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REAL-GAS EFFECTS ASSOCIATED WITH ONE-DIMENSIONAL TRANSONIC FLOW OF CRYOGENIC NITROGEN

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16. Abstract

Real-gas solutions for one-dimensional isentropic and normal-shock flows of nitrogen have been obtained for a wide range of temperatures and pressures. These calculations are compared to ideal-gas solutions and are presented in tables. For temperatures (300 K and below) and pressures (1 to 10 atm) that cover those anticipated for transonic cryogenic tunnels, the solutions are analyzed in detail to obtain indications of the magnitude of inviscid flow simulation errors. For these ranges, the maximum deviation of the various isentropic and normal-shock parameters from the ideal values is about 1 percent or less, and for most wind-tunnel investigations this deviation would be insignificant.

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SUMMARY

The cryogenic wind-tunnel concept that has been developed at the Langley Research Center uses nitrogen as the test gas. For the range of temperatures and pressures anticipated for tunnels of this type, a study has been made to determine the real-gas effects on one-dimensional isentropic and normal-shock flows. Real-gas calculations of these flows have been made, and the solutions were compared with the ideal diatomic gas solutions. This report presents the details of the calculations and the tabulated results for stagnation temperatures of 300 K and below with stagnation pressures from 1 to 30 atmospheres. A detailed analysis is presented for a range of conditions encompassing those under consideration in transonic cryogenic wind-tunnel designs. This analysis, which is for stagnation pressures up to 10 atm, shows that the real-gas imperfections of nitrogen cause deviations of 1 percent or less in the various isentropic and normal-shock parameters. If the maximum deviations in the isentropic and normal-shock parameters are indicative of the errors in simulation of two- and three-dimensional inviscid flows in a cryogenic tunnel, then the errors would be insignificant for most wind-tunnel investigations.

INTRODUCTION

In response to the need for new transonic wind tunnels which are capable of more nearly matching the flight Reynolds numbers of current and future air vehicles, the Langley Research Center has been studying and developing the cryogenic wind-tunnel concept. References 1 to 4 describe the cryogenic tunnel concept and the advantages of such a tunnel. As explained in reference 2, the method of cooling developed at the Langley Research Center consists of spraying liquid nitrogen directly into the tunnel circuit. With this procedure, the test gas is dry nitrogen, and the tunnel can be operated at constant temperatures within the range from near 300 K down to saturation (approximately 80 K). Because of various practical considerations such as tunnel drive power and model strength limitations, a maximum tunnel operating pressure of less than 10 atm (1 atm = 101.32 kPa) is anticipated. Even for this limited pressure range, cryogenic nitrogen does not have the characteristics of an ideal diatomic gas; cryogenic nitrogen has both thermal imperfections (compressibility factor not equal to 1, fig. 1(a)) and caloric imperfections (specific heats not constant, fig. 1(b)).

A study was therefore made to determine to what extent one-dimensional flows are affected by these real-gas imperfections. Selected results covering the operating range of the Langley 1/3-meter transonic cryogenic tunnel, published in references 1 to 3, indicate that cryogenic nitrogen is a valid test gas for these conditions. This paper presents the procedures used and extends the results to cover a wider range of conditions.

Since air at the temperatures and pressures of transonic flight has essentially the characteristics of an ideal diatomic gas, the approach used here compares the real-gas isentropic and normal-shock flow solutions for nitrogen with the ideal diatomic gas solutions. The real-gas solutions are obtained by using the thermodynamic properties for nitrogen as given by Jacobsen (ref. 5).

Solutions covering transonic Mach numbers and a range of stagnation temperatures from 300 K to saturation and stagnation pressures from 1 to 30 atm are presented in tabular form. The pressure range is extended beyond that which is set by model and model support strength considerations. Figures are presented for a pressure range from 1 to 10 atm to illustrate the deviations from the ideal-gas solutions as a function of the various tunnel operating parameters.

SYMBOLS

A	area
a	speed of sound (equal to W in table I)
C_p	pressure coefficient, $\frac{p - p_\infty}{q_\infty}$
c	length of airfoil or stream tube
c_p	specific heat at constant pressure
c_v	specific heat at constant volume
H	enthalpy
M	Mach number
p	pressure
q	dynamic pressure
R	Reynolds number per unit length

$\mathcal{R}$ gas constant for nitrogen, 296.791 m^2/sec^2-K or 2.92909×-10^{-3} atm-m^3/kg-K

S entropy

T temperature

U internal energy

V flow velocity

$\bar{v}$ specific volume, $1/\rho$

x linear dimension along airfoil chord or along stream-tube axis of symmetry

Z compressibility factor, pv/RT

α isentropic expansion coefficient, $p = \rho^{\alpha}$(Constant)

γ ratio of specific heats, c_p/c_v

μ viscosity

ρ density (equal to D in tables I and II)

Subscripts:

* based on conditions at M = 1.0

a,b signifies iterative values

L local Mach number

N nitrogen

∞	free stream
t	stagnation conditions
1	conditions upstream of shock
2	conditions downstream of shock

ISENTROPIC FLOW

Exact real-gas solutions can be obtained for one-dimensional isentropic flow because of the relative simplicity of this flow. The more complicated two- and three-dimensional flows that occur in wind-tunnel tests pose a higher order of difficulty for exact real-gas analyses. Comparisons of the real-gas solutions for one-dimensional isentropic flows for nitrogen with those solutions for the ideal diatomic gas can give an indication of the order of magnitude of the real-gas effects for the more complicated flows. The applicable energy equation for isentropic flow is

$$H + \frac{V^2}{2} = H_t \tag{1}$$

Ideal-Gas Solutions

An ideal gas, as defined here, is one that is both thermally and calorically perfect. Ideal gases have certain characteristics that make possible the transformation of equation (1) into more usable equations which express p, T, and ρ in terms of their corresponding stagnation value, Mach number, and specific heat ratio. These characteristics, which can be found in most gas dynamics textbooks (see, for example, ref. 6), are stated briefly as follows:

For thermally perfect gases,

(1) the thermal equation of state is $pv = \mathcal{R}T$;

(2) the caloric equation of state is $U = U(T)$ rather than $U = U(p,T)$ or $H = H(T)$ rather than $H = H(p,T)$;

(3) the specific heats are a function of temperature only $\left(c_p = \frac{dH}{dT} \text{ and } c_v = \frac{dU}{dT}\right)$ and are related by the equation $c_p - c_v = \mathcal{R}$.

For calorically perfect gases, the specific heats c_p and c_v are independent of both temperature and pressure and, therefore, are constant. For a gas to be calorically perfect, it must also be thermally perfect.

As a result of these ideal-gas characteristics, the fundamental equations for isentropic flow of an ideal gas are

$$p = \rho^{\gamma}(\text{Constant}) = T^{\frac{\gamma}{\gamma-1}}(\text{Constant})$$

$$a = \sqrt{\left(\frac{\partial p}{\partial \rho}\right)_S} = \sqrt{\gamma \mathcal{R} T}$$

$$\frac{T}{T_t} = \left[1 + 0.5(\gamma - 1)M^2\right]^{-1} \tag{2}$$

$$\frac{p}{p_t} = \left[1 + 0.5(\gamma - 1)M^2\right]^{\frac{-\gamma}{\gamma-1}} \tag{3}$$

$$\frac{\rho}{\rho t} = \left[1 + 0.5(\gamma - 1)M^2\right]^{\frac{-1}{\gamma-1}} \tag{4}$$

$$\frac{A}{A_*} = \frac{1}{M}\left(\frac{\gamma + 1}{2}\right)^{\frac{\gamma+1}{2(1-\gamma)}} \left[1 + 0.5(\gamma - 1)M^2\right]^{\frac{\gamma+1}{2(\gamma-1)}} \tag{5}$$

The isentropic flow parameters (eqs. (2) to (5)) for ideal gases are a function of Mach number and specific heat ratio γ only. The value of γ depends on the number of degrees of freedom associated with the molecule. As mentioned earlier, air at the pressures and temperatures of atmospheric flight has the characteristics of an ideal diatomic gas for which the value of γ is 1.4. Therefore, solutions to equations (2) to (5) for a γ of 1.4 are compared with the real-gas solutions for cryogenic nitrogen.

Real-Gas Solutions

Real-gas solutions to the energy equation cannot be expressed in such simplified forms because the thermal equation of state $p = p(\rho,T)$ typically has many terms on the right-hand side of the equation in order to describe adequately the variation of pressure with density and temperature over a wide range of these variables. Because of this complication, the thermodynamic properties such as internal energy, enthalpy, entropy, and the specific heats are also complicated functions of density and temperature. Therefore, solutions to the adiabatic energy equation are made by using a high-speed digital computer and iterative techniques.

For the present analysis, Jacobsen's equation of state for nitrogen (ref. 5) is used. This equation was developed with a simultaneous fitting procedure where $p - \rho - T$ data, specific heat data c_v, and the criteria for phase equilibrium between saturated liquid and saturated vapor points were used. The specific heat data were used primarily to give an equation of state which exhibited the proper behavior of the first and second derivatives so that the calculated properties using these derivatives would be accurate. The density prediction accuracy of this equation of state is estimated to be within 0.2 percent for the temperature and pressure ranges covered in this report. Reference 5 also includes equations for the calculation of all the thermodynamic properties of nitrogen along with details (ref. 5, appendix D) of

the functions for evaluating the integrals and derivatives which appear in the equations.

In the present analysis, extensive use is made of a National Bureau of Standards computer program which was based on Jacobsen's work. Extensions to this program permitted the adiabatic energy equation to be solved for the real gas, nitrogen. The flow chart given in figure 2 outlines the solution procedure.

Isentropic Flow Results

Real-gas isentropic flow solutions of the type just described have been obtained for expansions up to a Mach number of 2.0; this level is about the maximum local Mach number encountered in transonic testing. These solutions cover stagnation pressures from 1 to 30 atm and stagnation temperatures from 90 to 300 K. The pressure range is extended well beyond that anticipated for a transonic cryogenic wind tunnel so that flow solutions at constant unit Reynolds numbers could be compared over a wide range of temperatures. These flow solutions are presented in table I. The table key presented prior to the table gives the subdivisions and the parameters that are listed.

The isentropic flow solutions are analyzed in the following manner. First, the deviation from the ideal diatomic gas values is presented for a range of wind-tunnel operating conditions including conditions of constant unit Reynolds number. Second, the implications of the deviations with regard to the adequacy of cryogenic nitrogen as a transonic test gas are illustrated by expanding nitrogen analytically through a contoured stream tube at various stagnation conditions. And, finally, the isentropic expansion coefficients for nitrogen are compared with the specific heat ratios for the same conditions.

Deviation of Isentropic Flow Parameters

The deviation of each of the isentropic flow parameters for nitrogen from the corresponding ideal-gas value is illustrated in four summary figures. The stagnation-pressure range (1 to 10 atm) covers the extremes in pressure anticipated for transonic cryogenic wind tunnels. For the comparisons at constant unit Reynolds numbers, the pressures have been allowed to go beyond this range. The lower temperature limits correspond to conditions of saturation.

Pressure ratio p/p_t.- In the temperature range of interest for cryogenic testing (that is, below about 150 K), the deviation of this parameter from the ideal value increases with decreasing temperature and with increasing pressure (fig. 3). For conditions of constant unit Reynolds number (fig. 4), the deviations of the pressure ratio at saturation temperatures are in the same order as those at ambient temperatures (300 K). This result indicates that the real-gas effects for the high-pressure, ambient-temperature approach of achieving higher test Reynolds numbers are of the same order of magnitude as for the cryogenic wind-tunnel approach.

The effect of Mach number on the deviation of the pressure ratio is not systematic (fig. 5). At temperatures near saturation, the deviation does increase with increasing Mach number, but because the saturation temperature is higher at the higher Mach numbers, the maximum deviation does not occur at the highest Mach number (2.0). A maximum deviation of 0.8 percent occurs at the saturation temperature for a Mach number of about 1.4 (fig. 6; 10 atm). At $M = 1.4$, this deviation is equivalent to a Mach number difference in the ideal gas of 0.006 or to the difference which occurs when a different ideal gas having a $\gamma \approx 1.380$ is used.

Temperature ratio T/T_t.- Figures 7 to 10 show the real-gas effects on the temperature ratio. The deviation of the temperature ratio increases with increases in stagnation pressure (fig. 7), with increases in Mach number (fig. 9), and with

decreases in temperature (figs. 7 and 9). At constant unit Reynolds numbers (fig. 8), the deviation of this ratio is nearly independent of stagnation temperature, slightly less deviation occurring at temperatures near saturation. The maximum deviation of this parameter is about 1.2 percent (fig. 10). At $M = 2.0$, this deviation is equivalent to a difference in Mach number in the ideal gas of 0.03 or to the difference which occurs when a different ideal gas having a $\gamma \approx 1.411$ is used.

Density ratio ρ/ρ_t.- Figures 11 to 14 show the real-gas effects on the density ratio. The deviations of this parameter are generally less at cryogenic temperatures (near saturation) than at ambient temperatures (fig. 11). The deviations increase with stagnation pressure and generally increase with increasing Mach number (fig. 13). At constant unit Reynolds numbers (fig. 12), the deviation is much less at cryogenic temperatures than at ambient temperatures. The maximum deviations occur at ambient temperatures and high Mach numbers (fig. 13). At $M = 2.0$, $p_t = 10$ atm, and $T_t = 300$ K, the deviation (from table I) is about 0.9 percent. This deviation is equivalent to a difference in Mach number of 0.007 or to the difference which occurs when a different ideal gas having a $\gamma \approx 1.410$ is used.

Stream-tube area ratio A/A_*.- Figures 15 to 18 show the real-gas effects on the stream-tube area ratio. Since this parameter is normalized by conditions at $M = 1.0$, comparisons at other Mach numbers are significant. Increasing stagnation pressure generally increases the deviation of this parameter (fig. 15). The effect of reducing stagnation temperature is generally one of reducing the deviations (fig. 17). At constant unit Reynolds numbers (fig. 16), the deviations at saturation temperatures are considerably less than those at ambient temperatures. For the 10-atm pressure range, the maximum deviation is about 0.3 percent (fig. 15). For the $M = 2.0$ saturation-temperature case (fig. 17), the observed 0.3 percent is equivalent to a difference in Mach number in the ideal gas of 0.004 or to the differ-

ence which occurs when a different ideal gas having a $\gamma \approx 1.396$ is used.

Summary.- For the temperature range from ambient (300 K) down to saturation, the following table gives the maximum deviation of the various isentropic parameters for 5- and 10-atm pressure:

Isentropic parameters	Maximum deviation in percent at -	
	p_t = 5 atm	p_t = 10 atm
p/p_t	0.5	0.8
T/T_t	-0.7	-1.2
ρ/ρ_t	0.4	0.9
A/A_*	±0.2	±0.3

The values at 5 atm are given because this pressure is the maximum operating pressure of the existing Langley 1/3-meter transonic cryogenic tunnel (ref. 3; formerly known as the Langley pilot transonic cryogenic tunnel) and, at this time, no apparent problems of flow simulation have been detected in the various experimental investigations performed in this facility.

Stream-Tube Analysis

The potential user of a transonic tunnel which uses cryogenic nitrogen as the test gas is concerned with how much these real-gas deviations affect the pressure distributions or force measurements of an aerodynamic test. To obtain some indication of how much the pressure distribution of an airfoil might be affected by testing in a cryogenic nitrogen tunnel, it is possible to study analytically the expansion of nitrogen through an especially contoured stream tube and to compare the resulting pressure distribution with that obtained when an ideal diatomic gas is expanded through the same stream tube. The area distribution of such a stream tube would be such that as the ideal gas

expands through it, some typical wing pressure distribution is obtained. This analysis is not entirely rigorous because it assumes streamline similarity of gases as they flow over the airfoil, but it probably does give the approximate values of the expected differences in the pressure distribution.

The pressure distribution selected for the analysis is shown in figure 19. This distribution is representative of one obtained on an airfoil in wind-tunnel tests at a Mach number of 0.90 and at high lift conditions. It was chosen primarily because of the wide range of local Mach numbers. Figure 20 shows the effective area distribution in terms of A/A_* of a stream tube which would give the same pressure distribution when the ideal gas is expanded through the stream tube.

First, nitrogen is analytically expanded through this stream tube for stagnation pressures to 10 atm and at temperatures which are near the saturation temperature associated with the maximum local Mach number. Figure 21 gives the resulting pressure distributions relative to the ideal-gas pressure distribution. The deviation of the pressure coefficients increases with increased stagnation pressure, and the maximum deviation of about 0.6 percent occurs at 10 atm and at locations where the Mach number is near free stream.

The effect of variations of stagnation temperature on the stream-tube pressure distribution is shown in figure 22 for 8-atm pressure. At 300 K, the values of the pressure coefficient c_p are about 0.7 percent lower than those for the ideal gas. As stagnation temperature is reduced, the pressure coefficients along the stream tube increase. At 145 K, the coefficients are at most 0.4 percent lower than the ideal value. As stagnation temperature is reduced further, the gas in the high Mach number region reaches saturation temperatures. Since, in the computer program, the gaseous thermodynamic properties can only be determined for temperatures equal to or above the saturation temperature, the pressure coefficients could not be computed for this region of the stream tube. Tests made in the Langley 1/3-meter transonic cryogenic

tunnel (ref. 7) show that tests of an airfoil can be made at temperatures near free-stream saturation temperatures without any significant effects on airfoil pressure distribution caused by liquefaction. For this reason, the lower stagnation-temperature pressure distributions are presented for that portion of the nozzle for which the flow solutions could be obtained. For these temperatures that approach the free-stream saturation temperature, the pressure coefficients become greater than those for the ideal gas. In the low Mach number region of the stream tube the deviation from the ideal is only about 0.2 or 0.3 percent. However, if these curves are extrapolated into the high Mach number region, the deviation might be approximately 1 percent. This deviation is slightly higher than that at ambient temperatures, but is probably not of consequence for most wind-tunnel investigations.

The stream-tube pressure distributions for different combinations of stagnation temperature and pressure which result in a constant unit Reynolds number of 400×10^6 per meter at $M_\infty = 0.90$ are presented in figure 23. At ambient temperatures (300 K) and at the pressure required to achieve this unit Reynolds number, the stream-tube pressure coefficients can be as much as 2.5 percent lower than those coefficients for the ideal gas. At 150 K (near the onset of local saturation), the pressure coefficients are at most 0.8 percent lower than the ideal values. At a temperature near free-stream saturation (115 K), the deviation is about 0.3 percent in the low Mach number regions of the stream tube and, if extrapolated into the high Mach number region, the deviation again would probably be about 1 percent.

Figure 23 and others (figs. 4, 8, 12, and 16) show that when a transonic tunnel capable of achieving a given unit Reynolds number is considered, the real-gas effects of nitrogen for isentropic flow are less than at ambient temperatures, where the desired unit Reynolds number must be achieved through greatly increased operating pressure. This result is consistent with the desire to operate at low pressures because of model and balance strength considerations.

The maximum deviations of the pressure coefficients for the stream-tube expansions of nitrogen at cryogenic temperatures are about 1 percent. Assuming that these deviations are indicative of the maximum deviations of the pressure coefficients on an airfoil as a result of the real-gas effects in the isentropic flow field, then this error would not, in most cases, be larger than the other uncertainties encountered in transonic wind-tunnel testing.

Isentropic Expansion Coefficients

As previously mentioned, for an ideal gas expanding isentropically, pressure and density are related by $p = \rho^{\gamma}(\text{Constant})$. The coefficient is constant along the isentrope and is equal to the specific heat ratio. The caloric imperfections of nitrogen at cryogenic temperatures were noted earlier (fig. 1(b)). With γ varying thus with pressure and temperature, it might be anticipated that this exponential equation would no longer be valid and that the isentropic flow solutions for nitrogen might deviate considerably more from the ideal solutions than they do.

Woolley and Benedict (ref. 8) indicate that this exponential equation may still adequately describe the pressure-density relationship for real-gas isentropic expansions, but the exponent would no longer be equal to the specific heat ratio. These authors defined this real-gas exponent as the isentropic expansion coefficient α. They further indicated that the usual ideal-gas formulas may be adequately valid if α rather than γ is used.

The equations given by Woolley and Benedict for calculating α are

$$\alpha = \frac{\gamma\left[Z - v\left(\frac{\partial Z}{\partial v}\right)_T\right]}{Z}$$

and

$$\alpha = \frac{\gamma Z}{Z - p\left(\frac{\partial Z}{\partial p}\right)_T}$$

Since, for the present analysis, the real-gas isentropic flow solutions have been obtained and the variation of pressure with density is known, it is much easier to determine α from the equation

$$\alpha = \frac{\ln(p3/p4)}{\ln(\rho 3/\rho 4)} \tag{6}$$

where states 3 and 4 represent an increment along an isentrope that is equivalent to 0.05 in Mach number. The isentropic expansion coefficients that were obtained by use of equation (6) and the real-gas solutions are presented in figure 24. In this case, the isentropes begin at a stagnation temperature of 130 K and at various values of stagnation pressure. This temperature is chosen because it allows expansions to near $M = 2.0$ before saturation takes place. The deviation of α along the isentrope is dependent on the pressure; at the highest pressure, α varies by about 2.5 percent over the Mach number range (extrapolated from $M = 1.6$ to $M = 2.0$).

The degree to which α remains constant for isentropes which begin at 8 atm and at various stagnation temperatures is shown in figure 25. The levels of α vary slightly with temperature, but the degree of constancy along the isentrope is not a strong function of temperature. At 300 K, the variation is about 1 percent, while at 120 K the variation is about 2.0 percent if the curves are extrapolated to cover Mach numbers to 2.0. For these isentropic expansions to Mach 2.0 (figs. 24 and 25), the maximum variation of the coefficients is about 2.5 percent. For the Mach range under consideration, the isentropic

flow parameters are rather weak functions of γ, and this amount of variation is not very significant.

Figure 26 shows the variation of the isentropic expansion coefficients with stagnation temperature for various stagnation pressures. These coefficients are taken at the Mach 1.0 position on the isentropes because the coefficients at this position are representative of an average value for the isentrope. These coefficients remain surprisingly close to the ideal diatomic gas value of 1.4, especially in view of the large variations of the specific heat ratios shown in figure 1(b). These results indicate that nitrogen at the temperatures and pressures of interest for wind tunnels expands very much like an ideal diatomic gas with a γ of 1.4.

An indication of the accuracy of isentropic flow solutions made by using these expansion coefficients in combination with the usual ideal-gas equations can be obtained by comparing these solutions with the real-gas solutions. Also, as a matter of interest, these solutions can be compared with those obtained by using the actual values of γ in the ideal-gas equations. As an example, stagnation conditions of 8 atm and 120 K are chosen. From figures 1(b) and 26, the values of γ and α are 1.565 and 1.389, respectively. The isentropic flow parameters resulting from solutions obtained as described and from the real-gas solutions are shown in figure 27. These parameters (p/p_t, T/T_t, ρ/ρ_t, and A/A_*) are presented in relation to their ideal diatomic gas value. The use of the expansion coefficient in the ideal-gas equations gives results that approximate the real-gas solutions to within about 1 percent. On the other hand, it is clearly indicated that the use of the actual γ in the ideal-gas equations gives erroneous indications of the magnitude of real-gas effects.

FLOW THROUGH NORMAL SHOCKS

Across a normal shock the conservation equations for mass, momentum, and energy must be satisfied. These equations are as follows:

Mass

$$\rho_1 V_1 = \rho_2 V_2$$

Momentum

$$p_1 + \rho_1 V_1^2 = p_2 + \rho_2 V_2^2$$

Energy

$$H_1 + \frac{V_1^2}{2} = H_2 + \frac{V_2^2}{2} = H_t$$

These equations, together with the caloric equation of state $H = H(p,T)$ and the thermal equation of state $p = p(\rho,T)$, can be solved simultaneously for the five downstream flow parameters p_2, ρ_2, V_2, H_2, and T_2.

Ideal-Gas Solutions

Because of the simplicity of the caloric and thermal equations of state for an ideal gas, the five equations can be solved readily and the flow parameters downstream of the shock can be expressed as a function of the upstream value, the upstream Mach number, and the specific heat ratio of the gas. These equations are

$$\frac{p_2}{p_1} = \frac{2\gamma M_1^2 - (\gamma - 1)}{\gamma + 1}$$

$$\frac{\rho_2}{\rho_1} = \frac{V_1}{V_2} = \frac{(\gamma + 1)M_1^2}{(\gamma - 1)M_1^2 + 2}$$

$$\frac{T_2}{T_1} = \frac{\left[2\gamma M_1^2 - (\gamma - 1)\right]\left[(\gamma - 1)M_1^2 + 2\right]}{(\gamma + 1)^2 M_1^2}$$

$$\frac{M_2}{M_1} = \left[\frac{(\gamma - 1)M_1^2 + 2}{2\gamma M_1^2 - (\gamma - 1)}\right]^{0.5} \frac{1}{M_1}$$

From the energy equation it is apparent that

$$H_{t,1} = H_{t,2}$$

and since for an ideal gas, $c_p T_t = H_t$, then

$$T_{t,1} = T_{t,2}$$

The other stagnation or total conditions are determined by analytically bringing the downstream flow to rest isentropically. The following is the resulting expression for the stagnation pressure and density which is in terms of the upstream value, the upstream Mach number, and the specific heat ratio of the gas:

$$\frac{p_{t,2}}{p_{t,1}} = \frac{\rho_{t,2}}{\rho_{t,1}} = \left[\frac{(\gamma + 1)M_1^2}{(\gamma - 1)M_1^2 + 2}\right]^{\frac{\gamma}{\gamma-1}} \left[\frac{\gamma + 1}{2\gamma M_1^2 - (\gamma - 1)}\right]^{\frac{1}{\gamma-1}}$$

Many ideal-gas normal-shock tables have been generated by using equations similar to those given above. The table in reference 9, for example, is for an ideal diatomic gas.

Real-Gas Solutions

Because of the complexity of the thermal and caloric equations of state of a real gas, the real-gas normal-shock solutions are much more difficult to obtain. The simultaneous solution of the five pertinent equations is best accomplished by a high-speed digital computer using iterative solution techniques. For the real-gas normal-shock solutions of the present analysis, the thermodynamic equations for nitrogen (as given by Jacobsen, ref. 5) are again used. As was the case for the isentropic flow solutions, extensive use is made of a National Bureau of Standards program based on Jacobsen's equations.

The five basic equations that must be solved simultaneously are written again thusly:

Mass

$$C_1 = \rho_1 V_1 = \rho_2 V_2 \tag{7}$$

Momentum

$$C_2 = p_1 + \rho_1 V_1^2 = p_2 + \rho_2 V_2^2 \tag{8}$$

Energy

$$C_3 = \frac{V_1^2}{2} + H_1 = \frac{V_2^2}{2} + H_2 \tag{9}$$

Thermal equation of state

$$p_2 = f(\rho_2, T_2) \tag{10}$$

Caloric equation of state

$$H_2 = f(\rho_2, T_2) \tag{11}$$

By combining equation (7) with equations (8) and (9), respectively, the following two equations are formed:

$$\rho_2 = \frac{C_1^2}{C_2 - p_2} \tag{12}$$

$$H_2 = C_3 - \frac{C_1^2}{2\rho_2^2} \tag{13}$$

This procedure reduces the problem to one of solving four equations (eqs. (10), (11), (12), and (13)) for the four unknowns ρ_2, H_2, p_2, and T_2. The iterative procedure that is used in solving these equations is outlined in the flow chart of figure 28. When this iterative procedure converges, all the local flow properties downstream of the shock are known, and the total or stagnation quantities can be determined from isentropic considerations.

Real-gas normal-shock solutions have been obtained by use of these procedures and the solutions are presented in tables II to XI. These tables cover ranges of stagnation temperature and pressure from 100 to 300 K and 1.0 to 30.0 atm, respectively. The details of the tables are given in the key preceding table II.

Normal-Shock Results

The results of the real-gas normal-shock solutions are presented in two parts. First, summary plots are presented to illustrate the magnitude of real-gas effects on the various normal-shock parameters. These plots are in terms of the deviations from the corresponding ideal-gas values. These parameters are shown as a function of stagnation pressure, stagnation temperature, and upstream Mach number. Second, the magnitude of the real-gas effects is illustrated by looking at the flow

parameters in a supersonic stream tube where normal shocks are assumed to occur.

Although the tabulated solutions cover a wide range of variables, this analysis covers the extreme ranges anticipated for a transonic cryogenic tunnel. The stagnation pressure and temperature ranges are from 1 to 10 atm and from 300 K to saturation temperatures, respectively, and the upstream Mach number range is from 1.0 to 2.0.

Plots of Shock Parameters

Pressure ratios p_2/p_1 and $p_{t,2}/p_{t,1}$.- The deviations of the static-pressure ratio across normal shocks from the ideal diatomic gas values are shown in figures 29 and 30. The static-pressure ratio for nitrogen is always less than the corresponding ideal-gas value. The deviation increases with increasing stagnation pressure (fig. 29), decreasing stagnation temperature (fig. 29), and increasing upstream Mach number (fig. 30). The maximum deviation of this pressure ratio is about 0.7 percent. For an ideal gas at $M_1 = 1.7$, this deviation is equivalent to a difference in upstream Mach number of about 0.006 or to the difference which occurs when a different ideal gas having a $\gamma \approx 1.370$ is used.

The deviations of the stagnation-pressure ratio across normal shocks from the ideal-gas values are shown in figures 31 and 32. The deviations of this parameter are rather insignificant (0.2 percent or less) for the entire range of conditions considered.

Temperature ratios T_2/T_1 and $T_{t,2}/T_{t,1}$.- The real-gas effects on the static-temperature ratios across normal shocks are shown in figures 33 and 34. The direction of the deviations is very much dependent on all three independent variables. Again, the magnitude of deviation is rather small (0.5 percent or less). For an ideal gas at $M_1 = 2.0$, the maximum deviation is equivalent to a change in upstream Mach number of 0.01 or to using a different ideal gas having a $\gamma \approx 1.395$.

The deviations of the stagnation-temperature ratios across normal shocks are shown in figures 35 and 36. For the ideal-gas case, $(T_{t,2}/T_{t,1}) \equiv 1$. The stagnation-temperature ratios for nitrogen are less than 1.0. The deviation increases with increases in stagnation pressure and upstream Mach number and with decreases in stagnation temperature. A maximum deviation of about 1.4 percent occurs at $p_{t,1} = 10$ atm, $M_1 = 2.0$, and near saturation temperatures (from table II E). The deviations of the total-temperature ratio are considerably larger than those for the static-temperature ratio. This result is caused by the generally lower temperatures ahead of the shock (fig. 9; isentropic solutions) and the small deviations in static-temperature ratio across the shock (fig. 34).

Density ratios ρ_2/ρ_1 and $\rho_{t,2}/\rho_{t,1}$.- The real-gas effects on the static-density ratio across normal shocks are shown in figures 37 and 38. The deviations of this parameter are greater at ambient temperatures than at cryogenic temperatures. The deviations are basically independent of upstream Mach number and generally increase with increased stagnation pressure. The maximum deviation of about 0.4 percent is equivalent to a difference in upstream Mach number of 0.007 or to using a different ideal gas having a $\gamma \approx 1.406$.

The real-gas effects on the total-density ratios across normal shocks are shown in figures 39 and 40. Again, the deviations of the total-density ratio are greater at ambient temperatures than at cryogenic temperatures, but the maximum deviation is only about 0.4 percent.

Downstream Mach number M_2.- The real-gas effects on this parameter are so small that only one curve is presented in figure 41 to illustrate this fact. For 10 atm and an upstream Mach number of 2.0, the deviation throughout the stagnation-temperature range is no greater than about 0.06 percent.

Summary.- The following table gives a summary of the maximum deviations of the various normal-shock parameters for 5- and 10-atm stagnation pressure:

Normal shock parameters	Maximum deviation in percent at -	
	$p_{t,1}$ = 5 atm	$p_{t,1}$ = 10 atm
p_2/p_1	-0.4	-0.7
T_2/T_1	-0.4	-0.5
ρ_2/ρ_1	-0.2	-0.5
$p_{t,2}/p_{t,1}$	0.1	0.2
$T_{t,2}/T_{t,1}$	-0.9	-1.4
$\rho_{t,2}/\rho_{t,1}$	0.2	0.4
M_2	0.0	-0.1

Supersonic Stream Tube With Normal Shocks

The magnitudes of the real-gas effects of cryogenic nitrogen on the various normal-shock parameters are summarized in the preceding section, but a clearer picture of these effects may be obtained by examining the flow in a supersonic stream tube where normal shocks are assumed to occur. The effective area distribution of the stream tube chosen for analysis is shown in figure 42. The flow is assumed to be one-dimensional and the solution to the flow properties along the stream tube is a combination of the isentropic solutions and the normal-shock solutions which have been outlined previously. For the shock-free case, the exit Mach number of this stream tube is about 2.0.

The procedure is to choose a shock location in the stream tube and then to make the flow solutions for both the nitrogen and ideal-gas cases. The shock location chosen for illustration purposes is the point at which the upstream Mach number for nitrogen is 1.7. The difference in the flow properties along the stream tube for the two cases is then taken to be an indication of the real-gas effects.

Two sets of stagnation conditions are chosen for analysis so that the effects of stagnation temperature at 8-atm pressure and the effect of stagnation pressure at a temperature of 150 K can be determined. Flow solutions for the stream tube with no

shocks are also included in this analysis. The following summary lists the figures which illustrate the deviations of each of the stream-tube parameters from the ideal value:

Parameter:	Figures
Static pressure	43 to 44
Static temperature	45 to 46
Static density	47 to 48
Mach number	49 to 50

Each of these figures shows the deviations in the isentropic flow solutions (shock-free solutions), the deviations in the ratios across the shock (length of the vertical line at the shock location), and the deviations in the value of the parameter downstream of the shock.

The static pressures in the stream tube for the shock-free case are generally higher for nitrogen than for the ideal gas. However, the maximum deviation which occurs at the highest stagnation pressure and lowest stagnation temperature is only about 0.8 percent. For these same stagnation conditions, the pressure ratio across the shock is lower than the ideal value by about the same percentage. This combination of results causes the pressures downstream of the shock to be almost identical to those for the ideal-gas case (within 0.1 percent). The lack of appreciable shock movement for this wide range of conditions should also be noted in figures 43 and 44. The nominal shock position is at an x/c of 0.345. Computed results indicate movement to be less than 0.8 percent.

The static temperatures in the stream tube for the shock-free case are always lower for nitrogen than for the ideal gas. The deviation of the temperature reaches about 1.0 percent at the stream-tube exit and at high stagnation pressures and low stagnation temperatures. The temperature ratios across the shock are about the same for nitrogen as for the ideal gas (relatively short

vertical lines at shock location). Consequently, the deviations of the temperatures downstream of the shock are about the same magnitude as for the shock-free case (about 1.0 percent).

The deviations in the static densities and Mach numbers along the stream tube are considerably smaller than those for static pressure and temperature and, as a result, are presented without comment.

CONCLUDING REMARKS

Real-gas calculations of one-dimensional isentropic and normal-shock flows of nitrogen gas are presented. The solutions are compared with the corresponding ideal diatomic gas solutions; tables of the comparative solutions are presented for a wide range of stagnation temperatures and pressures. To obtain an indication of the possible errors in inviscid flow simulation in a transonic cryogenic tunnel, an analysis of these solutions is made for ranges of temperature (300 K to liquefaction), pressure (1 to 10 atm), and Mach number (up to 2.0). These ranges encompass those conditions currently being considered in cryogenic tunnel designs. For the range of conditions considered, this analysis leads to the following conclusions:

1. The deviations in the isentropic and normal-shock parameters caused by the real-gas characteristics of nitrogen are small (about 1.0 percent or less). Errors in cryogenic-tunnel flow simulation of this magnitude would be insignificant for most wind-tunnel investigations.

2. The deviations of nitrogen from ideal-gas behavior (compressibility factor not equal to 1, ratio of specific heats not constant) do not cause nearly as much difference in isentropic and normal-shock flow solutions as might be anticipated from the erroneous use of ideal equations combined with the real values of specific heat ratios. The isentropic expansion coefficients

remain very near the ideal-gas value of 1.4, even though the specific heat ratios are as high as 1.7.

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APPENDIX

VISCOSITY OF NITROGEN

To calculate unit Reynolds numbers for various conditions in this report, the viscosity equation for nitrogen (ref. 10) was used. This equation is

$$\mu = \mu(T) + \Delta\mu(\rho, T)$$

where μ is in 10^2 N-sec/m^2, T is in K, and ρ is in g/cm^3. The first term $\mu(T)$ is called the dilute gas contribution (i.e., low densities) and is given by

$$\mu(T) = \sum_{i=1}^{9} C_i T^{(i-3)}$$

The C constants are as follows:

$$C_1 = 7.4165322904 \times 10^{1}$$

$$C_2 = -1.5834400475$$

$$C_3 = 3.8530771011 \times 10^{-3}$$

$$C_4 = 8.0133713668 \times 10^{-4}$$

$$C_5 = -8.9203123846 \times 10^{-7}$$

$$C_6 = 8.9059711315 \times 10^{-10}$$

$$C_7 = -5.3779372664 \times 10^{-13}$$

$$C_8 = 1.7398277309 \times 10^{-16}$$

$$C_9 = -2.3084044942 \times 10^{-20}$$

The second term $\Delta\mu(\rho,T)$ is called the dense fluid contribution and, as pointed out in reference 10, the temperature dependence of this term is extremely small for nitrogen and has been neglected. Therefore, this term is given by the following expression:

$$\Delta\mu(\rho,T) \simeq \Delta\mu(\rho) = \sum_{i=1}^{7} D_i \rho^i$$

The D constants are as follows:

$$D_1 = 2.3083514362 \times 10^{-1}$$

$$D_2 = -9.3636207171 \times 10^{-1}$$

$$D_3 = 9.0339186452$$

$$D_4 = -4.1832067163 \times 10$$

$$D_5 = 1.0897627893 \times 10^{2}$$

$$D_6 = -1.2913856376 \times 10^{2}$$

$$D_7 = 5.9782049913 \times 10$$

The viscosities of nitrogen as determined from this equation and the equation of state for nitrogen (ref. 5) are presented in figure 51 as a function of temperature and pressure (1 to 10 atm). At temperatures near saturation, increasing the pressure to 10 atm increases the viscosity by about 10 percent over the value at 1 atm. This viscosity equation is believed to predict values within about ±2 percent in this pressure and temperature range.

APPENDIX

It should be noted that for a gas to simulate the viscous characteristics of air at near-ambient temperature conditions adequately, the slope of the viscosity-temperature curve at a given temperature must be similar to the slope for air at ambient temperatures. For comparison purposes, the viscosity curve for air (Sutherland formula, ref. 9) is also presented in figure 51. It is interesting to note that as pressure is increased at cryogenic temperatures, the slope of the viscosity-temperature curve for nitrogen becomes even more like that for air at ambient temperatures.

REFERENCES

1. Kilgore, Robert Ashworth: The Cryogenic Wind Tunnel for High Reynolds Number Testing. Ph. D. Thesis, Southampton Univ., 1974. (Available as NASA TM X-70207.)
2. Kilgore, Robert A.; Goodyer, Michael J.; Adcock, Jerry B.; and Davenport, Edwin E.: The Cryogenic Wind-Tunnel Concept for High Reynolds Number Testing. NASA TN D-7762, 1974.
3. Kilgore, Robert A.; Adcock, Jerry B.; and Ray, Edward J.: Simulation of Flight Test Conditions in the Langley Pilot Transonic Cryogenic Tunnel. NASA TN D-7811, 1974.
4. Smelt, R.: Power Economy in High-Speed Wind Tunnels by Choice of Working Fluid and Temperature. Rep. No. Aero. 2081, British R.A.E., Aug. 1945.
5. Jacobsen, Richard T.: The Thermodynamic Properties of Nitrogen From 65 to 2000 K With Pressures to 10,000 Atmospheres. Ph. D. Thesis, Washington State Univ., 1972. (Available as NASA CR-128526.)
6. Liepmann, H. W.; and Roshko, A.: Elements of Gasdynamics. John Wiley & Sons, Inc., c.1957.
7. Ray, Edward J.; Kilgore, Robert A.; Adcock, Jerry B.; and Davenport, Edwin E.: Analysis of Validation Tests of the Langley Pilot Transonic Cryogenic Tunnel. NASA TN D-7828, 1975.
8. Woolley, Harold W.; and Benedict, William S.: Generalized Tables of Corrections to Thermodynamic Properties for Nonpolar Gases. NACA TN 3272, 1956.
9. Equations, Tables, and Charts for Compressible Flow. NACA Rep. 1135, 1953.
10. Jacobsen, R. T.; Stewart, R. B.; McCarty, R. D.; and Hanley, H. J. M.: Thermophysical Properties of Nitrogen From the Fusion Line to 3500 R (1944 K) for Pressures to 150 000 psia (10 342 × 10^5 N/m^2). NBS Tech. Note 648, U.S. Dep. Com., Dec. 1973.

TABLE KEY

This table is subdivided for various values of stagnation temperature.

Letter subdivision	A	B	C	D	E	F	G	H	I	J	K
T_t, K	90	100	110	120	130	140	150	175	200	250	300

Each page of the subdivision corresponds to a particular stagnation pressure. In addition to the isentropic flow parameters and their values relative to the ideal diatomic gas values, various other gas properties are also given.

TABLE NOMENCLATURE

ATM	1 atmosphere (1 atm = 101.32 kN/m^2)
A/A*	stream-tube area ratio (A*, area where M = 1.0)
DT	stagnation density
D/DT	ratio of static density to stagnation density
GAMMA	ratio of specific heats, $\frac{c_p}{c_v}$
KGM/M3	kilogram per cubic meter
PT	stagnation pressure
P/PT	ratio of static pressure to stagnation pressure
MACH	Mach number

REY/M	Reynolds number per meter (viscosity equation, appendix)
TT	stagnation temperature
T/TT	ratio of static temperature to stagnation temperature
W	speed of sound
Z	compressibility factor

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

A. TT = 90 K PT = 1 ATM DT = 3.899 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9728	1.4354	190.42	1.0000	1.0000	1.0000	I	.9847	1.0000	1.0000	1.0000	I
.050	6.000E+06	.9728	1.4354	190.38	.9983	.9995	.9988	11.5976	.9847	1.0000	1.0000	1.0000	1.0005
.100	1.196E+07	.9729	1.4353	190.24	.9931	.9980	.9950	5.8248	.9847	1.0000	1.0000	1.0000	1.0005
.150	1.786E+07	.9729	1.4353	190.00	.9845	.9955	.9889	3.9122	.9847	1.0001	1.0000	1.0000	1.0005
.200	2.365E+07	.9730	1.4352	189.67	.9726	.9920	.9803	2.9649	.9847	1.0001	1.0000	1.0001	1.0004
.250	2.929E+07	.9730	1.4351	189.25	.9577	.9876	.9695	2.4037	.9848	1.0002	.9999	1.0001	1.0004
.300	3.477E+07	.9731	1.4349	188.75	.9398	.9822	.9565	2.0358	.9848	1.0003	.9999	1.0001	1.0004
.350	4.005E+07	.9732	1.4347	188.15	.9192	.9760	.9414	1.7785	.9848	1.0004	.9999	1.0001	1.0003
.400	4.511E+07	.9733	1.4345	187.47	.8961	.9689	.9244	1.5905	.9848	1.0005	.9999	1.0002	1.0002
.450	4.991E+07	.9735	1.4343	186.71	.8707	.9609	.9055	1.4492	.9849	1.0005	.9998	1.0000	1.0004
.500	5.445E+07	.9736	1.4341	185.87	.8435	.9522	.8852	1.3403	.9849	1.0006	.9998	1.0000	1.0003
.550	5.870E+07	.9737	1.4338	184.96	.8147	.9427	.8634	1.2553	.9850	1.0007	.9998	1.0000	1.0003
.600	6.265E+07	.9739	1.4336	183.98	.7846	.9326	.8404	1.1885	.9850	1.0008	.9997	1.0000	1.0002
.650	6.630E+07	.9741	1.4333	182.92	.7535	.9218	.8164	1.1358	.9851	1.0009	.9997	1.0000	1.0002
.700	6.963E+07	.9743	1.4330	181.81	.7217	.9104	.7915	1.0945	.9851	1.0010	.9996	.9999	1.0002
.750	7.263E+07	.9744	1.4327	180.63	.6894	.8985	.7660	1.0625	.9852	1.0011	.9996	.9999	1.0001
.800	7.531E+07	.9746	1.4324	179.40	.6568	.8861	.7399	1.0383	.9853	1.0013	.9995	.9999	1.0001
.850	7.767E+07	.9748	1.4320	178.11	.6244	.8733	.7135	1.0207	.9854	1.0014	.9995	.9998	1.0000
.900	7.970E+07	.9751	1.4317	176.78	.5921	.8601	.6869	1.0089	.9854	1.0015	.9994	.9998	1.0000
.950	8.142E+07	.9753	1.4314	175.40	.5603	.8466	.6603	1.0022	.9855	1.0016	.9994	.9997	1.0000
1.000	8.284E+07	.9755	1.4311	173.99	.5292	.8328	.6337	1.0000	.9856	1.0017	.9993	.9996	1.0000
1.050	8.395E+07	.9757	1.4307	172.54	.4987	.8187	.6074	1.0020	.9857	1.0018	.9993	.9996	1.0000
1.100	8.477E+07	.9759	1.4304	171.05	.4692	.8045	.5814	1.0079	.9858	1.0018	.9992	.9995	1.0000
1.150	8.531E+07	.9762	1.4301	169.54	.4407	.7902	.5558	1.0175	.9859	1.0019	.9991	.9993	1.0000

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

B. TT = 100 K PT = 1 ATM DT = 3.483 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9801	1.4261	201.61	1.0000	1.0000	1.0000	I	.9891	1.0000	1.0000	1.0000	I
.050	5.137E+06	.9802	1.4261	201.56	.9983	.9995	.9988	11.5945	.9891	1.0000	1.0000	1.0000	1.0003
.100	1.024E+07	.9802	1.4261	201.41	.9931	.9980	.9950	5.8233	.9891	1.0000	1.0000	1.0000	1.0002
.150	1.529E+07	.9802	1.4260	201.16	.9845	.9955	.9889	3.9112	.9891	1.0001	1.0000	1.0000	1.0002
.200	2.025E+07	.9802	1.4259	200.81	.9726	.9920	.9803	2.9641	.9891	1.0001	1.0000	1.0001	1.0002
.250	2.508E+07	.9803	1.4258	200.37	.9576	.9876	.9695	2.4031	.9891	1.0002	.9999	1.0001	1.0002
.300	2.978E+07	.9803	1.4257	199.83	.9397	.9822	.9565	2.0353	.9891	1.0002	.9999	1.0001	1.0001
.350	3.430E+07	.9804	1.4256	199.20	.9191	.9760	.9414	1.7781	.9891	1.0003	.9999	1.0002	1.0001
.400	3.862E+07	.9805	1.4254	198.47	.8958	.9689	.9243	1.5906	.9891	1.0002	.9999	1.0000	1.0002
.450	4.274E+07	.9806	1.4252	197.66	.8705	.9609	.9055	1.4491	.9891	1.0003	.9998	1.0000	1.0002
.500	4.663E+07	.9807	1.4250	196.77	.8433	.9522	.8852	1.3402	.9892	1.0003	.9998	1.0000	1.0002
.550	5.028E+07	.9808	1.4248	195.80	.8145	.9427	.8634	1.2552	.9892	1.0004	.9997	1.0000	1.0002
.600	5.368E+07	.9809	1.4246	194.75	.7844	.9326	.8405	1.1885	.9892	1.0005	.9997	1.0000	1.0002
.650	5.681E+07	.9811	1.4244	193.63	.7533	.9218	.8164	1.1358	.9892	1.0005	.9996	1.0000	1.0001
.700	5.968E+07	.9812	1.4241	192.44	.7214	.9104	.7916	1.0946	.9893	1.0006	.9996	1.0000	1.0001
.750	6.227E+07	.9813	1.4239	191.19	.6891	.8985	.7660	1.0626	.9893	1.0007	.9995	.9999	1.0001
.800	6.459E+07	.9815	1.4236	189.88	.6566	.8861	.7400	1.0384	.9893	1.0008	.9995	.9999	1.0001
.850	6.665E+07	.9817	1.4233	188.51	.6241	.8733	.7136	1.0208	.9894	1.0009	.9994	.9999	1.0001
.900	6.843E+07	.9818	1.4231	187.10	.5919	.8601	.6870	1.0090	.9894	1.0009	.9994	.9998	1.0001
.950	6.995E+07	.9820	1.4228	185.64	.5601	.8466	.6604	1.0022	.9895	1.0010	.9993	.9998	1.0001
1.000	7.122E+07	.9821	1.4225	184.13	.5289	.8328	.6338	1.0001	.9895	1.0011	.9993	.9998	1.0001
1.050	7.224E+07	.9823	1.4223	182.59	.4985	.8187	.6075	1.0021	.9896	1.0011	.9992	.9997	1.0001
1.100	7.302E+07	.9825	1.4220	181.01	.4690	.8045	.5815	1.0080	.9896	1.0012	.9992	.9996	1.0001
1.150	7.357E+07	.9827	1.4217	179.40	.4404	.7901	.5560	1.0175	.9897	1.0012	.9991	.9996	1.0001
1.200	7.390E+07	.9828	1.4214	177.77	.4130	.7757	.5309	1.0305	.9897	1.0013	.9990	.9995	1.0001
1.250	7.402E+07	.9830	1.4212	176.11	.3866	.7612	.5064	1.0469	.9898	1.0013	.9990	.9994	1.0001
1.300	7.395E+07	.9832	1.4209	174.44	.3614	.7466	.4826	1.0665	.9899	1.0013	.9989	.9993	1.0002
1.350	7.369E+07	.9834	1.4207	172.75	.3375	.7321	.4595	1.0892	.9899	1.0013	.9989	.9992	1.0002
1.400	7.325E+07	.9836	1.4204	171.04	.3147	.7176	.4371	1.1152	.9900	1.0013	.9988	.9991	1.0003
1.450	7.265E+07	.9837	1.4202	169.33	.2932	.7031	.4154	1.1443	.9900	1.0013	.9988	.9989	1.0004
1.500	7.190E+07	.9839	1.4200	167.61	.2728	.6888	.3946	1.1766	.9901	1.0013	.9987	.9988	1.0004
1.550	7.100E+07	.9841	1.4197	165.88	.2536	.6746	.3745	1.2121	.9902	1.0013	.9986	.9986	1.0005

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

8. TT = 100 K PT = 3 ATM DT = 10.918 KGM/M3 CONCLUDED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9381	1.4892	196.86	1.0000	1.0000	1.0000	I	.9658	1.0000	1.0000	1.0000	I
.050	1.536E+07	.9381	1.4892	196.81	.9983	.9995	.9988	11.5984	.9658	1.0000	1.0000	1.0000	1.0006
.100	3.063E+07	.9382	1.4891	196.66	.9931	.9980	.9951	5.8250	.9658	1.0001	1.0000	1.0001	1.0005
.150	4.572E+07	.9383	1.4889	196.42	.9846	.9955	.9890	3.9121	.9658	1.0002	.9999	1.0001	1.0004
.200	6.054E+07	.9384	1.4886	196.08	.9727	.9920	.9803	2.9651	.9658	1.0002	.9999	1.0000	1.0005
.250	7.501E+07	.9385	1.4883	195.65	.9577	.9875	.9695	2.4039	.9658	1.0003	.9998	1.0000	1.0005
.300	8.907E+07	.9387	1.4879	195.12	.9399	.9821	.9564	2.0360	.9658	1.0004	.9998	1.0001	1.0005
.350	1.026E+08	.9389	1.4874	194.51	.9193	.9758	.9414	1.7787	.9658	1.0006	.9997	1.0001	1.0004
.400	1.156E+08	.9391	1.4869	193.80	.8963	.9686	.9244	1.5907	.9659	1.0008	.9996	1.0001	1.0004
.450	1.280E+08	.9394	1.4863	193.02	.8711	.9606	.9056	1.4491	.9659	1.0010	.9995	1.0001	1.0003
.500	1.397E+08	.9397	1.4856	192.15	.8439	.9518	.8852	1.3405	.9659	1.0010	.9994	1.0000	1.0004
.550	1.507E+08	.9400	1.4849	191.21	.8152	.9422	.8634	1.2555	.9660	1.0012	.9992	1.0000	1.0004
.600	1.609E+08	.9404	1.4842	190.19	.7852	.9320	.8404	1.1887	.9660	1.0015	.9991	.9999	1.0003
.650	1.704E+08	.9408	1.4834	189.11	.7541	.9211	.8164	1.1360	.9661	1.0017	.9990	.9999	1.0003
.700	1.791E+08	.9412	1.4826	187.96	.7224	.9097	.7915	1.0947	.9662	1.0019	.9988	.9999	1.0003
.750	1.869E+08	.9416	1.4817	186.75	.6901	.8977	.7659	1.0627	.9663	1.0022	.9987	.9998	1.0002
.800	1.940E+08	.9420	1.4808	185.48	.6577	.8852	.7398	1.0384	.9664	1.0024	.9985	.9998	1.0002
.850	2.003E+08	.9425	1.4799	184.16	.6252	.8724	.7134	1.0208	.9665	1.0027	.9984	.9997	1.0001
.900	2.058E+08	.9430	1.4790	182.79	.5931	.8591	.6868	1.0090	.9666	1.0029	.9982	.9996	1.0001
.950	2.104E+08	.9434	1.4781	181.38	.5613	.8455	.6601	1.0022	.9668	1.0032	.9981	.9995	1.0001
1.000	2.144E+08	.9439	1.4771	179.93	.5301	.8316	.6335	1.0001	.9669	1.0034	.9979	.9993	1.0001
1.050	2.175E+08	.9445	1.4762	178.44	.4997	.8175	.6072	1.0021	.9671	1.0036	.9978	.9991	1.0001

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

C. TT = 110 K PT = 1 ATM DT = 3.151 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9850	1.4201	212.08	1.0000	1.0000	1.0000	I	.9920	1.0000	1.0000	1.0000	I
.050	4.464E+06	.9850	1.4201	212.02	.9983	.9995	.9988	11.5924	.9920	1.0000	1.0000	1.0000	1.0001
.100	8.902E+06	.9850	1.4201	211.87	.9931	.9980	.9950	5.8222	.9920	1.0000	1.0000	1.0000	1.0001
.150	1.329E+07	.9851	1.4200	211.60	.9845	.9955	.9889	3.9105	.9920	1.0001	1.0000	1.0000	1.0000
.200	1.759E+07	.9851	1.4200	211.23	.9726	.9920	.9803	2.9636	.9920	1.0001	1.0000	1.0001	1.0000
.250	2.179E+07	.9851	1.4199	210.76	.9576	.9876	.9695	2.4027	.9920	1.0001	.9999	1.0001	1.0000
.300	2.587E+07	.9852	1.4198	210.19	.9397	.9822	.9565	2.0350	.9920	1.0002	.9999	1.0001	1.0000
.350	2.980E+07	.9852	1.4197	209.52	.9190	.9760	.9414	1.7778	.9920	1.0003	.9999	1.0002	.9999
.400	3.356E+07	.9853	1.4195	208.76	.8957	.9688	.9243	1.5903	.9920	1.0001	.9998	1.0000	1.0001
.450	3.713E+07	.9854	1.4194	207.91	.8704	.9609	.9055	1.4489	.9920	1.0002	.9998	1.0000	1.0001
.500	4.051E+07	.9854	1.4192	206.97	.8432	.9522	.8852	1.3400	.9920	1.0002	.9998	1.0000	1.0001
.550	4.368E+07	.9855	1.4190	205.94	.8144	.9427	.8634	1.2551	.9920	1.0002	.9997	1.0000	1.0001
.600	4.663E+07	.9856	1.4189	204.83	.7842	.9326	.8405	1.1883	.9920	1.0003	.9997	1.0000	1.0001
.650	4.936E+07	.9857	1.4187	203.65	.7531	.9218	.8165	1.1357	.9920	1.0003	.9996	1.0000	1.0001
.700	5.185E+07	.9858	1.4185	202.40	.7212	.9104	.7916	1.0945	.9920	1.0004	.9996	1.0000	1.0001
.750	5.411E+07	.9859	1.4182	201.08	.6889	.8985	.7661	1.0625	.9920	1.0004	.9995	1.0000	1.0001
.800	5.613E+07	.9860	1.4180	199.69	.6564	.8861	.7400	1.0383	.9920	1.0005	.9995	1.0000	1.0001
.850	5.792E+07	.9862	1.4178	198.25	.6239	.8733	.7136	1.0207	.9921	1.0006	.9994	1.0000	1.0001
.900	5.948E+07	.9863	1.4176	196.76	.5917	.8601	.6870	1.0089	.9921	1.0006	.9994	.9999	1.0001
.950	6.082E+07	.9864	1.4173	195.21	.5599	.8466	.6604	1.0022	.9921	1.0007	.9993	.9999	1.0001
1.000	6.194E+07	.9865	1.4171	193.63	.5287	.8328	.6339	1.0000	.9921	1.0007	.9993	.9999	1.0000
1.050	6.285E+07	.9867	1.4169	192.00	.4983	.8187	.6076	1.0021	.9921	1.0008	.9992	.9999	1.0001
1.100	6.356E+07	.9868	1.4167	190.34	.4688	.8045	.5816	1.0080	.9922	1.0008	.9992	.9998	1.0001
1.150	6.407E+07	.9869	1.4164	188.64	.4403	.7902	.5561	1.0175	.9922	1.0009	.9991	.9998	1.0001
1.200	6.440E+07	.9871	1.4162	186.92	.4128	.7757	.5310	1.0305	.9922	1.0009	.9991	.9997	1.0001
1.250	6.456E+07	.9872	1.4160	185.17	.3865	.7612	.5066	1.0468	.9923	1.0009	.9990	.9997	1.0001
1.300	6.455E+07	.9874	1.4157	183.41	.3613	.7466	.4828	1.0664	.9923	1.0010	.9990	.9996	1.0001
1.350	6.438E+07	.9875	1.4155	181.62	.3373	.7321	.4596	1.0892	.9924	1.0010	.9989	.9996	1.0002
1.400	6.408E+07	.9876	1.4153	179.83	.3146	.7176	.4372	1.1151	.9924	1.0010	.9989	.9995	1.0002
1.450	6.363E+07	.9878	1.4151	178.02	.2930	.7032	.4156	1.1442	.9924	1.0010	.9988	.9994	1.0002
1.500	6.307E+07	.9879	1.4149	176.21	.2727	.6888	.3947	1.1764	.9925	1.0010	.9987	.9993	1.0003
1.550	6.238E+07	.9881	1.4147	174.39	.2535	.6746	.3747	1.2119	.9925	1.0010	.9987	.9992	1.0003
1.600	6.159E+07	.9882	1.4145	172.58	.2355	.6605	.3554	1.2507	.9926	1.0009	.9986	.9991	1.0004
1.650	6.070E+07	.9883	1.4143	170.76	.2186	.6466	.3370	1.2928	.9926	1.0009	.9986	.9990	1.0005
1.700	5.972E+07	.9885	1.4142	168.94	.2028	.6328	.3194	1.3383	.9927	1.0009	.9985	.9989	1.0006
1.750	5.866E+07	.9886	1.4140	167.13	.1880	.6192	.3025	1.3873	.9927	1.0008	.9985	.9987	1.0006
1.800	5.752E+07	.9887	1.4138	165.33	.1742	.6059	.2864	1.4399	.9927	1.0007	.9984	.9986	1.0007
1.850	5.631E+07	.9888	1.4137	163.54	.1613	.5927	.2711	1.4963	.9928	1.0007	.9984	.9984	1.0008

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

C. TT = 110 K PT = 3 ATM DT = 9.761 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9539	1.4660	208.50	1.0000	1.0000	1.0000	I	.9753	1.0000	1.0000	1.0000	I
.050	1.334E+07	.9539	1.4660	208.45	.9983	.9995	.9988	11.5923	.9753	1.0000	1.0000	1.0000	1.0000
.100	2.660E+07	.9540	1.4659	208.29	.9931	.9980	.9951	5.8220	.9753	1.0001	1.0000	1.0001	1.0000
.150	3.970E+07	.9540	1.4658	208.03	.9846	.9955	.9890	3.9102	.9752	1.0002	.9999	1.0001	.9999
.200	5.257E+07	.9541	1.4656	207.67	.9726	.9920	.9803	2.9637	.9752	1.0001	.9999	1.0000	1.0001
.250	6.513E+07	.9542	1.4653	207.20	.9576	.9875	.9695	2.4028	.9752	1.0002	.9998	1.0000	1.0001
.300	7.733E+07	.9543	1.4650	206.64	.9397	.9821	.9564	2.0352	.9752	1.0002	.9997	1.0001	1.0001
.350	8.909E+07	.9545	1.4646	205.98	.9191	.9758	.9414	1.7780	.9752	1.0003	.9997	1.0001	1.0000
.400	1.004E+08	.9547	1.4642	205.23	.8960	.9686	.9244	1.5902	.9752	1.0004	.9996	1.0001	1.0000
.450	1.111E+08	.9549	1.4637	204.39	.8708	.9606	.9056	1.4487	.9752	1.0006	.9995	1.0001	1.0000
.500	1.212E+08	.9551	1.4632	203.46	.8436	.9518	.8853	1.3398	.9752	1.0007	.9993	1.0002	1.0000
.550	1.308E+08	.9553	1.4626	202.45	.8149	.9422	.8636	1.2549	.9752	1.0009	.9992	1.0002	1.0000
.600	1.396E+08	.9556	1.4620	201.36	.7847	.9320	.8405	1.1884	.9752	1.0009	.9991	1.0000	1.0001
.650	1.478E+08	.9559	1.4614	200.20	.7536	.9211	.8165	1.1358	.9752	1.0010	.9990	1.0000	1.0001
.700	1.554E+08	.9562	1.4607	198.97	.7218	.9097	.7916	1.0945	.9752	1.0012	.9988	1.0000	1.0001
.750	1.622E+08	.9565	1.4600	197.67	.6895	.8977	.7660	1.0625	.9752	1.0013	.9987	1.0000	1.0001
.800	1.683E+08	.9568	1.4593	196.32	.6571	.8852	.7400	1.0383	.9753	1.0015	.9985	1.0000	1.0001
.850	1.738E+08	.9572	1.4586	194.91	.6246	.8724	.7136	1.0207	.9753	1.0017	.9984	.9999	1.0001
.900	1.786E+08	.9575	1.4578	193.45	.5924	.8591	.6870	1.0089	.9754	1.0019	.9982	.9999	1.0001
.950	1.827E+08	.9579	1.4571	191.94	.5607	.8455	.6603	1.0022	.9754	1.0021	.9981	.9998	1.0000
1.000	1.861E+08	.9583	1.4563	190.39	.5295	.8316	.6338	1.0000	.9755	1.0023	.9979	.9998	1.0000
1.050	1.889E+08	.9587	1.4556	188.80	.4991	.8175	.6075	1.0021	.9756	1.0024	.9978	.9997	1.0000
1.100	1.911E+08	.9591	1.4548	187.17	.4696	.8033	.5815	1.0080	.9757	1.0026	.9976	.9996	1.0001
1.150	1.928E+08	.9595	1.4541	185.52	.4411	.7889	.5559	1.0175	.9758	1.0028	.9975	.9994	1.0001
1.200	1.938E+08	.9599	1.4533	183.84	.4136	.7743	.5308	1.0306	.9759	1.0029	.9973	.9993	1.0001
1.250	1.944E+08	.9603	1.4526	182.13	.3872	.7598	.5063	1.0469	.9760	1.0030	.9972	.9991	1.0002
1.300	1.944E+08	.9607	1.4518	180.41	.3621	.7452	.4824	1.0666	.9761	1.0031	.9970	.9989	1.0003
1.350	1.940E+08	.9612	1.4511	178.67	.3381	.7306	.4592	1.0894	.9762	1.0031	.9969	.9987	1.0003
1.400	1.932E+08	.9616	1.4504	176.92	.3153	.7160	.4368	1.1154	.9764	1.0032	.9967	.9985	1.0005
1.450	1.919E+08	.9620	1.4497	175.16	.2937	.7016	.4151	1.1446	.9765	1.0032	.9965	.9982	1.0006

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

C. TT = 110 K PT = 5 ATM DT = 16.850 KGM/M3 CONCLUDED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9210	1.5221	204.70	1.0000	1.0000	1.0000	I	.9575	1.0000	1.0000	1.0000	I
.050	2.217E+07	.9210	1.5221	204.65	.9983	.9995	.9988	11.5922	.9575	1.0000	1.0000	1.0000	1.0000
.100	4.421E+07	.9210	1.5219	204.50	.9932	.9980	.9951	5.8218	.9575	1.0001	1.0000	1.0001	.9999
.150	6.600E+07	.9211	1.5216	204.24	.9845	.9954	.9889	3.9104	.9575	1.0001	.9999	1.0000	1.0000
.200	8.740E+07	.9213	1.5212	203.88	.9727	.9919	.9803	2.9636	.9574	1.0002	.9998	1.0001	1.0000
.250	1.083E+08	.9214	1.5208	203.42	.9578	.9874	.9695	2.4027	.9574	1.0003	.9997	1.0001	1.0000
.300	1.286E+08	.9216	1.5202	202.86	.9399	.9819	.9565	2.0351	.9574	1.0005	.9996	1.0002	1.0000
.350	1.482E+08	.9219	1.5195	202.21	.9192	.9755	.9413	1.7782	.9573	1.0005	.9994	1.0000	1.0001
.400	1.670E+08	.9222	1.5187	201.46	.8962	.9683	.9243	1.5904	.9573	1.0006	.9993	1.0001	1.0002
.450	1.849E+08	.9225	1.5178	200.63	.8710	.9602	.9056	1.4489	.9573	1.0008	.9991	1.0001	1.0002
.500	2.018E+08	.9228	1.5169	199.72	.8439	.9514	.8852	1.3401	.9573	1.0010	.9989	1.0001	1.0002
.550	2.177E+08	.9232	1.5159	198.72	.8152	.9418	.8635	1.2552	.9572	1.0012	.9987	1.0001	1.0002
.600	2.326E+08	.9236	1.5148	197.65	.7852	.9315	.8406	1.1884	.9572	1.0015	.9985	1.0001	1.0002
.650	2.464E+08	.9240	1.5136	196.51	.7542	.9205	.8165	1.1358	.9572	1.0018	.9983	1.0001	1.0002
.700	2.590E+08	.9245	1.5124	195.30	.7224	.9090	.7917	1.0945	.9572	1.0021	.9981	1.0001	1.0002
.750	2.705E+08	.9250	1.5112	194.03	.6902	.8970	.7661	1.0626	.9573	1.0024	.9979	1.0001	1.0001
.800	2.808E+08	.9256	1.5099	192.70	.6578	.8844	.7401	1.0383	.9573	1.0027	.9976	1.0001	1.0001
.850	2.900E+08	.9261	1.5085	191.32	.6254	.8715	.7137	1.0207	.9574	1.0031	.9974	1.0001	1.0001
.900	2.981E+08	.9267	1.5072	189.89	.5933	.8581	.6871	1.0089	.9575	1.0034	.9972	1.0000	1.0000
.950	3.051E+08	.9273	1.5058	188.41	.5616	.8445	.6604	1.0022	.9575	1.0037	.9969	1.0000	1.0000
1.000	3.110E+08	.9280	1.5044	186.90	.5304	.8306	.6339	1.0000	.9577	1.0041	.9967	.9999	1.0000
1.050	3.158E+08	.9286	1.5030	185.35	.5001	.8164	.6075	1.0020	.9578	1.0044	.9964	.9997	1.0000
1.100	3.196E+08	.9293	1.5016	183.76	.4705	.8021	.5814	1.0081	.9579	1.0045	.9962	.9994	1.0002
1.150	3.225E+08	.9300	1.5002	182.15	.4420	.7876	.5557	1.0177	.9581	1.0048	.9959	.9992	1.0002
1.200	3.244E+08	.9306	1.4988	180.51	.4145	.7730	.5306	1.0308	.9582	1.0050	.9957	.9989	1.0003

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

D. TT = 120 K PT = 1 ATM DT = 2.878 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9884	1.4160	221.96	1.0000	1.0000	1.0000	I	.9940	1.0000	1.0000	1.0000	I
.050	3.929E+06	.9884	1.4160	221.91	.9983	.9995	.9988	11.5910	.9940	1.0000	1.0000	1.0000	1.0000
.100	7.835E+06	.9884	1.4160	221.74	.9931	.9980	.9950	5.8215	.9940	1.0000	1.0000	1.0000	.9999
.150	1.169E+07	.9885	1.4159	221.46	.9844	.9955	.9889	3.9101	.9940	1.0000	1.0000	1.0000	.9999
.200	1.548E+07	.9885	1.4159	221.08	.9726	.9920	.9803	2.9633	.9940	1.0001	1.0000	1.0001	.9999
.250	1.918E+07	.9885	1.4158	220.58	.9576	.9876	.9695	2.4025	.9940	1.0001	.9999	1.0001	.9999
.300	2.277E+07	.9885	1.4157	219.98	.9396	.9822	.9565	2.0348	.9940	1.0001	.9999	1.0001	.9999
.350	2.622E+07	.9886	1.4156	219.28	.9190	.9760	.9414	1.7777	.9940	1.0002	.9999	1.0002	.9998
.400	2.953E+07	.9886	1.4155	218.48	.8957	.9689	.9243	1.5902	.9940	1.0001	.9999	1.0000	1.0000
.450	3.267E+07	.9887	1.4154	217.59	.8703	.9609	.9055	1.4488	.9940	1.0001	.9998	1.0000	1.0000
.500	3.564E+07	.9887	1.4152	216.60	.8431	.9522	.8852	1.3399	.9940	1.0001	.9998	1.0000	1.0000
.550	3.843E+07	.9888	1.4151	215.52	.8143	.9427	.8634	1.2550	.9940	1.0001	.9997	1.0000	1.0000
.600	4.102E+07	.9889	1.4149	214.36	.7841	.9326	.8405	1.1883	.9939	1.0001	.9997	1.0000	1.0000
.650	4.341E+07	.9889	1.4148	213.12	.7530	.9218	.8165	1.1357	.9939	1.0002	.9997	1.0000	1.0000
.700	4.560E+07	.9890	1.4146	211.81	.7211	.9104	.7916	1.0944	.9939	1.0002	.9996	1.0000	1.0000
.750	4.758E+07	.9891	1.4144	210.42	.6888	.8985	.7661	1.0625	.9939	1.0003	.9996	1.0000	1.0000
.800	4.936E+07	.9892	1.4142	208.97	.6562	.8861	.7400	1.0383	.9939	1.0003	.9995	1.0000	1.0000
.850	5.094E+07	.9893	1.4141	207.46	.6237	.8733	.7136	1.0207	.9939	1.0003	.9995	1.0000	1.0000
.900	5.231E+07	.9894	1.4139	205.89	.5915	.8601	.6871	1.0089	.9939	1.0004	.9994	1.0000	1.0000
.950	5.349E+07	.9895	1.4137	204.27	.5597	.8466	.6605	1.0022	.9939	1.0004	.9994	1.0000	1.0000
1.000	5.448E+07	.9896	1.4135	202.61	.5286	.8328	.6340	1.0000	.9939	1.0005	.9993	1.0000	1.0000
1.050	5.528E+07	.9897	1.4133	200.90	.4982	.8188	.6077	1.0021	.9940	1.0005	.9993	1.0000	1.0000
1.100	5.591E+07	.9898	1.4131	199.16	.4686	.8045	.5817	1.0080	.9940	1.0006	.9992	1.0000	1.0000
1.150	5.638E+07	.9899	1.4129	197.38	.4401	.7902	.5562	1.0175	.9940	1.0006	.9992	1.0000	1.0000
1.200	5.668E+07	.9900	1.4127	195.58	.4127	.7757	.5311	1.0305	.9940	1.0006	.9991	.9999	1.0001
1.250	5.684E+07	.9901	1.4125	193.75	.3863	.7612	.5067	1.0468	.9940	1.0007	.9991	.9999	1.0001
1.300	5.685E+07	.9902	1.4123	191.89	.3612	.7467	.4829	1.0664	.9940	1.0007	.9990	.9999	1.0001
1.350	5.673E+07	.9903	1.4121	190.03	.3372	.7321	.4597	1.0891	.9941	1.0007	.9990	.9998	1.0001
1.400	5.650E+07	.9905	1.4119	188.14	.3145	.7176	.4374	1.1150	.9941	1.0007	.9989	.9998	1.0001
1.450	5.614E+07	.9906	1.4117	186.25	.2930	.7032	.4157	1.1441	.9941	1.0008	.9989	.9997	1.0001
1.500	5.569E+07	.9907	1.4116	184.35	.2726	.6889	.3949	1.1763	.9941	1.0008	.9988	.9997	1.0002
1.550	5.513E+07	.9908	1.4114	182.45	.2535	.6746	.3748	1.2118	.9942	1.0008	.9988	.9996	1.0002
1.600	5.449E+07	.9909	1.4112	180.54	.2355	.6606	.3556	1.2505	.9942	1.0007	.9987	.9995	1.0003
1.650	5.377E+07	.9910	1.4111	178.64	.2186	.6466	.3371	1.2926	.9942	1.0007	.9987	.9994	1.0003
1.700	5.297E+07	.9911	1.4109	176.74	.2028	.6329	.3195	1.3380	.9943	1.0007	.9986	.9994	1.0004
1.750	5.211E+07	.9912	1.4108	174.84	.1880	.6193	.3027	1.3870	.9943	1.0007	.9986	.9993	1.0004
1.800	5.119E+07	.9913	1.4106	172.96	.1742	.6059	.2866	1.4396	.9943	1.0006	.9985	.9992	1.0005
1.850	5.021E+07	.9914	1.4105	171.08	.1613	.5928	.2713	1.4959	.9944	1.0006	.9985	.9991	1.0006
1.900	4.918E+07	.9915	1.4103	169.21	.1493	.5798	.2567	1.5562	.9944	1.0005	.9985	.9990	1.0006
1.950	4.810E+07	.9916	1.4102	167.35	.1382	.5671	.2429	1.6204	.9944	1.0005	.9984	.9989	1.0007
2.000	4.699E+07	.9917	1.4101	165.51	.1279	.5547	.2298	1.6887	.9944	1.0004	.9984	.9987	1.0008

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

D. TT = 120 K PT = 3 ATM DT = 8.848 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9647	1.4512	219.21	1.0000	1.0000	1.0000	I	.9817	1.0000	1.0000	1.0000	I
.050	1.174E+07	.9647	1.4512	219.15	.9983	.9995	.9988	11.5883	.9817	1.0000	1.0000	1.0000	.9997
.100	2.341E+07	.9647	1.4511	218.99	.9931	.9980	.9951	5.8200	.9817	1.0001	1.0000	1.0001	.9997
.150	3.494E+07	.9648	1.4510	218.71	.9846	.9955	.9890	3.9089	.9817	1.0002	.9999	1.0001	.9996
.200	4.626E+07	.9648	1.4508	218.33	.9725	.9920	.9803	2.9628	.9817	1.0000	.9999	1.0000	.9997
.250	5.731E+07	.9649	1.4506	217.84	.9575	.9875	.9695	2.4021	.9816	1.0001	.9998	1.0000	.9998
.300	6.804E+07	.9650	1.4503	217.24	.9396	.9821	.9564	2.0346	.9816	1.0001	.9998	1.0000	.9998
.350	7.838E+07	.9651	1.4500	216.54	.9189	.9758	.9413	1.7776	.9816	1.0002	.9997	1.0001	.9998
.400	8.828E+07	.9652	1.4496	215.75	.8958	.9686	.9243	1.5898	.9815	1.0002	.9996	1.0001	.9998
.450	9.771E+07	.9654	1.4493	214.86	.8705	.9606	.9056	1.4484	.9815	1.0003	.9995	1.0001	.9998
.500	1.066E+08	.9655	1.4488	213.87	.8433	.9518	.8853	1.3396	.9815	1.0004	.9994	1.0001	.9998
.550	1.150E+08	.9657	1.4484	212.80	.8146	.9422	.8636	1.2547	.9814	1.0005	.9992	1.0002	.9998
.600	1.228E+08	.9659	1.4479	211.65	.7845	.9320	.8406	1.1880	.9814	1.0006	.9991	1.0002	.9998
.650	1.300E+08	.9661	1.4474	210.42	.7534	.9212	.8166	1.1354	.9814	1.0007	.9990	1.0002	.9998
.700	1.366E+08	.9663	1.4468	209.12	.7214	.9097	.7916	1.0944	.9813	1.0007	.9989	1.0001	1.0000
.750	1.425E+08	.9666	1.4462	207.75	.6891	.8977	.7661	1.0625	.9813	1.0008	.9987	1.0001	1.0000
.800	1.479E+08	.9668	1.4457	206.32	.6566	.8853	.7401	1.0383	.9813	1.0009	.9986	1.0001	1.0000
.850	1.527E+08	.9671	1.4451	204.83	.6242	.8724	.7137	1.0207	.9813	1.0010	.9985	1.0001	1.0000
.900	1.569E+08	.9674	1.4444	203.28	.5920	.8591	.6871	1.0089	.9813	1.0012	.9983	1.0001	1.0000
.950	1.605E+08	.9677	1.4438	201.68	.5602	.8456	.6605	1.0022	.9813	1.0013	.9982	1.0001	1.0000
1.000	1.635E+08	.9680	1.4432	200.04	.5291	.8317	.6340	1.0000	.9814	1.0015	.9980	1.0000	1.0000
1.050	1.660E+08	.9683	1.4426	198.36	.4987	.8176	.6077	1.0020	.9814	1.0016	.9979	1.0000	1.0000
1.100	1.679E+08	.9686	1.4419	196.64	.4692	.8034	.5817	1.0080	.9814	1.0018	.9978	1.0000	1.0000
1.150	1.694E+08	.9689	1.4413	194.90	.4407	.7890	.5561	1.0175	.9815	1.0019	.9976	.9999	1.0000
1.200	1.704E+08	.9692	1.4407	193.12	.4132	.7744	.5311	1.0305	.9815	1.0020	.9975	.9998	1.0001
1.250	1.709E+08	.9696	1.4401	191.32	.3869	.7599	.5066	1.0468	.9816	1.0021	.9973	.9997	1.0001
1.300	1.710E+08	.9699	1.4394	189.50	.3617	.7453	.4827	1.0664	.9817	1.0022	.9972	.9996	1.0001
1.350	1.707E+08	.9702	1.4388	187.67	.3378	.7307	.4596	1.0892	.9817	1.0023	.9971	.9995	1.0002
1.400	1.701E+08	.9706	1.4382	185.82	.3150	.7162	.4372	1.1152	.9818	1.0024	.9969	.9994	1.0003
1.450	1.691E+08	.9709	1.4377	183.96	.2934	.7017	.4155	1.1443	.9819	1.0024	.9968	.9992	1.0003
1.500	1.677E+08	.9712	1.4371	182.09	.2731	.6873	.3946	1.1767	.9820	1.0024	.9966	.9990	1.0004
1.550	1.661E+08	.9716	1.4366	180.22	.2539	.6731	.3745	1.2122	.9820	1.0024	.9965	.9988	1.0006
1.600	1.642E+08	.9719	1.4360	178.35	.2358	.6590	.3552	1.2511	.9821	1.0024	.9963	.9986	1.0007
1.650	1.621E+08	.9722	1.4355	176.48	.2189	.6450	.3368	1.2933	.9822	1.0023	.9962	.9983	1.0008
1.700	1.597E+08	.9726	1.4350	174.62	.2031	.6312	.3191	1.3389	.9823	1.0023	.9961	.9981	1.0010
1.750	1.571E+08	.9729	1.4345	172.75	.1882	.6176	.3022	1.3881	.9824	1.0022	.9959	.9978	1.0012
1.800	1.544E+08	.9732	1.4341	170.90	.1744	.6042	.2861	1.4410	.9825	1.0020	.9958	.9975	1.0014

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

D. TT = 120 K PT = 5 ATM DT = 15.133 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9400	1.4918	216.36	1.0000	1.0000	1.0000	I	.9690	1.0000	1.0000	1.0000	I
.050	1.950E+07	.9400	1.4917	216.31	.9983	.9995	.9988	11.5854	.9689	1.0000	1.0000	1.0000	.9994
.100	3.889E+07	.9401	1.4916	216.14	.9931	.9980	.9951	5.8184	.9689	1.0001	1.0000	1.0001	.9993
.150	5.805E+07	.9401	1.4914	215.86	.9845	.9954	.9889	3.9082	.9689	1.0001	.9999	1.0000	.9995
.200	7.687E+07	.9402	1.4911	215.48	.9726	.9919	.9803	2.9620	.9688	1.0001	.9998	1.0001	.9995
.250	9.525E+07	.9404	1.4907	214.99	.9576	.9874	.9695	2.4015	.9688	1.0001	.9997	1.0001	.9995
.300	1.131E+08	.9405	1.4902	214.39	.9397	.9819	.9565	2.0341	.9687	1.0002	.9996	1.0001	.9995
.350	1.303E+08	.9407	1.4897	213.70	.9191	.9756	.9414	1.7772	.9687	1.0003	.9995	1.0002	.9996
.400	1.468E+08	.9409	1.4891	212.90	.8960	.9683	.9245	1.5895	.9686	1.0004	.9993	1.0002	.9996
.450	1.625E+08	.9411	1.4884	212.01	.8706	.9602	.9056	1.4484	.9685	1.0003	.9991	1.0001	.9998
.500	1.773E+08	.9414	1.4876	211.04	.8434	.9514	.8853	1.3397	.9684	1.0005	.9990	1.0001	.9999
.550	1.913E+08	.9416	1.4868	209.97	.8146	.9418	.8635	1.2548	.9684	1.0006	.9988	1.0001	.9999
.600	2.043E+08	.9419	1.4859	208.83	.7846	.9315	.8406	1.1881	.9683	1.0007	.9986	1.0002	.9999
.650	2.163E+08	.9423	1.4850	207.61	.7535	.9206	.8166	1.1356	.9682	1.0009	.9984	1.0002	1.0000
.700	2.274E+08	.9426	1.4841	206.32	.7217	.9091	.7917	1.0944	.9682	1.0011	.9981	1.0002	1.0000
.750	2.374E+08	.9430	1.4831	204.96	.6895	.8970	.7662	1.0624	.9681	1.0013	.9979	1.0002	1.0000
.800	2.465E+08	.9434	1.4820	203.54	.6570	.8845	.7402	1.0383	.9681	1.0016	.9977	1.0003	1.0000
.850	2.545E+08	.9438	1.4810	202.07	.6246	.8715	.7138	1.0207	.9681	1.0018	.9975	1.0003	1.0000
.900	2.616E+08	.9443	1.4799	200.54	.5925	.8582	.6872	1.0089	.9681	1.0021	.9973	1.0003	1.0000
.950	2.677E+08	.9447	1.4788	198.96	.5608	.8446	.6606	1.0022	.9681	1.0023	.9970	1.0003	1.0000
1.000	2.728E+08	.9452	1.4777	197.35	.5297	.8307	.6341	1.0000	.9681	1.0026	.9968	1.0003	1.0000
1.050	2.771E+08	.9457	1.4765	195.69	.4993	.8165	.6078	1.0020	.9682	1.0029	.9966	1.0002	1.0000
1.100	2.804E+08	.9462	1.4754	194.00	.4698	.8022	.5818	1.0079	.9682	1.0031	.9964	1.0002	1.0000
1.150	2.830E+08	.9468	1.4743	192.28	.4413	.7878	.5562	1.0175	.9683	1.0034	.9961	1.0001	1.0000
1.200	2.847E+08	.9473	1.4732	190.53	.4139	.7732	.5311	1.0305	.9684	1.0036	.9959	1.0000	1.0000
1.250	2.857E+08	.9478	1.4721	188.76	.3875	.7586	.5066	1.0468	.9685	1.0038	.9957	.9998	1.0001
1.300	2.860E+08	.9484	1.4710	186.98	.3624	.7440	.4827	1.0665	.9686	1.0040	.9954	.9997	1.0001
1.350	2.856E+08	.9490	1.4699	185.17	.3384	.7294	.4596	1.0893	.9687	1.0041	.9952	.9995	1.0002
1.400	2.846E+08	.9495	1.4688	183.36	.3156	.7148	.4371	1.1153	.9688	1.0043	.9950	.9992	1.0003
1.450	2.829E+08	.9501	1.4678	181.54	.2940	.7003	.4154	1.1446	.9690	1.0042	.9947	.9988	1.0006
1.500	2.808E+08	.9506	1.4668	179.71	.2736	.6859	.3944	1.1770	.9691	1.0042	.9945	.9985	1.0008
1.550	2.782E+08	.9512	1.4658	177.88	.2544	.6716	.3743	1.2127	.9692	1.0042	.9943	.9981	1.0010
1.600	2.751E+08	.9518	1.4648	176.04	.2363	.6575	.3550	1.2516	.9694	1.0042	.9940	.9978	1.0012

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

D. TT = 120 K PT = 8 ATM DT = 25.260 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9010	1.5661	211.88	1.0000	1.0000	1.0000	I	.9489	1.0000	1.0000	1.0000	I
.050	3.112E+07	.9010	1.5660	211.82	.9983	.9995	.9988	11.5740	.9488	1.0000	1.0000	1.0000	.9985
.100	6.206E+07	.9011	1.5658	211.65	.9932	.9979	.9952	5.8126	.9488	1.0002	.9999	1.0002	.9984
.150	9.263E+07	.9012	1.5654	211.37	.9845	.9954	.9889	3.9048	.9487	1.0001	.9998	1.0001	.9986
.200	1.227E+08	.9013	1.5649	210.99	.9727	.9918	.9804	2.9594	.9486	1.0002	.9997	1.0001	.9986
.250	1.520E+08	.9015	1.5642	210.49	.9576	.9872	.9695	2.3999	.9485	1.0001	.9995	1.0000	.9988
.300	1.805E+08	.9017	1.5634	209.89	.9396	.9817	.9565	2.0329	.9484	1.0002	.9994	1.0001	.9989
.350	2.080E+08	.9019	1.5625	209.19	.9190	.9752	.9414	1.7763	.9483	1.0003	.9991	1.0001	.9991
.400	2.344E+08	.9022	1.5614	208.40	.8959	.9679	.9244	1.5888	.9481	1.0004	.9989	1.0002	.9992
.450	2.595E+08	.9025	1.5602	207.51	.8707	.9598	.9057	1.4477	.9479	1.0005	.9986	1.0002	.9993
.500	2.834E+08	.9029	1.5589	206.53	.8436	.9508	.8854	1.3390	.9478	1.0007	.9984	1.0003	.9994
.550	3.057E+08	.9033	1.5575	205.47	.8149	.9411	.8637	1.2543	.9476	1.0009	.9981	1.0003	.9995
.600	3.267E+08	.9037	1.5559	204.33	.7849	.9307	.8408	1.1877	.9475	1.0012	.9978	1.0004	.9996
.650	3.460E+08	.9042	1.5543	203.12	.7538	.9197	.8167	1.1354	.9473	1.0013	.9974	1.0003	.9998
.700	3.638E+08	.9047	1.5526	201.84	.7221	.9081	.7919	1.0943	.9472	1.0016	.9971	1.0004	.9999
.750	3.800E+08	.9053	1.5508	200.50	.6899	.8960	.7664	1.0625	.9471	1.0019	.9968	1.0004	1.0000
.800	3.946E+08	.9059	1.5490	199.10	.6576	.8834	.7404	1.0383	.9470	1.0023	.9964	1.0005	1.0000
.850	4.077E+08	.9066	1.5471	197.65	.6253	.8704	.7140	1.0207	.9469	1.0027	.9961	1.0005	1.0001
.900	4.192E+08	.9072	1.5452	196.14	.5932	.8570	.6875	1.0089	.9469	1.0032	.9958	1.0005	1.0001
.950	4.292E+08	.9079	1.5432	194.60	.5615	.8432	.6609	1.0022	.9469	1.0036	.9954	1.0006	1.0001
1.000	4.377E+08	.9087	1.5413	193.01	.5305	.8293	.6343	1.0001	.9469	1.0041	.9951	1.0006	1.0001
1.050	4.447E+08	.9094	1.5392	191.39	.5002	.8150	.6080	1.0021	.9469	1.0045	.9947	1.0005	1.0001
1.100	4.504E+08	.9102	1.5372	189.74	.4707	.8007	.5820	1.0080	.9470	1.0050	.9944	1.0004	1.0001
1.150	4.547E+08	.9110	1.5352	188.06	.4423	.7861	.5564	1.0175	.9471	1.0054	.9940	1.0003	1.0001
1.200	4.577E+08	.9119	1.5332	186.36	.4148	.7715	.5313	1.0306	.9472	1.0058	.9937	1.0002	1.0002
1.250	4.595E+08	.9127	1.5312	184.64	.3885	.7569	.5067	1.0470	.9473	1.0062	.9933	.9999	1.0002
1.300	4.602E+08	.9136	1.5292	182.90	.3633	.7422	.4828	1.0666	.9475	1.0065	.9930	.9997	1.0003
1.350	4.598E+08	.9145	1.5273	181.15	.3393	.7275	.4595	1.0895	.9476	1.0068	.9926	.9993	1.0005

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

D. TT = 120 K PT = 10 ATM DT = 32.574 KGM/M3 CONCLUDED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.8734	1.6278	208.72	1.0000	1.0000	1.0000	I	.9347	1.0000	1.0000	1.0000	I
.050	3.888E+07	.8734	1.6277	208.66	.9983	.9995	.9988	11.5650	.9347	1.0001	1.0000	1.0001	.9977
.100	7.754E+07	.8735	1.6274	208.49	.9931	.9979	.9951	5.8090	.9346	1.0001	.9999	1.0001	.9978
.150	1.158E+08	.8736	1.6269	208.21	.9845	.9953	.9890	3.9019	.9345	1.0001	.9998	1.0001	.9978
.200	1.533E+08	.8737	1.6262	207.82	.9726	.9917	.9803	2.9577	.9344	1.0001	.9996	1.0001	.9980
.250	1.900E+08	.8739	1.6254	207.32	.9576	.9871	.9695	2.3984	.9342	1.0001	.9994	1.0001	.9982
.300	2.256E+08	.8741	1.6243	206.71	.9396	.9815	.9565	2.0317	.9340	1.0002	.9992	1.0001	.9984
.350	2.600E+08	.8744	1.6231	206.01	.9190	.9751	.9415	1.7754	.9338	1.0003	.9989	1.0002	.9985
.400	2.930E+08	.8747	1.6217	205.20	.8960	.9677	.9245	1.5881	.9336	1.0004	.9986	1.0003	.9987
.450	3.245E+08	.8751	1.6200	204.31	.8706	.9595	.9057	1.4473	.9333	1.0004	.9983	1.0002	.9991
.500	3.543E+08	.8755	1.6183	203.33	.8436	.9504	.8854	1.3388	.9331	1.0006	.9980	1.0003	.9992
.550	3.823E+08	.8760	1.6164	202.27	.8149	.9407	.8637	1.2542	.9328	1.0009	.9976	1.0003	.9994
.600	4.086E+08	.8765	1.6144	201.13	.7849	.9303	.8408	1.1877	.9326	1.0012	.9972	1.0004	.9996
.650	4.329E+08	.8770	1.6123	199.92	.7540	.9192	.8169	1.1353	.9324	1.0015	.9968	1.0005	.9997
.700	4.553E+08	.8776	1.6100	198.64	.7223	.9075	.7921	1.0942	.9322	1.0020	.9964	1.0007	.9998
.750	4.757E+08	.8783	1.6076	197.30	.6902	.8953	.7666	1.0623	.9320	1.0024	.9961	1.0008	.9999
.800	4.942E+08	.8790	1.6052	195.91	.6579	.8827	.7406	1.0382	.9318	1.0029	.9956	1.0009	1.0000
.850	5.107E+08	.8798	1.6027	194.47	.6257	.8696	.7143	1.0207	.9317	1.0035	.9952	1.0010	1.0000
.900	5.253E+08	.8806	1.6001	192.98	.5937	.8561	.6878	1.0089	.9316	1.0041	.9948	1.0011	1.0000
.950	5.379E+08	.8814	1.5974	191.45	.5621	.8424	.6612	1.0022	.9316	1.0047	.9944	1.0011	1.0000
1.000	5.487E+08	.8823	1.5947	189.89	.5311	.8283	.6347	1.0000	.9315	1.0053	.9940	1.0012	1.0000
1.050	5.578E+08	.8832	1.5920	188.29	.5008	.8141	.6083	1.0020	.9316	1.0059	.9936	1.0011	1.0000
1.100	5.650E+08	.8842	1.5892	186.66	.4714	.7997	.5823	1.0079	.9316	1.0066	.9932	1.0011	1.0000
1.150	5.705E+08	.8852	1.5865	185.01	.4429	.7851	.5566	1.0176	.9317	1.0070	.9928	1.0008	1.0002
1.200	5.746E+08	.8862	1.5837	183.34	.4155	.7705	.5315	1.0307	.9318	1.0075	.9923	1.0006	1.0003

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

E. TT = 130 K PT = 1 ATM DT = 2.650 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9909	1.4130	231.37	1.0000	1.0000	1.0000	I	.9955	1.0000	1.0000	1.0000	I
.050	3.497E+06	.9909	1.4130	231.31	.9983	.9995	.9988	11.5900	.9955	1.0000	1.0000	1.0000	.9999
.100	6.974E+06	.9909	1.4130	231.13	.9930	.9980	.9950	5.8210	.9955	1.0000	1.0000	1.0000	.9999
.150	1.041E+07	.9909	1.4130	230.84	.9844	.9955	.9889	3.9098	.9955	1.0000	1.0000	1.0000	.9998
.200	1.378E+07	.9909	1.4129	230.44	.9725	.9920	.9803	2.9630	.9955	1.0001	1.0000	1.0001	.9998
.250	1.707E+07	.9910	1.4129	229.93	.9575	.9876	.9695	2.4023	.9955	1.0001	.9999	1.0001	.9998
.300	2.026E+07	.9910	1.4128	229.30	.9396	.9822	.9565	2.0347	.9954	1.0001	.9999	1.0001	.9998
.350	2.333E+07	.9910	1.4127	228.57	.9189	.9760	.9414	1.7776	.9954	1.0001	.9999	1.0002	.9998
.400	2.627E+07	.9910	1.4126	227.73	.8958	.9689	.9245	1.5898	.9954	1.0002	.9999	1.0002	.9998
.450	2.906E+07	.9911	1.4125	226.80	.8703	.9609	.9055	1.4487	.9954	1.0000	.9998	1.0000	1.0000
.500	3.170E+07	.9911	1.4124	225.77	.8431	.9522	.8852	1.3398	.9954	1.0000	.9998	1.0000	1.0000
.550	3.418E+07	.9912	1.4123	224.64	.8142	.9427	.8634	1.2550	.9954	1.0000	.9998	1.0000	1.0000
.600	3.648E+07	.9912	1.4121	223.43	.7841	.9326	.8405	1.1882	.9954	1.0001	.9997	1.0000	1.0000
.650	3.860E+07	.9913	1.4120	222.14	.7529	.9218	.8165	1.1356	.9953	1.0001	.9997	1.0000	1.0000
.700	4.054E+07	.9913	1.4119	220.76	.7210	.9104	.7916	1.0944	.9953	1.0001	.9996	1.0000	1.0000
.750	4.230E+07	.9914	1.4117	219.32	.6887	.8985	.7661	1.0625	.9953	1.0001	.9996	1.0000	1.0000
.800	4.387E+07	.9915	1.4116	217.80	.6561	.8861	.7400	1.0383	.9953	1.0001	.9995	1.0000	1.0000
.850	4.527E+07	.9915	1.4114	216.22	.6236	.8733	.7137	1.0207	.9953	1.0002	.9995	1.0001	1.0000
.900	4.648E+07	.9916	1.4112	214.59	.5914	.8601	.6871	1.0089	.9953	1.0002	.9994	1.0001	1.0000
.950	4.753E+07	.9917	1.4111	212.90	.5596	.8466	.6605	1.0022	.9953	1.0003	.9994	1.0001	1.0000
1.000	4.840E+07	.9918	1.4109	211.16	.5285	.8328	.6340	1.0000	.9953	1.0003	.9994	1.0001	1.0000
1.050	4.912E+07	.9918	1.4107	209.38	.4981	.8188	.6077	1.0021	.9953	1.0003	.9993	1.0001	1.0000
1.100	4.968E+07	.9919	1.4105	207.56	.4685	.8046	.5818	1.0079	.9953	1.0004	.9993	1.0001	1.0000
1.150	5.009E+07	.9920	1.4104	205.71	.4400	.7902	.5562	1.0175	.9953	1.0004	.9992	1.0001	1.0000
1.200	5.036E+07	.9921	1.4102	203.82	.4126	.7758	.5312	1.0305	.9953	1.0004	.9992	1.0001	1.0000
1.250	5.050E+07	.9922	1.4100	201.91	.3863	.7613	.5067	1.0468	.9953	1.0005	.9991	1.0000	1.0000
1.300	5.052E+07	.9923	1.4099	199.98	.3611	.7467	.4829	1.0663	.9953	1.0005	.9991	1.0000	1.0000
1.350	5.043E+07	.9924	1.4097	198.03	.3372	.7322	.4598	1.0891	.9953	1.0005	.9990	1.0000	1.0000
1.400	5.023E+07	.9924	1.4095	196.07	.3144	.7177	.4374	1.1150	.9953	1.0006	.9990	1.0000	1.0001
1.450	4.993E+07	.9925	1.4094	194.09	.2929	.7033	.4158	1.1440	.9953	1.0006	.9990	1.0000	1.0001
1.500	4.955E+07	.9926	1.4092	192.11	.2726	.6889	.3950	1.1762	.9953	1.0006	.9989	.9999	1.0001
1.550	4.908E+07	.9927	1.4091	190.13	.2534	.6747	.3749	1.2117	.9954	1.0006	.9989	.9999	1.0001
1.600	4.854E+07	.9928	1.4089	188.14	.2354	.6606	.3557	1.2504	.9954	1.0006	.9988	.9998	1.0001
1.650	4.792E+07	.9929	1.4088	186.15	.2185	.6467	.3373	1.2924	.9954	1.0006	.9988	.9998	1.0002
1.700	4.725E+07	.9930	1.4087	184.17	.2027	.6329	.3196	1.3378	.9954	1.0006	.9988	.9997	1.0002
1.750	4.652E+07	.9931	1.4085	182.19	.1879	.6194	.3028	1.3868	.9954	1.0006	.9987	.9997	1.0003
1.800	4.574E+07	.9932	1.4084	180.22	.1741	.6060	.2867	1.4394	.9955	1.0006	.9987	.9996	1.0003
1.850	4.492E+07	.9932	1.4083	178.26	.1613	.5928	.2714	1.4957	.9955	1.0005	.9986	.9995	1.0003
1.900	4.406E+07	.9933	1.4082	176.32	.1493	.5799	.2569	1.5558	.9955	1.0005	.9986	.9995	1.0004
1.950	4.316E+07	.9934	1.4080	174.38	.1382	.5672	.2430	1.6200	.9955	1.0005	.9985	.9994	1.0005
2.000	4.223E+07	.9935	1.4079	172.46	.1279	.5547	.2299	1.6883	.9955	1.0004	.9985	.9993	1.0005

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

E. TT = 130 K PT = 3 ATM DT = 8.102 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9724	1.4410	229.22	1.0000	1.0000	1.0000	1	.9863	1.0000	1.0000	1.0000	1
.050	1.045E+07	.9724	1.4410	229.17	.9983	.9995	.9988	11.5857	.9863	1.0000	1.0000	1.0000	.9995
.100	2.084E+07	.9724	1.4409	228.99	.9931	.9980	.9951	5.8188	.9863	1.0001	1.0000	1.0001	.9994
.150	3.110E+07	.9724	1.4408	228.70	.9845	.9955	.9890	3.9081	.9862	1.0001	.9999	1.0001	.9994
.200	4.117E+07	.9725	1.4407	228.30	.9725	.9920	.9803	2.9622	.9862	1.0000	.9999	1.0000	.9995
.250	5.101E+07	.9725	1.4405	227.78	.9575	.9875	.9694	2.4017	.9862	1.0000	.9998	1.0000	.9996
.300	6.054E+07	.9726	1.4403	227.15	.9395	.9821	.9564	2.0343	.9861	1.0000	.9998	1.0000	.9996
.350	6.974E+07	.9727	1.4400	226.42	.9188	.9758	.9413	1.7773	.9861	1.0000	.9997	1.0001	.9996
.400	7.854E+07	.9728	1.4397	225.58	.8957	.9686	.9243	1.5896	.9860	1.0001	.9996	1.0001	.9997
.450	8.691E+07	.9729	1.4394	224.65	.8704	.9606	.9056	1.4482	.9860	1.0001	.9995	1.0001	.9997
.500	9.483E+07	.9730	1.4390	223.62	.8431	.9518	.8853	1.3395	.9859	1.0002	.9994	1.0001	.9997
.550	1.023E+08	.9731	1.4386	222.50	.8143	.9423	.8636	1.2546	.9859	1.0002	.9993	1.0002	.9998
.600	1.092E+08	.9733	1.4382	221.29	.7842	.9321	.8406	1.1879	.9858	1.0003	.9992	1.0002	.9998
.650	1.155E+08	.9734	1.4378	220.00	.7531	.9212	.8166	1.1354	.9858	1.0003	.9990	1.0002	.9998
.700	1.214E+08	.9736	1.4373	218.63	.7212	.9098	.7918	1.0942	.9857	1.0004	.9989	1.0003	.9998
.750	1.267E+08	.9738	1.4369	217.19	.6889	.8978	.7663	1.0622	.9857	1.0005	.9988	1.0003	.9998
.800	1.315E+08	.9740	1.4364	215.68	.6564	.8854	.7402	1.0380	.9856	1.0006	.9987	1.0003	.9998
.850	1.357E+08	.9742	1.4359	214.11	.6240	.8725	.7139	1.0205	.9856	1.0008	.9985	1.0004	.9998
.900	1.393E+08	.9744	1.4353	212.49	.5917	.8592	.6872	1.0089	.9856	1.0007	.9984	1.0002	1.0000
.950	1.425E+08	.9746	1.4348	210.82	.5599	.8457	.6606	1.0022	.9855	1.0008	.9983	1.0002	1.0000
1.000	1.452E+08	.9748	1.4343	209.09	.5288	.8318	.6341	1.0000	.9855	1.0009	.9982	1.0002	1.0000
1.050	1.474E+08	.9751	1.4338	207.33	.4984	.8177	.6078	1.0020	.9855	1.0010	.9980	1.0002	1.0000
1.100	1.491E+08	.9753	1.4332	205.53	.4689	.8035	.5818	1.0079	.9855	1.0011	.9979	1.0002	1.0000
1.150	1.504E+08	.9755	1.4327	203.69	.4404	.7891	.5563	1.0175	.9855	1.0013	.9978	1.0002	1.0000
1.200	1.513E+08	.9758	1.4322	201.83	.4130	.7746	.5313	1.0305	.9855	1.0014	.9977	1.0002	1.0000
1.250	1.517E+08	.9761	1.4316	199.94	.3866	.7600	.5068	1.0468	.9856	1.0015	.9975	1.0002	1.0000
1.300	1.518E+08	.9763	1.4311	198.03	.3615	.7455	.4830	1.0664	.9856	1.0016	.9974	1.0001	1.0001
1.350	1.516E+08	.9766	1.4306	196.10	.3375	.7309	.4598	1.0891	.9856	1.0017	.9973	1.0001	1.0001
1.400	1.511E+08	.9769	1.4301	194.17	.3148	.7164	.4374	1.1150	.9857	1.0018	.9972	1.0000	1.0001
1.450	1.502E+08	.9771	1.4296	192.22	.2933	.7019	.4158	1.1441	.9857	1.0018	.9970	.9999	1.0002
1.500	1.491E+08	.9774	1.4291	190.26	.2729	.6875	.3949	1.1764	.9858	1.0019	.9969	.9998	1.0002
1.550	1.477E+08	.9777	1.4286	188.30	.2537	.6733	.3748	1.2119	.9858	1.0019	.9968	.9997	1.0003
1.600	1.461E+08	.9780	1.4282	186.34	.2357	.6592	.3556	1.2507	.9859	1.0019	.9967	.9995	1.0004
1.650	1.443E+08	.9782	1.4277	184.38	.2188	.6452	.3371	1.2928	.9859	1.0019	.9965	.9994	1.0005
1.700	1.423E+08	.9785	1.4273	182.42	.2030	.6315	.3194	1.3384	.9860	1.0019	.9964	.9992	1.0006
1.750	1.401E+08	.9787	1.4269	180.47	.1882	.6179	.3026	1.3875	.9861	1.0018	.9963	.9990	1.0007
1.800	1.378E+08	.9790	1.4265	178.53	.1744	.6045	.2865	1.4402	.9861	1.0018	.9962	.9988	1.0008
1.850	1.354E+08	.9793	1.4261	176.60	.1615	.5913	.2712	1.4967	.9862	1.0017	.9961	.9986	1.0010
1.900	1.328E+08	.9795	1.4257	174.68	.1495	.5784	.2566	1.5571	.9862	1.0016	.9959	.9983	1.0012
1.950	1.301E+08	.9798	1.4254	172.77	.1383	.5656	.2427	1.6215	.9863	1.0015	.9958	.9981	1.0014
2.000	1.273E+08	.9800	1.4250	170.87	.1280	.5532	.2296	1.6901	.9864	1.0013	.9957	.9978	1.0016

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

E. TT = 130 K PT = 5 ATM DT = 13.773 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9534	1.4721	227.04	1.0000	1.0000	1.0000	I	.9769	1.0000	1.0000	1.0000	I
.050	1.736E+07	.9534	1.4721	226.98	.9983	.9995	.9988	11.5810	.9769	1.0000	1.0000	1.0000	.9990
.100	3.461E+07	.9534	1.4720	226.81	.9931	.9980	.9951	5.8163	.9769	1.0001	1.0000	1.0001	.9990
.150	5.166E+07	.9535	1.4718	226.52	.9844	.9954	.9889	3.9068	.9768	1.0000	.9999	1.0000	.9991
.200	6.840E+07	.9535	1.4715	226.11	.9725	.9919	.9803	2.9610	.9768	1.0000	.9998	1.0000	.9991
.250	8.475E+07	.9536	1.4712	225.59	.9575	.9874	.9695	2.4008	.9767	1.0000	.9997	1.0001	.9992
.300	1.006E+08	.9537	1.4708	224.96	.9395	.9819	.9565	2.0335	.9766	1.0001	.9996	1.0001	.9992
.350	1.159E+08	.9538	1.4704	224.23	.9189	.9756	.9414	1.7767	.9765	1.0001	.9995	1.0001	.9993
.400	1.305E+08	.9540	1.4699	223.39	.8957	.9683	.9244	1.5891	.9764	1.0001	.9993	1.0002	.9994
.450	1.445E+08	.9541	1.4693	222.45	.8704	.9603	.9057	1.4478	.9763	1.0002	.9992	1.0002	.9994
.500	1.576E+08	.9543	1.4687	221.42	.8431	.9514	.8853	1.3395	.9762	1.0001	.9990	1.0001	.9997
.550	1.700E+08	.9545	1.4680	220.29	.8143	.9418	.8635	1.2547	.9761	1.0001	.9988	1.0001	.9997
.600	1.815E+08	.9548	1.4673	219.09	.7842	.9316	.8406	1.1880	.9760	1.0002	.9986	1.0001	.9998
.650	1.922E+08	.9550	1.4665	217.80	.7531	.9207	.8166	1.1355	.9759	1.0003	.9984	1.0002	.9999
.700	2.020E+08	.9553	1.4657	216.43	.7213	.9092	.7918	1.0943	.9758	1.0004	.9982	1.0002	.9999
.750	2.108E+08	.9555	1.4649	215.00	.6890	.8971	.7663	1.0624	.9757	1.0006	.9980	1.0003	1.0000
.800	2.188E+08	.9558	1.4641	213.50	.6565	.8846	.7403	1.0383	.9756	1.0007	.9978	1.0003	1.0000
.850	2.259E+08	.9562	1.4632	211.94	.6241	.8717	.7139	1.0207	.9756	1.0009	.9976	1.0004	1.0000
.900	2.321E+08	.9565	1.4623	210.33	.5920	.8584	.6874	1.0089	.9755	1.0011	.9974	1.0004	1.0000
.950	2.375E+08	.9569	1.4614	208.66	.5602	.8448	.6608	1.0022	.9755	1.0013	.9972	1.0005	1.0001
1.000	2.420E+08	.9572	1.4605	206.95	.5291	.8309	.6343	1.0001	.9754	1.0015	.9970	1.0005	1.0001
1.050	2.457E+08	.9576	1.4595	205.20	.4988	.8167	.6080	1.0021	.9754	1.0017	.9968	1.0005	1.0001
1.100	2.487E+08	.9580	1.4586	203.42	.4693	.8024	.5820	1.0080	.9754	1.0019	.9966	1.0005	1.0001
1.150	2.509E+08	.9584	1.4577	201.60	.4408	.7880	.5565	1.0175	.9754	1.0022	.9964	1.0005	1.0001
1.200	2.525E+08	.9588	1.4567	199.76	.4134	.7735	.5314	1.0305	.9754	1.0024	.9962	1.0005	1.0001
1.250	2.533E+08	.9593	1.4558	197.89	.3871	.7589	.5070	1.0468	.9755	1.0026	.9960	1.0004	1.0001
1.300	2.536E+08	.9597	1.4549	196.01	.3619	.7443	.4831	1.0664	.9755	1.0027	.9958	1.0004	1.0001
1.350	2.533E+08	.9601	1.4540	194.11	.3380	.7297	.4599	1.0892	.9756	1.0029	.9956	1.0003	1.0002
1.400	2.524E+08	.9606	1.4531	192.19	.3152	.7151	.4375	1.1151	.9756	1.0030	.9954	1.0001	1.0002
1.450	2.511E+08	.9610	1.4522	190.27	.2937	.7006	.4158	1.1442	.9757	1.0032	.9952	1.0000	1.0003
1.500	2.493E+08	.9615	1.4514	188.34	.2733	.6862	.3949	1.1766	.9758	1.0032	.9950	.9998	1.0004
1.550	2.471E+08	.9619	1.4506	186.40	.2541	.6719	.3748	1.2121	.9759	1.0033	.9948	.9996	1.0005
1.600	2.445E+08	.9624	1.4497	184.47	.2361	.6578	.3555	1.2510	.9760	1.0033	.9946	.9994	1.0006
1.650	2.415E+08	.9628	1.4490	182.54	.2191	.6438	.3370	1.2932	.9761	1.0033	.9944	.9991	1.0008
1.700	2.382E+08	.9633	1.4482	180.61	.2033	.6300	.3193	1.3389	.9762	1.0033	.9942	.9988	1.0010
1.750	2.346E+08	.9637	1.4475	178.69	.1885	.6164	.3024	1.3881	.9763	1.0032	.9940	.9985	1.0012
1.800	2.308E+08	.9642	1.4468	176.77	.1746	.6030	.2863	1.4410	.9764	1.0031	.9938	.9981	1.0015
1.850	2.267E+08	.9646	1.4461	174.87	.1617	.5898	.2709	1.4977	.9765	1.0030	.9936	.9977	1.0017
1.900	2.224E+08	.9650	1.4454	172.97	.1497	.5769	.2563	1.5583	.9766	1.0028	.9933	.9973	1.0020

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

E. TT = 130 K PT = 8 ATM DT = 22.741 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9239	1.5259	223.69	1.0000	1.0000	1.0000	I	.9625	1.0000	1.0000	1.0000	I
.050	2.767E+07	.9239	1.5258	223.63	.9983	.9995	.9988	11.5685	.9624	1.0000	1.0000	1.0000	.9980
.100	5.518E+07	.9239	1.5256	223.45	.9932	.9979	.9952	5.8099	.9624	1.0001	.9999	1.0002	.9979
.150	8.236E+07	.9240	1.5253	223.15	.9844	.9954	.9889	3.9031	.9623	1.0000	.9998	1.0001	.9981
.200	1.091E+08	.9241	1.5249	222.74	.9725	.9918	.9804	2.9582	.9622	1.0000	.9997	1.0001	.9982
.250	1.351E+08	.9242	1.5244	222.21	.9575	.9872	.9696	2.3986	.9621	1.0001	.9996	1.0002	.9983
.300	1.604E+08	.9243	1.5237	221.58	.9394	.9817	.9564	2.0321	.9619	.9999	.9994	1.0001	.9985
.350	1.848E+08	.9245	1.5230	220.83	.9187	.9753	.9414	1.7757	.9617	.9999	.9992	1.0001	.9987
.400	2.082E+08	.9247	1.5221	219.99	.8956	.9680	.9244	1.5883	.9616	1.0000	.9989	1.0001	.9989
.450	2.305E+08	.9249	1.5212	219.04	.8703	.9598	.9057	1.4472	.9614	1.0000	.9987	1.0002	.9990
.500	2.516E+08	.9252	1.5201	218.00	.8431	.9509	.8854	1.3387	.9612	1.0001	.9984	1.0002	.9992
.550	2.714E+08	.9255	1.5190	216.87	.8143	.9412	.8637	1.2541	.9609	1.0002	.9981	1.0003	.9993
.600	2.899E+08	.9258	1.5178	215.66	.7843	.9308	.8408	1.1875	.9607	1.0003	.9978	1.0004	.9994
.650	3.070E+08	.9262	1.5165	214.37	.7532	.9198	.8169	1.1351	.9605	1.0005	.9975	1.0005	.9995
.700	3.228E+08	.9265	1.5151	213.00	.7214	.9082	.7921	1.0940	.9603	1.0007	.9972	1.0006	.9996
.750	3.371E+08	.9270	1.5137	211.57	.6892	.8961	.7666	1.0621	.9602	1.0010	.9969	1.0007	.9997
.800	3.500E+08	.9274	1.5123	210.08	.6568	.8835	.7406	1.0380	.9600	1.0012	.9966	1.0008	.9998
.850	3.614E+08	.9279	1.5108	208.53	.6245	.8705	.7143	1.0205	.9599	1.0015	.9963	1.0009	.9998
.900	3.715E+08	.9284	1.5092	206.93	.5923	.8571	.6876	1.0089	.9598	1.0017	.9960	1.0009	1.0000
.950	3.802E+08	.9289	1.5077	205.28	.5606	.8434	.6611	1.0022	.9597	1.0020	.9956	1.0009	1.0000
1.000	3.876E+08	.9295	1.5061	203.59	.5296	.8295	.6346	1.0000	.9596	1.0024	.9953	1.0010	1.0000
1.050	3.938E+08	.9301	1.5045	201.86	.4993	.8153	.6083	1.0021	.9595	1.0028	.9950	1.0011	1.0000
1.100	3.987E+08	.9307	1.5029	200.10	.4699	.8009	.5824	1.0079	.9595	1.0032	.9947	1.0011	1.0000
1.150	4.025E+08	.9313	1.5012	198.31	.4414	.7864	.5568	1.0175	.9595	1.0035	.9944	1.0011	1.0000
1.200	4.051E+08	.9320	1.4996	196.50	.4140	.7718	.5317	1.0305	.9595	1.0039	.9941	1.0011	1.0000
1.250	4.067E+08	.9326	1.4980	194.66	.3877	.7572	.5072	1.0468	.9595	1.0042	.9938	1.0010	1.0000
1.300	4.073E+08	.9333	1.4965	192.81	.3626	.7425	.4834	1.0664	.9596	1.0046	.9935	1.0009	1.0001
1.350	4.070E+08	.9340	1.4949	190.94	.3386	.7279	.4602	1.0892	.9597	1.0049	.9932	1.0008	1.0001
1.400	4.058E+08	.9347	1.4933	189.06	.3159	.7133	.4377	1.1152	.9598	1.0051	.9928	1.0006	1.0002
1.450	4.038E+08	.9354	1.4918	187.18	.2943	.6987	.4160	1.1443	.9599	1.0053	.9925	1.0004	1.0004
1.500	4.011E+08	.9361	1.4903	185.29	.2739	.6843	.3950	1.1767	.9600	1.0055	.9922	1.0001	1.0005
1.550	3.977E+08	.9369	1.4889	183.40	.2547	.6700	.3749	1.2124	.9601	1.0056	.9919	.9998	1.0007
1.600	3.936E+08	.9376	1.4875	181.51	.2366	.6558	.3555	1.2513	.9603	1.0057	.9916	.9994	1.0009
1.650	3.889E+08	.9383	1.4861	179.62	.2197	.6418	.3370	1.2937	.9604	1.0057	.9913	.9990	1.0012

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

E. TT = 130 K PT = 10 ATM DT = 29.068 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9034	1.5676	221.39	1.0000	1.0000	1.0000	I	.9526	1.0000	1.0000	1.0000	I
.050	3.454E+07	.9035	1.5676	221.33	.9983	.9995	.9988	11.5591	.9526	1.0000	1.0000	1.0001	.9972
.100	6.887E+07	.9035	1.5673	221.15	.9930	.9979	.9951	5.8061	.9525	1.0000	.9999	1.0000	.9973
.150	1.028E+08	.9036	1.5669	220.85	.9844	.9953	.9889	3.9000	.9524	1.0000	.9998	1.0001	.9973
.200	1.361E+08	.9037	1.5664	220.43	.9726	.9917	.9804	2.9559	.9522	1.0001	.9997	1.0002	.9974
.250	1.687E+08	.9038	1.5657	219.90	.9574	.9871	.9695	2.3973	.9521	.9999	.9995	1.0001	.9977
.300	2.003E+08	.9040	1.5649	219.25	.9394	.9816	.9565	2.0308	.9518	.9999	.9992	1.0001	.9979
.350	2.308E+08	.9041	1.5639	218.50	.9187	.9751	.9414	1.7747	.9516	.9999	.9990	1.0001	.9981
.400	2.600E+08	.9044	1.5628	217.64	.8955	.9677	.9245	1.5875	.9513	.9999	.9987	1.0002	.9984
.450	2.879E+08	.9046	1.5616	216.69	.8702	.9595	.9058	1.4466	.9510	1.0000	.9984	1.0003	.9986
.500	3.143E+08	.9049	1.5602	215.64	.8431	.9505	.8855	1.3382	.9507	1.0000	.9980	1.0004	.9988
.550	3.391E+08	.9052	1.5587	214.50	.8143	.9408	.8639	1.2537	.9505	1.0002	.9977	1.0005	.9990
.600	3.622E+08	.9056	1.5571	213.28	.7841	.9303	.8408	1.1874	.9502	1.0002	.9973	1.0005	.9993
.650	3.836E+08	.9060	1.5555	211.99	.7531	.9193	.8169	1.1351	.9499	1.0004	.9970	1.0006	.9995
.700	4.033E+08	.9065	1.5537	210.62	.7214	.9076	.7921	1.0940	.9496	1.0006	.9966	1.0007	.9997
.750	4.213E+08	.9070	1.5519	209.19	.6892	.8955	.7667	1.0622	.9494	1.0009	.9962	1.0009	.9998
.800	4.375E+08	.9075	1.5500	207.70	.6569	.8828	.7407	1.0381	.9491	1.0013	.9958	1.0010	.9999
.850	4.520E+08	.9081	1.5480	206.15	.6245	.8697	.7144	1.0206	.9489	1.0017	.9954	1.0012	.9999
.900	4.646E+08	.9087	1.5460	204.55	.5925	.8563	.6879	1.0089	.9487	1.0020	.9950	1.0012	1.0000
.950	4.757E+08	.9093	1.5440	202.91	.5609	.8426	.6614	1.0022	.9486	1.0025	.9947	1.0014	1.0001
1.000	4.851E+08	.9100	1.5419	201.23	.5299	.8286	.6349	1.0001	.9485	1.0030	.9943	1.0015	1.0001
1.050	4.930E+08	.9107	1.5398	199.52	.4997	.8144	.6087	1.0021	.9484	1.0035	.9939	1.0016	1.0001
1.100	4.993E+08	.9114	1.5376	197.77	.4703	.8000	.5827	1.0080	.9483	1.0040	.9935	1.0017	1.0001
1.150	5.042E+08	.9122	1.5355	196.00	.4419	.7854	.5572	1.0175	.9483	1.0045	.9932	1.0017	1.0001
1.200	5.076E+08	.9130	1.5334	194.20	.4145	.7708	.5321	1.0305	.9483	1.0050	.9928	1.0017	1.0001
1.250	5.098E+08	.9138	1.5312	192.39	.3882	.7561	.5076	1.0468	.9483	1.0054	.9924	1.0016	1.0001
1.300	5.107E+08	.9146	1.5291	190.56	.3631	.7415	.4837	1.0664	.9484	1.0059	.9920	1.0015	1.0001
1.350	5.104E+08	.9155	1.5271	188.71	.3391	.7268	.4605	1.0892	.9485	1.0063	.9916	1.0014	1.0002
1.400	5.091E+08	.9164	1.5250	186.86	.3164	.7121	.4380	1.1152	.9486	1.0066	.9913	1.0012	1.0003
1.450	5.067E+08	.9173	1.5230	185.00	.2948	.6976	.4162	1.1444	.9487	1.0069	.9909	1.0009	1.0004
1.500	5.034E+08	.9181	1.5210	183.14	.2744	.6831	.3952	1.1768	.9489	1.0072	.9905	1.0005	1.0006
1.550	4.993E+08	.9190	1.5191	181.28	.2552	.6688	.3751	1.2125	.9490	1.0073	.9901	1.0001	1.0008

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

E. TT = 130 K PT = 15 ATM DT = 46.388 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.8492	1.7010	215.43	1.0000	1.0000	1.0000	I	.9269	1.0000	1.0000	1.0000	I
.050	5.179E+07	.8492	1.7009	215.36	.9983	.9995	.9988	11.5233	.9269	1.0001	1.0000	1.0001	.9941
.100	1.033E+08	.8492	1.7006	215.17	.9930	.9979	.9951	5.7886	.9267	1.0000	.9999	1.0001	.9943
.150	1.542E+08	.8493	1.7000	214.85	.9844	.9952	.9890	3.8885	.9265	1.0000	.9997	1.0002	.9944
.200	2.042E+08	.8494	1.6991	214.41	.9723	.9915	.9804	2.9481	.9262	.9998	.9995	1.0001	.9948
.250	2.530E+08	.8495	1.6980	213.84	.9572	.9869	.9696	2.3910	.9258	.9997	.9992	1.0002	.9951
.300	3.004E+08	.8496	1.6967	213.17	.9390	.9812	.9565	2.0262	.9254	.9995	.9988	1.0001	.9956
.350	3.462E+08	.8498	1.6952	212.38	.9182	.9746	.9415	1.7710	.9249	.9994	.9985	1.0002	.9961
.400	3.901E+08	.8501	1.6934	211.48	.8950	.9671	.9246	1.5847	.9244	.9994	.9980	1.0003	.9966
.450	4.320E+08	.8503	1.6915	210.48	.8697	.9588	.9059	1.4444	.9238	.9993	.9976	1.0004	.9971
.500	4.717E+08	.8506	1.6893	209.40	.8425	.9496	.8857	1.3365	.9232	.9994	.9971	1.0006	.9975
.550	5.090E+08	.8510	1.6869	208.22	.8138	.9398	.8641	1.2524	.9226	.9995	.9966	1.0008	.9980
.600	5.439E+08	.8514	1.6844	206.97	.7838	.9292	.8413	1.1863	.9220	.9997	.9961	1.0010	.9984
.650	5.763E+08	.8519	1.6816	205.64	.7527	.9180	.8174	1.1344	.9214	.9999	.9956	1.0012	.9989
.700	6.061E+08	.8524	1.6787	204.25	.7211	.9062	.7927	1.0935	.9209	1.0003	.9950	1.0014	.9992
.750	6.334E+08	.8530	1.6757	202.80	.6891	.8940	.7674	1.0619	.9204	1.0007	.9945	1.0018	.9995
.800	6.581E+08	.8536	1.6725	201.29	.6569	.8812	.7415	1.0379	.9199	1.0013	.9940	1.0021	.9997
.850	6.802E+08	.8544	1.6692	199.74	.6247	.8680	.7153	1.0205	.9194	1.0019	.9935	1.0024	.9998
.900	6.998E+08	.8551	1.6658	198.14	.5928	.8545	.6889	1.0088	.9190	1.0027	.9930	1.0028	.9999
.950	7.169E+08	.8560	1.6623	196.51	.5614	.8407	.6625	1.0021	.9186	1.0035	.9925	1.0031	1.0000
1.000	7.316E+08	.8569	1.6588	194.84	.5306	.8266	.6361	1.0000	.9184	1.0043	.9919	1.0034	1.0000
1.050	7.439E+08	.8578	1.6551	193.15	.5005	.8123	.6099	1.0020	.9181	1.0052	.9914	1.0037	1.0000
1.100	7.540E+08	.8588	1.6515	191.43	.4712	.7979	.5840	1.0079	.9179	1.0061	.9909	1.0039	.9999
1.150	7.618E+08	.8599	1.6477	189.69	.4429	.7833	.5585	1.0174	.9178	1.0070	.9904	1.0041	.9999
1.200	7.676E+08	.8610	1.6440	187.94	.4156	.7686	.5334	1.0303	.9177	1.0079	.9899	1.0042	.9999
1.250	7.715E+08	.8621	1.6403	186.17	.3895	.7539	.5089	1.0466	.9177	1.0088	.9894	1.0043	.9998
1.300	7.734E+08	.8633	1.6365	184.39	.3644	.7391	.4849	1.0662	.9177	1.0096	.9889	1.0042	.9999

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

E. TT = 130 K PT = 20 ATM DT = 66.569 KGM/M3 CONCLUDED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.7890	1.9011	209.07	1.0000	1.0000	1.0000	I	.8995	1.0000	1.0000	1.0000	I
.050	6.941E+07	.7890	1.9010	209.00	.9983	.9995	.9989	11.4649	.8995	1.0001	1.0000	1.0001	.9891
.100	1.384E+08	.7890	1.9006	208.79	.9930	.9978	.9952	5.7595	.8992	1.0000	.9998	1.0002	.9893
.150	2.066E+08	.7890	1.8999	208.44	.9842	.9951	.9890	3.8703	.8988	.9997	.9996	1.0001	.9897
.200	2.736E+08	.7890	1.8989	207.95	.9719	.9914	.9804	2.9349	.8983	.9994	.9993	1.0001	.9904
.250	3.391E+08	.7891	1.8976	207.34	.9567	.9866	.9696	2.3811	.8977	.9992	.9989	1.0002	.9910
.300	4.026E+08	.7891	1.8960	206.60	.9384	.9808	.9567	2.0183	.8969	.9989	.9985	1.0003	.9917
.350	4.639E+08	.7892	1.8940	205.74	.9174	.9741	.9416	1.7650	.8960	.9985	.9980	1.0003	.9927
.400	5.228E+08	.7893	1.8918	204.77	.8941	.9665	.9247	1.5799	.8951	.9983	.9974	1.0005	.9936
.450	5.789E+08	.7894	1.8893	203.70	.8686	.9581	.9062	1.4407	.8940	.9981	.9969	1.0007	.9945
.500	6.322E+08	.7896	1.8865	202.54	.8414	.9488	.8861	1.3336	.8930	.9981	.9963	1.0010	.9954
.550	6.823E+08	.7899	1.8834	201.30	.8126	.9388	.8646	1.2502	.8919	.9981	.9956	1.0014	.9962
.600	7.293E+08	.7902	1.8801	199.97	.7827	.9282	.8419	1.1846	.8909	.9983	.9950	1.0018	.9970
.650	7.729E+08	.7906	1.8764	198.58	.7518	.9169	.8183	1.1330	.8898	.9986	.9944	1.0023	.9977
.700	8.131E+08	.7911	1.8723	197.13	.7202	.9050	.7937	1.0927	.8888	.9990	.9937	1.0027	.9984
.750	8.499E+08	.7916	1.8681	195.62	.6883	.8927	.7685	1.0613	.8878	.9997	.9931	1.0032	.9990
.800	8.834E+08	.7923	1.8636	194.07	.6563	.8799	.7429	1.0376	.8869	1.0005	.9925	1.0039	.9994
.850	9.135E+08	.7930	1.8588	192.48	.6244	.8667	.7169	1.0203	.8860	1.0014	.9919	1.0045	.9997
.900	9.403E+08	.7938	1.8539	190.86	.5928	.8531	.6906	1.0087	.8852	1.0026	.9913	1.0052	.9999
.950	9.638E+08	.7947	1.8487	189.21	.5616	.8393	.6643	1.0021	.8845	1.0038	.9908	1.0059	1.0000
1.000	9.841E+08	.7957	1.8433	187.54	.5310	.8252	.6381	1.0000	.8839	1.0051	.9902	1.0066	1.0000
1.050	1.001E+09	.7967	1.8377	185.85	.5011	.8109	.6120	1.0020	.8834	1.0066	.9897	1.0072	1.0000
1.100	1.015E+09	.7979	1.8320	184.14	.4721	.7964	.5862	1.0078	.8830	1.0080	.9891	1.0078	.9999

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

F. TT = 140 K PT = 1 ATM DT = 2.456 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9927	1.4108	240.36	1.0000	1.0000	1.0000	1	.9966	1.0000	1.0000	1.0000	1
.050	3.143E+06	.9927	1.4108	240.30	.9983	.9995	.9988	11.5893	.9966	1.0000	1.0000	1.0000	.9998
.100	6.266E+06	.9927	1.4108	240.12	.9930	.9980	.9950	5.8207	.9966	1.0000	1.0000	1.0000	.9998
.150	9.352E+06	.9928	1.4108	239.82	.9844	.9955	.9889	3.9096	.9966	1.0000	1.0000	1.0000	.9998
.200	1.238E+07	.9928	1.4108	239.40	.9725	.9920	.9803	2.9629	.9966	1.0000	1.0000	1.0001	.9998
.250	1.534E+07	.9928	1.4107	238.86	.9575	.9876	.9695	2.4022	.9965	1.0001	.9999	1.0001	.9998
.300	1.820E+07	.9928	1.4106	238.21	.9395	.9822	.9565	2.0346	.9965	1.0001	.9999	1.0001	.9998
.350	2.096E+07	.9928	1.4106	237.45	.9189	.9760	.9414	1.7775	.9965	1.0001	.9999	1.0001	.9997
.400	2.360E+07	.9928	1.4105	236.58	.8957	.9689	.9244	1.5897	.9965	1.0001	.9999	1.0002	.9997
.450	2.610E+07	.9929	1.4104	235.61	.8703	.9609	.9055	1.4486	.9965	1.0000	.9998	1.0000	.9999
.500	2.847E+07	.9929	1.4103	234.54	.8430	.9522	.8852	1.3398	.9964	1.0000	.9998	1.0000	.9999
.550	3.069E+07	.9929	1.4102	233.37	.8142	.9427	.8634	1.2549	.9964	1.0000	.9998	1.0000	.9999
.600	3.275E+07	.9930	1.4101	232.11	.7840	.9326	.8405	1.1882	.9964	1.0000	.9997	1.0000	1.0000
.650	3.465E+07	.9930	1.4100	230.76	.7528	.9218	.8165	1.1356	.9964	1.0000	.9997	1.0000	1.0000
.700	3.638E+07	.9931	1.4098	229.33	.7209	.9104	.7916	1.0944	.9964	1.0000	.9996	1.0000	1.0000
.750	3.796E+07	.9931	1.4097	227.83	.6886	.8985	.7661	1.0624	.9963	1.0000	.9996	1.0001	1.0000
.800	3.936E+07	.9931	1.4096	226.25	.6561	.8861	.7401	1.0382	.9963	1.0000	.9996	1.0001	1.0000
.850	4.061E+07	.9932	1.4094	224.61	.6236	.8733	.7137	1.0207	.9963	1.0001	.9995	1.0001	1.0000
.900	4.169E+07	.9933	1.4093	222.91	.5913	.8601	.6871	1.0089	.9963	1.0001	.9995	1.0001	1.0000
.950	4.262E+07	.9933	1.4091	221.16	.5595	.8466	.6605	1.0022	.9963	1.0001	.9994	1.0001	1.0000
1.000	4.340E+07	.9934	1.4090	219.35	.5284	.8328	.6340	1.0000	.9963	1.0002	.9994	1.0001	1.0000
1.050	4.404E+07	.9934	1.4088	217.50	.4980	.8188	.6077	1.0020	.9962	1.0002	.9994	1.0001	1.0000
1.100	4.453E+07	.9935	1.4087	215.60	.4685	.8046	.5818	1.0079	.9962	1.0002	.9993	1.0001	1.0000
1.150	4.490E+07	.9936	1.4085	213.68	.4400	.7903	.5563	1.0175	.9962	1.0003	.9993	1.0001	1.0000
1.200	4.514E+07	.9936	1.4084	211.72	.4125	.7758	.5312	1.0304	.9962	1.0003	.9992	1.0001	1.0000
1.250	4.527E+07	.9937	1.4083	209.73	.3862	.7613	.5068	1.0468	.9962	1.0003	.9992	1.0002	1.0000
1.300	4.528E+07	.9938	1.4081	207.72	.3611	.7468	.4830	1.0663	.9962	1.0003	.9992	1.0002	1.0000
1.350	4.520E+07	.9938	1.4080	205.70	.3371	.7322	.4599	1.0890	.9962	1.0004	.9991	1.0001	1.0000
1.400	4.502E+07	.9939	1.4078	203.66	.3144	.7177	.4375	1.1149	.9962	1.0004	.9991	1.0001	1.0000
1.450	4.476E+07	.9940	1.4077	201.60	.2929	.7033	.4159	1.1440	.9962	1.0004	.9990	1.0001	1.0000
1.500	4.442E+07	.9941	1.4075	199.54	.2725	.6890	.3950	1.1762	.9962	1.0005	.9990	1.0001	1.0000
1.550	4.401E+07	.9941	1.4074	197.48	.2534	.6748	.3750	1.2116	.9963	1.0005	.9990	1.0001	1.0000
1.600	4.354E+07	.9942	1.4073	195.41	.2354	.6607	.3558	1.2503	.9963	1.0005	.9989	1.0001	1.0001
1.650	4.300E+07	.9943	1.4072	193.35	.2185	.6468	.3373	1.2923	.9963	1.0005	.9989	1.0000	1.0001
1.700	4.242E+07	.9944	1.4070	191.29	.2027	.6330	.3197	1.3377	.9963	1.0005	.9989	1.0000	1.0001
1.750	4.178E+07	.9944	1.4069	189.23	.1879	.6194	.3029	1.3866	.9963	1.0005	.9988	1.0000	1.0001
1.800	4.111E+07	.9945	1.4068	187.19	.1741	.6061	.2868	1.4392	.9963	1.0005	.9988	.9999	1.0002
1.850	4.040E+07	.9946	1.4067	185.15	.1613	.5929	.2715	1.4954	.9963	1.0005	.9988	.9999	1.0002
1.900	3.965E+07	.9946	1.4066	183.13	.1493	.5800	.2570	1.5556	.9963	1.0005	.9987	.9998	1.0002
1.950	3.888E+07	.9947	1.4065	181.11	.1382	.5673	.2431	1.6197	.9964	1.0004	.9987	.9998	1.0003
2.000	3.808E+07	.9948	1.4064	179.12	.1279	.5548	.2300	1.6880	.9964	1.0004	.9987	.9997	1.0003

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

F. TT = 140 K PT = 3 ATM DT = 7.480 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9781	1.4337	238.68	1.0000	1.0000	1.0000	I	.9896	1.0000	1.0000	1.0000	I
.050	9.391E+06	.9781	1.4336	238.62	.9983	.9995	.9988	11.5859	.9896	1.0000	1.0000	1.0000	.9995
.100	1.873E+07	.9781	1.4336	238.44	.9931	.9980	.9951	5.8189	.9896	1.0000	1.0000	1.0001	.9995
.150	2.795E+07	.9781	1.4335	238.14	.9845	.9955	.9890	3.9082	.9896	1.0001	.9999	1.0001	.9994
.200	3.700E+07	.9781	1.4334	237.71	.9725	.9920	.9803	2.9623	.9895	1.0000	.9999	1.0000	.9996
.250	4.583E+07	.9782	1.4332	237.18	.9574	.9875	.9694	2.4018	.9895	1.0000	.9998	1.0000	.9996
.300	5.440E+07	.9782	1.4330	236.52	.9394	.9821	.9564	2.0344	.9894	1.0000	.9998	1.0000	.9997
.350	6.265E+07	.9783	1.4328	235.76	.9187	.9758	.9413	1.7774	.9894	1.0000	.9997	1.0000	.9997
.400	7.055E+07	.9783	1.4326	234.88	.8956	.9686	.9243	1.5897	.9893	1.0000	.9996	1.0001	.9997
.450	7.806E+07	.9784	1.4323	233.91	.8702	.9606	.9056	1.4484	.9893	1.0000	.9995	1.0001	.9998
.500	8.515E+07	.9785	1.4320	232.83	.8430	.9518	.8853	1.3396	.9892	1.0000	.9994	1.0001	.9998
.550	9.180E+07	.9786	1.4317	231.66	.8142	.9423	.8636	1.2548	.9891	1.0000	.9993	1.0002	.9999
.600	9.799E+07	.9787	1.4313	230.39	.7840	.9321	.8406	1.1881	.9890	1.0000	.9992	1.0002	.9999
.650	1.037E+08	.9788	1.4309	229.05	.7529	.9213	.8166	1.1355	.9890	1.0001	.9991	1.0002	.9999
.700	1.089E+08	.9789	1.4306	227.62	.7210	.9098	.7918	1.0943	.9889	1.0001	.9990	1.0003	1.0000
.750	1.137E+08	.9790	1.4301	226.11	.6887	.8979	.7663	1.0624	.9888	1.0002	.9989	1.0003	1.0000
.800	1.179E+08	.9792	1.4297	224.54	.6562	.8854	.7403	1.0382	.9888	1.0003	.9988	1.0004	1.0000
.850	1.217E+08	.9793	1.4293	222.90	.6237	.8726	.7139	1.0207	.9887	1.0004	.9986	1.0004	1.0000
.900	1.250E+08	.9795	1.4289	221.21	.5915	.8593	.6874	1.0089	.9887	1.0005	.9985	1.0005	1.0000
.950	1.278E+08	.9797	1.4284	219.46	.5598	.8457	.6608	1.0021	.9886	1.0006	.9984	1.0005	1.0000
1.000	1.302E+08	.9798	1.4280	217.66	.5286	.8319	.6343	1.0000	.9886	1.0007	.9983	1.0006	1.0000
1.050	1.321E+08	.9800	1.4275	215.82	.4983	.8178	.6080	1.0020	.9886	1.0008	.9982	1.0006	1.0000
1.100	1.336E+08	.9802	1.4270	213.93	.4688	.8036	.5821	1.0079	.9885	1.0009	.9981	1.0006	1.0000
1.150	1.347E+08	.9804	1.4266	212.02	.4402	.7892	.5564	1.0176	.9885	1.0008	.9979	1.0005	1.0002
1.200	1.355E+08	.9806	1.4261	210.07	.4128	.7747	.5314	1.0306	.9885	1.0009	.9978	1.0005	1.0002
1.250	1.359E+08	.9808	1.4257	208.10	.3865	.7602	.5070	1.0469	.9885	1.0010	.9977	1.0005	1.0002
1.300	1.360E+08	.9810	1.4252	206.11	.3613	.7456	.4831	1.0665	.9885	1.0011	.9976	1.0005	1.0002
1.350	1.358E+08	.9812	1.4248	204.10	.3374	.7310	.4600	1.0892	.9885	1.0012	.9975	1.0005	1.0002
1.400	1.353E+08	.9814	1.4243	202.08	.3147	.7165	.4376	1.1151	.9885	1.0013	.9974	1.0004	1.0002
1.450	1.346E+08	.9817	1.4239	200.04	.2931	.7021	.4160	1.1442	.9885	1.0014	.9973	1.0004	1.0002
1.500	1.336E+08	.9819	1.4235	198.00	.2728	.6877	.3951	1.1764	.9886	1.0014	.9972	1.0004	1.0002
1.550	1.324E+08	.9821	1.4231	195.96	.2536	.6735	.3751	1.2119	.9886	1.0015	.9971	1.0003	1.0003
1.600	1.310E+08	.9823	1.4227	193.91	.2356	.6594	.3558	1.2506	.9886	1.0015	.9970	1.0002	1.0003
1.650	1.294E+08	.9825	1.4223	191.87	.2187	.6454	.3374	1.2927	.9887	1.0016	.9969	1.0001	1.0004
1.700	1.277E+08	.9828	1.4219	189.83	.2029	.6317	.3197	1.3382	.9887	1.0016	.9968	1.0000	1.0004
1.750	1.258E+08	.9830	1.4216	187.80	.1881	.6181	.3028	1.3872	.9887	1.0016	.9967	.9999	1.0005
1.800	1.238E+08	.9832	1.4212	185.77	.1743	.6047	.2867	1.4398	.9888	1.0015	.9966	.9997	1.0006
1.850	1.216E+08	.9834	1.4209	183.75	.1614	.5915	.2714	1.4962	.9888	1.0015	.9964	.9996	1.0007
1.900	1.194E+08	.9836	1.4205	181.75	.1495	.5786	.2568	1.5565	.9889	1.0014	.9963	.9994	1.0008
1.950	1.171E+08	.9838	1.4202	179.76	.1383	.5659	.2430	1.6208	.9889	1.0014	.9962	.9993	1.0010
2.000	1.147E+08	.9840	1.4199	177.79	.1280	.5534	.2298	1.6893	.9890	1.0013	.9961	.9991	1.0011

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

F. TT = 140 K PT = 5 ATM DT = 12.660 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9631	1.4584	236.99	1.0000	1.0000	1.0000	I	.9826	1.0000	1.0000	1.0000	I
.050	1.560E+07	.9631	1.4584	236.93	.9983	.9995	.9988	11.5782	.9826	1.0000	1.0000	1.0000	.9988
.100	3.111E+07	.9631	1.4581	236.75	.9931	.9980	.9951	5.8149	.9826	1.0001	1.0000	1.0001	.9988
.150	4.643E+07	.9632	1.4581	236.44	.9844	.9954	.9889	3.9060	.9825	1.0000	.9999	1.0000	.9989
.200	6.147E+07	.9632	1.4579	236.02	.9725	.9919	.9803	2.9603	.9825	1.0000	.9998	1.0000	.9989
.250	7.615E+07	.9633	1.4577	235.47	.9574	.9874	.9695	2.4003	.9824	1.0000	.9997	1.0001	.9990
.300	9.039E+07	.9633	1.4573	234.81	.9394	.9820	.9565	2.0331	.9823	.9999	.9996	1.0001	.9991
.350	1.041E+08	.9634	1.4570	234.04	.9187	.9756	.9414	1.7764	.9822	.9999	.9995	1.0001	.9991
.400	1.173E+08	.9635	1.4565	233.16	.8956	.9684	.9244	1.5889	.9821	.9999	.9994	1.0002	.9992
.450	1.298E+08	.9636	1.4561	232.18	.8702	.9603	.9057	1.4476	.9820	1.0000	.9992	1.0002	.9993
.500	1.416E+08	.9638	1.4555	231.10	.8430	.9515	.8854	1.3390	.9818	1.0000	.9991	1.0003	.9993
.550	1.526E+08	.9639	1.4550	229.92	.8141	.9419	.8635	1.2545	.9817	.9998	.9989	1.0001	.9996
.600	1.629E+08	.9641	1.4544	228.65	.7839	.9316	.8406	1.1879	.9816	.9999	.9987	1.0002	.9997
.650	1.725E+08	.9642	1.4537	227.30	.7528	.9207	.8166	1.1354	.9814	.9999	.9985	1.0002	.9998
.700	1.812E+08	.9644	1.4531	225.87	.7209	.9092	.7918	1.0942	.9813	1.0000	.9983	1.0003	.9999
.750	1.891E+08	.9646	1.4524	224.37	.6887	.8972	.7663	1.0623	.9812	1.0001	.9981	1.0003	.9999
.800	1.962E+08	.9649	1.4517	222.79	.6562	.8847	.7403	1.0382	.9811	1.0002	.9980	1.0004	1.0000
.850	2.025E+08	.9651	1.4509	221.16	.6237	.8718	.7140	1.0207	.9810	1.0003	.9978	1.0005	1.0000
.900	2.080E+08	.9654	1.4502	219.47	.5916	.8585	.6875	1.0089	.9809	1.0005	.9976	1.0006	1.0000
.950	2.128E+08	.9656	1.4494	217.72	.5598	.8449	.6609	1.0022	.9808	1.0006	.9974	1.0006	1.0000
1.000	2.168E+08	.9659	1.4486	215.93	.5287	.8310	.6344	1.0000	.9807	1.0008	.9972	1.0007	1.0000
1.050	2.201E+08	.9662	1.4478	214.10	.4984	.8169	.6081	1.0021	.9807	1.0010	.9970	1.0008	1.0000
1.100	2.227E+08	.9665	1.4470	212.23	.4689	.8026	.5822	1.0079	.9806	1.0012	.9968	1.0008	1.0000
1.150	2.247E+08	.9668	1.4463	210.32	.4405	.7882	.5567	1.0175	.9806	1.0014	.9967	1.0009	1.0000
1.200	2.260E+08	.9672	1.4455	208.39	.4130	.7737	.5316	1.0304	.9806	1.0016	.9965	1.0009	1.0000
1.250	2.268E+08	.9675	1.4447	206.43	.3868	.7591	.5072	1.0467	.9806	1.0017	.9963	1.0009	1.0000
1.300	2.270E+08	.9678	1.4439	204.46	.3616	.7445	.4834	1.0663	.9806	1.0019	.9961	1.0009	1.0000
1.350	2.267E+08	.9682	1.4431	202.46	.3377	.7299	.4602	1.0890	.9806	1.0021	.9959	1.0009	1.0000
1.400	2.260E+08	.9685	1.4424	200.46	.3150	.7154	.4378	1.1149	.9806	1.0022	.9958	1.0009	1.0000
1.450	2.248E+08	.9689	1.4416	198.44	.2934	.7009	.4162	1.1440	.9806	1.0024	.9956	1.0008	1.0001
1.500	2.232E+08	.9693	1.4409	196.42	.2731	.6865	.3953	1.1763	.9807	1.0025	.9954	1.0007	1.0001
1.550	2.212E+08	.9696	1.4402	194.40	.2539	.6722	.3752	1.2117	.9807	1.0026	.9952	1.0006	1.0002
1.600	2.189E+08	.9700	1.4395	192.37	.2359	.6581	.3559	1.2505	.9807	1.0027	.9951	1.0005	1.0002
1.650	2.163E+08	.9704	1.4388	190.35	.2190	.6442	.3374	1.2926	.9808	1.0027	.9949	1.0003	1.0003
1.700	2.135E+08	.9707	1.4382	188.33	.2032	.6304	.3198	1.3382	.9809	1.0027	.9947	1.0001	1.0005
1.750	2.104E+08	.9711	1.4376	186.32	.1883	.6168	.3029	1.3873	.9809	1.0027	.9945	.9999	1.0006
1.800	2.071E+08	.9714	1.4369	184.31	.1745	.6034	.2867	1.4400	.9810	1.0027	.9944	.9997	1.0008
1.850	2.035E+08	.9718	1.4364	182.32	.1616	.5902	.2714	1.4965	.9811	1.0026	.9942	.9994	1.0009
1.900	1.998E+08	.9721	1.4358	180.34	.1496	.5773	.2568	1.5569	.9812	1.0025	.9940	.9992	1.0011
1.950	1.960E+08	.9725	1.4352	178.37	.1385	.5645	.2429	1.6214	.9812	1.0024	.9939	.9989	1.0013
2.000	1.920E+08	.9728	1.4347	176.41	.1281	.5521	.2297	1.6901	.9813	1.0023	.9937	.9986	1.0016

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

F. TT = 140 K PT = 8 ATM DT = 20.750 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9402	1.4997	234.44	1.0000	1.0000	1.0000	1	.9720	1.0000	1.0000	1.0000	1
.050	2.486E+07	.9402	1.4996	234.38	.9983	.9995	.9988	11.5665	.9720	1.0000	1.0000	1.0000	.9979
.100	4.958E+07	.9402	1.4995	234.19	.9932	.9979	.9952	5.8089	.9720	1.0001	.9999	1.0002	.9978
.150	7.399E+07	.9403	1.4992	233.88	.9844	.9954	.9889	3.9025	.9719	1.0000	.9998	1.0000	.9980
.200	9.798E+07	.9403	1.4989	233.45	.9725	.9918	.9804	2.9578	.9718	1.0000	.9997	1.0001	.9981
.250	1.214E+08	.9404	1.4984	232.89	.9574	.9872	.9696	2.3983	.9716	.9999	.9996	1.0001	.9982
.300	1.441E+08	.9405	1.4979	232.22	.9394	.9817	.9566	2.0316	.9715	.9999	.9994	1.0002	.9983
.350	1.660E+08	.9406	1.4973	231.44	.9185	.9753	.9414	1.7755	.9713	.9997	.9992	1.0001	.9986
.400	1.870E+08	.9407	1.4966	230.55	.8953	.9680	.9244	1.5882	.9711	.9997	.9990	1.0001	.9988
.450	2.069E+08	.9409	1.4958	229.55	.8700	.9599	.9057	1.4472	.9708	.9997	.9988	1.0002	.9990
.500	2.258E+08	.9411	1.4949	228.45	.8427	.9509	.8854	1.3387	.9706	.9997	.9985	1.0002	.9991
.550	2.435E+08	.9413	1.4940	227.26	.8139	.9413	.8637	1.2541	.9704	.9997	.9982	1.0003	.9993
.600	2.600E+08	.9415	1.4930	225.99	.7838	.9309	.8408	1.1876	.9701	.9997	.9980	1.0004	.9995
.650	2.753E+08	.9418	1.4919	224.62	.7527	.9199	.8169	1.1352	.9699	.9998	.9977	1.0005	.9996
.700	2.893E+08	.9420	1.4908	223.19	.7209	.9084	.7921	1.0941	.9697	1.0000	.9974	1.0006	.9997
.750	3.021E+08	.9423	1.4897	221.68	.6886	.8963	.7666	1.0622	.9694	1.0001	.9971	1.0007	.9998
.800	3.135E+08	.9427	1.4885	220.10	.6562	.8837	.7406	1.0381	.9692	1.0003	.9968	1.0009	.9999
.850	3.237E+08	.9430	1.4872	218.47	.6238	.8707	.7143	1.0206	.9690	1.0005	.9965	1.0010	.9999
.900	3.327E+08	.9434	1.4860	216.78	.5917	.8573	.6878	1.0088	.9689	1.0008	.9962	1.0012	1.0000
.950	3.404E+08	.9438	1.4847	215.04	.5601	.8436	.6613	1.0021	.9687	1.0011	.9959	1.0013	1.0000
1.000	3.470E+08	.9442	1.4834	213.25	.5290	.8297	.6349	1.0000	.9686	1.0014	.9956	1.0015	1.0000
1.050	3.524E+08	.9447	1.4820	211.43	.4987	.8155	.6086	1.0020	.9685	1.0017	.9954	1.0016	1.0000
1.100	3.567E+08	.9451	1.4807	209.57	.4693	.8012	.5827	1.0079	.9684	1.0020	.9951	1.0017	1.0000
1.150	3.600E+08	.9456	1.4794	207.68	.4409	.7867	.5572	1.0174	.9683	1.0024	.9948	1.0018	.9999
1.200	3.623E+08	.9461	1.4780	205.77	.4135	.7721	.5321	1.0303	.9682	1.0027	.9945	1.0019	.9999
1.250	3.637E+08	.9467	1.4767	203.83	.3872	.7575	.5077	1.0466	.9682	1.0030	.9942	1.0019	.9999
1.300	3.642E+08	.9472	1.4754	201.88	.3621	.7429	.4839	1.0662	.9682	1.0033	.9940	1.0020	.9999
1.350	3.639E+08	.9477	1.4741	199.91	.3382	.7283	.4607	1.0889	.9682	1.0036	.9937	1.0020	.9999
1.400	3.628E+08	.9483	1.4728	197.93	.3155	.7137	.4383	1.1148	.9682	1.0039	.9934	1.0019	.9999
1.450	3.610E+08	.9489	1.4716	195.94	.2939	.6992	.4166	1.1439	.9683	1.0042	.9932	1.0018	.9999
1.500	3.586E+08	.9494	1.4703	193.95	.2736	.6848	.3957	1.1762	.9683	1.0044	.9929	1.0017	1.0000
1.550	3.555E+08	.9500	1.4691	191.95	.2544	.6705	.3755	1.2119	.9684	1.0044	.9926	1.0014	1.0003
1.600	3.520E+08	.9506	1.4679	189.96	.2363	.6563	.3561	1.2507	.9685	1.0045	.9923	1.0012	1.0004
1.650	3.479E+08	.9512	1.4668	187.97	.2194	.6423	.3376	1.2929	.9686	1.0046	.9921	1.0009	1.0006
1.700	3.434E+08	.9518	1.4656	185.98	.2035	.6285	.3199	1.3386	.9687	1.0046	.9918	1.0006	1.0007
1.750	3.385E+08	.9524	1.4646	184.00	.1887	.6149	.3030	1.3878	.9688	1.0046	.9915	1.0003	1.0010
1.800	3.332E+08	.9529	1.4635	182.03	.1748	.6015	.2868	1.4407	.9689	1.0046	.9912	.9999	1.0012
1.850	3.277E+08	.9535	1.4625	180.07	.1619	.5883	.2714	1.4974	.9690	1.0045	.9910	.9995	1.0015
1.900	3.218E+08	.9541	1.4615	178.12	.1499	.5753	.2567	1.5581	.9691	1.0043	.9907	.9990	1.0018
1.950	3.156E+08	.9546	1.4606	176.19	.1387	.5626	.2428	1.6228	.9693	1.0041	.9904	.9985	1.0022

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

F. TT = 140 K PT = 10 ATM DT = 26.376 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9245	1.5304	232.73	1.0000	1.0000	1.0000	1	.9649	1.0000	1.0000	1.0000	1
.050	3.102E+07	.9246	1.5303	232.67	.9983	.9995	.9988	11.5556	.9649	1.0000	1.0000	1.0000	.9969
.100	6.185E+07	.9246	1.5301	232.48	.9930	.9979	.9950	5.8044	.9648	1.0000	.9999	1.0000	.9970
.150	9.231E+07	.9246	1.5298	232.16	.9844	.9953	.9889	3.8989	.9647	1.0000	.9998	1.0001	.9971
.200	1.222E+08	.9247	1.5294	231.72	.9724	.9917	.9804	2.9552	.9646	.9999	.9997	1.0001	.9972
.250	1.515E+08	.9248	1.5288	231.15	.9574	.9872	.9696	2.3962	.9644	.9999	.9995	1.0002	.9973
.300	1.798E+08	.9249	1.5281	230.47	.9392	.9816	.9565	2.0303	.9641	.9997	.9993	1.0001	.9977
.350	2.071E+08	.9250	1.5273	229.68	.9184	.9751	.9414	1.7742	.9639	.9996	.9990	1.0001	.9979
.400	2.333E+08	.9251	1.5264	228.78	.8952	.9678	.9244	1.5872	.9636	.9996	.9987	1.0002	.9981
.450	2.583E+08	.9253	1.5254	227.77	.8699	.9596	.9057	1.4463	.9633	.9995	.9984	1.0002	.9984
.500	2.818E+08	.9255	1.5243	226.66	.8426	.9506	.8855	1.3380	.9630	.9995	.9981	1.0003	.9986
.550	3.040E+08	.9257	1.5232	225.46	.8138	.9409	.8638	1.2535	.9626	.9995	.9978	1.0005	.9989
.600	3.247E+08	.9260	1.5219	224.17	.7837	.9305	.8409	1.1871	.9623	.9996	.9975	1.0006	.9991
.650	3.438E+08	.9263	1.5205	222.80	.7526	.9194	.8170	1.1348	.9620	.9997	.9971	1.0007	.9992
.700	3.614E+08	.9266	1.5191	221.35	.7208	.9078	.7923	1.0937	.9617	.9999	.9968	1.0009	.9994
.750	3.773E+08	.9270	1.5176	219.84	.6886	.8956	.7669	1.0619	.9614	1.0001	.9964	1.0011	.9995
.800	3.917E+08	.9274	1.5161	218.26	.6561	.8830	.7408	1.0381	.9611	1.0001	.9960	1.0011	.9998
.850	4.045E+08	.9278	1.5145	216.62	.6238	.8700	.7145	1.0206	.9608	1.0004	.9957	1.0013	.9999
.900	4.158E+08	.9282	1.5128	214.93	.5917	.8566	.6881	1.0089	.9606	1.0007	.9953	1.0014	1.0000
.950	4.255E+08	.9287	1.5112	213.19	.5601	.8428	.6615	1.0022	.9604	1.0011	.9950	1.0016	1.0000
1.000	4.338E+08	.9292	1.5095	211.41	.5291	.8289	.6351	1.0000	.9602	1.0015	.9946	1.0018	1.0000
1.050	4.407E+08	.9298	1.5078	209.59	.4988	.8147	.6089	1.0021	.9600	1.0019	.9943	1.0020	1.0000
1.100	4.462E+08	.9303	1.5060	207.74	.4695	.8003	.5830	1.0079	.9599	1.0023	.9939	1.0022	1.0000
1.150	4.504E+08	.9309	1.5043	205.86	.4411	.7858	.5575	1.0174	.9598	1.0028	.9936	1.0023	1.0000
1.200	4.534E+08	.9315	1.5026	203.96	.4137	.7712	.5325	1.0304	.9597	1.0032	.9933	1.0024	.9999
1.250	4.553E+08	.9322	1.5008	202.03	.3875	.7565	.5080	1.0467	.9597	1.0036	.9929	1.0025	.9999
1.300	4.560E+08	.9328	1.4991	200.09	.3624	.7419	.4842	1.0662	.9596	1.0040	.9926	1.0025	.9999
1.350	4.557E+08	.9335	1.4974	198.14	.3385	.7272	.4610	1.0889	.9596	1.0044	.9923	1.0025	.9999
1.400	4.545E+08	.9342	1.4958	196.18	.3158	.7126	.4385	1.1148	.9596	1.0048	.9919	1.0025	.9999
1.450	4.524E+08	.9349	1.4941	194.21	.2942	.6981	.4168	1.1439	.9597	1.0051	.9916	1.0024	1.0000
1.500	4.495E+08	.9356	1.4925	192.24	.2739	.6837	.3959	1.1762	.9598	1.0054	.9913	1.0023	1.0000
1.550	4.458E+08	.9363	1.4909	190.26	.2547	.6694	.3758	1.2117	.9598	1.0056	.9910	1.0021	1.0002
1.600	4.415E+08	.9370	1.4894	188.29	.2367	.6552	.3564	1.2506	.9599	1.0058	.9906	1.0018	1.0003
1.650	4.365E+08	.9378	1.4878	186.32	.2197	.6412	.3378	1.2928	.9600	1.0060	.9903	1.0015	1.0005
1.700	4.309E+08	.9385	1.4864	184.35	.2038	.6274	.3201	1.3385	.9602	1.0060	.9899	1.0012	1.0007
1.750	4.248E+08	.9392	1.4850	182.40	.1890	.6137	.3031	1.3878	.9603	1.0060	.9896	1.0007	1.0010
1.800	4.183E+08	.9399	1.4836	180.45	.1751	.6003	.2869	1.4408	.9604	1.0060	.9893	1.0003	1.0013
1.850	4.114E+08	.9406	1.4822	178.51	.1622	.5871	.2715	1.4977	.9606	1.0059	.9889	.9997	1.0017

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

F. TT = 140 K PT = 15 ATM DT = 41.379 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.8840	1.6214	228.42	1.0000	1.0000	1.0000	I	.9471	1.0000	1.0000	1.0000	I
.050	4.640E+07	.8840	1.6213	228.35	.9983	.9995	.9988	11.5248	.9470	1.0000	1.0000	1.0001	.9943
.100	9.252E+07	.8840	1.6210	228.15	.9930	.9979	.9951	5.7893	.9469	1.0000	.9999	1.0001	.9944
.150	1.381E+08	.8840	1.6205	227.81	.9843	.9952	.9890	3.8890	.9467	.9999	.9997	1.0002	.9945
.200	1.829E+08	.8841	1.6199	227.35	.9722	.9916	.9803	2.9485	.9464	.9997	.9995	1.0001	.9949
.250	2.266E+08	.8842	1.6190	226.75	.9570	.9869	.9695	2.3913	.9460	.9995	.9992	1.0001	.9952
.300	2.690E+08	.8842	1.6180	226.04	.9389	.9812	.9566	2.0262	.9456	.9994	.9989	1.0002	.9956
.350	3.100E+08	.8843	1.6167	225.21	.9181	.9747	.9416	1.7709	.9451	.9992	.9985	1.0003	.9960
.400	3.492E+08	.8845	1.6153	224.26	.8947	.9672	.9245	1.5848	.9446	.9989	.9981	1.0002	.9966
.450	3.866E+08	.8847	1.6138	223.21	.8692	.9589	.9058	1.4445	.9440	.9988	.9977	1.0004	.9971
.500	4.220E+08	.8849	1.6121	222.06	.8420	.9497	.8856	1.3366	.9434	.9987	.9972	1.0005	.9976
.550	4.552E+08	.8851	1.6102	220.81	.8131	.9399	.8640	1.2525	.9428	.9987	.9967	1.0007	.9980
.600	4.863E+08	.8854	1.6082	219.49	.7830	.9293	.8412	1.1864	.9422	.9988	.9963	1.0009	.9985
.650	5.151E+08	.8857	1.6060	218.08	.7520	.9182	.8174	1.1343	.9416	.9989	.9958	1.0012	.9988
.700	5.416E+08	.8861	1.6038	216.60	.7203	.9064	.7928	1.0935	.9410	.9991	.9952	1.0015	.9992
.750	5.658E+08	.8865	1.6014	215.05	.6882	.8942	.7674	1.0618	.9405	.9994	.9947	1.0018	.9994
.800	5.876E+08	.8870	1.5989	213.45	.6559	.8814	.7416	1.0379	.9399	.9998	.9942	1.0022	.9997
.850	6.071E+08	.8875	1.5964	211.79	.6237	.8683	.7154	1.0205	.9394	1.0002	.9937	1.0025	.9998
.900	6.244E+08	.8881	1.5937	210.08	.5917	.8548	.6891	1.0088	.9390	1.0008	.9933	1.0029	.9999
.950	6.394E+08	.8887	1.5910	208.34	.5602	.8410	.6626	1.0021	.9385	1.0014	.9928	1.0033	1.0000
1.000	6.522E+08	.8894	1.5883	206.56	.5294	.8269	.6363	1.0000	.9382	1.0020	.9923	1.0037	1.0000
1.050	6.629E+08	.8901	1.5855	204.74	.4992	.8126	.6101	1.0020	.9378	1.0028	.9918	1.0041	1.0000
1.100	6.717E+08	.8908	1.5826	202.90	.4700	.7982	.5843	1.0078	.9376	1.0035	.9914	1.0044	.9999
1.150	6.784E+08	.8917	1.5798	201.04	.4417	.7836	.5588	1.0173	.9373	1.0043	.9909	1.0048	.9998
1.200	6.833E+08	.8925	1.5769	199.16	.4144	.7690	.5337	1.0304	.9371	1.0048	.9904	1.0048	1.0000
1.250	6.865E+08	.8934	1.5740	197.27	.3882	.7543	.5093	1.0466	.9370	1.0056	.9900	1.0050	.9999
1.300	6.880E+08	.8943	1.5711	195.36	.3632	.7396	.4854	1.0661	.9369	1.0063	.9895	1.0052	.9998
1.350	6.881E+08	.8953	1.5683	193.44	.3394	.7249	.4622	1.0888	.9369	1.0070	.9891	1.0053	.9998
1.400	6.866E+08	.8963	1.5655	191.52	.3167	.7102	.4398	1.1147	.9369	1.0077	.9886	1.0053	.9998
1.450	6.839E+08	.8973	1.5627	189.60	.2952	.6957	.4180	1.1437	.9369	1.0083	.9882	1.0052	.9998
1.500	6.799E+08	.8983	1.5599	187.67	.2748	.6812	.3970	1.1760	.9370	1.0088	.9877	1.0051	.9999
1.550	6.747E+08	.8994	1.5572	185.75	.2556	.6668	.3768	1.2116	.9371	1.0093	.9872	1.0048	1.0001
1.600	6.685E+08	.9005	1.5546	183.83	.2376	.6526	.3573	1.2505	.9372	1.0096	.9868	1.0045	1.0003
1.650	6.613E+08	.9015	1.5520	181.92	.2206	.6386	.3387	1.2929	.9374	1.0099	.9863	1.0040	1.0005

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

F. TT = 140 K PT = 20 ATM DT = 57.991 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.8410	1.7398	224.09	1.0000	1.0000	1.0000	1	.9291	1.0000	1.0000	1.0000	1
.050	6.190E+07	.8410	1.7397	224.01	.9983	.9995	.9989	11.4781	.9290	1.0001	1.0000	1.0001	.9902
.100	1.234E+08	.8410	1.7393	223.79	.9930	.9978	.9951	5.7665	.9288	.9999	.9998	1.0001	.9904
.150	1.842E+08	.8410	1.7387	223.43	.9841	.9951	.9889	3.8745	.9285	.9997	.9996	1.0001	.9908
.200	2.440E+08	.8410	1.7379	222.93	.9720	.9914	.9804	2.9377	.9280	.9995	.9993	1.0002	.9913
.250	3.023E+08	.8410	1.7367	222.29	.9565	.9866	.9695	2.3834	.9274	.9991	.9990	1.0001	.9920
.300	3.589E+08	.8410	1.7354	221.52	.9383	.9809	.9566	2.0200	.9267	.9987	.9985	1.0002	.9926
.350	4.135E+08	.8411	1.7338	220.63	.9173	.9742	.9416	1.7662	.9259	.9984	.9981	1.0003	.9934
.400	4.659E+08	.8411	1.7320	219.62	.8939	.9666	.9247	1.5808	.9250	.9981	.9975	1.0005	.9941
.450	5.158E+08	.8412	1.7300	218.50	.8684	.9582	.9061	1.4413	.9241	.9978	.9970	1.0007	.9949
.500	5.631E+08	.8413	1.7277	217.28	.8410	.9489	.8860	1.3341	.9231	.9976	.9964	1.0010	.9957
.550	6.075E+08	.8415	1.7252	215.97	.8120	.9389	.8644	1.2507	.9221	.9974	.9957	1.0011	.9966
.600	6.491E+08	.8417	1.7225	214.58	.7819	.9283	.8417	1.1850	.9211	.9974	.9951	1.0015	.9973
.650	6.876E+08	.8420	1.7196	213.11	.7509	.9170	.8180	1.1333	.9201	.9975	.9945	1.0019	.9980
.700	7.232E+08	.8423	1.7165	211.57	.7193	.9052	.7935	1.0928	.9192	.9977	.9939	1.0024	.9985
.750	7.557E+08	.8427	1.7132	209.97	.6873	.8928	.7683	1.0614	.9182	.9981	.9932	1.0030	.9990
.800	7.851E+08	.8431	1.7098	208.32	.6551	.8800	.7426	1.0376	.9173	.9987	.9926	1.0036	.9994
.850	8.115E+08	.8437	1.7062	206.62	.6231	.8668	.7166	1.0203	.9165	.9993	.9920	1.0042	.9997
.900	8.349E+08	.8443	1.7025	204.88	.5913	.8532	.6904	1.0087	.9157	1.0001	.9914	1.0049	.9999
.950	8.553E+08	.8449	1.6986	203.11	.5600	.8394	.6641	1.0021	.9150	1.0010	.9909	1.0055	1.0000
1.000	8.730E+08	.8457	1.6947	201.31	.5293	.8253	.6379	1.0000	.9143	1.0020	.9903	1.0062	1.0000
1.050	8.878E+08	.8465	1.6906	199.49	.4994	.8110	.6118	1.0020	.9138	1.0031	.9898	1.0069	1.0000
1.100	9.000E+08	.8474	1.6865	197.65	.4703	.7965	.5861	1.0078	.9133	1.0042	.9892	1.0075	.9999
1.150	9.096E+08	.8483	1.6823	195.79	.4422	.7819	.5607	1.0172	.9129	1.0054	.9887	1.0081	.9997
1.200	9.168E+08	.8494	1.6780	193.92	.4151	.7672	.5357	1.0300	.9125	1.0066	.9882	1.0087	.9996
1.250	9.217E+08	.8505	1.6737	192.05	.3891	.7525	.5113	1.0462	.9122	1.0078	.9877	1.0091	.9994
1.300	9.244E+08	.8516	1.6694	190.17	.3642	.7378	.4875	1.0655	.9120	1.0090	.9871	1.0095	.9993
1.350	9.250E+08	.8528	1.6651	188.28	.3404	.7231	.4643	1.0881	.9119	1.0102	.9866	1.0098	.9992
1.400	9.237E+08	.8540	1.6608	186.40	.3178	.7084	.4418	1.1139	.9118	1.0112	.9861	1.0099	.9991
1.450	9.204E+08	.8553	1.6565	184.52	.2963	.6938	.4199	1.1431	.9118	1.0120	.9855	1.0097	.9993

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

F. TT = 140 K PT = 25 ATM DT = 76.671 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.7951	1.8992	219.79	1.0000	1.0000	1.0000	I	.9113	1.0000	1.0000	1.0000	I
.050	7.768E+07	.7951	1.8992	219.71	.9983	.9995	.9989	11.4122	.9112	1.0000	1.0000	1.0001	.9845
.100	1.549E+08	.7951	1.8988	219.46	.9929	.9978	.9952	5.7335	.9108	.9999	.9998	1.0002	.9848
.150	2.312E+08	.7950	1.8982	219.06	.9839	.9951	.9890	3.8535	.9103	.9995	.9995	1.0002	.9854
.200	3.061E+08	.7949	1.8973	218.50	.9715	.9912	.9804	2.9228	.9096	.9989	.9992	1.0001	.9863
.250	3.793E+08	.7948	1.8962	217.80	.9559	.9864	.9696	2.3719	.9086	.9984	.9987	1.0002	.9872
.300	4.503E+08	.7946	1.8949	216.95	.9375	.9805	.9567	2.0111	.9076	.9979	.9982	1.0004	.9882
.350	5.187E+08	.7945	1.8932	215.97	.9161	.9737	.9417	1.7593	.9063	.9971	.9976	1.0004	.9895
.400	5.844E+08	.7944	1.8913	214.86	.8925	.9660	.9249	1.5754	.9050	.9966	.9969	1.0006	.9907
.450	6.469E+08	.7943	1.8891	213.65	.8668	.9575	.9064	1.4371	.9036	.9961	.9962	1.0009	.9920
.500	7.062E+08	.7942	1.8866	212.33	.8394	.9481	.8864	1.3308	.9021	.9956	.9955	1.0013	.9932
.550	7.620E+08	.7941	1.8839	210.92	.8104	.9381	.8650	1.2479	.9006	.9954	.9948	1.0018	.9944
.600	8.143E+08	.7942	1.8809	209.42	.7803	.9273	.8425	1.1829	.8990	.9953	.9941	1.0024	.9955
.650	8.627E+08	.7943	1.8775	207.86	.7492	.9159	.8189	1.1319	.8975	.9952	.9933	1.0030	.9967
.700	9.074E+08	.7944	1.8739	206.23	.7176	.9040	.7945	1.0918	.8960	.9955	.9926	1.0037	.9976
.750	9.484E+08	.7947	1.8700	204.55	.6858	.8916	.7696	1.0607	.8945	.9959	.9919	1.0046	.9984
.800	9.855E+08	.7950	1.8658	202.82	.6538	.8788	.7441	1.0372	.8931	.9966	.9913	1.0056	.9990
.850	1.019E+09	.7954	1.8614	201.05	.6219	.8656	.7183	1.0201	.8918	.9975	.9906	1.0066	.9995
.900	1.049E+09	.7959	1.8567	199.26	.5904	.8520	.6923	1.0086	.8906	.9986	.9900	1.0077	.9998
.950	1.075E+09	.7965	1.8518	197.44	.5594	.8381	.6662	1.0021	.8894	.9998	.9894	1.0088	.9999
1.000	1.098E+09	.7972	1.8466	195.60	.5290	.8240	.6402	1.0000	.8884	1.0013	.9889	1.0099	1.0000
1.050	1.117E+09	.7980	1.8413	193.74	.4993	.8098	.6144	1.0020	.8875	1.0028	.9883	1.0110	.9999
1.100	1.133E+09	.7989	1.8357	191.88	.4705	.7953	.5887	1.0077	.8866	1.0045	.9878	1.0121	.9998
1.150	1.145E+09	.7999	1.8300	190.01	.4426	.7807	.5635	1.0170	.8859	1.0063	.9872	1.0132	.9996
1.200	1.155E+09	.8010	1.8242	188.14	.4157	.7661	.5386	1.0297	.8853	1.0081	.9867	1.0141	.9993
1.250	1.162E+09	.8022	1.8182	186.28	.3899	.7514	.5143	1.0457	.8848	1.0099	.9862	1.0150	.9990
1.300	1.166E+09	.8035	1.8121	184.41	.3651	.7367	.4905	1.0650	.8844	1.0117	.9857	1.0157	.9987

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

F. TT = 140 K PT = 30 ATM DT = 98.112 KGM/M3 CONCLUDED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.7457	2.1233	215.62	1.0000	1.0000	1.0000	I	.8940	1.0000	1.0000	1.0000	I
.050	9.398E+07	.7456	2.1233	215.53	.9983	.9995	.9989	11.3191	.8938	1.0000	1.0000	1.0001	.9765
.100	1.874E+08	.7455	2.1232	215.25	.9926	.9978	.9951	5.6887	.8933	.9996	.9998	1.0001	.9771
.150	2.796E+08	.7453	2.1230	214.79	.9834	.9949	.9890	3.8242	.8925	.9990	.9994	1.0001	.9780
.200	3.702E+08	.7450	2.1228	214.15	.9709	.9911	.9805	2.9014	.8915	.9983	.9990	1.0002	.9790
.250	4.586E+08	.7447	2.1224	213.35	.9549	.9861	.9697	2.3559	.8901	.9973	.9984	1.0002	.9805
.300	5.443E+08	.7443	2.1219	212.39	.9360	.9802	.9568	1.9987	.8885	.9964	.9978	1.0004	.9821
.350	6.269E+08	.7438	2.1212	211.28	.9145	.9733	.9419	1.7493	.8867	.9954	.9971	1.0007	.9839
.400	7.061E+08	.7434	2.1202	210.04	.8905	.9654	.9251	1.5676	.8847	.9943	.9963	1.0009	.9859
.450	7.816E+08	.7430	2.1191	208.68	.8645	.9568	.9067	1.4309	.8826	.9933	.9956	1.0014	.9878
.500	8.531E+08	.7426	2.1176	207.22	.8368	.9474	.8869	1.3260	.8804	.9926	.9948	1.0019	.9897
.550	9.204E+08	.7422	2.1159	205.66	.8076	.9373	.8657	1.2443	.8781	.9920	.9940	1.0027	.9915
.600	9.834E+08	.7419	2.1138	204.02	.7775	.9265	.8434	1.1801	.8758	.9917	.9932	1.0036	.9932
.650	1.042E+09	.7416	2.1113	202.31	.7465	.9151	.8202	1.1297	.8735	.9916	.9924	1.0046	.9948
.700	1.096E+09	.7415	2.1085	200.55	.7150	.9032	.7962	1.0901	.8713	.9918	.9917	1.0058	.9961
.750	1.145E+09	.7414	2.1051	198.74	.6832	.8907	.7714	1.0597	.8691	.9922	.9910	1.0070	.9974
.800	1.191E+09	.7414	2.1013	196.89	.6514	.8779	.7463	1.0366	.8670	.9930	.9903	1.0085	.9984
.850	1.231E+09	.7416	2.0971	195.02	.6199	.8648	.7208	1.0198	.8650	.9942	.9897	1.0101	.9991
.900	1.268E+09	.7418	2.0924	193.12	.5887	.8512	.6951	1.0085	.8631	.9956	.9892	1.0117	.9996
.950	1.300E+09	.7422	2.0872	191.22	.5580	.8375	.6694	1.0021	.8614	.9973	.9886	1.0135	.9999
1.000	1.327E+09	.7427	2.0816	189.30	.5279	.8235	.6436	1.0000	.8598	.9993	.9882	1.0153	1.0000
1.050	1.351E+09	.7433	2.0755	187.39	.4986	.8093	.6181	1.0019	.8583	1.0015	.9877	1.0171	.9999
1.100	1.371E+09	.7441	2.0690	185.48	.4702	.7949	.5927	1.0076	.8570	1.0039	.9873	1.0189	.9997
1.150	1.388E+09	.7450	2.0620	183.58	.4426	.7804	.5676	1.0167	.8559	1.0064	.9869	1.0206	.9993

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

G. TT = 150 K PT = 1 ATM DT = 2.289 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9941	1.4092	249.00	1.0000	1.0000	1.0000	I	.9974	1.0000	1.0000	1.0000	I
.050	2.848E+06	.9941	1.4092	248.94	.9983	.9995	.9988	11.5888	.9974	1.0000	1.0000	1.0000	.9998
.100	5.678E+06	.9942	1.4091	248.75	.9930	.9980	.9950	5.8205	.9974	1.0000	1.0000	1.0000	.9998
.150	8.473E+06	.9942	1.4091	248.44	.9844	.9955	.9889	3.9094	.9974	1.0000	1.0000	1.0000	.9998
.200	1.122E+07	.9942	1.4091	248.01	.9725	.9920	.9803	2.9628	.9974	1.0000	1.0000	1.0000	.9998
.250	1.389E+07	.9942	1.4090	247.45	.9575	.9876	.9695	2.4021	.9974	1.0000	.9999	1.0001	.9997
.300	1.649E+07	.9942	1.4090	246.78	.9395	.9822	.9565	2.0345	.9973	1.0001	.9999	1.0001	.9997
.350	1.898E+07	.9942	1.4089	245.99	.9188	.9760	.9414	1.7775	.9973	1.0001	.9999	1.0001	.9997
.400	2.137E+07	.9942	1.4089	245.09	.8957	.9689	.9244	1.5897	.9973	1.0001	.9999	1.0002	.9997
.450	2.364E+07	.9942	1.4088	244.08	.8702	.9609	.9055	1.4485	.9973	.9999	.9998	1.0000	.9999
.500	2.578E+07	.9943	1.4087	242.97	.8430	.9522	.8852	1.3397	.9972	.9999	.9998	1.0000	.9999
.550	2.778E+07	.9943	1.4086	241.75	.8141	.9427	.8635	1.2549	.9972	.9999	.9998	1.0000	.9999
.600	2.964E+07	.9943	1.4085	240.45	.7840	.9326	.8405	1.1882	.9972	.9999	.9997	1.0000	.9999
.650	3.136E+07	.9943	1.4084	239.05	.7528	.9218	.8165	1.1356	.9972	.9999	.9997	1.0000	1.0000
.700	3.292E+07	.9944	1.4083	237.57	.7209	.9104	.7916	1.0944	.9971	.9999	.9997	1.0001	1.0000
.750	3.434E+07	.9944	1.4082	236.01	.6885	.8985	.7661	1.0624	.9971	1.0000	.9996	1.0001	1.0000
.800	3.561E+07	.9944	1.4081	234.38	.6560	.8862	.7401	1.0382	.9971	1.0000	.9996	1.0001	1.0000
.850	3.673E+07	.9945	1.4079	232.68	.6235	.8734	.7137	1.0207	.9971	1.0000	.9996	1.0001	1.0000
.900	3.770E+07	.9945	1.4078	230.91	.5913	.8602	.6871	1.0089	.9970	1.0000	.9995	1.0001	1.0000
.950	3.854E+07	.9946	1.4077	229.09	.5595	.8467	.6605	1.0022	.9970	1.0000	.9995	1.0001	1.0000
1.000	3.923E+07	.9946	1.4076	227.22	.5283	.8329	.6340	1.0000	.9970	1.0000	.9994	1.0002	1.0000
1.050	3.980E+07	.9946	1.4074	225.30	.4979	.8189	.6078	1.0020	.9970	1.0001	.9994	1.0002	1.0000
1.100	4.024E+07	.9947	1.4073	223.34	.4684	.8047	.5818	1.0079	.9970	1.0001	.9994	1.0002	1.0000
1.150	4.057E+07	.9947	1.4072	221.34	.4399	.7903	.5563	1.0175	.9970	1.0001	.9993	1.0002	1.0000
1.200	4.078E+07	.9948	1.4070	219.31	.4125	.7759	.5313	1.0304	.9970	1.0002	.9993	1.0002	1.0000
1.250	4.089E+07	.9949	1.4069	217.25	.3861	.7613	.5068	1.0467	.9969	1.0002	.9993	1.0002	1.0000
1.300	4.090E+07	.9949	1.4068	215.17	.3610	.7468	.4830	1.0663	.9969	1.0002	.9992	1.0002	1.0000
1.350	4.082E+07	.9950	1.4067	213.07	.3371	.7323	.4599	1.0890	.9969	1.0003	.9992	1.0002	1.0000
1.400	4.066E+07	.9950	1.4065	210.95	.3143	.7178	.4375	1.1149	.9969	1.0003	.9992	1.0002	1.0000
1.450	4.042E+07	.9951	1.4064	208.82	.2928	.7034	.4159	1.1439	.9969	1.0003	.9991	1.0002	1.0000
1.500	4.012E+07	.9951	1.4063	206.69	.2725	.6890	.3951	1.1761	.9969	1.0003	.9991	1.0002	1.0000
1.550	3.975E+07	.9952	1.4062	204.55	.2534	.6748	.3751	1.2116	.9969	1.0004	.9991	1.0002	1.0000
1.600	3.932E+07	.9953	1.4061	202.41	.2354	.6607	.3558	1.2502	.9969	1.0004	.9990	1.0002	1.0000
1.650	3.885E+07	.9953	1.4059	200.27	.2185	.6468	.3374	1.2922	.9969	1.0004	.9990	1.0002	1.0000
1.700	3.832E+07	.9954	1.4058	198.13	.2027	.6331	.3198	1.3376	.9970	1.0004	.9990	1.0002	1.0000
1.750	3.776E+07	.9954	1.4057	196.00	.1879	.6195	.3029	1.3865	.9970	1.0004	.9989	1.0002	1.0000
1.800	3.716E+07	.9955	1.4056	193.88	.1741	.6061	.2869	1.4390	.9970	1.0004	.9989	1.0002	1.0001
1.850	3.653E+07	.9956	1.4055	191.77	.1613	.5930	.2716	1.4953	.9970	1.0004	.9989	1.0001	1.0001
1.900	3.587E+07	.9956	1.4054	189.67	.1493	.5801	.2570	1.5554	.9970	1.0004	.9988	1.0001	1.0001
1.950	3.519E+07	.9957	1.4053	187.59	.1382	.5674	.2432	1.6195	.9970	1.0004	.9988	1.0001	1.0001
2.000	3.449E+07	.9957	1.4053	185.52	.1279	.5549	.2301	1.6877	.9970	1.0004	.9988	1.0000	1.0002

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

G. TT = 150 K PT = 3 ATM DT = 6.951 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9824	1.4282	247.69	1.0000	1.0000	1.0000	1	.9921	1.0000	1.0000	1.0000	1
.050	8.511E+06	.9824	1.4282	247.62	.9983	.9995	.9988	11.5842	.9921	1.0000	1.0000	1.0000	.9994
.100	1.697E+07	.9824	1.4281	247.43	.9931	.9980	.9951	5.8180	.9921	1.0000	1.0000	1.0001	.9993
.150	2.533E+07	.9824	1.4280	247.12	.9845	.9955	.9890	3.9077	.9921	1.0001	.9999	1.0001	.9993
.200	3.353E+07	.9824	1.4279	246.68	.9725	.9920	.9803	2.9619	.9920	1.0000	.9999	1.0000	.9994
.250	4.153E+07	.9824	1.4278	246.12	.9574	.9875	.9694	2.4015	.9920	.9999	.9999	1.0000	.9995
.300	4.929E+07	.9825	1.4276	245.44	.9394	.9821	.9564	2.0341	.9919	.9999	.9998	1.0000	.9995
.350	5.676E+07	.9825	1.4274	244.64	.9187	.9758	.9413	1.7772	.9919	.9999	.9997	1.0000	.9996
.400	6.390E+07	.9825	1.4272	243.74	.8955	.9686	.9243	1.5896	.9918	.9999	.9996	1.0001	.9996
.450	7.070E+07	.9826	1.4270	242.72	.8701	.9606	.9056	1.4482	.9917	.9999	.9996	1.0001	.9997
.500	7.711E+07	.9826	1.4267	241.60	.8429	.9519	.8853	1.3395	.9916	.9999	.9995	1.0001	.9997
.550	8.312E+07	.9827	1.4265	240.38	.8141	.9424	.8635	1.2547	.9916	.9999	.9994	1.0001	.9998
.600	8.870E+07	.9828	1.4262	239.07	.7839	.9321	.8406	1.1880	.9915	.9999	.9993	1.0002	.9998
.650	9.385E+07	.9829	1.4258	237.67	.7527	.9213	.8166	1.1355	.9914	.9999	.9992	1.0002	.9999
.700	9.856E+07	.9829	1.4255	236.18	.7209	.9099	.7918	1.0943	.9913	.9999	.9991	1.0003	.9999
.750	1.028E+08	.9830	1.4252	234.62	.6885	.8979	.7663	1.0624	.9912	1.0000	.9989	1.0003	1.0000
.800	1.066E+08	.9831	1.4248	232.98	.6560	.8855	.7403	1.0382	.9912	1.0000	.9988	1.0004	1.0000
.850	1.100E+08	.9832	1.4244	231.28	.6236	.8726	.7139	1.0207	.9911	1.0001	.9987	1.0004	1.0000
.900	1.130E+08	.9834	1.4240	229.52	.5913	.8594	.6874	1.0089	.9910	1.0001	.9986	1.0005	1.0000
.950	1.155E+08	.9835	1.4237	227.70	.5596	.8458	.6608	1.0021	.9910	1.0002	.9985	1.0006	1.0000
1.000	1.176E+08	.9836	1.4233	225.83	.5284	.8320	.6343	1.0000	.9909	1.0003	.9984	1.0006	1.0000
1.050	1.194E+08	.9838	1.4229	223.91	.4981	.8180	.6081	1.0020	.9908	1.0004	.9983	1.0007	1.0000
1.100	1.207E+08	.9839	1.4225	221.95	.4686	.8037	.5821	1.0079	.9908	1.0005	.9982	1.0007	1.0000
1.150	1.217E+08	.9841	1.4221	219.96	.4401	.7893	.5566	1.0174	.9908	1.0006	.9981	1.0008	1.0000
1.200	1.224E+08	.9842	1.4217	217.94	.4127	.7749	.5316	1.0304	.9907	1.0007	.9980	1.0008	.9999
1.250	1.228E+08	.9844	1.4213	215.89	.3864	.7603	.5071	1.0467	.9907	1.0008	.9979	1.0009	.9999
1.300	1.228E+08	.9845	1.4209	213.82	.3613	.7458	.4833	1.0662	.9907	1.0009	.9978	1.0009	.9999
1.350	1.226E+08	.9847	1.4205	211.73	.3373	.7312	.4602	1.0889	.9907	1.0010	.9977	1.0009	.9999
1.400	1.222E+08	.9849	1.4201	209.63	.3146	.7167	.4378	1.1148	.9907	1.0011	.9976	1.0009	.9999
1.450	1.215E+08	.9851	1.4198	207.51	.2931	.7022	.4162	1.1438	.9907	1.0012	.9975	1.0009	.9999
1.500	1.206E+08	.9852	1.4194	205.39	.2728	.6879	.3954	1.1760	.9907	1.0013	.9974	1.0009	.9999
1.550	1.195E+08	.9854	1.4190	203.27	.2536	.6737	.3753	1.2114	.9907	1.0014	.9973	1.0009	.9999
1.600	1.183E+08	.9856	1.4187	201.14	.2356	.6596	.3560	1.2501	.9907	1.0014	.9973	1.0009	.9999
1.650	1.168E+08	.9858	1.4183	199.02	.2187	.6456	.3375	1.2924	.9907	1.0013	.9972	1.0007	1.0001
1.700	1.153E+08	.9860	1.4180	196.90	.2029	.6319	.3199	1.3378	.9907	1.0013	.9971	1.0006	1.0002
1.750	1.136E+08	.9861	1.4177	194.79	.1881	.6183	.3030	1.3868	.9908	1.0013	.9970	1.0005	1.0002
1.800	1.118E+08	.9863	1.4174	192.68	.1743	.6049	.2869	1.4394	.9908	1.0014	.9969	1.0004	1.0003
1.850	1.099E+08	.9865	1.4171	190.59	.1614	.5918	.2716	1.4957	.9908	1.0013	.9968	1.0003	1.0003
1.900	1.080E+08	.9867	1.4168	188.51	.1494	.5788	.2571	1.5559	.9909	1.0013	.9967	1.0002	1.0004
1.950	1.059E+08	.9868	1.4165	186.44	.1383	.5661	.2432	1.6201	.9909	1.0013	.9966	1.0001	1.0005
2.000	1.038E+08	.9870	1.4162	184.39	.1280	.5536	.2300	1.6885	.9909	1.0013	.9965	1.0000	1.0006

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

G. TT = 150 K PT = 5 ATM DT = 11.727 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9704	1.4484	246.38	1.0000	1.0000	1.0000	I	.9869	1.0000	1.0000	1.0000	I
.050	1.414E+07	.9704	1.4484	246.31	.9983	.9995	.9988	11.5763	.9869	1.0000	1.0000	1.0000	.9986
.100	2.819E+07	.9704	1.4483	246.12	.9931	.9980	.9951	5.8140	.9868	1.0001	1.0000	1.0001	.9986
.150	4.208E+07	.9705	1.4482	245.80	.9844	.9954	.9889	3.9054	.9868	1.0000	.9999	1.0000	.9987
.200	5.571E+07	.9705	1.4480	245.36	.9724	.9919	.9803	2.9599	.9867	.9999	.9998	1.0000	.9988
.250	6.900E+07	.9705	1.4478	244.79	.9574	.9874	.9695	2.4000	.9866	.9999	.9998	1.0000	.9989
.300	8.190E+07	.9706	1.4475	244.10	.9393	.9820	.9564	2.0329	.9865	.9999	.9997	1.0001	.9989
.350	9.432E+07	.9706	1.4472	243.30	.9186	.9756	.9414	1.7762	.9864	.9998	.9995	1.0001	.9990
.400	1.062E+08	.9707	1.4468	242.38	.8954	.9684	.9244	1.5887	.9863	.9998	.9994	1.0001	.9991
.450	1.175E+08	.9708	1.4464	241.36	.8701	.9604	.9057	1.4475	.9862	.9998	.9993	1.0002	.9992
.500	1.282E+08	.9709	1.4460	240.23	.8428	.9515	.8854	1.3389	.9860	.9998	.9991	1.0002	.9993
.550	1.382E+08	.9709	1.4455	239.00	.8140	.9420	.8637	1.2542	.9859	.9998	.9990	1.0003	.9994
.600	1.475E+08	.9711	1.4450	237.68	.7839	.9317	.8408	1.1875	.9857	.9998	.9988	1.0004	.9994
.650	1.561E+08	.9712	1.4444	236.27	.7526	.9208	.8167	1.1353	.9856	.9996	.9986	1.0003	.9997
.700	1.639E+08	.9713	1.4439	234.78	.7207	.9093	.7918	1.0942	.9854	.9997	.9984	1.0003	.9998
.750	1.711E+08	.9715	1.4433	233.21	.6884	.8973	.7664	1.0623	.9853	.9997	.9983	1.0004	.9999
.800	1.774E+08	.9716	1.4427	231.57	.6559	.8848	.7404	1.0382	.9851	.9998	.9981	1.0005	.9999
.850	1.831E+08	.9718	1.4420	229.86	.6235	.8719	.7140	1.0206	.9850	.9999	.9979	1.0006	1.0000
.900	1.881E+08	.9720	1.4414	228.10	.5913	.8586	.6875	1.0089	.9849	1.0000	.9977	1.0007	1.0000
.950	1.923E+08	.9722	1.4407	226.28	.5596	.8450	.6610	1.0022	.9848	1.0001	.9976	1.0008	1.0000
1.000	1.959E+08	.9724	1.4401	224.41	.5284	.8312	.6345	1.0000	.9847	1.0003	.9974	1.0009	1.0000
1.050	1.988E+08	.9726	1.4394	222.50	.4981	.8171	.6082	1.0020	.9846	1.0004	.9972	1.0009	1.0000
1.100	2.011E+08	.9729	1.4387	220.55	.4687	.8028	.5823	1.0079	.9845	1.0006	.9971	1.0010	1.0000
1.150	2.029E+08	.9731	1.4380	218.56	.4402	.7884	.5568	1.0174	.9845	1.0008	.9969	1.0011	1.0000
1.200	2.040E+08	.9734	1.4374	216.55	.4128	.7739	.5318	1.0304	.9844	1.0010	.9967	1.0012	1.0000
1.250	2.047E+08	.9736	1.4367	214.51	.3865	.7593	.5074	1.0467	.9844	1.0011	.9966	1.0013	.9999
1.300	2.049E+08	.9739	1.4360	212.45	.3614	.7447	.4835	1.0662	.9843	1.0013	.9964	1.0013	.9999
1.350	2.046E+08	.9742	1.4354	210.37	.3375	.7302	.4604	1.0889	.9843	1.0015	.9963	1.0013	.9999
1.400	2.039E+08	.9745	1.4347	208.28	.3148	.7156	.4380	1.1148	.9843	1.0016	.9961	1.0014	.9999
1.450	2.028E+08	.9747	1.4341	206.18	.2933	.7012	.4164	1.1438	.9843	1.0018	.9960	1.0014	.9999
1.500	2.013E+08	.9750	1.4334	204.07	.2729	.6868	.3955	1.1760	.9843	1.0019	.9958	1.0014	.9999
1.550	1.996E+08	.9753	1.4328	201.96	.2538	.6725	.3755	1.2115	.9843	1.0020	.9957	1.0013	.9999
1.600	1.975E+08	.9756	1.4322	199.85	.2358	.6584	.3562	1.2502	.9843	1.0021	.9955	1.0013	1.0000
1.650	1.952E+08	.9759	1.4316	197.74	.2189	.6445	.3377	1.2922	.9844	1.0022	.9954	1.0012	1.0000
1.700	1.926E+08	.9762	1.4311	195.64	.2031	.6307	.3201	1.3377	.9844	1.0023	.9952	1.0011	1.0001
1.750	1.899E+08	.9765	1.4305	193.54	.1883	.6171	.3032	1.3867	.9844	1.0023	.9951	1.0010	1.0001
1.800	1.869E+08	.9768	1.4300	191.45	.1745	.6037	.2871	1.4393	.9845	1.0023	.9949	1.0008	1.0002
1.850	1.838E+08	.9771	1.4295	189.38	.1616	.5906	.2717	1.4957	.9845	1.0023	.9948	1.0007	1.0003
1.900	1.806E+08	.9774	1.4290	187.31	.1496	.5776	.2571	1.5560	.9846	1.0023	.9946	1.0005	1.0005
1.950	1.772E+08	.9777	1.4285	185.27	.1384	.5649	.2433	1.6203	.9846	1.0023	.9945	1.0003	1.0006
2.000	1.737E+08	.9780	1.4280	183.23	.1281	.5524	.2301	1.6888	.9847	1.0022	.9944	1.0001	1.0008

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

G. TT = 150 K PT = 8 ATM DT = 19.120 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9523	1.4813	244.42	1.0000	1.0000	1.0000	I	.9790	1.0000	1.0000	1.0000	I
.050	2.253E+07	.9523	1.4813	244.36	.9983	.9995	.9988	11.5640	.9790	1.0000	1.0000	1.0000	.9976
.100	4.493E+07	.9523	1.4812	244.16	.9931	.9979	.9952	5.8077	.9790	1.0001	.9999	1.0002	.9976
.150	6.706E+07	.9523	1.4809	243.83	.9843	.9954	.9889	3.9016	.9789	.9999	.9999	1.0000	.9978
.200	8.878E+07	.9524	1.4807	243.38	.9724	.9918	.9803	2.9572	.9788	.9999	.9997	1.0001	.9979
.250	1.100E+08	.9524	1.4803	242.80	.9573	.9873	.9695	2.3979	.9786	.9998	.9996	1.0001	.9980
.300	1.306E+08	.9525	1.4798	242.10	.9393	.9818	.9565	2.0312	.9784	.9998	.9994	1.0002	.9981
.350	1.504E+08	.9525	1.4793	241.28	.9185	.9754	.9415	1.7749	.9782	.9997	.9993	1.0002	.9982
.400	1.693E+08	.9526	1.4787	240.35	.8952	.9681	.9244	1.5879	.9780	.9995	.9990	1.0001	.9986
.450	1.874E+08	.9527	1.4781	239.30	.8698	.9599	.9057	1.4469	.9778	.9994	.9988	1.0002	.9988
.500	2.044E+08	.9528	1.4773	238.16	.8425	.9510	.8854	1.3385	.9775	.9994	.9986	1.0002	.9990
.550	2.204E+08	.9530	1.4766	236.91	.8136	.9414	.8637	1.2539	.9773	.9993	.9983	1.0003	.9992
.600	2.353E+08	.9531	1.4757	235.58	.7835	.9310	.8408	1.1874	.9770	.9993	.9981	1.0004	.9993
.650	2.491E+08	.9533	1.4748	234.15	.7524	.9201	.8169	1.1351	.9767	.9994	.9978	1.0005	.9995
.700	2.617E+08	.9535	1.4739	232.65	.7205	.9085	.7921	1.0940	.9765	.9994	.9975	1.0006	.9996
.750	2.731E+08	.9537	1.4729	231.07	.6882	.8964	.7666	1.0622	.9762	.9995	.9973	1.0008	.9998
.800	2.834E+08	.9539	1.4719	229.42	.6558	.8839	.7407	1.0381	.9760	.9996	.9970	1.0009	.9999
.850	2.925E+08	.9542	1.4709	227.70	.6234	.8709	.7144	1.0206	.9758	.9998	.9967	1.0011	.9999
.900	3.005E+08	.9545	1.4698	225.93	.5913	.8575	.6879	1.0088	.9756	1.0000	.9965	1.0013	1.0000
.950	3.074E+08	.9548	1.4687	224.11	.5596	.8439	.6614	1.0021	.9754	1.0002	.9962	1.0014	1.0000
1.000	3.133E+08	.9551	1.4676	222.24	.5285	.8299	.6350	1.0000	.9752	1.0005	.9959	1.0016	1.0000
1.050	3.180E+08	.9554	1.4665	220.34	.4983	.8158	.6087	1.0021	.9750	1.0007	.9957	1.0017	1.0001
1.100	3.219E+08	.9558	1.4654	218.39	.4689	.8015	.5828	1.0080	.9749	1.0009	.9954	1.0019	1.0001
1.150	3.247E+08	.9562	1.4642	216.41	.4404	.7870	.5573	1.0175	.9748	1.0012	.9952	1.0020	1.0000
1.200	3.267E+08	.9566	1.4631	214.41	.4131	.7725	.5323	1.0304	.9747	1.0015	.9949	1.0021	1.0000
1.250	3.279E+08	.9570	1.4620	212.38	.3868	.7579	.5079	1.0467	.9746	1.0018	.9947	1.0023	.9999
1.300	3.283E+08	.9574	1.4609	210.33	.3617	.7433	.4841	1.0662	.9745	1.0021	.9944	1.0024	.9999
1.350	3.280E+08	.9578	1.4598	208.27	.3378	.7287	.4610	1.0888	.9745	1.0024	.9942	1.0025	.9999
1.400	3.269E+08	.9583	1.4587	206.20	.3151	.7141	.4386	1.1147	.9745	1.0027	.9940	1.0025	.9998
1.450	3.253E+08	.9587	1.4576	204.12	.2936	.6996	.4169	1.1437	.9744	1.0030	.9937	1.0025	.9998
1.500	3.231E+08	.9592	1.4566	202.03	.2733	.6852	.3960	1.1759	.9745	1.0032	.9935	1.0025	.9998
1.550	3.204E+08	.9596	1.4555	199.94	.2542	.6709	.3759	1.2113	.9745	1.0034	.9933	1.0025	.9999
1.600	3.172E+08	.9601	1.4545	197.86	.2362	.6568	.3566	1.2500	.9745	1.0036	.9931	1.0024	.9999
1.650	3.136E+08	.9606	1.4535	195.77	.2192	.6428	.3381	1.2921	.9745	1.0037	.9928	1.0023	1.0000
1.700	3.096E+08	.9611	1.4526	193.69	.2034	.6290	.3204	1.3376	.9746	1.0039	.9926	1.0021	1.0001
1.750	3.052E+08	.9615	1.4516	191.62	.1886	.6154	.3035	1.3867	.9747	1.0039	.9924	1.0019	1.0002
1.800	3.006E+08	.9620	1.4507	189.56	.1748	.6020	.2873	1.4394	.9747	1.0040	.9921	1.0017	1.0004
1.850	2.956E+08	.9625	1.4499	187.51	.1619	.5889	.2720	1.4959	.9748	1.0040	.9919	1.0015	1.0005
1.900	2.905E+08	.9629	1.4490	185.47	.1499	.5759	.2573	1.5563	.9749	1.0039	.9917	1.0012	1.0007
1.950	2.851E+08	.9634	1.4482	183.45	.1387	.5632	.2434	1.6207	.9750	1.0038	.9914	1.0008	1.0010
2.000	2.795E+08	.9639	1.4474	181.44	.1283	.5507	.2302	1.6894	.9751	1.0037	.9912	1.0005	1.0013

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

G. TT = 150 K PT = 10 ATM DT = 24.212 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9400	1.5052	243.13	1.0000	1.0000	1.0000	I	.9739	1.0000	1.0000	1.0000	I
.050	2.811E+07	.9400	1.5051	243.06	.9983	.9995	.9988	11.5551	.9738	1.0000	1.0000	1.0000	.9969
.100	5.604E+07	.9400	1.5050	242.86	.9932	.9979	.9952	5.8037	.9738	1.0001	.9999	1.0002	.9968
.150	8.364E+07	.9401	1.5047	242.53	.9843	.9953	.9889	3.8988	.9737	.9999	.9998	1.0001	.9971
.200	1.107E+08	.9401	1.5043	242.07	.9724	.9918	.9804	2.9551	.9735	.9999	.9997	1.0001	.9972
.250	1.372E+08	.9401	1.5039	241.48	.9573	.9872	.9696	2.3963	.9733	.9998	.9995	1.0002	.9973
.300	1.628E+08	.9402	1.5033	240.77	.9391	.9816	.9564	2.0303	.9731	.9996	.9993	1.0001	.9977
.350	1.876E+08	.9403	1.5026	239.94	.9183	.9752	.9414	1.7742	.9728	.9994	.9991	1.0001	.9979
.400	2.112E+08	.9404	1.5019	238.99	.8950	.9678	.9244	1.5872	.9725	.9993	.9988	1.0002	.9982
.450	2.338E+08	.9405	1.5010	237.93	.8696	.9597	.9057	1.4464	.9722	.9992	.9985	1.0002	.9984
.500	2.551E+08	.9406	1.5001	236.77	.8423	.9507	.8854	1.3381	.9718	.9992	.9982	1.0003	.9987
.550	2.751E+08	.9408	1.4991	235.51	.8134	.9410	.8638	1.2536	.9715	.9991	.9979	1.0004	.9989
.600	2.937E+08	.9409	1.4981	234.16	.7833	.9306	.8409	1.1872	.9711	.9991	.9976	1.0005	.9991
.650	3.109E+08	.9411	1.4969	232.73	.7522	.9196	.8170	1.1349	.9708	.9991	.9973	1.0007	.9994
.700	3.267E+08	.9413	1.4958	231.21	.7204	.9080	.7923	1.0939	.9704	.9992	.9969	1.0009	.9995
.750	3.410E+08	.9416	1.4945	229.62	.6881	.8958	.7669	1.0621	.9701	.9993	.9966	1.0011	.9997
.800	3.539E+08	.9419	1.4932	227.96	.6557	.8832	.7409	1.0380	.9698	.9995	.9963	1.0013	.9998
.850	3.654E+08	.9422	1.4919	226.24	.6233	.8702	.7147	1.0206	.9695	.9997	.9959	1.0015	.9999
.900	3.755E+08	.9425	1.4905	224.46	.5912	.8568	.6882	1.0088	.9692	.9999	.9956	1.0017	1.0000
.950	3.842E+08	.9428	1.4892	222.64	.5596	.8431	.6617	1.0021	.9689	1.0002	.9953	1.0020	1.0000
1.000	3.916E+08	.9432	1.4877	220.77	.5286	.8292	.6353	1.0000	.9687	1.0006	.9950	1.0022	1.0000
1.050	3.976E+08	.9436	1.4863	218.86	.4983	.8150	.6091	1.0020	.9685	1.0009	.9947	1.0024	1.0000
1.100	4.025E+08	.9441	1.4849	216.91	.4690	.8006	.5833	1.0079	.9683	1.0013	.9944	1.0027	.9999
1.150	4.062E+08	.9445	1.4834	214.94	.4406	.7861	.5578	1.0173	.9681	1.0017	.9941	1.0029	.9999
1.200	4.088E+08	.9450	1.4820	212.94	.4132	.7716	.5328	1.0303	.9680	1.0021	.9938	1.0031	.9998
1.250	4.104E+08	.9455	1.4805	210.92	.3870	.7569	.5084	1.0465	.9679	1.0025	.9935	1.0033	.9998
1.300	4.109E+08	.9460	1.4791	208.88	.3619	.7423	.4845	1.0662	.9678	1.0027	.9932	1.0032	.9999
1.350	4.105E+08	.9465	1.4777	206.83	.3380	.7277	.4613	1.0889	.9677	1.0031	.9929	1.0033	.9999
1.400	4.094E+08	.9471	1.4763	204.77	.3153	.7131	.4389	1.1147	.9677	1.0035	.9926	1.0034	.9998
1.450	4.074E+08	.9476	1.4749	202.70	.2938	.6986	.4173	1.1437	.9677	1.0038	.9923	1.0035	.9998
1.500	4.048E+08	.9482	1.4735	200.63	.2735	.6842	.3964	1.1759	.9677	1.0041	.9920	1.0035	.9998
1.550	4.014E+08	.9488	1.4722	198.55	.2544	.6699	.3762	1.2113	.9677	1.0044	.9918	1.0034	.9998
1.600	3.975E+08	.9494	1.4709	196.48	.2364	.6557	.3569	1.2501	.9677	1.0046	.9915	1.0033	.9999
1.650	3.931E+08	.9499	1.4696	194.41	.2195	.6418	.3384	1.2922	.9678	1.0048	.9912	1.0032	1.0000
1.700	3.881E+08	.9505	1.4684	192.35	.2036	.6280	.3207	1.3377	.9679	1.0050	.9909	1.0030	1.0001
1.750	3.827E+08	.9511	1.4672	190.30	.1888	.6143	.3037	1.3868	.9679	1.0051	.9906	1.0028	1.0002
1.800	3.770E+08	.9517	1.4660	188.25	.1749	.6009	.2875	1.4396	.9680	1.0051	.9903	1.0025	1.0004
1.850	3.708E+08	.9523	1.4649	186.22	.1620	.5877	.2721	1.4961	.9681	1.0051	.9900	1.0022	1.0007
1.900	3.644E+08	.9529	1.4638	184.20	.1500	.5748	.2575	1.5567	.9682	1.0051	.9898	1.0018	1.0009
1.950	3.577E+08	.9535	1.4627	182.20	.1388	.5620	.2435	1.6212	.9683	1.0050	.9895	1.0014	1.0012
2.000	3.508E+08	.9540	1.4617	180.21	.1284	.5495	.2303	1.6901	.9684	1.0048	.9892	1.0009	1.0016

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

G. TT = 150 K PT = 15 ATM DT = 37.570 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9087	1.5726	239.95	1.0000	1.0000	1.0000	1	.9611	1.0000	1.0000	1.0000	1
.050	4.200E+07	.9087	1.5725	239.88	.9983	.9995	.9988	11.5244	.9611	1.0000	1.0000	1.0001	.9942
.100	8.374E+07	.9087	1.5723	239.67	.9930	.9979	.9951	5.7891	.9610	.9999	.9999	1.0001	.9944
.150	1.250E+08	.9087	1.5719	239.32	.9843	.9953	.9890	3.8889	.9608	.9999	.9997	1.0001	.9945
.200	1.655E+08	.9087	1.5713	238.83	.9721	.9916	.9803	2.9483	.9605	.9996	.9995	1.0001	.9949
.250	2.050E+08	.9088	1.5706	238.21	.9569	.9869	.9695	2.3912	.9601	.9994	.9993	1.0001	.9952
.300	2.434E+08	.9088	1.5698	237.46	.9387	.9813	.9565	2.0261	.9597	.9992	.9990	1.0001	.9956
.350	2.804E+08	.9089	1.5688	236.59	.9179	.9747	.9415	1.7709	.9592	.9990	.9986	1.0002	.9960
.400	3.158E+08	.9089	1.5676	235.60	.8945	.9673	.9246	1.5845	.9587	.9988	.9982	1.0003	.9964
.450	3.496E+08	.9090	1.5664	234.50	.8691	.9590	.9059	1.4442	.9581	.9986	.9978	1.0005	.9969
.500	3.814E+08	.9091	1.5649	233.29	.8416	.9499	.8856	1.3365	.9575	.9983	.9974	1.0005	.9975
.550	4.114E+08	.9093	1.5634	231.99	.8127	.9400	.8640	1.2524	.9569	.9982	.9969	1.0007	.9980
.600	4.393E+08	.9095	1.5618	230.59	.7825	.9295	.8412	1.1863	.9563	.9981	.9964	1.0009	.9984
.650	4.652E+08	.9097	1.5600	229.11	.7514	.9184	.8174	1.1342	.9557	.9981	.9960	1.0011	.9988
.700	4.890E+08	.9099	1.5582	227.55	.7197	.9066	.7927	1.0934	.9551	.9982	.9955	1.0014	.9991
.750	5.106E+08	.9102	1.5562	225.93	.6875	.8944	.7674	1.0618	.9545	.9984	.9950	1.0018	.9994
.800	5.301E+08	.9105	1.5542	224.23	.6551	.8817	.7416	1.0378	.9539	.9986	.9945	1.0021	.9996
.850	5.475E+08	.9109	1.5521	222.49	.6229	.8686	.7154	1.0205	.9534	.9990	.9941	1.0025	.9998
.900	5.629E+08	.9113	1.5500	220.69	.5909	.8551	.6891	1.0088	.9529	.9994	.9936	1.0029	.9999
.950	5.762E+08	.9117	1.5478	218.84	.5594	.8413	.6627	1.0021	.9524	.9998	.9932	1.0033	1.0000
1.000	5.875E+08	.9122	1.5456	216.96	.5285	.8273	.6363	1.0000	.9520	1.0004	.9927	1.0038	1.0000
1.050	5.970E+08	.9128	1.5433	215.04	.4983	.8130	.6102	1.0020	.9516	1.0009	.9923	1.0042	1.0000
1.100	6.045E+08	.9134	1.5410	213.10	.4691	.7986	.5844	1.0079	.9513	1.0015	.9919	1.0045	1.0000
1.150	6.104E+08	.9140	1.5387	211.13	.4408	.7841	.5590	1.0174	.9510	1.0021	.9915	1.0049	.9999
1.200	6.147E+08	.9146	1.5363	209.14	.4136	.7695	.5340	1.0302	.9507	1.0028	.9911	1.0053	.9998
1.250	6.174E+08	.9153	1.5340	207.13	.3875	.7548	.5096	1.0464	.9505	1.0035	.9907	1.0056	.9997
1.300	6.186E+08	.9160	1.5317	205.11	.3625	.7401	.4858	1.0658	.9503	1.0042	.9903	1.0059	.9996
1.350	6.185E+08	.9168	1.5294	203.09	.3387	.7255	.4627	1.0884	.9502	1.0048	.9899	1.0062	.9995
1.400	6.171E+08	.9176	1.5271	201.05	.3160	.7109	.4403	1.1142	.9501	1.0055	.9895	1.0064	.9994
1.450	6.145E+08	.9184	1.5249	199.01	.2945	.6963	.4186	1.1432	.9501	1.0061	.9891	1.0065	.9994
1.500	6.108E+08	.9192	1.5226	196.97	.2743	.6819	.3976	1.1753	.9500	1.0066	.9887	1.0065	.9993
1.550	6.061E+08	.9200	1.5204	194.93	.2551	.6676	.3774	1.2107	.9500	1.0071	.9883	1.0065	.9993
1.600	6.005E+08	.9209	1.5183	192.90	.2371	.6534	.3581	1.2494	.9501	1.0075	.9879	1.0064	.9994
1.650	5.941E+08	.9218	1.5162	190.87	.2202	.6394	.3395	1.2915	.9501	1.0079	.9875	1.0062	.9995
1.700	5.869E+08	.9226	1.5142	188.85	.2043	.6255	.3217	1.3370	.9502	1.0082	.9871	1.0060	.9997
1.750	5.790E+08	.9235	1.5122	186.84	.1894	.6119	.3046	1.3862	.9503	1.0084	.9866	1.0057	.9999
1.800	5.705E+08	.9244	1.5102	184.84	.1756	.5985	.2884	1.4391	.9505	1.0085	.9862	1.0053	1.0002
1.850	5.615E+08	.9253	1.5083	182.86	.1626	.5852	.2729	1.4958	.9506	1.0085	.9858	1.0048	1.0005
1.900	5.519E+08	.9261	1.5065	180.88	.1505	.5723	.2581	1.5565	.9507	1.0085	.9854	1.0042	1.0009

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

G. TT = 150 K PT = 20 ATM DT = 51.941 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.8764	1.6537	236.87	1.0000	1.0000	1.0000	I	.9488	1.0000	1.0000	1.0000	I
.050	5.591E+07	.8764	1.6536	236.80	.9983	.9995	.9988	11.4846	.9488	1.0000	1.0000	1.0001	.9908
.100	1.115E+08	.8764	1.6533	236.57	.9929	.9978	.9951	5.7696	.9486	.9999	.9998	1.0001	.9910
.150	1.664E+08	.8763	1.6528	236.20	.9841	.9952	.9889	3.8766	.9482	.9996	.9996	1.0001	.9914
.200	2.203E+08	.8763	1.6521	235.68	.9719	.9914	.9804	2.9392	.9478	.9994	.9994	1.0001	.9918
.250	2.729E+08	.8763	1.6512	235.01	.9566	.9867	.9696	2.3842	.9472	.9991	.9990	1.0002	.9923
.300	3.240E+08	.8762	1.6501	234.21	.9383	.9810	.9567	2.0206	.9466	.9987	.9986	1.0003	.9929
.350	3.732E+08	.8762	1.6487	233.29	.9171	.9743	.9415	1.7668	.9458	.9982	.9981	1.0002	.9937
.400	4.204E+08	.8762	1.6472	232.24	.8937	.9667	.9246	1.5813	.9450	.9978	.9976	1.0004	.9944
.450	4.653E+08	.8762	1.6455	231.07	.8681	.9583	.9060	1.4417	.9441	.9975	.9971	1.0006	.9952
.500	5.079E+08	.8763	1.6437	229.80	.8407	.9491	.8859	1.3343	.9432	.9972	.9965	1.0008	.9959
.550	5.478E+08	.8764	1.6416	228.43	.8117	.9391	.8644	1.2507	.9423	.9970	.9959	1.0011	.9966
.600	5.852E+08	.8765	1.6395	226.97	.7815	.9285	.8417	1.1850	.9413	.9969	.9953	1.0014	.9973
.650	6.197E+08	.8766	1.6371	225.43	.7505	.9172	.8180	1.1332	.9403	.9968	.9947	1.0019	.9979
.700	6.516E+08	.8768	1.6346	223.81	.7187	.9054	.7934	1.0926	.9394	.9969	.9941	1.0023	.9984
.750	6.806E+08	.8771	1.6320	222.13	.6866	.8931	.7682	1.0612	.9385	.9972	.9935	1.0029	.9989
.800	7.068E+08	.8774	1.6293	220.39	.6544	.8803	.7426	1.0374	.9376	.9975	.9929	1.0035	.9992
.850	7.301E+08	.8778	1.6264	218.60	.6222	.8671	.7164	1.0204	.9367	.9978	.9923	1.0039	.9997
.900	7.508E+08	.8782	1.6234	216.76	.5903	.8535	.6902	1.0088	.9359	.9983	.9918	1.0045	.9999
.950	7.689E+08	.8787	1.6203	214.89	.5589	.8397	.6639	1.0022	.9352	.9990	.9912	1.0052	1.0000
1.000	7.844E+08	.8792	1.6172	212.98	.5282	.8256	.6377	1.0001	.9345	.9998	.9907	1.0059	1.0001
1.050	7.974E+08	.8798	1.6140	211.04	.4982	.8113	.6117	1.0020	.9339	1.0006	.9902	1.0066	1.0000
1.100	8.080E+08	.8805	1.6108	209.09	.4691	.7969	.5860	1.0078	.9334	1.0016	.9897	1.0073	.9999
1.150	8.163E+08	.8812	1.6075	207.11	.4410	.7823	.5606	1.0172	.9329	1.0026	.9892	1.0080	.9998
1.200	8.224E+08	.8820	1.6042	205.12	.4139	.7677	.5357	1.0300	.9325	1.0036	.9887	1.0086	.9996
1.250	8.265E+08	.8828	1.6008	203.12	.3879	.7530	.5114	1.0461	.9321	1.0046	.9882	1.0092	.9994
1.300	8.286E+08	.8837	1.5975	201.11	.3630	.7383	.4876	1.0655	.9318	1.0057	.9878	1.0097	.9992
1.350	8.289E+08	.8847	1.5942	199.10	.3393	.7236	.4645	1.0880	.9316	1.0067	.9873	1.0101	.9991
1.400	8.274E+08	.8856	1.5909	197.09	.3167	.7089	.4420	1.1136	.9314	1.0077	.9868	1.0105	.9989
1.450	8.244E+08	.8867	1.5876	195.07	.2953	.6944	.4203	1.1425	.9313	1.0086	.9863	1.0107	.9988
1.500	8.199E+08	.8877	1.5843	193.07	.2750	.6799	.3993	1.1745	.9312	1.0095	.9858	1.0109	.9987
1.550	8.141E+08	.8888	1.5811	191.06	.2559	.6656	.3791	1.2099	.9312	1.0102	.9854	1.0110	.9986
1.600	8.070E+08	.8899	1.5779	189.06	.2379	.6514	.3596	1.2485	.9312	1.0109	.9849	1.0109	.9987
1.650	7.987E+08	.8910	1.5748	187.08	.2209	.6373	.3410	1.2906	.9313	1.0115	.9843	1.0107	.9988
1.700	7.895E+08	.8922	1.5718	185.10	.2050	.6235	.3231	1.3361	.9314	1.0120	.9838	1.0104	.9990
1.750	7.792E+08	.8933	1.5688	183.13	.1902	.6098	.3059	1.3853	.9315	1.0123	.9833	1.0100	.9992

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

G. TT = 150 K PT = 25 ATM DT = 67.499 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.8430	1.7524	233.96	1.0000	1.0000	1.0000	1	.9372	1.0000	1.0000	1.0000	1
.050	6.991E+07	.8430	1.7523	233.88	.9983	.9995	.9989	11.4341	.9371	1.0000	1.0000	1.0001	.9864
.100	1.394E+08	.8429	1.7520	233.63	.9929	.9978	.9952	5.7444	.9368	.9999	.9998	1.0001	.9867
.150	2.081E+08	.8428	1.7514	233.22	.9839	.9951	.9889	3.8605	.9363	.9995	.9995	1.0001	.9873
.200	2.755E+08	.8427	1.7506	232.66	.9716	.9913	.9805	2.9275	.9356	.9991	.9992	1.0002	.9878
.250	3.412E+08	.8426	1.7495	231.94	.9560	.9864	.9696	2.3757	.9348	.9984	.9988	1.0001	.9888
.300	4.051E+08	.8424	1.7483	231.07	.9375	.9806	.9566	2.0140	.9339	.9979	.9983	1.0003	.9897
.350	4.666E+08	.8423	1.7468	230.07	.9163	.9738	.9417	1.7614	.9328	.9973	.9977	1.0004	.9907
.400	5.256E+08	.8422	1.7451	228.94	.8927	.9661	.9248	1.5770	.9316	.9967	.9971	1.0006	.9917
.450	5.818E+08	.8420	1.7431	227.69	.8669	.9576	.9063	1.4383	.9303	.9962	.9964	1.0009	.9928
.500	6.349E+08	.8419	1.7409	226.33	.8392	.9483	.8861	1.3319	.9290	.9955	.9957	1.0011	.9941
.550	6.849E+08	.8419	1.7385	224.87	.8102	.9382	.8647	1.2488	.9276	.9951	.9950	1.0015	.9951
.600	7.316E+08	.8418	1.7359	223.32	.7800	.9275	.8422	1.1836	.9262	.9949	.9943	1.0020	.9961
.650	7.750E+08	.8418	1.7331	221.69	.7489	.9161	.8186	1.1322	.9248	.9948	.9935	1.0026	.9970
.700	8.149E+08	.8419	1.7301	220.00	.7172	.9042	.7942	1.0920	.9234	.9949	.9928	1.0033	.9978
.750	8.513E+08	.8420	1.7268	218.24	.6852	.8918	.7692	1.0608	.9220	.9951	.9921	1.0041	.9985
.800	8.843E+08	.8423	1.7234	216.43	.6531	.8790	.7437	1.0373	.9207	.9955	.9915	1.0050	.9991
.850	9.140E+08	.8425	1.7199	214.57	.6211	.8657	.7178	1.0202	.9195	.9961	.9908	1.0059	.9995
.900	9.402E+08	.8429	1.7162	212.68	.5894	.8521	.6918	1.0087	.9183	.9969	.9902	1.0069	.9998
.950	9.632E+08	.8433	1.7123	210.75	.5583	.8383	.6657	1.0021	.9172	.9978	.9896	1.0079	1.0000
1.000	9.830E+08	.8439	1.7083	208.80	.5277	.8242	.6396	1.0000	.9162	.9989	.9890	1.0090	1.0000
1.050	9.997E+08	.8445	1.7041	206.83	.4979	.8099	.6138	1.0020	.9153	1.0001	.9884	1.0101	.9999
1.100	1.013E+09	.8451	1.6999	204.85	.4690	.7954	.5882	1.0077	.9145	1.0015	.9879	1.0111	.9998
1.150	1.024E+09	.8459	1.6956	202.86	.4411	.7808	.5629	1.0170	.9137	1.0029	.9874	1.0122	.9996
1.200	1.033E+09	.8468	1.6912	200.86	.4142	.7662	.5381	1.0297	.9131	1.0043	.9869	1.0132	.9993
1.250	1.038E+09	.8477	1.6867	198.85	.3883	.7515	.5138	1.0457	.9125	1.0058	.9864	1.0141	.9990
1.300	1.042E+09	.8487	1.6822	196.85	.3636	.7368	.4901	1.0649	.9121	1.0073	.9858	1.0149	.9987
1.350	1.042E+09	.8498	1.6777	194.85	.3399	.7221	.4669	1.0874	.9117	1.0086	.9853	1.0155	.9986
1.400	1.041E+09	.8509	1.6731	192.85	.3174	.7075	.4445	1.1130	.9114	1.0100	.9848	1.0161	.9983
1.450	1.038E+09	.8521	1.6686	190.86	.2961	.6929	.4227	1.1417	.9112	1.0114	.9843	1.0166	.9980
1.500	1.033E+09	.8533	1.6641	188.88	.2759	.6785	.4017	1.1736	.9110	1.0127	.9837	1.0170	.9978
1.550	1.026E+09	.8546	1.6596	186.91	.2568	.6641	.3814	1.2087	.9109	1.0139	.9832	1.0172	.9977
1.600	1.018E+09	.8559	1.6552	184.94	.2388	.6499	.3619	1.2473	.9109	1.0149	.9826	1.0172	.9977

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

G. TT = 150 K PT = 30 ATM DT = 84.460 KGM/M3 CONCLUDED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.8084	1.8740	231.29	1.0000	1.0000	1.0000	I	.9265	1.0000	1.0000	1.0000	I
.050	8.411E+07	.8084	1.8739	231.20	.9983	.9995	.9989	11.3670	.9263	1.0000	1.0000	1.0001	.9806
.100	1.677E+08	.8083	1.8736	230.93	.9927	.9978	.9952	5.7121	.9259	.9997	.9998	1.0001	.9811
.150	2.503E+08	.8081	1.8731	230.47	.9836	.9950	.9890	3.8391	.9253	.9992	.9995	1.0002	.9818
.200	3.313E+08	.8079	1.8724	229.84	.9710	.9911	.9804	2.9125	.9243	.9985	.9990	1.0001	.9828
.250	4.104E+08	.8076	1.8714	229.05	.9553	.9862	.9697	2.3640	.9232	.9977	.9985	1.0002	.9839
.300	4.871E+08	.8073	1.8703	228.09	.9365	.9803	.9568	2.0049	.9218	.9969	.9979	1.0004	.9852
.350	5.610E+08	.8070	1.8689	226.99	.9150	.9734	.9417	1.7544	.9203	.9958	.9972	1.0005	.9867
.400	6.319E+08	.8066	1.8672	225.75	.8911	.9656	.9250	1.5715	.9186	.9949	.9965	1.0008	.9883
.450	6.994E+08	.8062	1.8654	224.39	.8651	.9569	.9065	1.4339	.9168	.9941	.9957	1.0011	.9898
.500	7.632E+08	.8059	1.8632	222.92	.8374	.9475	.8866	1.3283	.9150	.9933	.9949	1.0016	.9914
.550	8.233E+08	.8056	1.8608	221.34	.8083	.9374	.8653	1.2460	.9130	.9927	.9941	1.0022	.9929
.600	8.795E+08	.8053	1.8582	219.68	.7780	.9265	.8429	1.1814	.9111	.9923	.9933	1.0030	.9943
.650	9.316E+08	.8051	1.8553	217.94	.7469	.9151	.8196	1.1306	.9091	.9921	.9925	1.0038	.9956
.700	9.796E+08	.8049	1.8520	216.13	.7151	.9031	.7953	1.0909	.9071	.9920	.9917	1.0047	.9969
.750	1.024E+09	.8049	1.8485	214.27	.6832	.8907	.7705	1.0601	.9053	.9922	.9909	1.0058	.9978
.800	1.063E+09	.8049	1.8448	212.36	.6513	.8778	.7452	1.0368	.9034	.9927	.9902	1.0070	.9986
.850	1.099E+09	.8050	1.8408	210.41	.6194	.8646	.7196	1.0199	.9017	.9935	.9895	1.0083	.9993
.900	1.131E+09	.8052	1.8365	208.44	.5880	.8510	.6938	1.0085	.9000	.9945	.9889	1.0098	.9997
.950	1.159E+09	.8055	1.8321	206.44	.5571	.8371	.6679	1.0021	.8985	.9957	.9882	1.0113	.9999
1.000	1.183E+09	.8059	1.8273	204.43	.5268	.8231	.6421	1.0000	.8970	.9972	.9877	1.0128	1.0000
1.050	1.204E+09	.8064	1.8224	202.41	.4973	.8088	.6164	1.0019	.8957	.9988	.9871	1.0144	.9999
1.100	1.221E+09	.8070	1.8173	200.38	.4686	.7944	.5910	1.0076	.8945	1.0006	.9866	1.0160	.9997
1.150	1.235E+09	.8077	1.8120	198.36	.4409	.7798	.5659	1.0168	.8934	1.0025	.9861	1.0175	.9994
1.200	1.245E+09	.8086	1.8065	196.33	.4142	.7652	.5412	1.0294	.8925	1.0045	.9856	1.0190	.9990
1.250	1.253E+09	.8095	1.8009	194.31	.3886	.7506	.5170	1.0452	.8917	1.0065	.9851	1.0204	.9985
1.300	1.258E+09	.8105	1.7951	192.30	.3640	.7359	.4934	1.0642	.8910	1.0086	.9847	1.0217	.9980
1.350	1.259E+09	.8116	1.7893	190.29	.3406	.7213	.4703	1.0863	.8904	1.0107	.9842	1.0229	.9975
1.400	1.259E+09	.8129	1.7834	188.30	.3182	.7067	.4479	1.1116	.8899	1.0128	.9837	1.0240	.9970
1.450	1.256E+09	.8142	1.7774	186.33	.2970	.6921	.4261	1.1401	.8895	1.0147	.9832	1.0248	.9966
1.500	1.250E+09	.8155	1.7714	184.37	.2769	.6777	.4051	1.1717	.8893	1.0166	.9826	1.0255	.9962

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

H. TT = 175 K PT = 1 ATM DT = 1.958 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9965	1.4064	269.32	1.0000	1.0000	1.0000	I	.9987	1.0000	1.0000	1.0000	I
.050	2.292E+06	.9965	1.4064	269.25	.9983	.9995	.9988	11.5882	.9987	1.0000	1.0000	1.0000	.9997
.100	4.570E+06	.9965	1.4063	269.04	.9930	.9980	.9950	5.8202	.9987	1.0000	1.0000	1.0000	.9997
.150	6.820E+06	.9965	1.4063	268.71	.9844	.9955	.9889	3.9092	.9987	1.0000	1.0000	1.0000	.9997
.200	9.027E+06	.9965	1.4063	268.24	.9725	.9920	.9803	2.9627	.9987	1.0000	1.0000	1.0000	.9997
.250	1.118E+01	.9965	1.4063	267.63	.9575	.9876	.9695	2.4020	.9987	1.0000	1.0000	1.0001	.9997
.300	1.326E+01	.9965	1.4062	266.91	.9395	.9823	.9564	2.0345	.9987	1.0000	.9999	1.0001	.9997
.350	1.527E+01	.9965	1.4062	266.05	.9188	.9760	.9414	1.7775	.9986	1.0000	.9999	1.0001	.9997
.400	1.719E+01	.9965	1.4061	265.08	.8956	.9689	.9244	1.5897	.9986	1.0000	.9999	1.0001	.9997
.450	1.901E+07	.9965	1.4061	263.98	.8703	.9609	.9056	1.4483	.9986	1.0000	.9999	1.0001	.9997
.500	2.072E+07	.9965	1.4060	262.78	.8429	.9522	.8852	1.3397	.9986	.9999	.9998	1.0000	.9999
.550	2.232E+07	.9965	1.4060	261.47	.8141	.9428	.8635	1.2548	.9985	.9999	.9998	1.0000	.9999
.600	2.381E+07	.9965	1.4059	260.05	.7839	.9326	.8405	1.1881	.9985	.9999	.9998	1.0000	.9999
.650	2.517E+07	.9965	1.4058	258.54	.7527	.9219	.8165	1.1356	.9985	.9998	.9997	1.0001	.9999
.700	2.642E+07	.9965	1.4057	256.94	.7208	.9105	.7916	1.0943	.9984	.9998	.9997	1.0001	1.0000
.750	2.755E+07	.9965	1.4056	255.25	.6885	.8986	.7661	1.0624	.9984	.9998	.9997	1.0001	1.0000
.800	2.855E+07	.9966	1.4056	253.48	.6559	.8862	.7401	1.0382	.9984	.9998	.9997	1.0001	1.0000
.850	2.944E+07	.9966	1.4055	251.64	.6234	.8734	.7137	1.0207	.9983	.9998	.9996	1.0001	1.0000
.900	3.020E+07	.9966	1.4054	249.73	.5912	.8602	.6872	1.0089	.9983	.9999	.9996	1.0002	1.0000
.950	3.086E+07	.9966	1.4053	247.76	.5594	.8467	.6606	1.0022	.9983	.9999	.9996	1.0002	1.0000
1.000	3.140E+07	.9966	1.4052	245.73	.5282	.8329	.6341	1.0000	.9982	.9999	.9995	1.0002	1.0000
1.050	3.184E+07	.9966	1.4051	243.65	.4978	.8189	.6078	1.0020	.9982	.9999	.9995	1.0002	1.0000
1.100	3.218E+07	.9967	1.4050	241.53	.4683	.8047	.5819	1.0079	.9982	.9999	.9995	1.0003	1.0000
1.150	3.242E+07	.9967	1.4049	239.36	.4398	.7904	.5563	1.0175	.9982	1.0000	.9994	1.0003	1.0000
1.200	3.258E+07	.9967	1.4048	237.16	.4124	.7759	.5313	1.0304	.9982	1.0000	.9994	1.0003	1.0000
1.250	3.265E+07	.9968	1.4047	234.94	.3861	.7614	.5069	1.0467	.9981	1.0000	.9994	1.0003	1.0000
1.300	3.264E+07	.9968	1.4046	232.68	.3609	.7469	.4831	1.0663	.9981	1.0000	.9994	1.0004	1.0000
1.350	3.257E+07	.9968	1.4045	230.41	.3370	.7324	.4600	1.0890	.9981	1.0001	.9993	1.0004	1.0000
1.400	3.243E+07	.9968	1.4044	228.12	.3143	.7179	.4376	1.1149	.9981	1.0001	.9993	1.0004	1.0000
1.450	3.223E+07	.9969	1.4044	225.82	.2928	.7035	.4160	1.1439	.9981	1.0001	.9993	1.0004	.9999
1.500	3.197E+07	.9969	1.4043	223.51	.2725	.6892	.3952	1.1761	.9981	1.0002	.9993	1.0005	.9999
1.550	3.167E+07	.9969	1.4042	221.19	.2533	.6749	.3751	1.2115	.9981	1.0002	.9992	1.0005	.9999
1.600	3.132E+07	.9970	1.4041	218.87	.2353	.6609	.3559	1.2501	.9981	1.0002	.9992	1.0005	.9999
1.650	3.094E+07	.9970	1.4040	216.56	.2185	.6469	.3375	1.2921	.9981	1.0003	.9992	1.0005	.9999
1.700	3.052E+07	.9971	1.4039	214.24	.2027	.6332	.3199	1.3375	.9981	1.0003	.9992	1.0005	.9999
1.750	3.007E+07	.9971	1.4038	211.94	.1879	.6196	.3030	1.3863	.9981	1.0003	.9992	1.0005	.9999
1.800	2.960E+07	.9971	1.4038	209.64	.1741	.6063	.2870	1.4388	.9981	1.0003	.9991	1.0005	.9999
1.850	2.910E+07	.9972	1.4037	207.36	.1613	.5931	.2717	1.4950	.9980	1.0003	.9991	1.0005	.9999
1.900	2.859E+07	.9972	1.4036	205.09	.1493	.5802	.2571	1.5551	.9981	1.0003	.9991	1.0005	.9999
1.950	2.806E+07	.9972	1.4035	202.84	.1382	.5675	.2433	1.6191	.9981	1.0004	.9991	1.0005	.9999
2.000	2.751E+07	.9973	1.4035	200.60	.1279	.5550	.2302	1.6873	.9981	1.0004	.9991	1.0005	.9999

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

H. TT = 175 K PT = 3 ATM DT = 5.915 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9894	1.4192	268.62	1.0000	1.0000	1.0000	I	.9962	1.0000	1.0000	1.0000	I
.050	6.855E+06	.9894	1.4192	268.55	.9983	.9995	.9988	11.5820	.9962	1.0000	1.0000	1.0000	.9992
.100	1.367E+07	.9894	1.4192	268.35	.9931	.9980	.9951	5.8170	.9961	1.0000	1.0000	1.0000	.9992
.150	2.040E+07	.9894	1.4191	268.00	.9845	.9955	.9889	3.9070	.9961	1.0001	1.0000	1.0001	.9991
.200	2.700E+07	.9894	1.4190	267.53	.9726	.9920	.9804	2.9609	.9961	1.0001	.9999	1.0002	.9991
.250	3.343E+07	.9894	1.4189	266.92	.9573	.9875	.9694	2.4011	.9960	.9999	.9999	1.0000	.9993
.300	3.967E+07	.9894	1.4188	266.18	.9393	.9821	.9564	2.0338	.9960	.9998	.9998	1.0000	.9994
.350	4.567E+07	.9894	1.4187	265.31	.9186	.9758	.9413	1.7770	.9959	.9998	.9998	1.0000	.9994
.400	5.141E+07	.9894	1.4185	264.33	.8954	.9687	.9243	1.5893	.9958	.9998	.9997	1.0000	.9995
.450	5.685E+07	.9894	1.4184	263.22	.8700	.9607	.9056	1.4480	.9957	.9997	.9996	1.0001	.9996
.500	6.199E+07	.9894	1.4182	262.00	.8427	.9519	.8853	1.3394	.9956	.9997	.9995	1.0001	.9996
.550	6.679E+07	.9895	1.4180	260.68	.8139	.9424	.8635	1.2546	.9955	.9996	.9995	1.0001	.9997
.600	7.125E+07	.9895	1.4178	259.25	.7837	.9322	.8406	1.1879	.9954	.9996	.9994	1.0002	.9998
.650	7.535E+07	.9895	1.4175	257.73	.7525	.9214	.8166	1.1354	.9953	.9996	.9993	1.0002	.9998
.700	7.910E+07	.9895	1.4173	256.11	.7206	.9100	.7918	1.0942	.9952	.9996	.9992	1.0003	.9999
.750	8.248E+07	.9896	1.4171	254.41	.6883	.8981	.7663	1.0623	.9951	.9996	.9991	1.0003	.9999
.800	8.550E+07	.9896	1.4168	252.63	.6558	.8857	.7403	1.0382	.9950	.9996	.9990	1.0004	.9999
.850	8.816E+07	.9896	1.4165	250.78	.6233	.8728	.7139	1.0206	.9949	.9996	.9989	1.0004	1.0000
.900	9.047E+07	.9897	1.4163	248.87	.5911	.8596	.6874	1.0089	.9948	.9996	.9988	1.0005	1.0001
.950	9.244E+07	.9898	1.4160	246.89	.5593	.8461	.6608	1.0022	.9948	.9996	.9988	1.0005	1.0001
1.000	9.409E+07	.9898	1.4157	244.85	.5282	.8323	.6344	1.0001	.9947	.9997	.9987	1.0006	1.0001
1.050	9.543E+07	.9899	1.4154	242.77	.4978	.8182	.6081	1.0021	.9946	.9998	.9986	1.0007	1.0001
1.100	9.646E+07	.9899	1.4151	240.64	.4683	.8040	.5822	1.0080	.9945	.9998	.9985	1.0008	1.0001
1.150	9.721E+07	.9900	1.4148	238.48	.4398	.7896	.5567	1.0175	.9945	.9999	.9984	1.0008	1.0000
1.200	9.770E+07	.9901	1.4146	236.28	.4124	.7752	.5317	1.0304	.9944	1.0000	.9984	1.0009	1.0000
1.250	9.794E+07	.9902	1.4143	234.05	.3861	.7606	.5073	1.0467	.9944	1.0001	.9983	1.0010	1.0000
1.300	9.794E+07	.9903	1.4140	231.80	.3610	.7461	.4835	1.0662	.9943	1.0002	.9982	1.0011	1.0000
1.350	9.774E+07	.9904	1.4137	229.53	.3371	.7316	.4604	1.0889	.9943	1.0003	.9982	1.0011	.9999
1.400	9.733E+07	.9905	1.4134	227.24	.3144	.7171	.4380	1.1148	.9942	1.0004	.9981	1.0012	.9999
1.450	9.675E+07	.9906	1.4132	224.94	.2929	.7026	.4164	1.1438	.9942	1.0005	.9980	1.0013	.9999
1.500	9.601E+07	.9907	1.4129	222.64	.2726	.6883	.3955	1.1759	.9942	1.0006	.9980	1.0013	.9998
1.550	9.512E+07	.9908	1.4126	220.33	.2535	.6741	.3755	1.2113	.9942	1.0006	.9979	1.0014	.9998
1.600	9.410E+07	.9909	1.4124	218.02	.2355	.6600	.3563	1.2499	.9941	1.0007	.9978	1.0014	.9998
1.650	9.296E+07	.9910	1.4121	215.71	.2186	.6461	.3378	1.2919	.9941	1.0008	.9978	1.0014	.9998
1.700	9.172E+07	.9911	1.4119	213.41	.2028	.6323	.3202	1.3372	.9941	1.0009	.9977	1.0015	.9998
1.750	9.039E+07	.9912	1.4116	211.11	.1880	.6187	.3033	1.3861	.9941	1.0009	.9977	1.0015	.9998
1.800	8.898E+07	.9913	1.4114	208.82	.1742	.6054	.2873	1.4385	.9941	1.0010	.9976	1.0015	.9998
1.850	8.750E+07	.9914	1.4112	206.55	.1614	.5922	.2720	1.4947	.9941	1.0010	.9975	1.0015	.9998
1.900	8.597E+07	.9915	1.4109	204.29	.1494	.5793	.2574	1.5548	.9941	1.0011	.9975	1.0014	.9998
1.950	8.438E+07	.9916	1.4107	202.04	.1383	.5666	.2435	1.6188	.9941	1.0011	.9974	1.0014	.9998
2.000	8.276E+07	.9918	1.4105	199.82	.1280	.5541	.2304	1.6871	.9941	1.0011	.9974	1.0014	.9998

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

H. TT = 175 K PT = 5 ATM DT = 9.930 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9823	1.4325	267.95	1.0000	1.0000	1.0000	I	.9937	1.0000	1.0000	1.0000	I
.050	1.139E+07	.9823	1.4325	267.88	.9983	.9995	.9988	11.5761	.9937	1.0000	1.0000	1.0000	.9986
.100	2.272E+07	.9823	1.4324	267.67	.9931	.9980	.9951	5.8139	.9936	1.0000	1.0000	1.0001	.9986
.150	3.390E+07	.9823	1.4323	267.32	.9845	.9954	.9890	3.9049	.9936	1.0001	.9999	1.0002	.9986
.200	4.487E+07	.9823	1.4322	266.83	.9724	.9919	.9803	2.9600	.9935	.9999	.9999	1.0000	.9988
.250	5.557E+07	.9823	1.4320	266.22	.9573	.9874	.9694	2.4000	.9934	.9998	.9998	1.0000	.9989
.300	6.594E+07	.9823	1.4319	265.47	.9392	.9820	.9564	2.0330	.9933	.9997	.9997	1.0000	.9990
.350	7.592E+07	.9823	1.4316	264.59	.9185	.9757	.9413	1.7763	.9932	.9997	.9996	1.0001	.9991
.400	8.546E+07	.9823	1.4314	263.59	.8953	.9685	.9244	1.5888	.9930	.9996	.9995	1.0001	.9992
.450	9.452E+07	.9824	1.4311	262.47	.8699	.9605	.9056	1.4477	.9929	.9995	.9994	1.0001	.9993
.500	1.031E+08	.9824	1.4308	261.24	.8426	.9517	.8853	1.3390	.9927	.9995	.9992	1.0002	.9994
.550	1.111E+08	.9824	1.4305	259.90	.8137	.9421	.8636	1.2543	.9926	.9994	.9991	1.0003	.9995
.600	1.185E+08	.9824	1.4301	258.46	.7835	.9319	.8407	1.1877	.9924	.9994	.9990	1.0003	.9996
.650	1.253E+08	.9825	1.4297	256.92	.7523	.9210	.8168	1.1353	.9922	.9993	.9988	1.0004	.9997
.700	1.316E+08	.9825	1.4293	255.29	.7204	.9095	.7920	1.0941	.9920	.9993	.9987	1.0005	.9998
.750	1.372E+08	.9825	1.4289	253.58	.6881	.8976	.7665	1.0623	.9919	.9993	.9985	1.0006	.9999
.800	1.423E+08	.9826	1.4285	251.79	.6556	.8851	.7405	1.0381	.9917	.9994	.9984	1.0007	.9999
.850	1.467E+08	.9827	1.4280	249.92	.6231	.8722	.7142	1.0206	.9915	.9994	.9983	1.0008	1.0000
.900	1.506E+08	.9827	1.4276	248.00	.5910	.8590	.6877	1.0088	.9914	.9995	.9981	1.0010	1.0000
.950	1.539E+08	.9828	1.4271	246.01	.5592	.8454	.6612	1.0021	.9912	.9996	.9980	1.0011	1.0000
1.000	1.567E+08	.9829	1.4266	243.97	.5281	.8315	.6347	1.0000	.9911	.9997	.9978	1.0012	1.0000
1.050	1.589E+08	.9830	1.4262	241.88	.4978	.8175	.6085	1.0020	.9910	.9998	.9977	1.0014	1.0000
1.100	1.607E+08	.9831	1.4257	239.75	.4682	.8032	.5825	1.0081	.9908	.9997	.9976	1.0013	1.0002
1.150	1.620E+08	.9833	1.4252	237.58	.4398	.7888	.5570	1.0176	.9907	.9999	.9975	1.0015	1.0001
1.200	1.628E+08	.9834	1.4247	235.38	.4124	.7743	.5320	1.0305	.9906	1.0000	.9973	1.0016	1.0001
1.250	1.632E+08	.9835	1.4242	233.15	.3861	.7598	.5076	1.0468	.9905	1.0002	.9972	1.0017	1.0000
1.300	1.633E+08	.9837	1.4238	230.90	.3610	.7452	.4838	1.0663	.9905	1.0003	.9971	1.0019	1.0000
1.350	1.630E+08	.9838	1.4233	228.63	.3371	.7307	.4607	1.0890	.9904	1.0005	.9970	1.0020	.9999
1.400	1.623E+08	.9840	1.4228	226.35	.3145	.7162	.4383	1.1148	.9903	1.0007	.9969	1.0021	.9999
1.450	1.614E+08	.9841	1.4224	224.05	.2930	.7017	.4167	1.1438	.9903	1.0008	.9968	1.0022	.9998
1.500	1.602E+08	.9843	1.4219	221.75	.2727	.6874	.3959	1.1759	.9902	1.0010	.9967	1.0023	.9998
1.550	1.587E+08	.9845	1.4215	219.45	.2536	.6732	.3759	1.2113	.9902	1.0011	.9966	1.0024	.9997
1.600	1.570E+08	.9846	1.4210	217.15	.2356	.6591	.3566	1.2499	.9902	1.0013	.9965	1.0024	.9997
1.650	1.552E+08	.9848	1.4206	214.84	.2187	.6451	.3382	1.2918	.9902	1.0014	.9964	1.0025	.9997
1.700	1.531E+08	.9850	1.4202	212.55	.2029	.6314	.3205	1.3371	.9902	1.0015	.9963	1.0025	.9997
1.750	1.509E+08	.9852	1.4198	210.26	.1881	.6178	.3036	1.3860	.9901	1.0016	.9962	1.0026	.9996
1.800	1.486E+08	.9854	1.4194	207.98	.1743	.6044	.2876	1.4384	.9901	1.0017	.9961	1.0026	.9996
1.850	1.462E+08	.9856	1.4190	205.72	.1615	.5913	.2722	1.4947	.9902	1.0018	.9960	1.0025	.9996
1.900	1.436E+08	.9857	1.4186	203.47	.1495	.5783	.2576	1.5547	.9902	1.0019	.9959	1.0025	.9997
1.950	1.410E+08	.9859	1.4183	201.23	.1384	.5656	.2438	1.6188	.9902	1.0019	.9958	1.0025	.9997
2.000	1.383E+08	.9861	1.4179	199.02	.1281	.5532	.2306	1.6870	.9902	1.0020	.9957	1.0024	.9997

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

H. TT = 175 K PT = 8 ATM DT = 16.061 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9717	1.4533	266.97	1.0000	1.0000	1.0000	I	.9900	1.0000	1.0000	1.0000	I
.050	1.816E+07	.9717	1.4533	266.90	.9983	.9995	.9988	11.5624	.9900	1.0000	1.0000	1.0000	.9974
.100	3.621E+07	.9717	1.4532	266.68	.9931	.9980	.9951	5.8070	.9900	1.0001	.9999	1.0001	.9974
.150	5.403E+07	.9717	1.4531	266.33	.9843	.9954	.9889	3.9008	.9899	.9999	.9999	1.0000	.9976
.200	7.152E+07	.9717	1.4529	265.83	.9723	.9918	.9803	2.9566	.9897	.9998	.9998	1.0000	.9977
.250	8.859E+07	.9717	1.4526	265.20	.9572	.9873	.9695	2.3974	.9896	.9997	.9997	1.0001	.9978
.300	1.051E+08	.9717	1.4523	264.43	.9391	.9818	.9565	2.0309	.9894	.9996	.9995	1.0001	.9979
.350	1.210E+08	.9717	1.4520	263.53	.9183	.9755	.9414	1.7746	.9892	.9995	.9994	1.0002	.9981
.400	1.363E+08	.9717	1.4516	262.51	.8950	.9682	.9245	1.5874	.9890	.9994	.9992	1.0002	.9983
.450	1.507E+08	.9717	1.4511	261.37	.8696	.9601	.9058	1.4465	.9887	.9993	.9990	1.0003	.9985
.500	1.643E+08	.9717	1.4506	260.11	.8422	.9512	.8854	1.3383	.9884	.9990	.9988	1.0002	.9988
.550	1.771E+08	.9717	1.4501	258.75	.8132	.9416	.8637	1.2538	.9882	.9989	.9986	1.0003	.9990
.600	1.890E+08	.9717	1.4495	257.28	.7830	.9313	.8408	1.1873	.9879	.9988	.9984	1.0004	.9992
.650	1.999E+08	.9718	1.4489	255.72	.7519	.9204	.8169	1.1350	.9876	.9987	.9981	1.0005	.9994
.700	2.099E+08	.9718	1.4482	254.07	.7200	.9088	.7921	1.0939	.9873	.9987	.9979	1.0006	.9996
.750	2.190E+08	.9719	1.4476	252.33	.6877	.8968	.7666	1.0621	.9870	.9986	.9977	1.0008	.9997
.800	2.271E+08	.9720	1.4469	250.52	.6552	.8843	.7407	1.0381	.9867	.9987	.9975	1.0009	.9998
.850	2.342E+08	.9721	1.4462	248.64	.6227	.8713	.7144	1.0206	.9864	.9987	.9972	1.0011	.9999
.900	2.405E+08	.9722	1.4454	246.70	.5906	.8580	.6880	1.0088	.9862	.9988	.9970	1.0013	1.0000
.950	2.458E+08	.9723	1.4447	244.70	.5589	.8444	.6615	1.0022	.9859	.9990	.9968	1.0015	1.0000
1.000	2.503E+08	.9724	1.4439	242.64	.5278	.8305	.6351	1.0000	.9857	.9991	.9966	1.0018	1.0000
1.050	2.540E+08	.9726	1.4431	240.54	.4975	.8164	.6089	1.0020	.9855	.9993	.9964	1.0020	1.0000
1.100	2.569E+08	.9727	1.4423	238.40	.4681	.8021	.5830	1.0079	.9853	.9995	.9962	1.0022	1.0000
1.150	2.590E+08	.9729	1.4416	236.23	.4397	.7877	.5576	1.0174	.9851	.9997	.9960	1.0025	.9999
1.200	2.604E+08	.9731	1.4408	234.02	.4124	.7732	.5326	1.0303	.9849	1.0000	.9958	1.0027	.9999
1.250	2.612E+08	.9733	1.4400	231.79	.3862	.7586	.5082	1.0465	.9848	1.0003	.9957	1.0029	.9998
1.300	2.613E+08	.9735	1.4392	229.54	.3611	.7440	.4844	1.0660	.9846	1.0005	.9955	1.0032	.9997
1.350	2.609E+08	.9738	1.4384	227.28	.3373	.7295	.4614	1.0886	.9845	1.0008	.9953	1.0034	.9996
1.400	2.600E+08	.9740	1.4377	225.00	.3146	.7149	.4390	1.1144	.9844	1.0011	.9952	1.0036	.9995
1.450	2.585E+08	.9743	1.4369	222.71	.2931	.7005	.4174	1.1433	.9843	1.0014	.9950	1.0037	.9994
1.500	2.567E+08	.9745	1.4362	220.42	.2729	.6861	.3965	1.1754	.9843	1.0016	.9949	1.0039	.9994
1.550	2.544E+08	.9748	1.4354	218.12	.2538	.6719	.3765	1.2107	.9842	1.0019	.9947	1.0040	.9993
1.600	2.518E+08	.9751	1.4347	215.83	.2358	.6578	.3572	1.2492	.9842	1.0021	.9945	1.0041	.9992
1.650	2.489E+08	.9754	1.4340	213.54	.2189	.6438	.3388	1.2911	.9841	1.0024	.9944	1.0042	.9992
1.700	2.457E+08	.9756	1.4333	211.25	.2031	.6301	.3211	1.3364	.9841	1.0026	.9942	1.0043	.9991
1.750	2.422E+08	.9759	1.4327	208.98	.1883	.6165	.3042	1.3852	.9841	1.0027	.9941	1.0043	.9991
1.800	2.385E+08	.9762	1.4320	206.71	.1746	.6031	.2881	1.4376	.9841	1.0029	.9939	1.0043	.9991
1.850	2.346E+08	.9765	1.4314	204.46	.1617	.5900	.2727	1.4938	.9841	1.0030	.9938	1.0043	.9991
1.900	2.306E+08	.9769	1.4308	202.23	.1497	.5770	.2581	1.5539	.9841	1.0031	.9936	1.0043	.9991
1.950	2.264E+08	.9771	1.4302	200.01	.1386	.5643	.2442	1.6179	.9841	1.0032	.9935	1.0042	.9992
2.000	2.221E+08	.9774	1.4296	197.81	.1282	.5519	.2310	1.6862	.9842	1.0033	.9933	1.0041	.9992

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

H. TT = 175 K PT = 10 ATM DT = 20.224 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9646	1.4679	266.34	1.0000	1.0000	1.0000	I	.9877	1.0000	1.0000	1.0000	I
.050	2.265E+07	.9646	1.4678	266.27	.9983	.9995	.9988	11.5524	.9877	1.0000	1.0000	1.0000	.9966
.100	4.516E+07	.9646	1.4677	266.05	.9931	.9979	.9952	5.8019	.9876	1.0001	.9999	1.0002	.9966
.150	6.739E+07	.9646	1.4675	265.69	.9843	.9954	.9889	3.8980	.9875	.9999	.9998	1.0000	.9968
.200	8.921E+07	.9646	1.4673	265.18	.9723	.9918	.9803	2.9545	.9873	.9998	.9997	1.0001	.9970
.250	1.105E+08	.9646	1.4670	264.54	.9571	.9872	.9695	2.3958	.9871	.9996	.9996	1.0001	.9971
.300	1.311E+08	.9646	1.4666	263.76	.9390	.9817	.9565	2.0296	.9869	.9995	.9994	1.0002	.9973
.350	1.510E+08	.9645	1.4662	262.84	.9182	.9753	.9415	1.7736	.9866	.9994	.9992	1.0002	.9975
.400	1.700E+08	.9645	1.4656	261.81	.8947	.9680	.9244	1.5869	.9863	.9990	.9990	1.0001	.9979
.450	1.880E+08	.9645	1.4651	260.65	.8693	.9599	.9057	1.4462	.9860	.9988	.9987	1.0002	.9982
.500	2.050E+08	.9645	1.4645	259.38	.8419	.9509	.8854	1.3379	.9856	.9987	.9985	1.0003	.9985
.550	2.210E+08	.9646	1.4638	257.99	.8130	.9413	.8638	1.2535	.9853	.9985	.9982	1.0004	.9988
.600	2.358E+08	.9646	1.4631	256.51	.7828	.9309	.8409	1.1871	.9849	.9984	.9980	1.0005	.9990
.650	2.495E+08	.9646	1.4623	254.93	.7516	.9200	.8170	1.1348	.9845	.9983	.9977	1.0006	.9993
.700	2.620E+08	.9647	1.4615	253.26	.7197	.9084	.7922	1.0938	.9841	.9982	.9974	1.0008	.9995
.750	2.733E+08	.9647	1.4606	251.51	.6874	.8963	.7668	1.0621	.9838	.9982	.9971	1.0010	.9996
.800	2.834E+08	.9648	1.4598	249.68	.6549	.8837	.7409	1.0380	.9834	.9983	.9968	1.0012	.9998
.850	2.924E+08	.9649	1.4589	247.79	.6225	.8708	.7147	1.0206	.9831	.9983	.9966	1.0015	.9999
.900	3.003E+08	.9650	1.4579	245.83	.5904	.8574	.6883	1.0089	.9827	.9985	.9963	1.0017	1.0000
.950	3.070E+08	.9652	1.4570	243.82	.5587	.8438	.6618	1.0022	.9824	.9986	.9961	1.0020	1.0000
1.000	3.127E+08	.9653	1.4560	241.75	.5277	.8299	.6354	1.0001	.9821	.9988	.9958	1.0023	1.0001
1.050	3.173E+08	.9655	1.4550	239.65	.4974	.8157	.6093	1.0021	.9818	.9991	.9956	1.0026	1.0000
1.100	3.210E+08	.9657	1.4540	237.50	.4681	.8014	.5834	1.0079	.9815	.9993	.9953	1.0029	1.0000
1.150	3.237E+08	.9659	1.4531	235.32	.4397	.7870	.5580	1.0174	.9813	.9996	.9951	1.0032	.9999
1.200	3.255E+08	.9662	1.4521	233.11	.4124	.7724	.5330	1.0303	.9811	1.0000	.9949	1.0035	.9998
1.250	3.265E+08	.9664	1.4511	230.88	.3862	.7579	.5087	1.0465	.9809	1.0003	.9947	1.0038	.9997
1.300	3.268E+08	.9667	1.4501	228.63	.3612	.7433	.4849	1.0659	.9807	1.0007	.9945	1.0041	.9996
1.350	3.263E+08	.9670	1.4491	226.36	.3373	.7287	.4618	1.0885	.9806	1.0010	.9943	1.0044	.9995
1.400	3.252E+08	.9673	1.4481	224.09	.3147	.7141	.4395	1.1142	.9804	1.0014	.9941	1.0046	.9994
1.450	3.235E+08	.9676	1.4472	221.80	.2933	.6997	.4179	1.1431	.9803	1.0017	.9939	1.0049	.9993
1.500	3.212E+08	.9679	1.4462	219.51	.2730	.6853	.3970	1.1752	.9802	1.0021	.9937	1.0051	.9992
1.550	3.184E+08	.9682	1.4453	217.22	.2539	.6711	.3770	1.2104	.9802	1.0024	.9935	1.0053	.9991
1.600	3.152E+08	.9686	1.4444	214.94	.2359	.6570	.3577	1.2489	.9801	1.0027	.9933	1.0054	.9990
1.650	3.116E+08	.9689	1.4435	212.65	.2191	.6430	.3392	1.2908	.9801	1.0030	.9931	1.0055	.9989
1.700	3.076E+08	.9693	1.4426	210.38	.2033	.6292	.3215	1.3360	.9800	1.0033	.9929	1.0056	.9989
1.750	3.033E+08	.9696	1.4418	208.11	.1885	.6157	.3046	1.3848	.9800	1.0035	.9927	1.0057	.9988
1.800	2.988E+08	.9700	1.4409	205.86	.1747	.6023	.2885	1.4372	.9800	1.0037	.9925	1.0057	.9988
1.850	2.940E+08	.9703	1.4401	203.62	.1618	.5891	.2731	1.4934	.9800	1.0039	.9923	1.0057	.9988
1.900	2.889E+08	.9707	1.4394	201.39	.1499	.5762	.2585	1.5534	.9800	1.0040	.9922	1.0056	.9989
1.950	2.837E+08	.9711	1.4386	199.18	.1387	.5635	.2445	1.6175	.9801	1.0041	.9920	1.0055	.9989
2.000	2.784E+08	.9714	1.4379	196.99	.1284	.5510	.2313	1.6857	.9801	1.0042	.9918	1.0054	.9990

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

H. TT = 175 K PT = 15 ATM DT = 30.904 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9469	1.5065	264.87	1.0000	1.0000	1.0000	I	.9823	1.0000	1.0000	1.0000	I
.050	3.382E+07	.9469	1.5065	264.80	.9983	.9995	.9988	11.5278	.9822	1.0000	1.0000	1.0001	.9945
.100	6.742E+07	.9469	1.5063	264.57	.9929	.9979	.9950	5.7908	.9821	.9999	.9999	1.0000	.9947
.150	1.006E+08	.9468	1.5061	264.19	.9842	.9953	.9889	3.8901	.9819	.9998	.9998	1.0001	.9948
.200	1.332E+08	.9468	1.5057	263.65	.9721	.9917	.9804	2.9488	.9817	.9996	.9996	1.0001	.9950
.250	1.650E+08	.9468	1.5052	262.98	.9569	.9870	.9696	2.3914	.9813	.9994	.9994	1.0002	.9953
.300	1.958E+08	.9467	1.5047	262.16	.9385	.9814	.9565	2.0266	.9809	.9990	.9991	1.0001	.9958
.350	2.254E+08	.9467	1.5040	261.20	.9176	.9749	.9414	1.7713	.9805	.9987	.9988	1.0002	.9962
.400	2.538E+08	.9466	1.5032	260.12	.8942	.9675	.9245	1.5848	.9800	.9984	.9985	1.0002	.9967
.450	2.808E+08	.9466	1.5024	258.91	.8686	.9593	.9058	1.4445	.9794	.9981	.9981	1.0003	.9971
.500	3.063E+08	.9465	1.5015	257.59	.8412	.9502	.8856	1.3365	.9788	.9978	.9977	1.0005	.9975
.550	3.302E+08	.9465	1.5004	256.15	.8122	.9405	.8640	1.2524	.9782	.9976	.9974	1.0007	.9980
.600	3.524E+08	.9465	1.4994	254.62	.7820	.9300	.8412	1.1863	.9776	.9974	.9970	1.0009	.9984
.650	3.729E+08	.9465	1.4982	252.98	.7508	.9189	.8174	1.1342	.9770	.9972	.9965	1.0011	.9987
.700	3.917E+08	.9465	1.4970	251.26	.7189	.9072	.7927	1.0934	.9764	.9972	.9961	1.0014	.9991
.750	4.087E+08	.9466	1.4957	249.47	.6866	.8950	.7674	1.0617	.9758	.9971	.9957	1.0018	.9994
.800	4.240E+08	.9466	1.4944	247.59	.6542	.8824	.7416	1.0378	.9752	.9972	.9953	1.0022	.9996
.850	4.376E+08	.9467	1.4930	245.66	.6219	.8693	.7154	1.0204	.9746	.9973	.9950	1.0026	.9998
.900	4.495E+08	.9469	1.4916	243.66	.5898	.8559	.6891	1.0088	.9741	.9975	.9946	1.0030	.9999
.950	4.597E+08	.9470	1.4901	241.61	.5582	.8422	.6627	1.0021	.9735	.9978	.9942	1.0035	1.0000
1.000	4.684E+08	.9472	1.4887	239.52	.5273	.8282	.6365	1.0000	.9730	.9981	.9939	1.0040	1.0000
1.050	4.755E+08	.9474	1.4872	237.39	.4971	.8140	.6104	1.0020	.9726	.9985	.9935	1.0045	1.0000
1.100	4.812E+08	.9477	1.4857	235.22	.4679	.7997	.5846	1.0078	.9721	.9990	.9932	1.0050	.9999
1.150	4.854E+08	.9480	1.4841	233.03	.4396	.7852	.5592	1.0172	.9717	.9995	.9929	1.0055	.9998
1.200	4.884E+08	.9483	1.4826	230.80	.4124	.7706	.5343	1.0301	.9714	1.0000	.9926	1.0060	.9996
1.250	4.902E+08	.9486	1.4811	228.56	.3863	.7560	.5100	1.0462	.9711	1.0006	.9923	1.0065	.9995
1.300	4.907E+08	.9490	1.4795	226.31	.3613	.7414	.4862	1.0657	.9708	1.0010	.9920	1.0068	.9995
1.350	4.902E+08	.9494	1.4780	224.04	.3375	.7268	.4632	1.0882	.9705	1.0015	.9917	1.0073	.9993
1.400	4.888E+08	.9498	1.4765	221.77	.3149	.7122	.4408	1.1139	.9703	1.0021	.9914	1.0077	.9991
1.450	4.864E+08	.9503	1.4750	219.49	.2935	.6977	.4192	1.1427	.9701	1.0027	.9911	1.0081	.9989
1.500	4.832E+08	.9507	1.4735	217.21	.2733	.6834	.3983	1.1746	.9700	1.0033	.9909	1.0085	.9987
1.550	4.793E+08	.9512	1.4721	214.94	.2542	.6691	.3783	1.2098	.9698	1.0038	.9906	1.0088	.9985
1.600	4.746E+08	.9517	1.4706	212.66	.2363	.6550	.3589	1.2482	.9697	1.0043	.9903	1.0090	.9984
1.650	4.694E+08	.9522	1.4692	210.40	.2195	.6410	.3404	1.2899	.9697	1.0048	.9901	1.0092	.9982
1.700	4.636E+08	.9527	1.4679	208.14	.2037	.6273	.3227	1.3351	.9696	1.0052	.9898	1.0094	.9981
1.750	4.573E+08	.9533	1.4665	205.89	.1889	.6137	.3057	1.3838	.9696	1.0056	.9895	1.0095	.9981
1.800	4.506E+08	.9538	1.4652	203.66	.1751	.6003	.2896	1.4361	.9696	1.0060	.9893	1.0095	.9980
1.850	4.435E+08	.9543	1.4640	201.44	.1622	.5871	.2741	1.4922	.9696	1.0062	.9890	1.0095	.9980
1.900	4.361E+08	.9549	1.4627	199.24	.1502	.5742	.2594	1.5523	.9696	1.0065	.9887	1.0095	.9981
1.950	4.284E+08	.9554	1.4615	197.06	.1391	.5615	.2455	1.6163	.9696	1.0067	.9884	1.0094	.9982
2.000	4.204E+08	.9560	1.4604	194.89	.1287	.5490	.2322	1.6846	.9697	1.0068	.9882	1.0092	.9983

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

H. TT = 175 K PT = 20 ATM DT = 41.990 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9292	1.5488	263.57	1.0000	1.0000	1.0000	I	.9774	1.0000	1.0000	1.0000	I
.050	4.493E+07	.9292	1.5488	263.49	.9983	.9995	.9988	11.4959	.9774	1.0000	1.0000	1.0001	.9918
.100	8.959E+07	.9292	1.5486	263.24	.9929	.9979	.9951	5.7751	.9772	.9999	.9999	1.0001	.9920
.150	1.337E+08	.9291	1.5482	262.84	.9841	.9952	.9890	3.8798	.9769	.9997	.9997	1.0001	.9922
.200	1.770E+08	.9290	1.5477	262.28	.9718	.9915	.9803	2.9418	.9765	.9993	.9994	1.0001	.9927
.250	2.192E+08	.9289	1.5471	261.56	.9564	.9868	.9695	2.3862	.9760	.9989	.9991	1.0001	.9931
.300	2.601E+08	.9288	1.5464	260.70	.9381	.9811	.9565	2.0221	.9754	.9985	.9988	1.0002	.9936
.350	2.996E+08	.9287	1.5455	259.69	.9170	.9745	.9415	1.7677	.9748	.9981	.9984	1.0003	.9942
.400	3.373E+08	.9286	1.5445	258.55	.8935	.9670	.9246	1.5820	.9740	.9976	.9980	1.0004	.9949
.450	3.732E+08	.9284	1.5434	257.28	.8678	.9587	.9060	1.4422	.9732	.9972	.9975	1.0006	.9955
.500	4.071E+08	.9283	1.5422	255.89	.8403	.9495	.8859	1.3347	.9724	.9968	.9970	1.0008	.9961
.550	4.388E+08	.9282	1.5409	254.40	.8113	.9396	.8643	1.2509	.9715	.9965	.9965	1.0010	.9968
.600	4.683E+08	.9281	1.5394	252.80	.7809	.9291	.8415	1.1854	.9706	.9960	.9960	1.0012	.9976
.650	4.956E+08	.9281	1.5379	251.10	.7497	.9179	.8177	1.1335	.9697	.9957	.9954	1.0015	.9981
.700	5.207E+08	.9280	1.5363	249.32	.7178	.9061	.7932	1.0929	.9688	.9956	.9949	1.0020	.9986
.750	5.434E+08	.9280	1.5346	247.46	.6855	.8938	.7679	1.0615	.9679	.9955	.9944	1.0024	.9991
.800	5.639E+08	.9281	1.5328	245.54	.6532	.8811	.7422	1.0377	.9671	.9956	.9939	1.0030	.9994
.850	5.821E+08	.9281	1.5309	243.55	.6209	.8680	.7162	1.0204	.9662	.9958	.9934	1.0036	.9997
.900	5.981E+08	.9282	1.5290	241.51	.5890	.8545	.6900	1.0088	.9654	.9960	.9929	1.0042	.9999
.950	6.119E+08	.9284	1.5271	239.42	.5575	.8407	.6637	1.0022	.9647	.9964	.9924	1.0049	1.0000
1.000	6.237E+08	.9286	1.5251	237.29	.5267	.8267	.6375	1.0001	.9639	.9969	.9920	1.0056	1.0001
1.050	6.334E+08	.9288	1.5231	235.12	.4966	.8125	.6115	1.0020	.9633	.9974	.9916	1.0063	1.0000
1.100	6.412E+08	.9291	1.5210	232.93	.4675	.7981	.5859	1.0078	.9626	.9981	.9912	1.0071	.9999
1.150	6.472E+08	.9294	1.5189	230.71	.4393	.7835	.5606	1.0172	.9621	.9988	.9908	1.0079	.9998
1.200	6.514E+08	.9298	1.5168	228.47	.4122	.7690	.5358	1.0300	.9615	.9995	.9904	1.0086	.9996
1.250	6.540E+08	.9302	1.5147	226.22	.3862	.7543	.5115	1.0460	.9611	1.0003	.9900	1.0094	.9993
1.300	6.551E+08	.9306	1.5126	223.95	.3614	.7397	.4878	1.0652	.9607	1.0012	.9897	1.0101	.9990
1.350	6.548E+08	.9311	1.5105	221.68	.3377	.7251	.4648	1.0876	.9603	1.0020	.9893	1.0108	.9987
1.400	6.531E+08	.9316	1.5084	219.41	.3152	.7105	.4424	1.1132	.9600	1.0029	.9890	1.0114	.9984
1.450	6.503E+08	.9322	1.5064	217.13	.2938	.6960	.4208	1.1418	.9597	1.0037	.9887	1.0120	.9982
1.500	6.463E+08	.9328	1.5043	214.86	.2737	.6816	.4000	1.1736	.9595	1.0045	.9883	1.0125	.9979
1.550	6.413E+08	.9334	1.5023	212.59	.2546	.6674	.3799	1.2086	.9593	1.0053	.9880	1.0130	.9976
1.600	6.354E+08	.9340	1.5003	210.33	.2367	.6532	.3605	1.2469	.9591	1.0061	.9877	1.0134	.9974
1.650	6.286E+08	.9347	1.4983	208.08	.2199	.6393	.3420	1.2885	.9590	1.0068	.9873	1.0137	.9972
1.700	6.211E+08	.9353	1.4964	205.84	.2041	.6255	.3242	1.3335	.9589	1.0074	.9870	1.0140	.9970
1.750	6.129E+08	.9360	1.4946	203.62	.1893	.6119	.3072	1.3821	.9588	1.0080	.9867	1.0142	.9969
1.800	6.042E+08	.9367	1.4927	201.41	.1755	.5985	.2909	1.4343	.9588	1.0085	.9863	1.0143	.9968
1.850	5.949E+08	.9375	1.4909	199.21	.1627	.5853	.2754	1.4903	.9588	1.0089	.9860	1.0143	.9968
1.900	5.851E+08	.9382	1.4892	197.03	.1506	.5724	.2607	1.5503	.9588	1.0093	.9856	1.0142	.9968
1.950	5.750E+08	.9389	1.4875	194.87	.1395	.5597	.2466	1.6143	.9589	1.0095	.9853	1.0141	.9969
2.000	5.645E+08	.9396	1.4859	192.73	.1291	.5472	.2333	1.6825	.9589	1.0097	.9849	1.0139	.9971

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

H. TT = 175 K PT = 25 ATM DT = 53.502 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9116	1.5950	262.45	1.0000	1.0000	1.0000	I	.9733	1.0000	1.0000	1.0000	I
.050	5.603E+07	.9116	1.5949	262.37	.9983	.9995	.9989	11.4607	.9732	1.0000	1.0000	1.0001	.9887
.100	1.117E+08	.9115	1.5947	262.11	.9928	.9978	.9951	5.7579	.9730	.9998	.9998	1.0001	.9890
.150	1.667E+08	.9114	1.5943	261.67	.9840	.9951	.9890	3.8685	.9726	.9996	.9996	1.0002	.9893
.200	2.207E+08	.9113	1.5937	261.07	.9716	.9914	.9804	2.9337	.9720	.9990	.9993	1.0001	.9899
.250	2.733E+08	.9111	1.5930	260.31	.9560	.9866	.9696	2.3800	.9714	.9985	.9989	1.0002	.9906
.300	3.243E+08	.9109	1.5921	259.39	.9376	.9808	.9566	2.0173	.9706	.9980	.9985	1.0003	.9913
.350	3.735E+08	.9107	1.5911	258.32	.9164	.9741	.9417	1.7639	.9696	.9974	.9980	1.0004	.9921
.400	4.205E+08	.9105	1.5899	257.11	.8926	.9665	.9247	1.5792	.9686	.9966	.9974	1.0004	.9931
.450	4.652E+08	.9102	1.5885	255.77	.8668	.9581	.9061	1.4400	.9675	.9960	.9969	1.0006	.9940
.500	5.075E+08	.9100	1.5871	254.31	.8391	.9488	.8860	1.3330	.9664	.9954	.9962	1.0009	.9949
.550	5.471E+08	.9098	1.5854	252.74	.8100	.9388	.8645	1.2497	.9652	.9949	.9956	1.0012	.9958
.600	5.840E+08	.9096	1.5837	251.06	.7796	.9282	.8419	1.1842	.9640	.9944	.9950	1.0017	.9966
.650	6.182E+08	.9094	1.5818	249.29	.7484	.9169	.8182	1.1327	.9628	.9941	.9943	1.0022	.9974
.700	6.495E+08	.9093	1.5799	247.44	.7165	.9050	.7938	1.0923	.9615	.9939	.9937	1.0028	.9981
.750	6.780E+08	.9092	1.5778	245.51	.6843	.8927	.7687	1.0610	.9603	.9939	.9931	1.0034	.9987
.800	7.037E+08	.9091	1.5756	243.52	.6520	.8799	.7431	1.0374	.9591	.9939	.9925	1.0042	.9992
.850	7.265E+08	.9091	1.5733	241.47	.6199	.8667	.7172	1.0202	.9580	.9941	.9919	1.0050	.9995
.900	7.467E+08	.9091	1.5709	239.37	.5880	.8531	.6911	1.0087	.9569	.9945	.9913	1.0059	.9998
.950	7.642E+08	.9092	1.5685	237.22	.5567	.8393	.6650	1.0021	.9558	.9950	.9908	1.0068	1.0000
1.000	7.791E+08	.9094	1.5660	235.05	.5260	.8252	.6389	1.0000	.9549	.9956	.9903	1.0078	1.0000
1.050	7.915E+08	.9096	1.5634	232.84	.4961	.8110	.6130	1.0020	.9539	.9964	.9898	1.0089	.9999
1.100	8.015E+08	.9099	1.5608	230.61	.4671	.7966	.5875	1.0077	.9531	.9973	.9893	1.0099	.9998
1.150	8.093E+08	.9102	1.5582	228.36	.4390	.7820	.5623	1.0170	.9523	.9982	.9889	1.0110	.9996
1.200	8.149E+08	.9106	1.5555	226.10	.4121	.7674	.5375	1.0297	.9516	.9992	.9884	1.0120	.9993
1.250	8.185E+08	.9110	1.5528	223.82	.3862	.7528	.5133	1.0457	.9509	1.0003	.9880	1.0131	.9989
1.300	8.203E+08	.9115	1.5501	221.55	.3614	.7381	.4897	1.0648	.9504	1.0015	.9876	1.0141	.9986
1.350	8.202E+08	.9121	1.5474	219.27	.3379	.7235	.4667	1.0870	.9498	1.0026	.9872	1.0150	.9982
1.400	8.185E+08	.9127	1.5447	216.99	.3154	.7090	.4444	1.1124	.9494	1.0038	.9869	1.0159	.9977
1.450	8.153E+08	.9133	1.5420	214.71	.2942	.6945	.4228	1.1409	.9490	1.0049	.9865	1.0168	.9973
1.500	8.106E+08	.9140	1.5393	212.44	.2741	.6801	.4019	1.1725	.9487	1.0061	.9861	1.0175	.9969
1.550	8.047E+08	.9147	1.5367	210.18	.2551	.6658	.3818	1.2074	.9484	1.0071	.9857	1.0182	.9965
1.600	7.976E+08	.9155	1.5341	207.94	.2372	.6517	.3624	1.2455	.9482	1.0082	.9854	1.0188	.9962
1.650	7.894E+08	.9163	1.5315	205.71	.2204	.6378	.3438	1.2870	.9480	1.0090	.9850	1.0191	.9961
1.700	7.803E+08	.9171	1.5290	203.48	.2046	.6240	.3260	1.3318	.9479	1.0098	.9846	1.0195	.9958
1.750	7.703E+08	.9179	1.5265	201.28	.1899	.6104	.3089	1.3803	.9478	1.0106	.9842	1.0198	.9956
1.800	7.596E+08	.9188	1.5241	199.08	.1761	.5970	.2926	1.4323	.9477	1.0114	.9838	1.0200	.9955
1.850	7.482E+08	.9196	1.5218	196.91	.1632	.5838	.2770	1.4882	.9477	1.0120	.9834	1.0201	.9955
1.900	7.362E+08	.9205	1.5195	194.76	.1511	.5709	.2622	1.5480	.9477	1.0125	.9830	1.0200	.9955
1.950	7.237E+08	.9214	1.5173	192.62	.1399	.5581	.2481	1.6119	.9478	1.0129	.9825	1.0199	.9956
2.000	7.107E+08	.9223	1.5151	190.51	.1295	.5456	.2346	1.6801	.9478	1.0132	.9821	1.0196	.9958

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

H. TT = 175 K PT = 30 ATM DT = 65.458 KGM/M3 CONCLUDED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.8941	1.6454	261.56	1.0000	1.0000	1.0000	1	.9700	1.0000	1.0000	1.0000	1
.050	6.712E+07	.8941	1.6453	261.47	.9983	.9995	.9989	11.4181	.9699	1.0000	1.0000	1.0001	.9850
.100	1.338E+08	.8940	1.6450	261.19	.9928	.9978	.9951	5.7371	.9696	.9998	.9998	1.0001	.9854
.150	1.997E+08	.8938	1.6446	260.72	.9837	.9950	.9889	3.8554	.9690	.9993	.9995	1.0001	.9860
.200	2.643E+08	.8936	1.6439	260.07	.9713	.9912	.9804	2.9239	.9683	.9987	.9992	1.0001	.9866
.250	3.274E+08	.8933	1.6432	259.26	.9556	.9864	.9696	2.3725	.9674	.9981	.9987	1.0002	.9874
.300	3.884E+08	.8930	1.6421	258.27	.9368	.9805	.9566	2.0117	.9664	.9972	.9982	1.0002	.9885
.350	4.473E+08	.8927	1.6410	257.13	.9154	.9737	.9416	1.7595	.9652	.9963	.9976	1.0004	.9896
.400	5.036E+08	.8923	1.6397	255.84	.8916	.9660	.9248	1.5755	.9638	.9955	.9969	1.0006	.9908
.450	5.572E+08	.8919	1.6382	254.42	.8656	.9575	.9063	1.4370	.9624	.9947	.9962	1.0008	.9920
.500	6.078E+08	.8915	1.6365	252.87	.8379	.9481	.8862	1.3307	.9609	.9939	.9955	1.0012	.9932
.550	6.553E+08	.8912	1.6347	251.20	.8086	.9380	.8649	1.2478	.9593	.9932	.9948	1.0017	.9943
.600	6.995E+08	.8908	1.6327	249.44	.7782	.9273	.8423	1.1827	.9577	.9926	.9940	1.0022	.9954
.650	7.405E+08	.8905	1.6306	247.58	.7469	.9159	.8188	1.1316	.9561	.9922	.9933	1.0029	.9964
.700	7.781E+08	.8902	1.6283	245.64	.7151	.9040	.7945	1.0914	.9545	.9919	.9925	1.0037	.9973
.750	8.123E+08	.8900	1.6259	243.63	.6829	.8915	.7696	1.0604	.9529	.9918	.9918	1.0046	.9981
.800	8.432E+08	.8898	1.6233	241.55	.6507	.8787	.7441	1.0369	.9514	.9919	.9911	1.0056	.9987
.850	8.708E+08	.8897	1.6206	239.43	.6186	.8654	.7184	1.0199	.9499	.9921	.9905	1.0067	.9992
.900	8.950E+08	.8896	1.6178	237.26	.5868	.8519	.6923	1.0086	.9485	.9924	.9898	1.0076	.9998
.950	9.161E+08	.8896	1.6149	235.06	.5556	.8380	.6663	1.0021	.9471	.9930	.9892	1.0089	1.0000
1.000	9.343E+08	.8897	1.6119	232.82	.5251	.8239	.6404	1.0000	.9458	.9938	.9887	1.0102	1.0000
1.050	9.495E+08	.8898	1.6089	230.56	.4953	.8096	.6147	1.0020	.9446	.9948	.9881	1.0115	1.0000
1.100	9.618E+08	.8901	1.6057	228.29	.4665	.7952	.5892	1.0077	.9435	.9959	.9876	1.0129	.9998
1.150	9.715E+08	.8904	1.6025	226.00	.4386	.7807	.5642	1.0169	.9425	.9971	.9872	1.0143	.9995
1.200	9.787E+08	.8907	1.5993	223.71	.4118	.7661	.5395	1.0295	.9415	.9985	.9867	1.0157	.9991
1.250	9.834E+08	.8912	1.5960	221.41	.3860	.7515	.5154	1.0453	.9407	.9999	.9863	1.0171	.9987
1.300	9.859E+08	.8917	1.5927	219.11	.3614	.7368	.4918	1.0643	.9399	1.0013	.9858	1.0184	.9982
1.350	9.862E+08	.8923	1.5894	216.82	.3380	.7222	.4689	1.0864	.9392	1.0028	.9854	1.0197	.9976
1.400	9.846E+08	.8929	1.5860	214.53	.3156	.7077	.4466	1.1116	.9386	1.0043	.9850	1.0210	.9971
1.450	9.811E+08	.8936	1.5827	212.25	.2945	.6932	.4250	1.1399	.9381	1.0058	.9846	1.0221	.9965
1.500	9.760E+08	.8944	1.5794	209.98	.2744	.6788	.4041	1.1714	.9377	1.0073	.9842	1.0231	.9960
1.550	9.693E+08	.8952	1.5761	207.73	.2555	.6646	.3840	1.2060	.9373	1.0088	.9838	1.0241	.9954
1.600	9.612E+08	.8960	1.5728	205.48	.2377	.6504	.3646	1.2439	.9370	1.0101	.9834	1.0249	.9950
1.650	9.518E+08	.8969	1.5696	203.26	.2209	.6365	.3460	1.2851	.9368	1.0114	.9830	1.0256	.9945
1.700	9.412E+08	.8979	1.5664	201.05	.2052	.6227	.3281	1.3298	.9366	1.0126	.9826	1.0262	.9942
1.750	9.295E+08	.8989	1.5633	198.86	.1904	.6091	.3109	1.3780	.9364	1.0136	.9822	1.0266	.9939
1.800	9.169E+08	.8999	1.5603	196.69	.1766	.5957	.2945	1.4299	.9364	1.0146	.9817	1.0269	.9937
1.850	9.035E+08	.9009	1.5573	194.54	.1637	.5825	.2789	1.4856	.9363	1.0154	.9812	1.0270	.9936
1.900	8.893E+08	.9019	1.5543	192.41	.1517	.5696	.2640	1.5452	.9363	1.0161	.9808	1.0270	.9936
1.950	8.745E+08	.9030	1.5515	190.30	.1404	.5568	.2497	1.6090	.9363	1.0167	.9803	1.0269	.9937
2.000	8.590E+08	.9041	1.5487	188.21	.1300	.5443	.2362	1.6771	.9364	1.0171	.9798	1.0267	.9939

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

I. TT = 200 K PT = 1 ATM DT = 1.711 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9978	1.4047	288.13	1.0000	1.0000	1.0000	I	.9995	1.0000	1.0000	1.0000	I
.050	1.907E+06	.9978	1.4047	288.06	.9982	.9995	.9988	11.5879	.9995	1.0000	1.0000	1.0000	.9997
.100	3.802E+06	.9978	1.4047	287.84	.9930	.9980	.9950	5.8200	.9995	1.0000	1.0000	1.0000	.9997
.150	5.673E+06	.9978	1.4046	287.48	.9844	.9955	.9889	3.9092	.9995	1.0000	1.0000	1.0000	.9997
.200	7.509E+06	.9978	1.4046	286.97	.9725	.9920	.9803	2.9626	.9995	1.0000	1.0000	1.0000	.9997
.250	9.297E+06	.9978	1.4046	286.33	.9574	.9876	.9695	2.4020	.9994	1.0000	1.0000	1.0000	.9997
.300	1.103E+07	.9978	1.4046	285.55	.9395	.9823	.9564	2.0345	.9994	1.0000	.9999	1.0001	.9997
.350	1.269E+07	.9978	1.4045	284.63	.9188	.9760	.9413	1.7775	.9994	1.0000	.9999	1.0001	.9997
.400	1.428E+07	.9978	1.4045	283.59	.8956	.9689	.9244	1.5897	.9994	1.0000	.9999	1.0001	.9997
.450	1.579E+07	.9978	1.4045	282.42	.8702	.9610	.9056	1.4483	.9993	1.0000	.9999	1.0001	.9997
.500	1.721E+07	.9978	1.4044	281.13	.8429	.9522	.8852	1.3397	.9993	.9999	.9999	1.0000	.9999
.550	1.854E+07	.9978	1.4044	279.73	.8140	.9428	.8635	1.2548	.9993	.9998	.9998	1.0000	.9999
.600	1.977E+07	.9978	1.4043	278.21	.7839	.9327	.8405	1.1881	.9992	.9998	.9998	1.0000	.9999
.650	2.089E+07	.9978	1.4043	276.60	.7527	.9219	.8165	1.1355	.9992	.9998	.9998	1.0001	.9999
.700	2.192E+07	.9978	1.4042	274.88	.7208	.9105	.7916	1.0943	.9992	.9998	.9998	1.0001	.9999
.750	2.285E+07	.9978	1.4041	273.07	.6884	.8986	.7661	1.0624	.9991	.9998	.9997	1.0001	1.0000
.800	2.367E+07	.9978	1.4041	271.18	.6559	.8863	.7401	1.0382	.9991	.9998	.9997	1.0001	1.0000
.850	2.439E+07	.9978	1.4040	269.21	.6234	.8735	.7137	1.0207	.9991	.9998	.9997	1.0001	1.0000
.900	2.502E+07	.9978	1.4039	267.17	.5911	.8603	.6872	1.0089	.9990	.9998	.9996	1.0002	1.0000
.950	2.555E+07	.9978	1.4039	265.05	.5593	.8468	.6606	1.0021	.9990	.9998	.9996	1.0002	1.0000
1.000	2.599E+07	.9978	1.4038	262.88	.5282	.8330	.6341	1.0000	.9990	.9998	.9996	1.0002	1.0000
1.050	2.634E+07	.9978	1.4037	260.66	.4978	.8190	.6078	1.0020	.9989	.9998	.9996	1.0003	1.0000
1.100	2.660E+07	.9978	1.4037	258.39	.4683	.8048	.5819	1.0079	.9989	.9998	.9996	1.0003	1.0000
1.150	2.679E+07	.9978	1.4036	256.07	.4398	.7905	.5563	1.0174	.9989	.9999	.9995	1.0003	1.0000
1.200	2.691E+07	.9978	1.4035	253.72	.4123	.7760	.5313	1.0304	.9989	.9999	.9995	1.0004	1.0000
1.250	2.695E+07	.9979	1.4034	251.33	.3860	.7615	.5069	1.0467	.9988	.9999	.9995	1.0004	1.0000
1.300	2.694E+07	.9979	1.4034	248.92	.3609	.7470	.4831	1.0663	.9988	.9999	.9995	1.0004	1.0000
1.350	2.686E+07	.9979	1.4033	246.49	.3370	.7325	.4600	1.0890	.9988	1.0000	.9994	1.0005	.9999
1.400	2.673E+07	.9979	1.4032	244.04	.3142	.7180	.4376	1.1148	.9988	1.0000	.9994	1.0005	.9999
1.450	2.655E+07	.9979	1.4032	241.57	.2927	.7036	.4160	1.1439	.9988	1.0000	.9994	1.0005	.9999
1.500	2.633E+07	.9979	1.4031	239.10	.2724	.6892	.3952	1.1760	.9987	1.0001	.9994	1.0006	.9999
1.550	2.607E+07	.9980	1.4030	236.62	.2533	.6750	.3752	1.2114	.9987	1.0001	.9994	1.0006	.9999
1.600	2.578E+07	.9980	1.4030	234.14	.2353	.6610	.3559	1.2501	.9987	1.0001	.9994	1.0006	.9999
1.650	2.545E+07	.9980	1.4029	231.66	.2184	.6470	.3375	1.2920	.9987	1.0002	.9993	1.0006	.9998
1.700	2.510E+07	.9980	1.4028	229.19	.2026	.6333	.3199	1.3374	.9987	1.0002	.9993	1.0007	.9998
1.750	2.472E+07	.9980	1.4028	226.72	.1879	.6197	.3031	1.3862	.9987	1.0002	.9993	1.0007	.9998
1.800	2.432E+07	.9981	1.4027	224.26	.1741	.6064	.2870	1.4387	.9987	1.0002	.9993	1.0007	.9998
1.850	2.391E+07	.9981	1.4026	221.82	.1612	.5932	.2717	1.4949	.9987	1.0003	.9993	1.0007	.9998
1.900	2.348E+07	.9981	1.4026	219.39	.1493	.5803	.2572	1.5549	.9987	1.0003	.9993	1.0007	.9998
1.950	2.304E+07	.9981	1.4025	216.98	.1382	.5676	.2434	1.6189	.9987	1.0003	.9993	1.0007	.9998
2.000	2.259E+07	.9982	1.4025	214.58	.1278	.5551	.2302	1.6871	.9987	1.0003	.9992	1.0008	.9998

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

I. TT = 200 K PT = 3 ATM DT = 5.155 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9935	1.4139	287.82	1.0000	1.0000	1.0000	I	.9984	1.0000	1.0000	1.0000	I
.050	5.706E+06	.9935	1.4139	287.75	.9983	.9995	.9988	11.5812	.9984	1.0000	1.0000	1.0000	.9991
.100	1.138E+07	.9935	1.4139	287.52	.9930	.9980	.9951	5.8166	.9984	1.0000	1.0000	1.0000	.9991
.150	1.698E+07	.9935	1.4138	287.16	.9844	.9955	.9889	3.9068	.9984	1.0000	1.0000	1.0001	.9991
.200	2.247E+07	.9935	1.4138	286.65	.9725	.9920	.9804	2.9608	.9983	1.0001	.9999	1.0001	.9991
.250	2.782E+07	.9934	1.4137	285.99	.9573	.9875	.9694	2.4011	.9983	.9999	.9999	1.0000	.9993
.300	3.300E+07	.9934	1.4136	285.20	.9393	.9822	.9564	2.0338	.9982	.9998	.9998	1.0000	.9993
.350	3.798E+07	.9934	1.4135	284.27	.9186	.9759	.9413	1.7770	.9981	.9998	.9998	1.0000	.9994
.400	4.274E+07	.9934	1.4134	283.22	.8954	.9687	.9243	1.5894	.9980	.9997	.9997	1.0000	.9995
.450	4.726E+07	.9934	1.4133	282.03	.8700	.9608	.9056	1.4481	.9980	.9996	.9997	1.0000	.9995
.500	5.151E+07	.9934	1.4132	280.73	.8427	.9520	.8852	1.3394	.9979	.9996	.9996	1.0001	.9996
.550	5.548E+07	.9934	1.4130	279.30	.8138	.9425	.8635	1.2546	.9978	.9995	.9995	1.0001	.9997
.600	5.916E+07	.9934	1.4129	277.77	.7836	.9323	.8406	1.1880	.9977	.9995	.9995	1.0001	.9997
.650	6.255E+07	.9934	1.4127	276.14	.7524	.9215	.8166	1.1354	.9976	.9994	.9994	1.0002	.9998
.700	6.563E+07	.9933	1.4125	274.41	.7205	.9101	.7918	1.0943	.9974	.9994	.9993	1.0002	.9999
.750	6.841E+07	.9933	1.4123	272.58	.6882	.8982	.7663	1.0624	.9973	.9994	.9992	1.0003	.9999
.800	7.088E+07	.9933	1.4121	270.68	.6556	.8858	.7403	1.0382	.9972	.9994	.9992	1.0003	1.0000
.850	7.306E+07	.9933	1.4120	268.69	.6232	.8730	.7139	1.0207	.9971	.9994	.9991	1.0004	1.0000
.900	7.494E+07	.9934	1.4117	266.63	.5909	.8598	.6874	1.0089	.9970	.9994	.9990	1.0005	1.0000
.950	7.654E+07	.9934	1.4115	264.51	.5592	.8462	.6608	1.0022	.9969	.9994	.9990	1.0006	1.0000
1.000	7.786E+07	.9934	1.4113	262.33	.5280	.8324	.6344	1.0000	.9968	.9994	.9989	1.0007	1.0000
1.050	7.892E+07	.9934	1.4111	260.09	.4977	.8184	.6081	1.0021	.9968	.9995	.9988	1.0007	1.0000
1.100	7.974E+07	.9934	1.4109	257.81	.4682	.8042	.5822	1.0079	.9967	.9996	.9988	1.0008	1.0000
1.150	8.032E+07	.9935	1.4107	255.49	.4397	.7898	.5567	1.0174	.9966	.9996	.9987	1.0009	1.0000
1.200	8.067E+07	.9935	1.4105	253.13	.4123	.7754	.5317	1.0304	.9965	.9997	.9987	1.0010	1.0000
1.250	8.083E+07	.9935	1.4103	250.74	.3860	.7609	.5073	1.0467	.9965	.9998	.9986	1.0011	.9999
1.300	8.079E+07	.9936	1.4101	248.32	.3609	.7463	.4835	1.0662	.9964	.9999	.9985	1.0012	.9999
1.350	8.058E+07	.9936	1.4098	245.89	.3370	.7318	.4604	1.0889	.9963	1.0000	.9985	1.0013	.9999
1.400	8.020E+07	.9937	1.4096	243.43	.3143	.7173	.4381	1.1147	.9963	1.0001	.9985	1.0014	.9998
1.450	7.968E+07	.9937	1.4094	240.97	.2928	.7029	.4165	1.1437	.9963	1.0001	.9984	1.0015	.9998
1.500	7.903E+07	.9938	1.4092	238.49	.2725	.6885	.3956	1.1758	.9962	1.0002	.9984	1.0016	.9997
1.550	7.826E+07	.9938	1.4090	236.02	.2534	.6743	.3756	1.2112	.9962	1.0003	.9983	1.0017	.9997
1.600	7.739E+07	.9939	1.4088	233.54	.2354	.6603	.3564	1.2497	.9962	1.0004	.9983	1.0018	.9996
1.650	7.642E+07	.9939	1.4086	231.06	.2185	.6463	.3379	1.2917	.9961	1.0005	.9982	1.0018	.9996
1.700	7.537E+07	.9940	1.4084	228.59	.2027	.6326	.3203	1.3370	.9961	1.0006	.9982	1.0019	.9996
1.750	7.425E+07	.9941	1.4083	226.13	.1880	.6190	.3035	1.3858	.9961	1.0007	.9982	1.0019	.9995
1.800	7.307E+07	.9941	1.4081	223.68	.1742	.6057	.2874	1.4382	.9961	1.0008	.9981	1.0020	.9995
1.850	7.184E+07	.9942	1.4079	221.24	.1613	.5925	.2721	1.4943	.9961	1.0008	.9981	1.0020	.9995
1.900	7.056E+07	.9943	1.4077	218.81	.1494	.5796	.2575	1.5543	.9960	1.0009	.9980	1.0021	.9994
1.950	6.925E+07	.9944	1.4076	216.41	.1383	.5669	.2437	1.6183	.9960	1.0010	.9980	1.0021	.9994
2.000	6.791E+07	.9944	1.4074	214.02	.1279	.5544	.2305	1.6864	.9960	1.0010	.9980	1.0021	.9994

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

I. TT = 200 K PT = 5 ATM DT = 8.629 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9892	1.4234	287.53	1.0000	1.0000	1.0000	I	.9974	1.0000	1.0000	1.0000	I
.050	9.487E+06	.9891	1.4233	287.45	.9983	.9995	.9988	11.5746	.9974	1.0000	1.0000	1.0000	.9985
.100	1.891E+07	.9891	1.4233	287.23	.9931	.9980	.9951	5.8133	.9974	1.0000	1.0000	1.0001	.9985
.150	2.822E+07	.9891	1.4232	286.86	.9845	.9955	.9890	3.9045	.9973	1.0001	.9999	1.0001	.9985
.200	3.735E+07	.9891	1.4232	286.34	.9724	.9919	.9803	2.9596	.9972	.9999	.9999	1.0000	.9987
.250	4.625E+07	.9891	1.4230	285.67	.9572	.9875	.9694	2.3998	.9972	.9998	.9998	1.0000	.9988
.300	5.487E+07	.9891	1.4229	284.87	.9392	.9821	.9564	2.0328	.9970	.9997	.9997	1.0000	.9989
.350	6.316E+07	.9890	1.4227	283.93	.9184	.9757	.9413	1.7761	.9969	.9996	.9997	1.0001	.9990
.400	7.108E+07	.9890	1.4225	282.85	.8952	.9686	.9243	1.5887	.9968	.9995	.9996	1.0001	.9991
.450	7.859E+07	.9890	1.4223	281.65	.8698	.9606	.9056	1.4475	.9966	.9994	.9995	1.0001	.9992
.500	8.567E+07	.9890	1.4221	280.33	.8425	.9518	.8853	1.3389	.9965	.9993	.9993	1.0002	.9993
.550	9.228E+07	.9890	1.4219	278.89	.8135	.9422	.8636	1.2542	.9963	.9992	.9992	1.0002	.9994
.600	9.842E+07	.9889	1.4216	277.34	.7834	.9320	.8407	1.1877	.9961	.9992	.9991	1.0003	.9996
.650	1.041E+08	.9889	1.4213	275.69	.7522	.9212	.8167	1.1352	.9959	.9991	.9990	1.0004	.9997
.700	1.092E+08	.9889	1.4210	273.94	.7203	.9097	.7919	1.0941	.9958	.9991	.9989	1.0004	.9997
.750	1.138E+08	.9889	1.4207	272.10	.6879	.8978	.7665	1.0622	.9956	.9990	.9988	1.0005	.9998
.800	1.180E+08	.9889	1.4204	270.18	.6554	.8853	.7405	1.0381	.9954	.9990	.9986	1.0007	.9999
.850	1.216E+08	.9889	1.4201	268.17	.6229	.8724	.7142	1.0206	.9952	.9990	.9985	1.0008	.9999
.900	1.247E+08	.9889	1.4198	266.10	.5907	.8592	.6877	1.0088	.9951	.9991	.9984	1.0009	1.0000
.950	1.274E+08	.9889	1.4194	263.97	.5590	.8457	.6611	1.0021	.9949	.9991	.9983	1.0011	1.0000
1.000	1.296E+08	.9889	1.4191	261.77	.5279	.8318	.6347	1.0000	.9947	.9992	.9982	1.0012	1.0000
1.050	1.314E+08	.9890	1.4187	259.53	.4975	.8178	.6085	1.0020	.9946	.9993	.9981	1.0014	1.0000
1.100	1.328E+08	.9890	1.4183	257.23	.4681	.8035	.5826	1.0079	.9945	.9994	.9980	1.0015	1.0000
1.150	1.338E+08	.9890	1.4180	254.90	.4396	.7892	.5571	1.0174	.9943	.9995	.9979	1.0017	.9999
1.200	1.344E+08	.9891	1.4176	252.54	.4122	.7747	.5321	1.0303	.9942	.9996	.9978	1.0019	.9999
1.250	1.347E+08	.9892	1.4173	250.14	.3860	.7602	.5077	1.0466	.9941	.9998	.9977	1.0020	.9998
1.300	1.346E+08	.9892	1.4169	247.72	.3609	.7456	.4840	1.0660	.9940	.9999	.9976	1.0022	.9998
1.350	1.343E+08	.9893	1.4166	245.28	.3370	.7311	.4609	1.0887	.9939	1.0001	.9976	1.0024	.9997
1.400	1.337E+08	.9894	1.4162	242.82	.3143	.7166	.4385	1.1145	.9938	1.0002	.9975	1.0025	.9996
1.450	1.329E+08	.9895	1.4159	240.36	.2929	.7022	.4169	1.1435	.9937	1.0003	.9974	1.0025	.9997
1.500	1.318E+08	.9895	1.4155	237.89	.2726	.6879	.3961	1.1756	.9937	1.0004	.9973	1.0027	.9996
1.550	1.305E+08	.9896	1.4152	235.41	.2535	.6736	.3761	1.2109	.9936	1.0006	.9973	1.0028	.9995
1.600	1.291E+08	.9897	1.4149	232.94	.2355	.6596	.3568	1.2494	.9936	1.0007	.9972	1.0029	.9994
1.650	1.275E+08	.9898	1.4145	230.46	.2186	.6456	.3384	1.2913	.9935	1.0009	.9971	1.0031	.9994
1.700	1.258E+08	.9900	1.4142	228.00	.2029	.6319	.3208	1.3365	.9935	1.0010	.9971	1.0032	.9993
1.750	1.239E+08	.9901	1.4139	225.54	.1881	.6183	.3039	1.3853	.9935	1.0012	.9970	1.0033	.9992
1.800	1.220E+08	.9902	1.4136	223.09	.1743	.6050	.2878	1.4377	.9934	1.0013	.9969	1.0033	.9992
1.850	1.199E+08	.9903	1.4133	220.65	.1615	.5918	.2725	1.4938	.9934	1.0014	.9969	1.0034	.9992
1.900	1.178E+08	.9904	1.4130	218.24	.1495	.5789	.2579	1.5537	.9934	1.0015	.9968	1.0035	.9991
1.950	1.156E+08	.9905	1.4127	215.83	.1384	.5662	.2441	1.6176	.9934	1.0016	.9968	1.0035	.9991
2.000	1.134E+08	.9906	1.4125	213.45	.1281	.5538	.2309	1.6857	.9934	1.0017	.9967	1.0035	.9991

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

I. TT = 200 K PT = 8 ATM DT = 13.896 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9827	1.4379	287.13	1.0000	1.0000	1.0000	1	.9960	1.0000	1.0000	1.0000	1
.050	1.513E+07	.9827	1.4379	287.05	.9983	.9995	.9988	11.5620	.9960	1.0000	1.0000	1.0000	.9974
.100	3.016E+07	.9827	1.4378	286.82	.9931	.9980	.9951	5.8068	.9960	1.0000	1.0000	1.0001	.9974
.150	4.500E+07	.9827	1.4377	286.44	.9843	.9954	.9889	3.9007	.9959	.9999	.9999	1.0000	.9975
.200	5.956E+07	.9826	1.4376	285.90	.9723	.9919	.9803	2.9566	.9957	.9998	.9998	1.0000	.9977
.250	7.376E+07	.9826	1.4374	285.22	.9571	.9874	.9695	2.3974	.9956	.9997	.9997	1.0000	.9978
.300	8.750E+07	.9826	1.4371	284.40	.9390	.9819	.9565	2.0309	.9954	.9995	.9996	1.0001	.9979
.350	1.007E+08	.9825	1.4369	283.44	.9182	.9755	.9414	1.7746	.9952	.9994	.9994	1.0001	.9981
.400	1.134E+08	.9825	1.4366	282.34	.8949	.9683	.9244	1.5874	.9950	.9992	.9993	1.0002	.9983
.450	1.254E+08	.9824	1.4363	281.11	.8695	.9602	.9057	1.4465	.9947	.9991	.9991	1.0002	.9985
.500	1.367E+08	.9824	1.4359	279.76	.8421	.9514	.8854	1.3381	.9944	.9989	.9990	1.0003	.9987
.550	1.472E+08	.9823	1.4355	278.29	.8132	.9418	.8638	1.2535	.9942	.9988	.9988	1.0004	.9989
.600	1.570E+08	.9823	1.4351	276.72	.7830	.9315	.8409	1.1871	.9939	.9987	.9986	1.0005	.9990
.650	1.660E+08	.9822	1.4347	275.03	.7518	.9206	.8170	1.1347	.9936	.9986	.9984	1.0007	.9992
.700	1.743E+08	.9822	1.4342	273.26	.7199	.9091	.7922	1.0937	.9933	.9985	.9982	1.0008	.9994
.750	1.816E+08	.9822	1.4337	271.39	.6874	.8971	.7666	1.0621	.9930	.9983	.9980	1.0008	.9997
.800	1.883E+08	.9822	1.4332	269.44	.6549	.8846	.7407	1.0380	.9927	.9982	.9978	1.0010	.9998
.850	1.941E+08	.9822	1.4327	267.41	.6224	.8717	.7144	1.0206	.9924	.9983	.9977	1.0011	.9999
.900	1.992E+08	.9822	1.4321	265.32	.5903	.8584	.6880	1.0088	.9921	.9983	.9975	1.0014	1.0000
.950	2.035E+08	.9822	1.4316	263.16	.5586	.8448	.6615	1.0021	.9919	.9984	.9973	1.0016	1.0000
1.000	2.071E+08	.9822	1.4310	260.95	.5275	.8310	.6351	1.0000	.9916	.9985	.9972	1.0018	1.0000
1.050	2.100E+08	.9823	1.4304	258.68	.4972	.8169	.6089	1.0020	.9914	.9986	.9970	1.0021	1.0000
1.100	2.122E+08	.9823	1.4299	256.37	.4678	.8026	.5831	1.0079	.9911	.9988	.9968	1.0024	1.0000
1.150	2.138E+08	.9824	1.4293	254.03	.4394	.7882	.5576	1.0174	.9909	.9990	.9967	1.0026	.9999
1.200	2.149E+08	.9824	1.4287	251.65	.4121	.7737	.5327	1.0303	.9907	.9992	.9966	1.0029	.9998
1.250	2.154E+08	.9825	1.4281	249.25	.3858	.7592	.5083	1.0465	.9905	.9994	.9964	1.0032	.9997
1.300	2.154E+08	.9826	1.4276	246.82	.3608	.7446	.4846	1.0659	.9904	.9997	.9963	1.0035	.9996
1.350	2.149E+08	.9827	1.4270	244.37	.3370	.7301	.4615	1.0885	.9902	.9999	.9962	1.0037	.9995
1.400	2.140E+08	.9829	1.4264	241.91	.3143	.7156	.4392	1.1142	.9901	1.0002	.9961	1.0040	.9994
1.450	2.127E+08	.9830	1.4259	239.44	.2929	.7011	.4176	1.1431	.9900	1.0005	.9960	1.0042	.9993
1.500	2.110E+08	.9831	1.4253	236.97	.2726	.6868	.3968	1.1751	.9899	1.0007	.9959	1.0045	.9991
1.550	2.091E+08	.9833	1.4248	234.49	.2535	.6726	.3767	1.2104	.9898	1.0010	.9958	1.0047	.9990
1.600	2.068E+08	.9834	1.4242	232.02	.2356	.6585	.3575	1.2488	.9897	1.0013	.9957	1.0049	.9989
1.650	2.043E+08	.9836	1.4237	229.55	.2187	.6446	.3390	1.2906	.9896	1.0015	.9956	1.0051	.9988
1.700	2.016E+08	.9838	1.4232	227.08	.2030	.6308	.3214	1.3358	.9895	1.0018	.9955	1.0053	.9987
1.750	1.986E+08	.9839	1.4227	224.63	.1882	.6173	.3045	1.3845	.9895	1.0020	.9954	1.0054	.9986
1.800	1.955E+08	.9841	1.4222	222.19	.1744	.6039	.2884	1.4368	.9895	1.0022	.9953	1.0056	.9985
1.850	1.923E+08	.9843	1.4217	219.76	.1616	.5908	.2731	1.4928	.9894	1.0024	.9952	1.0057	.9984
1.900	1.890E+08	.9845	1.4213	217.35	.1496	.5779	.2585	1.5527	.9894	1.0026	.9951	1.0058	.9983
1.950	1.855E+08	.9847	1.4208	214.96	.1385	.5652	.2446	1.6165	.9894	1.0027	.9950	1.0058	.9983
2.000	1.820E+08	.9849	1.4204	212.58	.1282	.5527	.2314	1.6845	.9894	1.0029	.9949	1.0059	.9982

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

I. TT = 200 K PT = 10 ATM DT = 17.446 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9784	1.4478	286.88	1.0000	1.0000	1.0000	I	.9952	1.0000	1.0000	1.0000	I
.050	1.887E+07	.9784	1.4478	286.81	.9983	.9995	.9988	11.5527	.9952	1.0000	1.0000	1.0000	.9967
.100	3.762E+07	.9784	1.4477	286.57	.9931	.9979	.9952	5.8022	.9951	1.0001	.9999	1.0001	.9966
.150	5.613E+07	.9784	1.4476	286.18	.9842	.9954	.9889	3.8981	.9950	.9998	.9999	1.0000	.9969
.200	7.430E+07	.9784	1.4474	285.64	.9722	.9918	.9803	2.9546	.9948	.9997	.9998	1.0000	.9970
.250	9.201E+07	.9783	1.4472	284.95	.9570	.9873	.9695	2.3959	.9946	.9996	.9996	1.0001	.9972
.300	1.092E+08	.9783	1.4469	284.11	.9389	.9818	.9565	2.0297	.9944	.9994	.9995	1.0001	.9974
.350	1.257E+08	.9782	1.4466	283.13	.9180	.9754	.9414	1.7737	.9941	.9992	.9993	1.0002	.9976
.400	1.414E+08	.9781	1.4462	282.01	.8947	.9681	.9245	1.5867	.9938	.9990	.9991	1.0002	.9978
.450	1.564E+08	.9781	1.4458	280.77	.8692	.9600	.9058	1.4459	.9935	.9988	.9989	1.0003	.9981
.500	1.705E+08	.9780	1.4454	279.40	.8419	.9511	.8855	1.3375	.9931	.9987	.9987	1.0004	.9983
.550	1.837E+08	.9779	1.4449	277.91	.8128	.9415	.8637	1.2534	.9928	.9983	.9985	1.0003	.9987
.600	1.959E+08	.9779	1.4443	276.31	.7825	.9312	.8409	1.1870	.9924	.9981	.9982	1.0005	.9990
.650	2.072E+08	.9778	1.4438	274.61	.7513	.9203	.8170	1.1347	.9920	.9980	.9980	1.0006	.9992
.700	2.174E+08	.9778	1.4432	272.81	.7194	.9087	.7922	1.0938	.9917	.9979	.9978	1.0008	.9994
.750	2.267E+08	.9777	1.4426	270.93	.6871	.8967	.7668	1.0620	.9913	.9978	.9975	1.0010	.9996
.800	2.350E+08	.9777	1.4420	268.96	.6546	.8842	.7409	1.0380	.9909	.9978	.9973	1.0012	.9998
.850	2.423E+08	.9777	1.4413	266.91	.6221	.8712	.7147	1.0205	.9905	.9978	.9971	1.0015	.9999
.900	2.486E+08	.9777	1.4406	264.80	.5900	.8579	.6883	1.0088	.9902	.9978	.9969	1.0017	1.0000
.950	2.541E+08	.9777	1.4399	262.63	.5583	.8443	.6618	1.0022	.9898	.9979	.9967	1.0020	1.0000
1.000	2.586E+08	.9777	1.4392	260.40	.5273	.8304	.6354	1.0000	.9895	.9981	.9965	1.0024	1.0000
1.050	2.622E+08	.9777	1.4385	258.12	.4970	.8163	.6093	1.0020	.9892	.9982	.9963	1.0027	1.0000
1.100	2.651E+08	.9778	1.4378	255.80	.4676	.8020	.5835	1.0079	.9889	.9985	.9961	1.0030	1.0000
1.150	2.672E+08	.9779	1.4371	253.45	.4393	.7876	.5580	1.0173	.9887	.9987	.9959	1.0034	.9999
1.200	2.685E+08	.9780	1.4364	251.06	.4120	.7731	.5331	1.0302	.9884	.9990	.9958	1.0037	.9998
1.250	2.691E+08	.9781	1.4356	248.65	.3858	.7586	.5088	1.0464	.9882	.9993	.9956	1.0041	.9997
1.300	2.692E+08	.9782	1.4349	246.22	.3608	.7440	.4850	1.0658	.9880	.9996	.9955	1.0044	.9995
1.350	2.686E+08	.9783	1.4342	243.77	.3370	.7294	.4620	1.0884	.9878	.9999	.9953	1.0048	.9994
1.400	2.675E+08	.9785	1.4335	241.30	.3143	.7149	.4397	1.1141	.9876	1.0003	.9952	1.0051	.9992
1.450	2.660E+08	.9786	1.4328	238.83	.2929	.7005	.4181	1.1429	.9874	1.0006	.9950	1.0054	.9991
1.500	2.639E+08	.9788	1.4321	236.36	.2727	.6861	.3973	1.1749	.9873	1.0010	.9949	1.0057	.9989
1.550	2.615E+08	.9790	1.4314	233.88	.2536	.6719	.3772	1.2100	.9872	1.0013	.9948	1.0060	.9987
1.600	2.587E+08	.9792	1.4307	231.41	.2357	.6578	.3580	1.2485	.9871	1.0016	.9946	1.0063	.9986
1.650	2.556E+08	.9794	1.4300	228.94	.2188	.6439	.3395	1.2902	.9870	1.0020	.9945	1.0065	.9984
1.700	2.522E+08	.9796	1.4294	226.48	.2031	.6302	.3219	1.3353	.9869	1.0023	.9944	1.0067	.9983
1.750	2.486E+08	.9798	1.4288	224.03	.1883	.6166	.3050	1.3839	.9868	1.0026	.9943	1.0069	.9982
1.800	2.448E+08	.9800	1.4281	221.59	.1745	.6033	.2889	1.4362	.9868	1.0028	.9942	1.0071	.9981
1.850	2.408E+08	.9802	1.4275	219.17	.1617	.5901	.2735	1.4921	.9867	1.0031	.9940	1.0072	.9980
1.900	2.366E+08	.9805	1.4270	216.76	.1497	.5772	.2589	1.5519	.9867	1.0033	.9939	1.0074	.9979
1.950	2.323E+08	.9807	1.4264	214.37	.1386	.5645	.2450	1.6157	.9867	1.0035	.9938	1.0075	.9978
2.000	2.279E+08	.9809	1.4258	212.00	.1283	.5520	.2318	1.6837	.9867	1.0037	.9937	1.0075	.9978

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

I. TT = 200 K PT = 15 ATM DT = 26.454 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9679	1.4735	286.37	1.0000	1.0000	1.0000	I	.9934	1.0000	1.0000	1.0000	I
.050	2.818E+07	.9679	1.4735	286.29	.9983	.9995	.9988	11.5300	.9934	1.0000	1.0000	1.0001	.9947
.100	5.617E+07	.9679	1.4734	286.04	.9929	.9979	.9950	5.7918	.9932	.9999	.9999	1.0000	.9948
.150	8.382E+07	.9678	1.4732	285.63	.9842	.9953	.9889	3.8908	.9931	.9997	.9998	1.0000	.9950
.200	1.109E+08	.9677	1.4729	285.06	.9721	.9917	.9804	2.9493	.9928	.9996	.9996	1.0001	.9952
.250	1.374E+08	.9677	1.4726	284.34	.9568	.9871	.9696	2.3918	.9925	.9993	.9995	1.0001	.9955
.300	1.630E+08	.9675	1.4722	283.46	.9386	.9816	.9566	2.0265	.9921	.9991	.9992	1.0002	.9958
.350	1.876E+08	.9674	1.4717	282.44	.9175	.9751	.9414	1.7714	.9917	.9986	.9990	1.0001	.9963
.400	2.112E+08	.9673	1.4711	281.27	.8941	.9677	.9245	1.5849	.9912	.9983	.9987	1.0002	.9967
.450	2.336E+08	.9672	1.4705	279.97	.8685	.9595	.9058	1.4445	.9907	.9979	.9984	1.0003	.9971
.500	2.546E+08	.9671	1.4699	278.55	.8410	.9505	.8855	1.3366	.9901	.9976	.9981	1.0004	.9976
.550	2.744E+08	.9669	1.4692	277.01	.8120	.9408	.8639	1.2524	.9896	.9973	.9977	1.0006	.9980
.600	2.927E+08	.9668	1.4684	275.35	.7817	.9304	.8411	1.1863	.9890	.9970	.9974	1.0008	.9984
.650	3.095E+08	.9667	1.4676	273.60	.7504	.9194	.8173	1.1342	.9884	.9968	.9970	1.0010	.9987
.700	3.249E+08	.9666	1.4667	271.74	.7185	.9077	.7926	1.0933	.9878	.9966	.9967	1.0013	.9991
.750	3.389E+08	.9665	1.4658	269.80	.6862	.8956	.7673	1.0617	.9872	.9965	.9964	1.0016	.9993
.800	3.513E+08	.9664	1.4648	267.78	.6537	.8830	.7415	1.0379	.9866	.9964	.9960	1.0019	.9996
.850	3.623E+08	.9664	1.4638	265.69	.6213	.8700	.7153	1.0205	.9860	.9964	.9957	1.0023	.9998
.900	3.719E+08	.9663	1.4628	263.53	.5893	.8566	.6890	1.0088	.9854	.9965	.9954	1.0028	1.0000
.950	3.801E+08	.9663	1.4618	261.32	.5577	.8430	.6626	1.0022	.9849	.9967	.9951	1.0033	1.0000
1.000	3.870E+08	.9663	1.4607	259.05	.5267	.8290	.6364	1.0001	.9844	.9969	.9948	1.0037	1.0001
1.050	3.926E+08	.9664	1.4597	256.74	.4965	.8149	.6103	1.0021	.9839	.9972	.9945	1.0043	1.0000
1.100	3.970E+08	.9664	1.4586	254.39	.4672	.8006	.5845	1.0079	.9834	.9975	.9943	1.0048	1.0000
1.150	4.002E+08	.9665	1.4575	252.00	.4390	.7861	.5592	1.0173	.9830	.9979	.9940	1.0054	.9998
1.200	4.024E+08	.9666	1.4564	249.59	.4117	.7716	.5343	1.0301	.9826	.9983	.9938	1.0059	.9997
1.250	4.035E+08	.9667	1.4553	247.16	.3856	.7570	.5100	1.0462	.9822	.9988	.9936	1.0065	.9995
1.300	4.037E+08	.9669	1.4542	244.71	.3607	.7424	.4863	1.0655	.9819	.9993	.9934	1.0070	.9993
1.350	4.030E+08	.9671	1.4531	242.25	.3370	.7279	.4633	1.0880	.9816	.9998	.9932	1.0076	.9991
1.400	4.016E+08	.9673	1.4520	239.78	.3144	.7134	.4410	1.1136	.9813	1.0004	.9930	1.0081	.9988
1.450	3.993E+08	.9675	1.4509	237.30	.2930	.6989	.4194	1.1423	.9811	1.0009	.9928	1.0086	.9986
1.500	3.965E+08	.9677	1.4499	234.82	.2728	.6846	.3986	1.1741	.9809	1.0015	.9926	1.0091	.9983
1.550	3.930E+08	.9680	1.4488	232.34	.2538	.6703	.3786	1.2091	.9807	1.0020	.9924	1.0096	.9980
1.600	3.889E+08	.9683	1.4478	229.87	.2359	.6563	.3593	1.2474	.9805	1.0026	.9922	1.0100	.9978
1.650	3.844E+08	.9686	1.4467	227.41	.2191	.6423	.3408	1.2890	.9804	1.0031	.9921	1.0104	.9975
1.700	3.795E+08	.9689	1.4458	224.95	.2033	.6286	.3232	1.3340	.9802	1.0036	.9919	1.0108	.9973
1.750	3.742E+08	.9692	1.4448	222.51	.1886	.6150	.3062	1.3824	.9801	1.0040	.9917	1.0111	.9971
1.800	3.685E+08	.9695	1.4438	220.08	.1748	.6017	.2901	1.4345	.9801	1.0045	.9916	1.0113	.9969
1.850	3.626E+08	.9698	1.4429	217.67	.1620	.5886	.2747	1.4903	.9800	1.0048	.9914	1.0116	.9968
1.900	3.564E+08	.9702	1.4420	215.28	.1500	.5756	.2600	1.5499	.9799	1.0052	.9912	1.0118	.9966
1.950	3.500E+08	.9705	1.4411	212.90	.1389	.5630	.2461	1.6136	.9799	1.0055	.9910	1.0119	.9965
2.000	3.435E+08	.9709	1.4403	210.55	.1286	.5505	.2328	1.6814	.9799	1.0058	.9909	1.0120	.9965

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

I. TT = 200 K PT = 20 ATM DT = 35.653 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9576	1.5005	285.99	1.0000	1.0000	1.0000	I	.9921	1.0000	1.0000	1.0000	I
.050	3.743E+07	.9576	1.5004	285.90	.9983	.9995	.9988	11.5049	.9920	1.0000	1.0000	1.0001	.9925
.100	7.461E+07	.9575	1.5003	285.64	.9929	.9979	.9951	5.7795	.9919	.9998	.9999	1.0000	.9927
.150	1.113E+08	.9574	1.5000	285.21	.9841	.9953	.9889	3.8828	.9916	.9997	.9997	1.0001	.9929
.200	1.474E+08	.9573	1.4997	284.62	.9719	.9916	.9804	2.9435	.9913	.9994	.9995	1.0001	.9932
.250	1.825E+08	.9572	1.4992	283.85	.9564	.9869	.9695	2.3878	.9908	.9989	.9993	1.0001	.9938
.300	2.165E+08	.9570	1.4987	282.93	.9380	.9813	.9565	2.0234	.9903	.9985	.9990	1.0001	.9943
.350	2.492E+08	.9568	1.4981	281.86	.9169	.9747	.9415	1.7687	.9897	.9980	.9986	1.0002	.9948
.400	2.805E+08	.9566	1.4974	280.64	.8934	.9673	.9245	1.5828	.9890	.9975	.9982	1.0003	.9954
.450	3.103E+08	.9564	1.4966	279.28	.8677	.9590	.9059	1.4428	.9882	.9971	.9978	1.0004	.9960
.500	3.383E+08	.9562	1.4957	277.80	.8401	.9499	.8857	1.3352	.9875	.9966	.9974	1.0006	.9966
.550	3.645E+08	.9560	1.4948	276.19	.8110	.9401	.8642	1.2514	.9867	.9962	.9970	1.0009	.9972
.600	3.889E+08	.9558	1.4938	274.48	.7807	.9296	.8414	1.1855	.9858	.9958	.9965	1.0011	.9977
.650	4.113E+08	.9556	1.4927	272.66	.7494	.9185	.8177	1.1336	.9850	.9955	.9961	1.0015	.9982
.700	4.319E+08	.9554	1.4916	270.74	.7175	.9068	.7931	1.0929	.9841	.9952	.9956	1.0019	.9987
.750	4.504E+08	.9552	1.4904	268.74	.6852	.8946	.7678	1.0614	.9833	.9951	.9952	1.0024	.9991
.800	4.671E+08	.9551	1.4891	266.66	.6528	.8819	.7421	1.0376	.9824	.9950	.9948	1.0029	.9994
.850	4.818E+08	.9550	1.4878	264.51	.6204	.8688	.7161	1.0203	.9816	.9951	.9943	1.0035	.9997
.900	4.947E+08	.9549	1.4865	262.30	.5884	.8554	.6898	1.0087	.9808	.9952	.9940	1.0041	.9999
.950	5.057E+08	.9548	1.4851	260.03	.5569	.8417	.6636	1.0021	.9801	.9954	.9936	1.0047	1.0000
1.000	5.150E+08	.9548	1.4837	257.72	.5260	.8277	.6374	1.0000	.9794	.9957	.9932	1.0055	1.0000
1.050	5.227E+08	.9548	1.4822	255.37	.4959	.8135	.6114	1.0020	.9787	.9961	.9929	1.0062	1.0000
1.100	5.287E+08	.9548	1.4808	252.98	.4668	.7991	.5857	1.0078	.9780	.9966	.9925	1.0070	.9999
1.150	5.331E+08	.9549	1.4793	250.57	.4386	.7847	.5605	1.0171	.9774	.9972	.9922	1.0078	.9997
1.200	5.362E+08	.9550	1.4778	248.13	.4115	.7701	.5357	1.0299	.9769	.9978	.9919	1.0086	.9995
1.250	5.379E+08	.9552	1.4764	245.67	.3855	.7556	.5114	1.0459	.9763	.9984	.9917	1.0094	.9992
1.300	5.384E+08	.9553	1.4749	243.20	.3606	.7410	.4878	1.0651	.9759	.9991	.9914	1.0101	.9989
1.350	5.377E+08	.9556	1.4734	240.72	.3369	.7264	.4648	1.0875	.9754	.9999	.9912	1.0109	.9985
1.400	5.359E+08	.9558	1.4719	238.24	.3144	.7119	.4425	1.1129	.9751	1.0007	.9909	1.0117	.9982
1.450	5.332E+08	.9561	1.4705	235.75	.2931	.6974	.4210	1.1415	.9747	1.0014	.9907	1.0124	.9978
1.500	5.295E+08	.9564	1.4690	233.27	.2730	.6831	.4002	1.1732	.9744	1.0022	.9905	1.0131	.9975
1.550	5.250E+08	.9567	1.4676	230.79	.2540	.6689	.3801	1.2080	.9741	1.0030	.9902	1.0138	.9971
1.600	5.198E+08	.9570	1.4662	228.32	.2361	.6548	.3609	1.2461	.9739	1.0037	.9900	1.0144	.9967
1.650	5.140E+08	.9574	1.4648	225.86	.2194	.6409	.3424	1.2875	.9737	1.0045	.9898	1.0150	.9964
1.700	5.075E+08	.9578	1.4634	223.41	.2036	.6271	.3246	1.3326	.9735	1.0050	.9896	1.0153	.9963
1.750	5.005E+08	.9582	1.4621	220.97	.1889	.6136	.3076	1.3809	.9734	1.0056	.9894	1.0157	.9960
1.800	4.931E+08	.9586	1.4608	218.55	.1751	.6002	.2914	1.4328	.9733	1.0062	.9892	1.0161	.9957
1.850	4.854E+08	.9591	1.4595	216.15	.1623	.5871	.2760	1.4884	.9732	1.0068	.9889	1.0165	.9955
1.900	4.773E+08	.9595	1.4583	213.77	.1504	.5742	.2613	1.5477	.9731	1.0073	.9887	1.0167	.9953
1.950	4.689E+08	.9600	1.4570	211.41	.1392	.5615	.2473	1.6112	.9730	1.0078	.9885	1.0169	.9951
2.000	4.603E+08	.9604	1.4559	209.07	.1289	.5491	.2340	1.6788	.9730	1.0082	.9883	1.0171	.9950

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

I. TT = 200 K PT = 25 ATM DT = 45.042 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9475	1.5286	285.77	1.0000	1.0000	1.0000	I	.9913	1.0000	1.0000	1.0000	I
.050	4.664E+07	.9474	1.5286	285.68	.9983	.9995	.9988	11.4748	.9912	1.0000	1.0000	1.0001	.9899
.100	9.297E+07	.9474	1.5284	285.40	.9928	.9979	.9951	5.7647	.9910	.9998	.9998	1.0001	.9902
.150	1.387E+08	.9472	1.5281	284.95	.9840	.9952	.9890	3.8731	.9907	.9995	.9997	1.0001	.9905
.200	1.836E+08	.9471	1.5277	284.31	.9716	.9915	.9803	2.9369	.9902	.9990	.9994	1.0000	.9910
.250	2.274E+08	.9469	1.5272	283.51	.9561	.9867	.9695	2.3825	.9896	.9985	.9991	1.0001	.9916
.300	2.698E+08	.9466	1.5266	282.54	.9376	.9810	.9565	2.0192	.9889	.9980	.9987	1.0002	.9922
.350	3.105E+08	.9463	1.5258	281.41	.9164	.9744	.9415	1.7654	.9881	.9974	.9983	1.0003	.9929
.400	3.495E+08	.9461	1.5250	280.13	.8927	.9669	.9247	1.5801	.9872	.9967	.9978	1.0004	.9937
.450	3.866E+08	.9457	1.5240	278.71	.8669	.9585	.9061	1.4407	.9862	.9961	.9973	1.0006	.9945
.500	4.215E+08	.9454	1.5230	277.15	.8392	.9493	.8859	1.3335	.9852	.9955	.9968	1.0009	.9953
.550	4.542E+08	.9451	1.5218	275.48	.8100	.9394	.8644	1.2500	.9841	.9949	.9962	1.0012	.9960
.600	4.846E+08	.9448	1.5206	273.69	.7796	.9288	.8418	1.1844	.9830	.9944	.9957	1.0016	.9968
.650	5.126E+08	.9445	1.5193	271.79	.7483	.9176	.8181	1.1327	.9819	.9940	.9951	1.0020	.9974
.700	5.383E+08	.9442	1.5179	269.81	.7164	.9058	.7936	1.0922	.9807	.9937	.9946	1.0026	.9981
.750	5.614E+08	.9439	1.5164	267.74	.6840	.8935	.7683	1.0611	.9796	.9933	.9940	1.0030	.9988
.800	5.822E+08	.9437	1.5148	265.59	.6516	.8808	.7427	1.0374	.9785	.9932	.9935	1.0037	.9992
.850	6.007E+08	.9435	1.5132	263.38	.6193	.8677	.7168	1.0203	.9774	.9933	.9930	1.0044	.9996
.900	6.169E+08	.9433	1.5116	261.11	.5874	.8542	.6907	1.0087	.9764	.9934	.9925	1.0052	.9998
.950	6.308E+08	.9432	1.5099	258.79	.5560	.8404	.6645	1.0021	.9754	.9937	.9921	1.0061	1.0000
1.000	6.426E+08	.9431	1.5081	256.43	.5252	.8264	.6384	1.0000	.9744	.9941	.9917	1.0071	1.0000
1.050	6.522E+08	.9431	1.5063	254.03	.4952	.8122	.6126	1.0020	.9735	.9946	.9913	1.0080	1.0000
1.100	6.599E+08	.9431	1.5045	251.60	.4661	.7978	.5870	1.0078	.9727	.9952	.9909	1.0091	.9998
1.150	6.657E+08	.9431	1.5027	249.15	.4381	.7833	.5618	1.0171	.9719	.9960	.9905	1.0101	.9996
1.200	6.698E+08	.9432	1.5008	246.68	.4111	.7688	.5371	1.0298	.9712	.9968	.9902	1.0112	.9993
1.250	6.721E+08	.9434	1.4990	244.20	.3852	.7542	.5129	1.0457	.9705	.9976	.9899	1.0122	.9990
1.300	6.729E+08	.9436	1.4971	241.71	.3604	.7396	.4893	1.0648	.9699	.9986	.9896	1.0133	.9986
1.350	6.723E+08	.9438	1.4952	239.21	.3368	.7250	.4664	1.0870	.9693	.9995	.9893	1.0143	.9982
1.400	6.703E+08	.9441	1.4933	236.71	.3144	.7105	.4441	1.1123	.9688	1.0006	.9890	1.0153	.9977
1.450	6.671E+08	.9444	1.4915	234.21	.2932	.6961	.4226	1.1407	.9683	1.0016	.9887	1.0163	.9972
1.500	6.628E+08	.9447	1.4896	231.72	.2731	.6817	.4018	1.1723	.9679	1.0026	.9885	1.0172	.9967
1.550	6.575E+08	.9451	1.4878	229.23	.2542	.6675	.3818	1.2070	.9676	1.0036	.9882	1.0181	.9962
1.600	6.512E+08	.9455	1.4860	226.76	.2364	.6534	.3625	1.2449	.9672	1.0046	.9880	1.0189	.9957
1.650	6.441E+08	.9459	1.4842	224.30	.2196	.6395	.3440	1.2861	.9670	1.0056	.9877	1.0197	.9953
1.700	6.363E+08	.9464	1.4825	221.85	.2039	.6258	.3262	1.3307	.9667	1.0065	.9875	1.0204	.9949
1.750	6.278E+08	.9469	1.4808	219.42	.1892	.6123	.3092	1.3788	.9665	1.0073	.9872	1.0210	.9945
1.800	6.187E+08	.9474	1.4791	217.01	.1755	.5989	.2930	1.4305	.9664	1.0082	.9870	1.0215	.9941
1.850	6.092E+08	.9479	1.4775	214.62	.1626	.5858	.2775	1.4859	.9663	1.0089	.9867	1.0220	.9938
1.900	5.992E+08	.9485	1.4759	212.25	.1507	.5729	.2627	1.5452	.9662	1.0096	.9865	1.0223	.9935
1.950	5.888E+08	.9490	1.4743	209.90	.1395	.5602	.2487	1.6084	.9661	1.0102	.9862	1.0226	.9933
2.000	5.781E+08	.9496	1.4728	207.57	.1292	.5478	.2353	1.6759	.9660	1.0107	.9859	1.0228	.9932

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

I. TT = 200 K PT = 30 ATM DT = 54.619 KGM/M3 CONCLUDED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9376	1.5580	285.71	1.0000	1.0000	1.0000	I-	.9911	1.0000	1.0000	1.0000	I
.050	5.582E+07	.9375	1.5580	285.61	.9983	.9995	.9989	11.4432	.9910	1.0000	1.0000	1.0001	.9872
.100	1.113E+08	.9374	1.5578	285.32	.9928	.9978	.9951	5.7493	.9907	.9997	.9998	1.0001	.9875
.150	1.660E+08	.9373	1.5575	284.84	.9838	.9951	.9890	3.8630	.9903	.9994	.9996	1.0002	.9879
.200	2.197E+08	.9371	1.5570	284.17	.9713	.9913	.9803	2.9297	.9897	.9988	.9993	1.0001	.9886
.250	2.721E+08	.9368	1.5564	283.31	.9557	.9866	.9695	2.3770	.9889	.9981	.9989	1.0001	.9893
.300	3.228E+08	.9364	1.5557	282.29	.9371	.9808	.9566	2.0149	.9880	.9974	.9984	1.0002	.9901
.350	3.716E+08	.9361	1.5548	281.09	.9157	.9741	.9416	1.7620	.9870	.9967	.9979	1.0004	.9910
.400	4.183E+08	.9357	1.5539	279.75	.8919	.9664	.9248	1.5774	.9858	.9959	.9974	1.0006	.9920
.450	4.626E+08	.9352	1.5528	278.25	.8660	.9580	.9062	1.4385	.9846	.9951	.9968	1.0008	.9930
.500	5.043E+08	.9348	1.5516	276.62	.8381	.9487	.8860	1.3320	.9833	.9941	.9961	1.0010	.9941
.550	5.434E+08	.9343	1.5502	274.86	.8088	.9387	.8646	1.2488	.9819	.9934	.9955	1.0014	.9951
.600	5.798E+08	.9339	1.5488	272.99	.7783	.9280	.8420	1.1835	.9805	.9927	.9948	1.0018	.9961
.650	6.134E+08	.9334	1.5473	271.02	.7469	.9167	.8184	1.1322	.9791	.9922	.9942	1.0024	.9970
.700	6.441E+08	.9330	1.5457	268.96	.7150	.9049	.7940	1.0920	.9776	.9917	.9935	1.0030	.9978
.750	6.719E+08	.9327	1.5439	266.81	.6827	.8925	.7690	1.0608	.9762	.9914	.9929	1.0038	.9985
.800	6.970E+08	.9323	1.5421	264.59	.6504	.8797	.7435	1.0373	.9748	.9913	.9923	1.0047	.9990
.850	7.192E+08	.9320	1.5403	262.31	.6182	.8665	.7177	1.0202	.9735	.9914	.9917	1.0056	.9995
.900	7.387E+08	.9317	1.5383	259.98	.5863	.8530	.6917	1.0087	.9721	.9916	.9912	1.0067	.9998
.950	7.555E+08	.9315	1.5363	257.60	.5550	.8392	.6656	1.0021	.9709	.9919	.9907	1.0078	1.0000
1.000	7.698E+08	.9313	1.5342	255.18	.5243	.8252	.6397	1.0001	.9697	.9924	.9902	1.0090	1.0001
1.050	7.816E+08	.9312	1.5321	252.73	.4945	.8109	.6139	1.0020	.9685	.9931	.9897	1.0102	1.0000
1.100	7.910E+08	.9312	1.5299	250.25	.4655	.7966	.5884	1.0077	.9675	.9939	.9893	1.0115	.9998
1.150	7.982E+08	.9312	1.5277	247.76	.4376	.7821	.5634	1.0170	.9665	.9948	.9889	1.0129	.9996
1.200	8.033E+08	.9312	1.5255	245.25	.4107	.7675	.5387	1.0296	.9655	.9958	.9885	1.0142	.9992
1.250	8.064E+08	.9314	1.5233	242.74	.3849	.7529	.5146	1.0454	.9647	.9969	.9882	1.0156	.9987
1.300	8.077E+08	.9315	1.5210	240.22	.3603	.7383	.4911	1.0644	.9639	.9981	.9879	1.0169	.9982
1.350	8.072E+08	.9317	1.5187	237.70	.3368	.7238	.4682	1.0865	.9632	.9993	.9876	1.0182	.9977
1.400	8.051E+08	.9320	1.5165	235.18	.3145	.7093	.4460	1.1116	.9625	1.0006	.9873	1.0195	.9971
1.450	8.016E+08	.9324	1.5142	232.67	.2933	.6948	.4245	1.1399	.9619	1.0019	.9870	1.0208	.9965
1.500	7.966E+08	.9327	1.5120	230.16	.2733	.6805	.4037	1.1712	.9614	1.0032	.9867	1.0220	.9958
1.550	7.905E+08	.9331	1.5097	227.67	.2544	.6663	.3836	1.2057	.9610	1.0044	.9864	1.0231	.9952
1.600	7.833E+08	.9336	1.5075	225.20	.2366	.6522	.3644	1.2434	.9606	1.0057	.9862	1.0242	.9946
1.650	7.750E+08	.9341	1.5054	222.73	.2199	.6383	.3458	1.2844	.9602	1.0069	.9859	1.0251	.9940
1.700	7.658E+08	.9346	1.5032	220.29	.2043	.6246	.3280	1.3288	.9599	1.0081	.9856	1.0260	.9934
1.750	7.559E+08	.9352	1.5011	217.86	.1896	.6111	.3110	1.3766	.9597	1.0092	.9853	1.0268	.9929
1.800	7.452E+08	.9358	1.4990	215.46	.1758	.5978	.2947	1.4281	.9595	1.0102	.9851	1.0275	.9925
1.850	7.339E+08	.9364	1.4970	213.07	.1630	.5846	.2792	1.4833	.9593	1.0112	.9848	1.0281	.9921
1.900	7.221E+08	.9371	1.4950	210.71	.1511	.5717	.2644	1.5423	.9592	1.0121	.9845	1.0286	.9917
1.950	7.098E+08	.9377	1.4931	208.37	.1399	.5591	.2502	1.6054	.9591	1.0129	.9842	1.0290	.9914
2.000	6.972E+08	.9384	1.4912	206.06	.1296	.5466	.2368	1.6726	.9590	1.0136	.9839	1.0293	.9912

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

J. TT = 250 K PT = 1 ATM DT = 1.367 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9992	1.4028	322.37	1.0000	1.0000	1.0000	1	1.0002	1.0000	1.0000	1.0000	1
.050	1.414E+06	.9992	1.4028	322.29	.9982	.9995	.9987	11.5881	1.0002	1.0000	1.0000	1.0000	.9997
.100	2.820E+06	.9992	1.4028	322.04	.9930	.9980	.9950	5.8201	1.0002	1.0000	1.0000	1.0000	.9997
.150	4.206E+06	.9992	1.4028	321.64	.9844	.9955	.9888	3.9092	1.0002	1.0000	1.0000	1.0000	.9997
.200	5.566E+06	.9992	1.4028	321.08	.9725	.9920	.9803	2.9627	1.0002	1.0000	1.0000	1.0000	.9997
.250	6.891E+06	.9992	1.4028	320.36	.9574	.9876	.9694	2.4021	1.0002	1.0000	1.0000	1.0000	.9997
.300	8.172E+06	.9992	1.4028	319.48	.9394	.9823	.9564	2.0346	1.0001	.9999	1.0000	1.0000	.9998
.350	9.403E+06	.9992	1.4027	318.46	.9187	.9760	.9413	1.7776	1.0001	.9999	.9999	1.0000	.9998
.400	1.058E+07	.9992	1.4027	317.29	.8955	.9689	.9243	1.5898	1.0001	.9999	.9999	1.0000	.9998
.450	1.169E+07	.9991	1.4027	315.99	.8702	.9610	.9055	1.4484	1.0001	.9999	.9999	1.0000	.9998
.500	1.273E+07	.9991	1.4027	314.54	.8429	.9523	.8852	1.3397	1.0000	.9998	.9999	1.0000	.9999
.550	1.371E+07	.9991	1.4026	312.97	.8140	.9428	.8634	1.2548	1.0000	.9998	.9999	1.0000	.9999
.600	1.461E+07	.9991	1.4026	311.28	.7838	.9327	.8405	1.1881	1.0000	.9998	.9998	1.0000	.9999
.650	1.543E+07	.9991	1.4026	309.47	.7527	.9219	.8165	1.1355	.9999	.9998	.9998	1.0001	.9999
.700	1.618E+07	.9991	1.4025	307.55	.7208	.9106	.7916	1.0943	.9999	.9998	.9998	1.0001	.9999
.750	1.685E+07	.9991	1.4025	305.53	.6884	.8987	.7661	1.0624	.9999	.9997	.9998	1.0001	1.0000
.800	1.745E+07	.9991	1.4025	303.41	.6558	.8863	.7401	1.0382	.9998	.9997	.9998	1.0001	1.0000
.850	1.797E+07	.9990	1.4024	301.21	.6233	.8735	.7137	1.0207	.9998	.9997	.9997	1.0001	1.0000
.900	1.842E+07	.9990	1.4024	298.92	.5911	.8604	.6872	1.0089	.9998	.9997	.9997	1.0002	1.0000
.950	1.879E+07	.9990	1.4023	296.56	.5593	.8469	.6606	1.0021	.9997	.9997	.9997	1.0002	1.0000
1.000	1.910E+07	.9990	1.4023	294.13	.5281	.8331	.6341	1.0000	.9997	.9997	.9997	1.0002	1.0000
1.050	1.934E+07	.9990	1.4023	291.64	.4977	.8191	.6078	1.0020	.9997	.9997	.9997	1.0003	1.0000
1.100	1.952E+07	.9990	1.4022	289.09	.4682	.8049	.5819	1.0079	.9996	.9997	.9997	1.0003	1.0000
1.150	1.964E+07	.9990	1.4022	286.50	.4397	.7905	.5563	1.0174	.9996	.9998	.9996	1.0003	1.0000
1.200	1.971E+07	.9990	1.4021	283.87	.4123	.7761	.5313	1.0304	.9996	.9998	.9996	1.0004	1.0000
1.250	1.972E+07	.9990	1.4021	281.20	.3860	.7616	.5069	1.0467	.9996	.9998	.9996	1.0004	1.0000
1.300	1.969E+07	.9990	1.4020	278.50	.3609	.7471	.4831	1.0662	.9995	.9998	.9996	1.0004	.9999
1.350	1.962E+07	.9990	1.4020	275.78	.3369	.7326	.4600	1.0890	.9995	.9999	.9996	1.0005	.9999
1.400	1.951E+07	.9990	1.4019	273.03	.3142	.7181	.4377	1.1148	.9995	.9999	.9996	1.0005	.9999
1.450	1.936E+07	.9990	1.4019	270.27	.2927	.7037	.4160	1.1438	.9995	.9999	.9996	1.0006	.9999
1.500	1.918E+07	.9990	1.4019	267.51	.2724	.6894	.3952	1.1760	.9994	1.0000	.9996	1.0006	.9999
1.550	1.897E+07	.9990	1.4018	264.73	.2533	.6751	.3752	1.2114	.9994	1.0000	.9996	1.0006	.9998
1.600	1.874E+07	.9990	1.4018	261.96	.2353	.6611	.3560	1.2500	.9994	1.0000	.9995	1.0007	.9998
1.650	1.849E+07	.9990	1.4017	259.18	.2184	.6472	.3376	1.2920	.9994	1.0001	.9995	1.0007	.9998
1.700	1.821E+07	.9990	1.4017	256.41	.2026	.6334	.3199	1.3373	.9994	1.0001	.9995	1.0008	.9998
1.750	1.792E+07	.9990	1.4017	253.65	.1878	.6199	.3031	1.3862	.9994	1.0001	.9995	1.0008	.9998
1.800	1.762E+07	.9990	1.4016	250.90	.1741	.6065	.2871	1.4386	.9994	1.0002	.9995	1.0008	.9997
1.850	1.731E+07	.9990	1.4016	248.17	.1612	.5934	.2718	1.4948	.9994	1.0002	.9995	1.0009	.9997
1.900	1.698E+07	.9990	1.4015	245.45	.1493	.5804	.2572	1.5548	.9993	1.0002	.9995	1.0009	.9997
1.950	1.665E+07	.9990	1.4015	242.75	.1382	.5677	.2434	1.6188	.9993	1.0002	.9995	1.0009	.9997
2.000	1.632E+07	.9991	1.4015	240.07	.1278	.5553	.2303	1.6869	.9993	1.0003	.9995	1.0009	.9996

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

J. TT = 250 K PT = 3 ATM DT = 4.107 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9976	1.4082	322.48	1.0000	1.0000	1.0000	I	1.0006	1.0000	1.0000	1.0000	I
.050	4.235E+06	.9976	1.4082	322.40	.9983	.9995	.9988	11.5815	1.0006	1.0000	1.0000	1.0000	.9991
.100	8.442E+06	.9976	1.4082	322.15	.9930	.9980	.9950	5.8168	1.0005	1.0000	1.0000	1.0000	.9991
.150	1.259E+07	.9976	1.4082	321.74	.9844	.9955	.9889	3.9069	1.0005	1.0000	1.0000	1.0001	.9991
.200	1.667E+07	.9976	1.4081	321.17	.9725	.9920	.9804	2.9609	1.0005	1.0000	.9999	1.0001	.9991
.250	2.063E+07	.9976	1.4081	320.44	.9575	.9876	.9696	2.4006	1.0004	1.0000	.9999	1.0002	.9991
.300	2.447E+07	.9975	1.4081	319.55	.9395	.9822	.9566	2.0333	1.0004	1.0000	.9999	1.0002	.9991
.350	2.815E+07	.9975	1.4080	318.52	.9185	.9759	.9413	1.7769	1.0003	.9997	.9998	1.0000	.9994
.400	3.167E+07	.9975	1.4079	317.33	.8953	.9688	.9243	1.5893	1.0002	.9997	.9998	1.0000	.9995
.450	3.500E+07	.9974	1.4079	316.01	.8699	.9608	.9056	1.4480	1.0001	.9996	.9997	1.0000	.9995
.500	3.813E+07	.9974	1.4078	314.55	.8426	.9521	.8852	1.3393	1.0000	.9995	.9997	1.0001	.9996
.550	4.105E+07	.9974	1.4077	312.96	.8137	.9426	.8635	1.2546	.9999	.9995	.9996	1.0001	.9997
.600	4.375E+07	.9973	1.4076	311.24	.7836	.9325	.8406	1.1879	.9998	.9994	.9996	1.0001	.9997
.650	4.622E+07	.9973	1.4075	309.41	.7524	.9217	.8166	1.1354	.9997	.9994	.9995	1.0002	.9998
.700	4.847E+07	.9972	1.4074	307.47	.7204	.9103	.7918	1.0942	.9996	.9993	.9995	1.0002	.9998
.750	5.048E+07	.9972	1.4073	305.43	.6881	.8984	.7662	1.0623	.9995	.9993	.9994	1.0003	.9999
.800	5.227E+07	.9972	1.4072	303.29	.6555	.8860	.7402	1.0382	.9994	.9992	.9994	1.0003	.9999
.850	5.383E+07	.9971	1.4071	301.07	.6230	.8732	.7139	1.0206	.9993	.9992	.9993	1.0004	1.0000
.900	5.517E+07	.9971	1.4069	298.76	.5908	.8600	.6874	1.0089	.9992	.9992	.9993	1.0005	1.0000
.950	5.630E+07	.9971	1.4068	296.38	.5590	.8464	.6608	1.0022	.9991	.9992	.9992	1.0006	1.0000
1.000	5.723E+07	.9970	1.4067	293.94	.5279	.8327	.6344	1.0000	.9990	.9993	.9992	1.0006	1.0000
1.050	5.796E+07	.9970	1.4066	291.43	.4975	.8186	.6081	1.0020	.9989	.9993	.9991	1.0007	1.0000
1.100	5.850E+07	.9970	1.4064	288.87	.4680	.8044	.5822	1.0079	.9989	.9993	.9991	1.0008	1.0000
1.150	5.887E+07	.9970	1.4063	286.27	.4396	.7901	.5567	1.0174	.9988	.9994	.9991	1.0009	1.0000
1.200	5.908E+07	.9970	1.4062	283.62	.4122	.7756	.5317	1.0304	.9987	.9994	.9990	1.0011	.9999
1.250	5.913E+07	.9970	1.4061	280.94	.3859	.7611	.5073	1.0467	.9986	.9995	.9990	1.0012	.9999
1.300	5.905E+07	.9970	1.4059	278.23	.3608	.7466	.4835	1.0662	.9986	.9996	.9990	1.0013	.9999
1.350	5.884E+07	.9969	1.4058	275.50	.3369	.7321	.4604	1.0888	.9985	.9997	.9989	1.0014	.9998
1.400	5.851E+07	.9969	1.4057	272.75	.3142	.7176	.4381	1.1147	.9984	.9997	.9989	1.0015	.9998
1.450	5.807E+07	.9969	1.4055	269.98	.2927	.7032	.4165	1.1436	.9984	.9998	.9989	1.0016	.9997
1.500	5.754E+07	.9970	1.4054	267.21	.2724	.6889	.3957	1.1757	.9983	.9999	.9989	1.0017	.9996
1.550	5.692E+07	.9970	1.4053	264.43	.2533	.6747	.3757	1.2111	.9983	1.0000	.9989	1.0018	.9996
1.600	5.623E+07	.9970	1.4052	261.65	.2353	.6606	.3564	1.2496	.9982	1.0001	.9988	1.0019	.9995
1.650	5.548E+07	.9970	1.4050	258.87	.2184	.6467	.3380	1.2915	.9982	1.0002	.9988	1.0020	.9995
1.700	5.466E+07	.9970	1.4049	256.10	.2027	.6330	.3204	1.3368	.9982	1.0003	.9988	1.0021	.9994
1.750	5.380E+07	.9970	1.4048	253.34	.1879	.6194	.3035	1.3856	.9981	1.0004	.9988	1.0022	.9993
1.800	5.290E+07	.9970	1.4047	250.59	.1741	.6061	.2875	1.4379	.9981	1.0005	.9988	1.0023	.9993
1.850	5.196E+07	.9971	1.4046	247.85	.1613	.5929	.2722	1.4940	.9981	1.0006	.9987	1.0024	.9992
1.900	5.100E+07	.9971	1.4045	245.13	.1493	.5800	.2576	1.5539	.9981	1.0007	.9987	1.0025	.9992
1.950	5.001E+07	.9971	1.4044	242.43	.1382	.5673	.2438	1.6178	.9980	1.0008	.9987	1.0026	.9991
2.000	4.900E+07	.9971	1.4043	239.75	.1279	.5548	.2307	1.6859	.9980	1.0008	.9987	1.0026	.9991

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

J. TT = 250 K PT = 5 ATM DT = 6.855 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9961	1.4137	322.61	1.0000	1.0000	1.0000	I	1.0010	1.0000	1.0000	1.0000	I
.050	7.044E+06	.9961	1.4136	322.53	.9983	.9995	.9988	11.5748	1.0010	1.0000	1.0000	1.0000	.9986
.100	1.404E+07	.9961	1.4136	322.28	.9930	.9980	.9951	5.8134	1.0009	1.0000	1.0000	1.0001	.9985
.150	2.095E+07	.9960	1.4136	321.86	.9844	.9955	.9889	3.9047	1.0009	1.0000	.9999	1.0001	.9985
.200	2.773E+07	.9960	1.4135	321.28	.9725	.9920	.9805	2.9592	1.0008	1.0000	.9999	1.0002	.9985
.250	3.432E+07	.9960	1.4135	320.54	.9572	.9875	.9694	2.4000	1.0007	.9998	.9999	1.0000	.9988
.300	4.070E+07	.9959	1.4134	319.64	.9392	.9821	.9564	2.0329	1.0006	.9997	.9998	1.0000	.9989
.350	4.683E+07	.9959	1.4133	318.58	.9184	.9758	.9413	1.7763	1.0005	.9996	.9997	1.0000	.9990
.400	5.268E+07	.9958	1.4132	317.38	.8951	.9687	.9243	1.5888	1.0004	.9995	.9997	1.0000	.9991
.450	5.822E+07	.9958	1.4131	316.04	.8697	.9607	.9056	1.4476	1.0002	.9993	.9996	1.0001	.9992
.500	6.343E+07	.9957	1.4129	314.56	.8424	.9519	.8853	1.3390	1.0001	.9992	.9995	1.0001	.9993
.550	6.829E+07	.9956	1.4128	312.95	.8135	.9424	.8636	1.2543	.9999	.9991	.9994	1.0001	.9994
.600	7.278E+07	.9956	1.4126	311.21	.7833	.9322	.8406	1.1877	.9997	.9990	.9993	1.0002	.9996
.650	7.690E+07	.9955	1.4125	309.36	.7521	.9214	.8167	1.1353	.9996	.9989	.9992	1.0003	.9997
.700	8.064E+07	.9954	1.4123	307.40	.7201	.9100	.7919	1.0941	.9994	.9989	.9991	1.0003	.9998
.750	8.400E+07	.9954	1.4121	305.34	.6878	.8980	.7664	1.0623	.9992	.9988	.9991	1.0004	.9998
.800	8.698E+07	.9953	1.4119	303.18	.6552	.8856	.7404	1.0382	.9991	.9987	.9990	1.0005	.9999
.850	8.959E+07	.9952	1.4118	300.93	.6227	.8728	.7141	1.0207	.9989	.9987	.9989	1.0007	1.0000
.900	9.183E+07	.9952	1.4116	298.61	.5905	.8596	.6876	1.0089	.9987	.9987	.9988	1.0008	1.0000
.950	9.372E+07	.9951	1.4114	296.21	.5588	.8460	.6611	1.0022	.9986	.9987	.9987	1.0009	1.0000
1.000	9.527E+07	.9951	1.4111	293.75	.5277	.8322	.6346	1.0000	.9984	.9988	.9987	1.0011	1.0000
1.050	9.649E+07	.9950	1.4109	291.23	.4973	.8182	.6084	1.0021	.9982	.9988	.9986	1.0012	1.0000
1.100	9.741E+07	.9950	1.4107	288.65	.4679	.8040	.5825	1.0079	.9981	.9989	.9985	1.0014	1.0000
1.150	9.804E+07	.9950	1.4105	286.03	.4394	.7896	.5571	1.0174	.9980	.9990	.9985	1.0016	1.0000
1.200	9.840E+07	.9949	1.4103	283.38	.4120	.7752	.5321	1.0303	.9978	.9991	.9984	1.0018	.9999
1.250	9.850E+07	.9949	1.4101	280.68	.3858	.7607	.5077	1.0466	.9977	.9992	.9984	1.0019	.9999
1.300	9.837E+07	.9949	1.4099	277.96	.3607	.7462	.4840	1.0661	.9976	.9993	.9983	1.0021	.9998
1.350	9.803E+07	.9949	1.4096	275.22	.3368	.7316	.4609	1.0887	.9975	.9994	.9983	1.0023	.9997
1.400	9.749E+07	.9949	1.4094	272.46	.3141	.7172	.4385	1.1145	.9974	.9996	.9983	1.0025	.9996
1.450	9.678E+07	.9949	1.4092	269.69	.2927	.7027	.4170	1.1434	.9973	.9997	.9982	1.0027	.9995
1.500	9.590E+07	.9949	1.4090	266.91	.2724	.6884	.3961	1.1755	.9972	.9999	.9982	1.0029	.9994
1.550	9.489E+07	.9949	1.4088	264.13	.2533	.6742	.3761	1.2107	.9971	1.0001	.9982	1.0031	.9993
1.600	9.375E+07	.9949	1.4086	261.34	.2353	.6602	.3569	1.2492	.9971	1.0002	.9981	1.0032	.9992
1.650	9.250E+07	.9950	1.4084	258.56	.2185	.6462	.3385	1.2910	.9970	1.0004	.9981	1.0034	.9991
1.700	9.115E+07	.9950	1.4082	255.79	.2027	.6325	.3208	1.3363	.9969	1.0005	.9981	1.0036	.9990
1.750	8.972E+07	.9950	1.4080	253.02	.1880	.6190	.3040	1.3850	.9969	1.0007	.9981	1.0037	.9989
1.800	8.823E+07	.9951	1.4078	250.27	.1742	.6056	.2879	1.4372	.9968	1.0009	.9980	1.0039	.9988
1.850	8.667E+07	.9951	1.4076	247.54	.1614	.5925	.2726	1.4932	.9968	1.0010	.9980	1.0040	.9987
1.900	8.507E+07	.9951	1.4074	244.82	.1494	.5796	.2581	1.5531	.9968	1.0011	.9980	1.0041	.9986
1.950	8.343E+07	.9952	1.4073	242.12	.1383	.5669	.2442	1.6169	.9967	1.0013	.9980	1.0042	.9986
2.000	8.176E+07	.9952	1.4071	239.44	.1280	.5544	.2311	1.6849	.9967	1.0014	.9979	1.0043	.9985

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

J. TT = 250 K PT = 8 ATM DT = 10.993 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9938	1.4219	322.83	1.0000	1.0000	1.0000	I	1.0016	1.0000	1.0000	1.0000	I
.050	1.124E+07	.9938	1.4219	322.74	.9983	.9995	.9988	11.5649	1.0016	1.0000	1.0000	1.0000	.9977
.100	2.241E+07	.9938	1.4218	322.48	.9931	.9980	.9951	5.8084	1.0016	1.0000	1.0000	1.0001	.9977
.150	3.343E+07	.9937	1.4218	322.06	.9844	.9954	.9890	3.9012	1.0015	1.0000	.9999	1.0002	.9976
.200	4.423E+07	.9937	1.4217	321.46	.9723	.9919	.9803	2.9573	1.0014	.9998	.9999	1.0000	.9979
.250	5.476E+07	.9936	1.4216	320.70	.9571	.9874	.9694	2.3980	1.0012	.9996	.9998	1.0000	.9980
.300	6.495E+07	.9935	1.4215	319.78	.9390	.9820	.9564	2.0314	1.0011	.9995	.9997	1.0000	.9982
.350	7.473E+07	.9935	1.4213	318.70	.9181	.9757	.9413	1.7750	1.0009	.9993	.9996	1.0001	.9984
.400	8.407E+07	.9934	1.4212	317.47	.8948	.9685	.9244	1.5878	1.0007	.9991	.9995	1.0001	.9985
.450	9.292E+07	.9933	1.4210	316.10	.8694	.9604	.9057	1.4468	1.0004	.9990	.9993	1.0002	.9987
.500	1.012E+08	.9932	1.4208	314.59	.8420	.9516	.8854	1.3384	1.0002	.9988	.9992	1.0002	.9989
.550	1.090E+08	.9930	1.4205	312.95	.8131	.9421	.8637	1.2538	.9999	.9986	.9991	1.0003	.9991
.600	1.162E+08	.9929	1.4203	311.18	.7828	.9318	.8408	1.1873	.9997	.9985	.9989	1.0004	.9993
.650	1.228E+08	.9928	1.4200	309.29	.7516	.9210	.8169	1.1350	.9994	.9983	.9988	1.0005	.9994
.700	1.287E+08	.9927	1.4198	307.30	.7196	.9095	.7921	1.0939	.9991	.9982	.9987	1.0006	.9996
.750	1.341E+08	.9926	1.4195	305.21	.6873	.8975	.7666	1.0621	.9988	.9981	.9985	1.0008	.9997
.800	1.389E+08	.9925	1.4192	303.02	.6548	.8851	.7407	1.0380	.9985	.9981	.9984	1.0010	.9998
.850	1.431E+08	.9924	1.4189	300.74	.6223	.8722	.7144	1.0206	.9983	.9980	.9983	1.0012	.9999
.900	1.467E+08	.9923	1.4186	298.39	.5901	.8590	.6880	1.0088	.9980	.9980	.9981	1.0014	1.0000
.950	1.497E+08	.9922	1.4182	295.96	.5584	.8454	.6615	1.0021	.9977	.9981	.9980	1.0016	1.0000
1.000	1.522E+08	.9921	1.4179	293.47	.5273	.8316	.6351	1.0000	.9975	.9981	.9979	1.0019	1.0000
1.050	1.542E+08	.9921	1.4176	290.92	.4970	.8175	.6089	1.0020	.9972	.9982	.9978	1.0021	1.0000
1.100	1.557E+08	.9920	1.4172	288.33	.4676	.8033	.5831	1.0079	.9970	.9983	.9977	1.0024	.9999
1.150	1.567E+08	.9919	1.4169	285.69	.4391	.7890	.5577	1.0173	.9968	.9985	.9976	1.0027	.9999
1.200	1.573E+08	.9919	1.4165	283.01	.4118	.7745	.5327	1.0302	.9965	.9986	.9976	1.0030	.9998
1.250	1.575E+08	.9919	1.4162	280.30	.3856	.7600	.5084	1.0465	.9963	.9987	.9975	1.0031	.9998
1.300	1.573E+08	.9918	1.4158	277.57	.3606	.7455	.4846	1.0659	.9962	.9989	.9974	1.0034	.9997
1.350	1.568E+08	.9918	1.4155	274.81	.3367	.7310	.4616	1.0885	.9960	.9991	.9974	1.0038	.9996
1.400	1.559E+08	.9918	1.4152	272.04	.3141	.7165	.4393	1.1142	.9958	.9994	.9973	1.0041	.9994
1.450	1.548E+08	.9918	1.4148	269.26	.2927	.7021	.4177	1.1431	.9957	.9996	.9972	1.0044	.9993
1.500	1.534E+08	.9918	1.4145	266.47	.2724	.6878	.3969	1.1751	.9955	.9999	.9972	1.0046	.9991
1.550	1.519E+08	.9918	1.4141	263.68	.2533	.6736	.3769	1.2102	.9954	1.0001	.9971	1.0049	.9990
1.600	1.501E+08	.9919	1.4138	260.89	.2354	.6595	.3576	1.2486	.9953	1.0004	.9971	1.0052	.9988
1.650	1.481E+08	.9919	1.4135	258.10	.2186	.6456	.3392	1.2904	.9952	1.0006	.9971	1.0055	.9986
1.700	1.460E+08	.9919	1.4132	255.32	.2028	.6319	.3216	1.3355	.9951	1.0009	.9970	1.0057	.9985
1.750	1.437E+08	.9920	1.4129	252.56	.1881	.6183	.3047	1.3840	.9950	1.0011	.9970	1.0060	.9983
1.800	1.413E+08	.9920	1.4126	249.80	.1743	.6050	.2886	1.4362	.9950	1.0014	.9970	1.0062	.9982
1.850	1.388E+08	.9921	1.4123	247.07	.1615	.5918	.2733	1.4921	.9949	1.0016	.9969	1.0064	.9980
1.900	1.363E+08	.9922	1.4120	244.35	.1495	.5789	.2587	1.5518	.9948	1.0019	.9969	1.0066	.9979
1.950	1.337E+08	.9922	1.4117	241.65	.1384	.5663	.2449	1.6155	.9948	1.0021	.9968	1.0068	.9977
2.000	1.310E+08	.9923	1.4114	238.97	.1281	.5538	.2317	1.6833	.9948	1.0023	.9968	1.0070	.9976

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

J. TT = 250 K PT = 10 ATM DT = 13.762 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9923	1.4274	322.99	1.0000	1.0000	1.0000	I	1.0021	1.0000	1.0000	1.0000	I
.050	1.402E+07	.9923	1.4274	322.90	.9983	.9995	.9988	11.5583	1.0021	1.0000	1.0000	1.0000	.9971
.100	2.796E+07	.9923	1.4274	322.64	.9931	.9980	.9951	5.8051	1.0021	1.0000	1.0000	1.0001	.9971
.150	4.171E+07	.9922	1.4273	322.20	.9842	.9954	.9888	3.8996	1.0019	.9998	.9999	1.0000	.9973
.200	5.520E+07	.9921	1.4272	321.60	.9722	.9919	.9803	2.9558	1.0018	.9997	.9998	1.0000	.9974
.250	6.834E+07	.9921	1.4271	320.83	.9570	.9874	.9695	2.3968	1.0016	.9995	.9997	1.0000	.9975
.300	8.105E+07	.9920	1.4269	319.89	.9389	.9819	.9564	2.0305	1.0014	.9993	.9996	1.0001	.9977
.350	9.326E+07	.9919	1.4267	318.80	.9180	.9756	.9414	1.7743	1.0012	.9991	.9995	1.0001	.9979
.400	1.049E+08	.9918	1.4265	317.55	.8947	.9683	.9244	1.5872	1.0009	.9989	.9993	1.0001	.9982
.450	1.160E+08	.9916	1.4263	316.16	.8691	.9603	.9057	1.4463	1.0006	.9987	.9992	1.0002	.9984
.500	1.263E+08	.9915	1.4260	314.62	.8418	.9514	.8854	1.3380	1.0003	.9985	.9990	1.0003	.9986
.550	1.360E+08	.9913	1.4257	312.96	.8128	.9419	.8638	1.2535	1.0000	.9983	.9988	1.0004	.9988
.600	1.450E+08	.9912	1.4254	311.17	.7825	.9316	.8409	1.1871	.9996	.9981	.9987	1.0005	.9991
.650	1.532E+08	.9911	1.4251	309.26	.7513	.9207	.8170	1.1348	.9993	.9979	.9985	1.0007	.9993
.700	1.607E+08	.9909	1.4248	307.25	.7193	.9092	.7922	1.0938	.9989	.9978	.9983	1.0008	.9995
.750	1.674E+08	.9908	1.4244	305.13	.6870	.8972	.7668	1.0620	.9986	.9977	.9982	1.0010	.9996
.800	1.734E+08	.9906	1.4241	302.92	.6544	.8847	.7409	1.0380	.9982	.9976	.9980	1.0013	.9998
.850	1.786E+08	.9905	1.4237	300.62	.6220	.8719	.7147	1.0205	.9979	.9975	.9978	1.0015	.9999
.900	1.831E+08	.9904	1.4233	298.24	.5898	.8586	.6883	1.0088	.9975	.9975	.9977	1.0018	.9999
.950	1.869E+08	.9903	1.4229	295.80	.5581	.8450	.6618	1.0021	.9972	.9976	.9976	1.0021	1.0000
1.000	1.901E+08	.9902	1.4225	293.29	.5270	.8312	.6354	1.0000	.9969	.9976	.9974	1.0024	1.0000
1.050	1.925E+08	.9901	1.4220	290.73	.4968	.8171	.6093	1.0020	.9965	.9978	.9973	1.0027	1.0000
1.100	1.944E+08	.9900	1.4216	288.11	.4674	.8029	.5835	1.0079	.9962	.9979	.9972	1.0030	.9999
1.150	1.957E+08	.9899	1.4212	285.46	.4390	.7885	.5581	1.0173	.9960	.9981	.9971	1.0034	.9999
1.200	1.965E+08	.9899	1.4208	282.77	.4117	.7741	.5331	1.0302	.9957	.9983	.9970	1.0038	.9998
1.250	1.968E+08	.9898	1.4203	280.05	.3855	.7595	.5088	1.0464	.9955	.9985	.9969	1.0042	.9996
1.300	1.966E+08	.9898	1.4199	277.30	.3605	.7450	.4851	1.0658	.9952	.9988	.9968	1.0045	.9995
1.350	1.959E+08	.9898	1.4195	274.53	.3367	.7305	.4621	1.0883	.9950	.9991	.9967	1.0049	.9993
1.400	1.949E+08	.9897	1.4190	271.75	.3140	.7160	.4397	1.1140	.9948	.9994	.9967	1.0053	.9991
1.450	1.935E+08	.9897	1.4186	268.96	.2926	.7016	.4182	1.1428	.9946	.9997	.9966	1.0057	.9989
1.500	1.918E+08	.9898	1.4182	266.17	.2724	.6873	.3974	1.1747	.9944	1.0000	.9965	1.0061	.9987
1.550	1.899E+08	.9898	1.4178	263.37	.2533	.6731	.3774	1.2098	.9943	1.0003	.9965	1.0064	.9985
1.600	1.876E+08	.9898	1.4174	260.58	.2354	.6590	.3581	1.2481	.9942	1.0007	.9964	1.0068	.9983
1.650	1.852E+08	.9898	1.4170	257.79	.2186	.6451	.3397	1.2898	.9940	1.0010	.9964	1.0071	.9981
1.700	1.826E+08	.9899	1.4166	255.01	.2029	.6314	.3221	1.3348	.9939	1.0013	.9963	1.0074	.9979
1.750	1.797E+08	.9900	1.4162	252.24	.1881	.6179	.3052	1.3833	.9938	1.0016	.9963	1.0077	.9977
1.800	1.768E+08	.9900	1.4158	249.49	.1744	.6046	.2891	1.4355	.9937	1.0018	.9963	1.0078	.9977
1.850	1.737E+08	.9901	1.4154	246.76	.1616	.5914	.2738	1.4913	.9936	1.0021	.9962	1.0081	.9975
1.900	1.705E+08	.9902	1.4151	244.04	.1496	.5785	.2592	1.5509	.9936	1.0024	.9962	1.0084	.9973
1.950	1.673E+08	.9903	1.4147	241.34	.1385	.5659	.2453	1.6145	.9935	1.0026	.9961	1.0086	.9972
2.000	1.640E+08	.9903	1.4144	238.66	.1282	.5534	.2321	1.6822	.9934	1.0029	.9961	1.0088	.9970

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

J. TT = 250 K PT = 15 ATM DT = 20.719 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9887	1.4414	323.45	1.0000	1.0000	1.0000	I	1.0036	1.0000	1.0000	1.0000	I
.050	2.096E+07	.9887	1.4414	323.36	.9983	.9995	.9988	11.5366	1.0035	1.0000	1.0000	1.0000	.9953
.100	4.178E+07	.9886	1.4413	323.09	.9931	.9979	.9952	5.7941	1.0034	1.0000	.9999	1.0002	.9952
.150	6.233E+07	.9885	1.4412	322.63	.9841	.9954	.9889	3.8929	1.0033	.9997	.9998	1.0000	.9955
.200	8.248E+07	.9884	1.4410	322.00	.9720	.9918	.9803	2.9509	1.0031	.9995	.9997	1.0000	.9957
.250	1.021E+08	.9883	1.4409	321.20	.9568	.9872	.9695	2.3931	1.0028	.9993	.9996	1.0001	.9960
.300	1.211E+08	.9882	1.4406	320.22	.9385	.9817	.9565	2.0275	1.0025	.9990	.9994	1.0001	.9963
.350	1.393E+08	.9880	1.4404	319.08	.9176	.9753	.9414	1.7719	1.0021	.9987	.9992	1.0002	.9966
.400	1.568E+08	.9878	1.4400	317.79	.8942	.9680	.9245	1.5852	1.0017	.9984	.9990	1.0003	.9969
.450	1.733E+08	.9876	1.4397	316.34	.8686	.9599	.9058	1.4447	1.0012	.9980	.9988	1.0004	.9973
.500	1.888E+08	.9874	1.4393	314.76	.8411	.9510	.8856	1.3367	1.0007	.9977	.9985	1.0005	.9976
.550	2.033E+08	.9872	1.4389	313.03	.8121	.9413	.8640	1.2524	1.0002	.9974	.9983	1.0007	.9980
.600	2.167E+08	.9869	1.4385	311.19	.7816	.9310	.8410	1.1864	.9997	.9969	.9980	1.0007	.9985
.650	2.290E+08	.9867	1.4380	309.22	.7503	.9200	.8172	1.1343	.9991	.9966	.9978	1.0009	.9988
.700	2.402E+08	.9865	1.4375	307.14	.7183	.9085	.7925	1.0934	.9986	.9964	.9975	1.0011	.9991
.750	2.502E+08	.9863	1.4370	304.97	.6860	.8964	.7671	1.0618	.9980	.9962	.9973	1.0014	.9994
.800	2.592E+08	.9860	1.4364	302.70	.6535	.8839	.7413	1.0378	.9975	.9961	.9970	1.0017	.9996
.850	2.670E+08	.9858	1.4359	300.35	.6210	.8710	.7151	1.0205	.9969	.9960	.9968	1.0021	.9998
.900	2.738E+08	.9856	1.4353	297.92	.5889	.8576	.6888	1.0088	.9964	.9960	.9966	1.0025	.9999
.950	2.796E+08	.9854	1.4347	295.42	.5573	.8440	.6624	1.0021	.9959	.9961	.9964	1.0030	1.0000
1.000	2.843E+08	.9853	1.4341	292.87	.5263	.8302	.6361	1.0000	.9954	.9962	.9962	1.0034	1.0000
1.050	2.881E+08	.9851	1.4334	290.26	.4961	.8161	.6101	1.0020	.9949	.9963	.9960	1.0039	1.0000
1.100	2.910E+08	.9850	1.4328	287.60	.4667	.8018	.5843	1.0078	.9945	.9966	.9958	1.0045	.9999
1.150	2.930E+08	.9849	1.4322	284.91	.4384	.7874	.5590	1.0172	.9940	.9968	.9957	1.0050	.9998
1.200	2.942E+08	.9848	1.4315	282.18	.4112	.7730	.5341	1.0301	.9936	.9972	.9956	1.0056	.9996
1.250	2.947E+08	.9847	1.4309	279.43	.3851	.7584	.5098	1.0462	.9933	.9975	.9954	1.0062	.9995
1.300	2.945E+08	.9846	1.4302	276.65	.3602	.7439	.4862	1.0655	.9929	.9979	.9953	1.0068	.9992
1.350	2.936E+08	.9846	1.4296	273.86	.3364	.7294	.4632	1.0879	.9926	.9984	.9952	1.0073	.9990
1.400	2.922E+08	.9845	1.4290	271.06	.3139	.7149	.4409	1.1135	.9923	.9988	.9951	1.0079	.9987
1.450	2.902E+08	.9845	1.4283	268.25	.2925	.7005	.4194	1.1421	.9920	.9993	.9950	1.0085	.9984
1.500	2.878E+08	.9845	1.4277	265.44	.2724	.6862	.3986	1.1739	.9917	.9998	.9950	1.0091	.9981
1.550	2.849E+08	.9846	1.4271	262.63	.2533	.6720	.3786	1.2089	.9915	1.0003	.9949	1.0096	.9978
1.600	2.816E+08	.9846	1.4265	259.82	.2355	.6580	.3594	1.2471	.9913	1.0008	.9948	1.0102	.9975
1.650	2.780E+08	.9847	1.4258	257.02	.2187	.6441	.3409	1.2885	.9911	1.0013	.9948	1.0107	.9971
1.700	2.741E+08	.9847	1.4253	254.24	.2030	.6304	.3233	1.3334	.9909	1.0018	.9947	1.0112	.9968
1.750	2.700E+08	.9848	1.4247	251.46	.1883	.6168	.3064	1.3817	.9907	1.0023	.9946	1.0117	.9965
1.800	2.656E+08	.9849	1.4241	248.70	.1745	.6035	.2903	1.4335	.9906	1.0028	.9946	1.0121	.9962
1.850	2.611E+08	.9850	1.4235	245.96	.1617	.5904	.2749	1.4891	.9905	1.0033	.9945	1.0126	.9959
1.900	2.564E+08	.9851	1.4230	243.24	.1498	.5775	.2603	1.5485	.9904	1.0037	.9945	1.0130	.9957
1.950	2.516E+08	.9852	1.4225	240.55	.1387	.5648	.2464	1.6118	.9903	1.0041	.9944	1.0133	.9954
2.000	2.467E+08	.9854	1.4219	237.87	.1284	.5524	.2332	1.6793	.9902	1.0045	.9943	1.0136	.9951

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

J. TT = 250 K PT = 20 ATM DT = 27.721 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9852	1.4555	324.00	1.0000	1.0000	1.0000	I	1.0053	1.0000	1.0000	1.0000	I
.050	2.784E+07	.9852	1.4555	323.91	.9983	.9995	.9988	11.5162	1.0052	1.0000	1.0000	1.0001	.9935
.100	5.551E+07	.9852	1.4554	323.62	.9929	.9979	.9950	5.7850	1.0051	.9998	.9999	1.0000	.9937
.150	8.281E+07	.9851	1.4553	323.15	.9841	.9953	.9889	3.8864	1.0049	.9996	.9998	1.0000	.9939
.200	1.096E+08	.9849	1.4551	322.49	.9719	.9917	.9803	2.9462	1.0046	.9994	.9996	1.0001	.9941
.250	1.357E+08	.9847	1.4548	321.65	.9565	.9871	.9695	2.3894	1.0042	.9990	.9994	1.0001	.9945
.300	1.609E+08	.9845	1.4545	320.63	.9382	.9815	.9566	2.0246	1.0037	.9987	.9992	1.0002	.9949
.350	1.852E+08	.9843	1.4542	319.45	.9172	.9751	.9415	1.7696	1.0032	.9982	.9990	1.0003	.9953
.400	2.083E+08	.9840	1.4538	318.10	.8937	.9677	.9246	1.5834	1.0026	.9978	.9987	1.0004	.9957
.450	2.302E+08	.9837	1.4533	316.60	.8678	.9595	.9058	1.4436	1.0020	.9971	.9984	1.0003	.9964
.500	2.508E+08	.9834	1.4529	314.95	.8402	.9505	.8856	1.3358	1.0013	.9967	.9980	1.0005	.9970
.550	2.701E+08	.9831	1.4523	313.17	.8111	.9408	.8640	1.2518	1.0006	.9962	.9977	1.0007	.9975
.600	2.879E+08	.9828	1.4517	311.26	.7807	.9304	.8412	1.1858	.9999	.9958	.9974	1.0009	.9980
.650	3.043E+08	.9824	1.4511	309.23	.7494	.9194	.8174	1.1338	.9992	.9954	.9970	1.0012	.9984
.700	3.192E+08	.9821	1.4505	307.09	.7174	.9078	.7928	1.0931	.9984	.9951	.9967	1.0015	.9988
.750	3.326E+08	.9818	1.4498	304.85	.6850	.8956	.7675	1.0616	.9976	.9948	.9964	1.0019	.9992
.800	3.445E+08	.9815	1.4491	302.52	.6525	.8831	.7418	1.0377	.9969	.9946	.9961	1.0024	.9995
.850	3.550E+08	.9812	1.4483	300.11	.6201	.8701	.7157	1.0204	.9962	.9946	.9958	1.0029	.9997
.900	3.641E+08	.9809	1.4476	297.63	.5880	.8567	.6894	1.0088	.9954	.9945	.9955	1.0035	.9999
.950	3.718E+08	.9806	1.4468	295.08	.5565	.8431	.6631	1.0021	.9947	.9946	.9952	1.0041	1.0000
1.000	3.782E+08	.9804	1.4460	292.47	.5255	.8292	.6369	1.0000	.9941	.9948	.9950	1.0047	1.0000
1.050	3.833E+08	.9802	1.4452	289.81	.4954	.8151	.6110	1.0020	.9934	.9950	.9948	1.0054	1.0000
1.100	3.872E+08	.9800	1.4443	287.11	.4662	.8008	.5853	1.0078	.9928	.9953	.9946	1.0061	.9999
1.150	3.900E+08	.9798	1.4435	284.38	.4379	.7864	.5600	1.0172	.9922	.9957	.9944	1.0069	.9997
1.200	3.917E+08	.9796	1.4426	281.62	.4108	.7719	.5352	1.0299	.9916	.9961	.9942	1.0077	.9995
1.250	3.924E+08	.9795	1.4418	278.83	.3848	.7574	.5110	1.0460	.9911	.9966	.9940	1.0085	.9993
1.300	3.922E+08	.9794	1.4409	276.02	.3599	.7428	.4874	1.0652	.9906	.9972	.9939	1.0093	.9990
1.350	3.912E+08	.9793	1.4401	273.21	.3362	.7283	.4644	1.0875	.9902	.9978	.9938	1.0101	.9986
1.400	3.894E+08	.9793	1.4392	270.38	.3137	.7138	.4422	1.1129	.9898	.9984	.9937	1.0109	.9982
1.450	3.869E+08	.9793	1.4384	267.55	.2925	.6994	.4207	1.1415	.9894	.9990	.9935	1.0117	.9978
1.500	3.837E+08	.9793	1.4375	264.72	.2723	.6851	.3999	1.1731	.9890	.9997	.9935	1.0125	.9974
1.550	3.800E+08	.9793	1.4367	261.89	.2534	.6710	.3799	1.2079	.9887	1.0004	.9934	1.0132	.9970
1.600	3.758E+08	.9793	1.4359	259.07	.2355	.6569	.3607	1.2459	.9884	1.0011	.9933	1.0140	.9966
1.650	3.711E+08	.9794	1.4350	256.27	.2188	.6431	.3423	1.2872	.9881	1.0018	.9932	1.0147	.9961
1.700	3.660E+08	.9795	1.4342	253.47	.2031	.6294	.3246	1.3318	.9879	1.0025	.9931	1.0154	.9957
1.750	3.605E+08	.9796	1.4335	250.69	.1884	.6159	.3077	1.3799	.9877	1.0032	.9931	1.0160	.9953
1.800	3.548E+08	.9797	1.4327	247.93	.1747	.6025	.2916	1.4315	.9875	1.0038	.9930	1.0166	.9948
1.850	3.488E+08	.9798	1.4319	245.18	.1619	.5894	.2762	1.4869	.9873	1.0045	.9929	1.0172	.9944
1.900	3.427E+08	.9800	1.4312	242.46	.1500	.5766	.2616	1.5460	.9872	1.0051	.9928	1.0178	.9941
1.950	3.363E+08	.9801	1.4305	239.77	.1389	.5639	.2476	1.6091	.9871	1.0056	.9928	1.0183	.9937
2.000	3.298E+08	.9803	1.4298	237.09	.1286	.5515	.2344	1.6763	.9869	1.0062	.9927	1.0187	.9934

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

J. TT = 250 K PT = 25 ATM DT = 34.767 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9820	1.4698	324.65	1.0000	1.0000	1.0000	I	1.0073	1.0000	1.0000	1.0000	I
.050	3.470E+07	.9820	1.4698	324.55	.9983	.9995	.9988	11.4947	1.0072	1.0000	1.0000	1.0001	.9917
.100	6.916E+07	.9819	1.4697	324.25	.9928	.9979	.9950	5.7745	1.0071	.9998	.9999	1.0000	.9919
.150	1.032E+08	.9817	1.4695	323.75	.9840	.9953	.9889	3.8795	1.0068	.9995	.9997	1.0001	.9921
.200	1.365E+08	.9815	1.4693	323.06	.9717	.9916	.9804	2.9412	1.0064	.9992	.9995	1.0001	.9925
.250	1.690E+08	.9813	1.4690	322.19	.9563	.9870	.9696	2.3856	1.0059	.9988	.9993	1.0002	.9929
.300	2.005E+08	.9810	1.4686	321.13	.9379	.9814	.9566	2.0216	1.0053	.9983	.9990	1.0003	.9934
.350	2.307E+08	.9807	1.4682	319.89	.9165	.9748	.9414	1.7675	1.0046	.9976	.9987	1.0002	.9941
.400	2.595E+08	.9803	1.4677	318.49	.8929	.9674	.9245	1.5818	1.0039	.9969	.9983	1.0003	.9948
.450	2.868E+08	.9800	1.4672	316.93	.8671	.9591	.9059	1.4420	1.0030	.9963	.9979	1.0004	.9954
.500	3.125E+08	.9796	1.4666	315.22	.8394	.9500	.8857	1.3346	1.0022	.9957	.9975	1.0006	.9961
.550	3.365E+08	.9791	1.4659	313.37	.8102	.9403	.8642	1.2508	1.0013	.9951	.9971	1.0009	.9967
.600	3.587E+08	.9787	1.4652	311.39	.7798	.9298	.8415	1.1852	1.0003	.9946	.9967	1.0012	.9974
.650	3.791E+08	.9783	1.4645	309.30	.7484	.9187	.8177	1.1334	.9994	.9941	.9963	1.0015	.9980
.700	3.977E+08	.9778	1.4637	307.09	.7164	.9070	.7932	1.0928	.9984	.9937	.9959	1.0020	.9985
.750	4.145E+08	.9774	1.4629	304.79	.6840	.8949	.7680	1.0613	.9974	.9933	.9955	1.0025	.9990
.800	4.294E+08	.9770	1.4620	302.39	.6515	.8822	.7423	1.0376	.9965	.9931	.9951	1.0031	.9993
.850	4.425E+08	.9766	1.4611	299.92	.6192	.8692	.7163	1.0203	.9955	.9930	.9948	1.0037	.9997
.900	4.539E+08	.9762	1.4601	297.37	.5871	.8558	.6901	1.0087	.9946	.9930	.9944	1.0045	.9999
.950	4.636E+08	.9759	1.4592	294.77	.5556	.8421	.6639	1.0022	.9937	.9931	.9941	1.0052	1.0000
1.000	4.716E+08	.9755	1.4582	292.11	.5248	.8282	.6378	1.0000	.9928	.9933	.9938	1.0061	1.0000
1.050	4.781E+08	.9752	1.4572	289.40	.4947	.8141	.6119	1.0020	.9920	.9936	.9935	1.0070	1.0000
1.100	4.831E+08	.9749	1.4561	286.65	.4656	.7998	.5863	1.0078	.9912	.9940	.9933	1.0079	.9999
1.150	4.867E+08	.9747	1.4551	283.88	.4374	.7854	.5611	1.0171	.9904	.9944	.9931	1.0089	.9997
1.200	4.889E+08	.9745	1.4540	281.07	.4103	.7709	.5364	1.0298	.9897	.9950	.9929	1.0099	.9994
1.250	4.900E+08	.9743	1.4530	278.25	.3844	.7563	.5122	1.0458	.9891	.9957	.9927	1.0109	.9991
1.300	4.898E+08	.9742	1.4519	275.41	.3596	.7418	.4887	1.0649	.9884	.9964	.9925	1.0119	.9987
1.350	4.887E+08	.9741	1.4508	272.57	.3360	.7273	.4658	1.0871	.9879	.9971	.9924	1.0129	.9982
1.400	4.866E+08	.9740	1.4498	269.71	.3136	.7128	.4436	1.1124	.9873	.9979	.9922	1.0140	.9978
1.450	4.835E+08	.9740	1.4487	266.86	.2924	.6984	.4221	1.1408	.9868	.9988	.9921	1.0150	.9972
1.500	4.797E+08	.9739	1.4477	264.01	.2723	.6842	.4013	1.1723	.9864	.9996	.9920	1.0160	.9967
1.550	4.752E+08	.9740	1.4466	261.17	.2534	.6700	.3813	1.2069	.9860	1.0005	.9919	1.0170	.9962
1.600	4.700E+08	.9740	1.4456	258.34	.2356	.6560	.3621	1.2447	.9856	1.0014	.9918	1.0180	.9956
1.650	4.643E+08	.9741	1.4446	255.52	.2189	.6421	.3437	1.2858	.9853	1.0023	.9917	1.0189	.9950
1.700	4.581E+08	.9742	1.4436	252.71	.2033	.6284	.3260	1.3302	.9850	1.0032	.9916	1.0198	.9945
1.750	4.514E+08	.9743	1.4426	249.92	.1886	.6149	.3091	1.3780	.9847	1.0041	.9916	1.0206	.9939
1.800	4.443E+08	.9744	1.4416	247.16	.1749	.6016	.2930	1.4294	.9844	1.0049	.9915	1.0214	.9934
1.850	4.369E+08	.9746	1.4407	244.41	.1621	.5886	.2776	1.4845	.9842	1.0057	.9914	1.0222	.9929
1.900	4.293E+08	.9747	1.4397	241.69	.1502	.5757	.2629	1.5434	.9840	1.0065	.9913	1.0229	.9924
1.950	4.214E+08	.9749	1.4388	238.99	.1391	.5631	.2489	1.6062	.9839	1.0072	.9912	1.0235	.9920
2.000	4.134E+08	.9751	1.4379	236.32	.1288	.5506	.2356	1.6731	.9837	1.0079	.9911	1.0241	.9915

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

J. TT = 250 K PT = 30 ATM DT = 41.851 KGM/M3 CONCLUDED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9789	1.4843	325.38	1.0000	1.0000	1.0000	1	1.0096	1.0000	1.0000	1.0000	1
.050	4.152E+07	.9789	1.4842	325.28	.9983	.9995	.9988	11.4721	1.0095	1.0000	1.0000	1.0001	.9897
.100	8.276E+07	.9788	1.4841	324.97	.9928	.9979	.9950	5.7634	1.0093	.9997	.9999	1.0000	.9900
.150	1.235E+08	.9786	1.4839	324.45	.9839	.9952	.9889	3.8723	1.0089	.9994	.9997	1.0001	.9903
.200	1.634E+08	.9783	1.4837	323.73	.9715	.9915	.9804	2.9359	1.0084	.9990	.9995	1.0001	.9907
.250	2.023E+08	.9780	1.4833	322.81	.9560	.9868	.9696	2.3816	1.0078	.9985	.9992	1.0002	.9912
.300	2.398E+08	.9777	1.4829	321.70	.9373	.9811	.9565	2.0188	1.0071	.9977	.9988	1.0001	.9920
.350	2.760E+08	.9773	1.4824	320.41	.9160	.9745	.9415	1.7651	1.0063	.9970	.9984	1.0002	.9928
.400	3.104E+08	.9768	1.4818	318.95	.8922	.9670	.9246	1.5799	1.0053	.9962	.9980	1.0004	.9935
.450	3.431E+08	.9763	1.4812	317.33	.8663	.9587	.9060	1.4405	1.0043	.9955	.9975	1.0005	.9944
.500	3.739E+08	.9758	1.4805	315.55	.8386	.9496	.8859	1.3334	1.0032	.9947	.9971	1.0008	.9952
.550	4.026E+08	.9753	1.4798	313.63	.8093	.9397	.8644	1.2499	1.0021	.9940	.9966	1.0011	.9960
.600	4.292E+08	.9747	1.4790	311.59	.7788	.9292	.8417	1.1843	1.0010	.9933	.9961	1.0015	.9967
.650	4.536E+08	.9742	1.4781	309.42	.7474	.9180	.8180	1.1327	.9998	.9927	.9956	1.0020	.9975
.700	4.759E+08	.9736	1.4772	307.14	.7153	.9063	.7936	1.0923	.9986	.9922	.9951	1.0025	.9981
.750	4.960E+08	.9731	1.4762	304.77	.6830	.8941	.7685	1.0610	.9974	.9918	.9946	1.0032	.9987
.800	5.139E+08	.9726	1.4752	302.30	.6505	.8814	.7429	1.0373	.9962	.9916	.9942	1.0039	.9991
.850	5.297E+08	.9720	1.4741	299.76	.6182	.8683	.7170	1.0202	.9950	.9914	.9938	1.0047	.9995
.900	5.433E+08	.9716	1.4730	297.15	.5862	.8549	.6909	1.0086	.9939	.9914	.9934	1.0056	.9998
.950	5.550E+08	.9711	1.4719	294.49	.5547	.8412	.6648	1.0022	.9928	.9915	.9930	1.0065	1.0000
1.000	5.647E+08	.9707	1.4707	291.78	.5239	.8272	.6387	1.0001	.9917	.9917	.9927	1.0075	1.0001
1.050	5.725E+08	.9703	1.4695	289.02	.4940	.8131	.6129	1.0020	.9907	.9921	.9924	1.0086	1.0000
1.100	5.786E+08	.9699	1.4683	286.22	.4649	.7988	.5874	1.0078	.9897	.9925	.9921	1.0097	.9999
1.150	5.830E+08	.9696	1.4670	283.40	.4369	.7844	.5623	1.0170	.9888	.9931	.9918	1.0109	.9996
1.200	5.859E+08	.9693	1.4658	280.55	.4099	.7699	.5376	1.0297	.9879	.9938	.9916	1.0122	.9993
1.250	5.873E+08	.9691	1.4645	277.69	.3840	.7554	.5135	1.0455	.9871	.9946	.9914	1.0134	.9989
1.300	5.873E+08	.9689	1.4632	274.82	.3593	.7408	.4900	1.0645	.9863	.9955	.9912	1.0147	.9984
1.350	5.860E+08	.9688	1.4620	271.94	.3358	.7263	.4672	1.0867	.9856	.9964	.9910	1.0160	.9978
1.400	5.836E+08	.9687	1.4607	269.07	.3135	.7119	.4450	1.1118	.9849	.9974	.9909	1.0173	.9973
1.450	5.802E+08	.9686	1.4594	266.19	.2923	.6975	.4236	1.1400	.9843	.9985	.9908	1.0185	.9966
1.500	5.758E+08	.9686	1.4582	263.32	.2723	.6832	.4028	1.1714	.9838	.9995	.9906	1.0198	.9960
1.550	5.705E+08	.9686	1.4569	260.46	.2535	.6691	.3829	1.2058	.9833	1.0006	.9905	1.0210	.9953
1.600	5.644E+08	.9686	1.4557	257.61	.2357	.6551	.3637	1.2434	.9828	1.0017	.9904	1.0222	.9946
1.650	5.577E+08	.9687	1.4544	254.78	.2190	.6412	.3452	1.2843	.9824	1.0028	.9904	1.0233	.9939
1.700	5.504E+08	.9688	1.4532	251.96	.2034	.6276	.3275	1.3285	.9820	1.0039	.9903	1.0244	.9932
1.750	5.425E+08	.9689	1.4520	249.17	.1888	.6141	.3106	1.3761	.9817	1.0050	.9902	1.0255	.9926
1.800	5.341E+08	.9690	1.4509	246.40	.1751	.6008	.2944	1.4272	.9814	1.0060	.9901	1.0264	.9919
1.850	5.254E+08	.9692	1.4497	243.65	.1624	.5877	.2790	1.4821	.9811	1.0070	.9900	1.0274	.9913
1.900	5.163E+08	.9694	1.4486	240.92	.1505	.5749	.2643	1.5407	.9809	1.0080	.9899	1.0282	.9907
1.950	5.070E+08	.9696	1.4475	238.22	.1394	.5623	.2503	1.6032	.9807	1.0089	.9898	1.0290	.9901
2.000	4.975E+08	.9699	1.4464	235.55	.1291	.5499	.2369	1.6698	.9805	1.0098	.9897	1.0298	.9896

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

K. TT = 300 K PT = 1 ATM DT = 1.138 KGM/M3

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9998	1.4017	353.21	1.0000	1.0000	1.0000	1	1.0004	1.0000	1.0000	1.0000	1
.050	1.116E+06	.9998	1.4017	353.12	.9982	.9995	.9987	11.5890	1.0004	1.0000	1.0000	1.0000	.9998
.100	2.225E+06	.9998	1.4017	352.86	.9930	.9980	.9950	5.8206	1.0004	1.0000	1.0000	1.0000	.9998
.150	3.319E+06	.9998	1.4017	352.42	.9844	.9955	.9888	3.9095	1.0004	1.0000	1.0000	1.0000	.9998
.200	4.392E+06	.9998	1.4017	351.80	.9725	.9921	.9803	2.9630	1.0004	1.0000	1.0000	1.0000	.9998
.250	5.436E+06	.9998	1.4017	351.01	.9574	.9876	.9694	2.4023	1.0004	.9999	1.0000	1.0000	.9998
.300	6.445E+06	.9998	1.4017	350.06	.9394	.9823	.9564	2.0348	1.0004	.9999	1.0000	1.0000	.9998
.350	7.414E+06	.9998	1.4017	348.94	.9187	.9760	.9413	1.7777	1.0004	.9999	1.0000	1.0000	.9999
.400	8.337E+06	.9998	1.4017	347.66	.8955	.9689	.9242	1.5900	1.0003	.9999	1.0000	1.0000	.9999
.450	9.211E+06	.9998	1.4017	346.23	.8701	.9610	.9055	1.4486	1.0003	.9998	.9999	1.0000	.9999
.500	1.003E+07	.9997	1.4017	344.66	.8431	.9523	.8853	1.3394	1.0003	1.0000	.9999	1.0002	.9997
.550	1.080E+07	.9997	1.4017	342.94	.8142	.9429	.8636	1.2546	1.0003	1.0001	.9999	1.0002	.9997
.600	1.150E+07	.9997	1.4016	341.09	.7839	.9327	.8405	1.1881	1.0003	.9998	.9999	1.0000	.9999
.650	1.214E+07	.9997	1.4016	339.11	.7527	.9220	.8165	1.1355	1.0002	.9998	.9999	1.0000	.9999
.700	1.273E+07	.9997	1.4016	337.01	.7208	.9106	.7916	1.0943	1.0002	.9998	.9999	1.0001	1.0000
.750	1.325E+07	.9997	1.4016	334.79	.6884	.8987	.7661	1.0624	1.0002	.9998	.9999	1.0001	1.0000
.800	1.371E+07	.9996	1.4016	332.47	.6559	.8864	.7401	1.0382	1.0001	.9997	.9998	1.0001	1.0000
.850	1.411E+07	.9996	1.4016	330.06	.6233	.8736	.7137	1.0207	1.0001	.9997	.9998	1.0001	1.0000
.900	1.445E+07	.9996	1.4016	327.56	.5911	.8604	.6871	1.0089	1.0001	.9997	.9998	1.0001	1.0000
.950	1.474E+07	.9996	1.4016	324.97	.5593	.8469	.6605	1.0021	1.0001	.9997	.9998	1.0002	1.0000
1.000	1.497E+07	.9996	1.4015	322.31	.5281	.8331	.6341	1.0000	1.0000	.9997	.9998	1.0002	1.0000
1.050	1.515E+07	.9996	1.4015	319.58	.4977	.8191	.6078	1.0020	1.0000	.9997	.9998	1.0002	1.0000
1.100	1.528E+07	.9995	1.4015	316.79	.4682	.8050	.5818	1.0079	1.0000	.9997	.9998	1.0002	1.0000
1.150	1.536E+07	.9995	1.4015	313.95	.4397	.7906	.5563	1.0174	.9999	.9997	.9997	1.0003	1.0000
1.200	1.540E+07	.9995	1.4014	311.07	.4123	.7762	.5313	1.0304	.9999	.9997	.9997	1.0003	1.0000
1.250	1.540E+07	.9995	1.4014	308.14	.3860	.7617	.5069	1.0467	.9999	.9998	.9997	1.0004	1.0000
1.300	1.537E+07	.9995	1.4014	305.19	.3608	.7472	.4831	1.0663	.9999	.9998	.9997	1.0004	1.0000
1.350	1.530E+07	.9995	1.4014	302.20	.3369	.7327	.4600	1.0890	.9998	.9998	.9997	1.0004	.9999
1.400	1.520E+07	.9995	1.4013	299.19	.3142	.7182	.4376	1.1148	.9998	.9998	.9997	1.0005	.9999
1.450	1.507E+07	.9995	1.4013	296.17	.2927	.7038	.4160	1.1438	.9998	.9999	.9997	1.0005	.9999
1.500	1.492E+07	.9995	1.4013	293.14	.2724	.6894	.3952	1.1760	.9998	.9999	.9997	1.0006	.9999
1.550	1.475E+07	.9995	1.4012	290.10	.2532	.6752	.3752	1.2114	.9998	.9999	.9997	1.0006	.9998
1.600	1.455E+07	.9995	1.4012	287.06	.2353	.6612	.3560	1.2500	.9998	1.0000	.9997	1.0006	.9998
1.650	1.434E+07	.9995	1.4012	284.01	.2184	.6472	.3375	1.2920	.9997	1.0000	.9997	1.0007	.9998
1.700	1.412E+07	.9995	1.4012	280.98	.2026	.6335	.3199	1.3373	.9997	1.0000	.9997	1.0007	.9998
1.750	1.388E+07	.9995	1.4011	277.95	.1878	.6199	.3031	1.3861	.9997	1.0001	.9997	1.0008	.9997
1.800	1.364E+07	.9995	1.4011	274.94	.1741	.6066	.2870	1.4386	.9997	1.0001	.9997	1.0008	.9997
1.850	1.338E+07	.9995	1.4011	271.94	.1612	.5934	.2718	1.4947	.9997	1.0001	.9997	1.0008	.9997
1.900	1.312E+07	.9995	1.4010	268.96	.1493	.5805	.2572	1.5547	.9997	1.0002	.9996	1.0009	.9997
1.950	1.286E+07	.9995	1.4010	266.00	.1382	.5678	.2434	1.6187	.9997	1.0002	.9996	1.0009	.9996
2.000	1.259E+07	.9995	1.4010	263.07	.1278	.5554	.2303	1.6869	.9997	1.0002	.9996	1.0009	.9996

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

K. TT = 300 K PT = 3 ATM DT = 3.416 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9995	1.4051	353.53	1.0000	1.0000	1.0000	I	1.0013	1.0000	1.0000	1.0000	I
.050	3.343E+06	.9995	1.4051	353.44	.9982	.9995	.9988	11.5829	1.0013	1.0000	1.0000	1.0000	.9993
.100	6.665E+06	.9995	1.4051	353.17	.9930	.9980	.9950	5.8175	1.0013	1.0000	1.0000	1.0000	.9993
.150	9.942E+06	.9995	1.4051	352.72	.9844	.9955	.9889	3.9075	1.0013	1.0000	1.0000	1.0000	.9993
.200	1.316E+07	.9994	1.4051	352.10	.9725	.9920	.9803	2.9613	1.0013	1.0000	1.0000	1.0001	.9993
.250	1.628E+07	.9994	1.4051	351.30	.9574	.9876	.9695	2.4010	1.0012	1.0000	.9999	1.0001	.9993
.300	1.931E+07	.9994	1.4051	350.33	.9394	.9822	.9565	2.0336	1.0012	1.0000	.9999	1.0001	.9993
.350	2.221E+07	.9993	1.4051	349.20	.9187	.9760	.9415	1.7767	1.0011	.9999	.9999	1.0002	.9993
.400	2.498E+07	.9993	1.4050	347.91	.8955	.9688	.9245	1.5890	1.0010	.9999	.9998	1.0002	.9993
.450	2.759E+07	.9993	1.4050	346.46	.8699	.9609	.9055	1.4481	1.0010	.9996	.9998	1.0000	.9996
.500	3.005E+07	.9992	1.4050	344.86	.8427	.9522	.8852	1.3394	1.0009	.9996	.9998	1.0001	.9996
.550	3.233E+07	.9992	1.4049	343.12	.8138	.9427	.8635	1.2546	1.0008	.9995	.9997	1.0001	.9997
.600	3.445E+07	.9991	1.4049	341.25	.7836	.9325	.8405	1.1879	1.0007	.9994	.9997	1.0001	.9998
.650	3.638E+07	.9991	1.4048	339.25	.7524	.9218	.8166	1.1354	1.0006	.9994	.9997	1.0001	.9998
.700	3.813E+07	.9990	1.4048	337.12	.7205	.9104	.7917	1.0942	1.0006	.9993	.9996	1.0002	.9999
.750	3.969E+07	.9990	1.4047	334.89	.6881	.8985	.7662	1.0623	1.0005	.9993	.9996	1.0002	.9999
.800	4.107E+07	.9989	1.4047	332.55	.6555	.8861	.7402	1.0382	1.0004	.9993	.9995	1.0003	.9999
.850	4.227E+07	.9989	1.4046	330.11	.6230	.8733	.7139	1.0206	1.0003	.9992	.9995	1.0003	1.0000
.900	4.330E+07	.9988	1.4045	327.59	.5908	.8601	.6873	1.0089	1.0002	.9992	.9995	1.0004	1.0000
.950	4.416E+07	.9988	1.4045	324.98	.5590	.8466	.6608	1.0021	1.0001	.9992	.9994	1.0005	1.0000
1.000	4.485E+07	.9987	1.4044	322.30	.5279	.8328	.6343	1.0000	1.0000	.9992	.9994	1.0006	1.0000
1.050	4.539E+07	.9987	1.4043	319.56	.4975	.8188	.6081	1.0020	.9999	.9992	.9994	1.0007	1.0000
1.100	4.579E+07	.9987	1.4042	316.75	.4680	.8046	.5821	1.0079	.9998	.9993	.9993	1.0008	1.0000
1.150	4.604E+07	.9986	1.4041	313.90	.4395	.7903	.5566	1.0174	.9998	.9993	.9993	1.0009	1.0000
1.200	4.617E+07	.9986	1.4041	311.00	.4121	.7758	.5317	1.0304	.9997	.9993	.9993	1.0010	.9999
1.250	4.618E+07	.9985	1.4040	308.06	.3858	.7613	.5072	1.0467	.9996	.9994	.9993	1.0011	.9999
1.300	4.607E+07	.9985	1.4039	305.09	.3607	.7468	.4835	1.0662	.9995	.9995	.9992	1.0012	.9999
1.350	4.587E+07	.9985	1.4038	302.09	.3368	.7323	.4604	1.0888	.9995	.9995	.9992	1.0013	.9998
1.400	4.558E+07	.9985	1.4037	299.08	.3141	.7178	.4380	1.1147	.9994	.9996	.9992	1.0014	.9998
1.450	4.520E+07	.9985	1.4036	296.04	.2926	.7034	.4164	1.1436	.9994	.9997	.9992	1.0015	.9997
1.500	4.475E+07	.9984	1.4036	293.00	.2723	.6891	.3956	1.1757	.9993	.9998	.9992	1.0016	.9996
1.550	4.423E+07	.9984	1.4035	289.95	.2532	.6749	.3756	1.2111	.9993	.9999	.9992	1.0017	.9996
1.600	4.366E+07	.9984	1.4034	286.90	.2353	.6608	.3564	1.2496	.9992	1.0000	.9992	1.0019	.9995
1.650	4.303E+07	.9984	1.4033	283.86	.2184	.6469	.3380	1.2915	.9992	1.0001	.9992	1.0020	.9994
1.700	4.237E+07	.9984	1.4032	280.82	.2026	.6332	.3204	1.3368	.9991	1.0002	.9992	1.0021	.9994
1.750	4.166E+07	.9984	1.4032	277.79	.1879	.6196	.3035	1.3855	.9991	1.0002	.9992	1.0022	.9993
1.800	4.093E+07	.9984	1.4031	274.77	.1741	.6063	.2875	1.4379	.9991	1.0003	.9992	1.0023	.9992
1.850	4.017E+07	.9984	1.4030	271.77	.1613	.5931	.2722	1.4939	.9990	1.0004	.9992	1.0024	.9992
1.900	3.939E+07	.9984	1.4029	268.79	.1493	.5802	.2576	1.5539	.9990	1.0005	.9991	1.0025	.9991
1.950	3.859E+07	.9984	1.4029	265.83	.1382	.5675	.2438	1.6178	.9990	1.0006	.9991	1.0026	.9990
2.000	3.779E+07	.9984	1.4028	262.89	.1279	.5551	.2307	1.6858	.9990	1.0007	.9991	1.0026	.9990

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

K. TT = 300 K PT = 5 ATM DT = 5.695 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9991	1.4086	353.86	1.0000	1.0000	1.0000	I	1.0023	1.0000	1.0000	1.0000	I
.050	5.564E+06	.9991	1.4086	353.77	.9982	.9995	.9988	11.5767	1.0023	1.0000	1.0000	1.0000	.9987
.100	1.109E+07	.9991	1.4086	353.50	.9930	.9980	.9951	5.8144	1.0022	1.0000	1.0000	1.0000	.9987
.150	1.655E+07	.9991	1.4086	353.04	.9844	.9955	.9889	3.9054	1.0022	1.0000	1.0000	1.0001	.9987
.200	2.189E+07	.9991	1.4086	352.41	.9725	.9920	.9804	2.9597	1.0021	1.0000	.9999	1.0001	.9987
.250	2.710E+07	.9990	1.4086	351.60	.9574	.9875	.9696	2.3996	1.0021	1.0000	.9999	1.0002	.9987
.300	3.212E+07	.9990	1.4085	350.62	.9392	.9822	.9564	2.0331	1.0020	.9997	.9998	1.0000	.9990
.350	3.695E+07	.9989	1.4085	349.47	.9184	.9759	.9413	1.7764	1.0019	.9996	.9998	1.0000	.9991
.400	4.156E+07	.9989	1.4084	348.16	.8952	.9687	.9243	1.5889	1.0018	.9995	.9997	1.0000	.9992
.450	4.591E+07	.9988	1.4084	346.69	.8697	.9608	.9056	1.4477	1.0016	.9994	.9997	1.0001	.9993
.500	5.000E+07	.9987	1.4083	345.07	.8424	.9520	.8853	1.3391	1.0015	.9993	.9996	1.0001	.9994
.550	5.381E+07	.9986	1.4082	343.31	.8135	.9425	.8635	1.2543	1.0014	.9992	.9996	1.0001	.9995
.600	5.733E+07	.9986	1.4081	341.42	.7833	.9324	.8406	1.1877	1.0012	.9991	.9995	1.0002	.9996
.650	6.054E+07	.9985	1.4080	339.39	.7521	.9216	.8166	1.1353	1.0011	.9990	.9994	1.0002	.9997
.700	6.345E+07	.9984	1.4079	337.25	.7201	.9102	.7918	1.0941	1.0009	.9989	.9994	1.0003	.9998
.750	6.606E+07	.9983	1.4078	334.99	.6878	.8982	.7663	1.0623	1.0008	.9988	.9993	1.0004	.9998
.800	6.836E+07	.9982	1.4077	332.63	.6552	.8858	.7404	1.0381	1.0006	.9988	.9992	1.0005	.9999
.850	7.037E+07	.9981	1.4076	330.17	.6227	.8730	.7140	1.0206	1.0005	.9987	.9992	1.0006	1.0000
.900	7.208E+07	.9980	1.4075	327.62	.5905	.8598	.6875	1.0089	1.0003	.9987	.9991	1.0007	1.0000
.950	7.351E+07	.9980	1.4074	325.00	.5587	.8463	.6610	1.0022	1.0001	.9987	.9991	1.0008	1.0000
1.000	7.468E+07	.9979	1.4072	322.30	.5276	.8325	.6346	1.0000	1.0000	.9987	.9990	1.0010	1.0000
1.050	7.558E+07	.9978	1.4071	319.54	.4973	.8185	.6083	1.0020	.9999	.9988	.9990	1.0011	1.0000
1.100	7.624E+07	.9978	1.4070	316.72	.4678	.8043	.5824	1.0079	.9997	.9988	.9989	1.0013	1.0000
1.150	7.668E+07	.9977	1.4068	313.84	.4393	.7899	.5570	1.0174	.9996	.9989	.9989	1.0014	1.0000
1.200	7.689E+07	.9976	1.4067	310.93	.4120	.7755	.5320	1.0303	.9995	.9989	.9988	1.0016	.9999
1.250	7.691E+07	.9976	1.4066	307.98	.3857	.7610	.5076	1.0466	.9993	.9990	.9988	1.0018	.9998
1.300	7.675E+07	.9975	1.4064	304.99	.3606	.7465	.4839	1.0661	.9992	.9991	.9988	1.0020	.9998
1.350	7.642E+07	.9975	1.4063	301.99	.3367	.7320	.4608	1.0887	.9991	.9993	.9988	1.0022	.9997
1.400	7.593E+07	.9974	1.4061	298.96	.3141	.7175	.4385	1.1145	.9990	.9994	.9987	1.0023	.9996
1.450	7.531E+07	.9974	1.4060	295.92	.2926	.7031	.4169	1.1434	.9989	.9995	.9987	1.0025	.9995
1.500	7.457E+07	.9974	1.4059	292.87	.2723	.6888	.3961	1.1755	.9989	.9997	.9987	1.0027	.9994
1.550	7.371E+07	.9974	1.4057	289.81	.2532	.6746	.3761	1.2107	.9988	.9998	.9987	1.0029	.9993
1.600	7.277E+07	.9973	1.4056	286.75	.2353	.6605	.3568	1.2492	.9987	1.0000	.9987	1.0031	.9992
1.650	7.173E+07	.9973	1.4055	283.70	.2184	.6466	.3384	1.2910	.9986	1.0001	.9987	1.0033	.9991
1.700	7.063E+07	.9973	1.4053	280.66	.2027	.6329	.3208	1.3362	.9986	1.0003	.9987	1.0034	.9990
1.750	6.946E+07	.9973	1.4052	277.62	.1879	.6193	.3040	1.3849	.9985	1.0004	.9987	1.0036	.9989
1.800	6.824E+07	.9973	1.4051	274.60	.1741	.6060	.2879	1.4372	.9985	1.0006	.9987	1.0038	.9988
1.850	6.698E+07	.9973	1.4050	271.60	.1613	.5929	.2726	1.4932	.9984	1.0007	.9987	1.0039	.9986
1.900	6.568E+07	.9973	1.4048	268.61	.1494	.5799	.2580	1.5530	.9984	1.0009	.9987	1.0041	.9985
1.950	6.436E+07	.9973	1.4047	265.65	.1383	.5673	.2442	1.6168	.9983	1.0010	.9987	1.0042	.9984
2.000	6.302E+07	.9973	1.4046	262.71	.1280	.5548	.2311	1.6847	.9983	1.0012	.9986	1.0044	.9983

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

K. TT = 300 K PT = 8 ATM DT = 9.116 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9987	1.4139	354.37	1.0000	1.0000	1.0000	I	1.0037	1.0000	1.0000	1.0000	I
.050	8.882E+06	.9987	1.4139	354.28	.9983	.9995	.9988	11.5676	1.0037	1.0000	1.0000	1.0000	.9979
.100	1.771E+07	.9987	1.4139	354.00	.9930	.9980	.9951	5.8098	1.0037	1.0000	1.0000	1.0001	.9979
.150	2.642E+07	.9986	1.4138	353.54	.9844	.9955	.9890	3.9022	1.0036	1.0000	.9999	1.0001	.9979
.200	3.495E+07	.9986	1.4138	352.89	.9723	.9920	.9803	2.9580	1.0035	.9998	.9999	1.0000	.9981
.250	4.325E+07	.9985	1.4137	352.06	.9571	.9875	.9694	2.3985	1.0034	.9996	.9998	1.0000	.9982
.300	5.129E+07	.9984	1.4137	351.06	.9390	.9821	.9564	2.0317	1.0032	.9995	.9998	1.0000	.9984
.350	5.899E+07	.9983	1.4136	349.88	.9182	.9758	.9413	1.7755	1.0031	.9993	.9997	1.0000	.9985
.400	6.634E+07	.9982	1.4135	348.55	.8949	.9686	.9243	1.5882	1.0029	.9992	.9996	1.0001	.9987
.450	7.330E+07	.9981	1.4134	347.05	.8694	.9606	.9056	1.4471	1.0027	.9990	.9995	1.0001	.9988
.500	7.983E+07	.9980	1.4133	345.40	.8421	.9518	.8853	1.3386	1.0025	.9988	.9994	1.0001	.9990
.550	8.591E+07	.9978	1.4131	343.61	.8131	.9423	.8636	1.2540	1.0022	.9987	.9993	1.0002	.9992
.600	9.152E+07	.9977	1.4130	341.68	.7829	.9321	.8407	1.1875	1.0020	.9985	.9992	1.0003	.9993
.650	9.666E+07	.9976	1.4129	339.62	.7516	.9212	.8168	1.1351	1.0017	.9983	.9991	1.0004	.9995
.700	1.013E+08	.9974	1.4127	337.44	.7197	.9098	.7920	1.0940	1.0015	.9982	.9990	1.0005	.9996
.750	1.055E+08	.9973	1.4125	335.15	.6873	.8979	.7666	1.0622	1.0012	.9981	.9989	1.0006	.9998
.800	1.092E+08	.9972	1.4123	332.76	.6548	.8854	.7406	1.0381	1.0010	.9980	.9988	1.0008	.9999
.850	1.124E+08	.9970	1.4122	330.27	.6223	.8726	.7143	1.0206	1.0007	.9980	.9987	1.0010	.9999
.900	1.151E+08	.9969	1.4120	327.69	.5901	.8594	.6879	1.0089	1.0005	.9979	.9986	1.0011	1.0000
.950	1.174E+08	.9968	1.4118	325.03	.5583	.8458	.6614	1.0022	1.0002	.9979	.9985	1.0014	1.0000
1.000	1.193E+08	.9966	1.4116	322.30	.5272	.8320	.6350	1.0000	1.0000	.9980	.9984	1.0016	1.0000
1.050	1.208E+08	.9965	1.4114	319.51	.4969	.8180	.6088	1.0021	.9998	.9980	.9984	1.0018	1.0000
1.100	1.218E+08	.9964	1.4111	316.66	.4675	.8038	.5829	1.0079	.9996	.9981	.9983	1.0021	1.0000
1.150	1.225E+08	.9963	1.4109	313.77	.4391	.7894	.5575	1.0174	.9993	.9982	.9982	1.0023	.9999
1.200	1.229E+08	.9962	1.4107	310.83	.4117	.7750	.5326	1.0303	.9991	.9983	.9982	1.0026	.9999
1.250	1.229E+08	.9961	1.4105	307.86	.3855	.7605	.5082	1.0465	.9990	.9985	.9981	1.0029	.9998
1.300	1.227E+08	.9961	1.4103	304.86	.3605	.7460	.4845	1.0659	.9988	.9987	.9981	1.0032	.9997
1.350	1.222E+08	.9960	1.4100	301.83	.3366	.7315	.4614	1.0885	.9986	.9988	.9981	1.0035	.9995
1.400	1.214E+08	.9959	1.4098	298.79	.3140	.7170	.4391	1.1142	.9984	.9991	.9981	1.0038	.9994
1.450	1.204E+08	.9959	1.4096	295.73	.2925	.7026	.4175	1.1431	.9983	.9993	.9980	1.0041	.9992
1.500	1.193E+08	.9958	1.4094	292.67	.2723	.6883	.3967	1.1751	.9982	.9995	.9980	1.0044	.9991
1.550	1.179E+08	.9958	1.4092	289.60	.2532	.6741	.3767	1.2102	.9980	.9997	.9980	1.0047	.9989
1.600	1.164E+08	.9957	1.4089	286.53	.2353	.6601	.3575	1.2486	.9979	1.0000	.9980	1.0050	.9987
1.650	1.148E+08	.9957	1.4087	283.47	.2185	.6462	.3391	1.2903	.9978	1.0002	.9980	1.0053	.9986
1.700	1.130E+08	.9957	1.4085	280.42	.2027	.6324	.3215	1.3354	.9977	1.0005	.9980	1.0055	.9984
1.750	1.112E+08	.9957	1.4083	277.38	.1880	.6189	.3046	1.3840	.9976	1.0007	.9980	1.0058	.9982
1.800	1.092E+08	.9957	1.4081	274.35	.1742	.6056	.2886	1.4361	.9975	1.0010	.9980	1.0061	.9980
1.850	1.072E+08	.9957	1.4079	271.34	.1614	.5924	.2733	1.4920	.9975	1.0012	.9979	1.0063	.9979
1.900	1.052E+08	.9957	1.4077	268.35	.1495	.5795	.2587	1.5516	.9974	1.0014	.9979	1.0065	.9977
1.950	1.031E+08	.9957	1.4075	265.39	.1384	.5669	.2448	1.6153	.9973	1.0017	.9979	1.0068	.9975
2.000	1.009E+08	.9957	1.4073	262.45	.1281	.5544	.2317	1.6830	.9973	1.0019	.9979	1.0070	.9974

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

K. TT = 300 K PT = 10 ATM DT = 11.398 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9984	1.4174	354.73	1.0000	1.0000	1.0000	I	1.0047	1.0000	1.0000	1.0000	I
.050	1.109E+07	.9984	1.4174	354.63	.9983	.9995	.9988	11.5614	1.0047	1.0000	1.0000	1.0000	.9974
.100	2.210E+07	.9984	1.4174	354.35	.9930	.9980	.9951	5.8067	1.0046	1.0000	1.0000	1.0001	.9974
.150	3.297E+07	.9983	1.4173	353.87	.9844	.9954	.9890	3.9001	1.0046	1.0000	.9999	1.0002	.9973
.200	4.362E+07	.9982	1.4173	353.22	.9722	.9919	.9803	2.9565	1.0044	.9997	.9999	1.0000	.9976
.250	5.399E+07	.9982	1.4172	352.38	.9570	.9874	.9694	2.3974	1.0043	.9996	.9998	1.0000	.9978
.300	6.402E+07	.9981	1.4171	351.36	.9389	.9820	.9564	2.0309	1.0041	.9994	.9997	1.0000	.9979
.350	7.364E+07	.9979	1.4170	350.17	.9180	.9757	.9413	1.7746	1.0039	.9992	.9996	1.0001	.9981
.400	8.282E+07	.9978	1.4169	348.81	.8947	.9685	.9244	1.5875	1.0037	.9990	.9995	1.0001	.9983
.450	9.150E+07	.9977	1.4168	347.30	.8692	.9605	.9057	1.4465	1.0034	.9988	.9994	1.0002	.9985
.500	9.966E+07	.9975	1.4166	345.63	.8418	.9517	.8854	1.3381	1.0031	.9986	.9992	1.0002	.9987
.550	1.072E+08	.9973	1.4164	343.81	.8128	.9421	.8637	1.2536	1.0028	.9983	.9991	1.0003	.9989
.600	1.143E+08	.9972	1.4163	341.86	.7826	.9319	.8408	1.1872	1.0025	.9981	.9990	1.0004	.9991
.650	1.207E+08	.9970	1.4161	339.78	.7513	.9210	.8169	1.1348	1.0022	.9980	.9988	1.0005	.9993
.700	1.265E+08	.9968	1.4159	337.58	.7193	.9096	.7921	1.0938	1.0019	.9978	.9987	1.0007	.9995
.750	1.317E+08	.9966	1.4157	335.26	.6870	.8976	.7667	1.0620	1.0016	.9977	.9986	1.0009	.9996
.800	1.363E+08	.9965	1.4154	332.84	.6544	.8852	.7408	1.0380	1.0013	.9976	.9985	1.0010	.9998
.850	1.403E+08	.9963	1.4152	330.34	.6220	.8723	.7145	1.0206	1.0009	.9974	.9983	1.0012	.9999
.900	1.437E+08	.9961	1.4150	327.74	.5898	.8591	.6881	1.0089	1.0006	.9974	.9982	1.0014	1.0000
.950	1.466E+08	.9960	1.4147	325.06	.5581	.8455	.6616	1.0022	1.0003	.9974	.9981	1.0017	1.0000
1.000	1.490E+08	.9958	1.4145	322.31	.5270	.8317	.6352	1.0001	1.0000	.9974	.9980	1.0020	1.0001
1.050	1.508E+08	.9957	1.4142	319.50	.4967	.8177	.6091	1.0021	.9997	.9975	.9980	1.0023	1.0001
1.100	1.521E+08	.9955	1.4139	316.64	.4673	.8035	.5833	1.0079	.9995	.9976	.9979	1.0026	1.0000
1.150	1.530E+08	.9954	1.4137	313.72	.4389	.7891	.5578	1.0174	.9992	.9977	.9978	1.0029	.9999
1.200	1.535E+08	.9953	1.4134	310.77	.4116	.7747	.5329	1.0303	.9989	.9979	.9978	1.0033	.9998
1.250	1.536E+08	.9952	1.4131	307.78	.3854	.7602	.5086	1.0464	.9987	.9981	.9977	1.0037	.9997
1.300	1.533E+08	.9951	1.4128	304.77	.3603	.7457	.4849	1.0658	.9985	.9983	.9977	1.0040	.9996
1.350	1.527E+08	.9950	1.4125	301.73	.3365	.7311	.4618	1.0884	.9983	.9986	.9976	1.0044	.9994
1.400	1.517E+08	.9949	1.4123	298.67	.3139	.7167	.4395	1.1141	.9981	.9988	.9976	1.0048	.9993
1.450	1.505E+08	.9948	1.4120	295.61	.2925	.7023	.4180	1.1428	.9979	.9991	.9976	1.0051	.9991
1.500	1.491E+08	.9948	1.4117	292.54	.2723	.6880	.3972	1.1748	.9977	.9994	.9975	1.0055	.9989
1.550	1.474E+08	.9947	1.4114	289.46	.2532	.6738	.3772	1.2099	.9976	.9997	.9975	1.0059	.9987
1.600	1.455E+08	.9947	1.4112	286.39	.2353	.6598	.3580	1.2482	.9974	1.0000	.9975	1.0062	.9984
1.650	1.435E+08	.9946	1.4109	283.32	.2185	.6459	.3396	1.2899	.9973	1.0003	.9975	1.0066	.9982
1.700	1.413E+08	.9946	1.4107	280.26	.2027	.6321	.3219	1.3349	.9972	1.0006	.9975	1.0070	.9980
1.750	1.390E+08	.9946	1.4104	277.22	.1880	.6186	.3051	1.3833	.9970	1.0009	.9975	1.0073	.9978
1.800	1.366E+08	.9946	1.4101	274.19	.1743	.6053	.2890	1.4354	.9969	1.0012	.9975	1.0076	.9976
1.850	1.341E+08	.9946	1.4099	271.17	.1615	.5922	.2737	1.4911	.9968	1.0015	.9975	1.0079	.9973
1.900	1.315E+08	.9946	1.4097	268.18	.1495	.5793	.2591	1.5507	.9968	1.0018	.9975	1.0082	.9971
1.950	1.289E+08	.9946	1.4094	265.21	.1384	.5666	.2453	1.6143	.9967	1.0021	.9975	1.0085	.9969
2.000	1.263E+08	.9946	1.4092	262.27	.1281	.5542	.2321	1.6819	.9966	1.0024	.9975	1.0088	.9967

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

K. TT = 300 K PT = 15 ATM DT = 17.108 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9978	1.4262	355.65	1.0000	1.0000	1.0000	I	1.0073	1.0000	1.0000	1.0000	I
.050	1.657E+07	.9978	1.4261	355.55	.9983	.9995	.9988	11.5460	1.0073	1.0000	1.0000	1.0000	.9960
.100	3.304E+07	.9977	1.4261	355.25	.9930	.9980	.9951	5.7989	1.0072	1.0000	.9999	1.0001	.9960
.150	4.929E+07	.9976	1.4261	354.76	.9842	.9954	.9888	3.8956	1.0071	.9997	.9999	1.0000	.9962
.200	6.521E+07	.9975	1.4260	354.08	.9721	.9919	.9803	2.9529	1.0069	.9996	.9998	1.0000	.9964
.250	8.072E+07	.9974	1.4259	353.21	.9568	.9873	.9695	2.3946	1.0066	.9993	.9997	1.0000	.9966
.300	9.571E+07	.9972	1.4257	352.15	.9386	.9819	.9565	2.0287	1.0064	.9991	.9995	1.0001	.9969
.350	1.101E+08	.9970	1.4256	350.92	.9176	.9755	.9414	1.7729	1.0060	.9988	.9994	1.0001	.9971
.400	1.238E+08	.9968	1.4254	349.52	.8942	.9682	.9244	1.5861	1.0057	.9985	.9992	1.0002	.9974
.450	1.368E+08	.9966	1.4252	347.95	.8686	.9602	.9057	1.4454	1.0053	.9981	.9990	1.0003	.9978
.500	1.490E+08	.9964	1.4250	346.22	.8412	.9513	.8855	1.3373	1.0049	.9978	.9988	1.0004	.9981
.550	1.604E+08	.9961	1.4247	344.35	.8121	.9417	.8639	1.2529	1.0044	.9975	.9987	1.0005	.9984
.600	1.708E+08	.9959	1.4245	342.34	.7818	.9314	.8410	1.1866	1.0039	.9972	.9985	1.0007	.9987
.650	1.804E+08	.9956	1.4242	340.20	.7505	.9205	.8171	1.1344	1.0035	.9969	.9983	1.0009	.9990
.700	1.892E+08	.9953	1.4239	337.94	.7185	.9090	.7924	1.0935	1.0030	.9967	.9981	1.0011	.9992
.750	1.970E+08	.9950	1.4235	335.57	.6862	.8970	.7671	1.0618	1.0025	.9965	.9979	1.0013	.9995
.800	2.039E+08	.9948	1.4232	333.09	.6536	.8845	.7412	1.0379	1.0020	.9963	.9977	1.0016	.9996
.850	2.099E+08	.9945	1.4229	330.52	.6212	.8716	.7150	1.0205	1.0015	.9962	.9975	1.0020	.9998
.900	2.151E+08	.9943	1.4225	327.86	.5890	.8583	.6887	1.0088	1.0010	.9962	.9974	1.0023	.9999
.950	2.194E+08	.9940	1.4221	325.13	.5573	.8448	.6623	1.0021	1.0006	.9962	.9972	1.0027	1.0000
1.000	2.229E+08	.9938	1.4217	322.34	.5263	.8309	.6360	1.0000	1.0001	.9962	.9971	1.0032	1.0000
1.050	2.257E+08	.9935	1.4214	319.48	.4961	.8169	.6099	1.0020	.9997	.9964	.9970	1.0036	1.0000
1.100	2.278E+08	.9933	1.4210	316.57	.4667	.8026	.5841	1.0078	.9993	.9965	.9969	1.0041	.9999
1.150	2.291E+08	.9931	1.4206	313.61	.4384	.7883	.5587	1.0173	.9989	.9967	.9968	1.0046	.9998
1.200	2.299E+08	.9929	1.4201	310.62	.4111	.7738	.5339	1.0301	.9985	.9970	.9967	1.0052	.9997
1.250	2.300E+08	.9928	1.4197	307.59	.3850	.7593	.5096	1.0462	.9981	.9973	.9966	1.0057	.9995
1.300	2.297E+08	.9926	1.4193	304.54	.3600	.7448	.4859	1.0655	.9978	.9976	.9966	1.0063	.9993
1.350	2.288E+08	.9925	1.4189	301.48	.3363	.7303	.4629	1.0880	.9974	.9980	.9965	1.0068	.9990
1.400	2.274E+08	.9923	1.4185	298.39	.3137	.7159	.4407	1.1135	.9971	.9984	.9965	1.0074	.9988
1.450	2.257E+08	.9922	1.4181	295.30	.2924	.7015	.4191	1.1422	.9969	.9988	.9964	1.0080	.9985
1.500	2.235E+08	.9921	1.4177	292.22	.2722	.6872	.3984	1.1741	.9966	.9991	.9964	1.0084	.9983
1.550	2.211E+08	.9920	1.4173	289.12	.2532	.6730	.3784	1.2091	.9964	.9995	.9964	1.0089	.9980
1.600	2.183E+08	.9920	1.4169	286.03	.2353	.6590	.3592	1.2472	.9962	1.0000	.9964	1.0095	.9977
1.650	2.153E+08	.9919	1.4165	282.95	.2185	.6451	.3407	1.2887	.9960	1.0005	.9964	1.0100	.9973
1.700	2.121E+08	.9919	1.4161	279.88	.2028	.6314	.3231	1.3335	.9958	1.0009	.9964	1.0106	.9970
1.750	2.087E+08	.9919	1.4157	276.82	.1881	.6179	.3063	1.3818	.9956	1.0014	.9963	1.0111	.9967
1.800	2.051E+08	.9918	1.4153	273.78	.1744	.6046	.2902	1.4336	.9954	1.0019	.9963	1.0116	.9964
1.850	2.014E+08	.9918	1.4149	270.76	.1616	.5915	.2748	1.4891	.9953	1.0023	.9963	1.0120	.9960
1.900	1.976E+08	.9918	1.4146	267.76	.1497	.5786	.2602	1.5484	.9952	1.0028	.9963	1.0125	.9957
1.950	1.937E+08	.9919	1.4142	264.79	.1386	.5660	.2463	1.6117	.9951	1.0032	.9963	1.0129	.9954
2.000	1.897E+08	.9919	1.4139	261.84	.1283	.5535	.2331	1.6791	.9950	1.0036	.9963	1.0133	.9951

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

K. TT = 300 K PT = 20 ATM DT = 22.823 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9973	1.4349	356.62	1.0000	1.0000	1.0000	I	1.0101	1.0000	1.0000	1.0000	I
.050	2.203E+07	.9972	1.4349	356.52	.9983	.9995	.9988	11.5264	1.0101	1.0000	1.0000	1.0000	.9944
.100	4.393E+07	.9972	1.4349	356.21	.9930	.9979	.9952	5.7891	1.0099	1.0000	.9999	1.0002	.9944
.150	6.552E+07	.9971	1.4348	355.70	.9841	.9954	.9889	3.8897	1.0097	.9997	.9998	1.0000	.9947
.200	8.669E+07	.9969	1.4347	354.99	.9719	.9918	.9803	2.9485	1.0095	.9994	.9997	1.0000	.9949
.250	1.073E+08	.9967	1.4345	354.09	.9566	.9872	.9695	2.3913	1.0092	.9991	.9996	1.0001	.9952
.300	1.272E+08	.9965	1.4343	353.00	.9383	.9817	.9565	2.0261	1.0088	.9987	.9994	1.0001	.9956
.350	1.463E+08	.9963	1.4341	351.72	.9173	.9753	.9414	1.7708	1.0083	.9983	.9992	1.0002	.9960
.400	1.646E+08	.9960	1.4339	350.27	.8938	.9680	.9245	1.5844	1.0078	.9979	.9990	1.0003	.9964
.450	1.818E+08	.9957	1.4336	348.64	.8681	.9598	.9059	1.4440	1.0073	.9975	.9987	1.0004	.9968
.500	1.980E+08	.9953	1.4333	346.86	.8405	.9509	.8856	1.3361	1.0067	.9971	.9985	1.0005	.9972
.550	2.132E+08	.9950	1.4330	344.93	.8114	.9413	.8640	1.2520	1.0061	.9966	.9982	1.0007	.9976
.600	2.271E+08	.9946	1.4327	342.86	.7811	.9309	.8412	1.1859	1.0055	.9962	.9979	1.0009	.9980
.650	2.399E+08	.9943	1.4323	340.66	.7497	.9200	.8174	1.1338	1.0048	.9959	.9977	1.0012	.9984
.700	2.515E+08	.9939	1.4319	338.34	.7177	.9084	.7928	1.0930	1.0042	.9956	.9974	1.0015	.9988
.750	2.619E+08	.9935	1.4315	335.90	.6853	.8964	.7675	1.0614	1.0035	.9953	.9972	1.0019	.9991
.800	2.711E+08	.9931	1.4310	333.36	.6528	.8838	.7417	1.0375	1.0028	.9951	.9970	1.0023	.9993
.850	2.791E+08	.9928	1.4306	330.73	.6204	.8709	.7156	1.0202	1.0022	.9950	.9967	1.0027	.9995
.900	2.860E+08	.9924	1.4301	328.02	.5881	.8576	.6891	1.0087	1.0015	.9947	.9965	1.0030	.9999
.950	2.918E+08	.9921	1.4296	325.24	.5565	.8440	.6628	1.0021	1.0009	.9947	.9963	1.0036	1.0000
1.000	2.965E+08	.9917	1.4291	322.39	.5255	.8301	.6366	1.0000	1.0003	.9948	.9962	1.0042	1.0000
1.050	3.002E+08	.9914	1.4286	319.48	.4953	.8161	.6106	1.0020	.9997	.9949	.9960	1.0048	1.0000
1.100	3.030E+08	.9911	1.4281	316.52	.4661	.8018	.5849	1.0078	.9991	.9951	.9959	1.0054	.9999
1.150	3.049E+08	.9908	1.4275	313.52	.4378	.7875	.5596	1.0172	.9986	.9954	.9958	1.0061	.9997
1.200	3.060E+08	.9906	1.4270	310.49	.4107	.7730	.5349	1.0298	.9980	.9960	.9957	1.0070	.9993
1.250	3.063E+08	.9904	1.4265	307.43	.3847	.7585	.5106	1.0458	.9976	.9964	.9956	1.0078	.9991
1.300	3.058E+08	.9901	1.4259	304.34	.3598	.7440	.4870	1.0650	.9971	.9968	.9955	1.0085	.9988
1.350	3.047E+08	.9899	1.4254	301.24	.3361	.7295	.4641	1.0874	.9967	.9973	.9954	1.0093	.9985
1.400	3.030E+08	.9898	1.4248	298.13	.3136	.7151	.4418	1.1128	.9963	.9979	.9954	1.0101	.9981
1.450	3.007E+08	.9896	1.4243	295.01	.2923	.7007	.4203	1.1414	.9959	.9984	.9953	1.0108	.9978
1.500	2.980E+08	.9895	1.4237	291.89	.2721	.6864	.3996	1.1730	.9955	.9990	.9953	1.0116	.9973
1.550	2.947E+08	.9894	1.4232	288.78	.2532	.6723	.3796	1.2078	.9952	.9996	.9953	1.0124	.9969
1.600	2.911E+08	.9893	1.4226	285.67	.2353	.6583	.3604	1.2458	.9949	1.0003	.9953	1.0131	.9965
1.650	2.872E+08	.9892	1.4221	282.57	.2186	.6444	.3420	1.2871	.9947	1.0009	.9953	1.0138	.9960
1.700	2.830E+08	.9891	1.4216	279.49	.2029	.6307	.3243	1.3317	.9944	1.0015	.9953	1.0146	.9956
1.750	2.785E+08	.9891	1.4211	276.42	.1882	.6172	.3075	1.3798	.9942	1.0022	.9953	1.0152	.9951
1.800	2.738E+08	.9891	1.4206	273.37	.1745	.6039	.2914	1.4313	.9940	1.0028	.9953	1.0159	.9947
1.850	2.689E+08	.9891	1.4201	270.34	.1617	.5908	.2760	1.4866	.9938	1.0034	.9953	1.0165	.9943
1.900	2.639E+08	.9891	1.4196	267.33	.1498	.5780	.2614	1.5457	.9936	1.0040	.9953	1.0172	.9938
1.950	2.587E+08	.9891	1.4191	264.35	.1388	.5653	.2475	1.6087	.9935	1.0046	.9953	1.0177	.9934
2.000	2.535E+08	.9891	1.4187	261.40	.1285	.5529	.2343	1.6757	.9933	1.0052	.9952	1.0183	.9930

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

K. TT = 300 K PT = 25 ATM DT = 28.540 KGM/M3 CONTINUED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									-------RELATIVE TO IDEAL GAS VALUES-------				
0.000	0.	.9969	1.4437	357.66	1.0000	1.0000	1.0000	I	1.0130	1.0000	1.0000	1.0000	I
.050	2.747E+07	.9968	1.4436	357.55	.9983	.9995	.9988	11.5086	1.0130	1.0000	1.0000	1.0001	.9929
.100	5.475E+07	.9967	1.4436	357.23	.9928	.9979	.9950	5.7813	1.0128	.9998	.9999	1.0000	.9930
.150	8.167E+07	.9966	1.4435	356.70	.9840	.9953	.9889	3.8840	1.0126	.9996	.9998	1.0000	.9933
.200	1.080E+08	.9964	1.4433	355.97	.9718	.9917	.9803	2.9444	1.0123	.9993	.9996	1.0001	.9936
.250	1.337E+08	.9962	1.4432	355.03	.9564	.9871	.9695	2.3881	1.0118	.9989	.9995	1.0001	.9939
.300	1.586E+08	.9959	1.4430	353.89	.9380	.9816	.9565	2.0236	1.0113	.9984	.9992	1.0002	.9944
.350	1.824E+08	.9956	1.4427	352.57	.9169	.9751	.9415	1.7688	1.0108	.9979	.9990	1.0002	.9948
.400	2.051E+08	.9952	1.4424	351.06	.8933	.9677	.9246	1.5827	1.0101	.9974	.9987	1.0004	.9953
.450	2.266E+08	.9948	1.4421	349.39	.8675	.9595	.9060	1.4427	1.0094	.9968	.9984	1.0005	.9959
.500	2.468E+08	.9944	1.4417	347.55	.8399	.9506	.8858	1.3350	1.0087	.9963	.9981	1.0007	.9964
.550	2.656E+08	.9939	1.4413	345.55	.8105	.9408	.8641	1.2514	1.0079	.9955	.9978	1.0007	.9972
.600	2.830E+08	.9935	1.4409	343.42	.7801	.9304	.8413	1.1855	1.0071	.9950	.9974	1.0010	.9977
.650	2.989E+08	.9930	1.4404	341.15	.7487	.9194	.8175	1.1336	1.0063	.9945	.9971	1.0013	.9982
.700	3.134E+08	.9925	1.4400	338.77	.7167	.9078	.7929	1.0929	1.0054	.9941	.9968	1.0017	.9987
.750	3.263E+08	.9920	1.4394	336.27	.6843	.8957	.7677	1.0614	1.0046	.9938	.9965	1.0021	.9991
.800	3.378E+08	.9915	1.4389	333.67	.6518	.8832	.7420	1.0376	1.0037	.9935	.9962	1.0027	.9994
.850	3.479E+08	.9911	1.4383	330.98	.6194	.8702	.7159	1.0203	1.0029	.9934	.9959	1.0032	.9997
.900	3.565E+08	.9906	1.4378	328.21	.5873	.8569	.6897	1.0087	1.0021	.9933	.9957	1.0039	.9999
.950	3.638E+08	.9902	1.4372	325.36	.5557	.8433	.6634	1.0021	1.0013	.9933	.9955	1.0045	1.0000
1.000	3.698E+08	.9897	1.4365	322.46	.5248	.8294	.6373	1.0000	1.0005	.9934	.9953	1.0053	1.0000
1.050	3.745E+08	.9893	1.4359	319.50	.4947	.8153	.6113	1.0020	.9997	.9936	.9951	1.0061	1.0000
1.100	3.780E+08	.9890	1.4353	316.49	.4655	.8011	.5857	1.0078	.9990	.9938	.9949	1.0069	.9999
1.150	3.805E+08	.9886	1.4346	313.45	.4373	.7867	.5605	1.0171	.9983	.9942	.9948	1.0078	.9997
1.200	3.818E+08	.9883	1.4339	310.37	.4102	.7722	.5358	1.0298	.9977	.9946	.9946	1.0087	.9994
1.250	3.822E+08	.9880	1.4333	307.27	.3842	.7577	.5116	1.0458	.9971	.9952	.9945	1.0096	.9991
1.300	3.817E+08	.9877	1.4326	304.15	.3594	.7432	.4880	1.0650	.9965	.9957	.9944	1.0106	.9988
1.350	3.804E+08	.9874	1.4319	301.02	.3357	.7288	.4651	1.0872	.9959	.9964	.9944	1.0116	.9983
1.400	3.784E+08	.9872	1.4312	297.88	.3133	.7143	.4429	1.1126	.9954	.9970	.9943	1.0125	.9979
1.450	3.756E+08	.9870	1.4305	294.74	.2921	.7000	.4214	1.1410	.9950	.9978	.9943	1.0135	.9974
1.500	3.722E+08	.9868	1.4299	291.59	.2720	.6857	.4007	1.1725	.9945	.9985	.9943	1.0145	.9969
1.550	3.683E+08	.9867	1.4292	288.46	.2531	.6716	.3808	1.2071	.9941	.9993	.9942	1.0155	.9963
1.600	3.639E+08	.9866	1.4285	285.33	.2353	.6576	.3616	1.2450	.9937	1.0001	.9942	1.0164	.9958
1.650	3.590E+08	.9865	1.4279	282.21	.2186	.6437	.3432	1.2860	.9934	1.0009	.9942	1.0173	.9952
1.700	3.538E+08	.9864	1.4272	279.11	.2029	.6300	.3255	1.3304	.9931	1.0017	.9942	1.0182	.9947
1.750	3.483E+08	.9863	1.4266	276.03	.1883	.6166	.3087	1.3783	.9928	1.0025	.9942	1.0191	.9941
1.800	3.425E+08	.9863	1.4260	272.97	.1746	.6033	.2925	1.4297	.9925	1.0033	.9942	1.0200	.9935
1.850	3.364E+08	.9863	1.4253	269.93	.1619	.5902	.2772	1.4847	.9923	1.0041	.9942	1.0208	.9930
1.900	3.302E+08	.9863	1.4247	266.92	.1500	.5774	.2625	1.5435	.9921	1.0049	.9942	1.0215	.9924
1.950	3.238E+08	.9863	1.4241	263.93	.1389	.5647	.2486	1.6062	.9919	1.0056	.9942	1.0223	.9919
2.000	3.173E+08	.9863	1.4236	260.98	.1286	.5524	.2353	1.6730	.9917	1.0063	.9942	1.0230	.9914

TABLE I. REAL-GAS ISENTROPIC EXPANSIONS OF NITROGEN

K. TT = 300 K PT = 30 ATM DT = 34.258 KGM/M3 CONCLUDED

MACH	REY/M	Z	GAMMA	W M/SEC	P/PT	T/TT	D/DT	A/A*	W	P/PT	T/TT	D/DT	A/A*
									RELATIVE TO IDEAL GAS VALUES				
0.000	0.	.9966	1.4524	358.75	1.0000	1.0000	1.0000	1	1.0161	1.0000	1.0000	1.0000	1
.050	3.287E+07	.9965	1.4524	358.64	.9983	.9995	.9988	11.4903	1.0161	1.0000	1.0000	1.0001	.9913
.100	6.552E+07	.9964	1.4523	358.31	.9928	.9979	.9950	5.7723	1.0159	.9998	.9999	1.0000	.9915
.150	9.774E+07	.9963	1.4522	357.76	.9839	.9953	.9889	3.8781	1.0156	.9995	.9998	1.0000	.9918
.200	1.293E+08	.9960	1.4520	356.99	.9716	.9916	.9804	2.9402	1.0152	.9991	.9996	1.0001	.9921
.250	1.601E+08	.9957	1.4518	356.02	.9561	.9870	.9695	2.3849	1.0147	.9986	.9993	1.0001	.9926
.300	1.898E+08	.9954	1.4516	354.84	.9377	.9814	.9566	2.0210	1.0140	.9981	.9991	1.0002	.9931
.350	2.183E+08	.9950	1.4513	353.47	.9164	.9749	.9416	1.7667	1.0133	.9975	.9988	1.0003	.9937
.400	2.455E+08	.9945	1.4509	351.91	.8928	.9675	.9247	1.5811	1.0126	.9968	.9984	1.0005	.9943
.450	2.712E+08	.9940	1.4505	350.17	.8667	.9592	.9059	1.4417	1.0117	.9959	.9981	1.0004	.9952
.500	2.953E+08	.9935	1.4501	348.27	.8390	.9502	.8857	1.3344	1.0108	.9952	.9977	1.0006	.9959
.550	3.178E+08	.9929	1.4497	346.22	.8097	.9404	.8642	1.2507	1.0098	.9946	.9973	1.0009	.9965
.600	3.387E+08	.9924	1.4492	344.02	.7793	.9300	.8415	1.1849	1.0089	.9939	.9969	1.0012	.9972
.650	3.577E+08	.9918	1.4486	341.69	.7478	.9189	.8178	1.1332	1.0078	.9933	.9966	1.0016	.9978
.700	3.750E+08	.9912	1.4481	339.23	.7158	.9073	.7932	1.0926	1.0068	.9928	.9962	1.0021	.9984
.750	3.906E+08	.9906	1.4475	336.67	.6834	.8951	.7681	1.0612	1.0058	.9924	.9958	1.0026	.9989
.800	4.043E+08	.9900	1.4468	334.00	.6509	.8825	.7424	1.0375	1.0047	.9921	.9955	1.0032	.9993
.850	4.164E+08	.9894	1.4462	331.25	.6185	.8695	.7164	1.0203	1.0037	.9919	.9952	1.0039	.9996
.900	4.268E+08	.9889	1.4455	328.42	.5864	.8562	.6903	1.0087	1.0027	.9918	.9949	1.0047	.9998
.950	4.355E+08	.9883	1.4448	325.52	.5549	.8425	.6641	1.0021	1.0017	.9918	.9946	1.0055	1.0000
1.000	4.427E+08	.9878	1.4440	322.55	.5240	.8286	.6380	1.0000	1.0008	.9919	.9944	1.0064	1.0000
1.050	4.485E+08	.9873	1.4433	319.54	.4940	.8145	.6122	1.0020	.9999	.9922	.9941	1.0074	1.0000
1.100	4.528E+08	.9868	1.4425	316.49	.4649	.8003	.5866	1.0078	.9990	.9925	.9940	1.0084	.9998
1.150	4.557E+08	.9864	1.4417	313.40	.4367	.7859	.5615	1.0171	.9982	.9930	.9938	1.0095	.9996
1.200	4.575E+08	.9860	1.4409	310.28	.4097	.7715	.5368	1.0297	.9974	.9935	.9936	1.0106	.9993
1.250	4.580E+08	.9856	1.4401	307.14	.3838	.7570	.5127	1.0456	.9966	.9941	.9935	1.0118	.9989
1.300	4.575E+08	.9852	1.4393	303.98	.3590	.7425	.4891	1.0647	.9959	.9948	.9934	1.0129	.9985
1.350	4.560E+08	.9849	1.4385	300.81	.3355	.7280	.4663	1.0868	.9953	.9956	.9934	1.0141	.9980
1.400	4.537E+08	.9846	1.4377	297.64	.3131	.7136	.4441	1.1121	.9946	.9964	.9933	1.0153	.9974
1.450	4.504E+08	.9844	1.4369	294.47	.2919	.6992	.4227	1.1403	.9941	.9973	.9933	1.0165	.9968
1.500	4.465E+08	.9842	1.4361	291.30	.2719	.6850	.4020	1.1717	.9935	.9982	.9932	1.0177	.9962
1.550	4.419E+08	.9840	1.4353	288.14	.2531	.6709	.3820	1.2062	.9930	.9991	.9932	1.0188	.9956
1.600	4.367E+08	.9838	1.4345	285.00	.2353	.6569	.3629	1.2438	.9926	1.0001	.9932	1.0200	.9949
1.650	4.310E+08	.9837	1.4337	281.86	.2186	.6431	.3444	1.2847	.9922	1.0011	.9932	1.0211	.9942
1.700	4.248E+08	.9836	1.4330	278.75	.2030	.6294	.3268	1.3289	.9918	1.0021	.9932	1.0222	.9935
1.750	4.182E+08	.9835	1.4322	275.65	.1884	.6160	.3099	1.3765	.9914	1.0031	.9932	1.0233	.9928
1.800	4.114E+08	.9835	1.4314	272.58	.1747	.6027	.2938	1.4277	.9911	1.0040	.9932	1.0243	.9921
1.850	4.042E+08	.9835	1.4307	269.53	.1620	.5896	.2784	1.4824	.9908	1.0050	.9932	1.0253	.9915
1.900	3.968E+08	.9835	1.4300	266.51	.1501	.5768	.2637	1.5410	.9906	1.0059	.9933	1.0263	.9908
1.950	3.892E+08	.9835	1.4293	263.52	.1391	.5642	.2498	1.6034	.9903	1.0068	.9933	1.0272	.9902
2.000	3.815E+08	.9835	1.4286	260.56	.1288	.5518	.2365	1.6699	.9901	1.0077	.9933	1.0280	.9896

TABLE KEY

Each table accounts for a certain stagnation temperature and is subdivided (by letter) for various values of stagnation pressure. Lists of the table-temperature and letter-pressure correspondence are as follows:

Table number	$T_{t,1}$, K
II	100
III	110
IV	120
V	130
VI	140
VII	150
VIII	175
IX	200
X	250
XI	300

Letter subdivision	$p_{t,1}$, atm
A	1
B	3
C	5
D	8
E	10
F	20
G	30

These tables were compiled by selecting stagnation pressure and temperature and incrementing the upstream Mach number by 0.05 from 1.0 to 3.0. If the free-stream saturation boundary was reached or the temperature dropped below the triple point temperature, the solutions were terminated before reaching the maximum Mach number of 3.0. For each subdivision of a table, there are two pages of information. The first page shows each of the downstream flow parameters in dimensional form as well as its value relative to its upstream value. The second page shows the ratio of each relative parameter to the corresponding value for an ideal diatomic gas.

TABLE NOMENCLATURE

ATM	1 atmosphere (1 atm = 101.32 kN/m^2)
D1	static density upstream of shock
D2	static density downstream of shock
DT1	stagnation density upstream of shock
DT2/DT1	ratio of downstream stagnation density to upstream stagnation density
KGM/M3	kilograms per cubic meter
M1	upstream Mach number
M2	downstream Mach number
P2	downstream static pressure
P2/P1	ratio of downstream static pressure to upstream static pressure
PT1	upstream stagnation pressure
PT2	downstream stagnation pressure
T2	downstream static temperature
T2/T1	ratio of upstream static temperature to downstream static temperature

TT1	upstream stagnation temperature
TT2	downstream stagnation temperature

TABLE II. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 100 K

A. PT1 = 1. ATM DT1 = 3.483 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	.5289	83.27	2.208	1.0001	100.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9530	.5581	84.57	2.294	.9999	100.00	1.1196	1.0330	1.0842	.9999	1.0000	.9999
1.10	.9116	.5838	85.69	2.369	.9990	100.00	1.2450	1.0652	1.1695	.9990	1.0000	.9989
1.15	.8747	.6061	86.67	2.432	.9967	99.99	1.3762	1.0970	1.2557	.9967	.9999	.9967
1.20	.8418	.6248	87.53	2.482	.9928	99.99	1.5131	1.1284	1.3424	.9928	.9999	.9928
1.25	.8124	.6401	88.28	2.522	.9871	99.98	1.6557	1.1598	1.4294	.9871	.9998	.9870
1.30	.7857	.6521	88.94	2.550	.9794	99.97	1.8042	1.1913	1.5167	.9794	.9997	.9793
1.35	.7615	.6609	89.52	2.567	.9697	99.95	1.9585	1.2229	1.6039	.9697	.9995	.9696
1.40	.7395	.6667	90.04	2.574	.9582	99.93	2.1186	1.2549	1.6909	.9582	.9993	.9580
1.45	.7194	.6697	90.50	2.572	.9448	99.91	2.2846	1.2872	1.7775	.9448	.9991	.9446
1.50	.7009	.6701	90.91	2.561	.9297	99.89	2.4564	1.3200	1.8636	.9297	.9989	.9295
1.55	.6839	.6680	91.28	2.542	.9130	99.86	2.6341	1.3533	1.9490	.9130	.9986	.9128

LAST POINT AT SATURATION BOUNDARY

TABLE II. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 100 K

A. PT1 = 1. ATM DT1 = 3.483 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9999	1.0000	1.0001	1.0002	1.0001	1.0000	1.0000
1.10	.9998	1.0000	1.0003	1.0003	1.0001	1.0000	1.0000
1.15	.9997	.9999	1.0003	1.0005	1.0000	.9999	1.0000
1.20	.9996	.9998	1.0004	1.0006	1.0000	.9999	1.0000
1.25	.9997	.9997	1.0004	1.0006	1.0000	.9998	1.0000
1.30	.9996	.9996	1.0003	1.0007	1.0000	.9997	.9999
1.35	.9997	.9994	1.0002	1.0007	1.0000	.9995	.9999
1.40	.9997	.9994	1.0001	1.0007	1.0000	.9993	.9998
1.45	.9997	.9993	1.0000	1.0008	.9999	.9991	.9997
1.50	.9997	.9992	.9998	1.0008	.9999	.9989	.9997
1.55	.9997	.9992	.9996	1.0009	.9998	.9986	.9995

LAST POINT AT SATURATION BOUNDARY

TABLE III. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 110 K

A. PT1 = 1. ATM DT1 = 3.151 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	.5287	91.60	1.997	1.0000	110.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9530	.5579	93.03	2.076	.9999	110.00	1.1196	1.0330	1.0841	.9999	1.0000	.9999
1.10	.9116	.5836	94.26	2.143	.9990	110.00	1.2450	1.0652	1.1693	.9990	1.0000	.9989
1.15	.8748	.6058	95.34	2.200	.9967	110.00	1.3762	1.0969	1.2554	.9967	1.0000	.9967
1.20	.8419	.6246	96.28	2.246	.9928	109.99	1.5132	1.1284	1.3421	.9928	.9999	.9928
1.25	.8124	.6399	97.11	2.281	.9871	109.98	1.6559	1.1598	1.4291	.9871	.9998	.9870
1.30	.7857	.6519	97.84	2.306	.9794	109.97	1.8044	1.1913	1.5163	.9794	.9997	.9793
1.35	.7615	.6607	98.49	2.322	.9697	109.96	1.9588	1.2230	1.6035	.9697	.9996	.9697
1.40	.7395	.6666	99.06	2.329	.9582	109.94	2.1189	1.2550	1.6904	.9582	.9995	.9581
1.45	.7194	.6696	99.57	2.327	.9448	109.92	2.2850	1.2874	1.7769	.9448	.9993	.9447
1.50	.7009	.6700	100.03	2.317	.9297	109.90	2.4568	1.3203	1.8629	.9297	.9991	.9296
1.55	.6839	.6679	100.45	2.300	.9131	109.88	2.6344	1.3537	1.9483	.9131	.9989	.9129
1.60	.6683	.6637	100.81	2.277	.8951	109.86	2.8179	1.3876	2.0328	.8951	.9987	.8948
1.65	.6538	.6574	101.15	2.247	.8758	109.83	3.0072	1.4222	2.1163	.8758	.9985	.8756
1.70	.6404	.6494	101.45	2.213	.8555	109.80	3.2024	1.4575	2.1989	.8555	.9982	.8552
1.75	.6279	.6398	101.72	2.174	.8343	109.77	3.4034	1.4934	2.2803	.8343	.9979	.8340
1.80	.6163	.6289	101.97	2.130	.8124	109.74	3.6102	1.5301	2.3605	.8124	.9977	.8120
1.85	.6056	.6167	102.19	2.084	.7899	109.71	3.8229	1.5675	2.4395	.7899	.9974	.7895

LAST POINT AT SATURATION BOUNDARY

TABLE III. REAL-GAS NORMAL SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 110 K

A. PT1 = 1. ATM DT1 = 3.151 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9999	1.0000	1.0001	1.0001	1.0001	1.0000	1.0000
1.10	.9998	1.0000	1.0002	1.0002	1.0000	1.0000	1.0000
1.15	.9997	.9999	1.0003	1.0003	1.0000	1.0000	1.0000
1.20	.9996	.9999	1.0004	1.0004	1.0000	.9999	1.0000
1.25	.9997	.9998	1.0004	1.0004	1.0000	.9998	1.0000
1.30	.9997	.9997	1.0004	1.0004	1.0000	.9997	1.0000
1.35	.9997	.9996	1.0003	1.0004	1.0000	.9996	.9999
1.40	.9997	.9995	1.0003	1.0004	1.0000	.9995	.9999
1.45	.9997	.9994	1.0002	1.0005	1.0000	.9993	.9998
1.50	.9997	.9994	1.0001	1.0005	.9999	.9991	.9998
1.55	.9998	.9993	.9999	1.0005	.9999	.9989	.9997
1.60	.9998	.9993	.9998	1.0005	.9999	.9987	.9996
1.65	.9998	.9992	.9996	1.0005	.9998	.9985	.9995
1.70	.9998	.9992	.9994	1.0005	.9998	.9982	.9994
1.75	.9997	.9992	.9992	1.0005	.9997	.9979	.9993
1.80	.9997	.9991	.9990	1.0006	.9996	.9977	.9992
1.85	.9998	.9991	.9988	1.0006	.9995	.9974	.9990

LAST POINT AT SATURATION BOUNDARY

TABLE III. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 110 K

8. PT1 = 3. ATM DT1 = 9.761 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	1.5885	91.48	6.186	3.0001	110.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9528	1.6763	92.92	6.430	2.9996	110.00	1.1196	1.0332	1.0844	.9999	1.0000	.9999
1.10	.9112	1.7538	94.16	6.640	2.9968	110.00	1.2449	1.0657	1.1699	.9989	1.0000	.9989
1.15	.8746	1.8201	95.23	6.815	2.9900	109.99	1.3755	1.0975	1.2560	.9967	.9999	.9967
1.20	.8418	1.8760	96.17	6.956	2.9783	109.97	1.5120	1.1291	1.3427	.9928	.9997	.9927
1.25	.8123	1.9218	96.99	7.066	2.9610	109.95	1.6543	1.1605	1.4298	.9870	.9995	.9869
1.30	.7857	1.9576	97.70	7.144	2.9379	109.91	1.8023	1.1919	1.5172	.9793	.9992	.9792
1.35	.7614	1.9840	98.33	7.192	2.9088	109.87	1.9563	1.2236	1.6045	.9696	.9989	.9694
1.40	.7394	2.0012	98.88	7.212	2.8741	109.83	2.1160	1.2554	1.6916	.9580	.9984	.9577
1.45	.7193	2.0101	99.36	7.205	2.8337	109.77	2.2815	1.2876	1.7784	.9446	.9979	.9442

LAST POINT AT SATURATION BOUNDARY

TABLE III. REAL-GAS NORMAL SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 110 K

8. PT1 = 3. ATM DT1 = 9.761 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9997	1.0000	1.0004	1.0004	1.0000	1.0000	1.0000
1.10	.9994	.9999	1.0007	1.0007	1.0000	1.0000	1.0000
1.15	.9995	.9995	1.0009	1.0007	1.0000	.9999	1.0000
1.20	.9996	.9991	1.0009	1.0008	1.0000	.9997	.9999
1.25	.9996	.9988	1.0010	1.0009	1.0000	.9995	.9999
1.30	.9996	.9985	1.0009	1.0010	.9999	.9992	.9998
1.35	.9996	.9983	1.0008	1.0011	.9999	.9989	.9997
1.40	.9996	.9981	1.0006	1.0012	.9998	.9984	.9995
1.45	.9996	.9979	1.0003	1.0013	.9997	.9979	.9994

LAST POINT AT SATURATION BOUNDARY

TABLE III. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 110 K

C. PT1 = 5. ATM DT1 = 16.850 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	2.6522	91.36	10.680	5.0000	110.00	1.0000	1.0000	1.0000	1.0002	1.0000	1.0001
1.05	.9526	2.7992	92.81	11.103	5.0001	110.00	1.1195	1.0335	1.0847	1.0000	1.0000	1.0000
1.10	.9111	2.9272	94.05	11.463	4.9945	109.99	1.2443	1.0661	1.1702	.9989	.9999	.9989
1.15	.8745	3.0374	95.13	11.764	4.9833	109.98	1.3746	1.0980	1.2563	.9967	.9998	.9966
1.20	.8417	3.1304	96.06	12.008	4.9637	109.95	1.5106	1.1296	1.3432	.9927	.9995	.9927

LAST POINT AT SATURATION BOUNDARY

TABLE III. REAL-GAS NORMAL SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 110 K

C. PT1 = 5. ATM DT1 = 16.850 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0002	1.0000	1.0001
1.05	.9994	1.0000	1.0006	1.0007	1.0002	1.0000	1.0001
1.10	.9993	.9995	1.0011	1.0009	1.0000	.9999	1.0000
1.15	.9994	.9988	1.0013	1.0010	1.0000	.9998	.9999
1.20	.9995	.9982	1.0015	1.0012	.9999	.9995	.9999

LAST POINT AT SATURATION BOUNDARY

TABLE IV. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 120 K

A. PT1 = 1. ATM DT1 = 2.878 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	.5285	99.93	1.825	1.0000	120.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	.5577	101.49	1.896	.9999	120.00	1.1196	1.0330	1.0841	.9999	1.0000	.9999
1.10	.9116	.5834	102.83	1.958	.9990	120.00	1.2450	1.0652	1.1693	.9990	1.0000	.9989
1.15	.8748	.6057	104.01	2.009	.9967	120.00	1.3762	1.0969	1.2553	.9967	1.0000	.9967
1.20	.8419	.6244	105.04	2.051	.9928	119.99	1.5132	1.1284	1.3419	.9928	.9999	.9928
1.25	.8124	.6398	105.94	2.084	.9871	119.98	1.6560	1.1598	1.4289	.9871	.9999	.9870
1.30	.7857	.6518	106.74	2.107	.9794	119.98	1.8046	1.1913	1.5160	.9794	.9998	.9793
1.35	.7615	.6606	107.45	2.121	.9697	119.96	1.9590	1.2231	1.6032	.9697	.9997	.9697
1.40	.7395	.6664	108.08	2.127	.9582	119.95	2.1191	1.2551	1.6900	.9582	.9996	.9581
1.45	.7194	.6695	108.64	2.126	.9448	119.94	2.2852	1.2875	1.7765	.9448	.9995	.9447
1.50	.7009	.6699	109.15	2.117	.9298	119.92	2.4570	1.3204	1.8625	.9298	.9993	.9296
1.55	.6840	.6678	109.60	2.101	.9131	119.90	2.6347	1.3539	1.9478	.9131	.9992	.9130
1.60	.6683	.6636	110.01	2.080	.8951	119.88	2.8183	1.3879	2.0322	.8951	.9990	.8950
1.65	.6538	.6574	110.38	2.053	.8759	119.86	3.0077	1.4226	2.1158	.8759	.9988	.8757
1.70	.6404	.6494	110.72	2.022	.8556	119.83	3.2029	1.4579	2.1983	.8556	.9986	.8554
1.75	.6280	.6398	111.02	1.986	.8344	119.81	3.4039	1.4939	2.2796	.8344	.9984	.8342
1.80	.6164	.6289	111.29	1.947	.8125	119.78	3.6107	1.5307	2.3598	.8125	.9982	.8122
1.85	.6056	.6167	111.54	1.904	.7900	119.76	3.8234	1.5682	2.4387	.7900	.9980	.7897
1.90	.5955	.6036	111.77	1.860	.7671	119.73	4.0419	1.6064	2.5163	.7671	.9977	.7668
1.95	.5861	.5896	111.98	1.813	.7439	119.70	4.2662	1.6455	2.5926	.7439	.9975	.7436
2.00	.5772	.5750	112.18	1.764	.7205	119.67	4.4965	1.6854	2.6674	.7205	.9973	.7202
2.05	.5689	.5598	112.35	1.714	.6971	119.65	4.7325	1.7261	2.7408	.6971	.9971	.6967
2.10	.5612	.5441	112.51	1.664	.6738	119.62	4.9744	1.7676	2.8127	.6738	.9968	.6734

T1 NEAR TRIPLE-POINT TEMPERATURE

TABLE IV. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 120 K

A. PT1 = 1. ATM DT1 = 2.878 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9999	1.0000	1.0001	1.0001	1.0000	1.0000	1.0000
1.10	.9998	1.0000	1.0002	1.0001	1.0000	1.0000	1.0000
1.15	.9998	1.0000	1.0003	1.0002	1.0000	1.0000	1.0000
1.20	.9997	.9999	1.0004	1.0002	1.0000	.9999	1.0000
1.25	.9997	.9998	1.0004	1.0002	1.0000	.9999	1.0000
1.30	.9997	.9998	1.0004	1.0002	1.0000	.9998	1.0000
1.35	.9997	.9997	1.0004	1.0002	1.0000	.9997	.9999
1.40	.9998	.9996	1.0003	1.0002	1.0000	.9996	.9999
1.45	.9998	.9995	1.0002	1.0002	1.0000	.9995	.9999
1.50	.9998	.9995	1.0002	1.0002	1.0000	.9993	.9998
1.55	.9998	.9994	1.0001	1.0002	.9999	.9992	.9998
1.60	.9998	.9994	1.0000	1.0002	.9999	.9990	.9997
1.65	.9997	.9994	.9998	1.0002	.9999	.9988	.9996
1.70	.9998	.9993	.9997	1.0002	.9998	.9986	.9996
1.75	.9998	.9993	.9996	1.0002	.9998	.9984	.9995
1.80	.9998	.9993	.9994	1.0003	.9998	.9982	.9994
1.85	.9998	.9993	.9992	1.0003	.9997	.9980	.9993
1.90	.9998	.9992	.9991	1.0003	.9997	.9977	.9993
1.95	.9998	.9992	.9989	1.0003	.9996	.9975	.9992
2.00	.9997	.9992	.9987	1.0003	.9995	.9973	.9990
2.05	.9998	.9992	.9986	1.0003	.9994	.9971	.9989
2.10	.9998	.9992	.9984	1.0003	.9994	.9968	.9988

T1 NEAR TRIPLE-POINT TEMPERATURE

TABLE IV. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 120 K

B. PT1 = 3. ATM DT1 = 8.648 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	1.5872	99.80	5.609	3.0001	120.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9529	1.6749	101.37	5.829	2.9996	120.00	1.1196	1.0332	1.0842	.9999	1.0000	.9999
1.10	.9113	1.7523	102.73	6.019	2.9968	120.00	1.2449	1.0656	1.1696	.9989	1.0000	.9989
1.15	.8746	1.8188	103.90	6.178	2.9900	119.99	1.3758	1.0975	1.2556	.9967	.9999	.9967
1.20	.8418	1.8748	104.92	6.306	2.9783	119.97	1.5123	1.1290	1.3422	.9928	.9998	.9927
1.25	.8123	1.9205	105.82	6.406	2.9611	119.95	1.6547	1.1605	1.4292	.9870	.9996	.9870
1.30	.7857	1.9564	106.61	6.476	2.9380	119.93	1.8029	1.1920	1.5164	.9793	.9994	.9792
1.35	.7615	1.9828	107.30	6.520	2.9090	119.89	1.9569	1.2237	1.6035	.9697	.9991	.9695
1.40	.7395	2.0003	107.91	6.539	2.8742	119.85	2.1167	1.2556	1.6905	.9581	.9988	.9579
1.45	.7193	2.0091	108.45	6.533	2.8341	119.81	2.2823	1.2879	1.7771	.9447	.9984	.9444
1.50	.7008	2.0102	108.93	6.505	2.7887	119.75	2.4538	1.3206	1.8631	.9296	.9979	.9293
1.55	.6839	2.0039	109.35	6.457	2.7388	119.69	2.6311	1.3538	1.9485	.9129	.9975	.9125
1.60	.6682	1.9911	109.72	6.390	2.6846	119.63	2.8141	1.3875	2.0330	.8949	.9969	.8944
1.65	.6537	1.9722	110.05	6.307	2.6267	119.56	3.0031	1.4218	2.1167	.8756	.9964	.8750
1.70	.6403	1.9480	110.34	6.209	2.5656	119.49	3.1978	1.4567	2.1993	.8552	.9958	.8546
1.75	.6279	1.9191	110.60	6.098	2.5019	119.42	3.3983	1.4923	2.2808	.8340	.9951	.8333
1.80	.6162	1.8860	110.83	5.977	2.4359	119.34	3.6048	1.5285	2.3610	.8120	.9945	.8112

LAST POINT AT SATURATION BOUNDARY

TABLE IV. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 120 K

8. PT1 = 3. ATM DT1 = 8.848 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9997	1.0000	1.0003	1.0002	1.0000	1.0000	1.0000
1.10	.9995	.9999	1.0006	1.0004	1.0000	1.0000	1.0000
1.15	.9995	.9996	1.0008	1.0004	1.0000	.9999	1.0000
1.20	.9996	.9993	1.0009	1.0004	1.0000	.9998	.9999
1.25	.9996	.9990	1.0010	1.0004	1.0000	.9996	.9999
1.30	.9997	.9988	1.0009	1.0004	.9999	.9994	.9998
1.35	.9997	.9986	1.0009	1.0005	.9999	.9991	.9998
1.40	.9996	.9985	1.0007	1.0005	.9999	.9988	.9997
1.45	.9997	.9983	1.0005	1.0005	.9998	.9984	.9996
1.50	.9996	.9982	1.0003	1.0006	.9998	.9979	.9994
1.55	.9997	.9980	1.0000	1.0006	.9997	.9975	.9993
1.60	.9997	.9979	.9997	1.0006	.9996	.9969	.9991
1.65	.9996	.9978	.9993	1.0007	.9995	.9964	.9989
1.70	.9996	.9977	.9989	1.0007	.9994	.9958	.9987
1.75	.9997	.9977	.9985	1.0007	.9993	.9951	.9985
1.80	.9996	.9976	.9980	1.0008	.9991	.9945	.9982

LAST POINT AT SATURATION BOUNDARY

TABLE IV. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 120 K

C. PT1 = 5. ATM DT1 = 15.133 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	2.6483	99.68	9.596	5.0004	120.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9527	2.7949	101.26	9.974	4.9996	120.00	1.1195	1.0334	1.0844	.9999	1.0000	.9999
1.10	.9111	2.9238	102.62	10.299	4.9949	119.99	1.2447	1.0660	1.1698	.9990	.9999	.9989
1.15	.8745	3.0339	103.79	10.569	4.9837	119.98	1.3750	1.0979	1.2557	.9967	.9998	.9967
1.20	.8418	3.1271	104.81	10.789	4.9643	119.96	1.5112	1.1296	1.3423	.9929	.9996	.9928
1.25	.8123	3.2032	105.70	10.958	4.9355	119.92	1.6532	1.1611	1.4294	.9871	.9994	.9870
1.30	.7856	3.2629	106.47	11.079	4.8970	119.88	1.8010	1.1926	1.5166	.9794	.9990	.9792
1.35	.7614	3.3068	107.15	11.153	4.8486	119.82	1.9546	1.2242	1.6038	.9697	.9985	.9695
1.40	.7394	3.3357	107.74	11.184	4.7906	119.75	2.1140	1.2561	1.6909	.9581	.9979	.9578
1.45	.7193	3.3503	108.25	11.173	4.7235	119.67	2.2792	1.2882	1.7775	.9447	.9973	.9443
1.50	.7008	3.3518	108.70	11.125	4.6478	119.58	2.4502	1.3207	1.8637	.9296	.9965	.9291
1.55	.6837	3.3413	109.09	11.041	4.5643	119.49	2.6270	1.3536	1.9492	.9129	.9957	.9122
1.60	.6681	3.3195	109.42	10.926	4.4738	119.38	2.8096	1.3870	2.0338	.8948	.9948	.8940

LAST POINT AT SATURATION BOUNDARY

TABLE IV. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 120 K

C. PT1 = 5. ATM DT1 = 15.133 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9995	1.0000	1.0006	1.0004	1.0001	1.0000	1.0000
1.10	.9993	.9997	1.0010	1.0006	1.0000	.9999	1.0000
1.15	.9994	.9991	1.0012	1.0005	1.0001	.9998	1.0000
1.20	.9995	.9986	1.0014	1.0005	1.0001	.9996	1.0000
1.25	.9996	.9981	1.0015	1.0005	1.0000	.9994	.9999
1.30	.9996	.9978	1.0014	1.0006	1.0000	.9990	.9999
1.35	.9996	.9975	1.0013	1.0007	1.0000	.9985	.9997
1.40	.9996	.9972	1.0011	1.0007	.9999	.9979	.9996
1.45	.9996	.9969	1.0008	1.0008	.9999	.9973	.9994
1.50	.9995	.9967	1.0004	1.0009	.9998	.9965	.9992
1.55	.9995	.9965	.9999	1.0010	.9996	.9957	.9990
1.60	.9995	.9963	.9993	1.0010	.9995	.9948	.9987

LAST POINT AT SATURATION BOUNDARY

TABLE IV. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 120 K

D. PT1 = 8. ATM DT1 = 25.260 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	4.2438	99.51	16.024	8.0004	120.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9524	4.4796	101.11	16.659	7.9991	120.00	1.1195	1.0338	1.0847	.9999	1.0000	.9999
1.10	.9111	4.6837	102.46	17.197	7.9916	119.99	1.2437	1.0665	1.1698	.9989	.9999	.9989
1.15	.8745	4.8596	103.63	17.648	7.9737	119.97	1.3736	1.0986	1.2557	.9967	.9997	.9967
1.20	.8417	5.0082	104.65	18.014	7.9425	119.93	1.5092	1.1303	1.3423	.9928	.9994	.9927
1.25	.8122	5.1298	105.52	18.296	7.8965	119.88	1.6506	1.1619	1.4294	.9871	.9990	.9869
1.30	.7855	5.2250	106.28	18.497	7.8347	119.80	1.7977	1.1934	1.5167	.9793	.9984	.9791
1.35	.7613	5.2950	106.93	18.621	7.7571	119.71	1.9507	1.2249	1.6041	.9696	.9976	.9693

LAST POINT AT SATURATION BOUNDARY

TABLE IV. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 120 K

D. PT1 = 8. ATM DT1 = 25.260 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9992	.9999	1.0009	1.0006	1.0000	1.0000	1.0000
1.10	.9992	.9990	1.0014	1.0006	1.0000	.9999	1.0000
1.15	.9994	.9980	1.0018	1.0005	1.0000	.9997	1.0000
1.20	.9995	.9972	1.0021	1.0005	1.0000	.9994	.9999
1.25	.9995	.9966	1.0022	1.0006	1.0000	.9990	.9998
1.30	.9995	.9960	1.0021	1.0007	1.0000	.9984	.9997
1.35	.9994	.9955	1.0019	1.0008	.9999	.9976	.9996

LAST POINT AT SATURATION BOUNDARY

TABLE V. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 130 K

A. PT1 = 1. ATM DT1 = 2.650 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	.5284	108.26	1.680	1.0000	130.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	.5576	109.95	1.746	.9999	130.00	1.1196	1.0330	1.0840	.9999	1.0000	.9999
1.10	.9117	.5833	111.41	1.803	.9990	130.00	1.2450	1.0651	1.1692	.9990	1.0000	.9989
1.15	.8749	.6056	112.68	1.850	.9967	130.00	1.3762	1.0969	1.2552	.9967	1.0000	.9967
1.20	.8420	.6243	113.79	1.889	.9928	129.99	1.5132	1.1284	1.3418	.9928	.9999	.9928
1.25	.8124	.6397	114.78	1.919	.9871	129.99	1.6561	1.1598	1.4288	.9871	.9999	.9870
1.30	.7857	.6517	115.64	1.940	.9794	129.98	1.8047	1.1913	1.5159	.9794	.9998	.9793
1.35	.7616	.6605	116.41	1.953	.9697	129.97	1.9591	1.2230	1.6029	.9697	.9998	.9697
1.40	.7395	.6664	117.10	1.959	.9582	129.96	2.1193	1.2551	1.6898	.9582	.9997	.9581
1.45	.7194	.6694	117.71	1.957	.9448	129.94	2.2854	1.2876	1.7763	.9448	.9996	.9448
1.50	.7009	.6698	118.26	1.949	.9298	129.93	2.4573	1.3205	1.8622	.9298	.9995	.9297
1.55	.6839	.6678	118.76	1.935	.9132	129.91	2.6350	1.3540	1.9474	.9132	.9993	.9131
1.60	.6683	.6636	119.21	1.915	.8952	129.89	2.8186	1.3881	2.0318	.8952	.9992	.8950
1.65	.6538	.6574	119.61	1.891	.8759	129.87	3.0080	1.4228	2.1153	.8759	.9990	.8758
1.70	.6404	.6494	119.98	1.862	.8556	129.85	3.2032	1.4582	2.1978	.8556	.9989	.8555
1.75	.6280	.6398	120.31	1.829	.8345	129.83	3.4042	1.4942	2.2792	.8345	.9987	.8343
1.80	.6164	.6289	120.61	1.793	.8126	129.81	3.6111	1.5310	2.3593	.8126	.9985	.8124
1.85	.6056	.6167	120.89	1.754	.7901	129.79	3.8238	1.5686	2.4382	.7901	.9984	.7899
1.90	.5955	.6036	121.14	1.713	.7672	129.77	4.0424	1.6069	2.5158	.7672	.9982	.7670
1.95	.5861	.5897	121.38	1.670	.7440	129.74	4.2668	1.6461	2.5920	.7440	.9980	.7438
2.00	.5772	.5750	121.59	1.625	.7206	129.72	4.4970	1.6861	2.6668	.7206	.9978	.7204
2.05	.5690	.5598	121.79	1.579	.6973	129.69	4.7331	1.7268	2.7402	.6973	.9976	.6970
2.10	.5612	.5442	121.97	1.533	.6739	129.67	4.9749	1.7685	2.8121	.6739	.9975	.6737
2.15	.5539	.5283	122.13	1.485	.6508	129.65	5.2227	1.8109	2.8825	.6508	.9973	.6505
2.20	.5470	.5123	122.29	1.438	.6278	129.62	5.4762	1.8543	2.9514	.6278	.9971	.6275
2.25	.5405	.4961	122.43	1.391	.6052	129.60	5.7356	1.8985	3.0188	.6052	.9969	.6049

T1 NEAR TRIPLE-POINT TEMPERATURE

TABLE V. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 130 K

A. PT1 = 1. ATM DT1 = 2.650 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO IDEAL DIATOMIC	----------	GAS VALUE	----------	---------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9999	1.0000	1.0001	1.0000	1.0000	1.0000	1.0000
1.10	.9999	1.0000	1.0002	1.0001	1.0000	1.0000	1.0000
1.15	.9998	1.0000	1.0003	1.0001	1.0000	1.0000	1.0000
1.20	.9997	.9999	1.0003	1.0001	1.0000	.9999	1.0000
1.25	.9997	.9999	1.0004	1.0001	1.0000	.9999	1.0000
1.30	.9997	.9998	1.0004	1.0001	1.0000	.9998	1.0000
1.35	.9997	.9997	1.0004	1.0001	1.0000	.9998	1.0000
1.40	.9997	.9997	1.0003	1.0001	1.0000	.9997	.9999
1.45	.9997	.9996	1.0003	1.0001	1.0000	.9996	.9999
1.50	.9997	.9996	1.0002	1.0001	1.0000	.9995	.9999
1.55	.9998	.9995	1.0002	1.0001	1.0000	.9993	.9999
1.60	.9998	.9995	1.0001	1.0000	.9999	.9992	.9998
1.65	.9998	.9995	1.0000	1.0000	.9999	.9990	.9998
1.70	.9998	.9994	.9999	1.0000	.9999	.9989	.9997
1.75	.9998	.9994	.9998	1.0000	.9999	.9987	.9997
1.80	.9998	.9994	.9996	1.0000	.9999	.9985	.9996
1.85	.9999	.9994	.9995	1.0000	.9998	.9984	.9996
1.90	.9999	.9993	.9994	1.0000	.9998	.9982	.9995
1.95	.9998	.9994	.9993	1.0000	.9997	.9980	.9994
2.00	.9998	.9993	.9991	1.0000	.9997	.9978	.9993
2.05	.9998	.9993	.9990	1.0001	.9996	.9976	.9993
2.10	.9998	.9993	.9989	1.0001	.9996	.9975	.9992
2.15	.9999	.9993	.9987	1.0001	.9995	.9973	.9991
2.20	.9999	.9993	.9986	1.0001	.9995	.9971	.9990
2.25	.9999	.9993	.9985	1.0001	.9994	.9969	.9989

T1 NEAR TRIPLE-POINT TEMPERATURE

TABLE V. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 130 K

B. PT1 = 3. ATM DT1 = 8.102 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	1.5963	108.13	5.138	3.0000	130.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9529	1.6739	109.83	5.339	2.9996	130.00	1.1196	1.0332	1.0841	.9999	1.0000	.9999
1.10	.9114	1.7512	111.30	5.513	2.9968	130.00	1.2449	1.0656	1.1694	.9989	1.0000	.9989
1.15	.8746	1.8179	112.57	5.658	2.9900	129.99	1.3759	1.0974	1.2554	.9967	.9999	.9967
1.20	.8418	1.8738	113.68	5.776	2.9783	129.98	1.5125	1.1290	1.3418	.9928	.9998	.9927
1.25	.8123	1.9197	114.65	5.867	2.9611	129.96	1.6550	1.1604	1.4287	.9870	.9997	.9870
1.30	.7857	1.9556	115.51	5.932	2.9380	129.94	1.8033	1.1920	1.5158	.9793	.9995	.9793
1.35	.7615	1.9821	116.27	5.972	2.9091	129.91	1.9574	1.2237	1.6029	.9697	.9993	.9696
1.40	.7395	1.9995	116.94	5.989	2.8744	129.87	2.1172	1.2557	1.6897	.9581	.9990	.9580
1.45	.7193	2.0086	117.53	5.984	2.8342	129.83	2.2830	1.2881	1.7762	.9447	.9987	.9446
1.50	.7009	2.0097	118.06	5.958	2.7890	129.79	2.4545	1.3209	1.8622	.9297	.9984	.9294
1.55	.6839	2.0035	118.52	5.914	2.7391	129.74	2.6319	1.3542	1.9474	.9130	.9980	.9128
1.60	.6682	1.9908	118.94	5.854	2.6850	129.68	2.8151	1.3880	2.0319	.8950	.9975	.8947
1.65	.6538	1.9720	119.31	5.778	2.6272	129.62	3.0041	1.4225	2.1154	.8757	.9971	.8754
1.70	.6404	1.9479	119.64	5.689	2.5663	129.56	3.1989	1.4575	2.1979	.8554	.9966	.8550
1.75	.6279	1.9191	119.94	5.588	2.5026	129.50	3.3995	1.4932	2.2793	.8342	.9961	.8337
1.80	.6163	1.8862	120.20	5.477	2.4367	129.43	3.6061	1.5297	2.3595	.8122	.9956	.8117
1.85	.6055	1.8496	120.44	5.357	2.3692	129.36	3.8184	1.5668	2.4385	.7897	.9951	.7891
1.90	.5955	1.8101	120.65	5.230	2.3003	129.29	4.0364	1.6047	2.5160	.7668	.9945	.7661
1.95	.5860	1.7680	120.84	5.098	2.2306	129.22	4.2604	1.6433	2.5923	.7435	.9940	.7429
2.00	.5772	1.7240	121.01	4.961	2.1603	129.15	4.4903	1.6828	2.6672	.7201	.9934	.7194
2.05	.5689	1.6782	121.16	4.820	2.0900	129.08	4.7259	1.7230	2.7406	.6967	.9929	.6959

LAST POINT AT SATURATION BOUNDARY

TABLE V. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 130 K

B. PT1 = 3. ATM DT1 = 8.102 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO IDEAL DIATOMIC GAS VALUE	----------	----------	----------	----------
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9998	1.0000	1.0003	1.0001	1.0000	1.0000	1.0000
1.10	.9996	.9999	1.0006	1.0002	1.0000	1.0000	1.0000
1.15	.9995	.9998	1.0008	1.0003	1.0000	.9999	1.0000
1.20	.9996	.9995	1.0009	1.0002	1.0000	.9998	.9999
1.25	.9996	.9992	1.0009	1.0001	1.0000	.9997	.9999
1.30	.9997	.9990	1.0009	1.0001	1.0000	.9995	.9999
1.35	.9997	.9989	1.0009	1.0001	1.0000	.9993	.9998
1.40	.9997	.9987	1.0008	1.0000	.9999	.9990	.9998
1.45	.9997	.9986	1.0007	1.0001	.9999	.9987	.9997
1.50	.9997	.9985	1.0005	1.0001	.9999	.9984	.9996
1.55	.9997	.9983	1.0003	1.0001	.9998	.9980	.9995
1.60	.9997	.9983	1.0000	1.0001	.9998	.9975	.9994
1.65	.9997	.9982	.9998	1.0001	.9997	.9971	.9993
1.70	.9997	.9981	.9994	1.0001	.9997	.9966	.9992
1.75	.9998	.9980	.9991	1.0001	.9996	.9961	.9990
1.80	.9997	.9980	.9988	1.0001	.9995	.9956	.9988
1.85	.9997	.9979	.9984	1.0001	.9994	.9951	.9986
1.90	.9997	.9979	.9980	1.0002	.9992	.9945	.9984
1.95	.9997	.9979	.9976	1.0002	.9991	.9940	.9982
2.00	.9997	.9979	.9972	1.0002	.9989	.9934	.9979
2.05	.9997	.9978	.9968	1.0002	.9988	.9929	.9977

LAST POINT AT SATURATION BOUNDARY

TABLE V. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 130 K

C. PT1 = 5. ATM DT1 = 13.773 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	2.6456	108.01	8.736	5.0002	130.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9528	2.7920	109.72	9.079	4.9995	130.00	1.1196	1.0334	1.0842	.9999	1.0000	.9999
1.10	.9111	2.9209	111.19	9.375	4.9947	129.99	1.2448	1.0659	1.1695	.9989	1.0000	.9989
1.15	.8745	3.0312	112.46	9.621	4.9835	129.98	1.3753	1.0978	1.2553	.9967	.9999	.9967
1.20	.8418	3.1243	113.57	9.821	4.9641	129.96	1.5116	1.1295	1.3417	.9928	.9997	.9928
1.25	.8123	3.2006	114.53	9.975	4.9354	129.93	1.6538	1.1610	1.4286	.9871	.9995	.9870
1.30	.7857	3.2604	115.38	10.085	4.8970	129.90	1.8017	1.1926	1.5157	.9794	.9992	.9793
1.35	.7615	3.3045	116.13	10.153	4.8487	129.85	1.9555	1.2243	1.6027	.9697	.9988	.9696
1.40	.7395	3.3335	116.78	10.181	4.7909	129.79	2.1150	1.2562	1.6896	.9582	.9984	.9580
1.45	.7193	3.3484	117.35	10.172	4.7239	129.72	2.2804	1.2885	1.7761	.9448	.9978	.9445
1.50	.7008	3.3502	117.85	10.129	4.6484	129.64	2.4516	1.3212	1.8621	.9297	.9973	.9293
1.55	.6838	3.3398	118.29	10.053	4.5652	129.56	2.6285	1.3542	1.9473	.9130	.9966	.9126
1.60	.6681	3.3184	118.68	9.949	4.4748	129.47	2.8114	1.3879	2.0318	.8950	.9959	.8944
1.65	.6537	3.2870	119.02	9.820	4.3784	129.37	2.9999	1.4220	2.1154	.8757	.9951	.8751
1.70	.6403	3.2466	119.31	9.667	4.2766	129.26	3.1943	1.4567	2.1979	.8553	.9943	.8546
1.75	.6278	3.1984	119.57	9.495	4.1702	129.16	3.3946	1.4921	2.2794	.8340	.9935	.8333
1.80	.6162	3.1433	119.79	9.305	4.0602	129.04	3.6006	1.5281	2.3597	.8120	.9926	.8112
1.85	.6054	3.0822	119.99	9.100	3.9473	128.93	3.8125	1.5648	2.4387	.7895	.9917	.7886
1.90	.5953	3.0161	120.16	8.884	3.8322	128.81	4.0303	1.6023	2.5164	.7664	.9908	.7655

LAST POINT AT SATURATION BOUNDARY

TABLE V. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 130 K

C. PT1 = 5. ATM DT1 = 13.773 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9996	1.0000	1.0005	1.0002	1.0000	1.0000	1.0000
1.10	.9993	.9999	1.0009	1.0004	1.0000	1.0000	1.0000
1.15	.9994	.9993	1.0012	1.0002	1.0000	.9999	1.0000
1.20	.9996	.9989	1.0013	1.0001	1.0000	.9997	1.0000
1.25	.9996	.9985	1.0014	1.0000	1.0000	.9995	.9999
1.30	.9996	.9982	1.0014	1.0000	1.0000	.9992	.9999
1.35	.9996	.9979	1.0014	1.0000	1.0000	.9988	.9998
1.40	.9997	.9976	1.0012	1.0000	1.0000	.9984	.9998
1.45	.9996	.9974	1.0010	1.0000	.9999	.9978	.9996
1.50	.9996	.9973	1.0007	1.0000	.9999	.9973	.9995
1.55	.9996	.9971	1.0003	1.0000	.9998	.9966	.9994
1.60	.9996	.9969	.9999	1.0000	.9997	.9959	.9992
1.65	.9996	.9968	.9994	1.0001	.9996	.9951	.9990
1.70	.9996	.9967	.9989	1.0001	.9995	.9943	.9987
1.75	.9995	.9966	.9984	1.0001	.9994	.9935	.9985
1.80	.9996	.9965	.9978	1.0002	.9992	.9926	.9982
1.85	.9996	.9964	.9971	1.0002	.9990	.9917	.9979
1.90	.9995	.9964	.9965	1.0003	.9988	.9908	.9975

LAST POINT AT SATURATION BOUNDARY

TABLE V. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 130 K

D. PT1 = 8. ATM DT1 = 22.741 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	4.2365	107.83	14.431	8.0002	130.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9525	4.4716	109.55	15.001	7.9989	130.00	1.1195	1.0337	1.0844	.9999	1.0000	.9999
1.10	.9111	4.6764	111.03	15.486	7.9913	129.99	1.2441	1.0664	1.1693	.9989	.9999	.9989
1.15	.8745	4.8524	112.29	15.891	7.9735	129.97	1.3741	1.0984	1.2550	.9967	.9998	.9967
1.20	.8417	5.0012	113.40	16.221	7.9424	129.94	1.5100	1.1302	1.3414	.9928	.9995	.9927
1.25	.8122	5.1231	114.36	16.475	7.8964	129.89	1.6517	1.1618	1.4282	.9871	.9992	.9870
1.30	.7856	5.2187	115.19	16.656	7.8349	129.83	1.7992	1.1934	1.5153	.9794	.9987	.9792
1.35	.7614	5.2890	115.92	16.768	7.7577	129.75	1.9524	1.2251	1.6023	.9697	.9981	.9695
1.40	.7393	5.3352	116.54	16.814	7.6650	129.66	2.1114	1.2569	1.6892	.9581	.9974	.9578
1.45	.7192	5.3587	117.08	16.797	7.5579	129.55	2.2761	1.2890	1.7756	.9447	.9965	.9443
1.50	.7007	5.3614	117.55	16.724	7.4369	129.43	2.4467	1.3214	1.8616	.9296	.9956	.9291
1.55	.6837	5.3446	117.94	16.598	7.3034	129.29	2.6230	1.3542	1.9470	.9129	.9945	.9123
1.60	.6680	5.3099	118.28	16.425	7.1587	129.14	2.8051	1.3874	2.0315	.8948	.9934	.8941
1.65	.6535	5.2594	118.57	16.209	7.0039	128.98	2.9931	1.4211	2.1152	.8755	.9922	.8747

LAST POINT AT SATURATION BOUNDARY

TABLE V. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 130 K

D. PT1 = 8. ATM DT1 = 22.741 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9993	1.0000	1.0008	1.0003	1.0000	1.0000	1.0000
1.10	.9993	.9993	1.0013	1.0002	1.0000	.9999	1.0000
1.15	.9994	.9985	1.0017	1.0000	1.0000	.9998	1.0000
1.20	.9995	.9978	1.0020	.9998	1.0000	.9995	.9999
1.25	.9995	.9973	1.0021	.9998	1.0000	.9992	.9999
1.30	.9995	.9968	1.0021	.9997	1.0000	.9987	.9998
1.35	.9995	.9963	1.0020	.9997	1.0000	.9981	.9997
1.40	.9994	.9959	1.0018	.9997	.9999	.9974	.9996
1.45	.9995	.9956	1.0014	.9997	.9999	.9965	.9995
1.50	.9994	.9953	1.0009	.9998	.9998	.9956	.9993
1.55	.9994	.9950	1.0003	.9998	.9997	.9945	.9990
1.60	.9994	.9947	.9996	.9999	.9996	.9934	.9988
1.65	.9993	.9945	.9988	1.0000	.9994	.9922	.9985

LAST POINT AT SATURATION BOUNDARY

TABLE V. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 130 K

E. PT1 = 10. ATM DT1 = 29.068 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	5.2989	107.71	18.456	10.0006	130.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9523	5.5935	109.45	19.187	9.9989	130.00	1.1195	1.0339	1.0844	.9999	1.0000	.9999
1.10	.9111	5.8481	110.92	19.804	9.9896	129.99	1.2436	1.0666	1.1692	.9990	.9999	.9989
1.15	.8745	6.0677	112.19	20.322	9.9673	129.97	1.3733	1.0988	1.2548	.9967	.9997	.9967
1.20	.8417	6.2536	113.29	20.743	9.9285	129.93	1.5089	1.1306	1.3411	.9929	.9994	.9928
1.25	.8122	6.4058	114.25	21.067	9.8712	129.87	1.6502	1.1623	1.4278	.9871	.9990	.9870
1.30	.7855	6.5251	115.07	21.299	9.7944	129.79	1.7972	1.1938	1.5148	.9794	.9984	.9792
1.35	.7613	6.6128	115.78	21.441	9.6979	129.69	1.9500	1.2255	1.6018	.9698	.9976	.9695
1.40	.7393	6.6706	116.39	21.499	9.5822	129.57	2.1086	1.2572	1.6886	.9582	.9967	.9579
1.45	.7191	6.7001	116.91	21.478	9.4481	129.44	2.2729	1.2892	1.7751	.9446	.9957	.9443
1.50	.7006	6.7033	117.35	21.383	9.2969	129.28	2.4430	1.3214	1.8611	.9297	.9945	.9291
1.55	.6836	6.6822	117.71	21.221	9.1298	129.11	2.6189	1.3540	1.9465	.9130	.9931	.9123

LAST POINT AT SATURATION BOUNDARY

TABLE V. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 130 K

E. PT1 = 10. ATM DT1 = 29.068 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(--------	--------	RELATIVE TO IDEAL DIATOMIC GAS VALUE	--------	--------	--------	--------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9991	.9999	1.0010	1.0004	1.0000	1.0000	1.0000
1.10	.9992	.9989	1.0016	1.0001	1.0000	.9999	1.0000
1.15	.9994	.9979	1.0020	.9998	1.0000	.9997	1.0000
1.20	.9994	.9970	1.0023	.9996	1.0001	.9994	1.0000
1.25	.9994	.9963	1.0025	.9995	1.0001	.9990	.9999
1.30	.9994	.9957	1.0025	.9994	1.0001	.9984	.9999
1.35	.9994	.9951	1.0023	.9994	1.0001	.9976	.9998
1.40	.9994	.9946	1.0020	.9994	1.0000	.9967	.9996
1.45	.9993	.9942	1.0015	.9994	1.0000	.9957	.9995
1.50	.9993	.9938	1.0009	.9995	.9999	.9945	.9993
1.55	.9992	.9934	1.0001	.9996	.9998	.9931	.9990

LAST POINT AT SATURATION BOUNDARY

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

A. PT1 = 1. ATM DT1 = 2.456 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	.5284	116.60	1.557	1.0000	140.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	.5575	118.41	1.618	.9999	140.00	1.1196	1.0329	1.0840	.9999	1.0000	.9999
1.10	.9117	.5832	119.98	1.671	.9990	140.00	1.2450	1.0651	1.1691	.9990	1.0000	.9989
1.15	.8749	.6055	121.35	1.715	.9967	140.00	1.3762	1.0968	1.2551	.9967	1.0000	.9967
1.20	.8420	.6242	122.55	1.751	.9928	139.99	1.5133	1.1283	1.3417	.9928	1.0000	.9928
1.25	.8124	.6396	123.61	1.778	.9871	139.99	1.6561	1.1598	1.4286	.9871	.9999	.9870
1.30	.7857	.6516	124.55	1.798	.9794	139.98	1.8048	1.1913	1.5157	.9794	.9999	.9793
1.35	.7615	.6605	125.38	1.811	.9697	139.97	1.9592	1.2230	1.6028	.9697	.9998	.9697
1.40	.7395	.6663	126.12	1.816	.9582	139.96	2.1194	1.2551	1.6896	.9582	.9997	.9582
1.45	.7194	.6693	126.78	1.814	.9448	139.95	2.2855	1.2876	1.7760	.9448	.9997	.9448
1.50	.7009	.6697	127.38	1.807	.9298	139.94	2.4575	1.3206	1.8619	.9298	.9996	.9297
1.55	.6840	.6677	127.91	1.794	.9132	139.92	2.6352	1.3541	1.9472	.9132	.9995	.9131
1.60	.6683	.6635	128.40	1.775	.8952	139.91	2.8188	1.3882	2.0316	.8952	.9993	.8951
1.65	.6538	.6573	128.84	1.753	.8760	139.89	3.0082	1.4229	2.1150	.8760	.9992	.8759
1.70	.6404	.6493	129.23	1.726	.8557	139.87	3.2035	1.4583	2.1975	.8557	.9991	.8556
1.75	.6280	.6398	129.60	1.695	.8345	139.85	3.4045	1.4944	2.2788	.8345	.9990	.8344
1.80	.6164	.6289	129.93	1.662	.8126	139.83	3.6114	1.5313	2.3590	.8126	.9988	.8125
1.85	.6056	.6168	130.23	1.626	.7902	139.81	3.8242	1.5689	2.4378	.7902	.9987	.7900
1.90	.5955	.6036	130.51	1.588	.7673	139.79	4.0428	1.6073	2.5154	.7673	.9985	.7671
1.95	.5861	.5897	130.76	1.548	.7441	139.77	4.2672	1.6465	2.5916	.7441	.9984	.7439
2.00	.5773	.5751	131.00	1.506	.7207	139.75	4.4974	1.6865	2.6664	.7207	.9982	.7206
2.05	.5690	.5599	131.21	1.464	.6974	139.73	4.7335	1.7273	2.7397	.6974	.9981	.6972
2.10	.5612	.5443	131.41	1.421	.6740	139.71	4.9754	1.7690	2.8116	.6740	.9979	.6739
2.15	.5539	.5284	131.59	1.377	.6509	139.69	5.2232	1.8116	2.8820	.6509	.9978	.6507
2.20	.5470	.5124	131.76	1.333	.6279	139.67	5.4768	1.8550	2.9510	.6279	.9976	.6277
2.25	.5405	.4962	131.92	1.290	.6053	139.65	5.7362	1.8993	3.0184	.6053	.9975	.6051
2.30	.5344	.4800	132.07	1.246	.5831	139.63	6.0015	1.9444	3.0843	.5831	.9974	.5828
2.35	.5286	.4640	132.21	1.203	.5612	139.61	6.2726	1.9905	3.1487	.5612	.9972	.5610
2.40	.5231	.4480	132.33	1.160	.5399	139.59	6.5495	2.0374	3.2117	.5399	.9971	.5397
2.45	.5179	.4323	132.45	1.118	.5190	139.57	6.8323	2.0853	3.2731	.5190	.9970	.5188

T1 NEAR TRIPLE-POINT TEMPERATURE

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

A. PT1 = 1. ATM DT1 = 2.456 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO	IDEAL DIATOMIC	GAS VALUE	----------	----------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9999	1.0000	1.0001	1.0000	1.0000	1.0000	1.0000
1.10	.9999	1.0000	1.0002	1.0000	1.0000	1.0000	1.0000
1.15	.9998	1.0000	1.0002	1.0000	1.0000	1.0000	1.0000
1.20	.9998	1.0000	1.0003	1.0000	1.0000	1.0000	1.0000
1.25	.9997	.9999	1.0003	1.0000	1.0000	.9999	1.0000
1.30	.9997	.9999	1.0004	1.0000	1.0000	.9999	1.0000
1.35	.9997	.9998	1.0004	1.0000	1.0000	.9998	1.0000
1.40	.9998	.9997	1.0003	1.0000	1.0000	.9997	1.0000
1.45	.9998	.9997	1.0003	.9999	1.0000	.9997	1.0000
1.50	.9998	.9997	1.0003	.9999	1.0000	.9996	.9999
1.55	.9998	.9996	1.0002	.9999	1.0000	.9995	.9999
1.60	.9998	.9996	1.0001	.9999	1.0000	.9993	.9999
1.65	.9998	.9995	1.0001	.9999	1.0000	.9992	.9999
1.70	.9998	.9995	1.0000	.9999	1.0000	.9991	.9998
1.75	.9999	.9995	.9999	.9999	1.0000	.9990	.9998
1.80	.9999	.9995	.9998	.9999	.9999	.9988	.9998
1.85	.9999	.9995	.9997	.9999	.9999	.9987	.9997
1.90	.9998	.9995	.9996	.9999	.9999	.9985	.9997
1.95	.9998	.9994	.9995	.9999	.9999	.9984	.9996
2.00	.9998	.9994	.9994	.9999	.9998	.9982	.9996
2.05	.9999	.9994	.9993	.9999	.9998	.9981	.9995
2.10	.9999	.9994	.9992	.9999	.9998	.9979	.9995
2.15	.9999	.9994	.9991	.9999	.9997	.9978	.9994
2.20	.9999	.9994	.9990	.9999	.9997	.9976	.9994
2.25	.9999	.9994	.9989	.9999	.9996	.9975	.9993
2.30	.9999	.9994	.9988	.9999	.9996	.9974	.9992
2.35	.9999	.9994	.9987	.9999	.9995	.9972	.9992
2.40	.9999	.9994	.9986	.9999	.9995	.9971	.9991
2.45	.9999	.9994	.9985	.9999	.9994	.9970	.9990

T1 NEAR TRIPLE-POINT TEMPERATURE

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

B. PT1 = 3. ATM DT1 = 7.480 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	1.5859	116.47	4.744	3.0005	140.00	1.0000	1.0000	1.0000	1.0002	1.0000	1.0002
1.05	.9530	1.6735	118.29	4.930	3.0001	140.00	1.1196	1.0331	1.0841	1.0000	1.0000	1.0000
1.10	.9114	1.7508	119.87	5.091	2.9973	140.00	1.2449	1.0655	1.1692	.9991	1.0000	.9991
1.15	.8746	1.8172	121.25	5.224	2.9900	139.99	1.3761	1.0974	1.2552	.9967	.9999	.9967
1.20	.8418	1.8732	122.44	5.333	2.9783	139.98	1.5127	1.1289	1.3416	.9928	.9999	.9928
1.25	.8124	1.9190	123.49	5.416	2.9611	139.97	1.6552	1.1604	1.4284	.9870	.9998	.9870
1.30	.7857	1.9550	124.42	5.477	2.9380	139.95	1.8036	1.1919	1.5154	.9793	.9996	.9793
1.35	.7615	1.9815	125.24	5.514	2.9091	139.92	1.9577	1.2237	1.6024	.9697	.9994	.9696
1.40	.7395	1.9990	125.96	5.529	2.8745	139.89	2.1177	1.2557	1.6892	.9582	.9992	.9581
1.45	.7194	2.0081	126.61	5.525	2.8344	139.85	2.2835	1.2881	1.7756	.9448	.9990	.9447
1.50	.7009	2.0092	127.18	5.502	2.7892	139.81	2.4551	1.3210	1.8615	.9297	.9987	.9296
1.55	.6839	2.0032	127.70	5.461	2.7394	139.77	2.6326	1.3544	1.9467	.9131	.9984	.9129
1.60	.6683	1.9905	128.16	5.405	2.6854	139.72	2.8158	1.3883	2.0310	.8951	.9980	.8949
1.65	.6538	1.9718	128.57	5.336	2.6277	139.67	3.0048	1.4228	2.1145	.8759	.9976	.8756
1.70	.6404	1.9478	128.93	5.254	2.5668	139.62	3.1997	1.4580	2.1969	.8556	.9973	.8553
1.75	.6279	1.9191	129.27	5.161	2.5031	139.56	3.4005	1.4939	2.2783	.8344	.9969	.8340
1.80	.6164	1.8863	129.56	5.059	2.4374	139.50	3.6071	1.5304	2.3584	.8125	.9964	.8121
1.85	.6056	1.8498	129.83	4.948	2.3699	139.44	3.8194	1.5677	2.4373	.7900	.9960	.7896
1.90	.5955	1.8104	130.07	4.832	2.3011	139.38	4.0377	1.6057	2.5149	.7670	.9956	.7666
1.95	.5860	1.7684	130.29	4.710	2.2314	139.32	4.2618	1.6446	2.5911	.7438	.9951	.7433
2.00	.5772	1.7244	130.48	4.583	2.1613	139.25	4.4917	1.6842	2.6659	.7204	.9947	.7199
2.05	.5689	1.6788	130.66	4.454	2.0910	139.19	4.7274	1.7246	2.7393	.6970	.9942	.6965
2.10	.5612	1.6319	130.82	4.322	2.0209	139.13	4.9690	1.7658	2.8112	.6736	.9938	.6731
2.15	.5538	1.5842	130.97	4.189	1.9513	139.07	5.2164	1.8079	2.8817	.6504	.9933	.6499
2.20	.5469	1.5359	131.10	4.055	1.8822	139.00	5.4697	1.8508	2.9506	.6274	.9929	.6268
2.25	.5404	1.4873	131.22	3.921	1.8143	138.94	5.7288	1.8946	3.0181	.6048	.9925	.6042
2.30	.5343	1.4387	131.33	3.788	1.7474	138.88	5.9937	1.9392	3.0840	.5825	.9920	.5819

LAST POINT AT SATURATION BOUNDARY

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

B. PT1 = 3. ATM DT1 = 7.480 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0002	1.0000	1.0002
1.05	.9998	1.0000	1.0003	1.0001	1.0002	1.0000	1.0002
1.10	.9996	1.0000	1.0005	1.0001	1.0002	1.0000	1.0002
1.15	.9995	.9999	1.0007	1.0001	1.0000	.9999	1.0000
1.20	.9996	.9996	1.0008	1.0000	1.0000	.9999	1.0000
1.25	.9996	.9994	1.0009	.9999	1.0000	.9998	.9999
1.30	.9997	.9992	1.0009	.9998	1.0000	.9996	.9999
1.35	.9997	.9991	1.0009	.9998	1.0000	.9994	.9999
1.40	.9997	.9989	1.0008	.9997	1.0000	.9992	.9999
1.45	.9997	.9988	1.0007	.9997	1.0000	.9990	.9998
1.50	.9998	.9987	1.0006	.9997	1.0000	.9987	.9998
1.55	.9997	.9986	1.0004	.9997	.9999	.9984	.9997
1.60	.9997	.9985	1.0002	.9997	.9999	.9980	.9997
1.65	.9998	.9984	1.0000	.9997	.9999	.9976	.9996
1.70	.9998	.9984	.9998	.9997	.9998	.9973	.9995
1.75	.9997	.9983	.9995	.9997	.9998	.9969	.9994
1.80	.9998	.9983	.9992	.9997	.9997	.9964	.9993
1.85	.9998	.9982	.9989	.9997	.9997	.9960	.9991
1.90	.9998	.9982	.9986	.9997	.9996	.9956	.9990
1.95	.9997	.9982	.9983	.9997	.9995	.9951	.9988
2.00	.9997	.9982	.9980	.9997	.9994	.9947	.9987
2.05	.9998	.9981	.9977	.9997	.9993	.9942	.9985
2.10	.9998	.9981	.9974	.9998	.9991	.9938	.9984
2.15	.9998	.9981	.9971	.9998	.9990	.9933	.9982
2.20	.9997	.9981	.9967	.9998	.9988	.9929	.9979
2.25	.9997	.9981	.9964	.9998	.9987	.9925	.9977
2.30	.9998	.9981	.9961	.9998	.9986	.9920	.9975

LAST POINT AT SATURATION BOUNDARY

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

C. PT1 = 5. ATM DT1 = 12.660 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	2.6436	116.34	8.032	5.0001	140.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9528	2.7898	118.17	8.346	4.9994	140.00	1.1196	1.0333	1.0841	.9999	1.0000	.9999
1.10	.9112	2.9188	119.76	8.618	4.9946	140.00	1.2449	1.0658	1.1693	.9989	1.0000	.9989
1.15	.8746	3.0292	121.13	8.844	4.9835	139.99	1.3755	1.0977	1.2550	.9967	.9999	.9967
1.20	.8418	3.1224	122.32	9.028	4.9640	139.97	1.5119	1.1294	1.3413	.9928	.9998	.9928
1.25	.8123	3.1988	123.37	9.170	4.9354	139.94	1.6542	1.1609	1.4281	.9871	.9996	.9870
1.30	.7857	3.2587	124.29	9.271	4.8970	139.91	1.8023	1.1925	1.5150	.9794	.9993	.9793
1.35	.7615	3.3029	125.10	9.334	4.8486	139.87	1.9562	1.2243	1.6020	.9698	.9990	.9696
1.40	.7395	3.3320	125.81	9.360	4.7911	139.81	2.1158	1.2563	1.6887	.9582	.9987	.9581
1.45	.7193	3.3471	126.44	9.352	4.7242	139.76	2.2814	1.2886	1.7751	.9448	.9983	.9446
1.50	.7009	3.3490	126.99	9.313	4.6489	139.69	2.4526	1.3214	1.8609	.9298	.9978	.9295
1.55	.6839	3.3388	127.48	9.244	4.5659	139.61	2.6297	1.3546	1.9461	.9132	.9972	.9129
1.60	.6682	3.3177	127.92	9.149	4.4757	139.53	2.8127	1.3883	2.0305	.8951	.9967	.8948
1.65	.6538	3.2865	128.30	9.030	4.3794	139.45	3.0014	1.4227	2.1139	.8759	.9961	.8755
1.70	.6403	3.2464	128.64	8.891	4.2777	139.36	3.1960	1.4576	2.1964	.8555	.9954	.8551
1.75	.6279	3.1984	128.93	8.733	4.1717	139.26	3.3963	1.4932	2.2777	.8343	.9947	.8338
1.80	.6163	3.1435	129.20	8.559	4.0619	139.17	3.6025	1.5294	2.3578	.8124	.9940	.8118
1.85	.6055	3.0827	129.43	8.372	3.9491	139.06	3.8146	1.5664	2.4368	.7898	.9933	.7892
1.90	.5954	3.0168	129.63	8.174	3.8343	138.96	4.0325	1.6041	2.5144	.7669	.9926	.7662
1.95	.5860	2.9466	129.81	7.967	3.7180	138.86	4.2562	1.6425	2.5906	.7436	.9918	.7429
2.00	.5772	2.8731	129.97	7.752	3.6009	138.75	4.4857	1.6817	2.6654	.7202	.9911	.7194
2.05	.5688	2.7969	130.11	7.532	3.4834	138.65	4.7211	1.7216	2.7389	.6967	.9903	.6959
2.10	.5611	2.7185	130.23	7.308	3.3664	138.54	4.9624	1.7624	2.8108	.6733	.9896	.6725
2.15	.5537	2.6387	130.34	7.082	3.2501	138.44	5.2094	1.8040	2.8813	.6500	.9888	.6492

LAST POINT AT SATURATION BOUNDARY

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

C. PT1 = 5. ATM DT1 = 12.660 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO IDEAL DIATOMIC GAS VALUE	----------	----------	----------	----------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9997	1.0000	1.0005	1.0001	1.0000	1.0000	1.0000
1.10	.9994	.9999	1.0008	1.0002	1.0000	1.0000	1.0000
1.15	.9995	.9995	1.0011	.9999	1.0000	.9999	1.0000
1.20	.9996	.9991	1.0012	.9998	1.0000	.9998	1.0000
1.25	.9996	.9988	1.0013	.9997	1.0000	.9996	1.0000
1.30	.9997	.9985	1.0014	.9996	1.0000	.9993	.9999
1.35	.9996	.9983	1.0013	.9995	1.0000	.9990	.9999
1.40	.9997	.9980	1.0012	.9994	1.0000	.9987	.9999
1.45	.9996	.9979	1.0011	.9994	1.0000	.9983	.9998
1.50	.9997	.9977	1.0009	.9994	1.0000	.9978	.9997
1.55	.9997	.9975	1.0006	.9994	1.0000	.9972	.9997
1.60	.9997	.9974	1.0003	.9994	.9999	.9967	.9995
1.65	.9997	.9973	.9999	.9994	.9999	.9961	.9994
1.70	.9996	.9972	.9995	.9994	.9998	.9954	.9993
1.75	.9997	.9971	.9991	.9994	.9997	.9947	.9991
1.80	.9997	.9970	.9986	.9994	.9996	.9940	.9989
1.85	.9996	.9970	.9981	.9994	.9995	.9933	.9987
1.90	.9996	.9969	.9976	.9995	.9994	.9926	.9985
1.95	.9997	.9969	.9971	.9995	.9992	.9918	.9983
2.00	.9997	.9968	.9965	.9995	.9990	.9911	.9980
2.05	.9996	.9968	.9960	.9996	.9988	.9903	.9977
2.10	.9996	.9968	.9955	.9996	.9986	.9896	.9974
2.15	.9996	.9968	.9949	.9997	.9984	.9888	.9971

LAST POINT AT SATURATION BOUNDARY

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

0. PT1 = 8. ATM DT1 = 20.750 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	4.2320	116.16	13.173	8.0010	140.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0001
1.05	.9526	4.4666	118.01	13.691	7.9998	140.00	1.1195	1.0336	1.0841	1.0000	1.0000	1.0000
1.10	.9111	4.6720	119.60	14.135	7.9921	139.99	1.2444	1.0663	1.1691	.9990	.9999	.9989
1.15	.8746	4.8481	120.96	14.504	7.9745	139.98	1.3746	1.0983	1.2546	.9968	.9998	.9968
1.20	.8417	4.9972	122.16	14.805	7.9434	139.95	1.5107	1.1301	1.3408	.9929	.9996	.9929
1.25	.8123	5.1192	123.20	15.037	7.8977	139.91	1.6525	1.1617	1.4274	.9872	.9994	.9871
1.30	.7856	5.2151	124.11	15.203	7.8363	139.85	1.8002	1.1933	1.5143	.9795	.9990	.9794
1.35	.7615	5.2856	124.90	15.305	7.7594	139.79	1.9536	1.2250	1.6011	.9699	.9985	.9698
1.40	.7394	5.3322	125.59	15.348	7.6671	139.70	2.1128	1.2570	1.6877	.9584	.9979	.9582
1.45	.7192	5.3563	126.19	15.334	7.5602	139.61	2.2778	1.2892	1.7740	.9450	.9972	.9447
1.50	.7007	5.3595	126.72	15.269	7.4396	139.50	2.4486	1.3218	1.8598	.9299	.9964	.9296
1.55	.6838	5.3421	127.17	15.153	7.3053	139.38	2.6251	1.3548	1.9449	.9132	.9956	.9128
1.60	.6681	5.3082	127.56	14.996	7.1609	139.25	2.8076	1.3883	2.0293	.8951	.9947	.8946
1.65	.6536	5.2581	127.90	14.801	7.0068	139.12	2.9957	1.4223	2.1127	.8758	.9937	.8753
1.70	.6402	5.1938	128.19	14.571	6.8438	138.97	3.1898	1.4568	2.1952	.8555	.9926	.8548
1.75	.6278	5.1158	128.44	14.311	6.6738	138.82	3.3895	1.4920	2.2765	.8342	.9916	.8335
1.80	.6162	5.0267	128.65	14.025	6.4979	138.66	3.5952	1.5277	2.3567	.8122	.9904	.8114
1.85	.6054	4.9310	128.82	13.717	6.3170	138.50	3.8067	1.5642	2.4357	.7896	.9893	.7888
1.90	.5953	4.8252	128.97	13.390	6.1329	138.33	4.0240	1.6013	2.5134	.7666	.9881	.7657
1.95	.5859	4.7126	129.09	13.048	5.9463	138.16	4.2471	1.6391	2.5897	.7433	.9869	.7423

LAST POINT AT SATURATION BOUNDARY

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

D. PT1 = 8. ATM DT1 = 20.750 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO IDEAL DIATOMIC GAS VALUE	----------	----------	----------	----------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0001
1.05	.9995	1.0000	1.0007	1.0001	1.0001	1.0000	1.0001
1.10	.9993	.9995	1.0012	1.0000	1.0001	.9999	1.0000
1.15	.9995	.9988	1.0016	.9996	1.0001	.9998	1.0001
1.20	.9995	.9983	1.0018	.9994	1.0001	.9996	1.0001
1.25	.9996	.9978	1.0020	.9992	1.0002	.9994	1.0001
1.30	.9996	.9973	1.0020	.9991	1.0002	.9990	1.0000
1.35	.9996	.9969	1.0020	.9989	1.0002	.9985	1.0000
1.40	.9996	.9966	1.0018	.9989	1.0002	.9979	1.0000
1.45	.9996	.9963	1.0016	.9988	1.0002	.9972	.9999
1.50	.9995	.9960	1.0012	.9988	1.0002	.9964	.9998
1.55	.9995	.9958	1.0007	.9988	1.0000	.9956	.9995
1.60	.9995	.9956	1.0002	.9988	.9999	.9947	.9994
1.65	.9995	.9954	.9996	.9988	.9998	.9937	.9992
1.70	.9994	.9952	.9990	.9989	.9997	.9926	.9990
1.75	.9995	.9951	.9982	.9989	.9996	.9916	.9987
1.80	.9995	.9950	.9975	.9989	.9994	.9904	.9985
1.85	.9994	.9949	.9967	.9990	.9992	.9893	.9982
1.90	.9994	.9948	.9959	.9991	.9990	.9881	.9978
1.95	.9995	.9947	.9950	.9992	.9988	.9869	.9975

LAST POINT AT SATURATION BOUNDARY

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

E. PT1 = 10. ATM DT1 = 26.376 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	5.2908	116.04	16.752	10.0003	140.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9525	5.5845	117.90	17.412	9.9986	140.00	1.1195	1.0338	1.0842	.9999	1.0000	.9999
1.10	.9111	5.8400	119.49	17.973	9.9892	139.99	1.2440	1.0665	1.1688	.9989	.9999	.9989
1.15	.8745	6.0597	120.86	18.442	9.9670	139.97	1.3739	1.0986	1.2542	.9967	.9998	.9967
1.20	.8418	6.2458	122.05	18.824	9.9283	139.94	1.5097	1.1304	1.3403	.9928	.9995	.9928
1.25	.8123	6.3982	123.08	19.118	9.8711	139.89	1.6513	1.1621	1.4269	.9871	.9992	.9870
1.30	.7856	6.5179	123.98	19.329	9.7945	139.82	1.7986	1.1938	1.5136	.9795	.9987	.9793
1.35	.7614	6.6061	124.77	19.459	9.6984	139.73	1.9517	1.2255	1.6004	.9698	.9981	.9697
1.40	.7393	6.6644	125.44	19.513	9.5830	139.63	2.1106	1.2574	1.6869	.9583	.9974	.9581
1.45	.7192	6.6945	126.03	19.495	9.4494	139.51	2.2752	1.2895	1.7732	.9449	.9965	.9446
1.50	.7007	6.6984	126.53	19.411	9.2987	139.36	2.4457	1.3220	1.8589	.9299	.9956	.9295
1.55	.6837	6.6781	126.96	19.267	9.1323	139.23	2.6219	1.3548	1.9440	.9132	.9945	.9128
1.60	.6680	6.6355	127.32	19.067	8.9519	139.07	2.8038	1.3881	2.0283	.8952	.9933	.8946
1.65	.6535	6.5730	127.63	18.818	8.7589	138.90	2.9917	1.4219	2.1118	.8759	.9921	.8753
1.70	.6401	6.4924	127.89	18.525	8.5553	138.71	3.1853	1.4562	2.1942	.8555	.9908	.8548
1.75	.6276	6.3961	128.11	18.193	8.3423	138.52	3.3847	1.4910	2.2756	.8342	.9894	.8334
1.80	.6161	6.2857	128.28	17.828	8.1220	138.32	3.5900	1.5264	2.3559	.8122	.9880	.8113
1.85	.6053	6.1633	128.42	17.435	7.8958	138.12	3.8010	1.5625	2.4349	.7896	.9866	.7886

LAST POINT AT SATURATION BOUNDARY

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140.K

E. PT1 = 10. ATM DT1 = 26.376 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9993	1.0000	1.0009	1.0002	1.0000	1.0000	1.0000
1.10	.9993	.9992	1.0015	.9998	1.0000	.9999	1.0000
1.15	.9994	.9983	1.0019	.9994	1.0000	.9998	1.0000
1.20	.9995	.9976	1.0022	.9990	1.0000	.9995	1.0000
1.25	.9995	.9970	1.0024	.9988	1.0001	.9992	1.0000
1.30	.9995	.9965	1.0024	.9986	1.0001	.9987	1.0000
1.35	.9995	.9960	1.0023	.9985	1.0001	.9981	.9999
1.40	.9995	.9956	1.0021	.9984	1.0001	.9974	.9999
1.45	.9995	.9952	1.0018	.9983	1.0001	.9965	.9998
1.50	.9994	.9948	1.0013	.9983	1.0001	.9956	.9997
1.55	.9994	.9946	1.0008	.9983	1.0000	.9945	.9995
1.60	.9994	.9943	1.0001	.9983	1.0000	.9933	.9994
1.65	.9993	.9941	.9994	.9984	.9999	.9921	.9992
1.70	.9993	.9938	.9985	.9984	.9998	.9908	.9989
1.75	.9993	.9937	.9976	.9985	.9996	.9894	.9986
1.80	.9993	.9935	.9966	.9986	.9994	.9880	.9983
1.85	.9993	.9934	.9956	.9987	.9992	.9866	.9980

LAST POINT AT SATURATION BOUNDARY

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

F. PT1 = 20. ATM DT1 = 57.991 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	10.5867	115.54	36.991	20.0016	140.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9518	11.1755	117.44	38.448	19.9980	140.00	1.1189	1.0344	1.0836	.9999	1.0000	.9999
1.10	.9110	11.6752	119.01	39.657	19.9806	139.98	1.2412	1.0673	1.1668	.9990	.9999	.9990
1.15	.8743	12.1123	120.38	40.683	19.9368	139.94	1.3695	1.0997	1.2512	.9968	.9996	.9968
1.20	.8415	12.4826	121.57	41.518	19.8606	139.88	1.5035	1.1318	1.3364	.9930	.9991	.9930
1.25	.8119	12.7875	122.58	42.164	19.7485	139.78	1.6433	1.1635	1.4220	.9874	.9984	.9874
1.30	.7851	13.0277	123.44	42.627	19.5974	139.65	1.7887	1.1951	1.5079	.9799	.9975	.9798
1.35	.7608	13.2058	124.16	42.914	19.4072	139.48	1.9398	1.2266	1.5939	.9704	.9963	.9703
1.40	.7387	13.3247	124.77	43.035	19.1786	139.28	2.0966	1.2581	1.6799	.9589	.9948	.9589
1.45	.7185	13.3852	125.26	42.991	18.9115	139.04	2.2591	1.2897	1.7656	.9456	.9932	.9456

LAST POINT AT SATURATION BOUNDARY

TABLE VI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 140 K

F. PT1 = 20. ATM DT1 = 57.991 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO IDEAL DIATOMIC GAS VALUE	----------	----------	----------	----------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9986	.9994	1.0015	.9997	1.0000	1.0000	1.0000
1.10	.9992	.9969	1.0022	.9981	1.0001	.9999	1.0001
1.15	.9992	.9951	1.0029	.9970	1.0002	.9996	1.0001
1.20	.9992	.9935	1.0033	.9961	1.0002	.9991	1.0002
1.25	.9991	.9922	1.0036	.9954	1.0004	.9984	1.0003
1.30	.9990	.9910	1.0035	.9948	1.0005	.9975	1.0005
1.35	.9988	.9899	1.0033	.9945	1.0006	.9963	1.0006
1.40	.9986	.9890	1.0027	.9942	1.0008	.9948	1.0007
1.45	.9985	.9881	1.0019	.9941	1.0008	.9932	1.0008

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

A. PT1 = 1. ATM DT1 = 2.289 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	.5283	124.93	1.452	1.0000	150.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	.5575	126.87	1.508	.9999	150.00	1.1196	1.0329	1.0840	.9999	1.0000	.9999
1.10	.9117	.5832	128.56	1.557	.9989	150.00	1.2450	1.0651	1.1691	.9989	1.0000	.9989
1.15	.8749	.6054	130.02	1.598	.9967	150.00	1.3762	1.0968	1.2550	.9967	1.0000	.9967
1.20	.8420	.6242	131.31	1.632	.9928	149.99	1.5133	1.1283	1.3416	.9928	1.0000	.9928
1.25	.8125	.6395	132.44	1.658	.9871	149.99	1.6561	1.1597	1.4285	.9871	.9999	.9870
1.30	.7857	.6516	133.45	1.676	.9794	149.98	1.8048	1.1913	1.5156	.9794	.9999	.9794
1.35	.7616	.6604	134.34	1.688	.9697	149.98	1.9593	1.2230	1.6027	.9697	.9998	.9697
1.40	.7395	.6663	135.13	1.692	.9582	149.97	2.1196	1.2551	1.6895	.9582	.9998	.9582
1.45	.7194	.6693	135.85	1.691	.9448	149.96	2.2857	1.2876	1.7759	.9448	.9997	.9448
1.50	.7010	.6697	136.49	1.684	.9298	149.94	2.4576	1.3206	1.8618	.9298	.9996	.9298
1.55	.6840	.6677	137.06	1.672	.9132	149.93	2.6354	1.3541	1.9470	.9132	.9995	.9132
1.60	.6683	.6635	137.59	1.655	.8952	149.92	2.8190	1.3882	2.0314	.8952	.9995	.8952
1.65	.6539	.6573	138.06	1.634	.8760	149.90	3.0084	1.4230	2.1148	.8760	.9994	.8759
1.70	.6405	.6493	138.49	1.609	.8557	149.89	3.2037	1.4584	2.1973	.8557	.9992	.8557
1.75	.6280	.6398	138.88	1.580	.8346	149.87	3.4048	1.4946	2.2786	.8346	.9991	.8345
1.80	.6164	.6289	139.24	1.549	.8127	149.85	3.6118	1.5315	2.3587	.8127	.9990	.8126
1.85	.6056	.6168	139.57	1.516	.7902	149.84	3.8245	1.5691	2.4376	.7902	.9989	.7901
1.90	.5955	.6037	139.87	1.480	.7673	149.82	4.0431	1.6075	2.5151	.7673	.9988	.7672
1.95	.5861	.5897	140.14	1.443	.7442	149.80	4.2675	1.6468	2.5913	.7442	.9987	.7440
2.00	.5773	.5751	140.40	1.404	.7208	149.78	4.4978	1.6868	2.6661	.7208	.9985	.7207
2.05	.5690	.5599	140.63	1.365	.6974	149.76	4.7339	1.7277	2.7394	.6974	.9984	.6973
2.10	.5612	.5443	140.85	1.325	.6741	149.74	4.9758	1.7694	2.8113	.6741	.9983	.6740
2.15	.5539	.5285	141.05	1.284	.6510	149.73	5.2236	1.8120	2.8817	.6510	.9982	.6508
2.20	.5470	.5124	141.23	1.243	.6280	149.71	5.4772	1.8555	2.9506	.6280	.9981	.6279
2.25	.5405	.4963	141.41	1.202	.6054	149.69	5.7366	1.8998	3.0180	.6054	.9979	.6053
2.30	.5344	.4801	141.57	1.162	.5832	149.67	6.0019	1.9450	3.0840	.5832	.9978	.5830
2.35	.5286	.4640	141.72	1.122	.5613	149.65	6.2731	1.9911	3.1484	.5613	.9977	.5612
2.40	.5231	.4481	141.86	1.082	.5400	149.64	6.5500	2.0381	3.2113	.5400	.9976	.5398
2.45	.5179	.4324	141.99	1.043	.5191	149.62	6.8328	2.0860	3.2728	.5191	.9975	.5190
2.50	.5130	.4168	142.11	1.004	.4988	149.61	7.1214	2.1349	3.3328	.4988	.9974	.4987
2.55	.5083	.4016	142.23	.967	.4791	149.59	7.4159	2.1846	3.3913	.4791	.9973	.4789
2.60	.5038	.3867	142.33	.930	.4599	149.57	7.7162	2.2353	3.4485	.4599	.9972	.4598

T1 NEAR TRIPLE-POINT TEMPERATURE

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

A. PT1 = 1. ATM DT1 = 2.289 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	1.0000	1.0000	1.0001	1.0000	1.0000	1.0000	1.0000
1.10	.9999	1.0000	1.0002	1.0000	1.0000	1.0000	1.0000
1.15	.9999	1.0000	1.0002	1.0000	1.0000	1.0000	1.0000
1.20	.9998	1.0000	1.0003	1.0000	1.0000	1.0000	1.0000
1.25	.9998	.9999	1.0003	1.0000	1.0000	.9999	1.0000
1.30	.9997	.9999	1.0003	1.0000	1.0000	.9999	1.0000
1.35	.9998	.9998	1.0003	.9999	1.0000	.9998	1.0000
1.40	.9997	.9998	1.0003	.9999	1.0000	.9998	1.0000
1.45	.9997	.9998	1.0003	.9999	1.0000	.9997	1.0000
1.50	.9998	.9997	1.0003	.9998	1.0000	.9996	1.0000
1.55	.9998	.9997	1.0002	.9998	1.0000	.9995	1.0000
1.60	.9998	.9996	1.0002	.9998	1.0000	.9995	1.0000
1.65	.9999	.9996	1.0001	.9998	1.0000	.9994	.9999
1.70	.9999	.9996	1.0000	.9998	1.0000	.9992	.9999
1.75	.9999	.9996	1.0000	.9998	1.0000	.9991	.9999
1.80	.9998	.9996	.9999	.9998	1.0000	.9990	.9999
1.85	.9998	.9996	.9998	.9998	1.0000	.9989	.9998
1.90	.9998	.9995	.9998	.9998	1.0000	.9988	.9998
1.95	.9998	.9995	.9997	.9998	.9999	.9987	.9998
2.00	.9999	.9995	.9996	.9998	.9999	.9985	.9998
2.05	.9999	.9995	.9995	.9998	.9999	.9984	.9997
2.10	.9999	.9995	.9994	.9998	.9999	.9983	.9997
2.15	.9999	.9995	.9993	.9998	.9999	.9982	.9997
2.20	.9999	.9995	.9992	.9998	.9998	.9981	.9996
2.25	.9999	.9995	.9992	.9998	.9998	.9979	.9996
2.30	.9999	.9995	.9991	.9998	.9998	.9978	.9995
2.35	.9999	.9995	.9990	.9998	.9997	.9977	.9995
2.40	.9999	.9995	.9989	.9998	.9997	.9976	.9994
2.45	.9999	.9995	.9988	.9998	.9997	.9975	.9994
2.50	.9999	.9995	.9988	.9998	.9996	.9974	.9993
2.55	.9999	.9995	.9987	.9998	.9996	.9973	.9993
2.60	.9999	.9995	.9986	.9999	.9995	.9972	.9992

T1 NEAR TRIPLE-POINT TEMPERATURE

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

B. PT1 = 3. ATM DT1 = 6.951 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	1.5853	124.80	4.409	3.0004	150.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0001
1.05	.9530	1.6729	126.75	4.581	3.0000	150.00	1.1196	1.0331	1.0840	1.0000	1.0000	1.0000
1.10	.9115	1.7501	128.44	4.730	2.9972	150.00	1.2449	1.0654	1.1691	.9991	1.0000	.9991
1.15	.8746	1.8169	129.92	4.855	2.9904	149.99	1.3761	1.0973	1.2550	.9968	.9999	.9968
1.20	.8418	1.8730	131.20	4.956	2.9788	149.98	1.5129	1.1288	1.3414	.9929	.9999	.9929
1.25	.8123	1.9189	132.33	5.034	2.9616	149.97	1.6554	1.1603	1.4282	.9872	.9998	.9872
1.30	.7857	1.9549	133.32	5.090	2.9386	149.95	1.8038	1.1918	1.5151	.9795	.9997	.9795
1.35	.7616	1.9815	134.20	5.125	2.9097	149.93	1.9580	1.2236	1.6021	.9699	.9995	.9699
1.40	.7395	1.9990	134.99	5.140	2.8751	149.90	2.1181	1.2557	1.6888	.9584	.9993	.9583
1.45	.7194	2.0081	135.69	5.135	2.8351	149.87	2.2839	1.2881	1.7752	.9450	.9991	.9449
1.50	.7009	2.0094	136.31	5.114	2.7899	149.84	2.4556	1.3210	1.8610	.9300	.9989	.9299
1.55	.6839	2.0034	136.87	5.077	2.7401	149.80	2.6331	1.3545	1.9461	.9134	.9986	.9132
1.60	.6683	1.9907	137.36	5.025	2.6862	149.75	2.8164	1.3884	2.0305	.8954	.9984	.8952
1.65	.6538	1.9717	137.81	4.959	2.6280	149.71	3.0055	1.4230	2.1139	.8760	.9981	.8758
1.70	.6404	1.9478	138.22	4.883	2.5671	149.66	3.2005	1.4583	2.1963	.8557	.9977	.8555
1.75	.6280	1.9191	138.58	4.797	2.5036	149.61	3.4013	1.4942	2.2776	.8345	.9974	.8343
1.80	.6164	1.8863	138.91	4.702	2.4379	149.56	3.6079	1.5309	2.3577	.8126	.9971	.8124
1.85	.6056	1.8500	139.20	4.600	2.3704	149.51	3.8204	1.5683	2.4365	.7901	.9967	.7899
1.90	.5955	1.8106	139.48	4.492	2.3017	149.45	4.0387	1.6064	2.5141	.7672	.9963	.7669
1.95	.5861	1.7687	139.72	4.379	2.2321	149.40	4.2629	1.6454	2.5902	.7440	.9960	.7437
2.00	.5772	1.7248	139.94	4.261	2.1620	149.34	4.4928	1.6851	2.6650	.7207	.9956	.7203
2.05	.5690	1.6792	140.14	4.141	2.0918	149.29	4.7286	1.7256	2.7384	.6973	.9952	.6969
2.10	.5612	1.6324	140.32	4.019	2.0217	149.23	4.9702	1.7670	2.8103	.6739	.9949	.6736
2.15	.5539	1.5847	140.49	3.895	1.9521	149.17	5.2177	1.8092	2.8807	.6507	.9945	.6504
2.20	.5469	1.5365	140.65	3.771	1.8832	149.12	5.4711	1.8523	2.9496	.6277	.9941	.6274
2.25	.5404	1.4879	140.79	3.647	1.8152	149.07	5.7302	1.8962	3.0171	.6051	.9938	.6047
2.30	.5343	1.4394	140.91	3.524	1.7484	149.01	5.9952	1.9410	3.0830	.5828	.9934	.5824
2.35	.5285	1.3911	141.03	3.401	1.6828	148.96	6.2661	1.9867	3.1475	.5609	.9931	.5605
2.40	.5230	1.3432	141.14	3.280	1.6187	148.91	6.5428	2.0333	3.2105	.5396	.9927	.5392
2.45	.5178	1.2959	141.24	3.161	1.5560	148.86	6.8253	2.0808	3.2720	.5187	.9924	.5183
2.50	.5129	1.2493	141.33	3.045	1.4950	148.81	7.1137	2.1291	3.3320	.4983	.9921	.4979
2.55	.5082	1.2035	141.42	2.930	1.4357	148.76	7.4080	2.1784	3.3906	.4786	.9918	.4782

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

B. PT1 = 3. ATM DT1 = 6.951 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0001
1.05	.9999	1.0000	1.0002	1.0000	1.0001	1.0000	1.0001
1.10	.9997	1.0000	1.0005	1.0000	1.0001	1.0000	1.0001
1.15	.9995	.9999	1.0006	1.0000	1.0001	.9999	1.0001
1.20	.9996	.9997	1.0007	.9998	1.0001	.9999	1.0001
1.25	.9996	.9995	1.0008	.9997	1.0001	.9998	1.0001
1.30	.9997	.9993	1.0008	.9996	1.0002	.9997	1.0001
1.35	.9997	.9992	1.0008	.9996	1.0002	.9995	1.0001
1.40	.9998	.9991	1.0008	.9995	1.0002	.9993	1.0001
1.45	.9998	.9990	1.0007	.9995	1.0002	.9991	1.0001
1.50	.9997	.9989	1.0006	.9994	1.0002	.9989	1.0001
1.55	.9998	.9988	1.0005	.9994	1.0002	.9986	1.0001
1.60	.9998	.9987	1.0003	.9994	1.0002	.9984	1.0000
1.65	.9998	.9987	1.0002	.9994	1.0000	.9981	.9998
1.70	.9998	.9986	1.0000	.9994	1.0000	.9977	.9997
1.75	.9998	.9986	.9998	.9993	1.0000	.9974	.9997
1.80	.9998	.9985	.9996	.9993	.9999	.9971	.9996
1.85	.9998	.9985	.9993	.9994	.9999	.9967	.9996
1.90	.9997	.9985	.9991	.9994	.9998	.9963	.9994
1.95	.9998	.9984	.9988	.9994	.9998	.9960	.9994
2.00	.9998	.9984	.9986	.9994	.9997	.9956	.9993
2.05	.9998	.9984	.9983	.9994	.9996	.9952	.9992
2.10	.9998	.9984	.9981	.9994	.9996	.9949	.9990
2.15	.9999	.9984	.9978	.9994	.9995	.9945	.9989
2.20	.9998	.9984	.9976	.9995	.9993	.9941	.9988
2.25	.9998	.9984	.9973	.9995	.9992	.9938	.9986
2.30	.9998	.9984	.9970	.9995	.9991	.9934	.9985
2.35	.9998	.9984	.9968	.9995	.9990	.9931	.9983
2.40	.9999	.9984	.9966	.9996	.9989	.9927	.9982
2.45	.9999	.9984	.9963	.9996	.9988	.9924	.9980
2.50	.9999	.9984	.9961	.9996	.9986	.9921	.9978
2.55	.9999	.9984	.9959	.9996	.9985	.9918	.9976

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

C. PT1 = 5. ATM DT1 = 11.727 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	2.6422	124.68	7.441	5.0001	150.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9529	2.7883	126.64	7.732	4.9993	150.00	1.1196	1.0333	1.0840	.9999	1.0000	.9999
1.10	.9113	2.9171	128.34	7.983	4.9946	150.00	1.2449	1.0657	1.1691	.9989	1.0000	.9989
1.15	.8746	3.0279	129.81	8.193	4.9834	149.99	1.3757	1.0977	1.2548	.9967	.9999	.9967
1.20	.8418	3.1212	131.09	8.363	4.9640	149.97	1.5123	1.1293	1.3411	.9928	.9998	.9928
1.25	.8123	3.1975	132.21	8.495	4.9354	149.95	1.6546	1.1608	1.4277	.9871	.9997	.9870
1.30	.7857	3.2575	133.20	8.589	4.8970	149.92	1.8027	1.1924	1.5146	.9794	.9995	.9794
1.35	.7615	3.3017	134.07	8.647	4.8489	149.88	1.9567	1.2242	1.6014	.9698	.9992	.9697
1.40	.7395	3.3310	134.85	8.671	4.7913	149.84	2.1165	1.2562	1.6881	.9583	.9989	.9582
1.45	.7194	3.3462	135.53	8.664	4.7245	149.78	2.2821	1.2886	1.7744	.9449	.9986	.9448
1.50	.7009	3.3482	136.13	8.628	4.6494	149.73	2.4535	1.3214	1.8601	.9299	.9982	.9297
1.55	.6839	3.3382	136.67	8.565	4.5663	149.66	2.6307	1.3548	1.9452	.9133	.9977	.9131
1.60	.6683	3.3171	137.14	8.477	4.4764	149.59	2.8137	1.3886	2.0295	.8953	.9973	.8950
1.65	.6537	3.2862	137.57	8.368	4.3801	149.51	3.0026	1.4231	2.1129	.8760	.9968	.8758
1.70	.6404	3.2462	137.95	8.239	4.2787	149.43	3.1973	1.4581	2.1952	.8557	.9962	.8555
1.75	.6279	3.1984	138.28	8.094	4.1728	149.35	3.3977	1.4939	2.2765	.8346	.9957	.8342
1.80	.6164	3.1437	138.58	7.933	4.0632	149.26	3.6040	1.5303	2.3566	.8126	.9951	.8123
1.85	.6055	3.0831	138.85	7.760	3.9506	149.17	3.8162	1.5674	2.4354	.7901	.9945	.7897
1.90	.5955	3.0173	139.08	7.577	3.8359	149.08	4.0342	1.6053	2.5130	.7672	.9939	.7668
1.95	.5860	2.9474	139.29	7.386	3.7198	148.99	4.2580	1.6439	2.5891	.7440	.9933	.7435
2.00	.5772	2.8740	139.48	7.187	3.6029	148.90	4.4876	1.6833	2.6639	.7206	.9927	.7201
2.05	.5689	2.7980	139.65	6.984	3.4856	148.81	4.7232	1.7235	2.7373	.6971	.9920	.6966
2.10	.5611	2.7198	139.80	6.777	3.3686	148.71	4.9645	1.7645	2.8092	.6737	.9914	.6732
2.15	.5538	2.6402	139.93	6.568	3.2525	148.62	5.2117	1.8063	2.8797	.6505	.9908	.6500
2.20	.5469	2.5596	140.05	6.358	3.1375	148.53	5.4647	1.8490	2.9487	.6275	.9902	.6269
2.25	.5404	2.4786	140.16	6.148	3.0240	148.44	5.7236	1.8925	3.0161	.6048	.9896	.6042
2.30	.5342	2.3976	140.26	5.939	2.9123	148.35	5.9884	1.9369	3.0821	.5825	.9890	.5819
2.35	.5285	2.3169	140.34	5.733	2.8029	148.26	6.2589	1.9821	3.1466	.5606	.9884	.5600

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

C. PT1 = 5. ATM DT1 = 11.727 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9997	1.0000	1.0004	1.0000	1.0000	1.0000	1.0000
1.10	.9995	.9999	1.0008	1.0000	1.0000	1.0000	1.0000
1.15	.9995	.9996	1.0010	.9998	1.0000	.9999	1.0000
1.20	.9995	.9993	1.0011	.9996	1.0000	.9998	1.0000
1.25	.9996	.9990	1.0012	.9994	1.0000	.9997	1.0000
1.30	.9997	.9988	1.0013	.9993	1.0000	.9995	1.0000
1.35	.9997	.9985	1.0013	.9992	1.0001	.9992	1.0000
1.40	.9997	.9984	1.0012	.9991	1.0001	.9989	1.0000
1.45	.9997	.9982	1.0011	.9990	1.0001	.9986	.9999
1.50	.9997	.9980	1.0009	.9989	1.0001	.9982	.9999
1.55	.9997	.9979	1.0007	.9989	1.0001	.9977	.9999
1.60	.9997	.9978	1.0005	.9989	1.0001	.9973	.9998
1.65	.9997	.9977	1.0002	.9989	1.0000	.9968	.9998
1.70	.9997	.9976	.9999	.9989	1.0000	.9962	.9997
1.75	.9997	.9975	.9995	.9989	1.0000	.9957	.9996
1.80	.9998	.9974	.9991	.9989	.9999	.9951	.9995
1.85	.9997	.9974	.9988	.9989	.9999	.9945	.9994
1.90	.9997	.9973	.9983	.9989	.9998	.9939	.9992
1.95	.9997	.9973	.9979	.9989	.9997	.9933	.9991
2.00	.9998	.9973	.9975	.9990	.9996	.9927	.9989
2.05	.9997	.9972	.9971	.9990	.9994	.9920	.9987
2.10	.9997	.9972	.9966	.9990	.9993	.9914	.9985
2.15	.9997	.9972	.9962	.9991	.9991	.9908	.9983
2.20	.9997	.9972	.9958	.9991	.9990	.9902	.9981
2.25	.9998	.9972	.9953	.9992	.9988	.9896	.9979
2.30	.9997	.9972	.9949	.9992	.9986	.9890	.9976
2.35	.9997	.9972	.9945	.9993	.9984	.9884	.9973

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

D. PT1 = 8. ATM DT1 = 19.120 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	4.2282	124.49	12.141	8.0006	150.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9527	4.4624	126.47	12.617	7.9993	150.00	1.1195	1.0335	1.0840	.9999	1.0000	.9999
1.10	.9111	4.6683	128.17	13.026	7.9917	149.99	1.2447	1.0662	1.1689	.9990	1.0000	.9989
1.15	.8745	4.8444	129.64	13.366	7.9740	149.98	1.3750	1.0982	1.2543	.9968	.9999	.9967
1.20	.8418	4.9935	130.92	13.643	7.9431	149.96	1.5112	1.1299	1.3404	.9929	.9997	.9929
1.25	.8123	5.1157	132.04	13.857	7.8974	149.92	1.6532	1.1615	1.4269	.9872	.9995	.9871
1.30	.7856	5.2117	133.02	14.010	7.8361	149.87	1.8010	1.1932	1.5136	.9795	.9991	.9794
1.35	.7615	5.2824	133.88	14.105	7.7593	149.81	1.9545	1.2249	1.6003	.9699	.9987	.9698
1.40	.7394	5.3293	134.63	14.145	7.6672	149.74	2.1139	1.2570	1.6868	.9584	.9983	.9583
1.45	.7193	5.3537	135.29	14.133	7.5604	149.66	2.2791	1.2893	1.7730	.9451	.9977	.9449
1.50	.7008	5.3570	135.87	14.073	7.4402	149.56	2.4501	1.3220	1.8586	.9300	.9971	.9298
1.55	.6838	5.3411	136.38	13.970	7.3074	149.46	2.6269	1.3551	1.9436	.9134	.9964	.9132
1.60	.6682	5.3074	136.82	13.827	7.1635	149.35	2.8094	1.3888	2.0278	.8954	.9956	.8951
1.65	.6537	5.2579	137.21	13.648	7.0095	149.22	2.9978	1.4230	2.1111	.8762	.9948	.8758
1.70	.6403	5.1940	137.54	13.437	6.8472	149.10	3.1920	1.4577	2.1934	.8559	.9940	.8555
1.75	.6278	5.1174	137.83	13.199	6.6775	148.96	3.3920	1.4931	2.2746	.8347	.9931	.8342
1.80	.6162	5.0299	138.09	12.937	6.5018	148.82	3.5979	1.5292	2.3547	.8127	.9922	.8122
1.85	.6054	4.9327	138.31	12.654	6.3216	148.68	3.8095	1.5659	2.4335	.7902	.9912	.7897
1.90	.5954	4.8274	138.50	12.355	6.1379	148.53	4.0270	1.6033	2.5111	.7672	.9902	.7667
1.95	.5859	4.7154	138.66	12.041	5.9516	148.39	4.2504	1.6415	2.5873	.7439	.9892	.7433
2.00	.5771	4.5977	138.80	11.717	5.7641	148.24	4.4795	1.6803	2.6621	.7205	.9882	.7199
2.05	.5688	4.4756	138.91	11.384	5.5762	148.09	4.7146	1.7200	2.7356	.6970	.9872	.6963
2.10	.5610	4.3503	139.01	11.046	5.3886	147.94	4.9554	1.7604	2.8075	.6736	.9862	.6729
2.15	.5537	4.2226	139.09	10.704	5.2021	147.79	5.2022	1.8017	2.8780	.6503	.9852	.6495
2.20	.5468	4.0933	139.16	10.360	5.0177	147.64	5.4548	1.8437	2.9471	.6272	.9843	.6264

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

D. PT1 = 8. ATM DT1 = 19.120 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9996	1.0000	1.0006	1.0000	1.0001	1.0000	1.0000
1.10	.9993	.9997	1.0011	.9998	1.0000	1.0000	1.0000
1.15	.9995	.9991	1.0014	.9994	1.0001	.9999	1.0000
1.20	.9995	.9986	1.0017	.9991	1.0001	.9997	1.0001
1.25	.9996	.9981	1.0018	.9988	1.0001	.9995	1.0001
1.30	.9996	.9978	1.0019	.9986	1.0001	.9991	1.0001
1.35	.9996	.9974	1.0019	.9984	1.0002	.9987	1.0001
1.40	.9996	.9971	1.0018	.9983	1.0002	.9983	1.0001
1.45	.9996	.9969	1.0016	.9982	1.0002	.9977	1.0000
1.50	.9996	.9966	1.0013	.9981	1.0003	.9971	1.0000
1.55	.9996	.9964	1.0010	.9981	1.0003	.9964	1.0000
1.60	.9996	.9962	1.0006	.9980	1.0003	.9956	.9999
1.65	.9996	.9961	1.0001	.9980	1.0002	.9948	.9998
1.70	.9996	.9959	.9996	.9980	1.0002	.9940	.9997
1.75	.9996	.9958	.9990	.9980	1.0002	.9931	.9996
1.80	.9996	.9957	.9984	.9981	1.0001	.9922	.9994
1.85	.9996	.9956	.9978	.9981	1.0000	.9912	.9993
1.90	.9996	.9955	.9971	.9982	.9998	.9902	.9991
1.95	.9995	.9955	.9965	.9982	.9997	.9892	.9988
2.00	.9996	.9955	.9958	.9983	.9995	.9882	.9986
2.05	.9996	.9954	.9950	.9984	.9993	.9872	.9983
2.10	.9996	.9954	.9943	.9984	.9991	.9862	.9980
2.15	.9995	.9954	.9936	.9985	.9988	.9852	.9977
2.20	.9995	.9954	.9929	.9986	.9985	.9843	.9973

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

E. PT1 = 10. ATM DT1 = 24.212 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	5.2858	124.37	15.383	10.0015	150.00	1.0000	1.0000	1.0000	1.0002	1.0000	1.0001
1.05	.9526	5.5790	126.36	15.987	9.9999	150.00	1.1195	1.0337	1.0840	1.0000	1.0000	1.0000
1.10	.9111	5.8353	128.06	16.503	9.9905	149.99	1.2443	1.0664	1.1686	.9991	1.0000	.9990
1.15	.8746	6.0552	129.53	16.934	9.9684	149.98	1.3744	1.0985	1.2539	.9968	.9998	.9968
1.20	.8418	6.2416	130.81	17.284	9.9298	149.95	1.5104	1.1303	1.3399	.9930	.9996	.9929
1.25	.8123	6.3941	131.93	17.555	9.8728	149.90	1.6521	1.1619	1.4262	.9873	.9993	.9872
1.30	.7856	6.5130	132.90	17.745	9.7948	149.84	1.7997	1.1936	1.5128	.9795	.9989	.9794
1.35	.7614	6.6016	133.75	17.865	9.6988	149.77	1.9530	1.2254	1.5994	.9699	.9984	.9698
1.40	.7394	6.6603	134.49	17.916	9.5838	149.68	2.1121	1.2574	1.6858	.9584	.9978	.9582
1.45	.7192	6.6909	135.14	17.901	9.4505	149.57	2.2770	1.2896	1.7719	.9450	.9971	.9449
1.50	.7008	6.6951	135.70	17.825	9.3003	149.45	2.4476	1.3223	1.8574	.9300	.9964	.9298
1.55	.6838	6.6753	136.18	17.694	9.1344	149.32	2.6241	1.3553	1.9423	.9134	.9955	.9132
1.60	.6681	6.6334	136.60	17.512	8.9543	149.18	2.8064	1.3888	2.0265	.8954	.9945	.8951
1.65	.6536	6.5714	136.97	17.285	8.7621	149.03	2.9944	1.4228	2.1097	.8762	.9935	.8758
1.70	.6402	6.4917	137.28	17.019	8.5588	148.87	3.1883	1.4574	2.1920	.8559	.9925	.8555
1.75	.6277	6.3960	137.54	16.716	8.3467	148.70	3.3880	1.4925	2.2732	.8347	.9914	.8342
1.80	.6162	6.2864	137.76	16.384	8.1271	148.53	3.5934	1.5283	2.3533	.8127	.9902	.8122
1.85	.6053	6.1649	137.95	16.025	7.9014	148.35	3.8048	1.5648	2.4322	.7901	.9890	.7896
1.90	.5953	6.0331	138.11	15.645	7.6715	148.17	4.0220	1.6019	2.5097	.7672	.9878	.7665
1.95	.5859	5.8928	138.23	15.247	7.4386	147.98	4.2449	1.6397	2.5860	.7439	.9865	.7432
2.00	.5770	5.7456	138.34	14.835	7.2037	147.79	4.4738	1.6782	2.6608	.7204	.9853	.7197
2.05	.5687	5.5928	138.42	14.413	6.9684	147.60	4.7085	1.7175	2.7343	.6968	.9840	.6961
2.10	.5610	5.4359	138.48	13.983	6.7337	147.42	4.9491	1.7575	2.8063	.6734	.9828	.6726

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

E. PT1 = 10. ATM DT1 = 24.212 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO	IDEAL DIATOMIC	GAS VALUE	----------	----------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0002	1.0000	1.0001
1.05	.9994	1.0000	1.0008	1.0000	1.0001	1.0000	1.0001
1.10	.9993	.9994	1.0013	.9996	1.0001	1.0000	1.0001
1.15	.9995	.9986	1.0017	.9991	1.0002	.9998	1.0001
1.20	.9995	.9981	1.0020	.9987	1.0002	.9996	1.0001
1.25	.9996	.9975	1.0022	.9984	1.0002	.9993	1.0002
1.30	.9996	.9970	1.0023	.9981	1.0001	.9989	1.0000
1.35	.9996	.9966	1.0023	.9979	1.0001	.9984	1.0000
1.40	.9996	.9963	1.0021	.9977	1.0002	.9978	1.0000
1.45	.9995	.9960	1.0019	.9976	1.0002	.9971	1.0000
1.50	.9996	.9956	1.0015	.9975	1.0003	.9964	1.0000
1.55	.9995	.9954	1.0011	.9974	1.0003	.9955	1.0000
1.60	.9995	.9952	1.0006	.9974	1.0003	.9945	.9999
1.65	.9995	.9950	1.0000	.9974	1.0003	.9935	.9998
1.70	.9994	.9948	.9994	.9974	1.0002	.9925	.9997
1.75	.9995	.9946	.9986	.9974	1.0001	.9914	.9996
1.80	.9995	.9945	.9979	.9975	1.0000	.9902	.9994
1.85	.9994	.9944	.9971	.9976	.9999	.9890	.9992
1.90	.9994	.9943	.9962	.9976	.9997	.9878	.9989
1.95	.9995	.9942	.9954	.9977	.9995	.9865	.9987
2.00	.9994	.9942	.9945	.9978	.9993	.9853	.9983
2.05	.9994	.9941	.9936	.9979	.9990	.9840	.9980
2.10	.9994	.9941	.9927	.9980	.9988	.9828	.9976

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

F. PT1 = 20. ATM DT1 = 51.941 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	10.5639	123.84	33.124	20.0007	150.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9518	11.1535	125.87	34.427	19.9971	150.00	1.1193	1.0343	1.0836	.9999	1.0000	.9999
1.10	.9110	11.6539	127.56	35.509	19.9792	149.98	1.2421	1.0672	1.1667	.9990	.9999	.9990
1.15	.8744	12.0914	129.03	36.427	19.9355	149.95	1.3710	1.0996	1.2509	.9968	.9997	.9968
1.20	.8416	12.4626	130.31	37.174	19.8593	149.89	1.5056	1.1317	1.3359	.9930	.9993	.9929
1.25	.8120	12.7678	131.41	37.753	19.7467	149.81	1.6459	1.1635	1.4213	.9873	.9987	.9873
1.30	.7853	13.0087	132.35	38.168	19.5963	149.69	1.7919	1.1952	1.5070	.9798	.9979	.9798
1.35	.7610	13.1876	133.16	38.427	19.4065	149.55	1.9437	1.2269	1.5928	.9703	.9970	.9704
1.40	.7390	13.3071	133.84	38.536	19.1789	149.37	2.1011	1.2586	1.6784	.9589	.9958	.9590
1.45	.7188	13.3707	134.41	38.506	18.9148	149.17	2.2642	1.2905	1.7638	.9457	.9944	.9458
1.50	.7003	13.3822	134.88	38.347	18.6163	148.94	2.4331	1.3226	1.8488	.9308	.9929	.9309
1.55	.6832	13.3454	135.27	38.068	18.2870	148.68	2.6078	1.3549	1.9333	.9143	.9912	.9145
1.60	.6675	13.2643	135.58	37.680	17.9284	148.40	2.7882	1.3876	2.0172	.8964	.9893	.8966
1.65	.6530	13.1429	135.81	37.195	17.5443	148.10	2.9745	1.4207	2.1002	.8772	.9873	.8774
1.70	.6395	12.9852	135.99	36.621	17.1381	147.78	3.1665	1.4541	2.1824	.8569	.9852	.8571
1.75	.6271	12.7950	136.11	35.970	16.7135	147.44	3.3643	1.4880	2.2636	.8357	.9830	.8358

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

F. PT1 = 20. ATM DT1 = 51.941 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9987	.9998	1.0014	.9996	1.0000	1.0000	1.0000
1.10	.9992	.9977	1.0021	.9979	1.0000	.9999	1.0000
1.15	.9993	.9962	1.0028	.9967	1.0001	.9997	1.0001
1.20	.9993	.9949	1.0033	.9958	1.0002	.9993	1.0001
1.25	.9993	.9937	1.0036	.9949	1.0003	.9987	1.0002
1.30	.9992	.9928	1.0036	.9943	1.0004	.9979	1.0005
1.35	.9991	.9919	1.0035	.9938	1.0006	.9970	1.0006
1.40	.9990	.9911	1.0031	.9934	1.0008	.9958	1.0008
1.45	.9989	.9904	1.0025	.9931	1.0010	.9944	1.0010
1.50	.9988	.9897	1.0018	.9929	1.0011	.9929	1.0012
1.55	.9987	.9892	1.0008	.9928	1.0013	.9912	1.0014
1.60	.9986	.9887	.9997	.9928	1.0014	.9893	1.0015
1.65	.9985	.9883	.9985	.9929	1.0014	.9873	1.0016
1.70	.9984	.9880	.9971	.9930	1.0014	.9852	1.0016
1.75	.9984	.9877	.9956	.9932	1.0013	.9830	1.0015

LAST POINT AT SATURATION BOUNDARY

TABLF VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

G. PT1 = 30. ATM DT1 = 84.460 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	15.8033	123.46	54.228	30.0017	150.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0008
1.05	.9518	16.6762	125.49	56.321	29.9964	150.00	1.1179	1.0344	1.0818	.9999	1.0000	.9999
1.10	.9109	17.4184	127.18	58.058	29.9706	149.98	1.2390	1.0674	1.1632	.9990	.9999	.9998
1.15	.8742	18.0692	128.65	59.534	29.9067	149.93	1.3660	1.0998	1.2456	.9969	.9995	.9969
1.20	.8412	18.6252	129.91	60.743	29.7966	149.85	1.4988	1.1318	1.3288	.9932	.9990	.9933
1.25	.8116	19.0846	130.99	61.683	29.6324	149.73	1.6371	1.1635	1.4125	.9877	.9982	.9879
1.30	.7847	19.4506	131.91	62.365	29.4136	149.57	1.7810	1.1949	1.4966	.9805	.9971	.9808
1.35	.7603	19.7256	132.67	62.797	29.1363	149.36	1.9306	1.2262	1.5808	.9712	.9957	.9718
1.40	.7381	19.9139	133.30	62.993	28.8041	149.11	2.0858	1.2575	1.6652	.9601	.9941	.9609
1.45	.7178	20.0198	133.80	62.966	28.4158	148.82	2.2467	1.2888	1.7495	.9472	.9921	.9482
1.50	.6992	20.0477	134.20	62.728	27.9763	148.49	2.4132	1.3201	1.8335	.9325	.9899	.9338

LAST POINT AT SATURATION BOUNDARY

TABLE VII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 150 K

G. PT1 = 30. ATM DT1 = 84.460 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9986	.9985	1.0015	.9980	1.0000	1.0000	1.0000
1.10	.9990	.9952	1.0023	.9949	1.0001	.9999	1.0001
1.15	.9991	.9926	1.0029	.9925	1.0002	.9995	1.0002
1.20	.9989	.9904	1.0034	.9905	1.0004	.9990	1.0005
1.25	.9987	.9884	1.0035	.9888	1.0007	.9982	1.0009
1.30	.9984	.9867	1.0034	.9874	1.0011	.9971	1.0015
1.35	.9982	.9852	1.0030	.9863	1.0015	.9957	1.0021
1.40	.9979	.9839	1.0022	.9855	1.0020	.9941	1.0029
1.45	.9976	.9827	1.0012	.9850	1.0025	.9921	1.0036
1.50	.9973	.9817	.9999	.9847	1.0030	.9899	1.0043

LAST POINT AT SATURATION BOUNDARY

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

A. PT1 = 1. ATM DT1 = 1.958 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	.5282	145.76	1.241	1.0000	175.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	.5574	148.03	1.290	.9999	175.00	1.1196	1.0329	1.0840	.9999	1.0000	.9999
1.10	.9117	.5831	149.99	1.332	.9989	175.00	1.2450	1.0651	1.1690	.9989	1.0000	.9989
1.15	.8749	.6053	151.70	1.367	.9967	175.00	1.3762	1.0968	1.2549	.9967	1.0000	.9967
1.20	.8421	.6240	153.20	1.395	.9928	175.00	1.5133	1.1282	1.3415	.9928	1.0000	.9928
1.25	.8125	.6394	154.53	1.417	.9871	174.99	1.6561	1.1597	1.4284	.9871	1.0000	.9871
1.30	.7858	.6514	155.70	1.433	.9794	174.99	1.8049	1.1912	1.5154	.9794	.9999	.9794
1.35	.7616	.6603	156.74	1.443	.9697	174.98	1.9594	1.2230	1.6025	.9697	.9999	.9697
1.40	.7395	.6662	157.68	1.447	.9582	174.97	2.1198	1.2550	1.6893	.9582	.9999	.9582
1.45	.7194	.6692	158.51	1.446	.9448	174.97	2.2859	1.2876	1.7757	.9448	.9998	.9448
1.50	.7010	.6697	159.26	1.440	.9298	174.96	2.4579	1.3205	1.8615	.9298	.9998	.9298
1.55	.6840	.6677	159.94	1.430	.9132	174.95	2.6357	1.3541	1.9467	.9132	.9997	.9132
1.60	.6683	.6635	160.55	1.415	.8952	174.94	2.8193	1.3882	2.0311	.8952	.9996	.8952
1.65	.6539	.6573	161.11	1.397	.8760	174.93	3.0088	1.4230	2.1145	.8760	.9996	.8760
1.70	.6404	.6493	161.62	1.376	.8558	174.91	3.2041	1.4585	2.1969	.8558	.9995	.8558
1.75	.6280	.6398	162.08	1.352	.8346	174.90	3.4052	1.4947	2.2782	.8346	.9994	.8346
1.80	.6164	.6289	162.50	1.325	.8127	174.89	3.6122	1.5316	2.3583	.8127	.9994	.8127
1.85	.6056	.6168	162.89	1.296	.7903	174.87	3.8250	1.5693	2.4372	.7903	.9993	.7903
1.90	.5956	.6037	163.25	1.266	.7674	174.86	4.0436	1.6078	2.5147	.7674	.9992	.7674
1.95	.5861	.5898	163.58	1.234	.7443	174.85	4.2681	1.6471	2.5909	.7443	.9991	.7443
2.00	.5773	.5751	163.88	1.201	.7209	174.83	4.4984	1.6872	2.6656	.7209	.9990	.7209
2.05	.5690	.5600	164.16	1.167	.6976	174.82	4.7345	1.7282	2.7390	.6976	.9990	.6976
2.10	.5612	.5444	164.42	1.133	.6743	174.80	4.9765	1.7700	2.8108	.6743	.9989	.6743
2.15	.5539	.5286	164.66	1.098	.6511	174.79	5.2243	1.8126	2.8812	.6511	.9988	.6511
2.20	.5470	.5125	164.89	1.064	.6282	174.78	5.4780	1.8562	2.9501	.6282	.9987	.6281
2.25	.5405	.4964	165.10	1.029	.6056	174.76	5.7375	1.9006	3.0175	.6056	.9986	.6055
2.30	.5343	.4802	165.29	.994	.5833	174.75	6.0028	1.9459	3.0834	.5833	.9986	.5833
2.35	.5286	.4642	165.47	.960	.5615	174.74	6.2739	1.9921	3.1479	.5615	.9985	.5615
2.40	.5231	.4482	165.64	.926	.5402	174.72	6.5509	2.0392	3.2108	.5402	.9984	.5401
2.45	.5179	.4325	165.80	.892	.5193	174.71	6.8337	2.0872	3.2723	.5193	.9983	.5193
2.50	.5130	.4170	165.95	.859	.4990	174.70	7.1224	2.1361	3.3323	.4990	.9983	.4990
2.55	.5083	.4018	166.09	.827	.4793	174.69	7.4169	2.1859	3.3908	.4793	.9982	.4793
2.60	.5039	.3869	166.22	.796	.4601	174.67	7.7172	2.2366	3.4479	.4601	.9981	.4601
2.65	.4996	.3723	166.34	.765	.4415	174.66	8.0234	2.2883	3.5036	.4415	.9981	.4415
2.70	.4956	.3581	166.46	.736	.4236	174.65	8.3354	2.3409	3.5580	.4236	.9980	.4235
2.75	.4918	.3443	166.57	.707	.4062	174.64	8.6532	2.3944	3.6109	.4062	.9980	.4062
2.80	.4881	.3308	166.68	.679	.3894	174.63	8.9769	2.4489	3.6626	.3894	.9979	.3894
2.85	.4847	.3178	166.78	.651	.3732	174.62	9.3064	2.5043	3.7129	.3732	.9978	.3732
2.90	.4814	.3052	166.87	.625	.3577	174.61	9.6417	2.5607	3.7619	.3577	.9978	.3576
2.95	.4782	.2930	166.96	.600	.3427	174.60	9.9829	2.6180	3.8097	.3427	.9977	.3426

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

A. PT1 = 1. ATM DT1 = 1.958 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	1.0000	1.0000	1.0001	1.0000	1.0000	1.0000	1.0000
1.10	.9999	1.0000	1.0001	.9999	1.0000	1.0000	1.0000
1.15	.9999	1.0000	1.0002	.9999	1.0000	1.0000	1.0000
1.20	.9999	1.0000	1.0002	.9999	1.0000	1.0000	1.0000
1.25	.9998	1.0000	1.0002	.9999	1.0000	1.0000	1.0000
1.30	.9998	.9999	1.0003	.9998	1.0000	.9999	1.0000
1.35	.9998	.9999	1.0003	.9998	1.0000	.9999	1.0000
1.40	.9998	.9999	1.0003	.9998	1.0000	.9999	1.0000
1.45	.9997	.9999	1.0003	.9998	1.0000	.9998	1.0000
1.50	.9998	.9998	1.0003	.9997	1.0000	.9998	1.0000
1.55	.9998	.9998	1.0002	.9997	1.0000	.9997	1.0000
1.60	.9998	.9998	1.0002	.9997	1.0000	.9996	1.0000
1.65	.9998	.9998	1.0002	.9997	1.0000	.9996	1.0000
1.70	.9998	.9997	1.0001	.9996	1.0001	.9995	1.0000
1.75	.9998	.9997	1.0001	.9996	1.0001	.9994	1.0001
1.80	.9999	.9997	1.0000	.9996	1.0001	.9994	1.0001
1.85	.9999	.9997	1.0000	.9996	1.0001	.9993	1.0001
1.90	.9999	.9997	1.0000	.9996	1.0001	.9992	1.0001
1.95	.9999	.9997	.9999	.9996	1.0001	.9991	1.0001
2.00	.9999	.9997	.9998	.9996	1.0001	.9990	1.0001
2.05	.9999	.9997	.9998	.9996	1.0001	.9990	1.0001
2.10	.9999	.9996	.9997	.9996	1.0001	.9989	1.0001
2.15	.9999	.9996	.9997	.9996	1.0001	.9988	1.0001
2.20	.9998	.9996	.9996	.9996	1.0000	.9987	1.0000
2.25	.9998	.9996	.9996	.9996	1.0000	.9986	1.0000
2.30	.9999	.9996	.9995	.9996	1.0000	.9986	1.0000
2.35	.9999	.9996	.9995	.9997	1.0000	.9985	1.0000
2.40	.9999	.9996	.9994	.9997	1.0000	.9984	1.0000
2.45	1.0000	.9996	.9994	.9997	1.0000	.9983	1.0000
2.50	1.0000	.9996	.9993	.9997	1.0000	.9983	1.0000
2.55	1.0000	.9996	.9993	.9997	1.0000	.9982	.9999
2.60	1.0000	.9996	.9992	.9997	.9999	.9981	.9999
2.65	1.0000	.9997	.9992	.9997	.9999	.9981	.9999
2.70	1.0000	.9997	.9992	.9997	.9999	.9980	.9999
2.75	1.0000	.9997	.9991	.9997	.9999	.9980	.9998
2.80	1.0000	.9997	.9991	.9997	.9998	.9979	.9998
2.85	.9999	.9997	.9990	.9997	.9998	.9978	.9998
2.90	.9999	.9997	.9998	.9997	.9998	.9978	.9997
2.95	.9999	.9997	.9998	.9998	.9997	.9977	.9997

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

B. PT1 = 3. ATM DT1 = 5.915 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	1.5845	145.64	3.752	3.0002	175.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9530	1.6719	147.91	3.899	2.9998	175.00	1.1196	1.0330	1.0839	.9999	1.0000	.9999
1.10	.9116	1.7491	149.88	4.025	2.9970	175.00	1.2450	1.0653	1.1689	.9990	1.0000	.9989
1.15	.8748	1.8158	151.60	4.132	2.9903	174.99	1.3762	1.0971	1.2547	.9968	1.0000	.9967
1.20	.8418	1.8722	153.10	4.218	2.9786	174.99	1.5132	1.1287	1.3412	.9929	.9999	.9928
1.25	.8123	1.9181	154.42	4.284	2.9614	174.98	1.6558	1.1601	1.4279	.9871	.9999	.9871
1.30	.7857	1.9541	155.59	4.332	2.9384	174.96	1.8043	1.1917	1.5148	.9795	.9998	.9795
1.35	.7615	1.9807	156.62	4.362	2.9095	174.95	1.9586	1.2235	1.6017	.9698	.9997	.9698
1.40	.7395	1.9983	157.54	4.374	2.8750	174.93	2.1187	1.2555	1.6883	.9583	.9996	.9583
1.45	.7194	2.0075	158.37	4.371	2.8350	174.90	2.2847	1.2880	1.7746	.9450	.9994	.9450
1.50	.7009	2.0088	159.11	4.353	2.7899	174.87	2.4565	1.3210	1.8603	.9300	.9993	.9300
1.55	.6839	2.0029	159.77	4.321	2.7402	174.84	2.6341	1.3545	1.9454	.9134	.9991	.9134
1.60	.6683	1.9903	160.37	4.277	2.6863	174.81	2.8175	1.3886	2.0297	.8954	.9989	.8954
1.65	.6538	1.9718	160.91	4.223	2.6287	174.78	3.0068	1.4233	2.1130	.8762	.9987	.8762
1.70	.6404	1.9480	161.40	4.158	2.5680	174.74	3.2019	1.4587	2.1953	.8560	.9985	.8560
1.75	.6280	1.9194	161.84	4.085	2.5045	174.70	3.4028	1.4947	2.2766	.8348	.9983	.8348
1.80	.6164	1.8867	162.24	4.005	2.4388	174.66	3.6096	1.5315	2.3566	.8129	.9981	.8129
1.85	.6056	1.8505	162.61	3.918	2.3715	174.62	3.8222	1.5691	2.4354	.7905	.9978	.7905
1.90	.5955	1.8112	162.94	3.826	2.3029	174.58	4.0406	1.6074	2.5129	.7676	.9976	.7676
1.95	.5861	1.7694	163.24	3.730	2.2334	174.54	4.2648	1.6465	2.5890	.7445	.9974	.7444
2.00	.5773	1.7255	163.52	3.630	2.1634	174.50	4.4949	1.6864	2.6638	.7211	.9971	.7211
2.05	.5690	1.6800	163.78	3.528	2.0932	174.46	4.7308	1.7271	2.7371	.6977	.9969	.6977
2.10	.5612	1.6333	164.02	3.424	2.0232	174.41	4.9726	1.7687	2.8089	.6744	.9966	.6744
2.15	.5539	1.5857	164.23	3.319	1.9537	174.37	5.2202	1.8112	2.8793	.6512	.9964	.6512
2.20	.5470	1.5376	164.43	3.214	1.8849	174.33	5.4736	1.8545	2.9482	.6283	.9962	.6282
2.25	.5405	1.4891	164.61	3.108	1.8170	174.29	5.7329	1.8986	3.0157	.6057	.9959	.6056
2.30	.5344	1.4407	164.78	3.004	1.7502	174.25	5.9980	1.9437	3.0816	.5834	.9957	.5834
2.35	.5286	1.3924	164.94	2.900	1.6847	174.21	6.2689	1.9896	3.1460	.5616	.9955	.5615
2.40	.5231	1.3446	165.09	2.797	1.6205	174.17	6.5457	2.0364	3.2090	.5402	.9953	.5401
2.45	.5179	1.2973	165.22	2.696	1.5579	174.13	6.8284	2.0842	3.2705	.5193	.9950	.5193
2.50	.5130	1.2508	165.35	2.596	1.4970	174.10	7.1168	2.1328	3.3305	.4990	.9948	.4989
2.55	.5083	1.2050	165.47	2.499	1.4376	174.06	7.4112	2.1823	3.3891	.4792	.9946	.4792
2.60	.5038	1.1603	165.58	2.404	1.3801	174.02	7.7113	2.2328	3.4463	.4600	.9944	.4600
2.65	.4996	1.1165	165.68	2.312	1.3243	173.99	8.0173	2.2842	3.5020	.4414	.9942	.4414
2.70	.4956	1.0739	165.78	2.222	1.2703	173.96	8.3292	2.3365	3.5564	.4234	.9940	.4234
2.75	.4918	1.0323	165.87	2.134	1.2181	173.93	8.6468	2.3898	3.6094	.4060	.9939	.4060
2.80	.4881	.9920	165.96	2.049	1.1677	173.90	8.9704	2.4439	3.6611	.3892	.9937	.3892
2.85	.4846	.9529	166.04	1.967	1.1191	173.87	9.2997	2.4990	3.7114	.3730	.9935	.3730
2.90	.4813	.9151	166.11	1.888	1.0724	173.84	9.6349	2.5551	3.7605	.3575	.9934	.3574
2.95	.4781	.8784	166.19	1.811	1.0273	173.81	9.9760	2.6121	3.8083	.3424	.9932	.3424

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

8. PT1 = 3. ATM DT1 = 5.915 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	O2/O1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9999	1.0000	1.0002	.9999	1.0001	1.0000	1.0000
1.10	.9998	1.0000	1.0004	.9998	1.0001	1.0000	1.0000
1.15	.9997	.9999	1.0005	.9998	1.0001	1.0000	1.0000
1.20	.9996	.9999	1.0006	.9997	1.0001	.9999	1.0000
1.25	.9996	.9997	1.0007	.9995	1.0001	.9999	1.0001
1.30	.9997	.9996	1.0007	.9994	1.0001	.9998	1.0001
1.35	.9997	.9995	1.0007	.9993	1.0001	.9997	1.0001
1.40	.9998	.9994	1.0007	.9992	1.0002	.9996	1.0001
1.45	.9998	.9993	1.0006	.9991	1.0002	.9994	1.0002
1.50	.9997	.9993	1.0006	.9991	1.0002	.9993	1.0002
1.55	.9998	.9992	1.0005	.9990	1.0002	.9991	1.0002
1.60	.9998	.9991	1.0004	.9990	1.0003	.9989	1.0002
1.65	.9998	.9991	1.0003	.9989	1.0003	.9987	1.0003
1.70	.9998	.9990	1.0002	.9989	1.0003	.9985	1.0003
1.75	.9999	.9990	1.0001	.9989	1.0003	.9983	1.0003
1.80	.9998	.9990	1.0000	.9989	1.0003	.9981	1.0003
1.85	.9998	.9989	.9998	.9989	1.0003	.9978	1.0003
1.90	.9998	.9989	.9997	.9989	1.0003	.9976	1.0003
1.95	.9999	.9989	.9995	.9989	1.0003	.9974	1.0003
2.00	.9999	.9989	.9993	.9989	1.0003	.9971	1.0003
2.05	.9999	.9988	.9992	.9989	1.0003	.9969	1.0003
2.10	.9998	.9988	.9990	.9989	1.0003	.9966	1.0002
2.15	.9998	.9988	.9989	.9990	1.0003	.9964	1.0002
2.20	.9999	.9988	.9987	.9990	1.0002	.9962	1.0002
2.25	.9999	.9988	.9985	.9990	1.0002	.9959	1.0001
2.30	.9999	.9988	.9984	.9990	1.0002	.9957	1.0001
2.35	.9999	.9988	.9982	.9991	1.0001	.9955	1.0001
2.40	.9999	.9988	.9981	.9991	1.0001	.9953	1.0000
2.45	.9999	.9988	.9979	.9991	1.0000	.9950	.9999
2.50	.9999	.9989	.9978	.9992	.9999	.9948	.9999
2.55	.9999	.9989	.9977	.9992	.9999	.9946	.9998
2.60	.9999	.9989	.9975	.9992	.9998	.9944	.9997
2.65	.9999	.9989	.9974	.9992	.9997	.9942	.9996
2.70	.9999	.9989	.9973	.9993	.9996	.9940	.9995
2.75	.9999	.9989	.9972	.9993	.9995	.9939	.9994
2.80	.9999	.9989	.9970	.9993	.9994	.9937	.9993
2.85	.9998	.9989	.9969	.9993	.9993	.9935	.9992
2.90	.9998	.9990	.9968	.9994	.9992	.9934	.9991
2.95	.9998	.9990	.9967	.9994	.9991	.9932	.9990

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

C. PT1 = 5. ATM OT1 = 9.930 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	F2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	2.6405	145.52	6.303	5.0009	175.00	1.0000	1.0000	1.0000	1.0002	1.0000	1.0002
1.05	.9530	2.7864	147.80	6.549	5.0002	175.00	1.1196	1.0332	1.0838	1.0000	1.0000	1.0000
1.10	.9114	2.9145	149.78	6.760	4.9946	175.00	1.2449	1.0655	1.1688	.9989	1.0000	.9989
1.15	.8746	3.0257	151.50	6.938	4.9833	174.99	1.3760	1.0974	1.2545	.9967	.9999	.9967
1.20	.8418	3.1191	152.99	7.082	4.9640	174.98	1.5127	1.1290	1.3406	.9928	.9999	.9928
1.25	.8124	3.1956	154.31	7.194	4.9354	174.96	1.6552	1.1605	1.4272	.9871	.9998	.9871
1.30	.7857	3.2557	155.47	7.273	4.8971	174.94	1.8035	1.1921	1.5140	.9794	.9996	.9794
1.35	.7615	3.3001	156.50	7.323	4.8491	174.91	1.9577	1.2239	1.6007	.9698	.9995	.9698
1.40	.7395	3.3295	157.42	7.344	4.7916	174.88	2.1176	1.2560	1.6872	.9583	.9993	.9583
1.45	.7194	3.3448	158.23	7.338	4.7250	174.84	2.2834	1.2885	1.7734	.9450	.9991	.9450
1.50	.7009	3.3470	158.96	7.308	4.6500	174.79	2.4549	1.3214	1.8590	.9300	.9988	.9300
1.55	.6839	3.3373	159.61	7.255	4.5671	174.74	2.6324	1.3549	1.9440	.9134	.9985	.9134
1.60	.6683	3.3164	160.19	7.182	4.4773	174.69	2.8156	1.3889	2.0281	.8955	.9982	.8955
1.65	.6538	3.2857	160.71	7.090	4.3814	174.63	3.0046	1.4235	2.1114	.8763	.9979	.8763
1.70	.6404	3.2460	161.17	6.981	4.2802	174.57	3.1995	1.4587	2.1936	.8560	.9975	.8560
1.75	.6280	3.1985	161.60	6.859	4.1745	174.51	3.4002	1.4947	2.2748	.8349	.9972	.8349
1.80	.6164	3.1441	161.98	6.724	4.0651	174.44	3.6067	1.5313	2.3548	.8130	.9968	.8130
1.85	.6056	3.0837	162.32	6.578	3.9529	174.37	3.8191	1.5687	2.4335	.7906	.9964	.7906
1.90	.5955	3.0183	162.63	6.424	3.8385	174.30	4.0373	1.6069	2.5110	.7677	.9960	.7677
1.95	.5861	2.9487	162.91	6.262	3.7225	174.23	4.2613	1.6458	2.5871	.7445	.9956	.7445
2.00	.5772	2.8756	163.17	6.095	3.6058	174.16	4.4912	1.6855	2.6618	.7212	.9952	.7211
2.05	.5690	2.7998	163.40	5.924	3.4889	174.09	4.7269	1.7260	2.7351	.6978	.9948	.6978
2.10	.5612	2.7219	163.61	5.749	3.3722	174.02	4.9684	1.7674	2.8070	.6744	.9944	.6744
2.15	.5539	2.6425	163.80	5.573	3.2563	173.95	5.2158	1.8096	2.8773	.6513	.9940	.6512
2.20	.5469	2.5623	163.98	5.396	3.1414	173.88	5.4690	1.8527	2.9463	.6283	.9936	.6283
2.25	.5404	2.4815	164.13	5.218	3.0282	173.82	5.7281	1.8966	3.0137	.6056	.9932	.6056
2.30	.5343	2.4007	164.28	5.042	2.9168	173.75	5.9930	1.9414	3.0797	.5834	.9928	.5833
2.35	.5285	2.3202	164.41	4.867	2.8075	173.68	6.2637	1.9870	3.1441	.5615	.9925	.5615
2.40	.5231	2.2404	164.53	4.694	2.7005	173.62	6.5403	2.0336	3.2071	.5401	.9921	.5401
2.45	.5179	2.1616	164.65	4.525	2.5961	173.55	6.8227	2.0810	3.2687	.5192	.9917	.5192
2.50	.5129	2.0839	164.75	4.358	2.4944	173.49	7.1110	2.1294	3.3287	.4989	.9914	.4988
2.55	.5083	2.0076	164.85	4.194	2.3954	173.43	7.4052	2.1787	3.3874	.4791	.9910	.4791
2.60	.5038	1.9329	164.94	4.035	2.2994	173.37	7.7052	2.2288	3.4446	.4599	.9907	.4598
2.65	.4996	1.8600	165.02	3.879	2.2063	173.32	8.0110	2.2799	3.5004	.4413	.9904	.4412
2.70	.4956	1.7888	165.10	3.728	2.1162	173.26	8.3227	2.3320	3.5548	.4232	.9901	.4232
2.75	.4917	1.7196	165.17	3.581	2.0291	173.21	8.6402	2.3849	3.6078	.4058	.9898	.4058
2.80	.4881	1.6523	165.23	3.438	1.9450	173.16	8.9636	2.4388	3.6596	.3890	.9895	.3890
2.85	.4847	1.5871	165.29	3.300	1.8641	173.11	9.2929	2.4936	3.7100	.3728	.9892	.3728
2.90	.4813	1.5239	165.35	3.167	1.7861	173.06	9.6280	2.5493	3.7592	.3572	.9889	.3572

LAST POINT AT SATURATION BOUNDARY

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

C. PT1 = 5. ATM DT1 = 9.930 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0002	1.0000	1.0002
1.05	.9998	1.0000	1.0003	.9999	1.0002	1.0000	1.0002
1.10	.9996	1.0000	1.0006	.9997	1.0000	1.0000	1.0000
1.15	.9995	.9998	1.0008	.9996	1.0000	.9999	1.0000
1.20	.9996	.9996	1.0009	.9993	1.0000	.9999	1.0000
1.25	.9996	.9994	1.0010	.9991	1.0000	.9998	1.0000
1.30	.9997	.9992	1.0011	.9989	1.0000	.9996	1.0000
1.35	.9997	.9990	1.0011	.9987	1.0001	.9995	1.0001
1.40	.9997	.9989	1.0011	.9986	1.0001	.9993	1.0001
1.45	.9998	.9988	1.0010	.9985	1.0002	.9991	1.0002
1.50	.9998	.9986	1.0009	.9984	1.0002	.9988	1.0002
1.55	.9997	.9986	1.0008	.9983	1.0002	.9985	1.0002
1.60	.9998	.9985	1.0007	.9982	1.0003	.9982	1.0003
1.65	.9998	.9984	1.0005	.9982	1.0003	.9979	1.0003
1.70	.9998	.9983	1.0003	.9981	1.0004	.9975	1.0004
1.75	.9998	.9982	1.0001	.9981	1.0004	.9972	1.0004
1.80	.9998	.9982	.9998	.9981	1.0004	.9968	1.0004
1.85	.9998	.9981	.9996	.9981	1.0004	.9964	1.0004
1.90	.9999	.9981	.9993	.9981	1.0004	.9960	1.0004
1.95	.9998	.9981	.9991	.9982	1.0004	.9956	1.0004
2.00	.9998	.9980	.9988	.9982	1.0004	.9952	1.0004
2.05	.9998	.9980	.9986	.9982	1.0004	.9948	1.0004
2.10	.9999	.9980	.9983	.9982	1.0004	.9944	1.0003
2.15	.9999	.9980	.9980	.9983	1.0003	.9940	1.0003
2.20	.9998	.9980	.9978	.9983	1.0002	.9936	1.0002
2.25	.9998	.9980	.9975	.9984	1.0002	.9932	1.0001
2.30	.9998	.9980	.9972	.9984	1.0001	.9928	1.0001
2.35	.9999	.9980	.9970	.9985	1.0000	.9925	1.0000
2.40	.9999	.9980	.9967	.9985	.9999	.9921	.9999
2.45	.9999	.9980	.9965	.9986	.9998	.9917	.9998
2.50	.9999	.9980	.9962	.9986	.9997	.9914	.9997
2.55	.9999	.9981	.9960	.9987	.9996	.9910	.9995
2.60	.9999	.9981	.9958	.9987	.9994	.9907	.9994
2.65	.9999	.9981	.9955	.9988	.9993	.9904	.9992
2.70	.9998	.9981	.9953	.9988	.9991	.9901	.9991
2.75	.9998	.9982	.9951	.9989	.9990	.9898	.9989
2.80	.9998	.9982	.9950	.9989	.9988	.9895	.9987
2.85	.9999	.9982	.9948	.9990	.9987	.9892	.9986
2.90	.9999	.9982	.9946	.9990	.9985	.9889	.9985

LAST POINT AT SATURATION BOUNDARY

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

0. PT1 = 8. ATM DT1 = 16.061 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	4.2226	145.34	10.200	8.0002	175.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9528	4.4562	147.63	10.599	7.9990	175.00	1.1196	1.0333	1.0837	.9999	1.0000	.9999
1.10	.9112	4.6623	149.62	10.942	7.9914	174.99	1.2449	1.0659	1.1685	.9989	1.0000	.9989
1.15	.8745	4.8391	151.33	11.229	7.9736	174.98	1.3756	1.0979	1.2539	.9967	.9999	.9967
1.20	.8418	4.9883	152.83	11.461	7.9427	174.97	1.5120	1.1295	1.3398	.9928	.9998	.9928
1.25	.8123	5.1106	154.15	11.641	7.8971	174.94	1.6542	1.1611	1.4262	.9871	.9997	.9871
1.30	.7857	5.2068	155.30	11.770	7.8361	174.90	1.8023	1.1928	1.5127	.9795	.9994	.9795
1.35	.7615	5.2780	156.32	11.850	7.7594	174.86	1.9562	1.2246	1.5992	.9699	.9992	.9699
1.40	.7395	5.3252	157.23	11.884	7.6676	174.80	2.1159	1.2567	1.6855	.9585	.9989	.9585
1.45	.7193	5.3500	158.02	11.876	7.5612	174.74	2.2814	1.2891	1.7715	.9452	.9985	.9452
1.50	.7009	5.3538	158.73	11.827	7.4414	174.67	2.4526	1.3220	1.8569	.9302	.9981	.9302
1.55	.6839	5.3383	159.36	11.741	7.3092	174.59	2.6297	1.3554	1.9417	.9136	.9977	.9137
1.60	.6683	5.3054	159.92	11.622	7.1656	174.50	2.8127	1.3893	2.0257	.8957	.9972	.8957
1.65	.6538	5.2564	160.41	11.474	7.0124	174.41	3.0014	1.4237	2.1088	.8765	.9966	.8766
1.70	.6404	5.1933	160.85	11.299	6.8504	174.32	3.1959	1.4588	2.1910	.8563	.9961	.8563
1.75	.6279	5.1174	161.24	11.100	6.6814	174.22	3.3963	1.4946	2.2720	.8352	.9955	.8352
1.80	.6164	5.0305	161.59	10.882	6.5065	174.11	3.6024	1.5310	2.3519	.8133	.9949	.8133
1.85	.6055	4.9341	161.90	10.647	6.3268	174.00	3.8145	1.5682	2.4306	.7908	.9943	.7909
1.90	.5955	4.8295	162.17	10.397	6.1438	173.89	4.0323	1.6060	2.5080	.7680	.9937	.7680
1.95	.5861	4.7181	162.42	10.135	5.9583	173.78	4.2560	1.6447	2.5840	.7448	.9930	.7448
2.00	.5772	4.6012	162.64	9.865	5.7715	173.67	4.4855	1.6841	2.6587	.7214	.9924	.7215
2.05	.5689	4.4800	162.83	9.587	5.5840	173.56	4.7209	1.7243	2.7320	.6980	.9918	.6980
2.10	.5611	4.3553	163.00	9.304	5.3972	173.44	4.9621	1.7653	2.8039	.6746	.9911	.6747
2.15	.5538	4.2283	163.16	9.019	5.2115	173.33	5.2091	1.8072	2.8743	.6514	.9905	.6515
2.20	.5469	4.0997	163.29	8.731	5.0276	173.22	5.4620	1.8499	2.9432	.6285	.9898	.6285
2.25	.5404	3.9703	163.42	8.444	4.8462	173.11	5.7207	1.8934	3.0107	.6058	.9892	.6058
2.30	.5343	3.8409	163.53	8.158	4.6675	173.00	5.9853	1.9378	3.0767	.5834	.9886	.5835
2.35	.5285	3.7120	163.62	7.875	4.4923	172.89	6.2558	1.9831	3.1412	.5615	.9880	.5616
2.40	.5230	3.5842	163.71	7.595	4.3210	172.79	6.5321	2.0292	3.2043	.5401	.9874	.5402
2.45	.5178	3.4578	163.79	7.319	4.1536	172.69	6.8142	2.0762	3.2659	.5192	.9868	.5192
2.50	.5129	3.3334	163.86	7.049	3.9905	172.59	7.1022	2.1242	3.3260	.4988	.9862	.4989
2.55	.5082	3.2112	163.92	6.784	3.8319	172.49	7.3961	2.1730	3.3847	.4790	.9857	.4790
2.60	.5038	3.0915	163.97	6.525	3.6780	172.40	7.6958	2.2227	3.4420	.4597	.9851	.4598
2.65	.4995	2.9745	164.02	6.273	3.5287	172.31	8.0014	2.2734	3.4979	.4411	.9846	.4411
2.70	.4955	2.8604	164.07	6.026	3.3843	172.22	8.3128	2.3249	3.5524	.4230	.9841	.4231
2.75	.4917	2.7495	164.11	5.790	3.2448	172.13	8.6302	2.3774	3.6056	.4056	.9836	.4056

LAST POINT AT SATURATION BOUNDARY

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

0. PT1 = 8. ATM DT1 = 16.061 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9997	1.0000	1.0005	.9998	1.0000	1.0000	1.0000
1.10	.9994	.9999	1.0009	.9995	1.0000	1.0000	1.0000
1.15	.9995	.9995	1.0012	.9991	1.0000	.9999	1.0000
1.20	.9995	.9991	1.0014	.9987	1.0000	.9998	1.0000
1.25	.9996	.9988	1.0015	.9983	1.0001	.9997	1.0001
1.30	.9997	.9985	1.0016	.9980	1.0001	.9994	1.0001
1.35	.9997	.9983	1.0016	.9978	1.0002	.9992	1.0002
1.40	.9997	.9981	1.0016	.9975	1.0003	.9989	1.0003
1.45	.9997	.9979	1.0015	.9974	1.0003	.9985	1.0003
1.50	.9997	.9977	1.0014	.9972	1.0004	.9981	1.0004
1.55	.9998	.9975	1.0012	.9971	1.0005	.9977	1.0005
1.60	.9997	.9974	1.0009	.9970	1.0006	.9972	1.0006
1.65	.9998	.9973	1.0006	.9970	1.0006	.9966	1.0007
1.70	.9997	.9972	1.0003	.9969	1.0007	.9961	1.0007
1.75	.9997	.9971	1.0000	.9969	1.0007	.9955	1.0008
1.80	.9998	.9970	.9996	.9969	1.0008	.9949	1.0008
1.85	.9997	.9969	.9992	.9969	1.0008	.9943	1.0008
1.90	.9997	.9969	.9988	.9969	1.0008	.9937	1.0008
1.95	.9998	.9968	.9984	.9970	1.0008	.9930	1.0008
2.00	.9998	.9968	.9980	.9970	1.0008	.9924	1.0008
2.05	.9997	.9968	.9975	.9971	1.0007	.9918	1.0008
2.10	.9997	.9967	.9971	.9971	1.0007	.9911	1.0007
2.15	.9998	.9967	.9967	.9972	1.0006	.9905	1.0006
2.20	.9998	.9967	.9962	.9973	1.0005	.9898	1.0006
2.25	.9998	.9967	.9958	.9974	1.0004	.9892	1.0005
2.30	.9997	.9967	.9954	.9975	1.0002	.9886	1.0003
2.35	.9998	.9967	.9950	.9975	1.0001	.9880	1.0002
2.40	.9998	.9968	.9945	.9976	1.0000	.9874	1.0000
2.45	.9998	.9968	.9941	.9977	.9998	.9868	.9999
2.50	.9998	.9968	.9938	.9978	.9996	.9862	.9997
2.55	.9998	.9968	.9934	.9979	.9994	.9857	.9995
2.60	.9998	.9969	.9930	.9980	.9992	.9851	.9993
2.65	.9998	.9969	.9927	.9981	.9989	.9846	.9990
2.70	.9997	.9969	.9923	.9981	.9987	.9841	.9988
2.75	.9998	.9970	.9920	.9982	.9985	.9836	.9985

LAST POINT AT SATURATION BOUNDARY

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

E. PT1 = 10. ATM DT1 = 20.224 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	5.2769	145.22	12.851	10.0005	175.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9528	5.5691	147.52	13.353	9.9989	175.00	1.1196	1.0335	1.0837	.9999	1.0000	.9999
1.10	.9111	5.8266	149.52	13.786	9.9894	174.99	1.2448	1.0661	1.1683	.9989	1.0000	.9989
1.15	.8746	6.0467	151.23	14.145	9.9674	174.98	1.3752	1.0981	1.2534	.9967	.9999	.9967
1.20	.8418	6.2332	152.73	14.437	9.9288	174.96	1.5115	1.1298	1.3392	.9929	.9998	.9929
1.25	.8123	6.3862	154.04	14.664	9.8719	174.92	1.6536	1.1615	1.4254	.9872	.9996	.9872
1.30	.7857	6.5065	155.19	14.826	9.7958	174.88	1.8015	1.1932	1.5117	.9796	.9993	.9796
1.35	.7615	6.5956	156.21	14.927	9.7002	174.82	1.9552	1.2250	1.5981	.9700	.9990	.9700
1.40	.7395	6.6547	157.10	14.970	9.5856	174.76	2.1146	1.2571	1.6843	.9586	.9986	.9586
1.45	.7193	6.6860	157.89	14.959	9.4529	174.68	2.2800	1.2895	1.7701	.9453	.9982	.9453
1.50	.7009	6.6910	158.58	14.898	9.3033	174.59	2.4510	1.3223	1.8554	.9303	.9976	.9303
1.55	.6839	6.6720	159.20	14.790	9.1380	174.49	2.6279	1.3556	1.9401	.9138	.9971	.9138
1.60	.6683	6.6309	159.74	14.641	8.9590	174.38	2.8106	1.3895	2.0240	.8959	.9965	.8959
1.65	.6537	6.5701	160.22	14.454	8.7674	174.27	2.9991	1.4238	2.1070	.8767	.9958	.8768
1.70	.6404	6.4912	160.63	14.234	8.5653	174.15	3.1934	1.4588	2.1890	.8565	.9951	.8566
1.75	.6279	6.3967	161.01	13.984	8.3539	174.02	3.3936	1.4944	2.2700	.8354	.9944	.8354
1.80	.6163	6.2883	161.33	13.709	8.1354	173.89	3.5995	1.5307	2.3499	.8135	.9937	.8137
1.85	.6055	6.1678	161.62	13.413	7.9110	173.76	3.8112	1.5677	2.4285	.7911	.9929	.7912
1.90	.5954	6.0373	161.87	13.098	7.6819	173.62	4.0289	1.6054	2.5059	.7682	.9921	.7683
1.95	.5860	5.8982	162.09	12.769	7.4501	173.48	4.2523	1.6438	2.5819	.7450	.9913	.7452
2.00	.5772	5.7521	162.29	12.428	7.2165	173.34	4.4816	1.6831	2.6566	.7216	.9905	.7218
2.05	.5689	5.6005	162.45	12.078	6.9823	173.20	4.7167	1.7230	2.7299	.6982	.9897	.6984
2.10	.5611	5.4448	162.60	11.722	6.7483	173.06	4.9577	1.7639	2.8017	.6748	.9889	.6749
2.15	.5538	5.2859	162.73	11.361	6.5160	172.92	5.2045	1.8055	2.8722	.6516	.9881	.6517
2.20	.5469	5.1251	162.84	10.999	6.2860	172.78	5.4571	1.8479	2.9411	.6286	.9873	.6287
2.25	.5404	4.9633	162.94	10.637	6.0589	172.64	5.7156	1.8912	3.0087	.6059	.9865	.6060
2.30	.5343	4.8013	163.02	10.277	5.8355	172.51	5.9800	1.9353	3.0747	.5836	.9857	.5837
2.35	.5285	4.6401	163.10	9.920	5.6163	172.37	6.2503	1.9803	3.1393	.5616	.9850	.5617
2.40	.5230	4.4801	163.16	9.566	5.4017	172.24	6.5264	2.0262	3.2024	.5402	.9842	.5403
2.45	.5178	4.3220	163.21	9.219	5.1922	172.11	6.8083	2.0729	3.2640	.5192	.9835	.5193
2.50	.5129	4.1662	163.26	8.878	4.9881	171.99	7.0961	2.1205	3.3242	.4988	.9828	.4989
2.55	.5082	4.0133	163.30	8.544	4.7896	171.87	7.3898	2.1691	3.3830	.4790	.9821	.4791
2.60	.5037	3.8635	163.33	8.217	4.5969	171.75	7.6894	2.2185	3.4403	.4597	.9814	.4598
2.65	.4995	3.7171	163.36	7.899	4.4101	171.63	7.9948	2.2688	3.4963	.4410	.9808	.4411

LAST POINT AT SATURATION BOUNDARY

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

E. PT1 = 10. ATM DT1 = 20.224 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9996	1.0000	1.0006	.9997	1.0000	1.0000	1.0000
1.10	.9993	.9998	1.0011	.9994	1.0000	1.0000	1.0000
1.15	.9995	.9992	1.0014	.9987	1.0000	.9999	1.0000
1.20	.9996	.9988	1.0016	.9982	1.0001	.9998	1.0001
1.25	.9996	.9984	1.0018	.9978	1.0001	.9996	1.0001
1.30	.9997	.9980	1.0019	.9974	1.0002	.9993	1.0002
1.35	.9996	.9978	1.0020	.9971	1.0003	.9990	1.0003
1.40	.9997	.9975	1.0019	.9968	1.0004	.9986	1.0004
1.45	.9997	.9972	1.0018	.9966	1.0005	.9982	1.0005
1.50	.9997	.9970	1.0016	.9964	1.0006	.9976	1.0006
1.55	.9997	.9968	1.0014	.9963	1.0007	.9971	1.0007
1.60	.9997	.9967	1.0011	.9962	1.0008	.9965	1.0008
1.65	.9997	.9965	1.0007	.9961	1.0009	.9958	1.0009
1.70	.9997	.9964	1.0003	.9960	1.0009	.9951	1.0010
1.75	.9997	.9963	.9999	.9960	1.0010	.9944	1.0011
1.80	.9997	.9962	.9994	.9960	1.0011	.9937	1.0012
1.85	.9997	.9961	.9989	.9961	1.0011	.9929	1.0013
1.90	.9996	.9960	.9984	.9961	1.0011	.9921	1.0013
1.95	.9997	.9960	.9979	.9962	1.0011	.9913	1.0013
2.00	.9997	.9959	.9974	.9962	1.0011	.9905	1.0013
2.05	.9997	.9959	.9968	.9963	1.0010	.9897	1.0013
2.10	.9996	.9959	.9963	.9964	1.0009	.9889	1.0011
2.15	.9997	.9958	.9957	.9965	1.0008	.9881	1.0010
2.20	.9997	.9958	.9952	.9966	1.0007	.9873	1.0009
2.25	.9997	.9958	.9946	.9967	1.0006	.9865	1.0008
2.30	.9998	.9958	.9941	.9968	1.0004	.9857	1.0006
2.35	.9998	.9959	.9936	.9969	1.0003	.9850	1.0005
2.40	.9997	.9959	.9931	.9970	1.0000	.9842	1.0003
2.45	.9997	.9959	.9926	.9971	.9998	.9835	1.0000
2.50	.9998	.9959	.9921	.9973	.9996	.9828	.9998
2.55	.9998	.9960	.9916	.9974	.9993	.9821	.9996
2.60	.9997	.9960	.9911	.9975	.9991	.9814	.9993
2.65	.9997	.9961	.9907	.9976	.9987	.9808	.9990

LAST POINT AT SATURATION BOUNDARY

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

F. PT1 = 20. ATM DT1 = 41.990 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	10.5333	144.67	26.770	20.0008	175.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9523	11.1197	147.01	27.814	19.9974	175.00	1.1195	1.0340	1.0832	.9999	1.0000	.9999
1.10	.9111	11.6259	148.99	28.696	19.9791	174.99	1.2435	1.0669	1.1665	.9990	.9999	.9989
1.15	.8745	12.0647	150.72	29.438	19.9356	174.96	1.3731	1.0992	1.2506	.9968	.9998	.9968
1.20	.8417	12.4371	152.22	30.042	19.8596	174.92	1.5086	1.1312	1.3354	.9930	.9995	.9930
1.25	.8122	12.7433	153.52	30.510	19.7474	174.85	1.6498	1.1630	1.4206	.9874	.9992	.9874
1.30	.7855	12.9851	154.66	30.847	19.5970	174.77	1.7967	1.1948	1.5060	.9799	.9987	.9799
1.35	.7613	13.1650	155.64	31.058	19.4086	174.66	1.9493	1.2267	1.5914	.9704	.9981	.9706
1.40	.7393	13.2860	156.50	31.150	19.1820	174.53	2.1078	1.2587	1.6767	.9591	.9973	.9594
1.45	.7191	13.3514	157.24	31.130	18.9193	174.38	2.2720	1.2910	1.7617	.9460	.9965	.9463
1.50	.7006	13.3650	157.87	31.007	18.6227	174.21	2.4419	1.3235	1.8463	.9311	.9955	.9315
1.55	.6836	13.3306	158.42	30.788	18.2949	174.02	2.6176	1.3565	1.9303	.9147	.9944	.9152
1.60	.6679	13.2522	158.88	30.483	17.9389	173.81	2.7991	1.3899	2.0136	.8969	.9932	.8975
1.65	.6535	13.1335	159.28	30.099	17.5584	173.59	2.9864	1.4237	2.0961	.8779	.9919	.8786
1.70	.6400	12.9793	159.60	29.645	17.1557	173.35	3.1795	1.4581	2.1778	.8578	.9906	.8585
1.75	.6276	12.7929	159.87	29.130	16.7349	173.11	3.3783	1.4930	2.2584	.8367	.9892	.8376
1.80	.6160	12.5788	160.10	28.561	16.2984	172.85	3.5831	1.5285	2.3380	.8149	.9877	.8158
1.85	.6052	12.3401	160.27	27.947	15.8501	172.58	3.7935	1.5647	2.4164	.7925	.9862	.7935
1.90	.5952	12.0806	160.41	27.294	15.3926	172.31	4.0099	1.6014	2.4937	.7696	.9846	.7706
1.95	.5857	11.8038	160.51	26.610	14.9281	172.03	4.2321	1.6389	2.5697	.7464	.9831	.7475
2.00	.5769	11.5125	160.58	25.900	14.4601	171.75	4.4601	1.6770	2.6444	.7230	.9814	.7241
2.05	.5686	11.2098	160.63	25.172	13.9899	171.47	4.6940	1.7159	2.7178	.6995	.9798	.7006
2.10	.5608	10.8981	160.65	24.429	13.5210	171.19	4.9338	1.7555	2.7898	.6760	.9782	.6772
2.15	.5535	10.5799	160.65	23.677	13.0545	170.90	5.1794	1.7958	2.8604	.6527	.9766	.6539
2.20	.5466	10.2576	160.63	22.921	12.5921	170.62	5.4309	1.8369	2.9296	.6296	.9750	.6308
2.25	.5401	9.9330	160.61	22.163	12.1351	170.34	5.6883	1.8789	2.9974	.6068	.9734	.6079
2.30	.5340	9.6079	160.56	21.409	11.6858	170.06	5.9515	1.9216	3.0637	.5843	.9718	.5854
2.35	.5282	9.2838	160.51	20.661	11.2446	169.79	6.2206	1.9651	3.1286	.5622	.9702	.5634

LAST POINT AT SATURATION BOUNDARY

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

F. PT1 = 20. ATM DT1 = 41.990 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9991	.9999	1.0011	.9993	1.0000	1.0000	1.0000
1.10	.9993	.9988	1.0018	.9978	1.0000	.9999	1.0000
1.15	.9994	.9977	1.0024	.9965	1.0001	.9998	1.0001
1.20	.9994	.9969	1.0028	.9954	1.0002	.9995	1.0002
1.25	.9995	.9961	1.0031	.9944	1.0003	.9992	1.0004
1.30	.9995	.9954	1.0033	.9936	1.0005	.9987	1.0005
1.35	.9995	.9948	1.0033	.9929	1.0007	.9981	1.0009
1.40	.9994	.9942	1.0032	.9924	1.0009	.9973	1.0012
1.45	.9994	.9937	1.0029	.9919	1.0012	.9965	1.0015
1.50	.9994	.9933	1.0025	.9915	1.0015	.9955	1.0019
1.55	.9993	.9929	1.0020	.9913	1.0017	.9944	1.0022
1.60	.9993	.9926	1.0014	.9911	1.0020	.9932	1.0026
1.65	.9993	.9923	1.0007	.9910	1.0022	.9919	1.0030
1.70	.9992	.9920	.9999	.9909	1.0024	.9906	1.0033
1.75	.9993	.9918	.9990	.9909	1.0026	.9892	1.0036
1.80	.9992	.9916	.9980	.9910	1.0028	.9877	1.0038
1.85	.9992	.9914	.9970	.9911	1.0029	.9862	1.0041
1.90	.9992	.9913	.9960	.9913	1.0030	.9846	1.0043
1.95	.9992	.9912	.9949	.9914	1.0030	.9831	1.0044
2.00	.9992	.9911	.9938	.9917	1.0030	.9814	1.0045
2.05	.9991	.9911	.9927	.9919	1.0028	.9798	1.0044
2.10	.9992	.9910	.9915	.9921	1.0027	.9782	1.0044
2.15	.9992	.9910	.9904	.9924	1.0026	.9766	1.0043
2.20	.9992	.9910	.9893	.9927	1.0023	.9750	1.0042
2.25	.9992	.9911	.9882	.9930	1.0020	.9734	1.0039
2.30	.9992	.9911	.9870	.9932	1.0017	.9718	1.0037
2.35	.9992	.9911	.9860	.9935	1.0013	.9702	1.0033

LAST POINT AT SATURATION BOUNDARY

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

G. PT1 = 30. ATM DT1 = 65.458 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	15.7515	144.18	41.922	30.0009	175.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9518	16.5305	146.56	43.547	29.9955	175.00	1.1192	1.0344	1.0823	.9999	1.0000	.9999
1.10	.9110	17.3774	148.53	44.896	29.9691	174.98	1.2418	1.0673	1.1640	.9990	.9999	.9990
1.15	.8744	18.0327	150.25	46.043	29.9049	174.95	1.3705	1.0998	1.2468	.9968	.9997	.9969
1.20	.8416	18.5901	151.75	46.979	29.7931	174.89	1.5049	1.1319	1.3302	.9931	.9993	.9932
1.25	.8120	19.0506	153.05	47.707	29.6290	174.80	1.6450	1.1639	1.4141	.9876	.9988	.9878
1.30	.7853	19.4168	154.17	48.235	29.4078	174.67	1.7908	1.1957	1.4982	.9803	.9981	.9806
1.35	.7610	19.6919	155.13	48.570	29.1295	174.52	1.9423	1.2275	1.5824	.9710	.9972	.9715
1.40	.7389	19.8793	155.95	48.722	28.7964	174.33	2.0995	1.2593	1.6666	.9599	.9962	.9606
1.45	.7187	19.9845	156.65	48.701	28.4087	174.12	2.2623	1.2914	1.7505	.9470	.9950	.9479
1.50	.7002	20.0127	157.23	48.521	27.9703	173.87	2.4309	1.3236	1.8341	.9323	.9936	.9335
1.55	.6832	19.9692	157.71	48.193	27.4849	173.60	2.6053	1.3562	1.9173	.9162	.9920	.9176
1.60	.6675	19.8600	158.11	47.730	26.9570	173.30	2.7854	1.3891	1.9999	.8986	.9903	.9002
1.65	.6530	19.6906	158.42	47.145	26.3909	172.98	2.9713	1.4223	2.0818	.8797	.9885	.8816
1.70	.6396	19.4667	158.66	46.450	25.7923	172.64	3.1629	1.4560	2.1629	.8597	.9865	.8618
1.75	.6271	19.1947	158.84	45.658	25.1645	172.28	3.3604	1.4902	2.2432	.8388	.9844	.8411
1.80	.6155	18.8799	158.96	44.781	24.5134	171.90	3.5637	1.5249	2.3226	.8171	.9823	.8197
1.85	.6047	18.5274	159.03	43.831	23.8432	171.51	3.7728	1.5600	2.4009	.7948	.9801	.7975
1.90	.5946	18.1431	159.06	42.819	23.1573	171.11	3.9878	1.5958	2.4782	.7719	.9778	.7748
1.95	.5852	17.7312	159.04	41.755	22.4615	170.70	4.2086	1.6322	2.5543	.7487	.9754	.7518
2.00	.5764	17.2969	158.99	40.650	21.7587	170.28	4.4352	1.6691	2.6291	.7253	.9730	.7285
2.05	.5681	16.8446	158.92	39.512	21.0519	169.86	4.6678	1.7068	2.7028	.7017	.9706	.7050
2.10	.5603	16.3778	158.81	38.350	20.3459	169.43	4.9061	1.7451	2.7751	.6782	.9682	.6815
2.15	.5530	15.9007	158.69	37.172	19.6424	169.00	5.1504	1.7841	2.8461	.6547	.9657	.6581

LAST POINT AT SATURATION BOUNDARY

TABLE VIII. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 175 K

G. PT1 = 30. ATM DT1 = 65.458 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9986	.9997	1.0015	.9984	1.0000	1.0000	1.0000
1.10	.9992	.9974	1.0022	.9956	1.0000	.9999	1.0001
1.15	.9993	.9958	1.0030	.9934	1.0001	.9997	1.0002
1.20	.9993	.9944	1.0035	.9915	1.0003	.9993	1.0004
1.25	.9992	.9932	1.0039	.9899	1.0006	.9988	1.0008
1.30	.9991	.9921	1.0040	.9885	1.0009	.9981	1.0012
1.35	.9990	.9912	1.0040	.9873	1.0013	.9972	1.0018
1.40	.9990	.9903	1.0037	.9863	1.0018	.9962	1.0025
1.45	.9989	.9895	1.0032	.9856	1.0022	.9950	1.0032
1.50	.9988	.9889	1.0026	.9850	1.0027	.9936	1.0040
1.55	.9987	.9883	1.0018	.9846	1.0033	.9920	1.0048
1.60	.9986	.9877	1.0008	.9843	1.0038	.9903	1.0056
1.65	.9985	.9873	.9997	.9842	1.0042	.9885	1.0064
1.70	.9985	.9869	.9984	.9842	1.0047	.9865	1.0072
1.75	.9984	.9865	.9971	.9843	1.0051	.9844	1.0079
1.80	.9983	.9863	.9956	.9845	1.0055	.9823	1.0086
1.85	.9983	.9860	.9941	.9847	1.0057	.9801	1.0092
1.90	.9983	.9859	.9925	.9851	1.0059	.9778	1.0098
1.95	.9983	.9857	.9908	.9855	1.0061	.9754	1.0102
2.00	.9983	.9856	.9891	.9859	1.0061	.9730	1.0105
2.05	.9983	.9855	.9874	.9864	1.0061	.9706	1.0107
2.10	.9983	.9855	.9857	.9869	1.0059	.9682	1.0109
2.15	.9983	.9855	.9839	.9874	1.0057	.9657	1.0108

LAST POINT AT SATURATION BOUNDARY

TABLE IX. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

A. PT1 = 1. ATM DT1 = 1.711 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	.5282	166.60	1.085	1.0000	200.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	.5573	169.19	1.127	.9999	200.00	1.1196	1.0329	1.0839	.9999	1.0000	.9999
1.10	.9117	.5838	171.43	1.164	.9989	200.00	1.2450	1.0650	1.1690	.9989	1.0000	.9989
1.15	.8750	.6052	173.38	1.194	.9967	200.00	1.3762	1.0967	1.2549	.9967	1.0000	.9967
1.20	.8421	.6240	175.10	1.219	.9928	200.00	1.5133	1.1282	1.3414	.9928	1.0000	.9928
1.25	.8126	.6393	176.61	1.239	.9871	199.99	1.6562	1.1596	1.4283	.9871	1.0000	.9871
1.30	.7859	.6514	177.95	1.252	.9794	199.99	1.8049	1.1911	1.5153	.9794	1.0000	.9794
1.35	.7616	.6603	179.15	1.261	.9698	199.99	1.9595	1.2229	1.6024	.9698	.9999	.9697
1.40	.7396	.6661	180.21	1.265	.9582	199.98	2.1198	1.2550	1.6892	.9582	.9999	.9582
1.45	.7194	.6692	181.17	1.264	.9449	199.97	2.2860	1.2875	1.7756	.9449	.9999	.9449
1.50	.7010	.6696	182.03	1.258	.9298	199.97	2.4581	1.3205	1.8614	.9298	.9998	.9298
1.55	.6840	.6676	182.81	1.249	.9132	199.96	2.6359	1.3541	1.9466	.9132	.9998	.9133
1.60	.6683	.6635	183.52	1.237	.8953	199.95	2.8196	1.3883	2.0310	.8953	.9998	.8953
1.65	.6539	.6573	184.15	1.221	.8761	199.94	3.0090	1.4231	2.1144	.8761	.9997	.8761
1.70	.6405	.6493	184.74	1.202	.8558	199.93	3.2044	1.4586	2.1968	.8558	.9997	.8558
1.75	.6280	.6398	185.27	1.181	.8347	199.92	3.4055	1.4948	2.2781	.8347	.9996	.8347
1.80	.6164	.6289	185.76	1.158	.8128	199.91	3.6125	1.5317	2.3582	.8128	.9996	.8128
1.85	.6056	.6168	186.21	1.133	.7904	199.90	3.8254	1.5694	2.4370	.7904	.9995	.7904
1.90	.5956	.6037	186.62	1.106	.7675	199.89	4.0440	1.6080	2.5145	.7675	.9994	.7675
1.95	.5861	.5898	187.00	1.079	.7443	199.88	4.2685	1.6473	2.5907	.7443	.9994	.7444
2.00	.5773	.5752	187.35	1.050	.7210	199.87	4.4989	1.6874	2.6654	.7210	.9993	.7211
2.05	.5690	.5600	187.68	1.020	.6976	199.86	4.7351	1.7284	2.7388	.6976	.9993	.6977
2.10	.5612	.5445	187.98	.990	.6743	199.85	4.9771	1.7703	2.8106	.6743	.9992	.6744
2.15	.5539	.5286	188.26	.960	.6512	199.83	5.2249	1.8130	2.8810	.6512	.9992	.6512
2.20	.5470	.5126	188.52	.930	.6283	199.82	5.4786	1.8565	2.9499	.6283	.9991	.6283
2.25	.5405	.4964	188.76	.899	.6057	199.81	5.7381	1.9010	3.0173	.6057	.9991	.6057
2.30	.5344	.4803	188.99	.869	.5834	199.80	6.0034	1.9463	3.0832	.5834	.9990	.5835
2.35	.5286	.4642	189.20	.839	.5616	199.79	6.2746	1.9926	3.1476	.5616	.9990	.5617
2.40	.5231	.4483	189.40	.809	.5403	199.78	6.5516	2.0397	3.2106	.5403	.9989	.5403
2.45	.5179	.4326	189.58	.780	.5194	199.77	6.8344	2.0877	3.2720	.5194	.9989	.5195
2.50	.5130	.4171	189.76	.751	.4991	199.76	7.1231	2.1367	3.3320	.4991	.9988	.4992
2.55	.5083	.4019	189.92	.723	.4794	199.75	7.4176	2.1866	3.3906	.4794	.9988	.4794
2.60	.5039	.3869	190.08	.696	.4602	199.74	7.7180	2.2374	3.4477	.4602	.9987	.4603
2.65	.4997	.3724	190.22	.669	.4417	199.73	8.0242	2.2891	3.5034	.4417	.9987	.4417
2.70	.4957	.3582	190.36	.643	.4237	199.73	8.3362	2.3417	3.5578	.4237	.9986	.4237
2.75	.4919	.3444	190.49	.618	.4063	199.72	8.6541	2.3953	3.6107	.4063	.9986	.4064
2.80	.4882	.3309	190.61	.593	.3895	199.71	8.9778	2.4498	3.6624	.3895	.9985	.3896
2.85	.4848	.3179	190.73	.570	.3734	199.70	9.3073	2.5053	3.7127	.3734	.9985	.3734
2.90	.4814	.3053	190.84	.547	.3578	199.69	9.6426	2.5617	3.7617	.3578	.9985	.3578
2.95	.4782	.2931	190.94	.524	.3428	199.69	9.9836	2.6190	3.8094	.3428	.9984	.3428
3.00	.4752	.2813	191.04	.503	.3284	199.68	10.3308	2.6773	3.8560	.3284	.9984	.3284

TABLE IX. REAL-GAS NORAML-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

A. PT1 = 1. ATM DT1 = 1.711 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	1.0000	1.0000	1.0001	1.0000	1.0000	1.0000	1.0000
1.10	1.0000	1.0000	1.0001	.9999	1.0000	1.0000	1.0000
1.15	.9999	1.0000	1.0001	.9999	1.0000	1.0000	1.0000
1.20	.9999	1.0000	1.0002	.9998	1.0000	1.0000	1.0000
1.25	.9999	1.0000	1.0002	.9998	1.0000	1.0000	1.0000
1.30	.9999	1.0000	1.0002	.9998	1.0000	1.0000	1.0000
1.35	.9999	.9999	1.0002	.9997	1.0000	.9999	1.0000
1.40	.9998	.9999	1.0002	.9997	1.0000	.9999	1.0000
1.45	.9998	.9999	1.0002	.9997	1.0000	.9999	1.0000
1.50	.9998	.9999	1.0002	.9997	1.0000	.9998	1.0001
1.55	.9998	.9999	1.0002	.9996	1.0000	.9998	1.0001
1.60	.9998	.9999	1.0002	.9996	1.0001	.9998	1.0001
1.65	.9999	.9998	1.0002	.9996	1.0001	.9997	1.0001
1.70	.9999	.9998	1.0002	.9996	1.0001	.9997	1.0001
1.75	.9999	.9998	1.0001	.9996	1.0001	.9996	1.0002
1.80	.9999	.9998	1.0001	.9996	1.0001	.9996	1.0002
1.85	.9999	.9998	1.0001	.9995	1.0002	.9995	1.0002
1.90	.9999	.9998	1.0000	.9995	1.0002	.9994	1.0002
1.95	.9999	.9998	1.0000	.9995	1.0002	.9994	1.0002
2.00	.9999	.9998	1.0000	.9995	1.0002	.9993	1.0002
2.05	.9998	.9998	.9999	.9995	1.0002	.9993	1.0002
2.10	.9998	.9998	.9999	.9995	1.0002	.9992	1.0002
2.15	.9999	.9998	.9999	.9996	1.0002	.9992	1.0003
2.20	.9999	.9997	.9998	.9996	1.0002	.9991	1.0003
2.25	.9999	.9997	.9998	.9996	1.0002	.9991	1.0003
2.30	.9999	.9997	.9998	.9996	1.0002	.9990	1.0003
2.35	.9999	.9997	.9997	.9996	1.0002	.9990	1.0003
2.40	1.0000	.9997	.9997	.9996	1.0002	.9989	1.0003
2.45	1.0000	.9997	.9997	.9996	1.0002	.9989	1.0003
2.50	1.0000	.9997	.9996	.9996	1.0002	.9988	1.0003
2.55	1.0000	.9997	.9996	.9996	1.0002	.9988	1.0003
2.60	1.0000	.9997	.9996	.9996	1.0002	.9987	1.0003
2.65	1.0000	.9997	.9995	.9996	1.0002	.9987	1.0003
2.70	1.0001	.9997	.9995	.9997	1.0002	.9986	1.0003
2.75	1.0001	.9998	.9995	.9997	1.0002	.9986	1.0003
2.80	1.0001	.9998	.9994	.9997	1.0002	.9985	1.0003
2.85	1.0001	.9998	.9994	.9997	1.0002	.9985	1.0003
2.90	1.0000	.9998	.9994	.9997	1.0001	.9985	1.0003
2.95	1.0000	.9998	.9994	.9997	1.0001	.9984	1.0002
3.00	1.0000	.9998	.9994	.9997	1.0001	.9984	1.0002

TABLE IX. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

B. PT1 = 3. ATM DT1 = 5.155 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	1.5840	166.48	3.270	3.0001	200.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	1.6715	169.08	3.398	2.9997	200.00	1.1196	1.0330	1.0839	.9999	1.0000	.9999
1.10	.9116	1.7486	171.32	3.508	2.9969	200.00	1.2450	1.0652	1.1688	.9990	1.0000	.9989
1.15	.8748	1.8153	173.28	3.600	2.9902	200.00	1.3762	1.0970	1.2546	.9967	1.0000	.9967
1.20	.8419	1.8716	175.00	3.675	2.9785	199.99	1.5132	1.1285	1.3410	.9928	.9999	.9928
1.25	.8123	1.9177	176.52	3.734	2.9613	199.98	1.6561	1.1600	1.4278	.9871	.9999	.9871
1.30	.7857	1.9537	177.85	3.775	2.9383	199.97	1.8046	1.1915	1.5146	.9794	.9999	.9795
1.35	.7615	1.9804	179.04	3.801	2.9095	199.96	1.9590	1.2233	1.6015	.9698	.9998	.9698
1.40	.7396	1.9980	180.10	3.812	2.8750	199.94	2.1191	1.2554	1.6881	.9583	.9997	.9584
1.45	.7194	2.0072	181.05	3.809	2.8350	199.92	2.2852	1.2879	1.7743	.9450	.9996	.9450
1.50	.7010	2.0085	181.90	3.793	2.7900	199.90	2.4570	1.3209	1.8600	.9300	.9995	.9300
1.55	.6840	2.0026	182.66	3.766	2.7403	199.88	2.6347	1.3544	1.9451	.9134	.9994	.9135
1.60	.6683	1.9901	183.36	3.728	2.6864	199.85	2.8182	1.3886	2.0293	.8955	.9993	.8955
1.65	.6538	1.9717	183.98	3.680	2.6288	199.82	3.0076	1.4233	2.1126	.8763	.9991	.8763
1.70	.6404	1.9479	184.55	3.624	2.5681	199.80	3.2028	1.4588	2.1949	.8560	.9990	.8561
1.75	.6280	1.9194	185.07	3.561	2.5047	199.77	3.4038	1.4949	2.2761	.8349	.9988	.8350
1.80	.6164	1.8867	185.54	3.491	2.4391	199.73	3.6106	1.5318	2.3561	.8130	.9987	.8131
1.85	.6056	1.8505	185.97	3.415	2.3718	199.70	3.8232	1.5694	2.4349	.7906	.9985	.7907
1.90	.5956	1.8113	186.37	3.335	2.3033	199.67	4.0417	1.6078	2.5124	.7678	.9983	.7679
1.95	.5861	1.7696	186.73	3.252	2.2338	199.64	4.2661	1.6470	2.5885	.7446	.9982	.7447
2.00	.5773	1.7258	187.06	3.165	2.1639	199.60	4.4962	1.6870	2.6632	.7213	.9980	.7214
2.05	.5690	1.6804	187.37	3.076	2.0937	199.57	4.7323	1.7279	2.7365	.6979	.9979	.6980
2.10	.5612	1.6337	187.65	2.986	2.0238	199.54	4.9741	1.7695	2.8083	.6746	.9977	.6747
2.15	.5539	1.5861	187.91	2.894	1.9543	199.50	5.2218	1.8121	2.8787	.6514	.9975	.6516
2.20	.5470	1.5380	188.15	2.803	1.8856	199.47	5.4753	1.8555	2.9476	.6285	.9974	.6287
2.25	.5405	1.4896	188.37	2.711	1.8177	199.44	5.7346	1.8998	3.0150	.6059	.9972	.6061
2.30	.5344	1.4412	188.58	2.619	1.7510	199.41	5.9998	1.9450	3.0810	.5837	.9970	.5838
2.35	.5286	1.3930	188.78	2.529	1.6855	199.38	6.2708	1.9910	3.1454	.5618	.9969	.5620
2.40	.5231	1.3452	188.96	2.439	1.6214	199.35	6.5477	2.0380	3.2083	.5405	.9967	.5406
2.45	.5179	1.2980	189.12	2.351	1.5588	199.32	6.8304	2.0858	3.2698	.5196	.9966	.5198
2.50	.5130	1.2514	189.28	2.265	1.4979	199.29	7.1189	2.1346	3.3299	.4993	.9964	.4995
2.55	.5083	1.2058	189.43	2.180	1.4386	199.26	7.4133	2.1843	3.3884	.4795	.9963	.4797
2.60	.5039	1.1610	189.57	2.097	1.3810	199.23	7.7135	2.2349	3.4456	.4603	.9962	.4605
2.65	.4996	1.1173	189.70	2.017	1.3253	199.20	8.0196	2.2865	3.5013	.4418	.9960	.4419
2.70	.4956	1.0747	189.82	1.938	1.2713	199.18	8.3314	2.3389	3.5557	.4238	.9959	.4239
2.75	.4918	1.0332	189.93	1.862	1.2191	199.15	8.6492	2.3923	3.6087	.4064	.9958	.4065
2.80	.4881	.9929	190.04	1.788	1.1687	199.13	8.9727	2.4467	3.6604	.3896	.9956	.3897
2.85	.4847	.9538	190.14	1.717	1.1202	199.11	9.3022	2.5019	3.7107	.3734	.9955	.3736
2.90	.4813	.9159	190.24	1.648	1.0734	199.08	9.6374	2.5581	3.7598	.3578	.9954	.3580
2.95	.4782	.8793	190.33	1.581	1.0284	199.06	9.9785	2.6153	3.8076	.3428	.9953	.3429
3.00	.4751	.8439	190.42	1.516	.9851	199.04	10.3254	2.6734	3.8542	.3284	.9952	.3285

TABLE IX. REAL-GAS NORAML-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

B. PT1 = 3. ATM DT1 = 5.155 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9999	1.0000	1.0001	.9999	1.0000	1.0000	1.0000
1.10	.9999	1.0000	1.0003	.9998	1.0000	1.0000	1.0000
1.15	.9998	1.0000	1.0004	.9997	1.0000	1.0000	1.0000
1.20	.9997	.9999	1.0005	.9995	1.0000	.9999	1.0000
1.25	.9996	.9999	1.0006	.9994	1.0000	.9999	1.0000
1.30	.9997	.9998	1.0006	.9993	1.0001	.9999	1.0001
1.35	.9997	.9997	1.0006	.9992	1.0001	.9998	1.0001
1.40	.9998	.9996	1.0006	.9991	1.0001	.9997	1.0002
1.45	.9998	.9995	1.0006	.9990	1.0002	.9996	1.0002
1.50	.9998	.9995	1.0005	.9989	1.0002	.9995	1.0003
1.55	.9998	.9994	1.0005	.9988	1.0003	.9994	1.0003
1.60	.9999	.9994	1.0004	.9988	1.0003	.9993	1.0004
1.65	.9998	.9993	1.0004	.9988	1.0003	.9991	1.0004
1.70	.9998	.9993	1.0003	.9987	1.0004	.9990	1.0005
1.75	.9998	.9993	1.0002	.9987	1.0004	.9988	1.0005
1.80	.9999	.9992	1.0001	.9987	1.0004	.9987	1.0006
1.85	.9999	.9992	1.0000	.9987	1.0005	.9985	1.0006
1.90	.9999	.9992	.9999	.9987	1.0005	.9983	1.0007
1.95	.9999	.9992	.9998	.9987	1.0005	.9982	1.0007
2.00	.9999	.9992	.9997	.9987	1.0006	.9980	1.0008
2.05	.9998	.9992	.9996	.9987	1.0006	.9979	1.0008
2.10	.9999	.9991	.9995	.9987	1.0006	.9977	1.0008
2.15	.9999	.9991	.9994	.9988	1.0006	.9975	1.0008
2.20	.9999	.9991	.9993	.9988	1.0006	.9974	1.0009
2.25	.9999	.9991	.9992	.9988	1.0006	.9972	1.0009
2.30	1.0000	.9991	.9991	.9988	1.0006	.9970	1.0009
2.35	1.0000	.9991	.9989	.9989	1.0006	.9969	1.0009
2.40	1.0000	.9991	.9988	.9989	1.0006	.9967	1.0009
2.45	1.0000	.9991	.9987	.9989	1.0006	.9966	1.0009
2.50	1.0000	.9991	.9987	.9990	1.0006	.9964	1.0009
2.55	1.0000	.9992	.9986	.9990	1.0005	.9963	1.0009
2.60	1.0000	.9992	.9985	.9990	1.0005	.9962	1.0008
2.65	1.0000	.9992	.9984	.9990	1.0004	.9960	1.0008
2.70	1.0000	.9992	.9983	.9991	1.0004	.9959	1.0008
2.75	.9999	.9992	.9982	.9991	1.0004	.9958	1.0008
2.80	.9999	.9992	.9982	.9991	1.0003	.9956	1.0007
2.85	.9999	.9992	.9981	.9992	1.0002	.9955	1.0007
2.90	.9999	.9992	.9980	.9992	1.0002	.9954	1.0006
2.95	.9999	.9992	.9980	.9992	1.0001	.9953	1.0006
3.00	.9998	.9992	.9979	.9992	1.0001	.9952	1.0005

TABLE IX. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

C. PT1 = 5. ATM DT1 = 8.629 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	2.6392	166.37	5.477	5.0005	200.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9530	2.7850	168.97	5.690	4.9998	200.00	1.1196	1.0331	1.0838	1.0000	1.0000	1.0000
1.10	.9115	2.9136	171.22	5.875	4.9952	200.00	1.2450	1.0654	1.1686	.9990	1.0000	.9990
1.15	.8747	3.0248	173.19	6.030	4.9839	199.99	1.3761	1.0973	1.2543	.9968	1.0000	.9967
1.20	.8418	3.1185	174.90	6.155	4.9646	199.98	1.5130	1.1288	1.3405	.9929	.9999	.9929
1.25	.8123	3.1951	176.41	6.252	4.9360	199.97	1.6556	1.1603	1.4270	.9872	.9998	.9872
1.30	.7857	3.2552	177.74	6.321	4.8978	199.95	1.8040	1.1919	1.5137	.9796	.9998	.9796
1.35	.7615	3.2997	178.93	6.365	4.8498	199.93	1.9583	1.2237	1.6004	.9700	.9996	.9700
1.40	.7395	3.3292	179.98	6.383	4.7923	199.90	2.1184	1.2556	1.6869	.9585	.9995	.9585
1.45	.7194	3.3446	180.92	6.378	4.7258	199.87	2.2842	1.2883	1.7730	.9452	.9994	.9452
1.50	.7009	3.3470	181.76	6.352	4.6509	199.84	2.4559	1.3213	1.8586	.9302	.9992	.9302
1.55	.6840	3.3373	182.52	6.307	4.5682	199.80	2.6335	1.3548	1.9435	.9136	.9990	.9137
1.60	.6683	3.3166	183.20	6.243	4.4785	199.75	2.8168	1.3889	2.0276	.8957	.9988	.8958
1.65	.6538	3.2860	183.81	6.163	4.3826	199.71	3.0061	1.4236	2.1108	.8765	.9985	.8766
1.70	.6404	3.2465	184.37	6.070	4.2815	199.66	3.2010	1.4589	2.1930	.8563	.9983	.8564
1.75	.6280	3.1990	184.87	5.963	4.1760	199.61	3.4019	1.4950	2.2741	.8352	.9981	.8354
1.80	.6164	3.1448	185.32	5.846	4.0667	199.56	3.6085	1.5317	2.3541	.8133	.9978	.8135
1.85	.6056	3.0845	185.74	5.720	3.9546	199.51	3.8210	1.5693	2.4328	.7909	.9975	.7911
1.90	.5955	3.0193	186.12	5.586	3.8403	199.45	4.0394	1.6076	2.5102	.7681	.9973	.7683
1.95	.5861	2.9498	186.46	5.446	3.7245	199.40	4.2635	1.6466	2.5862	.7449	.9970	.7451
2.00	.5773	2.8769	186.77	5.301	3.6080	199.34	4.4935	1.6865	2.6609	.7216	.9967	.7218
2.05	.5690	2.8012	187.06	5.153	3.4911	199.29	4.7293	1.7272	2.7342	.6982	.9964	.6985
2.10	.5612	2.7234	187.32	5.001	3.3746	199.23	4.9710	1.7688	2.8060	.6749	.9962	.6752
2.15	.5539	2.6442	187.57	4.848	3.2586	199.18	5.2185	1.8112	2.8764	.6517	.9959	.6520
2.20	.5470	2.5641	187.79	4.695	3.1440	199.12	5.4719	1.8544	2.9453	.6288	.9956	.6291
2.25	.5405	2.4834	187.99	4.541	3.0309	199.07	5.7310	1.8986	3.0127	.6062	.9953	.6065
2.30	.5344	2.4027	188.18	4.388	2.9196	199.02	5.9961	1.9436	3.0786	.5839	.9951	.5842
2.35	.5286	2.3223	188.36	4.236	2.8103	198.96	6.2669	1.9894	3.1431	.5621	.9948	.5624
2.40	.5231	2.2426	188.52	4.086	2.7035	198.91	6.5436	2.0362	3.2061	.5407	.9946	.5410
2.45	.5179	2.1639	188.67	3.939	2.5991	198.86	6.8262	2.0839	3.2676	.5198	.9943	.5201
2.50	.5130	2.0863	188.81	3.794	2.4974	198.81	7.1146	2.1325	3.3276	.4995	.9941	.4998
2.55	.5083	2.0101	188.94	3.652	2.3985	198.77	7.4088	2.1820	3.3863	.4797	.9938	.4800
2.60	.5038	1.9354	189.06	3.513	2.3025	198.72	7.7089	2.2324	3.4435	.4605	.9936	.4608
2.65	.4996	1.8625	189.17	3.378	2.2095	198.68	8.0148	2.2838	3.4993	.4419	.9934	.4422
2.70	.4956	1.7914	189.28	3.247	2.1194	198.63	8.3266	2.3361	3.5537	.4239	.9932	.4242
2.75	.4918	1.7222	189.38	3.119	2.0323	198.59	8.6442	2.3893	3.6067	.4065	.9930	.4068
2.80	.4881	1.6550	189.47	2.995	1.9483	198.55	8.9676	2.4434	3.6584	.3897	.9928	.3899
2.85	.4846	1.5897	189.56	2.875	1.8673	198.51	9.2969	2.4985	3.7088	.3735	.9926	.3737
2.90	.4814	1.5266	189.64	2.759	1.7893	198.47	9.6321	2.5544	3.7580	.3579	.9924	.3581
2.95	.4782	1.4655	189.72	2.648	1.7142	198.44	9.9732	2.6114	3.8059	.3428	.9922	.3431
3.00	.4752	1.4065	189.79	2.540	1.6420	198.40	10.3200	2.6693	3.8526	.3284	.9920	.3287

TABLE IX. REAL-GAS NORAML-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

C. PT1 = 5. ATM DT1 = 8.629 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9999	1.0000	1.0002	.9998	1.0001	1.0000	1.0001
1.10	.9997	1.0000	1.0005	.9996	1.0001	1.0000	1.0001
1.15	.9996	.9999	1.0006	.9994	1.0001	1.0000	1.0000
1.20	.9996	.9998	1.0007	.9992	1.0001	.9999	1.0001
1.25	.9996	.9996	1.0008	.9989	1.0001	.9998	1.0002
1.30	.9997	.9995	1.0009	.9987	1.0002	.9998	1.0002
1.35	.9997	.9993	1.0009	.9985	1.0002	.9996	1.0003
1.40	.9997	.9992	1.0009	.9984	1.0003	.9995	1.0003
1.45	.9998	.9991	1.0009	.9982	1.0003	.9994	1.0004
1.50	.9998	.9990	1.0008	.9981	1.0004	.9992	1.0005
1.55	.9998	.9989	1.0007	.9980	1.0005	.9990	1.0006
1.60	.9999	.9989	1.0006	.9979	1.0006	.9988	1.0007
1.65	.9998	.9988	1.0005	.9979	1.0006	.9985	1.0008
1.70	.9998	.9988	1.0004	.9979	1.0007	.9983	1.0008
1.75	.9999	.9987	1.0003	.9978	1.0008	.9981	1.0009
1.80	.9999	.9987	1.0001	.9978	1.0008	.9978	1.0010
1.85	.9999	.9986	.9999	.9978	1.0009	.9975	1.0011
1.90	.9998	.9986	.9998	.9978	1.0009	.9973	1.0012
1.95	.9999	.9986	.9996	.9978	1.0010	.9970	1.0013
2.00	.9999	.9986	.9994	.9978	1.0010	.9967	1.0013
2.05	.9999	.9985	.9992	.9979	1.0010	.9964	1.0014
2.10	.9999	.9985	.9991	.9979	1.0011	.9962	1.0014
2.15	.9998	.9985	.9989	.9979	1.0010	.9959	1.0015
2.20	.9999	.9985	.9987	.9980	1.0011	.9956	1.0015
2.25	.9999	.9985	.9985	.9980	1.0011	.9953	1.0015
2.30	.9999	.9985	.9983	.9981	1.0011	.9951	1.0016
2.35	.9999	.9985	.9982	.9981	1.0010	.9948	1.0016
2.40	1.0000	.9985	.9980	.9982	1.0010	.9946	1.0016
2.45	1.0000	.9985	.9978	.9982	1.0010	.9943	1.0016
2.50	1.0000	.9985	.9977	.9983	1.0009	.9941	1.0015
2.55	1.0000	.9985	.9975	.9983	1.0009	.9938	1.0015
2.60	1.0000	.9986	.9974	.9984	1.0008	.9936	1.0015
2.65	.9999	.9986	.9972	.9985	1.0008	.9934	1.0014
2.70	.9999	.9986	.9971	.9985	1.0007	.9932	1.0014
2.75	.9999	.9986	.9969	.9986	1.0006	.9930	1.0013
2.80	.9999	.9986	.9968	.9986	1.0005	.9928	1.0012
2.85	.9998	.9986	.9967	.9986	1.0004	.9926	1.0012
2.90	1.0000	.9987	.9966	.9987	1.0004	.9924	1.0011
2.95	1.0000	.9987	.9965	.9988	1.0003	.9922	1.0011
3.00	1.0000	.9987	.9964	.9988	1.0002	.9920	1.0010

TABLE IX. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

0. PT1 = 8. ATM OT1 = 13.896 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	4.2199	166.19	8.826	8.0001	200.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9529	4.4531	168.80	9.170	7.9989	200.00	1.1196	1.0332	1.0836	.9999	1.0000	.9999
1.10	.9114	4.6589	171.07	9.466	7.9914	200.00	1.2449	1.0657	1.1683	.9989	1.0000	.9989
1.15	.8746	4.8365	173.03	9.715	7.9735	199.99	1.3759	1.0976	1.2537	.9967	.9999	.9967
1.20	.8418	4.9858	174.75	9.916	7.9426	199.97	1.5125	1.1292	1.3396	.9928	.9999	.9928
1.25	.8124	5.1082	176.25	10.072	7.8970	199.95	1.6549	1.1608	1.4259	.9871	.9998	.9872
1.30	.7857	5.2046	177.58	10.184	7.8360	199.92	1.8031	1.1924	1.5123	.9795	.9996	.9795
1.35	.7615	5.2759	178.76	10.253	7.7595	199.89	1.9572	1.2243	1.5988	.9699	.9994	.9700
1.40	.7395	5.3233	179.81	10.283	7.6679	199.85	2.1170	1.2564	1.6850	.9585	.9992	.9586
1.45	.7194	5.3484	180.74	10.276	7.5616	199.80	2.2828	1.2889	1.7709	.9452	.9990	.9453
1.50	.7009	5.3524	181.57	10.234	7.4420	199.74	2.4542	1.3218	1.8562	.9302	.9987	.9304
1.55	.6840	5.3372	182.30	10.161	7.3100	199.68	2.6315	1.3553	1.9409	.9137	.9984	.9139
1.60	.6683	5.3046	182.97	10.059	7.1666	199.61	2.8147	1.3893	2.0249	.8958	.9981	.8960
1.65	.6538	5.2559	183.56	9.931	7.0137	199.54	3.0036	1.4239	2.1079	.8767	.9977	.8769
1.70	.6404	5.1930	184.09	9.781	6.8522	199.46	3.1983	1.4591	2.1900	.8565	.9973	.8568
1.75	.6280	5.1175	184.57	9.610	6.6835	199.38	3.3989	1.4950	2.2710	.8354	.9969	.8357
1.80	.6164	5.0310	185.00	9.422	6.5088	199.30	3.6054	1.5317	2.3508	.8136	.9965	.8139
1.85	.6056	4.9349	185.39	9.219	6.3296	199.22	3.8176	1.5690	2.4294	.7912	.9961	.7915
1.90	.5955	4.8308	185.74	9.004	6.1469	199.13	4.0356	1.6072	2.5067	.7684	.9957	.7687
1.95	.5861	4.7198	186.06	8.778	5.9618	199.04	4.2595	1.6461	2.5827	.7452	.9952	.7456
2.00	.5772	4.6033	186.34	8.545	5.7752	198.96	4.4893	1.6858	2.6573	.7219	.9948	.7223
2.05	.5690	4.4824	186.60	8.306	5.5883	198.87	4.7248	1.7263	2.7306	.6985	.9943	.6990
2.10	.5612	4.3581	186.84	8.062	5.4018	198.78	4.9662	1.7676	2.8024	.6752	.9939	.6757
2.15	.5539	4.2315	187.05	7.816	5.2165	198.69	5.2135	1.8097	2.8727	.6521	.9935	.6525
2.20	.5470	4.1032	187.24	7.568	5.0329	198.60	5.4666	1.8527	2.9417	.6291	.9930	.6296
2.25	.5405	3.9742	187.42	7.320	4.8516	198.52	5.7255	1.8966	3.0091	.6065	.9926	.6070
2.30	.5343	3.8451	187.58	7.073	4.6734	198.43	5.9903	1.9414	3.0750	.5842	.9922	.5847
2.35	.5286	3.7165	187.73	6.829	4.4986	198.35	6.2609	1.9870	3.1395	.5623	.9917	.5628
2.40	.5231	3.5889	187.86	6.587	4.3274	198.27	6.5374	2.0335	3.2026	.5409	.9913	.5415
2.45	.5179	3.4628	187.99	6.349	4.1603	198.19	6.8197	2.0809	3.2641	.5200	.9909	.5206
2.50	.5130	3.3386	188.10	6.116	3.9974	198.11	7.1079	2.1292	3.3243	.4997	.9905	.5002
2.55	.5083	3.2166	188.20	5.887	3.8390	198.03	7.4019	2.1785	3.3829	.4799	.9902	.4804
2.60	.5038	3.0971	188.30	5.663	3.6852	197.96	7.7018	2.2286	3.4402	.4607	.9898	.4612
2.65	.4996	2.9803	188.39	5.445	3.5361	197.89	8.0075	2.2796	3.4961	.4420	.9894	.4425
2.70	.4956	2.8664	188.47	5.233	3.3918	197.82	8.3191	2.3316	3.5506	.4240	.9891	.4245
2.75	.4917	2.7556	188.55	5.027	3.2523	197.75	8.6365	2.3845	3.6037	.4065	.9888	.4070
2.80	.4881	2.6479	188.62	4.827	3.1178	197.69	8.9598	2.4383	3.6555	.3897	.9884	.3902
2.85	.4847	2.5434	188.68	4.634	2.9880	197.62	9.2890	2.4931	3.7061	.3735	.9881	.3740
2.90	.4814	2.4423	188.74	4.447	2.8630	197.56	9.6240	2.5488	3.7553	.3579	.9878	.3584
2.95	.4782	2.3444	188.80	4.266	2.7427	197.50	9.9648	2.6054	3.8033	.3428	.9875	.3433
3.00	.4752	2.2499	188.85	4.092	2.6270	197.45	10.3116	2.6630	3.8500	.3284	.9872	.3288

TABLE IX. REAL-GAS NORAML-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

D. PT1 = 8. ATM DT1 = 13.896 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO IDEAL DIATOMIC GAS VALUE	----------	----------	----------	----------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9998	1.0000	1.0004	.9997	1.0000	1.0000	1.0000
1.10	.9996	.9999	1.0007	.9994	1.0000	1.0000	1.0000
1.15	.9995	.9998	1.0010	.9990	1.0000	.9999	1.0000
1.20	.9996	.9995	1.0011	.9985	1.0000	.9999	1.0000
1.25	.9996	.9992	1.0012	.9981	1.0001	.9998	1.0001
1.30	.9997	.9990	1.0013	.9978	1.0001	.9996	1.0002
1.35	.9997	.9988	1.0013	.9975	1.0002	.9994	1.0003
1.40	.9998	.9986	1.0013	.9973	1.0003	.9992	1.0004
1.45	.9997	.9985	1.0013	.9971	1.0004	.9990	1.0005
1.50	.9998	.9983	1.0012	.9969	1.0005	.9987	1.0006
1.55	.9998	.9982	1.0011	.9967	1.0006	.9984	1.0008
1.60	.9998	.9981	1.0009	.9966	1.0007	.9981	1.0009
1.65	.9998	.9980	1.0008	.9965	1.0008	.9977	1.0011
1.70	.9998	.9979	1.0005	.9965	1.0009	.9973	1.0012
1.75	.9999	.9979	1.0003	.9964	1.0010	.9969	1.0014
1.80	.9998	.9978	1.0001	.9964	1.0011	.9965	1.0015
1.85	.9998	.9977	.9998	.9964	1.0012	.9961	1.0017
1.90	.9999	.9977	.9995	.9964	1.0013	.9957	1.0018
1.95	.9999	.9977	.9993	.9965	1.0014	.9952	1.0019
2.00	.9998	.9976	.9990	.9965	1.0014	.9948	1.0020
2.05	.9998	.9976	.9987	.9966	1.0015	.9943	1.0021
2.10	.9999	.9976	.9984	.9966	1.0015	.9939	1.0022
2.15	.9999	.9976	.9981	.9967	1.0015	.9935	1.0023
2.20	.9999	.9976	.9978	.9968	1.0016	.9930	1.0023
2.25	.9998	.9976	.9975	.9968	1.0015	.9926	1.0023
2.30	.9999	.9976	.9972	.9969	1.0015	.9922	1.0024
2.35	.9999	.9976	.9969	.9970	1.0015	.9917	1.0024
2.40	.9999	.9976	.9967	.9971	1.0014	.9913	1.0024
2.45	.9999	.9976	.9964	.9972	1.0014	.9909	1.0024
2.50	.9999	.9976	.9961	.9973	1.0013	.9905	1.0024
2.55	.9999	.9976	.9959	.9974	1.0012	.9902	1.0023
2.60	.9999	.9977	.9956	.9975	1.0011	.9898	1.0023
2.65	.9999	.9977	.9954	.9975	1.0010	.9894	1.0022
2.70	.9999	.9977	.9952	.9976	1.0009	.9891	1.0021
2.75	.9998	.9977	.9950	.9977	1.0008	.9888	1.0020
2.80	.9999	.9978	.9948	.9978	1.0007	.9884	1.0020
2.85	1.0000	.9978	.9946	.9979	1.0005	.9881	1.0019
2.90	1.0000	.9978	.9944	.9980	1.0004	.9878	1.0017
2.95	1.0000	.9979	.9942	.9981	1.0002	.9875	1.0016
3.00	1.0000	.9979	.9940	.9982	1.0001	.9872	1.0015

TABLE IX. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

E. PT1 = 10. ATM DT1 = 17.446 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	5.2727	166.08	11.086	10.0002	200.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9529	5.5643	168.70	11.518	9.9987	200.00	1.1196	1.0333	1.0835	.9999	1.0000	.9999
1.10	.9113	5.8217	170.97	11.890	9.9893	200.00	1.2449	1.0659	1.1681	.9989	1.0000	.9989
1.15	.8746	6.0427	172.93	12.201	9.9671	199.98	1.3756	1.0978	1.2532	.9967	.9999	.9967
1.20	.8418	6.2294	174.64	12.454	9.9286	199.97	1.5121	1.1295	1.3390	.9929	.9998	.9929
1.25	.8123	6.3827	176.15	12.649	9.8717	199.94	1.6545	1.1611	1.4251	.9872	.9997	.9872
1.30	.7857	6.5032	177.48	12.790	9.7957	199.91	1.8026	1.1928	1.5114	.9796	.9995	.9796
1.35	.7615	6.5924	178.65	12.877	9.7003	199.86	1.9565	1.2246	1.5976	.9700	.9993	.9701
1.40	.7395	6.6518	179.69	12.915	9.5859	199.81	2.1162	1.2567	1.6837	.9586	.9990	.9587
1.45	.7194	6.6834	180.61	12.906	9.4534	199.75	2.2818	1.2892	1.7694	.9453	.9987	.9455
1.50	.7009	6.6888	181.43	12.854	9.3041	199.68	2.4531	1.3221	1.8546	.9304	.9984	.9306
1.55	.6839	6.6703	182.17	12.762	9.1391	199.60	2.6303	1.3556	1.9392	.9139	.9980	.9141
1.60	.6683	6.6296	182.81	12.634	8.9605	199.52	2.8132	1.3895	2.0230	.8960	.9976	.8963
1.65	.6538	6.5691	183.39	12.474	8.7695	199.43	3.0019	1.4241	2.1059	.8769	.9971	.8772
1.70	.6404	6.4909	183.91	12.285	8.5676	199.33	3.1966	1.4593	2.1879	.8568	.9967	.8571
1.75	.6280	6.3968	184.38	12.071	8.3570	199.23	3.3970	1.4951	2.2688	.8357	.9962	.8361
1.80	.6164	6.2889	184.79	11.836	8.1389	199.13	3.6032	1.5316	2.3485	.8139	.9957	.8143
1.85	.6056	6.1691	185.16	11.581	7.9149	199.03	3.8153	1.5689	2.4271	.7915	.9951	.7920
1.90	.5955	6.0391	185.50	11.311	7.6866	198.92	4.0332	1.6069	2.5044	.7687	.9946	.7692
1.95	.5861	5.9006	185.79	11.028	7.4554	198.81	4.2569	1.6457	2.5803	.7455	.9941	.7461
2.00	.5773	5.7551	186.06	10.736	7.2223	198.70	4.4864	1.6852	2.6549	.7222	.9935	.7229
2.05	.5689	5.6042	186.30	10.435	6.9884	198.59	4.7219	1.7256	2.7281	.6988	.9930	.6995
2.10	.5612	5.4488	186.52	10.129	6.7553	198.48	4.9630	1.7667	2.7999	.6755	.9924	.6762
2.15	.5539	5.2905	186.71	9.820	6.5235	198.37	5.2101	1.8087	2.8703	.6524	.9919	.6531
2.20	.5470	5.1303	186.89	9.509	6.2940	198.26	5.4630	1.8516	2.9392	.6294	.9913	.6301
2.25	.5405	4.9690	187.04	9.197	6.0675	198.15	5.7217	1.8953	3.0066	.6067	.9908	.6075
2.30	.5343	4.8077	187.19	8.887	5.8443	198.05	5.9864	1.9399	3.0726	.5844	.9902	.5852
2.35	.5285	4.6469	187.31	8.580	5.6256	197.94	6.2568	1.9853	3.1371	.5626	.9897	.5633
2.40	.5231	4.4873	187.43	8.276	5.4116	197.84	6.5331	2.0316	3.2002	.5412	.9892	.5419
2.45	.5179	4.3297	187.54	7.977	5.2025	197.74	6.8153	2.0789	3.2618	.5202	.9887	.5209
2.50	.5129	4.1743	187.63	7.684	4.9987	197.64	7.1033	2.1270	3.3220	.4999	.9882	.5006
2.55	.5083	4.0217	187.72	7.396	4.8005	197.55	7.3972	2.1760	3.3807	.4801	.9877	.4808
2.60	.5038	3.8722	187.80	7.115	4.6080	197.45	7.6970	2.2260	3.4380	.4608	.9873	.4615
2.65	.4996	3.7261	187.87	6.841	4.4215	197.36	8.0026	2.2768	3.4939	.4421	.9868	.4428
2.70	.4956	3.5836	187.94	6.575	4.2409	197.28	8.3140	2.3286	3.5485	.4241	.9864	.4248
2.75	.4918	3.4450	188.00	6.316	4.0665	197.19	8.6313	2.3813	3.6017	.4067	.9860	.4073
2.80	.4881	3.3102	188.05	6.065	3.8981	197.11	8.9544	2.4349	3.6536	.3898	.9856	.3905
2.85	.4847	3.1796	188.10	5.821	3.7357	197.03	9.2835	2.4895	3.7041	.3736	.9852	.3742
2.90	.4814	3.0530	188.15	5.586	3.5792	196.96	9.6184	2.5449	3.7534	.3579	.9848	.3586
2.95	.4782	2.9306	188.19	5.359	3.4287	196.88	9.9591	2.6014	3.8015	.3429	.9844	.3435
3.00	.4752	2.8123	188.23	5.140	3.2839	196.81	10.3057	2.6587	3.8483	.3284	.9841	.3290

TABLE IX. REAL-GAS NORAML-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

E. PT1 = 10. ATM DT1 = 17.446 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9997	1.0000	1.0005	.9996	1.0000	1.0000	1.0000
1.10	.9994	.9999	1.0009	.9992	1.0000	1.0000	1.0000
1.15	.9995	.9996	1.0011	.9986	1.0000	.9999	1.0000
1.20	.9996	.9992	1.0013	.9980	1.0001	.9998	1.0001
1.25	.9996	.9989	1.0015	.9976	1.0001	.9997	1.0002
1.30	.9997	.9987	1.0016	.9971	1.0002	.9995	1.0003
1.35	.9997	.9984	1.0016	.9968	1.0003	.9993	1.0004
1.40	.9998	.9982	1.0016	.9965	1.0004	.9990	1.0005
1.45	.9997	.9980	1.0016	.9962	1.0005	.9987	1.0007
1.50	.9998	.9979	1.0015	.9960	1.0007	.9984	1.0009
1.55	.9997	.9977	1.0013	.9959	1.0008	.9980	1.0010
1.60	.9998	.9976	1.0011	.9957	1.0009	.9976	1.0012
1.65	.9998	.9975	1.0009	.9956	1.0011	.9971	1.0014
1.70	.9998	.9974	1.0006	.9955	1.0012	.9967	1.0016
1.75	.9998	.9973	1.0003	.9955	1.0014	.9962	1.0018
1.80	.9998	.9972	1.0000	.9955	1.0015	.9957	1.0020
1.85	.9998	.9971	.9997	.9955	1.0016	.9951	1.0023
1.90	.9998	.9971	.9994	.9955	1.0017	.9946	1.0024
1.95	.9998	.9970	.9990	.9955	1.0018	.9941	1.0026
2.00	.9999	.9970	.9986	.9956	1.0019	.9935	1.0028
2.05	.9998	.9970	.9983	.9957	1.0019	.9930	1.0029
2.10	.9998	.9969	.9979	.9957	1.0019	.9924	1.0030
2.15	.9999	.9969	.9975	.9958	1.0020	.9919	1.0031
2.20	.9999	.9969	.9972	.9959	1.0020	.9913	1.0031
2.25	.9999	.9969	.9968	.9960	1.0020	.9908	1.0032
2.30	.9998	.9969	.9965	.9961	1.0019	.9902	1.0032
2.35	.9999	.9969	.9961	.9962	1.0019	.9897	1.0031
2.40	.9999	.9969	.9957	.9964	1.0019	.9892	1.0031
2.45	.9999	.9970	.9954	.9965	1.0018	.9887	1.0031
2.50	.9999	.9970	.9951	.9966	1.0017	.9882	1.0031
2.55	.9999	.9970	.9948	.9967	1.0016	.9877	1.0031
2.60	.9999	.9970	.9945	.9968	1.0015	.9873	1.0030
2.65	.9999	.9971	.9942	.9969	1.0013	.9868	1.0029
2.70	.9998	.9971	.9939	.9970	1.0012	.9864	1.0028
2.75	.9999	.9971	.9936	.9972	1.0010	.9860	1.0027
2.80	.9999	.9972	.9934	.9973	1.0009	.9856	1.0026
2.85	.9999	.9972	.9931	.9974	1.0007	.9852	1.0024
2.90	.9999	.9973	.9929	.9975	1.0005	.9848	1.0023
2.95	1.0000	.9973	.9927	.9976	1.0003	.9844	1.0022
3.00	1.0000	.9973	.9924	.9977	1.0001	.9841	1.0020

TABLE IX. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

F. PT1 = 20. ATM DT1 = 35.653 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	10.5204	165.53	22.725	20.0027	200.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0001
1.05	.9525	11.1045	168.19	23.607	19.9995	200.00	1.1195	1.0337	1.0830	1.0000	1.0000	1.0000
1.10	.9111	11.6149	170.46	24.361	19.9810	199.99	1.2442	1.0665	1.1665	.9991	1.0000	.9990
1.15	.8745	12.0544	172.43	24.991	19.9374	199.97	1.3743	1.0987	1.2506	.9969	.9999	.9969
1.20	.8418	12.4274	174.15	25.504	19.8615	199.94	1.5102	1.1306	1.3354	.9931	.9997	.9931
1.25	.8123	12.7340	175.65	25.902	19.7495	199.89	1.6518	1.1624	1.4205	.9875	.9994	.9875
1.30	.7856	12.9766	176.97	26.189	19.5993	199.82	1.7993	1.1942	1.5058	.9800	.9991	.9801
1.35	.7614	13.1575	178.13	26.370	19.4113	199.74	1.9525	1.2261	1.5912	.9706	.9987	.9708
1.40	.7394	13.2793	179.14	26.450	19.1851	199.63	2.1115	1.2582	1.6764	.9593	.9982	.9596
1.45	.7192	13.3456	180.03	26.435	18.9229	199.52	2.2763	1.2907	1.7613	.9461	.9976	.9466
1.50	.7008	13.3597	180.80	26.333	18.6274	199.38	2.4468	1.3235	1.8457	.9314	.9969	.9320
1.55	.6838	13.3264	181.49	26.150	18.3006	199.23	2.6231	1.3567	1.9295	.9150	.9962	.9157
1.60	.6682	13.2489	182.08	25.893	17.9462	199.07	2.8052	1.3904	2.0126	.8973	.9954	.8982
1.65	.6537	13.1319	182.60	25.571	17.5666	198.90	2.9931	1.4246	2.0950	.8783	.9945	.8793
1.70	.6403	12.9766	183.05	25.185	17.1627	198.72	3.1867	1.4594	2.1763	.8581	.9936	.8592
1.75	.6278	12.7922	183.44	24.753	16.7433	198.52	3.3863	1.4948	2.2568	.8372	.9926	.8384
1.80	.6163	12.5797	183.77	24.275	16.3092	198.32	3.5916	1.5309	2.3361	.8155	.9916	.8168
1.85	.6054	12.3433	184.06	23.759	15.8626	198.12	3.8028	1.5676	2.4144	.7931	.9906	.7946
1.90	.5954	12.0859	184.31	23.210	15.4073	197.91	4.0197	1.6050	2.4914	.7704	.9895	.7719
1.95	.5860	11.8112	184.52	22.634	14.9456	197.69	4.2425	1.6431	2.5672	.7473	.9885	.7489
2.00	.5771	11.5223	184.70	22.037	14.4795	197.48	4.4712	1.6820	2.6416	.7240	.9874	.7257
2.05	.5688	11.2218	184.85	21.424	14.0124	197.26	4.7057	1.7216	2.7148	.7006	.9863	.7024
2.10	.5611	10.9125	184.97	20.799	13.5459	197.04	4.9460	1.7620	2.7866	.6773	.9852	.6792
2.15	.5538	10.5968	185.07	20.166	13.0817	196.82	5.1922	1.8032	2.8570	.6541	.9841	.6560
2.20	.5468	10.2768	185.15	19.529	12.6214	196.60	5.4442	1.8453	2.9260	.6311	.9830	.6330
2.25	.5404	9.9545	185.21	18.892	12.1672	196.39	5.7021	1.8881	2.9935	.6084	.9819	.6104
2.30	.5342	9.6316	185.26	18.256	11.7201	196.18	5.9659	1.9318	3.0597	.5860	.9809	.5880
2.35	.5284	9.3096	185.29	17.626	11.2810	195.97	6.2355	1.9763	3.1244	.5640	.9798	.5661
2.40	.5230	8.9900	185.32	17.002	10.8510	195.76	6.5110	2.0217	3.1877	.5425	.9788	.5446
2.45	.5177	8.6739	185.33	16.387	10.4307	195.56	6.7924	2.0679	3.2495	.5215	.9778	.5236
2.50	.5128	8.3623	185.34	15.784	10.0213	195.36	7.0797	2.1151	3.3100	.5011	.9768	.5031
2.55	.5082	8.0560	185.34	15.192	9.6228	195.17	7.3728	2.1631	3.3690	.4811	.9758	.4831
2.60	.5037	7.7559	185.33	14.614	9.2358	194.98	7.6718	2.2120	3.4266	.4618	.9749	.4638
2.65	.4995	7.4624	185.32	14.050	8.8607	194.80	7.9767	2.2618	3.4829	.4430	.9740	.4450
2.70	.4955	7.1761	185.30	13.501	8.4975	194.62	8.2875	2.3126	3.5377	.4249	.9731	.4268
2.75	.4917	6.8975	185.28	12.967	8.1464	194.45	8.6042	2.3642	3.5913	.4073	.9722	.4092
2.80	.4880	6.6267	185.26	12.450	7.8075	194.28	8.9268	2.4168	3.6435	.3904	.9714	.3922
2.85	.4846	6.3640	185.24	11.949	7.4807	194.12	9.2552	2.4703	3.6944	.3740	.9706	.3758

LAST POINT AT SATURATION BOUNDARY

TABLE IX. REAL-GAS NORAML-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

F. PT1 = 20. ATM DT1 = 35.653 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------RELATIVE TO IDEAL DIATOMIC GAS VALUE----------)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0001
1.05	.9994	1.0000	1.0009	.9991	1.0001	1.0000	1.0001
1.10	.9993	.9994	1.0015	.9978	1.0001	1.0000	1.0001
1.15	.9994	.9986	1.0020	.9965	1.0002	.9999	1.0002
1.20	.9995	.9979	1.0023	.9954	1.0003	.9997	1.0003
1.25	.9996	.9973	1.0026	.9944	1.0004	.9994	1.0005
1.30	.9996	.9968	1.0028	.9935	1.0006	.9991	1.0007
1.35	.9996	.9964	1.0029	.9928	1.0009	.9987	1.0011
1.40	.9996	.9960	1.0028	.9921	1.0011	.9982	1.0015
1.45	.9996	.9956	1.0027	.9916	1.0014	.9976	1.0019
1.50	.9996	.9953	1.0025	.9912	1.0017	.9969	1.0023
1.55	.9996	.9950	1.0021	.9909	1.0020	.9962	1.0028
1.60	.9996	.9947	1.0017	.9906	1.0024	.9954	1.0033
1.65	.9996	.9945	1.0013	.9904	1.0027	.9945	1.0038
1.70	.9996	.9943	1.0007	.9903	1.0028	.9936	1.0041
1.75	.9996	.9942	1.0002	.9902	1.0031	.9926	1.0046
1.80	.9996	.9940	.9995	.9902	1.0034	.9916	1.0051
1.85	.9995	.9939	.9989	.9903	1.0037	.9906	1.0055
1.90	.9996	.9938	.9982	.9904	1.0039	.9895	1.0060
1.95	.9996	.9937	.9975	.9905	1.0041	.9885	1.0064
2.00	.9995	.9936	.9967	.9906	1.0043	.9874	1.0067
2.05	.9996	.9936	.9960	.9908	1.0045	.9863	1.0071
2.10	.9996	.9935	.9952	.9910	1.0046	.9852	1.0074
2.15	.9997	.9935	.9945	.9912	1.0047	.9841	1.0076
2.20	.9996	.9935	.9938	.9915	1.0047	.9830	1.0078
2.25	.9996	.9935	.9930	.9917	1.0047	.9819	1.0080
2.30	.9997	.9935	.9923	.9920	1.0046	.9809	1.0081
2.35	.9997	.9935	.9916	.9922	1.0046	.9798	1.0082
2.40	.9997	.9936	.9909	.9925	1.0044	.9788	1.0082
2.45	.9997	.9936	.9902	.9927	1.0043	.9778	1.0082
2.50	.9997	.9937	.9895	.9930	1.0041	.9768	1.0081
2.55	.9997	.9937	.9889	.9933	1.0039	.9758	1.0080
2.60	.9997	.9938	.9882	.9935	1.0036	.9749	1.0079
2.65	.9997	.9938	.9876	.9938	1.0033	.9740	1.0077
2.70	.9997	.9939	.9871	.9940	1.0030	.9731	1.0075
2.75	.9997	.9940	.9865	.9943	1.0027	.9722	1.0073
2.80	.9997	.9941	.9860	.9945	1.0023	.9714	1.0070
2.85	.9998	.9942	.9855	.9948	1.0019	.9706	1.0067

LAST POINT AT SATURATION BOUNDARY

TABLE IX. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

G. PT1 = 30. ATM DT1 = 54.619 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	15.7293	165.03	34.939	30.0014	200.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9521	16.6064	167.72	36.289	29.9962	200.00	1.1195	1.0341	1.0822	.9999	1.0000	.9999
1.10	.9111	17.3607	169.98	37.423	29.9693	199.99	1.2431	1.0670	1.1644	.9990	.9999	.9989
1.15	.8745	18.0180	171.96	38.382	29.9052	199.96	1.3726	1.0994	1.2474	.9968	.9998	.9969
1.20	.8417	18.5768	173.68	39.164	29.7933	199.91	1.5079	1.1315	1.3310	.9931	.9996	.9932
1.25	.8122	19.0379	175.18	39.772	29.6279	199.84	1.6488	1.1634	1.4150	.9876	.9992	.9877
1.30	.7855	19.4049	176.49	40.214	29.4068	199.74	1.7955	1.1952	1.4992	.9802	.9987	.9806
1.35	.7613	19.6798	177.63	40.494	29.1285	199.62	1.9480	1.2271	1.5834	.9710	.9981	.9715
1.40	.7392	19.8675	178.62	40.622	28.7943	199.48	2.1061	1.2592	1.6676	.9598	.9974	.9605
1.45	.7191	19.9730	179.48	40.607	28.4066	199.31	2.2700	1.2916	1.7514	.9469	.9965	.9478
1.50	.7006	20.0016	180.22	40.459	27.9685	199.12	2.4397	1.3242	1.8349	.9323	.9956	.9334
1.55	.6836	19.9589	180.85	40.189	27.4847	198.91	2.6151	1.3572	1.9179	.9162	.9945	.9176
1.60	.6679	19.8500	181.40	39.807	26.9588	198.68	2.7962	1.3906	2.0003	.8986	.9934	.9004
1.65	.6534	19.6822	181.86	39.324	26.3949	198.43	2.9832	1.4245	2.0819	.8798	.9921	.8818
1.70	.6401	19.4602	182.25	38.751	25.7989	198.16	3.1759	1.4589	2.1628	.8600	.9908	.8622
1.75	.6276	19.1906	182.57	38.098	25.1744	197.88	3.3745	1.4938	2.2427	.8391	.9894	.8416
1.80	.6160	18.8784	182.83	37.375	24.5271	197.59	3.5788	1.5294	2.3217	.8176	.9880	.8203
1.85	.6052	18.5297	183.05	36.592	23.8605	197.29	3.7890	1.5655	2.3996	.7953	.9865	.7983
1.90	.5951	18.1489	183.21	35.758	23.1801	196.99	4.0049	1.6023	2.4764	.7727	.9849	.7758
1.95	.5857	17.7417	183.34	34.882	22.4886	196.67	4.2268	1.6398	2.5520	.7496	.9834	.7530
2.00	.5769	17.3120	183.43	33.972	21.7913	196.35	4.4544	1.6779	2.6264	.7264	.9818	.7299
2.05	.5686	16.8644	183.49	33.035	21.0910	196.03	4.6879	1.7168	2.6996	.7030	.9801	.7067
2.10	.5608	16.4031	183.52	32.078	20.3901	195.70	4.9273	1.7564	2.7714	.6797	.9785	.6834
2.15	.5535	15.9312	183.53	31.109	19.6932	195.38	5.1726	1.7968	2.8420	.6564	.9769	.6603
2.20	.5466	15.4523	183.51	30.131	19.0018	195.05	5.4237	1.8379	2.9111	.6334	.9753	.6373
2.25	.5401	14.9694	183.49	29.152	18.3177	194.73	5.6807	1.8798	2.9789	.6106	.9737	.6146
2.30	.5340	14.4849	183.44	28.174	17.6447	194.41	5.9435	1.9226	3.0453	.5882	.9721	.5922
2.35	.5282	14.0015	183.38	27.204	16.9834	194.10	6.2123	1.9661	3.1103	.5661	.9705	.5701
2.40	.5228	13.5210	183.31	26.243	16.3353	193.79	6.4869	2.0105	3.1739	.5445	.9689	.5485
2.45	.5176	13.0455	183.23	25.295	15.7018	193.48	6.7675	2.0557	3.2361	.5234	.9674	.5274
2.50	.5126	12.5763	183.15	24.363	15.0837	193.18	7.0539	2.1018	3.2969	.5028	.9659	.5068
2.55	.5080	12.1150	183.06	23.449	14.4824	192.89	7.3463	2.1488	3.3564	.4827	.9645	.4867
2.60	.5036	11.6626	182.96	22.555	13.8980	192.61	7.6446	2.1966	3.4144	.4633	.9630	.4671
2.65	.4993	11.2201	182.86	21.683	13.3314	192.33	7.9487	2.2454	3.4710	.4444	.9616	.4482

LAST POINT AT SATURATION BOUNDARY

TABLE IX. REAL-GAS NORAML-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 200 K

G. PT1 = 30. ATM DT1 = 54.619 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9990	.9999	1.0012	.9984	1.0000	1.0000	1.0000
1.10	.9993	.9985	1.0019	.9960	1.0000	.9999	1.0000
1.15	.9994	.9974	1.0026	.9939	1.0002	.9998	1.0002
1.20	.9994	.9964	1.0031	.9921	1.0003	.9996	1.0004
1.25	.9995	.9955	1.0034	.9905	1.0005	.9992	1.0007
1.30	.9994	.9948	1.0037	.9891	1.0009	.9987	1.0012
1.35	.9994	.9941	1.0037	.9879	1.0013	.9981	1.0018
1.40	.9994	.9934	1.0036	.9869	1.0017	.9974	1.0024
1.45	.9993	.9929	1.0034	.9861	1.0022	.9965	1.0031
1.50	.9993	.9924	1.0030	.9854	1.0027	.9956	1.0039
1.55	.9992	.9920	1.0025	.9849	1.0032	.9945	1.0049
1.60	.9993	.9916	1.0019	.9845	1.0038	.9934	1.0058
1.65	.9992	.9912	1.0012	.9843	1.0044	.9921	1.0067
1.70	.9992	.9909	1.0004	.9841	1.8050	.9908	1.0076
1.75	.9992	.9907	.9995	.9841	1.0055	.9894	1.0085
1.80	.9992	.9904	.9986	.9841	1.0060	.9880	1.0094
1.85	.9992	.9903	.9976	.9842	1.0065	.9865	1.0102
1.90	.9992	.9901	.9965	.9844	1.0069	.9849	1.0110
1.95	.9991	.9900	.9954	.9846	1.0073	.9834	1.0118
2.00	.9992	.9899	.9943	.9849	1.0076	.9818	1.0125
2.05	.9992	.9898	.9932	.9852	1.0079	.9801	1.0132
2.10	.9991	.9898	.9921	.9856	1.0081	.9785	1.0137
2.15	.9992	.9897	.9909	.9860	1.0083	.9769	1.0142
2.20	.9992	.9897	.9898	.9864	1.0084	.9753	1.0146
2.25	.9991	.9897	.9887	.9868	1.0084	.9737	1.0149
2.30	.9992	.9898	.9876	.9873	1.0083	.9721	1.0152
2.35	.9993	.9898	.9865	.9877	1.0082	.9705	1.0154
2.40	.9993	.9899	.9854	.9882	1.0081	.9689	1.0155
2.45	.9993	.9899	.9843	.9886	1.0079	.9674	1.0156
2.50	.9993	.9900	.9833	.9891	1.0076	.9659	1.0155
2.55	.9994	.9901	.9823	.9895	1.0072	.9645	1.0154
2.60	.9994	.9902	.9814	.9900	1.0068	.9630	1.0152
2.65	.9994	.9903	.9804	.9904	1.0064	.9616	1.0150

LAST POINT AT SATURATION BOUNDARY

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

A. PT1 = 1. ATM DT1 = 1.367 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	.5281	208.27	.867	1.0000	250.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	.5573	211.50	.900	.9999	250.00	1.1196	1.0329	1.0839	.9999	1.0000	.9999
1.10	.9118	.5830	214.30	.930	.9989	250.00	1.2450	1.0650	1.1690	.9989	1.0000	.9989
1.15	.8750	.6052	216.74	.954	.9967	250.00	1.3762	1.0967	1.2549	.9967	1.0000	.9967
1.20	.8421	.6239	218.89	.974	.9928	250.00	1.5133	1.1281	1.3414	.9928	1.0000	.9928
1.25	.8126	.6393	220.78	.989	.9871	250.00	1.6562	1.1595	1.4282	.9871	1.0000	.9871
1.30	.7859	.6513	222.46	1.001	.9794	249.99	1.8050	1.1911	1.5153	.9794	1.0000	.9794
1.35	.7617	.6602	223.95	1.007	.9698	249.99	1.9595	1.2228	1.6023	.9698	1.0000	.9698
1.40	.7396	.6661	225.29	1.010	.9582	249.99	2.1199	1.2549	1.6891	.9582	.9999	.9582
1.45	.7195	.6692	226.49	1.010	.9449	249.98	2.2862	1.2874	1.7755	.9449	.9999	.9449
1.50	.7010	.6696	227.57	1.005	.9299	249.98	2.4582	1.3205	1.8613	.9299	.9999	.9298
1.55	.6840	.6676	228.54	.998	.9133	249.97	2.6361	1.3540	1.9465	.9133	.9999	.9133
1.60	.6684	.6634	229.43	.988	.8953	249.97	2.8198	1.3882	2.0309	.8953	.9999	.8953
1.65	.6539	.6573	230.23	.975	.8761	249.96	3.0094	1.4230	2.1143	.8761	.9998	.8761
1.70	.6405	.6493	230.97	.961	.8558	249.95	3.2047	1.4586	2.1967	.8558	.9998	.8559
1.75	.6280	.6398	231.64	.944	.8347	249.95	3.4059	1.4948	2.2780	.8347	.9998	.8348
1.80	.6164	.6289	232.26	.925	.8128	249.94	3.6130	1.5318	2.3581	.8128	.9998	.8129
1.85	.6056	.6168	232.82	.905	.7904	249.93	3.8258	1.5695	2.4369	.7904	.9997	.7905
1.90	.5956	.6037	233.34	.884	.7675	249.93	4.0445	1.6081	2.5144	.7675	.9997	.7676
1.95	.5861	.5898	233.82	.862	.7444	249.92	4.2691	1.6474	2.5906	.7444	.9997	.7445
2.00	.5773	.5752	234.27	.839	.7211	249.91	4.4994	1.6876	2.6653	.7211	.9996	.7212
2.05	.5690	.5601	234.68	.815	.6977	249.90	4.7356	1.7286	2.7387	.6977	.9996	.6978
2.10	.5612	.5445	235.06	.791	.6744	249.90	4.9777	1.7705	2.8105	.6744	.9996	.6745
2.15	.5539	.5287	235.42	.767	.6513	249.89	5.2255	1.8132	2.8809	.6513	.9996	.6514
2.20	.5470	.5126	235.75	.743	.6283	249.88	5.4792	1.8568	2.9498	.6283	.9995	.6285
2.25	.5405	.4965	236.06	.718	.6057	249.88	5.7388	1.9013	3.0172	.6057	.9995	.6059
2.30	.5344	.4804	236.35	.694	.5835	249.87	6.0041	1.9467	3.0831	.5835	.9995	.5836
2.35	.5286	.4643	236.62	.670	.5617	249.86	6.2753	1.9930	3.1475	.5617	.9994	.5618
2.40	.5231	.4484	236.87	.647	.5404	249.86	6.5524	2.0402	3.2104	.5404	.9994	.5405
2.45	.5179	.4326	237.11	.623	.5195	249.85	6.8353	2.0883	3.2719	.5195	.9994	.5196
2.50	.5130	.4172	237.33	.600	.4992	249.84	7.1240	2.1373	3.3319	.4992	.9994	.4993
2.55	.5083	.4019	237.54	.578	.4795	249.84	7.4185	2.1872	3.3904	.4795	.9993	.4796
2.60	.5039	.3870	237.74	.556	.4603	249.83	7.7189	2.2380	3.4475	.4603	.9993	.4604
2.65	.4997	.3725	237.93	.535	.4418	249.82	8.0251	2.2898	3.5033	.4418	.9993	.4419
2.70	.4957	.3583	238.11	.514	.4238	249.82	8.3372	2.3425	3.5576	.4238	.9993	.4239
2.75	.4918	.3445	238.27	.494	.4064	249.81	8.6550	2.3961	3.6105	.4064	.9993	.4065
2.80	.4882	.3310	238.43	.474	.3897	249.81	8.9788	2.4507	3.6622	.3897	.9992	.3898
2.85	.4847	.3180	238.58	.455	.3735	249.80	9.3083	2.5062	3.7125	.3735	.9992	.3736
2.90	.4814	.3054	238.72	.437	.3579	249.80	9.6437	2.5626	3.7615	.3579	.9992	.3580
2.95	.4783	.2932	238.85	.419	.3429	249.79	9.9850	2.6200	3.8093	.3429	.9992	.3430
3.00	.4752	.2814	238.98	.402	.3285	249.79	10.3320	2.6783	3.8559	.3285	.9992	.3286

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

A. PT1 = 1. ATM DT1 = 1.367 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO	IDEAL DIATOMIC	GAS VALUE	----------	----------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	1.0000	1.0000	1.0000	.9999	1.0000	1.0000	1.0000
1.10	1.0000	1.0000	1.0001	.9999	1.0000	1.0000	1.0000
1.15	1.0000	1.0000	1.0001	.9999	1.0000	1.0000	1.0000
1.20	1.0000	1.0000	1.0001	.9998	1.0000	1.0000	1.0000
1.25	.9999	1.0000	1.0001	.9998	1.0000	1.0000	1.0000
1.30	.9999	1.0000	1.0002	.9997	1.0000	1.0000	1.0000
1.35	.9999	1.0000	1.0002	.9997	1.0000	1.0000	1.0000
1.40	.9999	1.0000	1.0002	.9997	1.0000	.9999	1.0000
1.45	.9999	1.0000	1.0002	.9996	1.0001	.9999	1.0000
1.50	.9999	1.0000	1.0002	.9996	1.0001	.9999	1.0000
1.55	.9999	.9999	1.0002	.9996	1.0001	.9999	1.0001
1.60	.9999	.9999	1.0002	.9996	1.0001	.9999	1.0002
1.65	.9999	.9999	1.0002	.9996	1.0001	.9998	1.0002
1.70	.9999	.9999	1.0002	.9995	1.0001	.9998	1.0002
1.75	.9999	.9999	1.0001	.9995	1.0002	.9998	1.0002
1.80	.9999	.9999	1.0001	.9995	1.0002	.9998	1.0003
1.85	.9999	.9999	1.0001	.9995	1.0002	.9997	1.0003
1.90	.9999	.9999	1.0001	.9995	1.0002	.9997	1.0003
1.95	.9999	.9999	1.0001	.9995	1.0002	.9997	1.0004
2.00	.9999	.9999	1.0001	.9995	1.0003	.9996	1.0004
2.05	.9999	.9999	1.0000	.9995	1.0003	.9996	1.0004
2.10	.9999	.9999	1.0000	.9995	1.0003	.9996	1.0005
2.15	.9999	.9999	1.0000	.9995	1.0003	.9996	1.0005
2.20	.9999	.9999	1.0000	.9995	1.0003	.9995	1.0005
2.25	1.0000	.9999	1.0000	.9995	1.0004	.9995	1.0005
2.30	1.0000	.9999	1.0000	.9995	1.0004	.9995	1.0006
2.35	1.0000	.9999	.9999	.9995	1.0004	.9994	1.0006
2.40	1.0000	.9999	.9999	.9995	1.0004	.9994	1.0006
2.45	1.0000	.9999	.9999	.9996	1.0004	.9994	1.0006
2.50	1.0000	.9999	.9999	.9996	1.0004	.9994	1.0007
2.55	1.0000	.9999	.9999	.9996	1.0004	.9993	1.0007
2.60	1.0000	.9999	.9999	.9996	1.0005	.9993	1.0007
2.65	1.0000	.9999	.9998	.9996	1.0005	.9993	1.0007
2.70	1.0001	.9999	.9998	.9996	1.0005	.9993	1.0007
2.75	1.0001	.9999	.9998	.9996	1.0005	.9993	1.0008
2.80	1.0001	.9999	.9998	.9996	1.0005	.9992	1.0008
2.85	1.0001	.9999	.9998	.9996	1.0005	.9992	1.0008
2.90	1.0001	.9999	.9998	.9996	1.0005	.9992	1.0008
2.95	1.0001	.9999	.9998	.9997	1.0005	.9992	1.0008
3.00	1.0001	.9999	.9998	.9997	1.0005	.9992	1.0008

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

B. PT1 = 3. ATM DT1 = 4.107 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	1.5837	208.16	2.685	3.0000	250.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	1.6711	211.40	2.787	2.9996	250.00	1.1196	1.0329	1.0838	.9999	1.0000	.9999
1.10	.9117	1.7481	214.28	2.794	2.9968	250.00	1.2450	1.0651	1.1687	.9989	1.0000	.9989
1.15	.8749	1.8148	216.65	2.868	2.9901	250.00	1.3762	1.0969	1.2545	.9967	1.0000	.9967
1.20	.8420	1.8711	218.80	2.928	2.9785	249.99	1.5133	1.1284	1.3409	.9928	1.0000	.9928
1.25	.8125	1.9172	220.69	2.974	2.9613	249.99	1.6562	1.1598	1.4276	.9871	1.0000	.9871
1.30	.7858	1.9534	222.37	3.007	2.9383	249.98	1.8049	1.1914	1.5145	.9794	.9999	.9794
1.35	.7615	1.9801	223.86	3.028	2.9094	249.97	1.9594	1.2231	1.6014	.9698	.9999	.9699
1.40	.7395	1.9977	225.19	3.037	2.8749	249.96	2.1196	1.2552	1.6880	.9583	.9998	.9584
1.45	.7194	2.0070	226.39	3.035	2.8350	249.95	2.2858	1.2878	1.7742	.9450	.9998	.9451
1.50	.7009	2.0084	227.46	3.022	2.7899	249.93	2.4577	1.3208	1.8599	.9300	.9997	.9301
1.55	.6840	2.0024	228.43	3.000	2.7403	249.92	2.6354	1.3543	1.9449	.9134	.9997	.9135
1.60	.6684	1.9900	229.31	2.970	2.6865	249.90	2.8190	1.3885	2.0291	.8955	.9996	.8956
1.65	.6539	1.9716	230.10	2.932	2.6289	249.88	3.0085	1.4233	2.1125	.8763	.9995	.8765
1.70	.6405	1.9478	230.83	2.888	2.5683	249.86	3.2037	1.4587	2.1947	.8561	.9995	.8563
1.75	.6280	1.9194	231.49	2.837	2.5049	249.84	3.4049	1.4950	2.2760	.8350	.9994	.8351
1.80	.6164	1.8868	232.10	2.781	2.4393	249.82	3.6118	1.5319	2.3559	.8131	.9993	.8133
1.85	.6056	1.8506	232.65	2.721	2.3720	249.80	3.8245	1.5696	2.4347	.7907	.9992	.7909
1.90	.5955	1.8114	233.16	2.658	2.3035	249.78	4.0431	1.6081	2.5121	.7678	.9991	.7681
1.95	.5861	1.7697	233.63	2.591	2.2341	249.76	4.2675	1.6473	2.5882	.7447	.9990	.7450
2.00	.5773	1.7260	234.06	2.522	2.1642	249.74	4.4978	1.6874	2.6629	.7214	.9990	.7217
2.05	.5690	1.6806	234.46	2.452	2.0942	249.72	4.7338	1.7284	2.7362	.6981	.9989	.6984
2.10	.5613	1.6340	234.84	2.380	2.0243	249.69	4.9758	1.7702	2.8081	.6748	.9988	.6751
2.15	.5539	1.5865	235.18	2.307	1.9549	249.67	5.2235	1.8128	2.8784	.6516	.9987	.6520
2.20	.5470	1.5384	235.50	2.234	1.8862	249.65	5.4771	1.8564	2.9473	.6287	.9986	.6291
2.25	.5405	1.4901	235.80	2.161	1.8184	249.63	5.7366	1.9008	3.0147	.6061	.9985	.6065
2.30	.5344	1.4417	236.07	2.088	1.7516	249.61	6.0018	1.9461	3.0806	.5839	.9984	.5842
2.35	.5286	1.3936	236.33	2.016	1.6862	249.59	6.2729	1.9922	3.1450	.5621	.9984	.5624
2.40	.5231	1.3458	236.57	1.945	1.6222	249.57	6.5499	2.0393	3.2080	.5407	.9983	.5411
2.45	.5179	1.2986	236.80	1.875	1.5596	249.55	6.8327	2.0873	3.2695	.5199	.9982	.5202
2.50	.5130	1.2521	237.01	1.806	1.4987	249.53	7.1213	2.1362	3.3295	.4996	.9981	.4999
2.55	.5083	1.2064	237.21	1.739	1.4395	249.51	7.4157	2.1861	3.3881	.4798	.9980	.4802
2.60	.5039	1.1617	237.40	1.673	1.3819	249.49	7.7160	2.2368	3.4452	.4606	.9980	.4610
2.65	.4997	1.1180	237.58	1.608	1.3262	249.47	8.0221	2.2885	3.5010	.4421	.9979	.4424
2.70	.4956	1.0754	237.74	1.546	1.2722	249.46	8.3341	2.3411	3.5553	.4241	.9978	.4244
2.75	.4918	1.0339	237.90	1.485	1.2201	249.44	8.6519	2.3946	3.6083	.4067	.9978	.4070
2.80	.4882	.9936	238.05	1.427	1.1697	249.42	8.9755	2.4491	3.6600	.3899	.9977	.3902
2.85	.4847	.9546	238.19	1.370	1.1212	249.41	9.3050	2.5045	3.7103	.3737	.9976	.3741
2.90	.4814	.9167	238.32	1.314	1.0744	249.39	9.6403	2.5608	3.7594	.3581	.9976	.3585
2.95	.4782	.8801	238.45	1.261	1.0294	249.38	9.9814	2.6181	3.8072	.3431	.9975	.3435
3.00	.4752	.8447	238.57	1.210	.9861	249.37	10.3284	2.6764	3.8538	.3287	.9975	.3290

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

B. PT1 = 3. ATM DT1 = 4.107 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	1.0000	1.0000	1.0001	.9999	1.0000	1.0000	1.0000
1.10	.9999	1.0000	1.0002	.9997	1.0000	1.0000	1.0000
1.15	.9999	1.0000	1.0003	.9996	1.0000	1.0000	1.0000
1.20	.9998	1.0000	1.0003	.9995	1.0000	1.0000	1.0000
1.25	.9998	.9999	1.0004	.9993	1.0000	1.0000	1.0000
1.30	.9998	.9999	1.0004	.9992	1.0001	.9999	1.0000
1.35	.9997	.9999	1.0004	.9991	1.0001	.9999	1.0001
1.40	.9998	.9998	1.0004	.9990	1.0001	.9998	1.0002
1.45	.9998	.9998	1.0004	.9989	1.0002	.9998	1.0002
1.50	.9998	.9998	1.0004	.9988	1.0002	.9997	1.0003
1.55	.9999	.9997	1.0004	.9988	1.0003	.9997	1.0004
1.60	.9999	.9997	1.0004	.9987	1.0003	.9996	1.0005
1.65	.9999	.9996	1.0003	.9987	1.0004	.9995	1.0005
1.70	.9999	.9996	1.0003	.9986	1.0004	.9995	1.0006
1.75	.9998	.9996	1.0003	.9986	1.0005	.9994	1.0007
1.80	.9998	.9996	1.0002	.9986	1.0005	.9993	1.0008
1.85	.9999	.9996	1.0001	.9986	1.0006	.9992	1.0009
1.90	.9999	.9995	1.0001	.9986	1.0006	.9991	1.0009
1.95	.9999	.9995	1.0000	.9986	1.0007	.9990	1.0010
2.00	.9999	.9995	1.0000	.9986	1.0007	.9990	1.0011
2.05	.9999	.9995	.9999	.9986	1.0008	.9989	1.0012
2.10	.9999	.9995	.9999	.9986	1.0008	.9988	1.0013
2.15	1.0000	.9995	.9998	.9987	1.0009	.9987	1.0014
2.20	1.0000	.9995	.9997	.9987	1.0009	.9986	1.0014
2.25	1.0000	.9995	.9997	.9987	1.0010	.9985	1.0015
2.30	1.0000	.9995	.9996	.9987	1.0010	.9984	1.0016
2.35	1.0000	.9995	.9996	.9988	1.0010	.9984	1.0016
2.40	1.0000	.9995	.9995	.9988	1.0011	.9983	1.0017
2.45	1.0000	.9995	.9995	.9988	1.0011	.9982	1.0018
2.50	1.0000	.9995	.9994	.9989	1.0011	.9981	1.0018
2.55	1.0000	.9995	.9994	.9989	1.0011	.9980	1.0018
2.60	1.0000	.9995	.9993	.9989	1.0011	.9980	1.0019
2.65	1.0000	.9995	.9993	.9989	1.0011	.9979	1.0019
2.70	1.0000	.9995	.9992	.9990	1.0011	.9978	1.0019
2.75	1.0000	.9995	.9992	.9990	1.0011	.9978	1.0020
2.80	1.0000	.9995	.9992	.9990	1.0011	.9977	1.0020
2.85	1.0000	.9995	.9991	.9991	1.0011	.9976	1.0020
2.90	1.0000	.9995	.9991	.9991	1.0011	.9976	1.0020
2.95	1.0000	.9995	.9991	.9991	1.0011	.9975	1.0020
3.00	.9999	.9995	.9990	.9991	1.0011	.9975	1.0020

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

C. PT1 = 5. ATM DT1 = 6.855 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	2.6382	208.06	4.351	5.0002	250.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	2.7839	211.30	4.520	4.9995	250.00	1.1196	1.0330	1.0837	.9999	1.0000	.9999
1.10	.9116	2.9123	214.11	4.666	4.9948	250.00	1.2450	1.0652	1.1685	.9990	1.0000	.9989
1.15	.8748	3.0235	216.56	4.789	4.9837	249.99	1.3762	1.0970	1.2542	.9967	1.0000	.9967
1.20	.8419	3.1173	218.71	4.889	4.9643	249.99	1.5132	1.1286	1.3404	.9929	1.0000	.9928
1.25	.8123	3.1942	220.61	4.966	4.9356	249.98	1.6561	1.1601	1.4270	.9871	.9999	.9871
1.30	.7857	3.2544	222.28	5.022	4.8975	249.97	1.8046	1.1916	1.5136	.9795	.9999	.9795
1.35	.7615	3.2989	223.77	5.056	4.8495	249.95	1.9590	1.2234	1.6003	.9699	.9998	.9700
1.40	.7396	3.3284	225.09	5.071	4.7921	249.94	2.1191	1.2555	1.6868	.9584	.9997	.9585
1.45	.7194	3.3439	226.28	5.067	4.7256	249.91	2.2852	1.2880	1.7729	.9451	.9997	.9452
1.50	.7010	3.3463	227.35	5.047	4.6507	249.89	2.4570	1.3210	1.8584	.9301	.9996	.9303
1.55	.6840	3.3367	228.31	5.010	4.5681	249.87	2.6347	1.3546	1.9433	.9136	.9995	.9138
1.60	.6684	3.3161	229.18	4.960	4.4785	249.84	2.8182	1.3887	2.0274	.8957	.9994	.8959
1.65	.6538	3.2857	229.98	4.897	4.3827	249.81	3.0076	1.4235	2.1106	.8765	.9992	.8768
1.70	.6404	3.2462	230.69	4.823	4.2817	249.78	3.2028	1.4589	2.1928	.8563	.9991	.8566
1.75	.6280	3.1989	231.34	4.739	4.1762	249.74	3.4038	1.4951	2.2739	.8352	.9990	.8356
1.80	.6164	3.1448	231.94	4.646	4.0671	249.71	3.6106	1.5320	2.3538	.8134	.9988	.8138
1.85	.6056	3.0847	232.48	4.546	3.9551	249.67	3.8232	1.5696	2.4325	.7910	.9987	.7914
1.90	.5956	3.0195	232.98	4.440	3.8410	249.64	4.0417	1.6080	2.5098	.7682	.9986	.7686
1.95	.5862	2.9502	233.44	4.329	3.7254	249.60	4.2660	1.6472	2.5859	.7451	.9984	.7455
2.00	.5773	2.8774	233.86	4.214	3.6090	249.57	4.4962	1.6873	2.6606	.7218	.9983	.7223
2.05	.5690	2.8019	234.25	4.096	3.4921	249.53	4.7322	1.7282	2.7338	.6984	.9981	.6989
2.10	.5612	2.7242	234.61	3.976	3.3757	249.49	4.9740	1.7699	2.8056	.6751	.9980	.6757
2.15	.5539	2.6451	234.94	3.855	3.2601	249.46	5.2217	1.8125	2.8760	.6520	.9978	.6526
2.20	.5470	2.5651	235.25	3.733	3.1455	249.42	5.4752	1.8559	2.9448	.6291	.9977	.6297
2.25	.5405	2.4846	235.53	3.611	3.0325	249.39	5.7345	1.9002	3.0122	.6065	.9975	.6071
2.30	.5344	2.4040	235.80	3.490	2.9213	249.35	5.9997	1.9454	3.0781	.5843	.9974	.5848
2.35	.5286	2.3237	236.05	3.369	2.8122	249.32	6.2707	1.9915	3.1426	.5624	.9973	.5630
2.40	.5231	2.2441	236.28	3.250	2.7055	249.28	6.5475	2.0385	3.2056	.5411	.9971	.5417
2.45	.5179	2.1655	236.49	3.133	2.6012	249.25	6.8302	2.0864	3.2671	.5202	.9970	.5208
2.50	.5130	2.0880	236.69	3.018	2.4996	249.22	7.1187	2.1352	3.3271	.4999	.9969	.5005
2.55	.5083	2.0119	236.88	2.906	2.4008	249.19	7.4131	2.1850	3.3857	.4802	.9967	.4808
2.60	.5039	1.9373	237.06	2.796	2.3049	249.16	7.7133	2.2356	3.4429	.4610	.9966	.4616
2.65	.4997	1.8645	237.22	2.688	2.2119	249.13	8.0193	2.2872	3.4987	.4424	.9965	.4430
2.70	.4956	1.7934	237.38	2.584	2.1219	249.10	8.3312	2.3397	3.5531	.4244	.9964	.4250
2.75	.4918	1.7243	237.53	2.483	2.0349	249.07	8.6489	2.3931	3.6061	.4070	.9963	.4076
2.80	.4882	1.6571	237.67	2.384	1.9509	249.04	8.9725	2.4475	3.6578	.3902	.9962	.3908
2.85	.4847	1.5919	237.80	2.289	1.8699	249.02	9.3019	2.5028	3.7082	.3740	.9961	.3745
2.90	.4813	1.5288	237.92	2.197	1.7919	248.99	9.6371	2.5591	3.7574	.3584	.9960	.3589
2.95	.4782	1.4677	238.04	2.108	1.7168	248.97	9.9782	2.6163	3.8052	.3434	.9959	.3439
3.00	.4751	1.4087	238.15	2.022	1.6446	248.95	10.3251	2.6744	3.8518	.3289	.9958	.3295

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

C. PT1 = 5. ATM DT1 = 6.855 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9999	1.0000	1.0002	.9998	1.0000	1.0000	1.0000
1.10	.9999	1.0000	1.0003	.9995	1.0000	1.0000	1.0000
1.15	.9998	1.0000	1.0004	.9993	1.0000	1.0000	1.0000
1.20	.9997	.9999	1.0005	.9991	1.0001	1.0000	1.0000
1.25	.9996	.9999	1.0006	.9989	1.0001	.9999	1.0000
1.30	.9997	.9998	1.0006	.9986	1.0001	.9999	1.0002
1.35	.9997	.9997	1.0006	.9985	1.0002	.9998	1.0002
1.40	.9998	.9996	1.0006	.9983	1.0002	.9997	1.0003
1.45	.9998	.9995	1.0006	.9982	1.0003	.9997	1.0004
1.50	.9998	.9995	1.0006	.9980	1.0004	.9996	1.0005
1.55	.9999	.9994	1.0006	.9979	1.0005	.9995	1.0007
1.60	.9999	.9994	1.0005	.9979	1.0006	.9994	1.0008
1.65	.9998	.9993	1.0005	.9978	1.0006	.9992	1.0009
1.70	.9998	.9993	1.0004	.9978	1.0007	.9991	1.0011
1.75	.9999	.9993	1.0003	.9977	1.0008	.9990	1.0012
1.80	.9999	.9992	1.0002	.9977	1.0009	.9988	1.0014
1.85	.9999	.9992	1.0002	.9977	1.0010	.9987	1.0015
1.90	.9999	.9992	1.0001	.9977	1.0011	.9986	1.0016
1.95	.9999	.9992	1.0000	.9977	1.0012	.9984	1.0018
2.00	1.0000	.9991	.9999	.9977	1.0013	.9983	1.0019
2.05	.9999	.9991	.9998	.9977	1.0013	.9981	1.0020
2.10	.9999	.9991	.9997	.9978	1.0014	.9980	1.0022
2.15	.9999	.9991	.9996	.9978	1.0015	.9978	1.0023
2.20	1.0000	.9991	.9995	.9978	1.0015	.9977	1.0024
2.25	1.0000	.9991	.9994	.9979	1.0016	.9975	1.0025
2.30	1.0000	.9991	.9993	.9979	1.0017	.9974	1.0027
2.35	1.0000	.9991	.9992	.9980	1.0017	.9973	1.0028
2.40	1.0000	.9991	.9991	.9980	1.0018	.9971	1.0029
2.45	1.0000	.9991	.9990	.9981	1.0018	.9970	1.0029
2.50	1.0000	.9991	.9989	.9981	1.0018	.9969	1.0030
2.55	1.0000	.9991	.9989	.9982	1.0018	.9967	1.0031
2.60	1.0000	.9991	.9988	.9982	1.0019	.9966	1.0031
2.65	1.0000	.9991	.9987	.9983	1.0019	.9965	1.0032
2.70	1.0000	.9991	.9986	.9983	1.0019	.9964	1.0032
2.75	1.0000	.9992	.9986	.9984	1.0019	.9963	1.0033
2.80	1.0000	.9992	.9985	.9984	1.0019	.9962	1.0033
2.85	1.0000	.9992	.9984	.9985	1.0018	.9961	1.0033
2.90	.9999	.9992	.9984	.9985	1.0018	.9960	1.0034
2.95	.9999	.9992	.9983	.9986	1.0018	.9959	1.0034
3.00	.9999	.9992	.9983	.9986	1.0018	.9958	1.0034

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

D. PT1 = 8. ATM DT1 = 10.993 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	4.2183	207.90	6.982	8.0007	250.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9530	4.4512	211.15	7.254	7.9996	250.00	1.1196	1.0331	1.0636	.9999	1.0000	.9999
1.10	.9116	4.6568	213.97	7.488	7.9922	250.00	1.2450	1.0654	1.1682	.9990	1.0000	.9989
1.15	.8747	4.8347	216.43	7.685	7.9743	249.99	1.3762	1.0973	1.2536	.9968	1.0000	.9967
1.20	.8418	4.9848	218.58	7.845	7.9433	249.98	1.5131	1.1289	1.3396	.9929	.9999	.9929
1.25	.8124	5.1073	220.46	7.968	7.8978	249.97	1.6557	1.1604	1.4258	.9872	.9999	.9873
1.30	.7857	5.2038	222.13	8.057	7.8369	249.95	1.8041	1.1919	1.5123	.9796	.9998	.9797
1.35	.7616	5.2753	223.62	8.112	7.7604	249.93	1.9584	1.2238	1.5987	.9701	.9997	.9702
1.40	.7395	5.3228	224.94	8.136	7.6688	249.90	2.1184	1.2559	1.6849	.9586	.9996	.9588
1.45	.7194	5.3479	226.13	8.131	7.5627	249.87	2.2843	1.2884	1.7708	.9453	.9995	.9455
1.50	.7010	5.3522	227.19	8.098	7.4432	249.83	2.4561	1.3214	1.8561	.9304	.9993	.9306
1.55	.6840	5.3372	228.14	8.040	7.3113	249.79	2.6336	1.3549	1.9408	.9139	.9992	.9142
1.60	.6683	5.3048	229.00	7.960	7.1681	249.74	2.8170	1.3890	2.0247	.8960	.9990	.8964
1.65	.6538	5.2563	229.78	7.860	7.0154	249.70	3.0062	1.4238	2.1077	.8769	.9988	.8773
1.70	.6405	5.1936	230.48	7.741	6.8541	249.65	3.2012	1.4592	2.1897	.8568	.9986	.8572
1.75	.6280	5.1184	231.12	7.606	6.6857	249.59	3.4020	1.4952	2.2707	.8357	.9984	.8362
1.80	.6165	5.0321	231.70	7.458	6.5113	249.54	3.6087	1.5320	2.3505	.8139	.9982	.8145
1.85	.6056	4.9364	232.23	7.298	6.3322	249.48	3.8213	1.5696	2.4290	.7915	.9979	.7922
1.90	.5955	4.8325	232.72	7.129	6.1498	249.43	4.0396	1.6080	2.5063	.7687	.9977	.7694
1.95	.5861	4.7218	233.16	6.951	5.9651	249.37	4.2637	1.6471	2.5823	.7456	.9975	.7464
2.00	.5773	4.6056	233.56	6.767	5.7789	249.31	4.4937	1.6870	2.6569	.7224	.9973	.7231
2.05	.5690	4.4850	233.93	6.578	5.5923	249.25	4.7295	1.7278	2.7301	.6990	.9970	.6999
2.10	.5613	4.3611	234.27	6.386	5.4061	249.20	4.9712	1.7694	2.8018	.6758	.9968	.6766
2.15	.5539	4.2347	234.59	6.192	5.2209	249.14	5.2187	1.8119	2.8722	.6526	.9966	.6535
2.20	.5470	4.1068	234.88	5.996	5.0377	249.08	5.4721	1.8552	2.9410	.6297	.9963	.6306
2.25	.5405	3.9781	235.15	5.801	4.8569	249.02	5.7312	1.8994	3.0084	.6071	.9961	.6080
2.30	.5344	3.8492	235.39	5.606	4.6789	248.97	5.9962	1.9444	3.0744	.5849	.9959	.5858
2.35	.5286	3.7209	235.62	5.413	4.5043	248.91	6.2671	1.9904	3.1388	.5630	.9957	.5640
2.40	.5231	3.5935	235.83	5.222	4.3334	248.86	6.5438	2.0372	3.2018	.5417	.9954	.5426
2.45	.5179	3.4677	236.03	5.034	4.1665	248.81	6.8263	2.0850	3.2634	.5208	.9952	.5218
2.50	.5130	3.3437	236.22	4.850	4.0038	248.76	7.1147	2.1337	3.3235	.5005	.9950	.5015
2.55	.5083	3.2219	236.39	4.669	3.8456	248.71	7.4090	2.1832	3.3821	.4807	.9948	.4817
2.60	.5039	3.1026	236.55	4.492	3.6920	248.66	7.7090	2.2337	3.4394	.4615	.9946	.4625
2.65	.4997	2.9859	236.70	4.320	3.5430	248.61	8.0149	2.2852	3.4952	.4429	.9944	.4438
2.70	.4956	2.8722	236.85	4.153	3.3989	248.57	8.3267	2.3375	3.5497	.4249	.9943	.4258
2.75	.4918	2.7614	236.98	3.990	3.2595	248.52	8.6443	2.3908	3.6028	.4074	.9941	.4084
2.80	.4881	2.6538	237.10	3.832	3.1250	248.48	8.9677	2.4451	3.6546	.3906	.9939	.3916
2.85	.4847	2.5495	237.22	3.679	2.9952	248.44	9.2970	2.5002	3.7050	.3744	.9938	.3753
2.90	.4814	2.4484	237.33	3.531	2.8703	248.40	9.6322	2.5563	3.7543	.3588	.9936	.3597
2.95	.4782	2.3506	237.43	3.388	2.7501	248.36	9.9732	2.6133	3.8023	.3438	.9934	.3446
3.00	.4752	2.2561	237.53	3.250	2.6344	248.32	10.3200	2.6713	3.8490	.3293	.9933	.3302

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

D. PT1 = 8. ATM DT1 = 10.993 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9999	1.0000	1.0002	.9996	1.0001	1.0000	1.0000
1.10	.9998	1.0000	1.0005	.9992	1.0001	1.0000	1.0000
1.15	.9996	.9999	1.0006	.9989	1.0001	1.0000	1.0000
1.20	.9996	.9998	1.0008	.9985	1.0001	.9999	1.0001
1.25	.9997	.9996	1.0008	.9981	1.0002	.9999	1.0002
1.30	.9997	.9995	1.0009	.9977	1.0002	.9998	1.0003
1.35	.9997	.9994	1.0009	.9975	1.0003	.9997	1.0004
1.40	.9998	.9993	1.0009	.9972	1.0004	.9996	1.0006
1.45	.9998	.9992	1.0009	.9970	1.0005	.9995	1.0007
1.50	.9998	.9991	1.0009	.9968	1.0007	.9993	1.0009
1.55	.9999	.9990	1.0008	.9967	1.0008	.9992	1.0011
1.60	.9998	.9989	1.0008	.9965	1.0009	.9990	1.0013
1.65	.9998	.9989	1.0007	.9964	1.0011	.9988	1.0015
1.70	.9999	.9988	1.0006	.9964	1.0012	.9986	1.0018
1.75	.9999	.9988	1.0004	.9963	1.0014	.9984	1.0020
1.80	.9999	.9987	1.0003	.9963	1.0015	.9982	1.0022
1.85	.9998	.9987	1.0002	.9963	1.0016	.9979	1.0024
1.90	.9999	.9987	1.0000	.9963	1.0018	.9977	1.0027
1.95	.9999	.9986	.9999	.9963	1.0019	.9975	1.0029
2.00	.9999	.9986	.9997	.9963	1.0021	.9973	1.0031
2.05	1.0000	.9986	.9996	.9964	1.0022	.9970	1.0034
2.10	1.0000	.9986	.9994	.9964	1.0023	.9968	1.0036
2.15	.9999	.9986	.9993	.9965	1.0024	.9966	1.0037
2.20	.9999	.9986	.9991	.9965	1.0025	.9963	1.0039
2.25	1.0000	.9985	.9989	.9966	1.0026	.9961	1.0041
2.30	1.0000	.9985	.9988	.9967	1.0027	.9959	1.0043
2.35	1.0000	.9985	.9986	.9968	1.0028	.9957	1.0045
2.40	1.0000	.9985	.9985	.9969	1.0028	.9954	1.0046
2.45	1.0000	.9986	.9983	.9970	1.0029	.9952	1.0048
2.50	1.0000	.9986	.9982	.9970	1.0029	.9950	1.0049
2.55	1.0000	.9986	.9981	.9971	1.0030	.9948	1.0050
2.60	1.0000	.9986	.9979	.9972	1.0030	.9946	1.0051
2.65	1.0000	.9986	.9978	.9973	1.0030	.9944	1.0052
2.70	1.0000	.9986	.9977	.9974	1.0030	.9943	1.0053
2.75	1.0000	.9986	.9976	.9975	1.0030	.9941	1.0053
2.80	.9999	.9986	.9975	.9975	1.0030	.9939	1.0054
2.85	.9999	.9986	.9974	.9976	1.0029	.9938	1.0054
2.90	1.0000	.9987	.9973	.9977	1.0030	.9936	1.0055
2.95	1.0001	.9987	.9972	.9978	1.0029	.9934	1.0055
3.00	1.0001	.9987	.9971	.9979	1.0029	.9933	1.0055

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

E. PT1 = 10. ATM DT1 = 13.762 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	5.2704	207.80	8.745	10.0014	250.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0001
1.05	.9530	5.5615	211.05	9.085	10.0000	250.00	1.1196	1.0331	1.0834	1.0000	1.0000	1.0000
1.10	.9115	5.8185	213.87	9.378	9.9907	250.00	1.2449	1.0655	1.1679	.9991	1.0000	.9991
1.15	.8746	6.0410	216.34	9.625	9.9684	249.99	1.3761	1.0974	1.2532	.9968	1.0000	.9968
1.20	.8418	6.2280	218.48	9.824	9.9299	249.98	1.5128	1.1290	1.3390	.9930	.9999	.9930
1.25	.8123	6.3815	220.37	9.979	9.8731	249.96	1.6554	1.1606	1.4251	.9873	.9998	.9874
1.30	.7857	6.5021	222.04	10.090	9.7971	249.94	1.8037	1.1922	1.5113	.9797	.9998	.9798
1.35	.7616	6.5916	223.52	10.159	9.7017	249.91	1.9579	1.2240	1.5976	.9702	.9996	.9703
1.40	.7395	6.6512	224.85	10.189	9.5874	249.87	2.1179	1.2561	1.6837	.9587	.9995	.9589
1.45	.7194	6.6829	226.02	10.183	9.4551	249.83	2.2837	1.2886	1.7694	.9455	.9993	.9458
1.50	.7009	6.6887	227.08	10.142	9.3058	249.79	2.4554	1.3217	1.8546	.9306	.9992	.9309
1.55	.6840	6.6703	228.03	10.070	9.1412	249.74	2.6329	1.3552	1.9391	.9141	.9989	.9145
1.60	.6683	6.6299	228.88	9.970	8.9628	249.68	2.8161	1.3892	2.0229	.8963	.9987	.8967
1.65	.6539	6.5698	229.65	9.845	8.7721	249.62	3.0052	1.4239	2.1057	.8772	.9985	.8777
1.70	.6404	6.4919	230.35	9.697	8.5705	249.56	3.2002	1.4593	2.1877	.8571	.9982	.8576
1.75	.6280	6.3982	230.98	9.529	8.3602	249.50	3.4009	1.4953	2.2685	.8360	.9980	.8367
1.80	.6164	6.2907	231.55	9.343	8.1426	249.43	3.6075	1.5321	2.3482	.8143	.9977	.8150
1.85	.6057	6.1713	232.07	9.144	7.9191	249.36	3.8198	1.5696	2.4267	.7919	.9974	.7927
1.90	.5956	6.0417	232.54	8.932	7.6913	249.29	4.0381	1.6079	2.5039	.7691	.9972	.7700
1.95	.5861	5.9037	232.97	8.710	7.4602	249.22	4.2622	1.6470	2.5798	.7460	.9969	.7470
2.00	.5773	5.7587	233.36	8.479	7.2277	249.15	4.4920	1.6868	2.6544	.7228	.9966	.7238
2.05	.5690	5.6082	233.72	8.243	6.9946	249.07	4.7277	1.7275	2.7276	.6995	.9963	.7005
2.10	.5613	5.4534	234.05	8.003	6.7619	249.00	4.9693	1.7690	2.7993	.6762	.9960	.6773
2.15	.5539	5.2956	234.35	7.760	6.5306	248.93	5.2167	1.8114	2.8696	.6531	.9957	.6542
2.20	.5470	5.1358	234.64	7.515	6.3013	248.86	5.4700	1.8547	2.9385	.6301	.9954	.6313
2.25	.5405	4.9750	234.89	7.270	6.0753	248.79	5.7290	1.8988	3.0059	.6075	.9952	.6087
2.30	.5344	4.8140	235.13	7.027	5.8529	248.72	5.9939	1.9437	3.0718	.5853	.9949	.5865
2.35	.5286	4.6537	235.34	6.785	5.6346	248.65	6.2647	1.9896	3.1363	.5635	.9946	.5647
2.40	.5231	4.4945	235.54	6.546	5.4208	248.58	6.5413	2.0364	3.1993	.5421	.9943	.5433
2.45	.5179	4.3372	235.73	6.311	5.2121	248.52	6.8237	2.0840	3.2609	.5212	.9941	.5224
2.50	.5130	4.1822	235.91	6.080	5.0087	248.45	7.1120	2.1326	3.3210	.5009	.9938	.5021
2.55	.5083	4.0299	236.07	5.853	4.8108	248.39	7.4062	2.1821	3.3797	.4811	.9936	.4823
2.60	.5039	3.8807	236.22	5.632	4.6186	248.33	7.7062	2.2325	3.4370	.4619	.9933	.4631
2.65	.4997	3.7348	236.36	5.416	4.4323	248.27	8.0120	2.2838	3.4929	.4432	.9931	.4445
2.70	.4956	3.5926	236.49	5.206	4.2519	248.22	8.3236	2.3361	3.5474	.4252	.9929	.4264
2.75	.4918	3.4541	236.61	5.002	4.0776	248.16	8.6412	2.3893	3.6005	.4078	.9926	.4090
2.80	.4881	3.3195	236.73	4.804	3.9092	248.11	8.9645	2.4434	3.6524	.3909	.9924	.3921
2.85	.4846	3.1890	236.84	4.612	3.7469	248.06	9.2937	2.4985	3.7029	.3747	.9922	.3758
2.90	.4814	3.0626	236.94	4.427	3.5907	248.01	9.6288	2.5544	3.7522	.3591	.9920	.3602
2.95	.4782	2.9402	237.03	4.248	3.4402	247.96	9.9697	2.6114	3.8002	.3440	.9918	.3451
3.00	.4752	2.8220	237.12	4.075	3.2955	247.91	10.3165	2.6692	3.8470	.3295	.9917	.3306

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

E. PT1 = 10. ATM DT1 = 13.762 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0001
1.05	.9998	1.0000	1.0003	.9995	1.0001	1.0000	1.0001
1.10	.9997	1.0000	1.0006	.9990	1.0001	1.0000	1.0001
1.15	.9995	.9999	1.0008	.9986	1.0001	1.0000	1.0002
1.20	.9996	.9997	1.0009	.9980	1.0002	.9999	1.0002
1.25	.9996	.9995	1.0010	.9976	1.0003	.9998	1.0003
1.30	.9997	.9993	1.0011	.9971	1.0003	.9998	1.0004
1.35	.9997	.9992	1.0011	.9968	1.0004	.9996	1.0006
1.40	.9998	.9990	1.0011	.9965	1.0006	.9995	1.0008
1.45	.9998	.9989	1.0011	.9962	1.0007	.9993	1.0010
1.50	.9998	.9988	1.0011	.9960	1.0009	.9992	1.0012
1.55	.9998	.9987	1.0010	.9958	1.0010	.9989	1.0014
1.60	.9999	.9986	1.0009	.9956	1.0012	.9987	1.0017
1.65	.9999	.9985	1.0008	.9955	1.0014	.9985	1.0020
1.70	.9998	.9985	1.0007	.9954	1.0016	.9982	1.0022
1.75	.9999	.9984	1.0005	.9954	1.0017	.9980	1.0025
1.80	.9999	.9984	1.0003	.9953	1.0019	.9977	1.0028
1.85	.9999	.9983	1.0002	.9953	1.0021	.9974	1.0031
1.90	1.0000	.9983	1.0000	.9953	1.0023	.9972	1.0034
1.95	.9999	.9983	.9998	.9954	1.0025	.9969	1.0037
2.00	.9999	.9982	.9996	.9954	1.0026	.9966	1.0040
2.05	.9999	.9982	.9994	.9955	1.0028	.9963	1.0043
2.10	1.0000	.9982	.9992	.9955	1.0029	.9960	1.0045
2.15	1.0000	.9982	.9990	.9956	1.0031	.9957	1.0048
2.20	.9999	.9982	.9988	.9957	1.0032	.9954	1.0050
2.25	.9999	.9982	.9986	.9958	1.0033	.9952	1.0052
2.30	1.0000	.9982	.9984	.9959	1.0034	.9949	1.0055
2.35	1.0000	.9982	.9982	.9960	1.0035	.9946	1.0057
2.40	1.0000	.9982	.9981	.9961	1.0036	.9943	1.0059
2.45	1.0000	.9982	.9979	.9962	1.0037	.9941	1.0060
2.50	1.0000	.9982	.9977	.9963	1.0037	.9938	1.0062
2.55	1.0000	.9982	.9975	.9964	1.0038	.9936	1.0063
2.60	1.0000	.9982	.9974	.9965	1.0038	.9933	1.0065
2.65	1.0000	.9982	.9972	.9966	1.0038	.9931	1.0066
2.70	1.0000	.9982	.9971	.9967	1.0038	.9929	1.0066
2.75	1.0000	.9983	.9970	.9968	1.0038	.9926	1.0067
2.80	.9999	.9983	.9968	.9969	1.0037	.9924	1.0068
2.85	.9999	.9983	.9967	.9970	1.0037	.9922	1.0068
2.90	1.0001	.9983	.9966	.9972	1.0037	.9920	1.0069
2.95	1.0001	.9983	.9965	.9973	1.0037	.9918	1.0070
3.00	1.0001	.9984	.9964	.9974	1.0037	.9917	1.0070

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

F. PT1 = 20. ATM DT1 = 27.721 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	10.5105	207.29	17.657	20.0004	250.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9528	11.0923	210.57	18.340	19.9974	250.00	1.1196	1.0334	1.0828	.9999	1.0000	.9999
1.10	.9112	11.6063	213.42	18.929	19.9787	249.99	1.2449	1.0661	1.1667	.9989	1.0000	.9989
1.15	.8746	12.0471	215.87	19.420	19.9349	249.98	1.3754	1.0981	1.2509	.9967	.9999	.9967
1.20	.8418	12.4204	218.02	19.819	19.8590	249.96	1.5118	1.1298	1.3358	.9930	.9998	.9930
1.25	.8123	12.7279	219.91	20.129	19.7468	249.93	1.6540	1.1615	1.4210	.9873	.9997	.9875
1.30	.7857	12.9707	221.58	20.353	19.5966	249.88	1.8020	1.1932	1.5064	.9798	.9995	.9800
1.35	.7616	13.1514	223.06	20.494	19.4081	249.83	1.9557	1.2251	1.5918	.9704	.9993	.9707
1.40	.7395	13.2736	224.37	20.557	19.1819	249.76	2.1154	1.2573	1.6770	.9591	.9990	.9595
1.45	.7194	13.3400	225.53	20.547	18.9202	249.68	2.2807	1.2898	1.7619	.9460	.9987	.9465
1.50	.7009	13.3550	226.56	20.469	18.6247	249.59	2.4519	1.3227	1.8463	.9312	.9984	.9320
1.55	.6840	13.3218	227.48	20.328	18.2987	249.50	2.6289	1.3561	1.9301	.9149	.9980	.9159
1.60	.6683	13.2453	228.30	20.131	17.9446	249.39	2.8117	1.3901	2.0132	.8972	.9976	.8983
1.65	.6538	13.1289	229.04	19.883	17.5663	249.28	3.0003	1.4247	2.0955	.8783	.9971	.8796
1.70	.6405	12.9769	229.69	19.589	17.1667	249.16	3.1947	1.4598	2.1768	.8583	.9966	.8598
1.75	.6280	12.7936	230.28	19.255	16.7485	249.03	3.3949	1.4957	2.2572	.8374	.9961	.8390
1.80	.6164	12.5824	230.80	18.887	16.3159	248.90	3.6009	1.5322	2.3364	.8158	.9956	.8175
1.85	.6056	12.3471	231.27	18.488	15.8714	248.77	3.8128	1.5694	2.4145	.7936	.9951	.7955
1.90	.5955	12.0914	231.70	18.065	15.4173	248.63	4.0305	1.6074	2.4915	.7709	.9945	.7729
1.95	.5861	11.8183	232.07	17.621	14.9575	248.49	4.2540	1.6462	2.5671	.7479	.9940	.7501
2.00	.5773	11.5310	232.41	17.161	14.4939	248.35	4.4833	1.6857	2.6414	.7247	.9934	.7270
2.05	.5690	11.2323	232.71	16.688	14.0288	248.21	4.7185	1.7260	2.7144	.7014	.9928	.7039
2.10	.5612	10.9250	232.99	16.205	13.5639	248.07	4.9595	1.7672	2.7861	.6782	.9923	.6807
2.15	.5539	10.6111	233.23	15.717	13.1020	247.93	5.2064	1.8091	2.8563	.6551	.9917	.6577
2.20	.5470	10.2929	233.45	15.225	12.6441	247.79	5.4590	1.8519	2.9251	.6322	.9911	.6349
2.25	.5405	9.9725	233.65	14.733	12.1920	247.65	5.7175	1.8956	2.9926	.6096	.9906	.6123
2.30	.5344	9.6515	233.83	14.242	11.7468	247.51	5.9819	1.9401	3.0586	.5873	.9900	.5901
2.35	.5286	9.3314	233.99	13.755	11.3094	247.37	6.2522	1.9855	3.1231	.5655	.9895	.5683
2.40	.5231	9.0135	234.14	13.273	10.8814	247.24	6.5283	2.0318	3.1863	.5441	.9890	.5469
2.45	.5179	8.6992	234.27	12.799	10.4634	247.11	6.8103	2.0790	3.2480	.5232	.9884	.5260
2.50	.5130	8.3892	234.39	12.332	10.0556	246.98	7.0981	2.1271	3.3084	.5028	.9879	.5056
2.55	.5083	8.0845	234.50	11.874	9.6587	246.86	7.3918	2.1760	3.3673	.4829	.9874	.4857
2.60	.5039	7.7857	234.59	11.427	9.2731	246.74	7.6913	2.2260	3.4248	.4637	.9870	.4664
2.65	.4996	7.4935	234.68	10.990	8.8992	246.62	7.9967	2.2768	3.4809	.4450	.9865	.4477
2.70	.4956	7.2084	234.76	10.565	8.5373	246.51	8.3080	2.3285	3.5357	.4269	.9860	.4296
2.75	.4918	6.9308	234.84	10.152	8.1873	246.40	8.6251	2.3812	3.5891	.4094	.9856	.4121
2.80	.4882	6.6609	234.91	9.751	7.8493	246.29	8.9480	2.4348	3.6412	.3925	.9852	.3951
2.85	.4847	6.3991	234.97	9.362	7.5232	246.19	9.2769	2.4893	3.6920	.3762	.9847	.3788
2.90	.4814	6.1452	235.02	8.986	7.2090	246.09	9.6114	2.5448	3.7416	.3604	.9843	.3630
2.95	.4783	5.8997	235.08	8.623	6.9065	245.99	9.9519	2.6012	3.7899	.3453	.9840	.3478
3.00	.4752	5.6624	235.13	8.272	6.6156	245.90	10.2984	2.6585	3.8370	.3308	.9836	.3332

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

F. PT1 = 20. ATM DT1 = 27.721 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9997	1.0000	1.0006	.9990	1.0000	1.0000	1.0000
1.10	.9993	.9999	1.0011	.9979	1.0000	1.0000	1.0000
1.15	.9995	.9994	1.0014	.9967	1.0001	.9999	1.0000
1.20	.9996	.9990	1.0016	.9956	1.0002	.9998	1.0002
1.25	.9996	.9986	1.0018	.9947	1.0003	.9997	1.0004
1.30	.9997	.9983	1.0019	.9939	1.0005	.9995	1.0007
1.35	.9997	.9980	1.0020	.9931	1.0007	.9993	1.0010
1.40	.9997	.9978	1.0020	.9925	1.0009	.9990	1.0014
1.45	.9998	.9976	1.0020	.9920	1.0012	.9987	1.0018
1.50	.9998	.9974	1.0019	.9915	1.0016	.9984	1.0024
1.55	.9998	.9972	1.0017	.9912	1.0019	.9980	1.0029
1.60	.9998	.9971	1.0016	.9909	1.0023	.9976	1.0035
1.65	.9998	.9969	1.0013	.9907	1.0027	.9971	1.0041
1.70	.9999	.9968	1.0010	.9905	1.0031	.9966	1.0047
1.75	.9998	.9967	1.0007	.9904	1.0034	.9961	1.0053
1.80	.9999	.9966	1.0004	.9903	1.0038	.9956	1.0060
1.85	.9999	.9965	1.0001	.9903	1.0042	.9951	1.0066
1.90	.9998	.9964	.9997	.9904	1.0046	.9945	1.0072
1.95	.9999	.9963	.9993	.9904	1.0049	.9940	1.0079
2.00	.9999	.9963	.9989	.9905	1.0053	.9934	1.0085
2.05	.9999	.9962	.9985	.9907	1.0056	.9928	1.0091
2.10	.9999	.9962	.9981	.9908	1.0059	.9923	1.0096
2.15	.9999	.9962	.9977	.9910	1.0062	.9917	1.0102
2.20	.9999	.9962	.9973	.9912	1.0065	.9911	1.0107
2.25	1.0000	.9962	.9969	.9914	1.0067	.9906	1.0112
2.30	1.0000	.9962	.9966	.9916	1.0069	.9900	1.0116
2.35	.9999	.9962	.9962	.9918	1.0071	.9895	1.0120
2.40	1.0000	.9962	.9958	.9920	1.0073	.9890	1.0124
2.45	1.0000	.9962	.9955	.9923	1.0074	.9884	1.0128
2.50	1.0000	.9962	.9951	.9925	1.0075	.9879	1.0132
2.55	1.0000	.9963	.9948	.9927	1.0076	.9874	1.0135
2.60	1.0000	.9963	.9945	.9930	1.0077	.9870	1.0137
2.65	1.0000	.9963	.9942	.9932	1.0077	.9865	1.0140
2.70	1.0000	.9964	.9939	.9934	1.0077	.9860	1.0142
2.75	1.0000	.9964	.9936	.9937	1.0077	.9856	1.0144
2.80	1.0000	.9964	.9933	.9939	1.0077	.9852	1.0145
2.85	1.0001	.9965	.9931	.9941	1.0077	.9847	1.0146
2.90	1.0001	.9965	.9928	.9943	1.0076	.9843	1.0147
2.95	1.0001	.9966	.9926	.9946	1.0075	.9840	1.0148
3.00	1.0001	.9966	.9924	.9948	1.0074	.9836	1.0148

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

G. PT1 = 30. ATM DT1 = 41.851 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	15.7180	206.80	26.732	30.0019	250.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9526	16.5901	210.11	27.759	29.9972	250.00	1.1195	1.0337	1.0822	.9999	1.0000	.9999
1.10	.9111	17.3556	212.96	28.640	29.9697	249.99	1.2444	1.0664	1.1650	.9990	1.0000	.9989
1.15	.8746	18.0143	215.42	29.376	29.9054	249.97	1.3746	1.0986	1.2483	.9968	.9999	.9969
1.20	.8418	18.5749	217.58	29.977	29.7929	249.94	1.5106	1.1305	1.3323	.9931	.9998	.9932
1.25	.8123	19.0370	219.47	30.445	29.6273	249.89	1.6524	1.1622	1.4165	.9876	.9996	.9878
1.30	.7857	19.4041	221.14	30.784	29.4049	249.83	1.8001	1.1940	1.5010	.9802	.9993	.9805
1.35	.7615	19.6792	222.61	30.999	29.1259	249.75	1.9534	1.2260	1.5855	.9709	.9990	.9714
1.40	.7395	19.8662	223.90	31.098	28.7913	249.66	2.1125	1.2582	1.6698	.9597	.9986	.9605
1.45	.7193	19.9715	225.05	31.088	28.4030	249.55	2.2775	1.2907	1.7538	.9468	.9982	.9477
1.50	.7008	19.9998	226.07	30.976	27.9646	249.42	2.4482	1.3236	1.8374	.9322	.9977	.9334
1.55	.6839	19.9563	226.96	30.771	27.4808	249.28	2.6246	1.3569	1.9204	.9160	.9971	.9175
1.60	.6682	19.8481	227.76	30.481	26.9548	249.13	2.8070	1.3908	2.0028	.8985	.9965	.9003
1.65	.6538	19.6801	228.46	30.114	26.3925	248.97	2.9950	1.4251	2.0844	.8797	.9959	.8818
1.70	.6403	19.4593	229.08	29.679	25.7973	248.80	3.1889	1.4601	2.1652	.8599	.9952	.8622
1.75	.6279	19.1905	229.62	29.183	25.1754	248.61	3.3885	1.4958	2.2450	.8392	.9945	.8418
1.80	.6164	18.8799	230.10	28.634	24.5307	248.43	3.5940	1.5320	2.3238	.8177	.9937	.8206
1.85	.6055	18.5332	230.53	28.040	23.8671	248.23	3.8053	1.5690	2.4015	.7956	.9929	.7987
1.90	.5955	18.1549	230.90	27.407	23.1903	248.03	4.0224	1.6067	2.4781	.7730	.9921	.7764
1.95	.5861	17.7503	231.23	26.743	22.5034	247.83	4.2453	1.6451	2.5534	.7501	.9913	.7537
2.00	.5772	17.3241	231.52	26.053	21.8097	247.62	4.4742	1.6843	2.6276	.7270	.9905	.7308
2.05	.5690	16.8801	231.77	25.343	21.1140	247.42	4.7088	1.7242	2.7004	.7038	.9897	.7078
2.10	.5612	16.4224	231.99	24.618	20.4186	247.21	4.9492	1.7649	2.7720	.6806	.9888	.6847
2.15	.5538	15.9547	232.18	23.884	19.7257	247.00	5.1955	1.8065	2.8422	.6575	.9880	.6618
2.20	.5470	15.4799	232.35	23.143	19.0396	246.79	5.4477	1.8489	2.9110	.6347	.9872	.6390
2.25	.5405	15.0012	232.49	22.401	18.3615	246.59	5.7056	1.8921	2.9785	.6121	.9863	.6165
2.30	.5344	14.5211	232.61	21.661	17.6933	246.38	5.9695	1.9361	3.0446	.5898	.9855	.5943
2.35	.5286	14.0419	232.72	20.925	17.0369	246.18	6.2392	1.9811	3.1093	.5679	.9847	.5725
2.40	.5231	13.5657	232.81	20.196	16.3936	245.98	6.5148	2.0269	3.1726	.5465	.9839	.5511
2.45	.5179	13.0943	232.89	19.478	15.7645	245.79	6.7962	2.0736	3.2345	.5255	.9832	.5301
2.50	.5130	12.6291	232.95	18.771	15.1511	245.60	7.0835	2.1211	3.2950	.5050	.9824	.5096
2.55	.5083	12.1716	233.01	18.077	14.5539	245.42	7.3767	2.1696	3.3542	.4851	.9817	.4897
2.60	.5038	11.7228	233.05	17.399	13.9734	245.23	7.6758	2.2190	3.4119	.4658	.9809	.4703
2.65	.4996	11.2836	233.09	16.736	13.4105	245.06	7.9807	2.2693	3.4683	.4470	.9802	.4515
2.70	.4956	10.8549	233.12	16.090	12.8651	244.89	8.2915	2.3205	3.5234	.4288	.9795	.4333
2.75	.4918	10.4372	233.14	15.463	12.3376	244.72	8.6082	2.3726	3.5771	.4113	.9789	.4157
2.80	.4882	10.0311	233.16	14.853	11.8281	244.56	8.9307	2.4257	3.6295	.3943	.9782	.3986
2.85	.4847	9.6368	233.18	14.262	11.3365	244.40	9.2591	2.4797	3.6807	.3779	.9776	.3821
2.90	.4814	9.2546	233.19	13.690	10.8627	244.25	9.5934	2.5346	3.7306	.3621	.9770	.3663
2.95	.4783	8.8846	233.20	13.137	10.4065	244.11	9.9336	2.5905	3.7792	.3469	.9764	.3510
3.00	.4752	8.5269	233.21	12.603	9.9669	243.97	10.2796	2.6474	3.8265	.3322	.9759	.3362

TABLE X. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 250 K

G. PT1 = 30. ATM DT1 = 41.851 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9995	1.0000	1.0008	.9983	1.0001	1.0000	1.0000
1.10	.9993	.9995	1.0014	.9965	1.0001	1.0000	1.0000
1.15	.9995	.9988	1.0018	.9946	1.0002	.9999	1.0002
1.20	.9995	.9982	1.0022	.9930	1.0003	.9998	1.0004
1.25	.9996	.9977	1.0025	.9916	1.0005	.9996	1.0007
1.30	.9996	.9973	1.0027	.9903	1.0008	.9993	1.0011
1.35	.9996	.9969	1.0028	.9892	1.0012	.9990	1.0017
1.40	.9997	.9965	1.0028	.9882	1.0016	.9986	1.0024
1.45	.9997	.9962	1.0027	.9874	1.0020	.9982	1.0031
1.50	.9997	.9959	1.0025	.9867	1.0025	.9977	1.0039
1.55	.9997	.9956	1.0023	.9862	1.0031	.9971	1.0047
1.60	.9997	.9954	1.0020	.9857	1.0037	.9965	1.0057
1.65	.9997	.9951	1.0016	.9854	1.0043	.9959	1.0066
1.70	.9997	.9950	1.0012	.9852	1.0049	.9952	1.0076
1.75	.9997	.9948	1.0008	.9850	1.0055	.9945	1.0087
1.80	.9998	.9946	1.0003	.9850	1.0062	.9937	1.0097
1.85	.9997	.9945	.9998	.9850	1.0068	.9929	1.0107
1.90	.9998	.9944	.9992	.9850	1.0074	.9921	1.0117
1.95	.9998	.9943	.9986	.9852	1.0080	.9913	1.0128
2.00	.9998	.9943	.9981	.9853	1.0085	.9905	1.0137
2.05	.9998	.9942	.9975	.9856	1.0090	.9897	1.0147
2.10	.9998	.9941	.9969	.9858	1.0095	.9888	1.0156
2.15	.9998	.9941	.9963	.9861	1.0099	.9880	1.0165
2.20	.9998	.9941	.9957	.9864	1.0104	.9872	1.0173
2.25	.9999	.9941	.9951	.9867	1.0108	.9863	1.0181
2.30	.9999	.9941	.9945	.9871	1.0111	.9855	1.0189
2.35	.9999	.9941	.9940	.9874	1.0114	.9847	1.0196
2.40	.9999	.9941	.9934	.9878	1.0117	.9839	1.0202
2.45	.9999	.9941	.9929	.9881	1.0119	.9832	1.0208
2.50	.9999	.9942	.9923	.9885	1.0121	.9824	1.0213
2.55	1.0000	.9942	.9918	.9889	1.0122	.9817	1.0218
2.60	.9999	.9943	.9914	.9893	1.0123	.9809	1.0222
2.65	1.0000	.9943	.9909	.9896	1.0124	.9802	1.0226
2.70	1.0000	.9944	.9904	.9900	1.0124	.9795	1.0229
2.75	1.0000	.9944	.9900	.9904	1.0124	.9789	1.0232
2.80	1.0000	.9945	.9896	.9907	1.0123	.9782	1.0235
2.85	1.0000	.9946	.9892	.9911	1.0123	.9776	1.0237
2.90	1.0000	.9947	.9889	.9914	1.0122	.9770	1.0238
2.95	1.0001	.9947	.9885	.9918	1.0121	.9764	1.0239
3.00	.9999	.9948	.9882	.9921	1.0118	.9759	1.0240

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

A. PT1 = 1. ATM DT1 = 1.138 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	.5281	249.94	.722	1.0000	300.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	.5573	253.82	.750	.9999	300.00	1.1196	1.0329	1.0839	.9999	1.0000	.9999
1.10	.9118	.5829	257.18	.774	.9989	300.00	1.2450	1.0650	1.1690	.9989	1.0000	.9989
1.15	.8750	.6052	260.11	.795	.9967	300.00	1.3763	1.0967	1.2549	.9967	1.0000	.9967
1.20	.8422	.6239	262.68	.811	.9928	300.00	1.5133	1.1281	1.3414	.9928	1.0000	.9928
1.25	.8126	.6393	264.95	.824	.9871	300.00	1.6563	1.1595	1.4283	.9871	1.0000	.9871
1.30	.7859	.6513	266.97	.833	.9794	300.00	1.8050	1.1910	1.5153	.9794	1.0000	.9794
1.35	.7617	.6602	268.76	.839	.9698	299.99	1.9596	1.2228	1.6023	.9698	1.0000	.9698
1.40	.7397	.6661	270.36	.841	.9582	299.99	2.1200	1.2549	1.6891	.9582	1.0000	.9582
1.45	.7195	.6691	271.80	.841	.9449	299.99	2.2862	1.2874	1.7755	.9449	1.0000	.9449
1.50	.7011	.6696	273.10	.837	.9299	299.98	2.4583	1.3204	1.8614	.9299	.9999	.9298
1.55	.6841	.6676	274.28	.831	.9133	299.98	2.6362	1.3540	1.9466	.9133	.9999	.9133
1.60	.6684	.6634	275.34	.823	.8953	299.98	2.8199	1.3882	2.0309	.8953	.9999	.8954
1.65	.6539	.6573	276.31	.812	.8761	299.97	3.0095	1.4230	2.1143	.8761	.9999	.8762
1.70	.6405	.6493	277.19	.800	.8559	299.97	3.2049	1.4585	2.1968	.8559	.9999	.8559
1.75	.6281	.6398	278.00	.786	.8347	299.96	3.4061	1.4948	2.2780	.8347	.9999	.8348
1.80	.6165	.6289	278.75	.770	.8128	299.96	3.6132	1.5318	2.3581	.8128	.9999	.8129
1.85	.6057	.6168	279.43	.754	.7904	299.95	3.8261	1.5695	2.4370	.7904	.9998	.7905
1.90	.5956	.6037	280.06	.736	.7675	299.95	4.0448	1.6081	2.5145	.7675	.9998	.7676
1.95	.5862	.5898	280.64	.718	.7444	299.94	4.2694	1.6475	2.5907	.7444	.9998	.7445
2.00	.5773	.5752	281.17	.699	.7211	299.94	4.4998	1.6877	2.6654	.7211	.9998	.7212
2.05	.5690	.5601	281.68	.679	.6977	299.93	4.7360	1.7287	2.7387	.6977	.9998	.6978
2.10	.5612	.5445	282.14	.659	.6744	299.93	4.9781	1.7706	2.8106	.6744	.9998	.6745
2.15	.5540	.5287	282.57	.639	.6513	299.92	5.2259	1.8133	2.8810	.6513	.9997	.6514
2.20	.5471	.5126	282.97	.619	.6284	299.92	5.4796	1.8569	2.9499	.6284	.9997	.6285
2.25	.5406	.4965	283.34	.598	.6058	299.91	5.7392	1.9015	3.0173	.6058	.9997	.6059
2.30	.5344	.4804	283.69	.578	.5835	299.91	6.0046	1.9469	3.0832	.5835	.9997	.5837
2.35	.5286	.4643	284.02	.558	.5617	299.91	6.2758	1.9931	3.1476	.5617	.9997	.5619
2.40	.5231	.4484	284.33	.539	.5404	299.90	6.5529	2.0403	3.2105	.5404	.9997	.5405
2.45	.5179	.4327	284.61	.519	.5196	299.90	6.8358	2.0884	3.2720	.5196	.9997	.5197
2.50	.5130	.4172	284.89	.500	.4993	299.89	7.1245	2.1375	3.3319	.4993	.9996	.4994
2.55	.5083	.4020	285.14	.481	.4795	299.89	7.4190	2.1874	3.3905	.4795	.9996	.4797
2.60	.5039	.3871	285.38	.463	.4604	299.88	7.7194	2.2383	3.4476	.4604	.9996	.4605
2.65	.4997	.3725	285.61	.445	.4418	299.88	8.0257	2.2901	3.5033	.4418	.9996	.4419
2.70	.4957	.3583	285.82	.428	.4238	299.88	8.3377	2.3428	3.5576	.4238	.9996	.4240
2.75	.4918	.3445	286.02	.411	.4065	299.87	8.6556	2.3964	3.6106	.4065	.9996	.4066
2.80	.4882	.3311	286.22	.395	.3897	299.87	8.9794	2.4510	3.6622	.3897	.9996	.3898
2.85	.4847	.3180	286.40	.379	.3735	299.86	9.3089	2.5065	3.7125	.3735	.9995	.3737
2.90	.4814	.3054	286.57	.364	.3580	299.86	9.6443	2.5630	3.7616	.3580	.9995	.3581
2.95	.4783	.2932	286.73	.349	.3430	299.86	9.9856	2.6204	3.8093	.3430	.9995	.3431
3.00	.4752	.2815	286.89	.335	.3286	299.85	10.3327	2.6788	3.8559	.3286	.9995	.3287

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

A. PT1 = 1. ATM DT1 = 1.138 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	1.0000	1.0000	1.0000	.9999	1.0000	1.0000	1.0000
1.10	1.0000	1.0000	1.0000	.9999	1.0000	1.0000	1.0000
1.15	1.0000	1.0000	1.0001	.9999	1.0000	1.0000	1.0000
1.20	1.0000	1.0000	1.0001	.9998	1.0000	1.0000	1.0000
1.25	1.0000	1.0000	1.0001	.9998	1.0000	1.0000	1.0000
1.30	1.0000	1.0000	1.0001	.9997	1.0000	1.0000	1.0000
1.35	1.0000	1.0000	1.0001	.9997	1.0000	1.0000	1.0000
1.40	1.0000	1.0000	1.0001	.9997	1.0001	1.0000	1.0000
1.45	1.0000	1.0000	1.0001	.9997	1.0001	1.0000	1.0000
1.50	1.0000	1.0000	1.0001	.9996	1.0001	.9999	1.0000
1.55	1.0000	1.0000	1.0001	.9996	1.0001	.9999	1.0001
1.60	1.0000	1.0000	1.0001	.9996	1.0001	.9999	1.0002
1.65	1.0000	1.0000	1.0001	.9996	1.0001	.9999	1.0002
1.70	1.0000	1.0000	1.0001	.9996	1.0002	.9999	1.0002
1.75	1.0000	1.0000	1.0001	.9996	1.0002	.9999	1.0003
1.80	1.0000	1.0000	1.0001	.9995	1.0002	.9999	1.0003
1.85	1.0000	1.0000	1.0001	.9995	1.0002	.9998	1.0003
1.90	1.0000	1.0000	1.0001	.9995	1.0002	.9998	1.0004
1.95	1.0000	1.0000	1.0001	.9995	1.0003	.9998	1.0004
2.00	1.0000	.9999	1.0001	.9995	1.0003	.9998	1.0004
2.05	.9999	1.0000	1.0001	.9995	1.0003	.9998	1.0004
2.10	.9999	1.0000	1.0001	.9995	1.0003	.9998	1.0005
2.15	1.0000	.9999	1.0001	.9995	1.0004	.9997	1.0006
2.20	1.0000	.9999	1.0000	.9995	1.0004	.9997	1.0006
2.25	1.0000	.9999	1.0000	.9995	1.0004	.9997	1.0006
2.30	1.0000	.9999	1.0000	.9996	1.0004	.9997	1.0007
2.35	1.0000	.9999	1.0000	.9996	1.0004	.9997	1.0007
2.40	1.0000	.9999	1.0000	.9996	1.0005	.9997	1.0007
2.45	1.0000	.9999	1.0000	.9996	1.0005	.9997	1.0007
2.50	1.0000	.9999	1.0000	.9996	1.0005	.9996	1.0008
2.55	1.0001	.9999	1.0000	.9996	1.0005	.9996	1.0008
2.60	1.0001	.9999	1.0000	.9996	1.0005	.9996	1.0008
2.65	1.0001	.9999	1.0000	.9996	1.0005	.9996	1.0009
2.70	1.0001	.9999	1.0000	.9996	1.0006	.9996	1.0009
2.75	1.0001	.9999	.9999	.9996	1.0006	.9996	1.0009
2.80	1.0001	.9999	.9999	.9996	1.0006	.9996	1.0009
2.85	1.0001	.9999	.9999	.9996	1.0006	.9995	1.0009
2.90	1.0001	.9999	.9999	.9997	1.0006	.9995	1.0010
2.95	1.0001	.9999	.9999	.9997	1.0006	.9995	1.0010
3.00	1.0001	.9999	.9999	.9997	1.0006	.9995	1.0010

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

B. PT1 = 3. ATM DT1 = 3.416 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	1.5836	249.85	2.167	3.0000	300.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	1.6709	253.73	2.251	2.9996	300.00	1.1196	1.0329	1.0838	.9999	1.0000	.9999
1.10	.9117	1.7480	257.09	2.324	2.9968	300.00	1.2450	1.0651	1.1687	.9989	1.0000	.9989
1.15	.8750	1.8147	260.03	2.385	2.9901	300.00	1.3762	1.0968	1.2545	.9967	1.0000	.9967
1.20	.8421	1.8709	262.60	2.435	2.9785	300.00	1.5133	1.1282	1.3409	.9928	1.0000	.9928
1.25	.8126	1.9170	264.87	2.474	2.9613	299.99	1.6562	1.1597	1.4276	.9871	1.0000	.9871
1.30	.7859	1.9532	266.89	2.501	2.9383	299.99	1.8049	1.1912	1.5145	.9794	1.0000	.9794
1.35	.7617	1.9799	268.68	2.518	2.9094	299.98	1.9595	1.2230	1.6014	.9698	.9999	.9698
1.40	.7396	1.9977	270.28	2.526	2.8749	299.97	2.1198	1.2551	1.6881	.9583	.9999	.9584
1.45	.7194	2.0069	271.72	2.524	2.8349	299.96	2.2860	1.2876	1.7743	.9450	.9999	.9451
1.50	.7010	2.0083	273.02	2.514	2.7899	299.95	2.4580	1.3206	1.8600	.9300	.9998	.9301
1.55	.6840	2.0025	274.19	2.496	2.7402	299.94	2.6359	1.3542	1.9451	.9134	.9998	.9135
1.60	.6684	1.9900	275.24	2.470	2.6864	299.93	2.8195	1.3884	2.0293	.8955	.9998	.8956
1.65	.6539	1.9716	276.21	2.439	2.6289	299.92	3.0090	1.4232	2.1126	.8763	.9997	.8765
1.70	.6405	1.9478	277.09	2.402	2.5682	299.91	3.2043	1.4587	2.1949	.8561	.9997	.8563
1.75	.6280	1.9194	277.89	2.360	2.5049	299.89	3.4055	1.4949	2.2761	.8350	.9996	.8352
1.80	.6165	1.8868	278.62	2.314	2.4394	299.88	3.6124	1.5319	2.3561	.8131	.9996	.8134
1.85	.6057	1.8507	279.30	2.264	2.3721	299.86	3.8253	1.5696	2.4349	.7907	.9995	.7910
1.90	.5956	1.8115	279.92	2.211	2.3036	299.85	4.0439	1.6081	2.5123	.7679	.9995	.7682
1.95	.5862	1.7698	280.49	2.156	2.2342	299.84	4.2684	1.6474	2.5884	.7447	.9995	.7450
2.00	.5773	1.7261	281.02	2.098	2.1643	299.82	4.4987	1.6876	2.6632	.7214	.9994	.7218
2.05	.5691	1.6807	281.51	2.039	2.0943	299.80	4.7348	1.7286	2.7364	.6981	.9993	.6984
2.10	.5613	1.6341	281.97	1.980	2.0245	299.79	4.9768	1.7704	2.8083	.6748	.9993	.6752
2.15	.5539	1.5866	282.39	1.919	1.9550	299.77	5.2247	1.8131	2.8786	.6517	.9992	.6520
2.20	.5470	1.5386	282.79	1.858	1.8863	299.76	5.4783	1.8567	2.9475	.6288	.9992	.6291
2.25	.5405	1.4903	283.15	1.798	1.8185	299.75	5.7378	1.9012	3.0149	.6062	.9992	.6066
2.30	.5344	1.4419	283.49	1.737	1.7518	299.73	6.0031	1.9465	3.0808	.5839	.9991	.5843
2.35	.5286	1.3937	283.81	1.677	1.6864	299.72	6.2743	1.9927	3.1452	.5621	.9991	.5625
2.40	.5231	1.3460	284.11	1.618	1.6224	299.70	6.5513	2.0399	3.2082	.5408	.9990	.5412
2.45	.5179	1.2988	284.39	1.560	1.5599	299.69	6.8341	2.0879	3.2696	.5200	.9990	.5204
2.50	.5130	1.2523	284.66	1.503	1.4990	299.68	7.1227	2.1369	3.3297	.4997	.9989	.5001
2.55	.5084	1.2067	284.90	1.447	1.4397	299.66	7.4172	2.1868	3.3882	.4799	.9989	.4803
2.60	.5039	1.1620	285.14	1.392	1.3823	299.65	7.7176	2.2376	3.4454	.4608	.9988	.4612
2.65	.4997	1.1183	285.36	1.338	1.3265	299.64	8.0238	2.2893	3.5011	.4422	.9988	.4426
2.70	.4957	1.0757	285.56	1.286	1.2726	299.63	8.3358	2.3419	3.5555	.4242	.9988	.4246
2.75	.4919	1.0342	285.76	1.236	1.2205	299.62	8.6536	2.3955	3.6085	.4068	.9987	.4072
2.80	.4883	.9940	285.95	1.187	1.1701	299.61	8.9773	2.4500	3.6602	.3900	.9987	.3904
2.85	.4847	.9549	286.13	1.140	1.1215	299.59	9.3068	2.5056	3.7105	.3738	.9986	.3742
2.90	.4814	.9170	286.29	1.094	1.0748	299.58	9.6421	2.5620	3.7596	.3583	.9986	.3586
2.95	.4782	.8804	286.45	1.050	1.0298	299.57	9.9833	2.6193	3.8074	.3433	.9986	.3436
3.00	.4752	.8451	286.60	1.007	.9865	299.57	10.3303	2.6776	3.8539	.3288	.9986	.3292

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

B. PT1 = 3. ATM DT1 = 3.416 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO IDEAL DIATOMIC GAS VALUE	----------	----------	----------	----------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	1.0000	1.0000	1.0001	.9999	1.0000	1.0000	1.0000
1.10	1.0000	1.0000	1.0001	.9997	1.0000	1.0000	1.0000
1.15	.9999	1.0000	1.0002	.9996	1.0000	1.0000	1.0000
1.20	.9999	1.0000	1.0002	.9995	1.0000	1.0000	1.0000
1.25	.9999	1.0000	1.0003	.9993	1.0000	1.0000	1.0000
1.30	.9999	1.0000	1.0003	.9992	1.0001	1.0000	1.0000
1.35	.9999	.9999	1.0003	.9991	1.0001	.9999	1.0001
1.40	.9998	.9999	1.0003	.9991	1.0001	.9999	1.0002
1.45	.9998	.9999	1.0003	.9990	1.0001	.9999	1.0002
1.50	.9998	.9999	1.0003	.9989	1.0002	.9998	1.0003
1.55	.9998	.9999	1.0003	.9989	1.0002	.9998	1.0004
1.60	.9999	.9998	1.0003	.9988	1.0003	.9998	1.0005
1.65	.9999	.9998	1.0003	.9988	1.0004	.9997	1.0006
1.70	.9999	.9998	1.0002	.9987	1.0004	.9997	1.0007
1.75	.9999	.9998	1.0002	.9987	1.0005	.9996	1.0007
1.80	.9999	.9998	1.0002	.9987	1.0005	.9996	1.0008
1.85	.9999	.9997	1.0002	.9987	1.0006	.9995	1.0009
1.90	1.0000	.9997	1.0001	.9987	1.0007	.9995	1.0010
1.95	1.0000	.9997	1.0001	.9987	1.0007	.9995	1.0011
2.00	1.0000	.9997	1.0001	.9987	1.0008	.9994	1.0012
2.05	1.0000	.9997	1.0000	.9987	1.0008	.9993	1.0013
2.10	1.0000	.9997	1.0000	.9987	1.0009	.9993	1.0014
2.15	.9999	.9997	1.0000	.9987	1.0009	.9992	1.0015
2.20	.9999	.9997	.9999	.9987	1.0010	.9992	1.0016
2.25	.9999	.9997	.9999	.9988	1.0010	.9992	1.0017
2.30	1.0000	.9997	.9998	.9988	1.0011	.9991	1.0018
2.35	1.0000	.9997	.9998	.9988	1.0011	.9991	1.0019
2.40	1.0000	.9997	.9998	.9988	1.0012	.9990	1.0019
2.45	1.0000	.9997	.9997	.9989	1.0012	.9990	1.0020
2.50	1.0001	.9997	.9997	.9989	1.0013	.9989	1.0021
2.55	1.0001	.9997	.9997	.9989	1.0013	.9989	1.0022
2.60	1.0001	.9997	.9996	.9990	1.0014	.9988	1.0022
2.65	1.0001	.9997	.9996	.9990	1.0014	.9988	1.0023
2.70	1.0002	.9997	.9996	.9990	1.0014	.9988	1.0024
2.75	1.0002	.9997	.9996	.9991	1.0015	.9987	1.0024
2.80	1.0002	.9997	.9995	.9991	1.0015	.9987	1.0025
2.85	1.0000	.9997	.9995	.9991	1.0014	.9986	1.0025
2.90	1.0000	.9997	.9995	.9991	1.0015	.9986	1.0025
2.95	1.0000	.9997	.9995	.9991	1.0015	.9986	1.0026
3.00	1.0000	.9997	.9995	.9992	1.0015	.9986	1.0026

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

C. PT1 = 5. ATM DT1 = 5.695 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	2.6381	249.75	3.614	5.0001	300.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	2.7836	253.64	3.754	4.9994	300.00	1.1196	1.0330	1.0837	.9999	1.0000	.9999
1.10	.9117	2.9120	257.00	3.876	4.9947	300.00	1.2450	1.0651	1.1685	.9989	1.0000	.9989
1.15	.8749	3.0231	259.94	3.978	4.9836	300.00	1.3762	1.0969	1.2542	.9967	1.0000	.9967
1.20	.8420	3.1170	262.52	4.061	4.9642	299.99	1.5133	1.1284	1.3404	.9928	1.0000	.9928
1.25	.8125	3.1938	264.79	4.125	4.9356	299.99	1.6562	1.1598	1.4270	.9871	1.0000	.9871
1.30	.7858	3.2543	266.81	4.171	4.8973	299.98	1.8049	1.1914	1.5138	.9795	.9999	.9794
1.35	.7616	3.2989	268.60	4.200	4.8493	299.97	1.9594	1.2232	1.6005	.9699	.9999	.9699
1.40	.7396	3.3284	270.20	4.212	4.7919	299.96	2.1196	1.2553	1.6870	.9584	.9999	.9585
1.45	.7194	3.3439	271.63	4.209	4.7254	299.94	2.2857	1.2878	1.7731	.9451	.9998	.9452
1.50	.7010	3.3463	272.92	4.192	4.6506	299.93	2.4576	1.3208	1.8586	.9301	.9998	.9303
1.55	.6840	3.3367	274.09	4.162	4.5679	299.91	2.6354	1.3544	1.9435	.9136	.9997	.9138
1.60	.6684	3.3161	275.14	4.120	4.4783	299.89	2.8190	1.3885	2.0277	.8957	.9996	.8959
1.65	.6539	3.2856	276.10	4.068	4.3826	299.87	3.0084	1.4233	2.1109	.8765	.9996	.8768
1.70	.6405	3.2461	276.97	4.006	4.2816	299.85	3.2036	1.4588	2.1930	.8563	.9995	.8567
1.75	.6281	3.1989	277.77	3.937	4.1762	299.82	3.4047	1.4950	2.2741	.8352	.9994	.8356
1.80	.6164	3.1448	278.50	3.860	4.0670	299.80	3.6117	1.5319	2.3541	.8134	.9993	.8138
1.85	.6056	3.0847	279.17	3.777	3.9550	299.78	3.8244	1.5696	2.4328	.7910	.9993	.7915
1.90	.5956	3.0196	279.79	3.689	3.8409	299.75	4.0430	1.6081	2.5101	.7682	.9992	.7687
1.95	.5861	2.9503	280.35	3.597	3.7254	299.73	4.2674	1.6474	2.5862	.7451	.9991	.7456
2.00	.5773	2.8775	280.87	3.501	3.6090	299.70	4.4976	1.6875	2.6609	.7218	.9990	.7224
2.05	.5690	2.8020	281.36	3.403	3.4924	299.68	4.7337	1.7285	2.7341	.6985	.9989	.6991
2.10	.5613	2.7245	281.80	3.304	3.3760	299.65	4.9756	1.7702	2.8059	.6752	.9988	.6758
2.15	.5540	2.6454	282.22	3.203	3.2604	299.63	5.2233	1.8129	2.8763	.6521	.9988	.6527
2.20	.5471	2.5654	282.60	3.102	3.1459	299.60	5.4769	1.8564	2.9451	.6292	.9987	.6298
2.25	.5406	2.4849	282.96	3.001	3.0329	299.58	5.7363	1.9008	3.0125	.6066	.9986	.6072
2.30	.5344	2.4044	283.30	2.900	2.9218	299.55	6.0016	1.9461	3.0784	.5844	.9985	.5850
2.35	.5286	2.3242	283.61	2.800	2.8127	299.53	6.2727	1.9923	3.1429	.5625	.9984	.5632
2.40	.5232	2.2446	283.90	2.701	2.7060	299.51	6.5496	2.0394	3.2058	.5412	.9984	.5419
2.45	.5180	2.1660	284.17	2.604	2.6018	299.49	6.8323	2.0874	3.2673	.5204	.9983	.5210
2.50	.5130	2.0886	284.43	2.509	2.5003	299.46	7.1209	2.1363	3.3274	.5001	.9982	.5007
2.55	.5083	2.0125	284.67	2.415	2.4015	299.44	7.4154	2.1861	3.3860	.4803	.9981	.4810
2.60	.5039	1.9380	284.90	2.324	2.3056	299.42	7.7157	2.2368	3.4431	.4611	.9981	.4618
2.65	.4997	1.8651	285.11	2.235	2.2127	299.40	8.0218	2.2885	3.4989	.4425	.9980	.4432
2.70	.4957	1.7941	285.31	2.148	2.1227	299.38	8.3337	2.3411	3.5533	.4245	.9979	.4252
2.75	.4918	1.7250	285.51	2.064	2.0358	299.36	8.6515	2.3947	3.6063	.4072	.9979	.4078
2.80	.4882	1.6578	285.68	1.982	1.9518	299.34	8.9751	2.4491	3.6580	.3904	.9978	.3910
2.85	.4847	1.5927	285.85	1.903	1.8709	299.33	9.3046	2.5045	3.7084	.3742	.9978	.3748
2.90	.4814	1.5296	286.02	1.827	1.7929	299.31	9.6398	2.5609	3.7576	.3586	.9977	.3592
2.95	.4782	1.4686	286.17	1.753	1.7178	299.29	9.9810	2.6182	3.8054	.3436	.9976	.3442
3.00	.4752	1.4096	286.31	1.682	1.6456	299.28	10.3279	2.6764	3.8520	.3291	.9976	.3297

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

C. PT1 = 5. ATM DT1 = 5.695 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	1.0000	1.0000	1.0001	.9998	1.0000	1.0000	1.0000
1.10	.9999	1.0000	1.0002	.9995	1.0000	1.0000	1.0000
1.15	.9999	1.0000	1.0003	.9993	1.0000	1.0000	1.0000
1.20	.9998	1.0000	1.0003	.9991	1.0000	1.0000	1.0000
1.25	.9998	.9999	1.0004	.9989	1.0001	1.0000	1.0000
1.30	.9998	.9999	1.0004	.9987	1.0001	.9999	1.0001
1.35	.9997	.9999	1.0005	.9986	1.0001	.9999	1.0002
1.40	.9998	.9998	1.0005	.9984	1.0002	.9999	1.0003
1.45	.9998	.9998	1.0005	.9983	1.0003	.9998	1.0004
1.50	.9999	.9997	1.0005	.9982	1.0004	.9998	1.0005
1.55	.9999	.9997	1.0004	.9981	1.0004	.9997	1.0007
1.60	.9999	.9996	1.0004	.9980	1.0005	.9996	1.0008
1.65	.9999	.9996	1.0004	.9979	1.0006	.9996	1.0010
1.70	.9999	.9996	1.0003	.9979	1.0007	.9995	1.0011
1.75	.9999	.9996	1.0003	.9978	1.0008	.9994	1.0012
1.80	.9999	.9996	1.0002	.9978	1.0009	.9993	1.0014
1.85	.9999	.9995	1.0002	.9978	1.0010	.9993	1.0015
1.90	.9999	.9995	1.0001	.9978	1.0011	.9992	1.0017
1.95	.9999	.9995	1.0001	.9978	1.0012	.9991	1.0019
2.00	.9999	.9995	1.0000	.9978	1.0013	.9990	1.0020
2.05	1.0000	.9995	1.0000	.9979	1.0014	.9989	1.0022
2.10	1.0000	.9995	.9999	.9979	1.0015	.9988	1.0024
2.15	1.0000	.9995	.9998	.9979	1.0016	.9988	1.0025
2.20	1.0000	.9995	.9998	.9979	1.0016	.9987	1.0027
2.25	1.0000	.9994	.9997	.9980	1.0017	.9986	1.0028
2.30	1.0000	.9994	.9996	.9980	1.0018	.9985	1.0030
2.35	1.0001	.9994	.9996	.9981	1.0019	.9984	1.0031
2.40	1.0001	.9994	.9995	.9981	1.0020	.9984	1.0032
2.45	1.0001	.9994	.9995	.9982	1.0020	.9983	1.0033
2.50	1.0001	.9994	.9994	.9982	1.0021	.9982	1.0034
2.55	1.0001	.9994	.9994	.9983	1.0021	.9981	1.0036
2.60	1.0001	.9995	.9993	.9983	1.0022	.9981	1.0037
2.65	1.0001	.9995	.9993	.9984	1.0022	.9980	1.0037
2.70	1.0001	.9995	.9992	.9984	1.0022	.9979	1.0038
2.75	1.0001	.9995	.9992	.9985	1.0023	.9979	1.0039
2.80	1.0000	.9995	.9992	.9985	1.0023	.9978	1.0040
2.85	1.0000	.9995	.9991	.9985	1.0023	.9978	1.0040
2.90	1.0000	.9995	.9991	.9986	1.0023	.9977	1.0041
2.95	1.0000	.9995	.9991	.9986	1.0024	.9976	1.0042
3.00	1.0000	.9995	.9990	.9987	1.0024	.9976	1.0042

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

0. PT1 = 8. ATM DT1 = 9.116 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	4.2178	249.61	5.788	8.0003	300.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9531	4.4506	253.50	6.013	7.9991	300.00	1.1196	1.0330	1.0836	.9999	1.0000	.9999
1.10	.9116	4.6560	256.87	6.208	7.9918	300.00	1.2450	1.0653	1.1682	.9990	1.0000	.9989
1.15	.8748	4.8338	259.81	6.371	7.9739	299.99	1.3762	1.0970	1.2536	.9967	1.0000	.9967
1.20	.8419	4.9840	262.40	6.504	7.9429	299.99	1.5132	1.1286	1.3397	.9929	1.0000	.9928
1.25	.8124	5.1072	264.67	6.606	7.8973	299.98	1.6561	1.1601	1.4261	.9872	.9999	.9872
1.30	.7858	5.2036	266.68	6.680	7.8364	299.97	1.8046	1.1916	1.5125	.9795	.9999	.9796
1.35	.7616	5.2751	268.47	6.726	7.7598	299.95	1.9590	1.2234	1.5990	.9700	.9998	.9701
1.40	.7396	5.3225	270.07	6.746	7.6683	299.93	2.1191	1.2556	1.6852	.9585	.9998	.9587
1.45	.7194	5.3477	271.50	6.741	7.5622	299.91	2.2852	1.2881	1.7711	.9453	.9997	.9455
1.50	.7010	5.3520	272.78	6.714	7.4426	299.88	2.4570	1.3211	1.8565	.9303	.9996	.9306
1.55	.6840	5.3370	273.95	6.667	7.3107	299.85	2.6347	1.3546	1.9412	.9138	.9995	.9142
1.60	.6684	5.3045	274.99	6.600	7.1677	299.82	2.8182	1.3888	2.0251	.8960	.9994	.8964
1.65	.6539	5.2562	275.95	6.517	7.0148	299.79	3.0076	1.4236	2.1082	.8768	.9993	.8773
1.70	.6405	5.1936	276.81	6.419	6.8536	299.76	3.2027	1.4590	2.1902	.8567	.9992	.8572
1.75	.6280	5.1183	277.60	6.307	6.6852	299.72	3.4037	1.4952	2.2712	.8356	.9991	.8363
1.80	.6165	5.0321	278.32	6.185	6.5110	299.68	3.6105	1.5321	2.3510	.8139	.9989	.8145
1.85	.6057	4.9364	278.98	6.052	6.3321	299.65	3.8231	1.5697	2.4296	.7915	.9988	.7922
1.90	.5956	4.8326	279.58	5.912	6.1498	299.61	4.0416	1.6081	2.5069	.7687	.9987	.7695
1.95	.5862	4.7220	280.14	5.765	5.9651	299.57	4.2659	1.6474	2.5828	.7456	.9986	.7465
2.00	.5774	4.6059	280.65	5.612	5.7791	299.53	4.4961	1.6874	2.6574	.7224	.9984	.7233
2.05	.5690	4.4854	281.13	5.456	5.5925	299.49	4.7321	1.7283	2.7306	.6991	.9983	.7000
2.10	.5613	4.3615	281.56	5.297	5.4064	299.45	4.9739	1.7700	2.8024	.6758	.9982	.6768
2.15	.5539	4.2353	281.96	5.136	5.2215	299.41	5.2215	1.8126	2.8727	.6527	.9980	.6537
2.20	.5471	4.1074	282.34	4.974	5.0384	299.37	5.4750	1.8560	2.9416	.6298	.9979	.6308
2.25	.5406	3.9788	282.68	4.812	4.8577	299.33	5.7343	1.9003	3.0090	.6072	.9978	.6083
2.30	.5344	3.8501	283.01	4.651	4.6799	299.29	5.9994	1.9456	3.0749	.5850	.9976	.5861
2.35	.5286	3.7219	283.31	4.491	4.5055	299.26	6.2704	1.9917	3.1393	.5632	.9975	.5643
2.40	.5232	3.5947	283.59	4.333	4.3347	299.22	6.5473	2.0387	3.2023	.5418	.9974	.5429
2.45	.5180	3.4689	283.85	4.177	4.1679	299.18	6.8299	2.0866	3.2638	.5210	.9973	.5221
2.50	.5130	3.3450	284.10	4.024	4.0054	299.15	7.1184	2.1354	3.3239	.5007	.9972	.5018
2.55	.5084	3.2233	284.33	3.874	3.8473	299.11	7.4128	2.1851	3.3826	.4809	.9970	.4820
2.60	.5039	3.1041	284.54	3.728	3.6937	299.08	7.7130	2.2358	3.4398	.4617	.9969	.4628
2.65	.4997	2.9875	284.75	3.585	3.5449	299.05	8.0190	2.2874	3.4956	.4431	.9968	.4442
2.70	.4957	2.8739	284.94	3.446	3.4009	299.02	8.3308	2.3399	3.5501	.4251	.9967	.4262
2.75	.4918	2.7632	285.12	3.312	3.2616	298.99	8.6485	2.3933	3.6032	.4077	.9966	.4088
2.80	.4882	2.6557	285.29	3.181	3.1271	298.96	8.9721	2.4477	3.6549	.3909	.9965	.3919
2.85	.4847	2.5514	285.45	3.054	2.9974	298.93	9.3014	2.5030	3.7054	.3747	.9964	.3757
2.90	.4814	2.4504	285.61	2.931	2.8725	298.90	9.6366	2.5593	3.7546	.3591	.9963	.3601
2.95	.4782	2.3526	285.75	2.813	2.7522	298.88	9.9777	2.6165	3.8025	.3440	.9963	.3450
3.00	.4752	2.2582	285.88	2.699	2.6368	298.85	10.3247	2.6746	3.8493	.3296	.9962	.3306

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

D. PT1 = 8. ATM DT1 = 9.116 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9999	1.0000	1.0002	.9996	1.0000	1.0000	1.0000
1.10	.9999	1.0000	1.0003	.9992	1.0000	1.0000	1.0000
1.15	.9998	1.0000	1.0004	.9989	1.0001	1.0000	1.0000
1.20	.9997	.9999	1.0005	.9985	1.0001	1.0000	1.0000
1.25	.9997	.9999	1.0006	.9982	1.0001	.9999	1.0002
1.30	.9997	.9998	1.0006	.9979	1.0002	.9999	1.0003
1.35	.9997	.9997	1.0007	.9976	1.0002	.9998	1.0004
1.40	.9998	.9996	1.0007	.9974	1.0004	.9998	1.0005
1.45	.9998	.9995	1.0007	.9972	1.0005	.9997	1.0007
1.50	.9999	.9995	1.0007	.9970	1.0006	.9996	1.0009
1.55	.9999	.9994	1.0006	.9969	1.0007	.9995	1.0011
1.60	.9999	.9994	1.0006	.9968	1.0009	.9994	1.0013
1.65	.9998	.9993	1.0005	.9967	1.0010	.9993	1.0015
1.70	.9999	.9993	1.0005	.9966	1.0011	.9992	1.0018
1.75	.9999	.9993	1.0004	.9965	1.0013	.9991	1.0020
1.80	.9999	.9992	1.0003	.9965	1.0015	.9989	1.0023
1.85	.9999	.9992	1.0002	.9965	1.0016	.9988	1.0025
1.90	1.0000	.9992	1.0001	.9965	1.0018	.9987	1.0028
1.95	1.0000	.9991	1.0000	.9965	1.0019	.9986	1.0031
2.00	1.0000	.9991	.9999	.9965	1.0021	.9984	1.0033
2.05	.9999	.9991	.9999	.9966	1.0022	.9983	1.0036
2.10	1.0000	.9991	.9998	.9966	1.0024	.9982	1.0038
2.15	1.0000	.9991	.9997	.9967	1.0025	.9980	1.0041
2.20	1.0000	.9991	.9996	.9967	1.0027	.9979	1.0043
2.25	1.0000	.9991	.9995	.9968	1.0028	.9978	1.0045
2.30	1.0000	.9991	.9994	.9969	1.0029	.9976	1.0048
2.35	1.0001	.9991	.9993	.9969	1.0030	.9975	1.0050
2.40	1.0001	.9991	.9992	.9970	1.0031	.9974	1.0052
2.45	1.0001	.9991	.9991	.9971	1.0032	.9973	1.0054
2.50	1.0001	.9991	.9990	.9972	1.0033	.9972	1.0055
2.55	1.0001	.9991	.9989	.9973	1.0034	.9970	1.0057
2.60	1.0001	.9991	.9989	.9973	1.0035	.9969	1.0059
2.65	1.0001	.9991	.9988	.9974	1.0035	.9968	1.0060
2.70	1.0001	.9991	.9987	.9975	1.0036	.9967	1.0061
2.75	1.0000	.9991	.9986	.9976	1.0036	.9966	1.0063
2.80	1.0000	.9991	.9986	.9976	1.0037	.9965	1.0064
2.85	1.0000	.9991	.9985	.9977	1.0037	.9964	1.0065
2.90	1.0000	.9991	.9985	.9978	1.0037	.9963	1.0066
2.95	1.0000	.9991	.9984	.9979	1.0037	.9963	1.0067
3.00	1.0001	.9992	.9984	.9980	1.0038	.9962	1.0068

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

E. PT1 = 10. ATM DT1 = 11.398 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	5.2696	249.51	7.241	10.0005	300.00	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9530	5.5605	253.41	7.522	9.9991	300.00	1.1196	1.0330	1.0834	.9999	1.0000	.9999
1.10	.9116	5.8173	256.78	7.765	9.9899	300.00	1.2450	1.0653	1.1679	.9990	1.0000	.9989
1.15	.8748	6.0396	259.73	7.969	9.9676	299.99	1.3762	1.0972	1.2533	.9968	1.0000	.9967
1.20	.8419	6.2274	262.32	8.135	9.9289	299.98	1.5132	1.1287	1.3392	.9929	.9999	.9928
1.25	.8124	6.3809	264.59	8.263	9.8721	299.97	1.6559	1.1602	1.4253	.9872	.9999	.9873
1.30	.7858	6.5017	266.60	8.355	9.7961	299.96	1.8044	1.1918	1.5117	.9796	.9999	.9797
1.35	.7616	6.5913	268.39	8.412	9.7006	299.94	1.9587	1.2236	1.5980	.9701	.9998	.9702
1.40	.7395	6.6510	269.98	8.437	9.5862	299.91	2.1189	1.2557	1.6841	.9586	.9997	.9588
1.45	.7194	6.6827	271.41	8.432	9.4539	299.89	2.2849	1.2883	1.7699	.9454	.9996	.9457
1.50	.7010	6.6883	272.70	8.398	9.3047	299.85	2.4566	1.3213	1.8551	.9305	.9995	.9308
1.55	.6840	6.6699	273.85	8.339	9.1401	299.82	2.6343	1.3548	1.9397	.9140	.9994	.9144
1.60	.6684	6.6296	274.90	8.256	8.9617	299.78	2.8177	1.3889	2.0235	.8962	.9993	.8967
1.65	.6539	6.5694	275.84	8.153	8.7710	299.74	3.0069	1.4237	2.1064	.8771	.9991	.8777
1.70	.6405	6.4915	276.70	8.030	8.5697	299.70	3.2020	1.4591	2.1883	.8570	.9990	.8577
1.75	.6281	6.3978	277.49	7.891	8.3595	299.65	3.4029	1.4952	2.2692	.8360	.9988	.8367
1.80	.6164	6.2906	278.20	7.738	8.1418	299.61	3.6097	1.5321	2.3489	.8142	.9987	.8150
1.85	.6057	6.1712	278.86	7.573	7.9184	299.56	3.8223	1.5697	2.4274	.7918	.9985	.7928
1.90	.5956	6.0417	279.45	7.398	7.6908	299.51	4.0407	1.6081	2.5046	.7691	.9984	.7701
1.95	.5862	5.9038	280.00	7.214	7.4601	299.46	4.2649	1.6473	2.5806	.7460	.9982	.7471
2.00	.5774	5.7589	280.50	7.024	7.2278	299.42	4.4950	1.6873	2.6551	.7228	.9981	.7239
2.05	.5691	5.6085	280.97	6.828	6.9948	299.37	4.7309	1.7281	2.7283	.6995	.9979	.7007
2.10	.5612	5.4540	281.40	6.629	6.7621	299.32	4.9727	1.7698	2.8000	.6762	.9977	.6774
2.15	.5539	5.2963	281.80	6.428	6.5311	299.27	5.2202	1.8124	2.8703	.6531	.9976	.6544
2.20	.5471	5.1367	282.16	6.226	6.3023	299.22	5.4736	1.8558	2.9392	.6302	.9974	.6315
2.25	.5406	4.9760	282.50	6.024	6.0765	299.17	5.7329	1.9000	3.0065	.6076	.9972	.6090
2.30	.5344	4.8152	282.82	5.822	5.8542	299.12	5.9979	1.9452	3.0725	.5854	.9971	.5868
2.35	.5286	4.6550	283.11	5.622	5.6361	299.08	6.2689	1.9912	3.1369	.5636	.9969	.5650
2.40	.5232	4.4961	283.38	5.425	5.4226	299.03	6.5456	2.0382	3.1999	.5423	.9968	.5436
2.45	.5180	4.3389	283.64	5.230	5.2141	298.98	6.8282	2.0860	3.2615	.5214	.9966	.5228
2.50	.5130	4.1841	283.88	5.039	5.0109	298.94	7.1167	2.1348	3.3216	.5011	.9965	.5025
2.55	.5084	4.0320	284.10	4.851	4.8132	298.90	7.4109	2.1844	3.3803	.4813	.9963	.4827
2.60	.5039	3.8829	284.31	4.668	4.6212	298.86	7.7111	2.2350	3.4375	.4621	.9962	.4635
2.65	.4997	3.7372	284.51	4.490	4.4351	298.82	8.0170	2.2866	3.4934	.4435	.9961	.4449
2.70	.4957	3.5951	284.69	4.316	4.2549	298.78	8.3288	2.3390	3.5479	.4255	.9959	.4269
2.75	.4918	3.4567	284.87	4.147	4.0807	298.74	8.6465	2.3924	3.6010	.4081	.9958	.4094
2.80	.4882	3.3223	285.03	3.983	3.9125	298.70	8.9699	2.4467	3.6528	.3912	.9957	.3926
2.85	.4847	3.1918	285.19	3.825	3.7503	298.67	9.2993	2.5020	3.7033	.3750	.9956	.3763
2.90	.4814	3.0655	285.33	3.671	3.5940	298.64	9.6344	2.5582	3.7525	.3594	.9955	.3607
2.95	.4783	2.9433	285.47	3.523	3.4437	298.60	9.9755	2.6153	3.8006	.3444	.9953	.3456
3.00	.4753	2.8251	285.60	3.380	3.2991	298.57	10.3224	2.6734	3.8474	.3299	.9952	.3311

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

E. PT1 = 10. ATM DT1 = 11.398 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0001	1.0000	1.0000
1.05	.9999	1.0000	1.0002	.9995	1.0001	1.0000	1.0000
1.10	.9998	1.0000	1.0004	.9990	1.0001	1.0000	1.0000
1.15	.9997	.9999	1.0005	.9986	1.0001	1.0000	1.0000
1.20	.9996	.9999	1.0007	.9982	1.0001	.9999	1.0000
1.25	.9997	.9998	1.0007	.9977	1.0002	.9999	1.0002
1.30	.9997	.9996	1.0008	.9973	1.0002	.9999	1.0004
1.35	.9998	.9996	1.0008	.9970	1.0003	.9998	1.0005
1.40	.9998	.9995	1.0008	.9967	1.0004	.9997	1.0007
1.45	.9998	.9994	1.0008	.9965	1.0006	.9996	1.0009
1.50	.9998	.9993	1.0008	.9963	1.0007	.9995	1.0011
1.55	.9998	.9992	1.0008	.9961	1.0009	.9994	1.0014
1.60	.9999	.9992	1.0007	.9959	1.0011	.9993	1.0017
1.65	.9999	.9991	1.0006	.9958	1.0013	.9991	1.0019
1.70	.9999	.9991	1.0005	.9957	1.0015	.9990	1.0023
1.75	1.0000	.9990	1.0004	.9957	1.0017	.9988	1.0026
1.80	.9999	.9990	1.0004	.9956	1.0018	.9987	1.0029
1.85	.9999	.9990	1.0002	.9956	1.0020	.9985	1.0032
1.90	1.0000	.9989	1.0001	.9956	1.0022	.9984	1.0035
1.95	1.0000	.9989	1.0000	.9956	1.0024	.9982	1.0039
2.00	1.0000	.9989	.9999	.9957	1.0026	.9981	1.0042
2.05	1.0000	.9989	.9998	.9957	1.0028	.9979	1.0045
2.10	.9999	.9989	.9997	.9958	1.0030	.9977	1.0048
2.15	1.0000	.9988	.9995	.9958	1.0032	.9976	1.0051
2.20	1.0000	.9988	.9994	.9959	1.0033	.9974	1.0054
2.25	1.0000	.9988	.9993	.9960	1.0035	.9972	1.0057
2.30	1.0000	.9988	.9992	.9961	1.0036	.9971	1.0060
2.35	1.0001	.9988	.9990	.9962	1.0038	.9969	1.0062
2.40	1.0001	.9988	.9989	.9963	1.0039	.9968	1.0065
2.45	1.0001	.9988	.9988	.9964	1.0040	.9966	1.0067
2.50	1.0001	.9988	.9987	.9965	1.0042	.9965	1.0069
2.55	1.0001	.9988	.9986	.9966	1.0042	.9963	1.0072
2.60	1.0001	.9988	.9985	.9967	1.0043	.9962	1.0074
2.65	1.0001	.9989	.9984	.9968	1.0044	.9961	1.0075
2.70	1.0001	.9989	.9984	.9969	1.0045	.9959	1.0077
2.75	1.0000	.9989	.9983	.9970	1.0045	.9958	1.0079
2.80	1.0000	.9989	.9982	.9971	1.0046	.9957	1.0080
2.85	1.0000	.9989	.9981	.9972	1.0046	.9956	1.0081
2.90	1.0000	.9989	.9981	.9973	1.0046	.9955	1.0082
2.95	1.0001	.9989	.9980	.9974	1.0047	.9953	1.0084
3.00	1.0001	.9989	.9979	.9975	1.0048	.9952	1.0085

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

F. PT1 = 20. ATM DT1 = 22.823 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	10.5103	249.04	14.528	20.0000	300.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9529	11.0914	252.96	15.089	19.9971	300.00	1.1196	1.0332	1.0829	.9999	1.0000	.9999
1.10	.9114	11.6047	256.35	15.574	19.9786	300.00	1.2449	1.0657	1.1667	.9989	1.0000	.9989
1.15	.8746	12.0483	259.31	15.981	19.9344	299.99	1.3759	1.0976	1.2513	.9967	1.0000	.9967
1.20	.8419	12.4246	261.89	16.313	19.8523	299.97	1.5126	1.1293	1.3363	.9931	.9999	.9932
1.25	.8124	12.7322	264.16	16.569	19.7499	299.95	1.6550	1.1609	1.4217	.9875	.9998	.9876
1.30	.7857	12.9753	266.18	16.754	19.5994	299.92	1.8033	1.1925	1.5073	.9800	.9997	.9802
1.35	.7616	13.1561	267.96	16.870	19.4105	299.88	1.9574	1.2244	1.5928	.9705	.9996	.9708
1.40	.7396	13.2779	269.55	16.922	19.1841	299.83	2.1172	1.2565	1.6781	.9592	.9994	.9596
1.45	.7194	13.3445	270.98	16.914	18.9217	299.78	2.2830	1.2891	1.7632	.9461	.9993	.9467
1.50	.7010	13.3589	272.25	16.850	18.6261	299.72	2.4545	1.3221	1.8477	.9313	.9991	.9320
1.55	.6840	13.3256	273.39	16.734	18.2998	299.66	2.6318	1.3556	1.9316	.9150	.9989	.9159
1.60	.6683	13.2489	274.42	16.572	17.9455	299.58	2.8150	1.3896	2.0148	.8973	.9986	.8983
1.65	.6539	13.1323	275.35	16.368	17.5671	299.51	3.0039	1.4243	2.0971	.8784	.9984	.8797
1.70	.6405	12.9802	276.18	16.126	17.1675	299.42	3.1986	1.4596	2.1785	.8584	.9981	.8598
1.75	.6281	12.7966	276.94	15.852	16.7498	299.34	3.3992	1.4956	2.2589	.8375	.9978	.8391
1.80	.6164	12.5856	277.63	15.549	16.3169	299.25	3.6056	1.5324	2.3382	.8158	.9975	.8177
1.85	.6057	12.3503	278.25	15.222	15.8726	299.16	3.8178	1.5698	2.4163	.7936	.9972	.7956
1.90	.5956	12.0946	278.81	14.874	15.4195	299.06	4.0359	1.6080	2.4932	.7710	.9969	.7731
1.95	.5862	11.8217	279.33	14.510	14.9600	298.97	4.2598	1.6470	2.5689	.7480	.9966	.7503
2.00	.5773	11.5349	279.80	14.131	14.4965	298.87	4.4895	1.6868	2.6432	.7248	.9962	.7272
2.05	.5691	11.2366	280.23	13.743	14.0320	298.78	4.7250	1.7274	2.7162	.7016	.9959	.7041
2.10	.5613	10.9295	280.62	13.347	13.5682	298.68	4.9664	1.7689	2.7878	.6784	.9956	.6810
2.15	.5540	10.6161	280.98	12.946	13.1069	298.58	5.2136	1.8111	2.8581	.6553	.9953	.6581
2.20	.5471	10.2986	281.31	12.542	12.6499	298.49	5.4667	1.8543	2.9269	.6325	.9950	.6353
2.25	.5405	9.9787	281.62	12.138	12.1980	298.39	5.7256	1.8983	2.9942	.6099	.9946	.6128
2.30	.5344	9.6583	281.89	11.735	11.7538	298.30	5.9903	1.9432	3.0602	.5877	.9943	.5906
2.35	.5286	9.3387	282.15	11.335	11.3175	298.21	6.2609	1.9889	3.1247	.5659	.9940	.5688
2.40	.5232	9.0214	282.39	10.939	10.8903	298.12	6.5373	2.0356	3.1878	.5445	.9937	.5475
2.45	.5180	8.7076	282.61	10.549	10.4728	298.03	6.8196	2.0831	3.2495	.5236	.9934	.5266
2.50	.5131	8.3981	282.81	10.166	10.0657	297.94	7.1077	2.1316	3.3097	.5033	.9931	.5063
2.55	.5084	8.0939	283.00	9.790	9.6695	297.86	7.4017	2.1810	3.3686	.4835	.9929	.4865
2.60	.5039	7.7957	283.18	9.422	9.2846	297.78	7.7015	2.2313	3.4260	.4642	.9926	.4672
2.65	.4997	7.5041	283.34	9.064	8.9114	297.70	8.0071	2.2825	3.4821	.4456	.9923	.4485
2.70	.4957	7.2194	283.49	8.714	8.5499	297.62	8.3186	2.3347	3.5368	.4275	.9921	.4304
2.75	.4918	6.9423	283.64	8.375	8.2003	297.54	8.6360	2.3878	3.5901	.4100	.9918	.4129
2.80	.4882	6.6728	283.77	8.045	7.8630	297.47	8.9592	2.4418	3.6422	.3932	.9916	.3960
2.85	.4848	6.4113	283.89	7.726	7.5374	297.40	9.2883	2.4967	3.6930	.3769	.9913	.3797
2.90	.4815	6.1579	284.01	7.417	7.2236	297.33	9.6232	2.5526	3.7425	.3612	.9911	.3639
2.95	.4783	5.9126	284.12	7.118	6.9215	297.27	9.9640	2.6095	3.7907	.3461	.9909	.3488
3.00	.4753	5.6756	284.22	6.830	6.6309	297.21	10.3106	2.6673	3.8377	.3315	.9907	.3342

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

F. PT1 = 20. ATM DT1 = 22.823 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(----------	----------	RELATIVE TO IDEAL DIATOMIC GAS VALUE	----------	----------	----------	----------)
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9998	1.0000	1.0004	.9990	1.0000	1.0000	1.0000
1.10	.9996	.9999	1.0007	.9980	1.0000	1.0000	1.0000
1.15	.9995	.9998	1.0010	.9970	1.0000	1.0000	1.0000
1.20	.9996	.9995	1.0011	.9961	1.0003	.9999	1.0004
1.25	.9997	.9993	1.0013	.9952	1.0004	.9998	1.0006
1.30	.9997	.9991	1.0014	.9944	1.0006	.9997	1.0008
1.35	.9998	.9989	1.0014	.9938	1.0008	.9996	1.0011
1.40	.9998	.9987	1.0015	.9932	1.0011	.9994	1.0015
1.45	.9998	.9986	1.0015	.9927	1.0013	.9993	1.0019
1.50	.9998	.9984	1.0014	.9923	1.0016	.9991	1.0024
1.55	.9999	.9983	1.0013	.9919	1.0020	.9989	1.0029
1.60	.9998	.9982	1.0012	.9917	1.0023	.9986	1.0035
1.65	.9999	.9981	1.0011	.9914	1.0027	.9984	1.0042
1.70	.9999	.9980	1.0009	.9913	1.0031	.9981	1.0048
1.75	1.0000	.9979	1.0007	.9912	1.0035	.9978	1.0055
1.80	.9999	.9979	1.0005	.9911	1.0039	.9975	1.0061
1.85	1.0000	.9978	1.0003	.9911	1.0043	.9972	1.0068
1.90	1.0000	.9977	1.0001	.9911	1.0047	.9969	1.0075
1.95	1.0000	.9977	.9998	.9911	1.0051	.9966	1.0082
2.00	.9999	.9977	.9996	.9912	1.0055	.9962	1.0088
2.05	1.0000	.9976	.9993	.9913	1.0059	.9959	1.0095
2.10	1.0000	.9976	.9991	.9914	1.0062	.9956	1.0101
2.15	1.0001	.9976	.9988	.9916	1.0066	.9953	1.0108
2.20	1.0001	.9976	.9986	.9917	1.0069	.9950	1.0114
2.25	1.0000	.9976	.9984	.9919	1.0072	.9946	1.0119
2.30	1.0000	.9976	.9981	.9921	1.0075	.9943	1.0125
2.35	1.0001	.9976	.9979	.9923	1.0078	.9940	1.0131
2.40	1.0001	.9976	.9977	.9925	1.0081	.9937	1.0136
2.45	1.0001	.9976	.9975	.9927	1.0083	.9934	1.0141
2.50	1.0001	.9976	.9972	.9929	1.0086	.9931	1.0145
2.55	1.0001	.9976	.9970	.9931	1.0088	.9929	1.0150
2.60	1.0001	.9976	.9969	.9933	1.0089	.9926	1.0154
2.65	1.0001	.9976	.9967	.9935	1.0091	.9923	1.0157
2.70	1.0001	.9976	.9965	.9938	1.0092	.9921	1.0161
2.75	1.0000	.9977	.9963	.9940	1.0093	.9918	1.0164
2.80	1.0001	.9977	.9962	.9942	1.0095	.9916	1.0167
2.85	1.0002	.9977	.9960	.9944	1.0096	.9913	1.0170
2.90	1.0002	.9977	.9959	.9946	1.0096	.9911	1.0173
2.95	1.0002	.9978	.9957	.9948	1.0097	.9909	1.0175
3.00	1.0002	.9978	.9956	.9950	1.0097	.9907	1.0177

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

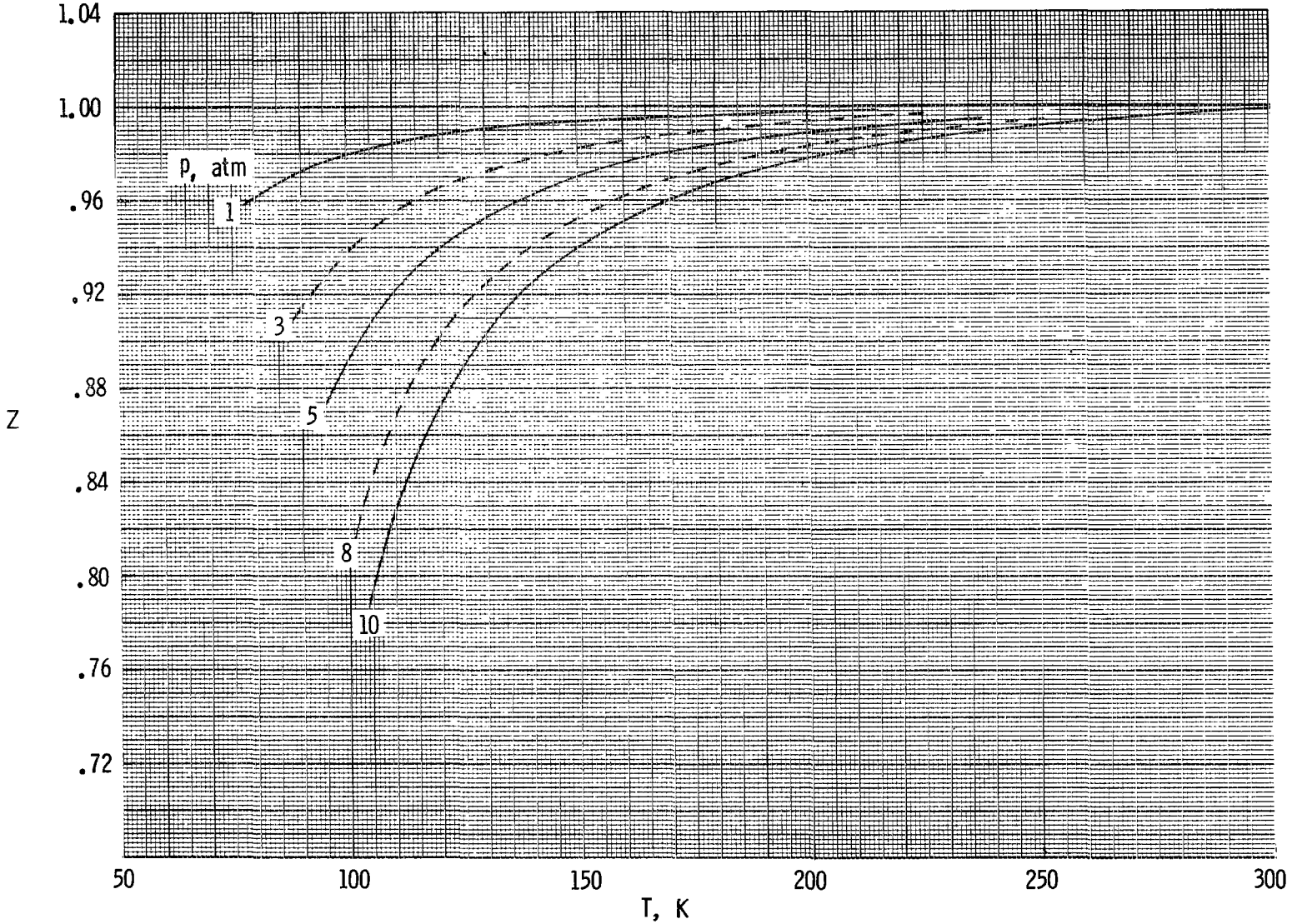
G. PT1 = 30. ATM DT1 = 34.258 KGM/M3

M1	M2	P2 ATM	T2 K	D2 KGM/M3	PT2 ATM	TT2 K	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
1.00	1.0000	15.7209	248.59	21.857	30.0004	300.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9528	16.5913	252.52	22.697	29.9959	300.00	1.1196	1.0334	1.0823	.9999	1.0000	.9999
1.10	.9112	17.3608	255.94	23.422	29.9682	299.99	1.2449	1.0660	1.1655	.9989	1.0000	.9989
1.15	.8746	18.0217	258.89	24.026	29.9031	299.98	1.3755	1.0980	1.2491	.9968	.9999	.9968
1.20	.8418	18.5824	261.47	24.519	29.7904	299.96	1.5119	1.1298	1.3333	.9930	.9999	.9931
1.25	.8124	19.0451	263.75	24.902	29.6238	299.93	1.6541	1.1614	1.4179	.9875	.9998	.9877
1.30	.7857	19.4116	265.77	25.180	29.4008	299.88	1.8021	1.1932	1.5026	.9800	.9996	.9804
1.35	.7615	19.6865	267.56	25.357	29.1204	299.83	1.9560	1.2251	1.5874	.9707	.9994	.9712
1.40	.7395	19.8725	269.14	25.437	28.7845	299.76	2.1155	1.2572	1.6719	.9595	.9992	.9602
1.45	.7194	19.9764	270.55	25.428	28.3957	299.69	2.2809	1.2898	1.7561	.9465	.9990	.9475
1.50	.7010	20.0038	271.82	25.337	27.9565	299.60	2.4522	1.3227	1.8399	.9319	.9987	.9331
1.55	.6840	19.9594	272.95	25.169	27.4719	299.51	2.6292	1.3562	1.9232	.9157	.9984	.9172
1.60	.6683	19.8502	273.96	24.932	26.9453	299.40	2.8120	1.3902	2.0057	.8982	.9980	.8999
1.65	.6539	19.6814	274.87	24.631	26.3825	299.29	3.0006	1.4248	2.0874	.8794	.9976	.8814
1.70	.6404	19.4598	275.69	24.276	25.7871	299.17	3.1951	1.4600	2.1683	.8596	.9972	.8619
1.75	.6280	19.1904	276.42	23.870	25.1652	299.05	3.3953	1.4959	2.2482	.8388	.9968	.8414
1.80	.6165	18.8794	277.08	23.422	24.5209	298.92	3.6013	1.5324	2.3271	.8174	.9964	.8202
1.85	.6057	18.5322	277.67	22.936	23.8585	298.79	3.8132	1.5697	2.4048	.7953	.9960	.7984
1.90	.5956	18.1543	278.21	22.420	23.1817	298.65	4.0309	1.6078	2.4814	.7727	.9955	.7761
1.95	.5862	17.7499	278.69	21.878	22.4959	298.52	4.2544	1.6466	2.5568	.7499	.9951	.7534
2.00	.5774	17.3240	279.13	21.315	21.8041	298.38	4.4837	1.6861	2.6309	.7268	.9946	.7306
2.05	.5691	16.8806	279.53	20.736	21.1098	298.23	4.7189	1.7265	2.7037	.7037	.9941	.7076
2.10	.5613	16.4240	279.89	20.145	20.4154	298.09	4.9600	1.7677	2.7752	.6805	.9936	.6846
2.15	.5540	15.9571	280.22	19.545	19.7251	297.95	5.2068	1.8098	2.8453	.6575	.9932	.6618
2.20	.5471	15.4835	280.51	18.942	19.0408	297.81	5.4595	1.8526	2.9141	.6347	.9927	.6391
2.25	.5406	15.0061	280.78	18.337	18.3645	297.67	5.7180	1.8964	2.9815	.6122	.9922	.6166
2.30	.5345	14.5274	281.02	17.733	17.6983	297.53	5.9824	1.9410	3.0475	.5899	.9918	.5945
2.35	.5286	14.0497	281.25	17.133	17.0434	297.40	6.2526	1.9865	3.1121	.5681	.9913	.5727
2.40	.5232	13.5750	281.45	16.540	16.4024	297.26	6.5287	2.0329	3.1753	.5467	.9909	.5514
2.45	.5180	13.1050	281.63	15.954	15.7757	297.13	6.8106	2.0801	3.2371	.5259	.9904	.5305
2.50	.5131	12.6414	281.80	15.378	15.1643	297.01	7.0984	2.1283	3.2975	.5055	.9900	.5102
2.55	.5084	12.1854	281.96	14.813	14.5690	296.88	7.3920	2.1774	3.3565	.4856	.9896	.4903
2.60	.5039	11.7380	282.10	14.260	13.9904	296.76	7.6915	2.2274	3.4141	.4663	.9892	.4710
2.65	.4997	11.3003	282.23	13.719	13.4291	296.64	7.9969	2.2783	3.4704	.4476	.9888	.4522
2.70	.4957	10.8730	282.35	13.193	12.8856	296.52	8.3081	2.3301	3.5253	.4295	.9884	.4341
2.75	.4919	10.4566	282.46	12.681	12.3598	296.41	8.6251	2.3829	3.5789	.4120	.9880	.4165
2.80	.4883	10.0516	282.57	12.184	11.8517	296.30	8.9481	2.4366	3.6312	.3951	.9877	.3995
2.85	.4848	9.6585	282.66	11.702	11.3614	296.20	9.2769	2.4913	3.6822	.3787	.9873	.3831
2.90	.4815	9.2774	282.75	11.235	10.8889	296.10	9.6115	2.5469	3.7320	.3630	.9870	.3672
2.95	.4783	8.9084	282.83	10.784	10.4338	296.00	9.9520	2.6034	3.7805	.3478	.9867	.3520
3.00	.4753	8.5516	282.91	10.348	9.9960	295.90	10.2984	2.6609	3.8278	.3332	.9863	.3373

TABLE XI. REAL-GAS NORMAL-SHOCK SOLUTIONS FOR NITROGEN AT TT1 = 300 K

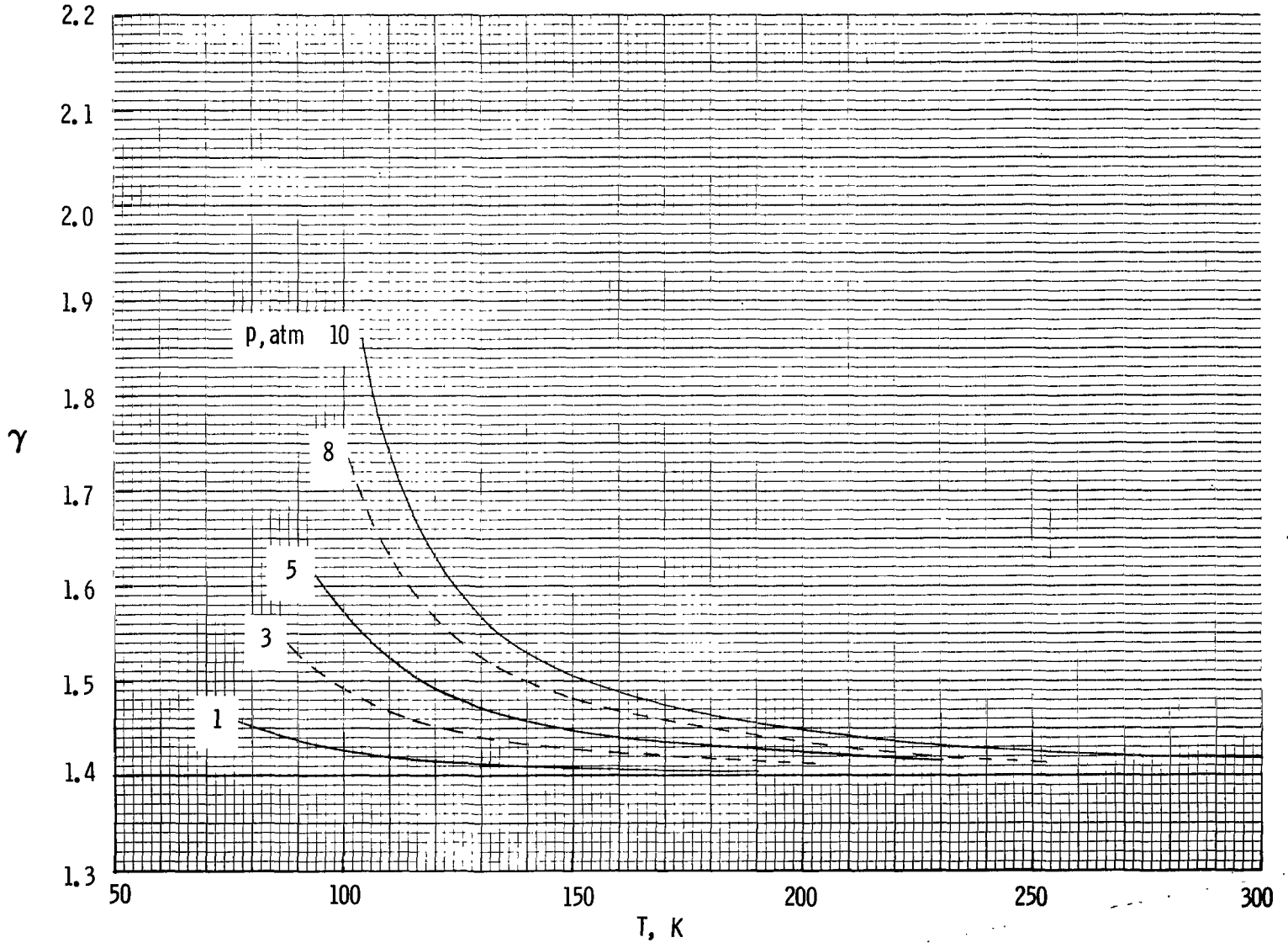
G. PT1 = 30. ATM DT1 = 34.258 KGM/M3 CONCLUDED.

M1	M2	P2/P1	T2/T1	D2/D1	PT2/PT1	TT2/TT1	DT2/DT1
	(RELATIVE TO IDEAL DIATOMIC GAS VALUE)						
1.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.05	.9997	1.0000	1.0005	.9984	1.0000	1.0000	1.0000
1.10	.9994	.9999	1.0010	.9969	1.0000	1.0000	1.0000
1.15	.9995	.9994	1.0013	.9953	1.0001	.9999	1.0001
1.20	.9996	.9990	1.0016	.9938	1.0002	.9999	1.0003
1.25	.9997	.9987	1.0018	.9925	1.0004	.9998	1.0006
1.30	.9997	.9984	1.0019	.9914	1.0007	.9996	1.0010
1.35	.9997	.9982	1.0020	.9904	1.0010	.9994	1.0015
1.40	.9998	.9979	1.0020	.9895	1.0013	.9992	1.0020
1.45	.9998	.9977	1.0020	.9888	1.0018	.9990	1.0028
1.50	.9998	.9975	1.0019	.9881	1.0023	.9987	1.0036
1.55	.9999	.9973	1.0018	.9876	1.0028	.9984	1.0044
1.60	.9998	.9972	1.0016	.9872	1.0033	.9980	1.0053
1.65	.9999	.9970	1.0014	.9869	1.0039	.9976	1.0062
1.70	.9998	.9969	1.0012	.9866	1.0045	.9972	1.0072
1.75	.9999	.9968	1.0009	.9865	1.0051	.9968	1.0082
1.80	.9999	.9967	1.0006	.9864	1.0058	.9964	1.0093
1.85	1.0000	.9966	1.0002	.9863	1.0064	.9960	1.0103
1.90	.9999	.9965	.9999	.9864	1.0070	.9955	1.0113
1.95	1.0000	.9965	.9996	.9865	1.0076	.9951	1.0124
2.00	1.0000	.9964	.9992	.9866	1.0082	.9946	1.0134
2.05	1.0000	.9963	.9988	.9868	1.0088	.9941	1.0145
2.10	1.0000	.9963	.9985	.9870	1.0093	.9936	1.0154
2.15	1.0000	.9963	.9981	.9872	1.0099	.9932	1.0164
2.20	1.0001	.9963	.9977	.9874	1.0104	.9927	1.0174
2.25	1.0001	.9963	.9974	.9877	1.0109	.9922	1.0183
2.30	1.0001	.9962	.9970	.9880	1.0114	.9918	1.0192
2.35	1.0000	.9962	.9967	.9883	1.0118	.9913	1.0200
2.40	1.0001	.9963	.9963	.9886	1.0122	.9909	1.0208
2.45	1.0001	.9963	.9960	.9889	1.0126	.9904	1.0216
2.50	1.0001	.9963	.9957	.9892	1.0129	.9900	1.0223
2.55	1.0001	.9963	.9954	.9896	1.0132	.9896	1.0230
2.60	1.0001	.9963	.9951	.9899	1.0135	.9892	1.0236
2.65	1.0001	.9963	.9948	.9902	1.0138	.9888	1.0242
2.70	1.0002	.9964	.9946	.9905	1.0140	.9884	1.0248
2.75	1.0002	.9964	.9943	.9909	1.0142	.9880	1.0253
2.80	1.0002	.9965	.9941	.9912	1.0143	.9877	1.0257
2.85	1.0002	.9965	.9938	.9915	1.0145	.9873	1.0262
2.90	1.0002	.9965	.9936	.9918	1.0146	.9870	1.0266
2.95	1.0002	.9966	.9934	.9921	1.0147	.9867	1.0269
3.00	1.0003	.9966	.9932	.9924	1.0148	.9863	1.0273



(a) Thermal.

Figure 1.- Imperfections of nitrogen gas at cryogenic temperatures (ref. 5).



(b) Caloric.

Figure 1.- Concluded.

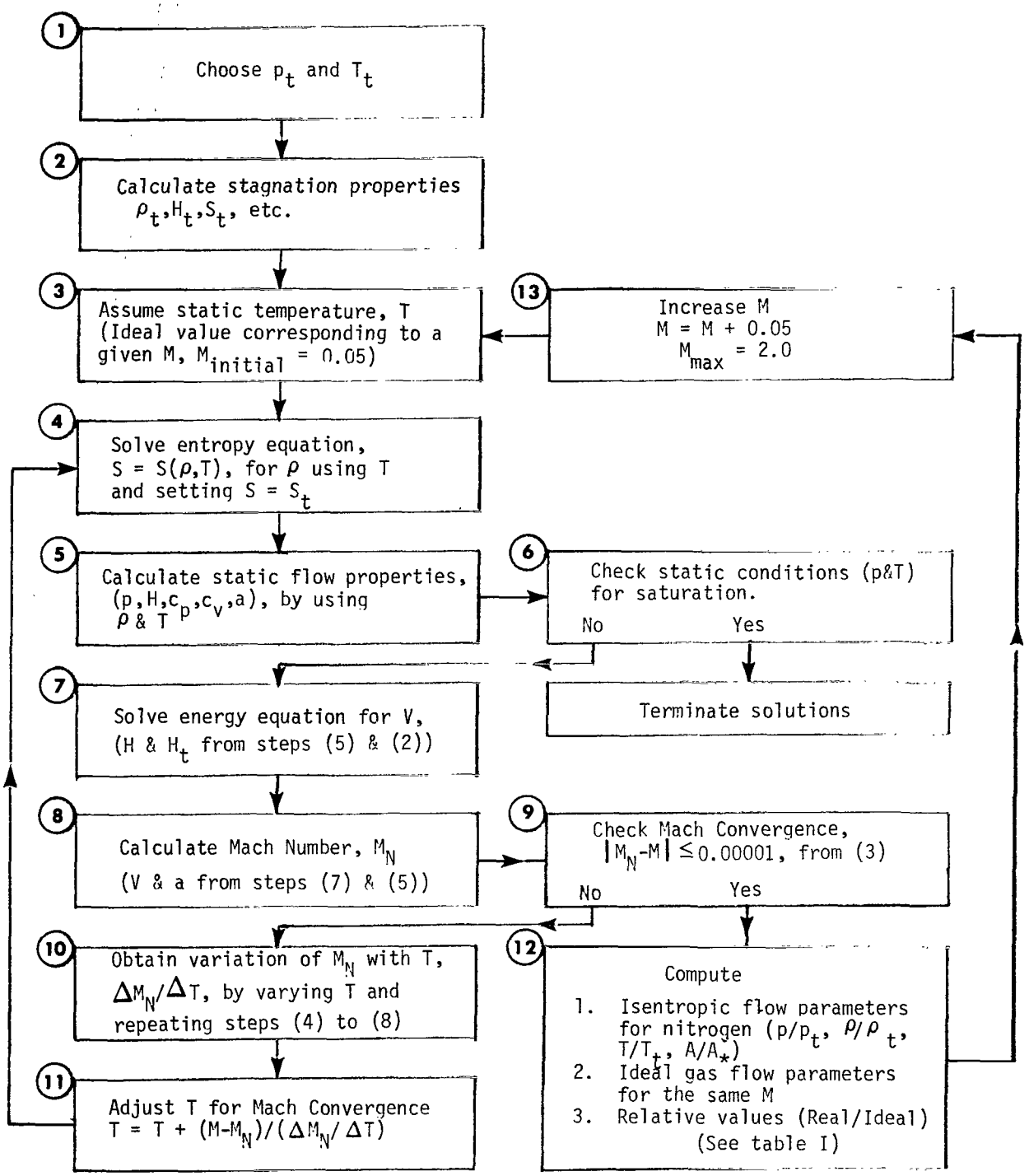


Figure 2.- Flow chart for real-gas isentropic flow solutions.

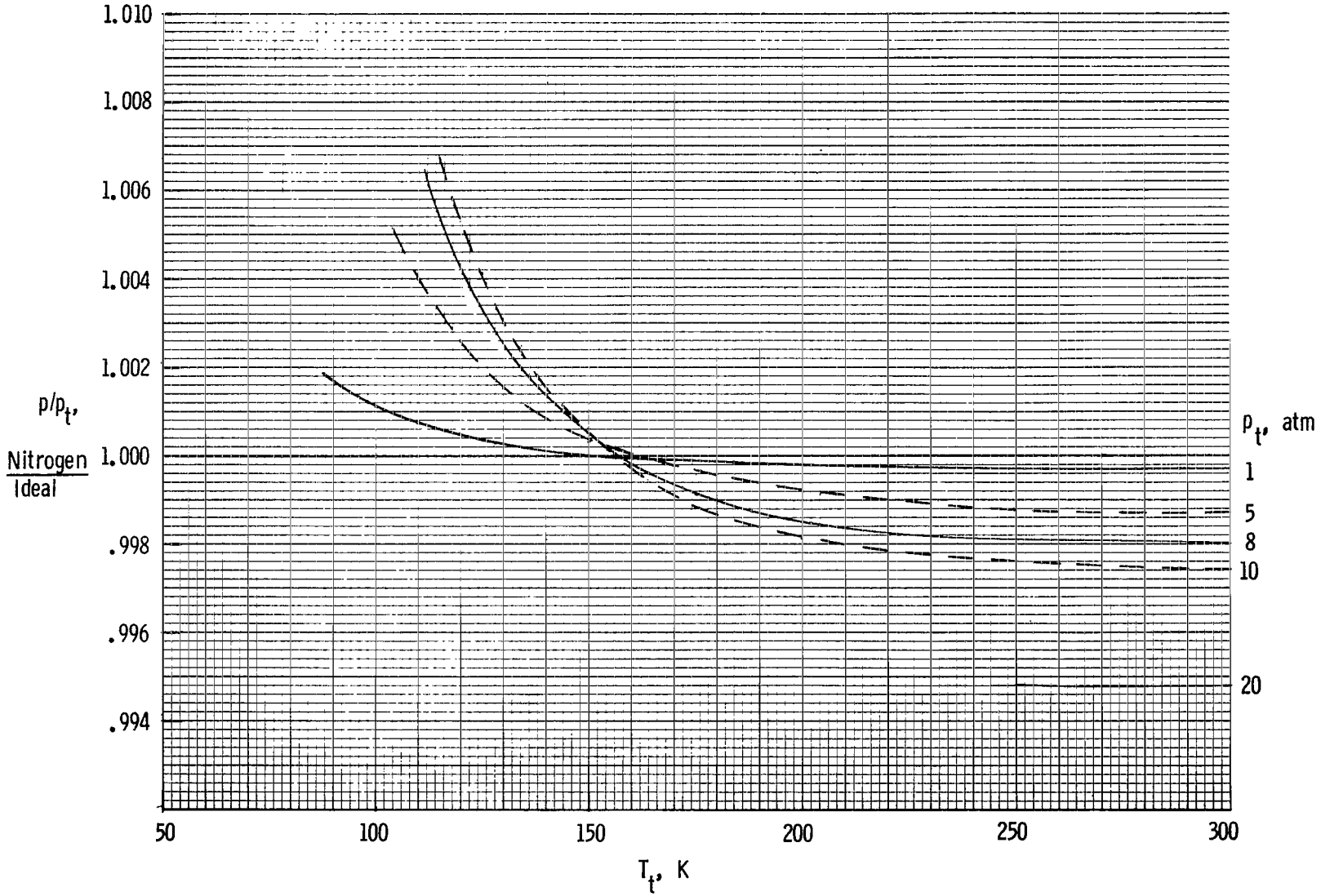


Figure 3.- Pressure ratios for isentropic expansions of nitrogen to Mach 1.0, relative to ideal diatomic gas value.

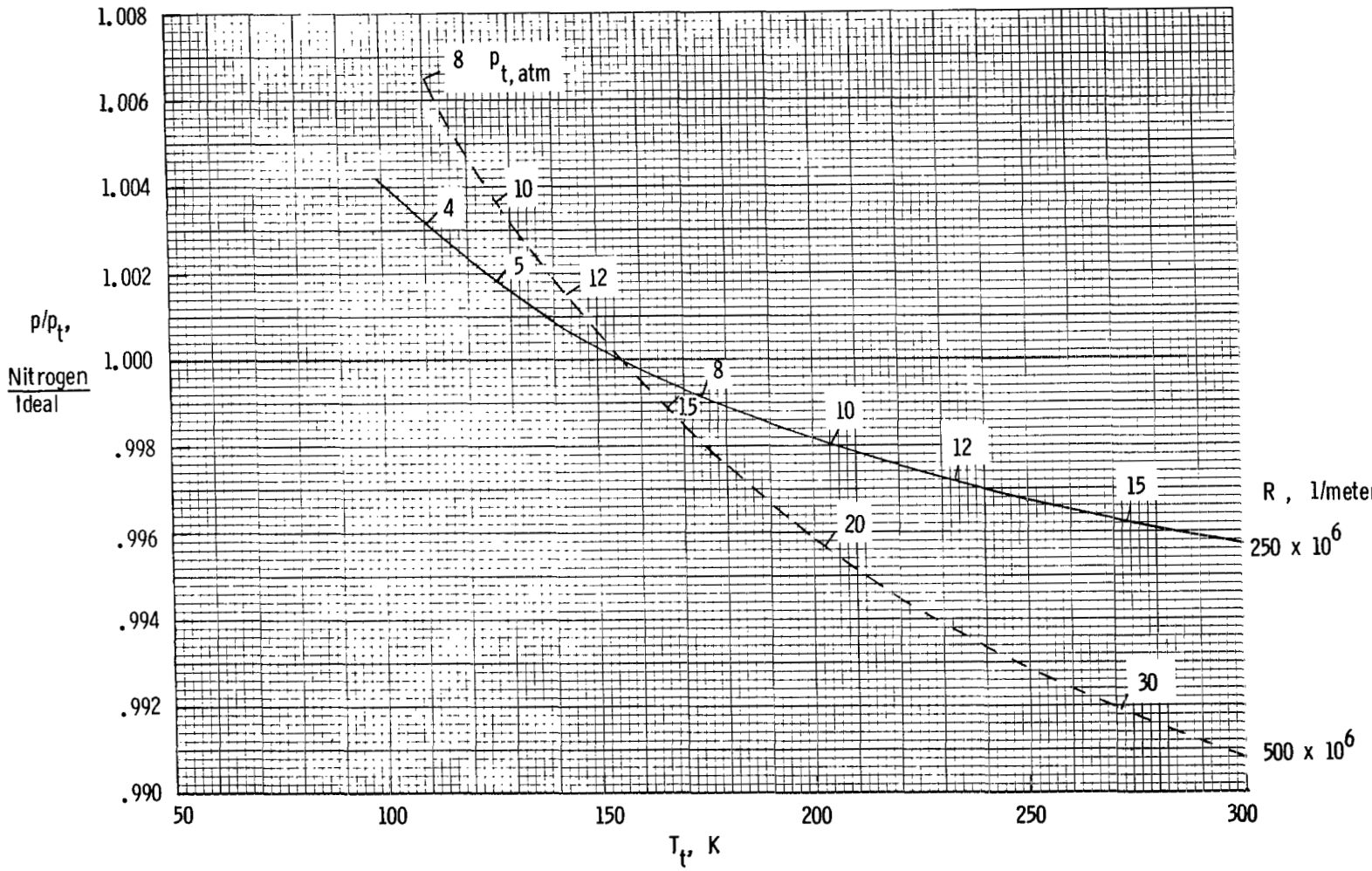


Figure 4.- Pressure ratios for isentropic expansions of nitrogen to Mach 1.0 at constant unit Reynolds numbers, relative to ideal diatomic gas value.

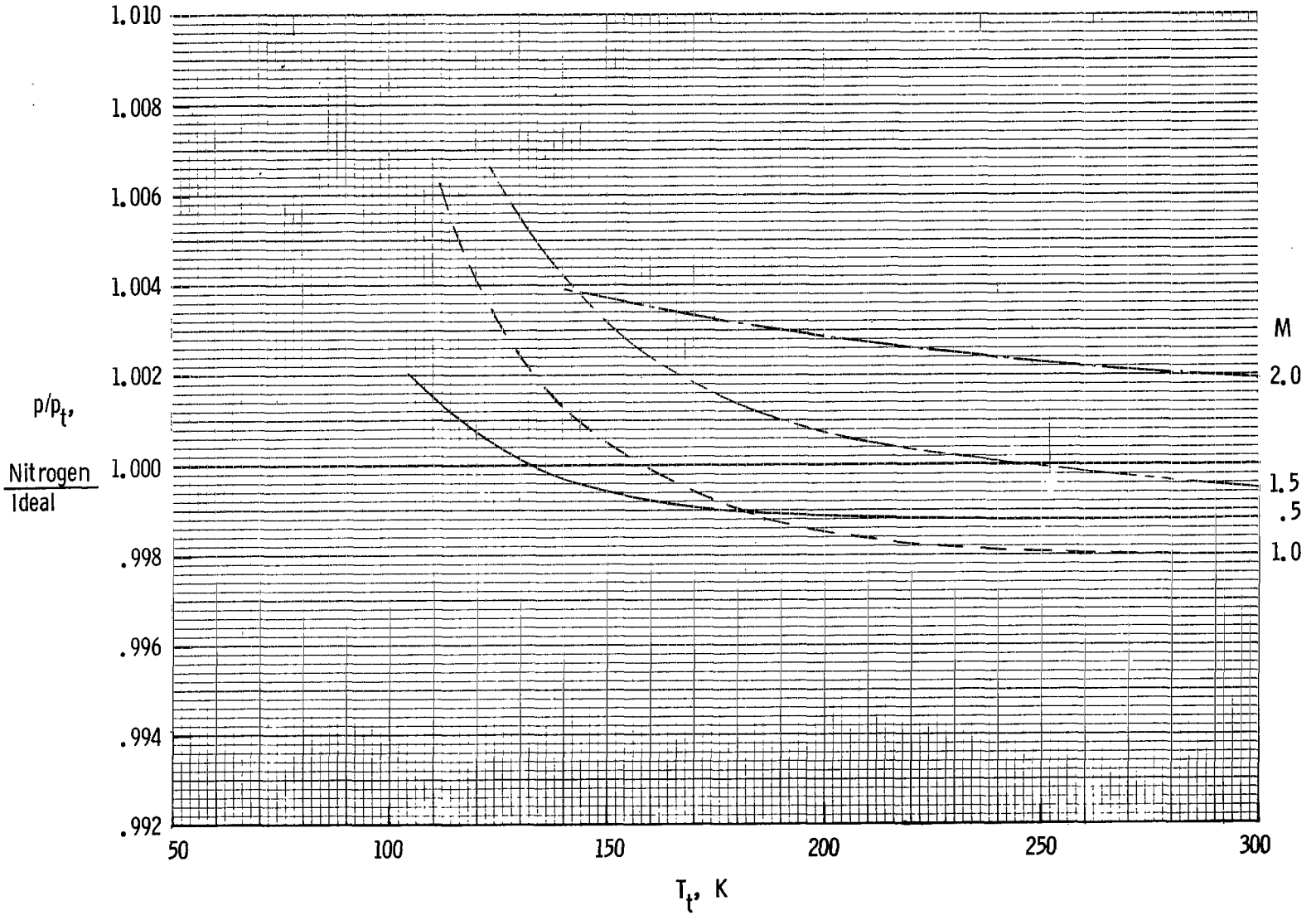


Figure 5.- Pressure ratios for isentropic expansions of nitrogen to various Mach numbers, relative to ideal diatomic gas values. p_t = 8 atm.

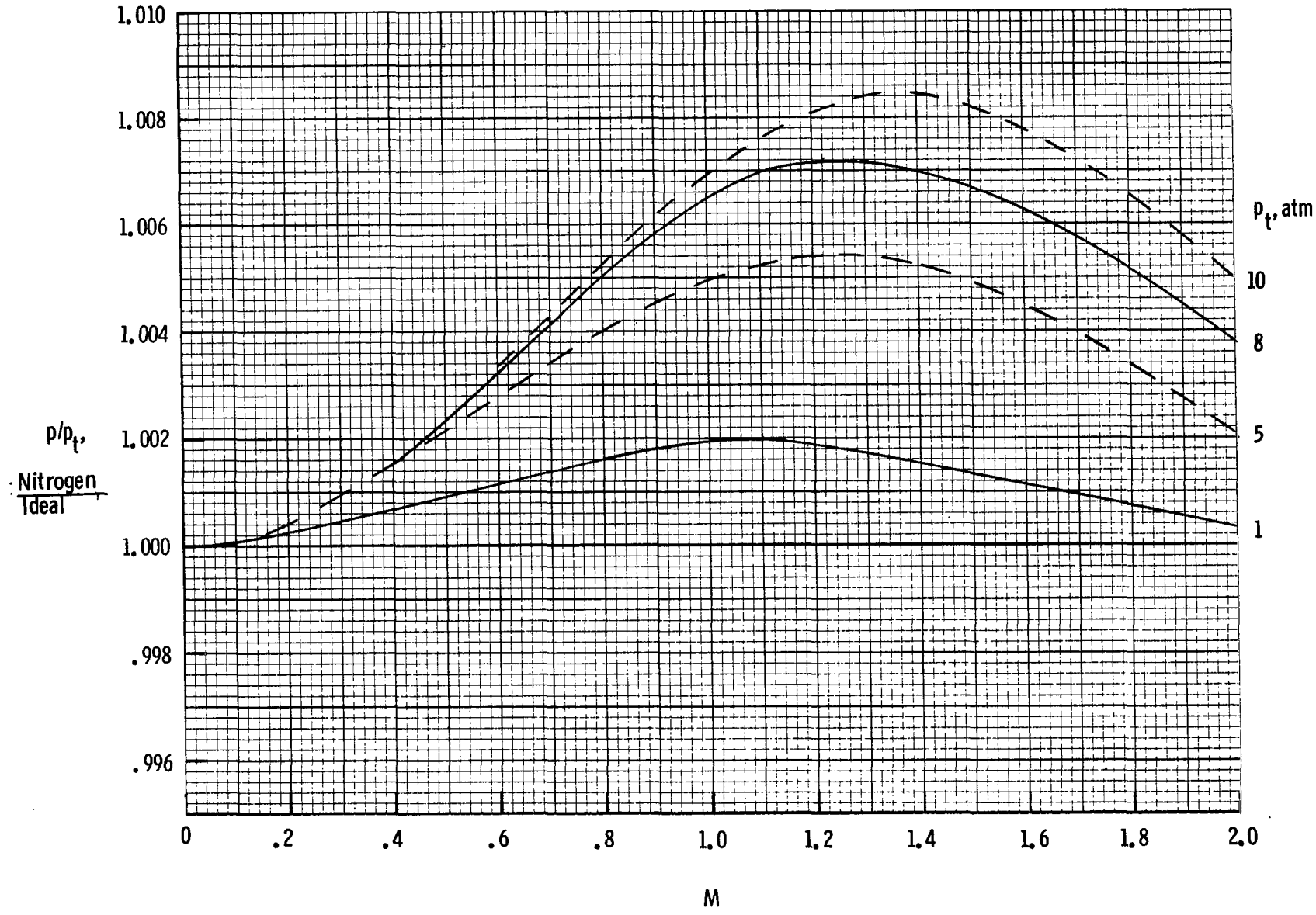


Figure 6.- Pressure ratios for isentropic expansions of nitrogen to various Mach numbers at saturated stream temperatures, relative to ideal diatomic gas values.

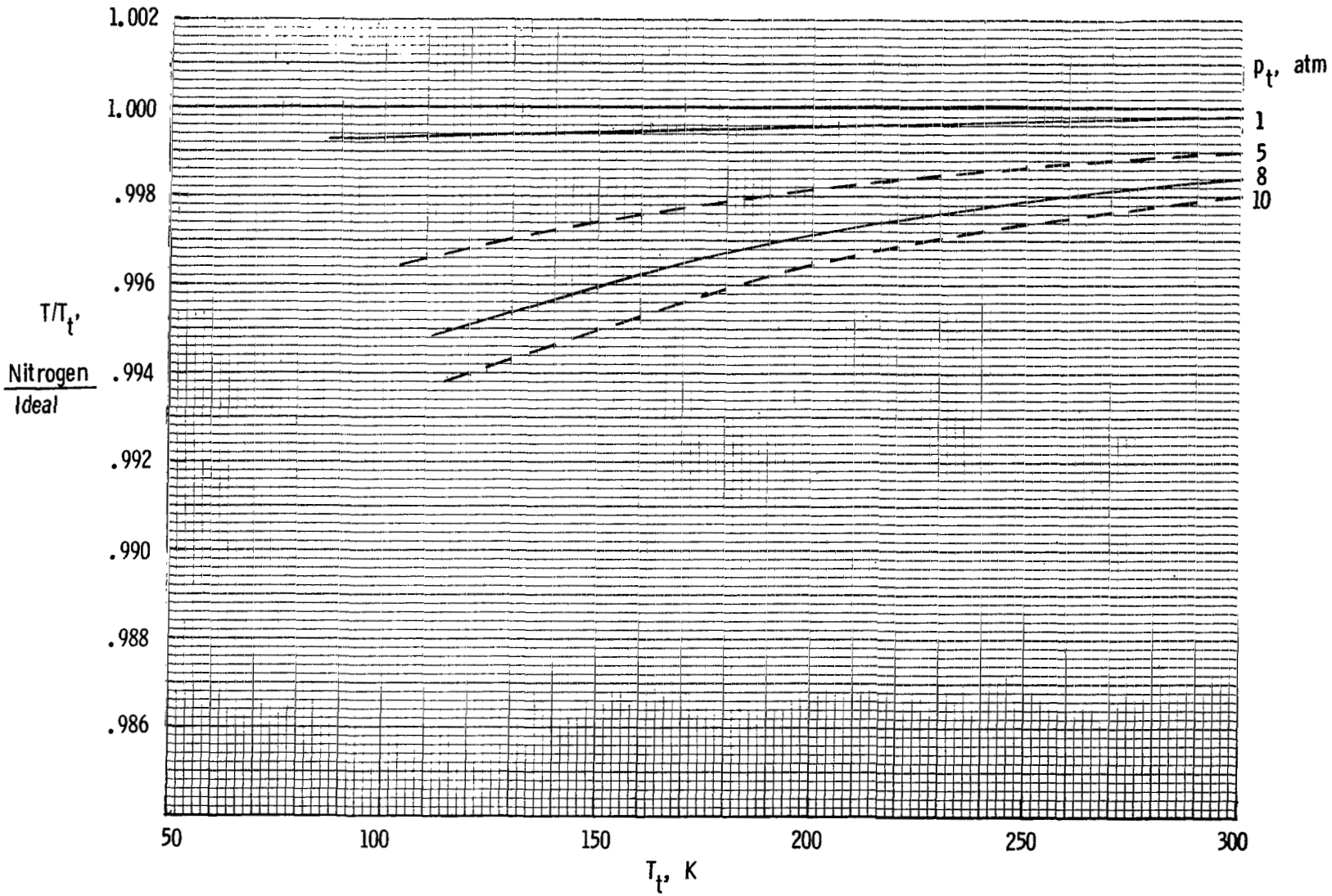


Figure 7.- Temperature ratios for isentropic expansions of nitrogen to Mach 1.0, relative to ideal diatomic gas value.

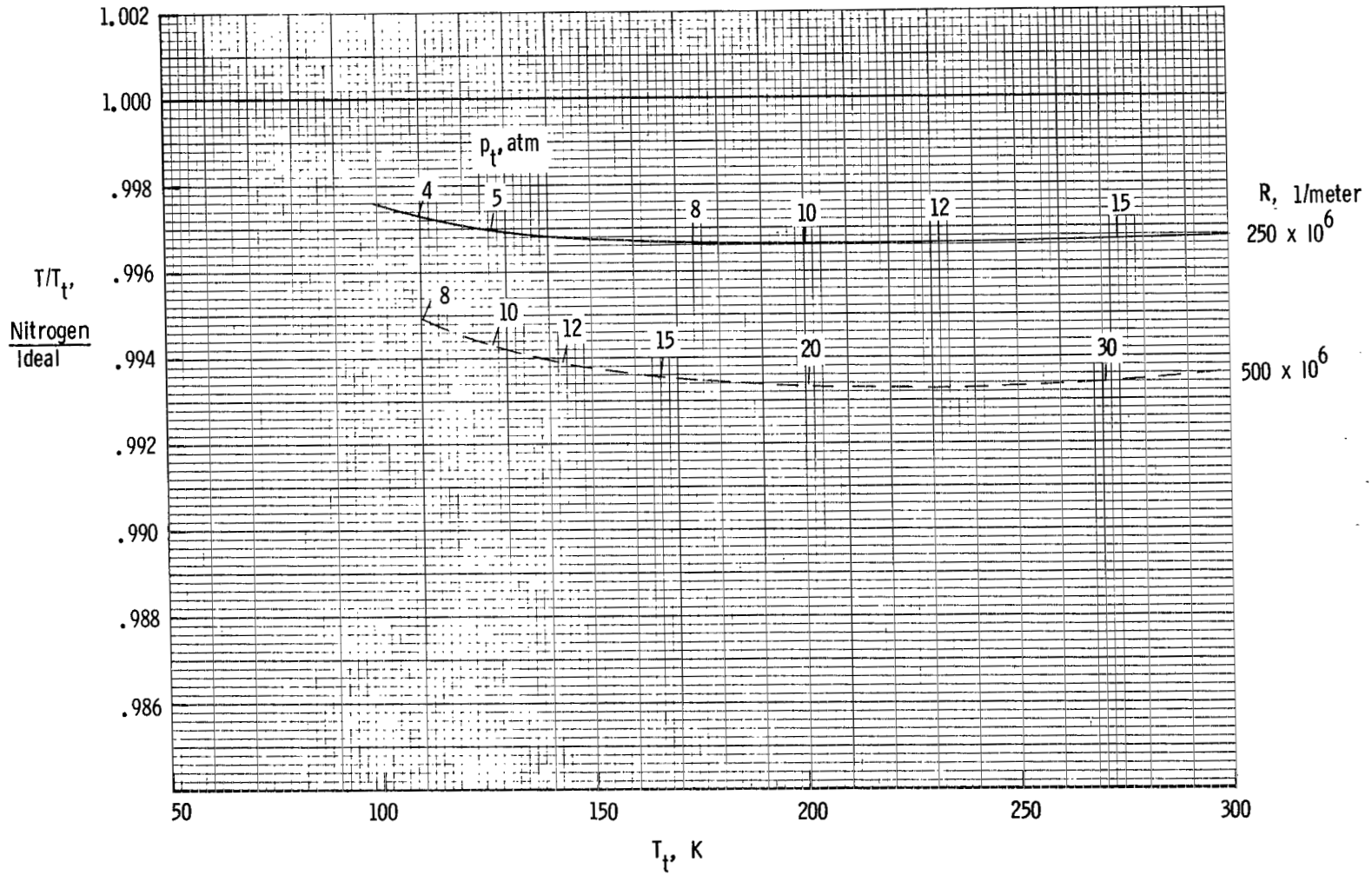


Figure 8.- Temperature ratios for isentropic expansions of nitrogen to Mach 1.0 at constant unit Reynolds numbers, relative to ideal diatomic gas value.

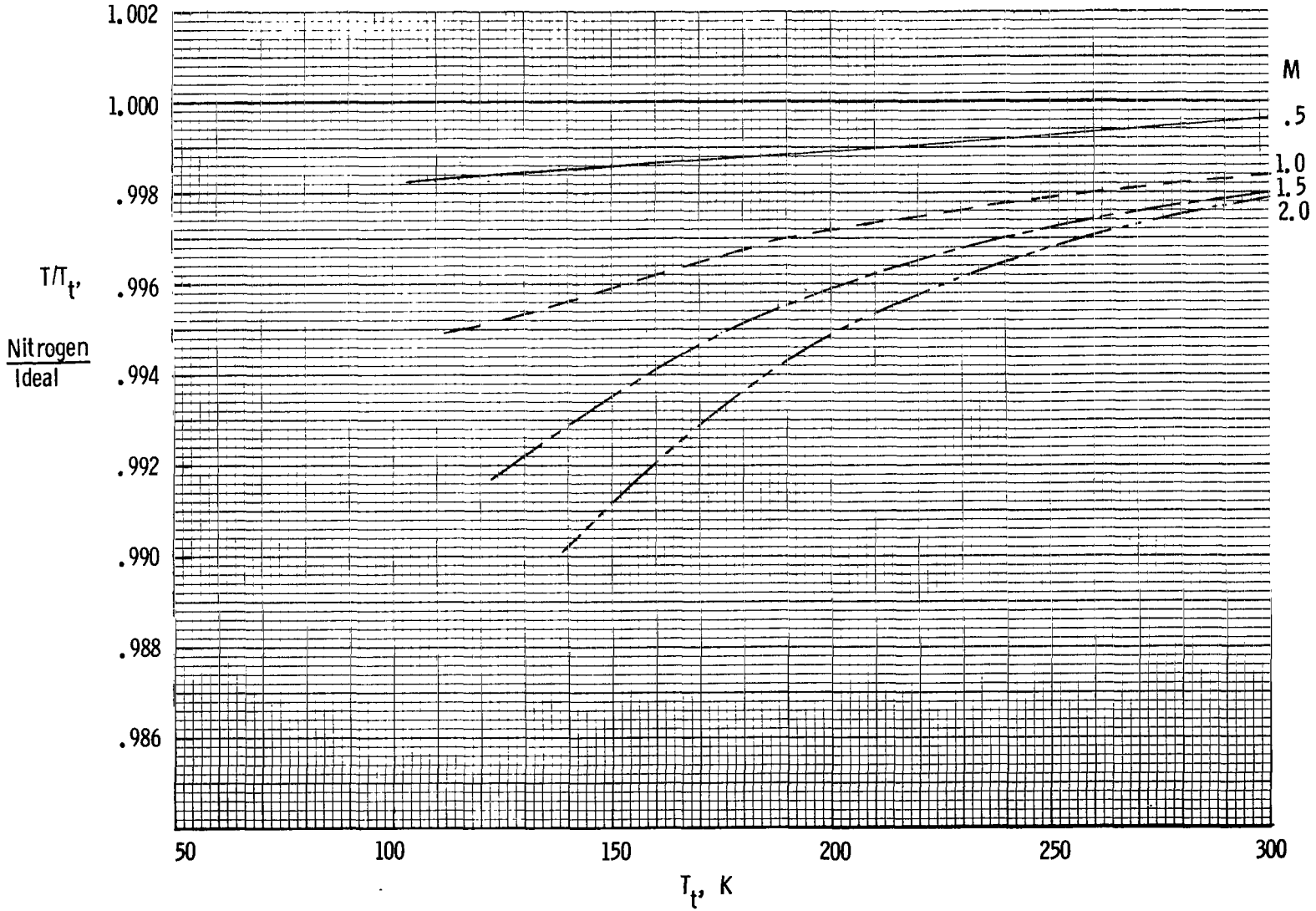


Figure 9.- Temperature ratios for isentropic expansions of nitrogen to various Mach numbers, relative to ideal diatomic gas values. p_t = 8 atm.

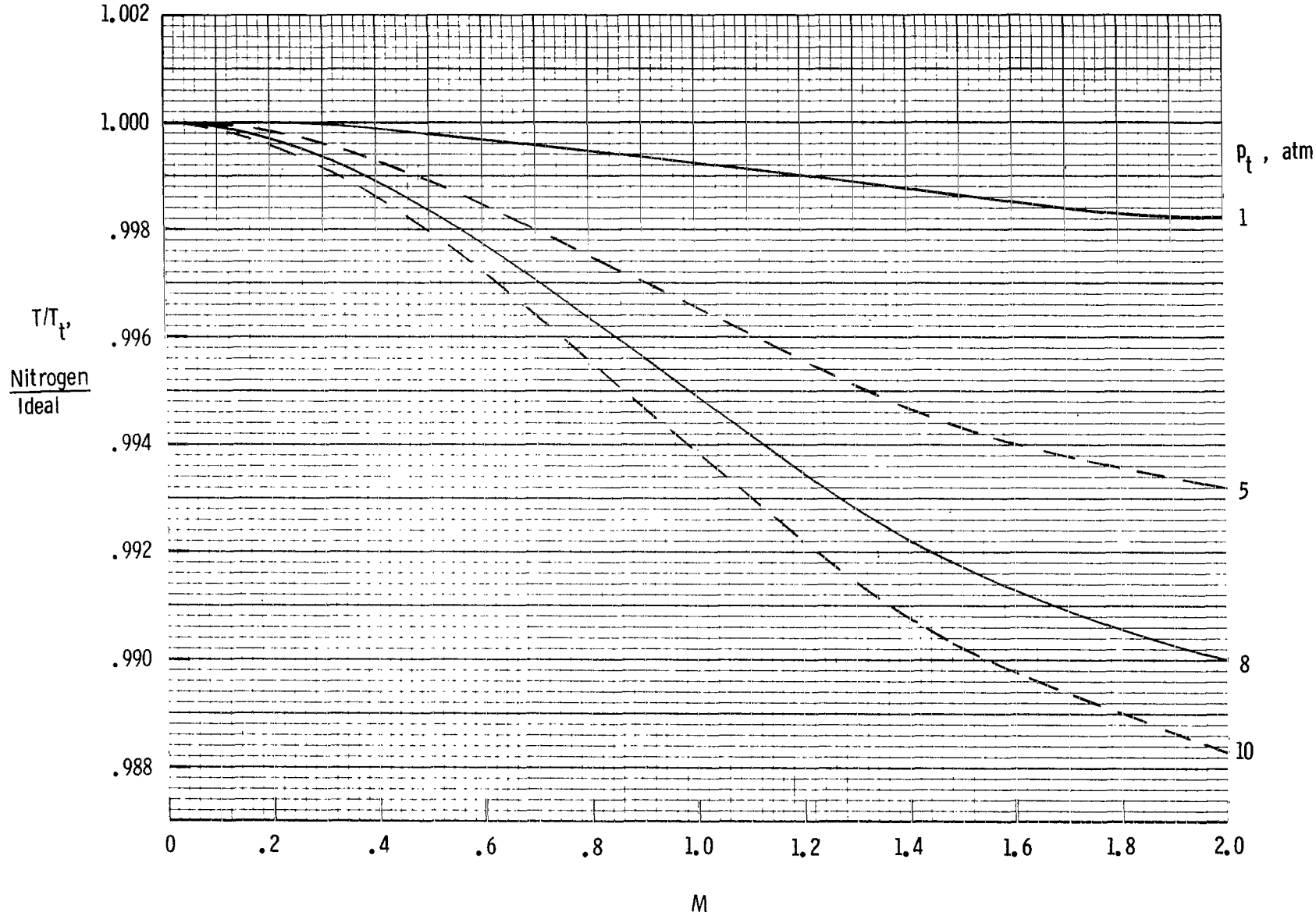


Figure 10.- Temperature ratios for isentropic expansions of nitrogen to various Mach numbers at saturated stream temperatures, relative to ideal diatomic gas values.

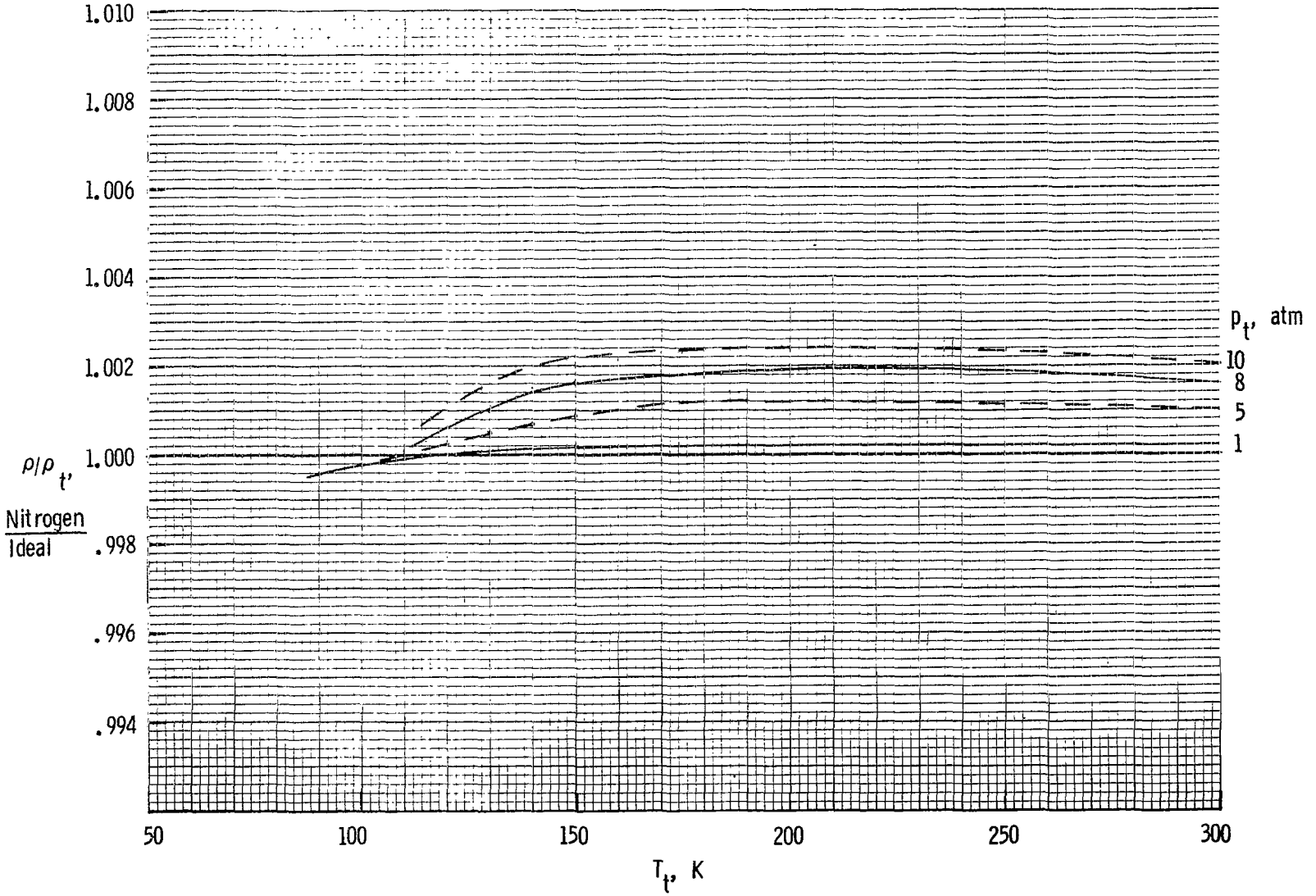


Figure 11.- Density ratios for isentropic expansions of nitrogen to Mach 1.0, relative to ideal diatomic gas value.

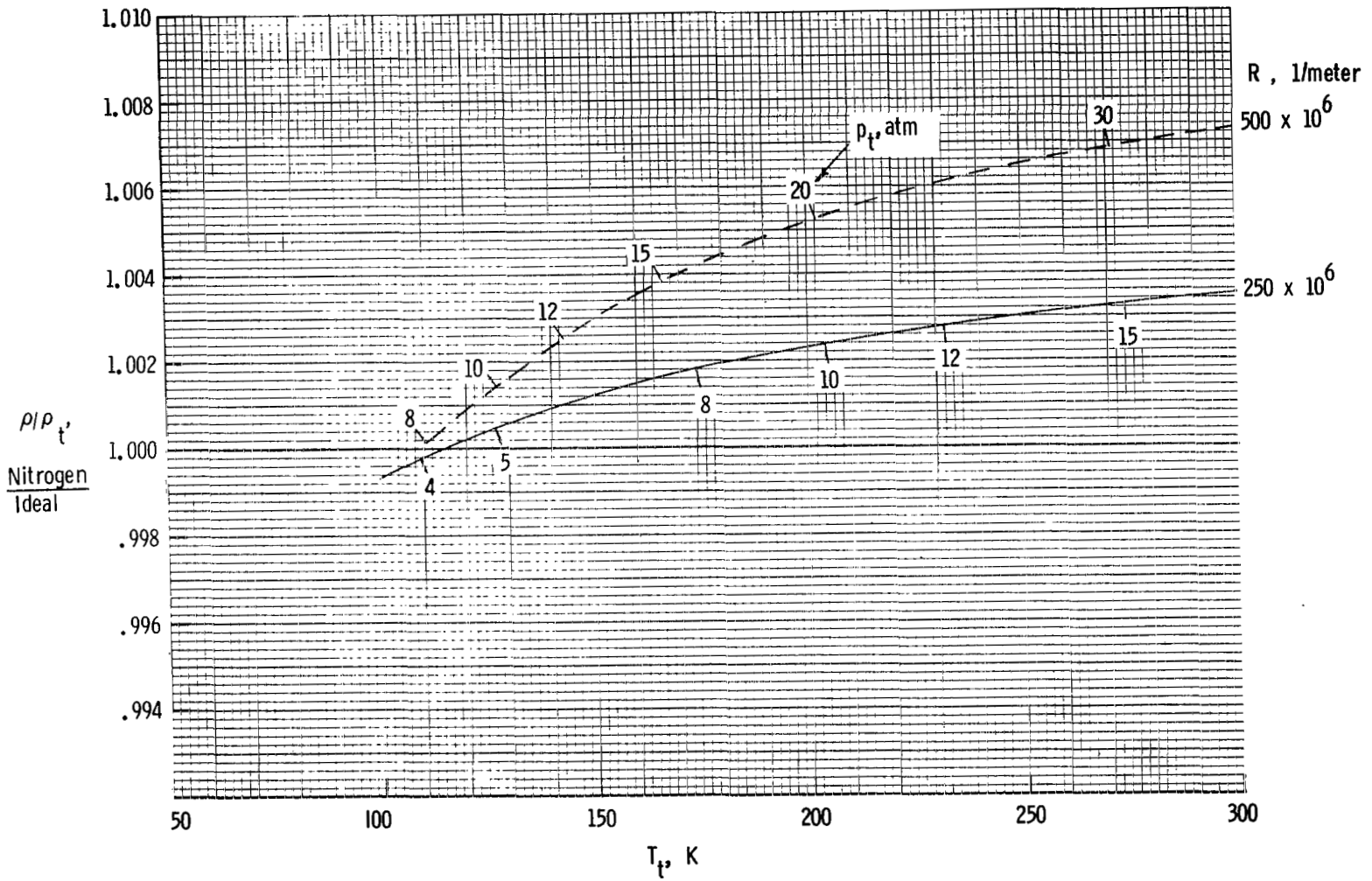


Figure 12.- Density ratios for isentropic expansions of nitrogen to Mach 1.0 at constant unit Reynolds numbers, relative to ideal diatomic gas value.

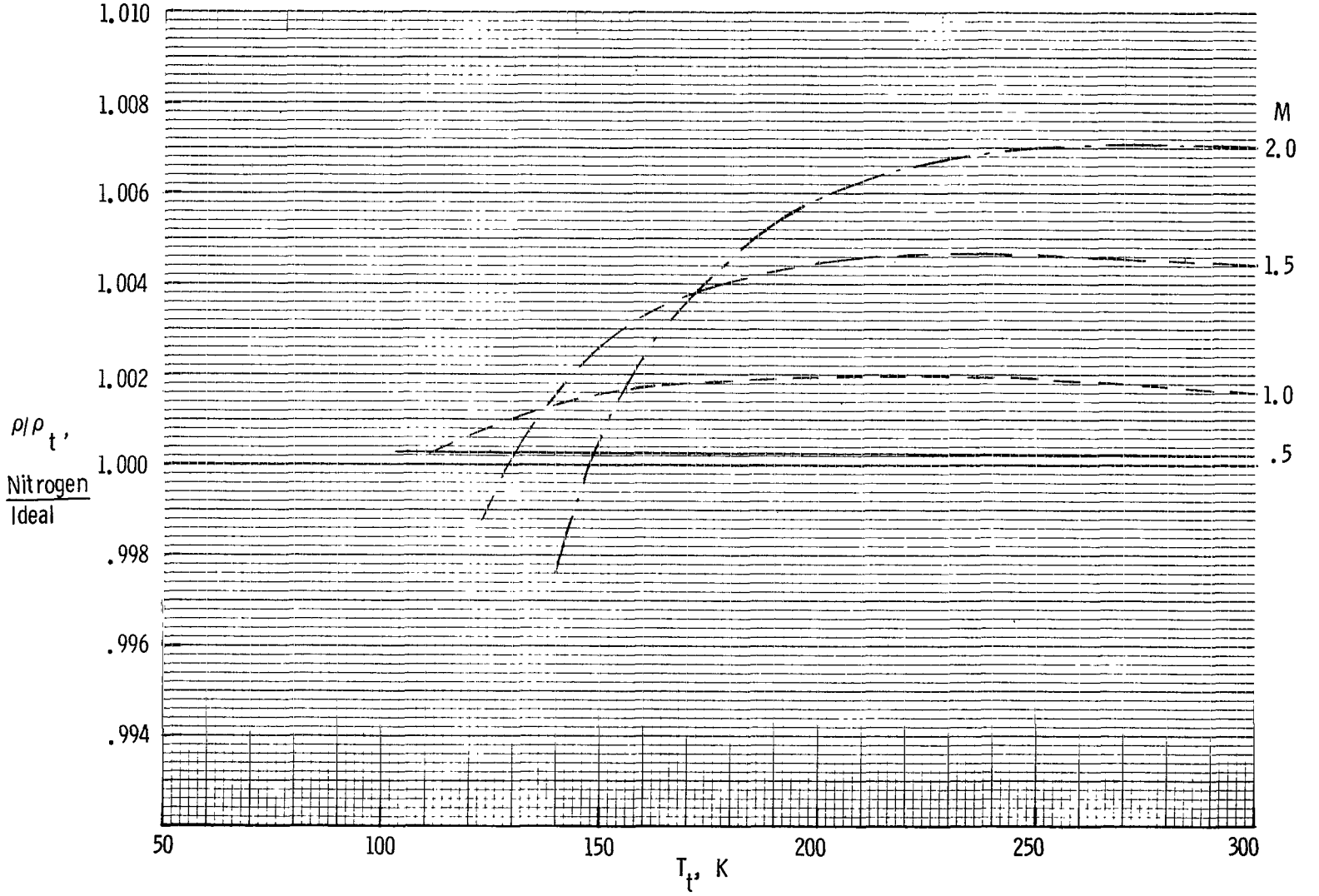


Figure 13.- Density ratios for isentropic expansions of nitrogen to various Mach numbers, relative to ideal diatomic gas values. p_t = 8 atm.

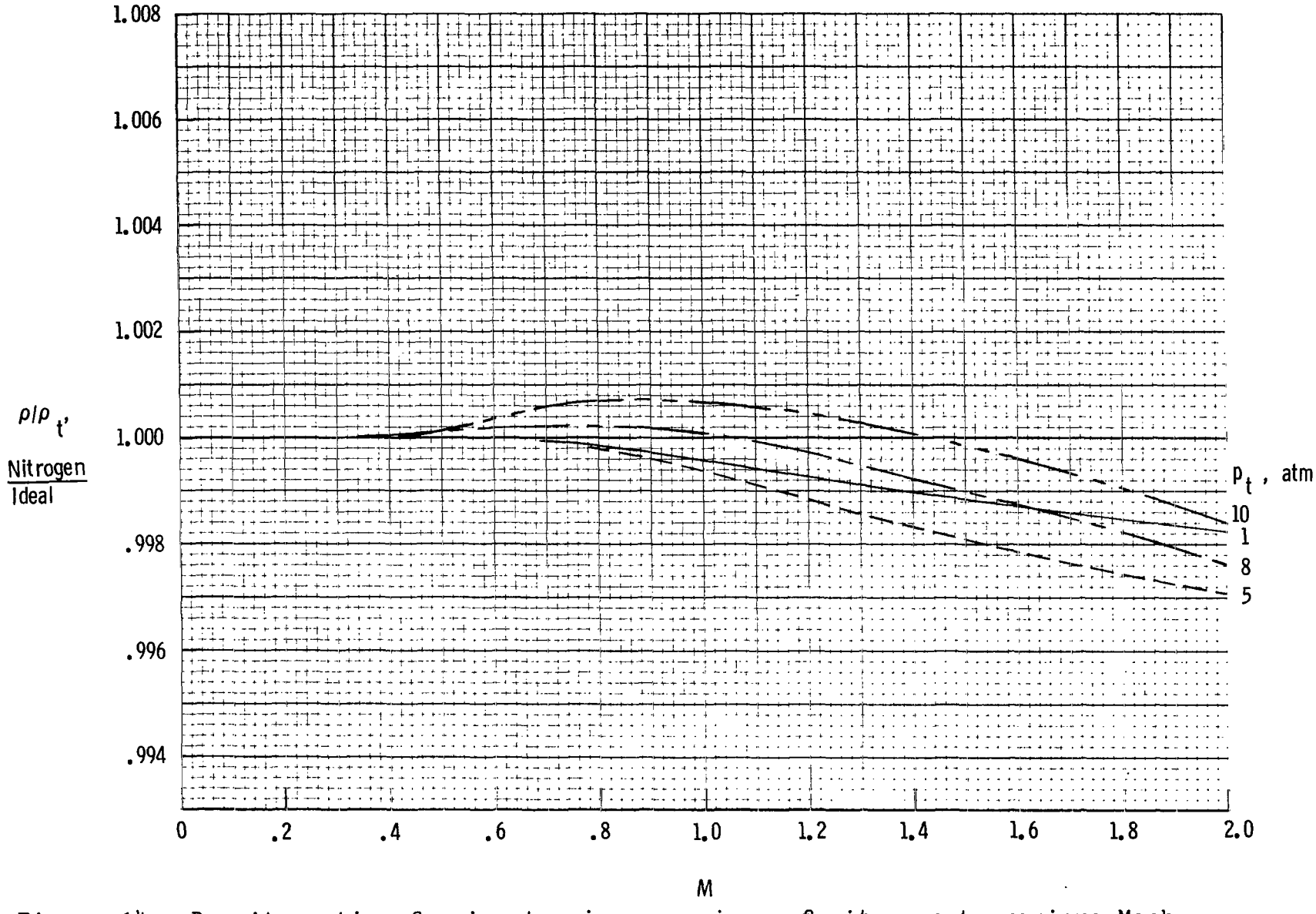


Figure 14.- Density ratios for isentropic expansions of nitrogen to various Mach numbers at saturated stream temperatures, relative to ideal diatomic gas values.

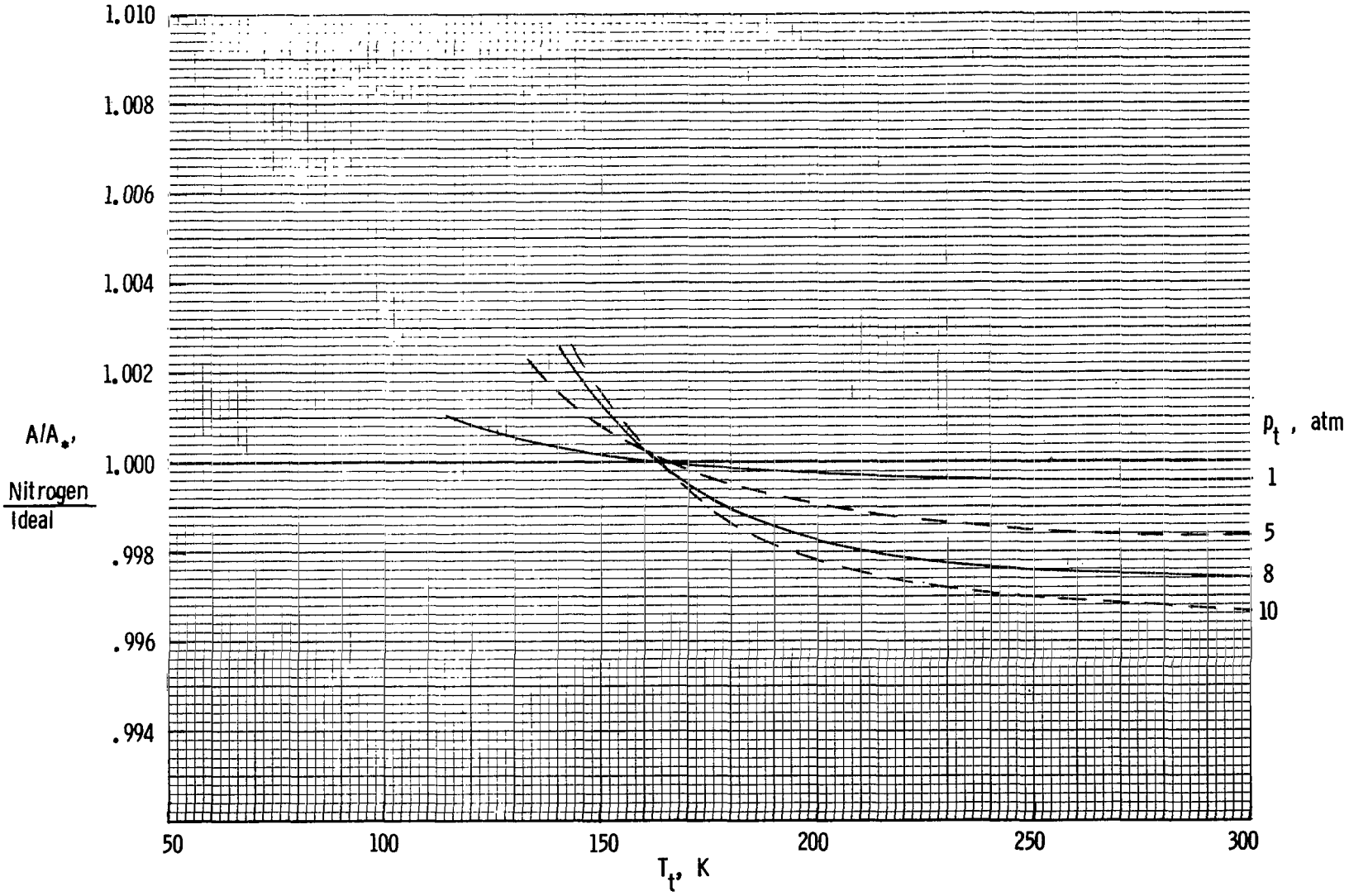


Figure 15.- Isentropic stream-tube area ratio for nitrogen at a Mach number of 2.0, relative to ideal diatomic gas value.

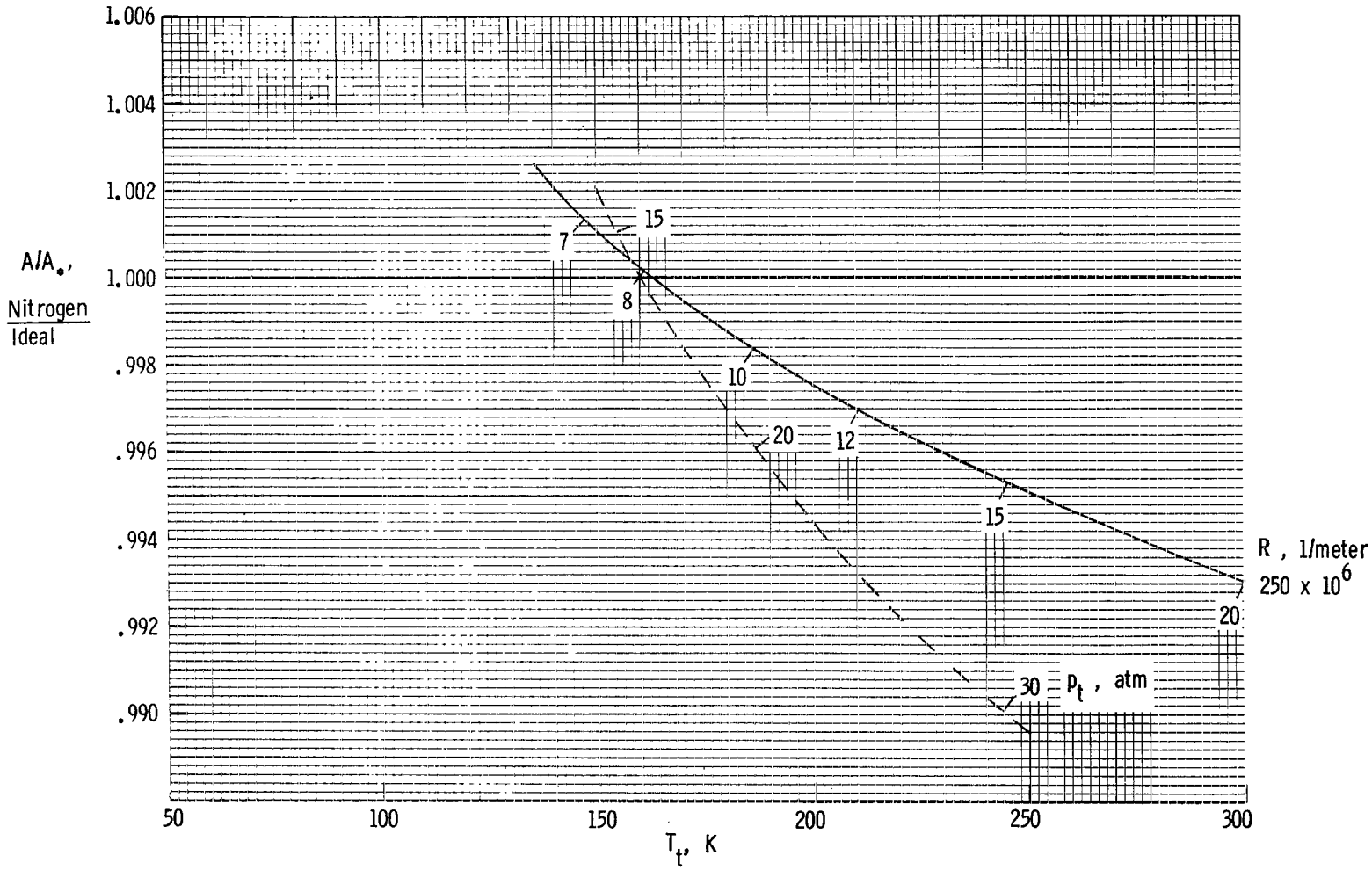


Figure 16.- Isentropic stream-tube area ratio for nitrogen at Mach 2.0 and at constant unit Reynolds numbers, relative to ideal diatomic gas value.

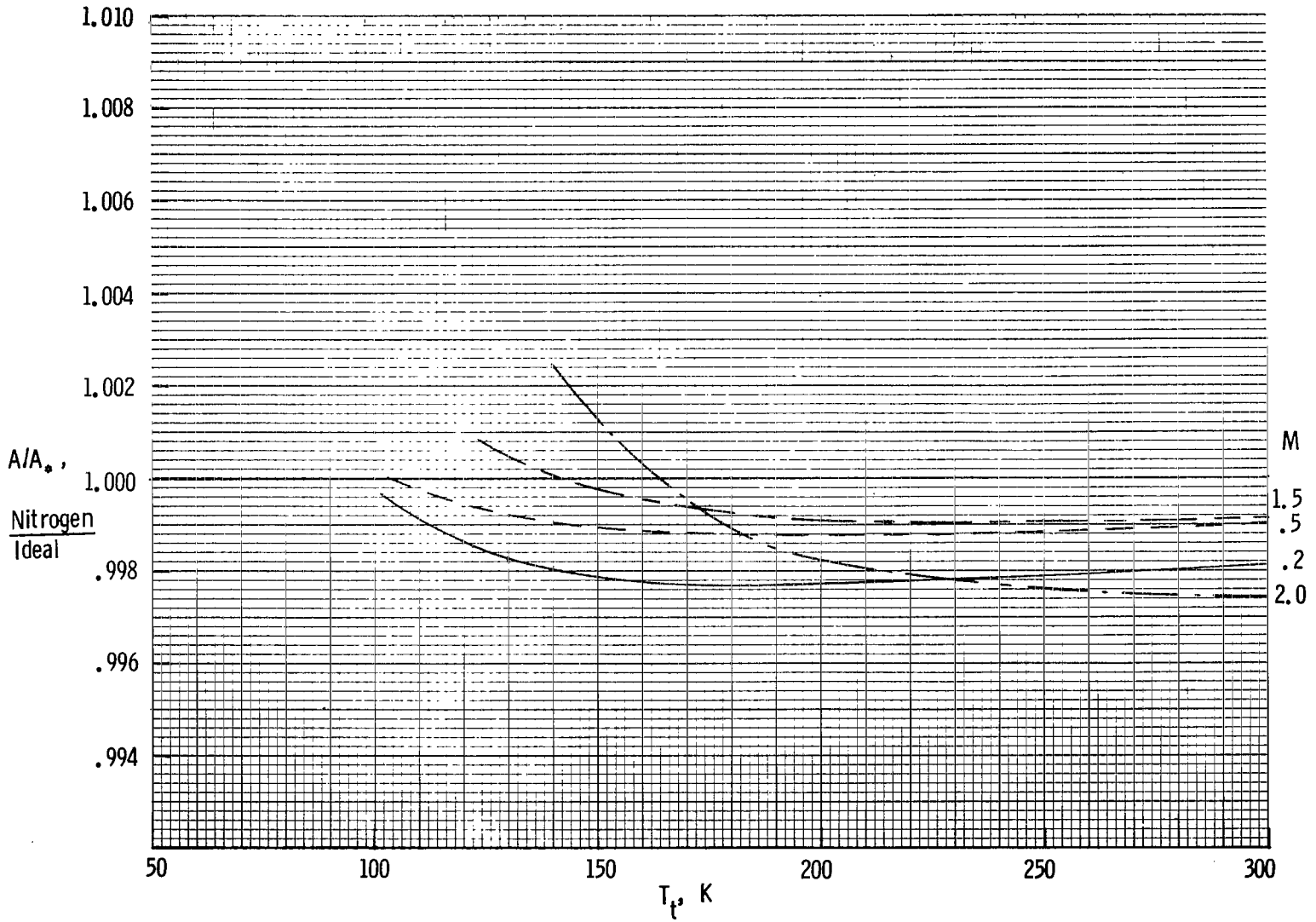


Figure 17.- Isentropic stream-tube area ratio for nitrogen at various Mach numbers, relative to ideal diatomic gas values. p_t = 8 atm.

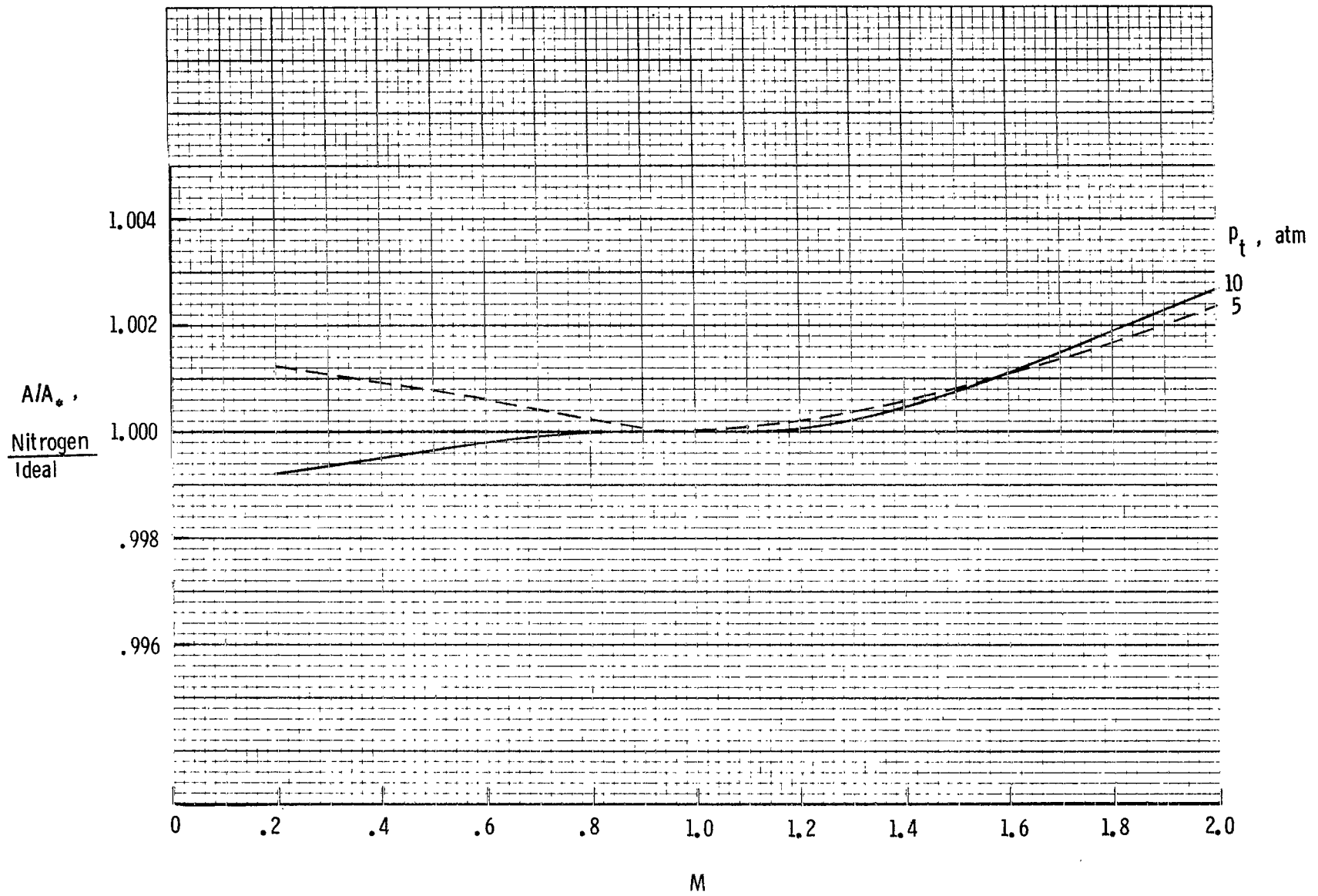


Figure 18.- Isentropic stream-tube area ratio for nitrogen at saturated stream temperatures, relative to ideal diatomic gas values.

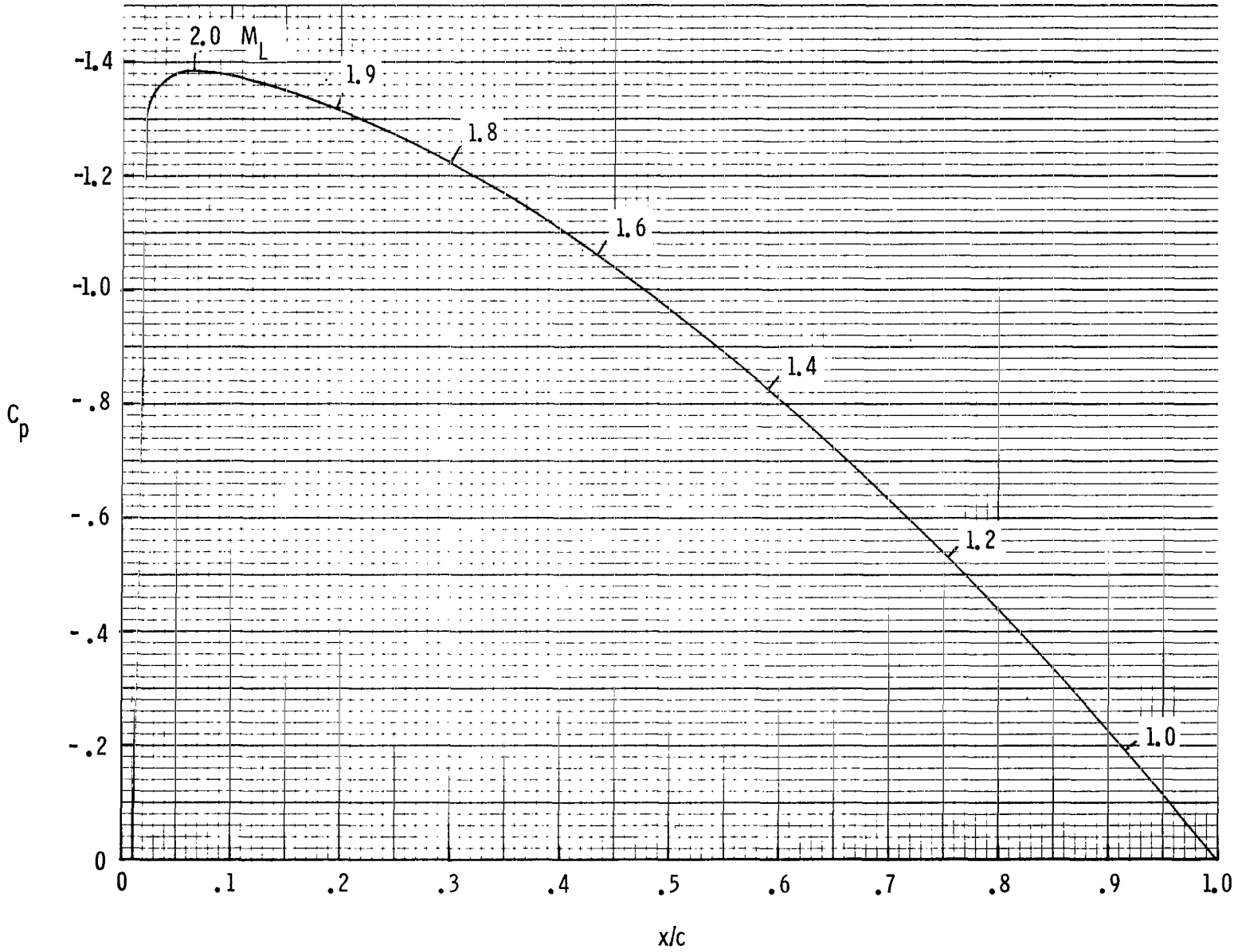


Figure 19.- Typical pressure distribution on upper surface of airfoil at high lift conditions. $M_\infty = 0.90$.

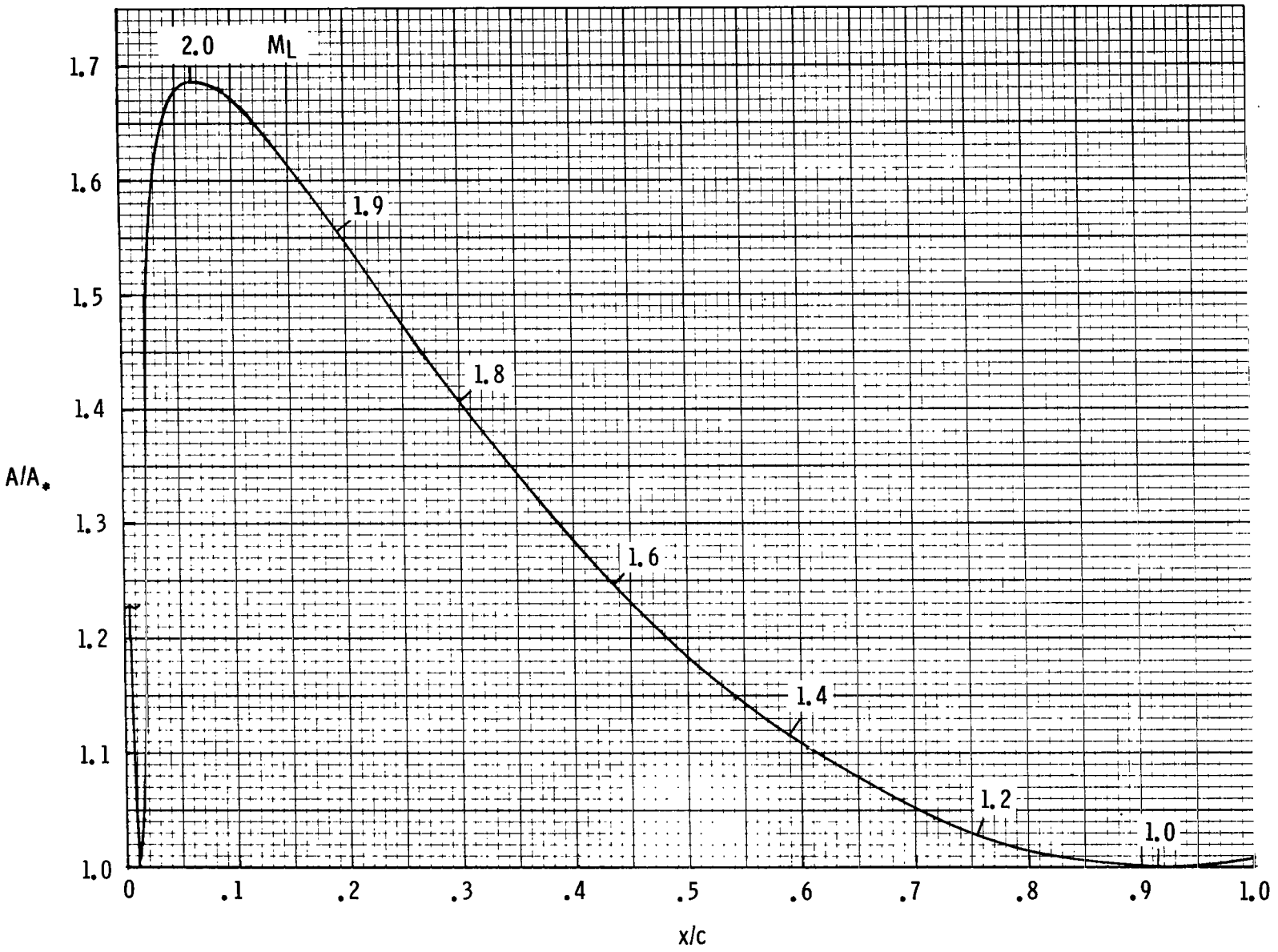


Figure 20.- Area distribution of stream tube that has same pressure distribution as that of airfoil of figure 19, ideal diatomic gas and isentropic flow assumed.

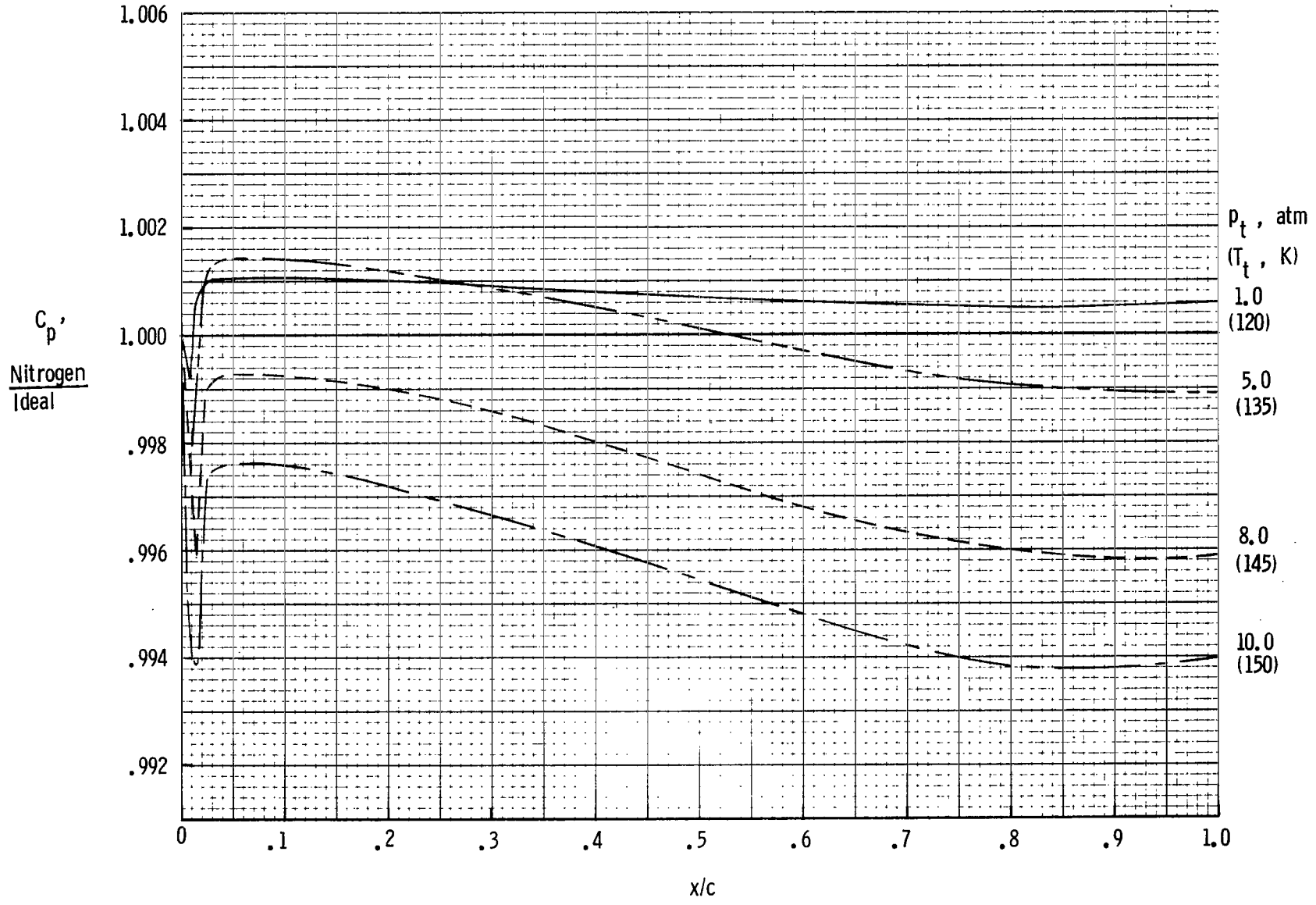


Figure 21.- Stream-tube pressure distributions for nitrogen at various stagnation pressures and at temperatures near saturation at maximum local Mach number of 2.0, relative to ideal diatomic gas distributions.

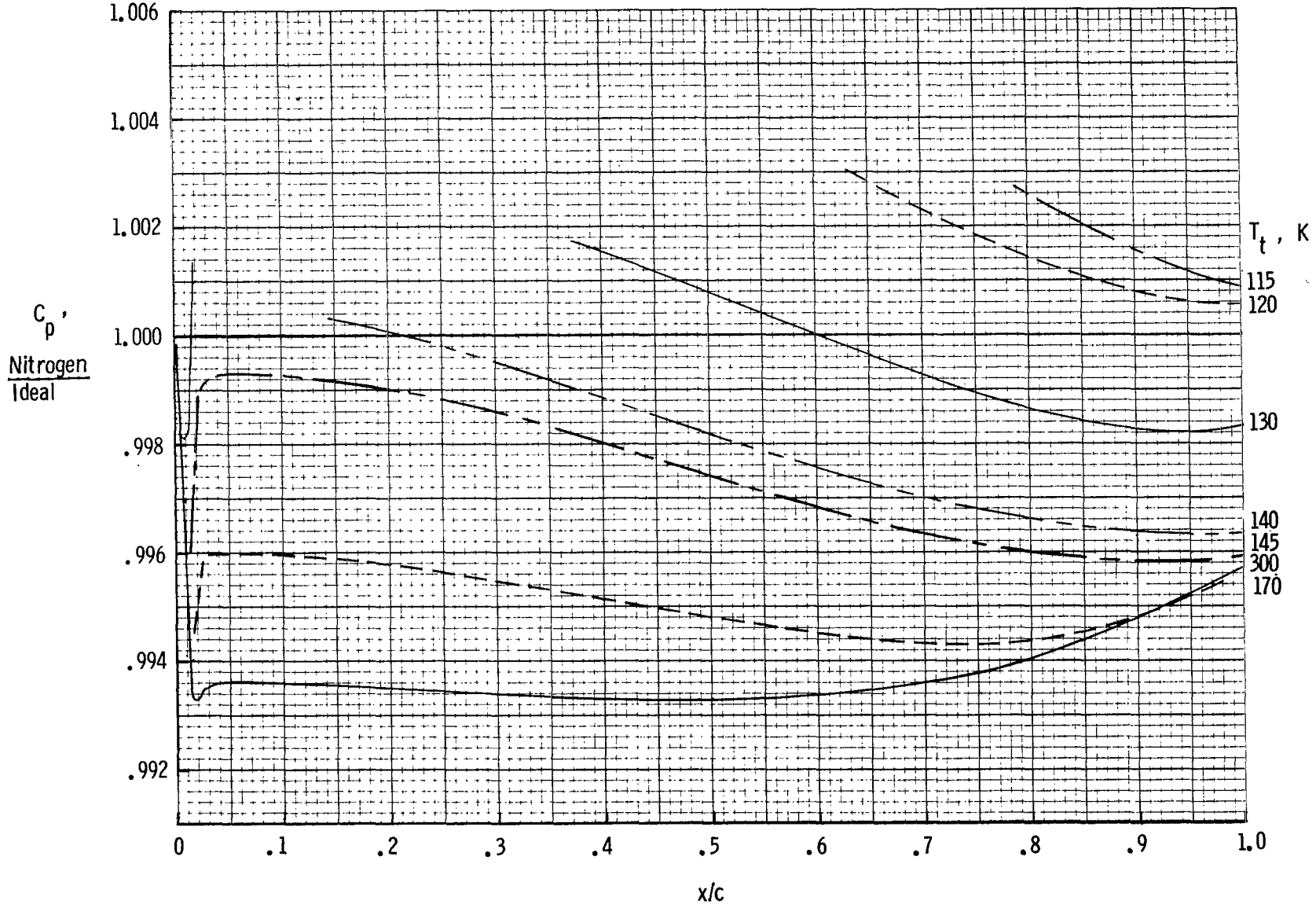


Figure 22.- Stream-tube pressure distributions for nitrogen at various stagnation temperatures and 8-atm stagnation pressure, relative to ideal diatomic gas distributions.

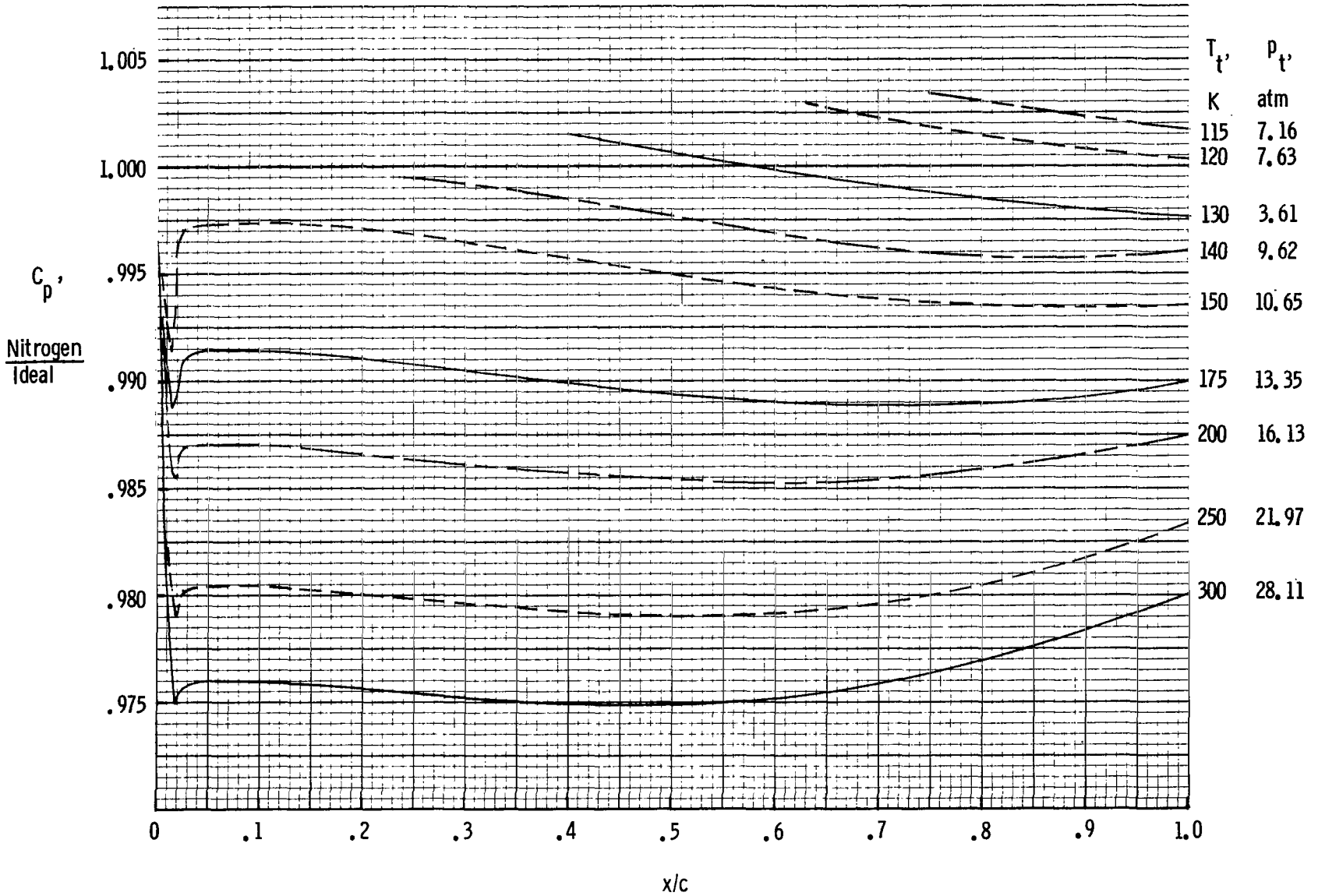


Figure 23.- Stream-tube pressure distributions for nitrogen at combinations of stagnation temperature and pressure that result in flow at constant unit Reynolds number of 400×10^6 per meter at $M_\infty = 0.90$.

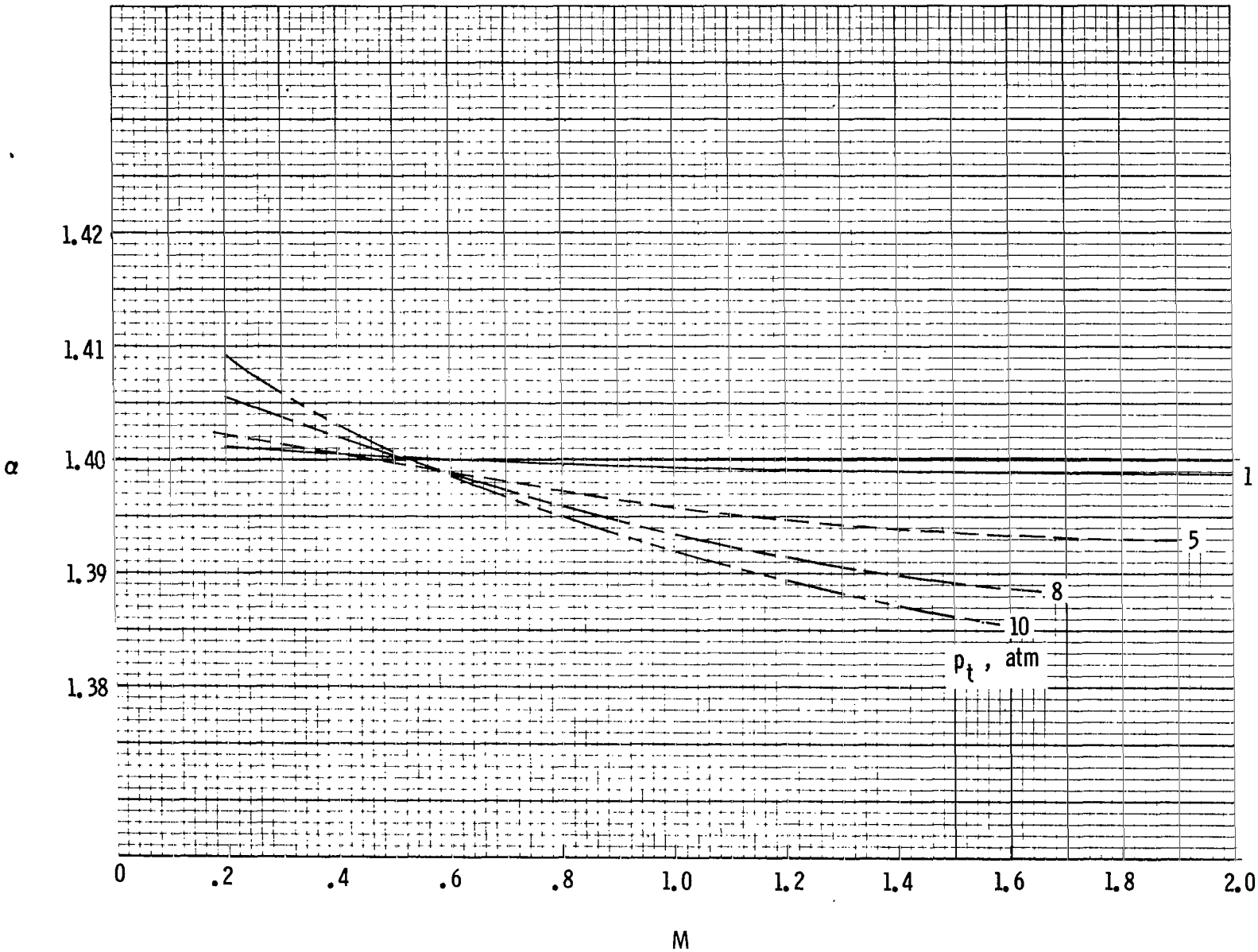


Figure 24.- Isentropic expansion coefficients along isentropes that begin at stagnation temperature of 130 K.

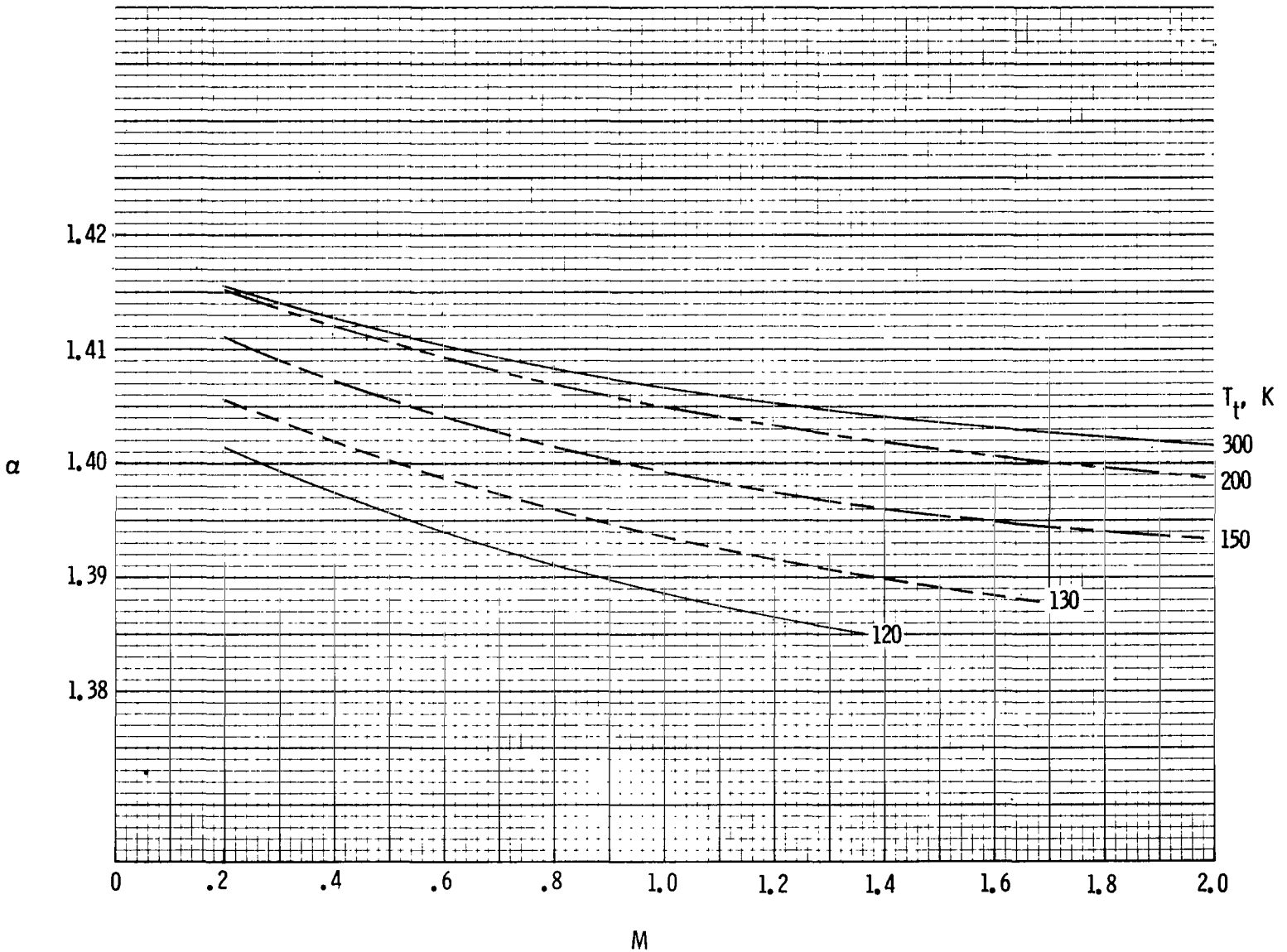


Figure 25.- Isentropic expansion coefficients along isentropes that begin at stagnation pressure of 8 atm.

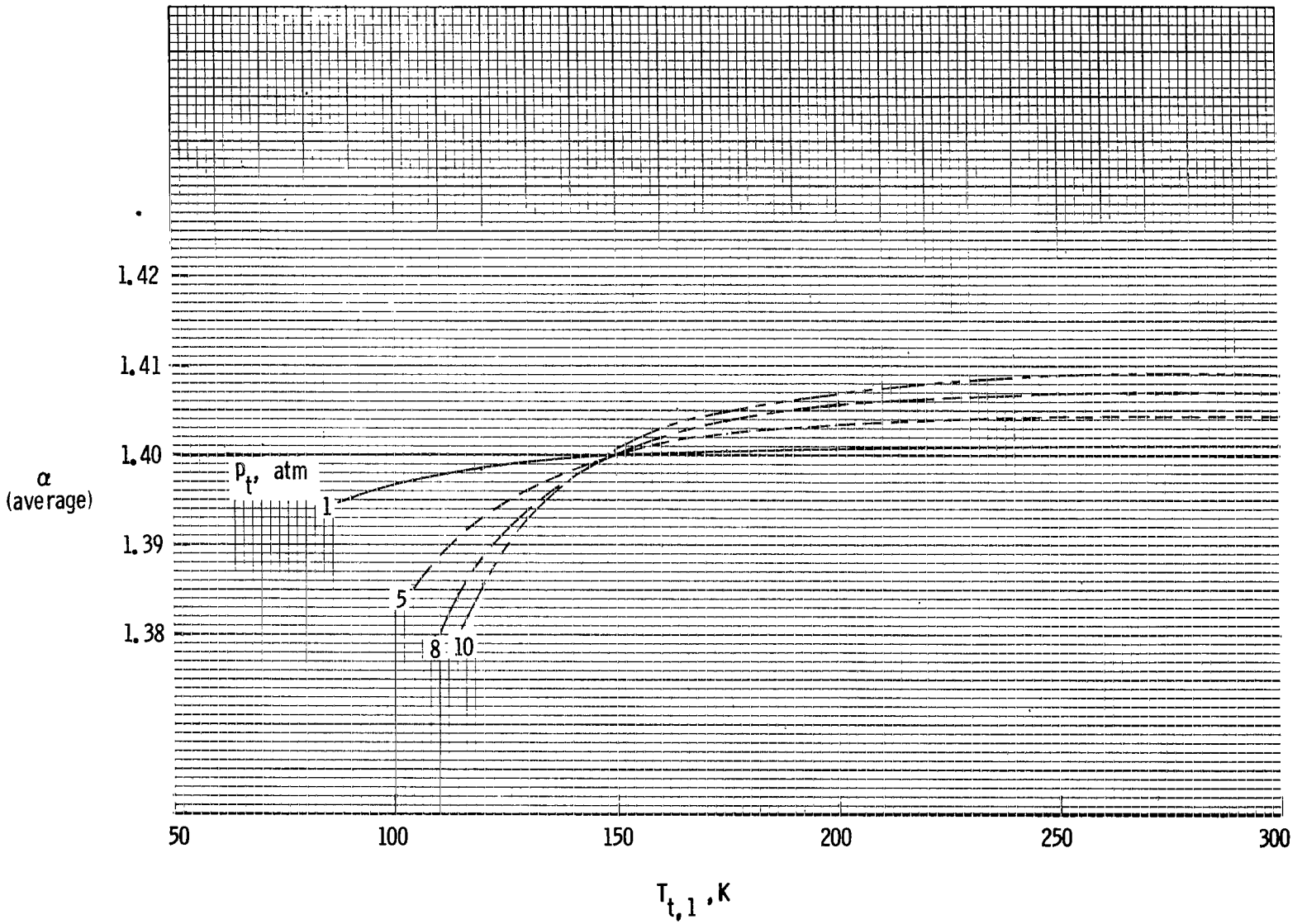
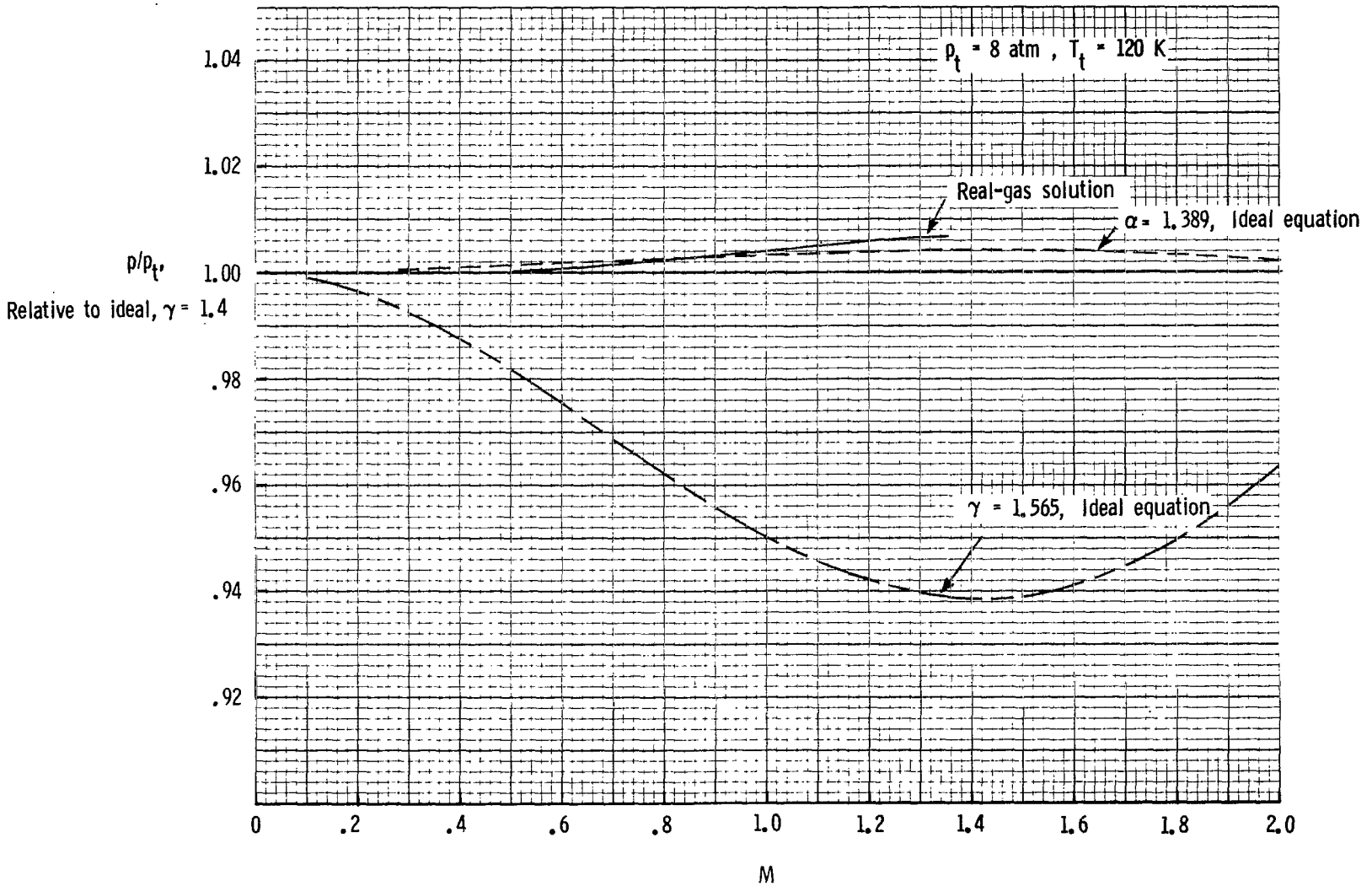
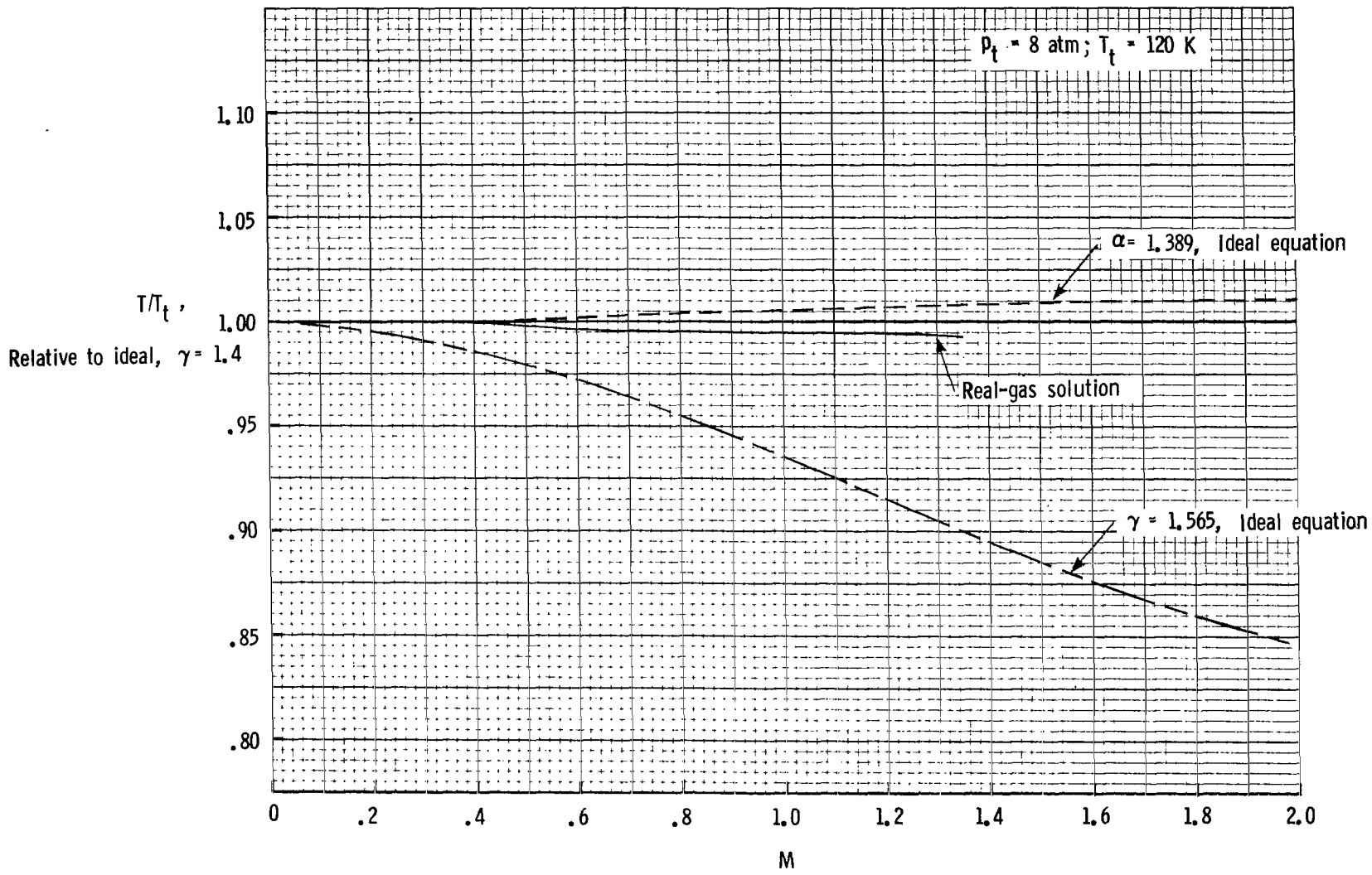


Figure 26.- Average isentropic expansion coefficients for expansions of nitrogen to Mach 2.0.



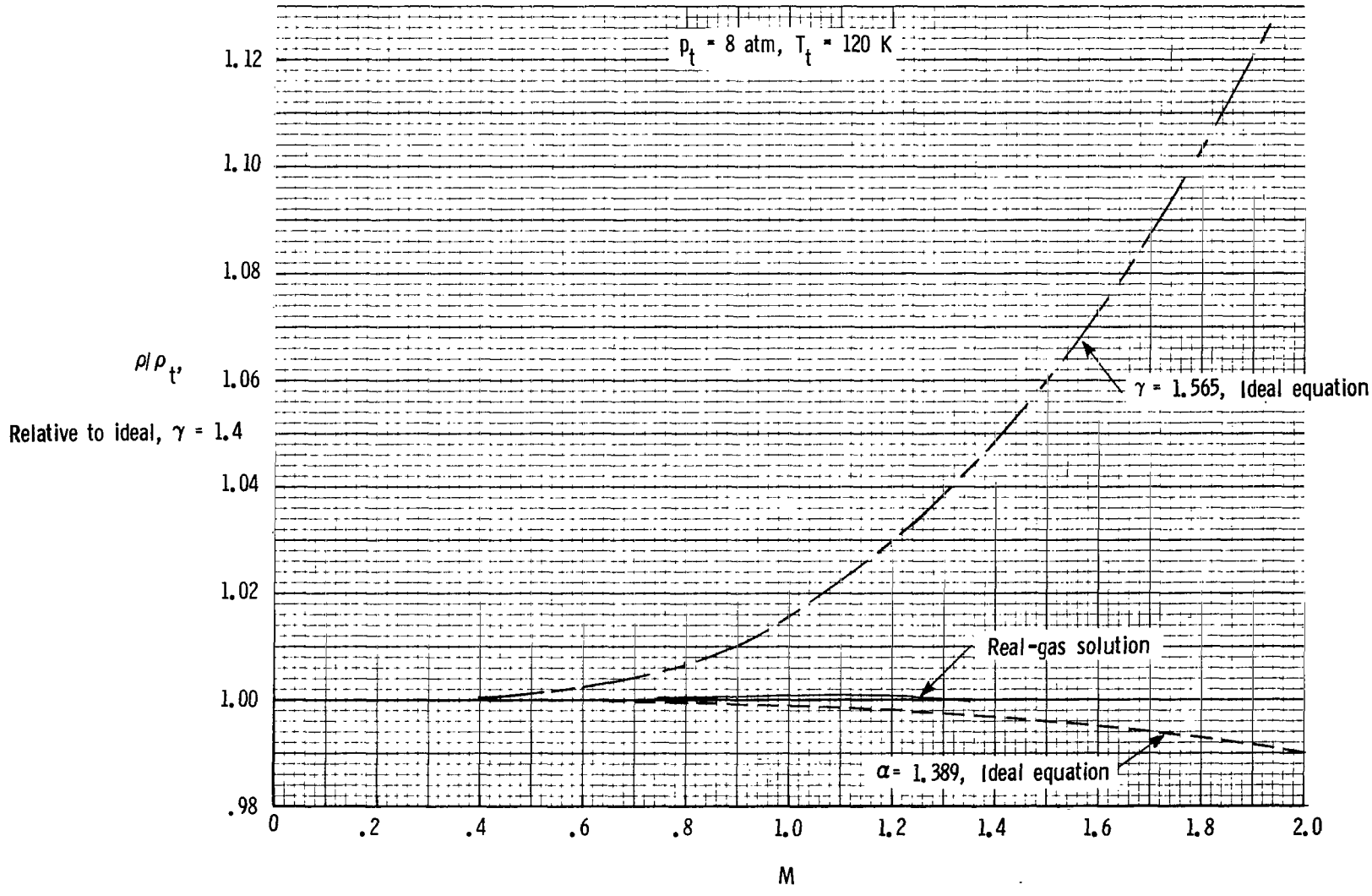
(a) Pressure ratio.

Figure 27.- Isentropic flow parameters for nitrogen as determined by various methods, relative to ideal diatomic gas values.



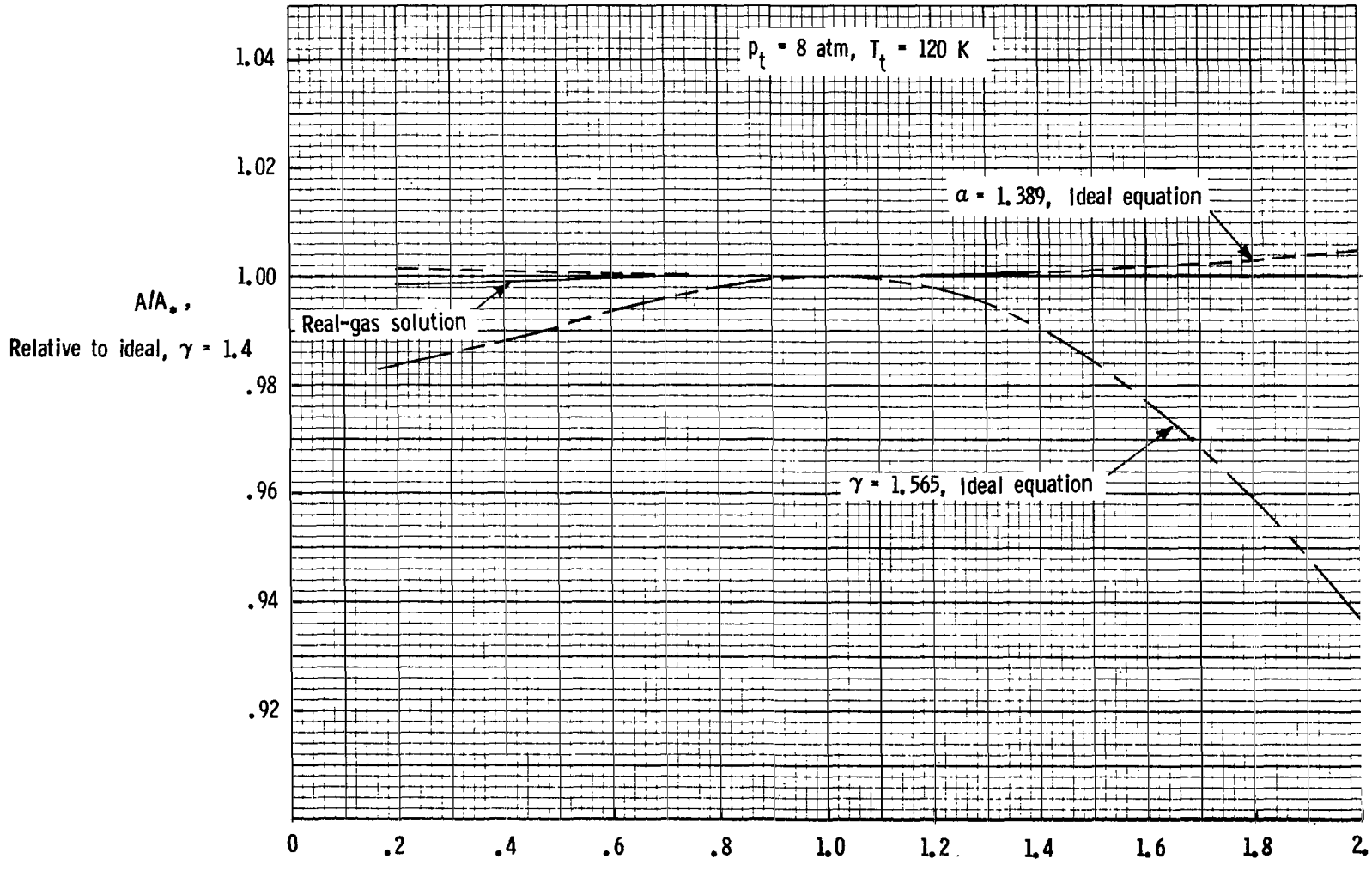
(b) Temperature ratio.

Figure 27.- Continued.



(c) Density ratio.

Figure 27.- Continued.



(d) Stream-tube area ratio.

Figure 27.- Concluded.

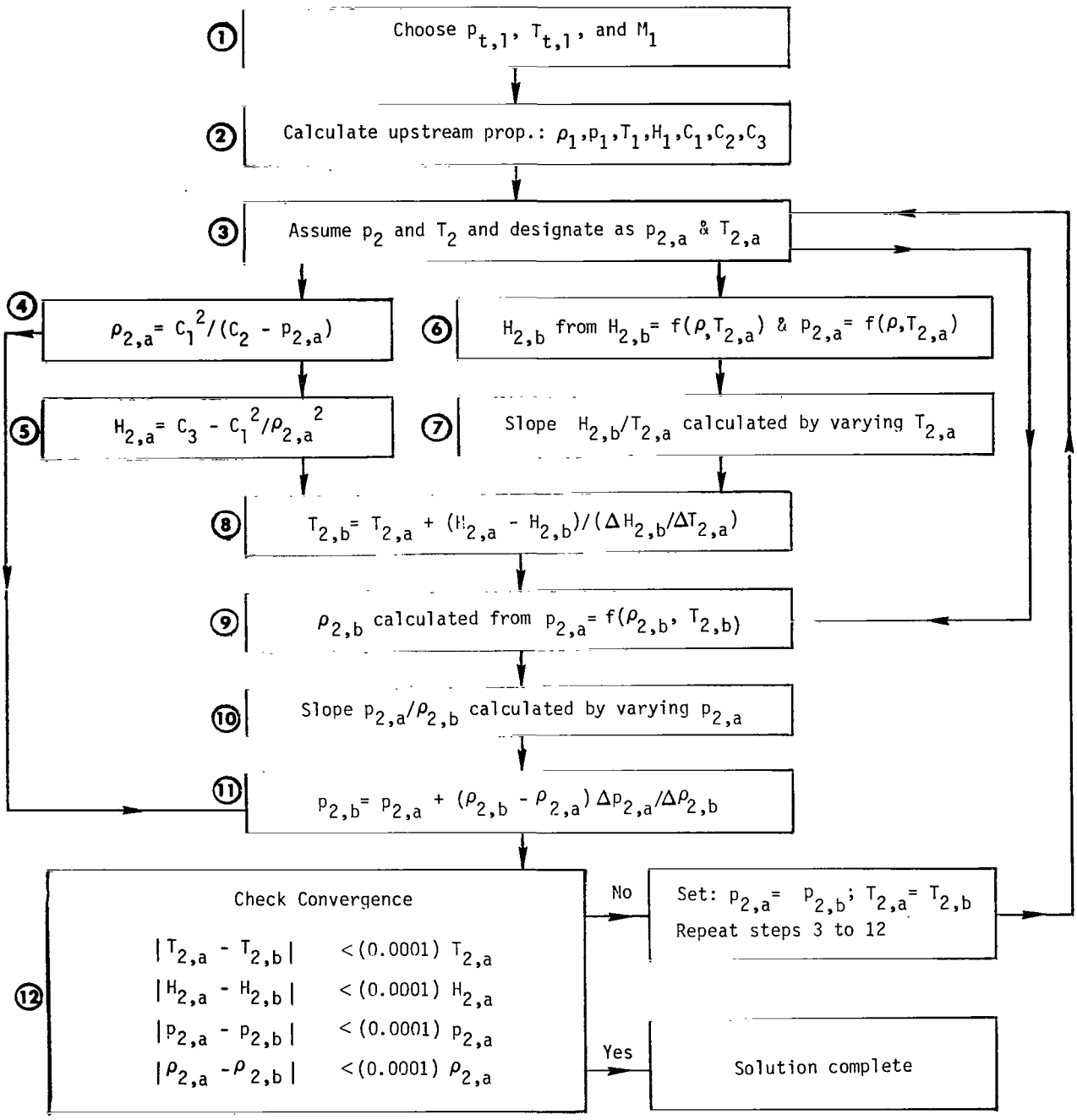


Figure 28.- Iterative procedure used to obtain real-gas normal-shock solutions.

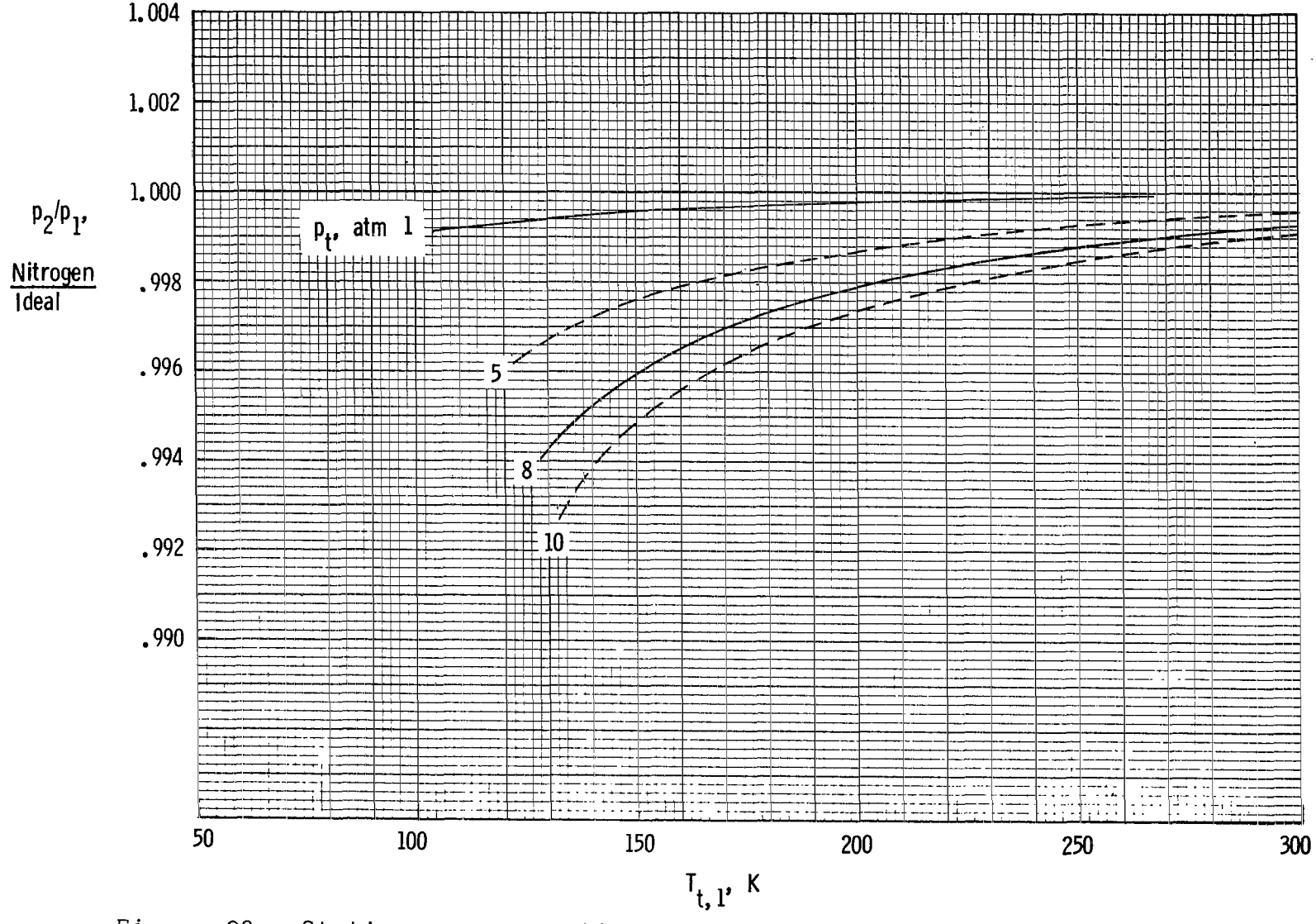


Figure 29.- Static-pressure ratio across normal shocks in nitrogen gas at various stagnation temperatures and pressures, relative to ideal diatomic gas value. $M_1 = 1.7$.

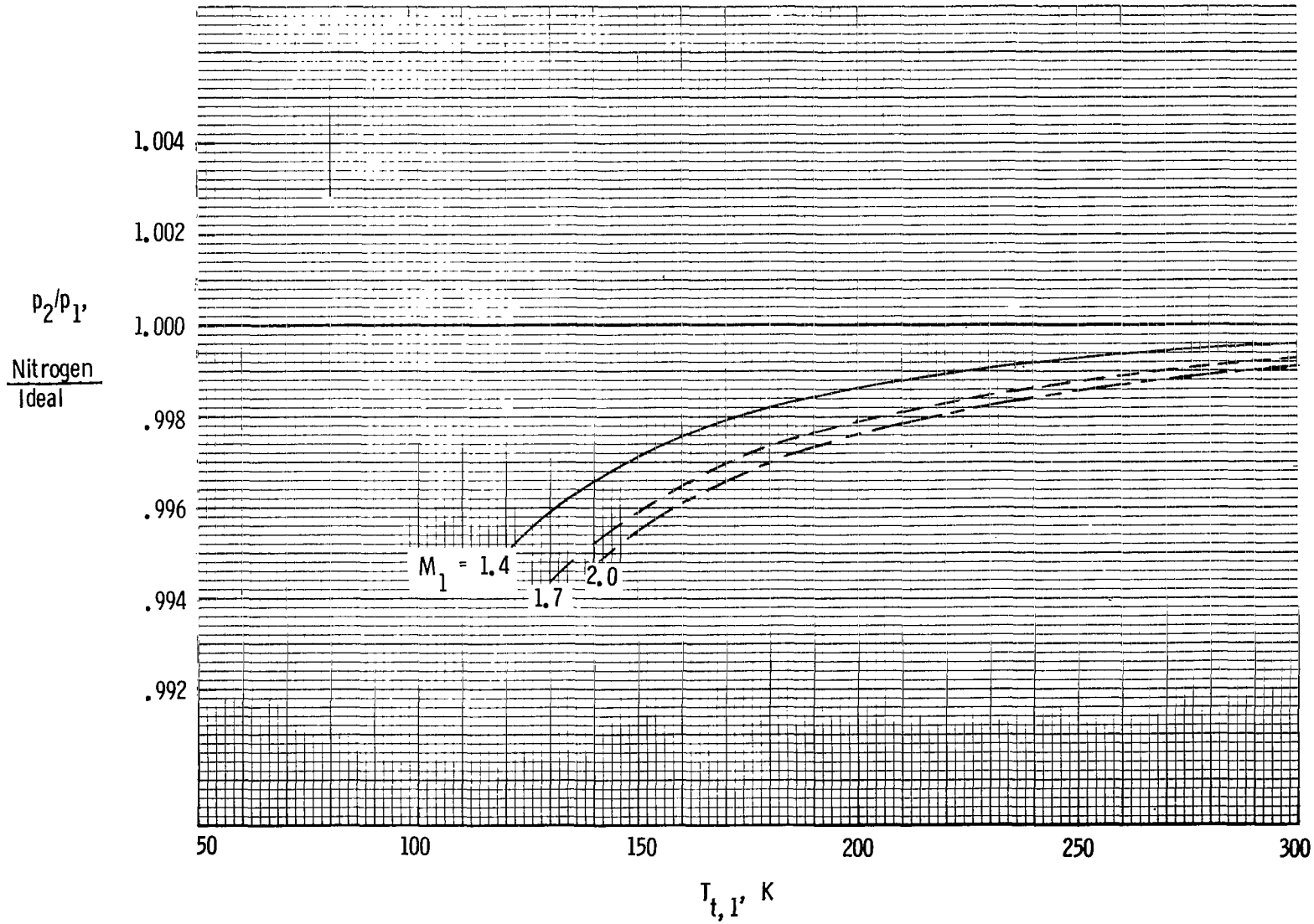


Figure 30.- Static-pressure ratio across normal shocks in nitrogen gas at various stagnation temperatures and upstream Mach numbers, relative to ideal diatomic gas values. p_t = 8 atm.

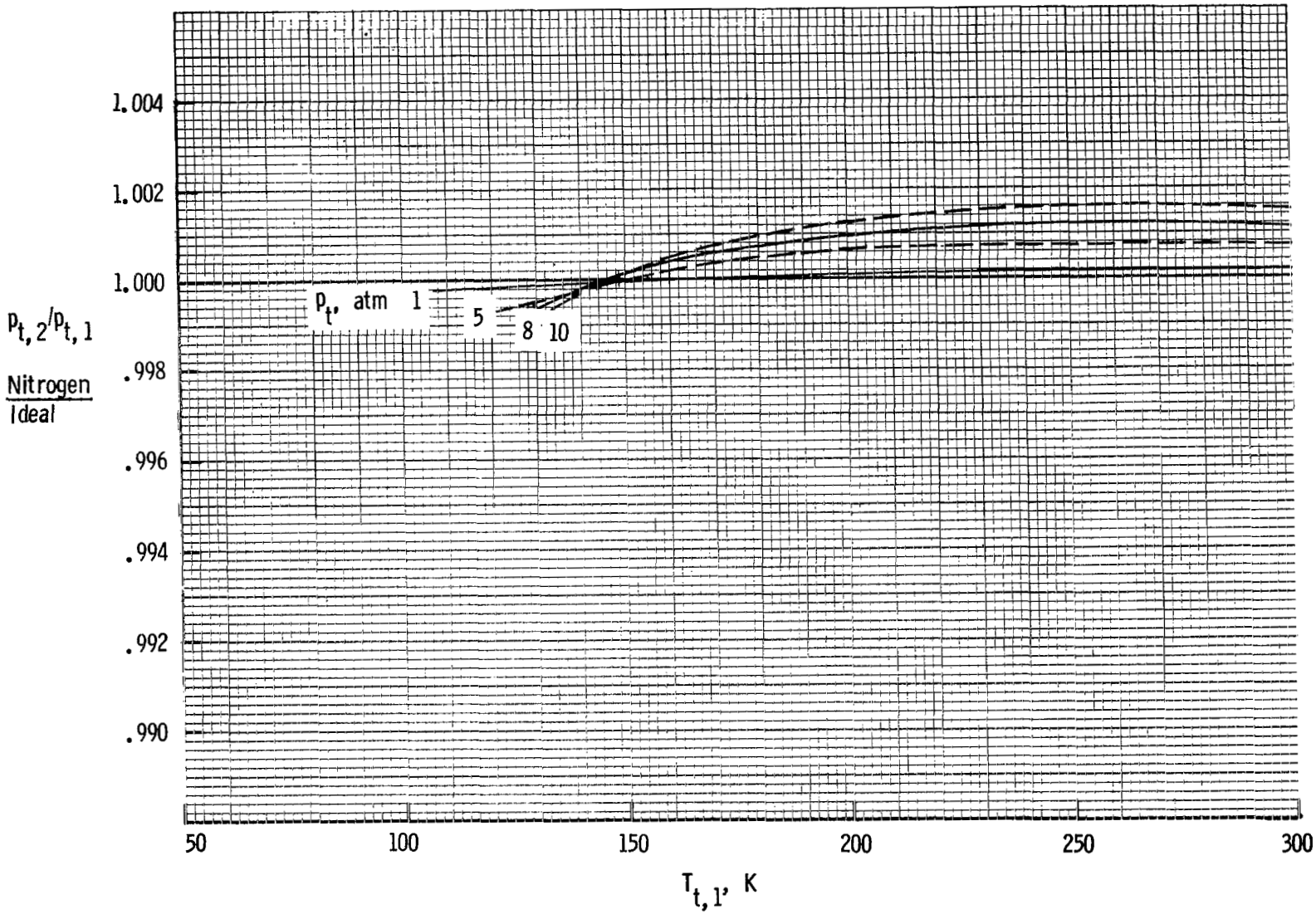


Figure 31.- Total-pressure ratio across normal shocks in nitrogen gas at various stagnation temperatures and pressures, relative to ideal diatomic gas value. $M_1 = 1.7$.

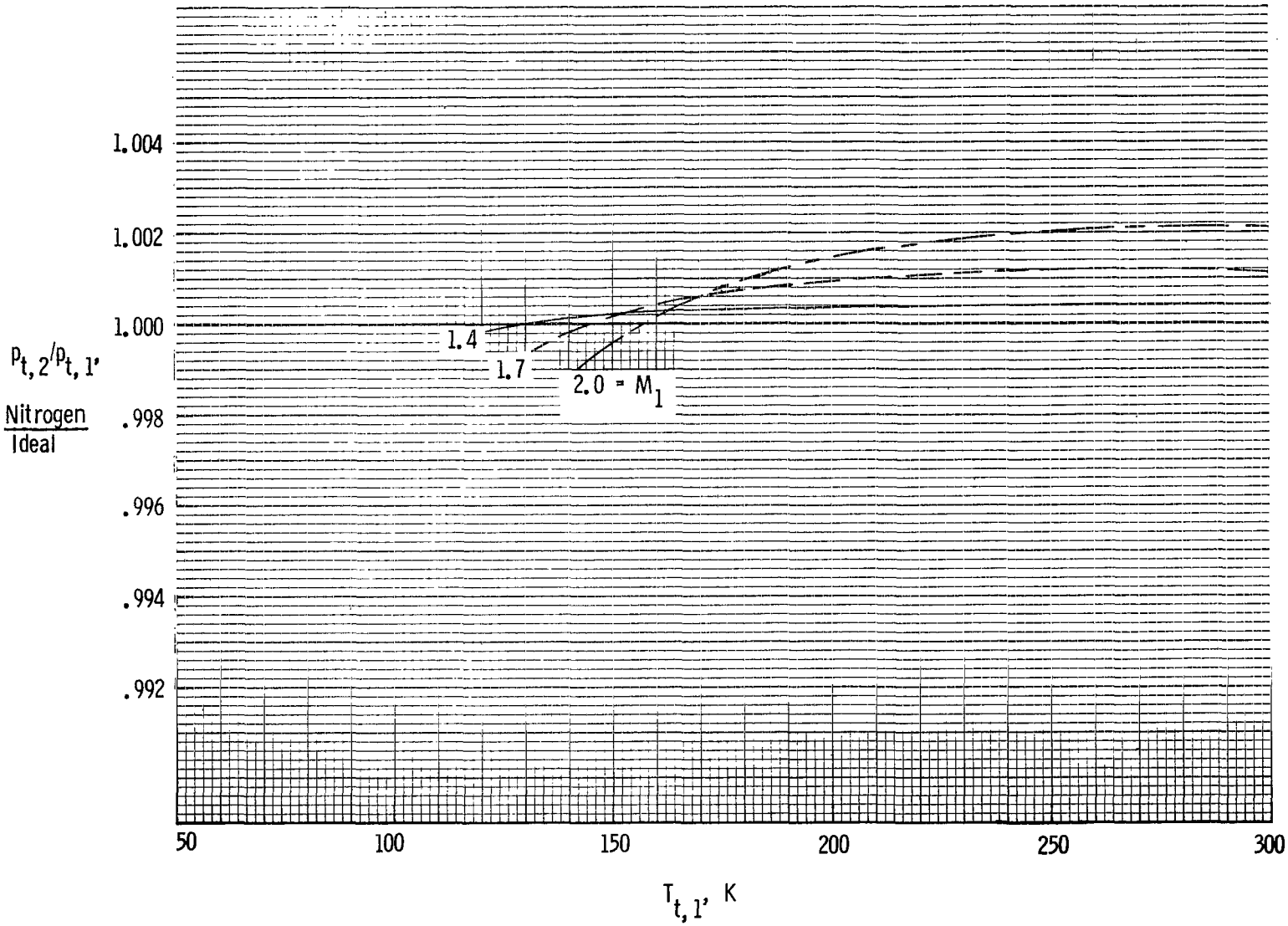


Figure 32.- Total-pressure ratio across normal shocks in nitrogen gas at various stagnation temperatures and upstream Mach numbers, relative to ideal diatomic gas values. p_t = 8 atm.

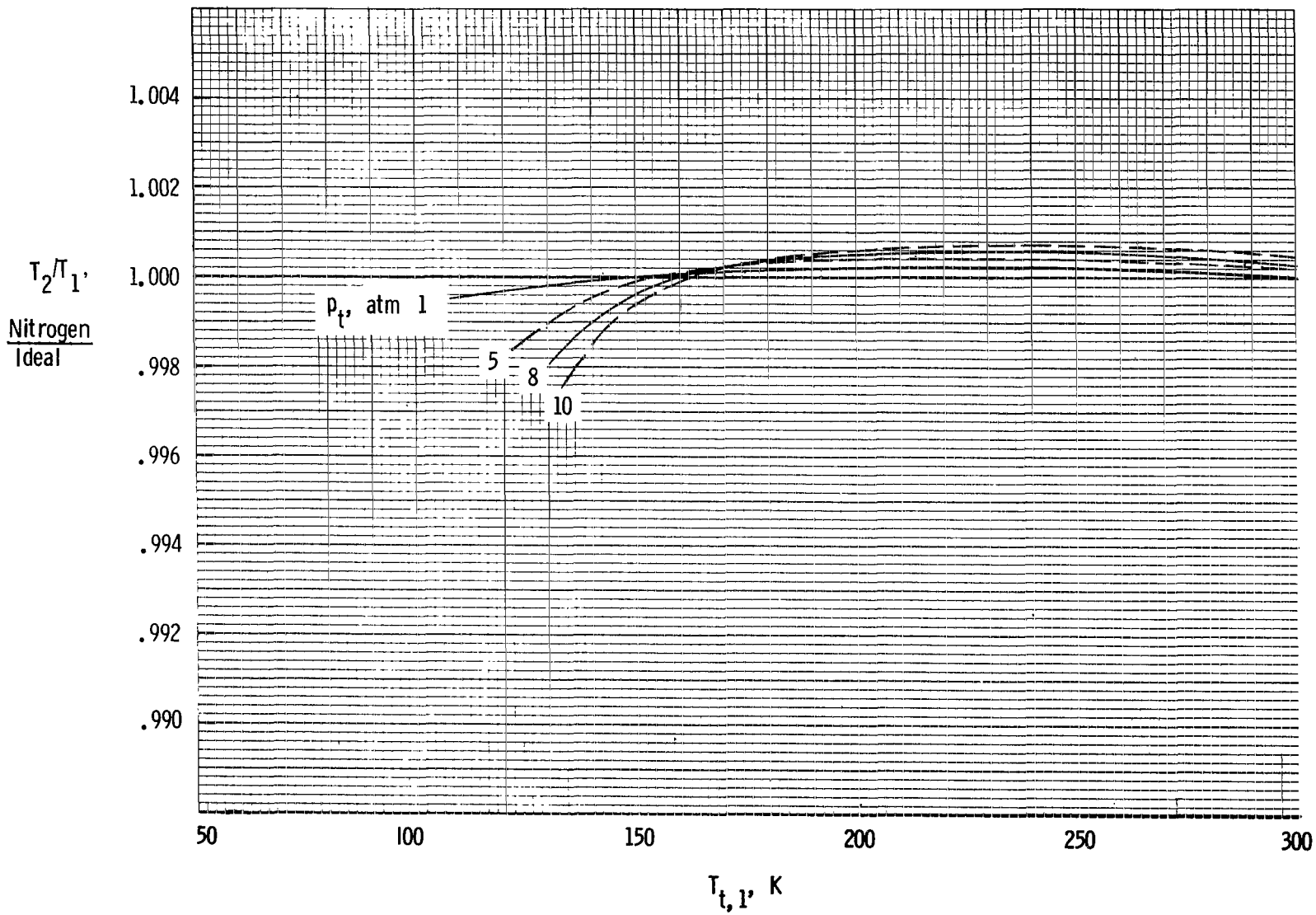


Figure 33.- Static-temperature ratio across normal shocks in nitrogen gas at various stagnation temperatures and pressures, relative to ideal diatomic gas value. $M_1 = 1.7$.

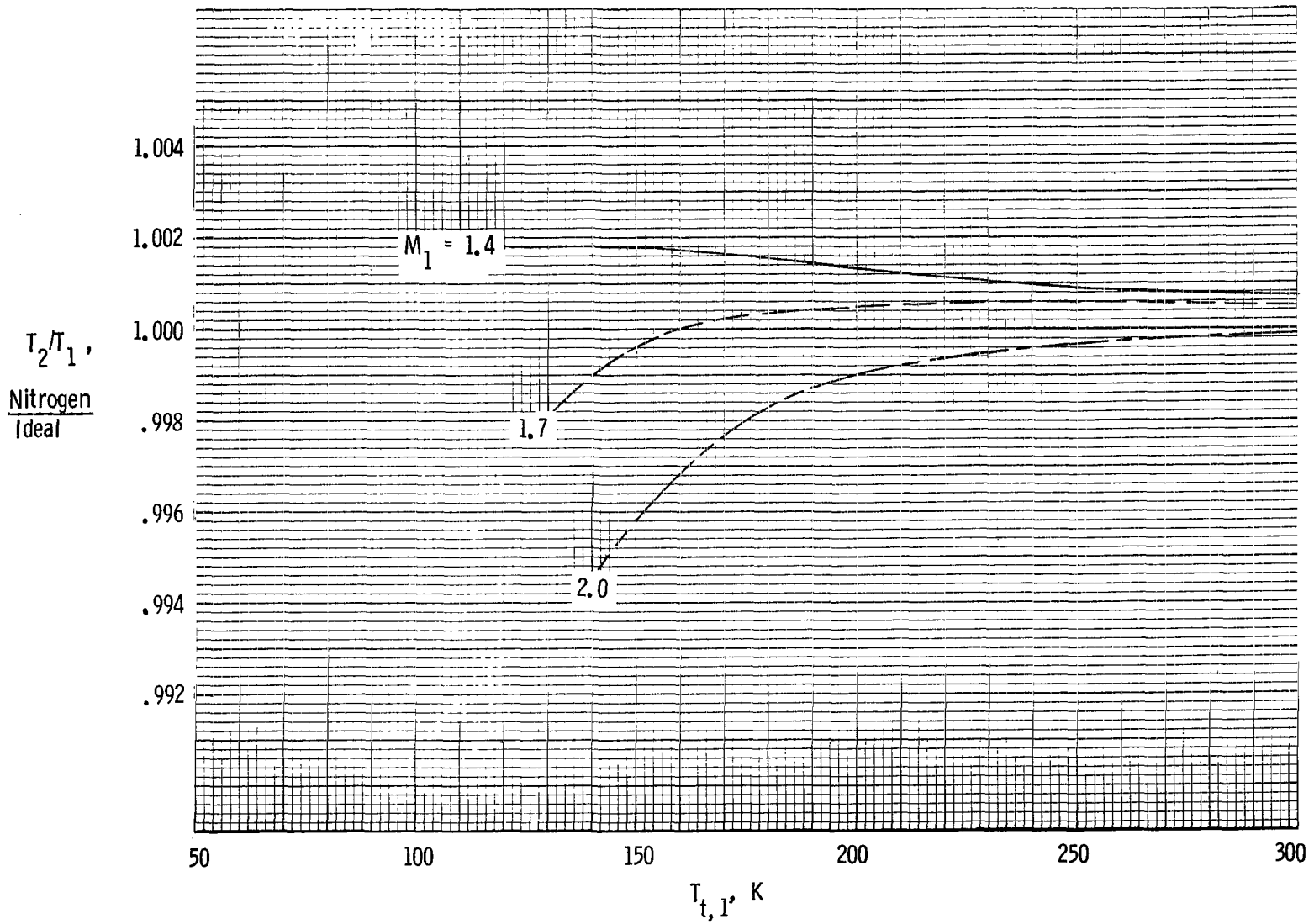


Figure 34.- Static-temperature ratio across normal shocks in nitrogen gas at various stagnation temperatures and upstream Mach numbers, relative to ideal diatomic gas values. p_t = 8 atm.

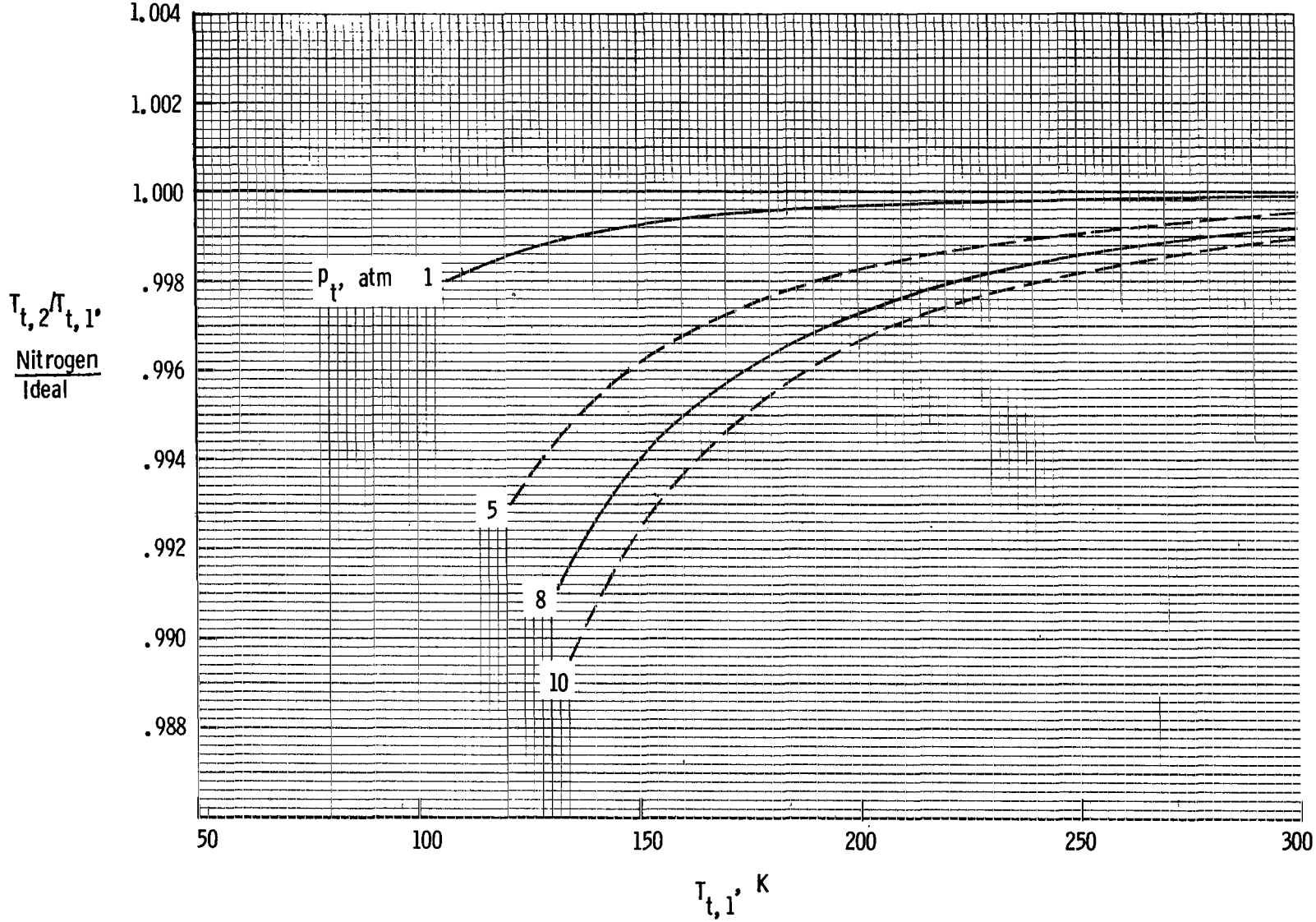


Figure 35.- Total-temperature ratio across normal shocks in nitrogen gas at various stagnation temperatures and pressures, relative to ideal diatomic gas value. $M_1 = 1.7$.

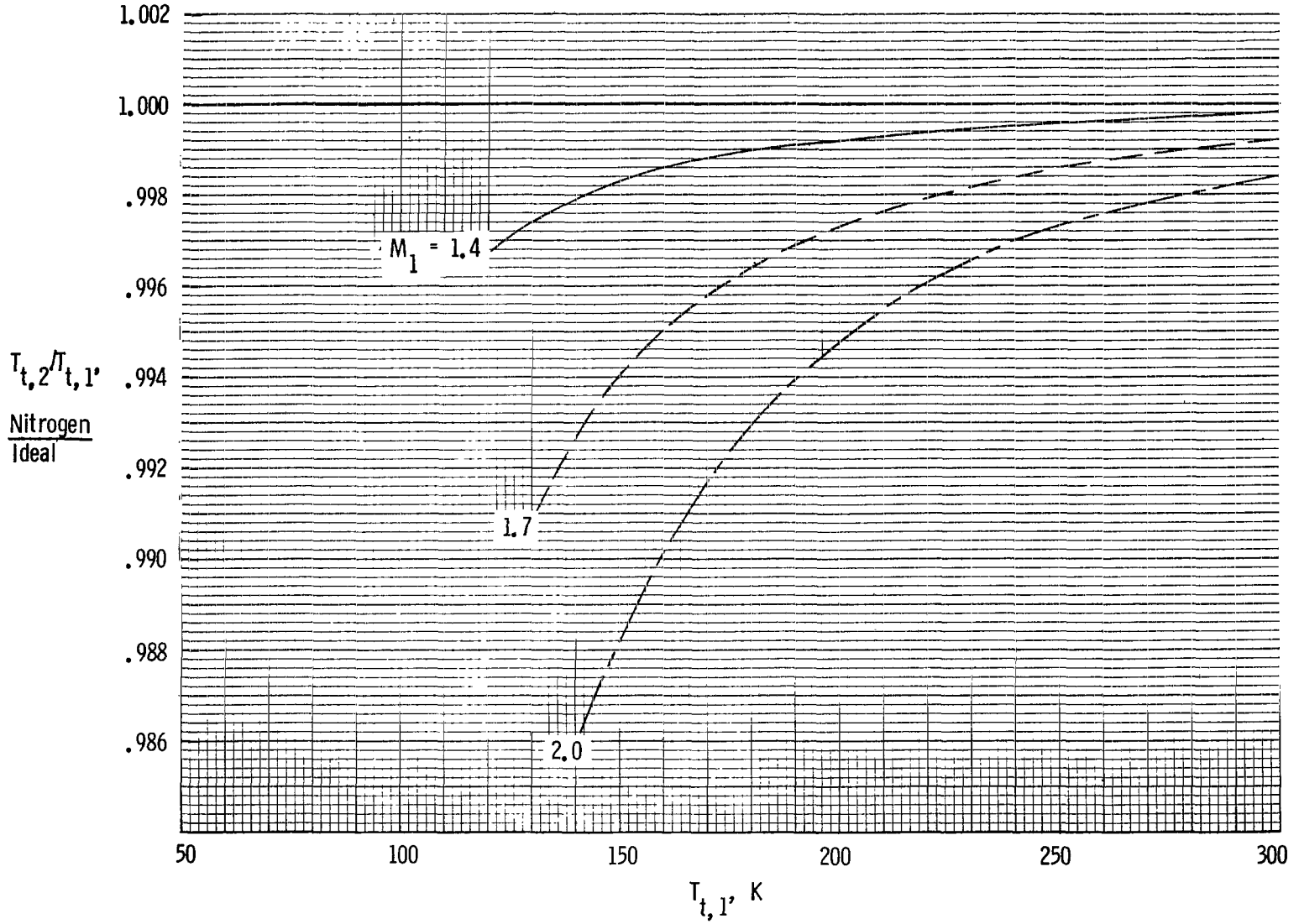


Figure 36.- Total-temperature ratio across normal shocks in nitrogen gas at various stagnation temperatures and upstream Mach numbers, relative to ideal diatomic gas values. p_t = 8 atm.

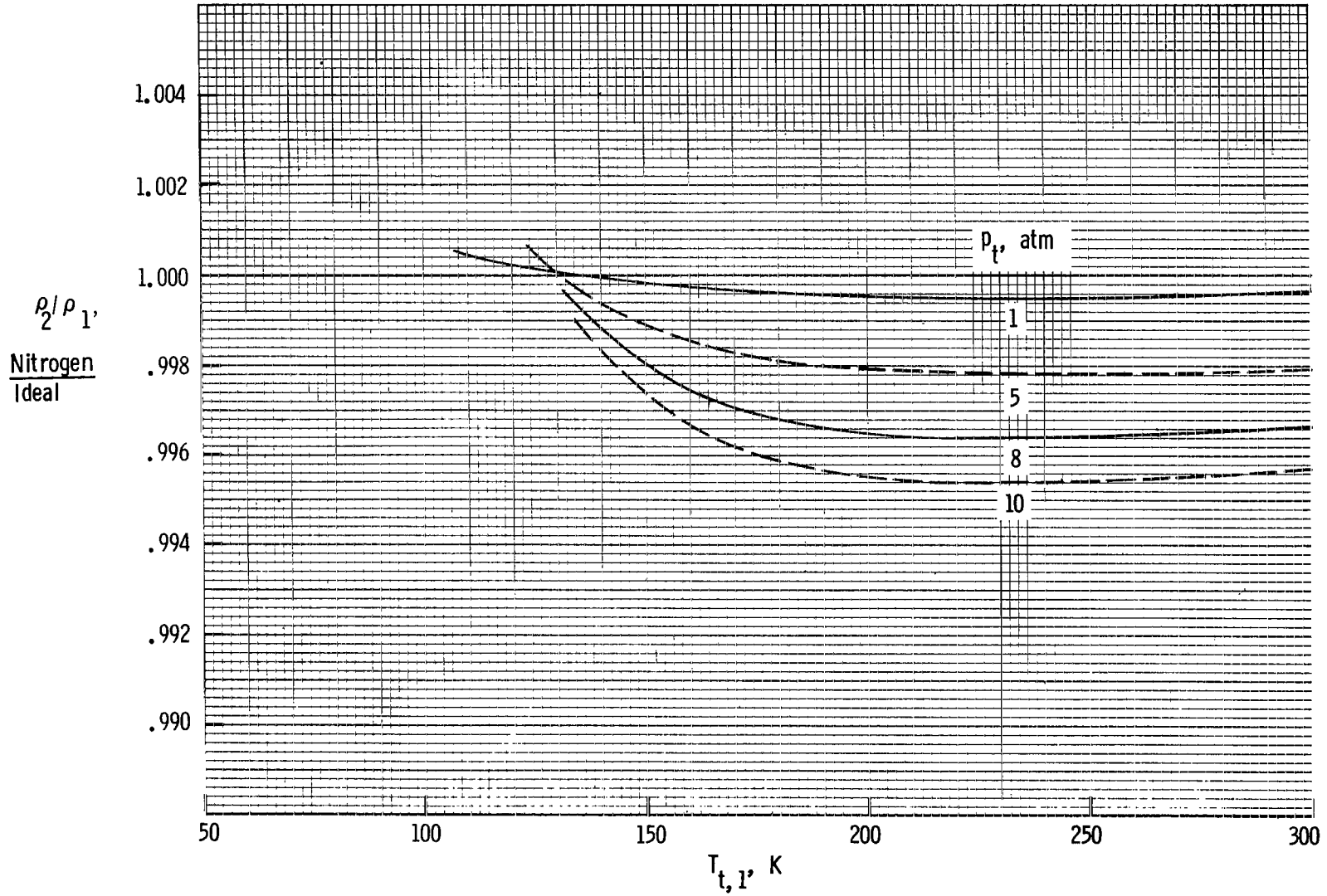


Figure 37.- Static-density ratio across normal shocks in nitrogen gas at various stagnation temperatures and pressures, relative to ideal diatomic gas value. $M_1 = 1.7$.

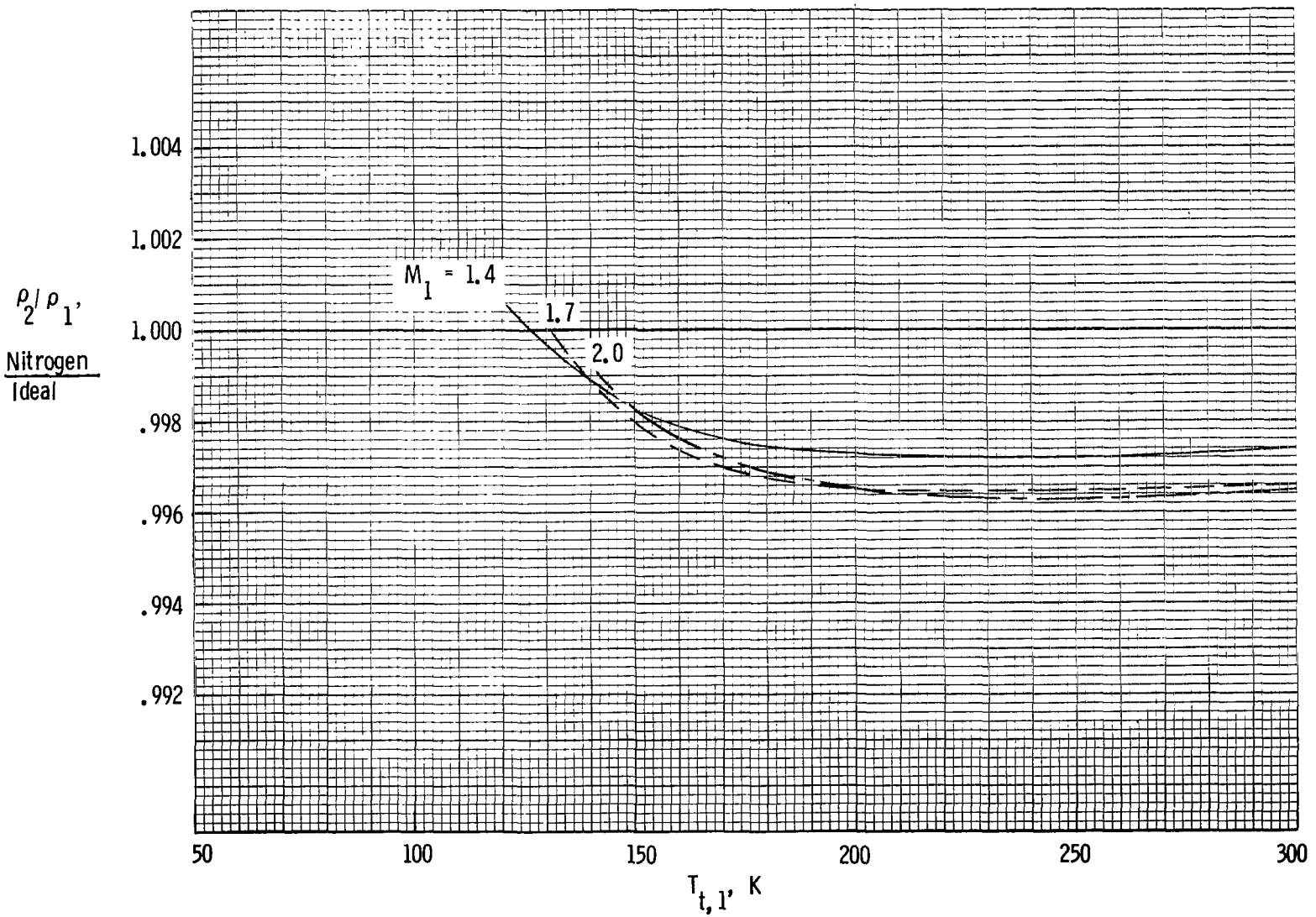


Figure 38.- Static-density ratio across normal shocks in nitrogen gas at various stagnation temperatures and upstream Mach numbers, relative to ideal diatomic gas values. p_t = 8 atm.

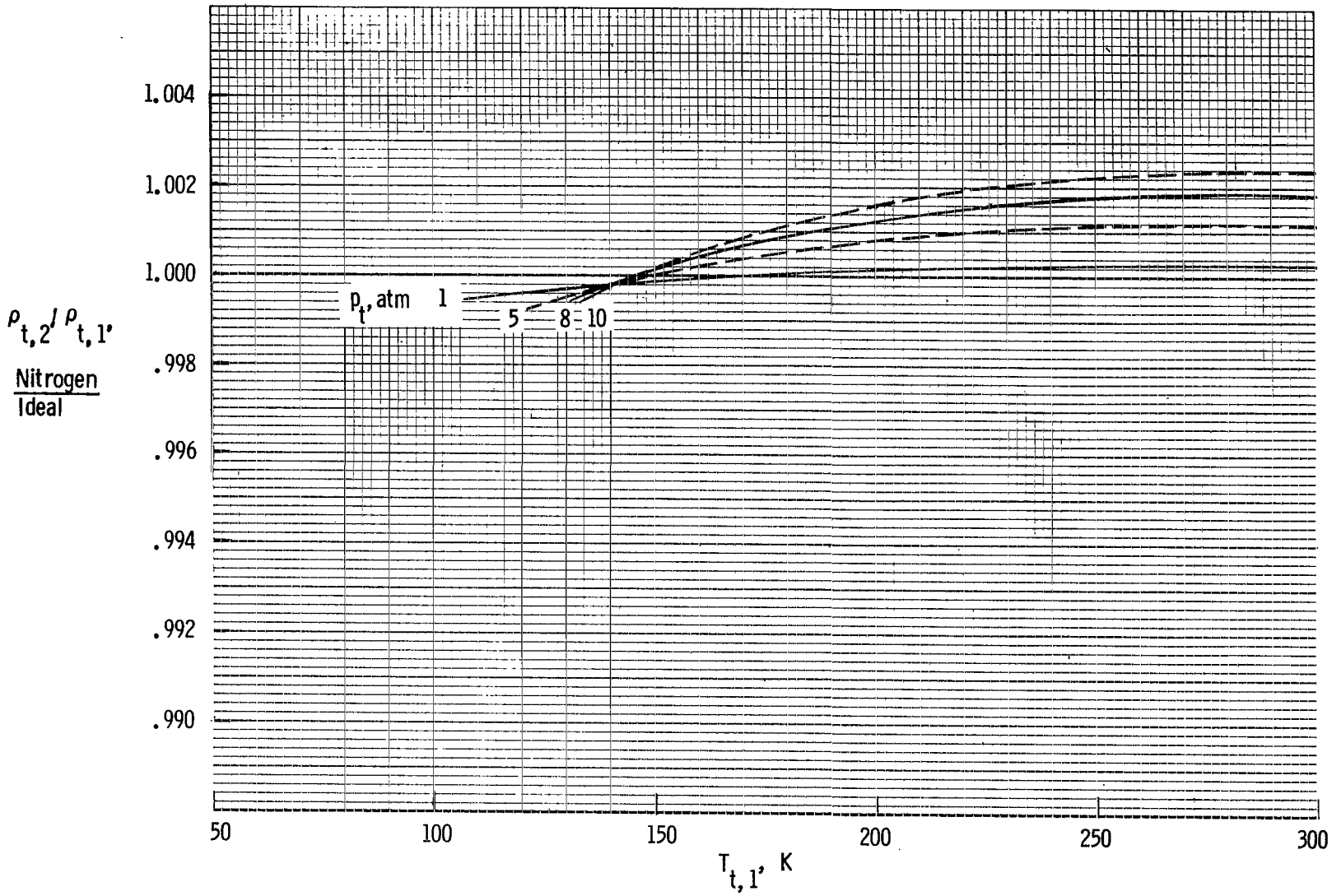


Figure 39.- Total-density ratio across normal shocks in nitrogen gas at various stagnation temperatures and pressures, relative to ideal diatomic gas value. $M_1 = 1.7$.

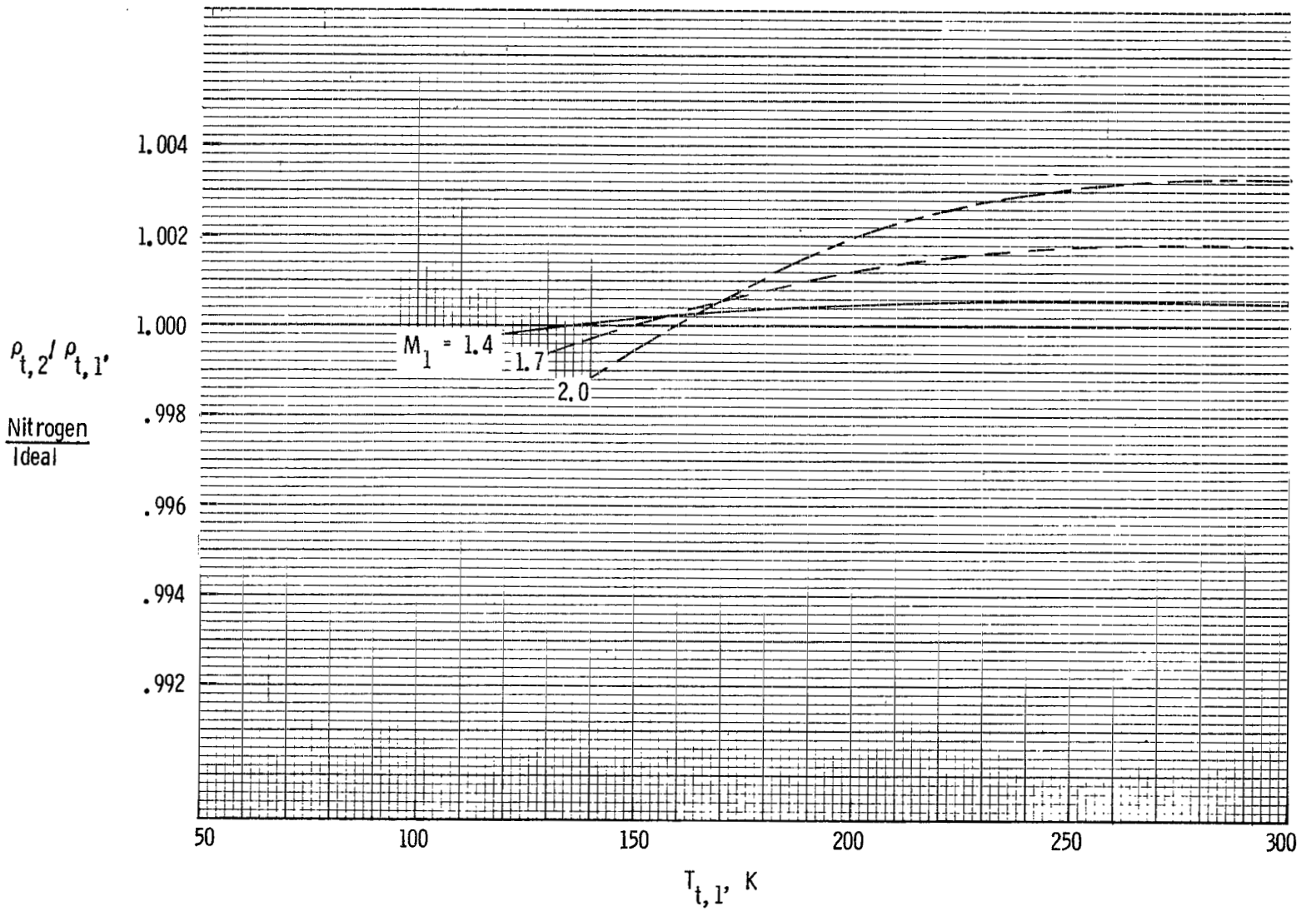


Figure 40.- Total-density ratio across normal shocks in nitrogen gas at various stagnation temperatures and upstream Mach numbers, relative to ideal diatomic gas values. p_t = 8 atm.

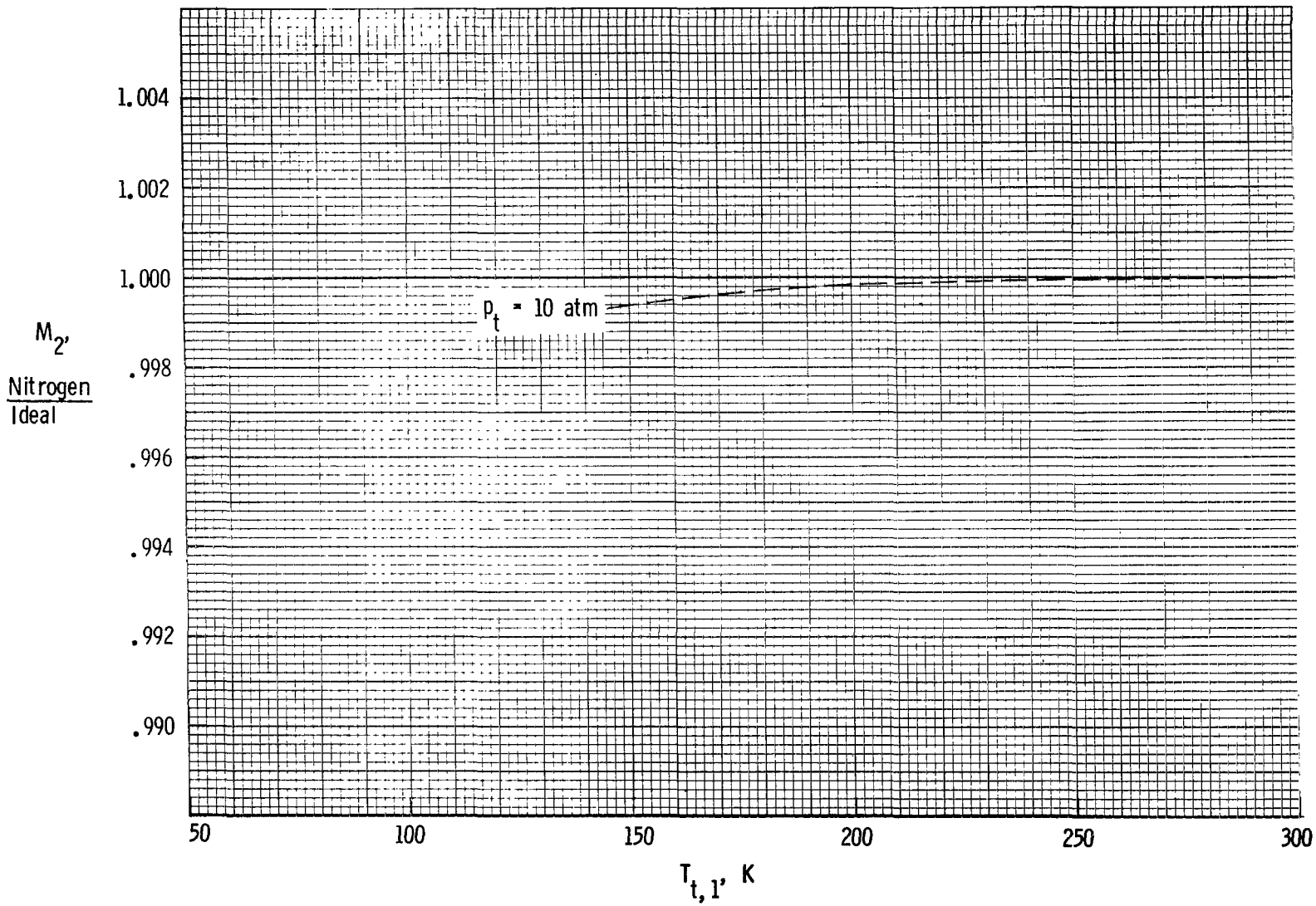


Figure 41.- Mach number downstream of normal shocks in nitrogen gas as a function of stagnation temperature, relative to ideal diatomic gas value. M_1 = 2.0.

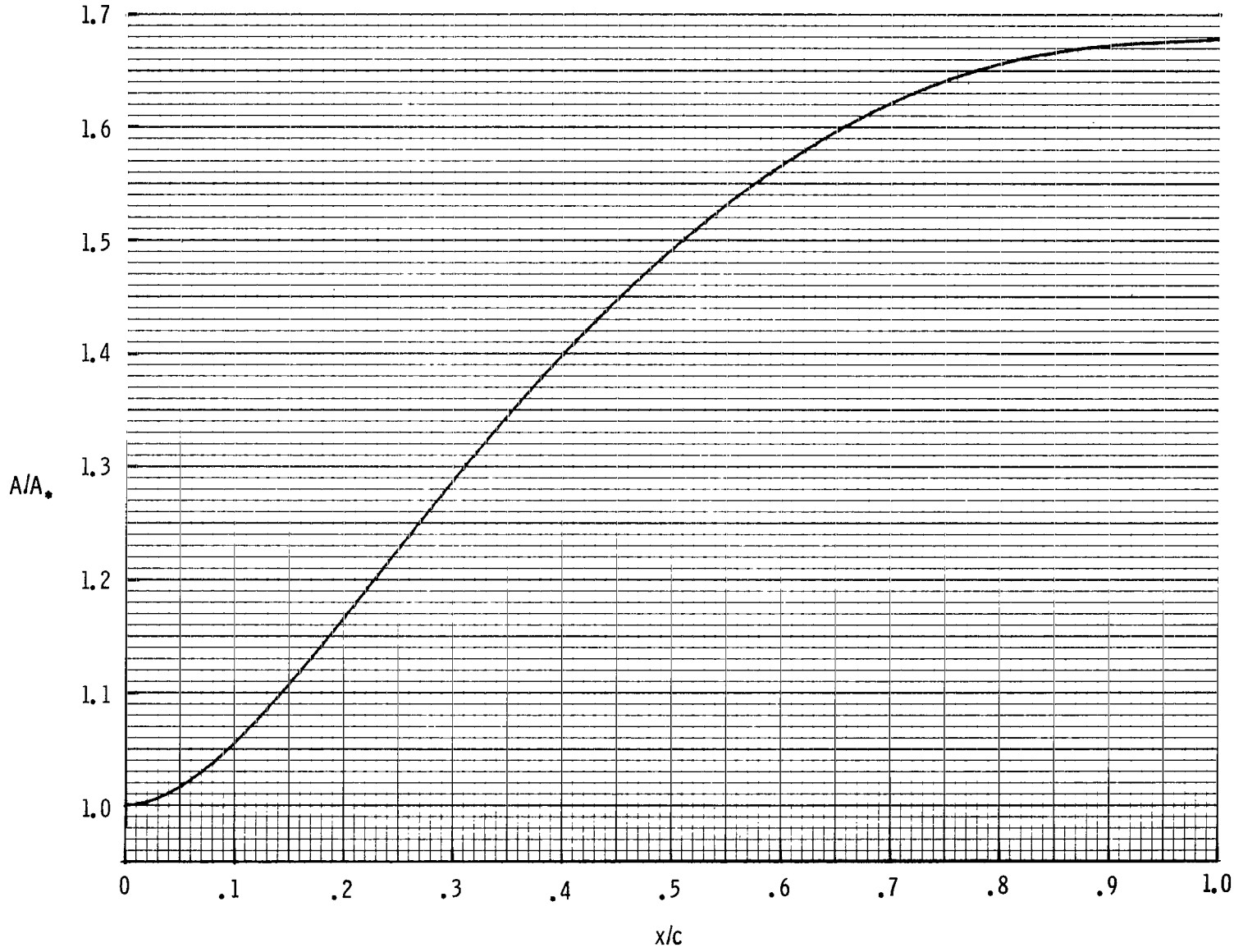


Figure 42.- Area distribution of supersonic stream tube.

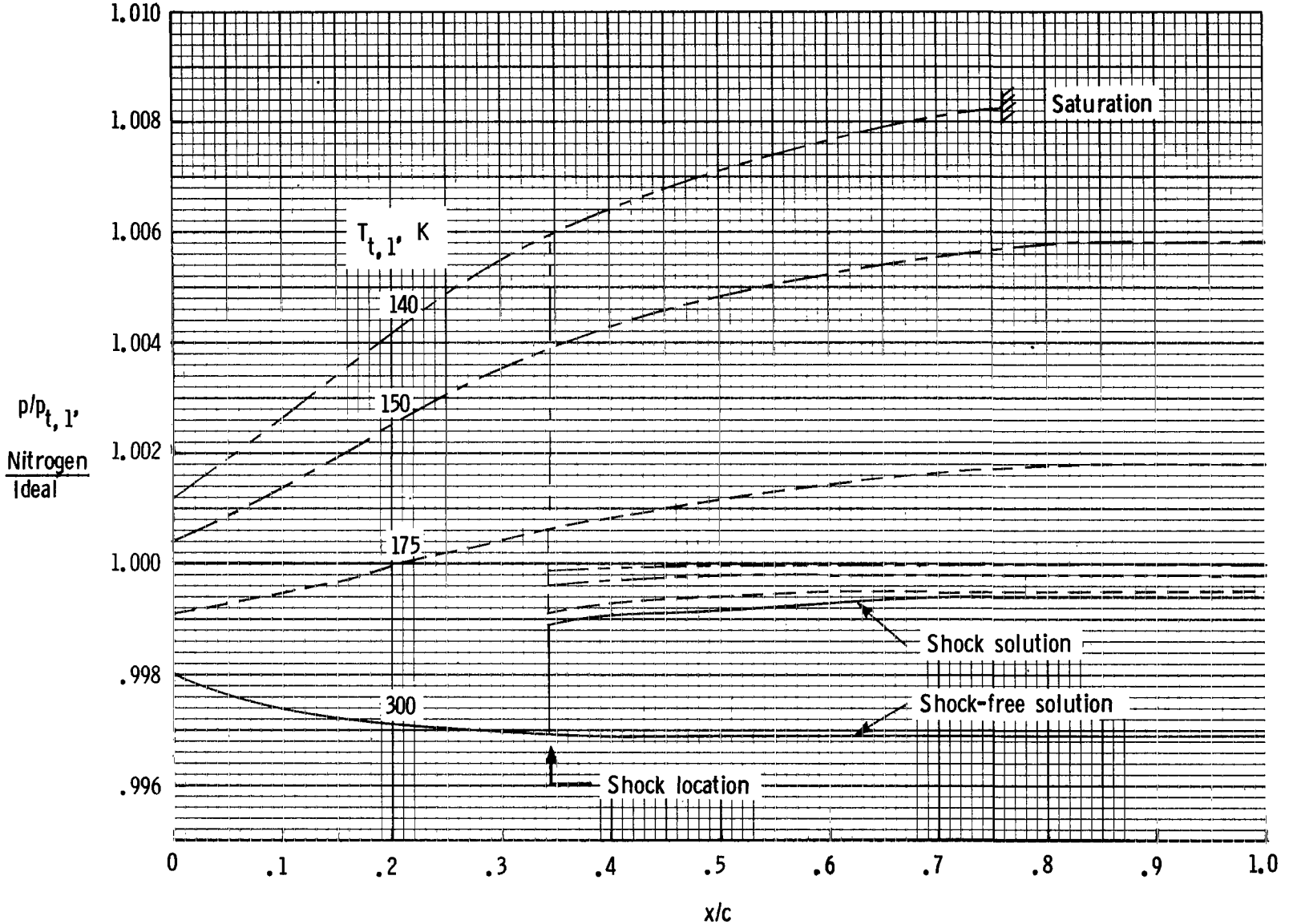


Figure 43.- Variation of relative stream-tube pressure distribution with stagnation temperature at a stagnation pressure of 8 atm.

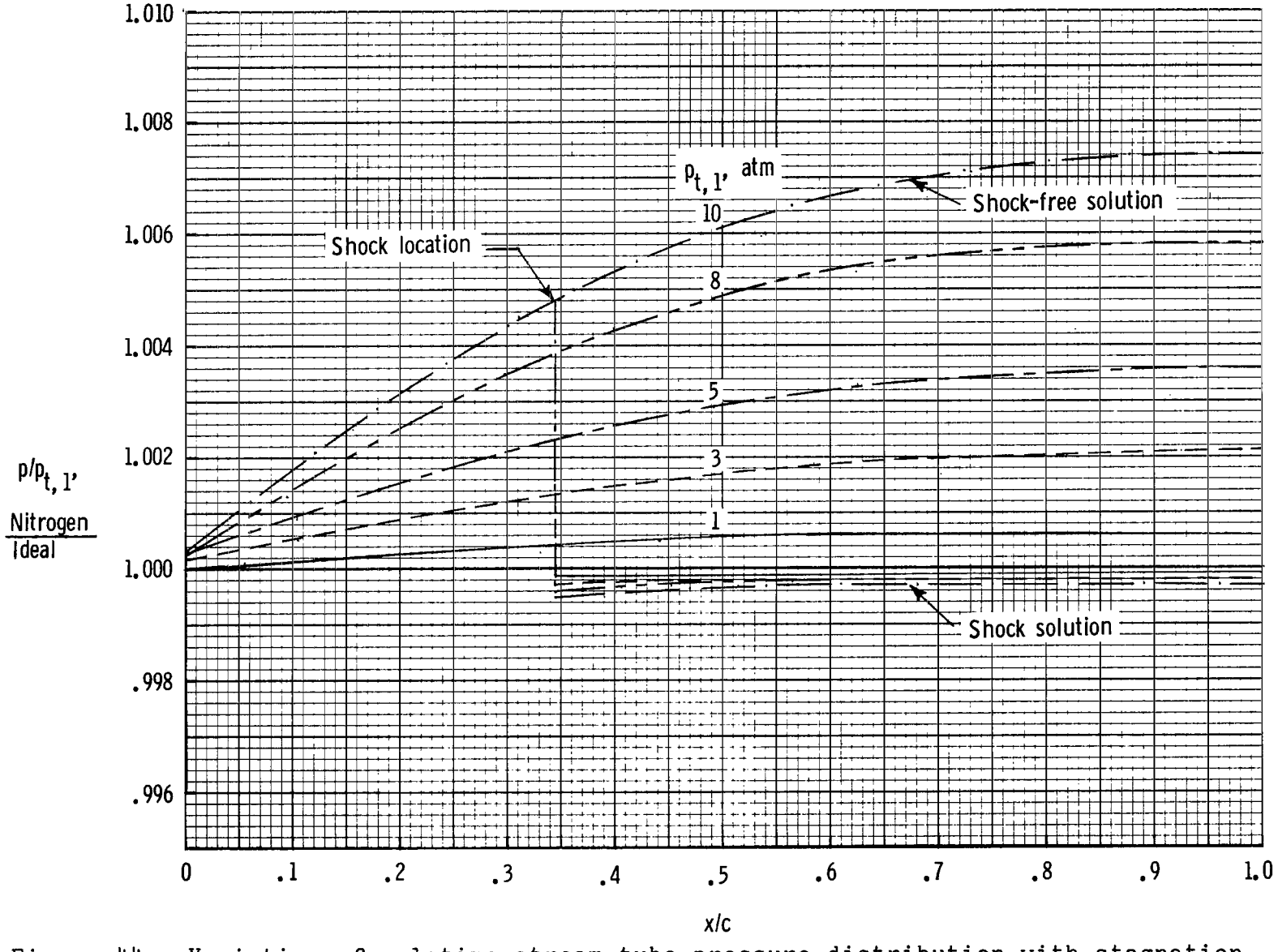


Figure 44.- Variation of relative stream-tube pressure distribution with stagnation pressure at a stagnation temperature of 150 K.

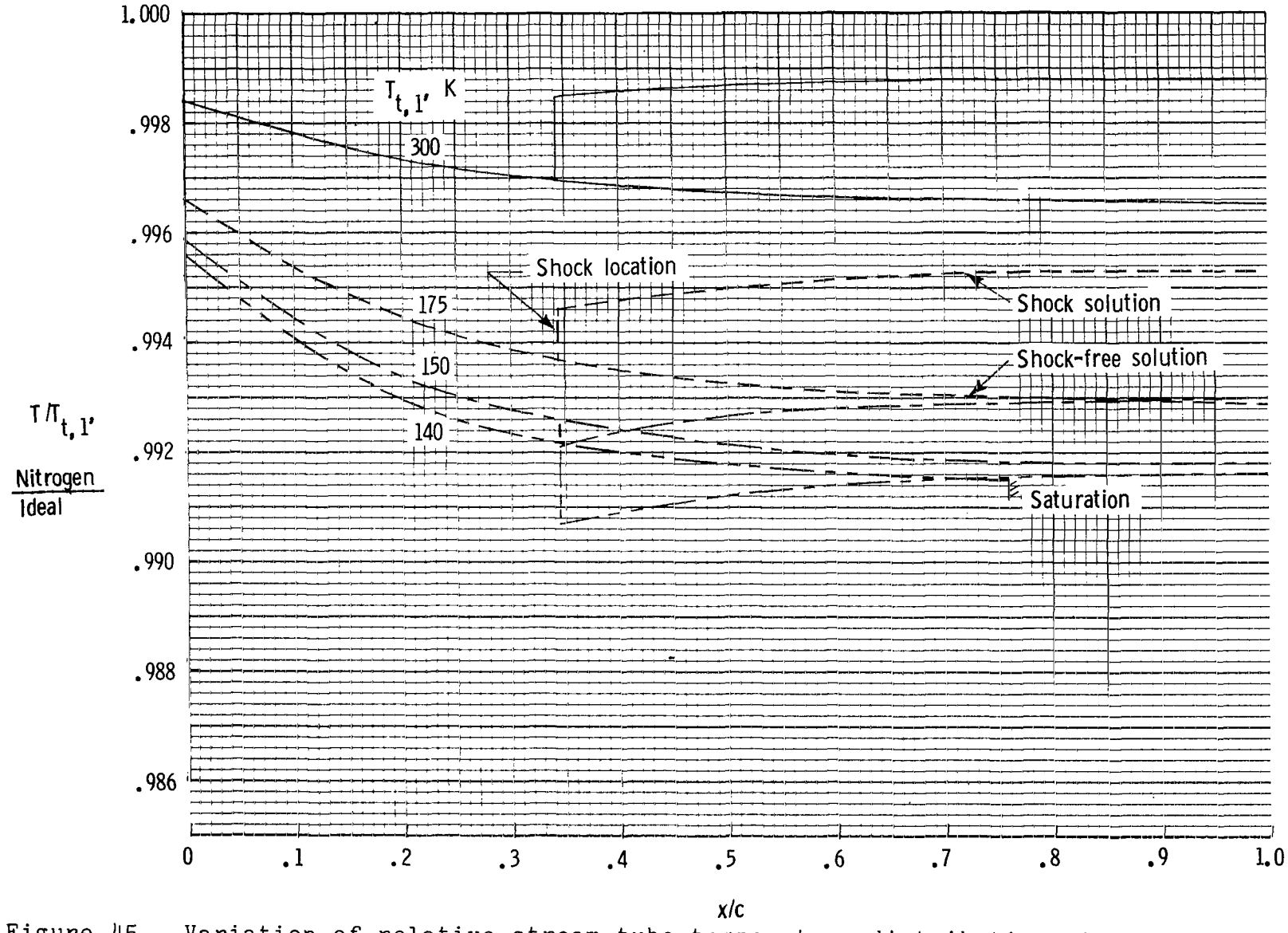


Figure 45.- Variation of relative stream-tube temperature distribution with stagnation temperature at a stagnation pressure of 8 atm.

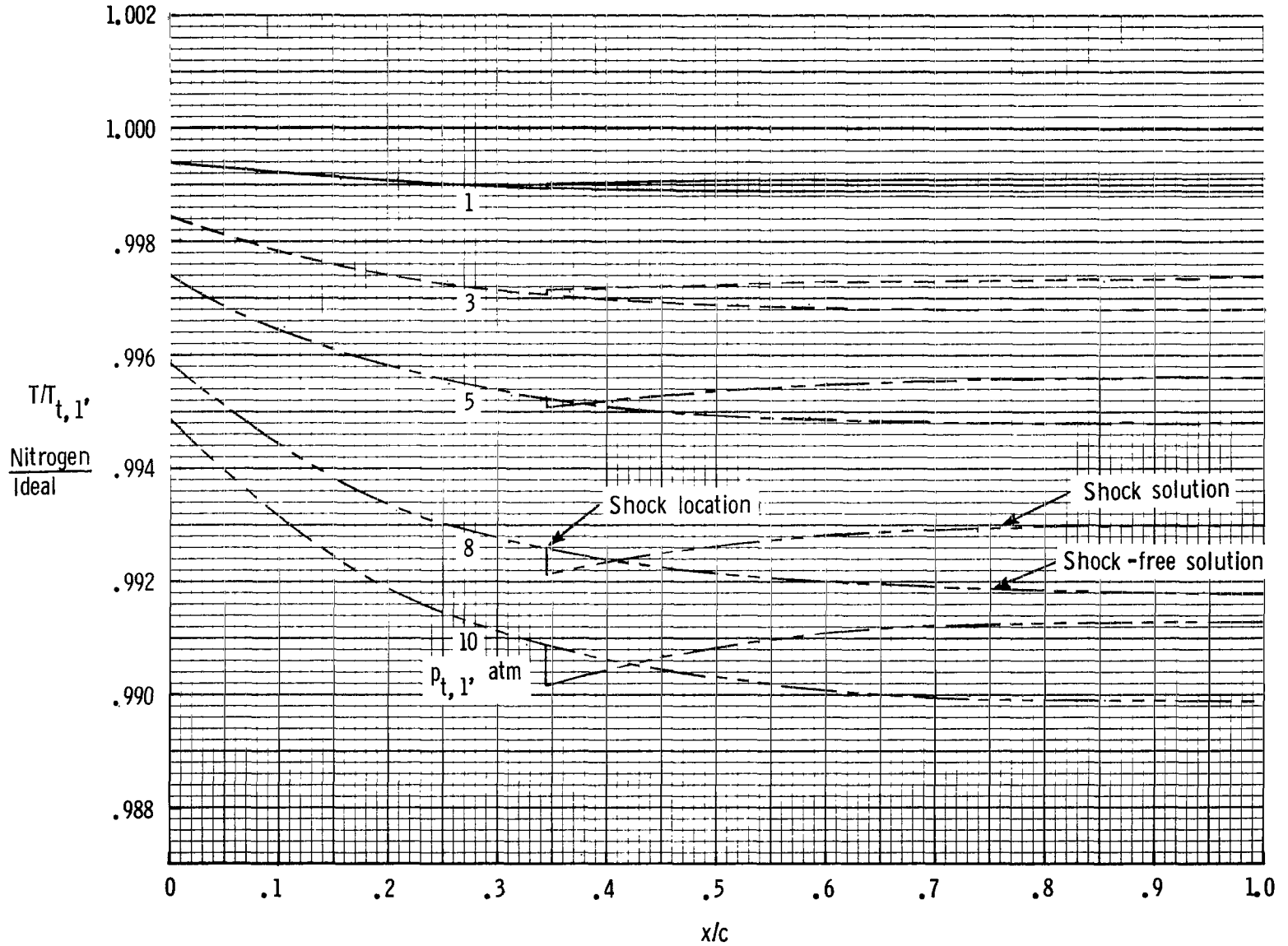


Figure 46.- Variation of relative stream-tube temperature distribution with stagnation pressure at a stagnation temperature of 150 K.

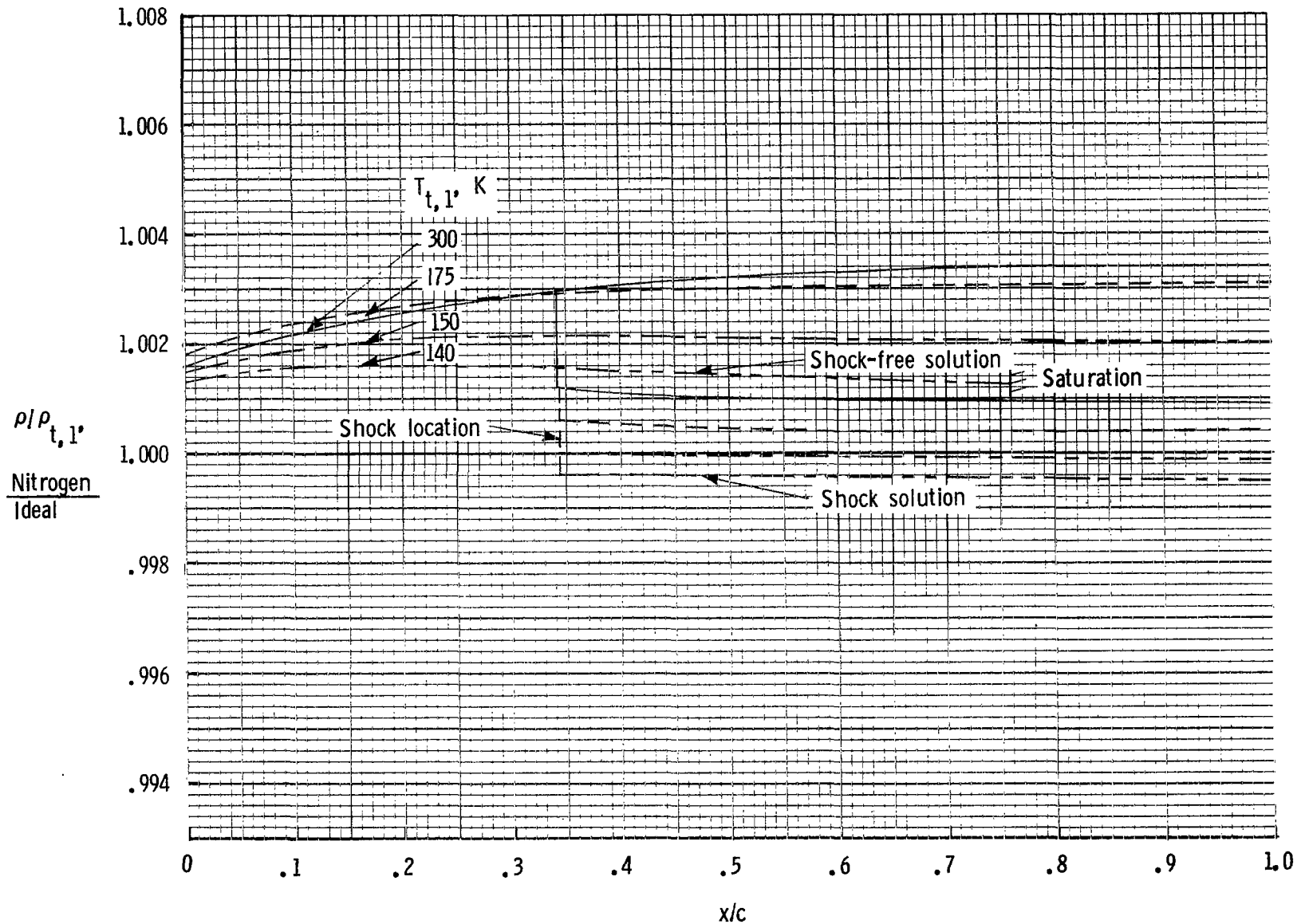


Figure 47.- Variation of relative stream-tube density distribution with stagnation temperature at a stagnation pressure of 8 atm.

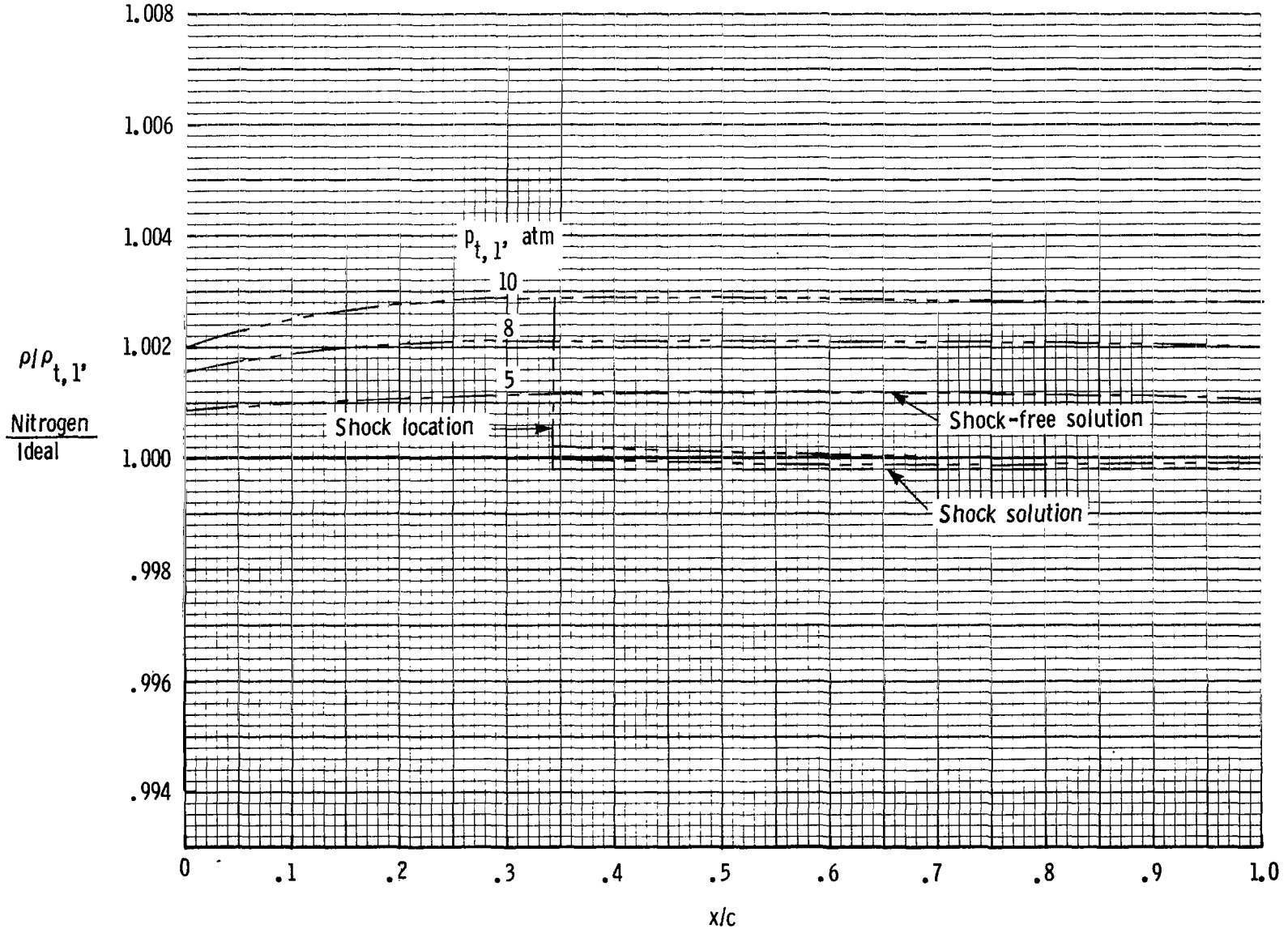


Figure 48.- Variation of relative stream-tube density distribution with stagnation pressure at a stagnation temperature of 150 K.

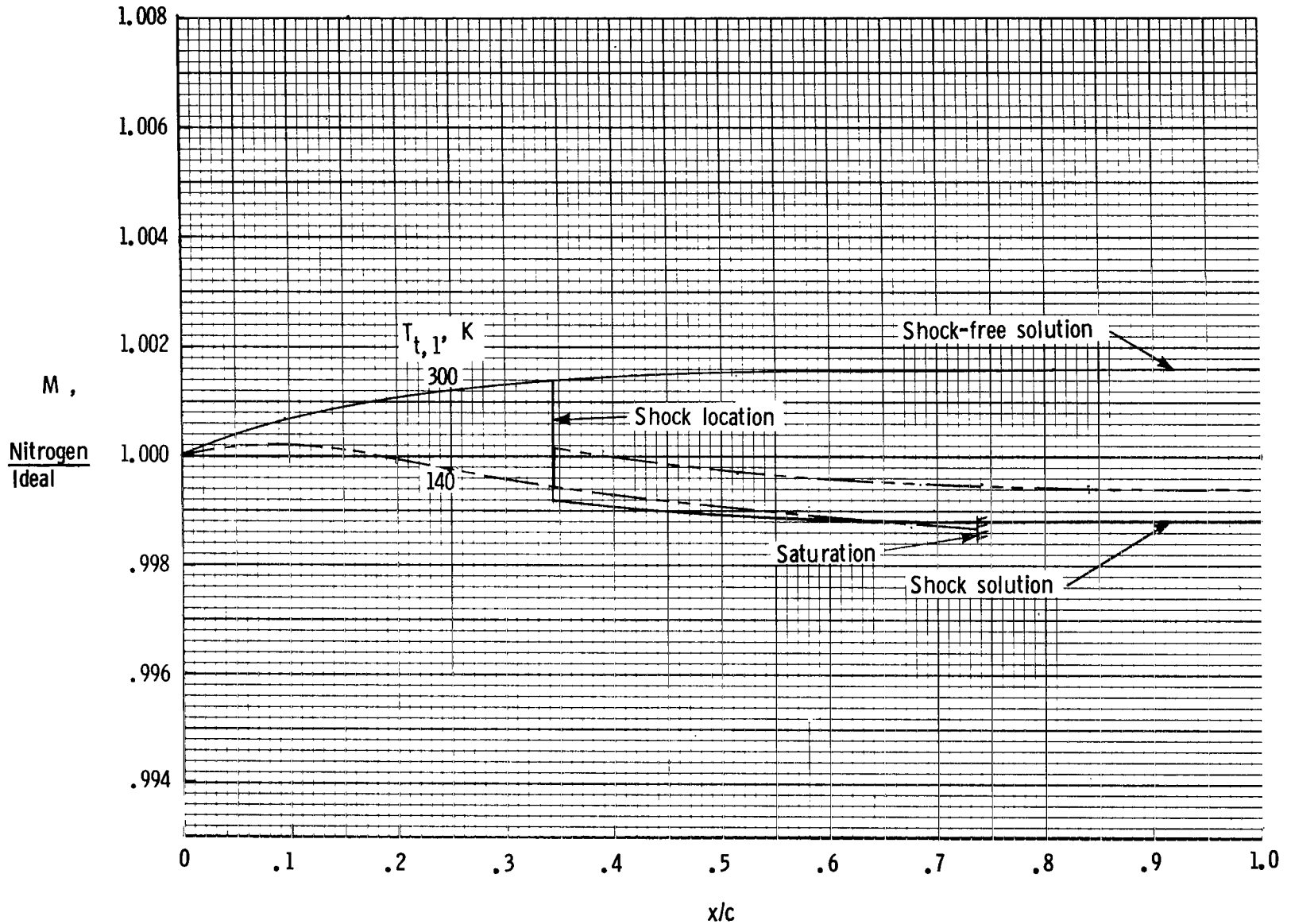


Figure 49.- Variation of relative stream-tube Mach number distribution with stagnation temperature at a stagnation pressure of 8 atm.

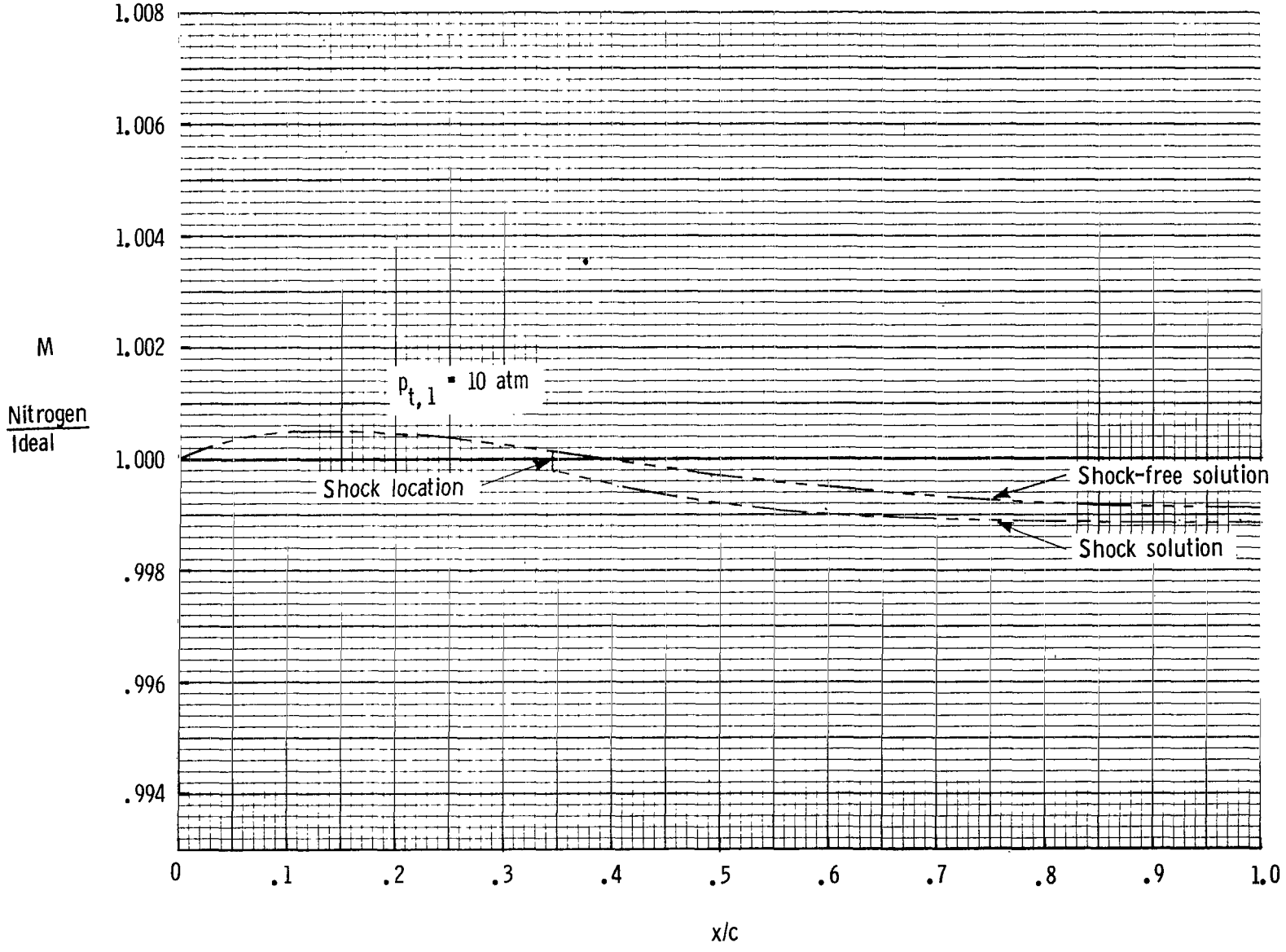


Figure 50.- Relative stream-tube Mach number distribution at a stagnation pressure of 10 atm and a stagnation temperature of 150 K.

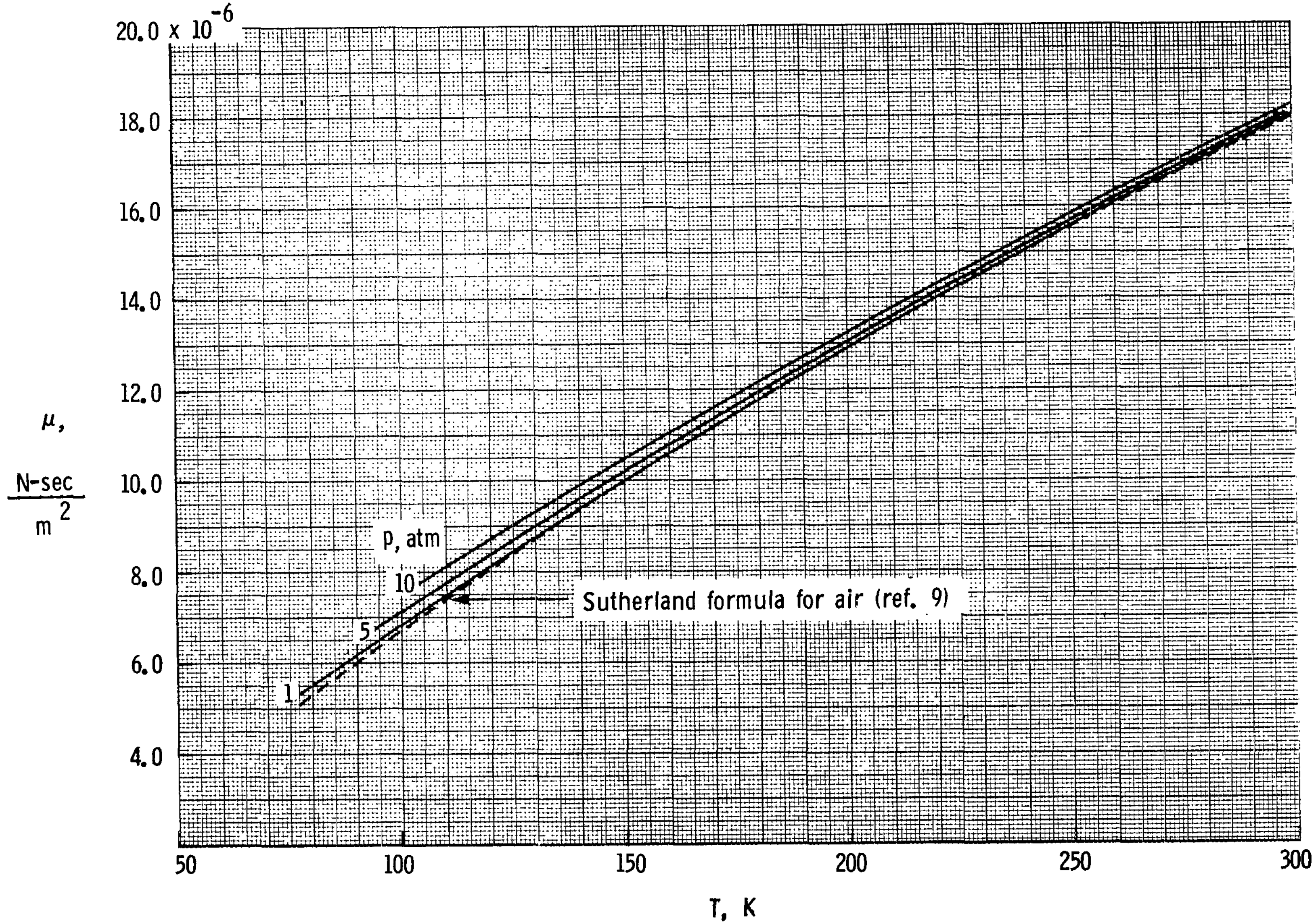


Figure 51.- Viscosity of nitrogen (ref. 10).

*U.S. GOVERNMENT PRINTING OFFICE: 1976 - 735-004/7

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