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REAL-GAS EFFECTS IN CRITICAL-FLOW-THROUGH NOZZLES AND TABULATED THERMODYNAMIC PROPERTIES

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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SUMMARY

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The mass-flow rate for real gases passing through critical-flow nozzles has been calculated. The result of this calculation is presented in the form of a critical-flow factor that provides a convenient means of calculating the mass-flow rate; the variation of the critical-flow factor also provides a measure of the real-gas effects. In addition the results include the nozzle-throat velocity, the compressibility factor, the specific heat, the specific heat ratio, the speed of sound, and the critical pressure, temperature, and density ratios. These results are tabulated as functions of upstream stagnation pressure and temperature for air, nitrogen, oxygen, normal hydrogen, parahydrogen, and steam. For steam the pressure ranges up to 300 atmospheres and the temperature ranges from 700° to 1500° R. For hydrogen the pressure ranges up to 100 atmospheres and the temperature ranges from 175° to 700° R. For the other gases the pressure ranges to 100 atmospheres and the temperature ranges from 400° to 700° R.

Real-gas effects are found to modify the conventional one-dimensional results by up to about 10 percent at the low-temperature and high-pressure ends of the respective ranges.

Author

INTRODUCTION

When gases are metered by critical-flow nozzles, errors frequently arise when conventional one-dimensional isentropic flow relations are used to compute the mass-flow rate. The assumption usually made is that the gas is ideal. The ideal gas will be defined as one having a constant specific heat and a compressibility factor of unity. For many common gases this assumption is valid for ambient temperatures and pressures. At lower temperatures and higher pressures (e.g., values of pressure and temperature near the critical point) significant errors can occur if these ideal-gas flow relations are used.

References 1 to 3 estimate the flow rates for imperfect gases represented by the van der Waals or the Beattie-Bridgeman state equations. Reference 4 is an experimental check on references 2 and 3. An effective gamma for the isen-

tropic expansion for a real gas is estimated in reference 5. Reference 6 presents a graphical method for computing the mass-flow rate for real gases by using the property data from reference 7. Using the tabulated property data of reference 7, Jordan and Mintz have prepared tables of a critical-flow factor for air (private communication from D. P. Jordan and M. D. Mintz). In reference 8 the results of some sonic-flow calculations for steam are given.

In reference 9 the author presents a correction in graphical form that, when applied to the mass-flow rate of an ideal gas, yields the mass-flow rate of a real gas. This correction is given for both critical and subcritical flow. The computational uncertainty of this method is about 0.1 percent, which is on the order of the uncertainty of the physical factors involved in the analysis. Reference 9 contains results for air, nitrogen, oxygen, normal hydrogen, steam, helium, and argon.

Since the critical-flow nozzle has the potential of becoming a primary standard for flow measurements, tabulation of flow functions at small intervals of pressure and temperature would be an aid in performing precise calculations. Except for helium and argon, the data of reference 9 are, therefore, presented in tabular form. In addition, tables for para-hydrogen have been included.

Errors involved in plotting or reading the graphs in reference 9 are eliminated by the tabular presentations in this report that are carried to one physically nonsignificant figure. In addition, the critical-flow factor C^* has been presented here instead of the mass-flow-rate correction of reference 9 because the use of C^* permits convenient computation of mass-flow rate directly from measured temperatures and pressures.

As a by-product of these calculations, additional functions were determined. These functions fall into two groups. The first group consists of functions that depend on both the plenum conditions and on the conditions at the nozzle throat where the Mach number is unity. In addition to the critical-flow function, this group includes

(1) Nozzle-throat velocity

(2) Ratio of throat to plenum pressure

(3) Ratio of throat to plenum temperature

(4) Ratio of throat to plenum density

The second group consists of thermodynamic point functions that depend only on plenum conditions. These functions are

(1) Compressibility factor

(2) Specific heat at constant pressure, c_p/R

(3) Specific heat ratio

(4) Speed of sound, a/a^*

Within the somewhat limited range of pressures and temperatures, this group of functions for the most part is the same as that included in reference 7; however, in this report the pressure and temperature intervals are considerably smaller, thereby making interpolation easier.

Curve fits for equations of state are given in appendix B by Jeanne V. Szel.

ANALYSIS

A conventional expression for the mass-flow rate per unit area for gases flowing through critical-flow nozzles is

$$G_i = \left[\gamma\left(\frac{2}{\gamma + 1}\right)^{\frac{\gamma+1}{\gamma-1}}\right]^{1/2} \frac{p_0}{\sqrt{RT_0}} \tag{1a}$$

or

$$G_i = C_i^* \frac{p_0}{\sqrt{RT_0}} \tag{1b}$$

where C_i^* is the ideal-gas critical-flow factor defined by

$$C_i^* = \left[\gamma\left(\frac{2}{\gamma + 1}\right)^{\frac{\gamma+1}{\gamma-1}}\right]^{1/2} \tag{2a}$$

(Symbols are defined in appendix A.) The assumptions involved in the derivation of equation (1) are as follows:

(a) The flow is isentropic.

(b) The flow is one-dimensional.

(c) The compressibility factor of the gas is unity.

(d) The specific heat of the gas is constant.

In this analysis, a procedure for calculating a real-gas critical-flow factor C^* will be developed. The definition of C^*, which is similar to that implied by equation (1b), is

$$C^* = \frac{G\sqrt{RT_0}}{p_0} \tag{2b}$$

For each gas two expressions are necessary: one is an expression relating

pressure, density, and temperature; the second is the expression that gives the low-pressure specific heat as a function of temperature. In most cases the data of reference 7 or its sources are used to obtain these expressions. Appendix B lists these equations and their sources for each gas involved.

Since the compressibility is given as a function of pressure and temperature for nitrogen, oxygen, and hydrogen and as a function of density and temperature for air and steam, it is necessary to develop the mass-flow-rate solutions for each of these cases. For both cases the low-pressure specific heat $c_{p,i}/R$ is considered a function of temperature. Also for both cases, the assumed quantities are the stagnation pressure p_0, the stagnation temperature T_0, and the nozzle-throat Mach number M_1 that is unity for critical flow. An outline of the procedure for determining the state and velocity of the gas for both cases will follow. For a more detailed description of this procedure, see appendix C.

Case I: $Z = Z(p,T)$

The pressure-density-temperature relation is given by

$$Z = \frac{p}{\rho RT} = Z(p,T) \tag{3}$$

The expressions for the differential entropy and enthalpy are

$$dS = c_p \frac{dT}{T} + \frac{1}{\rho^2}\left(\frac{\partial\rho}{\partial T}\right)_p dp \tag{4}$$

$$dH = T\,dS + \frac{1}{\rho}\,dp \tag{5}$$

Since it is assumed that the flow is isentropic,

$$dS = 0 \tag{6}$$

Recalling the energy equation

$$dH = -V\,dV \tag{7}$$

and substituting equations (3), (6), and (7) into equations (4) and (5) yield the results

$$\frac{dS}{R} = \frac{c_p}{R}\frac{dT}{T} - \left[Z + T\left(\frac{\partial Z}{\partial T}\right)_p\right]\frac{dp}{p} = 0 \tag{8}$$

$$-\frac{V\,dV}{R} = \frac{c_p}{R}\,dT - T^2\left(\frac{\partial Z}{\partial T}\right)_p \frac{dp}{p} \tag{9}$$

Equations (8) and (9) are integrated along the path indicated in figure 1.

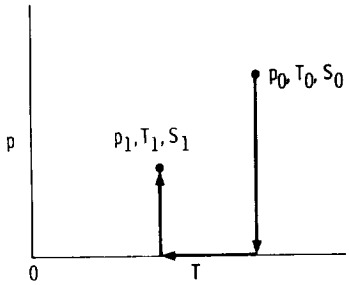

Figure 1. - Integration path for equations (8) and (9).

The pressure end point of the path p_1 satisfies the integral of equation (6); that is, $S_1 = S_0$. At this point, equation (9) can be integrated along the same path. The result of this integration permits the evaluation of the nozzle-throat velocity V_1. The speed of sound in the nozzle throat can be evaluated from the expression

$$\frac{1}{a^2} = \left(\frac{\partial\rho}{\partial p}\right)_S = \left(\frac{\partial\rho}{\partial p}\right)_T + \left(\frac{\partial\rho}{\partial T}\right)_p \left(\frac{\partial T}{\partial p}\right)_S \tag{10}$$

where $(\partial\rho/\partial p)_T$ and $(\partial\rho/\partial T)_p$ are derived from the state equation (3), and $(\partial T/\partial p)_S$ is derived from the integrated form of equation (8). The nozzle-throat Mach number is then given by

$$M' = \frac{V_1}{a_1} \tag{11}$$

Since this Mach number will not, in general, be unity, a new throat temperature has to be estimated. The temperature correction to be added to the previous temperature estimate is

$$\Delta T = \left[\left(\frac{\partial T}{\partial M}\right)_S\right]_i \Delta M \tag{12}$$

where $\left[(\partial T/\partial M)_S\right]_i$ is estimated from isentropic ideal-gas relations, and ΔM is the difference between the desired and actual Mach number. A new Mach number can now be calculated by using the new temperature estimate. This process is repeated until ΔM is less than 10^{-5}. At this point the state and the velocity of the gas at the nozzle throat are considered known.

Case II: $Z = Z(\rho,T)$

The pressure-density-temperature relation is given by

$$Z = \frac{p}{\rho RT} = Z(\rho,T) \tag{13}$$

The stagnation density ρ_0 of the gas is determined by using the state equation (13) when p_0 and T_0 are known. The expressions for the differential entropy and enthalpy are

$$dS = c_v \frac{dT}{T} - \frac{1}{\rho^2}\left(\frac{\partial p}{\partial T}\right)_\rho d\rho \tag{14}$$

$$dH = T\,dS + \frac{p}{\rho^2}\,d\rho + d\left(\frac{p}{\rho}\right) \tag{15}$$

Substituting equations (13), (6), and (7) into equations (14) and (15) yields the results

$$\frac{dS}{R} = \frac{c_v}{R}\frac{dT}{T} - \left[Z + T\left(\frac{\partial Z}{\partial T}\right)_\rho\right]\frac{d\rho}{\rho} = 0 \tag{16}$$

$$-\frac{V\,dV}{R} = \frac{c_v}{R}\,dT - T^2\left(\frac{\partial Z}{\partial T}\right)_\rho \frac{d\rho}{\rho} + d(ZT) \tag{17}$$

Equations (16) and (17) are integrated along the path indicated in figure 2.

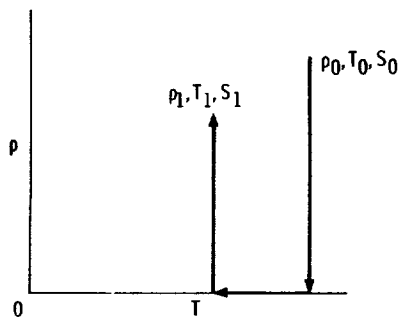

Figure 2. - Integration path for equations (16) and (17).

The density end point of the path ρ_1 is that point which satisfies the integral of equation (16); that is, $S_1 = S_0$. At this point, equation (17) can be integrated along the same path. The integral of equation (17) permits the evaluation of the nozzle-throat velocity V_1. The speed of sound in the nozzle throat can be evaluated from

$$a^2 = \left(\frac{\partial p}{\partial \rho}\right)_S = \left(\frac{\partial p}{\partial \rho}\right)_T + \left(\frac{\partial p}{\partial T}\right)_\rho \left(\frac{\partial T}{\partial \rho}\right)_S \tag{18}$$

where $(\partial p/\partial \rho)_T$ and $(\partial p/\partial T)_\rho$ are derived from equation (13), and $(\partial T/\partial \rho)_S$ is derived from the integral form of equation (16).

The nozzle-throat Mach number is then

$$M' = \frac{V_1}{a_1} \tag{11}$$

An iterative procedure similar to that employed in case I is utilized until the difference between the desired and actual Mach number is less than 10^{-5}. At this point the state and velocity of the gas at the nozzle throat are known.

The mass-flow rate per unit area of the gas is

$$G = \rho_1 V_1 \tag{19}$$

The critical-flow factor C^* can now be determined from equation (2b).

Also tabulated in this report are Z, c_p/R, γ, a, V_1, p_1/p_0, T_1/T_0, and ρ_1/ρ_0. Appendix D develops the expressions used for their evaluation.

RESULTS AND DISCUSSION

Calculations were performed for air, nitrogen, oxygen, normal hydrogen, para-hydrogen, and steam according to the procedures described in the previous section. Because of the extent of these calculations, it was necessary to

utilize a high-speed digital computer. For each gas these calculations yielded the following quantities:

(a) Critical-flow factor, $C^* = \frac{G\sqrt{RT_0}}{p_0}$

(b) Nozzle-throat velocity, V_1

(c) Critical pressure ratio, p_1/p_0

(d) Critical temperature ratio, T_1/T_0

(e) Critical density ratio, ρ_1/ρ_0

(f) Compressibility factor, $Z_0 = p_0/\rho_0 RT_0$

(g) Normalized specific heat, $c_{p,0}/R$

(h) Specific heat ratio, $\gamma_0 = c_{p,0}/c_{v,0}$

(i) Speed of sound, a_0

The first five functions depend on both plenum and nozzle-throat conditions; the last four functions represent the thermodynamic point functions evaluated at the upstream stagnation conditions. Appropriate values of the gas constant R for the various gases are given in table I.

TABLE I. - VALUES OF SPECIFIC GAS CONSTANT FOR VARIOUS GASES[a]

Gas	Density, ρ, lb/cu ft	Mass-flow rate per unit area, G, lb/(sq in.)(sec)
Air	0.025210	0.0076777
Nitrogen	.026065	.0079380
Oxygen	.022820	.0069497
Hydrogen	.36222	.11031
Steam	.040532	.012344

[a]Pressure measured in atm; temperature measured in °R.

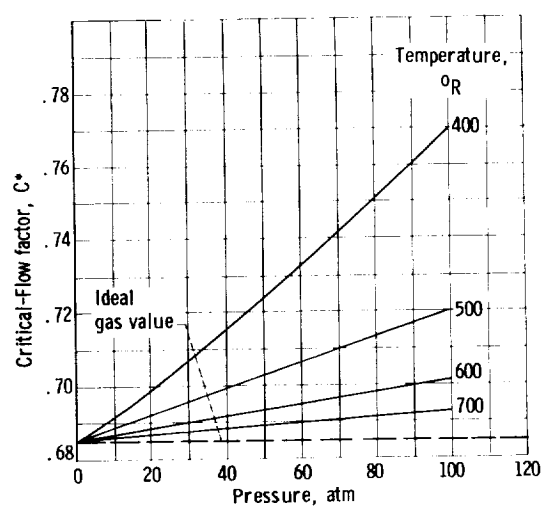

Figure 3. - Critical-flow factor for air.

The tables for the critical-flow factor enable the calculation of the mass-flow rate per unit area of a gas by use of equation (2b). This function is plotted in figure 3 for the typical case of air to indicate the extent of deviation of this function from its value if air were ideal with a specific heat

ratio of 1.4. The value of this ideal-gas critical-flow factor is 0.6847 (shown as a dashed line in fig. 3).

The tables for the critical pressure ratio, the critical temperature ratio, and the critical density ratio enable the determination of the pressure-density-temperature gas state in the nozzle throat from the plenum conditions. The nozzle-throat velocity also represents the speed of sound at the nozzle throat because the Mach number is unity.

The tables for the compressibility factor permit the calculation of the plenum density. The values for the compressibility factor and the values for specific heat obtained in this report will be compared with the values listed in reference 7 when the individual gases are discussed. The other functions will not be individually compared because, in general, they will resemble the specific heat comparison. The specific heat ratio can be used to obtain the constant-volume specific heat and, indirectly, the internal energy of the gas. It should be noted that the specific heat ratio at high pressures is not a very useful isentropic flow parameter. It becomes useful only when the state equation for the gas is represented by $p = \rho RT$.

Air

The results for air are given in tables II(a) to (i) for a pressure range up to 100 atmospheres and a temperature range from 400° to 700° R. Within these ranges, the values of Z_0 agree with those in reference 7 to within 0.1 percent. Over most of the ranges the agreement is within 0.02 percent. The values of specific heat agree to within 0.2 percent with those tabulated in reference 7. The critical-flow factor varies from 0.684 to 0.770, amounting to a variation of 12 percent. The critical-flow factor in this report agrees to within 0.2 percent with that calculated by Jordan and Mintz (private communication from D. P. Jordan and M. D. Mintz). Since a different calculation procedure was used by Jordan and Mintz, which was essentially the interpolation of the entropy and enthalpy tables of reference 7, it is not surprising that a disagreement of this size exists.

Nitrogen

The results for nitrogen are given in tables III(a) to (i) for a pressure range up to 100 atmospheres and a temperature range from 400° to 700° R. Within these ranges the values of Z_0 agree with those in reference 7 to within 0.1 percent. Over most of the range the agreement is better than 0.02 percent. The values of specific heat agree with those in reference 7 to within 0.2 percent. The values of the critical-flow factor range from 0.684 to 0.761, a variation of 11 percent.

Oxygen

The results for oxygen are given in tables IV(a) to (i) for a pressure range up to 100 atmospheres and a temperature range from 400° to 700° R. With-

in this range the values of Z_0 agree with those of reference 7 to within 0.02 percent, and the values of specific heat agree to within 0.2 percent. The critical-flow factor varies from 0.683 to 0.800, a variation of 17 percent.

Normal Hydrogen

The results for normal hydrogen are given in table V(a) to (i) for a pressure range up to 100 atmospheres and a temperature range from 175° to 700° R. The values of Z_0 agree with those in reference 7 to within 0.02 percent; the average disagreement is about 0.01 percent. The specific heat agrees with reference 7 to the order of 0.5 percent. The critical-flow factor varies from 0.678 to 0.759, a variation of 12 percent.

Para-hydrogen

The results for para-hydrogen are given in tables VI(a) to (i) for a pressure range up to 100 atmospheres and a temperature range from 175° to 700° R. For this case the low-pressure specific heat was taken from reference 10. The state equation is the same as that used for normal hydrogen. A comparison of reference 11 for para-hydrogen with reference 12 for normal hydrogen indicates that for the same conditions of pressure and temperature the density of para-hydrogen is for the most part within 0.1 percent of the density of normal hydrogen. The agreement between this tabulation of Z_0 and that implied by reference 11 is within 0.1 percent over most of the range. The values of the critical-flow factor ranged from 0.669 to 0.738, a variation of 10 percent. It was not possible to make a direct comparison of the specific heats.

Steam

The results for steam are given in tables VII(a) to (i) for a pressure range up to 300 atmospheres unless limited by condensation and a temperature range from 700° to 1500° R. Since the same state equation (ref. 13) is used for this tabulation as was used in reference 7, the values of Z_0 agree with those in reference 7. Since the values of specific heat in reference 7 were derived from a different state equation (ref. 14) than that used for Z_0, it is not surprising that the values of specific heat in reference 7 differ by as much as 10 percent from those listed in this report, which uses the state equation of reference 13.

In certain tabulated functions a difficulty arises because of the state equation of reference 13 since Keyes, in reality, uses two state equations, one for temperatures below the critical temperatures (T_c = 1165.16° R) and the other for temperatures above the critical temperature. While Z_0 itself seems continuous in the critical temperature region, some of its derivatives do not have the same degree of continuity. This causes some rather abrupt changes in some of the tabulated functions in this region, especially in the functions that depend on both the plenum and the nozzle-throat conditions. These functions exhibit discontinuities when the plenum temperature is above T_c and the

nozzle-throat temperature is below T_c. The behavior of the critical-flow function in this region suggests inaccuracies on the order of 1 to 2 percent for temperatures from about 1170° to 1350° R and pressures above 100 atmospheres.

The critical-flow factor varies from 0.663 to 0.862, a change of 30 percent.

CONCLUSIONS

Real-gas effects have been found to introduce significant corrections in the conventional ideal-gas relations used to compute isentropic critical flow through nozzles. The combined effects of compressibility and of real-gas behavior can be represented by the use of a critical-flow factor C^* that permits direct computation of mass-flow rate through a nozzle of geometric area A with measurements of upstream temperature T_0 and pressure p_0:

$$\dot{m} = AC^* p_0 \sqrt{\frac{1}{RT_0}}$$

The extent to which real-gas effects are important is suggested by the following tabulation, which gives the change in C^* at a particular combination of temperature and pressure different from its value at normal temperature and pressure (492° R, 1 atm).

Gas	Conditions		$(C^* - C^*_{stp})/C^*_{stp}$, percent
	°R	atm	
Air	400	100	12
Nitrogen	400	100	11
Oxygen	400	100	17
Normal hydrogen	175	100	10
Para-hydrogen	175	100	8

Lewis Research Center
National Aeronautics and Space Administration
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APPENDIX A

SYMBOLS

A	geometric area of nozzle
a	speed of sound
a_j	coefficients for ideal-gas specific heat polynomial, $j = 0,1,\ldots,7$
a^*	speed of sound at 1 atmosphere and 491.688° R
B_p	second virial coefficient for $Z = Z(p,T)$
B_ρ	second virial coefficient for $Z = Z(\rho,T)$
b_j	coefficient for second virial coefficient polynomial, $j = 0,1,\ldots,7$
C_p	third virial coefficient for $Z = Z(p,T)$
C_ρ	third virial coefficient for $Z = Z(\rho,T)$
C^*	critical-flow factor, $G\sqrt{RT_0}/p_0$, dimensionless
C^*_{stp}	critical-flow factor at 1 atmosphere and 491.688° R
c_j	coefficient for third virial coefficient polynomial, $j = 0,1,\ldots,6$
c_p	specific heat at constant pressure
c_v	specific heat at constant volume
D_p	fourth virial coefficient for $Z = Z(p,T)$
D_ρ	fourth virial coefficient for $Z = Z(\rho,T)$
d_j	coefficient for fourth virial coefficient polynomial, $j = 0,1,\ldots,6$
G	mass-flow rate per unit area
H	enthalpy
M	Mach number
M'	actual Mach number derived from nozzle-throat temperature approximation
$\dot{m}$	mass-flow rate
p	pressure

R	specific gas constant
S	entropy
T	temperature
V	velocity
Z	compressibility factor, $p/\rho RT$
γ	ratio of specific heats
$\epsilon_{p,I}$ to $\epsilon_{p,VI}$	functions of $Z = Z(p,T)$ defined in appendix C
$\epsilon_{\rho,I}$ to $\epsilon_{\rho,VI}$	functions of $Z = Z(\rho,T)$ defined in appendix C
$\xi_{p,I}$, $\xi_{p,II}$	functions of $c_{p,i}/R$ for case $Z = Z(p,T)$ defined in appendix C
$\xi_{\rho,I}$, $\xi_{\rho,II}$	functions of $c_{\rho,i}/R$ for case $Z = Z(\rho,T)$ defined in appendix C
ρ	density
τ	temperature function

Subscripts:

a	n - 1 estimate in iteration process
b	n estimate in iteration process
c	critical
i	values at vanishing density
0	upstream stagnation conditions
1	nozzle-throat conditions

APPENDIX B

CURVE FITS FOR EQUATIONS OF STATE

by Jeanne Szel

The equations used in air calculation are

Low-pressure specific heat:

$$\frac{c_{p,i}}{R} = \sum_{j=0}^{4} a_j \tau^j \tag{B1}$$

where

$\tau = \frac{T}{100}$

$a_0 = 3.45849$

$a_1 = 3.13625 \times 10^{-2}$

$a_2 = -1.06296 \times 10^{-2}$

$a_3 = 1.44603 \times 10^{-3}$

$a_4 = -5.30303 \times 10^{-5}$

Second virial coefficient for density series:

$$B_\rho = \sum_{j=0}^{4} b_j \tau^j \tag{B2}$$

where

$\tau = \left(\frac{T}{100}\right)^{-1}$

$b_0 = 38.7361$

$b_1 = -167.218$

$b_2 = -584.145$

$b_3 = 904.752$

$b_4 = -814.723$

Third virial coefficient for density series:

$$C_\rho = \sum_{j=0}^{5} c_j \tau^j \tag{B3}$$

where

$$\tau = \left(\frac{T}{100}\right)^{-2}$$

$c_0 = 960.767$

$c_1 = 1.65312\times10^4$

$c_2 = -2.70131\times10^5$

$c_3 = 2.37506\times10^6$

$c_4 = -1.34407\times10^7$

$c_5 = 2.94026\times10^7$

Fourth virial coefficient for density series:

$$D_\rho = \sum_{j=0}^{6} d_j \tau^j \tag{B4}$$

where

$\tau = \left(\frac{T}{100}\right)^{-2}$

$d_0 = -3.42860\times10^3$

$d_1 = 1.58277\times10^6$

$d_2 = -1.50611\times10^7$

$d_3 = 1.38162\times10^6$

$d_4 = 1.43166\times10^9$

$d_5 = -1.17452\times10^{10}$

$d_6 = 2.99748\times10^{10}$

Thus, the state equation is

$$\frac{p}{\rho RT} = 1 + B_\rho \rho + C_\rho \rho^2 + D_\rho \rho^3$$

Equations (B1) to (B4) are fitted to the data tabulated in reference 7. The temperature range for which the equations are valid is 300° to 720° R. The pressure ranges up to 100 atmospheres; the density units are gram-mole per cubic centimeter.

The equations used in the nitrogen calculation are

Low-pressure specific heat:

$$\frac{c_{p,i}}{R} = \sum_{j=0}^{6} a_j \tau^j \tag{B5}$$

where

$\tau = \frac{T}{100}$

$a_0 = 3.53266$

$a_1 = -4.19429\times10^{-2}$

$a_2 = 2.13309\times10^{-2}$

$a_3 = -5.34238\times10^{-3}$

$a_4 = 6.83446\times10^{-4}$

$a_5 = -4.12717\times10^{-5}$

$a_6 = 9.85401\times10^{-7}$

Second virial coefficient for the pressure series:

$$B_p = \sum_{j=0}^{3} b_j \tau^j \tag{B6}$$

where

$\tau = \left(\frac{T}{100}\right)^{-1}$

$b_0 = -7.16199\times10^{-5}$

$b_1 = 1.08525\times10^{-2}$

$b_2 = -5.42122\times10^{-2}$

$b_3 = -4.12757\times10^{-2}$

Third virial coefficient for the pressure series:

$$C_p = \sum_{j=0}^{5} c_j \tau^j \tag{B7}$$

where

$\tau = \left(\frac{T}{100}\right)^{-2}$

$c_0 = -3.30707\times10^{-7}$

$c_1 = 6.76575\times10^{-5}$

$c_2 = 9.95177\times10^{-4}$

$c_3 = -2.99652\times10^{-2}$

$c_4 = 9.55379\times10^{-2}$

$c_5 = -1.86565\times10^{-1}$

Fourth virial coefficient for the pressure series:

$$D_p = \sum_{j=0}^{5} d_j \tau^j \tag{B8}$$

where

$\tau = \left(\frac{T}{100}\right)^{-3}$

$d_0 = 4.14491\times10^{-12}$

$d_1 = -1.07407\times10^{-6}$

$d_2 = 2.77794\times10^{-4}$

$d_3 = -5.84824\times10^{-3}$

$d_4 = 7.37829\times10^{-2}$

$d_5 = -1.17440$

Thus, the state equation is

$$\frac{p}{\rho RT} = 1 + B_p p + C_p p^2 + D_p p^3$$

These equations are fitted to the data tabulated in reference 7. The temperature range for which the equations are valid is 300° to 720° R. The pressure ranges up to 100 atmospheres.

The equations used in the oxygen calculation are

Low-pressure specific heat:

$$\frac{c_{p,i}}{R} \sum_{j=0}^{4} a_j \tau^j \tag{B9}$$

where

$\tau = \frac{T}{100}$

$a_0 = 3.41402$

$a_1 = 9.42344 \times 10^{-2}$

$a_2 = -3.64726 \times 10^{-2}$

$a_3 = 5.73982 \times 10^{-3}$

$a_4 = -2.68976 \times 10^{-4}$

Second virial coefficient for the pressure series:

$$B_p = \sum_{j=0}^{5} b_j \tau^j \tag{B10}$$

where

$\tau = \left(\frac{T}{100}\right)^{-1}$

$b_0 = -9.81910 \times 10^{-5}$

$b_1 = 1.06107 \times 10^{-2}$

$b_2 = -6.84752 \times 10^{-2}$

$b_3 = -3.28223 \times 10^{-3}$

$b_4 = -1.01578 \times 10^{-1}$

$b_5 = 7.59776 \times 10^{-2}$

Third virial coefficient for the pressure series:

$$C_p \sum_{j=0}^{6} c_j \tau^j \tag{B11}$$

where

$\tau = \left(\frac{T}{100}\right)^{-2}$

$c_0 = -8.36908 \times 10^{-8}$

$c_1 = 5.49367 \times 10^{-5}$

$c_2 = -2.01187 \times 10^{-4}$

$c_3 = -2.77318\times10^{-2}$ $\qquad$ $c_5 = -5.94688\times10^{-1}$

$c_4 = 1.29470\times10^{-1}$ $\qquad$ $c_6 = 1.03742$

Fourth virial coefficient for the pressure series:

$$D_p = \sum_{j=0}^{5} d_j \tau^j \tag{B12}$$

where

$\tau = \left(\frac{T}{100}\right)^{-3}$ $\qquad$ $d_3 = -1.79950\times10^{-2}$

$d_0 = -1.71306\times10^{-9}$ $\qquad$ $d_4 = 1.69612\times10^{-1}$

$d_1 = -7.57007\times10^{-7}$ $\qquad$ $d_5 = -2.70345$

$d_2 = 4.85752\times10^{-4}$

Thus, the state equation is

$$\frac{p}{\rho RT} = 1 + B_p p + C_p p^2 + D_p p^3$$

These equations are fitted to the data tabulated in reference 7. The temperature range for which the equations are valid is 300° to 720° R. The pressure ranges up to 100 atmospheres.

The equations used in the hydrogen calculation are

Low-pressure specific heat for normal hydrogen:

$$\frac{c_{p,i}}{R} = \sum_{j=0}^{7} a_j \tau^j \tag{B13}$$

where

$$\tau = \frac{T}{100}$$

and

$$\left.\begin{aligned}
a_0 &= 2.97545 \\
a_1 &= -1.05530 \\
a_2 &= 7.21363\times10^{-1} \\
a_3 &= -1.63158\times10^{-1} \\
a_4 &= 7.06331\times10^{-2} \\
a_5 &= -4.21183\times10^{-2} \\
a_6 &= 1.07152\times10^{-2} \\
a_7 &= -9.38419\times10^{-4}
\end{aligned}\right\} 125^\circ\ R < T \leq 360^\circ\ R$$

and

$$\left.\begin{aligned}
a_0 &= 1.53856 \\
a_1 &= 7.76980\times10^{-1} \\
a_2 &= -5.72845\times10^{-2} \\
a_3 &= -1.53220\times10^{-2} \\
a_4 &= 2.89690\times10^{-3} \\
a_5 &= -1.40509\times10^{-4} \\
a_6 &= 0 \\
a_7 &= 0
\end{aligned}\right\} 360^\circ\ R < T \leq 720^\circ\ R$$

Low-pressure specific heat for para-hydrogen:

$$\frac{c_{p,i}}{R} \sum_{j=0}^{6} a_j \tau^j \tag{B14}$$

where

$$\tau = \frac{T}{100}$$

and

$$\left.\begin{aligned} a_0 &= 3.97292 \\ a_1 &= -3.04009 \\ a_2 &= 1.56358 \\ a_3 &= 1.35045\times10^{-1} \\ a_4 &= 1.55751\times10^{-2} \\ a_5 &= -1.07913\times10^{-1} \\ a_6 &= 2.26222\times10^{-2} \end{aligned}\right\} 125^\circ\ R < T \leq 270^\circ\ R$$

and

$$\left.\begin{aligned} a_0 &= 2.46702 \\ a_1 &= 8.47613\times10^{-1} \\ a_2 &= -1.66437\times10^{-2} \\ a_3 &= -5.28617\times10^{-2} \\ a_4 &= 6.30834\times10^{-3} \\ a_5 &= 0 \\ a_6 &= 0 \end{aligned}\right\} 270^\circ\ R < T \leq 450^\circ\ R$$

and

$$\left.\begin{aligned} a_0 &= 6.28915 \\ a_1 &= -1.10996 \\ a_2 &= 1.50478\times10^{-1} \\ a_3 &= -6.88607\times10^{-3} \\ a_4 &= 0 \\ a_5 &= 0 \\ a_6 &= 0 \end{aligned}\right\} 450^\circ\ R < T \leq 720^\circ\ R$$

The pressure-density-temperature equation for the range of temperatures and pressures considered is essentially the same for both normal and para-hydrogen. A comparison of references 11 and 12 indicates that at 100 atmospheres and 150° R the density differs by less than 0.1 percent. The coefficients for the state equation are

Second virial coefficient for pressure series:

$$B_p = \sum_{j=0}^{7} b_j \tau^j \tag{B15}$$

where

$$\tau = \left(\frac{T}{100}\right)^{-1}$$

and

$$\left.\begin{aligned}
b_0 &= -1.26595\times10^{-4} \\
b_1 &= 5.71618\times10^{-3} \\
b_2 &= -9.12709\times10^{-3} \\
b_3 &= -6.07334\times10^{-3} \\
b_4 &= 6.35129\times10^{-3} \\
b_5 &= 7.26686\times10^{-3} \\
b_6 &= -2.05010\times10^{-2} \\
b_7 &= 1.02971\times10^{-2}
\end{aligned}\right\} 108^\circ\ R < T < 720^\circ\ R$$

Third virial coefficient for pressure series:

$$C_p = \sum_{j=0}^{6} c_j \tau^j \tag{B16}$$

where

$$\tau = \left(\frac{T}{100}\right)^{-2}$$

and

$$\left.\begin{aligned}
c_0 &= 2.25754\times10^{-9} \\
c_1 &= -9.25244\times10^{-7} \\
c_2 &= 2.13262\times10^{-4} \\
c_3 &= -7.88318\times10^{-4} \\
c_4 &= 1.73842\times10^{-3} \\
c_5 &= -1.83765\times10^{-3} \\
c_6 &= 7.41596\times10^{-4}
\end{aligned}\right\} 108^\circ\ R < T < 720^\circ\ R$$

Thus, the state equation is

$$\frac{p}{\rho RT} = 1 + B_p p + C_p p^2$$

The specific heat equations are fitted to the data tabulated in reference 10. The virial coefficient equations are fitted to the data tabulated in reference 7. The pressure ranges to 100 atmospheres.

The equations used in the steam calculation are

Low-pressure specific heat:

$$\frac{c_{p,i}}{R} = \sum_{j=0}^{4} a_j \tau^j \tag{B17}$$

where

$$\tau = \frac{T}{100}$$

and

$$\left.\begin{aligned} a_0 &= 4.28247 \\ a_1 &= -1.53273\times10^{-1} \\ a_2 &= 2.68595\times10^{-2} \\ a_3 &= -1.41891\times10^{-3} \\ a_4 &= 2.89278\times10^{-5} \end{aligned}\right\} 540^\circ\ R < T < 1500^\circ\ R$$

Except for mathematical rearrangement, the following state equation is the same as that given in reference 13:

$$Z = \frac{1}{1 - \delta\rho} e^{-\alpha(1-\delta\rho)\rho\psi} \tag{B18}$$

where

$$\delta = 2.0624\ e^{-0.38\rho\alpha} \tag{B19}$$

$$\alpha = 2.30259$$

$$\tau = \frac{1.8}{T} \tag{B20}$$

$$\psi_0 = 1260.17\tau\ e^{170944\tau^2} \tag{B21}$$

$$\psi = \psi_0(1 + \psi_1\rho + \psi_2\rho^2) \tag{B22}$$

and

$$\left.\begin{aligned} \psi_1 &= 305.6\psi_0\tau\, e^{341889\tau^2} && \text{(B23)} \\ \psi_2 &= 0 && \text{(B24)} \end{aligned}\right\} T \leq 1165.16^\circ\ R$$

and

$$\left.\begin{aligned} \psi_1 &= (479.76 + 141.5\times10^3\ \tau)\psi_0\tau && \text{(B25)} \\ \psi_2 &= \frac{75.364 - 27.505\ \psi_0}{\psi_0^3} && \text{(B26)} \end{aligned}\right\} T > 1165.16^\circ\ R$$

The specific heat equations are fitted to the data tabulated in reference 7. The state equation is that given in reference 13, which is the origin for the data in reference 7. The units of temperature and density are degrees Rankine and grams per cubic centimeter, respectively.

APPENDIX C

CALCULATION OF CRITICAL-FLOW FUNCTION

Calculation Procedure Using State Equation in the Form $Z = Z(p,T)$

The following functions of Z are necessary in this calculation:

$$\epsilon_{p,I}(p,T) = Z - 1 \tag{C1}$$

$$\epsilon_{p,II}(p,T) = T\left(\frac{\partial Z}{\partial T}\right)_p \tag{C2}$$

$$\epsilon_{p,III}(p,T) = \int_0^p (\epsilon_{p,I} + \epsilon_{p,II}) \frac{dp}{p} \tag{C3}$$

$$\epsilon_{p,IV}(p,T) = \int_0^p \epsilon_{p,II} \frac{dp}{p} \tag{C4}$$

$$\epsilon_{p,V}(p,T) = \epsilon_{p,I} - p\left(\frac{\partial Z}{\partial p}\right)_T \tag{C5}$$

$$\epsilon_{p,VI}(p,T) = T\left(\frac{\partial \epsilon_{p,III}}{\partial T}\right)_p \tag{C6}$$

(The quantities $\epsilon_{p,I}$ to $\epsilon_{p,VI}$ are evaluated in a subprogram.) For an ideal gas, functions $\epsilon_{p,I}$ to $\epsilon_{p,VI}$ would be zero.

In another subprogram, two functions of plenum temperature and nozzle-throat temperature are evaluated:

$$\xi_{p,I}(T_0,T_1) = \int_{T_1}^{T_0} \frac{c_{p,i}}{R} \frac{dT}{T} \tag{C7}$$

$$\xi_{p,II}(T_0,T_1) = \int_{T_1}^{T_0} \frac{c_{p,i}}{R} dT \tag{C8}$$

In terms of these defined functions the integrated forms of equations (8) and (9) become

$$\frac{S_0 - S_1}{R} = \xi_{p,I}(T_0,T_1) - \ln \frac{p_0}{p_1} - \epsilon_{p,III}(p_0,T_0) + \epsilon_{p,III}(p_1,T_1) = 0 \tag{C9}$$

$$\frac{H_0 - H_1}{R} = \xi_{p,II}(T_0,T_1) - T_0\epsilon_{p,IV}(p_0,T_0) + T_1\epsilon_{p,IV}(p_1,T_1) = \frac{1}{2}\frac{V_1^2}{R} \tag{C10}$$

If the derivatives in equation (10) are evaluated, the resulting expression for the speed of sound is

$$\frac{1}{a^2} = \frac{1}{Z^2RT}\left[1 + \epsilon_{p,V} - \frac{(1 + \epsilon_{p,I} + \epsilon_{p,II})^2}{\frac{c_{p,i}}{R} - \epsilon_{p,VI}}\right] \tag{C11}$$

In terms of the assumed quantities p_0, T_0, and M_1 (for critical flow $M_1 = 1$), the initial estimate of T_1 is found by assuming the ideal-gas isentropic-flow relations

$$T_1 = T_0\left(1 + \frac{\gamma_i - 1}{2} M_1^2\right)^{-1} \tag{C12}$$

where T_1 represents the initial estimate of the nozzle-throat temperature.

It is now required that equation (C9) be solved for p_1. Since p_1 is involved implicitly in this equation, an iterative procedure will be necessary. This procedure is outlined in the following steps:

(1) For the first trial solution

$$\epsilon_{p,III}(p_0,T_0) = \epsilon_{p,III}(p_1,T_1)$$

is assumed. Then

$$p_{1,a} = p_0 e^{-\xi_{p,I}(T_0,T_1)} \tag{C13}$$

where $p_{1,a}$ represents the initial estimate of p_1.

(2) For the next solution

$$\epsilon_{p,III}(p_{1,a}T_1) = \epsilon_{p,III}(p_1,T_1)$$

is assumed. Then

$$p_{1,b} = p_0 e^{[-\xi_{p,I}(T_0,T_1)+\epsilon_{p,III}(p_0,T_0)-\epsilon_{p,III}(p_{1,a}T_1)]} \tag{C14}$$

where $p_{1,b}$ represents the second estimate of p_1.

(3) For the succeeding trial solutions $p_{1,a}$ is replaced by $p_{1,b}$ and step (2) is repeated.

Step (3) is repeated until $\left|\frac{p_{1,b} - p_{1,a}}{p_{1,a}}\right| < 1\times10^{-6}$. A maximum of 30 iterations was permitted. For the cases reported herein, there was no failure to converge to the required limit. The value of p_1 is now given by $p_{1,b}$.

Equation (C10) can now be solved for V_1^2/R:

$$\frac{V_1^2}{R} = 2\left[\xi_{p,II}(T_0,T_1) - T_0\epsilon_{p,IV}(p_0,T_0) + T_1\epsilon_{p,IV}(p_1,T_1)\right] \tag{C15}$$

The speed of sound in the nozzle throat is determined from equation (C11). The actual Mach number M' is then

$$M' = \frac{V_1}{a_1} \tag{C16}$$

Since M' is probably not equal to M_1, a new estimate of T_1 is made. The quantity ΔT that must be added to the old value of T_1 to get the new value is

$$\Delta T = \left[\left(\frac{\partial T}{\partial M}\right)_S\right]_i (M_1 - M') \tag{C17}$$

where

$$\left[\left(\frac{\partial T}{\partial M}\right)_S\right]_i = -T_1\left(\frac{T_1}{T_0}\right)(\gamma_i - 1)M_1 \tag{C18}$$

With this new value of T_1, equations (C13) to (C18) are again solved. This procedure was repeated until $|M_1 - M'|$ was less than 10^{-5}. A maximum of 10 iterations was permitted. In most cases the required convergence was obtained. In no case was the value of $|M_1 - M'|$ greater than 10^{-3}.

For critical flow, M_1 equals unity. For this condition the gas state at the nozzle throat has been determined. The critical-flow factor is then

$$C^* = \frac{p_1}{p_0}\frac{\sqrt{T_0}}{Z_1T_1}\sqrt{\frac{V_1^2}{R}} \tag{C19}$$

Calculation Procedure Using State Equation in the Form $Z = Z(\rho,T)$

The following functions of Z are necessary in this calculation:

$$\epsilon_{\rho,I}(\rho,T) = Z - 1 \tag{C20}$$

$$\epsilon_{\rho,II}(\rho,T) = T\left(\frac{\partial Z}{\partial T}\right)_{\rho} \tag{C21}$$

$$\epsilon_{\rho,III}(\rho,T) = \int_0^{\rho} (\epsilon_{\rho,I} + \epsilon_{\rho,II}) \frac{d\rho}{\rho} \tag{C22}$$

$$\epsilon_{\rho,IV}(\rho,T) = \int_0^{\rho} \epsilon_{\rho,II} \frac{d\rho}{\rho} \tag{C23}$$

$$\epsilon_{\rho,V}(\rho,T) = \epsilon_{\rho,I} + \rho\left(\frac{\partial Z}{\partial \rho}\right)_{T} \tag{C24}$$

$$\epsilon_{\rho,VI}(\rho,T) = T\left(\frac{\partial \epsilon_{\rho,III}}{\partial T}\right)_{\rho} \tag{C25}$$

(These quantities are evaluated in a subprogram.) For an ideal gas, $\epsilon_{\rho,I}$ to $\epsilon_{\rho,VI}$ approach zero.

In another subprogram, two functions of plenum temperature and nozzle-throat temperature are computed:

$$\xi_{\rho,I}(T_0,T_1) = \int_{T_1}^{T_0} \left(\frac{c_{p,i}}{R} - 1\right) \frac{dT}{T} \tag{C26}$$

$$\xi_{\rho,II}(T_0,T_1) = \int_{T_1}^{T_0} \left(\frac{c_{p,i}}{R} - 1\right) dT \tag{C27}$$

In terms of these functions the integrated forms of equations (16) and (17) are

$$\frac{S_0 - S_1}{R} = \xi_{\rho,I}(T_0,T_1) - \ln \frac{\rho_0}{\rho_1} - \epsilon_{\rho,III}(\rho_0,T_0) + \epsilon_{\rho,III}(\rho_1,T_1) = 0 \tag{C28}$$

$$\frac{H_0 - H_1}{R} = \xi_{\rho,II}(T_0,T_1) + T_0\left[1 + \epsilon_{\rho,I}(\rho_0,T_0) - \epsilon_{\rho,IV}(\rho_0,T_0)\right]$$

$$- T_1\left[1 + \epsilon_{\rho,I}(\rho_1,T_1) - \epsilon_{\rho,IV}(\rho_1,T_1)\right] = \frac{1}{2}\frac{V_1^2}{R} \qquad (C29)$$

If the derivatives in equation (18) are evaluated, the resulting expression for the speed of sound is

$$a^2 = RT\left[1 + \epsilon_{\rho,V} + \frac{(1 + \epsilon_{\rho,I} + \epsilon_{\rho,II})^2}{\frac{c_{p,i}}{R} - 1 - \epsilon_{\rho,VI}}\right] \qquad (C30)$$

Since the state equation involves density, it is first necessary to solve the following equation for the upstream gas density. The assumed quantities are p_0, T_0, and M_1 (for critical flow $M_1 = 1$).

$$p_0 = Z_0\rho_0RT_0 = \left[1 + \epsilon_{\rho,I}(\rho_0,T_0)\right]\rho_0RT_0 \qquad (C31)$$

It is necessary to employ an iterative procedure to solve equation (C31) for ρ_0:

(1) First approximation

$$\rho_{0,a} = \frac{p_0}{RT_0} \qquad (C32)$$

(2) Second approximation

$$\rho_{0,b} = \frac{p_0}{\left[1 + \epsilon_{\rho,I}(\rho_{0,a},T_0)\right]RT_0} \qquad (C33)$$

The succeeding approximations are found by replacing $\rho_{0,a}$ by $\rho_{0,b}$ and repeating part 2. This process is continued until $\left|\frac{\rho_{0,b} - \rho_{0,a}}{\rho_{0,a}}\right| < 1\times10^{-6}$. A maximum of 30 iterations was permitted for all gases except steam for which 200 iterations were permitted. For the values reported herein there was no failure to converge to the required limit. The value of the plenum density ρ_0 is now known.

An initial estimate of T_1 is determined by solving equation (C12). The solution of equation (C28) will yield the nozzle-throat density ρ_1. Since ρ_1 is involved implicitly in this equation, an iterative procedure is necessary for its solution. The steps for this are as follows:

(1) For the first approximation

$$\epsilon_{\rho,III}(\rho_0,T_0) = \epsilon_{\rho,III}(\rho_1,T_1)$$

is assumed. Then

$$\rho_{1,a} = \rho_0 e^{-\xi_{\rho,I}(T_0,T_1)} \tag{C34}$$

(2) For the second approximation

$$\epsilon_{\rho,III}(\rho_1,T_1) = \epsilon_{\rho,III}(\rho_{1,a},T_1)$$

is assumed. Then

$$\rho_{1,b} = \rho_0 e^{[-\xi_{\rho,I}(T_0,T_1)+\epsilon_{\rho,III}(\rho_0,T_0)-\epsilon_{\rho,III}(\rho_{1,a},T_1)]} \tag{C35}$$

(3) For the succeeding approximations $\rho_{1,a}$ is replaced by $\rho_{1,b}$ and step (2) is repeated.

Step (3) is continued until $\left|\frac{\rho_{1,b} - \rho_{1,a}}{\rho_{1,a}}\right| < 10^{-6}$. A maximum of 30 iterations was permitted. For the results reported, there was no failure to converge to the required limit. With the determined value of ρ_1, equation (C29) can now be solved for V_1. Equation (C30) is solved for the speed of sound in the nozzle throat a_1. The actual Mach number M' is now determined from equation (C16). Since this Mach number is probably not equal to the assumed Mach number M_1, a new estimate of T_1 is made. The quantity ΔT to be added to the old value of T_1 is determined from equation (C17). The calculation starting at equation (C34) is repeated by using this new value of T_1. This is continued until $|M' - M_1| < 10^{-5}$. A maximum of 10 iterations was permitted. For most of the reported cases, convergence to the stated limits was obtained. In no case was $|M' - M_1| > 10^{-3}$.

The nozzle-throat conditions are now determined, and the value of the critical-flow factor is given by

$$C^* = \frac{\rho_1}{\rho_0} \frac{1}{Z_0\sqrt{T_0}} \sqrt{\frac{V_1^2}{R}} \tag{C36}$$

APPENDIX D

ADDITIONAL CALCULATIONS

Calculation of V_1

For steam the nozzle-throat velocity is calculated from

$$V_1 = \sqrt{R \frac{V_1^2}{R}} \tag{D1}$$

For the other gases this function is presented as a ratio of V_1 to the speed of sound under standard conditions. This latter quantity a^* is calculated by evaluating equations (C11) or (C30) at one atmosphere and 491.688° R.

Calculation of p_1/p_0, T_1/T_0, and ρ_1/ρ_0

Since the states of the gas at both the plenum and nozzle conditions can now be completely determined from the state equation (the other necessary quantities having been determined in the course of calculating C^*), these quantities are determined by simply taking ratios.

The following quantities are point thermodynamic functions. They depend on the upstream stagnation pressure p_0 and the upstream stagnation temperature T_0.

Calculation of Z

The plenum compressibility factor Z_0 is determined from either

$$Z = 1 + \epsilon_{p,I} \tag{D2}$$

or

$$Z = 1 + \epsilon_{\rho,I} \tag{D3}$$

Calculation of c_p/R

Consider the case where $Z = Z(p,T)$. The expression for c_p/R is

$$\frac{c_p}{R} = \frac{T}{R}\left(\frac{\partial S}{\partial T}\right)_p \tag{D4}$$

Equation (C9) can be rewritten by considering the initial state constant and by dropping the subscript 1 as

$$\frac{S}{R} = - \xi_{p,I}(T_0,T) - \ln p - \epsilon_{p,III} + \text{constant}$$

$$\frac{T}{R}\left(\frac{\partial S}{\partial T}\right)_p = -T\left\{\frac{\partial\left[\xi_{p,I}(T_0,T)\right]}{\partial T}\right\}_p - T\left[\frac{\partial(\epsilon_{p,III})}{\partial T}\right]_p \tag{D5}$$

or by referring to equations (C6) and (C7) as

$$\frac{c_p}{R} = \frac{T}{R}\left(\frac{\partial S}{\partial T}\right)_p = \frac{c_{p,i}}{R} - \epsilon_{p,VI} \tag{D6}$$

Consider the case where $Z = Z(\rho,T)$. For this case

$$\frac{c_p}{R} = \frac{T}{R}\left(\frac{\partial S}{\partial T}\right)_p = \frac{T}{R}\left[\left(\frac{\partial S}{\partial T}\right)_\rho + \left(\frac{\partial S}{\partial \rho}\right)_T\left(\frac{\partial \rho}{\partial T}\right)_p\right]$$

or

$$\frac{c_p}{R} = \frac{c_v}{R} + \frac{T}{R}\left(\frac{\partial S}{\partial \rho}\right)_T\left(\frac{\partial \rho}{\partial T}\right)_p \tag{D7}$$

Equation (C28) can be rewritten by considering the initial state constant and by dropping the subscript 1:

$$\frac{S}{R} = -\xi_{\rho,I}(T_0,T) - \ln \rho - \epsilon_{\rho,III} + \text{constant} \tag{D8}$$

Therefore,

$$\frac{T}{R}\left(\frac{\partial S}{\partial T}\right)_\rho = -T\left\{\frac{\partial\left[\xi_{\rho,I}(T_0,T)\right]}{\partial T}\right\}_\rho - T\left[\frac{\partial(\epsilon_{\rho,III})}{\partial T}\right]_\rho$$

or by referring to equations (C25) and (C26)

$$\frac{T}{R}\left(\frac{\partial S}{\partial T}\right)_\rho = \frac{c_{p,i}}{R} - 1 - \epsilon_{\rho,VI} = \frac{c_v}{R} \tag{D9}$$

and

$$\frac{\rho}{R}\left(\frac{\partial S}{\partial \rho}\right)_T = -1 - \left[\frac{\partial(\epsilon_{\rho,III})}{\partial \rho}\right]_T$$

or by referring to equations (C20) to (C22)

$$\frac{\rho}{R}\left(\frac{\partial S}{\partial \rho}\right)_T = -\left(1 + \epsilon_{\rho,I} + \epsilon_{\rho,II}\right) \tag{D10}$$

From the state equation

$$\frac{T}{\rho}\left(\frac{\partial \rho}{\partial T}\right)_p = -\frac{Z + T\left(\frac{\partial Z}{\partial T}\right)_\rho}{Z + \rho\left(\frac{\partial Z}{\partial \rho}\right)_T}$$

or by referring to equations (C20), (C21), and (C24)

$$\frac{T}{\rho}\left(\frac{\partial \rho}{\partial T}\right)_p = -\frac{1 + \epsilon_{\rho,I} + \epsilon_{\rho,II}}{1 + \epsilon_{\rho,V}} \tag{D11}$$

Substituting equations (D9) to (D11) in equation (D7) results in

$$\frac{c_p}{R} = T\left(\frac{\partial S}{\partial T}\right)_p = \frac{c_{p,i}}{R} - 1 + \frac{(1 + \epsilon_{\rho,I} + \epsilon_{\rho,II})^2}{1 + \epsilon_{\rho,V}} - \epsilon_{\rho,VI} \tag{D12}$$

Calculation of γ

Consider the case where $Z = Z(p,T)$. By definition

$$\gamma = \frac{c_p/R}{c_v/R} \tag{D13}$$

$$\frac{c_v}{R} = \frac{T}{R}\left(\frac{\partial S}{\partial T}\right)_\rho = \frac{T}{R}\left(\frac{\partial S}{\partial T}\right)_p + \frac{T}{R}\left(\frac{\partial S}{\partial p}\right)_T\left(\frac{\partial p}{\partial T}\right)_\rho = \frac{c_p}{R} + \frac{T}{R}\left(\frac{\partial S}{\partial p}\right)_T\left(\frac{\partial p}{\partial T}\right)_\rho \tag{D14}$$

Referring to equation (D5) yields

$$\frac{p}{R}\left(\frac{\partial S}{\partial p}\right)_T = -1 - p\left(\frac{\partial \epsilon_{p,III}}{\partial p}\right)_T$$

or referring to equation (C3) results in

$$\frac{p}{R}\left(\frac{\partial S}{\partial p}\right)_T = -(1 + \epsilon_{p,I} + \epsilon_{p,II}) \tag{D15}$$

From the state equation

$$\frac{T}{p}\left(\frac{\partial p}{\partial T}\right)_\rho \quad \frac{Z + T\left(\frac{\partial Z}{\partial T}\right)_p}{Z - p\left(\frac{\partial Z}{\partial p}\right)_T}$$

or by referring to equations (C1), (C2), and (C5)

$$\frac{T}{p}\left(\frac{\partial p}{\partial T}\right)_\rho = \frac{1 + \epsilon_{p,I} + \epsilon_{p,II}}{1 + \epsilon_{p,V}} \tag{D16}$$

If equations (D15) and (D16) are substituted in equation (D14), the expression for c_v/R becomes

$$\frac{c_v}{R} = \frac{c_p}{R} - \frac{(1 + \epsilon_{p,I} + \epsilon_{p,II})^2}{1 + \epsilon_{p,V}} \tag{D17}$$

After substituting equation (D6) into (D17), the expression for γ becomes

$$\gamma = \frac{1 + \epsilon_{p,V}}{1 + \epsilon_{p,V} - \dfrac{(1 + \epsilon_{p,I} + \epsilon_{p,II})^2}{\dfrac{c_{p,i}}{R} - \epsilon_{p,VI}}} \tag{D18}$$

In terms of the expression for the speed of sound, equation (C11), the expression for γ is

$$\gamma = \frac{a^2(1 + \epsilon_{p,V})}{RT(1 + \epsilon_{p,I})^2} = \left(\frac{a^2\rho}{p}\right)\frac{(1 + \epsilon_{p,V})}{(1 + \epsilon_{p,I})} \tag{D19}$$

Consider the case where $Z = Z(\rho,T)$. For this case

$$\gamma = \frac{c_p/R}{c_v/R} \tag{D13}$$

where c_p/R is represented by equation (D12) and c_v/R is represented by equation (D9). The expression for γ is, therefore,

$$\gamma = \frac{1}{1 + \epsilon_{\rho,V}}\left[1 + \epsilon_{\rho,V} + \frac{(1 + \epsilon_{\rho,I} + \epsilon_{\rho,II})^2}{\dfrac{c_{p,i}}{R} - 1 - \epsilon_{\rho,VI}}\right] \tag{D20}$$

In terms of the expression for the speed of sound, equation (C30), the expression for γ is

$$\gamma = \frac{a^2}{RT(1 + \epsilon_{\rho,V})} = \left(\frac{a^2\rho}{p}\right) \frac{(1 + \epsilon_{\rho,I})}{(1 + \epsilon_{\rho,V})} \tag{D21}$$

Calculation of a

The speed of sound is calculated from either equation (C11) or (C30) depending on whether the compressibility factor is in terms of pressure and temperature or in terms of density and temperature.

REFERENCES

1. Hsue-Shen, Tsien: One-Dimensional Flows of a Gas Characterized by van-der Wall's Equation of State. Jour. Math. and Phys., vol. XXV, no. 4, Jan. 1947, pp. 301-324.

2. Donaldson, Coleman duP.: Note on the Importance of Imperfect-Gas Effects and Variation of Heat Capacities on the Isentropic Flow of Gases. NACA RM L8J14, 1948.

3. Crown, J. C.: Flow of a Gas Characterized by the Beattie-Bridgeman Equation of State and Variable Specific Heats. Pt. I. Isentropic Relations. Memo. 9619, Naval Ordinance Lab., Apr. 22, 1949.

4. Donaldson, Coleman duP., and Jones, Jim J.: Some Measurements of the Effect of Gaseous Imperfections on the Critical Pressure Ratio in Air and the Speed of Sound in Nitrogen. NACA TN 2437, 1951.

5. Iberall, Arthur S.: The Effective Gamma for Isentropic Expansion of Real Gases. Jour. Appl. Phys., vol. 19, no. 11, Nov. 1948, pp. 997-999.

6. Reimer, R. M.: Computations of the Critical-Flow-Function, Pressure Ratio and Temperature Ratio for Real Air. Paper 62-WA-177, ASME, 1962.

7. Hilsenrath, Joseph, et al.: Tables of Thermodynamic and Transport Properties of Air, Argon, Carbon Dioxide, Carbon Monoxide, Hydrogen, Nitrogen, Oxygen, and Steam. Pergamon Press, 1960.

8. Murdock, J. W., and Bauman, J. M.: Critical Flow Functions for Superheated Steam. Paper 63-WA-19, ASME, 1963.

9. Johnson, R. C.: Calculation of Real-Gas Effects in Flow Through Critical-Flow-Nozzles. Paper 63-WA-71, ASME, 1963.

10. Woolley, H. W., Scott, R. B., and Brickwidde, F. G.: Compilation of Thermal Properties of Hydrogen in Its Various Isotopic and Ortho-Para Modifications. Jour. Res. Nat. Bur. Standards, vol. 41, no. 5, Nov. 1948, pp. 379-475.

11. Roder, Hans M., and Goodwin, Robert D.: Provisional Thermodynamic Functions for Para-Hydrogen. TN 130, NBS, 1961.

12. Dean, John W.: A Tabulation of the Thermodynamic Properties of Normal Hydrogen from Low Temperatures to 300° K and from 1 to 100 Atmospheres. Tech. Note 120, NBS, Nov. 1961.

13. Keyes, Frederick G.: The Consistency of the Thermodynamic Data for Water Substance Vapor Phase to 550° C, pt. VII. Jour. Chem. Phys., vol. 17, no. 10, Oct. 1949, pp. 923-934.

14. Keyes, F. G., Smith, L. B., and Gerry, H. T.: Specific Volume of Steam in Saturated and Superheated Condition Together with Derived Values of Enthalpy, Entropy, Heat Capacity and Joule Thomson Coefficients. Proc. Am. Acad. Arts and Sci., vol. 70, no. 8, Feb. 1936, pp. 319-364.

TABLE II. - THERMODYNAMIC

(a) Critical-

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	0.6849	0.6884	0.6920	0.6956	0.6994	0.7032	0.7072	0.7112	0.7154	0.7196
405	0.6849	0.6883	0.6917	0.6952	0.6988	0.7025	0.7063	0.7101	0.7141	0.7181
410	0.6849	0.6882	0.6915	0.6948	0.6983	0.7018	0.7054	0.7091	0.7129	0.7167
415	0.6849	0.6880	0.6912	0.6945	0.6978	0.7012	0.7046	0.7082	0.7118	0.7154
420	0.6849	0.6879	0.6910	0.6941	0.6973	0.7006	0.7039	0.7072	0.7107	0.7142
425	0.6849	0.6878	0.6908	0.6938	0.6968	0.7000	0.7031	0.7064	0.7097	0.7130
430	0.6849	0.6877	0.6906	0.6935	0.6964	0.6994	0.7025	0.7056	0.7087	0.7119
435	0.6849	0.6876	0.6904	0.6932	0.6960	0.6989	0.7018	0.7048	0.7078	0.7108
440	0.6849	0.6875	0.6902	0.6929	0.6956	0.6984	0.7012	0.7040	0.7069	0.7098
445	0.6849	0.6874	0.6900	0.6926	0.6952	0.6979	0.7006	0.7033	0.7061	0.7088
450	0.6849	0.6873	0.6898	0.6923	0.6948	0.6974	0.7000	0.7026	0.7053	0.7079
455	0.6849	0.6873	0.6896	0.6920	0.6945	0.6970	0.6994	0.7020	0.7045	0.7071
460	0.6849	0.6872	0.6895	0.6918	0.6941	0.6965	0.6989	0.7013	0.7038	0.7062
465	0.6849	0.6871	0.6893	0.6916	0.6938	0.6961	0.6984	0.7007	0.7031	0.7054
470	0.6849	0.6870	0.6892	0.6913	0.6935	0.6957	0.6979	0.7002	0.7024	0.7047
475	0.6849	0.6869	0.6890	0.6911	0.6932	0.6953	0.6975	0.6996	0.7018	0.7039
480	0.6849	0.6869	0.6889	0.6909	0.6929	0.6950	0.6970	0.6991	0.7012	0.7033
485	0.6849	0.6868	0.6887	0.6907	0.6926	0.6946	0.6966	0.6986	0.7006	0.7026
490	0.6849	0.6867	0.6886	0.6905	0.6924	0.6943	0.6962	0.6981	0.7000	0.7020
495	0.6849	0.6867	0.6885	0.6903	0.6921	0.6940	0.6958	0.6976	0.6995	0.7013
500	0.6849	0.6866	0.6884	0.6901	0.6919	0.6936	0.6954	0.6972	0.6990	0.7008
510	0.6849	0.6865	0.6881	0.6898	0.6914	0.6931	0.6947	0.6964	0.6980	0.6997
520	0.6849	0.6864	0.6879	0.6894	0.6910	0.6925	0.6940	0.6956	0.6971	0.6986
530	0.6848	0.6863	0.6877	0.6891	0.6906	0.6920	0.6934	0.6949	0.6963	0.6977
540	0.6848	0.6862	0.6875	0.6888	0.6902	0.6915	0.6929	0.6942	0.6955	0.6968
550	0.6848	0.6861	0.6873	0.6886	0.6898	0.6911	0.6923	0.6936	0.6948	0.6960
560	0.6848	0.6860	0.6871	0.6883	0.6895	0.6907	0.6918	0.6930	0.6941	0.6953
570	0.6848	0.6859	0.6870	0.6881	0.6892	0.6903	0.6913	0.6924	0.6935	0.6945
580	0.6847	0.6858	0.6868	0.6878	0.6889	0.6899	0.6909	0.6919	0.6929	0.6939
590	0.6847	0.6857	0.6867	0.6876	0.6886	0.6895	0.6905	0.6914	0.6923	0.6933
600	0.6847	0.6856	0.6865	0.6874	0.6883	0.6892	0.6901	0.6910	0.6918	0.6927
610	0.6847	0.6855	0.6864	0.6872	0.6881	0.6889	0.6897	0.6905	0.6913	0.6921
620	0.6847	0.6855	0.6862	0.6870	0.6878	0.6886	0.6894	0.6901	0.6909	0.6916
630	0.6846	0.6854	0.6861	0.6869	0.6876	0.6883	0.6890	0.6897	0.6904	0.6911
640	0.6846	0.6853	0.6860	0.6867	0.6874	0.6880	0.6887	0.6894	0.6900	0.6907
650	0.6846	0.6852	0.6859	0.6865	0.6872	0.6878	0.6884	0.6890	0.6896	0.6902
660	0.6845	0.6851	0.6858	0.6864	0.6870	0.6875	0.6881	0.6887	0.6893	0.6898
670	0.6845	0.6851	0.6856	0.6862	0.6868	0.6873	0.6879	0.6884	0.6889	0.6894
680	0.6845	0.6850	0.6855	0.6861	0.6866	0.6871	0.6876	0.6881	0.6886	0.6891
690	0.6844	0.6849	0.6854	0.6859	0.6864	0.6869	0.6873	0.6878	0.6883	0.6887
700	0.6844	0.6848	0.6853	0.6858	0.6862	0.6867	0.6871	0.6875	0.6880	0.6884

PROPERTIES OF AIR

flow factor

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
0.7239	0.7283	0.7328	0.7373	0.7419	0.7466	0.7512	0.7559	0.7606	0.7652	0.7699
0.7222	0.7264	0.7306	0.7349	0.7393	0.7436	0.7480	0.7524	0.7568	0.7612	0.7655
0.7206	0.7246	0.7286	0.7327	0.7368	0.7409	0.7450	0.7492	0.7533	0.7574	0.7615
0.7191	0.7229	0.7267	0.7305	0.7344	0.7383	0.7422	0.7461	0.7500	0.7539	0.7577
0.7177	0.7213	0.7249	0.7285	0.7322	0.7359	0.7396	0.7433	0.7470	0.7506	0.7542
0.7164	0.7198	0.7232	0.7267	0.7301	0.7336	0.7371	0.7406	0.7441	0.7476	0.7510
0.7151	0.7183	0.7216	0.7249	0.7282	0.7315	0.7348	0.7381	0.7414	0.7447	0.7479
0.7139	0.7170	0.7201	0.7232	0.7264	0.7295	0.7327	0.7358	0.7389	0.7420	0.7451
0.7127	0.7157	0.7187	0.7216	0.7246	0.7276	0.7306	0.7336	0.7365	0.7395	0.7424
0.7116	0.7145	0.7173	0.7202	0.7230	0.7258	0.7287	0.7315	0.7343	0.7371	0.7399
0.7106	0.7133	0.7160	0.7187	0.7214	0.7242	0.7269	0.7296	0.7322	0.7349	0.7375
0.7096	0.7122	0.7148	0.7174	0.7200	0.7226	0.7251	0.7277	0.7302	0.7327	0.7352
0.7087	0.7112	0.7136	0.7161	0.7186	0.7211	0.7235	0.7259	0.7284	0.7308	0.7331
0.7078	0.7102	0.7125	0.7149	0.7173	0.7196	0.7220	0.7243	0.7266	0.7289	0.7311
0.7069	0.7092	0.7115	0.7137	0.7160	0.7182	0.7205	0.7227	0.7249	0.7271	0.7292
0.7061	0.7083	0.7105	0.7126	0.7148	0.7169	0.7191	0.7212	0.7233	0.7254	0.7274
0.7053	0.7074	0.7095	0.7116	0.7137	0.7157	0.7178	0.7198	0.7218	0.7238	0.7257
0.7046	0.7066	0.7086	0.7106	0.7126	0.7145	0.7165	0.7184	0.7203	0.7222	0.7241
0.7039	0.7058	0.7077	0.7096	0.7115	0.7134	0.7153	0.7171	0.7190	0.7208	0.7225
0.7032	0.7050	0.7069	0.7087	0.7105	0.7123	0.7141	0.7159	0.7176	0.7194	0.7211
0.7025	0.7043	0.7061	0.7078	0.7096	0.7113	0.7130	0.7147	0.7164	0.7180	0.7197
0.7013	0.7029	0.7046	0.7062	0.7078	0.7094	0.7110	0.7125	0.7141	0.7156	0.7171
0.7002	0.7017	0.7032	0.7047	0.7062	0.7076	0.7091	0.7105	0.7119	0.7133	0.7147
0.6991	0.7005	0.7019	0.7033	0.7047	0.7060	0.7073	0.7087	0.7100	0.7112	0.7125
0.6981	0.6994	0.7007	0.7020	0.7033	0.7045	0.7058	0.7070	0.7082	0.7093	0.7105
0.6972	0.6984	0.6996	0.7008	0.7020	0.7031	0.7043	0.7054	0.7065	0.7076	0.7087
0.6964	0.6975	0.6986	0.6997	0.7008	0.7019	0.7029	0.7040	0.7050	0.7060	0.7070
0.6956	0.6966	0.6977	0.6987	0.6997	0.7007	0.7017	0.7026	0.7036	0.7045	0.7054
0.6949	0.6958	0.6968	0.6977	0.6987	0.6996	0.7005	0.7014	0.7022	0.7031	0.7039
0.6942	0.6951	0.6960	0.6968	0.6977	0.6985	0.6994	0.7002	0.7010	0.7018	0.7026
0.6935	0.6944	0.6952	0.6960	0.6968	0.6976	0.6984	0.6991	0.6999	0.7006	0.7013
0.6929	0.6937	0.6945	0.6952	0.6960	0.6967	0.6974	0.6981	0.6988	0.6995	0.7001
0.6924	0.6931	0.6938	0.6945	0.6952	0.6959	0.6965	0.6972	0.6978	0.6984	0.6990
0.6918	0.6925	0.6932	0.6938	0.6944	0.6951	0.6957	0.6963	0.6969	0.6974	0.6980
0.6913	0.6919	0.6925	0.6932	0.6937	0.6943	0.6949	0.6954	0.6960	0.6965	0.6970
0.6908	0.6914	0.6920	0.6925	0.6931	0.6936	0.6941	0.6947	0.6952	0.6956	0.6961
0.6904	0.6909	0.6914	0.6920	0.6925	0.6930	0.6934	0.6939	0.6944	0.6948	0.6953
0.6899	0.6904	0.6909	0.6914	0.6919	0.6923	0.6928	0.6932	0.6937	0.6941	0.6945
0.6895	0.6900	0.6905	0.6909	0.6913	0.6918	0.6922	0.6926	0.6930	0.6933	0.6937
0.6891	0.6896	0.6900	0.6904	0.6908	0.6912	0.6916	0.6919	0.6923	0.6927	0.6930
0.6888	0.6892	0.6896	0.6899	0.6903	0.6907	0.6910	0.6914	0.6917	0.6920	0.6923

TABLE II. - Continued.

(b) Ratio of nozzle-throat velocity to speed of

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	0.8232	0.8201	0.8171	0.8141	0.8112	0.8083	0.8055	0.8028	0.8003	0.7978
405	0.8283	0.8254	0.8225	0.8197	0.8169	0.8142	0.8116	0.8091	0.8067	0.8044
410	0.8334	0.8307	0.8279	0.8252	0.8226	0.8201	0.8176	0.8152	0.8130	0.8109
415	0.8385	0.8359	0.8333	0.8307	0.8282	0.8258	0.8235	0.8213	0.8192	0.8173
420	0.8435	0.8410	0.8386	0.8362	0.8338	0.8316	0.8294	0.8273	0.8254	0.8236
425	0.8485	0.8462	0.8438	0.8416	0.8394	0.8372	0.8352	0.8333	0.8315	0.8298
430	0.8535	0.8513	0.8491	0.8469	0.8448	0.8429	0.8410	0.8392	0.8375	0.8359
435	0.8585	0.8563	0.8542	0.8522	0.8503	0.8484	0.8466	0.8450	0.8434	0.8419
440	0.8634	0.8614	0.8594	0.8575	0.8557	0.8539	0.8523	0.8507	0.8493	0.8479
445	0.8683	0.8664	0.8645	0.8627	0.8610	0.8594	0.8578	0.8564	0.8550	0.8538
450	0.8731	0.8713	0.8696	0.8679	0.8663	0.8648	0.8633	0.8620	0.8608	0.8596
455	0.8780	0.8763	0.8746	0.8731	0.8716	0.8701	0.8688	0.8676	0.8664	0.8654
460	0.8828	0.8812	0.8796	0.8782	0.8768	0.8755	0.8742	0.8731	0.8720	0.8711
465	0.8876	0.8861	0.8846	0.8832	0.8819	0.8807	0.8796	0.8785	0.8776	0.8767
470	0.8923	0.8909	0.8896	0.8883	0.8871	0.8859	0.8849	0.8839	0.8831	0.8823
475	0.8971	0.8957	0.8945	0.8933	0.8922	0.8911	0.8902	0.8893	0.8885	0.8879
480	0.9018	0.9005	0.8994	0.8983	0.8972	0.8963	0.8954	0.8946	0.8939	0.8933
485	0.9065	0.9053	0.9042	0.9032	0.9022	0.9014	0.9006	0.8999	0.8993	0.8987
490	0.9111	0.9101	0.9090	0.9081	0.9072	0.9064	0.9057	0.9051	0.9045	0.9041
495	0.9158	0.9148	0.9138	0.9130	0.9122	0.9115	0.9108	0.9103	0.9098	0.9094
500	0.9204	0.9195	0.9186	0.9178	0.9171	0.9164	0.9159	0.9154	0.9150	0.9147
510	0.9295	0.9288	0.9280	0.9274	0.9268	0.9263	0.9259	0.9255	0.9253	0.9251
520	0.9386	0.9380	0.9374	0.9369	0.9364	0.9361	0.9357	0.9355	0.9354	0.9353
530	0.9476	0.9471	0.9466	0.9462	0.9459	0.9457	0.9455	0.9454	0.9453	0.9454
540	0.9565	0.9561	0.9558	0.9555	0.9553	0.9551	0.9551	0.9551	0.9551	0.9553
550	0.9653	0.9650	0.9648	0.9646	0.9645	0.9645	0.9645	0.9646	0.9648	0.9650
560	0.9740	0.9739	0.9737	0.9737	0.9737	0.9737	0.9739	0.9741	0.9743	0.9746
570	0.9827	0.9826	0.9826	0.9826	0.9827	0.9829	0.9831	0.9834	0.9837	0.9841
580	0.9913	0.9913	0.9914	0.9915	0.9917	0.9919	0.9922	0.9926	0.9930	0.9935
590	0.9998	0.9999	1.0000	1.0003	1.0005	1.0009	1.0012	1.0017	1.0022	1.0027
600	1.0082	1.0084	1.0086	1.0089	1.0093	1.0097	1.0102	1.0107	1.0112	1.0119
610	1.0166	1.0168	1.0172	1.0175	1.0180	1.0184	1.0190	1.0196	1.0202	1.0209
620	1.0249	1.0252	1.0256	1.0261	1.0265	1.0271	1.0277	1.0283	1.0290	1.0298
630	1.0331	1.0335	1.0340	1.0345	1.0350	1.0357	1.0363	1.0370	1.0378	1.0386
640	1.0412	1.0417	1.0423	1.0428	1.0435	1.0441	1.0449	1.0456	1.0464	1.0473
650	1.0493	1.0499	1.0505	1.0511	1.0518	1.0525	1.0533	1.0541	1.0550	1.0559
660	1.0574	1.0580	1.0586	1.0593	1.0601	1.0609	1.0617	1.0626	1.0635	1.0644
670	1.0653	1.0660	1.0667	1.0675	1.0683	1.0691	1.0700	1.0709	1.0719	1.0729
680	1.0732	1.0740	1.0747	1.0755	1.0764	1.0773	1.0782	1.0792	1.0802	1.0812
690	1.0811	1.0819	1.0827	1.0835	1.0844	1.0854	1.0863	1.0874	1.0884	1.0895
700	1.0889	1.0897	1.0906	1.0915	1.0924	1.0934	1.0944	1.0955	1.0966	1.0977

THERMODYNAMIC PROPERTIES OF AIR

sound at 1 atmosphere and 491.688° R (1087.42 ft/sec)

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
0.7955	0.7934	0.7914	0.7897	0.7882	0.7869	0.7858	0.7850	0.7846	0.7844	0.7845
0.8023	0.8003	0.7985	0.7969	0.7955	0.7943	0.7934	0.7927	0.7923	0.7922	0.7923
0.8089	0.8071	0.8054	0.8040	0.8027	0.8016	0.8008	0.8002	0.7999	0.7998	0.8000
0.8154	0.8138	0.8122	0.8109	0.8097	0.8088	0.8080	0.8075	0.8073	0.8072	0.8075
0.8219	0.8203	0.8189	0.8177	0.8167	0.8158	0.8152	0.8147	0.8145	0.8146	0.8148
0.8282	0.8268	0.8255	0.8244	0.8235	0.8227	0.8222	0.8218	0.8217	0.8218	0.8221
0.8345	0.8331	0.8320	0.8310	0.8302	0.8295	0.8290	0.8288	0.8287	0.8288	0.8292
0.8406	0.8394	0.8384	0.8375	0.8367	0.8362	0.8358	0.8356	0.8356	0.8358	0.8361
0.8467	0.8456	0.8447	0.8439	0.8432	0.8427	0.8424	0.8423	0.8423	0.8426	0.8430
0.8527	0.8517	0.8509	0.8502	0.8496	0.8492	0.8490	0.8489	0.8490	0.8493	0.8497
0.8586	0.8577	0.8570	0.8564	0.8559	0.8556	0.8554	0.8554	0.8556	0.8559	0.8564
0.8645	0.8637	0.8630	0.8625	0.8621	0.8618	0.8617	0.8618	0.8620	0.8624	0.8629
0.8703	0.8696	0.8690	0.8685	0.8682	0.8680	0.8680	0.8681	0.8684	0.8688	0.8694
0.8760	0.8754	0.8749	0.8745	0.8743	0.8741	0.8742	0.8743	0.8746	0.8751	0.8757
0.8817	0.8811	0.8807	0.8804	0.8802	0.8802	0.8803	0.8805	0.8808	0.8813	0.8820
0.8873	0.8868	0.8865	0.8862	0.8861	0.8861	0.8863	0.8865	0.8869	0.8875	0.8881
0.8928	0.8924	0.8922	0.8920	0.8919	0.8920	0.8922	0.8925	0.8930	0.8935	0.8942
0.8983	0.8980	0.8978	0.8977	0.8977	0.8978	0.8980	0.8984	0.8989	0.8995	0.9003
0.9037	0.9035	0.9033	0.9033	0.9034	0.9035	0.9038	0.9042	0.9048	0.9054	0.9062
0.9091	0.9089	0.9089	0.9089	0.9090	0.9092	0.9096	0.9100	0.9106	0.9113	0.9121
0.9145	0.9143	0.9143	0.9144	0.9146	0.9148	0.9152	0.9157	0.9163	0.9170	0.9179
0.9250	0.9250	0.9251	0.9252	0.9255	0.9259	0.9264	0.9269	0.9276	0.9284	0.9293
0.9353	0.9354	0.9356	0.9359	0.9363	0.9367	0.9373	0.9379	0.9387	0.9395	0.9404
0.9455	0.9457	0.9460	0.9463	0.9468	0.9473	0.9480	0.9487	0.9495	0.9504	0.9514
0.9555	0.9558	0.9562	0.9566	0.9571	0.9578	0.9585	0.9592	0.9601	0.9611	0.9621
0.9653	0.9657	0.9662	0.9667	0.9673	0.9680	0.9688	0.9696	0.9705	0.9715	0.9726
0.9750	0.9755	0.9760	0.9766	0.9773	0.9781	0.9789	0.9798	0.9808	0.9818	0.9829
0.9846	0.9851	0.9858	0.9864	0.9872	0.9880	0.9889	0.9898	0.9908	0.9919	0.9931
0.9940	0.9947	0.9953	0.9961	0.9969	0.9977	0.9987	0.9997	1.0007	1.0019	1.0031
1.0034	1.0040	1.0048	1.0056	1.0064	1.0074	1.0083	1.0094	1.0105	1.0117	1.0129
1.0125	1.0133	1.0141	1.0149	1.0158	1.0168	1.0179	1.0190	1.0201	1.0213	1.0226
1.0216	1.0224	1.0233	1.0242	1.0251	1.0262	1.0272	1.0284	1.0296	1.0308	1.0321
1.0306	1.0314	1.0323	1.0333	1.0343	1.0354	1.0365	1.0377	1.0389	1.0402	1.0415
1.0394	1.0404	1.0413	1.0423	1.0434	1.0445	1.0456	1.0468	1.0481	1.0494	1.0508
1.0482	1.0492	1.0502	1.0512	1.0523	1.0535	1.0547	1.0559	1.0572	1.0585	1.0599
1.0569	1.0579	1.0589	1.0600	1.0611	1.0623	1.0636	1.0648	1.0662	1.0675	1.0689
1.0654	1.0665	1.0676	1.0687	1.0699	1.0711	1.0724	1.0737	1.0750	1.0764	1.0778
1.0739	1.0750	1.0761	1.0773	1.0785	1.0798	1.0811	1.0824	1.0838	1.0852	1.0866
1.0823	1.0834	1.0846	1.0858	1.0870	1.0883	1.0897	1.0910	1.0924	1.0939	1.0953
1.0906	1.0918	1.0930	1.0942	1.0955	1.0968	1.0982	1.0995	1.1010	1.1024	1.1039
1.0988	1.1000	1.1013	1.1025	1.1038	1.1052	1.1066	1.1080	1.1094	1.1109	1.1124

TABLE II. - Continued. THERMODYNAMIC PROPERTIES OF AIR

(c) Critical pressure ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
400	0.5281	0.5271	0.5260	0.5246	0.5228	0.5207	0.5182	0.5152	0.5117	0.5077	0.5030
420	0.5281	0.5271	0.5259	0.5244	0.5227	0.5208	0.5185	0.5158	0.5127	0.5093	0.5054
440	0.5281	0.5270	0.5258	0.5243	0.5227	0.5208	0.5187	0.5163	0.5135	0.5105	0.5072
460	0.5281	0.5270	0.5257	0.5243	0.5227	0.5209	0.5189	0.5167	0.5142	0.5115	0.5086
480	0.5281	0.5270	0.5257	0.5243	0.5227	0.5210	0.5191	0.5170	0.5148	0.5123	0.5097
500	0.5281	0.5269	0.5257	0.5243	0.5228	0.5211	0.5193	0.5174	0.5153	0.5130	0.5106
520	0.5281	0.5269	0.5257	0.5243	0.5228	0.5212	0.5195	0.5177	0.5157	0.5136	0.5114
540	0.5281	0.5270	0.5257	0.5244	0.5229	0.5214	0.5197	0.5180	0.5161	0.5141	0.5121
560	0.5281	0.5270	0.5257	0.5244	0.5230	0.5215	0.5199	0.5182	0.5165	0.5146	0.5127
580	0.5282	0.5270	0.5258	0.5245	0.5231	0.5216	0.5201	0.5185	0.5168	0.5151	0.5133
600	0.5282	0.5270	0.5258	0.5245	0.5232	0.5218	0.5203	0.5188	0.5171	0.5155	0.5138
620	0.5282	0.5271	0.5259	0.5246	0.5233	0.5219	0.5205	0.5190	0.5175	0.5159	0.5142
640	0.5282	0.5271	0.5259	0.5247	0.5234	0.5221	0.5207	0.5192	0.5178	0.5162	0.5147
660	0.5283	0.5272	0.5260	0.5248	0.5235	0.5222	0.5209	0.5195	0.5180	0.5166	0.5151
680	0.5283	0.5272	0.5261	0.5249	0.5236	0.5224	0.5211	0.5197	0.5183	0.5169	0.5155
700	0.5284	0.5273	0.5261	0.5250	0.5238	0.5225	0.5212	0.5199	0.5186	0.5172	0.5158

(d) Critical temperature ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
400	0.8329	0.8304	0.8280	0.8257	0.8235	0.8215	0.8196	0.8180	0.8166	0.8155	0.8146
420	0.8329	0.8306	0.8283	0.8262	0.8241	0.8222	0.8204	0.8188	0.8174	0.8161	0.8151
440	0.8329	0.8308	0.8287	0.8267	0.8247	0.8229	0.8212	0.8196	0.8182	0.8169	0.8158
460	0.8330	0.8309	0.8290	0.8271	0.8253	0.8235	0.8219	0.8204	0.8190	0.8177	0.8165
480	0.8330	0.8311	0.8293	0.8275	0.8258	0.8241	0.8226	0.8211	0.8198	0.8185	0.8173
500	0.8330	0.8312	0.8295	0.8278	0.8262	0.8247	0.8232	0.8218	0.8205	0.8193	0.8181
520	0.8331	0.8314	0.8298	0.8282	0.8267	0.8252	0.8238	0.8225	0.8212	0.8200	0.8189
540	0.8331	0.8315	0.8300	0.8285	0.8271	0.8257	0.8243	0.8231	0.8218	0.8207	0.8196
560	0.8332	0.8317	0.8302	0.8288	0.8274	0.8261	0.8248	0.8236	0.8224	0.8213	0.8202
580	0.8333	0.8318	0.8305	0.8291	0.8278	0.8265	0.8253	0.8241	0.8230	0.8219	0.8209
600	0.8334	0.8320	0.8307	0.8294	0.8282	0.8269	0.8258	0.8246	0.8235	0.8225	0.8215
620	0.8335	0.8322	0.8309	0.8297	0.8285	0.8273	0.8262	0.8251	0.8241	0.8230	0.8221
640	0.8336	0.8323	0.8311	0.8300	0.8288	0.8277	0.8266	0.8256	0.8246	0.8236	0.8226
660	0.8337	0.8325	0.8314	0.8302	0.8291	0.8281	0.8270	0.8260	0.8250	0.8241	0.8232
680	0.8338	0.8327	0.8316	0.8305	0.8295	0.8284	0.8274	0.8265	0.8255	0.8246	0.8237
700	0.8340	0.8329	0.8319	0.8308	0.8298	0.8288	0.8278	0.8269	0.8260	0.8251	0.8242

TABLE II. - Continued. THERMODYNAMIC PROPERTIES OF AIR

(e) Critical density ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
400	0.6340	0.6353	0.6369	0.6388	0.6411	0.6438	0.6469	0.6503	0.6541	0.6582	0.6625
420	0.6340	0.6353	0.6368	0.6386	0.6407	0.6431	0.6458	0.6488	0.6520	0.6555	0.6591
440	0.6340	0.6353	0.6367	0.6384	0.6404	0.6425	0.6449	0.6476	0.6504	0.6534	0.6565
460	0.6340	0.6352	0.6367	0.6383	0.6401	0.6421	0.6442	0.6466	0.6491	0.6517	0.6545
480	0.6340	0.6352	0.6366	0.6381	0.6398	0.6417	0.6437	0.6458	0.6481	0.6504	0.6529
500	0.6339	0.6352	0.6365	0.6380	0.6396	0.6413	0.6431	0.6451	0.6472	0.6493	0.6515
520	0.6339	0.6351	0.6364	0.6378	0.6393	0.6410	0.6427	0.6445	0.6464	0.6484	0.6504
540	0.6339	0.6351	0.6363	0.6377	0.6391	0.6407	0.6423	0.6440	0.6458	0.6476	0.6495
560	0.6339	0.6350	0.6362	0.6375	0.6389	0.6404	0.6419	0.6435	0.6452	0.6469	0.6487
580	0.6338	0.6350	0.6361	0.6374	0.6387	0.6402	0.6416	0.6431	0.6447	0.6463	0.6479
600	0.6338	0.6349	0.6361	0.6373	0.6386	0.6399	0.6413	0.6427	0.6442	0.6457	0.6473
620	0.6338	0.6348	0.6360	0.6372	0.6384	0.6397	0.6410	0.6424	0.6438	0.6452	0.6467
640	0.6337	0.6348	0.6359	0.6370	0.6382	0.6395	0.6407	0.6421	0.6434	0.6448	0.6461
660	0.6337	0.6347	0.6358	0.6369	0.6381	0.6393	0.6405	0.6417	0.6430	0.6443	0.6456
680	0.6336	0.6346	0.6357	0.6368	0.6379	0.6390	0.6402	0.6414	0.6427	0.6439	0.6452
700	0.6335	0.6345	0.6356	0.6366	0.6377	0.6388	0.6400	0.6412	0.6423	0.6435	0.6448

TABLE II. - Continued.

(f) Plenum

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	1.0000	0.9922	0.9845	0.9769	0.9694	0.9621	0.9549	0.9480	0.9412	0.9347
405	1.0000	0.9926	0.9853	0.9780	0.9710	0.9641	0.9573	0.9507	0.9444	0.9383
410	1.0000	0.9929	0.9860	0.9792	0.9725	0.9659	0.9596	0.9534	0.9474	0.9417
415	1.0000	0.9933	0.9867	0.9802	0.9739	0.9677	0.9617	0.9559	0.9503	0.9449
420	1.0000	0.9936	0.9874	0.9812	0.9752	0.9694	0.9638	0.9583	0.9530	0.9480
425	1.0000	0.9939	0.9880	0.9822	0.9765	0.9710	0.9657	0.9606	0.9556	0.9509
430	1.0000	0.9943	0.9886	0.9831	0.9778	0.9726	0.9676	0.9627	0.9581	0.9536
435	1.0000	0.9945	0.9892	0.9840	0.9789	0.9740	0.9693	0.9648	0.9604	0.9563
440	1.0000	0.9948	0.9898	0.9848	0.9801	0.9755	0.9710	0.9667	0.9626	0.9588
445	1.0000	0.9951	0.9903	0.9857	0.9811	0.9768	0.9726	0.9686	0.9648	0.9611
450	1.0000	0.9953	0.9908	0.9864	0.9822	0.9781	0.9741	0.9704	0.9668	0.9634
455	1.0000	0.9956	0.9913	0.9872	0.9832	0.9793	0.9756	0.9721	0.9687	0.9656
460	1.0000	0.9958	0.9918	0.9879	0.9841	0.9805	0.9770	0.9737	0.9706	0.9676
465	1.0000	0.9961	0.9922	0.9885	0.9850	0.9816	0.9783	0.9753	0.9723	0.9696
470	1.0000	0.9963	0.9927	0.9892	0.9858	0.9827	0.9796	0.9767	0.9740	0.9715
475	1.0000	0.9965	0.9931	0.9898	0.9867	0.9837	0.9808	0.9782	0.9756	0.9733
480	1.0000	0.9967	0.9935	0.9904	0.9875	0.9847	0.9820	0.9795	0.9772	0.9750
485	1.0000	0.9969	0.9939	0.9910	0.9882	0.9856	0.9831	0.9808	0.9787	0.9767
490	1.0000	0.9970	0.9942	0.9915	0.9889	0.9865	0.9842	0.9821	0.9801	0.9782
495	1.0000	0.9972	0.9946	0.9920	0.9896	0.9874	0.9852	0.9833	0.9814	0.9797
500	1.0000	0.9974	0.9949	0.9925	0.9903	0.9882	0.9862	0.9844	0.9827	0.9812
510	1.0000	0.9977	0.9955	0.9935	0.9916	0.9898	0.9881	0.9865	0.9852	0.9839
520	1.0000	0.9980	0.9961	0.9944	0.9927	0.9912	0.9898	0.9885	0.9874	0.9864
530	1.0000	0.9983	0.9967	0.9952	0.9938	0.9925	0.9914	0.9904	0.9895	0.9887
540	1.0000	0.9985	0.9972	0.9959	0.9948	0.9937	0.9928	0.9920	0.9914	0.9908
550	1.0000	0.9988	0.9976	0.9966	0.9957	0.9949	0.9942	0.9936	0.9931	0.9928
560	1.0000	0.9990	0.9981	0.9973	0.9965	0.9959	0.9954	0.9950	0.9947	0.9946
570	1.0000	0.9992	0.9985	0.9978	0.9973	0.9969	0.9966	0.9964	0.9963	0.9962
580	1.0000	0.9994	0.9988	0.9984	0.9981	0.9978	0.9977	0.9976	0.9976	0.9978
590	1.0000	0.9996	0.9992	0.9989	0.9987	0.9986	0.9987	0.9987	0.9989	0.9992
600	1.0000	0.9997	0.9995	0.9994	0.9994	0.9994	0.9996	0.9998	1.0001	1.0006
610	1.0000	0.9999	0.9998	0.9998	1.0000	1.0002	1.0004	1.0008	1.0013	1.0018
620	1.0000	1.0000	1.0001	1.0003	1.0005	1.0008	1.0012	1.0017	1.0023	1.0030
630	1.0000	1.0001	1.0004	1.0006	1.0010	1.0015	1.0020	1.0026	1.0033	1.0040
640	1.0000	1.0003	1.0006	1.0010	1.0015	1.0020	1.0027	1.0034	1.0042	1.0050
650	1.0000	1.0004	1.0008	1.0013	1.0019	1.0026	1.0033	1.0041	1.0050	1.0059
660	1.0000	1.0005	1.0010	1.0017	1.0023	1.0031	1.0039	1.0048	1.0058	1.0068
670	1.0000	1.0006	1.0012	1.0019	1.0027	1.0036	1.0045	1.0055	1.0065	1.0076
680	1.0000	1.0007	1.0014	1.0022	1.0031	1.0040	1.0050	1.0061	1.0072	1.0084
690	1.0000	1.0008	1.0016	1.0025	1.0034	1.0044	1.0055	1.0066	1.0078	1.0091
700	1.0000	1.0008	1.0018	1.0027	1.0037	1.0048	1.0060	1.0071	1.0084	1.0097

THERMODYNAMIC PROPERTIES OF AIR

compressibility factor

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
0.9284	0.9225	0.9168	0.9115	0.9066	0.9021	0.8979	0.8943	0.8910	0.8882	0.8859
0.9324	0.9269	0.9216	0.9167	0.9121	0.9079	0.9040	0.9006	0.8976	0.8951	0.8930
0.9362	0.9310	0.9261	0.9215	0.9172	0.9133	0.9098	0.9066	0.9039	0.9016	0.8997
0.9398	0.9349	0.9303	0.9261	0.9221	0.9185	0.9152	0.9123	0.9098	0.9077	0.9060
0.9432	0.9386	0.9344	0.9304	0.9267	0.9234	0.9204	0.9177	0.9154	0.9135	0.9119
0.9464	0.9421	0.9382	0.9345	0.9311	0.9280	0.9252	0.9228	0.9207	0.9190	0.9175
0.9494	0.9455	0.9418	0.9384	0.9352	0.9324	0.9298	0.9276	0.9257	0.9242	0.9229
0.9523	0.9487	0.9452	0.9420	0.9391	0.9365	0.9342	0.9322	0.9305	0.9291	0.9280
0.9551	0.9517	0.9485	0.9456	0.9429	0.9405	0.9384	0.9365	0.9350	0.9337	0.9328
0.9577	0.9545	0.9516	0.9489	0.9464	0.9442	0.9423	0.9406	0.9393	0.9382	0.9374
0.9602	0.9573	0.9545	0.9520	0.9498	0.9478	0.9460	0.9446	0.9433	0.9424	0.9417
0.9626	0.9599	0.9574	0.9551	0.9530	0.9512	0.9496	0.9483	0.9472	0.9464	0.9459
0.9649	0.9624	0.9600	0.9579	0.9561	0.9544	0.9530	0.9518	0.9509	0.9502	0.9498
0.9671	0.9647	0.9626	0.9607	0.9590	0.9575	0.9562	0.9552	0.9544	0.9539	0.9535
0.9692	0.9670	0.9650	0.9633	0.9617	0.9604	0.9593	0.9584	0.9578	0.9573	0.9571
0.9711	0.9692	0.9674	0.9658	0.9644	0.9632	0.9622	0.9615	0.9610	0.9606	0.9605
0.9730	0.9712	0.9696	0.9682	0.9669	0.9659	0.9651	0.9644	0.9640	0.9638	0.9638
0.9748	0.9732	0.9717	0.9704	0.9693	0.9684	0.9677	0.9672	0.9669	0.9668	0.9669
0.9766	0.9751	0.9738	0.9726	0.9717	0.9709	0.9703	0.9699	0.9697	0.9697	0.9699
0.9782	0.9769	0.9757	0.9747	0.9739	0.9732	0.9727	0.9724	0.9723	0.9724	0.9727
0.9798	0.9786	0.9776	0.9767	0.9760	0.9754	0.9751	0.9749	0.9749	0.9751	0.9754
0.9828	0.9819	0.9811	0.9804	0.9799	0.9796	0.9795	0.9795	0.9796	0.9800	0.9805
0.9855	0.9848	0.9843	0.9838	0.9836	0.9834	0.9835	0.9837	0.9840	0.9845	0.9851
0.9881	0.9876	0.9872	0.9870	0.9869	0.9870	0.9872	0.9875	0.9880	0.9886	0.9894
0.9904	0.9901	0.9899	0.9899	0.9900	0.9902	0.9906	0.9911	0.9917	0.9925	0.9934
0.9925	0.9924	0.9924	0.9926	0.9928	0.9932	0.9937	0.9943	0.9951	0.9960	0.9970
0.9945	0.9946	0.9947	0.9950	0.9954	0.9959	0.9966	0.9973	0.9982	0.9992	1.0003
0.9963	0.9966	0.9969	0.9973	0.9978	0.9985	0.9992	1.0001	1.0011	1.0022	1.0034
0.9980	0.9984	0.9989	0.9994	1.0001	1.0008	1.0017	1.0027	1.0038	1.0049	1.0062
0.9996	1.0001	1.0007	1.0014	1.0021	1.0030	1.0040	1.0051	1.0062	1.0075	1.0089
1.0011	1.0017	1.0024	1.0032	1.0041	1.0050	1.0061	1.0073	1.0085	1.0099	1.0113
1.0024	1.0032	1.0040	1.0048	1.0058	1.0069	1.0081	1.0093	1.0106	1.0120	1.0135
1.0037	1.0045	1.0054	1.0064	1.0075	1.0086	1.0099	1.0112	1.0126	1.0141	1.0156
1.0049	1.0058	1.0068	1.0079	1.0090	1.0102	1.0116	1.0129	1.0144	1.0160	1.0176
1.0059	1.0070	1.0080	1.0092	1.0104	1.0117	1.0131	1.0146	1.0161	1.0177	1.0194
1.0070	1.0081	1.0092	1.0104	1.0117	1.0131	1.0146	1.0161	1.0177	1.0193	1.0210
1.0079	1.0091	1.0103	1.0116	1.0130	1.0144	1.0159	1.0175	1.0191	1.0208	1.0226
1.0088	1.0100	1.0113	1.0127	1.0141	1.0156	1.0172	1.0188	1.0205	1.0222	1.0240
1.0096	1.0109	1.0123	1.0137	1.0152	1.0167	1.0183	1.0200	1.0217	1.0235	1.0254
1.0104	1.0117	1.0132	1.0146	1.0162	1.0178	1.0194	1.0211	1.0229	1.0247	1.0266
1.0111	1.0125	1.0140	1.0155	1.0171	1.0187	1.0204	1.0222	1.0240	1.0259	1.0278

TABLE II. - Continued.

(g) Plenum

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	3.4928	3.5482	3.6063	3.6674	3.7315	3.7985	3.8685	3.9414	4.0171	4.0954
405	3.4930	3.5466	3.6029	3.6618	3.7235	3.7878	3.8549	3.9245	3.9966	4.0710
410	3.4931	3.5451	3.5996	3.6566	3.7160	3.7778	3.8420	3.9086	3.9774	4.0482
415	3.4932	3.5438	3.5965	3.6516	3.7088	3.7683	3.8300	3.8937	3.9594	4.0269
420	3.4933	3.5424	3.5936	3.6468	3.7021	3.7593	3.8186	3.8797	3.9425	4.0070
425	3.4935	3.5412	3.5908	3.6423	3.6957	3.7509	3.8078	3.8664	3.9266	3.9883
430	3.4937	3.5400	3.5882	3.6380	3.6896	3.7428	3.7977	3.8540	3.9117	3.9707
435	3.4938	3.5389	3.5856	3.6340	3.6838	3.7352	3.7880	3.8422	3.8976	3.9542
440	3.4940	3.5379	3.5833	3.6301	3.6784	3.7280	3.7789	3.8311	3.8843	3.9386
445	3.4942	3.5369	3.5810	3.6264	3.6731	3.7211	3.7703	3.8205	3.8718	3.9239
450	3.4944	3.5360	3.5788	3.6229	3.6682	3.7146	3.7621	3.8105	3.8599	3.9100
455	3.4946	3.5351	3.5768	3.6196	3.6635	3.7084	3.7543	3.8011	3.8486	3.8968
460	3.4948	3.5343	3.5748	3.6164	3.6590	3.7025	3.7469	3.7921	3.8379	3.8844
465	3.4951	3.5335	3.5730	3.6134	3.6547	3.6969	3.7398	3.7835	3.8278	3.8726
470	3.4953	3.5328	3.5712	3.6105	3.6506	3.6915	3.7331	3.7754	3.8182	3.8614
475	3.4956	3.5322	3.5696	3.6078	3.6468	3.6864	3.7267	3.7676	3.8090	3.8508
480	3.4959	3.5316	3.5680	3.6052	3.6431	3.6816	3.7207	3.7603	3.8003	3.8407
485	3.4962	3.5310	3.5665	3.6027	3.6395	3.6769	3.7149	3.7532	3.7920	3.8310
490	3.4965	3.5305	3.5651	3.6003	3.6362	3.6725	3.7093	3.7465	3.7841	3.8219
495	3.4968	3.5300	3.5638	3.5981	3.6330	3.6683	3.7040	3.7402	3.7766	3.8132
500	3.4972	3.5296	3.5625	3.5960	3.6299	3.6643	3.6990	3.7341	3.7694	3.8049
510	3.4979	3.5288	3.5602	3.5920	3.6242	3.6568	3.6896	3.7227	3.7560	3.7894
520	3.4987	3.5282	3.5582	3.5884	3.6190	3.6499	3.6810	3.7123	3.7438	3.7752
530	3.4996	3.5278	3.5564	3.5852	3.6144	3.6437	3.6732	3.7029	3.7326	3.7624
540	3.5005	3.5275	3.5548	3.5824	3.6101	3.6380	3.6661	3.6942	3.7224	3.7506
550	3.5015	3.5274	3.5535	3.5798	3.6063	3.6329	3.6596	3.6863	3.7131	3.7398
560	3.5026	3.5274	3.5524	3.5776	3.6028	3.6282	3.6536	3.6791	3.7045	3.7299
570	3.5037	3.5275	3.5515	3.5756	3.5998	3.6240	3.6482	3.6725	3.6967	3.7209
580	3.5049	3.5278	3.5508	3.5739	3.5970	3.6202	3.6433	3.6665	3.6896	3.7126
590	3.5062	3.5282	3.5503	3.5724	3.5946	3.6167	3.6389	3.6610	3.6831	3.7050
600	3.5076	3.5287	3.5499	3.5712	3.5924	3.6137	3.6349	3.6560	3.6771	3.6981
610	3.5091	3.5294	3.5498	3.5702	3.5906	3.6109	3.6313	3.6515	3.6717	3.6918
620	3.5106	3.5302	3.5498	3.5694	3.5890	3.6085	3.6280	3.6475	3.6668	3.6860
630	3.5122	3.5311	3.5500	3.5688	3.5877	3.6064	3.6252	3.6438	3.6623	3.6807
640	3.5139	3.5321	3.5503	3.5684	3.5866	3.6046	3.6226	3.6405	3.6583	3.6760
650	3.5157	3.5332	3.5508	3.5683	3.5857	3.6031	3.6204	3.6376	3.6547	3.6716
660	3.5176	3.5345	3.5514	3.5683	3.5851	3.6018	3.6184	3.6350	3.6514	3.6677
670	3.5195	3.5359	3.5522	3.5684	3.5846	3.6008	3.6168	3.6327	3.6485	3.6642
680	3.5215	3.5373	3.5531	3.5688	3.5844	3.6000	3.6154	3.6308	3.6460	3.6611
690	3.5236	3.5389	3.5541	3.5693	3.5844	3.5994	3.6143	3.6291	3.6438	3.6583
700	3.5258	3.5406	3.5553	3.5700	3.5845	3.5990	3.6134	3.6277	3.6418	3.6559

THERMODYNAMIC PROPERTIES OF AIR

specific heat

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
4.1761	4.2590	4.3437	4.4297	4.5166	4.6039	4.6909	4.7772	4.8621	4.9449	5.0253
4.1475	4.2259	4.3058	4.3868	4.4686	4.5507	4.6325	4.7135	4.7933	4.8713	4.9470
4.1209	4.1951	4.2707	4.3473	4.4244	4.5018	4.5788	4.6552	4.7303	4.8039	4.8754
4.0960	4.1666	4.2382	4.3107	4.3836	4.4567	4.5294	4.6015	4.6725	4.7420	4.8095
4.0728	4.1399	4.2080	4.2767	4.3458	4.4149	4.4838	4.5520	4.6191	4.6850	4.7491
4.0511	4.1150	4.1798	4.2451	4.3107	4.3763	4.4415	4.5062	4.5698	4.6323	4.6931
4.0308	4.0918	4.1535	4.2156	4.2780	4.3403	4.4023	4.4637	4.5241	4.5835	4.6414
4.0117	4.0699	4.1288	4.1881	4.2475	4.3068	4.3658	4.4242	4.4817	4.5381	4.5933
3.9937	4.0494	4.1057	4.1623	4.2190	4.2755	4.3317	4.3873	4.4422	4.4960	4.5486
3.9767	4.0302	4.0840	4.1381	4.1923	4.2462	4.2999	4.3530	4.4055	4.4566	4.5068
3.9607	4.0120	4.0636	4.1154	4.1672	4.2188	4.2701	4.3208	4.3708	4.4199	4.4677
3.9456	3.9949	4.0444	4.0940	4.1436	4.1930	4.2421	4.2906	4.3385	4.3855	4.4314
3.9314	3.9787	4.0262	4.0739	4.1214	4.1688	4.2158	4.2623	4.3081	4.3532	4.3972
3.9178	3.9634	4.0091	4.0549	4.1005	4.1460	4.1911	4.2357	4.2796	4.3228	4.3651
3.9050	3.9489	3.9929	4.0369	4.0808	4.1245	4.1678	4.2106	4.2528	4.2943	4.3347
3.8929	3.9351	3.9775	4.0199	4.0621	4.1042	4.1458	4.1870	4.2275	4.2674	4.3065
3.8813	3.9221	3.9630	4.0038	4.0445	4.0849	4.1250	4.1646	4.2036	4.2420	4.2796
3.8703	3.9097	3.9492	3.9885	4.0278	4.0667	4.1053	4.1435	4.1811	4.2180	4.2543
3.8599	3.8980	3.9361	3.9741	4.0119	4.0495	4.0867	4.1235	4.1597	4.1953	4.2303
3.8499	3.8868	3.9236	3.9603	3.9968	4.0331	4.0690	4.1045	4.1395	4.1739	4.2076
3.8405	3.8761	3.9117	3.9472	3.9825	4.0176	4.0523	4.0865	4.1203	4.1535	4.1861
3.8228	3.8563	3.8897	3.9229	3.9560	3.9887	4.0212	4.0532	4.0848	4.1158	4.1462
3.8068	3.8382	3.8696	3.9009	3.9319	3.9626	3.9930	4.0230	4.0526	4.0817	4.1103
3.7921	3.8218	3.8514	3.8808	3.9099	3.9389	3.9674	3.9957	4.0235	4.0508	4.0775
3.7787	3.8068	3.8347	3.8624	3.8900	3.9172	3.9441	3.9707	3.9969	4.0227	4.0479
3.7665	3.7930	3.8194	3.8457	3.8717	3.8974	3.9229	3.9480	3.9727	3.9970	4.0209
3.7552	3.7804	3.8055	3.8303	3.8550	3.8793	3.9034	3.9271	3.9505	3.9735	3.9961
3.7450	3.7689	3.7927	3.8163	3.8396	3.8627	3.8855	3.9081	3.9302	3.9521	3.9737
3.7355	3.7583	3.7809	3.8033	3.8255	3.8475	3.8692	3.8906	3.9116	3.9323	3.9527
3.7269	3.7486	3.7701	3.7915	3.8126	3.8335	3.8541	3.8745	3.8945	3.9142	3.9335
3.7190	3.7397	3.7602	3.7806	3.8007	3.8206	3.8403	3.8597	3.8787	3.8975	3.9160
3.7117	3.7315	3.7511	3.7706	3.7898	3.8088	3.8275	3.8460	3.8642	3.8821	3.8998
3.7051	3.7240	3.7428	3.7614	3.7797	3.7979	3.8158	3.8335	3.8509	3.8680	3.8848
3.6990	3.7172	3.7351	3.7529	3.7705	3.7878	3.8050	3.8219	3.8385	3.8549	3.8710
3.6935	3.7109	3.7281	3.7451	3.7620	3.7786	3.7950	3.8112	3.8272	3.8428	3.8583
3.6885	3.7052	3.7217	3.7380	3.7542	3.7701	3.7859	3.8014	3.8167	3.8317	3.8465
3.6839	3.6999	3.7158	3.7315	3.7470	3.7623	3.7774	3.7923	3.8070	3.8214	3.8356
3.6798	3.6952	3.7104	3.7255	3.7404	3.7551	3.7697	3.7840	3.7981	3.8119	3.8256
3.6761	3.6909	3.7056	3.7201	3.7344	3.7486	3.7625	3.7763	3.7898	3.8032	3.8163
3.6728	3.6870	3.7012	3.7151	3.7289	3.7425	3.7560	3.7692	3.7823	3.7951	3.8078
3.6698	3.6836	3.6972	3.7106	3.7239	3.7371	3.7500	3.7628	3.7753	3.7877	3.7999

TABLE II. - Continued.

(h) Plenum

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	1.4012	1.4191	1.4380	1.4577	1.4783	1.4998	1.5221	1.5451	1.5689	1.5933
405	1.4011	1.4186	1.4369	1.4559	1.4758	1.4964	1.5177	1.5398	1.5625	1.5857
410	1.4011	1.4181	1.4358	1.4542	1.4733	1.4932	1.5136	1.5347	1.5564	1.5785
415	1.4011	1.4176	1.4347	1.4525	1.4710	1.4901	1.5098	1.5300	1.5507	1.5718
420	1.4011	1.4171	1.4337	1.4510	1.4688	1.4872	1.5061	1.5255	1.5453	1.5655
425	1.4010	1.4166	1.4328	1.4494	1.4667	1.4844	1.5026	1.5212	1.5402	1.5596
430	1.4010	1.4162	1.4318	1.4480	1.4647	1.4818	1.4993	1.5172	1.5354	1.5540
435	1.4010	1.4157	1.4309	1.4466	1.4627	1.4793	1.4962	1.5134	1.5309	1.5487
440	1.4010	1.4153	1.4301	1.4453	1.4609	1.4769	1.4932	1.5098	1.5266	1.5436
445	1.4009	1.4149	1.4293	1.4440	1.4591	1.4746	1.4903	1.5063	1.5225	1.5389
450	1.4009	1.4145	1.4285	1.4428	1.4574	1.4724	1.4876	1.5030	1.5186	1.5344
455	1.4009	1.4141	1.4277	1.4416	1.4558	1.4703	1.4850	1.4999	1.5149	1.5301
460	1.4008	1.4137	1.4270	1.4405	1.4542	1.4683	1.4825	1.4969	1.5114	1.5261
465	1.4008	1.4134	1.4262	1.4394	1.4527	1.4663	1.4801	1.4940	1.5081	1.5222
470	1.4007	1.4130	1.4255	1.4383	1.4513	1.4645	1.4778	1.4913	1.5049	1.5185
475	1.4007	1.4127	1.4249	1.4373	1.4499	1.4627	1.4756	1.4887	1.5018	1.5150
480	1.4007	1.4123	1.4242	1.4363	1.4486	1.4610	1.4735	1.4862	1.4989	1.5116
485	1.4006	1.4120	1.4236	1.4354	1.4473	1.4593	1.4715	1.4838	1.4961	1.5084
490	1.4006	1.4117	1.4230	1.4344	1.4460	1.4578	1.4696	1.4815	1.4934	1.5053
495	1.4005	1.4114	1.4224	1.4335	1.4448	1.4562	1.4677	1.4792	1.4908	1.5024
500	1.4005	1.4111	1.4218	1.4327	1.4437	1.4548	1.4659	1.4771	1.4883	1.4995
510	1.4003	1.4105	1.4207	1.4310	1.4415	1.4520	1.4625	1.4731	1.4837	1.4942
520	1.4002	1.4099	1.4196	1.4295	1.4394	1.4494	1.4593	1.4693	1.4793	1.4893
530	1.4001	1.4093	1.4186	1.4280	1.4374	1.4469	1.4564	1.4659	1.4753	1.4847
540	1.3999	1.4088	1.4177	1.4266	1.4356	1.4446	1.4536	1.4626	1.4716	1.4805
550	1.3998	1.4082	1.4167	1.4253	1.4339	1.4424	1.4510	1.4596	1.4681	1.4765
560	1.3996	1.4077	1.4159	1.4240	1.4322	1.4404	1.4486	1.4567	1.4648	1.4728
570	1.3994	1.4072	1.4150	1.4228	1.4306	1.4385	1.4463	1.4540	1.4617	1.4694
580	1.3992	1.4067	1.4142	1.4217	1.4292	1.4366	1.4441	1.4515	1.4588	1.4661
590	1.3990	1.4062	1.4134	1.4206	1.4277	1.4349	1.4420	1.4491	1.4561	1.4630
600	1.3988	1.4057	1.4126	1.4195	1.4263	1.4332	1.4400	1.4468	1.4535	1.4601
610	1.3986	1.4052	1.4118	1.4184	1.4250	1.4316	1.4381	1.4446	1.4510	1.4574
620	1.3983	1.4047	1.4111	1.4174	1.4238	1.4301	1.4363	1.4425	1.4487	1.4548
630	1.3981	1.4042	1.4103	1.4165	1.4225	1.4286	1.4346	1.4406	1.4465	1.4523
640	1.3978	1.4037	1.4096	1.4155	1.4214	1.4272	1.4329	1.4387	1.4443	1.4499
650	1.3975	1.4032	1.4089	1.4146	1.4202	1.4258	1.4314	1.4368	1.4423	1.4477
660	1.3972	1.4027	1.4082	1.4137	1.4191	1.4245	1.4298	1.4351	1.4403	1.4455
670	1.3969	1.4022	1.4075	1.4128	1.4180	1.4232	1.4283	1.4334	1.4385	1.4434
680	1.3966	1.4017	1.4068	1.4119	1.4169	1.4219	1.4269	1.4318	1.4367	1.4414
690	1.3963	1.4012	1.4061	1.4110	1.4159	1.4207	1.4255	1.4302	1.4349	1.4395
700	1.3959	1.4007	1.4055	1.4102	1.4149	1.4196	1.4242	1.4287	1.4332	1.4377

THERMODYNAMIC PROPERTIES OF AIR

specific heat ratio

pressure, atm.										
50	55	60	65	70	75	80	85	90	95	100
1.6183	1.6436	1.6692	1.6949	1.7205	1.7458	1.7706	1.7946	1.8177	1.8397	1.8603
1.6094	1.6334	1.6576	1.6819	1.7060	1.7299	1.7532	1.7759	1.7978	1.8186	1.8382
1.6010	1.6238	1.6468	1.6698	1.6926	1.7151	1.7372	1.7587	1.7794	1.7992	1.8179
1.5933	1.6149	1.6367	1.6585	1.6801	1.7015	1.7224	1.7428	1.7624	1.7812	1.7991
1.5860	1.6066	1.6273	1.6480	1.6686	1.6888	1.7087	1.7280	1.7467	1.7646	1.7816
1.5791	1.5988	1.6185	1.6382	1.6578	1.6770	1.6959	1.7143	1.7321	1.7492	1.7654
1.5726	1.5915	1.6103	1.6291	1.6477	1.6660	1.6840	1.7016	1.7185	1.7348	1.7503
1.5666	1.5846	1.6026	1.6205	1.6382	1.6558	1.6729	1.6896	1.7058	1.7214	1.7363
1.5608	1.5781	1.5953	1.6124	1.6294	1.6461	1.6625	1.6785	1.6940	1.7089	1.7231
1.5554	1.5719	1.5884	1.6048	1.6211	1.6371	1.6527	1.6680	1.6828	1.6971	1.7108
1.5502	1.5661	1.5819	1.5977	1.6132	1.6286	1.6436	1.6582	1.6724	1.6861	1.6993
1.5454	1.5606	1.5758	1.5909	1.6058	1.6205	1.6349	1.6490	1.6626	1.6758	1.6884
1.5407	1.5554	1.5700	1.5845	1.5989	1.6130	1.6268	1.6403	1.6534	1.6660	1.6782
1.5363	1.5505	1.5645	1.5785	1.5922	1.6058	1.6191	1.6321	1.6447	1.6568	1.6685
1.5321	1.5458	1.5593	1.5727	1.5860	1.5990	1.6118	1.6243	1.6364	1.6482	1.6595
1.5281	1.5413	1.5543	1.5673	1.5801	1.5926	1.6049	1.6170	1.6286	1.6400	1.6509
1.5243	1.5370	1.5496	1.5621	1.5744	1.5865	1.5984	1.6100	1.6213	1.6322	1.6427
1.5207	1.5330	1.5451	1.5572	1.5691	1.5807	1.5922	1.6034	1.6143	1.6248	1.6350
1.5172	1.5291	1.5408	1.5525	1.5640	1.5752	1.5863	1.5971	1.6076	1.6178	1.6277
1.5139	1.5254	1.5367	1.5480	1.5591	1.5700	1.5807	1.5911	1.6013	1.6112	1.6207
1.5107	1.5218	1.5328	1.5437	1.5544	1.5650	1.5753	1.5854	1.5953	1.6048	1.6140
1.5047	1.5152	1.5255	1.5357	1.5458	1.5557	1.5654	1.5748	1.5841	1.5930	1.6017
1.4992	1.5090	1.5188	1.5284	1.5378	1.5471	1.5562	1.5651	1.5738	1.5823	1.5904
1.4941	1.5034	1.5125	1.5216	1.5305	1.5393	1.5479	1.5563	1.5645	1.5724	1.5801
1.4894	1.4981	1.5068	1.5154	1.5238	1.5321	1.5402	1.5481	1.5558	1.5634	1.5707
1.4849	1.4933	1.5015	1.5096	1.5175	1.5254	1.5331	1.5406	1.5479	1.5550	1.5620
1.4808	1.4887	1.4965	1.5042	1.5118	1.5192	1.5265	1.5336	1.5405	1.5473	1.5539
1.4770	1.4845	1.4919	1.4992	1.5064	1.5134	1.5203	1.5271	1.5337	1.5401	1.5464
1.4733	1.4805	1.4875	1.4945	1.5013	1.5080	1.5146	1.5211	1.5273	1.5335	1.5395
1.4699	1.4767	1.4835	1.4901	1.4966	1.5030	1.5093	1.5154	1.5214	1.5273	1.5330
1.4667	1.4732	1.4796	1.4860	1.4922	1.4983	1.5043	1.5101	1.5159	1.5215	1.5269
1.4637	1.4699	1.4760	1.4821	1.4880	1.4938	1.4996	1.5052	1.5106	1.5160	1.5212
1.4608	1.4668	1.4726	1.4784	1.4841	1.4897	1.4951	1.5005	1.5057	1.5109	1.5159
1.4581	1.4638	1.4694	1.4749	1.4804	1.4857	1.4910	1.4961	1.5011	1.5060	1.5108
1.4555	1.4609	1.4663	1.4716	1.4769	1.4820	1.4870	1.4919	1.4968	1.5015	1.5061
1.4530	1.4582	1.4634	1.4685	1.4735	1.4784	1.4833	1.4880	1.4926	1.4972	1.5016
1.4506	1.4557	1.4606	1.4655	1.4703	1.4751	1.4797	1.4843	1.4887	1.4931	1.4973
1.4484	1.4532	1.4580	1.4627	1.4673	1.4719	1.4763	1.4807	1.4850	1.4892	1.4933
1.4462	1.4508	1.4554	1.4600	1.4644	1.4688	1.4731	1.4773	1.4814	1.4855	1.4894
1.4441	1.4486	1.4530	1.4574	1.4617	1.4659	1.4700	1.4741	1.4781	1.4820	1.4858
1.4421	1.4464	1.4507	1.4549	1.4590	1.4631	1.4671	1.4710	1.4748	1.4786	1.4823

TABLE II. - Concluded.

(i) Ratio of plenum speed of sound to speed

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	Plenum 45
400	0.9020	0.9007	0.8997	0.8990	0.8986	0.8986	0.8989	0.8997	0.9009	0.9026
405	0.9076	0.9065	0.9056	0.9051	0.9049	0.9050	0.9055	0.9064	0.9077	0.9095
410	0.9132	0.9122	0.9115	0.9112	0.9111	0.9114	0.9120	0.9130	0.9145	0.9163
415	0.9187	0.9179	0.9174	0.9172	0.9173	0.9177	0.9185	0.9196	0.9211	0.9231
420	0.9242	0.9236	0.9232	0.9232	0.9234	0.9239	0.9248	0.9261	0.9277	0.9297
425	0.9297	0.9292	0.9290	0.9291	0.9294	0.9301	0.9311	0.9325	0.9342	0.9363
430	0.9351	0.9348	0.9347	0.9349	0.9354	0.9362	0.9373	0.9388	0.9406	0.9428
435	0.9406	0.9404	0.9404	0.9407	0.9414	0.9423	0.9435	0.9450	0.9469	0.9492
440	0.9459	0.9459	0.9461	0.9465	0.9472	0.9483	0.9496	0.9512	0.9532	0.9555
445	0.9513	0.9513	0.9517	0.9522	0.9531	0.9542	0.9556	0.9573	0.9594	0.9618
450	0.9566	0.9568	0.9572	0.9579	0.9589	0.9601	0.9616	0.9634	0.9655	0.9679
455	0.9619	0.9622	0.9627	0.9635	0.9646	0.9659	0.9675	0.9694	0.9716	0.9741
460	0.9671	0.9676	0.9682	0.9691	0.9703	0.9717	0.9734	0.9753	0.9776	0.9801
465	0.9724	0.9729	0.9737	0.9747	0.9759	0.9774	0.9792	0.9812	0.9835	0.9861
470	0.9776	0.9782	0.9791	0.9802	0.9815	0.9831	0.9849	0.9870	0.9894	0.9921
475	0.9827	0.9835	0.9844	0.9856	0.9871	0.9887	0.9906	0.9928	0.9953	0.9980
480	0.9879	0.9887	0.9898	0.9911	0.9926	0.9943	0.9963	0.9985	1.0010	1.0038
485	0.9930	0.9939	0.9951	0.9965	0.9980	0.9999	1.0019	1.0042	1.0068	1.0096
490	0.9981	0.9991	1.0004	1.0018	1.0035	1.0054	1.0075	1.0098	1.0124	1.0153
495	1.0032	1.0043	1.0056	1.0071	1.0089	1.0108	1.0130	1.0154	1.0181	1.0210
500	1.0082	1.0094	1.0108	1.0124	1.0142	1.0162	1.0185	1.0210	1.0237	1.0266
510	1.0182	1.0195	1.0211	1.0228	1.0248	1.0270	1.0293	1.0319	1.0347	1.0377
520	1.0281	1.0296	1.0313	1.0332	1.0352	1.0375	1.0400	1.0427	1.0455	1.0486
530	1.0379	1.0395	1.0413	1.0434	1.0456	1.0479	1.0505	1.0533	1.0562	1.0594
540	1.0475	1.0493	1.0513	1.0534	1.0557	1.0582	1.0609	1.0637	1.0667	1.0699
550	1.0571	1.0590	1.0611	1.0634	1.0658	1.0684	1.0711	1.0740	1.0771	1.0804
560	1.0666	1.0687	1.0709	1.0732	1.0757	1.0784	1.0812	1.0842	1.0873	1.0907
570	1.0760	1.0782	1.0805	1.0829	1.0855	1.0883	1.0912	1.0942	1.0974	1.1008
580	1.0854	1.0876	1.0900	1.0925	1.0952	1.0980	1.1010	1.1041	1.1074	1.1108
590	1.0946	1.0969	1.0994	1.1020	1.1048	1.1077	1.1107	1.1139	1.1172	1.1207
600	1.1038	1.1062	1.1087	1.1114	1.1143	1.1172	1.1203	1.1235	1.1269	1.1304
610	1.1128	1.1153	1.1180	1.1207	1.1236	1.1267	1.1298	1.1331	1.1365	1.1400
620	1.1218	1.1244	1.1271	1.1299	1.1329	1.1360	1.1392	1.1425	1.1460	1.1495
630	1.1307	1.1334	1.1362	1.1391	1.1421	1.1452	1.1485	1.1518	1.1553	1.1589
640	1.1395	1.1423	1.1451	1.1481	1.1512	1.1543	1.1576	1.1611	1.1646	1.1682
650	1.1483	1.1511	1.1540	1.1570	1.1602	1.1634	1.1667	1.1702	1.1737	1.1774
660	1.1570	1.1598	1.1628	1.1659	1.1691	1.1723	1.1757	1.1792	1.1828	1.1865
670	1.1656	1.1685	1.1715	1.1746	1.1779	1.1812	1.1846	1.1881	1.1917	1.1954
680	1.1741	1.1771	1.1802	1.1833	1.1866	1.1900	1.1934	1.1970	1.2006	1.2043
690	1.1826	1.1856	1.1887	1.1919	1.1952	1.1986	1.2021	1.2057	1.2094	1.2131
700	1.1910	1.1940	1.1972	1.2005	1.2038	1.2072	1.2107	1.2144	1.2180	1.2218

THERMODYNAMIC PROPERTIES OF AIR

of sound at 1 atmosphere and 491.688° R (1087.42 ft/sec)

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
0.9047	0.9074	0.9106	0.9143	0.9187	0.9235	0.9290	0.9350	0.9416	0.9487	0.9564
0.9117	0.9144	0.9177	0.9214	0.9257	0.9305	0.9358	0.9417	0.9481	0.9550	0.9625
0.9186	0.9214	0.9246	0.9284	0.9326	0.9373	0.9426	0.9483	0.9546	0.9613	0.9685
0.9254	0.9282	0.9315	0.9352	0.9394	0.9441	0.9493	0.9549	0.9611	0.9676	0.9747
0.9321	0.9350	0.9383	0.9420	0.9462	0.9508	0.9559	0.9615	0.9675	0.9739	0.9807
0.9388	0.9417	0.9450	0.9487	0.9529	0.9575	0.9625	0.9679	0.9738	0.9801	0.9868
0.9453	0.9482	0.9516	0.9553	0.9595	0.9640	0.9690	0.9744	0.9801	0.9863	0.9929
0.9518	0.9547	0.9581	0.9618	0.9660	0.9705	0.9754	0.9807	0.9864	0.9924	0.9989
0.9581	0.9612	0.9645	0.9683	0.9724	0.9769	0.9818	0.9870	0.9926	0.9985	1.0049
0.9645	0.9675	0.9709	0.9747	0.9788	0.9832	0.9881	0.9932	0.9988	1.0046	1.0108
0.9707	0.9738	0.9772	0.9810	0.9851	0.9895	0.9943	0.9994	1.0049	1.0106	1.0167
0.9769	0.9800	0.9834	0.9872	0.9913	0.9957	1.0005	1.0055	1.0109	1.0166	1.0226
0.9830	0.9861	0.9896	0.9934	0.9975	1.0019	1.0066	1.0116	1.0169	1.0225	1.0284
0.9890	0.9922	0.9957	0.9995	1.0036	1.0080	1.0126	1.0176	1.0229	1.0284	1.0343
0.9950	0.9982	1.0017	1.0055	1.0096	1.0140	1.0186	1.0236	1.0288	1.0343	1.0400
1.0009	1.0042	1.0077	1.0115	1.0156	1.0200	1.0246	1.0295	1.0346	1.0401	1.0458
1.0068	1.0101	1.0136	1.0174	1.0215	1.0259	1.0305	1.0353	1.0405	1.0458	1.0515
1.0126	1.0159	1.0195	1.0233	1.0274	1.0317	1.0363	1.0411	1.0462	1.0515	1.0571
1.0184	1.0217	1.0253	1.0291	1.0332	1.0375	1.0421	1.0469	1.0519	1.0572	1.0627
1.0241	1.0274	1.0310	1.0349	1.0390	1.0433	1.0478	1.0526	1.0576	1.0628	1.0683
1.0297	1.0331	1.0367	1.0406	1.0447	1.0490	1.0535	1.0583	1.0632	1.0684	1.0738
1.0409	1.0443	1.0480	1.0519	1.0559	1.0602	1.0647	1.0695	1.0744	1.0795	1.0848
1.0519	1.0554	1.0591	1.0629	1.0670	1.0713	1.0758	1.0805	1.0853	1.0904	1.0956
1.0627	1.0662	1.0699	1.0738	1.0779	1.0822	1.0867	1.0913	1.0961	1.1011	1.1063
1.0733	1.0769	1.0806	1.0846	1.0887	1.0929	1.0974	1.1020	1.1067	1.1117	1.1168
1.0838	1.0874	1.0912	1.0951	1.0992	1.1035	1.1079	1.1125	1.1172	1.1221	1.1272
1.0941	1.0978	1.1016	1.1055	1.1096	1.1139	1.1183	1.1229	1.1276	1.1324	1.1374
1.1043	1.1080	1.1118	1.1158	1.1199	1.1241	1.1285	1.1331	1.1377	1.1426	1.1475
1.1143	1.1180	1.1219	1.1259	1.1300	1.1342	1.1386	1.1432	1.1478	1.1526	1.1575
1.1242	1.1280	1.1318	1.1358	1.1400	1.1442	1.1486	1.1531	1.1577	1.1625	1.1673
1.1340	1.1378	1.1417	1.1457	1.1498	1.1540	1.1584	1.1629	1.1675	1.1722	1.1770
1.1437	1.1475	1.1514	1.1554	1.1595	1.1638	1.1681	1.1726	1.1772	1.1819	1.1867
1.1532	1.1570	1.1609	1.1650	1.1691	1.1733	1.1777	1.1822	1.1867	1.1914	1.1961
1.1626	1.1665	1.1704	1.1744	1.1786	1.1828	1.1872	1.1916	1.1962	1.2008	1.2055
1.1719	1.1758	1.1797	1.1838	1.1879	1.1922	1.1965	1.2009	1.2055	1.2101	1.2148
1.1811	1.1850	1.1890	1.1930	1.1972	1.2014	1.2057	1.2102	1.2147	1.2193	1.2240
1.1902	1.1941	1.1981	1.2022	1.2063	1.2105	1.2149	1.2193	1.2238	1.2284	1.2330
1.1992	1.2031	1.2071	1.2112	1.2153	1.2196	1.2239	1.2283	1.2328	1.2374	1.2420
1.2081	1.2120	1.2160	1.2201	1.2243	1.2285	1.2328	1.2372	1.2417	1.2462	1.2509
1.2169	1.2209	1.2249	1.2289	1.2331	1.2373	1.2417	1.2460	1.2505	1.2550	1.2596
1.2257	1.2296	1.2336	1.2377	1.2419	1.2461	1.2504	1.2548	1.2592	1.2637	1.2683

TABLE III. - THERMODYNAMIC

(a) Critical

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	0.6847	0.6880	0.6914	0.6948	0.6983	0.7019	0.7056	0.7093	0.7131	0.7169
405	0.6847	0.6879	0.6911	0.6944	0.6978	0.7012	0.7047	0.7083	0.7119	0.7155
410	0.6847	0.6878	0.6909	0.6940	0.6973	0.7006	0.7039	0.7073	0.7108	0.7143
415	0.6847	0.6876	0.6906	0.6937	0.6968	0.7000	0.7032	0.7064	0.7097	0.7130
420	0.6847	0.6875	0.6904	0.6934	0.6963	0.6994	0.7025	0.7056	0.7087	0.7119
425	0.6847	0.6874	0.6902	0.6930	0.6959	0.6988	0.7018	0.7047	0.7078	0.7108
430	0.6847	0.6873	0.6900	0.6927	0.6955	0.6983	0.7011	0.7040	0.7068	0.7097
435	0.6847	0.6872	0.6898	0.6924	0.6951	0.6978	0.7005	0.7032	0.7060	0.7088
440	0.6847	0.6872	0.6896	0.6922	0.6947	0.6973	0.6999	0.7025	0.7052	0.7078
445	0.6847	0.6871	0.6895	0.6919	0.6943	0.6968	0.6993	0.7018	0.7044	0.7069
450	0.6847	0.6870	0.6893	0.6916	0.6940	0.6964	0.6988	0.7012	0.7036	0.7061
455	0.6847	0.6869	0.6891	0.6914	0.6937	0.6959	0.6983	0.7006	0.7029	0.7053
460	0.6847	0.6868	0.6890	0.6911	0.6933	0.6955	0.6978	0.7000	0.7022	0.7045
465	0.6847	0.6868	0.6888	0.6909	0.6930	0.6951	0.6973	0.6994	0.7016	0.7037
470	0.6847	0.6867	0.6887	0.6907	0.6927	0.6948	0.6968	0.6989	0.7010	0.7030
475	0.6847	0.6866	0.6885	0.6905	0.6924	0.6944	0.6964	0.6984	0.7004	0.7023
480	0.6847	0.6865	0.6884	0.6903	0.6922	0.6941	0.6960	0.6979	0.6998	0.7017
485	0.6847	0.6865	0.6883	0.6901	0.6919	0.6937	0.6956	0.6974	0.6992	0.7011
490	0.6847	0.6864	0.6882	0.6899	0.6917	0.6934	0.6952	0.6969	0.6987	0.7005
495	0.6847	0.6864	0.6880	0.6897	0.6914	0.6931	0.6948	0.6965	0.6982	0.6999
500	0.6847	0.6863	0.6879	0.6896	0.6912	0.6928	0.6945	0.6961	0.6977	0.6994
510	0.6847	0.6862	0.6877	0.6892	0.6907	0.6923	0.6938	0.6953	0.6968	0.6983
520	0.6847	0.6861	0.6875	0.6889	0.6903	0.6917	0.6932	0.6946	0.6960	0.6974
530	0.6847	0.6860	0.6873	0.6886	0.6900	0.6913	0.6926	0.6939	0.6952	0.6965
540	0.6847	0.6859	0.6871	0.6884	0.6896	0.6908	0.6920	0.6933	0.6945	0.6957
550	0.6847	0.6858	0.6870	0.6881	0.6893	0.6904	0.6915	0.6927	0.6938	0.6949
560	0.6847	0.6857	0.6868	0.6879	0.6890	0.6900	0.6911	0.6921	0.6932	0.6942
570	0.6847	0.6857	0.6867	0.6877	0.6887	0.6896	0.6906	0.6916	0.6926	0.6935
580	0.6847	0.6856	0.6865	0.6875	0.6884	0.6893	0.6902	0.6911	0.6920	0.6929
590	0.6847	0.6855	0.6864	0.6873	0.6881	0.6890	0.6898	0.6907	0.6915	0.6923
600	0.6846	0.6855	0.6863	0.6871	0.6879	0.6887	0.6895	0.6903	0.6910	0.6918
610	0.6846	0.6854	0.6862	0.6869	0.6877	0.6884	0.6891	0.6899	0.6906	0.6913
620	0.6846	0.6853	0.6860	0.6867	0.6874	0.6881	0.6888	0.6895	0.6902	0.6908
630	0.6846	0.6853	0.6859	0.6866	0.6872	0.6879	0.6885	0.6891	0.6898	0.6904
640	0.6846	0.6852	0.6858	0.6864	0.6870	0.6876	0.6882	0.6888	0.6894	0.6899
650	0.6846	0.6852	0.6857	0.6863	0.6869	0.6874	0.6880	0.6885	0.6890	0.6895
660	0.6846	0.6851	0.6856	0.6862	0.6867	0.6872	0.6877	0.6882	0.6887	0.6892
670	0.6846	0.6851	0.6855	0.6860	0.6865	0.6870	0.6875	0.6879	0.6884	0.6888
680	0.6845	0.6850	0.6855	0.6859	0.6864	0.6868	0.6872	0.6876	0.6881	0.6885
690	0.6845	0.6850	0.6854	0.6858	0.6862	0.6866	0.6870	0.6874	0.6878	0.6881
700	0.6845	0.6849	0.6853	0.6857	0.6860	0.6864	0.6868	0.6871	0.6875	0.6878

PROPERTIES OF NITROGEN

flow factor

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
0.7208	0.7247	0.7286	0.7326	0.7366	0.7406	0.7446	0.7487	0.7527	0.7567	0.7606
0.7192	0.7230	0.7267	0.7305	0.7343	0.7381	0.7419	0.7456	0.7494	0.7532	0.7569
0.7178	0.7213	0.7249	0.7285	0.7321	0.7356	0.7392	0.7428	0.7464	0.7499	0.7534
0.7164	0.7198	0.7232	0.7266	0.7300	0.7334	0.7368	0.7402	0.7435	0.7469	0.7502
0.7151	0.7183	0.7215	0.7248	0.7280	0.7312	0.7345	0.7377	0.7409	0.7440	0.7472
0.7138	0.7169	0.7200	0.7231	0.7262	0.7292	0.7323	0.7353	0.7384	0.7414	0.7443
0.7127	0.7156	0.7185	0.7215	0.7244	0.7273	0.7302	0.7331	0.7360	0.7388	0.7416
0.7115	0.7143	0.7171	0.7200	0.7227	0.7255	0.7283	0.7311	0.7338	0.7365	0.7391
0.7105	0.7132	0.7158	0.7185	0.7212	0.7238	0.7265	0.7291	0.7317	0.7342	0.7367
0.7095	0.7120	0.7146	0.7171	0.7197	0.7222	0.7247	0.7272	0.7297	0.7321	0.7345
0.7085	0.7110	0.7134	0.7158	0.7183	0.7207	0.7231	0.7255	0.7278	0.7301	0.7324
0.7076	0.7099	0.7123	0.7146	0.7169	0.7192	0.7215	0.7238	0.7260	0.7282	0.7304
0.7067	0.7090	0.7112	0.7134	0.7157	0.7179	0.7200	0.7222	0.7243	0.7264	0.7285
0.7059	0.7080	0.7102	0.7123	0.7144	0.7165	0.7186	0.7207	0.7227	0.7247	0.7267
0.7051	0.7072	0.7092	0.7113	0.7133	0.7153	0.7173	0.7193	0.7212	0.7231	0.7250
0.7043	0.7063	0.7083	0.7102	0.7122	0.7141	0.7160	0.7179	0.7198	0.7216	0.7234
0.7036	0.7055	0.7074	0.7093	0.7111	0.7130	0.7148	0.7166	0.7184	0.7201	0.7218
0.7029	0.7047	0.7065	0.7083	0.7101	0.7119	0.7136	0.7154	0.7171	0.7187	0.7204
0.7022	0.7040	0.7057	0.7074	0.7092	0.7109	0.7125	0.7142	0.7158	0.7174	0.7190
0.7016	0.7033	0.7049	0.7066	0.7082	0.7099	0.7115	0.7130	0.7146	0.7161	0.7176
0.7010	0.7026	0.7042	0.7058	0.7074	0.7089	0.7105	0.7120	0.7135	0.7149	0.7163
0.6998	0.7013	0.7028	0.7043	0.7057	0.7071	0.7086	0.7099	0.7113	0.7127	0.7140
0.6988	0.7001	0.7015	0.7029	0.7042	0.7055	0.7068	0.7081	0.7093	0.7106	0.7118
0.6978	0.6990	0.7003	0.7016	0.7028	0.7040	0.7052	0.7064	0.7075	0.7087	0.7098
0.6969	0.6980	0.6992	0.7004	0.7015	0.7026	0.7037	0.7048	0.7059	0.7069	0.7079
0.6960	0.6971	0.6982	0.6992	0.7003	0.7013	0.7024	0.7034	0.7043	0.7053	0.7062
0.6952	0.6962	0.6972	0.6982	0.6992	0.7001	0.7011	0.7020	0.7029	0.7038	0.7047
0.6945	0.6954	0.6963	0.6973	0.6982	0.6990	0.6999	0.7008	0.7016	0.7024	0.7032
0.6938	0.6947	0.6955	0.6964	0.6972	0.6980	0.6988	0.6996	0.7004	0.7011	0.7018
0.6932	0.6940	0.6947	0.6955	0.6963	0.6970	0.6978	0.6985	0.6992	0.6999	0.7006
0.6925	0.6933	0.6940	0.6947	0.6955	0.6961	0.6968	0.6975	0.6981	0.6988	0.6994
0.6920	0.6927	0.6934	0.6940	0.6947	0.6953	0.6959	0.6966	0.6971	0.6977	0.6983
0.6915	0.6921	0.6927	0.6933	0.6939	0.6945	0.6951	0.6957	0.6962	0.6967	0.6973
0.6910	0.6915	0.6921	0.6927	0.6932	0.6938	0.6943	0.6948	0.6953	0.6958	0.6963
0.6905	0.6910	0.6916	0.6921	0.6926	0.6931	0.6936	0.6941	0.6945	0.6950	0.6954
0.6900	0.6905	0.6910	0.6915	0.6920	0.6924	0.6929	0.6933	0.6937	0.6942	0.6946
0.6896	0.6901	0.6905	0.6910	0.6914	0.6918	0.6922	0.6926	0.6930	0.6934	0.6938
0.6892	0.6897	0.6901	0.6905	0.6909	0.6912	0.6916	0.6920	0.6923	0.6927	0.6930
0.6889	0.6892	0.6896	0.6900	0.6903	0.6907	0.6910	0.6914	0.6917	0.6920	0.6923
0.6885	0.6889	0.6892	0.6895	0.6899	0.6902	0.6905	0.6908	0.6911	0.6914	0.6916
0.6882	0.6885	0.6888	0.6891	0.6894	0.6897	0.6900	0.6902	0.6905	0.6907	0.6910

TABLE III. - Continued.

(b) Ratio of nozzle-throat velocity to speed of

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	0.8232	0.8205	0.8179	0.8154	0.8129	0.8106	0.8083	0.8061	0.8041	0.8022
405	0.8283	0.8258	0.8234	0.8210	0.8187	0.8164	0.8143	0.8123	0.8104	0.8087
410	0.8334	0.8310	0.8287	0.8265	0.8243	0.8222	0.8203	0.8184	0.8167	0.8151
415	0.8385	0.8362	0.8341	0.8320	0.8299	0.8280	0.8262	0.8244	0.8228	0.8214
420	0.8435	0.8414	0.8394	0.8374	0.8355	0.8337	0.8320	0.8304	0.8289	0.8276
425	0.8485	0.8465	0.8446	0.8428	0.8410	0.8393	0.8377	0.8363	0.8349	0.8337
430	0.8535	0.8516	0.8498	0.8481	0.8465	0.8449	0.8434	0.8421	0.8408	0.8397
435	0.8584	0.8567	0.8550	0.8534	0.8519	0.8504	0.8491	0.8478	0.8467	0.8457
440	0.8634	0.8617	0.8602	0.8587	0.8572	0.8559	0.8547	0.8535	0.8525	0.8516
445	0.8682	0.8667	0.8653	0.8639	0.8626	0.8613	0.8602	0.8592	0.8582	0.8574
450	0.8731	0.8717	0.8703	0.8690	0.8678	0.8667	0.8657	0.8647	0.8639	0.8632
455	0.8779	0.8766	0.8754	0.8742	0.8731	0.8720	0.8711	0.8703	0.8695	0.8689
460	0.8828	0.8815	0.8804	0.8793	0.8783	0.8773	0.8765	0.8757	0.8751	0.8746
465	0.8875	0.8864	0.8853	0.8843	0.8834	0.8826	0.8818	0.8812	0.8806	0.8802
470	0.8923	0.8913	0.8903	0.8894	0.8885	0.8878	0.8871	0.8865	0.8861	0.8857
475	0.8970	0.8961	0.8952	0.8944	0.8936	0.8929	0.8924	0.8919	0.8915	0.8912
480	0.9017	0.9009	0.9001	0.8993	0.8987	0.8981	0.8976	0.8971	0.8968	0.8966
485	0.9064	0.9056	0.9049	0.9042	0.9037	0.9032	0.9027	0.9024	0.9021	0.9020
490	0.9111	0.9104	0.9097	0.9091	0.9086	0.9082	0.9078	0.9076	0.9074	0.9073
495	0.9157	0.9151	0.9145	0.9140	0.9136	0.9132	0.9129	0.9127	0.9126	0.9126
500	0.9203	0.9198	0.9193	0.9188	0.9185	0.9182	0.9180	0.9178	0.9178	0.9178
510	0.9295	0.9291	0.9287	0.9284	0.9282	0.9280	0.9279	0.9279	0.9280	0.9282
520	0.9386	0.9383	0.9380	0.9379	0.9378	0.9377	0.9378	0.9379	0.9381	0.9383
530	0.9475	0.9474	0.9473	0.9472	0.9472	0.9473	0.9475	0.9477	0.9480	0.9484
540	0.9564	0.9564	0.9564	0.9565	0.9566	0.9568	0.9570	0.9574	0.9578	0.9582
550	0.9653	0.9653	0.9654	0.9656	0.9658	0.9661	0.9665	0.9669	0.9674	0.9679
560	0.9740	0.9742	0.9744	0.9746	0.9750	0.9753	0.9758	0.9763	0.9769	0.9775
570	0.9827	0.9829	0.9832	0.9836	0.9840	0.9845	0.9850	0.9856	0.9863	0.9870
580	0.9912	0.9916	0.9920	0.9924	0.9929	0.9935	0.9941	0.9948	0.9955	0.9963
590	0.9998	1.0002	1.0006	1.0012	1.0018	1.0024	1.0031	1.0039	1.0047	1.0055
600	1.0082	1.0087	1.0092	1.0099	1.0105	1.0112	1.0120	1.0128	1.0137	1.0146
610	1.0166	1.0171	1.0178	1.0185	1.0192	1.0200	1.0208	1.0217	1.0226	1.0236
620	1.0249	1.0255	1.0262	1.0270	1.0278	1.0286	1.0295	1.0305	1.0315	1.0325
630	1.0331	1.0338	1.0346	1.0354	1.0363	1.0372	1.0381	1.0392	1.0402	1.0413
640	1.0413	1.0420	1.0429	1.0438	1.0447	1.0457	1.0467	1.0477	1.0489	1.0500
650	1.0494	1.0502	1.0511	1.0520	1.0530	1.0541	1.0551	1.0562	1.0574	1.0586
660	1.0574	1.0583	1.0593	1.0602	1.0613	1.0624	1.0635	1.0647	1.0659	1.0671
670	1.0654	1.0663	1.0673	1.0684	1.0695	1.0706	1.0718	1.0730	1.0743	1.0756
680	1.0733	1.0743	1.0754	1.0765	1.0776	1.0788	1.0800	1.0813	1.0826	1.0839
690	1.0812	1.0822	1.0833	1.0845	1.0857	1.0869	1.0881	1.0894	1.0908	1.0922
700	1.0890	1.0901	1.0912	1.0924	1.0936	1.0949	1.0962	1.0976	1.0989	1.1003

THERMODYNAMIC PROPERTIES OF NITROGEN

sound at 1 atmosphere and 491.688° R (1105.51 ft/sec)

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
0.8005	0.7989	0.7975	0.7963	0.7953	0.7946	0.7940	0.7937	0.7936	0.7938	0.7943
0.8071	0.8057	0.8044	0.8033	0.8025	0.8018	0.8014	0.8011	0.8012	0.8014	0.8020
0.8136	0.8123	0.8112	0.8102	0.8095	0.8089	0.8086	0.8084	0.8085	0.8089	0.8095
0.8200	0.8188	0.8178	0.8170	0.8163	0.8159	0.8156	0.8156	0.8157	0.8162	0.8168
0.8263	0.8253	0.8244	0.8237	0.8231	0.8227	0.8226	0.8226	0.8228	0.8233	0.8240
0.8326	0.8316	0.8308	0.8302	0.8297	0.8295	0.8294	0.8295	0.8298	0.8303	0.8310
0.8387	0.8379	0.8372	0.8367	0.8363	0.8361	0.8361	0.8362	0.8366	0.8372	0.8380
0.8448	0.8441	0.8435	0.8430	0.8427	0.8426	0.8427	0.8429	0.8433	0.8439	0.8448
0.8508	0.8502	0.8497	0.8493	0.8491	0.8490	0.8492	0.8495	0.8499	0.8506	0.8515
0.8568	0.8562	0.8558	0.8555	0.8554	0.8554	0.8556	0.8559	0.8564	0.8571	0.8580
0.8626	0.8621	0.8618	0.8616	0.8615	0.8616	0.8619	0.8623	0.8629	0.8636	0.8645
0.8684	0.8680	0.8678	0.8676	0.8676	0.8678	0.8681	0.8686	0.8692	0.8700	0.8709
0.8741	0.8738	0.8736	0.8736	0.8737	0.8739	0.8742	0.8747	0.8754	0.8762	0.8772
0.8798	0.8796	0.8795	0.8795	0.8796	0.8799	0.8803	0.8809	0.8816	0.8824	0.8834
0.8854	0.8853	0.8852	0.8853	0.8855	0.8858	0.8863	0.8869	0.8876	0.8885	0.8896
0.8910	0.8909	0.8909	0.8910	0.8913	0.8917	0.8922	0.8929	0.8936	0.8946	0.8956
0.8965	0.8965	0.8965	0.8967	0.8971	0.8975	0.8981	0.8987	0.8996	0.9005	0.9016
0.9019	0.9020	0.9021	0.9024	0.9027	0.9032	0.9038	0.9046	0.9054	0.9064	0.9075
0.9073	0.9074	0.9076	0.9079	0.9084	0.9089	0.9095	0.9103	0.9112	0.9122	0.9134
0.9127	0.9128	0.9131	0.9135	0.9139	0.9145	0.9152	0.9160	0.9169	0.9180	0.9191
0.9180	0.9182	0.9185	0.9189	0.9194	0.9201	0.9208	0.9216	0.9226	0.9237	0.9249
0.9284	0.9287	0.9292	0.9297	0.9303	0.9310	0.9318	0.9327	0.9337	0.9349	0.9361
0.9387	0.9391	0.9397	0.9403	0.9410	0.9417	0.9426	0.9436	0.9447	0.9459	0.9471
0.9488	0.9493	0.9499	0.9506	0.9514	0.9523	0.9532	0.9543	0.9554	0.9566	0.9579
0.9588	0.9594	0.9601	0.9608	0.9617	0.9626	0.9637	0.9647	0.9659	0.9672	0.9686
0.9686	0.9693	0.9700	0.9709	0.9718	0.9728	0.9739	0.9750	0.9763	0.9776	0.9790
0.9782	0.9790	0.9799	0.9808	0.9818	0.9828	0.9840	0.9852	0.9864	0.9878	0.9892
0.9878	0.9886	0.9895	0.9905	0.9916	0.9927	0.9939	0.9951	0.9965	0.9978	0.9993
0.9972	0.9981	0.9991	1.0001	1.0012	1.0024	1.0036	1.0049	1.0063	1.0077	1.0092
1.0065	1.0074	1.0085	1.0096	1.0107	1.0120	1.0133	1.0146	1.0160	1.0175	1.0190
1.0156	1.0167	1.0178	1.0189	1.0201	1.0214	1.0227	1.0241	1.0256	1.0271	1.0286
1.0247	1.0258	1.0269	1.0281	1.0294	1.0307	1.0321	1.0335	1.0350	1.0365	1.0381
1.0336	1.0348	1.0360	1.0372	1.0385	1.0399	1.0413	1.0428	1.0443	1.0458	1.0475
1.0425	1.0437	1.0449	1.0462	1.0476	1.0490	1.0504	1.0519	1.0535	1.0551	1.0567
1.0512	1.0525	1.0538	1.0551	1.0565	1.0579	1.0594	1.0609	1.0625	1.0641	1.0658
1.0599	1.0612	1.0625	1.0639	1.0653	1.0668	1.0683	1.0699	1.0715	1.0731	1.0748
1.0684	1.0698	1.0711	1.0726	1.0740	1.0755	1.0771	1.0787	1.0803	1.0820	1.0837
1.0769	1.0783	1.0797	1.0811	1.0826	1.0842	1.0858	1.0874	1.0890	1.0907	1.0925
1.0853	1.0867	1.0881	1.0896	1.0912	1.0927	1.0943	1.0960	1.0977	1.0994	1.1011
1.0936	1.0950	1.0965	1.0980	1.0996	1.1012	1.1028	1.1045	1.1062	1.1079	1.1097
1.1018	1.1033	1.1048	1.1063	1.1079	1.1096	1.1112	1.1129	1.1146	1.1164	1.1182

TABLE III. - Continued. THERMODYNAMIC PROPERTIES OF NITROGEN

(c) Critical pressure ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
400	0.5283	0.5272	0.5258	0.5242	0.5223	0.5201	0.5175	0.5146	0.5112	0.5075	0.5034
420	0.5283	0.5271	0.5257	0.5241	0.5222	0.5201	0.5177	0.5150	0.5120	0.5087	0.5051
440	0.5283	0.5271	0.5256	0.5241	0.5222	0.5202	0.5180	0.5155	0.5128	0.5098	0.5065
460	0.5283	0.5270	0.5256	0.5240	0.5223	0.5204	0.5182	0.5159	0.5134	0.5107	0.5077
480	0.5283	0.5270	0.5256	0.5240	0.5223	0.5205	0.5185	0.5163	0.5139	0.5114	0.5087
500	0.5283	0.5270	0.5256	0.5241	0.5224	0.5206	0.5187	0.5166	0.5144	0.5121	0.5096
520	0.5283	0.5270	0.5256	0.5241	0.5225	0.5207	0.5189	0.5169	0.5149	0.5127	0.5104
540	0.5283	0.5270	0.5256	0.5241	0.5225	0.5209	0.5191	0.5172	0.5152	0.5132	0.5110
560	0.5283	0.5270	0.5256	0.5242	0.5226	0.5210	0.5193	0.5175	0.5156	0.5137	0.5116
580	0.5283	0.5270	0.5257	0.5242	0.5227	0.5211	0.5195	0.5177	0.5160	0.5141	0.5122
600	0.5283	0.5270	0.5257	0.5243	0.5228	0.5213	0.5197	0.5180	0.5163	0.5145	0.5126
620	0.5283	0.5271	0.5257	0.5243	0.5229	0.5214	0.5198	0.5182	0.5166	0.5149	0.5131
640	0.5283	0.5271	0.5258	0.5244	0.5230	0.5215	0.5200	0.5185	0.5169	0.5152	0.5135
660	0.5284	0.5271	0.5258	0.5245	0.5231	0.5217	0.5202	0.5187	0.5171	0.5155	0.5139
680	0.5284	0.5271	0.5259	0.5245	0.5232	0.5218	0.5204	0.5189	0.5174	0.5159	0.5143
700	0.5284	0.5272	0.5259	0.5246	0.5233	0.5219	0.5205	0.5191	0.5177	0.5162	0.5147

(d) Critical temperature ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
400	0.8334	0.8308	0.8283	0.8259	0.8237	0.8216	0.8197	0.8180	0.8165	0.8151	0.8139
420	0.8334	0.8310	0.8287	0.8265	0.8243	0.8224	0.8205	0.8188	0.8172	0.8158	0.8146
440	0.8334	0.8312	0.8290	0.8269	0.8249	0.8230	0.8212	0.8196	0.8181	0.8167	0.8154
460	0.8334	0.8313	0.8293	0.8273	0.8254	0.8236	0.8219	0.8203	0.8188	0.8175	0.8162
480	0.8334	0.8314	0.8295	0.8277	0.8259	0.8242	0.8226	0.8210	0.8196	0.8182	0.8170
500	0.8334	0.8316	0.8298	0.8280	0.8263	0.8247	0.8231	0.8217	0.8202	0.8189	0.8177
520	0.8334	0.8317	0.8300	0.8283	0.8267	0.8252	0.8237	0.8222	0.8209	0.8196	0.8184
540	0.8334	0.8318	0.8302	0.8286	0.8271	0.8256	0.8242	0.8228	0.8215	0.8202	0.8190
560	0.8335	0.8319	0.8304	0.8289	0.8274	0.8260	0.8246	0.8233	0.8220	0.8208	0.8197
580	0.8335	0.8320	0.8305	0.8291	0.8277	0.8264	0.8251	0.8238	0.8226	0.8214	0.8203
600	0.8335	0.8321	0.8307	0.8294	0.8280	0.8267	0.8255	0.8243	0.8231	0.8219	0.8208
620	0.8335	0.8322	0.8309	0.8296	0.8283	0.8271	0.8259	0.8247	0.8236	0.8224	0.8214
640	0.8336	0.8323	0.8310	0.8298	0.8286	0.8274	0.8262	0.8251	0.8240	0.8229	0.8219
660	0.8336	0.8324	0.8312	0.8300	0.8288	0.8277	0.8266	0.8255	0.8245	0.8234	0.8224
680	0.8337	0.8325	0.8314	0.8302	0.8291	0.8280	0.8269	0.8259	0.8249	0.8239	0.8229
700	0.8338	0.8326	0.8315	0.8304	0.8294	0.8283	0.8273	0.8263	0.8253	0.8243	0.8234

TABLE III. - Continued. THERMODYNAMIC PROPERTIES OF NITROGEN

(e) Critical density ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
400	0.6339	0.6354	0.6371	0.6391	0.6415	0.6442	0.6474	0.6509	0.6549	0.6594	0.6644
420	0.6339	0.6353	0.6370	0.6389	0.6411	0.6436	0.6464	0.6495	0.6529	0.6566	0.6607
440	0.6339	0.6353	0.6369	0.6388	0.6408	0.6431	0.6456	0.6483	0.6513	0.6545	0.6580
460	0.6339	0.6353	0.6369	0.6386	0.6405	0.6426	0.6449	0.6474	0.6500	0.6529	0.6559
480	0.6339	0.6353	0.6368	0.6385	0.6403	0.6422	0.6444	0.6466	0.6490	0.6516	0.6542
500	0.6339	0.6352	0.6367	0.6382	0.6400	0.6419	0.6439	0.6460	0.6482	0.6505	0.6529
520	0.6339	0.6352	0.6366	0.6382	0.6398	0.6416	0.6434	0.6454	0.6474	0.6495	0.6517
540	0.6339	0.6352	0.6366	0.6381	0.6396	0.6412	0.6430	0.6449	0.6468	0.6487	0.6507
560	0.6339	0.6352	0.6365	0.6379	0.6394	0.6410	0.6427	0.6444	0.6462	0.6480	0.6499
580	0.6339	0.6351	0.6364	0.6378	0.6393	0.6408	0.6424	0.6440	0.6457	0.6474	0.6491
600	0.6339	0.6351	0.6363	0.6377	0.6391	0.6405	0.6421	0.6436	0.6452	0.6468	0.6485
620	0.6338	0.6350	0.6363	0.6376	0.6389	0.6403	0.6416	0.6432	0.6448	0.6463	0.6478
640	0.6338	0.6350	0.6362	0.6375	0.6388	0.6401	0.6415	0.6429	0.6443	0.6458	0.6473
660	0.6338	0.6349	0.6361	0.6373	0.6386	0.6399	0.6412	0.6426	0.6440	0.6453	0.6467
680	0.6338	0.6349	0.6360	0.6372	0.6384	0.6397	0.6410	0.6423	0.6436	0.6449	0.6463
700	0.6337	0.6348	0.6359	0.6371	0.6383	0.6395	0.6407	0.6420	0.6432	0.6445	0.6458

TABLE III. - Continued.

(f) Plenum

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	1.0000	0.9931	0.9863	0.9796	0.9731	0.9668	0.9607	0.9548	0.9492	0.9438
405	1.0000	0.9935	0.9870	0.9807	0.9746	0.9687	0.9629	0.9574	0.9521	0.9472
410	1.0000	0.9938	0.9877	0.9818	0.9760	0.9704	0.9651	0.9599	0.9550	0.9503
415	1.0000	0.9941	0.9884	0.9828	0.9774	0.9721	0.9671	0.9622	0.9576	0.9533
420	1.0000	0.9945	0.9891	0.9838	0.9787	0.9737	0.9690	0.9645	0.9602	0.9561
425	1.0000	0.9948	0.9897	0.9847	0.9799	0.9753	0.9708	0.9666	0.9626	0.9588
430	1.0000	0.9951	0.9903	0.9856	0.9811	0.9767	0.9726	0.9686	0.9649	0.9614
435	1.0000	0.9953	0.9908	0.9864	0.9822	0.9781	0.9743	0.9706	0.9671	0.9639
440	1.0000	0.9956	0.9913	0.9872	0.9833	0.9795	0.9758	0.9724	0.9692	0.9662
445	1.0000	0.9959	0.9919	0.9880	0.9843	0.9807	0.9774	0.9742	0.9712	0.9684
450	1.0000	0.9961	0.9923	0.9887	0.9853	0.9819	0.9788	0.9759	0.9731	0.9705
455	1.0000	0.9963	0.9928	0.9894	0.9862	0.9831	0.9802	0.9775	0.9749	0.9726
460	1.0000	0.9966	0.9933	0.9901	0.9871	0.9842	0.9815	0.9790	0.9766	0.9745
465	1.0000	0.9968	0.9937	0.9907	0.9879	0.9853	0.9828	0.9804	0.9783	0.9763
470	1.0000	0.9970	0.9941	0.9914	0.9887	0.9863	0.9840	0.9818	0.9799	0.9781
475	1.0000	0.9972	0.9945	0.9919	0.9895	0.9873	0.9851	0.9832	0.9814	0.9798
480	1.0000	0.9974	0.9949	0.9925	0.9903	0.9882	0.9862	0.9845	0.9829	0.9814
485	1.0000	0.9976	0.9952	0.9930	0.9910	0.9891	0.9873	0.9857	0.9842	0.9830
490	1.0000	0.9977	0.9956	0.9936	0.9917	0.9899	0.9883	0.9869	0.9856	0.9844
495	1.0000	0.9979	0.9959	0.9941	0.9923	0.9907	0.9893	0.9880	0.9868	0.9858
500	1.0000	0.9981	0.9962	0.9945	0.9930	0.9915	0.9902	0.9891	0.9881	0.9872
510	1.0000	0.9984	0.9968	0.9954	0.9942	0.9930	0.9920	0.9911	0.9904	0.9898
520	1.0000	0.9986	0.9974	0.9963	0.9952	0.9944	0.9936	0.9930	0.9925	0.9921
530	1.0000	0.9989	0.9979	0.9970	0.9963	0.9956	0.9951	0.9947	0.9944	0.9942
540	1.0000	0.9991	0.9984	0.9977	0.9972	0.9968	0.9965	0.9963	0.9962	0.9962
550	1.0000	0.9994	0.9988	0.9984	0.9981	0.9978	0.9977	0.9977	0.9978	0.9981
560	1.0000	0.9996	0.9992	0.9990	0.9989	0.9988	0.9989	0.9991	0.9994	0.9998
570	1.0000	0.9998	0.9996	0.9995	0.9996	0.9997	1.0000	1.0003	1.0008	1.0013
580	1.0000	0.9999	0.9999	1.0001	1.0003	1.0006	1.0010	1.0015	1.0021	1.0028
590	1.0000	1.0001	1.0003	1.0005	1.0009	1.0014	1.0019	1.0025	1.0033	1.0041
600	1.0000	1.0002	1.0006	1.0010	1.0015	1.0021	1.0028	1.0035	1.0044	1.0053
610	1.0000	1.0004	1.0009	1.0014	1.0020	1.0028	1.0036	1.0045	1.0054	1.0065
620	1.0000	1.0005	1.0011	1.0018	1.0026	1.0034	1.0043	1.0053	1.0064	1.0076
630	1.0000	1.0006	1.0014	1.0022	1.0030	1.0040	1.0050	1.0061	1.0073	1.0085
640	1.0000	1.0008	1.0016	1.0025	1.0035	1.0045	1.0056	1.0068	1.0081	1.0095
650	1.0000	1.0009	1.0018	1.0028	1.0039	1.0050	1.0062	1.0075	1.0089	1.0103
660	1.0000	1.0010	1.0020	1.0031	1.0043	1.0055	1.0068	1.0082	1.0096	1.0111
670	1.0000	1.0011	1.0022	1.0034	1.0046	1.0059	1.0073	1.0088	1.0103	1.0118
680	1.0000	1.0011	1.0023	1.0036	1.0049	1.0063	1.0078	1.0093	1.0109	1.0125
690	1.0000	1.0012	1.0025	1.0038	1.0052	1.0067	1.0082	1.0098	1.0115	1.0132
700	1.0000	1.0013	1.0026	1.0041	1.0055	1.0071	1.0086	1.0103	1.0120	1.0137

THERMODYNAMIC PROPERTIES OF NITROGEN

compressibility factor

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
0.9388	0.9341	0.9297	0.9257	0.9221	0.9190	0.9163	0.9140	0.9123	0.9110	0.9104
0.9425	0.9381	0.9340	0.9303	0.9270	0.9241	0.9217	0.9197	0.9181	0.9171	0.9165
0.9459	0.9419	0.9381	0.9347	0.9317	0.9290	0.9268	0.9250	0.9236	0.9227	0.9223
0.9492	0.9454	0.9420	0.9389	0.9361	0.9337	0.9316	0.9300	0.9289	0.9281	0.9279
0.9524	0.9489	0.9457	0.9428	0.9402	0.9381	0.9362	0.9348	0.9338	0.9332	0.9331
0.9553	0.9521	0.9492	0.9465	0.9442	0.9422	0.9406	0.9394	0.9385	0.9380	0.9380
0.9582	0.9552	0.9525	0.9501	0.9480	0.9462	0.9447	0.9437	0.9429	0.9426	0.9427
0.9609	0.9581	0.9556	0.9534	0.9515	0.9499	0.9487	0.9478	0.9472	0.9470	0.9471
0.9634	0.9609	0.9586	0.9566	0.9549	0.9535	0.9524	0.9516	0.9512	0.9511	0.9514
0.9659	0.9636	0.9615	0.9597	0.9582	0.9569	0.9560	0.9553	0.9550	0.9550	0.9554
0.9682	0.9661	0.9642	0.9626	0.9613	0.9602	0.9594	0.9589	0.9587	0.9588	0.9592
0.9704	0.9685	0.9668	0.9654	0.9642	0.9633	0.9626	0.9622	0.9621	0.9624	0.9629
0.9726	0.9708	0.9693	0.9680	0.9670	0.9662	0.9657	0.9654	0.9655	0.9658	0.9664
0.9746	0.9730	0.9717	0.9706	0.9697	0.9690	0.9686	0.9685	0.9686	0.9690	0.9697
0.9765	0.9751	0.9739	0.9730	0.9722	0.9717	0.9714	0.9714	0.9716	0.9721	0.9729
0.9784	0.9771	0.9761	0.9753	0.9747	0.9743	0.9741	0.9742	0.9745	0.9751	0.9759
0.9801	0.9791	0.9782	0.9775	0.9770	0.9767	0.9767	0.9769	0.9773	0.9779	0.9788
0.9818	0.9809	0.9802	0.9796	0.9792	0.9791	0.9791	0.9794	0.9799	0.9806	0.9816
0.9835	0.9827	0.9821	0.9816	0.9814	0.9813	0.9815	0.9819	0.9824	0.9832	0.9843
0.9850	0.9844	0.9839	0.9836	0.9834	0.9835	0.9837	0.9842	0.9848	0.9857	0.9868
0.9865	0.9860	0.9856	0.9854	0.9854	0.9855	0.9859	0.9864	0.9872	0.9881	0.9892
0.9893	0.9890	0.9889	0.9889	0.9890	0.9894	0.9899	0.9906	0.9915	0.9926	0.9938
0.9919	0.9918	0.9918	0.9921	0.9924	0.9929	0.9936	0.9945	0.9955	0.9967	0.9980
0.9942	0.9943	0.9946	0.9950	0.9955	0.9962	0.9970	0.9980	0.9991	1.0004	1.0019
0.9964	0.9967	0.9971	0.9977	0.9984	0.9992	1.0002	1.0013	1.0025	1.0039	1.0054
0.9984	0.9989	0.9995	1.0002	1.0010	1.0020	1.0030	1.0043	1.0056	1.0071	1.0087
1.0003	1.0009	1.0016	1.0025	1.0034	1.0045	1.0057	1.0070	1.0085	1.0100	1.0117
1.0020	1.0027	1.0036	1.0046	1.0057	1.0069	1.0082	1.0096	1.0111	1.0128	1.0145
1.0036	1.0045	1.0054	1.0065	1.0077	1.0090	1.0104	1.0120	1.0136	1.0153	1.0171
1.0050	1.0060	1.0071	1.0084	1.0097	1.0111	1.0126	1.0141	1.0158	1.0176	1.0195
1.0064	1.0075	1.0087	1.0100	1.0114	1.0129	1.0145	1.0162	1.0179	1.0198	1.0217
1.0076	1.0089	1.0102	1.0116	1.0131	1.0146	1.0163	1.0180	1.0199	1.0218	1.0238
1.0088	1.0101	1.0115	1.0130	1.0146	1.0162	1.0180	1.0198	1.0217	1.0236	1.0257
1.0099	1.0113	1.0128	1.0143	1.0160	1.0177	1.0195	1.0214	1.0233	1.0253	1.0274
1.0109	1.0124	1.0139	1.0156	1.0173	1.0191	1.0209	1.0229	1.0249	1.0269	1.0291
1.0118	1.0134	1.0150	1.0167	1.0185	1.0203	1.0223	1.0242	1.0263	1.0284	1.0306
1.0127	1.0143	1.0160	1.0178	1.0196	1.0215	1.0235	1.0255	1.0276	1.0297	1.0319
1.0135	1.0152	1.0169	1.0188	1.0207	1.0226	1.0246	1.0267	1.0288	1.0310	1.0332
1.0142	1.0160	1.0178	1.0197	1.0216	1.0236	1.0257	1.0278	1.0299	1.0322	1.0344
1.0149	1.0167	1.0186	1.0205	1.0225	1.0245	1.0266	1.0288	1.0310	1.0332	1.0355
1.0156	1.0174	1.0193	1.0213	1.0233	1.0254	1.0275	1.0297	1.0320	1.0342	1.0366

TABLE III. - Continued.

(g) Plenum

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	3.5010	3.5554	3.6122	3.6710	3.7319	3.7945	3.8587	3.9244	3.9914	4.0594
405	3.5010	3.5538	3.6088	3.6656	3.7243	3.7846	3.8463	3.9093	3.9734	4.0385
410	3.5011	3.5523	3.6055	3.6605	3.7171	3.7752	3.8345	3.8950	3.9565	4.0188
415	3.5011	3.5508	3.6024	3.6556	3.7102	3.7662	3.8234	3.8816	3.9406	4.0003
420	3.5011	3.5494	3.5994	3.6509	3.7037	3.7578	3.8128	3.8688	3.9255	3.9828
425	3.5011	3.5481	3.5966	3.6464	3.6975	3.7497	3.8028	3.8567	3.9113	3.9664
430	3.5012	3.5468	3.5939	3.6422	3.6916	3.7421	3.7933	3.8453	3.8978	3.9508
435	3.5012	3.5456	3.5913	3.6381	3.6860	3.7348	3.7843	3.8344	3.8850	3.9360
440	3.5012	3.5444	3.5888	3.6342	3.6806	3.7278	3.7757	3.8241	3.8729	3.9220
445	3.5013	3.5433	3.5864	3.6305	3.6755	3.7212	3.7675	3.8143	3.8614	3.9088
450	3.5013	3.5422	3.5842	3.6270	3.6706	3.7149	3.7597	3.8049	3.8505	3.8962
455	3.5014	3.5412	3.5820	3.6236	3.6659	3.7088	3.7522	3.7960	3.8400	3.8842
460	3.5014	3.5402	3.5799	3.6204	3.6614	3.7031	3.7451	3.7875	3.8301	3.8728
465	3.5015	3.5393	3.5779	3.6172	3.6572	3.6976	3.7383	3.7794	3.8206	3.8619
470	3.5015	3.5384	3.5760	3.6143	3.6530	3.6923	3.7318	3.7717	3.8116	3.8516
475	3.5016	3.5376	3.5742	3.6114	3.6491	3.6872	3.7256	3.7643	3.8030	3.8417
480	3.5017	3.5367	3.5724	3.6087	3.6454	3.6824	3.7197	3.7572	3.7947	3.8323
485	3.5017	3.5360	3.5708	3.6060	3.6417	3.6778	3.7140	3.7504	3.7869	3.8233
490	3.5018	3.5352	3.5691	3.6035	3.6383	3.6733	3.7086	3.7439	3.7793	3.8147
495	3.5019	3.5345	3.5676	3.6011	3.6350	3.6691	3.7033	3.7377	3.7721	3.8064
500	3.5020	3.5338	3.5661	3.5988	3.6318	3.6650	3.6983	3.7318	3.7652	3.7986
510	3.5022	3.5326	3.5634	3.5945	3.6258	3.6573	3.6889	3.7206	3.7522	3.7838
520	3.5024	3.5315	3.5608	3.5904	3.6203	3.6502	3.6802	3.7103	3.7403	3.7702
530	3.5027	3.5305	3.5585	3.5868	3.6152	3.6437	3.6723	3.7008	3.7293	3.7577
540	3.5030	3.5296	3.5564	3.5834	3.6105	3.6377	3.6649	3.6920	3.7191	3.7461
550	3.5034	3.5288	3.5545	3.5803	3.6062	3.6321	3.6581	3.6840	3.7098	3.7355
560	3.5037	3.5282	3.5527	3.5774	3.6022	3.6270	3.6518	3.6765	3.7011	3.7256
570	3.5042	3.5276	3.5512	3.5748	3.5985	3.6223	3.6459	3.6696	3.6931	3.7165
580	3.5046	3.5272	3.5498	3.5725	3.5952	3.6179	3.6406	3.6632	3.6857	3.7080
590	3.5052	3.5268	3.5486	3.5703	3.5921	3.6139	3.6356	3.6572	3.6788	3.7002
600	3.5058	3.5266	3.5475	3.5684	3.5893	3.6102	3.6310	3.6518	3.6724	3.6929
610	3.5064	3.5264	3.5465	3.5666	3.5867	3.6068	3.6268	3.6467	3.6665	3.6862
620	3.5071	3.5264	3.5458	3.5651	3.5844	3.6037	3.6229	3.6421	3.6611	3.6800
630	3.5078	3.5265	3.5451	3.5637	3.5823	3.6009	3.6194	3.6378	3.6561	3.6742
640	3.5087	3.5266	3.5446	3.5626	3.5805	3.5983	3.6161	3.6339	3.6515	3.6689
650	3.5096	3.5269	3.5442	3.5615	3.5788	3.5960	3.6132	3.6302	3.6472	3.6640
660	3.5105	3.5273	3.5440	3.5607	3.5774	3.5940	3.6105	3.6269	3.6433	3.6595
670	3.5115	3.5277	3.5439	3.5600	3.5761	3.5921	3.6081	3.6239	3.6397	3.6553
680	3.5126	3.5283	3.5439	3.5595	3.5750	3.5905	3.6059	3.6212	3.6364	3.6515
690	3.5138	3.5290	3.5441	3.5591	3.5742	3.5891	3.6040	3.6188	3.6335	3.6480
700	3.5151	3.5297	3.5444	3.5589	3.5735	3.5879	3.6023	3.6166	3.6308	3.6449

THERMODYNAMIC PROPERTIES OF NITROGEN

Specific Heat

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
4.1285	4.1983	4.2687	4.3395	4.4106	4.4818	4.5529	4.6237	4.6942	4.7641	4.8332
4.1044	4.1709	4.2378	4.3051	4.3724	4.4397	4.5068	4.5736	4.6397	4.7052	4.7698
4.0818	4.1452	4.2090	4.2730	4.3369	4.4007	4.4642	4.5272	4.5895	4.6511	4.7117
4.0606	4.1212	4.1821	4.2430	4.3038	4.3644	4.4246	4.4842	4.5431	4.6011	4.6581
4.0406	4.0986	4.1568	4.2149	4.2729	4.3306	4.3877	4.4443	4.5001	4.5549	4.6087
4.0218	4.0774	4.1330	4.1886	4.2440	4.2989	4.3533	4.4071	4.4600	4.5120	4.5628
4.0040	4.0573	4.1107	4.1639	4.2168	4.2693	4.3212	4.3724	4.4227	4.4721	4.5203
3.9872	4.0384	4.0896	4.1406	4.1913	4.2415	4.2911	4.3399	4.3879	4.4349	4.4807
3.9713	4.0206	4.0698	4.1187	4.1673	4.2154	4.2628	4.3095	4.3553	4.4001	4.4438
3.9562	4.0037	4.0510	4.0980	4.1447	4.1908	4.2363	4.2810	4.3248	4.3676	4.4092
3.9420	3.9877	4.0332	4.0785	4.1233	4.1676	4.2113	4.2541	4.2961	4.3371	4.3769
3.9284	3.9725	4.0164	4.0600	4.1031	4.1457	4.1877	4.2288	4.2691	4.3084	4.3465
3.9155	3.9581	4.0004	4.0424	4.0840	4.1250	4.1654	4.2050	4.2437	4.2814	4.3180
3.9032	3.9443	3.9852	4.0258	4.0659	4.1054	4.1443	4.1824	4.2197	4.2559	4.2911
3.8915	3.9313	3.9708	4.0100	4.0487	4.0868	4.1243	4.1611	4.1970	4.2319	4.2658
3.8804	3.9189	3.9571	3.9950	4.0324	4.0692	4.1054	4.1409	4.1755	4.2092	4.2418
3.8698	3.9070	3.9440	3.9807	4.0168	4.0525	4.0874	4.1217	4.1551	4.1877	4.2192
3.8596	3.8957	3.9316	3.9670	4.0021	4.0365	4.0704	4.1035	4.1358	4.1673	4.1977
3.8499	3.8849	3.9197	3.9541	3.9880	4.0214	4.0541	4.0862	4.1175	4.1479	4.1774
3.8407	3.8746	3.9083	3.9417	3.9745	4.0069	4.0387	4.0697	4.1000	4.1295	4.1580
3.8318	3.8648	3.8975	3.9298	3.9617	3.9931	4.0239	4.0540	4.0834	4.1120	4.1397
3.8152	3.8463	3.8772	3.9077	3.9378	3.9674	3.9964	4.0248	4.0525	4.0794	4.1055
3.7999	3.8294	3.8586	3.8875	3.9159	3.9439	3.9713	3.9981	4.0243	4.0497	4.0744
3.7859	3.8138	3.8415	3.8688	3.8958	3.9223	3.9483	3.9737	3.9985	4.0226	4.0461
3.7729	3.7995	3.8258	3.8517	3.8773	3.9025	3.9271	3.9513	3.9749	3.9978	4.0201
3.7610	3.7862	3.8112	3.8359	3.8603	3.8842	3.9077	3.9307	3.9531	3.9750	3.9962
3.7499	3.7740	3.7978	3.8214	3.8446	3.8676	3.8897	3.9117	3.9331	3.9539	3.9742
3.7397	3.7627	3.7854	3.8079	3.8300	3.8519	3.8732	3.8941	3.9146	3.9345	3.9539
3.7302	3.7522	3.7739	3.7954	3.8165	3.8374	3.8578	3.8778	3.8974	3.9165	3.9351
3.7214	3.7425	3.7633	3.7838	3.8040	3.8240	3.8435	3.8627	3.8815	3.8998	3.9177
3.7133	3.7334	3.7534	3.7730	3.7924	3.8116	3.8303	3.8487	3.8668	3.8844	3.9015
3.7057	3.7251	3.7442	3.7631	3.7817	3.8000	3.8180	3.8357	3.8530	3.8700	3.8865
3.6987	3.7173	3.7357	3.7538	3.7717	3.7893	3.8066	3.8236	3.8403	3.8566	3.8725
3.6923	3.7101	3.7277	3.7452	3.7624	3.7793	3.7960	3.8123	3.8284	3.8441	3.8595
3.6863	3.7034	3.7204	3.7372	3.7537	3.7700	3.7861	3.8018	3.8173	3.8325	3.8473
3.6807	3.6972	3.7136	3.7297	3.7457	3.7614	3.7769	3.7921	3.8070	3.8216	3.8360
3.6756	3.6915	3.7072	3.7228	3.7382	3.7533	3.7683	3.7830	3.7974	3.8115	3.8254
3.6708	3.6862	3.7014	3.7164	3.7312	3.7459	3.7603	3.7745	3.7884	3.8021	3.8155
3.6665	3.6813	3.6960	3.7105	3.7248	3.7389	3.7529	3.7666	3.7801	3.7933	3.8063
3.6625	3.6768	3.6910	3.7050	3.7188	3.7325	3.7460	3.7592	3.7723	3.7851	3.7977
3.6588	3.6727	3.6864	3.6999	3.7133	3.7265	3.7396	3.7524	3.7650	3.7774	3.7896

TABLE III. - Continued.

(h) Plenum

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	1.3998	1.4175	1.4359	1.4551	1.4749	1.4954	1.5164	1.5380	1.5599	1.5823
405	1.3998	1.4170	1.4349	1.4534	1.4725	1.4922	1.5125	1.5331	1.5542	1.5755
410	1.3998	1.4165	1.4338	1.4517	1.4702	1.4892	1.5087	1.5285	1.5487	1.5692
415	1.3998	1.4160	1.4328	1.4502	1.4680	1.4864	1.5051	1.5242	1.5436	1.5632
420	1.3998	1.4156	1.4319	1.4487	1.4659	1.4836	1.5017	1.5201	1.5388	1.5576
425	1.3998	1.4151	1.4309	1.4472	1.4640	1.4811	1.4985	1.5162	1.5342	1.5523
430	1.3998	1.4147	1.4301	1.4459	1.4621	1.4786	1.4954	1.5125	1.5298	1.5472
435	1.3998	1.4143	1.4292	1.4446	1.4602	1.4762	1.4925	1.5090	1.5257	1.5424
440	1.3998	1.4139	1.4284	1.4433	1.4585	1.4740	1.4897	1.5056	1.5217	1.5379
445	1.3998	1.4135	1.4276	1.4421	1.4568	1.4718	1.4871	1.5025	1.5180	1.5336
450	1.3998	1.4132	1.4269	1.4409	1.4552	1.4698	1.4845	1.4994	1.5144	1.5295
455	1.3998	1.4128	1.4262	1.4398	1.4537	1.4678	1.4821	1.4965	1.5110	1.5255
460	1.3998	1.4125	1.4255	1.4388	1.4522	1.4659	1.4798	1.4937	1.5078	1.5218
465	1.3998	1.4122	1.4248	1.4377	1.4508	1.4641	1.4775	1.4911	1.5047	1.5183
470	1.3998	1.4118	1.4242	1.4367	1.4495	1.4624	1.4754	1.4885	1.5017	1.5149
475	1.3997	1.4115	1.4236	1.4358	1.4482	1.4607	1.4734	1.4861	1.4988	1.5116
480	1.3997	1.4112	1.4230	1.4349	1.4469	1.4591	1.4714	1.4837	1.4961	1.5085
485	1.3997	1.4110	1.4224	1.4340	1.4457	1.4576	1.4695	1.4815	1.4935	1.5055
490	1.3997	1.4107	1.4218	1.4331	1.4445	1.4561	1.4677	1.4793	1.4910	1.5027
495	1.3997	1.4104	1.4213	1.4323	1.4434	1.4547	1.4659	1.4773	1.4886	1.4999
500	1.3997	1.4101	1.4208	1.4315	1.4423	1.4533	1.4643	1.4753	1.4863	1.4973
510	1.3996	1.4096	1.4198	1.4300	1.4403	1.4507	1.4611	1.4715	1.4819	1.4923
520	1.3996	1.4092	1.4188	1.4286	1.4384	1.4482	1.4581	1.4680	1.4779	1.4877
530	1.3996	1.4087	1.4179	1.4272	1.4366	1.4459	1.4553	1.4647	1.4741	1.4834
540	1.3995	1.4083	1.4171	1.4260	1.4349	1.4438	1.4527	1.4617	1.4706	1.4794
550	1.3995	1.4078	1.4163	1.4248	1.4333	1.4418	1.4503	1.4588	1.4673	1.4757
560	1.3994	1.4074	1.4155	1.4236	1.4318	1.4399	1.4480	1.4561	1.4642	1.4722
570	1.3993	1.4070	1.4148	1.4226	1.4303	1.4381	1.4459	1.4536	1.4613	1.4690
580	1.3993	1.4067	1.4141	1.4215	1.4290	1.4364	1.4439	1.4512	1.4586	1.4659
590	1.3992	1.4063	1.4134	1.4206	1.4277	1.4348	1.4419	1.4490	1.4560	1.4630
600	1.3991	1.4059	1.4128	1.4196	1.4265	1.4333	1.4401	1.4469	1.4536	1.4603
610	1.3990	1.4056	1.4121	1.4187	1.4253	1.4318	1.4384	1.4448	1.4513	1.4577
620	1.3989	1.4052	1.4115	1.4179	1.4242	1.4305	1.4367	1.4429	1.4491	1.4552
630	1.3988	1.4048	1.4109	1.4170	1.4231	1.4291	1.4351	1.4411	1.4470	1.4529
640	1.3986	1.4045	1.4104	1.4162	1.4220	1.4278	1.4336	1.4393	1.4450	1.4506
650	1.3985	1.4041	1.4098	1.4154	1.4210	1.4266	1.4322	1.4377	1.4431	1.4485
660	1.3983	1.4038	1.4092	1.4147	1.4201	1.4254	1.4308	1.4361	1.4413	1.4465
670	1.3982	1.4034	1.4087	1.4139	1.4191	1.4243	1.4294	1.4345	1.4395	1.4445
680	1.3980	1.4031	1.4082	1.4132	1.4182	1.4232	1.4281	1.4330	1.4379	1.4426
690	1.3978	1.4027	1.4076	1.4125	1.4173	1.4221	1.4269	1.4316	1.4362	1.4408
700	1.3976	1.4024	1.4071	1.4118	1.4164	1.4211	1.4257	1.4302	1.4347	1.4391

THERMODYNAMIC PROPERTIES OF NITROGEN

specific heat ratio

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
1.6049	1.6278	1.6508	1.6738	1.6968	1.7197	1.7423	1.7646	1.7864	1.8076	1.8282
1.5972	1.6189	1.6408	1.6627	1.6844	1.7060	1.7273	1.7482	1.7686	1.7884	1.8074
1.5899	1.6107	1.6315	1.6523	1.6729	1.6933	1.7134	1.7331	1.7523	1.7708	1.7885
1.5830	1.6029	1.6228	1.6425	1.6622	1.6816	1.7006	1.7192	1.7372	1.7546	1.7712
1.5765	1.5956	1.6146	1.6335	1.6522	1.6706	1.6887	1.7063	1.7233	1.7397	1.7553
1.5704	1.5887	1.6069	1.6249	1.6428	1.6603	1.6775	1.6943	1.7104	1.7259	1.7407
1.5647	1.5822	1.5996	1.6169	1.6340	1.6507	1.6671	1.6831	1.6985	1.7132	1.7271
1.5592	1.5760	1.5928	1.6093	1.6257	1.6417	1.6574	1.6726	1.6873	1.7013	1.7146
1.5541	1.5702	1.5863	1.6022	1.6179	1.6333	1.6483	1.6628	1.6768	1.6902	1.7029
1.5492	1.5647	1.5802	1.5955	1.6106	1.6253	1.6397	1.6536	1.6671	1.6799	1.6920
1.5445	1.5595	1.5744	1.5891	1.6036	1.6178	1.6316	1.6450	1.6579	1.6701	1.6817
1.5401	1.5545	1.5689	1.5831	1.5970	1.6107	1.6240	1.6369	1.6492	1.6610	1.6721
1.5359	1.5498	1.5637	1.5774	1.5908	1.6040	1.6168	1.6292	1.6411	1.6524	1.6631
1.5318	1.5453	1.5587	1.5719	1.5849	1.5976	1.6099	1.6219	1.6334	1.6443	1.6546
1.5280	1.5411	1.5540	1.5667	1.5793	1.5915	1.6035	1.6150	1.6261	1.6366	1.6466
1.5243	1.5370	1.5495	1.5618	1.5739	1.5858	1.5973	1.6084	1.6191	1.6293	1.6390
1.5208	1.5331	1.5452	1.5571	1.5688	1.5803	1.5914	1.6022	1.6126	1.6225	1.6318
1.5175	1.5293	1.5411	1.5526	1.5640	1.5751	1.5859	1.5963	1.6063	1.6159	1.6250
1.5142	1.5258	1.5371	1.5483	1.5593	1.5701	1.5805	1.5906	1.6004	1.6097	1.6185
1.5112	1.5223	1.5334	1.5442	1.5549	1.5653	1.5755	1.5853	1.5947	1.6037	1.6123
1.5082	1.5190	1.5297	1.5403	1.5506	1.5608	1.5706	1.5801	1.5893	1.5980	1.6064
1.5026	1.5129	1.5230	1.5329	1.5427	1.5522	1.5615	1.5705	1.5791	1.5874	1.5953
1.4975	1.5071	1.5167	1.5261	1.5353	1.5443	1.5531	1.5616	1.5698	1.5777	1.5852
1.4927	1.5018	1.5109	1.5198	1.5285	1.5371	1.5454	1.5535	1.5612	1.5687	1.5758
1.4882	1.4969	1.5055	1.5140	1.5222	1.5303	1.5382	1.5459	1.5533	1.5604	1.5672
1.4841	1.4923	1.5005	1.5085	1.5164	1.5241	1.5316	1.5389	1.5459	1.5527	1.5592
1.4802	1.4881	1.4958	1.5034	1.5109	1.5183	1.5254	1.5324	1.5391	1.5456	1.5518
1.4765	1.4840	1.4914	1.4987	1.5058	1.5128	1.5196	1.5263	1.5327	1.5389	1.5448
1.4731	1.4803	1.4873	1.4942	1.5010	1.5077	1.5142	1.5205	1.5267	1.5326	1.5383
1.4699	1.4767	1.4834	1.4901	1.4966	1.5029	1.5091	1.5152	1.5210	1.5267	1.5322
1.4668	1.4734	1.4798	1.4861	1.4923	1.4984	1.5043	1.5101	1.5158	1.5212	1.5264
1.4640	1.4702	1.4763	1.4824	1.4883	1.4942	1.4998	1.5054	1.5108	1.5160	1.5210
1.4612	1.4672	1.4731	1.4789	1.4846	1.4901	1.4956	1.5009	1.5060	1.5110	1.5159
1.4586	1.4644	1.4700	1.4755	1.4810	1.4863	1.4915	1.4966	1.5016	1.5064	1.5110
1.4562	1.4617	1.4671	1.4724	1.4776	1.4827	1.4877	1.4926	1.4974	1.5020	1.5064
1.4538	1.4591	1.4643	1.4694	1.4744	1.4793	1.4841	1.4888	1.4933	1.4978	1.5021
1.4516	1.4566	1.4616	1.4665	1.4713	1.4760	1.4806	1.4851	1.4895	1.4938	1.4979
1.4494	1.4543	1.4591	1.4638	1.4684	1.4729	1.4773	1.4816	1.4859	1.4900	1.4939
1.4474	1.4520	1.4566	1.4611	1.4656	1.4699	1.4742	1.4783	1.4824	1.4863	1.4901
1.4454	1.4499	1.4543	1.4586	1.4629	1.4671	1.4712	1.4752	1.4790	1.4828	1.4865
1.4435	1.4478	1.4520	1.4562	1.4603	1.4643	1.4683	1.4721	1.4759	1.4795	1.4831

TABLE III. - Concluded.

(1) Ratio of plenum speed of sound to speed of

Plenum temperature, °R										Plenum
	0	5	10	15	20	25	30	35	40	45
400	0.9017	0.9011	0.9009	0.9009	0.9013	0.9020	0.9031	0.9047	0.9066	0.9091
405	0.9073	0.9069	0.9068	0.9070	0.9075	0.9084	0.9096	0.9113	0.9134	0.9159
410	0.9129	0.9127	0.9127	0.9131	0.9137	0.9147	0.9161	0.9179	0.9201	0.9227
415	0.9185	0.9184	0.9186	0.9191	0.9199	0.9210	0.9225	0.9244	0.9267	0.9294
420	0.9240	0.9240	0.9244	0.9250	0.9260	0.9272	0.9288	0.9308	0.9332	0.9359
425	0.9295	0.9297	0.9301	0.9309	0.9320	0.9334	0.9351	0.9372	0.9396	0.9424
430	0.9349	0.9353	0.9359	0.9368	0.9380	0.9395	0.9413	0.9434	0.9460	0.9489
435	0.9403	0.9408	0.9415	0.9426	0.9439	0.9455	0.9474	0.9497	0.9523	0.9552
440	0.9457	0.9463	0.9472	0.9483	0.9497	0.9515	0.9535	0.9558	0.9585	0.9615
445	0.9511	0.9518	0.9528	0.9540	0.9556	0.9574	0.9595	0.9619	0.9647	0.9677
450	0.9564	0.9572	0.9583	0.9597	0.9613	0.9632	0.9654	0.9679	0.9708	0.9739
455	0.9617	0.9627	0.9639	0.9653	0.9671	0.9691	0.9713	0.9739	0.9768	0.9800
460	0.9670	0.9680	0.9693	0.9709	0.9727	0.9748	0.9772	0.9798	0.9828	0.9860
465	0.9722	0.9734	0.9748	0.9765	0.9784	0.9805	0.9830	0.9857	0.9887	0.9920
470	0.9774	0.9787	0.9802	0.9820	0.9840	0.9862	0.9887	0.9915	0.9946	0.9979
475	0.9826	0.9840	0.9856	0.9874	0.9895	0.9918	0.9944	0.9973	1.0004	1.0038
480	0.9877	0.9892	0.9909	0.9928	0.9950	0.9974	1.0001	1.0030	1.0061	1.0096
485	0.9929	0.9944	0.9962	0.9982	1.0005	1.0030	1.0057	1.0086	1.0119	1.0153
490	0.9980	0.9996	1.0015	1.0036	1.0059	1.0085	1.0112	1.0143	1.0175	1.0210
495	1.0030	1.0048	1.0067	1.0089	1.0113	1.0139	1.0168	1.0198	1.0231	1.0267
500	1.0081	1.0099	1.0119	1.0142	1.0167	1.0193	1.0222	1.0254	1.0287	1.0323
510	1.0181	1.0201	1.0223	1.0247	1.0272	1.0300	1.0331	1.0363	1.0397	1.0434
520	1.0280	1.0301	1.0325	1.0350	1.0377	1.0406	1.0437	1.0470	1.0505	1.0543
530	1.0378	1.0401	1.0426	1.0452	1.0480	1.0510	1.0542	1.0576	1.0612	1.0650
540	1.0476	1.0500	1.0525	1.0553	1.0582	1.0613	1.0646	1.0681	1.0717	1.0756
550	1.0572	1.0597	1.0624	1.0652	1.0683	1.0715	1.0748	1.0784	1.0821	1.0860
560	1.0668	1.0694	1.0721	1.0751	1.0782	1.0815	1.0849	1.0885	1.0923	1.0963
570	1.0762	1.0789	1.0818	1.0848	1.0880	1.0914	1.0949	1.0986	1.1024	1.1064
580	1.0856	1.0884	1.0914	1.0945	1.0978	1.1012	1.1048	1.1085	1.1124	1.1164
590	1.0949	1.0978	1.1008	1.1040	1.1074	1.1109	1.1145	1.1183	1.1222	1.1263
600	1.1041	1.1071	1.1102	1.1135	1.1169	1.1204	1.1241	1.1280	1.1319	1.1360
610	1.1132	1.1163	1.1195	1.1228	1.1263	1.1299	1.1336	1.1375	1.1415	1.1456
620	1.1222	1.1254	1.1286	1.1321	1.1356	1.1393	1.1430	1.1470	1.1510	1.1551
630	1.1312	1.1344	1.1377	1.1412	1.1448	1.1485	1.1523	1.1563	1.1604	1.1645
640	1.1401	1.1434	1.1468	1.1503	1.1539	1.1577	1.1616	1.1655	1.1696	1.1738
650	1.1489	1.1522	1.1557	1.1593	1.1630	1.1667	1.1707	1.1747	1.1788	1.1830
660	1.1576	1.1610	1.1645	1.1682	1.1719	1.1757	1.1797	1.1837	1.1879	1.1921
670	1.1663	1.1698	1.1733	1.1770	1.1807	1.1846	1.1886	1.1927	1.1968	1.2011
680	1.1749	1.1784	1.1820	1.1857	1.1895	1.1934	1.1974	1.2015	1.2057	1.2100
690	1.1834	1.1870	1.1906	1.1944	1.1982	1.2021	1.2062	1.2103	1.2145	1.2188
700	1.1919	1.1955	1.1992	1.2029	1.2068	1.2108	1.2148	1.2190	1.2232	1.2275

THERMODYNAMIC PROPERTIES OF NITROGEN

sound at 1 atmosphere and 491.688° R (1105.51 ft/sec)

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
0.9121	0.9156	0.9197	0.9244	0.9298	0.9359	0.9427	0.9504	0.9589	0.9684	0.9789
0.9190	0.9225	0.9266	0.9313	0.9366	0.9426	0.9493	0.9567	0.9650	0.9741	0.9841
0.9258	0.9294	0.9335	0.9381	0.9434	0.9492	0.9558	0.9630	0.9710	0.9798	0.9895
0.9325	0.9361	0.9402	0.9448	0.9500	0.9558	0.9622	0.9693	0.9770	0.9856	0.9949
0.9391	0.9428	0.9469	0.9515	0.9566	0.9623	0.9686	0.9755	0.9831	0.9913	1.0003
0.9457	0.9494	0.9535	0.9581	0.9632	0.9688	0.9750	0.9817	0.9891	0.9971	1.0058
0.9522	0.9559	0.9600	0.9646	0.9696	0.9752	0.9812	0.9879	0.9950	1.0028	1.0113
0.9586	0.9623	0.9664	0.9710	0.9760	0.9815	0.9875	0.9940	1.0010	1.0086	1.0168
0.9649	0.9687	0.9728	0.9774	0.9824	0.9878	0.9937	1.0001	1.0069	1.0143	1.0223
0.9712	0.9749	0.9791	0.9837	0.9886	0.9940	0.9998	1.0061	1.0128	1.0201	1.0278
0.9774	0.9812	0.9853	0.9899	0.9948	1.0002	1.0059	1.0121	1.0187	1.0258	1.0334
0.9835	0.9873	0.9915	0.9961	1.0010	1.0063	1.0119	1.0180	1.0245	1.0315	1.0389
0.9896	0.9934	0.9976	1.0022	1.0071	1.0123	1.0179	1.0239	1.0303	1.0372	1.0444
0.9956	0.9995	1.0037	1.0082	1.0131	1.0183	1.0239	1.0298	1.0361	1.0428	1.0499
1.0015	1.0054	1.0097	1.0142	1.0191	1.0242	1.0298	1.0356	1.0418	1.0484	1.0554
1.0074	1.0114	1.0156	1.0201	1.0250	1.0301	1.0356	1.0414	1.0475	1.0540	1.0609
1.0133	1.0172	1.0215	1.0260	1.0308	1.0360	1.0414	1.0471	1.0532	1.0596	1.0663
1.0190	1.0230	1.0273	1.0318	1.0366	1.0417	1.0471	1.0528	1.0588	1.0651	1.0718
1.0248	1.0288	1.0331	1.0376	1.0424	1.0475	1.0528	1.0585	1.0644	1.0706	1.0772
1.0305	1.0345	1.0388	1.0433	1.0481	1.0532	1.0585	1.0641	1.0700	1.0761	1.0825
1.0361	1.0402	1.0445	1.0490	1.0538	1.0588	1.0641	1.0697	1.0755	1.0816	1.0879
1.0472	1.0513	1.0557	1.0602	1.0650	1.0700	1.0752	1.0807	1.0864	1.0924	1.0985
1.0582	1.0623	1.0667	1.0712	1.0760	1.0810	1.0862	1.0916	1.0972	1.1030	1.1091
1.0690	1.0731	1.0775	1.0821	1.0868	1.0918	1.0969	1.1023	1.1078	1.1135	1.1195
1.0796	1.0838	1.0882	1.0927	1.0975	1.1024	1.1075	1.1128	1.1183	1.1240	1.1298
1.0900	1.0943	1.0987	1.1033	1.1080	1.1129	1.1180	1.1232	1.1287	1.1342	1.1400
1.1004	1.1046	1.1090	1.1136	1.1184	1.1233	1.1283	1.1335	1.1389	1.1444	1.1500
1.1105	1.1148	1.1193	1.1238	1.1286	1.1335	1.1385	1.1436	1.1489	1.1544	1.1600
1.1206	1.1249	1.1293	1.1339	1.1386	1.1435	1.1485	1.1536	1.1589	1.1643	1.1698
1.1305	1.1348	1.1393	1.1439	1.1486	1.1534	1.1584	1.1635	1.1687	1.1741	1.1795
1.1402	1.1446	1.1491	1.1537	1.1584	1.1632	1.1682	1.1733	1.1784	1.1837	1.1891
1.1499	1.1543	1.1587	1.1633	1.1681	1.1729	1.1778	1.1829	1.1880	1.1933	1.1986
1.1594	1.1638	1.1683	1.1729	1.1776	1.1824	1.1874	1.1924	1.1975	1.2027	1.2080
1.1688	1.1732	1.1777	1.1824	1.1871	1.1919	1.1968	1.2018	1.2068	1.2120	1.2173
1.1781	1.1826	1.1871	1.1917	1.1964	1.2012	1.2061	1.2110	1.2161	1.2212	1.2264
1.1874	1.1918	1.1963	1.2009	1.2056	1.2104	1.2153	1.2202	1.2252	1.2303	1.2355
1.1965	1.2009	1.2054	1.2100	1.2147	1.2195	1.2243	1.2293	1.2343	1.2393	1.2445
1.2055	1.2099	1.2144	1.2190	1.2237	1.2285	1.2333	1.2382	1.2432	1.2482	1.2533
1.2144	1.2188	1.2233	1.2279	1.2326	1.2374	1.2422	1.2471	1.2520	1.2570	1.2621
1.2232	1.2276	1.2322	1.2368	1.2414	1.2462	1.2510	1.2559	1.2608	1.2658	1.2708
1.2319	1.2364	1.2409	1.2455	1.2501	1.2549	1.2597	1.2645	1.2694	1.2744	1.2794

TABLE IV. - THERMODYNAMIC

(a) Critical-

Plenum Temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	0.6846	0.6888	0.6930	0.6975	0.7021	0.7069	0.7118	0.7169	0.7222	0.7277
405	0.6846	0.6886	0.6927	0.6970	0.7014	0.7060	0.7107	0.7156	0.7207	0.7259
410	0.6846	0.6885	0.6924	0.6966	0.7008	0.7052	0.7097	0.7144	0.7192	0.7242
415	0.6846	0.6883	0.6922	0.6961	0.7002	0.7044	0.7088	0.7133	0.7179	0.7226
420	0.6846	0.6882	0.6919	0.6957	0.6997	0.7037	0.7079	0.7122	0.7166	0.7211
425	0.6846	0.6881	0.6916	0.6953	0.6991	0.7030	0.7070	0.7111	0.7154	0.7197
430	0.6846	0.6879	0.6914	0.6949	0.6986	0.7024	0.7062	0.7102	0.7142	0.7183
435	0.6846	0.6878	0.6912	0.6946	0.6981	0.7017	0.7054	0.7092	0.7131	0.7170
440	0.6846	0.6877	0.6909	0.6942	0.6976	0.7011	0.7047	0.7083	0.7120	0.7158
445	0.6846	0.6876	0.6907	0.6939	0.6972	0.7005	0.7040	0.7075	0.7110	0.7147
450	0.6845	0.6875	0.6905	0.6936	0.6967	0.7000	0.7033	0.7066	0.7101	0.7136
455	0.6845	0.6874	0.6903	0.6933	0.6963	0.6994	0.7026	0.7059	0.7092	0.7125
460	0.6845	0.6873	0.6901	0.6930	0.6959	0.6989	0.7020	0.7051	0.7083	0.7115
465	0.6845	0.6872	0.6899	0.6927	0.6955	0.6984	0.7014	0.7044	0.7075	0.7106
470	0.6845	0.6871	0.6897	0.6924	0.6952	0.6980	0.7008	0.7037	0.7067	0.7096
475	0.6845	0.6870	0.6895	0.6921	0.6948	0.6975	0.7003	0.7031	0.7059	0.7088
480	0.6845	0.6869	0.6894	0.6919	0.6945	0.6971	0.6997	0.7024	0.7052	0.7079
485	0.6844	0.6868	0.6892	0.6916	0.6941	0.6966	0.6992	0.7018	0.7045	0.7071
490	0.6844	0.6867	0.6890	0.6914	0.6938	0.6962	0.6987	0.7012	0.7038	0.7064
495	0.6844	0.6866	0.6889	0.6912	0.6935	0.6958	0.6982	0.7007	0.7031	0.7056
500	0.6844	0.6865	0.6887	0.6909	0.6932	0.6955	0.6978	0.7001	0.7025	0.7049
510	0.6843	0.6864	0.6884	0.6905	0.6926	0.6947	0.6969	0.6991	0.7013	0.7036
520	0.6843	0.6862	0.6881	0.6901	0.6921	0.6941	0.6961	0.6982	0.7002	0.7023
530	0.6842	0.6860	0.6878	0.6897	0.6916	0.6934	0.6953	0.6973	0.6992	0.7011
540	0.6842	0.6859	0.6876	0.6893	0.6911	0.6928	0.6946	0.6964	0.6982	0.7001
550	0.6841	0.6857	0.6873	0.6890	0.6906	0.6923	0.6939	0.6956	0.6973	0.6990
560	0.6841	0.6856	0.6871	0.6886	0.6902	0.6917	0.6933	0.6949	0.6965	0.6981
570	0.6840	0.6854	0.6868	0.6883	0.6898	0.6912	0.6927	0.6942	0.6957	0.6972
580	0.6839	0.6853	0.6866	0.6880	0.6894	0.6907	0.6921	0.6935	0.6949	0.6963
590	0.6838	0.6851	0.6864	0.6877	0.6890	0.6903	0.6916	0.6929	0.6942	0.6955
600	0.6838	0.6850	0.6862	0.6874	0.6886	0.6898	0.6911	0.6923	0.6935	0.6948
610	0.6837	0.6848	0.6859	0.6871	0.6882	0.6894	0.6906	0.6917	0.6929	0.6941
620	0.6836	0.6847	0.6857	0.6868	0.6879	0.6890	0.6901	0.6912	0.6923	0.6934
630	0.6835	0.6845	0.6855	0.6865	0.6876	0.6886	0.6896	0.6907	0.6917	0.6927
640	0.6834	0.6844	0.6853	0.6863	0.6873	0.6882	0.6892	0.6902	0.6911	0.6921
650	0.6833	0.6842	0.6851	0.6860	0.6869	0.6879	0.6888	0.6897	0.6906	0.6915
660	0.6832	0.6841	0.6849	0.6858	0.6866	0.6875	0.6884	0.6892	0.6901	0.6910
670	0.6831	0.6839	0.6847	0.6855	0.6863	0.6872	0.6880	0.6888	0.6896	0.6904
680	0.6830	0.6837	0.6845	0.6853	0.6860	0.6868	0.6876	0.6884	0.6891	0.6899
690	0.6829	0.6836	0.6843	0.6850	0.6858	0.6865	0.6872	0.6879	0.6887	0.6894
700	0.6828	0.6834	0.6841	0.6848	0.6855	0.6862	0.6869	0.6875	0.6882	0.6889

PROPERTIES OF OXYGEN

flow factor

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
0.7333	0.7391	0.7452	0.7514	0.7577	0.7643	0.7711	0.7781	0.7853	0.7927	0.8003
0.7312	0.7368	0.7425	0.7483	0.7543	0.7605	0.7669	0.7734	0.7801	0.7869	0.7940
0.7293	0.7345	0.7399	0.7455	0.7511	0.7569	0.7629	0.7690	0.7753	0.7816	0.7882
0.7275	0.7324	0.7376	0.7428	0.7482	0.7536	0.7592	0.7650	0.7708	0.7768	0.7828
0.7257	0.7305	0.7353	0.7403	0.7454	0.7506	0.7558	0.7612	0.7667	0.7723	0.7779
0.7241	0.7286	0.7332	0.7380	0.7428	0.7477	0.7527	0.7577	0.7629	0.7681	0.7734
0.7226	0.7269	0.7313	0.7358	0.7403	0.7450	0.7497	0.7545	0.7593	0.7642	0.7692
0.7211	0.7252	0.7294	0.7337	0.7380	0.7424	0.7469	0.7514	0.7560	0.7606	0.7653
0.7197	0.7236	0.7277	0.7317	0.7359	0.7400	0.7443	0.7486	0.7529	0.7573	0.7617
0.7184	0.7222	0.7260	0.7299	0.7338	0.7378	0.7418	0.7459	0.7500	0.7541	0.7583
0.7171	0.7207	0.7244	0.7281	0.7319	0.7357	0.7395	0.7434	0.7473	0.7512	0.7551
0.7159	0.7194	0.7229	0.7265	0.7300	0.7337	0.7373	0.7410	0.7447	0.7484	0.7522
0.7148	0.7181	0.7215	0.7249	0.7283	0.7318	0.7353	0.7388	0.7423	0.7458	0.7494
0.7137	0.7169	0.7201	0.7234	0.7267	0.7300	0.7333	0.7367	0.7400	0.7434	0.7468
0.7127	0.7157	0.7188	0.7220	0.7251	0.7283	0.7315	0.7347	0.7379	0.7411	0.7443
0.7117	0.7146	0.7176	0.7206	0.7236	0.7266	0.7297	0.7328	0.7358	0.7389	0.7419
0.7107	0.7136	0.7164	0.7193	0.7222	0.7251	0.7280	0.7310	0.7339	0.7368	0.7397
0.7098	0.7126	0.7153	0.7181	0.7208	0.7236	0.7264	0.7292	0.7320	0.7348	0.7376
0.7090	0.7116	0.7142	0.7169	0.7196	0.7222	0.7249	0.7276	0.7303	0.7330	0.7356
0.7081	0.7106	0.7132	0.7157	0.7183	0.7209	0.7235	0.7261	0.7286	0.7312	0.7338
0.7073	0.7098	0.7122	0.7147	0.7171	0.7196	0.7221	0.7246	0.7270	0.7295	0.7320
0.7058	0.7081	0.7103	0.7126	0.7149	0.7172	0.7195	0.7218	0.7241	0.7263	0.7286
0.7044	0.7065	0.7086	0.7108	0.7129	0.7150	0.7171	0.7193	0.7214	0.7235	0.7255
0.7031	0.7051	0.7070	0.7090	0.7110	0.7130	0.7150	0.7169	0.7189	0.7208	0.7227
0.7019	0.7037	0.7056	0.7074	0.7093	0.7111	0.7129	0.7148	0.7166	0.7184	0.7202
0.7008	0.7025	0.7042	0.7059	0.7076	0.7094	0.7111	0.7128	0.7145	0.7161	0.7178
0.6997	0.7013	0.7029	0.7045	0.7061	0.7077	0.7093	0.7109	0.7125	0.7141	0.7156
0.6987	0.7002	0.7017	0.7032	0.7047	0.7062	0.7077	0.7092	0.7107	0.7121	0.7136
0.6978	0.6992	0.7006	0.7020	0.7034	0.7048	0.7062	0.7076	0.7090	0.7103	0.7117
0.6969	0.6982	0.6995	0.7008	0.7022	0.7035	0.7048	0.7061	0.7074	0.7086	0.7099
0.6960	0.6973	0.6985	0.6998	0.7010	0.7022	0.7035	0.7047	0.7059	0.7071	0.7082
0.6952	0.6964	0.6976	0.6987	0.6999	0.7011	0.7022	0.7033	0.7045	0.7056	0.7067
0.6945	0.6956	0.6967	0.6978	0.6989	0.6999	0.7010	0.7021	0.7031	0.7042	0.7052
0.6938	0.6948	0.6958	0.6969	0.6979	0.6989	0.6999	0.7009	0.7019	0.7029	0.7038
0.6931	0.6941	0.6950	0.6960	0.6970	0.6979	0.6989	0.6998	0.7007	0.7016	0.7025
0.6924	0.6934	0.6943	0.6952	0.6961	0.6970	0.6979	0.6987	0.6996	0.7005	0.7013
0.6918	0.6927	0.6935	0.6944	0.6952	0.6961	0.6969	0.6977	0.6985	0.6993	0.7001
0.6912	0.6920	0.6928	0.6936	0.6944	0.6952	0.6960	0.6968	0.6975	0.6983	0.6990
0.6906	0.6914	0.6922	0.6929	0.6937	0.6944	0.6951	0.6959	0.6966	0.6973	0.6980
0.6901	0.6908	0.6915	0.6922	0.6929	0.6936	0.6943	0.6950	0.6957	0.6963	0.6970
0.6896	0.6902	0.6909	0.6916	0.6922	0.6929	0.6935	0.6942	0.6948	0.6954	0.6960

TABLE IV. - Continued.

(b) Ratio of nozzle-throat velocity to speed of

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	0.8244	0.8200	0.8156	0.8111	0.8066	0.8021	0.7975	0.7930	0.7885	0.7841
405	0.8295	0.8253	0.8211	0.8168	0.8125	0.8082	0.8038	0.7995	0.7952	0.7910
410	0.8346	0.8306	0.8265	0.8224	0.8183	0.8142	0.8100	0.8059	0.8019	0.7978
415	0.8397	0.8358	0.8319	0.8280	0.8241	0.8201	0.8162	0.8122	0.8084	0.8046
420	0.8448	0.8410	0.8373	0.8335	0.8297	0.8260	0.8222	0.8185	0.8148	0.8112
425	0.8498	0.8462	0.8426	0.8390	0.8354	0.8318	0.8282	0.8246	0.8211	0.8177
430	0.8548	0.8513	0.8479	0.8444	0.8410	0.8375	0.8341	0.8307	0.8274	0.8241
435	0.8597	0.8564	0.8531	0.8498	0.8465	0.8432	0.8399	0.8367	0.8335	0.8304
440	0.8646	0.8615	0.8583	0.8552	0.8520	0.8488	0.8457	0.8426	0.8396	0.8367
445	0.8695	0.8665	0.8635	0.8605	0.8574	0.8544	0.8514	0.8485	0.8456	0.8428
450	0.8744	0.8715	0.8686	0.8657	0.8628	0.8599	0.8571	0.8543	0.8516	0.8489
455	0.8793	0.8765	0.8737	0.8709	0.8682	0.8654	0.8627	0.8600	0.8574	0.8549
460	0.8841	0.8814	0.8788	0.8761	0.8735	0.8708	0.8682	0.8657	0.8632	0.8608
465	0.8889	0.8863	0.8838	0.8812	0.8787	0.8762	0.8737	0.8713	0.8690	0.8667
470	0.8936	0.8912	0.8888	0.8863	0.8839	0.8815	0.8792	0.8769	0.8746	0.8725
475	0.8984	0.8960	0.8937	0.8914	0.8891	0.8868	0.8846	0.8824	0.8803	0.8782
480	0.9031	0.9008	0.8986	0.8964	0.8942	0.8921	0.8899	0.8878	0.8858	0.8839
485	0.9078	0.9056	0.9035	0.9014	0.8993	0.8973	0.8952	0.8932	0.8913	0.8895
490	0.9124	0.9104	0.9084	0.9064	0.9044	0.9024	0.9005	0.8986	0.8968	0.8950
495	0.9171	0.9151	0.9132	0.9113	0.9094	0.9075	0.9057	0.9039	0.9022	0.9005
500	0.9217	0.9198	0.9180	0.9162	0.9144	0.9126	0.9109	0.9092	0.9075	0.9060
510	0.9309	0.9292	0.9275	0.9259	0.9242	0.9226	0.9211	0.9196	0.9181	0.9167
520	0.9399	0.9384	0.9369	0.9354	0.9340	0.9325	0.9311	0.9298	0.9285	0.9272
530	0.9489	0.9475	0.9462	0.9449	0.9435	0.9423	0.9410	0.9398	0.9387	0.9376
540	0.9578	0.9566	0.9554	0.9542	0.9530	0.9519	0.9508	0.9497	0.9487	0.9478
550	0.9666	0.9655	0.9645	0.9634	0.9624	0.9614	0.9604	0.9595	0.9586	0.9578
560	0.9754	0.9744	0.9734	0.9725	0.9716	0.9708	0.9699	0.9691	0.9684	0.9677
570	0.9840	0.9832	0.9823	0.9815	0.9808	0.9800	0.9793	0.9786	0.9780	0.9774
580	0.9926	0.9919	0.9911	0.9904	0.9898	0.9891	0.9885	0.9880	0.9875	0.9870
590	1.0011	1.0005	0.9998	0.9993	0.9987	0.9982	0.9977	0.9972	0.9968	0.9964
600	1.0095	1.0090	1.0085	1.0080	1.0075	1.0071	1.0067	1.0064	1.0060	1.0057
610	1.0179	1.0174	1.0170	1.0166	1.0163	1.0159	1.0156	1.0154	1.0151	1.0149
620	1.0261	1.0258	1.0255	1.0252	1.0249	1.0247	1.0245	1.0243	1.0241	1.0240
630	1.0344	1.0341	1.0339	1.0336	1.0335	1.0333	1.0332	1.0331	1.0330	1.0330
640	1.0425	1.0423	1.0422	1.0420	1.0419	1.0418	1.0418	1.0418	1.0418	1.0419
650	1.0506	1.0505	1.0504	1.0503	1.0503	1.0503	1.0503	1.0504	1.0505	1.0506
660	1.0586	1.0585	1.0585	1.0586	1.0586	1.0587	1.0588	1.0589	1.0591	1.0593
670	1.0665	1.0666	1.0666	1.0667	1.0668	1.0670	1.0671	1.0673	1.0676	1.0678
680	1.0744	1.0745	1.0746	1.0748	1.0750	1.0752	1.0754	1.0757	1.0760	1.0763
690	1.0822	1.0824	1.0826	1.0828	1.0830	1.0833	1.0836	1.0839	1.0843	1.0847
700	1.0900	1.0902	1.0904	1.0907	1.0910	1.0914	1.0917	1.0921	1.0925	1.0929

THERMODYNAMIC PROPERTIES OF OXYGEN

sound at 1 atmosphere and 491.688° R (1032.87 ft/sec)

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
0.7797	0.7754	0.7712	0.7671	0.7631	0.7593	0.7556	0.7522	0.7489	0.7459	0.7431
0.7869	0.7828	0.7788	0.7750	0.7713	0.7677	0.7643	0.7611	0.7581	0.7553	0.7528
0.7939	0.7901	0.7863	0.7827	0.7792	0.7759	0.7727	0.7697	0.7670	0.7644	0.7621
0.8008	0.7972	0.7936	0.7902	0.7869	0.7838	0.7809	0.7781	0.7755	0.7732	0.7711
0.8076	0.8042	0.8008	0.7976	0.7945	0.7916	0.7888	0.7862	0.7838	0.7817	0.7797
0.8143	0.8110	0.8079	0.8048	0.8019	0.7992	0.7966	0.7942	0.7919	0.7899	0.7882
0.8209	0.8178	0.8148	0.8119	0.8092	0.8066	0.8042	0.8019	0.7998	0.7980	0.7963
0.8274	0.8244	0.8216	0.8189	0.8163	0.8139	0.8116	0.8095	0.8075	0.8058	0.8043
0.8338	0.8310	0.8283	0.8257	0.8233	0.8210	0.8188	0.8169	0.8151	0.8135	0.8121
0.8401	0.8374	0.8349	0.8324	0.8301	0.8280	0.8260	0.8241	0.8224	0.8209	0.8197
0.8463	0.8438	0.8414	0.8391	0.8369	0.8348	0.8330	0.8312	0.8297	0.8283	0.8271
0.8524	0.8500	0.8477	0.8456	0.8435	0.8416	0.8398	0.8382	0.8367	0.8354	0.8343
0.8585	0.8562	0.8540	0.8520	0.8500	0.8482	0.8466	0.8450	0.8437	0.8425	0.8415
0.8644	0.8623	0.8603	0.8583	0.8565	0.8548	0.8532	0.8518	0.8505	0.8494	0.8485
0.8703	0.8683	0.8664	0.8645	0.8628	0.8612	0.8597	0.8584	0.8572	0.8562	0.8553
0.8762	0.8743	0.8724	0.8707	0.8691	0.8676	0.8662	0.8649	0.8638	0.8629	0.8621
0.8820	0.8801	0.8784	0.8768	0.8752	0.8738	0.8725	0.8714	0.8703	0.8695	0.8687
0.8877	0.8860	0.8843	0.8828	0.8813	0.8800	0.8788	0.8777	0.8767	0.8759	0.8753
0.8933	0.8917	0.8902	0.8887	0.8873	0.8861	0.8850	0.8840	0.8831	0.8823	0.8817
0.8989	0.8974	0.8959	0.8946	0.8933	0.8921	0.8911	0.8901	0.8893	0.8886	0.8881
0.9044	0.9030	0.9016	0.9003	0.8992	0.8981	0.8971	0.8962	0.8954	0.8948	0.8943
0.9153	0.9141	0.9129	0.9117	0.9107	0.9097	0.9089	0.9081	0.9075	0.9070	0.9066
0.9260	0.9249	0.9239	0.9229	0.9220	0.9212	0.9204	0.9198	0.9193	0.9189	0.9186
0.9365	0.9356	0.9347	0.9338	0.9330	0.9323	0.9317	0.9312	0.9308	0.9305	0.9303
0.9469	0.9460	0.9452	0.9445	0.9439	0.9433	0.9428	0.9424	0.9421	0.9418	0.9417
0.9570	0.9563	0.9556	0.9550	0.9545	0.9540	0.9536	0.9533	0.9531	0.9529	0.9529
0.9670	0.9664	0.9659	0.9654	0.9649	0.9646	0.9643	0.9641	0.9639	0.9638	0.9638
0.9768	0.9764	0.9759	0.9755	0.9752	0.9749	0.9747	0.9746	0.9745	0.9745	0.9746
0.9865	0.9861	0.9858	0.9855	0.9853	0.9851	0.9850	0.9849	0.9849	0.9850	0.9852
0.9961	0.9958	0.9955	0.9953	0.9952	0.9951	0.9951	0.9951	0.9952	0.9953	0.9955
1.0055	1.0053	1.0051	1.0050	1.0050	1.0050	1.0050	1.0051	1.0052	1.0054	1.0057
1.0148	1.0147	1.0146	1.0146	1.0146	1.0146	1.0148	1.0149	1.0151	1.0154	1.0157
1.0240	1.0239	1.0239	1.0240	1.0241	1.0242	1.0244	1.0246	1.0249	1.0252	1.0256
1.0330	1.0330	1.0331	1.0333	1.0334	1.0336	1.0339	1.0342	1.0345	1.0349	1.0353
1.0419	1.0421	1.0422	1.0424	1.0426	1.0429	1.0432	1.0436	1.0439	1.0444	1.0449
1.0508	1.0510	1.0512	1.0514	1.0517	1.0521	1.0524	1.0528	1.0533	1.0538	1.0543
1.0595	1.0597	1.0600	1.0603	1.0607	1.0611	1.0615	1.0620	1.0625	1.0630	1.0636
1.0681	1.0684	1.0688	1.0691	1.0696	1.0700	1.0705	1.0710	1.0715	1.0721	1.0727
1.0766	1.0770	1.0774	1.0778	1.0783	1.0788	1.0793	1.0799	1.0805	1.0811	1.0818
1.0851	1.0855	1.0860	1.0864	1.0870	1.0875	1.0881	1.0887	1.0893	1.0900	1.0907
1.0934	1.0939	1.0944	1.0949	1.0955	1.0961	1.0967	1.0974	1.0980	1.0988	1.0995

TABLE IV. - Continued. THERMODYNAMIC PROPERTIES OF OXYGEN

(c) Critical pressure ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
400	0.5283	0.5279	0.5273	0.5266	0.5256	0.5243	0.5227	0.5207	0.5182	0.5151	0.5114
420	0.5283	0.5278	0.5271	0.5263	0.5253	0.5240	0.5224	0.5205	0.5182	0.5155	0.5123
440	0.5284	0.5277	0.5270	0.5261	0.5250	0.5238	0.5223	0.5205	0.5184	0.5160	0.5132
460	0.5284	0.5277	0.5269	0.5259	0.5249	0.5236	0.5222	0.5205	0.5186	0.5164	0.5140
480	0.5284	0.5277	0.5268	0.5258	0.5248	0.5235	0.5221	0.5206	0.5188	0.5168	0.5146
500	0.5285	0.5276	0.5268	0.5258	0.5247	0.5235	0.5221	0.5206	0.5190	0.5172	0.5152
520	0.5285	0.5277	0.5267	0.5258	0.5247	0.5235	0.5222	0.5207	0.5192	0.5175	0.5156
540	0.5286	0.5277	0.5268	0.5258	0.5247	0.5235	0.5222	0.5208	0.5194	0.5178	0.5160
560	0.5286	0.5278	0.5268	0.5258	0.5247	0.5236	0.5223	0.5210	0.5196	0.5180	0.5164
580	0.5287	0.5278	0.5269	0.5259	0.5248	0.5236	0.5224	0.5211	0.5198	0.5183	0.5168
600	0.5288	0.5279	0.5270	0.5259	0.5249	0.5237	0.5226	0.5213	0.5200	0.5186	0.5171
620	0.5289	0.5280	0.5271	0.5260	0.5250	0.5239	0.5227	0.5215	0.5202	0.5189	0.5175
640	0.5291	0.5281	0.5272	0.5262	0.5251	0.5240	0.5229	0.5217	0.5205	0.5192	0.5179
660	0.5292	0.5283	0.5273	0.5263	0.5253	0.5242	0.5231	0.5219	0.5207	0.5195	0.5182
680	0.5293	0.5284	0.5275	0.5265	0.5255	0.5244	0.5233	0.5222	0.5210	0.5198	0.5186
700	0.5295	0.5286	0.5277	0.5267	0.5257	0.5246	0.5235	0.5224	0.5213	0.5201	0.5189

(d) Critical temperature ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
400	0.8335	0.8310	0.8286	0.8264	0.8244	0.8226	0.8211	0.8198	0.8188	0.8180	0.8173
420	0.8336	0.8313	0.8290	0.8269	0.8249	0.8231	0.8216	0.8202	0.8190	0.8181	0.8172
440	0.8336	0.8315	0.8294	0.8274	0.8255	0.8237	0.8222	0.8208	0.8195	0.8185	0.8176
460	0.8337	0.8317	0.8298	0.8279	0.8261	0.8244	0.8228	0.8214	0.8201	0.8190	0.8181
480	0.8339	0.8320	0.8301	0.8283	0.8266	0.8250	0.8234	0.8220	0.8208	0.8196	0.8186
500	0.8340	0.8322	0.8305	0.8288	0.8271	0.8256	0.8241	0.8227	0.8214	0.8203	0.8193
520	0.8342	0.8325	0.8309	0.8292	0.8277	0.8262	0.8247	0.8234	0.8221	0.8210	0.8199
540	0.8344	0.8328	0.8312	0.8297	0.8282	0.8268	0.8254	0.8241	0.8228	0.8217	0.8206
560	0.8346	0.8331	0.8316	0.8302	0.8287	0.8274	0.8260	0.8247	0.8235	0.8224	0.8214
580	0.8349	0.8335	0.8321	0.8307	0.8293	0.8280	0.8267	0.8254	0.8243	0.8232	0.8221
600	0.8352	0.8339	0.8325	0.8312	0.8299	0.8286	0.8273	0.8262	0.8250	0.8239	0.8229
620	0.8356	0.8343	0.8330	0.8317	0.8304	0.8292	0.8280	0.8269	0.8258	0.8247	0.8237
640	0.8359	0.8347	0.8334	0.8322	0.8310	0.8299	0.8287	0.8276	0.8265	0.8255	0.8245
660	0.8363	0.8351	0.8340	0.8328	0.8316	0.8305	0.8294	0.8283	0.8273	0.8263	0.8253
680	0.8367	0.8356	0.8345	0.8334	0.8323	0.8312	0.8301	0.8291	0.8281	0.8271	0.8262
700	0.8372	0.8361	0.8350	0.8340	0.8329	0.8319	0.8308	0.8298	0.8289	0.8279	0.8270

TABLE IV. - Continued. THERMODYNAMIC PROPERTIES OF OXYGEN

(e) Critical density ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
400	0.6339	0.6348	0.6360	0.6374	0.6393	0.6416	0.6444	0.6478	0.6520	0.6571	0.6632
420	0.6338	0.6348	0.6359	0.6373	0.6390	0.6411	0.6435	0.6463	0.6497	0.6537	0.6583
440	0.6338	0.6348	0.6359	0.6373	0.6388	0.6407	0.6428	0.6453	0.6481	0.6513	0.6550
460	0.6337	0.6347	0.6359	0.6372	0.6386	0.6403	0.6422	0.6444	0.6468	0.6495	0.6526
480	0.6337	0.6347	0.6358	0.6370	0.6384	0.6400	0.6418	0.6437	0.6458	0.6482	0.6507
500	0.6336	0.6346	0.6357	0.6369	0.6383	0.6397	0.6413	0.6431	0.6450	0.6471	0.6493
520	0.6336	0.6345	0.6356	0.6368	0.6381	0.6394	0.6410	0.6426	0.6443	0.6462	0.6481
540	0.6335	0.6344	0.6355	0.6366	0.6379	0.6392	0.6406	0.6421	0.6437	0.6454	0.6471
560	0.6334	0.6343	0.6354	0.6365	0.6377	0.6389	0.6403	0.6417	0.6431	0.6447	0.6463
580	0.6333	0.6342	0.6352	0.6363	0.6374	0.6387	0.6399	0.6413	0.6426	0.6440	0.6455
600	0.6332	0.6341	0.6351	0.6361	0.6372	0.6384	0.6396	0.6409	0.6421	0.6435	0.6448
620	0.6330	0.6339	0.6349	0.6359	0.6370	0.6381	0.6393	0.6405	0.6417	0.6429	0.6442
640	0.6329	0.6338	0.6347	0.6357	0.6368	0.6379	0.6390	0.6401	0.6413	0.6424	0.6436
660	0.6328	0.6336	0.6346	0.6355	0.6366	0.6376	0.6387	0.6397	0.6408	0.6419	0.6430
680	0.6326	0.6335	0.6344	0.6353	0.6363	0.6373	0.6384	0.6394	0.6404	0.6415	0.6425
700	0.6325	0.6333	0.6342	0.6351	0.6361	0.6371	0.6381	0.6391	0.6401	0.6410	0.6420

TABLE IV. - Continued.

(f) Plenum

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	1.0000	0.9894	0.9788	0.9680	0.9573	0.9465	0.9358	0.9251	0.9145	0.9040
405	1.0000	0.9899	0.9797	0.9694	0.9592	0.9489	0.9387	0.9285	0.9184	0.9085
410	1.0000	0.9903	0.9806	0.9708	0.9610	0.9512	0.9414	0.9317	0.9221	0.9127
415	1.0000	0.9907	0.9814	0.9720	0.9627	0.9533	0.9440	0.9348	0.9257	0.9167
420	1.0000	0.9911	0.9822	0.9733	0.9643	0.9554	0.9465	0.9377	0.9291	0.9205
425	1.0000	0.9915	0.9830	0.9744	0.9659	0.9574	0.9489	0.9405	0.9323	0.9242
430	1.0000	0.9919	0.9837	0.9755	0.9674	0.9592	0.9512	0.9432	0.9353	0.9276
435	1.0000	0.9922	0.9844	0.9766	0.9688	0.9610	0.9533	0.9457	0.9382	0.9309
440	1.0000	0.9925	0.9851	0.9776	0.9701	0.9627	0.9554	0.9482	0.9410	0.9340
445	1.0000	0.9929	0.9857	0.9786	0.9714	0.9644	0.9574	0.9505	0.9437	0.9370
450	1.0000	0.9932	0.9863	0.9795	0.9727	0.9659	0.9593	0.9527	0.9462	0.9398
455	1.0000	0.9935	0.9869	0.9804	0.9739	0.9674	0.9611	0.9548	0.9486	0.9426
460	1.0000	0.9937	0.9875	0.9812	0.9750	0.9689	0.9628	0.9568	0.9509	0.9452
465	1.0000	0.9940	0.9880	0.9821	0.9761	0.9702	0.9644	0.9587	0.9531	0.9476
470	1.0000	0.9943	0.9885	0.9828	0.9772	0.9716	0.9660	0.9606	0.9552	0.9500
475	1.0000	0.9945	0.9890	0.9836	0.9782	0.9728	0.9676	0.9624	0.9573	0.9523
480	1.0000	0.9947	0.9895	0.9843	0.9791	0.9740	0.9690	0.9641	0.9592	0.9545
485	1.0000	0.9950	0.9900	0.9850	0.9801	0.9752	0.9704	0.9657	0.9611	0.9566
490	1.0000	0.9952	0.9904	0.9857	0.9810	0.9763	0.9717	0.9673	0.9629	0.9586
495	1.0000	0.9954	0.9908	0.9863	0.9818	0.9774	0.9730	0.9688	0.9646	0.9605
500	1.0000	0.9956	0.9912	0.9869	0.9826	0.9784	0.9743	0.9702	0.9662	0.9624
510	1.0000	0.9960	0.9920	0.9881	0.9842	0.9804	0.9766	0.9729	0.9693	0.9658
520	1.0000	0.9964	0.9927	0.9892	0.9856	0.9822	0.9788	0.9754	0.9722	0.9690
530	1.0000	0.9967	0.9934	0.9902	0.9870	0.9838	0.9808	0.9778	0.9748	0.9720
540	1.0000	0.9970	0.9940	0.9911	0.9882	0.9854	0.9826	0.9799	0.9773	0.9748
550	1.0000	0.9973	0.9946	0.9919	0.9894	0.9868	0.9843	0.9819	0.9796	0.9773
560	1.0000	0.9975	0.9951	0.9927	0.9904	0.9881	0.9859	0.9838	0.9817	0.9797
570	1.0000	0.9978	0.9956	0.9935	0.9914	0.9894	0.9874	0.9855	0.9837	0.9819
580	1.0000	0.9980	0.9961	0.9942	0.9923	0.9906	0.9888	0.9871	0.9855	0.9840
590	1.0000	0.9982	0.9965	0.9948	0.9932	0.9916	0.9901	0.9886	0.9872	0.9859
600	1.0000	0.9984	0.9969	0.9954	0.9940	0.9926	0.9913	0.9900	0.9888	0.9877
610	1.0000	0.9986	0.9973	0.9960	0.9948	0.9936	0.9924	0.9913	0.9903	0.9893
620	1.0000	0.9988	0.9977	0.9965	0.9955	0.9945	0.9935	0.9926	0.9917	0.9909
630	1.0000	0.9990	0.9980	0.9970	0.9961	0.9953	0.9945	0.9937	0.9930	0.9923
640	1.0000	0.9991	0.9983	0.9975	0.9968	0.9961	0.9954	0.9948	0.9942	0.9937
650	1.0000	0.9993	0.9986	0.9979	0.9973	0.9968	0.9963	0.9958	0.9954	0.9950
660	1.0000	0.9994	0.9989	0.9984	0.9979	0.9975	0.9971	0.9967	0.9964	0.9962
670	1.0000	0.9995	0.9991	0.9987	0.9984	0.9981	0.9978	0.9976	0.9974	0.9973
680	1.0000	0.9997	0.9994	0.9991	0.9989	0.9987	0.9985	0.9984	0.9984	0.9983
690	1.0000	0.9998	0.9996	0.9994	0.9993	0.9993	0.9992	0.9992	0.9993	0.9993
700	1.0000	0.9999	0.9998	0.9998	0.9997	0.9998	0.9998	0.9999	1.0001	1.0003

THERMODYNAMIC PROPERTIES OF OXYGEN

compressibility factor

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
0.8937	0.8836	0.8737	0.8641	0.8547	0.8457	0.8371	0.8288	0.8210	0.8136	0.8067
0.8987	0.8891	0.8798	0.8707	0.8619	0.8534	0.8453	0.8375	0.8302	0.8233	0.8169
0.9034	0.8944	0.8855	0.8769	0.8686	0.8606	0.8530	0.8457	0.8388	0.8324	0.8264
0.9079	0.8993	0.8909	0.8828	0.8749	0.8674	0.8602	0.8533	0.8469	0.8409	0.8353
0.9122	0.9040	0.8960	0.8883	0.8809	0.8738	0.8670	0.8605	0.8545	0.8489	0.8437
0.9162	0.9084	0.9009	0.8936	0.8866	0.8798	0.8734	0.8673	0.8616	0.8563	0.8515
0.9200	0.9127	0.9055	0.8986	0.8919	0.8855	0.8795	0.8737	0.8684	0.8634	0.8588
0.9237	0.9167	0.9099	0.9033	0.8970	0.8910	0.8852	0.8798	0.8748	0.8701	0.8658
0.9272	0.9205	0.9140	0.9078	0.9018	0.8961	0.8907	0.8856	0.8808	0.8764	0.8723
0.9305	0.9242	0.9180	0.9121	0.9064	0.9010	0.8958	0.8910	0.8865	0.8823	0.8785
0.9336	0.9276	0.9218	0.9162	0.9108	0.9056	0.9008	0.8962	0.8919	0.8880	0.8844
0.9367	0.9309	0.9254	0.9200	0.9149	0.9101	0.9054	0.9011	0.8971	0.8933	0.8900
0.9396	0.9341	0.9288	0.9238	0.9189	0.9143	0.9099	0.9058	0.9020	0.8984	0.8953
0.9423	0.9371	0.9321	0.9273	0.9227	0.9183	0.9141	0.9102	0.9066	0.9033	0.9003
0.9449	0.9400	0.9352	0.9307	0.9263	0.9221	0.9182	0.9145	0.9111	0.9079	0.9051
0.9475	0.9428	0.9382	0.9339	0.9297	0.9258	0.9221	0.9186	0.9153	0.9124	0.9097
0.9499	0.9454	0.9411	0.9370	0.9330	0.9293	0.9258	0.9224	0.9194	0.9166	0.9140
0.9522	0.9480	0.9439	0.9399	0.9362	0.9326	0.9293	0.9262	0.9233	0.9206	0.9182
0.9544	0.9504	0.9465	0.9428	0.9392	0.9359	0.9327	0.9297	0.9270	0.9245	0.9222
0.9565	0.9527	0.9490	0.9455	0.9421	0.9389	0.9359	0.9331	0.9305	0.9282	0.9260
0.9586	0.9550	0.9515	0.9481	0.9449	0.9419	0.9390	0.9364	0.9339	0.9317	0.9297
0.9624	0.9592	0.9560	0.9530	0.9501	0.9474	0.9449	0.9425	0.9403	0.9383	0.9366
0.9660	0.9630	0.9602	0.9575	0.9550	0.9525	0.9503	0.9482	0.9462	0.9445	0.9429
0.9693	0.9666	0.9641	0.9617	0.9594	0.9573	0.9553	0.9534	0.9517	0.9501	0.9487
0.9723	0.9700	0.9677	0.9656	0.9635	0.9616	0.9599	0.9582	0.9567	0.9554	0.9542
0.9751	0.9731	0.9711	0.9692	0.9674	0.9657	0.9641	0.9627	0.9614	0.9602	0.9592
0.9778	0.9759	0.9742	0.9725	0.9709	0.9695	0.9681	0.9669	0.9657	0.9647	0.9639
0.9802	0.9786	0.9770	0.9756	0.9742	0.9730	0.9718	0.9707	0.9698	0.9689	0.9682
0.9825	0.9811	0.9797	0.9785	0.9773	0.9762	0.9752	0.9743	0.9735	0.9728	0.9722
0.9846	0.9834	0.9822	0.9812	0.9802	0.9792	0.9784	0.9777	0.9770	0.9765	0.9760
0.9866	0.9855	0.9846	0.9837	0.9828	0.9821	0.9814	0.9808	0.9803	0.9799	0.9795
0.9884	0.9875	0.9867	0.9860	0.9853	0.9847	0.9842	0.9837	0.9833	0.9830	0.9828
0.9901	0.9894	0.9888	0.9882	0.9876	0.9872	0.9868	0.9865	0.9862	0.9860	0.9859
0.9917	0.9912	0.9907	0.9902	0.9898	0.9895	0.9892	0.9890	0.9889	0.9888	0.9888
0.9932	0.9928	0.9924	0.9921	0.9919	0.9916	0.9915	0.9914	0.9914	0.9914	0.9915
0.9946	0.9943	0.9941	0.9939	0.9938	0.9937	0.9936	0.9936	0.9937	0.9938	0.9940
0.9960	0.9958	0.9957	0.9956	0.9955	0.9956	0.9956	0.9957	0.9959	0.9961	0.9963
0.9972	0.9971	0.9971	0.9971	0.9972	0.9973	0.9975	0.9977	0.9979	0.9982	0.9986
0.9983	0.9984	0.9985	0.9986	0.9988	0.9990	0.9992	0.9995	0.9999	1.0002	1.0006
0.9994	0.9996	0.9998	1.0000	1.0003	1.0006	1.0009	1.0013	1.0017	1.0021	1.0026
1.0005	1.0007	1.0010	1.0013	1.0016	1.0020	1.0024	1.0029	1.0034	1.0039	1.0044

TABLE IV. - Continued.

(g) Plenum

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	3.5059	3.5684	3.6344	3.7043	3.7781	3.8560	3.9381	4.0247	4.1159	4.2118
405	3.5064	3.5669	3.6308	3.6981	3.7690	3.8436	3.9220	4.0043	4.0907	4.1813
410	3.5069	3.5656	3.6273	3.6923	3.7605	3.8320	3.9069	3.9854	4.0674	4.1531
415	3.5074	3.5643	3.6241	3.6868	3.7525	3.8211	3.8929	3.9677	4.0457	4.1270
420	3.5080	3.5632	3.6211	3.6817	3.7449	3.8109	3.8797	3.9512	4.0256	4.1027
425	3.5086	3.5622	3.6183	3.6769	3.7379	3.8014	3.8674	3.9358	4.0068	4.0802
430	3.5093	3.5613	3.6157	3.6723	3.7312	3.7924	3.8558	3.9214	3.9892	4.0592
435	3.5099	3.5605	3.6133	3.6681	3.7250	3.7840	3.8449	3.9079	3.9728	4.0397
440	3.5107	3.5599	3.6110	3.6641	3.7191	3.7760	3.8347	3.8952	3.9574	4.0214
445	3.5114	3.5593	3.6089	3.6604	3.7136	3.7686	3.8251	3.8833	3.9431	4.0043
450	3.5123	3.5588	3.6070	3.6569	3.7085	3.7615	3.8161	3.8721	3.9295	3.9883
455	3.5131	3.5584	3.6053	3.6537	3.7036	3.7549	3.8076	3.8616	3.9169	3.9733
460	3.5140	3.5581	3.6036	3.6507	3.6990	3.7487	3.7997	3.8517	3.9049	3.9591
465	3.5149	3.5579	3.6022	3.6478	3.6948	3.7429	3.7921	3.8424	3.8937	3.9459
470	3.5159	3.5577	3.6008	3.6452	3.6908	3.7374	3.7851	3.8337	3.8832	3.9334
475	3.5169	3.5577	3.5997	3.6428	3.6870	3.7322	3.7784	3.8254	3.8732	3.9217
480	3.5180	3.5577	3.5986	3.6406	3.6835	3.7274	3.7721	3.8176	3.8638	3.9107
485	3.5191	3.5579	3.5977	3.6385	3.6802	3.7228	3.7662	3.8103	3.8550	3.9003
490	3.5203	3.5581	3.5969	3.6366	3.6772	3.7186	3.7607	3.8034	3.8467	3.8905
495	3.5215	3.5583	3.5962	3.6349	3.6744	3.7146	3.7555	3.7969	3.8389	3.8812
500	3.5228	3.5587	3.5956	3.6333	3.6717	3.7109	3.7506	3.7908	3.8315	3.8725
510	3.5254	3.5597	3.5948	3.6306	3.6671	3.7041	3.7416	3.7796	3.8179	3.8565
520	3.5282	3.5610	3.5944	3.6285	3.6631	3.6983	3.7338	3.7697	3.8059	3.8423
530	3.5312	3.5625	3.5944	3.6269	3.6599	3.6932	3.7270	3.7610	3.7953	3.8297
540	3.5345	3.5644	3.5948	3.6258	3.6572	3.6890	3.7211	3.7534	3.7858	3.8184
550	3.5379	3.5665	3.5956	3.6252	3.6552	3.6855	3.7160	3.7467	3.7776	3.8085
560	3.5414	3.5689	3.5968	3.6251	3.6537	3.6826	3.7117	3.7410	3.7703	3.7997
570	3.5452	3.5715	3.5983	3.6253	3.6527	3.6803	3.7081	3.7360	3.7640	3.7920
580	3.5492	3.5744	3.6001	3.6260	3.6522	3.6786	3.7052	3.7319	3.7586	3.7853
590	3.5533	3.5776	3.6022	3.6271	3.6522	3.6775	3.7029	3.7284	3.7540	3.7795
600	3.5576	3.5810	3.6046	3.6285	3.6526	3.6768	3.7012	3.7256	3.7501	3.7745
610	3.5621	3.5846	3.6073	3.6303	3.6534	3.6767	3.7000	3.7235	3.7469	3.7703
620	3.5668	3.5884	3.6103	3.6324	3.6546	3.6770	3.6994	3.7219	3.7444	3.7668
630	3.5716	3.5925	3.6135	3.6348	3.6562	3.6777	3.6992	3.7208	3.7424	3.7640
640	3.5766	3.5967	3.6170	3.6375	3.6581	3.6788	3.6995	3.7202	3.7410	3.7617
650	3.5817	3.6012	3.6207	3.6405	3.6603	3.6802	3.7002	3.7202	3.7401	3.7601
660	3.5870	3.6058	3.6247	3.6437	3.6628	3.6820	3.7013	3.7205	3.7397	3.7589
670	3.5924	3.6106	3.6288	3.6472	3.6656	3.6841	3.7027	3.7212	3.7398	3.7583
680	3.5980	3.6155	3.6332	3.6509	3.6687	3.6866	3.7045	3.7224	3.7403	3.7581
690	3.6037	3.6206	3.6377	3.6548	3.6720	3.6893	3.7066	3.7239	3.7411	3.7583
700	3.6095	3.6259	3.6424	3.6589	3.6756	3.6923	3.7090	3.7257	3.7423	3.7590

THERMODYNAMIC PROPERTIES OF OXYGEN

specific heat

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
4.3126	4.4185	4.5296	4.6462	4.7682	4.8961	5.0297	5.1695	5.3154	5.4678	5.6266
4.2761	4.3753	4.4791	4.5875	4.7007	4.8187	4.9418	5.0699	5.2033	5.3421	5.4863
4.2425	4.3357	4.4329	4.5340	4.6392	4.7486	4.8622	4.9801	5.1024	5.2292	5.3606
4.2115	4.2993	4.3905	4.4851	4.5832	4.6848	4.7901	4.8989	5.0114	5.1277	5.2477
4.1828	4.2657	4.3515	4.4403	4.5320	4.6267	4.7244	4.8252	4.9290	5.0359	5.1460
4.1562	4.2346	4.3156	4.3990	4.4850	4.5735	4.6646	4.7581	4.8542	4.9529	5.0541
4.1314	4.2058	4.2824	4.3610	4.4418	4.5248	4.6098	4.6969	4.7862	4.8774	4.9708
4.1084	4.1791	4.2516	4.3259	4.4021	4.4800	4.5596	4.6410	4.7240	4.8088	4.8951
4.0870	4.1542	4.2231	4.2935	4.3653	4.4387	4.5135	4.5897	4.6672	4.7461	4.8262
4.0670	4.1311	4.1966	4.2633	4.3314	4.4006	4.4710	4.5425	4.6151	4.6887	4.7633
4.0483	4.1095	4.1719	4.2353	4.2999	4.3654	4.4318	4.4991	4.5672	4.6361	4.7057
4.0308	4.0893	4.1488	4.2093	4.2706	4.3327	4.3955	4.4590	4.5231	4.5877	4.6528
4.0143	4.0704	4.1273	4.1850	4.2433	4.3023	4.3619	4.4219	4.4824	4.5432	4.6043
3.9989	4.0527	4.1072	4.1623	4.2180	4.2741	4.3307	4.3875	4.4447	4.5021	4.5595
3.9844	4.0361	4.0883	4.1411	4.1943	4.2478	4.3016	4.3556	4.4098	4.4640	4.5182
3.9708	4.0205	4.0707	4.1212	4.1721	4.2232	4.2746	4.3260	4.3774	4.4288	4.4800
3.9580	4.0059	4.0541	4.1026	4.1514	4.2003	4.2493	4.2983	4.3472	4.3960	4.4446
3.9460	3.9921	4.0385	4.0851	4.1319	4.1788	4.2257	4.2725	4.3192	4.3656	4.4117
3.9346	3.9791	4.0238	4.0687	4.1137	4.1587	4.2036	4.2484	4.2930	4.3372	4.3811
3.9239	3.9669	4.0100	4.0533	4.0966	4.1398	4.1829	4.2258	4.2685	4.3108	4.3526
3.9138	3.9553	3.9970	4.0387	4.0805	4.1221	4.1635	4.2047	4.2456	4.2861	4.3261
3.8953	3.9342	3.9732	4.0121	4.0510	4.0897	4.1281	4.1663	4.2040	4.2413	4.2780
3.8788	3.9154	3.9520	3.9885	4.0248	4.0610	4.0968	4.1323	4.1673	4.2018	4.2358
3.8641	3.8986	3.9331	3.9674	4.0015	4.0354	4.0690	4.1021	4.1348	4.1670	4.1985
3.8511	3.8837	3.9162	3.9486	3.9807	4.0126	4.0441	4.0753	4.1059	4.1360	4.1656
3.8394	3.8703	3.9011	3.9318	3.9621	3.9922	4.0220	4.0513	4.0802	4.1085	4.1362
3.8291	3.8585	3.8877	3.9167	3.9455	3.9740	4.0022	4.0299	4.0572	4.0839	4.1101
3.8200	3.8480	3.8757	3.9033	3.9307	3.9577	3.9844	4.0107	4.0366	4.0619	4.0867
3.8120	3.8386	3.8651	3.8914	3.9174	3.9431	3.9686	3.9936	4.0181	4.0422	4.0658
3.8050	3.8304	3.8557	3.8807	3.9056	3.9301	3.9543	3.9782	4.0016	4.0246	4.0470
3.7989	3.8232	3.8473	3.8713	3.8950	3.9185	3.9416	3.9644	3.9868	4.0087	4.0301
3.7937	3.8169	3.8400	3.8630	3.8857	3.9081	3.9302	3.9520	3.9735	3.9944	4.0150
3.7892	3.8115	3.8336	3.8556	3.8774	3.8989	3.9201	3.9410	3.9615	3.9817	4.0014
3.7855	3.8069	3.8281	3.8492	3.8701	3.8907	3.9111	3.9312	3.9509	3.9702	3.9892
3.7824	3.8029	3.8234	3.8436	3.8637	3.8835	3.9031	3.9224	3.9414	3.9600	3.9782
3.7799	3.7997	3.8193	3.8388	3.8581	3.8772	3.8961	3.9146	3.9329	3.9508	3.9684
3.7781	3.7971	3.8160	3.8348	3.8534	3.8717	3.8899	3.9078	3.9254	3.9427	3.9597
3.7767	3.7951	3.8133	3.8314	3.8493	3.8670	3.8845	3.9018	3.9188	3.9355	3.9519
3.7759	3.7936	3.8111	3.8286	3.8459	3.8630	3.8799	3.8966	3.9130	3.9291	3.9450
3.7755	3.7926	3.8095	3.8264	3.8431	3.8596	3.8759	3.8920	3.9079	3.9235	3.9389
3.7755	3.7920	3.8084	3.8247	3.8408	3.8568	3.8726	3.8882	3.9035	3.9187	3.9335

TABLE IV. - Continued.

(h) Plenum

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
400	1.3991	1.4189	1.4401	1.4626	1.4864	1.5114	1.5378	1.5656	1.5947	1.6251
405	1.3990	1.4183	1.4388	1.4605	1.4834	1.5075	1.5328	1.5592	1.5869	1.6158
410	1.3989	1.4176	1.4375	1.4585	1.4805	1.5037	1.5280	1.5533	1.5796	1.6071
415	1.3988	1.4170	1.4363	1.4565	1.4778	1.5001	1.5234	1.5477	1.5728	1.5989
420	1.3987	1.4164	1.4351	1.4547	1.4753	1.4967	1.5191	1.5423	1.5664	1.5913
425	1.3986	1.4158	1.4339	1.4529	1.4728	1.4935	1.5150	1.5373	1.5604	1.5841
430	1.3985	1.4152	1.4328	1.4512	1.4704	1.4904	1.5111	1.5326	1.5547	1.5774
435	1.3984	1.4147	1.4317	1.4496	1.4682	1.4875	1.5075	1.5281	1.5493	1.5711
440	1.3983	1.4141	1.4307	1.4480	1.4660	1.4847	1.5039	1.5238	1.5442	1.5651
445	1.3982	1.4136	1.4297	1.4465	1.4639	1.4820	1.5006	1.5197	1.5393	1.5594
450	1.3981	1.4131	1.4287	1.4450	1.4619	1.4794	1.4974	1.5158	1.5347	1.5540
455	1.3979	1.4125	1.4278	1.4436	1.4600	1.4769	1.4943	1.5121	1.5303	1.5489
460	1.3978	1.4120	1.4268	1.4422	1.4581	1.4745	1.4913	1.5086	1.5261	1.5440
465	1.3976	1.4115	1.4259	1.4409	1.4563	1.4722	1.4885	1.5052	1.5221	1.5394
470	1.3975	1.4110	1.4250	1.4396	1.4546	1.4700	1.4858	1.5019	1.5183	1.5350
475	1.3973	1.4105	1.4242	1.4383	1.4529	1.4678	1.4832	1.4988	1.5146	1.5307
480	1.3971	1.4100	1.4233	1.4371	1.4513	1.4658	1.4806	1.4958	1.5111	1.5267
485	1.3970	1.4095	1.4225	1.4359	1.4497	1.4638	1.4782	1.4929	1.5077	1.5228
490	1.3968	1.4090	1.4217	1.4348	1.4481	1.4619	1.4758	1.4901	1.5045	1.5191
495	1.3966	1.4086	1.4209	1.4336	1.4467	1.4600	1.4736	1.4874	1.5014	1.5155
500	1.3964	1.4081	1.4201	1.4325	1.4452	1.4582	1.4714	1.4848	1.4984	1.5121
510	1.3960	1.4071	1.4186	1.4304	1.4424	1.4547	1.4672	1.4799	1.4927	1.5056
520	1.3955	1.4062	1.4171	1.4283	1.4398	1.4514	1.4633	1.4752	1.4873	1.4995
530	1.3951	1.4052	1.4157	1.4263	1.4372	1.4483	1.4595	1.4709	1.4823	1.4939
540	1.3946	1.4043	1.4143	1.4244	1.4348	1.4453	1.4560	1.4668	1.4776	1.4885
550	1.3940	1.4034	1.4129	1.4226	1.4325	1.4425	1.4527	1.4629	1.4732	1.4835
560	1.3935	1.4024	1.4115	1.4208	1.4302	1.4398	1.4495	1.4592	1.4690	1.4788
570	1.3929	1.4014	1.4102	1.4191	1.4281	1.4372	1.4464	1.4557	1.4650	1.4744
580	1.3923	1.4005	1.4088	1.4173	1.4260	1.4347	1.4435	1.4523	1.4612	1.4701
590	1.3917	1.3995	1.4075	1.4157	1.4239	1.4322	1.4406	1.4491	1.4576	1.4661
600	1.3910	1.3986	1.4062	1.4140	1.4219	1.4299	1.4379	1.4460	1.4541	1.4622
610	1.3903	1.3976	1.4050	1.4124	1.4200	1.4276	1.4353	1.4430	1.4508	1.4585
620	1.3896	1.3966	1.4037	1.4108	1.4181	1.4254	1.4328	1.4402	1.4476	1.4550
630	1.3889	1.3956	1.4024	1.4093	1.4162	1.4233	1.4303	1.4374	1.4445	1.4515
640	1.3881	1.3946	1.4011	1.4078	1.4144	1.4212	1.4279	1.4347	1.4415	1.4483
650	1.3873	1.3936	1.3999	1.4062	1.4127	1.4191	1.4256	1.4321	1.4386	1.4451
660	1.3865	1.3925	1.3986	1.4047	1.4109	1.4171	1.4233	1.4296	1.4358	1.4421
670	1.3857	1.3915	1.3974	1.4033	1.4092	1.4152	1.4211	1.4271	1.4331	1.4391
680	1.3849	1.3905	1.3961	1.4018	1.4075	1.4132	1.4190	1.4248	1.4305	1.4362
690	1.3841	1.3895	1.3949	1.4003	1.4058	1.4114	1.4169	1.4224	1.4280	1.4335
700	1.3832	1.3884	1.3936	1.3989	1.4042	1.4095	1.4149	1.4202	1.4255	1.4308

THERMODYNAMIC PROPERTIES OF OXYGEN

specific heat ratio

pressure, atm										
50	55	60	65	70	75	80	85	90	95	100
1.6569	1.6902	1.7249	1.7611	1.7990	1.8386	1.8801	1.9237	1.9696	2.0182	2.0698
1.6458	1.6771	1.7096	1.7433	1.7784	1.8149	1.8528	1.8923	1.9336	1.9768	2.0222
1.6355	1.6650	1.6955	1.7270	1.7596	1.7933	1.8282	1.8642	1.9015	1.9403	1.9806
1.6259	1.6538	1.6825	1.7121	1.7425	1.7738	1.8059	1.8389	1.8729	1.9079	1.9440
1.6170	1.6434	1.6705	1.6983	1.7268	1.7559	1.7857	1.8161	1.8472	1.8790	1.9115
1.6086	1.6337	1.6593	1.6856	1.7123	1.7396	1.7673	1.7955	1.8240	1.8531	1.8825
1.6007	1.6246	1.6489	1.6738	1.6990	1.7245	1.7504	1.7766	1.8030	1.8297	1.8565
1.5933	1.6161	1.6392	1.6628	1.6866	1.7107	1.7349	1.7594	1.7839	1.8085	1.8331
1.5864	1.6081	1.6302	1.6525	1.6751	1.6978	1.7207	1.7435	1.7664	1.7892	1.8119
1.5798	1.6006	1.6217	1.6429	1.6644	1.6859	1.7074	1.7289	1.7504	1.7716	1.7926
1.5736	1.5935	1.6137	1.6339	1.6543	1.6748	1.6952	1.7154	1.7356	1.7555	1.7750
1.5677	1.5868	1.6061	1.6255	1.6449	1.6644	1.6837	1.7029	1.7219	1.7406	1.7589
1.5622	1.5805	1.5990	1.6175	1.6361	1.6546	1.6730	1.6913	1.7092	1.7268	1.7440
1.5569	1.5745	1.5922	1.6100	1.6278	1.6455	1.6631	1.6804	1.6974	1.7140	1.7302
1.5518	1.5688	1.5859	1.6029	1.6200	1.6369	1.6537	1.6702	1.6864	1.7021	1.7175
1.5470	1.5634	1.5798	1.5962	1.6126	1.6288	1.6448	1.6606	1.6760	1.6910	1.7056
1.5424	1.5582	1.5740	1.5898	1.6056	1.6211	1.6365	1.6516	1.6663	1.6807	1.6945
1.5380	1.5532	1.5685	1.5838	1.5989	1.6139	1.6286	1.6431	1.6572	1.6709	1.6841
1.5338	1.5485	1.5633	1.5780	1.5926	1.6070	1.6212	1.6351	1.6486	1.6617	1.6743
1.5297	1.5440	1.5582	1.5724	1.5865	1.6004	1.6141	1.6275	1.6405	1.6531	1.6652
1.5258	1.5397	1.5534	1.5672	1.5808	1.5942	1.6074	1.6203	1.6328	1.6449	1.6565
1.5185	1.5315	1.5444	1.5573	1.5700	1.5825	1.5948	1.6068	1.6185	1.6297	1.6405
1.5117	1.5239	1.5361	1.5482	1.5601	1.5719	1.5834	1.5946	1.6055	1.6160	1.6261
1.5054	1.5169	1.5284	1.5398	1.5510	1.5621	1.5729	1.5834	1.5937	1.6035	1.6130
1.4995	1.5104	1.5212	1.5319	1.5425	1.5530	1.5632	1.5731	1.5828	1.5921	1.6009
1.4939	1.5042	1.5145	1.5246	1.5347	1.5445	1.5542	1.5636	1.5727	1.5815	1.5899
1.4886	1.4984	1.5082	1.5178	1.5273	1.5366	1.5458	1.5547	1.5633	1.5716	1.5796
1.4837	1.4930	1.5022	1.5114	1.5204	1.5293	1.5379	1.5464	1.5546	1.5625	1.5701
1.4790	1.4878	1.4966	1.5053	1.5139	1.5223	1.5306	1.5386	1.5464	1.5539	1.5611
1.4745	1.4830	1.4913	1.4996	1.5078	1.5158	1.5236	1.5313	1.5387	1.5459	1.5527
1.4703	1.4783	1.4863	1.4942	1.5020	1.5096	1.5171	1.5244	1.5315	1.5383	1.5448
1.4662	1.4739	1.4815	1.4890	1.4964	1.5037	1.5109	1.5178	1.5246	1.5311	1.5374
1.4623	1.4697	1.4769	1.4841	1.4912	1.4982	1.5050	1.5116	1.5181	1.5243	1.5303
1.4586	1.4656	1.4726	1.4794	1.4862	1.4929	1.4994	1.5057	1.5119	1.5179	1.5236
1.4550	1.4617	1.4684	1.4749	1.4814	1.4878	1.4940	1.5001	1.5060	1.5117	1.5172
1.4516	1.4580	1.4644	1.4707	1.4769	1.4830	1.4889	1.4947	1.5004	1.5059	1.5112
1.4483	1.4544	1.4605	1.4665	1.4725	1.4783	1.4840	1.4896	1.4950	1.5003	1.5054
1.4451	1.4510	1.4568	1.4626	1.4683	1.4739	1.4793	1.4847	1.4899	1.4949	1.4998
1.4420	1.4476	1.4532	1.4588	1.4642	1.4696	1.4748	1.4800	1.4850	1.4898	1.4945
1.4390	1.4444	1.4498	1.4551	1.4603	1.4655	1.4705	1.4755	1.4802	1.4849	1.4894
1.4361	1.4413	1.4465	1.4516	1.4566	1.4615	1.4664	1.4711	1.4757	1.4802	1.4845

TABLE IV. - Concluded.

(1) Ratio of plenum speed of sound to speed of Plenum

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	45
400	0.9028	0.8996	0.8964	0.8934	0.8906	0.8880	0.8857	0.8836	0.8820	0.8807
405	0.9084	0.9054	0.9024	0.8997	0.8971	0.8947	0.8925	0.8907	0.8892	0.8881
410	0.9140	0.9111	0.9084	0.9058	0.9034	0.9013	0.8993	0.8977	0.8964	0.8954
415	0.9195	0.9169	0.9143	0.9120	0.9098	0.9078	0.9060	0.9046	0.9034	0.9026
420	0.9250	0.9225	0.9202	0.9180	0.9160	0.9142	0.9126	0.9114	0.9104	0.9097
425	0.9304	0.9282	0.9260	0.9240	0.9222	0.9206	0.9192	0.9180	0.9172	0.9167
430	0.9359	0.9338	0.9318	0.9300	0.9283	0.9269	0.9256	0.9247	0.9240	0.9236
435	0.9412	0.9393	0.9375	0.9359	0.9344	0.9331	0.9320	0.9312	0.9306	0.9304
440	0.9466	0.9448	0.9432	0.9417	0.9404	0.9392	0.9383	0.9376	0.9372	0.9371
445	0.9519	0.9503	0.9488	0.9475	0.9463	0.9453	0.9445	0.9440	0.9437	0.9437
450	0.9572	0.9558	0.9544	0.9532	0.9522	0.9513	0.9507	0.9503	0.9501	0.9502
455	0.9625	0.9612	0.9600	0.9589	0.9580	0.9573	0.9568	0.9565	0.9565	0.9567
460	0.9677	0.9665	0.9655	0.9645	0.9638	0.9632	0.9628	0.9627	0.9627	0.9630
465	0.9729	0.9718	0.9709	0.9701	0.9695	0.9691	0.9688	0.9687	0.9689	0.9693
470	0.9780	0.9771	0.9763	0.9757	0.9752	0.9749	0.9747	0.9748	0.9750	0.9756
475	0.9832	0.9824	0.9817	0.9812	0.9808	0.9806	0.9806	0.9807	0.9811	0.9817
480	0.9883	0.9876	0.9871	0.9867	0.9864	0.9863	0.9864	0.9866	0.9871	0.9878
485	0.9934	0.9928	0.9924	0.9921	0.9919	0.9919	0.9921	0.9925	0.9930	0.9938
490	0.9984	0.9980	0.9976	0.9974	0.9974	0.9975	0.9978	0.9983	0.9989	0.9998
495	1.0034	1.0031	1.0029	1.0028	1.0028	1.0031	1.0034	1.0040	1.0047	1.0056
500	1.0084	1.0082	1.0081	1.0081	1.0082	1.0085	1.0090	1.0097	1.0105	1.0115
510	1.0183	1.0182	1.0183	1.0185	1.0189	1.0194	1.0200	1.0208	1.0218	1.0230
520	1.0280	1.0282	1.0285	1.0289	1.0294	1.0301	1.0309	1.0318	1.0330	1.0342
530	1.0377	1.0380	1.0385	1.0391	1.0397	1.0406	1.0415	1.0426	1.0439	1.0453
540	1.0473	1.0478	1.0484	1.0491	1.0499	1.0509	1.0520	1.0533	1.0546	1.0562
550	1.0567	1.0574	1.0581	1.0590	1.0600	1.0611	1.0623	1.0637	1.0652	1.0668
560	1.0661	1.0669	1.0678	1.0688	1.0699	1.0711	1.0725	1.0740	1.0756	1.0773
570	1.0753	1.0762	1.0773	1.0784	1.0797	1.0810	1.0825	1.0841	1.0858	1.0876
580	1.0845	1.0855	1.0867	1.0879	1.0893	1.0908	1.0924	1.0941	1.0959	1.0978
590	1.0935	1.0947	1.0960	1.0973	1.0988	1.1004	1.1021	1.1039	1.1058	1.1078
600	1.1025	1.1038	1.1052	1.1066	1.1082	1.1099	1.1117	1.1136	1.1155	1.1176
610	1.1114	1.1128	1.1142	1.1158	1.1175	1.1193	1.1212	1.1231	1.1252	1.1273
620	1.1202	1.1216	1.1232	1.1249	1.1267	1.1285	1.1305	1.1325	1.1347	1.1369
630	1.1289	1.1304	1.1321	1.1339	1.1357	1.1377	1.1397	1.1418	1.1440	1.1463
640	1.1375	1.1391	1.1409	1.1427	1.1447	1.1467	1.1488	1.1510	1.1533	1.1556
650	1.1460	1.1478	1.1496	1.1515	1.1535	1.1556	1.1578	1.1601	1.1624	1.1648
660	1.1545	1.1563	1.1582	1.1602	1.1623	1.1644	1.1667	1.1690	1.1714	1.1738
670	1.1628	1.1647	1.1667	1.1688	1.1709	1.1732	1.1755	1.1778	1.1803	1.1828
680	1.1711	1.1731	1.1752	1.1773	1.1795	1.1818	1.1841	1.1866	1.1891	1.1916
690	1.1794	1.1814	1.1835	1.1857	1.1880	1.1903	1.1927	1.1952	1.1977	1.2003
700	1.1875	1.1896	1.1918	1.1940	1.1964	1.1988	1.2012	1.2037	1.2063	1.2089

THERMODYNAMIC PROPERTIES OF OXYGEN

sound at 1 atmosphere and 491.688° R (1032.87 ft/sec)

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
0.8799	0.8796	0.8799	0.8808	0.8825	0.8850	0.8884	0.8928	0.8985	0.9055	0.9140
0.8875	0.8873	0.8877	0.8887	0.8904	0.8928	0.8961	0.9004	0.9058	0.9124	0.9203
0.8949	0.8949	0.8953	0.8964	0.8981	0.9005	0.9038	0.9079	0.9130	0.9192	0.9267
0.9023	0.9023	0.9029	0.9040	0.9057	0.9081	0.9113	0.9152	0.9201	0.9260	0.9331
0.9095	0.9097	0.9103	0.9115	0.9132	0.9156	0.9186	0.9225	0.9272	0.9328	0.9394
0.9166	0.9169	0.9176	0.9188	0.9206	0.9229	0.9259	0.9296	0.9341	0.9395	0.9458
0.9236	0.9240	0.9248	0.9260	0.9278	0.9301	0.9331	0.9367	0.9410	0.9462	0.9522
0.9305	0.9310	0.9318	0.9331	0.9349	0.9373	0.9402	0.9437	0.9479	0.9528	0.9585
0.9373	0.9379	0.9388	0.9402	0.9420	0.9443	0.9471	0.9506	0.9546	0.9593	0.9648
0.9440	0.9447	0.9457	0.9471	0.9489	0.9512	0.9540	0.9574	0.9613	0.9659	0.9711
0.9506	0.9514	0.9524	0.9539	0.9558	0.9581	0.9608	0.9641	0.9679	0.9723	0.9774
0.9572	0.9580	0.9591	0.9606	0.9625	0.9648	0.9675	0.9708	0.9745	0.9788	0.9836
0.9636	0.9645	0.9657	0.9673	0.9692	0.9715	0.9742	0.9773	0.9810	0.9851	0.9898
0.9700	0.9710	0.9722	0.9738	0.9757	0.9780	0.9807	0.9838	0.9874	0.9914	0.9960
0.9763	0.9773	0.9787	0.9803	0.9822	0.9845	0.9872	0.9903	0.9938	0.9977	1.0021
0.9825	0.9836	0.9850	0.9867	0.9887	0.9910	0.9936	0.9967	1.0001	1.0039	1.0082
0.9887	0.9899	0.9913	0.9930	0.9950	0.9973	1.0000	1.0030	1.0063	1.0101	1.0142
0.9948	0.9960	0.9975	0.9993	1.0013	1.0036	1.0062	1.0092	1.0125	1.0162	1.0202
1.0008	1.0021	1.0036	1.0054	1.0075	1.0098	1.0124	1.0154	1.0186	1.0222	1.0262
1.0068	1.0081	1.0097	1.0115	1.0136	1.0160	1.0186	1.0215	1.0247	1.0282	1.0321
1.0127	1.0141	1.0157	1.0176	1.0197	1.0220	1.0246	1.0275	1.0307	1.0342	1.0380
1.0243	1.0258	1.0275	1.0295	1.0316	1.0340	1.0366	1.0395	1.0426	1.0459	1.0496
1.0357	1.0373	1.0391	1.0411	1.0433	1.0457	1.0483	1.0512	1.0542	1.0575	1.0610
1.0469	1.0486	1.0505	1.0525	1.0548	1.0572	1.0598	1.0626	1.0657	1.0689	1.0723
1.0578	1.0596	1.0616	1.0637	1.0660	1.0685	1.0711	1.0739	1.0769	1.0801	1.0834
1.0686	1.0705	1.0725	1.0747	1.0771	1.0796	1.0822	1.0850	1.0879	1.0910	1.0943
1.0792	1.0812	1.0833	1.0855	1.0879	1.0904	1.0931	1.0959	1.0988	1.1019	1.1051
1.0896	1.0916	1.0938	1.0961	1.0985	1.1011	1.1038	1.1066	1.1095	1.1125	1.1157
1.0998	1.1019	1.1042	1.1065	1.1090	1.1116	1.1143	1.1171	1.1200	1.1230	1.1261
1.1099	1.1121	1.1144	1.1168	1.1193	1.1219	1.1246	1.1274	1.1303	1.1333	1.1363
1.1198	1.1221	1.1244	1.1269	1.1294	1.1320	1.1348	1.1376	1.1404	1.1434	1.1465
1.1296	1.1319	1.1343	1.1368	1.1394	1.1420	1.1448	1.1476	1.1504	1.1534	1.1564
1.1392	1.1416	1.1440	1.1466	1.1492	1.1519	1.1546	1.1574	1.1603	1.1632	1.1662
1.1487	1.1511	1.1536	1.1562	1.1588	1.1615	1.1643	1.1671	1.1700	1.1729	1.1759
1.1580	1.1605	1.1631	1.1657	1.1683	1.1711	1.1739	1.1767	1.1796	1.1825	1.1854
1.1672	1.1698	1.1724	1.1750	1.1777	1.1805	1.1833	1.1861	1.1890	1.1919	1.1948
1.1763	1.1789	1.1815	1.1842	1.1870	1.1897	1.1925	1.1954	1.1983	1.2012	1.2041
1.1853	1.1879	1.1906	1.1933	1.1961	1.1989	1.2017	1.2045	1.2074	1.2103	1.2132
1.1942	1.1968	1.1995	1.2023	1.2051	1.2079	1.2107	1.2136	1.2165	1.2194	1.2223
1.2030	1.2056	1.2084	1.2111	1.2139	1.2168	1.2196	1.2225	1.2254	1.2283	1.2312
1.2116	1.2143	1.2171	1.2199	1.2227	1.2256	1.2284	1.2313	1.2342	1.2371	1.2400

TABLE V. - THERMODYNAMIC

(a) Critical-

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
175	0.7193	0.7218	0.7242	0.7266	0.7289	0.7311	0.7332	0.7353	0.7373	0.7392
180	0.7185	0.7208	0.7230	0.7251	0.7272	0.7292	0.7312	0.7331	0.7349	0.7367
185	0.7177	0.7198	0.7218	0.7237	0.7256	0.7275	0.7293	0.7310	0.7326	0.7342
190	0.7169	0.7187	0.7206	0.7224	0.7241	0.7258	0.7274	0.7290	0.7305	0.7319
195	0.7160	0.7177	0.7194	0.7210	0.7226	0.7241	0.7256	0.7270	0.7284	0.7297
200	0.7151	0.7167	0.7182	0.7197	0.7211	0.7225	0.7239	0.7252	0.7264	0.7276
205	0.7142	0.7157	0.7171	0.7184	0.7197	0.7210	0.7222	0.7234	0.7245	0.7256
210	0.7134	0.7147	0.7159	0.7172	0.7183	0.7195	0.7206	0.7216	0.7227	0.7236
215	0.7125	0.7137	0.7148	0.7159	0.7170	0.7180	0.7190	0.7200	0.7209	0.7218
220	0.7116	0.7127	0.7137	0.7147	0.7157	0.7166	0.7175	0.7184	0.7192	0.7200
225	0.7107	0.7117	0.7126	0.7136	0.7144	0.7153	0.7161	0.7168	0.7176	0.7183
230	0.7098	0.7107	0.7116	0.7124	0.7132	0.7140	0.7147	0.7154	0.7160	0.7166
235	0.7090	0.7098	0.7106	0.7113	0.7120	0.7127	0.7133	0.7139	0.7145	0.7151
240	0.7081	0.7089	0.7096	0.7102	0.7109	0.7115	0.7120	0.7126	0.7131	0.7136
245	0.7073	0.7080	0.7086	0.7092	0.7098	0.7103	0.7108	0.7113	0.7117	0.7121
250	0.7065	0.7071	0.7077	0.7082	0.7087	0.7091	0.7096	0.7100	0.7104	0.7107
255	0.7057	0.7062	0.7067	0.7072	0.7076	0.7081	0.7084	0.7088	0.7091	0.7094
260	0.7050	0.7054	0.7059	0.7063	0.7066	0.7070	0.7073	0.7076	0.7079	0.7082
265	0.7042	0.7046	0.7050	0.7053	0.7057	0.7060	0.7063	0.7065	0.7068	0.7070
270	0.7035	0.7038	0.7042	0.7045	0.7048	0.7050	0.7052	0.7055	0.7057	0.7058
275	0.7028	0.7031	0.7034	0.7036	0.7039	0.7041	0.7043	0.7044	0.7046	0.7047
280	0.7021	0.7024	0.7026	0.7028	0.7030	0.7032	0.7033	0.7035	0.7036	0.7037
285	0.7014	0.7017	0.7019	0.7020	0.7022	0.7023	0.7024	0.7025	0.7026	0.7027
290	0.7008	0.7010	0.7011	0.7013	0.7014	0.7015	0.7016	0.7017	0.7017	0.7017
295	0.7002	0.7003	0.7005	0.7006	0.7006	0.7007	0.7008	0.7008	0.7008	0.7008
300	0.6996	0.6997	0.6998	0.6999	0.6999	0.7000	0.7000	0.7000	0.7000	0.7000
305	0.6990	0.6991	0.6992	0.6992	0.6992	0.6992	0.6992	0.6992	0.6992	0.6991
310	0.6985	0.6985	0.6985	0.6986	0.6986	0.6986	0.6985	0.6985	0.6984	0.6984
315	0.6979	0.6980	0.6980	0.6980	0.6979	0.6979	0.6978	0.6978	0.6977	0.6976
320	0.6974	0.6974	0.6974	0.6974	0.6973	0.6973	0.6972	0.6971	0.6970	0.6969
325	0.6969	0.6969	0.6969	0.6968	0.6967	0.6966	0.6966	0.6964	0.6963	0.6962
330	0.6965	0.6964	0.6963	0.6963	0.6962	0.6961	0.6960	0.6958	0.6957	0.6955
335	0.6960	0.6959	0.6958	0.6957	0.6956	0.6955	0.6954	0.6952	0.6951	0.6949
340	0.6956	0.6955	0.6954	0.6952	0.6951	0.6950	0.6948	0.6947	0.6945	0.6943
345	0.6951	0.6950	0.6949	0.6948	0.6946	0.6945	0.6943	0.6941	0.6939	0.6937
350	0.6947	0.6946	0.6944	0.6943	0.6941	0.6940	0.6938	0.6936	0.6934	0.6932
360	0.6939	0.6938	0.6936	0.6934	0.6932	0.6930	0.6928	0.6926	0.6924	0.6922
370	0.6932	0.6930	0.6928	0.6926	0.6924	0.6922	0.6920	0.6917	0.6915	0.6912
380	0.6925	0.6923	0.6921	0.6919	0.6916	0.6914	0.6911	0.6909	0.6906	0.6904
390	0.6919	0.6917	0.6914	0.6912	0.6909	0.6907	0.6904	0.6901	0.6898	0.6896
400	0.6913	0.6911	0.6908	0.6905	0.6903	0.6900	0.6897	0.6894	0.6891	0.6888
410	0.6908	0.6905	0.6902	0.6899	0.6897	0.6894	0.6891	0.6888	0.6885	0.6882
420	0.6903	0.6900	0.6897	0.6894	0.6891	0.6888	0.6885	0.6882	0.6879	0.6876
430	0.6898	0.6895	0.6892	0.6889	0.6886	0.6883	0.6880	0.6876	0.6873	0.6870
440	0.6894	0.6891	0.6887	0.6884	0.6881	0.6878	0.6875	0.6871	0.6868	0.6865
450	0.6890	0.6886	0.6883	0.6880	0.6877	0.6873	0.6870	0.6867	0.6863	0.6860
460	0.6886	0.6883	0.6879	0.6876	0.6873	0.6869	0.6866	0.6863	0.6859	0.6856
470	0.6882	0.6879	0.6876	0.6872	0.6869	0.6866	0.6862	0.6859	0.6855	0.6852
480	0.6879	0.6876	0.6872	0.6869	0.6866	0.6862	0.6859	0.6855	0.6852	0.6848
490	0.6876	0.6873	0.6869	0.6866	0.6862	0.6859	0.6855	0.6852	0.6848	0.6845
500	0.6874	0.6870	0.6867	0.6863	0.6860	0.6856	0.6852	0.6849	0.6845	0.6842
510	0.6871	0.6868	0.6864	0.6860	0.6857	0.6853	0.6850	0.6846	0.6842	0.6839
520	0.6869	0.6865	0.6862	0.6858	0.6855	0.6851	0.6847	0.6844	0.6840	0.6836
530	0.6867	0.6863	0.6859	0.6856	0.6852	0.6849	0.6845	0.6841	0.6838	0.6834
540	0.6865	0.6861	0.6857	0.6854	0.6850	0.6847	0.6843	0.6839	0.6836	0.6832
550	0.6863	0.6859	0.6856	0.6852	0.6848	0.6845	0.6841	0.6837	0.6834	0.6830
560	0.6861	0.6858	0.6854	0.6850	0.6847	0.6843	0.6839	0.6836	0.6832	0.6828
570	0.6860	0.6856	0.6852	0.6849	0.6845	0.6841	0.6838	0.6834	0.6830	0.6827
580	0.6858	0.6855	0.6851	0.6847	0.6844	0.6840	0.6836	0.6833	0.6829	0.6825
590	0.6857	0.6853	0.6850	0.6846	0.6842	0.6839	0.6835	0.6831	0.6828	0.6824
600	0.6856	0.6852	0.6849	0.6845	0.6841	0.6838	0.6834	0.6830	0.6827	0.6823
610	0.6855	0.6851	0.6847	0.6844	0.6840	0.6836	0.6833	0.6829	0.6825	0.6822
620	0.6854	0.6850	0.6846	0.6843	0.6839	0.6835	0.6832	0.6828	0.6825	0.6821
630	0.6853	0.6849	0.6846	0.6842	0.6838	0.6835	0.6831	0.6827	0.6824	0.6820
640	0.6852	0.6848	0.6845	0.6841	0.6837	0.6834	0.6830	0.6826	0.6823	0.6819
650	0.6851	0.6848	0.6844	0.6840	0.6837	0.6833	0.6829	0.6826	0.6822	0.6819
660	0.6850	0.6847	0.6843	0.6840	0.6836	0.6832	0.6829	0.6825	0.6821	0.6818
670	0.6850	0.6846	0.6843	0.6839	0.6835	0.6832	0.6828	0.6825	0.6821	0.6817
680	0.6849	0.6846	0.6842	0.6838	0.6835	0.6831	0.6828	0.6824	0.6820	0.6817
690	0.6849	0.6845	0.6841	0.6838	0.6834	0.6831	0.6827	0.6824	0.6820	0.6816
700	0.6848	0.6844	0.6841	0.6837	0.6834	0.6830	0.6827	0.6823	0.6820	0.6816

PROPERTIES OF NORMAL HYDROGEN

flow factor

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
0.7411	0.7428	0.7445	0.7461	0.7476	0.7490	0.7504	0.7516	0.7528	0.7539	0.7549
0.7383	0.7399	0.7415	0.7429	0.7443	0.7456	0.7469	0.7480	0.7491	0.7501	0.7510
0.7358	0.7372	0.7386	0.7400	0.7412	0.7424	0.7435	0.7446	0.7456	0.7465	0.7474
0.7333	0.7346	0.7359	0.7371	0.7383	0.7394	0.7404	0.7414	0.7423	0.7431	0.7439
0.7310	0.7322	0.7333	0.7344	0.7355	0.7365	0.7374	0.7383	0.7391	0.7399	0.7406
0.7287	0.7298	0.7309	0.7319	0.7328	0.7337	0.7345	0.7353	0.7360	0.7367	0.7374
0.7266	0.7276	0.7285	0.7294	0.7303	0.7311	0.7318	0.7325	0.7331	0.7337	0.7343
0.7246	0.7254	0.7263	0.7271	0.7278	0.7285	0.7292	0.7298	0.7304	0.7309	0.7314
0.7226	0.7234	0.7241	0.7248	0.7255	0.7261	0.7267	0.7272	0.7277	0.7282	0.7286
0.7207	0.7214	0.7221	0.7227	0.7233	0.7238	0.7243	0.7248	0.7252	0.7256	0.7259
0.7189	0.7196	0.7201	0.7207	0.7212	0.7217	0.7221	0.7225	0.7228	0.7232	0.7234
0.7172	0.7178	0.7183	0.7187	0.7192	0.7196	0.7200	0.7203	0.7206	0.7208	0.7211
0.7156	0.7160	0.7165	0.7169	0.7173	0.7176	0.7179	0.7182	0.7184	0.7186	0.7188
0.7140	0.7144	0.7148	0.7151	0.7155	0.7157	0.7160	0.7162	0.7164	0.7166	0.7167
0.7125	0.7129	0.7132	0.7135	0.7137	0.7140	0.7142	0.7144	0.7145	0.7146	0.7147
0.7111	0.7114	0.7116	0.7119	0.7121	0.7123	0.7124	0.7126	0.7127	0.7127	0.7128
0.7097	0.7100	0.7102	0.7104	0.7105	0.7107	0.7108	0.7109	0.7110	0.7110	0.7110
0.7084	0.7086	0.7088	0.7089	0.7091	0.7092	0.7092	0.7093	0.7093	0.7093	0.7093
0.7072	0.7073	0.7075	0.7076	0.7077	0.7077	0.7078	0.7078	0.7078	0.7077	0.7077
0.7060	0.7061	0.7062	0.7063	0.7063	0.7064	0.7064	0.7063	0.7063	0.7063	0.7062
0.7048	0.7049	0.7050	0.7050	0.7051	0.7051	0.7050	0.7050	0.7049	0.7048	0.7047
0.7038	0.7038	0.7038	0.7039	0.7038	0.7038	0.7038	0.7037	0.7036	0.7035	0.7034
0.7027	0.7028	0.7028	0.7027	0.7027	0.7026	0.7026	0.7025	0.7024	0.7022	0.7021
0.7017	0.7017	0.7017	0.7017	0.7016	0.7015	0.7014	0.7013	0.7012	0.7010	0.7009
0.7008	0.7008	0.7007	0.7007	0.7006	0.7005	0.7004	0.7002	0.7001	0.6999	0.6997
0.6999	0.6999	0.6998	0.6997	0.6996	0.6995	0.6993	0.6992	0.6990	0.6988	0.6986
0.6991	0.6990	0.6989	0.6988	0.6987	0.6985	0.6984	0.6982	0.6980	0.6978	0.6976
0.6983	0.6982	0.6980	0.6979	0.6978	0.6976	0.6974	0.6972	0.6970	0.6968	0.6966
0.6975	0.6974	0.6972	0.6971	0.6969	0.6967	0.6966	0.6964	0.6961	0.6959	0.6957
0.6968	0.6966	0.6965	0.6963	0.6961	0.6959	0.6957	0.6955	0.6953	0.6950	0.6948
0.6961	0.6959	0.6957	0.6955	0.6954	0.6951	0.6949	0.6947	0.6945	0.6942	0.6939
0.6954	0.6952	0.6950	0.6948	0.6946	0.6944	0.6942	0.6939	0.6937	0.6934	0.6931
0.6947	0.6945	0.6944	0.6941	0.6939	0.6937	0.6934	0.6932	0.6929	0.6927	0.6924
0.6941	0.6939	0.6937	0.6935	0.6933	0.6930	0.6928	0.6925	0.6922	0.6919	0.6917
0.6935	0.6933	0.6931	0.6929	0.6926	0.6924	0.6921	0.6918	0.6916	0.6913	0.6910
0.6930	0.6927	0.6925	0.6923	0.6920	0.6918	0.6915	0.6912	0.6909	0.6906	0.6903
0.6919	0.6917	0.6914	0.6912	0.6909	0.6906	0.6903	0.6900	0.6897	0.6894	0.6891
0.6910	0.6907	0.6904	0.6901	0.6899	0.6896	0.6893	0.6889	0.6886	0.6883	0.6880
0.6901	0.6898	0.6895	0.6892	0.6889	0.6886	0.6883	0.6880	0.6876	0.6873	0.6870
0.6893	0.6890	0.6887	0.6884	0.6881	0.6877	0.6874	0.6871	0.6867	0.6864	0.6861
0.6885	0.6882	0.6879	0.6876	0.6873	0.6869	0.6866	0.6863	0.6859	0.6856	0.6852
0.6879	0.6875	0.6872	0.6869	0.6865	0.6862	0.6859	0.6855	0.6852	0.6848	0.6845
0.6872	0.6869	0.6866	0.6862	0.6859	0.6855	0.6852	0.6848	0.6845	0.6841	0.6838
0.6867	0.6863	0.6860	0.6856	0.6853	0.6849	0.6846	0.6842	0.6839	0.6835	0.6831
0.6861	0.6858	0.6854	0.6851	0.6847	0.6844	0.6840	0.6837	0.6833	0.6829	0.6826
0.6857	0.6853	0.6850	0.6846	0.6842	0.6839	0.6835	0.6832	0.6828	0.6824	0.6820
0.6852	0.6849	0.6845	0.6841	0.6838	0.6834	0.6831	0.6827	0.6823	0.6819	0.6816
0.6848	0.6845	0.6841	0.6837	0.6834	0.6830	0.6826	0.6823	0.6819	0.6815	0.6811
0.6844	0.6841	0.6837	0.6834	0.6830	0.6826	0.6822	0.6819	0.6815	0.6811	0.6807
0.6841	0.6837	0.6834	0.6830	0.6826	0.6823	0.6819	0.6815	0.6811	0.6808	0.6804
0.6838	0.6834	0.6831	0.6827	0.6823	0.6820	0.6816	0.6812	0.6808	0.6804	0.6801
0.6835	0.6832	0.6828	0.6824	0.6820	0.6817	0.6813	0.6809	0.6805	0.6802	0.6798
0.6833	0.6829	0.6825	0.6822	0.6818	0.6814	0.6810	0.6807	0.6803	0.6799	0.6795
0.6830	0.6827	0.6823	0.6819	0.6815	0.6812	0.6808	0.6804	0.6800	0.6797	0.6793
0.6828	0.6825	0.6821	0.6817	0.6813	0.6810	0.6806	0.6802	0.6798	0.6794	0.6791
0.6826	0.6823	0.6819	0.6815	0.6811	0.6808	0.6804	0.6800	0.6796	0.6793	0.6789
0.6825	0.6821	0.6817	0.6813	0.6810	0.6806	0.6802	0.6798	0.6795	0.6791	0.6787
0.6823	0.6819	0.6816	0.6812	0.6808	0.6804	0.6801	0.6797	0.6793	0.6789	0.6786
0.6822	0.6818	0.6814	0.6810	0.6807	0.6803	0.6799	0.6796	0.6792	0.6788	0.6784
0.6820	0.6817	0.6813	0.6809	0.6805	0.6802	0.6798	0.6794	0.6791	0.6787	0.6783
0.6819	0.6815	0.6812	0.6808	0.6804	0.6801	0.6797	0.6793	0.6789	0.6786	0.6782
0.6818	0.6814	0.6811	0.6807	0.6803	0.6800	0.6796	0.6792	0.6789	0.6785	0.6781
0.6817	0.6813	0.6810	0.6806	0.6802	0.6799	0.6795	0.6791	0.6788	0.6784	0.6780
0.6816	0.6813	0.6809	0.6805	0.6802	0.6798	0.6794	0.6791	0.6787	0.6783	0.6780
0.6816	0.6812	0.6808	0.6805	0.6801	0.6797	0.6794	0.6790	0.6786	0.6783	0.6779
0.6815	0.6811	0.6808	0.6804	0.6800	0.6797	0.6793	0.6789	0.6786	0.6782	0.6778
0.6814	0.6811	0.6807	0.6803	0.6800	0.6796	0.6793	0.6789	0.6785	0.6782	0.6778
0.6814	0.6810	0.6806	0.6803	0.6799	0.6796	0.6792	0.6788	0.6785	0.6781	0.6778
0.6813	0.6810	0.6806	0.6802	0.6799	0.6795	0.6792	0.6788	0.6784	0.6781	0.6777
0.6813	0.6809	0.6806	0.6802	0.6798	0.6795	0.6791	0.6788	0.6784	0.6781	0.6777
0.6812	0.6809	0.6805	0.6802	0.6798	0.6795	0.6791	0.6788	0.6784	0.6780	0.6777

TABLE V. - Continued.

(b) Ratio of nozzle-throat velocity to speed of

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
175	0.5613	0.5613	0.5614	0.5616	0.5620	0.5625	0.5631	0.5639	0.5647	0.5658
180	0.5691	0.5692	0.5695	0.5698	0.5703	0.5709	0.5716	0.5724	0.5734	0.5745
185	0.5768	0.5770	0.5774	0.5778	0.5784	0.5791	0.5799	0.5809	0.5819	0.5831
190	0.5843	0.5846	0.5851	0.5857	0.5864	0.5872	0.5881	0.5891	0.5902	0.5915
195	0.5917	0.5921	0.5927	0.5934	0.5942	0.5951	0.5961	0.5972	0.5984	0.5997
200	0.5989	0.5995	0.6002	0.6010	0.6019	0.6029	0.6039	0.6051	0.6064	0.6078
205	0.6061	0.6067	0.6075	0.6084	0.6094	0.6104	0.6116	0.6128	0.6142	0.6156
210	0.6131	0.6138	0.6147	0.6157	0.6167	0.6179	0.6191	0.6204	0.6218	0.6233
215	0.6200	0.6208	0.6218	0.6228	0.6239	0.6251	0.6264	0.6278	0.6292	0.6308
220	0.6267	0.6277	0.6287	0.6298	0.6310	0.6323	0.6336	0.6350	0.6365	0.6381
225	0.6334	0.6344	0.6355	0.6367	0.6379	0.6393	0.6406	0.6421	0.6436	0.6453
230	0.6400	0.6411	0.6422	0.6435	0.6448	0.6461	0.6476	0.6491	0.6506	0.6523
235	0.6465	0.6476	0.6488	0.6501	0.6515	0.6529	0.6543	0.6559	0.6575	0.6592
240	0.6529	0.6541	0.6553	0.6567	0.6580	0.6595	0.6610	0.6626	0.6642	0.6659
245	0.6592	0.6604	0.6617	0.6631	0.6645	0.6660	0.6676	0.6692	0.6708	0.6725
250	0.6654	0.6667	0.6680	0.6694	0.6709	0.6724	0.6740	0.6756	0.6773	0.6791
255	0.6715	0.6729	0.6743	0.6757	0.6772	0.6787	0.6803	0.6820	0.6837	0.6855
260	0.6776	0.6790	0.6804	0.6819	0.6834	0.6850	0.6866	0.6883	0.6900	0.6918
265	0.6836	0.6850	0.6865	0.6880	0.6895	0.6911	0.6928	0.6945	0.6962	0.6980
270	0.6895	0.6910	0.6925	0.6940	0.6956	0.6972	0.6989	0.7006	0.7023	0.7041
275	0.6954	0.6969	0.6984	0.6999	0.7015	0.7032	0.7049	0.7066	0.7084	0.7102
280	0.7012	0.7027	0.7042	0.7058	0.7074	0.7091	0.7108	0.7125	0.7143	0.7161
285	0.7069	0.7085	0.7100	0.7116	0.7133	0.7149	0.7167	0.7184	0.7202	0.7220
290	0.7126	0.7142	0.7158	0.7174	0.7190	0.7207	0.7225	0.7242	0.7260	0.7279
295	0.7183	0.7198	0.7215	0.7231	0.7248	0.7265	0.7282	0.7300	0.7318	0.7336
300	0.7239	0.7255	0.7271	0.7287	0.7304	0.7321	0.7339	0.7357	0.7375	0.7393
305	0.7294	0.7310	0.7327	0.7343	0.7360	0.7378	0.7395	0.7413	0.7431	0.7450
310	0.7349	0.7365	0.7382	0.7399	0.7416	0.7433	0.7451	0.7469	0.7487	0.7506
315	0.7404	0.7420	0.7437	0.7454	0.7471	0.7488	0.7506	0.7524	0.7543	0.7561
320	0.7458	0.7475	0.7491	0.7508	0.7526	0.7543	0.7561	0.7579	0.7598	0.7616
325	0.7512	0.7529	0.7545	0.7563	0.7580	0.7598	0.7615	0.7634	0.7652	0.7671
330	0.7565	0.7582	0.7599	0.7616	0.7634	0.7652	0.7669	0.7688	0.7706	0.7725
335	0.7618	0.7635	0.7652	0.7670	0.7687	0.7705	0.7723	0.7741	0.7760	0.7778
340	0.7671	0.7688	0.7705	0.7723	0.7740	0.7758	0.7776	0.7794	0.7813	0.7832
345	0.7724	0.7741	0.7758	0.7775	0.7793	0.7811	0.7829	0.7847	0.7866	0.7884
350	0.7776	0.7793	0.7810	0.7828	0.7845	0.7863	0.7881	0.7900	0.7918	0.7937
360	0.7879	0.7896	0.7914	0.7931	0.7949	0.7967	0.7985	0.8003	0.8022	0.8041
370	0.7981	0.7998	0.8016	0.8033	0.8051	0.8069	0.8088	0.8106	0.8124	0.8143
380	0.8081	0.8099	0.8117	0.8134	0.8152	0.8170	0.8189	0.8207	0.8225	0.8244
390	0.8181	0.8198	0.8216	0.8234	0.8252	0.8270	0.8288	0.8307	0.8325	0.8344
400	0.8279	0.8297	0.8315	0.8332	0.8350	0.8369	0.8387	0.8405	0.8424	0.8442
410	0.8376	0.8394	0.8412	0.8430	0.8448	0.8466	0.8484	0.8502	0.8521	0.8539
420	0.8473	0.8490	0.8508	0.8526	0.8544	0.8562	0.8580	0.8599	0.8617	0.8635
430	0.8568	0.8586	0.8603	0.8621	0.8639	0.8657	0.8676	0.8694	0.8712	0.8731
440	0.8662	0.8680	0.8698	0.8716	0.8734	0.8752	0.8770	0.8788	0.8806	0.8825
450	0.8756	0.8773	0.8791	0.8809	0.8827	0.8845	0.8863	0.8881	0.8900	0.8918
460	0.8848	0.8866	0.8884	0.8901	0.8919	0.8937	0.8955	0.8973	0.8992	0.9010
470	0.8940	0.8957	0.8975	0.8993	0.9011	0.9029	0.9047	0.9065	0.9083	0.9101
480	0.9030	0.9048	0.9066	0.9083	0.9101	0.9119	0.9137	0.9155	0.9173	0.9191
490	0.9120	0.9138	0.9156	0.9173	0.9191	0.9209	0.9227	0.9245	0.9263	0.9281
500	0.9209	0.9227	0.9245	0.9262	0.9280	0.9298	0.9316	0.9333	0.9351	0.9369
510	0.9298	0.9315	0.9333	0.9351	0.9368	0.9386	0.9404	0.9421	0.9439	0.9457
520	0.9385	0.9403	0.9420	0.9438	0.9456	0.9473	0.9491	0.9509	0.9526	0.9544
530	0.9472	0.9490	0.9507	0.9525	0.9542	0.9560	0.9577	0.9595	0.9613	0.9630
540	0.9559	0.9576	0.9593	0.9611	0.9628	0.9646	0.9663	0.9681	0.9698	0.9716
550	0.9644	0.9661	0.9679	0.9696	0.9714	0.9731	0.9748	0.9766	0.9783	0.9801
560	0.9729	0.9746	0.9764	0.9781	0.9798	0.9815	0.9833	0.9850	0.9868	0.9885
570	0.9813	0.9830	0.9848	0.9865	0.9882	0.9899	0.9917	0.9934	0.9951	0.9969
580	0.9897	0.9914	0.9931	0.9948	0.9965	0.9983	1.0000	1.0017	1.0034	1.0051
590	0.9980	0.9997	1.0014	1.0031	1.0048	1.0065	1.0082	1.0099	1.0116	1.0134
600	1.0062	1.0079	1.0096	1.0113	1.0130	1.0147	1.0164	1.0181	1.0198	1.0215
610	1.0144	1.0161	1.0178	1.0195	1.0212	1.0228	1.0245	1.0262	1.0279	1.0296
620	1.0225	1.0242	1.0259	1.0276	1.0292	1.0309	1.0326	1.0343	1.0360	1.0377
630	1.0306	1.0323	1.0339	1.0356	1.0373	1.0390	1.0406	1.0423	1.0440	1.0457
640	1.0386	1.0403	1.0419	1.0436	1.0453	1.0469	1.0486	1.0503	1.0519	1.0536
650	1.0465	1.0482	1.0499	1.0515	1.0532	1.0548	1.0565	1.0581	1.0598	1.0615
660	1.0544	1.0561	1.0577	1.0594	1.0610	1.0627	1.0643	1.0660	1.0676	1.0693
670	1.0623	1.0639	1.0656	1.0672	1.0688	1.0705	1.0721	1.0738	1.0754	1.0771
680	1.0701	1.0717	1.0733	1.0750	1.0766	1.0782	1.0799	1.0815	1.0831	1.0848
690	1.0778	1.0794	1.0811	1.0827	1.0843	1.0859	1.0876	1.0892	1.0908	1.0924
700	1.0855	1.0871	1.0887	1.0904	1.0920	1.0936	1.0952	1.0968	1.0984	1.1000

THERMODYNAMIC PROPERTIES OF NORMAL HYDROGEN

sound at 1 atmosphere and 491.688° R (4137.10 ft/sec)

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
0.5669	0.5682	0.5696	0.5711	0.5727	0.5745	0.5764	0.5784	0.5806	0.5829	0.5853
0.5757	0.5770	0.5784	0.5800	0.5816	0.5834	0.5853	0.5873	0.5894	0.5917	0.5940
0.5843	0.5857	0.5872	0.5888	0.5905	0.5923	0.5942	0.5962	0.5984	0.6006	0.6030
0.5928	0.5942	0.5958	0.5974	0.5992	0.6011	0.6030	0.6051	0.6072	0.6095	0.6118
0.6011	0.6026	0.6042	0.6059	0.6077	0.6096	0.6116	0.6137	0.6159	0.6182	0.6205
0.6092	0.6108	0.6124	0.6142	0.6160	0.6180	0.6200	0.6221	0.6243	0.6266	0.6290
0.6171	0.6187	0.6204	0.6222	0.6241	0.6261	0.6281	0.6303	0.6325	0.6348	0.6372
0.6248	0.6265	0.6283	0.6301	0.6320	0.6340	0.6361	0.6382	0.6405	0.6428	0.6452
0.6324	0.6341	0.6359	0.6377	0.6397	0.6417	0.6438	0.6460	0.6482	0.6505	0.6530
0.6397	0.6415	0.6433	0.6452	0.6471	0.6492	0.6513	0.6535	0.6557	0.6581	0.6605
0.6469	0.6487	0.6505	0.6524	0.6544	0.6565	0.6586	0.6608	0.6630	0.6654	0.6678
0.6540	0.6558	0.6576	0.6596	0.6615	0.6636	0.6657	0.6679	0.6702	0.6725	0.6749
0.6609	0.6627	0.6646	0.6665	0.6685	0.6706	0.6727	0.6749	0.6772	0.6795	0.6818
0.6677	0.6695	0.6714	0.6733	0.6753	0.6774	0.6795	0.6817	0.6840	0.6863	0.6886
0.6743	0.6762	0.6781	0.6800	0.6820	0.6841	0.6862	0.6884	0.6906	0.6929	0.6953
0.6809	0.6827	0.6846	0.6866	0.6886	0.6907	0.6928	0.6950	0.6972	0.6995	0.7018
0.6873	0.6891	0.6911	0.6930	0.6950	0.6971	0.6992	0.7014	0.7036	0.7059	0.7082
0.6936	0.6955	0.6974	0.6994	0.7014	0.7034	0.7056	0.7077	0.7099	0.7122	0.7145
0.6998	0.7017	0.7036	0.7056	0.7076	0.7097	0.7118	0.7139	0.7161	0.7184	0.7207
0.7060	0.7079	0.7098	0.7118	0.7138	0.7158	0.7179	0.7201	0.7223	0.7245	0.7268
0.7120	0.7139	0.7158	0.7178	0.7198	0.7219	0.7240	0.7261	0.7283	0.7305	0.7328
0.7180	0.7199	0.7218	0.7238	0.7258	0.7279	0.7300	0.7321	0.7342	0.7364	0.7387
0.7239	0.7258	0.7277	0.7297	0.7317	0.7338	0.7359	0.7380	0.7401	0.7423	0.7445
0.7297	0.7316	0.7336	0.7355	0.7376	0.7396	0.7417	0.7438	0.7459	0.7481	0.7503
0.7355	0.7374	0.7393	0.7413	0.7433	0.7454	0.7474	0.7495	0.7517	0.7538	0.7560
0.7412	0.7431	0.7451	0.7470	0.7490	0.7511	0.7531	0.7552	0.7573	0.7595	0.7617
0.7469	0.7488	0.7507	0.7527	0.7547	0.7567	0.7588	0.7608	0.7630	0.7651	0.7673
0.7525	0.7544	0.7563	0.7583	0.7603	0.7623	0.7643	0.7664	0.7685	0.7706	0.7728
0.7580	0.7599	0.7619	0.7638	0.7658	0.7678	0.7699	0.7719	0.7740	0.7761	0.7783
0.7635	0.7654	0.7673	0.7693	0.7713	0.7733	0.7753	0.7774	0.7795	0.7816	0.7837
0.7690	0.7709	0.7728	0.7748	0.7767	0.7787	0.7808	0.7828	0.7849	0.7870	0.7891
0.7744	0.7763	0.7782	0.7802	0.7821	0.7841	0.7862	0.7882	0.7903	0.7924	0.7945
0.7797	0.7816	0.7836	0.7855	0.7875	0.7895	0.7915	0.7935	0.7956	0.7977	0.7998
0.7850	0.7870	0.7889	0.7908	0.7928	0.7948	0.7968	0.7988	0.8009	0.8029	0.8050
0.7903	0.7922	0.7942	0.7961	0.7981	0.8001	0.8021	0.8041	0.8061	0.8082	0.8103
0.7956	0.7975	0.7994	0.8013	0.8033	0.8053	0.8073	0.8093	0.8113	0.8134	0.8154
0.8060	0.8079	0.8098	0.8117	0.8137	0.8156	0.8176	0.8196	0.8216	0.8237	0.8257
0.8162	0.8181	0.8200	0.8219	0.8239	0.8258	0.8278	0.8298	0.8318	0.8338	0.8358
0.8263	0.8282	0.8301	0.8320	0.8339	0.8359	0.8378	0.8398	0.8418	0.8438	0.8458
0.8363	0.8381	0.8400	0.8419	0.8439	0.8458	0.8478	0.8497	0.8517	0.8537	0.8557
0.8461	0.8480	0.8499	0.8518	0.8537	0.8556	0.8575	0.8595	0.8614	0.8634	0.8654
0.8558	0.8577	0.8596	0.8615	0.8634	0.8653	0.8672	0.8691	0.8711	0.8730	0.8750
0.8654	0.8673	0.8691	0.8710	0.8729	0.8748	0.8767	0.8787	0.8806	0.8825	0.8845
0.8749	0.8768	0.8786	0.8805	0.8824	0.8843	0.8862	0.8881	0.8900	0.8919	0.8939
0.8843	0.8862	0.8880	0.8899	0.8918	0.8937	0.8956	0.8975	0.8994	0.9013	0.9032
0.8936	0.8955	0.8973	0.8992	0.9010	0.9029	0.9048	0.9067	0.9086	0.9105	0.9124
0.9028	0.9047	0.9065	0.9083	0.9102	0.9121	0.9139	0.9158	0.9177	0.9196	0.9215
0.9119	0.9138	0.9156	0.9174	0.9193	0.9211	0.9230	0.9248	0.9267	0.9286	0.9305
0.9209	0.9228	0.9246	0.9264	0.9283	0.9301	0.9319	0.9338	0.9357	0.9375	0.9394
0.9299	0.9317	0.9335	0.9353	0.9371	0.9390	0.9408	0.9427	0.9445	0.9464	0.9482
0.9387	0.9405	0.9423	0.9441	0.9460	0.9478	0.9496	0.9514	0.9533	0.9551	0.9569
0.9475	0.9493	0.9511	0.9529	0.9547	0.9565	0.9583	0.9601	0.9620	0.9638	0.9656
0.9562	0.9580	0.9598	0.9616	0.9634	0.9652	0.9670	0.9688	0.9706	0.9724	0.9742
0.9648	0.9666	0.9684	0.9702	0.9719	0.9737	0.9755	0.9773	0.9791	0.9809	0.9827
0.9734	0.9751	0.9769	0.9787	0.9804	0.9822	0.9840	0.9858	0.9876	0.9894	0.9912
0.9818	0.9836	0.9854	0.9871	0.9889	0.9907	0.9924	0.9942	0.9960	0.9978	0.9995
0.9903	0.9920	0.9938	0.9955	0.9973	0.9990	1.0008	1.0025	1.0043	1.0061	1.0078
0.9986	1.0003	1.0021	1.0038	1.0056	1.0073	1.0091	1.0108	1.0126	1.0143	1.0161
1.0069	1.0086	1.0103	1.0121	1.0138	1.0155	1.0173	1.0190	1.0208	1.0225	1.0243
1.0151	1.0168	1.0185	1.0203	1.0220	1.0237	1.0254	1.0272	1.0289	1.0306	1.0324
1.0232	1.0249	1.0267	1.0284	1.0301	1.0318	1.0335	1.0352	1.0370	1.0387	1.0404
1.0313	1.0330	1.0347	1.0364	1.0381	1.0399	1.0416	1.0433	1.0450	1.0467	1.0484
1.0394	1.0411	1.0428	1.0444	1.0461	1.0478	1.0495	1.0512	1.0529	1.0546	1.0563
1.0473	1.0490	1.0507	1.0524	1.0541	1.0558	1.0575	1.0591	1.0608	1.0625	1.0642
1.0553	1.0569	1.0586	1.0603	1.0620	1.0636	1.0653	1.0670	1.0687	1.0703	1.0720
1.0631	1.0648	1.0665	1.0681	1.0698	1.0715	1.0731	1.0748	1.0765	1.0781	1.0798
1.0709	1.0726	1.0742	1.0759	1.0776	1.0792	1.0809	1.0825	1.0842	1.0858	1.0875
1.0787	1.0803	1.0820	1.0836	1.0853	1.0869	1.0886	1.0902	1.0919	1.0935	1.0952
1.0864	1.0880	1.0897	1.0913	1.0929	1.0946	1.0962	1.0978	1.0995	1.1011	1.1028
1.0941	1.0957	1.0973	1.0989	1.1006	1.1022	1.1038	1.1054	1.1071	1.1087	1.1103
1.1016	1.1033	1.1049	1.1065	1.1081	1.1097	1.1113	1.1130	1.1146	1.1162	1.1178

TABLE V. - Continued. THERMODYNAMIC PROPERTIES OF NORMAL HYDROGEN

(c) Critical pressure ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
170	0.4898	0.4869	0.4838	0.4804	0.4769	0.4731	0.4691	0.4649	0.4606	0.4560	0.4512
180	0.4909	0.4881	0.4852	0.4822	0.4789	0.4755	0.4720	0.4683	0.4645	0.4605	0.4565
190	0.4921	0.4894	0.4866	0.4837	0.4806	0.4773	0.4739	0.4704	0.4667	0.4630	0.4591
200	0.4935	0.4909	0.4881	0.4853	0.4822	0.4791	0.4758	0.4723	0.4688	0.4652	0.4614
220	0.4965	0.4941	0.4915	0.4888	0.4860	0.4830	0.4800	0.4769	0.4736	0.4703	0.4669
240	0.4999	0.4975	0.4951	0.4926	0.4900	0.4873	0.4846	0.4818	0.4789	0.4760	0.4729
260	0.5032	0.5010	0.4988	0.4965	0.4941	0.4917	0.4892	0.4867	0.4841	0.4815	0.4789
280	0.5063	0.5043	0.5022	0.5001	0.4980	0.4958	0.4935	0.4913	0.4890	0.4866	0.4843
300	0.5092	0.5073	0.5054	0.5035	0.5015	0.4995	0.4974	0.4954	0.4933	0.4912	0.4891
320	0.5118	0.5100	0.5082	0.5064	0.5046	0.5027	0.5009	0.4990	0.4971	0.4952	0.4932
340	0.5140	0.5124	0.5107	0.5090	0.5073	0.5056	0.5039	0.5021	0.5004	0.4986	0.4968
360	0.5160	0.5144	0.5129	0.5113	0.5097	0.5081	0.5065	0.5049	0.5032	0.5016	0.5000
380	0.5177	0.5162	0.5147	0.5132	0.5118	0.5103	0.5087	0.5072	0.5057	0.5042	0.5027
400	0.5192	0.5178	0.5164	0.5150	0.5136	0.5122	0.5107	0.5093	0.5079	0.5065	0.5050
420	0.5205	0.5192	0.5178	0.5165	0.5152	0.5138	0.5125	0.5112	0.5098	0.5085	0.5071
440	0.5216	0.5203	0.5191	0.5178	0.5166	0.5153	0.5140	0.5128	0.5115	0.5102	0.5090
460	0.5226	0.5214	0.5202	0.5190	0.5178	0.5166	0.5154	0.5142	0.5130	0.5118	0.5106
480	0.5235	0.5223	0.5212	0.5200	0.5189	0.5177	0.5166	0.5154	0.5143	0.5132	0.5120
500	0.5242	0.5231	0.5220	0.5209	0.5198	0.5187	0.5176	0.5166	0.5155	0.5144	0.5133
520	0.5249	0.5238	0.5228	0.5217	0.5207	0.5196	0.5186	0.5175	0.5165	0.5155	0.5144
540	0.5254	0.5244	0.5234	0.5224	0.5214	0.5204	0.5194	0.5184	0.5174	0.5164	0.5154
560	0.5259	0.5249	0.5240	0.5230	0.5220	0.5211	0.5201	0.5192	0.5182	0.5172	0.5163
580	0.5263	0.5254	0.5245	0.5235	0.5226	0.5217	0.5208	0.5198	0.5189	0.5180	0.5171
600	0.5267	0.5258	0.5249	0.5240	0.5231	0.5222	0.5213	0.5204	0.5195	0.5187	0.5178
620	0.5270	0.5261	0.5252	0.5244	0.5235	0.5227	0.5218	0.5210	0.5201	0.5193	0.5184
640	0.5272	0.5264	0.5256	0.5247	0.5239	0.5231	0.5223	0.5214	0.5206	0.5198	0.5190
660	0.5275	0.5267	0.5258	0.5250	0.5242	0.5235	0.5227	0.5219	0.5211	0.5203	0.5195
680	0.5276	0.5269	0.5261	0.5253	0.5245	0.5238	0.5230	0.5222	0.5215	0.5207	0.5200
700	0.5278	0.5271	0.5263	0.5256	0.5248	0.5241	0.5233	0.5226	0.5219	0.5211	0.5204

(d) Critical temperature ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
170	0.7606	0.7586	0.7568	0.7550	0.7532	0.7516	0.7499	0.7483	0.7467	0.7451	0.7436
180	0.7634	0.7614	0.7595	0.7576	0.7558	0.7540	0.7523	0.7507	0.7491	0.7475	0.7460
190	0.7665	0.7644	0.7624	0.7604	0.7585	0.7566	0.7548	0.7530	0.7513	0.7495	0.7479
200	0.7699	0.7677	0.7656	0.7636	0.7616	0.7597	0.7578	0.7559	0.7541	0.7523	0.7506
220	0.7768	0.7746	0.7726	0.7706	0.7686	0.7667	0.7649	0.7630	0.7613	0.7595	0.7578
240	0.7837	0.7817	0.7797	0.7778	0.7760	0.7743	0.7725	0.7709	0.7692	0.7677	0.7661
260	0.7902	0.7884	0.7866	0.7849	0.7832	0.7816	0.7800	0.7785	0.7771	0.7757	0.7743
280	0.7961	0.7945	0.7929	0.7913	0.7898	0.7884	0.7870	0.7856	0.7843	0.7830	0.7818
300	0.8014	0.7999	0.7985	0.7971	0.7957	0.7944	0.7931	0.7919	0.7907	0.7895	0.7884
320	0.8060	0.8046	0.8034	0.8021	0.8009	0.7997	0.7985	0.7974	0.7963	0.7952	0.7942
340	0.8100	0.8088	0.8076	0.8065	0.8053	0.8043	0.8032	0.8022	0.8012	0.8002	0.7993
360	0.8134	0.8123	0.8113	0.8102	0.8092	0.8082	0.8073	0.8063	0.8054	0.8045	0.8036
380	0.8164	0.8154	0.8144	0.8135	0.8126	0.8117	0.8108	0.8099	0.8091	0.8082	0.8074
400	0.8190	0.8181	0.8172	0.8163	0.8155	0.8147	0.8138	0.8130	0.8123	0.8115	0.8108
420	0.8212	0.8204	0.8196	0.8188	0.8180	0.8173	0.8165	0.8158	0.8150	0.8143	0.8136
440	0.8231	0.8224	0.8216	0.8209	0.8202	0.8195	0.8188	0.8181	0.8174	0.8168	0.8161
460	0.8248	0.8241	0.8234	0.8228	0.8221	0.8214	0.8208	0.8202	0.8195	0.8189	0.8183
480	0.8262	0.8256	0.8250	0.8243	0.8237	0.8231	0.8225	0.8219	0.8213	0.8208	0.8202
500	0.8275	0.8269	0.8263	0.8257	0.8251	0.8246	0.8240	0.8234	0.8229	0.8224	0.8218
520	0.8285	0.8280	0.8274	0.8269	0.8263	0.8258	0.8253	0.8248	0.8243	0.8238	0.8233
540	0.8294	0.8289	0.8284	0.8279	0.8274	0.8269	0.8264	0.8259	0.8254	0.8250	0.8245
560	0.8302	0.8297	0.8292	0.8287	0.8282	0.8278	0.8273	0.8269	0.8264	0.8260	0.8256
580	0.8308	0.8303	0.8299	0.8294	0.8290	0.8286	0.8281	0.8277	0.8273	0.8269	0.8265
600	0.8313	0.8309	0.8305	0.8301	0.8297	0.8293	0.8289	0.8285	0.8281	0.8277	0.8273
620	0.8318	0.8314	0.8310	0.8306	0.8302	0.8298	0.8295	0.8291	0.8287	0.8284	0.8280
640	0.8322	0.8318	0.8314	0.8311	0.8307	0.8304	0.8300	0.8296	0.8293	0.8290	0.8286
660	0.8325	0.8322	0.8318	0.8315	0.8311	0.8308	0.8305	0.8301	0.8298	0.8295	0.8292
680	0.8328	0.8325	0.8322	0.8318	0.8315	0.8312	0.8309	0.8306	0.8302	0.8299	0.8296
700	0.8331	0.8328	0.8324	0.8321	0.8318	0.8315	0.8312	0.8309	0.8306	0.8304	0.8301

TABLE V. - Continued. THERMODYNAMIC PROPERTIES OF NORMAL HYDROGEN

(ρ) Critical density ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
170	0.6441	0.6466	0.6494	0.6525	0.6559	0.6596	0.6636	0.6679	0.6724	0.6771	0.6821
180	0.6430	0.6455	0.6482	0.6513	0.6546	0.6582	0.6620	0.6661	0.6704	0.6750	0.6798
190	0.6420	0.6444	0.6470	0.6498	0.6529	0.6561	0.6596	0.6633	0.6673	0.6714	0.6757
200	0.6410	0.6433	0.6457	0.6483	0.6511	0.6541	0.6573	0.6606	0.6641	0.6677	0.6715
220	0.6393	0.6413	0.6434	0.6457	0.6481	0.6506	0.6532	0.6558	0.6586	0.6615	0.6645
240	0.6379	0.6397	0.6416	0.6436	0.6457	0.6478	0.6500	0.6523	0.6546	0.6570	0.6594
260	0.6368	0.6385	0.6402	0.6420	0.6438	0.6457	0.6476	0.6496	0.6516	0.6537	0.6558
280	0.6360	0.6375	0.6391	0.6408	0.6424	0.6441	0.6458	0.6476	0.6494	0.6512	0.6530
300	0.6354	0.6369	0.6383	0.6398	0.6413	0.6429	0.6444	0.6460	0.6476	0.6492	0.6509
320	0.6350	0.6363	0.6377	0.6391	0.6405	0.6419	0.6433	0.6448	0.6462	0.6477	0.6492
340	0.6346	0.6359	0.6372	0.6385	0.6398	0.6411	0.6424	0.6437	0.6451	0.6464	0.6478
360	0.6344	0.6355	0.6367	0.6379	0.6392	0.6404	0.6416	0.6429	0.6441	0.6454	0.6466
380	0.6341	0.6352	0.6364	0.6375	0.6386	0.6398	0.6409	0.6421	0.6433	0.6444	0.6456
400	0.6339	0.6350	0.6361	0.6371	0.6382	0.6393	0.6404	0.6415	0.6426	0.6436	0.6447
420	0.6338	0.6348	0.6358	0.6368	0.6379	0.6389	0.6399	0.6409	0.6420	0.6430	0.6440
440	0.6337	0.6346	0.6356	0.6366	0.6375	0.6385	0.6395	0.6404	0.6414	0.6424	0.6433
460	0.6336	0.6345	0.6354	0.6363	0.6373	0.6382	0.6391	0.6400	0.6409	0.6419	0.6428
480	0.6336	0.6344	0.6353	0.6362	0.6370	0.6379	0.6388	0.6397	0.6405	0.6414	0.6423
500	0.6335	0.6344	0.6352	0.6360	0.6369	0.6377	0.6385	0.6393	0.6402	0.6410	0.6418
520	0.6335	0.6343	0.6351	0.6359	0.6367	0.6375	0.6383	0.6391	0.6399	0.6407	0.6414
540	0.6335	0.6343	0.6350	0.6358	0.6366	0.6373	0.6381	0.6388	0.6396	0.6403	0.6411
560	0.6335	0.6342	0.6350	0.6357	0.6364	0.6372	0.6379	0.6386	0.6393	0.6400	0.6408
580	0.6335	0.6342	0.6349	0.6356	0.6363	0.6370	0.6377	0.6384	0.6391	0.6398	0.6405
600	0.6335	0.6342	0.6349	0.6355	0.6362	0.6369	0.6376	0.6382	0.6389	0.6395	0.6402
620	0.6335	0.6342	0.6348	0.6355	0.6361	0.6368	0.6374	0.6380	0.6387	0.6393	0.6399
640	0.6335	0.6342	0.6348	0.6354	0.6360	0.6366	0.6373	0.6379	0.6385	0.6391	0.6397
660	0.6336	0.6342	0.6348	0.6354	0.6359	0.6365	0.6371	0.6377	0.6383	0.6389	0.6395
680	0.6336	0.6341	0.6347	0.6353	0.6359	0.6364	0.6370	0.6376	0.6381	0.6387	0.6393
700	0.6336	0.6341	0.6347	0.6352	0.6358	0.6363	0.6369	0.6374	0.6380	0.6385	0.6390

TABLE V. - Continued.

(f) Plenum

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	Plenum 45
175	1.0000	0.9984	0.9973	0.9965	0.9963	0.9965	0.9971	0.9981	0.9996	1.0016
180	1.0000	0.9989	0.9983	0.9980	0.9982	0.9987	0.9997	1.0011	1.0028	1.0050
185	1.0000	0.9994	0.9992	0.9993	0.9998	1.0007	1.0020	1.0037	1.0057	1.0081
190	1.0000	0.9998	1.0000	1.0005	1.0013	1.0025	1.0041	1.0060	1.0082	1.0108
195	1.0000	1.0002	1.0007	1.0015	1.0027	1.0042	1.0059	1.0081	1.0105	1.0132
200	1.0000	1.0005	1.0013	1.0025	1.0039	1.0056	1.0076	1.0099	1.0125	1.0154
205	1.0000	1.0008	1.0019	1.0033	1.0050	1.0069	1.0091	1.0116	1.0143	1.0174
210	1.0000	1.0011	1.0024	1.0041	1.0059	1.0080	1.0104	1.0131	1.0160	1.0191
215	1.0000	1.0013	1.0029	1.0047	1.0068	1.0091	1.0116	1.0144	1.0174	1.0207
220	1.0000	1.0016	1.0033	1.0053	1.0076	1.0100	1.0127	1.0156	1.0187	1.0221
225	1.0000	1.0017	1.0037	1.0059	1.0083	1.0109	1.0137	1.0167	1.0199	1.0233
230	1.0000	1.0019	1.0041	1.0064	1.0089	1.0116	1.0145	1.0176	1.0209	1.0244
235	1.0000	1.0021	1.0044	1.0068	1.0095	1.0123	1.0153	1.0185	1.0219	1.0254
240	1.0000	1.0022	1.0046	1.0072	1.0100	1.0129	1.0160	1.0193	1.0227	1.0263
245	1.0000	1.0024	1.0049	1.0076	1.0104	1.0134	1.0166	1.0199	1.0234	1.0271
250	1.0000	1.0025	1.0051	1.0079	1.0108	1.0139	1.0172	1.0206	1.0241	1.0278
255	1.0000	1.0026	1.0053	1.0082	1.0112	1.0144	1.0177	1.0211	1.0247	1.0284
260	1.0000	1.0027	1.0055	1.0084	1.0115	1.0148	1.0181	1.0216	1.0252	1.0290
265	1.0000	1.0028	1.0057	1.0087	1.0118	1.0151	1.0185	1.0220	1.0257	1.0295
270	1.0000	1.0028	1.0058	1.0089	1.0121	1.0154	1.0189	1.0224	1.0261	1.0299
275	1.0000	1.0029	1.0059	1.0091	1.0123	1.0157	1.0192	1.0228	1.0265	1.0303
280	1.0000	1.0030	1.0061	1.0092	1.0125	1.0159	1.0194	1.0231	1.0268	1.0306
285	1.0000	1.0030	1.0062	1.0094	1.0127	1.0162	1.0197	1.0233	1.0271	1.0309
290	1.0000	1.0031	1.0063	1.0095	1.0129	1.0164	1.0199	1.0236	1.0273	1.0311
295	1.0000	1.0031	1.0063	1.0096	1.0130	1.0165	1.0201	1.0238	1.0275	1.0313
300	1.0000	1.0032	1.0064	1.0097	1.0132	1.0167	1.0203	1.0239	1.0277	1.0315
305	1.0000	1.0032	1.0065	1.0098	1.0133	1.0168	1.0204	1.0241	1.0278	1.0317
310	1.0000	1.0032	1.0065	1.0099	1.0134	1.0169	1.0205	1.0242	1.0280	1.0318
315	1.0000	1.0033	1.0066	1.0100	1.0135	1.0170	1.0206	1.0243	1.0281	1.0319
320	1.0000	1.0033	1.0066	1.0100	1.0135	1.0171	1.0207	1.0244	1.0281	1.0320
325	1.0000	1.0033	1.0067	1.0101	1.0136	1.0171	1.0208	1.0244	1.0282	1.0320
330	1.0000	1.0033	1.0067	1.0101	1.0136	1.0172	1.0208	1.0245	1.0282	1.0320
335	1.0000	1.0033	1.0067	1.0102	1.0137	1.0172	1.0208	1.0245	1.0283	1.0320
340	1.0000	1.0033	1.0067	1.0102	1.0137	1.0173	1.0209	1.0245	1.0283	1.0320
345	1.0000	1.0034	1.0068	1.0102	1.0137	1.0173	1.0209	1.0245	1.0283	1.0320
350	1.0000	1.0034	1.0068	1.0102	1.0137	1.0173	1.0209	1.0245	1.0282	1.0320
360	1.0000	1.0034	1.0068	1.0102	1.0137	1.0173	1.0209	1.0245	1.0282	1.0319
370	1.0000	1.0034	1.0068	1.0102	1.0137	1.0172	1.0208	1.0244	1.0281	1.0318
380	1.0000	1.0034	1.0068	1.0102	1.0137	1.0172	1.0207	1.0243	1.0279	1.0316
390	1.0000	1.0034	1.0067	1.0102	1.0136	1.0171	1.0206	1.0242	1.0278	1.0314
400	1.0000	1.0033	1.0067	1.0101	1.0135	1.0170	1.0205	1.0240	1.0276	1.0311
410	1.0000	1.0033	1.0067	1.0100	1.0135	1.0169	1.0203	1.0238	1.0273	1.0309
420	1.0000	1.0033	1.0066	1.0100	1.0134	1.0168	1.0202	1.0236	1.0271	1.0306
430	1.0000	1.0033	1.0066	1.0099	1.0133	1.0166	1.0200	1.0234	1.0269	1.0303
440	1.0000	1.0033	1.0065	1.0098	1.0131	1.0165	1.0198	1.0232	1.0266	1.0301
450	1.0000	1.0032	1.0065	1.0097	1.0130	1.0163	1.0197	1.0230	1.0264	1.0298
460	1.0000	1.0032	1.0064	1.0097	1.0129	1.0162	1.0195	1.0228	1.0261	1.0294
470	1.0000	1.0032	1.0064	1.0096	1.0128	1.0160	1.0193	1.0225	1.0258	1.0291
480	1.0000	1.0031	1.0063	1.0095	1.0127	1.0159	1.0191	1.0223	1.0255	1.0288
490	1.0000	1.0031	1.0062	1.0094	1.0125	1.0157	1.0189	1.0221	1.0253	1.0285
500	1.0000	1.0031	1.0062	1.0093	1.0124	1.0155	1.0187	1.0218	1.0250	1.0282
510	1.0000	1.0030	1.0061	1.0092	1.0123	1.0153	1.0185	1.0216	1.0247	1.0278
520	1.0000	1.0030	1.0060	1.0091	1.0121	1.0152	1.0182	1.0213	1.0244	1.0275
530	1.0000	1.0030	1.0060	1.0090	1.0120	1.0150	1.0180	1.0211	1.0241	1.0272
540	1.0000	1.0029	1.0059	1.0089	1.0119	1.0148	1.0178	1.0208	1.0239	1.0269
550	1.0000	1.0029	1.0058	1.0088	1.0117	1.0147	1.0176	1.0206	1.0236	1.0266
560	1.0000	1.0029	1.0058	1.0087	1.0116	1.0145	1.0174	1.0204	1.0233	1.0262
570	1.0000	1.0028	1.0057	1.0086	1.0114	1.0143	1.0172	1.0201	1.0230	1.0259
580	1.0000	1.0028	1.0056	1.0085	1.0113	1.0142	1.0170	1.0199	1.0227	1.0256
590	1.0000	1.0028	1.0056	1.0084	1.0112	1.0140	1.0168	1.0196	1.0225	1.0253
600	1.0000	1.0028	1.0055	1.0083	1.0110	1.0138	1.0166	1.0194	1.0222	1.0250
610	1.0000	1.0027	1.0054	1.0082	1.0109	1.0137	1.0164	1.0192	1.0219	1.0247
620	1.0000	1.0027	1.0054	1.0081	1.0108	1.0135	1.0162	1.0189	1.0217	1.0244
630	1.0000	1.0027	1.0053	1.0080	1.0107	1.0133	1.0160	1.0187	1.0214	1.0241
640	1.0000	1.0026	1.0053	1.0079	1.0105	1.0132	1.0158	1.0185	1.0211	1.0238
650	1.0000	1.0026	1.0052	1.0078	1.0104	1.0130	1.0156	1.0183	1.0209	1.0235
660	1.0000	1.0026	1.0051	1.0077	1.0103	1.0129	1.0155	1.0180	1.0206	1.0232
670	1.0000	1.0025	1.0051	1.0076	1.0102	1.0127	1.0153	1.0178	1.0204	1.0230
680	1.0000	1.0025	1.0050	1.0075	1.0100	1.0126	1.0151	1.0176	1.0201	1.0227
690	1.0000	1.0025	1.0050	1.0074	1.0099	1.0124	1.0149	1.0174	1.0199	1.0224
700	1.0000	1.0024	1.0049	1.0073	1.0098	1.0123	1.0147	1.0172	1.0197	1.0221

THERMODYNAMIC PROPERTIES OF NORMAL HYDROGEN

compressibility factor

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
1.0040	1.0068	1.0100	1.0137	1.0179	1.0225	1.0275	1.0330	1.0389	1.0453	1.0521
1.0076	1.0106	1.0140	1.0178	1.0220	1.0266	1.0317	1.0371	1.0429	1.0492	1.0558
1.0108	1.0140	1.0175	1.0214	1.0257	1.0303	1.0353	1.0407	1.0465	1.0526	1.0592
1.0137	1.0170	1.0206	1.0246	1.0289	1.0336	1.0386	1.0440	1.0497	1.0557	1.0621
1.0163	1.0197	1.0234	1.0275	1.0318	1.0365	1.0415	1.0469	1.0525	1.0585	1.0647
1.0186	1.0221	1.0259	1.0300	1.0344	1.0391	1.0441	1.0494	1.0550	1.0609	1.0671
1.0207	1.0243	1.0282	1.0323	1.0367	1.0414	1.0464	1.0517	1.0572	1.0630	1.0691
1.0225	1.0262	1.0301	1.0343	1.0388	1.0435	1.0484	1.0537	1.0591	1.0649	1.0709
1.0242	1.0279	1.0319	1.0361	1.0406	1.0453	1.0502	1.0554	1.0609	1.0665	1.0724
1.0256	1.0294	1.0335	1.0377	1.0422	1.0469	1.0518	1.0570	1.0623	1.0679	1.0738
1.0270	1.0308	1.0349	1.0391	1.0436	1.0483	1.0532	1.0583	1.0636	1.0692	1.0749
1.0281	1.0320	1.0361	1.0404	1.0449	1.0496	1.0544	1.0595	1.0648	1.0702	1.0759
1.0292	1.0331	1.0372	1.0415	1.0460	1.0507	1.0555	1.0605	1.0658	1.0712	1.0768
1.0301	1.0341	1.0382	1.0425	1.0470	1.0516	1.0564	1.0614	1.0666	1.0719	1.0775
1.0309	1.0349	1.0390	1.0434	1.0478	1.0525	1.0572	1.0622	1.0673	1.0726	1.0780
1.0316	1.0356	1.0398	1.0441	1.0486	1.0532	1.0579	1.0629	1.0679	1.0731	1.0785
1.0323	1.0363	1.0405	1.0448	1.0492	1.0538	1.0585	1.0634	1.0684	1.0736	1.0789
1.0329	1.0369	1.0411	1.0454	1.0498	1.0543	1.0590	1.0639	1.0688	1.0739	1.0792
1.0334	1.0374	1.0416	1.0459	1.0503	1.0548	1.0595	1.0643	1.0692	1.0742	1.0794
1.0338	1.0379	1.0420	1.0463	1.0507	1.0552	1.0598	1.0646	1.0694	1.0744	1.0795
1.0342	1.0382	1.0424	1.0466	1.0510	1.0555	1.0601	1.0648	1.0696	1.0746	1.0796
1.0345	1.0386	1.0427	1.0470	1.0513	1.0558	1.0603	1.0650	1.0698	1.0747	1.0797
1.0348	1.0389	1.0430	1.0472	1.0515	1.0560	1.0605	1.0651	1.0699	1.0747	1.0796
1.0351	1.0391	1.0432	1.0474	1.0517	1.0561	1.0606	1.0652	1.0699	1.0747	1.0796
1.0353	1.0393	1.0434	1.0476	1.0519	1.0563	1.0607	1.0653	1.0699	1.0746	1.0795
1.0354	1.0395	1.0435	1.0477	1.0520	1.0563	1.0608	1.0653	1.0699	1.0746	1.0793
1.0356	1.0396	1.0437	1.0478	1.0521	1.0564	1.0608	1.0652	1.0698	1.0744	1.0792
1.0357	1.0397	1.0437	1.0479	1.0521	1.0564	1.0607	1.0652	1.0697	1.0743	1.0789
1.0358	1.0398	1.0438	1.0479	1.0521	1.0564	1.0607	1.0651	1.0696	1.0741	1.0787
1.0358	1.0398	1.0438	1.0479	1.0521	1.0563	1.0606	1.0650	1.0694	1.0739	1.0785
1.0359	1.0398	1.0438	1.0479	1.0520	1.0562	1.0605	1.0648	1.0692	1.0737	1.0782
1.0359	1.0398	1.0438	1.0479	1.0520	1.0561	1.0604	1.0647	1.0690	1.0734	1.0779
1.0359	1.0398	1.0438	1.0478	1.0519	1.0560	1.0602	1.0645	1.0688	1.0731	1.0776
1.0359	1.0398	1.0437	1.0477	1.0518	1.0559	1.0600	1.0643	1.0685	1.0729	1.0772
1.0358	1.0397	1.0436	1.0476	1.0516	1.0557	1.0599	1.0640	1.0683	1.0726	1.0769
1.0358	1.0397	1.0436	1.0475	1.0515	1.0556	1.0597	1.0638	1.0680	1.0722	1.0765
1.0357	1.0395	1.0433	1.0472	1.0512	1.0552	1.0592	1.0633	1.0674	1.0716	1.0758
1.0355	1.0393	1.0431	1.0469	1.0508	1.0548	1.0587	1.0627	1.0668	1.0709	1.0750
1.0353	1.0390	1.0428	1.0466	1.0504	1.0543	1.0582	1.0622	1.0661	1.0702	1.0742
1.0350	1.0387	1.0424	1.0462	1.0500	1.0538	1.0577	1.0615	1.0655	1.0694	1.0734
1.0348	1.0384	1.0421	1.0458	1.0495	1.0533	1.0571	1.0609	1.0648	1.0686	1.0726
1.0345	1.0381	1.0417	1.0453	1.0490	1.0527	1.0565	1.0602	1.0640	1.0679	1.0717
1.0342	1.0377	1.0413	1.0449	1.0485	1.0522	1.0559	1.0596	1.0633	1.0671	1.0709
1.0338	1.0373	1.0409	1.0444	1.0480	1.0516	1.0552	1.0589	1.0626	1.0663	1.0700
1.0335	1.0370	1.0405	1.0440	1.0475	1.0510	1.0546	1.0582	1.0618	1.0655	1.0691
1.0332	1.0366	1.0400	1.0435	1.0470	1.0505	1.0540	1.0575	1.0611	1.0647	1.0683
1.0328	1.0362	1.0396	1.0430	1.0464	1.0499	1.0534	1.0568	1.0603	1.0639	1.0674
1.0324	1.0358	1.0391	1.0425	1.0459	1.0493	1.0527	1.0561	1.0596	1.0631	1.0666
1.0321	1.0354	1.0387	1.0420	1.0454	1.0487	1.0521	1.0555	1.0589	1.0623	1.0657
1.0317	1.0350	1.0382	1.0415	1.0448	1.0481	1.0514	1.0548	1.0581	1.0615	1.0649
1.0314	1.0346	1.0378	1.0410	1.0443	1.0475	1.0508	1.0541	1.0574	1.0607	1.0640
1.0310	1.0342	1.0373	1.0405	1.0437	1.0470	1.0502	1.0534	1.0567	1.0599	1.0632
1.0306	1.0338	1.0369	1.0400	1.0432	1.0464	1.0496	1.0527	1.0559	1.0592	1.0624
1.0303	1.0334	1.0365	1.0396	1.0427	1.0458	1.0489	1.0521	1.0552	1.0584	1.0616
1.0299	1.0330	1.0360	1.0391	1.0421	1.0452	1.0483	1.0514	1.0545	1.0577	1.0608
1.0296	1.0326	1.0356	1.0386	1.0416	1.0447	1.0477	1.0508	1.0538	1.0569	1.0600
1.0292	1.0322	1.0351	1.0381	1.0411	1.0441	1.0471	1.0501	1.0532	1.0562	1.0592
1.0288	1.0318	1.0347	1.0377	1.0406	1.0436	1.0465	1.0495	1.0525	1.0555	1.0585
1.0285	1.0314	1.0343	1.0372	1.0401	1.0430	1.0459	1.0489	1.0518	1.0548	1.0577
1.0282	1.0310	1.0339	1.0367	1.0396	1.0425	1.0454	1.0483	1.0512	1.0541	1.0570
1.0278	1.0306	1.0334	1.0363	1.0391	1.0419	1.0448	1.0476	1.0505	1.0534	1.0562
1.0275	1.0302	1.0330	1.0358	1.0386	1.0414	1.0442	1.0470	1.0499	1.0527	1.0555
1.0271	1.0299	1.0326	1.0354	1.0381	1.0409	1.0437	1.0465	1.0492	1.0520	1.0548
1.0268	1.0295	1.0322	1.0349	1.0377	1.0404	1.0431	1.0459	1.0486	1.0514	1.0541
1.0265	1.0292	1.0318	1.0345	1.0372	1.0399	1.0426	1.0453	1.0480	1.0507	1.0534
1.0262	1.0288	1.0314	1.0341	1.0367	1.0394	1.0421	1.0447	1.0474	1.0501	1.0528
1.0258	1.0284	1.0311	1.0337	1.0363	1.0389	1.0415	1.0442	1.0468	1.0495	1.0521
1.0255	1.0281	1.0307	1.0333	1.0358	1.0384	1.0410	1.0436	1.0462	1.0488	1.0514
1.0252	1.0278	1.0303	1.0329	1.0354	1.0380	1.0405	1.0431	1.0457	1.0482	1.0508
1.0249	1.0274	1.0299	1.0325	1.0350	1.0375	1.0400	1.0426	1.0451	1.0476	1.0502
1.0246	1.0271	1.0296	1.0321	1.0345	1.0370	1.0395	1.0420	1.0445	1.0470	1.0496

TABLE V. - Continued.

(g) Plenum

Plenum temperature, °R	Plenum 0	5	10	15	20	25	30	35	40	45
175	2.6952	2.7374	2.7781	2.8172	2.8549	2.8910	2.9257	2.9588	2.9904	3.0205
180	2.7142	2.7533	2.7911	2.8275	2.8626	2.8965	2.9290	2.9601	2.9900	3.0185
185	2.7336	2.7699	2.8051	2.8392	2.8720	2.9038	2.9343	2.9637	2.9920	3.0191
190	2.7532	2.7871	2.8200	2.8519	2.8828	2.9126	2.9414	2.9692	2.9960	3.0217
195	2.7731	2.8048	2.8357	2.8656	2.8946	2.9228	2.9500	2.9763	3.0017	3.0261
200	2.7930	2.8229	2.8518	2.8800	2.9074	2.9340	2.9597	2.9846	3.0087	3.0320
205	2.8131	2.8411	2.8684	2.8950	2.9209	2.9460	2.9704	2.9940	3.0169	3.0391
210	2.8330	2.8595	2.8853	2.9105	2.9350	2.9588	2.9819	3.0043	3.0261	3.0472
215	2.8529	2.8780	2.9024	2.9263	2.9495	2.9721	2.9940	3.0154	3.0361	3.0562
220	2.8727	2.8965	2.9197	2.9423	2.9643	2.9858	3.0067	3.0270	3.0467	3.0659
225	2.8923	2.9148	2.9369	2.9584	2.9793	2.9998	3.0197	3.0390	3.0578	3.0761
230	2.9116	2.9331	2.9540	2.9745	2.9945	3.0140	3.0329	3.0514	3.0693	3.0868
235	2.9306	2.9511	2.9711	2.9906	3.0097	3.0283	3.0464	3.0640	3.0812	3.0978
240	2.9493	2.9689	2.9880	3.0066	3.0248	3.0426	3.0599	3.0768	3.0931	3.1091
245	2.9677	2.9864	3.0046	3.0225	3.0399	3.0569	3.0734	3.0896	3.1053	3.1205
250	2.9856	3.0035	3.0210	3.0381	3.0548	3.0711	3.0869	3.1024	3.1174	3.1320
255	3.0032	3.0204	3.0371	3.0535	3.0695	3.0851	3.1003	3.1151	3.1296	3.1436
260	3.0203	3.0368	3.0529	3.0686	3.0840	3.0990	3.1136	3.1278	3.1416	3.1551
265	3.0370	3.0529	3.0684	3.0835	3.0982	3.1126	3.1267	3.1403	3.1536	3.1666
270	3.0533	3.0686	3.0834	3.0980	3.1122	3.1260	3.1395	3.1527	3.1655	3.1779
275	3.0692	3.0838	3.0982	3.1122	3.1258	3.1392	3.1522	3.1648	3.1771	3.1891
280	3.0846	3.0987	3.1125	3.1260	3.1392	3.1520	3.1646	3.1768	3.1886	3.2002
285	3.0996	3.1132	3.1265	3.1396	3.1523	3.1646	3.1767	3.1885	3.1999	3.2111
290	3.1142	3.1273	3.1402	3.1527	3.1650	3.1770	3.1886	3.2000	3.2110	3.2218
295	3.1284	3.1411	3.1535	3.1656	3.1775	3.1890	3.2003	3.2112	3.2219	3.2323
300	3.1421	3.1544	3.1664	3.1782	3.1896	3.2008	3.2117	3.2223	3.2326	3.2426
305	3.1556	3.1674	3.1791	3.1904	3.2015	3.2123	3.2228	3.2331	3.2431	3.2528
310	3.1686	3.1801	3.1914	3.2023	3.2131	3.2235	3.2337	3.2437	3.2533	3.2628
315	3.1813	3.1925	3.2034	3.2140	3.2244	3.2345	3.2444	3.2540	3.2634	3.2725
320	3.1937	3.2045	3.2151	3.2254	3.2354	3.2452	3.2548	3.2642	3.2733	3.2821
325	3.2058	3.2162	3.2265	3.2364	3.2462	3.2557	3.2650	3.2741	3.2829	3.2915
330	3.2175	3.2276	3.2376	3.2473	3.2567	3.2660	3.2750	3.2838	3.2923	3.3007
335	3.2289	3.2387	3.2484	3.2578	3.2670	3.2759	3.2847	3.2932	3.3016	3.3097
340	3.2400	3.2495	3.2588	3.2680	3.2769	3.2856	3.2941	3.3024	3.3105	3.3184
345	3.2506	3.2599	3.2690	3.2779	3.2865	3.2950	3.3033	3.3114	3.3192	3.3269
350	3.2609	3.2699	3.2788	3.2874	3.2958	3.3041	3.3121	3.3199	3.3276	3.3351
360	3.2800	3.2885	3.2969	3.3051	3.3130	3.3208	3.3284	3.3359	3.3431	3.3502
370	3.2985	3.3066	3.3145	3.3222	3.3298	3.3372	3.3444	3.3515	3.3584	3.3651
380	3.3159	3.3235	3.3310	3.3383	3.3455	3.3525	3.3594	3.3661	3.3727	3.3791
390	3.3320	3.3393	3.3464	3.3534	3.3602	3.3669	3.3734	3.3798	3.3860	3.3921
400	3.3470	3.3539	3.3607	3.3673	3.3738	3.3802	3.3864	3.3925	3.3985	3.4043
410	3.3610	3.3676	3.3740	3.3804	3.3865	3.3926	3.3985	3.4044	3.4100	3.4156
420	3.3740	3.3803	3.3864	3.3924	3.3983	3.4041	3.4098	3.4153	3.4208	3.4261
430	3.3860	3.3920	3.3978	3.4036	3.4092	3.4148	3.4202	3.4255	3.4307	3.4358
440	3.3971	3.4028	3.4084	3.4139	3.4193	3.4246	3.4298	3.4349	3.4398	3.4447
450	3.4074	3.4128	3.4182	3.4234	3.4286	3.4337	3.4386	3.4435	3.4483	3.4530
460	3.4168	3.4220	3.4272	3.4322	3.4371	3.4420	3.4468	3.4514	3.4560	3.4605
470	3.4255	3.4305	3.4354	3.4402	3.4450	3.4496	3.4542	3.4587	3.4631	3.4674
480	3.4335	3.4383	3.4430	3.4476	3.4522	3.4566	3.4610	3.4653	3.4696	3.4737
490	3.4408	3.4454	3.4499	3.4544	3.4587	3.4630	3.4673	3.4714	3.4755	3.4795
500	3.4476	3.4520	3.4563	3.4606	3.4648	3.4689	3.4729	3.4769	3.4809	3.4847
510	3.4537	3.4580	3.4621	3.4662	3.4703	3.4742	3.4781	3.4820	3.4858	3.4895
520	3.4594	3.4634	3.4674	3.4714	3.4753	3.4791	3.4828	3.4865	3.4902	3.4938
530	3.4645	3.4684	3.4723	3.4761	3.4798	3.4835	3.4871	3.4907	3.4942	3.4977
540	3.4693	3.4730	3.4767	3.4804	3.4840	3.4875	3.4910	3.4945	3.4979	3.5012
550	3.4736	3.4772	3.4808	3.4843	3.4878	3.4912	3.4946	3.4979	3.5012	3.5044
560	3.4775	3.4810	3.4845	3.4879	3.4912	3.4945	3.4978	3.5010	3.5042	3.5073
570	3.4812	3.4845	3.4879	3.4912	3.4944	3.4976	3.5007	3.5038	3.5069	3.5099
580	3.4845	3.4878	3.4910	3.4941	3.4973	3.5004	3.5034	3.5064	3.5094	3.5123
590	3.4876	3.4907	3.4938	3.4969	3.4999	3.5029	3.5058	3.5087	3.5116	3.5144
600	3.4904	3.4935	3.4965	3.4994	3.5023	3.5052	3.5081	3.5109	3.5136	3.5164
610	3.4930	3.4960	3.4989	3.5017	3.5046	3.5073	3.5101	3.5128	3.5155	3.5182
620	3.4955	3.4983	3.5011	3.5039	3.5066	3.5093	3.5120	3.5146	3.5172	3.5198
630	3.4977	3.5004	3.5032	3.5058	3.5085	3.5111	3.5137	3.5162	3.5188	3.5213
640	3.4998	3.5024	3.5051	3.5076	3.5102	3.5128	3.5153	3.5177	3.5202	3.5226
650	3.5017	3.5043	3.5068	3.5093	3.5118	3.5143	3.5167	3.5191	3.5215	3.5238
660	3.5035	3.5059	3.5084	3.5108	3.5133	3.5156	3.5180	3.5203	3.5226	3.5249
670	3.5051	3.5075	3.5099	3.5122	3.5146	3.5169	3.5192	3.5214	3.5237	3.5259
680	3.5065	3.5089	3.5112	3.5135	3.5157	3.5180	3.5202	3.5224	3.5246	3.5268
690	3.5078	3.5101	3.5123	3.5146	3.5168	3.5190	3.5211	3.5233	3.5254	3.5275
700	3.5090	3.5112	3.5133	3.5155	3.5176	3.5198	3.5219	3.5239	3.5260	3.5280

specific heat

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
3.0491	3.0762	3.1018	3.1259	3.1485	3.1696	3.1891	3.2072	3.2237	3.2388	3.2523
3.0458	3.0717	3.0963	3.1196	3.1415	3.1621	3.1815	3.1995	3.2162	3.2315	3.2456
3.0450	3.0698	3.0935	3.1159	3.1372	3.1574	3.1764	3.1943	3.2109	3.2265	3.2409
3.0465	3.0702	3.0929	3.1145	3.1352	3.1548	3.1734	3.1910	3.2075	3.2231	3.2376
3.0497	3.0724	3.0941	3.1150	3.1349	3.1539	3.1721	3.1893	3.2056	3.2210	3.2355
3.0545	3.0761	3.0970	3.1170	3.1362	3.1546	3.1722	3.1889	3.2049	3.2200	3.2343
3.0605	3.0812	3.1012	3.1204	3.1388	3.1566	3.1736	3.1898	3.2053	3.2201	3.2342
3.0676	3.0874	3.1065	3.1249	3.1426	3.1597	3.1761	3.1918	3.2068	3.2212	3.2348
3.0757	3.0945	3.1128	3.1304	3.1474	3.1638	3.1795	3.1947	3.2092	3.2231	3.2364
3.0845	3.1025	3.1199	3.1368	3.1530	3.1688	3.1839	3.1984	3.2124	3.2258	3.2387
3.0939	3.1111	3.1277	3.1438	3.1594	3.1745	3.1890	3.2030	3.2164	3.2293	3.2417
3.1037	3.1202	3.1361	3.1515	3.1665	3.1809	3.1948	3.2082	3.2211	3.2335	3.2454
3.1140	3.1297	3.1450	3.1597	3.1740	3.1878	3.2012	3.2140	3.2264	3.2383	3.2497
3.1246	3.1396	3.1542	3.1683	3.1820	3.1953	3.2080	3.2204	3.2322	3.2437	3.2546
3.1354	3.1498	3.1637	3.1773	3.1904	3.2031	3.2153	3.2271	3.2385	3.2495	3.2600
3.1463	3.1601	3.1734	3.1864	3.1990	3.2112	3.2229	3.2342	3.2452	3.2557	3.2658
3.1572	3.1705	3.1833	3.1958	3.2078	3.2195	3.2308	3.2416	3.2521	3.2622	3.2719
3.1682	3.1809	3.1932	3.2052	3.2168	3.2280	3.2388	3.2493	3.2593	3.2690	3.2783
3.1791	3.1914	3.2032	3.2147	3.2258	3.2366	3.2470	3.2570	3.2667	3.2760	3.2850
3.1900	3.2018	3.2132	3.2242	3.2349	3.2453	3.2553	3.2649	3.2743	3.2832	3.2918
3.2008	3.2121	3.2231	3.2337	3.2440	3.2540	3.2636	3.2729	3.2819	3.2905	3.2988
3.2114	3.2223	3.2329	3.2432	3.2531	3.2627	3.2720	3.2810	3.2896	3.2979	3.3059
3.2219	3.2324	3.2426	3.2525	3.2621	3.2714	3.2803	3.2890	3.2973	3.3054	3.3131
3.2322	3.2424	3.2523	3.2618	3.2711	3.2800	3.2887	3.2970	3.3051	3.3128	3.3203
3.2424	3.2522	3.2618	3.2710	3.2799	3.2886	3.2970	3.3050	3.3128	3.3203	3.3275
3.2524	3.2619	3.2711	3.2801	3.2887	3.2971	3.3052	3.3130	3.3205	3.3278	3.3348
3.2623	3.2714	3.2804	3.2890	3.2974	3.3055	3.3133	3.3209	3.3282	3.3352	3.3420
3.2719	3.2808	3.2895	3.2978	3.3060	3.3138	3.3214	3.3288	3.3358	3.3427	3.3492
3.2814	3.2900	3.2984	3.3065	3.3144	3.3220	3.3294	3.3365	3.3434	3.3500	3.3564
3.2907	3.2991	3.3072	3.3151	3.3227	3.3301	3.3373	3.3442	3.3509	3.3573	3.3635
3.2999	3.3080	3.3159	3.3235	3.3310	3.3381	3.3451	3.3518	3.3583	3.3646	3.3706
3.3088	3.3167	3.3244	3.3318	3.3390	3.3460	3.3528	3.3593	3.3656	3.3717	3.3776
3.3175	3.3252	3.3327	3.3399	3.3469	3.3537	3.3603	3.3667	3.3728	3.3788	3.3845
3.3261	3.3335	3.3408	3.3478	3.3547	3.3613	3.3677	3.3739	3.3799	3.3857	3.3913
3.3343	3.3416	3.3487	3.3555	3.3622	3.3686	3.3749	3.3809	3.3868	3.3924	3.3979
3.3423	3.3494	3.3563	3.3629	3.3694	3.3757	3.3818	3.3877	3.3934	3.3989	3.4042
3.3571	3.3638	3.3703	3.3767	3.3829	3.3888	3.3947	3.4003	3.4057	3.4110	3.4161
3.3717	3.3780	3.3842	3.3903	3.3962	3.4019	3.4074	3.4128	3.4180	3.4230	3.4279
3.3853	3.3914	3.3973	3.4031	3.4087	3.4141	3.4194	3.4246	3.4296	3.4344	3.4390
3.3981	3.4039	3.4095	3.4150	3.4204	3.4256	3.4307	3.4356	3.4404	3.4450	3.4495
3.4100	3.4155	3.4209	3.4262	3.4313	3.4363	3.4412	3.4459	3.4505	3.4550	3.4593
3.4210	3.4263	3.4315	3.4366	3.4415	3.4463	3.4509	3.4555	3.4599	3.4642	3.4684
3.4313	3.4364	3.4413	3.4462	3.4509	3.4555	3.4600	3.4644	3.4686	3.4727	3.4768
3.4408	3.4456	3.4504	3.4550	3.4596	3.4640	3.4683	3.4725	3.4766	3.4806	3.4845
3.4495	3.4542	3.4587	3.4632	3.4676	3.4718	3.4760	3.4801	3.4840	3.4879	3.4916
3.4575	3.4620	3.4664	3.4707	3.4749	3.4790	3.4830	3.4870	3.4908	3.4945	3.4981
3.4649	3.4692	3.4735	3.4776	3.4816	3.4856	3.4895	3.4932	3.4969	3.5005	3.5041
3.4717	3.4758	3.4799	3.4839	3.4878	3.4916	3.4953	3.4990	3.5025	3.5060	3.5094
3.4778	3.4818	3.4857	3.4896	3.4933	3.4970	3.5006	3.5042	3.5076	3.5110	3.5143
3.4834	3.4873	3.4910	3.4947	3.4984	3.5019	3.5054	3.5088	3.5122	3.5155	3.5187
3.4885	3.4922	3.4959	3.4994	3.5030	3.5064	3.5098	3.5131	3.5163	3.5195	3.5226
3.4931	3.4967	3.5002	3.5037	3.5071	3.5104	3.5137	3.5169	3.5200	3.5231	3.5261
3.4973	3.5008	3.5042	3.5075	3.5108	3.5140	3.5172	3.5203	3.5233	3.5263	3.5292
3.5011	3.5044	3.5077	3.5109	3.5141	3.5172	3.5203	3.5233	3.5262	3.5291	3.5320
3.5045	3.5077	3.5109	3.5140	3.5171	3.5201	3.5231	3.5260	3.5289	3.5317	3.5344
3.5076	3.5107	3.5138	3.5168	3.5198	3.5227	3.5256	3.5284	3.5312	3.5339	3.5366
3.5104	3.5134	3.5164	3.5193	3.5222	3.5250	3.5278	3.5305	3.5332	3.5359	3.5385
3.5129	3.5158	3.5187	3.5215	3.5243	3.5271	3.5298	3.5324	3.5351	3.5376	3.5402
3.5152	3.5180	3.5208	3.5235	3.5262	3.5289	3.5315	3.5341	3.5367	3.5392	3.5416
3.5172	3.5200	3.5227	3.5253	3.5280	3.5306	3.5331	3.5356	3.5381	3.5405	3.5429
3.5191	3.5217	3.5244	3.5270	3.5295	3.5320	3.5345	3.5370	3.5394	3.5417	3.5441
3.5208	3.5234	3.5259	3.5284	3.5309	3.5333	3.5358	3.5381	3.5405	3.5428	3.5450
3.5223	3.5248	3.5273	3.5297	3.5322	3.5345	3.5369	3.5392	3.5415	3.5437	3.5459
3.5237	3.5262	3.5286	3.5309	3.5333	3.5356	3.5379	3.5401	3.5423	3.5445	3.5467
3.5250	3.5274	3.5297	3.5320	3.5343	3.5365	3.5387	3.5409	3.5431	3.5452	3.5473
3.5261	3.5284	3.5307	3.5329	3.5352	3.5373	3.5395	3.5416	3.5437	3.5458	3.5478
3.5272	3.5294	3.5316	3.5338	3.5359	3.5381	3.5402	3.5422	3.5443	3.5463	3.5483
3.5281	3.5303	3.5324	3.5345	3.5366	3.5387	3.5407	3.5427	3.5447	3.5467	3.5486
3.5289	3.5310	3.5331	3.5351	3.5372	3.5392	3.5412	3.5431	3.5451	3.5470	3.5489
3.5295	3.5316	3.5336	3.5356	3.5376	3.5396	3.5415	3.5434	3.5453	3.5472	3.5490
3.5301	3.5320	3.5340	3.5360	3.5379	3.5398	3.5417	3.5436	3.5454	3.5472	3.5490

TABLE V. - Continued.

(b) Plenum

Plenum temperature, °R	Plenum									
	0	5	10	15	20	25	30	35	40	45
175	1.5899	1.6091	1.6282	1.6469	1.6654	1.6837	1.7016	1.7193	1.7366	1.7536
180	1.5834	1.6014	1.6191	1.6366	1.6539	1.6709	1.6876	1.7040	1.7201	1.7358
185	1.5768	1.5937	1.6103	1.6266	1.6427	1.6586	1.6741	1.6893	1.7043	1.7189
190	1.5704	1.5861	1.6017	1.6170	1.6320	1.6468	1.6612	1.6754	1.6893	1.7028
195	1.5640	1.5788	1.5933	1.6076	1.6217	1.6355	1.6490	1.6622	1.6750	1.6876
200	1.5577	1.5716	1.5852	1.5986	1.6118	1.6246	1.6372	1.6495	1.6615	1.6732
205	1.5516	1.5646	1.5774	1.5900	1.6023	1.6143	1.6261	1.6376	1.6487	1.6596
210	1.5455	1.5578	1.5698	1.5816	1.5932	1.6045	1.6155	1.6262	1.6366	1.6468
215	1.5397	1.5512	1.5625	1.5736	1.5845	1.5950	1.6054	1.6154	1.6251	1.6346
220	1.5340	1.5449	1.5555	1.5659	1.5761	1.5861	1.5957	1.6051	1.6143	1.6231
225	1.5285	1.5387	1.5488	1.5586	1.5682	1.5775	1.5866	1.5954	1.6040	1.6123
230	1.5231	1.5328	1.5423	1.5515	1.5606	1.5694	1.5779	1.5862	1.5943	1.6021
235	1.5180	1.5271	1.5361	1.5448	1.5533	1.5616	1.5697	1.5775	1.5850	1.5924
240	1.5130	1.5217	1.5301	1.5384	1.5464	1.5542	1.5618	1.5692	1.5763	1.5832
245	1.5082	1.5164	1.5244	1.5322	1.5398	1.5472	1.5544	1.5613	1.5681	1.5746
250	1.5036	1.5114	1.5190	1.5264	1.5335	1.5405	1.5473	1.5539	1.5603	1.5664
255	1.4992	1.5066	1.5138	1.5208	1.5276	1.5342	1.5406	1.5468	1.5528	1.5587
260	1.4950	1.5020	1.5088	1.5154	1.5219	1.5282	1.5342	1.5401	1.5458	1.5513
265	1.4909	1.4975	1.5040	1.5103	1.5165	1.5224	1.5282	1.5338	1.5392	1.5444
270	1.4870	1.4933	1.4995	1.5055	1.5113	1.5170	1.5224	1.5277	1.5329	1.5378
275	1.4833	1.4893	1.4951	1.5008	1.5064	1.5118	1.5170	1.5220	1.5269	1.5316
280	1.4797	1.4854	1.4910	1.4964	1.5017	1.5068	1.5118	1.5166	1.5212	1.5257
285	1.4763	1.4817	1.4870	1.4922	1.4972	1.5021	1.5068	1.5114	1.5158	1.5201
290	1.4730	1.4782	1.4833	1.4882	1.4930	1.4976	1.5021	1.5065	1.5107	1.5148
295	1.4698	1.4748	1.4796	1.4843	1.4889	1.4933	1.4976	1.5018	1.5058	1.5097
300	1.4668	1.4716	1.4762	1.4806	1.4850	1.4892	1.4933	1.4973	1.5011	1.5048
305	1.4639	1.4684	1.4728	1.4771	1.4813	1.4853	1.4892	1.4930	1.4967	1.5002
310	1.4611	1.4654	1.4696	1.4737	1.4777	1.4816	1.4853	1.4890	1.4925	1.4959
315	1.4584	1.4626	1.4666	1.4705	1.4743	1.4780	1.4816	1.4851	1.4884	1.4917
320	1.4558	1.4598	1.4636	1.4674	1.4710	1.4746	1.4780	1.4813	1.4845	1.4876
325	1.4534	1.4571	1.4608	1.4644	1.4679	1.4713	1.4746	1.4778	1.4808	1.4838
330	1.4510	1.4546	1.4581	1.4615	1.4649	1.4681	1.4713	1.4743	1.4773	1.4801
335	1.4487	1.4521	1.4555	1.4588	1.4620	1.4651	1.4681	1.4711	1.4739	1.4766
340	1.4464	1.4498	1.4530	1.4562	1.4592	1.4622	1.4651	1.4679	1.4706	1.4733
345	1.4443	1.4475	1.4506	1.4537	1.4566	1.4595	1.4622	1.4649	1.4675	1.4701
350	1.4423	1.4454	1.4483	1.4513	1.4541	1.4568	1.4595	1.4621	1.4646	1.4670
360	1.4386	1.4414	1.4442	1.4468	1.4495	1.4520	1.4545	1.4568	1.4592	1.4614
370	1.4351	1.4377	1.4402	1.4427	1.4451	1.4474	1.4497	1.4519	1.4540	1.4561
380	1.4318	1.4342	1.4366	1.4389	1.4411	1.4432	1.4453	1.4474	1.4494	1.4513
390	1.4288	1.4310	1.4332	1.4353	1.4374	1.4394	1.4414	1.4432	1.4451	1.4469
400	1.4261	1.4281	1.4301	1.4321	1.4340	1.4359	1.4377	1.4394	1.4411	1.4428
410	1.4235	1.4255	1.4273	1.4291	1.4309	1.4326	1.4343	1.4359	1.4375	1.4391
420	1.4212	1.4230	1.4247	1.4264	1.4281	1.4297	1.4312	1.4327	1.4342	1.4356
430	1.4191	1.4208	1.4224	1.4239	1.4255	1.4269	1.4284	1.4298	1.4312	1.4325
440	1.4172	1.4187	1.4202	1.4216	1.4231	1.4244	1.4258	1.4271	1.4284	1.4296
450	1.4154	1.4168	1.4182	1.4196	1.4209	1.4222	1.4234	1.4246	1.4258	1.4269
460	1.4138	1.4151	1.4164	1.4176	1.4189	1.4201	1.4212	1.4223	1.4234	1.4245
470	1.4123	1.4135	1.4147	1.4159	1.4170	1.4181	1.4192	1.4203	1.4213	1.4223
480	1.4109	1.4121	1.4132	1.4143	1.4153	1.4164	1.4174	1.4183	1.4193	1.4202
490	1.4097	1.4108	1.4118	1.4128	1.4138	1.4147	1.4157	1.4166	1.4175	1.4183
500	1.4086	1.4096	1.4105	1.4114	1.4124	1.4133	1.4141	1.4150	1.4158	1.4166
510	1.4075	1.4085	1.4093	1.4102	1.4111	1.4119	1.4127	1.4135	1.4142	1.4150
520	1.4066	1.4075	1.4083	1.4091	1.4099	1.4106	1.4114	1.4121	1.4128	1.4135
530	1.4058	1.4065	1.4073	1.4081	1.4088	1.4095	1.4102	1.4108	1.4115	1.4121
540	1.4050	1.4057	1.4064	1.4071	1.4078	1.4084	1.4091	1.4097	1.4103	1.4109
550	1.4043	1.4049	1.4056	1.4062	1.4069	1.4075	1.4081	1.4086	1.4092	1.4097
560	1.4036	1.4042	1.4048	1.4054	1.4060	1.4066	1.4071	1.4076	1.4081	1.4086
570	1.4030	1.4036	1.4042	1.4047	1.4052	1.4057	1.4062	1.4067	1.4072	1.4076
580	1.4025	1.4030	1.4035	1.4040	1.4045	1.4050	1.4054	1.4059	1.4063	1.4067
590	1.4020	1.4025	1.4029	1.4034	1.4038	1.4043	1.4047	1.4051	1.4055	1.4059
600	1.4015	1.4020	1.4024	1.4028	1.4032	1.4036	1.4040	1.4044	1.4047	1.4051
610	1.4011	1.4015	1.4019	1.4023	1.4027	1.4030	1.4034	1.4037	1.4040	1.4043
620	1.4007	1.4011	1.4014	1.4018	1.4021	1.4024	1.4028	1.4031	1.4033	1.4036
630	1.4004	1.4007	1.4010	1.4013	1.4016	1.4019	1.4022	1.4025	1.4027	1.4030
640	1.4000	1.4003	1.4006	1.4009	1.4012	1.4014	1.4017	1.4019	1.4021	1.4024
650	1.3997	1.4000	1.4002	1.4005	1.4007	1.4010	1.4012	1.4014	1.4016	1.4018
660	1.3994	1.3997	1.3999	1.4001	1.4003	1.4005	1.4007	1.4009	1.4011	1.4012
670	1.3992	1.3994	1.3996	1.3998	1.4000	1.4001	1.4003	1.4005	1.4006	1.4007
680	1.3990	1.3991	1.3993	1.3995	1.3996	1.3998	1.3999	1.4000	1.4002	1.4003
690	1.3988	1.3989	1.3990	1.3992	1.3993	1.3994	1.3995	1.3997	1.3998	1.3999
700	1.3986	1.3987	1.3988	1.3989	1.3990	1.3991	1.3992	1.3993	1.3994	1.3995

THERMODYNAMIC PROPERTIES OF NORMAL HYDROGEN

specific heat ratio

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
1.7703	1.7867	1.8026	1.8182	1.8334	1.8483	1.8627	1.8766	1.8902	1.9033	1.9159
1.7513	1.7664	1.7811	1.7955	1.8095	1.8231	1.8363	1.8491	1.8615	1.8734	1.8849
1.7332	1.7472	1.7608	1.7740	1.7869	1.7993	1.8114	1.8231	1.8343	1.8451	1.8555
1.7161	1.7290	1.7415	1.7537	1.7655	1.7769	1.7880	1.7986	1.8088	1.8186	1.8280
1.6999	1.7118	1.7234	1.7346	1.7455	1.7560	1.7661	1.7758	1.7851	1.7939	1.8024
1.6846	1.6957	1.7064	1.7167	1.7267	1.7363	1.7456	1.7544	1.7629	1.7710	1.7786
1.6702	1.6804	1.6904	1.6999	1.7091	1.7180	1.7265	1.7346	1.7423	1.7497	1.7566
1.6566	1.6661	1.6753	1.6842	1.6927	1.7009	1.7087	1.7162	1.7232	1.7300	1.7363
1.6438	1.6527	1.6612	1.6694	1.6773	1.6849	1.6921	1.6990	1.7055	1.7116	1.7174
1.6317	1.6400	1.6479	1.6556	1.6629	1.6700	1.6766	1.6830	1.6890	1.6947	1.7000
1.6203	1.6280	1.6355	1.6426	1.6495	1.6560	1.6622	1.6681	1.6737	1.6789	1.6838
1.6096	1.6168	1.6238	1.6305	1.6368	1.6429	1.6487	1.6542	1.6594	1.6642	1.6687
1.5994	1.6062	1.6128	1.6190	1.6250	1.6307	1.6361	1.6412	1.6460	1.6505	1.6547
1.5899	1.5963	1.6024	1.6083	1.6139	1.6192	1.6243	1.6291	1.6336	1.6378	1.6417
1.5808	1.5869	1.5926	1.5982	1.6034	1.6085	1.6132	1.6177	1.6219	1.6259	1.6295
1.5723	1.5780	1.5834	1.5887	1.5936	1.5983	1.6028	1.6070	1.6110	1.6147	1.6182
1.5642	1.5696	1.5748	1.5797	1.5844	1.5888	1.5931	1.5971	1.6008	1.6043	1.6075
1.5566	1.5617	1.5666	1.5712	1.5757	1.5799	1.5839	1.5877	1.5912	1.5945	1.5976
1.5494	1.5542	1.5589	1.5633	1.5675	1.5715	1.5753	1.5788	1.5822	1.5853	1.5882
1.5426	1.5472	1.5516	1.5557	1.5597	1.5635	1.5671	1.5705	1.5737	1.5767	1.5794
1.5361	1.5405	1.5446	1.5486	1.5524	1.5560	1.5594	1.5627	1.5657	1.5685	1.5711
1.5300	1.5341	1.5381	1.5419	1.5455	1.5489	1.5522	1.5553	1.5581	1.5608	1.5633
1.5242	1.5281	1.5319	1.5355	1.5390	1.5422	1.5453	1.5483	1.5510	1.5536	1.5560
1.5187	1.5224	1.5260	1.5295	1.5328	1.5359	1.5388	1.5416	1.5443	1.5467	1.5490
1.5134	1.5170	1.5204	1.5237	1.5269	1.5299	1.5327	1.5354	1.5379	1.5402	1.5424
1.5084	1.5118	1.5151	1.5183	1.5213	1.5241	1.5268	1.5294	1.5318	1.5341	1.5362
1.5037	1.5069	1.5101	1.5131	1.5159	1.5187	1.5213	1.5237	1.5260	1.5282	1.5302
1.4991	1.5022	1.5053	1.5081	1.5109	1.5135	1.5160	1.5183	1.5206	1.5226	1.5246
1.4948	1.4978	1.5007	1.5034	1.5060	1.5086	1.5109	1.5132	1.5153	1.5173	1.5192
1.4906	1.4935	1.4963	1.4989	1.5014	1.5038	1.5061	1.5083	1.5104	1.5123	1.5141
1.4867	1.4894	1.4921	1.4946	1.4970	1.4993	1.5015	1.5036	1.5056	1.5075	1.5092
1.4829	1.4855	1.4881	1.4905	1.4928	1.4951	1.4972	1.4992	1.5011	1.5029	1.5045
1.4793	1.4818	1.4842	1.4866	1.4888	1.4909	1.4930	1.4949	1.4967	1.4985	1.5001
1.4758	1.4782	1.4806	1.4828	1.4850	1.4870	1.4890	1.4908	1.4926	1.4943	1.4958
1.4725	1.4748	1.4771	1.4792	1.4813	1.4833	1.4852	1.4870	1.4887	1.4903	1.4918
1.4693	1.4716	1.4738	1.4758	1.4778	1.4797	1.4815	1.4833	1.4849	1.4865	1.4879
1.4635	1.4656	1.4676	1.4696	1.4714	1.4732	1.4749	1.4765	1.4780	1.4794	1.4808
1.4581	1.4600	1.4619	1.4637	1.4654	1.4670	1.4686	1.4701	1.4715	1.4729	1.4742
1.4531	1.4549	1.4566	1.4583	1.4599	1.4614	1.4629	1.4643	1.4656	1.4669	1.4681
1.4486	1.4502	1.4518	1.4534	1.4549	1.4563	1.4576	1.4589	1.4602	1.4614	1.4625
1.4444	1.4459	1.4474	1.4488	1.4502	1.4516	1.4528	1.4540	1.4552	1.4563	1.4573
1.4405	1.4420	1.4434	1.4447	1.4460	1.4472	1.4484	1.4495	1.4506	1.4516	1.4526
1.4370	1.4383	1.4396	1.4409	1.4421	1.4432	1.4443	1.4454	1.4464	1.4474	1.4483
1.4338	1.4350	1.4362	1.4374	1.4385	1.4396	1.4406	1.4416	1.4425	1.4434	1.4443
1.4308	1.4319	1.4331	1.4341	1.4352	1.4362	1.4371	1.4381	1.4389	1.4398	1.4406
1.4281	1.4291	1.4302	1.4312	1.4321	1.4331	1.4340	1.4348	1.4356	1.4364	1.4372
1.4255	1.4265	1.4275	1.4284	1.4293	1.4302	1.4310	1.4318	1.4326	1.4333	1.4340
1.4232	1.4242	1.4251	1.4259	1.4268	1.4276	1.4283	1.4291	1.4298	1.4305	1.4311
1.4211	1.4220	1.4228	1.4236	1.4244	1.4251	1.4259	1.4266	1.4272	1.4279	1.4285
1.4191	1.4199	1.4207	1.4215	1.4222	1.4229	1.4236	1.4242	1.4248	1.4254	1.4260
1.4173	1.4181	1.4188	1.4195	1.4202	1.4208	1.4214	1.4220	1.4226	1.4232	1.4237
1.4157	1.4164	1.4170	1.4177	1.4183	1.4189	1.4195	1.4200	1.4206	1.4211	1.4216
1.4142	1.4148	1.4154	1.4160	1.4166	1.4171	1.4177	1.4182	1.4187	1.4192	1.4196
1.4127	1.4133	1.4139	1.4145	1.4150	1.4155	1.4160	1.4165	1.4169	1.4174	1.4178
1.4114	1.4120	1.4125	1.4130	1.4135	1.4140	1.4144	1.4149	1.4153	1.4157	1.4161
1.4102	1.4107	1.4112	1.4117	1.4121	1.4126	1.4130	1.4134	1.4138	1.4142	1.4145
1.4091	1.4096	1.4100	1.4105	1.4109	1.4113	1.4117	1.4120	1.4124	1.4127	1.4130
1.4081	1.4085	1.4089	1.4093	1.4097	1.4101	1.4104	1.4107	1.4111	1.4114	1.4117
1.4071	1.4075	1.4079	1.4082	1.4086	1.4089	1.4092	1.4095	1.4098	1.4101	1.4104
1.4062	1.4066	1.4069	1.4072	1.4076	1.4079	1.4081	1.4084	1.4087	1.4089	1.4092
1.4054	1.4057	1.4060	1.4063	1.4066	1.4069	1.4071	1.4074	1.4076	1.4078	1.4080
1.4046	1.4049	1.4052	1.4054	1.4057	1.4059	1.4062	1.4064	1.4066	1.4068	1.4070
1.4039	1.4041	1.4044	1.4046	1.4048	1.4051	1.4053	1.4055	1.4056	1.4058	1.4060
1.4032	1.4034	1.4036	1.4039	1.4041	1.4042	1.4044	1.4046	1.4047	1.4049	1.4050
1.4026	1.4028	1.4030	1.4031	1.4033	1.4035	1.4036	1.4038	1.4039	1.4040	1.4041
1.4020	1.4021	1.4023	1.4025	1.4026	1.4027	1.4029	1.4030	1.4031	1.4032	1.4033
1.4014	1.4016	1.4017	1.4018	1.4019	1.4021	1.4022	1.4023	1.4024	1.4024	1.4025
1.4009	1.4010	1.4011	1.4012	1.4013	1.4014	1.4015	1.4016	1.4017	1.4017	1.4018
1.4004	1.4005	1.4006	1.4007	1.4008	1.4008	1.4009	1.4009	1.4010	1.4010	1.4011
1.3999	1.4000	1.4001	1.4002	1.4002	1.4003	1.4003	1.4003	1.4004	1.4004	1.4004
1.3995	1.3996	1.3996	1.3997	1.3997	1.3998	1.3998	1.3998	1.3998	1.3998	1.3998

TABLE V. - Concluded.

(i) Ratio of plenum speed of sound to speed of

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	Plenum 45
175	0.6332	0.6361	0.6393	0.6428	0.6468	0.6511	0.6557	0.6608	0.6662	0.6721
180	0.6408	0.6438	0.6472	0.6508	0.6548	0.6591	0.6638	0.6688	0.6742	0.6800
185	0.6483	0.6515	0.6549	0.6586	0.6626	0.6670	0.6716	0.6766	0.6820	0.6876
190	0.6557	0.6589	0.6624	0.6662	0.6703	0.6746	0.6793	0.6842	0.6895	0.6951
195	0.6629	0.6662	0.6698	0.6736	0.6777	0.6821	0.6867	0.6916	0.6968	0.7023
200	0.6700	0.6734	0.6770	0.6809	0.6850	0.6894	0.6940	0.6989	0.7040	0.7094
205	0.6770	0.6804	0.6841	0.6880	0.6921	0.6965	0.7011	0.7060	0.7110	0.7164
210	0.6839	0.6874	0.6911	0.6950	0.6992	0.7035	0.7081	0.7129	0.7179	0.7232
215	0.6906	0.6942	0.6979	0.7019	0.7061	0.7104	0.7150	0.7197	0.7247	0.7299
220	0.6973	0.7009	0.7047	0.7087	0.7128	0.7172	0.7217	0.7265	0.7314	0.7365
225	0.7039	0.7076	0.7114	0.7154	0.7195	0.7239	0.7284	0.7331	0.7380	0.7430
230	0.7105	0.7141	0.7180	0.7220	0.7261	0.7305	0.7349	0.7396	0.7444	0.7494
235	0.7169	0.7206	0.7245	0.7285	0.7326	0.7370	0.7414	0.7461	0.7508	0.7558
240	0.7233	0.7271	0.7309	0.7349	0.7391	0.7434	0.7478	0.7524	0.7572	0.7621
245	0.7297	0.7334	0.7373	0.7413	0.7455	0.7497	0.7542	0.7587	0.7634	0.7683
250	0.7360	0.7397	0.7436	0.7476	0.7518	0.7560	0.7604	0.7650	0.7696	0.7744
255	0.7422	0.7460	0.7499	0.7539	0.7580	0.7623	0.7667	0.7712	0.7758	0.7805
260	0.7484	0.7522	0.7561	0.7601	0.7642	0.7685	0.7728	0.7773	0.7819	0.7866
265	0.7545	0.7583	0.7622	0.7662	0.7703	0.7746	0.7789	0.7834	0.7879	0.7926
270	0.7606	0.7644	0.7683	0.7723	0.7764	0.7807	0.7850	0.7894	0.7939	0.7985
275	0.7667	0.7705	0.7744	0.7784	0.7825	0.7867	0.7910	0.7954	0.7999	0.8045
280	0.7727	0.7765	0.7804	0.7844	0.7885	0.7927	0.7969	0.8013	0.8058	0.8103
285	0.7786	0.7824	0.7864	0.7903	0.7944	0.7986	0.8029	0.8072	0.8116	0.8162
290	0.7846	0.7884	0.7923	0.7963	0.8003	0.8045	0.8087	0.8130	0.8175	0.8219
295	0.7904	0.7943	0.7982	0.8021	0.8062	0.8103	0.8146	0.8189	0.8232	0.8277
300	0.7963	0.8001	0.8040	0.8080	0.8120	0.8162	0.8204	0.8246	0.8290	0.8334
305	0.8021	0.8059	0.8098	0.8138	0.8178	0.8219	0.8261	0.8304	0.8347	0.8391
310	0.8079	0.8117	0.8156	0.8195	0.8236	0.8277	0.8318	0.8360	0.8403	0.8447
315	0.8136	0.8174	0.8213	0.8253	0.8293	0.8334	0.8375	0.8417	0.8460	0.8503
320	0.8193	0.8231	0.8270	0.8310	0.8350	0.8390	0.8431	0.8473	0.8516	0.8559
325	0.8250	0.8288	0.8327	0.8366	0.8406	0.8446	0.8487	0.8529	0.8571	0.8614
330	0.8306	0.8344	0.8383	0.8422	0.8462	0.8502	0.8543	0.8584	0.8626	0.8669
335	0.8362	0.8400	0.8439	0.8478	0.8518	0.8558	0.8598	0.8639	0.8681	0.8723
340	0.8418	0.8456	0.8494	0.8533	0.8573	0.8613	0.8653	0.8694	0.8736	0.8778
345	0.8474	0.8511	0.8550	0.8589	0.8628	0.8668	0.8708	0.8749	0.8790	0.8832
350	0.8529	0.8567	0.8605	0.8644	0.8683	0.8722	0.8762	0.8803	0.8844	0.8886
360	0.8639	0.8676	0.8714	0.8753	0.8792	0.8831	0.8871	0.8911	0.8952	0.8993
370	0.8747	0.8784	0.8822	0.8861	0.8899	0.8938	0.8978	0.9017	0.9058	0.9098
380	0.8854	0.8892	0.8929	0.8967	0.9006	0.9044	0.9083	0.9123	0.9163	0.9203
390	0.8961	0.8998	0.9035	0.9073	0.9111	0.9150	0.9188	0.9227	0.9267	0.9306
400	0.9066	0.9103	0.9140	0.9178	0.9216	0.9254	0.9292	0.9331	0.9370	0.9409
410	0.9171	0.9207	0.9244	0.9282	0.9319	0.9357	0.9395	0.9433	0.9472	0.9511
420	0.9274	0.9311	0.9347	0.9384	0.9422	0.9459	0.9497	0.9535	0.9573	0.9612
430	0.9377	0.9413	0.9450	0.9486	0.9523	0.9561	0.9598	0.9636	0.9673	0.9712
440	0.9479	0.9515	0.9551	0.9588	0.9624	0.9661	0.9698	0.9736	0.9773	0.9811
450	0.9580	0.9616	0.9652	0.9688	0.9724	0.9761	0.9798	0.9835	0.9872	0.9909
460	0.9680	0.9716	0.9752	0.9788	0.9824	0.9860	0.9896	0.9933	0.9970	1.0007
470	0.9780	0.9815	0.9851	0.9886	0.9922	0.9958	0.9994	1.0030	1.0067	1.0104
480	0.9879	0.9914	0.9949	0.9984	1.0020	1.0055	1.0091	1.0127	1.0163	1.0200
490	0.9977	1.0011	1.0046	1.0081	1.0117	1.0152	1.0188	1.0223	1.0259	1.0295
500	1.0074	1.0108	1.0143	1.0178	1.0213	1.0248	1.0283	1.0319	1.0354	1.0390
510	1.0170	1.0205	1.0239	1.0274	1.0308	1.0343	1.0378	1.0413	1.0448	1.0484
520	1.0266	1.0300	1.0334	1.0369	1.0403	1.0438	1.0472	1.0507	1.0542	1.0577
530	1.0361	1.0395	1.0429	1.0463	1.0497	1.0531	1.0566	1.0600	1.0635	1.0669
540	1.0456	1.0489	1.0523	1.0557	1.0591	1.0625	1.0659	1.0693	1.0727	1.0761
550	1.0549	1.0583	1.0616	1.0650	1.0683	1.0717	1.0751	1.0785	1.0818	1.0853
560	1.0642	1.0675	1.0709	1.0742	1.0775	1.0809	1.0842	1.0876	1.0909	1.0943
570	1.0735	1.0768	1.0800	1.0833	1.0866	1.0900	1.0933	1.0966	1.0999	1.1033
580	1.0826	1.0859	1.0892	1.0924	1.0957	1.0990	1.1023	1.1056	1.1089	1.1122
590	1.0917	1.0950	1.0982	1.1015	1.1047	1.1080	1.1112	1.1145	1.1178	1.1211
600	1.1008	1.1040	1.1072	1.1104	1.1136	1.1169	1.1201	1.1233	1.1266	1.1299
610	1.1097	1.1129	1.1161	1.1193	1.1225	1.1257	1.1289	1.1321	1.1354	1.1386
620	1.1187	1.1218	1.1250	1.1281	1.1313	1.1345	1.1377	1.1409	1.1440	1.1472
630	1.1275	1.1306	1.1338	1.1369	1.1400	1.1432	1.1464	1.1495	1.1527	1.1559
640	1.1363	1.1394	1.1425	1.1456	1.1487	1.1518	1.1550	1.1581	1.1613	1.1644
650	1.1450	1.1481	1.1512	1.1542	1.1573	1.1604	1.1635	1.1666	1.1698	1.1729
660	1.1536	1.1567	1.1598	1.1628	1.1659	1.1690	1.1720	1.1751	1.1782	1.1813
670	1.1622	1.1653	1.1683	1.1714	1.1744	1.1774	1.1805	1.1836	1.1866	1.1897
680	1.1708	1.1738	1.1768	1.1798	1.1828	1.1859	1.1889	1.1919	1.1950	1.1980
690	1.1793	1.1823	1.1852	1.1882	1.1912	1.1942	1.1972	1.2002	1.2032	1.2063
700	1.1877	1.1907	1.1936	1.1966	1.1996	1.2025	1.2055	1.2085	1.2115	1.2145

THERMODYNAMIC PROPERTIES OF NORMAL HYDROGEN

sound at 1 atmosphere and 491.68A° R (4137.10 ft/sec)

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
0.6783	0.6850	0.6921	0.6996	0.7076	0.7161	0.7250	0.7344	0.7444	0.7548	0.7659
0.6861	0.6926	0.6995	0.7068	0.7145	0.7227	0.7312	0.7403	0.7498	0.7597	0.7702
0.6936	0.7000	0.7067	0.7138	0.7212	0.7291	0.7373	0.7460	0.7551	0.7645	0.7745
0.7010	0.7072	0.7137	0.7206	0.7278	0.7354	0.7433	0.7516	0.7603	0.7694	0.7788
0.7081	0.7142	0.7206	0.7273	0.7343	0.7416	0.7492	0.7572	0.7656	0.7742	0.7833
0.7151	0.7210	0.7273	0.7338	0.7406	0.7477	0.7551	0.7628	0.7708	0.7791	0.7878
0.7220	0.7278	0.7339	0.7402	0.7468	0.7537	0.7609	0.7683	0.7761	0.7841	0.7924
0.7287	0.7344	0.7404	0.7466	0.7530	0.7597	0.7667	0.7739	0.7813	0.7891	0.7971
0.7353	0.7409	0.7468	0.7528	0.7591	0.7656	0.7724	0.7794	0.7866	0.7941	0.8018
0.7418	0.7474	0.7531	0.7590	0.7652	0.7715	0.7781	0.7849	0.7919	0.7991	0.8066
0.7483	0.7537	0.7593	0.7652	0.7712	0.7774	0.7838	0.7904	0.7972	0.8042	0.8114
0.7546	0.7600	0.7655	0.7712	0.7771	0.7832	0.7894	0.7959	0.8025	0.8093	0.8163
0.7609	0.7662	0.7716	0.7772	0.7830	0.7889	0.7951	0.8014	0.8076	0.8145	0.8213
0.7671	0.7723	0.7777	0.7832	0.7889	0.7947	0.8007	0.8068	0.8131	0.8196	0.8262
0.7733	0.7784	0.7837	0.7891	0.7947	0.8004	0.8063	0.8123	0.8184	0.8248	0.8312
0.7794	0.7844	0.7897	0.7950	0.8005	0.8061	0.8118	0.8177	0.8238	0.8299	0.8363
0.7854	0.7904	0.7956	0.8008	0.8062	0.8117	0.8174	0.8232	0.8291	0.8351	0.8413
0.7914	0.7964	0.8014	0.8066	0.8119	0.8174	0.8229	0.8286	0.8344	0.8403	0.8464
0.7974	0.8023	0.8073	0.8124	0.8176	0.8230	0.8284	0.8340	0.8397	0.8455	0.8514
0.8033	0.8081	0.8131	0.8181	0.8233	0.8286	0.8339	0.8394	0.8450	0.8507	0.8565
0.8091	0.8139	0.8188	0.8238	0.8289	0.8341	0.8394	0.8448	0.8503	0.8559	0.8616
0.8150	0.8197	0.8246	0.8295	0.8345	0.8396	0.8449	0.8502	0.8556	0.8611	0.8667
0.8208	0.8255	0.8302	0.8351	0.8401	0.8451	0.8503	0.8555	0.8609	0.8663	0.8718
0.8265	0.8312	0.8359	0.8407	0.8456	0.8506	0.8557	0.8609	0.8661	0.8715	0.8769
0.8322	0.8368	0.8415	0.8463	0.8512	0.8561	0.8611	0.8662	0.8714	0.8766	0.8820
0.8379	0.8425	0.8471	0.8518	0.8566	0.8615	0.8665	0.8715	0.8766	0.8818	0.8870
0.8435	0.8481	0.8527	0.8573	0.8621	0.8669	0.8718	0.8768	0.8818	0.8869	0.8921
0.8491	0.8536	0.8582	0.8628	0.8675	0.8723	0.8771	0.8820	0.8870	0.8921	0.8972
0.8547	0.8592	0.8637	0.8683	0.8729	0.8776	0.8824	0.8873	0.8922	0.8972	0.9022
0.8602	0.8647	0.8691	0.8737	0.8783	0.8830	0.8877	0.8925	0.8974	0.9023	0.9073
0.8657	0.8701	0.8746	0.8791	0.8836	0.8883	0.8930	0.8977	0.9025	0.9074	0.9123
0.8712	0.8755	0.8800	0.8844	0.8890	0.8935	0.8982	0.9029	0.9076	0.9124	0.9173
0.8766	0.8809	0.8853	0.8898	0.8943	0.8988	0.9034	0.9080	0.9127	0.9175	0.9223
0.8820	0.8863	0.8907	0.8951	0.8995	0.9040	0.9086	0.9132	0.9178	0.9225	0.9273
0.8874	0.8917	0.8960	0.9003	0.9048	0.9092	0.9137	0.9183	0.9229	0.9275	0.9323
0.8927	0.8970	0.9013	0.9056	0.9100	0.9144	0.9189	0.9234	0.9280	0.9326	0.9372
0.9034	0.9076	0.9118	0.9161	0.9204	0.9247	0.9291	0.9336	0.9380	0.9426	0.9471
0.9139	0.9180	0.9222	0.9264	0.9307	0.9349	0.9393	0.9436	0.9480	0.9525	0.9569
0.9243	0.9284	0.9325	0.9367	0.9408	0.9451	0.9493	0.9536	0.9579	0.9623	0.9667
0.9346	0.9387	0.9427	0.9468	0.9509	0.9551	0.9593	0.9635	0.9678	0.9721	0.9764
0.9448	0.9488	0.9528	0.9569	0.9610	0.9651	0.9692	0.9734	0.9775	0.9818	0.9860
0.9550	0.9589	0.9629	0.9669	0.9709	0.9749	0.9790	0.9831	0.9873	0.9914	0.9956
0.9650	0.9689	0.9728	0.9768	0.9808	0.9848	0.9888	0.9928	0.9969	1.0010	1.0051
0.9750	0.9788	0.9827	0.9866	0.9905	0.9945	0.9985	1.0024	1.0065	1.0105	1.0146
0.9849	0.9887	0.9925	0.9964	1.0002	1.0041	1.0081	1.0120	1.0160	1.0199	1.0239
0.9947	0.9984	1.0022	1.0060	1.0099	1.0137	1.0176	1.0215	1.0254	1.0293	1.0333
1.0044	1.0081	1.0119	1.0157	1.0194	1.0232	1.0271	1.0309	1.0348	1.0387	1.0425
1.0140	1.0177	1.0215	1.0252	1.0289	1.0327	1.0365	1.0403	1.0441	1.0479	1.0518
1.0236	1.0273	1.0310	1.0346	1.0384	1.0421	1.0458	1.0496	1.0533	1.0571	1.0609
1.0331	1.0367	1.0404	1.0440	1.0477	1.0514	1.0551	1.0588	1.0625	1.0663	1.0700
1.0426	1.0461	1.0497	1.0534	1.0570	1.0606	1.0643	1.0680	1.0716	1.0753	1.0790
1.0519	1.0555	1.0590	1.0626	1.0662	1.0698	1.0734	1.0771	1.0807	1.0843	1.0880
1.0612	1.0647	1.0683	1.0718	1.0754	1.0789	1.0825	1.0861	1.0897	1.0933	1.0969
1.0704	1.0739	1.0774	1.0809	1.0844	1.0880	1.0915	1.0951	1.0986	1.1022	1.1058
1.0796	1.0830	1.0865	1.0900	1.0935	1.0970	1.1005	1.1040	1.1075	1.1110	1.1146
1.0887	1.0921	1.0955	1.0990	1.1024	1.1059	1.1093	1.1128	1.1163	1.1198	1.1233
1.0977	1.1011	1.1045	1.1079	1.1113	1.1147	1.1182	1.1216	1.1251	1.1285	1.1320
1.1066	1.1100	1.1134	1.1167	1.1201	1.1235	1.1269	1.1303	1.1337	1.1372	1.1406
1.1155	1.1189	1.1222	1.1255	1.1289	1.1323	1.1356	1.1390	1.1424	1.1458	1.1492
1.1244	1.1277	1.1310	1.1343	1.1376	1.1409	1.1443	1.1476	1.1509	1.1543	1.1577
1.1331	1.1364	1.1397	1.1429	1.1462	1.1495	1.1528	1.1561	1.1595	1.1628	1.1661
1.1418	1.1451	1.1483	1.1516	1.1548	1.1581	1.1614	1.1646	1.1679	1.1712	1.1745
1.1505	1.1537	1.1569	1.1601	1.1633	1.1666	1.1698	1.1731	1.1763	1.1796	1.1828
1.1590	1.1622	1.1654	1.1686	1.1718	1.1750	1.1782	1.1814	1.1846	1.1879	1.1911
1.1675	1.1707	1.1739	1.1770	1.1802	1.1834	1.1865	1.1897	1.1929	1.1961	1.1993
1.1760	1.1791	1.1823	1.1854	1.1885	1.1917	1.1948	1.1980	1.2011	1.2043	1.2075
1.1844	1.1875	1.1906	1.1937	1.1968	1.1999	1.2031	1.2062	1.2093	1.2124	1.2156
1.1927	1.1958	1.1989	1.2020	1.2051	1.2081	1.2112	1.2143	1.2174	1.2205	1.2236
1.2010	1.2041	1.2071	1.2102	1.2132	1.2163	1.2194	1.2224	1.2255	1.2286	1.2317
1.2093	1.2123	1.2153	1.2183	1.2214	1.2244	1.2274	1.2305	1.2335	1.2366	1.2396
1.2175	1.2205	1.2235	1.2265	1.2295	1.2325	1.2355	1.2385	1.2415	1.2445	1.2475

TABLE VI. - THERMODYNAMIC

(a) Critical-

Plenum temperature, °R	Plenum 0	5	10	15	20	25	30	35	40	45
175	0.7029	0.7052	0.7074	0.7096	0.7117	0.7137	0.7157	0.7176	0.7195	0.7213
180	0.7007	0.7028	0.7048	0.7067	0.7086	0.7105	0.7122	0.7140	0.7156	0.7172
185	0.6986	0.7004	0.7022	0.7040	0.7057	0.7073	0.7089	0.7105	0.7120	0.7134
190	0.6965	0.6982	0.6998	0.7014	0.7029	0.7044	0.7058	0.7072	0.7085	0.7098
195	0.6945	0.6960	0.6974	0.6989	0.7002	0.7015	0.7028	0.7041	0.7052	0.7064
200	0.6926	0.6939	0.6952	0.6965	0.6977	0.6989	0.7000	0.7011	0.7022	0.7032
205	0.6908	0.6920	0.6932	0.6943	0.6954	0.6964	0.6974	0.6984	0.6993	0.7002
210	0.6891	0.6902	0.6912	0.6922	0.6932	0.6941	0.6950	0.6958	0.6967	0.6974
215	0.6875	0.6885	0.6894	0.6903	0.6911	0.6919	0.6927	0.6935	0.6942	0.6949
220	0.6860	0.6869	0.6877	0.6885	0.6892	0.6899	0.6906	0.6913	0.6919	0.6925
225	0.6847	0.6854	0.6861	0.6868	0.6875	0.6881	0.6887	0.6893	0.6898	0.6903
230	0.6834	0.6841	0.6847	0.6853	0.6859	0.6864	0.6869	0.6874	0.6879	0.6883
235	0.6823	0.6828	0.6834	0.6839	0.6844	0.6849	0.6853	0.6857	0.6861	0.6865
240	0.6812	0.6817	0.6822	0.6826	0.6831	0.6835	0.6839	0.6842	0.6845	0.6848
245	0.6803	0.6807	0.6811	0.6815	0.6819	0.6822	0.6825	0.6828	0.6831	0.6833
250	0.6794	0.6798	0.6801	0.6805	0.6808	0.6811	0.6813	0.6816	0.6818	0.6820
255	0.6786	0.6790	0.6793	0.6795	0.6798	0.6800	0.6802	0.6804	0.6806	0.6807
260	0.6780	0.6782	0.6785	0.6787	0.6789	0.6791	0.6793	0.6794	0.6795	0.6796
265	0.6773	0.6776	0.6778	0.6779	0.6781	0.6782	0.6784	0.6785	0.6786	0.6786
270	0.6768	0.6770	0.6771	0.6773	0.6774	0.6775	0.6776	0.6776	0.6777	0.6777
275	0.6763	0.6764	0.6765	0.6766	0.6767	0.6768	0.6769	0.6769	0.6769	0.6769
280	0.6759	0.6760	0.6761	0.6761	0.6762	0.6762	0.6762	0.6762	0.6762	0.6762
285	0.6755	0.6756	0.6756	0.6757	0.6757	0.6757	0.6757	0.6757	0.6756	0.6756
290	0.6752	0.6752	0.6753	0.6753	0.6753	0.6752	0.6752	0.6752	0.6751	0.6750
295	0.6750	0.6750	0.6750	0.6749	0.6749	0.6749	0.6748	0.6747	0.6746	0.6745
300	0.6748	0.6747	0.6747	0.6747	0.6746	0.6745	0.6744	0.6744	0.6742	0.6741
305	0.6746	0.6746	0.6745	0.6744	0.6744	0.6743	0.6742	0.6740	0.6739	0.6738
310	0.6745	0.6744	0.6744	0.6743	0.6742	0.6740	0.6739	0.6738	0.6736	0.6735
315	0.6744	0.6743	0.6742	0.6741	0.6740	0.6739	0.6737	0.6736	0.6734	0.6732
320	0.6744	0.6743	0.6742	0.6741	0.6739	0.6738	0.6736	0.6734	0.6733	0.6731
325	0.6744	0.6743	0.6741	0.6740	0.6738	0.6737	0.6735	0.6733	0.6731	0.6729
330	0.6744	0.6743	0.6741	0.6739	0.6738	0.6736	0.6734	0.6732	0.6730	0.6728
335	0.6744	0.6743	0.6741	0.6739	0.6737	0.6735	0.6733	0.6731	0.6729	0.6727
340	0.6744	0.6743	0.6741	0.6739	0.6737	0.6735	0.6733	0.6731	0.6728	0.6726
345	0.6745	0.6743	0.6741	0.6739	0.6737	0.6735	0.6732	0.6730	0.6728	0.6725
350	0.6745	0.6743	0.6741	0.6739	0.6737	0.6735	0.6732	0.6730	0.6727	0.6725
360	0.6747	0.6744	0.6742	0.6740	0.6737	0.6735	0.6732	0.6730	0.6727	0.6724
370	0.6748	0.6746	0.6743	0.6741	0.6738	0.6736	0.6733	0.6730	0.6727	0.6724
380	0.6750	0.6748	0.6745	0.6743	0.6740	0.6737	0.6734	0.6731	0.6728	0.6725
390	0.6753	0.6750	0.6747	0.6745	0.6742	0.6739	0.6736	0.6733	0.6730	0.6727
400	0.6756	0.6753	0.6750	0.6747	0.6744	0.6741	0.6738	0.6735	0.6732	0.6728
410	0.6759	0.6756	0.6753	0.6750	0.6747	0.6744	0.6740	0.6737	0.6734	0.6731
420	0.6763	0.6759	0.6756	0.6753	0.6750	0.6747	0.6743	0.6740	0.6737	0.6733
430	0.6766	0.6763	0.6760	0.6757	0.6753	0.6750	0.6747	0.6743	0.6740	0.6736
440	0.6770	0.6767	0.6764	0.6760	0.6757	0.6754	0.6750	0.6747	0.6743	0.6740
450	0.6774	0.6771	0.6768	0.6764	0.6761	0.6757	0.6754	0.6750	0.6747	0.6743
460	0.6778	0.6775	0.6772	0.6768	0.6765	0.6761	0.6758	0.6754	0.6751	0.6747
470	0.6783	0.6779	0.6776	0.6772	0.6769	0.6765	0.6762	0.6758	0.6755	0.6751
480	0.6787	0.6783	0.6780	0.6776	0.6773	0.6769	0.6766	0.6762	0.6758	0.6755
490	0.6791	0.6787	0.6784	0.6780	0.6777	0.6773	0.6769	0.6766	0.6762	0.6758
500	0.6795	0.6791	0.6787	0.6784	0.6780	0.6777	0.6773	0.6769	0.6766	0.6762
510	0.6798	0.6795	0.6791	0.6787	0.6784	0.6780	0.6777	0.6773	0.6769	0.6765
520	0.6802	0.6798	0.6794	0.6791	0.6787	0.6784	0.6780	0.6776	0.6772	0.6769
530	0.6805	0.6801	0.6798	0.6794	0.6790	0.6787	0.6783	0.6779	0.6776	0.6772
540	0.6808	0.6804	0.6800	0.6797	0.6793	0.6789	0.6786	0.6782	0.6778	0.6775
550	0.6810	0.6807	0.6803	0.6800	0.6796	0.6792	0.6788	0.6785	0.6781	0.6777
560	0.6813	0.6809	0.6806	0.6802	0.6798	0.6795	0.6791	0.6787	0.6784	0.6780
570	0.6815	0.6812	0.6808	0.6804	0.6801	0.6797	0.6793	0.6790	0.6786	0.6782
580	0.6818	0.6814	0.6810	0.6807	0.6803	0.6799	0.6796	0.6792	0.6788	0.6785
590	0.6820	0.6816	0.6813	0.6809	0.6805	0.6801	0.6798	0.6794	0.6790	0.6787
600	0.6822	0.6818	0.6814	0.6811	0.6807	0.6803	0.6800	0.6796	0.6792	0.6789
610	0.6824	0.6820	0.6816	0.6813	0.6809	0.6805	0.6802	0.6798	0.6794	0.6791
620	0.6825	0.6822	0.6818	0.6814	0.6811	0.6807	0.6803	0.6800	0.6796	0.6792
630	0.6827	0.6823	0.6820	0.6816	0.6812	0.6809	0.6805	0.6801	0.6798	0.6794
640	0.6828	0.6825	0.6821	0.6817	0.6814	0.6810	0.6806	0.6803	0.6799	0.6796
650	0.6830	0.6826	0.6822	0.6819	0.6815	0.6811	0.6808	0.6804	0.6801	0.6797
660	0.6831	0.6827	0.6824	0.6820	0.6816	0.6813	0.6809	0.6806	0.6802	0.6798
670	0.6832	0.6828	0.6825	0.6821	0.6818	0.6814	0.6810	0.6807	0.6803	0.6800
680	0.6833	0.6829	0.6826	0.6822	0.6819	0.6815	0.6811	0.6808	0.6804	0.6801
690	0.6834	0.6830	0.6827	0.6823	0.6820	0.6816	0.6812	0.6809	0.6805	0.6802
700	0.6835	0.6831	0.6828	0.6824	0.6820	0.6817	0.6813	0.6810	0.6806	0.6803

PROPERTIES OF PARA-HYDROGEN

flow factor

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
0.7230	0.7246	0.7262	0.7277	0.7291	0.7304	0.7317	0.7329	0.7340	0.7350	0.7360
0.7188	0.7203	0.7217	0.7230	0.7243	0.7255	0.7267	0.7277	0.7287	0.7297	0.7306
0.7148	0.7161	0.7174	0.7186	0.7197	0.7208	0.7219	0.7228	0.7237	0.7246	0.7254
0.7110	0.7122	0.7133	0.7144	0.7154	0.7164	0.7173	0.7182	0.7190	0.7197	0.7204
0.7075	0.7085	0.7095	0.7105	0.7114	0.7122	0.7131	0.7138	0.7145	0.7152	0.7158
0.7042	0.7051	0.7060	0.7068	0.7076	0.7083	0.7090	0.7097	0.7103	0.7109	0.7114
0.7011	0.7019	0.7026	0.7034	0.7041	0.7047	0.7053	0.7059	0.7064	0.7069	0.7073
0.6982	0.6989	0.6996	0.7002	0.7008	0.7013	0.7019	0.7023	0.7028	0.7032	0.7035
0.6955	0.6961	0.6967	0.6972	0.6977	0.6982	0.6987	0.6991	0.6994	0.6997	0.7000
0.6930	0.6936	0.6941	0.6945	0.6950	0.6953	0.6957	0.6960	0.6963	0.6966	0.6968
0.6908	0.6912	0.6917	0.6920	0.6924	0.6927	0.6930	0.6933	0.6935	0.6937	0.6939
0.6887	0.6891	0.6894	0.6898	0.6901	0.6903	0.6905	0.6907	0.6909	0.6911	0.6912
0.6868	0.6871	0.6874	0.6877	0.6879	0.6881	0.6883	0.6884	0.6886	0.6887	0.6887
0.6851	0.6854	0.6856	0.6858	0.6860	0.6861	0.6863	0.6864	0.6864	0.6865	0.6865
0.6836	0.6838	0.6839	0.6841	0.6842	0.6843	0.6844	0.6845	0.6845	0.6845	0.6845
0.6822	0.6823	0.6824	0.6825	0.6826	0.6827	0.6827	0.6827	0.6827	0.6827	0.6827
0.6809	0.6810	0.6811	0.6811	0.6812	0.6812	0.6812	0.6812	0.6812	0.6811	0.6810
0.6797	0.6798	0.6798	0.6799	0.6799	0.6799	0.6798	0.6798	0.6797	0.6796	0.6795
0.6787	0.6787	0.6787	0.6787	0.6787	0.6787	0.6786	0.6785	0.6784	0.6783	0.6782
0.6777	0.6777	0.6777	0.6777	0.6776	0.6776	0.6775	0.6774	0.6773	0.6771	0.6770
0.6769	0.6769	0.6768	0.6768	0.6767	0.6766	0.6765	0.6763	0.6762	0.6760	0.6759
0.6762	0.6761	0.6760	0.6759	0.6758	0.6757	0.6756	0.6754	0.6753	0.6751	0.6749
0.6755	0.6754	0.6753	0.6752	0.6751	0.6749	0.6748	0.6746	0.6744	0.6742	0.6740
0.6749	0.6748	0.6747	0.6746	0.6744	0.6743	0.6741	0.6739	0.6737	0.6735	0.6733
0.6744	0.6743	0.6742	0.6740	0.6738	0.6737	0.6735	0.6733	0.6731	0.6728	0.6726
0.6740	0.6738	0.6737	0.6735	0.6733	0.6731	0.6729	0.6727	0.6725	0.6722	0.6720
0.6736	0.6735	0.6733	0.6731	0.6729	0.6727	0.6725	0.6722	0.6720	0.6717	0.6715
0.6733	0.6731	0.6729	0.6727	0.6725	0.6723	0.6721	0.6718	0.6716	0.6713	0.6710
0.6731	0.6729	0.6727	0.6724	0.6722	0.6720	0.6717	0.6715	0.6712	0.6709	0.6706
0.6729	0.6727	0.6724	0.6722	0.6720	0.6717	0.6715	0.6712	0.6709	0.6706	0.6703
0.6727	0.6725	0.6722	0.6720	0.6718	0.6715	0.6712	0.6710	0.6707	0.6704	0.6701
0.6726	0.6723	0.6721	0.6718	0.6716	0.6713	0.6710	0.6707	0.6704	0.6701	0.6698
0.6724	0.6722	0.6719	0.6717	0.6714	0.6711	0.6708	0.6706	0.6703	0.6699	0.6696
0.6723	0.6721	0.6718	0.6716	0.6713	0.6710	0.6707	0.6704	0.6701	0.6698	0.6694
0.6723	0.6720	0.6717	0.6714	0.6712	0.6709	0.6706	0.6703	0.6699	0.6696	0.6693
0.6722	0.6719	0.6717	0.6714	0.6711	0.6708	0.6705	0.6702	0.6698	0.6695	0.6692
0.6721	0.6719	0.6716	0.6713	0.6710	0.6706	0.6703	0.6700	0.6697	0.6693	0.6690
0.6721	0.6718	0.6715	0.6712	0.6709	0.6706	0.6703	0.6699	0.6696	0.6692	0.6689
0.6722	0.6719	0.6716	0.6713	0.6709	0.6706	0.6703	0.6699	0.6696	0.6692	0.6689
0.6723	0.6720	0.6717	0.6714	0.6710	0.6707	0.6703	0.6700	0.6696	0.6693	0.6689
0.6725	0.6722	0.6718	0.6715	0.6712	0.6708	0.6705	0.6701	0.6697	0.6694	0.6690
0.6727	0.6724	0.6721	0.6717	0.6714	0.6710	0.6706	0.6703	0.6699	0.6696	0.6692
0.6730	0.6727	0.6723	0.6720	0.6716	0.6712	0.6709	0.6705	0.6701	0.6698	0.6694
0.6733	0.6729	0.6726	0.6722	0.6719	0.6715	0.6711	0.6708	0.6704	0.6700	0.6697
0.6736	0.6733	0.6729	0.6725	0.6722	0.6718	0.6715	0.6711	0.6707	0.6703	0.6699
0.6740	0.6736	0.6733	0.6729	0.6725	0.6722	0.6718	0.6714	0.6710	0.6707	0.6703
0.6743	0.6740	0.6736	0.6733	0.6729	0.6725	0.6721	0.6718	0.6714	0.6710	0.6706
0.6747	0.6744	0.6740	0.6736	0.6733	0.6729	0.6725	0.6721	0.6717	0.6714	0.6710
0.6751	0.6747	0.6744	0.6740	0.6736	0.6732	0.6729	0.6725	0.6721	0.6717	0.6713
0.6755	0.6751	0.6747	0.6744	0.6740	0.6736	0.6732	0.6729	0.6725	0.6721	0.6717
0.6758	0.6755	0.6751	0.6747	0.6743	0.6740	0.6736	0.6732	0.6728	0.6724	0.6721
0.6762	0.6758	0.6754	0.6751	0.6747	0.6743	0.6739	0.6735	0.6732	0.6728	0.6724
0.6765	0.6761	0.6758	0.6754	0.6750	0.6746	0.6743	0.6739	0.6735	0.6731	0.6727
0.6768	0.6764	0.6761	0.6757	0.6753	0.6749	0.6746	0.6742	0.6738	0.6734	0.6730
0.6771	0.6767	0.6763	0.6760	0.6756	0.6752	0.6748	0.6745	0.6741	0.6737	0.6733
0.6774	0.6770	0.6766	0.6762	0.6759	0.6755	0.6751	0.6747	0.6744	0.6740	0.6736
0.6776	0.6772	0.6769	0.6765	0.6761	0.6757	0.6754	0.6750	0.6746	0.6742	0.6739
0.6779	0.6775	0.6771	0.6767	0.6764	0.6760	0.6756	0.6752	0.6749	0.6745	0.6741
0.6781	0.6777	0.6773	0.6770	0.6766	0.6762	0.6758	0.6755	0.6751	0.6747	0.6743
0.6783	0.6779	0.6776	0.6772	0.6768	0.6764	0.6761	0.6757	0.6753	0.6749	0.6746
0.6785	0.6781	0.6778	0.6774	0.6770	0.6766	0.6763	0.6759	0.6755	0.6752	0.6748
0.6787	0.6783	0.6780	0.6776	0.6772	0.6768	0.6765	0.6761	0.6757	0.6754	0.6750
0.6789	0.6785	0.6781	0.6778	0.6774	0.6770	0.6767	0.6763	0.6759	0.6755	0.6752
0.6790	0.6787	0.6783	0.6779	0.6776	0.6772	0.6768	0.6765	0.6761	0.6757	0.6754
0.6792	0.6788	0.6785	0.6781	0.6777	0.6774	0.6770	0.6766	0.6763	0.6759	0.6755
0.6793	0.6790	0.6786	0.6782	0.6779	0.6775	0.6771	0.6768	0.6764	0.6761	0.6757
0.6795	0.6791	0.6787	0.6784	0.6780	0.6777	0.6773	0.6769	0.6766	0.6762	0.6758
0.6796	0.6792	0.6789	0.6785	0.6781	0.6778	0.6774	0.6771	0.6767	0.6763	0.6760
0.6797	0.6793	0.6790	0.6786	0.6783	0.6779	0.6776	0.6772	0.6768	0.6765	0.6761
0.6798	0.6795	0.6791	0.6787	0.6784	0.6780	0.6777	0.6773	0.6770	0.6766	0.6762
0.6799	0.6796	0.6792	0.6788	0.6785	0.6781	0.6778	0.6774	0.6771	0.6767	0.6764

TABLE VI. - Continued.

(b) Ratio of nozzle-throat velocity to speed of

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	Plenum 45
175	0.5647	0.5648	0.5649	0.5652	0.5656	0.5661	0.5668	0.5676	0.5685	0.5695
180	0.5717	0.5719	0.5722	0.5726	0.5731	0.5738	0.5746	0.5754	0.5765	0.5776
185	0.5785	0.5788	0.5792	0.5798	0.5804	0.5812	0.5821	0.5830	0.5841	0.5853
190	0.5851	0.5856	0.5861	0.5867	0.5875	0.5883	0.5893	0.5904	0.5915	0.5928
195	0.5916	0.5921	0.5927	0.5935	0.5943	0.5953	0.5963	0.5975	0.5987	0.6001
200	0.5979	0.5985	0.5992	0.6001	0.6010	0.6020	0.6031	0.6043	0.6056	0.6071
205	0.6041	0.6048	0.6056	0.6065	0.6075	0.6086	0.6098	0.6110	0.6124	0.6138
210	0.6101	0.6109	0.6118	0.6128	0.6139	0.6150	0.6163	0.6176	0.6190	0.6205
215	0.6161	0.6170	0.6180	0.6190	0.6201	0.6213	0.6226	0.6240	0.6254	0.6269
220	0.6221	0.6230	0.6240	0.6251	0.6263	0.6275	0.6289	0.6303	0.6317	0.6333
225	0.6279	0.6289	0.6300	0.6312	0.6324	0.6337	0.6350	0.6365	0.6380	0.6396
230	0.6338	0.6348	0.6360	0.6371	0.6384	0.6397	0.6411	0.6426	0.6441	0.6457
235	0.6396	0.6407	0.6418	0.6431	0.6444	0.6457	0.6472	0.6487	0.6502	0.6518
240	0.6453	0.6465	0.6477	0.6490	0.6503	0.6517	0.6532	0.6547	0.6562	0.6579
245	0.6511	0.6523	0.6535	0.6548	0.6562	0.6576	0.6591	0.6606	0.6622	0.6639
250	0.6568	0.6580	0.6593	0.6607	0.6621	0.6635	0.6650	0.6666	0.6682	0.6699
255	0.6625	0.6638	0.6651	0.6665	0.6679	0.6694	0.6709	0.6725	0.6741	0.6758
260	0.6682	0.6695	0.6709	0.6723	0.6737	0.6752	0.6768	0.6784	0.6800	0.6817
265	0.6739	0.6753	0.6766	0.6781	0.6795	0.6811	0.6826	0.6842	0.6859	0.6876
270	0.6796	0.6810	0.6824	0.6838	0.6853	0.6869	0.6885	0.6901	0.6917	0.6935
275	0.6853	0.6867	0.6881	0.6896	0.6911	0.6927	0.6943	0.6959	0.6976	0.6993
280	0.6910	0.6924	0.6939	0.6954	0.6969	0.6985	0.7001	0.7017	0.7034	0.7051
285	0.6966	0.6981	0.6996	0.7011	0.7026	0.7042	0.7058	0.7075	0.7092	0.7109
290	0.7023	0.7037	0.7052	0.7068	0.7083	0.7099	0.7116	0.7132	0.7149	0.7167
295	0.7079	0.7093	0.7109	0.7124	0.7140	0.7156	0.7173	0.7190	0.7207	0.7224
300	0.7134	0.7149	0.7165	0.7180	0.7196	0.7213	0.7229	0.7246	0.7263	0.7281
305	0.7189	0.7205	0.7220	0.7236	0.7252	0.7269	0.7285	0.7302	0.7320	0.7337
310	0.7244	0.7259	0.7275	0.7291	0.7307	0.7324	0.7341	0.7358	0.7375	0.7393
315	0.7298	0.7314	0.7329	0.7346	0.7362	0.7379	0.7396	0.7413	0.7431	0.7448
320	0.7354	0.7370	0.7386	0.7402	0.7418	0.7435	0.7452	0.7469	0.7487	0.7504
325	0.7410	0.7426	0.7442	0.7459	0.7475	0.7492	0.7509	0.7526	0.7544	0.7562
330	0.7466	0.7482	0.7498	0.7515	0.7532	0.7548	0.7566	0.7583	0.7601	0.7618
335	0.7522	0.7538	0.7554	0.7571	0.7588	0.7605	0.7622	0.7639	0.7657	0.7675
340	0.7577	0.7593	0.7610	0.7626	0.7643	0.7660	0.7678	0.7695	0.7713	0.7731
345	0.7632	0.7648	0.7665	0.7682	0.7699	0.7716	0.7733	0.7751	0.7768	0.7786
350	0.7687	0.7703	0.7720	0.7737	0.7754	0.7771	0.7788	0.7806	0.7824	0.7842
360	0.7795	0.7811	0.7828	0.7845	0.7862	0.7880	0.7897	0.7915	0.7933	0.7951
370	0.7902	0.7918	0.7935	0.7953	0.7970	0.7987	0.8005	0.8023	0.8041	0.8059
380	0.8007	0.8024	0.8042	0.8059	0.8076	0.8094	0.8111	0.8129	0.8147	0.8165
390	0.8112	0.8129	0.8146	0.8164	0.8181	0.8199	0.8217	0.8234	0.8252	0.8271
400	0.8216	0.8233	0.8250	0.8268	0.8285	0.8303	0.8321	0.8338	0.8356	0.8375
410	0.8318	0.8336	0.8353	0.8370	0.8388	0.8406	0.8423	0.8441	0.8459	0.8477
420	0.8420	0.8437	0.8455	0.8472	0.8490	0.8507	0.8525	0.8543	0.8561	0.8579
430	0.8521	0.8538	0.8555	0.8573	0.8591	0.8608	0.8626	0.8644	0.8662	0.8680
440	0.8620	0.8638	0.8655	0.8673	0.8691	0.8708	0.8726	0.8744	0.8762	0.8780
450	0.8719	0.8737	0.8754	0.8772	0.8790	0.8807	0.8825	0.8843	0.8861	0.8879
460	0.8818	0.8835	0.8853	0.8870	0.8888	0.8906	0.8923	0.8941	0.8959	0.8977
470	0.8915	0.8933	0.8950	0.8968	0.8986	0.9003	0.9021	0.9039	0.9057	0.9075
480	0.9012	0.9030	0.9047	0.9065	0.9083	0.9100	0.9118	0.9136	0.9154	0.9172
490	0.9109	0.9127	0.9144	0.9162	0.9179	0.9197	0.9214	0.9232	0.9250	0.9268
500	0.9205	0.9222	0.9240	0.9257	0.9275	0.9293	0.9310	0.9328	0.9346	0.9363
510	0.9300	0.9318	0.9335	0.9353	0.9370	0.9388	0.9405	0.9423	0.9441	0.9458
520	0.9395	0.9413	0.9430	0.9447	0.9465	0.9482	0.9500	0.9518	0.9535	0.9553
530	0.9489	0.9507	0.9524	0.9542	0.9559	0.9576	0.9594	0.9611	0.9629	0.9647
540	0.9582	0.9600	0.9617	0.9634	0.9652	0.9669	0.9687	0.9704	0.9722	0.9739
550	0.9674	0.9691	0.9708	0.9726	0.9743	0.9760	0.9778	0.9795	0.9813	0.9830
560	0.9764	0.9782	0.9799	0.9816	0.9833	0.9851	0.9868	0.9885	0.9903	0.9920
570	0.9854	0.9871	0.9888	0.9906	0.9923	0.9940	0.9957	0.9975	0.9992	1.0009
580	0.9943	0.9960	0.9977	0.9994	1.0012	1.0029	1.0046	1.0063	1.0081	1.0098
590	1.0031	1.0048	1.0065	1.0082	1.0100	1.0117	1.0134	1.0151	1.0168	1.0185
600	1.0119	1.0136	1.0153	1.0170	1.0187	1.0204	1.0221	1.0238	1.0255	1.0272
610	1.0205	1.0222	1.0239	1.0256	1.0273	1.0290	1.0307	1.0324	1.0341	1.0358
620	1.0291	1.0308	1.0325	1.0342	1.0359	1.0375	1.0392	1.0409	1.0426	1.0443
630	1.0376	1.0393	1.0410	1.0426	1.0443	1.0460	1.0477	1.0494	1.0511	1.0528
640	1.0460	1.0477	1.0494	1.0511	1.0527	1.0544	1.0561	1.0578	1.0594	1.0611
650	1.0544	1.0561	1.0577	1.0594	1.0611	1.0627	1.0644	1.0661	1.0677	1.0694
660	1.0627	1.0644	1.0660	1.0677	1.0693	1.0710	1.0726	1.0743	1.0760	1.0776
670	1.0709	1.0726	1.0742	1.0759	1.0775	1.0792	1.0808	1.0825	1.0841	1.0858
680	1.0791	1.0807	1.0823	1.0840	1.0856	1.0873	1.0889	1.0906	1.0922	1.0939
690	1.0872	1.0888	1.0904	1.0921	1.0937	1.0953	1.0970	1.0986	1.1002	1.1019
700	1.0952	1.0968	1.0984	1.1000	1.1017	1.1033	1.1049	1.1066	1.1082	1.1098

THERMODYNAMIC PROPERTIES OF PARA-HYDROGEN

sound at 1 atmosphere and 441.6 °R (4000.44 ft/sec)

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
0.5707	0.5720	0.5734	0.5750	0.5767	0.5785	0.5804	0.5824	0.5846	0.5869	0.5893
0.5788	0.5802	0.5817	0.5833	0.5850	0.5868	0.5888	0.5908	0.5930	0.5953	0.5977
0.5867	0.5881	0.5897	0.5913	0.5931	0.5949	0.5969	0.5990	0.6012	0.6035	0.6059
0.5942	0.5957	0.5973	0.5990	0.6008	0.6028	0.6048	0.6069	0.6091	0.6114	0.6138
0.6015	0.6031	0.6047	0.6065	0.6083	0.6102	0.6123	0.6144	0.6167	0.6190	0.6214
0.6086	0.6101	0.6118	0.6136	0.6155	0.6175	0.6195	0.6217	0.6239	0.6262	0.6287
0.6154	0.6170	0.6187	0.6205	0.6224	0.6244	0.6265	0.6287	0.6309	0.6332	0.6356
0.6220	0.6237	0.6254	0.6273	0.6292	0.6312	0.6333	0.6354	0.6376	0.6400	0.6424
0.6285	0.6302	0.6320	0.6338	0.6358	0.6378	0.6398	0.6420	0.6442	0.6465	0.6489
0.6349	0.6366	0.6384	0.6403	0.6422	0.6442	0.6463	0.6484	0.6506	0.6529	0.6553
0.6412	0.6429	0.6447	0.6466	0.6485	0.6505	0.6526	0.6547	0.6569	0.6592	0.6615
0.6474	0.6491	0.6509	0.6528	0.6547	0.6567	0.6588	0.6609	0.6631	0.6654	0.6677
0.6535	0.6553	0.6571	0.6589	0.6609	0.6629	0.6649	0.6670	0.6692	0.6715	0.6737
0.6596	0.6613	0.6631	0.6650	0.6670	0.6689	0.6710	0.6731	0.6753	0.6775	0.6798
0.6656	0.6674	0.6692	0.6711	0.6730	0.6750	0.6770	0.6791	0.6813	0.6835	0.6857
0.6716	0.6733	0.6752	0.6770	0.6790	0.6810	0.6830	0.6851	0.6872	0.6894	0.6916
0.6775	0.6793	0.6811	0.6830	0.6849	0.6869	0.6889	0.6910	0.6931	0.6953	0.6975
0.6834	0.6852	0.6871	0.6889	0.6909	0.6928	0.6949	0.6969	0.6990	0.7012	0.7034
0.6893	0.6911	0.6930	0.6948	0.6968	0.6987	0.7007	0.7028	0.7049	0.7070	0.7092
0.6952	0.6970	0.6989	0.7007	0.7027	0.7046	0.7066	0.7087	0.7108	0.7129	0.7151
0.7011	0.7029	0.7047	0.7066	0.7085	0.7105	0.7125	0.7145	0.7166	0.7187	0.7209
0.7069	0.7087	0.7105	0.7124	0.7143	0.7163	0.7183	0.7203	0.7224	0.7245	0.7266
0.7127	0.7145	0.7164	0.7182	0.7202	0.7221	0.7241	0.7261	0.7282	0.7303	0.7324
0.7185	0.7203	0.7221	0.7240	0.7259	0.7279	0.7299	0.7319	0.7339	0.7360	0.7381
0.7242	0.7260	0.7279	0.7298	0.7317	0.7336	0.7356	0.7376	0.7396	0.7417	0.7438
0.7299	0.7317	0.7336	0.7354	0.7374	0.7393	0.7413	0.7433	0.7453	0.7474	0.7495
0.7355	0.7374	0.7392	0.7411	0.7430	0.7450	0.7469	0.7489	0.7509	0.7530	0.7551
0.7411	0.7430	0.7448	0.7467	0.7486	0.7505	0.7525	0.7545	0.7565	0.7586	0.7606
0.7466	0.7485	0.7503	0.7522	0.7541	0.7561	0.7580	0.7600	0.7620	0.7641	0.7661
0.7522	0.7540	0.7559	0.7578	0.7597	0.7616	0.7635	0.7655	0.7675	0.7695	0.7716
0.7580	0.7598	0.7616	0.7635	0.7654	0.7673	0.7693	0.7712	0.7732	0.7753	0.7773
0.7636	0.7655	0.7673	0.7692	0.7711	0.7730	0.7750	0.7769	0.7789	0.7809	0.7830
0.7693	0.7711	0.7730	0.7749	0.7768	0.7787	0.7806	0.7826	0.7846	0.7866	0.7886
0.7749	0.7767	0.7786	0.7805	0.7824	0.7843	0.7862	0.7882	0.7901	0.7921	0.7942
0.7805	0.7823	0.7841	0.7860	0.7879	0.7898	0.7918	0.7937	0.7957	0.7977	0.7997
0.7860	0.7878	0.7897	0.7915	0.7934	0.7954	0.7973	0.7992	0.8012	0.8032	0.8052
0.7969	0.7988	0.8006	0.8025	0.8044	0.8063	0.8082	0.8101	0.8121	0.8141	0.8161
0.8077	0.8095	0.8114	0.8133	0.8151	0.8170	0.8190	0.8209	0.8228	0.8248	0.8268
0.8184	0.8202	0.8220	0.8239	0.8258	0.8277	0.8296	0.8315	0.8335	0.8354	0.8374
0.8289	0.8307	0.8326	0.8344	0.8363	0.8382	0.8401	0.8420	0.8439	0.8459	0.8478
0.8393	0.8411	0.8430	0.8448	0.8467	0.8486	0.8505	0.8524	0.8543	0.8562	0.8582
0.8496	0.8514	0.8532	0.8551	0.8570	0.8588	0.8607	0.8626	0.8645	0.8664	0.8684
0.8598	0.8616	0.8634	0.8653	0.8671	0.8690	0.8709	0.8728	0.8747	0.8766	0.8785
0.8698	0.8717	0.8735	0.8753	0.8772	0.8791	0.8809	0.8828	0.8847	0.8866	0.8885
0.8798	0.8816	0.8835	0.8853	0.8872	0.8890	0.8909	0.8927	0.8946	0.8965	0.8984
0.8897	0.8915	0.8934	0.8952	0.8970	0.8989	0.9007	0.9026	0.9045	0.9063	0.9082
0.8995	0.9013	0.9032	0.9050	0.9068	0.9087	0.9105	0.9124	0.9142	0.9161	0.9179
0.9093	0.9111	0.9129	0.9147	0.9165	0.9184	0.9202	0.9221	0.9239	0.9258	0.9276
0.9190	0.9208	0.9226	0.9244	0.9262	0.9280	0.9298	0.9317	0.9335	0.9354	0.9372
0.9286	0.9304	0.9322	0.9340	0.9358	0.9376	0.9394	0.9412	0.9431	0.9449	0.9467
0.9381	0.9399	0.9417	0.9435	0.9453	0.9471	0.9489	0.9507	0.9526	0.9544	0.9562
0.9476	0.9494	0.9512	0.9530	0.9548	0.9566	0.9584	0.9602	0.9620	0.9638	0.9656
0.9571	0.9588	0.9606	0.9624	0.9642	0.9660	0.9678	0.9696	0.9714	0.9732	0.9750
0.9664	0.9682	0.9700	0.9717	0.9735	0.9753	0.9771	0.9789	0.9807	0.9825	0.9843
0.9757	0.9774	0.9792	0.9810	0.9827	0.9845	0.9863	0.9881	0.9899	0.9916	0.9934
0.9848	0.9865	0.9883	0.9900	0.9918	0.9936	0.9953	0.9971	0.9989	1.0007	1.0024
0.9938	0.9955	0.9973	0.9990	1.0008	1.0025	1.0043	1.0060	1.0078	1.0096	1.0113
1.0027	1.0044	1.0062	1.0079	1.0096	1.0114	1.0131	1.0149	1.0167	1.0184	1.0202
1.0115	1.0132	1.0150	1.0167	1.0184	1.0202	1.0219	1.0237	1.0254	1.0272	1.0289
1.0203	1.0220	1.0237	1.0254	1.0272	1.0289	1.0306	1.0324	1.0341	1.0358	1.0376
1.0289	1.0306	1.0324	1.0341	1.0358	1.0375	1.0392	1.0410	1.0427	1.0444	1.0461
1.0375	1.0392	1.0409	1.0426	1.0443	1.0461	1.0478	1.0495	1.0512	1.0529	1.0546
1.0460	1.0477	1.0494	1.0511	1.0528	1.0545	1.0562	1.0579	1.0596	1.0613	1.0631
1.0544	1.0561	1.0578	1.0595	1.0612	1.0629	1.0646	1.0663	1.0680	1.0697	1.0714
1.0628	1.0645	1.0662	1.0678	1.0695	1.0712	1.0729	1.0746	1.0763	1.0780	1.0797
1.0711	1.0728	1.0744	1.0761	1.0778	1.0795	1.0811	1.0828	1.0845	1.0862	1.0878
1.0793	1.0810	1.0826	1.0843	1.0860	1.0876	1.0893	1.0910	1.0926	1.0943	1.0960
1.0874	1.0891	1.0907	1.0924	1.0941	1.0957	1.0974	1.0990	1.1007	1.1023	1.1040
1.0955	1.0971	1.0988	1.1004	1.1021	1.1037	1.1054	1.1070	1.1087	1.1103	1.1120
1.1035	1.1051	1.1068	1.1084	1.1100	1.1117	1.1133	1.1150	1.1166	1.1182	1.1199
1.1114	1.1131	1.1147	1.1163	1.1179	1.1196	1.1212	1.1228	1.1245	1.1261	1.1277

C-2

TABLE VI. - Continued. THERMODYNAMIC PROPERTIES OF PARA-HYDROGEN

(c) Critical pressure ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
170	0.4993	0.4964	0.4934	0.4902	0.4868	0.4832	0.4795	0.4755	0.4714	0.4671	0.4627
180	0.5034	0.5008	0.4979	0.4949	0.4917	0.4883	0.4848	0.4812	0.4774	0.4734	0.4694
190	0.5079	0.5053	0.5026	0.4997	0.4966	0.4934	0.4901	0.4866	0.4829	0.4792	0.4753
200	0.5123	0.5099	0.5073	0.5045	0.5016	0.4986	0.4954	0.4921	0.4887	0.4852	0.4815
220	0.5204	0.5182	0.5159	0.5135	0.5109	0.5083	0.5055	0.5027	0.4997	0.4967	0.4936
240	0.5269	0.5250	0.5229	0.5207	0.5185	0.5162	0.5138	0.5113	0.5088	0.5062	0.5036
260	0.5317	0.5299	0.5280	0.5261	0.5241	0.5220	0.5199	0.5177	0.5155	0.5133	0.5110
280	0.5349	0.5332	0.5315	0.5297	0.5279	0.5260	0.5241	0.5222	0.5202	0.5182	0.5161
300	0.5370	0.5354	0.5338	0.5321	0.5304	0.5287	0.5270	0.5252	0.5234	0.5216	0.5197
320	0.5384	0.5369	0.5354	0.5339	0.5323	0.5307	0.5291	0.5275	0.5258	0.5242	0.5225
340	0.5386	0.5372	0.5358	0.5343	0.5328	0.5314	0.5298	0.5283	0.5268	0.5252	0.5236
360	0.5387	0.5373	0.5360	0.5346	0.5332	0.5318	0.5303	0.5289	0.5274	0.5260	0.5245
380	0.5386	0.5373	0.5360	0.5347	0.5333	0.5320	0.5306	0.5293	0.5279	0.5265	0.5251
400	0.5384	0.5371	0.5358	0.5346	0.5333	0.5320	0.5307	0.5294	0.5281	0.5268	0.5255
420	0.5380	0.5368	0.5356	0.5343	0.5331	0.5319	0.5307	0.5294	0.5282	0.5269	0.5257
440	0.5375	0.5363	0.5352	0.5340	0.5328	0.5316	0.5305	0.5293	0.5281	0.5269	0.5257
460	0.5369	0.5358	0.5346	0.5335	0.5324	0.5313	0.5301	0.5290	0.5279	0.5267	0.5256
480	0.5362	0.5351	0.5340	0.5329	0.5319	0.5308	0.5297	0.5286	0.5275	0.5264	0.5254
500	0.5354	0.5344	0.5333	0.5323	0.5312	0.5302	0.5292	0.5281	0.5271	0.5260	0.5250
520	0.5346	0.5336	0.5326	0.5316	0.5306	0.5296	0.5286	0.5276	0.5266	0.5256	0.5246
540	0.5338	0.5328	0.5318	0.5309	0.5299	0.5289	0.5279	0.5270	0.5260	0.5251	0.5241
560	0.5331	0.5322	0.5313	0.5303	0.5294	0.5285	0.5275	0.5266	0.5257	0.5247	0.5238
580	0.5326	0.5316	0.5307	0.5298	0.5289	0.5280	0.5271	0.5262	0.5253	0.5244	0.5235
600	0.5320	0.5312	0.5303	0.5294	0.5285	0.5277	0.5268	0.5259	0.5251	0.5242	0.5233
620	0.5316	0.5307	0.5299	0.5290	0.5282	0.5273	0.5265	0.5257	0.5248	0.5240	0.5232
640	0.5311	0.5303	0.5295	0.5287	0.5279	0.5271	0.5262	0.5254	0.5246	0.5238	0.5230
660	0.5308	0.5300	0.5292	0.5284	0.5276	0.5268	0.5260	0.5252	0.5245	0.5237	0.5229
680	0.5304	0.5297	0.5289	0.5281	0.5274	0.5266	0.5259	0.5251	0.5243	0.5236	0.5228
700	0.5302	0.5294	0.5287	0.5279	0.5272	0.5265	0.5257	0.5250	0.5243	0.5235	0.5228

(d) Critical temperature ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
170	0.7884	0.7859	0.7835	0.7813	0.7791	0.7771	0.7752	0.7733	0.7715	0.7699	0.7683
180	0.7973	0.7947	0.7923	0.7899	0.7877	0.7855	0.7834	0.7814	0.7795	0.7776	0.7759
190	0.8060	0.8035	0.8010	0.7987	0.7964	0.7942	0.7921	0.7900	0.7880	0.7861	0.7842
200	0.8143	0.8118	0.8095	0.8072	0.8050	0.8029	0.8008	0.7988	0.7969	0.7950	0.7931
220	0.8285	0.8264	0.8243	0.8223	0.8204	0.8185	0.8167	0.8150	0.8133	0.8116	0.8101
240	0.8391	0.8373	0.8355	0.8338	0.8322	0.8306	0.8290	0.8276	0.8261	0.8248	0.8234
260	0.8463	0.8448	0.8433	0.8418	0.8404	0.8390	0.8377	0.8365	0.8352	0.8341	0.8329
280	0.8510	0.8497	0.8483	0.8471	0.8458	0.8447	0.8435	0.8424	0.8413	0.8403	0.8393
300	0.8535	0.8523	0.8512	0.8501	0.8490	0.8479	0.8469	0.8459	0.8449	0.8440	0.8431
320	0.8546	0.8535	0.8525	0.8515	0.8505	0.8496	0.8487	0.8478	0.8469	0.8461	0.8453
340	0.8546	0.8536	0.8527	0.8518	0.8509	0.8500	0.8492	0.8484	0.8476	0.8468	0.8461
360	0.8542	0.8533	0.8525	0.8516	0.8508	0.8500	0.8493	0.8485	0.8478	0.8470	0.8463
380	0.8535	0.8527	0.8519	0.8511	0.8504	0.8496	0.8489	0.8482	0.8475	0.8468	0.8462
400	0.8524	0.8517	0.8509	0.8502	0.8495	0.8488	0.8482	0.8475	0.8469	0.8462	0.8456
420	0.8511	0.8504	0.8497	0.8491	0.8484	0.8478	0.8472	0.8465	0.8459	0.8453	0.8448
440	0.8496	0.8489	0.8483	0.8477	0.8471	0.8465	0.8459	0.8453	0.8447	0.8442	0.8436
460	0.8479	0.8473	0.8467	0.8462	0.8456	0.8450	0.8445	0.8439	0.8434	0.8429	0.8424
480	0.8463	0.8457	0.8452	0.8446	0.8441	0.8436	0.8430	0.8425	0.8420	0.8415	0.8410
500	0.8447	0.8442	0.8436	0.8431	0.8426	0.8421	0.8416	0.8411	0.8407	0.8402	0.8397
520	0.8432	0.8427	0.8422	0.8417	0.8413	0.8408	0.8403	0.8399	0.8394	0.8390	0.8385
540	0.8419	0.8414	0.8410	0.8405	0.8400	0.8396	0.8392	0.8387	0.8383	0.8379	0.8374
560	0.8408	0.8403	0.8399	0.8395	0.8390	0.8386	0.8382	0.8378	0.8374	0.8370	0.8366
580	0.8398	0.8394	0.8390	0.8386	0.8381	0.8377	0.8373	0.8369	0.8366	0.8362	0.8358
600	0.8389	0.8385	0.8381	0.8377	0.8374	0.8370	0.8366	0.8362	0.8359	0.8355	0.8351
620	0.8382	0.8378	0.8374	0.8371	0.8367	0.8363	0.8360	0.8356	0.8353	0.8349	0.8346
640	0.8375	0.8372	0.8368	0.8365	0.8361	0.8358	0.8354	0.8351	0.8348	0.8344	0.8341
660	0.8370	0.8366	0.8363	0.8360	0.8356	0.8353	0.8350	0.8347	0.8344	0.8340	0.8337
680	0.8365	0.8362	0.8359	0.8356	0.8352	0.8349	0.8346	0.8343	0.8340	0.8337	0.8334
700	0.8361	0.8358	0.8355	0.8352	0.8349	0.8346	0.8343	0.8341	0.8338	0.8335	0.8332

TABLE VI. - Continued. THERMODYNAMIC PROPERTIES OF PARA-HYDROGEN

(e) Critical density ratio

Plenum temperature, °R	Plenum pressure, atm										
	0	10	20	30	40	50	60	70	80	90	100
170	0.6332	0.6354	0.6379	0.6408	0.6440	0.6475	0.6514	0.6556	0.6601	0.6648	0.6699
180	0.6314	0.6335	0.6358	0.6385	0.6414	0.6446	0.6481	0.6519	0.6560	0.6603	0.6649
190	0.6301	0.6320	0.6342	0.6366	0.6392	0.6421	0.6452	0.6485	0.6521	0.6559	0.6599
200	0.6291	0.6309	0.6329	0.6351	0.6375	0.6401	0.6429	0.6459	0.6490	0.6523	0.6558
220	0.6282	0.6298	0.6316	0.6335	0.6355	0.6377	0.6400	0.6424	0.6449	0.6476	0.6504
240	0.6280	0.6295	0.6311	0.6328	0.6346	0.6366	0.6385	0.6406	0.6428	0.6450	0.6474
260	0.6282	0.6297	0.6312	0.6327	0.6344	0.6361	0.6379	0.6397	0.6416	0.6436	0.6456
280	0.6285	0.6299	0.6313	0.6328	0.6343	0.6359	0.6375	0.6391	0.6408	0.6426	0.6444
300	0.6291	0.6304	0.6317	0.6331	0.6345	0.6360	0.6374	0.6390	0.6405	0.6421	0.6437
320	0.6300	0.6312	0.6325	0.6338	0.6351	0.6365	0.6379	0.6393	0.6407	0.6422	0.6436
340	0.6303	0.6315	0.6327	0.6339	0.6352	0.6364	0.6377	0.6390	0.6403	0.6417	0.6430
360	0.6306	0.6318	0.6329	0.6341	0.6353	0.6365	0.6377	0.6389	0.6401	0.6413	0.6426
380	0.6311	0.6322	0.6333	0.6344	0.6355	0.6366	0.6377	0.6389	0.6400	0.6412	0.6423
400	0.6316	0.6326	0.6336	0.6347	0.6358	0.6368	0.6379	0.6390	0.6400	0.6411	0.6422
420	0.6321	0.6331	0.6341	0.6351	0.6361	0.6371	0.6381	0.6391	0.6401	0.6412	0.6422
440	0.6326	0.6336	0.6345	0.6355	0.6364	0.6374	0.6384	0.6393	0.6403	0.6413	0.6422
460	0.6331	0.6341	0.6350	0.6359	0.6368	0.6377	0.6386	0.6395	0.6405	0.6414	0.6423
480	0.6336	0.6344	0.6353	0.6362	0.6370	0.6379	0.6388	0.6397	0.6405	0.6414	0.6423
500	0.6338	0.6347	0.6355	0.6363	0.6372	0.6380	0.6388	0.6397	0.6405	0.6413	0.6422
520	0.6340	0.6348	0.6356	0.6364	0.6372	0.6380	0.6388	0.6396	0.6403	0.6411	0.6419
540	0.6340	0.6348	0.6355	0.6363	0.6371	0.6378	0.6386	0.6393	0.6401	0.6408	0.6416
560	0.6341	0.6348	0.6356	0.6363	0.6370	0.6377	0.6385	0.6392	0.6399	0.6406	0.6414
580	0.6341	0.6348	0.6356	0.6363	0.6370	0.6377	0.6383	0.6390	0.6397	0.6404	0.6411
600	0.6342	0.6349	0.6355	0.6362	0.6369	0.6375	0.6382	0.6389	0.6395	0.6402	0.6409
620	0.6342	0.6348	0.6355	0.6361	0.6368	0.6374	0.6381	0.6387	0.6393	0.6400	0.6406
640	0.6342	0.6348	0.6354	0.6360	0.6367	0.6373	0.6379	0.6385	0.6391	0.6397	0.6403
660	0.6341	0.6347	0.6353	0.6359	0.6365	0.6371	0.6377	0.6383	0.6389	0.6395	0.6401
680	0.6341	0.6347	0.6353	0.6358	0.6364	0.6370	0.6376	0.6381	0.6387	0.6393	0.6398
700	0.6341	0.6346	0.6352	0.6357	0.6363	0.6368	0.6374	0.6379	0.6385	0.6390	0.6396

TABLE VI. - Continued.

(f) Plenum

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	Plenum 45
175	1.0000	0.9984	0.9973	0.9965	0.9963	0.9965	0.9971	0.9981	0.9996	1.0016
180	1.0000	0.9989	0.9983	0.9980	0.9982	0.9987	0.9997	1.0011	1.0028	1.0050
185	1.0000	0.9994	0.9992	0.9993	0.9998	1.0007	1.0020	1.0037	1.0057	1.0081
190	1.0000	0.9998	1.0000	1.0005	1.0013	1.0025	1.0041	1.0060	1.0082	1.0108
195	1.0000	1.0002	1.0007	1.0015	1.0027	1.0042	1.0059	1.0081	1.0105	1.0132
200	1.0000	1.0005	1.0013	1.0025	1.0039	1.0056	1.0076	1.0099	1.0125	1.0154
205	1.0000	1.0008	1.0019	1.0033	1.0050	1.0069	1.0091	1.0116	1.0143	1.0174
210	1.0000	1.0011	1.0024	1.0041	1.0059	1.0080	1.0104	1.0131	1.0160	1.0191
215	1.0000	1.0013	1.0029	1.0047	1.0068	1.0091	1.0116	1.0144	1.0174	1.0207
220	1.0000	1.0016	1.0033	1.0053	1.0076	1.0100	1.0127	1.0156	1.0187	1.0221
225	1.0000	1.0017	1.0037	1.0059	1.0083	1.0109	1.0137	1.0167	1.0199	1.0233
230	1.0000	1.0019	1.0041	1.0064	1.0089	1.0116	1.0145	1.0176	1.0209	1.0244
235	1.0000	1.0021	1.0044	1.0068	1.0095	1.0123	1.0153	1.0185	1.0219	1.0254
240	1.0000	1.0022	1.0046	1.0072	1.0100	1.0129	1.0160	1.0193	1.0227	1.0263
245	1.0000	1.0024	1.0049	1.0076	1.0104	1.0134	1.0166	1.0199	1.0234	1.0271
250	1.0000	1.0025	1.0051	1.0079	1.0108	1.0139	1.0172	1.0206	1.0241	1.0278
255	1.0000	1.0026	1.0053	1.0082	1.0112	1.0144	1.0177	1.0211	1.0247	1.0284
260	1.0000	1.0027	1.0055	1.0084	1.0115	1.0148	1.0181	1.0216	1.0252	1.0290
265	1.0000	1.0028	1.0057	1.0087	1.0118	1.0151	1.0185	1.0220	1.0257	1.0295
270	1.0000	1.0028	1.0058	1.0089	1.0121	1.0154	1.0189	1.0224	1.0261	1.0299
275	1.0000	1.0029	1.0059	1.0091	1.0123	1.0157	1.0192	1.0228	1.0265	1.0303
280	1.0000	1.0030	1.0061	1.0092	1.0125	1.0159	1.0194	1.0231	1.0268	1.0306
285	1.0000	1.0030	1.0062	1.0094	1.0127	1.0162	1.0197	1.0233	1.0271	1.0309
290	1.0000	1.0031	1.0063	1.0095	1.0129	1.0164	1.0199	1.0236	1.0273	1.0311
295	1.0000	1.0031	1.0063	1.0096	1.0130	1.0165	1.0201	1.0238	1.0275	1.0313
300	1.0000	1.0032	1.0064	1.0097	1.0132	1.0167	1.0203	1.0239	1.0277	1.0315
305	1.0000	1.0032	1.0065	1.0098	1.0133	1.0168	1.0204	1.0241	1.0278	1.0317
310	1.0000	1.0032	1.0065	1.0099	1.0134	1.0169	1.0205	1.0242	1.0280	1.0318
315	1.0000	1.0033	1.0066	1.0100	1.0135	1.0170	1.0206	1.0243	1.0281	1.0319
320	1.0000	1.0033	1.0066	1.0100	1.0135	1.0171	1.0207	1.0244	1.0281	1.0320
325	1.0000	1.0033	1.0067	1.0101	1.0136	1.0171	1.0208	1.0244	1.0282	1.0320
330	1.0000	1.0033	1.0067	1.0101	1.0136	1.0172	1.0208	1.0245	1.0282	1.0320
335	1.0000	1.0033	1.0067	1.0102	1.0137	1.0172	1.0208	1.0245	1.0283	1.0320
340	1.0000	1.0033	1.0067	1.0102	1.0137	1.0173	1.0209	1.0245	1.0283	1.0320
345	1.0000	1.0034	1.0068	1.0102	1.0137	1.0173	1.0209	1.0245	1.0283	1.0320
350	1.0000	1.0034	1.0068	1.0102	1.0137	1.0173	1.0209	1.0245	1.0282	1.0320
360	1.0000	1.0034	1.0068	1.0102	1.0137	1.0173	1.0209	1.0245	1.0282	1.0319
370	1.0000	1.0034	1.0068	1.0102	1.0137	1.0172	1.0208	1.0244	1.0281	1.0318
380	1.0000	1.0034	1.0068	1.0102	1.0137	1.0172	1.0207	1.0243	1.0279	1.0316
390	1.0000	1.0034	1.0067	1.0102	1.0136	1.0171	1.0206	1.0242	1.0278	1.0314
400	1.0000	1.0033	1.0067	1.0101	1.0135	1.0170	1.0205	1.0240	1.0276	1.0311
410	1.0000	1.0033	1.0067	1.0100	1.0135	1.0169	1.0203	1.0238	1.0273	1.0309
420	1.0000	1.0033	1.0066	1.0100	1.0134	1.0168	1.0202	1.0236	1.0271	1.0306
430	1.0000	1.0033	1.0066	1.0099	1.0133	1.0166	1.0200	1.0234	1.0269	1.0303
440	1.0000	1.0033	1.0065	1.0098	1.0131	1.0165	1.0198	1.0232	1.0266	1.0301
450	1.0000	1.0032	1.0065	1.0097	1.0130	1.0163	1.0197	1.0230	1.0264	1.0298
460	1.0000	1.0032	1.0064	1.0097	1.0129	1.0162	1.0195	1.0228	1.0261	1.0294
470	1.0000	1.0032	1.0064	1.0096	1.0128	1.0160	1.0193	1.0225	1.0258	1.0291
480	1.0000	1.0031	1.0063	1.0095	1.0127	1.0159	1.0191	1.0223	1.0255	1.0288
490	1.0000	1.0031	1.0062	1.0094	1.0125	1.0157	1.0189	1.0221	1.0253	1.0285
500	1.0000	1.0031	1.0062	1.0093	1.0124	1.0155	1.0187	1.0218	1.0250	1.0282
510	1.0000	1.0030	1.0061	1.0092	1.0123	1.0153	1.0185	1.0216	1.0247	1.0278
520	1.0000	1.0030	1.0060	1.0091	1.0121	1.0152	1.0182	1.0213	1.0244	1.0275
530	1.0000	1.0030	1.0060	1.0090	1.0120	1.0150	1.0180	1.0211	1.0241	1.0272
540	1.0000	1.0029	1.0059	1.0089	1.0119	1.0148	1.0178	1.0208	1.0239	1.0269
550	1.0000	1.0029	1.0058	1.0088	1.0117	1.0147	1.0176	1.0206	1.0236	1.0266
560	1.0000	1.0029	1.0058	1.0087	1.0116	1.0145	1.0174	1.0204	1.0233	1.0262
570	1.0000	1.0028	1.0057	1.0086	1.0114	1.0143	1.0172	1.0201	1.0230	1.0259
580	1.0000	1.0028	1.0056	1.0085	1.0113	1.0142	1.0170	1.0199	1.0227	1.0256
590	1.0000	1.0028	1.0056	1.0084	1.0112	1.0140	1.0168	1.0196	1.0225	1.0253
600	1.0000	1.0028	1.0055	1.0083	1.0110	1.0138	1.0166	1.0194	1.0222	1.0250
610	1.0000	1.0027	1.0054	1.0082	1.0109	1.0137	1.0164	1.0192	1.0219	1.0247
620	1.0000	1.0027	1.0054	1.0081	1.0108	1.0135	1.0162	1.0189	1.0217	1.0244
630	1.0000	1.0027	1.0053	1.0080	1.0107	1.0133	1.0160	1.0187	1.0214	1.0241
640	1.0000	1.0026	1.0053	1.0079	1.0105	1.0132	1.0158	1.0185	1.0211	1.0238
650	1.0000	1.0026	1.0052	1.0078	1.0104	1.0130	1.0156	1.0183	1.0209	1.0235
660	1.0000	1.0026	1.0051	1.0077	1.0103	1.0129	1.0155	1.0180	1.0206	1.0232
670	1.0000	1.0025	1.0051	1.0076	1.0102	1.0127	1.0153	1.0178	1.0204	1.0230
680	1.0000	1.0025	1.0050	1.0075	1.0100	1.0126	1.0151	1.0176	1.0201	1.0227
690	1.0000	1.0025	1.0050	1.0074	1.0099	1.0124	1.0149	1.0174	1.0199	1.0224
700	1.0000	1.0024	1.0049	1.0073	1.0098	1.0123	1.0147	1.0172	1.0197	1.0221

THERMODYNAMIC PROPERTIES OF PARA-HYDROGEN

compressibility factor

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
1.0040	1.0068	1.0100	1.0137	1.0179	1.0225	1.0275	1.0330	1.0389	1.0453	1.0521
1.0076	1.0106	1.0140	1.0178	1.0220	1.0266	1.0317	1.0371	1.0429	1.0492	1.0558
1.0108	1.0140	1.0175	1.0214	1.0257	1.0303	1.0353	1.0407	1.0465	1.0526	1.0592
1.0137	1.0170	1.0206	1.0246	1.0289	1.0336	1.0386	1.0440	1.0497	1.0557	1.0621
1.0163	1.0197	1.0234	1.0275	1.0318	1.0365	1.0415	1.0469	1.0525	1.0585	1.0647
1.0186	1.0221	1.0259	1.0300	1.0344	1.0391	1.0441	1.0494	1.0550	1.0609	1.0671
1.0207	1.0243	1.0282	1.0323	1.0367	1.0414	1.0464	1.0517	1.0572	1.0630	1.0691
1.0225	1.0262	1.0301	1.0343	1.0388	1.0435	1.0484	1.0537	1.0591	1.0649	1.0709
1.0242	1.0279	1.0319	1.0361	1.0406	1.0453	1.0502	1.0554	1.0609	1.0665	1.0724
1.0256	1.0294	1.0335	1.0377	1.0422	1.0469	1.0518	1.0570	1.0623	1.0679	1.0738
1.0270	1.0308	1.0349	1.0391	1.0436	1.0483	1.0532	1.0583	1.0636	1.0692	1.0749
1.0281	1.0320	1.0361	1.0404	1.0449	1.0496	1.0544	1.0595	1.0648	1.0702	1.0759
1.0292	1.0331	1.0372	1.0415	1.0460	1.0507	1.0555	1.0605	1.0658	1.0712	1.0768
1.0301	1.0341	1.0382	1.0425	1.0470	1.0516	1.0564	1.0614	1.0666	1.0719	1.0775
1.0309	1.0349	1.0390	1.0434	1.0478	1.0525	1.0572	1.0622	1.0673	1.0726	1.0780
1.0316	1.0356	1.0398	1.0441	1.0486	1.0532	1.0579	1.0629	1.0679	1.0731	1.0785
1.0323	1.0363	1.0405	1.0448	1.0492	1.0538	1.0585	1.0634	1.0684	1.0736	1.0789
1.0329	1.0369	1.0411	1.0454	1.0498	1.0543	1.0590	1.0639	1.0688	1.0739	1.0792
1.0334	1.0374	1.0416	1.0459	1.0503	1.0548	1.0595	1.0643	1.0692	1.0742	1.0794
1.0338	1.0379	1.0420	1.0463	1.0507	1.0552	1.0598	1.0646	1.0694	1.0744	1.0795
1.0342	1.0382	1.0424	1.0466	1.0510	1.0555	1.0601	1.0648	1.0696	1.0746	1.0796
1.0345	1.0386	1.0427	1.0470	1.0513	1.0558	1.0603	1.0650	1.0698	1.0747	1.0797
1.0348	1.0389	1.0430	1.0472	1.0515	1.0560	1.0605	1.0651	1.0699	1.0747	1.0796
1.0351	1.0391	1.0432	1.0474	1.0517	1.0561	1.0606	1.0652	1.0699	1.0747	1.0796
1.0353	1.0393	1.0434	1.0476	1.0519	1.0563	1.0607	1.0653	1.0699	1.0746	1.0795
1.0354	1.0395	1.0435	1.0477	1.0520	1.0563	1.0608	1.0653	1.0699	1.0746	1.0793
1.0356	1.0396	1.0437	1.0478	1.0521	1.0564	1.0608	1.0652	1.0698	1.0744	1.0792
1.0357	1.0397	1.0437	1.0479	1.0521	1.0564	1.0607	1.0652	1.0697	1.0743	1.0789
1.0358	1.0398	1.0438	1.0479	1.0521	1.0564	1.0607	1.0651	1.0696	1.0741	1.0787
1.0358	1.0398	1.0438	1.0479	1.0521	1.0563	1.0606	1.0650	1.0694	1.0739	1.0785
1.0359	1.0398	1.0438	1.0479	1.0520	1.0562	1.0605	1.0648	1.0692	1.0737	1.0782
1.0359	1.0398	1.0438	1.0479	1.0520	1.0561	1.0604	1.0647	1.0690	1.0734	1.0779
1.0359	1.0398	1.0438	1.0478	1.0519	1.0560	1.0602	1.0645	1.0688	1.0731	1.0776
1.0359	1.0398	1.0437	1.0477	1.0518	1.0559	1.0600	1.0643	1.0685	1.0729	1.0772
1.0358	1.0397	1.0436	1.0476	1.0516	1.0557	1.0599	1.0640	1.0683	1.0726	1.0769
1.0358	1.0397	1.0436	1.0475	1.0515	1.0556	1.0597	1.0638	1.0680	1.0722	1.0765
1.0357	1.0395	1.0433	1.0472	1.0512	1.0552	1.0592	1.0633	1.0674	1.0716	1.0758
1.0355	1.0393	1.0431	1.0469	1.0508	1.0548	1.0587	1.0627	1.0668	1.0709	1.0750
1.0353	1.0390	1.0428	1.0466	1.0504	1.0543	1.0582	1.0622	1.0661	1.0702	1.0742
1.0350	1.0387	1.0424	1.0462	1.0500	1.0538	1.0577	1.0615	1.0655	1.0694	1.0734
1.0348	1.0384	1.0421	1.0458	1.0495	1.0533	1.0571	1.0609	1.0648	1.0686	1.0726
1.0345	1.0381	1.0417	1.0453	1.0490	1.0527	1.0565	1.0602	1.0640	1.0679	1.0717
1.0342	1.0377	1.0413	1.0449	1.0485	1.0522	1.0559	1.0596	1.0633	1.0671	1.0709
1.0338	1.0373	1.0409	1.0444	1.0480	1.0516	1.0552	1.0589	1.0626	1.0663	1.0700
1.0335	1.0370	1.0405	1.0440	1.0475	1.0510	1.0546	1.0582	1.0618	1.0655	1.0691
1.0332	1.0366	1.0400	1.0435	1.0470	1.0505	1.0540	1.0575	1.0611	1.0647	1.0683
1.0328	1.0362	1.0396	1.0430	1.0464	1.0499	1.0534	1.0568	1.0603	1.0639	1.0674
1.0324	1.0358	1.0391	1.0425	1.0459	1.0493	1.0527	1.0561	1.0596	1.0631	1.0666
1.0321	1.0354	1.0387	1.0420	1.0454	1.0487	1.0521	1.0555	1.0589	1.0623	1.0657
1.0317	1.0350	1.0382	1.0415	1.0448	1.0481	1.0514	1.0548	1.0581	1.0615	1.0649
1.0314	1.0346	1.0378	1.0410	1.0443	1.0475	1.0508	1.0541	1.0574	1.0607	1.0640
1.0310	1.0342	1.0373	1.0405	1.0437	1.0470	1.0502	1.0534	1.0567	1.0599	1.0632
1.0306	1.0338	1.0369	1.0400	1.0432	1.0464	1.0496	1.0527	1.0559	1.0592	1.0624
1.0303	1.0334	1.0365	1.0396	1.0427	1.0458	1.0489	1.0521	1.0552	1.0584	1.0616
1.0299	1.0330	1.0360	1.0391	1.0421	1.0452	1.0483	1.0514	1.0545	1.0577	1.0608
1.0296	1.0326	1.0356	1.0386	1.0416	1.0447	1.0477	1.0508	1.0538	1.0569	1.0600
1.0292	1.0322	1.0351	1.0381	1.0411	1.0441	1.0471	1.0501	1.0532	1.0562	1.0592
1.0288	1.0318	1.0347	1.0377	1.0406	1.0436	1.0465	1.0495	1.0525	1.0555	1.0585
1.0285	1.0314	1.0343	1.0372	1.0401	1.0430	1.0459	1.0489	1.0518	1.0548	1.0577
1.0282	1.0310	1.0339	1.0367	1.0396	1.0425	1.0454	1.0483	1.0512	1.0541	1.0570
1.0278	1.0306	1.0334	1.0363	1.0391	1.0419	1.0448	1.0476	1.0505	1.0534	1.0562
1.0275	1.0302	1.0330	1.0358	1.0386	1.0414	1.0442	1.0470	1.0499	1.0527	1.0555
1.0271	1.0299	1.0326	1.0354	1.0381	1.0409	1.0437	1.0465	1.0492	1.0520	1.0548
1.0268	1.0295	1.0322	1.0349	1.0377	1.0404	1.0431	1.0459	1.0486	1.0514	1.0541
1.0265	1.0292	1.0318	1.0345	1.0372	1.0399	1.0426	1.0453	1.0480	1.0507	1.0534
1.0262	1.0288	1.0314	1.0341	1.0367	1.0394	1.0421	1.0447	1.0474	1.0501	1.0528
1.0258	1.0284	1.0311	1.0337	1.0363	1.0389	1.0415	1.0442	1.0468	1.0495	1.0521
1.0255	1.0281	1.0307	1.0333	1.0358	1.0384	1.0410	1.0436	1.0462	1.0488	1.0514
1.0252	1.0278	1.0303	1.0329	1.0354	1.0380	1.0405	1.0431	1.0457	1.0482	1.0508
1.0249	1.0274	1.0299	1.0325	1.0350	1.0375	1.0400	1.0426	1.0451	1.0476	1.0502
1.0246	1.0271	1.0296	1.0321	1.0345	1.0370	1.0395	1.0420	1.0445	1.0470	1.0496

TABLE VI. - Continued.

(g) Plenum

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	Plenum 45
175	3.1897	3.2318	3.2725	3.3117	3.3493	3.3855	3.4201	3.4533	3.4849	3.5150
180	3.2482	3.2873	3.3250	3.3615	3.3966	3.4304	3.4629	3.4941	3.5240	3.5525
185	3.3060	3.3424	3.3776	3.4116	3.4445	3.4762	3.5068	3.5362	3.5645	3.5916
190	3.3628	3.3967	3.4296	3.4615	3.4923	3.5222	3.5510	3.5788	3.6055	3.6313
195	3.4180	3.4497	3.4806	3.5105	3.5395	3.5676	3.5949	3.6212	3.6465	3.6710
200	3.4712	3.5010	3.5300	3.5582	3.5856	3.6121	3.6379	3.6628	3.6869	3.7102
205	3.5222	3.5503	3.5776	3.6042	3.6301	3.6552	3.6796	3.7032	3.7261	3.7483
210	3.5706	3.5971	3.6229	3.6481	3.6726	3.6964	3.7195	3.7419	3.7637	3.7848
215	3.6162	3.6413	3.6657	3.6895	3.7127	3.7353	3.7573	3.7786	3.7993	3.8194
220	3.6587	3.6825	3.7057	3.7283	3.7503	3.7718	3.7927	3.8130	3.8327	3.8519
225	3.6981	3.7207	3.7427	3.7642	3.7852	3.8056	3.8255	3.8449	3.8637	3.8820
230	3.7342	3.7557	3.7767	3.7972	3.8172	3.8366	3.8556	3.8741	3.8920	3.9095
235	3.7672	3.7877	3.8077	3.8272	3.8463	3.8648	3.8830	3.9006	3.9177	3.9344
240	3.7970	3.8166	3.8357	3.8543	3.8725	3.8903	3.9076	3.9244	3.9408	3.9568
245	3.8239	3.8426	3.8609	3.8787	3.8961	3.9131	3.9297	3.9458	3.9615	3.9768
250	3.8482	3.8661	3.8836	3.9007	3.9174	3.9336	3.9495	3.9649	3.9800	3.9946
255	3.8702	3.8874	3.9042	3.9206	3.9366	3.9522	3.9674	3.9822	3.9966	4.0106
260	3.8906	3.9071	3.9232	3.9389	3.9543	3.9692	3.9838	3.9981	4.0119	4.0254
265	3.9099	3.9257	3.9412	3.9563	3.9711	3.9855	3.9995	4.0132	4.0265	4.0394
270	3.9290	3.9443	3.9591	3.9737	3.9879	4.0017	4.0152	4.0284	4.0412	4.0536
275	3.9335	3.9482	3.9625	3.9765	3.9902	4.0035	4.0165	4.0292	4.0415	4.0535
280	3.9372	3.9513	3.9651	3.9786	3.9918	4.0046	4.0171	4.0293	4.0412	4.0528
285	3.9400	3.9537	3.9670	3.9800	3.9927	4.0051	4.0171	4.0289	4.0404	4.0515
290	3.9421	3.9552	3.9681	3.9806	3.9929	4.0048	4.0165	4.0279	4.0389	4.0497
295	3.9433	3.9560	3.9684	3.9806	3.9924	4.0040	4.0152	4.0262	4.0369	4.0473
300	3.9438	3.9561	3.9681	3.9798	3.9912	4.0024	4.0133	4.0239	4.0342	4.0443
305	3.9435	3.9554	3.9670	3.9783	3.9894	4.0002	4.0107	4.0210	4.0310	4.0407
310	3.9425	3.9540	3.9652	3.9762	3.9869	3.9974	4.0076	4.0175	4.0272	4.0366
315	3.9407	3.9518	3.9627	3.9734	3.9837	3.9939	4.0038	4.0134	4.0228	4.0319
320	3.9383	3.9490	3.9596	3.9699	3.9800	3.9898	3.9994	4.0087	4.0178	4.0266
325	3.9351	3.9456	3.9558	3.9658	3.9755	3.9851	3.9944	4.0034	4.0122	4.0208
330	3.9313	3.9415	3.9514	3.9611	3.9705	3.9798	3.9888	3.9976	4.0062	4.0145
335	3.9269	3.9367	3.9464	3.9558	3.9649	3.9739	3.9827	3.9912	3.9995	4.0076
340	3.9218	3.9314	3.9407	3.9499	3.9588	3.9675	3.9760	3.9843	3.9924	4.0003
345	3.9162	3.9255	3.9345	3.9434	3.9521	3.9606	3.9688	3.9769	3.9848	3.9924
350	3.9100	3.9190	3.9278	3.9364	3.9449	3.9531	3.9612	3.9690	3.9767	3.9841
360	3.8960	3.9045	3.9128	3.9210	3.9290	3.9368	3.9444	3.9518	3.9591	3.9662
370	3.8800	3.8881	3.8960	3.9037	3.9113	3.9187	3.9259	3.9330	3.9398	3.9466
380	3.8624	3.8700	3.8775	3.8848	3.8920	3.8990	3.9059	3.9126	3.9192	3.9256
390	3.8433	3.8505	3.8576	3.8646	3.8714	3.8781	3.8846	3.8910	3.8973	3.9034
400	3.8230	3.8299	3.8366	3.8433	3.8498	3.8561	3.8623	3.8684	3.8744	3.8802
410	3.8018	3.8083	3.8148	3.8211	3.8273	3.8333	3.8393	3.8451	3.8508	3.8563
420	3.7799	3.7862	3.7923	3.7984	3.8043	3.8101	3.8157	3.8213	3.8267	3.8320
430	3.7578	3.7638	3.7697	3.7754	3.7811	3.7866	3.7920	3.7973	3.8025	3.8076
440	3.7358	3.7415	3.7470	3.7525	3.7579	3.7632	3.7684	3.7735	3.7785	3.7834
450	3.7140	3.7195	3.7248	3.7301	3.7352	3.7403	3.7453	3.7501	3.7549	3.7596
460	3.6972	3.7024	3.7075	3.7126	3.7175	3.7223	3.7271	3.7318	3.7364	3.7409
470	3.6815	3.6865	3.6914	3.6962	3.7009	3.7056	3.7101	3.7146	3.7190	3.7234
480	3.6668	3.6716	3.6763	3.6809	3.6855	3.6899	3.6943	3.6986	3.7029	3.7070
490	3.6532	3.6578	3.6623	3.6667	3.6711	3.6754	3.6796	3.6837	3.6878	3.6918
500	3.6405	3.6449	3.6493	3.6535	3.6577	3.6619	3.6659	3.6699	3.6738	3.6777
510	3.6288	3.6331	3.6372	3.6413	3.6454	3.6493	3.6532	3.6571	3.6609	3.6646
520	3.6180	3.6221	3.6261	3.6301	3.6339	3.6378	3.6415	3.6452	3.6489	3.6525
530	3.6081	3.6120	3.6159	3.6197	3.6234	3.6271	3.6307	3.6343	3.6378	3.6413
540	3.5990	3.6028	3.6065	3.6101	3.6137	3.6173	3.6208	3.6242	3.6276	3.6309
550	3.5907	3.5943	3.5979	3.6014	3.6049	3.6083	3.6117	3.6150	3.6183	3.6215
560	3.5831	3.5866	3.5900	3.5934	3.5967	3.6001	3.6033	3.6065	3.6097	3.6128
570	3.5762	3.5795	3.5828	3.5861	3.5894	3.5926	3.5957	3.5988	3.6019	3.6049
580	3.5699	3.5732	3.5764	3.5795	3.5827	3.5857	3.5888	3.5918	3.5947	3.5977
590	3.5643	3.5674	3.5705	3.5736	3.5766	3.5796	3.5825	3.5854	3.5883	3.5911
600	3.5592	3.5622	3.5652	3.5682	3.5711	3.5740	3.5768	3.5797	3.5824	3.5852
610	3.5547	3.5576	3.5605	3.5634	3.5662	3.5690	3.5717	3.5745	3.5771	3.5798
620	3.5506	3.5535	3.5563	3.5590	3.5618	3.5645	3.5671	3.5698	3.5724	3.5749
630	3.5470	3.5498	3.5525	3.5552	3.5578	3.5604	3.5630	3.5656	3.5681	3.5706
640	3.5438	3.5465	3.5491	3.5517	3.5543	3.5568	3.5593	3.5618	3.5643	3.5667
650	3.5410	3.5436	3.5461	3.5486	3.5511	3.5536	3.5560	3.5584	3.5608	3.5632
660	3.5385	3.5410	3.5435	3.5459	3.5483	3.5507	3.5531	3.5554	3.5577	3.5600
670	3.5363	3.5387	3.5411	3.5435	3.5458	3.5481	3.5504	3.5527	3.5549	3.5571
680	3.5343	3.5367	3.5390	3.5413	3.5435	3.5458	3.5480	3.5502	3.5524	3.5546
690	3.5325	3.5348	3.5371	3.5393	3.5415	3.5437	3.5458	3.5480	3.5501	3.5522
700	3.5309	3.5331	3.5353	3.5375	3.5396	3.5417	3.5438	3.5459	3.5480	3.5500

THERMODYNAMIC PROPERTIES OF PARA-HYDROGEN

specific heat

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
3.5436	3.5707	3.5963	3.6204	3.6430	3.6640	3.6836	3.7016	3.7182	3.7332	3.7467
3.5797	3.6057	3.6303	3.6535	3.6755	3.6961	3.7154	3.7334	3.7501	3.7655	3.7796
3.6175	3.6423	3.6659	3.6884	3.7097	3.7299	3.7489	3.7667	3.7834	3.7989	3.8133
3.6560	3.6797	3.7024	3.7241	3.7447	3.7643	3.7829	3.8005	3.8171	3.8326	3.8471
3.6946	3.7173	3.7390	3.7599	3.7798	3.7988	3.8170	3.8342	3.8505	3.8659	3.8804
3.7327	3.7543	3.7752	3.7952	3.8144	3.8328	3.8504	3.8671	3.8831	3.8982	3.9125
3.7697	3.7904	3.8103	3.8295	3.8480	3.8657	3.8827	3.8990	3.9145	3.9293	3.9433
3.8052	3.8250	3.8441	3.8625	3.8802	3.8973	3.9136	3.9293	3.9444	3.9587	3.9724
3.8389	3.8578	3.8760	3.8936	3.9106	3.9270	3.9428	3.9579	3.9724	3.9863	3.9996
3.8705	3.8885	3.9059	3.9228	3.9391	3.9548	3.9699	3.9845	3.9985	4.0119	4.0247
3.8997	3.9169	3.9336	3.9497	3.9653	3.9803	3.9949	4.0088	4.0223	4.0352	4.0475
3.9264	3.9429	3.9588	3.9742	3.9891	4.0036	4.0175	4.0309	4.0438	4.0562	4.0681
3.9506	3.9663	3.9816	3.9963	4.0106	4.0244	4.0378	4.0506	4.0630	4.0749	4.0863
3.9723	3.9873	4.0019	4.0160	4.0297	4.0430	4.0557	4.0681	4.0799	4.0913	4.1023
3.9916	4.0060	4.0200	4.0335	4.0466	4.0593	4.0715	4.0834	4.0948	4.1057	4.1162
4.0088	4.0226	4.0360	4.0490	4.0616	4.0737	4.0855	4.0968	4.1077	4.1182	4.1283
4.0243	4.0375	4.0504	4.0628	4.0749	4.0865	4.0978	4.1087	4.1192	4.1293	4.1390
4.0385	4.0512	4.0635	4.0755	4.0870	4.0982	4.1091	4.1195	4.1296	4.1393	4.1486
4.0520	4.0642	4.0761	4.0876	4.0987	4.1095	4.1199	4.1299	4.1396	4.1489	4.1578
4.0657	4.0775	4.0889	4.0999	4.1106	4.1210	4.1310	4.1406	4.1500	4.1589	4.1675
4.0651	4.0764	4.0874	4.0981	4.1084	4.1183	4.1280	4.1373	4.1462	4.1549	4.1632
4.0640	4.0749	4.0855	4.0957	4.1057	4.1153	4.1246	4.1335	4.1422	4.1505	4.1585
4.0623	4.0729	4.0831	4.0930	4.1025	4.1118	4.1208	4.1294	4.1378	4.1458	4.1535
4.0601	4.0703	4.0801	4.0897	4.0990	4.1079	4.1166	4.1249	4.1330	4.1407	4.1482
4.0574	4.0672	4.0767	4.0859	4.0949	4.1035	4.1119	4.1200	4.1278	4.1353	4.1425
4.0541	4.0635	4.0728	4.0817	4.0903	4.0987	4.1068	4.1146	4.1222	4.1294	4.1364
4.0502	4.0594	4.0683	4.0769	4.0853	4.0934	4.1013	4.1088	4.1161	4.1232	4.1299
4.0457	4.0546	4.0633	4.0717	4.0798	4.0877	4.0953	4.1026	4.1097	4.1165	4.1231
4.0408	4.0494	4.0578	4.0659	4.0738	4.0814	4.0888	4.0959	4.1028	4.1094	4.1158
4.0352	4.0436	4.0517	4.0596	4.0673	4.0747	4.0818	4.0888	4.0954	4.1019	4.1081
4.0292	4.0373	4.0452	4.0529	4.0603	4.0675	4.0744	4.0812	4.0877	4.0939	4.1000
4.0226	4.0305	4.0382	4.0456	4.0528	4.0598	4.0666	4.0731	4.0795	4.0856	4.0914
4.0155	4.0232	4.0307	4.0379	4.0449	4.0517	4.0583	4.0647	4.0708	4.0768	4.0825
4.0080	4.0154	4.0227	4.0297	4.0365	4.0432	4.0496	4.0558	4.0618	4.0676	4.0731
3.9999	4.0072	4.0142	4.0211	4.0277	4.0342	4.0404	4.0465	4.0523	4.0580	4.0634
3.9914	3.9985	4.0053	4.0120	4.0185	4.0248	4.0309	4.0368	4.0425	4.0480	4.0533
3.9730	3.9798	3.9863	3.9926	3.9988	4.0048	4.0106	4.0162	4.0217	4.0269	4.0320
3.9531	3.9595	3.9657	3.9718	3.9776	3.9833	3.9889	3.9943	3.9995	4.0045	4.0094
3.9318	3.9379	3.9438	3.9496	3.9552	3.9606	3.9659	3.9711	3.9761	3.9809	3.9856
3.9093	3.9151	3.9208	3.9263	3.9316	3.9369	3.9419	3.9469	3.9516	3.9563	3.9608
3.8859	3.8914	3.8968	3.9021	3.9072	3.9122	3.9171	3.9218	3.9264	3.9309	3.9352
3.8618	3.8671	3.8722	3.8773	3.8822	3.8870	3.8917	3.8962	3.9006	3.9049	3.9091
3.8372	3.8423	3.8473	3.8521	3.8568	3.8614	3.8659	3.8703	3.8746	3.8787	3.8827
3.8126	3.8175	3.8222	3.8269	3.8314	3.8358	3.8402	3.8444	3.8485	3.8525	3.8563
3.7881	3.7928	3.7974	3.8019	3.8062	3.8105	3.8146	3.8187	3.8227	3.8265	3.8303
3.7642	3.7687	3.7731	3.7774	3.7816	3.7857	3.7897	3.7936	3.7974	3.8011	3.8048
3.7453	3.7496	3.7538	3.7580	3.7620	3.7660	3.7698	3.7736	3.7773	3.7809	3.7844
3.7276	3.7318	3.7358	3.7398	3.7437	3.7475	3.7513	3.7549	3.7585	3.7620	3.7654
3.7111	3.7151	3.7190	3.7229	3.7266	3.7303	3.7339	3.7375	3.7409	3.7443	3.7476
3.6957	3.6996	3.7034	3.7071	3.7107	3.7143	3.7178	3.7212	3.7245	3.7278	3.7310
3.6815	3.6852	3.6888	3.6924	3.6959	3.6994	3.7027	3.7060	3.7093	3.7124	3.7155
3.6682	3.6718	3.6753	3.6788	3.6822	3.6855	3.6888	3.6920	3.6951	3.6982	3.7012
3.6560	3.6594	3.6628	3.6662	3.6695	3.6727	3.6758	3.6789	3.6820	3.6850	3.6879
3.6447	3.6480	3.6513	3.6545	3.6577	3.6608	3.6639	3.6669	3.6698	3.6727	3.6756
3.6342	3.6375	3.6406	3.6438	3.6468	3.6499	3.6528	3.6557	3.6586	3.6614	3.6642
3.6247	3.6278	3.6309	3.6339	3.6369	3.6398	3.6427	3.6455	3.6483	3.6510	3.6537
3.6159	3.6189	3.6219	3.6248	3.6277	3.6305	3.6333	3.6361	3.6388	3.6414	3.6440
3.6079	3.6108	3.6137	3.6165	3.6193	3.6221	3.6248	3.6274	3.6300	3.6326	3.6351
3.6005	3.6034	3.6062	3.6089	3.6116	3.6143	3.6169	3.6195	3.6221	3.6246	3.6270
3.5939	3.5966	3.5993	3.6020	3.6046	3.6072	3.6098	3.6123	3.6148	3.6172	3.6196
3.5879	3.5905	3.5932	3.5957	3.5983	3.6008	3.6033	3.6057	3.6081	3.6105	3.6128
3.5824	3.5850	3.5875	3.5901	3.5925	3.5950	3.5974	3.5998	3.6021	3.6044	3.6067
3.5775	3.5800	3.5825	3.5849	3.5873	3.5897	3.5920	3.5943	3.5966	3.5989	3.6011
3.5731	3.5755	3.5779	3.5803	3.5826	3.5849	3.5872	3.5894	3.5916	3.5938	3.5960
3.5691	3.5714	3.5738	3.5761	3.5783	3.5806	3.5828	3.5850	3.5871	3.5893	3.5914
3.5655	3.5678	3.5700	3.5723	3.5745	3.5767	3.5788	3.5810	3.5831	3.5851	3.5872
3.5622	3.5645	3.5667	3.5689	3.5710	3.5731	3.5752	3.5773	3.5793	3.5814	3.5834
3.5593	3.5615	3.5636	3.5658	3.5678	3.5699	3.5720	3.5740	3.5760	3.5779	3.5799
3.5567	3.5588	3.5609	3.5629	3.5650	3.5670	3.5690	3.5709	3.5729	3.5748	3.5767
3.5543	3.5563	3.5583	3.5603	3.5623	3.5643	3.5662	3.5681	3.5700	3.5719	3.5738
3.5520	3.5540	3.5560	3.5579	3.5599	3.5618	3.5637	3.5655	3.5674	3.5692	3.5710

TABLE VI. - Continued.

(h) Plenum

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	Plenum 45
175	1.4567	1.4720	1.4870	1.5019	1.5165	1.5308	1.5449	1.5587	1.5723	1.5855
180	1.4448	1.4588	1.4727	1.4863	1.4997	1.5129	1.5258	1.5385	1.5508	1.5630
185	1.4336	1.4466	1.4593	1.4719	1.4842	1.4963	1.5081	1.5197	1.5311	1.5422
190	1.4232	1.4352	1.4470	1.4585	1.4699	1.4810	1.4919	1.5026	1.5130	1.5231
195	1.4136	1.4246	1.4355	1.4462	1.4567	1.4670	1.4770	1.4868	1.4964	1.5057
200	1.4047	1.4149	1.4250	1.4349	1.4446	1.4541	1.4634	1.4725	1.4813	1.4899
205	1.3965	1.4060	1.4154	1.4246	1.4336	1.4424	1.4510	1.4594	1.4675	1.4755
210	1.3890	1.3979	1.4067	1.4152	1.4236	1.4318	1.4397	1.4475	1.4551	1.4624
215	1.3822	1.3906	1.3987	1.4067	1.4145	1.4221	1.4296	1.4368	1.4438	1.4506
220	1.3761	1.3839	1.3916	1.3990	1.4063	1.4134	1.4204	1.4271	1.4337	1.4400
225	1.3706	1.3779	1.3851	1.3921	1.3990	1.4056	1.4121	1.4184	1.4245	1.4305
230	1.3657	1.3726	1.3794	1.3859	1.3924	1.3986	1.4047	1.4106	1.4164	1.4219
235	1.3614	1.3679	1.3742	1.3804	1.3865	1.3923	1.3981	1.4036	1.4090	1.4142
240	1.3575	1.3637	1.3697	1.3755	1.3812	1.3868	1.3922	1.3974	1.4025	1.4074
245	1.3541	1.3599	1.3656	1.3711	1.3765	1.3818	1.3869	1.3918	1.3966	1.4012
250	1.3511	1.3566	1.3620	1.3672	1.3723	1.3773	1.3821	1.3868	1.3913	1.3957
255	1.3484	1.3536	1.3587	1.3637	1.3685	1.3733	1.3778	1.3823	1.3865	1.3907
260	1.3460	1.3509	1.3558	1.3605	1.3651	1.3696	1.3739	1.3781	1.3822	1.3861
265	1.3437	1.3484	1.3530	1.3575	1.3619	1.3661	1.3702	1.3742	1.3781	1.3818
270	1.3414	1.3459	1.3503	1.3546	1.3587	1.3628	1.3667	1.3705	1.3742	1.3778
275	1.3409	1.3452	1.3494	1.3535	1.3575	1.3613	1.3651	1.3687	1.3723	1.3757
280	1.3405	1.3446	1.3486	1.3525	1.3564	1.3601	1.3637	1.3671	1.3705	1.3738
285	1.3401	1.3441	1.3480	1.3517	1.3554	1.3589	1.3624	1.3657	1.3689	1.3721
290	1.3399	1.3437	1.3474	1.3510	1.3545	1.3579	1.3612	1.3644	1.3675	1.3705
295	1.3398	1.3434	1.3470	1.3504	1.3538	1.3571	1.3602	1.3633	1.3663	1.3692
300	1.3397	1.3432	1.3466	1.3500	1.3532	1.3563	1.3594	1.3623	1.3652	1.3680
305	1.3397	1.3431	1.3464	1.3496	1.3527	1.3557	1.3587	1.3615	1.3643	1.3669
310	1.3399	1.3431	1.3463	1.3493	1.3523	1.3552	1.3581	1.3608	1.3634	1.3660
315	1.3401	1.3432	1.3462	1.3492	1.3521	1.3549	1.3576	1.3602	1.3628	1.3652
320	1.3403	1.3433	1.3463	1.3491	1.3519	1.3546	1.3572	1.3598	1.3622	1.3646
325	1.3407	1.3436	1.3464	1.3492	1.3519	1.3545	1.3570	1.3594	1.3618	1.3641
330	1.3411	1.3439	1.3467	1.3493	1.3519	1.3544	1.3568	1.3592	1.3615	1.3637
335	1.3417	1.3444	1.3470	1.3495	1.3520	1.3545	1.3568	1.3591	1.3613	1.3634
340	1.3423	1.3449	1.3474	1.3499	1.3523	1.3546	1.3569	1.3591	1.3612	1.3633
345	1.3429	1.3454	1.3479	1.3503	1.3526	1.3549	1.3570	1.3592	1.3612	1.3632
350	1.3436	1.3461	1.3484	1.3508	1.3530	1.3552	1.3573	1.3594	1.3614	1.3633
360	1.3453	1.3476	1.3498	1.3519	1.3540	1.3561	1.3581	1.3600	1.3619	1.3637
370	1.3472	1.3493	1.3514	1.3534	1.3554	1.3573	1.3592	1.3610	1.3627	1.3644
380	1.3494	1.3514	1.3533	1.3552	1.3570	1.3588	1.3606	1.3623	1.3639	1.3655
390	1.3517	1.3536	1.3554	1.3572	1.3589	1.3606	1.3622	1.3638	1.3654	1.3669
400	1.3542	1.3560	1.3577	1.3594	1.3610	1.3626	1.3641	1.3656	1.3671	1.3685
410	1.3569	1.3586	1.3602	1.3617	1.3633	1.3648	1.3662	1.3676	1.3690	1.3703
420	1.3597	1.3613	1.3628	1.3643	1.3657	1.3671	1.3684	1.3698	1.3711	1.3723
430	1.3626	1.3641	1.3655	1.3669	1.3682	1.3695	1.3708	1.3721	1.3733	1.3744
440	1.3655	1.3669	1.3682	1.3695	1.3708	1.3720	1.3732	1.3744	1.3756	1.3767
450	1.3685	1.3697	1.3710	1.3722	1.3734	1.3746	1.3757	1.3768	1.3779	1.3789
460	1.3708	1.3720	1.3731	1.3743	1.3754	1.3765	1.3776	1.3786	1.3796	1.3806
470	1.3729	1.3741	1.3752	1.3762	1.3773	1.3783	1.3793	1.3803	1.3812	1.3821
480	1.3750	1.3760	1.3771	1.3781	1.3791	1.3800	1.3810	1.3819	1.3828	1.3836
490	1.3769	1.3779	1.3789	1.3798	1.3807	1.3816	1.3825	1.3834	1.3842	1.3850
500	1.3787	1.3796	1.3805	1.3814	1.3823	1.3831	1.3839	1.3847	1.3855	1.3863
510	1.3804	1.3813	1.3821	1.3829	1.3837	1.3845	1.3853	1.3860	1.3868	1.3875
520	1.3820	1.3828	1.3836	1.3843	1.3851	1.3858	1.3865	1.3872	1.3879	1.3885
530	1.3834	1.3842	1.3849	1.3856	1.3863	1.3870	1.3877	1.3883	1.3889	1.3895
540	1.3848	1.3855	1.3861	1.3868	1.3875	1.3881	1.3887	1.3893	1.3899	1.3905
550	1.3860	1.3867	1.3873	1.3879	1.3885	1.3891	1.3897	1.3902	1.3908	1.3913
560	1.3871	1.3877	1.3883	1.3889	1.3895	1.3900	1.3905	1.3910	1.3915	1.3920
570	1.3882	1.3887	1.3893	1.3898	1.3903	1.3908	1.3913	1.3918	1.3922	1.3927
580	1.3891	1.3896	1.3901	1.3906	1.3911	1.3916	1.3920	1.3924	1.3929	1.3933
590	1.3900	1.3904	1.3909	1.3914	1.3918	1.3922	1.3926	1.3930	1.3934	1.3938
600	1.3907	1.3912	1.3916	1.3920	1.3924	1.3928	1.3932	1.3935	1.3939	1.3942
610	1.3914	1.3918	1.3922	1.3926	1.3930	1.3933	1.3937	1.3940	1.3943	1.3946
620	1.3921	1.3924	1.3928	1.3931	1.3934	1.3938	1.3941	1.3944	1.3947	1.3949
630	1.3926	1.3929	1.3933	1.3936	1.3939	1.3941	1.3944	1.3947	1.3950	1.3952
640	1.3931	1.3934	1.3937	1.3940	1.3942	1.3945	1.3947	1.3950	1.3952	1.3954
650	1.3935	1.3938	1.3941	1.3943	1.3945	1.3948	1.3950	1.3952	1.3954	1.3956
660	1.3939	1.3942	1.3944	1.3946	1.3948	1.3950	1.3952	1.3954	1.3956	1.3957
670	1.3943	1.3945	1.3947	1.3949	1.3950	1.3952	1.3954	1.3955	1.3957	1.3958
680	1.3946	1.3948	1.3949	1.3951	1.3952	1.3954	1.3955	1.3957	1.3958	1.3959
690	1.3949	1.3950	1.3952	1.3953	1.3954	1.3955	1.3957	1.3958	1.3959	1.3960
700	1.3951	1.3952	1.3954	1.3955	1.3956	1.3957	1.3958	1.3959	1.3959	1.3960

THERMODYNAMIC PROPERTIES OF PARA-HYDROGEN

specific heat ratio

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
1.5985	1.6111	1.6235	1.6359	1.6471	1.6584	1.6694	1.6799	1.6901	1.6999	1.7093
1.5748	1.5863	1.5976	1.6085	1.6191	1.6294	1.6393	1.6489	1.6581	1.6669	1.6754
1.5530	1.5635	1.5738	1.5837	1.5934	1.6027	1.6117	1.6204	1.6287	1.6367	1.6443
1.5331	1.5427	1.5520	1.5611	1.5699	1.5784	1.5865	1.5944	1.6019	1.6091	1.6160
1.5148	1.5237	1.5322	1.5405	1.5485	1.5562	1.5637	1.5708	1.5776	1.5841	1.5903
1.4982	1.5064	1.5142	1.5218	1.5291	1.5362	1.5430	1.5494	1.5556	1.5615	1.5671
1.4832	1.4907	1.4979	1.5049	1.5116	1.5180	1.5242	1.5302	1.5358	1.5412	1.5462
1.4696	1.4765	1.4831	1.4896	1.4958	1.5017	1.5074	1.5128	1.5180	1.5228	1.5275
1.4573	1.4637	1.4698	1.4758	1.4815	1.4870	1.4922	1.4972	1.5019	1.5064	1.5106
1.4462	1.4521	1.4579	1.4634	1.4687	1.4737	1.4786	1.4832	1.4875	1.4916	1.4955
1.4362	1.4418	1.4471	1.4522	1.4571	1.4618	1.4663	1.4706	1.4746	1.4784	1.4820
1.4273	1.4325	1.4374	1.4422	1.4468	1.4512	1.4554	1.4593	1.4631	1.4666	1.4699
1.4193	1.4241	1.4288	1.4333	1.4376	1.4417	1.4456	1.4493	1.4528	1.4561	1.4591
1.4121	1.4167	1.4211	1.4253	1.4293	1.4332	1.4368	1.4403	1.4435	1.4466	1.4495
1.4057	1.4100	1.4141	1.4181	1.4219	1.4255	1.4289	1.4322	1.4353	1.4382	1.4408
1.3999	1.4040	1.4079	1.4116	1.4152	1.4186	1.4219	1.4249	1.4278	1.4305	1.4331
1.3947	1.3985	1.4022	1.4058	1.4092	1.4124	1.4154	1.4183	1.4211	1.4236	1.4260
1.3899	1.3936	1.3971	1.4004	1.4036	1.4067	1.4096	1.4123	1.4149	1.4173	1.4196
1.3854	1.3889	1.3922	1.3954	1.3985	1.4014	1.4041	1.4067	1.4092	1.4115	1.4136
1.3812	1.3845	1.3876	1.3907	1.3936	1.3963	1.3989	1.4014	1.4038	1.4059	1.4080
1.3789	1.3821	1.3851	1.3880	1.3908	1.3934	1.3959	1.3983	1.4005	1.4026	1.4046
1.3769	1.3799	1.3828	1.3856	1.3882	1.3908	1.3932	1.3954	1.3976	1.3996	1.4015
1.3751	1.3780	1.3807	1.3834	1.3859	1.3884	1.3907	1.3928	1.3949	1.3968	1.3986
1.3734	1.3762	1.3789	1.3814	1.3838	1.3862	1.3884	1.3905	1.3925	1.3943	1.3960
1.3719	1.3746	1.3772	1.3796	1.3820	1.3842	1.3863	1.3883	1.3902	1.3920	1.3937
1.3706	1.3732	1.3756	1.3780	1.3803	1.3824	1.3845	1.3864	1.3882	1.3900	1.3916
1.3695	1.3719	1.3743	1.3766	1.3788	1.3808	1.3828	1.3847	1.3864	1.3881	1.3897
1.3685	1.3708	1.3731	1.3753	1.3774	1.3794	1.3813	1.3831	1.3848	1.3864	1.3879
1.3676	1.3699	1.3721	1.3742	1.3762	1.3782	1.3800	1.3817	1.3834	1.3849	1.3864
1.3669	1.3691	1.3712	1.3733	1.3752	1.3771	1.3788	1.3805	1.3821	1.3836	1.3850
1.3663	1.3684	1.3705	1.3724	1.3743	1.3761	1.3778	1.3795	1.3810	1.3825	1.3839
1.3658	1.3679	1.3699	1.3718	1.3736	1.3753	1.3770	1.3786	1.3801	1.3815	1.3828
1.3655	1.3675	1.3694	1.3712	1.3730	1.3747	1.3763	1.3778	1.3793	1.3806	1.3819
1.3653	1.3672	1.3690	1.3708	1.3725	1.3742	1.3757	1.3772	1.3786	1.3799	1.3812
1.3652	1.3670	1.3688	1.3705	1.3722	1.3738	1.3753	1.3767	1.3781	1.3794	1.3806
1.3651	1.3669	1.3687	1.3703	1.3719	1.3735	1.3749	1.3763	1.3777	1.3789	1.3801
1.3654	1.3671	1.3687	1.3703	1.3718	1.3732	1.3746	1.3759	1.3772	1.3784	1.3795
1.3661	1.3676	1.3692	1.3706	1.3721	1.3734	1.3747	1.3759	1.3771	1.3782	1.3793
1.3670	1.3685	1.3700	1.3713	1.3727	1.3740	1.3752	1.3763	1.3775	1.3785	1.3795
1.3683	1.3697	1.3711	1.3724	1.3736	1.3748	1.3760	1.3771	1.3781	1.3791	1.3801
1.3698	1.3712	1.3724	1.3737	1.3748	1.3760	1.3771	1.3781	1.3791	1.3801	1.3810
1.3716	1.3728	1.3740	1.3752	1.3763	1.3774	1.3784	1.3794	1.3803	1.3812	1.3821
1.3735	1.3747	1.3758	1.3769	1.3780	1.3790	1.3799	1.3809	1.3818	1.3826	1.3834
1.3756	1.3767	1.3777	1.3788	1.3798	1.3807	1.3816	1.3825	1.3834	1.3842	1.3849
1.3777	1.3788	1.3798	1.3807	1.3817	1.3826	1.3835	1.3843	1.3851	1.3858	1.3866
1.3799	1.3809	1.3819	1.3828	1.3837	1.3845	1.3853	1.3861	1.3869	1.3876	1.3883
1.3815	1.3824	1.3833	1.3842	1.3850	1.3858	1.3866	1.3873	1.3880	1.3887	1.3894
1.3830	1.3839	1.3847	1.3855	1.3863	1.3871	1.3878	1.3885	1.3891	1.3898	1.3904
1.3844	1.3853	1.3860	1.3868	1.3875	1.3882	1.3889	1.3896	1.3902	1.3908	1.3914
1.3858	1.3865	1.3873	1.3880	1.3886	1.3893	1.3899	1.3906	1.3911	1.3917	1.3922
1.3870	1.3877	1.3884	1.3890	1.3897	1.3903	1.3909	1.3915	1.3920	1.3925	1.3930
1.3881	1.3888	1.3894	1.3900	1.3906	1.3912	1.3918	1.3923	1.3928	1.3933	1.3938
1.3892	1.3898	1.3904	1.3910	1.3915	1.3921	1.3926	1.3931	1.3935	1.3940	1.3944
1.3901	1.3907	1.3913	1.3918	1.3923	1.3928	1.3933	1.3937	1.3942	1.3946	1.3950
1.3910	1.3915	1.3920	1.3925	1.3930	1.3935	1.3939	1.3944	1.3948	1.3951	1.3955
1.3918	1.3923	1.3928	1.3932	1.3937	1.3941	1.3945	1.3949	1.3953	1.3956	1.3960
1.3925	1.3929	1.3934	1.3938	1.3942	1.3946	1.3950	1.3953	1.3957	1.3960	1.3963
1.3931	1.3935	1.3939	1.3943	1.3947	1.3951	1.3954	1.3957	1.3960	1.3963	1.3966
1.3937	1.3940	1.3944	1.3948	1.3951	1.3954	1.3958	1.3961	1.3963	1.3966	1.3969
1.3941	1.3945	1.3948	1.3952	1.3955	1.3958	1.3960	1.3963	1.3966	1.3968	1.3971
1.3946	1.3949	1.3952	1.3955	1.3957	1.3960	1.3963	1.3965	1.3967	1.3970	1.3972
1.3949	1.3952	1.3955	1.3957	1.3960	1.3962	1.3964	1.3967	1.3969	1.3971	1.3973
1.3952	1.3955	1.3957	1.3959	1.3962	1.3964	1.3966	1.3968	1.3969	1.3971	1.3973
1.3954	1.3957	1.3959	1.3961	1.3963	1.3965	1.3967	1.3968	1.3970	1.3971	1.3973
1.3956	1.3958	1.3960	1.3962	1.3964	1.3965	1.3967	1.3968	1.3970	1.3971	1.3972
1.3958	1.3960	1.3961	1.3963	1.3964	1.3966	1.3967	1.3968	1.3969	1.3970	1.3971
1.3959	1.3960	1.3962	1.3963	1.3964	1.3966	1.3967	1.3968	1.3969	1.3969	1.3970
1.3960	1.3961	1.3962	1.3963	1.3964	1.3965	1.3966	1.3967	1.3968	1.3968	1.3969
1.3960	1.3961	1.3962	1.3963	1.3964	1.3965	1.3965	1.3966	1.3966	1.3967	1.3967
1.3961	1.3961	1.3962	1.3963	1.3963	1.3964	1.3964	1.3965	1.3965	1.3965	1.3966
1.3961	1.3961	1.3962	1.3962	1.3963	1.3963	1.3963	1.3964	1.3964	1.3964	1.3964

TABLE VI. - Concluded.

(i) Ratio of plenum speed of sound to speed of

Plenum temperature, °R										Plenum
	0	5	10	15	20	25	30	35	40	45
175	0.6131	0.6154	0.6181	0.6210	0.6244	0.6280	0.6321	0.6365	0.6413	0.6465
180	0.6193	0.6217	0.6244	0.6274	0.6308	0.6345	0.6385	0.6429	0.6477	0.6527
185	0.6254	0.6279	0.6307	0.6338	0.6372	0.6409	0.6449	0.6493	0.6539	0.6589
190	0.6315	0.6341	0.6369	0.6401	0.6435	0.6472	0.6512	0.6555	0.6601	0.6650
195	0.6376	0.6402	0.6432	0.6463	0.6498	0.6535	0.6575	0.6618	0.6663	0.6711
200	0.6437	0.6464	0.6494	0.6526	0.6561	0.6598	0.6638	0.6680	0.6725	0.6772
205	0.6498	0.6526	0.6556	0.6588	0.6623	0.6660	0.6700	0.6742	0.6786	0.6833
210	0.6559	0.6587	0.6618	0.6651	0.6686	0.6723	0.6763	0.6804	0.6848	0.6895
215	0.6620	0.6649	0.6680	0.6714	0.6749	0.6786	0.6825	0.6867	0.6910	0.6956
220	0.6682	0.6711	0.6743	0.6777	0.6812	0.6849	0.6888	0.6930	0.6973	0.7018
225	0.6744	0.6774	0.6806	0.6840	0.6875	0.6913	0.6952	0.6993	0.7036	0.7080
230	0.6806	0.6837	0.6869	0.6903	0.6939	0.6976	0.7015	0.7056	0.7099	0.7143
235	0.6869	0.6900	0.6932	0.6967	0.7002	0.7040	0.7079	0.7119	0.7162	0.7206
240	0.6932	0.6963	0.6996	0.7030	0.7066	0.7104	0.7143	0.7183	0.7225	0.7269
245	0.6995	0.7026	0.7060	0.7094	0.7130	0.7168	0.7207	0.7247	0.7289	0.7332
250	0.7058	0.7090	0.7123	0.7158	0.7194	0.7232	0.7271	0.7311	0.7353	0.7396
255	0.7121	0.7153	0.7187	0.7222	0.7258	0.7296	0.7335	0.7375	0.7416	0.7459
260	0.7184	0.7217	0.7251	0.7286	0.7322	0.7360	0.7398	0.7438	0.7480	0.7522
265	0.7246	0.7279	0.7314	0.7349	0.7385	0.7423	0.7462	0.7501	0.7542	0.7585
270	0.7308	0.7342	0.7376	0.7411	0.7448	0.7485	0.7524	0.7564	0.7605	0.7647
275	0.7374	0.7408	0.7442	0.7478	0.7515	0.7552	0.7591	0.7630	0.7671	0.7713
280	0.7440	0.7474	0.7508	0.7544	0.7581	0.7618	0.7657	0.7697	0.7737	0.7779
285	0.7505	0.7539	0.7574	0.7610	0.7647	0.7684	0.7723	0.7762	0.7803	0.7844
290	0.7570	0.7604	0.7639	0.7675	0.7712	0.7750	0.7788	0.7828	0.7868	0.7909
295	0.7634	0.7669	0.7704	0.7740	0.7777	0.7815	0.7853	0.7893	0.7933	0.7974
300	0.7699	0.7733	0.7769	0.7805	0.7842	0.7880	0.7918	0.7957	0.7998	0.8038
305	0.7763	0.7797	0.7833	0.7869	0.7906	0.7944	0.7983	0.8022	0.8062	0.8102
310	0.7826	0.7861	0.7897	0.7933	0.7970	0.8008	0.8047	0.8086	0.8126	0.8166
315	0.7890	0.7925	0.7961	0.7997	0.8034	0.8072	0.8110	0.8149	0.8189	0.8229
320	0.7953	0.7988	0.8024	0.8060	0.8098	0.8135	0.8174	0.8213	0.8252	0.8293
325	0.8016	0.8051	0.8087	0.8124	0.8161	0.8198	0.8237	0.8276	0.8315	0.8355
330	0.8079	0.8114	0.8150	0.8187	0.8224	0.8261	0.8300	0.8338	0.8378	0.8418
335	0.8141	0.8177	0.8213	0.8249	0.8286	0.8324	0.8362	0.8401	0.8440	0.8480
340	0.8204	0.8239	0.8275	0.8312	0.8349	0.8386	0.8425	0.8463	0.8502	0.8542
345	0.8266	0.8301	0.8337	0.8374	0.8411	0.8449	0.8487	0.8525	0.8564	0.8604
350	0.8328	0.8363	0.8399	0.8436	0.8473	0.8511	0.8549	0.8587	0.8626	0.8666
360	0.8451	0.8487	0.8523	0.8560	0.8596	0.8634	0.8672	0.8710	0.8749	0.8788
370	0.8574	0.8610	0.8646	0.8682	0.8719	0.8756	0.8794	0.8832	0.8871	0.8910
380	0.8696	0.8732	0.8768	0.8804	0.8841	0.8878	0.8916	0.8954	0.8992	0.9031
390	0.8817	0.8853	0.8889	0.8925	0.8962	0.8999	0.9037	0.9074	0.9112	0.9151
400	0.8938	0.8974	0.9010	0.9046	0.9082	0.9119	0.9157	0.9194	0.9232	0.9270
410	0.9058	0.9093	0.9129	0.9166	0.9202	0.9239	0.9276	0.9313	0.9351	0.9389
420	0.9177	0.9213	0.9248	0.9285	0.9321	0.9358	0.9394	0.9432	0.9469	0.9507
430	0.9295	0.9331	0.9367	0.9403	0.9439	0.9475	0.9512	0.9549	0.9586	0.9624
440	0.9413	0.9448	0.9484	0.9520	0.9556	0.9592	0.9629	0.9665	0.9702	0.9740
450	0.9530	0.9565	0.9600	0.9636	0.9672	0.9708	0.9744	0.9781	0.9818	0.9855
460	0.9643	0.9678	0.9713	0.9749	0.9785	0.9821	0.9857	0.9893	0.9929	0.9966
470	0.9755	0.9790	0.9825	0.9860	0.9896	0.9932	0.9968	1.0004	1.0040	1.0076
480	0.9866	0.9900	0.9935	0.9971	1.0006	1.0041	1.0077	1.0113	1.0149	1.0185
490	0.9975	1.0009	1.0044	1.0079	1.0114	1.0150	1.0185	1.0220	1.0256	1.0292
500	1.0083	1.0117	1.0152	1.0186	1.0221	1.0256	1.0292	1.0327	1.0362	1.0398
510	1.0189	1.0223	1.0258	1.0292	1.0327	1.0362	1.0397	1.0432	1.0467	1.0502
520	1.0294	1.0329	1.0363	1.0397	1.0431	1.0466	1.0501	1.0535	1.0570	1.0605
530	1.0398	1.0432	1.0466	1.0500	1.0535	1.0569	1.0603	1.0638	1.0672	1.0707
540	1.0501	1.0535	1.0569	1.0602	1.0636	1.0670	1.0705	1.0739	1.0773	1.0808
550	1.0603	1.0636	1.0670	1.0703	1.0737	1.0771	1.0805	1.0839	1.0873	1.0907
560	1.0703	1.0736	1.0770	1.0803	1.0836	1.0870	1.0904	1.0937	1.0971	1.1005
570	1.0802	1.0835	1.0868	1.0901	1.0935	1.0968	1.1001	1.1035	1.1068	1.1102
580	1.0900	1.0933	1.0966	1.0999	1.1032	1.1065	1.1098	1.1131	1.1164	1.1198
590	1.0997	1.1030	1.1062	1.1095	1.1128	1.1161	1.1193	1.1226	1.1259	1.1292
600	1.1093	1.1125	1.1158	1.1190	1.1223	1.1255	1.1288	1.1321	1.1353	1.1386
610	1.1188	1.1220	1.1252	1.1284	1.1317	1.1349	1.1381	1.1414	1.1446	1.1479
620	1.1282	1.1314	1.1345	1.1377	1.1409	1.1441	1.1474	1.1506	1.1538	1.1570
630	1.1375	1.1406	1.1438	1.1470	1.1501	1.1533	1.1565	1.1597	1.1629	1.1661
640	1.1467	1.1498	1.1529	1.1561	1.1592	1.1624	1.1655	1.1687	1.1719	1.1750
650	1.1558	1.1589	1.1620	1.1651	1.1682	1.1714	1.1745	1.1776	1.1808	1.1839
660	1.1648	1.1679	1.1710	1.1741	1.1772	1.1803	1.1834	1.1865	1.1896	1.1927
670	1.1737	1.1768	1.1799	1.1829	1.1860	1.1891	1.1922	1.1952	1.1983	1.2014
680	1.1826	1.1856	1.1887	1.1917	1.1948	1.1978	1.2009	1.2039	1.2070	1.2101
690	1.1914	1.1944	1.1974	1.2004	1.2034	1.2065	1.2095	1.2125	1.2156	1.2186
700	1.2001	1.2031	1.2061	1.2091	1.2121	1.2151	1.2181	1.2211	1.2241	1.2271

THERMODYNAMIC PROPERTIES OF PARA-HYDROGEN

sound at 1 atmosphere and 491.688° R (4089.44 ft/sec)

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
0.6521	0.6580	0.6644	0.6712	0.6785	0.6862	0.6943	0.7030	0.7121	0.7217	0.7318
0.6582	0.6640	0.6702	0.6768	0.6838	0.6911	0.6989	0.7072	0.7159	0.7250	0.7346
0.6642	0.6699	0.6759	0.6823	0.6890	0.6961	0.7036	0.7115	0.7198	0.7285	0.7376
0.6702	0.6758	0.6816	0.6878	0.6943	0.7012	0.7084	0.7159	0.7238	0.7321	0.7408
0.6762	0.6816	0.6873	0.6933	0.6997	0.7063	0.7132	0.7205	0.7281	0.7360	0.7443
0.6822	0.6875	0.6931	0.6989	0.7051	0.7115	0.7182	0.7252	0.7325	0.7401	0.7481
0.6883	0.6934	0.6989	0.7046	0.7105	0.7168	0.7233	0.7300	0.7371	0.7445	0.7521
0.6943	0.6994	0.7047	0.7103	0.7161	0.7222	0.7285	0.7350	0.7419	0.7489	0.7563
0.7004	0.7054	0.7106	0.7161	0.7217	0.7277	0.7338	0.7402	0.7468	0.7536	0.7607
0.7065	0.7114	0.7166	0.7219	0.7275	0.7332	0.7392	0.7454	0.7518	0.7585	0.7654
0.7127	0.7175	0.7226	0.7278	0.7333	0.7389	0.7447	0.7508	0.7570	0.7635	0.7701
0.7189	0.7237	0.7286	0.7338	0.7391	0.7446	0.7503	0.7562	0.7623	0.7686	0.7751
0.7251	0.7299	0.7347	0.7398	0.7451	0.7505	0.7561	0.7618	0.7678	0.7739	0.7802
0.7314	0.7361	0.7409	0.7459	0.7510	0.7563	0.7618	0.7675	0.7733	0.7793	0.7854
0.7377	0.7423	0.7471	0.7520	0.7571	0.7623	0.7677	0.7732	0.7789	0.7847	0.7907
0.7440	0.7486	0.7533	0.7581	0.7631	0.7683	0.7735	0.7790	0.7846	0.7903	0.7962
0.7503	0.7548	0.7595	0.7643	0.7692	0.7743	0.7795	0.7848	0.7903	0.7959	0.8016
0.7566	0.7610	0.7657	0.7704	0.7753	0.7802	0.7854	0.7906	0.7960	0.8015	0.8071
0.7628	0.7672	0.7718	0.7765	0.7813	0.7862	0.7913	0.7964	0.8017	0.8071	0.8126
0.7690	0.7734	0.7779	0.7825	0.7873	0.7921	0.7971	0.8022	0.8074	0.8127	0.8181
0.7756	0.7799	0.7844	0.7890	0.7937	0.7985	0.8034	0.8084	0.8136	0.8188	0.8242
0.7821	0.7865	0.7909	0.7955	0.8001	0.8049	0.8097	0.8147	0.8197	0.8249	0.8302
0.7887	0.7930	0.7974	0.8019	0.8065	0.8112	0.8160	0.8209	0.8259	0.8310	0.8362
0.7951	0.7994	0.8038	0.8083	0.8129	0.8175	0.8223	0.8271	0.8320	0.8371	0.8422
0.8016	0.8059	0.8102	0.8147	0.8192	0.8238	0.8285	0.8333	0.8381	0.8431	0.8481
0.8080	0.8123	0.8166	0.8210	0.8255	0.8300	0.8347	0.8394	0.8442	0.8491	0.8541
0.8144	0.8186	0.8229	0.8273	0.8317	0.8363	0.8409	0.8456	0.8503	0.8551	0.8601
0.8207	0.8249	0.8292	0.8336	0.8380	0.8425	0.8470	0.8517	0.8564	0.8612	0.8660
0.8271	0.8312	0.8355	0.8398	0.8442	0.8486	0.8532	0.8577	0.8624	0.8671	0.8719
0.8333	0.8375	0.8417	0.8460	0.8504	0.8548	0.8593	0.8638	0.8684	0.8731	0.8779
0.8396	0.8437	0.8479	0.8522	0.8565	0.8609	0.8654	0.8699	0.8744	0.8791	0.8838
0.8458	0.8500	0.8541	0.8584	0.8627	0.8670	0.8714	0.8759	0.8804	0.8850	0.8897
0.8521	0.8561	0.8603	0.8645	0.8688	0.8731	0.8775	0.8819	0.8864	0.8909	0.8955
0.8582	0.8623	0.8664	0.8706	0.8749	0.8792	0.8835	0.8879	0.8924	0.8969	0.9014
0.8644	0.8685	0.8726	0.8767	0.8809	0.8852	0.8895	0.8939	0.8983	0.9028	0.9073
0.8705	0.8746	0.8787	0.8828	0.8870	0.8912	0.8955	0.8998	0.9042	0.9087	0.9131
0.8828	0.8868	0.8908	0.8949	0.8990	0.9032	0.9075	0.9117	0.9160	0.9204	0.9248
0.8949	0.8989	0.9029	0.9069	0.9110	0.9152	0.9193	0.9235	0.9278	0.9321	0.9364
0.9070	0.9109	0.9149	0.9189	0.9229	0.9270	0.9311	0.9353	0.9395	0.9437	0.9480
0.9190	0.9229	0.9268	0.9308	0.9348	0.9388	0.9429	0.9470	0.9511	0.9553	0.9595
0.9309	0.9347	0.9386	0.9426	0.9466	0.9506	0.9546	0.9586	0.9627	0.9669	0.9710
0.9427	0.9465	0.9504	0.9543	0.9583	0.9622	0.9662	0.9702	0.9743	0.9783	0.9824
0.9545	0.9583	0.9621	0.9660	0.9699	0.9738	0.9777	0.9817	0.9857	0.9897	0.9938
0.9661	0.9699	0.9737	0.9776	0.9814	0.9853	0.9892	0.9931	0.9971	1.0011	1.0051
0.9777	0.9815	0.9852	0.9890	0.9929	0.9967	1.0006	1.0045	1.0084	1.0123	1.0163
0.9892	0.9929	0.9966	1.0004	1.0042	1.0080	1.0118	1.0157	1.0196	1.0235	1.0274
1.0003	1.0040	1.0077	1.0115	1.0152	1.0190	1.0228	1.0266	1.0304	1.0343	1.0381
1.0113	1.0149	1.0186	1.0223	1.0261	1.0298	1.0336	1.0373	1.0411	1.0449	1.0488
1.0221	1.0257	1.0294	1.0331	1.0368	1.0405	1.0442	1.0479	1.0517	1.0555	1.0592
1.0328	1.0364	1.0400	1.0437	1.0473	1.0510	1.0547	1.0584	1.0621	1.0658	1.0696
1.0433	1.0469	1.0505	1.0541	1.0578	1.0614	1.0651	1.0687	1.0724	1.0761	1.0798
1.0538	1.0573	1.0609	1.0645	1.0681	1.0717	1.0753	1.0789	1.0826	1.0862	1.0899
1.0640	1.0676	1.0711	1.0747	1.0782	1.0818	1.0854	1.0890	1.0926	1.0962	1.0998
1.0742	1.0777	1.0812	1.0847	1.0882	1.0918	1.0953	1.0989	1.1025	1.1061	1.1096
1.0842	1.0877	1.0912	1.0947	1.0982	1.1017	1.1052	1.1087	1.1122	1.1158	1.1193
1.0941	1.0976	1.1010	1.1045	1.1079	1.1114	1.1149	1.1184	1.1219	1.1254	1.1289
1.1039	1.1073	1.1107	1.1142	1.1176	1.1210	1.1245	1.1280	1.1314	1.1349	1.1384
1.1136	1.1170	1.1203	1.1237	1.1271	1.1306	1.1340	1.1374	1.1408	1.1443	1.1477
1.1231	1.1265	1.1298	1.1332	1.1366	1.1400	1.1433	1.1467	1.1501	1.1536	1.1570
1.1326	1.1359	1.1392	1.1426	1.1459	1.1493	1.1526	1.1560	1.1593	1.1627	1.1661
1.1419	1.1452	1.1485	1.1518	1.1551	1.1584	1.1618	1.1651	1.1684	1.1718	1.1751
1.1511	1.1544	1.1577	1.1609	1.1642	1.1675	1.1708	1.1741	1.1774	1.1807	1.1841
1.1603	1.1635	1.1667	1.1700	1.1732	1.1765	1.1798	1.1830	1.1863	1.1896	1.1929
1.1693	1.1725	1.1757	1.1789	1.1822	1.1854	1.1886	1.1919	1.1951	1.1984	1.2016
1.1782	1.1814	1.1846	1.1878	1.1910	1.1942	1.1974	1.2006	1.2038	1.2071	1.2103
1.1871	1.1902	1.1934	1.1966	1.1997	1.2029	1.2061	1.2093	1.2125	1.2157	1.2189
1.1958	1.1990	1.2021	1.2052	1.2084	1.2115	1.2147	1.2178	1.2210	1.2242	1.2273
1.2045	1.2076	1.2107	1.2139	1.2170	1.2201	1.2232	1.2263	1.2295	1.2326	1.2357
1.2131	1.2162	1.2193	1.2224	1.2255	1.2286	1.2317	1.2348	1.2379	1.2410	1.2441
1.2217	1.2247	1.2278	1.2308	1.2339	1.2370	1.2400	1.2431	1.2462	1.2492	1.2523
1.2301	1.2332	1.2362	1.2392	1.2422	1.2453	1.2483	1.2514	1.2544	1.2575	1.2605

TABLE VII. - THERMODYNAMIC

(a) Critical-

Plenum temperature, °R	0	1	2	3	4	5	6	7	8	9	10	15	20	25
700	0.6717	------	------	------	------	------	------	------	------	------	------	------	------	------
710	0.6716	------	------	------	------	------	------	------	------	------	------	------	------	------
720	0.6715	------	------	------	------	------	------	------	------	------	------	------	------	------
730	0.6714	------	------	------	------	------	------	------	------	------	------	------	------	------
740	0.6713	------	------	------	------	------	------	------	------	------	------	------	------	------
750	0.6712	0.6735	------	------	------	------	------	------	------	------	------	------	------	------
760	0.6711	0.6733	------	------	------	------	------	------	------	------	------	------	------	------
770	0.6711	0.6731	------	------	------	------	------	------	------	------	------	------	------	------
780	0.6710	0.6730	------	------	------	------	------	------	------	------	------	------	------	------
790	0.6709	0.6728	0.6747	------	------	------	------	------	------	------	------	------	------	------
800	0.6708	0.6726	0.6744	------	------	------	------	------	------	------	------	------	------	------
810	0.6707	0.6724	0.6742	0.6760	------	------	------	------	------	------	------	------	------	------
820	0.6706	0.6723	0.6740	0.6757	------	------	------	------	------	------	------	------	------	------
830	0.6705	0.6721	0.6737	0.6754	0.6771	------	------	------	------	------	------	------	------	------
840	0.6704	0.6719	0.6735	0.6751	0.6767	0.6784	------	------	------	------	------	------	------	------
850	0.6703	0.6717	0.6733	0.6748	0.6763	0.6779	------	------	------	------	------	------	------	------
860	0.6702	0.6716	0.6730	0.6745	0.6760	0.6775	0.6791	------	------	------	------	------	------	------
870	0.6701	0.6714	0.6728	0.6742	0.6757	0.6771	0.6786	0.6801	------	------	------	------	------	------
880	0.6699	0.6713	0.6726	0.6739	0.6753	0.6767	0.6781	0.6796	0.6811	0.6826	------	------	------	------
890	0.6698	0.6711	0.6724	0.6737	0.6750	0.6763	0.6777	0.6791	0.6805	0.6820	0.6835	------	------	------
900	0.6697	0.6709	0.6722	0.6734	0.6747	0.6760	0.6773	0.6786	0.6800	0.6814	0.6828	------	------	------
910	0.6696	0.6708	0.6720	0.6732	0.6744	0.6756	0.6769	0.6781	0.6794	0.6808	0.6821	------	------	------
920	0.6695	0.6706	0.6718	0.6729	0.6741	0.6753	0.6765	0.6777	0.6789	0.6802	0.6815	0.6883	------	------
930	0.6694	0.6705	0.6716	0.6727	0.6738	0.6749	0.6761	0.6773	0.6784	0.6797	0.6809	0.6874	------	------
940	0.6693	0.6703	0.6714	0.6724	0.6735	0.6746	0.6757	0.6768	0.6780	0.6791	0.6803	0.6865	------	------
950	0.6692	0.6702	0.6712	0.6722	0.6732	0.6743	0.6754	0.6764	0.6775	0.6786	0.6798	0.6857	0.6921	------
960	0.6691	0.6700	0.6710	0.6720	0.6730	0.6740	0.6750	0.6760	0.6771	0.6782	0.6792	0.6849	0.6909	------
970	0.6690	0.6699	0.6708	0.6718	0.6727	0.6737	0.6747	0.6757	0.6767	0.6777	0.6787	0.6841	0.6899	0.6962
980	0.6688	0.6697	0.6706	0.6716	0.6725	0.6734	0.6744	0.6753	0.6763	0.6773	0.6782	0.6834	0.6889	0.6949
990	0.6687	0.6696	0.6705	0.6713	0.6722	0.6731	0.6740	0.6750	0.6759	0.6768	0.6778	0.6827	0.6880	0.6936
1000	0.6686	0.6695	0.6703	0.6711	0.6720	0.6729	0.6737	0.6746	0.6755	0.6764	0.6773	0.6821	0.6871	0.6924
1010	0.6685	0.6693	0.6701	0.6709	0.6718	0.6726	0.6734	0.6743	0.6751	0.6760	0.6769	0.6814	0.6862	0.6914
1020	0.6684	0.6692	0.6699	0.6707	0.6715	0.6723	0.6731	0.6740	0.6748	0.6756	0.6765	0.6808	0.6854	0.6903
1030	0.6683	0.6690	0.6698	0.6705	0.6713	0.6721	0.6729	0.6737	0.6745	0.6753	0.6761	0.6803	0.6847	0.6893
1040	0.6682	0.6689	0.6696	0.6704	0.6711	0.6718	0.6726	0.6734	0.6741	0.6749	0.6757	0.6797	0.6839	0.6884
1050	0.6681	0.6688	0.6695	0.6702	0.6709	0.6716	0.6723	0.6731	0.6738	0.6746	0.6753	0.6792	0.6832	0.6875
1060	0.6679	0.6686	0.6693	0.6700	0.6707	0.6714	0.6721	0.6728	0.6735	0.6742	0.6749	0.6787	0.6826	0.6867
1070	0.6678	0.6685	0.6691	0.6698	0.6705	0.6711	0.6718	0.6725	0.6732	0.6739	0.6746	0.6782	0.6819	0.6859
1080	0.6677	0.6683	0.6690	0.6696	0.6703	0.6709	0.6716	0.6722	0.6729	0.6736	0.6742	0.6777	0.6813	0.6851
1090	0.6676	0.6682	0.6688	0.6694	0.6701	0.6707	0.6713	0.6720	0.6726	0.6733	0.6739	0.6773	0.6807	0.6843
1100	0.6675	0.6681	0.6687	0.6693	0.6699	0.6705	0.6711	0.6717	0.6723	0.6730	0.6736	0.6768	0.6802	0.6836

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
1100	0.6675	0.6705	0.6736	0.6768	0.6802	0.6836	0.6873	0.6910	0.6950	0.6991	0.7034	0.7079	0.7127	0.7177	0.7230
1110	0.6674	0.6703	0.6733	0.6764	0.6796	0.6830	0.6864	0.6901	0.6938	0.6977	0.7018	0.7061	0.7106	0.7154	0.7203
1120	0.6673	0.6701	0.6730	0.6760	0.6791	0.6823	0.6857	0.6891	0.6927	0.6965	0.7004	0.7045	0.7087	0.7132	0.7179
1130	0.6671	0.6699	0.6727	0.6756	0.6786	0.6817	0.6849	0.6882	0.6917	0.6953	0.6990	0.7029	0.7069	0.7112	0.7156
1140	0.6670	0.6697	0.6724	0.6752	0.6781	0.6811	0.6842	0.6874	0.6907	0.6941	0.6977	0.7014	0.7053	0.7093	0.7134
1150	0.6669	0.6695	0.6721	0.6748	0.6776	0.6805	0.6835	0.6866	0.6898	0.6931	0.6965	0.7000	0.7037	0.7075	0.7114
1160	0.6668	0.6693	0.6718	0.6745	0.6772	0.6800	0.6828	0.6858	0.6889	0.6920	0.6953	0.6987	0.7022	0.7058	0.7096
1170	0.6667	0.6691	0.6716	0.6741	0.6767	0.6793	0.6821	0.6849	0.6878	0.6907	0.6938	0.6969	0.7002	0.7035	0.7070
1180	0.6666	0.6689	0.6713	0.6737	0.6763	0.6788	0.6815	0.6842	0.6870	0.6898	0.6927	0.6958	0.6989	0.7021	0.7054
1190	0.6664	0.6687	0.6710	0.6734	0.6758	0.6783	0.6809	0.6835	0.6862	0.6889	0.6918	0.6947	0.6976	0.7007	0.7039
1200	0.6663	0.6685	0.6708	0.6731	0.6755	0.6779	0.6803	0.6829	0.6854	0.6881	0.6908	0.6936	0.6964	0.6994	0.7024
1210	0.6662	0.6684	0.6705	0.6728	0.6751	0.6774	0.6798	0.6822	0.6847	0.6873	0.6899	0.6926	0.6953	0.6981	0.7010
1220	0.6661	0.6682	0.6703	0.6725	0.6747	0.6769	0.6793	0.6816	0.6840	0.6865	0.6890	0.6916	0.6942	0.6969	0.6997
1230	0.6660	0.6680	0.6701	0.6722	0.6743	0.6765	0.6787	0.6810	0.6834	0.6857	0.6882	0.6907	0.6932	0.6958	0.6985
1240	0.6659	0.6678	0.6698	0.6719	0.6740	0.6761	0.6783	0.6805	0.6827	0.6850	0.6874	0.6898	0.6922	0.6947	0.6973
1250	0.6658	0.6677	0.6696	0.6716	0.6736	0.6757	0.6778	0.6799	0.6821	0.6843	0.6866	0.6889	0.6913	0.6937	0.6961
1260	0.6657	0.6675	0.6694	0.6713	0.6733	0.6753	0.6773	0.6794	0.6815	0.6836	0.6858	0.6881	0.6903	0.6927	0.6950
1270	0.6655	0.6673	0.6692	0.6711	0.6730	0.6749	0.6769	0.6789	0.6809	0.6830	0.6851	0.6873	0.6895	0.6917	0.6940
1280	0.6654	0.6672	0.6690	0.6708	0.6726	0.6745	0.6764	0.6784	0.6804	0.6824	0.6844	0.6865	0.6886	0.6908	0.6930
1290	0.6653	0.6670	0.6688	0.6705	0.6723	0.6742	0.6760	0.6779	0.6798	0.6818	0.6838	0.6858	0.6878	0.6899	0.6920
1300	0.6652	0.6669	0.6686	0.6703	0.6720	0.6738	0.6756	0.6774	0.6793	0.6812	0.6831	0.6851	0.6870	0.6890	0.6911
1310	0.6651	0.6667	0.6684	0.6700	0.6717	0.6735	0.6752	0.6770	0.6788	0.6806	0.6825	0.6844	0.6863	0.6882	0.6902
1320	0.6650	0.6666	0.6682	0.6698	0.6714	0.6731	0.6748	0.6765	0.6783	0.6801	0.6819	0.6837	0.6856	0.6874	0.6893
1330	0.6649	0.6664	0.6680	0.6696	0.6712	0.6728	0.6744	0.6761	0.6778	0.6795	0.6813	0.6831	0.6848	0.6867	0.6885
1340	0.6647	0.6663	0.6678	0.6693	0.6709	0.6725	0.6741	0.6758	0.6775	0.6792	0.6809	0.6827	0.6845	0.6863	0.6882
1350	0.6646	0.6661	0.6676	0.6691	0.6706	0.6722	0.6738	0.6754	0.6770	0.6787	0.6804	0.6821	0.6838	0.6856	0.6874
1360	0.6645	0.6660	0.6674	0.6689	0.6704	0.6719	0.6734	0.6750	0.6766	0.6782	0.6798	0.6815	0.6832	0.6849	0.6866
1370	0.6644	0.6658	0.6672	0.6687	0.6701	0.6716	0.6731	0.6746	0.6761	0.6777	0.6793	0.6809	0.6825	0.6842	0.6859
1380	0.6643	0.6657	0.6670	0.6684	0.6699	0.6713	0.6728	0.6742	0.6757	0.6772	0.6788	0.6804	0.6819	0.6835	0.6852
1390	0.6642	0.6655	0.6669	0.6682	0.6696	0.6710	0.6724	0.6739	0.6753	0.6768	0.6783	0.6798	0.6814	0.6829	0.6845
1400	0.6641	0.6654	0.6667	0.6680	0.6694	0.6707	0.6721	0.6735	0.6749	0.6764	0.6778	0.6793	0.6808	0.6823	0.6838
1410	0.6640	0.6652	0.6665	0.6678	0.6691	0.6704	0.6718	0.6732	0.6745	0.6759	0.6773	0.6788	0.6802	0.6817	0.6832
1420	0.6639	0.6651	0.6663	0.6676	0.6689	0.6702	0.6715	0.6728	0.6742	0.6755	0.6769	0.6783	0.6797	0.6811	0.6826
1430	0.6637	0.6650	0.6662	0.6674	0.6686	0.6699	0.6712	0.6725	0.6738	0.6751	0.6764	0.6778	0.6792	0.6806	0.6820
1440	0.6636	0.6648	0.6660	0.6672	0.6684	0.6697	0.6709	0.6722	0.6734	0.6747	0.6760	0.6773	0.6787	0.6800	0.6814
1450	0.6635	0.6647	0.6658	0.6670	0.6682	0.6694	0.6706	0.6718	0.6731	0.6743	0.6756	0.6769	0.6782	0.6795	0.6808
1460	0.6634	0.6645	0.6657	0.6668	0.6680	0.6691	0.6703	0.6715	0.6727	0.6739	0.6752	0.6764	0.6777	0.6790	0.6802
1470	0.6633	0.6644	0.6655	0.6666	0.6678	0.6689	0.6700	0.6712	0.6724	0.6736	0.6748	0.6760	0.6772	0.6785	0.6797
1480	0.6632	0.6643	0.6653	0.6664	0.6675	0.6687	0.6698	0.6709	0.6721	0.6732	0.6744	0.6756	0.6768	0.6780	0.6792
1490	0.6631	0.6641	0.6652	0.6663	0.6673	0.6684	0.6695	0.6706	0.6717	0.6729	0.6740	0.6752	0.6763	0.6775	0.6787
1500	0.6630	0.6640	0.6650	0.6661	0.6671	0.6682	0.6693	0.6703	0.6714	0.6725	0.6736	0.6748	0.6759	0.6770	0.6782

pressure, atm

50	55	60	65	70	75	80	85	90	95	100
0.6997										
0.6982	0.7044									
0.6968	0.7027									
0.6955	0.7010	0.7070								
0.6943	0.6995	0.7053	0.7111							
0.6931	0.6981	0.7034	0.7090	0.7141						
0.6920	0.6967	0.7018	0.7071	0.7120	0.7169					
0.6910	0.6955	0.7002	0.7053	0.7100	0.7148	0.7224				
0.6900	0.6943	0.6988	0.7037	0.7085	0.7140	0.7197	0.7258			
0.6890	0.6931	0.6975	0.7020	0.7068	0.7118	0.7172	0.7229	0.7289		
0.6881	0.6921	0.6962	0.7005	0.7050	0.7098	0.7148	0.7202	0.7258	0.7314	
0.6873	0.6910	0.6950	0.6991	0.7034	0.7079	0.7127	0.7177	0.7230	0.7286	0.7345

pressure, atm

75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
0.7286	0.7345	0.7409												
0.7256	0.7311	0.7370	0.7433											
0.7228	0.7280	0.7334	0.7392	0.7454	0.7520									
0.7202	0.7251	0.7302	0.7356	0.7413	0.7473	0.7537								
0.7178	0.7224	0.7272	0.7322	0.7375	0.7431	0.7490	0.7553	0.7620						
0.7156	0.7199	0.7244	0.7291	0.7340	0.7392	0.7447	0.7505	0.7566	0.7631	0.7700				
0.7135	0.7175	0.7218	0.7262	0.7308	0.7357	0.7408	0.7461	0.7517	0.7577	0.7640	0.7706			
0.7106	0.7142	0.7181	0.7221	0.7262	0.7305	0.7349	0.7396	0.7445	0.7496	0.7549	0.7605	0.7665	0.7727	
0.7088	0.7123	0.7159	0.7197	0.7236	0.7276	0.7318	0.7362	0.7407	0.7455	0.7504	0.7556	0.7610	0.7668	0.7728
0.7071	0.7104	0.7139	0.7175	0.7212	0.7250	0.7289	0.7330	0.7373	0.7417	0.7463	0.7511	0.7561	0.7614	0.7669
0.7055	0.7087	0.7120	0.7154	0.7189	0.7225	0.7262	0.7301	0.7341	0.7382	0.7425	0.7470	0.7516	0.7565	0.7616
0.7040	0.7071	0.7102	0.7134	0.7167	0.7202	0.7237	0.7273	0.7311	0.7350	0.7390	0.7432	0.7475	0.7520	0.7567
0.7026	0.7055	0.7085	0.7116	0.7147	0.7180	0.7213	0.7248	0.7283	0.7320	0.7358	0.7397	0.7437	0.7479	0.7523
0.7012	0.7040	0.7069	0.7098	0.7128	0.7159	0.7191	0.7224	0.7257	0.7292	0.7328	0.7364	0.7402	0.7441	0.7482
0.6999	0.7026	0.7053	0.7081	0.7110	0.7140	0.7170	0.7201	0.7233	0.7266	0.7299	0.7334	0.7370	0.7406	0.7444
0.6986	0.7012	0.7038	0.7065	0.7093	0.7121	0.7150	0.7179	0.7210	0.7241	0.7273	0.7306	0.7339	0.7374	0.7409
0.6975	0.6999	0.7025	0.7050	0.7077	0.7104	0.7131	0.7159	0.7188	0.7218	0.7248	0.7279	0.7311	0.7343	0.7377
0.6963	0.6987	0.7011	0.7036	0.7061	0.7087	0.7113	0.7140	0.7168	0.7196	0.7224	0.7254	0.7284	0.7315	0.7346
0.6952	0.6975	0.6998	0.7022	0.7046	0.7071	0.7096	0.7122	0.7148	0.7175	0.7202	0.7230	0.7259	0.7288	0.7318
0.6942	0.6964	0.6986	0.7009	0.7032	0.7056	0.7080	0.7105	0.7130	0.7155	0.7181	0.7208	0.7235	0.7263	0.7291
0.6932	0.6953	0.6975	0.6997	0.7019	0.7042	0.7065	0.7088	0.7112	0.7137	0.7162	0.7187	0.7213	0.7239	0.7266
0.6922	0.6943	0.6963	0.6984	0.7006	0.7028	0.7050	0.7073	0.7096	0.7119	0.7143	0.7167	0.7192	0.7217	0.7243
0.6913	0.6933	0.6953	0.6973	0.6994	0.7015	0.7036	0.7058	0.7080	0.7102	0.7125	0.7148	0.7172	0.7196	0.7220
0.6904	0.6923	0.6942	0.6962	0.6982	0.7002	0.7023	0.7043	0.7065	0.7086	0.7108	0.7130	0.7153	0.7176	0.7199
0.6901	0.6920	0.6939	0.6959	0.6979	0.7000	0.7021	0.7042	0.7064	0.7071	0.7092	0.7113	0.7134	0.7156	0.7179
0.6892	0.6911	0.6930	0.6949	0.6968	0.6988	0.7008	0.7029	0.7050	0.7071	0.7093	0.7115	0.7137	0.7160	0.7183
0.6884	0.6902	0.6920	0.6939	0.6957	0.6977	0.6996	0.7016	0.7036	0.7056	0.7077	0.7098	0.7120	0.7142	0.7164
0.6876	0.6893	0.6911	0.6929	0.6947	0.6966	0.6984	0.7003	0.7023	0.7042	0.7062	0.7083	0.7103	0.7124	0.7146
0.6868	0.6885	0.6902	0.6920	0.6937	0.6955	0.6973	0.6991	0.7010	0.7029	0.7048	0.7068	0.7087	0.7108	0.7128
0.6861	0.6877	0.6894	0.6910	0.6927	0.6945	0.6962	0.6980	0.6998	0.7016	0.7035	0.7053	0.7072	0.7092	0.7111
0.6854	0.6870	0.6886	0.6902	0.6918	0.6935	0.6952	0.6969	0.6986	0.7004	0.7022	0.7040	0.7058	0.7077	0.7095
0.6847	0.6862	0.6878	0.6893	0.6909	0.6925	0.6942	0.6958	0.6975	0.6992	0.7009	0.7027	0.7044	0.7062	0.7080
0.6840	0.6855	0.6870	0.6885	0.6901	0.6916	0.6932	0.6948	0.6964	0.6980	0.6997	0.7014	0.7031	0.7048	0.7066
0.6834	0.6848	0.6863	0.6877	0.6892	0.6907	0.6923	0.6938	0.6954	0.6970	0.6986	0.7002	0.7018	0.7035	0.7052
0.6827	0.6841	0.6856	0.6870	0.6884	0.6899	0.6914	0.6929	0.6944	0.6959	0.6974	0.6990	0.7006	0.7022	0.7038
0.6821	0.6835	0.6849	0.6862	0.6876	0.6891	0.6905	0.6919	0.6934	0.6949	0.6964	0.6979	0.6994	0.7010	0.7025
0.6815	0.6829	0.6842	0.6855	0.6869	0.6883	0.6896	0.6910	0.6925	0.6939	0.6953	0.6968	0.6983	0.6998	0.7013
0.6810	0.6822	0.6835	0.6848	0.6862	0.6875	0.6888	0.6902	0.6916	0.6929	0.6943	0.6958	0.6972	0.6986	0.7001
0.6804	0.6817	0.6829	0.6842	0.6855	0.6867	0.6880	0.6894	0.6907	0.6920	0.6934	0.6948	0.6961	0.6975	0.6989
0.6799	0.6811	0.6823	0.6835	0.6848	0.6860	0.6873	0.6886	0.6898	0.6911	0.6925	0.6938	0.6951	0.6965	0.6978
0.6793	0.6805	0.6817	0.6829	0.6841	0.6853	0.6865	0.6878	0.6890	0.6903	0.6916	0.6928	0.6941	0.6954	0.6968

TABLE VII. - THERMODYNAMIC

(a) Concluded.

Plenum temperature, °R	150	155	160	165	170	175	180	185	190	195	200	205	210	215	Plenum 220
1100	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1110	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1120	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1130	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1140	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1150	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1160	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1170	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1180	0.7792	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1190	0.7727	0.7788	0.7852	0.7920	------	------	------	------	------	------	------	------	------	------	------
1200	0.7669	0.7724	0.7782	0.7844	0.7908	0.7977	------	------	------	------	------	------	------	------	------
1210	0.7616	0.7667	0.7720	0.7776	0.7834	0.7895	0.7960	0.8028	------	------	------	------	------	------	------
1220	0.7568	0.7615	0.7664	0.7714	0.7768	0.7823	0.7881	0.7942	0.8006	0.8074	0.8146	------	------	------	------
1230	0.7524	0.7567	0.7612	0.7659	0.7708	0.7758	0.7811	0.7866	0.7924	0.7984	0.8049	0.8114	0.8185	0.8258	------
1240	0.7483	0.7524	0.7566	0.7607	0.7654	0.7700	0.7748	0.7799	0.7851	0.7905	0.7962	0.8021	0.8083	0.8149	0.8217
1250	0.7446	0.7484	0.7523	0.7563	0.7604	0.7647	0.7692	0.7738	0.7785	0.7835	0.7886	0.7939	0.7995	0.8053	0.8114
1260	0.7411	0.7447	0.7483	0.7521	0.7559	0.7597	0.7640	0.7682	0.7726	0.7771	0.7818	0.7866	0.7917	0.7969	0.8023
1270	0.7379	0.7412	0.7446	0.7481	0.7517	0.7554	0.7593	0.7632	0.7672	0.7714	0.7757	0.7801	0.7847	0.7894	0.7943
1280	0.7349	0.7380	0.7412	0.7445	0.7479	0.7513	0.7549	0.7585	0.7623	0.7661	0.7701	0.7742	0.7784	0.7827	0.7872
1290	0.7320	0.7350	0.7380	0.7411	0.7443	0.7475	0.7509	0.7543	0.7578	0.7613	0.7650	0.7688	0.7727	0.7766	0.7807
1300	0.7294	0.7322	0.7350	0.7380	0.7410	0.7440	0.7471	0.7503	0.7536	0.7569	0.7603	0.7638	0.7674	0.7711	0.7749
1310	0.7269	0.7295	0.7322	0.7350	0.7378	0.7407	0.7436	0.7466	0.7497	0.7528	0.7560	0.7593	0.7626	0.7661	0.7695
1320	0.7245	0.7270	0.7296	0.7322	0.7349	0.7376	0.7404	0.7432	0.7461	0.7490	0.7520	0.7551	0.7582	0.7614	0.7646
1330	0.7223	0.7247	0.7271	0.7296	0.7321	0.7347	0.7373	0.7400	0.7427	0.7455	0.7483	0.7512	0.7541	0.7571	0.7601
1340	0.7201	0.7224	0.7247	0.7271	0.7295	0.7320	0.7344	0.7370	0.7395	0.7421	0.7448	0.7475	0.7502	0.7530	0.7559
1350	0.7207	0.7231	0.7256	0.7281	0.7306	0.7332	0.7359	0.7386	0.7413	0.7442	0.7470	0.7500	0.7530	0.7560	0.7591
1360	0.7187	0.7210	0.7233	0.7257	0.7281	0.7306	0.7331	0.7357	0.7383	0.7410	0.7437	0.7465	0.7493	0.7522	0.7551
1370	0.7167	0.7189	0.7212	0.7235	0.7258	0.7281	0.7305	0.7330	0.7355	0.7380	0.7406	0.7432	0.7458	0.7486	0.7513
1380	0.7149	0.7170	0.7191	0.7213	0.7235	0.7258	0.7281	0.7304	0.7328	0.7352	0.7376	0.7401	0.7426	0.7452	0.7478
1390	0.7131	0.7152	0.7172	0.7193	0.7214	0.7236	0.7257	0.7280	0.7302	0.7325	0.7348	0.7372	0.7396	0.7420	0.7445
1400	0.7115	0.7134	0.7154	0.7174	0.7194	0.7215	0.7235	0.7257	0.7278	0.7300	0.7322	0.7344	0.7367	0.7390	0.7414
1410	0.7099	0.7117	0.7136	0.7155	0.7175	0.7194	0.7214	0.7235	0.7255	0.7276	0.7297	0.7318	0.7340	0.7362	0.7384
1420	0.7083	0.7101	0.7119	0.7138	0.7156	0.7175	0.7194	0.7214	0.7233	0.7253	0.7273	0.7294	0.7315	0.7335	0.7357
1430	0.7069	0.7086	0.7103	0.7121	0.7139	0.7157	0.7175	0.7194	0.7213	0.7232	0.7251	0.7270	0.7290	0.7310	0.7330
1440	0.7055	0.7071	0.7088	0.7105	0.7122	0.7140	0.7157	0.7175	0.7193	0.7211	0.7230	0.7248	0.7267	0.7286	0.7306
1450	0.7041	0.7057	0.7073	0.7090	0.7106	0.7123	0.7140	0.7157	0.7174	0.7192	0.7209	0.7227	0.7245	0.7263	0.7282
1460	0.7028	0.7044	0.7059	0.7075	0.7091	0.7107	0.7123	0.7140	0.7156	0.7173	0.7190	0.7207	0.7224	0.7242	0.7259
1470	0.7016	0.7031	0.7046	0.7061	0.7076	0.7092	0.7107	0.7123	0.7139	0.7155	0.7171	0.7188	0.7204	0.7221	0.7238
1480	0.7004	0.7018	0.7032	0.7047	0.7062	0.7077	0.7092	0.7107	0.7122	0.7138	0.7154	0.7169	0.7185	0.7201	0.7218
1490	0.6992	0.7006	0.7020	0.7034	0.7048	0.7063	0.7077	0.7092	0.7107	0.7122	0.7137	0.7152	0.7167	0.7183	0.7198
1500	0.6981	0.6994	0.7008	0.7022	0.7035	0.7049	0.7063	0.7077	0.7092	0.7106	0.7120	0.7135	0.7150	0.7164	0.7179

PROPERTIES OF STEAM

Critical-flow factor

pressure, atm

225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300
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0.8267	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
0.8177	0.8243	0.8313	0.8384	------	------	------	------	------	------	------	------	------	------	------	------
0.8036	0.8138	0.8209	0.8264	0.8310	0.8398	0.8465	0.8536	------	------	------	------	------	------	------	------
0.7974	0.8047	0.8101	0.8158	0.8217	0.8278	0.8341	0.8406	0.8474	0.8536	0.8571	------	------	------	------	------
0.7918	0.7962	0.8014	0.8065	0.8118	0.8172	0.8227	0.8287	0.8347	0.8409	0.8471	0.8532	0.8586	0.8643	0.8616	------
0.7849	0.7893	0.7937	0.7983	0.8030	0.8079	0.8133	0.8182	0.8235	0.8290	0.8347	0.8406	0.8465	0.8523	0.8576	0.8618
0.7787	0.7827	0.7858	0.7910	0.7953	0.7997	0.8042	0.8084	0.8127	0.8176	0.8227	0.8280	0.8343	0.8378	0.8454	0.8509
0.7731	0.7768	0.7805	0.7843	0.7883	0.7923	0.7965	0.8007	0.8050	0.8095	0.8140	0.8187	0.8235	0.8284	0.8335	0.8385
0.7680	0.7713	0.7748	0.7783	0.7819	0.7856	0.7894	0.7933	0.7972	0.8013	0.8054	0.8096	0.8140	0.8184	0.8229	0.8276
0.7632	0.7664	0.7696	0.7728	0.7762	0.7796	0.7831	0.7866	0.7902	0.7939	0.7977	0.8015	0.8055	0.8095	0.8136	0.8177
0.7588	0.7617	0.7647	0.7677	0.7709	0.7740	0.7772	0.7805	0.7839	0.7872	0.7907	0.7942	0.8155	0.8122	0.8239	0.8288
0.7623	0.7656	0.7689	0.7723	0.7757	0.7793	0.7829	0.7866	0.7904	0.7943	0.7982	0.8023	0.8064	0.8107	0.8150	0.8195
0.7581	0.7611	0.7642	0.7674	0.7707	0.7740	0.7773	0.7808	0.7843	0.7877	0.7915	0.7953	0.7991	0.8030	0.8070	0.8110
0.7541	0.7570	0.7599	0.7629	0.7659	0.7690	0.7722	0.7754	0.7787	0.7820	0.7854	0.7888	0.7924	0.7960	0.7996	0.8034
0.7505	0.7532	0.7559	0.7587	0.7616	0.7645	0.7674	0.7706	0.7735	0.7766	0.7797	0.7830	0.7862	0.7895	0.7930	0.7964
0.7470	0.7496	0.7522	0.7548	0.7575	0.7602	0.7630	0.7658	0.7687	0.7716	0.7745	0.7775	0.7806	0.7837	0.7869	0.7900
0.7438	0.7462	0.7486	0.7511	0.7537	0.7562	0.7589	0.7615	0.7642	0.7669	0.7697	0.7725	0.7754	0.7783	0.7812	0.7842
0.7407	0.7430	0.7453	0.7477	0.7501	0.7525	0.7550	0.7575	0.7600	0.7626	0.7652	0.7679	0.7706	0.7732	0.7760	0.7788
0.7378	0.7400	0.7422	0.7445	0.7467	0.7490	0.7513	0.7537	0.7561	0.7585	0.7610	0.7635	0.7660	0.7685	0.7711	0.7737
0.7351	0.7372	0.7393	0.7414	0.7436	0.7457	0.7479	0.7502	0.7524	0.7547	0.7570	0.7594	0.7618	0.7642	0.7665	0.7691
0.7325	0.7345	0.7365	0.7385	0.7406	0.7426	0.7447	0.7468	0.7490	0.7512	0.7534	0.7556	0.7578	0.7601	0.7624	0.7647
0.7301	0.7319	0.7339	0.7358	0.7377	0.7397	0.7417	0.7437	0.7457	0.7478	0.7499	0.7520	0.7541	0.7563	0.7584	0.7606
0.7277	0.7295	0.7314	0.7332	0.7351	0.7369	0.7388	0.7407	0.7427	0.7446	0.7466	0.7486	0.7505	0.7527	0.7547	0.7568
0.7255	0.7272	0.7290	0.7307	0.7325	0.7343	0.7361	0.7379	0.7396	0.7416	0.7435	0.7454	0.7473	0.7493	0.7512	0.7532
0.7234	0.7250	0.7267	0.7284	0.7301	0.7318	0.7335	0.7353	0.7370	0.7388	0.7406	0.7424	0.7442	0.7461	0.7479	0.7498
0.7214	0.7230	0.7246	0.7262	0.7278	0.7294	0.7311	0.7329	0.7344	0.7361	0.7378	0.7395	0.7413	0.7430	0.7448	0.7466
0.7195	0.7210	0.7225	0.7240	0.7256	0.7272	0.7288	0.7303	0.7320	0.7336	0.7352	0.7368	0.7385	0.7402	0.7418	0.7435

TABLE VIII

Plasma temperature	0	1	2	3	4	5	6	7	8	9	10	15	20	25
700	1484.8													
710	1495.3													
720	1505.7													
730	1516.1													
740	1526.3													
750	1536.5	1527.6												
760	1546.7	1538.4												
770	1556.7	1549.0												
780	1566.7	1559.5												
790	1576.6	1569.8	1562.4											
800	1586.5	1580.1	1573.2											
810	1596.2	1590.2	1583.8	1577.0										
820	1605.9	1600.2	1594.2	1587.8										
830	1615.6	1610.2	1604.5	1598.5	1592.3									
840	1625.2	1620.0	1614.7	1609.0	1603.2	1597.2								
850	1634.7	1629.8	1624.7	1619.4	1614.0	1608.3								
860	1644.2	1639.5	1634.7	1629.7	1624.5	1619.2	1613.7							
870	1653.6	1649.1	1644.5	1639.8	1634.9	1629.9	1624.7	1619.4						
880	1662.9	1658.7	1654.3	1649.8	1645.1	1640.4	1635.5	1630.5	1625.4	1620.2				
890	1672.2	1668.2	1664.0	1659.7	1655.3	1650.8	1646.2	1641.4	1636.6	1631.7	1626.7			
900	1681.5	1677.6	1673.6	1669.5	1665.3	1661.0	1656.6	1652.2	1647.6	1643.0	1638.2			
910	1690.6	1686.9	1683.1	1679.2	1675.2	1671.1	1666.9	1662.7	1658.4	1654.0	1649.5			
920	1699.8	1696.2	1692.5	1688.8	1685.0	1681.1	1677.1	1673.1	1669.0	1664.5	1660.6	1638.2		
930	1708.8	1705.4	1701.9	1698.3	1694.6	1690.9	1687.2	1683.3	1679.4	1675.5	1671.4	1650.2		
940	1717.9	1714.5	1711.2	1707.7	1704.2	1700.7	1697.1	1693.4	1689.7	1685.9	1682.1	1662.0		
950	1726.8	1723.6	1720.4	1717.1	1713.8	1710.4	1706.9	1703.4	1699.9	1696.3	1692.6	1673.5	1653.0	
960	1735.7	1732.7	1729.6	1726.4	1723.2	1719.9	1716.6	1713.3	1709.9	1706.4	1702.9	1684.8	1665.3	
970	1744.6	1741.7	1738.6	1735.6	1732.5	1729.4	1726.2	1723.0	1719.8	1716.5	1713.1	1695.8	1677.4	1657.7
980	1753.4	1750.6	1747.7	1744.7	1741.8	1738.8	1735.7	1732.7	1729.5	1726.4	1723.2	1706.7	1689.1	1670.5
990	1762.2	1759.4	1756.7	1753.8	1751.0	1748.1	1745.1	1742.2	1739.2	1736.2	1733.1	1717.5	1700.6	1682.9
1000	1770.9	1768.3	1765.6	1762.8	1760.1	1757.3	1754.5	1751.7	1748.8	1745.9	1743.0	1727.8	1711.9	1695.0
1010	1779.6	1777.0	1774.4	1771.8	1769.1	1766.5	1763.8	1761.0	1758.3	1755.5	1752.7	1738.1	1722.9	1706.9
1020	1788.2	1785.7	1783.2	1780.7	1778.1	1775.5	1772.9	1770.3	1767.6	1765.0	1762.3	1748.3	1733.7	1718.5
1030	1796.8	1794.4	1792.0	1789.5	1787.0	1784.6	1782.0	1779.5	1776.9	1774.4	1771.8	1758.4	1744.4	1729.8
1040	1805.3	1803.0	1800.7	1798.3	1795.9	1793.5	1791.1	1788.6	1786.2	1783.7	1781.2	1768.3	1754.9	1740.9
1050	1813.8	1811.6	1809.3	1807.0	1804.7	1802.4	1800.0	1797.7	1795.3	1792.7	1790.5	1778.1	1765.2	1751.8
1060	1822.3	1820.1	1817.9	1815.7	1813.5	1811.2	1808.9	1806.5	1804.3	1802.0	1799.7	1787.8	1775.4	1762.6
1070	1830.7	1828.6	1826.5	1824.3	1822.1	1820.0	1817.8	1815.6	1813.3	1811.1	1808.8	1797.3	1785.4	1773.1
1080	1839.1	1837.0	1834.9	1832.9	1830.8	1828.7	1826.5	1824.4	1822.2	1820.1	1817.9	1806.8	1795.4	1783.5
1090	1847.4	1845.4	1843.4	1841.4	1839.3	1837.3	1835.2	1833.2	1831.1	1829.0	1826.9	1816.2	1805.1	1793.7
1100	1855.7	1853.7	1851.8	1849.8	1847.9	1845.9	1843.9	1841.7	1839.9	1837.7	1835.8	1825.5	1814.8	1803.8

Plasma temperature	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
1100	1855.7	1845.9	1835.8	1825.5	1814.8	1803.8	1792.6	1780.9	1768.9	1756.5	1743.7	1730.5	1716.9	1702.7	1688.0
1110	1863.9	1854.4	1844.7	1834.7	1824.4	1813.8	1802.9	1791.8	1780.3	1768.4	1756.2	1743.6	1730.6	1717.2	1703.3
1120	1872.1	1862.9	1853.5	1843.8	1833.8	1823.6	1813.2	1802.4	1791.4	1780.1	1768.4	1756.4	1744.0	1731.3	1718.1
1130	1880.3	1871.3	1862.2	1852.8	1843.2	1833.4	1823.3	1812.9	1802.3	1791.5	1780.3	1768.8	1757.0	1744.9	1732.4
1140	1888.4	1879.7	1870.8	1861.7	1852.5	1843.0	1833.2	1823.3	1813.1	1802.7	1792.0	1781.0	1769.7	1758.1	1746.3
1150	1896.5	1888.0	1879.4	1870.6	1861.6	1852.4	1843.1	1833.5	1823.7	1813.6	1803.4	1792.9	1782.1	1771.0	1759.7
1160	1904.5	1896.3	1888.0	1879.4	1870.7	1861.8	1852.8	1843.5	1834.1	1824.4	1814.6	1804.5	1794.2	1783.6	1772.8
1170	1912.5	1904.6	1896.5	1888.2	1879.8	1871.3	1862.7	1853.9	1844.9	1835.8	1826.5	1817.0	1807.4	1797.6	1787.5
1180	1920.5	1912.8	1904.9	1896.9	1888.8	1880.5	1872.1	1863.6	1854.9	1846.1	1837.2	1828.0	1818.8	1809.3	1799.7
1190	1928.4	1920.9	1913.2	1905.5	1897.6	1889.6	1881.5	1873.2	1864.8	1856.3	1847.7	1838.9	1829.9	1820.8	1811.6
1200	1936.3	1929.0	1921.6	1914.0	1906.4	1898.6	1890.7	1882.7	1874.6	1866.4	1858.0	1849.5	1840.9	1832.2	1823.3
1210	1944.2	1937.1	1929.8	1922.5	1915.0	1907.5	1899.9	1892.1	1884.3	1876.3	1868.2	1860.1	1851.7	1843.3	1834.7
1220	1952.0	1945.1	1938.0	1930.9	1923.7	1916.4	1908.9	1901.4	1893.8	1886.1	1878.3	1870.4	1862.4	1854.3	1846.0
1230	1959.8	1953.1	1946.2	1939.3	1932.2	1925.1	1917.9	1910.7	1903.3	1895.8	1888.3	1880.6	1872.9	1865.0	1857.1
1240	1967.6	1961.0	1954.3	1947.6	1940.7	1933.8	1926.9	1919.8	1912.6	1905.4	1898.1	1890.7	1883.2	1875.6	1868.0
1250	1975.3	1968.9	1962.4	1955.8	1949.2	1942.5	1935.7	1928.8	1921.9	1914.9	1907.8	1900.7	1893.4	1886.1	1878.7
1260	1983.0	1976.7	1970.4	1964.0	1957.6	1951.0	1944.5	1937.8	1931.1	1924.3	1917.4	1910.5	1903.5	1896.4	1889.2
1270	1990.7	1984.6	1978.4	1972.2	1965.9	1959.5	1953.1	1946.7	1940.2	1933.6	1926.9	1920.2	1913.4	1906.6	1899.6
1280	1998.3	1992.3	1986.3	1980.3	1974.2	1968.0	1961.8	1955.5	1949.2	1942.8	1936.3	1929.8	1923.2	1916.6	1909.9
1290	2005.9	2000.1	1994.2	1988.3	1982.4	1976.4	1970.3	1964.2	1958.1	1951.9	1945.6	1939.3	1932.9	1926.5	1920.0
1300	2013.4	2007.8	2002.1	1996.3	1990.5	1984.7	1978.8	1972.9	1966.9	1960.9	1954.8	1948.7	1942.5	1936.3	1930.0
1310	2021.0	2015.5	2009.9	2004.3	1998.7	1993.0	1987.2	1981.5	1975.7	1969.8	1963.9	1958.0	1952.0	1946.0	1939.9
1320	2028.5	2023.1	2017.7	2012.2	2006.7	2001.2	1995.6	1990.0	1984.3	1978.7	1972.9	1967.2	1961.4	1955.5	1949.6
1330	2036.0	2030.7	2025.4	2020.1	2014.7	2009.3	2003.9	1998.5	1993.0	1987.4	1981.9	1976.3	1970.6	1965.0	1959.3
1340	2043.4	2038.3	2033.1	2027.9	2022.6	2017.3	2012.0	2006.7	2001.3	1995.9	1990.4	1984.9	1979.3	1973.7	1968.1
1350	2050.8	2045.8	2040.7	2035.7	2030.5	2025.4	2020.2	2015.0	2009.8	2004.5	1999.2	1993.8	1988.4	1983.0	1977.5
1360	2058.2	2053.3	2048.4	2043.4	2038.4	2033.4	2028.4	2023.3	2018.2	2013.1	2007.9	2002.7	1997.4	1992.2	1986.9
1370	2065.5	2060.8	2056.0	2051.1	2046.3	2041.4	2036.5	2031.5	2026.5	2021.5	2016.5	2011.5	2006.4	2001.2	1996.1
1380	2072.9	2068.2	2063.5	2058.8	2054.1	2049.3	2044.5	2039.7	2034.8	2030.0	2025.1	2020.2	2015.2	2010.2	2005.2
1390	2080.2	2075.6	2071.0	2066.4	2061.8	2057.2	2052.5	2047.8	2043.1	2038.3	2033.6	2028.8	2024.0	2019.2	2014.3
1400	2087.4	2083.0	2078.5	2074.0	2069.5	2065.0	2060.4	2055.8	2051.3	2046.6	2042.0	2037.4	2032.7	2028.0	2023.3
1410	2094.7	2090.3	2086.0	2081.6	2077.2	2072.8	2068.3	2063.9	2059.4	2054.9	2050.4	2045.8	2041.3	2036.7	2032.1
1420	2101.9	2097.6	2093.4	2089.1	2084.8	2080.5	2076.2	2071.8	2067.5	2063.1	2058.7	2054.3	2049.9	2045.4	2040.9
1430	2109.1	2104.9	2100.7	2096.6	2092.4	2088.2	2084.0	2079.7	2075.5	2071.2	2066.9	2062.6	2058.3	2054.0	2049.7
1440	2116.2	2112.2	2108.1	2104.0	2099.9	2095.8	2091.7	2087.6	2083.4	2079.3	2075.1	2070.9	2066.8	2062.5	2058.3
1450	2123.3	2119.4	2115.4	2111.4	2107.4	2103.4	2099.4	2095.4	2091.4	2087.3	2083.3	2079.2	2075.1	2071.0	2066.9
1460	2130.4	2126.6	2122.7	2118.8	2114.9	2111.0	2107.1	2103.2	2099.2	2095.3	2091.3	2087.4	2083.4	2079.4	2075.4
1470	2137.5	2133.7	2130.0	2126.2	2122.4	2118.5	2114.7	2110.9	2107.1	2103.2	2099.4	2095.5	2091.6	2087.7	2083.9
1480	2144.6	2140.9	2137.2	2133.5	2129.8	2126.0	2122.3	2118.6	2114.8	2111.1	2107.3	2103.6	2099.8	2096.0	2092.2
1490	2151.6	2148.0	2144.4	2140.8	2137.1	2133.5	2129.9	2126.2	2122.6	2118.9	2115.2	2111.6	2107.9	2104.2	2100.5
1500	2158.6	2155.1	2151.5	2148.0	2144.5	2140.9	2137.4	2133.8	2130.2	2126.7	2123.1	2119.5	2116.0	2112.4	2108.8

30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
1694.2														
1677.5	1658.5													
1670.0	1672.2													
1702.4	1685.6	1667.8												
1714.5	1698.5	1681.7	1664.1											
1726.3	1711.1	1695.2	1678.5	1661.1										
1737.9	1723.4	1708.3	1692.5	1675.7	1658.6									
1749.2	1735.4	1721.0	1706.0	1690.5	1674.0	1656.9								
1760.4	1747.1	1733.4	1719.1	1704.3	1688.8	1672.7	1655.8							
1771.5	1758.5	1745.5	1731.7	1717.5	1703.2	1687.7	1672.1	1655.8						
1782.0	1769.7	1757.5	1744.4	1731.0	1717.1	1702.6	1687.7	1672.1	1655.8					
1792.6	1780.9	1768.9	1756.5	1743.7	1730.5	1716.9	1702.7	1688.0	1672.7	1656.8	1640.2			

75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
1672.7	1656.8	1640.2												
1688.9	1673.9	1658.4	1642.2											
1704.5	1690.4	1675.8	1660.7	1644.9	1628.5									
1719.5	1706.2	1692.5	1678.3	1663.5	1648.3	1632.4								
1734.0	1721.4	1708.5	1695.1	1681.3	1667.0	1652.2	1636.8	1620.8						
1748.1	1736.2	1723.9	1711.3	1698.3	1684.8	1671.0	1656.7	1641.8	1626.5	1610.5				
1761.8	1750.4	1738.8	1726.8	1714.5	1701.9	1688.9	1675.5	1661.7	1647.4	1632.6	1617.3			
1777.3	1766.9	1756.2	1745.3	1734.2	1722.8	1711.1	1699.2	1686.9	1674.4	1661.4	1648.1	1634.4	1620.2	
1789.9	1779.9	1769.7	1759.3	1748.7	1737.8	1726.8	1715.4	1703.8	1692.0	1679.8	1667.3	1654.4	1641.2	1627.6
1802.2	1792.6	1782.8	1772.9	1762.8	1752.4	1741.9	1731.1	1720.1	1708.9	1697.4	1685.6	1673.6	1661.2	1648.5
1814.2	1805.0	1795.7	1786.2	1776.5	1766.6	1756.6	1746.3	1735.9	1725.2	1714.3	1703.2	1691.8	1680.2	1668.3
1826.0	1817.2	1808.2	1799.1	1789.8	1780.4	1770.8	1761.0	1751.1	1741.0	1730.7	1720.1	1709.4	1698.4	1687.3
1837.6	1829.1	1820.5	1811.8	1802.9	1793.8	1784.7	1775.3	1765.9	1756.2	1746.4	1736.5	1726.3	1715.9	1705.4
1849.0	1840.8	1832.5	1824.1	1815.6	1807.0	1798.2	1789.3	1780.2	1771.0	1761.7	1752.2	1742.6	1732.8	1722.8
1860.2	1852.3	1844.3	1836.3	1828.1	1819.8	1811.4	1802.8	1794.2	1785.4	1776.5	1767.5	1758.3	1749.0	1739.6
1871.2	1863.6	1855.9	1848.1	1840.3	1832.3	1824.3	1816.1	1807.8	1799.4	1790.9	1782.3	1773.6	1764.7	1755.8
1882.0	1874.7	1867.3	1859.8	1852.2	1844.6	1836.8	1829.0	1821.1	1813.0	1804.9	1796.7	1788.4	1780.0	1771.4
1892.7	1885.6	1878.5	1871.3	1864.0	1856.6	1849.2	1841.6	1834.0	1826.3	1818.6	1810.7	1802.8	1794.7	1786.6
1903.2	1896.3	1889.5	1882.5	1875.5	1868.4	1861.2	1854.0	1846.7	1839.3	1831.9	1824.4	1816.8	1809.1	1801.3
1913.5	1906.9	1900.3	1893.6	1886.8	1880.0	1873.1	1866.1	1859.1	1852.0	1844.9	1837.7	1830.4	1823.0	1815.6
1923.7	1917.3	1910.9	1904.4	1897.9	1891.3	1884.7	1878.0	1871.3	1864.5	1857.6	1850.7	1843.7	1836.7	1829.6
1933.8	1927.6	1921.4	1915.2	1908.9	1902.5	1896.1	1889.7	1883.2	1876.6	1870.0	1863.4	1856.7	1850.0	1843.1
1943.7	1937.8	1931.8	1925.7	1919.6	1913.5	1907.3	1901.1	1894.9	1888.6	1882.2	1875.8	1869.4	1862.9	1856.4
1953.5	1947.8	1942.0	1936.1	1930.2	1924.3	1918.4	1912.4	1906.3	1900.3	1894.2	1888.0	1881.8	1875.6	1869.4
1962.4	1956.7	1950.9	1945.1	1939.3	1933.4	1927.5	1921.5	1915.5	1918.2	1912.7	1907.3	1901.7	1896.2	1890.6
1972.0	1966.5	1960.9	1955.3	1949.6	1943.9	1938.2	1932.4	1926.6	1920.8	1914.9	1909.0	1903.0	1897.0	1890.9
1981.5	1976.1	1970.7	1965.3	1959.8	1954.3	1948.8	1943.2	1937.6	1931.9	1926.3	1920.5	1914.8	1909.0	1903.2
1990.9	1985.7	1980.5	1975.2	1969.9	1964.6	1959.2	1953.8	1948.4	1942.9	1937.5	1931.9	1926.4	1920.8	1915.2
2000.2	1995.2	1990.1	1985.0	1979.8	1974.7	1969.5	1964.3	1959.0	1953.8	1948.5	1943.1	1937.8	1932.4	1927.0
2009.4	2004.5	1999.6	1994.6	1989.7	1984.7	1979.6	1974.6	1969.5	1964.4	1959.3	1954.1	1949.0	1943.8	1938.6
2018.5	2013.8	2009.0	2004.2	1999.4	1994.5	1989.6	1984.8	1979.8	1974.9	1970.0	1965.0	1960.0	1955.0	1949.9
2027.6	2022.9	2018.3	2013.6	2008.9	2004.2	1999.5	1994.8	1990.0	1985.3	1980.5	1975.7	1970.8	1966.0	1961.1
2036.5	2032.0	2027.5	2023.0	2018.4	2013.9	2009.3	2004.7	2000.1	1995.5	1990.8	1986.2	1981.5	1976.8	1972.1
2045.3	2041.0	2036.6	2032.2	2027.8	2023.4	2018.9	2014.5	2010.0	2005.5	2001.1	1996.5	1992.0	1987.5	1983.0
2054.1	2047.9	2045.6	2041.3	2037.1	2032.8	2028.5	2024.2	2019.8	2015.5	2011.1	2006.8	2002.4	1998.0	1993.6
2062.8	2058.7	2054.5	2050.4	2046.2	2042.1	2037.9	2033.7	2029.5	2025.3	2021.1	2016.9	2012.6	2008.4	2004.1
2071.4	2067.4	2063.4	2059.4	2055.3	2051.3	2047.2	2043.2	2039.1	2035.0	2030.9	2026.8	2022.7	2018.6	2014.5
2080.0	2076.1	2072.1	2068.2	2064.3	2060.4	2056.4	2052.5	2048.6	2044.6	2040.6	2036.7	2032.7	2028.7	2024.7
2088.4	2084.6	2080.8	2077.0	2073.2	2069.4	2065.6	2061.7	2057.9	2054.1	2050.2	2046.4	2042.5	2038.7	2034.8
2096.8	2093.2	2089.5	2085.8	2082.0	2078.3	2074.6	2070.9	2067.2	2063.4	2059.7	2056.0	2052.3	2048.5	2044.8
2105.2	2101.6	2098.0	2094.4	2090.8	2087.2	2083.6	2080.0	2076.3	2072.7	2069.1	2065.5	2061.8	2058.2	2054.6

TABLE VII. - Continued.

(b) Concluded.

Plenum temperature, °R	150	155	160	165	170	175	180	185	190	195	200	205	210	215	Plenum 220
1100	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1110	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1120	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1130	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1140	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1150	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1160	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1170	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1180	1613.6	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1190	1645.4	1627.0	1608.1	1593.8	------	------	------	------	------	------	------	------	------	------	------
1200	1656.1	1643.6	1630.8	1617.6	1603.9	1589.9	------	------	------	------	------	------	------	------	------
1210	1675.8	1664.1	1652.2	1639.9	1627.3	1614.4	1601.1	1587.4	------	------	------	------	------	------	------
1220	1694.6	1683.7	1672.5	1661.0	1649.3	1637.3	1625.0	1612.4	1599.5	1586.2	1572.6	------	------	------	------
1230	1712.7	1702.3	1691.8	1681.1	1670.1	1658.9	1647.5	1635.9	1624.0	1611.8	1599.3	1586.4	1573.3	1559.8	------
1240	1730.0	1720.2	1710.3	1700.2	1689.9	1679.5	1668.8	1658.0	1646.9	1635.6	1624.1	1612.3	1600.3	1588.0	1575.5
1250	1746.7	1737.4	1728.0	1718.5	1708.8	1699.0	1689.1	1678.9	1668.6	1658.1	1647.4	1636.5	1625.5	1614.2	1602.7
1260	1762.8	1754.0	1745.1	1736.1	1727.0	1717.7	1708.3	1698.8	1689.2	1679.4	1669.4	1659.3	1649.0	1638.5	1628.0
1270	1778.4	1770.0	1761.6	1753.1	1744.4	1735.7	1726.8	1717.9	1708.8	1699.6	1690.3	1680.8	1671.3	1661.6	1651.7
1280	1793.5	1785.5	1777.5	1769.4	1761.2	1753.0	1744.6	1736.1	1727.6	1718.9	1710.2	1701.3	1692.3	1683.3	1674.1
1290	1808.1	1800.6	1792.9	1785.2	1777.5	1769.6	1761.7	1753.7	1745.6	1737.4	1729.1	1720.8	1712.4	1703.9	1695.3
1300	1822.4	1815.2	1807.9	1800.6	1793.2	1785.7	1778.2	1770.6	1762.9	1755.2	1747.4	1739.5	1731.6	1723.6	1715.5
1310	1836.3	1829.4	1822.4	1815.4	1808.4	1801.3	1794.1	1786.9	1779.6	1772.3	1764.9	1757.5	1750.0	1742.4	1734.8
1320	1849.8	1843.2	1836.6	1829.9	1823.2	1816.4	1809.5	1802.7	1795.8	1788.8	1781.8	1774.7	1767.6	1760.5	1753.3
1330	1863.1	1856.7	1850.4	1844.0	1837.5	1831.0	1824.5	1818.0	1811.4	1804.8	1798.1	1791.4	1784.7	1777.9	1771.1
1340	1884.9	1879.3	1873.5	1867.8	1862.0	1856.1	1850.2	1844.2	1838.2	1832.1	1826.0	1819.8	1813.6	1807.3	1800.9
1350	1884.8	1878.7	1872.5	1866.3	1860.0	1853.7	1847.4	1841.0	1834.6	1828.1	1821.6	1815.1	1808.5	1801.9	1795.2
1360	1897.3	1891.4	1885.5	1879.5	1873.5	1867.5	1861.4	1855.3	1849.2	1843.0	1836.8	1830.5	1824.2	1817.9	1811.6
1370	1909.6	1903.9	1898.2	1892.4	1886.7	1880.9	1875.1	1869.2	1863.3	1857.4	1851.5	1845.5	1839.5	1833.4	1827.4
1380	1921.6	1916.1	1910.6	1905.1	1899.6	1894.0	1888.4	1882.8	1877.1	1871.5	1865.8	1860.0	1854.3	1848.5	1842.7
1390	1933.3	1928.1	1922.8	1917.5	1912.1	1906.8	1901.4	1896.0	1890.6	1885.2	1879.7	1874.2	1868.7	1863.2	1857.6
1400	1944.9	1939.8	1934.7	1929.6	1924.5	1919.3	1914.2	1909.0	1903.8	1898.5	1893.3	1888.0	1882.8	1877.5	1872.2
1410	1956.2	1951.4	1946.4	1941.5	1936.6	1931.6	1926.6	1921.6	1916.6	1911.6	1906.6	1901.5	1896.4	1891.4	1886.3
1420	1967.4	1962.7	1957.9	1953.2	1948.4	1943.6	1938.8	1934.0	1929.2	1924.4	1919.5	1914.7	1909.8	1904.9	1900.0
1430	1978.4	1973.8	1969.3	1964.7	1960.1	1955.5	1950.8	1946.2	1941.6	1936.9	1932.2	1927.6	1922.9	1918.2	1913.5
1440	1989.2	1984.8	1980.4	1975.9	1971.5	1967.1	1962.6	1958.1	1953.6	1949.2	1944.7	1940.2	1935.7	1931.1	1926.6
1450	1999.9	1995.6	1991.3	1987.0	1982.8	1978.5	1974.1	1969.8	1965.5	1961.2	1956.9	1952.5	1948.2	1943.8	1939.5
1460	2010.4	2006.2	2002.1	1998.0	1993.8	1989.7	1985.5	1981.3	1977.2	1973.0	1968.8	1964.6	1960.4	1956.3	1952.1
1470	2020.7	2016.7	2012.7	2008.7	2004.7	2000.7	1996.7	1992.6	1988.6	1984.6	1980.6	1976.5	1972.5	1968.4	1964.4
1480	2030.9	2027.1	2023.2	2019.3	2015.4	2011.5	2007.7	2003.8	1999.9	1996.0	1992.1	1988.2	1984.3	1980.4	1976.5
1490	2041.0	2037.3	2033.5	2029.8	2026.0	2022.2	2018.5	2014.7	2010.9	2007.2	2003.4	1999.7	1995.9	1992.1	1988.4
1500	2051.0	2047.3	2043.7	2040.1	2036.4	2032.8	2029.1	2025.5	2021.9	2018.2	2014.6	2010.9	2007.3	2003.6	2000.0

THERMODYNAMIC PROPERTIES OF STEAM

Nozzle-throat velocity (ft/sec)

pressure, atm

225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300
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1562.6	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1590.9	1578.9	1566.7	1554.2	------	------	------	------	------	------	------	------	------	------	------	------
1617.2	1606.2	1595.1	1583.7	1572.2	1560.4	1548.4	1536.1	------	------	------	------	------	------	------	------
1641.7	1631.6	1621.3	1610.9	1600.4	1589.6	1578.8	1567.8	1556.5	1545.1	1533.2	------	------	------	------	------
1664.8	1655.4	1645.9	1636.3	1626.6	1616.7	1606.7	1596.7	1586.5	1576.2	1565.7	1555.1	1544.2	1532.8	1520.4	------
1686.6	1677.9	1669.0	1660.1	1651.1	1642.0	1632.8	1623.5	1614.1	1604.7	1595.2	1585.6	1575.9	1566.0	1556.0	1545.7
1707.4	1699.2	1690.9	1682.6	1674.2	1665.7	1657.2	1648.6	1639.9	1631.2	1622.4	1613.6	1604.7	1595.8	1586.8	1577.7
1727.2	1719.5	1711.7	1703.9	1696.0	1688.1	1680.2	1672.2	1664.1	1656.0	1647.9	1639.7	1631.5	1623.2	1615.0	1606.7
1746.1	1738.8	1731.6	1724.2	1716.8	1709.4	1702.0	1694.5	1687.0	1679.4	1671.8	1664.2	1656.6	1648.9	1641.3	1633.6
1764.3	1757.4	1750.5	1743.6	1736.7	1729.7	1722.7	1715.7	1708.6	1701.6	1694.5	1687.4	1680.2	1673.1	1666.0	1658.8
1774.4	1767.7	1761.3	1774.7	1767.9	1761.1	1754.2	1747.3	1740.2	1733.1	1725.9	1718.8	1683.2	1675.6	1668.0	1660.4
1788.5	1781.7	1775.0	1768.1	1761.3	1754.4	1747.5	1740.5	1733.5	1726.5	1719.5	1712.4	1705.3	1698.2	1691.0	1683.9
1805.2	1798.8	1792.3	1785.8	1779.3	1772.8	1766.2	1759.6	1753.0	1746.4	1739.7	1733.0	1726.3	1719.6	1712.9	1706.1
1821.3	1815.2	1809.1	1802.9	1796.7	1790.5	1784.3	1778.0	1771.7	1765.4	1759.1	1752.8	1746.4	1740.1	1733.7	1727.3
1836.9	1831.1	1825.2	1819.4	1813.5	1807.6	1801.6	1795.7	1789.7	1783.7	1777.7	1771.7	1765.7	1759.7	1753.6	1747.6
1852.1	1846.5	1840.9	1835.3	1829.7	1824.0	1818.4	1812.7	1807.0	1801.3	1795.6	1789.9	1784.2	1778.5	1772.7	1767.0
1866.8	1861.5	1856.1	1850.8	1845.4	1840.0	1834.6	1829.2	1823.8	1818.3	1812.9	1807.5	1802.0	1796.6	1791.1	1785.6
1881.2	1876.1	1870.9	1865.8	1860.6	1855.5	1850.3	1845.2	1840.0	1834.8	1829.6	1824.4	1819.2	1814.0	1808.8	1803.6
1895.1	1890.2	1885.3	1880.4	1875.5	1870.5	1865.6	1860.6	1855.7	1850.7	1845.8	1840.8	1835.8	1830.8	1825.9	1820.9
1908.8	1904.1	1899.4	1894.6	1889.9	1885.2	1880.4	1875.7	1870.9	1866.2	1861.4	1856.7	1851.9	1847.2	1842.4	1837.6
1922.1	1917.6	1913.0	1908.5	1904.0	1899.4	1894.9	1890.3	1885.8	1881.2	1876.6	1872.1	1867.5	1863.0	1858.4	1853.9
1935.1	1930.8	1926.4	1922.0	1917.7	1913.3	1908.9	1904.6	1900.2	1895.8	1891.4	1887.1	1882.7	1878.3	1874.0	1869.6
1947.9	1943.7	1939.5	1935.3	1931.1	1926.9	1922.7	1918.5	1914.3	1910.1	1905.9	1901.7	1897.5	1893.3	1889.1	1884.9
1960.4	1956.5	1952.3	1948.2	1944.2	1940.1	1936.1	1932.0	1928.0	1923.9	1919.9	1915.9	1911.8	1907.8	1903.8	1899.8
1972.6	1968.7	1964.8	1960.9	1957.0	1953.1	1949.2	1945.3	1941.4	1937.5	1933.6	1929.7	1925.9	1922.0	1918.1	1914.2
1984.6	1980.8	1977.1	1973.3	1969.5	1965.8	1962.0	1958.3	1954.5	1950.8	1947.0	1943.3	1939.5	1935.8	1932.1	1928.4
1996.4	1992.7	1989.1	1985.5	1981.8	1978.2	1974.6	1971.0	1967.4	1963.7	1960.1	1956.5	1952.9	1949.3	1945.7	1942.1

TABLE VII. - Continued.

(c) Critical

Plenum temperature, °R	Plenum 0	10	20	30	40	50	60	70	80	90
750	0.5412	------	------	------	------	------	------	------	------	------
800	0.5416	------	------	------	------	------	------	------	------	------
850	0.5421	------	------	------	------	------	------	------	------	------
900	0.5425	0.5455	------	------	------	------	------	------	------	------
950	0.5430	0.5449	0.5474	------	------	------	------	------	------	------
1000	0.5435	0.5448	0.5464	0.5483	------	------	------	------	------	------
1050	0.5440	0.5450	0.5461	0.5473	0.5487	0.5503	------	------	------	------
1100	0.5446	0.5453	0.5460	0.5469	0.5478	0.5489	0.5500	0.5512	0.5525	------
1150	0.5451	0.5456	0.5462	0.5468	0.5475	0.5482	0.5489	0.5497	0.5505	0.5513
1200	0.5456	0.5461	0.5465	0.5469	0.5474	0.5478	0.5483	0.5487	0.5492	0.5496
1250	0.5462	0.5465	0.5468	0.5472	0.5475	0.5478	0.5480	0.5483	0.5486	0.5488
1300	0.5467	0.5470	0.5472	0.5475	0.5477	0.5479	0.5481	0.5482	0.5484	0.5485
1350	0.5473	0.5475	0.5477	0.5479	0.5481	0.5482	0.5484	0.5486	0.5487	0.5489
1400	0.5478	0.5480	0.5481	0.5483	0.5484	0.5485	0.5487	0.5488	0.5489	0.5489
1450	0.5483	0.5485	0.5486	0.5487	0.5488	0.5489	0.5490	0.5490	0.5491	0.5491
1500	0.5489	0.5490	0.5490	0.5491	0.5492	0.5492	0.5493	0.5493	0.5493	0.5494

(d) Critical

Plenum temperature, °R	Plenum 0	10	20	30	40	50	60	70	80	90
750	0.8612	------	------	------	------	------	------	------	------	------
800	0.8621	------	------	------	------	------	------	------	------	------
850	0.8632	------	------	------	------	------	------	------	------	------
900	0.8643	0.8693	------	------	------	------	------	------	------	------
950	0.8654	0.8679	0.8716	------	------	------	------	------	------	------
1000	0.8666	0.8677	0.8696	0.8720	------	------	------	------	------	------
1050	0.8677	0.8682	0.8690	0.8702	0.8716	0.8733	------	------	------	------
1100	0.8689	0.8689	0.8692	0.8696	0.8703	0.8711	0.8722	0.8733	0.8746	------
1150	0.8701	0.8699	0.8698	0.8698	0.8700	0.8703	0.8707	0.8713	0.8720	0.8727
1200	0.8713	0.8710	0.8707	0.8706	0.8706	0.8707	0.8709	0.8712	0.8716	0.8721
1250	0.8725	0.8721	0.8717	0.8714	0.8711	0.8709	0.8708	0.8708	0.8708	0.8709
1300	0.8737	0.8732	0.8727	0.8723	0.8719	0.8716	0.8713	0.8711	0.8709	0.8707
1350	0.8749	0.8743	0.8738	0.8733	0.8729	0.8724	0.8719	0.8715	0.8711	0.8707
1400	0.8760	0.8755	0.8750	0.8745	0.8740	0.8735	0.8731	0.8726	0.8722	0.8718
1450	0.8772	0.8767	0.8762	0.8757	0.8752	0.8747	0.8742	0.8738	0.8734	0.8729
1500	0.8784	0.8778	0.8773	0.8769	0.8764	0.8759	0.8754	0.8750	0.8746	0.8741

(e) Critical

Plenum temperature, °R	Plenum 0	10	20	30	40	50	60	70	80	90
750	0.6285	------	------	------	------	------	------	------	------	------
800	0.6282	------	------	------	------	------	------	------	------	------
850	0.6280	------	------	------	------	------	------	------	------	------
900	0.6277	0.6275	------	------	------	------	------	------	------	------
950	0.6275	0.6272	0.6269	------	------	------	------	------	------	------
1000	0.6272	0.6270	0.6268	0.6266	------	------	------	------	------	------
1050	0.6270	0.6267	0.6266	0.6265	0.6264	0.6263	------	------	------	------
1100	0.6267	0.6265	0.6264	0.6263	0.6263	0.6263	0.6263	0.6264	0.6266	------
1150	0.6265	0.6263	0.6262	0.6262	0.6262	0.6262	0.6263	0.6264	0.6266	0.6269
1200	0.6262	0.6261	0.6260	0.6258	0.6257	0.6255	0.6252	0.6250	0.6247	0.6244
1250	0.6260	0.6259	0.6258	0.6257	0.6256	0.6255	0.6253	0.6252	0.6250	0.6248
1300	0.6258	0.6257	0.6256	0.6256	0.6255	0.6254	0.6253	0.6252	0.6251	0.6250
1350	0.6255	0.6255	0.6255	0.6255	0.6256	0.6256	0.6257	0.6258	0.6260	0.6261
1400	0.6253	0.6253	0.6253	0.6254	0.6254	0.6255	0.6256	0.6257	0.6259	0.6260
1450	0.6251	0.6251	0.6252	0.6252	0.6253	0.6254	0.6255	0.6256	0.6257	0.6259
1500	0.6249	0.6249	0.6250	0.6250	0.6251	0.6252	0.6253	0.6254	0.6256	0.6257

THERMODYNAMIC PROPERTIES OF STEAM

pressure ratio

pressure, atm

100	120	140	160	180	200	220	240	260	280	300
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0.5522	0.5541	------	------	------	------	------	------	------	------	------
0.5501	0.5509	0.5515	0.5520	------	------	------	------	------	------	------
0.5490	0.5493	0.5495	0.5494	0.5490	0.5480	0.5464	0.5434	------	------	------
0.5485	0.5486	0.5485	0.5481	0.5475	0.5466	0.5452	0.5432	0.5404	0.5367	0.5312
0.5490	0.5492	0.5493	0.5494	0.5493	0.5491	0.5487	0.5481	0.5473	0.5461	0.5446
0.5490	0.5491	0.5492	0.5491	0.5490	0.5488	0.5484	0.5479	0.5473	0.5464	0.5454
0.5491	0.5492	0.5491	0.5490	0.5489	0.5486	0.5483	0.5478	0.5473	0.5466	0.5458
0.5494	0.5493	0.5492	0.5491	0.5489	0.5486	0.5483	0.5479	0.5474	0.5468	0.5462

temperature ratio

pressure, atm

100	120	140	160	180	200	220	240	260	280	300
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0.8736	0.8758	------	------	------	------	------	------	------	------	------
0.8727	0.8741	0.8759	0.8779	------	------	------	------	------	------	------
0.8711	0.8716	0.8723	0.8732	0.8743	0.8755	0.8769	0.8785	------	------	------
0.8706	0.8705	0.8705	0.8707	0.8711	0.8715	0.8721	0.8728	0.8735	0.8743	0.8750
0.8704	0.8697	0.8692	0.8688	0.8685	0.8683	0.8683	0.8685	0.8688	0.8693	0.8699
0.8714	0.8707	0.8700	0.8695	0.8691	0.8687	0.8685	0.8684	0.8685	0.8686	0.8689
0.8725	0.8718	0.8711	0.8705	0.8699	0.8695	0.8692	0.8689	0.8687	0.8687	0.8687
0.8737	0.8729	0.8722	0.8716	0.8710	0.8705	0.8701	0.8697	0.8694	0.8692	0.8691

density ratio

pressure, atm

100	120	140	160	180	200	220	240	260	280	300
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0.6273	0.6284	------	------	------	------	------	------	------	------	------
0.6240	0.6231	0.6219	0.6204	------	------	------	------	------	------	------
0.6245	0.6239	0.6232	0.6222	0.6210	0.6193	0.6172	0.6142	------	------	------
0.6248	0.6244	0.6239	0.6233	0.6224	0.6214	0.6199	0.6181	0.6158	0.6128	0.6086
0.6263	0.6268	0.6273	0.6280	0.6288	0.6297	0.6307	0.6318	0.6330	0.6342	0.6356
0.6262	0.6266	0.6271	0.6276	0.6283	0.6290	0.6297	0.6304	0.6312	0.6320	0.6327
0.6260	0.6264	0.6269	0.6273	0.6278	0.6284	0.6289	0.6295	0.6300	0.6305	0.6309
0.6259	0.6262	0.6266	0.6270	0.6275	0.6279	0.6283	0.6287	0.6291	0.6294	0.6296

TABLE VII. - Continued.

(f) Plenum

Plenum temperature, °R	Plenum 0	1	2	3	4	5	6	7	8
700	1.0000	0.9875	0.	------	------	------	------	------	------
710	1.0000	0.9883	0.9756	------	------	------	------	------	------
720	1.0000	0.9891	0.9773	------	------	------	------	------	------
730	1.0000	0.9898	0.9789	------	------	------	------	------	------
740	1.0000	0.9904	0.9803	0.9694	------	------	------	------	------
750	1.0000	0.9910	0.9815	0.9714	------	------	------	------	------
760	1.0000	0.9915	0.9826	0.9733	0.9634	------	------	------	------
770	1.0000	0.9920	0.9837	0.9749	0.9658	0.9562	------	------	------
780	1.0000	0.9925	0.9846	0.9764	0.9679	0.9590	0.9497	------	------
790	1.0000	0.9929	0.9855	0.9778	0.9698	0.9615	0.9529		
800	1.0000	0.9932	0.9862	0.9790	0.9715	0.9638	0.9557	0.9474	0.9388
810	1.0000	0.9936	0.9870	0.9802	0.9731	0.9658	0.9583	0.9506	0.9426
820	1.0000	0.9939	0.9876	0.9812	0.9746	0.9677	0.9607	0.9535	0.9460
830	1.0000	0.9942	0.9883	0.9822	0.9759	0.9695	0.9629	0.9561	0.9491
840	1.0000	0.9945	0.9889	0.9831	0.9772	0.9711	0.9649	0.9585	0.9520
850	1.0000	0.9948	0.9894	0.9839	0.9783	0.9726	0.9667	0.9607	0.9546
860	1.0000	0.9950	0.9899	0.9847	0.9794	0.9739	0.9684	0.9627	0.9569
870	1.0000	0.9952	0.9904	0.9854	0.9803	0.9752	0.9699	0.9646	0.9591
880	1.0000	0.9954	0.9908	0.9861	0.9813	0.9764	0.9714	0.9663	0.9612
890	1.0000	0.9956	0.9912	0.9867	0.9821	0.9775	0.9727	0.9679	0.9630
900	1.0000	0.9958	0.9916	0.9873	0.9829	0.9785	0.9740	0.9694	0.9648
910	1.0000	0.9960	0.9920	0.9878	0.9837	0.9794	0.9752	0.9708	0.9664
920	1.0000	0.9962	0.9923	0.9884	0.9844	0.9803	0.9763	0.9721	0.9679
930	1.0000	0.9963	0.9926	0.9888	0.9850	0.9812	0.9773	0.9733	0.9693
940	1.0000	0.9965	0.9929	0.9893	0.9857	0.9820	0.9782	0.9745	0.9707
950	1.0000	0.9966	0.9932	0.9897	0.9862	0.9827	0.9792	0.9756	0.9719
960	1.0000	0.9967	0.9935	0.9902	0.9868	0.9834	0.9800	0.9766	0.9731
970	1.0000	0.9969	0.9937	0.9905	0.9873	0.9841	0.9808	0.9775	0.9742
980	1.0000	0.9970	0.9940	0.9909	0.9878	0.9847	0.9816	0.9784	0.9752
990	1.0000	0.9971	0.9942	0.9912	0.9883	0.9853	0.9823	0.9792	0.9762
1000	1.0000	0.9972	0.9944	0.9916	0.9887	0.9859	0.9830	0.9800	0.9771
1010	1.0000	0.9973	0.9946	0.9919	0.9891	0.9864	0.9836	0.9808	0.9780
1020	1.0000	0.9974	0.9948	0.9922	0.9895	0.9869	0.9842	0.9815	0.9788
1030	1.0000	0.9975	0.9950	0.9925	0.9899	0.9874	0.9848	0.9822	0.9796
1040	1.0000	0.9976	0.9952	0.9927	0.9903	0.9878	0.9853	0.9829	0.9803
1050	1.0000	0.9977	0.9953	0.9930	0.9906	0.9883	0.9859	0.9835	0.9811
1060	1.0000	0.9978	0.9955	0.9932	0.9910	0.9887	0.9864	0.9840	0.9817
1070	1.0000	0.9978	0.9957	0.9935	0.9913	0.9891	0.9868	0.9846	0.9824
1080	1.0000	0.9979	0.9958	0.9937	0.9916	0.9894	0.9873	0.9851	0.9830
1090	1.0000	0.9980	0.9959	0.9939	0.9918	0.9898	0.9877	0.9856	0.9836
1100	1.0000	0.9980	0.9961	0.9941	0.9921	0.9901	0.9881	0.9861	0.9841

Plenum temperature, °R	Plenum 55	60	65	70	75	80	85	90	95
700	------	------	------	------	------	------	------	------	------
710	------	------	------	------	------	------	------	------	------
720	------	------	------	------	------	------	------	------	------
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740	------	------	------	------	------	------	------	------	------
750	------	------	------	------	------	------	------	------	------
760	------	------	------	------	------	------	------	------	------
770	------	------	------	------	------	------	------	------	------
780	------	------	------	------	------	------	------	------	------
790	------	------	------	------	------	------	------	------	------
800	------	------	------	------	------	------	------	------	------
810	------	------	------	------	------	------	------	------	------
820	------	------	------	------	------	------	------	------	------
830	------	------	------	------	------	------	------	------	------
840	------	------	------	------	------	------	------	------	------
850	------	------	------	------	------	------	------	------	------
860	------	------	------	------	------	------	------	------	------
870	------	------	------	------	------	------	------	------	------
880	------	------	------	------	------	------	------	------	------
890	------	------	------	------	------	------	------	------	------
900	------	------	------	------	------	------	------	------	------
910	------	------	------	------	------	------	------	------	------
920	------	------	------	------	------	------	------	------	------
930	------	------	------	------	------	------	------	------	------
940	------	------	------	------	------	------	------	------	------
950	------	------	------	------	------	------	------	------	------
960	------	------	------	------	------	------	------	------	------
970	------	------	------	------	------	------	------	------	------
980	0.7800	------	------	------	------	------	------	------	------
990	0.7930	0.7663		------	------	------	------	------	------
1000	0.8046	0.7802	0.7539	------	------	------	------	------	------
1010	0.8151	0.7927	0.7687	0.7427	------	------	------	------	------
1020	0.8247	0.8039	0.7818	0.7582	0.7327	------	------	------	------
1030	0.8334	0.8141	0.7937	0.7721	0.7489	0.7239	------	------	------
1040	0.8415	0.8234	0.8045	0.7845	0.7633	0.7407	0.7163	0.6897	------
1050	0.8489	0.8320	0.8143	0.7958	0.7762	0.7556	0.7335	0.7098	0.6841
1060	0.8557	0.8398	0.8233	0.8060	0.7879	0.7689	0.7486	0.7274	0.7045
1070	0.8621	0.8471	0.8316	0.8154	0.7986	0.7810	0.7625	0.7430	0.7223
1080	0.8680	0.8539	0.8392	0.8241	0.8083	0.7919	0.7748	0.7569	0.7380
1090	0.8735	0.8601	0.8463	0.8321	0.8173	0.8020	0.7861	0.7695	0.7521
1100	0.8787	0.8660	0.8529	0.8395	0.8256	0.8112	0.7964	0.7810	0.7649

THERMODYNAMIC PROPERTIES OF STEAM

compressibility factor

pressure, atm

5	10	15	20	25	30	35	40	45	50
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0.9343	------	------	------	------	------	------	------	------	------
[illegible]	0.9304	------	------	------	------	------	------	------	------
0.9417	0.9346	------	------	------	------	------	------	------	------
0.9455	0.9384	------	------	------	------	------	------	------	------
[illegible]	0.9418	0.9071	------	------	------	------	------	------	------
[illegible]	0.9450	0.9126	------	------	------	------	------	------	------
[illegible]	0.9479	0.9176	------	------	------	------	------	------	------
[illegible]	0.9505	0.9222	0.8908	------	------	------	------	------	------
[illegible]	0.9530	0.9263	0.8971	------	------	------	------	------	------
0.9601	0.9553	0.9301	0.9027	0.8727	------	------	------	------	------
0.9617	0.9574	0.9336	0.9079	0.8800	------	------	------	------	------
0.9637	0.9594	0.9369	0.9127	0.8866	0.8581	------	------	------	------
0.9653	0.9612	0.9399	0.9171	0.8925	0.8661	0.8372	------	------	------
0.9668	0.9629	0.9427	0.9211	0.8981	0.8734	0.8466	------	------	------
0.9682	0.9645	0.9452	0.9248	0.9032	0.8800	0.8551	0.8283	------	------
0.9696	0.9660	0.9477	0.9283	0.9078	0.8861	0.8627	0.8379	0.8110	------
[illegible]	0.9674	0.9499	0.9315	0.9122	0.8917	0.8697	0.8467	0.8216	[illegible]
[illegible]	0.9687	0.9520	0.9345	0.9162	0.8968	0.8764	0.8547	0.8316	[illegible]
[illegible]	0.9700	0.9540	0.9374	0.9199	0.9016	0.8824	0.8621	0.8405	[illegible]
0.9742	0.9712	0.9559	0.9400	0.9234	0.9061	0.8877	0.8688	0.8486	[illegible]
[illegible]	0.9723	0.9577	0.9425	0.9267	0.9102	0.8930	0.8750	0.8561	[illegible]
[illegible]	0.9733	0.9593	0.9448	0.9297	0.9141	0.8978	0.8807	[illegible]	[illegible]
[illegible]	0.9743	0.9609	0.9470	0.9326	0.9177	0.9022	0.8861	[illegible]	[illegible]
[illegible]	0.9753	0.9624	0.9490	0.9353	0.9210	[illegible]	0.8911	0.8752	[illegible]
[illegible]	0.9762	0.9638	0.9510	0.9378	0.9242	0.9102	0.8957	0.8807	[illegible]
[illegible]	0.9770	0.9651	0.9528	0.9402	0.9272	0.9138	0.9000	0.8858	[illegible]
[illegible]	0.9778	0.9664	0.9546	0.9425	0.9300	0.9173	0.9041	0.8905	[illegible]
[illegible]	0.9786	0.9676	0.9562	0.9446	0.9327	0.9205	0.9079	0.8950	[illegible]
0.9815	0.9794	0.9687	0.9578	0.9466	0.9352	0.9235	0.9115	0.8992	[illegible]
0.9821	0.9801	0.9698	0.9593	0.9486	0.9376	0.9264	0.9147	0.9032	[illegible]

pressure, atm

100	105	110	115	120	125	130	135	140	145	150
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0.6796	------	------	------	------	------	------	------	------	------	------
0.7001	0.6762	0.6501	------	------	------	------	------	------	------	------
0.7160	0.6968	0.6739	0.6490	0.6214	------	------	------	------	------	------
0.7339	0.7147	0.6943	0.6725	0.6488	0.6228	0.5937	------	------	------	------
0.7482	0.7306	0.7122	0.6927	0.6719	0.6495	0.6251	0.5981	------	------	------

TABLE VII. - Continued.

(c) Concluded.

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	45	50	55	60	65
1100	1.0000	0.9901	0.9801	0.9698	0.9593	0.9486	0.9376	0.9264	0.9149	0.9032	0.8911	0.8787	0.8660	0.8529
1110	1.0000	0.9905	0.9807	0.9708	0.9607	0.9504	0.9399	0.9291	0.9181	0.9069	0.8954	0.8836	0.8715	0.8591
1120	1.0000	0.9908	0.9814	0.9718	0.9620	0.9521	0.9420	0.9317	0.9211	0.9104	0.8994	0.8881	0.8766	0.8649
1130	1.0000	0.9911	0.9820	0.9727	0.9633	0.9538	0.9440	0.9341	0.9240	0.9137	0.9032	0.8924	0.8815	0.8703
1140	1.0000	0.9913	0.9826	0.9736	0.9646	0.9553	0.9460	0.9364	0.9267	0.9168	0.9068	0.8965	0.8860	0.8754
1150	1.0000	0.9916	0.9831	0.9745	0.9657	0.9568	0.9478	0.9386	0.9293	0.9198	0.9102	0.9003	0.8903	0.8801
1160	1.0000	0.9919	0.9837	0.9753	0.9669	0.9583	0.9496	0.9407	0.9317	0.9226	0.9134	0.9040	0.8944	0.8846
1170	1.0000	0.9921	0.9842	0.9761	0.9679	0.9596	0.9512	0.9427	0.9340	0.9252	0.9163	0.9073	0.8981	0.8887
1180	1.0000	0.9924	0.9847	0.9768	0.9689	0.9609	0.9528	0.9445	0.9362	0.9277	0.9192	0.9104	0.9016	0.8926
1190	1.0000	0.9926	0.9851	0.9776	0.9699	0.9621	0.9543	0.9463	0.9383	0.9301	0.9219	0.9135	0.9050	0.8964
1200	1.0000	0.9928	0.9856	0.9782	0.9708	0.9633	0.9557	0.9481	0.9403	0.9324	0.9244	0.9164	0.9082	0.8999
1210	1.0000	0.9930	0.9860	0.9789	0.9717	0.9645	0.9571	0.9497	0.9422	0.9346	0.9269	0.9191	0.9112	0.9033
1220	1.0000	0.9932	0.9864	0.9795	0.9726	0.9656	0.9584	0.9513	0.9440	0.9367	0.9293	0.9218	0.9142	0.9065
1230	1.0000	0.9934	0.9868	0.9802	0.9734	0.9666	0.9597	0.9528	0.9458	0.9387	0.9315	0.9243	0.9170	0.9096
1240	1.0000	0.9936	0.9872	0.9807	0.9742	0.9676	0.9609	0.9542	0.9474	0.9406	0.9337	0.9267	0.9196	0.9125
1250	1.0000	0.9938	0.9876	0.9813	0.9750	0.9686	0.9621	0.9556	0.9491	0.9424	0.9357	0.9290	0.9222	0.9153
1260	1.0000	0.9940	0.9879	0.9818	0.9757	0.9695	0.9633	0.9570	0.9506	0.9442	0.9377	0.9312	0.9246	0.9180
1270	1.0000	0.9942	0.9883	0.9824	0.9764	0.9704	0.9643	0.9582	0.9521	0.9459	0.9396	0.9333	0.9270	0.9206
1280	1.0000	0.9943	0.9886	0.9829	0.9771	0.9713	0.9654	0.9595	0.9535	0.9475	0.9415	0.9354	0.9292	0.9230
1290	1.0000	0.9945	0.9889	0.9834	0.9777	0.9721	0.9664	0.9607	0.9549	0.9491	0.9432	0.9373	0.9314	0.9254
1300	1.0000	0.9946	0.9893	0.9838	0.9784	0.9729	0.9674	0.9618	0.9562	0.9506	0.9449	0.9392	0.9334	0.9277
1310	1.0000	0.9948	0.9896	0.9843	0.9790	0.9737	0.9683	0.9629	0.9575	0.9520	0.9465	0.9410	0.9354	0.9298
1320	1.0000	0.9949	0.9898	0.9847	0.9796	0.9744	0.9692	0.9640	0.9587	0.9534	0.9481	0.9427	0.9374	0.9319
1330	1.0000	0.9951	0.9901	0.9851	0.9801	0.9751	0.9701	0.9650	0.9599	0.9547	0.9496	0.9444	0.9392	0.9339
1340	1.0000	0.9952	0.9904	0.9856	0.9807	0.9758	0.9709	0.9660	0.9610	0.9560	0.9510	0.9460	0.9410	0.9359
1350	1.0000	0.9953	0.9907	0.9859	0.9812	0.9765	0.9717	0.9669	0.9621	0.9573	0.9524	0.9476	0.9427	0.9377
1360	1.0000	0.9955	0.9909	0.9863	0.9817	0.9771	0.9725	0.9678	0.9632	0.9585	0.9538	0.9491	0.9443	0.9395
1370	1.0000	0.9956	0.9911	0.9867	0.9822	0.9777	0.9732	0.9687	0.9642	0.9596	0.9551	0.9505	0.9459	0.9413
1380	1.0000	0.9957	0.9914	0.9871	0.9827	0.9783	0.9740	0.9696	0.9652	0.9608	0.9563	0.9519	0.9474	0.9429
1390	1.0000	0.9958	0.9916	0.9874	0.9832	0.9789	0.9747	0.9704	0.9661	0.9618	0.9575	0.9532	0.9489	0.9445
1400	1.0000	0.9959	0.9918	0.9877	0.9836	0.9795	0.9754	0.9712	0.9671	0.9629	0.9587	0.9545	0.9503	0.9461
1410	1.0000	0.9960	0.9920	0.9881	0.9841	0.9800	0.9760	0.9720	0.9679	0.9639	0.9598	0.9558	0.9517	0.9476
1420	1.0000	0.9961	0.9923	0.9884	0.9845	0.9806	0.9767	0.9727	0.9688	0.9649	0.9609	0.9570	0.9530	0.9490
1430	1.0000	0.9962	0.9925	0.9887	0.9849	0.9811	0.9773	0.9735	0.9696	0.9658	0.9620	0.9581	0.9543	0.9504
1440	1.0000	0.9963	0.9926	0.9890	0.9853	0.9816	0.9779	0.9742	0.9704	0.9667	0.9630	0.9593	0.9555	0.9518
1450	1.0000	0.9964	0.9928	0.9892	0.9857	0.9821	0.9785	0.9748	0.9712	0.9676	0.9640	0.9604	0.9567	0.9531
1460	1.0000	0.9965	0.9930	0.9895	0.9860	0.9825	0.9790	0.9755	0.9720	0.9685	0.9649	0.9614	0.9579	0.9544
1470	1.0000	0.9966	0.9932	0.9898	0.9864	0.9830	0.9796	0.9761	0.9727	0.9693	0.9659	0.9624	0.9590	0.9556
1480	1.0000	0.9967	0.9934	0.9901	0.9867	0.9834	0.9801	0.9768	0.9734	0.9701	0.9668	0.9634	0.9601	0.9568
1490	1.0000	0.9968	0.9935	0.9903	0.9871	0.9838	0.9806	0.9774	0.9741	0.9709	0.9676	0.9644	0.9611	0.9579
1500	1.0000	0.9968	0.9937	0.9905	0.9874	0.9842	0.9811	0.9779	0.9748	0.9716	0.9685	0.9653	0.9622	0.9590

Plenum temperature, °R	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220
1100	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1110	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1120	0.5830	0.5541	0.5199	------	------	------	------	------	------	------	------	------	------	------	------
1130	0.6143	0.5910	0.5652	0.5358	0.5004	------	------	------	------	------	------	------	------	------	------
1140	0.6401	0.6203	0.5991	0.5759	0.5502	0.5207	0.4851	------	------	------	------	------	------	------	------
1150	0.6622	0.6448	0.6265	0.6070	0.5861	0.5633	0.5381	0.5093	0.4746	0.4273	------	------	------	------	------
1160	0.6815	0.6660	0.6498	0.6328	0.6149	0.5959	0.5756	0.5535	0.5292	0.5017	0.4693	0.4273	0.3424	------	------
1170	0.6974	0.6833	0.6686	0.6534	0.6375	0.6208	0.6033	0.5847	0.5649	0.5436	0.5202	0.4942	0.4642	0.4275	0.3763
1180	0.7118	0.6988	0.6853	0.6714	0.6570	0.6420	0.6265	0.6101	0.5930	0.5749	0.5556	0.5349	0.5124	0.4875	0.4573
1190	0.7250	0.7129	0.7005	0.6877	0.6745	0.6609	0.6468	0.6322	0.6169	0.6011	0.5844	0.5669	0.5483	0.5285	0.5071
1200	0.7372	0.7259	0.7143	0.7025	0.6903	0.6778	0.6649	0.6516	0.6379	0.6237	0.6090	0.5936	0.5776	0.5607	0.5430
1210	0.7485	0.7379	0.7271	0.7160	0.7047	0.6932	0.6813	0.6691	0.6566	0.6437	0.6304	0.6167	0.6025	0.5877	0.5724
1220	0.7590	0.7490	0.7389	0.7285	0.7180	0.7072	0.6962	0.6850	0.6734	0.6615	0.6495	0.6370	0.6242	0.6110	0.5974
1230	0.7688	0.7594	0.7498	0.7401	0.7302	0.7202	0.7099	0.6994	0.6887	0.6778	0.6667	0.6553	0.6436	0.6316	0.6193
1240	0.7779	0.7690	0.7600	0.7509	0.7416	0.7321	0.7225	0.7127	0.7028	0.6926	0.6823	0.6718	0.6610	0.6500	0.6388
1250	0.7865	0.7781	0.7696	0.7609	0.7521	0.7432	0.7342	0.7250	0.7157	0.7062	0.6966	0.6868	0.6768	0.6667	0.6564
1260	0.7946	0.7866	0.7785	0.7703	0.7620	0.7536	0.7451	0.7364	0.7277	0.7188	0.7098	0.7006	0.6914	0.6819	0.6723
1270	0.8022	0.7946	0.7869	0.7791	0.7713	0.7633	0.7552	0.7471	0.7388	0.7305	0.7220	0.7134	0.7047	0.6959	0.6870
1280	0.8094	0.8022	0.7948	0.7874	0.7800	0.7724	0.7648	0.7570	0.7492	0.7413	0.7334	0.7253	0.7171	0.7088	0.7005
1290	0.8162	0.8093	0.8023	0.7953	0.7881	0.7810	0.7737	0.7664	0.7590	0.7515	0.7440	0.7363	0.7286	0.7208	0.7130
1300	0.8227	0.8161	0.8094	0.8027	0.7959	0.7890	0.7821	0.7752	0.7681	0.7610	0.7539	0.7467	0.7394	0.7320	0.7246
1310	0.8288	0.8225	0.8161	0.8096	0.8032	0.7966	0.7901	0.7834	0.7767	0.7700	0.7632	0.7564	0.7495	0.7425	0.7355
1320	0.8346	0.8285	0.8224	0.8163	0.8101	0.8039	0.7976	0.7912	0.7849	0.7784	0.7720	0.7655	0.7589	0.7523	0.7456
1330	0.8401	0.8343	0.8285	0.8226	0.8167	0.8107	0.8047	0.7986	0.7926	0.7864	0.7803	0.7741	0.7678	0.7615	0.7552
1340	0.8454	0.8398	0.8342	0.8286	0.8229	0.8172	0.8114	0.8056	0.7998	0.7940	0.7881	0.7822	0.7762	0.7702	0.7642
1350	0.8505	0.8451	0.8397	0.8343	0.8288	0.8233	0.8178	0.8123	0.8067	0.8011	0.7955	0.7898	0.7842	0.7784	0.7727
1360	0.8553	0.8501	0.8449	0.8397	0.8345	0.8292	0.8239	0.8186	0.8133	0.8079	0.8025	0.7971	0.7917	0.7862	0.7807
1370	0.8599	0.8549	0.8499	0.8449	0.8399	0.8348	0.8297	0.8246	0.8195	0.8144	0.8092	0.8040	0.7988	0.7936	0.7883
1380	0.8643	0.8595	0.8547	0.8498	0.8450	0.8401	0.8353	0.8304	0.8255	0.8205	0.8156	0.8106	0.8056	0.8006	0.7956
1390	0.8685	0.8639	0.8592	0.8546	0.8499	0.8452	0.8406	0.8358	0.8311	0.8264	0.8216	0.8168	0.8120	0.8072	0.8024
1400	0.8725	0.8681	0.8636	0.8591	0.8546	0.8501	0.8456	0.8411	0.8365	0.8320	0.8274	0.8228	0.8182	0.8136	0.8089
1410	0.8764	0.8721	0.8678	0.8635	0.8591	0.8548	0.8504	0.8461	0.8417	0.8373	0.8329	0.8285	0.8241	0.8196	0.8152
1420	0.8801	0.8759	0.8718	0.8676	0.8634	0.8593	0.8551	0.8509	0.8466	0.8424	0.8382	0.8339	0.8297	0.8254	0.8211
1430	0.8836	0.8796	0.8756	0.8716	0.8676	0.8635	0.8595	0.8554	0.8514	0.8473	0.8432	0.8391	0.8350	0.8309	0.8268
1440	0.8871	0.8832	0.8793	0.8754	0.8716	0.8677	0.8637	0.8598	0.8559	0.8520	0.8480	0.8441	0.8401	0.8362	0.8322
1450	0.8904	0.8866	0.8829	0.8791	0.8754	0.8716	0.8678	0.8640	0.8603	0.8565	0.8527	0.8489	0.8450	0.8412	0.8374
1460	0.8935	0.8899	0.8863	0.8827	0.8790	0.8754	0.8717	0.8681	0.8644	0.8608	0.8571	0.8534	0.8497	0.8461	0.8424
1470	0.8966	0.8931	0.8896	0.8861	0.8826	0.8790	0.8755	0.8720	0.8684	0.8649	0.8614	0.8578	0.8542	0.8507	0.8471
1480	0.8996	0.8962	0.8928	0.8894	0.8860	0.8825	0.8791	0.8757	0.8723	0.8689	0.8654	0.8620	0.8586	0.8551	0.8517
1490	0.9024	0.8991	0.8958	0.8925	0.8892	0.8859	0.8826	0.8793	0.8760	0.8727	0.8694	0.8661	0.8627	0.8594	0.8561
1500	0.9051	0.9019	0.8988	0.8956	0.8924	0.8892	0.8860	0.8828	0.8796	0.8764	0.8732	0.8700	0.8667	0.8635	0.8603

70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
0.8395	0.8256	0.8112	0.7964	0.7810	0.7649	0.7482	0.7306	0.7122	0.6927	0.6719	0.6495	0.6251	0.5981	0.	0.
0.8464	0.8333	0.8198	0.8058	0.7914	0.7765	0.7610	0.7449	0.7281	0.7104	0.6918	0.6720	0.6509	0.6281	0.6031	0.5750
0.8528	0.8404	0.8277	0.8146	0.8011	0.7872	0.7728	0.7579	0.7424	0.7262	0.7093	0.6916	0.6729	0.6530	0.6317	0.6085
0.8588	0.8471	0.8350	0.8227	0.8100	0.7970	0.7835	0.7696	0.7553	0.7404	0.7250	0.7089	0.6920	0.6743	0.6556	0.6357
0.8644	0.8533	0.8419	0.8302	0.8183	0.8060	0.7934	0.7804	0.7671	0.7533	0.7391	0.7243	0.7090	0.6930	0.6763	0.6587
0.8697	0.8591	0.8483	0.8373	0.8260	0.8144	0.8025	0.7904	0.7779	0.7651	0.7519	0.7383	0.7242	0.7096	0.6945	0.6787
0.8747	0.8646	0.8543	0.8438	0.8331	0.8222	0.8110	0.7996	0.7879	0.7759	0.7636	0.7510	0.7380	0.7245	0.7107	0.6964
0.8792	0.8696	0.8597	0.8497	0.8395	0.8291	0.8185	0.8077	0.7966	0.7853	0.7737	0.7618	0.7497	0.7372	0.7243	0.7111
0.8835	0.8743	0.8649	0.8553	0.8455	0.8356	0.8255	0.8153	0.8048	0.7941	0.7831	0.7720	0.7605	0.7488	0.7368	0.7245
0.8876	0.8787	0.8697	0.8606	0.8513	0.8418	0.8322	0.8224	0.8124	0.8023	0.7920	0.7814	0.7706	0.7596	0.7484	0.7368
0.8915	0.8830	0.8743	0.8656	0.8567	0.8476	0.8365	0.8291	0.8197	0.8100	0.8002	0.7902	0.7800	0.7697	0.7591	0.7483
0.8952	0.8870	0.8787	0.8703	0.8618	0.8532	0.8444	0.8355	0.8265	0.8173	0.8080	0.7985	0.7889	0.7790	0.7691	0.7589
0.8987	0.8909	0.8829	0.8748	0.8667	0.8584	0.8500	0.8415	0.8329	0.8242	0.8153	0.8063	0.7971	0.7878	0.7784	0.7688
0.9021	0.8945	0.8869	0.8791	0.8713	0.8634	0.8553	0.8472	0.8390	0.8306	0.8222	0.8136	0.8049	0.7961	0.7871	0.7780
0.9053	0.8980	0.8907	0.8832	0.8757	0.8681	0.8604	0.8526	0.8447	0.8368	0.8287	0.8205	0.8122	0.8038	0.7953	0.7867
0.9084	0.9014	0.8943	0.8871	0.8799	0.8726	0.8652	0.8577	0.8502	0.8426	0.8348	0.8270	0.8191	0.8111	0.8030	0.7948
0.9113	0.9045	0.8977	0.8908	0.8839	0.8769	0.8698	0.8626	0.8554	0.8481	0.8407	0.8332	0.8257	0.8180	0.8103	0.8025
0.9141	0.9076	0.9010	0.8944	0.8877	0.8809	0.8741	0.8672	0.8603	0.8533	0.8462	0.8391	0.8318	0.8246	0.8172	0.8097
0.9168	0.9105	0.9042	0.8978	0.8913	0.8848	0.8783	0.8717	0.8650	0.8583	0.8515	0.8446	0.8377	0.8307	0.8237	0.8166
0.9194	0.9133	0.9072	0.9010	0.8948	0.8885	0.8822	0.8759	0.8695	0.8630	0.8565	0.8499	0.8433	0.8366	0.8299	0.8231
0.9218	0.9160	0.9101	0.9041	0.8981	0.8921	0.8860	0.8799	0.8737	0.8675	0.8613	0.8550	0.8486	0.8422	0.8357	0.8292
0.9242	0.9185	0.9128	0.9071	0.9013	0.8955	0.8896	0.8838	0.8778	0.8718	0.8658	0.8596	0.8537	0.8475	0.8413	0.8351
0.9265	0.9210	0.9155	0.9100	0.9044	0.8988	0.8931	0.8874	0.8817	0.8760	0.8702	0.8643	0.8585	0.8526	0.8466	0.8406
0.9287	0.9234	0.9181	0.9127	0.9073	0.9019	0.8964	0.8910	0.8854	0.8799	0.8743	0.8687	0.8631	0.8574	0.8517	0.8459
0.9308	0.9257	0.9205	0.9153	0.9101	0.9049	0.8996	0.8943	0.8890	0.8837	0.8783	0.8729	0.8675	0.8620	0.8565	0.8510
0.9328	0.9278	0.9229	0.9178	0.9128	0.9078	0.9027	0.8976	0.8924	0.8873	0.8821	0.8769	0.8717	0.8664	0.8611	0.8558
0.9348	0.9299	0.9251	0.9203	0.9154	0.9105	0.9056	0.9007	0.8957	0.8907	0.8857	0.8807	0.8757	0.8706	0.8655	0.8604
0.9366	0.9320	0.9273	0.9226	0.9179	0.9132	0.9084	0.9037	0.8989	0.8941	0.8892	0.8844	0.8795	0.8746	0.8697	0.8648
0.9384	0.9339	0.9294	0.9249	0.9203	0.9157	0.9111	0.9065	0.9019	0.8973	0.8926	0.8879	0.8832	0.8785	0.8738	0.8690
0.9402	0.9358	0.9314	0.9270	0.9226	0.9182	0.9137	0.9093	0.9048	0.9003	0.8958	0.8913	0.8868	0.8822	0.8776	0.8731
0.9419	0.9376	0.9334	0.9291	0.9248	0.9205	0.9162	0.9119	0.9076	0.9033	0.8989	0.8945	0.8902	0.8858	0.8814	0.8769
0.9435	0.9394	0.9353	0.9311	0.9270	0.9228	0.9187	0.9145	0.9103	0.9061	0.9019	0.8977	0.8934	0.8892	0.8849	0.8806
0.9451	0.9411	0.9371	0.9331	0.9290	0.9250	0.9210	0.9169	0.9129	0.9088	0.9047	0.9007	0.8966	0.8925	0.8883	0.8842
0.9466	0.9427	0.9388	0.9349	0.9310	0.9271	0.9232	0.9193	0.9154	0.9114	0.9075	0.9035	0.8996	0.8956	0.8916	0.8876
0.9480	0.9443	0.9405	0.9367	0.9330	0.9292	0.9254	0.9216	0.9178	0.9140	0.9101	0.9063	0.9025	0.8986	0.8948	0.8909
0.9494	0.9458	0.9421	0.9385	0.9348	0.9311	0.9275	0.9238	0.9201	0.9164	0.9127	0.9090	0.9053	0.9016	0.8978	0.8941
0.9508	0.9473	0.9437	0.9402	0.9366	0.9330	0.9295	0.9259	0.9223	0.9188	0.9152	0.9116	0.9080	0.9044	0.9008	0.8972
0.9521	0.9487	0.9452	0.9418	0.9383	0.9349	0.9314	0.9280	0.9245	0.9210	0.9175	0.9141	0.9106	0.9071	0.9036	0.9001
0.9534	0.9501	0.9467	0.9434	0.9400	0.9367	0.9333	0.9299	0.9266	0.9232	0.9198	0.9165	0.9131	0.9097	0.9063	0.9029
0.9546	0.9514	0.9481	0.9449	0.9416	0.9384	0.9351	0.9319	0.9286	0.9253	0.9221	0.9188	0.9155	0.9122	0.9090	0.9057
0.9558	0.9527	0.9495	0.9464	0.9432	0.9400	0.9369	0.9337	0.9305	0.9274	0.9242	0.9210	0.9179	0.9147	0.9115	0.9083

225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.2590	0.2141	0.2007	0.1934	0.1847	0.1855	0.1833	0.1818	0.1807	0.1800	0.1795	0.1793	0.1793	0.1794	0.1747	[illegible]
0.4261	0.1840	0.3236	0.2601	0.2330	0.2177	0.2117	0.2063	0.2025	0.1998	0.1978	0.1964	0.1953	0.1946	0.1941	0.1739
0.4837	0.4578	0.4283	0.3938	0.3522	0.3063	0.2714	0.2508	0.2383	0.2299	0.2241	0.2198	0.2166	0.2142	0.2124	0.2110
0.5242	0.5041	0.4825	0.4590	0.4332	0.4044	0.3726	0.3389	0.3079	0.2842	0.2677	0.2562	0.2479	0.2418	0.2372	0.2335
0.5564	0.5396	0.5219	0.5033	0.4834	0.4623	0.4397	0.4154	0.3897	0.3632	0.3377	0.3153	0.2975	0.2838	0.2734	0.2554
0.5833	0.5687	0.5536	0.5378	0.5214	0.5041	0.4861	0.4671	0.4472	0.4264	0.4049	0.3831	0.3619	0.3423	0.3251	0.3108
0.6057	0.5937	0.5803	0.5665	0.5523	0.5375	0.5223	0.5065	0.4900	0.4730	0.4555	0.4374	0.4190	0.4005	0.3825	0.3554
0.6273	0.6156	0.6036	0.5912	0.5766	0.5656	0.5523	0.5385	0.5244	0.5099	0.4950	0.4797	0.4641	0.4482	0.4322	0.4152
0.6458	0.6351	0.6242	0.6130	0.6016	0.5899	0.5780	0.5658	0.5533	0.5406	0.5276	0.5143	0.5007	0.4869	0.4729	0.4588
0.6626	0.6527	0.6426	0.6324	0.6220	0.6114	0.6006	0.5896	0.5783	0.5669	0.5553	0.5435	0.5315	0.5193	0.5059	0.4944
0.6779	0.6687	0.6594	0.6499	0.6403	0.6306	0.6207	0.6106	0.6004	0.5901	0.5796	0.5689	0.5581	0.5471	0.5360	0.5248
0.6920	0.6834	0.6747	0.6659	0.6570	0.6480	0.6389	0.6296	0.6202	0.6107	0.6011	0.5914	0.5815	0.5715	0.5615	0.5513
0.7050	0.6970	0.6888	0.6806	0.6723	0.6637	0.6554	0.6468	0.6381	0.6294	0.6205	0.6115	0.6025	0.5933	0.5841	0.5748
0.7171	0.7095	0.7019	0.6942	0.6864	0.6785	0.6706	0.6626	0.6545	0.6463	0.6381	0.6298	0.6214	0.6129	0.6044	0.5958
0.7284	0.7212	0.7140	0.7068	0.6994	0.6921	0.6846	0.6771	0.6695	0.6619	0.6542	0.6464	0.6386	0.6307	0.6228	0.6148
0.7389	0.7322	0.7254	0.7185	0.7116	0.7045	0.6976	0.6905	0.6834	0.6762	0.6690	0.6618	0.6544	0.6471	0.6397	0.6322
0.7488	0.7424	0.7350	0.7295	0.7229	0.7153	0.7097	0.7030	0.6963	0.6896	0.6828	0.6759	0.6690	0.6621	0.6552	0.6482
0.7581	0.7520	0.7459	0.7397	0.7335	0.7273	0.7210	0.7147	0.7083	0.7019	0.6955	0.6891	0.6826	0.6761	0.6695	0.6629
0.7669	0.7611	0.7553	0.7494	0.7435	0.7376	0.7316	0.7256	0.7196	0.7135	0.7074	0.7013	0.6952	0.6890	0.6828	0.6765
0.7752	0.7697	0.7641	0.7585	0.7529	0.7472	0.7416	0.7359	0.7301	0.7244	0.7186	0.7128	0.7070	0.7011	0.6953	0.6894
0.7831	0.7778	0.7724	0.7671	0.7617	0.7563	0.7509	0.7455	0.7401	0.7346	0.7291	0.7236	0.7180	0.7125	0.7069	0.7013
0.7905	0.7854	0.7803	0.7752	0.7701	0.7650	0.7598	0.7546	0.7494	0.7442	0.7389	0.7337	0.7284	0.7231	0.7178	0.7125
0.7976	0.7927	0.7878	0.7830	0.7780	0.7731	0.7682	0.7632	0.7583	0.7533	0.7483	0.7432	0.7382	0.7332	0.7281	0.7230
0.8043	0.7996	0.7950	0.7903	0.7856	0.7809	0.7761	0.7714	0.7666	0.7618	0.7571	0.7523	0.7475	0.7426	0.7378	0.7329
0.8107	0.8062	0.8017	0.7972	0.7927	0.7882	0.7837	0.7791	0.7746	0.7700	0.7654	0.7608	0.7562	0.7516	0.7470	0.7423
0.8168	0.8125	0.8082	0.8039	0.7995	0.7952	0.7908	0.7865	0.7821	0.7777	0.7733	0.7689	0.7645	0.7601	0.7556	0.7512
0.8226	0.8185	0.8144	0.8102	0.8060	0.8019	0.7977	0.7935	0.7893	0.7851	0.7808	0.7766	0.7724	0.7681	0.7637	0.7595
0.8282	0.8242	0.8202	0.8162	0.8122	0.8082	0.8042	0.8001	0.7961	0.7921	0.7880	0.7839	0.7799	0.7758	0.7717	0.7675
0.8336	0.8297	0.8259	0.8220	0.8181	0.8143	0.8104	0.8065	0.8026	0.7987	0.7948	0.7909	0.7870	0.7831	0.7791	0.7752
0.8387	0.8350	0.8312	0.8275	0.8238	0.8201	0.8163	0.8126	0.8088	0.8051	0.8013	0.7976	0.7938	0.7900	0.7852	0.7824
0.8436	0.8400	0.8364	0.8328	0.8292	0.8256	0.8220	0.8184	0.8148	0.8112	0.8075	0.8039	0.8003	0.7966	0.7930	0.7893
0.8482	0.8448	0.8413	0.8379	0.8344	0.8309	0.8275	0.8240	0.8205	0.8170	0.8135	0.8100	0.8065	0.8030	0.7994	0.7959
0.8528	0.8494	0.8461	0.8427	0.8394	0.8360	0.8327	0.8293	0.8259	0.8226	0.8192	0.8158	0.8124	0.8090	0.8056	0.8022
0.8571	0.8539	0.8506	0.8474	0.8441	0.8409	0.8377	0.8344	0.8312	0.8279	0.8246	0.8214	0.8181	0.8148	0.8115	[illegible]

TABLE VII. - Continued.

(g) Plenum

Plenum temperature, °R	Plenum 0	1	2	3	4	5	6	7	8	9
700	4.1087	4.4091	------	------	------	------	------	------	------	------
710	4.1141	4.3807	4.7491	------	------	------	------	------	------	------
720	4.1196	4.3576	4.6765	------	------	------	------	------	------	------
730	4.1253	4.3389	4.6173	------	------	------	------	------	------	------
740	4.1310	4.3237	4.5687	4.8700	------	------	------	------	------	------
750	4.1369	4.3114	4.5284	4.7910	------	------	------	------	------	------
760	4.1428	4.3016	4.4951	4.7255	4.9959	------	------	------	------	------
770	4.1488	4.2938	4.4673	4.6710	4.9072	5.1783	------	------	------	------
780	4.1549	4.2877	4.4441	4.6254	4.8332	5.0694	5.3365	------	------	------
790	4.1611	4.2831	4.4247	4.5870	4.7710	4.9784	5.2109	------	------	------
800	4.1674	4.2798	4.4086	4.5545	4.7186	4.9019	5.1058	5.3317	5.5813	------
810	4.1738	4.2776	4.3952	4.5271	4.6742	4.8372	5.0172	5.2153	5.4328	5.6710
820	4.1802	4.2763	4.3841	4.5039	4.6364	4.7823	4.9422	5.1171	5.3079	5.5157
830	4.1867	4.2759	4.3750	4.4843	4.6042	4.7353	4.8783	5.0337	5.2022	5.3848
840	4.1933	4.2762	4.3676	4.4676	4.5767	4.6952	4.8236	4.9624	5.1123	5.2737
850	4.1999	4.2772	4.3617	4.4536	4.5531	4.6607	4.7766	4.9013	5.0353	5.1790
860	4.2067	4.2788	4.3571	4.4418	4.5330	4.6310	4.7361	4.8487	4.9691	5.0977
870	4.2134	4.2809	4.3537	4.4319	4.5157	4.6054	4.7012	4.8033	4.9120	5.0276
880	4.2203	4.2835	4.3512	4.4237	4.5010	4.5834	4.6709	4.7639	4.8625	4.9670
890	4.2272	4.2864	4.3497	4.4170	4.4885	4.5644	4.6447	4.7297	4.8195	4.9143
900	4.2341	4.2898	4.3490	4.4116	4.4780	4.5480	4.6220	4.6999	4.7821	4.8685
910	4.2411	4.2935	4.3489	4.4074	4.4691	4.5340	4.6023	4.6740	4.7494	4.8284
920	4.2481	4.2975	4.3495	4.4042	4.4617	4.5220	4.5852	4.6515	4.7208	4.7934
930	4.2552	4.3018	4.3507	4.4020	4.4556	4.5118	4.5705	4.6318	4.6959	4.7627
940	4.2624	4.3064	4.3524	4.4005	4.4507	4.5031	4.5578	4.6147	4.6740	4.7358
950	4.2696	4.3111	4.3546	4.3998	4.4469	4.4959	4.5469	4.5999	4.6549	4.7121
960	4.2768	4.3162	4.3571	4.3997	4.4440	4.4899	4.5376	4.5870	4.6383	4.6914
970	4.2841	4.3214	4.3601	4.4003	4.4419	4.4850	4.5297	4.5759	4.6237	4.6732
980	4.2914	4.3268	4.3634	4.4014	4.4406	4.4812	4.5231	4.5664	4.6111	4.6573
990	4.2987	4.3323	4.3671	4.4029	4.4400	4.4782	4.5176	4.5583	4.6002	4.6434
1000	4.3061	4.3380	4.3710	4.4050	4.4400	4.4760	4.5132	4.5514	4.5907	4.6312
1010	4.3135	4.3439	4.3752	4.4074	4.4405	4.4746	4.5096	4.5457	4.5827	4.6207
1020	4.3209	4.3499	4.3796	4.4102	4.4416	4.4739	4.5070	4.5409	4.5758	4.6116
1030	4.3284	4.3560	4.3843	4.4134	4.4432	4.4737	4.5050	4.5371	4.5700	4.6037
1040	4.3359	4.3622	4.3892	4.4168	4.4452	4.4741	4.5038	4.5342	4.5653	4.5971
1050	4.3434	4.3686	4.3943	4.4206	4.4475	4.4751	4.5032	4.5320	4.5614	4.5915
1060	4.3510	4.3750	4.3995	4.4246	4.4503	4.4764	4.5032	4.5305	4.5584	4.5868
1070	4.3586	4.3815	4.4050	4.4289	4.4533	4.4783	4.5037	4.5296	4.5561	4.5831
1080	4.3662	4.3881	4.4106	4.4334	4.4567	4.4805	4.5047	4.5293	4.5545	4.5801
1090	4.3738	4.3948	4.4163	4.4381	4.4604	4.4830	4.5061	4.5296	4.5535	4.5778
1100	4.3814	4.4016	4.4221	4.4430	4.4643	4.4859	4.5079	4.5303	4.5531	4.5763

Plenum temperature, °R	Plenum 55	60	65	70	75	80	85	90	95
700	------	------	------	------	------	------	------	------	------
710	------	------	------	------	------	------	------	------	------
720	------	------	------	------	------	------	------	------	------
730	------	------	------	------	------	------	------	------	------
740	------	------	------	------	------	------	------	------	------
750	------	------	------	------	------	------	------	------	------
760	------	------	------	------	------	------	------	------	------
770	------	------	------	------	------	------	------	------	------
780	------	------	------	------	------	------	------	------	------
790	------	------	------	------	------	------	------	------	------
800	------	------	------	------	------	------	------	------	------
810	------	------	------	------	------	------	------	------	------
820	------	------	------	------	------	------	------	------	------
830	------	------	------	------	------	------	------	------	------
840	------	------	------	------	------	------	------	------	------
850	------	------	------	------	------	------	------	------	------
860	------	------	------	------	------	------	------	------	------
870	------	------	------	------	------	------	------	------	------
880	------	------	------	------	------	------	------	------	------
890	------	------	------	------	------	------	------	------	------
900	------	------	------	------	------	------	------	------	------
910	------	------	------	------	------	------	------	------	------
920	------	------	------	------	------	------	------	------	------
930	------	------	------	------	------	------	------	------	------
940	------	------	------	------	------	------	------	------	------
950	------	------	------	------	------	------	------	------	------
960	------	------	------	------	------	------	------	------	------
970	------	------	------	------	------	------	------	------	------
980	9.6344	------	------	------	------	------	------	------	------
990	9.0317	10.1030	------	------	------	------	------	------	------
1000	8.5344	9.4296	10.5419	------	------	------	------	------	------
1010	8.1181	8.8785	9.7999	10.9458	------	------	------	------	------
1020	7.7655	8.4200	9.1974	10.1390	11.3096	------	------	------	------
1030	7.4638	8.0335	8.6991	9.4885	10.4433	11.6288	------	------	------
1040	7.2035	7.7039	8.2808	8.9535	9.7496	10.7102	11.8999	13.4271	------
1050	6.9772	7.4205	7.9255	8.5062	9.1817	9.9789	10.9379	12.1209	13.6314
1060	6.7793	7.1746	7.6207	8.1275	8.7086	9.3825	10.1753	11.1251	12.2907
1070	6.6051	6.9600	7.3569	7.8033	8.3092	8.8874	9.5556	10.3384	11.2717
1080	6.4512	6.7715	7.1270	7.5234	7.9680	8.4701	9.0421	9.7006	10.4685
1090	6.3145	6.6050	6.9253	7.2797	7.6738	8.1144	8.6103	9.1730	9.8180
1100	6.1926	6.4574	6.7474	7.0663	7.4180	7.8080	8.2425	8.7298	9.2805

THERMODYNAMIC PROPERTIES OF STEAM

specific heat

pressure, atm

10	15	20	25	30	35	40	45	50
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5.7419	------	------	------	------	------	------	------	------
5.5824	------	------	------	------	------	------	------	------
5.4476	------	------	------	------	------	------	------	------
5.3329	6.2809	------	------	------	------	------	------	------
5.2348	6.0679	------	------	------	------	------	------	------
5.1504	5.8874	------	------	------	------	------	------	------
5.0776	5.7336	6.5999	------	------	------	------	------	------
5.0143	5.6015	6.3633	------	------	------	------	------	------
4.9593	5.4876	6.1620	7.0274	------	------	------	------	------
4.9113	5.3888	5.9895	6.7476	------	------	------	------	------
4.8693	5.3028	5.8408	6.5098	7.3497	------	------	------	------
4.8324	5.2276	5.7120	6.3061	7.0403	7.9613	------	------	------
4.8000	5.1616	5.5997	6.1306	6.7774	7.5745	------	------	------
4.7715	5.1036	5.5016	5.9784	6.5521	7.2485	8.1064	------	------
4.7464	5.0523	5.4153	5.8458	6.3578	6.9711	7.7142	8.6307	------
4.7244	5.0070	5.3393	5.7297	6.1892	6.7331	7.3828	8.1696	9.1416
4.7049	4.9668	5.2721	5.6276	6.0421	6.5276	7.1002	7.7831	8.6103
4.6879	4.9312	5.2125	5.5375	5.9131	6.3489	6.8573	7.4555	8.1662
4.6729	4.8995	5.1595	5.4576	5.7996	6.1927	6.6469	7.1753	7.7956
4.6597	4.8713	5.1123	5.3867	5.6991	6.0556	6.4637	6.9335	7.4786
4.6482	4.8462	5.0702	5.3236	5.6101	5.9345	6.3031	6.7236	7.2065
4.6383	4.8238	5.0326	5.2672	5.5308	5.8273	6.1618	6.5403	6.9704
4.6296	4.8039	4.9989	5.2167	5.4600	5.7320	6.0368	6.3792	6.7054
4.6222	4.7862	4.9687	5.1714	5.3967	5.6471	5.9258	6.2370	6.5654
4.6159	4.7705	4.9416	5.1308	5.3399	5.5711	5.8270	6.1109	6.4267
4.6106	4.7566	4.9173	5.0942	5.2888	5.5029	5.7387	5.9988	6.2873
4.6062	4.7442	4.8956	5.0613	5.2428	5.4416	5.6595	5.8986	6.1515
4.6026	4.7334	4.8761	5.0317	5.2014	5.3864	5.5883	5.8089	6.0501
4.5998	4.7238	4.8586	5.0050	5.1640	5.3366	5.5243	5.7283	5.9504

pressure, atm

100	105	110	115	120	125	130	135	140	145	1.0
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13.7685	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
12.4099	13.8407	15.7168	-------	-------	-------	-------	-------	-------	-------	-------
11.3787	12.4807	13.8522	15.6253	18.0476	-------	-------	-------	-------	-------	-------
10.5663	11.4477	12.5060	13.8088	15.4677	17.6827	20.8601	-------	-------	-------	-------
9.9087	10.6334	11.4811	12.4899	13.7176	15.2561	17.2635	20.0411	-------	-------	-------

TABLE VII. - Continued.

(c) Concluded.

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	45	50	55	60	65
1100	4.3814	4.4859	4.5998	4.7238	4.8586	5.0050	5.1640	5.3366	5.5243	5.7283	5.9504	6.1926	6.4574	6.7474
1110	4.3891	4.4891	4.5977	4.7154	4.8429	4.9809	5.1302	5.2916	5.4664	5.6557	5.8609	6.0836	6.3258	6.5897
1120	4.3968	4.4926	4.5962	4.7081	4.8289	4.9592	5.0996	5.2509	5.4141	5.5902	5.7802	5.9857	6.2081	6.4493
1130	4.4045	4.4964	4.5953	4.7019	4.8164	4.9396	5.0719	5.2140	5.3667	5.5309	5.7075	5.8976	6.1026	6.3238
1140	4.4122	4.5003	4.5950	4.6965	4.8053	4.9219	5.0468	5.1805	5.3237	5.4772	5.6416	5.8181	6.0076	6.2113
1150	4.4200	4.5046	4.5951	4.6920	4.7955	4.9060	5.0241	5.1501	5.2847	5.4284	5.5820	5.7462	5.9218	6.1100
1160	4.4277	4.5090	4.5957	4.6882	4.7868	4.8918	5.0035	5.1225	5.2492	5.3841	5.5278	5.6809	5.8442	6.0186
1170	4.4355	4.5130	4.5943	4.6795	4.7689	4.8627	4.9611	5.0646	5.1733	5.2876	5.4080	5.5349	5.6687	5.8100
1180	4.4433	4.5179	4.5960	4.6778	4.7634	4.8531	4.9471	5.0456	5.1490	5.2576	5.3716	5.4915	5.6177	5.7507
1190	4.4511	4.5230	4.5981	4.6766	4.7587	4.8445	4.9343	5.0283	5.1268	5.2300	5.3381	5.4517	5.5708	5.6961
1200	4.4589	4.5282	4.6004	4.6759	4.7546	4.8368	4.9227	5.0125	5.1064	5.2045	5.3073	5.4149	5.5277	5.6459
1210	4.4668	4.5335	4.6031	4.6756	4.7512	4.8301	4.9123	4.9981	5.0876	5.1812	5.2789	5.3810	5.4878	5.5996
1220	4.4746	4.5390	4.6061	4.6758	4.7485	4.8241	4.9029	4.9849	5.0705	5.1596	5.2527	5.3497	5.4511	5.5569
1230	4.4825	4.5447	4.6093	4.6764	4.7462	4.8189	4.8944	4.9730	5.0547	5.1399	5.2285	5.3209	5.4172	5.5175
1240	4.4904	4.5504	4.6127	4.6774	4.7446	4.8143	4.8868	4.9621	5.0403	5.1217	5.2063	5.2943	5.3858	5.4811
1250	4.4983	4.5563	4.6164	4.6787	4.7434	4.8105	4.8801	4.9523	5.0272	5.1050	5.1858	5.2697	5.3569	5.4475
1260	4.5062	4.5622	4.6203	4.6804	4.7427	4.8072	4.8741	4.9434	5.0152	5.0897	5.1669	5.2470	5.3301	5.4164
1270	4.5142	4.5683	4.6244	4.6824	4.7424	4.8046	4.8689	4.9354	5.0043	5.0757	5.1495	5.2261	5.3054	5.3876
1280	4.5221	4.5745	4.6287	4.6847	4.7426	4.8024	4.8643	4.9283	4.9944	5.0628	5.1336	5.2068	5.2826	5.3610
1290	4.5301	4.5808	4.6332	4.6873	4.7431	4.8008	4.8604	4.9219	4.9854	5.0511	5.1189	5.1890	5.2615	5.3364
1300	4.5380	4.5872	4.6378	4.6901	4.7440	4.7997	4.8570	4.9163	4.9774	5.0404	5.1055	5.1726	5.2420	5.3136
1310	4.5460	4.5936	4.6427	4.6932	4.7453	4.7990	4.8543	4.9113	4.9701	5.0307	5.0932	5.1576	5.2240	5.2925
1320	4.5541	4.6002	4.6476	4.6965	4.7469	4.7987	4.8521	4.9070	4.9636	5.0219	5.0819	5.1437	5.2074	5.2730
1330	4.5621	4.6068	4.6528	4.7001	4.7488	4.7988	4.8503	4.9033	4.9578	5.0139	5.0716	5.1310	5.1921	5.2550
1340	4.5702	4.6135	4.6581	4.7039	4.7509	4.7993	4.8491	4.9002	4.9528	5.0068	5.0623	5.1194	5.1781	5.2384
1350	4.5782	4.6203	4.6635	4.7078	4.7534	4.8002	4.8483	4.8976	4.9483	5.0004	5.0538	5.1087	5.1651	5.2231
1360	4.5863	4.6271	4.6690	4.7120	4.7561	4.8014	4.8479	4.8956	4.9445	4.9947	5.0462	5.0990	5.1533	5.2089
1370	4.5944	4.6341	4.6747	4.7164	4.7591	4.8030	4.8479	4.8940	4.9412	4.9896	5.0393	5.0902	5.1424	5.1959
1380	4.6026	4.6411	4.6805	4.7209	4.7624	4.8048	4.8483	4.8928	4.9385	4.9852	5.0331	5.0822	5.1325	5.1840
1390	4.6107	4.6481	4.6864	4.7257	4.7658	4.8069	4.8490	4.8921	4.9363	4.9814	5.0277	5.0750	5.1235	5.1731
1400	4.6189	4.6553	4.6925	4.7305	4.7695	4.8094	4.8501	4.8918	4.9345	4.9782	5.0228	5.0685	5.1152	5.1630
1410	4.6271	4.6625	4.6986	4.7356	4.7734	4.8120	4.8515	4.8919	4.9332	4.9755	5.0186	5.0627	5.1078	5.1539
1420	4.6354	4.6697	4.7049	4.7408	4.7775	4.8150	4.8533	4.8924	4.9324	4.9732	5.0150	5.0576	5.1011	5.1456
1430	4.6436	4.6771	4.7112	4.7461	4.7818	4.8182	4.8553	4.8932	4.9320	4.9715	5.0119	5.0531	5.0951	5.1381
1440	4.6519	4.6845	4.7177	4.7516	4.7862	4.8216	4.8576	4.8944	4.9319	4.9702	5.0093	5.0492	5.0898	5.1313
1450	4.6603	4.6919	4.7243	4.7573	4.7909	4.8252	4.8602	4.8959	4.9323	4.9694	5.0072	5.0458	5.0851	5.1252
1460	4.6686	4.6995	4.7309	4.7630	4.7957	4.8291	4.8631	4.8977	4.9330	4.9690	5.0056	5.0429	5.0810	5.1198
1470	4.6770	4.7071	4.7377	4.7689	4.8007	4.8331	4.8662	4.8998	4.9340	4.9689	5.0044	5.0406	5.0775	5.1150
1480	4.6854	4.7147	4.7446	4.7750	4.8059	4.8374	4.8695	4.9022	4.9354	4.9692	5.0037	5.0388	5.0744	5.1108
1490	4.6939	4.7225	4.7515	4.7811	4.8112	4.8419	4.8731	4.9048	4.9371	4.9699	5.0034	5.0374	5.0719	5.1071
1500	4.7024	4.7303	4.7586	4.7874	4.8167	4.8465	4.8769	4.9077	4.9391	4.9710	5.0034	5.0364	5.0699	5.1040

Plenum temperature, °R	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220
1100	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
1110	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
1120	21.3085	25.5850	42.9593	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
1130	17.6796	20.0728	23.4098	28.5213	37.8178	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
1140	15.3821	16.9652	18.4728	21.6300	25.3730	31.1927	42.0585	-------	-------	-------	-------	-------	-------	-------	-------
1150	13.7637	14.9169	16.2953	17.9913	20.1439	22.9940	27.0038	33.2092	44.6232	77.0011	-------	-------	-------	-------	-------
1160	12.5644	13.4448	14.4666	15.6700	17.1130	18.8829	21.1180	24.0529	28.1246	34.2637	44.9321	70.1126	509.0436	-------	-------
1170	10.4913	11.0532	11.6876	12.4111	13.2456	14.2215	15.3818	16.7902	18.5445	20.8052	23.8559	28.2551	35.2905	48.8356	89.3787
1180	9.9435	10.4162	10.9416	11.5297	12.1934	12.9494	13.8201	14.8360	16.0401	17.4947	19.2942	21.5889	24.6347	28.9061	35.3949
1190	9.4823	9.8873	10.3318	10.8222	11.3666	11.9750	12.6601	13.4384	14.3316	15.3691	16.5912	18.0552	19.8454	22.0908	24.9987
1200	9.0885	9.4404	9.8227	10.2399	10.6970	11.2005	11.7581	12.3794	13.0767	13.8654	14.7657	15.8042	17.0167	18.4524	20.1810
1210	8.7480	9.0574	9.3908	9.7512	10.1421	10.5678	11.0332	11.5443	12.1085	12.7347	13.4340	14.2205	15.1119	16.1309	17.3076
1220	8.4506	8.7253	9.0193	9.3347	9.6740	10.0401	10.4362	10.8663	11.3351	11.8480	12.4118	13.0345	13.7257	14.4975	15.3649
1230	8.1888	8.4347	8.6964	8.9754	9.2734	9.5924	9.9349	10.3034	10.7010	11.1312	11.5984	12.1073	12.6638	13.2748	13.9484
1240	7.9566	8.1784	8.4131	8.6620	8.9264	9.2077	9.5075	9.8278	10.1705	10.5381	10.9335	11.3596	11.8202	12.3195	12.8624
1250	7.7494	7.9506	8.1626	8.3865	8.6230	8.8733	9.1386	9.4202	9.7196	10.0384	10.3786	10.7422	11.1316	11.5497	11.9993
1260	7.5634	7.7470	7.9397	8.1423	8.3555	8.5800	8.8169	9.0669	9.3313	9.6112	9.9079	10.2228	10.5577	10.9143	11.2946
1270	7.3958	7.5640	7.7401	7.9246	8.1179	8.3207	8.5338	8.7577	8.9933	9.2415	9.5032	9.7774	10.0713	10.3801	10.7072
1280	7.2441	7.3989	7.5608	7.7293	7.9056	8.0900	8.2829	8.4848	8.6965	8.9184	9.1514	9.3962	9.6535	9.9243	10.2095
1290	7.1062	7.2493	7.3983	7.5534	7.7150	7.8834	8.0590	8.2423	8.4337	8.6337	8.8428	9.0615	9.2905	9.5304	9.7819
1300	6.9805	7.1132	7.2511	7.3942	7.5429	7.6975	7.8582	8.0255	8.1996	8.3810	8.5699	8.7669	8.9723	9.1867	9.4105
1310	6.8656	6.9891	7.1170	7.2496	7.3870	7.5294	7.6773	7.8306	7.9898	8.1552	8.3270	8.5055	8.6911	8.8841	9.0849
1320	6.7603	6.8755	6.9946	7.1177	7.2452	7.3770	7.5134	7.6547	7.8009	7.9524	8.1094	8.2721	8.4408	8.6157	8.7971
1330	6.6635	6.7713	6.8825	6.9972	7.1158	7.2381	7.3645	7.4951	7.6300	7.7695	7.9136	8.0626	8.2168	8.3762	8.5411
1340	6.5744	6.6754	6.7795	6.8868	6.9973	7.1113	7.2288	7.3499	7.4748	7.6037	7.7366	7.8737	8.0152	8.1612	8.3119
1350	6.4922	6.5871	6.6848	6.7853	6.8887	6.9951	7.1046	7.2173	7.3334	7.4528	7.5758	7.7025	7.8329	7.9672	8.1056
1360	6.4162	6.5056	6.5974	6.6918	6.7888	6.8884	6.9907	7.0960	7.2041	7.3152	7.4294	7.5468	7.6675	7.7916	7.9191
1370	6.3459	6.4302	6.5167	6.6055	6.6966	6.7901	6.8861	6.9845	7.0855	7.1892	7.2956	7.4048	7.5169	7.6319	7.7499
1380	6.2806	6.3604	6.4421	6.5258	6.6116	6.6995	6.7896	6.8820	6.9766	7.0736	7.1729	7.2748	7.3792	7.4861	7.5957
1390	6.2201	6.2956	6.3729	6.4519	6.5329	6.6158	6.7006	6.7874	6.8762	6.9672	7.0602	7.1555	7.2530	7.3527	7.4548
1400	6.1639	6.2354	6.3086	6.3835	6.4600	6.5382	6.6182	6.7000	6.7836	6.8690	6.9564	7.0457	7.1370	7.2303	7.3257
1410	6.1115	6.1795	6.2489	6.3199	6.3923	6.4663	6.5419	6.6191	6.6979	6.7784	6.8606	6.9445	7.0102	7.1177	7.2070
1420	6.0628	6.1275	6.1934	6.2608	6.3295	6.3996	6.4711	6.5441	6.6185	6.6945	6.7720	6.8510	6.9316	7.0138	7.0977
1430	6.0174	6.0790	6.1417	6.2057	6.2710	6.3375	6.4053	6.4744	6.5449	6.6167	6.6899	6.7645	6.8404	6.9177	6.9967
1440	5.9751	6.0338	6.0936	6.1545	6.2165	6.2797	6.3441	6.4097	6.4765	6.5445	6.6137	6.6842	6.7560	6.8290	6.9034
1450	5.9356	5.9916	6.0487	6.1067	6.1658	6.2259	6.2872	6.3495	6.4128	6.4773	6.5429	6.6097	6.6776	6.7466	6.8169
1460	5.8987	5.9523	6.0067	6.0621	6.1185	6.1758	6.2341	6.2933	6.3536	6.4148	6.4771	6.5404	6.6048	6.6701	6.7366
1470	5.8643	5.9155	5.9676	6.0205	6.0743	6.1290	6.1845	6.2410	6.2983	6.3566	6.4158	6.4759	6.5370	6.5990	6.6620
1480	5.8322	5.8812	5.9310	5.9816	6.0330	6.0852	6.1383	6.1921	6.2468	6.3023	6.3586	6.4158	6.4739	6.5328	6.5925
1490	5.8021	5.8491	5.8969	5.9453	5.9945	6.0444	6.0951	6.1465	6.1986	6.2516	6.3053	6.3597	6.4150	6.4710	6.5278
1500	5.7741	5.8192	5.8649	5.9113	5.9584	6.0062	6.0547	6.1038	6.1537	6.2042	6.2554	6.3074	6.3600	6.4134	6.4675

THERMODYNAMIC PROPERTIES OF STEAM

Plenum specific heat

Pressure, atm

70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
7.0663	7.4180	7.8080	8.2425	8.7298	9.2805	9.9087	10.6334	11.4811	12.4899	13.7176	15.2561	17.2635	20.0411		
6.8781	7.1942	7.5419	7.9260	8.3526	8.8291	9.3654	9.9739	10.6717	11.4819	12.4372	13.5859	15.0025	16.8095	19.2265	22.6982
6.7115	6.9970	7.3091	7.6513	8.0282	8.4451	8.9091	9.4287	10.0152	10.6835	11.4535	12.3528	13.4212	14.7179	16.3366	18.4355
6.5631	6.8225	7.1042	7.4112	7.7467	8.1149	8.5208	8.9705	9.4718	10.0345	10.6714	11.3995	12.2419	13.2306	14.4124	15.8577
6.4306	6.6672	6.9228	7.1998	7.5006	7.8284	8.1869	8.5804	9.0146	9.4962	10.0337	10.6381	11.3236	12.1092	13.0206	14.0940
6.3118	6.5284	6.7615	7.0127	7.2841	7.5779	7.8970	8.2447	8.6250	9.0426	9.5035	10.0150	10.5864	11.2294	11.9594	12.7969
6.2048	6.4040	6.6174	6.8464	7.0924	7.3574	7.6435	7.9532	8.2893	8.6555	9.0558	9.4955	9.9806	10.5189	11.1201	11.7966
5.9594	6.1175	6.2852	6.4632	6.6527	6.8546	7.0704	7.3014	7.5494	7.8164	8.1049	8.4175	8.7578	9.1297	9.5383	9.9896
5.8908	6.0388	6.1952	6.3608	6.5363	6.7227	6.9211	7.1325	7.3584	7.6003	7.8600	8.1397	8.4418	8.7693	9.1258	9.5154
5.8279	5.9666	6.1129	6.2673	6.4304	6.6031	6.7861	6.9805	7.1872	7.4075	7.6428	7.8948	8.1652	8.4564	8.7709	9.1117
5.7700	5.9004	6.0375	6.1818	6.3338	6.4943	6.6637	6.8430	7.0330	7.2347	7.4491	7.6775	7.9213	8.1823	8.4623	8.7635
5.7167	5.8395	5.9682	6.1034	6.2455	6.3950	6.5524	6.7184	6.8937	7.0790	7.2753	7.4835	7.7047	7.9402	8.1915	8.4601
5.6676	5.7834	5.9045	6.0314	6.1645	6.3041	6.4508	6.6050	6.7673	6.9383	7.1188	7.3094	7.5112	7.7250	7.9520	8.1934
5.6223	5.7316	5.8459	5.9653	6.0901	6.2209	6.3579	6.5015	6.6522	6.8106	6.9772	7.1525	7.3374	7.5326	7.7389	7.9573
5.5804	5.6839	5.7918	5.9043	6.0217	6.1444	6.2727	6.4068	6.5472	6.6943	6.8486	7.0105	7.1807	7.3597	7.5481	7.7468
5.5417	5.6398	5.7418	5.8480	5.9587	6.0741	6.1944	6.3200	6.4511	6.5882	6.7315	6.8816	7.0388	7.2036	7.3765	7.5583
5.5059	5.5990	5.6956	5.7961	5.9006	6.0092	6.1224	6.2402	6.3630	6.4910	6.6246	6.7641	6.9098	7.0621	7.2215	7.3885
5.4728	5.5612	5.6529	5.7480	5.8468	5.9494	6.0560	6.1668	6.2820	6.4019	6.5267	6.6567	6.7922	6.9335	7.0809	7.2349
5.4422	5.5263	5.6134	5.7036	5.7971	5.8941	5.9947	6.0991	6.2074	6.3200	6.4369	6.5584	6.6847	6.8162	6.9530	7.0955
5.4138	5.4939	5.5767	5.6624	5.7511	5.8430	5.9381	6.0366	6.1387	6.2445	6.3542	6.4680	6.5862	6.7088	6.8362	6.9686
5.3875	5.4639	5.5428	5.6243	5.7085	5.7956	5.8856	5.9788	6.0751	6.1748	6.2781	6.3850	6.4957	6.6104	6.7293	6.8526
5.3632	5.4361	5.5113	5.5889	5.6690	5.7517	5.8371	5.9253	6.0164	6.1105	6.2078	6.3084	6.4123	6.5199	6.6312	6.7464
5.3406	5.4103	5.4821	5.5560	5.6323	5.7109	5.7920	5.8757	5.9619	6.0510	6.1428	6.2376	6.3355	6.4366	6.5410	6.6488
5.3197	5.3864	5.4550	5.5256	5.5983	5.6731	5.7502	5.8297	5.9115	5.9958	6.0827	6.1722	6.2645	6.3597	6.4579	6.5591
5.3004	5.3642	5.4298	5.4973	5.5667	5.6380	5.7114	5.7870	5.8647	5.9446	6.0269	6.1117	6.1989	6.2887	6.3811	6.4763
5.2826	5.3437	5.4065	5.4710	5.5373	5.6054	5.6754	5.7473	5.8212	5.8971	5.9752	6.0555	6.1380	6.2229	6.3101	6.3999
5.2661	5.3247	5.3849	5.4466	5.5100	5.5751	5.6418	5.7104	5.7808	5.8530	5.9272	6.0034	6.0816	6.1619	6.2444	6.3292
5.2508	5.3071	5.3648	5.4240	5.4846	5.5469	5.6107	5.6761	5.7432	5.8120	5.8826	5.9550	6.0292	6.1054	6.1835	6.2636
5.2368	5.2908	5.3462	5.4030	5.4611	5.5206	5.5817	5.6442	5.7082	5.7738	5.8410	5.9099	5.9805	6.0528	6.1269	6.2028
5.2238	5.2758	5.3290	5.3835	5.4392	5.4963	5.5547	5.6145	5.6756	5.7383	5.8024	5.8680	5.9352	6.0039	6.0743	6.1464
5.2119	5.2619	5.3131	5.3654	5.4189	5.4736	5.5296	5.5868	5.6453	5.7052	5.7664	5.8290	5.8930	5.9585	6.0254	6.0939
5.2010	5.2492	5.2984	5.3487	5.4000	5.4526	5.5062	5.5611	5.6171	5.6744	5.7329	5.7926	5.8537	5.9161	5.9799	6.0450
5.1910	5.2374	5.2848	5.3332	5.3826	5.4330	5.4845	5.5371	5.5908	5.6456	5.7016	5.7588	5.8171	5.8767	5.9374	5.9995
5.1819	5.2266	5.2723	5.3188	5.3664	5.4149	5.4643	5.5148	5.5663	5.6189	5.6725	5.7272	5.7830	5.8399	5.8979	5.9571
5.1736	5.2167	5.2607	5.3056	5.3514	5.3980	5.4456	5.4941	5.5435	5.5940	5.6453	5.6977	5.7511	5.8055	5.8610	5.9175
5.1661	5.2077	5.2501	5.2934	5.3375	5.3824	5.4282	5.4748	5.5223	5.5707	5.6200	5.6703	5.7214	5.7735	5.8266	5.8806
5.1593	5.1995	5.2404	5.2822	5.3247	5.3680	5.4120	5.4569	5.5026	5.5491	5.5964	5.6446	5.6937	5.7436	5.7944	5.8461
5.1531	5.1920	5.2316	5.2719	5.3129	5.3546	5.3971	5.4403	5.4842	5.5290	5.5745	5.6208	5.6678	5.7157	5.7644	5.8140
5.1477	5.1853	5.2235	5.2624	5.3020	5.3423	5.3832	5.4249	5.4672	5.5102	5.5540	5.5985	5.6437	5.6897	5.7364	5.7839
5.1429	5.1793	5.2162	5.2538	5.2921	5.3309	5.3704	5.4106	5.4514	5.4928	5.5350	5.5778	5.6212	5.6654	5.7103	5.7559
5.1387	5.1739	5.2096	5.2460	5.2830	5.3205	5.3586	5.3974	5.4367	5.4767	5.5172	5.5585	5.6003	5.6428	5.6859	5.7297

Pressure, atm

225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
287.2437	92.7095	55.7976	44.4053	37.9463	33.7207	30.7133	28.4509	26.6808	25.2552	24.0813	23.0977	22.2619	21.5437	20.9298	20.4767
46.5674	70.3747	134.8649	120.2882	73.6727	59.8052	45.0069	38.9807	34.8751	31.8838	29.5995	27.7939	25.3286	25.1149	24.9926	23.2255
28.9234	34.9159	43.0723	57.2948	81.0521	99.7649	83.5567	64.2391	52.0884	44.3899	39.1691	35.4115	32.5792	30.3671	28.5908	27.1324
22.3036	24.7717	28.4199	33.0176	39.3577	48.2519	60.0968	71.5631	73.5277	65.5876	56.0868	48.4726	42.8065	38.5676	35.3227	32.7701
18.6814	20.1056	22.2530	24.6241	27.5576	31.2411	35.9055	41.7931	48.6511	55.4294	59.4573	58.7676	54.5986	49.4277	44.6455	40.6308
16.3463	17.4652	18.7513	20.2424	21.9867	24.1497	26.4910	29.4083	32.8716	36.8962	41.3242	45.6007	48.3561	50.2979	49.4561	47.0802
14.6946	15.5251	16.4543	17.4995	18.6815	20.0252	21.5601	23.3194	25.3381	27.6468	30.2585	33.1424	36.1837	39.1373	41.6214	43.1158
13.4545	14.1025	14.8139	15.5979	16.4648	17.4266	18.4970	19.6913	21.0258	22.5167	24.1776	26.0151	28.0206	30.1593	32.3552	34.4741
12.4840	13.0077	13.5750	14.1909	14.8611	15.5921	16.3910	17.2657	18.2245	19.2759	20.4279	21.6669	23.0560	24.5316	25.1034	27.7331
11.7009	12.1356	12.6016	13.1019	13.6398	14.2192	14.8441	15.5188	16.2480	17.0364	17.8887	18.8088	19.8001	20.8636	21.7975	23.1354
11.0541	11.4225	11.8140	12.2308	12.6748	13.1484	13.6541	14.1944	14.7721	15.3899	16.0507	16.7569	17.5108	18.3138	19.1663	20.0671
10.5101	10.8273	11.1623	11.5164	11.8908	12.2872	12.7071	13.1521	13.6239	14.1242	14.6548	15.2171	15.8128	16.4429	17.1061	17.8053
10.0457	10.3225	10.6133	10.9188	11.2401	11.5781	11.9339	12.3084	12.7029	13.1184	13.5559	14.0166	14.5014	15.0111	15.5463	16.1071
9.6443	9.8886	10.1440	10.4111	10.6906	10.9832	11.2895	11.6103	11.9463	12.2982	12.6668	13.0527	13.4566	13.8790	14.3205	14.7812
9.2939	9.5115	9.7381	9.9742	10.2201	10.4765	10.7438	11.0224	11.3127	11.6158	11.9316	12.2606	12.6035	12.9606	13.3321	13.7183
8.9854	9.1607	9.3435	9.5340	9.7126	10.3395	10.2753	10.5202	10.7745	11.0386	11.3129	11.5977	11.8932	12.1998	12.5177	12.8471
8.7117	8.8883	9.0710	9.2602	9.4565	9.6588	9.8687	10.0860	10.3110	10.5438	10.7849	11.0343	11.2923	11.5591	11.8347	12.1147
8.4674	8.6280	8.7937	8.9649	9.1416	9.3240	9.5124	9.7069	9.9077	10.1149	10.3288	10.5495	10.7772	11.0119	11.2537	11.4931
8.2481	8.3949	8.5461	8.7018	8.8622	9.0275	9.1977	9.3730	9.5536	9.7395	9.9309	10.1279	10.3306	10.5391	10.7535	10.9737
8.0503	8.1851	8.3236	8.4661	8.6126	8.7631	8.9178	9.0769	9.2403	9.4082	9.5807	9.7579	9.9398	10.1265	10.3181	10.5145
7.8710	7.9954	8.1229	8.2539	8.3882	8.5260	8.6674	8.8125	8.9613	9.1138	9.2703	9.4306	9.5950	9.7634	9.9357	10.1124
7.7080	7.8231	7.9410	8.0618	8.1856	8.3123	8.4422	8.5751	8.7113	8.8507	8.9933	9.1393	9.2887	9.4415	9.5977	9.7574
7.5593	7.6662	7.7755	7.8874	8.0019	8.1189	8.2386	8.3610	8.4862	8.6141	8.7448	8.8784	9.0149	9.1543	9.2966	9.4418
7.4231	7.5227	7.6245	7.7284	7.8345	7.9431	8.0539	8.1670	8.2825	8.4004	8.5207	8.6435	8.7688	8.8966	9.0269	9.1595
7.2982	7.3912	7.4861	7.5830	7.6819	7.7827	7.8856	7.9905	8.0975	8.2066	8.3178	8.4311	8.5466	8.6642	8.7842	8.9062
7.1831	7.2703	7.3591	7.4497	7.5420	7.6360	7.7319	7.8295	7.9289	8.0302	8.1333	8.2383	8.3451	8.4538	8.5644	8.6769
7.0771	7.1589	7.2422	7.3271	7.4135	7.5014	7.5909	7.6820	7.7747	7.8690	7.9649	8.0625	8.1617	8.2625	8.3650	8.4691
6.9790	7.0560	7.1344	7.2141	7.2951	7.3776	7.4614	7.5466	7.6333	7.7214	7.8108	7.9018	7.9941	8.0879	8.1832	8.2799
6.8883	6.9609	7.0347	7.1097	7.1859	7.2634	7.3421	7.4220	7.5032	7.5857	7.6694	7.7544	7.8406	7.9282	8.0170	8.1071
6.8041	6.8727	6.9423	7.0131	7.0849	7.1578	7.2319	7.3070	7.3833	7.4607	7.5392	7.6189	7.6996	7.7815	7.8645	7.9487
6.7259	6.7908	6.8567	6.9235	6.9913	7.0601	7.1299	7.2007	7.2725	7.3453	7.4191	7.4939	7.5698	7.6466	7.7244	7.8032
6.6532	6.7147	6.7771	6.8403	6.9045	6.9695	7.0355	7.1023	7.1700	7.2386	7.3081	7.3785	7.4499	7.5221	7.5951	7.6691
6.5854	6.6438	6.7030	6.7630	6.8238	6.8853	6.9477	7.0109	7.0749	7.1397	7.2053	7.2717	7.3389	7.4070	7.4758	7.5454
6.5223	6.5778	6.6340	6.6910	6.7486	6.8070	6.8662	6.9260	6.9866	7.0479	7.1099	7.1727	7.2362	7.3004	7.3653	7.4309

TABLE VII. - Continued.

(b) Plenum

Plenum temperature, °R	Plenum 0	1	2	3	4	5	6	7	8
700	1.3217	1.3336	------	------	------	------	------	------	------
710	1.3212	1.3325	1.3454	------	------	------	------	------	------
720	1.3206	1.3313	1.3435	------	------	------	------	------	------
730	1.3200	1.3302	1.3416	------	------	------	------	------	------
740	1.3194	1.3291	1.3399	1.3520	------	------	------	------	------
750	1.3188	1.3280	1.3382	1.3495	------	------	------	------	------
760	1.3182	1.3270	1.3366	1.3471	1.3589	------	------	------	------
770	1.3176	1.3259	1.3350	1.3449	1.3558	1.3679	------	------	------
780	1.3170	1.3249	1.3335	1.3428	1.3530	1.3642	1.3765	------	------
790	1.3164	1.3239	1.3320	1.3408	1.3503	1.3607	1.3720	------	------
800	1.3157	1.3229	1.3306	1.3389	1.3478	1.3574	1.3679	1.3792	1.3915
810	1.3151	1.3220	1.3293	1.3371	1.3454	1.3544	1.3641	1.3745	1.3858
820	1.3145	1.3210	1.3279	1.3353	1.3432	1.3516	1.3606	1.3702	1.3806
830	1.3138	1.3201	1.3267	1.3337	1.3411	1.3490	1.3574	1.3663	1.3759
840	1.3132	1.3191	1.3254	1.3321	1.3391	1.3465	1.3543	1.3627	1.3715
850	1.3125	1.3182	1.3242	1.3305	1.3371	1.3441	1.3515	1.3593	1.3675
860	1.3119	1.3173	1.3230	1.3290	1.3353	1.3419	1.3488	1.3561	1.3638
870	1.3112	1.3164	1.3219	1.3276	1.3335	1.3398	1.3463	1.3532	1.3604
880	1.3105	1.3155	1.3207	1.3262	1.3318	1.3378	1.3439	1.3504	1.3572
890	1.3099	1.3147	1.3196	1.3248	1.3302	1.3358	1.3417	1.3478	1.3541
900	1.3092	1.3138	1.3186	1.3235	1.3286	1.3340	1.3395	1.3453	1.3513
910	1.3085	1.3129	1.3175	1.3222	1.3271	1.3322	1.3375	1.3429	1.3486
920	1.3079	1.3121	1.3165	1.3210	1.3257	1.3305	1.3355	1.3407	1.3460
930	1.3072	1.3113	1.3155	1.3198	1.3243	1.3289	1.3336	1.3385	1.3436
940	1.3065	1.3104	1.3145	1.3186	1.3229	1.3273	1.3318	1.3365	1.3413
950	1.3059	1.3096	1.3135	1.3175	1.3215	1.3257	1.3301	1.3345	1.3391
960	1.3052	1.3088	1.3125	1.3163	1.3202	1.3243	1.3284	1.3326	1.3370
970	1.3045	1.3080	1.3116	1.3152	1.3190	1.3228	1.3268	1.3308	1.3350
980	1.3038	1.3072	1.3106	1.3141	1.3177	1.3214	1.3252	1.3291	1.3331
990	1.3032	1.3064	1.3097	1.3131	1.3165	1.3201	1.3237	1.3274	1.3312
1000	1.3025	1.3056	1.3088	1.3120	1.3154	1.3188	1.3222	1.3258	1.3294
1010	1.3018	1.3048	1.3079	1.3110	1.3142	1.3175	1.3208	1.3242	1.3277
1020	1.3011	1.3040	1.3070	1.3100	1.3131	1.3162	1.3194	1.3227	1.3260
1030	1.3004	1.3032	1.3061	1.3090	1.3120	1.3150	1.3181	1.3212	1.3244
1040	1.2998	1.3025	1.3052	1.3080	1.3109	1.3138	1.3168	1.3198	1.3229
1050	1.2991	1.3017	1.3044	1.3071	1.3098	1.3126	1.3155	1.3184	1.3213
1060	1.2984	1.3010	1.3035	1.3061	1.3088	1.3115	1.3142	1.3170	1.3199
1070	1.2977	1.3002	1.3027	1.3052	1.3078	1.3104	1.3130	1.3157	1.3185
1080	1.2971	1.2994	1.3019	1.3043	1.3068	1.3093	1.3118	1.3144	1.3171
1090	1.2964	1.2987	1.3010	1.3034	1.3058	1.3082	1.3107	1.3132	1.3157
1100	1.2957	1.2980	1.3002	1.3025	1.3048	1.3072	1.3095	1.3120	1.3144

Plenum temperature, °R	Plenum 55	60	65	70	75	80	85	90	95
700	------	------	------	------	------	------	------	------	------
710	------	------	------	------	------	------	------	------	------
720	------	------	------	------	------	------	------	------	------
730	------	------	------	------	------	------	------	------	------
740	------	------	------	------	------	------	------	------	------
750	------	------	------	------	------	------	------	------	------
760	------	------	------	------	------	------	------	------	------
770	------	------	------	------	------	------	------	------	------
780	------	------	------	------	------	------	------	------	------
790	------	------	------	------	------	------	------	------	------
800	------	------	------	------	------	------	------	------	------
810	------	------	------	------	------	------	------	------	------
820	------	------	------	------	------	------	------	------	------
830	------	------	------	------	------	------	------	------	------
840	------	------	------	------	------	------	------	------	------
850	------	------	------	------	------	------	------	------	------
860	------	------	------	------	------	------	------	------	------
870	------	------	------	------	------	------	------	------	------
880	------	------	------	------	------	------	------	------	------
890	------	------	------	------	------	------	------	------	------
900	------	------	------	------	------	------	------	------	------
910	------	------	------	------	------	------	------	------	------
920	------	------	------	------	------	------	------	------	------
930	------	------	------	------	------	------	------	------	------
940	------	------	------	------	------	------	------	------	------
950	------	------	------	------	------	------	------	------	------
960	------	------	------	------	------	------	------	------	------
970	------	------	------	------	------	------	------	------	------
980	1.7541	------	------	------	------	------	------	------	------
990	1.7087	1.8031	------	------	------	------	------	------	------
1000	1.6710	1.7504	1.8510	------	------	------	------	------	------
1010	1.6391	1.7072	1.7911	1.8973	------	------	------	------	------
1020	1.6118	1.6710	1.7423	1.8299	1.9409	------	------	------	------
1030	1.5881	1.6402	1.7018	1.7757	1.8665	1.9813	------	------	------
1040	1.5673	1.6137	1.6675	1.7310	1.8071	1.9003	2.0177	2.1715	------
1050	1.5489	1.5905	1.6381	1.6934	1.7584	1.8360	1.9308	2.0497	2.2043
1060	1.5325	1.5700	1.6126	1.6613	1.7176	1.7836	1.8622	1.9577	2.0767
1070	1.5178	1.5519	1.5902	1.6335	1.6830	1.7400	1.8065	1.8854	1.9867
1080	1.5044	1.5356	1.5703	1.6092	1.6531	1.7030	1.7603	1.8269	1.9055
1090	1.4923	1.5210	1.5526	1.5878	1.6270	1.6712	1.7212	1.7784	1.8447
1100	1.4813	1.5077	1.5367	1.5687	1.6041	1.6435	1.6877	1.7376	1.7944

THERMODYNAMIC PROPERTIES OF STEAM

specific heat ratio

pressure, atm

9	10	15	20	25	30	35	40	45	50
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1.3960	------	------	------	------	------	------	------	------	------
1.3917	1.4038	------	------	------	------	------	------	------	------
1.3861	1.3970	------	------	------	------	------	------	------	------
1.3810	1.3910	------	------	------	------	------	------	------	------
1.3763	1.3855	1.4414	------	------	------	------	------	------	------
1.3719	1.3805	1.4314	------	------	------	------	------	------	------
1.3679	1.3759	1.4225	------	------	------	------	------	------	------
1.3642	1.3716	1.4145	1.4703	------	------	------	------	------	------
1.3608	1.3677	1.4074	1.4579	------	------	------	------	------	------
1.3575	1.3640	1.4009	1.4469	1.5059	------	------	------	------	------
1.3545	1.3606	1.3949	1.4371	1.4901	------	------	------	------	------
1.3516	1.3573	1.3894	1.4283	1.4763	1.5368	------	------	------	------
1.3489	1.3543	1.3844	1.4204	1.4641	1.5181	1.5867	------	------	------
1.3463	1.3514	1.3797	1.4131	1.4532	1.5018	1.5623	------	------	------
1.3438	1.3487	1.3753	1.4065	1.4433	1.4875	1.5414	1.6085	------	------
1.3415	1.3461	1.3712	1.4004	1.4345	1.4748	1.5231	1.5822	1.6562	------
1.3393	1.3436	1.3674	1.3948	1.4264	1.4634	1.5071	1.5597	1.6241	[illegible]
1.3371	1.3413	1.3638	1.3895	1.4190	1.4531	1.4929	1.5401	1.5968	1.6664
1.3351	1.3391	1.3605	1.3847	1.4122	1.4437	1.4802	1.5228	1.5733	1.6540
1.3331	1.3369	1.3573	1.3801	1.4059	1.4352	1.4688	1.5075	1.5528	[illegible]
1.3312	1.3349	1.3542	1.3758	1.4001	1.4274	1.4584	1.4939	1.5348	1.5825
1.3294	1.3329	1.3513	1.3718	1.3947	1.4202	1.4490	1.4816	1.5188	1.5616
1.3277	1.3310	1.3486	1.3681	1.3896	1.4136	1.4404	1.4705	1.5045	1.5434
1.3263	1.3292	1.3460	1.3645	1.3849	1.4074	1.4324	1.4603	1.4917	1.5270
1.3243	1.3274	1.3435	1.3611	1.3804	1.4017	1.4251	1.4511	1.4800	1.5124
1.3228	1.3257	1.3411	1.3579	1.3762	1.3963	1.4183	1.4425	1.4694	1.4992
1.3212	1.3240	1.3388	1.3549	1.3723	1.3913	1.4120	1.4347	1.4596	1.4872
1.3197	1.3224	1.3366	1.3520	1.3686	1.3865	1.4061	1.4274	1.4507	1.4763
1.3183	1.3209	1.3345	1.3492	1.3650	1.3821	1.4006	1.4206	1.4424	1.4665
1.3169	1.3194	1.3325	1.3466	1.3617	1.3779	1.3954	1.4143	1.4348	[illegible]

pressure, atm

100	105	110	115	120	125	130	135	140	145	150
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2.2303	------	------	------	------	------	------	------	------	------	------
2.0987	2.2494	2.4505	------	------	------	------	------	------	------	------
1.9997	2.1155	2.2617	2.4539	2.7212	------	------	------	------	------	------
1.9223	2.0148	2.1273	2.2677	2.4493	2.6957	3.0555	------	------	------	------
1.8597	1.9359	2.0259	2.1343	2.2680	2.4378	2.6627	2.9790	------	------	------

TABLE VII. - Continued.

(b) Concluded.

Plenum temperature, °K	0	5	10	15	20	25	30	35	40	45	50	55	60	65
1100	1.2957	1.3072	1.3194	1.3325	1.3466	1.3617	1.3779	1.3954	1.4143	1.4348	1.4570	1.4813	1.5077	1.5367
1110	1.2951	1.3061	1.3179	1.3305	1.3440	1.3585	1.3739	1.3905	1.4084	1.4277	1.4485	1.4711	1.4956	1.5223
1120	1.2944	1.3051	1.3165	1.3286	1.3416	1.3554	1.3702	1.3860	1.4029	1.4211	1.4406	1.4617	1.4845	1.5093
1130	1.2937	1.3041	1.3151	1.3268	1.3393	1.3525	1.3666	1.3816	1.3977	1.4149	1.4333	1.4531	1.4744	1.4973
1140	1.2931	1.3031	1.3138	1.3250	1.3370	1.3497	1.3632	1.3775	1.3928	1.4091	1.4264	1.4450	1.4650	1.4864
1150	1.2924	1.3022	1.3125	1.3233	1.3348	1.3470	1.3599	1.3736	1.3882	1.4036	1.4200	1.4376	1.4563	1.4763
1160	1.2917	1.3012	1.3112	1.3217	1.3328	1.3445	1.3568	1.3699	1.3838	1.3985	1.4140	1.4306	1.4482	1.4669
1170	1.2911	1.3003	1.3099	1.3200	1.3307	1.3420	1.3538	1.3663	1.3795	1.3934	1.4082	1.4238	1.4403	1.4578
1180	1.2904	1.2993	1.3087	1.3185	1.3288	1.3396	1.3510	1.3630	1.3756	1.3890	1.4030	1.4178	1.4335	1.4501
1190	1.2898	1.2984	1.3075	1.3170	1.3269	1.3374	1.3484	1.3599	1.3720	1.3847	1.3981	1.4122	1.4271	1.4428
1200	1.2891	1.2975	1.3063	1.3155	1.3251	1.3352	1.3458	1.3568	1.3685	1.3806	1.3934	1.4069	1.4210	1.4359
1210	1.2885	1.2966	1.3052	1.3141	1.3234	1.3331	1.3433	1.3539	1.3651	1.3768	1.3890	1.4019	1.4153	1.4295
1220	1.2878	1.2957	1.3040	1.3127	1.3217	1.3311	1.3409	1.3512	1.3619	1.3731	1.3848	1.3971	1.4099	1.4234
1230	1.2872	1.2949	1.3029	1.3113	1.3200	1.3291	1.3386	1.3485	1.3588	1.3696	1.3808	1.3925	1.4048	1.4176
1240	1.2865	1.2940	1.3018	1.3100	1.3184	1.3272	1.3364	1.3459	1.3558	1.3662	1.3770	1.3882	1.3999	1.4122
1250	1.2859	1.2932	1.3008	1.3086	1.3168	1.3254	1.3342	1.3434	1.3530	1.3629	1.3733	1.3841	1.3953	1.4070
1260	1.2852	1.2923	1.2997	1.3074	1.3153	1.3236	1.3321	1.3410	1.3502	1.3598	1.3698	1.3801	1.3909	1.4020
1270	1.2846	1.2915	1.2987	1.3061	1.3138	1.3218	1.3301	1.3387	1.3476	1.3568	1.3664	1.3763	1.3866	1.3973
1280	1.2839	1.2907	1.2977	1.3049	1.3124	1.3201	1.3281	1.3364	1.3450	1.3539	1.3631	1.3727	1.3826	1.3929
1290	1.2833	1.2899	1.2967	1.3037	1.3110	1.3185	1.3262	1.3343	1.3426	1.3511	1.3600	1.3692	1.3787	1.3886
1300	1.2826	1.2891	1.2957	1.3025	1.3096	1.3169	1.3244	1.3321	1.3402	1.3485	1.3570	1.3659	1.3750	1.3845
1310	1.2820	1.2883	1.2947	1.3013	1.3082	1.3153	1.3226	1.3301	1.3379	1.3459	1.3541	1.3627	1.3715	1.3806
1320	1.2814	1.2875	1.2937	1.3002	1.3069	1.3137	1.3208	1.3281	1.3356	1.3434	1.3514	1.3596	1.3681	1.3768
1330	1.2807	1.2867	1.2928	1.2991	1.3056	1.3123	1.3191	1.3262	1.3335	1.3410	1.3487	1.3566	1.3648	1.3732
1340	1.2801	1.2859	1.2919	1.2980	1.3043	1.3108	1.3175	1.3243	1.3314	1.3386	1.3461	1.3538	1.3616	1.3697
1350	1.2795	1.2851	1.2909	1.2969	1.3031	1.3094	1.3158	1.3225	1.3293	1.3364	1.3436	1.3510	1.3586	1.3664
1360	1.2788	1.2844	1.2900	1.2959	1.3018	1.3080	1.3143	1.3207	1.3274	1.3342	1.3411	1.3483	1.3557	1.3632
1370	1.2782	1.2836	1.2891	1.2948	1.3006	1.3066	1.3127	1.3190	1.3254	1.3320	1.3388	1.3457	1.3528	1.3601
1380	1.2776	1.2828	1.2882	1.2938	1.2994	1.3053	1.3112	1.3173	1.3236	1.3300	1.3365	1.3432	1.3501	1.3571
1390	1.2770	1.2821	1.2874	1.2928	1.2983	1.3039	1.3097	1.3157	1.3217	1.3279	1.3343	1.3408	1.3475	1.3543
1400	1.2763	1.2814	1.2865	1.2918	1.2971	1.3027	1.3083	1.3141	1.3200	1.3260	1.3322	1.3385	1.3449	1.3515
1410	1.2757	1.2806	1.2856	1.2908	1.2960	1.3014	1.3069	1.3125	1.3182	1.3241	1.3301	1.3362	1.3424	1.3488
1420	1.2751	1.2799	1.2848	1.2898	1.2949	1.3002	1.3055	1.3110	1.3165	1.3222	1.3280	1.3340	1.3400	1.3462
1430	1.2745	1.2791	1.2839	1.2888	1.2938	1.2989	1.3041	1.3095	1.3149	1.3204	1.3261	1.3318	1.3377	1.3437
1440	1.2738	1.2784	1.2831	1.2879	1.2928	1.2977	1.3028	1.3080	1.3133	1.3186	1.3241	1.3297	1.3354	1.3412
1450	1.2732	1.2777	1.2823	1.2869	1.2917	1.2966	1.3015	1.3066	1.3117	1.3169	1.3223	1.3277	1.3332	1.3389
1460	1.2726	1.2770	1.2814	1.2860	1.2907	1.2954	1.3002	1.3051	1.3101	1.3152	1.3204	1.3257	1.3311	1.3365
1470	1.2720	1.2763	1.2806	1.2851	1.2896	1.2943	1.2990	1.3038	1.3086	1.3136	1.3186	1.3238	1.3290	1.3343
1480	1.2713	1.2755	1.2798	1.2842	1.2886	1.2931	1.2977	1.3024	1.3072	1.3120	1.3169	1.3219	1.3270	1.3321
1490	1.2707	1.2748	1.2790	1.2833	1.2876	1.2920	1.2965	1.3011	1.3057	1.3104	1.3152	1.3201	1.3250	1.3300
1500	1.2701	1.2741	1.2782	1.2824	1.2866	1.2909	1.2954	1.2998	1.3043	1.3089	1.3135	1.3183	1.3231	1.3279

Plenum temperature, °K	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220
1100	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1110	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
1120	3.1585	3.6644	4.5512	------	------	------	------	------	------	------	------	------	------	------	------
1130	2.7490	3.0284	3.4232	4.0367	5.1708	------	------	------	------	------	------	------	------	------	------
1140	2.4946	2.6776	2.9123	3.2266	3.6751	4.3822	5.7229	------	------	------	------	------	------	------	------
1150	2.3185	2.4502	2.6100	2.8085	3.0631	3.4039	3.8893	4.6504	6.0714	10.1780	------	------	------	------	------
1160	2.1883	2.2889	2.4066	2.5464	2.7154	2.9247	3.1915	3.5456	4.0423	4.8006	6.1372	9.3485	67.4789	------	------
1170	2.0791	2.1575	2.2468	2.3494	2.4688	2.6096	2.7785	2.9854	3.2455	3.5840	4.0455	4.7185	5.8083	7.9379	14.4906
1180	2.0049	2.0704	2.1437	2.2263	2.3203	2.4281	2.5532	2.7003	2.8761	3.0902	3.3573	3.7010	4.1616	4.8140	5.8166
1190	1.9428	1.9985	2.0601	2.1284	2.2047	2.2906	2.3880	2.4993	2.6279	2.7784	2.9569	3.1723	3.4377	3.7732	4.2115
1200	1.8899	1.9381	1.9907	2.0484	2.1120	2.1824	2.2608	2.3487	2.4480	2.5609	2.6905	2.8410	3.0177	3.2284	3.4837
1210	1.8444	1.8865	1.9321	1.9816	2.0356	2.0947	2.1596	2.2312	2.3106	2.3992	2.4987	2.6111	2.7392	2.8863	3.0571
1220	1.8046	1.8418	1.8819	1.9250	1.9715	2.0220	2.0768	2.1365	2.2019	2.2738	2.3531	2.4410	2.5390	2.6489	2.7730
1230	1.7696	1.8028	1.8383	1.8762	1.9169	1.9606	2.0076	2.0584	2.1134	2.1731	2.2382	2.3093	2.3873	2.4733	2.5683
1240	1.7385	1.7683	1.8000	1.8338	1.8697	1.9080	1.9489	1.9928	2.0398	2.0905	2.1450	2.2040	2.2679	2.3374	2.4131
1250	1.7106	1.7377	1.7662	1.7964	1.8284	1.8624	1.8984	1.9367	1.9776	2.0211	2.0677	2.1176	2.1712	2.2287	2.2908
1260	1.6856	1.7102	1.7361	1.7633	1.7921	1.8224	1.8544	1.8882	1.9241	1.9621	2.0025	2.0453	2.0910	2.1397	2.1916
1270	1.6629	1.6854	1.7090	1.7338	1.7597	1.7870	1.8157	1.8459	1.8776	1.9112	1.9465	1.9839	2.0234	2.0652	2.1095
1280	1.6423	1.6630	1.6846	1.7072	1.7308	1.7555	1.7814	1.8085	1.8369	1.8667	1.8980	1.9309	1.9655	2.0019	2.0402
1290	1.6234	1.6425	1.6624	1.6831	1.7047	1.7272	1.7507	1.7752	1.8008	1.8275	1.8555	1.8847	1.9153	1.9473	1.9809
1300	1.6060	1.6238	1.6421	1.6612	1.6811	1.7017	1.7231	1.7454	1.7686	1.7927	1.8179	1.8441	1.8714	1.8998	1.9295
1310	1.5901	1.6065	1.6236	1.6412	1.6595	1.6785	1.6981	1.7185	1.7397	1.7616	1.7844	1.8080	1.8325	1.8580	1.8845
1320	1.5753	1.5906	1.6065	1.6229	1.6398	1.6573	1.6755	1.6942	1.7135	1.7336	1.7543	1.7758	1.7979	1.8209	1.8447
1330	1.5616	1.5759	1.5907	1.6060	1.6217	1.6380	1.6547	1.6720	1.6898	1.7082	1.7272	1.7467	1.7669	1.7878	1.8093
1340	1.5488	1.5623	1.5762	1.5904	1.6051	1.6202	1.6357	1.6517	1.6682	1.6851	1.7025	1.7205	1.7389	1.7580	1.7775
1350	1.5369	1.5496	1.5626	1.5759	1.5896	1.6037	1.6182	1.6330	1.6483	1.6640	1.6801	1.6966	1.7136	1.7310	1.7489
1360	1.5258	1.5377	1.5499	1.5625	1.5753	1.5885	1.6020	1.6158	1.6300	1.6446	1.6595	1.6748	1.6904	1.7065	1.7229
1370	1.5154	1.5266	1.5381	1.5499	1.5620	1.5743	1.5870	1.5999	1.6132	1.6267	1.6406	1.6547	1.6692	1.6841	1.6992
1380	1.5056	1.5162	1.5271	1.5382	1.5496	1.5612	1.5730	1.5852	1.5975	1.6102	1.6231	1.6363	1.6498	1.6635	1.6775
1390	1.4963	1.5064	1.5167	1.5272	1.5379	1.5489	1.5600	1.5714	1.5830	1.5949	1.6069	1.6192	1.6318	1.6446	1.6576
1400	1.4876	1.4972	1.5069	1.5169	1.5270	1.5373	1.5478	1.5586	1.5695	1.5806	1.5919	1.6034	1.6152	1.6271	1.6392
1410	1.4794	1.4885	1.4977	1.5071	1.5167	1.5265	1.5364	1.5466	1.5568	1.5673	1.5779	1.5887	1.5997	1.6109	1.6222
1420	1.4716	1.4802	1.4890	1.4980	1.5071	1.5163	1.5257	1.5353	1.5450	1.5548	1.5647	1.5750	1.5853	1.5958	1.6064
1430	1.4642	1.4724	1.4808	1.4893	1.4980	1.5067	1.5156	1.5247	1.5339	1.5432	1.5526	1.5622	1.5719	1.5817	1.5917
1440	1.4571	1.4650	1.4730	1.4811	1.4893	1.4977	1.5061	1.5147	1.5234	1.5322	1.5411	1.5502	1.5593	1.5686	1.5780
1450	1.4505	1.4580	1.4656	1.4733	1.4812	1.4891	1.4972	1.5053	1.5136	1.5219	1.5304	1.5389	1.5475	1.5563	1.5651
1460	1.4441	1.4513	1.4586	1.4660	1.4734	1.4810	1.4887	1.4964	1.5042	1.5122	1.5202	1.5283	1.5365	1.5447	1.5531
1470	1.4380	1.4449	1.4519	1.4589	1.4661	1.4733	1.4806	1.4880	1.4954	1.5030	1.5106	1.5183	1.5260	1.5338	1.5417
1480	1.4322	1.4388	1.4455	1.4522	1.4591	1.4660	1.4729	1.4800	1.4871	1.4943	1.5015	1.5088	1.5162	1.5236	1.5311
1490	1.4267	1.4330	1.4394	1.4459	1.4524	1.4590	1.4657	1.4724	1.4792	1.4860	1.4929	1.4998	1.5068	1.5139	1.5210
1500	1.4213	1.4274	1.4336	1.4398	1.4460	1.4524	1.4587	1.4652	1.4716	1.4782	1.4847	1.4913	1.4980	1.5047	1.5115

70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
1.5687	1.6041	1.6435	1.6877	1.7376	1.7944	1.8597	1.9359	2.0259	2.1343	2.2680	2.4378	2.6627	2.9790	0.	0.
1.5516	1.5837	1.6192	1.6586	1.7026	1.7520	1.8080	1.8721	1.9463	2.0333	2.1370	2.2631	2.4207	2.6244	2.9010	3.3045
1.5362	1.5655	1.5977	1.6331	1.6722	1.7158	1.7645	1.8194	1.8819	1.9537	2.0372	2.1357	2.2540	2.3992	2.5827	2.8218
1.5222	1.5491	1.5784	1.6105	1.6456	1.6843	1.7272	1.7750	1.8286	1.8892	1.9584	2.0380	2.1310	2.2413	2.3744	2.5390
1.5094	1.5342	1.5611	1.5903	1.6221	1.6568	1.6950	1.7370	1.7837	1.8357	1.8942	1.9604	2.0360	2.1234	2.2257	2.3472
1.4977	1.5207	1.5455	1.5722	1.6011	1.6325	1.6667	1.7041	1.7452	1.7905	1.8408	1.8969	1.9600	2.0315	2.1133	2.2078
1.4869	1.5083	1.5312	1.5558	1.5823	1.6108	1.6418	1.6753	1.7118	1.7518	1.7956	1.8440	1.8977	1.9576	2.0249	2.1012
1.4765	1.4963	1.5175	1.5401	1.5643	1.5902	1.6181	1.6481	1.6805	1.7157	1.7540	1.7957	1.8415	1.8918	1.9476	2.0096
1.4676	1.4863	1.5061	1.5271	1.5496	1.5716	1.5992	1.6267	1.6563	1.6881	1.7225	1.7597	1.8002	1.8444	1.8928	1.9460
1.4594	1.4769	1.4955	1.5152	1.5361	1.5584	1.5820	1.6073	1.6344	1.6633	1.6944	1.7279	1.7641	1.8032	1.8457	1.8921
1.4516	1.4682	1.4856	1.5041	1.5237	1.5444	1.5663	1.5897	1.6145	1.6411	1.6694	1.6997	1.7322	1.7672	1.8049	1.8457
1.4444	1.4600	1.4765	1.4938	1.5121	1.5315	1.5519	1.5735	1.5965	1.6209	1.6468	1.6744	1.7038	1.7353	1.7691	1.8053
1.4375	1.4523	1.4679	1.4842	1.5014	1.5195	1.5386	1.5587	1.5800	1.6025	1.6263	1.6516	1.6784	1.7069	1.7374	1.7698
1.4310	1.4451	1.4598	1.4752	1.4914	1.5084	1.5263	1.5451	1.5648	1.5857	1.6077	1.6309	1.6555	1.6815	1.7091	1.7384
1.4249	1.4383	1.4522	1.4668	1.4821	1.4981	1.5148	1.5324	1.5509	1.5702	1.5906	1.6121	1.6347	1.6585	1.6837	1.7103
1.4191	1.4318	1.4451	1.4589	1.4733	1.4884	1.5042	1.5207	1.5379	1.5560	1.5750	1.5948	1.6157	1.6376	1.6607	1.6850
1.4137	1.4258	1.4384	1.4515	1.4651	1.4794	1.4942	1.5097	1.5259	1.5428	1.5605	1.5790	1.5984	1.6186	1.6399	1.6622
1.4084	1.4200	1.4320	1.4444	1.4574	1.4709	1.4849	1.4995	1.5148	1.5306	1.5472	1.5644	1.5824	1.6012	1.6209	1.6414
1.4035	1.4145	1.4260	1.4378	1.4501	1.4629	1.4762	1.4900	1.5043	1.5192	1.5348	1.5509	1.5677	1.5852	1.6034	1.6224
1.3988	1.4093	1.4202	1.4315	1.4433	1.4554	1.4680	1.4810	1.4946	1.5086	1.5232	1.5383	1.5541	1.5704	1.5874	1.6050
1.3943	1.4043	1.4148	1.4256	1.4368	1.4483	1.4603	1.4726	1.4854	1.4987	1.5124	1.5267	1.5414	1.5567	1.5726	1.5890
1.3899	1.3996	1.4096	1.4199	1.4306	1.4416	1.4530	1.4647	1.4768	1.4894	1.5024	1.5158	1.5296	1.5440	1.5588	1.5742
1.3858	1.3951	1.4047	1.4146	1.4247	1.4352	1.4461	1.4572	1.4687	1.4806	1.4929	1.5056	1.5186	1.5321	1.5461	1.5604
1.3819	1.3908	1.4000	1.4094	1.4192	1.4292	1.4395	1.4502	1.4611	1.4724	1.4840	1.4960	1.5083	1.5211	1.5342	1.5477
1.3781	1.3867	1.3955	1.4045	1.4139	1.4235	1.4333	1.4435	1.4539	1.4646	1.4756	1.4870	1.4987	1.5107	1.5230	1.5358
1.3745	1.3827	1.3912	1.3999	1.4088	1.4180	1.4274	1.4371	1.4470	1.4573	1.4677	1.4785	1.4896	1.5010	1.5126	1.5246
1.3710	1.3789	1.3870	1.3954	1.4040	1.4128	1.4218	1.4311	1.4406	1.4503	1.4603	1.4705	1.4810	1.4918	1.5029	1.5142
1.3676	1.3752	1.3831	1.3911	1.3994	1.4078	1.4165	1.4253	1.4344	1.4437	1.4532	1.4630	1.4729	1.4832	1.4937	1.5044
1.3644	1.3717	1.3793	1.3870	1.3949	1.4031	1.4113	1.4198	1.4285	1.4374	1.4465	1.4558	1.4653	1.4750	1.4850	1.4952
1.3612	1.3684	1.3756	1.3831	1.3907	1.3985	1.4065	1.4146	1.4229	1.4314	1.4401	1.4490	1.4581	1.4673	1.4768	1.4865
1.3582	1.3651	1.3721	1.3793	1.3866	1.3941	1.4018	1.4096	1.4176	1.4257	1.4340	1.4425	1.4512	1.4600	1.4690	1.4782
1.3553	1.3620	1.3687	1.3757	1.3827	1.3900	1.3973	1.4048	1.4125	1.4203	1.4283	1.4364	1.4447	1.4531	1.4617	1.4705
1.3525	1.3589	1.3655	1.3722	1.3790	1.3859	1.3930	1.4002	1.4076	1.4151	1.4227	1.4305	1.4384	1.4465	1.4547	1.4631
1.3498	1.3560	1.3623	1.3688	1.3754	1.3821	1.3889	1.3959	1.4029	1.4101	1.4175	1.4249	1.4325	1.4402	1.4481	1.4561
1.3471	1.3532	1.3593	1.3655	1.3719	1.3784	1.3849	1.3916	1.3985	1.4054	1.4124	1.4196	1.4269	1.4343	1.4418	1.4494
1.3446	1.3504	1.3564	1.3624	1.3685	1.3748	1.3811	1.3876	1.3941	1.4008	1.4076	1.4145	1.4215	1.4285	1.4357	1.4431
1.3421	1.3478	1.3535	1.3594	1.3653	1.3713	1.3775	1.3837	1.3900	1.3964	1.4030	1.4096	1.4163	1.4231	1.4300	1.4370
1.3397	1.3452	1.3508	1.3564	1.3622	1.3680	1.3739	1.3799	1.3860	1.3922	1.3985	1.4049	1.4113	1.4179	1.4245	1.4312
1.3374	1.3427	1.3481	1.3536	1.3591	1.3648	1.3705	1.3763	1.3822	1.3882	1.3942	1.4004	1.4066	1.4129	1.4192	1.4257
1.3351	1.3403	1.3455	1.3508	1.3562	1.3617	1.3672	1.3728	1.3785	1.3843	1.3901	1.3960	1.4020	1.4081	1.4142	1.4204
1.3329	1.3379	1.3430	1.3481	1.3534	1.3586	1.3640	1.3694	1.3749	1.3805	1.3862	1.3919	1.3976	1.4035	1.4094	1.4153

225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300
50.5777	16.6252	12.0702	10.2080	9.1378	8.5757	8.1677	7.8917	7.7044	7.5807	7.5048	7.4664	7.4584	7.4762	7.5153	7.5751
7.5667	11.3675	22.1016	21.1086	13.8161	13.8283	7.2899	8.3623	7.7175	7.3152	6.9991	6.7621	6.5817	6.4434	6.3375	6.2572
4.8083	5.6674	6.9976	9.2445	13.1034	16.4704	14.3301	11.4510	9.4090	8.4414	7.6550	7.0956	6.6805	6.3623	6.1125	5.9127
3.7773	4.1989	4.7193	5.4174	6.3936	7.7780	9.6575	11.5558	12.0490	10.9777	9.6020	8.4800	7.6406	7.0129	6.5337	6.1993
3.2576	3.4960	3.7833	4.1352	4.5731	5.1267	5.8329	6.7259	7.7922	8.8620	9.5370	9.5029	8.9289	8.1858	7.4867	6.8797
2.9139	3.0752	3.2614	3.4782	3.7329	4.0346	4.3947	4.8260	5.3604	5.9410	6.5057	7.2604	7.7678	7.9854	7.8756	7.3359
2.6740	2.7919	2.9242	3.0735	3.2429	3.4359	3.6570	3.9110	4.2030	4.5377	4.9168	5.3198	5.7777	6.2062	6.5650	6.7720
2.4958	2.5866	2.6865	2.7967	2.9189	3.0547	3.2060	3.3750	3.5641	3.7754	4.0108	4.2710	4.5545	4.8558	5.1636	5.4587
2.3577	2.4302	2.5088	2.5943	2.6874	2.7890	2.9001	3.0218	3.1551	3.3013	3.4614	3.6366	3.8254	4.0288	4.2440	4.4653
2.2472	2.3067	2.3735	2.4491	2.5128	2.5923	2.6779	2.7703	2.8702	2.9780	3.0943	3.2196	3.3542	3.4981	3.6507	3.8103
2.1565	2.2064	2.2595	2.3160	2.3761	2.4402	2.5086	2.5816	2.6596	2.7428	2.8316	2.9262	3.0259	3.1337	3.2465	3.3650
2.0806	2.1232	2.1692	2.2157	2.2659	2.3189	2.3750	2.4344	2.4972	2.5637	2.6340	2.7083	2.7866	2.8671	2.9508	3.0364
2.0161	2.0529	2.0916	2.1322	2.1749	2.2197	2.2667	2.3161	2.3680	2.4225	2.4797	2.5397	2.6026	2.6684	2.7371	2.8067
1.9604	1.9927	2.0265	2.0617	2.0984	2.1369	2.1769	2.2188	2.2625	2.3081	2.3557	2.4054	2.4571	2.5109	2.5669	2.6248
1.9120	1.9405	1.9702	2.0011	2.0332	2.0665	2.1012	2.1372	2.1746	2.2135	2.2538	2.2957	2.3391	2.3840	2.4305	2.4784
1.8693	1.8948	1.9212	1.9485	1.9768	2.0061	2.0364	2.0678	2.1002	2.1338	2.1685	2.2043	2.2413	2.2794	2.3187	2.3591
1.8315	1.8544	1.8780	1.9024	1.9276	1.9535	1.9803	2.0079	2.0364	2.0657	2.0959	2.1269	2.1589	2.1917	2.2254	2.2600
1.7977	1.8184	1.8397	1.8616	1.8842	1.9074	1.9312	1.9558	1.9809	2.0068	2.0333	2.0606	2.0885	2.1171	2.1463	2.1763
1.7672	1.7861	1.8054	1.8253	1.8456	1.8665	1.8879	1.9098	1.9323	1.9553	1.9789	2.0030	2.0276	2.0527	2.0784	2.1046
1.7397	1.7569	1.7746	1.7926	1.8111	1.8300	1.8494	1.8691	1.8893	1.9099	1.9310	1.9525	1.9744	1.9967	2.0194	2.0425
1.7147	1.7305	1.7467	1.7632	1.7800	1.7973	1.8148	1.8327	1.8510	1.8696	1.8885	1.9078	1.9275	1.9474	1.9677	1.9882
1.6919	1.7064	1.7213	1.7365	1.7519	1.7677	1.7837	1.8000	1.8166	1.8335	1.8506	1.8681	1.8858	1.9037	1.9219	1.9404
1.6709	1.6844	1.6981	1.7121	1.7263	1.7408	1.7555	1.7704	1.7856	1.8010	1.8166	1.8324	1.8485	1.8647	1.8812	1.8978
1.6515	1.6641	1.6768	1.6898	1.7029	1.7162	1.7298	1.7435	1.7574	1.7715	1.7858	1.8003	1.8149	1.8297	1.8446	1.8597
1.6337	1.6454	1.6572	1.6692	1.6814	1.6938	1.7063	1.7189	1.7318	1.7447	1.7578	1.7711	1.7845	1.7980	1.8116	1.8253
1.6172	1.6281	1.6391	1.6503	1.6616	1.6731	1.6847	1.6964	1.7083	1.7202	1.7323	1.7445	1.7568	1.7692	1.7817	1.7943
1.6019	1.6120	1.6223	1.6328	1.6433	1.6540	1.6648	1.6757	1.6867	1.6978	1.7089	1.7202	1.7315	1.7430	1.7545	1.7660
1.5874	1.5970	1.6067	1.6165	1.6263	1.6363	1.6464	1.6565	1.6667	1.6770	1.6874	1.6979	1.7084	1.7189	1.7295	1.7402
1.5740	1.5830	1.5921	1.6013	1.6106	1.6199	1.6293	1.6388	1.6483	1.6579	1.6676	1.6773	1.6870	1.6968	1.7066	1.7165
1.5613	1.5700	1.5785	1.5871	1.5958	1.6046	1.6134	1.6223	1.6312	1.6402	1.6492	1.6582	1.6673	1.6764	1.6855	1.6946
1.5497	1.5577	1.5658	1.5739	1.5821	1.5903	1.5986	1.6069	1.6153	1.6237	1.6321	1.6405	1.6490	1.6575	1.6660	1.6745
1.5386	1.5462	1.5538	1.5615	1.5692	1.5769	1.5847	1.5925	1.6004	1.6083	1.6162	1.6241	1.6320	1.6399	1.6478	1.6558
1.5281	1.5353	1.5425	1.5498	1.5571	1.5644	1.5717	1.5791	1.5865	1.5939	1.6013	1.6087	1.6161	1.6236	1.6310	1.6384
1.5182	1.5250	1.5319	1.5388	1.5457	1.5526	1.5595	1.5665	1.5734	1.5804	1.5874	1.5944	1.6013	1.6083	1.6152	1.6222

TABLE VII. - Continued.

(c) Plenum

Plenum temperature, °R	Plenum								
	0	1	2	3	4	5	6	7	8
700	1597.9	1584.5	------	------	------	------	------	------	------
710	1608.9	1596.6	1582.5	------	------	------	------	------	------
720	1619.9	1608.4	1595.4	------	------	------	------	------	------
730	1630.7	1620.1	1608.1	------	------	------	------	------	------
740	1641.5	1631.5	1620.5	1608.5	------	------	------	------	------
750	1652.2	1642.8	1632.6	1621.6	------	------	------	------	------
760	1662.8	1654.0	1644.5	1634.3	1623.4	------	------	------	------
770	1673.3	1665.0	1656.2	1646.7	1636.6	1625.9	------	------	------
780	1683.7	1675.9	1667.6	1658.8	1649.5	1639.6	1629.3	------	------
790	1694.1	1686.7	1678.9	1670.7	1662.0	1652.9	1643.3		
800	1704.4	1697.4	1690.0	1682.3	1674.2	1665.8	1656.9	1647.7	1638.0
810	1714.6	1707.9	1701.0	1693.7	1686.2	1678.3	1670.0	1661.5	1652.6
820	1724.7	1718.4	1711.8	1705.0	1697.9	1690.5	1682.8	1674.9	1666.6
830	1734.8	1728.7	1722.5	1716.1	1709.4	1702.4	1695.3	1687.8	1680.2
840	1744.7	1739.0	1733.1	1727.0	1720.7	1714.1	1707.4	1700.4	1693.3
850	1754.7	1749.2	1743.6	1737.8	1731.8	1725.6	1719.3	1712.8	1706.0
860	1764.5	1759.3	1753.9	1748.4	1742.7	1736.9	1730.9	1724.8	1718.5
870	1774.3	1769.3	1764.2	1758.9	1753.5	1748.0	1742.3	1736.5	1730.6
880	1784.0	1779.2	1774.3	1769.3	1764.2	1758.9	1753.6	1748.1	1742.5
890	1793.7	1789.1	1784.4	1779.6	1774.7	1769.7	1764.6	1759.4	1754.1
900	1803.3	1798.9	1794.4	1789.8	1785.1	1780.4	1775.5	1770.6	1765.5
910	1812.8	1808.6	1804.3	1799.9	1795.4	1790.9	1786.3	1781.6	1776.8
920	1822.3	1818.2	1814.1	1809.9	1805.6	1801.3	1796.8	1792.4	1787.8
930	1831.7	1827.8	1823.8	1819.8	1815.7	1811.5	1807.3	1803.0	1798.7
940	1841.0	1837.2	1833.4	1829.6	1825.6	1821.7	1817.6	1813.5	1809.4
950	1850.3	1846.7	1843.0	1839.3	1835.5	1831.7	1827.8	1823.9	1820.0
960	1859.5	1856.0	1852.5	1848.9	1845.3	1841.6	1837.9	1834.2	1830.4
970	1868.7	1865.3	1861.9	1858.5	1855.0	1851.5	1847.9	1844.3	1840.7
980	1877.8	1874.6	1871.3	1868.0	1864.6	1861.2	1857.8	1854.4	1850.9
990	1886.9	1883.8	1880.6	1877.4	1874.2	1870.9	1867.6	1864.3	1861.0
1000	1895.9	1892.9	1889.8	1886.7	1883.6	1880.5	1877.3	1874.1	1870.9
1010	1904.9	1901.9	1899.0	1896.0	1893.0	1890.0	1886.9	1883.7	1880.8
1020	1913.8	1910.9	1908.1	1905.2	1902.3	1899.4	1896.5	1893.5	1890.5
1030	1922.6	1919.9	1917.1	1914.4	1911.6	1908.8	1905.9	1903.1	1900.2
1040	1931.4	1928.8	1926.1	1923.4	1920.8	1918.0	1915.3	1912.6	1909.8
1050	1940.2	1937.6	1935.1	1932.5	1929.9	1927.2	1924.6	1921.9	1919.3
1060	1948.9	1946.4	1943.9	1941.4	1938.9	1936.4	1933.8	1931.3	1928.7
1070	1957.6	1955.2	1952.8	1950.3	1947.9	1945.4	1943.0	1940.5	1938.0
1080	1966.2	1963.9	1961.5	1959.2	1956.8	1954.4	1952.1	1949.7	1947.3
1090	1974.8	1972.5	1970.2	1968.0	1965.7	1963.4	1961.1	1958.8	1956.4
1100	1983.3	1981.1	1978.9	1976.7	1974.5	1972.3	1970.0	1967.8	1965.5

Plenum temperature, °R	Plenum									
	50	55	60	65	70	75	80	85	90	95
700	------	------	------	------	------	------	------	------	------	------
710	------	------	------	------	------	------	------	------	------	------
720	------	------	------	------	------	------	------	------	------	------
730	------	------	------	------	------	------	------	------	------	------
740	------	------	------	------	------	------	------	------	------	------
750	------	------	------	------	------	------	------	------	------	------
760	------	------	------	------	------	------	------	------	------	------
770	------	------	------	------	------	------	------	------	------	------
780	------	------	------	------	------	------	------	------	------	------
790	------	------	------	------	------	------	------	------	------	------
800	------	------	------	------	------	------	------	------	------	------
810	------	------	------	------	------	------	------	------	------	------
820	------	------	------	------	------	------	------	------	------	------
830	------	------	------	------	------	------	------	------	------	------
840	------	------	------	------	------	------	------	------	------	------
850	------	------	------	------	------	------	------	------	------	------
860	------	------	------	------	------	------	------	------	------	------
870	------	------	------	------	------	------	------	------	------	------
880	------	------	------	------	------	------	------	------	------	------
890	------	------	------	------	------	------	------	------	------	------
900	------	------	------	------	------	------	------	------	------	------
910	------	------	------	------	------	------	------	------	------	------
920	------	------	------	------	------	------	------	------	------	------
930	------	------	------	------	------	------	------	------	------	------
940	------	------	------	------	------	------	------	------	------	------
950	------	------	------	------	------	------	------	------	------	------
960	------	------	------	------	------	------	------	------	------	------
970	1637.3	------	------	------	------	------	------	------	------	------
980	1660.4	1628.9	------	------	------	------	------	------	------	------
990	1682.0	1653.2	1621.9	------	------	------	------	------	------	------
1000	1702.3	1675.9	1647.4	1616.3	------	------	------	------	------	------
1010	1721.4	1697.1	1671.0	1642.9	1612.2	------	------	------	------	------
1020	1739.6	1717.1	1693.1	1667.4	1639.8	1609.6	------	------	------	------
1030	1757.0	1736.0	1713.8	1690.3	1665.1	1638.0	1608.6	------	------	------
1040	1773.7	1754.0	1733.4	1711.7	1688.6	1664.0	1637.6	1609.0	1577.6	
1050	1789.6	1771.3	1752.0	1731.9	1710.6	1688.1	1664.2	1638.6	1610.9	1580.7
1060	1805.0	1787.8	1769.8	1751.0	1731.3	1710.6	1688.8	1665.6	1640.9	1614.3
1070	1819.9	1803.6	1786.7	1769.2	1750.9	1731.8	1711.7	1690.6	1668.2	1644.5
1080	1834.3	1818.9	1803.0	1786.6	1769.5	1751.7	1733.2	1713.8	1693.5	1672.0
1090	1848.3	1833.7	1818.7	1803.3	1787.3	1770.7	1753.5	1735.6	1716.9	1697.4
1100	1861.8	1848.0	1833.9	1819.3	1804.3	1788.8	1772.7	1756.1	1738.9	1721.0

THERMODYNAMIC PROPERTIES OF STEAM

speed of sound (ft/sec)

pressure, atm									
9	10	15	20	25	30	35	40	45	50
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1643.4	------	------	------	------	------	------	------	------	------
1658.1	1649.2	------	------	------	------	------	------	------	------
1672.2	1664.0	------	------	------	------	------	------	------	------
1685.9	1678.3	------	------	------	------	------	------	------	------
1699.1	1692.0	1653.2	------	------	------	------	------	------	------
1712.0	1705.3	1669.3	------	------	------	------	------	------	------
1724.5	1718.3	1684.7	------	------	------	------	------	------	------
1736.7	1730.9	1699.4	1664.1	------	------	------	------	------	------
1748.7	1743.2	1713.7	1680.8	------	------	------	------	------	------
1760.4	1755.2	1727.4	1696.7	1662.6	------	------	------	------	------
1771.9	1766.9	1740.8	1712.0	1680.3	------	------	------	------	------
1783.2	1778.5	1753.7	1726.8	1697.2	1664.7	------	------	------	------
1794.3	1789.8	1766.4	1741.0	1713.4	1683.2	1649.9	------	------	------
1805.2	1800.9	1778.7	1754.7	1728.9	1700.8	1670.1	------	------	------
1816.0	1811.9	1790.7	1768.1	1743.8	1717.5	1689.1	1658.0	------	------
1826.6	1822.7	1802.5	1781.1	1758.1	1733.6	1707.1	1678.4	1647.0	------
1837.0	1833.3	1814.1	1793.7	1772.1	1749.0	1724.2	1697.6	1668.8	1637.3
1847.4	1843.8	1825.4	1806.1	1785.6	1763.8	1740.6	1715.9	1689.2	1660.4
1857.6	1854.2	1836.6	1818.1	1798.7	1778.1	1756.4	1733.2	1708.5	1682.0
1867.7	1864.4	1847.6	1830.0	1811.5	1792.0	1771.5	1749.8	1726.8	1702.3
1877.7	1874.5	1858.4	1841.6	1824.0	1805.5	1786.2	1765.8	1744.3	1721.4
1887.5	1884.5	1869.0	1852.9	1836.2	1818.6	1800.3	1781.1	1760.9	1739.6
1897.3	1894.4	1879.5	1864.1	1848.1	1831.4	1814.1	1795.9	1776.9	1757.0
1907.0	1904.2	1889.9	1875.1	1859.8	1843.9	1827.4	1810.3	1792.4	1773.7
1916.6	1913.9	1900.1	1885.9	1871.3	1856.1	1840.4	1824.1	1807.2	1789.6
1926.1	1923.5	1910.2	1896.6	1882.6	1868.1	1853.1	1837.7	1821.6	1805.[illegible]
1935.5	1933.0	1920.2	1907.1	1893.6	1879.8	1865.5	1850.8	1835.6	1819.7
1944.8	1942.4	1930.1	1917.5	1904.5	1891.3	1877.6	1863.6	1849.2	1834.5
1954.1	1951.8	1939.9	1927.7	1915.3	1902.6	1889.5	1876.1	1862.4	1848.3
1963.3	1961.0	1949.5	1937.8	1925.9	1913.7	1901.2	1888.4	1875.3	1861.6

pressure, atm										
100	105	110	115	120	125	130	135	140	145	150
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1585.3	------	------	------	------	------	------	------	------	------	------
1619.0	1591.3	1561.0	------	------	------	------	------	------	------	------
1649.2	1624.9	1598.7	1570.2	1538.5	------	------	------	------	------	------
1676.8	1655.1	1632.0	1607.3	1580.6	1551.2	1518.2	------	------	------	------
1702.3	1682.7	1662.1	1640.3	1617.0	1592.1	1565.0	1535.0	------	------	------

TABLE VII. - Concluded.

([illegible]) Concluded.

Plenum temperature, °R	0	5	10	15	20	25	30	35	40	45	50	55	60	Plenum 65
1100	1983.3	1972.3	1961.0	1949.5	1937.8	1925.9	1913.7	1901.2	1888.4	1875.3	1861.8	1848.0	1833.9	1819.3
1110	1991.8	1981.1	1970.2	1959.1	1947.8	1936.3	1924.6	1912.6	1900.4	1887.9	1875.1	1862.0	1848.5	1834.8
1120	2000.2	1989.8	1979.3	1968.6	1957.7	1946.6	1935.3	1923.8	1912.1	1900.2	1888.0	1875.5	1862.8	1849.7
1130	2008.6	1998.5	1988.3	1978.0	1967.5	1956.8	1945.9	1934.9	1923.6	1912.2	1900.6	1888.7	1876.6	1864.2
1140	2017.0	2007.2	1997.3	1987.3	1977.1	1966.8	1956.4	1945.8	1935.0	1924.0	1912.9	1901.5	1890.0	1878.3
1150	2025.3	2015.8	2006.2	1996.5	1986.7	1976.8	1966.7	1956.5	1946.1	1935.6	1924.9	1914.1	1903.1	1891.9
1160	2033.5	2024.3	2015.0	2005.7	1996.2	1986.6	1976.9	1967.0	1957.1	1947.0	1936.8	1926.4	1915.9	1905.3
1170	2041.7	2032.8	2023.8	2014.7	2005.5	1996.2	1986.7	1977.2	1967.6	1957.8	1947.9	1937.9	1927.7	1917.4
1180	2049.9	2041.3	2032.5	2023.7	2014.8	2005.7	1996.6	1987.4	1978.1	1968.7	1959.2	1949.6	1939.8	1929.9
1190	2058.1	2049.7	2041.2	2032.6	2023.9	2015.2	2006.4	1997.5	1988.5	1979.5	1970.3	1961.0	1951.7	1942.2
1200	2066.2	2058.0	2049.8	2041.4	2033.1	2024.6	2016.1	2007.5	1998.8	1990.1	1981.3	1972.3	1963.3	1954.2
1210	2074.2	2066.3	2058.3	2050.2	2042.1	2033.9	2025.7	2017.4	2009.0	2000.6	1992.0	1983.4	1974.8	1966.0
1220	2082.3	2074.5	2066.8	2058.9	2051.1	2043.1	2035.2	2027.1	2019.0	2010.9	2002.7	1994.4	1986.1	1977.6
1230	2090.3	2082.7	2075.2	2067.6	2060.0	2052.3	2044.6	2036.8	2029.0	2021.1	2013.2	2005.2	1997.1	1989.1
1240	2098.2	2090.9	2083.6	2076.2	2068.8	2061.3	2053.9	2046.3	2038.8	2031.2	2023.5	2015.8	2008.1	2000.3
1250	2106.1	2099.0	2091.9	2084.7	2077.5	2070.3	2063.1	2055.8	2048.5	2041.1	2033.7	2026.3	2018.8	2011.3
1260	2114.0	2107.1	2100.2	2093.2	2086.2	2079.2	2072.2	2065.2	2058.1	2051.0	2043.8	2036.7	2029.5	2022.2
1270	2121.8	2115.1	2108.4	2101.6	2094.9	2088.1	2081.3	2074.4	2067.6	2060.7	2053.8	2046.9	2039.9	2032.9
1280	2129.6	2123.1	2116.6	2110.0	2103.4	2096.8	2090.2	2083.6	2077.0	2070.3	2063.7	2057.0	2050.3	2043.5
1290	2137.4	2131.1	2124.7	2118.3	2111.9	2105.5	2099.1	2092.7	2086.3	2079.9	2073.4	2066.9	2060.5	2054.0
1300	2145.1	2139.0	2132.8	2126.6	2120.4	2114.2	2108.0	2101.8	2095.5	2089.3	2083.0	2076.8	2070.5	2064.3
1310	2152.8	2146.8	2140.8	2134.8	2128.8	2122.8	2116.7	2110.7	2104.7	2098.6	2092.6	2086.5	2080.5	2074.4
1320	2160.5	2154.7	2148.8	2143.0	2137.1	2131.3	2125.4	2119.6	2113.7	2107.9	2102.0	2096.2	2090.3	2084.5
1330	2168.1	2162.5	2156.8	2151.1	2145.4	2139.7	2134.0	2128.4	2122.7	2117.0	2111.4	2105.7	2100.0	2094.4
1340	2175.7	2170.2	2164.7	2159.1	2153.6	2148.1	2142.6	2137.1	2131.6	2126.1	2120.6	2115.1	2109.7	2104.2
1350	2183.3	2177.9	2172.5	2167.2	2161.8	2156.4	2151.1	2145.8	2140.4	2135.1	2129.8	2124.5	2119.2	2113.9
1360	2190.8	2185.6	2180.3	2175.1	2169.9	2164.7	2159.5	2154.3	2149.2	2144.0	2138.9	2133.7	2128.6	2123.5
1370	2198.3	2193.2	2188.1	2183.0	2178.0	2172.9	2167.9	2162.9	2157.9	2152.9	2147.9	2142.9	2137.9	2133.0
1380	2205.8	2200.8	2195.9	2190.9	2186.0	2181.1	2176.2	2171.3	2166.5	2161.6	2156.8	2152.0	2147.2	2142.4
1390	2213.2	2208.4	2203.6	2198.8	2194.0	2189.2	2184.5	2179.7	2175.0	2170.3	2165.6	2161.0	2156.3	2151.7
1400	2220.6	2215.9	2211.2	2206.6	2201.9	2197.3	2192.7	2188.1	2183.5	2178.9	2174.4	2169.9	2165.4	2160.9
1410	2228.0	2223.4	2218.9	2214.3	2209.8	2205.3	2200.8	2196.3	2191.9	2187.5	2183.1	2178.7	2174.3	2170.0
1420	2235.3	2230.9	2226.4	2222.0	2217.6	2213.2	2208.9	2204.6	2200.3	2196.0	2191.7	2187.4	2183.2	2179.0
1430	2242.7	2238.3	2234.0	2229.7	2225.4	2221.2	2216.9	2212.7	2208.5	2204.4	2200.2	2196.1	2192.0	2187.9
1440	2249.9	2245.7	2241.5	2237.3	2233.2	2229.0	2224.9	2220.8	2216.8	2212.7	2208.7	2204.7	2200.8	2196.8
1450	2257.2	2253.1	2249.0	2244.9	2240.9	2236.8	2232.9	2228.9	2225.0	2221.0	2217.1	2213.3	2209.4	2205.6
1460	2264.4	2260.4	2256.4	2252.4	2248.5	2244.6	2240.7	2236.9	2233.1	2229.3	2225.5	2221.7	2218.0	2214.3
1470	2271.6	2267.7	2263.8	2260.0	2256.1	2252.3	2248.6	2244.8	2241.1	2237.5	2233.8	2230.1	2226.5	2222.9
1480	2278.7	2274.9	2271.2	2267.4	2263.7	2260.0	2256.4	2252.7	2249.1	2245.6	2242.0	2238.5	2235.0	2231.5
1490	2285.9	2282.2	2278.5	2274.9	2271.2	2267.7	2264.1	2260.6	2257.1	2253.6	2250.2	2246.8	2243.4	2240.0
1500	2293.0	2289.4	2285.8	2282.3	2278.7	2275.3	2271.8	2268.4	2265.0	2261.6	2258.3	2255.0	2251.7	2248.4

Plenum temperature, °R	150	155	160	165	170	175	180	185	190	195	200	205	210	215	Plenum 220
1100	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1110	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1120	1543.4	1513.4	1478.4	----	----	----	----	----	----	----	----	----	----	----	----
1130	1588.6	1564.7	1538.5	1509.3	1475.4	----	----	----	----	----	----	----	----	----	----
1140	1627.2	1607.1	1585.7	1562.9	1538.1	1510.6	1478.9	----	----	----	----	----	----	----	----
1150	1661.2	1643.8	1625.6	1606.6	1586.6	1565.3	1542.4	1517.4	1489.4	1455.7	----	----	----	----	----
1160	1691.9	1676.5	1660.7	1644.3	1627.3	1609.6	1591.2	1571.8	1551.3	1529.6	1506.1	1480.4	1454.8	----	----
1170	1711.9	1697.1	1681.9	1666.1	1649.8	1632.8	1615.1	1596.5	1576.9	1556.2	1534.0	1510.0	1483.5	1453.4	1417.7
1180	1736.3	1722.7	1708.8	1694.5	1679.7	1664.5	1648.8	1632.4	1615.4	1597.7	1579.1	1559.6	1538.8	1516.6	1492.8
1190	1759.3	1746.7	1733.9	1720.8	1707.3	1693.5	1679.3	1664.7	1649.6	1634.0	1617.8	1601.0	1583.6	1565.3	1546.1
1200	1781.0	1769.4	1757.5	1745.3	1733.0	1720.3	1707.3	1694.1	1680.5	1666.5	1652.1	1637.3	1622.1	1606.3	1590.0
1210	1801.7	1790.8	1779.7	1768.5	1757.0	1745.3	1733.4	1721.2	1708.8	1696.1	1683.2	1669.9	1656.3	1642.3	1627.9
1220	1821.4	1811.2	1800.8	1790.3	1779.7	1768.8	1757.8	1746.6	1735.2	1723.5	1711.7	1699.6	1687.3	1674.7	1661.8
1230	1840.3	1830.7	1821.0	1811.1	1801.1	1791.0	1780.8	1770.4	1759.8	1749.0	1738.1	1727.0	1715.7	1704.3	1692.6
1240	1858.4	1849.4	1840.2	1831.0	1821.6	1812.1	1802.5	1792.8	1783.0	1773.0	1762.9	1752.6	1742.2	1731.6	1720.9
1250	1875.9	1867.3	1858.7	1849.9	1841.1	1832.2	1823.2	1814.1	1804.9	1795.6	1786.1	1776.6	1766.9	1757.1	1747.2
1260	1892.7	1884.6	1876.4	1868.2	1859.9	1851.5	1843.0	1834.4	1825.8	1817.0	1808.2	1799.3	1790.2	1781.1	1771.9
1270	1909.0	1901.3	1893.5	1885.7	1877.8	1869.9	1861.9	1853.8	1845.7	1837.4	1829.1	1820.8	1812.3	1803.7	1795.1
1280	1924.8	1917.4	1910.1	1902.7	1895.2	1887.7	1880.1	1872.4	1864.7	1857.0	1849.1	1841.2	1833.3	1825.2	1817.1
1290	1940.1	1933.1	1926.1	1919.0	1911.9	1904.8	1897.6	1890.3	1883.0	1875.7	1868.3	1860.8	1853.3	1845.7	1838.0
1300	1954.9	1948.3	1941.6	1934.9	1928.1	1921.3	1914.5	1907.6	1900.7	1893.7	1886.7	1879.6	1872.5	1865.3	1858.0
1310	1969.4	1963.1	1956.7	1950.3	1943.8	1937.3	1930.8	1924.3	1917.7	1911.1	1904.4	1897.7	1890.9	1884.1	1877.2
1320	1983.5	1977.5	1971.4	1965.2	1959.1	1952.9	1946.7	1940.4	1934.1	1927.8	1921.5	1915.1	1908.6	1902.1	1895.6
1330	1997.3	1991.5	1985.6	1979.8	1973.9	1968.0	1962.0	1956.1	1950.1	1944.0	1938.0	1931.9	1925.7	1919.5	1913.3
1340	2010.8	2005.2	1999.6	1994.0	1988.3	1982.7	1977.0	1971.3	1965.5	1959.8	1954.0	1948.1	1942.3	1936.4	1930.4
1350	2023.9	2018.5	2013.2	2007.8	2002.4	1997.0	1991.5	1986.1	1980.6	1975.0	1969.5	1963.9	1958.3	1952.6	1946.9
1360	2036.8	2031.6	2026.5	2021.3	2016.1	2010.9	2005.7	2000.4	1995.2	1989.9	1984.6	1979.2	1973.8	1968.4	1963.0
1370	2049.4	2044.4	2039.5	2034.5	2029.5	2024.5	2019.5	2014.5	2009.4	2004.3	1999.2	1994.1	1988.9	1983.7	1978.5
1380	2061.7	2057.0	2052.2	2047.4	2042.7	2037.8	2033.0	2028.2	2023.3	2018.4	2013.5	2008.6	2003.6	1998.6	1993.6
1390	2073.9	2069.3	2064.7	2060.1	2055.5	2050.9	2046.2	2041.6	2036.9	2032.2	2027.5	2022.7	2018.0	2013.1	2008.3
1400	2085.8	2081.4	2076.9	2072.5	2068.1	2063.6	2059.2	2054.7	2050.2	2045.6	2041.1	2036.5	2031.9	2027.3	2022.6
1410	2097.5	2093.2	2089.0	2084.7	2080.4	2076.1	2071.8	2067.5	2063.2	2058.8	2054.4	2050.0	2045.6	2041.1	2036.6
1420	2109.0	2104.9	2100.8	2096.6	2092.5	2088.4	2084.2	2080.1	2075.9	2071.7	2067.4	2063.2	2058.9	2054.6	2050.2
1430	2120.3	2116.3	2112.3	2108.4	2104.4	2100.4	2096.4	2092.4	2088.3	2084.3	2080.2	2076.1	2071.9	2067.8	2063.6
1440	2131.4	2127.6	2123.7	2119.9	2116.1	2112.2	2108.3	2104.5	2100.6	2096.6	2092.7	2088.7	2084.7	2080.7	2076.6
1450	2142.3	2138.7	2135.0	2131.3	2127.5	2123.8	2120.1	2116.3	2112.6	2108.8	2104.9	2101.1	2097.2	2093.3	2089.4
1460	2153.1	2149.6	2146.0	2142.4	2138.8	2135.2	2131.6	2128.0	2124.3	2120.7	2117.0	2113.2	2109.5	2105.7	2101.9
1470	2163.8	2160.3	2156.9	2153.4	2149.9	2146.5	2143.0	2139.4	2135.9	2132.4	2128.8	2125.2	2121.5	2117.9	2114.2
1480	2174.3	2170.9	2167.6	2164.2	2160.9	2157.5	2154.1	2150.7	2147.3	2143.9	2140.4	2136.9	2133.4	2129.8	2126.2
1490	2184.6	2181.4	2178.2	2174.9	2171.7	2168.4	2165.1	2161.8	2158.5	2155.2	2151.8	2148.4	2145.0	2141.5	2138.1
1500	2194.8	2191.7	2188.6	2185.4	2182.3	2179.1	2175.9	2172.7	2169.5	2166.3	2163.0	2159.7	2156.4	2153.1	2149.7

70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
1804.3	1788.8	1772.7	1756.1	1738.9	1721.0	1702.3	1682.7	1662.1	1640.3	1617.0	1592.1	1565.0	1535.0		----
1820.6	1806.1	1791.1	1775.6	1759.7	1743.1	1726.0	1708.1	1689.5	1670.0	1649.5	1627.7	1604.6	1579.6	1552.4	1522.2
1836.4	1822.7	1808.6	1794.2	1779.3	1764.0	1748.2	1731.8	1714.8	1697.2	1678.8	1659.5	1639.3	1617.8	1595.0	1570.3
1851.6	1838.7	1825.4	1811.9	1798.0	1783.8	1769.1	1754.0	1738.5	1722.4	1705.7	1688.4	1670.4	1651.6	1631.8	1610.9
1866.3	1854.1	1841.6	1828.9	1815.9	1802.6	1789.0	1775.0	1760.6	1745.9	1730.7	1715.0	1698.8	1682.0	1664.5	1646.3
1880.6	1869.0	1857.2	1845.3	1833.0	1820.6	1807.8	1794.8	1781.5	1767.9	1753.9	1739.6	1724.9	1709.7	1694.1	1677.9
1894.5	1883.5	1872.4	1861.0	1849.5	1837.8	1825.9	1813.7	1801.4	1788.7	1775.8	1762.7	1749.2	1735.4	1721.3	1706.8
1907.0	1896.4	1885.6	1874.7	1863.6	1852.3	1840.8	1829.1	1817.2	1805.1	1792.7	1780.0	1767.0	1753.8	1740.2	1726.2
1919.9	1909.8	1899.5	1889.1	1878.6	1867.8	1856.9	1845.9	1834.6	1823.1	1811.5	1799.6	1787.5	1775.1	1762.5	1749.5
1932.6	1922.9	1913.1	1903.2	1893.1	1882.9	1872.5	1862.0	1851.4	1840.5	1829.5	1818.4	1807.0	1795.4	1783.6	1771.6
1945.0	1935.7	1926.4	1916.9	1907.2	1897.5	1887.7	1877.7	1867.6	1857.3	1846.9	1836.4	1825.7	1814.8	1803.7	1792.5
1957.2	1948.3	1939.3	1930.2	1921.0	1911.8	1902.4	1892.9	1883.3	1873.5	1863.7	1853.7	1843.6	1833.4	1823.0	1812.4
1969.2	1960.6	1952.0	1943.3	1934.5	1925.6	1916.7	1907.6	1898.5	1889.3	1879.9	1870.5	1860.9	1851.2	1841.4	1831.5
1980.9	1972.7	1964.4	1956.1	1947.7	1939.2	1930.6	1922.0	1913.3	1904.5	1895.6	1886.6	1877.6	1868.4	1859.1	1849.8
1992.4	1984.5	1976.6	1968.6	1960.5	1952.4	1944.2	1936.0	1927.7	1919.3	1910.8	1902.3	1893.7	1885.0	1876.2	1867.4
2003.8	1996.2	1988.6	1980.9	1973.1	1965.4	1957.5	1949.6	1941.7	1933.7	1925.6	1917.5	1909.3	1901.1	1892.7	1884.3
2014.9	2007.6	2000.3	1992.9	1985.5	1978.0	1970.5	1963.0	1955.4	1947.7	1940.0	1932.3	1924.5	1916.6	1908.7	1900.7
2025.9	2018.9	2011.8	2004.7	1997.6	1990.5	1983.3	1976.0	1968.7	1961.4	1954.1	1946.7	1939.2	1931.8	1924.2	1916.6
2036.8	2030.0	2023.2	2016.4	2009.5	2002.6	1995.7	1988.8	1981.8	1974.8	1967.8	1960.7	1953.6	1946.4	1939.3	1932.0
2047.4	2040.9	2034.4	2027.8	2021.2	2014.6	2007.9	2001.3	1994.6	1987.9	1981.2	1974.4	1967.6	1960.8	1953.9	1947.0
2058.0	2051.7	2045.4	2039.0	2032.7	2026.3	2019.9	2013.5	2007.1	2000.7	1994.2	1987.8	1981.2	1974.7	1968.2	1961.6
2068.4	2062.3	2056.2	2050.1	2044.0	2037.9	2031.7	2025.6	2019.4	2013.2	2007.0	2000.8	1994.6	1988.3	1982.1	1975.8
2078.6	2072.7	2066.9	2061.0	2055.1	2049.2	2043.3	2037.4	2031.5	2025.5	2019.6	2013.6	2007.6	2001.6	1995.6	1989.6
2088.7	2083.1	2077.4	2071.7	2066.1	2060.4	2054.7	2049.0	2043.3	2037.6	2031.9	2026.1	2020.4	2014.7	2008.9	2003.1
2098.7	2093.3	2087.8	2082.3	2076.8	2071.4	2065.9	2060.4	2054.9	2049.4	2043.9	2038.4	2032.9	2027.4	2021.9	2016.3
2108.6	2103.3	2098.0	2092.8	2087.5	2082.2	2076.9	2071.6	2066.4	2061.1	2055.8	2050.5	2045.2	2039.9	2034.6	2029.2
2118.4	2113.3	2108.2	2103.1	2098.0	2092.9	2087.8	2082.7	2077.6	2072.5	2067.4	2062.3	2057.2	2052.1	2047.0	2041.9
2128.0	2123.1	2118.2	2113.2	2108.3	2103.4	2098.5	2093.6	2088.7	2083.8	2078.9	2074.0	2069.1	2064.1	2059.2	2054.3
2137.6	2132.8	2128.0	2123.3	2118.5	2113.8	2109.0	2104.3	2099.6	2094.9	2090.1	2085.4	2080.7	2076.0	2071.2	2066.5
2147.0	2142.4	2137.8	2133.2	2128.6	2124.0	2119.5	2114.9	2110.3	2105.8	2101.2	2096.7	2092.1	2087.5	2083.0	2078.4
2156.4	2151.9	2147.5	2143.0	2138.6	2134.1	2129.7	2125.3	2120.9	2116.5	2112.1	2107.7	2103.3	2099.0	2094.6	2090.2
2165.6	2161.3	2157.0	2152.7	2148.4	2144.1	2139.9	2135.6	2131.4	2127.1	2122.9	2118.6	2114.4	2110.2	2105.9	2101.7
2174.8	2170.6	2166.4	2162.3	2158.1	2154.0	2149.9	2145.8	2141.7	2137.6	2133.5	2129.4	2125.3	2121.2	2117.1	2113.0
2183.9	2179.8	2175.8	2171.8	2167.8	2163.8	2159.8	2155.8	2151.8	2147.9	2143.9	2140.0	2136.0	2132.1	2128.2	2124.2
2192.9	2188.9	2185.0	2181.2	2177.3	2173.4	2169.6	2165.7	2161.9	2158.1	2154.2	2150.4	2146.6	2142.8	2139.0	2135.2
2201.8	2198.0	2194.2	2190.4	2186.7	2183.0	2179.2	2175.5	2171.8	2168.1	2164.4	2160.7	2157.1	2153.4	2149.7	2146.0
2210.6	2206.9	2203.3	2199.6	2196.0	2192.4	2188.8	2185.2	2181.6	2178.0	2174.5	2170.9	2167.4	2163.8	2160.3	2156.7
2219.4	2215.8	2212.3	2208.7	2205.2	2201.7	2198.2	2194.8	2191.3	2187.9	2184.4	2181.0	2177.5	2174.1	2170.7	2167.2
2228.0	2224.6	2221.2	2217.7	2214.3	2211.0	2207.6	2204.2	2200.9	2197.5	2194.2	2190.9	2187.6	2184.2	2180.9	2177.6
2236.6	2233.3	2230.0	2226.7	2223.4	2220.1	2216.8	2213.6	2210.4	2207.1	2203.9	2200.7	2197.5	2194.3	2191.0	2187.8
2245.2	2241.9	2238.7	2235.5	2232.3	2229.2	2226.0	2222.9	2219.7	2216.6	2213.5	2210.4	2207.3	2204.2	2201.0	2197.9

225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300
1405.8	1473.4	1561.3	1622.2	1679.3	1734.1	1787.4	1839.7	1891.4	1942.7	1993.9	2045.1	2096.4	2147.9	[illegible]	2252.3
1466.8	1438.7	1414.8	1437.6	1488.3	1537.4	1583.6	1627.6	1669.8	1710.8	1750.7	1789.8	1826.1	1865.9	[illegible]	[illegible]
1526.0	1504.8	1482.6	1460.2	1440.8	1436.6	1457.5	1490.4	1525.6	1560.5	1594.5	1627.6	1659.8	[illegible]	1722.0	[illegible]
1573.1	1555.5	1537.4	1518.7	1497.8	1481.3	1465.2	1455.9	1458.8	1474.0	1496.3	1521.5	1547.6	1573.8	1599.8	[illegible]
1613.2	1598.1	1582.5	1566.6	1550.3	1533.8	1517.4	1501.7	1487.8	1477.8	1474.0	1477.9	1486.6	1504.0	1522.1	1541.5
1648.7	1635.2	1621.5	1607.5	1593.2	1578.7	1564.1	1549.4	1535.0	1521.3	1509.0	1497.1	1482.8	1471.2	1474.3	[illegible]
1680.7	1668.5	1656.2	1643.7	1630.9	1617.9	1604.8	1591.6	1578.3	1565.2	1552.4	1540.2	1529.0	1519.5	1512.2	1507.8
1710.0	1698.9	1687.7	1676.3	1664.7	1653.0	1641.1	1629.1	1617.0	1604.9	1592.8	1580.8	1569.2	1558.1	1547.8	1538.6
1737.1	1726.9	1715.6	1706.1	1695.5	1684.8	1673.9	1662.9	1651.9	1640.7	1629.5	1618.3	1607.1	1596.1	1585.4	[illegible]
1762.5	1753.0	1743.5	1733.8	1724.0	1714.1	1704.0	1693.9	1683.7	1673.3	1662.7	1652.5	1642.0	1631.6	1621.2	1611.0
1786.4	1777.5	1768.6	1759.6	1750.5	1741.2	1731.9	1722.5	1713.0	1703.4	1693.7	1684.0	1674.1	1664.3	1654.5	1644.5
1808.9	1800.6	1792.3	1783.8	1775.3	1765.6	1757.9	1749.1	1740.2	1731.3	1722.2	1713.1	1703.9	1694.6	1685.3	[illegible]
1830.3	1822.5	1814.6	1806.7	1798.7	1790.6	1782.4	1774.1	1765.8	1757.4	1748.8	1740.3	1731.6	1722.7	1714.1	[illegible]
1850.7	1843.4	1835.9	1828.4	1820.7	1813.2	1805.5	1797.7	1789.8	1781.9	1773.9	1765.8	1757.6	1749.3	[illegible]	[illegible]
1870.3	1863.3	1856.2	1849.1	1842.0	1834.7	1827.4	1820.0	1812.6	1805.1	1797.5	1789.4	1782.1	1774.2	1766.3	[illegible]
1889.0	1882.4	1875.7	[illegible]	1862.1	1855.2	1848.3	1841.3	1834.2	1827.1	1819.9	1812.6	1805.2	1797.8	[illegible]	1782.5
1907.0	1900.7	1894.3	1887.9	1881.4	1874.9	1868.3	1861.6	1854.9	1848.1	1841.2	1834.2	1827.2	1820.1	1812.9	[illegible]
1924.4	1918.4	1912.3	1906.1	1900.0	1893.7	1887.4	1881.0	1874.6	1868.1	1861.6	[illegible]	1848.2	1841.4	1834.6	1827.5
1941.2	1935.4	1929.6	1923.7	1917.8	1911.8	1905.8	1899.7	1893.6	1887.3	1881.1	1874.7	1868.3	1861.8	[illegible]	[illegible]
1957.5	[illegible]	1946.3	1940.7	[illegible]	1929.3	1923.5	1917.7	1911.8	1905.8	1899.8	1893.7	1887.5	1881.3	1875.0	[illegible]
1973.2	[illegible]	1962.6	1957.2	1951.7	1946.2	1940.7	1935.0	1929.4	1923.6	1917.9	1912.0	1906.0	1900.0	[illegible]	[illegible]
1988.5	1983.4	1978.3	1973.1	1967.8	1962.6	1957.2	1951.8	1946.4	1940.8	1935.3	1929.6	[illegible]	1918.1	[illegible]	[illegible]
2003.4	1998.5	1993.6	1988.6	1983.5	1978.4	1973.3	1968.1	1962.8	1957.5	1952.1	1946.6	1941.1	1935.5	[illegible]	[illegible]
2017.9	2013.2	2008.4	2003.6	1998.7	1993.8	1988.8	1983.8	1978.7	1973.6	1968.4	1963.1	1957.8	1952.4	[illegible]	[illegible]
2032.1	2027.5	2022.9	2018.2	2013.5	2008.8	2004.0	1999.1	1994.2	1989.2	1984.2	1979.1	1973.9	1968.7	1963.4	[illegible]
2045.9	2041.4	2037.0	2032.5	2027.9	2023.3	2018.7	2014.0	2009.3	2004.4	1999.6	1994.6	1989.6	1984.5	1979.4	[illegible]
2059.3	2055.1	2050.8	2046.4	[illegible]	2037.6	2033.1	2028.5	2023.9	2019.2	2014.5	2009.7	2004.8	1999.9	[illegible]	[illegible]
2072.5	2068.4	2064.2	2060.0	2055.7	2051.4	2047.1	2042.6	2038.2	2033.6	2029.0	2024.4	2019.7	2014.9	[illegible]	[illegible]
2085.4	2081.4	2077.4	2073.3	2069.1	2065.0	2060.7	2056.4	2052.1	2047.7	2043.2	2038.7	2034.1	2029.4	2024.7	[illegible]
2098.1	2094.2	2090.3	2086.3	2082.3	2078.2	2074.1	2069.9	2065.7	2061.4	2057.1	2052.7	2048.2	2043.6	[illegible]	[illegible]
2110.5	2106.7	2102.9	2099.0	2095.1	2091.2	2087.2	2083.1	2079.0	2074.8	2070.6	2066.3	2061.9	2057.5	2053.0	[illegible]
2122.6	2118.9	2115.2	2111.5	2107.7	2103.9	2100.0	2096.0	2092.0	2087.9	2083.8	2079.6	2075.4	2071.0	2066.6	[illegible]
2134.5	2131.0	2127.4	2123.7	2120.0	2116.3	2112.5	2108.7	2104.8	2100.8	2096.8	2092.7	2088.5	2084.3	[illegible]	[illegible]
2146.3	2142.8	2139.3	2135.7	2132.2	2128.5	2124.8	2121.1	2117.2	2113.4	2109.4	2105.4	2101.4	[illegible]	2093.3	[illegible]