UNITED STATES DEPARTMENT OF COMMERCE
HENRY A. WALLACE, Secretary
NATIONAL BUREAU OF STANDARDS
LYMAN J. BRIGGS, Director

TANK-MOUNTED AIR COMPRESSORS

COMMERCIAL STANDARD CS126–45

Effective Date for New Production from December 5, 1945

A RECORDED VOLUNTARY STANDARD
OF THE TRADE

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1945

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 10 cents

PROMULGATION

of

COMMERCIAL STANDARD CS126–45

for

TANK-MOUNTED AIR COMPRESSORS

On November 29, 1944, at the instance of the Pneumatic Automotive Equipment Association, a proposed commercial standard for tank-mounted air compressors was circulated to leading user organizations, Government agencies, distributors, and manufacturers for comment. Following adjustment in the light of that comment, the recommended commercial standard was circulated on March 26, 1945, to the entire trade for written acceptance.

Those concerned have since accepted and approved the standard as shown herein for promulgation by the U. S. Department of Commerce, through the National Bureau of Standards.

The standard is effective for new production from December 5, 1945.

Promulgation recommended.

I. J. Fairchild,
Chief, Division of Trade Standards.

Promulgated.

Lyman J. Briggs,
Director, National Bureau of Standards.

Promulgation approved.

Henry A. Wallace,
Secretary of Commerce.

TANK-MOUNTED AIR COMPRESSORS

COMMERCIAL STANDARD CS126–45

PURPOSE

1. The purpose of this commercial standard is to establish minimum standard specifications and uniform methods of designating capacity; definite size classifications for compressors, motors, and tanks; to provide uniform laboratory test methods, and a uniform basis for fair competition and for guaranteeing compliance with the standard for the guidance of manufacturers, distributors, wholesalers, and users.

SCOPE

2. This standard covers ratings, motor loading, and methods of testing single-stage and two-stage air compressors from ¼ to 10 horsepower, inclusive.

2a. This minimum standard applies only to complete stationary tank-mounted, electric-motor-driven, automatic start and stop air compressors, operating above 100-lb/in.^{2} gage pressure and up to 200-lb/in.^{2} gage pressure, of air-cooled construction. For purposes of field selection the machines are divided into two groups as follows:

(1) Single-stage compressors up to 150-lb/in.^{2} gage pressure.
(2) Two-stage compressors up to 200-lb/in.^{2} gage pressure.

2b. This standard covers compressors driven by single-phase and polyphase motors of the standard, open, general-purpose type.

DEFINITIONS

3. *Manufacturer.*—The manufacturer, for the purpose of this commercial standard, shall be the company or organization that evidences its responsibility by all of the following:

(a) Being a prime fabricator of tank-mounted air compressors.
(b) Affixing its name or its distributor's name and/or nationally registered trade-mark or trade name to the air compressor.

4. *A single-stage compressor* is one in which air is compressed in each cylinder, from initial intake pressure to final discharge pressure, on each working stroke of the piston.

5. A *two-stage compressor* is one in which air is compressed to final discharge pressure in two distinct steps.

6. *Piston displacement* of a compressor is the volume in cubic feet displaced by the piston or pistons in 1 minute. In a reciprocating single-acting compressor it equals the net area of the compressor piston or pistons multiplied by the length of the stroke and by the revolutions per minute. Piston displacement of a two-stage com-

pressor is the piston displacement of the low-pressure cylinder or cylinders only.

7. *Capacity.*—The capacity of an air compressor is the actual volume of air compressed and delivered at a definite discharge pressure, expressed in cubic feet per minute at ambient conditions.

8. *Volumetric efficiency* is the ratio of capacity of the compressor to the piston displacement of the compressor.

9. *Free air* is defined as air at atmospheric conditions at any specific location.

10. *Nominal receiver tank capacity* is the cubical content of the tank expressed in United States gallons.

11. *The over-all efficiency* of these compressors is the ratio of the capacity of the compressor to the actual electricpower input to the motor, and is expressed in terms of cubic feet of air per kilowatt hour input to the motor.

GENERAL REQUIREMENTS

12. *Safety.*—All tanks shall be constructed in accordance with the ASME [1] Code for Unfired Pressure Vessels and shall be equipped with an ASME safety valve and with a suitable drain outlet.

13. *Electric equipment.*—All electric wiring shall be in accordance with the National Electrical Code for ordinary locations.

14. *Rating.*—

14a. *Compressor.*—For rating purposes the compressor shall be tested by the methods of test outlined in paragraphs 18 to 26.

14b. *Over-all efficiency.*—To meet these standards, the over-all efficiencies of tank-mounted air compressors shall meet the minimum cubic feet per kilowatt hour basic ratings shown in table 1.

TABLE 1.—*Basic ratings*

	Motor size	Discharge pressure gage	Cu ft/kw hr minimum (basic rating)	Discharge pressure gage	Cu ft/kw hr minimum (basic rating)
	hp	*Psi*		*Psi*	
Single-stage compressor, single-phase or polyphase motor	¼	150	100	----------	----------
	⅓	150	100	----------	----------
	½	150	100	----------	----------
	¾	150	125	----------	----------
	1	150	125	----------	----------
	1½	150	140	----------	----------
	2	150	150	----------	----------
Two-stage compressor, single-phase motor	1	175	175	200	165
	1½	175	175	200	165
	2	175	180	200	170
	3	175	180	200	170
	5	175	180	200	170
Two-stage compressor, polyphase motor	1	175	180	200	170
	1½	175	185	200	175
	2	175	195	200	185
	3	175	195	200	185
	5	175	195	200	185
	7½	175	195	200	185
	10	175	195	200	185

14c. *Motor loading.*—General purpose, 40-degree-centigrade rating, open-type motors will be so applied that the average-duty cycle loading will not exceed 115 percent rated horsepower on an equivalent continuous basis, and will not exceed 125 percent rated horsepower at the maximum cut-off pressure.

[1] The American Society of Mechanical Engineers.

DETAIL REQUIREMENTS

15. *Standard equipment.*—The standard equipment for tank-mounted air compressors shall be as shown in table 2.

TABLE 2.—*Standard equipment for tank-mounted air compressors*

Single-stage models	Two-stage models
Compressor.	Compressor.
Motor.	Intercooler.
Pressure gage.	Motor.
Shut-off line valve.	Pressure gage.
ASME safety valve.	Shut-off line valve.
Automatic unloader.	ASME safety valve.
V-belt drive, if belt-driven.	Automatic unloader.
Tank—must conform to ASME Code.	V-belt drive, if belt-driven.
Intake muffler and air filter.	Tank—must conform to ASME Code.
Tank drain cock.	Intake muffler and air filter.
Automatic pressure switch.	Tank drain cock.
	Automatic pressure switch.

16. *Size classifications.*—Tank-mounted air compressors shall be classified according to the sizes given in table 3.

TABLE 3.—*Size classifications of tank-mounted air compressors*

	Single-stage models						Two-stage models						
Horsepower of compressor units	¼	½	¾	1	1½	2	1	1½	2	3	5	7½	10
Minimum tank capacity in U. S. gallons	20	30	30	30	60	60	60	60	60	80	80	80	80

17. *Production tests on units.*—Each unit shall be manufactured so that each complete tank-mounted assembled unit shall be tested and operated for a suitable period of time to reveal and eliminate oil leaks, air leaks, electrical defects, excessive mechanical noise, vibration, and other defects.

METHODS OF TEST

18. These test methods provide for the determination of over-all efficiency of tank-mounted, electric-driven air compressors.

19. A simplified ASME low-pressure orifice test shall be used to determine conformance with the basic ratings. In any competitive test, the several units shall be tested under conditions agreed upon by all interested parties. No provision is made for correcting power input and compressor capacity for variations in barometer readings because correction formulas are not applicable to units in the size range covered by this standard. However, the basic test conditions are so specified that all rating tests will be made under comparable conditions.

20. *Capacity* is measured by discharging the output of the compressor to the atmosphere through a low pressure nozzle made in accordance with ASME specifications (see fig. 2 and table 4) and of such dimension that the drop in pressure through the nozzle is at least 10 inches of water but less than 40 inches of water.

21. *Basic test conditions.*—Basic rating tests shall be conducted in an ambient temperature of 65° to 90° F and with the barometric pressure between 29.0 and 30.0 inches of mercury. The reference

temperature at which the delivery is to be expressed shall be the ambient. Under these conditions no corrections will be necessary or permissible in determining over-all efficiency. A maximum deviation of ±5 percent from motor rated voltage is permissible. During the actual test run, a maximum of ±2 percent fluctuation in voltage is permissible. No test shall be run during periods of sudden and widely changing weather conditions.

22. *Apparatus.*—

22a. The arrangement of the essential apparatus is shown in figure 1.

22b. The discharge pressure of the compressor shall be measured by means of a 300 lb/in.² Bourdon gage. The scale of this gage shall be such that a pressure difference of 3 lb/in.² may be readily read with an instrument error not exceeding 2 lb/in.²

22c. A water manometer with a bore of at least one-fourth inch shall be used for measuring the gaging tank pressure.

22d. Ammeter, voltmeter, and wattmeter shall be accurate to within plus or minus 2 percent of full-scale reading. The scales of the meters shall be at least 4 inches long and electrical indications shall be between one-third and three-fourths of full-scale reading. The electric input to the motor shall be determined by the wattmeter.

22e. Thermometers for obtaining the ambient and nozzle tank temperatures shall be of the mercury-in-glass type with etched stems. Commercial or industrial metal-encased thermometers are not permitted.

22f. The design of the test nozzle used shall be that shown in figure 2. Nozzle dimensions are shown in table 4 (ASME specifications).

TABLE 4.—*Test nozzle dimensions and approximate air capacities*

[See fig. 2]

D	A	B	C	E	F	G	J	K	R	Minimum capacity free air [1]	Maximum capacity free air [1]
in.	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*cu ft/min*	*cu ft/min*
⅛	7/32	1 1/32	2	1 5/8	½	1¼	2½	2⅜	3/32	0.988	1.98
3/16	5/16	1 5/16	2	1 5/8	½	1¼	2½	2⅜	⅛	2.235	4.45
¼	1 3/32	2 7/32	2	1 5/8	½	1¼	2½	2⅜	5/32	3.95	7.91
3/8	5/8	5/8	2	1 5/8	½	1¼	2½	2⅜	¼	8.89	17.8
½	1 3/16	7/16	2	1 5/8	½	1¼	2½	2⅜	5/16	15.8	31.6
¾	1¼	0	2	-------	½	1¼	2½	2⅜	½	35.6	71.2
1	1 5/8	0	2	-------	½	1 5/8	2½	2⅜	5/8	63.2	127

[1] Approximate minimum and maximum air capacities based on nozzle pressures of 10 and 40 in. of water 30-in. barometer, 150° F nozzle temperature, 70° F intake temperature.

22g. Gaging tank dimensions shall agree with those shown in figure 3.

23. *Duration of test.*—The duration of a compressor test will be governed by the time required to record enough observations to demonstrate the uniformity of running conditions, but in no case shall the test be less than 1 hour. During this period the final discharge pressure shall be held constant.

24. *Test data.*—The test data shall include the following:

(a) Duration of test, minutes.
(b) Compressor speed, revolutions per minute.
(c) Discharge pressure—psi gage.
(d) Barometer, inches Hg=P_b.
(e) Nozzle diameter, inches=D.
(f) Nozzle pressure, inches of water=i.
(g) Nozzle temperature—degrees Fahrenheit=t_n. $T_n=460+t_n$.
(h) Ambient temperature—degrees Fahrenheit=t_a. $T_a=460+t_a$.
(i) Power input, kilowatts=kw.

25. *Compressor capacity.*—Compressor delivery shall be calculated by the following formula:

$$Q=\frac{2.552D^2CT_a}{0.491P_b}\sqrt{\frac{P_bi}{T_n}},$$

where C is a coefficient of discharge selected from chart, figure 4 and table 5, and Q is the actual delivery in cubic feet per minute expressed at ambient conditions.

TABLE 5.—*Nozzle coefficients*

Curve (see fig. 4)	Nozzle diameter, in.						
	⅛	3/16	¼	⅜	½	¾	1
A	0.920	0.934	0.943	0.950	0.956	0.961	0.965
B	.928	.940	.947	.954	.958	.963	.967
C	.933	.944	.950	.957	.960	.965	.969
D	.936	.947	.953	.958	.961	.967	.971
E	.940	.949	.955	.960	.963	.969	.973
F	.943	.951	.956	.961	.965	.970	.974
G	.945	.953	.957	.963	.966	.972	.976
H	.947	.955	.958	.964	.968	.973	.977
I	.949	.956	.959	.965	.969	.974	.979
J	.951	.957	.960	.966	.970	.976	.980
K	.953	.958	.961	.967	.971	.977	.981
L	.955	.960	.963	.969	.973	.978	.982
M	.957	.961	.965	.970	.974	.980	.983
N	.958	.963	.966	.972	.976	.982	.985
O	.959	.964	.968	.973	.977	.983	.986
P	.960	.965	.969	.975	.979	.984	.988
Q	.961	.966	.970	.976	.980	.985	.990
R	.962	.967	.971	.977	.981	.986	.990

26. *Over-all efficiency.*—Over-all efficiency shall be calculated by the following formula:

$$E=\frac{60Q}{kw},$$

where E is the over-all efficiency expressed in cubic feet per kilowatt hour.

LABELING

27. The name of the manufacturer or distributor, model number and serial number shall be shown in a conspicuous place on each unit.

28. *Warranty.*—The air compressor shall be warranted by the manufacturer against defects in material and workmanship for a period of 90 days from date of installation.

29. *Guarantee of compliance.*—In order that purchasers of air compressors may be assured that these units comply with the requirements of this standard as a basis for fair competition, it is recommended that the following statement be included in manufacturers' and/or distributors' warranty, labels, invoices, contracts, sales literature, etc., "This air compressor complies with all requirements of Commercial Standard CS126–45, as issued by the National Bureau of Standards of the United States Department of Commerce."

30. The following illustrates the label adopted by the Pneumatic Automotive Equipment Association for use by its members in guaranteeing compliance with the standard:

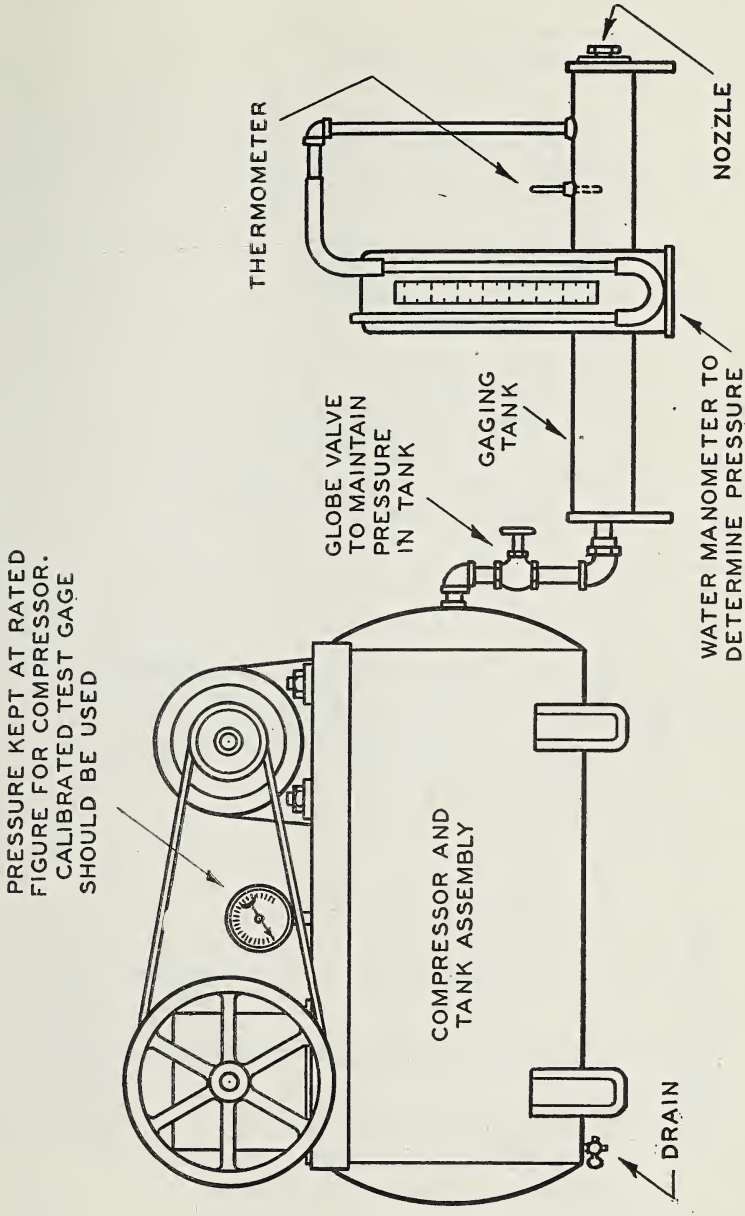
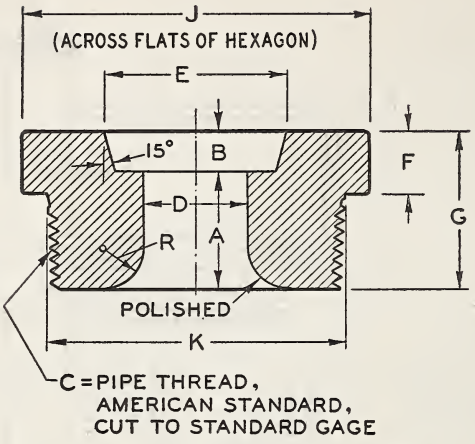


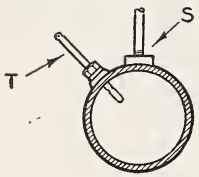
FIGURE 1.—*Arrangement of essential apparatus.*

654258—45——2



MATERIAL – TOBIN BRONZE OR STAINLESS STEEL

FIGURE 2.—*Test-nozzle design.*



SECTION B–B

E – LOCATION OF BARE THERMOMETER
S – TAP FOR NOZZLE PRESSURE
T – BARE THERMOMETER FOR MEASURING AIR TEMPERATURE
D – NOZZLE DIAMETER

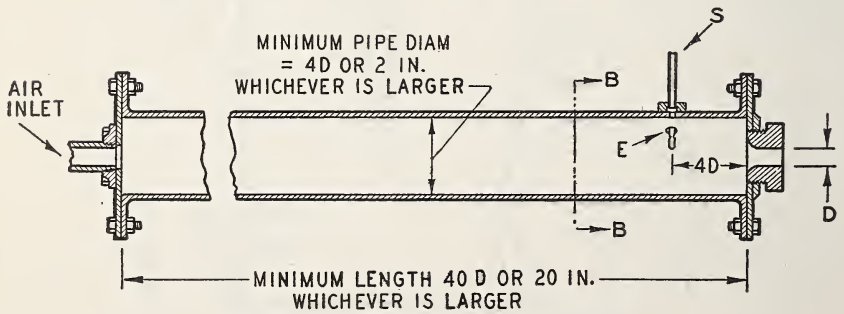


FIGURE 3.—*Dimensions of gaging tank.*

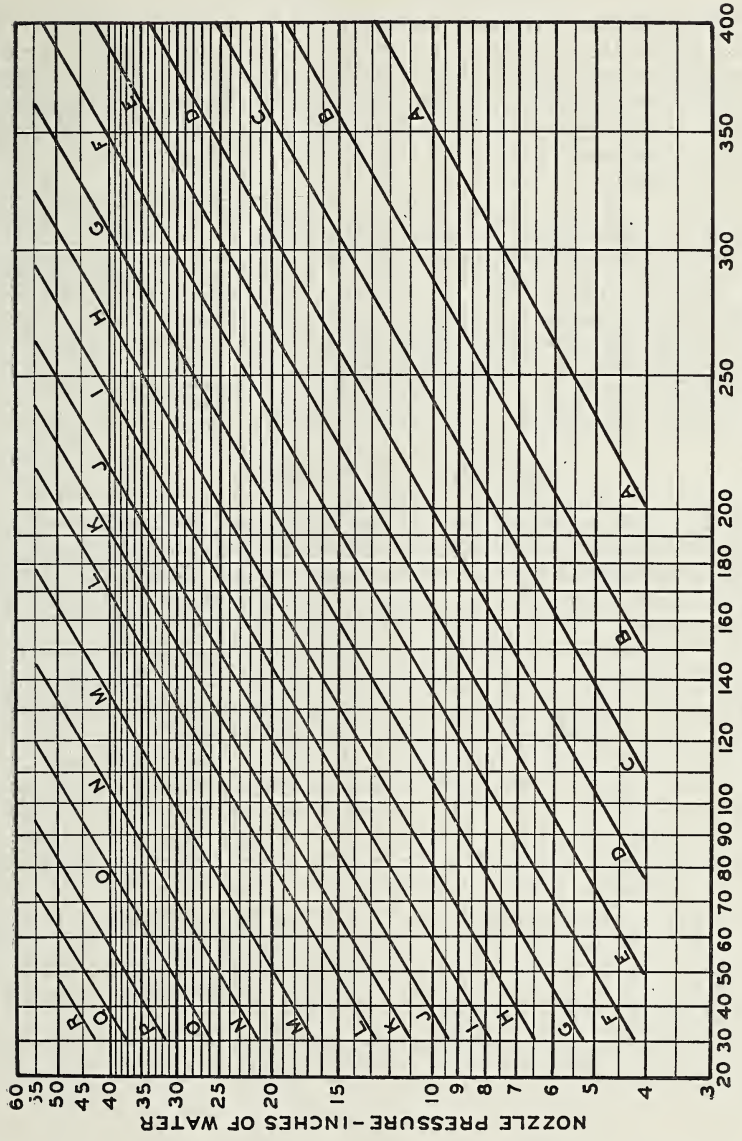


FIGURE 4.—*Isoparameter lines for selection of nozzle coefficient from table 5.*

EFFECTIVE DATE

31. The standard is effective for new production from December 5, 1945.

STANDING COMMITTEE

32. The following individuals comprise the membership of the standing committee, which is to review, prior to circulation for acceptance, revisions proposed to keep the standard abreast of progress. Comment concerning the standard and suggestions for revision may be addressed to any member of the committee or to the Division of Trade Standards, National Bureau of Standards, which acts as secretary for the committee.

J. D. Lodwick (chairman), Curtis Pneumatic Machinery Division, Curtis Manufacturing Co., 1905 Kienlen Ave., St. Louis 20, Mo.
B. J. Scholl, Brunner Manufacturing Co., Utica, 1, N. Y.
W. H. Wheeler, Vertical Compressor Division, Worthington Pump & Machinery Corp., Holyoke, Mass.
Herbert Rosen, Franklin Industrial Supply Co., Providence 3, R. I.
H. R. Williams, The Amco Corp., 5733 Grand River Ave., Detroit, Mich.
E. C. Walling, Ballou & Wright, Seattle, Wash.
W. A. Courtenay, Jr., Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.
H. W. Holland, The Texas Co., 135 East 42d St., New York 17, N. Y.
Herbert Henderson, Gulf Oil Corp., P. O. Box 1166, Pittsburgh 30, Pa.

HISTORY OF PROJECT

33. After some exploratory conferences on general objectives, the Pneumatic Automotive Equipment Association, under date of August 25, 1943, requested the cooperation of the National Bureau of Standards in the establishment of a commercial standard for tank-mounted air compressors.

34. On November 29, 1944, a proposed commercial standard was circulated to leading user organizations, Government agencies, distributors, and manufacturers for advance comment. Conferences were held October 25, 1944, and February 13, 1945, which adjusted the proposed commercial standard in the light of that comment.

35. Under date of March 26, 1945, the recommended commercial standard as adjusted was circulated to the entire trade for written acceptance, as the comment was mostly commendatory in character, and did not seem to warrant the holding of a general conference under wartime conditions.

36. Upon receipt of acceptances in writing from a satisfactory majority of the production volume, and in the absence of active, valid opposition from any quarter, announcement was issued on June 5, 1945, that the standard would become effective for new production from December 5, 1945.

ACCEPTANCE OF COMMERCIAL STANDARD

If acceptance has not previously been filed, this sheet properly filled in, signed, and returned will provide for the recording of your organization as an acceptor of this commercial standard.

Date _____

Division of Trade Stanards,
National Bureau of Standards,
Washington 25, D. C.

Gentlemen:

We believe that the Commercial Standard CS126–45 constitutes a useful standard of practice, and we individually plan to utilize it as far as practicable in the

Production [1] Distribution [1] Use [1] Testing [1]

of tank-mounted air compressors.

We reserve the right to depart from it as we deem advisable.

We understand, of course, that only those articles which actually comply with the standard in all respects can be identified or labeled as conforming thereto.

Signature of authorized officer _____
(In ink)

(Kindly typewrite or print the following lines)

Name and title of above officer _____

Organization _____
(Fill in exactly as it should be listed)

Street address _____

City, zone, and State _____

[1] Underscore which one. Please see that separate acceptances are filed for all subsidiary companies and affiliates which should be listed separately as acceptors. In the case of related interests, trade papers, etc., desiring to record their general support, the words "General support" should be added after the signature.

TO THE ACCEPTOR

The following statements answer the usual questions arising in connection with the acceptance and its significance:

1. *Enforcement.*—Commercial standards are commodity specifications voluntarily established by mutual consent of those concerned. They present a common basis of understanding between the producer, distributor, and consumer and should not be confused with any plan of governmental regulation or control. The United States Department of Commerce has no regulatory power in the enforcement of their provisions, but since they represent the will of the interested groups as a whole, their provisions through usage soon become established as trade customs, and are made effective through incorporation into sales contracts by means of labels, invoices and the like.

2. *The acceptor's responsibility.*—The purpose of commercial standards is to establish for specific commodities, nationally recognized grades or consumer criteria and the benefits therefrom will be measurable in direct proportion to their general recognition and actual use. Instances will occur when it may be necessary to deviate from the standard and the signing of an acceptance does not preclude such departures; however, such signature indicates an intention to follow the commercial standard where practicable, in the production, distribution, or consumption of the article in question.

3. *The Department's responsibility.*—The major function performed by the Department of Commerce in the voluntary establishment of commercial standards on a Nation-wide basis is fourfold: first, to act as an unbiased coordinator to bring all interested parties together for the mutually satisfactory adjustment of trade standards; second, to supply such assistance and advice as past experience with similar programs may suggest; third, to canvass and record the extent of acceptance and adherence to the standard on the part of producers, distributors, and users; and fourth, after acceptance, to publish and promulgate the standard for the information and guidance of buyers and sellers of the commodity.

4. *Announcement and promulgation.*—When the standard has been endorsed by a satisfactory majority of production or consumption in the absence of active, valid opposition, the success of the project is announced. If, however, in the opinion of the standing committee or the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.

ACCEPTORS

37. The organizations listed below have individually accepted this standard for use as far as practicable in the production, distribution, testing, or use of tank mounted air compressors. In accepting the standard they reserved the right to depart therefrom as they individually deem advisable. It is expected that articles which actually comply with the requirements of this standard in all respects will be regularly identified or labeled as conforming thereto, and that purchasers will require such specific evidence of conformity.

ASSOCIATIONS

(General Support)

American Association of Engineers, Chicago, Ill.
National-American Wholesale Grocers' Association, New York, N. Y.
National Association of Ice Industries, Washington, D. C.
National Association of Motor Bus Operators, Washington, D. C.
Pneumatic Automotive Equipment Association, Pittsburgh, Pa.

FIRMS

A. & G. Jobbers, Washington, D. C.
Adams-Barre Co., The, Columbus, Ohio.
Air Compressor & Motor Repair Co., Cleveland, Ohio.
Alexander-Seewald Co., Inc., Atlanta, Ga.
Amco Corporation, The, Detroit, Mich.
American Air Compressor Corporation, North Bergen, N. J.
American Brake Shoe Co., Kellogg Division, Rochester, N. Y.
American Machinery & Supply Co., Omaha, Nebr.
American Motor Specialties Co., Newark, N. J.
Anchor Motor Freight, Inc. of Delaware, Cleveland, Ohio.
Anderson Co., Inc., Peter, Lafayette, Ind.
Angert Auto Parts Co., Inc., Buffalo, N. Y.
Anniston Auto Parts Co., Anniston, Ala.
Atlantic Refining Co., The, Philadelphia, Pa.
Ault Tire Service, Tacoma, Wash. (General support).
Auto Compressor Co., The, Wilmington, Ohio.
Auto Electric Shop, Inc., Pontiac, Mich.
Auto Parts Co., St. Louis, Mo.
Auto Parts Co., Inc., Ann Arbor, Mich.
Auto Parts Distributing Co., Kansas City, Mo.
Auto Parts House, Lafayette, La.
Auto Parts Service, La Crosse, Wis.
Automobile Equipment Co., The, Detroit, Mich.
Automotive Distributors, Inc., Boston, Mass.
Automotive Parts Co., The, Cleveland, Ohio.
Automotive Supply Co., Altoona, Pa.
Automotive Supply Co., Bluefield, W. Va.
Bacon Vulcanizer Manufacturing Co., Oakland, Calif.
Baird Bearings & Parts Co., Birmingham, Ala.
Baird Hardware Co., Inc., Gainesville, Fla.
Balco-Pedrick Parts Corporation, Buffalo, N. Y.
Ballou & Wright, Portland, Oreg., and Seattle, Wash.
Barker, Rose & Kimball, Inc., Elmira, N. Y.
Becker's Vulcanizing Shop, St. Louis, Mo.
Bee, Inc., Allentown, Pa.
Bergman Co., Inc., W., Buffalo, N. Y.
Berks Engineering Co., Reading, Pa.
Bernstein Bros., Inc., Paterson, N. J.
Binney Auto Parts Co., Big Rapids, Mich.
Borden-Aicklen Auto Supply Co., Inc., New Orleans, La.
Byink's Auto Parts Co., Paterson, N. J.
Bronx Gear & Bearing Co., Inc., New York, N. Y.
Brown's Auto Supply, Decatur, Ill.
Brundred Oil Corporation, Oil City, Pa.
Brunner Manufacturing Co., Utica, N. Y.
C. & D. Auto Supply, Inc., Cincinnati, Ohio.
Central States Oil Co., Council Bluffs, Iowa.
Chabot's Super Service, Portsmouth, Ohio.
Champion Pneumatic Machinery Co., Chicago, Ill.
Chanslor & Lyon Co., San Francisco, Calif.
Chicago Pneumatic Tool Co., New York, N. Y. (General support.)
Clinton Square Auto Supply Co., Newark, N. J.
Cochin Manufacturing Co., J. D., San Francisco, Calif.
Cohen Auto Parts Co., Erie, Pa.
Collins & Leary, Inc., Bridgeport, Conn.
Commercial Tire Supply Co., Chicago, Ill.
Community Tire Service, St. Louis, Mo.
Continental Oil Co., Ponca City, Okla.
Co-Operative Parts Co., River Rouge, Mich.
Crump Co., Inc., B. T., Richmond, Va.
Curtis Manufacturing Co., Curtis Pneumatic Machinery Division, St. Louis, Mo.
Cushman Foundry & Machinery Co., Fort Madison, Iowa.
Danville Auto Parts Co., Danville, Ill.
Dayton Air Compressor Co., Inc., The, Dayton, Ohio.
Denver Gear & Parts Co., Denver, Colo.
Detroit Edison Co., The, Detroit, Mich.
Detroit, University of, Detroit, Mich.
DeVilbiss Co., The, Toledo, Ohio.
Downtown Tire Service, Pittsburgh, Pa.
Dunson Supply Co., The, Sidney, Ohio.
East Texas Auto Supply Co., Tyler, Tex.
Eastern Auto Parts Co., Inc., Malden, Mass.
Elder, Bill, Grand Rapids, Mich.
Electric Motors Corporation, New York, N. Y.
Electrical Engineering & Construction Co., Des Moines, Iowa.
Erie Meter Systems, Inc., Erie, Pa.
Evansville Auto Parts, Inc., Evansville, Ind.
555, Inc., Little Rock, Ark.
Flaherty Tire Service, Los Angeles, Calif.
Flood City Brass & Electric Co., Johnstown, Pa.
Florida, University of, Gainesville, Fla.
Franklin Auto Supply Co., Inc., Providence, R. I.
Franklin Industrial Supply, Providence, R. I.
Fred's Service, Pontiac, Ill.
Gabriel Sales Co., Cicero, Ill.
Gavin Co., P. W., San Diego, Calif.
Gehringer-Harlacher Co., Allentown, Pa.
General Auto Supply Co., Tampa, Fla.
General Electric Co., Schenectady, N. Y.
General Trading Co., St. Paul, Minn.
Genuine Parts Co., Wheeling, W. Va.
Georgia School of Technology, Atlanta, Ga.
Gibson Co., The, Indianapolis, Ind.
Goodrich Co., B. F., Akron, Ohio.
Graff Motors Supply Co., Sioux Falls, S. Dak.
Green Bay Auto Parts Co., Green Bay, Wis.
Griffin-Doege Auto Parts Co., Chippewa Falls, Wis.
Grinold Auto Parts, Inc., Hartford, Conn.
Griswold-Sohl Automobile Co., The, Columbus, Ohio.
Gulf Oil Corporation, Pittsburgh, Pa.

Hanson Sales & Service, Howard, Beloit, Wis.
Hardware & Supply Co., The, Akron, Ohio.
Harper Garage Co., Salem, Mass.
Harrisburg Autoparts Co., Harrisburg, Pa.
Hayward Products Co., Los Angeles, Calif.
Henderson Bros., Sacramento, Calif.
Hendrie & Bolthoff Manufacturing & Supply Co., Denver, Colo.
Herberg Auto Service, Inc., Burlington, Vt.
Hill Piston Service Co., Battle Creek, Mich.
Hines Motor Supply Co., Billings, Mont.
Hoag's Tire Service, Glens Falls, N. Y.
Hockaday & Phillips, Inc., Santa Ana, Calif.
Howard Supply Co., Urbana, Ohio, Bellefontaine, Ohio, and Marysville, Ohio.
Hub Engineering Corporation, New York, N. Y.
Hudson-Tucker, Inc., San Diego, Calif.
Ingersoll-Rand Co., New York, N. Y.
Johnson Auto Supplies, Andrew, Chicago, Ill.
Johnson Bros. Auto Supply Co., Wichita, Kans.
K. & G. Sales Co., The, Baltimore, Md.
Keller's Tire Shop, Kelso, Wash.
Kelly Tire Service, Marshfield, Wis.
King Auto Supply, New York, N. Y.
Kuehn Baymiller Co., Omaha, Nebr.
Lambert Co., Ltd., Los Angeles, Calif.
Leavitt, Joseph, Worcester, Mass.
Lewis Motor Mart Co., The, Dayton, Ohio.
Lister Co., A., Portland, Oreg.
Lynch Manufacturing Corporation, Defiance, Ohio.
Machinery & Supplies Co., Kansas City, Mo.
Mackenzie Auto Equipment, Pocatello, Idaho.
Macomb Motor Parts, Inc., Mount Clemens, Mich.
Maddalena Tire Co., San Luis Obispo, Calif.
Magnolia Petroleum Co., Refining Division, Beaumont, Tex.
Manley Tire Service, Wilkes-Barre, Pa.
Manning Co., Inc., Wm. T., Fall River, Mass.
Mann's Automotive Supply, Dickinson, N. Dak.
Masse's Auto Service, Willimantic, Conn.
Master Tire Service, Inc., Grand Rapids, Mich.
McCornack Oil Co., St. Charles, Ill.
McDonald Auto Supply Co., Amarillo, Tex.
McGowin Lyons Hardware & Supply Co., Mobile, Ala.
Messer Co., L. J., Lincoln, Nebr.
Miami Parts & Spring Co., Inc., Miami, Fla.
Miller Co., Inc., Waco, Tex.
Montana Hardware Co., Butte, Mont.
Montgomery Ward & Co., Chicago, Ill.
Morris Auto Supply Co., Inc., Stockton, Calif.
Motor Accessory & Parts Co., Pueblo, Colo.
Motor Car Supply Co., Charleston, W. Va.
Motor & Electric Supply Co., Inc., Bowling Green, Ky.
Motor Grinding & Parts Co., Milwaukee, Wis.
Motor Mart, The, Dallas, Tex.
Motor Parts & Equipment, Inc., Tacoma, Wash.
Motor Parts & Supply Co., Mobile, Ala.
Motor Replacement Service, Inc., Detroit, Mich.
Motor Supply Co., Inc., Elkhart, Ind.
Motor Supply Co., Inc., Monroe, La.
Mount Vernon Tire Surgery, Mount Vernon, Wash.
Mountjoy Co., San Antonio, Tex.
Mountjoy Co. of Houston, The, Houston, Tex.
Muskegon Reliable Tire & Accessories Co., Muskegon, Mich
National Motor Rebuilding Co , Brooklyn, N. Y.
National Utilities Co., Milwaukee, Wis.
New Mexico Agricultural & Mechanical Arts College, State College, N. Mex.
New York University, New York, N. Y.
Newark College of Engineering, Newark, N. J.
Nicols, Dean & Gregg, St. Paul, Minn.
Nichols Equipment Co., Little Rock, Ark.
Nordberg Manufacturing Co., Milwaukee, Wis.
Nordling Parts Co., Eugene, Oreg.
Northern Supply Co., Bay City Mich.
Norwood Tire Co., Long Branch, N. J.
Ohio Oil Co., The, Findlay, Ohio.
Ohio State University, Mechanical Engineering Department, Columbus, Ohio.
Oregon State College, Corvallis, Oreg.
Ozburn, Crow & Yantis Co., Operating Ozburn-Abston & Co., Memphis, Tenn.
Paxton & Gallagher Co., Omaha, Nebr.
Pennsylvania, Commonwealth of, Department of Property & Supplies, Harrisburg, Pa.
Pennway Oil Co., Uniontown, Pa.
Peterson Tire Service, Rockford, Ill.
Petroleum Equipment Co., Washington, D. C.
Philips Tire Service, Opelika, Ala.
Pittsburgh Auto Equipment Co., Pittsburgh, Pa.
Progress Manufacturing Co., Arthur, Ill.
Quanrud, Brink & Reibold, Inc., Bismarck, N. Dak.
Quincy Compressor Co., Quincy, Ill.
Rainbow Tire Service, Everett, Wash.
Reliable Auto Parts Co., New Philadelphia, Ohio.
Rhodes, S. Arthur, Cromwell, Conn.
Richfield Oil Corporation, Los Angeles, Calif.
Ridge Co., The, South Bend, Ind.
Ridgeton Auto Supply Co., Brooklyn, N. Y.
Rogers Diesel & Aircraft Corporation, Bronx, N. Y.
Royal Tire Service, Columbia, S. C.
Rudolph & West Co., Washington, D. C.
Rudy's Tire Service, King City, Calif.
Russell & Co., Inc., J., Holyoke, Mass.
Rutland Auto Supply Co., Rutland, Vt.
Safety Vulcanizer Co., South Orange, N. J.
Salt Lake Hardware Co., The, Salt Lake City, Utah.
Sandmann Co., Inc., Knoxville, Tenn.
Satchell Co., E. T., Allentown, Pa.
Saylor-Beall Manufacturing Co., Detroit, Mich.
Scheufler Supply Co., Inc., Great Bend, Kans., and other cities.
Schiebel Bros., Manchester, Conn.
Scotts Service Station, Greenville, N. C.
Sears, Roebuck & Co., Chicago, Ill.
Service Parts Co., Minneapolis, Minn.
Service Station Equipment Co., Muskegon, Mich.
Service Supply Corporation, Philadelphia, Pa.
Service Tire & Repair Co., Beaumont, Tex.
Severin Supply Co., Oklahoma City, Okla.
Sharp Auto Supply Co., Oklahoma City, Okla.
Sharpe Manufacturing Co., Los Angeles, Calif.
Sheaffer Bros. Auto Parts, Carlisle, Pa.
Short Motor Co., A. L., Arkansas City, Kans.
Shriber-Slates Co., The, Akron, Ohio.
Siferd-Hossellman Co., The, Lima, Ohio.
Sipé Auto Parts Co., Somerset, Pa.
Skelly Oil Co., Kansas City, Mo.
Skinner Auto Supply Co., Augusta, Ga.
Smith Auto Parts Co., Portland, Oreg.
Socony-Vacuum Oil Co., Inc., New York, N. Y.
Southern Tire Recappers, Nashville, Tenn.
Southwest Hardware & Implement Journal, Dallas, Tex. (General Support).
Spohr Co., New York, N. Y.
Standard Automotive Supply Co., Inc., Washington, D. C.
Standard Oil Co. of California, San Francisco, Calif.
Standard Oil Co. of New Jersey, New York, N. Y.
Steele's Automotive Parts, Inc., Lima, Ohio.
Stein & Son, Hyman, Chester, Pa.
Stevens Institute of Technology, Hoboken, N. J.
Straus-Frank Co., Houston, Tex.
Strevell-Paterson Hardware Co., Motor Mercantile Co. Division, Salt Lake City, Utah.
Stromes Systems, Inc., New York, N. Y. (General Support).
Stuckman Tire Service, Bluefield, W. Va.
Sullivan Machinery Co., Michigan City, Ind.
Sun Oil Co., Philadelphia, Pa.
Sunbury Auto Parts Co., Sunbury Pa.
Sweeney Electric Co., The B. K., Denver, Colo.
Sweet Service Co., Santa Cruz, Calif., Watsonville, Calif., and Monterey, Calif.
Swifts Tire Service, Memphis, Tenn.
Ted's Master Service, Salem, Mass.
Tennessee, University of, Engineering Experiment Station, Knoxville, Tenn.
Texas Co., The, New York, N. Y.
Tide Water Associated Oil Co., Bayonne, N. J., and San Francisco, Calif.
Tire Service Co., Spokane, Wash.
Torello & Son Machine Co., F., West Haven, Conn.
Towers Motor Parts Corporation, Lowell, Mass.
Traines Auto Parts, Ben, Mt. Pleasant, Mich.
Triangle Engineering Co., St. Johns, Mich.
Tufts College Engineering School, Medford, Mass.
Twining Laboratories, The, Fresno, Calif.
Union Oil Co. of California, Los Angeles, Calif.
United Auto Service, Aurora, Ill.
United Parts Co., Muncie, Ind.
United Service Co., Lexington, Ky.
United States Air Compressor Co., The, Cleveland, Ohio.
United States Testing Co., Inc., Hoboken, N. J.
U. S. Tire Supply Co., New York, N. Y.
United Wholesalers, Sioux City, Iowa.

Utah Auto Parts Co., Salt Lake City, Utah.
Van Camp Hardware & Iron Co., Indianapolis, Ind.
Van Horn & Son, Inc., New Orleans, La.
Waite Auto Supply Co., Providence, R. I.
Walker Service Station, A. M., Santa Barbara, Calif.
Washington, University of, Seattle, Wash.
Wayne Pump Co., The, Fort Wayne, Ind.
Weaver Manufacturing Co., Springfield, Ill.
Welborn Supply Co., Hutchinson, Kans.
Welliver Auto Parts Co., Bloomsburg, Pa.
West Side Auto Parts & Machine Shop Co., Mount Vernon, N. Y.
Western Electric Co., Inc., New York, N. Y.
Westinghouse Air Brake Co., Wilmerding, Pa.
Whipple's Automotive Equipment, Binghamton, N. Y.
Winchester Auto Stores, Inc., Pine Bluff, Ark.
Wombwell Automotive Parts Co., Lexington, Ky.
Woods Master Service Station, Lexington, Nebr.
Worthington Pump & Machinery Corporation, Holyoke, Mass.
Wyoming Automotive Co., Casper, Wyo.
Yakie Supply Co., Inc., Port Arthur, Tex.

UNITED STATES GOVERNMENT

Agriculture, U. S. Department of, Washington, D. C.
Interior, U. S. Department of the, Bureau of Reclamation, Denver, Colo.
Tennessee Valley Authority, Knoxville, Tenn.
Veterans Administration, Washington, D. C.
War Department, Washington, D. C.
War Production Board, Office of Civilian Requirements, Washington, D. C.

○