WANL-TME-826
October 21, 1964

Test Series FFL-7

AN EXPERIMENTAL DETERMINATION OF THE LOSS COEFFICIENTS FOR THE INNER IMPEDANCE RING USING AIR AND HYDROGEN (Title Unclassified)

Astronuclear Laboratory
Westinghouse Electric Corporation

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November 9, 1964

MASTER

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Subject: **WANL-TME-826, "Test Series FFL-7, An Experimental Determination of the Loss Coefficients for the Inner Impedance Ring using Air and Hydrogen," dated October 21, 1964**

Dear Mr. Dooling:

Transmitted herewith are five (5) copies of the subject report. This report is transmitted for your information.

Respectfully,

H. F. Faught

H. F. Faught
Program Manager
NERVA Nuclear Subsystem

Enclosures - 5

cc: R. W. Schroeder, SNPO-C, w/enclosures (3)
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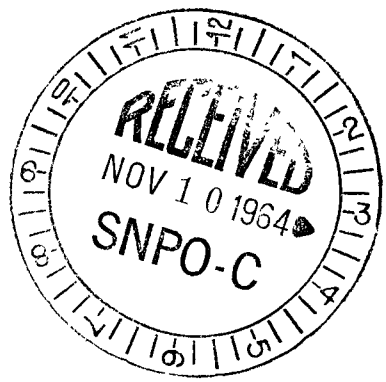
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AN EXPERIMENTAL DETERMINATION OF THE LOSS COEFFICIENTS FOR THE INNER IMPEDANCE RING USING AIR AND HYDROGEN
(Title Unclassified)

by

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INTRODUCTION

The impedance ring in the inner reflector-outer reflector annulus of the NRX-A2 reactor is a means of balancing flow in that region with the flow in other parts of the reflector system. The ring is welded to the aluminum barrel which forms the inner diameter of the flow annulus. The outer diameter is formed by the outer reflector. The flow area of the impedance ring is determined by the machined slots cut into it, and by the clearance between the ring and the inner diameter of the outer reflector.

This memo presents the results of tests performed using hydrogen gas at ambient temperature and an inlet pressure of 750 psig. Data was obtained for the metering rings having design dimensions and for nominal annulus clearances of .080 and .130 inches. A comparison is given between the loss coefficients and friction factors for these data and values from the previously reported air data.[1]

TEST APPARATUS AND INSTRUMENTATION

The model used in these tests, which was constructed according to Drawing NT-576F056, is shown in Figures 1 and 2. It consists of a flat piece of aluminum on each end of which is machined a rectangular plenum. A .080-inch deep rectangular flow channel was machined lengthwise in the piece and a slot was cut perpendicular to this into which interchangeable metering rings were

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[1] V.R.Amatangelo, WANL-TME-669, "An Experimental Determination of the Pressure Loss Coefficients for the Inner Reflector-Outer Reflector Annulus Using Air", January 1964.

fitted. A stand-off type spacer plate, which is used during the testing of rings A. B, and C, is replaced by a blank plate when rings D, E, and F are tested (Figure 2).

Four different cover plates are available. The first is a flat plate which limits the depth of the flow channel to the .080-inch deep groove cut into the model base. Two of the other cover plates have a rectangular channel which corresponds in length and width to the .080-inch channel cut into the base and which are .015 and .050 inch, respectively. The last plate has a stepped-up configuration of .015-inch thickness and which again conforms geometrically to the base channel. Thus, channel depths of .080, .095, .130 and .065 inch respectively, are available by using these covers.

Overall the model simulates a 10° sector of the impedance ring in the inner reflector-outer reflector flow annulus. Since this does not fully simulate the angular symmetry of the impedance ring, two different metering ring geometries were used. Type "A" ring consists of a full "land" section with half grooves on either side and has design dimensions. Types "B" and "C" have the same configuration and dimensions which give smaller and larger flow areas, respectively. Type "D" ring represents a full groove with half "lands" on either side. It has design dimensions while rings "E" and "F" have dimensions giving a larger and smaller flow area, respectively. A sketch of the two ring configurations and their dimensions is given in Figure 3, and a photograph of the rings along with the cover plates is given in Figure 4.

For the air tests, data was obtained for all metering ring and cover plate combinations. However, since the hydrogen tests were done primarily for comparison, only combinations of the "A" and "D" rings and the .080 and .130 inch annulus clearances were tested.

During a test of the fixture, the working fluid was introduced into the inlet plenum through a series of ten 3/16-inch diameter holes. This provided a uniform pressure distribution in the inlet plenum and an evenly distributed flow to the simulated inner reflector-outer reflector annulus. From the inlet plenum, the flow proceeded down the annulus, across the metering ring, and expanded into the outlet plenum.

For the air tests the pressure in the inlet plenum was measured by taps P_1, P_{1A}, and P_{1B} (see Figure 1). The pressure in the annulus just downstream of the inlet plenum was given by taps P_{6A} and P_{6B} and the differential pressure between this point and the inlet plenum was taken from taps P_1 and P_{6A}. The pressure in the annulus upstream of the metering ring was measured by taps P_{8A} and P_{8B}, and the differential pressure in the 3-inch annular section was read as $P_{6A} - P_{8A}$. The exhaust plenum pressure was determined using taps P_4, P_{4A}, and P_{4B}. The pressure drop across the metering ring was measured using taps P_{8A} and P_4.

While testing with hydrogen the same static pressure measurements were made. Also, in addition to the differential pressures measured during the air tests, pressure drops were measured from P_1 to P_{6B}, from P_{6B} to P_{8B}, and from P_{8B} to P_4. During all tests the inlet and exhaust plenum temperatures were measured and flow rates were determined using calibrated nozzles made to ASME specifications.

The model was installed in a flow loop having a normal flow capacity of 0.2 pps of hydrogen. Inlet pressure was controlled by a remotely operated pressure reducing valve. Outlet pressure was similarly maintained by a flow valve also operated from the control room. The entire flow in the system was measured through a precalibrated sonic flow orifice. The discharge gas was vented to a flared stack. The flow loop was also provided with a bank of helium bottles used for complete purging of the system before and after each test. Supply lines for both hydrogen and helium gases were remotely operated from the control room.

CALCULATIONS

The experimental data was reduced and the loss coefficients, Reynolds numbers, etc., were calculated using the following equations.

Since different nozzles were used in the air and hydrogen tests, the mass flow equation depends upon which fluid was used. For the air tests

$$W = C_D A \left[\frac{2kg\rho_{5A}P_{5A}(R^{2/k} - R^{k+1/k})}{(k-1)(1-\beta^2 R^{2/k})} \right]^{\frac{1}{2}}$$

where

W = mass flow (lb/sec)

C_D = nozzle discharge coefficient (0.98)

A = nozzle area (1 in.diam.)

β = area ratio (nozzle area to pipe area) (0.49421)

g = gravitational constant (32.17 ft/sec^2)

k = specific heat ratio (1.4 for air)

R = pressure ratio = P_A/P_{5A}

P_A = atmospheric pressure (psi)

P_{5A} = absolute pressure at inlet of the flow measuring nozzle (psia)

T_{5A} = air temperature at inlet of the flow measuring nozzle (°R)

ρ_{5A} = density at P_{5A} and T_{5A} (lb/cu ft)

The hydrogen flow rates were computed from a sonic orifice flow meter from the formula

$$W = \frac{.00962\ P}{\sqrt{T}}$$

where

P = absolute pressure at the nozzle inlet (psia)

T = temperature of fluid at nozzle inlet (°R)

and the other symbols have the same meaning as in the air tests.

The loss coefficients were given by

$$C = \frac{0.44686\ \rho \Delta P\ A^2}{W^2}$$

where

C = loss coefficient

ρ = density evaluated at upstream conditions using Perfect Gas Law for the air tests or a properties subroutine for the hydrogen tests (lb/ft^3)

ΔP = average pressure drop across the component (psi)

A = geometrical flow area ($in.^2$)

The friction factor was computed using

$$f = \frac{0.44686\ \rho \Delta P\ A^2}{W^2}\ \frac{D_e}{L}$$

where

f = friction factor

D_e = equivalent diameter (in.), $\frac{4\ A}{P_w}$

P_w = wetted perimeter (in.)

L = length of annulus across which the pressure drop is measured (in.)

and all other symbols are the same as in the loss coefficient equation.

The Reynolds number was defined for these tests by

$$Re = \frac{12\ W\ De}{\mu\ A}$$

where

Re = Reynolds number

μ = absolute viscosity (lb/ft sec)

and the other symbols have been previously defined.

RESULTS

The data obtained from the hydrogen tests was reduced using a modified form of the computer program used for the air data. The gas properties were calculated by a normal (25% para-) hydrogen subroutine.

The computer program and the output for the various test configurations is given in Appendix A. Blanks under some of the pressure drops indicate that no reading was made for that drop during the test.

Appendix B contains the computer output for the reworked air data. All of the test configurations were redone and are reported in the appendix although only those annulus clearance and ring configurations which correspond to the hydrogen data are plotted.

The data for the entrance loss coefficient from the inlet plenum to the simulated annulus is plotted in Figures 5-8. Figure 5 shows the variation of the loss coefficient with Reynolds number for the "A" and "D" rings in a .080-inch annulus for both air and hydrogen. Figure 6 is the same except that the annulus clearance is .130 inch. Figure 7 is a plot of loss coefficient versus Reynolds number for an "A" ring in a .080 and a .130-inch annulus for air and hydrogen while Figure 8 is the same except for a "D" ring.

In Figures 9-12 is displayed the variation of the loss coefficient from the annulus, across the metering ring and into the outlet plenum versus Reynolds number through the metering ring. The same ring and clearance configurations as used in Figures 5-8 are used for Figures 9-12.

DISCUSSION

The intent of the hydrogen tests was to verify the loss coefficients obtained using air at ambient temperature and an inlet pressure of 120 psig. The tests were to be conducted at high pressure and cryogenic temperatures. However, during attempts at cryogenic sealing it was discovered that the annulus surfaces were being bowed out by the high pressure load by as much as 14 mils at the centerline. Reinforced channel iron backing plates were installed which reduced this to a negligible amount in the region of the ring. Analysis of the test section at cryogenic temperatures revealed that the difference in thermal expansion between the aluminum test section and materials strong enough to take the bolting loads caused leaks after the gasket material had lost its resiliency. An attempt to use a more ductile

bolting material with adequate pre-strain to compensate for the difference in thermal expansion resulted in appreciable crushing of the model on the bearing surfaces.

The crushed surfaces were used to position the cover plate and thereby define the annulus thickness and impedance ring clearance. While the crushing was only 3-6 mils, this still resulted in a large percentage change in impedance ring flow area, expecially for the .080-inch annulus case. The model was re-measured and a rubber impression made of the area over the ring. The measurements showed that at least 3 mils uniform crushing had occurred over the model base. The rubber impression confirmed these measurements, but also indicated that local distortions had decreased the annulus downstream of the ring by 6 mils. However, only the uniform crushing could be accounted for in the analysis. Another variable was discovered when re-measuring the impedance rings. Apparently the parts of the rings which contact the cover had been crushed on the rings used for the hydrogen test. A set of dimensions that made the air and hydrogen results coincide almost exactly were obtained by assuming that they had originally had the same dimensions as the other rings, that the rings fit exactly on the bottom of the ring groove when the air tests were run, and that no crushing of the annulus sides had taken place at that time. However, measurement of the installed ring dimensions at the time that the hydrogen tests were run indicated that the ring clearance should be based on the cover rather than on the bottom of the ring groove. Therefore these values have been used for comparison with the hydrogen.

Figure 5 presents the annulus inlet loss coefficient C 1-6 vs Reynolds number for the .080-inch annulus containing the A ring assembly or the D ring assembly. The air data and the hydrogen data have been plotted on the same graph for comparison. A similar plot is given in Figure 6 for the 0.130-inch annulus. The air results are the same as reported earlier except that the spacer plate area has been subtracted from the total annulus area for the A ring assembly data.

For the .080-inch annulus, the results obtained using both air and hydrogen agree quite well. The Reynolds number range over which the loss coefficient remains constant is extended to about 2.5×10^6 by the hydrogen tests. Also, as occurred in the air tests, the hydrogen data gives a loss coefficient for the A ring assembly that is about 8 percent higher than that for the D ring assembly. This is becuase the annulus area for the A ring assembly is less than that for the D ring assembly due to the presence of the spacer bar.

However, in the case of the 0.130-inch annulus, the hydrogen loss coefficients are about 10 percent lower than those obtained using air. An examination of the equation and the data gives no particular reason why this should occur; however, this is in line with accepted published works in the area of Fluid Dynamics and Fluid Mechanics. This is especially true when one considers that the data was obtained using two distinct fluids and two distinct flow and data acquisition systems. The prime source of experimented error would be the pressure drops which were measured to $\pm$ 0.2 psi.

As can be seen by comparing Figures 5 and 6, which is done in Figures 7 and 8, the loss coefficient varies with annulus clearance for the same ring. This decrease in coefficient with increasing annulus, which is to be expected,[2] is greater for the A ring than for the D ring. From this fact and from the fact that the A and D coefficients were essentially the same for the 0.130-inch annulus (Figure 6), it is concluded that the spacer bar has more effect in the 0.080-inch annulus than in the 0.130-inch annulus.

The data for friction factor along the simulated annulus (F 6-8) obtained using hydrogen exhibited a large amount of scatter due to the small pressure drops involved. For the 80-mil annulus containing the A ring assembly, the most frequently occurring values were around 0.0180 compared to a value of 0.0165 from the air data which agrees within about 9 percent. The value for air is about 21 percent lower than that previously reported[3] due to the effect of excluding the spacer plate area in the former equivalent diameter and friction factor calculations. For the D ring assembly, 80-mil annulus configuration, a factor of about 0.023 occurred most frequently for hydrogen. This deviation from the air value of 0.0175[4] is reasonable when one considers the accuracy to which the pressure drops can be measured, and that the tests were conducted using two distinct data acquisition systems.

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2 Hunsacker, J.C. & Rightmire, B.G., Engineering Application of Fluid Mechanics, p.153.

3 Amatangelo, V.R., WANL-TME-669, "An Experimental Determination of the Pressure Loss Coefficients for the Inner Reflector-Outer Reflector Annulus Using Air", January 1964, p.30.

4 Amatangelo, p.31.

The loss coefficient across the metering ring based on metering ring area vs Reynolds number for the A and D rings, is presented in Figures 9 and 10 for the 0.080-inch and 0.130-inch annulus respectively. The air data is different than that given previously[5] because of the spacer bar area and because the metering ring clearance is based on the cover as stated earlier (page 9). It should be noted that the D ring coefficient is greater than that for the A ring for both annuli and both fluids. The explanation of this is given in the air report.[6] For the hydrogen data the coefficients remain constant over a relatively large Reynolds number range but differ by about 15 to 20 percent from the values obtained for the air tests.

Figures 11 and 12 demonstrate the effect of annulus clearance on the metering ring loss coefficient for the A and D rings, respectively. These graphs exhibit the expected trends.

Finally, the loss coefficients for air which were based on the metering ring-cover clearance can be converted to those reported earlier which were calculated assuming the ring sat down on the base of the ring groove. The only change this introduces into the loss coefficient equation is in the area term. Thus, for the D ring in a 80-mil annulus, the previously used ring clearance was 0.015-inch and the corresponding area was 0.1186 square inches. The metering ring-cover clearance was 0.012-inch and this gave an area of 0.1066 square inches. This represents a decrease of 10 percent in area and since the area enters as the square in the loss coefficient formula, the loss coefficient could decrease by 20 percent.

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5 Amatangelo, pp.32-33.

6 Amatangelo, p.11.

CONCLUSIONS

The loss coefficients obtained for the metering ring are as follows:

Metering Ring	Annulus	Fluid	Re No Range	Metering Ring Loss Coefficient
A	80	air	$6x10^4$ to $9x10^4$	0.58
D	80	air	$4x10^4$ to $9x10^4$	0.73
A	77	hydrogen	$9x10^4$ to $20x10^4$	0.74
D	77	hydrogen	$1.5x10^5$ to $75x10^5$	0.85
A	130	air	$1.1x10^5$ to $2.0x10^5$	0.34
D	130	air	$1.1x10^5$ to $2.0x10^5$	0.48
A	127	hydrogen	$1.1x10^5$ to $2.5x10^5$	0.27
D	127	hydrogen	$1.1x10^5$ to $2.5x10^5$	0.39

From the values obtained for the various loss coefficients using both air and hydrogen, which are within the accuracy one would expect using the above measuring techniques, it may be concluded that air tests can be used to predict the necessary flow parameters. Thus, the expense and experimental difficulties connected with hydrogen testing may be avoided when loss coefficients for these types of geometries are to be determined.

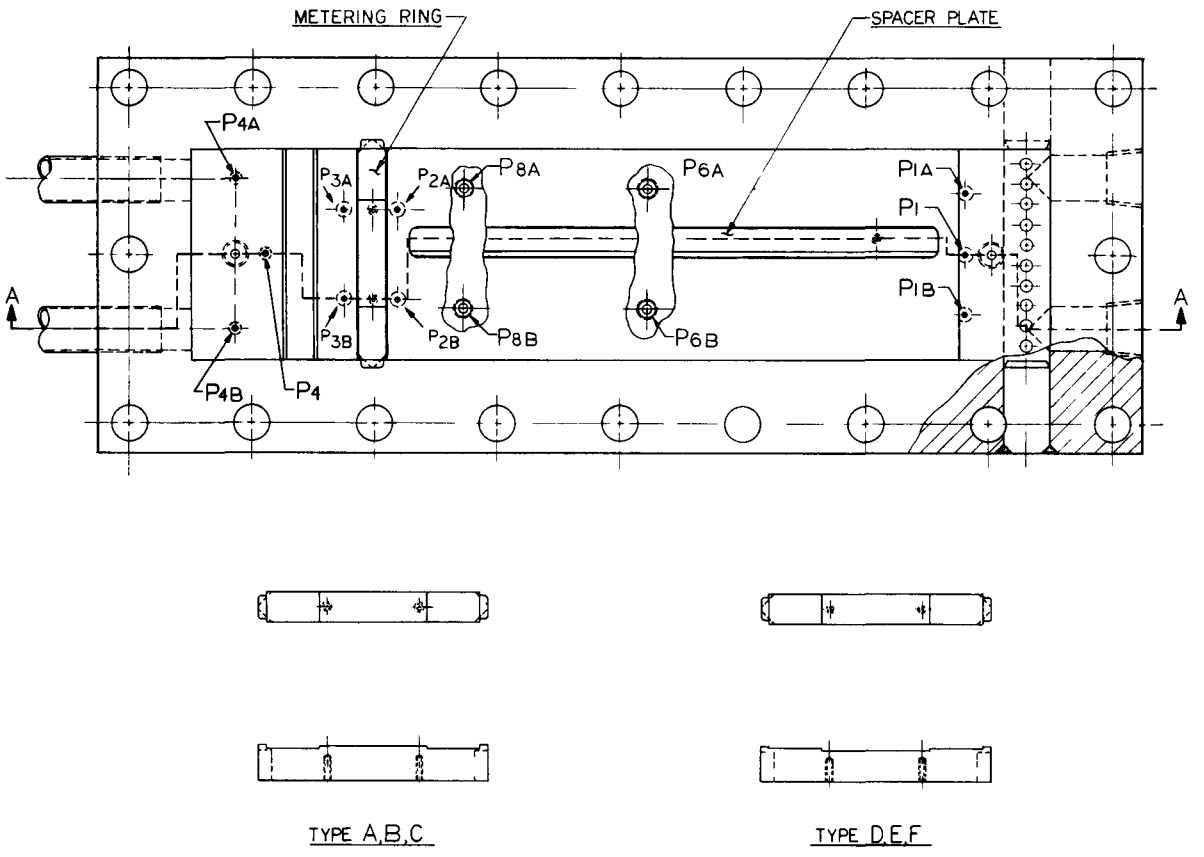


Figure 1 Fixture Inner Impedance Ring Assembly

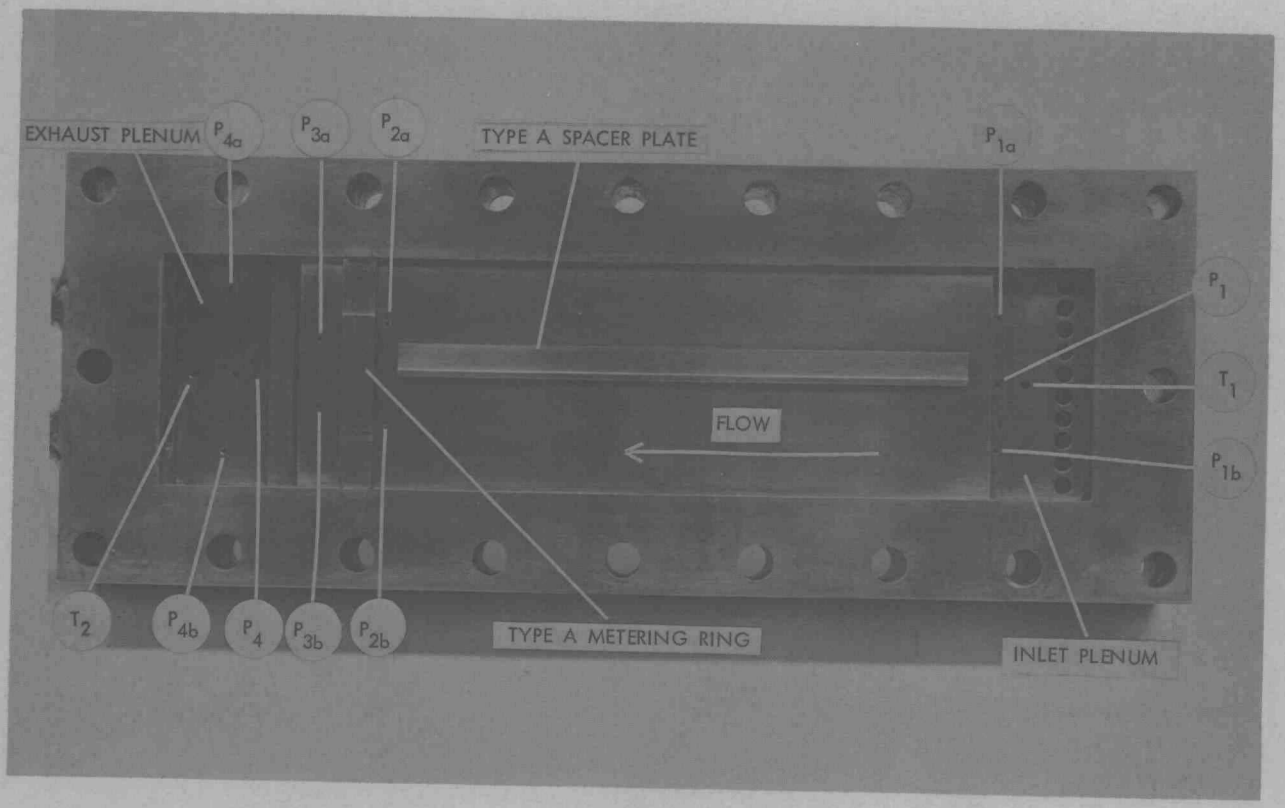
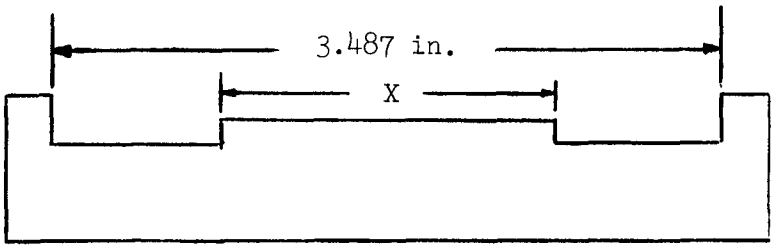
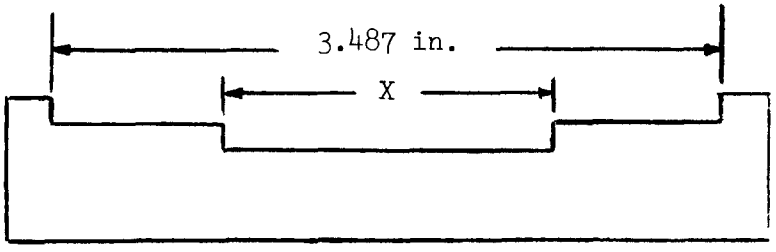


Figure 2 Inner Impedance Ring Fixture



Metering Ring Type A, B, or C



Metering Ring Type D, E, or F

Metering Ring Type	"X" Dimension (in.)
A and D	1.7435
B and E	2.000
C and F	1.500

Figure 3
Metering Ring Cross Sections and Dimensions
of Various Types

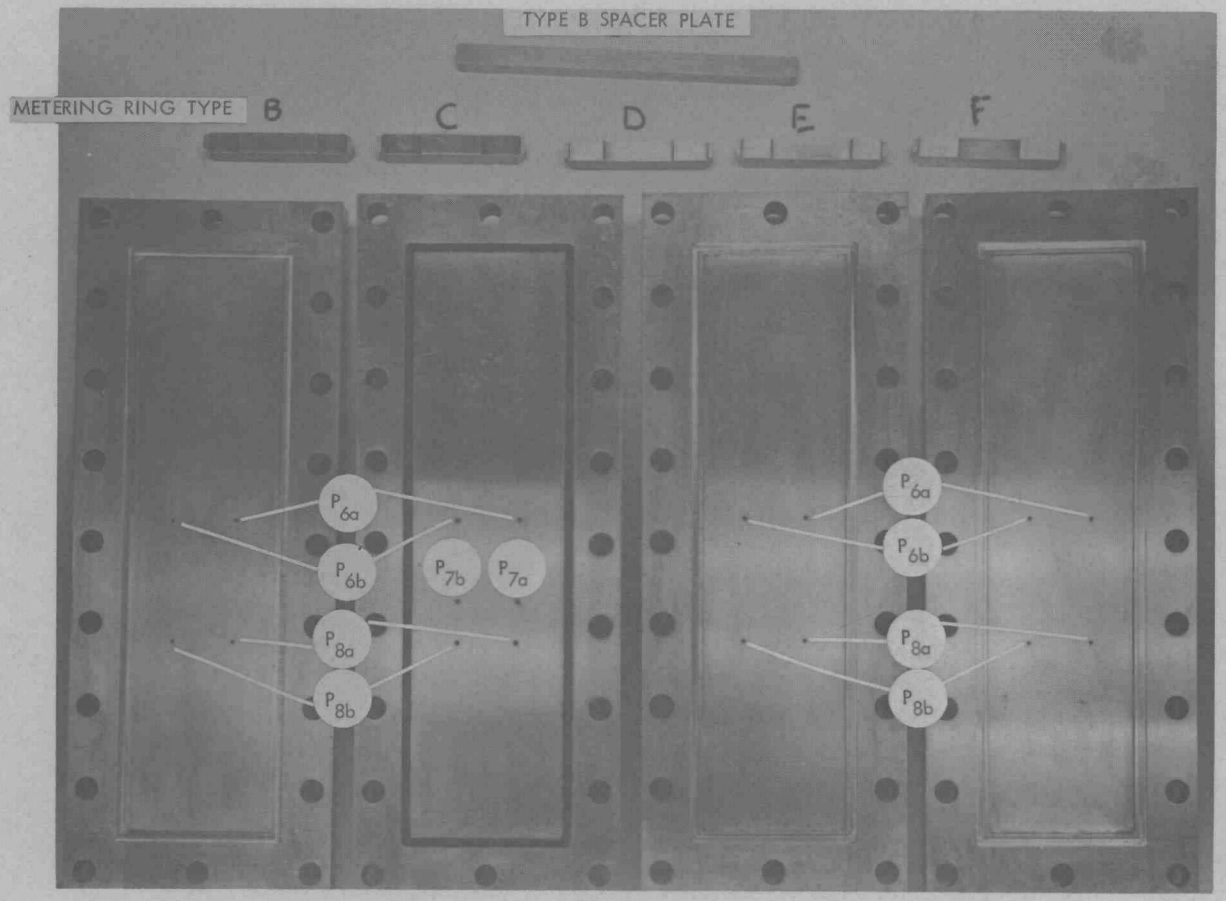


Figure 4

Inner Impedance Ring Fixture Cover Plates and Metering Rings

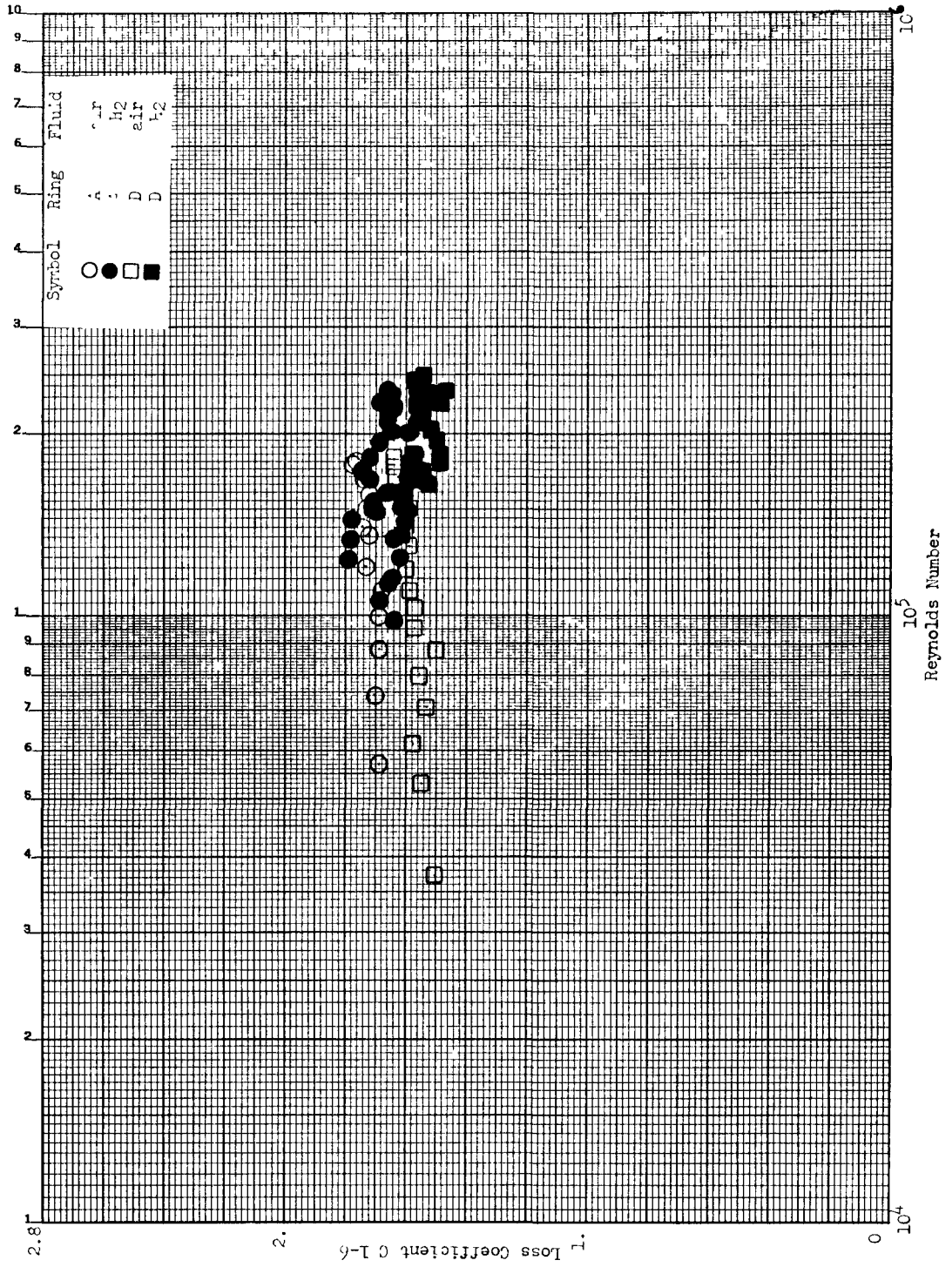


Figure 5
Inlet Loss Coefficient C 1-6 vs Reynolds Number
For .080 inch Annulus, Type A and D Metering Rings
Air and Hydrogen

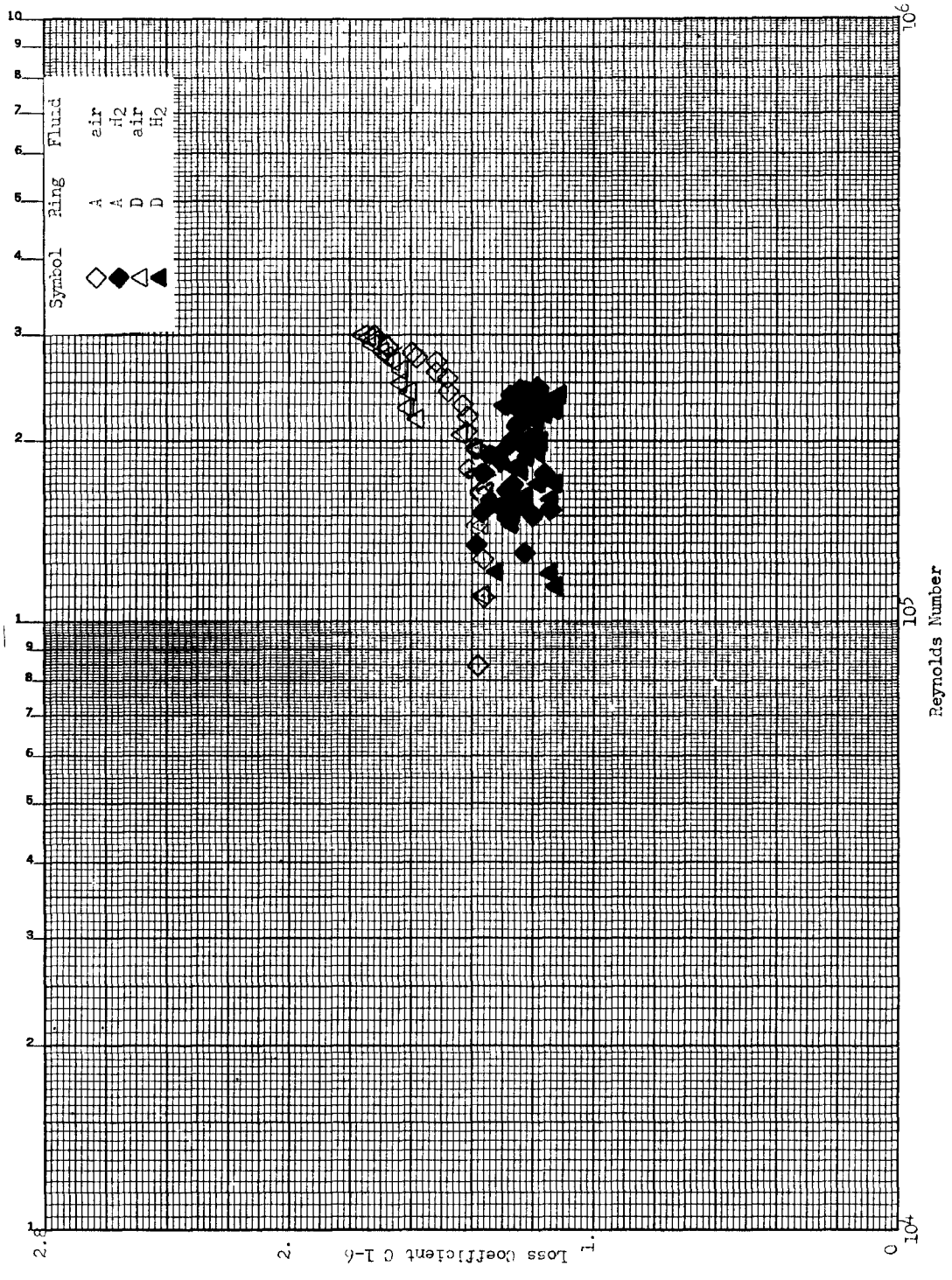


Figure 6
Inlet Loss Coefficient vs Reynolds Number
For .130 inch Annulus, Type A and D Metering Rings
Air and Hydrogen

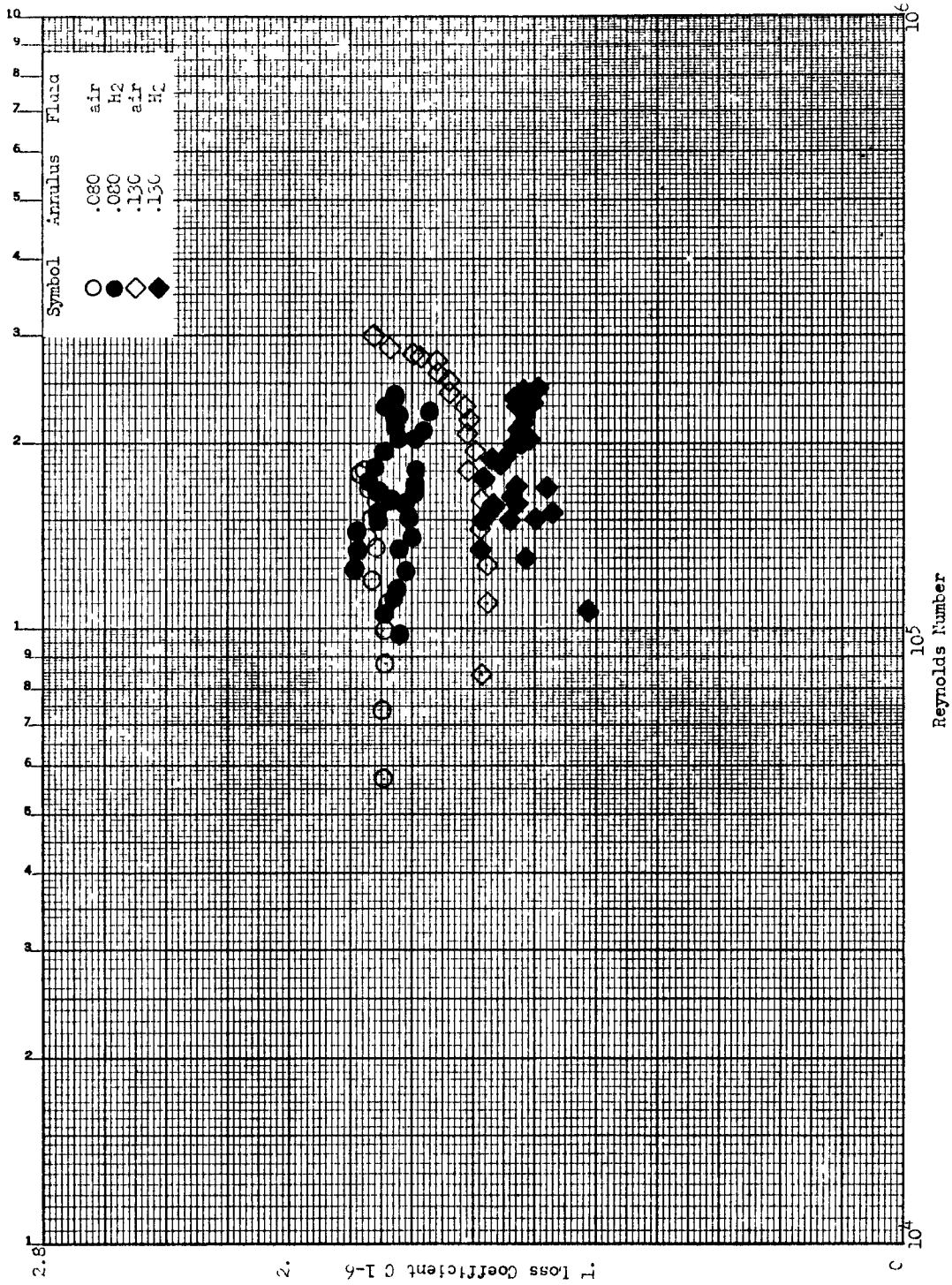


Figure 7
Inlet Loss Coefficient vs Reynolds Number
For Type A Metering Ring, .080 and .130 inch Annulus
Air and Hydrogen

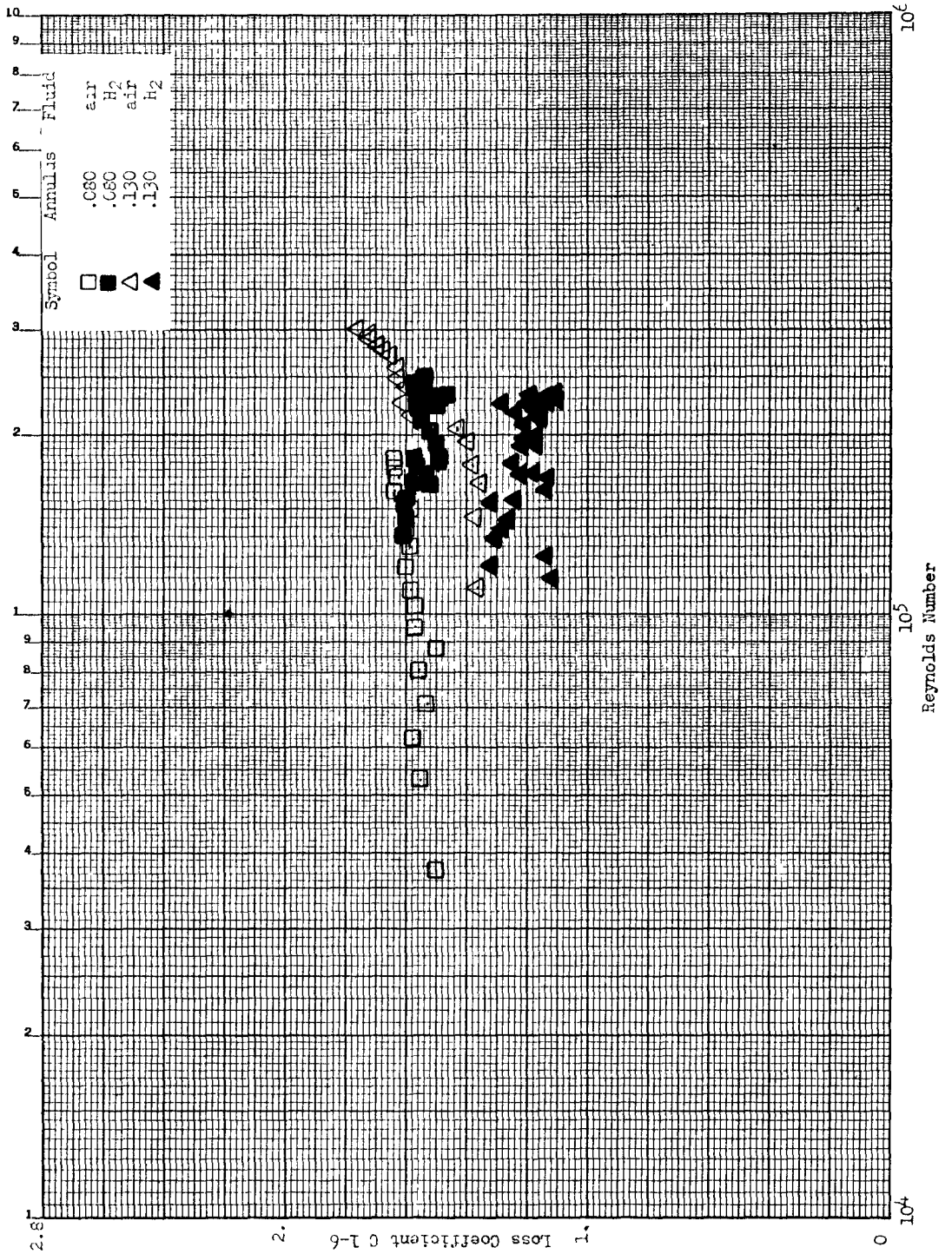


Figure 8
Inlet Loss Coefficient vs Reynolds Number
For Type D Metering Ring, .080 and .130 inch Annulus
Air and Hydrogen

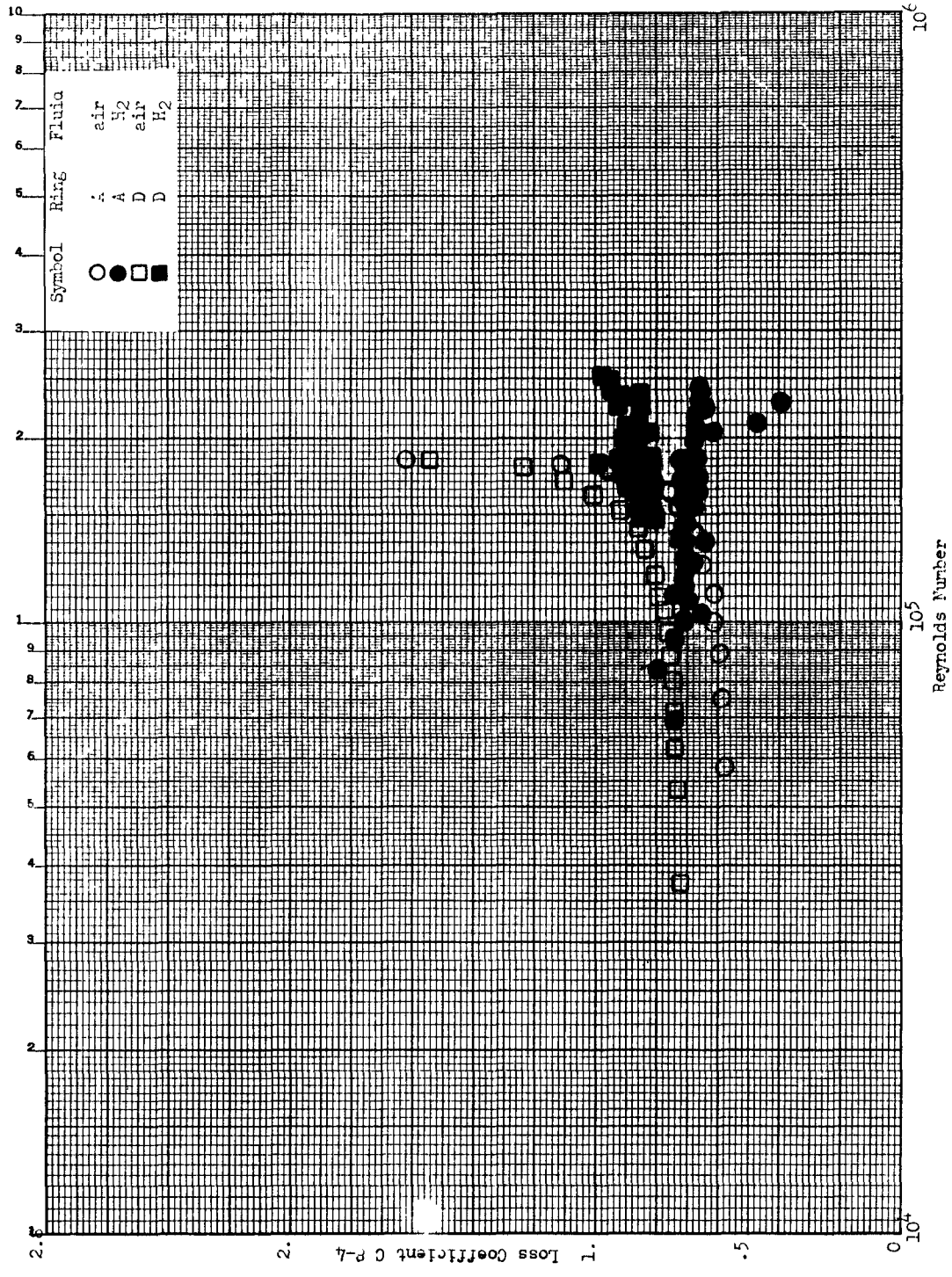


Figure 9
Metering Ring Loss Coefficient vs Reynolds Number
For .080 inch Annulus, Type A and D Metering Rings
Air And Hydrogen

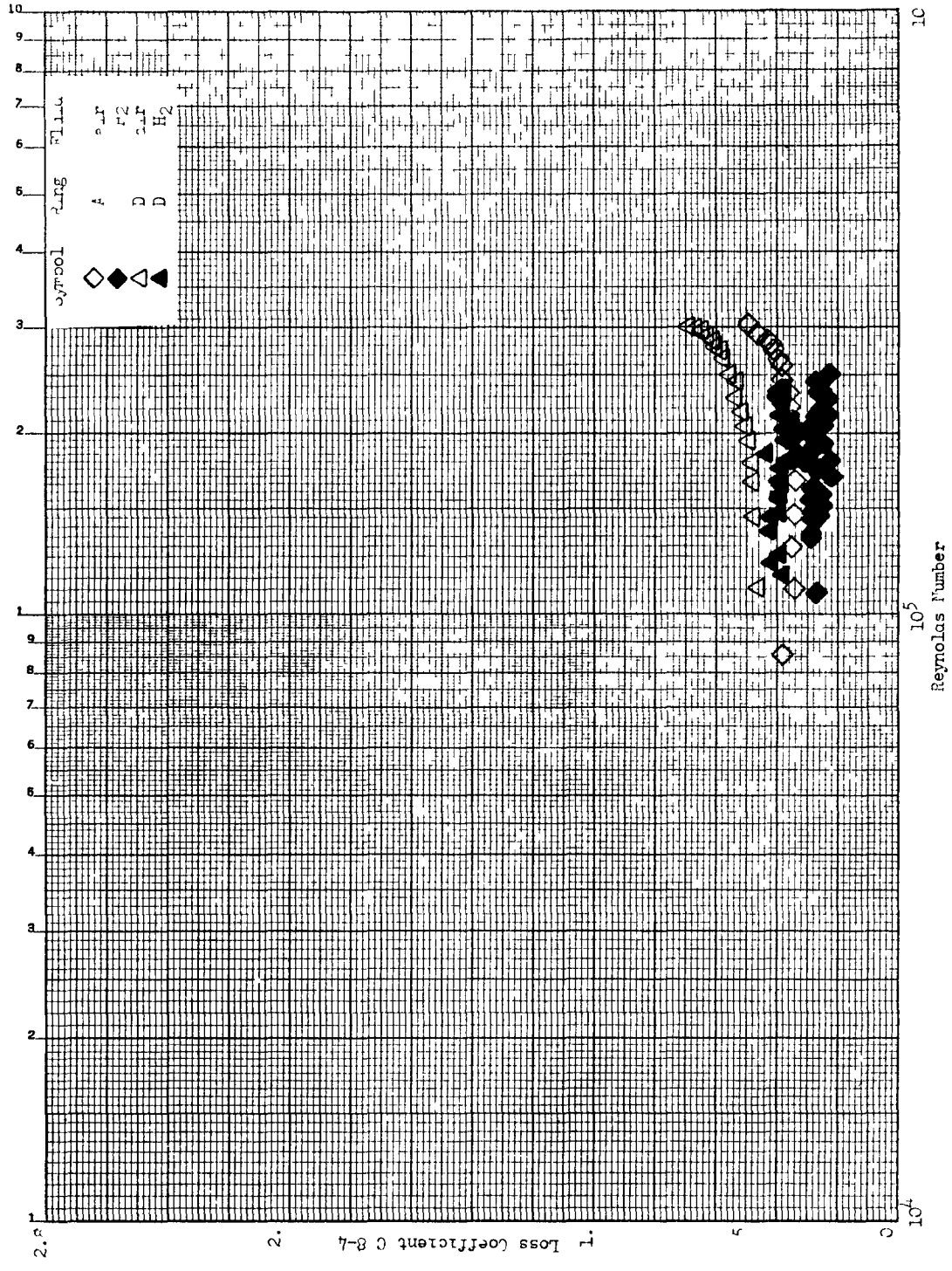


Figure 10
Metering Ring Loss Coefficient vs Reynolds Number
For .130 inch Annulus, Type A and D Metering Rings,
Air and Hydrogen

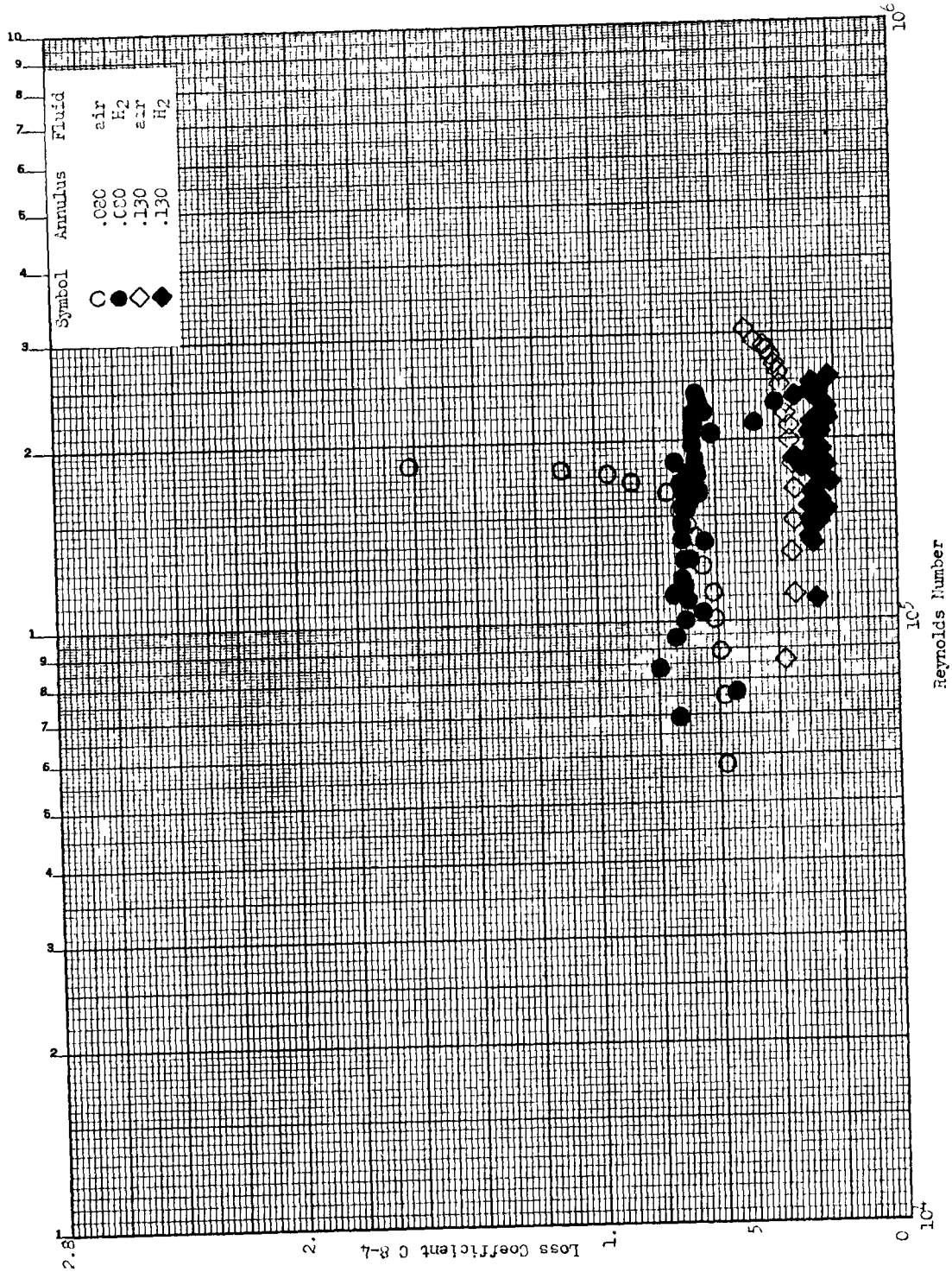


Figure 11
Metering Ring Loss Coefficient vs Reynolds Number
For Type A Metering Ring, .080 and .130 inch Annulus
Air and Hydrogen

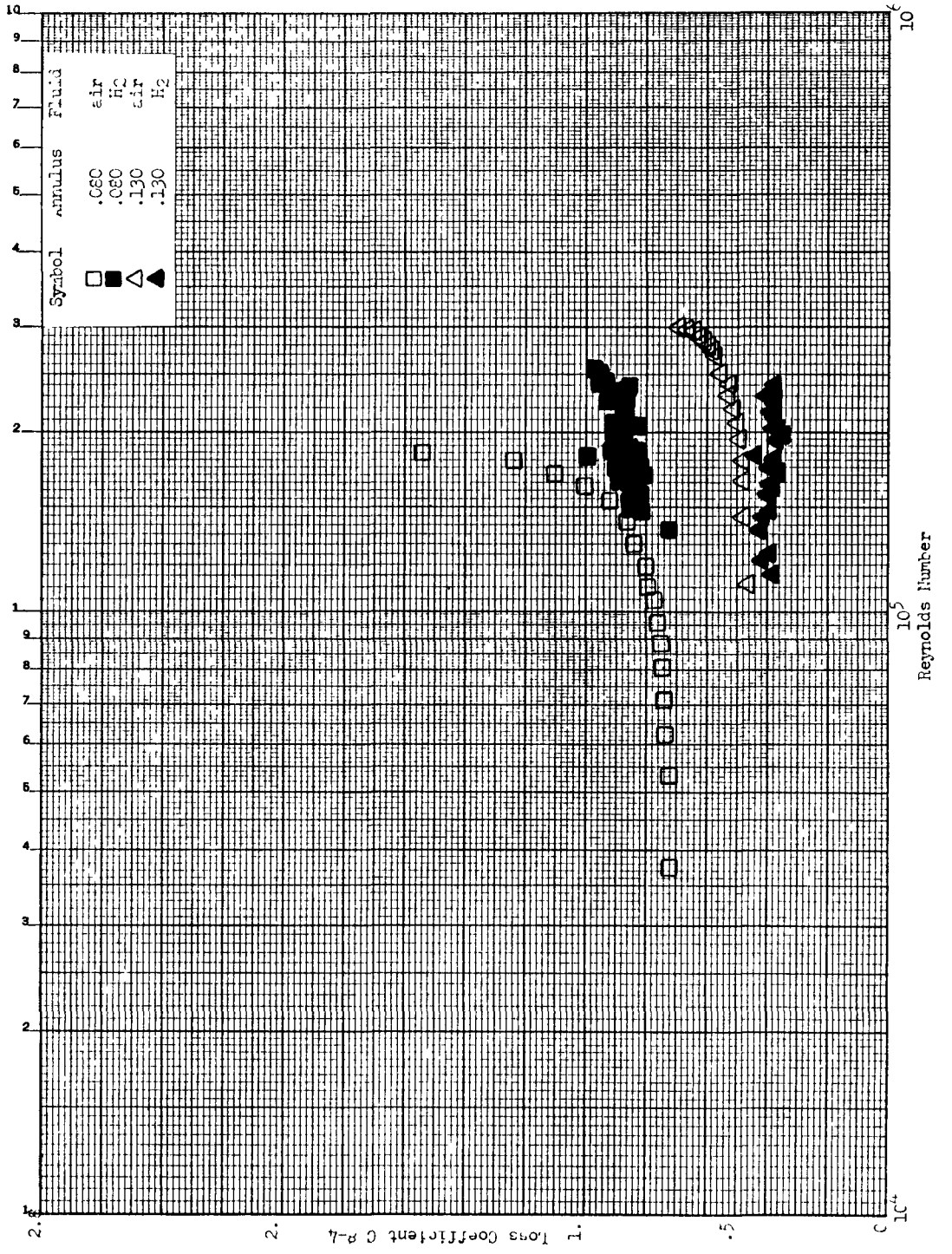


Figure 12
Metering Ring Loss Coefficient vs Reynolds Number
For Type D Metering Ring, .080 and .130 inch Annulus
Air and Hydrogen

APPENDIX A

COMPUTER PROGRAM NOMENCLATURE
HYDROGEN DATA

INPUT TAPE

A	Width of annulus (3.487 inches)
B	Length of raised portion of metering ring
CMR	Metering Ring Clearance
D	Annulus clearance
DE	Equivalent diameter of annulus
DP11A	Differential pressure between P1 and P1A
DP11B	Differential pressure between P1 and P1B
DP15A	Differential pressure between P1 and P5A
DP15B	Differential pressure between P1 and P5B
DP16A	Differential pressure between P1 and P6A
DP16B	Differential pressure between P1 and P6B
DP5A8A	Differential pressure between P5A and P8A
DP5B8B	Differential pressure between P5B and P8B
DP8A4	Differential pressure across metering ring measured from P8A to P4
DP8B4	Differential pressure across metering ring measured from P8B to P4
DP4A4	Differential pressure between P4A and P4
DP4B4	Differential pressure between P4B and P4
DP14	Differential pressure between P1 and P4

APPENDIX A (Continued)

E	Height of step in metering ring (0.038 inches)
PBAROM	Atmospheric pressure
P1	Pressure at inlet plenum
P4	Pressure in exhaust plenum
P6A	Pressure in annulus downstream of the inlet plenum
P7	Pressure at the inlet of the flow measuring nozzle
P8A	Pressure just upstream of the metering ring
T1	Millivolt reading inlet plenum thermocouple
T2	Millivolt reading exhaust plenum thermocouple
T5	Millivolt reading at the inlet of the flow measuring nozzle

OUTPUT TAPE

C84AA	Metering ring loss coefficient based on annulus area
C84MRA	Metering ring loss coefficient based on metering ring area
DP16AV	Average differential pressure measured from P1 to P6
DP58AV	Average differential pressure measured from P5 to P8
DP68AV	Average differential pressure measured from P6 to P8
DP84AV	Average differential pressure measured from P8 to P4
FLOW	Flow rate
F68	Annulus friction factor
P1AB	Absolute pressure at inlet plenum
P6AB	Absolute pressure downstream of inlet plenum
P8AB	Absolute pressure upstream of metering ring

APPENDIX A (Continued)

RE18	Reynolds number in the annulus, based on the equivalent diameter of the annulus
RE84	Reynolds number at the metering ring, based on the equivalent diameter of the metering ring
RO15	Hydrogen density at the inlet plenum, based on P1AB
RO68	Hydrogen density in the annulus, based on P6AB
RO84	Hydrogen density upstream of metering ring, based on P8AB
TR	Average hydrogen temperature in the test fixture
TR1	Hydrogen temperature at the inlet plenum
TR2	Hydrogen temperature at the exhaust plenum
VIS84	Average viscosity of the hydrogen flowing through the impedance ring based on P8AB

```
      TEMPF(X)=472.002+45.0872*R-1.57688*(R**2+0.14385*R**3+0.02549)*(R**4
      TEMPF(X)=472.002+45.0872*R-1.57688*R**2+0.14385*R**3+0.02549)*R**4
     1+0.002026*R**5-0.001103*R**6
      DIMENSION P1(20),DP11A(20),DP11B(20),DP1A15(20),DP15A(20),DP15B(20
     1),DP16A(20),DP16B(20),DP5A8A(20),DP5B8B(20),DP8A4(20),DP3B4(20),
     2DP4A4(20),DP4B4(20),DP14(20),TR(20),FLOW(20),DP15AV(20)
     3,DP58AV(20),DP68AV(20),DP84AV(20),C15(20),F58(20),F68(20),C84A4(20
     4),C84MBA(20),VIS13(20),RE18(20),VIS84(20),RE84(20),RC(4),
     5DP16AV(20),C16(20)
   30 READ INPUT TAPE 5,1,(RC(I),I=1,4),TMR,TSP
    1 FORMAT(4A6,A3,A3)
      READ INPUT TAPE 5,2,FLOATJ,PBAROM,TNO,RNO,CMR,A,B,C,E,DEF
    2 FORMAT(6E12.4)
      J=FLOATJ
      NOT=TNO
      NOR=RNO
      PA=PBAROM*0.4912
      IF(DEF) 50,50,51
   50 AA=A*D-0.0195
      DE=2.0*(A*D-0.0195)/(A+D+0.067)
      GO TO 52
   51 AA=A*D
      DE=2.0*(A*D)/(A+D)
   52 AMR=(B*CMR)+(CMR+E)*(A-B)
      DO 200  I=1,J                                                    12
      READ INPUT TAPE 5,3,P1(I),DP15A(I),DP15B(I),DP16A(I),DP16B(I),
     1DP5A8A(I),DP5B8B(I),DP8A4(I),DP8B4(I),P7,T1,T2,T5
    3 FORMAT(6E12.4)
      TR1=TEMPF(T1)
      TR2=TEMPF(T2)
      TR(I)=(TR1+TR2)/2.0
      FLOW(I)=0.00962*(P7+PA)/SQRTF(TEMPF(T5))
      DP15AV(I)=(DP15A(I)+DP15B(I))/2.0
      DP16AV(I)=(DP16A(I)+DP16B(I))/2.0
      DP58AV(I)=(DP5A8A(I)+DP5B8B(I))/2.0
      DP68AV(I)=(DP5A8A(I)+DP5B8B(I)+DP15A(I)+DP15B(I)-DP16A(I)-DP16B(I)
     1)/2.0
      DP84AV(I)=(DP8A4(I)+DP3B4(I))/2.0
      P1AB=P1(I)+PA
      P5AB=P1AB-DP15AV(I)
      P6AB=P5AB-DP58AV(I)+DP68AV(I)
      P3AB = P5AB - DP53AV(I)                                          43
      CALL PRPS(TR(I),P1AB,.25,RU15,HX,SX,XX)
      CALL PRPS(TR(I),P5AB,.25,RU58,HX,SX,XX)
```

```
      TEMPF(I)=492.002+46.6622*R-1.69688*R**2+0.14385*R**3+0.0254)*R**4
      CALL PROPS(TR(I),P8AB,.25,RO68,HX,SX,XX)
      CALL PROPS(TR(I),P84B,.25,RO84,HX,SX,XX)
      C15(I)=0.44686*RO15*DP15AV(I)*AA**2/(FLOW(I))**2-1.0-.0255/DE
      C16(I)=0.44686*RO15*DP16AV(I)*AA**2/(FLOW(I))**2
      F58(I)=0.07150*RO58*DP58AV(I)*AA**2*DE/(FLOW(I))**2
      F68(I)=0.1485*RO68*DP68AV(I)*AA**2*DE/(FLOW(I))**2
      C84AA(I)=0.44686*RO84*DP84AV(I)*AA**2/FLOW(I)**2
      C84MRA(I)=0.44686*RO84*DP84AV(I)*AMR**2/FLOW(I)**2
      V=1.0/RO84
      VIS84(I)=HMU(P8AB,V,TR(I),0)
      RE18(I)=FLOW(I)*DE*12.0/(VIS84(I)*AA)
      IF(CMR) 40,40,22                                                  58
   40 IF(DEF) 31,31,32                                                  59
   31 RE84(I)=48.000*FLOW(I)/(VIS84(I)*(4.0*E+2.0*(A-B)))
      GO TO 200
   32 RE84(I)=48.000*FLOW(I)/(VIS84(I)*(2.0*E+2.0*(A-B)))
      GO TO 200
   22 IF(DEF)1000,1000,1001
 1000 RE84(I)=48.000*FLOW(I)/(VIS84(I)*(2.*A+2.*CMR+4.*E))
      GO TO 200
 1001 RE84(I)=48.000*FLOW(I)/(VIS84(I)*(2.*A+2.*CMR+2.*E))
  200 CONTINUE                                                          66
      ARMR=AMR/AA
      WRITE OUTPUT TAPE 6,5,NOT,NOR,(RD(I),I=1,4),PBAROM,PA,TMR,TSP,CMR,
     1D,ARMR,DE,AA,AMR
    5 FORMAT(1H1///31X,48HC1-2  INNER  IMPEDANCE  RING  LOSS  COEFFICIEN
     1TS//47X,16HTEST  CONDITIONS//5X,12HTEST  NUMBER,I8,20X,11HRUN  NUM
     2BER,I5,14X,9HDATE  RUN,4A6/5X,12HBAR. PRESS.=,F6.2,7H IN HG=,F6.2,
     35H PSIA,4X,4HTYPE,A3,13HMETERING RING,10X,4HTYPE,A3,12HSPACER PLAT
     4E/5X,24HMETERING RING CLEARANCE=,F7.4, 9X,18HANNULUS CLEARANCE=,F6
     5.3,6X,25HMETERING RING AREA RATIO=,F5.3/5X,20HEQUIVALENT DIAMETER=
     6,F7.4,13X,13HANNULUS AREA=,F7.4,6H SQ IN,4X,19HMETERING RING AREA=
     7,F7.4,6H SQ IN//5X,33HPRESSURES  IN  PSIG,   PRESSURE  DROPS  IN
     8PSID,   TEMPERATURE  IN  DEG.R,   FLOW  RATE  IN  LB/SE,1HC//)
      WRITE OUTPUT TAPE 6,6,(P(I),DP11A(I),DP11B(I),          DP15A(I),
     1DP15B(I),DP16A(I),DP16B(I),DP5A8A(I),DP5B8B(I),DP8A4(I),DP8B4(I),
     2DP4A4(I),DP4B4(I),          DP14(I),TR(I),I=1,J)
    6 FORMAT(4X,2HP1,4X,9HDP11A  DP11B  DP15A  DP15B  DP16A  DP16B  DP5
     1A8A DP5B8B DP8A4  DP8B4  DP4A4  DP4B4  DP14   TEMP/15(2X,F5.1))
      WRITE OUTPUT TAPE 6,5,NOT,NOR,(RD(I),I=1,4),PBAROM,PA,TMR,TSP,CMR,
     1D,ARMR,DE,AA,AMR
      WRITE OUTPUT TAPE 6,10000
10000 FORMAT(//4X,4HFLOW,3X,5HDP16V,2X,6HDP58V,2X,6HDP68V,2X,6HDP84V
```

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```
 TEMPF(R)=492.002+46.6822*R-1.69688*R**2+0.14385*R**3+0.025499*R**4      6/17/64        PAGE 3

1,4X,3HC16,6X,4HRE18,8X,3HF58,5X,3HF68,4X,5HC84AA,5X,4HRE84,6X,6HC8
24MRA)
 WRITE OUTPUT TAPE 6,7,(FLOW(I),DP16AV(I),DP58AV(I),DP68AV(I),DP84A
1V(I),C16(I),RE18(I),F58(I),F68(I),C84AA(I),RE84(I),C84MRA(I),I=1,J
2)
7 FORMAT(3X,F6.4,2X,F6.2,2X,F6.2,2X,F6.2,2X,F6.2,1X,F7.4,2X,1PE11.4,
31X,0PF7.4,1X,F7.4,1X,F7.4,2X,1PE11.4,1X,0PF7.4)
 GO TO 30
 END
```

[redacted]

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 1 | RUN NUMBER 1 | DATE RUN 04 15 64
BAR. PRESS.= 29.47 IN HG= 14.48 PSIA | TYPEA METERING RING | TYPEA SPACER PLATE
METERING RING CLEARANCE= 0.0095 | ANNULUS CLEARANCE= 0.077 | METERING RING AREA RATIO=0.398
EQUIVALENT DIAMETER= 0.1371 | ANNULUS AREA= 0.2488 SQ IN | METERING RING AREA= 0.0990 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

P1	DP11A	DP11B	DP15A	DP15B	DP16A	DP16B	DP5A8A	DP5B8B	DP8A4	DP8B4	DP4A4	DP4B4	DP14	TEMP
684.0			5.9	5.9	7.7	8.0	4.0	3.8	19.4	19.5				526.3
742.0			3.6	3.6	4.6	4.7	2.2	2.3	12.0	12.0				523.2
752.0			4.0	4.0	5.1	5.3	2.5	2.5	13.6	13.7				524.1
751.0			5.0	5.0	8.5	8.7	4.3	4.0	14.0	14.0				521.2
749.0			5.7	5.7	7.3	7.5	3.6	3.5	14.4	14.4				518.8
750.0			3.6	3.6	4.6	4.7	2.3	2.1	12.5	12.8				516.1
719.0			4.6	4.5	5.7	5.8	2.8	2.6	16.8	17.0				513.6
750.0			3.7	3.6	4.6	4.8	2.3	2.2	13.4	13.6				513.3
750.0			3.1	3.0	3.8	4.0	1.9	1.8	10.8	11.0				511.5
752.0			2.7	2.7	3.3	3.5	1.7	1.6	9.6	9.7				511.1
755.0			2.4	2.4	3.0	3.1	1.5	1.4	8.4	8.5				510.4
748.0			2.1	2.0	2.6	2.7	1.3	1.3	7.3	7.4				510.2
748.0			1.8	1.8	2.3	2.3	1.1	1.1	6.2	6.3				509.7
751.0			1.5	1.5	2.0	2.0	1.0	1.0	5.2	5.2				509.7
752.0			1.3	1.3	1.6	1.7	0.8	0.8	4.5	4.6				509.7
592.0			2.2	2.2	2.7	2.8	1.4	1.3	7.4	7.5				509.5

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APPENDIX A (Continued)

SI- INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 1 RUN NUMBER 1 DATE RUN 04 15 64
BAR. PRESS.= 29.47 IN HG= 14.45 PSIA TYPEA METERING RING TYPEA SPACER PLATE
METERING RING CLEARANCE= 0. 075 ANNULUS CLEARANCE= 0.077 METERING RING AREA RATI =0.39
EQUIVALENT DIAMETER= 0.1371 ANNULUS AREA= 0.2438 SQ IN METERING RING AREA= 0.0990 SQ I

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

FLOW	DP16AV	DP56AV	DP68AV	DP84AV	C16	RE18	F58	F68	C84AA	RE84	C84RA
.1519	7.85	3.70	1.95	19.45	1.5912	2.0127E 05	0.0172	0.0179	3.8889	2.0457E 05	0.6158
.1445	4.65	2.25	1.20	12.00	1.6240	1.6036E 05	0.0172	0.0190	4.1597	1.6299E 05	0.5586
.1555	5.20	2.50	1.30	13.65	1.5948	1.7187E 05	0.0167	0.0131	4.1521	1.7467E 05	0.6574
.2030	0.6	4.15	0.55	14.00	1.5452	2.2582E 05	0.0163	0.0045	2.4864	2.2955E 05	0.3937
.1577	7.40	3.55	1.85	14.40	1.5581	2.0946E 05	0.0163	0.0176	2.9965	2.1290E 05	0.4745
.1446	4.65	2.20	1.15	12.65	1.6550	1.6215E 05	0.0171	0.0186	4.4693	1.6481E 05	0.7077
.1614	5.75	2.70	1.50	16.90	1.5897	1.8137E 05	0.0163	0.0188	4.6281	1.8434E 05	0.7328
.1489	4.70	2.25	1.20	13.50	1.5899	1.6732E 05	0.0166	0.0184	4.5326	1.7006E 05	0.7177
.1350	3.90	1.85	1.00	10.90	1.6115	1.5200E 05	0.0167	0.0188	4.4760	1.5449E 05	0.7087
.1265	3.40	1.65	0.95	9.65	1.6049	1.4253E 05	0.0170	0.0204	4.5300	1.4487E 05	0.7173
.1189	3.05	1.45	0.80	8.45	1.6386	1.3405E 05	0.0170	0.0196	4.5179	1.3624E 05	0.7154
.1110	2.65	1.30	0.75	7.35	1.6232	1.2506E 05	0.0174	0.0209	4.4827	1.2711E 05	0.7095
.1024	2.30	1.10	0.60	6.25	1.6539	1.1553E 05	0.0173	0.0197	4.4779	1.1743E 05	0.7090
.0946	2.0	1.00	0.50	5.20	1.6894	1.0680E 05	0.0185	0.0193	4.3786	1.0855E 05	0.6933
.0874	1.65	0.80	0.45	4.55	1.6372	9.8600E 04	0.0174	0.0204	4.5028	1.0022E 05	0.7130
.1005	2.75	1.35	0.80	7.45	1.6591	1.1310E 05	0.0178	0.0220	4.4690	1.1495E 05	0.7076

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C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 3 | RUN NUMBER 1 | DATE RUN 04 23 64
BAR. PRESS.= 29.29 IN HG= 14.39 PSIA | TYPED METERING RING | TYPEB SPACER PLATE
METERING RING CLEARANCE= 0.0590 | ANNULUS CLEARANCE= 0.127 | METERING RING AREA RATIO=0.611
EQUIVALENT DIAMETER= 0.2451 | ANNULUS AREA= 0.4425 SQ IN | METERING RING AREA= 0.2703 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

P1	DP11A	DP11B	DP15A	DP15B	DP16A	DP16B	DP5A8A	DP5B8B	DP8A4	DP8B4	DP4A4	DP4B4	DP14	TEMP
751.0			1.8	1.8	2.3	2.2	0.9	0.9	2.0	2.0				533.2
740.0			1.7	1.8	2.2	2.2	0.8	0.9	1.9	1.9				529.9
738.0			1.7	1.6	2.1	2.0	0.8	0.9	1.8	1.8				525.9
745.0			1.8	1.8	2.3	2.3	0.9	0.9	2.0	2.0				523.9
727.0			1.8	1.8	2.2	2.2	0.9	0.9	2.0	2.0				522.1
750.0			1.6	1.6	2.0	2.0	0.8	0.8	1.6	1.8				521.2
590.0			1.7	1.8	2.4	2.2	1.0	0.9	2.0	2.1				518.5
622.0			2.0	2.1	2.7	2.6	1.2	1.0	2.3	2.4				516.3
638.0			1.7	1.8	2.4	2.2	1.0	1.0	2.0	2.1				513.6
625.0			1.7	1.8	2.3	2.2	1.0	0.9	2.0	2.1				512.2
585.0			1.8	2.0	2.5	2.4	1.1	1.0	2.2	2.2				509.5
742.0			1.3	1.2	1.6	1.6	0.6	0.7	1.3	1.3				508.1
750.0			1.2	1.2	1.4	1.4	0.6	0.6	1.2	1.2				507.2
750.0			1.0	1.0	1.3	1.3	0.5	0.5	1.0	1.1				506.5
748.0			0.4	0.4	1.1	1.0	0.4	0.4	0.9	0.9				504.5
748.0			0.8	0.8	1.0	1.0	0.4	0.4	0.8	0.8				504.0

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 3 | RUN NUMBER 1 | DATE RUN 04 23 64
BAR. PRESS.= 29.29 IN HG= 14.39 PSIA | TYPED METERING RING | TYPEB SPACER PLATE
METERING RING CLEARANCE= 0.0590 | ANNULUS CLEARANCE= 0.127 | METERING RING AREA RATIO=0.611
EQUIVALENT DIAMETER= 0.2451 | ANNULUS AREA= 0.4425 SQ IN | METERING RING AREA= 0.2703 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

FLOW	DP16AV	DP58AV	DP68AV	DP84AV	C16	RE18	F58	F68	C84AA	RE84	C84MRA
0.2069	2.25	0.90	0.45	2.00	1.2036	2.2795E 05	0.0188	0.0196	1.0662	2.2993E 05	0.3979
0.2052	2.20	0.85	0.42	1.92	1.1864	2.2705E 05	0.0179	0.0187	1.0346	2.2902E 05	0.3861
0.2001	2.05	0.85	0.47	1.80	1.1693	2.2238E 05	0.0190	0.0221	1.0233	2.2431E 05	0.3819
0.2134	2.30	0.90	0.40	2.00	1.1679	2.3775E 05	0.0179	0.0165	1.0121	2.3981E 05	0.3777
0.2093	2.20	0.90	0.50	2.00	1.1377	2.3380E 05	0.0182	0.0211	1.0307	2.3582E 05	0.3846
0.2034	2.00	0.80	0.40	1.70	1.1308	2.2732E 05	0.0177	0.0184	0.9582	2.2929E 05	0.3576
0.1903	2.30	0.95	0.40	2.05	1.1887	2.1368E 05	0.0192	0.0168	1.0549	2.1553E 05	0.3937
0.2083	2.65	1.10	0.50	2.35	1.2062	2.3458E 05	0.0196	0.0185	1.0645	2.3661E 05	0.3973
0.1988	2.30	1.00	0.45	2.05	1.1846	2.2449E 05	0.0201	0.0189	1.0516	2.2644E 05	0.3924
0.1959	2.25	0.95	0.45	2.05	1.1731	2.2164E 05	0.0194	0.0191	1.0645	2.2356E 05	0.3973
0.1984	2.45	1.05	0.50	2.22	1.1758	2.2530E 05	0.0197	0.0195	1.0627	2.2725E 05	0.3966
0.1768	1.60	0.65	0.30	1.35	1.2146	2.0087E 05	0.0193	0.0186	1.0224	2.0261E 05	0.3815
0.1688	1.40	0.60	0.40	1.20	1.1796	1.9201E 05	0.0198	0.0275	1.0088	1.9367E 05	0.3765
0.1584	1.30	0.50	0.20	1.05	1.2468	1.8024E 05	0.0188	0.0156	1.0052	1.8180E 05	0.3751
0.1435	1.05	0.42	0.20	0.90	1.2285	1.6373E 05	0.0195	-0.0191	1.0519	1.6515E 05	0.3926
0.1354	1.00	0.40	0.20	0.80	1.3152	1.5459E 05	0.0206	0.0215	1.0505	1.5593E 05	0.3921

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 2 RUN NUMBER 1 DATE RUN 04 21 64
BAR. PRESS.= 29.34 IN HG= 14.41 PSIA TYPED METERING RING TYPEB SPACER PLATE
METERING RING CLEARANCE= 0.0090 ANNULUS CLEARANCE= 0.077 METERING RING AREA RATIO=0.358
EQUIVALENT DIAMETER= 0.1507 ANNULUS AREA= 0.2683 SQ IN METERING RING AREA= 0.0961 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

P1	DP15A	DP15B	DP16A	DP16B	DP5A8A	DP5B8B	DP8A4	DP8B4	TEMP
750.0	6.0	6.2	7.8	7.8	4.2	3.7	33.5	38.0	533.6
740.0	6.0	6.2	7.7	7.8	4.1	3.7	33.5	38.0	530.6
720.0	5.7	5.8	7.2	7.3	3.8	3.4	30.7	35.5	526.8
730.0	5.3	5.0	6.5	6.7	3.2	3.5	27.0	31.2	524.3
745.0	4.6	4.3	5.6	5.7	2.8	3.0	22.0	26.5	519.4
748.0	3.9	3.8	4.8	4.9	2.4	2.4	18.5	21.5	520.8
740.0	3.5	3.4	4.2	4.2	2.1	2.2	15.7	19.0	520.3
750.0	3.2	3.2	4.0	4.0	2.0	2.0	14.5	17.5	519.9
750.0	2.8	2.7	3.5	3.5	1.8	1.8	12.0	16.0	519.0
748.0	2.5	2.4	3.1	3.1	1.7	1.7	11.0	13.5	518.5
740.0	2.3	2.2	2.7	2.7	1.3	1.4	8.5	10.5	518.1
557.0	5.4	5.4	6.7	6.8	3.6	3.2	29.0	33.5	516.3
570.0	4.7	4.7	5.8	5.9	3.1	3.0	24.5	28.5	515.8
560.0	4.5	4.5	5.7	5.8	2.9	2.9	24.0	27.5	514.9
548.0	4.3	4.3	5.4	5.6	2.9	3.0	22.0	26.0	514.5
560.0	4.0	3.8	5.0	5.2	2.8	2.9	20.5	24.5	514.0
570.0	3.8	3.7	4.6	4.8	2.5	2.5	19.0	23.0	513.6
531.0	3.6	3.4	4.4	4.5	2.3	2.4	17.0	20.5	512.2
555.0	3.4	3.3	4.1	4.2	2.2	2.3	15.5	19.0	511.8
560.0	3.2	3.2	3.9	4.0	2.0	2.2	15.0	18.0	511.3

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 2 | RUN NUMBER 1 | DATE RUN 04 21 64
BAR. PRESS.= 29.34 IN HG= 14.41 PSIA | TYPED METERING RING | TYPEB SPACER PLATE
METERING RING CLEARANCE= 0.0090 | ANNULUS CLEARANCE= 0.077 | METERING RING AREA RATIO=0.353
EQUIVALENT DIAMETER= 0.1507 | ANNULUS AREA= 0.2683 SQ IN | METERING RING AREA= 0.0961 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

FLOW	DP16AV	DP58AV	DP68AV	DP84AV	C16	RE18	F58	F68	C84AA	RE84	C84MRA
0.2108	7.80	3.95	2.25	35.75	1.4743	2.3537E 05	0.0179	0.0212	6.6741	2.3744E 05	0.8566
0.2083	7.75	3.90	2.25	35.75	1.4899	2.3349E 05	0.0179	0.0215	6.7847	2.3554E 05	0.8707
0.1997	7.25	3.60	2.10	33.10	1.4672	2.2495E 05	0.0177	0.0214	6.7059	2.2693E 05	0.8606
0.1881	6.60	3.35	1.90	29.10	1.5536	2.1246E 05	0.0189	0.0223	6.7742	2.1433E 05	0.8694
0.1785	5.65	2.90	1.70	24.25	1.5206	2.0274E 05	0.0187	0.0228	6.4655	2.0452E 05	0.8298
0.1625	4.85	2.40	1.40	20.00	1.5754	1.8435E 05	0.0187	0.0227	6.4449	1.8597E 05	0.8271
0.1521	4.20	2.15	1.40	17.35	1.5434	1.7261E 05	0.0190	0.0257	6.3300	1.7413E 05	0.8124
0.1479	4.00	2.00	1.20	16.00	1.5765	1.6789E 05	0.0189	0.0236	6.2647	1.6936E 05	0.8040
0.1373	3.50	1.80	1.05	14.00	1.6016	1.5611E 05	0.0198	0.0240	6.3695	1.5748E 05	0.8175
0.1290	3.10	1.70	1.05	12.25	1.6056	1.4670E 05	0.0212	0.0272	6.3112	1.4799E 05	0.8100
0.1197	2.70	1.35	0.90	9.50	1.6096	1.3618E 05	0.0193	0.0269	5.6374	1.3738E 05	0.7235
0.1715	6.75	3.40	2.05	31.25	1.5012	1.9589E 05	0.0181	0.0226	6.8455	1.9761E 05	0.8785
0.1622	5.85	3.05	1.90	26.50	1.4877	1.8537E 05	0.0186	0.0240	6.6521	1.8700E 05	0.8537
0.1594	5.75	2.90	1.65	25.75	1.4921	1.8235E 05	0.0180	0.0213	6.5979	1.8396E 05	0.8468
0.1510	5.50	2.95	1.75	24.00	1.5589	1.7287E 05	0.0200	0.0247	6.7169	1.7439E 05	0.8620
0.1472	5.10	2.85	1.65	22.50	1.5535	1.6864E 05	0.0208	0.0250	6.7751	1.7012E 05	0.8695
0.1442	4.70	2.50	1.55	21.00	1.5182	1.6530E 05	0.0193	0.0249	6.7125	1.6675E 05	0.8615
0.1321	4.45	2.35	1.40	18.75	1.6058	1.5171E 05	0.0203	0.0252	6.6950	1.5304E 05	0.8592
0.1309	4.15	2.25	1.45	17.25	1.5926	1.5036E 05	0.0207	0.0277	6.5561	1.5168E 05	0.8414
0.1279	3.95	2.10	1.35	16.50	1.6011	1.4707E 05	0.0204	0.0273	6.6279	1.4836E 05	0.8506

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 9 RUN NUMBER 3 DATE RUN 05 15 64
BAR. PRESS.= 30.15 IN Hg= 14.81 PSIA TYPE A METERING RING TYPE A SPACER PLATE
METERING RING CLEARANCE= 0.0595 ANNULUS CLEARANCE= 0.127 METERING RING AREA RATIO=0.646
EQUIVALENT DIAMETER= 0.2300 ANNULUS AREA= 0.4230 SQ IN METERING RING AREA= 0.2732 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

P1	DP15A	DP15B	DP16A	DP16B	DP5A8A	DP5B8B	DP8A4	DP8B4	TEMP
746.0	2.0	2.0	2.6	2.6	1.1	0.9	1.2	1.2	500.4
748.0	1.7	1.7	2.3	2.4	1.0	1.0	1.2	1.2	498.5
740.0	1.8	1.8	2.2	2.2	0.8	0.8	1.0	1.0	498.0
742.0	1.5	1.5	2.0	2.0	0.8	0.8	1.0	0.8	496.2
742.0	1.5	1.5	1.7	1.8	0.7	0.4	0.9	0.8	494.8
740.0	1.4	1.4	1.8	1.8	0.7	0.5	0.8	0.8	494.3
722.0	1.5	1.5	2.0	2.0	0.7	0.6	0.9	0.8	493.4
742.0	1.3	1.3	1.7	1.7	0.5	0.5	0.8	0.7	496.7
740.0	1.1	1.1	1.5	1.5	0.5	0.4	0.5	0.5	491.8
740.0	0.8	0.8	0.9	1.0	0.4	0.4	0.5	0.5	491.1
745.0	1.0	1.0	1.2	1.2	0.5	0.3	0.6	0.5	490.6
720.0	1.1	1.0	1.3	1.3	0.5	0.4	0.7	0.5	489.4
745.0	0.7	0.7	0.7	0.7	0.4	0.2	0.5	0.4	491.1
740.0	0.5	0.6	0.7	0.7	0.3	0.2	0.4	0.4	489.2
742.0	0.3	0.4	0.4	0.4	0.2	0.2	0.3	0.2	490.1
740.0	0.8	0.8	1.1	1.0	0.5	0.3	0.5	0.5	504.5
740.0	0.8	0.8	1.0	1.0	0.5	0.2	0.5	0.4	504.5

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 9 | RUN NUMBER 3 | DATE RUN 05 15 64
BAR. PRESS.= 30.15 IN HG= 14.81 PSIA | TYPEA METERING RING | TYPEA SPACER PLATE
METERING RING CLEARANCE= 0.0595 | ANNULUS CLEARANCE= 0.127 | METERING RING AREA RATIO=0.646
EQUIVALENT DIAMETER= 0.2300 | ANNULUS AREA= 0.4230 SQ IN | METERING RING AREA= 0.2732 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

FLOW	DP16AV	DP58AV	DP68AV	DP84AV	C16	RE18	F58	F68	C84AA	RE84	C84MRA
0.2197	2.60	1.00	0.40	1.20	1.1928	2.4744E 05	0.0168	0.0140	0.5484	2.5144E 05	0.2288
0.2082	2.35	1.00	0.38	1.20	1.2082	2.3501E 05	0.0189	0.0147	0.6148	2.3881E 05	0.2565
0.1989	2.20	0.80	0.40	1.00	1.2277	2.2469E 05	0.0164	0.0171	0.5562	2.2832E 05	0.2320
0.1884	2.00	0.80	0.30	0.90	1.2521	2.1329E 05	0.0184	0.0144	0.5618	2.1674E 05	0.2344
0.1788	1.75	0.65	0.30	0.85	1.2137	2.0287E 05	0.0141	0.0160	0.5904	2.0615E 05	0.2463
0.1780	1.80	0.60	0.20	0.80	1.2636	2.0202E 05	0.0155	0.0107	0.5602	2.0528E 05	0.2337
0.1868	2.00	0.65	0.15	0.85	1.2472	2.1235E 05	0.0149	0.0072	0.5286	2.1578E 05	0.2205
0.1675	1.70	0.50	0.10	0.75	1.3449	1.8954E 05	0.0145	0.0061	0.5920	1.9260E 05	0.2470
0.1461	1.50	0.45	0.05	0.50	1.5700	1.6642E 05	0.0173	0.0040	0.5223	1.6911E 05	0.2179
0.1364	0.95	0.40	0.25	0.50	1.1424	1.5551E 05	0.0177	0.0230	0.6003	1.5803E 05	0.2504
0.1456	1.20	0.40	0.20	0.55	1.2761	1.6607E 05	0.0156	0.0163	0.5838	1.6875E 05	0.2436
0.1565	1.30	0.45	0.20	0.60	1.1620	1.7876E 05	0.0148	0.0137	0.5352	1.8165E 05	0.2233
0.1256	0.70	0.30	0.30	0.45	0.9994	1.4317E 05	0.0157	0.0328	0.6417	1.4548E 05	0.2677
0.1150	0.72	0.25	0.07	0.40	1.2315	1.3141E 05	0.0156	0.0098	0.6788	1.3353E 05	0.2832
0.0935	0.40	0.20	0.15	0.25	1.0297	1.0665E 05	0.0189	0.0296	0.6431	1.0837E 05	0.2683
0.1338	1.05	0.40	0.15	0.50	1.2783	1.4993E 05	0.0179	0.0140	0.6078	1.5235E 05	0.2535
0.1348	1.00	0.35	0.15	0.45	1.2000	1.5102E 05	0.0154	0.0138	0.5392	1.5346E 05	0.2249

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 6 RUN NUMBER 2 DATE RUN 05 05 64
BAR. PRESS.= 29.51 IN HG= 14.50 PSIA TYPED METERING RING TYPED SPACER PLATE
METERING RING CLEARANCE= 0.0590 ANNULUS CLEARANCE= 0.127 METERING RING AREA RATIO=0.611
EQUIVALENT DIAMETER= 0.2451 ANNULUS AREA= 0.4425 SQ IN METERING RING AREA= 0.2703 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

P1	DP15A	DP15B	DP16A	DP16B	DP5A8A	DP5B8B	DP8A4	DP8B4	TEMP
740.0	1.8	1.8	2.4	2.4	1.0	0.8	2.1	2.0	529.5
748.0	1.8	1.8	2.2	2.2	1.0	1.0	2.1	2.0	526.6
750.0	1.8	1.7	2.4	2.3	0.8	0.8	1.8	1.8	525.9
750.0	1.7	1.7	2.0	2.1	0.8	0.8	1.8	1.7	522.8
750.0	1.6	1.5	1.8	1.8	0.7	0.6	1.6	1.5	522.1
758.0	1.5	1.4	1.8	1.8	0.7	0.6	1.5	1.4	521.4
750.0	1.4	1.3	1.6	1.6	0.5	0.5	1.4	1.3	520.8
751.0	1.3	1.2	1.6	1.6	0.5	0.5	1.3	1.2	519.0
752.0	1.2	1.2	1.5	1.5	0.5	0.5	1.3	1.2	518.5
750.0	1.2	1.1	1.4	1.4	0.5	0.5	1.3	1.3	518.1
742.0	1.1	1.0	1.2	1.2	0.5	0.4	1.1	1.0	517.2
752.0	1.0	0.9	1.1	1.1	0.4	0.4	1.0	0.9	516.7
748.0	0.9	0.8	1.0	1.0	0.4	0.3	1.0	0.8	516.3
762.0	0.8	0.8	1.0	1.0	0.4	0.3	0.9	0.8	515.4
750.0	0.8	0.7	0.9	0.9	0.4	0.3	0.8	0.7	514.9
751.0	0.7	0.6	0.8	0.8	0.3	0.3	0.8	0.7	514.5
751.0	0.6	0.6	0.8	0.8	0.3	0.2	0.8	0.6	514.0
750.0	0.6	0.5	0.6	0.6	0.2	0.2	0.6	0.5	514.0
748.0	0.5	0.4	0.7	0.6	0.2	0.1	0.6	0.5	514.0
742.0	0.5	0.4	0.5	0.5	0.2	0.1	0.5	0.4	514.0

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 6 | RUN NUMBER 2 | DATE RUN 05 05 64
BAR. PRESS.= 29.51 IN HG= 14.50 PSIA | TYPED METERING RING | TYPEB SPACER PLATE
METERING RING CLEARANCE= 0.0590 | ANNULUS CLEARANCE= 0.127 | METERING RING AREA RATIO=0.611
EQUIVALENT DIAMETER= 0.2451 | ANNULUS AREA= 0.4425 SQ IN | METERING RING AREA= 0.2703 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

FLOW	DP16AV	DP58AV	DP68AV	DP84AV	C16	RE18	F58	F68	C64AA	RE84	C84MRA
0.2140	2.40	0.90	0.30	2.05	1.1921	2.3682E 05	0.0175	0.0121	1.0147	2.3887E 05	0.3787
0.2149	2.20	1.00	0.60	2.05	1.1004	2.3865E 05	0.0196	0.0244	1.0217	2.4071E 05	0.3813
0.2051	2.35	0.80	0.20	1.80	1.2948	2.2799E 05	0.0172	0.0090	0.9885	2.2996E 05	0.3639
0.1966	2.05	0.80	0.45	1.75	1.2371	2.1931E 05	0.0189	0.0221	1.0527	2.2121E 05	0.3929
0.1901	1.80	0.65	0.40	1.55	1.1629	2.1226E 05	0.0164	0.0211	0.9986	2.1410E 05	0.3727
0.1869	1.80	0.65	0.30	1.45	1.2168	2.0884E 05	0.0172	0.0165	0.9776	2.1065E 05	0.3847
0.1796	1.60	0.50	0.25	1.35	1.1723	2.0089E 05	0.0143	0.0149	0.9869	2.0263E 05	0.3683
0.1754	1.60	0.50	0.15	1.25	1.2227	1.9662E 05	0.0150	0.0093	0.9531	1.9832E 05	0.3557
0.1705	1.50	0.50	0.20	1.25	1.2157	1.9122E 05	0.0159	0.0132	1.0109	1.9288E 05	0.3773
0.1622	1.40	0.50	0.25	1.30	1.2526	1.8195E 05	0.0175	0.0182	1.1607	1.8352E 05	0.4332
0.1539	1.20	0.45	0.30	1.05	1.1826	1.7283E 05	0.0174	0.0241	1.0328	1.7434E 05	0.3865
0.1517	1.10	0.40	0.25	0.95	1.1297	1.7054E 05	0.0161	0.0209	0.9740	1.7202E 05	0.3635
0.1439	1.00	0.35	0.20	0.90	1.1370	1.6193E 05	0.0156	0.0186	1.0218	1.6323E 05	0.3813
0.1393	1.00	0.35	0.15	0.85	1.2368	1.5682E 05	0.0170	0.0151	1.0498	1.5816E 05	0.3918
0.1297	0.90	0.35	0.20	0.75	1.2672	1.4604E 05	0.0193	0.0230	1.0545	1.4730E 05	0.3936
0.1267	0.80	0.30	0.15	0.75	1.1822	1.4278E 05	0.0174	0.0181	1.1070	1.4402E 05	0.4131
0.1204	0.80	0.25	0.05	0.70	1.3090	1.3582E 05	0.0160	0.0067	1.1441	1.3700E 05	0.4270
0.1116	0.60	0.20	0.15	0.55	1.1430	1.2580E 05	0.0149	0.0233	1.0468	1.2689E 05	0.3907
0.1077	0.65	0.15	-0.05	0.55	1.3240	1.2150E 05	0.0120	-0.0083	1.1195	1.2256E 05	0.4178
0.1022	0.50	0.15	0.10	0.45	1.1225	1.1530E 05	0.0132	0.0183	1.0095	1.1630E 05	0.3767

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 9 RUN NUMBER 2 DATE RUN 05 14 64
BAR. PRESS.= 29.70 IN HG= 14.63 PSIA TYPE8 METERING RING TYPE8 SPACER PLATE
METERING RING CLEARANCE= 0.0090 ANNULUS CLEARANCE= 0.077 METERING RING AREA RATIO=0.358
EQUIVALENT DIAMETER= 0.1507 ANNULUS AREA= 0.2683 SQ IN METERING RING AREA= 0.0961 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

P1	DP15A	DP15B	DP16A	DP16B	DP5A8A	DP5B8B	DP8A4	DP8B4	TEMP
748.0	7.0	7.6	0.	0.	4.0	4.4	43.0	41.0	517.8
740.0	6.8	6.5	8.5	8.4	4.5	4.2	41.5	42.0	508.9
745.0	6.4	6.0	8.2	8.2	4.3	4.2	39.0	39.5	506.9
748.0	5.8	5.5	7.5	7.5	4.0	4.0	36.0	36.0	506.0
740.0	5.8	5.5	7.4	7.5	4.0	3.8	36.0	36.0	502.0
745.0	5.6	5.2	7.0	7.0	3.7	3.7	33.0	33.0	500.6
738.0	5.2	4.8	6.4	6.4	3.3	3.3	30.0	30.0	495.0
750.0	4.2	4.2	5.6	5.6	2.8	2.8	25.0	25.0	496.9
750.0	4.0	3.9	5.0	5.0	2.4	2.4	22.5	22.5	496.4
750.0	3.6	3.5	4.5	4.4	2.4	2.2	20.0	20.0	495.9
740.0	3.1	3.1	4.1	4.1	2.0	2.0	17.5	18.0	495.5
740.0	2.7	2.8	3.6	3.6	1.8	1.7	15.5	15.5	495.5
475.0	4.8	4.9	6.5	6.5	3.6	3.0	31.5	32.0	494.6

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 8 | RUN NUMBER 2 | DATE RUN 05 14 64
BAR. PRESS.= 29.78 IN HG= 14.63 PSIA | TYPED METERING RING | TYPED SPACER PLATE
METERING RING CLEARANCE= 0.0090 | ANNULUS CLEARANCE= 0.077 | METERING RING AREA RATIO=0.359
EQUIVALENT DIAMETER= 0.1507 | ANNULUS AREA= 0.2683 SQ IN | METERING RING AREA= 0.0961 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

FLOW	DP16AV	DP58AV	DP68AV	DP84AV	C16	RE18	F58	F68	C84AA	RE84	C84MRA
0.2192	0.	4.20	11.50	42.00	0.	2.4956E 05	0.0180	0.1037	7.4324	2.5175E 05	0.9539
0.2184	8.45	4.35	2.55	41.75	1.5398	2.5137E 05	0.0189	0.0231	7.5008	2.5358E 05	0.9627
0.2141	8.20	4.25	2.25	39.25	1.5708	2.4705E 05	0.0195	0.0214	7.4187	2.4922E 05	0.9521
0.2059	7.50	4.00	2.15	36.00	1.5617	2.3789E 05	0.0199	0.0223	7.4044	2.3998E 05	0.9503
0.2066	7.45	3.90	2.10	36.00	1.5384	2.3983E 05	0.0193	0.0216	7.3428	2.4194E 05	0.9424
0.2005	7.00	3.70	2.10	33.00	1.5486	2.3316E 05	0.0196	0.0231	7.2161	2.3521E 05	0.9261
0.1903	6.40	3.30	1.90	30.00	1.5650	2.2207E 05	0.0193	0.0231	7.2577	2.2402E 05	0.9315
0.1779	5.60	2.80	1.40	25.00	1.5944	2.0789E 05	0.0191	0.0199	7.0550	2.0972E 05	0.9054
0.1688	5.00	2.40	1.35	22.50	1.5826	1.9737E 05	0.0182	0.0213	7.0647	1.9911E 05	0.9067
0.1581	4.45	2.30	1.40	20.00	1.6068	1.8499E 05	0.0199	0.0252	7.1680	1.8662E 05	0.9199
0.1495	4.10	2.00	1.00	17.75	1.6377	1.7497E 05	0.0192	0.0200	7.0439	1.7650E 05	0.9040
0.1412	3.60	1.75	0.90	15.50	1.6107	1.6532E 05	0.0188	0.0201	6.8951	1.6677E 05	0.8949
0.1538	6.50	3.30	1.65	31.75	1.6121	1.8072E 05	0.0195	0.0203	7.7462	1.8231E 05	0.9942

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 4 RUN NUMBER 1 DATE RUN 04 28 64
BAR. PRESS.= 29.08 IN HG= 14.28 PSIA TYPEA METERING RING TYPEA SPACER PLATE
METERING RING CLEARANCE= 0.0595 ANNULUS CLEARANCE= 0.127 METERING RING AREA RATIO=0.646
EQUIVALENT DIAMETER= 0.2300 ANNULUS AREA= 0.4230 SQ IN METERING RING AREA= 0.2732 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

P1	DP15A	DP15B	DP16A	DP16B	DP5A8A	DP5B8B	DP8A4	DP8B4	TEMP
748.0	2.1	1.9	2.5	2.5	1.0	1.0	1.3	1.2	513.1
741.0	2.0	2.0	2.6	2.6	1.3	1.0	1.4	1.4	509.6
743.0	2.0	2.0	2.7	2.6	1.2	1.0	1.4	1.4	507.0
748.0	2.0	2.0	2.7	2.7	1.3	1.0	1.4	1.4	504.5
742.0	2.0	2.0	2.6	2.6	1.0	1.0	1.3	1.3	502.7
748.0	2.0	1.8	2.4	2.4	0.9	0.9	1.8	1.3	500.1
745.0	1.7	1.6	2.0	2.1	0.8	0.8	1.0	1.0	499.0
749.0	1.5	1.4	1.8	1.8	0.8	0.8	1.0	1.0	497.6
740.0	1.3	1.3	1.7	1.7	0.7	0.8	0.9	0.8	496.7
748.0	1.3	1.0	1.6	1.6	0.6	0.7	0.8	0.8	496.2
750.0	1.1	1.0	1.5	1.5	0.6	0.6	0.8	0.8	495.3
740.0	1.1	1.0	1.3	1.3	0.6	0.6	0.7	0.6	494.8
742.0	0.9	0.8	1.2	1.1	0.4	0.4	0.5	0.5	494.3
752.0	0.9	0.8	1.1	1.1	0.4	0.5	0.6	0.5	493.9
745.0	0.8	0.7	1.0	1.0	0.4	0.4	0.5	0.5	493.9
752.0	0.7	0.6	1.0	1.0	0.4	0.4	0.5	0.4	493.4
543.0	1.3	1.2	1.6	1.6	0.7	0.7	0.8	0.8	493.2
502.0	1.3	1.2	1.6	1.6	0.7	0.7	0.9	0.9	492.7
410.0	0.8	0.7	1.5	1.5	0.8	0.7	0.8	0.7	492.0

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 4 | RUN NUMBER 1 | DATE RUN 04 28 64
BAR. PRESS.= 29.06 IN HG= 14.28 PSIA | TYPEA METERING RING | TYPEA SPACER PLATE
METERING RING CLEARANCE= 0.0595 | ANNULUS CLEARANCE= 0.127 | METERING RING AREA RATIO=0.646
EQUIVALENT DIAMETER= 0.2300 | ANNULUS AREA= 0.4230 SQ IN | METERING RING AREA= 0.2732 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

FLOW	DP16AV	DP58AV	DP68AV	DP84AV	C16	RE18	F58	F68	C84AA	RE84	C84MRA
0.2095	2.50	1.00	0.50	1.27	1.2330	2.3218E 05	0.0181	0.0186	0.6264	2.3594E 05	0.2613
0.2156	2.60	1.15	0.55	1.40	1.2101	2.4036E 05	0.0196	0.0196	0.6490	2.4424E 05	0.2707
0.2171	2.65	1.10	0.45	1.40	1.2231	2.4252E 05	0.0186	0.0159	0.6436	2.4644E 05	0.2685
0.2186	2.70	1.15	0.45	1.40	1.2435	2.4492E 05	0.0194	0.0158	0.6422	2.4886E 05	0.2679
0.2116	2.60	1.00	0.40	1.30	1.2704	2.3786E 05	0.0179	0.0149	0.6328	2.4170E 05	0.2640
0.2060	2.40	0.90	0.40	1.55	1.2553	2.3208E 05	0.0173	0.0160	0.8078	2.3583E 05	0.3370
0.1911	2.05	0.80	0.40	1.00	1.2435	2.1566E 05	0.0178	0.0186	0.6047	2.1915E 05	0.2523
0.1799	1.80	0.80	0.45	1.00	1.2422	2.0333E 05	0.0203	0.0238	0.6881	2.0662E 05	0.2871
0.1700	1.70	0.75	0.35	0.85	1.3007	1.9243E 05	0.0211	0.0205	0.6486	1.9554E 05	0.2706
0.1651	1.60	0.65	0.20	0.80	1.3128	1.8695E 05	0.0196	0.0126	0.6549	1.8997E 05	0.2732
0.1566	1.50	0.60	0.15	0.80	1.3743	1.7751E 05	0.0202	0.0105	0.7314	1.8038E 05	0.3051
0.1511	1.30	0.60	0.35	0.65	1.2647	1.7137E 05	0.0215	0.0261	0.6310	1.7414E 05	0.2632
0.1382	1.15	0.40	0.10	0.50	1.3421	1.5683E 05	0.0172	0.0089	0.5826	1.5936E 05	0.2430
0.1348	1.10	0.45	0.20	0.55	1.3674	1.5307E 05	0.0206	0.0190	0.6826	1.5554E 05	0.2848
0.1275	1.00	0.40	0.15	0.50	1.3776	1.4477E 05	0.0203	0.0158	0.6878	1.4711E 05	0.2869
0.1245	1.00	0.40	0.05	0.45	1.4579	1.4149E 05	0.0214	0.0056	0.6552	1.4378E 05	0.2733
0.1406	1.60	0.70	0.35	0.80	1.3425	1.6019E 05	0.0216	0.0225	0.6690	1.6278E 05	0.2791
0.1399	1.60	0.70	0.35	0.90	1.2613	1.5944E 05	0.0203	0.0211	0.7069	1.6202E 05	0.2949
0.1174	1.50	0.75	-0.00	0.75	1.3857	1.3410E 05	0.0255	-0.0000	0.6904	1.3627E 05	0.2880

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 5 | RUN NUMBER 2 | DATE RUN 04 29 64
BAR. PRESS.= 29.06 IN HG= 14.27 PSIA | TYPEA METERING RING | TYPEA SPACER PLATE
METERING RING CLEARANCE= 0.0595 | ANNULUS CLEARANCE= 0.127 | METERING RING AREA RATIO=0.646
EQUIVALENT DIAMETER= 0.2300 | ANNULUS AREA= 0.4230 SQ IN | METERING RING AREA= 0.2732 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

P1	DP15A	DP15B	DP16A	DP16B	DP5A8A	DP5B8B	DP8A4	DP8B4	TEMP
740.0	2.2	2.1	2.8	2.7	1.2	1.2	1.5	1.4	519.2
743.0	1.8	2.1	2.7	2.7	1.0	1.1	1.5	1.4	517.0
743.0	1.7	2.1	2.6	2.6	1.2	1.1	1.5	1.4	512.2
742.0	1.6	1.8	2.4	2.4	1.0	0.9	1.3	1.2	511.3
745.0	1.3	1.6	2.0	2.0	0.8	0.9	1.2	1.0	509.3
743.0	0.8	0.9	1.4	1.4	0.6	0.5	1.0	1.0	508.1

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 5 | RUN NUMBER 2 | DATE RUN 04 29 64
BAR. PRESS.= 29.06 IN HG= 14.27 PSIA | TYPEA METERING RING | TYPEA SPACER PLATE
METERING RING CLEARANCE= 0.0505 | ANNULUS CLEARANCE= 0.127 | METERING RING AREA RATIO=0.646
EQUIVALENT DIAMETER= 0.2300 | ANNULUS AREA= 0.4230 SQ IN | METERING RING AREA= 0.2732 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

FLOW	DP16AV	DP58AV	DP68AV	DP84AV	C16	RE18	F58	F68	C84AA	RE84	C84MRA
0.2150	2.75	1.20	0.60	1.45	1.2602	2.3651E 05	0.0202	0.0210	0.6616	2.4033E 05	0.2760
0.2180	2.70	1.05	0.30	1.45	1.2126	2.4053E 05	0.0173	0.0103	0.6487	2.4441E 05	0.2706
0.2178	2.60	1.15	0.45	1.45	1.1803	2.4174E 05	0.0192	0.0156	0.6557	2.4564E 05	0.2735
0.2051	2.40	0.97	0.28	1.25	1.2294	2.2787E 05	0.0183	0.0108	0.6381	2.3155E 05	0.2662
0.1904	2.00	0.85	0.30	1.10	1.1987	2.1202E 05	0.0187	0.0137	0.6573	2.1544E 05	0.2742
0.1634	1.40	0.55	0.	1.00	1.1391	1.8220E 05	0.0165	0.	0.8122	1.8514E 05	0.3388

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 7 | RUN NUMBER 2 | DATE RUN 05 08 64

BAR. PRESS.= 29.26 IN HG= 14.33 PSIA | TYPEA METERING RING | TYPEA SPACER PLATE

METERING RING CLEARANCE= 0.0095 | ANNULUS CLEARANCE= 0.077 | METERING RING AREA RATIO=0.398

EQUIVALENT DIAMETER= 0.1371 | ANNULUS AREA= 0.2488 SQ IN | METERING RING AREA= 0.0990 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN Lb/SEC

P1	DP15A	DP15B	DP16A	DP16B	DP5A8A	DP5B8B	DP8A4	DP8B4	TEMP
742.0	7.8	8.0	10.6	10.5	5.2	4.7	25.0	29.0	528.6
740.0	7.9	8.1	10.6	10.6	5.2	4.8	25.0	29.0	524.6
738.0	7.5	7.5	10.0	10.0	4.8	4.8	23.5	27.0	523.2
732.0	7.3	7.2	9.8	9.7	4.7	4.7	22.5	26.0	521.4
751.0	6.7	6.5	8.8	8.7	4.3	4.4	20.0	23.5	520.6
732.0	6.7	6.4	8.8	8.6	4.1	4.3	21.0	24.0	514.7
754.0	6.1	5.9	8.2	8.1	3.8	4.2	19.5	22.5	512.7
750.0	5.8	5.6	7.7	7.6	3.6	3.9	18.5	21.5	512.0
735.0	5.6	5.3	7.2	7.2	3.4	3.5	17.0	20.5	510.9
750.0	5.2	5.1	6.6	6.6	3.1	3.2	15.5	18.0	510.2
749.0	4.4	4.4	6.0	6.0	2.8	2.8	13.5	16.0	509.0
740.0	4.0	4.1	5.6	5.6	2.7	2.5	13.0	15.0	509.0
750.0	3.7	3.8	5.0	5.0	2.4	2.4	12.0	13.5	508.8
743.0	3.1	3.3	4.3	4.4	2.1	2.1	10.5	11.5	508.8
745.0	3.0	3.0	4.0	4.1	2.0	2.0	10.0	11.0	507.9
746.0	3.0	3.1	4.0	4.1	2.0	2.0	9.5	11.0	507.7
751.0	2.8	2.7	3.8	3.8	1.8	1.8	9.0	10.0	507.5
751.0	2.4	2.4	3.3	3.3	1.6	1.5	7.0	8.0	507.0
755.0	2.0	2.0	2.8	2.8	1.4	1.3	6.5	7.0	507.0
752.0	1.8	1.8	2.6	2.6	1.2	1.2	6.0	6.5	506.8

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 7 | RUN NUMBER 2 | DATE RUN 05 08 64
BAR. PRESS.= 29.28 IN HG= 14.38 PSIA | TYPEA METERING RING | TYPEA SPACER PLATE
METERING RING CLEARANCE= 0.0095 | ANNULUS CLEARANCE= 0.077 | METERING RING AREA RATIO=0.398
EQUIVALENT DIAMETER= 0.1371 | ANNULUS AREA= 0.2488 SQ IN | METERING RING AREA= 0.0990 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

FLOW	DP16AV	DP58AV	DP68AV	DP84AV	C16	RE18	F58	F68	C84AA	RE84	C84MRA
0.2147	10.55	4.95	2.30	27.00	1.6510	2.3685E 05	0.0168	0.0162	4.1558	2.4073E 05	0.6580
0.2153	10.60	5.00	2.40	27.00	1.6587	2.3859E 05	0.0170	0.0169	4.1544	2.4250E 05	0.6578
0.2082	10.00	4.80	2.30	25.25	1.6732	2.3110E 05	0.0175	0.0174	4.1579	2.3489E 05	0.6584
0.2046	9.75	4.70	2.20	24.25	1.6819	2.2761E 05	0.0176	0.0171	4.1183	2.3134E 05	0.6521
0.1987	8.75	4.35	2.20	21.75	1.6422	2.2127E 05	0.0178	0.0187	4.0254	2.2490E 05	0.6374
0.1958	8.70	4.20	2.05	22.50	1.6588	2.1969E 05	0.0174	0.0177	4.2301	2.2329E 05	0.6698
0.1924	8.15	4.00	1.80	21.00	1.6628	2.1629E 05	0.0178	0.0166	4.2309	2.1983E 05	0.6699
0.1863	7.65	3.75	1.80	20.00	1.6586	2.0961E 05	0.0177	0.0177	4.2844	2.1304E 05	0.6784
0.1799	7.20	3.45	1.70	18.75	1.6452	2.0276E 05	0.0172	0.0176	4.2350	2.0609E 05	0.6706
0.1716	6.60	3.15	1.70	16.75	1.6923	1.9351E 05	0.0176	0.0198	4.2498	1.9668E 05	0.6729
0.1622	6.00	2.80	1.20	14.75	1.7222	1.8324E 05	0.0175	0.0156	4.1951	1.8625E 05	0.6643
0.1552	5.60	2.60	1.05	14.00	1.7373	1.7527E 05	0.0176	0.0148	4.3062	1.7814E 05	0.6819
0.1484	5.00	2.40	1.15	12.75	1.7190	1.6762E 05	0.0180	0.0180	4.3493	1.7037E 05	0.6887
0.1382	4.35	2.10	0.95	11.00	1.7090	1.5612E 05	0.0180	0.0170	4.2924	1.5867E 05	0.6797
0.1337	4.05	2.00	0.95	10.50	1.7073	1.5121E 05	0.0184	0.0182	4.3981	1.5368E 05	0.6964
0.1341	4.05	2.00	1.00	10.25	1.6994	1.5173E 05	0.0183	0.0191	4.2733	1.5422E 05	0.6766
0.1273	3.80	1.80	0.75	9.50	1.7815	1.4406E 05	0.0185	0.0160	4.4282	1.4642E 05	0.7012
0.1188	3.30	1.55	0.65	7.50	1.7781	1.3452E 05	0.0183	0.0159	4.0210	1.3672E 05	0.6367
0.1094	2.80	1.35	0.55	6.75	1.7866	1.2392E 05	0.0189	0.0160	4.2889	1.2595E 05	0.6791
0.1031	2.60	1.20	0.40	6.25	1.8628	1.1678E 05	0.0188	0.0131	4.4609	1.1870E 05	0.7064

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 7 | RUN NUMBER 3 | DATE RUN 05 08 64
BAR. PRESS.= 29.28 IN Hg= 14.38 PSIA | TYPEA METERING RING | TYPEA SPACER PLATE
METERING RING CLEARANCE= 0.0075 | ANNULUS CLEARANCE= 0.077 | METERING RING AREA RATIO=0.398
EQUIVALENT DIAMETER= 0.1371 | ANNULUS AREA= 0.2488 SQ IN | METERING RING AREA= 0.0990 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

P1	DP15A	DP15B	DP16A	DP16B	DP5A8A	DP5B8B	DP8A4	DP8B4	TEMP
751.0	1.7	1.6	2.2	2.2	1.0	1.0	5.5	6.0	507.0
752.0	1.4	1.3	2.0	2.0	0.9	0.8	4.0	4.5	506.8
745.0	1.2	1.2	1.7	1.7	0.8	0.7	4.0	4.2	507.7
755.0	0.9	0.9	1.2	1.2	0.6	0.5	3.5	3.5	508.8
750.0	0.6	0.6	0.9	0.9	0.5	0.5	2.0	2.5	509.7
747.0	0.6	0.6	1.1	1.1	0.5	0.4	1.5	2.5	510.0

C1-2 INNER IMPEDANCE RING LOSS COEFFICIENTS

TEST CONDITIONS

TEST NUMBER 7 RUN NUMBER 3 DATE RUN 05 08 64
BAR. PRESS.= 29.28 IN Hg= 14.38 PSIA TYPEA METERING RING TYPEA SPACER PLATE
METERING RING CLEARANCE= 0.0095 ANNULUS CLEARANCE= 0.077 METERING RING AREA RATIO=0.398
EQUIVALENT DIAMETER= 0.1371 ANNULUS AREA= 0.2488 SQ IN METERING RING AREA= 0.0990 SQ IN

PRESSURES IN PSIG, PRESSURE DROPS IN PSID, TEMPERATURE IN DEG.R, FLOW RATE IN LB/SEC

FLOW	DP16AV	DP58AV	DP68AV	DP84AV	C16	RE18	F58	F68	C84AA	RE84	C84MRA
0.0963	2.20	1.00	0.45	5.75	1.8038	1.0904E 05	0.0180	0.0168	4.6987	1.1083E 05	0.7440
0.0891	2.00	0.85	0.20	4.25	1.9202	1.0088E 05	0.0179	0.0088	4.0691	1.0254E 05	0.6443
0.0813	1.70	0.75	0.25	4.10	1.9364	9.2030E 04	0.0187	0.0130	4.6585	9.3536E 04	0.7376
0.0728	1.20	0.55	0.25	3.50	1.7254	8.2214E 04	0.0173	0.0164	5.0233	8.3562E 04	0.7954
0.0604	0.90	0.50	0.20	2.25	1.8631	6.8169E 04	0.0227	0.0189	4.6513	6.9286E 04	0.7365
0.0663	1.10	0.47	-0.03	2.00	1.8830	7.4787E 04	0.0178	-0.0020	3.4189	7.6013E 04	0.5414

APPENDIX B

COMPUTER PROGRAM NOMENCLATURE
AIR DATA

INPUT TAPE

A	Width of annulus (3.487 inches)
B	Length of raised portion of metering ring
CMR	Metering Ring Clearance
D	Annulus clearance
DE	Equivalent diameter of annulus
DIS	Distance between P6 and P8 (3.0 inches)
DP11A	Differential pressure between P1 and P1A
DP11B	Differential pressure between P1 and P1B
DP16A	Differential pressure between P1 and P6A
DP6A6B	Differential pressure between P6A and P6B
DP6A8A	Differential pressure between P6A and P8A
DP8A8B	Differential pressure between P8A and P8B
DP8A3A	Differential pressure across metering ring measured from P8A to P3A
DP8A4	Differential pressure across metering ring measured from P8A to P4
DP3A4	Differential pressure measured from P3A to P4
DP44A	Differential pressure between P4 and P4A
DP44B	Differential pressure between P4 and P4B
E	Height of step in metering ring (0.038 inches)
PA	Atmospheric pressure
P1	Pressure at inlet plenum

APPENDIX B (Continued)

P3A	Pressure just downstream of metering ring
P4	Pressure in exhaust plenum
P5	Pressure at the inlet of the flow measuring nozzle
P5A	Absolute pressure at the inlet of flow measuring nozzle
P6A	Pressure in annulus downstream of the inlet plenum
P8A	Pressure just upstream of the metering ring
VM1	Millivolt reading inlet plenum thermocouple
VM2	Millivolt reading exhaust plenum thermocouple

OUTPUT TAPE

DP16AV	Average differential pressure measured from P1 to P6
DP68AV	Average differential pressure measured from P6 to P8
DP83AV	Average differential pressure measured from P8 to P3
DP84AV	Average differential pressure measured from P8 to P4
DP34AV	Average differential pressure measured from P3 to P4
FLOW	Flow rate
F68	Annulus friction factor
P1AB	Absolute pressure at inlet plenum
P3AB	Absolute pressure just downstream of metering ring
P6AB	Absolute pressure downstream of inlet plenum
P8AB	Absolute pressure upstream of metering ring
R	Pressure ratio - atmospheric to absolute pressure at flow measuring nozzle inlet

APPENDIX B (Continued)

RE1668	Reynolds number in the annulus, based on the equivalent diameter of the annulus
RE8384	Reynolds number at the metering ring, based on the equivalent diameter of the metering ring
RO16	Air density at the inlet plenum, based on P1AB
RO34	Air density downstream of the metering ring, based on P3AB
RO5	Air density at the inlet of the flow measuring nozzle, based on P5A
RO68	Air density in the annulus, based on P6AB
RO834	Air density upstream of metering ring, based on P8AB
TR	Average air temperature in the test fixture
TR1	Air temperature at the inlet plenum
TR2	Air temperature at the exhaust plenum
VIS	Average viscosity of the air flowing through the test fixture

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      DIMENSION P1(50),P3A(50) ,P4(50),P6A(50),P8A(50),P5(50),DP11A(50),    8/17/64        PAGE 1

      DIMENSION P1(50),P3A(50) ,P4(50),P6A(50),P8A(50),P5(50),DP11A(50),      3
     1DP11B(50),DP16A(50), DP6A6B(50),DP6A8A(50),DP8A8B(50),DP8A3A(50),       4
     2DP3A3B(50),DP8A4(50),DP3A4(50),DP44A(50),DP44B(50),FLOW(50),DP16AV      5
     3(50),DP68AV(50),DP83AV(50),DP84AV(50),DP34AV(50),C16(50),RE16(50),      6
     4RE68(50),RE834(50),P5A(50),RE34(50),F68(50),C83(50),C84(50),C34(50      7
     5),VM1(50),VM2(50),P1AVG(50),RD(4),TR1(50),TR2(50),TR(50),VIS(50)        8
   30 RIPT 5,2,J,PA,TNO,RNO,RD,CMR,ARMR,A,B,D,E,MRT,SPT,DEF,DIS               9    NON-STANDARD
    2 FORMAT (I6,E12.8,2(I8),4A6,2E11.8,/4E12.8,2A3,2E11.8)                  10
      PA = PA * 0.4912                                                       11
      AMR =(B*CMR) + (CMR+E) * (A-B)                                        67B
      DO 200  I=1,J                                                          12
      RIPT 5,3,P1(I),P3A(I),P4(I),P6A(I),P8A(I),DP11A(I),DP11B(I),DP16A(     13    NON-STANDARD
     1I),DP6A6B(I),DP6A8A(I),DP8A8B(I),DP8A3A(I),DP3A3B(I),DP8A4(I),DP3A     14    NON-STANDARD
     24(I),DP44A(I),DP44B(I),P5(I),VM1(I),VM2(I)                             15    NON-STANDARD
    3 FORMAT (6E12.8,/6E12.8,/6E12.8,/2E12.8)                                16
      DP11A(I)= DP11A(I) * 0.03613                                           17
      DP11B(I)= DP11B(I) * 0.03613                                           18
      DP16A(I)= DP16A(I) * 0.4912                                            19
      DP6A6B(I)=DP6A6B(I)* 0.03613                                           20
      DP6A8A(I)=DP6A8A(I)* 0.4912                                            21
      DP8A8B(I)=DP8A8B(I)* 0.03613                                           22
      DP8A3A(I)=DP8A3A(I)* 0.4912                                            23
      DP3A3B(I)=DP3A3B(I)* 0.03613                                           24
      DP8A4(I)= DP8A4(I) * 0.4912                                            25
      DP3A4(I)= DP3A4(I) * 0.4912                                            26
      DP44A(I)= DP44A(I) * 0.03613                                           27
      DP44B(I)= DP44B(I) * 0.03613                                           28
      TR1(I)=537.066+44.229*(LOGF(VM1(I)))+2C.836*(LOGF(VM1(I)))**2.+6.0     29
     142*(LOGF(VM1(I)))**3.+1.1089*(LOGF(VM1(I)))**4.+0.12*(LOGF(VM1(I))     30
     2)**5.+0.C062*(LOGF(VM1(I)))**6.                                        31
      TR2(I)=537.066+44.229*(LOGF(VM2(I)))+2C.836*(LOGF(VM2(I)))**2.+6.0     32
     142*(LOGF(VM2(I)))**3.+1.1089*(LOGF(VM2(I)))**4.+0.12*(LOGF(VM2(I))     33
     2)**5.+0.C062*(LOGF(VM2(I)))**6.                                        34
      TR(I)=(TR1(I)+TR2(I))/2.                                               35
      R05 = 2.6997 * ((P5(I)*(0.03613))+PA)/TR(I)                           35A
      P5A(I) = (P5(I) * (0.03613 )) + PA                                    3581
      R = PA / P5A(I)                                                       3582
      FLOW(I) =0.96295*SQRTF((R**1.4286)*(1.C-(R**0.2857))*P5A(I)*R05)      3583
     1 /SQRTF(1.0-0.2442*(R**1.4286))                                       3584
      DP16AV(I) = DP16A(I)+DP6A6B(I)-DP11A(I)/3.- DP11B(I)/3.                36
      DP68AV(I) = DP6A8A(I) - DP6A6B(I)/2. + DP8A8B(I)/2.                    37
      DP83AV(I) = DP8A3A(I) + DP3A3B(I)/2. - DP8A8B(I)/2.                    38
      DP84AV(I) = DP8A4(I) - DP8A8B(I)/2.+(DP44A(I)+DP44B(I))/3.             39
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      DIMENSION P1(50),P3A(50) ,P4(50),P6A(5C),P8A(50),P5(50),DP11A(50),    8/17/64        PAGE 2

      DP34AV(I) = DP3A4(I) - DP3A3B(I)/2.+(DP44A(I)+DP44B(I))/3.                40
      P1AB = P1(I) -(DP11A(I)+DP11B(I))/3. +PA                                  41
      P6AB = P1AB - DP16AV(I)                                                   42
      P8AB = P6AB - DP68AV(I)                                                   43
      P3AB = P8AB - DP83AV(I)                                                   44
      RO16 = 2.6997 *  (P1AB)/TR(I)                                             45
      RO68 = 2.6997 *  (P6AB)/TR(I)                                             46
      RO834= 2.6997 *  (P8AB)/TR(I)                                             47
      RO34 = 2.6997 *  (P3AB)/TR(I)                                             48
      IF(DEF) 50,50,51                                                          49
   50 AA = A*D - 0.0195
      DE = 2.*(A*D - 0.0195) /(A+D+0.067)
      GO TO 52
   51 AA = A*D                                                                  52
      DE = 2.*(A*D)/(A+D)                                                       53
   52 C16(I)=.44686*RO16*AA**2*DP16AV(I)/FLOW(I)**2
      F68(I)= C.44686*RO68*DP68AV(I)* AA**2./FLOW(I)**2.*DE/DIS                 54A
      C83(I)= 0.44686*RO834*DP84AV(I)*AA**2./FLOW(I)**2.
      C84(I)= 0.44686*RO834*DP84AV(I)*AMR**2/FLOW(I)**2
      C34(I)=0.44686*RO34*DP34AV(I)*AA**2/FLOW(I)**2
      VIS(I)=3.669 E-07 +5.56E-10 *(TR(I)-509.6)                                55
      RE16(I)=0.373*FLOW(I)*DE/(AA*VIS(I))
      RE68(I)=RE16(I)                                                           57
      IF(CMR) 40,40,22                                                          58
   40 IF(DEF) 31,31,32                                                          59
   31 RE834(I) =1.4921*FLOW(I)/(VIS(I)*(4.*E+2.*(A-B)))                         60
      GOTO 21                                                                   61
   32 RE834(I) =1.4921*FLOW(I)/(VIS(I)*(2.*E+2.*(A-B)))                         62
      GOTO 21                                                                   63
   22 IF(DEF)1000,1000,1001
 1000 RE834(I)=1.4921*FLOW(I)/(VIS(I)*(2.*A+2.*CMR+4.*E))
      GO TO 21
 1001 RE834(I)=1.4921*FLOW(I)/(VIS(I)*(2.*A+2.*CMR+2.*E))
   21 RE34(I)=RE16(I)                                                           65
  200 CONTINUE                                                                  66
      ARMR=AMR/AA
      PA= PA /0.4912                                                            67
      LINES =1                                                                  68
      DO 300 I=1,J                                                              69
      IF(LINES-1) 4,5,4                                                         70
    5 WOT 6,1,TNO,RNO,RD,PA,MRT,SPT,CMR,D,ARMR,DE,AA,AMR                        71    NON-STANDARD
    1 FORMAT (1H1 //// 22B,64HMASS FLOW VS PRESSURE DROP AND LOSS COEFFI       72
     1CIENT VS RE FOR REV- 5 //47B,15HTEST CONDITIONS //,5B,11HTEST NUMB        73
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      DIMENSION P1(50),P3A(50) ,P4(50),P6A(50),P8A(50),P5(50),DP11A(50),     8/17/64        PAGE 3

     2ER I8 ,21B,11HRUN NUMBER I8 ,11B,9HDATE RUN 4A6,/5B,22HBAROMETRIC        74
     3PRESSURE = F6.3,6H IN HG,6B,4HTYPE A3,13HMETERING RING,10B,4HTYPE         75
     4A3,12HSPACER PLATE /5B,26HMETERING RING CLEARANCE = ,F6.4,8B,20HAN        76
     5NULUS CLEARANCE = ,F5.3,5B,26HMETERING RING AREA RATIO = ,F4.3/,5B        77
     6,21HEQUIVALENT DIAMETER =          ,F7.4,12B,15HANNULUS AREA = ,F6.       77A
     74,1B,5HSQ IN,3B,21HMETERING RING AREA = ,F6.4,1B,5HSQ IN ///)             77B
      WOT 6,6                                                                   78    NON-STANDARD
   6 FORMAT (2B,2HP1,5B,3HP3A,4B,2HP4,5B,3HP6A,4B,3HP8A,3B,5HDP16A,2B,6         79
     1HDP6A6B,2B,6HDP6A8A,2B,6HDP8A8B,2B,6HDP3A3B,2B,5HDP8A4,2B,5HDP3A4,        80
     22B,6HDP8A3A,2B,5HDP44A,3B,2HTR,/2B,3HPSI,6(4B,3HPSI),4(5B,3HPSI),3        81
     3(4B,3HPSI),5B,1HR//)                                                      82
   4 WOT 6,7,P1(I),P3A(I),P4(I),P6A(I),P8A(I),DP16A(I),DP6A6B(I),DP6A8A         83    NON-STANDARD
     1(I),DP8A8B(I),DP3A3B(I),DP8A4(I),DP3A4(I),DP8A3A(I),DP44A(I),TR(I)        84    NON-STANDARD
   7 FORMAT (1B,5(F5.1,2B),F5.2,2B,4(F6.3,2B),F5.2,2B,F5.3,2B,F6.3,1B,F         85
     15.3,2B,F6.2 /)                                                            86
      LINES = LINES +1                                                          87
      IF(LINES - 30) 300,8,300                                                  88
   8 LINES = 1                                                                  89
      GO TO 5                                                                   90
 300 CONTINUE                                                                   91
      LINES = 1                                                                 92
      DO 400 I=1,J                                                              93
      IF(LINES-1) 9,10,9                                                        94
  10 WOT 6,20,TNO,RNO,RD,PA,MRT,SPT,CMR,D,ARMR,DE,AA,AMR                        95    NON-STANDARD
  20 FORMAT (1H1 //// 22B,64HMASS FLOW VS PRESSURE DROP AND LOSS COEFFI         96
     1CIENT VS RE FOR REV- 5 //47B,15HTEST CONDITIONS //,5B,11HTEST NUMB        97
     2ER I8 ,21B,11HRUN NUMBER I8 ,11B,9HDATE RUN 4A6,/5B,22HBAROMETRIC         98
     3PRESSURE = F6.3,6H IN HG,6B,4HTYPE A3,13HMETERING RING,10B,4HTYPE         99
     4A3,12HSPACER PLATE /5B,26HMETERING RING CLEARANCE = ,F6.4,8B,20HAN       100
     5NULUS CLEARANCE = ,F5.3,5B,26HMETERING RING AREA RATIO = ,F4.3/,5B       101
     6,21HEQUIVALENT DIAMETER =          ,F7.4,12B,15HANNULUS AREA = ,F6.      101A
     74,1B,5HSQ IN,3B,21HMETERING RING AREA = ,F6.4,1B,5HSQ IN ///)            101B
      WOT 6,11                                                                 102    NON-STANDARD
  11 FORMAT (2B,6HDP16AV,2B,6HDP68AV,2B,6HDP83AV,2B,6HDP84AV,2B,6HDP34A        103
     1V,3B,3HC16,4B,6HRE1668,5B,3HF68,5B,3HC83,4B,6HRE8384,5B,3HC84,4B,3       104
     2HC34,3B,4HFLOW / 4B,3HPSI,4(5B,3HPSI),6B,6HLB/SEC //)                    105
   9 WOT 6,12,DP16AV(I),DP68AV(I),DP83AV(I),DP84AV(I),DP34AV(I),C16(I),        106    NON-STANDARD
     1RE16(I),F68(I),C83(I),RE834(I),C84(I),C34(I),FLOW(I)                    107    NON-STANDARD
  12 FORMAT (2B,F6.3,4(2B,F6.3),2B,F5.3,1B,1PE10.3,2B,0PF5.4,2B,F5.3,1B       108
     1,1PE10.3,2B,0PF5.3,3B,F5.3,2B,F6.4 / )                                  109
      LINES = LINES +1                                                         110
      IF (LINES -30) 400,13,400                                                111
  13 LINES =1                                                                  112
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[redacted]


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      GO TO  10
  400 CONTINUE
      GO TO 30
      END
```

[redacted]

APPENDIX B (Continued)

Astronuclear

WANL-TME-826

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2400 | RUN NUMBER 2 | DATE RUN DECEMBER 19, 1963
BAROMETRIC PRESSURE = 29.840 IN HG | TYPE C METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0120 | ANNULUS CLEARANCE = 0.080 | METERING RING AREA RATIO =.382
EQUIVALENT DIAMETER = 0.1564 | ANNULUS AREA = 0.2787 SQ IN | METERING RING AREA = 0.1066 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.0	119.0	120.0	120.0	0.27	0.	0.049	0.	0.007	0.87	0.049	0.835	0.016	517.82
119.5	118.0	117.5	119.8	119.5	0.56	-0.002	0.098	-0.002	-0.047	1.79	0.123	1.695	0.022	517.36
120.0	117.9	117.3	120.0	119.8	0.78	0.	0.147	0.005	-0.070	2.48	0.098	2.333	0.033	516.91
120.0	116.5	116.0	119.5	119.4	0.98	-0.002	0.206	0.011	-0.091	3.24	0.172	3.119	0.043	516.00
120.0	115.3	114.8	119.3	119.0	1.28	-0.002	0.270	0.010	-0.126	4.20	0.295	3.930	0.054	515.55
120.0	114.0	113.5	119.0	118.7	1.47	-0.003	0.319	0.013	-0.108	5.07	0.295	4.765	0.051	515.10
120.0	112.8	112.1	118.9	118.2	1.82	-0.003	0.393	0.013	-0.126	6.09	0.344	5.722	0.061	514.87
120.0	111.2	110.5	118.2	117.5	2.11	-0.002	0.442	0.020	-0.145	7.20	0.393	6.779	0.072	514.19
120.0	110.0	109.0	118.0	117.2	2.43	0.	0.516	0.022	-0.172	8.40	0.481	7.884	0.090	514.19
120.0	108.0	107.0	118.0	117.0	2.87	0.004	0.614	0.023	-0.179	10.07	0.589	9.456	0.108	513.96
120.5	105.0	104.5	118.0	117.2	3.41	0.004	0.712	0.027	-0.204	12.62	0.663	11.887	0.148	513.73
120.0	101.7	100.5	116.9	115.8	4.00	0.	0.835	0.036	-0.204	15.25	0.835	14.368	0.168	513.50
120.0	97.5	96.5	116.5	115.2	4.62	0.	1.007	0.047	-0.098	18.91	1.007	17.831	0.181	513.96
118.0	90.0	88.5	113.2	112.0	5.40	0.005	1.154	0.061	-0.074	23.82	1.277	22.595	0.220	513.73
118.0	83.5	82.0	112.5	111.0	5.99	0.013	1.302	0.058	0.069	29.32	1.488	27.527	0.289	513.50
118.0	76.0	74.5	112.5	111.0	6.58	0.011	1.424	0.076	0.338	36.15	1.646	35.037	0.379	513.28
118.0	64.0	62.5	111.8	110.5	6.99	0.009	1.498	0.067	0.840	48.05	0.884	46.551	0.600	513.28
118.0	59.0	59.0	111.5	110.0	7.00	0.013	1.523	0.061	0.929	51.06	0.196	51.055	0.643	513.50

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2400 | RUN NUMBER 2 | DATE RUN DECEMBER 19, 1963
BAROMETRIC PRESSURE = 29.840 IN HG | TYPE C METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0120 | ANNULUS CLEARANCE = 0.080 | METERING RING AREA RATIO =.382
EQUIVALENT DIAMETER = 0.1564 | ANNULUS AREA = 0.2787 SQ IN | METERING RING AREA = 0.1066 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.270	0.049	0.839	0.886	0.057	1.504	3.728E 04	.0142	4.920	3.761E 04	0.719	0.314	0.0662
0.563	0.098	1.672	1.808	0.160	1.554	5.292E 04	.0141	4.963	5.338E 04	0.725	0.434	0.0938
0.776	0.150	2.295	2.498	0.154	1.576	6.187E 04	.0158	5.039	6.241E 04	0.736	0.305	0.1096
0.981	0.213	3.068	3.263	0.244	1.528	7.079E 04	.0171	5.039	7.142E 04	0.736	0.368	0.1253
1.275	0.276	3.861	4.230	0.393	1.555	8.011E 04	.0174	5.098	8.082E 04	0.745	0.460	0.1417
1.471	0.327	4.704	5.099	0.380	1.504	8.757E 04	.0172	5.145	8.835E 04	0.752	0.370	0.1548
1.815	0.401	5.653	6.124	0.447	1.569	9.529E 04	.0178	5.209	9.613E 04	0.761	0.364	0.1684
2.110	0.453	6.696	7.232	0.511	1.572	1.028E 05	.0173	5.285	1.037E 05	0.772	0.354	0.1815
2.431	0.527	7.787	8.443	0.621	1.587	1.099E 05	.0176	5.390	1.108E 05	0.788	0.373	0.1939
2.877	0.624	9.354	10.128	0.749	1.598	1.192E 05	.0177	5.479	1.202E 05	0.801	0.376	0.2103
3.417	0.724	11.771	12.699	0.854	1.589	1.306E 05	.0171	5.724	1.317E 05	0.837	0.350	0.2303
4.003	0.853	14.247	15.331	1.034	1.597	1.408E 05	.0172	5.894	1.420E 05	0.861	0.354	0.2482
4.617	1.030	17.758	18.999	1.167	1.589	1.514E 05	.0179	6.266	1.527E 05	0.916	0.332	0.2671
5.433	1.182	22.527	23.925	1.447	1.636	1.607E 05	.0178	6.844	1.622E 05	1.000	0.340	0.2835
6.029	1.324	27.532	29.463	1.621	1.626	1.700E 05	.0178	7.503	1.715E 05	1.097	0.322	0.2997
6.619	1.457	35.168	36.337	1.699	1.638	1.775E 05	.0179	8.444	1.791E 05	1.234	0.283	0.3129
7.025	1.527	46.938	48.381	0.829	1.637	1.829E 05	.0176	0.546	1.846E 05	1.541	0.112	0.3224
7.039	1.547	51.489	51.420	0.127	1.640	1.828E 05	.0178	1.206	1.845E 05	1.638	0.016	0.3224

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2500 RUN NUMBER 3 DATE RUN JANUARY 16, 1964
BAROMETRIC PRESSURE = 29.380 IN HG TYPE E METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0110 ANNULUS CLEARANCE = 0.080 METERING RING AREA RATIO =.415
EQUIVALENT DIAMETER = 0.1564 ANNULUS AREA = 0.2787 SQ IN METERING RING AREA = 0.1158 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
119.0	117.5	116.8	119.0	118.5	0.65	0.	0.147	-0.018	0.005	1.72	0.108	1.596	0.058	520.08
120.0	117.0	116.5	119.5	119.0	1.03	-0.002	0.246	-0.022	0.085	2.82	0.172	2.628	0.087	516.91
120.0	115.5	115.0	119.0	118.5	1.40	-0.004	0.344	-0.033	0.130	3.86	0.270	3.610	0.119	515.10
120.0	114.0	113.5	119.0	118.2	1.77	-0.002	0.418	-0.040	0.116	4.94	0.295	4.617	0.173	513.74
119.8	112.0	111.5	118.5	117.3	2.11	-0.002	0.491	-0.043	0.083	6.07	0.319	5.722	0.228	512.14
120.0	110.8	110.0	118.0	117.0	2.48	-0.007	0.589	-0.056	-0.195	7.29	0.373	7.000	0.278	508.95
119.8	108.0	107.2	117.2	116.3	3.05	-0.002	0.688	-0.060	-0.228	9.19	0.393	8.842	0.343	506.44
120.0	104.5	103.5	117.0	115.5	3.78	-0.007	0.884	-0.079	-0.280	12.26	0.467	11.789	0.441	505.52
119.9	102.0	101.0	116.2	115.0	4.18	-0.007	0.982	-0.076	-0.264	13.95	0.540	13.434	0.477	505.06
120.0	99.8	99.0	116.0	114.5	4.57	-0.004	1.056	-0.087	-0.264	15.87	0.589	15.227	0.524	503.68
120.1	97.3	96.8	116.0	114.8	5.05	-0.004	1.179	-0.108	-0.313	18.22	0.639	17.536	0.553	503.22
119.5	93.0	92.8	114.8	113.0	5.55	-0.004	1.277	-0.101	-0.495	20.95	0.614	20.336	0.650	502.76
118.0	87.9	87.0	113.0	111.1	6.02	-0.007	1.375	-0.110	-0.609	24.39	0.639	23.725	0.752	502.99
118.5	83.0	82.2	112.8	111.0	6.61	-0.007	1.523	-0.125	-0.696	28.91	0.688	27.998	0.824	502.53
117.5	75.2	74.0	111.0	109.2	7.00	0.	1.621	-0.072	-0.137	35.42	0.909	33.996	0.730	502.07
115.0	54.0	56.5	108.5	106.5	7.44	-0.007	1.695	-0.094	-1.843	50.05	2.407	52.558	1.203	500.92

APPENDIX B (Continued)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2500 | RUN NUMBER 3 | DATE RUN JANUARY 16, 1964
BAROMETRIC PRESSURE = 29.380 IN HG | TYPE E METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0110 | ANNULUS CLEARANCE = 0.080 | METERING RING AREA RATIO =.415
EQUIVALENT DIAMETER = 0.1564 | ANNULUS AREA = 0.2787 SQ IN | METERING RING AREA = 0.1158 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.653	0.138	1.608	1.770	0.148	1.703	5.394E 04	.0187	4.586	5.440E 04	0.791	0.377	0.0961
1.030	0.236	2.681	2.903	0.197	1.657	6.945E 04	.0196	4.626	7.004E 04	0.798	0.308	0.1231
1.396	0.329	3.692	3.965	0.298	1.662	8.110E 04	.0202	4.659	8.180E 04	0.804	0.340	0.1433
1.767	0.399	4.695	5.086	0.367	1.656	9.170E 04	.0192	4.691	9.249E 04	0.809	0.326	0.1617
2.110	0.470	5.786	6.257	0.446	1.654	1.006E 05	.0189	4.808	1.015E 05	0.830	0.328	0.1771
2.473	0.565	6.930	7.507	0.655	1.648	1.101E 05	.0193	4.888	1.110E 05	0.843	0.404	0.1928
3.044	0.659	8.758	9.453	0.744	1.667	1.221E 05	.0184	5.033	1.231E 05	0.868	0.370	0.2130
3.775	0.848	11.689	12.589	0.901	1.654	1.369E 05	.0188	5.327	1.381E 05	0.919	0.347	0.2385
4.168	0.948	13.340	14.313	0.997	1.661	1.437E 05	.0191	5.486	1.449E 05	0.947	0.343	0.2501
4.565	1.015	15.139	16.260	1.072	1.665	1.507E 05	.0186	5.686	1.520E 05	0.981	0.331	0.2618
5.046	1.126	17.434	18.658	1.175	1.673	1.584E 05	.0187	5.902	1.597E 05	1.018	0.321	0.2749
5.571	1.228	20.139	21.434	1.295	1.735	1.632E 05	.0191	6.337	1.646E 05	1.094	0.322	0.2831
6.039	1.324	23.476	24.943	1.443	1.683	1.715E 05	.0184	6.566	1.729E 05	1.133	0.309	0.2976
6.631	1.464	27.713	29.521	1.587	1.721	1.782E 05	.0188	7.197	1.798E 05	1.242	0.301	0.3091
7.032	1.585	33.963	36.020	1.546	1.767	1.807E 05	.0197	8.461	1.822E 05	1.460	0.263	0.3131
7.468	1.651	51.684	50.925	-0.661	1.726	1.872E 05	.0187	0.937	1.888E 05	1.887	0.081	0.3238

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2600 | RUN NUMBER 2 | DATE RUN JANUARY 16, 1964
BAROMETRIC PRESSURE = 29.250 IN HG | TYPE F METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0100 | ANNULUS CLEARANCE = 0.080 | METERING RING AREA RATIO =.346
EQUIVALENT DIAMETER = 0.1564 | ANNULUS AREA = 0.2787 SQ IN | METERING RING AREA = 0.0963 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.8	119.0	120.0	119.8	0.25	0.	0.039	0.	0.	0.87	0.039	0.835	0.011	521.88
119.0	117.0	116.0	118.8	118.0	0.64	0.	0.147	0.004	-0.056	2.30	0.196	2.137	0.016	519.63
118.0	114.5	113.8	117.6	117.0	1.01	0.	0.221	0.004	-0.125	3.71	0.221	3.488	0.027	517.59
119.8	114.0	113.2	119.0	118.0	1.40	0.	0.319	0.007	-0.168	5.16	0.295	4.863	0.025	517.37
120.5	113.0	112.8	119.5	119.0	1.72	0.004	0.393	0.009	-0.191	6.68	0.295	6.361	0.023	516.91
120.1	111.0	110.5	119.0	118.5	2.06	0.007	0.467	0.014	-0.215	8.03	0.393	7.589	0.033	516.46
120.0	109.0	108.2	118.8	117.5	2.43	0.009	0.540	0.014	-0.231	9.58	0.521	9.038	0.033	516.23
119.6	106.5	105.5	117.5	116.8	2.80	0.009	0.614	0.016	-0.298	11.20	0.614	10.585	0.051	516.01
119.8	103.3	102.0	117.0	115.7	3.39	0.009	0.761	0.023	-0.369	14.12	0.786	13.361	0.072	515.33
120.2	101.0	100.4	117.5	116.5	3.73	0.009	0.810	0.018	-0.426	16.28	0.860	15.350	0.083	515.10
120.0	98.0	96.5	116.8	115.2	4.20	0.004	0.958	0.025	-0.520	19.13	1.056	18.052	0.108	514.64
120.0	94.0	92.5	116.0	114.5	4.69	0.004	1.056	0.036	-0.603	22.15	1.253	21.097	0.134	514.42
120.1	90.5	89.0	116.0	114.5	5.13	0.007	1.154	0.025	-0.670	25.96	1.498	24.413	0.166	514.42
119.9	86.2	84.2	115.0	113.2	5.53	0.004	1.228	0.029	-0.761	29.64	1.842	27.006	0.195	514.42
118.6	79.5	77.0	113.5	111.8	5.89	0.	1.326	0.036	-0.715	34.92	2.235	32.296	0.260	513.74
118.5	62.5	59.5	113.0	111.0	6.36	0.007	1.424	0.043	-1.239	51.56	2.923	48.550	0.481	513.28

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2600 RUN NUMBER 2 DATE RUN JANUARY 16, 1964
BAROMETRIC PRESSURE = 29.250 IN HG TYPE F METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0100 ANNULUS CLEARANCE = 0.080 METERING RING AREA RATIO =.346
EQUIVALENT DIAMETER = 0.1564 ANNULUS AREA = 0.2787 SQ IN METERING RING AREA = 0.0963 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.246	0.039	0.835	0.883	0.048	1.623	3.385E 04	.0135	5.820	3.413E 04	0.695	0.313	0.0604
0.639	0.149	2.107	2.310	0.237	1.654	5.415E 04	.0201	5.948	5.460E 04	0.711	0.601	0.0964
1.007	0.223	3.423	3.725	0.302	1.642	6.833E 04	.0188	6.019	6.890E 04	0.719	0.475	0.1212
1.405	0.323	4.775	5.172	0.397	1.666	8.073E 04	.0197	6.053	8.140E 04	0.723	0.448	0.1432
1.723	0.396	6.261	6.694	0.409	1.568	9.247E 04	.0185	5.999	9.324E 04	0.717	0.349	0.1639
2.070	0.471	7.474	8.047	0.523	1.598	1.004E 05	.0187	6.096	1.012E 05	0.728	0.374	0.1778
2.440	0.543	8.915	9.594	0.659	1.615	1.084E 05	.0184	6.209	1.093E 05	0.742	0.398	0.1920
2.809	0.617	10.429	11.229	0.800	1.637	1.154E 05	.0184	6.377	1.164E 05	0.762	0.418	0.2043
3.398	0.769	13.165	14.163	1.023	1.642	1.271E 05	.0189	6.632	1.281E 05	0.792	0.431	0.2247
3.742	0.815	15.128	16.334	1.133	1.626	1.343E 05	.0179	6.857	1.354E 05	0.819	0.420	0.2374
4.203	0.969	17.779	19.203	1.399	1.631	1.422E 05	.0190	7.162	1.434E 05	0.856	0.450	0.2512
4.695	1.072	20.777	22.242	1.661	1.635	1.502E 05	.0188	7.414	1.514E 05	0.886	0.464	0.2651
5.163	1.163	24.065	26.075	1.961	1.644	1.571E 05	.0186	7.910	1.584E 05	0.945	0.483	0.2774
5.556	1.241	26.611	29.787	2.380	1.658	1.622E 05	.0185	8.440	1.635E 05	1.008	0.534	0.2863
5.921	1.344	31.921	35.123	2.809	1.677	1.659E 05	.0190	9.402	1.673E 05	1.123	0.561	0.2927
6.397	1.443	47.909	51.948	3.955	1.682	1.723E 05	.0188	2.854	1.738E 05	1.536	0.604	0.3038

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2700 | RUN NUMBER 3 | DATE RUN JANUARY 9, 1964
BAROMETRIC PRESSURE = 28.820 IN HG | TYPE A METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0130 | ANNULUS CLEARANCE = 0.080 | METERING RING AREA RATIO =.429
EQUIVALENT DIAMETER = 0.1428 | ANNULUS AREA = 0.2592 SQ IN | METERING RING AREA = 0.1112 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	118.0	118.0	119.5	119.5	0.88	0.004	0.196	-0.007	0.007	1.67	0.172	1.817	0.007	524.58
120.0	115.5	115.8	119.0	118.5	1.47	0.007	0.295	-0.014	0.004	2.80	0.295	3.095	0.018	521.43
120.2	114.1	114.8	119.0	118.1	2.06	0.005	0.442	-0.018	0.018	4.03	0.403	4.411	0.036	520.31
119.9	111.4	111.7	117.5	116.5	2.63	0.	0.585	-0.020	0.042	5.30	0.491	5.747	0.049	518.50
120.0	109.8	110.0	117.2	116.4	3.19	0.	0.688	-0.025	0.072	6.53	0.589	7.122	0.061	517.59
120.0	108.8	107.1	116.5	115.0	3.93	0.007	0.845	-0.042	0.108	8.30	0.737	8.989	0.079	516.46
120.0	103.0	103.5	115.5	114.0	4.66	0.011	1.056	-0.047	0.119	10.86	0.933	11.789	0.108	515.78
119.6	100.5	101.5	115.0	113.5	5.35	0.009	1.130	-0.061	0.145	12.23	1.032	13.262	0.112	515.10
120.0	97.5	99.0	114.5	113.0	6.09	0.011	1.277	-0.076	0.181	14.61	1.228	15.807	0.123	514.64
120.1	94.2	95.6	114.3	112.5	6.75	0.022	1.449	-0.098	0.202	17.19	1.474	18.656	0.145	514.64
117.0	84.0	86.0	110.0	108.0	7.69	0.027	1.646	-0.076	0.287	22.72	1.867	24.462	0.217	514.42
117.0	79.1	81.0	109.5	107.5	8.23	0.014	1.768	-0.090	0.361	26.62	2.137	28.406	0.217	513.51
117.0	72.2	74.8	109.0	106.8	8.72	0.018	1.867	-0.137	0.535	32.39	2.554	34.580	0.314	513.51
118.0	53.0	58.0	109.5	107.0	9.01	0.018	1.891	-0.143	0.708	49.05	5.182	54.057	0.267	513.28

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2700 | RUN NUMBER 3 | DATE RUN JANUARY 9, 1964
BAROMETRIC PRESSURE = 28.820 IN HG | TYPE A METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0130 | ANNULUS CLEARANCE = 0.080 | METERING RING AREA RATIO =.429
EQUIVALENT DIAMETER = 0.1428 | ANNULUS AREA = 0.2592 SQ IN | METERING RING AREA = 0.1112 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.888	0.191	1.825	1.675	-0.174	1.689	5.716E 04	.0172	3.160	5.809E 04	0.581	0.324	0.1044
1.481	0.284	3.104	2.801	-0.303	1.703	7.409E 04	.0154	3.178	7.530E 04	0.585	0.335	0.1347
2.068	0.430	4.429	4.028	-0.420	1.692	8.814E 04	.0165	3.235	8.958E 04	0.595	0.326	0.1600
2.628	0.575	5.778	5.296	-0.531	1.692	9.967E 04	.0173	3.329	1.013E 05	0.612	0.319	0.1804
3.193	0.675	7.171	6.518	-0.653	1.679	1.106E 05	.0165	3.328	1.124E 05	0.612	0.315	0.1999
3.937	0.820	9.064	8.291	-0.822	1.732	1.212E 05	.0167	3.519	1.232E 05	0.647	0.325	0.2188
4.874	1.027	11.872	10.838	-1.034	1.720	1.356E 05	.0166	3.658	1.378E 05	0.673	0.317	0.2444
5.363	1.095	13.365	12.222	-1.144	1.740	1.414E 05	.0162	3.774	1.438E 05	0.694	0.316	0.2547
6.102	1.234	15.935	14.605	-1.364	1.730	1.517E 05	.0159	3.914	1.542E 05	0.720	0.320	0.2730
6.776	1.389	18.806	17.188	-1.628	1.722	1.603E 05	.0160	4.103	1.629E 05	0.755	0.331	0.2884
7.714	1.594	24.643	22.660	-2.107	1.740	1.683E 05	.0161	4.749	1.710E 05	0.874	0.352	0.3027
8.242	1.716	28.632	26.580	-2.405	1.745	1.741E 05	.0162	5.201	1.769E 05	0.957	0.359	0.3127
8.737	1.789	34.916	32.316	-2.969	1.770	1.780E 05	.0161	6.021	1.809E 05	1.108	0.393	0.3197
9.032	1.811	54.482	48.971	-5.688	1.764	1.820E 05	.0157	8.779	1.850E 05	1.615	0.562	0.3269

APPENDIX B (Continued)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2800 | RUN NUMBER 3 | DATE RUN JANUARY 10, 1964
BAROMETRIC PRESSURE = 29.335 IN HG | TYPE B METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0130 | ANNULUS CLEARANCE = 0.080 | METERING RING AREA RATIO =.387
EQUIVALENT DIAMETER = 0.1428 | ANNULUS AREA = 0.2592 SQ IN | METERING RING AREA = 0.1003 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP1oA PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	118.3	118.3	120.0	119.5	0.61	0.	0.123	-0.004	0.033	1.60	0.147	1.729	0.004	515.33
120.1	117.0	117.2	120.0	119.5	0.96	0.004	0.196	-0.007	0.036	2.60	0.295	2.874	0.007	515.55
120.0	115.4	115.2	119.1	118.9	1.35	0.	0.295	-0.011	0.083	3.66	0.368	4.003	0.018	516.01
120.0	113.4	113.3	118.6	118.0	1.74	0.	0.344	-0.013	0.089	4.81	0.467	5.280	0.031	515.55
120.0	111.5	112.0	118.0	117.2	2.09	0.004	0.442	-0.013	0.110	6.04	0.550	6.558	0.025	516.01
120.2	110.0	110.5	118.1	117.3	2.46	0.	0.491	-0.014	0.163	7.39	0.639	8.007	0.029	516.46
120.0	108.0	108.5	117.5	116.8	2.79	0.007	0.565	-0.03[illegible]	0.217	8.62	0.712	9.333	0.036	516.91
120.0	106.0	106.5	117.5	116.5	3.19	0.	0.639	-0.025	0.251	10.36	0.860	11.175	0.007	516.01
120.1	104.5	105.0	117.5	116.3	3.44	0.	0.712	-0.033	0.284	11.74	0.958	12.648	0.007	514.87
120.1	98.5	99.7	116.8	115.5	4.30	0.	0.884	-0.040	0.387	16.11	1.326	17.428	0.072	513.96
120.0	94.3	95.5	115.5	114.5	4.76	0.	0.958	-0.043	0.453	19.11	1.533	20.704	0.116	513.96
120.1	90.0	91.5	115.5	114.5	5.23	0.007	1.056	-0.054	0.457	23.26	1.867	24.879	0.145	512.83
120.5	83.0	85.2	115.5	114.0	5.77	0.004	1.154	-0.061	0.477	29.42	2.309	30.995	0.217	512.60
119.7	74.5	77.0	114.0	112.5	6.19	0.007	1.253	-0.069	0.607	35.83	2.751	38.039	0.296	511.69
120.5	63.0	67.5	115.0	113.5	6.31	0.	1.302	-0.072	0.499	56.06	4.593	60.565	0.361	511.00

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2800 | RUN NUMBER 3 | DATE RUN JANUARY 10, 1964
BAROMETRIC PRESSURE = 29.335 IN HG | TYPE B METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0130 | ANNULUS CLEARANCE = 0.080 | METERING RING AREA RATIO =.387
EQUIVALENT DIAMETER = 0.1428 | ANNULUS AREA = 0.2592 SQ IN | METERING RING AREA = 0.1003 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.614	0.121	1.747	1.597	-0.165	1.674	4.889E 04	.0156	4.330	4.972E 04	0.648	0.441	0.0881
0.961	0.191	2.895	2.605	-0.315	1.628	6.203E 04	.0153	4.371	6.308E 04	0.654	0.517	0.1118
1.351	0.289	4.050	3.655	-0.420	1.671	7.246E 04	.0169	4.466	7.368E 04	0.668	0.497	0.1307
1.744	0.338	5.351	4.806	-0.525	1.711	8.144E 04	.0156	4.643	8.282E 04	0.695	0.487	0.1468
2.091	0.434	6.619	6.044	-0.609	1.707	8.920E 04	.0166	4.840	9.071E 04	0.724	0.463	0.1608
2.456	0.484	8.035	7.390	-0.729	1.679	9.743E 04	.0155	4.942	9.907E 04	0.739	0.458	0.1758
2.797	0.546	9.457	8.624	-0.833	1.702	1.031E 05	.0155	5.116	1.048E 05	0.765	0.458	0.1861
3.193	0.626	11.313	10.384	-0.978	1.696	1.106E 05	.0154	5.358	1.124E 05	0.802	0.461	0.1994
3.438	0.696	12.806	11.766	-1.090	1.668	1.161E 05	.0157	5.533	1.180E 05	0.828	0.462	0.2089
4.298	0.864	17.641	16.124	-1.527	1.683	1.295E 05	.0156	6.073	1.317E 05	0.909	0.497	0.2327
4.765	0.936	20.952	19.096	-1.793	1.706	1.354E 05	.0154	6.548	1.376E 05	0.980	0.515	0.2433
5.239	1.025	25.135	23.255	-2.125	1.696	1.428E 05	.0152	7.180	1.452E 05	1.074	0.528	0.2562
5.775	1.122	31.264	29.399	-2.601	1.702	1.500E 05	.0151	8.221	1.525E 05	1.230	0.550	0.2691
6.196	1.215	38.376	35.783	-3.139	1.723	1.543E 05	.0153	9.401	1.569E 05	1.407	0.575	0.2764
6.386	1.266	60.850	55.947	-4.991	1.688	1.590E 05	.0152	3.949	1.617E 05	2.087	0.649	0.2846

APPENDIX B (Continued)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2900 | RUN NUMBER 3 | DATE RUN JANUARY 10, 1964
BAROMETRIC PRESSURE = 29.360 IN HG | TYPE C METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0130 | ANNULUS CLEARANCE = 0.080 | METERING RING AREA RATIO =.474
EQUIVALENT DIAMETER = 0.1428 | ANNULUS AREA = 0.2592 SQ IN | METERING RING AREA = 0.1227 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.2	119.2	120.0	120.0	0.61	-0.002	0.138	-0.014	0.014	0.93	0.074	0.982	0.004	515.10
120.0	118.0	118.0	119.5	119.2	1.13	0.	0.246	-0.022	0.029	1.72	0.088	1.768	0.007	515.10
119.5	115.8	115.5	118.2	117.2	1.65	0.	0.368	-0.034	0.034	2.51	0.123	2.603	0.011	514.64
120.0	115.0	115.0	118.5	117.5	2.09	0.009	0.467	-0.047	0.034	3.24	0.147	3.340	0.018	515.33
120.0	113.0	113.5	118.0	117.0	2.68	0.004	0.589	-0.065	0.025	4.22	0.196	4.421	0.033	516.01
120.0	111.0	111.2	117.5	116.5	3.39	0.	0.747	-0.085	0.022	5.58	0.270	5.796	0.054	516.01
120.0	108.5	108.0	116.7	115.3	4.10	0.	0.884	-0.108	0.011	6.98	0.295	7.260	0.069	515.33
119.9	106.5	106.7	115.5	114.5	4.67	0.	1.032	-0.119	-0.011	8.15	0.393	8.498	0.094	515.10
119.0	104.0	104.0	114.5	112.7	5.21	0.009	1.130	-0.137	-0.022	9.28	0.442	9.701	0.108	514.42
119.7	101.0	101.5	114.2	112.5	6.02	0.004	1.302	-0.163	-0.054	11.32	0.540	11.838	0.145	514.87
120.0	99.5	100.0	114.5	112.8	6.48	-0.004	1.449	-0.186	-0.069	12.77	0.639	13.312	0.173	514.64
120.5	97.0	98.0	114.0	112.1	7.17	-0.011	1.562	-0.206	-0.090	14.69	0.737	15.375	0.220	514.87
119.5	93.5	94.5	112.5	110.3	7.71	-0.014	1.695	-0.217	-0.119	16.41	0.786	17.167	0.235	514.19
116.5	85.5	86.5	108.6	106.5	8.55	-0.004	1.867	-0.238	-0.148	20.31	1.007	21.220	0.303	514.19
116.5	78.0	79.5	107.5	105.3	9.43	0.004	2.088	-0.285	-0.141	26.38	1.277	27.296	0.459	513.74
115.2	63.0	65.0	105.5	103.0	10.14	0.014	2.260	-0.296	0.224	38.04	1.965	40.043	0.477	511.92

APPENDIX B (Continued)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2900 | RUN NUMBER 3 | DATE RUN JANUARY 10, 1964
BAROMETRIC PRESSURE = 29.360 IN HG | TYPE C METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0130 | ANNULUS CLEARANCE = 0.080 | METERING RING AREA RATIO =.474
EQUIVALENT DIAMETER = 0.1428 | ANNULUS AREA = 0.2592 SQ IN | METERING RING AREA = 0.1227 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.612	0.131	0.997	0.941	-0.081	1.668	4.894E 04	.0169	2.548	4.971E 04	0.571	0.218	0.0881
1.130	0.235	1.794	1.731	-0.102	1.680	6.623E 04	.0165	2.549	6.728E 04	0.571	0.148	0.1193
1.646	0.351	2.638	2.522	-0.140	1.693	7.958E 04	.0170	2.556	8.083E 04	0.573	0.139	0.1432
2.097	0.439	3.381	3.264	-0.166	1.701	8.963E 04	.0167	2.598	9.104E 04	0.583	0.129	0.1614
2.681	0.555	4.466	4.248	-0.218	1.682	1.017E 05	.0163	2.602	1.033E 05	0.583	0.129	0.1834
3.389	0.704	5.849	5.598	-0.300	1.668	1.149E 05	.0161	2.672	1.167E 05	0.599	0.137	0.2071
4.102	0.830	7.320	7.002	-0.328	1.677	1.262E 05	.0157	2.758	1.282E 05	0.618	0.122	0.2274
4.666	0.972	8.552	8.175	-0.426	1.698	1.338E 05	.0162	2.850	1.359E 05	0.639	0.139	0.2410
5.216	1.057	9.759	9.304	-0.479	1.719	1.404E 05	.0159	2.923	1.426E 05	0.655	0.139	0.2525
6.021	1.219	11.892	11.338	-0.578	1.709	1.515E 05	.0157	3.045	1.539E 05	0.683	0.141	0.2727
6.480	1.358	13.370	12.790	-0.679	1.682	1.587E 05	.0160	3.125	1.612E 05	0.701	0.148	0.2857
7.161	1.464	15.432	14.695	-0.787	1.698	1.663E 05	.0156	3.261	1.689E 05	0.731	0.153	0.2993
7.697	1.593	17.216	16.412	-0.829	1.713	1.713E 05	.0159	3.400	1.740E 05	0.762	0.148	0.3080
8.543	1.749	21.265	20.287	-1.076	1.727	1.777E 05	.0157	3.778	1.805E 05	0.847	0.165	0.3196
9.435	1.943	27.368	26.290	-1.437	1.722	1.872E 05	.0157	4.381	1.902E 05	0.982	0.185	0.3364
10.158	2.104	40.303	37.914	-2.349	1.770	1.915E 05	.0161	5.981	1.945E 05	1.341	0.243	0.3432

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3000
BAROMETRIC PRESSURE = 29.280 IN HG
METERING RING CLEARANCE = 0.0280
EQUIVALENT DIAMETER = 0.1709

RUN NUMBER 3
TYPE A METERING RING
ANNULUS CLEARANCE = 0.095
ANNULUS AREA = 0.3115 SQ IN

DATE RUN JANUARY 21, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO =.525
METERING RING AREA = 0.1634 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.3	119.5	120.0	119.8	0.37	0.	0.074	-0.005	0.020	0.35	0.138	0.481	0.007	518.72
119.8	118.1	118.0	119.1	119.0	0.79	0.004	0.138	-0.010	0.038	0.74	0.246	0.958	0.005	517.14
119.9	115.5	117.0	119.0	118.5	1.45	0.005	0.270	-0.014	0.086	1.42	0.393	1.768	0.014	515.78
120.0	114.4	115.2	118.2	117.5	2.26	0.013	0.418	-0.022	0.108	2.28	0.663	2.947	0.033	514.87
120.5	113.0	114.1	118.0	117.0	3.14	0.023	0.589	-0.033	0.148	3.02	0.933	4.151	0.040	514.42
120.0	109.7	111.0	116.5	115.3	4.15	0.023	0.776	-0.043	0.206	4.37	1.179	5.526	0.061	512.83
114.8	101.2	103.0	110.0	108.8	5.33	0.029	0.982	-0.061	0.271	5.82	1.572	7.353	0.087	511.92
115.3	99.1	101.0	109.5	108.5	6.19	0.040	1.154	-0.065	0.293	7.07	1.916	8.964	0.134	511.23
115.5	97.0	99.3	109.0	107.5	6.93	0.076	1.302	-0.076	0.309	8.30	2.260	10.536	0.155	510.78
115.2	94.5	97.0	108.2	106.5	7.59	0.065	1.424	-0.090	0.329	9.38	2.530	11.912	0.181	510.09
112.5	88.5	91.0	104.0	102.2	8.67	0.101	1.670	-0.094	0.347	11.32	2.898	14.318	0.210	509.41
109.5	81.0	85.0	100.5	98.5	9.55	0.094	1.842	-0.096	0.390	13.68	3.635	17.290	0.220	508.95
109.8	76.5	81.0	99.5	97.5	10.46	0.103	2.014	-0.123	0.430	16.36	4.372	20.729	0.238	508.49
110.2	73.0	78.5	99.5	97.0	11.08	0.089	2.112	-0.134	0.468	18.74	5.035	23.750	0.267	508.04
110.0	70.0	75.5	99.0	96.7	11.44	0.094	2.210	-0.112	0.471	20.68	5.501	26.500	0.314	507.81
109.0	62.5	69.5	97.3	94.8	11.89	0.101	2.309	-0.141	0.399	25.59	6.680	32.301	0.397	507.35
109.0	55.0	63.5	97.0	95.0	12.01	0.090	2.309	-0.135	0.350	31.36	8.449	40.043	0.246	507.58

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3000 RUN NUMBER 3 DATE RUN JANUARY 21, 1964
BAROMETRIC PRESSURE = 29.280 IN HG TYPE A METERING RING TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0280 ANNULUS CLEARANCE = 0.095 METERING RING AREA RATIO =.525
EQUIVALENT DIAMETER = 0.1709 ANNULUS AREA = 0.3115 SQ IN METERING RING AREA = 0.1634 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.368	0.071	0.494	0.351	-0.153	1.461	4.809E 04	.0160	1.388	4.887E 04	0.382	0.602	0.0874
0.790	0.131	0.982	0.745	-0.262	1.552	6.854E 04	.0145	1.454	6.966E 04	0.400	0.507	0.1243
1.454	0.261	1.818	1.430	-0.437	1.555	9.327E 04	.0157	1.510	9.479E 04	0.416	0.455	0.1688
2.272	0.400	3.012	2.283	-0.729	1.539	1.175E 05	.0152	1.515	1.194E 05	0.417	0.473	0.2124
3.167	0.561	4.241	3.024	-1.021	1.526	1.397E 05	.0150	1.417	1.420E 05	0.390	0.463	0.2523
4.174	0.743	5.651	4.373	-1.302	1.568	1.586E 05	.0154	1.583	1.611E 05	0.436	0.451	0.2857
5.383	0.937	7.519	5.814	-1.745	1.623	1.739E 05	.0154	1.668	1.767E 05	0.459	0.470	0.3130
6.279	1.102	9.143	7.048	-2.120	1.617	1.889E 05	.0154	1.711	1.920E 05	0.471	0.476	0.3396
7.058	1.226	10.729	8.283	-2.471	1.623	2.003E 05	.0152	1.783	2.036E 05	0.491	0.485	0.3598
7.714	1.347	12.121	9.352	-2.769	1.625	2.094E 05	.0152	1.832	2.128E 05	0.504	0.488	0.3758
8.835	1.573	14.539	11.274	-3.167	1.677	2.186E 05	.0158	1.965	2.222E 05	0.541	0.483	0.3919
9.719	1.747	17.533	13.633	-3.925	1.673	2.272E 05	.0158	2.129	2.309E 05	0.586	0.517	0.4070
10.647	1.901	21.005	16.316	-4.689	1.694	2.368E 05	.0158	2.334	2.407E 05	0.643	0.545	0.4239
11.247	2.001	24.050	18.694	-5.381	1.689	2.445E 05	.0156	2.509	2.484E 05	0.691	0.566	0.4373
11.626	2.107	26.792	20.597	-5.876	1.704	2.474E 05	.0160	2.687	2.514E 05	0.740	0.581	0.4424
12.077	2.188	32.571	25.468	-7.074	1.710	2.510E 05	.0159	3.190	2.550E 05	0.878	0.622	0.4485
12.187	2.196	40.286	31.304	-8.750	1.706	2.523E 05	.0158	3.871	2.564E 05	1.066	0.683	0.4510

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3100 | RUN NUMBER 2 | DATE RUN DECEMBER 4, 1963
BAROMETRIC PRESSURE = 29.295 IN HG | TYPE A METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0630 | ANNULUS CLEARANCE = 0.130 | METERING RING AREA RATIO =.658
EQUIVALENT DIAMETER = 0.2355 | ANNULUS AREA = 0.4334 SQ IN | METERING RING AREA = 0.2854 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	109.5	109.5	110.0	110.0	0.64	-0.007	0.098	-0.011	0.016	0.39	0.196	0.540	0.005	526.15
110.0	109.0	108.5	109.0	109.0	1.05	-0.007	0.147	-0.011	0.022	0.59	0.295	0.874	0.007	525.47
110.0	107.5	107.8	109.0	108.8	1.42	-0.013	0.196	0.014	0.022	0.84	0.467	1.326	0.011	525.47
110.0	106.5	107.0	108.5	108.2	1.87	-0.020	0.246	0.016	0.025	1.06	0.565	1.646	0.014	525.02
110.0	106.0	106.5	108.0	107.5	2.36	-0.029	0.295	0.022	0.034	1.33	0.688	2.038	0.018	525.02
110.0	105.0	105.5	107.5	107.1	2.90	-0.043	0.368	0.023	0.036	1.62	0.810	2.456	0.018	524.35
110.0	104.0	105.0	107.0	106.7	3.44	-0.096	0.393	0.036	0.045	1.99	0.982	2.962	0.029	524.35
110.0	103.0	103.5	106.5	106.0	3.93	-0.110	0.442	0.090	0.049	2.26	1.105	3.340	0.051	524.35
110.0	102.0	103.0	106.5	106.0	4.40	-0.126	0.516	-0.014	0.054	2.53	1.253	3.758	0.051	524.57
110.0	101.0	102.5	105.5	105.0	4.86	-0.125	0.639	-0.058	0.047	2.80	1.375	4.126	0.058	524.57
100.0	88.5	90.3	95.0	94.0	6.02	-0.090	0.933	-0.087	0.083	3.63	1.793	5.403	0.083	524.35
100.0	87.0	89.0	94.0	93.0	6.63	-0.087	1.056	-0.083	0.094	4.10	2.038	6.140	0.072	524.12
100.0	85.5	88.0	93.0	92.0	7.12	-0.101	1.007	-0.083	0.081	4.47	2.137	6.582	0.065	523.67
100.0	84.0	86.5	92.0	91.5	7.81	-0.145	0.761	-0.105	0.100	5.03	2.431	7.442	0.051	523.67
100.0	82.8	85.3	92.0	90.5	8.37	-0.087	1.277	-0.116	0.065	5.43	2.628	7.982	0.072	523.90
100.0	82.0	85.0	92.0	90.5	8.72	-0.087	1.375	-0.079	0.060	5.75	2.726	8.449	0.072	523.90
100.0	80.0	82.9	91.0	89.1	9.55	-0.072	1.670	-0.105	0.094	6.51	2.923	9.333	0.051	523.90
97.0	73.0	76.0	86.5	84.5	11.08	-0.108	1.940	-0.090	0.130	8.10	3.512	11.617	0.029	523.67

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3100 RUN NUMBER 2 DATE RUN DECEMBER 4, 1963
BAROMETRIC PRESSURE = 29.295 IN HG TYPE A METERING RING TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0630 ANNULUS CLEARANCE = 0.130 METERING RING AREA RATIO =.658
EQUIVALENT DIAMETER = 0.2355 ANNULUS AREA = 0.4334 SQ IN METERING RING AREA = 0.2854 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.631	0.096	0.554	0.407	-0.196	1.375	8.451E 04	.0164	0.881	8.586E 04	0.382	0.423	0.1568
1.039	0.146	0.891	0.606	-0.295	1.359	1.092E 05	.0148	0.785	1.110E 05	0.340	0.379	0.2025
1.412	0.210	1.330	0.846	-0.459	1.358	1.274E 05	.0157	0.803	1.294E 05	0.348	0.431	0.2362
1.847	0.264	1.650	1.074	-0.551	1.378	1.448E 05	.0152	0.788	1.471E 05	0.342	0.399	0.2683
2.329	0.320	2.045	1.349	-0.671	1.369	1.632E 05	.0145	0.776	1.658E 05	0.336	0.379	0.3023
2.879	0.402	2.462	1.649	-0.789	1.409	1.791E 05	.0151	0.786	1.820E 05	0.341	0.368	0.3315
3.372	0.459	2.966	2.021	-0.956	1.388	1.952E 05	.0144	0.807	1.984E 05	0.350	0.372	0.3614
3.853	0.542	3.319	2.277	-1.067	1.415	2.068E 05	.0151	0.806	2.101E 05	0.350	0.367	0.3827
4.306	0.572	3.792	2.606	-1.211	1.410	2.188E 05	.0142	0.820	2.223E 05	0.356	0.369	0.4051
4.779	0.672	4.178	2.899	-1.329	1.432	2.288E 05	.0152	0.830	2.324E 05	0.360	0.367	0.4236
5.975	0.935	5.488	3.761	-1.751	1.478	2.416E 05	.0172	0.874	2.455E 05	0.379	0.386	0.4472
6.593	1.058	6.229	4.218	-2.011	1.481	2.536E 05	.0176	0.884	2.577E 05	0.383	0.397	0.4693
7.079	1.016	6.664	4.592	-2.097	1.522	2.596E 05	.0161	0.917	2.638E 05	0.398	0.393	0.4800
7.731	0.781	7.544	5.157	-2.412	1.523	2.711E 05	.0113	0.941	2.755E 05	0.408	0.409	0.5013
8.353	1.263	8.072	5.582	-2.564	1.581	2.765E 05	.0174	0.968	2.810E 05	0.420	0.410	0.5115
8.697	1.379	8.518	5.888	-2.655	1.595	2.809E 05	.0183	0.985	2.854E 05	0.427	0.408	0.5196
9.547	1.654	9.432	6.684	-2.847	1.679	2.868E 05	.0209	1.061	2.914E 05	0.460	0.411	0.5305
11.040	1.949	11.727	8.244	-3.483	1.725	3.005E 05	.0215	1.138	3.053E 05	0.493	0.424	0.5556

APPENDIX B (Continued)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3200 | RUN NUMBER 1 | DATE RUN DECEMBER 4, 1963
BAROMETRIC PRESSURE = 29.362 IN HG | TYPE A METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0. | ANNULUS CLEARANCE = 0.065 | METERING RING AREA RATIO =.318
EQUIVALENT DIAMETER = 0.1145 | ANNULUS AREA = 0.2070 SQ IN | METERING RING AREA = 0.0659 SQ I

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	T5 R
120.0	111.5	111.5	119.8	119.5	1.05	0.051	0.246	0.042	-0.007	8.01	0.088	7.957	0.022	525.70
120.0	109.5	109.0	119.5	119.0	1.28	0.061	0.295	0.049	-0.007	10.12	0.098	10.011	0.023	525.25
120.0	107.6	106.5	119.3	118.8	1.55	0.075	0.368	0.060	-0.007	12.30	0.147	12.182	0.025	524.80
120.0	104.0	104.0	118.5	118.0	1.77	0.094	0.418	0.074	-0.014	14.05	0.147	13.926	0.036	526.82
120.0	102.0	101.0	118.5	118.0	2.04	0.105	0.491	0.089	-0.014	16.68	0.162	16.504	0.043	525.70
120.0	99.5	99.0	118.0	117.5	2.28	0.116	0.516	0.094	-0.014	18.86	0.196	18.680	0.040	525.03
120.0	97.0	96.5	118.0	117.5	2.53	0.130	0.580	0.107	-0.014	21.32	0.196	21.097	0.043	523.90
120.0	93.8	93.2	118.0	117.0	2.73	0.137	0.639	0.117	-0.014	23.77	0.246	23.455	0.043	523.68
120.0	91.0	90.5	117.8	117.0	2.95	0.166	0.688	0.137	-0.016	26.13	0.270	26.029	0.047	523.68
120.0	87.5	87.0	117.5	116.8	3.29	0.173	0.737	0.145	-0.014	29.62	0.295	29.330	0.108	523.45
120.0	83.0	83.0	117.0	116.3	3.63	0.206	0.835	0.179	-0.016	33.40	0.319	33.338	0.087	523.00
120.0	79.5	78.0	117.0	116.0	3.98	0.240	0.933	0.211	-0.020	37.85	0.368	37.538	0.099	523.00
120.0	73.0	72.5	116.2	115.3	4.32	0.257	0.997	0.208	-0.015	42.85	0.418	42.346	0.119	523.00
120.0	61.0	60.5	116.0	115.0	4.67	0.249	1.081	0.188	-0.004	54.56	0.540	54.061	0.043	523.00
120.0	51.0	50.0	116.0	115.0	4.67	0.251	1.095	0.184	-0.031	65.07	0.639	64.067	0.025	523.23

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3200 | RUN NUMBER 1 | DATE RUN DECEMBER 4, 1963
BAROMETRIC PRESSURE = 29.362 IN HG | TYPE A METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0. | ANNULUS CLEARANCE = 0.065 | METERING RING AREA RATIO =.318
EQUIVALENT DIAMETER = 0.1145 | ANNULUS AREA = 0.2070 SQ IN | METERING RING AREA = 0.0659 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
1.097	0.241	7.933	8.006	0.113	1.904	4.788E 04	.0158	3.762	9.567E 04	1.395	0.182	0.0872
1.339	0.288	9.933	10.120	0.128	1.882	5.327E 04	.0153	4.058	1.064E 05	1.425	0.164	0.0970
1.622	0.361	12.148	12.305	0.182	1.911	5.827E 04	.0160	4.277	1.164E 05	1.447	0.191	0.1060
1.862	0.408	13.882	14.043	0.186	1.921	6.195E 04	.0158	4.241	1.238E 05	1.444	0.168	0.1131
2.143	0.483	16.453	16.671	0.207	1.891	6.717E 04	.0160	4.420	1.342E 05	1.462	0.157	0.1224
2.400	0.505	18.626	18.856	0.245	1.911	7.082E 04	.0151	4.690	1.415E 05	1.489	0.164	0.1289
2.660	0.568	21.037	21.307	0.245	1.907	7.484E 04	.0152	4.910	1.495E 05	1.511	0.144	0.1360
2.863	0.629	23.389	23.759	0.296	1.885	7.816E 04	.0154	5.230	1.562E 05	1.544	0.156	0.1420
3.113	0.673	25.952	26.113	0.327	1.894	8.129E 04	.0153	5.439	1.624E 05	1.565	0.155	0.1477
3.464	0.722	29.250	29.618	0.373	1.892	8.584E 04	.0147	5.674	1.715E 05	1.589	0.153	0.1559
3.841	0.821	33.240	33.381	0.396	1.914	8.997E 04	.0152	6.057	1.798E 05	1.628	0.142	0.1633
4.219	0.919	37.422	37.815	0.452	1.916	9.423E 04	.0154	6.520	1.883E 05	1.675	0.140	0.1710
4.579	0.973	42.235	42.827	0.508	1.936	9.769E 04	.0152	7.355	1.952E 05	1.759	0.138	0.1773
4.916	1.050	53.966	54.529	0.607	1.954	1.007E 05	.0153	0.711	2.013E 05	2.099	0.134	0.1828
4.918	1.062	63.960	65.005	0.682	1.893	1.023E 05	.0150	3.913	2.044E 05	2.424	0.126	0.1857

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3300 | RUN NUMBER 1 | DATE RUN DECEMBER 5, 1963
BAROMETRIC PRESSURE = 29.475 IN Hg | TYPE C METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0. | ANNULUS CLEARANCE = 0.065 | METERING RING AREA RATIO =.286
EQUIVALENT DIAMETER = 0.1276 | ANNULUS AREA = 0.2265 SQ IN | METERING RING AREA = 0.0647 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	T R
120.0	116.0	115.5	120.0	119.7	0.49	0.	0.123	0.	0.052	4.62	0.098	4.372	0.011	525.25
120.0	112.5	112.0	120.0	120.0	0.74	0.	0.196	0.	0.079	7.96	0.418	7.368	0.011	524.80
120.0	109.5	108.5	119.5	119.0	1.01	0.	0.295	0.	0.090	10.56	0.589	9.922	0.018	524.53
120.0	106.0	105.5	119.5	119.0	1.20	0.	0.344	0.004	0.121	13.41	0.761	12.648	0.036	523.68
120.0	103.5	102.5	119.5	119.0	1.50	0.	0.393	0.004	0.125	16.63	0.982	15.620	0.040	523.23
120.0	100.0	99.0	119.0	118.5	1.74	0.	0.442	0.004	0.121	19.55	1.105	18.420	0.061	522.78
120.0	96.0	94.5	119.0	118.0	2.06	-0.004	0.516	0.	0.107	23.70	1.154	22.472	0.079	522.33
120.0	93.0	91.5	118.5	117.5	2.21	-0.004	0.589	0.	0.114	26.21	1.302	24.526	0.083	522.33
120.0	90.5	89.0	118.0	117.3	2.46	-0.011	0.639	0.004	0.043	28.88	1.400	26.829	0.098	521.88
120.0	85.0	84.0	117.9	117.0	2.78	-0.002	0.712	0.007	0.074	33.57	1.842	31.034	0.101	521.65
120.0	80.0	79.5	117.5	116.2	3.05	0.023	0.835	0.014	0.034	36.74	2.603	36.241	0.105	521.65
120.0	74.5	71.0	117.0	115.8	3.63	0.	0.982	0.033	-0.155	44.85	3.266	41.344	0.101	521.42
120.0	66.0	63.0	117.0	115.5	4.00	0.	1.130	0.087	0.155	52.56	3.483	49.547	0.264	522.32
120.0	62.0	59.0	116.5	115.0	4.18	0.007	1.228	0.123	1.120	56.06	2.677	53.055	0.303	522.10
120.0	39.5	39.0	116.5	115.0	4.32	0.	1.375	0.014	-0.090	76.08	0.295	75.581	0.289	521.87

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3300 | RUN NUMBER 1 | DATE RUN DECEMBER 5, 1963
BAROMETRIC PRESSURE = 29.475 IN HG | TYPE D METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0. | ANNULUS CLEARANCE = 0.065 | METERING RING AREA RATIO =.286
EQUIVALENT DIAMETER = 0.1276 | ANNULUS AREA = 0.2265 SQ IN | METERING RING AREA = 0.0647 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.491	0.123	4.398	4.624	0.079	1.887	3.593E 04	.0200	7.685	7.137E 04	1.446	0.291	0.0642
0.737	0.196	7.408	7.966	0.387	1.690	4.656E 04	.0191	8.143	9.248E 04	1.483	0.832	0.0831
1.007	0.295	9.967	10.575	0.559	1.767	5.326E 04	.0218	8.376	1.058E 05	1.502	0.898	0.0951
1.203	0.346	12.707	13.439	0.732	1.684	5.977E 04	.0204	8.590	1.187E 05	1.520	0.916	0.1066
1.498	0.395	15.681	16.657	0.951	1.740	6.569E 04	.0193	9.068	1.305E 05	1.559	0.960	0.1170
1.744	0.444	18.479	19.596	1.093	1.756	7.06CE 04	.0188	9.418	1.402E 05	1.587	0.932	0.1257
2.059	0.518	22.526	23.759	1.160	1.741	7.716E 04	.0183	9.697	1.533E 05	1.610	0.797	0.1373
2.207	0.591	24.583	26.269	1.309	1.718	8.041E 04	.0193	0.021	1.597E 05	1.637	0.811	0.1431
2.445	0.646	26.849	28.957	1.455	1.771	8.344E 04	.0195	0.494	1.657E 05	1.675	0.819	0.1484
2.773	0.717	31.067	33.651	1.886	1.804	8.810E 04	.0194	1.322	1.750E 05	1.743	0.911	0.1566
3.069	0.831	36.251	36.813	2.669	1.831	9.200E 04	.0206	1.322	1.827E 05	1.743	1.117	0.1635
3.635	0.999	41.250	44.900	3.414	1.994	9.600E 04	.0227	3.778	1.907E 05	1.944	1.234	0.1706
4.003	1.173	49.582	52.715	3.610	2.024	9.975E 04	.0245	5.632	1.981E 05	2.095	1.082	0.1775
4.182	1.286	53.553	56.233	2.351	2.055	1.013E 05	.0260	6.509	2.011E 05	2.167	0.648	0.1801
4.323	1.383	75.529	76.316	0.581	1.990	1.047E 05	.0262	3.650	2.079E 05	2.751	0.106	0.1861

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3400 RUN NUMBER 1 DATE RUN DECEMBER 6, 1963
BAROMETRIC PRESSURE = 29.410 IN Hg TYPE C METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0270 ANNULUS CLEARANCE = 0.095 METERING RING AREA RATIO =.480
EQUIVALENT DIAMETER = 0.1850 ANNULUS AREA = 0.3310 SQ IN METERING RING AREA = 0.1588 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.8	120.0	120.0	120.0	0.32	0.002	0.039	0.	0.005	0.59	0.025	0.565	0.043	526.15
120.0	119.5	119.5	120.0	120.0	0.52	0.005	0.098	0.	0.004	1.11	0.025	1.081	0.083	526.15
120.0	119.0	118.0	119.8	119.8	0.83	0.005	0.147	0.	0.	1.74	0.039	1.719	0.132	525.92
120.0	117.5	117.0	119.8	119.5	1.13	0.011	0.196	0.	0.016	2.38	0.123	2.210	0.051	525.25
120.0	116.0	115.9	119.5	119.0	1.40	0.013	0.295	0.007	0.	3.05	0.147	2.898	0.244	524.80
120.0	115.5	115.0	119.0	118.5	1.69	0.007	0.319	0.007	0.023	3.63	0.196	3.438	0.289	524.57
119.5	115.5	115.0	117.8	117.2	2.11	0.	0.393	0.009	-0.014	4.32	0.196	4.077	0.350	524.12
120.5	111.0	111.0	118.0	117.5	3.22	-0.014	0.565	0.	-0.022	6.61	0.246	6.361	0.477	523.67
120.0	109.5	109.0	117.0	116.5	3.68	0.036	0.688	-0.036	-0.025	7.32	0.246	6.975	0.517	523.67
120.0	106.0	105.5	116.5	115.0	4.52	0.	0.982	0.	-0.087	9.36	0.319	8.989	0.650	523.23
110.5	90.0	89.5	105.0	103.5	6.19	0.069	1.523	-0.036	-0.300	13.95	0.295	13.483	0.903	522.55
110.0	86.0	85.5	104.0	102.0	6.88	0.014	1.695	0.022	-0.009	16.50	0.589	15.905	1.084	522.55
110.0	82.0	81.0	103.0	101.0	7.71	0.036	1.842	0.	-0.405	19.80	0.589	19.206	1.275	521.65
111.0	79.5	78.5	103.0	101.0	8.55	0.014	1.842	0.	-0.238	24.76	1.105	23.627	1.333	522.55
107.5	66.0	65.0	99.0	96.5	9.73	0.072	2.088	0.022	-0.258	31.14	0.786	30.533	1.843	522.32

APPENDIX B (Continued)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3400 RUN NUMBER 1 DATE RUN DECEMBER 6, 1963
BAROMETRIC PRESSURE = 29.410 IN HG TYPE C METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0270 ANNULUS CLEARANCE = 0.095 METERING RING AREA RATIO =.480
EQUIVALENT DIAMETER = 0.1850 ANNULUS AREA = 0.3310 SQ IN METERING RING AREA = 0.1588 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.321	0.038	0.568	0.617	0.050	1.771	4.337E 04	.0130	3.394	4.375E 04	0.781	0.271	0.0783
0.521	0.096	1.082	1.158	0.076	1.524	5.955E 04	.0172	3.372	6.008E 04	0.776	0.219	0.1075
0.831	0.145	1.719	1.830	0.126	1.555	7.448E 04	.0166	3.402	7.514E 04	0.783	0.231	0.1343
1.141	0.191	2.219	2.426	0.159	1.621	8.563E 04	.0166	3.413	8.638E 04	0.786	0.219	0.1543
1.413	0.292	2.894	3.201	0.307	1.548	9.759E 04	.0195	3.465	9.845E 04	0.798	0.325	0.1757
1.702	0.319	3.447	3.819	0.373	1.577	1.062E 05	.0180	3.485	1.072E 05	0.802	0.331	0.1912
2.112	0.397	4.065	4.538	0.424	1.661	1.152E 05	.0190	3.502	1.162E 05	0.806	0.317	0.2072
3.203	0.572	6.350	6.900	0.550	1.706	1.407E 05	.0183	3.573	1.419E 05	0.823	0.271	0.2529
3.720	0.652	6.980	7.666	0.587	1.789	1.477E 05	.0188	3.567	1.490E 05	0.821	0.259	0.2656
4.546	0.982	8.946	9.760	0.765	1.824	1.619E 05	.0235	3.755	1.634E 05	0.865	0.274	0.2909
6.288	1.470	13.352	14.534	1.011	1.907	1.799E 05	.0261	4.134	1.815E 05	0.952	0.255	0.3228
6.927	1.698	15.870	17.180	1.280	1.887	1.894E 05	.0269	4.356	1.911E 05	1.003	0.280	0.3399
7.787	1.824	19.004	20.608	1.605	1.897	2.007E 05	.0257	4.634	2.025E 05	1.067	0.301	0.3598
8.607	1.835	23.507	25.610	2.078	1.935	2.093E 05	.0237	5.279	2.112E 05	1.216	0.341	0.3757
9.846	2.062	30.393	32.263	2.047	1.961	2.194E 05	.0233	5.800	2.213E 05	1.335	0.266	0.3936

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3400 | RUN NUMBER 2 | DATE RUN DECEMBER 26, 1963
BAROMETRIC PRESSURE = 29.000 IN HG | TYPE C METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0270 | ANNULUS CLEARANCE = 0.095 | METERING RING AREA RATIO =.490
EQUIVALENT DIAMETER = 0.1850 | ANNULUS AREA = 0.3310 SQ IN | METERING RING AREA = 0.1588 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
119.6	118.5	118.5	119.8	119.8	0.49	0.004	0.098	-0.002	-0.014	0.93	0.	0.874	0.079	525.71
120.1	119.3	119.0	117.5	117.0	3.64	0.042	0.663	0.009	-0.009	7.69	0.285	7.368	0.574	521.43
106.8	78.0	78.0	99.5	98.3	7.79	0.101	1.498	-0.016	-0.565	19.94	0.196	20.115	1.474	518.50
102.0	66.8	66.8	94.0	92.0	8.60	0.107	1.695	0.004	-0.517	25.44	0.196	24.226	1.734	517.82

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3400 RUN NUMBER 2 DATE RUN DECEMBER 26, 1963
BAROMETRIC PRESSURE = 29.000 IN HG TYPE D METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0270 ANNULUS CLEARANCE = 0.095 METERING RING AREA RATIO =.480
EQUIVALENT DIAMETER = 0.1850 ANNULUS AREA = 0.3310 SQ IN METERING RING AREA = 0.1588 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.495	0.096	0.868	0.986	0.059	1.456	5.931E 04	.0173	2.889	5.983E 04	0.665	0.173	0.1070
3.708	0.647	7.359	8.052	0.659	1.511	1.614E 05	.0158	3.174	1.628E 05	0.731	0.245	0.2891
7.931	1.439	19.840	20.905	1.040	1.586	2.202E 05	.0166	3.858	2.221E 05	0.888	0.158	0.3928
8.751	1.643	23.966	26.562	1.182	1.628	2.241E 05	.0174	4.500	2.261E 05	1.036	0.155	0.3994

APPENDIX B (Continued)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3500 RUN NUMBER 1 DATE RUN DECEMBER 6, 1963
BAROMETRIC PRESSURE = 29.400 IN HG TYPE C METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0620 ANNULUS CLEARANCE = 0.130 METERING RING AREA RATIO =.620
EQUIVALENT DIAMETER = 0.2506 ANNULUS AREA = 0.4529 SQ IN METERING RING AREA = 0.2808 SQ I.

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP1oA PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	108.8	108.5	109.5	109.5	0.93	0.025	0.147	0.007	C.C05	0.74	C.123	0.860	0.172	527.49
110.0	107.0	107.0	109.0	108.5	1.57	0.049	0.246	0.011	C.C11	1.28	C.187	1.449	0.300	526.60
111.0	107.0	107.3	109.5	109.0	1.99	0.070	0.295	0.014	0.019	1.67	0.295	1.965	0.396	525.93
111.0	106.5	106.5	109.0	108.8	2.33	0.074	C.344	0.016	0.011	1.96	C.309	2.309	0.459	525.70
110.0	104.5	104.8	107.8	107.5	2.85	0.069	0.393	0.020	0.007	2.41	C.344	2.775	0.556	525.25
110.5	104.0	104.0	107.5	107.0	3.29	0.069	0.467	0.014	C.C14	2.75	0.393	3.144	0.614	524.80
110.0	102.0	102.5	106.5	105.8	4.08	0.036	0.737	C.022	0.	3.24	C.491	3.723	0.621	524.58
110.0	101.8	101.0	105.5	105.0	4.59	0.051	0.860	C.007	0.	3.71	0.530	4.200	0.723	524.13
110.0	97.5	100.0	105.0	104.5	5.13	0.036	C.958	0.022	C.011	4.18	0.639	4.814	0.809	524.13
00.3	88.0	88.5	95.0	93.8	6.03	0.036	1.130	0.018	0.	5.13	0.810	5.845	0.957	524.13
0.3	86.0	87.0	94.5	93.0	6.73	0.043	1.228	0.014	0.	5.97	0.884	6.828	1.098	524.35
100.0	84.5	85.5	93.5	92.0	7.32	0.036	1.449	0.022	0.	6.58	0.958	7.564	1.207	524.13
100.0	83.0	84.0	93.0	91.0	7.69	0.058	1.523	0.022	0.	7.07	1.007	8.056	1.279	524.35
100.0	82.3	83.2	92.5	91.0	8.06	0.061	1.646	0.007	C.	7.52	1.081	8.596	1.355	524.12
0.0	80.5	82.0	91.5	90.0	8.60	0.029	1.719	C.036	C.	8.20	1.164	9.308	1.445	523.68
0	79.8	80.5	91.2	89.5	8.94	0.043	1.867	0.	C.C13	8.74	1.302	9.996	1.554	523.90
0	76.5	78.0	89.5	87.0	9.31	0.045	1.940	0.018	0.C05	9.38	1.366	10.684	1.626	523.90
95.5	72.5	74.0	86.2	84.0	9.87	0.045	2.053	0.014	0.	10.32	1.474	11.789	1.741	523.45

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 350C
BAROMETRIC PRESSURE = 29.400 IN HG
METERING RING CLEARANCE = 0.0620
EQUIVALENT DIAMETER = 0.2506

RUN NUMBER 1
TYPE C METERING RING
ANNULUS CLEARANCE = 0.130
ANNULUS AREA = 0.4529 SQ IN

DATE RUN DECEMBER 6, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO =.620
METERING RING AREA = 0.2808 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.959	0.138	0.859	0.848	-0.011	1.365	1.109E 05	.0163	1.196	1.119E 05	0.460	0.016	0.2025
1.621	0.227	1.449	1.470	0.007	1.373	1.441E 05	.0158	1.227	1.454E 05	0.472	0.005	0.2627
2.060	0.267	1.967	1.924	-0.043	1.351	1.647E 05	.0144	1.239	1.661E 05	0.476	0.027	0.3000
2.434	0.315	2.306	2.260	-0.011	1.381	1.772E 05	.0146	1.254	1.787E 05	0.482	0.006	0.3226
2.948	0.369	2.769	2.768	0.023	1.389	1.939E 05	.0142	1.269	1.956E 05	0.488	0.011	0.3528
3.391	0.439	3.144	3.147	0.003	1.432	2.054E 05	.0151	1.289	2.072E 05	0.495	0.001	0.3735
4.149	0.730	3.712	3.639	-0.083	1.580	2.160E 05	.0224	1.331	2.179E 05	0.512	0.029	0.3927
4.684	0.838	4.196	4.177	-0.058	1.609	2.277E 05	.0231	1.371	2.297E 05	0.527	0.018	0.4137
5.215	0.951	4.808	4.689	-0.119	1.605	2.406E 05	.0234	1.372	2.427E 05	0.527	0.033	0.4370
6.123	1.121	5.836	5.749	-0.185	1.631	2.483E 05	.0236	1.435	2.505E 05	0.551	0.044	0.4511
6.831	1.214	6.820	6.676	-0.169	1.629	2.623E 05	.0227	1.481	2.646E 05	0.569	0.035	0.4766
7.414	1.442	7.554	7.353	-0.176	1.656	2.708E 05	.0252	1.515	2.732E 05	0.582	0.034	0.4920
7.805	1.505	8.045	7.891	-0.178	1.682	2.756E 05	.0252	1.562	2.780E 05	0.600	0.033	0.5008
8.181	1.618	8.592	8.390	-0.203	1.688	2.818E 05	.0259	1.583	2.843E 05	0.608	0.035	0.5119
8.695	1.723	9.290	9.115	-0.234	1.725	2.877E 05	.0264	1.644	2.902E 05	0.632	0.038	0.5223
9.053	1.845	10.002	9.741	-0.311	1.722	2.937E 05	.0270	1.676	2.963E 05	0.644	0.048	0.5333
9.426	1.927	10.677	10.419	-0.322	1.740	2.961E 05	.0272	1.730	2.987E 05	0.665	0.048	0.5378
9.993	2.038	11.782	11.418	-0.363	1.764	2.991E 05	.0273	1.795	3.017E 05	0.690	0.050	0.5428

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3600 | RUN NUMBER 1 | DATE RUN DECEMBER 9, 1963
BAROMETRIC PRESSURE = 28.865 IN HG | TYPE E METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0610 | ANNULUS CLEARANCE = 0.130 | METERING RING AREA RATIO =.640
EQUIVALENT DIAMETER = 0.2506 | ANNULUS AREA = 0.4529 SQ IN | METERING RING AREA = 0.2900 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
109.5	108.0	108.0	109.0	109.0	0.84	-0.004	0.123	0.	0.	0.61	0.098	0.712	0.154	520.30
109.5	107.0	107.0	108.5	108.3	1.35	0.	0.211	-0.005	0.	0.98	0.147	1.154	0.257	519.85
109.8	106.3	106.3	108.5	108.0	1.92	-0.011	0.295	-0.016	0.005	1.45	0.221	1.660	0.361	519.63
109.8	105.5	105.5	107.5	107.5	2.41	-0.007	0.368	-0.013	0.009	1.84	0.270	2.088	0.470	519.62
110.0	105.0	105.0	107.5	107.5	2.75	-0.014	0.418	-0.014	0.011	2.14	0.295	2.456	0.538	519.62
110.0	103.5	103.5	106.5	106.3	3.44	0.011	0.540	0.004	0.007	2.68	0.359	3.021	0.629	518.72
110.0	102.0	102.0	106.3	105.2	4.27	0.	0.786	0.016	0.007	3.24	0.418	3.625	0.650	518.72
110.0	100.3	100.5	105.5	104.9	4.79	-0.014	0.982	-0.014	0.031	3.86	0.491	4.323	0.788	518.27
110.0	99.8	100.0	105.5	104.5	5.38	-0.018	1.081	-0.043	0.020	4.25	0.580	4.804	0.842	519.61
101.5	90.0	90.5	96.5	95.5	5.54	0.	0.909	-0.036	0.031	5.03	0.712	5.713	1.149	520.98
100.0	87.5	88.0	94.5	93.5	6.02	-0.007	1.007	-0.054	0.027	5.48	0.712	6.179	1.265	520.52
101.0	87.0	87.5	95.0	93.5	6.51	-0.036	1.081	-0.043	0.022	6.18	0.810	6.926	1.373	520.07
99.5	84.5	85.2	93.0	92.0	6.93	-0.027	1.154	-0.040	0.013	6.73	0.860	7.540	1.481	518.49
100.0	84.5	84.5	93.2	91.8	7.34	-0.014	1.228	-0.033	0.025	7.29	0.933	8.154	1.554	519.16
99.5	82.5	83.5	92.0	90.5	7.59	-0.018	1.253	-0.014	0.011	7.54	0.973	8.473	1.604	517.59
96.0	77.3	78.0	88.5	86.5	8.18	-0.014	1.351	0.	0.007	8.60	1.081	9.603	1.749	519.16

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3600 | RUN NUMBER 1 | DATE RUN DECEMBER 9, 1963
BAROMETRIC PRESSURE = 28.865 IN HG | TYPE E METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0610 | ANNULUS CLEARANCE = 0.130 | METERING RING AREA RATIO =.640
EQUIVALENT DIAMETER = 0.2506 | ANNULUS AREA = 0.4529 SQ IN | METERING RING AREA = 0.2900 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.831	0.125	0.712	0.716	0.004	1.330	1.062E 05	.0165	1.136	1.071E 05	0.466	0.006	0.1917
1.351	0.209	1.157	1.153	0.020	1.380	1.330E 05	.0176	1.162	1.341E 05	0.476	0.020	0.2401
1.905	0.292	1.671	1.694	0.014	1.355	1.597E 05	.0171	1.184	1.610E 05	0.485	0.009	0.2881
2.424	0.366	2.098	2.151	0.028	1.393	1.776E 05	.0172	1.208	1.791E 05	0.495	0.015	0.3205
2.762	0.418	2.469	2.492	0.048	1.375	1.911E 05	.0170	1.209	1.927E 05	0.495	0.023	0.3448
3.477	0.537	3.022	3.086	0.048	1.457	2.087E 05	.0183	1.251	2.104E 05	0.513	0.019	0.3760
4.307	0.794	3.621	3.655	0.000	1.598	2.218E 05	.0238	1.300	2.237E 05	0.533	0.000	0.3997
4.813	0.982	4.345	4.363	-0.007	1.583	2.358E 05	.0260	1.368	2.378E 05	0.561	0.002	0.4247
5.403	1.068	4.836	4.811	-0.049	1.594	2.482E 05	.0252	1.346	2.503E 05	0.552	0.013	0.4478
5.591	0.891	5.746	5.795	0.014	1.394	2.597E 05	.0177	1.364	2.619E 05	0.559	0.003	0.4696
6.069	0.983	6.220	6.318	0.088	1.434	2.654E 05	.0184	1.401	2.676E 05	0.574	0.018	0.4795
6.540	1.077	6.958	7.085	0.063	1.426	2.777E 05	.0185	1.443	2.801E 05	0.591	0.012	0.5015
6.970	1.148	7.566	7.698	0.083	1.452	2.834E 05	.0188	1.490	2.858E 05	0.611	0.015	0.5105
7.401	1.219	8.183	8.308	0.051	1.468	2.906E 05	.0189	1.524	2.930E 05	0.625	0.009	0.5240
7.643	1.254	8.486	8.565	0.040	1.493	2.933E 05	.0191	1.542	2.958E 05	0.632	0.007	0.5277
8.271	1.358	9.607	9.712	0.032	1.521	2.965E 05	.0193	1.630	2.990E 05	0.668	0.005	0.5347

APPENDIX B (Continued)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3700 | RUN NUMBER 1 | DATE RUN DECEMBER 9, 1963
BAROMETRIC PRESSURE = 28.885 IN HG | TYPE F METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0600 | ANNULUS CLEARANCE = 0.130 | METERING RING AREA RATIO =.597
EQUIVALENT DIAMETER = 0.2506 | ANNULUS AREA = 0.4529 SQ IN | METERING RING AREA = 0.2705 SQ I

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	109.0	109.0	109.5	109.5	0.61	0.	0.098	0.	0.004	0.52	0.098	0.614	0.116	522.10
110.0	107.5	107.5	109.0	109.0	1.20	0.	0.187	0.	0.004	1.06	0.177	1.203	0.231	521.65
109.5	106.3	106.3	108.3	108.0	1.57	0.	0.236	0.	0.004	1.45	0.221	1.646	0.311	520.97
111.0	107.0	107.0	109.5	109.0	2.06	-0.005	0.295	0.	0.011	1.92	0.344	2.210	0.372	519.40
110.0	105.0	105.0	108.0	107.5	2.60	0.	0.393	0.	0.	2.43	0.393	2.800	0.517	521.42
110.0	103.5	103.5	107.0	106.8	3.14	0.	0.491	0.	0.009	2.97	0.491	3.414	0.636	520.75
109.5	102.5	102.5	106.5	106.0	3.59	0.004	0.540	0.007	0.007	3.44	0.540	3.930	0.712	520.52
110.5	101.9	102.5	107.0	106.5	4.08	0.005	0.604	-0.007	0.011	3.98	0.639	4.593	0.824	520.29
110.0	100.5	101.0	106.5	105.5	4.40	0.014	0.589	-0.014	0.009	4.35	0.688	5.010	0.896	518.94
99.8	87.5	88.0	94.5	93.5	5.38	0.	0.835	0.007	0.	5.64	0.801	6.386	1.113	519.84
99.5	86.0	87.0	94.0	93.0	5.85	0.	0.909	-0.007	0.014	6.02	0.884	7.147	1.221	519.16
100.0	85.5	86.5	94.5	93.0	6.16	-0.014	0.958	-0.004	0.020	6.75	0.973	7.687	1.286	518.04
99.8	84.0	85.0	93.5	92.5	6.56	0.	1.032	-0.011	0.020	7.29	1.032	8.326	1.362	519.16
99.8	84.0	85.0	93.5	92.5	6.70	0.	1.081	-0.047	0.025	7.54	0.589	8.621	1.420	518.71
110.3	83.0	84.5	93.5	92.5	7.12	0.	1.130	-0.036	0.029	8.20	1.154	9.333	1.528	518.71
100.0	81.5	83.0	93.0	91.5	7.49	0.	1.179	-0.014	0.025	8.82	1.253	10.011	1.601	518.71
94.0	72.3	73.5	85.5	84.5	8.44	-0.022	1.326	-0.036	0.007	10.76	1.424	12.182	1.806	518.49

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3700 RUN NUMBER 1 DATE RUN DECEMBER 9, 1963
BAROMETRIC PRESSURE = 28.885 IN HG TYPE F METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0600 ANNULUS CLEARANCE = 0.130 METERING RING AREA RATIO =.597
EQUIVALENT DIAMETER = 0.2506 ANNULUS AREA = 0.4529 SQ IN METERING RING AREA = 0.2705 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.614	0.098	0.616	0.593	-0.022	1.325	9.121E 04	.0176	1.273	9.195E 04	0.454	0.048	0.1652
1.203	0.187	1.205	1.210	-0.024	1.361	1.261E 05	.0175	1.353	1.271E 05	0.483	0.027	0.2282
1.572	0.236	1.649	1.657	-0.015	1.328	1.459E 05	.0164	1.379	1.470E 05	0.492	0.012	0.2637
2.081	0.297	2.216	2.164	-0.101	1.362	1.673E 05	.0160	1.390	1.687E 05	0.496	0.064	0.3018
2.632	0.393	2.800	2.776	-0.049	1.353	1.872E 05	.0165	1.392	1.887E 05	0.497	0.024	0.3387
3.175	0.491	3.418	3.398	-0.069	1.372	2.045E 05	.0173	1.425	2.062E 05	0.508	0.028	0.3697
3.628	0.542	3.930	3.907	-0.072	1.401	2.160E 05	.0170	1.458	2.178E 05	0.520	0.026	0.3903
4.127	0.598	4.602	4.530	-0.096	1.383	2.329E 05	.0162	1.461	2.348E 05	0.521	0.030	0.4208
4.459	0.575	5.022	4.949	-0.097	1.399	2.410E 05	.0145	1.490	2.430E 05	0.532	0.028	0.4345
5.435	0.839	6.382	6.365	-0.071	1.445	2.504E 05	.0177	1.599	2.524E 05	0.570	0.017	0.4520
5.905	0.905	7.158	6.813	-0.099	1.450	2.606E 05	.0176	1.573	2.627E 05	0.561	0.021	0.4699
6.236	0.963	7.699	7.592	-0.147	1.451	2.691E 05	.0177	1.655	2.713E 05	0.590	0.030	0.4844
6.650	1.026	8.341	8.185	-0.156	1.472	2.749E 05	.0179	1.690	2.771E 05	0.603	0.030	0.4956
6.798	1.057	8.657	8.479	0.313	1.468	2.786E 05	.0179	1.705	2.809E 05	0.608	0.058	0.5021
7.213	1.112	9.365	9.195	-0.194	1.605	2.868E 05	.0195	1.910	2.891E 05	0.681	0.037	0.5168
7.582	1.172	10.031	9.848	-0.242	1.496	2.918E 05	.0180	1.794	2.941E 05	0.640	0.040	0.5257
8.512	1.319	12.203	11.932	-0.272	1.550	2.958E 05	.0185	1.975	2.982E 05	0.705	0.039	0.5328

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3800 | RUN NUMBER 1 | DATE RUN DECEMBER 10, 1963
BAROMETRIC PRESSURE = 29.320 IN HG | TYPE F METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0250 | ANNULUS CLEARANCE = 0.095 | METERING RING AREA RATIO =.449
EQUIVALENT DIAMETER = 0.1850 | ANNULUS AREA = 0.3310 SQ IN | METERING RING AREA = 0.1486 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	108.5	108.5	110.0	110.0	0.54	0.	0.123	-0.007	-0.020	1.28	0.	1.253	0.070	524.35
110.5	107.0	107.0	109.8	109.6	1.08	0.	0.221	-0.011	-0.051	2.60	0.	2.628	0.132	523.23
110.0	104.5	104.0	108.5	108.3	1.67	0.005	0.344	-0.014	-0.108	4.09	0.049	4.003	0.206	522.10
110.0	102.0	102.0	108.3	107.5	2.19	0.009	0.467	-0.020	-0.190	5.62	0.074	5.541	0.264	521.43
109.9	100.0	99.8	107.5	107.0	2.75	0.014	0.565	-0.022	-0.237	7.17	0.123	6.990	0.325	521.65
110.0	98.8	98.5	107.5	106.5	3.09	0.016	0.639	-0.023	-0.269	8.30	0.138	8.154	0.376	520.30
110.0	95.5	95.3	106.5	106.0	3.78	0.016	0.786	-0.016	-0.289	10.49	0.147	10.315	0.495	519.84
109.3	92.8	92.5	105.5	104.5	4.27	0.023	0.884	-0.029	-0.350	12.03	0.172	11.862	0.537	518.72
110.5	91.0	91.0	106.5	105.5	4.85	0.029	1.007	-0.029	-0.448	14.49	0.172	14.245	0.643	520.07
110.0	88.0	87.5	105.0	103.7	5.30	0.036	1.130	-0.043	-0.520	16.28	0.221	16.038	0.701	518.94
110.0	83.5	83.0	104.0	103.0	6.01	0.043	1.277	-0.054	-0.547	19.65	0.309	19.402	0.820	518.71
110.5	80.5	80.0	104.5	103.0	6.53	0.049	1.375	-0.051	-0.643	23.04	0.540	22.325	0.921	518.49
110.0	76.8	75.8	103.5	102.0	7.00	0.045	1.474	-0.054	-0.674	25.71	0.702	25.228	1.004	518.48
110.0	70.8	70.2	102.8	101.0	7.56	0.040	1.572	-0.054	-1.060	30.99	0.516	30.233	1.120	517.80
109.5	60.2	60.2	102.0	100.0	8.01	0.040	1.670	-0.045	-1.853	39.84	0.393	39.841	1.373	518.93

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3800 | RUN NUMBER 1 | DATE RUN DECEMBER 10, 1963
BAROMETRIC PRESSURE = 29.320 IN HG | TYPE F METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0250 | ANNULUS CLEARANCE = 0.095 | METERING RING AREA RATIO =.449
EQUIVALENT DIAMETER = 0.1850 | ANNULUS AREA = 0.3310 SQ IN | METERING RING AREA = 0.1486 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.540	0.119	1.246	1.328	0.057	1.572	5.769E 04	.0213	3.842	5.816E 04	0.775	0.163	0.1038
1.081	0.216	2.608	2.697	0.113	1.546	8.266E 04	.0189	3.817	8.334E 04	0.770	0.157	0.1485
1.675	0.334	3.956	4.236	0.240	1.618	1.007E 05	.0196	4.025	1.015E 05	0.811	0.221	0.1806
2.195	0.452	5.456	5.812	0.347	1.585	1.166E 05	.0198	4.107	1.176E 05	0.828	0.234	0.2090
2.765	0.547	6.882	7.398	0.457	1.595	1.303E 05	.0190	4.154	1.314E 05	0.837	0.242	0.2336
3.111	0.619	8.031	8.565	0.524	1.603	1.384E 05	.0192	4.280	1.396E 05	0.863	0.244	0.2476
3.798	0.770	10.179	10.819	0.616	1.602	1.532E 05	.0194	4.395	1.545E 05	0.886	0.229	0.2739
4.318	0.858	11.702	12.401	0.699	1.640	1.614E 05	.0194	4.514	1.627E 05	0.910	0.229	0.2881
4.908	0.978	14.035	14.926	0.817	1.622	1.733E 05	.0191	4.701	1.747E 05	0.948	0.227	0.3099
5.369	1.090	15.799	16.759	0.935	1.651	1.798E 05	.0198	4.886	1.813E 05	0.985	0.236	0.3210
6.082	1.228	19.156	20.204	1.112	1.656	1.912E 05	.0196	5.176	1.928E 05	1.043	0.238	0.3413
6.615	1.326	22.029	23.654	1.453	1.649	2.003E 05	.0193	5.522	2.020E 05	1.113	0.275	0.3574
7.081	1.424	24.918	26.385	1.682	1.653	2.066E 05	.0193	5.739	2.083E 05	1.157	0.287	0.3686
7.643	1.525	29.730	31.732	1.757	1.686	2.129E 05	.0195	6.485	2.147E 05	1.307	0.266	0.3794
8.086	1.628	38.937	40.755	1.425	1.690	2.177E 05	.0196	7.850	2.195E 05	1.582	0.181	0.3886

APPENDIX B (Continued)

APPENDIX B (Continued)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3900 | RUN NUMBER 1 | DATE RUN DECEMBER 10, 1963
BAROMETRIC PRESSURE = 29.360 IN HG | TYPE E METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0260 | ANNULUS CLEARANCE = 0.095 | METERING RING AREA RATIO =.508
EQUIVALENT DIAMETER = 0.1850 | ANNULUS AREA = 0.3310 SQ IN | METERING RING AREA = 0.1680 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	104.5	108.3	109.6	109.6	0.56	0.004	0.098	0.	0.	1.15	0.049	1.090	0.085	521.88
109.5	104.0	105.8	108.5	108.3	1.13	0.007	0.231	0.007	-0.056	2.33	0.123	2.260	0.072	521.88
109.3	104.5	104.0	108.0	107.5	1.72	0.011	0.319	0.011	-0.098	3.56	0.123	3.414	0.108	522.10
110.0	103.0	103.0	108.3	107.8	2.16	0.011	0.442	0.009	-0.137	4.72	0.123	4.593	0.166	521.88
110.0	102.0	101.3	107.5	107.0	2.51	0.016	0.491	0.011	-0.165	5.55	0.147	5.379	0.213	521.88
110.0	100.0	99.8	107.0	106.5	3.05	0.029	0.614	0.013	-0.173	6.88	0.196	6.656	0.282	521.20
110.0	98.0	97.5	107.0	106.0	3.63	0.042	0.737	0.023	-0.188	8.40	0.246	8.129	0.369	521.65
109.5	96.0	95.5	106.0	105.0	4.08	0.051	0.810	0.009	-0.210	9.63	0.295	9.308	0.405	521.43
110.0	93.5	92.3	105.2	104.5	4.91	0.034	0.982	0.007	-0.302	12.16	0.368	11.740	0.484	521.65
109.8	92.9	90.1	104.8	103.5	5.33	0.042	1.056	-0.004	-0.318	13.51	0.393	13.041	0.538	521.43
110.0	86.0	86.0	104.2	103.0	6.31	0.054	1.228	-0.014	-0.452	17.00	0.491	16.504	0.650	521.20
110.5	84.0	82.5	104.0	102.8	7.00	0.065	1.375	-0.016	-0.542	20.07	0.540	19.501	0.672	521.20
110.0	80.0	79.5	103.0	101.5	7.47	0.054	1.474	-0.004	-0.632	22.35	0.614	21.686	0.715	521.65
110.8	78.0	74.5	103.0	101.0	8.08	0.079	1.621	-0.029	-0.710	26.79	0.678	26.029	0.759	521.20
110.0	75.0	69.5	101.5	99.8	8.65	0.061	1.744	-0.031	-0.831	30.48	0.688	29.231	0.744	520.98

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3900 RUN NUMBER 1 DATE RUN DECEMBER 10, 1963
BAROMETRIC PRESSURE = 29.360 IN HG TYPE E METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0.0260 ANNULUS CLEARANCE = 0.095 METERING RING AREA RATIO =.508
EQUIVALENT DIAMETER = 0.1850 ANNULUS AREA = 0.3310 SQ IN METERING RING AREA = 0.1680 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.568	0.096	1.090	1.210	0.105	1.604	5.893E 04	.0167	3.396	5.943E 04	0.875	0.291	0.1057
1.137	0.231	2.228	2.383	0.204	1.592	8.349E 04	.0197	3.300	8.420E 04	0.850	0.277	0.1497
1.730	0.319	3.360	3.630	0.246	1.629	1.017E 05	.0183	3.362	1.025E 05	0.867	0.222	0.1824
2.172	0.441	4.520	4.824	0.305	1.554	1.170E 05	.0191	3.379	1.180E 05	0.871	0.205	0.2098
2.521	0.488	5.290	5.691	0.376	1.574	1.253E 05	.0184	3.466	1.264E 05	0.894	0.219	0.2247
3.074	0.606	6.563	7.061	0.473	1.582	1.382E 05	.0187	3.526	1.394E 05	0.909	0.224	0.2476
3.696	0.728	8.024	8.636	0.588	1.605	1.503E 05	.0189	3.616	1.516E 05	0.932	0.230	0.2695
4.149	0.790	9.199	9.901	0.677	1.609	1.588E 05	.0182	3.686	1.602E 05	0.950	0.233	0.2846
4.973	0.969	11.585	12.487	0.853	1.626	1.733E 05	.0187	3.887	1.747E 05	1.002	0.240	0.3105
5.401	1.033	12.884	13.875	0.917	1.632	1.802E 05	.0184	3.975	1.817E 05	1.025	0.234	0.3228
6.400	1.194	16.286	17.439	1.153	1.655	1.951E 05	.0180	4.233	1.967E 05	1.091	0.241	0.3494
7.101	1.335	19.238	20.536	1.274	1.657	2.057E 05	.0181	4.468	2.075E 05	1.152	0.231	0.3685
7.560	1.445	21.372	22.833	1.412	1.661	2.114E 05	.0184	4.653	2.132E 05	1.199	0.234	0.3789
8.199	1.567	25.688	27.320	1.543	1.651	2.217E 05	.0182	5.072	2.236E 05	1.307	0.223	0.3972
8.750	1.698	28.831	30.983	1.592	1.677	2.267E 05	.0187	5.440	2.286E 05	1.402	0.209	0.4059

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4000 RUN NUMBER 3 DATE RUN JANUARY 17, 1964
BAROMETRIC PRESSURE = 29.300 IN HG TYPE E METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0. ANNULUS CLEARANCE = 0.065 METERING RING AREA RATIO =.342
EQUIVALENT DIAMETER = 0.1276 ANNULUS AREA = 0.2265 SQ IN METERING RING AREA = 0.0775 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
119.5	118.2	117.5	119.5	119.3	0.39	0.	0.098	0.011	0.074	1.92	0.221	1.719	0.011	523.01
119.8	117.0	116.3	119.5	119.3	0.66	0.	0.147	0.020	0.119	3.17	0.344	2.824	0.016	521.21
120.0	115.9	115.2	120.0	119.5	0.91	0.	0.196	0.028	0.197	4.59	0.476	4.087	0.027	520.08
120.0	114.0	113.1	119.5	119.0	1.18	0.	0.270	0.036	0.264	5.92	0.599	5.295	0.036	518.50
120.0	112.5	111.5	119.3	118.7	1.47	0.	0.344	0.047	0.331	7.49	0.747	6.705	0.054	517.59
120.0	110.6	109.5	119.0	118.2	1.74	0.	0.393	0.052	0.390	8.94	0.909	8.007	0.069	517.37
120.0	108.9	107.2	118.6	117.5	2.01	0.	0.467	0.061	0.452	10.56	1.081	9.480	0.079	517.82
120.0	106.0	104.5	118.0	117.2	2.36	0.	0.540	0.072	0.544	12.87	1.302	11.519	0.098	517.59
120.1	104.0	102.5	118.3	117.2	2.73	0.	0.639	0.079	0.659	15.23	1.523	13.680	0.108	517.37
120.0	101.5	99.6	117.5	116.6	3.08	-0.010	0.688	0.085	0.710	17.44	1.758	15.645	0.119	517.37
120.0	98.5	96.5	117.0	116.0	3.91	0.	0.810	0.094	0.777	20.11	1.989	18.076	0.126	518.72
120.0	95.2	93.0	117.0	115.5	3.78	0.	0.884	0.103	0.900	23.14	2.260	20.827	0.155	518.95
119.9	91.2	88.7	116.0	114.6	4.18	0.	0.982	0.108	0.961	26.52	2.554	23.946	0.145	518.50
120.0	88.0	85.5	116.1	115.0	4.52	0.011	1.032	0.110	1.050	30.01	2.849	27.011	0.159	519.40
120.0	83.1	79.9	115.9	114.5	4.91	0.014	1.169	0.116	1.106	34.95	3.144	31.398	0.159	518.50
120.1	76.8	73.5	115.5	114.0	5.34	0.018	1.277	0.116	0.988	40.54	3.193	37.238	0.166	517.59
120.0	56.0	56.5	115.0	113.0	5.80	0.022	1.400	0.107	-1.445	56.56	0.442	57.063	0.191	518.50

APPENDIX B (Continued)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4000 RUN NUMBER 3 DATE RUN JANUARY 17, 1964
BAROMETRIC PRESSURE = 29.300 IN HG TYPE E METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0. ANNULUS CLEARANCE = 0.065 METERING RING AREA RATIO =.342
EQUIVALENT DIAMETER = 0.1276 ANNULUS AREA = 0.2265 SQ IN METERING RING AREA = 0.0775 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.393	0.104	1.751	1.919	0.192	1.603	3.499E 04	.0179	7.797	6.133E 04	0.912	0.772	0.0623
0.663	0.157	2.874	3.171	0.297	1.636	4.524E 04	.0164	7.776	7.928E 04	0.910	0.712	0.0803
0.909	0.211	4.171	4.603	0.403	1.556	5.450E 04	.0152	7.814	9.552E 04	0.914	0.662	0.0966
1.179	0.288	5.409	5.935	0.501	1.576	6.191E 04	.0162	7.847	1.085E 05	0.918	0.636	0.1095
1.474	0.367	6.847	7.511	0.625	1.579	6.932E 04	.0166	7.936	1.215E 05	0.928	0.626	0.1225
1.744	0.419	8.175	8.967	0.767	1.588	7.521E 04	.0160	8.037	1.318E 05	0.940	0.645	0.1328
2.014	0.497	9.675	10.595	0.920	1.587	8.079E 04	.0164	8.191	1.416E 05	0.958	0.659	0.1428
2.358	0.576	11.754	12.909	1.106	1.571	8.790E 04	.0160	8.412	1.541E 05	0.984	0.656	0.1553
2.726	0.678	13.970	15.275	1.281	1.564	9.481E 04	.0162	8.541	1.662E 05	0.999	0.640	0.1674
3.075	0.735	15.957	17.487	1.495	1.588	9.989E 04	.0158	8.774	1.751E 05	1.026	0.659	0.1764
3.905	0.857	18.418	20.180	1.713	1.815	1.049E 05	.0165	9.047	1.839E 05	1.058	0.659	0.1857
3.782	0.936	21.225	23.219	1.945	1.580	1.106E 05	.0162	9.356	1.939E 05	1.094	0.655	0.1959
4.175	1.037	24.372	26.605	2.209	1.601	1.156E 05	.0164	9.805	2.025E 05	1.147	0.660	0.2044
4.530	1.081	27.481	30.119	2.486	1.595	1.204E 05	.0156	0.162	2.110E 05	1.189	0.660	0.2132
4.926	1.220	31.892	35.074	2.774	1.612	1.251E 05	.0164	0.951	2.193E 05	1.281	0.651	0.2214
5.362	1.326	37.674	40.706	2.919	1.616	1.307E 05	.0163	1.658	2.291E 05	1.364	0.590	0.2310
5.818	1.442	56.287	56.823	0.595	1.626	1.354E 05	.0164	5.025	2.373E 05	1.758	0.088	0.2395

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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4100 | RUN NUMBER 1 | DATE RUN DECEMBER 13, 1963
BAROMETRIC PRESSURE = 29.375 IN HG | TYPE F METERING RING | TYPE B SPACER PLATE
METERING RING CLEARANCE = 0. | ANNULUS CLEARANCE = 0.065 | METERING RING AREA RATIO =.272
EQUIVALENT DIAMETER = 0.1276 | ANNULUS AREA = 0.2265 SQ IN | METERING RING AREA = 0.0615 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	118.5	118.0	120.0	120.0	0.29	0.	0.074	0.	-0.043	1.96	0.098	1.817	0.007	531.96
120.0	116.5	116.0	120.0	120.0	0.56	0.004	0.123	0.004	-0.089	4.03	0.221	3.733	0.014	531.07
118.5	113.3	112.5	118.5	118.3	0.88	0.005	0.221	0.009	-0.085	5.87	0.393	5.403	0.020	532.18
119.5	112.5	112.0	119.5	119.0	1.06	0.005	0.270	0.011	-0.155	7.12	0.393	6.705	0.029	529.29
120.0	111.0	110.3	119.5	119.5	1.28	0.004	0.319	0.013	-0.072	8.79	0.442	8.301	0.029	528.17
120.0	108.2	107.3	119.0	118.5	1.60	0.	0.393	0.013	-0.007	11.17	0.688	10.512	0.043	528.39
120.0	105.5	104.0	119.0	118.5	1.92	0.	0.491	0.014	0.	13.80	0.860	12.869	0.054	528.17
120.0	103.8	102.2	118.3	117.6	2.11	0.	0.516	0.014	0.	15.60	1.081	14.515	0.065	527.50
120.0	101.0	100.0	118.5	117.8	2.36	-0.004	0.589	0.018	0.031	18.22	1.179	17.020	0.054	525.71
120.0	97.2	96.0	118.0	117.0	2.70	0.	0.688	0.018	-0.036	21.44	1.375	20.090	0.065	526.82
119.8	93.7	92.0	117.2	116.5	3.00	0.005	0.761	0.018	0.065	24.76	1.719	23.062	0.061	526.15
120.0	89.9	87.0	117.5	116.5	3.29	0.	0.835	0.016	0.144	28.71	2.137	26.628	0.069	526.82
120.0	85.5	82.8	117.0	116.5	3.63	-0.011	0.884	0.023	0.193	33.48	2.569	31.034	0.065	524.58
120.0	78.2	72.5	116.5	115.5	4.05	-0.011	1.007	0.016	0.181	43.04	3.659	39.340	0.051	526.60
120.0	66.0	61.0	116.5	115.5	4.27	-0.018	1.081	0.022	0.141	54.56	4.912	49.552	0.152	524.13
120.0	54.0	49.5	116.3	115.0	4.37	-0.009	1.081	0.036	0.379	65.57	4.421	61.066	0.036	525.03

APPENDIX B (Continued)

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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4100 RUN NUMBER 1 DATE RUN DECEMBER 13, 1963
BAROMETRIC PRESSURE = 29.375 IN HG TYPE F METERING RING TYPE B SPACER PLATE
METERING RING CLEARANCE = 0. ANNULUS CLEARANCE = 0.065 METERING RING AREA RATIO =.272
EQUIVALENT DIAMETER = 0.1276 ANNULUS AREA = 0.2265 SQ IN METERING RING AREA = 0.0615 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.295	0.074	1.796	1.968	0.124	1.512	3.059E 04	.0160	0.072	7.045E 04	0.743	0.624	0.0552
0.568	0.123	3.687	4.037	0.276	1.412	4.406E 04	.0129	9.973	1.015E 05	0.736	0.663	0.0794
0.890	0.223	5.356	5.878	0.448	1.525	5.260E 04	.0161	9.992	1.211E 05	0.737	0.731	0.0949
1.061	0.273	6.622	7.135	0.488	1.475	5.905E 04	.0160	9.816	1.360E 05	0.724	0.638	0.1061
1.281	0.324	8.259	8.811	0.504	1.444	6.586E 04	.0154	9.814	1.517E 05	0.724	0.526	0.1182
1.596	0.399	10.502	11.207	0.730	1.447	7.340E 04	.0152	0.008	1.691E 05	0.738	0.600	0.1318
1.916	0.498	12.862	13.826	0.890	1.445	8.051E 04	.0158	0.242	1.854E 05	0.755	0.595	0.1445
2.112	0.523	14.508	15.625	1.117	1.447	8.463E 04	.0150	0.492	1.949E 05	0.774	0.667	0.1517
2.354	0.600	17.026	18.272	1.221	1.420	9.056E 04	.0151	0.783	2.086E 05	0.795	0.627	0.1619
2.702	0.697	20.063	21.493	1.455	1.451	9.571E 04	.0156	1.254	2.204E 05	0.830	0.645	0.1714
3.002	0.768	23.085	24.806	1.746	1.464	1.006E 05	.0156	1.757	2.316E 05	0.867	0.681	0.1799
3.291	0.843	26.692	28.774	2.136	1.439	1.061E 05	.0153	2.195	2.443E 05	0.899	0.720	0.1900
3.624	0.901	31.119	33.538	2.547	1.465	1.109E 05	.0151	3.106	2.555E 05	0.967	0.757	0.1980
4.042	1.021	39.422	43.110	3.644	1.461	1.168E 05	.0152	4.993	2.689E 05	1.106	0.881	0.2091
4.255	1.101	49.612	54.708	5.003	1.454	1.208E 05	.0155	7.950	2.782E 05	1.324	1.011	0.2155
4.363	1.103	61.238	65.663	4.342	1.457	1.219E 05	.0152	1.032	2.809E 05	1.551	0.730	0.2178

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4200 | RU NUMBER 3 | DATE RUN JANUARY 20, 1964
BAROMETRIC PRESSURE = 29.690 IN HG | TYPE B METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0. | ANNULUS CLEARANCE = 0.065 | METERING RING AREA RATIO =.266
EQUIVALENT DIAMETER = 0.1145 | ANNULUS AREA = 0.2070 SQ IN | METERING RING AREA = 0.0550 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	118.0	117.9	120.0	120.0	0.35	0.007	0.074	0.011	0.	2.60	0.	2.603	0.009	522.11
119.8	114.0	113.9	119.5	119.0	0.74	0.011	0.172	0.020	-0.007	5.55	0.025	5.477	0.025	520.98
120.0	112.5	112.0	119.5	119.0	0.93	0.013	0.187	0.025	-0.004	7.10	0.	7.049	0.034	520.08
120.2	110.0	109.8	119.5	119.0	1.23	0.018	0.270	0.029	0.014	9.77	0.	9.677	0.047	520.08
120.0	106.0	105.0	118.9	118.0	1.57	0.025	0.354	0.034	0.036	12.94	0.074	12.845	0.056	519.63
120.1	102.5	102.0	119.0	118.0	1.92	0.027	0.418	0.051	0.060	16.46	0.074	16.406	0.065	519.63
120.0	98.8	98.2	118.7	117.5	2.23	0.032	0.491	0.058	0.078	19.97	0.098	19.869	0.083	519.40
120.0	95.2	95.0	118.2	117.0	2.43	0.032	0.516	0.065	0.087	22.69	0.098	22.546	0.087	519.63
120.0	90.0	89.6	118.0	117.0	2.82	0.025	0.589	0.081	0.094	27.83	0.108	27.006	0.108	518.05
120.0	84.5	84.2	117.3	116.5	3.12	0.029	0.639	0.096	0.099	32.74	0.157	32.002	0.123	517.14
120.0	80.9	80.5	117.2	116.4	3.29	0.029	0.663	0.098	0.092	36.30	0.172	35.504	0.130	516.69
120.2	73.4	72.8	117.3	116.5	3.54	0.045	0.761	0.105	0.052	43.75	0.196	43.343	0.163	516.01
120.0	55.2	55.0	117.0	115.5	3.78	0.052	0.786	0.112	-0.094	60.56	0.221	60.364	0.173	514.64
120.0	44.5	44.0	116.9	115.4	3.78	0.049	0.810	0.112	-0.163	71.47	0.452	70.973	0.033	514.42

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4200 RUN NUMBER 3 DATE RUN JANUARY 20, 1964
BAROMETRIC PRESSURE = 29.690 IN HG TYPE B METERING RING TYPE A SPACER PLATE
METERING RING CLEARANCE = 0. ANNULUS CLEARANCE = 0.065 METERING RING AREA RATIO =.266
EQUIVALENT DIAMETER = 0.1145 ANNULUS AREA = 0.2070 SQ IN METERING RING AREA = 0.0550 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.361	0.075	2.598	2.605	0.007	1.630	2.996E 04	.0130	1.730	6.946E 04	0.828	0.032	0.0543
0.748	0.176	5.463	5.558	0.046	1.603	4.358E 04	.0144	1.836	1.010E 05	0.835	0.093	0.0788
0.946	0.193	7.034	7.109	0.025	1.607	4.911E 04	.0124	1.972	1.138E 05	0.845	0.040	0.0887
1.246	0.276	9.669	9.792	0.024	1.590	5.670E 04	.0133	2.357	1.314E 05	0.872	0.028	0.1024
1.597	0.358	12.846	12.963	0.092	1.603	6.396E 04	.0136	2.819	1.483E 05	0.905	0.082	0.1155
1.943	0.429	16.411	16.473	0.087	1.593	7.079E 04	.0132	3.268	1.641E 05	0.936	0.062	0.1278
2.267	0.504	19.879	19.994	0.115	1.597	7.638E 04	.0133	3.798	1.770E 05	0.974	0.067	0.1378
2.463	0.532	22.557	22.724	0.118	1.587	7.983E 04	.0128	4.315	1.850E 05	1.010	0.061	0.1441
2.850	0.617	27.012	27.861	0.136	1.593	8.604E 04	.0129	5.172	1.994E 05	1.071	0.059	0.1550
3.148	0.672	32.003	32.781	0.198	1.598	9.050E 04	.0127	6.163	2.098E 05	1.141	0.074	0.1628
3.320	0.697	35.501	36.347	0.222	1.595	9.310E 04	.0125	6.945	2.158E 05	1.196	0.075	0.1674
3.582	0.791	43.317	43.814	0.291	1.582	9.735E 04	.0130	8.723	2.257E 05	1.321	0.083	0.1748
3.835	0.816	60.261	60.645	0.409	1.615	9.994E 04	.0127	4.666	2.317E 05	1.741	0.089	0.1791
3.831	0.842	70.836	71.490	0.604	1.605	1.003E 05	.0131	8.910	2.324E 05	2.040	0.111	0.1796

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4300 | RUN NUMBER 3 | DATE RUN JANUARY 20, 1964
BAROMETRIC PRESSURE = 29.720 IN HG | TYPE C METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0. | ANNULUS CLEARANCE = 0.065 | METERING RING AREA RATIO =.374
EQUIVALENT DIAMETER = 0.1145 | ANNULUS AREA = 0.2070 SQ IN | METERING RING AREA = 0.0775 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.2	119.0	120.0	119.6	0.37	0.005	0.088	0.014	0.005	1.28	0.	1.302	0.014	520.53
120.0	117.0	117.2	120.0	119.6	0.79	0.009	0.157	0.030	0.004	2.90	0.	2.898	0.029	519.18
120.0	115.5	115.5	119.7	119.2	1.13	0.014	0.246	0.038	0.007	4.22	0.025	4.151	0.036	517.14
119.9	114.0	113.8	119.0	118.5	1.33	0.018	0.295	0.045	0.014	4.99	0.059	4.912	0.043	515.78
120.0	113.0	113.0	119.0	118.5	1.57	0.018	0.344	0.052	0.014	5.97	0.069	5.894	0.054	515.10
120.0	112.0	111.9	119.0	118.3	1.77	0.022	0.393	0.060	0.018	6.83	0.093	6.729	0.067	514.42
120.1	110.0	109.9	119.0	118.0	2.19	0.023	0.467	0.072	0.023	8.60	0.098	8.498	0.079	514.42
120.0	107.5	107.0	118.0	117.0	2.53	0.025	0.516	0.085	0.034	10.12	0.108	10.011	0.090	513.51
120.2	106.0	105.8	118.3	117.3	2.85	0.016	0.589	0.098	0.043	11.79	0.123	11.641	0.108	513.05
120.0	103.1	102.8	117.5	116.3	3.27	0.022	0.688	0.110	0.043	13.85	0.172	13.655	0.119	512.60
120.1	100.0	99.0	117.3	116.2	3.68	0.029	0.786	0.130	0.049	16.58	0.187	16.357	0.137	512.37
120.0	98.7	96.2	116.5	115.0	4.13	0.033	0.884	0.152	0.050	19.67	0.196	18.911	0.164	511.92
120.1	91.3	91.0	116.2	114.9	4.81	0.060	1.032	0.170	0.049	24.17	0.221	23.799	0.188	512.14
120.0	86.5	86.0	115.3	114.0	5.26	0.078	1.154	0.184	0.049	28.44	0.295	27.497	0.220	512.37
119.5	79.6	79.0	114.0	112.5	6.12	0.083	1.302	0.228	0.051	37.54	0.418	36.904	0.191	512.37
119.9	57.8	57.0	113.5	112.0	6.58	0.108	1.375	0.253	-0.098	55.06	0.614	54.258	0.036	511.69

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4300 RUN NUMBER 3 DATE RUN JANUARY 20, 1964
BAROMETRIC PRESSURE = 29.720 IN HG TYPE C METERING RING TYPE A SPACER PLATE
METERING RING CLEARANCE = 0. ANNULUS CLEARANCE = 0.065 METERING RING AREA RATIO =.374
EQUIVALENT DIAMETER = 0.1145 ANNULUS AREA = 0.2070 SQ IN METERING RING AREA = 0.0775 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.374	0.093	1.298	1.282	0.009	1.715	2.985E 04	.0162	5.859	5.230E 04	0.821	0.040	0.0540
0.795	0.167	2.885	2.907	0.022	1.586	4.542E 04	.0127	5.758	7.958E 04	0.806	0.043	0.0820
1.144	0.257	4.135	4.238	0.053	1.587	5.475E 04	.0135	5.816	9.592E 04	0.815	0.071	0.0985
1.344	0.308	4.897	5.002	0.090	1.590	5.945E 04	.0138	5.845	1.042E 05	0.819	0.102	0.1067
1.590	0.361	5.875	5.992	0.112	1.578	6.505E 04	.0135	5.860	1.140E 05	0.821	0.105	0.1167
1.790	0.412	6.709	6.855	0.142	1.571	6.928E 04	.0136	5.919	1.214E 05	0.829	0.116	0.1241
2.209	0.491	8.473	8.627	0.154	1.572	7.699E 04	.0131	6.014	1.349E 05	0.842	0.100	0.1379
2.554	0.546	9.985	10.156	0.170	1.592	8.240E 04	.0127	6.184	1.444E 05	0.866	0.096	0.1474
2.865	0.630	11.614	11.834	0.195	1.558	8.837E 04	.0128	6.270	1.548E 05	0.878	0.094	0.1580
3.288	0.732	13.622	13.903	0.256	1.581	9.402E 04	.0131	6.486	1.647E 05	0.908	0.107	0.1680
3.713	0.837	16.316	16.632	0.281	1.553	1.009E 05	.0130	6.722	1.768E 05	0.941	0.100	0.1802
4.159	0.944	18.860	19.734	0.309	1.579	1.060E 05	.0133	7.209	1.857E 05	1.010	0.096	0.1892
4.873	1.087	23.738	24.245	0.359	1.588	1.144E 05	.0130	7.550	2.004E 05	1.057	0.091	0.2042
5.334	1.208	27.430	28.532	0.454	5.066	3.882E 04	.1250	6.679	6.801E 04	0.740	0.959	0.0693
6.199	1.374	36.815	37.610	0.579	1.644	1.264E 05	.0133	9.411	2.215E 05	1.318	0.103	0.2258
6.690	1.448	54.083	55.041	0.771	1.647	1.316E 05	.0129	2.732	2.307E 05	1.783	0.102	0.2349

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4400 | RUN NUMBER 1 | DATE RUN DECEMBER 1963
BAROMETRIC PRESSURE = 29.742 IN Hg | TYPE C METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0280 | ANNULUS CLEARANCE = 0.095 | METERING RING AREA RATIO =.562
EQUIVALENT DIAMETER = 0.1709 | ANNULUS AREA = 0.3115 SQ IN | METERING RING AREA = 0.1750 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.5	110.0	110.0	110.5	110.5	0.52	0.004	0.098	-0.009	0.051	0.54	0.172	0.639	0.004	523.46
110.5	108.9	108.9	110.2	110.0	1.03	0.009	0.196	-0.016	0.087	0.96	0.221	1.154	0.016	524.13
110.0	107.5	107.5	109.0	109.0	1.42	0.014	0.295	-0.022	0.117	1.28	0.221	1.498	0.025	524.36
110.0	106.0	106.0	108.5	108.0	1.87	0.016	0.368	-0.027	0.163	1.69	0.295	1.989	0.040	522.78
110.0	105.5	105.8	108.5	108.0	2.21	0.022	0.467	-0.029	0.182	2.06	0.393	2.456	0.049	523.23
110.8	105.2	105.8	109.0	108.4	2.51	0.020	0.516	-0.034	0.213	2.87	0.467	2.849	0.051	522.56
109.8	103.5	103.5	107.0	106.5	2.96	0.007	0.589	-0.025	0.248	2.82	0.516	3.340	0.043	524.58
110.0	102.2	102.5	107.0	106.5	3.59	0.014	0.712	-0.007	0.287	3.41	0.663	4.077	0.045	522.56
110.0	100.5	100.1	106.5	105.5	4.25	0.042	0.884	-0.051	0.370	4.22	0.810	4.986	0.051	523.68
110.0	99.0	99.8	105.2	104.7	4.75	0.052	0.982	-0.054	0.420	4.79	0.909	5.673	0.069	521.88
110.0	97.2	98.2	105.0	104.0	5.55	0.060	1.130	-0.067	0.423	5.76	1.056	6.793	0.098	521.66
110.0	94.2	95.5	104.0	103.0	6.61	0.067	1.366	-0.087	0.562	7.20	1.351	8.473	0.079	521.88
110.0	89.0	90.8	102.0	100.2	8.30	0.085	1.253	-0.098	0.737	9.75	1.867	11.592	0.137	522.33
109.5	85.5	87.5	100.5	99.0	9.23	0.065	1.940	-0.119	0.817	11.49	2.210	13.631	0.163	523.23
110.0	80.0	82.7	99.8	97.5	10.71	0.123	2.260	-0.155	0.898	14.83	2.898	17.732	0.224	522.56
109.0	74.4	77.5	98.0	95.5	11.72	0.116	2.456	-0.164	0.952	17.93	3.488	21.465	0.318	521.21
109.0	66.0	70.8	97.0	94.0	12.50	0.103	2.652	-0.258	0.945	22.45	4.666	28.028	0.423	520.53
108.0	55.5	62.0	95.6	93.0	12.92	0.081	2.751	-0.267	1.131	30.97	6.901	37.538	0.033	519.40

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4400 | RUN NUMBER 1 | DATE RUN DECEMBER 1963
BAROMETRIC PRESSURE = 29.742 IN HG | TYPE C METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0280 | ANNULUS CLEARANCE = 0.095 | METERING RING AREA RATIO =.562
EQUIVALENT DIAMETER = 0.1709 | ANNULUS AREA = 0.3115 SQ IN | METERING RING AREA = 0.1750 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.519	0.092	0.668	0.546	-0.196	1.429	5.507E 04	.0143	1.495	5.593E 04	0.472	0.534	0.1008
1.041	0.184	1.206	0.962	-0.269	1.523	7.539E 04	.0152	1.394	7.657E 04	0.440	0.385	0.1382
1.439	0.277	1.568	1.282	-0.286	1.551	8.763E 04	.0168	1.363	8.900E 04	0.430	0.300	0.1606
1.882	0.347	2.084	1.700	-0.384	1.589	9.939E 04	.0164	1.409	1.009E 05	0.445	0.313	0.1818
2.232	0.441	2.562	2.067	-0.494	1.594	1.080E 05	.0176	1.444	1.097E 05	0.456	0.338	0.1976
2.525	0.489	2.973	2.880	-0.584	1.551	1.170E 05	.0167	1.726	1.188E 05	0.545	0.342	0.2139
2.969	0.573	3.477	2.832	-0.645	1.593	1.240E 05	.0171	1.476	1.260E 05	0.466	0.326	0.2275
3.623	0.701	4.224	3.420	-0.804	1.614	1.369E 05	.0173	1.471	1.391E 05	0.464	0.333	0.2503
4.316	0.838	5.196	4.251	-0.994	1.592	1.501E 05	.0170	1.503	1.524E 05	0.474	0.336	0.2748
4.834	0.929	5.910	4.814	-1.121	1.616	1.583E 05	.0170	1.535	1.608E 05	0.485	0.340	0.2891
5.640	1.067	7.038	5.776	-1.282	1.614	1.712E 05	.0166	1.564	1.739E 05	0.494	0.326	0.3126
6.710	1.289	8.797	7.239	-1.632	1.616	1.865E 05	.0167	1.632	1.894E 05	0.515	0.340	0.3407
8.424	1.161	12.010	9.782	-2.252	1.651	2.065E 05	.0121	1.770	2.097E 05	0.559	0.365	0.3775
9.339	1.848	14.099	11.530	-2.643	1.672	2.152E 05	.0174	1.879	2.185E 05	0.593	0.377	0.3938
10.877	2.120	18.259	14.857	-3.402	1.695	2.315E 05	.0172	2.074	2.351E 05	0.655	0.397	0.4232
11.878	2.316	22.024	17.912	-4.062	1.712	2.405E 05	.0172	2.286	2.443E 05	0.721	0.414	0.4389
12.679	2.472	28.629	22.426	-5.289	1.700	2.499E 05	.0169	2.638	2.538E 05	0.833	0.458	0.4555
13.077	2.576	38.237	31.126	-7.445	1.720	2.519E 05	.0172	3.571	2.559E 05	1.127	0.549	0.4585

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4500 | RUN NUMBER 1 | DATE RUN DECEMBER 18, 1963
BAROMETRIC PRESSURE = 29.730 IN Hg | TYPE d METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0280 | ANNULUS CLEARANCE = 0.095 | METERING RING AREA RATIO =.490
EQUIVALENT DIAMETER = 0.1709 | ANNULUS AREA = 0.3115 SQ IN | METERING RING AREA = 0.1525 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	108.5	109.0	110.0	110.0	0.54	0.004	0.098	-0.011	0.034	0.81	0.196	0.982	0.009	527.50
110.0	107.5	107.5	109.5	109.3	1.03	0.007	0.196	-0.022	0.056	1.52	0.393	1.891	0.020	527.50
110.0	106.0	106.5	109.0	108.8	1.42	0.007	0.285	-0.029	0.083	2.14	0.565	2.677	0.031	527.05
110.3	105.0	105.8	109.0	108.8	1.78	0.007	0.344	-0.036	0.115	2.73	0.712	3.414	0.036	527.05
110.0	104.5	104.8	108.7	108.2	2.05	0.	0.393	-0.042	0.132	3.17	0.786	3.930	0.033	525.93
110.0	103.0	104.0	108.1	107.5	2.38	0.007	0.472	-0.058	0.152	3.71	0.909	4.593	0.022	523.91
110.0	102.0	102.8	108.0	107.2	2.80	0.010	0.540	-0.072	0.184	4.42	1.105	5.492	0.029	525.48
110.0	99.8	100.8	107.0	106.3	3.39	0.045	0.663	-0.083	0.228	5.45	1.351	6.769	0.011	524.13
110.0	97.0	98.5	106.5	105.5	4.19	0.025	0.786	-0.090	0.267	7.00	1.768	8.734	0.014	523.68
110.0	93.7	95.6	105.0	104.2	4.94	0.038	0.982	-0.125	0.302	8.60	2.137	10.733	0.018	523.01
110.0	90.2	92.7	104.5	103.5	5.75	0.054	1.179	-0.181	0.356	10.63	2.677	13.287	0.022	523.91
112.0	88.2	91.5	104.7	104.6	6.36	0.052	1.326	-0.220	0.412	12.98	3.316	16.136	0.033	524.81
110.0	84.2	87.5	103.5	102.5	6.90	0.058	1.424	-0.112	0.421	14.59	3.610	18.150	0.036	523.68
110.2	81.0	85.1	103.2	102.0	7.44	0.070	1.523	-0.199	0.439	16.73	4.126	20.768	0.025	523.91
110.5	78.0	82.5	103.0	101.0	7.96	0.038	1.646	-0.217	0.461	18.81	4.642	23.406	0.029	523.91
111.0	72.0	77.5	102.8	101.0	8.69	0.058	1.817	-0.238	0.490	23.14	5.747	29.030	0.069	524.58
109.8	64.2	71.0	100.8	99.0	9.26	0.051	1.916	-0.289	0.383	28.00	6.754	34.836	0.217	523.68
109.0	59.0	66.5	100.0	98.0	9.38	0.043	1.940	-0.294	0.325	31.73	7.515	39.041	0.314	523.46

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4500 | RUN NUMBER 1 | DATE RUN DECEMBER 18, 1963
BAROMETRIC PRESSURE = 29.730 IN HG | TYPE B METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0280 | ANNULUS CLEARANCE = 0.095 | METERING RING AREA RATIO =.490
EQUIVALENT DIAMETER = 0.1709 | ANNULUS AREA = 0.3115 SQ IN | METERING RING AREA = 0.1525 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.544	0.091	1.005	0.813	-0.217	1.458	5.514E 04	.0138	2.168	5.606E 04	0.520	0.573	0.1016
1.039	0.182	1.930	1.527	-0.428	1.515	7.476E 04	.0150	2.205	7.602E 04	0.529	0.608	0.1377
1.432	0.267	2.733	2.143	-0.615	1.501	8.826E 04	.0158	2.216	8.974E 04	0.531	0.622	0.1625
1.785	0.322	3.489	2.735	-0.779	1.472	9.964E 04	.0149	2.217	1.013E 05	0.532	0.614	0.1834
2.053	0.372	4.016	3.185	-0.855	1.481	1.067E 05	.0150	2.253	1.085E 05	0.540	0.585	0.1961
2.390	0.439	4.697	3.742	-0.980	1.504	1.148E 05	.0154	2.302	1.167E 05	0.552	0.579	0.2103
2.810	0.499	5.620	4.470	-1.184	1.515	1.235E 05	.0150	2.346	1.256E 05	0.563	0.593	0.2269
3.434	0.599	6.924	5.520	-1.438	1.530	1.364E 05	.0148	2.380	1.386E 05	0.571	0.584	0.2499
4.215	0.728	8.912	7.076	-1.871	1.527	1.514E 05	.0145	2.462	1.539E 05	0.590	0.602	0.2772
4.996	0.901	10.946	8.703	-2.243	1.543	1.642E 05	.0152	2.561	1.670E 05	0.614	0.599	0.3005
5.823	1.061	13.555	10.771	-2.809	1.565	1.757E 05	.0155	2.734	1.787E 05	0.656	0.631	0.3219
6.439	1.190	16.452	13.154	-3.460	1.566	1.858E 05	.0156	3.006	1.889E 05	0.721	0.681	0.3408
6.987	1.340	18.416	14.710	-3.756	1.580	1.916E 05	.0163	3.104	1.948E 05	0.744	0.667	0.3510
7.542	1.388	21.087	16.893	-4.277	1.584	1.989E 05	.0156	3.293	2.023E 05	0.790	0.682	0.3645
8.029	1.518	23.744	18.995	-4.799	1.592	2.049E 05	.0160	3.480	2.084E 05	0.835	0.699	0.3754
8.788	1.669	29.394	23.304	-5.942	1.598	2.141E 05	.0161	3.885	2.177E 05	0.932	0.738	0.3926
9.348	1.746	35.172	28.119	-6.970	1.624	2.185E 05	.0160	4.450	2.221E 05	1.067	0.761	0.4001
9.464	1.771	39.350	31.793	-7.763	1.628	2.190E 05	.0160	4.972	2.226E 05	1.192	0.789	0.4009

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4600 | RUN NUMBER 1 | DATE RUN DECEMBER 20, 1963
BAROMETRIC PRESSURE = 29.525 IN HG | TYPE B METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0630 | ANNULUS CLEARANCE = 0.130 | METERING RING AREA RATIO =.633
EQUIVALENT DIAMETER = 0.2355 | ANNULUS AREA = 0.4334 SQ IN | METERING RING AREA = 0.2745 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
109.5	108.0	108.0	109.0	109.0	0.91	0.007	0.147	-0.007	0.014	0.59	0.309	0.909	0.014	515.32
109.5	106.5	106.8	108.5	108.0	1.55	0.014	0.246	-0.011	0.022	1.03	0.516	1.533	0.014	514.19
110.0	106.3	106.8	108.8	108.5	1.96	0.011	0.295	-0.014	0.014	1.33	0.737	2.063	0.018	514.19
110.0	105.0	105.5	107.5	107.3	2.38	0.018	0.368	-0.014	0.014	1.67	0.835	2.515	0.022	513.28
109.5	104.0	104.5	107.2	106.8	2.73	0.101	0.530	-0.025	0.025	1.99	0.933	2.923	0.036	513.73
110.0	103.8	104.5	107.5	107.0	3.02	0.123	0.589	-0.023	0.029	2.23	1.105	3.340	0.051	513.50
111.0	103.2	104.2	108.0	107.1	3.53	0.137	0.737	-0.023	0.036	2.65	1.326	3.954	0.072	513.05
110.0	101.5	102.5	106.5	105.8	3.88	0.148	0.747	-0.040	0.036	2.95	1.351	4.323	0.072	512.59
110.0	100.0	101.0	105.5	105.0	4.45	0.145	0.835	-0.036	0.040	3.44	1.596	5.010	0.072	511.68
109.0	98.0	99.5	104.5	103.5	4.94	0.173	0.909	-0.047	0.049	3.88	1.817	5.698	0.094	511.68
100.0	86.8	88.8	95.0	93.5	5.77	0.173	1.071	-0.045	0.043	4.81	2.210	6.975	0.090	511.68
101.0	86.0	88.0	95.0	93.5	6.39	0.191	1.203	-0.043	0.051	3.56	2.063	7.982	0.094	511.46
100.0	83.5	86.0	93.5	92.2	6.95	0.195	1.302	-0.116	0.042	6.09	2.702	8.743	0.101	511.46
100.0	82.5	85.0	93.0	91.5	7.37	0.215	1.375	-0.112	0.051	6.57	2.898	9.406	0.087	511.68
99.5	80.5	81.5	92.0	90.5	7.81	0.237	1.474	-0.058	0.051	7.12	3.085	10.217	0.094	511.68
100.0	78.0	82.0	91.5	90.0	8.47	0.255	1.572	-0.049	0.047	8.18	3.488	11.568	0.094	511.68

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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4600
BAROMETRIC PRESSURE = 29.525 IN HG
METERING RING CLEARANCE = 0.0630
EQUIVALENT DIAMETER = 0.2355

RUN NUMBER 1
TYPE B METERING RING
ANNULUS CLEARANCE = 0.130
ANNULUS AREA = 0.4334 SQ IN

DATE RUN DECEMBER 20, 1963
TYPE A SPACER PLATE
METERING RING AREA RATIO =.633
METERING RING AREA = 0.2745 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.916	0.140	0.920	0.603	-0.307	1.270	1.086E 05	.0151	0.828	1.104E 05	0.332	0.419	0.1983
1.562	0.233	1.549	1.048	-0.516	1.304	1.403E 05	.0151	0.862	1.427E 05	0.346	0.419	0.2558
1.976	0.282	2.077	1.347	-0.731	1.280	1.596E 05	.0141	0.857	1.623E 05	0.344	0.457	0.2910
2.400	0.352	2.529	1.694	-0.825	1.290	1.757E 05	.0146	0.890	1.786E 05	0.357	0.425	0.3199
2.827	0.467	2.948	2.027	-0.921	1.312	1.885E 05	.0166	0.916	1.916E 05	0.367	0.406	0.3433
3.168	0.516	3.366	2.280	-1.086	1.304	2.006E 05	.0163	0.911	2.040E 05	0.365	0.422	0.3654
3.691	0.656	3.984	2.712	-1.296	1.312	2.170E 05	.0178	0.931	2.206E 05	0.373	0.430	0.3950
4.058	0.653	4.360	3.016	-1.319	1.328	2.255E 05	.0162	0.950	2.293E 05	0.381	0.400	0.4102
4.621	0.745	5.048	3.506	-1.567	1.343	2.399E 05	.0164	0.975	2.439E 05	0.391	0.417	0.4357
5.150	0.799	5.746	3.971	-1.774	1.340	2.525E 05	.0156	0.984	2.567E 05	0.394	0.418	0.4586
5.991	0.962	7.019	4.904	-2.165	1.362	2.601E 05	.0163	1.048	2.644E 05	0.420	0.432	0.4723
6.626	1.086	8.029	3.646	-2.026	1.351	2.760E 05	.0164	0.694	2.806E 05	0.278	0.357	0.5011
7.206	1.146	8.822	6.210	-2.661	1.391	2.825E 05	.0163	1.111	2.872E 05	0.446	0.437	0.5128
7.668	1.212	9.488	6.685	-2.867	1.417	2.885E 05	.0164	1.140	2.933E 05	0.457	0.445	0.5240
8.141	1.326	10.271	7.218	-3.044	1.437	2.946E 05	.0171	1.168	2.995E 05	0.469	0.444	0.5350
8.823	1.420	11.616	8.259	-3.454	1.452	3.058E 05	.0169	1.238	3.109E 05	0.496	0.460	0.5554

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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4700 | RUN NUMBER 1 | DATE RUN DECEMBER 20, 1963
BAROMETRIC PRESSURE = 29.470 IN Hg | TYPE C METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0630 | ANNULUS CLEARANCE = 0.130 | METERING RING AREA RATIO =.685
EQUIVALENT DIAMETER = 0.2355 | ANNULUS AREA = 0.4334 SQ IN | METERING RING AREA = 0.2969 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	108.5	108.5	109.3	109.3	0.93	0.	0.147	-0.007	0.011	0.42	0.196	0.688	0.029	515.10
109.5	107.0	107.0	108.0	107.7	1.47	0.	0.236	-0.014	0.009	0.64	0.270	0.933	0.043	516.67
110.0	107.0	107.0	108.5	108.2	1.84	0.005	0.295	-0.018	0.011	0.81	0.393	1.253	0.058	516.00
110.0	106.2	106.5	108.0	107.5	2.36	0.013	0.363	-0.014	0.005	1.06	0.516	1.572	0.072	515.77
110.0	105.2	105.5	107.5	107.0	2.82	0.029	0.442	-0.018	0.004	1.28	0.639	1.891	0.094	514.86
110.0	104.5	105.0	107.0	106.5	3.32	0.036	0.516	-0.009	0.020	1.50	0.737	2.260	0.116	513.96
110.0	103.8	104.0	106.5	106.0	3.71	0.036	0.589	-0.022	0.036	1.69	0.835	2.530	0.116	515.09
110.0	103.0	103.5	106.0	105.5	4.13	0.033	0.639	-0.014	0.038	1.89	0.933	2.824	0.145	514.86
110.5	102.6	103.5	106.5	105.5	4.57	0.027	0.712	-0.022	0.045	2.11	1.081	3.193	0.148	514.63
100.9	90.8	92.0	95.8	95.0	5.67	0.036	0.884	-0.047	0.058	2.78	1.424	4.151	0.181	513.73
100.8	89.9	91.0	95.3	94.4	6.19	0.036	0.982	-0.033	0.069	3.12	1.547	4.617	0.191	513.27
100.0	87.8	89.0	93.5	92.5	6.51	0.036	1.056	-0.045	0.054	3.27	1.572	4.838	0.188	513.95
100.5	87.5	89.0	94.2	92.9	7.02	0.045	1.105	-0.042	0.081	3.63	1.768	5.354	0.220	513.50
100.5	86.5	88.0	93.5	92.3	7.59	0.033	1.203	-0.036	0.079	4.03	1.965	5.944	0.235	513.27
100.0	84.5	86.5	92.5	91.0	8.06	0.036	1.277	-0.022	0.058	4.35	2.112	6.361	0.238	513.27
97.0	79.5	81.5	88.5	87.0	8.99	0.040	1.449	-0.022	0.072	5.11	2.407	7.515	0.249	513.49
93.2	73.5	76.0	83.5	82.0	9.73	0.168	1.719	-0.036	0.065	5.87	2.652	8.522	0.282	512.81

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4700 | RUN NUMBER 1 | DATE RUN DECEMBER 20, 1963
BAROMETRIC PRESSURE = 29.470 IN HG | TYPE C METERING RING | TYPE A SPACER PLATE
METERING RING CLEARANCE = 0.0630 | ANNULUS CLEARANCE = 0.130 | METERING RING AREA RATIO =.685
EQUIVALENT DIAMETER = 0.2355 | ANNULUS AREA = 0.4334 SQ IN | METERING RING AREA = 0.2969 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.933	0.144	0.697	0.455	-0.168	1.287	1.092E 05	.0154	0.622	1.109E 05	0.292	0.229	0.1993
1.474	0.229	0.945	0.675	-0.246	1.313	1.350E 05	.0158	0.593	1.371E 05	0.278	0.214	0.2470
1.847	0.283	1.267	0.889	-0.329	1.276	1.539E 05	.0151	0.604	1.563E 05	0.283	0.221	0.2813
2.370	0.350	1.582	1.146	-0.435	1.310	1.721E 05	.0149	0.620	1.748E 05	0.291	0.232	0.3146
2.877	0.419	1.902	1.390	-0.537	1.336	1.882E 05	.0149	0.628	1.912E 05	0.295	0.239	0.3435
3.379	0.493	2.274	1.626	-0.624	1.337	2.044E 05	.0149	0.623	2.076E 05	0.292	0.235	0.3726
3.772	0.561	2.559	1.839	-0.719	1.347	2.146E 05	.0152	0.634	2.179E 05	0.297	0.243	0.3917
4.190	0.615	2.851	2.049	-0.802	1.353	2.258E 05	.0151	0.636	2.293E 05	0.299	0.243	0.4120
4.629	0.688	3.226	2.283	-0.943	1.337	2.394E 05	.0150	0.631	2.431E 05	0.296	0.254	0.4366
5.756	0.843	4.203	2.948	-1.304	1.359	2.549E 05	.0148	0.656	2.588E 05	0.308	0.279	0.4643
6.273	0.948	4.668	3.349	-1.368	1.366	2.657E 05	.0153	0.683	2.698E 05	0.321	0.267	0.4836
6.593	1.015	4.888	3.506	-1.382	1.293	2.784E 05	.0147	0.642	2.828E 05	0.301	0.241	0.5074
7.122	1.062	5.415	3.895	-1.569	1.386	2.805E 05	.0152	0.704	2.848E 05	0.330	0.269	0.5108
7.682	1.169	6.001	4.307	-1.743	1.399	2.901E 05	.0156	0.724	2.946E 05	0.340	0.276	0.5282
8.176	1.248	6.401	4.630	-1.869	1.430	2.954E 05	.0159	0.743	3.000E 05	0.349	0.282	0.5378
9.125	1.418	7.562	5.417	-2.146	1.460	3.046E 05	.0164	0.785	3.093E 05	0.368	0.288	0.5547
9.988	1.617	8.573	6.214	-2.359	1.503	3.092E 05	.0173	0.835	3.140E 05	0.392	0.289	0.5625