

PRODUCT INFORMATION**PRESSURE GAUGE ACCURACIES**

Attached is a copy of Engineering drawing 85A154 covering Accuracy Grade Specifications for all Ashcroft® Pressure Gauges.

We direct your attention to sheets 1 through 5 as follows:

- **Sheet 1**
All accuracy grades conform to ASME Standard B40.1.
- **Sheets 2 and 3**
Definitions of the various terms associated with the measurement of gauge accuracy are listed. Also some important general notes are addressed.
- **Sheet 3**
A continuation of general notes as well as accuracy testing of all ASME grades per Standard B40.1.
- **Sheet 4**
Overpressure tolerances, accuracy grade by gauge line and accuracy coding are tabulated.
- **Sheet 5**
Gauge and Diaphragm seal accuracy.

We suggest you familiarize yourselves with the information contained in this Engineering drawing. It is both informative and useful.

ACCURACY GRADE (SEE NOTE-1)	MAXIMUM PERMISSIBLE ERROR (EXCLUDING FRICTION % OF SPAN SEE "EXAMPLE")			MAXIMUM ALLOWABLE FRICTION	REMARKS
	0/25% OF ARC	25%/75% OF ARC	75%/100% OF ARC		
A	2	1	2	1% OF SPAN	-----
B	3	2	3	2% OF SPAN	-----
C	4	3	4	MAX. FRICTION 3% OF SPAN	-----
D	5	5	5	3% OF SPAN	-----
1A	1	1	1	1% OF SPAN	-----
2A	0.5	0.5	0.5	0.50% OF SPAN	SEE NOTE-3
3A	0.25	0.25	0.25	0.30% OF SPAN	SEE NOTE-3
4A	0.1% OF SPAN OVER FULL RANGE			-----	GAUGE MUST REMAIN WITHIN SPECIFIED TOLERANCE BEFORE AND AFTER TAPPING

EXAMPLE: IN THE TOP 25% OF THE SCALE, A GRADE A GAUGE MUST BE WITHIN 2% OF TRUE INDICATION, AFTER FRICTION ERRORS HAVE BEEN ELIMINATED BY TAPPING OR VIBRATION. THE AMOUNT OF POINTER MOTION RESULTING FROM TAPPING OR VIBRATION MUST NOT EXCEED 1%.

NOTE-1: ACCURACY GRADES CONFORM TO ANSI B40.1.

NOTE-2: SEE SHEET-4 FOR SPECIAL ACCURACY REQUIREMENTS.

NOTE-3: NO TOLERANCE AT ZERO PER TYPES 1080, 1082, AND 1084 GAUGES.

INSPECTION PROCEDURE: AFTER EXERCISING TUBE TO FULL SCALE, RESET POINTER TO ZERO (IF REQD.). GAUGE TO BE WITHIN SPECIFIED ACCURACY AT ALL POINTS.

(SHT-1 CONT.)

N	8285	REDRAWN & REVISED, ADDED NOTE-3	RIKI	5/8/96
REV LTR	C/N NO	DESCRIPTION	BY	DATE
		S	RIKI	5/8/96
			RIKI	5/8/96
			Ugw	5/28/96
SCALE		85A154	REV	N

CHART
ACCURACY GRADE SPECS.
FOR PRESSURE GAUGES

Form No. 250-2881-B

ACCURACY

Accuracy - the conformity of a gauge indication to an accepted standard or true indication. Accuracy is the difference (error) between the true value and the gauge indication expressed a percent of the gauge span. It includes the combined effects of method, observer, apparatus, and environment. Accuracy error includes hysteresis (except for gauges with bourdon tubes using non-hardenable materials, in higher ranges, as specified) and repeatability errors, but, not friction error.

CORRECTION

The quantity that is algebraically added to an indicated value to obtain the true value. The algebraic sign of the correction is opposite to the sign of the error.

ERROR - (See also Correction)

The difference between the indicated value and true value of the variable being measured. A positive error denotes that the indicated value is greater than the true value.

ERROR, FRICTION

The difference between indicated readings before and after the gauge has been lightly tapped. Gauges without hairsprings should be continuously vibrated, instead of tapped, to obtain consistent friction readings.

ERROR, HYSTERESIS

The difference between increasing pressure and decreasing pressure readings at any point on the scale obtained during a pressure cycle, after friction errors have been eliminated by tapping or vibrating.

ERROR, POSITION

The change of pressure indication that results when a gauge is placed in a position different from that in which it was calibrated.

ERROR, TEMPERATURE

The change of pressure indication that results when the gauge components are at a temperature different from their temperature at calibration.

TITLE: CHART
ACCURACY GRADE SPEC.
FOR PRESSURE GAUGES

A	0237	REDRAWN & UPDATED ERROR HYSL PAR & ERROR TEMP PAR.	PS	11-4-85	DRAWN PS	DATE	11-4-85	REV.	A
REV. LTR.	C/N NO.	DESCRIPTION	BY	DATE	CHK'D. R.G.B.	RELEASED	11-4-85	85A154	

SPAN

The algebraic difference between the limits of the unretarded portion of the scale:

- 1) The span of a 0/100 psi gauge is 100 psi.
The span of a 0/100 kPa gauge is 100 kPa.
- 2) The span of a suppressed scale is the difference between the minimum and maximum scale pressures. For example, the span of a 200/500 psi gauge is 300 psi, and the span of a 200/500 kPa gauge is 300 kPa.
- 3) The span of a compound gauge is the algebraic difference between the limits of the vacuum and pressure scales when both are expressed in the same units. For example, the span of a 30 in.Hg Vacuum (approximately -15 psi)/30 psi pressure gauge is 45 psi, and the span of a -100/300 kPa gauge is 400 kPa.

REFERENCE TEMPERATURE

A temperature of 73°F (23°C) shall be the reference standard for testing gauges.

GENERAL NOTES

The accuracy of a retard gauge shall be expressed as a percentage of the expanded portion of the scale. The accuracy classification of the gauge is not determined by its accuracy in the compressed portion of the scale. The error allowed at the last mark is +20/-10% of span.

The accuracy of a gauge with suppressed scale shall be expressed as a percent of span.

The accuracy of a compound gauge shall be expressed as a percent of span.

Accuracy is affected by readability. For this reason more accurate gauges are generally made in larger sizes.

Mounting a pressure gauge in a position other than that of which it was calibrated can affect its accuracy. Normal calibrating position is upright/vertical.

TITLE: **CHART**
ACCURACY GRADE SPEC.
FOR PRESSURE GAUGES

A	0237	REDRAWN-UPDATED SPAN(3) AND GENERAL NOTES, PAR. 1	PS	11-4-85	DRAWN <i>BS</i>	DATE	REV.	A
REV. LTR.	C/N NO.	DESCRIPTION	BY	DATE	CHK'D. <i>RSB</i>	11-4-85	RELEASED	
					APP'D. <i>[Signature]</i>	11-4-85	85A154	

GENERAL NOTES - (continued)

(All Compound) Pointer must be between graduation lines at zero; the edge of the pointer must not touch the graduation lines on either side of zero. Bending of pointer to meet this requirement is not permitted.

HYSTERESIS ERROR (% OF RANGE)

<u>MAX PERMISSIBLE HYSTERESIS FOR "SS" SYSTEMS (TEST GAUGE ONLY)</u>
1500 PSI = 0.3%

GAUGE/SEAL ASSEMBLIES

(For all grades of gauges) When liquid filled devices such as diaphragm seals and gauge saver are applied to gauges, an additional 0.5% accuracy is permitted. For each 10°F temperature change from calibration to final test, the following additional tolerance is permitted for metal diaphragms, 15 psi -1%; 30 psi -0.8%; 60 psi -0.5%.

ACCURACY TESTING

Grades 3A and 4A only - Before conducting the accuracy test, subject the gauge to a pressure equal to the maximum scale pressure (or vacuum). Conduct the accuracy test within 10 min.

General - Known pressure, equivalent to each test point, shall be applied to the gauge. The gauge shall be read on increasing pressure (or vacuum) from one end to the other end of the scale, then on decreasing pressure (or vacuum) back to the starting end, reading the same test points. The gauge being tested shall be read, and then lightly tapped and read again.

<u>Accuracy Grade</u>	<u>No. of Test Points</u>
4A	10
3A-2A-1A-A	5
B-D	3

TITLE: CHART
ACCURACY GRADE SPEC. FOR PRESS. GAUGES

D	6969	REMOVED HYSTERESIS CHART FOR "TA" & "RT" SYSTEMS	RIKI	10/10/94
C	3132	ADDED COLUMN FOR MAX-PERMISSIBLE HYSTERESIS FOR "SS" SYSTEMS (TEST GAUGE ONLY) 1500PSI = 0.3%	RIKI	9/8/89
B	0237	ADDED "ACCURACY TESTING"	FS	11/4/85
A	A5612	REDRAWN WITH ADDITION OF HYSTERESIS ERROR TABLE	RIKI	8/19/83
REV. LTR.	C/N NO.	DESCRIPTION	BY	DATE

DRAWN	RIKI	DATE		REV.	D
CHK'D.	S.E.B.	8-15-83			
APP'D.	[Signature]	RELEASED	8/19/83		
					85A154

OVERPRESSURE

Unless otherwise specified accuracy requirements must be maintained after overpressure as follows:

- Bellows (1188 Series) - See 84A197
- Utility - No overpressure requirement
- Retard Ranges - No overpressure requirement
- Suppressed Scale Ranges- No overpressure requirement
- All Other Gauges - up through 1000 psi - 130% of span
above 1000 psi - 110% of span

Differential Press. Range		Max. Static Press. psi	Differential Press. Range		Max. Static Press.
1125	1125A		1125	1125A	
0/20	10-0-10	30	0/200	100-0-100	300
0/30	15-0-15	60	0/300	150-0-150	450
0/40	20-0-20	78	0/400	200-0-200	600
0/60	30-0-30	120	0/600	300-0-300	900
0/100	50-0-50	200	0/800	400-0-400	1200
0/120	60-0-60	220	0/1000	500-0-500	1500
0/160	80-0-80	300	-	--	-

Intended Application of Accuracy Grades

- 4A Heise
- 3A Test Gauges
- 2A *Duragauges
- 1A General Service/Special Application Gauges (Formerly "Quality" Gauges)
- A (~~FORMER ACCURACY OF GENERAL SERVICE GAUGES.~~) Special Application Gauges
- B Utility Gauges

Coding to designate accuracy grade different from product standard.

<u>Coding</u>	<u>Accuracy Grade</u>
XAJ	Grade 2A
XAM	Grade A
XAN	Grade 1A
XAQ	Accuracy per order (see 84A215)

*DURAGAUGE ACCURACY FOR RANGES:
 "TA" - 0/30000, 0/40000, 0/50000 } GRADE 1A
 "D" - 0/100,000 PSI }
 "TA" - 0/80,000 PSI - GRADE 1A WITH AN
 ADDITIONAL 1% FOR
 HYSTERESIS.

TITLE: CHART			
ACCURACY GRADE SPEC. FOR PRESS. GAUGES			
DRAWN		DATE	REV. D
CHK'D.		RELEASED	85A154
APP'D. <i>H&W</i>		2-11-80	

D	0919	ADDED *DURA. ACCURACY... NOTE	FS	
C	0237	REVISED ACCURACY GRADE "A"	FS	11/4/85
B	-	RELEASED DWG.		2/11/80
REV. LTR.	C/N NO.	DESCRIPTION	BY	DATE

SHEET 4 (CONT.)

GENERAL NOTES

(FOR ALL GRADES OF GAUGES) WHEN LIQUID FILLED DEVICES SUCH AS DIAPHRAGM SEALS AND GAUGE SAVER ARE APPLIED TO GAUGES, AN ADDITIONAL 0.5% ACCURACY IS PERMITTED. FOR EACH 10°F TEMPERATURE CHANGE FROM CALIBRATION TO FINAL TEST, THE FOLLOWING ADDITIONAL TOLERANCE IS PERMITTED WITH METAL DIAPHRAGMS 15 PSI -1%, 30 PSI -0.8%, 60 PSI -0.5%.

ON COMPOUND RANGES AND VACUUM GAUGES, THE ACCURACY APPLIES DOWN TO 20 IN HG VAC ONLY.



THIRD ANGLE PROJECTION

SHT-5 CONT.

A	5679	REDRAWN ONTO CAD (NO CHANGES)	RIKI	4/8/93
REV LTR	C/N NO	DESCRIPTION	BY	DATE

GAUGE & DIAPHRAGM SEAL ACCURACY	S				DRAWN	RIKI	4/8/93	
					CHECKED	RIKI	4/8/93	
					APPROVED			
	SCALE	85A154					REV	A
	1/1							

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