

Designation: D3505 - 96 (Reapproved 2006)

Standard Test Method for Density or Relative Density of Pure Liquid Chemicals¹

This standard is issued under the fixed designation D3505; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method describes a simplified procedure for the measurement of density or relative density of pure liquid chemicals for which accurate temperature expansion functions are known. It is restricted to liquids having vapor pressures not exceeding 600 mm Hg (0.8 atm) at the equilibration temperature, and having viscosities not exceeding 15 cSt at 20°C (60°F).

1.2 Means are provided for reporting results in the following units:

Density g/cm³ at 20°C

Density g/ml at 20°C

Relative density 20°C/4°C

Relative density 60°F/60°F (15.56°C/15.56°C)

Commercial density, lb (in air)/U.S. gal at 60°F

Commercial density, lb (in air)/U.K. gal at 60°F.

Note 1—This test method is based on the old definition of 1 $L=1.000028~dm^3$ (1 $mL=1.000028~cm^3$). In 1964 the General Conference on Weights and Measures withdrew this definition of the litre and declared that the word "litre" was a special name for the cubic decimetre, thus making 1 $mL=1~cm^3$ exactly.

NOTE 2—An alternative method for determining relative density of pure liquid chemicals is Test Method D4052.

- 1.3 The following applies to all specified limits in this test method: for purposes of determining conformance with this test method, an observed value or a calculated value shall be rounded off "to the nearest unit" in the last right-hand digit used in expressing the specification limit, in accordance with the rounding-off method of Practice E29.
- 1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Specific hazard statements are given in 7.1.

2. Referenced Documents

2.1 ASTM Standards:²

D1193 Specification for Reagent Water

D1555 Test Method for Calculation of Volume and Weight of Industrial Aromatic Hydrocarbons and Cyclohexane

D3437 Practice for Sampling and Handling Liquid Cyclic Products

D4052 Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter

E1 Specification for ASTM Liquid-in-Glass Thermometers E12 Terminology Relating to Density and Specific Gravity of Solids, Liquids, and Gases³

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

2.2 Other Document:

OSHA Regulations, 29 CFR paragraphs 1910.1000 and 1910.1200⁴

3. Terminology

- 3.1 Definitions:
- 3.1.1 *density*, *n*—the mass of material per unit volume at a given temperature called the "reference temperature." Weight corrected to a standard acceleration of gravity and corrected for the buoyant effect of air is used to measure mass. This method specifies the use of a beam balance to determine weight so that no correction for variation in acceleration of gravity is necessary. When a torsion or spring balance is used, such correction must be applied.
- 3.1.2 relative density, n—the ratio of the density of the material at reference temperature "t" to the density of pure water, in consistent units, at reference temperature t_2 . It is common practice to use reference temperature t_1 equal to t_2 .

¹ This test method is under the jurisdiction of ASTM Committee D16 on Aromatic Hydrocarbons and Related Chemicals and is the direct responsibility of Subcommittee D16.04 on Instrumental Analysis.

Current edition approved Jan. 1, 2006. Published January 2006. Originally approved in 1976. Last previous edition approved in 2000 as D3505-96 (2000). DOI: 10.1520/D3505-96R06.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

- 3.1.2.1 Since the mass of water at 4°C is very close to 1 g/mL or 1 g/cm³, it is common practice to set the reference temperature t_2 for water at 4°C. When this is done and the density of the material is given in grams per millilitre, or grams per cubic centimetre, the value of density is very nearly identical to the value for relative density. Thus, density at 20°C in g/cm³ or g/mL, is nearly identical with relative density 20°C/4°C.
- 3.1.3 commercial density, n—weight per unit volume without correcting for the buoyant effect of air and is limited in this document to pounds (in air) per U.S. gallon at 60°F, or pounds in air per U.K. gallon at 60°F. This is the density most commonly used in commercial transactions in the petroleum and coal chemicals industry in the United States and Canada.
- 3.2 The definitions included in Terminology E12 are applicable to this test method.

4. Summary of Test Method

Note 3—See Appendix X1 for details on the method and derivation of formulas.

4.1 For materials listed in Table 1 the sample is drawn into a weighed and calibrated bicapillary pycnometer. The filler pycnometer is allowed to come to equilibrium at any conve-

nient temperature between 10 and 30°C (50 and 86°F). The equilibrium temperature is measured to the nearest 0.02°C. The weight is determined using a beam balance. The density, relative density, or commercial density at the desired reference temperature is then calculated from the sample weight, a calibration factor proportional to an equal volume of water, and a multiplier which corrects for the buoyancy of air and the change in volume of the pycnometer and the sample due to deviation from the chosen reference temperature.

4.2 For liquids not listed in Table 1, the sample is equilibrated at the desired reference temperature, usually 20°C or 60°F (15.56°C), the density, relative density, or commercial density is then calculated from the sample weight, a calibration factor proportional to an equal volume of water and a term which corrects for the buoyancy of air. In the case of volatile liquids such as pentane, the time between reading of volume at the equilibrium temperature and weighing must not be prolonged, otherwise weight loss through evaporation may result in errors.⁵

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⁵ For a more complete discussion on the use of this design pycnometer, see Lipken, Davidson, Harvey and Kurtz, *Industrial Engineering Chemistry, Analytical Edition*; Vol 16, 1944, p. 55.

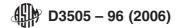


TABLE I, PART I 20°C Reference Temperature Multiplier, F20, for use in Computing Density, 12.1 CHOOSE A MULTIPLIER FOR THE MATERIAL BEING MEASURED CORRESPONDING TO THE BATH TEMPERATURE AT WHICH THE PYCNOMETER EQUILIBRATED.

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	TEMP			MIXED	0-	M-	P-		CYCLO-	_
	DEGC	BENZENE	TOLUENE	XYLENES	XYLENE	XYLENE	XYLENE	STYRENE	HEXANE	
	10.0	0.98822	0.98941	0.99028	0.99052	0.99028	0.99011	0.99029	0.98912	
-	10.2		0.98962	0.99047		0.99047	0.99030	0.99048	0.98933	
	10.4	0.98868	0.98983	0.99066	0.99089	0.99066	0.99049	0.99066	0.98953	
	10.6	0.98891	0.99003	0.99085	0.99107	0.99085	0.99069	0.99085	0.98973	
	10.8	0.98914	0.99024	0.99104	0.99126	0.99104	0.99088	0.99104	0.98993	
	11.0	0.98937	0.99045	0.99123	0.99144	0.99123	0.99107	0.99123	0.99013	
_	11.2		0.99066	0.99142	0.99163		0.99126	0.99142	0.99034	
	11.4	0.98982	0.99086	0.99161	0.99181	0.99161	0.99146	0.99161	0.99054	
	11.6	0.99005	0.99107	0.99179	0.99200	0.99179	0.99165	0.99180	0.99075	
	11.8	0.99028	0.99128	0.99198	0.99218	0.99198	0.99184	0.99199	0.99095	
	12.0	0.99051	0.99148	0.99217	0.99237	0.99217	0.99204	0.99218	0.99116	
_	12.2	0.99074	0.99169	0.99236	0.99255	0.99236	0.99223	0.99237	0.99136	
	12.4	0.99097	0.99190	0.99255	0.99274	0.99255	0.99242	0.99256	0.99157	
	12.6	0.99120	0.99211	0.99274	0.99292	0.99274	0.99262	0.99275	0.99178	
	12.8	0.99144	0.99231	0.99293	0.99311	0.99293	0.99281	0.99294	0.99199	
										•
	13.0	0.99167	0.99252	0.99312	0.99329	0.99312	0.99300	0.99313	0.99220	
	13.2	0.99190	0.99273	0.99331	0.99348	0.99331	0.99320	0.99332	0.99240	
**	13.4	0.99213		0.99350	0.99367	0.99350	0.99339	0.99351	0.99261	
	13.6	0.99236	0.99315	0.99369	0.99385	0.99369	0.99358	0.99370	0.99252	
	13.8	0.99259	0.99335	0.99389	0.99404	0.99389	0.99378	0.99390	0.99303	
	14.0	0.99282	0.99356	0.99408	0.99422	0.99408	0.99397	0.99409	0.90325	
	14.2	0.99305	0.99377	0.99427					0.99346	
	14.4		0.99398	0.99446	0.99460	0.99446			0.99367	
	14.6	0.99352	0.99419	0.99465	0.99478	0.99465	0.99456	0.99466	0.99383	
	14.8	0.99375	0.99440	0.99484		0.99484	0.99475	0.99485	0.99385	
	- 1 -		-H-7000					_ 0 • 2 7 7 9 0 0 .	0.499410	
	15.0	0.99398	0.99461	0.99503	0.99516	0.99503	0.99495	0.99504	0.99431	
	15.2	0.99421	0.99481	0.99522	0.99534	0.99522		0.99523	0.99452	
	15.4	0.99445	0.99502	0.99541	0.99553	0.99541	0.99534	0.99542	0.99474	
	15.6	0.99468	0.99523	0.99561	0.99572	0.99561	0.99553	0.99562	0.99496	
	15.8	0.99491	0.99544	0.99580	0.99590	0.99580	0.99573	0.99581	0.99517	
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	16.0	0.99515	0.99565	0.99599	0.99609	0.99599	0.99592	0.99600	0.99539	
	16.2	0.99538	0.99586	0.99618	0.99628	0.99618	0.99612	0.99619	0.99561	
	16.4	0.99561	0.99607	0.99637	0.99646	0.99637	0.99631	0.99638		_
	16.6	0.99585	0.99628	0.99657	0.99665	0.99657	0.99651	0.99538	0.99582	
	16.8	0.99608	0.99649	0.99676	0.99684	0.99676	0.99670		0.99604	
					7.77004	3.77010	0.77010	0.99677	0.99626	-
	17.0	0.99632	0.99670	0.99695	0.99703	0.99695	0.99690	U•99696	0.99648	
	17.2	0.99655	0.99691	0.99714	0.99721	0.99714	0.99710			
	17.4	0.99679	0.99712		0.99740	0.99734		0.99715	0.99670	-
	17.6	0.99702	0.99733	0.99753	0.99740	0.99734	0.99729	0.99734	0.99692	
	17.8	0.99726	0.99754	0.99772	0.99739	0.99753	0.99749	0.99754	0.99715	
			3077134	0.77112	0.99118	0.77112	0.99768	0.99773	0.99737	
	18.0	0.99749	0.99775	0.99791	0.99797	0.00701	0.00700	0.00702	0.00743	
		0.99773					0.99788	0.99792	0.99759	
		0.99796			_0.99815_	0.99811	0.99808	0.99811	0.99761	
	18.6	0.99796			0.99834		0.99827			
	18.8	0.99820	0.99838		0.99853	0.99849	0.99847	0.99850	0.99826	
	10.8	0.99843	V•77857	0.99869	0.99872	0.99869	0.99867	0.99869	0.99849	
	10.0	0.00047	• 00000		0					
		0.99867		0.99888		0.99888	0.99886	0.99888	0.99871	
	19.2	0.99890		0.99907		0.99907		0.99908	0.99894	
	19.4	0.99914		0.99927		0.99927		0.99927	0.99917	
	19.6	0.99938	0.99943	0.99946	0.99947	0.99946	0.99946	0.99946	0.9 9939	
*	19.8	0.99961	0.99964	0.99966	0,99966	0.99966	0.99965	0.99966		
				_						
	20.0	0.99985	0.99985	0.99985	0.99985	0.99985	0.99985	0.99985	0.99985	

TABLE I, PART I Continued

CHOOSE A MULTIPLIER FOR THE MATERIAL BEING MEASURED CORRESPONDING TO THE BATH TEMPERATURE AT WHICH THE PYCNOMETER EQUILIBRATED.

20.0 0.99985 0.99885 0.99985	YCLO- HEXANE									T. F
DEGC BENZENE TOLUENE XYLENE X				ρ_	М-	0-	MIXED			1 EMP
20.0	HEXANE		CTUEFUE					TOLLIENE	PENZENE	
20.0		,	SITHENE	ATLENE	ATLENE		VILENES	TOLOCIAL	CENZENE	DEGC
20.2 1.00009 1.00006 1.00004 1.00004 1.00005 1.00004 1.000025 1.00004 1.000025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00026 1.00080 1.00080 1.00080 1.00081 1.00081 1.00082 1.00082 1.00084 1.00082 1.00084 1.00082 1.00082 1.00082 1.00084 1.00082 1.00084 1.00082		_				~				
20.2 1.00009 1.00006 1.00004 1.00004 1.00005 1.00004 1.000025 1.00004 1.000025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00026 1.00080 1.00080 1.00080 1.00081 1.00081 1.00082 1.00082 1.00084 1.00082 1.00084 1.00082 1.00082 1.00082 1.00084 1.00082 1.00084 1.00082										
20.2 1.00009 1.00006 1.00004 1.00004 1.00005 1.00004 1.00003 1.00004 1.00005 1.00004 1.00003 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00024 1.00025 1.00025 1.00024 1.00025 1.00025 1.00024 1.00025	ODGOS	0	0.0000	1.00005	1.00005	0.99985	0.99985	0.99985	0.99985	20.0
20.4 1.00032 1.00027 1.00024 1.00023 1.00024 1.00025 1.00024 1.0003 2 1.0006	99985									
20.6 1.00056 1.00048 1.00043 1.00042 1.00043 1.00044 1.00043 1. 20.8 1.00080 1.00069 1.00063 1.00061 1.00063 1.00064 1.00062 1. 21.0 1.00104 1.00091 1.00082 1.00080 1.00082 1.00088 1.00082 1. 21.2 1.00128 1.00112 1.00102 1.00099 1.00102 1.00104 1.00101 1. 21.4 1.00151 1.00133 1.00121 1.00118 1.00121 1.00124 1.00121 1. 21.6 1.00175 1.00154 1.00114 1.00137 1.00141 1.00143 1.00140 1. 21.8 1.00199 1.00175 1.00160 1.00156 1.00160 1.00163 1.00159 1. 22.0 1.00223 1.00196 1.00180 1.00175 1.00180 1.00183 1.00179 1. 22.1 1.00247 1.00218 1.00199 1.00175 1.00180 1.00183 1.00179 1. 22.2 1.00247 1.00228 1.00199 1.00194 1.00199 1.00203 1.00198 1. 22.4 1.00271 1.00229 1.00259 1.00213 1.00223 1.00223 1.00216 1. 22.5 1.00249 1.00260 1.00238 1.00232 1.00238 1.00223 1.00216 1. 22.8 1.00319 1.00281 1.00258 1.00251 1.00258 1.00263 1.00257 1. 23.0 1.00342 1.00302 1.00278 1.00270 1.00278 1.00283 1.00276 1. 23.1 1.00360 1.00324 1.00297 1.00269 1.00371 1.0038 1.00392 1.00322 1.00365 1.00257 1. 23.2 1.00366 1.00324 1.0036 1.0036 1.00377 1.00388 1.00362 1.00322 1.00315 1. 23.8 1.00498 1.00387 1.00396 1.00368 1.00397 1.00382 1.00392 1.00315 1. 24.0 1.00462 1.00409 1.00376 1.00368 1.00376 1.00362 1.00393 1.0224 24.0 1.00467 1.00437 1.00387 1.00368 1.00395 1.00402 1.00393 1.00258 1.00259 1.00368 1.00362 1.00350 1.00350 1.00462 1.00393 1.00494 1.00467 1.00467 1.00467 1.00467 1.00459 1.00467 1.00467 1.00459 1.00467 1.00467 1.00459 1.00467 1.00467 1.00459 1.00467 1.00459 1.00469 1.00469 1.00559 1.00469 1.00559 1.00559 1.00559 1.00559 1.00559 1.00569 1.00569 1.00569 1.00569 1.00569 1.00569 1.00661 1.00577 1.00661 1.00559 1.00663 1.00569 1.00669 1.00661 1.00559 1.00669	.0000⊬	1	1.00004							
20.6 1.00056 1.00048 1.00043 1.00042 1.00043 1.00044 1.00043 1. 20.8 1.00080 1.00069 1.00063 1.00061 1.00063 1.00064 1.00062 1. 21.0 1.00104 1.00091 1.00082 1.00080 1.00082 1.00084 1.00082 1. 21.2 1.00128 1.00112 1.00102 1.00099 1.00102 1.00104 1.00101 1. 21.4 1.00151 1.00133 1.00121 1.00118 1.00121 1.00124 1.00121 1. 21.6 1.00175 1.00154 1.00114 1.00118 1.00121 1.00124 1.00121 1. 21.8 1.00199 1.00175 1.00160 1.00160 1.00160 1.00163 1.00169 1. 22.0 1.00223 1.00196 1.00180 1.00175 1.00180 1.00163 1.00159 1. 22.1 1.00247 1.00228 1.00199 1.00175 1.00180 1.00183 1.00179 1. 22.2 1.00247 1.00228 1.00199 1.00129 1.00223 1.00219 1.00223 1.00218 1. 22.4 1.00271 1.00259 1.00280 1.00238 1.00221 1.00238 1.00223 1.00248 1.00237 1. 22.8 1.00319 1.00281 1.00258 1.00251 1.00258 1.00263 1.00257 1. 23.0 1.00342 1.00302 1.00278 1.00251 1.00258 1.00263 1.00257 1. 23.1 1.00366 1.00324 1.00278 1.00259 1.00278 1.00263 1.00257 1. 23.2 1.00366 1.00324 1.00297 1.00269 1.00278 1.00333 1.00276 1. 23.3 1.00408 1.00381 1.00317 1.00308 1.003317 1.00332 1.00315 1. 23.4 1.00390 1.00345 1.00317 1.00308 1.00337 1.00322 1.00315 1. 23.5 1.00467 1.00467 1.00451 1.00316 1.00356 1.00362 1.00355 1. 23.6 1.00414 1.00366 1.00336 1.00327 1.00336 1.00342 1.00335 1.00296 1. 24.0 1.00462 1.00409 1.00376 1.00366 1.00362 1.00393 1.00296 1. 24.1 1.00467 1.00407 1.00356 1.00346 1.00356 1.00342 1.00335 1. 25.2 1.00607 1.00537 1.00494 1.00494 1.00492 1.00492 1.00491 1. 25.4 1.00515 1.00494 1.00495 1.00494 1.00492 1.00492 1.00491 1. 25.6 1.00566 1.00579 1.00533 1.00494 1.00502 1.00491 1.00502 1.00491 1. 25.6 1.00728 1.00602 1.00533 1.00553 1.00563 1.00569 1.00569 1.00666 1.00577 1.00533 1.00569 1.00666 1.00569 1.00666 1.00553 1.00662 1.00666 1.00569 1.00666 1.00569 1.00666 1.00662 1.00666 1.00666 1.00662 1.00668 1.00666 1.00666 1.00662 1.00668 1.00666 1.00666 1.00662 1.00668 1.00666 1.00666 1.00666 1.00662 1.00668 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666 1.00666	00031	1.	1.00024	1.00025	1.00024	1.00023	1.00024	1.00027	1.00032	20.4
20.8 1.00080 1.00069 1.00063 1.00061 1.00063 1.00064 1.00062 1.	00054					1.00042	1.00043	1.00048	1.00056	20.6
21.0										
21.2 1.00128 1.00112 1.00102 1.00109 1.00102 1.00104 1.00101 1.	00077	1.	1.00005	1.00064	1.00063	1.00001	1.00003	1.0000	1.0000	
21.2 1.00128 1.00112 1.00102 1.00109 1.00102 1.00104 1.00101 1.										
21.4 1.00128 1.00112 1.00102 1.00108 1.00102 1.00104 1.00101 1.	00100	1.	1.00082	1.00084	1.00082	1.00080	1.00082	1.00091	1.00104	21.0
21.4 1.00151 1.00133 1.00121 1.00118 1.00121 1.00124 1.00121 1. 21.6 1.00175 1.00154 1.00141 1.00118 1.00141 1.00124 1.00121 1. 21.8 1.00199 1.00175 1.00160 1.00166 1.00161 1.00163 1.00159 1. 22.0 1.00223 1.00196 1.00180 1.00175 1.00180 1.00183 1.00159 1. 22.2 1.00247 1.00218 1.00199 1.00194 1.00199 1.00203 1.00179 1. 22.2 1.00247 1.00239 1.00219 1.00213 1.00219 1.00223 1.00216 1. 22.4 1.00271 1.00260 1.00238 1.00219 1.00218 1.00228 1.00228 1.00216 1. 22.8 1.00319 1.00260 1.00238 1.00251 1.00258 1.00263 1.00257 1. 23.0 1.00342 1.00302 1.00278 1.00251 1.00278 1.00263 1.00257 1. 23.1 1.00366 1.00324 1.00297 1.00289 1.00297 1.00303 1.00296 1. 23.2 1.00366 1.00324 1.00297 1.00289 1.00297 1.00303 1.00296 1. 23.4 1.00390 1.00345 1.00317 1.00308 1.00317 1.00322 1.00315 1. 23.6 1.00414 1.00366 1.00336 1.00337 1.00336 1.00342 1.00335 1. 23.8 1.00438 1.00387 1.00356 1.00346 1.00356 1.00362 1.00355 1. 24.0 1.00462 1.00409 1.00376 1.00346 1.00356 1.00362 1.00354 1. 24.1 1.00511 1.00451 1.00451 1.00451 1.00403 1.00492 1.00492 1.00493 1. 24.2 1.00487 1.00430 1.00395 1.00384 1.00395 1.00402 1.00393 1. 24.3 1.00583 1.00473 1.00455 1.00402 1.00452 1.00402 1.00492 1. 25.0 1.00583 1.00473 1.00454 1.00462 1.00474 1.00462 1.00462 1.00452 1. 25.1 1.00666 1.00579 1.00537 1.00491 1.00494 1.00492 1.00492 1.00551 1. 25.2 1.00607 1.00537 1.00494 1.00494 1.00494 1.00502 1.00551 1.00502 1.00559 1.00563 1.00559 1.00563 1.00559 1.00559 1.00559 1.00559 1.00559 1.00559 1.00665 1.00559 1.00559 1.00662 1.00559 1.00662 1.00559 1.00662 1.00559 1.00662 1.00559 1.00662 1.00664 1.00662 1.00664 1.00662 1.00667 1.00665 1.006	00124				1.00102	1.00099	1.00102	1.00112	1.00128	21.2
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22.0	00170	1.	1.00140	1.00143	1.00141	1.00137				
22.0	00194	1.	1.00159	1.00163	1.00160	1.00156	1.00160	1.00175	1.00199	21.8
22.2 1.00247 1.00218 1.00199 1.00194 1.00199 1.00203 1.00198 1. 22.4 1.00271 1.00239 1.00219 1.00213 1.00219 1.00223 1.00218 1. 22.6 1.00295 1.00260 1.00238 1.00232 1.00238 1.00243 1.00237 1. 22.8 1.00319 1.00281 1.00258 1.00251 1.00258 1.00263 1.00257 1. 23.0 1.00342 1.00302 1.00278 1.00270 1.00278 1.00283 1.00267 1. 23.1 1.00366 1.00324 1.00297 1.00289 1.00297 1.00303 1.00296 1. 23.2 1.00366 1.00324 1.00297 1.00289 1.00297 1.00303 1.00296 1. 23.3 1.00390 1.00345 1.00317 1.00308 1.00317 1.00322 1.00315 1. 23.6 1.00414 1.00366 1.00336 1.00327 1.00336 1.00342 1.00335 1. 23.8 1.00488 1.00387 1.00356 1.00346 1.00356 1.00342 1.00335 1. 24.0 1.00462 1.00409 1.00376 1.00346 1.00356 1.00362 1.00334 1. 24.1 1.00487 1.00430 1.00395 1.00344 1.00395 1.00402 1.00393 1. 24.2 1.00487 1.00430 1.00395 1.00344 1.00395 1.00402 1.00393 1. 24.3 1.00559 1.00473 1.00455 1.00402 1.00455 1.00402 1.00432 1. 24.6 1.00535 1.00473 1.00435 1.00422 1.00435 1.00442 1.00432 1. 25.0 1.00583 1.00473 1.00454 1.00442 1.00454 1.00462 1.00452 1. 25.1 1.00506 1.00597 1.00593 1.00494 1.00494 1.00502 1.00491 1.0 25.2 1.00607 1.06537 1.00494 1.00499 1.00514 1.00502 1.00491 1.0 25.8 1.00680 1.00601 1.00553 1.00557 1.00573 1.00583 1.00589 1.0 26.4 1.00704 1.00622 1.00573 1.00557 1.00573 1.00583 1.00589 1.0 26.5 1.00708 1.00605 1.00612 1.00593 1.00514 1.00522 1.00623 1.00649 1.0 26.6 1.00773 1.00665 1.00593 1.00557 1.00593 1.00603 1.00689 1.0 26.6 1.00777 1.00665 1.00593 1.00557 1.00593 1.00663 1.00669 1.0 26.6 1.00777 1.00665 1.00692 1.00652 1.00663 1.00668 1.00668 1.00668 1.00669 1.0										
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25.2 1.00607 1.00537 1.00494 1.00480 1.00494 1.00502 1.00491 1.0 25.4 1.00631 1.00558 1.00514 1.00499 1.00514 1.00522 1.00511 1.0 25.6 1.00656 1.00579 1.00533 1.00518 1.00533 1.00542 1.00530 1.0 25.8 1.00680 1.00601 1.00553 1.00537 1.00553 1.00563 1.00560 1.0 26.0 1.00704 1.00622 1.00573 1.00557 1.00573 1.00583 1.00569 1.0 26.2 1.00728 1.00643 1.00593 1.00576 1.00593 1.00603 1.00589 1.0 26.4 1.00753 1.00665 1.00612 1.00595 1.00612 1.00623 1.00609 1.0 26.6 1.00777 1.00686 1.00632 1.00614 1.00632 1.00643 1.00628 1.0 26.8 1.00801 1.00707. 1.00652 1.00634 1.00652 1.00663 1.00648 1.0 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.0 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0	00553	1.	1.00452	1.00462	1.00454	1.00442	1.00454	1.00494	1.00224	24.8
25.2 1.00607 1.00537 1.00494 1.00480 1.00494 1.00502 1.00491 1.0 25.4 1.00631 1.00558 1.00514 1.00499 1.00514 1.00522 1.00511 1.0 25.6 1.00656 1.00579 1.00533 1.00518 1.00533 1.00542 1.00530 1.0 25.8 1.00600 1.00601 1.00553 1.00537 1.00553 1.00563 1.00560 1.0 26.0 1.00704 1.00622 1.00573 1.00557 1.00573 1.00583 1.00569 1.0 26.2 1.00728 1.00643 1.00593 1.00576 1.00593 1.00603 1.00589 1.0 26.4 1.00753 1.00665 1.00612 1.00595 1.00612 1.00623 1.00609 1.0 26.6 1.00777 1.00666 1.00632 1.00614 1.00632 1.00643 1.00628 1.0 26.8 1.00801 1.00707 1.00652 1.00653 1.00663 1.00648 1.0 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.0 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0										
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25.4 1.00631 1.00558 1.00514 1.00499 1.00514 1.00522 1.00511 1.0 25.6 1.00656 1.00579 1.00533 1.00518 1.00533 1.00542 1.00530 1.0 25.8 1.00680 1.00601 1.00553 1.00537 1.00553 1.00563 1.00550 1.0 26.0 1.00704 1.00622 1.00573 1.00557 1.00573 1.00583 1.00569 1.0 26.2 1.00728 1.00643 1.00593 1.00576 1.00593 1.00603 1.00589 1.0 26.4 1.00753 1.00665 1.00612 1.00595 1.00612 1.00623 1.00609 1.0 26.6 1.00777 1.00666 1.00632 1.00614 1.00632 1.00643 1.00628 1.0 26.8 1.00801 1.00707 1.00652 1.00634 1.00652 1.00663 1.00648 1.0 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.0 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0										
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25.8 1.00680 1.00601 1.00553 1.00537 1.00553 1.00563 1.00550 1.00 26.0 1.00704 1.00622 1.00573 1.00557 1.00573 1.00583 1.00569 1.00 26.2 1.00728 1.00643 1.00593 1.00576 1.00593 1.00603 1.00589 1.00 26.4 1.00753 1.00665 1.00612 1.00595 1.00612 1.00623 1.00609 1.00 26.6 1.00777 1.00686 1.00632 1.00614 1.00632 1.00643 1.00628 1.00 26.8 1.00801 1.00707 1.00652 1.00634 1.00652 1.00663 1.00648 1.00 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.00 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.00	00651	l.	1.00530	1.00542	1.00533	1.00518	1.00533	1.00579	1.00656	25.6
26.0 1.00704 1.00622 1.00573 1.00557 1.00573 1.00583 1.00569 1.00 26.2 1.00728 1.00643 1.00593 1.00576 1.00593 1.00603 1.00589 1.00 26.4 1.00753 1.00665 1.00612 1.00595 1.00612 1.00623 1.00609 1.00 26.6 1.00777 1.00686 1.00632 1.00614 1.00632 1.00643 1.00628 1.00 26.8 1.00801 1.00707. 1.00652 1.00634 1.00652 1.00663 1.00648 1.00 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.00 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.00	00676						1.00553	1.00601	1.00680	25.8
26.2 1.00728 1.00643 1.00593 1.00576 1.00593 1.00603 1.00589 1.0 26.4 1.00753 1.00665 1.00612 1.00595 1.00612 1.00623 1.00609 1.0 26.6 1.00777 1.00686 1.00632 1.00614 1.00632 1.00643 1.00628 1.0 26.8 1.00801 1.00707. 1.00652 1.00634 1.00652 1.00663 1.00648 1.0 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.0 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0		:-	200333		100/1	1505 OCC	A COTA A DO		· - · - · - · · · · · · · · · · · · · ·	
26.2 1.00728 1.00643 1.00593 1.00576 1.00593 1.00603 1.00589 1.0 26.4 1.00753 1.00665 1.00612 1.00595 1.00612 1.00623 1.00609 1.0 26.6 1.00777 1.00686 1.00632 1.00614 1.00632 1.00643 1.00628 1.0 26.8 1.00801 1.00707. 1.00652 1.00634 1.00652 1.00663 1.00648 1.0 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.0 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0					4UU(b.)	10U0-9 <u>0</u> (2	AS 1 1 2 2 2 2 2	. 00000	1 0070/	24.0
26.4 1.00753 1.00665 1.00612 1.00595 1.00612 1.00623 1.00609 1.0 26.6 1.00777 1.00686 1.00632 1.00614 1.00632 1.00643 1.00628 1.0 26.8 1.00801 1.00707. 1.00652 1.00634 1.00652 1.00663 1.00648 1.0 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.0 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0	00701	l.	1.00569	.00583	1.00573					
26.4 1.00753 1.00665 1.00612 1.00595 1.00612 1.00623 1.00609 1.0 26.6 1.00777 1.00686 1.00632 1.00614 1.00632 1.00643 1.00628 1.0 26.8 1.00801 1.00707 1.00652 1.00634 1.00652 1.00663 1.00648 1.0 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.0 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0	00726 5-96	stm	1.00589	.00603	1.00593	1.00576	1.00593	1.00643	1.00728	26.2
26.6 1.00777 1.00686 1.00632 1.00614 1.00632 1.00643 1.00625 1.6 26.8 1.00801 1.00707. 1.00652 1.00634 1.00652 1.00663 1.00648 1.0 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.0 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0	00751					1.00595	1.00612	1.00665	1.00753	26.4
26.8 1.00801 1.00707. 1.00652 1.00634 1.00652 1.00663 1.00648 1.0 27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.0 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0		_								
27.0 1.00825 1.00729 1.00672 1.00653 1.00672 1.00683 1.00667 1.0 27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0	00775									
27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0	00801	1.	1.00648	.00663	1.00652	1.00634	1.00025	1.00/0/.	1.00001	∠0.8
27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0										
27.2 1.00850 1.00750 1.00692 1.00672 1.00692 1.00703 1.00667 1.0	00826	1	1.00667	.00683	1.00672	1.00653	1.00672	1.00729	1.00825	27.0
	00851									
	00875	1.	1.00707	.00724						
27.6 1.00899 1.00793 1.00731 1.00711 1.00731 1.00744 1.00726 1.0	00902	ì.	1.00726	00744	1.00731	1.00711	1.00731	1.00793	1.00899	27.6
27 0 1 00022 1 0001/ 1 00751 1 00720 1 007	00927							1.00815	1.00923	27.8
100.00 100.07 100.70 1.0	0076,		- 100170							
26.0 1.08447 1.08634 1.00771 1.00740 1.00771						1 00715	1 00771	1 00637	1 00077	26 4
28.0 1.00947 1.00836 1.00771 1.00749 1.00771 1.00784 1.00766 1.0	00953	1.	1.00766	•00784	1.00771	1.00749	1.00//1			
28.2 1.00972 1.00858 1.00791 1.00769 1.00791 1.00804 1.00786 1.0	00978	1.	1.00786	.00804	1.00791	1.00769	1.00791	1.00858	1.00972	28.2
	01004						1.00811		1.00996	28.4
1000005 100										
20.0.1.010.5	01089									
28.8 1.01045 1.00922 1.00851 1.00827 1.00851 1.00865 1.00845 1.0	01055	1.	1.00845	•00865	1.00851	1.00827	1.00851	1.00925	1.01045	20.8
	_									
29.6 1.01070 1.00944 1.00871 1.00846 1.00871 1.00885 1.00864 1.0	01081	1	1.00866	.00885	1.00871	1.00846	1.00871	1.00944	1.01070	29.0
20.5										
	011-7									
29.4 1.01119 1.00987 1.00911 1.00885 1.00911 1.00926 1.00904 1.0	01135	1.	1.00904	.00926	1.00911	1.00885	1.00911			
	0115-					1.00904	1.00931	1.01008	1.01143	29.6
29.8 1.01168 1.01030 1.00951 1.00924 1.00951 7.00044 1.00044 7.0		1.	ひひづみみ	• ひりづむむ	1 0 U U J D I					
29.8 1.01168 1.01030 1.00951 1.00924 1.00951 1.00966 1.00944 1.0	<u>01</u> 185									
20.0. 1.01100 1.01011 1.00071 1.00072		1.		.00987	1.00971	1.00943	1.00971	1.01051	1.01192	30.0

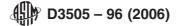


TABLE I, PART II 60°F Reference Temperature Multiplier, F60, for use in Computing Density, 12.1

CHOOSE A MULTIPLIER FOR THE MATERIAL BEING MEASURED CORRESPONDING TO THE BATH TEMPERATURE AT WHICH THE PYCNOMETER EQUILIBRATED.

TEMP MIXED 0-M-P-CYCLO-DEGC BENZENE TOLUENE **XYLENES** XYLENE XYLENE XYLENE STYRENE HEXANE ---------0.99405 0.99454 10.0 0.99341 0.99467 0.99454 0.99444 0.99454 0.99403 0.99464 0.99364 0.99426 0.99473 0.99485 0.99473 0.99473 0.99424 10.2 0.99387 0.99446 0.99492 0.99504 10.4 0.99492 0.99483 0.99492 0.99444 10.6 0.99410 0.99467 0.99511 0.99523 0.99511 0.99502 0.99511 0.99464 0.99433 0.99488 0.99530 0.99541 0.99530 0.99522 0.99530 10.8 0.99485 0.99509 0.99560 11.0 0.99456 0.99549 0.99549 0.99541 0.99549 0.99505 0.99479 0.99530 0.99568 0.99578 0.99568 0.99560 0.99568 0.99525 11.2 0.99502 0.99550 0.99587 0.99597 0.99587 0.99580 0.99587 11.4 0.99545 0.99571 0.99615 0.99599 11.6 0.99525 0.99606 0.99606 0.99606 0.99557 11.8 0.99548 0.99592 0.99625 0.99634 0.99625 0.99619 0.99625 0.99587 0.99644 0.99571 0.99613 0.99653 0.99644 0.99644 0.99508 12.0 0.99638 0.99594 12.2 0.99634 0.99663 0.99671 0.99663 0.99657 0.99663 0.99629 12.4 0.99617 0.99655 0.99682 0.99690 0.99682 0.99677 0.99662 0.99649 0.99701 0.99696 0.99670 12.6 0.99640 0.99675 0.99708 0.99701 0.99701 12.8 0.99664 0.99696 0.99721 0.99727 0.99721 0.99716 0.99721 0.99691 13.0 0.99746 0.99687 0.99717 0.99740 0.99740 0.99735 0.99740 0.99712 13.2 0.99710 0.99738 0.99759 0.99764 0.99759 0.99755 0.99759 0.99733 13.4 0.99733 0.99759 0.99778 0.99783 0.99778 0.99774 0.99778 0.90754 0.99756 0.99797 0.99802 0.99797 0.99794 U.99797 13.6 0.99780 0.99775 13.8 0.99780 0.99801 0.99816 0.99820 0.99816 0.99813 0.99816 0.99796 14.0 0.99803 0.99822 0.99835 0.99839 0.99835 0.99833 0.99835 0.99618 14.2 0.99826 0.99843 0.99854 0.99858 0.99854 0.99852 0.99855 0.99639 14.4 0.99350 0.99863 0.99674 0.99876 0.99874 0.99872 0.99874 0.90863 0.99873 0.99893 14.6 0.99884 0.99895 0.99893 0.99891 0.99893 0.99882 14.8 0.99896 0.99912 0.999:3 0.99905 0.99912 0.99914 0.99912 0.99911 0.99920 0.99926 0.99931 0.99933 0.99931 0.99930 0.99931 0.99925 15.0 0.99950 0.99946 0.99943 0.99947 0.99950 0.99951 0.99950 0.99950 15.2 15.4 0.99968 0.99970 0.99970 0.99969 0.99966 0.99970 0.99970 0.99968 15.6 0.99990 0.99989 0.99989 0.99989 0.99989 0.99989 0.99989 0.99989 1.00013 1.00010 1.00008 1.00008 1.00008 1.00009 1.00008 1.00011 1.00037 https://standards.itel; 610 1.00031 ...1.00027 1.00026 1.00027 1.00028 1.00027 1.00033 1.00060 1.00052 1.00047 1.00045 1.00047 1.00048 1.00047 1.00055 1.00077 16.4 1.00084 1.00073 1.00066 1.00064 1.00066 1.00067 1.00056 1.00099 1.00094 1.00085 1.00087 1.00107 1.00085 1.00083 1.00085 16.6 1.00131 1.00115 1.00105 1.00102 1.00105 1.00107 1.00105 16.8 1.00121 17.0 1.00154 1.00136 1.00124 1.00124 1.00124 1.00120 1.00126 1.00143 1.00178 1.00158 1.00143 1.00139 1.00143 1.00143 1.00165 1.00146 17.2 1.00201 1.00179 1.00163 17.4 1.00163 1.00158 1.00166 1.00162 1.00187 17.6 1.00225 1.00200 1.00182 1.C0177 1.00182 1.00186 1.00182 1.00210 17.8 1.00249 1.00221 1.00201 1.00196 1.00201 1.00205 1.00201 1.00232 1.00272 1.00242 1.00221 1.00215 1.00221 1.00220 18.0 1.00225 1.00254 1.00240 1.00296 1.00240 1.00245 1.00263 1.00234 1.00240 1.00277 18.2 18.4 1.00319 1.00284 1.00259 1.00252 1.00259 1.00264 1.00259 1.00299 1.00343 1.00305 1.00279 1.00271 1.00279 1.00278 18.6 1.00284 1.00322 1.00326 18.8 1.00367 1.00298 1.00290 1.00298 1.00304 1.00296 1.00344 1.00318 1.00318 19.0 1.00391 1.00348 1.00309 1.00324 1.00317 1.00367 1.00337 19.2 1.00414 1.00369 1.00337 1.00328 1.00337 1.00344 1.00390 19.4 1.00438 1.00390 1.00357 1.00347 1.00357 1.00363 1.00356 1.00413 1.00462 1.00411 1.00376 1.00366 1.00376 19.6 1.00383 1.00375 1.00435 19.8 1.00486 1.00432 1.00396 1.00385 1.00396 1.00403 1.00395 1.00453 20.0 1.00509 1.00453 1.00415 1.00404 1.00415 1.00423 1.00414 1.00481

TABLE I, PART II Continued

CHOOSE A MULTIPLIER FOR THE MATERIAL BEING MEASURED CORRESPONDING TO THE BATH TEMPERATURE AT WHICH THE PYCNOMETER EQUILIBRATED.

TEMP		<u> </u>	MIXED	0-	M-	P-		CYCLO-
DEGC	BENZENE	TOLUENE	XYLENES	XYLENE	XYLENE	XYLENE	STYPENE	HEXANE
20.0	1.00509	1.00453	1.00415	1.00404	1.00415	1.00423	1.00414	1.00481
20.2	1.00533	1.00474	1.00435	1.00423	1.00435	1.00443	1.00434	1.00504
20.4	1.00557	1.00496	1.00454	1.00442	1.00454	1.00463	1.00453	1.00527
20.6	1.00581	1.00517	1.00474	1.00461	1.00474	1.00482	1.00472	1.00551
20.8	1.00605	1.00538	1.00493	1.00480	1.00493	1.00502	1.00492	1.00574
21.0	1 00620	1 00550	1 00513	1 00600	1 00513	1 00522	1 00511	1 00507
21.0	1.00629	1.00559	1.00513	1.00499	1.00513	1.00522	1.00511	1.00597
21.2	1.00653	1.00581	1.00532	1.00518	1.00532	1.00542	1.00531	1.00621
21.4	1.00677	1.00602	1.00552		1.00552	1.00562	1.00550	1.00644
21.6	1.00701	1.00623	1.00572	1.00556		1.00582	1.00570 1.00589	1.00668
21.8	1.00725	1.00644	1.00591	1.00373	1.00591	1.00602	1.00309	1.00691
22.0	1.00749	1.00666	1.00611	1.00594	1.00611	1.00622	1.00609	1.00715
22.2	1.00773	1.00687	1.00630	1.00613	1.00630	1.00642	1.00628	1.00738
22.4	1.00797	1.00708	1.00650	1.00632	1.00650	1.00662	1.00648	1.00762
22.6	1.00821	1.00730	1.00670	1.00652	1.00670	1.00682	1.00667	1.00786
22.8	1.00845	1.00751	1.00689	1.00671	1.00689	1.00702	1.00687	1.00810
23.0	1.00869	1.00772	1.00709	1.00690	1.00709	1.00722	1.00707	1.00834
23.2	1.00893	1.00794	1.00729	1.00709	1.00729	1.00742	1.00726	1.00858
23.4	1.00917		1.00748	1.00728	1.00748	1.00762	1.00746	1.000882
23.6	1.00941	1.00836	1.00768	1.00747	1.00768	1.00782	1.00765	1.00906
23.8	1.00965	1.00858	1.00788	1.00767	1.00788	1.00802	1.00785	1.00930
			56 84	ond				
24.0	1.00990	1.00879	1.00808	1.00786	1.00808	1.00822	1.00805	1.00954
24.2	1.01014	1.00900	1.00827	1.00805	1.00827	1.00842	1.00824	1.00979
24.4	1.01038	1.00922	1.00847	1.00824	1.00847	1.00862	1.00844	1.01013
24.6	1.01062	1.00943	1.00867	1.00843	1.00867	1.00882	1.00863	1.01028
24.8	1.01086	1.00965	1.00887	1.00863	1.00887	1.00902	1.00663	1.01052
				3/44/30			1 00000	1 01077
25.0	1.01111	1.00986	1.00906	1.00882	1.00906	1.00922	1.00903	1.01077
25.2	1.01135	1.01007	1.00926	1.00901	1.00926	1.00943	1.00922	1.01101
25.4	1.01159	1.01029	1.00946	1.00920	1.00946	1.00963	1.00942	1.01126
25.6	1.01184	1.01050	1.00966	1.00940	1.00966	1.00983	1.00962	1.01151
25.8	1.01208	1.01072	1.00986	1.00959	1.00986	1.01003	1.00981	1.01170
24.0	1 01222	1 01002	1.01006	1.00978	1.01006	1.01023	1.01001	1.01201
Is ite 26.0	1.01232	1.01093 1.01115	1.01025	1.00997	1.01025	1.01043	1.01021	1.01226
26.2	1.01281	1.01136	1.01045	1.01017	1.01045	1.01064	1.01040	1.01251
26.4 26.6	1.01305	1.01158	1.01065	1.01036	1.01065	1.01084	1.01060	1.01275
26.8	1.01330	1.01179	1.01085	1.01055	1.01085	1.01104	1.01080	1.01301
27.0	1.01354	1.01201	1.01105	1.01075	1.01105	1.01124	1.01099	1.01326
27.2	1.01379	1.01222	1.01125	1.01094	1.01125	1.01144	1.01119	1.01352
27.4	1.01403	1.01244	1.01145	1.01113	1.01145	1.01165	1.01139	1.01377
27.6	1.01428	1.01265	1.01165	1.01133	1.01165	1.01185	1.01159	1.01402
27.8	1.01452	1.01287	1.01185	1.01152	1.01185	1.01205	1.01178	1.01428
28.0	1.01477	1.01308	1.01205	1.01172	1.01205	1.01225	1.01198	1.01454
28.2	1.01501	1.01330		1.01191	1.01225			1.01479
28.4	1.01526	1.01352	1.01245		1.01245	1.01266		1.01505
28.6	1.01551	1.01373	1.01265	1.01230	1.01265	1.01286	1.01258	1.01531
28.8	1.01575	1.01395	1.01285	1.01249	1.01285	1.01307	1.01278	1.01557
				1			1 01007	1 33000
29.0	1.01600	1.01416	1.01305	1.01269	1.01305	1.01327	1.01297	1.01983
29.2	1.01624	1.01438	1.01325	1.01288	1.01325	1.01347	1.01317	1.01609
29.4	1.01649	1.01450	1.01345	1.01308	1.01345	1.01368	1.01337	
29.6	1.01674	1.01481	1.01365	1.01327	1.01365	1.01388	1.01357	1.01661
29.8	1.01699	1.01503	1.01385	1.01347	1.01385	1.01408	1.01377	1.01687
							1 0120-	1 0171
30.0	1.01723	1.01524	1.01405	1.01366	1.01405	1.01429	1.01397	1.0171-