

EGT3
ENGINEERING TRIPOS PART IIB

Tuesday 23rd April 2024 2 to 3.40

Module 4A3

TURBOMACHINERY 1

*Answer not more than **two** questions.*

All questions carry the same number of marks.

*The **approximate** percentage of marks allocated to each part of a question is indicated in the right margin.*

*Write your candidate number **not** your name on the cover sheet.*

STATIONERY REQUIREMENTS

Single-sided script paper

SPECIAL REQUIREMENTS TO BE SUPPLIED FOR THIS EXAM

CUED approved calculator allowed

Attachment: Excerpt from Compressible Flow Data Book (pages 1-20 of 38 pages).

Engineering Data Book

10 minutes reading time is allowed for this paper at the start of the exam.

You may not start to read the questions printed on the subsequent pages of this question paper until instructed to do so.

You may not remove any stationery from the Examination Room.

1 An axial turbine is designed to operate with hydrogen as a working fluid. The turbine is designed as part of the hydrogen fuel system for a future hypersonic aircraft. The turbine is designed with a repeating stage and 50% reaction, a stage loading coefficient of 1.85, and a total-to-total efficiency of 91%. The following relationship applies to a repeating stage of an axial turbomachine

$$\psi = 2(1 - \Lambda - \phi \tan \alpha_1)$$

where α_1 is the absolute flow angle at entry to the stage, ϕ is the flow coefficient, ψ is the stage loading coefficient and Λ is the reaction.

- (a) Considering the Smith chart shown in Fig. 1, determine the flow coefficient of the turbine. Hence calculate the flow angles for a stage of the turbine and draw the velocity triangles. [30%]
- (b) The mass flow rate of hydrogen is 10 kg s^{-1} . The stagnation pressure and stagnation temperature of the hydrogen at inlet are 50 bar and 600 K and the mean radius at inlet is 0.1 m. The turbine rotates at 20000 rpm. Calculate the blade height at stator inlet. [10%]
- (c) Calculate the Mach number at the exit of the stator. Explain why this is different from the Mach number that would occur if the working fluid of the turbine was replaced with air. [20%]
- (d) The pressure ratio of the turbine is 4. Calculate how many stages are required in the turbine. Explain why the number of stages would change if the working fluid was changed to air and the pressure ratio and inlet conditions to the turbine remain unchanged. [20%]
- (e) A designer decides to redesign the turbine to reduce the number of stages by changing the stage loading coefficient and flow coefficient. Calculate the minimum number of stages which can be achieved. Explain why there is a practical lower limit on the number of stages. [20%]

Assume hydrogen behaves as a perfect gas with $\gamma = 1.41$ and $c_p = 14200 \text{ J kg}^{-1} \text{ K}^{-1}$.

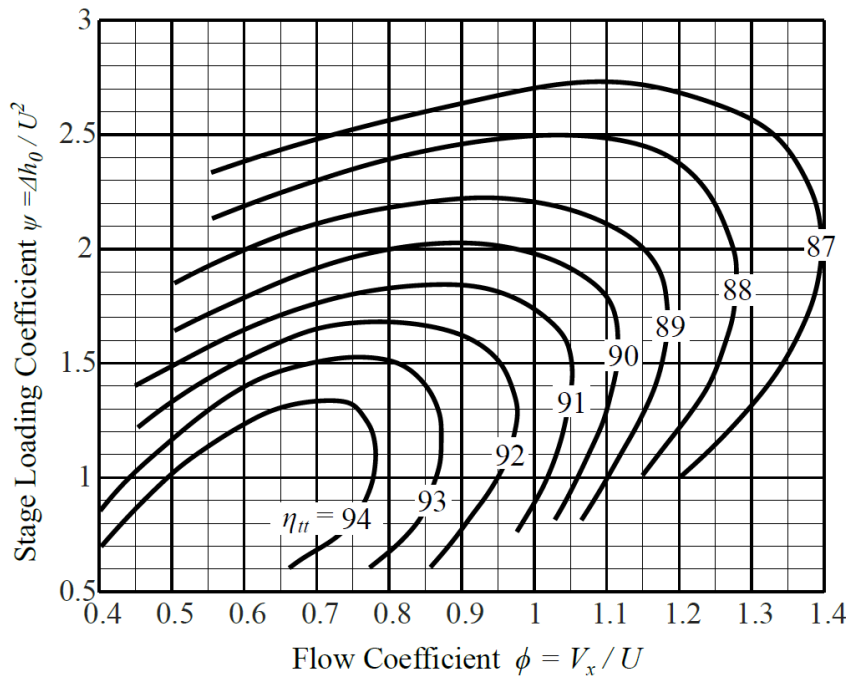


Fig. 1

2 A single shaft turbojet, shown in Fig. 2 with the station numbers 1 to 5, is used to power an aircraft.

(a) The axial compressor in the turbojet has 6 stages and has a stagnation pressure ratio of 3.80 and a stagnation temperature ratio of 1.53. Calculate the polytropic efficiency of the compressor. [10%]

(b) The turbine stator and nozzle remain choked over the entire operating range of the turbojet. The polytropic efficiency of the turbine is the same as the polytropic efficiency of the compressor, calculated in part (a). Both efficiencies remain constant as the operating point of the turbojet is changed. Show that the pressure ratio of the compressor is given by

$$\frac{P_{02}}{P_{01}} = \left(1 - B \frac{T_{03}}{T_{01}} \left(1 - \left(\frac{A_3}{A_5} \right)^C \right) \right)^D$$

where the compressor inlet stagnation temperature is T_{01} , the turbine inlet stagnation temperature is T_{03} , the throat area of the turbine stator is A_3 , the throat area of the propulsive nozzle is A_5 , and B , C and D are constants. Determine the values of the constants. [40%]

(c) Find an expression for the compressor inlet non-dimensional mass flow function $\dot{m} \sqrt{c_p T_{01}} / P_{01} A_1$ as a function of the non-dimensional temperature ratio T_{03} / T_{01} and the throat area ratio A_3 / A_5 . [20%]

(d) On a constant speed characteristic, the compressor pressure ratio can only increase by 30% and the mass flow rate can only be reduced by 10% before stall occurs. The fuel flow rate is increased suddenly causing the compressor to move towards the stall point. During the transient the compressor remains on a constant speed line. Calculate the fractional increase in the temperature ratio T_{03} / T_{01} between the stall point and the working line. [15%]

(e) Assuming that during the transient the compressor reaches the stall point, but does not stall, describe the subsequent transient of the compressor and the operating point of the engine. [15%]

Assume that both air and combustion products behave as perfect gases. Assume that air has $\gamma = 1.4$ and $c_p = 1005 \text{ J kg}^{-1} \text{ K}^{-1}$ and that combustion products have $\gamma = 1.333$ and $c_p = 1224 \text{ J kg}^{-1} \text{ K}^{-1}$.

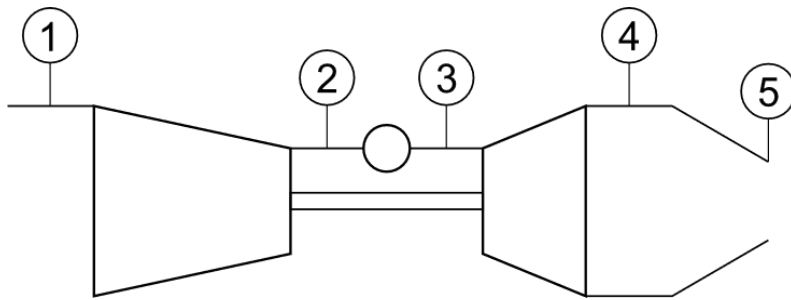


Fig. 2

3 A centrifugal compressor is designed which has radial blades at impeller exit and axial flow at compressor inlet.

(a) Show that the loading coefficient is equal to the slip factor. Explain the causes of slip in centrifugal compressors. [20%]

(b) The compressor is experimentally tested. The flow angle at the exit of the impeller, in the absolute frame is measured to be 69° and the radial velocity is 0.32 times the blade speed. Sketch the velocity triangle at this location. Calculate the slip factor. [20%]

(c) The working fluid of the compressor is air. At the entry of the compressor the stagnation temperature and stagnation pressure are 300 K and 105 kPa. The rotational speed of the compressor is 50000 rpm. At exit the radius of the compressor is 70 mm. Calculate the stagnation temperature and the absolute Mach number at the impeller exit. [20%]

(d) The stagnation pressure at impeller exit is measured to be 293 kPa. Calculate the total-to-total efficiency of the impeller. The axial width of the impeller at exit is 10 mm. Ignoring the thickness of the blades calculate the mass flow through the compressor. [20%]

(e) A designer has the objective of designing an exit diffuser for the centrifugal compressor that achieves the maximum pressure recovery. Explain what they should consider in designing the individual passages of the diffuser. [20%]

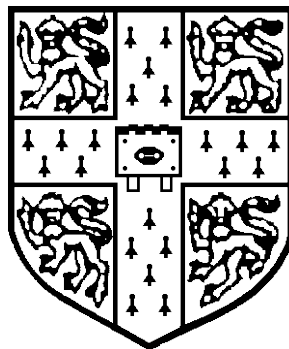
Assume air behaves as a perfect gas with $\gamma = 1.4$ and $c_p = 1005 \text{ J kg}^{-1} \text{ K}^{-1}$.

END OF PAPER

Compressible Flow Data Book

for Part II of the
Engineering Tripos

2009 Edition



Cambridge University Engineering Department

PERFECT GAS RELATIONS FOR COMPRESSIBLE FLOW

Ratios of stagnation to static quantities

$$\frac{T}{T_0} = \left(1 + \frac{\gamma-1}{2} M^2\right)^{-1}$$

$$\frac{p}{p_0} = \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{\gamma}{\gamma-1}}$$

$$\frac{\rho}{\rho_0} = \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{1}{\gamma-1}}$$

Notes:

(1) $T_0 = \text{const.}$ in adiabatic flow with no shaft work

(2) If flow is isentropic, $p_0 = \text{const.}$ and $\rho_0 = \text{const.}$ when $T_0 = \text{const.}$

Mach number relations (see tables)

$$\frac{V}{\sqrt{c_p T_0}} = \sqrt{\gamma-1} M \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{1}{2}}$$

$$\frac{\dot{m} \sqrt{c_p T_0}}{A p_0} = \frac{\gamma}{\sqrt{\gamma-1}} M \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{1}{2} \left(\frac{\gamma+1}{\gamma-1}\right)}$$

$$\frac{\dot{m} \sqrt{c_p T_0}}{A p} = \frac{\gamma}{\sqrt{\gamma-1}} M \left(1 + \frac{\gamma-1}{2} M^2\right)^{\frac{1}{2}}$$

$$\frac{F}{\dot{m} \sqrt{c_p T_0}} = \frac{\sqrt{\gamma-1}}{\gamma} \frac{1 + \gamma M^2}{M} \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{1}{2}} \quad \text{where} \quad F = (p + \rho V^2) A$$

$$\frac{\frac{1}{2} \rho V^2}{p_0} = \frac{1}{2} \gamma M^2 \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{\gamma}{\gamma-1}}$$

ONE-DIMENSIONAL FLOW OF A PERFECT GAS

Isentropic flow

$$\frac{A}{A^*} = \frac{1}{M} \left\{ \frac{2}{\gamma+1} \left(1 + \frac{\gamma-1}{2} M^2 \right) \right\}^{\frac{1}{2} \left(\frac{\gamma+1}{\gamma-1} \right)}$$

Adiabatic constant area flow

$$\frac{4c_f L_{\max}}{D} = \frac{1-M^2}{\gamma M^2} + \frac{\gamma+1}{2\gamma} \ln \left(\frac{(\gamma+1)M^2}{2 \left(1 + \frac{\gamma-1}{2} M^2 \right)} \right)$$

Normal shock waves in perfect gases

$$VV_s = a^{*2}$$

$$M_s = \left(\frac{1 + \frac{\gamma-1}{2} M^2}{\gamma M^2 - \frac{\gamma-1}{2}} \right)^{\frac{1}{2}}$$

$$\frac{p_{0s}}{p_0} = \left(\frac{\frac{\gamma+1}{2} M^2}{1 + \frac{\gamma-1}{2} M^2} \right)^{\frac{\gamma}{\gamma-1}} \left(\frac{2\gamma}{\gamma+1} M^2 - \frac{\gamma-1}{\gamma+1} \right)^{\frac{1}{1-\gamma}}$$

$$\frac{p_s}{p} = 1 + \frac{2\gamma}{\gamma+1} (M^2 - 1)$$

$$\frac{p_{0s}}{p} = \left(\frac{\gamma+1}{2} M^2 \right)^{\frac{\gamma}{\gamma-1}} \left(\frac{2\gamma}{\gamma+1} M^2 - \frac{\gamma-1}{\gamma+1} \right)^{\frac{1}{1-\gamma}}$$

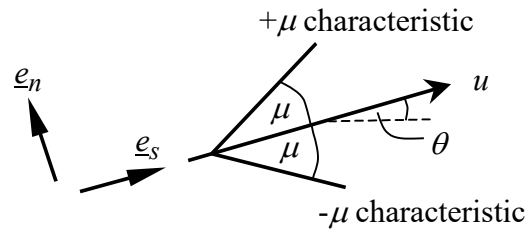
$$\frac{T_s}{T} = \frac{\gamma-1}{(\gamma+1)^2} \frac{2}{M^2} \left(1 + \frac{\gamma-1}{2} M^2 \right) \left(\frac{2\gamma}{\gamma-1} M^2 - 1 \right)$$

$$\frac{\rho_s}{\rho} = \frac{(\gamma+1)M^2}{2 \left(1 + \frac{\gamma-1}{2} M^2 \right)}$$

TWO DIMENSIONAL SUPERSONIC FLOW

Method of Characteristics for 2-D supersonic flow

Applicable to adiabatic ($h_0 = \text{constant}$), isentropic flow



Mach Number $M = u/c$

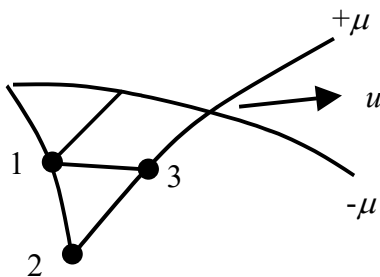
Mach angle $\mu = \sin^{-1}\left(\frac{1}{M}\right)$

Prandtl-Meyer function $\nu = \int_1^M \sqrt{M^2 - 1} \frac{du}{u}$

$$\nu = \sqrt{\frac{\gamma+1}{\gamma-1}} \tan^{-1} \sqrt{\frac{\gamma-1}{\gamma+1} (M^2 - 1)} - \tan^{-1} \sqrt{M^2 - 1} \quad \text{for a perfect gas}$$

Calculations

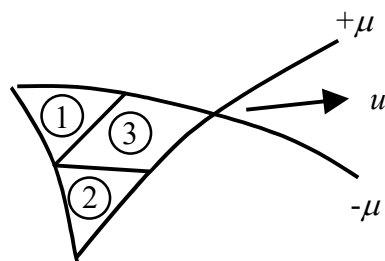
Lattice Method



$$\nu_3 - \theta_3 = \nu_2 - \theta_2 \quad \text{along } +\mu$$

$$\nu_3 + \theta_3 = \nu_1 + \theta_1 \quad \text{along } -\mu$$

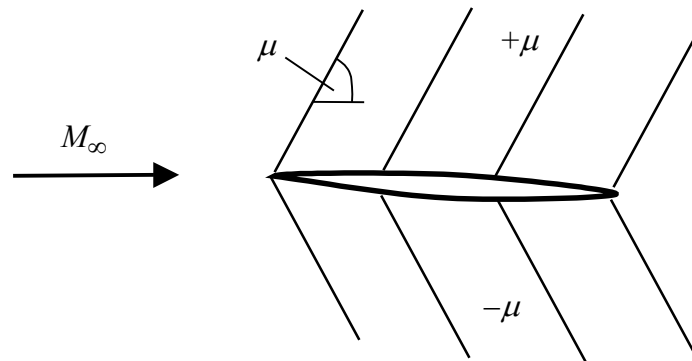
Field (or wave) method



$$\nu_3 + \theta_3 = \nu_1 + \theta_1 \quad \text{across } +\mu$$

$$\nu_3 - \theta_3 = \nu_2 - \theta_2 \quad \text{across } -\mu$$

Linearised Method of Characteristics (thin film theory)

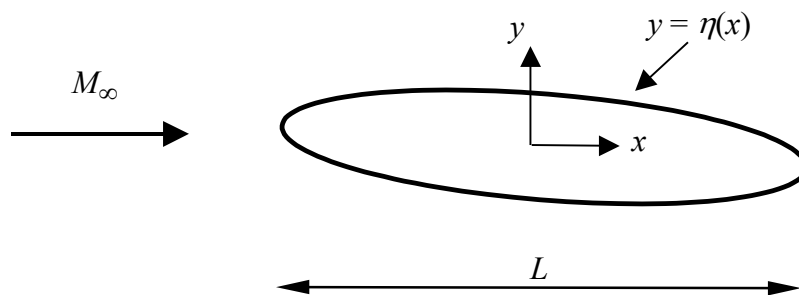


$$\mu \approx \sin^{-1}(1/M_\infty)$$

$$\Delta p \approx \pm \frac{\rho_\infty u_\infty^2 \Delta \theta}{\sqrt{M_\infty^2 - 1}} \quad \text{across } \pm \mu \text{ waves}$$

$$\text{Pressure coefficient } c_p = \frac{p - p_\infty}{\frac{1}{2} \rho_\infty u_\infty^2} = \pm \frac{2\theta}{\sqrt{M_\infty^2 - 1}} \quad \text{on upper/lower surface}$$

Prandtl-Glauert rule for linearised potential flow past geometrically similar bodies



$$\text{Pressure coefficient } c_p = \frac{p - p_\infty}{\frac{1}{2} \rho_\infty u_\infty^2}$$

For geometrically similar bodies with $\frac{\eta}{L} = f\left(\frac{x}{L}\right)$ and $c_p(M_\infty = 0) = c_{p0}$,

$$c_p = \frac{c_{p0}}{\sqrt{1 - M_\infty^2}} \quad \text{in subsonic flow}$$

$$c_p \propto \frac{1}{\sqrt{M_\infty^2 - 1}} \quad \text{in supersonic flow}$$

Oblique Shock Relations (see tables)

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

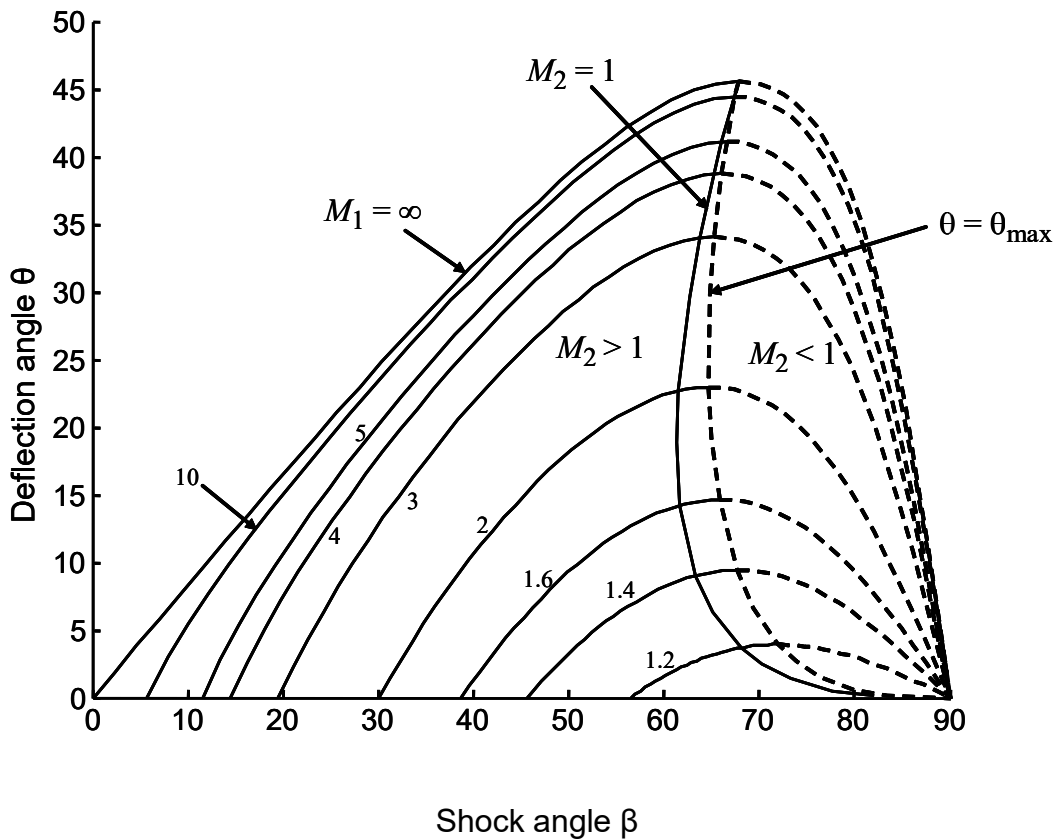
$$\frac{T_2}{T_1} = \frac{\gamma-1}{(\gamma+1)^2} \frac{2}{M_1^2 \sin^2 \beta} \left(1 + \frac{\gamma-1}{2} M_1^2 \sin^2 \beta \right) \left(\frac{2\gamma}{\gamma-1} M_1^2 \sin^2 \beta - 1 \right)$$

$$\frac{\rho_2}{\rho_1} = \frac{(\gamma+1)M_1^2 \sin^2 \beta}{2 \left[1 + \frac{\gamma-1}{2} M_1^2 \sin^2 \beta \right]}$$

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

$$\frac{p_{02}}{p_{01}} = \left(\frac{\frac{\gamma+1}{2} M_1^2 \sin^2 \beta}{1 + \frac{\gamma-1}{2} M_1^2 \sin^2 \beta} \right)^{\frac{\gamma}{\gamma-1}} \left(\frac{2\gamma}{\gamma+1} M_1^2 \sin^2 \beta - \frac{\gamma-1}{\gamma+1} \right)^{\frac{1}{1-\gamma}}$$

$$\tan \theta = \frac{2 \cot \beta (M_1^2 \sin^2 \beta - 1)}{(\gamma+1)M_1^2 - 2(M_1^2 \sin^2 \beta - 1)}$$



GAS FLOW TABLES ($\gamma=1.400$): SUBSONIC FLOW

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\frac{\rho V^2}{p_0}$
0.010	1.0000	0.9999	1.0000	0.0063	0.0221	0.0221	45.1813	7134.405	0.0001
0.020	0.9999	0.9997	0.9998	0.0126	0.0443	0.0443	22.5994	1778.450	0.0003
0.030	0.9998	0.9994	0.9996	0.0190	0.0664	0.0664	15.0761	787.0814	0.0006
0.040	0.9997	0.9989	0.9992	0.0253	0.0885	0.0886	11.3173	440.3522	0.0011
0.050	0.9995	0.9983	0.9988	0.0316	0.1105	0.1107	9.0644	280.0203	0.0017
0.060	0.9993	0.9975	0.9982	0.0379	0.1325	0.1329	7.5645	193.0311	0.0025
0.070	0.9990	0.9966	0.9976	0.0443	0.1545	0.1550	6.4947	140.6550	0.0034
0.080	0.9987	0.9955	0.9968	0.0506	0.1764	0.1772	5.6939	106.7182	0.0045
0.090	0.9984	0.9944	0.9960	0.0569	0.1983	0.1994	5.0723	83.4961	0.0056
0.100	0.9980	0.9930	0.9950	0.0632	0.2200	0.2216	4.5762	66.9216	0.0070
0.110	0.9976	0.9916	0.9940	0.0695	0.2417	0.2438	4.1714	54.6879	0.0084
0.120	0.9971	0.9900	0.9928	0.0758	0.2633	0.2660	3.8350	45.4080	0.0100
0.130	0.9966	0.9883	0.9916	0.0821	0.2849	0.2883	3.5513	38.2070	0.0117
0.140	0.9961	0.9864	0.9903	0.0884	0.3063	0.3105	3.3089	32.5113	0.0135
0.150	0.9955	0.9844	0.9888	0.0947	0.3276	0.3328	3.0996	27.9320	0.0155
0.160	0.9949	0.9823	0.9873	0.1009	0.3488	0.3551	2.9172	24.1978	0.0176
0.170	0.9943	0.9800	0.9857	0.1072	0.3699	0.3774	2.7569	21.1152	0.0198
0.180	0.9936	0.9776	0.9840	0.1135	0.3908	0.3997	2.6151	18.5427	0.0222
0.190	0.9928	0.9751	0.9822	0.1197	0.4116	0.4221	2.4889	16.3752	0.0246
0.200	0.9921	0.9725	0.9803	0.1260	0.4323	0.4445	2.3758	14.5333	0.0272
0.210	0.9913	0.9697	0.9783	0.1322	0.4528	0.4669	2.2740	12.9560	0.0299
0.220	0.9904	0.9668	0.9762	0.1385	0.4731	0.4893	2.1820	11.5961	0.0328
0.230	0.9895	0.9638	0.9740	0.1447	0.4933	0.5118	2.0985	10.4161	0.0357
0.240	0.9886	0.9607	0.9718	0.1509	0.5133	0.5343	2.0225	9.3865	0.0387
0.250	0.9877	0.9575	0.9694	0.1571	0.5332	0.5568	1.9530	8.4834	0.0419
0.260	0.9867	0.9541	0.9670	0.1633	0.5528	0.5794	1.8892	7.6876	0.0451
0.270	0.9856	0.9506	0.9645	0.1695	0.5723	0.6020	1.8306	6.9832	0.0485
0.280	0.9846	0.9470	0.9619	0.1757	0.5915	0.6246	1.7766	6.3572	0.0520
0.290	0.9835	0.9433	0.9592	0.1819	0.6106	0.6473	1.7267	5.7989	0.0555
0.300	0.9823	0.9395	0.9564	0.1881	0.6295	0.6700	1.6805	5.2993	0.0592
0.310	0.9811	0.9355	0.9535	0.1942	0.6481	0.6928	1.6377	4.8507	0.0629
0.320	0.9799	0.9315	0.9506	0.2003	0.6666	0.7156	1.5978	4.4467	0.0668
0.330	0.9787	0.9274	0.9476	0.2065	0.6848	0.7384	1.5608	4.0821	0.0707
0.340	0.9774	0.9231	0.9445	0.2126	0.7027	0.7613	1.5262	3.7520	0.0747
0.350	0.9761	0.9188	0.9413	0.2187	0.7205	0.7842	1.4939	3.4525	0.0788
0.360	0.9747	0.9143	0.9380	0.2248	0.7380	0.8072	1.4637	3.1801	0.0829
0.370	0.9733	0.9098	0.9347	0.2309	0.7553	0.8302	1.4354	2.9320	0.0872
0.380	0.9719	0.9052	0.9313	0.2369	0.7723	0.8532	1.4090	2.7054	0.0915
0.390	0.9705	0.9004	0.9278	0.2430	0.7891	0.8763	1.3841	2.4983	0.0959
0.400	0.9690	0.8956	0.9243	0.2490	0.8056	0.8995	1.3608	2.3085	0.1003
0.410	0.9675	0.8907	0.9207	0.2551	0.8219	0.9227	1.3388	2.1344	0.1048
0.420	0.9659	0.8857	0.9170	0.2611	0.8379	0.9460	1.3182	1.9744	0.1094
0.430	0.9643	0.8807	0.9132	0.2671	0.8536	0.9693	1.2988	1.8272	0.1140
0.440	0.9627	0.8755	0.9094	0.2730	0.8691	0.9927	1.2804	1.6915	0.1186
0.450	0.9611	0.8703	0.9055	0.2790	0.8843	1.0161	1.2632	1.5664	0.1234
0.460	0.9594	0.8650	0.9016	0.2850	0.8992	1.0396	1.2469	1.4509	0.1281
0.470	0.9577	0.8596	0.8976	0.2909	0.9138	1.0631	1.2315	1.3441	0.1329
0.480	0.9559	0.8541	0.8935	0.2968	0.9282	1.0867	1.2170	1.2453	0.1378
0.490	0.9542	0.8486	0.8894	0.3027	0.9423	1.1104	1.2033	1.1539	0.1426
0.500	0.9524	0.8430	0.8852	0.3086	0.9561	1.1341	1.1903	1.0691	0.1475

$$\gamma=1.400$$

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\frac{\rho V^2}{p_0}$
0.510	0.9506	0.8374	0.8809	0.3145	0.9696	1.1579	1.1781	0.9904	0.1525
0.520	0.9487	0.8317	0.8766	0.3203	0.9828	1.1818	1.1665	0.9174	0.1574
0.530	0.9468	0.8259	0.8723	0.3262	0.9958	1.2057	1.1556	0.8496	0.1624
0.540	0.9449	0.8201	0.8679	0.3320	1.0084	1.2297	1.1452	0.7866	0.1674
0.550	0.9430	0.8142	0.8634	0.3378	1.0208	1.2538	1.1354	0.7281	0.1724
0.560	0.9410	0.8082	0.8589	0.3436	1.0328	1.2779	1.1261	0.6736	0.1774
0.570	0.9390	0.8022	0.8544	0.3493	1.0446	1.3021	1.1173	0.6229	0.1825
0.580	0.9370	0.7962	0.8498	0.3551	1.0561	1.3264	1.1090	0.5757	0.1875
0.590	0.9349	0.7901	0.8451	0.3608	1.0672	1.3507	1.1011	0.5317	0.1925
0.600	0.9328	0.7840	0.8405	0.3665	1.0781	1.3751	1.0937	0.4908	0.1976
0.610	0.9307	0.7778	0.8357	0.3722	1.0887	1.3996	1.0867	0.4527	0.2026
0.620	0.9286	0.7716	0.8310	0.3779	1.0990	1.4242	1.0800	0.4172	0.2076
0.630	0.9265	0.7654	0.8262	0.3835	1.1090	1.4489	1.0737	0.3841	0.2127
0.640	0.9243	0.7591	0.8213	0.3891	1.1186	1.4736	1.0678	0.3533	0.2177
0.650	0.9221	0.7528	0.8164	0.3948	1.1280	1.4984	1.0621	0.3246	0.2226
0.660	0.9199	0.7465	0.8115	0.4003	1.1371	1.5233	1.0568	0.2979	0.2276
0.670	0.9176	0.7401	0.8066	0.4059	1.1459	1.5483	1.0518	0.2730	0.2326
0.680	0.9153	0.7338	0.8016	0.4115	1.1544	1.5733	1.0471	0.2498	0.2375
0.690	0.9131	0.7274	0.7966	0.4170	1.1626	1.5984	1.0426	0.2282	0.2424
0.700	0.9107	0.7209	0.7916	0.4225	1.1705	1.6237	1.0384	0.2081	0.2473
0.710	0.9084	0.7145	0.7865	0.4280	1.1782	1.6490	1.0344	0.1895	0.2521
0.720	0.9061	0.7080	0.7814	0.4335	1.1855	1.6744	1.0307	0.1721	0.2569
0.730	0.9037	0.7016	0.7763	0.4389	1.1925	1.6999	1.0272	0.1561	0.2617
0.740	0.9013	0.6951	0.7712	0.4443	1.1993	1.7254	1.0239	0.1411	0.2664
0.750	0.8989	0.6886	0.7660	0.4497	1.2058	1.7511	1.0208	0.1273	0.2711
0.760	0.8964	0.6821	0.7609	0.4551	1.2119	1.7768	1.0179	0.1145	0.2758
0.770	0.8940	0.6756	0.7557	0.4605	1.2178	1.8027	1.0152	0.1026	0.2804
0.780	0.8915	0.6691	0.7505	0.4658	1.2234	1.8286	1.0126	0.0917	0.2849
0.790	0.8890	0.6625	0.7452	0.4711	1.2288	1.8547	1.0103	0.0816	0.2894
0.800	0.8865	0.6560	0.7400	0.4764	1.2338	1.8808	1.0081	0.0723	0.2939
0.810	0.8840	0.6495	0.7347	0.4817	1.2386	1.9070	1.0060	0.0638	0.2983
0.820	0.8815	0.6430	0.7295	0.4869	1.2431	1.9333	1.0041	0.0559	0.3026
0.830	0.8789	0.6365	0.7242	0.4921	1.2474	1.9598	1.0024	0.0488	0.3069
0.840	0.8763	0.6300	0.7189	0.4973	1.2514	1.9863	1.0008	0.0423	0.3112
0.850	0.8737	0.6235	0.7136	0.5025	1.2551	2.0129	0.9993	0.0363	0.3153
0.860	0.8711	0.6170	0.7083	0.5077	1.2585	2.0396	0.9979	0.0310	0.3195
0.870	0.8685	0.6106	0.7030	0.5128	1.2617	2.0665	0.9967	0.0261	0.3235
0.880	0.8659	0.6041	0.6977	0.5179	1.2646	2.0934	0.9956	0.0218	0.3275
0.890	0.8632	0.5977	0.6924	0.5230	1.2673	2.1204	0.9946	0.0179	0.3314
0.900	0.8606	0.5913	0.6870	0.5280	1.2698	2.1476	0.9937	0.0145	0.3352
0.910	0.8579	0.5849	0.6817	0.5331	1.2719	2.1748	0.9929	0.0115	0.3390
0.920	0.8552	0.5785	0.6764	0.5381	1.2739	2.2021	0.9922	0.0089	0.3427
0.930	0.8525	0.5721	0.6711	0.5431	1.2756	2.2296	0.9916	0.0067	0.3464
0.940	0.8498	0.5658	0.6658	0.5481	1.2770	2.2572	0.9911	0.0048	0.3499
0.950	0.8471	0.5595	0.6604	0.5530	1.2783	2.2848	0.9907	0.0033	0.3534
0.960	0.8444	0.5532	0.6551	0.5579	1.2793	2.3126	0.9903	0.0021	0.3569
0.970	0.8416	0.5469	0.6498	0.5628	1.2800	2.3405	0.9901	0.0011	0.3602
0.980	0.8389	0.5407	0.6445	0.5677	1.2806	2.3685	0.9899	0.0005	0.3635
0.990	0.8361	0.5345	0.6392	0.5725	1.2809	2.3966	0.9898	0.0001	0.3667
1.000	0.8333	0.5283	0.6339	0.5774	1.2810	2.4249	0.9897	0.0000	0.3698

GAS FLOW TABLES ($\gamma=1.400$): SUPERSONIC FLOW

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{\frac{1}{2}\rho V^2}{p_0}$	M_s	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	ν	M
1.010	0.8306	0.5221	0.6287	0.5821	1.2809	2.4532	0.9898	0.0001	0.3728	0.9901	1.0000	1.0235	1.9152	1.0066	0.04	1.010
1.020	0.8278	0.5160	0.6234	0.5869	1.2806	2.4817	0.9899	0.0005	0.3758	0.9805	1.0000	1.0471	1.9379	1.0132	0.13	1.020
1.030	0.8250	0.5099	0.6181	0.5917	1.2801	2.5103	0.9900	0.0010	0.3787	0.9712	1.0000	1.0711	1.9610	1.0198	0.23	1.030
1.040	0.8222	0.5039	0.6129	0.5964	1.2793	2.5390	0.9903	0.0018	0.3815	0.9620	0.9999	1.0952	1.9844	1.0263	0.35	1.040
1.050	0.8193	0.4979	0.6077	0.6011	1.2784	2.5678	0.9905	0.0027	0.3842	0.9531	0.9999	1.1196	2.0083	1.0328	0.49	1.050
1.060	0.8165	0.4919	0.6024	0.6058	1.2773	2.5967	0.9909	0.0038	0.3869	0.9444	0.9998	1.1442	2.0325	1.0393	0.64	1.060
1.070	0.8137	0.4860	0.5972	0.6104	1.2760	2.6258	0.9913	0.0051	0.3895	0.9360	0.9996	1.1691	2.0570	1.0458	0.80	1.070
1.080	0.8108	0.4800	0.5920	0.6151	1.2745	2.6549	0.9917	0.0066	0.3919	0.9277	0.9994	1.1941	2.0819	1.0522	0.97	1.080
1.090	0.8080	0.4742	0.5869	0.6197	1.2728	2.6842	0.9922	0.0082	0.3944	0.9196	0.9992	1.2195	2.1072	1.0586	1.15	1.090
1.100	0.8052	0.4684	0.5817	0.6243	1.2709	2.7136	0.9928	0.0099	0.3967	0.9118	0.9989	1.2450	2.1328	1.0649	1.34	1.100
1.110	0.8023	0.4626	0.5766	0.6288	1.2689	2.7432	0.9934	0.0118	0.3990	0.9041	0.9986	1.2708	2.1588	1.0713	1.53	1.110
1.120	0.7994	0.4568	0.5714	0.6333	1.2667	2.7728	0.9940	0.0138	0.4011	0.8966	0.9982	1.2968	2.1851	1.0776	1.74	1.120
1.130	0.7966	0.4511	0.5663	0.6379	1.2643	2.8026	0.9947	0.0159	0.4032	0.8892	0.9978	1.3231	2.2118	1.0840	1.94	1.130
1.140	0.7937	0.4455	0.5612	0.6423	1.2618	2.8325	0.9954	0.0182	0.4052	0.8820	0.9973	1.3495	2.2388	1.0903	2.16	1.140
1.150	0.7908	0.4398	0.5562	0.6468	1.2590	2.8626	0.9961	0.0205	0.4072	0.8750	0.9967	1.3763	2.2661	1.0966	2.38	1.150
1.160	0.7879	0.4343	0.5511	0.6512	1.2562	2.8927	0.9969	0.0230	0.4090	0.8682	0.9961	1.4032	2.2937	1.1029	2.61	1.160
1.170	0.7851	0.4287	0.5461	0.6556	1.2531	2.9230	0.9978	0.0255	0.4108	0.8615	0.9953	1.4304	2.3217	1.1092	2.84	1.170
1.180	0.7822	0.4232	0.5411	0.6600	1.2500	2.9534	0.9986	0.0281	0.4125	0.8549	0.9946	1.4578	2.3500	1.1154	3.07	1.180
1.190	0.7793	0.4178	0.5361	0.6644	1.2466	2.9840	0.9995	0.0309	0.4141	0.8485	0.9937	1.4855	2.3786	1.1217	3.31	1.190
1.200	0.7764	0.4124	0.5311	0.6687	1.2432	3.0147	1.0004	0.0336	0.4157	0.8422	0.9928	1.5133	2.4075	1.1280	3.56	1.200
1.210	0.7735	0.4070	0.5262	0.6730	1.2396	3.0455	1.0014	0.0365	0.4171	0.8360	0.9918	1.5415	2.4367	1.1343	3.81	1.210
1.220	0.7706	0.4017	0.5213	0.6773	1.2358	3.0764	1.0024	0.0394	0.4185	0.8300	0.9907	1.5698	2.4663	1.1405	4.06	1.220
1.230	0.7677	0.3964	0.5164	0.6816	1.2319	3.1075	1.0034	0.0424	0.4198	0.8241	0.9896	1.5984	2.4961	1.1468	4.31	1.230
1.240	0.7648	0.3912	0.5115	0.6858	1.2279	3.1387	1.0045	0.0455	0.4211	0.8183	0.9884	1.6272	2.5263	1.1531	4.57	1.240
1.250	0.7619	0.3861	0.5067	0.6901	1.2238	3.1700	1.0055	0.0486	0.4223	0.8126	0.9871	1.6563	2.5568	1.1594	4.83	1.250

$$\gamma=1.400$$

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{\frac{1}{2}\rho V^2}{p_0}$	M_s	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	ν	M
1.260	0.7590	0.3809	0.5019	0.6943	1.2195	3.2015	1.0066	0.0517	0.4233	0.8071	0.9857	1.6855	2.5875	1.1657	5.09	1.260
1.270	0.7561	0.3759	0.4971	0.6984	1.2152	3.2331	1.0077	0.0549	0.4244	0.8016	0.9842	1.7151	2.6186	1.1720	5.36	1.270
1.280	0.7532	0.3708	0.4923	0.7026	1.2107	3.2648	1.0089	0.0582	0.4253	0.7963	0.9827	1.7448	2.6500	1.1783	5.63	1.280
1.290	0.7503	0.3658	0.4876	0.7067	1.2061	3.2967	1.0100	0.0615	0.4262	0.7911	0.9811	1.7748	2.6816	1.1846	5.90	1.290
1.300	0.7474	0.3609	0.4829	0.7108	1.2014	3.3287	1.0112	0.0648	0.4270	0.7860	0.9794	1.8050	2.7136	1.1909	6.17	1.300
1.310	0.7445	0.3560	0.4782	0.7149	1.1965	3.3608	1.0124	0.0682	0.4277	0.7809	0.9776	1.8355	2.7459	1.1972	6.44	1.310
1.320	0.7416	0.3512	0.4736	0.7189	1.1916	3.3931	1.0136	0.0716	0.4283	0.7760	0.9758	1.8661	2.7784	1.2035	6.72	1.320
1.330	0.7387	0.3464	0.4690	0.7229	1.1866	3.4255	1.0149	0.0750	0.4289	0.7712	0.9738	1.8971	2.8112	1.2099	7.00	1.330
1.340	0.7358	0.3417	0.4644	0.7270	1.1815	3.4581	1.0161	0.0785	0.4294	0.7664	0.9718	1.9282	2.8444	1.2162	7.28	1.340
1.350	0.7329	0.3370	0.4598	0.7309	1.1763	3.4907	1.0174	0.0820	0.4299	0.7618	0.9697	1.9596	2.8778	1.2226	7.56	1.350
1.360	0.7300	0.3323	0.4553	0.7349	1.1710	3.5236	1.0187	0.0855	0.4303	0.7572	0.9676	1.9912	2.9115	1.2290	7.84	1.360
1.370	0.7271	0.3277	0.4508	0.7388	1.1656	3.5566	1.0200	0.0890	0.4306	0.7527	0.9653	2.0231	2.9455	1.2354	8.13	1.370
1.380	0.7242	0.3232	0.4463	0.7427	1.1601	3.5897	1.0213	0.0926	0.4308	0.7483	0.9630	2.0551	2.9798	1.2418	8.41	1.380
1.390	0.7213	0.3187	0.4418	0.7466	1.1546	3.6229	1.0226	0.0962	0.4310	0.7440	0.9607	2.0875	3.0144	1.2482	8.70	1.390
1.400	0.7184	0.3142	0.4374	0.7505	1.1490	3.6563	1.0240	0.0997	0.4311	0.7397	0.9582	2.1200	3.0492	1.2547	8.99	1.400
1.410	0.7155	0.3098	0.4330	0.7543	1.1433	3.6899	1.0253	0.1033	0.4312	0.7355	0.9557	2.1528	3.0844	1.2612	9.28	1.410
1.420	0.7126	0.3055	0.4287	0.7581	1.1375	3.7236	1.0267	0.1069	0.4312	0.7314	0.9531	2.1858	3.1198	1.2676	9.57	1.420
1.430	0.7097	0.3012	0.4244	0.7619	1.1317	3.7574	1.0281	0.1106	0.4311	0.7274	0.9504	2.2191	3.1555	1.2741	9.86	1.430
1.440	0.7069	0.2969	0.4201	0.7657	1.1258	3.7914	1.0295	0.1142	0.4310	0.7235	0.9476	2.2525	3.1915	1.2807	10.15	1.440
1.450	0.7040	0.2927	0.4158	0.7694	1.1198	3.8255	1.0308	0.1178	0.4308	0.7196	0.9448	2.2863	3.2278	1.2872	10.44	1.450
1.460	0.7011	0.2886	0.4116	0.7732	1.1138	3.8598	1.0323	0.1215	0.4306	0.7157	0.9420	2.3202	3.2643	1.2938	10.73	1.460
1.470	0.6982	0.2845	0.4074	0.7769	1.1077	3.8942	1.0337	0.1251	0.4303	0.7120	0.9390	2.3544	3.3011	1.3003	11.02	1.470
1.480	0.6954	0.2804	0.4032	0.7805	1.1016	3.9287	1.0351	0.1288	0.4299	0.7083	0.9360	2.3888	3.3382	1.3069	11.32	1.480
1.490	0.6925	0.2764	0.3991	0.7842	1.0954	3.9634	1.0365	0.1324	0.4295	0.7047	0.9329	2.4235	3.3756	1.3136	11.61	1.490
1.500	0.6897	0.2724	0.3950	0.7878	1.0891	3.9983	1.0379	0.1361	0.4290	0.7011	0.9298	2.4583	3.4133	1.3202	11.91	1.500

$$\gamma=1.400$$

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{\frac{1}{2}\rho V^2}{p_0}$	M_s	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	ν	M
1.510	0.6868	0.2685	0.3909	0.7914	1.0829	4.0333	1.0394	0.1397	0.4285	0.6976	0.9266	2.4935	3.4512	1.3269	12.20	1.510
1.520	0.6840	0.2646	0.3869	0.7950	1.0765	4.0684	1.0408	0.1433	0.4279	0.6941	0.9233	2.5288	3.4894	1.3336	12.49	1.520
1.530	0.6811	0.2608	0.3829	0.7986	1.0702	4.1037	1.0423	0.1470	0.4273	0.6907	0.9200	2.5644	3.5279	1.3403	12.79	1.530
1.540	0.6783	0.2570	0.3789	0.8021	1.0638	4.1392	1.0437	0.1506	0.4266	0.6874	0.9166	2.6002	3.5667	1.3470	13.09	1.540
1.550	0.6754	0.2533	0.3750	0.8057	1.0573	4.1748	1.0452	0.1543	0.4259	0.6841	0.9132	2.6363	3.6057	1.3538	13.38	1.550
1.560	0.6726	0.2496	0.3710	0.8092	1.0508	4.2105	1.0467	0.1579	0.4252	0.6809	0.9097	2.6725	3.6450	1.3606	13.68	1.560
1.570	0.6698	0.2459	0.3672	0.8126	1.0443	4.2464	1.0481	0.1615	0.4243	0.6777	0.9062	2.7091	3.6846	1.3674	13.97	1.570
1.580	0.6670	0.2423	0.3633	0.8161	1.0378	4.2825	1.0496	0.1651	0.4235	0.6746	0.9026	2.7458	3.7244	1.3742	14.27	1.580
1.590	0.6642	0.2388	0.3595	0.8195	1.0312	4.3187	1.0511	0.1688	0.4226	0.6715	0.8989	2.7828	3.7646	1.3811	14.56	1.590
1.600	0.6614	0.2353	0.3557	0.8230	1.0246	4.3551	1.0526	0.1724	0.4216	0.6684	0.8952	2.8200	3.8050	1.3880	14.86	1.600
1.610	0.6586	0.2318	0.3520	0.8263	1.0180	4.3916	1.0541	0.1760	0.4206	0.6655	0.8915	2.8575	3.8456	1.3949	15.16	1.610
1.620	0.6558	0.2284	0.3483	0.8297	1.0114	4.4282	1.0555	0.1795	0.4196	0.6625	0.8877	2.8951	3.8866	1.4018	15.45	1.620
1.630	0.6530	0.2250	0.3446	0.8331	1.0047	4.4651	1.0570	0.1831	0.4185	0.6596	0.8838	2.9331	3.9278	1.4088	15.75	1.630
1.640	0.6502	0.2217	0.3409	0.8364	0.9980	4.5020	1.0585	0.1867	0.4174	0.6568	0.8799	2.9712	3.9693	1.4158	16.04	1.640
1.650	0.6475	0.2184	0.3373	0.8397	0.9913	4.5392	1.0600	0.1902	0.4162	0.6540	0.8760	3.0096	4.0110	1.4228	16.34	1.650
1.660	0.6447	0.2151	0.3337	0.8430	0.9846	4.5765	1.0615	0.1938	0.4150	0.6512	0.8720	3.0482	4.0531	1.4299	16.63	1.660
1.670	0.6419	0.2119	0.3302	0.8462	0.9779	4.6139	1.0630	0.1973	0.4138	0.6485	0.8680	3.0871	4.0953	1.4369	16.93	1.670
1.680	0.6392	0.2088	0.3266	0.8495	0.9712	4.6515	1.0645	0.2008	0.4125	0.6458	0.8639	3.1261	4.1379	1.4440	17.22	1.680
1.690	0.6364	0.2057	0.3232	0.8527	0.9644	4.6892	1.0660	0.2043	0.4112	0.6431	0.8599	3.1655	4.1807	1.4512	17.52	1.690
1.700	0.6337	0.2026	0.3197	0.8559	0.9577	4.7272	1.0674	0.2078	0.4098	0.6405	0.8557	3.2050	4.2238	1.4583	17.81	1.700
1.710	0.6310	0.1996	0.3163	0.8591	0.9509	4.7652	1.0689	0.2113	0.4085	0.6380	0.8516	3.2448	4.2672	1.4655	18.10	1.710
1.720	0.6283	0.1966	0.3129	0.8622	0.9442	4.8035	1.0704	0.2147	0.4071	0.6355	0.8474	3.2848	4.3108	1.4727	18.40	1.720
1.730	0.6256	0.1936	0.3095	0.8654	0.9374	4.8418	1.0719	0.2182	0.4056	0.6330	0.8431	3.3251	4.3547	1.4800	18.69	1.730
1.740	0.6229	0.1907	0.3062	0.8685	0.9307	4.8804	1.0734	0.2216	0.4041	0.6305	0.8389	3.3655	4.3989	1.4873	18.98	1.740
1.750	0.6202	0.1878	0.3029	0.8716	0.9239	4.9191	1.0749	0.2250	0.4026	0.6281	0.8346	3.4063	4.4433	1.4946	19.27	1.750

$$\gamma=1.400$$

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{\frac{1}{2}\rho V^2}{p_0}$	M_s	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	ν	M
1.760	0.6175	0.1850	0.2996	0.8747	0.9172	4.9580	1.0764	0.2284	0.4011	0.6257	0.8302	3.4472	4.4880	1.5019	19.56	1.760
1.770	0.6148	0.1822	0.2964	0.8777	0.9104	4.9970	1.0779	0.2318	0.3996	0.6234	0.8259	3.4884	4.5330	1.5093	19.86	1.770
1.780	0.6121	0.1794	0.2931	0.8808	0.9037	5.0362	1.0793	0.2352	0.3980	0.6210	0.8215	3.5298	4.5782	1.5167	20.15	1.780
1.790	0.6095	0.1767	0.2900	0.8838	0.8970	5.0755	1.0808	0.2385	0.3964	0.6188	0.8171	3.5715	4.6237	1.5241	20.44	1.790
1.800	0.6068	0.1740	0.2868	0.8868	0.8902	5.1150	1.0823	0.2419	0.3947	0.6165	0.8127	3.6133	4.6695	1.5316	20.73	1.800
1.810	0.6041	0.1714	0.2837	0.8898	0.8835	5.1547	1.0838	0.2452	0.3931	0.6143	0.8082	3.6555	4.7155	1.5391	21.01	1.810
1.820	0.6015	0.1688	0.2806	0.8927	0.8768	5.1945	1.0852	0.2485	0.3914	0.6121	0.8038	3.6978	4.7618	1.5466	21.30	1.820
1.830	0.5989	0.1662	0.2776	0.8957	0.8701	5.2345	1.0867	0.2518	0.3897	0.6099	0.7993	3.7404	4.8084	1.5541	21.59	1.830
1.840	0.5963	0.1637	0.2745	0.8986	0.8634	5.2747	1.0882	0.2551	0.3879	0.6078	0.7948	3.7832	4.8552	1.5617	21.88	1.840
1.850	0.5936	0.1612	0.2715	0.9015	0.8568	5.3150	1.0896	0.2583	0.3862	0.6057	0.7902	3.8263	4.9023	1.5693	22.16	1.850
1.860	0.5910	0.1587	0.2686	0.9044	0.8501	5.3555	1.0911	0.2616	0.3844	0.6036	0.7857	3.8695	4.9497	1.5770	22.45	1.860
1.870	0.5884	0.1563	0.2656	0.9072	0.8435	5.3962	1.0926	0.2648	0.3826	0.6016	0.7811	3.9131	4.9973	1.5847	22.73	1.870
1.880	0.5859	0.1539	0.2627	0.9101	0.8368	5.4370	1.0940	0.2680	0.3808	0.5996	0.7765	3.9568	5.0452	1.5924	23.02	1.880
1.890	0.5833	0.1516	0.2598	0.9129	0.8302	5.4780	1.0955	0.2712	0.3790	0.5976	0.7720	4.0008	5.0934	1.6001	23.30	1.890
1.900	0.5807	0.1492	0.2570	0.9157	0.8237	5.5191	1.0969	0.2743	0.3771	0.5956	0.7674	4.0450	5.1418	1.6079	23.59	1.900
1.910	0.5782	0.1470	0.2542	0.9185	0.8171	5.5604	1.0984	0.2775	0.3753	0.5937	0.7627	4.0895	5.1905	1.6157	23.87	1.910
1.920	0.5756	0.1447	0.2514	0.9213	0.8106	5.6019	1.0998	0.2806	0.3734	0.5918	0.7581	4.1341	5.2394	1.6236	24.15	1.920
1.930	0.5731	0.1425	0.2486	0.9240	0.8041	5.6435	1.1012	0.2837	0.3715	0.5899	0.7535	4.1791	5.2886	1.6314	24.43	1.930
1.940	0.5705	0.1403	0.2459	0.9268	0.7976	5.6853	1.1027	0.2868	0.3696	0.5880	0.7488	4.2242	5.3381	1.6394	24.71	1.940
1.950	0.5680	0.1381	0.2432	0.9295	0.7911	5.7273	1.1041	0.2899	0.3677	0.5862	0.7442	4.2696	5.3878	1.6473	24.99	1.950
1.960	0.5655	0.1360	0.2405	0.9322	0.7846	5.7695	1.1055	0.2929	0.3657	0.5844	0.7395	4.3152	5.4378	1.6553	25.27	1.960
1.970	0.5630	0.1339	0.2378	0.9349	0.7782	5.8118	1.1069	0.2960	0.3638	0.5826	0.7349	4.3611	5.4881	1.6633	25.55	1.970
1.980	0.5605	0.1318	0.2352	0.9375	0.7718	5.8542	1.1084	0.2990	0.3618	0.5808	0.7302	4.4071	5.5386	1.6713	25.83	1.980
1.990	0.5580	0.1298	0.2326	0.9402	0.7655	5.8969	1.1098	0.3020	0.3598	0.5791	0.7255	4.4535	5.5894	1.6794	26.10	1.990
2.000	0.5556	0.1278	0.2300	0.9428	0.7591	5.9397	1.1112	0.3050	0.3579	0.5774	0.7209	4.5000	5.6404	1.6875	26.38	2.000

$$\gamma=1.400$$

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{\frac{1}{2}\rho V^2}{p_0}$	M_s	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	ν	M
2.010	0.5531	0.1258	0.2275	0.9454	0.7528	5.9827	1.1126	0.3080	0.3559	0.5757	0.7162	4.5468	5.6918	1.6956	26.66	2.010
2.020	0.5506	0.1239	0.2250	0.9480	0.7465	6.0258	1.1140	0.3109	0.3539	0.5740	0.7115	4.5938	5.7433	1.7038	26.93	2.020
2.030	0.5482	0.1220	0.2225	0.9506	0.7403	6.0692	1.1154	0.3138	0.3518	0.5723	0.7069	4.6411	5.7952	1.7120	27.20	2.030
2.040	0.5458	0.1201	0.2200	0.9531	0.7340	6.1126	1.1167	0.3168	0.3498	0.5707	0.7022	4.6885	5.8473	1.7203	27.48	2.040
2.050	0.5433	0.1182	0.2176	0.9557	0.7279	6.1563	1.1181	0.3197	0.3478	0.5691	0.6975	4.7363	5.8996	1.7285	27.75	2.050
2.060	0.5409	0.1164	0.2152	0.9582	0.7217	6.2001	1.1195	0.3225	0.3458	0.5675	0.6928	4.7842	5.9523	1.7369	28.02	2.060
2.070	0.5385	0.1146	0.2128	0.9607	0.7156	6.2441	1.1209	0.3254	0.3437	0.5659	0.6882	4.8324	6.0051	1.7452	28.29	2.070
2.080	0.5361	0.1128	0.2104	0.9632	0.7095	6.2883	1.1222	0.3282	0.3417	0.5643	0.6835	4.8808	6.0583	1.7536	28.56	2.080
2.090	0.5337	0.1111	0.2081	0.9657	0.7034	6.3326	1.1236	0.3310	0.3396	0.5628	0.6789	4.9295	6.1117	1.7620	28.83	2.090
2.100	0.5313	0.1094	0.2058	0.9681	0.6974	6.3772	1.1250	0.3339	0.3376	0.5613	0.6742	4.9783	6.1654	1.7705	29.10	2.100
2.110	0.5290	0.1077	0.2035	0.9706	0.6914	6.4218	1.1263	0.3366	0.3355	0.5598	0.6696	5.0275	6.2193	1.7789	29.36	2.110
2.120	0.5266	0.1060	0.2013	0.9730	0.6854	6.4667	1.1276	0.3394	0.3334	0.5583	0.6649	5.0768	6.2735	1.7875	29.63	2.120
2.130	0.5243	0.1043	0.1990	0.9754	0.6795	6.5117	1.1290	0.3422	0.3314	0.5568	0.6603	5.1264	6.3280	1.7960	29.90	2.130
2.140	0.5219	0.1027	0.1968	0.9778	0.6736	6.5569	1.1303	0.3449	0.3293	0.5554	0.6557	5.1762	6.3827	1.8046	30.16	2.140
2.150	0.5196	0.1011	0.1946	0.9802	0.6677	6.6023	1.1317	0.3476	0.3272	0.5540	0.6511	5.2263	6.4377	1.8132	30.43	2.150
2.160	0.5173	0.0996	0.1925	0.9825	0.6619	6.6478	1.1330	0.3503	0.3252	0.5525	0.6464	5.2765	6.4929	1.8219	30.69	2.160
2.170	0.5150	0.0980	0.1903	0.9849	0.6561	6.6936	1.1343	0.3530	0.3231	0.5511	0.6419	5.3271	6.5484	1.8306	30.95	2.170
2.180	0.5127	0.0965	0.1882	0.9872	0.6503	6.7395	1.1356	0.3556	0.3210	0.5498	0.6373	5.3778	6.6042	1.8393	31.21	2.180
2.190	0.5104	0.0950	0.1861	0.9895	0.6446	6.7855	1.1369	0.3583	0.3189	0.5484	0.6327	5.4288	6.6602	1.8481	31.47	2.190
2.200	0.5081	0.0935	0.1841	0.9918	0.6389	6.8318	1.1382	0.3609	0.3169	0.5471	0.6281	5.4800	6.7165	1.8569	31.73	2.200
2.210	0.5059	0.0921	0.1820	0.9941	0.6333	6.8782	1.1395	0.3635	0.3148	0.5457	0.6236	5.5315	6.7730	1.8657	31.99	2.210
2.220	0.5036	0.0906	0.1800	0.9964	0.6277	6.9248	1.1408	0.3661	0.3127	0.5444	0.6191	5.5831	6.8298	1.8746	32.25	2.220
2.230	0.5014	0.0892	0.1780	0.9986	0.6221	6.9715	1.1421	0.3687	0.3106	0.5431	0.6145	5.6351	6.8869	1.8835	32.51	2.230
2.240	0.4991	0.0878	0.1760	1.0009	0.6165	7.0185	1.1434	0.3712	0.3085	0.5418	0.6100	5.6872	6.9442	1.8924	32.76	2.240
2.250	0.4969	0.0865	0.1740	1.0031	0.6110	7.0656	1.1446	0.3738	0.3065	0.5406	0.6055	5.7396	7.0018	1.9014	33.02	2.250

$$\gamma=1.400$$

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\frac{\rho V^2}{p_0}$	M_s	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	ν	M
2.260	0.4947	0.0851	0.1721	1.0053	0.6056	7.1129	1.1459	0.3763	0.3044	0.5393	0.6011	5.7922	7.0597	1.9104	33.27	2.260
2.270	0.4925	0.0838	0.1702	1.0075	0.6002	7.1603	1.1472	0.3788	0.3023	0.5381	0.5966	5.8451	7.1178	1.9194	33.53	2.270
2.280	0.4903	0.0825	0.1683	1.0097	0.5948	7.2080	1.1484	0.3813	0.3003	0.5368	0.5921	5.8981	7.1762	1.9285	33.78	2.280
2.290	0.4881	0.0812	0.1664	1.0118	0.5894	7.2558	1.1497	0.3838	0.2982	0.5356	0.5877	5.9515	7.2348	1.9376	34.03	2.290
2.300	0.4859	0.0800	0.1646	1.0140	0.5841	7.3038	1.1509	0.3862	0.2961	0.5344	0.5833	6.0050	7.2937	1.9468	34.28	2.300
2.310	0.4837	0.0787	0.1628	1.0161	0.5788	7.3520	1.1521	0.3887	0.2941	0.5332	0.5789	6.0588	7.3528	1.9560	34.53	2.310
2.320	0.4816	0.0775	0.1609	1.0182	0.5736	7.4003	1.1534	0.3911	0.2920	0.5321	0.5745	6.1128	7.4122	1.9652	34.78	2.320
2.330	0.4794	0.0763	0.1592	1.0204	0.5684	7.4488	1.1546	0.3935	0.2900	0.5309	0.5702	6.1671	7.4719	1.9745	35.03	2.330
2.340	0.4773	0.0751	0.1574	1.0224	0.5632	7.4975	1.1558	0.3959	0.2879	0.5297	0.5658	6.2215	7.5319	1.9838	35.28	2.340
2.350	0.4752	0.0740	0.1556	1.0245	0.5581	7.5464	1.1570	0.3983	0.2859	0.5286	0.5615	6.2763	7.5920	1.9931	35.53	2.350
2.360	0.4731	0.0728	0.1539	1.0266	0.5530	7.5955	1.1582	0.4006	0.2839	0.5275	0.5572	6.3312	7.6525	2.0025	35.77	2.360
2.370	0.4709	0.0717	0.1522	1.0286	0.5480	7.6447	1.1595	0.4030	0.2818	0.5264	0.5529	6.3864	7.7132	2.0119	36.02	2.370
2.380	0.4688	0.0706	0.1505	1.0307	0.5430	7.6941	1.1606	0.4053	0.2798	0.5253	0.5486	6.4418	7.7742	2.0213	36.26	2.380
2.390	0.4668	0.0695	0.1488	1.0327	0.5380	7.7437	1.1618	0.4076	0.2778	0.5242	0.5444	6.4975	7.8354	2.0308	36.50	2.390
2.400	0.4647	0.0684	0.1472	1.0347	0.5331	7.7935	1.1630	0.4099	0.2758	0.5231	0.5401	6.5533	7.8969	2.0403	36.75	2.400
2.410	0.4626	0.0673	0.1456	1.0367	0.5282	7.8434	1.1642	0.4122	0.2738	0.5221	0.5359	6.6095	7.9587	2.0499	36.99	2.410
2.420	0.4606	0.0663	0.1439	1.0387	0.5233	7.8935	1.1654	0.4144	0.2718	0.5210	0.5317	6.6658	8.0207	2.0595	37.23	2.420
2.430	0.4585	0.0653	0.1424	1.0407	0.5185	7.9438	1.1665	0.4167	0.2698	0.5200	0.5276	6.7224	8.0830	2.0691	37.47	2.430
2.440	0.4565	0.0643	0.1408	1.0426	0.5137	7.9943	1.1677	0.4189	0.2678	0.5189	0.5234	6.7792	8.1455	2.0788	37.71	2.440
2.450	0.4544	0.0633	0.1392	1.0446	0.5090	8.0450	1.1689	0.4211	0.2658	0.5179	0.5193	6.8363	8.2083	2.0885	37.95	2.450
2.460	0.4524	0.0623	0.1377	1.0465	0.5043	8.0958	1.1700	0.4233	0.2639	0.5169	0.5152	6.8935	8.2713	2.0982	38.18	2.460
2.470	0.4504	0.0613	0.1362	1.0484	0.4996	8.1468	1.1712	0.4255	0.2619	0.5159	0.5111	6.9511	8.3346	2.1080	38.42	2.470
2.480	0.4484	0.0604	0.1346	1.0503	0.4950	8.1980	1.1723	0.4277	0.2599	0.5149	0.5071	7.0088	8.3982	2.1178	38.66	2.480
2.490	0.4464	0.0594	0.1332	1.0522	0.4904	8.2494	1.1734	0.4298	0.2580	0.5140	0.5030	7.0668	8.4620	2.1276	38.89	2.490
2.500	0.4444	0.0585	0.1317	1.0541	0.4858	8.3010	1.1746	0.4320	0.2561	0.5130	0.4990	7.1250	8.5261	2.1375	39.12	2.500

$$\gamma=1.400$$

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{\frac{1}{2}\rho V^2}{p_0}$	M_s	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	ν	M
2.510	0.4425	0.0576	0.1302	1.0560	0.4813	8.3527	1.1757	0.4341	0.2541	0.5120	0.4950	7.1835	8.5905	2.1474	39.36	2.510
2.520	0.4405	0.0567	0.1288	1.0578	0.4768	8.4046	1.1768	0.4362	0.2522	0.5111	0.4911	7.2421	8.6551	2.1574	39.59	2.520
2.530	0.4386	0.0559	0.1274	1.0597	0.4724	8.4567	1.1779	0.4383	0.2503	0.5102	0.4871	7.3011	8.7200	2.1674	39.82	2.530
2.540	0.4366	0.0550	0.1260	1.0615	0.4680	8.5090	1.1790	0.4404	0.2484	0.5092	0.4832	7.3602	8.7851	2.1774	40.05	2.540
2.550	0.4347	0.0542	0.1246	1.0633	0.4636	8.5615	1.1801	0.4425	0.2465	0.5083	0.4793	7.4196	8.8505	2.1875	40.28	2.550
2.560	0.4328	0.0533	0.1232	1.0651	0.4593	8.6141	1.1812	0.4445	0.2446	0.5074	0.4754	7.4792	8.9161	2.1976	40.51	2.560
2.570	0.4309	0.0525	0.1218	1.0669	0.4550	8.6670	1.1823	0.4466	0.2427	0.5065	0.4715	7.5391	8.9820	2.2077	40.74	2.570
2.580	0.4289	0.0517	0.1205	1.0687	0.4507	8.7200	1.1834	0.4486	0.2409	0.5056	0.4677	7.5991	9.0482	2.2179	40.96	2.580
2.590	0.4271	0.0509	0.1192	1.0705	0.4465	8.7732	1.1844	0.4506	0.2390	0.5047	0.4639	7.6595	9.1146	2.2281	41.19	2.590
2.600	0.4252	0.0501	0.1179	1.0722	0.4423	8.8265	1.1855	0.4526	0.2371	0.5039	0.4601	7.7200	9.1813	2.2383	41.41	2.600
2.610	0.4233	0.0493	0.1166	1.0740	0.4382	8.8801	1.1866	0.4546	0.2353	0.5030	0.4564	7.7808	9.2483	2.2486	41.64	2.610
2.620	0.4214	0.0486	0.1153	1.0757	0.4341	8.9338	1.1876	0.4565	0.2335	0.5022	0.4526	7.8418	9.3155	2.2590	41.86	2.620
2.630	0.4196	0.0478	0.1140	1.0774	0.4300	8.9877	1.1887	0.4585	0.2317	0.5013	0.4489	7.9031	9.3829	2.2693	42.09	2.630
2.640	0.4177	0.0471	0.1128	1.0791	0.4260	9.0418	1.1897	0.4604	0.2298	0.5005	0.4452	7.9645	9.4506	2.2797	42.31	2.640
2.650	0.4159	0.0464	0.1115	1.0808	0.4220	9.0961	1.1908	0.4624	0.2280	0.4996	0.4416	8.0263	9.5186	2.2902	42.53	2.650
2.660	0.4141	0.0457	0.1103	1.0825	0.4180	9.1506	1.1918	0.4643	0.2262	0.4988	0.4379	8.0882	9.5869	2.3006	42.75	2.660
2.670	0.4122	0.0450	0.1091	1.0842	0.4141	9.2052	1.1928	0.4662	0.2245	0.4980	0.4343	8.1504	9.6554	2.3111	42.97	2.670
2.680	0.4104	0.0443	0.1079	1.0859	0.4102	9.2601	1.1939	0.4681	0.2227	0.4972	0.4307	8.2128	9.7241	2.3217	43.19	2.680
2.690	0.4086	0.0436	0.1067	1.0875	0.4063	9.3151	1.1949	0.4700	0.2209	0.4964	0.4271	8.2755	9.7931	2.3323	43.40	2.690
2.700	0.4068	0.0430	0.1056	1.0892	0.4025	9.3703	1.1959	0.4718	0.2192	0.4956	0.4236	8.3383	9.8624	2.3429	43.62	2.700
2.710	0.4051	0.0423	0.1044	1.0908	0.3987	9.4257	1.1969	0.4737	0.2174	0.4949	0.4201	8.4015	9.9319	2.3536	43.84	2.710
2.720	0.4033	0.0417	0.1033	1.0924	0.3949	9.4812	1.1979	0.4755	0.2157	0.4941	0.4166	8.4648	10.0017	2.3642	44.05	2.720
2.730	0.4015	0.0410	0.1022	1.0941	0.3912	9.5370	1.1989	0.4773	0.2140	0.4933	0.4131	8.5284	10.0718	2.3750	44.27	2.730
2.740	0.3998	0.0404	0.1010	1.0957	0.3875	9.5929	1.1999	0.4791	0.2123	0.4926	0.4097	8.5922	10.1421	2.3858	44.48	2.740
2.750	0.3980	0.0398	0.0999	1.0973	0.3838	9.6490	1.2009	0.4809	0.2106	0.4918	0.4062	8.6563	10.2127	2.3966	44.69	2.750

$$\gamma=1.400$$

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{\frac{1}{2}\rho V^2}{p_0}$	M_s	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	ν	M
2.760	0.3963	0.0392	0.0989	1.0988	0.3802	9.7053	1.2019	0.4827	0.2089	0.4911	0.4028	8.7205	10.2835	2.4074	44.91	2.760
2.770	0.3945	0.0386	0.0978	1.1004	0.3766	9.7618	1.2029	0.4845	0.2072	0.4903	0.3994	8.7851	10.3546	2.4183	45.12	2.770
2.780	0.3928	0.0380	0.0967	1.1020	0.3730	9.8185	1.2038	0.4863	0.2055	0.4896	0.3961	8.8498	10.4259	2.4292	45.33	2.780
2.790	0.3911	0.0374	0.0957	1.1035	0.3695	9.8753	1.2048	0.4880	0.2039	0.4889	0.3928	8.9148	10.4975	2.4402	45.54	2.790
2.800	0.3894	0.0368	0.0946	1.1051	0.3660	9.9324	1.2058	0.4898	0.2022	0.4882	0.3895	8.9800	10.5694	2.4512	45.75	2.800
2.810	0.3877	0.0363	0.0936	1.1066	0.3625	9.9896	1.2067	0.4915	0.2006	0.4875	0.3862	9.0455	10.6415	2.4622	45.95	2.810
2.820	0.3860	0.0357	0.0926	1.1081	0.3591	10.0470	1.2077	0.4932	0.1990	0.4868	0.3829	9.1111	10.7139	2.4733	46.16	2.820
2.830	0.3844	0.0352	0.0916	1.1096	0.3557	10.1046	1.2086	0.4949	0.1973	0.4861	0.3797	9.1771	10.7865	2.4844	46.37	2.830
2.840	0.3827	0.0347	0.0906	1.1111	0.3523	10.1624	1.2095	0.4966	0.1957	0.4854	0.3765	9.2432	10.8594	2.4955	46.57	2.840
2.850	0.3810	0.0341	0.0896	1.1126	0.3490	10.2204	1.2105	0.4983	0.1941	0.4847	0.3733	9.3096	10.9326	2.5067	46.78	2.850
2.860	0.3794	0.0336	0.0886	1.1141	0.3457	10.2785	1.2114	0.5000	0.1926	0.4840	0.3701	9.3762	11.0060	2.5179	46.98	2.860
2.870	0.3777	0.0331	0.0877	1.1156	0.3424	10.3368	1.2123	0.5016	0.1910	0.4833	0.3670	9.4431	11.0797	2.5292	47.19	2.870
2.880	0.3761	0.0326	0.0867	1.1171	0.3392	10.3954	1.2132	0.5033	0.1894	0.4827	0.3639	9.5101	11.1536	2.5405	47.39	2.880
2.890	0.3745	0.0321	0.0858	1.1185	0.3359	10.4541	1.2142	0.5049	0.1879	0.4820	0.3608	9.5775	11.2278	2.5518	47.59	2.890
2.900	0.3729	0.0317	0.0849	1.1199	0.3328	10.5130	1.2151	0.5065	0.1863	0.4814	0.3577	9.6450	11.3022	2.5632	47.79	2.900
2.910	0.3712	0.0312	0.0840	1.1214	0.3296	10.5720	1.2160	0.5081	0.1848	0.4807	0.3547	9.7128	11.3770	2.5746	47.99	2.910
2.920	0.3696	0.0307	0.0831	1.1228	0.3265	10.6313	1.2169	0.5097	0.1833	0.4801	0.3517	9.7808	11.4519	2.5861	48.19	2.920
2.930	0.3681	0.0302	0.0822	1.1242	0.3234	10.6908	1.2178	0.5113	0.1818	0.4795	0.3487	9.8491	11.5271	2.5976	48.39	2.930
2.940	0.3665	0.0298	0.0813	1.1256	0.3203	10.7504	1.2187	0.5129	0.1803	0.4788	0.3457	9.9175	11.6026	2.6091	48.59	2.940
2.950	0.3649	0.0293	0.0804	1.1270	0.3173	10.8102	1.2195	0.5145	0.1788	0.4782	0.3428	9.9863	11.6784	2.6206	48.78	2.950
2.960	0.3633	0.0289	0.0796	1.1284	0.3143	10.8702	1.2204	0.5160	0.1773	0.4776	0.3398	10.0552	11.7544	2.6322	48.98	2.960
2.970	0.3618	0.0285	0.0787	1.1298	0.3113	10.9304	1.2213	0.5176	0.1758	0.4770	0.3369	10.1244	11.8306	2.6439	49.18	2.970
2.980	0.3602	0.0281	0.0779	1.1312	0.3083	10.9908	1.2222	0.5191	0.1744	0.4764	0.3340	10.1938	11.9072	2.6555	49.37	2.980
2.990	0.3587	0.0276	0.0770	1.1325	0.3054	11.0514	1.2230	0.5206	0.1729	0.4758	0.3312	10.2635	11.9839	2.6673	49.56	2.990
3.000	0.3571	0.0272	0.0762	1.1339	0.3025	11.1122	1.2239	0.5222	0.1715	0.4752	0.3283	10.3333	12.0610	2.6790	49.76	3.000

GAS FLOW TABLES ($\gamma=1.333$): SUBSONIC FLOW

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\rho V^2$ p_0
0.010	1.0000	0.9999	1.0000	0.0058	0.0231	0.0231	43.2958	7493.200	0.0001
0.020	0.9999	0.9997	0.9998	0.0115	0.0462	0.0462	21.6560	1868.007	0.0003
0.030	0.9999	0.9994	0.9996	0.0173	0.0693	0.0693	14.4464	826.7890	0.0006
0.040	0.9997	0.9989	0.9992	0.0231	0.0923	0.0924	10.8442	462.6179	0.0011
0.050	0.9996	0.9983	0.9988	0.0288	0.1153	0.1155	8.6851	294.2161	0.0017
0.060	0.9994	0.9976	0.9982	0.0346	0.1383	0.1386	7.2475	202.8455	0.0024
0.070	0.9992	0.9967	0.9976	0.0404	0.1612	0.1618	6.2222	147.8292	0.0033
0.080	0.9989	0.9957	0.9968	0.0461	0.1841	0.1849	5.4546	112.1800	0.0042
0.090	0.9987	0.9946	0.9960	0.0519	0.2069	0.2080	4.8587	87.7848	0.0054
0.100	0.9983	0.9934	0.9950	0.0577	0.2297	0.2312	4.3831	70.3719	0.0066
0.110	0.9980	0.9920	0.9940	0.0634	0.2523	0.2544	3.9949	57.5186	0.0080
0.120	0.9976	0.9905	0.9928	0.0692	0.2749	0.2775	3.6724	47.7680	0.0095
0.130	0.9972	0.9888	0.9916	0.0749	0.2974	0.3007	3.4003	40.2012	0.0111
0.140	0.9967	0.9870	0.9903	0.0807	0.3197	0.3239	3.1678	34.2155	0.0129
0.150	0.9963	0.9851	0.9888	0.0864	0.3420	0.3471	2.9670	29.4027	0.0148
0.160	0.9958	0.9831	0.9873	0.0921	0.3641	0.3704	2.7920	25.4777	0.0168
0.170	0.9952	0.9810	0.9857	0.0979	0.3861	0.3936	2.6383	22.2372	0.0189
0.180	0.9946	0.9787	0.9840	0.1036	0.4080	0.4169	2.5022	19.5326	0.0211
0.190	0.9940	0.9763	0.9822	0.1093	0.4298	0.4402	2.3809	17.2536	0.0235
0.200	0.9934	0.9738	0.9803	0.1150	0.4514	0.4635	2.2724	15.3166	0.0260
0.210	0.9927	0.9711	0.9783	0.1207	0.4728	0.4869	2.1747	13.6578	0.0285
0.220	0.9920	0.9684	0.9762	0.1264	0.4941	0.5102	2.0863	12.2273	0.0312
0.230	0.9913	0.9655	0.9740	0.1321	0.5152	0.5336	2.0061	10.9859	0.0340
0.240	0.9905	0.9625	0.9717	0.1378	0.5362	0.5570	1.9330	9.9026	0.0370
0.250	0.9897	0.9594	0.9694	0.1435	0.5569	0.5805	1.8662	8.9522	0.0400
0.260	0.9889	0.9562	0.9669	0.1492	0.5775	0.6040	1.8049	8.1146	0.0431
0.270	0.9880	0.9529	0.9644	0.1549	0.5979	0.6275	1.7486	7.3731	0.0463
0.280	0.9871	0.9494	0.9618	0.1605	0.6181	0.6510	1.6966	6.7140	0.0496
0.290	0.9862	0.9459	0.9591	0.1662	0.6380	0.6746	1.6486	6.1261	0.0530
0.300	0.9852	0.9422	0.9563	0.1718	0.6578	0.6982	1.6042	5.5998	0.0565
0.310	0.9843	0.9384	0.9534	0.1775	0.6774	0.7218	1.5629	5.1272	0.0601
0.320	0.9832	0.9346	0.9505	0.1831	0.6967	0.7455	1.5245	4.7016	0.0638
0.330	0.9822	0.9306	0.9475	0.1887	0.7158	0.7692	1.4888	4.3173	0.0675
0.340	0.9811	0.9265	0.9444	0.1943	0.7347	0.7929	1.4555	3.9693	0.0714
0.350	0.9800	0.9224	0.9412	0.1999	0.7533	0.8167	1.4244	3.6535	0.0753
0.360	0.9789	0.9181	0.9379	0.2055	0.7717	0.8405	1.3953	3.3663	0.0793
0.370	0.9777	0.9137	0.9346	0.2111	0.7898	0.8644	1.3680	3.1046	0.0834
0.380	0.9765	0.9093	0.9311	0.2167	0.8077	0.8883	1.3425	2.8655	0.0875
0.390	0.9753	0.9047	0.9276	0.2223	0.8253	0.9122	1.3185	2.6469	0.0917
0.400	0.9741	0.9001	0.9241	0.2278	0.8427	0.9362	1.2959	2.4466	0.0960
0.410	0.9728	0.8954	0.9204	0.2334	0.8598	0.9603	1.2747	2.2627	0.1003
0.420	0.9715	0.8906	0.9167	0.2389	0.8766	0.9843	1.2548	2.0937	0.1047
0.430	0.9701	0.8857	0.9130	0.2444	0.8932	1.0085	1.2360	1.9382	0.1091
0.440	0.9688	0.8807	0.9091	0.2499	0.9095	1.0326	1.2183	1.7949	0.1136
0.450	0.9674	0.8757	0.9052	0.2554	0.9255	1.0569	1.2016	1.6627	0.1182
0.460	0.9660	0.8706	0.9012	0.2609	0.9412	1.0811	1.1858	1.5405	0.1228
0.470	0.9645	0.8654	0.8972	0.2664	0.9567	1.1055	1.1710	1.4276	0.1274
0.480	0.9631	0.8601	0.8931	0.2718	0.9718	1.1299	1.1569	1.3231	0.1321
0.490	0.9616	0.8548	0.8890	0.2773	0.9867	1.1543	1.1436	1.2263	0.1368
0.500	0.9600	0.8494	0.8847	0.2827	1.0012	1.1788	1.1310	1.1365	0.1415

$$\gamma=1.333$$

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\rho V^2$ p_0
0.510	0.9585	0.8439	0.8805	0.2881	1.0155	1.2033	1.1192	1.0532	0.1463
0.520	0.9569	0.8384	0.8761	0.2935	1.0295	1.2279	1.1079	0.9759	0.1511
0.530	0.9553	0.8328	0.8717	0.2989	1.0431	1.2526	1.0973	0.9041	0.1559
0.540	0.9537	0.8271	0.8673	0.3043	1.0565	1.2773	1.0872	0.8373	0.1608
0.550	0.9520	0.8214	0.8628	0.3097	1.0696	1.3021	1.0777	0.7752	0.1656
0.560	0.9504	0.8157	0.8583	0.3150	1.0823	1.3269	1.0687	0.7174	0.1705
0.570	0.9487	0.8099	0.8537	0.3204	1.0948	1.3518	1.0601	0.6636	0.1754
0.580	0.9470	0.8040	0.8490	0.3257	1.1069	1.3768	1.0520	0.6136	0.1803
0.590	0.9452	0.7981	0.8443	0.3310	1.1188	1.4018	1.0444	0.5669	0.1852
0.600	0.9434	0.7921	0.8396	0.3363	1.1303	1.4269	1.0371	0.5235	0.1901
0.610	0.9417	0.7861	0.8348	0.3416	1.1415	1.4521	1.0303	0.4830	0.1950
0.620	0.9398	0.7801	0.8300	0.3469	1.1524	1.4773	1.0238	0.4452	0.1999
0.630	0.9380	0.7740	0.8252	0.3521	1.1630	1.5026	1.0176	0.4101	0.2048
0.640	0.9362	0.7679	0.8203	0.3573	1.1733	1.5280	1.0118	0.3773	0.2096
0.650	0.9343	0.7618	0.8153	0.3626	1.1833	1.5534	1.0063	0.3467	0.2145
0.660	0.9324	0.7556	0.8104	0.3678	1.1930	1.5789	1.0011	0.3183	0.2194
0.670	0.9305	0.7494	0.8054	0.3729	1.2023	1.6045	0.9962	0.2918	0.2242
0.680	0.9285	0.7431	0.8003	0.3781	1.2114	1.6301	0.9916	0.2671	0.2290
0.690	0.9266	0.7368	0.7953	0.3833	1.2201	1.6559	0.9872	0.2441	0.2338
0.700	0.9246	0.7306	0.7902	0.3884	1.2285	1.6817	0.9831	0.2227	0.2386
0.710	0.9226	0.7242	0.7850	0.3935	1.2367	1.7075	0.9792	0.2028	0.2433
0.720	0.9205	0.7179	0.7799	0.3986	1.2445	1.7335	0.9755	0.1843	0.2480
0.730	0.9185	0.7116	0.7747	0.4037	1.2520	1.7595	0.9721	0.1671	0.2527
0.740	0.9164	0.7052	0.7695	0.4088	1.2592	1.7856	0.9688	0.1512	0.2574
0.750	0.9144	0.6988	0.7643	0.4139	1.2661	1.8118	0.9658	0.1364	0.2620
0.760	0.9123	0.6924	0.7590	0.4189	1.2727	1.8381	0.9629	0.1227	0.2666
0.770	0.9102	0.6860	0.7537	0.4239	1.2790	1.8644	0.9603	0.1100	0.2711
0.780	0.9080	0.6796	0.7484	0.4289	1.2850	1.8908	0.9578	0.0983	0.2756
0.790	0.9059	0.6732	0.7431	0.4339	1.2907	1.9174	0.9554	0.0875	0.2800
0.800	0.9037	0.6668	0.7378	0.4389	1.2961	1.9440	0.9533	0.0776	0.2844
0.810	0.9015	0.6603	0.7325	0.4438	1.3013	1.9706	0.9513	0.0685	0.2888
0.820	0.8993	0.6539	0.7271	0.4487	1.3061	1.9974	0.9494	0.0601	0.2930
0.830	0.8971	0.6475	0.7217	0.4536	1.3107	2.0243	0.9477	0.0524	0.2973
0.840	0.8949	0.6411	0.7164	0.4585	1.3149	2.0512	0.9461	0.0454	0.3015
0.850	0.8926	0.6346	0.7110	0.4634	1.3189	2.0782	0.9446	0.0391	0.3056
0.860	0.8904	0.6282	0.7056	0.4683	1.3226	2.1053	0.9433	0.0333	0.3097
0.870	0.8881	0.6218	0.7002	0.4731	1.3260	2.1326	0.9420	0.0281	0.3137
0.880	0.8858	0.6154	0.6948	0.4779	1.3292	2.1599	0.9409	0.0235	0.3176
0.890	0.8835	0.6090	0.6893	0.4827	1.3321	2.1873	0.9399	0.0193	0.3215
0.900	0.8812	0.6026	0.6839	0.4875	1.3347	2.2147	0.9390	0.0156	0.3253
0.910	0.8788	0.5963	0.6785	0.4923	1.3370	2.2423	0.9383	0.0124	0.3291
0.920	0.8765	0.5899	0.6731	0.4970	1.3391	2.2700	0.9376	0.0096	0.3328
0.930	0.8741	0.5836	0.6676	0.5018	1.3410	2.2978	0.9370	0.0072	0.3364
0.940	0.8717	0.5773	0.6622	0.5065	1.3425	2.3256	0.9365	0.0052	0.3400
0.950	0.8694	0.5710	0.6568	0.5111	1.3439	2.3536	0.9360	0.0035	0.3435
0.960	0.8670	0.5647	0.6514	0.5158	1.3449	2.3817	0.9357	0.0022	0.3469
0.970	0.8646	0.5585	0.6459	0.5205	1.3458	2.4098	0.9354	0.0012	0.3502
0.980	0.8621	0.5522	0.6405	0.5251	1.3464	2.4381	0.9353	0.0005	0.3535
0.990	0.8597	0.5460	0.6351	0.5297	1.3467	2.4664	0.9351	0.0001	0.3567
1.000	0.8573	0.5398	0.6297	0.5343	1.3468	2.4949	0.9351	0.0000	0.3598

GAS FLOW TABLES ($\gamma=1.333$): SUPERSONIC FLOW

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\frac{\rho V^2}{p_0}$
1.010	0.8548	0.5337	0.6243	0.5389	1.3467	2.5234	0.9351	0.0001	0.3628
1.020	0.8524	0.5276	0.6189	0.5434	1.3464	2.5521	0.9352	0.0005	0.3658
1.030	0.8499	0.5215	0.6136	0.5479	1.3458	2.5809	0.9354	0.0011	0.3687
1.040	0.8474	0.5154	0.6082	0.5525	1.3450	2.6097	0.9356	0.0019	0.3715
1.050	0.8449	0.5093	0.6028	0.5569	1.3440	2.6387	0.9359	0.0029	0.3743
1.060	0.8424	0.5033	0.5975	0.5614	1.3428	2.6678	0.9363	0.0042	0.3769
1.070	0.8399	0.4974	0.5922	0.5659	1.3414	2.6970	0.9367	0.0056	0.3795
1.080	0.8374	0.4914	0.5869	0.5703	1.3397	2.7263	0.9371	0.0071	0.3820
1.090	0.8349	0.4855	0.5816	0.5747	1.3379	2.7557	0.9376	0.0089	0.3845
1.100	0.8323	0.4796	0.5763	0.5791	1.3359	2.7852	0.9381	0.0108	0.3868
1.110	0.8298	0.4738	0.5710	0.5835	1.3337	2.8148	0.9387	0.0128	0.3891
1.120	0.8272	0.4680	0.5658	0.5878	1.3313	2.8446	0.9394	0.0150	0.3913
1.130	0.8247	0.4622	0.5605	0.5922	1.3287	2.8744	0.9401	0.0173	0.3934
1.140	0.8221	0.4565	0.5553	0.5965	1.3259	2.9043	0.9408	0.0197	0.3954
1.150	0.8195	0.4508	0.5501	0.6008	1.3229	2.9344	0.9415	0.0223	0.3974
1.160	0.8170	0.4452	0.5449	0.6050	1.3198	2.9646	0.9424	0.0250	0.3993
1.170	0.8144	0.4396	0.5398	0.6093	1.3165	2.9949	0.9432	0.0277	0.4011
1.180	0.8118	0.4340	0.5347	0.6135	1.3131	3.0253	0.9441	0.0306	0.4028
1.190	0.8092	0.4285	0.5295	0.6177	1.3094	3.0558	0.9450	0.0335	0.4044
1.200	0.8066	0.4230	0.5245	0.6219	1.3057	3.0864	0.9459	0.0366	0.4060
1.210	0.8040	0.4176	0.5194	0.6261	1.3017	3.1172	0.9469	0.0397	0.4075
1.220	0.8014	0.4122	0.5143	0.6302	1.2976	3.1481	0.9479	0.0429	0.4089
1.230	0.7988	0.4068	0.5093	0.6344	1.2934	3.1791	0.9489	0.0462	0.4102
1.240	0.7962	0.4015	0.5043	0.6385	1.2890	3.2102	0.9500	0.0495	0.4115
1.250	0.7936	0.3963	0.4994	0.6426	1.2845	3.2414	0.9511	0.0529	0.4127
1.260	0.7909	0.3911	0.4944	0.6466	1.2798	3.2727	0.9522	0.0564	0.4138
1.270	0.7883	0.3859	0.4895	0.6507	1.2751	3.3042	0.9533	0.0599	0.4148
1.280	0.7857	0.3808	0.4846	0.6547	1.2701	3.3358	0.9545	0.0634	0.4158
1.290	0.7830	0.3757	0.4798	0.6587	1.2651	3.3675	0.9557	0.0670	0.4167
1.300	0.7804	0.3706	0.4749	0.6627	1.2599	3.3993	0.9569	0.0707	0.4175
1.310	0.7778	0.3657	0.4701	0.6667	1.2547	3.4313	0.9581	0.0744	0.4182
1.320	0.7751	0.3607	0.4654	0.6706	1.2493	3.4633	0.9594	0.0781	0.4189
1.330	0.7725	0.3558	0.4606	0.6746	1.2438	3.4955	0.9606	0.0819	0.4195
1.340	0.7698	0.3510	0.4559	0.6785	1.2382	3.5279	0.9619	0.0857	0.4200
1.350	0.7672	0.3462	0.4512	0.6824	1.2325	3.5603	0.9632	0.0895	0.4205
1.360	0.7646	0.3414	0.4465	0.6862	1.2266	3.5929	0.9645	0.0934	0.4209
1.370	0.7619	0.3367	0.4419	0.6901	1.2207	3.6256	0.9659	0.0973	0.4212
1.380	0.7593	0.3320	0.4373	0.6939	1.2147	3.6584	0.9672	0.1012	0.4215
1.390	0.7566	0.3274	0.4328	0.6977	1.2086	3.6914	0.9686	0.1051	0.4216
1.400	0.7540	0.3229	0.4282	0.7015	1.2025	3.7245	0.9700	0.1091	0.4218
1.410	0.7513	0.3183	0.4237	0.7053	1.1962	3.7577	0.9714	0.1130	0.4218
1.420	0.7487	0.3139	0.4192	0.7090	1.1899	3.7910	0.9728	0.1170	0.4218
1.430	0.7460	0.3094	0.4148	0.7127	1.1835	3.8245	0.9742	0.1210	0.4217
1.440	0.7434	0.3051	0.4104	0.7164	1.1770	3.8581	0.9756	0.1250	0.4216
1.450	0.7407	0.3007	0.4060	0.7201	1.1704	3.8918	0.9771	0.1290	0.4214
1.460	0.7381	0.2965	0.4017	0.7238	1.1638	3.9257	0.9785	0.1331	0.4212
1.470	0.7354	0.2922	0.3974	0.7275	1.1571	3.9597	0.9800	0.1371	0.4209
1.480	0.7328	0.2880	0.3931	0.7311	1.1504	3.9938	0.9815	0.1411	0.4205
1.490	0.7301	0.2839	0.3888	0.7347	1.1435	4.0281	0.9829	0.1452	0.4201
1.500	0.7275	0.2798	0.3846	0.7383	1.1367	4.0625	0.9844	0.1492	0.4196

$$\gamma=1.333$$

M	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\frac{\rho V^2}{p_0}$
1.510	0.7248	0.2758	0.3804	0.7419	1.1298	4.0970	0.9859	0.1532	0.4191
1.520	0.7222	0.2718	0.3763	0.7454	1.1228	4.1317	0.9874	0.1573	0.4185
1.530	0.7195	0.2678	0.3722	0.7489	1.1158	4.1665	0.9889	0.1613	0.4178
1.540	0.7169	0.2639	0.3681	0.7524	1.1087	4.2014	0.9905	0.1654	0.4171
1.550	0.7143	0.2600	0.3641	0.7559	1.1016	4.2365	0.9920	0.1694	0.4164
1.560	0.7116	0.2562	0.3600	0.7594	1.0945	4.2717	0.9935	0.1734	0.4156
1.570	0.7090	0.2524	0.3561	0.7629	1.0873	4.3070	0.9950	0.1775	0.4147
1.580	0.7064	0.2487	0.3521	0.7663	1.0801	4.3425	0.9966	0.1815	0.4138
1.590	0.7038	0.2450	0.3482	0.7697	1.0729	4.3782	0.9981	0.1855	0.4129
1.600	0.7011	0.2414	0.3443	0.7731	1.0656	4.4139	0.9997	0.1895	0.4119
1.610	0.6985	0.2378	0.3405	0.7765	1.0583	4.4498	1.0012	0.1935	0.4109
1.620	0.6959	0.2343	0.3367	0.7799	1.0510	4.4859	1.0028	0.1975	0.4098
1.630	0.6933	0.2308	0.3329	0.7832	1.0436	4.5220	1.0043	0.2015	0.4087
1.640	0.6907	0.2273	0.3291	0.7865	1.0363	4.5584	1.0059	0.2055	0.4075
1.650	0.6881	0.2239	0.3254	0.7898	1.0289	4.5948	1.0075	0.2094	0.4063
1.660	0.6855	0.2206	0.3217	0.7931	1.0215	4.6314	1.0090	0.2134	0.4051
1.670	0.6829	0.2172	0.3181	0.7964	1.0141	4.6682	1.0106	0.2173	0.4038
1.680	0.6803	0.2139	0.3145	0.7996	1.0066	4.7051	1.0122	0.2213	0.4025
1.690	0.6777	0.2107	0.3109	0.8028	0.9992	4.7421	1.0137	0.2252	0.4011
1.700	0.6751	0.2075	0.3074	0.8061	0.9918	4.7793	1.0153	0.2291	0.3997
1.710	0.6726	0.2044	0.3039	0.8093	0.9843	4.8166	1.0169	0.2330	0.3983
1.720	0.6700	0.2012	0.3004	0.8124	0.9769	4.8541	1.0184	0.2369	0.3968
1.730	0.6674	0.1982	0.2969	0.8156	0.9694	4.8917	1.0200	0.2407	0.3953
1.740	0.6649	0.1951	0.2935	0.8187	0.9620	4.9294	1.0216	0.2446	0.3938
1.750	0.6623	0.1922	0.2901	0.8218	0.9545	4.9673	1.0232	0.2484	0.3922
1.760	0.6597	0.1892	0.2868	0.8249	0.9471	5.0054	1.0247	0.2522	0.3906
1.770	0.6572	0.1863	0.2835	0.8280	0.9396	5.0435	1.0263	0.2560	0.3890
1.780	0.6546	0.1834	0.2802	0.8311	0.9322	5.0819	1.0279	0.2598	0.3874
1.790	0.6521	0.1806	0.2770	0.8341	0.9248	5.1204	1.0294	0.2636	0.3857
1.800	0.6496	0.1778	0.2737	0.8372	0.9173	5.1590	1.0310	0.2673	0.3840
1.810	0.6471	0.1751	0.2706	0.8402	0.9099	5.1978	1.0326	0.2711	0.3822
1.820	0.6445	0.1723	0.2674	0.8432	0.9025	5.2367	1.0341	0.2748	0.3805
1.830	0.6420	0.1697	0.2643	0.8461	0.8951	5.2758	1.0357	0.2785	0.3787
1.840	0.6395	0.1670	0.2612	0.8491	0.8878	5.3150	1.0373	0.2822	0.3769
1.850	0.6370	0.1644	0.2581	0.8521	0.8804	5.3544	1.0388	0.2858	0.3751
1.860	0.6345	0.1619	0.2551	0.8550	0.8731	5.3939	1.0404	0.2895	0.3732
1.870	0.6320	0.1593	0.2521	0.8579	0.8658	5.4336	1.0419	0.2931	0.3714
1.880	0.6295	0.1568	0.2491	0.8608	0.8585	5.4734	1.0435	0.2967	0.3695
1.890	0.6271	0.1544	0.2462	0.8636	0.8512	5.5134	1.0450	0.3003	0.3676
1.900	0.6246	0.1520	0.2433	0.8665	0.8439	5.5535	1.0466	0.3039	0.3656
1.910	0.6221	0.1496	0.2404	0.8693	0.8367	5.5938	1.0481	0.3074	0.3637
1.920	0.6197	0.1472	0.2376	0.8722	0.8295	5.6342	1.0497	0.3110	0.3617
1.930	0.6172	0.1449	0.2348	0.8750	0.8223	5.6748	1.0512	0.3145	0.3598
1.940	0.6148	0.1426	0.2320	0.8778	0.8152	5.7155	1.0527	0.3180	0.3578
1.950	0.6123	0.1404	0.2292	0.8805	0.8081	5.7564	1.0543	0.3215	0.3558
1.960	0.6099	0.1382	0.2265	0.8833	0.8010	5.7974	1.0558	0.3249	0.3537
1.970	0.6075	0.1360	0.2238	0.8860	0.7939	5.8386	1.0573	0.3284	0.3517
1.980	0.6051	0.1338	0.2212	0.8888	0.7869	5.8800	1.0588	0.3318	0.3497
1.990	0.6026	0.1317	0.2185	0.8915	0.7799	5.9215	1.0603	0.3352	0.3476
2.000	0.6002	0.1296	0.2159	0.8942	0.7729	5.9631	1.0619	0.3386	0.3455