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Thermodynamic Properties of Nitrogen Including Liquid and Vapor Phases from 63 K to 2000 K with Pressures to 10,000 Bar*

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Tables of thermodynamic properties of nitrogen are presented for the liquid and vapor phases for temperatures from the freezing line to 2000 K and pressures to 10,000 bar. The tables include values of density, internal energy, enthalpy, entropy, isochoric heat capacity (C_v), isobaric heat capacity (C_p), velocity of sound, the isotherm derivative $(\partial P/\partial \rho)_T$, and the isochor derivative $(\partial P/\partial T)_\rho$. The thermodynamic property tables are based on an equation of state, $P = P(\rho, T)$, which accurately represents liquid and gaseous nitrogen for the range of pressures and temperatures covered by the tables. Comparisons of property values calculated from the equation of state with measured values for P-ρ-T, heat capacity, enthalpy, latent heat, and velocity of sound are included to illustrate the agreement between the experimental data and the tables of properties presented here. The coefficients of the equation of state were determined by a weighted least squares fit to selected P-ρ-T data and, simultaneously, to C_v data determined by corresponding states analysis from oxygen data, and to data which define the phase equilibrium criteria for the saturated liquid and the saturated vapor. The vapor pressure equation, melting curve equation, and an equation to represent the ideal gas heat capacity are also presented. Estimates of the accuracy of the equation of state, the vapor pressure equation, and the ideal gas heat capacity equation are given. The equation of state, derivatives of the equation, and the integral functions for calculating derived thermodynamic properties are included.

Key words: Critical point; density; enthalpy; entropy; equation of state; heat capacity; ideal gas properties; latent heat; nitrogen; second virial coefficient; vapor pressure; velocity of sound; critically evaluated data.

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Nomenclature

Symbol	Physical Quantity	Unit Symbol
T	Temperature	K
P	Pressure	bar
ρ	Density	mol/liter
U	Internal energy	J/mol
H	Enthalpy	J/mol
S	Entropy	J/mol · K
C_p	Isobaric heat capacity	J/mol · K
C_v	Isochoric heat capacity	J/mol · K
W	Velocity of sound	m/s
L	Latent heat	J/mol
$B(T)$	Second virial coefficient	liter/mol
$(\partial P/\partial\rho)_T$	Isotherm derivative	liter bar/mol
$(\partial P/\partial T)_\rho$	Isochor derivative	bar/K

Superscript

^{0}	Ideal gas property

Subscripts

$_0$	Reference state property
$_{calc}$	Calculated property value
$_{eq(\ )}$	Calculated property value from equation indicated in parentheses
$_{data}$	Measured property value

Molecular weight of nitrogen, 28.0134.

Gas constant, $R = 8.31434$ J/mol · K

1. Introduction

An equation of state is presented for nitrogen which covers the full range of liquid and vapor values for temperatures from the triple-point temperature to 2000 K, and pressures to 10,000 bar. The equation of state reproduces the experimental P-ρ-T data which were used in the determination of the coefficients of the equation of state to within the claimed accuracies of these data. The thermodyanmic property table is based on this equation of state, and a function representing the ideal gas heat capacity. The equation also conforms to the Maxwell criterion, which provides for a thermodynamically consistent table of properties, without discontinuities at the two-phase boundaries.

In addition to providing an accurate means for the calculation of the thermodynamic property tables, the equation of state is particularly useful in the analysis of thermodynamic systems since it may be readily used with input variables other than density and temperature (i.e., by iterative solution using any pair of independent thermodynamic coordinates).

In the determination of the equation of state, considerable experimentation was carried out in the simultaneous fitting of P-ρ-T and related thermodynamic property data using the method of least squares. A large number of independent data sets were used in the determination of the equation, which made weighting of the data imperative in the least squares determination of the coefficients. These methods are discussed in section 4. Additional discussion of the effects of simultaneous fitting of related property data and weighting of the data are reported in [114][1].

In addition to the equation of state, the adjunct functions required for the calculation of thermodynamic property tables and a description of the methods of determining the equation are presented. A summary of the data which forms the basis for the equations is given and corrections made to the data are identified (e.g., adjustments of temperature scales). Particular attention has been given to a comparison of available measured thermodynamic data with values calculated using the equation of state. The P-ρ-T data used for calculating the coefficients for the equation are compared to values calculated from the equation of state. Similar comparisons are also illustrated for other thermodynamic properties which have been measured for nitrogen.

The thermodynamic property table included in this volume has been calculated by use of the equation of state and the derivative functions relating the various thermodynamic properties. Since the equation of state conforms to the Maxwell criterion, properties of the liquid have been calculated by continuous integration along hypothetical isotherms through the two-phase (liquid-vapor) region. An evaluation of this procedure is given in [114]. The phase boundary properties included in the table have been identified by simultaneous solution of the equation of state with the vapor pressure equation or the fusion line equation. This equation of state is unique since the single equation represents a wide range of states including liquid and vapor, and returns values of the first and second derivatives which allow for accurate calculations of the heat capacities (C_v, C_p), and the velocity of sound. The user of these functions is cautioned that some properties become discontinuous at the critical point, and no estimate of accuracy can be made regarding these properties in the vicinity of the critical point. The extrapolation of the equation of state in the liquid region to the fusion line, and for the vapor at low temperatures and at high pressures, is illustrated. The thermodynamic property tables included these extrapolations.

The derivatives of the equation of state and the integrals used in the calculation of thermodynamic properties are given in Appendix A. The derivative and integral functions are presented in a convenient format for computer programming.

The authors have attempted to be comprehensive in reviewing the scientific literature for thermodynamic property measurements. The National Bureau of Standards—Cryogenic Data Center prepared the initial bibliography used in this study. Particular attention has been given to maintaining a search of current documents for new measurements, and the authors have maintained a world-wide correspondence with others working in the field to obtain current information on new measurements. Following the development of the equation of state, new data on vapor pressure, saturated liquid density, enthalpy, and P-ρ-T data for high density values extending to the fusion line have been obtained. Although these data were not incorporated in the determination of the functions, comparisons to the equation of state are reported here.

A parallel study of thermodynamic properties of oxygen has also been made by the authors which is reported in [108] and [115]. The form of the equation of state used for oxygen is the same as reported here for nitrogen. In the determination of the coefficients for the equation of state for oxygen, the task was considerably simplified since the bulk of the data were values of high accuracy from a single source. In addition, measurements of the isochoric heat capacity

[1] Numbers in brackets refer to citations in the bibliography.

(C_v) for oxygen for the same range as the P-ρ-T data are also available. The values of the isochoric heat capacity (C_v) for oxygen were the basis for estimating values for nitrogen which were used in determining the equation of state. The conformance of the nitrogen C_v and C_p values in these tables with values predicted from the oxygen data lend assurance of the relative accuracy of these estimated data. An evaluation of the results of using estimated values of C_v in the determination of the coefficients for the equation of state is summarized in [114].

The work reported here is a culmination of a study which was initiated in 1968 at Worchester Polytechnic Institute. Interim reports were presented in [99] and [100]. The final formulation was first reported in [107] and later in [108], and [115]. Additional tests of the equations, a study of the methods used in determining the equations as reported in [114], and comparisons to data reported subsequently to the publication of [107] have now been completed. In initiating this work, the authors have made substantial use of techniques and previous work published by the staff of the National Bureau of Standards, Cryogenics Division in Boulder, Colorado (e.g., the earlier nitrogen property table of Strobridge [116], and the curve fitting techniques suggested by Hust and McCarty [105]).

2. Data for Determining the Equation of State

2.1. Pressure-Density-Temperature Data

The sources of experimental P-ρ-T data that form the basis of this work are listed in table 1. This table summarizes the literature in which data are reported for the liquid phase, the vapor phase, the saturated liquid, and the liquid on the freezing line. The 1246 P-ρ-T data values used in the determination of the equation of state are described in section 5. Figure 1 is a map of the P-ρ-T data used in the final formulation of the equation of state.

2.2. Saturated Liquid and Saturated Vapor Densities

Three sources of experimental saturated liquid density data are listed in table 1. These data are not generally concordant with the selected P-ρ-T values for the

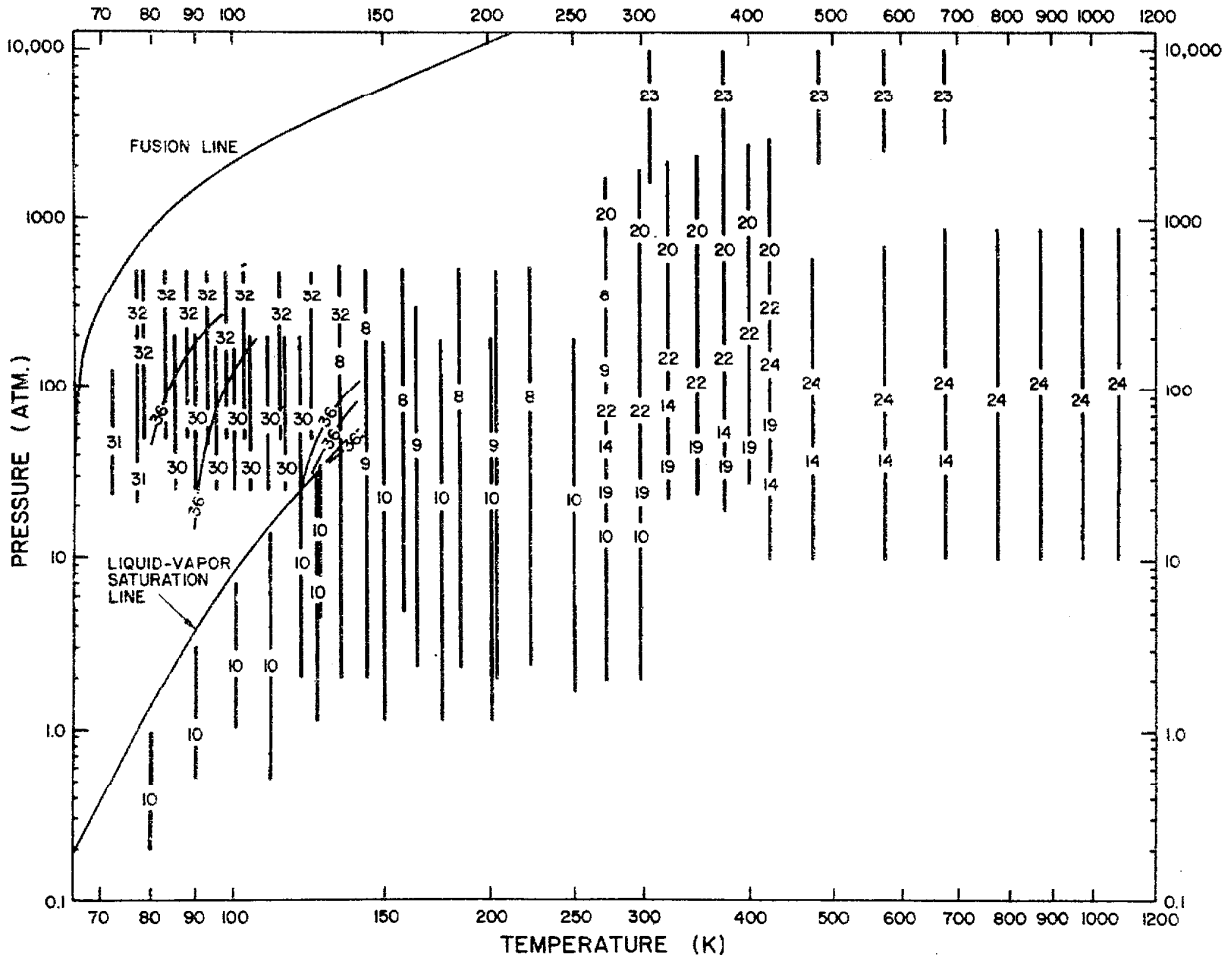

FIGURE 1. Map of the P-ρ-T data used in the determination of the equation of state.

single phase liquid near the saturation line. Therefore, these data were not used in the determination of the equation of state. These experimental saturated liquid density data are described in section 6. Eleven measured values of the density of the saturated liquid and six measured values of the density of the saturated vapor were reported by Mathias, et al [110] in 1914, but these data were not used in determining the equation of state.

The method for fitting the data to the equation of state, as described in section 4, requires values of saturated liquid and saturated vapor densities. Two hundred forty-one values were estimated by the simultaneous solution of the vapor pressure equation and interim equations of state at intervals of 0.25 K between the triple point and the critical point. Separate interim equations of state were determined for the liquid and vapor phases for calculating these values.

2.3. Isochoric Heat Capacity

Isochoric Heat capacity values were included in the data used in the determination of the coefficients of the equation of state. To provide a set of C_v data, 396 values of C_v were determined using the principle of corresponding states and the calculation procedure suggested by Diller [101]. The equation for C_v for oxygen from Goodwin and Weber [103] was used as the basis for estimating the values of C_v for nitrogen. The range of values for nitrogen was limited to the corresponding range of experimental values for which C_v data for oxygen were reported in [103]. These calculated values for nitrogen are for 14 isochors between 5 and 31 mol/liter. This included C_v values along isochors from 10 to 31 mol/liter from the saturated liquid (or vapor) line to approximately 240 atm, and along isochors from 5 to 7 mol/liter from the saturated vapor line to 230 K. An accuracy of ± 5 percent was estimated for these calculated C_v values.

The only measurements of C_v reported in the literature are values along the critical isochor from Voronel et al. [57]. These data, which were not used in the determination of the equation of state, are discussed in section 10.3.

2.4. Critical Point Parameters

The method for fitting the equation of state to the data, as described in section 4, uses selected values of the critical parameters P_c, ρ_c, and T_c. The values selected for these critical parameters were $P_c = 33.555$ atm., $\rho_c = 11.21$ mol/liter, and $T_c = 126.20$ K. These values were selected to be in accord with the best values from the literature, and with the P-ρ-T and vapor pressure data near the critical point.

Measurements of the critical pressure and temperature are reported by White, et al. [118] as 33.54 ± 0.02 atm and 126.26 ± 0.04 kelvin, respectively. (This value for critical temperature converted to the IPTS-68 temperature scale is 126.25 K.) A more recent experiment reported by Voronel [57] identifies the critical temperature as between 126.191 K and 126.197 K. Wagner [90] used a critical temperature of 126.20 K and reports a measured value of the vapor pressure at 126.20 K of 34.002 ± 0.02 bar (33.557 atm). The value of the critical temperature selected for use in the least squares fitting procedure for the equation of state was 126.20 K. A solution of a preliminary vapor pressure equation gave a pressure of $P = 33.555$ atm at $T = 126.20$ K, which is the critical pressure used in this work.

The generally accepted value for the critical density from the literature is 0.311 g/cm^3 (11.10 mol/liter) which was recommended in a critical review of the critical constants by Pickering [113] in 1924. This recommended value was based primarily on the critical density value published in 1914 by Mathias, et al. [110], which was determined by the method of rectilinear diameters. Wagner [117] used a value of 11.25 mol/liter in a recent study of equations of state. A new value for the critical density was determined in this work by the method of rectilinear diameters using the calculated saturated liquid and saturated vapor densities described in section 2.2. This calculated value for the critical density which was selected for use in the least squares fitting procedure for the equation of state is 11.21 mol/liter.

TABLE 1. Summary of P-ρ-T data for nitrogen

Source	Temp range (K)	Pressure range (atm)	Number of data points
Vapor			
Amagat [1]	273–473	100–1000	72
Amagat [2]	273–317	100–3000	75
Bartlett [3]	273	1–1000	9
Bartlett et al. [4]	273–673	50–1000	46
Bartlett et al. [5]	203–293	75–1000	41
Benedict [6]	90–273	100–1563	25
Benedict [7]	98–473	981–5879	124
*Canfield [8]	133–273	2–541	152
Cheng [87]	87–309	225–10,245	420
*Crain [9]	143–273	2–506	90

TABLE 1. Summary of P-ρ-T data for nitrogen—Continued

Source	Temp range (K)	Pressure range (atm)	Number of data points
*Friedman [10]	80–300	0.2–200	201
Hall and Canfield [11]	103, 113	2–16	18
Heuse and Otto [12]	273	0.4–1.2	8
Holborn and Otto [13]	273–373	19–99	32
*Holborn and Otto [14]	273–673	19–99	66
Holborn and Otto [15]	143–273	20–99	24
Kamerlingh Onnes and van Urk [16]	124–293	23–63	143
Malbrunot and Vodar [17]	473–1274	1000–4000	63
Malbrunot [18]	473–1274	790–4935	191
*Michels et al. [19]	273–423	19–85	56
*Michels et al. [20]	273–423	192–2961	147
Miller et al. [21]	294	9–263	10
*Otto et al. [22]	273–423	46–415	63
*Robertson and Babb [23]	308–673	1621–9983	170
*Saurel [24]	423–1074	10–900	87
Smith and Taylor [25]	273–473	34–339	40
Townsend [26]	298, 323	2–140	35
Tsiklis and Polyakov [27]	294–673	1500–10,000	69
Tsiklis [28]	323–423	3000–10,000	45
Verschoyle [29]	273, 293	25–205	36
Liquid			
*Cockett et al. [30]	85–120	25–200	63
*Gibbons [31]	72–78	21–125	17
*Golubev and Dobrovolskii [32]	77–133	49–485	59
Streett and Staveley [33]	77–120	4–680	107
Van Itterbeek and Verbeke [34]	66–91	13–144	67
Van Itterbeek and Verbeke [35]	77, 90	79–815	13
*Weber [36]	80–140	14–266	76
Saturated liquid			
Goldman et al. [37]	79–126	1–33	30
Terry et al. [38]	78–105	1–10	15
Brauns [87]	66–111	0.2–15	49
Liquid on the freezing line			
Grilly and Mills [39]	65–120	77–3441	10

*P-ρ-T data selected for the determination of the equation of state.

3. Preparation of Data for Use in the Least Squares Fitting of the Equation of State

3.1. Weighting the Data

In a preliminary evaluation of the P-ρ-T data for nitrogen, estimates of the accuracy of the data were made, and the data sets to be used for determining the equation of state were selected. (Comparisons of the equation of state were made to both the data used in fitting the equation and to the data not selected, to further verify the data selection.) Preliminary weighting of the P-ρ-T data for fitting the equation of state used estimated uncertainties in density assigned to measurements from each experimenter. These uncertainty values were generally based on the experimenter's estimates of the accuracy of his measurements, and on the estimated uncertainties expressed by other data evaluators. In cases where there was very little information on the data, preliminary uncertainties were assessed on the basis of the precision of the data.

The uncertainty of the dependent variable (pressure) may be expressed as a function of the uncertainties of the independent variables (temperature and density) by the error propagation formula.

$$\sigma_P^2 = [\sigma_\rho(\partial P/\partial \rho)_T]^2 + [\sigma_T(\partial P/\partial T)_\rho]^2 \qquad (1)$$

where σ_P is the uncertainty in pressure due to the uncertainties in density (σ_ρ) and in temperature (σ_T).

The isotherm derivative and the isochor derivative in eq (1) were taken from a preliminary equation of state. Incorporating the estimated experimental uncertainty in pressure, σ_p, the weighting factor to be applied to each data point in performing a least squares fit to the data may then be calculated as,

$$W = \frac{1}{\sigma_P^2 + \sigma_p^2} \tag{2}$$

However, it is usually difficult to determine independently the uncertainty of each variable, and the preliminary weights applied to the data were calculated using the error propagation formula with the uncertainty in pressure determined from the estimated uncertainty in density of each data point. With this approximation, the weighting function becomes,

$$W = \frac{1}{[\sigma_\rho (\partial P/\partial \rho)_T]^2} \tag{3}$$

The relative weights of the P-ρ-T data, as calculated by eq (3) were judged to be essentially equivalent to weights based on the uncertainties as determined by the error propagation equation, as expressed in eq (1), for most of the P-ρ-T data, with the following exceptions.

(1) In the region near the critical point, the values of $(\partial P/\partial \rho)_T$ become very small, and values of W calculated by eq (3) were consequently very large. If separate estimates of σ_ρ, σ_T, σ_T had been used with eq (1), the resulting weights for the P-ρ-T data in the critical region would not have been disproportionately large.

(2) In the low pressure vapor region, the values of $(\partial P/\partial \rho)_T$ are again small, which may have resulted in unrealistic weights for the P-ρ-T data in this region.

(3) In the liquid region, values of $(\partial P/\partial \rho)_T$ are very large, which may have resulted in weights for the liquid data that were smaller than would have resulted from weights based on eqs (1) and (2).

As a consequence of the approximation of the uncertainties of the dependent variable as introduced by the use of eq (3), it was found that the accuracy of the equation of state determined by a weighted least squares fit to P-ρ-T data with weights determined by eq (3) was not satisfactory in the vicinity of the critical point. This was considered to be a reflection of the disproportionately large weights used with the P-ρ-T data in the critical region.

An alternate method of weighting the P-ρ-T data was then introduced, which was based on the equation of state, as determined by a weighted least squares fit with weights determined from eq (3). This method of weighting used the root-mean-square deviation in pressure for a given data set (usually an isotherm) from each experimenter. This rms deviation is expressed as,

$$\text{rms} = \left[\frac{\Sigma[(P_{\text{calc}} - P_{\text{data}})/P_{\text{data}}]^2}{N}\right]^{1/2} \tag{4}$$

where N is the number of data points. The weight for each data point based on the rms deviation is then,

$$W = \frac{1}{(\text{rms} \times P_{\text{data}})^2} \tag{5}$$

The use of eq (5) avoids the errors in weighting introduced by the approximation of eq (3) as outlined above. The use of the rms deviation for the calculation of weights gives approximately the same weights as the error propagation formula eq (3), except for the critical region, the low pressure vapor region, and the liquid region. In the use of eq (4), values of $[P_{\text{calc}} - P_{\text{data}}]$ were assigned as average deviations for a given run (usually an isotherm) as reported by the experimenter. Although the equation being developed was to represent the entire P-ρ-T surface, an accurate equation of more limited range is easier to obtain, and rms values in eq (4) were determined from pressures calculated using preliminary equations of state valid only for limited ranges of the data. This procedure allowed for some judgment to be used to reflect systematic errors which appeared to be present in a data set. This judgment was based on comparisons with data in the same region as reported by other experimenters.

Following the development of the functional form of the equation of state using P-ρ-T data, calculated values of C_v and saturation density data to define the equilibrium criteria for the liquid vapor phases were included in the least squares fit of the equation of state. The method of simulaneously fitting these data is discussed in section 4.2. The calculated isochoric heat capacity data were weighted by, $W = 10{,}000/(C_v)^2$ with C_v in liter · atm/mol · K, and the saturation data by, $W = 100/(P + 0.01)$, with P in atm. The relations for the weights were determined to produce an equation of state which would return accurate calculated values of C_v and of the saturation densities without a significant change in the accuracy of the P-ρ-T representation obtained by an interim equation determined from P-ρ-T data alone.

3.2. Temperature Scale Corrections

The data sets used in this investigation span the period of the evolution of interim uniform temperature scales, terminating with the adoption of the International Practical Temperature Scale of 1968 (IPTS-68) by the Comité International des Poids et Mesures (CIPM) in October of 1968 [106]. Temperature scale corrections were applied to all experimental data to correct all data temperatures to the IPTS-68 scale as specified in [92], [93], [102], and [104]. Details of the temperature scale corrections may be found in [107].

4. The Determination of the Equation of State

4.1. Analysis of the Functional Form of the Equation of State

In the selection of the functional form for the equation of state, theory is inadequate to indicate the functional form of the equation except for some of the boundary conditions. Several years experience in the determination of equations of state had indicated the terms of an equation of state that were generally useful in fitting P-ρ-T data. To systematically evaluate the terms in the equation of state, a stepwise multiple regression analysis was developed to ascertain the best of 50 terms for fitting the selected P-ρ-T data for nitrogen. The first term for the equation was selected as the one which had the highest correlation coefficient for the data used. The second term was chosen from among the remaining terms to provide the highest correlation coefficient for two terms including the first term as selected above. This procedure was continued until all 50 terms with undetermined coefficients had been utilized in the final fit. The fitting process was then repeated with 45 terms by deleting the 5 terms which had the lowest F-statistics of the group of 50, and repeated again with 43 terms after the deletion of 2 more terms with the least significant F-values. To eliminate further terms which had small or negligible contributions to the fit, the analysis of the F-statistics of the coefficients was continued until an equation was obtained with only one term with an F-statistic below the value of significance at the one percentile level. This resulted in eq (6) below. This equation, when fit to the P-ρ-T data for the entire range of available measurements, had 31 coefficients with F-values above the level for significance.

$$\begin{aligned} P = {} & \rho RT + \rho^2(N_1T + N_2T^{1/2} + N_3 + N_4/T + N_5/T^2) \\ & + \rho^3(N_6T + N_7 + N_8/T + N_9/T^2) \\ & + \rho^4(N_{10}T + N_{11} + N_{12}/T) + \rho^5(N_{13}) \\ & + \rho^6(N_{14}/T + N_{15}/T^2) + \rho^7(N_{16}/T) \\ & + \rho^8(N_{17}/T + N_{18}/T^2) + \rho^9(N_{19}/T^2) \\ & + \rho^3(N_{20}/T^2 + N_{21}/T^3)\exp(-\gamma\rho^2) \\ & + \rho^5(N_{22}/T^2 + N_{23}/T^4)\exp(-\gamma\rho^2) \\ & + \rho^7(N_{24}/T^2 + N_{25}/T^3)\exp(\gamma\rho^2) \\ & + \rho^9(N_{26}/T^2 + N_{27}/T^4)\exp(-\gamma\rho^2) \\ & + \rho^{11}(N_{28}/T^2 + N_{29}/T^3)\exp(-\gamma\rho^2) \\ & + \rho^{13}(N_{30}/T^2 + N_{31}/T^3 + N_{32}/T^4)\exp(-\gamma\rho^2) \end{aligned} \tag{6}$$

4.2. Simultaneous Least Squares Fitting of the Equation of State to Related Thermodynamic Property Data

In a least squares fit to determine the coefficients for the equation of state it is often desirable to include related thermodynamic data with the P-ρ-T data. Procedures were developed for including the values of C_v, and the criteria for phase equilibrium between saturated liquid and saturated vapor, simultaneously with the P-ρ-T data in a least squares fitting technique. The inclusion of C_v values proved successful for determining an equation of state which provides accurate second derivatives of the P-ρ-T surface. An equation which conforms to the conditions for phase equilibrium (i.e., the Maxwell criterion) is particularly useful since the integration of functions for property calculations along hypothetical isotherms through the two-phase region is then possible, and the use of an independent definition of vapor pressure as required in the Clapeyron relation is eliminated. (The inclusion of the Maxwell criterion with the least squares methods was recently described by Bender [94], [95], [96], and Wagner [50], [117].) Because of the paucity of data for the vapor near the saturated vapor states, and the disagreement in the liquid density values near the saturated liquid line (see figure 3), the calculated saturation density data were required in the least squares fit to achieve an equation of state which conforms to the Maxwell criterion.

In the least squares formulation incorporating P-ρ-T data, isochoric heat capacity data, and the phase equilibrium conditions, the sums of the squares of the weighted residuals of the functions in table 2 were minimized simultaneously. Equations (A) and (B) express the fit parameters for the P-ρ-T and C_v data, respectively, ane eqs (C) and (D), the conditions for equilibrium for the liquid and vapor phases (i.e., equal pressures and Gibbs functions of the saturated liquid and the saturated vapor at a given temperature.)

TABLE 2. Functions for simultaneous fitting

Function	
$P = \Sigma N_i P_i(\rho, T) + \rho RT$	(A)
$C_v = \Sigma N_i C_i(\rho, T) + C_v^\circ$	(B)
$\Sigma N_i P_i(\rho_{SL}, T_S) - \Sigma N_i P_i(\rho_{SV}, T_S) = (\rho_{SV} - \rho_{SL})RT_S$	(C)
$\Sigma N_i G_i = P_S\left(\frac{1}{\rho_{SL}} - \frac{1}{\rho_{SV}}\right) + RT\ln\left(\frac{\rho_{SL}}{\rho_{SV}}\right)$	(D)

P, ρ, T, and C_v are respectively the pressure, density, temperature, and constant volume heat capacity of data points used in the fit: P_S, T_S, ρ_{SL}, ρ_{SV}, are the saturation pressure, saturation temperature, density of the saturated liquid, and density of the saturated vapor respectively; the P_i are the individual terms of the equation of state, the $C_i(\rho, T)$ are given by

$$C_i(\rho, T) = \int_0^\rho \frac{T}{\rho^2}\left[\frac{\partial^2 P_i(\rho, T)}{\partial T^2}\right] d\rho,$$

the G_i are given by

$$G_i = \int_{\rho_{SL}}^{\rho_{SV}}\left[\frac{P_i(\rho, T_S)}{\rho^2} - \frac{RT_S}{\rho}\right] d\rho,$$

and the N_i are the coefficients of the equation of state to be determined.

4.3. Critical Point Constraints for the Equation of State

The final coefficients of the equation of state were determined by a weighted least squares fit using the

criteria outlined above, and constrained to the critical point which was determined independently. The procedure for constraining the equation of state to a selected critical point used the method of undetermined LaGrange multipliers in the least squares fit. The equation of state was constrained to give a pressure of 33.555 atm at a temperature and density of 126.20 K and 11.21 mol/liter, respectively, and a first and second isotherm derivative of zero at this selected critical point. (The vapor pressure equation was constrained to the same critical pressure and temperature, with the slope at the critical point constrained to the value of the slope of the critical isochor calculated from the equation of state.)

4.4. Coefficients for the Equation of State

The coefficients for the equation of state (6) for nitrogen are presented in table 3. These coefficients were determined by a weighted least squares fit using the functions given in table 2. The data used for the calculation of these coefficients included the P-ρ-T measurements, saturated liquid and vapor densities, and C_v values summarized in sections 2.1, 2.2, and 2.3.

TABLE 3. Coefficients for the equation of state (6) for nitrogen*

Coefficient	Numerical value	Coefficient	Numerical value
N_1	$0.136097243686983 \times 10^{-2}$	N_{17}	$-0.110400310752087 \times 10^{-5}$
N_2	0.107028500555504	N_{18}	$0.341309483327025 \times 10^{-3}$
N_3	$-0.243926251659031 \times 10^{1}$	N_{19}	$-0.166216790652177 \times 10^{-5}$
N_4	$0.341240789637052 \times 10^{2}$	N_{20}	$-0.164616585853003 \times 10^{5}$
N_5	$-0.422956791527436 \times 10^{1}$	N_{21}	$-0.119724198386865 \times 10^{6}$
N_6	$0.105277159433708 \times 10^{-5}$	N_{22}	$-0.948085610750225 \times 10^{2}$
N_7	$-0.111355267180312 \times 10^{-1}$	N_{23}	$0.554879602331972 \times 10^{5}$
N_8	$0.142748464727047 \times 10^{-5}$	N_{24}	−0.174677685666810
N_9	$0.179621096187021 \times 10^{5}$	N_{25}	$-0.256709963280944 \times 10^{1}$
N_{10}	$0.751267113751007 \times 10^{-7}$	N_{26}	$-0.404528219006087 \times 10^{-3}$
N_{11}	$0.231737284741220 \times 10^{-2}$	N_{27}	−0.257279422571519
N_{12}	−0.509008258448481	N_{28}	$-0.121204517440575 \times 10^{-6}$
N_{13}	$0.488523311385766 \times 10^{-4}$	N_{29}	$0.104690038752288 \times 10^{-4}$
N_{14}	$-0.112001704676209 \times 10^{-2}$	N_{30}	$-0.529499586313775 \times 10^{-9}$
N_{15}	−0.678366343173806	N_{31}	$-0.774723053052639 \times 10^{-8}$
N_{16}	$0.742796115735318 \times 10^{-4}$	N_{32}	$0.610368224362452 \times 10^{-7}$

$\lambda = 0.0056$; $R = 0.0820562$ liter·atm/mol·K

*Coefficients are for temperature in kelvin, pressure in atmospheres, and density in mols/liter.

5. Comparison of P-ρ-T Data to the Equation of State

Figures 2, 3, 4, and 5 illustrate the accuracy of the equation of state (6) in representing the P-ρ-T data selected for the determination of the coefficients for the equation of state. The basis for data selection among the values reported by the several experimenters was concordance of data in the same region of the P-ρ-T surface, and the relative agreement with trends established by the data selected to define adjacent regions. The P-ρ-T data sets utilized in the calculation of the coefficients in table 3 consisted of 1246 weighted data points from [8], [9], [10], [14], [19], [20], [22], [23], [24], [30], [31], [32], and [36]. Comparisons were also made of data not used in determining the equation of state to confirm the data selections. Graphs of deviations between densities calculated by eq (6) and all the P-ρ-T data listed in table 1 were published in [107].

Figures 2, 3, 4, and 5 are comparisons of the percent density deviation $[(\rho_{exp}-\rho_{calc})/\rho_{exp}] \times 100$, along approximate isotherms (in figure 5, along approximate isochors). where ρ_{exp} is the observed density reported by the experimenter at a particular temperature and pressure, and ρ_{calc} is the density calculated from eq (6) for each experimental temperature and pressure. The density deviations for some data points exceeded the percent density deviation scales used in figures 2, 3, 4, or 5, and are listed in table 4.

Table 5 lists the root-mean-square deviations in pressure and in density for the various P-ρ-T data sets. Comparison of the several data sets should be made only for data in the same ranges of pressure and temperature. Table 5 has, therefore, been divided into four ranges where the deviations of the data are comparable. In comparing these results consideration must also be given to individual differences of the various data sets. For example, the data by Saurel [24] is for pressures considerably higher than the other data listed for vapor above 273 K (below 1000 atm) (see table 1). The vapor data by Friedman [10] below 273 K includes numerous points in the vicinity of the critical point where large deviations in density are expected. The data of Weber [36] listed under liquid in table 5 includes some data for

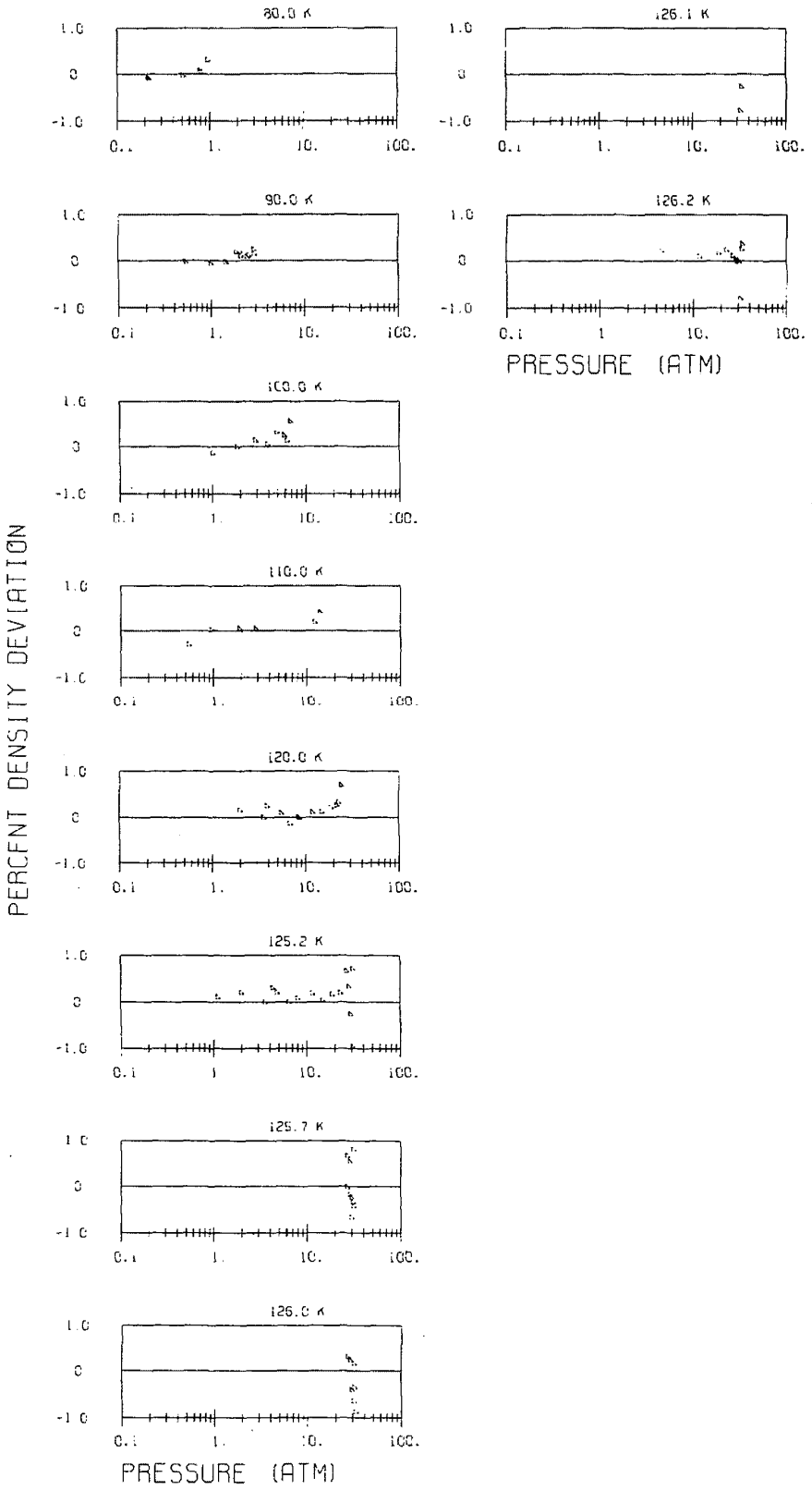

FIGURE 2. Deviations in density of equation (6) from the P-ρ-T data for the low temperature vapor from Friedman [10]

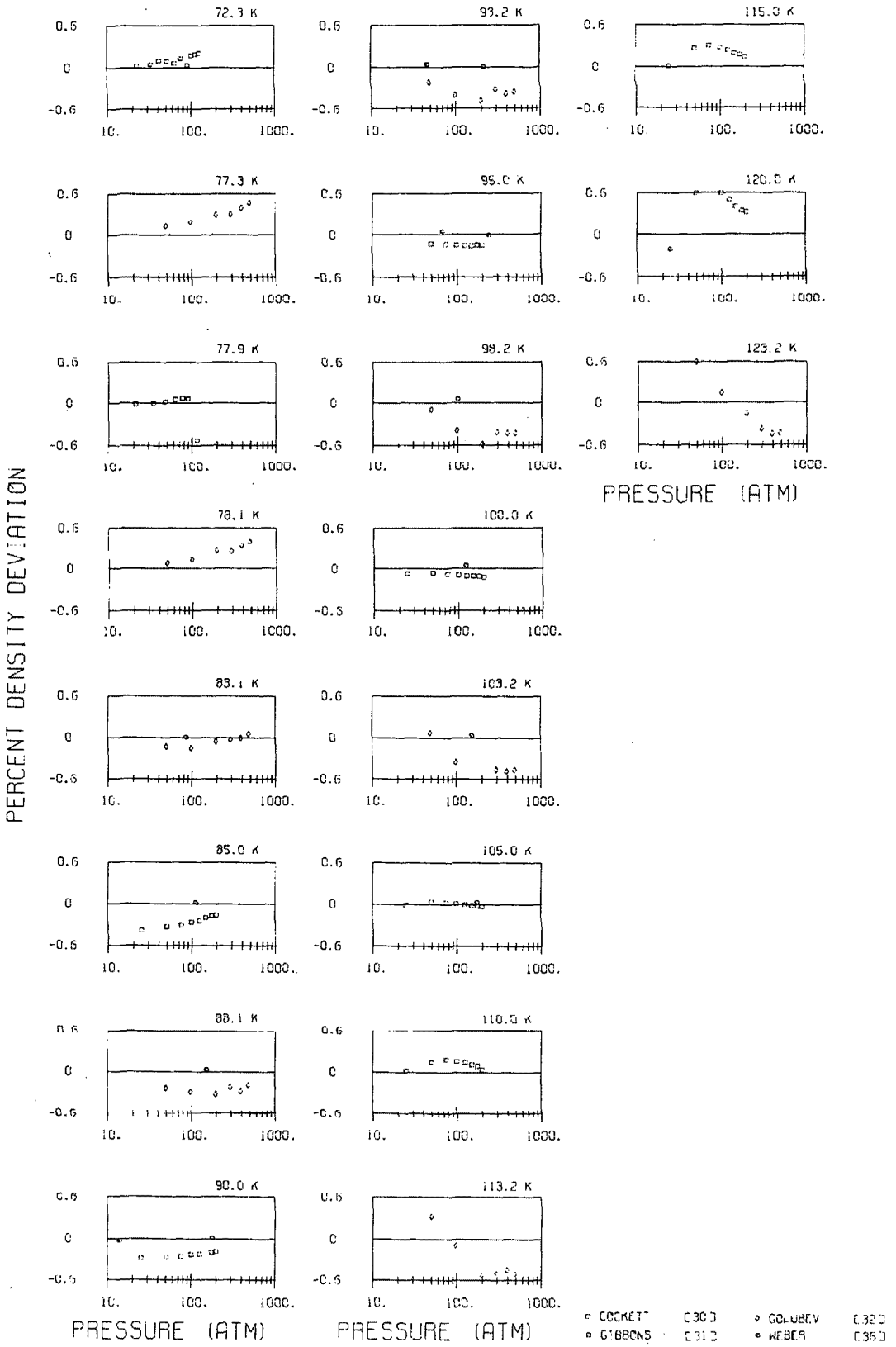

FIGURE 3. Deviation in density of equation (6) from the P-ρ-T data of the liquid from the references cited.

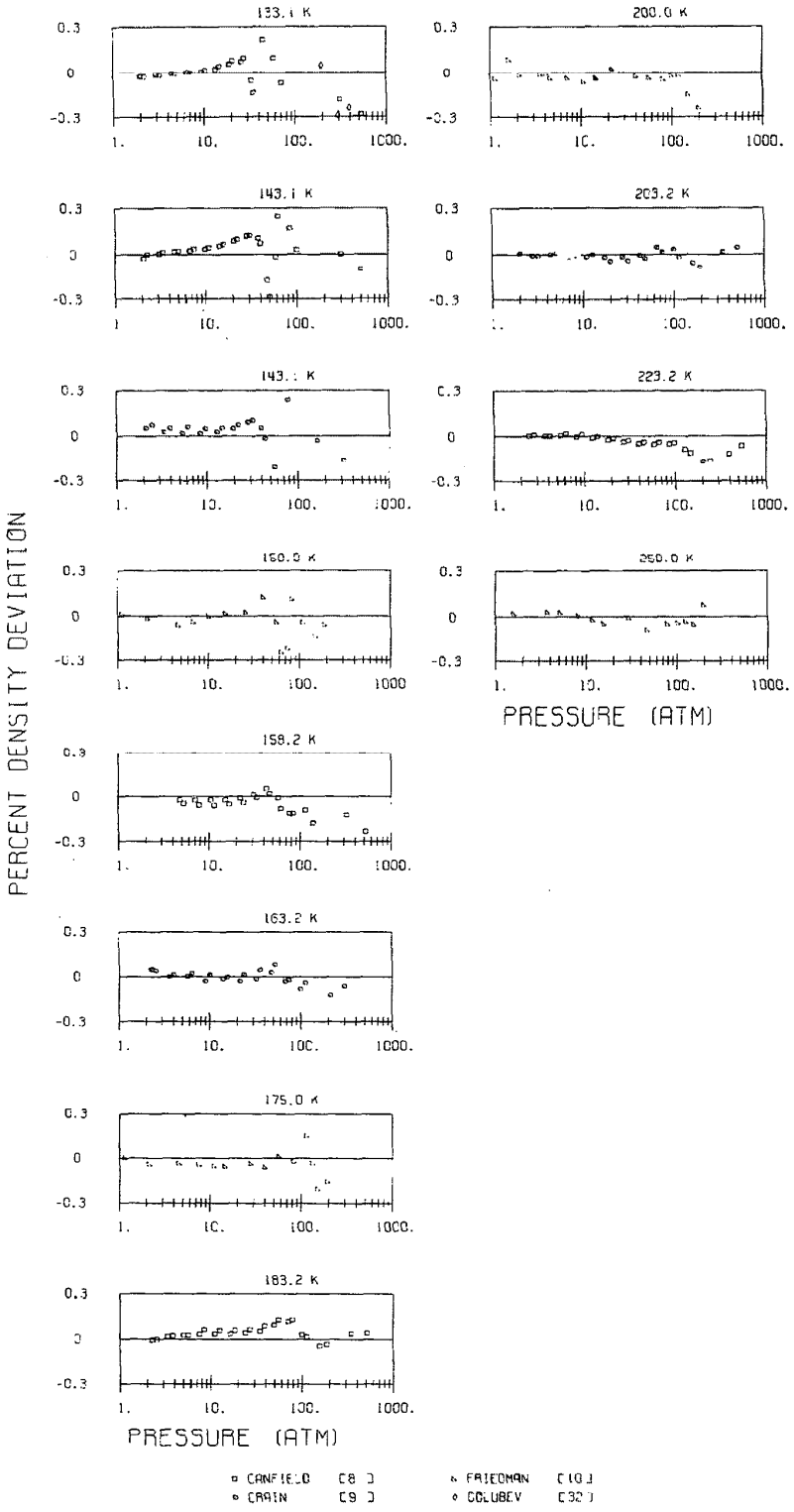

FIGURE 4. Deviation in density of equation (6) from the P-ρ-T data at temperatures above the critical temperature from references cited.

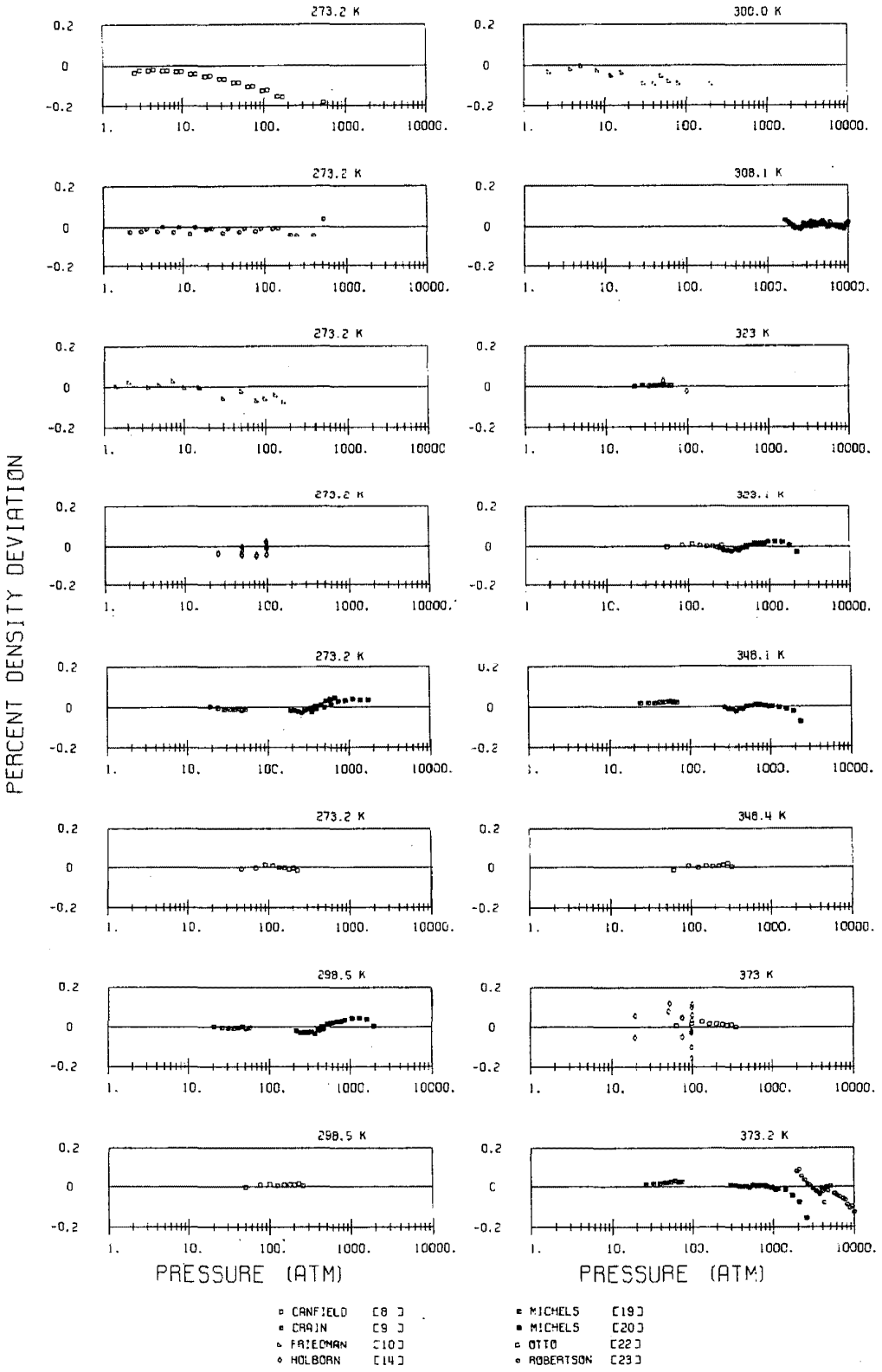

FIGURE 4. Deviation in density of equation (6) from the P-ρ-T data at temperatures above the critical temperature from references cited.—Continued

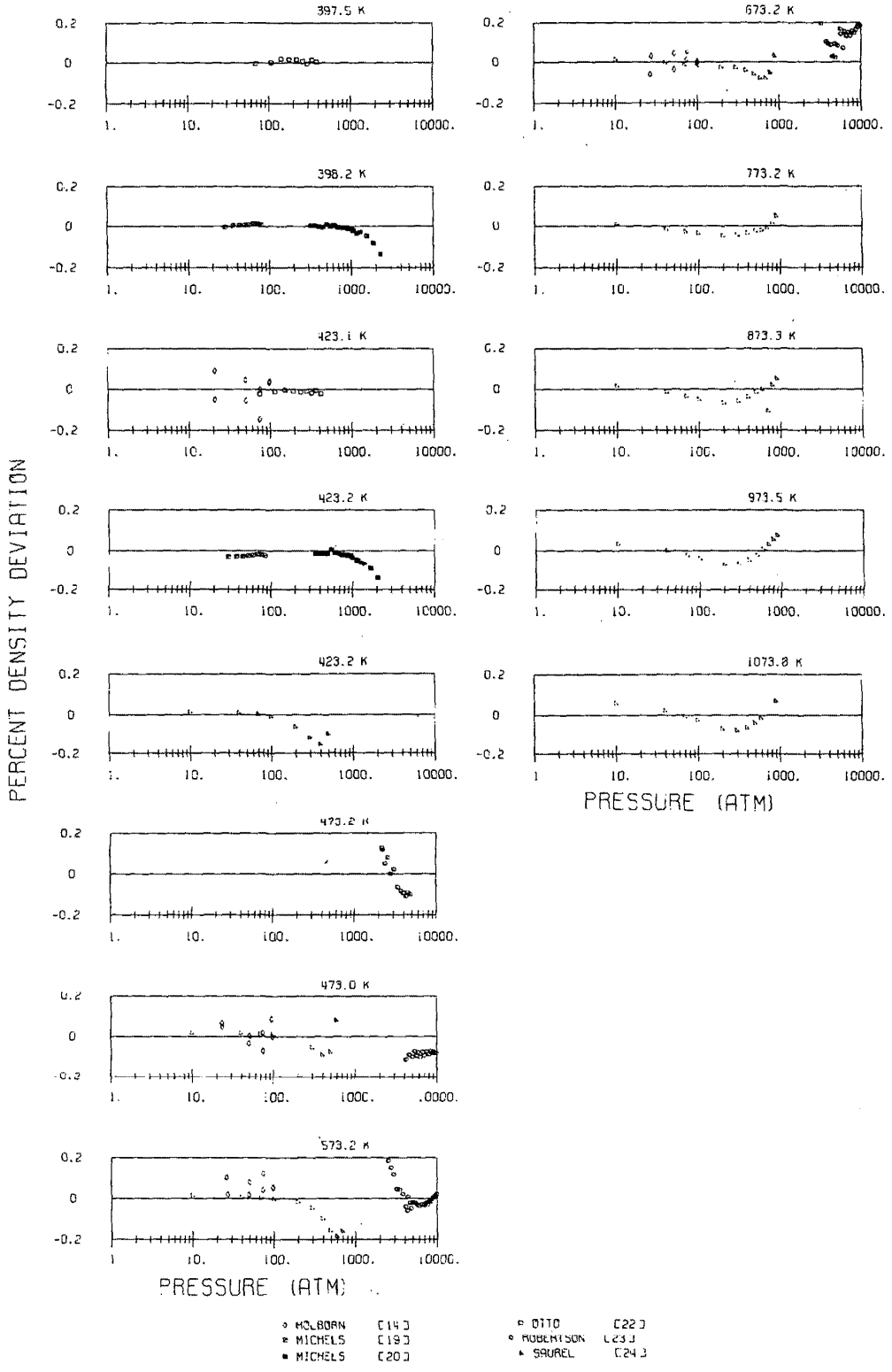

FIGURE 4. Deviation in density of equation (6) from the P-ρ-T data at temperatures above the critical temperature from references cited.—Continued

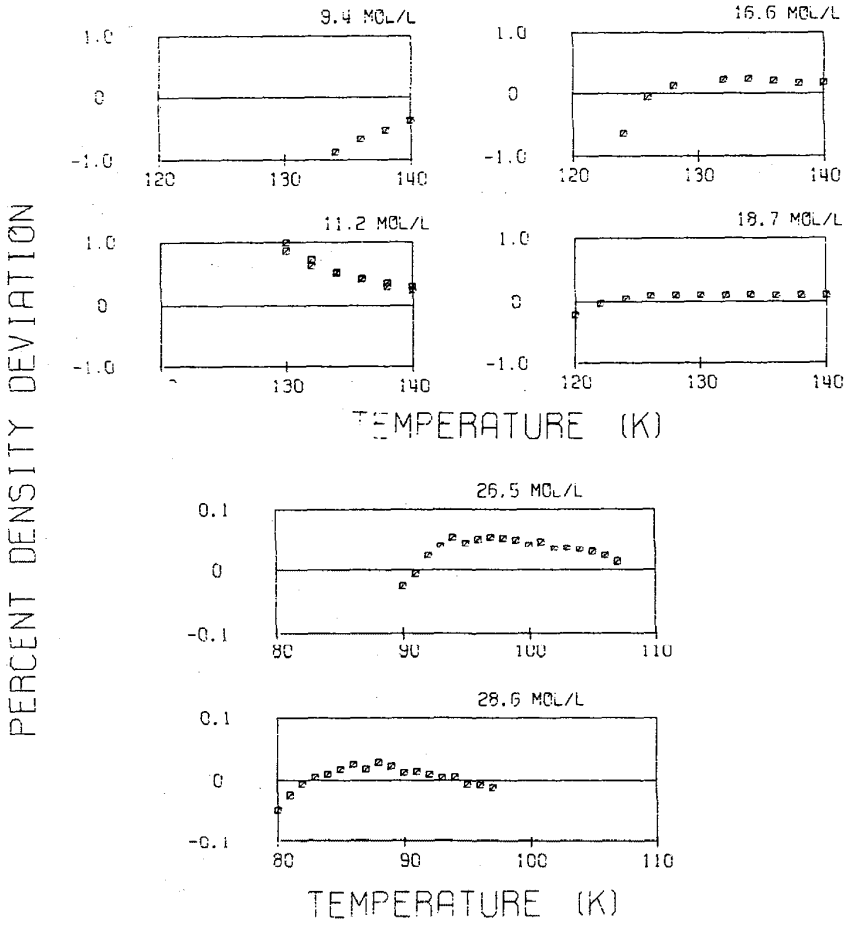

FIGURE 5. Deviation in density of equation (6) from the P-ρ-T data of Weber [36] along approximate isochors.

TABLE 4. P-ρ-T data with density deviations in excess of the scale used in figures 2, 3, 4, or 5

Figure	Temp (K)	Pressure (atm)	Density deviation (percent)	Reference
2	110.02	8.91	−1.24	[10]
2	125.21	31.67	−1.35	[10]
2	125.73	32.12	−1.97	[10]
2	125.73	32.77	−5.53	[10]
2	125.73	31.66	−1.42	[10]
2	125.73	31.21	−1.91	[10]
2	126.17	33.17	−1.42	[10]
2	126.17	33.08	−1.26	[10]
2	126.17	33.46	−1.09	[10]
2	126.17	33.51	−1.20	[10]
3	103.16	194.60	−0.64	[32]
3	119.99	25.00	−0.61	[30]
3	119.99	75.00	0.69	[30]
4	133.14	45.79	0.97	[8]
4	133.14	40.74	−1.11	[8]
4	133.14	39.56	−0.89	[8]
4	133.14	97.80	0.71	[32]
4	133.14	485.00	−0.33	[32]
4	143.14	66.67	0.41	[9]
4	143.14	51.07	−0.31	[9]
4	150.03	91.35	−0.32	[10]
4	273.15	277.19	−0.21	[8]
4	273.15	415.03	0.29	[8]

Figure	Temp (K)	Pressure (atm)	Density deviation (percent)	Reference
4	273.15	230.43	−0.20	[8]
4	273.15	199.61	−0.25	[10]
4	299.97	111.78	−0.34	[10]
4	299.97	153.76	−0.44	[10]
4	398.15	2766.00	−0.26	[20]
4	423.17	2437.94	−0.25	[20]
4	423.17	2960.95	−0.36	[20]
4	473.19	200.00	−0.27	[24]
4	673.45	3466.07	−0.28	[23]
4	673.45	3003.21	0.23	[23]
4	673.45	2797.93	0.29	[23]
4	1073.82	800.00	−0.28	[24]
4	1073.82	700.00	−0.21	[24]

Figure	Temp (K)	Density (mol/liter)	Density deviation (percent)	Reference
5	132.00	9.4	−1.16	[36]
5	130.00	9.4	−1.59	[36]
5	128.00	9.4	−2.39	[36]
5	128.00	11.2	1.15	[36]
5	128.00	11.2	1.24	[36]

TABLE 5. Root mean square deviations in density and pressure of P-ρ-T data from the equation of state

Source	RMS deviation in density (percent)	RMS deviation in pressure (percent)
Vapor—above 273 K (below 1000 atm)		
Amagat [1]	0.298	0.499
Amagat [2]	0.136	0.402
Bartlett et al. [4]	0.315	0.478
Bartlett et al. [5]	0.152	0.421
Heuse and Otto [12]	0.009	0.009
Holborn and Otto [13]	0.082	0.084
*Holborn and Otto [14]	0.066	0.060
Holborn and Otto [15]	0.681	0.551
*Michels et al. [19]	0.015	0.016
Miller et al. [21]	0.264	0.303
*Otto et al. [22]	0.011	0.012
*Saurel [24]	0.074	0.093
Verschoyle [29]	0.129	0.139
Vapor—below 273 K (below 1000 atm)		
Bartlett et al. [5]	0.152	0.421
Benedict [6]	1.110	3.505
*Canfield [8]	0.166	0.225
*Crain [9]	0.077	0.114
*Friedman [10]	0.552	0.166
Kamerlingh Onnes and van Urk [16]	6.105	0.333
Vapor at high pressures (above 1000 atm)		
Amagat [2]	0.136	0.402
Benedict [7]	0.279	1.786
Malbrunot and Vodar [17]	3.570	4.521
Malbrunot [18]	1.590	2.327
*Michels et al. [20]	0.053	0.149
*Robertson and Babb [23]	0.077	0.224
Tsiklis and Polyakov [27]	0.580	2.393
Tsiklis [28]	0.483	1.423
Liquid		
*Cocket et al. [30]	0.260	7.077
*Gibbons [31]	0.161	7.901
*Golubev and Dobrovolskii [32]	0.352	5.522
Streett and Staveley [33]	0.377	26.805
Van Itterbeek and Verbeke [34, 35]	0.372	19.604
*Weber [36]	0.496	0.813

*P-ρ-T data selected for the determination of the equation of state.

the low pressure vapor, and data along an approximate critical isochor, which have significantly higher deviations than the remainder of the liquid data.

The equation of state generally shows agreement with P-ρ-T data within the experimental uncertainty of the measured values, except in the vicinity of the critical point, in the low temperature liquid region, and in the high pressure supercritical region. The data in these regions are discussed below.

5.1. Data Near the Critical Point

The data of Friedman [10] (fig. 2) for temperatures above 125 K, illustrate the imprecision of the data in the region of the critical point. In this region the slopes of the isotherms, $(\partial P/\partial \rho)_T$, are small, and small errors in pressure result in large errors in calculated density. This is a difficult region for fitting the equation of state and also a difficult region for precise experimental measurements. Systematic deviations between the equation and the data near the critical point are apparent for isotherms above the critical temperature at 133.1 K and 143.1 K in the data of Canfield [8] (fig. 4), and that of Crain [9] at 143.1 K (fig. 4), and for the data along the 11.2 mol/liter isochor of Weber [36] (fig. 5).

5.2. Low Temperature Liquid Data

The data for the liquid from the several experimenters indicate a lack of agreement larger than the discordance for the vapor data. The differences between the liquid P-ρ-T data and equation (6) illustrated in figure 3 are generally systematic, but the trend of the deviations for data from various sources is dissimilar. Data selected for the determination of the coefficients of eq (6) cover most of the range of temperatures and pressures of the data that were not used (see table 1).

The density deviations of the equation of state from the data of Weber [36] are illustrated on several isotherms in figure 3 to facilitate comparison to other liquid data. All of Weber's data are compared with eq (6) in figure 5 for approximate isochoric values between 9 and 28 mol/liter. (At 9.47 mol/liter the state is vapor, while all other isochors are for liquid density values.) These data exhibit general agreement with the equation of state, although the isochoric plots indicate a systematic deviation with a maximum discrepancy of −2.4 percent for the 9.47 mol/liter vapor isochor, and systematic trends are evident for the 11.2 and 16.0 mol/liter isochors.

5.3. High Pressure Data

The data of Saurel [24] (shown in figure 4 for several isotherms from 423.2 K to 1073.8 K), and those of Robertson and Babb [23] (illustrated in figure 4 for several isotherms from 308.1 K to 673.1 K) were used in the determination of the equation of state. These measurements were judged to be the most accurate of the available high pressure data, and thus were used to define this region. The data of [17], [18], [27], [28], and [88] exhibit large systematic deviations from the equation of state, and are generally not in accord with measurements by the other experimenters.

The high pressure P-ρ-T data of Cheng [88] include high pressure values at lower temperatures than other available measurements, except for some measurements of density on the fusion line. These measurements include 420 P-ρ-T values along 16 isotherms ranging from 87 K to 309 K, with pressures from 225 atm to 10,245 atm. (The maximum pressures for data below 200 K were the fusion line pressures.) The values of density calculated from the equation of state (6) deviate systematically from the measurements of [88], with

maximum deviations generally within 1 percent, except for values near the fusion line (see fig. 7). These data are adjacent to the range of values measured by Robertson and Babb [23], and overlap the measurements of Michels et al. [20] at temperatures of 273 K and 298 K. Values of density calculated from the equation of state (6) are essentially in agreement with the data of [20] and [23] for these isotherms (see fig. 4). The agreement of the extrapolated values from the equation of state with Cheng's measurements confirms the validity of the extrapolation of the equation to the melting line, with an uncertainty as indicated by the agreement with the data from [88]. Comparisons of the density measurements of Cheng [88] on the fusion line are given in section 6.

6. Extrapolation of the Equation of State

The P-ρ-T data for the saturated liquid and the freezing line were excluded in the determination of the coefficients of the equation of state (6). Extrapolations of the equation of state to the saturated liquid line have been made and are compared with the experimental data from references [37], [38], and [87] in figure 6. The P-ρ-T values calculated for these comparisons were determined using the vapor pressure equation (9) to calculate the pressure corresponding to the measured temperature. A comparison of the density deviations for the lowest pressure values for each isotherm given in figure 3 to the density deviations given in figure 6, indicates the lack of concordance between these measured data. In the least squares fitting of the equation of state, the values required for functions C and D in table 2 were determined as outlined in section 2.2.

The saturated liquid data of Brauns [87] were received after the coefficients for eq (6) had been determined. These measurements include one set of values from 66 to 78 K, and a second set of measurements from 76 to 111 K from a separate experiment using a different apparatus. Brauns has reported smoothed values in two tables which represent two separate experiments. The deviations between these smoothed values and eq (6) are illustrated in figure 6.

Extrapolation of the equation of state to the melting curve was made with pressures on the melting curve determined from the Simon melting curve equation (7) as reported by Grilly and Mills [39] with appropriate temperature corrections.

$$P = a + bT^c, \tag{7}$$

where $a = -1579.08$, $b = 0.926302$, and $c = 1.795$, with pressures in atmospheres and temperatures in kelvin. Densities at the melting curve calculated from the equation of state are compared to the measured values of Grilly and Mills [39] and Cheng [88] in figure 7. The data by Cheng [88] for the high pressure liquid are discussed in section 5.

In addition to the extrapolation of the equation of state in the liquid range it is also desirable to extrapolate the equation of state in the vapor phase to higher and lower temperatures. At both high and low temperatures, the dominant portion of the equation of state is $\rho RT + \rho^2(N_1T + N_2T^{1/2} + N_3 + N_4/T + N_5/T^2)$. With eq (6) expanded as a power series (i.e., a virial equation), the second virial coefficient becomes,

$$B(T) = (N_1T + N_2T^{1/2} + N_3 + N_4/T + N_5/T^2)RT, \tag{8}$$

where the N_i are the coefficients from table 3, and T is the temperature in kelvins. Hence, the dominant terms

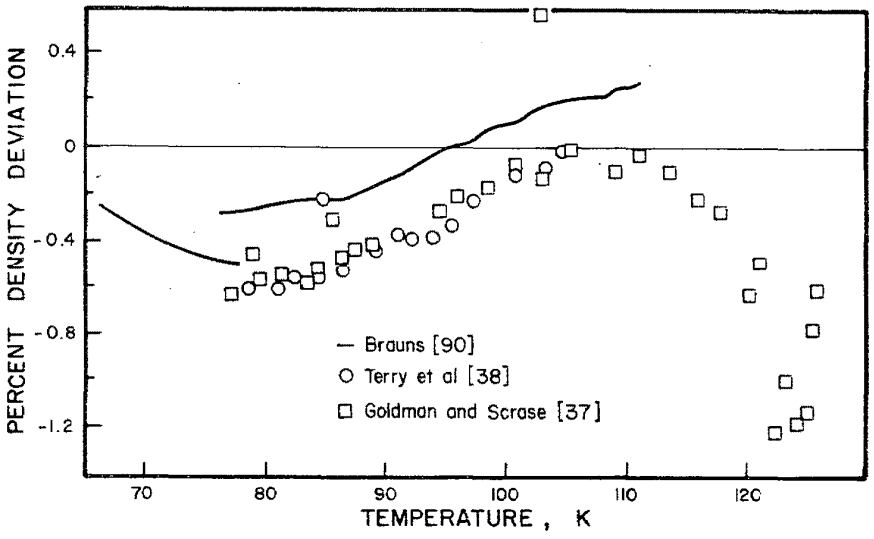

FIGURE 6. Deviation of equation (6) from liquid P-ρ-T data at the vapor pressure.

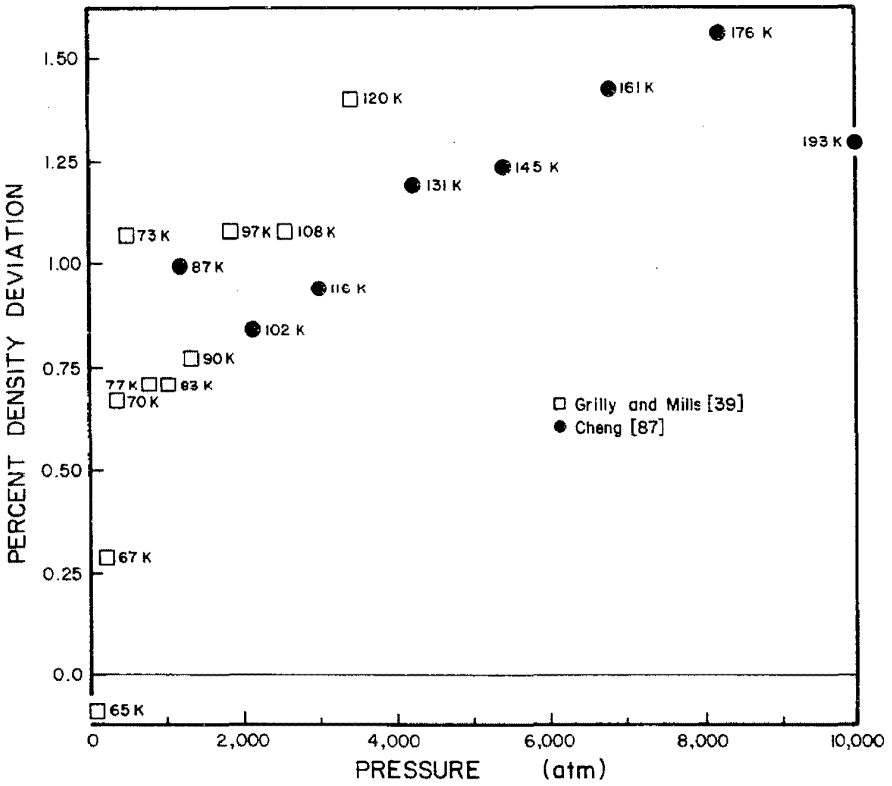

FIGURE 7. Deviation of equation (6) from liquid P-ρ-T on the freezing line from [39] and [88]. (Nominal temperatures are given beside each point.)

are the contributions from first and second virial terms.

The contribution to the total pressure, as calculated by eq (6), from the ideal gas and second virial terms is illustrated in figures 8, 9, and 10. This contribution is expressed as (percent $P = (\mathscr{P}/P_{eq}) \times 100)$. where P_{eq} is the pressure calculated from eq (6) at the specified temperature T, and density ρ, and $\mathscr{P}$ is the contribution to the calculated pressure (i.e., the sum of the ideal gas and second virial term $(\mathscr{P} = \rho RT + B(T)\rho^2/RT)$ in figures 8 and 9, and in figure 10 of the ideal gas term alone $(\mathscr{P} = \rho RT)$).

Examination of figures 8, 9, and 10 indicates that the extrapolation of the equation of state for the vapor at high and low temperatures is reasonable, and for higher

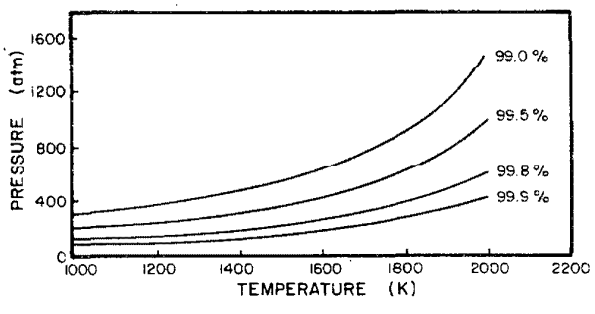

FIGURE 8. Percentage contribution of first and second virial terms to pressure from equation (6) at high temperature.

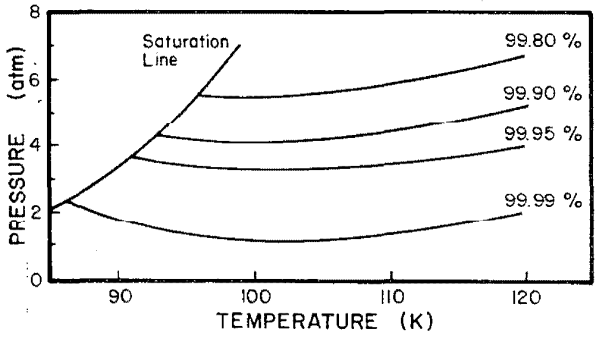

FIGURE 9. Percentage contribution of first and second virial terms to pressure from equation (6) at low temperature.

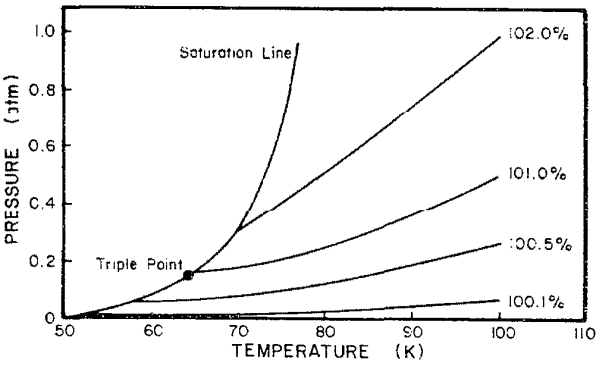

FIGURE 10. Percentage contribution of first al (ideal gas) term to pressure from equation (6) at low iperature.

temperatures is essentially limited by the accuracy of the second virial coefficient as predicted by eq (8). Figure 11 is a comparison of values from eq (8) with the experimental virial coefficients from the references cited. Figure 10 indicates that eq (6) may also be extrapolated to lower temperatures for the gas to the saturated vapor line. These comparisons indicate that the extrapolations suggested have the anticipated physical features and are prudent for the range of values included in these thermodynamic property tables.

7. The Vapor Pressure Equation

The literature reporting measurements of the vapor pressure of nitrogen is summarized in table 6. A preliminary study of the vapor pressure data, and a preliminary vapor pressure equation were reported in [99] and [100]. Following the development of the equation for the vapor pressure of oxygen using calorimetric as well as vapor pressure measurements [112], a new vapor pressure equation was developed for nitrogen. This

TABLE 6. Summary of vapor pressure data

Source	Temperature range (K)	Number of data points
*Armstrong [40]	64–78	74
Cath [41]	58–84	10
Crommelin [42]	81–124	9
Dodge and Davis [43]	76–122	30
Friedman and White [44]	78–126	19
Giauque and Clayton [45]	65–78	10
Keesom and Bijl [46]	65–78	18
Michels et al. [47]	97–125	10
Moussa et al. [48]	63–78	32
Porter and Perry [49]	90–121	12
Wagner [50]	63–126	75
*Weber [36]	65–126	47

*Data selected for the determination of the vapor pressure equation.

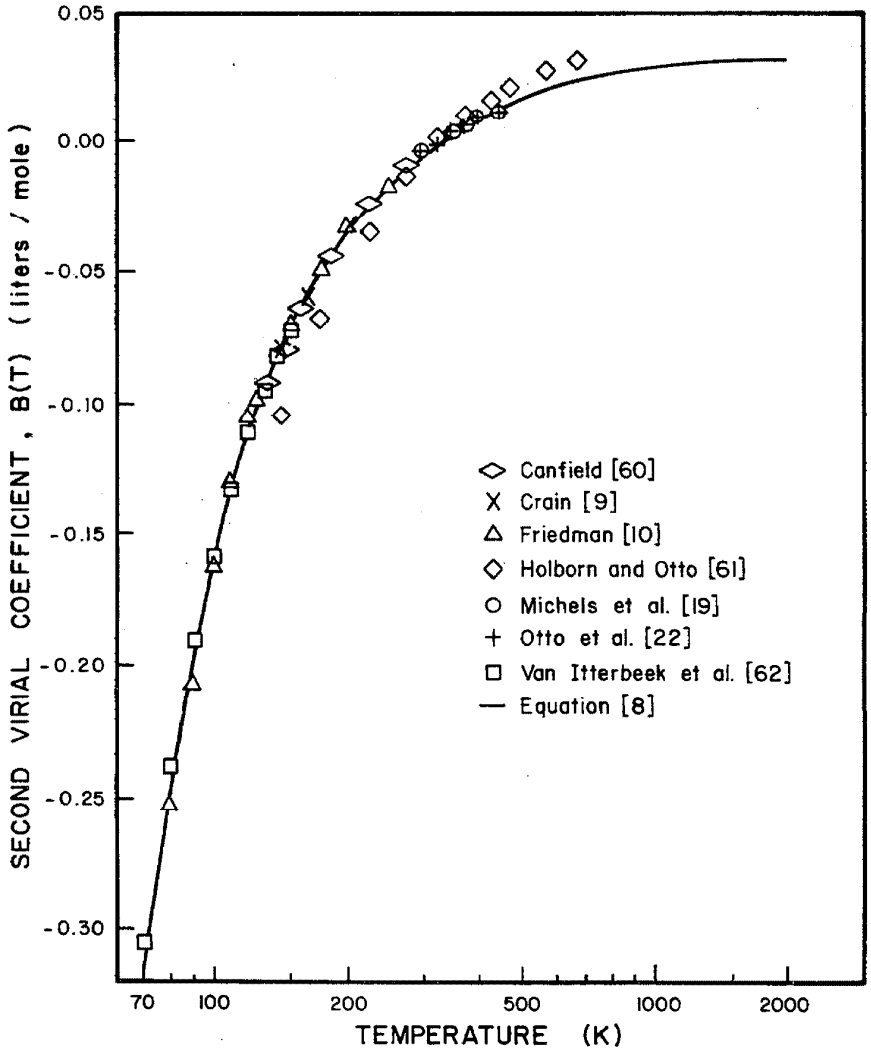

FIGURE 11. Comparison of second virial coefficient from equation (8) to experimental values from the sources indicated.

TABLE 7. Coefficients for nitrogen vapor pressure equation (9)*

Coefficient	Numerical value	Coefficient	Numerical value
N_1	$0.8394409444 \times 10^{2}$	N_6	$-0.5944544662 \times 10^{-5}$
N_2	$-0.1890045259 \times 10^{4}$	N_7	$0.2715433932 \times 10^{-7}$
N_3	$-0.7282229165 \times 10^{1}$	N_8	$-0.4879535904 \times 10^{-10}$
N_4	$0.1022850966 \times 10^{-1}$	N_9	$0.5095360824 \times 10^{3}$
N_5	$0.5556063825 \times 10^{-5}$		

*Coefficients are for temperature in kelvin, and pressure in atmospheres.

equation is the result of a least squares fit to the nitrogen data of Armstrong [40], and Weber [36]. These data were used since they cover the range from the triple point to the critical point, have a high precision, and appeared to be the most accurate measurements available. The vapor pressure measurements from [36] are reported by the experimenter to include possible systematic errors in temperature of 0.003 K at 65 K increasing to 0.007 K at 140 K, and to have an accuracy in pressure of 0.01 percent. The form of the vapor pressure equation used in this work is

$$\ln(P) = N_1/T + N_2 + N_3 T + N_4 (T_c - T)^{1.95} + N_5 T^3 + N_6 T^4 + N_7 T^5 + N_8 T^6 + N_9 \ln(T) \qquad (9)$$

where $T_c = 126.20$ K, the critical point temperature, T is the saturation temperature, and P is the vapor pressure. The coefficients for this equation for temperature in kelvin and pressure in atmospheres are given in table 7.

The new vapor pressure measurements by Wagner [50] were brought to the attention of the authors following the determination of the vapor pressure equation. Wagner reports an accuracy of ± 0.005 K in temperature, and an uncertainty of one part in 10,000 in pressure. A comparison of the vapor pressure equation (9) with the data from [36], [40], [48], and [50] is given in figure 12. The data of the experimenters listed in table 6 not included in the comparisons of figure 12 are either not concordant with the data of [36], [40], [48], and [50], or

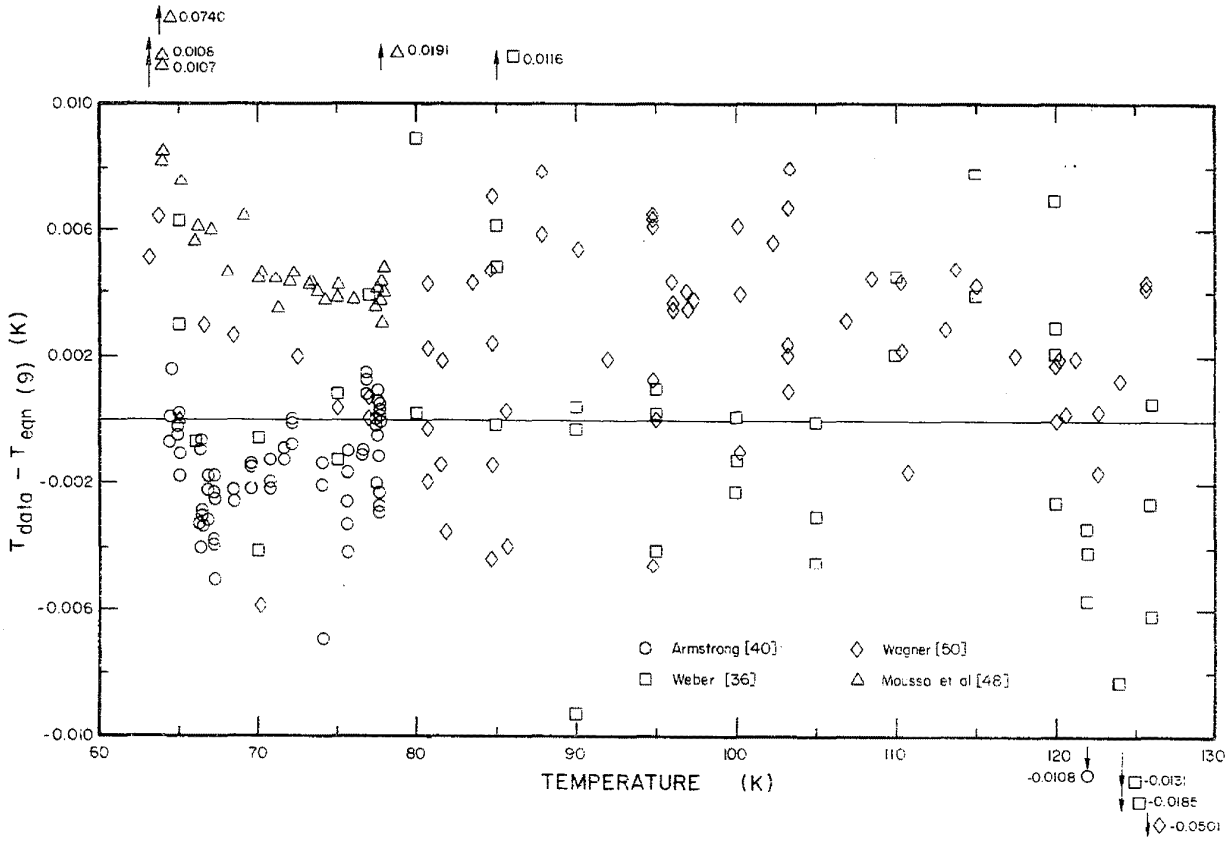

FIGURE 12. Deviations of nitrogen vapor pressure equation (9) from selected vapor pressure data.

exhibit imprecisions which are an order of magnitude larger than that of the selected data. Equation (9), with the coefficients given in table 7 gives a temperature at one atmosphere pressure of 77.347 K. This value is 0.001 K lower than the value published as a secondary reference point for the International Practical Temperature Scale of 1968 [93].

A recent paper by Wagner [90] reports a new vapor pressure equation which may be more accurate than eq (9). Wagner indicates that the data of [36], [40], [48], and [50] cover a field of maximum deviations of 0.006 K, whereas figure 12 illustrates a field of maximum deviations of 0.01 K. Since eq (9) represents the data of [36] and [50] within the reported accuracy of the measured data, the determination of the coefficients for the vapor pressure equation was not repeated to include the new data from [50].

The vapor pressure equation has been constrained at the critical point to a temperature of 126.20 K, a pressure of 33.555 atmospheres, and the slope dP/dT of 1.6569 atm/K, which is the value of $(\partial P/\partial T)_\rho$ at the critical point from the equation of state (6). In the calculation of the thermodynamic property tables, the vapor pressure equation (9) was used only to determine the vapor pressure for the saturation table, and the saturation temperature for each isobar.

8. The Ideal Gas Heat Capacity

The values for ideal gas heat capacity used in the calculation of the thermodynamic property tables are from [85] and [86]. These values appear to be the most accurate to date.

The equation suggested by Barieau [91], has been fitted to the data from [85]. This equation is

$$C_p^0/R = N_1/T^3 + N_2/T^2 + N_3/T + N_4 + N_5T + N_6T^2 + N_7T^3 + N_8u^2e^u/(e^u - 1)^2, \quad (10)$$

where C_p^0 is the ideal gas heat capacity, T the temperature, and $\mu = N_9/T$. The coefficients for eq (10) with values of T in kelvin are given in table 8.

Table 9 is a listing of the ideal gas heat capacity values (C_p^0/R) as a function of temperature as reported in [85]. A comparison between these values from [85] and values calculated from eq (10) indicates exact agreement within the number of figures reported, except above 1200 K. Above 1200 K the differences between the values from eq (10) and from [85] is no more than ± 0.0001.

TABLE 8. Coefficients for the ideal gas heat capacity equation (10) for nitrogen

Coefficient	Numerical value	Coefficient	Numerical value
N_1	$-0.7352104012 \times 10^3$	N_6	$0.1746508498 \times 10^{-7}$
N_2	0.3422399804×10^2	N_7	$-0.3568920335 \times 10^{-11}$
N_3	-0.5576482846	N_8	0.1005387228×10^1
N_4	0.3504042283×10^1	N_9	3353.4061
N_5	$-0.1733901851 \times 10^{-4}$		

TABLE 9. Values of ideal gas heat capacity, C_p^0/R, from Baehr et al. [85]

Temperature (K)	C_p^0/R	Temperature (K)	C_p^0/R
50.0	3.4999	270.0	3.4995
60.0	3.4998	280.0	3.4998
70.0	3.4998	290.0	3.5001
80.0	3.4997	300.0	3.5006
90.0	3.4997	310.0	3.5011
100.0	3.4996	320.0	3.5018
110.0	3.4996	330.0	3.5027
120.0	3.4995	340.0	3.5038
130.0	3.4995	350.0	3.5050
140.0	3.4994	360.0	3.5065
150.0	3.4994	370.0	3.5081
160.0	3.4994	380.0	3.5101
170.0	3.4993	390.0	3.5122
180.0	3.4993	400.0	3.5147
190.0	3.4992	410.0	3.5174
200.0	3.4992	420.0	3.5203
210.0	3.4992	430.0	3.5235
220.0	3.4992	440.0	3.5270
230.0	3.4992	450.0	3.5308
240.0	3.4992	460.0	3.5349
250.0	3.4993	470.0	3.5392
260.0	3.4994	480.0	3.5438

TABLE 9. Values of ideal gas heat capacity, C_p^0/R, from Baehr et al. [85]—Continued

Temperature (K)	C_p^0/R	Temperature (K)	C_p^0/R
490.0	3.5487	710.0	3.7014
500.0	3.5538	720.0	3.7095
510.0	3.5591	730.0	3.7176
520.0	3.5647	740.0	3.7257
530.0	3.5705	750.0	3.7338
540.0	3.5765	760.0	3.7419
550.0	3.5828	770.0	3.7500
560.0	3.5892	780.0	3.7581
570.0	3.5958	790.0	3.7662
580.0	3.6026	800.0	3.7742
590.0	3.6095	810.0	3.7822
600.0	3.6166	820.0	3.7902
610.0	3.6239	830.0	3.7982
620.0	3.6312	840.0	3.8061
630.0	3.6387	850.0	3.8139
640.0	3.6463	860.0	3.8217
650.0	3.6539	870.0	3.8295
660.0	3.6617	880.0	3.8372
670.0	3.6695	890.0	3.8448
680.0	3.6774	900.0	3.8524
690.0	3.6854	910.0	3.8599
700.0	3.6934	920.0	3.8674

TABLE 9. Values of ideal gas heat capacity, C_p^0/R, from Baehr et al. [85]—Continued

Temperature (K)	C_p^0/R	Temperature (K)	C_p^0/R
930.0	3.8748	1350.0	4.1192
940.0	3.8821	1400.0	4.1404
950.0	3.8894	1450.0	4.1601
960.0	3.8966	1500.0	4.1786
970.0	3.9037	1550.0	4.1959
980.0	3.9107	1600.0	4.2120
990.0	3.9177	1650.0	4.2271
1000.0	3.9246	1700.0	4.2413
1050.0	3.9579	1750.0	4.2546
1100.0	3.9893	1800.0	4.2671
1150.0	4.0188	1850.0	4.2789
1200.0	4.0465	1900.0	4.2899
1250.0	4.0724	1950.0	4.3003
1300.0	4.0966	2000.0	4.3101

9. Derived Thermodynamic Properties

The values of entropy, enthalpy, internal energy, the isotherm derivative, the isochor derivative, C_v, C_p, and the velocity of sound at various state points are calculated from the equation of state (6), and the ideal gas heat capacity equation (10). The vapor pressure equation (9) and the Simon melting curve equation (7) were used to identify the temperatures of the phase changes from vapor to liquid, and solid to vapor, respectively, for each isobar. The representations for the properties are continuously integrated through the two-phase region to calculate properties in the liquid range. This was made possible by the fitting procedures employed in the development of the equation of state as described in section 4.2 in which the conditions for two-phase equilibrium were included in the least squares determination of the coefficients for the equation of state (6). The thermodynamic formulations for the calculation of the thermodynamic property tables are summarized in the following paragraphs. Functions for the integrals and derivatives of the equation of state required to perform these calculations are given in Appendix A.

The entropy of any thermodynamic state was calculated from

$$S(T,\rho) = S^0_{T_0} + \int_{T_0}^{T} (C_p^0/T)dT - R\ln(RT\rho) + \int_0^{\rho} [R/\rho - (1/\rho^2)(\partial P/\partial T)_\rho]_T d\rho. \quad (11)$$

The ideal gas specific heat, C_p^0, is from eq (10). The reference entropy of the ideal gas at $T_0 = 298.15$ K and $P_0 = 1$ atmosphere, $S^0_{T_0} = 191.502 \pm 0.025$ joules/mol · K is taken from [98].

The enthalpy of any state may be calculated from

$$H(T,\rho) = H^0_{T_0} + T\int_0^{\rho} [(P/T\rho^2) - (1/\rho^2)(\partial P/\partial T)_\rho]_T d\rho + (P - \rho RT)/\rho + \int_{T_0}^{T} C_p^0 dT. \quad (12)$$

However, it is convenient to replace the first integral term in eq (12) as follows:

$$T\int_0^{\rho} [(P/T\rho^2) - (1/\rho^2)(\partial P/\partial T)_\rho]_T d\rho \equiv T\int_0^{\rho} [(R/\rho) - (1/\rho^2)(\partial P/\partial T)_\rho]_T d\rho + \int_0^{\rho} [(P/\rho^2) - (RT/\rho)]_T d\rho. \quad (13)$$

By substitution of the identity of (13) in eq (12), the expression for enthalpy is given as

$$H(T,\rho) = H^0_{T_0} + T\int_0^{\rho} [(R/\rho) - (1/\rho^2)(\partial P/\partial T)_\rho]_T d\rho + \int_0^{\rho} [(P/\rho^2) - (RT/\rho)]_T d\rho + (P - \rho RT)/\rho + \int_{T_0}^{T} C_p^0 dT. \quad (14)$$

The reference enthalpy of the ideal gas at $T_0 = 298.15$ K of $H^0_{T_0} = 8669 \pm 3$ joules/mole was taken from the value of $(H^0 - H^0_0)$ in [98] with $H^0_0 = 0.0$. The internal energy of a fluid state was calculated from

$$U(T,\rho) = H(T,\rho) - P/\rho. \quad (15)$$

The specific heat at constant volume, C_v, of liquid and gas phase points was calculated using the relation

$$C_v(T,\rho) = (C_p^0 - R) - \int_0^{\rho} (T/\rho^2)[(\partial^2 P/\partial T^2)_\rho]_T d\rho, \quad (16)$$

where C_p^0 at temperature, T, is calculated from eqn (10). The specific heat at constant pressure, C_p, is given by

$$C_p(T,\rho) = C_v(T,\rho) + [(T/\rho^2)(\partial P/\partial T)^2_\rho/(\partial P/\partial\rho)_T] \quad (17)$$

It is notable that the calculation of properties from the equation developed in this work is considerably simplified from the prior methods of [99] by the continuous integration along isotherms through the two-phase region due to the imposing of the requirements for phase equilibrium in the determination of the equation of state. Differences between values of the thermodynamic properties for the liquid calculated by continuous integration along isotherms through the vapor-liquid phase change, and those calculated by

TABLE 10. Comparison between liquid thermodynamic properties of nitrogen calculated by continuous integration along isotherms and the Clapeyron equation for the vapor-liquid phase change.

(Subscript $_c$ refers to Clapeyron calculation, $_b$ to continuous integration; H = enthalpy, S = entropy, C_v = isochoric heat capacity, W = velocity of sound.)

Temp (K)	H_b	$H_c - H_b$	S_b	$S_c - S_b$	C_{v_b}	$C_{v_c} - C_{v_b}$	W_b	$W_c - W_b$
	(J/mol)		(J/mol · K)		(J/mol · K)		(m/s)	
65	−4109	+1	69.60	0.08	27.71	−4.45	1247	52
70	−3826	−12	73.80	−.08	28.50	−.71	1092	5
75	−3538	−13	77.75	−.11	28.11	−.29	983	2
80	−3248	−15	81.47	−.14	27.49	−.66	894	5
85	−2954	−19	84.99	−.18	26.96	−.59	017	4
90	−2656	−21	88.34	−.20	26.57	−.05	746	0
100	−2033	−18	94.73	−.16	26.19	+.39	613	−2
110	−1345	−16	100.99	−.15	26.21	+.55	484	−3
120	−505	+14	107.85	+.11	26.86	+4.94	338	−26
126.20	863	0	118.41	0	30.68	0	182	0

use of the Clapeyron equation for the phase change are given in table 10. The differences in liquid properties indicated in table 10 are generally within the uncertainty of the property values.

10. Comparison of the Equation of State with Related Thermodynamic Data

Experimental measurements of properties of nitrogen in addition to the P-ρ-T data are available for comparison to values calculated using the equation of state developed in this work. Comparisons between measured and calculated values of the heat capacities, latent heats of vaporization, enthalpies, and sonic velocities are reported here. The thermodynamic property formulations used in the calculation of various properties from the equation of state are presented in the preceding section.

10.1. Calculated Heat Capacity Values

Values of C_p and C_v for nitrogen calculated by integration along isotherms using eq (6) with coefficients from table 3 are illustrated in figures 13 and 14 for isobars of 1, 10, 40, 100, 150, 200, and 400 atm.

10.2. Comparison to the Estimated Isochoric Heat Capacity Data Used in the Least Squares Fit for the Equation of State

In the determination of the coefficients for the equation of state, the 396 values of C_v described in section 2.3, were used. These generated values of C_v were compared with isochoric heat capacity values calculated with the equation of state (6) and the ideal gas heat capacity eq (10). This comparison shows that only 19 of the calculated C_v values differ from the corresponding generated data in excess of 5 percent. Two-thirds of the calculated C_v values differ from the generated data in excess of 1 percent, and 53 values have differences exceeding 2 percent. The root-mean-square deviation between the calculated C_v values and the input values is 4.14 percent. Since the estimated uncertainty of the 396 C_v values used for the determination of the equation of state is 5 percent, the accuracy of the equation of state for use in calculating heat capacity values was considered to be satisfactory.

Some of the calculated values of C_v which differed in excess of 5 percent from the input C_v values were near the critical point (i.e., for isochors between 7 and 13 mol/liter and temperatures from 126 K to 131 K). The remaining data points with deviations in excess of 5 percent were in the low temperature liquid, (i.e., for isochors from 27 to 31 mol/liter and temperatures from 72 K to 88 K). The maximum C_v deviation observed in the critical region was 16 percent, and in the low temperature liquid region, 12 percent.

10.3. Comparison of the Heat Capacity Data

Comparisons of isobaric heat capacity values, C_p, calculated from the equation of state (6) and the ideal gas heat capacity equation (10) to measured values from Krase and Mackey [55] and Mage et al. [56] are given in table 11. The data reported in [56] also includes the values from [52] and [54]. The isobaric heat capacities, C_p, listed in table 11 from [55] and [56] agree with the values calculated from the equation of state generally within 0.6 percent, except for five values of Mage et al. [56] in the region of the critical point where the calculated C_p values reflect the imprecision of the experimental data and the fitting problems in the critical region.

Comparisons of isochoric heat capacity values, C_v, calculated from the equation of state (6) and the ideal gas heat capacity equation (10) to measured values along the critical isochor published by Voronel et al. [57] are also given in table 11. (The value of the critical density determined in this work is 11.21 mol/liter while that of

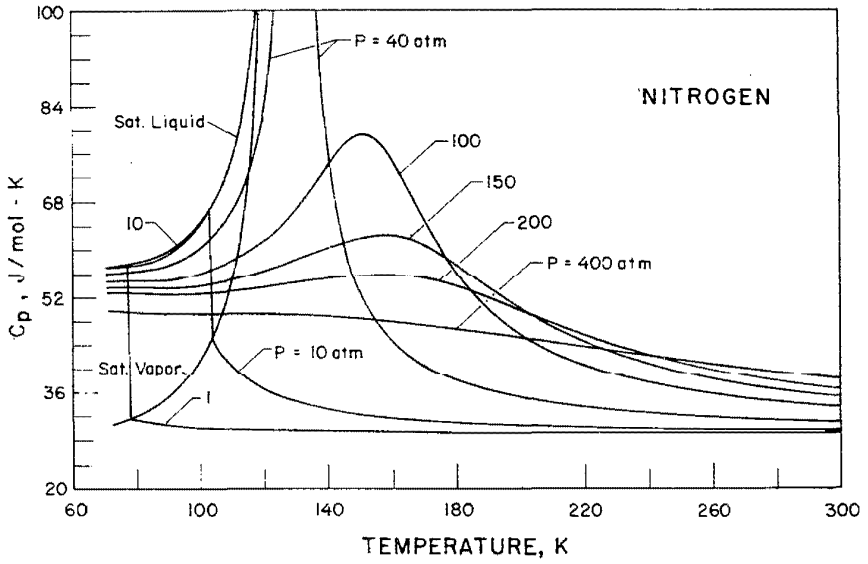

FIGURE 13. Constant pressure heat capacity (C_p) of nitrogen calculated from equation of state (6) with coefficients of table 3.

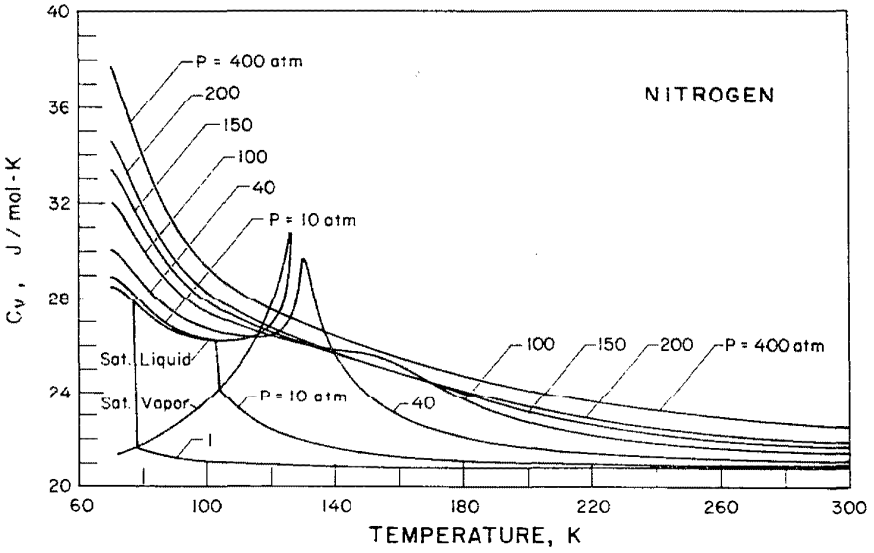

FIGURE 14. Constant volume heat capacity (C_v) of nitrogen calculated from equation of state (6) with coefficients of table 3.

TABLE 11. Comparison of heat capacity measurements with values calculated from the equation of state (6) and the ideal gas heat capacity equation (10)

Comparison to C_p data of Krase and Mackey [55]			
Temp (K)	Press (atm)	C_p [55] (J/mol · K)	ΔC_p^* (J/mol · K)
303.1	1	28.94	−0.22
303.1	50	31.03	−0.31
303.1	100	33.17	−0.20
303.1	200	36.18	−0.10
303.1	300	37.44	−0.22
303.1	400	37.98	−0.13

TABLE 11. Comparison of heat capacity measurements with values calculated from the equation of state (6) and the ideal gas heat capacity equation (10)—Continued

Comparison to C_p data of Krase and Mackey [55]			
Temp (K)	Press (atm)	C_p [55] (J/mol · K)	ΔC_p^* (J/mol · K)
303.1	500	38.19	0.02
303.1	600	38.27	0.17
303.1	700	38.36	0.35
323.1	1	28.98	−0.18
323.1	100	32.33	−0.40
323.1	200	34.84	−0.42

TABLE 11. Comparison of heat capacity measurements with values calculated from the equation of state (6) and the ideal gas heat capacity equation (10)—Continued

Comparison to C_p data of Krase and Mackey [55]

Temp (K)	Press (atm)	C_p[55] (J/mol · K)	ΔC_p^* (J/mol · K)
323.1	300	36.43	−0.16
323.1	400	36.89	−0.26
323.1	500	37.06	−0.28
323.1	600	37.10	−0.27
323.1	700	37.19	−0.15
323.1	800	37.23	−0.05
373.2	1	29.06	−0.14
373.2	50	30.19	−0.32
373.2	100	31.32	−0.38
373.2	200	33.17	−0.38
373.2	300	34.46	−0.23
373.2	400	34.97	−0.38
373.2	500	35.13	−0.56
373.2	600	35.30	−0.57
373.2	700	35.39	−0.57
398.2	1	29.10	−0.14
398.2	50	30.15	−0.22
398.2	100	30.99	−0.40
398.2	200	32.50	−0.49
398.2	300	33.54	−0.50
398.2	400	34.21	−0.47
398.2	500	34.59	−0.47
398.2	600	34.76	−0.52
398.2	700	34.97	−0.44
423.2	1	29.15	−0.15
423.2	50	30.11	−0.16
423.2	100	30.82	−0.34
423.2	200	32.08	−0.49
423.2	300	33.04	−0.48
423.2	400	33.58	−0.56
423.2	500	34.04	−0.50
423.2	600	34.34	−0.45
423.2	700	34.55	−0.39

Comparison to C_p Data of Mage et al. [56]

Temp range (K)	Press (atm)	C_p[56] (J/mol·K)	ΔC_p^{**} (J/mol·K)
268.3–279.6	10.0	29.58	−0.09
222.7–233.9	10.0	29.87	−0.13
194.3–205.0	10.0	30.23	−0.17
166.6–177.7	10.0	31.02	−0.06
267.7–279.0	20.0	30.19	−0.07
222.7–233.9	20.0	30.85	−0.11
194.3–205.3	20.0	31.62	−0.20
166.6–177.6	20.0	33.53	0.05
116.5–119.2	27.2	94.76	2.48
122.5–124.7	33.6	166.32	25.25
122.5–125.6	33.6	265.07	99.49
122.5–125.7	33.6	496.48	323.99
122.5–128.0	33.6	409.22	−1.38
122.5–153.0	33.6	128.31	−0.35
267.8–279.0	40.0	31.35	−0.09
222.7–234.0	40.0	32.86	−0.10
194.3–205.3	40.0	34.98	−0.08

TABLE 11. Comparison of heat capacity measurements with values calculated from the equation of state (6) and the ideal gas heat capacity equation (10)—Continued

Comparison to C_p Data of Mage et al. [56]

Temp range (K)	Press (atm)	C_p[56] (J/mol·K)	ΔC_p^{**} (J/mol·K)
166.6–177.7	40.0	39.85	−0.04
119.3–125.1	40.0	96.50	0.81
267.8–279.2	80.0	33.67	−0.04
222.8–234.1	80.0	37.19	0.07
194.3–205.3	80.0	42.32	−0.15
166.6–177.7	80.0	57.19	−0.72
119.3–125.0	80.0	66.63	−0.23
267.8–279.0	136.1	36.48	0.06
222.9–234.2	136.1	41.78	−0.07
194.3–205.4	136.1	49.36	−0.16
166.6–177.6	136.1	61.38	−0.13
146.0–148.0	136.1	64.90	0.35
146.0–150.3	136.1	65.17	0.40
146.0–154.6	136.1	65.58	0.49
146.0–165.4	136.1	65.51	0.41
126.9–129.1	136.1	59.82	0.27
126.9–131.3	136.1	60.23	0.41
126.9–135.4	136.1	60.85	0.51
119.3–125.1	136.1	58.01	−0.20

Comparison to C_v data of Voronel [57]

Temp (K)	C_v[57] (J/mol · K)	$C_{v_{calc}}$ (J/mol · K)	Temp (K)	C_v[57] (J/mol · K)	$C_{v_{calc}}$ (J/mol · K)
126.21	95.7	30.7	126.57	54.7	30.6
126.22	94.8	30.7	126.73	50.5	30.6
126.23	85.6	30.7	126.87	49.2	30.5
126.23	87.9	30.7	126.97	47.1	30.5
126.23	79.5	30.7	127.06	45.8	30.5
126.25	79.7	30.7	127.35	43.8	30.4
126.25	84.2	30.7	127.91	40.4	30.2
126.26	76.6	30.7	128.75	37.6	30.0
126.27	77.8	30.7	129.79	35.7	29.8
126.29	75.7	30.7	130.87	34.0	29.5
126.29	71.0	30.7	131.97	32.8	29.2
126.33	65.3	30.7	133.10	31.8	29.0
126.34	67.9	30.7	135.36	29.9	28.5
126.34	65.6	30.7	136.34	30.0	28.3
126.38	65.0	30.7	142.18	28.1	27.3
126.38	61.5	30.7	143.05	27.8	27.1
126.45	58.8	30.6	155.66	26.4	25.6
126.40	58.8	30.7	156.72	26.1	25.5
126.47	56.6	30.6	167.04	26.1	24.6

*$\Delta C_p = C_p[55] - C_{p_{calc}}$

**$\Delta C_p = C_p[56] - C_{p_{calc}}$

[57] is 11.1 mol/liter.) The calculated values of C_v do not exhibit the large increase in value near the critical point that is evident in the data of [57]. It is well known that the critical region is non-analytic, and all analytic equations must fail in this region.

Some of the data reported in [57] are for temperatures below 126.20 K (i.e., for the two-phase fluid). These two-phase data points are not included in the comparison in table 11.

10.4. Comparison of Latent Heat Data

Furukawa and McCoskey [53] have published measured latent heats of vaporization at low temperatures (67 K–78 K), and Jones [54] has presented five measurements of the latent heat of vaporization for the range from 119 K to 124 K. The comparisons of calculated values from eqs (6), (9), and (10) to these measured values are given in table 12.

TABLE 12. Comparison of latent heats of vaporization from [53] and [54] with values calculated from equations (6), (9), and (10).

Comparison to data of Furukawa and McCoskey [53]

Temperature (K)	Pressure (atm)	Latent heat [53] (joules/mole)	$\frac{L[53]-L_{calc}}{L[53]}\times 100$ (percent)
67.96	0.28	5901.6	0.29
67.96	0.28	5899.0	0.24
73.09	0.59	5739.1	0.40
73.09	0.59	5732.1	0.28
78.02	1.08	5579.4	0.70
78.01	1.08	5563.1	0.41

Comparison to data of Jones [54]

Temperature (K)	Pressure (atm)	Latent heat [54] (joules/mole)	$\frac{L[54]-L_{calc}}{L[54]}\times 100$ (percent)
119.20	23.80	2702.3	−1.10
119.19	23.80	2678.2	−2.04
121.89	27.18	2220.4	−2.33
124.29	30.61	1681.3	0.56
119.16	23.80	2714.7	−0.82

10.5. Comparison of Enthalpy Data

Wiener [58] has reported measurements of the enthalpy of nitrogen made prior to measuring hydrocarbon enthalpy values. A comparison of the measured enthalpy values by Wiener to values calculated from the equation of state (6) is presented in table 13. The values of [58] have been adjusted to the ideal gas reference enthalpy of 8669 joules/mole at 298.15 K from the datum of 0.0 Btu/lbm at 75 F and 14.7 psia used in [58]. Wiener has estimated the accuracy of the measured values of [58] as ± 130 joules/mole. The calculated values of enthalpy at the experimental temperature and pressure are well within this uncertainty with the exception of the two points which are indicated in [58] to be in doubt.

TABLE 13. Comparison of enthalpy data with values calculated from the equation of state (6) and the ideal gas heat capacity equation (10)

Comparison to data of Wiener [58]

Temperature (K)	Pressure (atm)	$H[58]$ (joules/mole)	$H[58]-H_{calc}$ (joules/mole)
138.71	67.37	621	−248
142.59	52.06	1988	−107
142.04	29.26	3551	323
145.93	28.58	3421	−10
143.15	21.78	3551	8
142.04	17.69	3616	−16
158.71	28.92	3877	−69
159.26	28.58	4072	96
199.82	51.72	5049	−22
202.04	28.99	5505	33
207.59	65.32	5179	−1
310.93	34.02	8826	−24
322.59	27.90	9151	−85
359.26	40.83	10258	−33
421.48	47.63	12146	−10
422.04	40.83	12146	−41
449.26	47.63	12993	−3

Comparison to data of Dawe [89]

Temperature (K)	Pressure (atm)	$H[89]$ (joules/mole)	$H[89]-H_{calc}$ (joules/mole)
273.15	1.0	7934.6	0.8
283.15	1.0	8225.5	0.2
293.15	1.0	8517.1	0.2
357.65	1.0	10397.7	0.0
273.15	4.0	7911.9	1.1
283.15	4.0	8204.6	0.6
293.15	4.0	8497.6	0.6
357.65	4.0	10385.9	0.5
273.15	7.0	7889.2	1.4
283.15	7.0	8183.7	1.0
293.15	7.0	8478.2	1.0
357.65	7.0	10374.1	1.0
273.15	10.0	7866.6	1.6
283.15	10.0	8162.9	1.4
293.15	10.0	8458.9	1.3
357.65	10.0	10362.4	1.5
273.15	14.0	7836.7	1.9
283.15	14.0	8135.3	1.8
293.15	14.0	8433.3	1.7
357.65	14.0	10346.9	2.0
273.15	17.0	7814.3	2.1
283.15	17.0	8114.6	2.0
293.15	17.0	8414.2	1.9
357.65	17.0	10335.3	2.3
273.15	20.0	7792.1	2.3
283.15	20.0	8094.1	2.2
293.15	20.0	8395.2	2.1
357.65	20.0	10323.8	2.6
273.15	30.0	7718.7	2.7
283.15	30.0	8026.3	2.6
293.15	30.0	8332.7	2.7
357.65	30.0	10286.1	3.4
273.15	40.0	7646.7	3.0
283.15	40.0	7959.7	2.6
293.15	40.0	8271.5	2.9
357.65	40.0	10249.2	3.8

TABLE 13. Comparison of enthalpy data with values calculated from the equation of state (6) and the ideal gas heat capacity equation (10)—Continued

Comparison to data of Dawe [89]

Temperature (K)	Pressure (atm)	H[89] (joules/mole)	H[89] $-H_{calc}$ (joules/mole)
273.15	50.0	7576.4	3.0
283.15	50.0	7894.6	2.4
293.15	50.0	8211.7	3.0
357.65	50.0	10213.3	3.9
273.15	60.0	7507.8	2.9
283.15	60.0	7831.2	2.0
293.15	60.0	8153.5	2.9
357.65	60.0	10178.5	3.8
273.15	70.0	7441.2	2.7
283.15	70.0	7769.8	1.5
293.15	70.0	8097.1	2.6
357.65	70.0	10144.9	3.6
273.15	80.0	7376.8	2.4
283.15	80.0	7710.5	1.2
293.15	80.0	8042.6	2.3
357.65	80.0	10112.6	3.3
273.15	90.0	7314.8	2.2
283.15	90.0	7653.6	1.0
293.15	90.0	7990.1	2.0
357.65	90.0	10081.7	3.1
273.15	100.0	7255.3	2.1
283.15	100.0	7599.3	1.2
293.15	100.0	7939.8	1.9
357.65	100.0	10052.3	3.1

New enthalpy measurements for nitrogen by Dawe [89] show very close agreement with the values calculated using the equation of state (6). A representative comparison of the enthalpy values from [89] to calculated values is inclued in table 13. These data are more precise than the other available enthalpy data for nitrogen, and serve to further establish the validity of the derivative behavior of the equation of state.

10.6. Comparison of Selected Velocity of Sound Data

The velocity of sound data from references [63] through [84] have been reviewed, and the data from [74], [75], [76], and [84] have been selected for comparison in table 14 with sonic velocities calculated from the equation of state. The values given in table 14 include data for the liquid, the vapor to high pressures, and values for the saturated liquid and the saturated vapor. A large proportion of the available velocity of sound data for nitrogen not included in these comparisons is for pressures of 1 atmosphere or less.

The calculated values of the velocity of sound for the vapor phase including the saturated vapor and the high pressure region above the critical temperature are generally within 1 percent of the measured values. However, deviations for the calculated sonic velocities in the low temperature liquid region are as large as 12 percent, while the saturated liquid values indicate

TABLE 14. Comparison of selected velocity of sound data to calculated values

Comparison to low temperature liquid data of [74]

Pressure (atm)	Temperature (K)	Experimental velocity of sound (m/s)	$\frac{W_{data}-W_{calc}}{W_{data}}\times 100$ (percent)
84.3	113.6	589	1.73
68.3	109.2	617	2.02
104.7	113.4	634	2.15
104.7	113.6	631	1.95
42.2	104.8	614	0.66
43.6	105.0	616	1.00
57.1	105.9	629	1.24
94.8	110.2	646	1.81
126.8	113.8	659	1.82
104.7	109.5	666	1.84
8.5	90.6	725	−2.38
8.5	90.6	726	−2.24
46.9	85.5	819	−2.89
86.0	87.6	836	−1.17
136.9	91.0	850	0.16
38.4	84.3	822	−3.72
84.3	87.7	834	−1.12
134.3	90.6	853	0.30
8.2	81.0	826	−6.76
1.6	77.6	851	−9.89
8.1	75.3	883	−10.87
52.0	77.5	897	−6.64
116.6	81.0	917	−2.39
61.5	77.6	902	−6.30
121.9	80.9	920	−2.47
1.7	73.6	896	−12.82
112.6	75.0	959	−5.97
111.5	75.0	959	−5.93
120.0	73.8	975	−6.35

Comparison to saturated liquid data of [75]

Temperature (K)	Experimental velocity of sound (m/s)	$\frac{W_{data}-W_{calc}}{W_{data}}\times 100$ (percent)
65.4	968	−27.16
66.4	959	−24.81
68.1	942	−21.37
70.0	924	−18.21
71.9	905	−15.64
74.2	881	−13.17
76.0	864	−11.44
79.3	831	−8.99
79.6	829	−8.77
80.3	822	−8.31
82.7	796	−6.95
83.2	791	−6.69
84.9	772	−5.85
86.7	755	−4.93
86.9	753	−4.79
87.4	748	−4.54
88.2	739	−4.26
91.3	705	−3.27
93.1	685	−2.72
97.4	636	−1.74
99.4	612	−1.47
101.2	590	−1.36
103.7	559	−1.22

TABLE 14. Comparison of selected velocity of sound data to calculated values—Continued

Temperature (K)	Experimental velocity of sound (m/s)	$\frac{W_{data}-W_{calc}}{W_{data}}\times 100$ (percent)
108.7	493	−1.50
110.2	472	−1.73
112.9	434	−2.32
115.0	403	−3.05
117.1	369	−4.22
119.3	329	−6.30
119.4	327	−6.11
120.2	313	−6.91
121.2	290	−9.10
122.4	265	−10.52
124.3	220	−14.94
124.3	219	−14.96
125.1	191	−20.47
125.5	183	−19.91
Comparison to saturated vapor data of [76]		
79.2	177	0.46
78.4	177	0.78
78.0	176	0.39
71.9	171	0.45
Comparison to high pressure data of [84]		
200	298.14	426	−0.18
600	298.14	655	−0.90
1000	298.14	844	−0.36
1500	298.14	1030	0.35
2500	298.14	1296	0.39
3500	298.14	1500	0.94
200	323.14	440	0.37
600	323.14	650	−0.59
1000	323.14	830	−0.38
1500	323.14	1010	0.08
2500	323.14	1280	0.59
3500	323.14	1480	0.75
400	348.14	551	0.15
600	348.14	655	0.73
1000	348.14	825	0.26
1500	348.14	1000	0.46
2500	348.14	1262	0.42
3500	348.14	1463	0.63
200	373.15	462	0.02
600	373.15	648	−0.19
1000	373.15	820	0.57
1500	373.15	985	0.08
2500	373.15	1248	0.39
3500	373.15	1442	0.12
200	398.16	476	0.55
600	398.16	654	0.60
1000	398.16	818	0.98
1500	398.16	978	0.29
2500	398.16	1232	0.05
3500	398.16	1424	−0.31
200	423.17	486	0.30
600	423.17	658	0.86
1000	423.17	810	0.43
1500	423.17	972	0.41
2500	423.17	1223	0.15
3500	423.17	1420	0.16
200	448.18	500	0.92
600	448.18	660	0.68
1000	448.18	810	0.69
1500	448.18	960	−0.24
2500	448.18	1216	0.29
3500	448.18	1410	0.13

TABLE 14. Comparison of selected velocity of sound data to calculated values—Continued

Pressure (atm)	Temperature (K)	Experimental velocity of sound (m/s)	$\frac{W_{data}-W_{calc}}{W_{data}}\times 100$ (percent)

differences of nearly 30 percent at pressures below 0.5 atm and near the critical point.

11. Estimated Accuracy

The estimation of the accuracy of this thermodynamic property table, which is based on information assembled from a large number of sources, is a difficult undertaking. However, the authors have attempted to summarize below, what in their judgment are prudent estimates of the uncertainties of the essential equations. Whenever possible these estimates were based on the agreement of independent data sets in the same or adjacent ranges of values. However, the indications of agreement of the various data sets as determined in this work, are subject to the manner in which the equations represent the data. It is possible that some of the comparisons have led to unwarranted conclusions.

11.1. The Equation of State

The equation of state (6) developed in this work represents the experimental P-ρ-T data in the liquid and vapor phases for pressures from 0 to 10,000 atmospheres and for temperatures of 65 to 1073 K. At temperatures above the critical temperature for pressures up to 1000 atmospheres, the uncertainty is probably within 0.1 percent except in the region near the critical point between temperatures of 126.2 K and 150 K at pressures between 30 and 150 atmospheres where the density deviations from experimental data are as large as 0.7 percent. Vapor values at temperatures below the critical temperature have an uncertainty of ± 0.5 percent. In the range from 1000 to 10,000 atmospheres the accuracy of eq (6) is estimated to be within 0.3 percent.

The equation may be extrapolated to 2000 K at pressures below 300 atmospheres with a probable accuracy of ± 0.5 percent. The equation may also be extrapolated to lower temperatures for the vapor with an accuracy of at least ± 0.2 percent down to 20 K.

It is estimated that values of density calculated iteratively by the equation of state in the liquid region have

an accuracy of ± 0.5 percent, except in the vicinity of the critical point where larger deviations are to be expected. The uncertainty of the equation of state for the liquid for pressures above 500 atm (and to the melting line) must be regarded as ±1.5 percent which is the maximum difference between the data from Cheng [88] and values from the equation of state.

11.2. The Vapor Pressure Equation

The vapor pressure equation (9) represents the selected data used in the formulation of the equation generally within an accuracy of ± 0.01 K between the triple point and the critical point.

11.3. The Ideal Gas Heat Capacity Equation

The equation for the ideal gas heat capacity (10) has been used to represent the recent values of C_p^0/R from [85] with an accuracy of ± 0.00005 for values to 1200 K, and within ± 0.0001 above 1200 K.

11.4. Derived Thermodynamic Properties

Values of the heat capacity, enthalpy, and latent heat of vaporization are presented with comparisons to available measurements. Although the paucity of these measurements makes it difficult to define the accuracy of the equation of state (6) for the calculation of heat capacity values, these comparisons further indicate that the behavior of the isobaric calculated values is correct. The new enthalpy data by Dawe [89] indicate an exceptionally close agreement with calculated values.

The derived properties which depend on the first derivatives of the surface (e.g., entropy, enthalpy) are considered to be well established by the equation of state (6). However, properties related to the second derivatives (e.g., C_p, C_v, velocity of sound) may have uncertainties an order of magnitude larger than the properties related to the first derivatives.

It is possible that large errors in the properties related to the second derivative of the equation of state exist in those regions wher C_v data were not used in the determination of the coefficients of equation (6). (The P-ρ-T range for which C_v values were used is given in section 2.3.) A review of the values of C_v, C_p, and the velocity of sound outside the range of values given in 2.3 indicated the behavior of these values at temperatures below 72 K is questionable. Values of C_v, C_p, and the velocity of sound have, therefore, been deleted from the tables of properties for temperatures below 72 K.

The least squares techniques used in the formulation presented here include the simultaneous fitting of P-ρ-T data, C_v data, and the criteria for phase equilibrium to allow for continuous integration along isotherms through the two-phase region. It is recommended that the derived properties for the liquid phase be calculated by this method in preference to the use of the Clapeyron equation for the difference in entropy or enthalpy for the phase change.

APPENDIX A

Functions for the Calculation of Thermodynamic Properties from the Equation of State (6)

The Equation of State

Equation (6) may be written in the form:

$$P = \rho RT + \sum_{i=1}^{32} N_i X_i,$$

where the N_i are listed in table 3 and the X_i are as follows:

$X_1 = \rho^2 T$	$X_{12} = \rho^4/T$	$X_{23} = \rho^5 F/T^4$
$X_2 = \rho^2 T^{1/2}$	$X_{13} = \rho^5$	$X_{24} = \rho^7 F/T^2$
$X_3 = \rho^2$	$X_{14} = \rho^6/T$	$X_{25} = \rho^7 F/T^3$
$X_4 = \rho^2/T$	$X_{15} = \rho^6/T^2$	$X_{26} = \rho^9 F/T^2$
$X_5 = \rho^2/T^2$	$X_{16} = \rho^7/T$	$X_{27} = \rho^9 F/T^4$
$X_6 = \rho^3 T$	$X_{17} = \rho^8/T$	$X_{28} = \rho^{11} F/T^2$
$X_7 = \rho^3$	$X_{18} = \rho^8/T^2$	$X_{29} = \rho^{11} F/T^3$
$X_8 = \rho^3/T$	$X_{19} = \rho^9/T^2$	$X_{30} = \rho^{13} F/T^2$
$X_9 = \rho^3/T^2$	$X_{20} = \rho^3 F/T^2$	$X_{31} = \rho^{13} F/T^3$
$X_{10} = \rho^4 T$	$X_{21} = \rho^3 F/T^3$	$X_{32} = \rho^{13} F/T^4$
$X_{11} = \rho^4$	$X_{22} = \rho^5 F/T^2$	

$$F = \exp\,(-0.0056\,\rho^2)$$

The Isotherm Derivative

The isotherm derivative of the equation of state (6) may be represented as:

$$(\partial P/\partial \rho)_T = RT + \sum_{i=1}^{32} N_i X_i,$$

where the N_i are given in table 3 and the X_i are as follows:

$X_1 = 2\rho T$	$X_{12} = 4\rho^3/T$	$X_{23} = F_{22}/T^4$
$X_2 = 2\rho T^{1/2}$	$X_{13} = 5\rho^4$	$X_{24} = F_{23}/T^2$
$X_3 = 2\rho$	$X_{14} = 6\rho^5/T$	$X_{25} = F_{23}/T^3$
$X_4 = 2\rho/T$	$X_{15} = 6\rho^5/T^2$	$X_{26} = F_{24}/T^2$
$X_5 = 2\rho/T^2$	$X_{16} = 7\rho^6/T$	$X_{27} = F_{24}/T^4$
$X_6 = 3\rho^2 T$	$X_{17} = 8\rho^7/T$	$X_{28} = F_{25}/T^2$
$X_7 = 3\rho^2$	$X_{18} = 8\rho^7/T^2$	$X_{29} = F_{25}/T^3$
$X_8 = 3\rho^2/T$	$X_{19} = 9\rho^8/T^2$	$X_{30} = F_{26}/T^2$
$X_9 = 3\rho^2/T^2$	$X_{20} = F_{21}/T^2$	$X_{31} = F_{26}/T^3$
$X_{10} = 4\rho^3 T$	$X_{21} = F_{21}/T^3$	$X_{32} = F_{26}/T^4$
$X_{11} = 4\rho^3$	$X_{22} = F_{22}/T^2$	

$$F = \exp\,(-0.0056\,\rho^2)$$
$$F_1 = 2F\rho(-0.0056)$$
$$F_{21} = 3F\rho^2 + F_1\rho^3$$
$$F_{22} = 5F\rho^4 + F_1\rho^5$$
$$F_{23} = 7F\rho^6 + F_1\rho^7$$
$$F_{24} = 9F\rho^8 + F_1\rho^9$$
$$F_{25} = 11F\rho^{10} + F_1\rho^{11}$$
$$F_{26} = 13F\rho^{12} + F_1\rho^{13}$$

The Isochore Derivative

The isochore derivative of the equation of state (6) may be written as:

$$(\partial P/\partial T)_\rho = \rho R + \sum_{i=1}^{32} N_i X_i,$$

where the N_i are given in table 3 and the X_i are as follows:

$X_1 = \rho^2$	$X_{12} = -\rho^4/T^2$	$X_{23} = -4\rho^5 F/T^5$
$X_2 = \rho^2/(2T^{1/2})$	$X_{13} = 0.0$	$X_{24} = -2\rho^7 F/T^3$
$X_3 = 0.0$	$X_{14} = -\rho^6/T^2$	$X_{25} = -3\rho^7 F/T^4$
$X_4 = -\rho^2/T^2$	$X_{15} = -2\rho^6/T^3$	$X_{26} = -2\rho^9 F/T^3$
$X_5 = -2\rho^2/T^3$	$X_{16} = -\rho^7/T^2$	$X_{27} = -4\rho^9 F/T^5$
$X_6 = \rho^3$	$X_{17} = -\rho^8/T^2$	$X_{28} = -2\rho^{11} F/T^3$
$X_7 = 0.0$	$X_{18} = -2\rho^8/T^3$	$X_{29} = -3\rho^{11} F/T^4$
$X_8 = -\rho^3/T^2$	$X_{19} = -2\rho^9/T^3$	$X_{30} = -2\rho^{13} F/T^3$
$X_9 = -2\rho^3/T^3$	$X_{20} = -2\rho^3 F/T^3$	$X_{31} = -3\rho^{13} F/T^4$
$X_{10} = \rho^4$	$X_{21} = -3\rho^3 F/T^4$	$X_{32} = -4\rho^{15} F/T^5$
$X_{11} = 0.0$	$X_{22} = -2\rho^5 F/T^3$	

$$F = \exp(-0.0056\,\rho^2)$$

The Evaluation of Integrals

The integral, $\int [R/\rho - (1/\rho^2)(\partial P/\partial T)_\rho]_T\, d\rho$ may be written as:

$$\sum_{i=1}^{32} N_i Y_i,$$

where the N_i are listed in table 3 and the Y_i are listed below:

$Y_1 = -\rho$	$Y_{12} = \rho^3/(3T^2)$	$Y_{23} = 4G_2/T^5$
$Y_2 = -\rho/(2T^{1/2})$	$Y_{13} = 0.0$	$Y_{24} = 2G_3/T^3$
$Y_3 = 0.0$	$Y_{14} = \rho^5/(5T^2)$	$Y_{25} = 3G_3/T^4$
$Y_4 = \rho/T^2$	$Y_{15} = 2\rho^5/(5T^3)$	$Y_{26} = 2G_4/T^3$
$Y_5 = 2\rho/T^3$	$Y_{16} = \rho^6/(6T^2)$	$Y_{27} = 4G_4/T^5$
$Y_6 = -\rho^2/2$	$Y_{17} = \rho^7/(7T^2)$	$Y_{28} = 2G_5/T^3$
$Y_7 = 0.0$	$Y_{18} = 2\rho^7/(7T^3)$	$Y_{29} = 3G_5/T^4$
$Y_8 = \rho^2/(2T^2)$	$Y_{19} = \rho^8/(4T^3)$	$Y_{30} = 2G_6/T^3$
$Y_9 = \rho^2/T^3$	$Y_{20} = 2G_1/T^3$	$Y_{31} = 3G_6/T^4$
$Y_{10} = -\rho^3/3$	$Y_{21} = 3G_1/T^4$	$Y_{32} = 4G_6/T^5$
$Y_{11} = 0.0$	$Y_{22} = 2G_2/T^3$	

where the G_i and F are listed in table 15.

The integral $\int [(P/\rho^2) - (RT/\rho)]_T\, d\rho$ may be written as:

$$\sum_{i=1}^{32} N_i Y_i,$$

where the N_i are listed in table 3 and the Y_i are listed below:

$Y_1 = \rho T$	$Y_{12} = \rho^3/(3T)$	$Y_{23} = G_2/T^4$
$Y_2 = \rho T^{1/2}$	$Y_{13} = \rho^4/4$	$Y_{24} = G_3/T^2$
$Y_3 = \rho$	$Y_{14} = \rho^5/(5T)$	$Y_{25} = G_3/T^3$
$Y_4 = \rho/T$	$Y_{15} = \rho^5/(5T^2)$	$Y_{26} = G_4/T^2$
$Y_5 = \rho/T^2$	$Y_{16} = \rho^6/(6T)$	$Y_{27} = G_4/T^3$
$Y_6 = \rho^2 T/2$	$Y_{17} = \rho^7/(7T)$	$Y_{28} = G_5/T^2$
$Y_7 = \rho^2/2$	$Y_{18} = \rho^7/(7T^2)$	$Y_{29} = G_5/T^3$
$Y_8 = \rho^2/(2T)$	$Y_{19} = \rho^8/(8T^2)$	$Y_{30} = G_6/T^2$
$Y_9 = \rho^2/(2T^2)$	$Y_{20} = G_1/T^2$	$Y_{31} = G_6/T^3$
$Y_{10} = \rho^3 T/3$	$Y_{21} = G_1/T^3$	$Y_{32} = G_6/T^4$
$Y_{11} = \rho^3/3$	$Y_{22} = G_2/T^2$	

where the G_i and F are listed in table 15.

The integral, $\int [(T/\rho^2)(\partial^2 P/\partial T^2)_\rho]_T\, d\rho$ may be written as:

$$\sum_{i=1}^{32} N_i Y_i,$$

where the N_i are listed in table 3 and the Y_i are listed below:

$Y_1 = 0.0$	$Y_{12} = (2\rho^3)/(3T^2)$	$Y_{23} = 20G_2/T^5$
$Y_2 = \rho/(4T^{1/2})$	$Y_{13} = 0.0$	$Y_{24} = 6G_3/T^3$
$Y_3 = 0.0$	$Y_{14} = (2\rho^5)/(5T^2)$	$Y_{25} = 12G_3/T^4$
$Y_4 = 2\rho/T^2$	$Y_{15} = (6\rho^5)/(5T^3)$	$Y_{26} = 6G_4/T^3$
$Y_5 = 6\rho/T^3$	$Y_{16} = \rho^6/(3T^2)$	$Y_{27} = 20G_4/T^5$
$Y_6 = 0.0$	$Y_{17} = (2\rho^7)/(7T^2)$	$Y_{28} = 6G_5/T^3$
$Y_7 = 0.0$	$Y_{18} = (6\rho^7)/(7T^3)$	$Y_{29} = 12G_5/T^4$
$Y_8 = \rho^2/T^2$	$Y_{19} = (3\rho^8)/(4T^3)$	$Y_{30} = 6G_6/T^3$
$Y_9 = 3\rho^2/T^3$	$Y_{20} = 6G_1/T^3$	$Y_{31} = 12G_6/T^4$
$Y_{10} = 0.0$	$Y_{21} = 12G_1/T^4$	$Y_{32} = 20G_6/T^5$
$Y_{11} = 0.0$	$Y_{22} = 6G_2/T^3$	

where the G_i and F are listed in table 15.

TABLE 15. Functions for derivatives of the equation of State

$F = \exp(-0.0056\rho^2)$
$G_1 = F/[2(-0.0056)]$
$G_2 = (F\rho^2 - 2G_1)/[2(-0.0056)]$
$G_3 = (F\rho^4 - 4G_2)/[2(-0.0056)]$
$G_4 = (F\rho^6 - 6G_3)/[2(-0.0056)]$
$G_5 = (F\rho^8 - 8G_4)/[2(-0.0056)]$
$G_6 = (F\rho^{10} - 10G_5)/[2(-0.0056)]$

The integral $\int C_p^0\,dT$ may be written as:

$$R\sum_{i=1}^{8} N_i Y_i,$$

where the N_i are listed in table 8 and the Y_i are listed below:

$Y_1=-1/(2T^2)$	$Y_5=T^2/2$
$Y_2=-1/T$	$Y_6=T^3/3$
$Y_3=\ln(T)$	$Y_7=T^4/4$
$Y_4=T$	$Y_8=UT/[\exp(U)-1]$

where $U=N_9/T$, and N_9 is listed in table 8.

The integral $\int (C_p^0/T)\,dT$ may be written as:

$$R\sum_{i=1}^{8} N_i Y_i.$$

where the N_i are listed in table 8 and the Y_i, are given below:

$Y_1=-1/(3T^3)$	$Y_5=T$
$Y_2=-1/(2T^2)$	$Y_6=T^2/2$
$Y_3=-1/T$	$Y_7=T^3/3$
$Y_4=\ln(T)$	$Y_8=U/(EU-1)-\ln[1-(1/EU)]$

where $U=N_9/T$, and N_9 is listed in table 8; $[EU=\exp(U)]$.

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Thermodynamic properties of saturated nitrogen

Temperature kelvin	Pressure bar	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar/K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
63.148	0.1253	30.977	240.266	31.959	−4212.15	−4211.75	68.01			
		0.02410	5.151	0.0020	1296.31	1816.40	163.56	21.00	29.64	161.
64	0.1462	30.863	228.739	30.875	−4165.36	−4164.88	68.74			
		0.02777	5.209	0.0023	1312.69	1839.19	162.65	21.02	29.70	162.
65	0.1742	30.727	216.221	29.688	−4109.87	−4109.31	69.60			
		0.03262	5.274	0.0027	1331.75	1865.68	161.62	21.05	29.78	163.
66	0.2064	30.589	204.690	28.581	−4053.91	−4053.24	70.46			
		0.03813	5.338	0.0032	1350.61	1891.88	160.63	21.08	29.87	164.
67	0.2432	30.448	194.047	27.546	−3997.57	−3996.78	71.31			
		0.04433	5.399	0.0037	1369.27	1917.76	159.67	21.11	29.96	165.
68	0.2850	30.306	184.204	26.574	−3940.94	−3940.00	72.15			
		0.05130	5.458	0.0043	1387.72	1943.33	158.75	21.15	30.06	166.
69	0.3324	30.160	175.080	25.659	−3884.08	−3882.97	72.98			
		0.05908	5.515	0.0050	1405.95	1968.54	157.87	21.19	30.17	167.
70	0.3858	30.013	166.604	24.795	−3827.04	−3825.75	73.80			
		0.06774	5.569	0.0058	1423.93	1993.39	157.01	21.23	30.29	168.
71	0.4457	29.863	158.712	23.976	−3769.86	−3768.37	74.61			
		0.07735	5.620	0.0066	1441.67	2017.86	156.18	21.27	30.42	169.
72	0.5126	29.712	151.345	23.198	−3712.58	−3710.86	75.41	28.42	57.42	1045.
		0.08796	5.669	0.0075	1459.14	2041.93	155.39	21.31	30.55	170.
73	0.5871	29.558	144.453	22.457	−3655.22	−3653.23	76.20	28.34	57.51	1023.
		0.09964	5.715	0.0085	1476.34	2065.57	154.62	21.36	30.70	171.
74	0.6698	29.402	137.989	21.750	−3597.80	−3595.52	76.98	28.23	57.58	1002.
		0.1125	5.758	0.0096	1493.25	2088.77	153.87	21.41	30.86	172.
75	0.7612	29.244	131.910	21.074	−3540.32	−3537.72	77.75	28.12	57.65	983.
		0.1265	5.797	0.0109	1509.86	2111.51	153.15	21.46	31.02	173.
76	0.8619	29.084	126.179	20.427	−3482.80	−3479.84	78.52	28.00	57.71	964.
		0.1418	5.833	0.0122	1526.15	2133.78	152.45	21.51	31.20	174.
77	0.9725	28.922	120.764	19.807	−3425.24	−3421.88	79.27	27.87	57.78	945.
		0.1585	5.866	0.0137	1542.12	2155.54	151.77	21.57	31.39	175.
77.347	1.01325	28.865	118.953	19.597	−3405.26	−3401.75	79.53	27.83	57.80	939.
		0.1647	5.877	0.0143	1547.58	2162.97	151.54	21.59	31.45	175.
78	1.094	28.758	115.634	19.211	−3367.64	−3363.84	80.01	27.74	57.85	928.
		0.1767	5.895	0.0153	1557.75	2176.79	151.11	21.63	31.59	175.
79	1.226	28.592	110.762	18.637	−3309.99	−3305.70	80.75	27.62	57.92	911.
		0.1963	5.921	0.0171	1573.03	2197.49	150.47	21.69	31.80	176.
80	1.370	28.424	106.126	18.085	−3252.29	−3247.47	81.47	27.50	58.01	894.
		0.2176	5.942	0.0190	1587.93	2217.63	149.85	21.75	32.03	177.
81	1.526	28.254	101.703	17.552	−3194.53	−3189.12	82.19	27.38	58.12	878.
		0.2405	5.960	0.0211	1602.46	2237.19	149.24	21.81	32.27	177.

Thermodynamic properties of saturated nitrogen—Continued

Temperature kelvin	Pressure bar	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar/K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
82	1.696	28.082	97.476	17.038	−3136.69	−3130.65	82.90	27.26	58.23	862.
		0.2652	5.974	0.0233	1616.58	2256.15	148.65	21.88	32.52	178.
83	1.880	27.908	93.427	16.542	−3078.77	−3072.04	83.60	27.16	58.37	847.
		0.2918	5.983	0.0258	1630.29	2274.48	148.07	21.95	32.79	179.
84	2.077	27.732	89.543	16.061	−3020.75	−3013.26	84.30	27.05	58.52	832.
		0.3203	5.988	0.0284	1643.58	2292.17	147.51	22.02	33.08	179.
85	2.291	27.554	85.810	15.596	−2962.63	−2954.31	84.99	26.96	58.69	817.
		0.3509	5.989	0.0313	1656.41	2309.18	146.96	22.10	33.39	180.
86	2.519	27.373	82.217	15.146	−2904.37	−2895.16	85.67	26.87	58.89	802.
		0.3837	5.985	0.0344	1668.79	2325.50	146.42	22.18	33.71	180.
87	2.765	27.191	78.754	14.708	−2845.97	−2835.80	86.34	26.79	59.11	788.
		0.4187	5.977	0.0377	1680.68	2341.09	145.89	22.26	34.05	181.
88	3.028	27.006	75.412	14.283	−2787.40	−2776.19	87.01	26.71	59.35	773.
		0.4561	5.964	0.0413	1692.08	2355.94	145.37	22.34	34.42	181.
89	3.308	26.819	72.183	13.871	−2728.65	−2716.32	87.68	26.64	59.62	759.
		0.4960	5.945	0.0451	1702.96	2370.02	144.87	22.43	34.81	181.
90	3.608	26.630	69.060	13.469	−2669.71	−2656.16	88.34	26.57	59.91	746.
		0.5385	5.922	0.0492	1713.30	2383.30	144.37	22.52	35.22	182.
91	3.927	26.438	66.038	13.079	−2610.54	−2595.69	88.99	26.51	60.24	732.
		0.5837	5.894	0.0537	1723.08	2395.75	143.88	22.61	35.66	182.
92	4.266	26.244	63.111	12.699	−2551.14	−2534.89	89.64	26.46	60.59	718.
		0.6319	5.860	0.0584	1732.28	2407.35	143.39	22.70	36.13	182.
93	4.626	26.047	60.273	12.328	−2491.48	−2473.72	90.29	26.41	60.98	705.
		0.6831	5.821	0.0636	1740.87	2418.05	142.92	22.80	36.63	183.
94	5.007	25.847	57.521	11.966	−2431.53	−2412.16	90.93	26.37	61.39	691.
		0.7374	5.777	0.0690	1748.83	2427.83	142.45	22.90	37.17	183.
95	5.411	25.644	54.850	11.613	−2371.28	−2350.18	91.57	26.33	61.85	678.
		0.7951	5.726	0.0749	1756.14	2436.65	141.98	23.01	37.74	183.
96	5.838	25.439	52.258	11.268	−2310.71	−2287.76	92.21	26.29	62.34	665.
		0.8563	5.670	0.0812	1762.76	2444.48	141.52	23.12	38.35	183.
97	6.288	25.230	49.740	10.931	−2249.78	−2224.86	92.84	26.26	62.87	652.
		0.9212	5.608	0.0880	1768.66	2451.26	141.07	23.23	39.01	183.
98	6.763	25.018	47.295	10.601	−2188.48	−2161.45	93.47	26.23	63.44	639.
		0.9900	5.540	0.0952	1773.82	2456.97	140.62	23.34	39.71	183.
99	7.264	24.802	44.918	10.277	−2126.78	−2097.49	94.10	26.21	64.06	626.
		1.063	5.466	0.1030	1778.18	2461.54	140.17	23.46	40.48	183.
100	7.790	24.583	42.607	9.961	−2064.65	−2032.96	94.73	26.19	64.73	613.
		1.140	5.385	0.1114	1781.72	2464.92	139.72	23.59	41.30	183.
101	8.344	24.360	40.360	9.650	−2002.07	−1967.81	95.36	26.18	65.45	600.
		1.222	5.298	0.1203	1784.38	2467.07	139.28	23.71	42.19	183.

Thermodynamic properties of saturated nitrogen—Continued

Temperature kelvin	Pressure bar	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar/K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
102	8.925	24.133	38.174	9.345	−1938.99	−1902.01	95.98	26.17	66.24	587.
		1.309	5.204	0.1299	1786.13	2467.91	138.83	23.85	43.15	183.
103	9.535	23.901	36.048	9.046	−1875.39	−1835.50	96.60	26.16	67.09	574.
		1.401	5.103	0.1403	1786.90	2467.38	138.39	23.99	44.21	183.
104	10.174	23.665	33.977	8.752	−1811.22	−1768.23	97.23	26.15	68.02	562.
		1.499	4.995	0.1514	1786.63	2465.40	137.94	24.13	45.36	183.
105	10.843	23.424	31.962	8.463	−1746.46	−1700.17	97.85	26.15	69.03	549.
		1.603	4.880	0.1633	1785.27	2461.88	137.49	24.28	46.62	183.
106	11.543	23.178	29.998	8.178	−1681.04	−1631.24	98.48	26.16	70.14	536.
		1.713	4.757	0.1762	1782.72	2456.72	137.05	24.43	48.01	183.
107	12.275	22.927	28.084	7.897	−1614.92	−1561.38	99.10	26.16	71.37	523.
		1.830	4.627	0.1901	1778.92	2449.82	136.59	24.59	49.55	182.
108	13.040	22.669	26.218	7.620	−1548.04	−1490.51	99.73	26.17	72.72	510.
		1.954	4.488	0.2051	1773.75	2441.05	136.13	24.76	51.26	182.
109	13.839	22.405	24.399	7.347	−1480.33	−1418.56	100.36	26.19	74.23	497.
		2.087	4.341	0.2213	1767.13	2430.27	135.67	24.94	53.17	182.
110	14.673	22.134	22.623	7.077	−1411.70	−1345.41	101.00	26.21	75.92	484.
		2.229	4.185	0.2389	1758.90	2417.32	135.20	25.12	55.32	181.
111	15.542	21.854	20.890	6.809	−1342.07	−1270.95	101.63	26.23	77.82	470.
		2.380	4.021	0.2580	1748.94	2402.01	134.72	25.32	57.77	181.
112	16.448	21.566	19.198	6.544	−1271.31	−1195.05	102.28	26.27	79.98	457.
		2.542	3.847	0.2788	1737.08	2384.14	134.23	25.52	60.56	181.
113	17.391	21.269	17.546	6.280	−1199.31	−1117.54	102.93	26.30	82.46	443.
		2.716	3.663	0.3016	1723.11	2363.45	133.73	25.73	63.78	180.
114	18.373	20.960	15.932	6.018	−1125.88	−1038.22	103.58	26.35	85.34	429.
		2.903	3.469	0.3266	1706.80	2339.63	133.21	25.96	67.53	179.
115	19.395	20.638	14.356	5.756	−1050.83	−956.86	104.25	26.40	88.72	415.
		3.106	3.265	0.3540	1687.86	2312.33	132.67	26.20	71.97	179.
116	20.457	20.302	12.818	5.495	−973.90	−873.14	104.93	26.46	92.75	400.
		3.325	3.049	0.3844	1665.95	2281.12	132.12	26.45	77.28	178.
117	21.561	19.949	11.316	5.232	−894.76	−786.67	105.63	26.54	97.65	386.
		3.565	2.822	0.4181	1640.62	2245.43	131.53	26.72	83.76	178.
118	22.708	19.575	9.852	4.967	−812.96	−696.96	106.34	26.62	103.73	370.
		3.828	2.583	0.4559	1611.32	2204.55	130.92	27.01	91.82	177.
119	23.899	19.176	8.428	4.698	−727.92	−603.29	107.08	26.73	111.49	354.
		4.119	2.331	0.4985	1577.29	2157.56	130.27	27.33	102.13	176.
120	25.135	18.745	7.044	4.424	−638.80	−504.72	107.85	26.86	121.75	338.
		4.443	2.065	0.5471	1537.51	2103.16	129.57	27.66	115.78	176.
121	26.417	18.274	5.704	4.142	−544.36	−399.80	108.66	27.02	135.98	320.
		4.812	1.784	0.6034	1490.47	2039.47	128.82	28.03	134.70	175.

Thermodynamic properties of saturated nitrogen—Continued

Temperature kelvin	Pressure bar	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar/K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
122	27.749	17.745	4.415	3.847	−442.66	−286.28	109.54	27.23	157.08	302.
		5.238	1.486	0.6699	1433.85	1963.58	127.97	28.43	162.66	174.
123	29.133	17.134	3.184	3.533	−330.28	−160.25	110.50	27.49	191.72	282.
		5.748	1.170	0.7509	1363.65	1870.50	127.01	28.89	208.24	174.
124	30.574	16.388	2.026	3.186	−200.41	−13.85	111.62	27.86	259.26	259.
		6.391	0.833	0.8551	1271.92	1750.33	125.84	29.40	295.94	173.
125	32.079	15.367	0.971	2.775	−35.02	173.74	113.05	28.44	448.21	234.
		7.299	0.469	1.005	1138.08	1577.61	124.28	30.02	534.94	173.
126	33.668	13.270	0.111	2.128	271.93	525.65	115.76			
		9.235	0.077	1.329	846.89	1211.46	121.20			
126.200	34.000	11.210	0.000	1.679	559.26	862.56	118.41			

Thermodynamic properties of nitrogen

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
				0.10 bar Isobar					
* 63.151	0.01919	5.17	0.0016	1298.4	1819.5	165.47	20.95	29.53	161.
64	0.01893	5.24	0.0016	1316.3	1844.6	165.86	20.95	29.51	162.
66	0.01834	5.42	0.0015	1358.4	1903.6	166.77	20.93	29.46	165.
68	0.01779	5.59	0.0015	1400.5	1962.5	167.65	20.91	29.43	168.
70	0.01728	5.76	0.0014	1442.5	2021.3	168.50	20.90	29.39	170.
72	0.01679	5.93	0.0014	1484.4	2080.0	169.33	20.88	29.36	172.
74	0.01633	6.10	0.0014	1526.3	2138.8	170.13	20.87	29.34	175.
76	0.01589	6.26	0.0013	1568.2	2197.4	170.92	20.86	29.32	177.
78	0.01548	6.43	0.0013	1610.1	2256.0	171.68	20.85	29.30	180.
80	0.01509	6.60	0.0013	1651.9	2314.6	172.42	20.85	29.28	182.
82	0.01472	6.77	0.0012	1693.7	2373.2	173.14	20.84	29.27	184.
84	0.01436	6.94	0.0012	1735.5	2431.7	173.85	20.84	29.25	186.
86	0.01403	7.11	0.0012	1777.3	2490.2	174.54	20.83	29.24	189.
88	0.01371	7.28	0.0011	1819.0	2548.7	175.21	20.83	29.23	191.
90	0.01340	7.44	0.0011	1860.7	2607.1	175.86	20.82	29.22	193.
92	0.01310	7.61	0.0011	1902.5	2665.6	176.51	20.82	29.21	195.
94	0.01282	7.78	0.0011	1944.2	2723.9	177.13	20.82	29.20	197.
96	0.01256	7.95	0.0010	1985.9	2782.3	177.75	20.81	29.20	199.
98	0.01230	8.11	0.0010	2027.6	2840.7	178.35	20.81	29.19	202.
100	0.01205	8.28	0.0010	2069.3	2899.1	178.94	20.81	29.18	204.
102	0.01181	8.45	0.0010	2110.9	2957.4	179.52	20.81	29.18	206.
104	0.01158	8.62	0.0010	2152.6	3015.8	180.09	20.80	29.17	208.
106	0.01137	8.78	0.0009	2194.3	3074.1	180.64	20.80	29.17	210.
108	0.01115	8.95	0.0009	2235.9	3132.5	181.19	20.80	29.16	212.
110	0.01095	9.12	0.0009	2277.6	3190.8	181.72	20.80	29.16	214.
112	0.01075	9.29	0.0009	2319.2	3249.1	182.25	20.80	29.16	216.
114	0.01056	9.45	0.0009	2360.8	3307.4	182.76	20.80	29.15	217.
116	0.01038	9.62	0.0009	2402.5	3365.7	183.27	20.80	29.15	219.
118	0.01020	9.79	0.0008	2444.1	3424.0	183.77	20.80	29.15	221.
120	0.01003	9.95	0.0008	2485.7	3482.3	184.26	20.79	29.15	223.
122	0.00987	10.12	0.0008	2527.4	3540.6	184.74	20.79	29.14	225.
124	0.00971	10.29	0.0008	2569.0	3598.9	185.21	20.79	29.14	227.
126	0.00955	10.46	0.0008	2610.6	3657.2	185.68	20.79	29.14	229.
128	0.00941	10.62	0.0008	2652.2	3715.5	186.14	20.79	29.14	231.
130	0.00926	10.79	0.0008	2693.8	3773.7	186.59	20.79	29.13	232.
132	0.00912	10.96	0.0008	2735.4	3832.0	187.04	20.79	29.13	234.
134	0.00898	11.12	0.0007	2777.0	3890.3	187.47	20.79	29.13	236.
136	0.00885	11.29	0.0007	2818.6	3948.5	187.90	20.79	29.13	238.
138	0.00872	11.46	0.0007	2860.3	4006.8	188.33	20.79	29.13	239.
140	0.00860	11.62	0.0007	2901.9	4065.0	188.75	20.79	29.13	241.
142	0.00848	11.79	0.0007	2943.5	4123.3	189.16	20.79	29.13	243.
144	0.00836	11.96	0.0007	2985.1	4181.5	189.57	20.79	29.12	245.
146	0.00824	12.12	0.0007	3026.6	4239.8	189.97	20.79	29.12	246.
148	0.00813	12.29	0.0007	3068.2	4298.0	190.37	20.79	29.12	248.
150	0.00802	12.46	0.0007	3109.8	4356.3	190.76	20.79	29.12	250.
155	0.00776	12.87	0.0006	3213.8	4501.9	191.71	20.79	29.12	254.
160	0.00752	13.29	0.0006	3317.8	4647.5	192.64	20.78	29.12	258.
165	0.00729	13.71	0.0006	3421.8	4793.0	193.53	20.78	29.11	262.
170	0.00708	14.12	0.0006	3525.7	4938.6	194.40	20.78	29.11	266.
175	0.00688	14.54	0.0006	3629.7	5084.2	195.25	20.78	29.11	270.
180	0.00668	14.96	0.0006	3733.6	5229.7	196.07	20.78	29.11	273.
185	0.00650	15.37	0.0005	3837.6	5375.3	196.86	20.78	29.11	277.
190	0.00633	15.79	0.0005	3941.5	5520.8	197.64	20.78	29.11	281.
195	0.00617	16.21	0.0005	4045.4	5666.4	198.40	20.78	29.11	285.
200	0.00602	16.62	0.0005	4149.4	5811.9	199.13	20.78	29.11	288.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
210	0.00573	17.45	0.0005	4357.2	6102.9	200.55	20.78	29.10	295.
220	0.00547	18.29	0.0005	4565.1	6394.0	201.91	20.78	29.10	302.
230	0.00523	19.12	0.0004	4772.9	6685.0	203.20	20.78	29.10	309.
240	0.00501	19.95	0.0004	4980.8	6976.2	204.44	20.78	29.10	316.
250	0.00481	20.78	0.0004	5188.6	7267.2	205.63	20.78	29.10	322.
260	0.00463	21.61	0.0004	5396.5	7558.2	206.77	20.78	29.10	329.
270	0.00445	22.45	0.0004	5604.3	7849.2	207.87	20.78	29.10	335.
280	0.00430	23.28	0.0004	5812.2	8140.2	208.93	20.78	29.10	341.
290	0.00415	24.11	0.0003	6020.0	8431.2	209.95	20.79	29.11	347.
300	0.00401	24.94	0.0003	6228.0	8722.3	210.93	20.79	29.11	353.
310	0.00388	25.77	0.0003	6435.9	9013.4	211.89	20.80	29.11	359.
320	0.00376	26.61	0.0003	6643.9	9304.5	212.81	20.80	29.12	365.
330	0.00364	27.44	0.0003	6852.0	9595.8	213.71	20.81	29.13	370.
340	0.00354	28.27	0.0003	7060.1	9887.0	214.58	20.82	29.13	376.
350	0.00344	29.10	0.0003	7268.4	10178.4	215.42	20.83	29.14	381.
360	0.00334	29.93	0.0003	7476.7	10469.9	216.24	20.84	29.16	387.
370	0.00325	30.76	0.0003	7685.2	10761.6	217.04	20.85	29.17	392.
380	0.00317	31.60	0.0003	7893.8	11053.3	217.82	20.87	29.19	397.
390	0.00308	32.43	0.0003	8102.6	11345.3	218.58	20.89	29.20	402.
400	0.00301	33.26	0.0003	8311.6	11637.4	219.32	20.91	29.22	407.
420	0.00286	34.92	0.0002	8730.3	12222.3	220.75	20.95	29.27	417.
440	0.00273	36.59	0.0002	9149.9	12808.3	222.11	21.01	29.33	427.
460	0.00261	38.25	0.0002	9570.8	13395.4	223.41	21.08	29.39	436.
480	0.00251	39.91	0.0002	9993.0	13984.0	224.67	21.15	29.47	446.
500	0.00241	41.58	0.0002	10416.9	14574.1	225.87	21.23	29.55	454.
520	0.00231	43.24	0.0002	10842.4	15165.9	227.03	21.32	29.64	463.
540	0.00223	44.90	0.0002	11269.9	15759.7	228.15	21.42	29.74	472.
560	0.00215	46.56	0.0002	11699.4	16355.5	229.24	21.53	29.84	480.
580	0.00207	48.23	0.0002	12131.0	16953.4	230.29	21.64	29.95	488.
600	0.00200	49.89	0.0002	12565.0	17553.7	231.30	21.76	30.07	496.
620	0.00194	51.55	0.0002	13001.3	18156.3	232.29	21.88	30.19	504.
640	0.00188	53.22	0.0002	13440.1	18761.4	233.25	22.00	30.32	512.
660	0.00182	54.88	0.0002	13881.4	19369.0	234.19	22.13	30.45	519.
680	0.00177	56.54	0.0001	14325.4	19979.2	235.10	22.26	30.58	527.
700	0.00172	58.21	0.0001	14771.9	20592.0	235.98	22.39	30.71	534.
720	0.00167	59.87	0.0001	15221.1	21207.5	236.85	22.53	30.84	541.
740	0.00163	61.53	0.0001	15673.1	21825.7	237.70	22.66	30.98	548.
760	0.00158	63.19	0.0001	16127.7	22446.6	238.53	22.80	31.11	555.
780	0.00154	64.86	0.0001	16585.0	23070.2	239.34	22.93	31.25	562.
800	0.00150	66.52	0.0001	17045.0	23696.5	240.13	23.07	31.38	568.
850	0.00141	70.68	0.0001	18206.6	25273.8	242.04	23.40	31.71	585.
900	0.00134	74.83	0.0001	19384.4	26867.4	243.86	23.72	32.03	601.
950	0.00127	78.99	0.0001	20578.0	28476.7	245.60	24.02	32.34	616.
1000	0.00120	83.15	0.0001	21786.5	30100.9	247.27	24.32	32.63	631.
1050	0.00115	87.31	0.0001	23009.3	31739.6	248.87	24.59	32.91	646.
1100	0.00109	91.46	0.0001	24245.5	33391.6	250.41	24.85	33.17	660.
1150	0.00105	95.62	0.0001	25494.4	35056.2	251.89	25.10	33.41	674.
1200	0.00100	99.78	0.0001	26755.2	36732.7	253.31	25.33	33.64	688.
1250	0.00096	103.94	0.0001	28027.1	38420.3	254.69	25.54	33.86	701.
1300	0.00093	108.09	0.0001	29309.4	40118.3	256.02	25.75	34.06	714.
1350	0.00089	112.25	0.0001	30601.4	41826.1	257.31	25.93	34.25	727.
1400	0.00086	116.41	0.0001	31902.6	43542.9	258.56	26.11	34.42	740.
1450	0.00083	120.56	0.0001	33212.2	45268.3	259.77	26.27	34.59	753.
1500	0.00080	124.72	0.0001	34529.8	47001.6	260.95	26.43	34.74	765.
1550	0.00078	128.88	0.0001	35854.8	48742.3	262.09	26.57	34.89	777.
1600	0.00075	133.04	0.0001	37186.8	50490.0	263.20	26.71	35.02	789.
1650	0.00073	137.19	0.0001	38525.3	52244.3	264.28	26.83	35.15	801.
1700	0.00071	141.35	0.0001	39869.9	54004.6	265.33	26.95	35.26	813.
1750	0.00069	145.51	0.0001	41220.2	55770.6	266.35	27.06	35.38	824.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1800	0.00067	149.66	0.0001	42575.9	57541.9	267.35	27.16	35.48	835.
1850	0.00065	153.82	0.0001	43936.5	59318.3	268.32	27.26	35.58	847.
1900	0.00063	157.98	0.0001	45301.9	61099.5	269.27	27.35	35.67	858.
1950	0.00062	162.14	0.0001	46671.8	62885.0	270.20	27.44	35.75	868.
2000	0.00060	166.29	0.0001	48045.8	64674.8	271.11	27.52	35.83	879.
				0.50 bar Isobar					
* 63.160	30.97747	240.23	31.94	−4211.8	−4210.2	68.01			
64	30.86492	228.86	30.87	−4165.7	−4164.1	68.74			
66	30.59048	204.79	28.58	−4054.2	−4052.6	70.45			
68	30.30671	184.27	26.57	−3941.2	−3939.5	72.14			
70	30.01370	166.64	24.79	−3827.2	−3825.5	73.79			
* 71.820	29.73919	152.64	23.33	−3722.9	−3721.2	75.27			
* 71.820	0.08597	5.66	0.0073	1456.0	2037.6	155.53			
72	0.08574	5.68	0.0073	1459.9	2043.1	155.61	21.30	30.51	170.
74	0.08324	5.86	0.0071	1503.3	2104.0	156.44	21.24	30.38	173.
76	0.08090	6.04	0.0069	1546.6	2164.6	157.25	21.19	30.26	175.
78	0.07869	6.22	0.0067	1589.6	2225.0	158.03	21.15	30.15	178.
80	0.07661	6.40	0.0065	1632.6	2285.2	158.79	21.11	30.06	180.
82	0.07464	6.58	0.0063	1675.4	2345.3	159.54	21.08	29.98	183.
84	0.07277	6.76	0.0061	1718.1	2405.2	160.26	21.05	29.90	185.
86	0.07100	6.93	0.0060	1760.7	2464.9	160.96	21.03	29.84	187.
88	0.06932	7.11	0.0058	1803.2	2524.5	161.65	21.01	29.78	190.
90	0.06771	7.28	0.0057	1845.6	2584.0	162.31	20.99	29.73	192.
92	0.06619	7.46	0.0056	1888.0	2643.4	162.97	20.97	29.69	194.
94	0.06473	7.63	0.0054	1930.3	2702.8	163.61	20.95	29.64	196.
96	0.06334	7.81	0.0053	1972.6	2762.0	164.23	20.94	29.61	199.
98	0.06200	7.98	0.0052	2014.8	2821.2	164.84	20.93	29.57	201.
100	0.06073	8.15	0.0051	2057.0	2880.3	165.44	20.91	29.54	203.
102	0.05950	8.33	0.0050	2099.1	2939.4	166.02	20.90	29.51	205.
104	0.05833	8.50	0.0049	2141.2	2998.4	166.59	20.89	29.49	207.
106	0.05720	8.67	0.0048	2183.2	3057.3	167.16	20.89	29.46	209.
108	0.05612	8.84	0.0047	2225.3	3116.2	167.71	20.88	29.44	211.
110	0.05507	9.01	0.0046	2267.2	3175.1	168.25	20.87	29.42	213.
112	0.05407	9.18	0.0045	2309.2	3233.9	168.78	20.87	29.41	215.
114	0.05310	9.35	0.0044	2351.2	3292.7	169.30	20.86	29.39	217.
116	0.05217	9.52	0.0044	2393.1	3351.5	169.81	20.85	29.37	219.
118	0.05127	9.69	0.0043	2435.0	3410.2	170.31	20.85	29.36	221.
120	0.05040	9.86	0.0042	2476.9	3468.9	170.80	20.85	29.35	223.
122	0.04956	10.03	0.0041	2518.7	3527.6	171.29	20.84	29.33	225.
124	0.04875	10.20	0.0041	2560.6	3586.3	171.76	20.84	29.32	226.
126	0.04796	10.37	0.0040	2602.4	3644.9	172.23	20.83	29.31	228.
128	0.04720	10.54	0.0039	2644.3	3703.5	172.70	20.83	29.30	230.
130	0.04647	10.71	0.0039	2686.1	3762.1	173.15	20.83	29.29	232.
132	0.04575	10.88	0.0038	2727.9	3820.7	173.60	20.83	29.28	234.
134	0.04506	11.05	0.0038	2769.7	3879.2	174.04	20.82	29.28	235.
136	0.04439	11.22	0.0037	2811.5	3937.8	174.47	20.82	29.27	237.
138	0.04374	11.39	0.0037	2853.2	3996.3	174.90	20.82	29.26	239.
140	0.04311	11.56	0.0036	2895.0	4054.8	175.32	20.82	29.25	241.
142	0.04250	11.73	0.0035	2936.7	4113.3	175.73	20.81	29.25	243.
144	0.04190	11.89	0.0035	2978.5	4171.8	176.14	20.81	29.24	244.
146	0.04132	12.06	0.0034	3020.2	4230.3	176.55	20.81	29.24	246.
148	0.04076	12.23	0.0034	3061.9	4288.8	176.94	20.81	29.23	248.
150	0.04021	12.40	0.0034	3103.7	4347.2	177.34	20.81	29.23	249.
155	0.03890	12.82	0.0032	3207.9	4493.3	178.29	20.80	29.21	254.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
160	0.03767	13.24	0.0031	3312.2	4639.4	179.22	20.80	29.20	258.
165	0.03652	13.66	0.0030	3416.4	4785.4	180.12	20.80	29.20	262.
170	0.03544	14.08	0.0030	3520.6	4931.3	180.99	20.80	29.19	266.
175	0.03442	14.50	0.0029	3624.8	5077.2	181.84	20.80	29.18	269.
180	0.03346	14.92	0.0028	3728.9	5223.1	182.66	20.79	29.17	273.
185	0.03255	15.34	0.0027	3833.0	5369.0	183.46	20.79	29.17	277.
190	0.03169	15.76	0.0026	3937.2	5514.8	184.24	20.79	29.16	281.
195	0.03088	16.17	0.0026	4041.2	5660.6	184.99	20.79	29.16	285.
200	0.03010	16.59	0.0025	4145.3	5806.4	185.73	20.79	29.15	288.
210	0.02866	17.43	0.0024	4353.5	6097.9	187.15	20.79	29.15	295.
220	0.02736	18.26	0.0023	4561.5	6389.4	188.51	20.79	29.14	302.
230	0.02616	19.10	0.0022	4769.6	6680.7	189.81	20.79	29.14	309.
240	0.02507	19.93	0.0021	4977.6	6972.1	191.05	20.79	29.13	316.
250	0.02406	20.77	0.0020	5185.6	7263.4	192.23	20.79	29.13	322.
260	0.02314	21.60	0.0019	5393.6	7554.7	193.38	20.79	29.13	329.
270	0.02228	22.44	0.0019	5601.6	7845.9	194.48	20.79	29.13	335.
280	0.02148	23.27	0.0018	5809.6	8137.2	195.54	20.79	29.13	341.
290	0.02074	24.11	0.0017	6017.6	8428.5	196.56	20.79	29.13	347.
300	0.02005	24.94	0.0017	6225.6	8719.7	197.54	20.79	29.13	353.
310	0.01940	25.77	0.0016	6433.7	9011.0	198.50	20.80	29.13	359.
320	0.01879	26.61	0.0016	6641.8	9302.3	199.42	20.80	29.14	365.
330	0.01822	27.44	0.0015	6850.0	9593.7	200.32	20.81	29.14	370.
340	0.01769	28.27	0.0015	7058.2	9885.2	201.19	20.82	29.15	376.
350	0.01718	29.10	0.0014	7266.5	10176.7	202.04	20.83	29.16	381.
360	0.01670	29.94	0.0014	7474.9	10468.3	202.86	20.84	29.17	387.
370	0.01625	30.77	0.0014	7683.5	10760.1	203.66	20.86	29.18	392.
380	0.01582	31.60	0.0013	7892.2	11052.0	204.44	20.87	29.20	397.
390	0.01542	32.43	0.0013	8101.0	11344.0	205.19	20.89	29.21	402.
400	0.01503	33.27	0.0013	8310.1	11636.3	205.93	20.91	29.23	407.
420	0.01432	34.93	0.0012	8728.8	12221.4	207.36	20.96	29.28	417.
440	0.01367	36.60	0.0011	9148.6	12807.5	208.73	21.01	29.33	427.
460	0.01307	38.26	0.0011	9569.5	13394.8	210.03	21.08	29.40	436.
480	0.01253	39.92	0.0010	9991.8	13983.5	211.28	21.15	29.47	446.
500	0.01202	41.59	0.0010	10415.7	14573.7	212.49	21.23	29.55	455.
520	0.01156	43.25	0.0010	10841.4	15165.7	213.65	21.32	29.64	463.
540	0.01113	44.92	0.0009	11268.9	15759.6	214.77	21.42	29.74	472.
560	0.01074	46.58	0.0009	11698.4	16355.4	215.85	21.53	29.85	480.
580	0.01037	48.24	0.0009	12130.1	16953.5	216.90	21.64	29.96	488.
600	0.01002	49.91	0.0008	12564.1	17553.8	217.92	21.76	30.07	496.
620	0.00970	51.57	0.0008	13000.5	18156.5	218.91	21.88	30.20	504.
640	0.00939	53.23	0.0008	13439.3	18761.6	219.87	22.00	30.32	512.
660	0.00911	54.90	0.0008	13880.7	19369.3	220.80	22.13	30.45	519.
680	0.00884	56.56	0.0007	14324.7	19979.6	221.71	22.26	30.58	527.
700	0.00859	58.22	0.0007	14771.3	20592.5	222.60	22.39	30.71	534.
720	0.00835	59.89	0.0007	15220.5	21208.1	223.47	22.53	30.85	541.
740	0.00812	61.55	0.0007	15672.5	21826.3	224.32	22.66	30.98	548.
760	0.00791	63.21	0.0007	16127.1	22447.3	225.14	22.80	31.11	555.
780	0.00771	64.88	0.0006	16584.4	23070.9	225.95	22.93	31.25	562.
800	0.00752	66.54	0.0006	17044.4	23697.2	226.75	23.07	31.38	568.
850	0.00707	70.70	0.0006	18206.1	25274.6	228.66	23.40	31.71	585.
900	0.00668	74.86	0.0006	19384.0	26868.3	230.48	23.72	32.03	601.
950	0.00633	79.01	0.0005	20577.6	28477.6	232.22	24.02	32.34	616.
1000	0.00601	83.17	0.0005	21786.2	30101.9	233.89	24.32	32.63	631.
1050	0.00573	87.33	0.0005	23009.0	31740.3	235.49	24.59	32.91	646.
1100	0.00547	91.49	0.0005	24245.3	33392.3	237.02	24.85	33.17	660.
1150	0.00523	95.64	0.0004	25494.2	35057.0	238.50	25.10	33.41	674.
1200	0.00501	99.80	0.0004	26755.0	36733.5	239.93	25.33	33.64	688.
1250	0.00481	103.96	0.0004	28026.9	38421.1	241.31	25.54	33.86	701.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1300	0.00463	108.12	0.0004	29309.2	40119.2	242.64	25.75	34.06	715.
1350	0.00445	112.27	0.0004	30601.3	41827.0	243.93	25.93	34.25	728.
1400	0.00430	116.43	0.0004	31902.4	43543.9	245.18	26.11	34.42	740.
1450	0.00415	120.59	0.0003	33212.1	45269.2	246.39	26.27	34.59	753.
1500	0.00401	124.75	0.0003	34529.7	47002.6	247.56	26.43	34.74	765.
1550	0.00388	128.90	0.0003	35854.8	48743.3	248.71	26.57	34.89	777.
1600	0.00376	133.06	0.0003	37186.8	50491.1	249.82	26.71	35.02	789.
1650	0.00364	137.22	0.0003	38525.3	52245.3	250.90	26.83	35.15	801.
1700	0.00354	141.37	0.0003	39869.8	54005.6	251.95	26.95	35.26	813.
1750	0.00344	145.53	0.0003	41220.2	55771.6	252.97	27.06	35.38	824.
1800	0.00334	149.69	0.0003	42575.8	57543.0	253.97	27.16	35.48	835.
1850	0.00325	153.85	0.0003	43936.5	59319.4	254.94	27.26	35.58	847.
1900	0.00316	158.00	0.0003	45301.9	61100.5	255.89	27.35	35.67	858.
1950	0.00308	162.16	0.0003	46671.8	62886.1	256.82	27.44	35.75	868.
2000	0.00301	166.32	0.0003	48045.8	64675.9	257.73	27.52	35.83	879.
				1 bar Isobar					
* 63.171	30.97809	240.24	31.92	−4211.7	−4208.5	68.02			
64	30.86710	229.02	30.86	−4166.1	−4162.9	68.73			
66	30.59292	204.95	28.57	−4054.7	−4051.4	70.45			
68	30.30942	184.44	26.57	−3941.7	−3938.4	72.13			
70	30.01670	166.80	24.79	−3827.7	−3824.4	73.79			
72	29.71491	151.50	23.20	−3713.2	−3709.8	75.40	28.44	57.41	1045.
74	29.40426	138.09	21.75	−3598.2	−3594.8	76.98	28.25	57.57	1002.
76	29.08490	126.22	20.43	−3483.0	−3479.6	78.51	28.00	57.70	964.
* 77.235	28.88331	119.53	19.66	−3411.7	−3408.2	79.44	27.84	57.79	941.
* 77.235	0.16267	5.87	0.0141	1545.8	2160.6	151.61	21.58	31.43	175.
78	0.16086	5.95	0.0139	1562.9	2184.6	151.92	21.55	31.35	176.
80	0.15633	6.14	0.0135	1607.4	2247.1	152.71	21.47	31.14	178.
82	0.15208	6.33	0.0131	1651.6	2309.2	153.48	21.40	30.95	181.
84	0.14807	6.52	0.0127	1695.5	2370.9	154.22	21.34	30.79	183.
86	0.14429	6.71	0.0123	1739.3	2432.3	154.95	21.29	30.65	186.
88	0.14071	6.90	0.0120	1782.8	2493.5	155.65	21.24	30.53	188.
90	0.13732	7.08	0.0117	1826.2	2554.5	156.33	21.20	30.42	190.
92	0.13410	7.27	0.0114	1869.5	2615.2	157.00	21.16	30.32	193.
94	0.13104	7.45	0.0111	1912.6	2675.7	157.65	21.13	30.23	195.
96	0.12812	7.63	0.0109	1955.6	2736.1	158.29	21.10	30.15	197.
98	0.12534	7.81	0.0106	1998.5	2796.4	158.91	21.07	30.08	199.
100	0.12268	7.99	0.0104	2041.3	2856.4	159.52	21.05	30.01	202.
102	0.12014	8.17	0.0102	2084.0	2916.4	160.11	21.03	29.95	204.
104	0.11770	8.35	0.0099	2126.7	2976.3	160.69	21.01	29.90	206.
106	0.11537	8.52	0.0097	2169.2	3036.0	161.26	20.99	29.85	208.
108	0.11313	8.70	0.0095	2211.7	3095.7	161.82	20.98	29.81	210.
110	0.11098	8.88	0.0094	2254.2	3155.2	162.36	20.96	29.77	212.
112	0.10891	9.05	0.0092	2296.6	3214.7	162.90	20.95	29.73	214.
114	0.10693	9.23	0.0090	2338.9	3274.1	163.43	20.94	29.69	216.
116	0.10501	9.40	0.0088	2381.2	3333.5	163.94	20.93	29.66	218.
118	0.10317	9.58	0.0087	2423.5	3392.8	164.45	20.92	29.63	220.
120	0.10139	9.75	0.0085	2465.7	3452.0	164.95	20.91	29.60	222.
122	0.09967	9.92	0.0084	2507.9	3511.2	165.44	20.90	29.58	224.
124	0.09801	10.10	0.0082	2550.0	3570.3	165.92	20.89	29.56	226.
126	0.09641	10.27	0.0081	2592.2	3629.4	166.39	20.89	29.53	228.
128	0.09486	10.44	0.0080	2634.3	3688.5	166.85	20.88	29.51	230.
130	0.09336	10.61	0.0078	2676.3	3747.5	167.31	20.88	29.49	231.
132	0.09190	10.79	0.0077	2718.4	3806.5	167.76	20.87	29.48	233.
134	0.09050	10.96	0.0076	2760.4	3865.4	168.20	20.86	29.46	235.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
136	0.08913	11.13	0.0075	2802.4	3924.3	168.64	20.86	29.44	237.
138	0.08781	11.30	0.0074	2844.4	3983.2	169.07	20.86	29.43	239.
140	0.08653	11.47	0.0072	2886.3	4042.0	169.49	20.85	29.42	240.
142	0.08528	11.64	0.0071	2928.3	4100.8	169.91	20.85	29.40	242.
144	0.08408	11.82	0.0070	2970.2	4159.6	170.32	20.84	29.39	244.
146	0.08290	11.99	0.0069	3012.1	4218.4	170.73	20.84	29.38	246.
148	0.08176	12.16	0.0068	3054.0	4277.1	171.13	20.84	29.37	247.
150	0.08065	12.33	0.0067	3095.9	4335.9	171.52	20.84	29.36	249.
155	0.07800	12.75	0.0065	3200.6	4482.6	172.48	20.83	29.34	253.
160	0.07553	13.18	0.0063	3305.2	4629.2	173.41	20.82	29.31	257.
165	0.07320	13.60	0.0061	3409.7	4775.8	174.32	20.82	29.30	261.
170	0.07102	14.03	0.0059	3514.2	4922.2	175.19	20.82	29.28	265.
175	0.06897	14.45	0.0058	3618.6	5068.6	176.04	20.81	29.27	269.
180	0.06703	14.87	0.0056	3723.0	5214.9	176.86	20.81	29.25	273.
185	0.06520	15.29	0.0054	3827.4	5361.1	177.66	20.81	29.24	277.
190	0.06347	15.71	0.0053	3931.7	5507.3	178.44	20.80	29.23	281.
195	0.06183	16.14	0.0052	4036.0	5653.5	179.20	20.80	29.22	284.
200	0.06027	16.56	0.0050	4140.3	5799.6	179.94	20.80	29.22	288.
210	0.05738	17.40	0.0048	4348.7	6091.6	181.37	20.80	29.20	295.
220	0.05475	18.24	0.0046	4557.1	6383.6	182.73	20.79	29.19	302.
230	0.05236	19.08	0.0044	4765.4	6675.4	184.02	20.79	29.18	309.
240	0.05016	19.92	0.0042	4973.7	6967.2	185.27	20.79	29.17	316.
250	0.04815	20.75	0.0040	5181.9	7258.9	186.46	20.79	29.16	322.
260	0.04629	21.59	0.0039	5390.1	7550.5	187.60	20.79	29.16	329.
270	0.04457	22.43	0.0037	5598.3	7842.1	188.70	20.79	29.16	335.
280	0.04297	23.26	0.0036	5806.4	8133.6	189.76	20.79	29.15	341.
290	0.04148	24.10	0.0035	6014.6	8425.1	190.78	20.79	29.15	347.
300	0.04010	24.93	0.0033	6222.7	8716.6	191.77	20.80	29.15	353.
310	0.03880	25.77	0.0032	6430.9	9008.1	192.73	20.80	29.15	359.
320	0.03759	26.60	0.0031	6639.1	9299.7	193.65	20.81	29.15	365.
330	0.03645	27.44	0.0030	6847.4	9591.2	194.55	20.81	29.16	370.
340	0.03537	28.27	0.0029	7055.7	9882.8	195.42	20.82	29.17	376.
350	0.03436	29.11	0.0029	7264.2	10174.5	196.27	20.83	29.17	381.
360	0.03340	29.94	0.0028	7472.7	10466.3	197.09	20.84	29.18	387.
370	0.03250	30.78	0.0027	7681.3	10758.2	197.89	20.86	29.20	392.
380	0.03164	31.61	0.0026	7890.1	11050.2	198.67	20.87	29.21	397.
390	0.03083	32.44	0.0026	8099.0	11342.4	199.43	20.89	29.23	403.
400	0.03006	33.28	0.0025	8308.1	11634.8	200.17	20.91	29.25	408.
420	0.02863	34.94	0.0024	8727.0	12220.1	201.59	20.96	29.29	418.
440	0.02733	36.61	0.0023	9146.9	12806.4	202.96	21.01	29.34	427.
460	0.02614	38.27	0.0022	9567.9	13393.9	204.26	21.08	29.41	437.
480	0.02505	39.94	0.0021	9990.3	13982.8	205.52	21.15	29.48	446.
500	0.02405	41.61	0.0020	10414.3	14573.2	206.72	21.24	29.56	455.
520	0.02312	43.27	0.0019	10840.0	15165.3	207.88	21.33	29.65	463.
540	0.02226	44.94	0.0019	11267.6	15759.3	209.00	21.42	29.75	472.
560	0.02147	46.60	0.0018	11697.2	16355.2	210.09	21.53	29.85	480.
580	0.02073	48.26	0.0017	12129.0	16953.4	211.14	21.64	29.96	488.
600	0.02004	49.93	0.0017	12563.1	17553.8	212.16	21.76	30.08	496.
620	0.01939	51.59	0.0016	12999.5	18156.6	213.14	21.88	30.20	504.
640	0.01878	53.26	0.0016	13438.4	18761.8	214.10	22.00	30.32	512.
660	0.01822	54.92	0.0015	13879.8	19369.6	215.04	22.13	30.45	519.
680	0.01768	56.58	0.0015	14323.8	19979.9	215.95	22.26	30.58	527.
700	0.01717	58.25	0.0014	14770.4	20592.9	216.84	22.40	30.71	534.
720	0.01670	59.91	0.0014	15219.7	21208.5	217.71	22.53	30.85	541.
740	0.01625	61.58	0.0014	15671.7	21826.8	218.55	22.66	30.98	548.
760	0.01582	63.24	0.0013	16126.4	22447.8	219.38	22.80	31.12	555.
780	0.01541	64.90	0.0013	16583.7	23071.5	220.19	22.93	31.25	562.
800	0.01503	66.57	0.0013	17043.8	23697.9	220.98	23.07	31.38	569.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
850	0.01414	70.73	0.0012	18205.5	25275.4	222.90	23.40	31.71	585.
900	0.01336	74.88	0.0011	19383.5	26869.1	224.72	23.72	32.03	601.
950	0.01266	79.04	0.0011	20577.1	28478.6	226.46	24.02	32.34	616.
1000	0.01202	83.20	0.0010	21785.8	30102.9	228.12	24.32	32.63	631.
1050	0.01145	87.36	0.0010	23008.6	31741.6	229.72	24.59	32.91	646.
1100	0.01093	91.52	0.0009	24244.9	33393.6	231.26	24.85	33.17	660.
1150	0.01046	95.67	0.0009	25493.9	35058.3	232.74	25.10	33.42	674.
1200	0.01002	99.83	0.0008	26754.7	36734.9	234.17	25.33	33.64	688.
1250	0.00962	103.99	0.0008	28026.6	38422.6	235.55	25.54	33.86	701.
1300	0.00925	108.15	0.0008	29309.0	40120.6	236.88	25.75	34.06	715.
1350	0.00891	112.30	0.0007	30601.1	41828.5	238.17	25.93	34.25	728.
1400	0.00859	116.46	0.0007	31902.3	43545.4	239.42	26.11	34.43	740.
1450	0.00829	120.62	0.0007	33212.0	45270.8	240.63	26.27	34.59	753.
1500	0.00802	124.78	0.0007	34529.6	47004.2	241.80	26.43	34.74	765.
1550	0.00776	128.93	0.0006	35854.6	48744.9	242.94	26.57	34.89	777.
1600	0.00752	133.09	0.0006	37186.7	50492.7	244.05	26.71	35.02	789.
1650	0.00729	137.25	0.0006	38525.2	52246.9	245.13	26.83	35.15	801.
1700	0.00707	141.41	0.0006	39869.8	54007.2	246.18	26.95	35.26	813.
1750	0.00687	145.56	0.0006	41220.1	55773.3	247.21	27.06	35.38	824.
1800	0.00668	149.72	0.0006	42575.8	57544.7	248.21	27.16	35.48	835.
1850	0.00650	153.88	0.0005	43936.5	59321.1	249.18	27.26	35.58	847.
1900	0.00633	158.03	0.0005	45301.9	61102.2	250.13	27.35	35.67	858.
1950	0.00617	162.19	0.0005	46671.8	62887.8	251.06	27.44	35.75	869.
2000	0.00601	166.35	0.0005	48045.8	64677.6	251.96	27.52	35.84	879.

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* 63.171	30.97811	240.24	31.92	−4211.7	−4208.4	68.02			
64	30.86716	229.03	30.86	−4166.1	−4162.9	68.73			
66	30.59298	204.96	28.57	−4054.7	−4051.4	70.45			
68	30.30949	184.44	26.57	−3941.7	−3938.4	72.13			
70	30.01678	166.80	24.79	−3827.8	−3824.4	73.79			
72	29.71500	151.50	23.20	−3713.2	−3709.8	75.40	28.44	57.41	1045.
74	29.40436	138.10	21.75	−3598.3	−3594.8	76.98	28.25	57.57	1002.
76	29.08501	126.23	20.43	−3483.0	−3479.5	78.51	28.00	57.70	964.
* 77.347	28.86506	118.95	19.60	−3405.3	−3401.8	79.53	27.83	57.80	939.
* 77.347	0.16465	5.88	0.0143	1547.6	2163.0	151.54	21.59	31.45	175.
78	0.16308	5.94	0.0141	1562.2	2183.5	151.80	21.56	31.38	176.
80	0.15849	6.13	0.0137	1606.7	2246.0	152.59	21.48	31.17	178.
82	0.15417	6.33	0.0133	1650.9	2308.2	153.36	21.41	30.98	181.
84	0.15010	6.52	0.0129	1694.9	2370.0	154.11	21.35	30.82	183.
86	0.14626	6.71	0.0125	1738.7	2431.5	154.83	21.29	30.68	186.
88	0.14263	6.89	0.0122	1782.3	2492.7	155.53	21.25	30.55	188.
90	0.13919	7.08	0.0119	1825.7	2553.7	156.22	21.20	30.44	190.
92	0.13592	7.26	0.0116	1869.0	2614.4	156.89	21.17	30.34	193.
94	0.13282	7.44	0.0113	1912.1	2675.0	157.54	21.13	30.25	195.
96	0.12986	7.62	0.0110	1955.2	2735.4	158.17	21.10	30.16	197.
98	0.12703	7.80	0.0108	1998.1	2795.7	158.79	21.08	30.09	199.
100	0.12434	7.98	0.0105	2040.9	2855.8	159.40	21.05	30.03	202.
102	0.12176	8.16	0.0103	2083.6	2915.8	160.00	21.03	29.97	204.
104	0.11929	8.34	0.0101	2126.3	2975.7	160.58	21.01	29.91	206.
106	0.11692	8.52	0.0099	2168.9	3035.4	161.15	21.00	29.86	208.
108	0.11465	8.70	0.0097	2211.4	3095.1	161.70	20.98	29.82	210.
110	0.11247	8.87	0.0095	2253.8	3154.7	162.25	20.97	29.77	212.
112	0.11038	9.05	0.0093	2296.2	3214.2	162.79	20.95	29.74	214.
114	0.10836	9.22	0.0091	2338.6	3273.7	163.31	20.94	29.70	216.
116	0.10642	9.40	0.0090	2380.9	3333.0	163.83	20.93	29.67	218.

Thermodynamic properties of nitrogen–Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
118	0.10455	9.57	0.0088	2423.2	3392.3	164.34	20.92	29.64	220.
120	0.10275	9.75	0.0086	2465.4	3451.6	164.83	20.91	29.61	222.
122	0.10100	9.92	0.0085	2507.6	3510.8	165.32	20.90	29.59	224.
124	0.09932	10.09	0.0083	2549.8	3569.9	165.80	20.90	29.56	226.
126	0.09770	10.27	0.0082	2591.9	3629.0	166.28	20.89	29.54	228.
128	0.09613	10.44	0.0081	2634.0	3688.1	166.74	20.88	29.52	230.
130	0.09461	10.61	0.0079	2676.1	3747.1	167.20	20.88	29.50	231.
132	0.09313	10.78	0.0078	2718.1	3806.1	167.65	20.87	29.48	233.
134	0.09171	10.96	0.0077	2760.2	3865.0	168.09	20.87	29.46	235.
136	0.09033	11.13	0.0076	2802.2	3923.9	168.53	20.86	29.45	237.
138	0.08899	11.30	0.0075	2844.1	3982.8	168.96	20.86	29.43	239.
140	0.08769	11.47	0.0073	2886.1	4041.7	169.38	20.85	29.42	240.
142	0.08642	11.64	0.0072	2928.1	4100.5	169.80	20.85	29.41	242.
144	0.08520	11.81	0.0071	2970.0	4159.3	170.21	20.85	29.39	244.
146	0.08401	11.98	0.0070	3011.9	4218.1	170.62	20.84	29.38	246.
148	0.08285	12.16	0.0069	3053.8	4276.8	171.02	20.84	29.37	247.
150	0.08172	12.33	0.0068	3095.7	4335.6	171.41	20.84	29.36	249.
155	0.07904	12.75	0.0066	3200.4	4482.3	172.37	20.83	29.34	253.
160	0.07653	13.18	0.0064	3305.0	4629.0	173.30	20.82	29.32	257.
165	0.07418	13.60	0.0062	3409.5	4775.5	174.21	20.82	29.30	261.
170	0.07197	14.02	0.0060	3514.0	4922.0	175.08	20.82	29.28	265.
175	0.06989	14.45	0.0058	3618.5	5068.3	175.93	20.81	29.27	269.
180	0.06792	14.87	0.0057	3722.9	5214.7	176.75	20.81	29.26	273.
185	0.06607	15.29	0.0055	3827.2	5360.9	177.55	20.81	29.25	277.
190	0.06431	15.71	0.0054	3931.6	5507.1	178.33	20.80	29.24	281.
195	0.06265	16.14	0.0052	4035.9	5653.3	179.09	20.80	29.23	284.
200	0.06107	16.56	0.0051	4140.1	5799.4	179.83	20.80	29.22	288.
210	0.05814	17.40	0.0049	4348.6	6091.5	181.26	20.80	29.20	295.
220	0.05548	18.24	0.0046	4557.0	6383.4	182.62	20.79	29.19	302.
230	0.05305	19.08	0.0044	4765.3	6675.3	183.91	20.79	29.18	309.
240	0.05083	19.91	0.0042	4973.6	6967.1	185.16	20.79	29.17	316.
250	0.04879	20.75	0.0041	5181.8	7258.7	186.35	20.79	29.17	322.
260	0.04690	21.59	0.0039	5390.0	7550.4	187.49	20.79	29.16	329.
270	0.04516	22.43	0.0038	5598.2	7842.0	188.59	20.79	29.16	335.
280	0.04354	23.26	0.0036	5806.4	8133.5	189.65	20.79	29.15	341.
290	0.04203	24.10	0.0035	6014.5	8425.0	190.67	20.79	29.15	347.
300	0.04063	24.93	0.0034	6222.7	8716.5	191.66	20.80	29.15	353.
310	0.03932	25.77	0.0033	6430.9	9008.0	192.62	20.80	29.15	359.
320	0.03808	26.60	0.0032	6639.1	9299.6	193.54	20.81	29.16	365.
330	0.03693	27.44	0.0031	6847.3	9591.2	194.44	20.81	29.16	370.
340	0.03584	28.27	0.0030	7055.7	9882.8	195.31	20.82	29.17	376.
350	0.03482	29.11	0.0029	7264.1	10174.5	196.16	20.83	29.17	381.
360	0.03385	29.94	0.0028	7472.6	10466.3	196.98	20.84	29.18	387.
370	0.03293	30.78	0.0027	7681.2	10758.2	197.78	20.86	29.20	392.
380	0.03206	31.61	0.0027	7890.0	11050.2	198.56	20.87	29.21	397.
390	0.03124	32.44	0.0026	8098.9	11342.4	199.32	20.89	29.23	403.
400	0.03046	33.28	0.0025	8308.1	11634.7	200.06	20.91	29.25	408.
420	0.02901	34.94	0.0024	8726.9	12220.1	201.48	20.96	29.29	418.
440	0.02769	36.61	0.0023	9146.8	12806.4	202.85	21.01	29.34	427.
460	0.02648	38.27	0.0022	9567.9	13393.9	204.15	21.08	29.41	437.
480	0.02538	39.94	0.0021	9990.3	13982.8	205.41	21.15	29.48	446.
500	0.02436	41.61	0.0020	10414.3	14573.2	206.61	21.24	29.56	455.
520	0.02343	43.27	0.0019	10840.0	15165.3	207.77	21.33	29.65	463.
540	0.02256	44.94	0.0019	11267.6	15759.2	208.89	21.42	29.75	472.
560	0.02175	46.60	0.0018	11697.2	16355.2	209.98	21.53	29.85	480.
580	0.02100	48.26	0.0017	12129.0	16953.4	211.03	21.64	29.96	488.
600	0.02030	49.93	0.0017	12563.0	17553.8	212.05	21.76	30.08	496.
620	0.01965	51.59	0.0016	12999.5	18156.6	213.03	21.88	30.20	504.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
640	0.01903	53.26	0.0016	13438.4	18761.8	213.99	22.00	30.32	512.
660	0.01846	54.92	0.0015	13879.8	19369.6	214.93	22.13	30.45	519.
680	0.01791	56.59	0.0015	14323.8	19979.9	215.84	22.26	30.58	527.
700	0.01740	58.25	0.0014	14770.4	20592.9	216.73	22.40	30.71	534.
720	0.01692	59.91	0.0014	15219.7	21208.5	217.60	22.53	30.85	541.
740	0.01646	61.58	0.0014	15671.7	21826.8	218.44	22.66	30.98	548.
760	0.01603	63.24	0.0013	16126.4	22447.8	219.27	22.80	31.12	555.
780	0.01562	64.90	0.0013	16583.7	23071.5	220.08	22.93	31.25	562.
800	0.01523	66.57	0.0013	17043.8	23697.9	220.87	23.07	31.38	569.
850	0.01433	70.73	0.0012	18205.5	25275.4	222.79	23.40	31.71	585.
900	0.01354	74.88	0.0011	19383.5	26869.2	224.61	23.72	32.03	601.
950	0.01282	79.04	0.0011	20577.1	28478.6	226.35	24.02	32.34	616.
1000	0.01218	83.20	0.0010	21785.7	30103.0	228.02	24.32	32.63	631.
1050	0.01160	87.36	0.0010	23008.6	31741.6	229.61	24.59	32.91	646.
1100	0.01108	91.52	0.0009	24244.9	33393.6	231.15	24.85	33.17	660.
1150	0.01059	95.67	0.0009	25493.9	35058.3	232.63	25.10	33.42	674.
1200	0.01015	99.83	0.0008	26754.7	36734.9	234.06	25.33	33.64	688.
1250	0.00975	103.99	0.0008	28026.6	38422.6	235.44	25.54	33.86	701.
1300	0.00937	108.15	0.0008	29309.0	40120.7	236.77	25.75	34.06	715.
1350	0.00902	112.30	0.0008	30601.1	41828.5	238.06	25.93	34.25	728.
1400	0.00870	116.46	0.0007	31902.3	43545.4	239.31	26.11	34.43	740.
1450	0.00840	120.62	0.0007	33211.9	45270.8	240.52	26.27	34.59	753.
1500	0.00812	124.78	0.0007	34529.6	47004.2	241.69	26.43	34.74	765.
1550	0.00786	128.93	0.0007	35854.6	48745.0	242.83	26.57	34.89	777.
1600	0.00761	133.09	0.0006	37186.6	50492.7	243.94	26.71	35.02	789.
1650	0.00738	137.25	0.0006	38525.2	52246.9	245.02	26.83	35.15	801.
1700	0.00717	141.41	0.0006	39869.8	54007.3	246.07	26.95	35.26	813.
1750	0.00696	145.56	0.0006	41220.1	55773.3	247.10	27.06	35.38	824.
1800	0.00677	149.72	0.0006	42575.8	57544.7	248.10	27.16	35.48	835.
1850	0.00659	153.88	0.0005	43936.5	59321.1	249.07	27.26	35.58	847.
1900	0.00641	158.04	0.0005	45301.9	61102.3	250.02	27.35	35.67	858.
1950	0.00625	162.19	0.0005	46671.8	62887.9	250.95	27.44	35.75	869.
2000	0.00609	166.35	0.0005	48045.8	64677.6	251.85	27.52	35.84	879.
				2 bar Isobar					
* 63.193	30.97933	240.27	31.87	−4211.4	−4204.9	68.02			
64	30.87146	229.36	30.85	−4167.0	−4160.6	68.72			
66	30.59779	205.28	28.57	−4055.7	−4049.1	70.43			
68	30.31484	184.76	26.57	−3942.8	−3936.2	72.12			
70	30.02269	167.12	24.79	−3828.9	−3822.2	73.77			
72	29.72151	151.82	23.20	−3714.4	−3707.7	75.38	28.48	57.37	1045.
74	29.41150	138.41	21.76	−3599.6	−3592.8	76.96	28.28	57.54	1003.
76	29.09281	126.54	20.44	−3484.5	−3477.6	78.49	28.04	57.67	964.
78	28.76553	115.92	19.22	−3369.1	−3362.1	79.99	27.77	57.81	928.
80	28.42960	106.33	18.09	−3253.4	−3246.3	81.46	27.52	57.99	894.
82	28.08482	97.57	17.04	−3137.2	−3130.1	82.89	27.27	58.22	862.
* 83.617	27.79926	91.01	16.24	−3043.0	−3035.8	84.03	27.09	58.46	837.
* 83.617	0.30915	5.99	0.0274	1638.5	2285.5	147.72	22.00	32.97	179.
84	0.30741	6.03	0.0272	1647.5	2298.1	147.87	21.97	32.90	179.
86	0.29869	6.24	0.0263	1693.9	2363.5	148.64	21.85	32.55	182.
88	0.29053	6.45	0.0255	1739.9	2428.3	149.39	21.75	32.25	185.
90	0.28287	6.66	0.0247	1785.5	2492.5	150.11	21.66	31.98	187.
92	0.27566	6.86	0.0240	1830.7	2556.2	150.81	21.58	31.75	190.
94	0.26886	7.06	0.0233	1875.6	2619.5	151.49	21.51	31.54	192.
96	0.26243	7.26	0.0227	1920.3	2682.4	152.15	21.44	31.35	195.
98	0.25634	7.46	0.0221	1964.7	2745.0	152.80	21.39	31.19	197.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
100	0.25055	7.65	0.0216	2008.9	2807.2	153.42	21.34	31.04	199.
102	0.24504	7.84	0.0211	2053.0	2869.1	154.04	21.29	30.91	202.
104	0.23980	8.04	0.0206	2096.8	2930.8	154.64	21.25	30.79	204.
106	0.23479	8.23	0.0201	2140.5	2992.3	155.22	21.22	30.68	206.
108	0.23001	8.41	0.0197	2184.0	3053.6	155.79	21.18	30.58	208.
110	0.22543	8.60	0.0193	2227.4	3114.6	156.36	21.15	30.49	210.
112	0.22104	8.79	0.0189	2270.7	3175.5	156.90	21.13	30.41	212.
114	0.21684	8.97	0.0185	2313.9	3236.3	157.44	21.10	30.34	215.
116	0.21280	9.15	0.0181	2357.0	3296.9	157.97	21.08	30.27	217.
118	0.20892	9.34	0.0178	2400.0	3357.4	158.49	21.06	30.20	219.
120	0.20518	9.52	0.0174	2443.0	3417.7	158.99	21.04	30.14	221.
122	0.20159	9.70	0.0171	2485.8	3477.9	159.49	21.03	30.09	223.
124	0.19812	9.88	0.0168	2528.6	3538.1	159.98	21.01	30.04	225.
126	0.19478	10.06	0.0165	2571.3	3598.1	160.46	21.00	29.99	227.
128	0.19156	10.24	0.0162	2614.0	3658.1	160.93	20.98	29.95	228.
130	0.18844	10.42	0.0160	2656.6	3717.9	161.40	20.97	29.91	230.
132	0.18543	10.60	0.0157	2699.1	3777.7	161.85	20.96	29.87	232.
134	0.18252	10.78	0.0154	2741.6	3837.4	162.30	20.95	29.84	234.
136	0.17970	10.95	0.0152	2784.1	3897.1	162.74	20.94	29.81	236.
138	0.17697	11.13	0.0149	2826.5	3956.6	163.18	20.93	29.78	238.
140	0.17433	11.31	0.0147	2868.9	4016.2	163.61	20.92	29.75	240.
142	0.17176	11.48	0.0145	2911.3	4075.6	164.03	20.92	29.72	241.
144	0.16928	11.66	0.0143	2953.6	4135.1	164.44	20.91	29.70	243.
146	0.16686	11.83	0.0141	2995.8	4194.4	164.85	20.90	29.67	245.
148	0.16452	12.01	0.0139	3038.1	4253.7	165.26	20.90	29.65	247.
150	0.16225	12.18	0.0137	3080.3	4313.0	165.65	20.89	29.63	248.
155	0.15683	12.62	0.0132	3185.8	4461.0	166.62	20.88	29.58	253.
160	0.15177	13.05	0.0128	3291.1	4608.8	167.56	20.87	29.54	257.
165	0.14704	13.49	0.0124	3396.3	4756.5	168.47	20.86	29.50	261.
170	0.14260	13.92	0.0120	3501.3	4903.9	169.35	20.85	29.47	265.
175	0.13842	14.35	0.0116	3606.3	5051.2	170.21	20.84	29.44	269.
180	0.13449	14.78	0.0113	3711.2	5198.3	171.03	20.84	29.42	273.
185	0.13078	15.21	0.0110	3816.0	5345.3	171.84	20.83	29.39	277.
190	0.12727	15.63	0.0107	3920.8	5492.3	172.62	20.83	29.37	281.
195	0.12395	16.06	0.0104	4025.5	5639.1	173.39	20.82	29.36	284.
200	0.12079	16.49	0.0101	4130.1	5785.8	174.13	20.82	29.34	288.
210	0.11495	17.34	0.0096	4339.3	6079.1	175.56	20.81	29.31	295.
220	0.10966	18.19	0.0092	4548.2	6372.1	176.92	20.81	29.29	302.
230	0.10484	19.03	0.0088	4757.1	6664.8	178.22	20.81	29.27	309.
240	0.10042	19.88	0.0084	4965.8	6957.4	179.47	20.80	29.25	316.
250	0.09637	20.72	0.0081	5174.5	7249.8	180.66	20.80	29.24	322.
260	0.09263	21.56	0.0077	5383.1	7542.1	181.81	20.80	29.22	329.
270	0.08918	22.41	0.0075	5591.6	7834.3	182.91	20.80	29.21	335.
280	0.08597	23.25	0.0072	5800.1	8126.4	183.98	20.80	29.21	341.
290	0.08299	24.09	0.0069	6008.5	8418.4	185.00	20.80	29.20	347.
300	0.08021	24.93	0.0067	6217.0	8710.4	185.99	20.80	29.20	353.
310	0.07761	25.76	0.0065	6425.4	9002.3	186.95	20.81	29.19	359.
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340	0.07074	28.28	0.0059	7050.9	9878.2	189.64	20.83	29.20	376.
350	0.06871	29.11	0.0057	7259.5	10170.2	190.49	20.84	29.21	382.
360	0.06680	29.95	0.0056	7468.2	10462.3	191.31	20.85	29.21	387.
370	0.06499	30.79	0.0054	7677.0	10754.5	192.11	20.86	29.22	392.
380	0.06327	31.62	0.0053	7885.9	11046.8	192.89	20.88	29.24	398.
390	0.06165	32.46	0.0051	8095.0	11339.2	193.65	20.90	29.25	403.
400	0.06010	33.29	0.0050	8304.2	11631.8	194.39	20.92	29.27	408.
420	0.05724	34.97	0.0048	8723.4	12217.6	195.82	20.96	29.31	418.
440	0.05463	36.63	0.0046	9143.5	12804.3	197.19	21.02	29.36	427.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
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480	0.05008	39.97	0.0042	9987.4	13981.4	199.75	21.16	29.49	446.
500	0.04807	41.64	0.0040	10411.5	14572.0	200.95	21.24	29.57	455.
520	0.04622	43.31	0.0039	10837.4	15164.4	202.12	21.33	29.66	464.
540	0.04451	44.97	0.0037	11265.1	15758.6	203.24	21.43	29.76	472.
560	0.04292	46.64	0.0036	11694.9	16354.8	204.32	21.53	29.86	481.
580	0.04144	48.31	0.0035	12126.8	16953.2	205.37	21.64	29.97	489.
600	0.04006	49.97	0.0033	12560.9	17553.8	206.39	21.76	30.09	497.
620	0.03877	51.64	0.0032	12997.5	18156.7	207.38	21.88	30.21	504.
640	0.03755	53.30	0.0031	13436.5	18762.1	208.34	22.01	30.33	512.
660	0.03642	54.97	0.0030	13878.0	19370.1	209.27	22.13	30.46	520.
680	0.03535	56.63	0.0029	14322.1	19980.5	210.18	22.26	30.59	527.
700	0.03434	58.30	0.0029	14768.8	20593.6	211.07	22.40	30.72	534.
720	0.03338	59.96	0.0028	15218.1	21209.4	211.94	22.53	30.85	541.
740	0.03248	61.63	0.0027	15670.2	21827.8	212.79	22.67	30.99	548.
760	0.03163	63.29	0.0026	16124.9	22448.9	213.62	22.80	31.12	555.
780	0.03082	64.95	0.0026	16582.4	23072.7	214.43	22.93	31.26	562.
800	0.03004	66.62	0.0025	17042.5	23699.2	215.22	23.07	31.39	569.
850	0.02828	70.78	0.0024	18204.3	25276.9	217.13	23.40	31.72	585.
900	0.02671	74.94	0.0022	19382.4	26870.8	218.95	23.72	32.04	601.
950	0.02530	79.10	0.0021	20576.2	28480.4	220.69	24.03	32.34	617.
1000	0.02404	83.26	0.0020	21784.9	30105.0	222.36	24.32	32.64	632.
1050	0.02289	87.42	0.0019	23007.9	31743.7	223.96	24.59	32.91	646.
1100	0.02185	91.57	0.0018	24244.2	33395.9	225.50	24.86	33.17	661.
1150	0.02090	95.73	0.0017	25493.3	35060.6	226.98	25.10	33.42	675.
1200	0.02003	99.89	0.0017	26754.1	36737.3	228.40	25.33	33.65	688.
1250	0.01923	104.05	0.0016	28026.2	38425.1	229.78	25.55	33.86	702.
1300	0.01849	108.21	0.0015	29308.6	40123.2	231.11	25.75	34.06	715.
1350	0.01781	112.36	0.0015	30600.7	41831.1	232.40	25.94	34.25	728.
1400	0.01717	116.52	0.0014	31901.9	43548.1	233.65	26.11	34.43	741.
1450	0.01658	120.68	0.0014	33211.6	45273.5	234.86	26.28	34.59	753.
1500	0.01603	124.84	0.0013	34529.3	47006.9	236.04	26.43	34.74	765.
1550	0.01551	129.00	0.0013	35854.4	48747.8	237.18	26.57	34.89	778.
1600	0.01503	133.15	0.0013	37186.5	50495.6	238.29	26.71	35.02	789.
1650	0.01457	137.31	0.0012	38525.0	52249.8	239.37	26.83	35.15	801.
1700	0.01414	141.47	0.0012	39869.6	54010.2	240.42	26.95	35.27	813.
1750	0.01374	145.62	0.0011	41220.0	55776.3	241.44	27.06	35.38	824.
1800	0.01336	149.78	0.0011	42575.7	57547.7	242.44	27.17	35.48	836.
1850	0.01300	153.94	0.0011	43936.4	59324.1	243.42	27.26	35.58	847.
1900	0.01266	158.10	0.0011	45301.9	61105.3	244.37	27.35	35.67	858.
1950	0.01233	162.25	0.0010	46671.7	62890.9	245.29	27.44	35.75	869.
2000	0.01202	166.41	0.0010	48045.8	64680.7	246.20	27.52	35.84	879.

4 bar Isobar

* 63.236	30.98184	240.33	31.79	−4210.7	−4197.8	68.03			
64	30.88017	230.02	30.83	−4168.8	−4155.9	68.69			
66	30.60752	205.93	28.55	−4057.6	−4044.6	70.40			
68	30.32565	185.41	26.56	−3944.9	−3931.7	72.09			
70	30.03463	167.76	24.79	−3831.2	−3817.9	73.74			
72	29.73465	152.45	23.20	−3716.9	−3703.5	75.35	28.56	57.31	1045.
74	29.42591	139.04	21.76	−3602.3	−3588.7	76.92	28.36	57.47	1003.
76	29.10858	127.17	20.45	−3487.3	−3473.6	78.46	28.11	57.60	965.
78	28.78274	116.55	19.24	−3372.2	−3358.3	79.95	27.84	57.73	929.
80	28.44836	106.96	18.11	−3256.7	−3242.6	81.42	27.58	57.90	895.
82	28.10525	98.22	17.07	−3140.9	−3126.6	82.85	27.33	58.13	863.
84	27.75306	90.17	16.09	−3024.5	−3010.1	84.25	27.11	58.42	833.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
86	27.39126	82.70	15.17	−2907.5	−2892.9	85.63	26.91	58.80	803.
88	27.01909	75.74	14.30	−2789.6	−2774.8	86.99	26.73	59.29	774.
90	26.63559	69.19	13.48	−2670.7	−2655.7	88.33	26.58	59.88	746.
* 91.221	26.39532	65.38	12.99	−2597.4	−2582.3	89.14	26.50	60.31	729.
+ 91.221	0.59415	5.89	0.0547	1725.2	2398.4	143.77	22.63	35.76	182.
92	0.58703	5.99	0.0539	1744.7	2426.1	144.07	22.56	35.50	183.
94	0.56971	6.23	0.0519	1794.4	2496.5	144.83	22.38	34.91	186.
96	0.55366	6.48	0.0501	1843.4	2565.8	145.56	22.23	34.39	189.
98	0.53869	6.71	0.0485	1891.6	2634.1	146.26	22.10	33.94	192.
100	0.52470	6.94	0.0470	1939.3	2701.6	146.94	21.99	33.55	194.
102	0.51157	7.17	0.0456	1986.5	2768.4	147.61	21.88	33.21	197.
104	0.49920	7.39	0.0443	2033.2	2834.5	148.25	21.79	32.90	200.
106	0.48753	7.60	0.0431	2079.6	2900.0	148.87	21.71	32.63	202.
108	0.47648	7.82	0.0420	2125.5	2965.0	149.48	21.64	32.38	204.
110	0.46601	8.03	0.0410	2171.2	3029.6	150.07	21.57	32.16	207.
112	0.45605	8.24	0.0400	2216.6	3093.7	150.65	21.51	31.97	209.
114	0.44657	8.44	0.0391	2261.7	3157.4	151.21	21.46	31.79	211.
116	0.43753	8.65	0.0382	2306.6	3220.9	151.76	21.41	31.63	214.
118	0.42890	8.85	0.0373	2351.3	3284.0	152.30	21.37	31.48	216.
120	0.42064	9.05	0.0366	2395.8	3346.8	152.83	21.33	31.34	218.
122	0.41273	9.25	0.0358	2440.2	3409.3	153.35	21.29	31.22	220.
124	0.40514	9.44	0.0351	2484.3	3471.7	153.86	21.26	31.10	222.
126	0.39786	9.64	0.0344	2528.4	3533.8	154.35	21.23	31.00	224.
128	0.39086	9.83	0.0337	2572.3	3595.7	154.84	21.20	30.90	226.
130	0.38413	10.02	0.0331	2616.0	3657.4	155.32	21.17	30.81	228.
132	0.37764	10.21	0.0325	2659.7	3718.9	155.79	21.15	30.73	230.
134	0.37139	10.40	0.0319	2703.2	3780.3	156.25	21.13	30.65	232.
136	0.36536	10.59	0.0314	2746.7	3841.5	156.70	21.11	30.58	234.
138	0.35953	10.78	0.0309	2790.1	3902.6	157.15	21.09	30.51	236.
140	0.35391	10.97	0.0303	2833.3	3963.6	157.59	21.07	30.45	238.
142	0.34847	11.16	0.0298	2876.5	4024.4	158.02	21.06	30.39	240.
144	0.34320	11.34	0.0294	2919.7	4085.2	158.44	21.04	30.34	242.
146	0.33811	11.53	0.0289	2962.7	4145.8	158.86	21.03	30.29	243.
148	0.33317	11.71	0.0285	3005.7	4206.3	159.27	21.02	30.24	245.
150	0.32838	11.89	0.0280	3048.6	4266.7	159.68	21.00	30.20	247.
155	0.31703	12.35	0.0270	3155.7	4417.5	160.67	20.98	30.09	251.
160	0.30647	12.80	0.0261	3262.5	4567.7	161.62	20.96	30.01	256.
165	0.29663	13.25	0.0252	3369.1	4717.5	162.54	20.94	29.93	260.
170	0.28743	13.70	0.0244	3475.4	4867.0	163.44	20.92	29.86	264.
175	0.27880	14.15	0.0236	3581.5	5016.2	164.30	20.91	29.80	268.
180	0.27070	14.59	0.0229	3687.4	5165.1	165.14	20.90	29.75	272.
185	0.26307	15.03	0.0223	3793.2	5313.7	165.95	20.89	29.70	276.
190	0.25587	15.47	0.0216	3898.8	5462.1	166.75	20.88	29.66	280.
195	0.24907	15.91	0.0210	4004.3	5610.3	167.52	20.87	29.62	284.
200	0.24263	16.35	0.0205	4109.7	5758.3	168.27	20.86	29.59	288.
210	0.23073	17.21	0.0195	4320.3	6053.9	169.71	20.85	29.53	295.
220	0.21996	18.08	0.0185	4530.5	6349.0	171.08	20.84	29.48	302.
230	0.21017	18.94	0.0177	4740.4	6643.6	172.39	20.83	29.44	309.
240	0.20124	19.80	0.0169	4950.1	6937.8	173.64	20.83	29.41	316.
250	0.19304	20.66	0.0162	5159.6	7231.7	174.84	20.82	29.38	323.
260	0.18550	21.51	0.0156	5369.0	7525.4	175.99	20.82	29.35	329.
270	0.17853	22.36	0.0150	5578.2	7818.8	177.10	20.82	29.33	335.
280	0.17207	23.21	0.0144	5787.3	8112.0	178.17	20.82	29.31	342.
290	0.16607	24.06	0.0139	5996.4	8405.0	179.20	20.82	29.30	348.
300	0.16048	24.91	0.0135	6205.4	8698.0	180.19	20.82	29.29	354.
310	0.15525	25.76	0.0130	6414.3	8990.8	181.15	20.82	29.28	360.
320	0.15036	26.60	0.0126	6623.3	9283.6	182.08	20.83	29.27	365.
330	0.14577	27.45	0.0122	6832.2	9576.3	182.98	20.83	29.27	371.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
340	0.14145	28.29	0.0118	7041.1	9868.9	183.85	20.84	29.27	377.
350	0.13739	29.13	0.0115	7250.1	10161.6	184.70	20.85	29.27	382.
360	0.13355	29.97	0.0112	7459.2	10454.3	185.53	20.86	29.27	387.
370	0.12992	30.81	0.0109	7668.3	10747.1	186.33	20.87	29.28	393.
380	0.12649	31.65	0.0106	7877.5	11039.9	187.11	20.89	29.29	398.
390	0.12323	32.49	0.0103	8086.9	11332.9	187.87	20.90	29.30	403.
400	0.12014	33.33	0.0100	8296.5	11626.0	188.61	20.92	29.32	408.
420	0.11440	35.01	0.0096	8716.1	12212.6	190.04	20.97	29.35	418.
440	0.10919	36.69	0.0091	9136.7	12800.1	191.41	21.02	29.40	428.
460	0.10443	38.36	0.0087	9558.4	13388.7	192.72	21.09	29.46	437.
480	0.10007	40.03	0.0084	9981.4	13978.5	193.97	21.16	29.53	447.
500	0.09606	41.71	0.0080	10405.9	14569.8	195.18	21.24	29.60	455.
520	0.09237	43.38	0.0077	10832.1	15162.7	196.34	21.33	29.69	464.
540	0.08894	45.05	0.0074	11260.1	15757.4	197.46	21.43	29.78	473.
560	0.08576	46.72	0.0072	11690.1	16354.1	198.55	21.54	29.88	481.
580	0.08281	48.39	0.0069	12122.3	16952.8	199.60	21.65	29.99	489.
600	0.08005	50.06	0.0067	12556.7	17553.8	200.62	21.76	30.11	497.
620	0.07746	51.72	0.0065	12993.4	18157.1	201.61	21.88	30.23	505.
640	0.07504	53.39	0.0063	13432.6	18762.8	202.57	22.01	30.35	513.
660	0.07277	55.06	0.0061	13874.3	19371.0	203.50	22.14	30.47	520.
680	0.07063	56.73	0.0059	14318.6	19981.8	204.42	22.27	30.60	528.
700	0.06861	58.39	0.0057	14765.5	20595.2	205.31	22.40	30.73	535.
720	0.06671	60.06	0.0056	15215.0	21211.2	206.17	22.53	30.87	542.
740	0.06491	61.73	0.0054	15667.2	21829.8	207.02	22.67	31.00	549.
760	0.06320	63.39	0.0053	16122.1	22451.1	207.85	22.80	31.13	556.
780	0.06158	65.06	0.0051	16579.6	23075.1	208.66	22.94	31.27	563.
800	0.06004	66.72	0.0050	17039.8	23701.8	209.45	23.07	31.40	569.
850	0.05651	70.89	0.0047	18202.0	25279.9	211.37	23.40	31.73	586.
900	0.05338	75.05	0.0044	19380.3	26874.2	213.19	23.72	32.04	602.
950	0.05057	79.21	0.0042	20574.3	28484.1	214.93	24.03	32.35	617.
1000	0.04804	83.37	0.0040	21783.2	30109.0	216.60	24.32	32.64	632.
1050	0.04576	87.53	0.0038	23006.4	31748.0	218.20	24.60	32.92	647.
1100	0.04368	91.69	0.0036	24242.9	33400.3	219.73	24.86	33.18	661.
1150	0.04178	95.85	0.0035	25492.0	35065.3	221.21	25.10	33.42	675.
1200	0.04004	100.01	0.0033	26753.1	36742.2	222.64	25.33	33.65	689.
1250	0.03844	104.17	0.0032	28025.2	38430.1	224.02	25.55	33.86	702.
1300	0.03697	108.33	0.0031	29307.7	40128.4	225.35	25.75	34.07	715.
1350	0.03560	112.49	0.0030	30599.9	41836.4	226.64	25.94	34.25	728.
1400	0.03433	116.64	0.0029	31901.2	43553.5	227.89	26.11	34.43	741.
1450	0.03315	120.80	0.0028	33211.0	45279.0	229.10	26.28	34.59	753.
1500	0.03204	124.96	0.0027	34528.8	47012.5	230.27	26.43	34.75	766.
1550	0.03101	129.12	0.0026	35853.9	48753.5	231.42	26.57	34.89	778.
1600	0.03004	133.28	0.0025	37186.1	50501.3	232.53	26.71	35.02	790.
1650	0.02913	137.43	0.0024	38524.7	52255.7	233.61	26.83	35.15	802.
1700	0.02828	141.59	0.0024	39869.4	54016.1	234.66	26.95	35.27	813.
1750	0.02747	145.75	0.0023	41219.8	55782.2	235.68	27.06	35.38	825.
1800	0.02671	149.91	0.0022	42575.5	57553.7	236.68	27.17	35.48	836.
1850	0.02598	154.06	0.0022	43936.3	59330.2	237.65	27.26	35.58	847.
1900	0.02530	158.22	0.0021	45301.8	61111.4	238.60	27.35	35.67	858.
1950	0.02465	162.38	0.0021	46671.7	62897.0	239.53	27.44	35.76	869.
2000	0.02404	166.53	0.0020	48045.8	64686.9	240.44	27.52	35.84	880.

6 bar Isobar

* 63.280	30.98436	240.39	31.71	−4210.0	−4190.7	68.04			
64	30.88885	230.69	30.80	−4170.6	−4151.2	68.66			
66	30.61722	206.59	28.53	−4059.6	−4040.0	70.37			

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
68	30.33641	186.05	26.55	−3947.0	−3927.2	72.06			
70	30.04653	168.40	24.79	−3833.5	−3813.5	73.70			
72	29.74775	153.09	23.21	−3719.4	−3699.2	75.31	28.63	57.25	1045.
74	29.44026	139.67	21.77	−3604.9	−3584.5	76.89	28.43	57.41	1003.
76	29.12427	127.80	20.46	−3490.2	−3469.6	78.42	28.18	57.53	965.
78	28.79985	117.19	19.25	−3375.3	−3354.4	79.91	27.91	57.66	930.
80	28.46700	107.60	18.14	−3260.0	−3239.0	81.38	27.64	57.82	896.
82	28.12555	98.86	17.09	−3144.4	−3123.1	82.81	27.39	58.04	865.
84	27.77517	90.82	16.12	−3028.4	−3006.8	84.21	27.16	58.32	834.
86	27.41534	83.36	15.20	−2911.7	−2889.8	85.58	26.96	58.69	805.
88	27.04538	76.40	14.34	−2794.1	−2771.9	86.94	26.78	59.16	776.
90	26.66435	69.87	13.52	−2675.6	−2653.1	88.27	26.63	59.73	748.
92	26.27109	63.71	12.74	−2555.8	−2532.9	89.59	26.50	60.44	720.
94	25.86414	57.87	11.99	−2434.4	−2411.2	90.90	26.39	61.29	693.
96	25.44168	52.32	11.27	−2311.2	−2287.6	92.20	26.30	62.32	665.
* 96.367	25.36234	51.33	11.14	−2288.4	−2264.7	92.44	26.28	62.53	660.
* 96.367	0.87966	5.65	0.0837	1765.0	2447.1	141.36	23.16	38.59	183.
98	0.85638	5.88	0.0808	1808.8	2509.4	142.00	22.96	37.79	186.
100	0.83007	6.16	0.0776	1861.3	2584.2	142.75	22.76	36.95	189.
102	0.80586	6.43	0.0748	1912.8	2657.3	143.48	22.57	36.24	192.
104	0.78345	6.69	0.0722	1963.3	2729.2	144.17	22.41	35.63	195.
106	0.76260	6.94	0.0699	2013.1	2799.9	144.85	22.27	35.09	198.
108	0.74313	7.19	0.0677	2062.2	2869.6	145.50	22.15	34.62	200.
110	0.72486	7.43	0.0657	2110.7	2938.4	146.13	22.04	34.21	203.
112	0.70769	7.66	0.0639	2158.7	3006.5	146.74	21.94	33.84	205.
114	0.69148	7.89	0.0621	2206.1	3073.8	147.34	21.85	33.52	208.
116	0.67616	8.12	0.0605	2253.2	3140.6	147.92	21.77	33.22	210.
118	0.66163	8.34	0.0590	2299.9	3206.8	148.49	21.70	32.96	213.
120	0.64783	8.56	0.0576	2346.3	3272.4	149.04	21.63	32.72	215.
122	0.63469	8.78	0.0563	2392.3	3337.7	149.58	21.57	32.51	217.
124	0.62216	8.99	0.0550	2438.1	3402.5	150.10	21.52	32.31	220.
126	0.61019	9.20	0.0538	2483.6	3466.9	150.62	21.47	32.13	222.
128	0.59874	9.41	0.0527	2528.9	3531.0	151.12	21.43	31.96	224.
130	0.58778	9.62	0.0516	2574.0	3594.8	151.62	21.39	31.81	226.
132	0.57726	9.82	0.0506	2618.9	3658.3	152.10	21.35	31.67	228.
134	0.56716	10.03	0.0496	2663.6	3721.5	152.58	21.31	31.55	230.
136	0.55746	10.23	0.0487	2708.1	3784.5	153.04	21.28	31.43	232.
138	0.54812	10.43	0.0478	2752.5	3847.2	153.50	21.25	31.32	234.
140	0.53912	10.63	0.0469	2796.8	3909.7	153.95	21.23	31.21	236.
142	0.53044	10.83	0.0461	2840.9	3972.1	154.39	21.20	31.12	238.
144	0.52207	11.02	0.0453	2884.9	4034.2	154.83	21.18	31.03	240.
146	0.51398	11.22	0.0446	2928.8	4096.2	155.26	21.16	30.95	242.
148	0.50617	11.41	0.0438	2972.6	4158.0	155.68	21.14	30.87	244.
150	0.49861	11.60	0.0431	3016.3	4219.7	156.09	21.12	30.80	246.
155	0.48075	12.08	0.0415	3125.2	4373.2	157.10	21.08	30.63	250.
160	0.46422	12.55	0.0400	3233.5	4526.0	158.07	21.05	30.49	255.
165	0.44886	13.02	0.0386	3341.5	4678.2	159.00	21.02	30.37	259.
170	0.43456	13.49	0.0373	3449.1	4829.8	159.91	20.99	30.27	263.
175	0.42119	13.95	0.0361	3556.4	4980.9	160.79	20.97	30.17	268.
180	0.40867	14.40	0.0349	3663.4	5131.6	161.63	20.95	30.09	272.
185	0.39690	14.86	0.0339	3770.1	5281.8	162.46	20.94	30.02	276.
190	0.38583	15.31	0.0329	3876.7	5431.8	163.26	20.92	29.95	280.
195	0.37539	15.76	0.0320	3983.1	5581.4	164.04	20.91	29.90	284.
200	0.36552	16.21	0.0311	4089.2	5730.7	164.79	20.90	29.84	287.
210	0.34731	17.09	0.0295	4301.2	6028.7	166.25	20.88	29.75	295.
220	0.33090	17.98	0.0281	4512.6	6325.9	167.63	20.87	29.68	302.
230	0.31601	18.85	0.0268	4723.6	6622.3	168.95	20.86	29.62	309.
240	0.30248	19.73	0.0256	4934.3	6918.2	170.20	20.85	29.56	316.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
250	0.29001	20.60	0.0245	5144.7	7213.6	171.41	20.84	29.52	323.
260	0.27858	21.46	0.0235	5354.9	7508.6	172.57	20.84	29.48	329.
270	0.26804	22.32	0.0226	5564.8	7803.3	173.68	20.84	29.45	336.
280	0.25828	23.18	0.0218	5774.6	8097.6	174.75	20.83	29.42	342.
290	0.24923	24.04	0.0210	5984.3	8391.7	175.78	20.83	29.40	348.
300	0.24079	24.89	0.0203	6193.8	8685.6	176.78	20.83	29.38	354.
310	0.23291	25.75	0.0196	6403.3	8979.3	177.74	20.83	29.36	360.
320	0.22555	26.60	0.0190	6612.7	9272.9	178.67	20.84	29.35	366.
330	0.21863	27.45	0.0184	6822.0	9566.3	179.58	20.84	29.34	371.
340	0.21214	28.30	0.0178	7031.4	9859.7	180.45	20.85	29.34	377.
350	0.20602	29.15	0.0173	7240.8	10153.1	181.30	20.86	29.33	383.
360	0.20025	29.99	0.0168	7450.2	10446.4	182.13	20.87	29.33	388.
370	0.19480	30.84	0.0164	7659.6	10739.7	182.93	20.88	29.34	393.
380	0.18964	31.68	0.0159	7869.2	11033.1	183.72	20.90	29.34	399.
390	0.18475	32.53	0.0155	8078.9	11326.6	184.48	20.91	29.35	404.
400	0.18010	33.37	0.0151	8288.7	11620.1	185.22	20.93	29.36	409.
420	0.17149	35.06	0.0144	8708.9	12207.7	186.65	20.98	29.39	419.
440	0.16366	36.74	0.0137	9129.9	12796.0	188.02	21.03	29.44	428.
460	0.15653	38.42	0.0131	9552.0	13385.2	189.33	21.09	29.49	438.
480	0.14999	40.10	0.0126	9975.4	13975.7	190.59	21.17	29.56	447.
500	0.14398	41.77	0.0120	10400.3	14567.5	191.80	21.25	29.63	456.
520	0.13843	43.45	0.0116	10826.8	15161.0	192.96	21.34	29.71	465.
540	0.13330	45.12	0.0111	11255.1	15756.2	194.08	21.44	29.81	473.
560	0.12854	46.80	0.0107	11685.4	16353.3	195.17	21.54	29.91	482.
580	0.12410	48.47	0.0104	12117.8	16952.5	196.22	21.65	30.01	490.
600	0.11997	50.14	0.0100	12552.4	17553.8	197.24	21.77	30.12	498.
620	0.11610	51.81	0.0097	12989.4	18157.5	198.23	21.89	30.24	506.
640	0.11247	53.48	0.0094	13428.8	18763.5	199.19	22.01	30.36	513.
660	0.10906	55.15	0.0091	13870.7	19372.0	200.13	22.14	30.49	521.
680	0.10586	56.82	0.0088	14315.1	19983.1	201.04	22.27	30.62	528.
700	0.10284	58.49	0.0086	14762.2	20596.7	201.93	22.40	30.75	535.
720	0.09998	60.16	0.0083	15211.9	21213.0	202.80	22.54	30.88	542.
740	0.09728	61.83	0.0081	15664.2	21831.8	203.65	22.67	31.01	549.
760	0.09472	63.49	0.0079	16119.2	22453.4	204.47	22.81	31.14	556.
780	0.09230	65.16	0.0077	16576.9	23077.6	205.28	22.94	31.20	563.
800	0.08999	66.83	0.0075	17037.2	23704.4	206.08	23.07	31.41	570.
850	0.08471	71.00	0.0071	18199.7	25283.0	207.99	23.40	31.73	586.
900	0.08001	75.16	0.0067	19378.2	26877.7	209.82	23.72	32.05	602.
950	0.07580	79.32	0.0063	20572.4	28487.9	211.56	24.03	32.36	617.
1000	0.07202	83.49	0.0060	21781.6	30113.0	213.22	24.32	32.65	632.
1050	0.06859	87.65	0.0057	23004.8	31752.2	214.82	24.60	32.92	647.
1100	0.06548	91.81	0.0055	24241.5	33404.8	216.36	24.86	33.18	661.
1150	0.06264	95.97	0.0052	25490.8	35070.0	217.84	25.10	33.42	675.
1200	0.06003	100.13	0.0050	26752.0	36747.0	219.27	25.33	33.65	689.
1250	0.05763	104.29	0.0048	28024.2	38435.1	220.65	25.55	33.87	702.
1300	0.05542	108.45	0.0046	29306.8	40133.5	221.98	25.75	34.07	716.
1350	0.05337	112.61	0.0044	30599.1	41841.7	223.27	25.94	34.26	729.
1400	0.05147	116.77	0.0043	31900.5	43558.9	224.52	26.11	34.43	741.
1450	0.04969	120.92	0.0041	33210.4	45284.5	225.73	26.28	34.59	754.
1500	0.04804	125.08	0.0040	34528.3	47018.1	226.90	26.43	34.75	766.
1550	0.04649	129.24	0.0039	35853.5	48759.1	228.05	26.57	34.89	778.
1600	0.04504	133.40	0.0038	37185.7	50507.1	229.15	26.71	35.02	790.
1650	0.04368	137.56	0.0036	38524.3	52261.5	230.23	26.83	35.15	802.
1700	0.04239	141.71	0.0035	39869.1	54022.0	231.29	26.95	35.27	814.
1750	0.04118	145.87	0.0034	41219.5	55788.2	232.31	27.06	35.38	825.
1800	0.04004	150.03	0.0033	42575.3	57559.7	233.31	27.17	35.48	836.
1850	0.03896	154.19	0.0032	43936.1	59336.2	234.28	27.26	35.58	848.
1900	0.03794	158.34	0.0032	45301.7	61117.5	235.23	27.36	35.67	859.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1950	0.03697	162.50	0.0031	46671.6	62903.2	236.16	27.44	35.76	869.
2000	0.03604	166.66	0.0030	48045.8	64693.0	237.07	27.52	35.84	880.
				8 bar Isobar					
* 63.324	30.98689	240.45	31.62	−4209.4	−4183.6	68.05			
64	30.89751	231.36	30.78	−4172.4	−4146.5	68.63			
66	30.62688	207.25	28.52	−4061.5	−4035.4	70.34			
68	30.34715	186.70	26.54	−3949.1	−3922.7	72.03			
70	30.05839	169.04	24.78	−3835.7	−3809.1	73.67			
72	29.76078	153.72	23.21	−3721.8	−3695.0	75.28	28.71	57.19	1046.
74	29.45455	140.30	21.78	−3607.6	−3580.4	76.85	28.50	57.34	1004.
76	29.13988	128.43	20.47	−3493.1	−3465.6	78.38	28.24	57.46	966.
78	28.81687	117.82	19.27	−3378.3	−3350.6	79.87	27.97	57.58	930.
80	28.48553	108.23	18.16	−3263.3	−3235.2	81.33	27.70	57.74	897.
82	28.14571	99.50	17.12	−3148.0	−3119.6	82.76	27.45	57.95	866.
84	27.79711	91.46	16.15	−3032.2	−3003.4	84.16	27.22	58.22	836.
86	27.43924	84.02	15.24	−2915.8	−2886.6	85.54	27.01	58.58	806.
88	27.07144	77.07	14.37	−2798.6	−2769.0	86.89	26.83	59.03	778.
90	26.69284	70.54	13.56	−2680.4	−2650.5	88.22	26.68	59.59	750.
92	26.30231	64.39	12.78	−2561.0	−2530.6	89.54	26.54	60.27	722.
94	25.89849	58.57	12.04	−2440.2	−2409.3	90.84	26.43	61.09	695.
96	25.47965	53.03	11.32	−2317.5	−2286.1	92.14	26.33	62.08	668.
98	25.04364	47.74	10.63	−2192.8	−2160.8	93.43	26.26	63.26	641.
100	24.58772	42.69	9.97	−2065.5	−2032.9	94.72	26.20	64.69	613.
* 100.385	24.49749	41.74	9.84	−2040.6	−2008.0	94.97	26.19	65.00	608.
* 100.385	1.17121	5.35	0.1147	1782.8	2465.9	139.55	23.63	41.63	183.
102	1.13806	5.62	0.1104	1829.3	2532.2	140.20	23.40	40.50	186.
104	1.10062	5.93	0.1057	1885.2	2612.0	140.98	23.15	39.33	190.
106	1.06652	6.22	0.1015	1939.6	2689.7	141.72	22.93	38.35	193.
108	1.03525	6.51	0.0977	1992.7	2765.5	142.43	22.74	37.51	196.
110	1.00637	6.79	0.0943	2044.8	2839.8	143.11	22.57	36.79	199.
112	0.97958	7.05	0.0912	2096.1	2912.7	143.77	22.42	36.17	202.
114	0.95460	7.31	0.0883	2146.5	2984.5	144.40	22.29	35.62	204.
116	0.93122	7.57	0.0857	2196.2	3055.3	145.02	22.17	35.14	207.
118	0.90925	7.81	0.0832	2245.3	3125.1	145.61	22.06	34.72	210.
120	0.88856	8.06	0.0810	2293.8	3194.2	146.19	21.97	34.34	212.
122	0.86901	8.29	0.0789	2341.9	3262.5	146.76	21.88	34.00	214.
124	0.85049	8.53	0.0769	2389.5	3330.2	147.31	21.80	33.69	217.
126	0.83291	8.76	0.0750	2436.8	3397.3	147.85	21.73	33.41	219.
128	0.81619	8.98	0.0733	2483.7	3463.9	148.37	21.67	33.16	222.
130	0.80025	9.21	0.0717	2530.3	3529.9	148.88	21.61	32.93	224.
132	0.78504	9.43	0.0701	2576.5	3595.6	149.38	21.56	32.72	226.
134	0.77049	9.65	0.0686	2622.6	3660.8	149.87	21.51	32.53	228.
136	0.75656	9.86	0.0672	2668.3	3725.7	150.36	21.47	32.36	230.
138	0.74321	10.07	0.0659	2713.9	3790.3	150.83	21.43	32.19	232.
140	0.73039	10.28	0.0646	2759.2	3854.5	151.29	21.39	32.04	235.
142	0.71807	10.49	0.0634	2804.4	3918.5	151.74	21.35	31.90	237.
144	0.70621	10.70	0.0622	2849.3	3982.1	152.19	21.32	31.77	239.
146	0.69479	10.91	0.0611	2894.1	4045.6	152.62	21.29	31.65	241.
148	0.68378	11.11	0.0601	2938.8	4108.8	153.05	21.27	31.54	243.
150	0.67316	11.31	0.0590	2983.3	4171.7	153.48	21.24	31.44	244.
155	0.64815	11.81	0.0566	3094.0	4328.3	154.50	21.18	31.21	249.
160	0.62512	12.31	0.0545	3204.1	4483.8	155.49	21.14	31.01	254.
165	0.60382	12.79	0.0525	3313.5	4638.4	156.44	21.10	30.84	258.
170	0.58405	13.27	0.0506	3422.5	4792.2	157.36	21.07	30.69	263.
175	0.56563	13.75	0.0489	3531.0	4945.4	158.25	21.04	30.56	267.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
180	0.54842	14.22	0.0473	3639.1	5097.9	159.11	21.01	30.45	271.
185	0.53230	14.69	0.0459	3746.9	5249.8	159.94	20.99	30.34	275.
190	0.51716	15.15	0.0445	3854.4	5401.3	160.75	20.97	30.26	279.
195	0.50290	15.61	0.0432	3961.6	5552.4	161.53	20.96	30.18	283.
200	0.48946	16.07	0.0420	4068.6	5703.1	162.30	20.94	30.10	287.
210	0.46472	16.98	0.0398	4282.0	6003.5	163.76	20.92	29.98	295.
220	0.44246	17.88	0.0378	4494.7	6302.8	165.15	20.90	29.88	302.
230	0.42233	18.77	0.0360	4706.9	6601.1	166.48	20.89	29.79	309.
240	0.40401	19.65	0.0344	4918.5	6898.7	167.75	20.87	29.72	316.
250	0.38726	20.54	0.0329	5129.8	7195.6	168.96	20.87	29.66	323.
260	0.37188	21.41	0.0316	5340.8	7492.0	170.12	20.86	29.61	329.
270	0.35772	22.28	0.0303	5551.4	7787.9	171.24	20.85	29.57	336.
280	0.34461	23.15	0.0292	5761.9	8083.3	172.31	20.85	29.53	342.
290	0.33246	24.02	0.0281	5972.2	8378.5	173.35	20.85	29.50	348.
300	0.32115	24.88	0.0272	6182.3	8673.3	174.35	20.85	29.47	354.
310	0.31060	25.74	0.0262	6392.2	8967.9	175.31	20.85	29.45	360.
320	0.30073	26.60	0.0254	6602.1	9262.3	176.25	20.85	29.43	366.
330	0.29148	27.46	0.0246	6811.9	9556.5	177.15	20.85	29.41	372.
340	0.28280	28.31	0.0239	7021.7	9850.6	178.03	20.86	29.40	377.
350	0.27462	29.17	0.0232	7231.4	10144.6	178.88	20.87	29.40	383.
360	0.26691	30.02	0.0225	7441.2	10438.5	179.71	20.88	29.39	388.
370	0.25962	30.87	0.0219	7651.0	10732.4	180.52	20.89	29.39	394.
380	0.25273	31.72	0.0213	7860.9	11026.3	181.30	20.90	29.39	399.
390	0.24620	32.57	0.0207	8070.9	11320.3	182.07	20.92	29.40	404.
400	0.24000	33.41	0.0202	8281.0	11614.3	182.81	20.94	29.41	409.
420	0.22850	35.10	0.0192	8701.6	12202.8	184.25	20.98	29.44	419.
440	0.21806	36.79	0.0183	9123.2	12791.8	185.62	21.04	29.47	429.
460	0.20854	38.48	0.0175	9545.7	13381.8	186.93	21.10	29.53	438.
480	0.19983	40.16	0.0168	9969.5	13972.9	188.18	21.17	29.59	448.
500	0.19182	41.84	0.0161	10394.7	14565.3	189.39	21.25	29.66	457.
520	0.18442	43.52	0.0155	10821.5	15159.3	190.56	21.34	29.74	465.
540	0.17759	45.20	0.0149	11250.1	15755.0	191.68	21.44	29.83	474.
560	0.17124	46.88	0.0143	11680.7	16352.5	192.77	21.55	29.93	482.
580	0.16533	48.55	0.0138	12113.3	16952.1	193.82	21.66	30.03	490.
600	0.15982	50.23	0.0134	12548.2	17553.9	194.84	21.77	30.14	498.
620	0.15466	51.90	0.0129	12985.4	18157.9	195.83	21.89	30.26	506.
640	0.14983	53.57	0.0125	13425.0	18764.2	196.79	22.02	30.38	514.
660	0.14530	55.25	0.0122	13867.0	19373.0	197.73	22.14	30.50	521.
680	0.14103	56.92	0.0118	14311.7	19984.4	198.64	22.28	30.63	529.
700	0.13700	58.59	0.0115	14758.9	20598.3	199.53	22.41	30.76	536.
720	0.13320	60.26	0.0111	15208.7	21214.7	200.40	22.54	30.89	543.
740	0.12960	61.93	0.0108	15661.2	21833.9	201.25	22.67	31.02	550.
760	0.12620	63.60	0.0105	16116.3	22455.6	202.08	22.81	31.15	557.
780	0.12297	65.27	0.0103	16574.2	23080.0	202.89	22.94	31.29	564.
800	0.11990	66.93	0.0100	17034.6	23707.0	203.68	23.08	31.42	570.
850	0.11286	71.10	0.0094	18197.3	25286.0	205.60	23.41	31.74	587.
900	0.10660	75.27	0.0089	19376.2	26881.1	207.42	23.73	32.06	603.
950	0.10100	79.44	0.0084	20570.6	28491.6	209.16	24.03	32.36	618.
1000	0.09596	83.60	0.0080	21779.9	30117.0	210.83	24.32	32.65	633.
1050	0.09140	87.76	0.0076	23003.3	31756.5	212.43	24.60	32.93	648.
1100	0.08725	91.93	0.0073	24240.2	33409.3	213.97	24.86	33.18	662.
1150	0.08346	96.09	0.0070	25489.6	35074.7	215.45	25.11	33.43	676.
1200	0.07999	100.25	0.0067	26750.9	36751.9	216.88	25.33	33.66	689.
1250	0.07680	104.41	0.0064	28023.2	38440.1	218.25	25.55	33.87	703.
1300	0.07385	108.57	0.0062	29305.9	40138.7	219.59	25.75	34.07	716.
1350	0.07112	112.73	0.0059	30598.4	41847.0	220.88	25.94	34.26	729.
1400	0.06858	116.89	0.0057	31899.9	43564.3	222.12	26.11	34.43	742.
1450	0.06622	121.05	0.0055	33209.8	45290.1	223.34	26.28	34.60	754.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1500	0.06402	125.21	0.0053	34527.7	47023.7	224.51	26.43	34.75	767.
1550	0.06196	129.36	0.0052	35853.0	48764.8	225.65	26.58	34.89	779.
1600	0.06003	133.52	0.0050	37185.3	50512.8	226.76	26.71	35.03	791.
1650	0.05821	137.68	0.0048	38524.0	52267.3	227.84	26.84	35.15	802.
1700	0.05650	141.84	0.0047	39868.8	54027.9	228.89	26.95	35.27	814.
1750	0.05489	146.00	0.0046	41219.3	55794.1	229.92	27.06	35.38	825.
1800	0.05337	150.15	0.0044	42575.1	57565.7	230.92	27.17	35.48	837.
1850	0.05193	154.31	0.0043	43936.0	59342.3	231.89	27.27	35.58	848.
1900	0.05056	158.47	0.0042	45301.6	61123.6	232.84	27.36	35.67	859.
1950	0.04927	162.63	0.0041	46671.6	62909.3	233.77	27.44	35.76	870.
2000	0.04804	166.78	0.0040	48045.7	64699.2	234.67	27.52	35.84	880.

10 bar Isobar

* 63.368	30.98945	240.51	31.54	−4208.7	−4176.4	68.06			
64	30.90614	232.02	30.76	−4174.2	−4141.8	68.61			
66	30.63652	207.90	28.50	−4063.4	−4030.8	70.31			
68	30.35784	187.34	26.53	−3951.2	−3918.2	71.99			
70	30.07019	169.68	24.78	−3838.0	−3804.7	73.64			
72	29.77377	154.35	23.21	−3724.3	−3690.7	75.25	28.79	57.13	1046.
74	29.46877	140.93	21.79	−3610.2	−3576.3	76.81	28.57	57.28	1004.
76	29.15541	129.06	20.49	−3495.9	−3461.6	78.34	28.31	57.39	966.
78	28.83380	118.45	19.29	−3381.4	−3346.7	79.83	28.04	57.51	931.
80	28.50396	108.87	18.18	−3266.6	−3231.5	81.29	27.76	57.66	898.
82	28.16575	100.14	17.15	−3151.5	−3116.0	82.72	27.51	57.86	867.
84	27.81890	92.11	16.18	−3036.0	−3000.1	84.12	27.28	58.12	837.
86	27.46296	84.67	15.27	−2919.9	−2883.5	85.49	27.07	58.47	808.
88	27.09728	77.73	14.41	−2803.0	−2766.1	86.84	26.88	58.90	780.
90	26.72105	71.22	13.60	−2685.2	−2647.8	88.17	26.72	59.44	752.
92	26.33321	65.08	12.82	−2566.2	−2528.3	89.48	26.59	60.10	725.
94	25.93244	59.26	12.08	−2445.9	−2407.3	90.78	26.47	60.90	698.
96	25.51712	53.74	11.37	−2323.8	−2284.6	92.07	26.37	61.85	671.
98	25.08522	48.47	10.69	−2199.6	−2159.8	93.36	26.29	62.99	644.
100	24.63417	43.43	10.02	−2073.1	−2032.5	94.64	26.23	64.36	617.
102	24.16064	38.58	9.38	−1943.5	−1902.1	95.93	26.18	66.02	589.
* 103.733	23.72881	34.53	8.83	−1828.4	−1786.3	97.06	26.16	67.76	565.
* 103.733	1.47217	5.02	0.1483	1786.8	2466.1	138.06	24.09	45.04	183.
104	1.46435	5.07	0.1472	1795.2	2478.1	138.18	24.04	44.76	184.
106	1.40973	5.43	0.1399	1856.3	2565.7	139.01	23.71	42.91	187.
108	1.36098	5.77	0.1335	1915.2	2649.9	139.80	23.43	41.41	191.
110	1.31696	6.10	0.1278	1972.2	2731.5	140.55	23.18	40.18	194.
112	1.27688	6.40	0.1228	2027.6	2810.8	141.26	22.97	39.14	197.
114	1.24009	6.70	0.1183	2081.8	2888.1	141.95	22.78	38.26	200.
116	1.20613	6.99	0.1142	2134.8	2963.9	142.60	22.61	37.50	203.
118	1.17459	7.26	0.1105	2186.8	3038.2	143.24	22.47	36.84	206.
120	1.14519	7.53	0.1071	2238.1	3111.3	143.85	22.33	36.26	209.
122	1.11766	7.79	0.1039	2288.5	3183.3	144.45	22.22	35.75	212.
124	1.09180	8.05	0.1010	2338.4	3254.3	145.03	22.11	35.29	214.
126	1.06742	8.30	0.0983	2387.6	3324.5	145.59	22.02	34.89	217.
128	1.04439	8.55	0.0958	2436.4	3393.9	146.13	21.93	34.52	219.
130	1.02256	8.79	0.0934	2484.7	3462.6	146.67	21.85	34.19	222.
132	1.00184	9.02	0.0912	2532.5	3530.7	147.19	21.78	33.90	224.
134	0.98212	9.26	0.0891	2580.0	3598.2	147.69	21.72	33.63	226.
136	0.96332	9.49	0.0871	2627.1	3665.2	148.19	21.66	33.38	228.
138	0.94537	9.71	0.0852	2673.9	3731.7	148.68	21.61	33.15	231.
140	0.92820	9.94	0.0835	2720.5	3797.8	149.15	21.56	32.95	233.
142	0.91176	10.16	0.0818	2766.7	3863.5	149.62	21.51	32.75	235.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
144	0.89599	10.38	0.0802	2812.8	3928.9	150.07	21.47	32.58	237.
146	0.88085	10.59	0.0786	2858.6	3993.8	150.52	21.43	32.41	239.
148	0.86629	10.81	0.0772	2904.2	4058.5	150.96	21.40	32.26	241.
150	0.85228	11.02	0.0758	2949.6	4122.9	151.39	21.36	32.12	243.
155	0.81942	11.54	0.0725	3062.3	4282.7	152.44	21.29	31.81	248.
160	0.78931	12.06	0.0696	3174.2	4441.1	153.45	21.23	31.55	253.
165	0.76159	12.56	0.0669	3285.2	4598.2	154.42	21.18	31.32	257.
170	0.73596	13.06	0.0645	3395.6	4754.3	155.35	21.14	31.13	262.
175	0.71216	13.55	0.0622	3505.4	4909.5	156.25	21.10	30.96	266.
180	0.68999	14.04	0.0601	3614.6	5063.9	157.12	21.07	30.81	271.
185	0.66927	14.52	0.0582	3723.5	5217.7	157.96	21.05	30.68	275.
190	0.64986	14.99	0.0564	3832.0	5370.8	158.78	21.02	30.56	279.
195	0.63162	15.46	0.0547	3940.1	5523.3	159.57	21.00	30.46	283.
200	0.61445	15.93	0.0531	4047.9	5675.4	160.34	20.98	30.37	287.
210	0.58293	16.86	0.0502	4262.8	5978.2	161.82	20.95	30.21	295.
220	0.55466	17.78	0.0477	4476.8	6279.7	163.22	20.93	30.08	302.
230	0.52913	18.68	0.0454	4690.0	6579.9	164.55	20.91	29.97	309.
240	0.50595	19.58	0.0433	4902.7	6879.2	165.83	20.90	29.88	316.
250	0.48479	20.48	0.0414	5114.9	7177.6	167.05	20.89	29.81	323.
260	0.46540	21.36	0.0397	5326.7	7475.4	168.21	20.88	29.74	330.
270	0.44754	22.25	0.0381	5538.1	7772.5	169.33	20.87	29.69	336.
280	0.43105	23.12	0.0367	5749.2	8069.1	170.41	20.86	29.64	342.
290	0.41576	24.00	0.0353	5960.0	8365.3	171.45	20.86	29.60	349.
300	0.40155	24.87	0.0341	6170.7	8661.0	172.46	20.86	29.56	355.
310	0.38830	25.74	0.0329	6381.2	8956.5	173.42	20.86	29.53	361.
320	0.37592	26.60	0.0319	6591.5	9251.7	174.36	20.86	29.51	366.
330	0.36431	27.47	0.0309	6801.8	9546.7	175.27	20.86	29.49	372.
340	0.35342	28.33	0.0299	7012.0	9841.5	176.15	20.87	29.47	378.
350	0.34317	29.18	0.0290	7222.1	10136.1	177.00	20.88	29.46	383.
360	0.33351	30.04	0.0282	7432.2	10430.7	177.83	20.89	29.45	389.
370	0.32438	30.90	0.0274	7642.4	10725.1	178.64	20.90	29.45	394.
380	0.31575	31.75	0.0267	7852.6	11019.6	179.42	20.91	29.45	399.
390	0.30758	32.60	0.0260	8062.9	11314.1	180.19	20.93	29.45	405.
400	0.29982	33.45	0.0253	8273.2	11608.6	180.94	20.95	29.45	410.
420	0.28543	35.15	0.0241	8694.4	12197.9	182.37	20.99	29.48	420.
440	0.27238	36.85	0.0229	9116.4	12787.7	183.74	21.04	29.51	429.
460	0.26048	38.54	0.0219	9539.4	13378.4	185.06	21.11	29.56	439.
480	0.24959	40.23	0.0210	9963.5	13970.2	186.32	21.18	29.62	448.
500	0.23957	41.91	0.0201	10389.1	14563.2	187.53	21.26	29.69	457.
520	0.23034	43.60	0.0193	10816.2	15157.7	188.69	21.35	29.76	466.
540	0.22179	45.28	0.0186	11245.1	15753.8	189.82	21.45	29.85	474.
560	0.21387	46.96	0.0179	11676.0	16351.8	190.91	21.55	29.95	483.
580	0.20649	48.64	0.0173	12108.9	16951.8	191.96	21.66	30.05	491.
600	0.19960	50.32	0.0167	12544.0	17553.9	192.98	21.78	30.16	499.
620	0.19317	51.99	0.0162	12981.4	18158.3	193.97	21.90	30.28	507.
640	0.18713	53.67	0.0157	13421.2	18765.0	194.93	22.02	30.39	514.
660	0.18147	55.34	0.0152	13863.4	19374.1	195.87	22.15	30.52	522.
680	0.17613	57.01	0.0148	14308.2	19985.7	196.78	22.28	30.64	529.
700	0.17111	58.69	0.0143	14755.6	20599.8	197.67	22.41	30.77	536.
720	0.16636	60.36	0.0139	15205.6	21216.6	198.54	22.54	30.90	543.
740	0.16187	62.03	0.0135	15658.2	21835.9	199.39	22.68	31.03	550.
760	0.15762	63.70	0.0132	16113.5	22457.9	200.22	22.81	31.16	557.
780	0.15359	65.37	0.0128	16571.4	23082.4	201.03	22.95	31.30	564.
800	0.14975	67.04	0.0125	17032.0	23709.7	201.82	23.08	31.43	571.
850	0.14096	71.21	0.0118	18195.0	25289.1	203.74	23.41	31.75	587.
900	0.13315	75.38	0.0111	19374.1	26884.5	205.56	23.73	32.06	603.
950	0.12616	79.55	0.0105	20568.7	28495.4	207.31	24.03	32.37	618.
1000	0.11986	83.72	0.0100	21778.2	30121.1	208.97	24.33	32.66	633.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1050	0.11417	87.88	0.0095	23001.8	31760.8	210.57	24.60	32.93	648.
1100	0.10899	92.04	0.0091	24238.8	33413.8	212.11	24.86	33.19	662.
1150	0.10426	96.21	0.0087	25488.4	35079.4	213.59	25.11	33.43	676.
1200	0.09993	100.37	0.0083	26749.8	36756.8	215.02	25.34	33.66	690.
1250	0.09594	104.53	0.0080	28022.3	38445.1	216.40	25.55	33.87	703.
1300	0.09226	108.69	0.0077	29305.1	40143.9	217.73	25.75	34.07	716.
1350	0.08885	112.85	0.0074	30597.6	41852.3	219.02	25.94	34.26	729.
1400	0.08569	117.01	0.0071	31899.2	43569.7	220.27	26.12	34.43	742.
1450	0.08274	121.17	0.0069	33209.2	45295.6	221.48	26.28	34.60	755.
1500	0.07999	125.33	0.0067	34527.2	47029.3	222.66	26.43	34.75	767.
1550	0.07741	129.49	0.0065	35852.6	48770.5	223.80	26.58	34.89	779.
1600	0.07500	133.65	0.0063	37184.9	50518.6	224.91	26.71	35.03	791.
1650	0.07273	137.80	0.0061	38523.6	52273.1	225.99	26.84	35.15	803.
1700	0.07060	141.96	0.0059	39868.5	54033.8	227.04	26.95	35.27	814.
1750	0.06858	146.12	0.0057	41219.1	55800.1	228.06	27.06	35.38	826.
1800	0.06668	150.28	0.0056	42575.0	57571.7	229.06	27.17	35.48	837.
1850	0.06488	154.44	0.0054	43935.9	59348.4	230.03	27.27	35.58	848.
1900	0.06318	158.59	0.0053	45301.5	61129.7	230.98	27.36	35.67	859.
1950	0.06156	162.75	0.0051	46671.5	62915.5	231.91	27.44	35.76	870.
2000	0.06003	166.91	0.0050	48045.7	64705.4	232.82	27.52	35.84	881.
				15 bar Isobar					
* 63.478	30.99592	240.68	31.33	−4207.0	−4158.6	68.09			
64	30.92761	233.69	30.69	−4178.6	−4130.1	68.54			
66	30.66047	209.54	28.46	−4068.2	−4019.3	70.24			
68	30.38441	188.96	26.50	−3956.3	−3907.0	71.92			
70	30.09952	171.27	24.77	−3843.6	−3793.7	73.56			
72	29.80600	155.93	23.22	−3730.3	−3680.0	75.16	28.97	56.99	1046.
74	29.50406	142.50	21.81	−3616.7	−3565.8	76.73	28.75	57.12	1005.
76	29.19392	130.63	20.52	−3502.9	−3451.5	78.25	28.48	57.23	968.
78	28.87574	120.02	19.33	−3388.9	−3336.9	79.74	28.20	57.33	933.
80	28.54956	110.44	18.23	−3274.7	−3222.2	81.19	27.92	57.46	901.
82	28.21529	101.72	17.21	−3160.2	−3107.1	82.61	27.65	57.64	870.
84	27.87272	93.71	16.25	−3045.4	−2991.5	84.00	27.41	57.88	840.
86	27.52145	86.29	15.35	−2930.0	−2875.5	85.37	27.19	58.20	812.
88	27.16094	79.37	14.50	−2813.9	−2758.7	86.71	27.00	58.60	784.
90	26.79045	72.88	13.69	−2697.0	−2641.0	88.03	26.84	59.10	757.
92	26.40906	66.77	12.93	−2579.0	−2522.2	89.34	26.69	59.71	730.
94	26.01560	60.98	12.19	−2459.8	−2402.1	90.63	26.57	60.44	704.
96	25.60867	55.49	11.49	−2339.0	−2280.4	91.91	26.47	61.31	677.
98	25.18652	50.26	10.82	−2216.3	−2156.8	93.19	26.38	62.34	651.
100	24.74695	45.26	10.16	−2091.5	−2030.9	94.46	26.31	63.58	625.
102	24.28717	40.46	9.53	−1964.1	−1902.3	95.73	26.25	65.06	598.
104	23.80354	35.84	8.91	−1833.5	−1770.4	97.01	26.21	66.85	571.
106	23.29108	31.38	8.30	−1699.0	−1634.6	98.31	26.19	69.08	544.
108	22.74277	27.03	7.70	−1559.6	−1493.7	99.62	26.19	71.93	515.
110	22.14800	22.77	7.09	−1413.9	−1346.2	100.97	26.21	75.74	485.
* 110.381	22.02806	21.96	6.97	−1385.3	−1317.2	101.24	26.22	76.61	479.
* 110.381	2.28501	4.12	0.2460	1755.3	2411.8	135.02	25.20	56.22	181.
112	2.19534	4.51	0.2326	1816.5	2499.8	135.81	24.79	52.66	185.
114	2.09999	4.95	0.2188	1887.3	2601.6	136.71	24.37	49.35	189.
116	2.01743	5.36	0.2072	1954.2	2697.7	137.55	24.01	46.83	193.
118	1.94462	5.74	0.1972	2017.9	2789.3	138.33	23.71	44.83	197.
120	1.87954	6.10	0.1885	2079.2	2877.3	139.07	23.44	43.21	200.
122	1.82071	6.45	0.1807	2138.4	2962.3	139.77	23.21	41.86	204.
124	1.76708	6.77	0.1738	2196.0	3044.9	140.44	23.01	40.73	207.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
126	1.71782	7.09	0.1676	2252.1	3125.3	141.09	22.83	39.76	210.
128	1.67230	7.39	0.1620	2307.0	3204.0	141.70	22.68	38.92	213.
130	1.63002	7.69	0.1568	2360.8	3281.1	142.30	22.54	38.19	216.
132	1.59057	7.97	0.1521	2413.8	3356.8	142.88	22.41	37.55	218.
134	1.55361	8.25	0.1477	2465.8	3431.3	143.44	22.30	36.98	221.
136	1.51887	8.52	0.1437	2517.2	3504.8	143.99	22.19	36.47	224.
138	1.48611	8.79	0.1399	2567.9	3577.3	144.51	22.10	36.02	226.
140	1.45514	9.05	0.1364	2618.0	3648.9	145.03	22.02	35.61	229.
142	1.42578	9.31	0.1331	2667.7	3719.7	145.53	21.94	35.24	231.
144	1.39788	9.56	0.1300	2716.8	3789.8	146.02	21.87	34.90	233.
146	1.37133	9.80	0.1271	2765.5	3859.3	146.50	21.80	34.59	236.
148	1.34600	10.05	0.1243	2813.8	3928.2	146.97	21.75	34.31	238.
150	1.32180	10.28	0.1217	2861.8	3996.6	147.43	21.69	34.05	240.
155	1.26571	10.87	0.1157	2980.3	4165.4	148.54	21.57	33.49	245.
160	1.21505	11.44	0.1104	3097.1	4331.6	149.59	21.48	33.02	251.
165	1.16896	11.99	0.1056	3212.5	4495.7	150.60	21.40	32.63	255.
170	1.12678	12.53	0.1013	3326.7	4658.0	151.57	21.33	32.30	260.
175	1.08796	13.06	0.0974	3440.0	4818.7	152.50	21.27	32.01	265.
180	1.05207	13.59	0.0939	3552.4	4978.2	153.40	21.22	31.77	269.
185	1.01877	14.10	0.0906	3664.1	5136.5	154.27	21.18	31.55	274.
190	0.98774	14.61	0.0875	3775.1	5293.7	155.11	21.15	31.36	278.
195	0.95876	15.11	0.0847	3885.6	5450.1	155.92	21.11	31.20	282.
200	0.93159	15.60	0.0821	3995.6	5605.8	156.71	21.09	31.05	286.
210	0.88202	16.58	0.0774	4214.3	5915.0	158.22	21.04	30.80	294.
220	0.83786	17.54	0.0733	4431.6	6221.9	159.64	21.01	30.60	302.
230	0.79822	18.48	0.0696	4647.8	6527.0	161.00	20.98	30.43	309.
240	0.76239	19.41	0.0662	4863.0	6830.6	162.29	20.96	30.29	316.
250	0.72982	20.34	0.0632	5077.5	7132.8	163.53	20.94	30.17	323.
260	0.70006	21.25	0.0605	5291.3	7434.0	164.71	20.92	30.07	330.
270	0.67275	22.16	0.0580	5504.6	7734.2	165.84	20.91	29.98	337.
280	0.64758	23.06	0.0558	5717.4	8033.7	166.93	20.90	29.91	343.
290	0.62430	23.95	0.0537	5929.8	8332.5	167.98	20.90	29.84	349.
300	0.60271	24.84	0.0517	6141.8	8630.6	168.99	20.89	29.79	356.
310	0.58260	25.73	0.0499	6353.6	8928.3	169.96	20.89	29.74	362.
320	0.56384	26.61	0.0483	6565.2	9225.5	170.91	20.89	29.70	368.
330	0.54629	27.49	0.0467	6776.5	9522.3	171.82	20.89	29.67	373.
340	0.52982	28.36	0.0452	6987.7	9818.9	172.71	20.90	29.64	379.
350	0.51435	29.24	0.0439	7198.8	10115.2	173.57	20.90	29.62	385.
360	0.49978	30.10	0.0426	7409.9	10411.2	174.40	20.91	29.60	390.
370	0.48602	30.97	0.0414	7620.9	10707.1	175.21	20.92	29.58	395.
380	0.47303	31.84	0.0402	7831.9	11002.9	176.00	20.93	29.58	401.
390	0.46072	32.70	0.0392	8042.9	11298.7	176.77	20.95	29.57	406.
400	0.44905	33.56	0.0382	8254.0	11594.4	177.52	20.97	29.57	411.
420	0.42743	35.27	0.0363	8676.5	12185.8	178.96	21.01	29.58	421.
440	0.40783	36.98	0.0346	9099.6	12777.6	180.34	21.06	29.60	431.
460	0.38997	38.69	0.0330	9523.6	13370.1	181.65	21.12	29.64	440.
480	0.37363	40.39	0.0316	9948.7	13963.4	182.92	21.19	29.69	449.
500	0.35862	42.09	0.0303	10375.1	14557.8	184.13	21.27	29.75	458.
520	0.34478	43.78	0.0291	10803.1	15153.6	185.30	21.36	29.83	467.
540	0.33198	45.47	0.0280	11232.7	15751.0	186.42	21.46	29.91	476.
560	0.32011	47.16	0.0270	11664.2	16350.1	187.51	21.56	30.00	484.
580	0.30907	48.85	0.0260	12097.7	16951.1	188.57	21.67	30.10	492.
600	0.29876	50.53	0.0252	12533.4	17554.1	189.59	21.79	30.21	500.
620	0.28913	52.22	0.0243	12971.3	18159.4	190.58	21.91	30.32	508.
640	0.28010	53.90	0.0236	13411.6	18766.8	191.55	22.03	30.43	516.
660	0.27162	55.58	0.0228	13854.4	19376.7	192.49	22.16	30.55	523.
680	0.26365	57.26	0.0222	14299.6	19989.0	193.40	22.29	30.68	530.
700	0.25613	58.93	0.0215	14747.4	20603.8	194.29	22.42	30.80	538.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
720	0.24903	60.61	0.0209	15197.8	21221.1	195.16	22.55	30.93	545.
740	0.24231	62.28	0.0203	15650.7	21841.0	196.01	22.69	31.06	552.
760	0.23595	63.96	0.0198	16106.4	22463.5	196.84	22.82	31.19	559.
780	0.22992	65.63	0.0193	16564.6	23088.6	197.65	22.95	31.32	565.
800	0.22419	67.30	0.0188	17025.5	23716.3	198.45	23.09	31.45	572.
850	0.21104	71.48	0.0177	18189.2	25296.8	200.36	23.41	31.77	588.
900	0.19936	75.66	0.0167	19368.9	26893.1	202.19	23.73	32.08	604.
950	0.18890	79.83	0.0158	20564.0	28504.8	203.93	24.04	32.38	620.
1000	0.17949	84.00	0.0150	21774.0	30131.2	205.60	24.33	32.67	635.
1050	0.17097	88.17	0.0143	22998.1	31771.5	207.20	24.61	32.94	649.
1100	0.16323	92.34	0.0137	24235.5	33425.1	208.74	24.87	33.20	663.
1150	0.15616	96.50	0.0131	25485.4	35091.2	210.22	25.11	33.44	677.
1200	0.14967	100.67	0.0125	26747.1	36768.9	211.65	25.34	33.67	691.
1250	0.14371	104.83	0.0120	28019.8	38457.7	213.02	25.55	33.88	704.
1300	0.13820	108.99	0.0115	29302.9	40156.8	214.36	25.76	34.08	718.
1350	0.13310	113.16	0.0111	30595.7	41865.5	215.65	25.94	34.27	730.
1400	0.12836	117.32	0.0107	31897.5	43583.2	216.90	26.12	34.44	743.
1450	0.12395	121.48	0.0103	33207.7	45309.3	218.11	26.28	34.60	756.
1500	0.11983	125.64	0.0100	34525.9	47043.4	219.28	26.44	34.76	768.
1550	0.11598	129.80	0.0097	35851.4	48784.7	220.43	26.58	34.90	780.
1600	0.11237	133.96	0.0094	37183.9	50533.0	221.54	26.71	35.03	792.
1650	0.10897	138.11	0.0091	38522.8	52287.7	222.62	26.84	35.16	804.
1700	0.10578	142.27	0.0088	39867.8	54048.5	223.67	26.96	35.27	815.
1750	0.10276	146.43	0.0086	41218.5	55815.0	224.69	27.07	35.38	827.
1800	0.09992	150.59	0.0083	42574.5	57586.7	225.69	27.17	35.49	838.
1850	0.09723	154.75	0.0081	43935.5	59363.5	226.66	27.27	35.58	849.
1900	0.09467	158.90	0.0079	45301.2	61145.0	227.61	27.36	35.67	860.
1950	0.09225	163.06	0.0077	46671.4	62930.8	228.54	27.45	35.76	871.
2000	0.08995	167.22	0.0075	48045.7	64720.9	229.45	27.53	35.84	882.

20 bar Isobar

* 63.587	31.00249	240.86	31.13	−4205.4	−4140.8	68.12			
64	30.94893	235.35	30.63	−4182.9	−4118.3	68.47			
66	30.68424	211.18	28.41	−4072.9	−4007.7	70.17			
68	30.41676	190.57	26.48	−3961.4	−3895.7	71.84			
70	30.12858	172.86	24.76	−3849.1	−3782.7	73.48			
72	29.83790	157.51	23.22	−3736.2	−3669.2	75.08	29.16	56.84	1047.
74	29.53895	144.07	21.83	−3623.1	−3555.4	76.64	28.93	56.97	1006.
76	29.23197	132.19	20.55	−3509.8	−3441.3	78.16	28.65	57.06	970.
78	28.91713	121.58	19.38	−3396.3	−3327.1	79.64	28.35	57.16	935.
80	28.59451	112.01	18.29	−3282.6	−3212.7	81.09	28.06	57.27	903.
82	28.26406	103.30	17.27	−3168.8	−3098.0	82.51	27.79	57.43	873.
84	27.92562	95.30	16.32	−3054.5	−2982.9	83.89	27.54	57.65	844.
86	27.57886	87.90	15.43	−2939.9	−2867.3	85.25	27.32	57.94	816.
88	27.22329	81.00	14.59	−2824.6	−2751.1	86.59	27.12	58.31	788.
90	26.85829	74.54	13.79	−2708.5	−2634.0	87.90	26.95	58.77	762.
92	26.48301	68.45	13.03	−2591.5	−2515.9	89.20	26.80	59.33	736.
94	26.09647	62.69	12.30	−2473.3	−2396.6	90.48	26.67	60.00	710.
96	25.69740	57.22	11.61	−2353.7	−2275.8	91.76	26.56	60.80	684.
98	25.28430	52.02	10.94	−2232.4	−2153.3	93.02	26.46	61.75	658.
100	24.85529	47.05	10.30	−2109.2	−2028.7	94.28	26.39	62.87	633.
102	24.40801	42.30	9.67	−1983.7	−1901.7	95.54	26.32	64.19	607.
104	23.93946	37.73	9.06	−1855.3	−1771.8	96.80	26.28	65.79	581.
106	23.44565	33.33	8.47	−1723.6	−1638.3	98.07	26.24	67.73	554.
108	22.92108	29.06	7.88	−1587.8	−1500.6	99.36	26.23	70.15	527.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
110	22.35789	24.90	7.29	−1446.7	−1357.3	100.67	26.23	73.27	498.
112	21.74400	20.80	6.71	−1298.7	−1206.8	102.03	26.26	77.49	468.
114	21.05936	16.71	6.10	−1141.0	−1046.1	103.45	26.33	83.61	435.
* 115.574	20.44721	13.47	5.61	−1006.9	−909.1	104.64	26.43	90.94	407.
* 115.574	3.22968	3.14	0.3711	1675.7	2294.9	132.35	26.34	74.90	179.
116	3.18103	3.28	0.3633	1697.5	2326.2	132.63	26.18	72.24	180.
118	2.98712	3.89	0.3327	1791.3	2460.9	133.78	25.51	63.14	185.
120	2.83274	4.42	0.3090	1874.9	2580.9	134.79	24.98	57.29	190.
122	2.70426	4.90	0.2899	1951.6	2691.2	135.70	24.54	53.16	195.
124	2.59417	5.34	0.2739	2023.3	2794.2	136.53	24.18	50.07	199.
126	2.49787	5.75	0.2603	2091.2	2891.9	137.32	23.87	47.65	202.
128	2.41233	6.14	0.2484	2156.1	2985.2	138.05	23.60	45.71	206.
130	2.33541	6.51	0.2380	2218.6	3074.9	138.75	23.36	44.11	209.
132	2.26557	6.86	0.2287	2279.0	3161.8	139.41	23.16	42.77	213.
134	2.20166	7.19	0.2203	2337.8	3246.2	140.04	22.97	41.63	216.
136	2.14278	7.52	0.2128	2395.1	3328.4	140.65	22.81	40.65	219.
138	2.08823	7.83	0.2059	2451.1	3408.8	141.24	22.67	39.80	222.
140	2.03744	8.13	0.1996	2506.1	3487.7	141.81	22.54	39.05	224.
142	1.98996	8.43	0.1937	2560.0	3565.1	142.36	22.42	38.38	227.
144	1.94540	8.72	0.1883	2613.2	3641.3	142.89	22.31	37.79	230.
146	1.90345	9.00	0.1833	2665.6	3716.3	143.41	22.21	37.26	232.
148	1.86384	9.27	0.1786	2717.3	3790.3	143.91	22.13	36.79	235.
150	1.82633	9.54	0.1743	2768.4	3863.5	144.40	22.05	36.36	237.
155	1.74057	10.20	0.1644	2893.8	4042.9	145.58	21.87	35.44	243.
160	1.66440	10.82	0.1559	3016.5	4218.2	146.69	21.73	34.70	248.
165	1.59605	11.43	0.1484	3137.0	4390.1	147.75	21.62	34.09	254.
170	1.53421	12.02	0.1417	3255.7	4559.3	148.76	21.52	33.59	259.
175	1.47785	12.59	0.1357	3372.8	4726.1	149.73	21.44	33.16	264.
180	1.42618	13.15	0.1303	3488.7	4891.0	150.66	21.38	32.80	268.
185	1.37857	13.70	0.1254	3603.4	5054.2	151.55	21.32	32.49	273.
190	1.33451	14.23	0.1208	3717.3	5216.0	152.41	21.27	32.21	277.
195	1.29356	14.76	0.1167	3830.3	5376.4	153.25	21.23	31.97	282.
200	1.25536	15.29	0.1129	3942.6	5535.7	154.05	21.19	31.76	286.
210	1.18611	16.31	0.1060	4165.4	5851.5	155.59	21.13	31.41	294.
220	1.12486	17.31	0.1000	4386.2	6164.2	157.05	21.08	31.12	302.
230	1.07017	18.29	0.0947	4605.4	6474.2	158.43	21.04	30.89	310.
240	1.02099	19.26	0.0900	4823.2	6782.1	159.74	21.01	30.70	317.
250	0.97645	20.21	0.0858	5040.1	7088.3	160.99	20.99	30.54	324.
260	0.93590	21.15	0.0820	5256.0	7392.9	162.18	20.97	30.40	331.
270	0.89879	22.08	0.0785	5471.1	7696.3	163.33	20.96	30.28	338.
280	0.86467	23.01	0.0753	5685.6	7998.6	164.43	20.94	30.18	344.
290	0.83319	23.92	0.0724	5899.6	8300.0	165.48	20.93	30.09	350.
300	0.80403	24.83	0.0697	6113.1	8600.5	166.50	20.93	30.02	357.
310	0.77693	25.73	0.0673	6326.1	8900.4	167.49	20.92	29.95	363.
320	0.75167	26.63	0.0650	6538.9	9199.6	168.44	20.92	29.90	369.
330	0.72807	27.52	0.0628	6751.4	9498.3	169.36	20.92	29.85	374.
340	0.70597	28.41	0.0608	6963.6	9796.6	170.25	20.92	29.81	380.
350	0.68521	29.29	0.0590	7175.7	10094.5	171.11	20.93	29.77	386.
360	0.66567	30.17	0.0572	7387.6	10392.1	171.95	20.93	29.74	391.
370	0.64726	31.05	0.0556	7599.5	10689.4	172.76	20.94	29.72	397.
380	0.62986	31.93	0.0540	7811.2	10986.5	173.55	20.95	29.70	402.
390	0.61340	32.80	0.0525	8023.0	11283.5	174.33	20.97	29.69	407.
400	0.59780	33.67	0.0512	8234.8	11580.4	175.08	20.99	29.68	412.
420	0.56892	35.40	0.0486	8658.6	12174.0	176.53	21.03	29.68	422.
440	0.54276	37.13	0.0463	9082.9	12767.7	177.91	21.08	29.69	432.
460	0.51894	38.85	0.0442	9507.9	13361.9	179.23	21.14	29.72	442.
480	0.49716	40.56	0.0423	9934.0	13956.8	180.49	21.21	29.77	451.
500	0.47717	42.27	0.0405	10361.3	14552.7	181.71	21.29	29.82	460.
520	0.45874	43.97	0.0389	10790.0	15149.8	182.88	21.37	29.89	469.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
540	0.44170	45.67	0.0374	11220.3	15748.3	184.01	21.47	29.97	477.
560	0.42590	47.37	0.0361	11652.5	16348.5	185.10	21.57	30.05	485.
580	0.41120	49.06	0.0348	12086.7	16950.5	186.16	21.68	30.15	493.
600	0.39749	50.75	0.0336	12522.9	17554.5	187.18	21.80	30.25	501.
620	0.38468	52.44	0.0325	12961.4	18160.5	188.17	21.92	30.36	509.
640	0.37267	54.13	0.0315	13402.2	18768.8	189.14	22.04	30.47	517.
660	0.36140	55.82	0.0305	13845.3	19379.4	190.08	22.17	30.59	524.
680	0.35079	57.50	0.0296	14291.0	19992.4	190.99	22.30	30.71	532.
700	0.34079	59.18	0.0287	14739.2	20607.8	191.89	22.43	30.83	539.
720	0.33136	60.86	0.0279	15190.0	21225.8	192.76	22.56	30.96	546.
740	0.32243	62.54	0.0272	15643.3	21846.2	193.61	22.69	31.09	553.
760	0.31397	64.22	0.0264	16099.3	22469.3	194.44	22.83	31.21	560.
780	0.30595	65.89	0.0257	16557.9	23094.8	195.25	22.96	31.34	567.
800	0.29833	67.57	0.0251	17019.1	23723.0	196.05	23.09	31.47	573.
850	0.28085	71.76	0.0236	18183.4	25304.5	197.96	23.42	31.79	590.
900	0.26532	75.94	0.0223	19363.7	26901.8	199.79	23.74	32.10	605.
950	0.25142	80.12	0.0211	20559.4	28514.2	201.53	24.04	32.40	621.
1000	0.23891	84.29	0.0200	21769.8	30141.3	203.20	24.34	32.68	636.
1050	0.22758	88.46	0.0191	22994.3	31782.3	204.80	24.61	32.95	650.
1100	0.21729	92.63	0.0182	24232.1	33436.4	206.34	24.87	33.21	664.
1150	0.20789	96.80	0.0174	25482.4	35102.9	207.82	25.11	33.45	678.
1200	0.19927	100.97	0.0167	26744.4	36781.1	209.25	25.34	33.68	692.
1250	0.19133	105.13	0.0160	28017.4	38470.3	210.63	25.56	33.89	705.
1300	0.18401	109.30	0.0154	29300.7	40169.7	211.96	25.76	34.09	719.
1350	0.17723	113.46	0.0148	30593.7	41878.7	213.25	25.95	34.27	731.
1400	0.17093	117.62	0.0143	31895.8	43596.7	214.50	26.12	34.45	744.
1450	0.16506	121.78	0.0138	33206.2	45323.1	215.71	26.29	34.61	757.
1500	0.15958	125.95	0.0133	34524.6	47057.4	216.89	26.44	34.76	769.
1550	0.15446	130.11	0.0129	35850.3	48799.0	218.03	26.58	34.90	781.
1600	0.14965	134.27	0.0125	37182.9	50547.4	219.14	26.72	35.04	793.
1650	0.14513	138.42	0.0121	38522.0	52302.3	220.22	26.84	35.16	805.
1700	0.14088	142.58	0.0118	39867.1	54063.3	221.27	26.96	35.28	816.
1750	0.13687	146.74	0.0114	41217.9	55829.9	222.30	27.07	35.39	828.
1800	0.13309	150.90	0.0111	42574.0	57601.8	223.30	27.17	35.49	839.
1850	0.12950	155.06	0.0108	43935.2	59378.7	224.27	27.27	35.59	850.
1900	0.12611	159.22	0.0105	45301.0	61160.2	225.22	27.36	35.68	861.
1950	0.12289	163.37	0.0103	46671.2	62946.2	226.15	27.45	35.76	872.
2000	0.11983	167.53	0.0100	48045.6	64736.3	227.06	27.53	35.84	882.

25 bar Isobar

* 63.696	31.00917	241.06	30.93	−4203.6	−4123.0	68.14			
64	30.97010	237.02	30.57	−4187.2	−4106.5	68.40			
66	30.70783	212.81	28.37	−4077.5	−3996.1	70.10			
68	30.43689	192.18	26.45	−3966.4	−3884.3	71.77			
70	30.15738	174.45	24.75	−3854.5	−3771.6	73.40			
72	29.86949	159.08	23.23	−3742.1	−3658.4	75.00	29.34	56.70	1048.
74	29.57347	145.63	21.84	−3629.4	−3544.8	76.55	29.10	56.82	1008.
76	29.26958	133.74	20.58	−3516.5	−3431.1	78.07	28.81	56.90	971.
78	28.95799	123.14	19.42	−3403.6	−3317.2	79.55	28.51	56.99	937.
80	28.63884	113.57	18.34	−3290.5	−3203.2	80.99	28.21	57.09	906.
82	28.31210	104.87	17.33	−3177.1	−3088.8	82.40	27.93	57.23	876.
84	27.97766	96.89	16.39	−3063.5	−2974.2	83.78	27.67	57.43	847.
86	27.63523	89.50	15.51	−2949.5	−2859.1	85.14	27.44	57.70	820.
88	27.28441	82.62	14.67	−2835.0	−2743.3	86.47	27.23	58.04	793.
90	26.92464	76.17	13.88	−2719.7	−2626.9	87.78	27.05	58.46	767.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
92	26.55519	70.10	13.13	−2603.6	−2509.4	89.07	26.90	58.98	741.
94	26.17518	64.37	12.41	−2486.4	−2390.9	90.34	26.76	59.60	715.
96	25.78350	58.93	11.72	−2367.9	−2271.0	91.60	26.64	60.33	690.
98	25.37884	53.76	11.06	−2248.0	−2149.5	92.86	26.55	61.20	665.
100	24.95959	48.82	10.43	−2126.3	−2026.1	94.10	26.46	62.21	640.
102	24.52375	44.11	9.81	−2002.4	−1900.5	95.35	26.39	63.41	615.
104	24.06881	39.58	9.21	−1876.2	−1772.3	96.59	26.34	64.83	590.
106	23.59152	35.23	8.63	−1746.9	−1641.0	97.84	26.29	66.54	564.
108	23.08754	31.03	8.05	−1614.2	−1505.9	99.10	26.27	68.62	538.
110	22.55085	26.94	7.49	−1477.0	−1366.1	100.39	26.26	71.24	511.
112	21.97268	22.95	6.92	−1334.2	−1220.4	101.70	26.27	74.65	483.
114	21.33942	19.02	6.35	−1183.9	−1066.7	103.06	26.31	79.31	452.
116	20.62802	15.10	5.75	−1022.9	−901.7	104.49	26.40	86.20	419.
118	19.79380	11.12	5.13	−845.2	−718.9	106.06	26.56	97.72	382.
* 119.893	18.79339	7.19	4.45	−648.6	−515.6	107.77	26.85	120.49	339.
* 119.893	4.40675	2.09	0.5416	1542.1	2109.4	129.65	27.63	114.11	176.
120	4.37948	2.15	0.5370	1550.7	2121.5	129.75	27.56	111.65	176.
122	3.98539	2.97	0.4714	1685.6	2312.9	131.34	26.55	83.98	183.
124	3.71363	3.64	0.4274	1793.3	2466.5	132.59	25.82	70.94	189.
126	3.50458	4.22	0.3945	1886.6	2600.0	133.65	25.25	63.08	194.
128	3.33432	4.74	0.3683	1970.7	2720.5	134.60	24.78	57.75	199.
130	3.19062	5.21	0.3468	2048.4	2831.9	135.47	24.40	53.86	203.
132	3.06634	5.65	0.3286	2121.3	2936.6	136.26	24.07	50.88	207.
134	2.95690	6.07	0.3129	2190.4	3035.9	137.01	23.78	48.52	210.
136	2.85918	6.46	0.2992	2256.6	3130.9	137.72	23.54	46.60	214.
138	2.77098	6.83	0.2870	2320.3	3222.5	138.38	23.32	45.00	217.
140	2.69065	7.19	0.2762	2381.9	3311.1	139.02	23.13	43.65	220.
142	2.61695	7.53	0.2664	2441.9	3397.2	139.63	22.96	42.49	223.
144	2.54891	7.86	0.2574	2500.3	3481.1	140.22	22.81	41.49	226.
146	2.48577	8.18	0.2493	2557.5	3563.2	140.79	22.67	40.61	229.
148	2.42689	8.50	0.2418	2613.5	3643.7	141.33	22.55	39.84	232.
150	2.37177	8.80	0.2349	2668.6	3722.6	141.86	22.43	39.15	234.
155	2.24781	9.53	0.2197	2802.5	3914.7	143.12	22.20	37.73	240.
160	2.13985	10.22	0.2067	2932.2	4100.5	144.30	22.01	36.63	246.
165	2.04450	10.88	0.1956	3058.5	4281.3	145.42	21.85	35.74	252.
170	1.95932	11.51	0.1859	3182.2	4458.2	146.47	21.73	35.02	257.
175	1.88252	12.13	0.1773	3303.7	4631.7	147.48	21.62	34.42	263.
180	1.81275	12.73	0.1696	3423.4	4802.5	148.44	21.53	33.91	267.
185	1.74894	13.31	0.1627	3541.5	4971.0	149.36	21.46	33.48	272.
190	1.69027	13.88	0.1564	3658.4	5137.4	150.25	21.39	33.11	277.
195	1.63606	14.44	0.1506	3774.1	5302.2	151.11	21.34	32.79	281.
200	1.58576	14.98	0.1454	3888.9	5465.4	151.93	21.29	32.51	286.
210	1.49513	16.05	0.1360	4116.0	5788.1	153.51	21.22	32.04	294.
220	1.41553	17.10	0.1279	4340.4	6106.5	154.99	21.16	31.67	302.
230	1.34488	18.11	0.1209	4562.7	6421.6	156.39	21.11	31.36	310.
240	1.28163	19.11	0.1146	4783.3	6734.0	157.72	21.07	31.12	317.
250	1.22458	20.09	0.1090	5002.6	7044.1	158.98	21.04	30.91	325.
260	1.17281	21.06	0.1040	5220.6	7352.2	160.19	21.02	30.73	332.
270	1.12556	22.02	0.0995	5437.7	7658.8	161.35	21.00	30.58	338.
280	1.08224	22.96	0.0954	5653.9	7963.9	162.46	20.98	30.45	345.
290	1.04233	23.89	0.0916	5869.4	8267.9	163.53	20.97	30.34	351.
300	1.00544	24.82	0.0881	6084.3	8570.8	164.55	20.96	30.25	358.
310	0.97121	25.74	0.0849	6298.7	8872.8	165.54	20.95	30.16	364.
320	0.93936	26.65	0.0820	6512.7	9174.1	166.50	20.95	30.09	370.
330	0.90963	27.56	0.0792	6726.3	9474.7	167.43	20.95	30.03	376.
340	0.88181	28.46	0.0767	6939.6	9774.7	168.32	20.95	29.97	381.
350	0.85571	29.36	0.0743	7152.6	10074.2	169.19	20.95	29.93	387.
360	0.83117	30.25	0.0720	7365.4	10373.2	170.03	20.96	29.89	392.
370	0.80805	31.14	0.0699	7578.1	10672.0	170.85	20.96	29.86	398.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
380	0.78623	32.02	0.0679	7790.7	10970.4	171.65	20.98	29.83	403.
390	0.76560	32.91	0.0661	8003.2	11268.6	172.42	20.99	29.81	408.
400	0.74605	33.78	0.0643	8215.7	11566.7	173.18	21.00	29.80	414.
420	0.70989	35.53	0.0610	8640.8	12162.4	174.63	21.04	29.78	424.
440	0.67717	37.27	0.0581	9066.2	12758.1	176.01	21.09	29.79	433.
460	0.64739	39.01	0.0555	9492.3	13353.9	177.34	21.15	29.81	443.
480	0.62018	40.73	0.0530	9919.3	13950.4	178.61	21.22	29.84	452.
500	0.59521	42.45	0.0508	10347.4	14547.7	179.83	21.30	29.89	461.
520	0.57220	44.16	0.0488	10777.0	15146.0	181.00	21.39	29.95	470.
540	0.55094	45.87	0.0469	11208.0	15745.8	182.13	21.48	30.02	478.
560	0.53122	47.58	0.0452	11640.9	16347.0	183.23	21.58	30.11	487.
580	0.51289	49.28	0.0436	12075.6	16950.0	184.28	21.69	30.20	495.
600	0.49579	50.98	0.0421	12512.5	17554.9	185.31	21.81	30.29	503.
620	0.47981	52.67	0.0407	12951.4	18161.8	186.30	21.93	30.40	511.
640	0.46484	54.37	0.0394	13392.7	18770.9	187.27	22.05	30.51	518.
660	0.45079	56.06	0.0382	13836.4	19382.2	188.21	22.17	30.62	526.
680	0.43756	57.74	0.0370	14282.5	19995.9	189.13	22.30	30.74	533.
700	0.42510	59.43	0.0360	14731.1	20612.0	190.02	22.43	30.86	540.
720	0.41334	61.11	0.0349	15182.2	21230.5	190.89	22.57	30.99	547.
740	0.40221	62.80	0.0340	15635.9	21851.5	191.74	22.70	31.11	554.
760	0.39167	64.48	0.0331	16092.2	22475.1	192.57	22.83	31.24	561.
780	0.38168	66.16	0.0322	16551.1	23101.1	193.39	22.97	31.37	568.
800	0.37218	67.84	0.0314	17012.6	23729.7	194.18	23.10	31.49	575.
850	0.35040	72.03	0.0295	18177.7	25312.3	196.10	23.43	31.81	591.
900	0.33104	76.22	0.0279	19358.5	26910.5	197.93	23.74	32.12	607.
950	0.31372	80.40	0.0264	20554.8	28523.7	199.67	24.05	32.41	622.
1000	0.29812	84.58	0.0251	21765.7	30151.5	201.34	24.34	32.70	637.
1050	0.28401	88.76	0.0239	22990.6	31793.0	202.94	24.62	32.96	651.
1100	0.27118	92.93	0.0228	24228.7	33447.7	204.48	24.87	33.22	666.
1150	0.25946	97.10	0.0218	25479.3	35114.7	205.97	25.12	33.46	679.
1200	0.24871	101.27	0.0209	26741.7	36793.4	207.39	25.35	33.68	693.
1250	0.23882	105.44	0.0200	28015.0	38482.9	208.77	25.56	33.90	706.
1300	0.22969	109.60	0.0192	29298.6	40182.7	210.11	25.76	34.09	720.
1350	0.22124	113.77	0.0185	30591.8	41892.0	211.40	25.95	34.28	732.
1400	0.21338	117.93	0.0179	31894.1	43610.3	212.65	26.12	34.45	745.
1450	0.20606	122.09	0.0173	33204.7	45336.9	213.86	26.29	34.61	758.
1500	0.19923	126.25	0.0167	34523.2	47071.4	215.03	26.44	34.76	770.
1550	0.19284	130.42	0.0161	35849.1	48813.2	216.18	26.58	34.91	782.
1600	0.18685	134.58	0.0156	37181.9	50561.9	217.29	26.72	35.04	794.
1650	0.18121	138.74	0.0152	38521.1	52316.9	218.37	26.84	35.16	805.
1700	0.17591	142.89	0.0147	39866.4	54078.0	219.42	26.96	35.28	817.
1750	0.17091	147.05	0.0143	41217.3	55844.8	220.44	27.07	35.39	828.
1800	0.16619	151.21	0.0139	42573.6	57616.8	221.44	27.17	35.49	840.
1850	0.16172	155.37	0.0135	43934.8	59393.8	222.42	27.27	35.59	851.
1900	0.15748	159.53	0.0132	45300.8	61175.5	223.37	27.36	35.68	862.
1950	0.15346	163.69	0.0128	46671.1	62961.6	224.29	27.45	35.76	873.
2000	0.14964	167.84	0.0125	48045.6	64751.8	225.20	27.53	35.84	883.
				30 bar Isobar					
* 63.805	31.01595	241.26	30.74	−4201.9	−4105.2	68.17			
64	30.99113	238.68	30.51	−4191.4	−4094.6	68.33			
66	30.73123	214.45	28.32	−4082.1	−3984.5	70.03			
68	30.46280	193.79	26.42	−3971.4	−3872.9	71.69			
70	30.18591	176.04	24.74	−3859.8	−3760.5	73.32			
72	29.90076	160.65	23.23	−3747.8	−3647.5	74.91	29.51	56.56	1048.

Thermodynamic properties of nitrogen–Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
74	29.60762	147.19	21.86	−3635.6	−3534.3	76.47	29.26	56.67	1009.
76	29.30674	135.30	20.61	−3523.2	−3420.8	77.98	28.97	56.75	973.
78	28.99835	124.69	19.46	−3410.7	−3307.3	79.45	28.66	56.82	939.
80	28.68256	115.13	18.39	−3298.1	−3193.5	80.89	28.35	56.91	908.
82	28.35943	106.44	17.39	−3185.4	−3079.6	82.30	28.06	57.04	879.
84	28.02885	98.46	16.46	−3072.4	−2965.3	83.68	27.80	57.22	851.
86	27.69061	91.09	15.58	−2959.0	−2850.7	85.03	27.56	57.46	823.
88	27.34435	84.22	14.76	−2845.2	−2735.4	86.35	27.35	57.77	797.
90	26.98959	77.80	13.97	−2730.7	−2619.5	87.65	27.16	58.16	771.
92	26.62569	71.75	13.23	−2615.4	−2502.7	88.94	27.00	58.64	746.
94	26.25186	66.04	12.52	−2499.2	−2384.9	90.20	26.85	59.21	721.
96	25.86715	60.62	11.84	−2381.8	−2265.8	91.46	26.73	59.89	696.
98	25.47040	55.47	11.18	−2263.0	−2145.2	92.70	26.62	60.69	672.
100	25.06021	50.57	10.55	−2142.7	−2023.0	93.93	26.53	61.61	647.
102	24.63488	45.88	9.95	−2020.5	−1898.7	95.17	26.46	62.70	623.
104	24.19231	41.40	9.36	−1896.1	−1772.1	96.39	26.40	63.97	598.
106	23.72981	37.09	8.78	−1769.1	−1642.6	97.63	26.35	65.48	574.
108	23.24390	32.94	8.22	−1639.0	−1509.9	98.87	26.31	67.30	548.
110	22.72990	28.92	7.66	−1505.1	−1373.2	100.12	26.29	69.54	523.
112	22.18123	25.02	7.12	−1366.6	−1231.4	101.40	26.28	72.35	496.
114	21.58824	21.19	6.57	−1222.1	−1083.2	102.71	26.30	76.05	468.
116	20.93579	17.43	6.01	−1069.5	−926.2	104.08	26.35	81.16	438.
118	20.19790	13.67	5.43	−905.4	−756.8	105.52	26.45	88.82	405.
120	19.32330	9.88	4.81	−722.7	−567.5	107.11	26.63	101.90	367.
122	18.18128	5.95	4.10	−504.2	−339.2	109.00	27.00	131.22	321.
* 123.607	16.70296	2.47	3.33	−254.3	−74.7	111.15	27.70	226.24	268.
* 123.607	6.11671	0.97	0.8104	1311.4	1801.8	126.33	29.19	253.26	173.
124	5.83858	1.26	0.7625	1375.2	1889.0	127.04	28.75	196.75	175.
126	5.05687	2.32	0.6289	1580.6	2173.9	129.32	27.33	111.32	184.
128	4.61994	3.10	0.5558	1718.6	2367.9	130.85	26.43	86.10	190.
130	4.31088	3.76	0.5053	1830.2	2526.1	132.07	25.75	73.25	195.
132	4.07084	4.34	0.4670	1927.1	2664.1	133.13	25.22	65.26	200.
134	3.87448	4.86	0.4364	2014.5	2788.8	134.06	24.78	59.75	205.
136	3.70840	5.34	0.4111	2095.0	2904.0	134.92	24.40	55.69	209.
138	3.56458	5.79	0.3896	2170.5	3012.1	135.71	24.09	52.56	212.
140	3.43787	6.21	0.3711	2242.0	3114.7	136.44	23.81	50.06	216.
142	3.32470	6.61	0.3548	2310.4	3212.7	137.14	23.57	48.03	219.
144	3.22256	7.00	0.3404	2376.1	3307.0	137.80	23.36	46.33	223.
146	3.12953	7.36	0.3275	2439.6	3398.2	138.43	23.17	44.89	226.
148	3.04420	7.72	0.3159	2501.2	3486.7	139.03	23.01	43.66	229.
150	2.96544	8.06	0.3053	2561.3	3572.9	139.61	22.86	42.59	231.
155	2.79184	8.86	0.2825	2705.7	3780.2	140.97	22.54	40.45	238.
160	2.64415	9.62	0.2637	2843.7	3978.3	142.23	22.30	38.84	245.
165	2.51602	10.34	0.2479	2976.9	4169.2	143.40	22.10	37.59	251.
170	2.40318	11.02	0.2343	3106.3	4354.6	144.51	21.94	36.60	256.
175	2.30262	11.68	0.2224	3232.6	4535.5	145.56	21.80	35.78	262.
180	2.21213	12.32	0.2120	3356.5	4712.7	146.55	21.69	35.11	267.
185	2.13005	12.94	0.2026	3478.4	4886.8	147.51	21.60	34.54	272.
190	2.05510	13.54	0.1942	3598.5	5058.3	148.42	21.52	34.06	277.
195	1.98626	14.12	0.1866	3717.1	5227.5	149.30	21.45	33.65	281.
200	1.92270	14.70	0.1797	3834.5	5394.8	150.15	21.40	33.28	286.
210	1.80894	15.82	0.1675	4066.1	5724.5	151.76	21.30	32.69	294.
220	1.70973	16.90	0.1571	4294.3	6049.0	153.27	21.23	32.22	303.
230	1.62218	17.95	0.1481	4519.9	6369.3	154.69	21.17	31.84	310.
240	1.54416	18.98	0.1401	4743.3	6686.1	156.04	21.13	31.54	318.
250	1.47408	19.99	0.1331	4965.0	7000.2	157.32	21.09	31.28	325.
260	1.41067	20.98	0.1267	5185.2	7311.9	158.55	21.06	31.06	332.
270	1.35297	21.96	0.1211	5404.2	7621.6	159.71	21.04	30.88	339.
280	1.30018	22.92	0.1159	5622.2	7929.6	160.83	21.02	30.72	346.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
290	1.25166	23.88	0.1112	5839.3	8236.1	161.91	21.00	30.59	352.
300	1.20688	24.82	0.1069	6055.7	8541.4	162.94	20.99	30.47	359.
310	1.16540	25.76	0.1029	6271.4	8845.6	163.94	20.98	30.37	365.
320	1.12685	26.69	0.0993	6486.6	9148.9	164.91	20.98	30.28	371.
330	1.09090	27.61	0.0959	6701.3	9451.3	165.84	20.97	30.21	377.
340	1.05730	28.52	0.0927	6915.6	9753.0	166.74	20.97	30.14	383.
350	1.02581	29.43	0.0898	7129.6	10054.1	167.61	20.97	30.08	388.
360	0.99623	30.33	0.0870	7343.4	10354.7	168.46	20.98	30.03	394.
370	0.96838	31.23	0.0844	7556.9	10654.8	169.28	20.99	29.99	399.
380	0.94211	32.13	0.0820	7770.2	10954.6	170.08	21.00	29.96	405.
390	0.91729	33.02	0.0797	7983.5	11254.0	170.86	21.01	29.93	410.
400	0.89378	33.91	0.0776	8196.7	11553.2	171.61	21.02	29.91	415.
420	0.85033	35.67	0.0736	8623.0	12151.1	173.07	21.06	29.88	425.
440	0.81104	37.43	0.0700	9049.6	12748.6	174.46	21.11	29.87	435.
460	0.77531	39.17	0.0668	9476.7	13346.2	175.79	21.17	29.89	444.
480	0.74267	40.91	0.0639	9904.7	13944.1	177.06	21.24	29.91	454.
500	0.71273	42.64	0.0612	10333.7	14542.8	178.28	21.31	29.96	463.
520	0.68517	44.36	0.0587	10764.0	15142.5	179.46	21.40	30.01	471.
540	0.65969	46.08	0.0565	11195.8	15743.4	180.59	21.49	30.08	480.
560	0.63608	47.79	0.0544	11629.3	16345.7	181.69	21.59	30.16	488.
580	0.61412	49.50	0.0524	12064.7	16949.7	182.75	21.70	30.24	496.
600	0.59366	51.20	0.0506	12502.0	17555.5	183.78	21.82	30.34	504.
620	0.57453	52.90	0.0489	12941.6	18163.2	184.77	21.93	30.44	512.
640	0.55661	54.60	0.0474	13383.3	18773.1	185.74	22.06	30.55	520.
660	0.53979	56.30	0.0459	13827.4	19385.1	186.68	22.18	30.66	527.
680	0.52397	57.99	0.0445	14274.0	19999.5	187.60	22.31	30.78	534.
700	0.50906	59.68	0.0432	14723.0	20616.2	188.49	22.44	30.90	542.
720	0.49498	61.37	0.0420	15174.5	21235.3	189.36	22.57	31.02	549.
740	0.48167	63.06	0.0408	15628.5	21856.9	190.22	22.71	31.14	556.
760	0.46906	64.74	0.0397	16085.2	22480.9	191.05	22.84	31.27	562.
780	0.45710	66.43	0.0387	16544.4	23107.5	191.86	22.97	31.39	569.
800	0.44574	68.11	0.0377	17006.2	23736.5	192.66	23.11	31.52	576.
850	0.41968	72.31	0.0355	18171.9	25320.2	194.58	23.43	31.83	592.
900	0.39652	76.50	0.0335	19353.4	26919.2	196.41	23.75	32.13	608.
950	0.37579	80.69	0.0317	20550.1	28533.2	198.15	24.05	32.43	623.
1000	0.35714	84.87	0.0301	21761.5	30161.7	199.82	24.34	32.71	638.
1050	0.34025	89.05	0.0286	22986.9	31803.8	201.42	24.62	32.98	653.
1100	0.32490	93.23	0.0273	24225.4	33459.0	202.96	24.88	33.23	667.
1150	0.31087	97.40	0.0261	25476.3	35126.5	204.45	25.12	33.47	681.
1200	0.29801	101.57	0.0250	26739.0	36805.6	205.88	25.35	33.69	694.
1250	0.28618	105.74	0.0240	28012.6	38495.5	207.26	25.57	33.90	708.
1300	0.27525	109.91	0.0231	29296.4	40195.7	208.59	25.77	34.10	721.
1350	0.26513	114.07	0.0222	30589.9	41905.3	209.88	25.95	34.28	733.
1400	0.25572	118.24	0.0214	31892.4	43623.8	211.13	26.13	34.46	746.
1450	0.24696	122.40	0.0207	33203.2	45350.7	212.34	26.29	34.62	759.
1500	0.23879	126.56	0.0200	34521.9	47085.5	213.52	26.44	34.77	771.
1550	0.23113	130.73	0.0194	35848.0	48827.5	214.66	26.59	34.91	783.
1600	0.22396	134.89	0.0188	37180.9	50576.3	215.77	26.72	35.04	795.
1650	0.21721	139.05	0.0182	38520.3	52331.6	216.85	26.85	35.17	806.
1700	0.21086	143.21	0.0177	39865.7	54092.8	217.90	26.96	35.28	818.
1750	0.20488	147.37	0.0171	41216.8	55859.7	218.93	27.07	35.39	829.
1800	0.19922	151.52	0.0167	42573.1	57631.9	219.93	27.18	35.49	840.
1850	0.19387	155.68	0.0162	43934.5	59409.0	220.90	27.27	35.59	852.
1900	0.18879	159.84	0.0158	45300.5	61190.8	221.85	27.36	35.68	863.
1950	0.18398	164.00	0.0154	46670.9	62977.0	222.78	27.45	35.77	873.
2000	0.17941	168.16	0.0150	48045.5	64767.3	223.68	27.53	35.85	884.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
				35 bar Isobar					
63.914	31.02283	241.48	30.54	−4200.2	−4087.4	68.20			
64	31.01200	240.35	30.44	−4195.6	−4082.7	68.27			
66	30.75446	216.08	28.28	−4086.6	−3972.8	69.96			
68	30.48849	195.40	26.39	−3976.3	−3861.5	71.62			
70	30.21419	177.62	24.73	−3865.1	−3749.3	73.25			
72	29.93174	162.22	23.23	−3753.5	−3636.6	74.83	29.69	56.43	1049.
74	29.64141	148.74	21.88	−3641.7	−3523.6	76.38	29.43	56.53	1010.
76	29.34349	136.84	20.64	−3529.8	−3410.5	77.89	29.12	56.60	974.
78	29.03820	126.23	19.50	−3417.8	−3297.2	79.36	28.80	56.66	942.
80	28.72570	116.68	18.44	−3305.7	−3183.8	80.80	28.49	56.74	911.
82	28.40606	107.99	17.45	−3193.5	−3070.2	82.20	28.19	56.85	882.
84	28.07923	100.02	16.53	−3081.0	−2956.4	83.57	27.92	57.01	854.
86	27.74503	92.66	15.66	−2968.3	−2842.1	84.92	27.67	57.24	827.
88	27.40316	85.82	14.84	−2855.1	−2727.4	86.23	27.45	57.52	801.
90	27.05320	79.41	14.06	−2741.4	−2612.0	87.53	27.26	57.88	776.
92	26.69460	73.38	13.32	−2626.9	−2495.8	88.81	27.09	58.32	751.
94	26.32665	67.68	12.62	−2511.6	−2378.7	90.07	26.94	58.85	726.
96	25.94851	62.29	11.95	−2395.2	−2260.3	91.31	26.81	59.48	702.
98	25.55918	57.17	11.30	−2277.6	−2140.7	92.55	26.70	60.21	678.
100	25.15744	52.29	10.68	−2158.6	−2019.4	93.77	26.61	61.06	654.
102	24.74182	47.63	10.08	−2037.8	−1896.4	94.99	26.52	62.04	631.
104	24.31056	43.18	9.49	−1915.1	−1771.1	96.21	26.45	63.19	607.
106	23.86141	38.91	8.93	−1790.1	−1643.4	97.42	26.40	64.54	583.
108	23.39155	34.80	8.38	−1662.4	−1512.8	98.64	26.35	66.14	558.
110	22.89726	30.84	7.83	−1531.5	−1378.6	99.87	26.32	68.07	534.
112	22.37351	27.01	7.30	−1396.6	−1240.2	101.12	26.30	70.45	508.
114	21.81322	23.27	6.77	−1256.9	−1096.4	102.39	26.30	73.46	482.
116	21.20591	19.62	6.23	−1110.8	−945.7	103.70	26.33	77.44	454.
118	20.53506	16.02	5.69	−956.1	−785.6	105.07	26.39	82.98	424.
120	19.77218	12.45	5.13	−789.0	−611.9	106.53	26.50	91.34	391.
122	18.86086	8.87	4.52	−601.9	−416.4	108.15	26.70	105.75	354.
124	17.65795	5.24	3.83	−376.1	−177.8	110.09	27.10	138.07	309.
126	15.46510	1.47	2.83	−19.9	206.4	113.16	28.21	314.88	242.
128	7.22037	1.02	0.9812	1240.5	1725.2	125.13	29.16	261.99	180.
130	6.06141	2.07	0.7810	1503.1	2080.6	127.88	27.68	131.78	188.
132	5.47053	2.88	0.6802	1665.1	2304.9	129.60	26.72	97.56	194.
134	5.06908	3.56	0.6130	1791.5	2481.9	130.93	26.01	81.02	199.
136	4.76472	4.16	0.5632	1898.7	2633.3	132.05	25.45	71.07	204.
138	4.51980	4.71	0.5239	1993.9	2768.3	133.03	24.99	64.35	208.
140	4.31513	5.21	0.4918	2080.8	2891.9	133.92	24.60	59.48	212.
142	4.13956	5.68	0.4647	2161.5	3007.0	134.74	24.27	55.77	216.
144	3.98602	6.12	0.4415	2237.5	3115.5	135.50	23.98	52.85	219.
146	3.84973	6.54	0.4213	2309.6	3218.8	136.21	23.73	50.48	223.
148	3.72735	6.94	0.4035	2378.7	3317.7	136.88	23.51	48.51	226.
150	3.61639	7.32	0.3876	2445.2	3413.0	137.52	23.32	46.86	229.
155	3.37774	8.21	0.3543	2602.7	3638.9	139.01	22.91	43.68	236.
160	3.18021	9.04	0.3277	2750.7	3851.3	140.35	22.60	41.39	243.
165	3.01231	9.82	0.3058	2891.8	4053.7	141.60	22.35	39.67	249.
170	2.86677	10.55	0.2874	3027.8	4248.6	142.76	22.15	38.34	255.
175	2.73869	11.26	0.2715	3159.6	4437.5	143.86	21.99	37.27	261.
180	2.62461	11.93	0.2577	3288.1	4621.6	144.90	21.85	36.39	266.
185	2.52200	12.58	0.2455	3414.0	4801.7	145.88	21.74	35.67	271.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
190	2.42897	13.21	0.2346	3537.6	4978.5	146.83	21.65	35.06	276.
195	2.34405	13.83	0.2248	3659.3	5152.5	147.73	21.57	34.54	281.
200	2.26606	14.43	0.2160	3779.5	5324.0	148.60	21.50	34.09	286.
210	2.12736	15.59	0.2006	4015.9	5661.1	150.24	21.39	33.36	295.
220	2.00727	16.71	0.1875	4248.0	5991.7	151.78	21.30	32.79	303.
230	1.90190	17.80	0.1763	4477.0	6317.2	153.23	21.23	32.33	311.
240	1.80844	18.86	0.1665	4703.3	6638.6	154.60	21.18	31.96	319.
250	1.72480	19.90	0.1578	4927.4	6956.7	155.90	21.14	31.66	326.
260	1.64937	20.91	0.1501	5149.9	7271.9	157.13	21.11	31.40	333.
270	1.58091	21.91	0.1432	5370.8	7584.8	158.31	21.08	31.18	340.
280	1.51842	22.90	0.1369	5590.6	7895.6	159.44	21.05	31.00	347.
290	1.46109	23.87	0.1312	5809.3	8204.8	160.53	21.04	30.84	353.
300	1.40828	24.83	0.1260	6027.1	8512.4	161.57	21.02	30.70	360.
310	1.35942	25.78	0.1213	6244.2	8818.8	162.58	21.01	30.58	366.
320	1.31408	26.73	0.1169	6460.6	9124.0	163.54	21.00	30.47	372.
330	1.27185	27.66	0.1128	6676.4	9428.3	164.48	21.00	30.38	378.
340	1.23241	28.59	0.1090	6891.8	9731.7	165.39	21.00	30.30	384.
350	1.19549	29.51	0.1055	7106.7	10034.4	166.26	21.00	30.24	389.
360	1.16083	30.42	0.1022	7321.4	10336.5	167.12	21.00	30.18	395.
370	1.12822	31.33	0.0991	7535.7	10638.0	167.94	21.01	30.13	400.
380	1.09748	32.24	0.0963	7749.9	10939.0	168.74	21.02	30.08	406.
390	1.06845	33.14	0.0935	7963.9	11239.6	169.52	21.03	30.05	411.
400	1.04098	34.03	0.0910	8177.8	11540.0	170.29	21.04	30.02	416.
420	0.99023	35.81	0.0863	8605.4	12139.9	171.75	21.08	29.98	426.
440	0.94436	37.58	0.0821	9033.1	12739.3	173.14	21.12	29.96	436.
460	0.90268	39.34	0.0782	9461.3	13338.6	174.48	21.18	29.97	446.
480	0.86464	41.09	0.0748	9890.1	13938.1	175.75	21.25	29.99	455.
500	0.82975	42.83	0.0716	10320.0	14538.1	176.98	21.33	30.02	464.
520	0.79763	44.56	0.0687	10751.1	15139.1	178.15	21.41	30.07	473.
540	0.76796	46.28	0.0660	11183.6	15741.1	179.29	21.50	30.13	481.
560	0.74047	48.00	0.0636	11617.8	16344.5	180.39	21.61	30.21	489.
580	0.71491	49.72	0.0613	12053.7	16949.4	181.45	21.71	30.29	498.
600	0.69109	51.43	0.0592	12491.7	17556.1	182.48	21.83	30.38	506.
620	0.66883	53.14	0.0572	12931.7	18164.7	183.47	21.94	30.48	513.
640	0.64798	54.84	0.0554	13374.0	18775.3	184.44	22.07	30.58	521.
660	0.62841	56.54	0.0536	13818.5	19388.1	185.39	22.19	30.69	528.
680	0.61001	58.24	0.0520	14265.5	20003.1	186.30	22.32	30.81	536.
700	0.59266	59.94	0.0505	14714.9	20620.5	187.20	22.45	30.93	543.
720	0.57628	61.63	0.0490	15166.8	21240.2	188.07	22.58	31.05	550.
740	0.56080	63.32	0.0477	15621.2	21862.3	188.92	22.71	31.17	557.
760	0.54613	65.01	0.0464	16078.2	22486.8	189.76	22.85	31.29	564.
780	0.53222	66.69	0.0452	16537.7	23113.9	190.57	22.98	31.41	570.
800	0.51901	68.38	0.0440	16999.8	23743.4	191.37	23.11	31.54	577.
850	0.48870	72.59	0.0414	18166.2	25328.0	193.29	23.44	31.85	593.
900	0.46176	76.78	0.0391	19348.3	26928.0	195.12	23.76	32.15	609.
950	0.43765	80.98	0.0370	20545.5	28542.8	196.87	24.06	32.44	624.
1000	0.41595	85.16	0.0351	21757.4	30171.9	198.54	24.35	32.72	639.
1050	0.39631	89.35	0.0334	22983.2	31814.7	200.14	24.62	32.99	654.
1100	0.37845	93.53	0.0319	24222.0	33470.4	201.68	24.88	33.24	668.
1150	0.36213	97.70	0.0305	25473.3	35138.4	203.16	25.13	33.48	682.
1200	0.34717	101.87	0.0292	26736.3	36817.9	204.59	25.35	33.70	695.
1250	0.33340	106.05	0.0280	28010.2	38508.2	205.97	25.57	33.91	709.
1300	0.32068	110.21	0.0270	29294.3	40208.6	207.31	25.77	34.11	722.
1350	0.30890	114.38	0.0260	30588.0	41918.6	208.60	25.96	34.29	734.
1400	0.29795	118.55	0.0250	31890.7	43637.4	209.85	26.13	34.46	747.
1450	0.28776	122.71	0.0242	33201.7	45364.6	211.06	26.29	34.62	759.
1500	0.27824	126.87	0.0234	34520.6	47099.5	212.24	26.45	34.77	772.
1550	0.26934	131.04	0.0226	35846.8	48841.7	213.38	26.59	34.91	784.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1600	0.26098	135.20	0.0219	37179.9	50590.8	214.49	26.72	35.05	796.
1650	0.25313	139.36	0.0212	38519.4	52346.2	215.57	26.85	35.17	807.
1700	0.24574	143.52	0.0206	39865.0	54107.6	216.62	26.97	35.29	819.
1750	0.23877	147.68	0.0200	41216.2	55874.6	217.64	27.08	35.39	830.
1800	0.23218	151.84	0.0194	42572.7	57646.9	218.64	27.18	35.50	841.
1850	0.22595	156.00	0.0189	43934.1	59424.2	219.62	27.28	35.59	852.
1900	0.22005	160.15	0.0184	45300.3	61206.1	220.57	27.37	35.68	863.
1950	0.21444	164.31	0.0179	46670.8	62992.4	221.50	27.45	35.77	874.
2000	0.20911	168.47	0.0175	48045.5	64782.8	222.40	27.53	35.85	885.
				40 bar Isobar					
* 64.023	31.02981	241.71	30.36	−4198.4	−4069.5	68.22			
66	30.77751	217.72	28.24	−4091.1	−3961.1	69.89			
68	30.51398	197.00	26.37	−3981.1	−3850.0	71.55			
70	30.24221	179.20	24.71	−3870.3	−3738.0	73.17			
72	29.96241	163.78	23.23	−3759.1	−3625.6	74.75	29.86	56.29	1050.
74	29.67486	150.29	21.89	−3647.7	−3512.9	76.30	29.59	56.39	1011.
76	29.37982	138.39	20.67	−3536.2	−3400.1	77.80	29.27	56.45	976.
78	29.07757	127.77	19.54	−3424.7	−3287.1	79.27	28.95	56.50	944.
80	28.76828	118.22	18.49	−3313.1	−3174.0	80.70	28.62	56.57	913.
82	28.45204	109.53	17.51	−3201.4	−3060.8	82.10	28.32	56.67	885.
84	28.12883	101.58	16.59	−3089.5	−2947.3	83.47	28.04	56.82	857.
86	27.79854	94.23	15.73	−2977.4	−2833.5	84.81	27.79	57.02	831.
88	27.46090	87.40	14.92	−2864.9	−2719.2	86.12	27.56	57.28	805.
90	27.11555	81.00	14.15	−2751.9	−2604.3	87.41	27.36	57.61	780.
92	26.76200	74.99	13.42	−2638.2	−2488.7	88.68	27.18	58.02	756.
94	26.39964	69.32	12.72	−2523.7	−2372.2	89.93	27.03	58.51	732.
96	26.02773	63.94	12.05	−2408.3	−2254.6	91.17	26.90	59.09	708.
98	25.64538	58.84	11.41	−2291.8	−2135.8	92.40	26.78	59.76	685.
100	25.25153	53.99	10.80	−2173.9	−2015.5	93.61	26.68	60.54	661.
102	24.84493	49.36	10.20	−2054.5	−1893.5	94.82	26.59	61.44	638.
104	24.42406	44.93	9.63	−1933.4	−1769.6	96.02	26.51	62.49	615.
106	23.98704	40.69	9.07	−1810.2	−1643.5	97.22	26.45	63.70	592.
108	23.53156	36.63	8.53	−1684.7	−1514.7	98.43	26.39	65.12	568.
110	23.05463	32.71	8.00	−1556.3	−1382.8	99.64	26.35	66.80	544.
112	22.55232	28.93	7.47	−1424.6	−1247.3	100.86	26.32	68.84	520.
114	22.01929	25.27	6.96	−1288.8	−1107.2	102.10	26.31	71.35	495.
116	21.44801	21.71	6.44	−1147.9	−961.4	103.37	26.31	74.55	469.
118	20.82731	18.22	5.93	−1000.3	−808.3	104.67	26.34	78.78	441.
120	20.13964	14.80	5.40	−843.8	−645.2	106.05	26.41	84.69	412.
122	19.35487	11.43	4.85	−674.2	−467.5	107.51	26.53	93.61	379.
124	18.41442	8.10	4.26	−483.9	−266.7	109.15	26.75	108.82	343.
126	17.17730	4.84	3.60	−254.3	−21.4	111.11	27.16	141.25	300.
128	15.13180	1.83	2.72	81.3	345.6	114.00	28.12	254.45	243.
130	10.65950	0.71	1.58	753.2	1128.5	120.06	29.78	432.23	192.
132	7.93415	1.40	1.09	1235.3	1739.4	124.73	28.69	206.52	190.
134	6.82938	2.23	0.8978	1478.1	2063.8	127.17	27.56	131.19	195.
136	6.18108	2.97	0.7856	1644.9	2292.0	128.86	26.71	100.70	200.
138	5.72755	3.62	0.7084	1777.3	2475.6	130.20	26.04	84.33	205.
140	5.38064	4.21	0.6505	1889.9	2633.3	131.33	25.50	74.08	209.
142	5.10074	4.75	0.6047	1989.9	2774.1	132.33	25.05	67.02	213.
144	4.86675	5.26	0.5671	2080.8	2902.7	133.23	24.67	61.85	217.
146	4.66614	5.73	0.5354	2165.0	3022.2	134.06	24.34	57.89	221.
148	4.49089	6.18	0.5083	2244.1	3134.8	134.82	24.06	54.75	224.
150	4.33552	6.60	0.4847	2319.0	3241.6	135.54	23.81	52.20	227.

Thermodynamic properties of nitrogen–Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
155	4.01110	7.59	0.4367	2492.9	3490.1	137.17	23.30	47.52	235.
160	3.75105	8.49	0.3997	2652.9	3719.3	138.62	22.91	44.32	242.
165	3.53503	9.32	0.3700	2803.3	3934.8	139.95	22.61	42.01	249.
170	3.35096	10.11	0.3455	2946.6	4140.3	141.18	22.37	40.25	255.
175	3.19114	10.85	0.3247	3084.5	4337.9	142.32	22.18	38.87	261.
180	3.05032	11.57	0.3068	3218.1	4529.4	143.40	22.02	37.77	266.
185	2.92477	12.25	0.2913	3348.3	4715.9	144.43	21.89	36.86	271.
190	2.81178	12.91	0.2775	3475.7	4898.3	145.40	21.77	36.11	276.
195	2.70927	13.56	0.2653	3600.8	5077.2	146.33	21.68	35.47	281.
200	2.61563	14.18	0.2542	3723.9	5253.1	147.22	21.60	34.92	286.
210	2.45019	15.39	0.2352	3965.2	5597.8	148.90	21.47	34.04	295.
220	2.30796	16.55	0.2192	4201.5	5934.7	150.47	21.37	33.36	304.
230	2.18386	17.67	0.2055	4433.9	6265.5	151.94	21.30	32.82	312.
240	2.07429	18.76	0.1937	4663.1	6591.5	153.33	21.24	32.39	320.
250	1.97659	19.82	0.1833	4889.9	6913.5	154.64	21.19	32.03	327.
260	1.88877	20.86	0.1741	5114.5	7232.3	155.89	21.15	31.73	334.
270	1.80925	21.88	0.1658	5337.5	7548.4	157.08	21.12	31.48	341.
280	1.73684	22.88	0.1584	5559.1	7862.1	158.22	21.09	31.27	348.
290	1.67054	23.87	0.1517	5779.4	8173.8	159.32	21.07	31.08	355.
300	1.60955	24.85	0.1455	5998.6	8483.8	160.37	21.05	30.92	361.
310	1.55322	25.82	0.1399	6217.0	8792.3	161.38	21.04	30.78	367.
320	1.50099	26.77	0.1348	6434.6	9099.5	162.36	21.03	30.66	373.
330	1.45242	27.72	0.1300	6651.6	9405.6	163.30	21.02	30.56	379.
340	1.40710	28.66	0.1256	6868.0	9710.7	164.21	21.02	30.47	385.
350	1.36470	29.59	0.1214	7083.9	10015.0	165.09	21.02	30.39	391.
360	1.32493	30.52	0.1176	7299.5	10318.5	165.95	21.02	30.32	396.
370	1.28754	31.44	0.1140	7514.7	10621.4	166.78	21.03	30.26	402.
380	1.25232	32.35	0.1107	7729.6	10923.7	167.58	21.04	30.21	407.
390	1.21907	33.26	0.1075	7944.4	11225.5	168.37	21.05	30.16	413.
400	1.18762	34.16	0.1045	8158.9	11527.0	169.13	21.06	30.13	418.
420	1.12956	35.96	0.0991	8587.8	12129.0	170.60	21.09	30.08	428.
440	1.07713	37.74	0.0942	9016.7	12730.3	172.00	21.14	30.05	438.
460	1.02951	39.51	0.0898	9445.9	13331.2	173.33	21.20	30.05	447.
480	0.98606	41.27	0.0857	9875.7	13932.2	174.61	21.26	30.06	456.
500	0.94624	43.02	0.0821	10306.4	14533.6	175.84	21.34	30.09	465.
520	0.90959	44.76	0.0787	10738.2	15135.8	177.09	21.42	30.13	474.
540	0.87575	46.49	0.0757	11171.5	15739.0	178.16	21.52	30.19	483.
560	0.84439	48.22	0.0728	11606.3	16343.4	179.26	21.62	30.26	491.
580	0.81525	49.94	0.0702	12042.8	16949.3	180.32	21.72	30.34	499.
600	0.78809	51.66	0.0678	12481.3	17556.9	181.35	21.84	30.42	507.
620	0.76272	53.37	0.0655	12921.9	18166.3	182.35	21.95	30.52	515.
640	0.73895	55.08	0.0634	13364.7	18777.7	183.32	22.08	30.62	522.
660	0.71665	56.79	0.0614	13809.7	19391.2	184.26	22.20	30.73	530.
680	0.69567	58.49	0.0595	14257.0	20006.9	185.18	22.33	30.84	537.
700	0.67591	60.19	0.0578	14706.8	20624.8	186.08	22.46	30.96	544.
720	0.65725	61.89	0.0561	15159.1	21245.1	186.95	22.59	31.07	551.
740	0.63960	63.58	0.0546	15613.9	21867.8	187.80	22.72	31.19	558.
760	0.62289	65.27	0.0531	16071.2	22492.8	188.64	22.85	31.31	565.
780	0.60704	66.96	0.0517	16531.0	23120.4	189.45	22.99	31.44	572.
800	0.59199	68.65	0.0504	16993.4	23750.3	190.25	23.12	31.56	578.
850	0.55745	72.86	0.0474	18160.5	25336.0	192.17	23.44	31.87	595.
900	0.52676	77.07	0.0447	19343.1	26936.8	194.00	23.76	32.17	610.
950	0.49929	81.27	0.0423	20541.0	28552.4	195.75	24.06	32.46	625.
1000	0.47456	85.46	0.0402	21753.3	30182.2	197.42	24.35	32.73	640.
1050	0.45218	89.64	0.0382	22979.4	31825.5	199.03	24.63	33.00	655.
1100	0.43182	93.82	0.0365	24218.7	33481.8	200.57	24.89	33.25	669.
1150	0.41323	98.00	0.0349	25470.3	35150.2	202.05	25.13	33.49	683.
1200	0.39617	102.18	0.0334	26733.6	36830.2	203.48	25.36	33.71	696.
1250	0.38048	106.35	0.0321	28007.8	38520.9	204.86	25.57	33.92	710.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1300	0.36598	110.52	0.0308	29292.1	40221.6	206.19	25.77	34.11	723.
1350	0.35255	114.69	0.0297	30586.1	41931.9	207.48	25.96	34.30	735.
1400	0.34008	118.86	0.0286	31889.0	43651.0	208.74	26.13	34.47	748.
1450	0.32846	123.02	0.0276	33200.2	45378.4	209.95	26.30	34.63	760.
1500	0.31760	127.19	0.0267	34519.3	47113.6	211.12	26.45	34.78	773.
1550	0.30745	131.35	0.0258	35845.7	48856.0	212.27	26.59	34.92	785.
1600	0.29792	135.51	0.0250	37178.9	50605.2	213.38	26.73	35.05	796.
1650	0.28897	139.67	0.0243	38518.6	52360.8	214.46	26.85	35.17	808.
1700	0.28054	143.83	0.0235	39864.3	54122.4	215.51	26.97	35.29	820.
1750	0.27259	147.99	0.0229	41215.6	55889.6	216.53	27.08	35.40	831.
1800	0.26508	152.15	0.0222	42572.2	57662.0	217.53	27.18	35.50	842.
1850	0.25797	156.31	0.0216	43933.8	59439.4	218.51	27.28	35.59	853.
1900	0.25123	160.47	0.0211	45300.0	61221.4	219.46	27.37	35.68	864.
1950	0.24484	164.62	0.0205	46670.7	63007.8	220.39	27.45	35.77	875.
2000	0.23877	168.78	0.0200	48045.4	64798.3	221.29	27.53	35.85	886.
				45 bar Isobar					
* 64.132	31.03689	241.95	30.17	−4196.6	−4051.7	68.25			
66	30.80039	219.35	28.19	−4095.4	−3949.3	69.82			
68	30.53926	198.61	26.34	−3985.8	−3838.5	71.48			
70	30.26999	180.78	24.70	−3875.4	−3726.8	73.10			
72	29.99280	165.34	23.24	−3764.6	−3614.6	74.68	30.03	56.16	1051.
74	29.70795	151.84	21.91	−3653.6	−3502.2	76.22	29.75	56.25	1012.
76	29.41576	139.92	20.69	−3542.6	−3389.6	77.72	29.42	56.30	978.
78	29.11647	129.30	19.57	−3431.5	−3276.9	79.18	29.09	56.35	946.
80	28.81030	119.75	18.53	−3320.4	−3164.2	80.61	28.76	56.41	916.
82	28.49737	111.07	17.57	−3209.2	−3051.3	82.00	28.44	56.49	887.
84	28.17768	103.12	16.66	−3097.9	−2938.2	83.36	28.16	56.63	860.
86	27.85116	95.79	15.80	−2986.3	−2824.8	84.70	27.90	56.81	834.
88	27.51760	88.97	15.00	−2874.4	−2710.9	86.01	27.66	57.05	809.
90	27.17668	82.59	14.24	−2762.1	−2596.5	87.29	27.46	57.36	785.
92	26.82797	76.59	13.51	−2649.2	−2481.4	88.56	27.27	57.73	761.
94	26.47094	70.94	12.82	−2535.5	−2365.5	89.80	27.11	58.19	737.
96	26.10494	65.58	12.16	−2421.0	−2248.6	91.03	26.97	58.72	714.
98	25.72918	60.50	11.52	−2305.5	−2130.6	92.25	26.85	59.34	691.
100	25.34274	55.66	10.91	−2188.8	−2011.2	93.46	26.74	60.06	668.
102	24.94453	51.06	10.33	−2070.7	−1890.3	94.65	26.65	60.89	645.
104	24.53325	46.66	9.76	−1951.0	−1767.6	95.85	26.57	61.83	623.
106	24.10733	42.45	9.21	−1829.5	−1642.8	97.03	26.50	62.93	600.
108	23.66483	38.41	8.67	−1705.9	−1515.7	98.22	26.44	64.20	577.
110	23.20334	34.54	8.15	−1579.8	−1385.9	99.41	26.39	65.68	554.
112	22.71974	30.81	7.64	−1450.9	−1252.8	100.61	26.35	67.45	531.
114	22.20991	27.20	7.14	−1318.5	−1115.9	101.82	26.32	69.58	507.
116	21.66829	23.71	6.64	−1181.9	−974.2	103.06	26.31	72.22	482.
118	21.08697	20.31	6.14	−1039.9	−826.5	104.32	26.32	75.58	456.
120	20.45436	17.00	5.64	−891.1	−671.1	105.62	26.35	80.03	429.
122	19.75239	13.77	5.13	−733.1	−505.3	106.99	26.42	86.21	400.
124	18.95069	10.61	4.60	−561.8	−324.3	108.47	26.55	95.43	369.
126	17.99272	7.56	4.04	−369.8	−119.7	110.10	26.77	110.65	334.
128	16.75662	4.70	3.41	−141.2	127.3	112.05	27.17	139.97	294.
130	14.93972	2.34	2.68	163.3	464.5	114.66	27.92	206.06	248.
132	12.20920	1.32	1.91	592.2	960.8	118.45	28.92	273.02	211.
134	9.74734	1.45	1.41	1006.1	1467.8	122.26	28.82	221.87	200.
136	8.25292	2.01	1.14	1296.6	1841.9	125.03	27.99	156.66	200.
138	7.34344	2.66	0.9753	1500.6	2113.4	127.01	27.17	118.66	204.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
140	6.72408	3.30	0.8665	1658.0	2327.2	128.55	26.47	97.01	208.
142	6.26376	3.89	0.7869	1788.4	2506.8	129.83	25.90	83.49	212.
144	5.90100	4.45	0.7254	1901.5	2664.1	130.93	25.41	74.33	216.
146	5.60339	4.97	0.6758	2002.7	2805.8	131.90	24.99	67.74	219.
148	5.35207	5.46	0.6346	2095.3	2936.1	132.79	24.64	62.76	223.
150	5.13520	5.92	0.5998	2181.3	3057.6	133.61	24.33	58.87	226.
155	4.69768	6.99	0.5315	2375.7	3333.6	135.42	23.71	52.07	234.
160	4.35949	7.96	0.4807	2550.0	3582.2	137.00	23.24	47.68	241.
165	4.08553	8.85	0.4411	2711.1	3812.5	138.41	22.88	44.61	248.
170	3.85637	9.69	0.4090	2862.7	4029.6	139.71	22.60	42.34	255.
175	3.66018	10.47	0.3824	3007.4	4236.8	140.91	22.37	40.60	261.
180	3.48924	11.22	0.3597	3146.6	4436.3	142.03	22.18	39.23	266.
185	3.33821	11.94	0.3402	3281.5	4629.5	143.09	22.03	38.12	272.
190	3.20330	12.63	0.3231	3412.9	4817.7	144.10	21.90	37.20	277.
195	3.08166	13.30	0.3080	3541.5	5001.8	145.05	21.79	36.43	282.
200	2.97115	13.95	0.2945	3667.7	5182.3	145.97	21.70	35.78	287.
210	2.77715	15.20	0.2713	3914.3	5534.7	147.69	21.55	34.74	296.
220	2.61154	16.40	0.2521	4154.8	5877.9	149.28	21.44	33.95	304.
230	2.46785	17.55	0.2358	4390.7	6214.2	150.78	21.36	33.32	313.
240	2.34153	18.67	0.2217	4623.0	6544.8	152.19	21.29	32.82	321.
250	2.22931	19.75	0.2095	4852.3	6870.9	153.52	21.23	32.41	328.
260	2.12873	20.82	0.1986	5079.3	7193.2	154.78	21.19	32.07	335.
270	2.03790	21.86	0.1890	5304.3	7512.4	155.99	21.16	31.78	342.
280	1.95535	22.88	0.1803	5527.6	7829.0	157.14	21.13	31.54	349.
290	1.87991	23.89	0.1725	5749.5	8143.3	158.24	21.10	31.33	356.
300	1.81063	24.88	0.1654	5970.3	8455.6	159.30	21.08	31.15	362.
310	1.74672	25.86	0.1589	6190.0	8766.2	160.32	21.07	30.99	368.
320	1.68755	26.83	0.1529	6408.8	9075.4	161.30	21.06	30.85	375.
330	1.63256	27.79	0.1474	6626.9	9383.3	162.25	21.05	30.73	381.
340	1.58131	28.74	0.1423	6844.4	9690.1	163.16	21.04	30.63	386.
350	1.53340	29.68	0.1376	7061.3	9995.9	164.05	21.04	30.54	392.
360	1.48850	30.62	0.1332	7277.7	10300.9	164.91	21.04	30.46	398.
370	1.44632	31.55	0.1291	7493.7	10605.1	165.74	21.05	30.39	403.
380	1.40659	32.47	0.1252	7709.5	10908.7	166.55	21.05	30.33	409.
390	1.36912	33.39	0.1216	7924.9	11211.7	167.34	21.06	30.28	414.
400	1.33369	34.30	0.1182	8140.2	11514.3	168.11	21.08	30.24	419.
420	1.26832	36.11	0.1120	8570.4	12118.4	169.58	21.11	30.17	429.
440	1.20932	37.90	0.1064	9000.4	12721.5	170.98	21.16	30.14	439.
460	1.15578	39.69	0.1013	9430.6	13324.0	172.32	21.21	30.12	449.
480	1.10695	41.46	0.0968	9861.3	13926.5	173.60	21.28	30.13	458.
500	1.06221	43.21	0.0926	10292.8	14529.3	174.83	21.35	30.15	467.
520	1.02105	44.96	0.0888	10725.4	15132.7	176.02	21.44	30.19	475.
540	0.98305	46.71	0.0853	11159.4	15737.0	177.16	21.53	30.24	484.
560	0.94784	48.44	0.0821	11594.8	16342.5	178.26	21.63	30.31	492.
580	0.91513	50.17	0.0792	12032.0	16949.3	179.32	21.73	30.38	500.
600	0.88466	51.89	0.0764	12471.1	17557.8	180.35	21.85	30.47	508.
620	0.85619	53.61	0.0738	12912.2	18168.0	181.35	21.96	30.56	516.
640	0.82952	55.33	0.0714	13355.4	18780.2	182.33	22.08	30.66	524.
660	0.80450	57.04	0.0692	13800.8	19394.4	183.27	22.21	30.76	531.
680	0.78097	58.74	0.0671	14248.6	20010.7	184.19	22.34	30.87	538.
700	0.75880	60.45	0.0651	14698.8	20629.2	185.09	22.47	30.98	546.
720	0.73787	62.15	0.0632	15151.5	21250.1	185.96	22.60	31.10	553.
740	0.71808	63.85	0.0615	15606.6	21873.3	186.82	22.73	31.22	560.
760	0.69934	65.54	0.0598	16064.2	22498.9	187.65	22.86	31.34	566.
780	0.68156	67.23	0.0582	16524.4	23126.9	188.47	22.99	31.46	573.
800	0.66467	68.92	0.0567	16987.0	23757.3	189.26	23.13	31.58	580.
850	0.62594	73.14	0.0533	18154.8	25344.0	191.19	23.45	31.88	596.
900	0.59151	77.35	0.0503	19338.1	26945.6	193.02	23.77	32.18	611.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
950	0.56071	81.56	0.0476	20536.4	28562.0	194.77	24.07	32.47	627.
1000	0.53297	85.75	0.0452	21749.2	30192.4	196.44	24.36	32.75	641.
1050	0.50786	89.94	0.0430	22975.7	31836.4	198.04	24.63	33.01	656.
1100	0.48503	94.12	0.0410	24215.4	33493.2	199.58	24.89	33.26	670.
1150	0.46417	98.31	0.0392	25467.4	35162.1	201.07	25.13	33.49	684.
1200	0.44504	102.48	0.0376	26730.9	36842.5	202.50	25.36	33.72	697.
1250	0.42742	106.66	0.0361	28005.4	38533.5	203.88	25.58	33.92	711.
1300	0.41116	110.83	0.0347	29290.0	40234.7	205.21	25.78	34.12	724.
1350	0.39609	115.00	0.0334	30584.2	41945.2	206.50	25.96	34.30	736.
1400	0.38209	119.17	0.0322	31887.3	43664.6	207.75	26.14	34.47	749.
1450	0.36905	123.33	0.0311	33198.7	45392.3	208.97	26.30	34.63	761.
1500	0.35687	127.50	0.0300	34518.0	47127.7	210.14	26.45	34.78	774.
1550	0.34547	131.66	0.0291	35844.5	48870.3	211.29	26.59	34.92	786.
1600	0.33478	135.82	0.0281	37177.9	50619.7	212.40	26.73	35.05	797.
1650	0.32473	139.99	0.0273	38517.8	52375.5	213.48	26.85	35.18	809.
1700	0.31527	144.15	0.0265	39863.6	54137.2	214.53	26.97	35.29	821.
1750	0.30634	148.31	0.0257	41215.0	55904.5	215.55	27.08	35.40	832.
1800	0.29791	152.46	0.0250	42571.8	57677.1	216.55	27.18	35.50	843.
1850	0.28993	156.62	0.0243	43933.4	59454.6	217.53	27.28	35.60	854.
1900	0.28236	160.78	0.0237	45299.8	61236.7	218.48	27.37	35.69	865.
1950	0.27518	164.94	0.0231	46670.5	63023.2	219.41	27.46	35.77	876.
2000	0.26836	169.10	0.0225	48045.4	64813.8	220.31	27.54	35.85	887.

50 bar Isobar

* 64.240	31.04406	242.20	29.98	−4194.9	−4033.8	68.28			
66	30.82310	220.98	28.14	−4099.8	−3937.6	69.75			
68	30.56433	200.21	26.31	−3990.5	−3826.9	71.41			
70	30.29753	182.36	24.69	−3880.5	−3715.4	73.02			
72	30.02290	166.90	23.24	−3770.0	−3603.5	74.60	30.19	56.04	1052.
74	29.74072	153.38	21.92	−3659.5	−3491.3	76.14	29.91	56.12	1014.
76	29.45130	141.46	20.72	−3548.8	−3379.1	77.63	29.57	56.16	979.
78	29.15491	130.83	19.61	−3438.2	−3266.7	79.09	29.22	56.20	948.
80	28.85179	121.28	18.58	−3327.6	−3154.3	80.52	28.89	56.25	918.
82	28.54207	112.60	17.62	−3216.9	−3041.7	81.90	28.57	56.32	890.
84	28.22581	104.66	16.72	−3106.1	−2928.9	83.26	28.27	56.44	864.
86	27.90295	97.33	15.88	−2995.1	−2815.9	84.59	28.00	56.61	838.
88	27.57331	90.52	15.08	−2883.8	−2702.5	85.90	27.76	56.83	813.
90	27.23665	84.16	14.32	−2772.1	−2588.5	87.18	27.55	57.11	789.
92	26.89258	78.18	13.60	−2659.9	−2474.0	88.44	27.36	57.46	766.
94	26.54064	72.54	12.91	−2547.1	−2358.7	89.68	27.20	57.88	742.
96	26.18025	67.20	12.26	−2433.4	−2242.4	90.90	27.05	58.37	719.
98	25.81072	62.14	11.63	−2318.8	−2125.1	92.11	26.92	58.95	697.
100	25.43125	57.32	11.03	−2203.2	−2006.6	93.31	26.81	59.61	675.
102	25.04088	52.73	10.45	−2086.3	−1886.6	94.49	26.71	60.37	652.
104	24.63850	48.36	9.88	−1968.0	−1765.0	95.67	26.62	61.24	630.
106	24.22278	44.17	9.34	−1848.0	−1641.6	96.85	26.54	62.23	608.
108	23.79210	40.17	8.81	−1726.2	−1516.0	98.02	26.48	63.37	586.
110	23.34446	36.33	8.30	−1602.2	−1388.0	99.20	26.42	64.69	563.
112	22.87738	32.64	7.80	−1475.7	−1257.1	100.38	26.37	66.23	541.
114	22.38764	29.08	7.30	−1346.2	−1122.9	101.57	26.34	68.07	518.
116	21.87098	25.64	6.82	−1213.2	−984.6	102.77	26.31	70.29	494.
118	21.32167	22.31	6.34	−1075.9	−841.4	103.99	26.31	73.03	470.
120	20.73165	19.09	5.86	−933.1	−692.0	105.25	26.32	76.52	445.
122	20.08921	15.95	5.38	−783.5	−534.6	106.55	26.35	81.11	419.
124	19.37648	12.92	4.88	−624.4	−366.4	107.92	26.43	87.42	391.
126	18.56461	10.00	4.38	−452.3	−183.0	109.38	26.56	96.60	360.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
128	17.60369	7.24	3.84	−260.6	23.4	111.01	26.77	110.95	327.
130	16.40274	4.78	3.27	−37.6	267.2	112.90	27.12	135.04	291.
132	14.81498	2.91	2.65	235.9	573.4	115.23	27.69	173.05	255.
134	12.82891	2.02	2.07	563.7	953.4	118.09	28.29	200.80	226.
136	10.92077	1.92	1.64	889.6	1347.5	121.01	28.40	187.73	213.
138	9.45930	2.21	1.35	1163.5	1692.1	123.53	27.96	155.90	210.
140	8.42562	2.68	1.16	1379.6	1973.1	125.55	27.32	126.40	210.
142	7.68344	3.22	1.03	1552.6	2203.3	127.18	26.69	105.19	213.
144	7.12514	3.77	0.9260	1696.5	2398.2	128.54	26.13	90.58	216.
146	6.68589	4.31	0.8490	1820.7	2568.5	129.72	25.65	80.27	219.
148	6.32760	4.82	0.7873	1930.9	2721.1	130.76	25.22	72.72	223.
150	6.02707	5.32	0.7365	2031.0	2860.6	131.69	24.86	66.99	226.
155	5.44247	6.45	0.6404	2250.6	3169.3	133.72	24.12	57.38	234.
160	5.00771	7.48	0.5718	2442.0	3440.4	135.44	23.57	51.47	241.
165	4.66470	8.42	0.5198	2615.3	3687.2	136.96	23.15	47.47	248.
170	4.38323	9.30	0.4785	2776.3	3917.0	138.33	22.82	44.60	255.
175	4.14573	10.13	0.4448	2928.3	4134.4	139.59	22.56	42.45	261.
180	3.94113	10.91	0.4165	3073.6	4342.3	140.76	22.35	40.77	267.
185	3.76201	11.66	0.3924	3213.6	4542.7	141.86	22.17	39.43	272.
190	3.60318	12.38	0.3714	3349.3	4737.0	142.90	22.03	38.34	277.
195	3.46087	13.07	0.3531	3481.6	4926.3	143.88	21.90	37.43	282.
200	3.33227	13.74	0.3368	3611.1	5111.5	144.82	21.80	36.67	287.
210	3.10794	15.03	0.3091	3863.1	5471.8	146.58	21.64	35.45	297.
220	2.91776	16.26	0.2863	4108.0	5821.6	148.21	21.51	34.54	305.
230	2.75363	17.45	0.2671	4347.5	6163.3	149.72	21.42	33.82	314.
240	2.60997	18.59	0.2507	4582.8	6498.5	151.15	21.34	33.25	322.
250	2.48279	19.70	0.2364	4814.8	6828.7	152.50	21.28	32.79	329.
260	2.36912	20.79	0.2239	5044.1	7154.6	153.78	21.23	32.40	336.
270	2.26672	21.85	0.2127	5271.1	7476.9	154.99	21.19	32.08	344.
280	2.17386	22.89	0.2028	5496.2	7796.3	156.16	21.16	31.80	350.
290	2.08913	23.91	0.1938	5719.8	8113.1	157.27	21.13	31.57	357.
300	2.01144	24.92	0.1856	5942.0	8427.8	158.33	21.11	31.37	364.
310	1.93987	25.91	0.1782	6163.1	8740.5	159.36	21.10	31.19	370.
320	1.87368	26.90	0.1714	6383.1	9051.7	160.35	21.08	31.04	376.
330	1.81224	27.87	0.1651	6602.3	9361.4	161.30	21.07	30.90	382.
340	1.75502	28.83	0.1593	6820.8	9669.8	162.22	21.07	30.79	388.
350	1.70157	29.78	0.1540	7038.7	9977.1	163.11	21.06	30.68	394.
360	1.65151	30.73	0.1490	7256.0	10283.5	163.98	21.06	30.60	399.
370	1.60451	31.66	0.1443	7472.9	10589.1	164.81	21.07	30.52	405.
380	1.56029	32.60	0.1399	7689.4	10893.9	165.63	21.07	30.45	410.
390	1.51858	33.52	0.1358	7905.6	11198.2	166.42	21.08	30.39	415.
400	1.47916	34.44	0.1320	8121.6	11501.8	167.18	21.09	30.34	421.
420	1.40649	36.27	0.1250	8553.0	12107.9	168.66	21.13	30.27	431.
440	1.34094	38.07	0.1187	8984.1	12712.8	170.07	21.17	30.22	440.
460	1.28149	39.87	0.1130	9415.3	13317.0	171.41	21.22	30.20	450.
480	1.22729	41.65	0.1079	9847.0	13921.0	172.70	21.29	30.20	459.
500	1.17764	43.41	0.1032	10279.3	14525.1	173.93	21.36	30.22	468.
520	1.13199	45.17	0.0990	10712.7	15129.7	175.12	21.45	30.25	477.
540	1.08985	46.92	0.0951	11147.3	15735.1	176.26	21.54	30.30	485.
560	1.05082	48.66	0.0915	11583.5	16341.6	177.36	21.64	30.36	494.
580	1.01457	50.40	0.0881	12021.2	16949.4	178.43	21.74	30.43	502.
600	0.98079	52.13	0.0850	12460.8	17558.8	179.46	21.86	30.51	510.
620	0.94924	53.85	0.0822	12902.4	18169.8	180.46	21.97	30.60	517.
640	0.91970	55.57	0.0795	13346.1	18782.7	181.44	22.09	30.69	525.
660	0.89197	57.29	0.0770	13792.1	19397.6	182.38	22.22	30.80	532.
680	0.86590	59.00	0.0746	14240.3	20014.6	183.30	22.34	30.90	540.
700	0.84134	60.71	0.0724	14690.8	20633.8	184.20	22.47	31.01	547.
720	0.81815	62.41	0.0703	15143.8	21255.2	185.08	22.60	31.13	554.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
740	0.79623	64.11	0.0684	15599.3	21878.9	185.93	22.74	31.25	561.
760	0.77547	65.81	0.0665	16057.3	22505.0	186.77	22.87	31.36	568.
780	0.75578	67.51	0.0648	16517.7	23133.5	187.58	23.00	31.48	574.
800	0.73707	69.20	0.0631	16980.7	23764.3	188.38	23.13	31.60	581.
850	0.69417	73.43	0.0593	18149.1	25352.0	190.30	23.46	31.90	597.
900	0.65603	77.64	0.0559	19333.0	26954.5	192.14	23.77	32.20	613.
950	0.62190	81.85	0.0529	20531.8	28571.6	193.89	24.07	32.48	628.
1000	0.59118	86.05	0.0502	21745.1	30202.8	195.56	24.36	32.76	643.
1050	0.56336	90.24	0.0478	22972.1	31847.3	197.16	24.64	33.02	657.
1100	0.53806	94.43	0.0456	24212.1	33504.7	198.71	24.90	33.27	671.
1150	0.51495	98.61	0.0436	25464.4	35174.0	200.19	25.14	33.50	685.
1200	0.49375	102.79	0.0418	26728.3	36854.8	201.62	25.37	33.72	698.
1250	0.47424	106.96	0.0401	28003.0	38546.2	203.00	25.58	33.93	712.
1300	0.45621	111.14	0.0385	29287.9	40247.7	204.34	25.78	34.13	725.
1350	0.43951	115.31	0.0371	30582.3	41958.6	205.63	25.97	34.31	737.
1400	0.42399	119.48	0.0356	31885.6	43678.2	206.88	26.14	34.48	750.
1450	0.40954	123.64	0.0345	33197.2	45406.1	208.09	26.30	34.64	762.
1500	0.39604	127.81	0.0334	34516.7	47141.7	209.27	26.45	34.79	775.
1550	0.38340	131.97	0.0323	35843.4	48884.6	210.41	26.60	34.93	787.
1600	0.37155	136.14	0.0313	37177.0	50634.2	211.52	26.73	35.06	798.
1650	0.36041	140.30	0.0303	38516.9	52390.1	212.60	26.86	35.18	810.
1700	0.34992	144.46	0.0294	39862.9	54152.0	213.65	26.97	35.29	821.
1750	0.34002	148.62	0.0286	41214.4	55919.5	214.68	27.08	35.40	833.
1800	0.33067	152.78	0.0278	42571.3	57692.2	215.68	27.18	35.50	844.
1850	0.32182	156.94	0.0270	43933.1	59469.8	216.65	27.28	35.60	855.
1900	0.31343	161.10	0.0263	45299.5	61252.0	217.60	27.37	35.69	866.
1950	0.30547	165.25	0.0256	46670.4	63038.6	218.53	27.46	35.77	877.
2000	0.29790	169.41	0.0250	48045.3	64829.3	219.44	27.54	35.85	887.

60 bar Isobar

* 64.457	31.05868	242.73	29.62	−4191.2	−3998.0	68.33			
66	30.86803	224.25	28.05	−4108.3	−3913.9	69.62			
68	30.61388	203.42	26.25	−3999.7	−3803.7	71.27			
70	30.35189	185.52	24.66	−3890.4	−3692.7	72.88			
72	30.08226	170.01	23.24	−3780.7	−3581.2	74.45	30.52	55.79	1053.
74	29.80527	156.46	21.95	−3670.9	−3469.6	75.98	30.21	55.86	1016.
76	29.52124	144.51	20.77	−3561.1	−3357.8	77.47	29.86	55.89	983.
78	29.23047	133.87	19.68	−3451.3	−3246.0	78.92	29.49	55.91	952.
80	28.93323	124.31	18.67	−3341.6	−3134.2	80.33	29.14	55.94	923.
82	28.62970	115.64	17.73	−3231.8	−3022.3	81.72	28.80	56.00	896.
84	28.31999	107.71	16.85	−3122.0	−2910.2	83.07	28.49	56.09	870.
86	28.00410	100.40	16.01	−3012.1	−2797.9	84.39	28.21	56.22	845.
88	27.68194	93.61	15.23	−2902.0	−2685.3	85.68	27.96	56.41	821.
90	27.35332	87.27	14.48	−2791.6	−2572.2	86.95	27.73	56.65	798.
92	27.01799	81.32	13.78	−2680.7	−2458.6	88.20	27.53	56.95	775.
94	26.67557	75.71	13.10	−2569.3	−2344.4	89.43	27.36	57.31	752.
96	26.32562	70.40	12.46	−2457.3	−2229.4	90.64	27.20	57.73	730.
98	25.96760	65.37	11.84	−2344.5	−2113.4	91.83	27.06	58.23	709.
100	25.60090	60.58	11.25	−2230.8	−1996.4	93.02	26.94	58.79	687.
102	25.22480	56.03	10.68	−2116.1	−1878.2	94.19	26.83	59.44	666.
104	24.83845	51.69	10.13	−2000.2	−1758.6	95.35	26.73	60.17	644.
106	24.44088	47.55	9.59	−1883.0	−1637.5	96.50	26.64	60.99	623.
108	24.03095	43.59	9.08	−1764.2	−1514.6	97.65	26.56	61.93	602.
110	23.60728	39.80	8.58	−1643.8	−1389.7	98.80	26.49	62.99	581.
112	23.16820	36.17	8.09	−1521.5	−1262.5	99.94	26.43	64.21	560.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
114	22.71167	32.69	7.62	−1396.9	−1132.7	101.09	26.38	65.61	539.
116	22.23510	29.34	7.15	−1269.8	−999.9	102.25	26.33	67.25	517.
118	21.73520	26.11	6.70	−1139.6	−863.5	103.41	26.30	69.19	495.
120	21.20769	23.00	6.25	−1005.8	−722.9	104.59	26.28	71.52	473.
122	20.64688	20.00	5.80	−867.7	−577.1	105.80	26.27	74.39	450.
124	20.04506	17.12	5.35	−724.2	−424.9	107.04	26.28	77.97	426.
126	19.39162	14.36	4.91	−573.9	−264.5	108.32	26.32	82.56	401.
128	18.67166	11.74	4.46	−415.0	−93.7	109.66	26.39	88.57	375.
130	17.86434	9.31	4.00	−244.8	91.1	111.10	26.50	96.61	348.
132	16.94186	7.15	3.54	−59.6	294.5	112.65	26.68	107.31	320.
134	15.87455	5.37	3.07	144.2	522.1	114.36	26.91	120.60	293.
136	14.65643	4.11	2.63	367.5	776.8	116.25	27.19	133.56	268.
138	13.35255	3.42	2.23	602.6	1051.9	118.25	27.42	139.99	249.
140	12.09003	3.17	1.91	834.2	1330.5	120.26	27.48	137.24	238.
142	10.96879	3.20	1.65	1049.7	1596.7	122.15	27.32	128.23	231.
144	10.02413	3.40	1.46	1243.1	1841.6	123.86	27.00	116.47	229.
146	9.24773	3.72	1.30	1413.7	2062.5	125.38	26.60	104.58	229.
148	8.61237	4.11	1.18	1564.2	2260.8	126.73	26.18	94.00	230.
150	8.08802	4.54	1.08	1697.9	2439.7	127.93	25.77	85.15	231.
155	7.10941	5.64	0.9066	1979.2	2823.2	130.45	24.89	69.58	237.
160	6.42377	6.71	0.7878	2211.5	3145.5	132.50	24.21	60.07	244.
165	5.90777	7.72	0.7020	2413.7	3429.3	134.24	23.68	53.87	250.
170	5.49929	8.66	0.6365	2596.3	3687.3	135.78	23.27	49.57	257.
175	5.16405	9.55	0.5847	2765.1	3927.0	137.17	22.94	46.44	263.
180	4.88146	10.39	0.5423	2923.8	4153.0	138.45	22.67	44.06	268.
185	4.63838	11.19	0.5069	3074.9	4368.4	139.63	22.45	42.20	274.
190	4.42591	11.95	0.4767	3220.0	4575.6	140.73	22.27	40.71	279.
195	4.23780	12.69	0.4506	3360.2	4776.0	141.77	22.12	39.50	284.
200	4.06951	13.40	0.4278	3496.5	4970.9	142.76	22.00	38.49	289.
210	3.77951	14.76	0.3895	3760.0	5347.5	144.60	21.80	36.91	299.
220	3.53688	16.05	0.3586	4014.0	5710.4	146.29	21.65	35.73	308.
230	3.32958	17.29	0.3329	4261.0	6063.0	147.85	21.53	34.83	316.
240	3.14960	18.48	0.3112	4502.6	6407.6	149.32	21.44	34.12	324.
250	2.99130	19.64	0.2925	4740.0	6745.8	150.70	21.37	33.54	332.
260	2.85060	20.76	0.2761	4973.9	7078.8	152.01	21.31	33.06	339.
270	2.72442	21.86	0.2618	5205.1	7407.4	153.25	21.27	32.67	346.
280	2.61042	22.93	0.2490	5433.9	7732.3	154.43	21.23	32.33	353.
290	2.50675	23.99	0.2375	5660.7	8054.2	155.56	21.20	32.05	360.
300	2.41196	25.02	0.2271	5885.8	8373.4	156.64	21.17	31.80	366.
310	2.32486	26.04	0.2177	6109.6	8690.4	157.68	21.15	31.59	373.
320	2.24447	27.05	0.2091	6332.1	9005.3	158.68	21.13	31.40	379.
330	2.16999	28.04	0.2012	6553.5	9318.5	159.64	21.12	31.24	385.
340	2.10074	29.03	0.1940	6774.1	9630.2	160.58	21.11	31.10	391.
350	2.03616	30.00	0.1873	6993.9	9940.6	161.47	21.11	30.98	396.
360	1.97574	30.96	0.1810	7213.0	10249.8	162.35	21.11	30.87	402.
370	1.91909	31.92	0.1752	7431.5	10558.0	163.19	21.11	30.77	408.
380	1.86583	32.87	0.1698	7649.6	10865.3	164.01	21.11	30.69	413.
390	1.81565	33.81	0.1647	7867.2	11171.8	164.81	21.12	30.62	418.
400	1.76828	34.74	0.1600	8084.6	11477.7	165.58	21.13	30.56	423.
420	1.68101	36.59	0.1513	8518.5	12087.8	167.07	21.16	30.46	434.
440	1.60240	38.42	0.1436	8951.9	12696.2	168.48	21.20	30.39	443.
460	1.53118	40.24	0.1366	9385.1	13303.6	169.83	21.25	30.35	453.
480	1.46629	42.04	0.1303	9818.5	13910.5	171.13	21.32	30.34	462.
500	1.40691	43.82	0.1246	10252.6	14517.2	172.36	21.39	30.34	471.
520	1.35233	45.60	0.1194	10687.5	15124.2	173.55	21.47	30.36	480.
540	1.30198	47.36	0.1146	11123.5	15731.8	174.70	21.56	30.40	488.
560	1.25536	49.12	0.1103	11560.9	16340.4	175.81	21.66	30.45	497.
580	1.21207	50.87	0.1062	11999.8	16950.0	176.88	21.76	30.52	505.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
600	1.17175	52.61	0.1024	12440.5	17561.1	177.91	21.87	30.59	512.
620	1.13409	54.34	0.0989	12883.1	18173.7	178.92	21.99	30.67	520.
640	1.09884	56.07	0.0957	13327.8	18788.1	179.89	22.11	30.76	528.
660	1.06576	57.80	0.0926	13774.6	19404.4	180.84	22.23	30.86	535.
680	1.03466	59.51	0.0898	14223.6	20022.6	181.76	22.36	30.97	542.
700	1.00536	61.23	0.0871	14675.0	20643.0	182.66	22.49	31.07	550.
720	0.97771	62.94	0.0846	15128.7	21265.5	183.54	22.62	31.18	557.
740	0.95156	64.65	0.0822	15584.9	21890.3	184.40	22.75	31.30	563.
760	0.92680	66.35	0.0800	16043.5	22517.4	185.23	22.88	31.41	570.
780	0.90331	68.06	0.0779	16504.6	23146.8	186.05	23.01	31.53	577.
800	0.88100	69.76	0.0758	16968.1	23778.5	186.85	23.14	31.65	583.
850	0.82984	73.99	0.0713	18137.9	25368.2	188.78	23.47	31.94	600.
900	0.78436	78.22	0.0672	19322.9	26972.4	190.61	23.78	32.23	615.
950	0.74365	82.43	0.0636	20522.7	28591.0	192.36	24.08	32.51	630.
1000	0.70700	86.64	0.0604	21736.9	30223.5	194.03	24.37	32.78	645.
1050	0.67382	90.84	0.0574	22964.7	31869.2	195.64	24.65	33.04	659.
1100	0.64363	95.03	0.0548	24205.5	33527.6	197.18	24.90	33.29	673.
1150	0.61605	99.22	0.0524	25458.5	35197.9	198.67	25.15	33.52	687.
1200	0.59075	103.40	0.0502	26722.9	36879.5	200.10	25.37	33.74	701.
1250	0.56746	107.58	0.0481	27998.2	38571.7	201.48	25.59	33.95	714.
1300	0.54594	111.76	0.0463	29283.6	40273.8	202.82	25.79	34.14	727.
1350	0.52600	115.93	0.0445	30578.5	41985.3	204.11	25.97	34.32	739.
1400	0.50747	120.10	0.0429	31882.2	43705.5	205.36	26.15	34.49	752.
1450	0.49021	124.27	0.0414	33194.2	45433.9	206.57	26.31	34.65	764.
1500	0.47409	128.44	0.0401	34514.0	47170.0	207.75	26.46	34.79	776.
1550	0.45899	132.60	0.0388	35841.1	48913.2	208.89	26.60	34.93	788.
1600	0.44483	136.77	0.0375	37175.0	50663.2	210.00	26.74	35.06	800.
1650	0.43152	140.93	0.0364	38515.2	52419.5	211.08	26.86	35.19	812.
1700	0.41899	145.09	0.0353	39861.5	54181.7	212.14	26.98	35.30	823.
1750	0.40716	149.25	0.0343	41213.3	55949.4	213.16	27.09	35.41	835.
1800	0.39599	153.41	0.0333	42570.4	57722.4	214.16	27.19	35.51	846.
1850	0.38541	157.57	0.0324	43932.4	59500.2	215.13	27.29	35.60	857.
1900	0.37538	161.73	0.0316	45299.1	61282.7	216.09	27.38	35.69	868.
1950	0.36587	165.88	0.0308	46670.1	63069.5	217.01	27.46	35.78	878.
2000	0.35682	170.04	0.0300	48045.2	64860.3	217.92	27.54	35.86	889.

70 bar Isobar

* 64.673	31.07365	243.31	29.28	−4187.5	−3962.3	68.39			
66	30.91230	227.51	27.96	−4116.6	−3890.1	69.49			
68	30.66266	206.62	26.19	−4008.6	−3780.3	71.13			
70	30.40534	188.67	24.63	−3900.0	−3669.7	72.73			
72	30.14055	173.11	23.24	−3791.0	−3558.8	74.30	30.83	55.54	1055.
74	29.86856	159.53	21.97	−3682.0	−3447.6	75.82	30.50	55.61	1019.
76	29.58972	147.55	20.82	−3573.0	−3336.4	77.30	30.13	55.63	986.
78	29.30434	136.89	19.75	−3464.0	−3225.1	78.75	29.75	55.63	956.
80	29.01271	127.33	18.76	−3355.1	−3113.8	80.16	29.38	55.65	928.
82	28.71507	118.66	17.83	−3246.3	−3002.5	81.53	29.03	55.69	901.
84	28.41155	110.73	16.97	−3137.5	−2891.1	82.87	28.70	55.75	876.
86	28.10222	103.43	16.15	−3028.6	−2779.5	84.19	28.41	55.86	852.
88	27.78705	96.66	15.37	−2919.5	−2667.6	85.47	28.15	56.02	829.
90	27.46594	90.34	14.64	−2810.2	−2555.4	86.73	27.91	56.22	806.
92	27.13868	84.41	13.95	−2700.6	−2442.7	87.97	27.70	56.48	784.
94	26.80500	78.82	13.28	−2590.6	−2329.4	89.19	27.51	56.79	762.
96	26.46457	73.54	12.65	−2480.0	−2215.5	90.39	27.34	57.15	741.
98	26.11698	68.54	12.04	−2368.8	−2100.8	91.57	27.19	57.58	720.
100	25.76174	63.78	11.46	−2256.9	−1985.1	92.74	27.06	58.07	699.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
102	25.39830	59.26	10.90	−2144.1	−1868.5	93.89	26.94	58.62	678.
104	25.02603	54.95	10.36	−2030.3	−1750.6	95.04	26.83	59.24	658.
106	24.64421	50.84	9.83	−1915.5	−1631.5	96.17	26.73	59.93	638.
108	24.25199	46.92	9.33	−1799.5	−1510.8	97.30	26.64	60.71	618.
110	23.84841	43.17	8.84	−1682.1	−1388.6	98.42	26.56	61.59	598.
112	23.43232	39.58	8.37	−1563.2	−1264.4	99.54	26.49	62.57	578.
114	23.00237	36.15	7.91	−1442.5	−1138.2	100.66	26.43	63.68	558.
116	22.55690	32.85	7.46	−1319.9	−1009.6	101.78	26.37	64.94	537.
118	22.09389	29.70	7.02	−1195.1	−878.3	102.90	26.32	66.39	517.
120	21.61085	26.66	6.59	−1067.8	−743.9	104.03	26.27	68.08	497.
122	21.10466	23.75	6.16	−937.5	−605.8	105.17	26.24	70.05	476.
124	20.57138	20.96	5.75	−803.7	−463.4	106.33	26.22	72.39	455.
126	20.00605	18.30	5.34	−665.8	−315.9	107.51	26.21	75.20	433.
128	19.40237	15.76	4.93	−523.0	−162.2	108.72	26.21	78.61	411.
130	18.75256	13.39	4.52	−374.3	−1.0	109.97	26.24	82.76	388.
132	18.04731	11.19	4.12	−218.5	169.4	111.27	26.29	87.79	365.
134	17.27676	9.24	3.72	−54.4	350.8	112.63	26.37	93.74	342.
136	16.43350	7.57	3.33	118.9	544.8	114.07	26.48	100.35	320.
138	15.51930	6.26	2.96	301.0	752.0	115.58	26.61	106.71	299.
140	14.55402	5.34	2.61	489.5	970.5	117.15	26.72	111.30	282.
142	13.57756	4.78	2.31	679.6	1195.1	118.75	26.79	112.78	268.
144	12.63647	4.51	2.05	865.5	1419.4	120.31	26.77	111.02	258.
146	11.76618	4.44	1.84	1042.7	1637.6	121.82	26.65	106.84	252.
148	10.98473	4.52	1.66	1208.6	1845.8	123.24	26.44	101.22	248.
150	10.29602	4.69	1.51	1362.2	2042.0	124.55	26.18	94.95	247.
155	8.93680	5.43	1.23	1695.0	2478.2	127.41	25.44	79.97	247.
160	7.96593	6.34	1.05	1969.1	2847.8	129.76	24.74	68.52	250.
165	7.24503	7.30	0.9185	2202.9	3169.1	131.74	24.15	60.46	255.
170	6.68590	8.24	0.8210	2409.4	3456.4	133.46	23.67	54.76	261.
175	6.23593	9.15	0.7454	2596.8	3719.3	134.98	23.29	50.61	266.
180	5.86310	10.02	0.6849	2770.3	3964.2	136.36	22.98	47.49	272.
185	5.54700	10.85	0.6352	2933.4	4195.4	137.63	22.72	45.08	277.
190	5.27409	11.65	0.5936	3088.6	4415.8	138.80	22.51	43.16	282.
195	5.03497	12.42	0.5580	3237.4	4627.6	139.90	22.33	41.62	287.
200	4.82293	13.16	0.5272	3381.0	4832.4	140.94	22.18	40.34	292.
210	4.46148	14.58	0.4764	3656.5	5225.5	142.86	21.95	38.37	302.
220	4.16257	15.92	0.4360	3920.0	5601.6	144.61	21.78	36.93	310.
230	3.90953	17.21	0.4028	4174.7	5965.2	146.23	21.64	35.83	319.
240	3.69141	18.44	0.3750	4422.8	6319.1	147.73	21.54	34.97	327.
250	3.50070	19.63	0.3513	4665.6	6665.2	149.14	21.46	34.28	335.
260	3.33200	20.79	0.3308	4904.3	7005.1	150.48	21.39	33.72	342.
270	3.18134	21.92	0.3128	5139.5	7339.9	151.74	21.34	33.25	349.
280	3.04568	23.02	0.2969	5372.0	7670.3	152.94	21.29	32.85	356.
290	2.92270	24.10	0.2828	5602.1	7997.2	154.09	21.26	32.52	363.
300	2.81052	25.16	0.2700	5830.2	8320.9	155.19	21.23	32.23	369.
310	2.70767	26.21	0.2585	6056.6	8641.9	156.24	21.20	31.98	376.
320	2.61293	27.24	0.2479	6281.6	8960.6	157.25	21.18	31.76	382.
330	2.52530	28.25	0.2383	6505.3	9277.2	158.23	21.17	31.57	388.
340	2.44395	29.25	0.2295	6727.9	9592.1	159.17	21.16	31.41	394.
350	2.36817	30.24	0.2214	6949.6	9905.4	160.07	21.15	31.26	399.
360	2.29738	31.22	0.2138	7170.4	10217.4	160.95	21.15	31.13	405.
370	2.23106	32.19	0.2068	7390.6	10528.1	161.80	21.15	31.02	411.
380	2.16877	33.16	0.2003	7610.2	10837.8	162.63	21.15	30.92	416.
390	2.11014	34.11	0.1942	7829.3	11146.6	163.43	21.15	30.84	421.
400	2.05482	35.06	0.1885	8048.0	11454.6	164.21	21.16	30.76	427.
420	1.95303	36.94	0.1780	8484.4	12068.6	165.71	21.19	30.64	437.
440	1.86144	38.79	0.1688	8919.9	12680.5	167.13	21.23	30.56	446.
460	1.77852	40.62	0.1605	9355.2	13291.0	168.49	21.28	30.50	456.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
480	1.70305	42.44	0.1530	9790.4	13900.7	169.79	21.34	30.47	465.
500	1.63402	44.25	0.1462	10226.1	14510.0	171.03	21.41	30.46	474.
520	1.57060	46.04	0.1400	10662.4	15119.3	172.23	21.49	30.47	483.
540	1.51212	47.81	0.1344	11099.8	15729.1	173.38	21.58	30.50	491.
560	1.45800	49.58	0.1292	11538.5	16339.6	174.49	21.68	30.55	499.
580	1.40775	51.34	0.1244	11978.6	16951.1	175.56	21.78	30.60	507.
600	1.36096	53.10	0.1200	12420.4	17563.8	176.60	21.89	30.67	515.
620	1.31727	54.84	0.1158	12864.0	18178.0	177.61	22.01	30.75	523.
640	1.27638	56.58	0.1120	13309.6	18793.8	178.58	22.13	30.83	531.
660	1.23802	58.31	0.1084	13757.3	19411.5	179.53	22.25	30.93	538.
680	1.20195	60.04	0.1050	14207.1	20031.0	180.46	22.38	31.03	545.
700	1.16798	61.76	0.1019	14659.3	20652.5	181.36	22.50	31.13	552.
720	1.13591	63.48	0.0989	15113.7	21276.2	182.24	22.63	31.24	559.
740	1.10559	65.19	0.0961	15570.6	21902.0	183.10	22.76	31.35	566.
760	1.07688	66.90	0.0935	16029.8	22530.0	183.93	22.90	31.46	573.
780	1.04965	68.61	0.0910	16491.5	23160.4	184.75	23.03	31.57	579.
800	1.02379	70.32	0.0886	16955.6	23793.0	185.55	23.16	31.69	586.
850	0.96447	74.56	0.0833	18126.7	25384.5	187.48	23.48	31.98	602.
900	0.91173	78.80	0.0785	19312.8	26990.5	189.32	23.79	32.26	618.
950	0.86453	83.02	0.0743	20513.7	28610.6	191.07	24.09	32.54	633.
1000	0.82202	87.24	0.0705	21728.8	30244.4	192.75	24.38	32.81	647.
1050	0.78354	91.44	0.0671	22957.4	31891.3	194.35	24.65	33.06	662.
1100	0.74853	95.64	0.0640	24198.9	33550.6	195.90	24.91	33.31	676.
1150	0.71653	99.83	0.0611	25452.6	35221.9	197.38	25.15	33.54	689.
1200	0.68718	104.02	0.0585	26717.6	36904.3	198.81	25.38	33.76	703.
1250	0.66014	108.20	0.0562	27993.5	38597.2	200.20	25.59	33.96	716.
1300	0.63517	112.38	0.0540	29279.4	40300.0	201.53	25.79	34.15	729.
1350	0.61203	116.55	0.0520	30574.7	42012.1	202.82	25.98	34.33	742.
1400	0.59052	120.73	0.0501	31878.8	43732.8	204.08	26.15	34.50	754.
1450	0.57048	124.90	0.0484	33191.3	45461.7	205.29	26.31	34.66	766.
1500	0.55176	129.07	0.0467	34511.4	47198.2	206.47	26.47	34.80	778.
1550	0.53423	133.23	0.0452	35838.8	48941.9	207.61	26.61	34.94	790.
1600	0.51778	137.40	0.0438	37173.0	50692.2	208.72	26.74	35.07	802.
1650	0.50232	141.56	0.0425	38513.6	52448.8	209.80	26.86	35.19	814.
1700	0.48776	145.72	0.0412	39860.1	54211.3	210.85	26.98	35.31	825.
1750	0.47402	149.88	0.0400	41212.1	55979.4	211.88	27.09	35.41	836.
1800	0.46104	154.04	0.0389	42569.5	57752.6	212.88	27.19	35.51	847.
1850	0.44875	158.20	0.0378	43931.7	59530.7	213.85	27.29	35.61	858.
1900	0.43710	162.36	0.0369	45298.6	61313.4	214.80	27.38	35.70	869.
1950	0.42604	166.52	0.0359	46669.8	63100.3	215.73	27.47	35.78	880.
2000	0.41552	170.67	0.0350	48045.1	64891.4	216.64	27.55	35.86	891.

80 bar Isobar

64.889	31.08896	243.92	28.94	−4183.8	−3926.5	68.44			
66	30.95594	230.77	27.86	−4124.6	−3866.2	69.36			
68	30.71069	209.82	26.13	−4017.3	−3756.8	71.00			
70	30.45791	191.81	24.60	−3909.3	−3646.7	72.59			
72	30.19780	176.21	23.23	−3801.1	−3536.2	74.15	31.13	55.31	1057.
74	29.93066	162.58	21.99	−3692.8	−3425.5	75.67	30.78	55.36	1022.
76	29.65680	150.58	20.86	−3584.5	−3314.7	77.14	30.40	55.37	990.
78	29.37659	139.90	19.82	−3476.3	−3204.0	78.58	30.00	55.37	960.
80	29.09034	130.32	18.84	−3368.3	−3093.3	79.98	29.61	55.37	933.
82	28.79830	121.65	17.93	−3260.3	−2982.5	81.35	29.25	55.39	907.
84	28.50065	113.73	17.08	−3152.4	−2871.7	82.69	28.91	55.44	882.
86	28.19752	106.44	16.28	−3044.4	−2760.7	83.99	28.60	55.53	859.
88	27.88892	99.68	15.52	−2936.4	−2649.5	85.27	28.32	55.65	836.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
90	27.57481	93.37	14.80	−2828.2	−2538.1	86.52	28.07	55.82	814.
92	27.25505	87.46	14.11	−2719.7	−2426.2	87.75	27.85	56.04	793.
94	26.92945	81.90	13.46	−2611.0	−2313.9	88.96	27.65	56.31	772.
96	26.59776	76.64	12.83	−2501.7	−2201.0	90.15	27.48	56.63	751.
98	26.25966	71.65	12.23	−2392.0	−2087.3	91.32	27.32	56.99	731.
100	25.91478	66.92	11.66	−2281.6	−1972.9	92.47	27.18	57.42	710.
102	25.56269	62.42	11.11	−2170.6	−1857.6	93.62	27.05	57.89	691.
104	25.20292	58.14	10.57	−2058.8	−1741.3	94.75	26.93	58.42	671.
106	24.83492	54.05	10.06	−1946.0	−1623.9	95.86	26.82	59.02	652.
108	24.45807	50.16	9.57	−1832.3	−1505.2	96.97	26.73	59.67	632.
110	24.07168	46.44	9.09	−1717.5	−1385.2	98.07	26.64	60.40	613.
112	23.67494	42.88	8.62	−1601.5	−1263.6	99.17	26.55	61.21	594.
114	23.26692	39.49	8.17	−1484.1	−1140.3	100.26	26.48	62.11	575.
116	22.84652	36.23	7.74	−1365.2	−1015.1	101.35	26.41	63.11	556.
118	22.41246	33.12	7.31	−1244.7	−887.8	102.44	26.34	64.24	537.
120	21.96320	30.14	6.89	−1122.3	−758.0	103.53	26.28	65.51	518.
122	21.49688	27.29	6.49	−997.7	−625.6	104.62	26.23	66.96	499.
124	21.01131	24.56	6.09	−870.8	−490.0	105.72	26.19	68.62	479.
126	20.50382	21.96	5.70	−741.1	−350.9	106.84	26.15	70.54	460.
128	19.97129	19.48	5.32	608.3	−207.7	107.97	26.12	72.75	440.
130	19.41008	17.14	4.94	−471.8	−59.7	109.11	26.11	75.32	420.
132	18.81613	14.96	4.57	−331.3	93.9	110.28	26.11	78.27	400.
134	18.18533	12.95	4.21	−186.2	253.7	111.49	26.12	81.63	380.
136	17.51422	11.15	3.86	−36.2	420.6	112.72	26.14	85.33	360.
138	16.80155	9.60	3.52	119.0	595.1	114.00	26.18	89.17	342.
140	16.05042	8.31	3.19	278.7	777.1	115.31	26.23	92.77	324.
142	15.27065	7.31	2.89	441.8	965.7	116.64	26.27	95.57	308.
144	14.47926	6.60	2.61	606.0	1158.5	117.99	26.29	97.06	295.
146	13.69754	6.14	2.36	768.8	1352.8	119.33	26.27	96.99	284.
148	12.94584	5.87	2.15	927.6	1545.5	120.64	26.21	95.49	276.
150	12.23933	5.76	1.96	1080.4	1734.1	121.91	26.09	92.88	271.
155	10.71560	5.94	1.60	1430.0	2176.6	124.81	25.63	83.75	263.
160	9.53248	6.52	1.35	1731.5	2570.7	127.31	25.05	74.06	262.
165	8.62266	7.29	1.17	1992.0	2919.7	129.46	24.49	65.84	264.
170	7.91117	8.14	1.03	2221.0	3232.2	131.33	24.01	59.44	268.
175	7.34053	9.00	0.9262	2426.8	3516.7	132.98	23.59	54.55	273.
180	6.87127	9.85	0.8440	2615.4	3779.7	134.46	23.25	50.81	277.
185	6.47681	10.69	0.7773	2791.0	4026.1	135.81	22.97	47.89	282.
190	6.13905	11.50	0.7219	2956.5	4259.6	137.06	22.73	45.58	287.
195	5.84539	12.28	0.6752	3114.1	4482.7	138.22	22.53	43.71	292.
200	5.58676	13.04	0.6351	3265.3	4697.3	139.30	22.36	42.18	296.
210	5.14970	14.50	0.5697	3553.1	5106.6	141.30	22.10	39.82	305.
220	4.79176	15.88	0.5183	3826.3	5495.8	143.11	21.90	38.11	314.
230	4.49108	17.20	0.4767	4088.9	5870.2	144.78	21.75	36.82	322.
240	4.23352	18.46	0.4422	4343.5	6233.1	146.32	21.63	35.81	330.
250	4.00946	19.69	0.4129	4591.8	6587.1	147.77	21.54	35.01	338.
260	3.81211	20.87	0.3878	4835.3	6933.8	149.13	21.47	34.36	345.
270	3.63648	22.03	0.3659	5074.7	7274.6	150.41	21.41	33.81	352.
280	3.47883	23.16	0.3466	5310.8	7610.4	151.63	21.36	33.36	359.
290	3.33627	24.26	0.3295	5544.2	7942.0	152.80	21.32	32.98	366.
300	3.20653	25.35	0.3142	5775.2	8270.1	153.91	21.28	32.64	373.
310	3.08781	26.41	0.3003	6004.3	8595.1	154.97	21.25	32.36	379.
320	2.97864	27.46	0.2878	6231.6	8917.4	156.00	21.23	32.11	385.
330	2.87781	28.49	0.2763	6457.5	9237.4	156.98	21.21	31.89	391.
340	2.78434	29.51	0.2659	6682.2	9555.4	157.93	21.20	31.70	397.
350	2.69737	30.52	0.2562	6905.7	9871.6	158.85	21.19	31.54	403.
360	2.61621	31.51	0.2473	7128.4	10186.2	159.73	21.19	31.39	408.
370	2.54024	32.50	0.2390	7350.2	10499.5	160.59	21.18	31.26	414.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
380	2.46895	33.47	0.2313	7571.3	10811.5	161.43	21.18	31.15	419.
390	2.40190	34.44	0.2241	7791.8	11122.5	162.23	21.19	31.05	424.
400	2.33868	35.40	0.2174	8011.8	11432.5	163.02	21.20	30.96	430.
420	2.22245	37.30	0.2052	8450.6	12050.3	164.53	21.22	30.82	440.
440	2.11797	39.17	0.1944	8888.4	12665.6	165.96	21.26	30.72	450.
460	2.02347	41.03	0.1847	9325.5	13279.1	167.32	21.31	30.65	459.
480	1.93751	42.86	0.1759	9762.6	13891.6	168.62	21.37	30.60	468.
500	1.85893	44.68	0.1681	10199.8	14503.4	169.87	21.44	30.58	477.
520	1.78677	46.49	0.1609	10637.7	15115.0	171.07	21.52	30.58	486.
540	1.72026	48.28	0.1543	11076.4	15726.9	172.23	21.60	30.60	494.
560	1.65872	50.06	0.1483	11516.3	16339.3	173.34	21.70	30.64	502.
580	1.60160	51.83	0.1427	11957.6	16952.6	174.42	21.80	30.69	510.
600	1.54843	53.59	0.1376	12400.5	17567.0	175.46	21.91	30.75	518.
620	1.49879	55.35	0.1328	12845.1	18182.7	176.47	22.03	30.82	526.
640	1.45233	57.09	0.1284	13291.6	18800.0	177.45	22.14	30.90	533.
660	1.40875	58.83	0.1242	13740.1	19418.9	178.40	22.27	30.99	541.
680	1.36778	60.57	0.1204	14190.8	20039.7	179.33	22.39	31.09	548.
700	1.32919	62.30	0.1167	14643.7	20662.4	180.23	22.52	31.19	555.
720	1.29277	64.02	0.1133	15098.8	21287.1	181.11	22.65	31.29	562.
740	1.25834	65.74	0.1101	15556.4	21913.9	181.97	22.78	31.40	569.
760	1.22573	67.46	0.1071	16016.2	22542.9	182.81	22.91	31.50	575.
780	1.19481	69.17	0.1042	16478.5	23174.1	183.62	23.04	31.62	582.
800	1.16544	70.88	0.1015	16943.2	23807.6	184.43	23.17	31.73	589.
850	1.09806	75.14	0.0953	18115.5	25401.1	186.36	23.49	32.01	605.
900	1.03817	79.39	0.0898	19302.8	27008.7	188.20	23.80	32.29	620.
950	0.98455	83.62	0.0850	20504.7	28630.3	189.95	24.10	32.57	635.
1000	0.93626	87.84	0.0806	21720.7	30265.3	191.63	24.39	32.83	650.
1050	0.89254	92.05	0.0767	22950.2	31913.4	193.24	24.66	33.09	664.
1100	0.85275	96.25	0.0731	24192.4	33573.8	194.78	24.92	33.33	678.
1150	0.81639	100.45	0.0699	25446.7	35245.9	196.27	25.16	33.56	692.
1200	0.78303	104.64	0.0669	26712.4	36929.1	197.70	25.39	33.77	705.
1250	0.75230	108.82	0.0642	27988.7	38622.8	199.08	25.60	33.97	718.
1300	0.72391	113.00	0.0617	29275.1	40326.2	200.42	25.80	34.16	731.
1350	0.69760	117.18	0.0594	30570.9	42038.9	201.71	25.98	34.34	744.
1400	0.67314	121.36	0.0573	31875.5	43760.2	202.96	26.16	34.51	756.
1450	0.65034	125.53	0.0553	33188.3	45489.5	204.18	26.32	34.66	768.
1500	0.62905	129.70	0.0534	34508.8	47226.5	205.35	26.47	34.81	780.
1550	0.60911	133.87	0.0517	35836.6	48970.6	206.50	26.61	34.95	792.
1600	0.59040	138.03	0.0501	37171.1	50721.3	207.61	26.74	35.08	804.
1650	0.57281	142.19	0.0485	38511.9	52478.2	208.69	26.87	35.20	815.
1700	0.55624	146.36	0.0471	39858.7	54241.0	209.74	26.99	35.31	827.
1750	0.54060	150.52	0.0457	41211.0	56009.4	210.77	27.09	35.42	838.
1800	0.52582	154.68	0.0445	42568.6	57782.8	211.77	27.20	35.52	849.
1850	0.51183	158.84	0.0433	43931.0	59561.2	212.74	27.29	35.61	860.
1900	0.49857	163.00	0.0421	45298.1	61344.1	213.69	27.38	35.70	871.
1950	0.48598	167.15	0.0410	46669.5	63131.2	214.62	27.47	35.78	882.
2000	0.47400	171.31	0.0400	48045.0	64922.5	215.53	27.55	35.86	892.
				90 bar Isobar					
* 65.103	31.10459	244.58	28.61	−4180.0	−3890.6	68.50			
66	30.99897	234.03	27.76	−4132.5	−3842.1	69.24			
68	30.75799	213.01	26.06	−4025.7	−3733.1	70.87			
70	30.50962	194.95	24.56	−3918.4	−3623.4	72.46			
72	30.25406	179.29	23.22	−3810.8	−3513.4	74.01	31.42	55.08	1059.
74	29.99159	165.63	22.01	−3703.2	−3403.1	75.52	31.06	55.13	1024.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
76	29.72256	153.59	20.90	−3595.7	−3292.9	76.99	30.65	55.13	993.
78	29.44732	142.89	19.88	−3488.3	−3182.7	78.42	30.24	55.11	964.
80	29.16621	133.29	18.92	−3381.0	−3072.4	79.81	29.84	55.10	937.
82	28.87951	124.61	18.03	−3273.9	−2962.2	81.18	29.46	55.11	912.
84	28.58746	116.69	17.19	−3166.8	−2852.0	82.50	29.10	55.14	888.
86	28.29018	109.41	16.40	−3059.8	−2741.6	83.80	28.78	55.21	866.
88	27.98777	102.66	15.65	−2952.7	−2631.1	85.07	28.49	55.31	843.
90	27.68022	96.37	14.94	−2845.5	−2520.4	86.32	28.23	55.45	822.
92	27.36746	90.47	14.27	−2738.1	−2409.3	87.54	28.00	55.64	801.
94	27.04935	84.93	13.62	−2630.5	−2297.8	88.74	27.79	55.87	781.
96	26.72571	79.68	13.01	−2522.5	−2185.8	89.92	27.61	56.14	761.
98	26.39631	74.72	12.42	−2414.1	−2073.2	91.08	27.44	56.46	741.
100	26.06086	70.01	11.85	−2305.2	−1959.9	92.22	27.29	56.83	721.
102	25.71903	65.53	11.31	−2195.8	−1845.8	93.35	27.15	57.24	702.
104	25.37046	61.26	10.78	−2085.6	−1730.9	94.47	27.02	57.70	683.
106	25.01473	57.20	10.28	−1974.8	−1615.0	95.57	26.91	58.21	665.
108	24.65139	53.32	9.79	−1863.1	−1498.0	96.66	26.80	58.77	646.
110	24.27993	49.62	9.32	−1750.6	−1379.9	97.75	26.71	59.38	628.
112	23.89978	46.09	8.87	−1637.0	−1260.5	98.82	26.62	60.06	609.
114	23.51028	42.72	8.43	−1522.4	−1139.6	99.89	26.53	60.80	591.
116	23.11070	39.50	8.00	−1406.6	−1017.2	100.96	26.45	61.61	573.
118	22.70017	36.42	7.58	−1289.6	−893.1	102.02	26.38	62.51	555.
120	22.27773	33.48	7.18	−1171.1	−767.1	103.08	26.31	63.51	537.
122	21.84222	30.67	6.78	−1051.0	−639.0	104.13	26.24	64.62	519.
124	21.39233	27.98	6.40	−929.2	−508.5	105.20	26.18	65.86	501.
126	20.92653	25.41	6.03	−805.5	−375.4	106.26	26.13	67.25	483.
128	20.44310	22.98	5.66	−679.6	−239.4	107.33	26.08	68.81	465.
130	19.94014	20.67	5.31	−551.4	−100.0	108.41	26.04	70.56	447.
132	19.41562	18.50	4.96	−420.5	43.0	109.50	26.00	72.52	429.
134	18.86756	16.47	4.62	−286.9	190.2	110.61	25.98	74.67	411.
136	18.29428	14.62	4.29	−150.1	341.8	111.73	25.96	77.01	393.
138	17.69492	12.95	3.96	10.4	498.3	112.88	25.95	79.45	376.
140	17.07014	11.48	3.66	132.4	659.6	114.04	25.95	81.88	360.
142	16.42291	10.24	3.36	277.6	825.6	115.21	25.95	84.09	344.
144	15.75926	9.23	3.09	424.6	995.7	116.40	25.94	85.84	330.
146	15.08826	8.44	2.83	572.0	1168.5	117.59	25.93	86.90	318.
148	14.42108	7.87	2.60	718.6	1342.7	118.78	25.90	87.13	307.
150	13.76921	7.47	2.39	862.9	1516.5	119.95	25.84	86.53	299.
155	12.26537	7.08	1.97	1205.8	1939.6	122.72	25.57	82.16	285.
160	10.99584	7.24	1.66	1516.0	2334.5	125.23	25.16	75.64	279.
165	9.96181	7.72	1.43	1792.2	2695.6	127.45	24.69	68.86	277.
170	9.12657	8.38	1.26	2038.3	3024.4	129.42	24.24	62.80	278.
175	8.44664	9.13	1.12	2259.9	3325.4	131.16	23.83	57.77	281.
180	7.88479	9.92	1.02	2462.3	3603.7	132.73	23.48	53.71	285.
185	7.41266	10.72	0.9318	2649.7	3863.8	134.15	23.18	50.45	289.
190	7.00951	11.51	0.8610	2825.3	4109.3	135.46	22.92	47.83	293.
195	6.66031	12.29	0.8015	2991.6	4342.9	136.68	22.71	45.69	297.
200	6.35402	13.05	0.7509	3150.4	4566.8	137.81	22.52	43.93	301.
210	5.83946	14.52	0.6690	3450.5	4991.7	139.89	22.23	41.22	310.
220	5.42106	15.92	0.6055	3733.4	5393.6	141.76	22.01	39.25	318.
230	5.07171	17.26	0.5545	4003.9	5778.4	143.47	21.85	37.77	326.
240	4.77396	18.55	0.5125	4265.0	6150.2	145.05	21.72	36.63	334.
250	4.51605	19.80	0.4772	4518.8	6511.7	146.52	21.62	35.71	342.
260	4.28968	21.01	0.4470	4767.0	6865.1	147.91	21.54	34.97	349.
270	4.08884	22.19	0.4209	5010.5	7211.6	149.22	21.47	34.36	356.
280	3.90903	23.34	0.3980	5250.3	7552.7	150.46	21.42	33.85	363.
290	3.74679	24.46	0.3777	5486.9	7888.9	151.64	21.37	33.42	370.
300	3.59943	25.57	0.3596	5720.8	8221.2	152.77	21.33	33.05	376.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
310	3.46481	26.65	0.3434	5952.5	8550.1	153.84	21.30	32.73	382.
320	3.34120	27.71	0.3286	6182.3	8875.9	154.88	21.28	32.45	388.
330	3.22720	28.76	0.3153	6410.4	9199.2	155.87	21.26	32.21	394.
340	3.12162	29.79	0.3030	6637.0	9520.2	156.83	21.24	31.99	400.
350	3.02350	30.82	0.2918	6862.5	9839.1	157.76	21.23	31.81	406.
360	2.93201	31.82	0.2814	7086.8	10156.4	158.65	21.22	31.64	412.
370	2.84645	32.82	0.2718	7310.2	10472.1	159.51	21.22	31.50	417.
380	2.76622	33.81	0.2629	7532.8	10786.4	160.35	21.22	31.37	422.
390	2.69080	34.79	0.2546	7754.7	11099.5	161.17	21.22	31.26	428.
400	2.61974	35.76	0.2468	7976.1	11411.5	161.96	21.23	31.16	433.
420	2.48919	37.68	0.2327	8417.3	12032.9	163.47	21.25	30.99	443.
440	2.37195	39.58	0.2202	8857.2	12651.5	164.91	21.29	30.87	453.
460	2.26598	41.45	0.2091	9296.3	13268.1	166.28	21.33	30.79	462.
480	2.16965	43.30	0.1991	9735.0	13883.2	167.59	21.39	30.73	471.
500	2.08163	45.13	0.1901	10173.9	14497.4	168.84	21.46	30.70	480.
520	2.00084	46.95	0.1819	10613.2	15111.3	170.05	21.54	30.69	489.
540	1.92639	48.75	0.1744	11053.3	15725.2	171.21	21.63	30.70	497.
560	1.85753	50.54	0.1675	11494.4	16339.5	172.32	21.72	30.73	505.
580	1.79363	52.33	0.1612	11936.8	16954.6	173.40	21.82	30.77	513.
600	1.73415	54.10	0.1553	12380.7	17570.6	174.45	21.93	30.83	521.
620	1.67864	55.86	0.1499	12826.3	18187.8	175.46	22.04	30.90	529.
640	1.62669	57.62	0.1449	13273.7	18806.4	176.44	22.16	30.97	536.
660	1.57796	59.36	0.1402	13723.1	19426.7	177.39	22.28	31.05	543.
680	1.53216	61.11	0.1358	14174.6	20048.6	178.32	22.41	31.14	551.
700	1.48901	62.84	0.1316	14628.2	20672.5	179.23	22.53	31.24	558.
720	1.44830	64.57	0.1278	15084.1	21298.3	180.11	22.66	31.34	565.
740	1.40981	66.30	0.1241	15542.3	21926.1	180.97	22.79	31.44	571.
760	1.37336	68.02	0.1207	16002.8	22556.1	181.81	22.92	31.55	578.
780	1.33879	69.74	0.1174	16465.6	23188.1	182.63	23.05	31.66	585.
800	1.30595	71.45	0.1144	16930.9	23822.4	183.43	23.18	31.77	591.
850	1.23063	75.72	0.1074	18104.5	25417.8	185.37	23.50	32.05	607.
900	1.16367	79.98	0.1012	19292.9	27027.1	187.21	23.81	32.32	622.
950	1.10372	84.22	0.0957	20495.8	28650.1	188.96	24.11	32.59	637.
1000	1.04972	88.44	0.0908	21712.7	30286.4	190.64	24.40	32.86	652.
1050	1.00082	92.66	0.0864	22943.0	31935.6	192.25	24.67	33.11	666.
1100	0.95632	96.87	0.0823	24185.9	33597.0	193.80	24.93	33.35	680.
1150	0.91564	101.07	0.0787	25440.9	35270.0	195.28	25.17	33.57	694.
1200	0.87831	105.26	0.0754	26707.1	36954.0	196.72	25.39	33.79	707.
1250	0.84393	109.45	0.0723	27984.0	38648.4	198.10	25.61	33.99	720.
1300	0.81216	113.63	0.0695	29270.9	40352.5	199.44	25.80	34.18	733.
1350	0.78270	117.81	0.0669	30567.2	42065.8	200.73	25.99	34.35	746.
1400	0.75532	121.99	0.0645	31872.2	43787.6	201.98	26.16	34.52	758.
1450	0.72980	126.16	0.0622	33185.4	45517.4	203.20	26.32	34.67	770.
1500	0.70596	130.33	0.0601	34506.3	47254.8	204.37	26.48	34.82	782.
1550	0.68363	134.50	0.0582	35834.3	48999.3	205.52	26.62	34.96	794.
1600	0.66268	138.67	0.0563	37169.1	50750.4	206.63	26.75	35.09	806.
1650	0.64298	142.83	0.0546	38510.2	52507.7	207.71	26.87	35.21	817.
1700	0.62441	146.99	0.0530	39857.3	54270.8	208.76	26.99	35.32	829.
1750	0.60690	151.16	0.0515	41209.9	56039.4	209.79	27.10	35.42	840.
1800	0.59034	155.32	0.0500	42567.6	57813.1	210.79	27.20	35.52	851.
1850	0.57466	159.47	0.0487	43930.3	59591.7	211.76	27.30	35.62	862.
1900	0.55980	163.63	0.0474	45297.6	61374.8	212.71	27.39	35.71	873.
1950	0.54569	167.79	0.0462	46669.2	63162.2	213.64	27.47	35.79	883.
2000	0.53227	171.95	0.0450	48044.9	64953.6	214.55	27.55	35.87	894.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
				100 bar Isobar					
* 65.318	31.12052	245.27	28.29	−4176.1	−3854.8	60.56			
66	31.04140	237.29	27.67	−4140.1	−3818.0	69.12			
68	30.80458	216.21	26.00	−4034.0	−3709.4	70.74			
70	30.56051	198.08	24.53	−3927.3	−3600.1	72.32			
72	30.30936	182.38	23.22	−3820.4	−3490.4	73.87	31.70	54.86	1061.
74	30.05142	168.66	22.03	−3713.4	−3380.7	75.37	31.32	54.90	1027.
76	29.78704	156.59	20.94	−3606.6	−3270.9	76.84	30.90	54.89	996.
78	29.51659	145.86	19.94	−3499.9	−3161.1	78.26	30.47	54.87	968.
80	29.24041	136.25	19.00	−3393.4	−3051.4	79.65	30.05	54.85	942.
82	28.95883	127.56	18.13	−3287.0	−2941.7	81.00	29.66	54.84	918.
84	28.67209	119.64	17.30	−3180.8	−2832.0	82.33	29.29	54.86	894.
86	28.38038	112.35	16.52	−3074.6	−2722.2	83.62	28.96	54.91	872.
88	28.08381	105.61	15.79	−2968.4	−2612.4	84.88	28.66	54.99	851.
90	27.78242	99.33	15.09	−2862.2	−2502.3	86.12	28.39	55.11	830.
92	27.47620	93.45	14.42	−2755.8	−2391.9	87.33	28.14	55.27	809.
94	27.16507	87.92	13.79	−2649.3	−2281.2	88.52	27.92	55.46	790.
96	26.84889	82.69	13.18	−2542.5	−2170.0	89.69	27.73	55.70	770.
98	26.52750	77.74	12.60	−2435.3	−2058.3	90.84	27.55	55.98	751.
100	26.20068	73.05	12.04	−2327.7	−1946.1	91.98	27.39	56.30	732.
102	25.86818	68.58	11.50	−2219.7	−1833.1	93.09	27.25	56.65	713.
104	25.52972	64.33	10.99	−2111.1	−1719.4	94.20	27.12	57.05	695.
106	25.18500	60.28	10.49	−2002.0	−1604.9	95.29	26.99	57.49	677.
108	24.83366	56.42	10.01	−1892.1	−1489.4	96.37	26.88	57.97	659.
110	24.47535	52.74	9.55	−1781.6	−1373.0	97.44	26.78	58.50	641.
112	24.10963	49.23	9.10	−1670.2	−1255.4	98.50	26.68	59.07	624.
114	23.73607	45.88	8.66	−1558.0	−1136.7	99.55	26.58	59.69	606.
116	23.35414	42.68	8.24	−1444.8	−1016.7	100.59	26.50	60.36	589.
118	22.96327	39.62	7.84	−1330.7	−895.2	101.63	26.41	61.09	572.
120	22.56282	36.70	7.44	−1215.4	−772.2	102.66	26.33	61.89	555.
122	22.15207	33.92	7.06	−1099.0	−647.6	103.69	26.26	62.77	538.
124	21.73020	31.26	6.68	−981.3	−521.1	104.72	26.19	63.73	521.
126	21.29629	28.72	6.32	−862.2	−392.6	105.75	26.12	64.78	504.
128	20.84934	26.31	5.97	−741.5	−261.9	106.78	26.06	65.94	487.
130	20.38830	24.02	5.63	−619.2	−128.8	107.81	26.00	67.21	471.
132	19.91208	21.86	5.29	−495.2	7.0	108.85	25.95	68.59	454.
134	19.41963	19.83	4.97	−369.2	145.7	109.89	25.90	70.09	438.
136	18.91011	17.95	4.65	−241.4	287.5	110.94	25.86	71.69	421.
138	18.38307	16.22	4.35	−111.5	432.5	112.00	25.82	73.36	406.
140	17.83872	14.66	4.05	20.3	580.9	113.06	25.79	75.03	390.
142	17.27828	13.27	3.77	153.8	732.6	114.14	25.76	76.64	376.
144	16.70431	12.08	3.50	288.7	887.3	115.22	25.73	78.06	362.
146	16.12090	11.08	3.25	424.3	1044.7	116.31	25.69	79.18	349.
148	15.53361	10.26	3.01	560.0	1203.8	117.39	25.66	79.89	338.
150	14.94906	9.62	2.80	694.9	1363.9	118.46	25.61	80.10	328.
155	13.54356	8.68	2.33	1023.1	1761.5	121.07	25.42	78.46	309.
160	12.28063	8.42	1.98	1330.3	2144.6	123.51	25.13	74.54	299.
165	11.19491	8.57	1.71	1611.9	2505.1	125.72	24.76	69.58	293.
170	10.28200	8.99	1.50	1867.8	2840.3	127.73	24.37	64.54	292.
175	9.51909	9.57	1.33	2100.7	3151.2	129.53	23.99	59.91	292.
180	8.87897	10.24	1.20	2314.3	3440.5	131.16	23.65	55.92	294.
185	8.33681	10.96	1.10	2512.0	3711.5	132.64	23.35	52.56	297.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
190	7.87234	11.70	1.01	2696.8	3967.1	134.01	23.09	49.77	300.
195	7.46975	12.45	0.9361	2871.3	4210.0	135.27	22.86	47.46	304.
200	7.11693	13.19	0.8739	3037.2	4442.3	136.45	22.67	45.53	308.
210	6.52567	14.65	0.7740	3349.3	4881.7	138.59	22.35	42.52	315.
220	6.04691	16.05	0.6971	3641.8	5295.5	140.52	22.12	40.34	323.
230	5.64881	17.41	0.6359	3919.9	5690.2	142.27	21.94	38.69	331.
240	5.31079	18.71	0.5858	4187.5	6070.4	143.89	21.80	37.41	339.
250	5.01894	19.98	0.5440	4446.8	6439.2	145.39	21.69	36.39	346.
260	4.76352	21.21	0.5084	4699.6	6798.9	146.81	21.61	35.57	353.
270	4.53746	22.40	0.4777	4947.2	7151.1	148.13	21.53	34.89	360.
280	4.33549	23.57	0.4509	5190.6	7497.1	149.39	21.47	34.33	367.
290	4.15361	24.71	0.4273	5430.4	7837.9	150.59	21.42	33.85	373.
300	3.98867	25.82	0.4063	5667.2	8174.3	151.73	21.38	33.44	380.
310	3.83821	26.92	0.3874	5901.5	8506.9	152.82	21.35	33.08	386.
320	3.70024	28.00	0.3704	6133.6	8836.1	153.87	21.32	32.78	392.
330	3.57312	29.06	0.3550	6363.8	9162.3	154.87	21.30	32.51	398.
340	3.45552	30.11	0.3409	6592.5	9486.4	155.84	21.28	32.27	404.
350	3.34633	31.14	0.3280	6819.7	9808.1	156.77	21.27	32.07	409.
360	3.24459	32.16	0.3161	7045.8	10127.8	157.67	21.26	31.88	415.
370	3.14951	33.17	0.3051	7270.8	10445.9	158.54	21.26	31.72	420.
380	3.06042	34.17	0.2949	7494.8	10762.4	159.39	21.25	31.58	426.
390	2.97672	35.16	0.2855	7718.1	11077.5	160.20	21.26	31.46	431.
400	2.89789	36.14	0.2766	7940.7	11391.5	161.00	21.26	31.34	436.
420	2.75318	38.08	0.2606	8384.4	12016.5	162.52	21.28	31.16	446.
440	2.62332	39.99	0.2464	8826.4	12638.3	163.97	21.31	31.02	456.
460	2.50601	41.88	0.2338	9267.3	13257.7	165.35	21.36	30.92	465.
480	2.39943	43.75	0.2225	9707.8	13875.5	166.66	21.42	30.85	474.
500	2.30209	45.59	0.2123	10148.2	14492.1	167.92	21.48	30.81	483.
520	2.21278	47.42	0.2031	10589.0	15108.2	169.13	21.56	30.80	492.
540	2.13050	49.24	0.1946	11030.4	15724.1	170.29	21.65	30.80	500.
560	2.05441	51.04	0.1869	11472.7	16340.2	171.41	21.74	30.82	508.
580	1.98382	52.83	0.1798	11916.2	16957.0	172.49	21.84	30.86	516.
600	1.91813	54.61	0.1732	12361.1	17574.6	173.54	21.95	30.90	524.
620	1.85682	56.38	0.1671	12807.7	18193.2	174.55	22.06	30.97	532.
640	1.79946	58.15	0.1614	13256.0	18813.3	175.54	22.18	31.04	539.
660	1.74565	59.90	0.1562	13706.2	19434.8	176.49	22.30	31.12	546.
680	1.69508	61.65	0.1512	14158.5	20057.9	177.42	22.42	31.20	553.
700	1.64745	63.39	0.1466	14612.9	20682.9	178.33	22.55	31.29	560.
720	1.60250	65.13	0.1423	15069.5	21309.7	179.21	22.68	31.39	567.
740	1.56000	66.86	0.1382	15528.3	21938.5	180.07	22.81	31.49	574.
760	1.51976	68.59	0.1344	15989.4	22569.4	180.92	22.94	31.60	581.
780	1.48159	70.31	0.1307	16452.9	23202.4	181.74	23.07	31.70	587.
800	1.44534	72.03	0.1273	16918.7	23837.5	182.54	23.19	31.81	594.
850	1.36218	76.31	0.1195	18093.6	25434.7	184.48	23.51	32.08	610.
900	1.28824	80.57	0.1126	19283.1	27045.6	186.32	23.83	32.35	625.
950	1.22204	84.82	0.1064	20487.0	28670.0	188.08	24.12	32.62	640.
1000	1.16240	89.05	0.1010	21704.7	30307.6	189.76	24.41	32.88	654.
1050	1.10839	93.27	0.0960	22935.8	31957.9	191.37	24.68	33.13	669.
1100	1.05923	97.48	0.0915	24179.4	33620.3	192.91	24.94	33.37	682.
1150	1.01428	101.69	0.0875	25435.0	35294.2	194.40	25.18	33.59	696.
1200	0.97304	105.89	0.0838	26701.9	36979.0	195.84	25.40	33.80	709.
1250	0.93504	110.08	0.0804	27979.3	38674.1	197.22	25.61	34.00	722.
1300	0.89992	114.26	0.0772	29266.7	40378.9	198.56	25.81	34.19	735.
1350	0.86736	118.44	0.0743	30563.4	42092.7	199.85	26.00	34.36	748.
1400	0.83709	122.62	0.0716	31868.8	43815.0	201.10	26.17	34.53	760.
1450	0.80887	126.80	0.0691	33182.4	45545.4	202.32	26.33	34.68	772.
1500	0.78250	130.97	0.0668	34503.7	47283.2	203.50	26.48	34.83	784.
1550	0.75781	135.14	0.0646	35832.1	49028.1	204.64	26.62	34.96	796.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1600	0.73463	139.31	0.0626	37167.2	50779.5	205.75	26.75	35.09	808.
1650	0.71283	143.47	0.0607	38508.6	52537.1	206.83	26.88	35.21	819.
1700	0.69230	147.63	0.0589	39855.9	54300.6	207.89	26.99	35.32	830.
1750	0.67292	151.79	0.0572	41208.7	56069.4	208.91	27.10	35.43	842.
1800	0.65459	155.95	0.0556	42566.7	57843.4	209.91	27.21	35.53	853.
1850	0.63724	160.11	0.0541	43929.6	59622.2	210.89	27.30	35.62	864.
1900	0.62079	164.27	0.0526	45297.1	61405.5	211.84	27.39	35.71	874.
1950	0.60517	168.43	0.0513	46668.9	63193.1	212.77	27.48	35.79	885.
2000	0.59032	172.58	0.0500	48044.7	64984.7	213.67	27.56	35.87	896.
				120 bar Isobar					
* 65.745	31.15324	246.77	27.69	−4168.2	−3783.0	68.67			
66	31.12455	243.81	27.46	−4154.8	−3769.3	68.88			
68	30.89575	222.59	25.86	−4049.8	−3661.4	70.49			
70	30.65992	204.34	24.45	−3944.3	−3552.9	72.06			
72	30.41722	188.52	23.19	−3838.6	−3444.1	73.60	32.24	54.44	1066.
74	30.16793	174.71	22.06	−3733.0	−3335.2	75.09	31.82	54.46	1033.
76	29.91239	162.56	21.01	−3627.5	−3226.3	76.54	31.37	54.44	1004.
78	29.65099	151.77	20.05	−3522.2	−3117.5	77.95	30.90	54.40	977.
80	29.38412	142.11	19.15	−3417.1	−3008.7	79.33	30.46	54.36	952.
82	29.11213	133.39	18.30	−3312.2	−2900.0	80.67	30.03	54.34	928.
84	28.83531	125.45	17.51	−3207.5	−2791.3	81.98	29.64	54.33	906.
86	28.55392	118.17	16.76	−3102.9	−2682.6	83.26	29.29	54.35	885.
88	28.26813	111.43	16.04	−2998.4	−2573.9	84.51	28.96	54.40	864.
90	27.97806	105.17	15.36	−2893.9	−2465.0	85.73	28.67	54.48	845.
92	27.68376	99.30	14.72	−2789.4	−2356.0	86.93	28.41	54.59	825.
94	27.38525	93.79	14.10	−2684.8	−2246.6	88.11	28.17	54.73	807.
96	27.08249	88.59	13.51	−2580.1	−2137.0	89.26	27.96	54.91	788.
98	26.77539	83.67	12.94	−2475.1	−2027.0	90.40	27.77	55.12	770.
100	26.46385	79.00	12.39	−2369.9	−1916.5	91.51	27.59	55.36	752.
102	26.14774	74.56	11.87	−2264.4	−1805.5	92.61	27.43	55.63	735.
104	25.82689	70.33	11.37	−2158.6	−1693.9	93.69	27.29	55.94	717.
106	25.50115	66.30	10.88	−2052.3	−1581.7	94.76	27.15	56.27	700.
108	25.17030	62.47	10.41	−1945.6	−1468.8	95.82	27.03	56.63	684.
110	24.83417	58.81	9.96	−1838.4	−1355.2	96.86	26.91	57.02	667.
112	24.49253	55.32	9.53	−1730.7	−1240.8	97.89	26.80	57.44	651.
114	24.14515	51.99	9.11	−1622.4	−1125.4	98.91	26.69	57.88	634.
116	23.79179	48.81	8.70	−1513.6	−1009.2	99.92	26.59	58.36	618.
118	23.43220	45.78	8.30	−1404.1	−892.0	100.93	26.50	58.87	603.
120	23.06609	42.89	7.92	−1293.9	−773.7	101.92	26.41	59.42	587.
122	22.69315	40.13	7.55	−1183.1	−654.3	102.91	26.32	59.99	571.
124	22.31308	37.50	7.19	−1071.5	−533.7	103.89	26.23	60.61	556.
126	21.92552	34.99	6.85	−959.1	−411.8	104.86	26.15	61.27	541.
128	21.53013	32.60	6.51	−845.9	−288.6	105.83	26.07	61.97	526.
130	21.12656	30.33	6.18	−731.9	−163.9	106.80	25.99	62.72	511.
132	20.71447	28.18	5.87	−617.0	−37.7	107.76	25.91	63.51	497.
134	20.29356	26.15	5.56	−501.2	90.2	108.72	25.84	64.34	482.
136	19.86364	24.24	5.27	−384.4	219.7	109.68	25.77	65.20	468.
138	19.42464	22.46	4.98	−266.8	351.0	110.64	25.70	66.09	454.
140	18.97670	20.80	4.70	−148.3	484.0	111.60	25.63	66.98	440.
142	18.52025	19.27	4.44	−29.0	618.9	112.55	25.57	67.86	427.
144	18.05608	17.88	4.18	90.9	755.5	113.51	25.51	68.70	415.
146	17.58543	16.64	3.94	211.2	893.6	114.46	25.45	69.45	403.
148	17.11003	15.53	3.71	331.8	1033.2	115.41	25.39	70.07	391.
150	16.63211	14.58	3.49	452.3	1173.8	116.36	25.33	70.54	381.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
155	15.44423	12.78	3.00	750.7	1527.7	118.68	25.16	70.78	358.
160	14.30302	11.72	2.59	1040.2	1879.2	120.91	24.95	69.62	342.
165	13.24688	11.22	2.26	1316.1	2222.0	123.02	24.71	67.33	330.
170	12.29698	11.11	1.99	1575.6	2551.4	124.99	24.43	64.38	323.
175	11.45799	11.28	1.77	1818.1	2865.4	126.81	24.14	61.18	319.
180	10.72386	11.63	1.59	2044.3	3163.3	128.48	23.85	58.03	318.
185	10.08329	12.10	1.45	2255.9	3446.0	130.03	23.57	55.08	318.
190	9.52344	12.66	1.33	2454.6	3714.6	131.47	23.32	52.42	319.
195	9.03196	13.28	1.22	2642.1	3970.7	132.80	23.10	50.08	321.
200	8.59792	13.92	1.14	2820.3	4215.9	134.04	22.90	48.04	323.
210	7.86683	15.26	0.9986	3153.7	4679.1	136.30	22.57	44.74	329.
220	7.27411	16.61	0.8923	3463.7	5113.4	138.32	22.31	42.24	335.
230	6.78225	17.94	0.8085	3756.6	5525.9	140.15	22.11	40.33	342.
240	6.36595	19.25	0.7406	4036.4	5921.4	141.84	21.96	38.84	349.
250	6.00778	20.52	0.6844	4306.2	6303.6	143.40	21.83	37.64	355.
260	5.69538	21.76	0.6369	4568.1	6675.0	144.85	21.73	36.68	362.
270	5.41977	22.97	0.5963	4823.6	7037.7	146.22	21.65	35.88	369.
280	5.17425	24.16	0.5611	5073.9	7393.1	147.52	21.58	35.21	375.
290	4.95372	25.32	0.5302	5319.9	7742.3	148.74	21.53	34.65	381.
300	4.75421	26.46	0.5029	5562.3	8086.3	149.91	21.48	34.17	388.
310	4.57259	27.57	0.4786	5801.6	8425.9	151.02	21.44	33.75	394.
320	4.40635	28.67	0.4567	6038.3	8761.6	152.09	21.41	33.39	400.
330	4.25345	29.76	0.4369	6272.7	9094.0	153.11	21.38	33.08	405.
340	4.11222	30.82	0.4189	6505.2	9423.4	154.09	21.36	32.80	411.
350	3.98125	31.88	0.4024	6736.0	9750.2	155.04	21.34	32.56	417.
360	3.85938	32.92	0.3873	6965.4	10074.7	155.96	21.33	32.35	422.
370	3.74562	33.95	0.3734	7193.4	10397.2	156.84	21.32	32.16	427.
380	3.63912	34.96	0.3605	7420.4	10717.9	157.69	21.32	31.99	433.
390	3.53916	35.97	0.3486	7646.3	11037.0	158.52	21.32	31.84	438.
400	3.44511	36.97	0.3375	7871.5	11354.7	159.33	21.32	31.71	443.
420	3.27260	38.94	0.3174	8319.7	11986.5	160.87	21.34	31.49	453.
440	3.11800	40.88	0.2997	8765.8	12614.4	162.33	21.37	31.32	462.
460	2.97849	42.79	0.2841	9210.5	13239.4	163.72	21.41	31.19	472.
480	2.85183	44.68	0.2700	9654.3	13862.1	165.04	21.46	31.09	481.
500	2.73624	46.55	0.2574	10097.8	14483.4	166.31	21.52	31.03	489.
520	2.63024	48.41	0.2460	10541.3	15103.6	167.53	21.60	31.00	498.
540	2.53263	50.24	0.2355	10985.2	15723.4	168.70	21.69	30.98	506.
560	2.44241	52.06	0.2260	11429.9	16343.1	169.82	21.78	30.99	514.
580	2.35873	53.87	0.2173	11875.6	16963.1	170.91	21.88	31.01	522.
600	2.28087	55.67	0.2092	12322.6	17583.8	171.96	21.98	31.05	530.
620	2.20821	57.46	0.2018	12771.0	18205.3	172.98	22.10	31.10	537.
640	2.14025	59.23	0.1948	13221.1	18827.9	173.97	22.21	31.16	545.
660	2.07651	61.00	0.1884	13673.0	19451.9	174.93	22.33	31.24	552.
680	2.01660	62.76	0.1824	14126.8	20077.4	175.87	22.45	31.31	559.
700	1.96018	64.52	0.1767	14582.6	20704.5	176.77	22.58	31.40	566.
720	1.90693	66.27	0.1715	15040.6	21333.4	177.66	22.71	31.49	573.
740	1.85660	68.01	0.1665	15500.7	21964.1	178.52	22.83	31.58	579.
760	1.80893	69.74	0.1618	15963.0	22596.8	179.37	22.96	31.68	586.
780	1.76372	71.48	0.1574	16427.6	23231.4	180.19	23.09	31.78	593.
800	1.72077	73.20	0.1532	16894.5	23868.1	181.00	23.22	31.89	599.
850	1.62225	77.50	0.1438	18071.9	25469.0	182.94	23.54	32.15	615.
900	1.53463	81.78	0.1354	19263.6	27083.1	184.78	23.85	32.41	630.
950	1.45616	86.04	0.1280	20469.5	28710.3	186.54	24.14	32.67	645.
1000	1.38546	90.28	0.1214	21689.0	30350.4	188.23	24.43	32.93	659.
1050	1.32140	94.51	0.1154	22921.6	32002.8	189.84	24.70	33.17	673.
1100	1.26309	98.73	0.1100	24166.6	33667.2	191.39	24.95	33.40	687.
1150	1.20976	102.94	0.1051	25423.5	35342.8	192.88	25.19	33.62	700.
1200	1.16080	107.15	0.1006	26691.5	37029.2	194.31	25.42	33.83	714.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
				140 bar Isobar					
* 66.170	31.18702	248.40	27.12	−4160.0	−3711.1	68.79			
68	30.98433	228.98	25.71	−4064.8	−3613.0	70.25			
70	30.75633	210.59	24.36	−3960.4	−3505.3	71.81			
72	30.52162	194.65	23.16	−3855.9	−3397.2	73.34	32.74	54.04	1071.
74	30.28047	180.73	22.07	−3751.5	−3289.1	74.82	32.29	54.04	1039.
76	30.03323	168.49	21.07	−3647.2	−3181.1	76.26	31.80	54.01	1011.
78	29.78029	157.63	20.15	−3543.2	−3073.1	77.66	31.31	53.96	985.
80	29.52205	147.92	19.28	−3439.5	−2965.2	79.02	30.83	53.91	961.
82	29.25891	139.16	18.47	−3335.9	−2857.4	80.36	30.39	53.87	938.
84	28.99119	131.19	17.70	−3232.6	−2749.7	81.65	29.97	53.85	917.
86	28.71919	123.89	16.98	−3129.5	−2642.0	82.92	29.59	53.85	897.
88	28.44314	117.15	16.28	−3026.5	−2534.3	84.16	29.25	53.87	878.
90	28.16322	110.89	15.63	−2923.6	−2426.5	85.37	28.93	53.92	859.
92	27.87955	105.04	15.00	−2820.8	−2318.6	86.56	28.65	53.99	841.
94	27.59219	99.54	14.39	−2717.9	−2210.6	87.72	28.40	54.10	823.
96	27.30118	94.36	13.82	−2615.0	−2102.2	88.86	28.17	54.23	805.
98	27.00651	89.45	13.26	−2512.0	−1993.6	89.98	27.97	54.38	788.
100	26.70814	84.79	12.73	−2408.9	−1884.7	91.08	27.78	54.57	771.
102	26.40601	80.37	12.22	−2305.6	−1775.3	92.16	27.61	54.78	754.
104	26.10005	76.16	11.72	−2202.0	−1665.6	93.23	27.45	55.01	738.
106	25.79017	72.15	11.25	−2098.1	−1555.3	94.28	27.30	55.26	722.
108	25.47628	68.32	10.79	−1994.0	−1444.5	95.31	27.17	55.53	706.
110	25.15828	64.67	10.35	−1889.6	−1333.2	96.33	27.04	55.83	690.
112	24.83605	61.19	9.92	−1784.9	−1221.2	97.34	26.92	56.14	675.
114	24.50950	57.87	9.51	−1679.8	−1108.6	98.34	26.80	56.48	660.
116	24.17852	54.70	9.11	−1574.3	−995.3	99.32	26.69	56.83	645.
118	23.84299	51.68	8.73	−1468.4	−881.2	100.30	26.59	57.19	630.
120	23.50281	48.79	8.36	−1362.1	−766.5	101.26	26.49	57.58	615.
122	23.15785	46.04	8.00	−1255.5	−650.9	102.22	26.39	57.99	601.
124	22.80802	43.42	7.65	−1148.3	−534.5	103.16	26.29	58.41	587.
126	22.45320	40.92	7.31	−1040.8	−417.3	104.10	26.20	58.85	573.
128	22.09328	38.54	6.99	−932.8	−299.1	105.03	26.10	59.31	559.
130	21.72817	36.28	6.67	−824.3	−180.0	105.96	26.01	59.79	546.
132	21.35779	34.13	6.37	−715.5	−60.0	106.87	25.93	60.28	532.
134	20.98211	32.09	6.07	−606.1	61.1	107.78	25.84	60.79	519.
136	20.60112	30.16	5.78	−496.4	183.2	108.69	25.76	61.31	506.
138	20.21488	28.34	5.51	−386.2	306.4	109.59	25.67	61.84	494.
140	19.82356	26.63	5.24	−275.7	430.6	110.48	25.59	62.37	481.
142	19.42741	25.03	4.99	−164.8	555.8	111.37	25.51	62.89	469.
144	19.02686	23.55	4.74	−53.7	682.1	112.25	25.43	63.39	458.
146	18.62246	22.18	4.50	57.6	809.4	113.13	25.36	63.85	446.
148	18.21500	20.93	4.28	168.9	937.5	114.00	25.28	64.26	436.
150	17.80544	19.79	4.06	280.1	1066.4	114.87	25.21	64.61	426.
155	16.78041	17.46	3.56	556.5	1390.8	116.99	25.02	65.06	403.
160	15.77219	15.80	3.13	828.1	1715.7	119.06	24.82	64.79	384.
165	14.80474	14.72	2.77	1091.8	2037.5	121.04	24.61	63.78	369.
170	13.89784	14.11	2.46	1345.2	2352.5	122.92	24.39	62.15	358.
175	13.06356	13.84	2.20	1586.6	2658.3	124.69	24.16	60.13	351.
180	12.30626	13.83	1.99	1815.8	2953.5	126.35	23.92	57.91	346.
185	11.62448	14.01	1.81	2033.0	3237.4	127.91	23.68	55.65	343.
190	11.01327	14.33	1.66	2238.9	3510.1	129.36	23.46	53.47	341.
195	10.46589	14.75	1.53	2434.6	3772.2	130.73	23.25	51.41	341.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
200	9.97512	15.23	1.42	2621.0	4024.5	132.00	23.06	49.53	342.
210	9.13589	16.35	1.24	2970.6	4503.1	134.34	22.73	46.30	345.
220	8.44726	17.56	1.10	3295.3	4952.6	136.43	22.47	43.72	349.
230	7.87252	18.81	0.9920	3600.9	5379.2	138.33	22.26	41.68	355.
240	7.38495	20.06	0.9047	3891.0	5787.5	140.07	22.09	40.04	360.
250	6.96523	21.31	0.8327	4171.2	6181.2	141.67	21.96	38.73	366.
260	6.59931	22.53	0.7723	4441.5	6562.9	143.17	21.85	37.65	372.
270	6.27677	23.74	0.7209	4704.4	6934.8	144.57	21.76	36.76	378.
280	5.98975	24.93	0.6765	4961.2	7298.5	145.90	21.68	36.01	384.
290	5.73224	26.09	0.6378	5213.1	7655.4	147.15	21.62	35.38	390.
300	5.49954	27.24	0.6036	5460.7	8006.4	148.34	21.57	34.84	396.
310	5.28796	28.37	0.5733	5704.8	8352.4	149.47	21.52	34.37	402.
320	5.09449	29.48	0.5461	5945.9	8694.0	150.56	21.49	33.96	408.
330	4.91673	30.57	0.5216	6184.3	9031.8	151.60	21.46	33.61	413.
340	4.75267	31.65	0.4994	6420.5	9366.2	152.60	21.43	33.29	419.
350	4.60068	32.72	0.4792	6654.7	9697.8	153.56	21.41	33.02	424.
360	4.45935	33.77	0.4607	6887.2	10026.7	154.48	21.40	32.77	430.
370	4.32751	34.81	0.4436	7118.2	10353.4	155.38	21.39	32.56	435.
380	4.20417	35.84	0.4279	7347.9	10678.0	156.24	21.38	32.37	440.
390	4.08847	36.86	0.4134	7576.5	11000.7	157.08	21.38	32.19	445.
400	3.97967	37.87	0.3999	7804.0	11321.9	157.90	21.38	32.04	450.
420	3.78026	39.87	0.3755	8256.7	11960.1	159.45	21.39	31.79	460.
440	3.60169	41.83	0.3541	8706.7	12593.8	160.93	21.42	31.59	469.
460	3.44067	43.77	0.3352	9155.0	13224.0	162.33	21.46	31.44	478.
480	3.29456	45.68	0.3183	9602.1	13851.5	163.66	21.51	31.32	487.
500	3.16127	47.57	0.3032	10048.5	14477.1	164.94	21.57	31.24	496.
520	3.03970	49.44	0.2895	10494.7	15101.3	166.16	21.65	31.19	504.
540	2.92664	51.29	0.2770	10941.1	15724.7	167.34	21.73	31.16	512.
560	2.82271	53.13	0.2657	11388.1	16347.8	168.47	21.82	31.15	520.
580	2.72633	54.95	0.2552	11835.9	16971.0	169.57	21.91	31.17	528.
600	2.63666	56.76	0.2456	12284.8	17594.6	170.62	22.02	31.19	536.
620	2.55301	58.56	0.2368	12735.1	18218.8	171.65	22.13	31.23	543.
640	2.47476	60.35	0.2285	13186.9	18844.0	172.64	22.24	31.29	550.
660	2.40138	62.13	0.2209	13640.4	19470.3	173.60	22.36	31.35	558.
680	2.33241	63.90	0.2138	14095.7	20098.0	174.54	22.48	31.42	565.
700	2.26745	65.67	0.2071	14552.9	20727.2	175.45	22.61	31.50	572.
720	2.20614	67.43	0.2009	15012.2	21358.1	176.34	22.73	31.58	578.
740	2.14819	69.18	0.1950	15473.5	21990.7	177.21	22.86	31.67	585.
760	2.09331	70.92	0.1895	15937.1	22625.1	178.05	22.99	31.77	591.
780	2.04125	72.66	0.1843	16402.8	23261.3	178.88	23.12	31.86	598.
800	1.99180	74.39	0.1794	16870.8	23899.6	179.69	23.24	31.96	604.
850	1.87832	78.71	0.1682	18050.5	25504.0	181.63	23.56	32.22	620.
900	1.77739	83.00	0.1583	19244.4	27121.2	183.48	23.87	32.47	635.
950	1.68697	87.27	0.1496	20452.2	28751.1	185.24	24.16	32.72	650.
1000	1.60548	91.53	0.1418	21673.4	30393.5	186.93	24.45	32.97	664.
1050	1.53163	95.77	0.1348	22907.5	32048.1	188.54	24.71	33.21	678.
1100	1.46438	99.99	0.1285	24154.0	33714.4	190.09	24.97	33.44	691.
1150	1.40286	104.21	0.1228	25412.1	35391.7	191.59	25.21	33.65	705.
1200	1.34637	108.42	0.1175	26681.3	37079.6	193.02	25.43	33.86	718.
				160 bar Isobar					
* 66.592	31.22173	250.15	26.58	−4151.6	−3639.2	68.91			
68	31.07048	235.36	25.56	−4079.1	−3564.1	70.02			
70	30.84992	216.83	24.27	−3975.8	−3457.1	71.57			
72	30.62279	200.76	23.12	−3872.3	−3349.8	73.08	33.21	53.66	1076.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
74	30.38933	186.73	22.08	−3769.0	−3242.5	74.55	32.72	53.65	1045.
76	30.14990	174.39	21.13	−3666.0	−3135.3	75.99	32.21	53.61	1018.
78	29.90488	163.45	20.24	−3563.2	−3028.1	77.38	31.69	53.55	993.
80	29.65470	153.67	19.41	−3460.6	−2921.1	78.73	31.18	53.49	970.
82	29.39975	144.86	18.63	−3358.4	−2814.2	80.05	30.71	53.44	949.
84	29.14043	136.86	17.89	−3256.4	−2707.3	81.34	30.27	53.40	928.
86	28.87704	129.54	17.18	−3154.6	−2600.5	82.60	29.87	53.38	909.
88	28.60987	122.79	16.51	−3053.0	−2493.8	83.82	29.51	53.38	891.
90	28.33914	116.52	15.87	−2951.6	−2387.0	85.02	29.18	53.41	873.
92	28.06501	110.67	15.26	−2850.2	−2280.1	86.20	28.88	53.46	855.
94	27.78762	105.18	14.67	−2748.9	−2173.1	87.35	28.61	53.53	838.
96	27.50703	100.00	14.11	−2647.7	−2066.0	88.48	28.37	53.62	821.
98	27.22329	95.11	13.57	−2546.4	−1958.6	89.58	28.15	53.74	805.
100	26.93643	90.46	13.05	−2445.0	−1851.0	90.67	27.95	53.88	789.
102	26.64643	86.05	12.54	−2343.6	−1743.1	91.74	27.77	54.04	773.
104	26.35328	81.85	12.06	−2242.0	−1634.8	92.79	27.60	54.22	758.
106	26.05695	77.84	11.60	−2140.3	−1526.2	93.82	27.44	54.41	742.
108	25.75739	74.02	11.15	−2038.4	−1417.2	94.84	27.30	54.62	727.
110	25.45458	70.38	10.71	−1936.3	−1307.7	95.85	27.16	54.85	712.
112	25.14848	66.90	10.29	−1834.0	−1197.8	96.84	27.03	55.09	698.
114	24.83903	63.58	9.89	−1731.5	−1087.4	97.81	26.91	55.34	683.
116	24.52621	60.41	9.50	−1628.8	−976.4	98.78	26.79	55.60	669.
118	24.20999	57.38	9.12	−1525.8	−865.0	99.73	26.68	55.87	655.
120	23.89034	54.50	8.76	−1422.7	−752.9	100.67	26.57	56.15	641.
122	23.56723	51.74	8.40	−1319.3	−640.3	101.60	26.46	56.45	628.
124	23.24066	49.12	8.06	−1215.6	−527.2	102.52	26.36	56.74	614.
126	22.91061	46.61	7.73	−1111.7	−413.4	103.43	26.26	57.05	601.
128	22.57708	44.23	7.41	−1007.6	−298.9	104.34	26.16	57.37	588.
130	22.24010	41.96	7.11	−903.3	−183.9	105.23	26.06	57.69	576.
132	21.89968	39.79	6.81	−798.8	−68.2	106.11	25.97	58.02	563.
134	21.55588	37.74	6.52	−694.1	48.2	106.99	25.87	58.35	551.
136	21.20876	35.79	6.24	−589.2	165.2	107.85	25.78	58.68	539.
138	20.85845	33.94	5.97	−484.2	282.9	108.71	25.69	59.01	528.
140	20.50510	32.20	5.71	−379.0	401.3	109.56	25.60	59.34	516.
142	20.14891	30.56	5.46	−273.8	520.3	110.41	25.51	59.66	505.
144	19.79017	29.01	5.22	−168.6	639.9	111.24	25.42	59.97	494.
146	19.42921	27.57	4.99	−63.4	760.1	112.07	25.34	60.26	484.
148	19.06649	26.23	4.77	41.7	880.9	112.89	25.25	60.51	474.
150	18.70252	24.99	4.55	146.7	1002.2	113.71	25.17	60.74	464.
155	17.79147	22.31	4.06	407.6	1306.9	115.71	24.97	61.09	441.
160	16.88885	20.24	3.62	665.0	1612.4	117.65	24.76	61.05	422.
165	16.00875	18.72	3.23	917.1	1916.6	119.52	24.56	60.55	406.
170	15.16495	17.66	2.90	1162.1	2217.1	121.31	24.36	59.62	393.
175	14.36849	17.00	2.62	1398.6	2512.1	123.02	24.15	58.33	383.
180	13.62637	16.64	2.37	1625.8	2800.0	124.65	23.94	56.80	375.
185	12.94155	16.51	2.17	1843.6	3079.9	126.18	23.74	55.13	370.
190	12.31375	16.57	1.99	2051.9	3351.3	127.63	23.54	53.43	366.
195	11.74051	16.76	1.83	2251.4	3614.2	128.99	23.35	51.75	364.
200	11.21801	17.06	1.70	2442.6	3868.9	130.28	23.17	50.13	363.
210	10.30752	17.88	1.48	2802.9	4355.2	132.66	22.86	47.20	363.
220	9.54687	18.89	1.32	3138.6	4814.5	134.79	22.60	44.73	365.
230	8.90486	20.00	1.18	3454.5	5251.3	136.73	22.39	42.69	369.
240	8.35652	21.16	1.08	3754.8	5669.5	138.51	22.21	41.01	373.
250	7.88261	22.34	0.9874	4042.6	6072.4	140.16	22.07	39.63	378.
260	7.46850	23.53	0.9134	4320.4	6462.8	141.69	21.95	38.48	384.
270	7.10303	24.71	0.8504	4590.1	6842.6	143.12	21.86	37.52	389.
280	6.77762	25.88	0.7963	4853.0	7213.7	144.47	21.78	36.71	395.
290	6.48562	27.03	0.7492	5110.3	7577.3	145.75	21.71	36.02	400.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
300	6.22178	28.17	0.7078	5362.9	7934.5	146.96	21.65	35.43	406.
310	5.98192	29.30	0.6711	5611.5	8286.2	148.11	21.60	34.92	411.
320	5.76267	30.41	0.6383	5856.6	8633.1	149.22	21.56	34.48	417.
330	5.56129	31.51	0.6089	6098.9	8975.9	150.27	21.53	34.09	422.
340	5.37550	32.59	0.5822	6338.5	9315.0	151.28	21.50	33.74	427.
350	5.20343	33.66	0.5580	6576.0	9650.9	152.26	21.48	33.44	433.
360	5.04349	34.72	0.5359	6811.5	9983.9	153.19	21.46	33.17	438.
370	4.89435	35.77	0.5156	7045.3	10314.4	154.10	21.45	32.93	443.
380	4.75486	36.81	0.4969	7277.6	10642.6	154.98	21.44	32.72	448.
390	4.62406	37.84	0.4796	7508.6	10968.8	155.82	21.44	32.53	453.
400	4.50109	38.86	0.4636	7738.5	11293.2	156.64	21.44	32.36	458.
420	4.27580	40.87	0.4347	8195.4	11937.3	158.22	21.45	32.07	467.
440	4.07416	42.85	0.4095	8649.2	12576.4	159.70	21.47	31.85	476.
460	3.89239	44.80	0.3872	9100.9	13211.5	161.11	21.51	31.67	485.
480	3.72751	46.72	0.3674	9551.1	13843.5	162.46	21.56	31.54	494.
500	3.57715	48.63	0.3496	10000.3	14473.1	163.74	21.62	31.44	502.
520	3.43935	50.51	0.3336	10449.1	15101.2	164.98	21.69	31.37	511.
540	3.31252	52.38	0.3190	10897.9	15728.1	166.16	21.77	31.33	519.
560	3.19533	54.23	0.3057	11347.1	16354.4	167.30	21.85	31.31	527.
580	3.08666	56.07	0.2936	11797.0	16980.6	168.40	21.95	31.31	534.
600	2.98558	57.89	0.2824	12247.8	17606.9	169.46	22.05	31.33	542.
620	2.89127	59.70	0.2721	12699.8	18233.7	170.49	22.16	31.36	549.
640	2.80305	61.50	0.2626	13153.3	18861.4	171.48	22.27	31.40	556.
660	2.72032	63.29	0.2537	13608.3	19490.0	172.45	22.39	31.46	563.
680	2.64256	65.07	0.2454	14065.1	20119.8	173.39	22.51	31.52	570.
700	2.56932	66.84	0.2377	14523.7	20751.0	174.30	22.63	31.60	577.
720	2.50020	68.61	0.2305	14984.3	21383.8	175.20	22.76	31.68	584.
740	2.43485	70.37	0.2237	15446.9	22018.1	176.06	22.89	31.76	590.
760	2.37296	72.12	0.2173	15911.5	22654.2	176.91	23.01	31.85	597.
780	2.31425	73.87	0.2113	16378.4	23292.1	177.74	23.14	31.94	603.
800	2.25847	75.61	0.2056	16847.4	23931.8	178.55	23.27	32.03	610.
850	2.13047	79.94	0.1927	18029.5	25539.6	180.50	23.58	32.28	625.
900	2.01657	84.24	0.1814	19225.5	27159.8	182.35	23.89	32.53	640.
950	1.91452	88.52	0.1713	20435.1	28792.3	184.12	24.18	32.77	654.
1000	1.82251	92.78	0.1624	21658.0	30437.1	185.80	24.46	33.02	669.
1050	1.73911	97.03	0.1543	22893.6	32093.8	187.42	24.73	33.25	682.
1100	1.66313	101.27	0.1470	24141.5	33761.9	188.97	24.98	33.47	696.
1150	1.59361	105.49	0.1404	25400.8	35440.9	190.47	25.22	33.69	709.
1200	1.52976	109.70	0.1344	26671.1	37130.3	191.90	25.44	33.89	722.

180 bar Isobar

* 67.013	31.25729	252.03	26.08	−4143.1	−3567.2	69.03			
68	31.15433	241.74	25.41	−4092.6	−3514.9	69.80			
70	30.94086	223.07	24.17	−3990.3	−3408.5	71.34			
72	30.72092	206.87	23.08	−3887.9	−3302.0	72.84	33.65	53.29	1081.
74	30.49476	192.72	22.08	−3785.7	−3195.4	74.30	33.13	53.27	1052.
76	30.26269	180.27	21.17	−3683.7	−3088.9	75.72	32.58	53.22	1025.
78	30.02512	169.24	20.32	−3582.1	−2982.6	77.11	32.04	53.15	1001.
80	29.78248	159.39	19.53	−3480.7	−2876.3	78.45	31.51	53.09	979.
82	29.53518	150.52	18.78	−3379.7	−2770.2	79.76	31.01	53.03	959.
84	29.28364	142.47	18.06	−3278.9	−2664.2	81.04	30.55	52.98	939.
86	29.02819	135.12	17.38	−3178.4	−2558.3	82.28	30.13	52.95	921.
88	28.76917	128.35	16.73	−3078.1	−2452.4	83.50	29.75	52.94	903.
90	28.50681	122.07	16.11	−2977.9	−2346.5	84.69	29.40	52.95	886.
92	28.24134	116.21	15.51	−2877.9	−2240.6	85.85	29.09	52.97	869.
94	27.97292	110.72	14.94	−2778.1	−2134.6	86.99	28.81	53.02	853.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
96	27.70166	105.54	14.39	−2678.3	−2028.5	88.11	28.55	53.09	837.
98	27.42766	100.65	13.86	−2578.5	−1922.2	89.21	28.32	53.17	821.
100	27.15097	96.02	13.35	−2478.7	−1815.8	90.28	28.11	53.28	806.
102	26.87163	91.61	12.86	−2379.0	−1709.1	91.34	27.92	53.40	791.
104	26.58966	87.41	12.38	−2279.1	−1602.2	92.38	27.74	53.53	776.
106	26.30507	83.41	11.92	−2179.2	−1495.0	93.40	27.57	53.68	761.
108	26.01786	79.59	11.48	−2079.3	−1387.4	94.40	27.42	53.85	747.
110	25.72804	75.95	11.06	−1979.2	−1279.6	95.39	27.28	54.02	733.
112	25.43560	72.47	10.64	−1879.0	−1171.3	96.37	27.14	54.20	719.
114	25.14054	69.14	10.25	−1778.7	−1062.8	97.33	27.01	54.39	705.
116	24.84288	65.96	9.86	−1678.3	−953.8	98.28	26.89	54.59	691.
118	24.54262	62.93	9.49	−1577.8	−844.4	99.21	26.77	54.80	678.
120	24.23978	60.04	9.13	−1477.2	−734.6	100.13	26.65	55.00	665.
122	23.93438	57.27	8.78	−1376.4	−624.4	101.04	26.54	55.22	652.
124	23.62646	54.63	8.45	−1275.6	−513.7	101.94	26.43	55.43	640.
126	23.31606	52.12	8.12	−1174.6	−402.6	102.83	26.33	55.65	627.
128	23.00322	49.72	7.81	−1073.6	−291.1	103.71	26.22	55.87	615.
130	22.68800	47.43	7.50	−972.5	−179.1	104.58	26.12	56.10	603.
132	22.37049	45.25	7.21	−871.3	−66.7	105.44	26.02	56.32	591.
134	22.05075	43.18	6.93	−770.2	46.1	106.29	25.92	56.54	580.
136	21.72890	41.21	6.65	−668.9	159.4	107.12	25.82	56.76	569.
138	21.40506	39.34	6.39	−567.8	273.2	107.96	25.73	56.97	558.
140	21.07938	37.56	6.13	−466.6	387.3	108.78	25.63	57.18	547.
142	20.75203	35.88	5.89	−365.5	501.9	109.59	25.54	57.38	536.
144	20.42322	34.29	5.65	−264.5	616.9	110.39	25.45	57.57	526.
146	20.09320	32.80	5.42	−163.7	732.2	111.19	25.36	57.75	516.
148	19.76227	31.39	5.20	−63.0	847.8	111.97	25.27	57.91	507.
150	19.43077	30.08	4.99	37.4	963.8	112.75	25.18	58.04	497.
155	18.60216	27.18	4.49	287.0	1254.6	114.66	24.96	58.26	476.
160	17.77984	24.82	4.05	533.6	1546.0	116.51	24.75	58.24	457.
165	16.97253	22.96	3.66	776.0	1836.5	118.30	24.55	57.94	440.
170	16.18939	21.55	3.31	1013.0	2124.8	120.02	24.35	57.34	426.
175	15.43874	20.54	3.01	1243.6	2409.5	121.67	24.15	56.48	414.
180	14.72709	19.86	2.74	1467.0	2689.3	123.25	23.96	55.40	405.
185	14.05857	19.44	2.51	1682.9	2963.2	124.75	23.78	54.16	398.
190	13.43502	19.24	2.31	1891.0	3230.8	126.17	23.59	52.84	392.
195	12.85640	19.20	2.14	2091.5	3491.6	127.53	23.42	51.49	388.
200	12.32124	19.30	1.99	2284.8	3745.7	128.82	23.26	50.15	385.
210	11.37144	19.80	1.73	2651.3	4234.2	131.20	22.96	47.60	383.
220	10.56240	20.57	1.54	2994.5	4698.6	133.36	22.71	45.33	383.
230	9.87006	21.51	1.38	3318.3	5141.9	135.33	22.49	43.38	385.
240	9.27307	22.54	1.25	3626.2	5567.3	137.14	22.32	41.73	388.
250	8.75376	23.62	1.15	3921.1	5977.4	138.82	22.17	40.33	392.
260	8.29798	24.74	1.06	4205.5	6374.7	140.38	22.05	39.16	396.
270	7.89454	25.87	0.9839	4481.1	6761.1	141.83	21.95	38.16	401.
280	7.53463	27.00	0.9197	4749.4	7138.4	143.21	21.86	37.31	406.
290	7.21122	28.13	0.8638	5011.7	7507.8	144.50	21.79	36.59	411.
300	6.91874	29.25	0.8149	5268.8	7870.5	145.73	21.73	35.96	416.
310	6.65268	30.36	0.7716	5521.6	8227.3	146.90	21.68	35.41	421.
320	6.40940	31.47	0.7330	5770.6	8579.0	148.02	21.64	34.94	426.
330	6.18588	32.56	0.6983	6016.4	8926.2	149.09	21.60	34.52	431.
340	5.97965	33.64	0.6671	6259.3	9269.5	150.11	21.57	34.15	436.
350	5.78863	34.71	0.6387	6499.8	9609.3	151.10	21.55	33.82	441.
360	5.61108	35.77	0.6128	6738.1	9946.1	152.05	21.53	33.53	446.
370	5.44552	36.82	0.5891	6974.6	10280.1	152.96	21.51	33.27	451.
380	5.29069	37.86	0.5673	7209.4	10611.6	153.85	21.50	33.04	456.
390	5.14550	38.89	0.5472	7442.7	10940.9	154.70	21.49	32.83	461.
400	5.00901	39.91	0.5285	7674.8	11268.3	155.53	21.49	32.65	465.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
420	4.75899	41.93	0.4950	8135.7	11918.0	157.11	21.50	32.33	474.
440	4.53524	43.92	0.4658	8593.2	12562.2	158.61	21.52	32.09	484.
460	4.33356	45.88	0.4400	9048.2	13201.8	160.03	21.55	31.89	492.
480	4.15065	47.82	0.4171	9501.3	13838.0	161.39	21.60	31.74	501.
500	3.98385	49.74	0.3967	9953.3	14471.5	162.68	21.66	31.62	509.
520	3.83100	51.63	0.3782	10404.6	15103.1	163.92	21.73	31.54	517.
540	3.69032	53.51	0.3615	10855.7	15733.4	165.11	21.80	31.49	525.
560	3.56033	55.37	0.3463	11307.0	16362.7	166.25	21.89	31.46	533.
580	3.43980	57.22	0.3323	11758.9	16991.7	167.36	21.98	31.45	541.
600	3.32767	59.05	0.3195	12211.6	17620.7	168.42	22.09	31.46	548.
620	3.22306	60.87	0.3078	12665.3	18250.1	169.46	22.19	31.48	555.
640	3.12519	62.68	0.2968	13120.4	18880.0	170.46	22.30	31.52	562.
660	3.03341	64.48	0.2867	13576.9	19510.8	171.43	22.42	31.57	569.
680	2.94714	66.26	0.2773	14035.1	20142.7	172.37	22.54	31.62	576.
700	2.86588	68.04	0.2685	14495.0	20775.8	173.29	22.66	31.69	583.
720	2.78918	69.82	0.2602	14956.9	21410.4	174.18	22.79	31.76	589.
740	2.71665	71.58	0.2525	15420.6	22046.4	175.05	22.91	31.84	596.
760	2.64796	73.34	0.2453	15886.4	22684.1	175.90	23.04	31.93	602.
780	2.58279	75.09	0.2384	16354.3	23323.5	176.73	23.16	32.01	609.
800	2.52087	76.84	0.2320	16824.3	23964.7	177.54	23.29	32.11	615.
850	2.37874	81.18	0.2173	18008.8	25575.8	179.50	23.60	32.34	630.
900	2.25224	85.50	0.2045	19206.8	27198.9	181.35	23.91	32.58	645.
950	2.13886	89.79	0.1931	20418.3	28834.0	183.12	24.20	32.82	659.
1000	2.03660	94.06	0.1829	21642.8	30481.1	184.81	24.48	33.06	673.
1050	1.94388	98.31	0.1738	22879.9	32139.8	186.43	24.75	33.29	687.
1100	1.85939	102.55	0.1656	24129.1	33809.7	187.98	25.00	33.51	701.
1150	1.78206	106.78	0.1582	25389.7	35490.4	189.48	25.23	33.72	714.
1200	1.71100	111.00	0.1514	26661.1	37181.3	190.92	25.46	33.92	727.
				200 bar Isobar					
* 67.431	31.29360	254.01	25.61	−4134.3	−3495.2	69.15			
68	31.23599	248.13	25.25	−4105.5	−3465.2	69.59			
70	31.02928	229.31	24.07	−4004.1	−3359.5	71.12			
72	30.81620	212.97	23.02	−3902.7	−3253.7	72.61	34.06	52.93	1087.
74	30.59696	198.69	22.08	−3801.5	−3147.9	74.06	33.51	52.90	1058.
76	30.37187	186.13	21.21	−3700.6	−3042.1	75.47	32.94	52.85	1032.
78	30.14133	175.00	20.40	−3600.0	−2936.5	76.84	32.36	52.77	1009.
80	29.90578	165.06	19.64	−3499.8	−2831.0	78.18	31.81	52.70	988.
82	29.66564	156.13	18.91	−3399.8	−2725.7	79.48	31.29	52.64	968.
84	29.42134	148.03	18.23	−3300.2	−2620.4	80.75	30.81	52.59	950.
86	29.17327	140.63	17.57	−3200.9	−2515.3	81.98	30.37	52.55	932.
88	28.92175	133.83	16.94	−3101.7	−2410.2	83.19	29.97	52.53	915.
90	28.66709	127.53	16.33	−3002.8	−2305.2	84.37	29.61	52.52	899.
92	28.40952	121.67	15.75	−2904.1	−2200.1	85.53	29.28	52.53	883.
94	28.14924	116.17	15.19	−2805.5	−2095.0	86.66	28.99	52.56	867.
96	27.88641	110.99	14.65	−2707.1	−1989.9	87.76	28.72	52.61	852.
98	27.62115	106.10	14.14	−2608.7	−1884.6	88.85	28.48	52.67	837.
100	27.35355	101.47	13.63	−2510.4	−1779.2	89.91	28.26	52.74	822.
102	27.08368	97.06	13.15	−2412.1	−1673.6	90.96	28.06	52.83	808.
104	26.81159	92.87	12.69	−2313.8	−1567.8	91.99	27.87	52.94	794.
106	26.53731	88.87	12.23	−2215.5	−1461.9	93.00	27.70	53.05	780.
108	26.26088	85.05	11.80	−2117.2	−1355.6	93.99	27.54	53.18	766.
110	25.98233	81.40	11.38	−2018.9	−1249.1	94.97	27.39	53.31	752.
112	25.70168	77.91	10.97	−1920.6	−1142.4	95.93	27.24	53.45	739.
114	25.41896	74.58	10.58	−1822.2	−1035.4	96.87	27.11	53.59	725.
116	25.13420	71.39	10.20	−1723.7	−928.0	97.81	26.98	53.74	713.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
118	24.84744	68.35	9.83	−1625.3	−820.4	98.73	26.86	53.90	700.
120	24.55871	65.44	9.48	−1526.8	−712.4	99.64	26.74	54.05	687.
122	24.26807	62.66	9.14	−1428.3	−604.2	100.53	26.62	54.21	675.
124	23.97557	60.01	8.80	−1329.8	−495.6	101.41	26.51	54.37	663.
126	23.68127	57.47	8.48	−1231.2	−386.7	102.28	26.40	54.53	651.
128	23.38524	55.05	8.17	−1132.7	−277.5	103.14	26.29	54.68	639.
130	23.08757	52.75	7.87	−1034.2	−168.0	103.99	26.19	54.84	628.
132	22.78834	50.55	7.58	−935.8	−58.1	104.83	26.08	54.99	617.
134	22.48764	48.45	7.30	−837.4	52.0	105.66	25.98	55.14	606.
136	22.18560	46.46	7.03	−739.1	162.4	106.48	25.88	55.28	595.
138	21.88233	44.56	6.77	−640.9	273.1	107.28	25.78	55.42	585.
140	21.57797	42.75	6.52	−542.8	384.1	108.08	25.68	55.55	575.
142	21.27267	41.04	6.27	−444.9	495.3	108.87	25.59	55.67	565.
144	20.96662	39.41	6.04	−347.1	606.8	109.65	25.49	55.79	555.
146	20.65999	37.88	5.81	−249.6	718.4	110.42	25.40	55.89	545.
148	20.35301	36.42	5.59	−152.3	830.3	111.18	25.30	55.98	536.
150	20.04592	35.05	5.38	−55.4	942.3	111.93	25.21	56.06	527.
155	19.27956	31.99	4.89	185.6	1222.9	113.77	24.99	56.16	507.
160	18.51918	29.41	4.44	423.7	1503.7	115.56	24.78	56.11	488.
165	17.77055	27.30	4.04	658.2	1783.7	117.28	24.57	55.88	471.
170	17.03987	25.62	3.69	888.4	2062.1	118.94	24.37	55.44	456.
175	16.33317	24.32	3.37	1113.3	2337.8	120.54	24.18	54.81	444.
180	15.65566	23.35	3.09	1332.4	2609.9	122.07	23.99	54.01	433.
185	15.01128	22.67	2.84	1545.4	2877.7	123.54	23.81	53.07	425.
190	14.40251	22.23	2.62	1751.8	3140.5	124.94	23.64	52.04	418.
195	13.83044	21.97	2.43	1951.9	3398.0	126.28	23.48	50.95	413.
200	13.29497	21.88	2.26	2145.6	3649.9	127.56	23.32	49.83	408.
210	12.32930	22.04	1.98	2515.1	4137.2	129.94	23.04	47.65	403.
220	11.49162	22.55	1.76	2863.0	4603.4	132.10	22.80	45.62	401.
230	10.76452	23.28	1.58	3192.4	5050.4	134.09	22.59	43.81	401.
240	10.13082	24.16	1.43	3506.2	5480.3	135.92	22.41	42.23	403.
250	9.57521	25.12	1.31	3806.9	5895.6	137.62	22.26	40.86	406.
260	9.08475	26.15	1.21	4096.8	6298.3	139.20	22.14	39.69	409.
270	8.64877	27.21	1.12	4377.6	6690.0	140.68	22.03	38.69	413.
280	8.25862	28.29	1.05	4650.7	7072.4	142.07	21.95	37.82	417.
290	7.90724	29.37	0.9811	4917.5	7446.8	143.38	21.87	37.07	422.
300	7.58893	30.47	0.9244	5178.7	7814.1	144.63	21.81	36.42	426.
310	7.29901	31.55	0.8743	5435.3	8175.4	145.81	21.75	35.85	431.
320	7.03364	32.64	0.8296	5687.8	8531.3	146.94	21.71	35.35	436.
330	6.78966	33.72	0.7897	5936.9	8882.5	148.02	21.67	34.91	440.
340	6.56442	34.79	0.7536	6182.9	9229.6	149.06	21.63	34.52	445.
350	6.35571	35.85	0.7209	6426.2	9573.0	150.05	21.61	34.17	450.
360	6.16165	36.90	0.6912	6667.2	9913.1	151.01	21.59	33.86	455.
370	5.98064	37.95	0.6639	6906.2	10250.3	151.93	21.57	33.58	459.
380	5.81132	38.99	0.6389	7143.3	10584.9	152.83	21.56	33.34	464.
390	5.65253	40.02	0.6158	7378.9	10917.1	153.69	21.55	33.12	469.
400	5.50323	41.04	0.5945	7613.0	11247.3	154.53	21.54	32.92	473.
420	5.22969	43.06	0.5562	8077.8	11902.1	156.12	21.55	32.58	482.
440	4.98486	45.06	0.5229	8538.8	12550.9	157.63	21.57	32.31	491.
460	4.76416	47.02	0.4935	8996.9	13194.9	159.06	21.60	32.09	499.
480	4.56397	48.97	0.4675	9452.9	13835.0	160.43	21.64	31.93	508.
500	4.38141	50.89	0.4442	9907.4	14472.2	161.73	21.70	31.80	516.
520	4.21409	52.79	0.4233	10361.2	15107.1	162.97	21.76	31.70	524.
540	4.06008	54.68	0.4044	10814.5	15740.5	164.17	21.84	31.64	532.
560	3.91777	56.55	0.3872	11267.9	16372.8	165.32	21.93	31.60	539.
580	3.78580	58.40	0.3714	11721.6	17004.5	166.42	22.02	31.58	547.
600	3.66302	60.24	0.3570	12176.1	17636.0	167.50	22.12	31.58	554.
620	3.54846	62.07	0.3437	12631.5	18267.7	168.53	22.22	31.59	561.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
640	3.44127	63.88	0.3314	13088.1	18899.9	169.53	22.33	31.62	568.
660	3.34074	65.69	0.3200	13546.1	19532.8	170.51	22.45	31.67	575.
680	3.24623	67.48	0.3094	14005.7	20166.7	171.45	22.57	31.72	582.
700	3.15719	69.27	0.2995	14466.9	20801.6	172.37	22.69	31.78	589.
720	3.07315	71.05	0.2902	14929.9	21437.9	173.27	22.81	31.85	595.
740	2.99368	72.82	0.2815	15394.9	22075.6	174.14	22.94	31.92	601.
760	2.91839	74.58	0.2734	15861.8	22714.9	175.00	23.06	32.00	608.
780	2.84695	76.34	0.2657	16330.7	23355.8	175.83	23.19	32.09	614.
800	2.77907	78.09	0.2585	16801.7	23998.4	176.64	23.31	32.17	620.
850	2.62322	82.44	0.2420	17988.4	25612.7	178.60	23.62	32.40	635.
900	2.48445	86.77	0.2277	19188.5	27238.5	180.46	23.93	32.63	650.
950	2.36004	91.07	0.2149	20401.7	28876.1	182.23	24.22	32.87	664.
1000	2.24780	95.34	0.2036	21627.8	30525.4	183.92	24.50	33.10	678.
1050	2.14599	99.60	0.1934	22866.4	32186.1	185.54	24.76	33.33	692.
1100	2.05319	103.85	0.1842	24116.9	33857.8	187.10	25.01	33.54	705.
1150	1.96823	108.08	0.1759	25378.7	35540.1	188.59	25.25	33.75	718.
1200	1.89014	112.30	0.1683	26651.2	37232.4	190.03	25.47	33.94	731.
				250 bar Isobar					
* 68.468	31.38709	259.39	24.56	−4111.7	−3315.1	69.45			
70	31.24023	244.92	23.78	−4035.7	−3235.4	70.60			
72	31.04296	228.21	22.86	−3936.5	−3131.2	72.07	34.90	52.09	1101.
74	30.83962	213.58	22.03	−3837.7	−3027.1	73.49	34.36	52.04	1075.
76	30.63050	200.71	21.26	−3739.2	−2923.1	74.88	33.72	51.97	1051.
78	30.41596	189.30	20.55	−3641.1	−2819.2	76.23	33.08	51.89	1029.
80	30.19645	179.13	19.87	−3543.4	−2715.5	77.54	32.48	51.81	1010.
82	29.97243	169.99	19.22	−3446.0	−2611.9	78.82	31.91	51.74	992.
84	29.74434	161.73	18.60	−3349.0	−2508.5	80.07	31.38	51.69	975.
86	29.51262	154.20	18.00	−3252.3	−2405.2	81.28	30.90	51.64	959.
88	29.27766	147.30	17.42	−3155.8	−2301.9	82.47	30.47	51.60	944.
90	29.03981	140.93	16.85	−3059.6	−2198.8	83.63	30.07	51.58	929.
92	28.79938	135.00	16.31	−2963.7	−2095.6	84.76	29.71	51.57	915.
94	28.55664	129.46	15.78	−2867.9	−1992.5	85.87	29.39	51.57	901.
96	28.31180	124.26	15.27	−2772.4	−1889.3	86.96	29.10	51.58	887.
98	28.06505	119.36	14.78	−2676.9	−1786.2	88.02	28.83	51.60	873.
100	27.81654	114.71	14.30	−2581.7	−1682.9	89.06	28.59	51.63	860.
102	27.56639	110.30	13.84	−2486.5	−1579.6	90.09	28.37	51.67	847.
104	27.31472	106.09	13.39	−2391.5	−1476.2	91.09	28.16	51.72	834.
106	27.06160	102.08	12.95	−2296.6	−1372.8	92.08	27.98	51.77	821.
108	26.80711	98.25	12.53	−2201.7	−1269.2	93.04	27.80	51.83	809.
110	26.55133	94.59	12.13	−2107.0	−1165.4	94.00	27.64	51.90	796.
112	26.29430	91.08	11.73	−2012.3	−1061.6	94.93	27.48	51.96	784.
114	26.03609	87.72	11.35	−1917.8	−957.6	95.85	27.34	52.04	772.
116	25.77676	84.50	10.98	−1823.3	−853.4	96.76	27.20	52.11	760.
118	25.51638	81.42	10.62	−1728.9	−749.1	97.65	27.07	52.18	749.
120	25.25499	78.48	10.27	−1634.6	−644.7	98.53	26.94	52.25	737.
122	24.99267	75.65	9.94	−1540.4	−540.1	99.39	26.82	52.32	726.
124	24.72950	72.95	9.61	−1446.4	−435.4	100.24	26.70	52.39	715.
126	24.46554	70.36	9.30	−1352.4	−330.6	101.08	26.58	52.45	704.
128	24.20088	67.89	8.99	−1258.6	−225.6	101.91	26.47	52.51	693.
130	23.93561	65.53	8.70	−1165.0	−120.5	102.72	26.36	52.57	683.
132	23.66980	63.26	8.42	−1071.5	−15.3	103.53	26.25	52.62	673.
134	23.40357	61.10	8.14	−978.2	90.0	104.32	26.14	52.67	663.
136	23.13701	59.04	7.87	−885.2	195.3	105.10	26.04	52.71	653.
138	22.87022	57.07	7.62	−792.3	300.8	105.87	25.94	52.74	644.
140	22.60332	55.19	7.37	−699.7	406.3	106.63	25.83	52.77	634.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
142	22.33642	53.40	7.12	−607.4	511.9	107.38	25.73	52.79	625.
144	22.06964	51.69	6.89	−515.3	617.5	108.11	25.64	52.81	616.
146	21.80311	50.06	6.67	−423.5	723.1	108.84	25.54	52.81	608.
148	21.53696	48.51	6.45	−332.1	828.7	109.56	25.44	52.81	600.
150	21.27132	47.04	6.24	−241.0	934.3	110.27	25.35	52.80	591.
155	20.61045	43.67	5.75	−14.8	1198.1	112.00	25.12	52.72	572.
160	19.95613	40.74	5.30	208.7	1461.4	113.67	24.90	52.58	554.
165	19.31100	38.21	4.89	429.2	1723.8	115.29	24.69	52.36	538.
170	18.67785	36.05	4.52	646.3	1984.8	116.84	24.49	52.05	523.
175	18.05949	34.24	4.18	859.8	2244.1	118.35	24.30	51.65	510.
180	17.45862	32.74	3.87	1069.2	2501.2	119.80	24.12	51.16	498.
185	16.87762	31.53	3.60	1274.3	2755.6	121.19	23.95	50.59	488.
190	16.31846	30.57	3.35	1475.0	3007.0	122.53	23.78	49.96	479.
195	15.78259	29.83	3.13	1671.0	3255.0	123.82	23.63	49.27	471.
200	15.27092	29.28	2.92	1862.5	3499.6	125.06	23.49	48.54	465.
210	14.32125	28.65	2.58	2231.8	3977.4	127.39	23.22	47.03	455.
220	13.46762	28.49	2.30	2583.9	4440.2	129.54	22.99	45.53	449.
230	12.70360	28.68	2.07	2920.3	4888.2	131.54	22.79	44.10	445.
240	12.02052	29.11	1.88	3242.7	5322.5	133.38	22.62	42.78	443.
250	11.40909	29.72	1.72	3552.9	5744.2	135.11	22.47	41.58	443.
260	10.86034	30.45	1.58	3852.5	6154.5	136.71	22.34	40.50	444.
270	10.36611	31.28	1.47	4142.9	6554.6	138.22	22.23	39.55	446.
280	9.91919	32.16	1.37	4425.4	6945.8	139.65	22.13	38.70	448.
290	9.51336	33.10	1.28	4701.1	7328.9	140.99	22.05	37.95	451.
300	9.14329	34.06	1.21	4970.7	7705.0	142.27	21.98	37.28	454.
310	8.80444	35.05	1.14	5235.3	8074.8	143.48	21.92	36.69	458.
320	8.49298	36.05	1.08	5495.3	8438.9	144.64	21.87	36.16	461.
330	8.20562	37.06	1.02	5751.4	8798.1	145.74	21.82	35.69	465.
340	7.93957	38.08	0.9756	6004.0	9152.8	146.80	21.78	35.27	469.
350	7.69247	39.10	0.9318	6253.6	9503.6	147.82	21.75	34.89	473.
360	7.46225	40.11	0.8920	6500.5	9850.7	148.79	21.73	34.55	477.
370	7.24716	41.13	0.8557	6745.0	10194.7	149.74	21.70	34.24	481.
380	7.04569	42.14	0.8223	6987.5	10535.7	150.65	21.69	33.97	485.
390	6.85649	43.15	0.7916	7228.0	10874.2	151.53	21.68	33.72	490.
400	6.67843	44.16	0.7632	7466.9	11210.3	152.38	21.67	33.50	494.
420	6.35176	46.16	0.7125	7940.4	11876.3	154.00	21.66	33.12	502.
440	6.05895	48.14	0.6685	8409.2	12535.3	155.53	21.68	32.80	510.
460	5.79469	50.10	0.6299	8874.5	13188.8	156.99	21.70	32.55	518.
480	5.55477	52.04	0.5957	9337.1	13837.8	158.37	21.74	32.35	526.
500	5.33578	53.96	0.5653	9797.8	14483.1	159.69	21.79	32.19	533.
520	5.13494	55.87	0.5379	10257.1	15125.7	160.95	21.86	32.07	541.
540	4.94996	57.76	0.5133	10715.6	15766.1	162.15	21.93	31.98	548.
560	4.77892	59.64	0.4909	11173.7	16405.0	163.32	22.01	31.92	556.
580	4.62023	61.50	0.4705	11632.0	17043.0	164.44	22.10	31.88	563.
600	4.47251	63.35	0.4518	12090.6	17680.3	165.52	22.20	31.86	570.
620	4.33461	65.19	0.4346	12550.0	18317.5	166.56	22.30	31.86	577.
640	4.20553	67.01	0.4187	13010.2	18954.8	167.57	22.41	31.87	583.
660	4.08441	68.83	0.4040	13471.7	19592.5	168.55	22.52	31.90	590.
680	3.97050	70.64	0.3904	13934.5	20231.0	169.51	22.63	31.94	597.
700	3.86313	72.43	0.3777	14398.8	20870.2	170.43	22.75	31.99	603.
720	3.76175	74.22	0.3658	14864.8	21510.6	171.33	22.87	32.05	609.
740	3.66583	76.00	0.3547	15332.4	22152.2	172.21	23.00	32.11	615.
760	3.57493	77.77	0.3443	15802.0	22795.1	173.07	23.12	32.18	622.
780	3.48865	79.54	0.3344	16273.4	23439.5	173.91	23.24	32.26	628.
800	3.40663	81.30	0.3252	16746.7	24085.3	174.73	23.37	32.33	634.
850	3.21818	85.67	0.3043	17938.8	25707.2	176.69	23.67	32.54	648.
900	3.05024	90.01	0.2860	19143.7	27339.7	178.56	23.97	32.76	663.
950	2.89953	94.33	0.2698	20361.2	28983.3	180.33	24.26	32.98	677.
1000	2.76345	98.62	0.2554	21591.2	30637.9	182.03	24.54	33.20	690.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1050	2.63990	102.89	0.2425	22833.3	32303.3	183.66	24.80	33.42	703.
1100	2.52720	107.14	0.2309	24087.0	33979.3	185.22	25.05	33.62	716.
1150	2.42394	111.38	0.2204	25351.6	35665.4	186.72	25.28	33.82	729.
1200	2.32895	115.61	0.2108	26626.8	37361.2	188.16	25.50	34.01	742.
				300 bar Isobar					
* 69.493	31.48354	265.30	23.67	−4088.1	−3135.2	69.75			
70	31.43812	260.58	23.45	−4063.4	−3109.2	70.12			
72	31.25505	243.47	22.66	−3966.4	−3006.5	71.57	35.77	51.31	1117.
74	31.06593	228.47	21.94	−3869.7	−2904.0	72.98	35.08	51.23	1091.
76	30.87101	215.24	21.28	−3773.4	−2801.6	74.34	34.37	51.15	1069.
78	30.67064	203.52	20.65	−3677.5	−2699.4	75.67	33.69	51.07	1049.
80	30.46524	193.07	20.06	−3582.0	−2597.3	76.96	33.03	50.99	1031.
82	30.25529	183.69	19.48	−3487.0	−2495.4	78.22	32.42	50.92	1015.
84	30.04125	175.23	18.92	−3392.2	−2393.6	79.44	31.86	50.87	999.
86	29.82358	167.53	18.37	−3297.8	−2291.9	80.64	31.34	50.83	985.
88	29.60271	160.48	17.84	−3203.7	−2190.3	81.81	30.88	50.79	971.
90	29.37905	154.00	17.32	−3109.9	−2088.7	82.95	30.45	50.77	957.
92	29.15294	147.98	16.81	−3016.3	−1987.2	84.07	30.07	50.75	944.
94	28.92470	142.38	16.32	−2922.9	−1885.7	85.16	29.72	50.74	931.
96	28.69459	137.12	15.83	−2829.8	−1784.3	86.23	29.41	50.73	919.
98	28.46285	132.17	15.36	−2736.8	−1682.8	87.27	29.13	50.73	907.
100	28.22968	127.50	14.91	−2644.1	−1581.3	88.30	28.87	50.74	894.
102	27.99523	123.06	14.46	−2551.5	−1479.9	89.30	28.63	50.75	882.
104	27.75965	118.83	14.03	−2459.0	−1378.3	90.29	28.42	50.77	871.
106	27.52305	114.80	13.61	−2366.8	−1276.8	91.25	28.22	50.79	859.
108	27.28554	110.95	13.20	−2274.7	−1175.2	92.20	28.03	50.81	847.
110	27.04722	107.26	12.80	−2182.7	−1073.5	93.14	27.86	50.84	836.
112	26.80815	103.73	12.42	−2090.9	−971.8	94.05	27.70	50.86	825.
114	26.56841	100.34	12.04	−1999.2	−870.1	94.95	27.55	50.89	813.
116	26.32808	97.09	11.68	−1907.7	−768.3	95.84	27.40	50.92	803.
118	26.08723	93.98	11.33	−1816.4	−666.4	96.71	27.26	50.94	792.
120	25.84591	90.98	10.99	−1725.2	−564.5	97.57	27.13	50.97	781.
122	25.60420	88.11	10.66	−1634.2	−462.5	98.41	27.01	50.99	771.
124	25.36216	85.36	10.34	−1543.4	−360.5	99.24	26.88	51.01	760.
126	25.11988	82.72	10.03	−1452.8	−258.5	100.05	26.76	51.02	750.
128	24.87741	80.19	9.72	−1362.3	−156.4	100.86	26.65	51.04	740.
130	24.63484	77.76	9.43	−1272.1	−54.4	101.65	26.53	51.04	731.
132	24.39225	75.44	9.15	−1182.2	47.7	102.43	26.42	51.04	721.
134	24.14971	73.21	8.88	−1092.4	149.8	103.20	26.32	51.04	712.
136	23.90732	71.07	8.61	−1003.0	251.9	103.95	26.21	51.03	703.
138	23.66514	69.03	8.35	−913.7	353.9	104.70	26.11	51.02	694.
140	23.42328	67.08	8.11	−824.8	456.0	105.43	26.00	51.00	685.
142	23.18182	65.21	7.87	−736.2	557.9	106.15	25.90	50.97	677.
144	22.94085	63.42	7.63	−647.9	659.8	106.87	25.80	50.94	669.
146	22.70046	61.71	7.41	−559.9	761.7	107.57	25.71	50.90	660.
148	22.46075	60.08	7.19	−472.2	863.4	108.26	25.61	50.85	653.
150	22.22180	58.52	6.98	385.0	965.1	108.94	25.52	50.80	645.
155	21.62843	54.92	6.48	−168.4	1218.7	110.61	25.29	50.64	627.
160	21.04199	51.73	6.03	45.7	1471.4	112.21	25.07	50.44	610.
165	20.46401	48.92	5.61	257.0	1723.0	113.76	24.86	50.19	594.
170	19.89606	46.45	5.23	465.4	1973.2	115.25	24.66	49.90	579.
175	19.33968	44.30	4.87	670.7	2221.9	116.69	24.46	49.56	566.
180	18.79634	42.45	4.55	872.7	2468.7	118.09	24.28	49.17	554.
185	18.26741	40.87	4.26	1071.2	2713.5	119.43	24.11	48.74	543.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
190	17.75410	39.53	3.99	1266.3	2956.1	120.72	23.95	48.27	533.
195	17.25742	38.41	3.75	1457.8	3196.2	121.97	23.80	47.77	525.
200	16.77813	37.49	3.53	1645.6	3433.7	123.17	23.66	47.23	517.
210	15.87361	36.17	3.14	2010.5	3900.5	125.45	23.40	46.12	504.
220	15.04188	35.40	2.82	2361.5	4355.9	127.57	23.17	44.97	495.
230	14.28112	35.05	2.55	2699.2	4799.9	129.54	22.97	43.84	489.
240	13.58733	35.03	2.32	3024.8	5232.8	131.38	22.80	42.75	484.
250	12.95529	35.24	2.13	3339.5	5655.2	133.11	22.65	41.74	482.
260	12.37931	35.64	1.96	3644.4	6067.8	134.73	22.52	40.80	480.
270	11.85371	36.19	1.82	3940.6	6471.5	136.25	22.40	39.94	480.
280	11.37311	36.84	1.69	4229.1	6866.9	137.69	22.30	39.16	481.
290	10.93256	37.57	1.59	4510.8	7254.9	139.05	22.22	38.45	482.
300	10.52763	38.36	1.49	4786.5	7636.2	140.34	22.14	37.81	484.
310	10.15437	39.20	1.41	5057.0	8011.4	141.57	22.07	37.23	486.
320	9.80931	40.08	1.33	5322.7	8381.0	142.75	22.02	36.71	488.
330	9.48941	40.99	1.26	5584.3	8745.7	143.87	21.97	36.24	491.
340	9.19202	41.91	1.20	5842.2	9105.9	144.94	21.92	35.81	494.
350	8.91482	42.85	1.15	6096.8	9462.0	145.98	21.89	35.42	498.
360	8.65578	43.80	1.10	6348.5	9814.4	146.97	21.86	35.07	501.
370	8.41312	44.76	1.05	6597.7	10163.5	147.93	21.83	34.75	504.
380	8.18529	45.72	1.01	6844.5	10509.6	148.85	21.81	34.46	508.
390	7.97092	46.69	0.9715	7089.2	10852.9	149.74	21.79	34.20	511.
400	7.76879	47.66	0.9359	7332.1	11193.7	150.60	21.78	33.96	515.
420	7.39714	49.60	0.8724	7813.1	11868.7	152.25	21.77	33.55	522.
440	7.06314	51.54	0.8173	8288.8	12536.2	153.80	21.78	33.21	530.
460	6.76108	53.46	0.7691	8760.5	13197.6	155.27	21.80	32.94	537.
480	6.48636	55.38	0.7265	9228.9	13854.0	156.67	21.84	32.71	544.
500	6.23523	57.29	0.6886	9694.9	14506.3	158.00	21.88	32.53	551.
520	6.00461	59.18	0.6547	10159.3	15155.4	159.27	21.94	32.39	558.
540	5.79197	61.06	0.6241	10622.4	15802.0	160.49	22.01	32.28	565.
560	5.59516	62.93	0.5964	11085.0	16446.7	161.67	22.09	32.20	572.
580	5.41238	64.79	0.5711	11547.3	17090.1	162.80	22.18	32.14	579.
600	5.24211	66.64	0.5480	12009.7	17732.6	163.88	22.27	32.11	586.
620	5.08304	68.48	0.5268	12472.6	18374.6	164.94	22.37	32.10	592.
640	4.93403	70.30	0.5073	12936.3	19016.5	165.96	22.47	32.10	599.
660	4.79412	72.12	0.4892	13400.9	19658.6	166.94	22.58	32.11	605.
680	4.66245	73.93	0.4724	13866.8	20301.1	167.90	22.70	32.14	611.
700	4.53828	75.73	0.4568	14333.9	20944.3	168.84	22.81	32.18	617.
720	4.42096	77.52	0.4422	14802.5	21588.4	169.74	22.93	32.23	624.
740	4.30991	79.30	0.4286	15272.8	22233.5	170.63	23.05	32.28	630.
760	4.20461	81.08	0.4158	15744.7	22879.8	171.49	23.18	32.34	636.
780	4.10461	82.85	0.4038	16218.4	23527.3	172.33	23.30	32.41	641.
800	4.00950	84.61	0.3925	16694.0	24176.2	173.15	23.42	32.48	647.
850	3.79082	89.00	0.3670	17891.2	25805.0	175.13	23.72	32.67	661.
900	3.59573	93.35	0.3447	19100.6	27443.8	177.00	24.02	32.88	675.
950	3.42047	97.67	0.3250	20322.2	29092.9	178.78	24.30	33.09	689.
1000	3.26207	101.97	0.3075	21555.9	30752.5	180.48	24.58	33.30	702.
1050	3.11814	106.24	0.2919	22801.3	32422.4	182.11	24.84	33.50	715.
1100	2.98672	110.50	0.2778	24058.0	34102.4	183.68	25.08	33.70	728.
1150	2.86622	114.75	0.2651	25325.4	35792.2	185.18	25.32	33.89	740.
1200	2.75528	118.98	0.2535	26603.1	37491.3	186.63	25.53	34.07	753.
				350 bar Isobar					
* 70.506	31.58195	271.65	22.91	−4063.7	−2955.5	70.05			
72	31.45422	258.78	22.42	−3992.7	−2879.9	71.11	36.43	50.56	1132.
74	31.27794	243.38	21.81	−3897.9	−2778.9	72.50	35.68	50.47	1109.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
76	31.09579	229.78	21.25	−3803.6	−2678.1	73.84	34.92	50.37	1088.
78	30.90812	217.71	20.72	−3709.8	−2577.4	75.15	34.19	50.29	1069.
80	30.71533	206.95	20.20	−3616.4	−2476.9	76.42	33.50	50.21	1052.
82	30.51787	197.29	19.69	−3523.4	−2376.5	77.66	32.85	50.16	1037.
84	30.31623	188.58	19.20	−3430.8	−2276.3	78.87	32.26	50.11	1023.
86	30.11088	180.68	18.70	−3338.5	−2176.1	80.05	31.71	50.08	1009.
88	29.90229	173.46	18.22	−3246.4	−2076.0	81.20	31.22	50.05	996.
90	29.69088	166.82	17.74	−3154.7	−1975.9	82.32	30.78	50.04	984.
92	29.47705	160.69	17.27	−3063.2	−1875.8	83.42	30.37	50.02	972.
94	29.26114	154.99	16.80	−2971.9	−1775.8	84.50	30.01	50.01	960.
96	29.04346	149.66	16.35	−2880.9	−1675.8	85.55	29.68	50.00	949.
98	28.82427	144.65	15.90	−2790.0	−1575.8	86.58	29.38	50.00	937.
100	28.60382	139.92	15.46	−2699.4	−1475.8	87.59	29.11	50.00	926.
102	28.38229	135.44	15.03	−2608.9	−1375.8	88.58	28.87	50.00	915.
104	28.15986	131.18	14.62	−2518.7	−1275.8	89.55	28.64	50.00	904.
106	27.93667	127.12	14.21	−2428.6	−1175.8	90.51	28.43	50.00	893.
108	27.71284	123.24	13.81	−2338.7	−1075.8	91.44	28.24	50.00	883.
110	27.48847	119.52	13.42	−2249.0	−975.8	92.36	28.06	50.00	872.
112	27.26368	115.96	13.04	−2159.5	−875.8	93.26	27.89	50.01	861.
114	27.03853	112.54	12.68	−2070.2	−775.7	94.14	27.74	50.01	851.
116	26.81310	109.26	12.32	−1981.1	−675.7	95.01	27.59	50.01	841.
118	26.58748	106.11	11.97	−1892.1	−575.7	95.87	27.45	50.01	831.
120	26.36171	103.08	11.64	−1803.4	−475.7	96.71	27.31	50.00	821.
122	26.13588	100.16	11.31	−1714.9	−375.7	97.54	27.18	49.99	811.
124	25.91005	97.36	10.99	−1626.6	−275.7	98.35	27.06	49.98	801.
126	25.68427	94.67	10.68	−1538.5	−175.8	99.15	26.94	49.97	792.
128	25.45862	92.08	10.39	−1450.6	−75.9	99.93	26.82	49.95	782.
130	25.23316	89.59	10.09	−1363.0	24.0	100.71	26.71	49.93	773.
132	25.00795	87.21	9.81	−1275.7	123.9	101.47	26.60	49.90	764.
134	24.78306	84.91	9.54	−1188.6	223.6	102.22	26.49	49.87	755.
136	24.55857	82.71	9.28	−1101.8	323.3	102.96	26.38	49.84	747.
138	24.33453	80.60	9.02	−1015.3	423.0	103.69	26.28	49.80	738.
140	24.11101	78.58	8.77	−929.1	522.5	104.40	26.18	49.75	730.
142	23.88809	76.63	8.53	−843.2	622.0	105.11	26.07	49.70	722.
144	23.66584	74.77	8.30	−757.6	721.3	105.80	25.98	49.64	714.
146	23.44432	72.98	8.07	−672.4	820.5	106.49	25.88	49.58	706.
148	23.22361	71.27	7.85	−587.5	919.6	107.16	25.78	49.51	699.
150	23.00377	69.63	7.64	−502.9	1018.6	107.83	25.69	49.44	692.
155	22.45847	65.83	7.14	−293.2	1265.3	109.44	25.46	49.24	674.
160	21.92014	62.43	6.67	−85.8	1510.9	111.00	25.24	49.00	658.
165	21.38983	59.39	6.25	118.9	1755.2	112.51	25.04	48.74	642.
170	20.86855	56.69	5.85	321.0	1998.2	113.96	24.84	48.44	628.
175	20.35726	54.28	5.49	520.3	2239.6	115.36	24.65	48.12	615.
180	19.85687	52.17	5.16	716.7	2479.4	116.71	24.47	47.77	603.
185	19.36822	50.31	4.85	910.2	2717.3	118.01	24.30	47.40	592.
190	18.89204	48.68	4.57	1100.7	2953.3	119.27	24.14	47.01	582.
195	18.42899	47.28	4.31	1288.2	3187.4	120.49	23.98	46.59	573.
200	17.97958	46.07	4.08	1472.6	3419.2	121.66	23.84	46.16	564.
210	17.12318	44.18	3.66	1832.3	3876.4	123.89	23.58	45.26	550.
220	16.32446	42.88	3.30	2180.3	4324.3	125.98	23.35	44.33	539.
230	15.58314	42.04	3.00	2516.9	4762.9	127.93	23.15	43.40	530.
240	14.89735	41.58	2.74	2843.0	5192.4	129.75	22.98	42.50	524.
250	14.26415	41.41	2.52	3159.4	5613.1	131.47	22.82	41.64	519.
260	13.67993	41.48	2.33	3466.8	6025.3	133.09	22.69	40.82	516.
270	13.14084	41.73	2.16	3766.3	6429.7	134.61	22.57	40.06	514.
280	12.64296	42.12	2.02	4058.4	6826.8	136.06	22.46	39.36	513.
290	12.18254	42.63	1.89	4344.1	7217.1	137.43	22.37	38.71	513.
300	11.75605	43.22	1.77	4623.9	7601.1	138.73	22.29	38.11	514.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
310	11.36023	43.89	1.67	4898.5	7979.4	139.97	22.22	37.56	515.
320	10.99213	44.62	1.58	5168.4	8352.5	141.16	22.16	37.06	516.
330	10.64908	45.39	1.50	5434.2	8720.8	142.29	22.10	36.60	518.
340	10.32871	46.21	1.43	5696.2	9084.8	143.38	22.06	36.19	520.
350	10.02887	47.04	1.37	5954.8	9444.7	144.42	22.01	35.80	523.
360	9.74768	47.91	1.31	6210.3	9800.9	145.42	21.98	35.45	525.
370	9.48345	48.79	1.25	6463.2	10153.8	146.39	21.95	35.13	528.
380	9.23467	49.68	1.20	6713.6	10503.7	147.32	21.93	34.84	531.
390	9.00000	50.59	1.15	6961.9	10850.7	148.22	21.91	34.57	534.
400	8.77824	51.51	1.11	7208.1	11195.2	149.10	21.89	34.33	537.
420	8.36931	53.36	1.03	7695.5	11877.4	150.76	21.88	33.90	543.
440	8.00061	55.22	0.9682	8177.2	12551.8	152.33	21.88	33.55	550.
460	7.66626	57.09	0.9102	8654.3	13219.8	153.81	21.90	33.25	556.
480	7.36147	58.97	0.8591	9127.9	13882.4	155.22	21.93	33.01	563.
500	7.08231	60.84	0.8136	9598.7	14540.6	156.57	21.97	32.82	570.
520	6.82552	62.70	0.7729	10067.5	15195.3	157.85	22.02	32.66	576.
540	6.58839	64.56	0.7363	10534.8	15847.2	159.08	22.09	32.54	583.
560	6.36863	66.41	0.7031	11001.3	16497.0	160.26	22.17	32.44	589.
580	6.16431	68.26	0.6729	11467.3	17145.1	161.40	22.25	32.38	595.
600	5.97376	70.09	0.6454	11933.2	17792.2	162.50	22.34	32.33	602.
620	5.79557	71.92	0.6201	12399.4	18438.5	163.56	22.44	32.31	608.
640	5.62851	73.74	0.5968	12866.1	19084.5	164.58	22.54	32.30	614.
660	5.47152	75.55	0.5752	13333.7	19730.5	165.58	22.65	32.30	620.
680	5.32367	77.35	0.5552	13802.3	20376.7	166.54	22.76	32.32	626.
700	5.18414	79.15	0.5367	14272.1	21023.4	167.48	22.87	32.35	632.
720	5.05222	80.94	0.5194	14743.2	21670.8	168.39	22.99	32.39	638.
740	4.92727	82.72	0.5032	15215.8	22319.1	169.28	23.11	32.44	644.
760	4.80872	84.49	0.4880	15690.0	22968.5	170.14	23.23	32.49	650.
780	4.69607	86.26	0.4738	16165.9	23618.9	170.99	23.35	32.55	655.
800	4.58888	88.03	0.4604	16643.5	24270.6	171.81	23.47	32.62	661.
850	4.34219	92.41	0.4301	17845.4	25905.9	173.80	23.77	32.80	675.
900	4.12185	96.76	0.4038	19059.1	27550.4	175.68	24.06	32.99	688.
950	3.92369	101.08	0.3805	20284.5	29204.7	177.46	24.35	33.19	701.
1000	3.74442	105.38	0.3599	21521.7	30868.9	179.17	24.62	33.38	714.
1050	3.58136	109.66	0.3415	22770.3	32543.1	180.81	24.87	33.58	727.
1100	3.43236	113.92	0.3249	24029.9	34226.9	182.37	25.12	33.77	739.
1150	3.29561	118.17	0.3099	25300.0	35920.2	183.88	25.35	33.96	752.
1200	3.16962	122.40	0.2963	26580.1	37622.5	185.33	25.56	34.13	764.
				400 bar Isobar					
* 71.508	31.68151	278.36	22.28	−4038.8	−2776.3	70.35			
72	31.64192	274.16	22.15	−4015.9	−2751.7	70.69	36.98	49.85	1149.
74	31.47732	258.34	21.65	−3922.9	−2652.1	72.06	36.18	49.73	1126.
76	31.30678	244.35	21.19	−3830.5	−2552.8	73.38	35.38	49.63	1106.
78	31.13061	231.91	20.74	−3738.5	−2453.6	74.67	34.61	49.54	1089.
80	30.94919	220.80	20.30	−3647.1	−2354.6	75.92	33.88	49.47	1073.
82	30.76297	210.84	19.87	−3556.0	−2255.7	77.14	33.20	49.43	1058.
84	30.57244	201.86	19.43	−3465.3	−2156.9	78.34	32.58	49.39	1045.
86	30.37808	193.71	18.99	−3374.9	−2058.1	79.50	32.02	49.38	1033.
88	30.18037	186.28	18.56	−3284.8	−1959.4	80.63	31.51	49.37	1021.
90	29.97976	179.47	18.12	−3194.9	−1860.7	81.74	31.04	49.36	1009.
92	29.77666	173.19	17.68	−3105.3	−1761.9	82.83	30.63	49.36	998.
94	29.57147	167.37	17.25	−3015.9	−1663.2	83.89	30.25	49.36	987.
96	29.36452	161.93	16.82	−2926.7	−1564.5	84.93	29.91	49.36	977.
98	29.15610	156.84	16.39	−2837.7	−1465.8	85.95	29.60	49.36	966.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
100	28.94648	152.04	15.98	−2748.9	−1367.1	86.94	29.32	49.36	956.
102	28.73588	147.51	15.56	−2660.3	−1268.3	87.92	29.07	49.35	945.
104	28.52449	143.20	15.16	−2571.9	−1169.6	88.88	28.84	49.35	935.
106	28.31249	139.10	14.76	−2483.8	−1071.0	89.82	28.62	49.34	925.
108	28.10001	135.18	14.37	−2395.8	−972.3	90.74	28.43	49.33	915.
110	27.88717	131.43	14.00	−2308.0	−873.6	91.65	28.24	49.32	905.
112	27.67408	127.84	13.63	−2220.4	−775.0	92.53	28.07	49.31	895.
114	27.46084	124.39	13.27	−2133.0	−676.4	93.41	27.91	49.30	886.
116	27.24753	121.07	12.91	−2045.8	−577.8	94.26	27.76	49.28	876.
118	27.03422	117.89	12.57	−1958.8	−479.2	95.11	27.62	49.26	866.
120	26.82099	114.82	12.24	−1872.1	−380.7	95.93	27.48	49.24	857.
122	26.60789	111.86	11.91	−1785.6	−282.3	96.75	27.35	49.22	848.
124	26.39499	109.02	11.60	−1699.3	−183.9	97.55	27.23	49.19	839.
126	26.18234	106.28	11.29	−1613.3	−85.5	98.33	27.11	49.16	829.
128	25.97001	103.64	10.99	−1527.5	12.8	99.11	26.99	49.12	821.
130	25.75805	101.10	10.70	−1441.9	111.0	99.87	26.87	49.08	812.
132	25.54651	98.66	10.42	−1356.7	209.1	100.62	26.76	49.04	803.
134	25.33546	96.31	10.15	−1271.7	307.1	101.36	26.66	48.99	795.
136	25.12494	94.04	9.89	−1187.0	405.0	102.08	26.55	48.94	787.
138	24.91501	91.87	9.63	−1102.6	502.9	102.80	26.45	48.88	779.
140	24.70573	89.77	9.38	−1018.5	600.6	103.50	26.35	48.82	771.
142	24.49715	87.76	9.14	−934.7	698.1	104.19	26.25	48.75	763.
144	24.28933	85.83	8.90	−851.2	795.6	104.87	26.15	48.68	755.
146	24.08231	83.97	8.67	−768.1	892.9	105.54	26.05	48.61	748.
148	23.87616	82.19	8.45	−685.3	990.0	106.20	25.96	48.53	741.
150	23.67094	80.48	8.24	−602.9	1087.0	106.85	25.87	48.45	734.
155	23.16223	76.49	7.73	−398.3	1328.6	108.44	25.64	48.22	717.
160	22.66040	72.89	7.26	−196.1	1569.1	109.97	25.42	47.97	701.
165	22.16620	69.65	6.83	3.7	1808.3	111.44	25.22	47.69	686.
170	21.68036	66.74	6.43	201.0	2046.0	112.86	25.02	47.40	672.
175	21.20353	64.13	6.06	395.8	2282.3	114.23	24.83	47.09	659.
180	20.73633	61.80	5.71	587.9	2516.9	115.55	24.65	46.76	647.
185	20.27929	59.71	5.40	777.4	2749.8	116.83	24.48	46.42	636.
190	19.83290	57.86	5.10	964.2	2981.0	118.06	24.32	46.06	625.
195	19.39757	56.23	4.83	1148.3	3210.4	119.25	24.17	45.69	616.
200	18.97366	54.79	4.58	1329.7	3437.9	120.40	24.03	45.31	607.
210	18.16107	52.43	4.14	1684.6	3887.1	122.59	23.77	44.53	592.
220	17.39635	50.67	3.75	2029.2	4328.5	124.65	23.53	43.74	580.
230	16.67956	49.41	3.42	2363.8	4762.0	126.57	23.33	42.95	570.
240	16.00970	48.55	3.14	2689.1	5187.6	128.39	23.15	42.18	562.
250	15.38500	48.03	2.90	3005.7	5605.6	130.09	22.99	41.43	556.
260	14.80308	47.77	2.68	3314.1	6016.3	131.70	22.85	40.71	551.
270	14.26126	47.72	2.49	3615.2	6420.0	133.23	22.73	40.04	548.
280	13.75670	47.86	2.33	3909.5	6817.1	134.67	22.62	39.40	546.
290	13.28653	48.13	2.18	4197.6	7208.2	136.04	22.52	38.81	544.
300	12.84799	48.52	2.06	4480.2	7593.5	137.35	22.43	38.26	544.
310	12.43844	49.01	1.94	4757.7	7973.5	138.60	22.36	37.75	543.
320	12.05542	49.58	1.84	5030.6	8348.6	139.79	22.29	37.28	544.
330	11.69667	50.20	1.74	5299.4	8719.2	140.93	22.23	36.84	545.
340	11.36010	50.88	1.66	5564.5	9085.6	142.02	22.18	36.44	546.
350	11.04382	51.61	1.58	5826.2	9448.1	143.07	22.14	36.07	548.
360	10.74613	52.37	1.51	6084.8	9807.1	144.08	22.10	35.73	550.
370	10.46546	53.16	1.45	6340.6	10162.7	145.06	22.07	35.41	552.
380	10.20042	53.97	1.39	6594.0	10515.4	146.00	22.04	35.12	554.
390	9.94975	54.80	1.34	6845.1	10865.3	146.91	22.02	34.86	557.
400	9.71229	55.65	1.29	7094.2	11212.7	147.79	22.00	34.61	559.
420	9.27303	57.39	1.20	7586.9	11900.5	149.46	21.98	34.18	564.
440	8.87551	59.16	1.12	8073.7	12580.4	151.05	21.97	33.82	570.
460	8.51391	60.96	1.05	8555.6	13253.8	152.54	21.99	33.52	576.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
480	8.18342	62.77	0.9928	9033.6	13921.5	153.96	22.01	33.27	582.
500	7.88004	64.59	0.9397	9508.6	14584.8	155.32	22.05	33.06	588.
520	7.60043	66.41	0.8922	9981.4	15244.3	156.61	22.10	32.89	594.
540	7.34178	68.23	0.8495	10452.5	15900.8	157.85	22.17	32.76	600.
560	7.10172	70.06	0.8108	10922.5	16554.9	159.04	22.24	32.66	606.
580	6.87821	71.87	0.7756	11391.8	17207.2	160.18	22.32	32.58	612.
600	6.66952	73.69	0.7435	11860.8	17858.3	161.29	22.41	32.53	618.
620	6.47415	75.50	0.7141	12330.0	18508.4	162.35	22.50	32.49	624.
640	6.29080	77.30	0.6870	12799.6	19158.1	163.38	22.60	32.48	630.
660	6.11834	79.10	0.6619	13269.8	19807.6	164.38	22.71	32.47	635.
680	5.95578	80.89	0.6387	13741.0	20457.1	165.35	22.82	32.49	641.
700	5.80225	82.68	0.6171	14213.2	21107.0	166.30	22.93	32.51	647.
720	5.65697	84.46	0.5970	14686.6	21757.5	167.21	23.05	32.54	652.
740	5.51928	86.24	0.5783	15161.4	22408.7	168.10	23.16	32.58	658.
760	5.38856	88.01	0.5607	15637.7	23060.9	168.97	23.28	32.63	664.
780	5.26427	89.77	0.5442	16115.6	23714.0	169.82	23.40	32.68	669.
800	5.14593	91.53	0.5287	16595.1	24368.3	170.65	23.52	32.74	674.
850	4.87332	95.90	0.4936	17801.5	26009.5	172.64	23.81	32.91	688.
900	4.62952	100.25	0.4631	19019.2	27659.4	174.53	24.10	33.09	701.
950	4.41002	104.57	0.4363	20248.3	29318.5	176.32	24.39	33.28	714.
1000	4.21123	108.87	0.4125	21488.7	30987.1	178.03	24.65	33.47	726.
1050	4.03024	113.14	0.3913	22740.3	32665.3	179.67	24.91	33.66	739.
1100	3.86470	117.40	0.3722	24002.7	34352.7	181.24	25.15	33.84	751.
1150	3.71264	121.64	0.3549	25275.3	36049.3	182.75	25.38	34.02	763.
1200	3.57244	125.87	0.3392	26557.8	37754.6	184.20	25.59	34.19	775.
				450 bar Isobar					
* 72.498	31.78159	285.39	21.74	−4013.5	−2597.6	70.64	37.24	49.13	1159.
74	31.66544	273.38	21.45	−3945.0	−2523.9	71.65	36.60	49.02	1143.
76	31.50552	258.97	21.09	−3854.3	−2425.9	72.96	35.76	48.90	1124.
78	31.33986	246.14	20.73	−3764.1	−2328.2	74.23	34.95	48.81	1108.
80	31.16881	234.67	20.37	−3674.4	−2230.7	75.46	34.19	48.75	1093.
82	30.99282	224.37	20.00	−3585.2	−2133.2	76.66	33.49	48.72	1079.
84	30.81236	215.09	19.63	−3496.2	−2035.8	77.84	32.85	48.70	1067.
86	30.62792	206.67	19.25	−3407.6	−1938.4	78.98	32.27	48.71	1055.
88	30.43999	199.01	18.86	−3319.3	−1841.0	80.10	31.74	48.72	1044.
90	30.24905	192.00	18.46	−3231.2	−1743.5	81.20	31.27	48.73	1033.
92	30.05552	185.54	18.06	−3143.3	−1646.0	82.27	30.84	48.75	1023.
94	29.85981	179.56	17.66	−3055.6	−1548.5	83.32	30.45	48.76	1013.
96	29.66229	174.01	17.25	−2968.1	−1451.0	84.34	30.11	48.77	1003.
98	29.46329	168.81	16.85	−2880.8	−1353.4	85.35	29.79	48.78	993.
100	29.26308	163.92	16.45	−2793.6	−1255.9	86.34	29.51	48.79	984.
102	29.06192	159.31	16.06	−2706.7	−1158.3	87.30	29.25	48.79	974.
104	28.86003	154.95	15.67	−2620.0	−1060.7	88.25	29.01	48.79	964.
106	28.65758	150.79	15.28	−2533.4	−963.1	89.18	28.79	48.78	955.
108	28.45474	146.83	14.90	−2447.1	−865.6	90.09	28.59	48.77	946.
110	28.25165	143.05	14.53	−2360.9	−768.1	90.99	28.41	48.75	936.
112	28.04843	139.42	14.17	−2275.0	−670.6	91.86	28.24	48.74	927.
114	27.84517	135.93	13.81	−2189.2	−573.1	92.73	28.07	48.71	918.
116	27.64196	132.58	13.47	−2103.7	−475.7	93.57	27.92	48.69	908.
118	27.43889	129.36	13.13	−2018.4	−378.4	94.41	27.78	48.66	899.
120	27.23603	126.26	12.80	−1933.3	−281.1	95.22	27.64	48.63	890.
122	27.03344	123.26	12.48	−1848.5	−183.9	96.03	27.51	48.59	882.
124	26.83118	120.38	12.16	−1763.9	−86.7	96.82	27.39	48.55	873.
126	26.62931	117.60	11.86	−1679.5	10.3	97.59	27.27	48.51	864.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
128	26.42787	114.92	11.56	−1595.4	107.3	98.36	27.15	48.46	856.
130	26.22692	112.33	11.27	−1511.6	204.2	99.11	27.04	48.41	847.
132	26.02651	109.84	10.99	−1428.0	301.0	99.85	26.93	48.36	839.
134	25.82668	107.43	10.72	−1344.8	397.6	100.57	26.82	48.30	831.
136	25.62747	105.11	10.45	−1261.8	494.2	101.29	26.71	48.24	823.
138	25.42895	102.88	10.19	−1179.1	590.6	101.99	26.61	48.17	815.
140	25.23114	100.72	9.94	−1096.7	686.8	102.68	26.51	48.10	808.
142	25.03409	98.65	9.70	−1014.6	782.9	103.37	26.41	48.02	800.
144	24.83785	96.65	9.46	−932.8	878.9	104.04	26.32	47.94	793.
146	24.64247	94.73	9.23	−851.4	974.7	104.70	26.22	47.86	786.
148	24.44797	92.88	9.01	−770.3	1070.4	105.35	26.13	47.78	779.
150	24.25441	91.10	8.79	−689.5	1165.8	105.99	26.04	47.69	772.
155	23.77487	86.93	8.28	−489.1	1403.7	107.55	25.82	47.45	755.
160	23.30204	83.16	7.80	−290.9	1640.3	109.05	25.60	47.19	740.
165	22.83650	79.74	7.36	−95.0	1875.5	110.50	25.40	46.91	725.
170	22.37879	76.64	6.95	98.5	2109.3	111.90	25.20	46.62	711.
175	21.92939	73.84	6.57	289.6	2341.7	113.24	25.02	46.31	699.
180	21.48873	71.32	6.22	478.3	2572.5	114.54	24.84	45.99	687.
185	21.05719	69.05	5.89	664.6	2801.6	115.80	24.67	45.67	675.
190	20.63510	67.01	5.59	848.4	3029.1	117.01	24.51	45.33	665.
195	20.22274	65.18	5.31	1029.7	3254.9	118.18	24.36	44.99	656.
200	19.82032	63.54	5.05	1208.6	3479.0	119.32	24.21	44.65	647.
210	19.04600	60.79	4.58	1559.3	3922.0	121.48	23.95	43.94	631.
220	18.31291	58.64	4.18	1900.6	4357.9	123.51	23.71	43.24	616.
230	17.62109	57.01	3.83	2233.0	4786.7	125.42	23.50	42.54	607.
240	16.96987	55.80	3.52	2556.9	5208.7	127.21	23.32	41.85	598.
250	16.35803	54.94	3.26	2872.9	5623.8	128.91	23.16	41.19	591.
260	15.78389	54.38	3.02	3181.5	6032.5	130.51	23.01	40.55	585.
270	15.24551	54.05	2.82	3483.2	6434.9	132.03	22.88	39.94	580.
280	14.74074	53.93	2.64	3778.6	6831.4	133.47	22.77	39.36	577.
290	14.26738	53.98	2.47	4068.2	7222.3	134.84	22.66	38.82	575.
300	13.82325	54.17	2.33	4352.6	7607.9	136.15	22.57	38.32	573.
310	13.40620	54.47	2.20	4632.0	7988.7	137.40	22.49	37.84	572.
320	13.01420	54.86	2.09	4907.1	8364.9	138.59	22.42	37.40	572.
330	12.64534	55.34	1.98	5178.2	8736.8	139.74	22.36	36.99	572.
340	12.29783	55.88	1.89	5445.6	9104.7	140.83	22.30	36.61	572.
350	11.97000	56.48	1.80	5709.6	9469.0	141.89	22.26	36.25	573.
360	11.66035	57.13	1.72	5970.6	9829.9	142.91	22.21	35.92	574.
370	11.36747	57.82	1.65	6228.9	10187.5	143.89	22.18	35.62	576.
380	11.09008	58.54	1.58	6484.6	10542.3	144.83	22.15	35.34	577.
390	10.82702	59.29	1.52	6738.0	10894.3	145.75	22.12	35.07	579.
400	10.57722	60.06	1.46	6989.4	11243.8	146.63	22.10	34.83	581.
420	10.11361	61.66	1.36	7486.6	11936.1	148.32	22.08	34.41	586.
440	9.69245	63.33	1.27	7977.7	12620.5	149.91	22.07	34.04	591.
460	9.30810	65.03	1.20	8463.7	13298.2	151.42	22.07	33.74	596.
480	8.95583	66.77	1.13	8945.7	13970.3	152.85	22.10	33.48	601.
500	8.63168	68.52	1.07	9424.4	14637.7	154.21	22.13	33.27	606.
520	8.33229	70.29	1.01	9900.7	15301.3	155.51	22.18	33.10	612.
540	8.05484	72.07	0.9633	10375.1	15961.8	156.76	22.24	32.96	617.
560	7.79689	73.85	0.9191	10848.2	16619.7	157.96	22.31	32.85	623.
580	7.55638	75.64	0.8789	11320.5	17275.8	159.11	22.39	32.76	629.
600	7.33152	77.42	0.8422	11792.4	17930.3	160.22	22.47	32.70	634.
620	7.12075	79.21	0.8086	12264.3	18583.9	161.29	22.56	32.66	640.
640	6.92274	80.99	0.7777	12736.5	19236.8	162.32	22.66	32.64	645.
660	6.73630	82.77	0.7491	13209.2	19889.4	163.33	22.77	32.63	651.
680	6.56039	84.54	0.7226	13682.6	20542.0	164.30	22.87	32.63	656.
700	6.39412	86.32	0.6980	14157.1	21194.8	165.25	22.99	32.65	662.
720	6.23667	88.08	0.6751	14632.7	21848.1	166.17	23.10	32.68	667.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
740	6.08732	89.85	0.6537	15109.5	22501.9	167.07	23.21	32.71	672.
760	5.94543	91.61	0.6337	15587.8	23156.6	167.94	23.33	32.76	678.
780	5.81043	93.36	0.6149	16067.5	23812.2	168.79	23.45	32.80	683.
800	5.68181	95.11	0.5973	16548.8	24468.8	169.62	23.57	32.86	688.
850	5.38524	99.47	0.5574	17759.4	26115.6	171.62	23.86	33.01	701.
900	5.11966	103.81	0.5227	18980.8	27770.5	173.51	24.15	33.18	714.
950	4.88026	108.12	0.4923	20213.3	29434.2	175.31	24.42	33.36	726.
1000	4.66321	112.41	0.4653	21456.9	31106.9	177.02	24.69	33.55	738.
1050	4.46541	116.68	0.4412	22711.4	32788.8	178.67	24.94	33.73	750.
1100	4.28433	120.93	0.4195	23976.3	34479.7	180.24	25.18	33.91	762.
1150	4.11785	125.17	0.4000	25251.4	36179.4	181.75	25.41	34.08	774.
1200	3.96423	129.39	0.3822	26536.1	37887.6	183.20	25.62	34.25	786.
				500 bar Isobar					
* 73.478	31.88166	292.67	21.30	−3987.8	−2419.5	70.93	37.17	48.37	1166.
74	31.84346	288.50	21.22	−3964.5	−2394.3	71.27	36.94	48.33	1161.
76	31.69332	273.67	20.95	−3875.4	−2297.8	72.56	36.06	48.20	1143.
78	31.53732	260.43	20.68	−3786.9	−2201.5	73.81	35.23	48.11	1127.
80	31.37581	248.57	20.40	−3698.9	−2105.3	75.03	34.45	48.05	1113.
82	31.20920	237.92	20.10	−3611.3	−2009.2	76.22	33.73	48.03	1100.
84	31.03796	228.31	19.79	−3524.1	−1913.2	77.37	33.07	48.03	1088.
86	30.86259	219.60	19.47	−3437.2	−1817.1	78.50	32.48	48.06	1077.
88	30.68356	211.67	19.12	−3350.5	−1720.9	79.61	31.94	48.09	1067.
90	30.50138	204.43	18.77	−3264.0	−1624.7	80.69	31.46	48.12	1057.
92	30.31648	197.77	18.40	−3177.7	−1528.4	81.75	31.02	48.16	1047.
94	30.12929	191.63	18.03	−3091.6	−1432.1	82.78	30.63	48.20	1038.
96	29.94021	185.92	17.65	−3005.7	−1335.7	83.80	30.27	48.23	1028.
98	29.74957	180.60	17.27	−2919.9	−1239.2	84.79	29.96	48.25	1019.
100	29.55769	175.61	16.89	−2834.3	−1142.7	85.77	29.67	48.27	1010.
102	29.36484	170.91	16.51	−2748.8	−1046.1	86.72	29.40	48.28	1001.
104	29.17125	166.47	16.14	−2663.6	−949.5	87.66	29.17	48.29	992.
106	28.97713	162.25	15.77	−2578.5	−853.0	88.58	28.95	48.28	983.
108	28.78265	158.24	15.40	−2493.6	−756.4	89.48	28.75	48.28	974.
110	28.58796	154.40	15.03	−2408.8	−659.9	90.37	28.56	48.26	965.
112	28.39320	150.73	14.68	−2324.3	−563.4	91.24	28.39	48.24	956.
114	28.19848	147.21	14.33	−2240.0	−466.9	92.09	28.22	48.22	948.
116	28.00389	143.83	13.99	−2155.9	−370.5	92.93	28.07	48.19	939.
118	27.80952	140.57	13.65	−2072.1	−274.1	93.76	27.93	48.16	930.
120	27.61544	137.43	13.32	−1988.4	−177.8	94.56	27.79	48.12	922.
122	27.42172	134.40	13.00	−1905.0	−81.6	95.36	27.66	48.08	913.
124	27.22842	131.48	12.69	−1821.8	14.5	96.14	27.54	48.03	905.
126	27.03559	128.66	12.39	−1738.9	110.5	96.91	27.42	47.98	897.
128	26.84328	125.94	12.09	−1656.3	206.4	97.66	27.30	47.93	888.
130	26.65154	123.31	11.80	−1573.9	302.2	98.41	27.19	47.87	880.
132	26.46040	120.77	11.52	−1491.7	397.9	99.14	27.08	47.81	872.
134	26.26992	118.32	11.25	−1409.9	493.4	99.86	26.98	47.74	865.
136	26.08013	115.95	10.98	−1328.3	588.8	100.56	26.87	47.67	857.
138	25.89106	113.66	10.72	−1247.0	684.1	101.26	26.77	47.60	849.
140	25.70276	111.46	10.47	−1166.1	779.2	101.94	26.67	47.52	842.
142	25.51526	109.33	10.23	−1085.4	874.2	102.62	26.58	47.44	835.
144	25.32860	107.27	9.99	−1005.0	969.0	103.28	26.48	47.36	828.
146	25.14281	105.29	9.76	−925.0	1063.6	103.93	26.39	47.27	821.
148	24.95792	103.38	9.53	−845.3	1158.1	104.57	26.30	47.18	814.
150	24.77397	101.53	9.31	−765.9	1252.4	105.21	26.21	47.09	807.
155	24.31842	97.21	8.79	−568.8	1487.2	106.75	25.99	46.84	791.
160	23.86940	93.26	8.31	−374.0	1720.8	108.23	25.78	46.58	776.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
165	23.42738	89.67	7.86	−181.3	1953.0	109.66	25.58	46.30	761.
170	22.99276	86.41	7.44	9.2	2183.8	111.04	25.38	46.01	748.
175	22.56589	83.44	7.06	197.3	2413.1	112.37	25.20	45.71	735.
180	22.14711	80.75	6.70	383.2	2640.9	113.65	25.02	45.40	723.
185	21.73668	78.30	6.36	566.8	2867.1	114.89	24.85	45.09	712.
190	21.33483	76.09	6.05	748.1	3091.7	116.09	24.69	44.77	702.
195	20.94175	74.09	5.76	927.1	3314.7	117.25	24.54	44.44	692.
200	20.55760	72.28	5.49	1103.9	3536.1	118.37	24.40	44.12	683.
210	19.81646	69.19	5.00	1450.9	3974.0	120.50	24.13	43.46	667.
220	19.11185	66.70	4.58	1789.2	4405.4	122.51	23.89	42.81	653.
230	18.44369	64.74	4.21	2119.4	4830.3	124.40	23.68	42.17	642.
240	17.81141	63.21	3.89	2441.8	5249.0	126.18	23.49	41.55	632.
250	17.21405	62.05	3.60	2756.8	5661.4	127.87	23.32	40.95	624.
260	16.65033	61.21	3.35	3065.0	6068.0	129.46	23.17	40.37	617.
270	16.11873	60.62	3.13	3366.9	6468.8	130.97	23.03	39.81	612.
280	15.61759	60.26	2.93	3662.8	6864.3	132.41	22.91	39.29	607.
290	15.14518	60.09	2.76	3953.3	7254.6	133.78	22.81	38.79	604.
300	14.69971	60.07	2.60	4238.7	7640.1	135.09	22.71	38.32	601.
310	14.27944	60.18	2.46	4519.5	8021.1	136.34	22.63	37.87	600.
320	13.88268	60.41	2.33	4796.1	8397.7	137.53	22.55	37.46	599.
330	13.50781	60.73	2.21	5068.8	8770.4	138.68	22.48	37.07	598.
340	13.15328	61.13	2.11	5337.9	9139.3	139.78	22.42	36.71	598.
350	12.81765	61.60	2.01	5603.8	9504.6	140.84	22.37	36.37	598.
360	12.49959	62.13	1.92	5866.6	9866.8	141.86	22.32	36.06	599.
370	12.19785	62.71	1.84	6126.8	10225.9	142.84	22.29	35.76	599.
380	11.91127	63.34	1.77	6384.4	10582.1	143.79	22.25	35.49	601.
390	11.63879	64.00	1.70	6639.7	10935.7	144.71	22.22	35.24	602.
400	11.37943	64.69	1.64	6893.0	11286.9	145.60	22.20	35.00	603.
420	10.89652	66.15	1.52	7394.0	11982.6	147.30	22.17	34.58	607.
440	10.45617	67.69	1.42	7888.7	12670.6	148.90	22.15	34.22	611.
460	10.05298	69.29	1.34	8378.2	13351.9	150.41	22.16	33.92	615.
480	9.68238	70.94	1.26	8863.6	14027.6	151.85	22.18	33.66	620.
500	9.34052	72.62	1.19	9345.5	14698.6	153.22	22.21	33.45	625.
520	9.02409	74.32	1.13	9824.9	15365.6	154.53	22.25	33.27	630.
540	8.73026	76.05	1.08	10302.3	16029.5	155.78	22.31	33.12	635.
560	8.45663	77.78	1.03	10778.3	16690.8	156.98	22.38	33.01	640.
580	8.20110	79.52	0.9825	11253.3	17350.0	158.14	22.45	32.92	645.
600	7.96186	81.27	0.9413	11727.8	18007.7	159.26	22.53	32.85	650.
620	7.73733	83.03	0.9035	12202.1	18664.3	160.33	22.63	32.81	656.
640	7.52615	84.78	0.8687	12676.6	19320.1	161.37	22.72	32.78	661.
660	7.32710	86.54	0.8366	13151.6	19975.6	162.38	22.82	32.77	666.
680	7.13912	88.29	0.8069	13627.2	20630.9	163.36	22.93	32.77	671.
700	6.96127	90.05	0.7792	14103.7	21286.3	164.31	23.04	32.78	676.
720	6.79271	91.80	0.7535	14581.2	21942.1	165.23	23.15	32.80	681.
740	6.63270	93.55	0.7295	15060.0	22598.4	166.13	23.26	32.83	687.
760	6.48058	95.29	0.7070	15540.0	23255.4	167.01	23.38	32.87	692.
780	6.33574	97.04	0.6859	16021.5	23913.3	167.86	23.49	32.92	697.
800	6.19766	98.78	0.6661	16504.5	24572.1	168.70	23.61	32.97	702.
850	5.87894	103.11	0.6214	17719.0	26223.9	170.70	23.90	33.11	714.
900	5.59313	107.43	0.5825	18944.0	27883.5	172.60	24.19	33.27	726.
950	5.33519	111.73	0.5484	20179.7	29551.4	174.40	24.46	33.45	738.
1000	5.10107	116.00	0.5182	21426.2	31228.1	176.12	24.73	33.62	750.
1050	4.88751	120.26	0.4912	22683.4	32913.6	177.77	24.98	33.80	762.
1100	4.69181	124.51	0.4670	23950.9	34607.8	179.34	25.22	33.97	774.
1150	4.51174	128.74	0.4452	25228.3	36310.5	180.86	25.44	34.14	785.
1200	4.34545	132.95	0.4253	26515.1	38021.4	182.31	25.65	34.30	797.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
				550 bar Isobar					
* 74.447	31.98132	300.16	20.92	−3962.0	−2242.2	71.21	37.01	47.62	1174.
76	31.87127	288.45	20.79	−3894.1	−2168.4	72.19	36.31	47.51	1161.
78	31.72421	274.79	20.60	−3807.2	−2073.5	73.43	35.45	47.42	1145.
80	31.57151	262.54	20.40	−3720.8	−1978.7	74.63	34.65	47.37	1132.
82	31.41358	251.51	20.17	−3634.8	−1884.0	75.80	33.91	47.36	1120.
84	31.25085	241.55	19.92	−3549.2	−1789.3	76.94	33.25	47.38	1109.
86	31.08383	232.52	19.65	−3463.9	−1694.5	78.05	32.64	47.42	1098.
88	30.91299	224.31	19.36	−3378.7	−1599.6	79.14	32.10	47.48	1088.
90	30.73883	216.81	19.04	−3293.8	−1504.5	80.21	31.61	47.54	1079.
92	30.56182	209.93	18.71	−3209.0	−1409.4	81.26	31.17	47.60	1070.
94	30.38239	203.59	18.37	−3124.4	−1314.1	82.28	30.77	47.66	1061.
96	30.20094	197.72	18.02	−3039.9	−1218.8	83.28	30.42	47.71	1052.
98	30.01785	192.25	17.67	−2955.6	−1123.3	84.27	30.10	47.75	1044.
100	29.83344	187.14	17.31	−2871.3	−1027.8	85.23	29.81	47.79	1035.
102	29.64801	182.33	16.94	−2787.3	−932.2	86.18	29.54	47.82	1026.
104	29.46180	177.80	16.58	−2703.3	−836.5	87.11	29.30	47.83	1018.
106	29.27504	173.51	16.22	−2619.6	−740.8	88.02	29.08	47.84	1009.
108	29.08792	169.43	15.86	−2536.0	−645.2	88.91	28.88	47.84	1001.
110	28.90061	165.54	15.51	−2452.6	−549.5	89.79	28.70	47.83	992.
112	28.71325	161.82	15.16	−2369.3	−453.8	90.65	28.53	47.82	984.
114	28.52595	158.26	14.81	−2286.3	−358.2	91.50	28.36	47.79	976.
116	28.33883	154.83	14.48	−2203.5	−262.7	92.33	28.21	47.77	967.
118	28.15198	151.54	14.15	−2120.9	−167.2	93.15	28.07	47.73	959.
120	27.96547	148.36	13.82	−2038.5	−71.7	93.95	27.94	47.69	951.
122	27.77938	145.30	13.50	−1956.3	23.6	94.74	27.81	47.65	943.
124	27.59376	142.34	13.19	−1874.4	118.8	95.51	27.68	47.60	935.
126	27.40867	139.49	12.89	−1792.7	214.0	96.27	27.57	47.54	927.
128	27.22415	136.73	12.59	−1711.3	309.0	97.02	27.45	47.49	919.
130	27.04025	134.06	12.31	−1630.1	403.9	97.76	27.34	47.42	911.
132	26.85702	131.48	12.02	−1549.2	498.7	98.48	27.24	47.36	903.
134	26.67447	128.99	11.75	−1468.5	593.3	99.19	27.13	47.29	896.
136	26.49266	126.58	11.48	−1388.2	687.9	99.89	27.03	47.21	888.
138	26.31161	124.24	11.22	−1308.1	782.2	100.58	26.93	47.14	881.
140	26.13136	121.99	10.97	−1228.4	876.4	101.26	26.83	47.06	874.
142	25.95193	119.81	10.72	−1148.9	970.4	101.93	26.74	46.97	867.
144	25.77336	117.70	10.48	−1069.7	1064.3	102.58	26.64	46.89	860.
146	25.59567	115.66	10.25	−990.8	1158.0	103.23	26.55	46.80	853.
148	25.41889	113.70	10.02	−912.3	1251.5	103.86	26.46	46.70	846.
150	25.24304	111.80	9.80	−834.0	1344.8	104.49	26.37	46.61	840.
155	24.80768	107.32	9.28	−639.9	1577.2	106.01	26.16	46.36	824.
160	24.37871	103.23	8.79	−447.7	1808.3	107.48	25.95	46.09	809.
165	23.95647	99.48	8.33	−257.7	2038.1	108.90	25.75	45.81	795.
170	23.54126	96.06	7.91	−69.9	2266.5	110.26	25.56	45.53	782.
175	23.13337	92.93	7.51	115.8	2493.4	111.57	25.38	45.23	769.
180	22.73304	90.08	7.14	299.4	2718.8	112.84	25.20	44.93	757.
185	22.34046	87.48	6.80	480.7	2942.6	114.07	25.03	44.62	746.
190	21.95581	85.10	6.48	659.9	3165.0	115.26	24.87	44.31	736.
195	21.57921	82.95	6.18	837.0	3385.8	116.40	24.72	44.00	726.
200	21.21075	80.98	5.90	1012.0	3605.0	117.51	24.57	43.69	717.
210	20.49853	77.58	5.40	1355.7	4038.8	119.63	24.31	43.07	701.
220	19.81935	74.80	4.96	1691.4	4466.5	121.62	24.06	42.46	686.
230	19.17298	72.54	4.57	2019.5	4888.1	123.50	23.85	41.87	674.

Thermodynamic properties of nitrogen--Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
240	18.55890	70.73	4.23	2340.3	5303.6	125.26	23.65	41.29	664.
250	17.97627	69.30	3.93	2654.3	5713.9	126.94	23.48	40.73	655.
260	17.42402	68.19	3.66	2961.9	6118.5	128.53	23.32	40.19	648.
270	16.90092	67.36	3.43	3263.5	6517.8	130.03	23.18	39.68	642.
280	16.40561	66.78	3.22	3559.6	6912.1	131.47	23.06	39.19	637.
290	15.93667	66.39	3.03	3850.5	7301.6	132.83	22.94	38.72	632.
300	15.49263	66.17	2.86	4136.6	7686.6	134.14	22.84	38.29	629.
310	15.07203	66.11	2.71	4418.3	8067.4	135.39	22.75	37.87	627.
320	14.67345	66.17	2.57	4695.9	8444.2	136.58	22.67	37.48	625.
330	14.29550	66.34	2.44	4969.8	8817.1	137.73	22.60	37.12	624.
340	13.93685	66.60	2.33	5240.2	9186.5	138.83	22.54	36.77	623.
350	13.59625	66.94	2.22	5507.4	9552.6	139.90	22.48	36.45	622.
360	13.27252	67.35	2.13	5771.7	9915.6	140.92	22.43	36.15	622.
370	12.96453	67.82	2.04	6033.3	10275.7	141.90	22.39	35.87	623.
380	12.67127	68.34	1.96	6292.5	10633.0	142.86	22.35	35.60	623.
390	12.39176	68.90	1.88	6549.4	10987.8	143.78	22.32	35.36	624.
400	12.12510	69.51	1.81	6804.2	11340.2	144.67	22.30	35.13	625.
420	11.62709	70.81	1.69	7308.3	12038.6	146.38	22.26	34.72	628.
440	11.17128	72.22	1.58	7806.1	12729.4	147.98	22.24	34.37	631.
460	10.75260	73.71	1.48	8298.6	13413.7	149.50	22.24	34.07	635.
480	10.36668	75.26	1.40	8786.9	14092.4	150.95	22.25	33.81	639.
500	10.00979	76.86	1.32	9271.7	14766.4	152.32	22.28	33.59	643.
520	9.67872	78.49	1.25	9753.8	15436.4	153.64	22.32	33.42	648.
540	9.37071	80.15	1.19	10233.9	16103.2	154.90	22.38	33.27	652.
560	9.08336	81.83	1.14	10712.4	16767.4	156.10	22.44	33.15	657.
580	8.81459	83.53	1.09	11189.8	17429.5	157.26	22.51	33.06	662.
600	8.56260	85.24	1.04	11666.6	18089.9	158.38	22.60	32.99	667.
620	8.32580	86.95	0.9986	12143.2	18749.2	159.46	22.68	32.94	671.
640	8.10281	88.68	0.9599	12619.9	19407.6	160.51	22.78	32.91	676.
660	7.89241	90.40	0.9243	13096.9	20065.6	161.52	22.88	32.89	681.
680	7.69350	92.13	0.8913	13574.5	20723.4	162.50	22.98	32.89	686.
700	7.50514	93.86	0.8606	14052.9	21381.2	163.46	23.09	32.90	691.
720	7.32647	95.59	0.8321	14532.2	22039.3	164.38	23.20	32.91	696.
740	7.15672	97.32	0.8054	15012.7	22697.8	165.29	23.31	32.94	701.
760	6.99522	99.05	0.7805	15494.5	23357.0	166.17	23.43	32.98	706.
780	6.84134	100.78	0.7571	15977.6	24016.9	167.02	23.54	33.02	710.
800	6.69455	102.51	0.7351	16462.1	24677.8	167.86	23.65	33.07	715.
850	6.35535	106.82	0.6856	17680.2	26334.4	169.87	23.94	33.20	727.
900	6.05077	111.11	0.6425	18908.5	27998.3	171.77	24.22	33.36	739.
950	5.77555	115.39	0.6047	20147.3	29670.2	173.58	24.50	33.52	751.
1000	5.52547	119.65	0.5712	21396.7	31350.6	175.30	24.76	33.69	762.
1050	5.29712	123.90	0.5414	22656.4	33039.4	176.95	25.01	33.86	774.
1100	5.08767	128.13	0.5146	23926.3	34736.7	178.53	25.25	34.03	785.
1150	4.89479	132.35	0.4904	25205.9	36442.3	180.05	25.47	34.19	796.
1200	4.71652	136.56	0.4685	26494.7	38155.9	181.50	25.68	34.35	807.

600 bar Isobar

* 75.407	32.08026	307.82	20.62	−3936.1	−2065.8	71.48	36.77	46.88	1184.
76	32.04028	303.34	20.59	−3910.6	−2038.0	71.85	36.49	46.84	1179.
78	31.90155	289.25	20.49	−3825.2	−1944.4	73.07	35.61	46.74	1164.
80	31.75705	276.57	20.36	−3740.3	−1851.0	74.25	34.80	46.69	1151.
82	31.60718	265.15	20.21	−3655.9	−1757.6	75.40	34.05	46.70	1139.
84	31.45237	254.83	20.02	−3571.8	−1664.2	76.53	33.38	46.73	1129.
86	31.29309	245.46	19.80	−3488.0	−1570.6	77.63	32.77	46.80	1119.
88	31.12985	236.95	19.56	−3404.4	−1477.0	78.70	32.22	46.88	1109.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
90	30.96311	229.17	19.29	−3320.9	−1383.1	79.76	31.73	46.97	1100.
92	30.79337	222.05	19.00	−3237.6	−1289.1	80.79	31.29	47.05	1092.
94	30.62107	215.49	18.69	−3154.4	−1194.9	81.80	30.89	47.14	1083.
96	30.44662	209.42	18.37	−3071.2	−1100.6	82.80	30.54	47.21	1075.
98	30.27041	203.79	18.03	−2988.2	−1006.1	83.77	30.22	47.28	1067.
100	30.09279	198.54	17.69	−2905.3	−911.5	84.73	29.93	47.34	1059.
102	29.91407	193.61	17.35	−2822.5	−816.7	85.67	29.66	47.38	1051.
104	29.73451	188.98	17.00	−2739.8	−721.9	86.59	29.43	47.41	1043.
106	29.55436	184.60	16.65	−2657.3	−627.1	87.49	29.21	47.43	1034.
108	29.37381	180.44	16.30	−2574.9	−532.2	88.38	29.01	47.44	1026.
110	29.19306	176.49	15.96	−2492.6	−437.3	89.25	28.83	47.44	1018.
112	29.01225	172.71	15.61	−2410.5	−342.5	90.10	28.66	47.43	1010.
114	28.83151	169.10	15.27	−2328.7	−247.6	90.94	28.50	47.42	1002.
116	28.65097	165.63	14.94	−2247.0	−152.8	91.77	28.35	47.39	994.
118	28.47072	162.29	14.61	−2165.5	−58.0	92.58	28.21	47.36	986.
120	28.29085	159.08	14.29	−2084.2	36.6	93.37	28.07	47.32	978.
122	28.11139	155.98	13.98	−2003.1	131.2	94.15	27.95	47.28	971.
124	27.93246	152.99	13.67	−1922.3	225.8	94.92	27.83	47.23	963.
126	27.75409	150.11	13.36	−1841.7	320.2	95.68	27.71	47.17	955.
128	27.57634	147.31	13.07	−1761.3	414.4	96.42	27.60	47.11	948.
130	27.39923	144.61	12.78	−1681.2	508.6	97.15	27.49	47.05	940.
132	27.22282	141.99	12.50	−1601.4	602.6	97.87	27.38	46.98	933.
134	27.04713	139.46	12.22	−1521.8	696.5	98.57	27.28	46.91	925.
136	26.87220	137.01	11.96	−1442.5	790.3	99.27	27.18	46.83	918.
138	26.69806	134.63	11.70	−1363.5	883.9	99.95	27.08	46.75	911.
140	26.52473	132.34	11.44	−1284.8	977.3	100.62	26.99	46.67	904.
142	26.35224	130.11	11.19	−1206.3	1070.5	101.28	26.89	46.58	897.
144	26.18062	127.96	10.95	−1128.2	1163.6	101.93	26.80	46.50	890.
146	26.00988	125.87	10.72	−1050.3	1256.5	102.58	26.71	46.40	884.
148	25.84006	123.86	10.49	−972.7	1349.2	103.21	26.62	46.31	877.
150	25.67116	121.90	10.27	−895.5	1441.8	103.83	26.54	46.21	871.
155	25.25312	117.30	9.73	−703.7	1672.2	105.34	26.32	45.96	855.
160	24.84132	113.06	9.24	−514.0	1901.3	106.79	26.12	45.69	840.
165	24.43603	109.17	8.78	−326.3	2129.1	108.20	25.92	45.42	826.
170	24.03747	105.60	8.34	−140.6	2355.5	109.55	25.73	45.13	813.
175	23.64587	102.33	7.94	43.0	2580.5	110.85	25.55	44.84	801.
180	23.26140	99.33	7.57	224.6	2803.9	112.11	25.38	44.55	789.
185	22.88420	96.58	7.21	404.0	3025.9	113.33	25.21	44.25	778.
190	22.51439	94.06	6.89	581.4	3246.4	114.50	25.05	43.95	768.
195	22.15207	91.75	6.58	756.8	3465.4	115.64	24.90	43.65	758.
200	21.79729	89.65	6.29	930.2	3682.9	116.74	24.75	43.35	749.
210	21.11049	85.97	5.77	1271.1	4113.3	118.84	24.48	42.75	732.
220	20.45400	82.91	5.32	1604.5	4537.9	120.82	24.23	42.17	718.
230	19.82752	80.38	4.92	1930.7	4956.8	122.68	24.01	41.60	705.
240	19.23052	78.31	4.56	2250.0	5370.0	124.44	23.81	41.06	694.
250	18.66220	76.63	4.25	2562.9	5777.9	126.10	23.63	40.53	685.
260	18.12165	75.28	3.97	2869.7	6180.7	127.68	23.47	40.03	677.
270	17.60780	74.23	3.72	3171.0	6578.5	129.18	23.33	39.54	670.
280	17.11950	73.43	3.49	3466.9	6971.7	130.61	23.20	39.09	665.
290	16.65554	72.84	3.29	3757.9	7360.3	131.98	23.08	38.65	660.
300	16.21468	72.44	3.11	4044.4	7744.8	133.28	22.97	38.24	656.
310	15.79568	72.19	2.95	4326.7	8125.2	134.53	22.88	37.85	653.
320	15.39730	72.09	2.80	4605.0	8501.8	135.72	22.80	37.48	650.
330	15.01837	72.11	2.67	4879.7	8874.8	136.87	22.72	37.13	649.
340	14.65772	72.23	2.54	5151.1	9244.5	137.98	22.65	36.81	647.
350	14.31425	72.44	2.43	5419.4	9611.0	139.04	22.59	36.50	646.
360	13.98692	72.73	2.32	5684.8	9974.5	140.06	22.54	36.21	646.
370	13.67472	73.08	2.23	5947.6	10335.3	141.05	22.49	35.94	646.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
380	13.37674	73.50	2.14	6208.0	10693.4	142.01	22.45	35.69	646.
390	13.09210	73.97	2.06	6466.1	11049.0	142.93	22.42	35.45	646.
400	12.81998	74.49	1.98	6722.2	11402.4	143.82	22.39	35.23	647.
420	12.31028	75.63	1.85	7228.9	12102.9	145.53	22.35	34.83	649.
440	11.84216	76.91	1.73	7729.3	12796.0	147.15	22.32	34.49	651.
460	11.41083	78.28	1.62	8224.5	13482.6	148.67	22.32	34.19	654.
480	11.01216	79.72	1.53	8715.3	14163.8	150.12	22.33	33.94	658.
500	10.64258	81.23	1.45	9202.6	14840.3	151.50	22.35	33.72	661.
520	10.29899	82.79	1.37	9687.1	15512.9	152.82	22.39	33.54	665.
540	9.97871	84.38	1.31	10169.5	16182.3	154.08	22.44	33.40	669.
560	9.67939	86.00	1.24	10650.2	16849.0	155.30	22.50	33.28	674.
580	9.39898	87.64	1.19	11129.9	17513.5	156.46	22.57	33.18	678.
600	9.13570	89.30	1.14	11608.8	18176.4	157.59	22.65	33.11	683.
620	8.88797	90.97	1.09	12087.4	18838.1	158.67	22.74	33.06	687.
640	8.65441	92.66	1.05	12566.0	19498.9	159.72	22.83	33.02	692.
660	8.43378	94.35	1.01	13044.9	20159.2	160.74	22.93	33.00	696.
680	8.22501	96.05	0.9758	13524.3	20819.1	161.72	23.03	33.00	701.
700	8.02711	97.76	0.9421	14004.5	21479.1	162.68	23.14	33.00	706.
720	7.83923	99.46	0.9108	14485.5	22139.3	163.61	23.25	33.02	710.
740	7.66060	101.17	0.8815	14967.6	22799.9	164.51	23.36	33.04	715.
760	7.49051	102.88	0.8541	15450.9	23461.1	165.39	23.47	33.07	719.
780	7.32833	104.60	0.8284	15935.5	24122.9	166.25	23.58	33.11	724.
800	7.17352	106.31	0.8043	16421.5	24785.6	167.09	23.70	33.16	729.
850	6.81541	110.58	0.7499	17643.1	26446.7	169.11	23.98	33.29	740.
900	6.49339	114.85	0.7026	18874.5	28114.7	171.01	24.26	33.44	752.
950	6.20206	119.10	0.6611	20116.2	29790.4	172.83	24.53	33.59	763.
1000	5.93705	123.34	0.6243	21368.2	31474.2	174.55	24.79	33.76	774.
1050	5.69482	127.57	0.5916	22630.4	33166.3	176.20	25.04	33.92	785.
1100	5.47243	131.79	0.5622	23902.5	34866.5	177.79	25.28	34.09	797.
1150	5.26747	136.00	0.5357	25184.2	36574.8	179.30	25.50	34.25	807.
1200	5.07789	140.19	0.5117	26475.0	38291.0	180.77	25.71	34.40	818.
				650 bar Isobar					
* 76.357	32.17824	315.63	20.36	−3910.1	−1890.1	71.75	36.47	46.15	1194.
78	32.07021	303.80	20.35	−3841.1	−1814.3	72.73	35.74	46.07	1182.
80	31.93337	290.70	20.30	−3757.7	−1722.3	73.90	34.91	46.03	1170.
82	31.79104	278.87	20.21	−3674.8	−1630.2	75.03	34.16	46.04	1158.
84	31.64362	268.16	20.09	−3592.2	−1538.1	76.14	33.48	46.10	1148.
86	31.49159	258.45	19.92	−3509.8	−1445.8	77.23	32.86	46.18	1139.
88	31.33542	249.61	19.73	−3427.6	−1353.3	78.29	32.31	46.29	1130.
90	31.17561	241.54	19.50	−3345.6	−1260.6	79.33	31.82	46.40	1121.
92	31.01263	234.14	19.25	−3263.6	−1167.7	80.35	31.38	46.52	1113.
94	30.84693	227.35	18.97	−3181.7	−1074.6	81.35	30.99	46.63	1105.
96	30.67896	221.07	18.68	−3099.9	−981.2	82.34	30.63	46.73	1097.
98	30.50910	215.26	18.37	−3018.2	−887.6	83.30	30.32	46.82	1089.
100	30.33772	209.84	18.05	−2936.5	−793.9	84.25	30.03	46.90	1082.
102	30.16513	204.78	17.72	−2854.9	−700.1	85.18	29.77	46.96	1074.
104	29.99163	200.03	17.39	−2773.3	−606.1	86.09	29.54	47.01	1066.
106	29.81747	195.55	17.05	−2691.9	−512.0	86.99	29.32	47.05	1058.
108	29.64287	191.30	16.72	−2610.6	−417.9	87.87	29.12	47.08	1051.
110	29.46802	187.27	16.38	−2529.5	−323.7	88.73	28.94	47.09	1043.
112	29.29310	183.43	16.04	−2448.5	−229.5	89.58	28.78	47.09	1035.
114	29.11823	179.76	15.71	−2367.6	−135.4	90.41	28.62	47.08	1027.
116	28.94355	176.24	15.38	−2287.0	−41.2	91.23	28.47	47.06	1020.
118	28.76916	172.86	15.06	−2206.5	52.9	92.03	28.33	47.03	1012.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
120	28.59514	169.61	14.74	−2126.2	146.9	92.83	28.20	47.00	1004.
122	28.42159	166.48	14.43	−2046.1	240.9	93.60	28.08	46.96	997.
124	28.24856	163.45	14.12	−1966.3	334.7	94.36	27.96	46.91	989.
126	28.07611	160.53	13.82	−1886.6	428.5	95.11	27.85	46.85	982.
128	27.90429	157.70	13.52	−1807.2	522.2	95.85	27.74	46.80	975.
130	27.73314	154.96	13.23	−1728.1	615.7	96.58	27.63	46.73	967.
132	27.56270	152.31	12.95	−1649.2	709.1	97.29	27.53	46.66	960.
134	27.39301	149.75	12.68	−1570.5	802.3	97.99	27.43	46.59	953.
136	27.22410	147.26	12.41	−1492.2	895.4	98.68	27.33	46.51	946.
138	27.05598	144.85	12.15	−1414.1	988.4	99.36	27.23	46.43	939.
140	26.88870	142.51	11.89	−1336.2	1081.2	100.03	27.14	46.35	932.
142	26.72226	140.25	11.64	−1258.7	1173.8	100.68	27.05	46.26	925.
144	26.55669	138.05	11.40	−1181.4	1266.2	101.33	26.96	46.17	919.
146	26.39201	135.92	11.16	−1104.4	1358.4	101.97	26.87	46.08	912.
148	26.22823	133.86	10.93	−1027.7	1450.5	102.59	26.78	45.98	906.
150	26.06539	131.86	10.71	−951.4	1542.4	103.21	26.69	45.89	900.
155	25.66241	127.14	10.17	−761.7	1771.2	104.71	26.48	45.63	884.
160	25.26554	122.78	9.67	−574.0	1998.7	106.15	26.28	45.37	870.
165	24.87499	118.75	9.20	−388.2	2224.8	107.55	26.09	45.09	856.
170	24.49093	115.05	8.76	−204.5	2449.6	108.89	25.90	44.81	843.
175	24.11351	111.63	8.35	−22.7	2672.9	110.18	25.72	44.52	831.
180	23.74287	108.49	7.97	157.2	2894.8	111.43	25.55	44.23	819.
185	23.37911	105.61	7.61	335.0	3115.2	112.64	25.38	43.94	808.
190	23.02231	102.95	7.27	510.9	3334.2	113.81	25.22	43.65	798.
195	22.67252	100.51	6.96	684.8	3551.7	114.94	25.07	43.35	788.
200	22.32980	98.27	6.67	856.8	3767.7	116.03	24.92	43.06	779.
210	21.66553	94.32	6.13	1195.3	4195.4	118.12	24.65	42.48	762.
220	21.02940	91.01	5.66	1526.5	4617.5	120.08	24.40	41.92	747.
230	20.42104	88.23	5.25	1851.0	5034.0	121.93	24.17	41.38	734.
240	19.83988	85.92	4.88	2168.9	5445.1	123.68	23.97	40.86	723.
250	19.28520	84.01	4.55	2480.7	5851.2	125.34	23.79	40.36	713.
260	18.75614	82.44	4.26	2786.8	6252.3	126.92	23.62	39.88	705.
270	18.25175	81.18	4.00	3087.5	6648.8	128.41	23.47	39.42	698.
280	17.77102	80.18	3.76	3383.2	7040.8	129.84	23.33	38.99	692.
290	17.31290	79.40	3.55	3674.2	7428.6	131.20	23.21	38.57	686.
300	16.87630	78.82	3.36	3960.9	7812.4	132.50	23.10	38.18	682.
310	16.46015	78.41	3.19	4243.4	8192.4	133.75	23.00	37.81	678.
320	16.06338	78.14	3.03	4522.2	8568.7	134.94	22.92	37.46	675.
330	15.68494	78.01	2.88	4797.6	8941.7	136.09	22.84	37.13	673.
340	15.32382	78.00	2.75	5069.6	9311.4	137.19	22.76	36.82	671.
350	14.97904	78.08	2.63	5338.7	9678.1	138.26	22.70	36.53	670.
360	14.64967	78.25	2.52	5605.0	10042.0	139.28	22.64	36.25	669.
370	14.33483	78.49	2.42	5868.7	10403.1	140.27	22.59	35.99	668.
380	14.03367	78.81	2.32	6130.1	10761.8	141.23	22.55	35.75	668.
390	13.74540	79.18	2.23	6389.3	11118.1	142.15	22.51	35.52	668.
400	13.46927	79.60	2.15	6646.4	11472.2	143.05	22.48	35.30	668.
420	12.95069	80.59	2.00	7155.3	12174.3	144.76	22.43	34.92	669.
440	12.47284	81.72	1.88	7657.9	12869.2	146.38	22.41	34.58	671.
460	12.03125	82.97	1.76	8155.2	13557.8	147.91	22.40	34.29	673.
480	11.62203	84.31	1.66	8648.3	14241.1	149.36	22.40	34.04	676.
500	11.24177	85.72	1.57	9137.8	14919.8	150.75	22.42	33.83	679.
520	10.88751	87.19	1.49	9624.4	15594.6	152.07	22.46	33.65	683.
540	10.55665	88.70	1.42	10108.9	16266.1	153.34	22.51	33.51	687.
560	10.24691	90.26	1.35	10591.6	16935.0	154.55	22.57	33.39	690.
580	9.95628	91.84	1.29	11073.2	17601.8	155.72	22.63	33.29	694.
600	9.68302	93.45	1.24	11554.1	18266.9	156.85	22.71	33.22	699.
620	9.42557	95.08	1.19	12034.5	18930.7	157.94	22.80	33.16	703.
640	9.18255	96.73	1.14	12514.9	19593.6	158.99	22.89	33.13	707.
660	8.95273	98.38	1.10	12995.5	20255.9	160.01	22.98	33.11	711.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
680	8.73504	100.05	1.06	13476.6	20917.9	161.00	23.08	33.10	716.
700	8.52851	101.73	1.02	13958.4	21579.9	161.96	23.19	33.10	720.
720	8.33225	103.41	0.9895	14441.0	22242.0	162.89	23.29	33.11	724.
740	8.14550	105.09	0.9576	14924.6	22904.5	163.80	23.40	33.14	729.
760	7.96754	106.78	0.9278	15409.3	23567.4	164.68	23.51	33.16	733.
780	7.79775	108.47	0.8998	15895.4	24231.1	165.54	23.63	33.20	738.
800	7.63555	110.16	0.8735	16382.7	24895.5	166.39	23.74	33.24	742.
850	7.25996	114.40	0.8142	17607.4	26560.7	168.40	24.02	33.37	753.
900	6.92175	118.63	0.7627	18841.8	28232.5	170.32	24.30	33.51	764.
950	6.61539	122.86	0.7175	20086.2	29911.8	172.13	24.57	33.66	775.
1000	6.33641	127.08	0.6775	21340.7	31598.9	173.86	24.83	33.82	786.
1050	6.08115	131.29	0.6419	22605.2	33294.0	175.52	25.07	33.98	797.
1100	5.84660	135.49	0.6099	23879.5	34997.1	177.10	25.31	34.14	808.
1150	5.63024	139.69	0.5811	25163.2	36708.0	178.62	25.53	34.30	819.
1200	5.42995	143.87	0.5549	26455.9	38426.6	180.09	25.73	34.45	829.
				700 bar Isobar					
* 77.298	32.27507	323.55	20.16	−3884.2	−1715.3	72.00	36.12	45.44	1205.
78	32.23095	318.46	20.18	−3855.2	−1683.4	72.41	35.81	45.41	1201.
80	32.10130	304.93	20.20	−3773.2	−1592.6	73.56	34.98	45.37	1188.
82	31.96604	292.68	20.19	−3691.7	−1501.9	74.68	34.22	45.40	1177.
84	31.82557	281.58	20.12	−3610.5	−1411.0	75.78	33.54	45.47	1167.
86	31.68033	271.49	20.02	−3529.6	−1320.0	76.85	32.93	45.57	1158.
88	31.53081	262.31	19.87	−3448.8	−1228.7	77.90	32.38	45.70	1150.
90	31.37749	253.92	19.69	−3368.1	−1137.2	78.93	31.89	45.84	1141.
92	31.22084	246.24	19.47	−3287.4	−1045.3	79.94	31.45	45.99	1134.
94	31.06133	239.19	19.23	−3206.8	−953.2	80.93	31.06	46.13	1126.
96	30.89939	232.69	18.97	−3126.2	−860.8	81.90	30.71	46.26	1118.
98	30.73543	226.67	18.68	−3045.7	−768.2	82.85	30.40	46.38	1111.
100	30.56982	221.08	18.38	−2965.2	−675.3	83.79	30.12	46.48	1104.
102	30.40291	215.86	18.07	−2884.7	−582.3	84.71	29.86	46.57	1096.
104	30.23499	210.98	17.76	−2804.3	−489.1	85.62	29.63	46.64	1089.
106	30.06632	206.38	17.43	−2723.9	−395.8	86.51	29.42	46.69	1081.
108	29.89715	202.04	17.11	−2643.7	−302.3	87.38	29.23	46.73	1074.
110	29.72769	197.92	16.78	−2563.5	−208.8	88.24	29.05	46.76	1066.
112	29.55809	194.00	16.45	−2483.5	−115.3	89.08	28.89	46.77	1059.
114	29.38853	190.27	16.13	−2403.6	−21.8	89.91	28.73	46.77	1051.
116	29.21914	186.69	15.80	−2323.9	71.8	90.72	28.59	46.76	1044.
118	29.05001	183.26	15.48	−2244.4	165.3	91.52	28.46	46.74	1037.
120	28.88126	179.97	15.17	−2165.0	258.7	92.31	28.33	46.71	1029.
122	28.71297	176.79	14.85	−2085.8	352.1	93.08	28.21	46.67	1022.
124	28.54520	173.73	14.55	−2006.8	445.4	93.84	28.09	46.63	1015.
126	28.37802	170.77	14.25	−1928.1	538.6	94.58	27.98	46.58	1007.
128	28.21148	167.91	13.95	−1849.5	631.7	95.32	27.87	46.52	1000.
130	28.04561	165.14	13.67	−1771.2	724.7	96.04	27.77	46.46	993.
132	27.88047	162.46	13.38	−1693.2	817.6	96.75	27.67	46.39	986.
134	27.71609	159.86	13.11	−1615.3	910.3	97.44	27.57	46.32	979.
136	27.55249	157.34	12.84	−1537.8	1002.8	98.13	27.47	46.24	972.
138	27.38970	154.90	12.58	−1460.5	1095.2	98.80	27.38	46.16	966.
140	27.22774	152.52	12.32	−1383.4	1187.5	99.47	27.29	46.08	959.
142	27.06663	150.22	12.07	−1306.7	1279.5	100.12	27.20	45.99	952.
144	26.90640	147.99	11.82	−1230.2	1371.4	100.76	27.11	45.90	946.
146	26.74705	145.82	11.59	−1154.0	1463.1	101.39	27.02	45.80	939.
148	26.58860	143.72	11.35	−1078.1	1554.6	102.02	26.93	45.71	933.
150	26.43108	141.68	11.13	−1002.4	1646.0	102.63	26.85	45.61	927.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
155	26.04136	136.85	10.59	−814.7	1873.4	104.12	26.64	45.36	912.
160	25.65763	132.37	10.08	−628.7	2099.5	105.56	26.44	45.09	898.
165	25.28005	128.23	9.60	−444.7	2324.3	106.94	26.25	44.82	884.
170	24.90874	124.40	9.16	−262.6	2547.7	108.27	26.07	44.54	871.
175	24.54383	120.86	8.74	−82.3	2769.7	109.56	25.89	44.26	859.
180	24.18540	117.59	8.35	96.0	2990.3	110.80	25.71	43.97	847.
185	23.83352	114.57	7.99	272.4	3209.4	112.01	25.55	43.68	836.
190	23.48824	111.78	7.65	446.9	3427.1	113.17	25.39	43.39	826.
195	23.14959	109.22	7.32	619.5	3643.4	114.29	25.23	43.11	816.
200	22.81759	106.85	7.02	790.4	3858.2	115.38	25.09	42.82	807.
210	22.17349	102.65	6.48	1126.7	4283.6	117.45	24.81	42.26	790.
220	21.55573	99.10	5.99	1456.1	4703.5	119.41	24.56	41.72	775.
230	20.96390	96.09	5.56	1778.9	5118.0	121.25	24.33	41.19	762.
240	20.39741	93.55	5.18	2095.6	5527.4	122.99	24.12	40.69	751.
250	19.85556	91.43	4.84	2406.4	5931.8	124.64	23.93	40.21	740.
260	19.33756	89.65	4.54	2711.7	6331.6	126.21	23.76	39.75	732.
270	18.84254	88.19	4.27	3011.8	6726.8	127.70	23.61	39.31	724.
280	18.36957	87.00	4.02	3307.2	7117.8	129.12	23.47	38.89	717.
290	17.91772	86.04	3.80	3598.0	7504.8	130.48	23.34	38.50	712.
300	17.48603	85.29	3.60	3884.7	7887.9	131.78	23.23	38.13	707.
310	17.07355	84.72	3.42	4167.5	8267.4	133.03	23.13	37.77	703.
320	16.67931	84.30	3.25	4446.6	8643.4	134.22	23.03	37.44	699.
330	16.30240	84.03	3.10	4722.3	9016.2	135.37	22.95	37.12	697.
340	15.94192	83.88	2.96	4994.9	9385.8	136.47	22.87	36.82	694.
350	15.59699	83.83	2.83	5264.6	9752.6	137.53	22.80	36.54	692.
360	15.26677	83.88	2.71	5531.6	10116.7	138.56	22.74	36.27	691.
370	14.95047	84.02	2.60	5796.0	10478.1	139.55	22.69	36.02	690.
380	14.64732	84.23	2.50	6058.2	10837.2	140.51	22.65	35.79	689.
390	14.35661	84.51	2.41	6318.1	11193.9	141.43	22.60	35.57	689.
400	14.07765	84.84	2.32	6576.2	11548.6	142.33	22.57	35.36	689.
420	13.55245	85.66	2.16	7086.8	12251.9	144.05	22.52	34.99	689.
440	13.06702	86.65	2.02	7591.3	12948.3	145.67	22.49	34.66	690.
460	12.61718	87.77	1.90	8090.6	13638.6	147.20	22.47	34.37	692.
480	12.19927	88.99	1.79	8585.5	14323.6	148.66	22.47	34.13	695.
500	11.81006	90.30	1.70	9076.9	15004.1	150.05	22.49	33.92	697.
520	11.44673	91.69	1.61	9565.5	15680.7	151.38	22.53	33.75	700.
540	11.10676	93.13	1.53	10051.8	16354.2	152.65	22.57	33.60	704.
560	10.78796	94.61	1.46	10536.4	17025.1	153.87	22.63	33.48	707.
580	10.48839	96.14	1.40	11019.7	17693.8	155.04	22.69	33.39	711.
600	10.20631	97.69	1.34	11502.3	18360.8	156.17	22.77	33.32	714.
620	9.94021	99.27	1.28	11984.4	19026.5	157.26	22.85	33.26	718.
640	9.68873	100.87	1.23	12466.4	19691.3	158.32	22.94	33.22	722.
660	9.45067	102.49	1.19	12948.6	20355.5	159.34	23.03	33.20	726.
680	9.22493	104.12	1.14	13431.2	21019.4	160.33	23.13	33.19	730.
700	9.01056	105.76	1.11	13914.5	21683.1	161.29	23.23	33.19	734.
720	8.80668	107.41	1.07	14398.5	22347.0	162.23	23.34	33.20	739.
740	8.61251	109.07	1.03	14883.5	23011.2	163.14	23.45	33.22	743.
760	8.42736	110.73	1.00	15369.6	23675.9	164.02	23.56	33.25	747.
780	8.25057	112.40	0.9711	15856.9	24341.2	164.89	23.67	33.28	751.
800	8.08157	114.07	0.9427	16345.5	25007.2	165.73	23.78	33.32	755.
850	7.68982	118.26	0.8786	17573.3	26676.2	167.75	24.06	33.44	766.
900	7.33658	122.46	0.8229	18810.4	28351.6	169.67	24.33	33.58	777.
950	7.01621	126.66	0.7740	20057.3	30034.2	171.49	24.60	33.73	787.
1000	6.72415	130.86	0.7307	21314.2	31724.5	173.22	24.86	33.88	798.
1050	6.45665	135.05	0.6922	22581.0	33422.5	174.88	25.10	34.04	809.
1100	6.21063	139.23	0.6577	23857.3	35128.3	176.47	25.33	34.19	819.
1150	5.98351	143.40	0.6265	25142.9	36841.8	177.99	25.55	34.34	829.
1200	5.77310	147.57	0.5982	26437.5	38562.7	179.45	25.76	34.49	840.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
				750 bar Isobar					
* 78.229	32.37063	331.56	19.99	−3858.3	−1541.4	72.25	35.75	44.76	1217.
80	32.26154	319.26	20.08	−3787.0	−1462.2	73.25	35.02	44.73	1207.
82	32.13294	306.59	20.13	−3706.8	−1372.7	74.36	34.26	44.76	1196.
84	31.99902	295.08	20.13	−3627.0	−1283.1	75.44	33.58	44.84	1186.
86	31.86019	284.61	20.08	−3547.4	−1193.3	76.49	32.97	44.97	1177.
88	31.71694	275.06	19.98	−3467.9	−1103.2	77.53	32.42	45.12	1169.
90	31.56974	266.35	19.85	−3388.5	−1012.8	78.54	31.94	45.29	1161.
92	31.41905	258.37	19.67	−3309.2	−922.1	79.54	31.51	45.46	1154.
94	31.26535	251.04	19.46	−3229.8	−831.0	80.52	31.12	45.63	1146.
96	31.10908	244.29	19.23	−3150.4	−739.6	81.48	30.78	45.79	1139.
98	30.95065	238.06	18.97	−3071.0	−647.8	82.43	30.47	45.94	1132.
100	30.79044	232.27	18.69	−2991.6	−555.8	83.36	30.19	46.07	1125.
102	30.62881	226.88	18.40	−2912.3	−463.6	84.27	29.94	46.18	1118.
104	30.46607	221.85	18.10	−2832.9	−371.1	85.17	29.72	46.27	1110.
106	30.30250	217.12	17.79	−2753.6	−278.5	86.05	29.51	46.35	1103.
108	30.13834	212.66	17.48	−2674.3	−185.8	86.92	29.32	46.40	1096.
110	29.97381	208.45	17.16	−2595.1	−92.9	87.77	29.15	46.45	1089.
112	29.80911	204.45	16.84	−2516.0	0.0	88.61	28.99	46.47	1082.
114	29.64440	200.64	16.52	−2437.0	93.0	89.43	28.84	46.49	1074.
116	29.47981	197.00	16.20	−2358.2	186.0	90.24	28.70	46.49	1067.
118	29.31547	193.52	15.89	−2279.5	278.9	91.03	28.57	46.48	1060.
120	29.15148	190.17	15.57	−2200.9	371.9	91.81	28.45	46.45	1053.
122	28.98794	186.95	15.26	−2122.6	464.7	92.58	28.33	46.42	1046.
124	28.82491	183.85	14.96	−2044.4	557.5	93.34	28.21	46.38	1039.
126	28.66247	180.85	14.66	−1966.4	650.3	94.08	28.11	46.33	1032.
128	28.50066	177.96	14.37	−1888.6	742.9	94.81	28.00	46.28	1025.
130	28.33954	175.16	14.08	−1811.1	835.4	95.52	27.90	46.22	1018.
132	28.17913	172.44	13.80	−1733.8	927.7	96.23	27.80	46.15	1011.
134	28.01949	169.81	13.52	−1656.7	1020.0	96.92	27.70	46.08	1004.
136	27.86063	167.26	13.25	−1579.9	1112.1	97.60	27.61	46.01	997.
138	27.70258	164.78	12.99	−1503.3	1204.0	98.28	27.52	45.93	991.
140	27.54537	162.38	12.73	−1427.0	1295.8	98.94	27.43	45.84	984.
142	27.38901	160.05	12.48	−1351.0	1387.4	99.59	27.34	45.76	978.
144	27.23352	157.78	12.23	−1275.2	1478.8	100.23	27.25	45.67	971.
146	27.07892	155.58	11.99	−1199.6	1570.0	100.85	27.17	45.57	965.
148	26.92521	153.44	11.76	−1124.4	1661.1	101.47	27.08	45.48	959.
150	26.77241	151.37	11.53	−1049.4	1751.9	102.08	27.00	45.38	953.
155	26.39446	146.44	10.98	−863.3	1978.2	103.57	26.80	45.13	938.
160	26.02241	141.85	10.47	−678.9	2203.2	105.00	26.60	44.86	924.
165	25.65636	137.60	9.99	−496.4	2426.8	106.37	26.41	44.59	911.
170	25.29641	133.65	9.54	−315.7	2649.1	107.70	26.23	44.32	898.
175	24.94263	129.99	9.12	−136.9	2870.0	108.98	26.05	44.03	886.
180	24.59508	126.60	8.72	40.1	3089.5	110.22	25.88	43.75	874.
185	24.25381	123.46	8.35	215.2	3307.5	111.41	25.71	43.47	863.
190	23.91883	120.56	8.00	388.5	3524.1	112.57	25.55	43.18	853.
195	23.59015	117.87	7.67	560.1	3739.4	113.69	25.40	42.90	843.
200	23.26778	115.38	7.37	729.8	3953.2	114.77	25.25	42.62	834.
210	22.64186	110.95	6.81	1064.2	4376.6	116.83	24.97	42.07	817.
220	22.04078	107.17	6.31	1391.9	4794.7	118.78	24.72	41.54	802.
230	21.46407	103.94	5.87	1713.3	5207.6	120.61	24.48	41.03	789.
240	20.91116	101.19	5.48	2028.8	5615.4	122.35	24.27	40.54	777.
250	20.38135	98.86	5.13	2338.6	6018.5	124.00	24.08	40.08	766.
260	19.87389	96.90	4.81	2643.2	6417.0	125.56	23.90	39.63	757.
270	19.38797	95.25	4.53	2942.8	6811.2	127.05	23.75	39.21	749.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
280	18.92974	93.87	4.27	3237.8	7201.3	128.47	23.60	38.81	742.
290	18.47735	92.74	4.04	3528.4	7587.4	129.82	23.47	38.43	736.
300	18.05092	91.83	3.83	3815.0	7969.9	131.12	23.35	38.07	731.
310	17.64260	91.10	3.64	4097.8	8348.9	132.36	23.24	37.73	727.
320	17.25152	90.54	3.47	4377.1	8724.6	133.55	23.15	37.41	723.
330	16.87686	90.13	3.31	4653.1	9097.1	134.70	23.06	37.10	720.
340	16.51781	89.85	3.16	4926.1	9466.7	135.80	22.98	36.81	717.
350	16.17357	89.68	3.02	5196.2	9833.4	136.87	22.91	36.54	715.
360	15.84339	89.62	2.90	5463.7	10197.6	137.89	22.84	36.29	713.
370	15.52654	89.64	2.78	5728.8	10559.2	138.88	22.79	36.05	711.
380	15.22234	89.75	2.68	5991.5	10918.5	139.84	22.74	35.82	710.
390	14.93012	89.93	2.58	6252.2	11275.6	140.77	22.69	35.60	710.
400	14.64926	90.18	2.48	6510.9	11630.7	141.67	22.66	35.40	709.
420	14.11927	90.83	2.32	7023.1	12335.0	143.39	22.60	35.04	709.
440	13.62801	91.67	2.17	7529.2	13032.6	145.01	22.56	34.72	710.
460	13.17160	92.66	2.04	8030.1	13724.2	146.54	22.55	34.45	711.
480	12.74659	93.77	1.92	8526.7	14410.6	148.01	22.54	34.21	713.
500	12.34992	94.98	1.82	9019.8	15092.7	149.40	22.56	34.00	715.
520	11.97890	96.27	1.73	9510.0	15771.0	150.73	22.59	33.83	717.
540	11.63112	97.63	1.64	9997.9	16446.2	152.00	22.63	33.69	720.
560	11.30446	99.05	1.57	10484.2	17118.7	153.23	22.68	33.57	723.
580	10.99704	100.50	1.50	10969.1	17789.1	154.40	22.75	33.48	727.
600	10.70719	102.00	1.44	11453.2	18457.9	155.53	22.82	33.40	730.
620	10.43341	103.53	1.38	11936.9	19125.3	156.63	22.90	33.35	734.
640	10.17438	105.08	1.32	12420.4	19791.8	157.69	22.99	33.31	737.
660	9.92890	106.66	1.27	12904.0	20457.7	158.71	23.08	33.28	741.
680	9.69590	108.25	1.23	13388.0	21123.3	159.71	23.18	33.27	745.
700	9.47443	109.85	1.19	13872.6	21788.7	160.67	23.28	33.27	749.
720	9.26361	111.47	1.15	14358.0	22454.2	161.61	23.38	33.28	753.
740	9.06268	113.10	1.11	14844.3	23120.0	162.52	23.49	33.30	757.
760	8.87093	114.74	1.08	15331.6	23786.2	163.41	23.60	33.33	761.
780	8.68772	116.38	1.04	15820.2	24453.1	164.27	23.71	33.36	765.
800	8.51246	118.03	1.01	16310.0	25120.6	165.12	23.82	33.40	769.
850	8.10578	122.18	0.9430	17540.5	26793.2	167.15	24.10	33.51	779.
900	7.73856	126.33	0.8830	18780.2	28472.0	169.07	24.37	33.64	789.
950	7.40511	130.50	0.8305	20029.6	30157.7	170.89	24.63	33.79	799.
1000	7.10079	134.67	0.7840	21288.7	31850.9	172.63	24.89	33.94	810.
1050	6.82181	138.83	0.7426	22557.6	33551.7	174.29	25.13	34.09	820.
1100	6.56499	143.00	0.7054	23835.9	35260.1	175.87	25.36	34.24	830.
1150	6.32770	147.16	0.6719	25123.3	36976.0	177.40	25.58	34.39	840.
1200	6.10770	151.31	0.6415	26419.6	38699.2	178.87	25.78	34.53	851.

800 bar Isobar

* 79.152	32.46482	339.64	19.86	−3832.6	−1368.4	72.49	35.37	44.09	1229.
80	32.41472	333.70	19.93	−3799.0	−1331.0	72.96	35.02	44.08	1225.
82	32.29242	320.59	20.05	−3720.2	−1242.8	74.05	34.26	44.12	1214.
84	32.16468	308.67	20.11	−3641.7	−1154.5	75.11	33.58	44.22	1205.
86	32.03193	297.80	20.12	−3563.4	−1065.9	76.15	32.98	44.37	1196.
88	31.89461	287.89	20.07	−3485.3	−977.0	77.18	32.44	44.55	1188.
90	31.75320	278.83	19.98	−3407.1	−887.7	78.18	31.96	44.74	1180.
92	31.60816	270.53	19.84	−3329.0	−798.0	79.16	31.54	44.94	1173.
94	31.45996	262.91	19.67	−3250.9	−707.9	80.13	31.16	45.14	1166.
96	31.30904	255.90	19.47	−3172.7	−617.5	81.09	30.83	45.33	1159.
98	31.15582	249.43	19.24	−3094.4	−526.6	82.02	30.53	45.50	1152.
100	31.00070	243.43	18.98	−3016.1	−435.5	82.94	30.26	45.66	1145.
102	30.84402	237.86	18.71	−2937.7	−344.0	83.85	30.01	45.80	1138.

Thermodynamic properties of nitrogen–Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
104	30.68613	232.66	18.43	−2859.4	−252.3	84.74	29.79	45.91	1131.
106	30.52730	227.78	18.13	−2781.0	−160.4	85.61	29.59	46.01	1124.
108	30.36780	223.20	17.83	−2702.7	−68.3	86.48	29.41	46.09	1117.
110	30.20786	218.88	17.52	−2624.4	24.0	87.32	29.24	46.15	1110.
112	30.04768	214.79	17.21	−2546.1	116.3	88.15	29.09	46.19	1103.
114	29.88743	210.89	16.90	−2468.0	208.7	88.97	28.94	46.22	1096.
116	29.72726	207.18	16.58	−2390.0	301.2	89.78	28.81	46.23	1089.
118	29.56730	203.64	16.27	−2312.1	393.6	90.57	28.68	46.23	1082.
120	29.40767	200.24	15.96	−2234.3	486.1	91.34	28.56	46.22	1076.
122	29.24846	196.97	15.66	−2156.7	578.5	92.11	28.44	46.19	1069.
124	29.08974	193.82	15.35	−2079.3	670.8	92.86	28.33	46.16	1062.
126	28.93159	190.79	15.06	−2002.0	763.1	93.60	28.23	46.12	1055.
128	28.77407	187.86	14.76	−1925.0	855.3	94.32	28.13	46.07	1048.
130	28.61723	185.02	14.48	−1848.1	947.4	95.04	28.03	46.01	1041.
132	28.46110	182.27	14.20	−1771.5	1039.3	95.74	27.93	45.95	1035.
134	28.30573	179.61	13.92	−1695.1	1131.2	96.43	27.84	45.88	1028.
136	28.15114	177.03	13.65	−1619.0	1222.9	97.11	27.75	45.80	1021.
138	27.99736	174.53	13.38	−1543.0	1314.4	97.77	27.66	45.73	1015.
140	27.84441	172.09	13.12	−1467.4	1405.8	98.43	27.57	45.64	1008.
142	27.69231	169.73	12.87	−1391.9	1497.0	99.08	27.48	45.56	1002.
144	27.54108	167.43	12.62	−1316.8	1588.0	99.72	27.40	45.47	996.
146	27.39073	165.20	12.38	−1241.9	1678.8	100.34	27.31	45.38	990.
148	27.24127	163.03	12.15	−1167.2	1769.5	100.96	27.23	45.28	984.
150	27.09271	160.92	11.92	−1092.9	1859.9	101.57	27.15	45.18	978.
155	26.72531	155.90	11.37	−908.2	2085.2	103.04	26.95	44.93	963.
160	26.36371	151.22	10.85	−725.2	2309.2	104.47	26.76	44.67	949.
165	26.00799	146.87	10.36	−544.1	2531.9	105.84	26.57	44.40	936.
170	25.65822	142.82	9.91	−364.7	2753.2	107.16	26.39	44.13	923.
175	25.31444	139.05	9.48	−187.1	2973.2	108.43	26.21	43.85	911.
180	24.97667	135.55	9.08	−11.3	3191.7	109.66	26.04	43.57	900.
185	24.64494	132.30	8.70	162.7	3408.8	110.85	25.87	43.29	889.
190	24.31924	129.28	8.34	335.0	3624.6	112.00	25.71	43.01	879.
195	23.99957	126.47	8.01	505.5	3838.9	113.12	25.56	42.73	869.
200	23.68591	123.87	7.70	674.3	4051.9	114.20	25.41	42.45	860.
210	23.07650	119.22	7.12	1007.0	4473.7	116.25	25.13	41.92	843.
220	22.49063	115.22	6.62	1333.2	4890.2	118.19	24.87	41.39	827.
230	21.92783	111.78	6.16	1653.3	5301.7	120.02	24.63	40.90	814.
240	21.38750	108.83	5.76	1967.7	5708.2	121.75	24.42	40.42	802.
250	20.86897	106.31	5.40	2276.7	6110.1	123.39	24.22	39.96	791.
260	20.37150	104.16	5.07	2580.5	6507.6	124.95	24.04	39.53	782.
270	19.89434	102.33	4.78	2879.6	6900.8	126.44	23.88	39.12	774.
280	19.43669	100.79	4.52	3174.1	7290.1	127.85	23.73	38.73	766.
290	18.99777	99.49	4.28	3464.5	7675.5	129.20	23.59	38.37	760.
300	18.57677	98.42	4.06	3751.0	8057.4	130.50	23.47	38.02	754.
310	18.17290	97.55	3.86	4033.8	8435.9	131.74	23.36	37.69	750.
320	17.78538	96.85	3.68	4313.2	8811.2	132.93	23.26	37.38	745.
330	17.41346	96.31	3.51	4589.4	9183.5	134.08	23.17	37.08	742.
340	17.05640	95.90	3.36	4862.6	9552.9	135.18	23.08	36.80	739.
350	16.71347	95.61	3.21	5133.1	9919.6	136.24	23.01	36.54	736.
360	16.38399	95.43	3.08	5401.0	10283.8	137.27	22.94	36.29	734.
370	16.06730	95.35	2.96	5666.5	10645.5	138.26	22.88	36.06	732.
380	15.76276	95.36	2.85	5929.7	11005.0	139.22	22.83	35.84	731.
390	15.46977	95.44	2.74	6191.0	11362.3	140.15	22.78	35.63	730.
400	15.18774	95.60	2.65	6450.3	11717.7	141.05	22.74	35.44	729.
420	14.65445	96.09	2.47	6963.7	12422.8	142.77	22.68	35.08	728.
440	14.15883	96.78	2.31	7471.1	13121.3	144.39	22.64	34.77	728.
460	13.69725	97.64	2.18	7973.5	13814.1	145.93	22.62	34.50	729.
480	13.26647	98.63	2.05	8471.5	14501.8	147.39	22.61	34.27	730.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
500	12.86361	99.74	1.94	8966.1	15185.2	148.79	22.63	34.07	732.
520	12.48609	100.94	1.85	9457.7	15864.9	150.12	22.65	33.90	734.
540	12.13162	102.21	1.76	9947.2	16541.5	151.40	22.69	33.76	737.
560	11.79816	103.55	1.68	10434.8	17215.6	152.63	22.74	33.65	740.
580	11.48388	104.94	1.60	10921.2	17887.5	153.80	22.80	33.55	742.
600	11.18718	106.38	1.53	11406.8	18557.8	154.94	22.87	33.48	746.
620	10.90658	107.85	1.47	11891.8	19226.8	156.04	22.95	33.42	749.
640	10.64080	109.36	1.41	12376.7	19894.9	157.10	23.04	33.39	752.
660	10.38866	110.88	1.36	12861.6	20562.3	158.12	23.13	33.36	756.
680	10.14911	112.44	1.31	13346.9	21229.4	159.12	23.22	33.35	759.
700	9.92120	114.01	1.27	13832.8	21896.3	160.09	23.32	33.35	763.
720	9.70408	115.59	1.23	14319.4	22563.3	161.03	23.43	33.36	766.
740	9.49698	117.19	1.19	14806.9	23230.6	161.94	23.53	33.37	770.
760	9.29919	118.80	1.15	15295.4	23898.3	162.83	23.64	33.40	774.
780	9.11007	120.42	1.11	15785.0	24566.5	163.70	23.75	33.43	778.
800	8.92905	122.04	1.08	16275.9	25235.5	164.55	23.86	33.47	782.
850	8.50855	126.13	1.01	17509.1	26911.4	166.58	24.13	33.58	792.
900	8.12834	130.25	0.9432	18751.3	28593.4	168.50	24.40	33.71	801.
950	7.78268	134.38	0.8870	20002.9	30282.2	170.33	24.67	33.85	811.
1000	7.46688	138.51	0.8372	21264.2	31978.2	172.07	24.92	33.99	821.
1050	7.17709	142.66	0.7929	22535.0	33681.6	173.73	25.16	34.14	831.
1100	6.91009	146.80	0.7532	23815.2	35392.5	175.32	25.39	34.29	841.
1150	6.66319	150.93	0.7173	25104.4	37110.7	176.85	25.61	34.44	851.
1200	6.43412	155.07	0.6849	26402.3	38836.0	178.32	25.81	34.58	861.
				850 bar Isobar					
* 80.067	32.55759	347.78	19.76	−3807.0	−1196.3	72.72	34.97	43.45	1242.
82	32.44505	334.71	19.94	−3732.1	−1112.3	73.76	34.24	43.50	1232.
84	32.32318	322.36	20.07	−3654.9	−1025.2	74.81	33.57	43.61	1223.
86	32.19619	311.09	20.13	−3577.9	−937.8	75.83	32.97	43.77	1214.
88	32.06452	300.79	20.13	−3501.0	−850.0	76.84	32.44	43.97	1206.
90	31.92861	291.37	20.09	−3424.1	−761.9	77.83	31.97	44.19	1199.
92	31.78894	282.74	19.99	−3347.2	−673.3	78.81	31.55	44.42	1192.
94	31.64596	274.82	19.85	−3270.2	−584.2	79.76	31.19	44.65	1185.
96	31.50012	267.53	19.68	−3193.1	−494.7	80.71	30.86	44.87	1178.
98	31.35184	260.81	19.48	−3115.9	−404.7	81.63	30.57	45.07	1172.
100	31.20153	254.58	19.25	−3038.6	−314.4	82.55	30.31	45.25	1165.
102	31.04954	248.81	19.00	−2961.3	−223.7	83.44	30.07	45.42	1158.
104	30.89621	243.43	18.73	−2883.9	−132.8	84.33	29.86	45.56	1152.
106	30.74184	238.40	18.45	−2806.5	−41.5	85.20	29.67	45.68	1145.
108	30.58671	233.68	18.16	−2729.0	50.0	86.05	29.49	45.78	1138.
110	30.43106	229.23	17.86	−2651.6	141.6	86.89	29.33	45.86	1131.
112	30.27508	225.03	17.56	−2574.2	233.4	87.72	29.18	45.92	1124.
114	30.11898	221.05	17.25	−2496.9	325.3	88.53	29.04	45.96	1118.
116	29.96290	217.26	16.95	−2419.6	417.2	89.33	28.91	45.99	1111.
118	29.80699	213.64	16.64	−2342.4	509.2	90.12	28.78	46.00	1104.
120	29.65136	210.18	16.34	−2265.4	601.2	90.89	28.67	46.00	1097.
122	29.49612	206.86	16.03	−2188.5	693.2	91.65	28.56	45.98	1090.
124	29.34136	203.66	15.73	−2111.8	785.2	92.40	28.45	45.96	1084.
126	29.18714	200.59	15.44	−2035.2	877.0	93.13	28.35	45.92	1077.
128	29.03353	197.62	15.15	−1958.8	968.8	93.86	28.25	45.88	1070.
130	28.88059	194.75	14.86	−1882.6	1060.5	94.57	28.15	45.82	1064.
132	28.72835	191.97	14.58	−1806.6	1152.1	95.27	28.06	45.76	1057.
134	28.57686	189.27	14.30	−1730.8	1243.6	95.95	27.97	45.70	1051.
136	28.42614	186.66	14.03	−1655.3	1334.9	96.63	27.88	45.63	1044.
138	28.27623	184.13	13.76	−1580.0	1426.1	97.30	27.79	45.55	1038.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
140	28.12714	181.66	13.50	−1504.9	1517.1	97.95	27.71	45.47	1032.
142	27.97890	179.27	13.25	−1430.0	1608.0	98.60	27.62	45.39	1025.
144	27.83152	176.95	13.00	−1355.4	1698.7	99.23	27.54	45.30	1019.
146	27.68501	174.68	12.76	−1281.1	1789.2	99.85	27.46	45.21	1013.
148	27.53938	172.48	12.52	−1207.0	1879.5	100.47	27.38	45.11	1007.
150	27.39464	170.34	12.29	−1133.2	1969.6	101.07	27.30	45.02	1001.
155	27.03676	165.24	11.73	−949.8	2194.1	102.55	27.10	44.77	987.
160	26.68460	160.48	11.21	−768.1	2417.3	103.96	26.91	44.51	973.
165	26.33821	156.04	10.72	−588.1	2639.1	105.33	26.72	44.24	960.
170	25.99763	151.89	10.26	−409.9	2859.6	106.64	26.54	43.96	948.
175	25.66288	148.02	9.82	−233.4	3078.8	107.92	26.36	43.69	936.
180	25.33396	144.42	9.42	−58.7	3296.5	109.14	26.19	43.41	924.
185	25.01087	141.06	9.03	114.3	3512.9	110.33	26.03	43.13	914.
190	24.69359	137.93	8.67	285.7	3727.8	111.47	25.87	42.86	903.
195	24.38211	135.02	8.33	455.3	3941.4	112.58	25.71	42.58	893.
200	24.07638	132.31	8.01	623.2	4153.7	113.66	25.56	42.31	884.
210	23.48204	127.45	7.43	954.3	4574.1	115.71	25.28	41.78	867.
220	22.91014	123.24	6.91	1279.2	4989.4	117.64	25.02	41.27	852.
230	22.36017	119.61	6.45	1598.2	5399.6	119.47	24.78	40.78	838.
240	21.83152	116.47	6.04	1911.6	5805.0	121.19	24.56	40.31	826.
250	21.32355	113.76	5.66	2219.7	6205.9	122.83	24.36	39.87	815.
260	20.83553	111.43	5.33	2522.8	6602.4	124.38	24.18	39.44	806.
270	20.36675	109.43	5.03	2821.4	6994.8	125.86	24.01	39.04	797.
280	19.91647	107.73	4.75	3115.5	7383.3	127.28	23.86	38.67	789.
290	19.48393	106.28	4.51	3405.6	7768.2	128.63	23.72	38.31	783.
300	19.06839	105.06	4.28	3691.9	8149.5	129.92	23.59	37.97	777.
310	18.66913	104.04	4.07	3974.6	8527.6	131.16	23.47	37.65	772.
320	18.28542	103.21	3.88	4254.1	8902.6	132.35	23.37	37.35	767.
330	17.91657	102.53	3.71	4530.4	9274.6	133.50	23.27	37.06	763.
340	17.56189	102.00	3.55	4803.8	9643.8	134.60	23.19	36.79	760.
350	17.22072	101.60	3.40	5074.5	10010.4	135.66	23.11	36.53	757.
360	16.89244	101.31	3.26	5342.7	10374.5	136.69	23.04	36.29	755.
370	16.57643	101.13	3.14	5608.6	10736.3	137.68	22.98	36.07	753.
380	16.27211	101.03	3.02	5872.3	11095.9	138.64	22.92	35.85	751.
390	15.97892	101.02	2.91	6133.9	11453.5	139.57	22.87	35.65	750.
400	15.69633	101.09	2.80	6393.7	11809.0	140.47	22.83	35.46	749.
420	15.16093	101.42	2.62	6908.3	12514.8	142.19	22.76	35.12	747.
440	14.66214	101.96	2.46	7416.8	13214.1	143.81	22.71	34.82	747.
460	14.19656	102.69	2.31	7920.4	13907.7	145.36	22.69	34.55	747.
480	13.76115	103.57	2.18	8419.7	14596.5	146.82	22.68	34.33	748.
500	13.35318	104.57	2.07	8915.5	15281.0	148.22	22.69	34.13	749.
520	12.97019	105.67	1.96	9408.5	15962.0	149.55	22.71	33.97	751.
540	12.61001	106.86	1.87	9899.2	16639.9	150.83	22.75	33.83	753.
560	12.27067	108.13	1.78	10388.2	17315.3	152.06	22.80	33.71	756.
580	11.95041	109.45	1.70	10875.9	17988.6	153.24	22.86	33.62	758.
600	11.64767	110.82	1.63	11362.7	18660.3	154.38	22.93	33.55	761.
620	11.36103	112.23	1.57	11849.0	19330.7	155.48	23.00	33.49	764.
640	11.08922	113.69	1.51	12335.1	20000.2	156.54	23.08	33.46	767.
660	10.83110	115.17	1.45	12821.3	20669.0	157.57	23.17	33.43	770.
680	10.58564	116.68	1.40	13307.8	21337.5	158.57	23.27	33.42	773.
700	10.35190	118.21	1.35	13794.8	22005.8	159.54	23.37	33.42	777.
720	10.12904	119.76	1.30	14282.5	22674.2	160.48	23.47	33.42	780.
740	9.91630	121.32	1.26	14771.1	23342.8	161.40	23.57	33.44	784.
760	9.71297	122.90	1.22	15260.7	24011.9	162.29	23.68	33.46	787.
780	9.51843	124.49	1.18	15751.4	24681.5	163.16	23.79	33.49	791.
800	9.33210	126.09	1.15	16243.4	25351.7	164.01	23.89	33.53	795.
850	8.89882	130.13	1.07	17478.9	27030.8	166.04	24.17	33.64	804.
900	8.50653	134.20	1.00	18723.4	28715.8	167.97	24.43	33.76	814.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
950	8.14946	138.29	0.9434	19977.2	30407.4	169.80	24.70	33.90	823.
1000	7.82290	142.39	0.8904	21240.5	32106.1	171.54	24.95	34.05	833.
1050	7.52294	146.51	0.8432	22513.3	33812.0	173.20	25.19	34.19	843.
1100	7.24634	150.62	0.8009	23795.2	35525.3	174.80	25.42	34.34	852.
1150	6.99036	154.74	0.7628	25086.1	37245.7	176.33	25.63	34.48	862.
1200	6.75269	158.86	0.7282	26385.6	38973.1	177.80	25.83	34.62	872.
				900 bar Isobar					
* 80.973	32.64890	355.96	19.69	−3781.7	−1025.1	72.94	34.57	42.84	1255.
82	32.59135	348.94	19.81	−3742.5	−981.1	73.48	34.19	42.88	1250.
84	32.47506	336.16	20.00	−3666.5	−895.2	74.52	33.53	43.00	1241.
86	32.35356	324.48	20.11	−3590.8	−809.0	75.53	32.94	43.18	1232.
88	32.22726	313.79	20.17	−3515.1	−722.4	76.52	32.42	43.40	1225.
90	32.09660	304.00	20.17	−3439.4	−635.4	77.50	31.96	43.65	1217.
92	31.96205	295.02	20.11	−3363.7	−547.8	78.46	31.55	43.90	1210.
94	31.82405	286.78	20.01	−3287.8	−459.8	79.41	31.20	44.16	1204.
96	31.68306	279.20	19.87	−3211.8	−371.2	80.34	30.88	44.41	1197.
98	31.53949	272.21	19.70	−3135.7	−282.2	81.26	30.60	44.64	1191.
100	31.39374	265.74	19.49	−3059.5	−192.7	82.17	30.34	44.85	1184.
102	31.24620	259.75	19.26	−2983.1	−102.8	83.06	30.12	45.04	1178.
104	31.09720	254.18	19.02	−2906.7	−12.5	83.93	29.91	45.21	1171.
106	30.94706	248.98	18.75	−2830.1	78.1	84.80	29.73	45.36	1164.
108	30.79604	244.10	18.47	−2753.5	168.9	85.64	29.56	45.48	1158.
110	30.64441	239.53	18.19	−2676.9	260.0	86.48	29.40	45.58	1151.
112	30.49239	235.21	17.89	−2600.3	351.2	87.30	29.26	45.66	1145.
114	30.34016	231.12	17.60	−2523.8	442.6	88.11	29.13	45.72	1138.
116	30.18790	227.24	17.30	−2447.2	534.1	88.91	29.00	45.76	1131.
118	30.03576	223.55	16.99	−2370.8	625.6	89.69	28.88	45.78	1125.
120	29.88385	220.02	16.69	−2294.5	717.2	90.46	28.77	45.79	1118.
122	29.73229	216.63	16.39	−2218.2	808.8	91.21	28.67	45.79	1111.
124	29.58117	213.39	16.10	−2142.1	900.3	91.96	28.56	45.77	1105.
126	29.43057	210.26	15.80	−2066.2	991.9	92.69	28.46	45.74	1098.
128	29.28056	207.25	15.51	−1990.4	1083.3	93.41	28.37	45.70	1092.
130	29.13120	204.34	15.23	−1914.8	1174.7	94.12	28.28	45.66	1085.
132	28.98252	201.53	14.94	−1839.4	1265.9	94.82	28.19	45.60	1079.
134	28.83458	198.80	14.67	−1764.2	1357.1	95.50	28.10	45.54	1072.
136	28.68740	196.16	14.40	−1689.2	1448.1	96.18	28.01	45.47	1066.
138	28.54102	193.60	14.13	−1614.4	1539.0	96.84	27.93	45.40	1060.
140	28.39545	191.10	13.87	−1539.8	1629.7	97.49	27.84	45.32	1054.
142	28.25072	188.68	13.61	−1465.5	1720.2	98.13	27.76	45.24	1048.
144	28.10683	186.33	13.36	−1391.4	1810.6	98.77	27.68	45.15	1042.
146	27.96382	184.04	13.12	−1317.6	1900.8	99.39	27.60	45.06	1036.
148	27.82168	181.81	12.88	−1244.0	1990.9	100.00	27.52	44.97	1030.
150	27.68042	179.65	12.65	−1170.7	2080.7	100.60	27.44	44.87	1024.
155	27.33118	174.47	12.09	−988.5	2304.5	102.07	27.25	44.62	1010.
160	26.98758	169.64	11.56	−807.9	2526.9	103.48	27.06	44.37	996.
165	26.64966	165.11	11.06	−629.1	2748.1	104.85	26.87	44.10	983.
170	26.31743	160.87	10.60	−451.9	2967.9	106.16	26.69	43.83	971.
175	25.99089	156.91	10.16	−276.4	3186.4	107.42	26.52	43.55	959.
180	25.67002	153.21	9.75	−102.6	3403.4	108.65	26.35	43.28	948.
185	25.35481	149.76	9.36	69.5	3619.2	109.83	26.18	43.00	937.
190	25.04522	146.53	8.99	240.0	3833.5	110.97	26.02	42.73	927.
195	24.74122	143.52	8.65	408.8	4046.5	112.08	25.86	42.46	917.
200	24.44275	140.71	8.32	576.0	4258.1	113.15	25.71	42.19	908.
210	23.86224	135.65	7.73	905.7	4677.4	115.20	25.43	41.67	891.
220	23.30321	131.24	7.20	1229.4	5091.5	117.12	25.17	41.16	875.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
230	22.76512	127.41	6.73	1547.3	5500.7	118.94	24.93	40.68	862.
240	22.24736	124.09	6.30	1859.7	5905.1	120.66	24.70	40.22	849.
250	21.74929	121.20	5.92	2167.1	6305.1	122.30	24.50	39.78	838.
260	21.27021	118.71	5.58	2469.6	6700.9	123.85	24.31	39.37	828.
270	20.80943	116.55	5.27	2767.6	7092.6	125.33	24.14	38.98	820.
280	20.36624	114.68	4.98	3061.4	7480.4	126.74	23.98	38.61	812.
290	19.93994	113.09	4.73	3351.2	7864.7	128.09	23.84	38.25	805.
300	19.52983	111.73	4.49	3637.3	8245.6	129.38	23.71	37.92	799.
310	19.13523	110.57	4.28	3919.9	8623.3	130.62	23.59	37.61	793.
320	18.75546	109.61	4.08	4199.3	8997.9	131.80	23.48	37.32	789.
330	18.38988	108.81	3.90	4475.7	9369.7	132.95	23.38	37.04	784.
340	18.03786	108.16	3.74	4749.2	9738.7	134.05	23.29	36.77	781.
350	17.69879	107.64	3.58	5020.1	10105.2	135.11	23.21	36.53	778.
360	17.37207	107.25	3.44	5288.5	10469.3	136.14	23.13	36.29	775.
370	17.05715	106.96	3.31	5554.7	10831.1	137.13	23.07	36.07	773.
380	16.75348	106.77	3.18	5818.7	11190.7	138.09	23.01	35.86	771.
390	16.46054	106.67	3.07	6080.8	11548.4	139.02	22.96	35.67	769.
400	16.17785	106.65	2.96	6341.0	11904.1	139.92	22.91	35.48	768.
420	15.64130	106.81	2.77	6856.4	12610.4	141.64	22.84	35.15	766.
440	15.14033	107.21	2.60	7365.9	13310.3	143.27	22.79	34.85	765.
460	14.67174	107.81	2.44	7870.5	14004.8	144.81	22.76	34.60	765.
480	14.23266	108.57	2.31	8370.9	14694.4	146.28	22.75	34.38	765.
500	13.82050	109.46	2.19	8867.9	15380.0	147.68	22.75	34.18	766.
520	13.43294	110.47	2.08	9362.1	16062.0	149.02	22.77	34.02	768.
540	13.06790	111.57	1.98	9853.9	16741.1	150.30	22.81	33.89	769.
560	12.72348	112.76	1.89	10344.1	17417.6	151.53	22.85	33.77	771.
580	12.39801	114.01	1.80	10833.0	18092.2	152.71	22.91	33.68	774.
600	12.08996	115.32	1.73	11320.9	18765.1	153.85	22.98	33.61	776.
620	11.79796	116.67	1.66	11808.4	19436.8	154.95	23.05	33.56	779.
640	11.52078	118.07	1.59	12295.6	20107.6	156.02	23.13	33.52	782.
660	11.25729	119.50	1.54	12782.9	20777.7	157.05	23.22	33.49	784.
680	11.00649	120.97	1.48	13270.5	21447.4	158.05	23.31	33.48	788.
700	10.76747	122.46	1.43	13758.5	22117.1	159.02	23.41	33.48	791.
720	10.53939	123.97	1.38	14247.3	22786.7	159.96	23.51	33.49	794.
740	10.32150	125.50	1.34	14737.0	23456.6	160.88	23.61	33.50	797.
760	10.11310	127.05	1.30	15227.6	24126.9	161.78	23.72	33.53	801.
780	9.91358	128.61	1.26	15719.3	24797.7	162.65	23.82	33.56	804.
800	9.72235	130.18	1.22	16212.2	25469.2	163.50	23.93	33.59	808.
850	9.27723	134.16	1.14	17450.1	27151.2	165.54	24.20	33.70	817.
900	8.87370	138.18	1.06	18696.7	28839.0	167.47	24.47	33.82	826.
950	8.50597	142.23	0.9998	19952.6	30533.4	169.30	24.73	33.95	835.
000	8.16931	146.30	0.9436	21217.8	32234.6	171.04	24.98	34.10	844.
1050	7.85979	150.38	0.8936	22492.3	33943.0	172.71	25.21	34.24	854.
1100	7.57412	154.48	0.8487	23776.0	35658.5	174.31	25.44	34.38	863.
1150	7.30955	158.57	0.8082	25068.4	37381.1	175.84	25.65	34.52	873.
1200	7.06373	162.67	0.7715	26369.4	39110.6	177.31	25.86	34.66	882.

950 bar Isobar

* 81.871	32.73873	364.17	19.63	−3756.5	−854.7	73.16	34.17	42.25	1268.
82	32.73178	363.27	19.65	−3751.7	−849.3	73.22	34.13	42.26	1267.
84	32.62081	350.07	19.90	−3676.9	−764.6	74.24	33.47	42.40	1258.
86	32.50454	337.96	20.07	−3602.3	−679.6	75.24	32.89	42.59	1250.
88	32.38337	326.88	20.18	−3527.8	−594.2	76.22	32.38	42.83	1242.
90	32.25773	316.71	20.23	−3453.3	−508.3	77.19	31.93	43.10	1235.
92	32.12808	307.37	20.21	−3378.7	−421.8	78.14	31.54	43.38	1229.
94	31.99485	298.80	20.15	−3304.0	−334.8	79.07	31.19	43.67	1222.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
96	31.85849	290.91	20.04	−3229.1	−247.1	80.00	30.89	43.95	1216.
98	31.71942	283.64	19.90	−3154.0	−159.0	80.91	30.61	44.21	1209.
100	31.57805	276.92	19.72	−3078.7	−70.3	81.80	30.37	44.45	1203.
102	31.43475	270.70	19.51	−3003.3	18.8	82.68	30.16	44.67	1196.
104	31.28987	264.92	19.28	−2927.8	108.3	83.55	29.96	44.87	1190.
106	31.14374	259.53	19.03	−2852.1	198.3	84.41	29.78	45.04	1184.
108	30.99663	254.50	18.77	−2776.4	288.5	85.25	29.62	45.18	1177.
110	30.84882	249.77	18.49	−2700.6	379.0	86.08	29.48	45.30	1171.
112	30.70052	245.33	18.21	−2624.7	469.7	86.90	29.34	45.40	1164.
114	30.55194	241.13	17.92	−2548.9	560.6	87.70	29.21	45.48	1158.
116	30.40327	237.15	17.63	−2473.1	651.6	88.50	29.09	45.54	1151.
118	30.25464	233.37	17.33	−2397.3	742.7	89.28	28.98	45.58	1145.
120	30.10621	229.76	17.04	−2321.6	833.9	90.04	28.87	45.60	1138.
122	29.95808	226.31	16.74	−2246.0	925.1	90.80	28.77	45.60	1132.
124	29.81035	223.01	16.45	−2170.5	1016.3	91.54	28.67	45.60	1125.
126	29.66311	219.83	16.15	−2095.2	1107.5	92.27	28.58	45.58	1119.
128	29.51643	216.77	15.87	−2020.0	1198.6	92.98	28.48	45.54	1112.
130	29.37037	213.82	15.58	−1944.9	1289.6	93.69	28.39	45.50	1106.
132	29.22498	210.97	15.30	−1870.1	1380.6	94.38	28.31	45.45	1100.
134	29.08031	208.21	15.02	−1795.4	1471.4	95.07	28.22	45.40	1093.
136	28.93638	205.53	14.75	−1720.9	1562.2	95.74	28.14	45.33	1087.
138	28.79324	202.94	14.48	−1646.6	1652.8	96.40	28.06	45.26	1081.
140	28.65089	200.42	14.22	−1572.6	1743.2	97.05	27.97	45.19	1075.
142	28.50938	197.97	13.97	−1498.7	1833.5	97.69	27.89	45.11	1069.
144	28.36870	195.59	13.72	−1425.1	1923.7	98.32	27.81	45.02	1063.
146	28.22888	193.28	13.47	−1351.7	2013.6	98.94	27.73	44.94	1057.
148	28.08993	191.02	13.23	−1278.6	2103.4	99.55	27.66	44.84	1052.
150	27.95185	188.83	13.00	−1205.7	2193.0	100.15	27.58	44.75	1046.
155	27.61051	183.59	12.43	−1024.6	2416.1	101.62	27.39	44.50	1032.
160	27.27473	178.68	11.90	−845.1	2638.0	103.03	27.20	44.25	1019.
165	26.94454	174.08	11.40	−667.2	2858.6	104.38	27.02	43.98	1006.
170	26.61994	169.76	10.93	−490.9	3077.8	105.69	26.84	43.71	993.
175	26.30090	165.72	10.48	−316.3	3295.7	106.96	26.67	43.44	982.
180	25.98740	161.94	10.06	−143.4	3512.2	108.18	26.50	43.17	970.
185	25.67940	158.39	9.67	27.9	3727.4	109.36	26.33	42.89	960.
190	25.37686	155.07	9.30	197.6	3941.2	110.50	26.17	42.62	950.
195	25.07972	151.97	8.95	365.7	4153.6	111.60	26.01	42.35	940.
200	24.78794	149.06	8.62	532.2	4364.7	112.67	25.86	42.09	931.
210	24.22017	143.81	8.02	860.6	4783.0	114.71	25.58	41.57	913.
220	23.67306	139.21	7.48	1183.2	5196.2	116.63	25.31	41.07	898.
230	23.14601	135.20	6.99	1500.1	5604.5	118.45	25.07	40.59	884.
240	22.63842	131.70	6.56	1811.7	6008.1	120.16	24.84	40.14	872.
250	22.14964	128.65	6.17	2118.3	6407.3	121.79	24.63	39.71	860.
260	21.67901	125.98	5.82	2420.3	6802.4	123.34	24.44	39.30	850.
270	21.22585	123.67	5.50	2717.8	7193.5	124.82	24.26	38.92	841.
280	20.78948	121.66	5.21	3011.2	7580.8	126.23	24.10	38.55	833.
290	20.36924	119.92	4.95	3300.7	7964.6	127.57	23.95	38.21	826.
300	19.96447	118.42	4.70	3586.6	8345.0	128.86	23.82	37.88	820.
310	19.57452	117.13	4.48	3869.1	8722.3	130.10	23.70	37.58	814.
320	19.19876	116.04	4.28	4148.4	9096.7	131.29	23.58	37.29	809.
330	18.83658	115.12	4.09	4424.8	9468.2	132.43	23.48	37.02	805.
340	18.48740	114.36	3.92	4698.4	9837.0	133.53	23.39	36.76	801.
350	18.15064	113.73	3.76	4969.4	10203.4	134.60	23.30	36.52	798.
360	17.82575	113.23	3.61	5238.1	10567.4	135.62	23.22	36.29	795.
370	17.51222	112.84	3.48	5504.4	10929.2	136.61	23.16	36.07	792.
380	17.20954	112.56	3.35	5768.7	11288.9	137.57	23.09	35.87	790.
390	16.91721	112.36	3.23	6031.1	11646.7	138.50	23.04	35.68	788.
400	16.63479	112.26	3.12	6291.6	12002.5	139.40	22.99	35.50	787.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
420	16.09789	112.26	2.91	6807.8	12709.2	141.13	22.91	35.17	784.
440	15.59554	112.52	2.73	7318.2	13409.7	142.76	22.86	34.88	783.
460	15.12475	112.98	2.58	7823.7	14104.8	144.30	22.83	34.63	782.
480	14.68281	113.62	2.43	8325.1	14795.2	145.77	22.81	34.42	782.
500	14.26727	114.41	2.31	8823.0	15481.6	147.17	22.81	34.23	783.
520	13.87591	115.32	2.19	9318.2	16164.6	148.51	22.83	34.07	784.
540	13.50675	116.34	2.09	9811.1	16844.7	149.79	22.86	33.94	785.
560	13.15797	117.44	1.99	10302.3	17522.3	151.03	22.91	33.83	787.
580	12.82796	118.62	1.90	10792.3	18198.0	152.21	22.96	33.74	789.
600	12.51524	119.86	1.83	11281.3	18872.0	153.35	23.03	33.67	791.
620	12.21849	121.16	1.75	11769.8	19544.9	154.46	23.10	33.62	793.
640	11.93651	122.50	1.68	12258.0	20216.8	155.52	23.18	33.58	796.
660	11.66821	123.89	1.62	12746.3	20888.1	156.56	23.26	33.55	799.
680	11.41260	125.30	1.56	13234.9	21559.0	157.56	23.36	33.54	801.
700	11.16879	126.75	1.51	13724.0	22229.8	158.53	23.45	33.54	804.
720	10.93596	128.22	1.46	14213.7	22900.7	159.48	23.55	33.55	807.
740	10.71336	129.72	1.41	14704.3	23571.8	160.40	23.65	33.56	811.
760	10.50032	131.23	1.37	15195.9	24243.2	161.29	23.76	33.58	814.
780	10.29621	132.77	1.33	15688.5	24915.2	162.16	23.86	33.61	817.
800	10.10047	134.31	1.29	16182.3	25587.8	163.01	23.97	33.65	820.
850	9.64439	138.23	1.20	17422.3	27272.6	165.06	24.23	33.75	829.
900	9.23039	142.20	1.12	18671.0	28963.1	166.99	24.50	33.87	838.
950	8.85270	146.20	1.06	19928.8	30660.0	168.82	24.76	34.00	847.
1000	8.50656	150.24	0.9968	21195.9	32363.7	170.57	25.00	34.14	856.
1050	8.18803	154.29	0.9439	22472.1	34074.4	172.24	25.24	34.28	865.
1100	7.89381	158.35	0.8964	23757.4	35792.1	173.84	25.47	34.42	874.
1150	7.62110	162.42	0.8536	25051.4	37516.8	175.37	25.68	34.56	883.
1200	7.36754	166.50	0.8148	26353.8	39248.2	176.85	25.88	34.69	893.

1000 bar Isobar

* 82.762	32.82707	372.39	19.59	−3731.5	−685.2	73.36	33.78	41.70	1281.
84	32.76086	364.08	19.78	−3685.9	−633.5	73.98	33.39	41.80	1276.
86	32.64959	351.56	20.01	−3612.6	−549.7	74.97	32.82	42.01	1267.
88	32.53333	340.06	20.17	−3539.2	−465.5	75.94	32.32	42.27	1260.
90	32.41251	329.51	20.26	−3465.9	−380.6	76.89	31.89	42.56	1253.
92	32.28754	319.81	20.29	−3392.4	−295.2	77.83	31.51	42.87	1246.
94	32.15889	310.89	20.26	−3318.7	−209.2	78.75	31.17	43.18	1240.
96	32.02698	302.69	20.19	−3244.9	−122.5	79.67	30.88	43.48	1233.
98	31.89223	295.12	20.07	−3170.8	−35.2	80.56	30.62	43.78	1227.
100	31.75505	288.13	19.92	−3096.5	52.6	81.45	30.39	44.05	1221.
102	31.61581	281.67	19.74	−3022.0	140.9	82.33	30.18	44.30	1215.
104	31.47488	275.66	19.53	−2947.4	229.8	83.19	30.00	44.52	1208.
106	31.33258	270.08	19.30	−2872.6	319.0	84.04	29.83	44.72	1202.
108	31.18920	264.87	19.05	−2797.6	408.6	84.88	29.68	44.89	1196.
110	31.04501	259.99	18.79	−2722.6	498.5	85.70	29.54	45.03	1189.
112	30.90025	255.40	18.51	−2647.5	588.7	86.51	29.41	45.15	1183.
114	30.75513	251.08	18.23	−2572.4	679.1	87.31	29.29	45.25	1177.
116	30.60984	246.99	17.95	−2497.2	769.7	88.10	29.18	45.32	1170.
118	30.46454	243.11	17.66	−2422.1	860.4	88.88	29.07	45.37	1164.
120	30.31937	239.42	17.37	−2347.1	951.2	89.64	28.97	45.41	1157.
122	30.17445	235.90	17.07	−2272.1	1042.0	90.39	28.87	45.43	1151.
124	30.02990	232.53	16.78	−2197.2	1132.9	91.13	28.78	45.43	1145.
126	29.88579	229.30	16.49	−2122.4	1223.7	91.86	28.68	45.42	1138.
128	29.74221	226.19	16.21	−2047.7	1314.5	92.57	28.60	45.40	1132.
130	29.59922	223.19	15.92	−1973.2	1405.3	93.27	28.51	45.36	1126.
132	29.45688	220.30	15.64	−1898.8	1496.0	93.97	28.43	45.32	1120.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
134	29.31523	217.50	15.37	−1824.6	1586.6	94.65	28.34	45.27	1114.
136	29.17432	214.80	15.09	−1750.6	1677.1	95.32	28.26	45.21	1107.
138	29.03416	212.17	14.83	−1676.8	1767.4	95.98	28.18	45.14	1101.
140	28.89480	209.62	14.56	−1603.2	1857.6	96.63	28.10	45.07	1096.
142	28.75625	207.15	14.31	−1529.8	1947.7	97.27	28.02	44.99	1090.
144	28.61853	204.74	14.06	−1456.6	2037.6	97.89	27.95	44.91	1084.
146	28.48165	202.40	13.81	−1383.7	2127.3	98.51	27.87	44.83	1078.
148	28.34562	200.12	13.57	−1311.0	2216.9	99.12	27.79	44.74	1072.
150	28.21046	197.90	13.33	−1238.5	2306.3	99.72	27.72	44.64	1067.
155	27.87637	192.60	12.76	−1058.4	2528.9	101.18	27.53	44.40	1053.
160	27.54777	187.62	12.23	−879.8	2750.3	102.59	27.35	44.15	1040.
165	27.22467	182.95	11.72	−702.8	2970.3	103.94	27.16	43.88	1027.
170	26.90707	178.57	11.24	−527.4	3189.1	105.25	26.99	43.61	1015.
175	26.59492	174.45	10.80	−353.6	3406.5	106.51	26.81	43.34	1003.
180	26.28820	170.58	10.37	−181.5	3622.5	107.73	26.64	43.07	992.
185	25.98684	166.95	9.97	−10.9	3837.2	108.90	26.48	42.80	981.
190	25.69078	163.55	9.60	158.1	4050.5	110.04	26.32	42.53	971.
195	25.39998	160.35	9.24	325.5	4262.5	111.14	26.16	42.26	962.
200	25.11436	157.36	8.91	491.4	4473.2	112.21	26.01	42.00	952.
210	24.55840	151.93	8.29	818.7	4890.6	114.25	25.72	41.49	935.
220	24.02234	147.15	7.74	1140.2	5303.0	116.16	25.45	40.99	920.
230	23.50559	142.97	7.25	1456.2	5710.5	117.98	25.21	40.52	906.
240	23.00752	139.30	6.81	1767.1	6113.5	119.69	24.97	40.07	893.
250	22.52749	136.08	6.41	2073.1	6512.1	121.32	24.76	39.65	882.
260	22.06485	133.26	6.05	2374.4	6906.5	122.86	24.57	39.25	872.
270	21.61894	130.79	5.73	2671.5	7297.1	124.34	24.39	38.87	863.
280	21.18912	128.63	5.43	2964.5	7683.9	125.75	24.22	38.51	854.
290	20.77475	126.76	5.16	3253.7	8067.3	127.09	24.07	38.17	847.
300	20.37519	125.12	4.91	3539.4	8447.4	128.38	23.93	37.85	841.
310	19.98983	123.71	4.68	3821.8	8824.3	129.62	23.80	37.55	835.
320	19.61808	122.50	4.47	4101.0	9198.4	130.80	23.69	37.27	829.
330	19.25937	121.46	4.28	4377.4	9569.7	131.95	23.58	37.00	825.
340	18.91314	120.58	4.10	4651.1	9938.4	133.05	23.48	36.75	821.
350	18.57886	119.85	3.94	4922.2	10304.6	134.11	23.39	36.51	817.
360	18.25601	119.25	3.78	5190.9	10668.6	135.13	23.31	36.28	814.
370	17.94410	118.76	3.64	5457.5	11030.4	136.12	23.24	36.07	811.
380	17.64265	118.39	3.51	5722.0	11390.1	137.08	23.18	35.87	809.
390	17.35121	118.11	3.38	5984.6	11747.9	138.01	23.12	35.69	807.
400	17.06936	117.91	3.27	6245.4	12103.8	138.91	23.07	35.51	805.
420	16.53273	117.76	3.06	6762.2	12810.8	140.64	22.99	35.19	802.
440	16.02968	117.87	2.87	7273.3	13511.7	142.27	22.93	34.91	800.
460	15.55738	118.21	2.71	7779.6	14207.4	143.82	22.89	34.66	799.
480	15.11327	118.73	2.56	8281.8	14898.5	145.29	22.88	34.45	799.
500	14.69502	119.41	2.42	8780.7	15585.7	146.69	22.87	34.27	799.
520	14.30053	120.23	2.30	9276.8	16269.5	148.03	22.89	34.12	800.
540	13.92789	121.15	2.19	9770.6	16950.5	149.32	22.92	33.98	801.
560	13.57537	122.17	2.10	10262.8	17629.1	150.55	22.96	33.88	802.
580	13.24142	123.28	2.00	10753.7	18305.7	151.74	23.01	33.79	804.
600	12.92461	124.45	1.92	11243.6	18980.8	152.88	23.07	33.72	806.
620	12.62366	125.69	1.84	11733.1	19654.7	153.99	23.14	33.67	808.
640	12.33740	126.98	1.77	12222.3	20327.7	155.05	23.22	33.63	810.
660	12.06478	128.31	1.71	12711.5	21000.1	156.09	23.31	33.61	813.
680	11.80484	129.68	1.65	13201.0	21672.1	157.09	23.40	33.60	815.
700	11.55668	131.08	1.59	13691.0	22344.0	158.07	23.49	33.59	818.
720	11.31952	132.52	1.54	14181.7	23016.0	159.01	23.59	33.60	821.
740	11.09263	133.98	1.49	14673.2	23688.2	159.93	23.69	33.62	824.
760	10.87532	135.46	1.44	15165.6	24360.7	160.83	23.79	33.64	827.
780	10.66700	136.96	1.40	15659.1	25033.8	161.70	23.90	33.67	830.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
800	10.46709	138.47	1.36	16153.7	25707.4	162.56	24.00	33.70	833.
850	10.00087	142.32	1.26	17395.8	27394.9	164.60	24.27	33.80	841.
900	9.57712	146.24	1.18	18646.4	29087.9	166.54	24.53	33.92	850.
950	9.19010	150.20	1.11	19906.0	30787.3	168.38	24.79	34.05	858.
1000	8.83506	154.20	1.05	21174.7	32493.3	170.13	25.03	34.19	867.
1050	8.50805	158.22	0.9941	22452.6	34206.2	171.80	25.27	34.33	876.
1100	8.20574	162.25	0.9441	23739.4	35926.0	173.40	25.49	34.47	885.
1150	7.92533	166.30	0.8990	25034.9	37652.7	174.93	25.70	34.60	894.
1200	7.66443	170.35	0.8581	26338.7	39386.0	176.41	25.90	34.73	903.
				1100 bar Isobar					
* 84.520	32.99938	388.87	19.56	−3682.1	−348.7	73.75	33.03	40.67	1307.
86	32.92348	379.08	19.81	−3629.5	−288.4	74.46	32.63	40.85	1301.
88	32.81646	366.75	20.07	−3558.4	−206.4	75.40	32.17	41.14	1294.
90	32.70468	355.40	20.26	−3487.2	−123.8	76.33	31.76	41.48	1287.
92	32.58858	344.95	20.37	−3415.9	−40.5	77.25	31.41	41.83	1281.
94	32.46856	335.32	20.43	−3344.3	43.6	78.15	31.10	42.20	1274.
96	32.34505	326.44	20.42	3272.5	128.3	79.04	30.84	42.56	1268.
98	32.21847	318.25	20.37	−3200.4	213.8	79.92	30.60	42.91	1262.
100	32.08921	310.69	20.27	−3128.0	299.9	80.79	30.40	43.24	1256.
102	31.95766	303.70	20.13	−3055.3	386.7	81.65	30.21	43.54	1250.
104	31.82417	297.22	19.96	−2982.4	474.1	82.50	30.05	43.82	1244.
106	31.68908	291.20	19.77	−2909.2	562.0	83.34	29.90	44.07	1238.
108	31.55270	285.60	19.55	−2835.9	650.4	84.16	29.77	44.29	1232.
110	31.41531	280.37	19.32	−2762.3	739.1	84.98	29.65	44.49	1225.
112	31.27716	275.47	19.07	−2688.7	828.3	85.78	29.53	44.65	1219.
114	31.13848	270.87	18.81	−2614.9	917.7	86.57	29.43	44.78	1213.
116	30.99947	266.54	18.54	−2541.1	1007.4	87.35	29.33	44.90	1207.
118	30.86031	262.44	18.26	−2467.2	1097.3	88.12	29.23	44.98	1201.
120	30.72116	258.56	17.98	−2393.3	1187.3	88.88	29.14	45.05	1194.
122	30.58215	254.87	17.70	−2319.4	1277.5	89.62	29.06	45.09	1188.
124	30.44339	251.35	17.42	−2245.6	1367.7	90.36	28.97	45.12	1182.
126	30.30500	247.98	17.13	−2171.8	1457.9	91.08	28.89	45.13	1176.
128	30.16706	244.76	16.85	−2098.2	1548.2	91.79	28.81	45.13	1170.
130	30.02964	241.66	16.57	−2024.6	1638.4	92.49	28.73	45.11	1164.
132	29.89281	238.67	16.29	−1951.2	1728.6	93.18	28.65	45.08	1158.
134	29.75662	235.79	16.02	−1877.9	1818.7	93.85	28.58	45.04	1152.
136	29.62112	233.01	15.75	−1804.8	1908.8	94.52	28.50	44.99	1146.
138	29.48634	230.32	15.48	−1731.8	1998.7	95.18	28.43	44.94	1140.
140	29.35231	227.71	15.22	−1659.0	2088.5	95.82	28.35	44.87	1134.
142	29.21906	225.17	14.96	−1586.5	2178.2	96.46	28.28	44.80	1129.
144	29.08661	222.71	14.70	−1514.1	2267.7	97.09	28.20	44.73	1123.
146	28.95498	220.32	14.46	−1441.9	2357.1	97.70	28.13	44.65	1117.
148	28.82418	217.99	14.21	−1369.9	2446.3	98.31	28.06	44.56	1112.
150	28.69421	215.72	13.97	−1298.2	2535.4	98.91	27.98	44.47	1106.
155	28.37300	210.30	13.40	−1119.8	2757.1	100.36	27.80	44.24	1093.
160	28.05715	205.21	12.85	−942.9	2977.7	101.76	27.62	43.99	1080.
165	27.74664	200.42	12.34	−767.4	3197.0	103.11	27.45	43.73	1068.
170	27.44146	195.90	11.85	−593.5	3415.0	104.41	27.27	43.46	1056.
175	27.14155	191.65	11.39	−421.2	3631.6	105.67	27.10	43.19	1044.
180	26.84686	187.64	10.96	−250.4	3846.9	106.88	26.93	42.93	1033.
185	26.55730	183.86	10.55	−81.1	4060.9	108.05	26.77	42.66	1023.
190	26.27282	180.31	10.17	86.7	4273.5	109.19	26.60	42.39	1013.
195	25.99332	176.96	9.80	252.9	4484.8	110.29	26.45	42.13	1003.
200	25.71872	173.80	9.46	417.7	4694.8	111.35	26.29	41.87	994.
210	25.18394	168.04	8.83	743.0	5110.9	113.38	26.00	41.36	977.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
220	24.66782	162.94	8.26	1062.8	5522.0	115.29	25.73	40.87	961.
230	24.16971	158.43	7.75	1377.2	5928.4	117.10	25.47	40.41	947.
240	23.68898	154.44	7.29	1686.7	6330.2	118.81	25.24	39.97	934.
250	23.22499	150.91	6.88	1991.5	6727.8	120.43	25.02	39.55	923.
260	22.77710	147.79	6.50	2291.9	7121.3	121.98	24.81	39.16	912.
270	22.34469	145.03	6.16	2588.1	7511.0	123.45	24.63	38.78	903.
280	21.92715	142.60	5.85	2880.4	7897.1	124.85	24.45	38.43	894.
290	21.52389	140.45	5.57	3169.1	8279.7	126.19	24.29	38.10	887.
300	21.13432	138.57	5.31	3454.4	8659.2	127.48	24.15	37.79	880.
310	20.75790	136.91	5.07	3736.4	9035.6	128.71	24.01	37.50	874.
320	20.39407	135.47	4.85	4015.5	9409.2	129.90	23.89	37.22	868.
330	20.04233	134.21	4.64	4291.8	9780.1	131.04	23.77	36.96	863.
340	19.70216	133.12	4.45	4565.4	10148.6	132.14	23.67	36.72	859.
350	19.37310	132.18	4.28	4836.6	10514.6	133.20	23.58	36.49	855.
360	19.05468	131.38	4.12	5105.5	10878.4	134.23	23.49	36.27	851.
370	18.74647	130.71	3.96	5372.3	11240.1	135.22	23.41	36.07	848.
380	18.44804	130.15	3.82	5637.1	11599.8	136.18	23.34	35.88	845.
390	18.15898	129.69	3.69	5900.1	11957.7	137.11	23.28	35.70	843.
400	17.87891	129.34	3.57	6161.3	12313.8	138.01	23.23	35.53	840.
420	17.34429	128.87	3.34	6679.1	13021.3	139.73	23.14	35.22	837.
440	16.84140	128.71	3.14	7191.4	13722.9	141.37	23.07	34.95	834.
460	16.36771	128.79	2.96	7699.0	14419.5	142.92	23.02	34.72	833.
480	15.92091	129.07	2.80	8202.6	15111.8	144.39	23.00	34.51	832.
500	15.49892	129.54	2.66	8702.9	15800.2	145.79	22.99	34.34	831.
520	15.09981	130.16	2.53	9200.6	16485.4	147.14	23.00	34.19	831.
540	14.72183	130.91	2.41	9696.0	17167.9	148.43	23.03	34.06	831.
560	14.36341	131.77	2.30	10189.8	17848.1	149.66	23.06	33.96	832.
580	14.02310	132.72	2.20	10682.3	18526.5	150.85	23.11	33.88	833.
600	13.69957	133.76	2.11	11173.9	19203.4	152.00	23.17	33.81	835.
620	13.39163	134.87	2.03	11665.0	19879.1	153.11	23.24	33.76	836.
640	13.09818	136.04	1.95	12155.9	20554.0	154.18	23.31	33.73	838.
660	12.81821	137.27	1.88	12646.8	21228.3	155.22	23.39	33.71	840.
680	12.55083	138.54	1.81	13138.0	21902.3	156.22	23.48	33.69	842.
700	12.29517	139.86	1.75	13629.6	22576.2	157.20	23.57	33.69	845.
720	12.05049	141.21	1.69	14121.8	23250.1	158.15	23.67	33.70	847.
740	11.81608	142.59	1.64	14614.9	23924.3	159.07	23.76	33.72	850.
760	11.59128	144.00	1.59	15108.9	24598.8	159.97	23.86	33.74	852.
780	11.37551	145.43	1.54	15603.9	25273.8	160.85	23.97	33.77	855.
800	11.16821	146.89	1.49	16100.1	25949.4	161.70	24.07	33.80	858.
850	10.68385	150.60	1.39	17345.8	27641.7	163.76	24.33	33.90	865.
900	10.24255	154.41	1.30	18600.0	29339.5	165.70	24.59	34.01	873.
950	9.83863	158.27	1.22	19862.9	31043.3	167.54	24.84	34.14	881.
1000	9.46736	162.19	1.16	21134.9	32753.7	169.29	25.09	34.27	889.
1050	9.12481	166.14	1.09	22415.8	34470.8	170.97	25.32	34.41	898.
1100	8.80763	170.11	1.04	23705.5	36194.6	172.57	25.54	34.54	906.
1150	8.51300	174.10	0.9896	25003.7	37925.1	174.11	25.75	34.67	915.
1200	8.23850	178.11	0.9445	26310.1	39662.0	175.59	25.95	34.80	923.

1200 bar Isobar

* 86.250	33.16599	405.33	19.57	−3633.5	−15.3	74.12	32.33	39.74	1334.
88	33.07954	393.87	19.89	−3573.2	54.5	74.92	31.95	40.03	1327.
90	32.97616	381.70	20.17	−3504.1	134.9	75.82	31.58	40.40	1320.
92	32.86828	370.47	20.37	−3434.8	216.1	76.71	31.26	40.80	1314.
94	32.75631	360.09	20.50	−3365.3	298.1	77.60	30.99	41.22	1308.
96	32.64064	350.52	20.57	−3295.4	381.0	78.47	30.75	41.63	1301.
98	32.52169	341.67	20.58	−3225.2	464.6	79.33	30.55	42.03	1295.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
100	32.39983	333.49	20.54	−3154.7	549.1	80.18	30.37	42.42	1290.
102	32.27545	325.93	20.45	3088.7	634.3	81.03	30.21	42.78	1284.
104	32.14892	318.93	20.33	−3012.5	720.2	81.86	30.07	43.12	1278.
106	32.02056	312.43	20.18	−2940.9	806.7	82.68	29.95	43.42	1272.
108	31.89069	306.39	20.00	−2869.0	893.8	83.50	29.84	43.69	1266.
110	31.75961	300.77	19.79	−2796.9	981.5	84.30	29.73	43.93	1260.
112	31.62758	295.51	19.57	−2724.6	1069.6	85.10	29.64	44.14	1253.
114	31.49484	290.59	19.33	−2652.1	1158.0	85.88	29.55	44.32	1247.
116	31.36160	285.97	19.08	−2579.5	1246.8	86.65	29.46	44.47	1241.
118	31.22806	281.62	18.82	−2506.8	1335.9	87.41	29.38	44.60	1235.
120	31.09438	277.51	18.55	−2434.0	1425.2	88.16	29.31	44.70	1229.
122	30.96072	273.62	18.28	−2361.2	1514.7	88.90	29.23	44.77	1223.
124	30.82721	269.92	18.00	−2288.4	1604.3	89.63	29.16	44.83	1217.
126	30.69396	266.40	17.73	−2215.6	1693.9	90.35	29.08	44.86	1211.
128	30.56106	263.03	17.45	−2142.9	1783.7	91.06	29.01	44.88	1205.
130	30.42861	259.81	17.17	−2070.2	1873.5	91.75	28.94	44.88	1199.
132	30.29668	256.71	16.90	−1997.6	1963.2	92.44	28.87	44.87	1193.
134	30.16532	253.74	16.63	−1925.2	2052.9	93.11	28.80	44.84	1188.
136	30.03459	250.87	16.36	−1852.8	2142.6	93.78	28.73	44.81	1182.
138	29.90453	248.10	16.09	−1780.6	2232.2	94.43	28.66	44.76	1176.
140	29.77518	245.41	15.83	−1708.6	2321.6	95.07	28.59	44.71	1170.
142	29.64657	242.82	15.57	−1636.7	2411.0	95.71	28.52	44.65	1165.
144	29.51872	240.29	15.31	−1565.0	2500.2	96.33	28.45	44.58	1159.
146	29.39166	237.85	15.06	−1493.5	2589.3	96.95	28.38	44.51	1154.
148	29.26539	235.47	14.82	−1422.2	2678.3	97.55	28.31	44.43	1148.
150	29.13993	233.15	14.58	−1351.0	2767.0	98.15	28.24	44.34	1143.
155	28.82989	227.61	14.00	−1174.2	2988.2	99.60	28.07	44.12	1130.
160	28.52503	222.41	13.44	−998.6	3208.2	100.99	27.89	43.88	1118.
165	28.22539	217.51	12.92	−824.6	3426.9	102.34	27.72	43.62	1105.
170	27.93092	212.89	12.43	−651.9	3644.4	103.64	27.55	43.36	1094.
175	27.64157	208.52	11.96	−480.8	3860.5	104.89	27.38	43.09	1082.
180	27.35726	204.39	11.52	−311.1	4075.3	106.10	27.21	42.82	1072.
185	27.07792	200.49	11.10	−142.9	4288.8	107.27	27.04	42.56	1061.
190	26.80344	196.81	10.71	23.8	4500.9	108.40	26.88	42.29	1051.
195	26.53375	193.32	10.34	189.1	4711.7	109.50	26.72	42.03	1042.
200	26.26874	190.03	9.98	353.0	4921.2	110.56	26.57	41.77	1033.
210	25.75243	183.98	9.33	676.6	5336.4	112.58	26.27	41.27	1016.
220	25.25380	178.58	8.75	994.9	5746.6	114.49	25.99	40.79	1000.
230	24.77215	173.77	8.23	1308.0	6152.2	116.30	25.73	40.33	986.
240	24.30683	169.49	7.75	1616.4	6553.2	118.00	25.49	39.89	973.
250	23.85718	165.67	7.32	1920.2	6950.1	119.62	25.26	39.48	961.
260	23.42259	162.27	6.93	2219.7	7342.9	121.16	25.05	39.09	951.
270	23.00245	159.25	6.58	2515.1	7732.0	122.63	24.86	38.72	941.
280	22.59619	156.55	6.25	2806.8	8117.5	124.03	24.68	38.38	932.
290	22.20323	154.16	5.96	3095.0	8499.6	125.37	24.51	38.05	924.
300	21.82304	152.03	5.69	3379.9	8878.6	126.66	24.36	37.75	917.
310	21.45511	150.15	5.44	3661.6	9254.7	127.89	24.21	37.46	911.
320	21.09893	148.48	5.20	3940.5	9628.0	129.08	24.08	37.19	905.
330	20.75403	147.01	4.99	4216.6	9998.6	130.22	23.96	36.94	899.
340	20.41996	145.71	4.79	4490.2	10366.8	131.32	23.85	36.70	895.
350	20.09627	144.58	4.61	4761.4	10732.6	132.38	23.75	36.48	890.
360	19.78254	143.59	4.44	5030.4	11096.3	133.40	23.66	36.26	886.
370	19.47838	142.74	4.28	5297.3	11458.0	134.39	23.58	36.07	883.
380	19.18341	142.01	4.13	5562.3	11817.7	135.35	23.51	35.88	880.
390	18.89726	141.39	3.99	5825.5	12175.6	136.28	23.44	35.71	877.
400	18.61958	140.87	3.85	6087.0	12531.9	137.18	23.38	35.54	874.
420	18.08830	140.11	3.61	6605.5	13239.6	138.91	23.28	35.24	870.
440	17.58708	139.67	3.40	7118.6	13941.8	140.54	23.20	34.98	867.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
460	17.11363	139.50	3.21	7627.2	14639.2	142.09	23.15	34.76	865.
480	16.66586	139.56	3.04	8131.9	15332.3	143.57	23.12	34.56	863.
500	16.24185	139.81	2.89	8633.4	16021.7	144.98	23.11	34.39	862.
520	15.83986	140.24	2.75	9132.2	16708.1	146.32	23.11	34.25	861.
540	15.45828	140.81	2.62	9629.0	17391.8	147.61	23.13	34.13	861.
560	15.09566	141.50	2.50	10124.1	18073.4	148.85	23.16	34.03	862.
580	14.75064	142.31	2.40	10617.9	18753.2	150.04	23.21	33.95	862.
600	14.42201	143.21	2.30	11111.0	19431.6	151.19	23.26	33.89	863.
620	14.10864	144.19	2.21	11603.4	20108.9	152.31	23.32	33.84	864.
640	13.80951	145.24	2.12	12095.7	20785.4	153.38	23.40	33.81	866.
660	13.52366	146.36	2.05	12588.0	21461.4	154.42	23.47	33.79	867.
680	13.25023	147.53	1.97	13080.6	22137.0	155.43	23.56	33.78	869.
700	12.98842	148.75	1.91	13573.6	22812.6	156.41	23.65	33.78	871.
720	12.73750	150.02	1.84	14067.2	23488.2	157.36	23.74	33.79	873.
740	12.49680	151.32	1.78	14561.7	24164.1	158.28	23.84	33.80	875.
760	12.26570	152.65	1.73	15057.0	24840.4	159.19	23.93	33.83	878.
780	12.04361	154.02	1.68	15553.4	25517.2	160.07	24.03	33.85	880.
800	11.83002	155.41	1.63	16050.9	26194.6	160.92	24.14	33.89	883.
850	11.33006	158.99	1.52	17299.9	27891.2	162.98	24.39	33.98	889.
900	10.87349	162.67	1.42	18557.1	29593.2	164.93	24.65	34.10	896.
950	10.45472	166.44	1.34	19823.1	31301.2	166.77	24.90	34.22	904.
1000	10.06910	170.26	1.26	21097.9	33015.6	168.53	25.14	34.35	911.
1050	9.71270	174.14	1.19	22381.6	34736.5	170.21	25.37	34.49	919.
1100	9.38220	178.04	1.13	23673.9	36464.1	171.82	25.59	34.62	927.
1150	9.07477	181.98	1.08	24974.6	38198.1	173.36	25.79	34.74	935.
1200	8.78798	185.94	1.03	26283.4	39938.4	174.84	25.99	34.87	944.
				1300 bar Isobar					
* 87.953	33.32715	421.74	19.61	−3585.6	315.1	74.46	31.70	38.92	1360.
88	33.32496	421.42	19.62	−3584.1	316.9	74.48	31.69	38.93	1359.
90	33.22940	408.43	20.00	−3517.0	395.2	75.36	31.35	39.34	1352.
92	33.12921	396.40	20.29	−3449.8	474.3	76.23	31.07	39.78	1346.
94	33.02476	385.26	20.50	−3382.2	554.3	77.09	30.83	40.23	1340.
96	32.91646	374.95	20.64	−3314.2	635.2	77.94	30.63	40.70	1334.
98	32.80467	365.41	20.72	−3245.8	717.1	78.78	30.45	41.15	1328.
100	32.68978	356.59	20.74	−3177.0	799.8	79.62	30.31	41.59	1322.
102	32.57217	348.42	20.71	−3107.7	883.4	80.45	30.18	42.01	1316.
104	32.45218	340.85	20.63	−3038.1	967.8	81.27	30.07	42.40	1310.
106	32.33016	333.83	20.52	−2968.0	1053.0	82.08	29.97	42.76	1304.
108	32.20642	327.32	20.37	−2897.6	1138.8	82.88	29.88	43.08	1298.
110	32.08127	321.25	20.20	−2826.9	1225.3	83.67	29.79	43.37	1292.
112	31.95498	315.60	20.01	−2755.9	1312.3	84.46	29.72	43.63	1286.
114	31.82779	310.32	19.79	−2684.7	1399.8	85.23	29.65	43.85	1280.
116	31.69993	305.38	19.56	−2613.3	1487.7	85.99	29.58	44.05	1274.
118	31.57161	300.74	19.32	−2541.7	1575.9	86.75	29.51	44.21	1268.
120	31.44301	296.37	19.07	−2470.0	1664.5	87.49	29.45	44.34	1262.
122	31.31428	292.24	18.81	−2398.2	1753.3	88.23	29.39	44.45	1256.
124	31.18559	288.33	18.55	−2326.3	1842.3	88.95	29.32	44.53	1250.
126	31.05704	284.62	18.28	−2254.4	1931.4	89.66	29.26	44.60	1244.
128	30.92874	281.09	18.01	−2182.6	2020.7	90.37	29.20	44.64	1239.
130	30.80080	277.72	17.74	−2110.7	2110.0	91.06	29.14	44.66	1233.
132	30.67329	274.50	17.47	−2038.9	2199.3	91.74	29.08	44.67	1227.
134	30.54628	271.40	17.20	−1967.2	2288.6	92.41	29.01	44.66	1221.
136	30.41984	268.43	16.93	−1895.6	2377.9	93.07	28.95	44.64	1216.
138	30.29401	265.56	16.67	−1824.1	2467.2	93.73	28.89	44.61	1210.
140	30.16883	262.80	16.40	−1752.7	2556.4	94.37	28.82	44.57	1204.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
142	30.04435	260.13	16.14	−1681.4	2645.5	95.00	28.76	44.52	1199.
144	29.92058	257.54	15.89	−1610.4	2734.5	95.62	28.69	44.46	1194.
146	29.79756	255.03	15.64	−1539.4	2823.3	96.23	28.63	44.40	1188.
148	29.67530	252.59	15.39	−1468.7	2912.1	96.84	28.56	44.32	1183.
150	29.55382	250.22	15.15	−1398.1	3000.6	97.43	28.49	44.25	1178.
155	29.25358	244.57	14.56	−1222.6	3221.3	98.88	28.32	44.03	1165.
160	28.95837	239.26	14.01	−1048.3	3440.9	100.27	28.16	43.80	1153.
165	28.66823	234.27	13.48	−875.4	3659.3	101.62	27.98	43.55	1141.
170	28.38312	229.54	12.97	−703.8	3876.4	102.91	27.81	43.29	1129.
175	28.10299	225.08	12.50	−533.7	4092.1	104.16	27.65	43.03	1118.
180	27.82776	220.85	12.05	−365.0	4306.6	105.37	27.48	42.76	1108.
185	27.55734	216.84	11.62	−197.7	4519.7	106.54	27.31	42.49	1097.
190	27.29163	213.04	11.22	−31.8	4731.6	107.67	27.15	42.23	1088.
195	27.03054	209.44	10.84	132.7	4942.1	108.76	26.99	41.97	1078.
200	26.77395	206.02	10.48	295.8	5151.2	109.82	26.83	41.71	1069.
210	26.27392	199.72	9.82	618.0	5565.8	111.85	26.53	41.21	1052.
220	25.79077	194.07	9.22	934.9	5975.5	113.75	26.25	40.73	1037.
230	25.32377	188.99	8.68	1247.0	6380.5	115.55	25.98	40.27	1023.
240	24.87223	184.44	8.19	1554.3	6781.0	117.26	25.73	39.84	1010.
250	24.43549	180.36	7.75	1857.3	7177.4	118.88	25.50	39.43	998.
260	24.01295	176.70	7.34	2156.0	7569.8	120.41	25.28	39.05	987.
270	23.60400	173.42	6.98	2450.8	7958.4	121.88	25.08	38.68	977.
280	23.20809	170.49	6.64	2742.0	8343.5	123.28	24.89	38.34	968.
290	22.82468	167.86	6.33	3029.7	8725.3	124.62	24.72	38.02	960.
300	22.45327	165.50	6.05	3314.2	9104.0	125.91	24.56	37.72	953.
310	22.09336	163.40	5.79	3595.6	9479.8	127.14	24.41	37.44	946.
320	21.74448	161.52	5.55	3874.3	9852.8	128.32	24.27	37.17	940.
330	21.40620	159.84	5.32	4150.2	10223.2	129.46	24.15	36.92	934.
340	21.07810	158.35	5.12	4423.7	10591.3	130.56	24.03	36.69	929.
350	20.75975	157.03	4.92	4694.9	10957.0	131.62	23.93	36.47	924.
360	20.45080	155.87	4.74	4963.9	11320.6	132.64	23.83	36.26	920.
370	20.15086	154.84	4.58	5230.9	11682.2	133.64	23.74	36.06	916.
380	19.85958	153.95	4.42	5496.0	12042.0	134.60	23.66	35.88	913.
390	19.57663	153.17	4.27	5759.3	12399.9	135.52	23.59	35.71	910.
400	19.30169	152.50	4.13	6021.1	12756.2	136.43	23.52	35.55	907.
420	18.77463	151.45	3.88	6540.1	13464.3	138.15	23.42	35.26	902.
440	18.27612	150.74	3.66	7053.8	14166.9	139.79	23.33	35.01	899.
460	17.80406	150.32	3.45	7563.1	14864.8	141.34	23.27	34.79	896.
480	17.35654	150.16	3.27	8068.7	15558.6	142.82	23.24	34.60	893.
500	16.93181	150.20	3.11	8571.1	16248.9	144.23	23.22	34.44	892.
520	16.52825	150.43	2.96	9070.9	16936.2	145.57	23.22	34.30	891.
540	16.14439	150.82	2.82	9568.7	17621.0	146.87	23.23	34.18	890.
560	15.77886	151.36	2.70	10064.8	18303.7	148.11	23.26	34.09	890.
580	15.43047	152.01	2.59	10559.8	18984.7	149.30	23.30	34.01	890.
600	15.09802	152.77	2.48	11054.0	19664.4	150.45	23.35	33.96	891.
620	14.78048	153.62	2.38	11547.6	20343.0	151.57	23.41	33.91	891.
640	14.47688	154.55	2.29	12041.1	21020.9	152.64	23.48	33.88	892.
660	14.18633	155.56	2.21	12534.6	21698.3	153.68	23.55	33.86	894.
680	13.90800	156.63	2.13	13028.3	22375.5	154.70	23.63	33.85	895.
700	13.64115	157.76	2.06	13522.5	23052.5	155.68	23.72	33.85	897.
720	13.38507	158.93	1.99	14017.4	23729.7	156.63	23.81	33.86	898.
740	13.13912	160.15	1.93	14513.0	24407.1	157.56	23.91	33.88	900.
760	12.90270	161.41	1.87	15009.6	25085.0	158.46	24.00	33.90	902.
780	12.67527	162.70	1.82	15507.1	25763.3	159.34	24.10	33.93	904.
800	12.45630	164.03	1.76	16005.7	26442.2	160.20	24.20	33.96	907.
850	11.94289	167.46	1.64	17257.6	28142.8	162.26	24.45	34.06	913.
900	11.47300	171.01	1.54	18517.7	29848.6	164.21	24.70	34.17	919.
950	11.04118	174.67	1.45	19786.3	31560.4	166.07	24.95	34.30	926.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1000	10.64283	178.41	1.37	21063.7	33278.5	167.83	25.19	34.43	933.
1050	10.27408	182.20	1.29	22349.9	35003.1	169.51	25.41	34.56	940.
1100	9.93162	186.04	1.23	23644.6	36734.1	171.12	25.63	34.68	948.
1150	9.61265	189.92	1.17	24947.6	38471.4	172.67	25.84	34.81	956.
1200	9.31472	193.82	1.12	26258.5	40214.9	174.15	26.03	34.93	964.
				1400 bar Isobar					
* 89.630	33.48316	438.06	19.67	−3538.5	642.7	74.78	31.14	38.20	1385.
90	33.46646	435.58	19.75	−3526.4	656.9	74.93	31.09	38.28	1384.
92	33.37347	422.74	20.13	−3461.0	733.9	75.78	30.84	38.76	1377.
94	33.27610	410.82	20.42	−3395.3	811.9	76.62	30.63	39.25	1371.
96	33.17473	399.76	20.64	−3329.1	890.9	77.45	30.47	39.76	1365.
98	33.06971	389.51	20.78	−3262.5	971.0	78.28	30.33	40.27	1359.
100	32.96141	380.01	20.86	−3195.4	1052.0	79.09	30.21	40.76	1353.
102	32.85020	371.20	20.89	−3127.8	1134.0	79.91	30.11	41.23	1347.
104	32.73643	363.04	20.86	−3059.7	1216.9	80.71	30.03	41.67	1341.
106	32.62042	355.46	20.80	−2991.2	1300.6	81.51	29.96	42.08	1335.
108	32.50250	348.43	20.69	−2922.2	1385.2	82.30	29.89	42.45	1329.
110	32.38297	341.89	20.55	−2852.8	1470.4	83.08	29.83	42.80	1323.
112	32.26211	335.81	20.39	−2783.1	1556.3	83.85	29.78	43.10	1317.
114	32.14017	330.13	20.20	−2713.1	1642.8	84.62	29.73	43.37	1311.
116	32.01739	324.82	20.00	−2642.8	1729.8	85.38	29.68	43.61	1305.
118	31.89399	319.85	19.78	−2572.3	1817.2	86.12	29.63	43.81	1299.
120	31.77015	315.19	19.54	−2501.6	1905.0	86.86	29.58	43.98	1293.
122	31.64604	310.79	19.30	−2430.8	1993.1	87.59	29.53	44.13	1288.
124	31.52183	306.65	19.05	−2359.9	2081.5	88.31	29.48	44.24	1282.
126	31.39765	302.72	18.79	−2288.9	2170.1	89.02	29.43	44.33	1276.
128	31.27361	299.00	18.53	−2217.8	2258.8	89.71	29.38	44.40	1270.
130	31.14983	295.46	18.26	−2146.7	2347.7	90.40	29.32	44.45	1264.
132	31.02638	292.08	18.00	−2075.7	2436.6	91.08	29.27	44.48	1259.
134	30.90336	288.85	17.73	−2004.7	2525.6	91.75	29.22	44.49	1253.
136	30.78083	285.75	17.47	−1933.7	2614.6	92.41	29.16	44.49	1248.
138	30.65884	282.78	17.21	−1862.9	2703.5	93.06	29.10	44.47	1242.
140	30.53744	279.92	16.95	−1792.1	2792.4	93.70	29.04	44.45	1237.
142	30.41669	277.16	16.69	−1721.4	2881.3	94.33	28.98	44.41	1231.
144	30.29660	274.49	16.43	−1650.9	2970.1	94.95	28.92	44.36	1226.
146	30.17721	271.91	16.18	−1580.5	3058.7	95.56	28.86	44.30	1221.
148	30.05854	269.41	15.94	−1510.3	3147.3	96.16	28.80	44.24	1215.
150	29.94061	266.98	15.69	−1440.3	3235.7	96.76	28.73	44.17	1210.
155	29.64912	261.20	15.10	−1265.9	3456.0	98.20	28.57	43.97	1198.
160	29.36248	255.79	14.54	−1092.7	3675.3	99.60	28.41	43.74	1186.
165	29.08075	250.69	14.00	−920.8	3893.4	100.94	28.24	43.50	1174.
170	28.80392	245.88	13.49	−750.2	4110.3	102.23	28.07	43.25	1163.
175	28.53193	241.33	13.01	−580.9	4325.9	103.48	27.91	42.99	1152.
180	28.26472	237.01	12.55	−413.0	4540.1	104.69	27.74	42.72	1142.
185	28.00218	232.90	12.12	−246.5	4753.1	105.86	27.57	42.46	1131.
190	27.74422	229.01	11.71	−81.4	4964.7	106.99	27.41	42.19	1122.
195	27.49074	225.31	11.32	82.4	5175.0	108.08	27.25	41.93	1113.
200	27.24161	221.79	10.96	244.9	5384.1	109.14	27.09	41.68	1104.
210	26.75604	215.27	10.28	565.8	5798.3	111.16	26.79	41.17	1087.
220	26.28670	209.38	9.66	881.7	6207.6	113.06	26.50	40.70	1071.
230	25.83282	204.07	9.11	1192.8	6612.3	114.86	26.22	40.24	1057.
240	25.39368	199.28	8.61	1499.3	7012.5	116.56	25.97	39.81	1044.
250	24.96863	194.95	8.15	1801.5	7408.5	118.18	25.73	39.40	1032.
260	24.55704	191.06	7.74	2099.6	7800.6	119.72	25.50	39.02	1021.
270	24.15834	187.54	7.36	2393.9	8189.0	121.18	25.29	38.66	1012.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
280	23.77197	184.38	7.01	2684.6	8573.8	122.58	25.10	38.32	1002.
290	23.39742	181.52	6.69	2971.9	8955.4	123.92	24.92	38.00	994.
300	23.03419	178.95	6.40	3256.0	9333.9	125.21	24.75	37.70	986.
310	22.68182	176.64	6.13	3537.2	9709.5	126.44	24.60	37.42	979.
320	22.33988	174.56	5.88	3815.6	10082.4	127.62	24.46	37.16	973.
330	22.00794	172.69	5.65	4091.4	10452.7	128.76	24.32	36.91	967.
340	21.68562	171.02	5.43	4364.7	10820.6	129.86	24.20	36.68	962.
350	21.37252	169.52	5.23	4635.9	11186.3	130.92	24.09	36.46	957.
360	21.06830	168.18	5.04	4904.8	11549.9	131.94	23.99	36.26	953.
370	20.77261	166.99	4.87	5171.9	11911.5	132.93	23.90	36.07	949.
380	20.48512	165.93	4.70	5437.0	12271.2	133.89	23.81	35.89	945.
390	20.20554	165.00	4.55	5700.5	12629.3	134.82	23.73	35.72	941.
400	19.93355	164.18	4.40	5962.3	12985.6	135.73	23.67	35.56	938.
420	19.41126	162.85	4.14	6481.7	13694.0	137.45	23.55	35.28	933.
440	18.91615	161.89	3.90	6995.9	14397.0	139.09	23.46	35.03	929.
460	18.44629	161.23	3.69	7505.8	15095.4	140.64	23.39	34.81	926.
480	17.99992	160.84	3.50	8011.9	15789.8	142.12	23.35	34.63	923.
500	17.57541	160.68	3.33	8515.1	16480.8	143.53	23.32	34.47	921.
520	17.17128	160.72	3.17	9015.7	17168.9	144.88	23.32	34.34	919.
540	16.78616	160.94	3.03	9514.3	17854.5	146.17	23.33	34.23	918.
560	16.41880	161.30	2.89	10011.4	18538.2	147.42	23.35	34.14	918.
580	16.06803	161.81	2.77	10507.3	19220.2	148.61	23.39	34.07	917.
600	15.73278	162.43	2.66	11002.4	19901.0	149.77	23.43	34.01	917.
620	15.41208	163.15	2.56	11497.0	20580.8	150.88	23.49	33.97	918.
640	15.10500	163.96	2.46	11991.5	21259.9	151.96	23.56	33.94	918.
660	14.81072	164.85	2.38	12486.0	21938.6	153.00	23.63	33.93	919.
680	14.52845	165.82	2.29	12980.7	22617.0	154.02	23.71	33.92	920.
700	14.25747	166.85	2.22	13476.0	23295.4	155.00	23.79	33.92	922.
720	13.99713	167.93	2.14	13971.9	23973.9	155.96	23.88	33.93	923.
740	13.74679	169.07	2.08	14468.5	24652.7	156.89	23.97	33.95	925.
760	13.50590	170.25	2.01	14966.1	25331.9	157.79	24.07	33.97	926.
780	13.27392	171.47	1.95	15464.7	26011.7	158.67	24.16	34.00	928.
800	13.05036	172.73	1.90	15964.3	26692.0	159.54	24.26	34.03	930.
850	12.52535	176.00	1.77	17218.8	28396.1	161.60	24.51	34.13	935.
900	12.04384	179.43	1.66	18481.3	30105.5	163.56	24.76	34.25	941.
950	11.60051	182.98	1.56	19752.4	31820.8	165.41	25.00	34.37	948.
1000	11.19085	186.61	1.47	21032.1	33542.3	167.18	25.23	34.49	954.
1050	10.81105	190.33	1.39	22320.5	35270.2	168.86	25.46	34.62	961.
1100	10.45785	194.09	1.32	23617.4	37004.5	170.48	25.67	34.75	968.
1150	10.12844	197.90	1.26	24922.5	38745.0	172.02	25.88	34.87	976.
1200	9.82040	201.75	1.20	26235.5	40491.5	173.51	26.07	34.99	983.
				1500 bar Isobar					
* 91.282	33.63434	454.28	19.74	−3491.9	967.8	75.07	30.64	37.56	1410.
92	33.60286	449.49	19.90	−3469.1	994.8	75.37	30.57	37.75	1408.
94	33.51215	436.79	20.27	−3405.1	1070.9	76.19	30.40	38.28	1401.
96	33.41732	424.97	20.56	−3340.7	1148.0	77.00	30.27	38.83	1395.
98	33.31872	413.98	20.78	−3275.8	1226.2	77.81	30.17	39.38	1389.
100	33.21668	403.78	20.92	−3210.3	1305.5	78.61	30.09	39.91	1383.
102	33.11156	394.31	21.01	−3144.3	1385.8	79.40	30.02	40.43	1377.
104	33.00371	385.52	21.03	−3077.8	1467.2	80.19	29.97	40.93	1371.
106	32.89344	377.36	21.01	−3010.7	1549.5	80.98	29.92	41.39	1365.
108	32.78107	369.78	20.95	−2943.1	1632.7	81.75	29.88	41.81	1359.
110	32.66691	362.73	20.85	−2875.1	1716.7	82.52	29.85	42.21	1353.
112	32.55123	356.18	20.72	−2806.6	1801.5	83.29	29.82	42.56	1347.
114	32.43430	350.07	20.56	−2737.8	1886.9	84.04	29.79	42.88	1341.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
116	32.31636	344.37	20.38	−2668.6	1973.0	84.79	29.76	43.16	1335.
118	32.19762	339.03	20.18	−2599.2	2059.5	85.53	29.72	43.40	1329.
120	32.07830	334.04	19.97	−2529.5	2146.6	86.26	29.69	43.61	1323.
122	31.95857	329.35	19.74	−2459.6	2234.0	86.99	29.66	43.79	1318.
124	31.83859	324.93	19.50	−2389.6	2321.7	87.70	29.62	43.94	1312.
126	31.71851	320.76	19.26	−2319.4	2409.7	88.40	29.58	44.06	1306.
128	31.59847	316.82	19.01	−2249.1	2497.9	89.10	29.54	44.16	1300.
130	31.47857	313.08	18.75	−2178.8	2586.3	89.78	29.50	44.23	1295.
132	31.35891	309.53	18.49	−2108.5	2674.9	90.46	29.45	44.29	1289.
134	31.23958	306.14	18.24	−2038.1	2763.5	91.13	29.41	44.32	1283.
136	31.12067	302.90	17.98	−1967.8	2852.1	91.78	29.36	44.34	1278.
138	31.00222	299.80	17.72	−1897.6	2940.8	92.43	29.31	44.34	1272.
140	30.88430	296.82	17.46	−1827.4	3029.5	93.07	29.25	44.33	1267.
142	30.76695	293.96	17.20	−1757.3	3118.1	93.70	29.20	44.30	1262.
144	30.65022	291.20	16.95	−1687.3	3206.7	94.31	29.14	44.27	1257.
146	30.53414	288.54	16.70	−1617.4	3295.2	94.93	29.09	44.22	1251.
148	30.41874	285.96	16.45	−1547.6	3383.5	95.53	29.03	44.17	1246.
150	30.30403	283.47	16.21	−1478.0	3471.8	96.12	28.97	44.10	1241.
155	30.02043	277.55	15.61	−1304.7	3691.9	97.56	28.81	43.92	1229.
160	29.74149	272.02	15.05	−1132.5	3911.0	98.95	28.65	43.71	1217.
165	29.46730	266.82	14.50	−961.5	4128.9	100.29	28.49	43.47	1206.
170	29.19786	261.92	13.99	−791.7	4345.7	101.59	28.32	43.23	1195.
175	28.93315	257.28	13.50	−623.2	4561.2	102.84	28.16	42.97	1184.
180	28.67308	252.88	13.04	−456.0	4775.3	104.04	27.99	42.71	1174.
185	28.41757	248.70	12.60	−290.2	4988.2	105.21	27.83	42.44	1164.
190	28.16653	244.72	12.18	−125.7	5199.8	106.34	27.66	42.18	1154.
195	27.91983	240.93	11.78	37.5	5410.0	107.43	27.50	41.92	1145.
200	27.67737	237.32	11.41	199.4	5619.0	108.49	27.34	41.66	1136.
210	27.20473	230.61	10.72	519.3	6033.1	110.51	27.03	41.16	1120.
220	26.74778	224.52	10.09	834.3	6442.3	112.41	26.74	40.68	1104.
230	26.30572	219.00	9.52	1144.6	6846.8	114.21	26.46	40.22	1090.
240	25.87781	213.99	9.01	1450.4	7246.8	115.92	26.20	39.79	1077.
250	25.46338	209.44	8.54	1751.9	7642.7	117.53	25.95	39.39	1065.
260	25.06181	205.33	8.12	2049.5	8034.7	119.07	25.72	39.00	1054.
270	24.67251	201.59	7.73	2343.2	8422.9	120.53	25.50	38.64	1044.
280	24.29494	198.21	7.37	2633.5	8807.6	121.93	25.30	38.31	1035.
290	23.92860	195.15	7.04	2920.4	9189.1	123.27	25.12	37.99	1026.
300	23.57302	192.38	6.74	3204.2	9567.4	124.55	24.94	37.69	1019.
310	23.22775	189.86	6.46	3485.2	9943.0	125.79	24.78	37.41	1012.
320	22.89237	187.59	6.20	3763.3	10315.8	126.97	24.63	37.15	1005.
330	22.56648	185.54	5.96	4039.0	10686.0	128.11	24.50	36.91	999.
340	22.24971	183.69	5.74	4312.2	11053.9	129.21	24.37	36.68	993.
350	21.94170	182.02	5.53	4583.3	11419.6	130.27	24.25	36.46	988.
360	21.64212	180.51	5.33	4852.2	11783.1	131.29	24.14	36.26	984.
370	21.35064	179.16	5.15	5119.2	12144.8	132.28	24.05	36.07	979.
380	21.06696	177.95	4.98	5384.4	12504.6	133.24	23.96	35.89	976.
390	20.79080	176.87	4.82	5647.9	12862.6	134.17	23.88	35.73	972.
400	20.52187	175.91	4.67	5909.8	13219.1	135.07	23.80	35.57	969.
420	20.00469	174.31	4.39	6429.4	13927.7	136.80	23.68	35.29	963.
440	19.51344	173.09	4.14	6944.0	14631.0	138.44	23.58	35.05	958.
460	19.04635	172.20	3.92	7454.3	15329.8	139.99	23.51	34.84	954.
480	18.60177	171.59	3.72	7961.0	16024.8	141.47	23.46	34.66	951.
500	18.17820	171.23	3.54	8464.7	16716.4	142.88	23.43	34.51	949.
520	17.77426	171.09	3.38	8966.0	17405.1	144.23	23.42	34.38	947.
540	17.38867	171.13	3.22	9465.3	18091.6	145.53	23.42	34.27	945.
560	17.02026	171.33	3.09	9963.1	18776.1	146.77	23.44	34.18	944.
580	16.66794	171.68	2.96	10459.7	19459.0	147.97	23.47	34.11	944.
600	16.33072	172.16	2.84	10955.6	20140.8	149.13	23.52	34.06	943.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
620	16.00767	172.76	2.73	11451.1	20821.6	150.24	23.57	34.02	943.
640	15.69794	173.45	2.63	11946.4	21501.8	151.32	23.63	34.00	944.
660	15.40072	174.23	2.54	12441.7	22181.5	152.37	23.70	33.98	944.
680	15.11528	175.09	2.45	12937.4	22861.1	153.38	23.78	33.98	945.
700	14.84095	176.02	2.37	13433.5	23540.7	154.37	23.86	33.98	946.
720	14.57708	177.01	2.29	13930.3	24220.4	155.33	23.95	33.99	947.
740	14.32309	178.06	2.22	14427.9	24900.5	156.26	24.04	34.01	948.
760	14.07843	179.16	2.15	14926.3	25580.9	157.16	24.13	34.04	950.
780	13.84260	180.31	2.09	15425.8	26261.9	158.05	24.22	34.07	951.
800	13.61511	181.49	2.03	15926.4	26943.5	158.91	24.32	34.10	953.
850	13.08009	184.61	1.89	17183.0	28650.9	160.98	24.56	34.20	958.
900	12.58842	187.90	1.77	18447.8	30363.5	162.94	24.81	34.31	963.
950	12.13492	191.34	1.67	19721.0	32082.0	164.80	25.05	34.43	969.
1000	11.71520	194.88	1.58	21002.9	33806.8	166.57	25.28	34.56	975.
1050	11.32550	198.50	1.49	22293.3	35537.8	168.26	25.50	34.68	982.
1100	10.96261	202.19	1.42	23592.2	37275.1	169.87	25.72	34.81	988.
1150	10.62375	205.94	1.35	24899.2	39018.5	171.42	25.92	34.93	995.
1200	10.30653	209.73	1.29	26214.1	40767.9	172.91	26.11	35.05	1003.
				1600 bar Isobar					
* 92.911	33.78097	470.38	19.81	−3445.9	1290.5	75.36	30.21	37.00	1434.
94	33.73447	463.15	20.05	−3411.9	1331.0	75.79	30.14	37.31	1431.
96	33.64584	450.57	20.42	−3349.2	1406.2	76.58	30.05	37.90	1424.
98	33.55332	438.84	20.70	−3286.0	1482.6	77.37	29.98	38.49	1418.
100	33.45724	427.92	20.91	−3222.1	1560.1	78.15	29.94	39.07	1412.
102	33.35793	417.77	21.06	−3157.6	1638.8	78.93	29.90	39.63	1406.
104	33.25573	408.33	21.14	−3092.6	1718.6	79.71	29.88	40.17	1400.
106	33.15095	399.56	21.17	−3026.9	1799.5	80.48	29.87	40.68	1394.
108	33.04391	391.40	21.15	−2960.7	1881.4	81.24	29.85	41.16	1388.
110	32.93489	383.82	21.09	−2893.9	1964.1	82.00	29.85	41.60	1382.
112	32.82419	376.76	21.00	−2826.7	2047.7	82.75	29.84	42.00	1376.
114	32.71207	370.19	20.87	−2759.1	2132.1	83.50	29.83	42.36	1370.
116	32.59876	364.05	20.72	−2691.0	2217.2	84.24	29.82	42.69	1364.
118	32.48450	358.33	20.54	−2622.6	2302.8	84.97	29.80	42.97	1358.
120	32.36950	352.97	20.35	−2553.9	2389.0	85.70	29.79	43.23	1352.
122	32.25394	347.95	20.14	−2484.9	2475.7	86.41	29.77	43.44	1346.
124	32.13800	343.23	19.92	−2415.8	2562.8	87.12	29.75	43.63	1341.
126	32.02182	338.79	19.69	−2346.4	2650.2	87.82	29.72	43.78	1335.
128	31.90556	334.60	19.45	−2276.9	2737.9	88.51	29.69	43.91	1329.
130	31.78933	330.64	19.21	−2207.3	2825.8	89.19	29.66	44.01	1323.
132	31.67325	326.89	18.96	−2137.7	2913.9	89.87	29.62	44.09	1318.
134	31.55739	323.32	18.70	−2068.0	3002.2	90.53	29.59	44.15	1312.
136	31.44186	319.92	18.45	−1998.3	3090.5	91.18	29.54	44.18	1307.
138	31.32672	316.67	18.20	−1928.6	3178.9	91.83	29.50	44.20	1301.
140	31.21203	313.56	17.94	−1858.9	3267.3	92.47	29.45	44.21	1296.
142	31.09785	310.58	17.69	−1789.4	3355.7	93.09	29.41	44.20	1291.
144	30.98423	307.72	17.44	−1719.8	3444.1	93.71	29.35	44.18	1286.
146	30.87120	304.96	17.19	−1650.4	3532.4	94.32	29.30	44.14	1281.
148	30.75879	302.30	16.94	−1581.1	3620.6	94.92	29.25	44.10	1276.
150	30.64704	299.72	16.70	−1511.9	3708.8	95.51	29.19	44.05	1271.
155	30.37065	293.64	16.10	−1339.6	3928.6	96.95	29.04	43.88	1258.
160	30.09871	287.98	15.53	−1168.3	4147.6	98.34	28.89	43.68	1247.
165	29.83134	282.67	14.99	−998.1	4365.4	99.68	28.73	43.46	1235.
170	29.56858	277.68	14.46	−829.0	4582.1	100.98	28.57	43.22	1225.
175	29.31041	272.96	13.97	−661.2	4797.6	102.23	28.40	42.97	1214.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
180	29.05678	268.48	13.50	−494.7	5011.8	103.43	28.24	42.71	1204.
185	28.80758	264.22	13.05	−329.4	5224.7	104.60	28.07	42.45	1194.
190	28.56274	260.17	12.63	−165.4	5436.3	105.73	27.91	42.18	1185.
195	28.32214	256.31	12.23	−2.8	5646.5	106.82	27.74	41.92	1176.
200	28.08568	252.62	11.84	158.6	5855.5	107.88	27.58	41.67	1167.
210	27.62470	245.75	11.14	477.7	6269.6	109.90	27.27	41.16	1151.
220	27.17893	239.48	10.50	791.9	6678.8	111.80	26.97	40.68	1136.
230	26.74758	233.77	9.92	1101.5	7083.3	113.60	26.69	40.22	1122.
240	26.32988	228.56	9.40	1406.6	7483.4	115.30	26.42	39.79	1109.
250	25.92514	223.82	8.92	1707.6	7879.2	116.92	26.17	39.38	1097.
260	25.53275	219.50	8.48	2004.7	8271.1	118.46	25.93	39.00	1086.
270	25.15210	215.57	8.08	2298.0	8659.3	119.92	25.71	38.64	1075.
280	24.78268	211.98	7.72	2587.9	9044.0	121.32	25.50	38.30	1066.
290	24.42398	208.73	7.38	2874.5	9425.5	122.66	25.31	37.99	1058.
300	24.07554	205.76	7.07	3158.1	9803.8	123.94	25.13	37.69	1050.
310	23.73694	203.06	6.78	3438.8	10179.3	125.17	24.96	37.41	1042.
320	23.40775	200.61	6.51	3716.8	10552.1	126.36	24.81	37.15	1036.
330	23.08761	198.38	6.26	3992.2	10922.4	127.50	24.66	36.91	1029.
340	22.77616	196.35	6.03	4265.4	11290.3	128.60	24.53	36.68	1024.
350	22.47306	194.52	5.82	4536.3	11656.0	129.66	24.41	36.46	1018.
360	22.17799	192.85	5.62	4805.2	12019.6	130.68	24.30	36.26	1014.
370	21.89064	191.35	5.43	5072.2	12381.2	131.67	24.19	36.07	1009.
380	21.61073	189.99	5.25	5337.4	12741.1	132.63	24.10	35.90	1005.
390	21.33800	188.76	5.08	5600.9	13099.3	133.56	24.01	35.73	1001.
400	21.07217	187.66	4.93	5862.9	13455.8	134.46	23.94	35.58	998.
420	20.56026	185.80	4.64	6382.6	14164.6	136.19	23.80	35.31	992.
440	20.07318	184.34	4.38	6897.5	14868.3	137.83	23.70	35.07	987.
460	19.60925	183.22	4.15	7408.1	15567.5	139.38	23.62	34.86	982.
480	19.16694	182.40	3.94	7915.2	16262.9	140.86	23.57	34.68	979.
500	18.74483	181.84	3.75	8419.4	16955.0	142.28	23.53	34.53	976.
520	18.34165	181.51	3.58	8921.1	17644.4	143.63	23.51	34.41	974.
540	17.95620	181.38	3.42	9421.0	18331.5	144.93	23.51	34.31	972.
560	17.58738	181.43	3.27	9919.4	19016.8	146.17	23.53	34.22	971.
580	17.23418	181.63	3.14	10416.7	19700.5	147.37	23.56	34.16	970.
600	16.89564	181.97	3.02	10913.2	20383.1	148.53	23.60	34.11	969.
620	16.57091	182.43	2.90	11409.4	21064.9	149.65	23.65	34.07	969.
640	16.25918	183.00	2.80	11905.4	21746.0	150.73	23.71	34.05	969.
660	15.95968	183.67	2.70	12401.5	22426.7	151.77	23.78	34.03	969.
680	15.67173	184.42	2.60	12897.9	23107.3	152.79	23.85	34.03	969.
700	15.39468	185.25	2.52	13394.8	23788.0	153.78	23.93	34.04	970.
720	15.12792	186.15	2.44	13892.3	24468.8	154.74	24.01	34.05	971.
740	14.87089	187.12	2.36	14390.7	25149.9	155.67	24.10	34.07	972.
760	14.62307	188.14	2.29	14889.9	25831.5	156.58	24.19	34.09	973.
780	14.38397	189.21	2.22	15390.2	26513.7	157.46	24.28	34.12	974.
800	14.15313	190.32	2.16	15891.6	27196.5	158.33	24.38	34.16	976.
850	13.60945	193.28	2.01	17150.2	28906.8	160.40	24.62	34.26	980.
900	13.10889	196.43	1.89	18416.9	30622.4	162.36	24.86	34.37	985.
950	12.64641	199.75	1.78	19692.1	32343.9	164.22	25.10	34.49	990.
1000	12.21772	203.19	1.68	20975.9	34071.6	166.00	25.33	34.62	996.
1050	11.81913	206.72	1.59	22268.2	35805.6	167.69	25.55	34.74	1002.
1100	11.44750	210.34	1.51	23568.9	37545.8	169.31	25.76	34.86	1008.
1150	11.10007	214.01	1.44	24877.7	39292.0	170.86	25.96	34.98	1015.
1200	10.77446	217.74	1.37	26194.2	41044.2	172.35	26.14	35.10	1022.
					1700 bar Isobar				
* 94.518	33.92337	486.37	19.88	−3400.3	1611.0	75.63	29.84	36.51	1458.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
96	33.86163	476.55	20.21	−3354.9	1665.5	76.20	29.80	36.97	1453.
98	33.77489	464.08	20.56	−3293.3	1740.1	76.97	29.77	37.60	1446.
100	33.68449	452.44	20.84	−3230.9	1815.9	77.73	29.76	38.22	1440.
102	33.59074	441.59	21.05	−3168.0	1892.9	78.50	29.76	38.83	1434.
104	33.49395	431.49	21.19	−3104.4	1971.2	79.25	29.77	39.41	1428.
106	33.39444	422.08	21.27	−3040.1	2050.6	80.01	29.78	39.97	1422.
108	33.29252	413.32	21.29	−2975.2	2131.0	80.76	29.80	40.49	1416.
110	33.18846	405.18	21.28	−2909.8	2212.5	81.51	29.82	40.98	1410.
112	33.08255	397.59	21.22	−2843.7	2294.9	82.25	29.84	41.43	1404.
114	32.97506	390.52	21.13	−2777.2	2378.2	82.99	29.85	41.83	1398.
116	32.86622	383.93	21.01	−2710.3	2462.2	83.72	29.86	42.20	1392.
118	32.75627	377.78	20.86	−2642.9	2547.0	84.44	29.87	42.53	1386.
120	32.64543	372.03	20.69	−2575.1	2632.3	85.16	29.87	42.82	1380.
122	32.53389	366.65	20.50	−2507.1	2718.2	85.87	29.86	43.08	1374.
124	32.42182	361.61	20.30	−2438.8	2804.6	86.57	29.86	43.30	1368.
126	32.30939	356.86	20.08	−2370.2	2891.4	87.27	29.85	43.49	1362.
128	32.19675	352.40	19.86	−2301.5	2978.6	87.95	29.83	43.65	1357.
130	32.08402	348.19	19.63	−2232.6	3066.0	88.63	29.81	43.78	1351.
132	31.97133	344.21	19.39	−2163.6	3153.7	89.30	29.78	43.88	1346.
134	31.85877	340.43	19.14	−2094.5	3241.5	89.96	29.75	43.96	1340.
136	31.74644	336.85	18.90	−2025.4	3329.5	90.61	29.72	44.02	1335.
138	31.63442	333.44	18.65	−1956.3	3417.6	91.26	29.69	44.06	1329.
140	31.52278	330.18	18.40	−1887.2	3505.7	91.89	29.65	44.09	1324.
142	31.41157	327.06	18.15	−1818.1	3593.9	92.52	29.60	44.09	1319.
144	31.30085	324.07	17.90	−1749.1	3682.1	93.13	29.56	44.09	1314.
146	31.19066	321.21	17.65	−1680.1	3770.3	93.74	29.51	44.07	1309.
148	31.08104	318.45	17.41	−1611.2	3858.4	94.34	29.46	44.04	1304.
150	30.97203	315.78	17.16	−1542.4	3946.4	94.93	29.41	43.99	1299.
155	30.70230	309.51	16.57	−1371.0	4166.0	96.37	29.27	43.85	1287.
160	30.43679	303.70	16.00	−1200.5	4384.9	97.76	29.12	43.67	1275.
165	30.17566	298.28	15.45	−1031.0	4602.7	99.10	28.97	43.46	1264.
170	29.91899	293.19	14.92	−862.6	4819.4	100.40	28.81	43.22	1253.
175	29.66677	288.38	14.42	−695.4	5034.9	101.65	28.64	42.98	1243.
180	29.41896	283.83	13.94	−529.4	5249.2	102.85	28.48	42.72	1233.
185	29.17549	279.50	13.49	−364.7	5462.1	104.02	28.31	42.46	1223.
190	28.93626	275.38	13.06	−201.2	5673.8	105.15	28.15	42.20	1214.
195	28.70119	271.45	12.65	−38.9	5884.2	106.24	27.98	41.94	1205.
200	28.47014	267.69	12.26	122.0	6093.2	107.30	27.82	41.68	1197.
210	28.01972	260.67	11.54	440.3	6507.5	109.32	27.50	41.18	1180.
220	27.58411	254.25	10.89	753.9	6916.8	111.23	27.20	40.70	1165.
230	27.16250	248.37	10.30	1062.9	7321.5	113.02	26.91	40.24	1151.
240	26.75412	242.99	9.77	1367.5	7721.6	114.73	26.63	39.80	1139.
250	26.35827	238.07	9.28	1668.0	8117.6	116.34	26.38	39.39	1127.
260	25.97431	233.57	8.83	1964.6	8509.6	117.88	26.13	39.01	1116.
270	25.60166	229.45	8.42	2257.6	8897.8	119.35	25.90	38.65	1105.
280	25.23979	225.68	8.05	2547.2	9282.6	120.75	25.69	38.31	1096.
290	24.88820	222.24	7.70	2833.5	9664.1	122.08	25.49	37.99	1087.
300	24.54644	219.09	7.38	3116.8	10042.5	123.37	25.31	37.69	1079.
310	24.21409	216.22	7.09	3397.3	10418.0	124.60	25.13	37.42	1072.
320	23.89076	213.59	6.81	3675.1	10790.8	125.78	24.97	37.16	1065.
330	23.57608	211.19	6.56	3950.5	11161.2	126.92	24.82	36.91	1059.
340	23.26971	209.00	6.32	4223.5	11529.1	128.02	24.69	36.68	1053.
350	22.97132	207.01	6.10	4494.3	11894.9	129.08	24.56	36.47	1048.
360	22.68060	205.19	5.89	4763.2	12258.6	130.11	24.44	36.27	1043.
370	22.39728	203.54	5.69	5030.1	12620.3	131.10	24.34	36.08	1038.
380	22.12107	202.03	5.51	5295.3	12980.2	132.06	24.24	35.91	1034.
390	21.85172	200.67	5.34	5558.8	13338.5	132.99	24.15	35.75	1030.
400	21.58899	199.44	5.18	5820.8	13695.2	133.89	24.07	35.59	1026.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
420	21.08245	197.32	4.88	6340.7	14404.3	135.62	23.93	35.32	1020.
440	20.59971	195.62	4.61	6855.7	15108.2	137.26	23.82	35.08	1014.
460	20.13921	194.28	4.37	7366.6	15807.8	138.81	23.73	34.88	1010.
480	19.69950	193.25	4.15	7874.0	16503.6	140.29	23.67	34.71	1006.
500	19.27926	192.50	3.96	8378.5	17196.3	141.71	23.63	34.56	1003.
520	18.87728	191.99	3.77	8880.7	17886.2	143.06	23.61	34.44	1000.
540	18.49244	191.69	3.61	9381.0	18573.9	144.36	23.60	34.34	998.
560	18.12372	191.58	3.46	9879.8	19259.8	145.61	23.62	34.26	996.
580	17.77014	191.63	3.32	10377.7	19944.3	146.81	23.64	34.19	995.
600	17.43083	191.83	3.19	10874.8	20627.6	147.96	23.68	34.14	994.
620	17.10496	192.16	3.07	11371.5	21310.2	149.08	23.72	34.11	993.
640	16.79177	192.61	2.96	11868.1	21992.1	150.17	23.78	34.09	993.
660	16.49054	193.17	2.85	12364.8	22673.8	151.21	23.85	34.08	993.
680	16.20062	193.81	2.76	12861.9	23355.3	152.23	23.92	34.08	993.
700	15.92139	194.55	2.67	13359.4	24036.9	153.22	23.99	34.08	993.
720	15.65227	195.35	2.58	13857.7	24718.7	154.18	24.08	34.10	994.
740	15.39272	196.23	2.50	14356.7	25400.9	155.11	24.16	34.12	995.
760	15.14225	197.17	2.43	14856.6	26083.5	156.03	24.25	34.15	995.
780	14.90038	198.16	2.36	15357.6	26766.7	156.91	24.34	34.18	997.
800	14.66668	199.20	2.29	15859.7	27450.6	157.78	24.43	34.21	998.
850	14.11552	201.99	2.14	17120.1	29163.6	159.86	24.67	34.31	1001.
900	13.60717	205.01	2.00	18388.6	30882.0	161.82	24.91	34.43	1006.
950	13.13674	208.20	1.89	19665.5	32606.3	163.68	25.14	34.55	1011.
1000	12.70004	211.54	1.78	20951.0	34336.8	165.46	25.37	34.67	1016.
1050	12.29347	214.98	1.69	22245.0	36073.5	167.15	25.59	34.80	1022.
1100	11.91392	218.51	1.60	23547.4	37816.4	168.78	25.80	34.92	1028.
1150	11.55870	222.12	1.53	24857.8	39565.3	170.33	25.99	35.04	1034.
1200	11.22545	225.78	1.46	26175.9	41320.1	171.82	26.18	35.15	1040.

1800 bar Isobar

* 96.103	34.06181	502.22	19.95	−3355.0	1929.5	75.88	29.52	36.09	1480.
98	33.98465	489.69	20.36	−3297.9	1998.6	76.59	29.53	36.71	1474.
100	33.89966	477.32	20.71	−3237.1	2072.7	77.34	29.55	37.37	1468.
102	33.81122	465.77	20.98	−3175.6	2148.0	78.09	29.59	38.02	1462.
104	33.71963	454.99	21.17	−3113.4	2224.7	78.83	29.63	38.65	1455.
106	33.62519	444.93	21.31	−3050.5	2302.6	79.57	29.68	39.24	1449.
108	33.52819	435.56	21.38	−2986.9	2381.7	80.31	29.73	39.81	1443.
110	33.42891	426.83	21.41	−2922.7	2461.8	81.05	29.77	40.34	1437.
112	33.32764	418.69	21.39	−2857.9	2543.0	81.78	29.81	40.84	1431.
114	33.22462	411.10	21.34	−2792.5	2625.2	82.51	29.85	41.29	1425.
116	33.12011	404.03	21.25	−2726.6	2708.1	83.23	29.88	41.70	1419.
118	33.01434	397.43	21.13	−2660.3	2791.9	83.94	29.91	42.07	1413.
120	32.90752	391.26	20.99	−2593.5	2876.4	84.65	29.93	42.40	1407.
122	32.79986	385.49	20.82	−2526.3	2961.5	85.36	29.95	42.70	1401.
124	32.69154	380.09	20.64	−2458.8	3047.2	86.05	29.95	42.96	1395.
126	32.58272	375.02	20.44	−2391.1	3133.3	86.74	29.96	43.18	1389.
128	32.47357	370.26	20.23	−2323.1	3219.9	87.42	29.95	43.37	1383.
130	32.36421	365.77	20.01	−2254.9	3306.8	88.10	29.95	43.53	1378.
132	32.25478	361.54	19.78	−2186.6	3394.0	88.76	29.93	43.66	1372.
134	32.14538	357.54	19.55	−2118.1	3481.4	89.42	29.91	43.77	1367.
136	32.03611	353.74	19.31	−2049.6	3569.1	90.07	29.89	43.86	1361.
138	31.92706	350.14	19.07	−1981.0	3656.8	90.71	29.86	43.92	1356.
140	31.81830	346.72	18.82	−1912.4	3744.7	91.34	29.83	43.96	1351.
142	31.70990	343.45	18.58	−1843.8	3832.7	91.97	29.79	43.99	1345.
144	31.60193	340.32	18.33	−1775.2	3920.6	92.58	29.75	43.99	1340.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
146	31.49442	337.32	18.09	−1706.7	4008.6	93.19	29.71	43.99	1335.
148	31.38742	334.45	17.85	−1638.2	4096.6	93.79	29.66	43.97	1330.
150	31.28098	331.69	17.61	−1569.8	4184.5	94.38	29.62	43.94	1325.
155	31.01746	325.20	17.01	−1399.2	4404.0	95.82	29.49	43.83	1314.
160	30.75791	319.22	16.44	−1229.5	4622.7	97.21	29.34	43.66	1302.
165	30.50254	313.66	15.89	−1060.6	4840.5	98.55	29.19	43.46	1291.
170	30.25145	308.47	15.36	−892.9	5057.3	99.84	29.04	43.24	1281.
175	30.00468	303.57	14.85	−726.2	5272.9	101.09	28.87	43.00	1270.
180	29.76220	298.94	14.37	−560.7	5487.2	102.30	28.71	42.75	1261.
185	29.52395	294.54	13.91	−396.4	5700.3	103.47	28.54	42.49	1251.
190	29.28985	290.35	13.48	−233.4	5912.1	104.60	28.38	42.23	1242.
195	29.05980	286.35	13.06	−71.5	6122.6	105.69	28.21	41.97	1233.
200	28.83369	282.53	12.67	89.1	6331.8	106.75	28.05	41.71	1225.
210	28.39288	275.39	11.94	406.8	6746.4	108.77	27.73	41.21	1209.
220	27.96654	268.83	11.27	719.7	7156.0	110.68	27.42	40.72	1194.
230	27.55383	262.81	10.67	1028.2	7560.9	112.48	27.12	40.26	1180.
240	27.15399	257.27	10.13	1332.4	7961.2	114.18	26.84	39.82	1167.
250	26.76630	252.19	9.63	1632.5	8357.4	115.80	26.58	39.41	1155.
260	26.39013	247.52	9.17	1928.8	8749.5	117.34	26.33	39.02	1144.
270	26.02488	243.23	8.76	2221.4	9137.9	118.80	26.10	38.66	1134.
280	25.67002	239.30	8.37	2510.7	9522.8	120.20	25.88	38.32	1125.
290	25.32507	235.68	8.02	2796.8	9904.4	121.54	25.67	38.00	1116.
300	24.98957	232.37	7.69	3079.9	10282.9	122.82	25.48	37.70	1108.
310	24.66311	229.33	7.39	3360.2	10658.5	124.06	25.30	37.43	1100.
320	24.34530	226.54	7.10	3637.9	11031.5	125.24	25.14	37.16	1093.
330	24.03580	223.98	6.84	3913.1	11401.9	126.38	24.98	36.92	1087.
340	23.73427	221.63	6.60	4186.0	11769.9	127.48	24.84	36.69	1081.
350	23.44039	219.48	6.37	4456.7	12135.8	128.54	24.71	36.48	1076.
360	23.15387	217.52	6.15	4725.5	12499.6	129.56	24.59	36.28	1070.
370	22.87444	215.72	5.95	4992.4	12861.4	130.55	24.48	36.09	1066.
380	22.60184	214.08	5.76	5257.5	13221.5	131.51	24.37	35.92	1061.
390	22.33582	212.58	5.59	5521.1	13579.9	132.45	24.28	35.76	1057.
400	22.07615	211.22	5.42	5783.1	13936.7	133.35	24.19	35.61	1053.
420	21.57498	208.86	5.11	6303.0	14646.0	135.08	24.05	35.33	1047.
440	21.09669	206.92	4.84	6818.1	15350.3	136.72	23.93	35.10	1041.
460	20.63978	205.37	4.59	7329.2	16050.2	138.27	23.84	34.90	1036.
480	20.20291	204.13	4.36	7836.8	16746.5	139.76	23.77	34.73	1032.
500	19.78483	203.19	4.16	8341.6	17439.5	141.17	23.73	34.58	1028
520	19.38439	202.50	3.97	8844.1	18130.0	142.52	23.70	34.46	1025
540	19.00054	202.03	3.80	9344.8	18818.2	143.82	23.69	34.37	1023.
560	18.63230	201.77	3.64	9844.1	19504.7	145.07	23.70	34.29	1021.
580	18.27877	201.67	3.49	10342.4	20189.8	146.27	23.72	34.23	1019.
600	17.93912	201.74	3.36	10839.9	20873.9	147.43	23.75	34.18	1018.
620	17.61255	201.94	3.23	11337.2	21557.1	148.55	23.80	34.15	1017.
640	17.29836	202.27	3.12	11834.3	22239.9	149.64	23.85	34.13	1016.
660	16.99586	202.71	3.01	12331.5	22922.3	150.69	23.91	34.12	1016.
680	16.70442	203.25	2.91	12829.1	23604.7	151.71	23.98	34.12	1016.
700	16.42346	203.89	2.81	13327.3	24287.2	152.69	24.06	34.13	1016.
720	16.15243	204.60	2.72	13826.1	24969.9	153.66	24.14	34.14	1016.
740	15.89081	205.39	2.64	14325.7	25653.0	154.59	24.22	34.17	1017.
760	15.63812	206.24	2.56	14826.2	26336.6	155.50	24.31	34.19	1018.
780	15.39392	207.16	2.49	15327.8	27020.7	156.39	24.40	34.22	1019.
800	15.15777	208.13	2.42	15830.5	27705.6	157.26	24.49	34.26	1020.
850	14.60016	210.76	2.26	17092.5	29421.1	159.34	24.72	34.36	1023.
900	14.08498	213.63	2.12	18362.5	31142.1	161.31	24.96	34.48	1026.
950	13.60750	216.70	1.99	19641.0	32869.0	163.17	25.19	34.60	1031.
1000	13.16364	219.93	1.88	20928.1	34602.1	164.95	25.41	34.72	1036.
1050	12.74988	223.28	1.79	22223.7	36341.4	166.65	25.63	34.85	1041.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1100	12.36317	226.73	1.70	23527.5	38086.9	168.27	25.84	34.97	1047.
1150	12.00086	230.26	1.62	24839.4	39838.3	169.83	26.03	35.09	1053.
1200	11.66062	233.86	1.54	26159.0	41595.6	171.33	26.22	35.20	1059.
				1900 bar Isobar					
* 97.667	34.19656	517.94	20.02	−3310.0	2246.1	76.12	29.25	35.72	1502.
98	34.18364	515.68	20.10	−3300.2	2258.0	76.25	29.26	35.83	1501.
100	34.10382	502.58	20.51	−3240.9	2330.3	76.98	29.33	36.52	1495.
102	34.02047	490.31	20.85	−3180.8	2404.1	77.71	29.40	37.21	1488.
104	33.93386	478.84	21.10	−3120.0	2479.2	78.44	29.48	37.87	1482.
106	33.84429	468.13	21.29	−3058.4	2555.6	79.16	29.55	38.51	1476.
108	33.75204	458.12	21.42	−2996.1	2633.2	79.89	29.63	39.12	1469.
110	33.65739	448.79	21.49	−2933.1	2712.0	80.61	29.71	39.70	1463.
112	33.56059	440.08	21.52	−2869.4	2792.0	81.33	29.77	40.23	1457.
114	33.46191	431.95	21.50	−2805.2	2872.9	82.05	29.84	40.73	1451.
116	33.36160	424.37	21.44	−2740.3	2954.9	82.76	29.89	41.18	1445.
118	33.25988	417.29	21.35	−2674.9	3037.6	83.47	29.94	41.60	1439.
120	33.15697	410.68	21.24	−2609.1	3121.2	84.17	29.98	41.97	1433.
122	33.05308	404.50	21.10	−2542.8	3205.5	84.87	30.01	42.30	1427.
124	32.94840	398.72	20.94	−2476.2	3290.4	85.56	30.04	42.60	1421.
126	32.84309	393.30	20.76	−2409.2	3375.8	86.24	30.06	42.85	1415.
128	32.73731	388.21	20.57	−2342.0	3461.8	86.92	30.07	43.08	1409.
130	32.63122	383.42	20.36	−2274.5	3548.1	87.59	30.07	43.27	1403.
132	32.52494	378.92	20.15	−2206.8	3634.8	88.25	30.07	43.43	1398.
134	32.41858	374.66	19.92	−2139.0	3721.9	88.90	30.06	43.57	1392.
136	32.31225	370.64	19.70	−2071.0	3809.1	89.55	30.04	43.68	1387.
138	32.20606	366.83	19.46	−2003.0	3896.5	90.19	30.02	43.76	1382.
140	32.10007	363.21	19.22	−1934.9	3984.1	90.82	30.00	43.82	1376.
142	31.99436	359.77	18.99	−1866.7	4071.8	91.44	29.97	43.87	1371.
144	31.88900	356.49	18.75	−1798.6	4159.6	92.05	29.94	43.90	1366.
146	31.78404	353.35	18.51	−1730.4	4247.4	92.66	29.90	43.91	1361.
148	31.67953	350.35	18.27	−1662.4	4335.2	93.26	29.86	43.90	1356.
150	31.57551	347.47	18.03	−1594.3	4423.0	93.85	29.82	43.89	1351.
155	31.31784	340.73	17.44	−1424.6	4642.2	95.28	29.69	43.80	1339.
160	31.06387	334.56	16.86	−1255.6	4860.9	96.67	29.56	43.65	1328.
165	30.81386	328.85	16.31	−1087.4	5078.7	98.01	29.41	43.47	1317.
170	30.56795	323.53	15.78	−920.1	5295.5	99.31	29.26	43.26	1307.
175	30.32622	318.54	15.27	−754.0	5511.2	100.56	29.10	43.02	1297.
180	30.08864	313.82	14.78	−588.9	5725.7	101.77	28.94	42.78	1287.
185	29.85519	309.35	14.32	−425.1	5939.0	102.94	28.77	42.52	1278.
190	29.62578	305.10	13.88	−262.3	6151.0	104.07	28.60	42.27	1269.
195	29.40034	301.04	13.46	−100.8	6361.7	105.16	28.44	42.01	1260.
200	29.17875	297.16	13.06	59.5	6571.1	106.22	28.27	41.75	1252.
210	28.74674	289.90	12.31	376.6	6986.0	108.25	27.95	41.24	1236.
220	28.32889	283.22	11.64	689.0	7396.0	110.15	27.64	40.75	1221.
230	27.92435	277.07	11.03	997.1	7801.2	111.95	27.33	40.29	1207.
240	27.53237	271.40	10.47	1300.9	8201.8	113.66	27.05	39.85	1195.
250	27.15221	266.17	9.97	1600.6	8598.2	115.28	26.78	39.43	1183.
260	26.78323	261.36	9.50	1896.6	8990.6	116.82	26.52	39.05	1172.
270	26.42485	256.91	9.08	2189.0	9379.2	118.28	26.28	38.68	1162.
280	26.07652	252.82	8.68	2478.0	9764.3	119.68	26.06	38.34	1152.
290	25.73776	249.05	8.32	2763.9	10146.1	121.02	25.85	38.02	1144.
300	25.40812	245.58	7.99	3046.8	10524.7	122.31	25.65	37.72	1135.
310	25.08720	242.38	7.68	3327.0	10900.5	123.54	25.47	37.44	1128.
320	24.77462	239.43	7.39	3604.5	11273.6	124.72	25.30	37.18	1121.
330	24.47003	236.72	7.12	3879.6	11644.2	125.86	25.14	36.93	1114.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
340	24.17310	234.23	6.87	4152.4	12012.3	126.96	24.99	36.71	1108.
350	23.88354	231.94	6.63	4423.1	12378.3	128.02	24.85	36.49	1103.
360	23.60106	229.83	6.41	4691.7	12742.2	129.05	24.73	36.29	1097.
370	23.32539	227.89	6.21	4958.6	13104.2	130.04	24.61	36.11	1092.
380	23.05629	226.12	6.01	5223.7	13464.4	131.00	24.50	35.93	1088.
390	22.79352	224.49	5.83	5487.2	13822.9	131.93	24.41	35.77	1084.
400	22.53686	223.00	5.66	5749.2	14179.9	132.84	24.32	35.62	1080.
420	22.04102	220.40	5.34	6269.2	14889.5	134.57	24.16	35.35	1073.
440	21.56721	218.24	5.06	6784.4	15594.1	136.21	24.04	35.12	1067.
460	21.11402	216.47	4.80	7295.6	16294.4	137.76	23.94	34.92	1062.
480	20.68015	215.04	4.57	7803.4	16991.0	139.25	23.87	34.75	1057.
500	20.26444	213.91	4.35	8308.5	17684.5	140.66	23.82	34.61	1053.
520	19.86579	213.05	4.16	8811.2	18375.4	142.02	23.79	34.49	1050.
540	19.48321	212.42	3.98	9312.2	19064.2	143.32	23.78	34.39	1047.
560	19.11578	211.99	3.82	9811.8	19751.2	144.56	23.78	34.32	1045.
580	18.76263	211.76	3.67	10310.4	20436.9	145.77	23.80	34.26	1043.
600	18.42299	211.68	3.53	10808.4	21121.6	146.93	23.83	34.21	1042.
620	18.09609	211.76	3.40	11306.0	21805.5	148.05	23.87	34.18	1040.
640	17.78127	211.97	3.28	11803.6	22489.0	149.13	23.92	34.16	1040.
660	17.47787	212.30	3.16	12301.3	23172.2	150.19	23.98	34.16	1039.
680	17.18530	212.73	3.06	12799.3	23855.3	151.21	24.05	34.16	1039.
700	16.90299	213.27	2.96	13297.9	24538.6	152.20	24.12	34.17	1038.
720	16.63043	213.89	2.86	13797.3	25222.1	153.16	24.20	34.19	1039.
740	16.36711	214.59	2.78	14297.4	25906.0	154.10	24.28	34.21	1039.
760	16.11258	215.36	2.69	14798.5	26590.5	155.01	24.36	34.24	1039.
780	15.86642	216.19	2.62	15300.6	27275.6	155.90	24.45	34.27	1040.
800	15.62820	217.09	2.54	15803.8	27961.3	156.77	24.54	34.31	1041.
850	15.06501	219.55	2.38	17067.2	29679.2	158.85	24.77	34.41	1043.
900	14.54385	222.28	2.23	18338.6	31402.6	160.82	25.00	34.53	1047.
950	14.06012	225.23	2.10	19618.5	33131.9	162.69	25.23	34.65	1051.
1000	13.60986	228.35	1.99	20907.0	34867.5	164.47	25.45	34.77	1055.
1050	13.18962	231.60	1.88	22204.0	36609.3	166.17	25.67	34.90	1060.
1100	12.79641	234.97	1.79	23509.2	38357.2	167.80	25.87	35.02	1065.
1150	12.42763	238.43	1.70	24822.5	40111.0	169.35	26.07	35.14	1071.
1200	12.08099	241.96	1.63	26143.4	41870.6	170.85	26.25	35.25	1077.
				2000 bar Isobar					
* 99.212	34.32785	533.53	20.08	−3265.3	2560.9	76.36	29.03	35.40	1524.
100	34.29791	528.19	20.26	−3242.4	2588.9	76.64	29.07	35.68	1521.
102	34.21942	515.21	20.66	−3183.7	2661.0	77.35	29.18	36.40	1515.
104	34.13761	503.05	20.98	−3124.2	2734.5	78.07	29.30	37.10	1508.
106	34.05273	491.66	21.22	−3063.9	2809.4	78.78	29.41	37.78	1502.
108	33.96506	481.02	21.40	−3002.8	2885.6	79.49	29.52	38.43	1495.
110	33.87487	471.07	21.52	−2941.0	2963.0	80.20	29.62	39.04	1489.
112	33.78241	461.77	21.59	−2878.5	3041.7	80.91	29.71	39.62	1483.
114	33.68795	453.09	21.61	−2815.4	3121.5	81.62	29.80	40.16	1476.
116	33.59171	444.98	21.59	−2751.5	3202.3	82.32	29.88	40.65	1470.
118	33.49393	437.41	21.54	−2687.2	3284.1	83.02	29.95	41.10	1464.
120	33.39484	430.33	21.45	−2622.3	3366.7	83.71	30.01	41.52	1458.
122	33.29462	423.71	21.34	−2556.9	3450.1	84.40	30.06	41.89	1452.
124	33.19348	417.52	21.20	−2491.1	3534.2	85.09	30.11	42.22	1446.
126	33.09158	411.72	21.04	−2424.9	3619.0	85.76	30.14	42.51	1440.
128	32.98910	406.29	20.87	−2358.4	3704.2	86.43	30.16	42.77	1434.
130	32.88618	401.18	20.68	−2291.6	3790.0	87.10	30.18	42.99	1428.
132	32.78295	396.37	20.48	−2224.5	3876.2	87.76	30.19	43.19	1423.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
134	32.67955	391.85	20.27	−2157.3	3962.7	88.41	30.19	43.35	1417.
136	32.57608	387.57	20.05	−2089.9	4049.6	89.05	30.19	43.48	1412.
138	32.47264	383.53	19.83	−2022.4	4136.6	89.69	30.18	43.59	1406.
140	32.36932	379.71	19.60	−1954.8	4223.9	90.32	30.16	43.68	1401.
142	32.26620	376.07	19.37	−1887.1	4311.3	90.94	30.14	43.74	1396.
144	32.16335	372.61	19.13	−1819.4	4398.9	91.55	30.11	43.79	1391.
146	32.06083	369.32	18.90	−1751.7	4486.5	92.15	30.08	43.82	1386.
148	31.95870	366.17	18.66	−1683.9	4574.1	92.75	30.05	43.83	1381.
150	31.85699	363.16	18.43	−1616.3	4661.8	93.34	30.01	43.83	1376.
155	31.60487	356.14	17.84	−1447.3	4880.8	94.77	29.90	43.77	1364.
160	31.35617	349.75	17.27	−1279.0	5099.3	96.16	29.77	43.64	1353.
165	31.11119	343.88	16.72	−1111.4	5317.2	97.50	29.63	43.48	1342.
170	30.87013	338.42	16.18	−944.7	5534.1	98.80	29.48	43.28	1332.
175	30.63307	333.31	15.67	−779.0	5749.9	100.05	29.32	43.05	1322.
180	30.40005	328.50	15.18	−614.4	5964.6	101.26	29.16	42.82	1312.
185	30.17103	323.96	14.71	−450.8	6178.0	102.43	28.99	42.57	1303.
190	29.94596	319.64	14.26	−288.5	6390.2	103.56	28.83	42.31	1294.
195	29.72476	315.52	13.84	−127.3	6601.1	104.65	28.66	42.05	1286.
200	29.50734	311.58	13.43	32.8	6810.8	105.72	28.49	41.79	1277.
210	29.08343	304.21	12.68	349.4	7226.2	107.74	28.16	41.29	1262.
220	28.67338	297.42	12.00	661.4	7636.5	109.65	27.85	40.80	1247.
230	28.27638	291.16	11.38	969.1	8042.1	111.45	27.54	40.33	1234.
240	27.89164	285.37	10.81	1272.6	8443.2	113.16	27.25	39.88	1221.
250	27.51844	280.02	10.29	1572.1	8839.9	114.78	26.97	39.47	1209.
260	27.15614	275.06	9.82	1867.8	9232.6	116.32	26.71	39.07	1198.
270	26.80414	270.48	9.39	2159.9	9621.5	117.79	26.47	38.71	1188.
280	26.46190	266.25	8.99	2448.8	10006.8	119.19	26.23	38.36	1179.
290	26.12893	262.33	8.62	2734.5	10388.8	120.53	26.02	38.04	1170.
300	25.80480	258.71	8.27	3017.2	10767.7	121.82	25.82	37.74	1162.
310	25.48910	255.37	7.96	3297.2	11143.7	123.05	25.63	37.46	1154.
320	25.18145	252.28	7.66	3574.6	11516.9	124.23	25.45	37.20	1147.
330	24.88152	249.42	7.39	3849.6	11887.7	125.37	25.29	36.95	1141.
340	24.58898	246.79	7.13	4122.3	12256.0	126.47	25.14	36.72	1134.
350	24.30354	244.36	6.89	4392.9	12622.1	127.53	24.99	36.51	1129.
360	24.02493	242.11	6.67	4661.5	12986.2	128.56	24.86	36.31	1123.
370	23.75289	240.05	6.46	4928.3	13348.3	129.55	24.74	36.12	1118.
380	23.48718	238.14	6.25	5193.4	13708.7	130.51	24.63	35.95	1114.
390	23.22757	236.39	6.07	5456.9	14067.3	131.45	24.53	35.79	1109.
400	22.97384	234.78	5.89	5718.9	14424.4	132.35	24.44	35.64	1105.
420	22.48326	231.94	5.56	6238.9	15134.4	134.08	24.28	35.37	1098.
440	22.01393	229.56	5.27	6754.1	15839.3	135.72	24.15	35.13	1092.
460	21.56450	227.59	5.01	7265.4	16539.9	137.28	24.04	34.94	1086.
480	21.13376	225.96	4.77	7773.4	17236.9	138.76	23.97	34.77	1082.
500	20.72057	224.65	4.55	8278.6	17930.8	140.18	23.91	34.63	1078.
520	20.32391	223.61	4.35	8781.5	18622.2	141.53	23.88	34.51	1074.
540	19.94283	222.82	4.16	9282.7	19311.4	142.83	23.86	34.42	1071.
560	19.57644	222.25	3.99	9782.6	19999.0	144.08	23.86	34.34	1069.
580	19.22395	221.87	3.84	10281.5	20685.2	145.29	23.88	34.28	1066.
600	18.88460	221.66	3.69	10779.8	21370.5	146.45	23.90	34.24	1065.
620	18.55768	221.61	3.56	11277.8	22055.0	147.57	23.94	34.21	1063.
640	18.24253	221.70	3.43	11775.7	22739.1	148.66	23.99	34.20	1062.
660	17.93855	221.92	3.31	12273.8	23423.0	149.71	24.05	34.19	1061.
680	17.64516	222.25	3.20	12772.3	24106.8	150.73	24.11	34.19	1061.
700	17.36184	222.68	3.10	13271.3	24790.8	151.72	24.18	34.21	1060.
720	17.08807	223.21	3.00	13771.0	25475.1	152.69	24.26	34.22	1060.
740	16.82338	223.82	2.91	14271.6	26159.8	153.62	24.34	34.25	1060.
760	16.56734	224.51	2.83	14773.2	26845.1	154.54	24.42	34.28	1061.
780	16.31953	225.27	2.75	15275.7	27531.0	155.43	24.51	34.31	1061.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
800	16.07955	226.09	2.67	15779.4	28217.6	156.30	24.59	34.35	1062.
850	15.51156	228.38	2.50	17044.0	29937.6	158.38	24.82	34.45	1064.
900	14.98516	230.97	2.34	18316.8	31663.3	160.36	25.05	34.57	1067.
950	14.49589	233.79	2.21	19597.9	33395.0	162.23	25.27	34.70	1070.
1000	14.03989	236.79	2.09	20887.7	35132.8	164.01	25.50	34.82	1074.
1050	13.61380	239.95	1.98	22186.0	36876.9	165.71	25.71	34.94	1079.
1100	13.21469	243.23	1.88	23492.5	38627.1	167.34	25.91	35.06	1084.
1150	12.84001	246.61	1.79	24807.0	40383.3	168.90	26.10	35.18	1089.
1200	12.48750	250.08	1.71	26129.1	42145.2	170.40	26.28	35.29	1095.
				2200 bar Isobar					
* 102.246	34.58094	564.32	20.18	−3176.2	3185.7	76.80	28.71	34.89	1564.
104	34.51692	552.49	20.57	−3126.2	3247.5	77.40	28.87	35.55	1558.
106	34.44091	539.76	20.92	−3068.4	3319.3	78.08	29.05	36.30	1552.
108	34.36193	527.80	21.21	−3009.8	3392.6	78.77	29.22	37.02	1545.
110	34.28024	516.59	21.43	−2950.3	3467.4	79.45	29.39	37.71	1538.
112	34.19607	506.09	21.59	−2890.0	3543.4	80.14	29.54	38.36	1532.
114	34.10967	496.25	21.70	−2829.0	3620.8	80.82	29.68	38.97	1525.
116	34.02127	487.04	21.76	−2767.2	3699.3	81.50	29.81	39.55	1519.
118	33.93108	478.43	21.77	−2704.8	3778.9	82.18	29.92	40.08	1512.
120	33.83932	470.36	21.75	−2641.7	3859.6	82.86	30.03	40.56	1506.
122	33.74619	462.82	21.69	−2578.1	3941.2	83.54	30.12	41.01	1500.
124	33.65189	455.75	21.61	−2513.9	4023.6	84.21	30.20	41.41	1494.
126	33.55660	449.14	21.50	−2449.3	4106.8	84.87	30.26	41.78	1488.
128	33.46048	442.93	21.37	−2384.2	4190.7	85.53	30.32	42.10	1482.
130	33.36369	437.12	21.22	−2318.8	4275.2	86.19	30.36	42.39	1476.
132	33.26638	431.65	21.05	−2253.1	4360.2	86.84	30.40	42.64	1470.
134	33.16867	426.51	20.87	−2187.0	4445.7	87.48	30.43	42.86	1465.
136	33.07069	421.68	20.68	−2120.8	4531.7	88.12	30.44	43.05	1459.
138	32.97256	417.12	20.48	−2054.3	4617.9	88.75	30.45	43.21	1454.
140	32.87436	412.81	20.27	−1987.7	4704.5	89.37	30.45	43.35	1448.
142	32.77619	408.73	20.05	−1920.9	4791.3	89.98	30.45	43.45	1443.
144	32.67813	404.87	19.83	−1854.0	4878.3	90.59	30.44	43.54	1438.
146	32.58026	401.21	19.61	−1787.1	4965.4	91.19	30.42	43.60	1433.
148	32.48262	397.72	19.39	−1720.2	5052.7	91.79	30.39	43.65	1428.
150	32.38529	394.40	19.16	−1653.2	5140.0	92.37	30.37	43.68	1423.
155	32.14360	386.72	18.59	−1485.8	5358.5	93.81	30.28	43.69	1411.
160	31.90470	379.81	18.03	−1318.8	5576.8	95.19	30.16	43.62	1400.
165	31.66902	373.51	17.48	−1152.3	5794.5	96.53	30.04	43.49	1389.
170	31.43684	367.73	16.94	−986.6	6011.6	97.83	29.89	43.32	1379.
175	31.20831	362.35	16.43	−821.7	6227.7	99.08	29.74	43.19	1369.
180	30.98353	357.33	15.93	−657.8	6442.8	100.29	29.58	42.90	1360.
185	30.76250	352.61	15.45	−494.9	6656.7	101.47	29.42	42.66	1351.
190	30.54522	348.14	15.00	−333.1	6869.3	102.60	29.25	42.41	1342.
195	30.33162	343.89	14.57	−172.4	7080.8	103.70	29.08	42.16	1334.
200	30.12164	339.85	14.15	−12.8	7290.9	104.76	28.91	41.90	1326.
210	29.71217	332.27	13.38	303.0	7707.4	106.79	28.58	41.39	1311.
220	29.31604	325.29	12.68	614.4	8118.8	108.71	28.25	40.90	1297.
230	28.93246	318.83	12.04	921.5	8525.4	110.52	27.93	40.42	1283.
240	28.56066	312.84	11.45	1224.4	8927.3	112.23	27.63	39.97	1271.
250	28.19992	307.27	10.92	1523.5	9324.9	113.85	27.35	39.55	1259.
260	27.84960	302.09	10.43	1818.8	9718.4	115.39	27.07	39.15	1249.
270	27.50910	297.27	9.98	2110.6	10108.0	116.86	26.82	38.77	1239.
280	27.17787	292.78	9.57	2399.1	10493.9	118.27	26.57	38.42	1229.
290	26.85543	288.61	9.18	2684.5	10876.5	119.61	26.35	38.10	1221.
300	26.54133	284.73	8.83	2967.0	11256.0	120.90	26.14	37.79	1212.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
310	26.23518	281.13	8.50	3246.8	11632.5	122.13	25.94	37.51	1205.
320	25.99661	277.77	8.19	3524.0	12006.2	123.32	25.75	37.24	1198.
330	25.64529	274.66	7.90	3798.8	12377.4	124.46	25.58	36.99	1191.
340	25.36090	271.77	7.64	4071.3	12746.1	125.56	25.42	36.76	1185.
350	25.08317	269.08	7.39	4341.8	13112.6	126.62	25.27	36.55	1179.
360	24.81182	266.58	7.15	4610.3	13477.1	127.65	25.13	36.34	1173.
370	24.54662	264.27	6.93	4877.0	13839.6	128.64	25.00	36.16	1168.
380	24.28734	262.12	6.72	5142.0	14200.2	129.60	24.88	35.98	1163.
390	24.03376	260.13	6.52	5405.4	14559.2	130.54	24.77	35.82	1159.
400	23.78569	258.29	6.34	5667.4	14916.7	131.44	24.67	35.67	1155.
420	23.30530	255.01	6.00	6187.4	15627.3	133.18	24.50	35.40	1147.
440	22.84481	252.21	5.69	6702.7	16332.9	134.82	24.36	35.17	1140.
460	22.40295	249.83	5.41	7214.1	17034.2	136.38	24.24	34.97	1134.
480	21.97861	247.83	5.15	7722.2	17731.9	137.86	24.15	34.81	1129.
500	21.57076	246.17	4.92	8227.6	18426.6	139.28	24.09	34.67	1125.
520	21.17846	244.80	4.71	8730.8	19118.8	140.64	24.05	34.55	1121.
540	20.80084	243.69	4.51	9232.4	19808.9	141.94	24.02	34.46	1117.
560	20.43712	242.82	4.33	9732.6	20497.4	143.19	24.02	34.39	1114.
580	20.08655	242.16	4.17	10232.0	21184.6	144.40	24.02	34.34	1112.
600	19.74844	241.69	4.01	10730.8	21870.9	145.56	24.04	34.30	1109.
620	19.42216	241.39	3.87	11229.3	22556.5	146.68	24.08	34.27	1107.
640	19.10710	241.25	3.73	11727.7	23241.8	147.77	24.12	34.26	1106.
660	18.80272	241.24	3.61	12226.4	23926.9	148.82	24.17	34.25	1105.
680	18.50848	241.36	3.49	12725.5	24612.0	149.85	24.23	34.26	1104.
700	18.22389	241.60	3.38	13225.2	25297.3	150.84	24.30	34.27	1103.
720	17.94850	241.94	3.28	13725.7	25983.0	151.81	24.37	34.29	1102.
740	17.68187	242.37	3.18	14227.0	26669.1	152.75	24.45	34.32	1102.
760	17.42360	242.90	3.09	14729.3	27355.8	153.66	24.53	34.35	1102.
780	17.17330	243.50	3.00	15232.6	28043.2	154.55	24.61	34.39	1102.
800	16.93060	244.17	2.92	15737.1	28731.3	155.43	24.69	34.43	1102.
850	16.35496	246.13	2.73	17003.7	30455.3	157.52	24.91	34.54	1104.
900	15.81995	248.42	2.56	18278.6	32185.1	159.49	25.14	34.66	1106.
950	15.32140	250.98	2.42	19561.9	33920.9	161.37	25.36	34.78	1109.
1000	14.85565	253.76	2.29	20853.9	35663.1	163.16	25.57	34.91	1112.
1050	14.41949	256.72	2.17	22154.4	37411.5	164.86	25.78	35.03	1116.
1100	14.01014	259.82	2.06	23463.1	39166.0	166.50	25.98	35.15	1120.
1150	13.62513	263.05	1.97	24779.8	40926.5	168.06	26.17	35.27	1125.
1200	13.26228	266.38	1.88	26104.2	42692.6	169.56	26.35	35.38	1130.
				2400 bar Isobar					
* 105.210	34.82268	594.62	20.26	−3087.4	3804.7	77.21	28.52	34.51	1603.
106	34.79552	589.15	20.43	−3065.4	3832.1	77.47	28.62	34.82	1600.
108	34.72465	575.89	20.83	−3009.0	3902.5	78.13	28.85	35.60	1593.
110	34.65092	563.40	21.15	−2951.8	3974.5	78.79	29.08	36.35	1586.
112	34.57454	551.67	21.41	−2893.6	4047.9	79.45	29.29	37.07	1579.
114	34.49575	540.64	21.61	−2834.6	4122.7	80.11	29.48	37.76	1572.
116	34.41477	530.29	21.75	−2774.9	4198.9	80.77	29.66	38.40	1565.
118	34.33179	520.57	21.84	−2714.3	4276.3	81.43	29.83	39.00	1559.
120	34.24703	511.47	21.89	−2653.0	4354.9	82.09	29.98	39.56	1552.
122	34.16069	502.93	21.89	−2591.1	4434.5	82.75	30.11	40.08	1546.
124	34.07296	494.92	21.87	−2528.6	4515.1	83.41	30.23	40.55	1539.
126	33.98400	487.42	21.81	−2465.5	4596.7	84.06	30.33	40.98	1533.
128	33.89401	480.38	21.73	−2401.9	4679.0	84.71	30.42	41.37	1527.
130	33.80312	473.77	21.62	−2337.8	4762.1	85.35	30.50	41.72	1521.
132	33.71150	467.57	21.50	−2273.3	4845.9	85.99	30.56	42.04	1515.
134	33.61928	461.75	21.35	−2208.5	4930.3	86.63	30.61	42.32	1509.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
136	33.52659	456.27	21.19	−2143.3	5015.1	87.26	30.65	42.56	1504.
138	33.43355	451.11	21.02	−2077.9	5100.5	87.88	30.68	42.77	1498.
140	33.34026	446.25	20.83	−2012.3	5186.2	88.50	30.70	42.95	1493.
142	33.24683	441.66	20.64	−1946.4	5272.3	89.11	30.72	43.11	1488.
144	33.15334	437.32	20.44	−1880.4	5358.6	89.71	30.72	43.24	1482.
146	33.05988	433.22	20.24	−1814.3	5445.2	90.31	30.72	43.34	1477.
148	32.96652	429.33	20.03	−1748.1	5532.0	90.90	30.71	43.43	1472.
150	32.87333	425.63	19.81	−1681.8	5618.9	91.48	30.69	43.49	1467.
155	32.64142	417.15	19.27	−1516.0	5836.6	92.91	30.63	43.57	1456.
160	32.41164	409.59	18.72	−1350.2	6054.5	94.29	30.53	43.57	1444.
165	32.18451	402.78	18.18	−1184.8	6272.2	95.63	30.42	43.49	1434.
170	31.96040	396.57	17.65	−1020.0	6489.3	96.93	30.28	43.35	1424.
175	31.73957	390.86	17.13	−855.9	6705.6	98.18	30.14	43.18	1414.
180	31.52215	385.57	16.63	−692.6	6921.0	99.40	29.98	42.98	1405.
185	31.30823	380.63	16.15	−530.3	7135.4	100.57	29.82	42.76	1396.
190	31.09781	375.98	15.69	−369.0	7348.6	101.71	29.65	42.52	1387.
195	30.89089	371.58	15.25	−208.7	7560.6	102.81	29.48	42.27	1379.
200	30.68741	367.41	14.83	−49.5	7771.3	103.88	29.31	42.02	1371.
210	30.29050	359.62	14.04	265.7	8189.0	105.91	28.97	41.51	1356.
220	29.90644	352.47	13.32	576.6	8601.6	107.83	28.64	41.02	1342.
230	29.53449	345.84	12.66	883.3	9009.4	109.65	28.31	40.54	1330.
240	29.17392	339.68	12.06	1185.9	9412.4	111.36	28.00	40.08	1317.
250	28.82402	333.94	11.51	1484.7	9811.1	112.99	27.70	39.65	1306.
260	28.48414	328.57	11.01	1779.7	10205.5	114.54	27.42	39.24	1296.
270	28.15370	323.56	10.55	2071.3	10595.9	116.01	27.15	38.86	1286.
280	27.83215	318.87	10.12	2359.6	10982.7	117.42	26.90	38.50	1276.
290	27.51900	314.49	9.72	2644.8	11366.1	118.76	26.66	38.17	1268.
300	27.21380	310.39	9.35	2927.1	11746.2	120.05	26.44	37.86	1260.
310	26.91617	306.57	9.01	3206.7	12123.3	121.29	26.23	37.57	1252.
320	26.62574	302.99	8.69	3483.8	12497.6	122.47	26.04	37.30	1245.
330	26.34217	299.64	8.40	3758.5	12869.3	123.62	25.85	37.05	1238.
340	26.06517	296.52	8.12	4030.9	13238.6	124.72	25.68	36.81	1232.
350	25.79445	293.60	7.86	4301.3	13605.6	125.78	25.53	36.59	1226.
360	25.52977	290.88	7.61	4569.7	13970.5	126.81	25.38	36.39	1220.
370	25.27088	288.34	7.38	4836.3	14333.4	127.81	25.24	36.20	1215.
380	25.01757	285.98	7.17	5101.2	14694.5	128.77	25.12	36.02	1210.
390	24.76963	283.77	6.96	5364.6	15053.9	129.70	25.00	35.86	1205.
400	24.52687	281.71	6.77	5626.5	15411.7	130.61	24.90	35.71	1201.
420	24.05619	278.01	6.41	6146.4	16123.0	132.34	24.71	35.43	1193.
440	23.60424	274.82	6.09	6661.7	16829.3	133.99	24.56	35.20	1186.
460	23.16984	272.07	5.79	7173.1	17531.4	135.55	24.43	35.01	1180.
480	22.75195	269.71	5.53	7681.3	18229.8	137.03	24.33	34.84	1174.
500	22.34962	267.70	5.29	8186.8	18925.2	138.45	24.26	34.70	1169.
520	21.96198	266.01	5.06	8690.2	19618.1	139.81	24.21	34.59	1165.
540	21.58825	264.60	4.86	9191.9	20309.1	141.12	24.18	34.50	1161.
560	21.22767	263.44	4.67	9692.4	20998.4	142.37	24.16	34.43	1158.
580	20.87959	262.51	4.49	10192.0	21686.5	143.58	24.16	34.38	1155.
600	20.54336	261.78	4.33	10691.1	22373.7	144.74	24.18	34.34	1152.
620	20.21840	261.24	4.17	11190.0	23060.3	145.87	24.21	34.32	1150.
640	19.90416	260.87	4.03	11688.8	23746.6	146.96	24.25	34.31	1148.
660	19.60013	260.64	3.90	12187.9	24432.8	148.01	24.29	34.31	1146.
680	19.30582	260.56	3.77	12687.5	25119.0	149.04	24.35	34.32	1145.
700	19.02079	260.60	3.66	13187.7	25805.5	150.03	24.41	34.33	1144.
720	18.74460	260.76	3.54	13688.6	26492.3	151.00	24.48	34.35	1143.
740	18.47687	261.02	3.44	14190.5	27179.7	151.94	24.55	34.38	1142.
760	18.21720	261.37	3.34	14693.3	27867.7	152.86	24.63	34.42	1142.
780	17.96525	261.82	3.25	15197.2	28556.4	153.75	24.71	34.45	1142.
800	17.72068	262.34	3.16	15702.3	29245.8	154.63	24.79	34.49	1142.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
850	17.13947	263.96	2.96	16970.6	30973.3	156.72	25.00	34.61	1142.
900	16.59792	265.95	2.78	18247.1	32706.7	158.70	25.22	34.73	1143.
950	16.09207	268.25	2.62	19532.2	34446.4	160.58	25.44	34.86	1146.
1000	15.61847	270.80	2.48	20825.9	36192.4	162.37	25.65	34.98	1148.
1050	15.17409	273.56	2.36	22128.2	37944.7	164.08	25.85	35.11	1152.
1100	14.75624	276.48	2.24	23438.8	39703.2	165.72	26.05	35.23	1155.
1150	14.36255	279.55	2.14	24757.4	41467.5	167.29	26.23	35.35	1160.
1200	13.99094	282.74	2.04	26083.6	43237.6	168.80	26.41	35.46	1164.
				2600 bar Isobar					
* 108.109	35.05439	624.43	20.29	−2998.5	4418.6	77.60	28.43	34.23	1638.
110	34.99163	611.44	20.70	−2946.3	4484.1	78.20	28.70	35.00	1631.
112	34.92258	598.46	21.05	−2890.2	4554.8	78.84	28.97	35.77	1624.
114	34.85098	586.23	21.34	−2833.2	4627.1	79.48	29.22	36.52	1617.
116	34.77702	574.71	21.57	−2775.3	4700.9	80.12	29.46	37.22	1610.
118	34.70090	563.87	21.74	−2716.6	4776.0	80.76	29.67	37.89	1603.
120	34.62283	553.68	21.87	−2657.1	4852.4	81.40	29.87	38.51	1596.
122	34.54299	544.11	21.95	−2596.9	4930.0	82.04	30.04	39.09	1590.
124	34.46156	535.11	21.98	−2535.9	5008.7	82.68	30.20	39.63	1583.
126	34.37871	526.66	21.99	−2474.3	5088.5	83.32	30.34	40.13	1577.
128	34.29463	518.73	21.96	−2412.2	5169.2	83.96	30.47	40.58	1571.
130	34.20945	511.27	21.90	−2349.4	5250.8	84.59	30.57	40.99	1564.
132	34.12334	504.27	21.82	−2286.3	5333.2	85.22	30.67	41.37	1558.
134	34.03644	497.69	21.71	−2222.6	5416.2	85.84	30.75	41.71	1552.
136	33.94888	491.50	21.59	−2158.6	5500.0	86.46	30.81	42.01	1547.
138	33.86078	485.68	21.45	−2094.3	5584.2	87.08	30.87	42.27	1541.
140	33.77226	480.20	21.30	−2029.6	5669.0	87.69	30.91	42.50	1535.
142	33.68342	475.03	21.13	−1964.7	5754.2	88.29	30.94	42.71	1530.
144	33.59436	470.15	20.95	−1899.6	5839.8	88.89	30.97	42.88	1525.
146	33.50517	465.54	20.77	−1834.2	5925.8	89.48	30.98	43.03	1519.
148	33.41592	461.18	20.58	−1768.8	6011.9	90.07	30.98	43.15	1514.
150	33.32670	457.06	20.38	−1703.2	6098.4	90.65	30.98	43.26	1509.
155	33.10417	447.63	19.87	−1538.9	6315.1	92.07	30.94	43.42	1497.
160	32.88304	439.29	19.35	−1374.4	6532.4	93.45	30.87	43.48	1486.
165	32.66395	431.84	18.82	−1210.1	6749.7	94.79	30.77	43.46	1475.
170	32.44738	425.12	18.30	−1046.2	6966.8	96.08	30.65	43.37	1465.
175	32.23365	419.00	17.78	−882.8	7183.3	97.34	30.51	43.23	1456.
180	32.02298	413.37	17.29	−720.1	7399.0	98.55	30.36	43.05	1446.
185	31.81550	408.15	16.80	−558.3	7613.8	99.73	30.20	42.85	1438.
190	31.61128	403.28	16.34	−397.4	7827.5	100.87	30.04	42.63	1429.
195	31.41033	398.70	15.89	−237.5	8040.0	101.97	29.87	42.39	1421.
200	31.21265	394.37	15.46	−78.6	8251.4	103.05	29.70	42.15	1414.
210	30.82688	386.35	14.66	236.1	8670.3	105.09	29.35	41.65	1399.
220	30.45345	379.01	13.93	546.7	9084.3	107.02	29.01	41.15	1385.
230	30.09171	372.23	13.26	853.1	9493.3	108.83	28.67	40.66	1373.
240	29.74099	365.92	12.64	1155.5	9897.6	110.55	28.35	40.20	1361.
250	29.40060	360.04	12.08	1454.0	10297.4	112.19	28.04	39.76	1350.
260	29.06992	354.52	11.56	1749.0	10692.9	113.74	27.75	39.35	1340.
270	28.74835	349.35	11.08	2040.4	11084.4	115.22	27.47	38.96	1330.
280	28.43535	344.50	10.64	2328.6	11472.1	116.63	27.21	38.59	1321.
290	28.13045	339.95	10.23	2613.7	11856.3	117.97	26.96	38.25	1312.
300	27.83319	335.67	9.85	2895.9	12237.2	119.26	26.73	37.94	1304.
310	27.54318	331.65	9.50	3175.4	12615.1	120.50	26.51	37.64	1296.
320	27.26006	327.88	9.17	3452.3	12990.1	121.69	26.31	37.36	1289.
330	26.98350	324.34	8.87	3726.9	13362.4	122.84	26.12	37.11	1282.
340	26.71320	321.02	8.58	3999.3	13732.3	123.94	25.94	36.87	1276.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
350	26.44888	317.90	8.31	4269.5	14099.8	125.01	25.78	36.64	1270.
360	26.19030	314.98	8.06	4537.9	14465.2	126.04	25.62	36.44	1265.
370	25.93722	312.23	7.82	4804.4	14828.6	127.03	25.48	36.25	1259.
380	25.68943	309.67	7.59	5069.3	15190.2	128.00	25.35	36.07	1254.
390	25.44674	307.26	7.38	5332.6	15550.0	128.93	25.22	35.90	1249.
400	25.20896	305.01	7.18	5594.5	15908.3	129.84	25.11	35.75	1245.
420	24.74745	300.93	6.81	6114.3	16620.4	131.58	24.91	35.47	1237.
440	24.30367	297.36	6.47	6629.5	17327.5	133.22	24.75	35.24	1229.
460	23.87651	294.25	6.17	7140.9	18030.2	134.78	24.61	35.04	1223.
480	23.46498	291.56	5.89	7649.0	18729.4	136.27	24.51	34.88	1217.
500	23.06820	289.23	5.64	8154.6	19425.5	137.69	24.42	34.74	1212.
520	22.68535	287.23	5.40	8658.1	20119.2	139.05	24.36	34.63	1207.
540	22.31571	285.52	5.19	9159.9	20810.9	140.36	24.33	34.54	1203.
560	21.95858	284.09	4.99	9660.5	21501.0	141.61	24.31	34.47	1199.
580	21.61334	282.89	4.80	10160.3	22189.9	142.82	24.30	34.42	1196.
600	21.27941	281.91	4.63	10659.5	22877.9	143.99	24.31	34.39	1193.
620	20.95624	281.13	4.47	11158.6	23565.4	145.12	24.33	34.36	1190.
640	20.64332	280.53	4.32	11657.7	24252.6	146.21	24.37	34.36	1188.
660	20.34018	280.10	4.18	12157.1	24939.7	147.26	24.41	34.36	1186.
680	20.04638	279.81	4.05	12657.0	25626.9	148.29	24.46	34.37	1185.
700	19.76149	279.66	3.92	13157.5	26314.4	149.29	24.52	34.38	1183.
720	19.48513	279.63	3.81	13658.8	27002.4	150.26	24.58	34.41	1182.
740	19.21691	279.72	3.70	14161.1	27690.8	151.20	24.65	34.44	1181.
760	18.95649	279.91	3.59	14664.3	28379.9	152.12	24.73	34.47	1180.
780	18.70353	280.20	3.49	15168.7	29069.8	153.01	24.80	34.51	1180.
800	18.45773	280.57	3.40	15674.2	29760.5	153.89	24.88	34.56	1179.
850	17.87260	281.85	3.19	16943.7	31491.1	155.99	25.09	34.67	1179.
900	17.32611	283.55	3.00	18221.5	33227.8	157.97	25.30	34.80	1180.
950	16.81455	285.58	2.83	19508.0	34970.8	159.86	25.51	34.93	1181.
1000	16.33465	287.90	2.68	20803.2	36720.3	161.65	25.72	35.05	1184.
1050	15.88352	290.45	2.54	22107.0	38476.2	163.36	25.92	35.18	1186.
1100	15.45860	293.19	2.42	23419.2	40238.3	165.00	26.11	35.30	1190.
1150	15.05762	296.10	2.31	24739.3	42006.3	166.58	26.30	35.42	1193.
1200	14.67857	299.14	2.21	26067.1	43780.0	168.09	26.47	35.53	1197.
				2800 bar Isobar					
* 110.947	35.27718	653.80	20.30	−2909.2	5027.9	77.97	28.42	34.04	1672.
112	35.24411	646.42	20.54	−2880.6	5064.0	78.29	28.59	34.47	1668.
114	35.17927	632.98	20.92	−2825.5	5133.7	78.91	28.90	35.27	1661.
116	35.11196	620.28	21.24	−2769.5	5205.0	79.53	29.18	36.03	1653.
118	35.04237	608.31	21.50	−2712.5	5277.8	80.15	29.45	36.75	1646.
120	34.97067	597.01	21.70	−2654.7	5352.0	80.77	29.69	37.43	1639.
122	34.89704	586.37	21.85	−2596.1	5427.5	81.40	29.91	38.07	1632.
124	34.82166	576.35	21.96	−2536.7	5504.2	82.02	30.11	38.67	1625.
126	34.74471	566.92	22.02	−2476.6	5582.1	82.65	30.30	39.23	1619.
128	34.66633	558.05	22.05	−2415.9	5661.1	83.27	30.46	39.74	1612.
130	34.58669	549.70	22.05	−2354.5	5741.1	83.89	30.60	40.21	1606.
132	34.50593	541.84	22.02	−2292.6	5821.9	84.50	30.73	40.64	1600.
134	34.42420	534.45	21.96	−2230.2	5903.6	85.12	30.84	41.04	1593.
136	34.34163	527.50	21.88	−2167.3	5986.1	85.73	30.93	41.39	1587.
138	34.25835	520.96	21.77	−2104.0	6069.2	86.34	31.01	41.71	1582.
140	34.17448	514.79	21.66	−2040.4	6152.9	86.94	31.07	42.00	1576.
142	34.09012	508.98	21.52	−1976.4	6237.1	87.54	31.13	42.25	1570.
144	34.00538	503.50	21.37	−1912.1	6321.8	88.13	31.17	42.47	1565.
146	33.92036	498.33	21.21	−1847.7	6407.0	88.72	31.20	42.66	1560.
148	33.83513	493.44	21.05	−1783.0	6492.5	89.30	31.22	42.83	1554.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
150	33.74978	488.82	20.87	−1718.1	6578.3	89.87	31.23	42.97	1549.
155	33.53635	478.31	20.40	−1555.4	6793.8	91.29	31.23	43.22	1537.
160	33.32357	469.06	19.91	−1392.2	7010.3	92.66	31.18	43.35	1526.
165	33.11219	460.86	19.40	−1228.9	7227.2	94.00	31.10	43.39	1515.
170	32.90278	453.53	18.89	−1065.9	7444.0	95.29	30.99	43.35	1505.
175	32.69575	446.90	18.39	−903.2	7660.6	96.55	30.87	43.25	1495.
180	32.49138	440.86	17.90	−741.2	7876.5	97.76	30.72	43.11	1486.
185	32.28987	435.30	17.41	−579.9	8091.6	98.94	30.57	42.93	1477.
190	32.09135	430.16	16.95	−419.4	8305.7	100.08	30.40	42.72	1469.
195	31.89587	425.35	16.50	−259.8	8518.8	101.19	30.23	42.50	1461.
200	31.70344	420.84	16.07	−101.1	8730.7	102.26	30.06	42.27	1453.
210	31.32770	412.53	15.25	213.2	9151.0	104.31	29.71	41.78	1439.
220	30.96378	404.99	14.51	523.5	9566.3	106.25	29.36	41.28	1426.
230	30.61114	398.04	13.82	829.7	9976.7	108.07	29.02	40.80	1413.
240	30.26916	391.60	13.19	1132.0	10382.3	109.80	28.69	40.33	1402.
250	29.93721	385.59	12.61	1430.4	10783.3	111.43	28.37	39.88	1391.
260	29.61468	379.95	12.08	1725.3	11180.0	112.99	28.07	39.46	1381.
270	29.30099	374.65	11.59	2016.6	11572.6	114.47	27.78	39.06	1371.
280	28.99562	369.66	11.14	2304.8	11961.4	115.89	27.51	38.69	1362.
290	28.69807	364.97	10.72	2589.8	12346.5	117.24	27.25	38.34	1354.
300	28.40792	360.54	10.33	2872.0	12728.4	118.53	27.01	38.02	1346.
310	28.12476	356.36	9.97	3151.4	13107.0	119.77	26.79	37.72	1338.
320	27.84824	352.43	9.63	3428.3	13482.8	120.97	26.57	37.44	1331.
330	27.57801	348.72	9.32	3702.8	13855.8	122.11	26.37	37.18	1325.
340	27.31380	345.23	9.02	3975.1	14226.4	123.22	26.19	36.93	1318.
350	27.05532	341.93	8.74	4245.4	14594.5	124.29	26.02	36.70	1312.
360	26.80233	338.83	8.48	4513.7	14960.5	125.32	25.85	36.49	1307.
370	26.55460	335.91	8.24	4780.1	15324.5	126.32	25.70	36.30	1301.
380	26.31192	333.17	8.00	5045.0	15686.5	127.28	25.56	36.12	1296.
390	26.07411	330.58	7.78	5308.2	16046.8	128.22	25.44	35.95	1291.
400	25.84097	328.15	7.58	5570.0	16405.5	129.13	25.32	35.79	1287.
420	25.38808	323.72	7.19	6089.7	17118.5	130.86	25.11	35.51	1279.
440	24.95206	319.81	6.84	6604.9	17826.4	132.51	24.93	35.28	1271.
460	24.53185	316.37	6.53	7116.2	18529.9	134.07	24.79	35.08	1264.
480	24.12651	313.35	6.24	7624.3	19229.8	135.56	24.67	34.91	1258.
500	23.73521	310.71	5.97	8129.8	19926.7	136.99	24.58	34.78	1253.
520	23.35717	308.42	5.73	8633.3	20621.0	138.35	24.52	34.67	1248.
540	22.99171	306.43	5.51	9135.1	21313.4	139.65	24.47	34.58	1243.
560	22.63819	304.73	5.30	9635.8	22004.3	140.91	24.44	34.51	1239.
580	22.29601	303.28	5.11	10135.6	22693.9	142.12	24.43	34.46	1236.
600	21.96465	302.06	4.93	10635.0	23382.8	143.29	24.44	34.43	1232.
620	21.64358	301.05	4.76	11134.2	24071.1	144.42	24.45	34.41	1230.
640	21.33234	300.23	4.60	11633.5	24759.1	145.51	24.48	34.40	1227.
660	21.03049	299.58	4.45	12133.1	25447.1	146.57	24.52	34.40	1225.
680	20.73760	299.09	4.31	12633.1	26135.2	147.60	24.57	34.41	1223.
700	20.45330	298.75	4.18	13133.9	26823.6	148.59	24.62	34.43	1221.
720	20.17721	298.55	4.06	13635.4	27512.5	149.56	24.68	34.46	1220.
740	19.90898	298.46	3.95	14137.9	28201.9	150.51	24.75	34.49	1218.
760	19.64829	298.49	3.84	14641.5	28892.1	151.43	24.82	34.53	1217.
780	19.39483	298.62	3.73	15146.2	29583.0	152.33	24.89	34.57	1217.
800	19.14830	298.85	3.63	15652.0	30274.7	153.20	24.97	34.61	1216.
850	18.56052	299.79	3.41	16922.4	32008.2	155.30	25.17	34.73	1215.
900	18.01039	301.19	3.21	18201.2	33747.8	157.29	25.38	34.86	1215.
950	17.49440	302.96	3.03	19488.9	35494.0	159.18	25.59	34.99	1216.
1000	17.00945	305.04	2.87	20785.3	37246.7	160.98	25.79	35.12	1218.
1050	16.55279	307.38	2.73	22090.3	39005.9	162.69	25.99	35.25	1220.
1100	16.12198	309.94	2.59	23403.7	40771.3	164.34	26.17	35.37	1223.
1150	15.71485	312.68	2.48	24725.2	42542.7	165.91	26.35	35.49	1226.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1200	15.32944	315.57	2.37	26054.3	44319.8	167.42	26.53	35.60	1230.
				3000 bar Isobar					
* 113.729	35.49198	682.75	20.29	−2819.5	5633.1	78.32	28.46	33.90	1704.
114	35.48391	680.81	20.35	−2812.2	5642.3	78.41	28.51	34.01	1703.
116	35.42288	666.95	20.76	−2758.0	5711.1	79.00	28.85	34.82	1695.
118	35.35947	653.83	21.10	−2702.7	5781.6	79.61	29.17	35.59	1688.
120	35.29384	641.43	21.39	−2646.6	5853.5	80.21	29.46	36.33	1680.
122	35.22615	629.71	21.62	−2589.5	5926.9	80.82	29.73	37.02	1673.
124	35.15658	618.64	21.80	−2531.7	6001.6	81.42	29.97	37.67	1666.
126	35.08528	608.21	21.93	−2473.1	6077.5	82.03	30.19	38.29	1659.
128	35.01242	598.36	22.02	−2413.7	6154.7	82.64	30.39	38.86	1652.
130	34.93813	589.08	22.08	−2353.7	6232.9	83.25	30.57	39.38	1646.
132	34.86257	580.34	22.10	−2293.0	6312.2	83.85	30.73	39.87	1639.
134	34.78587	572.10	22.09	−2231.8	6392.4	84.45	30.87	40.32	1633.
136	34.70818	564.33	22.05	−2170.1	6473.4	85.05	31.00	40.72	1627.
138	34.62961	557.02	21.99	−2107.9	6555.2	85.65	31.10	41.10	1621.
140	34.55028	550.12	21.91	−2045.2	6637.8	86.24	31.19	41.43	1615.
142	34.47032	543.62	21.81	−1982.2	6720.9	86.83	31.27	41.73	1609.
144	34.38981	537.48	21.70	−1918.8	6804.7	87.42	31.33	42.00	1604.
146	34.30887	531.70	21.57	−1855.2	6888.9	88.00	31.38	42.24	1598.
148	34.22758	526.23	21.43	−1791.3	6973.6	88.58	31.42	42.44	1593.
150	34.14603	521.06	21.27	−1727.1	7058.7	89.15	31.45	42.62	1588.
155	33.94151	509.33	20.85	−1566.0	7272.7	90.55	31.48	42.97	1575.
160	33.73689	499.05	20.40	−1404.2	7488.2	91.92	31.46	43.18	1564.
165	33.53301	489.99	19.92	−1242.0	7704.4	93.25	31.40	43.29	1553.
170	33.33051	481.93	19.43	−1079.9	7920.9	94.54	31.31	43.30	1542.
175	33.12990	474.71	18.94	−918.0	8137.3	95.80	31.19	43.25	1533.
180	32.93153	468.17	18.46	−756.5	8353.3	97.01	31.06	43.14	1524.
185	32.73567	462.21	17.98	−595.7	8568.6	98.19	30.91	42.99	1515.
190	32.54248	456.73	17.52	−435.6	8783.1	99.34	30.75	42.81	1507.
195	32.35208	451.65	17.07	−276.3	8996.7	100.45	30.58	42.60	1499.
200	32.16452	446.90	16.64	−117.9	9209.1	101.52	30.41	42.38	1491.
210	31.79796	438.25	15.82	196.1	9630.6	103.58	30.06	41.91	1477.
220	31.44267	430.46	15.06	506.1	10047.3	105.52	29.70	41.42	1464.
230	31.09823	423.34	14.36	812.2	10459.1	107.35	29.35	40.94	1452.
240	30.76410	416.76	13.72	1114.4	10866.0	109.08	29.01	40.46	1440.
250	30.43970	410.62	13.13	1412.8	11268.4	110.72	28.69	40.01	1430.
260	30.12447	404.87	12.59	1707.7	11666.3	112.28	28.37	39.58	1420.
270	29.81783	399.47	12.08	1999.0	12060.1	113.77	28.08	39.18	1411.
280	29.51929	394.37	11.62	2287.2	12450.0	115.19	27.80	38.80	1402.
290	29.22835	389.55	11.19	2572.2	12836.2	116.54	27.53	38.45	1393.
300	28.94459	385.00	10.79	2854.4	13219.0	117.84	27.28	38.11	1386.
310	28.66761	380.69	10.42	3133.8	13598.6	119.09	27.05	37.81	1378.
320	28.39705	376.62	10.07	3410.7	13975.2	120.28	26.83	37.52	1371.
330	28.13258	372.77	9.75	3685.2	14349.0	121.43	26.62	37.25	1365.
340	27.87391	369.13	9.44	3957.5	14720.2	122.54	26.43	37.00	1358.
350	27.62077	365.69	9.16	4227.7	15089.1	123.61	26.25	36.77	1352.
360	27.37291	362.43	8.89	4495.9	15455.7	124.64	26.08	36.55	1347.
370	27.13010	359.35	8.64	4762.4	15820.2	125.64	25.92	36.36	1341.
380	26.89215	356.45	8.40	5027.2	16182.8	126.61	25.77	36.17	1336.
390	26.65885	353.70	8.17	5290.4	16543.7	127.55	25.64	36.00	1331.
400	26.43004	351.11	7.96	5552.1	16902.9	128.46	25.51	35.84	1327.
420	25.98523	346.36	7.56	6071.8	17616.8	130.20	25.29	35.56	1318.
440	25.55655	342.13	7.20	6586.8	18325.5	131.85	25.11	35.32	1311.
460	25.14298	338.38	6.87	7098.0	19029.8	133.41	24.96	35.12	1304.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
480	24.74362	335.07	6.58	7606.1	19730.4	134.90	24.83	34.95	1298.
500	24.35766	332.14	6.30	8111.5	20428.0	136.33	24.73	34.81	1292.
520	23.98437	329.56	6.05	8614.9	21123.1	137.69	24.66	34.70	1287.
540	23.62310	327.31	5.82	9116.8	21816.2	139.00	24.61	34.61	1282.
560	23.27325	325.35	5.60	9617.4	22507.7	140.25	24.57	34.55	1278.
580	22.93427	323.65	5.40	10117.2	23198.1	141.47	24.56	34.50	1274.
600	22.60563	322.19	5.21	10616.6	23887.7	142.63	24.56	34.46	1270.
620	22.28688	320.96	5.04	11115.9	24576.7	143.76	24.57	34.44	1267.
640	21.97756	319.92	4.87	11615.2	25265.5	144.86	24.60	34.44	1265.
660	21.67727	319.07	4.72	12114.9	25954.3	145.92	24.63	34.44	1262.
680	21.38560	318.39	4.58	12615.1	26643.2	146.95	24.67	34.45	1260.
700	21.10221	317.87	4.44	13115.9	27332.5	147.94	24.72	34.47	1258.
720	20.82673	317.48	4.31	13617.7	28022.2	148.92	24.78	34.50	1256.
740	20.55886	317.23	4.19	14120.3	28712.6	149.86	24.84	34.54	1255.
760	20.29820	317.10	4.08	14624.1	29403.7	150.78	24.91	34.57	1253.
780	20.04469	317.08	3.97	15129.0	30095.5	151.68	24.98	34.61	1252.
800	19.79784	317.16	3.86	15635.1	30788.3	152.56	25.06	34.66	1251.
850	19.20842	317.77	3.63	16906.1	32524.3	154.66	25.25	34.78	1250.
900	18.65567	318.86	3.42	18185.7	34266.6	156.66	25.45	34.91	1250.
950	18.13628	320.37	3.23	19474.2	36015.6	158.55	25.66	35.05	1250.
1000	17.64731	322.21	3.06	20771.5	37771.3	160.35	25.85	35.18	1251.
1050	17.18614	324.34	2.91	22077.6	39533.5	162.07	26.05	35.31	1253.
1100	16.75042	326.71	2.77	23392.0	41302.0	163.71	26.23	35.43	1255.
1150	16.33809	329.28	2.64	24714.6	43076.6	165.29	26.41	35.55	1258.
1200	15.94725	332.02	2.53	26044.8	44856.8	166.81	26.58	35.66	1261.
				3200 bar Isobar					
* 116.458	35.69959	711.31	20.24	−2729.2	6234.5	78.67	28.54	33.81	1734.
118	35.65500	700.39	20.57	−2687.8	6287.1	79.12	28.83	34.43	1728.
120	35.59513	686.87	20.94	−2633.2	6356.8	79.70	29.17	35.21	1721.
122	35.53311	674.07	21.25	−2577.7	6428.0	80.29	29.48	35.96	1713.
124	35.46909	661.96	21.50	−2521.3	6500.6	80.88	29.77	36.66	1706.
126	35.40323	650.50	21.71	−2464.2	6574.6	81.47	30.04	37.32	1699.
128	35.33567	639.67	21.86	−2406.2	6649.8	82.07	30.28	37.94	1692.
130	35.26656	629.43	21.98	−2347.5	6726.3	82.66	30.49	38.52	1685.
132	35.19603	619.77	22.06	−2288.1	6803.9	83.25	30.69	39.05	1678.
134	35.12423	610.65	22.10	−2228.0	6882.5	83.84	30.86	39.55	1671.
136	35.05128	602.04	22.12	−2167.4	6962.1	84.43	31.01	40.01	1665.
138	34.97732	593.91	22.11	−2106.3	7042.5	85.02	31.15	40.43	1659.
140	34.90244	586.24	22.07	−2044.7	7123.7	85.60	31.27	40.81	1653.
142	34.82678	579.01	22.01	−1982.6	7205.7	86.18	31.37	41.16	1647.
144	34.75044	572.18	21.93	−1920.1	7288.4	86.76	31.45	41.48	1641.
146	34.67352	565.73	21.83	−1857.3	7371.6	87.34	31.53	41.76	1636.
148	34.59611	559.63	21.72	−1794.2	7455.4	87.91	31.58	42.01	1630.
150	34.51830	553.87	21.60	−1730.8	7539.6	88.47	31.63	42.23	1625.
155	34.32256	540.80	21.24	−1571.4	7751.9	89.86	31.70	42.67	1612.
160	34.12597	529.38	20.83	−1410.9	7966.1	91.22	31.71	42.97	1600.
165	33.92944	519.34	20.38	−1249.9	8181.4	92.55	31.67	43.14	1589.
170	33.73370	510.46	19.92	−1088.7	8397.3	93.84	31.60	43.22	1579.
175	33.53933	502.54	19.45	−927.6	8613.4	95.09	31.50	43.21	1569.
180	33.34676	495.42	18.98	−766.8	8829.3	96.31	31.37	43.15	1559.
185	33.15630	488.98	18.51	−606.5	9044.8	97.49	31.23	43.03	1551.
190	32.96819	483.10	18.06	−446.8	9259.6	98.63	31.08	42.87	1542.
195	32.78259	477.68	17.61	−287.8	9473.5	99.74	30.91	42.69	1535.
200	32.59959	472.66	17.17	−129.6	9686.4	100.82	30.74	42.49	1527.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
210	32.24159	463.59	16.35	184.0	10109.1	102.88	30.39	42.03	1513.
220	31.89424	455.51	15.58	493.9	10527.0	104.83	30.03	41.56	1500.
230	31.55728	448.18	14.88	799.9	10940.2	106.67	29.67	41.07	1488.
240	31.23028	441.44	14.22	1102.1	11348.6	108.40	29.32	40.60	1477.
250	30.91272	435.18	13.62	1400.5	11752.3	110.05	28.99	40.14	1467.
260	30.60406	429.32	13.07	1695.4	12151.5	111.62	28.67	39.71	1457.
270	30.30379	423.82	12.56	1986.8	12546.5	113.11	28.36	39.30	1448.
280	30.01140	418.62	12.08	2275.0	12937.6	114.53	28.07	38.91	1439.
290	29.72643	413.71	11.64	2560.1	13324.9	115.89	27.80	38.55	1431.
300	29.44845	409.05	11.23	2842.2	13708.7	117.19	27.54	38.21	1423.
310	29.17706	404.64	10.85	3121.7	14089.2	118.44	27.30	37.90	1416.
320	28.91192	400.45	10.50	3398.6	14466.7	119.64	27.07	37.60	1409.
330	28.65269	396.48	10.16	3673.1	14841.4	120.79	26.86	37.33	1403.
340	28.39908	392.72	9.85	3945.4	15213.4	121.90	26.65	37.08	1396.
350	28.15082	389.14	9.56	4215.6	15583.0	122.97	26.47	36.84	1391.
360	27.90767	385.76	9.28	4483.9	15950.3	124.01	26.29	36.62	1385.
370	27.66940	382.54	9.02	4750.3	16315.4	125.01	26.13	36.42	1380.
380	27.43582	379.50	8.78	5015.0	16678.6	125.98	25.98	36.23	1375.
390	27.20672	376.61	8.55	5278.2	17040.0	126.91	25.84	36.05	1370.
400	26.98193	373.87	8.33	5540.0	17399.7	127.83	25.71	35.89	1365.
420	26.54469	368.83	7.92	6059.5	18114.6	129.57	25.47	35.60	1357.
440	26.12293	364.32	7.55	6574.5	18824.2	131.22	25.28	35.36	1349.
460	25.71567	360.28	7.21	7085.6	19529.4	132.79	25.12	35.16	1342.
480	25.32204	356.68	6.90	7593.5	20230.8	134.28	24.99	34.99	1335.
500	24.94125	353.48	6.62	8098.9	20929.1	135.71	24.88	34.85	1329.
520	24.57260	350.65	6.36	8602.2	21624.9	137.07	24.80	34.74	1324.
540	24.21548	348.14	6.12	9103.9	22318.6	138.38	24.74	34.65	1319.
560	23.86931	345.93	5.90	9604.5	23010.9	139.64	24.70	34.58	1315.
580	23.53357	343.99	5.69	10104.3	23701.9	140.85	24.68	34.53	1311.
600	23.20777	342.31	5.49	10603.7	24392.2	142.02	24.68	34.50	1307.
620	22.89146	340.86	5.31	11102.9	25081.9	143.15	24.68	34.48	1304.
640	22.58422	339.62	5.14	11602.3	25771.4	144.25	24.70	34.47	1301.
660	22.28568	338.57	4.98	12101.9	26460.9	145.31	24.73	34.48	1298.
680	21.99545	337.70	4.83	12602.2	27150.6	146.34	24.77	34.49	1296.
700	21.71320	336.99	4.69	13103.1	27840.7	147.34	24.82	34.51	1293.
720	21.43861	336.43	4.56	13604.9	28531.2	148.31	24.88	34.54	1291.
740	21.17136	336.01	4.43	14107.7	29222.4	149.26	24.94	34.58	1290.
760	20.91117	335.72	4.31	14611.5	29914.4	150.18	25.00	34.62	1288.
780	20.65777	335.55	4.20	15116.6	30607.1	151.08	25.07	34.66	1287.
800	20.41089	335.49	4.09	15622.8	31300.7	151.96	25.14	34.71	1286.
850	19.82064	335.76	3.84	16894.3	33039.1	154.06	25.33	34.83	1284.
900	19.26612	336.56	3.62	18174.5	34784.0	156.06	25.53	34.96	1283.
950	18.74418	337.80	3.42	19463.6	36535.6	157.95	25.72	35.10	1283.
1000	18.25203	339.41	3.25	20761.7	38294.0	159.76	25.92	35.23	1283.
1050	17.78717	341.32	3.09	22068.5	40059.0	161.48	26.11	35.37	1285.
1100	17.34738	343.50	2.94	23383.8	41830.4	163.13	26.29	35.49	1287.
1150	16.93064	345.90	2.81	24707.3	43607.9	164.71	26.47	35.61	1289.
1200	16.53516	348.49	2.69	26038.4	45391.1	166.22	26.63	35.72	1292.
				3400 bar Isobar					
* 119.137	35.90068	739.50	20.17	−2638.1	6832.4	79.00	28.66	33.74	1763.
120	35.87692	733.28	20.36	−2615.1	6861.7	79.25	28.82	34.09	1760.
122	35.82030	719.41	20.75	−2561.1	6930.7	79.82	29.19	34.88	1752.
124	35.76159	706.24	21.08	−2506.2	7001.2	80.39	29.52	35.62	1744.
126	35.70093	693.76	21.36	−2450.4	7073.2	80.97	29.83	36.33	1737.
128	35.63847	681.93	21.59	−2393.8	7146.5	81.54	30.11	37.00	1729.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
130	35.57435	670.74	21.77	−2336.3	7221.1	82.12	30.36	37.62	1722.
132	35.50870	660.14	21.91	−2278.2	7296.9	82.70	30.59	38.21	1715.
134	35.44164	650.11	22.01	−2219.3	7373.9	83.28	30.80	38.75	1709.
136	35.37331	640.63	22.08	−2159.8	7451.9	83.86	30.99	39.26	1702.
138	35.30383	631.67	22.11	−2099.8	7530.9	84.43	31.15	39.72	1696.
140	35.23332	623.20	22.12	−2039.2	7610.8	85.01	31.30	40.15	1689.
142	35.16187	615.19	22.11	−1978.1	7691.5	85.58	31.42	40.55	1683.
144	35.08962	607.63	22.07	−1916.5	7772.9	86.15	31.53	40.90	1677.
146	35.01665	600.48	22.01	−1854.6	7855.1	86.72	31.63	41.23	1672.
148	34.94306	593.72	21.93	−1792.3	7937.8	87.28	31.71	41.52	1666.
150	34.86894	587.32	21.83	−1729.6	8021.2	87.84	31.77	41.79	1661.
155	34.68188	572.81	21.54	−1571.9	8231.5	89.22	31.88	42.32	1648.
160	34.49323	560.13	21.19	−1412.9	8444.1	90.57	31.93	42.70	1635.
165	34.30396	549.01	20.78	−1253.1	8658.3	91.89	31.92	42.95	1624.
170	34.11489	539.21	20.36	−1092.9	8873.4	93.17	31.87	43.09	1613.
175	33.92664	530.50	19.91	−932.6	9089.0	94.42	31.78	43.14	1603.
180	33.73973	522.72	19.46	−772.4	9304.7	95.64	31.67	43.12	1594.
185	33.55453	515.72	19.00	−612.6	9520.2	96.82	31.54	43.04	1585.
190	33.37132	509.36	18.55	−453.3	9735.1	97.96	31.39	42.92	1577.
195	33.19033	503.56	18.11	−294.7	9949.3	99.07	31.23	42.76	1569.
200	33.01168	498.21	17.68	−136.8	10162.6	100.16	31.06	42.57	1561.
210	32.66174	488.63	16.86	176.5	10586.3	102.22	30.70	42.15	1547.
220	32.32180	480.20	16.08	486.2	11005.5	104.17	30.34	41.69	1535.
230	31.99176	472.62	15.37	792.2	11419.9	106.02	29.98	41.21	1523.
240	31.67130	465.70	14.71	1094.4	11829.7	107.76	29.62	40.74	1512.
250	31.35998	459.30	14.10	1392.9	12234.7	109.41	29.28	40.28	1502.
260	31.05732	453.33	13.53	1687.8	12635.3	110.98	28.95	39.84	1492.
270	30.76283	447.73	13.01	1979.3	13031.6	112.48	28.64	39.42	1483.
280	30.47603	442.44	12.53	2267.6	13423.9	113.91	28.34	39.03	1475.
290	30.19647	437.44	12.08	2552.7	13812.3	115.27	28.06	38.66	1467.
300	29.92374	432.70	11.66	2835.0	14197.2	116.57	27.79	38.32	1459.
310	29.65744	428.20	11.27	3114.5	14578.7	117.83	27.54	38.00	1452.
320	29.39723	423.92	10.91	3391.5	14957.2	119.03	27.30	37.70	1445.
330	29.14279	419.85	10.57	3666.0	15332.7	120.18	27.08	37.42	1439.
340	28.89381	415.98	10.25	3938.3	15705.6	121.30	26.88	37.16	1433.
350	28.65003	412.30	9.95	4208.5	16075.9	122.37	26.68	36.91	1427.
360	28.41121	408.79	9.66	4476.8	16443.9	123.41	26.50	36.69	1421.
370	28.17713	405.46	9.40	4743.2	16809.7	124.41	26.33	36.48	1416.
380	27.94758	402.29	9.15	5007.9	17173.6	125.38	26.17	36.29	1411.
390	27.72237	399.28	8.91	5271.1	17535.6	126.32	26.03	36.11	1406.
400	27.50134	396.42	8.68	5532.8	17895.8	127.23	25.89	35.95	1402.
420	27.07117	391.12	8.26	6052.3	18611.7	128.98	25.65	35.65	1393.
440	26.65593	386.34	7.88	6567.1	19322.3	130.63	25.44	35.41	1385.
460	26.25465	382.05	7.54	7078.2	20028.2	132.20	25.27	35.20	1378.
480	25.86649	378.19	7.22	7586.0	20730.4	133.69	25.13	35.03	1372.
500	25.49067	374.74	6.93	8091.3	21429.5	135.12	25.02	34.88	1366.
520	25.12654	371.65	6.66	8594.5	22126.0	136.49	24.93	34.77	1360.
540	24.77348	368.90	6.41	9096.1	22820.4	137.80	24.87	34.68	1355.
560	24.43096	366.45	6.18	9596.6	23513.3	139.06	24.83	34.61	1350.
580	24.09846	364.29	5.97	10096.3	24205.1	140.27	24.80	34.56	1346.
600	23.77553	362.39	5.77	10595.6	24896.0	141.44	24.79	34.53	1342.
620	23.46174	360.73	5.58	11094.7	25586.4	142.57	24.79	34.51	1339.
640	23.15670	359.28	5.40	11594.0	26276.6	143.67	24.81	34.51	1336.
660	22.86003	358.04	5.24	12093.7	26966.8	144.73	24.84	34.51	1333.
680	22.57140	356.99	5.08	12593.9	27657.2	145.76	24.87	34.53	1330.
700	22.29047	356.10	4.94	13094.8	28348.0	146.76	24.92	34.55	1328.
720	22.01695	355.37	4.80	13596.6	29039.3	147.74	24.97	34.58	1326.
740	21.75054	354.79	4.66	14099.4	29731.2	148.68	25.02	34.62	1324.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
760	21.49097	354.34	4.54	14603.3	30424.0	149.61	25.09	34.66	1322.
780	21.23797	354.02	4.42	15108.5	31117.5	150.51	25.15	34.70	1320.
800	20.99132	353.82	4.31	15614.8	31812.0	151.39	25.22	34.75	1319.
850	20.40089	353.76	4.05	16886.6	33552.5	153.50	25.40	34.88	1317.
900	19.84526	354.27	3.82	18167.1	35299.7	155.50	25.60	35.01	1315.
950	19.32147	355.24	3.61	19456.7	37053.7	157.39	25.79	35.15	1315.
1000	18.82684	356.61	3.43	20755.3	38814.7	159.20	25.98	35.29	1315.
1050	18.35901	358.31	3.26	22062.8	40582.3	160.92	26.17	35.42	1316.
1100	17.91583	360.30	3.11	23378.8	42356.4	162.57	26.35	35.54	1317.
1150	17.49538	362.53	2.97	24702.9	44136.7	164.16	26.52	35.66	1319.
1200	17.09592	364.96	2.84	26034.9	45922.7	165.68	26.68	35.78	1322.
				3600 bar Isobar					
* 121.768	36.09583	767.35	20.08	−2546.4	7427.1	79.33	28.79	33.70	1791.
122	36.08976	765.65	20.13	−2540.2	7434.9	79.39	28.84	33.80	1790.
124	36.03611	751.45	20.55	−2486.7	7503.3	79.95	29.22	34.58	1782.
126	35.98044	737.95	20.90	−2432.2	7573.2	80.51	29.57	35.33	1774.
128	35.92288	725.12	21.20	−2376.9	7644.6	81.07	29.89	36.03	1767.
130	35.86356	712.95	21.44	−2320.7	7717.3	81.63	30.18	36.70	1759.
132	35.80260	701.41	21.65	−2263.8	7791.4	82.20	30.45	37.33	1752.
134	35.74014	690.47	21.81	−2206.1	7866.6	82.76	30.69	37.92	1745.
136	35.67630	680.10	21.93	−2147.7	7943.0	83.33	30.91	38.47	1738.
138	35.61119	670.29	22.02	−2088.7	8020.5	83.89	31.11	38.98	1732.
140	35.54492	660.99	22.08	−2029.1	8098.9	84.46	31.28	39.45	1725.
142	35.47761	652.19	22.11	−1969.0	8178.2	85.02	31.43	39.89	1719.
144	35.40936	643.86	22.11	−1908.4	8258.4	85.58	31.57	40.29	1713.
146	35.34027	635.98	22.09	−1847.3	8339.4	86.14	31.69	40.66	1707.
148	35.27045	628.52	22.05	−1785.8	8421.0	86.69	31.79	40.99	1701.
150	35.19997	621.46	21.99	−1723.9	8503.3	87.25	31.87	41.29	1695.
155	35.02150	605.41	21.77	−1567.9	8711.5	88.61	32.03	41.92	1682.
160	34.84071	591.39	21.48	−1410.4	8922.3	89.95	32.11	42.39	1669.
165	34.65865	579.09	21.13	−1251.9	9135.1	91.26	32.13	42.72	1658.
170	34.47617	568.27	20.73	−1092.7	9349.3	92.54	32.10	42.92	1647.
175	34.29398	558.69	20.32	−933.3	9564.2	93.79	32.04	43.03	1637.
180	34.11265	550.16	19.89	−773.8	9779.5	95.00	31.94	43.06	1627.
185	33.93260	542.52	19.45	−614.5	9994.7	96.18	31.82	43.02	1618.
190	33.75419	535.62	19.02	−455.7	10209.6	97.32	31.68	42.93	1610.
195	33.57766	529.36	18.58	−297.4	10424.0	98.44	31.52	42.80	1602.
200	33.40320	523.63	18.16	−139.8	10637.6	99.52	31.36	42.64	1594.
210	33.06098	513.45	17.34	173.2	11062.1	101.59	31.00	42.25	1580.
220	32.72804	504.60	16.56	482.7	11482.4	103.55	30.64	41.81	1568.
230	32.40448	496.72	15.84	788.6	11898.2	105.39	30.27	41.34	1556.
240	32.09008	489.58	15.17	1090.8	12309.2	107.14	29.91	40.87	1545.
250	31.78452	483.03	14.55	1389.4	12715.7	108.80	29.56	40.41	1535.
260	31.48736	476.94	13.98	1684.4	13117.6	110.38	29.23	39.97	1526.
270	31.19816	471.23	13.45	1976.0	13515.2	111.88	28.90	39.55	1517.
280	30.91647	465.86	12.95	2264.4	13908.7	113.31	28.60	39.15	1509.
290	30.64186	460.79	12.50	2549.6	14298.3	114.68	28.31	38.78	1501.
300	30.37392	455.97	12.07	2832.0	14684.3	115.99	28.03	38.43	1494.
310	30.11227	451.39	11.67	3111.6	15066.9	117.24	27.78	38.10	1487.
320	29.85658	447.03	11.30	3388.6	15446.3	118.45	27.53	37.79	1480.
330	29.60651	442.87	10.95	3663.2	15822.7	119.60	27.30	37.50	1474.
340	29.36179	438.91	10.63	3935.6	16196.4	120.72	27.09	37.24	1468.
350	29.12213	435.14	10.32	4205.8	16567.6	121.80	26.89	36.99	1462.
360	28.88731	431.54	10.03	4474.1	16936.3	122.83	26.70	36.76	1456.
370	28.65709	428.10	9.76	4740.5	17302.9	123.84	26.53	36.55	1451.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
380	28.43128	424.83	9.50	5005.3	17667.4	124.81	26.36	36.35	1446.
390	28.20968	421.71	9.26	5268.4	18030.0	125.75	26.21	36.17	1441.
400	27.99214	418.74	9.03	5530.1	18390.8	126.67	26.07	36.00	1437.
420	27.56858	413.21	8.60	6049.5	19107.8	128.42	25.82	35.70	1428.
440	27.15947	408.20	8.21	6564.3	19819.3	130.07	25.60	35.45	1420.
460	26.76386	403.66	7.85	7075.2	20526.2	131.64	25.43	35.24	1413.
480	26.38090	399.57	7.53	7582.9	21229.2	133.14	25.28	35.06	1407.
500	26.00986	395.88	7.23	8088.0	21929.0	134.57	25.16	34.92	1401.
520	25.65008	392.56	6.96	8591.1	22626.2	135.93	25.07	34.80	1395.
540	25.30096	389.58	6.70	9092.6	23321.3	137.24	25.00	34.71	1390.
560	24.96203	386.91	6.46	9593.0	24014.9	138.51	24.95	34.65	1385.
580	24.63275	384.53	6.24	10092.6	24707.3	139.72	24.91	34.60	1381.
600	24.31270	382.42	6.03	10591.8	25398.8	140.89	24.90	34.56	1377.
620	24.00146	380.56	5.84	11090.8	26089.9	142.03	24.90	34.55	1373.
640	23.69868	378.92	5.66	11590.0	26780.7	143.12	24.91	34.54	1370.
660	23.40398	377.49	5.49	12089.6	27471.6	144.19	24.93	34.55	1366.
680	23.11705	376.25	5.33	12589.7	28162.7	145.22	24.97	34.56	1364.
700	22.83757	375.19	5.17	13090.6	28854.1	146.22	25.01	34.59	1361.
720	22.56526	374.30	5.03	13592.4	29546.1	147.19	25.05	34.62	1359.
740	22.29984	373.56	4.89	14095.2	30238.8	148.14	25.11	34.65	1357.
760	22.04106	372.96	4.77	14599.1	30932.3	149.07	25.17	34.69	1355.
780	21.78867	372.49	4.64	15104.2	31626.6	149.97	25.23	34.74	1353.
800	21.54242	372.15	4.53	15610.6	32321.8	150.85	25.30	34.79	1352.
850	20.95232	371.76	4.26	16882.5	34064.4	152.96	25.48	34.92	1349.
900	20.39615	371.97	4.02	18163.3	35813.7	154.96	25.66	35.06	1347.
950	19.87108	372.69	3.80	19453.2	37570.0	156.86	25.85	35.20	1346.
1000	19.37457	373.82	3.61	20752.2	39333.3	158.67	26.04	35.33	1346.
1050	18.90435	375.31	3.44	22060.1	41103.4	160.40	26.22	35.47	1346.
1100	18.45836	377.11	3.28	23376.7	42880.0	162.05	26.40	35.60	1347.
1150	18.03477	379.16	3.13	24701.4	44662.9	163.64	26.57	35.72	1349.
1200	17.63191	381.44	3.00	26034.0	46451.5	165.16	26.73	35.83	1351.
				3800 bar Isobar					
* 124.356	36.20554	794.87	19.98	−2453.8	8018.7	79.64	28.94	33.68	1817.
126	36.24353	782.99	20.32	−2410.0	8074.6	80.09	29.26	34.32	1811.
128	36.19066	769.18	20.69	−2356.0	8144.0	80.64	29.62	35.06	1803.
130	36.13596	756.04	21.01	−2301.0	8214.8	81.18	29.96	35.77	1795.
132	36.07953	743.56	21.28	−2245.3	8287.0	81.74	30.26	36.44	1788.
134	36.02151	731.69	21.50	−2188.7	8360.5	82.29	30.54	37.06	1781.
136	35.96201	720.43	21.69	−2131.4	8435.3	82.84	30.79	37.65	1773.
138	35.90114	709.75	21.83	−2073.5	8511.1	83.40	31.02	38.21	1767.
140	35.83902	699.61	21.94	−2014.9	8588.1	83.95	31.22	38.72	1760.
142	35.77574	690.00	22.02	−1955.7	8666.0	84.50	31.40	39.20	1753.
144	35.71141	680.89	22.07	−1896.0	8744.8	85.05	31.56	39.64	1747.
146	35.64614	672.25	22.09	−1835.8	8824.5	85.60	31.71	40.05	1741.
148	35.58001	664.07	22.09	−1775.2	8905.0	86.15	31.83	40.42	1735.
150	35.51312	656.32	22.07	−1714.1	8986.2	86.70	31.94	40.76	1729.
155	35.34313	638.65	21.93	−1559.9	9191.9	88.04	32.14	41.48	1715.
160	35.17014	623.20	21.70	−1403.9	9400.7	89.37	32.26	42.04	1703.
165	34.99524	609.64	21.40	−1246.6	9612.0	90.67	32.32	42.44	1691.
170	34.81932	597.71	21.06	−1088.5	9824.9	91.94	32.31	42.72	1679.
175	34.64315	587.17	20.68	−930.0	10039.0	93.18	32.27	42.89	1669.
180	34.46735	577.82	20.28	−771.3	10253.7	94.39	32.19	42.97	1659.
185	34.29240	569.46	19.86	−612.6	10468.5	95.57	32.08	42.98	1650.
190	34.11870	561.95	19.44	−454.3	10683.3	96.72	31.95	42.92	1642.
195	33.94655	555.17	19.02	−296.4	10897.7	97.83	31.80	42.82	1634.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
200	33.77619	548.99	18.60	−139.0	11111.5	98.91	31.64	42.69	1626.
210	33.44142	538.12	17.79	173.5	11536.7	100.99	31.29	42.34	1612.
220	33.11518	528.77	17.02	482.9	11958.0	102.95	30.93	41.92	1599.
230	32.79775	520.54	16.29	788.7	12374.9	104.80	30.56	41.46	1588.
240	32.48905	513.14	15.62	1091.0	12787.2	106.55	30.19	41.00	1577.
250	32.18885	506.40	14.99	1389.6	13195.0	108.22	29.83	40.55	1567.
260	31.89679	500.17	14.41	1684.8	13598.2	109.80	29.49	40.10	1558.
270	31.61247	494.36	13.87	1976.5	13997.1	111.31	29.16	39.68	1550.
280	31.33547	488.91	13.37	2265.0	14391.8	112.74	28.85	39.27	1541.
290	31.06540	483.75	12.90	2550.4	14782.6	114.11	28.55	38.89	1534.
300	30.80186	478.86	12.47	2832.8	15169.7	115.43	28.27	38.54	1527.
310	30.54449	474.21	12.06	3112.5	15553.4	116.68	28.00	38.20	1520.
320	30.29294	469.78	11.69	3389.6	15933.8	117.89	27.75	37.89	1513.
330	30.04690	465.56	11.33	3664.3	16311.2	119.05	27.52	37.60	1507.
340	29.80608	461.52	11.00	3936.7	16685.8	120.17	27.30	37.33	1501.
350	29.57023	457.67	10.68	4207.0	17057.8	121.25	27.09	37.07	1495.
360	29.33909	453.99	10.39	4475.3	17427.3	122.29	26.89	36.84	1490.
370	29.11245	450.47	10.11	4741.8	17794.6	123.30	26.71	36.62	1485.
380	28.89010	447.10	9.85	5006.5	18159.8	124.27	26.54	36.42	1480.
390	28.67187	443.89	9.60	5269.7	18523.1	125.21	26.39	36.23	1475.
400	28.45757	440.82	9.36	5531.3	18884.5	126.13	26.24	36.06	1471.
420	28.04019	435.09	8.92	6050.7	19602.7	127.88	25.98	35.76	1462.
440	27.63685	429.87	8.53	6565.4	20315.2	129.54	25.76	35.50	1454.
460	27.24658	425.19	8.16	7076.2	21022.9	131.11	25.57	35.28	1447.
480	26.86857	420.81	7.83	7583.8	21726.7	132.61	25.42	35.10	1440.
500	26.50210	416.90	7.52	8088.8	22427.3	134.04	25.29	34.96	1434.
520	26.14651	413.36	7.24	8591.7	23125.2	135.41	25.19	34.84	1429.
540	25.80124	410.17	6.98	9093.1	23821.1	136.72	25.12	34.75	1423.
560	25.46578	407.29	6.73	9593.3	24515.3	137.98	25.06	34.68	1418.
580	25.13967	404.71	6.51	10092.8	25208.3	139.20	25.03	34.63	1414.
600	24.82247	402.40	6.29	10591.8	25900.5	140.37	25.01	34.59	1410.
620	24.51380	400.34	6.10	11090.7	26592.2	141.51	25.00	34.58	1406.
640	24.21329	398.51	5.91	11589.8	27283.7	142.60	25.01	34.57	1402.
660	23.92062	396.90	5.73	12089.3	27975.2	143.67	25.03	34.58	1399.
680	23.63546	395.49	5.57	12589.3	28666.9	144.70	25.06	34.59	1396.
700	23.35752	394.26	5.41	13090.1	29359.0	145.70	25.09	34.62	1393.
720	23.08653	393.21	5.26	13591.8	30051.6	146.68	25.14	34.65	1391.
740	22.82223	392.31	5.12	14094.6	30745.0	147.63	25.19	34.69	1389.
760	22.56436	391.56	4.99	14598.4	31439.1	148.55	25.25	34.73	1387.
780	22.31271	390.95	4.86	15103.5	32134.2	149.46	25.31	34.77	1385.
800	22.06704	390.47	4.74	15609.9	32830.1	150.34	25.37	34.82	1383.
850	21.47768	389.76	4.46	16881.8	34574.6	152.45	25.55	34.96	1380.
900	20.92142	389.68	4.21	18162.7	36325.9	154.46	25.73	35.10	1378.
950	20.39554	390.13	3.99	19452.8	38084.3	156.36	25.91	35.24	1376.
1000	19.89764	391.03	3.79	20752.1	39849.8	158.17	26.10	35.38	1376.
1050	19.42552	392.31	3.61	22060.3	41622.2	159.90	26.28	35.52	1376.
1100	18.97724	393.91	3.44	23377.2	43401.2	161.55	26.45	35.64	1376.
1150	18.55101	395.79	3.29	24702.5	45186.5	163.14	26.62	35.77	1378.
1200	18.14523	397.91	3.15	26035.5	46977.7	164.66	26.78	35.88	1380.
				4000 bar Isobar					
* 126.901	36.47023	822.09	19.85	−2360.5	8607.4	79.95	29.09	33.66	1843.
128	36.44340	814.05	20.09	−2331.3	8644.6	80.24	29.31	34.09	1838.
130	36.39312	799.95	20.48	−2277.5	8713.5	80.78	29.68	34.83	1830.
132	36.34105	786.52	20.81	−2222.9	8783.9	81.32	30.02	35.53	1823.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
134	36.28731	773.74	21.10	−2167.5	8855.6	81.86	30.34	36.19	1815.
136	36.23201	761.59	21.34	−2111.3	8928.7	82.40	30.62	36.82	1808.
138	36.17525	750.03	21.54	−2054.4	9002.9	82.94	30.88	37.41	1801.
140	36.11715	739.04	21.71	−1996.8	9078.3	83.48	31.12	37.96	1794.
142	36.05780	728.61	21.84	−1938.6	9154.7	84.02	31.33	38.48	1787.
144	35.99731	718.70	21.93	−1879.8	9232.1	84.56	31.52	38.96	1781.
146	35.93576	709.29	22.00	−1820.5	9310.5	85.10	31.69	39.40	1774.
148	35.87327	700.37	22.04	−1760.6	9389.7	85.64	31.83	39.81	1768.
150	35.80991	691.90	22.06	−1700.4	9469.7	86.18	31.96	40.19	1762.
155	35.64828	672.56	22.01	−1547.9	9672.8	87.51	32.22	41.00	1748.
160	35.48303	655.60	21.86	−1393.5	9879.5	88.82	32.38	41.64	1735.
165	35.31524	640.71	21.62	−1237.6	10089.0	90.11	32.47	42.12	1723.
170	35.14586	627.60	21.33	−1080.7	10300.5	91.38	32.50	42.47	1711.
175	34.97569	616.02	20.99	−923.0	10513.5	92.61	32.48	42.70	1700.
180	34.80539	605.75	20.62	−765.1	10727.4	93.82	32.41	42.84	1691.
185	34.63550	596.61	20.23	−607.1	10941.7	94.99	32.32	42.89	1681.
190	34.46648	588.43	19.83	−449.3	11156.2	96.13	32.20	42.88	1673.
195	34.29866	581.06	19.42	−291.8	11370.5	97.25	32.06	42.82	1664.
200	34.13232	574.38	19.02	−134.8	11584.3	98.33	31.90	42.71	1657.
210	33.80484	562.71	18.22	177.3	12010.0	100.41	31.56	42.40	1643.
220	33.48508	552.78	17.45	486.5	12432.1	102.37	31.20	42.01	1630.
230	33.17350	544.13	16.73	792.2	12850.1	104.23	30.83	41.58	1619.
240	32.87020	536.43	16.05	1094.5	13263.6	105.99	30.46	41.13	1608.
250	32.57504	529.47	15.42	1393.2	13672.6	107.66	30.10	40.67	1598.
260	32.28774	523.08	14.83	1688.5	14077.1	109.25	29.75	40.23	1589.
270	32.00796	517.15	14.28	1980.3	14477.2	110.76	29.41	39.80	1581.
280	31.73532	511.59	13.77	2269.0	14873.2	112.20	29.09	39.40	1573.
290	31.46945	506.36	13.30	2554.5	15265.2	113.57	28.78	39.01	1565.
300	31.20997	501.40	12.86	2837.1	15653.5	114.89	28.50	38.65	1558.
310	30.95653	496.69	12.44	3116.9	16038.2	116.15	28.22	38.31	1551.
320	30.70880	492.20	12.06	3394.1	16419.7	117.36	27.96	37.99	1545.
330	30.46647	487.91	11.70	3668.9	16798.1	118.52	27.72	37.69	1539.
340	30.22927	483.81	11.36	3941.4	17173.6	119.65	27.50	37.41	1533.
350	29.99692	479.89	11.04	4211.7	17546.4	120.73	27.28	37.16	1527.
360	29.76919	476.14	10.74	4480.1	17916.8	121.77	27.08	36.92	1522.
370	29.54587	472.55	10.45	4746.6	18284.8	122.78	26.90	36.70	1517.
380	29.32675	469.11	10.18	5011.3	18650.8	123.75	26.72	36.49	1512.
390	29.11164	465.81	9.93	5274.5	19014.7	124.70	26.56	36.30	1508.
400	28.90037	462.66	9.69	5536.1	19376.8	125.62	26.41	36.12	1503.
420	28.48877	456.75	9.24	6055.5	20096.1	127.37	26.14	35.81	1495.
440	28.09084	451.35	8.83	6570.1	20809.6	129.03	25.91	35.55	1487.
460	27.70563	446.40	8.46	7080.8	21518.3	130.61	25.71	35.33	1480.
480	27.33232	441.89	8.12	7588.3	22223.0	132.11	25.55	35.15	1473.
500	26.97019	437.78	7.81	8093.1	22924.3	133.54	25.42	35.00	1467.
520	26.61862	434.04	7.52	8595.9	23623.0	134.91	25.32	34.88	1461.
540	26.27705	430.65	7.25	9097.1	24319.5	136.22	25.23	34.78	1456.
560	25.94499	427.58	7.00	9597.2	25014.4	137.49	25.17	34.71	1451.
580	25.62197	424.80	6.77	10096.5	25708.1	138.70	25.13	34.66	1446.
600	25.30758	422.30	6.55	10595.3	26400.9	139.88	25.11	34.63	1442.
620	25.00145	420.06	6.35	11094.1	27093.2	141.01	25.10	34.61	1438.
640	24.70324	418.05	6.15	11593.1	27785.3	142.11	25.10	34.60	1434.
660	24.41261	416.27	5.97	12092.4	28477.4	143.18	25.12	34.61	1431.
680	24.12927	414.69	5.80	12592.3	29169.7	144.21	25.15	34.62	1428.
700	23.85293	413.30	5.64	13093.0	29862.4	145.21	25.18	34.65	1425.
720	23.58333	412.08	5.49	13594.6	30555.7	146.19	25.22	34.68	1422.
740	23.32023	411.03	5.34	14097.2	31249.7	147.14	25.27	34.72	1420.
760	23.06339	410.14	5.20	14601.0	31944.5	148.07	25.33	34.76	1418.
780	22.81258	409.39	5.07	15106.0	32640.2	148.97	25.38	34.81	1416.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
800	22.56760	408.77	4.95	15612.3	33336.8	149.85	25.45	34.86	1414.
850	21.97933	407.75	4.66	16884.2	35083.1	151.97	25.61	34.99	1410.
900	21.42335	407.38	4.41	18165.1	36836.3	153.97	25.79	35.14	1407.
950	20.89706	407.57	4.18	19455.2	38596.7	155.88	25.97	35.28	1406.
1000	20.39818	408.23	3.97	20754.6	40364.2	157.69	26.16	35.42	1405.
1050	19.92460	409.30	3.78	22063.1	42138.8	159.42	26.33	35.56	1405.
1100	19.47444	410.71	3.61	23380.3	43920.0	161.08	26.51	35.69	1405.
1150	19.04600	412.42	3.45	24705.9	45707.6	162.67	26.67	35.81	1406.
1200	18.63773	414.38	3.30	26039.4	47501.2	164.19	26.83	35.93	1407.
				4500 bar Isobar					
* 133.093	36.91239	888.90	19.48	−2123.6	10067.4	80.70	29.47	33.64	1903.
134	36.89235	882.16	19.68	−2099.6	10098.0	80.93	29.65	33.97	1899.
136	36.84690	867.79	20.08	−2046.0	10166.7	81.44	30.02	34.68	1892.
138	36.79983	854.05	20.43	−1991.6	10236.7	81.95	30.37	35.35	1884.
140	36.75125	840.94	20.73	−1936.4	10308.1	82.46	30.68	35.98	1876.
142	36.70124	828.44	21.00	−1880.5	10380.6	82.98	30.97	36.58	1869.
144	36.64989	816.51	21.22	−1824.0	10454.4	83.49	31.23	37.14	1862.
146	36.59729	805.14	21.41	−1766.8	10529.2	84.01	31.46	37.67	1855.
148	36.54353	794.30	21.57	−1709.1	10605.0	84.53	31.68	38.17	1848.
150	36.48869	783.98	21.70	−1650.8	10681.8	85.04	31.87	38.63	1842.
155	36.34741	760.29	21.89	−1502.9	10877.6	86.33	32.26	39.65	1827.
160	36.20110	739.35	21.95	−1352.5	11078.1	87.60	32.53	40.49	1812.
165	36.05087	720.84	21.89	−1200.1	11282.2	88.85	32.72	41.16	1799.
170	35.89770	704.49	21.75	−1046.2	11489.4	90.09	32.83	41.69	1787.
175	35.74246	690.02	21.53	−891.2	11698.9	91.31	32.88	42.08	1776.
180	35.58590	677.19	21.26	−735.4	11910.0	92.50	32.87	42.36	1765.
185	35.42866	665.79	20.96	−579.2	12122.3	93.66	32.82	42.55	1755.
190	35.27127	655.62	20.63	−422.9	12335.4	94.79	32.74	42.65	1746.
195	35.11419	646.52	20.27	−266.6	12548.7	95.90	32.63	42.68	1738.
200	34.95779	638.33	19.91	−110.6	12762.1	96.98	32.49	42.66	1730.
210	34.64813	624.23	19.17	200.2	13187.9	99.06	32.18	42.48	1715.
220	34.34398	612.48	18.44	508.6	13611.3	101.03	31.83	42.18	1702.
230	34.04631	602.48	17.73	814.0	14031.3	102.90	31.46	41.81	1691.
240	33.75561	593.79	17.05	1116.3	14447.4	104.67	31.08	41.40	1680.
250	33.47204	586.10	16.41	1415.1	14859.2	106.35	30.71	40.97	1671.
260	33.19555	579.17	15.81	1710.7	15266.7	107.95	30.35	40.53	1662.
270	32.92597	572.84	15.25	2002.9	15669.9	109.47	30.00	40.11	1654.
280	32.66303	566.98	14.72	2291.8	16068.9	110.92	29.66	39.70	1646.
290	32.40646	561.51	14.23	2577.7	16463.9	112.31	29.34	39.30	1639.
300	32.15593	556.36	13.78	2860.7	16855.0	113.63	29.03	38.93	1632.
310	31.91114	551.49	13.35	3140.9	17242.5	114.90	28.74	38.58	1625.
320	31.67180	546.86	12.94	3418.4	17626.6	116.12	28.47	38.25	1619.
330	31.43763	542.44	12.57	3693.4	18007.5	117.30	28.21	37.93	1614.
340	31.20835	538.21	12.21	3966.2	18385.4	118.42	27.97	37.64	1608.
350	30.98371	534.16	11.88	4236.7	18760.5	119.51	27.74	37.37	1603.
360	30.76349	530.27	11.56	4505.2	19132.9	120.56	27.53	37.12	1598.
370	30.54747	526.54	11.27	4771.8	19503.0	121.57	27.33	36.89	1593.
380	30.33546	522.95	10.99	5036.7	19870.8	122.55	27.14	36.67	1588.
390	30.12727	519.50	10.72	5299.9	20236.5	123.50	26.97	36.47	1584.
400	29.92274	516.19	10.47	5561.5	20600.3	124.43	26.81	36.29	1579.
420	29.52403	509.93	10.00	6080.8	21322.6	126.19	26.51	35.96	1571.
440	29.13825	504.15	9.57	6595.3	22038.9	127.85	26.27	35.68	1564.
460	28.76446	498.81	9.18	7105.8	22750.1	129.43	26.05	35.45	1556.
480	28.40184	493.89	8.82	7613.0	23457.0	130.94	25.87	35.25	1550.
500	28.04971	489.35	8.49	8117.5	24160.4	132.38	25.73	35.09	1544.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
520	27.70745	485.18	8.19	8619.9	24861.0	133.75	25.61	34.97	1538.
540	27.37452	481.35	7.90	9120.6	25559.3	135.07	25.51	34.87	1532.
560	27.05044	477.85	7.64	9620.2	26255.8	136.33	25.44	34.79	1527.
580	26.73478	474.64	7.39	10119.1	26951.1	137.55	25.39	34.74	1523.
600	26.42716	471.71	7.16	10617.5	27645.4	138.73	25.35	34.70	1518.
620	26.12722	469.04	6.95	11115.8	28339.2	139.87	25.34	34.68	1514.
640	25.83464	466.62	6.74	11614.3	29032.8	140.97	25.33	34.67	1510.
660	25.54912	464.43	6.55	12113.2	29726.3	142.04	25.34	34.68	1506.
680	25.27038	462.46	6.37	12612.6	30420.1	143.07	25.36	34.70	1503.
700	24.99817	460.68	6.20	13112.9	31114.2	144.08	25.39	34.72	1500.
720	24.73226	459.10	6.03	13614.1	31809.0	145.06	25.42	34.75	1497.
740	24.47240	457.69	5.88	14116.4	32504.5	146.01	25.46	34.79	1494.
760	24.21840	456.44	5.73	14619.8	33200.8	146.94	25.51	34.84	1492.
780	23.97005	455.35	5.59	15124.5	33898.0	147.84	25.56	34.89	1489.
800	23.72715	454.41	5.46	15630.6	34596.2	148.73	25.62	34.94	1487.
850	23.14265	452.62	5.15	16901.8	36346.4	150.85	25.78	35.08	1483.
900	22.58858	451.55	4.87	18182.3	38103.9	152.86	25.94	35.22	1479.
950	22.06262	451.11	4.62	19472.3	39868.8	154.77	26.12	35.37	1477.
1000	21.56270	451.19	4.40	20771.6	41641.0	156.58	26.29	35.52	1475.
1050	21.08692	451.73	4.19	22080.2	43420.5	158.32	26.46	35.66	1474.
1100	20.63358	452.66	4.01	23397.7	45206.8	159.98	26.63	35.79	1474.
1150	20.20113	453.94	3.84	24723.7	46999.7	161.58	26.79	35.92	1474.
1200	19.78814	455.51	3.68	26057.8	48798.7	163.11	26.94	36.04	1475.
				5000 bar Isobar					
* 139.065	37.33022	954.10	19.04	−1882.1	11511.8	81.42	29.82	33.61	1959.
140	37.31139	947.08	19.25	−1857.3	11543.4	81.64	30.00	33.94	1956.
142	37.26998	932.53	19.65	−1803.6	11612.0	82.13	30.37	34.60	1948.
144	37.22711	918.59	20.02	−1749.3	11681.8	82.62	30.70	35.23	1940.
146	37.18285	905.26	20.34	−1694.2	11752.9	83.11	31.01	35.83	1932.
148	37.13727	892.50	20.62	−1638.4	11825.1	83.60	31.29	36.40	1925.
150	37.09046	880.30	20.86	−1582.1	11898.5	84.09	31.54	36.93	1918.
155	36.96852	852.12	21.33	−1438.8	12086.2	85.32	32.08	38.14	1902.
160	36.84046	827.00	21.63	−1292.5	12279.5	86.55	32.49	39.15	1886.
165	36.70732	804.64	21.78	−1143.8	12477.5	87.77	32.78	40.00	1872.
170	36.57010	784.75	21.81	−993.1	12679.3	88.97	32.99	40.69	1859.
175	36.42966	767.06	21.75	−840.9	12884.2	90.16	33.11	41.25	1847.
180	36.28679	751.32	21.61	−687.6	13091.5	91.33	33.18	41.68	1836.
185	36.14220	737.30	21.42	−533.5	13300.8	92.48	33.18	42.00	1825.
190	35.99649	724.80	21.18	−378.9	13511.3	93.60	33.15	42.22	1815.
195	35.85019	713.61	20.90	−224.1	13722.8	94.70	33.07	42.36	1806.
200	35.70373	703.59	20.60	−69.3	13934.9	95.77	32.97	42.44	1798.
210	35.41179	686.42	19.95	239.7	14359.3	97.84	32.71	42.42	1783.
220	35.12293	672.31	19.28	547.0	14782.7	99.81	32.38	42.24	1769.
230	34.83864	660.51	18.60	851.8	15203.7	101.68	32.02	41.95	1758.
240	34.55983	650.45	17.95	1153.8	15621.5	103.46	31.65	41.60	1747.
250	34.28697	641.73	17.31	1452.7	16035.5	105.15	31.27	41.20	1737.
260	34.02028	634.03	16.71	1748.4	16445.5	106.76	30.90	40.80	1729.
270	33.75978	627.11	16.14	2040.9	16851.4	108.29	30.54	40.38	1721.
280	33.50535	620.81	15.61	2330.2	17253.2	109.75	30.19	39.98	1713.
290	33.25683	615.01	15.11	2616.5	17651.0	111.15	29.85	39.58	1706.
300	33.01399	609.61	14.64	2899.8	18044.9	112.49	29.53	39.20	1700.
310	32.77658	604.54	14.19	3180.3	18435.1	113.76	29.23	38.84	1694.
320	32.54436	599.75	13.78	3458.2	18821.8	114.99	28.94	38.50	1688.
330	32.31707	595.19	13.39	3733.5	19205.3	116.17	28.67	38.18	1682.
340	32.09447	590.85	13.02	4006.5	19585.6	117.31	28.41	37.88	1677.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
350	31.87633	586.69	12.67	4277.3	19962.9	118.40	28.17	37.60	1672.
360	31.66243	582.70	12.34	4546.0	20337.6	119.46	27.95	37.34	1667
370	31.45257	578.87	12.03	4812.8	20709.7	120.48	27.73	37.09	1662.
380	31.24657	575.18	11.74	5077.8	21079.5	121.46	27.54	36.87	1658.
390	31.04424	571.63	11.46	5341.1	21447.1	122.42	27.35	36.65	1654.
400	30.84541	568.20	11.20	5602.8	21812.7	123.34	27.18	36.46	1650.
420	30.45771	561.71	10.71	6122.1	22538.3	125.11	26.87	36.11	1642.
440	30.08236	555.66	10.27	6636.5	23257.5	126.79	26.60	35.82	1634.
460	29.71846	550.03	9.86	7146.8	23971.3	128.37	26.37	35.57	1627.
480	29.36519	544.80	9.48	7653.7	24680.6	129.88	26.17	35.37	1621.
500	29.02187	539.94	9.14	8157.8	25386.2	131.32	26.01	35.20	1615.
520	28.68790	535.43	8.82	8659.8	26088.8	132.70	25.88	35.06	1609.
540	28.36273	531.25	8.52	9160.1	26788.9	134.02	25.77	34.96	1604.
560	28.04592	527.38	8.25	9659.3	27487.2	135.29	25.69	34.87	1599.
580	27.73703	523.81	7.99	10157.6	28184.0	136.51	25.63	34.82	1594.
600	27.43570	520.52	7.75	10655.5	28879.9	137.69	25.59	34.78	1589.
620	27.14159	517.49	7.52	11153.3	29575.2	138.83	25.56	34.75	1585.
640	26.85439	514.70	7.30	11651.2	30270.2	139.94	25.54	34.75	1581.
660	26.57382	512.16	7.10	12149.6	30965.1	141.01	25.54	34.75	1577.
680	26.29962	509.83	6.91	12648.5	31660.2	142.04	25.56	34.77	1573.
700	26.03156	507.71	6.73	13148.3	32355.7	143.05	25.58	34.79	1570.
720	25.76940	505.78	6.56	13649.0	33051.8	144.03	25.61	34.82	1567.
740	25.51294	504.04	6.39	14150.8	33748.7	144.99	25.64	34.86	1564.
760	25.26198	502.48	6.24	14653.7	34446.3	145.92	25.68	34.91	1561.
780	25.01635	501.07	6.09	15158.0	35144.9	146.82	25.73	34.95	1559.
800	24.77587	499.82	5.95	15663.6	35844.5	147.71	25.78	35.01	1556.
850	24.19610	497.31	5.62	16933.9	37598.4	149.84	25.93	35.15	1551.
900	23.64513	495.57	5.33	18213.5	39359.5	151.85	26.09	35.30	1547.
950	23.12085	494.51	5.06	19502.8	41128.3	153.76	26.25	35.45	1544.
1000	22.62135	494.03	4.82	20801.7	42904.7	155.58	26.42	35.60	1542.
1050	22.14493	494.06	4.60	22110.0	44688.5	157.33	26.58	35.75	1540.
1100	21.69002	494.52	4.40	23427.3	46479.4	158.99	26.74	35.89	1539.
1150	21.25519	495.36	4.21	24753.2	48276.9	160.59	26.89	36.01	1539.
1200	20.83915	496.53	4.04	26087.4	50080.7	162.12	27.04	36.14	1539.

5500 bar Isobar

* 144.839	37.72730	1017.85	18.55	−1636.3	12942.0	82.11	30.12	33.56	2012.
146	37.70589	1009.07	18.81	−1605.4	12981.2	82.38	30.34	33.94	2007.
148	37.66791	994.42	19.22	−1551.6	13049.7	82.84	30.69	34.56	2000.
150	37.62859	980.37	19.59	−1497.2	13119.4	83.31	31.01	35.16	1992.
155	37.52484	947.71	20.36	−1358.3	13298.6	84.49	31.70	36.51	1974.
160	37.41413	918.35	20.91	−1216.2	13484.2	85.66	32.24	37.68	1957.
165	37.29745	892.01	21.29	−1071.2	13675.2	86.84	32.66	38.69	1942.
170	37.17572	868.41	21.53	−923.8	13870.8	88.01	32.97	39.53	1928.
175	37.04981	847.29	21.64	−774.6	14070.3	89.16	33.19	40.24	1915.
180	36.92052	828.40	21.66	−623.9	14272.9	90.31	33.33	40.81	1903.
185	36.78855	811.50	21.60	−472.2	14478.1	91.43	33.40	41.26	1892.
190	36.65455	796.38	21.47	−319.6	14685.4	92.54	33.42	41.61	1881.
195	36.51909	782.83	21.30	−166.5	14894.1	93.62	33.40	41.87	1872.
200	36.38266	770.66	21.08	−13.1	15103.9	94.68	33.34	42.05	1863.
210	36.10860	749.87	20.56	293.6	15525.4	96.74	33.13	42.21	1847.
220	35.83510	732.89	19.97	599.4	15947.5	98.70	32.84	42.17	1833.
230	35.56411	718.83	19.36	903.3	16368.3	100.57	32.51	41.99	1820.
240	35.29693	707.02	18.73	1204.8	16786.9	102.35	32.15	41.71	1810.
250	35.03439	696.93	18.12	1503.5	17202.3	104.05	31.78	41.37	1800.
260	34.77697	688.18	17.53	1799.2	17614.2	105.67	31.40	41.00	1791.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
270	34.52491	680.46	16.97	2091.8	18022.3	107.21	31.03	40.62	1783.
280	34.27827	673.55	16.43	2381.4	18426.5	108.68	30.67	40.22	1776.
290	34.03701	667.28	15.92	2667.9	18826.8	110.08	30.33	39.84	1769.
300	33.80101	661.52	15.44	2951.6	19223.3	111.43	30.00	39.46	1763.
310	33.57010	656.17	14.99	3232.5	19616.1	112.71	29.68	39.10	1757.
320	33.34409	651.16	14.56	3510.7	20005.3	113.95	29.38	38.75	1751.
330	33.12276	646.44	14.16	3786.3	20391.2	115.14	29.10	38.43	1746.
340	32.90593	641.96	13.78	4059.6	20773.9	116.28	28.83	38.12	1741.
350	32.69338	637.69	13.42	4330.6	21153.6	117.38	28.58	37.83	1736.
360	32.48491	633.60	13.08	4599.5	21530.5	118.44	28.34	37.55	1731.
370	32.28033	629.68	12.76	4866.5	21904.7	119.47	28.11	37.30	1727.
380	32.07947	625.91	12.46	5131.6	22276.5	120.46	27.90	37.06	1723.
390	31.88216	622.28	12.17	5395.0	22646.0	121.42	27.71	36.84	1719.
400	31.68824	618.77	11.90	5656.8	23013.4	122.35	27.53	36.64	1715.
420	31.30999	612.11	11.39	6176.2	23742.5	124.13	27.20	36.27	1707.
440	30.94367	605.88	10.93	6690.5	24464.8	125.81	26.91	35.96	1700.
460	30.58836	600.05	10.50	7200.7	25181.4	127.40	26.66	35.70	1694.
480	30.24327	594.59	10.11	7707.3	25893.2	128.91	26.46	35.49	1687.
500	29.90771	589.49	9.76	8211.1	26601.1	130.36	26.28	35.31	1681.
520	29.58109	584.72	9.42	8712.7	27305.7	131.74	26.14	35.16	1676.
540	29.26287	580.26	9.11	9212.6	28007.8	133.07	26.02	35.05	1670.
560	28.95261	576.11	8.83	9711.3	28707.8	134.34	25.93	34.96	1665.
580	28.64989	572.24	8.56	10209.1	29406.4	135.56	25.85	34.90	1660.
600	28.35434	568.64	8.30	10706.4	30103.8	136.75	25.80	34.85	1656.
620	28.06564	565.31	8.07	11203.6	30800.6	137.89	25.77	34.83	1652.
640	27.78348	562.22	7.84	11701.0	31496.9	138.99	25.75	34.81	1647.
660	27.50760	559.36	7.63	12198.8	32193.2	140.07	25.74	34.82	1644.
680	27.23775	556.72	7.43	12697.1	32889.7	141.11	25.74	34.83	1640.
700	26.97370	554.30	7.24	13196.3	33586.5	142.12	25.76	34.85	1636.
720	26.71525	552.07	7.06	13696.4	34283.9	143.10	25.78	34.89	1633.
740	26.46218	550.03	6.89	14197.6	34982.0	144.05	25.81	34.92	1630.
760	26.21432	548.17	6.72	14700.0	35680.9	144.99	25.85	34.97	1627.
780	25.97151	546.48	6.57	15203.7	36380.8	145.89	25.89	35.02	1624.
800	25.73356	544.95	6.42	15708.8	37081.7	146.78	25.94	35.07	1622.
850	25.15905	541.76	6.07	16977.8	38838.8	148.91	26.07	35.21	1616.
900	24.61189	539.39	5.76	18256.4	40603.3	150.93	26.22	35.37	1612.
950	24.09014	537.74	5.48	19544.7	42375.6	152.85	26.38	35.52	1608.
1000	23.59205	536.72	5.23	20842.8	44155.7	154.67	26.54	35.68	1605.
1050	23.11604	536.24	4.99	22150.3	45943.3	156.42	26.69	35.83	1603.
1100	22.66069	536.24	4.78	23467.1	47738.2	158.09	26.85	35.97	1601.
1150	22.22467	536.65	4.58	24792.6	49539.9	159.69	27.00	36.10	1600.
1200	21.80678	537.44	4.40	26126.5	51348.0	161.23	27.14	36.22	1600.

6000 bar Isobar

* 150.436	38.10636	1080.27	18.03	−1386.7	14358.7	82.77	30.36	33.47	2062.
155	38.02681	1046.58	18.99	−1263.8	14514.6	83.79	31.12	34.82	2044.
160	37.93245	1013.01	19.82	−1125.6	14692.0	84.92	31.81	36.12	2026.
165	37.83144	982.67	20.45	−984.3	14875.5	86.05	32.36	37.26	2010.
170	37.72462	955.30	20.91	−840.4	15064.4	87.18	32.78	38.25	1995.
175	37.61284	930.64	21.22	−694.3	15257.7	88.30	33.10	39.08	1981.
180	37.49684	908.45	21.41	−546.4	15455.0	89.41	33.33	39.79	1968.
185	37.37735	888.49	21.51	−397.1	15655.4	90.51	33.48	40.37	1956.
190	37.25501	870.54	21.51	−246.7	15858.5	91.59	33.57	40.84	1945.
195	37.13041	854.40	21.45	−95.6	16063.7	92.66	33.60	41.22	1934.
200	37.00410	839.88	21.34	56.1	16270.5	93.70	33.59	41.50	1925.
210	36.74813	814.99	20.98	360.2	16687.5	95.74	33.46	41.85	1908.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
220	36.49020	794.66	20.51	664.0	17106.8	97.69	33.22	41.97	1893.
230	36.23265	777.91	19.97	966.7	17526.3	99.55	32.92	41.91	1880.
240	35.97714	763.95	19.41	1267.3	17944.6	101.33	32.58	41.73	1869.
250	35.72483	752.17	18.84	1565.5	18360.6	103.03	32.22	41.46	1859.
260	35.47647	742.08	18.27	1861.0	18773.6	104.65	31.85	41.14	1850.
270	35.23254	733.31	17.72	2153.6	19183.4	106.20	31.48	40.79	1842.
280	34.99329	725.58	17.19	2443.3	19589.5	107.67	31.12	40.43	1834.
290	34.75881	718.67	16.68	2730.1	19991.9	109.09	30.77	40.06	1828.
300	34.52911	712.42	16.20	3014.0	20390.7	110.44	30.43	39.69	1821.
310	34.30410	706.69	15.74	3295.2	20785.8	111.73	30.10	39.33	1816.
320	34.08368	701.38	15.30	3573.6	21177.4	112.98	29.79	38.99	1810.
330	33.86768	696.43	14.89	3849.6	21565.6	114.17	29.50	38.66	1805.
340	33.65595	691.77	14.50	4123.1	21950.6	115.32	29.22	38.34	1800.
350	33.44830	687.36	14.14	4394.4	22332.5	116.43	28.95	38.05	1796.
360	33.24459	683.16	13.79	4663.5	22711.6	117.50	28.70	37.77	1791.
370	33.04462	679.14	13.46	4930.7	23088.0	118.53	28.47	37.51	1787.
380	32.84824	675.29	13.14	5196.0	23461.8	119.52	28.25	37.26	1783.
390	32.65529	671.58	12.85	5459.5	23833.2	120.49	28.05	37.03	1779.
400	32.46563	668.00	12.56	5721.4	24202.5	121.42	27.85	36.82	1775.
420	32.09560	661.22	12.04	6240.8	24935.0	123.21	27.51	36.44	1768.
440	31.73713	654.86	11.56	6755.2	25660.5	124.90	27.20	36.12	1762.
460	31.38932	648.88	11.12	7265.2	26379.9	126.50	26.94	35.84	1755.
480	31.05141	643.27	10.72	7771.6	27094.4	128.02	26.72	35.61	1749.
500	30.72270	637.99	10.35	8275.1	27804.7	129.47	26.54	35.42	1744.
520	30.40260	633.02	10.00	8776.4	28511.5	130.85	26.38	35.27	1738.
540	30.09060	628.36	9.68	9275.8	29215.6	132.18	26.25	35.14	1733.
560	29.78623	623.98	9.38	9774.0	29917.5	133.46	26.15	35.05	1728.
580	29.48909	619.88	9.10	10271.2	30617.7	134.69	26.07	34.98	1723.
600	29.19881	616.04	8.84	10768.0	31316.8	135.87	26.01	34.93	1719.
620	28.91508	612.45	8.59	11264.7	32015.1	137.02	25.96	34.90	1714.
640	28.63760	609.10	8.36	11761.4	32712.9	138.13	25.93	34.88	1710.
660	28.36611	605.98	8.14	12258.6	33410.6	139.20	25.92	34.88	1706.
680	28.10036	603.08	7.93	12756.3	34108.3	140.24	25.92	34.90	1702.
700	27.84014	600.39	7.73	13254.8	34806.5	141.25	25.93	34.92	1699.
720	27.58524	597.89	7.54	13754.3	35505.1	142.24	25.94	34.95	1696.
740	27.33547	595.59	7.36	14254.9	36204.4	143.19	25.97	34.99	1692.
760	27.09067	593.46	7.19	14756.7	36904.6	144.13	26.00	35.03	1689.
780	26.85066	591.51	7.03	15259.8	37605.6	145.04	26.04	35.08	1687.
800	26.61529	589.72	6.87	15764.3	38307.7	145.93	26.08	35.13	1684.
850	26.04625	585.91	6.51	17031.9	40067.8	148.06	26.21	35.28	1678.
900	25.50329	582.96	6.19	18309.1	41835.5	150.08	26.35	35.43	1673.
950	24.98461	580.75	5.89	19596.2	43611.0	152.00	26.50	35.59	1669.
1000	24.48857	579.21	5.62	20893.1	45394.4	153.83	26.65	35.75	1665.
1050	24.01372	578.24	5.37	22199.8	47185.5	155.58	26.80	35.90	1663.
1100	23.55873	577.79	5.15	23515.7	48984.0	157.25	26.95	36.04	1661.
1150	23.12237	577.79	4.94	24840.5	50789.4	158.86	27.09	36.18	1659.
1200	22.70352	578.19	4.75	26173.8	52601.4	160.40	27.23	36.30	1659.
				6500 bar Isobar					
* 155.871	38.46961	1141.43	17.48	−1133.8	15762.7	83.41	30.53	33.35	2110.
160	38.40379	1110.57	18.38	−1022.6	15902.8	84.30	31.21	34.51	2094.
165	38.31756	1076.27	19.27	−885.0	16078.5	85.38	31.88	35.76	2076.
170	38.22497	1045.13	19.97	−744.4	16260.1	86.47	32.43	36.87	2059.
175	38.12676	1016.89	20.49	−601.5	16446.9	87.55	32.85	37.82	2044.
180	38.02368	991.32	20.88	−456.4	16638.2	88.63	33.18	38.65	2030.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
185	37.91640	968.20	21.14	−309.8	16833.2	89.69	33.41	39.35	2018.
190	37.80557	947.29	21.30	−161.7	17031.5	90.75	33.58	39.94	2006.
195	37.69178	928.41	21.37	−12.7	17232.5	91.80	33.67	40.43	1995.
200	37.57557	911.35	21.37	137.1	17435.6	92.82	33.72	40.82	1984.
210	37.33783	881.99	21.21	438.1	17846.7	94.83	33.68	41.36	1966.
220	37.09571	857.93	20.88	739.7	18261.9	96.76	33.51	41.64	1951.
230	36.85182	838.10	20.45	1040.6	18678.8	98.61	33.26	41.71	1937.
240	36.60816	821.63	19.97	1340.1	19095.7	100.39	32.95	41.64	1925.
250	36.36617	807.82	19.45	1637.5	19511.3	102.09	32.61	41.46	1915.
260	36.12688	796.10	18.92	1932.6	19924.7	103.71	32.25	41.21	1906.
270	35.89099	786.03	18.40	2225.0	20335.4	105.26	31.89	40.91	1897.
280	35.65894	777.26	17.88	2514.6	20742.9	106.74	31.53	40.58	1890.
290	35.43100	769.53	17.38	2801.5	21147.0	108.16	31.17	40.24	1883.
300	35.20727	762.63	16.90	3085.5	21547.6	109.52	30.83	39.89	1877.
310	34.98781	756.39	16.44	3366.9	21944.8	110.82	30.49	39.54	1871.
320	34.77255	750.68	16.00	3645.6	22338.5	112.07	30.17	39.20	1866.
330	34.56143	745.42	15.59	3921.7	22728.8	113.27	29.87	38.87	1861.
340	34.35432	740.51	15.19	4195.5	23116.0	114.42	29.58	38.56	1856.
350	34.15111	735.90	14.82	4467.0	23500.1	115.54	29.31	38.26	1852.
360	33.95163	731.55	14.46	4736.4	23881.2	116.61	29.05	37.98	1848.
370	33.75576	727.41	14.12	5003.7	24259.7	117.65	28.81	37.71	1844.
380	33.56335	723.46	13.80	5269.1	24635.5	118.65	28.58	37.46	1840.
390	33.37426	719.67	13.49	5532.8	25008.9	119.62	28.37	37.22	1836.
400	33.18834	716.03	13.20	5794.8	25380.0	120.56	28.16	37.00	1833.
420	32.82554	709.13	12.66	6314.3	26116.0	122.36	27.80	36.61	1826.
440	32.47397	702.66	12.16	6828.6	26844.7	124.05	27.48	36.27	1819.
460	32.13277	696.59	11.71	7338.5	27567.1	125.66	27.21	35.98	1813.
480	31.80118	690.86	11.30	7844.8	28284.3	127.18	26.97	35.74	1808.
500	31.47853	685.45	10.91	8348.0	28997.0	128.64	26.78	35.54	1802.
520	31.16424	680.35	10.56	8848.9	29706.1	130.03	26.61	35.38	1797.
540	30.85778	675.53	10.22	9347.9	30412.3	131.36	26.47	35.25	1792.
560	30.55871	670.98	9.91	9845.6	31116.1	132.64	26.36	35.14	1787.
580	30.26661	666.70	9.62	10342.4	31818.2	133.87	26.27	35.07	1782.
600	29.98113	662.67	9.35	10838.6	32518.9	135.06	26.20	35.01	1778.
620	29.70194	658.87	9.10	11334.6	33218.7	136.21	26.15	34.97	1774.
640	29.42876	655.31	8.86	11830.8	33918.0	137.32	26.11	34.96	1770.
660	29.16134	651.97	8.63	12327.3	34617.1	138.39	26.09	34.95	1766.
680	28.89942	648.85	8.41	12824.4	35316.2	139.44	26.09	34.96	1762.
700	28.64280	645.93	8.20	13322.3	36015.6	140.45	26.09	34.98	1758.
720	28.39128	643.21	8.01	13821.1	36715.5	141.44	26.10	35.01	1755.
740	28.14467	640.67	7.82	14321.0	37416.0	142.40	26.12	35.04	1752.
760	27.90281	638.32	7.65	14822.1	38117.3	143.33	26.15	35.09	1749.
780	27.66553	636.13	7.48	15324.6	38819.5	144.24	26.18	35.14	1746.
800	27.43270	634.11	7.31	15828.4	39522.8	145.13	26.22	35.19	1743.
850	26.86917	629.74	6.94	17094.4	41285.7	147.27	26.34	35.33	1737.
900	26.33061	626.24	6.60	18370.2	43056.3	149.29	26.47	35.49	1731.
950	25.81531	623.51	6.29	19655.9	44834.7	151.22	26.61	35.65	1727.
1000	25.32175	621.47	6.01	20951.6	46621.2	153.05	26.76	35.81	1723.
1050	24.84856	620.05	5.75	22257.0	48415.5	154.80	26.90	35.96	1720.
1100	24.39449	619.16	5.51	23571.9	50217.3	156.48	27.05	36.11	1718.
1150	23.95841	618.76	5.29	24895.8	52026.2	158.09	27.19	36.25	1716.
1200	23.53926	618.78	5.09	26228.3	53841.8	159.63	27.32	36.38	1715.
				7000 bar Isobar					
* 161.161	38.81880	1201.41	16.92	−878.0	17154.5	84.03	30.64	33.19	2155.
165	38.76262	1172.41	17.79	−774.7	17284.0	84.82	31.25	34.22	2141.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
170	38.68348	1137.55	18.72	−637.4	17458.1	85.86	31.92	35.42	2123.
175	38.59824	1105.75	19.47	−497.6	17638.0	86.91	32.46	36.49	2106.
180	38.50758	1076.79	20.06	−355.5	17822.8	87.95	32.88	37.42	2091.
185	38.41215	1050.45	20.51	−211.4	18012.0	88.98	33.21	38.23	2078.
190	38.31258	1026.52	20.83	−65.9	18204.9	90.01	33.45	38.93	2065.
195	38.20943	1004.79	21.05	81.0	18401.0	91.03	33.62	39.52	2053.
200	38.10325	985.08	21.18	228.8	18599.9	92.04	33.73	40.01	2042.
210	37.88376	950.96	21.24	526.3	19003.9	94.01	33.80	40.74	2023.
220	37.65760	922.05	21.09	825.2	19413.7	95.92	33.71	41.19	2006.
230	37.42761	899.62	20.79	1124.1	19826.9	97.75	33.52	41.41	1992.
240	37.19601	880.32	20.40	1422.1	20241.3	99.52	33.25	41.46	1979.
250	36.96454	864.16	19.96	1718.5	20655.6	101.21	32.94	41.38	1968.
260	36.73444	850.53	19.48	2012.8	21068.5	102.83	32.60	41.20	1959.
270	36.50664	838.90	18.99	2304.8	21479.4	104.38	32.25	40.96	1950.
280	36.28177	828.88	18.50	2594.2	21887.6	105.86	31.89	40.68	1943.
290	36.06026	820.14	18.02	2880.9	22292.9	107.29	31.54	40.37	1936.
300	35.84237	812.42	17.55	3165.0	22694.9	108.65	31.19	40.05	1930.
310	35.62823	805.53	17.10	3446.4	23093.7	109.96	30.85	39.72	1924.
320	35.41789	799.31	16.66	3725.2	23489.3	111.21	30.53	39.39	1919.
330	35.21135	793.63	16.24	4001.6	23881.5	112.42	30.22	39.07	1914.
340	35.00855	788.40	15.84	4275.5	24270.6	113.58	29.92	38.76	1909.
350	34.80940	783.53	15.46	4547.2	24656.7	114.70	29.64	38.46	1905.
360	34.61381	778.97	15.10	4816.7	25039.9	115.78	29.38	38.17	1901.
370	34.42166	774.67	14.76	5084.2	25420.2	116.82	29.13	37.90	1897.
380	34.23282	770.59	14.43	5349.8	25798.0	117.83	28.89	37.65	1893.
390	34.04719	766.70	14.11	5613.5	26173.2	118.80	28.67	37.41	1890.
400	33.86462	762.97	13.81	5875.6	26546.2	119.75	28.46	37.18	1886.
420	33.50825	755.95	13.26	6395.3	27285.7	121.55	28.08	36.78	1880.
440	33.16280	749.39	12.75	6909.6	28017.6	123.25	27.75	36.43	1874.
460	32.82746	743.23	12.28	7419.4	28743.0	124.87	27.46	36.13	1868.
480	32.50149	737.42	11.85	7925.5	29463.0	126.40	27.21	35.87	1863.
500	32.18423	731.93	11.46	8428.5	30178.2	127.86	27.00	35.66	1858.
520	31.87511	726.72	11.09	8929.0	30889.7	129.25	26.83	35.49	1853.
540	31.57362	721.79	10.75	9427.6	31598.0	130.59	26.68	35.35	1848.
560	31.27930	717.12	10.43	9924.8	32303.8	131.87	26.56	35.24	1843.
580	30.99176	712.70	10.13	10421.1	33007.7	133.11	26.46	35.15	1839.
600	30.71063	708.52	9.85	10916.7	33710.2	134.30	26.38	35.09	1834.
620	30.43559	704.57	9.59	11412.2	34411.6	135.45	26.32	35.05	1830.
640	30.16636	700.84	9.34	11907.7	35112.4	136.56	26.28	35.03	1826.
660	29.90268	697.32	9.10	12403.6	35812.9	137.64	26.26	35.02	1822.
680	29.64432	694.01	8.88	12900.0	36513.3	138.69	26.24	35.03	1818.
700	29.39107	690.90	8.66	13397.3	37214.0	139.70	26.24	35.04	1815.
720	29.14272	687.98	8.46	13895.4	37915.1	140.69	26.25	35.07	1811.
740	28.89910	685.25	8.27	14394.7	38616.9	141.65	26.27	35.10	1808.
760	28.66004	682.69	8.08	14895.1	39319.3	142.59	26.29	35.15	1805.
780	28.42540	680.30	7.91	15396.9	40022.7	143.50	26.32	35.19	1802.
800	28.19503	678.08	7.74	15900.0	40727.1	144.39	26.35	35.24	1799.
850	27.63692	673.20	7.35	17164.4	42492.8	146.53	26.46	35.39	1793.
900	27.10281	669.20	7.00	18438.5	44266.1	148.56	26.58	35.54	1787.
950	26.59106	665.99	6.67	19722.7	46047.3	150.49	26.72	35.71	1782.
1000	26.10023	663.49	6.38	21016.9	47836.6	152.32	26.86	35.87	1778.
1050	25.62904	661.62	6.11	22321.1	49633.9	154.08	27.00	36.02	1775.
1100	25.17630	660.33	5.86	23634.8	51438.7	155.75	27.14	36.17	1772.
1150	24.74094	659.53	5.63	24957.6	53250.8	157.37	27.27	36.31	1770.
1200	24.32199	659.19	5.42	26289.1	55069.6	158.91	27.40	36.44	1769.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
				7500 bar Isobar					
* 166.315	39.15539	1260.26	16.35	−619.6	18534.8	84.63	30.70	33.00	2199.
170	39.10575	1232.21	17.20	−520.6	18658.2	85.36	31.27	33.94	2185.
175	39.03282	1196.89	18.18	−383.8	18830.8	86.36	31.92	35.10	2167.
180	38.95404	1164.57	18.98	−244.5	19008.9	87.37	32.45	36.12	2151.
185	38.87003	1135.01	19.62	−103.2	19191.9	88.37	32.88	37.03	2136.
190	38.78137	1108.03	20.12	39.9	19379.0	89.37	33.21	37.82	2123.
195	38.68862	1083.41	20.50	184.4	19569.9	90.36	33.45	38.51	2110.
200	38.59230	1060.96	20.78	330.0	19764.0	91.34	33.63	39.10	2098.
210	38.39094	1021.90	21.08	623.9	20159.8	93.27	33.81	40.01	2078.
220	38.18081	989.49	21.12	919.8	20563.2	95.15	33.82	40.62	2060.
230	37.96488	962.58	20.98	1216.3	20971.4	96.96	33.69	40.99	2045.
240	37.74558	940.17	20.71	1512.5	21382.4	98.71	33.48	41.17	2031.
250	37.52482	921.40	20.36	1807.5	21794.3	100.39	33.21	41.19	2020.
260	37.30410	905.59	19.95	2100.9	22205.9	102.01	32.90	41.11	2010.
270	37.08452	892.17	19.51	2392.1	22616.2	103.56	32.56	40.94	2001.
280	36.86691	880.67	19.06	2681.1	23024.5	105.04	32.22	40.71	1993.
290	36.65186	870.72	18.60	2967.5	23430.4	106.47	31.87	40.45	1986.
300	36.43975	862.03	18.15	3251.5	23833.4	107.83	31.52	40.16	1980.
310	36.23084	854.34	17.71	3532.9	24233.4	109.14	31.19	39.85	1974.
320	36.02529	847.47	17.28	3811.7	24630.4	110.40	30.86	39.54	1969.
330	35.82315	841.27	16.86	4088.1	25024.3	111.62	30.55	39.24	1964.
340	35.62444	835.62	16.46	4362.2	25415.2	112.78	30.24	38.93	1960.
350	35.42913	830.42	16.08	4634.0	25803.0	113.91	29.96	38.64	1955.
360	35.23716	825.59	15.71	4903.6	26188.0	114.99	29.69	38.36	1951.
370	35.04845	821.08	15.36	5171.2	26570.2	116.04	29.43	38.09	1948.
380	34.86290	816.83	15.03	5436.9	26949.7	117.05	29.18	37.83	1944.
390	34.68042	812.80	14.71	5700.8	27326.8	118.03	28.95	37.59	1941.
400	34.50090	808.97	14.41	5962.9	27701.5	118.98	28.74	37.36	1938.
420	34.15033	801.78	13.84	6482.7	28444.4	120.79	28.34	36.94	1931.
440	33.81038	795.12	13.31	6997.0	29179.5	122.50	28.00	36.58	1926.
460	33.48028	788.89	12.84	7506.7	29908.0	124.12	27.70	36.27	1920.
480	33.15933	783.01	12.39	8012.6	30630.7	125.66	27.44	36.01	1915.
500	32.84689	777.45	11.99	8515.3	31348.5	127.12	27.22	35.79	1910.
520	32.54241	772.18	11.61	9015.5	32062.4	128.52	27.03	35.60	1905.
540	32.24537	767.17	11.26	9513.8	32772.9	129.86	26.88	35.45	1901.
560	31.95534	762.41	10.93	10010.5	33480.8	131.15	26.75	35.34	1896.
580	31.67191	757.89	10.62	10506.3	34186.6	132.39	26.64	35.25	1892.
600	31.39472	753.60	10.33	11001.4	34890.8	133.58	26.56	35.18	1888.
620	31.12347	749.52	10.06	11496.3	35593.9	134.74	26.49	35.13	1884.
640	30.85785	745.66	9.80	11991.2	36296.2	135.85	26.45	35.10	1880.
660	30.59762	742.00	9.56	12486.4	36998.2	136.93	26.41	35.09	1876.
680	30.34255	738.54	9.33	12982.2	37700.0	137.98	26.39	35.09	1872.
700	30.09242	735.27	9.11	13478.8	38402.0	139.00	26.39	35.11	1869.
720	29.84704	732.19	8.90	13976.2	39104.4	139.99	26.39	35.13	1865.
740	29.60623	729.29	8.70	14474.8	39807.3	140.95	26.40	35.16	1862.
760	29.36983	726.56	8.51	14974.5	40510.9	141.89	26.42	35.20	1859.
780	29.13769	724.00	8.33	15475.6	41215.5	142.80	26.45	35.25	1856.
800	28.90967	721.60	8.15	15978.0	41920.9	143.70	26.48	35.30	1853.
850	28.35682	716.26	7.75	17240.7	43689.3	145.84	26.58	35.44	1847.
900	27.82711	711.81	7.38	18513.1	45465.2	147.87	26.69	35.60	1841.
950	27.31898	708.16	7.05	19795.7	47249.1	149.80	26.82	35.76	1836.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1000	26.83104	705.23	6.75	21088.4	49041.1	151.64	26.96	35.92	1832.
1050	26.36207	702.96	6.47	22391.1	50841.1	153.39	27.09	36.08	1828.
1100	25.91093	701.27	6.21	23703.5	52648.8	155.08	27.23	36.23	1825.
1150	25.47663	700.10	5.97	25025.1	54463.8	156.69	27.36	36.37	1823.
1200	25.05823	699.41	5.75	26355.4	56285.7	158.24	27.48	36.50	1821.
				8000 bar Isobar					
* 171.346	39.48060	1318.03	15.77	−359.2	19903.9	85.21	30.71	32.78	2241.
175	39.43516	1290.02	16.64	−261.1	20025.4	85.91	31.26	33.67	2227.
180	39.36769	1254.38	17.65	−124.7	20196.5	86.87	31.90	34.78	2210.
185	39.29461	1221.64	18.50	14.0	20373.0	87.84	32.42	35.77	2194.
190	39.21647	1191.60	19.18	154.5	20554.1	88.80	32.84	36.65	2179.
195	39.13382	1164.07	19.73	296.6	20739.3	89.77	33.17	37.43	2165.
200	39.04714	1138.87	20.16	440.1	20928.2	90.72	33.42	38.10	2153.
210	38.86364	1094.73	20.73	730.1	21314.9	92.61	33.73	39.19	2131.
220	38.66949	1057.85	20.99	1022.7	21710.9	94.45	33.83	39.96	2112.
230	38.46773	1027.04	21.02	1316.6	22113.3	96.24	33.79	40.48	2096.
240	38.26089	1001.28	20.89	1610.7	22519.8	97.97	33.64	40.79	2082.
250	38.05106	979.67	20.65	1904.1	22928.4	99.64	33.41	40.93	2070.
260	37.83991	961.45	20.32	2196.1	23337.8	101.24	33.14	40.93	2059.
270	37.62873	946.01	19.95	2486.5	23746.8	102.79	32.83	40.85	2050.
280	37.41851	932.83	19.54	2774.7	24154.5	104.27	32.50	40.68	2042.
290	37.20999	921.48	19.12	3060.7	24560.3	105.69	32.16	40.47	2034.
300	37.00371	911.63	18.69	3344.3	24963.8	107.06	31.82	40.22	2028.
310	36.80003	903.00	18.27	3625.5	25364.6	108.38	31.49	39.95	2022.
320	36.59920	895.36	17.85	3904.3	25762.7	109.64	31.16	39.66	2017.
330	36.40138	888.52	17.44	4180.7	26157.9	110.86	30.85	39.37	2012.
340	36.20664	882.36	17.05	4454.8	26550.1	112.03	30.54	39.08	2008.
350	36.01502	876.74	16.66	4726.6	26939.5	113.16	30.25	38.80	2003.
360	35.82649	871.57	16.30	4996.3	27326.1	114.24	29.97	38.52	2000.
370	35.64102	866.79	15.95	5264.0	27710.0	115.30	29.71	38.25	1996.
380	35.45855	862.32	15.61	5529.7	28091.3	116.31	29.46	38.00	1993.
390	35.27900	858.11	15.28	5793.6	28470.0	117.30	29.22	37.75	1989.
400	35.10229	854.14	14.97	6055.9	28846.4	118.25	29.00	37.52	1986.
420	34.75703	846.75	14.39	6575.7	29592.6	120.07	28.60	37.10	1980.
440	34.42207	839.96	13.86	7090.0	30330.9	121.79	28.24	36.73	1975.
460	34.09671	833.64	13.37	7599.6	31062.3	123.41	27.93	36.41	1970.
480	33.78028	827.70	12.92	8105.3	31787.8	124.96	27.66	36.14	1965.
500	33.47218	822.08	12.50	8607.8	32508.2	126.43	27.43	35.91	1960.
520	33.17187	816.76	12.11	9107.7	33224.5	127.83	27.23	35.72	1956.
540	32.87885	811.70	11.75	9605.5	33937.3	129.18	27.07	35.56	1951.
560	32.59269	806.88	11.41	10101.8	34647.2	130.47	26.93	35.44	1947.
580	32.31298	802.29	11.10	10597.1	35355.0	131.71	26.82	35.34	1943.
600	32.03938	797.91	10.80	11091.7	36061.0	132.91	26.73	35.27	1939.
620	31.77157	793.75	10.52	11586.0	36765.8	134.06	26.65	35.21	1935.
640	31.50926	789.79	10.25	12080.3	37469.7	135.18	26.60	35.18	1931.
660	31.25220	786.02	10.00	12574.9	38173.1	136.26	26.56	35.17	1927.
680	31.00016	782.44	9.77	13070.1	38876.4	137.31	26.54	35.16	1924.
700	30.75292	779.05	9.54	13565.9	39579.7	138.33	26.53	35.17	1920.
720	30.51030	775.83	9.32	14062.7	40283.4	139.32	26.53	35.19	1917.
740	30.27212	772.79	9.12	14560.6	40987.5	140.29	26.53	35.22	1914.
760	30.03821	769.91	8.92	15059.6	41692.4	141.23	26.55	35.26	1911.
780	29.80844	767.20	8.74	15560.0	42398.0	142.14	26.57	35.30	1908.
800	29.58266	764.65	8.56	16061.7	43104.6	143.04	26.60	35.35	1905.
850	29.03486	758.92	8.14	17322.6	44875.6	145.19	26.69	35.49	1898.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
900	28.50946	754.06	7.76	18593.3	46654.1	147.22	26.80	35.65	1892.
950	28.00493	750.01	7.42	19874.2	48440.6	149.15	26.92	35.81	1887.
1000	27.51995	746.69	7.10	21165.3	50235.1	150.99	27.05	35.97	1883.
1050	27.05332	744.03	6.81	22466.5	52037.7	152.75	27.18	36.13	1879.
1100	26.60399	741.97	6.54	23777.4	53848.0	154.43	27.31	36.28	1876.
1150	26.17098	740.45	6.30	25097.6	55665.8	156.05	27.44	36.43	1873.
1200	25.75340	739.42	6.07	26426.7	57490.6	157.60	27.56	36.56	1871.
				8500 bar Isobar					
* 176.261	39.79547	1374.73	15.19	−96.9	21262.3	85.76	30.67	32.54	2282.
180	39.75246	1345.94	16.09	3.3	21385.6	86.46	31.22	33.41	2268.
185	39.68981	1310.06	17.14	139.2	21555.3	87.39	31.84	34.47	2250.
190	39.62177	1277.00	18.02	277.3	21730.1	88.32	32.35	35.43	2234.
195	39.54885	1246.58	18.75	417.0	21909.5	89.25	32.77	36.28	2220.
200	39.47154	1218.60	19.34	558.3	22092.8	90.18	33.10	37.04	2206.
210	39.30554	1169.33	20.19	844.2	22469.7	92.02	33.54	38.28	2183.
220	39.12723	1127.85	20.69	1133.4	22857.4	93.82	33.76	39.21	2163.
230	38.93962	1093.00	20.91	1424.4	23253.1	95.58	33.81	39.87	2145.
240	38.74535	1063.69	20.94	1716.1	23654.2	97.29	33.72	40.31	2130.
250	38.54662	1039.03	20.82	2007.5	24058.7	98.94	33.55	40.57	2118.
260	38.34522	1018.20	20.59	2298.1	24465.1	100.53	33.32	40.68	2107.
270	38.14262	1000.54	20.29	2587.2	24872.0	102.07	33.04	40.68	2097.
280	37.93996	985.48	19.94	2874.5	25278.4	103.54	32.74	40.59	2088.
290	37.73811	972.56	19.57	3159.9	25683.5	104.97	32.42	40.43	2081.
300	37.53774	961.40	19.18	3443.0	26086.9	106.33	32.09	40.23	2074.
310	37.33933	951.67	18.78	3723.8	26488.0	107.65	31.76	40.00	2068.
320	37.14325	943.12	18.38	4002.4	26886.7	108.92	31.44	39.74	2063.
330	36.94972	935.54	17.98	4278.6	27282.8	110.13	31.12	39.48	2058.
340	36.75890	928.75	17.59	4552.6	27676.3	111.31	30.82	39.20	2054.
350	36.57087	922.63	17.22	4824.4	28066.9	112.44	30.52	38.93	2050.
360	36.38568	917.05	16.85	5094.1	28454.9	113.53	30.24	38.67	2046.
370	36.20332	911.92	16.50	5361.8	28840.3	114.59	29.98	38.40	2042.
380	36.02377	907.18	16.16	5627.5	29223.1	115.61	29.72	38.15	2039.
390	35.84699	902.75	15.84	5891.5	29603.4	116.60	29.48	37.91	2036.
400	35.67291	898.60	15.52	6153.7	29981.3	117.56	29.25	37.68	2033.
420	35.33259	890.95	14.93	6673.5	30730.7	119.38	28.84	37.26	2027.
440	35.00222	883.99	14.39	7187.8	31472.0	121.11	28.47	36.88	2022.
460	34.68118	877.56	13.89	7697.3	32206.3	122.74	28.15	36.56	2017.
480	34.36886	871.55	13.43	8202.9	32934.6	124.29	27.87	36.28	2012.
500	34.06469	865.88	13.00	8705.1	33657.6	125.77	27.63	36.04	2008.
520	33.76816	860.52	12.60	9204.7	34376.3	127.18	27.42	35.84	2004.
540	33.47878	855.42	12.23	9702.1	35091.4	128.52	27.25	35.67	1999.
560	33.19612	850.56	11.88	10198.0	35803.4	129.82	27.10	35.54	1995.
580	32.91980	845.92	11.56	10692.8	36513.2	131.06	26.98	35.44	1991.
600	32.64945	841.49	11.25	11186.9	37221.0	132.26	26.89	35.36	1988.
620	32.38478	837.26	10.97	11680.7	37927.6	133.42	26.81	35.30	1984.
640	32.12550	833.23	10.69	12174.4	38633.1	134.54	26.75	35.26	1980.
660	31.87135	829.38	10.44	12668.4	39338.1	135.63	26.71	35.24	1976.
680	31.62210	825.71	10.19	13162.8	40042.8	136.68	26.68	35.23	1973.
700	31.37754	822.21	9.96	13658.0	40747.5	137.70	26.66	35.24	1970.
720	31.13748	818.89	9.74	14154.1	41452.4	138.69	26.66	35.26	1966.
740	30.90175	815.73	9.53	14651.3	42157.8	139.66	26.66	35.28	1963.
760	30.67019	812.73	9.33	15149.6	42863.8	140.60	26.67	35.32	1960.
780	30.44264	809.90	9.14	15649.3	43570.6	141.52	26.69	35.36	1957.
800	30.21897	807.21	8.95	16150.3	44278.3	142.42	26.71	35.41	1954.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
850	29.67599	801.14	8.52	17409.3	46052.0	144.57	26.80	35.54	1948.
900	29.15475	795.94	8.13	18678.3	47833.1	146.60	26.90	35.70	1942.
950	28.65377	791.52	7.78	19957.4	49622.0	148.54	27.02	35.86	1937.
1000	28.17175	787.84	7.45	21246.9	51419.0	150.38	27.14	36.02	1932.
1050	27.70754	784.82	7.15	22546.5	53224.0	152.14	27.27	36.18	1928.
1100	27.26012	782.42	6.87	23855.9	55036.9	153.83	27.39	36.33	1925.
1150	26.82857	780.56	6.62	25174.7	56857.3	155.45	27.52	36.48	1922.
1200	26.41202	779.22	6.38	26502.5	58684.8	157.00	27.63	36.62	1920.
				9000 bar Isobar					
* 181.071	40.10090	1430.41	14.60	166.9	22610.3	86.30	30.59	32.27	2321.
185	40.05896	1400.05	15.58	271.9	22738.8	87.01	31.15	33.15	2306.
190	40.00059	1364.01	16.65	407.5	22907.2	87.90	31.76	34.17	2289.
195	39.93703	1330.71	17.56	544.9	23080.4	88.80	32.26	35.09	2273.
200	39.86876	1299.98	18.32	683.9	23257.9	89.70	32.67	35.92	2259.
210	39.71983	1245.55	19.48	965.7	23624.4	91.49	33.26	37.31	2233.
220	39.55710	1199.41	20.22	1251.3	24003.2	93.25	33.60	38.39	2212.
230	39.38358	1160.38	20.65	1539.1	24391.3	94.98	33.74	39.19	2194.
240	39.20192	1127.40	20.85	1828.2	24786.2	96.66	33.74	39.76	2178.
250	39.01439	1099.51	20.87	2117.4	25185.8	98.29	33.63	40.13	2164.
260	38.82291	1075.89	20.75	2406.2	25588.4	99.87	33.44	40.35	2153.
270	38.62906	1055.83	20.55	2693.9	25992.4	101.39	33.20	40.44	2142.
280	38.43411	1038.73	20.27	2980.1	26396.8	102.86	32.93	40.43	2134.
290	38.23908	1024.07	19.95	3264.5	26800.7	104.28	32.63	40.34	2126.
300	38.04474	1011.44	19.60	3547.0	27203.4	105.65	32.32	40.19	2119.
310	37.85171	1000.47	19.23	3827.3	27604.3	106.96	32.00	40.00	2113.
320	37.66042	990.89	18.86	4105.5	28003.3	108.23	31.69	39.78	2107.
330	37.47120	982.44	18.48	4381.5	28399.9	109.45	31.38	39.54	2102.
340	37.28429	974.93	18.11	4655.3	28794.1	110.62	31.07	39.30	2098.
350	37.09983	968.21	17.74	4926.9	29185.8	111.76	30.78	39.04	2094.
360	36.91791	962.14	17.38	5196.5	29574.9	112.86	30.50	38.79	2090.
370	36.73858	956.60	17.03	5464.2	29961.6	113.92	30.23	38.54	2087.
380	36.56186	951.52	16.69	5729.9	30345.7	114.94	29.97	38.29	2083.
390	36.38773	946.82	16.37	5993.8	30727.4	115.93	29.72	38.05	2080.
400	36.21615	942.45	16.05	6256.0	31106.8	116.89	29.49	37.83	2077.
420	35.88048	934.47	15.46	6775.8	31859.1	118.73	29.06	37.40	2072.
440	35.55439	927.29	14.91	7290.0	32603.3	120.46	28.69	37.03	2067.
460	35.23733	920.72	14.40	7799.3	33340.4	122.10	28.36	36.70	2062.
480	34.92878	914.63	13.92	8304.7	34071.4	123.65	28.07	36.41	2058.
500	34.62821	908.91	13.49	8806.7	34797.0	125.13	27.82	36.16	2054.
520	34.33512	903.51	13.08	9305.9	35518.2	126.55	27.60	35.96	2050.
540	34.04904	898.38	12.70	9803.0	36235.5	127.90	27.42	35.78	2046.
560	33.76957	893.49	12.34	10298.5	36949.7	129.20	27.27	35.64	2042.
580	33.49633	888.82	12.01	10792.8	37661.5	130.45	27.14	35.53	2038.
600	33.22896	884.35	11.70	11286.4	38371.2	131.65	27.04	35.45	2034.
620	32.96716	880.08	11.40	11779.6	39079.5	132.81	26.96	35.38	2031.
640	32.71065	875.99	11.12	12272.7	39786.7	133.94	26.89	35.34	2027.
660	32.45917	872.08	10.86	12766.1	40493.3	135.02	26.84	35.32	2024.
680	32.21249	868.34	10.61	13260.0	41199.4	136.08	26.81	35.30	2020.
700	31.97041	864.77	10.37	13754.5	41905.5	137.10	26.79	35.31	2017.
720	31.73273	861.37	10.14	14249.9	42611.8	138.09	26.78	35.32	2014.
740	31.49927	858.12	9.93	14746.4	43318.5	139.06	26.78	35.35	2011.
760	31.26989	855.03	9.72	15244.0	44025.7	140.01	26.79	35.38	2008.
780	31.04443	852.09	9.52	15742.9	44733.6	140.93	26.80	35.42	2005.
800	30.82275	849.29	9.33	16243.2	45442.4	141.82	26.82	35.46	2002.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
850	30.28434	842.93	8.89	17500.5	47218.8	143.98	26.90	35.60	1995.
900	29.76710	837.41	8.49	18767.6	49002.3	146.02	27.00	35.75	1990.
950	29.26957	832.68	8.13	20045.0	50793.7	147.95	27.11	35.91	1984.
1000	28.79048	828.67	7.79	21332.7	52593.1	149.80	27.23	36.07	1980.
1050	28.32872	825.33	7.48	22630.7	54400.6	151.56	27.35	36.23	1976.
1100	27.88329	822.60	7.20	23938.5	56215.9	153.25	27.47	36.38	1972.
1150	27.45329	820.43	6.93	25255.8	58038.7	154.87	27.59	36.53	1969.
1200	27.03792	818.78	6.69	26582.2	59868.7	156.43	27.71	36.67	1967.
				9500 bar Isobar					
* 185.780	40.39766	1485.09	14.02	432.0	23948.2	86.82	30.47	31.98	2359.
190	40.35579	1452.40	15.09	544.5	24085.1	87.55	31.06	32.89	2343.
195	40.30122	1416.28	16.18	679.5	24252.0	88.42	31.65	33.87	2326.
200	40.24166	1382.82	17.12	816.3	24423.7	89.29	32.15	34.77	2310.
210	40.10927	1323.24	18.58	1093.9	24779.2	91.02	32.89	36.29	2283.
220	39.96181	1272.40	19.59	1375.8	25148.5	92.74	33.35	37.50	2260.
230	39.80223	1229.13	20.25	1660.4	25528.4	94.43	33.59	38.44	2241.
240	39.63315	1192.35	20.63	1946.6	25916.4	96.08	33.68	39.13	2224.
250	39.45689	1161.11	20.80	2233.4	26310.3	97.69	33.64	39.62	2210.
260	39.27545	1134.56	20.81	2520.2	26708.3	99.25	33.51	39.95	2197.
270	39.09050	1111.95	20.71	2806.2	27108.8	100.76	33.32	40.13	2187.
280	38.90342	1092.64	20.51	3091.1	27510.5	102.22	33.07	40.20	2177.
290	38.71535	1076.09	20.26	3374.4	27912.5	103.63	32.80	40.18	2169.
300	38.52718	1061.84	19.96	3656.0	28313.9	104.99	32.51	40.09	2162.
310	38.33962	1049.50	19.63	3935.7	28714.2	106.31	32.21	39.96	2156.
320	38.15321	1038.76	19.29	4213.3	29112.9	107.57	31.91	39.78	2150.
330	37.96837	1029.33	18.93	4488.9	29509.7	108.79	31.60	39.57	2145.
340	37.78539	1021.01	18.58	4762.3	29904.3	109.97	31.30	39.35	2141.
350	37.60450	1013.59	18.22	5033.8	30296.7	111.11	31.01	39.12	2136.
360	37.42584	1006.94	17.87	5303.2	30686.7	112.21	30.73	38.88	2133.
370	37.24951	1000.93	17.53	5570.7	31074.4	113.27	30.46	38.65	2129.
380	37.07555	995.45	17.20	5836.3	31459.7	114.30	30.20	38.41	2126.
390	36.90399	990.43	16.87	6100.1	31842.6	115.29	29.95	38.18	2123.
400	36.73483	985.78	16.56	6362.3	32223.3	116.26	29.71	37.96	2120.
420	36.40360	977.39	15.96	6881.9	32978.2	118.10	29.28	37.54	2115.
440	36.08153	969.95	15.40	7396.0	33725.2	119.84	28.90	37.16	2110.
460	35.76820	963.21	14.89	7905.2	34465.1	121.48	28.56	36.83	2106.
480	35.46314	957.00	14.41	8410.3	35198.7	123.04	28.26	36.54	2102.
500	35.16587	951.22	13.96	8912.0	35926.9	124.53	28.00	36.29	2098.
520	34.87593	945.77	13.54	9411.0	36650.4	125.95	27.78	36.07	2094.
540	34.59288	940.61	13.16	9907.7	37370.0	127.30	27.59	35.89	2090.
560	34.31633	935.70	12.79	10402.8	38086.4	128.61	27.43	35.75	2086.
580	34.04589	931.01	12.45	10896.6	38800.2	129.86	27.30	35.63	2083.
600	33.78124	926.53	12.13	11389.7	39511.8	131.07	27.19	35.54	2079.
620	33.52207	922.23	11.83	11882.4	40221.9	132.23	27.10	35.47	2076.
640	33.26810	918.11	11.54	12374.9	40930.8	133.36	27.03	35.42	2072.
660	33.01907	914.16	11.27	12867.7	41638.9	134.44	26.98	35.39	2069.
680	32.77477	910.37	11.02	13360.9	42346.6	135.50	26.94	35.38	2066.
700	32.53497	906.75	10.77	13854.8	43054.1	136.53	26.91	35.38	2063.
720	32.29949	903.28	10.54	14349.5	43761.8	137.52	26.90	35.39	2060.
740	32.06815	899.96	10.32	14845.3	44469.7	138.49	26.89	35.41	2057.
760	31.84081	896.79	10.11	15342.2	45178.2	139.44	26.90	35.44	2054.
780	31.61730	893.76	9.90	15840.5	45887.3	140.36	26.91	35.48	2051.
800	31.39749	890.88	9.71	16340.0	46597.2	141.26	26.93	35.52	2048.
850	30.86339	884.28	9.26	17595.5	48376.3	143.41	27.00	35.65	2042.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
900	30.34997	878.49	8.85	18860.8	50162.3	145.46	27.09	35.80	2036.
950	29.85577	873.47	8.47	20136.4	51956.1	147.40	27.19	35.95	2030.
1000	29.37956	869.17	8.13	21422.4	53757.8	149.24	27.31	36.12	2026.
1050	28.92023	865.53	7.81	22718.6	55567.6	151.01	27.43	36.28	2022.
1100	28.47682	862.51	7.52	24024.8	57385.3	152.70	27.54	36.43	2018.
1150	28.04845	860.05	7.24	25340.5	59210.5	154.32	27.66	36.58	2015.
1200	27.63435	858.12	6.99	26665.4	61042.9	155.88	27.77	36.72	2012.
				10000 bar Isobar					
* 190.397	40.68642	1538.78	13.45	698.2	25276.4	87.33	30.32	31.67	2395.
195	40.64388	1503.07	14.63	820.5	25424.5	88.10	30.95	32.63	2378.
200	40.59270	1466.92	15.74	955.0	25590.0	88.94	31.53	33.58	2362.
210	40.47631	1402.24	17.52	1228.5	25934.3	90.62	32.42	35.23	2332.
220	40.34376	1346.70	18.81	1506.5	26293.5	92.29	33.01	36.56	2307.
230	40.19789	1299.14	19.70	1787.7	26664.6	93.94	33.37	37.62	2287.
240	40.04130	1258.49	20.28	2070.9	27045.1	95.56	33.55	38.44	2269.
250	39.87632	1223.79	20.62	2355.2	27432.7	97.14	33.59	39.05	2254.
260	39.70499	1194.18	20.77	2639.7	27825.4	98.68	33.52	39.48	2241.
270	39.52905	1168.88	20.77	2923.9	28221.7	100.17	33.37	39.75	2229.
280	39.34999	1147.24	20.67	3207.2	28620.1	101.62	33.17	39.91	2220.
290	39.16902	1128.66	20.49	3489.2	29019.6	103.02	32.93	39.97	2211.
300	38.98715	1112.67	20.25	3769.7	29419.2	104.38	32.67	39.95	2204.
310	38.80519	1098.83	19.98	4048.5	29818.3	105.69	32.39	39.86	2197.
320	38.62376	1086.81	19.67	4325.5	30216.3	106.95	32.09	39.73	2191.
330	38.44337	1076.30	19.35	4600.5	30612.8	108.17	31.80	39.57	2186.
340	38.26439	1067.05	19.01	4873.5	31007.5	109.35	31.51	39.38	2182.
350	38.08709	1058.86	18.68	5144.6	31400.2	110.49	31.22	39.17	2178.
360	37.91170	1051.55	18.34	5413.8	31790.8	111.59	30.94	38.95	2174.
370	37.73835	1044.99	18.00	5681.0	32179.3	112.65	30.67	38.73	2170.
380	37.56713	1039.05	17.68	5946.5	32565.5	113.68	30.41	38.51	2167.
390	37.39811	1033.64	17.36	6210.1	32949.5	114.68	30.16	38.29	2164.
400	37.23130	1028.67	17.04	6472.2	33331.3	115.65	29.93	38.08	2161.
420	36.90435	1019.80	16.45	6991.6	34088.7	117.49	29.49	37.67	2156.
440	36.58612	1012.04	15.89	7505.4	34838.2	119.24	29.09	37.29	2152.
460	36.27630	1005.08	15.36	8014.4	35580.6	120.89	28.75	36.96	2148.
480	35.97450	998.73	14.88	8519.3	36316.8	122.45	28.44	36.66	2144.
500	35.68030	992.86	14.42	9020.8	37047.4	123.95	28.18	36.41	2140.
520	35.39327	987.36	14.00	9519.4	37773.3	125.37	27.95	36.19	2136.
540	35.11301	982.17	13.60	10015.7	38495.2	126.73	27.75	36.01	2133.
560	34.83913	977.24	13.23	10510.4	39213.8	128.04	27.59	35.85	2129.
580	34.57128	972.54	12.88	11003.8	39929.5	129.29	27.45	35.73	2126.
600	34.30912	968.04	12.56	11496.4	40643.1	130.50	27.33	35.63	2123.
620	34.05236	963.73	12.25	11988.5	41355.0	131.67	27.24	35.56	2119.
640	33.80072	959.59	11.95	12480.5	42065.7	132.80	27.16	35.51	2116.
660	33.55396	955.62	11.68	12972.7	42775.4	133.89	27.11	35.47	2113.
680	33.31183	951.80	11.42	13465.2	43484.6	134.95	27.06	35.45	2110.
700	33.07415	948.14	11.17	13958.5	44193.6	135.98	27.03	35.45	2107.
720	32.84071	944.62	10.93	14452.6	44902.6	136.98	27.01	35.45	2104.
740	32.61134	941.25	10.70	14947.7	45611.9	137.95	27.01	35.47	2101.
760	32.38589	938.02	10.48	15443.9	46321.6	138.89	27.01	35.50	2098.
780	32.16420	934.93	10.28	15941.4	47031.9	139.82	27.02	35.53	2095.
800	31.94615	931.98	10.08	16440.3	47743.0	140.72	27.03	35.58	2092.
850	31.41612	925.18	9.62	17693.9	49524.7	142.88	27.09	35.70	2086.
900	30.90632	919.16	9.19	18957.4	51313.3	144.92	27.18	35.84	2080.
950	30.41533	913.89	8.81	20231.2	53109.4	146.86	27.28	36.00	2075.
1000	29.94191	909.33	8.46	21515.4	54913.4	148.71	27.39	36.16	2070.

Thermodynamic properties of nitrogen—Continued

Temperature kelvin	Density mol/l	Isotherm derivative l·bar/mol	Isochore derivative bar·K	Internal energy J/mol	Enthalpy J/mol	Entropy J/mol·K	C_v J/mol·K	C_p J/mol·K	Velocity of sound m/s
1050	29.48497	905.43	8.13	22809.9	56725.5	150.48	27.50	36.32	2066.
1100	29.04358	902.13	7.83	24114.5	58545.5	152.18	27.62	36.48	2062.
1150	28.61689	899.41	7.55	25428.6	60373.0	153.80	27.73	36.62	2059.
1200	28.20413	897.21	7.29	26752.0	62207.8	155.36	27.84	36.76	2057.

*Two phase boundary.