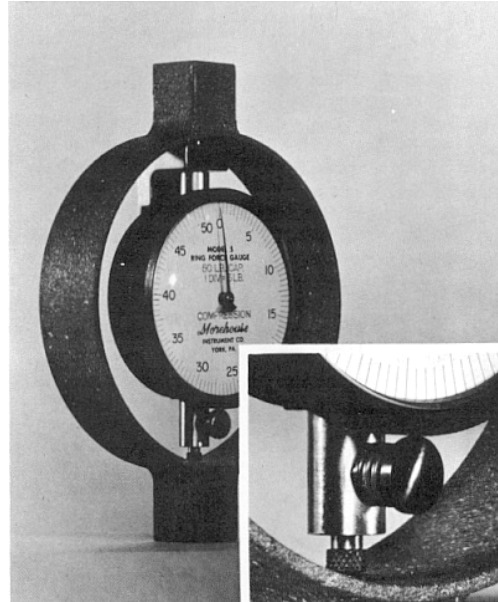
Indicators with a maximum load pointer in Model No. 5BT, Ring Force Gauges are slightly more expensive. Normally, indicators in Model No. 5BT, Ring Force Gauges operate in counter clockwise rotation, and since the maximum load pointer indicator operates only in a clockwise rotation the indicator requires special mounting to reverse the rotation.

"HOLD-MAXIMUM" INDICATOR

Ring Force Gauges are available with "Hold-Maximum" indicators. A "Hold-Maximum" indicator is suggested in a Ring Force Gauge when it is desired to measure forces that are applied and released too quickly to obtain meaningful readings with a standard indicator. It is normally used in place of an indicator with a maximum load pointer when forces are applied rapidly and in a manner that imparts inertia to the maximum load pointer thereby causing false larger readings, or when forces are quickly released from a Ring Force Gauge which could cause the maximum load pointer to be dislodged from its true readings by the consequent shocks. An indicator reading is released by pushing the button on the stem of the indicator.

"Hold Maximum" indicators are available at extra cost on Model No. 5C, and Model No. 5BT, Ring Force Gauges having capacities of 50 lbs. or more and on all capacities of Model No. 5TC, Ring Force Gauges.

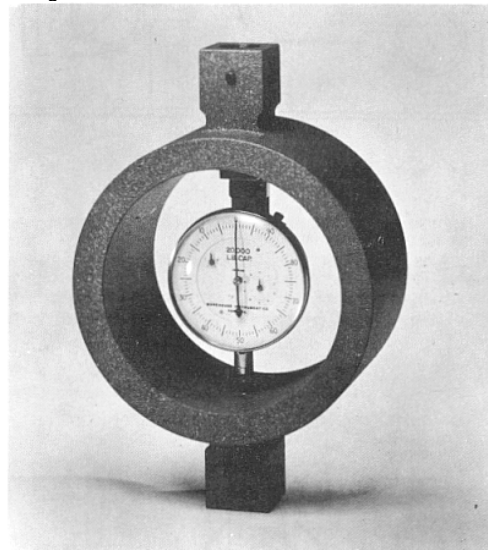
The "Hold Maximum" indicator is slightly more expensive for the Model No. 5BT, Ring Force Gauge than for the Model No. 5C, compression type. Normally, indicators in Model No. 5BT, Ring Force Gauges operate in a counter clockwise rotation, and since the "Hold Maximum" indicator will only operate in a clockwise rotation the indicator requires special mounting to reverse the rotation.



Model 5C; 50 lbs. capacity Ring Force Gauge with "Hold Maximum" indicator available at extra cost.

EXPANDED SCALE INDICATORS

If accuracy better than ½ of 1% at specific loads is required, an expanded scale indicator, which will provide greater resolution, can be installed in a Ring Force Gauge at extra cost. The standard indicator supplied in Ring Force Gauges makes one revolution every to reach the capacity load which provides a reading of 100 divisions. With an expanded scale indicator, the indicator will make approximately 2 2/3 revolutions to reach the capacity load, which provides a reading of 275 divisions.



Model 5BT; 20,000 lbs capacity Ring Force Gauge with an expanded scale indicator. The force gauge is shown without the ball end pull rods attached.

A Ring Force Gauge having an expanded scale indicator is not direct reading as is a Ring Force Gauge having the standard indicator. Rather, individual loads are calibrated in terms of the number of divisions read

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at the individual loads and entered on a separate calibration table accordingly. In use, the Ring Force Gauge is loaded until the indicator reads the correct number of divisions for an individually calibrated load as determined from the calibration chart. An accuracy of .2 of 1% of capacity load at the calibrated loads is obtainable with an expanded scale indicator, and the calibration is traceable to the National Institute of Standards and Technology.

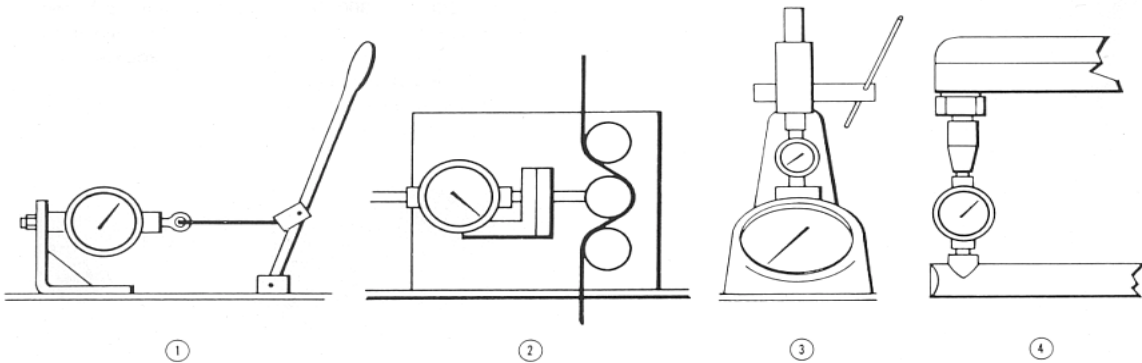
Normally, 10 standard loads are calibrated beginning at one-tenth capacity load and proceeding in

one-tenth capacity increments to the capacity load. For example, a 1,000 lbs. capacity Ring Force Gauge would be calibrated at 100 lbs., 200 lbs., 300 lbs., etc. If specified, up to ten special loads can be calibrated in lieu of the ten standard loads. If more than ten calibrated loads are required, they can be calibrated at extra cost.

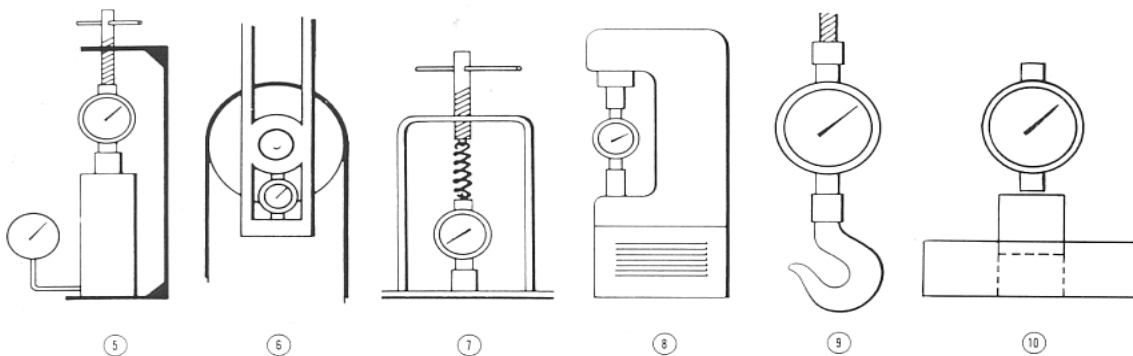
Expanded scale indicators can be installed in all models of the Ring Force Gauge at extra cost.

The Morehouse Ring Force Gauge Has Unlimited Uses

Because it is so versatile, the Ring Force Gauge can be applied in many different ways. It can be used as a calibration device for certain testing machines, weighing equipment, control instruments and hydraulic systems. It can be built into some testing equipment as both the sensing element and indicator. And it can be mounted as a permanent load sensing element in the plant operating and production equipment. The Ring Force Gauge is supplied with tapped holes in external bosses so it can be easily fitted with any special adaptors, accessories, mounting brackets or base plates the user wants to incorporate into an application.



1 TEST RIGS- use the Ring Force Gauge to build a device for physical testing like the tensile strength wire, etc. **2 MEASURING TENSION ON RUNNING WIRE** – continuous checking of force in production operations is possible with Ring Force Gauge. **3 CHECKING OTHER CALIBRATED DEVICES** – shop and production equipment not requiring high-accuracy calibrations can be checked periodically with the Ring Force Gauge. **4 CHECKING PRODUCTION EQUIPMENT** the correct operating pressure of spot welders, bottle capping machines, presses, etc., can be easily checked with the Ring Force Gauge.



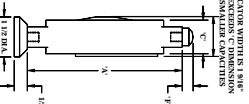
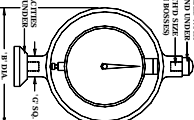
5 CHECKING HYDRAULIC SYSTEMS – determining the accuracy of hydraulic gauges can be accomplished with the Ring Force Gauge. **6 CHECKING THRUST ON A BEARING**-mounted in plant equipment, the Ring Force Gauge provides a ready check on mechanical forces wherever necessary. **7 CHECKING COIL SPRINGS**-various rigs can be devised for checking all sorts of springs and spring-loaded devices with Ring Force Gauge. **8 CHECKING TEST EQUIPMENT**-testing machines not requiring high-accuracy, soil testers, and similar equipment can be calibrated with the Ring Force Gauge. **9 CRANE SCALE**- with suitable accessories the Ring Force Gauge can be used as a scale, either in tension or compression. **10 PRESS FITS**-determining the force required to make press fits is a simple matter with a Ring Force Gauge.

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INDICATOR BALL MAY BE POSITIONED ON ONE OR BOTH BOSSES
IN PLACE OF LOADING OR BASE

LOAD BOSSES SUPPLIED WITH
CAPACITIES OF 2,500 LBF. AND UNDER
OF 2,500 LBF. AND UNDER
(BOTH BOSSES)

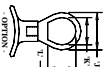


INDICATOR WIDTH IS 1.916"
AND EXCEEDS 'C' DIMENSION
ON SMALLER CAPACITIES

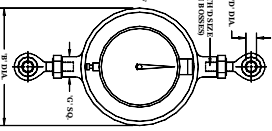
COMPRESSION TYPE MODEL 5C

CAPACITY	A				B				C				D			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
5	6	4.14	3.41	2.87	5.824	3.5	3.1	2.7	2.3	3.1	2.7	2.3	1.9	1.5	1.1	0.7
10	6	4.14	3.41	1.72	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
20	6	4.14	3.4	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
30	6	4.14	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
40	6	4.14	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
500	6	4.14	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
1,000	6	4.14	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
2,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
2,500	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
3,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
4,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
5,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
6,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
7,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
8,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
9,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
10,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
15,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
20,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
30,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
40,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
50,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
1,000,000	24	20	8	**	**	**	**	**	**	**	**	**	**	**	**	**

NO ATTACHMENTS SUPPLIED ON
CAPACITIES OVER 50,000 LBF.



EYE NUT SUPPLIED IN PLACE OF
BALL BEARING OR BOTH WHEN
REQUIRED FOR GREATER WORK
CAPACITIES UP TO 25,000 LBF.



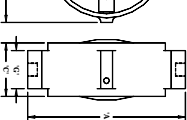
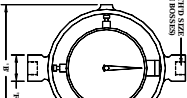
INDICATOR WIDTH IS 1.916"
AND EXCEEDS 'C' DIMENSION
ON SMALLER CAPACITIES

TENSION TYPE MODEL 5BT

CAPACITY	A				B				C				D			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
5	6	4.14	3.41	2.87	5.824	3.5	3.1	2.7	2.3	3.1	2.7	2.3	1.9	1.5	1.1	0.7
10	6	4.14	3.4	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
20	6	4.14	3.4	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
30	6	4.14	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
40	6	4.14	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
500	6	4.14	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
1,000	6	4.14	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
2,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
2,500	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
3,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
4,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
5,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
6,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
7,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
8,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
9,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
10,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
15,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
20,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
30,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
40,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
50,000	6	5	1.14	1.2	3.824	3.8	3.4	3.0	2.6	3.4	3.0	2.6	2.2	1.8	1.4	1.0
100,000	18	10	3.54	**	2.1/2	**	3.1/2	**	**	**	**	**	**	**	**	**
200,000	18	10	3.54	**	2.1/2	**	3.1/2	**	**	**	**	**	**	**	**	**
500,000	18	10	3.54	**	2.1/2	**	3.1/2	**	**	**	**	**	**	**	**	**
1,000,000	24	20	8	**	**	**	**	**	**	**	**	**	**	**	**	**

TENSION AND COMPRESSION TYPE MODEL 5TC

CAPACITY	A				B				C				D			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
500	7.14	5.1/2	2	3.824	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4
1,000	7.14	5.1/2	2	3.824	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4
1,500	7.14	5.5/8	2	3.1416	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4
2,000	7.14	5.5/8	2	3.1416	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4	1.1/4	1.3/4
3,000	10	7.1/2	3.1/4	1.2/2	2	2	2	2	2	2	2	2	2	2	2	2
40,000	10	7.5/8	3.1/4	1.2/2	2	2	2	2	2	2	2	2	2	2	2	2
50,000	10	7.7/8	3.1/4	1.2/2	2	2	2	2	2	2	2	2	2	2	2	2



GENERAL SPECIFICATIONS

CERTIFIED ACCURACY: 1/2 OF % OF RANGE OR AS DESCRIBED IN BULLETIN NO. 221-7
READABILITY: 1/10 DIVISION
SENSITIVITY: 1/290 DIVISION

SENSITIVITY IN LINEAR INCHES: .000015
CAPACITY LOAD DEFLECTION: APPROXIMATELY .030 INCH
CALIBRATION: WITH STANDARDS TRACEABLE TO THE UNITED STATES NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (FORMERLY NAT. L. BUREAU OF STANDARDS)

MOREHOUSE INSTRUMENT CO.
YORK, PA.

LAYOUT	TITLE
ASSEMBLY	RING FORCE GAUGE
DRAWN BY BKA	(DIMENSIONS IN INCHES)
CHECKED BY	DWG. NO. 99318
SCALE	SIZE
DATE 10/6/1989	A
	SHEET
	OF