

# PERMA-CAL INDUSTRIES, INC

## DIRECT DRIVE PRESSURE GAUGE

The advantage of **Perma-Cal** direct drive pressure gauges over conventional C-tube gauges is simple - only **one** moving part. No gears, linkages, or springs to wear or break. **Perma-Cal** gauges have a unique helical-wound elastic element that is attached directly to the pointer shaft. This eliminates the need for any movement-amplifying gears or linkages - the parts of a C-tube that fail most frequently. **Perma-Cal** gauges maintain their structural integrity and accurate calibration in the most demanding environments, even during prolonged and rugged use. **Perma-Cal** direct drive pressure gauges provide the lowest cost of ownership by giving the best value in durability, reliability, and accuracy.

## NO LIQUID FILL

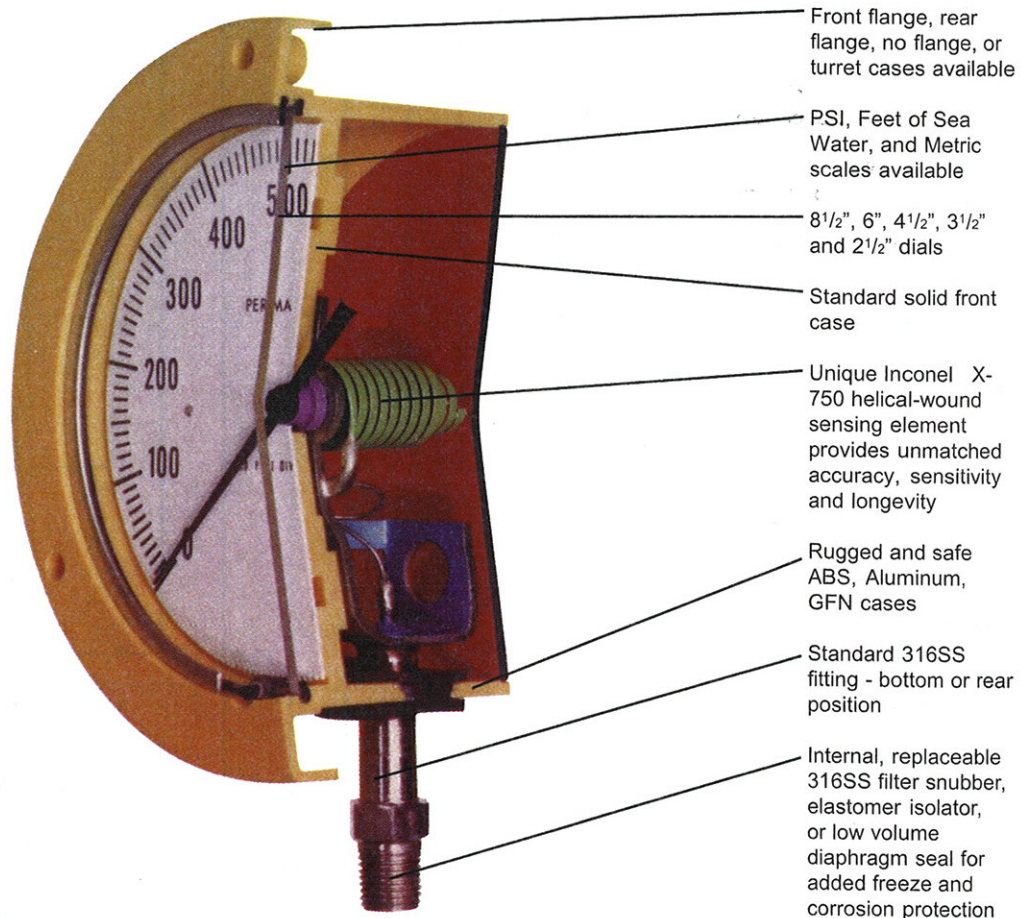
**Perma-Cal** gauges have more durability and longevity than liquid-filled gauges, without the mess or problems of liquid fill. **Perma-Cal's** gauges do not have any of the problems that liquid filling solves. There are no gears or linkages to lubricate, and **Perma-Cal** gauges are internally dampened with a small application of heavy (600,000 centistokes) silicone grease on the one moving part that eliminates pointer flutter. **Perma-Cal** provides a longer life gauge than liquid filled gauges without the leaking, discoloring problems of liquid fill.

## SAFETY FEATURES

**Perma-Cal** gauges have a very low volume elastic element and solid front case that provide the safest gauge possible. C-tube gauges have a relatively large volume elastic element that in cases of catastrophic failure could spill large amounts of process. Not all direct drive gauges offer the industry standard for case safety - solid front. The **Perma-Cal** configuration of solid front and blowout rear port, plug or back cover provide the customer with the safest possible case style. **Perma-Cal** furnishes the safest, most durable gauge in the industry.

## CERTIFIED ACCURACY

All **Perma-Cal** gauges have a high repeatable accuracy, instantaneous action, and are available as Grade 3A ( $\pm 0.25\%$  full scale), Grade 2A ( $\pm 0.5\%$  full scale), or  $0.5\%$  mid-scale, 1% full scale. The full scale accuracy rating is applicable in both ascending and descending modes on all gauges, except for gauges rated 8,000 psi and above, where the descending mode is 1% full scale. Test gauges (Grade 3A) come with a calibration certificate traceable to the National Institute of Standards and Technology included in the price. **Perma-Cal** provides the best in durability, reliability, and accuracy.



How to order a Perma-Cal gauge with the exact specifications you require.  
 Select appropriate symbols and build a model code number, as in the example shown below.

1 0 1 F T M XX Y 0 1 - V

<b>PRODUCT TYPE</b> Pressure Gauges	<b>1</b>
Seawater Depth Gauges	2

<b>ACCURACY</b> 4,5 1/4% Full scale (8 1/2", 6", 4 1/2" and 2 1/2"; calibration certification included)	<b>0</b>
1/2% Full scale (6", 4 1/2", 3 1/2" and 2 1/2" dials)	1
1% Full scale, 1/2% Mid scale (6", 4 1/2", 3 1/2" and 2 1/2" dials)	2

<b>DIAL SIZE</b> 8 1/2" (zero adjust dial included)	<b>8</b>
6" (zero adjust dial included)	0
4 1/2" (zero adjust dial included on test gauges; opt'l. on process gauges)	<b>1</b>
3 1/2" (zero adjust dial not available; zero adjust pointer included)	2
2 1/2" (zero adj. dial incl. on test gauges; optional on process gauges)	3

<b>CASE TYPE</b> (Solid front case standard on all models.)	
Front flange (8 1/2", 6", 4 1/2" and 2 1/2", ABS)	<b>F</b>
Rear flange (6" and 4 1/2", ABS)	R
No flange (4 1/2" metal)	M
No flange (6", 4 1/2" and 2 1/2", ABS)	N
No flange (4 1/2" SS)	S
Turret (4 1/2", ABS, GFN and 3 1/2", ABS)	T

<b>POINTER TYPE</b> Process (bold, easy reading)	<b>I</b>
Test (knife-edged, precision reading)	<b>T</b>

<b>MISC. OPTIONS</b>	
<b>C</b> Calibration certificate (not apropos on 1/4%)	<b>O</b> Cleaned for oxygen service
<b>E</b> EPDM Isolator installed	<b>T</b> Stainless steel tag
<b>L</b> Tempered glass	<b>V</b> Viton Isolator installed
<b>N</b> Microbraze	<b>Z</b> Aluminum case

<b>FITTING TYPE</b>	
<b>1</b> 1/4" NPT	<b>6</b> MS 33649E4
<b>2</b> 1/8" NPT	<b>7</b> 1/4" Aminco
<b>3</b> 1/2" NPT	<b>8</b> MIL-G 18997
<b>4</b> MS 33514E4	<b>9</b> 1/4" BSP
<b>5</b> SAE AS4395EO4	

<b>FITTING POSITION</b> 8	
<b>0</b> Rear	<b>4</b> Top (12 o'clock)
<b>2</b> Bottom (6 o'clock)	

<b>COLOR</b>		
<b>A</b> Black	<b>B</b> Blue	<b>G</b> Green
<b>R</b> Red	<b>W</b> White	<b>Y</b> Yellow
<b>U</b> Unpainted, (SS or Al cases)		
<b>H</b> High temp (GFN, 4 1/2" yellow turret)		

<b>PRESSURE RANGE</b> 7	
<b>XX</b>	Specify pressure range and units of measurement, i.e., PSI, Pascals, Bar, etc. or see Bulletin T-103 for pressure codes.

<b>DIAL TRIM</b>			
	<b>Dial Size</b>	<b>Mirror Band</b>	<b>Zero Adj.Dial</b>
<b>M</b>	2 1/2", 4 1/2", 6", 8 1/2"	Yes	Yes
<b>D</b>	2 1/2", 3 1/2", 4 1/2"	No	No
<b>B</b>	2 1/2", 4 1/2", 6"	No	Yes
<b>R</b>	Metal cases	No	No

**SPECIFICATIONS**

**Proof Pressure**  
 without calibration shift:  
 150% of F.S. pressure<sup>1</sup>  
**Response Time:**  
 Approx. 100 msec to F.S.<sup>3</sup>  
**Life:**  
 250,000 cycles min., 20% to 80%  
 F.S. on ranges below 3,000 psi.

**Burst Pressure:**  
 500% of F.S. pressure<sup>2</sup>  
**Accuracy:**  
 Grade 3A ±.25% full scale<sup>5</sup>  
 Grade 2A ±.5% full scale<sup>5</sup>  
 .5% M.S. ±1% full scale,  
 ±.5% midscale

**Wetted Parts:**  
 Inconel X-750, 316SS, 304SS and  
 silver solder. Other options  
 available.  
**Repeatability & Sensitivity:**  
 ±.01% full scale  
**Calibration:**  
 Vertical position standard<sup>6</sup>

**Media Temperature:**  
 -65° to +250°F w/ ABS case  
 -65° to +600°F w/ GFN, SS or Al case  
**Ambient Temperature:**  
 -65° to +190°F w/ ABS case  
 -65° to +400°F w/ GFN, SS or Al case

**NOTES:**

1. 125% of F.S. pressure, 8,000 psi and above 2. Or 25,000 psi, whichever is less 3. Gas operation, no dampening 4. Specified accuracy includes all friction error, hysteresis, and linearity variations. 5. On 8,000 psi and above, accuracy is 1% descending 6. Calibration in other mounting positions available. 7. Custom dials available 8. Fittings for case types M and S are field adjustable bottom/back.

Distributed by:



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Bulletin T-103  
 Revision L

## PERMA-CAL DIAL AVAILABILITY CHART

(Consult factory for special or custom dials)

### PRESSURE RANGES

UNITS OF MEASUREMENT	PSI	BAR	Kg/CM <sup>2</sup> PSI	PSI / kPa	MPa	kPa	PSI / BAR	FSW	MSW/FSW
PROCESS GAUGE DIAL SIZES	2½", 3½", 4½", 6"	2½", 3½", 4½", 6"	4½", 6"	3½", 4½", 6"	4½", 6"	2½", 3½", 4½", 6"	4½", 6"	N.A.	N.A.
TEST GAUGE DIAL SIZES	2½", 4½", 6", 8½"	4½", 6"	4½", 6"	4½", 6"	4½", 6"	4½", 6"	N.A.	4½", 6", 8½"	4½", 6"
DIAL CODES AND PRESSURE RANGES	CODE RANGE	CODE RANGE	CODE RANGE	CODE RANGE	CODE RANGE	CODE RANGE	CODE RANGE	CODE RANGE	CODE RANGE
	01 30	40 2	AA 2/30	BA 30/200		CA 200			
	02 (13½") 30	41 (13½") 2				CB 250			
	03 60	42 4	AC 4/60	BC 60/400		CC 400	DC 60/4	70 (13½") 70	
	04 100	43 7	AD 7/100	BD 100/700		CD 700		71 (200") 100	
	05 150	44 10	AE 10.5/150	BE 150/1000		CE 1000	DE 150/10	72 150	
	23 160		AL 11/160			CF 1400		73 250	88 250
	06 200	45 14	AF 14/200	BF 200/1400		CL 1600		74 300	89 300
	07 300	46 20	AG 21/300	BG 300/2000	EG 2	CG 2000		75 350	
	08 400	56 28	AH 28/400			CI 2800		76 450	91 450
	20 500	47 35	AI 35/500	BI 500/3500				77 600	
	09 600	48 40	AJ 42/600	BQ 600/4000	EJ 4	CJ 4000	DJ 600/40	78 700	
	10 800		AY 56/800					79 1000	
	11 1000	49 70	AK 70/1000	BK 1000/7000		CK 7000		80 1500	
	12 1500	50 100	AM 105/1500	BM 1500/10,000	EM 10	CM 10,000	DM 1500/100	81 2000	
	13 2000	51 140	AN 140/2000	BN 2000/14,000		CN 14,000	DN 2400/140	82 3500	
	14 3000	52 200	AP 210/3000	BP 3000/20,000	EP 20	CP 20,000			
	22 4000	55 280	AQ 280/4000			CQ 25,000	DQ 4000/280		
15 5000	53 350	AR 350/5000	BR 5000/35,000	ER 35	CR 35,000				
16 6000	57 400	AS 420/6000				DS 6000/400			
21 8000					CS 60,000				
17 10,000	54 700	AT 700/10,000	BT 10,000/70,000	ET 70	CT 70,000				
18† 15,000		AU 1000/15,000							

### VACUUM & COMPOUND RANGES

UNITS OF MEASUREMENT	PSI	BAR	kPa
PROCESS GAUGE DIAL SIZES	2½", 3½", 4½", 6"	3½", 4½", 6"	2½", 3½", 4½", 6"
TEST GAUGE DIAL SIZES	4½", 6", 8½"	4½", 6"	4½", 6"
DIAL CODES AND VACUUM/PRESSURE RANGES	CODE RANGE	CODE RANGE	CODE RANGE
	25† 30"Hg-0	60 -1/0	C0 -100/0
	27 30"Hg-0-30	61 -1/0/+2	
	24 30"Hg-0-60	62 -1/0/+3	C2 -100/0/+300
	29 30"Hg-0-100		
	28 30"Hg-0-150	64 -1/0/+10	C4 -100/0/+900
	30 30"Hg-0-200	65 -1/0/+14	
	31 30"Hg-0-300		
	32 30"Hg-0-400	67 -1/0/+28	
	33 30"Hg-0-500		
34 30"Hg-0-600			

All gauges 8000 psi and above are ±1% descending accuracy.

\* Exceptions for 8½" dials only.

- 1.) PSI codes 01, 02, 18, 32, 33, and 34 not available
- 2.) PSI codes 16, 17, and 21 available as 1½% ascending, 1% descending only
- 3.) FSW ranges available for codes 73, 76, and 79 only.

### RECEIVER RANGES

(±1% F.S. Accuracy only)

DIAL SIZES	2½", 3½", 4½", 6"	2½", 3½", 4½", 6"
DIAL CODES AND RANGES	CODE RANGE (WITH NUMERALS)	CODE RANGE (LESS NUMERALS)
	35 0-100%	37 0-100 Linear
	36 0-10 sq. rt.	38 0-10 sq. rt.
	39 3-15 psi	N.A. N.A.

### REFRIGERANT RANGES

(±1% F.S. Accuracy only)

DIAL SIZES	3½", 4½"	
DIAL CODES AND RANGES	CODE	RANGE
	RG†	30"Hg-0-150 Ammonia
	RH	30"Hg-0-150 R12
	RI	30"Hg-0-150 R22
	RQ†	30"Hg-0-300 Ammonia
	RR	30"Hg-0-300 R12
	RS	30"Hg-0-300 R22

† Specify microbrazed welds

See back for additional ranges



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### Additional Ranges / Limited Availability

RANGE CODE	RANGE	SIZE/TYPE AVAILABLE	RANGE CODE	RANGE	SIZE/TYPE AVAILABLE
00	0-15 PSI	2½", 3½", 4½", 6" PROCESS ONLY	26	30" Hg-0-15 PSI	2½", 3½", 4½", 6" PROCESS ONLY
A1	-1/0/2 kg/cm	2½", 4½" PROCESS	WA	840" H <sub>2</sub> O 30 PSI	4½", 6" TEST
XA	0-60"Hg POS. PRESSURE	4½", 6" TEST 4½", 6" PROCESS	WB	70 FFW	6" TEST
XV	0-760 mm Hg VAC 0-30 in Hg VAC	8½" TEST	WF	460 FFW	6" PROCESS
XY	0-760 mm Hg VAC	4½", 6" TEST 2½", 4½" PROCESS	WH	1000 FFW	6" PROCESS

### DIAL SPECIFICATIONS

#### Test Gauges

Standard PSI Ranges and Code Numbers for 1/4% Test Gauges

RANGE CODE	PSI AND COMPOUND (*Hg/PSI) RANGES	FIGURE INTERVAL		DIAL GRADUATIONS		
		MAJOR	MINOR	MAJOR	INTERMEDIATE	MINOR
01	0-30	5	1	5	0.5	0.1
02	0-30 (135°)	5	1	5	1	0.2
03	0-60	5	1	5	1	0.2
04	0-100	10	2	10	2	0.5
05	0-150	10	2	10	2	0.5
23	0-160	10	2	10	1	0.5
06	0-200	20	2	10	2	1.0
07	0-300	50	10	50	5	1.0
08	0-400	50	10	50	10	2.0
20	0-500	50	10	50	10	2.0
09	0-600	50	10	50	10	2.0
10	0-800	100	20	100	20	5.0
11	0-1000	100	20	100	20	5.0
12	0-1500	100	20	100	20	5.0
13	0-2000	200	20	200	100	10.0
14	0-3000	500	100	500	100	10.0
22	0-4000	500	100	500	100	20.0
15	0-5000	500	100	500	100	20.0
16	0-6000	500	100	500	100	20.0
21	0-8000	1000	200	1000	200	40.0
17	0-10,000	1000	200	1000	200	50.0
18*	0-15,000	1000	200	1000	200	50.0
25*	30" Hg-0	5	1	5	1	0.2
27	30" Hg-0	10	2	10	2	0.5
	0-30 PSI	5	1	5	1	0.2
24	30" Hg-0	10	2	10	2	0.5
	0-60 PSI	5	1	5	1	0.2
29	30" Hg-0	10	5	10	5	1.0
	0-100 PSI	10	2	10	2	0.5
28	30" Hg-0	30	5	10	5	1.0
	0-150 PSI	10	2	10	2	0.5
30	30" Hg-0	30	10	30	10	2.0
	0-200 PSI	20	2	10	2	1.0
31	30" Hg-0	30	10	30	10	2.0
	0-300 PSI	50	10	50	5	1.0
32	30" Hg-0	30	-	30	15	5.0
	0-400 PSI	50	10	50	10	2.0
33	30" Hg-0	30	-	30	10	5.0
	0-500 PSI	50	10	50	10	2.0

#### Process Gauges

Standard PSI Ranges and Pressure Code Numbers for 1/2% Full Scale and 1% Full Scale (1/2% Mid Scale) Gauges

RANGE CODE	PSI AND COMPOUND (*Hg/PSI) RANGES	FIGURE INTERVAL	DIAL GRADUATIONS		
			MAJOR	INTERMEDIATE	MINOR
01	0-30	3	3	1.0	0.2
02	0-30 (135°)	5	5	2.5	0.5
03	0-60	5	5	2.5	0.5
04	0-100	10	10	5.0	1.0
05	0-150	15	15	5.0	1.0
23	0-160	20	20	10.0	2.0
06	0-200	20	20	10.0	2.0
07	0-300	30	30	10.0	2.0
08	0-400	50	50	25.0	5.0
20	0-500	50	50	25.0	5.0
09	0-600	50	50	25.0	5.0
10	0-800	100	100	50.0	10.0
11	0-1000	100	100	50.0	10.0
12	0-1500	150	150	50.0	10.0
13	0-2000	200	200	100.0	20.0
14	0-3000	300	300	100.0	20.0
22	0-4000	500	500	250.0	50.0
15	0-5000	500	500	250.0	50.0
16	0-6000	500	500	250.0	50.0
21	0-8000	1000	1000	500.0	100.0
17	0-10,000	1000	1000	500.0	100.0
18	0-15,000	1500	1500	500.0	100.0
25	30" Hg-0	5	5	2.5	0.5
27	30" Hg-0	10	10	5.0	1.0
	0-30 PSI	5	5	2.5	0.5
24	30" Hg-0	10	10	5.0	1.0
	0-60 PSI	5	5	2.5	0.5
29	30" Hg-0	30	10	-	2.0
	0-100 PSI	10	10	5.0	1.0
28	30" Hg-0	30	10	-	2.0
	0-150 PSI	15	15	5.0	1.0
30	30" Hg-0	30	15	-	5.0
	0-200 PSI	20	20	10.0	2.0
31	30" Hg-0	30	15	-	5.0
	0-300 PSI	30	30	10.0	2.0
32	30" Hg-0	30	30	15.0	7.5
	0-400 PSI	50	50	25.0	5.0
33	30" Hg-0	30	30	15.0	7.5
	0-500 PSI	50	50	25.0	5.0

\*1/2% Test. (1/4% Test N.A.)

**NOTE:** Pressure codes in this bulletin are primarily for Perma-Cal's internal operations and are subject to change without notice. When ordering, to assure the desired pressure range is secured, write the pressure range and unit of measurement for each line item on the order. If a conflict occurs between a specified pressure code and the designated pressure range/unit of measurement, the latter shall prevail in processing the order.

Minor dial graduations on some 6" & 8½" gauges may have twice the resolution of the number shown.  
 Graduations on 2½" gauges may not comply with ASME B40.1 or the above due to space limitations.