



Rig Mass Flow Rate Calculations

Please Enter Parameters in highlighted boxes below

| Engine Data File | | |
|--------------------------------------|-------|---------|
| Ambient Conditions | | |
| Air Temperature | 5 | [C] |
| Atmospheric Pressure | 975 | [mBar] |
| Air Humidity | 95 | [%] |
| Viper Engine Parameters | | |
| Engine Air Intake Mass Flow | 18.7 | [Kg/s] |
| Butane Flow Rate | 1732 | [Ltr/h] |
| Engine Speed | 12150 | [RPM] |
| ETC | 650 | [C] |
| Gas Delivery System Data File | | |
| Gas Delivery System | | |
| Mixed Gas (Fuel) Mass Flow rate | 0.351 | [Kg/s] |
| Oxygen Mass Flow rate | 0.158 | [Kg/s] |

Please do not change anything in this box

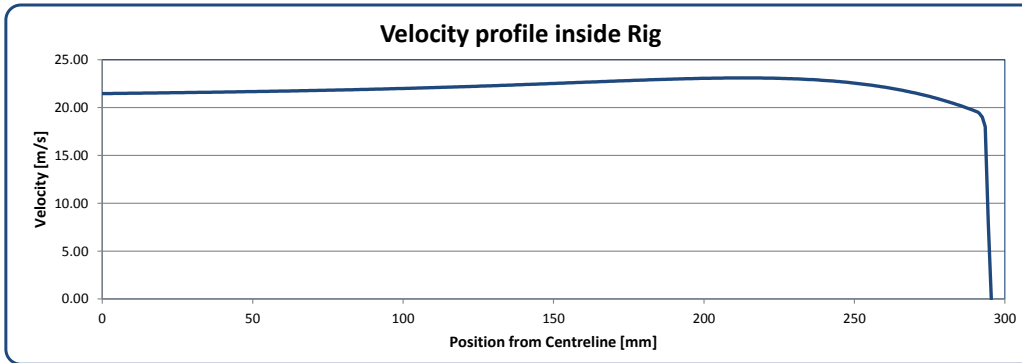
Test Date and Time = 29.04.2015 15:11:04.6

| Calculated Parameters | | |
|---|----------|----------------------|
| Air density | 1.217898 | [Kg/m ³] |
| Liquid Butane density | 584 | [Kg/m ³] |
| Butane mass Flow rate | 0.280969 | [Kg/s] |
| Air Fuel Ratio | 79.23263 | [] |
| Calculated Exhaust gas properties (Reaction Engines) | | |
| Exhaust products density | 0.389 | [Kg/m ³] |
| Pitot Traverse Results | | |
| Rig Gas flow rate - Integrated | 2.341684 | [Kg/s] |
| Total Rig Mass flow | 2.850684 | [Kg/s] |
| Rig Gas Temperature as read from TC 11 | | |
| Gas Temperature | 516 | [C] |

Bruce Ewan to fill in

Note

| | | | | | |
|---|---------|--------|----|----------|--------|
| Manual for viper 201 gives figures for fuel flow rate to be as follows at maximum power | | | | | |
| Fuel Flow | 2035 | lb/hr | to | 2920 | lb/hr |
| | 925 | Kg/hr | | 1327.273 | Kg/hr |
| | 1156.25 | ltr/hr | | 1659.091 | ltr/hr |



Data Acquisition Parameters

| | | |
|------------------------------|------|---------|
| Sampling Rate | 1000 | [Hz] |
| No of samples recorded | 100 | Samples |
| Averaged samples sampling | 10 | [Hz] |
| Pitot Traverse speed | 7 | [mm/s] |
| Distance Travelled every 0.1 | 0.7 | [mm] |

Averaged Pitot dp

0.929058368

Average Vel

21.8290133 [m/s]

Raw Data from CSV File

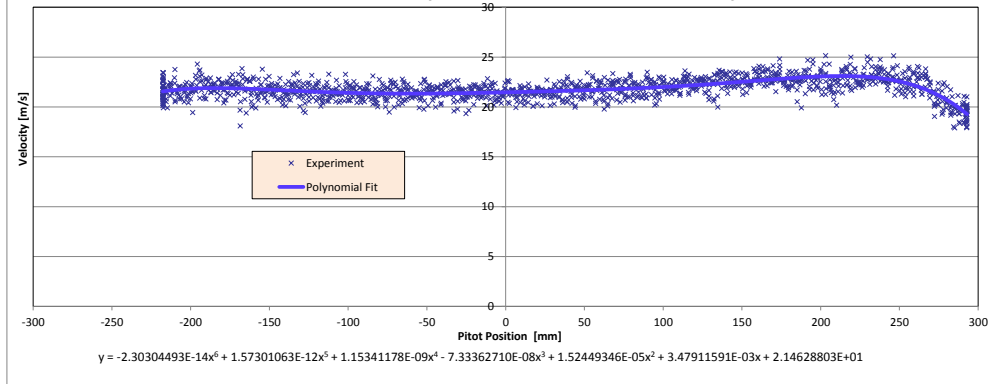
| Date and time [dd:mm:yyyy hh:mm:ss.ms] | Pitot Position from rig centre [mm] | TC11 - Pitot [deg C] | Pitot dP [mBar] | O2 % |
|---|---|-------------------------|--------------------|---------|
| 29.04.2015 15:11:04.6 | -217.33 | 508.6 | 1.0205 | 16.25 |
| 29.04.2015 15:11:04.7 | -217.34 | 508.6 | 1.0658 | 16.17 |
| 29.04.2015 15:11:04.8 | -217.39 | 508.5 | 0.8778 | 16.43 |
| 29.04.2015 15:11:04.9 | -217.4 | 508.6 | 0.9497 | 16.3 |
| 29.04.2015 15:11:05.0 | -217.36 | 508.6 | 0.9086 | 16.13 |
| 29.04.2015 15:11:05.1 | -217.39 | 508.7 | 0.8938 | 16.19 |
| 29.04.2015 15:11:05.2 | -217.39 | 508.7 | 1.0097 | 16.4 |
| 29.04.2015 15:11:05.3 | -217.37 | 508.8 | 1.0664 | 16.2 |
| 29.04.2015 15:11:05.4 | -217.36 | 509 | 0.9461 | 16.14 |
| 29.04.2015 15:11:05.5 | -217.4 | 509.1 | 0.8113 | 16.32 |
| 29.04.2015 15:11:05.6 | -217.38 | 509 | 0.8057 | 16.3 |
| 29.04.2015 15:11:05.7 | -217.4 | 509.1 | 0.806 | 16.2 |
| 29.04.2015 15:11:05.8 | -217.39 | 509.2 | 0.9932 | 16.17 |
| 29.04.2015 15:11:05.9 | -217.38 | 509.2 | 0.9886 | 16.3 |
| 29.04.2015 15:11:06.0 | -217.35 | 509.2 | 0.8306 | 16.27 |
| 29.04.2015 15:11:06.1 | -217.4 | 509.2 | 0.8544 | 16.3 |
| 29.04.2015 15:11:06.2 | -217.35 | 509.3 | 0.7956 | 16.14 |
| 29.04.2015 15:11:06.3 | -217.35 | 509.3 | 0.7715 | 16.29 |
| 29.04.2015 15:11:06.4 | -215.57 | 509.2 | 0.886 | 16.18 |
| 29.04.2015 15:11:06.5 | -215.39 | 509.3 | 0.9015 | 16.29 |
| 29.04.2015 15:11:06.6 | -215.39 | 509.3 | 0.9334 | 16.2 |
| 29.04.2015 15:11:06.7 | -214.71 | 509.3 | 0.7713 | 16.24 |
| 29.04.2015 15:11:06.8 | -212.7 | 509.4 | 0.9217 | 16.09 |
| 29.04.2015 15:11:06.9 | -212.78 | 509.4 | 0.9554 | 16.11 |
| 29.04.2015 15:11:07.0 | -212.82 | 509.5 | 0.8655 | 16.11 |
| 29.04.2015 15:11:07.1 | -211.83 | 509.6 | 0.889 | 16.23 |
| 29.04.2015 15:11:07.2 | -209.81 | 509.6 | 0.8303 | 16.12 |
| 29.04.2015 15:11:07.3 | -209.89 | 509.6 | 0.8185 | 16.12 |
| 29.04.2015 15:11:07.4 | -210.05 | 509.6 | 0.9067 | 16.22 |
| 29.04.2015 15:11:07.5 | -208.67 | 509.6 | 0.8979 | 16.26 |
| 29.04.2015 15:11:07.6 | -206.88 | 509.6 | 0.9482 | 16.12 |
| 29.04.2015 15:11:07.7 | -206.98 | 509.6 | 0.8404 | 16.01 |
| 29.04.2015 15:11:07.8 | -206.48 | 509.6 | 0.8611 | 16.17 |
| 29.04.2015 15:11:07.9 | -203.89 | 509.5 | 0.9418 | 16.15 |
| 29.04.2015 15:11:08.0 | -204.06 | 509.5 | 0.8178 | 16.1 |
| 29.04.2015 15:11:08.1 | -204.05 | 509.6 | 0.9073 | 16.08 |
| 29.04.2015 15:11:08.2 | -203.38 | 509.6 | 0.9638 | 16.08 |
| 29.04.2015 15:11:08.3 | -201.36 | 509.5 | 0.8859 | 16.12 |
| 29.04.2015 15:11:08.4 | -201.35 | 509.5 | 0.8113 | 16.06 |
| 29.04.2015 15:11:08.5 | -201.38 | 509.5 | 0.9342 | 16.02 |
| 29.04.2015 15:11:08.6 | -199.54 | 509.5 | 0.9515 | 16.16 |
| 29.04.2015 15:11:08.7 | -198.97 | 509.4 | 0.9008 | 16.13 |
| 29.04.2015 15:11:08.8 | -198.72 | 509.3 | 0.7355 | 16.09 |
| 29.04.2015 15:11:08.9 | -198.85 | 509.3 | 0.9093 | 16.12 |
| 29.04.2015 15:11:09.0 | -196.58 | 509.3 | 0.9029 | 16.09 |
| 29.04.2015 15:11:09.1 | -196.11 | 509.2 | 0.9544 | 16.09 |
| 29.04.2015 15:11:09.2 | -195.76 | 509.1 | 1.1484 | 16.05 |
| 29.04.2015 15:11:09.3 | -194.45 | 509.1 | 1.0856 | 16.13 |
| 29.04.2015 15:11:09.4 | -192.9 | 509.1 | 1.0466 | 16.2 |
| 29.04.2015 15:11:09.5 | -193.04 | 509.1 | 0.914 | 16.09 |
| 29.04.2015 15:11:09.6 | -192.83 | 509.2 | 0.9943 | 16.1 |
| 29.04.2015 15:11:09.7 | -191.49 | 509.2 | 0.8451 | 16.18 |
| 29.04.2015 15:11:09.8 | -190.32 | 509.2 | 0.8419 | 16.25 |
| 29.04.2015 15:11:09.9 | -190.43 | 509.2 | 0.9604 | 16.08 |
| 29.04.2015 15:11:10.0 | -190.27 | 509.3 | 1.0027 | 16.07 |
| 29.04.2015 15:11:10.1 | -187.27 | 509.3 | 0.8979 | 16.07 |
| 29.04.2015 15:11:10.2 | -187.36 | 509.3 | 0.9633 | 16.17 |
| 29.04.2015 15:11:10.3 | -187.39 | 509.3 | 1.0211 | 16.13 |
| 29.04.2015 15:11:10.4 | -187.07 | 509.4 | 0.8929 | 16.21 |

516.261603

16.19

| Calculated Velocity [m/s] |
|---------------------------------|
| 22.9058653 |
| 23.4087409 |
| 21.2440828 |
| 22.0970051 |
| 21.6135728 |
| 21.4368205 |
| 22.7843359 |
| 23.4153291 |
| 22.0550841 |
| 20.423536 |
| 20.3529272 |
| 20.356716 |
| 22.5974041 |
| 22.5450135 |
| 20.6650357 |
| 20.9590125 |
| 20.224956 |
| 19.9162772 |
| 21.3430783 |
| 21.5289606 |
| 21.9065555 |
| 19.9136955 |
| 21.7688251 |
| 22.1632179 |
| 21.0947185 |
| 21.3791817 |
| 20.6613034 |
| 20.5139616 |
| 21.5909626 |
| 21.4859313 |
| 22.0795477 |
| 20.7865885 |
| 21.0410298 |
| 22.0049071 |
| 20.5051878 |
| 21.5981052 |
| 22.2604356 |
| 21.3418738 |
| 20.423536 |
| 21.9159413 |
| 22.1179358 |
| 21.5206005 |
| 19.4460562 |
| 21.6218969 |
| 21.545671 |
| 22.1516159 |
| 24.2989098 |
| 23.6251794 |
| 23.1969327 |
| 21.6777047 |
| 22.6099143 |
| 20.8446328 |
| 20.8051309 |
| 22.221368 |
| 22.7052195 |
| 21.4859313 |
| 22.2546607 |
| 22.912598 |
| 21.4260251 |

Raw Data Plot with Polynomial fit on Calculated Velocity



| | | | | | |
|-----------------------|---------|-------|--------|-------|------------|
| 29.04.2015 15:11:10.5 | -184.71 | 509.4 | 0.9757 | 16.18 | 22.3974383 |
| 29.04.2015 15:11:10.6 | -184.94 | 509.3 | 0.9073 | 16.33 | 21.5981052 |
| 29.04.2015 15:11:10.7 | -184.77 | 509.3 | 0.9392 | 16.21 | 21.974512 |
| 29.04.2015 15:11:10.8 | -182.14 | 509.4 | 1.0086 | 16.21 | 22.7719216 |
| 29.04.2015 15:11:10.9 | -181.85 | 509.4 | 0.9418 | 16.44 | 22.0049071 |
| 29.04.2015 15:11:11.0 | -182.11 | 509.4 | 1.009 | 16.31 | 22.7764367 |
| 29.04.2015 15:11:11.1 | -181.17 | 509.4 | 0.8708 | 16.21 | 21.159208 |
| 29.04.2015 15:11:11.2 | -178.94 | 509.4 | 0.81 | 16.2 | 20.4071664 |
| 29.04.2015 15:11:11.3 | -179.36 | 509.5 | 0.9147 | 16.32 | 21.6860042 |
| 29.04.2015 15:11:11.4 | -179.44 | 509.4 | 0.9751 | 16.23 | 22.3905507 |
| 29.04.2015 15:11:11.5 | -178.45 | 509.5 | 0.8334 | 16.24 | 20.6998379 |
| 29.04.2015 15:11:11.6 | -176.43 | 509.5 | 0.9754 | 16.22 | 22.3939948 |
| 29.04.2015 15:11:11.7 | -176.72 | 509.5 | 0.8917 | 16.32 | 21.4116226 |
| 29.04.2015 15:11:11.8 | -176.62 | 509.5 | 0.9909 | 16.21 | 22.571224 |
| 29.04.2015 15:11:11.9 | -173.46 | 509.4 | 1.0513 | 16.15 | 23.24896 |
| 29.04.2015 15:11:12.0 | -173.68 | 509.4 | 0.954 | 16.24 | 22.1469734 |
| 29.04.2015 15:11:12.1 | -173.68 | 509.4 | 0.9633 | 16.33 | 22.2546607 |
| 29.04.2015 15:11:12.2 | -172.63 | 509.4 | 0.942 | 16.15 | 22.0072435 |
| 29.04.2015 15:11:12.3 | -170.91 | 509.4 | 0.9637 | 16.14 | 22.2592807 |
| 29.04.2015 15:11:12.4 | -171.08 | 509.4 | 0.9733 | 16.23 | 22.3698751 |
| 29.04.2015 15:11:12.5 | -171.12 | 509.3 | 0.8996 | 16.33 | 21.5062614 |
| 29.04.2015 15:11:12.6 | -169.79 | 509.3 | 0.8881 | 16.09 | 21.3683571 |
| 29.04.2015 15:11:12.7 | -168.32 | 509.4 | 0.8201 | 16.23 | 20.5340021 |
| 29.04.2015 15:11:12.8 | -168.49 | 509.5 | 0.6366 | 16.22 | 18.0914558 |
| 29.04.2015 15:11:12.9 | -168.57 | 509.4 | 0.7531 | 16.23 | 19.6773459 |
| 29.04.2015 15:11:13.0 | -165.63 | 509.4 | 0.9255 | 16.17 | 21.8136534 |
| 29.04.2015 15:11:13.1 | -165.55 | 509.4 | 0.9078 | 16.2 | 21.6040556 |
| 29.04.2015 15:11:13.2 | -165.6 | 509.3 | 0.839 | 16.23 | 20.7692674 |
| 29.04.2015 15:11:13.3 | -164.68 | 509.1 | 0.7322 | 16.23 | 19.4023824 |
| 29.04.2015 15:11:13.4 | -162.34 | 509 | 0.9896 | 16.18 | 22.5564131 |
| 29.04.2015 15:11:13.5 | -162.55 | 508.9 | 0.9952 | 16.18 | 22.6201448 |
| 29.04.2015 15:11:13.6 | -162.62 | 508.8 | 0.9911 | 16.23 | 22.5735018 |
| 29.04.2015 15:11:13.7 | -161.6 | 508.6 | 0.8723 | 16.24 | 21.1774241 |
| 29.04.2015 15:11:13.8 | -159.81 | 508.6 | 0.9134 | 16.16 | 21.6705883 |
| 29.04.2015 15:11:13.9 | -159.99 | 508.6 | 1.0088 | 16.13 | 22.7741792 |
| 29.04.2015 15:11:14.0 | -160.2 | 508.5 | 1.0291 | 16.27 | 23.0021794 |
| 29.04.2015 15:11:14.1 | -157.59 | 508.5 | 0.858 | 16.2 | 21.0031213 |
| 29.04.2015 15:11:14.2 | -156.91 | 508.5 | 1.0105 | 16.12 | 22.7933603 |
| 29.04.2015 15:11:14.3 | -157.02 | 508.5 | 0.8726 | 16.17 | 21.1810654 |
| 29.04.2015 15:11:14.4 | -157.1 | 508.5 | 0.8315 | 16.33 | 20.6762285 |
| 29.04.2015 15:11:14.5 | -154.66 | 508.5 | 0.9041 | 16.2 | 21.5599839 |
| 29.04.2015 15:11:14.6 | -154.44 | 508.6 | 0.9162 | 16.25 | 21.7037781 |
| 29.04.2015 15:11:14.7 | -154.47 | 508.6 | 1.1 | 16.25 | 23.7813519 |
| 29.04.2015 15:11:14.8 | -152.37 | 508.5 | 1.0095 | 16.36 | 22.7820793 |
| 29.04.2015 15:11:14.9 | -151.49 | 508.5 | 0.9182 | 16.17 | 21.7274541 |
| 29.04.2015 15:11:15.0 | -151.47 | 508.5 | 0.9004 | 16.18 | 21.5158219 |
| 29.04.2015 15:11:15.1 | -151.34 | 508.6 | 0.8162 | 16.16 | 20.4851191 |
| 29.04.2015 15:11:15.2 | -148.85 | 508.5 | 0.8748 | 16.3 | 21.2077495 |
| 29.04.2015 15:11:15.3 | -149.12 | 508.5 | 0.9466 | 16.19 | 22.0609112 |
| 29.04.2015 15:11:15.4 | -148.85 | 508.6 | 0.93 | 16.14 | 21.8666207 |
| 29.04.2015 15:11:15.5 | -148.59 | 508.6 | 0.9724 | 16.21 | 22.3595301 |
| 29.04.2015 15:11:15.6 | -146.34 | 508.5 | 0.9156 | 16.38 | 21.6966703 |
| 29.04.2015 15:11:15.7 | -146.33 | 508.4 | 0.8615 | 16.22 | 21.0459163 |
| 29.04.2015 15:11:15.8 | -146.29 | 508.5 | 0.927 | 16.2 | 21.8313235 |
| 29.04.2015 15:11:15.9 | -143.53 | 508.5 | 0.9152 | 16.27 | 21.6919304 |
| 29.04.2015 15:11:16.0 | -143.51 | 508.5 | 0.9347 | 16.28 | 21.9218054 |
| 29.04.2015 15:11:16.1 | -143.35 | 508.5 | 1.0164 | 16.19 | 22.8598052 |
| 29.04.2015 15:11:16.2 | -143.32 | 508.6 | 0.9344 | 16.21 | 21.9182871 |
| 29.04.2015 15:11:16.3 | -140.87 | 508.6 | 0.8397 | 16.32 | 20.7779298 |
| 29.04.2015 15:11:16.4 | -141.1 | 508.6 | 0.891 | 16.2 | 21.4032167 |
| 29.04.2015 15:11:16.5 | -140.68 | 508.7 | 0.9231 | 16.17 | 21.7853516 |
| 29.04.2015 15:11:16.6 | -139.69 | 508.7 | 0.9634 | 16.23 | 22.2558158 |
| 29.04.2015 15:11:16.7 | -137.73 | 508.7 | 0.9886 | 16.42 | 22.5450135 |
| 29.04.2015 15:11:16.8 | -137.98 | 508.7 | 0.8364 | 16.17 | 20.7370612 |
| 29.04.2015 15:11:16.9 | -137.8 | 508.8 | 0.8758 | 16.23 | 21.2198675 |
| 29.04.2015 15:11:17.0 | -136.64 | 508.9 | 0.8324 | 16.22 | 20.6874153 |
| 29.04.2015 15:11:17.1 | -135.12 | 508.9 | 0.8928 | 16.37 | 21.4248252 |
| 29.04.2015 15:11:17.2 | -135.33 | 508.9 | 0.9675 | 16.03 | 22.3031232 |
| 29.04.2015 15:11:17.3 | -134.58 | 509 | 1.0512 | 16.29 | 23.2478542 |
| 29.04.2015 15:11:17.4 | -132.21 | 509 | 1.0663 | 16.32 | 23.4142312 |
| 29.04.2015 15:11:17.5 | -132.27 | 508.9 | 0.9474 | 16.34 | 22.0702314 |

| | | | | | |
|-----------------------|---------|-------|--------|-------|------------|
| 29.04.2015 15:11:17.6 | -132.42 | 508.9 | 0.8951 | 16.28 | 21.4524044 |
| 29.04.2015 15:11:17.7 | -130.63 | 509 | 0.783 | 16.18 | 20.0641644 |
| 29.04.2015 15:11:17.8 | -129.76 | 509 | 0.8638 | 16.23 | 21.0739913 |
| 29.04.2015 15:11:17.9 | -129.84 | 508.8 | 0.927 | 16.26 | 21.8313235 |
| 29.04.2015 15:11:18.0 | -128.8 | 508.7 | 0.9389 | 16.24 | 21.9710022 |
| 29.04.2015 15:11:18.1 | -126.91 | 508.7 | 0.8839 | 16.15 | 21.3177696 |
| 29.04.2015 15:11:18.2 | -127.25 | 508.7 | 0.735 | 16.36 | 19.4394452 |
| 29.04.2015 15:11:18.3 | -127.42 | 508.6 | 0.8069 | 16.26 | 20.3680783 |
| 29.04.2015 15:11:18.4 | -124.9 | 508.6 | 0.8561 | 16.21 | 20.9798532 |
| 29.04.2015 15:11:18.5 | -124.47 | 508.6 | 0.9539 | 16.25 | 22.1458127 |
| 29.04.2015 15:11:18.6 | -124.69 | 508.6 | 0.8901 | 16.31 | 21.3924043 |
| 29.04.2015 15:11:18.7 | -124.73 | 508.5 | 0.8228 | 16.21 | 20.5677762 |
| 29.04.2015 15:11:18.8 | -122.15 | 508.5 | 0.8519 | 16.25 | 20.9283267 |
| 29.04.2015 15:11:18.9 | -121.98 | 508.5 | 0.9047 | 16.31 | 21.5671368 |
| 29.04.2015 15:11:19.0 | -122 | 508.5 | 0.9417 | 16.34 | 22.0037389 |
| 29.04.2015 15:11:19.1 | -120.23 | 508.5 | 0.8252 | 16.23 | 20.5977511 |
| 29.04.2015 15:11:19.2 | -118.79 | 508.5 | 0.993 | 16.1 | 22.5951288 |
| 29.04.2015 15:11:19.3 | -119.13 | 508.5 | 0.8553 | 16.17 | 20.9700484 |
| 29.04.2015 15:11:19.4 | -119.01 | 508.5 | 0.97 | 16.24 | 22.33192 |
| 29.04.2015 15:11:19.5 | -117.3 | 508.5 | 0.7839 | 16.11 | 20.0756922 |
| 29.04.2015 15:11:19.6 | -116.39 | 508.6 | 0.8199 | 16.13 | 20.5314982 |
| 29.04.2015 15:11:19.7 | -116.47 | 508.7 | 0.868 | 16.24 | 21.1251626 |
| 29.04.2015 15:11:19.8 | -116.16 | 508.5 | 0.8402 | 16.24 | 20.784115 |
| 29.04.2015 15:11:19.9 | -113.38 | 508.5 | 0.8236 | 16.29 | 20.5777727 |
| 29.04.2015 15:11:20.0 | -113.48 | 508.6 | 0.9804 | 16.17 | 22.4513184 |
| 29.04.2015 15:11:20.1 | -113.53 | 508.6 | 0.9486 | 16.34 | 22.0842044 |
| 29.04.2015 15:11:20.2 | -112.34 | 508.4 | 0.8241 | 16.23 | 20.5840181 |
| 29.04.2015 15:11:20.3 | -110.87 | 508.3 | 0.893 | 16.34 | 21.4272248 |
| 29.04.2015 15:11:20.4 | -110.87 | 508.4 | 0.8759 | 16.25 | 21.2210789 |
| 29.04.2015 15:11:20.5 | -110.95 | 508.4 | 0.9154 | 16.34 | 21.6943005 |
| 29.04.2015 15:11:20.6 | -108.18 | 508.2 | 0.886 | 16.24 | 21.3430783 |
| 29.04.2015 15:11:20.7 | -107.88 | 508.2 | 0.821 | 16.28 | 20.5452663 |
| 29.04.2015 15:11:20.8 | -107.82 | 508.3 | 0.9072 | 16.29 | 21.5969149 |
| 29.04.2015 15:11:20.9 | -107.4 | 508.3 | 1.001 | 16.38 | 22.6859639 |
| 29.04.2015 15:11:21.0 | -105.86 | 508.2 | 0.8896 | 16.28 | 21.386395 |
| 29.04.2015 15:11:21.1 | -105.67 | 508.2 | 0.878 | 16.25 | 21.2465028 |
| 29.04.2015 15:11:21.2 | -105.71 | 508.2 | 0.9518 | 16.29 | 22.1214223 |
| 29.04.2015 15:11:21.3 | -103.54 | 508.2 | 0.8737 | 16.35 | 21.1944116 |
| 29.04.2015 15:11:21.4 | -102.87 | 508.2 | 0.897 | 16.2 | 21.4751605 |
| 29.04.2015 15:11:21.5 | -102.69 | 508.2 | 0.9116 | 16.11 | 21.6492251 |
| 29.04.2015 15:11:21.6 | -102.4 | 508.2 | 0.8253 | 16.23 | 20.5989992 |
| 29.04.2015 15:11:21.7 | -99.67 | 508.1 | 0.8282 | 16.32 | 20.6351586 |
| 29.04.2015 15:11:21.8 | -100.04 | 508.1 | 0.8694 | 16.16 | 21.1421921 |
| 29.04.2015 15:11:21.9 | -99.74 | 508.2 | 0.836 | 16.12 | 20.732102 |
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| 29.04.2015 15:13:25.0 | -217.58 | 531.5 | 1.0366 | 15.99 | 23.0858463 |
| 29.04.2015 15:13:25.1 | -217.59 | 531.5 | 1.0703 | 16.08 | 23.4581068 |
| 29.04.2015 15:13:25.2 | -217.59 | 531.4 | 0.9139 | 16.09 | 21.6765188 |
| 29.04.2015 15:13:25.3 | -217.58 | 531.5 | 0.9581 | 16.06 | 22.1945129 |

| | | | | | |
|-----------------------|---------|-------|--------|-------|------------|
| 29.04.2015 15:13:25.4 | -217.57 | 531.5 | 0.8591 | 16.05 | 21.0165806 |
| 29.04.2015 15:13:25.5 | -217.57 | 531.5 | 0.7887 | 16.11 | 20.1370625 |
| 29.04.2015 15:13:25.6 | -217.59 | 531.5 | 0.809 | 16.08 | 20.3945655 |
| 29.04.2015 15:13:25.7 | -217.55 | 531.5 | 0.8556 | 15.89 | 20.9737258 |
| 29.04.2015 15:13:25.8 | -217.54 | 531.6 | 0.8253 | 16.19 | 20.5989992 |
| 29.04.2015 15:13:25.9 | -217.62 | 531.5 | 0.8798 | 16.08 | 21.2682705 |
| 29.04.2015 15:13:26.0 | -217.6 | 531.4 | 0.9525 | 16.13 | 22.1295554 |
| 29.04.2015 15:13:26.1 | -217.57 | 531.5 | 0.9974 | 16.04 | 22.6451332 |
| 29.04.2015 15:13:26.2 | -217.56 | 531.4 | 0.8427 | 16.18 | 20.8150134 |
| 29.04.2015 15:13:26.3 | -217.46 | 531.3 | 0.8563 | 16.06 | 20.9823037 |
| 29.04.2015 15:13:26.4 | -217.42 | 531.3 | 0.9095 | 16.01 | 21.6242747 |
| 29.04.2015 15:13:26.5 | -217.43 | 531.4 | 0.9449 | 15.99 | 22.0410927 |
| 29.04.2015 15:13:26.6 | -217.4 | 531.3 | 0.8568 | 16.1 | 20.9884287 |
| 29.04.2015 15:13:26.7 | -217.44 | 531.1 | 0.9518 | 16.05 | 22.1214223 |

Calculation of mass flow rate based on polynomial equation fitted to the experimental data

$$= -2.30304493E-14x^6 + 1.57301063E-12x^5 + 1.15341178E-09x^4 + 1.52449346E-05x^2 + 3.47911591E-03x + 2.14628803E+01$$

Please enter below Polynomial Coefficients

| Order no | Coeff |
|----------|-----------------|
| 6 | -2.30304493E-14 |
| 5 | 1.57301063E-12 |
| 4 | 1.15341178E-09 |
| 3 | -7.33362710E-08 |
| 2 | 1.52449346E-05 |
| 1 | 3.47911591E-03 |
| 0 | 2.14628803E+01 |

| | | |
|----------------------|-------------|--------|
| Actual Area | 0.274324656 | [m2] |
| Integrated area | 0.274324656 | [m2] |
| Area Error | 0 | [%] |
| Integrated Mass flow | 2.341683984 | [Kg/s] |

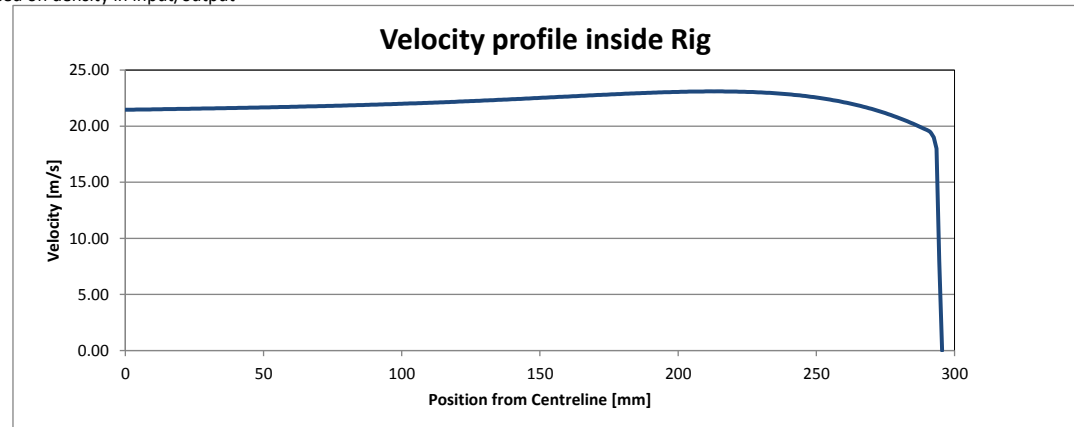
Polynomial curve (dP vs position)

Please do NOT alter any of the figures below

| position [mm] | Velocity [m/s] |
|---------------|----------------|
| 0 | 21.462880 |
| 1 | 21.466375 |
| 2 | 21.469899 |
| 3 | 21.473453 |
| 4 | 21.477036 |
| 5 | 21.480649 |
| 6 | 21.484289 |
| 7 | 21.487959 |
| 8 | 21.491656 |
| 9 | 21.495381 |
| 10 | 21.499134 |
| 11 | 21.502915 |
| 12 | 21.506722 |
| 13 | 21.510557 |
| 14 | 21.514420 |
| 15 | 21.518309 |
| 16 | 21.522225 |
| 17 | 21.526169 |
| 18 | 21.530139 |
| 19 | 21.534137 |
| 20 | 21.538162 |
| 21 | 21.542214 |
| 22 | 21.546294 |
| 23 | 21.550402 |
| 24 | 21.554537 |
| 25 | 21.558701 |
| 26 | 21.562893 |
| 27 | 21.567113 |
| 28 | 21.571363 |
| 29 | 21.575641 |
| 30 | 21.579950 |
| 31 | 21.584288 |
| 32 | 21.588657 |
| 33 | 21.593057 |

| Delta Area [m2] | Delta Mass flow [Kg/s] |
|-----------------|------------------------|
| 0 | 0 |
| 3.14159E-06 | 2.62336E-05 |
| 9.42478E-06 | 7.87138E-05 |
| 1.5708E-05 | 0.000131211 |
| 2.19911E-05 | 0.000183727 |
| 2.82743E-05 | 0.00023626 |
| 3.45575E-05 | 0.000288811 |
| 4.08407E-05 | 0.00034138 |
| 4.71239E-05 | 0.000393968 |
| 5.34071E-05 | 0.000446574 |
| 5.96903E-05 | 0.000499199 |
| 6.59734E-05 | 0.000551844 |
| 7.22566E-05 | 0.000604507 |
| 7.85398E-05 | 0.00065719 |
| 8.4823E-05 | 0.000709893 |
| 9.11062E-05 | 0.000762615 |
| 9.73894E-05 | 0.000815358 |
| 0.000103673 | 0.000868121 |
| 0.000109956 | 0.000920904 |
| 0.000116239 | 0.000973708 |
| 0.000122522 | 0.001026533 |
| 0.000128805 | 0.001079378 |
| 0.000135088 | 0.001132245 |
| 0.000141372 | 0.001185134 |
| 0.000147655 | 0.001238044 |
| 0.000153938 | 0.001290976 |
| 0.000160221 | 0.00134393 |
| 0.000166504 | 0.001396907 |
| 0.000172788 | 0.001449906 |
| 0.000179071 | 0.001502928 |
| 0.000185354 | 0.001555972 |
| 0.000191637 | 0.001609041 |
| 0.00019792 | 0.001662133 |
| 0.000204204 | 0.001715248 |

Based on density in input/output



| | |
|----|-----------|
| 34 | 21.597488 |
| 35 | 21.601951 |
| 36 | 21.606447 |
| 37 | 21.610975 |
| 38 | 21.615537 |
| 39 | 21.620132 |
| 40 | 21.624763 |
| 41 | 21.629428 |
| 42 | 21.634130 |
| 43 | 21.638868 |
| 44 | 21.643644 |
| 45 | 21.648457 |
| 46 | 21.653310 |
| 47 | 21.658202 |
| 48 | 21.663134 |
| 49 | 21.668107 |
| 50 | 21.673122 |
| 51 | 21.678180 |
| 52 | 21.683281 |
| 53 | 21.688427 |
| 54 | 21.693618 |
| 55 | 21.698855 |
| 56 | 21.704139 |
| 57 | 21.709471 |
| 58 | 21.714852 |
| 59 | 21.720283 |
| 60 | 21.725765 |
| 61 | 21.731299 |
| 62 | 21.736885 |
| 63 | 21.742525 |
| 64 | 21.748220 |
| 65 | 21.753970 |
| 66 | 21.759777 |
| 67 | 21.765642 |
| 68 | 21.771565 |
| 69 | 21.777548 |
| 70 | 21.783592 |
| 71 | 21.789697 |
| 72 | 21.795866 |
| 73 | 21.802097 |
| 74 | 21.808394 |
| 75 | 21.814757 |
| 76 | 21.821186 |
| 77 | 21.827683 |
| 78 | 21.834248 |
| 79 | 21.840884 |
| 80 | 21.847590 |
| 81 | 21.854368 |
| 82 | 21.861218 |
| 83 | 21.868142 |

| | |
|-------------|-------------|
| 0.000210487 | 0.001768388 |
| 0.00021677 | 0.001821552 |
| 0.000223053 | 0.001874741 |
| 0.000229336 | 0.001927954 |
| 0.000235619 | 0.001981193 |
| 0.000241903 | 0.002034457 |
| 0.000248186 | 0.002087747 |
| 0.000254469 | 0.002141063 |
| 0.000260752 | 0.002194406 |
| 0.000267035 | 0.002247776 |
| 0.000273319 | 0.002301172 |
| 0.000279602 | 0.002354596 |
| 0.000285885 | 0.002408048 |
| 0.000292168 | 0.002461528 |
| 0.000298451 | 0.002515037 |
| 0.000304734 | 0.002568575 |
| 0.000311018 | 0.002622142 |
| 0.000317301 | 0.002675738 |
| 0.000323584 | 0.002729365 |
| 0.000329867 | 0.002783023 |
| 0.00033615 | 0.002836712 |
| 0.000342434 | 0.002890432 |
| 0.000348717 | 0.002944184 |
| 0.000355 | 0.002997969 |
| 0.000361283 | 0.003051787 |
| 0.000367566 | 0.003105638 |
| 0.00037385 | 0.003159523 |
| 0.000380133 | 0.003213442 |
| 0.000386416 | 0.003267397 |
| 0.000392699 | 0.003321387 |
| 0.000398982 | 0.003375413 |
| 0.000405265 | 0.003429476 |
| 0.000411549 | 0.003483575 |
| 0.000417832 | 0.003537713 |
| 0.000424115 | 0.003591889 |
| 0.000430398 | 0.003646104 |
| 0.000436681 | 0.003700358 |
| 0.000442965 | 0.003754653 |
| 0.000449248 | 0.003808988 |
| 0.000455531 | 0.003863365 |
| 0.000461814 | 0.003917784 |
| 0.000468097 | 0.003972246 |
| 0.00047438 | 0.004026751 |
| 0.000480664 | 0.0040813 |
| 0.000486947 | 0.004135894 |
| 0.00049323 | 0.004190534 |
| 0.000499513 | 0.004245219 |
| 0.000505796 | 0.004299952 |
| 0.00051208 | 0.004354732 |
| 0.000518363 | 0.004409561 |

| | |
|-----|-----------|
| 84 | 21.875141 |
| 85 | 21.882215 |
| 86 | 21.889365 |
| 87 | 21.896592 |
| 88 | 21.903898 |
| 89 | 21.911283 |
| 90 | 21.918747 |
| 91 | 21.926292 |
| 92 | 21.933918 |
| 93 | 21.941627 |
| 94 | 21.949418 |
| 95 | 21.957293 |
| 96 | 21.965253 |
| 97 | 21.973297 |
| 98 | 21.981427 |
| 99 | 21.989643 |
| 100 | 21.997946 |
| 101 | 22.006336 |
| 102 | 22.014814 |
| 103 | 22.023380 |
| 104 | 22.032034 |
| 105 | 22.040778 |
| 106 | 22.049611 |
| 107 | 22.058533 |
| 108 | 22.067546 |
| 109 | 22.076648 |
| 110 | 22.085841 |
| 111 | 22.095124 |
| 112 | 22.104497 |
| 113 | 22.113960 |
| 114 | 22.123514 |
| 115 | 22.133158 |
| 116 | 22.142892 |
| 117 | 22.152715 |
| 118 | 22.162628 |
| 119 | 22.172630 |
| 120 | 22.182721 |
| 121 | 22.192899 |
| 122 | 22.203165 |
| 123 | 22.213518 |
| 124 | 22.223957 |
| 125 | 22.234482 |
| 126 | 22.245091 |
| 127 | 22.255784 |
| 128 | 22.266559 |
| 129 | 22.277415 |
| 130 | 22.288352 |
| 131 | 22.299368 |
| 132 | 22.310461 |
| 133 | 22.321631 |

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|-------------|-------------|
| 0.000524646 | 0.004464438 |
| 0.000530929 | 0.004519365 |
| 0.000537212 | 0.004574343 |
| 0.000543496 | 0.004629372 |
| 0.000549779 | 0.004684454 |
| 0.000556062 | 0.004739587 |
| 0.000562345 | 0.004794775 |
| 0.000568628 | 0.004850017 |
| 0.000574911 | 0.004905314 |
| 0.000581195 | 0.004960666 |
| 0.000587478 | 0.005016076 |
| 0.000593761 | 0.005071543 |
| 0.000600044 | 0.005127068 |
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| 0.000612611 | 0.005238295 |
| 0.000618894 | 0.005293999 |
| 0.000625177 | 0.005349765 |
| 0.00063146 | 0.005405592 |
| 0.000637743 | 0.005461482 |
| 0.000644026 | 0.005517436 |
| 0.00065031 | 0.005573454 |
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| 0.000662876 | 0.005685686 |
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| 0.000694292 | 0.005967442 |
| 0.000700575 | 0.006024 |
| 0.000706858 | 0.006080629 |
| 0.000713142 | 0.00613733 |
| 0.000719425 | 0.006194102 |
| 0.000725708 | 0.006250947 |
| 0.000731991 | 0.006307865 |
| 0.000738274 | 0.006364856 |
| 0.000744557 | 0.006421922 |
| 0.000750841 | 0.006479063 |
| 0.000757124 | 0.006536279 |
| 0.000763407 | 0.00659357 |
| 0.00076969 | 0.006650938 |
| 0.000775973 | 0.006708383 |
| 0.000782257 | 0.006765904 |
| 0.00078854 | 0.006823503 |
| 0.000794823 | 0.006881179 |
| 0.000801106 | 0.006938934 |
| 0.000807389 | 0.006996767 |
| 0.000813672 | 0.007054678 |
| 0.000819956 | 0.007112668 |
| 0.000826239 | 0.007170737 |
| 0.000832522 | 0.007228884 |

| | |
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| 134 | 22.332875 |
| 135 | 22.344192 |
| 136 | 22.355581 |
| 137 | 22.367039 |
| 138 | 22.378564 |
| 139 | 22.390155 |
| 140 | 22.401809 |
| 141 | 22.413524 |
| 142 | 22.425298 |
| 143 | 22.437128 |
| 144 | 22.449012 |
| 145 | 22.460947 |
| 146 | 22.472930 |
| 147 | 22.484958 |
| 148 | 22.497028 |
| 149 | 22.509138 |
| 150 | 22.521283 |
| 151 | 22.533460 |
| 152 | 22.545666 |
| 153 | 22.557898 |
| 154 | 22.570150 |
| 155 | 22.582420 |
| 156 | 22.594703 |
| 157 | 22.606995 |
| 158 | 22.619291 |
| 159 | 22.631587 |
| 160 | 22.643879 |
| 161 | 22.656161 |
| 162 | 22.668429 |
| 163 | 22.680677 |
| 164 | 22.692900 |
| 165 | 22.705092 |
| 166 | 22.717248 |
| 167 | 22.729363 |
| 168 | 22.741430 |
| 169 | 22.753442 |
| 170 | 22.765395 |
| 171 | 22.777280 |
| 172 | 22.789092 |
| 173 | 22.800824 |
| 174 | 22.812468 |
| 175 | 22.824018 |
| 176 | 22.835465 |
| 177 | 22.846803 |
| 178 | 22.858023 |
| 179 | 22.869118 |
| 180 | 22.880080 |
| 181 | 22.890899 |
| 182 | 22.901567 |
| 183 | 22.912076 |

| | |
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| 0.000838805 | 0.007287111 |
| 0.000845088 | 0.007345416 |
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| 0.000857655 | 0.007462264 |
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| 0.000870221 | 0.007579426 |
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| 0.000889071 | 0.007755756 |
| 0.000895354 | 0.007814687 |
| 0.000901637 | 0.007873695 |
| 0.00090792 | 0.007932779 |
| 0.000914203 | 0.007991939 |
| 0.000920487 | 0.008051173 |
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| 0.000939336 | 0.008229317 |
| 0.000945619 | 0.008288842 |
| 0.000951903 | 0.008348437 |
| 0.000958186 | 0.008408101 |
| 0.000964469 | 0.008467833 |
| 0.000970752 | 0.008527632 |
| 0.000977035 | 0.008587495 |
| 0.000983319 | 0.008647422 |
| 0.000989602 | 0.00870741 |
| 0.000995885 | 0.008767459 |
| 0.001002168 | 0.008827566 |
| 0.001008451 | 0.00888773 |
| 0.001014734 | 0.008947947 |
| 0.001021018 | 0.009008217 |
| 0.001027301 | 0.009068537 |
| 0.001033584 | 0.009128904 |
| 0.001039867 | 0.009189316 |
| 0.00104615 | 0.009249771 |
| 0.001052434 | 0.009310265 |
| 0.001058717 | 0.009370796 |
| 0.001065 | 0.009431361 |
| 0.001071283 | 0.009491956 |
| 0.001077566 | 0.009552579 |
| 0.001083849 | 0.009613225 |
| 0.001090133 | 0.009673892 |
| 0.001096416 | 0.009734575 |
| 0.001102699 | 0.009795271 |
| 0.001108982 | 0.009855976 |
| 0.001115265 | 0.009916685 |
| 0.001121549 | 0.009977394 |
| 0.001127832 | 0.010038099 |
| 0.001134115 | 0.010098794 |
| 0.001140398 | 0.010159476 |
| 0.001146681 | 0.010220139 |

| | |
|-----|-----------|
| 184 | 22.922417 |
| 185 | 22.932579 |
| 186 | 22.942554 |
| 187 | 22.952332 |
| 188 | 22.961903 |
| 189 | 22.971257 |
| 190 | 22.980384 |
| 191 | 22.989272 |
| 192 | 22.997912 |
| 193 | 23.006291 |
| 194 | 23.014400 |
| 195 | 23.022225 |
| 196 | 23.029755 |
| 197 | 23.036979 |
| 198 | 23.043883 |
| 199 | 23.050456 |
| 200 | 23.056684 |
| 201 | 23.062555 |
| 202 | 23.068054 |
| 203 | 23.073169 |
| 204 | 23.077885 |
| 205 | 23.082188 |
| 206 | 23.086064 |
| 207 | 23.089499 |
| 208 | 23.092476 |
| 209 | 23.094980 |
| 210 | 23.096997 |
| 211 | 23.098510 |
| 212 | 23.099502 |
| 213 | 23.099958 |
| 214 | 23.099861 |
| 215 | 23.099193 |
| 216 | 23.097937 |
| 217 | 23.096076 |
| 218 | 23.093590 |
| 219 | 23.090463 |
| 220 | 23.086674 |
| 221 | 23.082205 |
| 222 | 23.077038 |
| 223 | 23.071151 |
| 224 | 23.064525 |
| 225 | 23.057139 |
| 226 | 23.048973 |
| 227 | 23.040006 |
| 228 | 23.030217 |
| 229 | 23.019582 |
| 230 | 23.008081 |
| 231 | 22.995691 |
| 232 | 22.982388 |
| 233 | 22.968151 |

| | |
|-------------|-------------|
| 0.001152965 | 0.010280777 |
| 0.001159248 | 0.010341386 |
| 0.001165531 | 0.010401959 |
| 0.001171814 | 0.010462492 |
| 0.001178097 | 0.010522977 |
| 0.00118438 | 0.010583409 |
| 0.001190664 | 0.010643782 |
| 0.001196947 | 0.010704088 |
| 0.00120323 | 0.010764321 |
| 0.001209513 | 0.010824474 |
| 0.001215796 | 0.01088454 |
| 0.00122208 | 0.010944511 |
| 0.001228363 | 0.011004379 |
| 0.001234646 | 0.011064137 |
| 0.001240929 | 0.011123776 |
| 0.001247212 | 0.011183288 |
| 0.001253495 | 0.011242664 |
| 0.001259779 | 0.011301895 |
| 0.001266062 | 0.011360972 |
| 0.001272345 | 0.011419885 |
| 0.001278628 | 0.011478626 |
| 0.001284911 | 0.011537183 |
| 0.001291195 | 0.011595546 |
| 0.001297478 | 0.011653705 |
| 0.001303761 | 0.011711649 |
| 0.001310044 | 0.011769368 |
| 0.001316327 | 0.011826848 |
| 0.001322611 | 0.011884079 |
| 0.001328894 | 0.011941049 |
| 0.001335177 | 0.011997744 |
| 0.00134146 | 0.012054154 |
| 0.001347743 | 0.012110263 |
| 0.001354026 | 0.01216606 |
| 0.00136031 | 0.01222153 |
| 0.001366593 | 0.012276659 |
| 0.001372876 | 0.012331433 |
| 0.001379159 | 0.012385837 |
| 0.001385442 | 0.012439856 |
| 0.001391726 | 0.012493475 |
| 0.001398009 | 0.012546678 |
| 0.001404292 | 0.012599448 |
| 0.001410575 | 0.012651768 |
| 0.001416858 | 0.012703623 |
| 0.001423141 | 0.012754994 |
| 0.001429425 | 0.012805864 |
| 0.001435708 | 0.012856215 |
| 0.001441991 | 0.012906027 |
| 0.001448274 | 0.012955282 |
| 0.001454557 | 0.01300396 |
| 0.001460841 | 0.013052042 |

| | |
|-----|-----------|
| 234 | 22.952954 |
| 235 | 22.936774 |
| 236 | 22.919586 |
| 237 | 22.901367 |
| 238 | 22.882090 |
| 239 | 22.861730 |
| 240 | 22.840261 |
| 241 | 22.817657 |
| 242 | 22.793891 |
| 243 | 22.768935 |
| 244 | 22.742763 |
| 245 | 22.715346 |
| 246 | 22.686655 |
| 247 | 22.656663 |
| 248 | 22.625339 |
| 249 | 22.592654 |
| 250 | 22.558578 |
| 251 | 22.523080 |
| 252 | 22.486129 |
| 253 | 22.447694 |
| 254 | 22.407743 |
| 255 | 22.366243 |
| 256 | 22.323162 |
| 257 | 22.278466 |
| 258 | 22.232121 |
| 259 | 22.184094 |
| 260 | 22.134349 |
| 261 | 22.082851 |
| 262 | 22.029565 |
| 263 | 21.974455 |
| 264 | 21.917483 |
| 265 | 21.858613 |
| 266 | 21.797807 |
| 267 | 21.735027 |
| 268 | 21.670234 |
| 269 | 21.603390 |
| 270 | 21.534453 |
| 271 | 21.463384 |
| 272 | 21.390143 |
| 273 | 21.314688 |
| 274 | 21.236977 |
| 275 | 21.156968 |
| 276 | 21.074618 |
| 277 | 20.989884 |
| 278 | 20.902721 |
| 279 | 20.813085 |
| 280 | 20.720931 |
| 281 | 20.626214 |
| 282 | 20.528886 |
| 283 | 20.428902 |

| | |
|-------------|-------------|
| 0.001467124 | 0.013099507 |
| 0.001473407 | 0.013146334 |
| 0.00147969 | 0.013192502 |
| 0.001485973 | 0.013237989 |
| 0.001492257 | 0.013282774 |
| 0.00149854 | 0.013326833 |
| 0.001504823 | 0.013370143 |
| 0.001511106 | 0.013412681 |
| 0.001517389 | 0.013454423 |
| 0.001523672 | 0.013495343 |
| 0.001529956 | 0.013535418 |
| 0.001536239 | 0.01357462 |
| 0.001542522 | 0.013612925 |
| 0.001548805 | 0.013650304 |
| 0.001555088 | 0.013686732 |
| 0.001561372 | 0.01372218 |
| 0.001567655 | 0.01375662 |
| 0.001573938 | 0.013790023 |
| 0.001580221 | 0.013822359 |
| 0.001586504 | 0.013853598 |
| 0.001592787 | 0.01388371 |
| 0.001599071 | 0.013912664 |
| 0.001605354 | 0.013940427 |
| 0.001611637 | 0.013966967 |
| 0.00161792 | 0.013992251 |
| 0.001624203 | 0.014016246 |
| 0.001630487 | 0.014038916 |
| 0.00163677 | 0.014060227 |
| 0.001643053 | 0.014080144 |
| 0.001649336 | 0.014098629 |
| 0.001655619 | 0.014115646 |
| 0.001661903 | 0.014131158 |
| 0.001668186 | 0.014145126 |
| 0.001674469 | 0.01415751 |
| 0.001680752 | 0.014168271 |
| 0.001687035 | 0.014177369 |
| 0.001693318 | 0.014184763 |
| 0.001699602 | 0.01419041 |
| 0.001705885 | 0.014194268 |
| 0.001712168 | 0.014196293 |
| 0.001718451 | 0.014196442 |
| 0.001724734 | 0.014194669 |
| 0.001731018 | 0.014190928 |
| 0.001737301 | 0.014185173 |
| 0.001743584 | 0.014177357 |
| 0.001749867 | 0.014167432 |
| 0.00175615 | 0.014155348 |
| 0.001762433 | 0.014141056 |
| 0.001768717 | 0.014124506 |
| 0.001775 | 0.014105645 |

| | |
|-------|-----------|
| 284 | 20.326213 |
| 285 | 20.220772 |
| 286 | 20.112530 |
| 287 | 20.001439 |
| 288 | 19.887448 |
| 289 | 19.770506 |
| 290 | 19.650564 |
| 291 | 19.527569 |
| 291.5 | 19.400000 |
| 292.5 | 19.000000 |
| 293.5 | 18.000000 |
| 294.5 | 8.000000 |
| 295.5 | 0.000000 |

| | |
|-------------|-------------|
| 0.001781283 | 0.014084421 |
| 0.001787566 | 0.014060782 |
| 0.001793849 | 0.014034673 |
| 0.001800133 | 0.014006039 |
| 0.001806416 | 0.013974825 |
| 0.001812699 | 0.013940973 |
| 0.001818982 | 0.013904426 |
| 0.001825265 | 0.013865125 |
| 0.000914989 | 0.006905055 |
| 0.00183469 | 0.013560195 |
| 0.001840973 | 0.012890495 |
| 0.001847256 | 0.005748662 |
| 0.00185354 | 0 |

Please do not change any of the values in this sheet

| | | |
|-------------------|---|------------|
| Patm | Atmospheric air pressure - (As recorded from engine data) | 975 [mBar] |
| Patm | | 97500 [Pa] |
| Tatm | | 5 [C] |
| Tatm | | 278 [K] |
| Relative Humidity | | 95 [%] |

$$\rho_{\text{humid air}}^{[1]} = \frac{p_d}{R_d T} + \frac{p_v}{R_v T} = \frac{p_d M_d + p_v M_v}{RT}$$

where:

| | |
|---------------------------|---|
| $\rho_{\text{humid air}}$ | Density of the humid air (kg/m ³) |
| p_d | Partial pressure of dry air (Pa) |
| R_d | Specific gas constant for dry air, 287.058 J/(kg·K) |
| T | Temperature (K) |
| p_v | Pressure of water vapor (Pa) |
| R_v | Specific gas constant for water vapor, 461.495 J/(kg·K) |
| M_d | Molar mass of dry air, 0.028964 (kg/mol) |
| M_v | Molar mass of water vapor, 0.018016 (kg/mol) |
| R | Universal gas constant, 8.314 J/(K·mol) |

$$\rho_{\text{humid air}} = 1.217898 \text{ Kg/m}^3$$

$$0.318090154$$

The vapor pressure of water may be calculated from the [saturation vapor pressure](#) and [relative humidity](#). It is found by:

$$p_v = \phi p_{\text{sat}}$$

$$p_u = 828.6578 \text{ [Pa]}$$

Where:

| | |
|------------------|---------------------------|
| p_v | Vapor pressure of water |
| ϕ | Relative humidity |
| p_{sat} | Saturation vapor pressure |

The [saturation vapor pressure of water](#) at any given temperature is the vapor pressure when relative humidity is 100%. One formula ^[1] used to find the saturation vapor pressure is:

$$p_{\text{sat}} = 6.1078 \times 10^{\frac{7.5T}{T+237.3}}$$

$$p_{\text{sat}} = 8.722714 \text{ hPa}$$

$$p_{\text{sat}} = 872.2714 \text{ [Pa]}$$

where T is in degrees C. Note:

$$\rho = \frac{p}{R_{\text{specific}} T} \quad 1.22177 \text{ [kg/m}^3\text{]}$$

$$R = 287.058 \text{ J/Kg K}$$

$$T = \text{Temperature in degrees Kelvin}$$

$$P = \text{Absolute Pressure in Pa}$$