

# Morehouse

## MODEL 5 RING FORCE GAUGES



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 though the great majority are accurate to  $\frac{1}{4}$  of 1%. This understating 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 succeeding pages of this bulletin and are certified accordingly.

Each Ring Force Gauge is calibrated with standards traceable to the United States National Institute of Standards & Technology, (formerly named United States National Bureau of Standards) and a certificate of calibration showing the exact calibration results is issued accordingly as illustrated in Figure 2.

Certificate of Calibration		
and Traceability to the		
United States National Institute of Standards & Technology		
MOREHOUSE INSTRUMENT CO.		
MODEL #5BT		
RING FORCE GAUGE, SERIAL NO. 55048		
500 LBF CAPACITY, TENSION		
The following calibration forces were applied to the above identified Force Gauge. This calibration is in conformance with the requirements of Morehouse QAM Rev. 7, dated 12/04/00.		
FORCE INSTRUMENT		
APPLIED	READING	ERROR
LBF	LBF	LBF
50	50.5	+ 0.5
100	100.5	+ 0.5
150	150.5	+ 0.5
200	200.5	+ 0.5
250	250.5	+ 0.5
300	301.0	+ 1.0
350	350.5	+ 0.5
400	399.5	- 0.5
450	449.0	- 1.0
500	499.5	- 0.5
(1 DIV = 5 Lbf)		
ACCURACY: $\pm 1/2$ % Full Scale = $\pm 2.5$ Lbf		
RESOLUTION = 0.5 Lbf		
The dial indicator was lightly tapped before each reading was taken		
Calibration was performed for a temperature of 23 degrees C		
This calibration is certified traceable to the United States National Institute of Standards & Technology according to the following documentation and calibration apparatus used:		
Dead Weight Force Machine S/N M-4930 NIST Lab No. 822/254341-94		
Uncertainty of Force Standard used to perform this calibration did not exceed $\pm 0.003\%$ of applied load		
CALIBRATED BY:		DATE CALIBRATED:
B. COOK		MAY 25, 2001
		REPORT NO: 55048E2501
MOREHOUSE INSTRUMENT COMPANY, INC. FORCE CALIBRATION LABORATORY 1742 SIXTH AVENUE YORK, PA 17403-2675 U.S.A. PHONE: 717 / 843-0081 FAX: 717 / 846-4193 WEB: <a href="http://www.morehouseinst.com">www.morehouseinst.com</a>		
This Certificate shall not be reproduced except in full, without written approval from Morehouse Instrument Company, Inc.		

Figure 2. Certificate of calibration issued for each Ring Force Gauge shows accuracy of gauge and traceability of standard used to calibrate it to United States National Institute of Standards & Technology.

## MOREHOUSE INSTRUMENT COMPANY, INC.

1742 SIXTH AVENUE • YORK, PA., 17403-2675, U.S.A.

PHONE: 717/843-0081 FAX: 717/846-4193 WEB: [www.mhforce.com](http://www.mhforce.com)

## MODELS AND CAPACITIES AVAILABLE

**Model No. 5C:** This model is available in capacities from 5 lbs. 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 2500 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.

**Model No. 5BT:** This model is available in capacities from 5 lbs. to 200,000 lbs. for tension force measurements. 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 or eye nuts at no extra charge. Ball end pull rods are supplied unless eye nuts are specifically ordered. The pull rods or 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 methods as described on page 3 at a slightly higher price.

**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



Figure 4. 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.

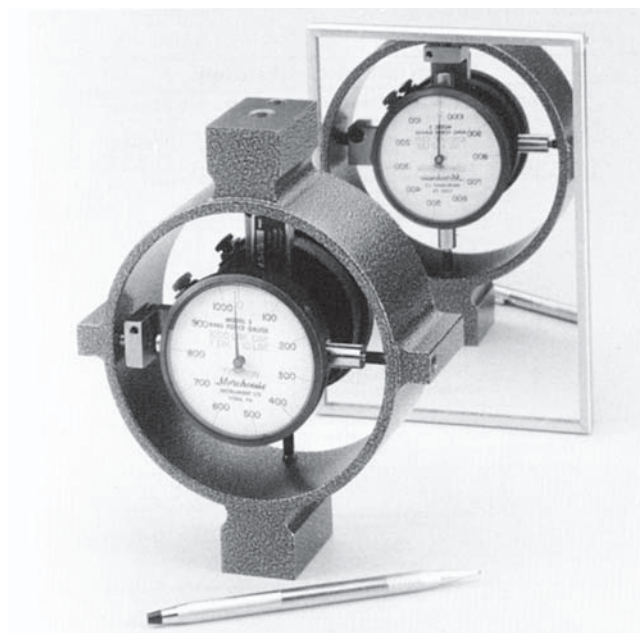


Figure 3. Model 5TC; 5,000 lbs. capacity Ring Force Gauge. Indicators shown have maximum load pointers which are available at extra cost.

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 in Figure 3. The indicator facing front is mounted on the vertical centerline of the force gauge and is calibrated to measure compression forces. The indicator that can be seen in the mirror is mounted on the horizontal centerline and is calibrated to read tension forces.

A Model No. 5TC, tension and compression Ring Force Gauge functions similarly to a Ring Force Gauge having a push/pull calibration as illustrated in Figure 4. except a Model No. 5TC, tension and compression Ring Force Gauge has its indicators calibrated for 360° which affords normal readability.

Model No. 5TC, force gauges are supplied with internally threaded bosses for the attachment of any adaptors 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 that they can be used for compression or tension loading. This can be accomplished by any one of the following three different methods:

**Push/Pull Calibration:** With this type of calibration the dial of the gauge is calibrated clockwise for 180° for compression loading, and counterclockwise for 180° for tension loading as illustrated in Figure 4. The accuracy of the Ring Force Gauge with this type of calibration is 1% of the maximum calibrated load instead of ½% because the readability is only ½ of the normal readability when the calibration is in one direction for 360°. Since the maximum calibrated load represents only one-half capacity, use the price of the model No. 5BT, gauge having a capacity of two times the maximum calibrated load in one direction, plus the amount indicated for the push/pull calibration.

**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 and entered on a chart. In use for compression loading, the pointer reading is made in terms of divisions and the 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 illustrated in Figure 5, 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.



Figure 5. Model 5C; 500 lbs. capacity Ring Force Gauge with maximum load pointer. Also shown is the spherical load button and the base supplied with capacities of 2500 lbs. and less.

### “HOLD-MAXIMUM” INDICATOR

Ring Force Gauges are available with “Hold-Maximum” indicators as illustrated in Figure 6. 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 Gauge.

The “Hold Maximum” indicator is slightly more expensive for the Model No. 5BT, tension type 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.

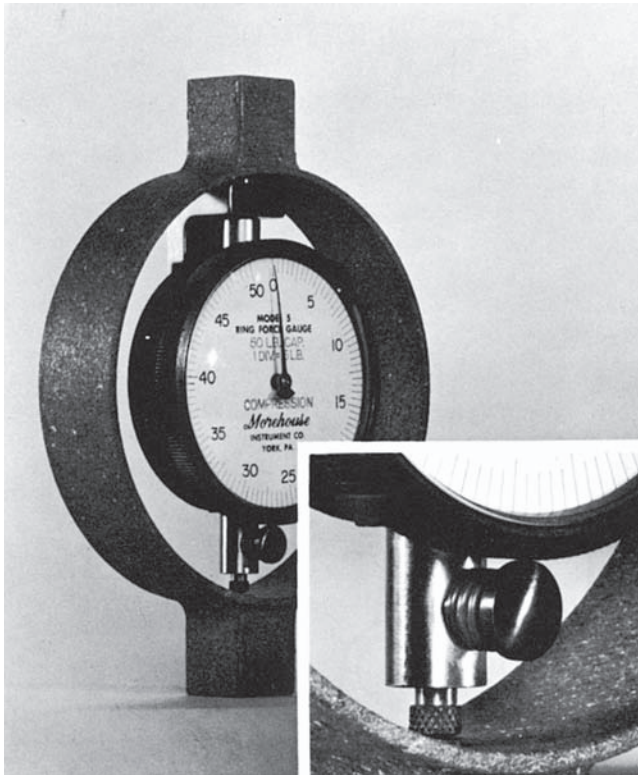


Figure 6. Model 5C; 50 lbs. capacity Ring Force Gauge with "Hold-Maximum" indicator available at extra cost.

## EXPANDED SCALE INDICATORS

If accuracy better than 1/2 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 to reach the capacity load which provides a reading of 100 divisions. With an expanded scale indicator, the indicator will make approximately 2 3/4 revolutions to reach the capacity load which provides a reading of 275 divisions.

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 at the individual loads and are 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 United States National Institute of Standards & Technology.

Normally, 10 standard loads are calibrated beginning at the 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.

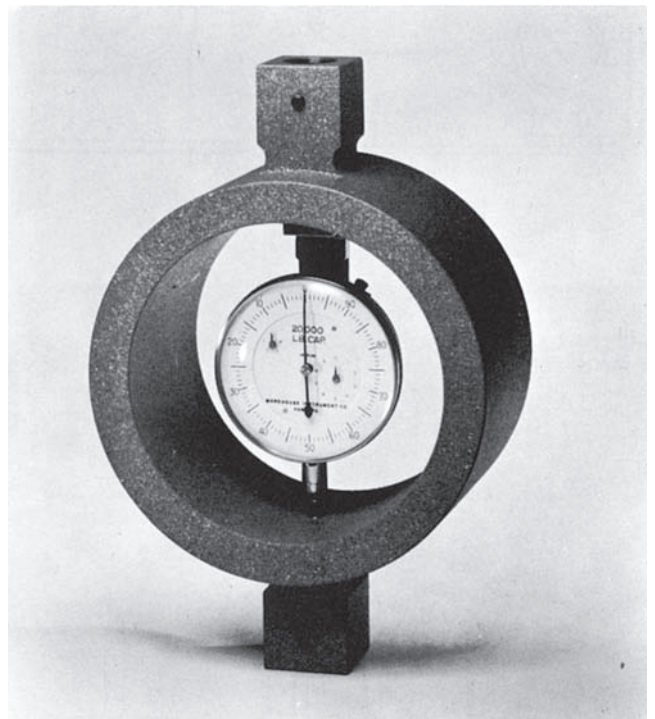


Figure 4. Model 5BT; 50 lbs. capacity Ring Force Gauge with push/pull calibration to 25 lbs. Maximum calibrated load with push/pull calibration is 1/2 capacity.

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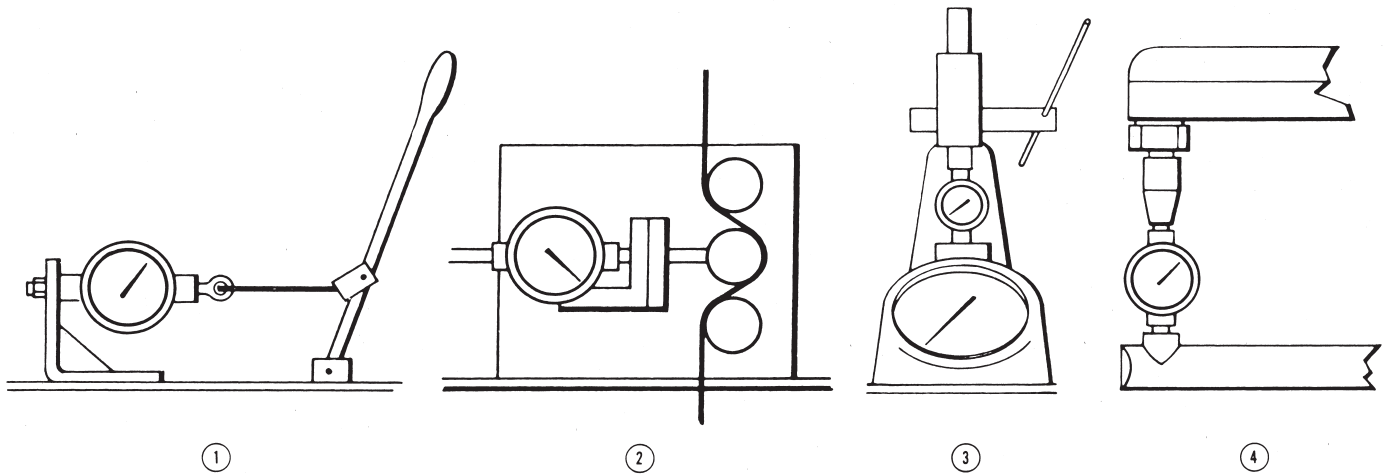
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# The Morehouse Ring Force Gauge Has Unlimited Uses

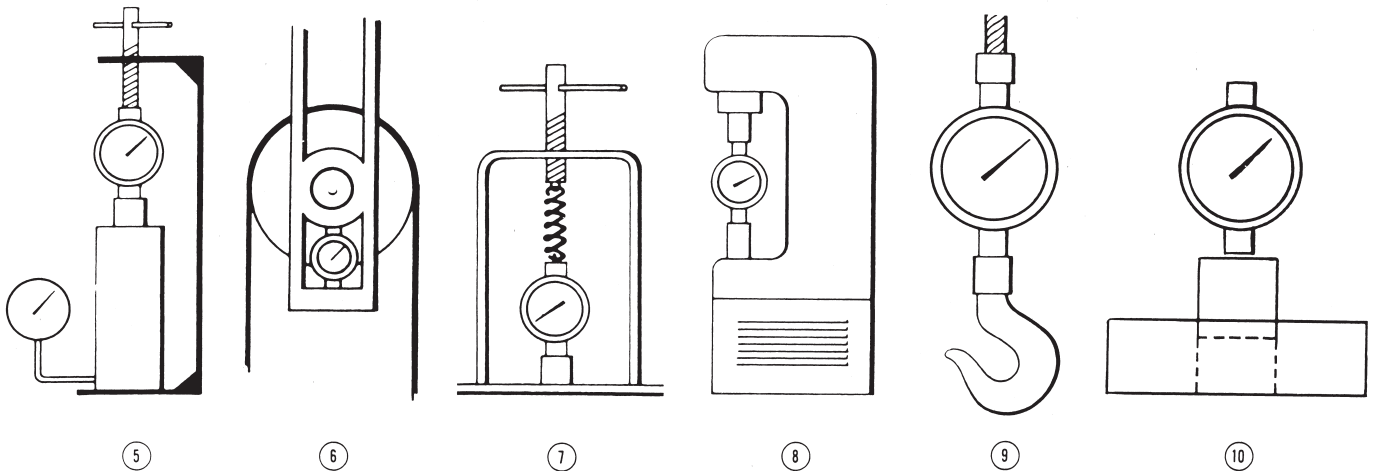
Because it is so versatile, the Ring Force Gauge can be applied in many different ways. It can be used as a calibration device for certain testing machines, weighing equipment, control instruments and hydraulic systems. It can be built into some testing equipment as both the sensing element and indicator. And it can be mounted as a

permanent load sensing element in plant operating and production equipment.

The Ring Force Gauge is supplied with tapped holes in the 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.

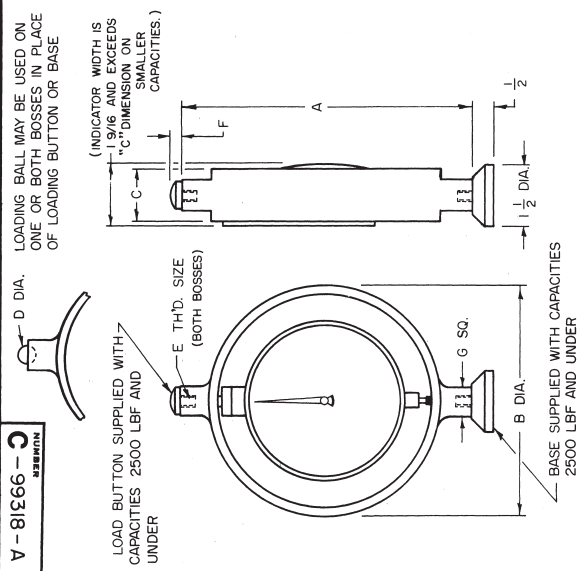


**1 TEST RIGS**—use the Ring Force Gauge to build a device for physical testing like the tensile strength of wire, etc... **2 MEASURING TENSION ON RUNNING WIRE**—continuous checking of force in production operations is possible with the Ring Force Gauge... **3 CHECKING OTHER CALIBRATED DEVICES**—shop 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.



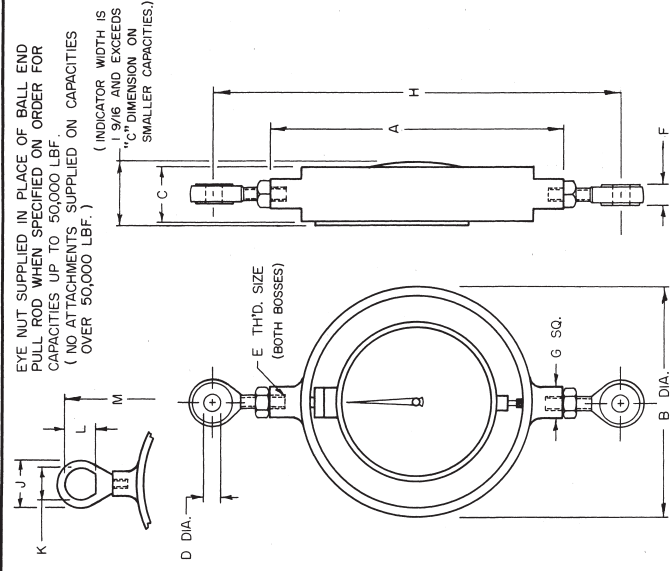
**5 CHECKING HYDRAULIC SYSTEMS**—determining the accuracy of hydraulic gauges can be accomplished with the Ring Force Gauge... **6 CHECKING THRUST ON A BEARING**—mounted in plant equipment, the Ring Force Gauge provides a ready check on mechanical forces wherever necessary... **7 CHECKING COIL SPRINGS**—various rigs can be devised for checking all sorts of springs and spring-loaded devices with the 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.

**V-81866-C**



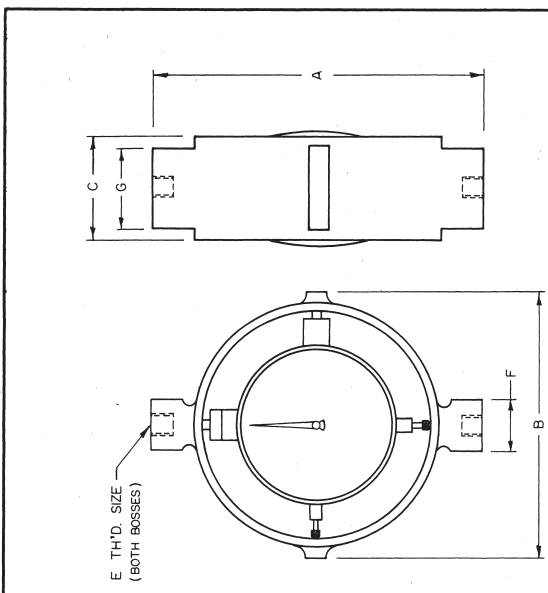
**COMPRESSION TYPE MODEL 5C**

CAPACITY IN LBF	A	B	C	D	E	F	G
5	6	4 1/4	3/4	1/2	3/8-24	3/8	3/4
10	6	4 1/4	3/4	1/2	3/8-24	3/8	3/4
20	6	4 1/4	3/4	1/2	3/8-24	3/8	3/4
50	6	4 1/4	1	1/2	3/8-24	3/8	3/4
100	6	4 1/4	1 1/4	1/2	3/8-24	3/8	3/4
200	6	4 1/4	1 1/4	1/2	3/8-24	3/8	3/4
500	6	4 1/4	1 1/4	1/2	3/8-24	3/8	3/4
1000	6	5	1 1/4	1/2	3/8-24	3/8	3/4
2000	6	5	1 1/4	1/2	3/8-24	3/8	3/4
5000	6	5	1 1/4	1/2	3/8-24	3/8	3/4
10000	6 1/2	5 1/4	2	1	5/8-18	1 1/4	1 1/4
20000	7	5 3/4	3	1	5/8-18	1 1/4	1 1/4
50000	9 1/2	7 1/2	3 1/4	1	5/8-18	1 3/4	1 3/4
100000	11	9	4 5/8	1	5/8-18	2 1/4	2 1/4
200000	13	11	4 1/2	1 1/2		2 1/4	2 1/4
300000	14 1/2	12 1/4	4 7/8			2 3/4	2 3/4
500000	16 1/2	14	5 1/2	3			3
600000	18 1/4	15 1/4	5 7/8	4			4
1,000,000	24	20	8				4 1/2



**TENSION TYPE MODEL 5BT**

CAPACITY IN LBF	A	B	C	D	E	F	G	H	I	J	K	L	M
5	6	4 1/4	3/4	3/8	3/8-24	1/2	3/4	9	2	1 1/4	1 1/2	10 1/4	
10	6	4 1/4	3/4	3/8	3/8-24	1/2	3/4	9	2	1 1/4	1 1/2	10 1/4	
20	6	4 1/4	3/4	3/8	3/8-24	1/2	3/4	9	2	1 1/4	1 1/2	10 1/4	
50	6	4 1/4	1	3/8	3/8-24	1/2	3/4	9	2	1 1/4	1 1/2	10 1/4	
100	6	4 1/4	1 1/4	3/8	3/8-24	1/2	3/4	9	2	1 1/4	1 1/2	10 1/4	
200	6	4 1/4	1 1/4	3/8	3/8-24	1/2	3/4	9	2	1 1/4	1 1/2	10 1/4	
500	6	4 1/4	1 1/4	3/8	3/8-24	1/2	3/4	9	2	1 1/4	1 1/2	10 1/4	
1000	6	5	1 1/4	3/8	3/8-24	1/2	3/4	9	2	1 1/4	1 1/2	10 1/4	
2000	6	5	1 1/4	3/8	3/8-24	1/2	3/4	9	2	1 1/4	1 1/2	10 1/4	
5000	6	5	1 1/4	3/8	3/8-24	1/2	3/4	9	2	1 1/4	1 1/2	10 1/4	
10000	6 1/2	5 1/4	2	1	5/8-18	1 1/4	1 1/4	10 1/4					
20000	7	5 3/4	3	1	5/8-18	1 1/4	1 1/4	10 1/4					
50000	9 1/2	7 1/2	3 1/4	1	5/8-18	1 3/4	1 3/4	10 1/4					
100000	11	9	4 5/8	1	5/8-18	2 1/4	2 1/4	10 1/4					
200000	13	11	4 1/2	1 1/2		2 1/4	2 1/4	10 1/4					
300000	14 1/2	12 1/4	4 7/8			2 3/4	2 3/4	10 1/4					
500000	16 1/2	14	5 1/2	3				10 1/4					
600000	18 1/4	15 1/4	5 7/8	4				10 1/4					
1,000,000	24	20	8					10 1/4					



**TENSION AND COMPRESSION TYPE MODEL 5TC**

CAPACITY IN LBF	A	B	C	D	E	F	G
100	7 1/4	5 1/2	2	3/8-24	1 1/4	1 1/4	1 3/4
200	7 1/4	5 1/2	2	3/8-24	1 1/4	1 1/4	1 3/4
500	7 1/4	5 1/2	2	3/8-24	1 1/4	1 1/4	1 3/4
1000	7 1/4	5 1/2	2	3/8-24	1 1/4	1 1/4	1 3/4
2000	7 1/4	5 1/2	2	3/8-24	1 1/4	1 1/4	1 3/4
5000	7 1/4	5 5/8	2	3/4-16	1 1/4	1 1/4	1 3/4
10,000	7 1/4	5 5/8	2	3/4-16	1 1/4	1 1/4	1 3/4
30,000	10	7 1/2	3 1/4	1 1/2-12	2	2	2
40,000	10	7 5/8	3 1/4	1 1/2-12	2	2	2
50,000	10	7 7/8	3 1/4	1 1/2-12	2	2	2

ALL MODELS AVAILABLE IN KILOGRAM AND NEWTON CAPACITIES.  
OTHER CAPACITIES AVAILABLE UPON REQUEST.

CERTIFIED PRINTS ON REQUEST WITH ORDER  
DESIGN SUBJECT TO CHANGE WITHOUT NOTICE

**MOREHOUSE INSTRUMENT CO.**  
YORK, PA.

**GENERAL SPECIFICATIONS**  
CERTIFIED ACCURACY: 1/2 OF 1% OF RANGE OR AS DESCRIBED IN BULLETIN  
READABILITY: 1/10 DIVISION  
SENSITIVITY: 1/20 DIVISION  
SENSITIVITY IN LINEAR INCHES: .000015  
CAPACITY LOAD DEFLECTION: APPROX. .030 INCH  
CALIBRATION: WITH STANDARDS TRACEABLE TO THE UNITED STATES NATIONAL BUREAU OF STANDARDS AND TECHNOLOGY (FORMERLY NAT'L. BUREAU OF STANDARDS)

**REQUIRED PER UNIT**  
HEAT TREATMENT: A THIS DWG. SUPERSEDES DWG. 9/18/89

**DESCRIPTION OF CHANGE**  
DATE: 10/6/89

**SCALE**  
N.T.S.

**DRAWING NO.**  
-99318-A

**SHEET**  
OF