A Bibliography of Thermophysical Properties of Air from 0 to 300 K

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A Bibliography of Thermophysical Properties of Air from 0 to 300 K

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CONTENTS

A BIBLIOGRAPHY OF THERMOPHYSICAL PROPERTIES OF AIR FROM 0 TO 300 K[1]

L. A. Hall

References together with an abbreviated abstract are presented for mechanical, thermodynamic, and transport properties *) of air from 0 to 300 K published up to December 1968. A total of 610 articles have been indexed. Each article has been reviewed and coded with regard to properties studied, type of article (i.e., experimental, theoretical, etc.), and method of presentation of data. The temperature and pressure ranges for each property under consideration are also given. An index has been prepared according to property with four sub-categories: solid, liquid, gas up to 200 K, and gas above 200 K.

*) density, P-V-T data, compressibility factor, expansivity, compressibity, equation of state, vapor pressure, melting pressure, latent heats, critical points, normal boiling temperature, specific heat, velocity of sound, Joule-Thomson coefficients, entropy, enthalpy, internal energy, Gibbs function, Helmholtz function, thermal conductivity, viscosity, Prandtl number, diffusion coefficients, surface tension, dielectric constant, refractive index

Key words: air; bibliography; equation of state; low temperature; mechanical properties; thermodynamic properties; transport properties

1. INTRODUCTION

The Compilation Unit of the Cryogenic Data Center has in its mission the critical evaluation of quantitative information from the world's literature related to the thermophysical properties of materials at cryogenic temperatures and preparation of charts and tables of data for the entire temperature and pressure range. At the outset of the study of a particular material, copies of the documents concerned with the properties are obtained and reviewed. As the task of document accumulation continues, a concentrated effort is made to complete a systematic and thorough literature search on the selected topic and an annotated bibliography is prepared. This bibliography on the properties of air is the fourth such bibliography[2] prepared on the properties of a cryogenic fluid.

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[1] This study was supported in part by the National Aeronautics and Space Administration, Contract No. R-06-006-046.

[2] Other materials for which similar bibliographies have been prepared are oxygen, argon, and methane.

Primarily, our search was for articles dealing with properties studied in the temperature range 0 to 300 K. Thirteen articles on properties of oxygen-nitrogen mixtures have been included, some presenting values in temperature ranges where experimental air data are missing. A group of 28 documents dealing with thermophysical properties of air at extremely high temperatures (>1000 K) have been referenced in the Appendix. These documents came to our attention during the literature search, but because of the high temperature range, they have not been included in the main body of the bibliography or indexed.

The collection of documents for air began over ten years ago in conjunction with the data compilation presented in the "Compendium."[1] The initial literature search was conducted by the use of various abstracting journals, in particular Chemical Abstracts. Copies of the articles were obtained at that time and reviewed for useful data. From the time of the "Compendium's" publication to the present, the Compilation Unit of the Cryogenic Data Center has been actively acquiring all articles dealing with the thermophysical properties of air at cryogenic temperatures. These articles were entered into our Storage and Retrieval System together with all the other cryogenically oriented documents that have come to our attention by a systematic scanning of the primary journals, and secondary publications such as Chemical Abstracts, Physics Abstracts, NASA STAR, Nuclear Science Abstracts, DDC TAB, and International Aerospace Abstracts. A computer search of the Storage and Retrieval System was the initial source of references for this annotated bibliography. All pertinent documents from the references listed in this search were reviewed and coded. In addition, other articles, which were referenced in these documents, were also obtained, reviewed, and coded. A final Chemical Abstracts search was conducted back to 1907 to bring to our attention any articles which might have been previously overlooked. Seventy articles written before 1900, not already in our files, were not ordered because these were believed to be of historical interest only.

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[1] "A Compendium of the Properties of Materials at Low Temperature (Phase I), Part I. Properties of Fluids," V. J. Johnson, Editor, Wright Air Development Division Technical Report 60-56 (1960), 560 pp., DDC AD 249 777.

2. FORMAT FOR LISTING CITATION AND DOCUMENT CONTENTS

The citations have been arranged alphabetically by first author and numbered.[1] Only information from the article which concerns the properties of air was noted in this bibliography. The temperature and pressure ranges were omitted on references to critical points and normal boiling points. In many cases the pressures were not stated in the article. This is most often the case in the study of properties near atmospheric pressure that are essentially temperature-dependent only.

The information given for each citation includes and is ordered as follows:

1. author(s),
2. title (original language) and translated title, if original is in a language other than English,
3. reference (if the same article is published in more than one place, each reference is cited.),
4. properties studied for air, state of substance, temperature and pressure ranges as available,
5. designation as to primary character of article,
   a. experimental
   b. theoretical
   c. compilation[2]
   d. correlation
   e. reference book[3]
6. form in which data are reported,
   a. tabular - tables (number of values)
   b. graphical
   c. equations
   d. apparatus, if described or illustrated

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[1] Documents obtained too late to be numbered sequentially have been placed alphabetically in the body of the bibliography and given the number of the preceding article immediately followed by a (+) sign. These articles have also been indexed.

[2] In compilations, the bibliography number of the original article from which the data was obtained is listed if the source of the data is mentioned.

[3] In some instances, the amount of data in reference books is not given.

3. INDEX OF PROPERTIES

The bibliography is indexed according to property with sub-indexes for the state of the substance; i.e., solid, liquid, gas up to 200 K, and gas above 200 K. The letters E, T, C, and R following each citation number refer to the type of data; i.e., E = experimental, T = theoretical, C = compilation, correlation, calculation, and R = review, discussion, reference work. A few reference books were coded by property only.

1. DENSITY, P-V-T DATA, COMPRESSIBILITY FACTOR

3 C	4 E	5 E	6 E	7 E	8 E	9 E	10 E	18 C	22 C
31 T	43 E	44 C	60 T	85 C	86 T	88 C	96 C	97 E	102 C
112 C	145 C	146 C	148 C	152 C	174 E	185 C	191 C	192 C	205 E
209 C	210 C	211 C	212 C	218 C	233 C	238 T	243 E	244 E	245 E
246 E	254 C	259 E	265 C	271 C	282 R	284 C	285 R	293 E	299 C
303 E	312 E	314 E	316 T	317 T	318 T	319 E	334 C	337 C	338 C
343 C	368 E	369 E	370 C	378 E	380 C	385 C	386 C	387 C	388 C
391 C	396 E	399 E	400 E	405 C	412 E	415 R	416 R	419 C	420 R
422 R	432 C	445 C	452 E	455 E	456 E	475 C	486 T	502 C	528 E
558 C	559 C	560 T	569 C	570 T	580 C	588 C	589 E	594 E	

SATURATED LIQUID

18 C	43 E	96 C	112 C	265 C	319 E	368 E	502 C	580 C

SATURATED VAPOR

18 C	102 C	112 C	265 C	319 E	368 E	502 C	580 C

SOLID - NONE

LIQUID

112 C	259 E	337 C	594 E

GAS (UP TO 200 DEGREES K)

18 C	31 T	85 C	86 T	88 C	102 C	112 C	185 C	209 C	210 C
218 C	233 C	254 C	259 E	265 C	271 C	285 R	312 E	314 E	334 C
337 C	368 E	370 C	380 C	386 C	387 C	388 C	405 C	412 E	416 R
432 C	445 C	452 E	455 E	456 E	486 T	502 C	528 E	560 T	569 C
588 C	589 E								

GAS (ABOVE 200 DEGREES K)

3 C	4 E	5 E	6 E	7 E	8 E	9 E	10 E	18 C	22 C
31 T	44 C	60 T	85 C	86 T	88 C	96 C	97 E	102 C	112 C
145 C	146 C	148 C	152 C	174 E	185 C	191 C	192 C	205 E	209 C
210 C	211 C	212 C	218 C	233 C	238 T	243 E	244 E	245 E	246 E
254 C	259 E	265 C	271 C	282 R	284 C	285 R	293 E	299 C	303 E
312 E	314 E	316 T	317 T	318 T	334 C	337 C	338 C	343 C	368 E
369 E	370 C	378 E	380 C	385 C	386 C	387 C	388 C	391 C	396 E
399 E	400 E	405 C	412 E	415 R	416 R	419 C	420 R	422 R	432 C
445 C	452 E	455 E	456 E	475 C	486 T	502 C	528 E	558 C	559 C
560 T	569 C	570 T	588 C	589 E					

2. EQUATION OF STATE, VIRIAL COEFFICIENTS

18 C	22 C	29 T	31 T	32 T	33 T	34 T	41 T	60 T	73 T
102 C	113 E	114 E	159 T	164 T	167 C	208 T	209 C	223 T	233 C
236 T	237 C	257 T	300 T	304 T	318 T	363 C	368 E	369 E	371 E
380 C	386 C	405 C	417 E	425 C	432 C	470 T	486 T	507 T	560 T
570 T	571 T								

LIQUID

41 T

GAS (UP TO 200 DEGREES K)

18 C	29 T	31 T	32 T	33 T	34 T	41 T	73 T	102 C	159 T
164 T	167 C	208 T	209 C	223 T	233 C	236 T	300 T	363 C	368 E
371 E	380 C	386 C	405 C	425 C	432 C	486 T	507 T	560 T	

GAS (ABOVE 200 DEGREES K)

18 C	22 C	29 T	31 T	32 T	33 T	34 T	41 T	60 T	73 T
102 C	113 E	114 E	159 T	164 T	167 C	208 T	209 C	223 T	233 C
236 T	237 C	257 T	300 T	304 T	318 T	363 C	368 E	369 E	371 E
380 C	386 C	405 C	417 E	425 C	432 C	470 T	486 T	507 T	560 T
570 T	571 T								

3. EXPANSIVITY AND COMPRESSIBILITY

71 E 194 R 425 C 452 E

SOLID - NONE

LIQUID - NONE

GAS (UP TO 200 DEGREES K)

194 R 425 C 452 E

GAS (ABOVE 200 DEGREES K)

71 E 425 C 452 E

4. VAPOR PRESSURE (DEW POINT PRESSURE, BUBBLE POINT PRESSURE)

SOLID

70 E 573 E

LIQUID

18 C 70 E 88 C 102 C 112 C 117 E 168 E 259 E 265 C 368 E
380 C 401 E 415 R 416 R 445 C 466 C 580 C 583 C 584+E 593 E

5. MELTING PRESSURE, FREEZING PRESSURE

88 C

6. LATENT HEATS

HEAT OF VAPORIZATION

35 E 106 E 107 R 112 C 149 E 265 C 331 E 380 C 466 C 489 T
580 C 583 C 590 E

7. SOLID-SOLID PHASE TRANSITION, MELTING RANGE, BOILING TEMPERATURES, CRITICAL POINTS (PLAIT POINT, POINT OF CONTACT)

SOLID-SOLID PHASE TRANSITION

145+E 428+E

MELTING RANGE

428+E

BOILING TEMPERATURES

96 C 109 E 595 E

CRITICAL POINTS

18 C 23 E 80 E 85 C 86 T 112 C 223 T 319 E 320 E 380 C
386 C 387 C 388 C 408 E 415 R 418 R 420 R 421 R 560 T 566 T
580 C 596 E

8. SPECIFIC HEAT

12 E	16 C	18 C	25 C	28 C	37 E	60 T	63 E	65 C	67 R
80 E	85 C	90 T	91 T	97 E	99 E	102 C	104 E	107 R	112 C
118 C	120 R	123 C	128 C	131 C	133 E	141 C	142 E	143 E	146 C
160 C	167 C	173 C	176 E	181 E	183 C	184 R	193 C	207 E	210 C
211 C	212 C	213 C	217 E	218 C	222 E	224 E	229 E	233 C	234 C
237 C	238 T	241 E	242 E	251 E	252 C	259 E	262 C	265 C	271 C
273 E	274 C	275 C	280 C	281 C	284 C	285 R	297 C	299 C	301 C
302 E	310 C	312 E	314 E	324 E	325 R	326 E	330 E	338 C	340 E
341 E	344 E	345 E	346 T	352 E	358 C	362 C	367 E	370 C	379 E
380 C	389 C	390 R	391 C	392 C	404 C	407 C	408 E	409 E	410 E
411 E	416 R	432 C	445 C	449 C	452 E	453 E	458 E	468 C	472 E
473 E	474 E	480 E	486 T	487 R	488 T	491 E	493 E	494 T	495 E
508 T	512 E	521 C	530 C	533 E	534 E	538 E	559 C	570 T	571 T
576 C	580 C	584+E	588 C	597 E	598 T				

SATURATED LIQUID

584+E

SATURATED VAPOR

18 C 85 C 584+E

IDEAL GAS

102 C 104 E 128 C 210 C 233 C 275 C 380 C 449 C 598 T

SOLID

330 E

LIQUID

25 C 107 R 112 C 142 E 259 E 265 C 445 C 508 T 580 C

GAS (UP TO 200 DEGREES K)

12 E	16 C	18 C	63 E	65 C	80 E	85 C	90 T	91 T	97 E
102 C	107 R	112 C	131 C	141 C	142 E	167 C	176 E	183 C	210 C
218 C	233 C	234 C	262 C	271 C	285 R	297 C	301 C	312 E	314 E
341 E	358 C	370 C	380 C	389 C	410 E	416 R	432 C	445 C	452 E
472 E	473 E	474 E	488 T	530 C	588 C				

8. SPECIFIC HEAT (CONT.)

GAS (ABOVE 200 DEGREES K)

12 E 16 C 18 C 28 C 37 E 60 T 63 E 65 C 67 R 85 C
90 T 91 T 99 E 102 C 104 E 107 R 112 C 118 C 120 R 123 C
128 C 131 C 133 E 141 C 143 E 146 C 160 C 167 C 173 C 176 E
181 E 183 C 184 R 193 C 207 E 210 C 211 C 212 C 213 C 217 E
218 C 222 E 224 E 229 E 233 C 234 C 237 C 238 T 241 E 242 E
251 E 252 C 262 C 271 C 273 E 274 C 280 C 281 C 284 C 285 R
297 C 299 C 301 C 302 E 310 C 312 E 314 E 324 E 325 R 326 E
338 C 340 E 344 E 345 E 346 T 352 E 358 C 362 C 367 E 370 C
379 E 380 C 389 C 390 R 391 C 392 C 404 C 407 C 408 E 409 E
410 E 411 E 416 R 432 C 445 C 452 E 453 E 458 E 468 C 472 E
473 E 474 E 480 E 486 T 487 R 488 T 491 E 493 E 494 T 495 E
512 E 521 C 530 C 533 E 534 E 538 E 559 C 570 T 571 T 576 C
588 C 597 E

9. VELOCITY OF SOUND

1 E 45 E 49 E 55 E 67 R 76 E 94 E 95 E 97 E 98 E
99 E 102 C 115 E 116 E 120 R 134 E 160 C 190 E 195 E 203 C
204 E 212 C 214 E 221 E 222 E 233 C 237 C 238 T 239 E 249 E
271 C 272 C 282 R 283 E 285 R 308 E 313 E 321 E 324 E 325 R
327 E 340 E 342 E 360 E 370 C 380 C 382 E 385 C 393 E 410 E
423 E 430 E 432 C 442 E 493 E 495 E 496 E 499 E 500 E 501 E
502 C 520 E 522 E 545 E 549 E 552+E 553 E 568 E 586 E 587 E
601 E 603 E

SOLID - NONE

LIQUID

552+E

GAS (UP TO 200 DEGREES K)

97 E 102 C 233 C 271 C 285 R 313 E 370 C 380 C 410 E 430 E
432 C 502 C 587 E

GAS (ABOVE 200 DEGREES K)

1 E 45 E 49 E 55 E 67 R 76 E 94 E 95 E 97 E 98 E
99 E 102 C 115 E 116 E 120 R 134 E 160 C 190 E 195 E 203 C
204 E 212 C 214 E 221 E 222 E 233 C 237 C 238 T 239 E 249 E
271 C 272 C 282 R 283 E 285 R 308 E 313 E 321 E 324 E 325 R
327 E 340 E 342 E 360 E 370 C 380 C 382 E 385 C 393 E 410 E
423 E 430 E 432 C 442 E 493 E 495 E 496 E 499 E 500 E 501 E
502 C 520 E 522 E 545 E 549 E 553 E 568 E 586 E 587 E 601 E
603 E

10. JOULE-THOMSON, INVERSION CURVE

15 E 19 E 30 C 60 T 62 E 85 C 105 E 144 E 161 R 218 C
219 C 236 T 250 E 257 T 258 E 261 C 263 E 268 R 299 C 309 R
370 C 380 C 402 E 415 R 416 R 428 E 451 E 452 E 453 E 488 T
592 C

11. ENTROPY, ENTHALPY, INTERNAL ENERGY, GIBBS FUNCTION, HELMHOLTZ FUNCTION

11 E 17 C 18 C 88 C 90 T 91 T 93 R 102 C 107 R 112 C
118 C 131 C 132 C 145 C 146 C 147 C 148 C 152 C 160 C 173 C
185 C 191 C 192 C 210 C 212 C 213 C 218 C 219 C 233 C 237 C
238 T 254 C 259 E 271 C 272 C 274 C 284 C 285 R 286 C 310 C
316 T 323 C 331 E 332 E 334 C 337 C 370 C 380 C 385 C 398 E
405 C 415 R 416 R 425 C 432 C 449 C 450 C 454 E 459 E 462 R
466 C 468 C 476 C 484 R 488 T 498 C 558 C 559 C 569 C 571 T
580 C 583 C 584+E

IDEAL GAS

102 C 148 C 210 C 233 C 449 C

SOLID

88 C

LIQUID

18 C 88 C 107 R 112 C 259 E 337 C 415 R 416 R 462 R 580 C
583 C 584+E

GAS (UP TO 200 DEGREES K)

17 C 18 C 88 C 90 T 91 T 93 R 102 C 107 R 112 C 131 C
132 C 185 C 210 C 218 C 219 C 233 C 254 C 259 E 271 C 285 R
286 C 323 C 331 E 332 E 334 C 337 C 370 C 380 C 405 C 415 R
416 R 425 C 432 C 462 R 466 C 484 R 488 T 569 C 580 C 583 C
584+E

GAS (ABOVE 200 DEGREES K)

11 E 17 C 18 C 88 C 90 T 91 T 93 R 102 C 107 R 112 C
118 C 131 C 132 C 145 C 146 C 147 C 148 C 152 C 160 C 173 C
185 C 191 C 192 C 210 C 212 C 213 C 218 C 219 C 233 C 237 C
238 T 254 C 259 E 271 C 272 C 274 C 284 C 285 R 286 C 310 C
316 T 323 C 331 E 332 E 334 C 337 C 370 C 380 C 385 C 398 E
405 C 415 R 416 R 425 C 432 C 450 C 454 E 459 E 466 C 468 C
476 C 484 R 488 T 498 C 558 C 559 C 569 C 571 T 583 C

12. THERMAL CONDUCTIVITY

12 E	14 E	41 T	46 E	61 E	64 T	65 C	72 E	73 T	79 C
82 C	84 E	93 R	108 C	111 E	118 C	121 C	122 E	123 C	125 E
139 E	140 E	141 C	162 R	163 E	170 E	171 T	172 E	181 E	186 E
193 C	196 E	197 E	198 E	199 E	200 C	211 C	212 C	227 E	230 E
231 E	232 E	233 C	234 C	236 T	237 C	255 E	256 E	265 C	277 E
278 E	279 E	285 R	297 C	322 E	328 C	329 E	333 R	337 C	338 C
346 T	353 E	359 E	374 E	375 E	377 E	391 C	392 C	394 C	445 C
460 E	464 E	465 E	467 T	468 C	477 E	478 E	479 R	481 E	482 E
483 E	484 R	487 R	488 T	490 E	503 E	504 E	511 C	518 E	519 E
526 E	543 E	544 E	546 E	547 R	555 E	562 E	563 E	564 E	565 E
577 E	578 E	579 E	584 E	585 E	600 E				

SOLID - NONE

LIQUID

41 T 140 E

GAS (UP TO 200 DEGREES K)

12 E	41 T	65 C	73 T	79 C	93 R	108 C	121 C	125 E	139 E
140 E	141 C	163 E	171 T	186 E	233 C	234 C	236 T	265 C	277 E
297 C	328 C	337 C	445 C	479 R	484 R	488 T	511 C	518 E	544 E

GAS (ABOVE 200 DEGREES K)

12 E	14 E	41 T	46 E	61 E	64 T	65 C	72 E	73 T	79 C
82 C	84 E	93 R	108 C	111 E	118 C	121 C	122 E	123 C	125 E
139 E	140 E	141 C	162 R	163 E	170 E	171 T	172 E	181 E	186 E
193 C	196 E	197 E	198 E	199 E	200 C	211 C	212 C	227 E	230 E
231 E	232 E	233 C	234 C	236 T	237 C	255 E	256 E	265 C	277 E
278 E	279 E	285 R	297 C	322 E	328 C	329 E	333 R	337 C	338 C
346 T	353 E	359 E	374 E	375 E	377 E	391 C	392 C	394 C	445 C
460 E	464 E	465 E	467 T	468 C	477 E	478 E	479 R	481 E	482 E
483 E	484 R	487 R	488 T	490 E	503 E	504 E	511 C	518 E	519 E
526 E	543 E	544 E	546 E	547 R	555 E	562 E	563 E	564 E	565 E
577 E	578 E	579 E	584 E	585 E	600 E				

13. VISCOSITY

12 E	13 C	20 E	21 E	26 E	27 E	39 R	40 E	41 T	50 E
51 E	52 C	54 C	56 E	57 E	58 E	59 C	64 T	65 C	66 C
67 R	73 T	77 C	78 C	83 C	87 E	91 T	92 R	93 R	101 E
113 E	114 E	118 C	123 C	127 E	129 R	130 E	141 C	150 E	151 C
153 E	156 E	157 E	158 E	169+E	177 E	178 E	179 E	180 E	181 E
182 C	184 R	187 E	188 E	193 C	201 E	202 E	211 C	212 C	215 R
216 E	233 C	234 C	235 T	236 T	237 C	240 E	247 E	248 E	260 E
262 C	264 T	265 C	266 E	267 E	276 E	285 R	287 E	288 E	289 E
290 E	292 E	293 E	294 E	295 E	296 C	297 C	298 R	305 E	315 E
333 R	336 C	337 C	338 C	346 T	349 E	350 E	351 E	354 E	355 E
356 E	361 E	366 E	373 E	376 C	380 C	381 C	383 E	384 E	391 C
392 C	394 C	424 E	431 C	434 E	435 E	436 E	437 E	438 E	439 E
440 E	441 E	444 E	445 C	447 E	448 E	461 E	477+E	479 R	484 R
485 E	488 T	492 E	509 E	510 C	511 C	524 E	525 E	527 E	531 E
532 C	535 E	536 E	537 E	539 E	540 E	541 E	542 E	545 E	548 E
550 E	551 E	554 E	556 E	557 E	561 C	567 E	572 E	581 E	582 E
591 C									

LIQUID

41 T	59 C	169+E	337 C	383 E	461 E	484 R	550 E

GAS (UP TO 200 DEGREES K)

12 E	39 R	41 T	59 C	64 T	65 C	66 C	73 T	83 C	91 T
92 R	93 R	101 E	129 R	141 C	150 E	151 C	156 E	158 E	201 E
233 C	234 C	235 T	236 T	262 C	265 C	266 E	267 E	297 C	298 R
337 C	380 C	381 C	445 C	477+E	479 R	484 R	488 T	509 E	511 C
531 E	540 E								

GAS (ABOVE 200 DEGREES K)

12 E	13 C	20 E	21 E	26 E	27 E	39 R	40 E	41 T	50 E
51 E	52 C	54 C	56 E	57 E	58 E	59 C	64 T	65 C	66 C
67 R	73 T	77 C	78 C	83 C	87 E	91 T	92 R	93 R	101 E
113 E	114 E	118 C	123 C	127 E	129 R	130 E	141 C	150 E	151 C
153 E	156 E	157 E	158 E	177 E	178 E	179 E	180 E	181 E	182 C
184 R	187 E	188 E	193 C	201 E	202 E	211 C	212 C	215 R	216 E
233 C	234 C	235 T	236 T	237 C	240 E	247 E	248 E	260 E	262 C
264 T	265 C	266 E	267 E	276 E	285 R	287 E	288 E	289 E	290 E
292 E	293 E	294 E	295 E	296 C	297 C	298 R	305 E	315 E	333 R
336 C	337 C	338 C	346 T	349 E	350 E	351 E	354 E	355 E	356 E
361 E	366 E	373 E	376 C	380 C	381 C	384 E	391 C	392 C	394 C
424 E	431 C	434 E	435 E	436 E	437 E	438 E	439 E	440 E	441 E
444 E	445 C	447 E	448 E	477+E	479 R	484 R	485 E	488 T	492 E
509 E	510 C	511 C	524 E	525 E	527 E	531 E	532 C	535 E	536 E
537 E	539 E	540 E	541 E	542 E	545 E	548 E	551 E	554 E	556 E
557 E	561 C	567 E	572 E	581 E	582 E	591 C			

14. PRANDTL NUMBER

90 T 93 R 122 E 123 C 124 E 125 E 181 E 212 C 233 C 234 C
255 E 256 E 285 R 297 C 391 C 394 C 488 T

15. DIFFUSION COEFFICIENT

64 T

16. SURFACE TENSION

NONE

17. DIELECTRIC CONSTANT

42 E 47 E 48 E 68 E 69 E 74 E 75 E 89 E 100 E 119 E
137 E 138 E 154 E 155 E 165 E 175 E 189 E 225 E 226 E 228 E
253 E 269 E 270 E 306 E 307 E 348 E 357 R 364 E 395 E 396 E
397 E 426 E 445 C 446 E 457 E 463 E 505 E 513 E 514 E 515 E
552 E 575 E 599 E 602 E

SOLID - NONE

LIQUID

119 E 154 E

GAS (UP TO 200 DEGREES K)

446 E

GAS (ABOVE 200 DEGREES K)

42 E 47 E 48 E 68 E 69 E 74 E 75 E 89 E 100 E 137 E
138 E 155 E 165 E 175 E 189 E 225 E 226 E 228 E 253 E 269 E
270 E 306 E 307 E 348 E 357 R 364 E 395 E 396 E 397 E 426 E
445 C 446 E 457 E 463 E 505 E 513 E 514 E 515 E 552 E 575 E
599 E 602 E

18. REFRACTIVE INDEX

2 E 23 E 24 E 36 E 38 E 53 R 81 E 103 E 110 E 126 C
135 E 136 E 137 E 138 E 166 E 206 E 220 E 282 R 291 E 311 E
335 E 339 E 347 E 365 R 403 E 406 R 413 E 414 E 427 E 429 E
433 R 443 E 471 E 497 E 516 E 517 E 523 R 529 E 574 E 604 E

LIQUID

335 E

GAS (UP TO 200 DEGREES K)

471 E

GAS (ABOVE 200 DEGREES K)

2 E 23 E 24 E 36 E 38 E 5: R 81 E 103 E 110 E 126 C
135 E 136 E 137 E 138 E 166 E 206 E 220 E 282 R 291 E 311 E
339 E 347 E 365 R 403 E 406 R 413 E 414 E 427 E 429 E 433 R
443 E 471 E 497 E 516 E 517 E 523 R 529 E 574 E 604 E

19. CORRESPONDING STATES

86 T 161 R 469 T 506 T

20. INTERMOLECULAR POTENTIAL

11 E 41 T 64 T 118 C 164 T 208 T 210 C 235 T 236 T 304 T
372 T 566 T

21. DOCUMENTS NOT APPEARING IN PROPERTY INDEX

169 E (X-RAY DIFFRACTION STUDIES)

4. BIBLIOGRAPHY OF REFERENCES

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EXPERIMENTAL - TABLE (6 VALUES), APPARATUS

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EXPERIMENTAL - TABLES (125 VALUES), GRAPHS, EQUATIONS

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CALCULATION - GRAPH

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CORRELATION - TABLES (40,000 VALUES), EQUATIONS, MOLLIER DIAGRAM

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CALCULATION - EQUATIONS, TABLE (52 VALUES)

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THEORETICAL - EQUATION, TABLE OF COEFFICIENTS

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THEORETICAL - TABLES (170 VALUES), EQUATIONS

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EXPERIMENTAL - TWO TABULAR VALUES, APPARATUS

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EXPERIMENTAL - TABLE (4 VALUES), GRAPH

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EXPERIMENTAL - TABLE (12 VALUES), EQUATIONS, APPARATUS

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EXPERIMENTAL - EQUATION

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THEORETICAL - EQUATIONS, TABLES

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - TABLE (19 VALUES), EQUATION, GRAPH
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COMPILATION - TABLE (10 VALUES)

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EXPERIMENTAL - TABLE (2 VALUES)

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CALCULATION - TABLE (25 VALUES)

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CALCULATION - TABLE (5 VALUES)

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EXPERIMENTAL - TABLE (5 VALUES), EQUATION

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(90 TO 503 K AND 14.7 TO 10000 PSIA)
COMPILATION - TABLES (142 VALUES), GRAPH DATA FROM REFERENCES 179, 234, 267, 294

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THEORETICAL - TABLES (151 VALUES), EQUATIONS

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EXPERIMENTAL - TABLE (27 VALUES), GRAPH

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EXPERIMENTAL - TABLES (30 VALUES), APPARATUS

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THEORETICAL - NOMOGRAPHS, EQUATIONS

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CALCULATION - TABLE (11 VALUES)

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CALCULATION - NOMOGRAPH

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REVIEW - TABLE (4 VALUES)

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EXPERIMENTAL - GRAPH

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - TABLES (140 VALUES), GRAPHS, EQUATIONS

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EXPERIMENTAL - GRAPHS, EQUATION

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EXPERIMENTAL - TABLE (12 VALUES)

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THEORETICAL - EQUATIONS, TABLE OF COEFFICIENTS

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EXPERIMENTAL - TABLE (13 VALUES), APPARATUS

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COMPILATION - GRAPH, DATA FROM REFERENCES 54, 188, 385

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CORRELATION - TABLES (396 VALUES), GRAPHS, EQUATION

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CRITICAL TEMPERATURE
EXPERIMENTAL - TABLE (57 VALUES), GRAPHS

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CALCULATION - NOMOGRAPH

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JOULE-THOMSON COEFFICIENT (120 TO 133 K AND 0 TO 20 ATM)
SPECIFIC HEAT (P = CONSTANT)(SAT. VAPOR, GAS)(78 TO 303 K),
COMPRESSIBILITY FACTOR (GAS)(78 TO 251 K AND 0 TO 200 PSIA),
CRITICAL TEMPERATURE, PRESSURE, AND COMPRESSIBILITY FACTOR
CALCULATION - TABLES (30 VALUES), GRAPHS, EQUATIONS

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THEORETICAL - GRAPH, EQUATION

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EXPERIMENTAL - ONE TABULAR VALUE

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CORRELATION - GRAPH, TABLES OF VALUES FOR MIXTURES OF NITROGEN, OXYGEN, AND ARGON

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EXPERIMENTAL - TABLE (18 VALUES)

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ENTHALPY, SPECIFIC HEAT (V = CONSTANT), PRANDTL NUMBER (GAS)
THEORETICAL - GRAPHS

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THEORETICAL - GRAPHS

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REVIEW - GRAPH, EQUATION

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EXPERIMENTAL - TABLES (13 VALUES)

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EXPERIMENTAL - TABLE (7 VALUES), APPARATUS

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COMPILATION - TABLE (3 VALUES)

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EXPERIMENTAL - TABLES (31 VALUES), GRAPH, APPARATUS

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EXPERIMENTAL - TABLE (6 VALUES), EQUATIONS

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CALCULATION - EQUATIONS, TABLES (623 VALUES)

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EXPERIMENTAL - TABLE (4 VALUES), EQUATION

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EXPERIMENTAL - TABLE (14 VALUES), GRAPH, EQUATION

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EXPERIMENTAL - TABLES (42 VALUES), GRAPHS, EQUATIONS, APPARATUS - OXYGEN-NITROGEN MIXTURES WITH OXYGEN COMPOSITIONS OF FROM 18.85 TO 92.8 PERCENT -

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EXPERIMENTAL - GRAPH

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CORRELATION - TABLES (3200 VALUES), GRAPHS, EQUATIONS

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SECOND VIRIAL COEFFICIENT (GAS) (270 TO 1200 K)
EXPERIMENTAL - TABLE (43 VALUES)

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EXPERIMENTAL - TABLE (50 VALUES), GRAPH, EQUATION
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CALCULATION - TABLE (112 VALUES), EQUATIONS, GRAPH

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EXPERIMENTAL - TABLE (4 VALUES)

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REVIEW - TABLE (2 VALUES)

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CALCULATION - TABLE (16 VALUES), GRAPH

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EXPERIMENTAL - ONE TABULAR VALUE, GRAPH

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CALCULATION - TABLES (180 VALUES), GRAPHS

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EXPERIMENTAL - GRAPH, EQUATIONS, APPARATUS

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EXPERIMENTAL - GRAPHS, EQUATIONS, APPARATUS

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CALCULATION - EQUATIONS, TABLE (53 VALUES)

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EXPERIMENTAL - TABLES (50 VALUES), GRAPH

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CALCULATION - TABLE (18 VALUES), EQUATIONS, GRAPHS

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REVIEW - TABLE (7 VALUES), DATA FROM REFERENCES 267, 558

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EXPERIMENTAL - GRAPH, APPARATUS

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CALCULATION - NOMOGRAPHS, EQUATIONS

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CALCULATION - GRAPHS, EQUATIONS

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - ONE TABULAR VALUE, EQUATION

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - TABLE (2 VALUES), APPARATUS

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EXPERIMENTAL - TABLE (2 VALUES)

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EXPERIMENTAL - TABLE (12 VALUES)

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EXPERIMENTAL - TABLES (10 VALUES)

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CALCULATION - TABLE (12 VALUES), EQUATIONS

142 EUCKEN, A. HAUCK, F.
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EXPERIMENTAL - TABLE (15 VALUES), GRAPH

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EXPERIMENTAL - GRAPH
- OXYGEN-NITROGEN MIXTURES WITH OXYGEN CONCENTRATIONS OF 77 AND 89.6 PERCENT -

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CALCULATION - EQUATION, GRAPH, TABLES (11 VALUES)

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CALCULATED - TABLE (11 VALUES), EQUATIONS

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CALCULATION - TABLES (8000 VALUES), GRAPHS

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EXPERIMENTAL - TABLE (45 VALUES), GRAPH

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EXPERIMENTAL - TABLE (32 VALUES)

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CALCULATION - EQUATIONS, GRAPHS

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - TABLE (5 VALUES), EQUATION

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REVIEW - EQUATIONS, GRAPH

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REVIEW - GRAPH

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EXPERIMENTAL - TABLE (14 VALUES), EQUATION

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THEORETICAL - TABLE (5 VALUES), EQUATIONS

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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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EXPERIMENTAL - TABLE (2 VALUES)

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CALCULATION - TABLE (1000 VALUES), GRAPHS, EQUATIONS

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EXPERIMENTAL - TABLES (56 VALUES), GRAPHS

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EXPERIMENTAL - TABLE (7 VALUES), GRAPH
- OXYGEN-NITROGEN MIXTURES WITH OXYGEN CONCENTRATIONS OF 19.6 AND 60 PERCENT -

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THEORETICAL - GRAPH , EQUATIONS

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EXPERIMENTAL - TABLE (12 VALUES), EQUATIONS, APPARATUS

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - TABLE (5 VALUES), GRAPH, APPARATUS

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EXPERIMENTAL - TABLE (7 VALUES), EQUATIONS

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EXPERIMENTAL - TABLES (17 VALUES), EQUATIONS

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EXPERIMENTAL - GRAPH, APPARATUS

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EXPERIMENTAL - GRAPHS, APPARATUS

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EXPERIMENTAL - TABLE (92 VALUES), EQUATIONS, APPARATUS

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VISCOSITY (GAS) (200 TO 2500 K)
CALCULATION - TABLE (25 VALUES), EQUATIONS

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CALCULATION - TABLE (80 VALUES), EQUATIONS

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VISCOSITY (GAS) (270 TO 300 K)
SURVEY - TABLES (33 VALUES)

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CALCULATION - TABLE (1000 VALUES), EQUATIONS

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EXPERIMENTAL - TABLE (72 VALUES), EQUATIONS, APPARATUS

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EXPERIMENTAL - TABLES (45 VALUES), GRAPH, APPARATUS

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EXPERIMENTAL - TABLE (32 VALUES), GRAPH, APPARATUS

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LA COSTANTE DIELETTRICA DEI GAS NELLA REGIONE DELLE MICROONDE.
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EXPERIMENTAL - TABLE (5 VALUES)

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EXPERIMENTAL - TABLE (60 VALUES), GRAPHS, EQUATIONS

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CALCULATION - EQUATIONS , GRAPHS

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CALCULATION - TABLES (5500 VALUES), EQUATIONS, GRAPHS

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THE VISCOSITY, THERMAL CONDUCTIVITY AND SPECIFIC HEAT OF DRY AIR AT ELEVATED PRESSURES AND TEMPERATURES.
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VISCOSITY, THERMAL CONDUCTIVITY, SPECIFIC HEAT (P = CONSTANT) (GAS) (328 TO 1103 K AND 0 TO 2000 PSIA)
CALCULATION - GRAPHS

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REVIEW

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EXPERIMENTAL - GRAPH

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EXPERIMENTAL - THREE TABULAR VALUES, GRAPH

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EXPERIMENTAL - TABLE (9 VALUES), APPARATUS

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - ONE TABULAR VALUE

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COMPILATION - TABLE (4 VALUES), DATA FROM REFERENCES 196, 527, 586

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EXPERIMENTAL - TABLE (19 VALUES), GRAPH, EQUATION

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EXPERIMENTAL - TABLES (130 VALUES), GRAPH, EQUATION

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VELOCITY OF SOUND (GAS) (298 K AND 0.000001 TO 1 ATM)
CALCULATION - GRAPHS, EQUATIONS

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - 1 TABULAR VALUE

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INDEX OF REFRACTION (GAS)(ASSUME 273 K)
EXPERIMENTAL - TABLE (6 VALUES)

207 GUERITOT,M.
ESSAI D UNE METHODE QUI PERMET DE DEDUIRE LE RAPPORT DES CHALEURS SPECIFIQUES DES GAZ DE MESURES DE VOLUMES.***TEST OF A METHOD FOR DETERMINING THE SPECIFIC HEAT RATIO OF GASES BY MEASURING VOLUMES
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EXPERIMENTAL - ONE TABULAR VALUE

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THEORETICAL - EQUATION, TABLE OF COEFFICIENTS

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CALCULATION - EQUATIONS, TABLES (1250 VALUES), GRAPH

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CALCULATION - TABLES (3000 VALUES), GRAPHS, EQUATIONS

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CALCULATION - TABLE (750 VALUES), GRAPHS, EQUATIONS

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CALCULATION - EQUATIONS , TABLES (1890 VALUES), GRAPHS

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CALCULATION - TABLES (2000 VALUES)

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EXPERIMENTAL - TABLE (8 VALUES)

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VISCOSITY (GAS)(295 K)
DISCUSSION

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EXPERIMENTAL - TABLE (30 VALUES)

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UNTERSUCHUNG UBER DIE LEISTUNGSFAHIGKEIT DER ASSMANNSCHEN METHODE ZUR EXPERIMENTELLEN BESTIMMUNG DES VERHALTNISSES C(P)/C(V) = X DER SPEZIFISCHEN WARMEN BEI KONSTANTEM DRUCK UND KONSTANTEM VOLUMEN VON GASEN.***THE USE OF THE ASSMANNSCHEN METHOD IN EXPERIMENTALLY DETERMINING THE SPECIFIC HEAT RATIO CP/CV = X FOR GASES
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EXPERIMENTAL - TABLES (25 VALUES)

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CALCULATION - EQUATIONS, GRAPHS, TABLE (25 VALUES)

219 HAUSEN,H.
DER THOMSON-JOULE-EFFEKT UND DIE ZUSTANDSGROSSEN DER LUFT BEI TIEFEN TEMPERATUREN.***THE THOMSON-JOULE EFFECT AND VALUES FOR AIR AT LOW TEMPERATURES.
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CALCULATION - GRAPHS, EQUATIONS

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EXPERIMENTAL - GRAPHS

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THE VELOCITY OF SOUND.
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EXPERIMENTAL - TABLE (7 VALUES), APPARATUS

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VELOCITY OF SOUND (GAS) (295 K AND 541 TO 747 MM HG),
SPECIFIC HEAT RATIO (GAS) (273 K AND 1 ATM)
EXPERIMENTAL - TABLES (18 VALUES)

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THEORETICAL - EQUATIONS, TABLE OF COEFFICIENTS

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EXPERIMENTAL - TABLE (60 VALUES)

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DIELECTRIC CONSTANT (GAS) (273 K AND 1 ATM)
EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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EXPERIMENTAL - TABLE (1 VALUE)

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EXPERIMENTAL - APPARATUS, NO DATA

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - TABLE (9 VALUES)

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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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EXPERIMENTAL - TABLE (4 VALUES), GRAPH, EQUATIONS

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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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VISCOSITY (GAS) (100 TO 1900 K), THERMAL CONDUCTIVITY (GAS) (80 TO 1000 K), PRANDTL NUMBER (100 TO 1000 K), SPECIFIC HEAT, ENTHALPY, ENTROPY (IDEAL GAS) (10 TO 3000 K), EQUATION OF STATE (GAS) (50 TO 1500 K)
CALCULATION - TABLES (8000 VALUES), GRAPHS, EQUATIONS

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CORRELATION - TABLES (50 VALUES), GRAPHS

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THEORETICAL - TABLE (24 VALUES), GRAPH, EQUATIONS

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THEORETICAL - EQUATIONS, TABLES (110 VALUES), GRAPHS

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CALCULATION - TABLES (1500 VALUES)

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THEORETICAL - EQUATIONS, TABLES (600 VALUES)

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EXPERIMENTAL - TABLE (12 VALUES), GRAPH, APPARATUS

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EXPERIMENTAL - TABLES (3 VALUES), APPARATUS

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EXPERIMENTAL - TABLE (13 VALUES), EQUATION, APPARATUS

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DIE SPEZIFISCHE WARME C(P) DER LUFT BEI 60 DEGREES UND 1 BIS 300 AT.***SPECIFIC HEAT OF AIR AT 60 DEGREES AND 1 - 300 ATM.
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SPECIFIC HEAT (P=CONSTANT) (GAS) (333 K AND 1 TO 300 KG/SQ CM)
EXPERIMENTAL - TABLE (7 VALUES), EQUATION

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UBER DIE ISOTHERMEN VON STICKSTOFF, SAUERSTOFF, UND HELIUM.***ISOTHERMS OF NITROGEN, OXYGEN AND HELIUM.
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P-V-T DATA (GAS) (273 TO 373 K AND 0 TO 75 M HG)
EXPERIMENTAL - TABLE (51 VALUES)

244 HOLBORN,L. OTTO,J.
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EXPERIMENTAL - TABLE (80 VALUES)

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UBER DIE ISOTHERMEN EINIGER GASE BIS 400 GRAD UND IHRE BEDEUTUNG FUR DAS GASTHERMOMETER.
THE ISOTHERMS OF SEVERAL GASES UP TO 400 DEGREES AND THEIR IMPORTANCE FOR THE GAS THERMOMETER.
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EXPERIMENTAL - TABLE (51 VALUES), GRAPH

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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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VISCOSITY (GAS) (295 K)
EXPERIMENTAL - ONE TABULAR VALUE, EQUATIONS

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VELOCITY OF SOUND AT DIFFERENT TEMPERATURES IN HYDROGEN, NITROGEN, AIR, OXYGEN, AND CARBON DIOXIDE.
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VELOCITY OF SOUND (GAS) (205 TO 292 K)
EXPERIMENTAL - TABLE (10 VALUES), GRAPH

250 HOXTON,L.G.
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JOULE-THOMSON COEFFICIENT (288 TO 363 K AND 2.5 TO [illegible].4 M HG)
EXPERIMENTAL - TABLE (14 VALUES), EQUATION, GRAPH, APPARATUS

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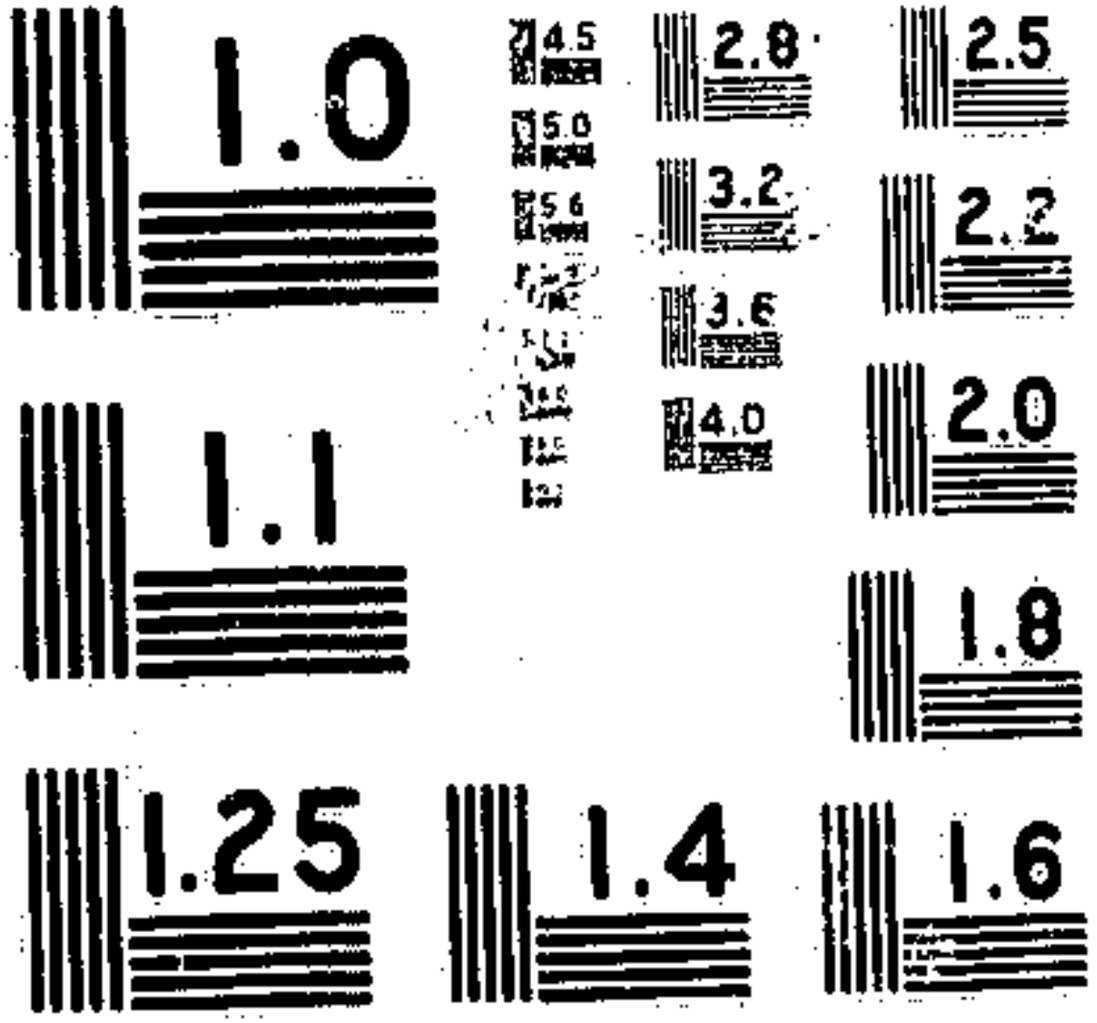
EXPERIMENTAL - TABLE (3 VALUES), GRAPH, EQUATION



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CALCULATION - TABLE (16 VALUES), GRAPHS, EQUATIONS

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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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COMPRESSIBILITY FACTOR, INTERNAL ENERGY, ENTHALPY, ENTROPY, DENSITY (GAS) (90 TO 1500 K AND 1 TO 1200 ATM)
CALCULATION - TABLE (5300 VALUES), GRAPHS, EQUATIONS

255 IBELE, W.E. NOVOTNY, J.L. ECKERT, E.R.G.
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EXPERIMENTAL - TABLE (21 VALUES), GRAPHS

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EXPERIMENTAL - GRAPHS, TABLE (16 VALUES)

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THEORETICAL - EQUATIONS

258 ISHKIN,I.P. KAGANER,M.G.
AN INVESTIGATION OF THE THERMODYNAMICAL PROPERTIES OF AIR AND NITROGEN AT HIGH PRESSURES AND LOW TEMPERATURES. I. THE ISOTHERMAL JOULE-THOMSON EFFECT FOR AIR AND NITROGEN.
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JOULE-THOMSON EFFECT (90 TO 298 K AND 1.5 TO 114 ATM)
EXPERIMENTAL - TABLE (150 VALUES), EQUATIONS, GRAPHS, APPARATUS

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EXPERIMENTAL - TABLES (22 VALUES), GRAPH

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EXPERIMENTAL - TABLES (60 VALUES), GRAPH, EQUATIONS

261 JACYNA, W.
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COMPILATION - TABLE (10 VALUES), DATA FROM REFERENCES 218, 451, 452

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CALCULATION - EQUATIONS, TABLES OF COEFFICIENTS

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EXPERIMENTAL - TABLE (3 VALUES), GRAPH

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THEORETICAL - EQUATIONS, GRAPH

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COMPILATION - TABLES (131 VALUES), GRAPHS, DATA FROM REFERENCES 112, 233

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EXPERIMENTAL - TABLE (48 VALUES), GRAPH, APPARATUS

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EXPERIMENTAL - TABLE (40 VALUES)

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EXPERIMENTAL - TABLE (7 VALUES), GRAPH, EQUATIONS, APPARATUS

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EXPERIMENTAL - TABLE (3 VALUES), APPARATUS, GRAPH

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CALCULATION - TABLES (13,000 VALUES), EQUATIONS

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CALCULATION - GRAPH, EQUATION

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EXPERIMENTAL - TABLE (30 VALUES), EQUATIONS

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CALCULATION - TABLES (22 VALUES), EQUATION

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CALCULATION - TABLES (60 VALUES), EQUATIONS

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CALCULATION - TABLE (6 VALUES), EQUATIONS

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CALCULATION - EQUATIONS, TABLE(6 VALUES)

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CALCULATION - TABLES (1240 VALUES), EQUATIONS

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REFERENCE BOOK - TABLES (2000 VALUES)

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - TABLE (72 VALUES), EQUATIONS

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EXPERIMENTAL - TWO TABULAR VALUES

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EXPERIMENTAL - TABLE (55 VALUES), EQUATIONS, APPARATUS

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EXPERIMENTAL - TWO TABULAR VALUES, APPARATUS

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EXPERIMENTAL - TABLE (9 VALUES), GRAPH

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EXPERIMENTAL - TABLE (54 VALUES), GRAPH

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EXPERIMENTAL - GRAPH

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EXPERIMENTAL - TABLE (10 VALUES), GRAPH

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CORRELATION - TABLE (13 VALUES), GRAPH, EQUATIONS

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CALCULATION - TABLE (80 VALUES), GRAPH, EQUATIONS

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SUMMARY - GRAPH

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JOULE-THOMSON COEFFICIENT (273 TO 373 K AND 1 ATM)
P-V-T DATA (GAS) (238 TO 473 K AND 1 TO 900 ATM), SPECIFIC HEAT (V = CONSTANT) (GAS) (293 K AND 6.8 TO 26.6 ATM)
CALCULATIONS - EQUATIONS, TABLES

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CALCULATION - TABLE (15 VALUES)

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THEORETICAL - EQUATIONS, TABLE (50 VALUES), GRAPH

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - ONE TABULAR VALUE

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CORRELATION - TABLES (70 VALUES), GRAPH

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C(P)/C(V) = K IN TROCKENER, KOHLENSAUREFREIER ATMOSPHARISCHER
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RATIO (GAS)(194 AND 273 K AND 1 TO 200 ATM)
EXPERIMENTAL - TABLES (50 VALUES), EQUATIONS, APPARATUS

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UBER DAS VERHALTNIS DER SPEZIFISCHEN WARMEN C(P)/C(V) = K IN
TROCKENER, KOHLENSAUREFREIER ATMOSPHARISCHER LUFT ALS FUNKTION
DES DRUCKES BEI DEN TEMPERATUREN 0 DEGREES UND -79.3 DEGREES C.
***SPECIFIC HEAT RATIO CP/CV = K IN DRY CARBON DIOXIDE FREE AT-
MOSPHERIC AIR AS FUNCTION OF PRESSURE FOR TEMPERATURES BETWEEN 0
AND -79.3 DEGREES C.
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EXPERIMENTAL - TABLE (16 VALUES), APPARATUS

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TROCKENER, KOHLENSAUREFREIER ATMOSPHARISCHER LUFT ALS FUNKTION
DES DRUCKES BEI DEN TEMPERATUREN 0 DEGREES UND -79.3 DEGREES
C. CONCERNING THE RATIO OF SPECIFIC HEATS CP/CV = K IN DRY
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EXPERIMENTAL - TABLES (35 VALUES), EQUATIONS

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THEORETICAL - EQUATIONS, GRAPH

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EXPERIMENTAL - TABLES (40 VALUES), GRAPH

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EXPERIMENTAL - FOUR TABULAR VALUES, GRAPH

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EXPERIMENTAL - ONE TABULAR VALUE

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CALCULATION - TABLE (230 VALUES), EQUATIONS, GRAPH

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EXPERIMENTAL - ONE TABULAR VALUE, EQUATIONS

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EXPERIMENTAL - ONE TABULAR VALUE

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CALCULATION - TABLE (54 VALUES), EQUATION

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EXPERIMENTAL - GRAPH

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EXPERIMENTAL - TABLES (63 VALUES), GRAPHS

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CALCULATION - TABLE (42 VALUES)

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EXPERIMENTAL - 2 TABULAR VALUES

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EXPERIMENTAL - TABLE (90 VALUES), GRAPHS, APPARATUS

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CORRELATION - GRAPH

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EXPERIMENTAL - TABLES (30 VALUES), EQUATIONS, APPARATUS

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EXPERIMENTAL - ONE TABULAR VALUE, EQUATION

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CORRELATION - TABLE (320 VALUES)

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CALCULATION - TABLE (13 VALUES), EQUATIONS

364 MCNABNEY,R. MOULTON,W. BEUSCHLEIN,W.L.
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EXPERIMENTAL - TABLE (10 VALUES), GRAPH

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INDEX OF REFRACTION (GAS)(273 TO 373 K AND 1 TO 200 ATM)
REVIEW - TABLE (92 VALUES)

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EXPERIMENTAL - GRAPH, APPARATUS

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EXPERIMENTAL - TABLE (3 VALUES), APPARATUS

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EXPERIMENTAL - TABLES (249 VALUES), GRAPHS

369 MICHELS,A. WASSENAAR,T. VAN SEVENTER,W.
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EXPERIMENTAL - TABLE (130 VALUES)

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CALCULATION - TABLES (3000 VALUES), GRAPHS

371 MICHELS,A. WASSENAAR,T. ZWIETERING,T.N.
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EXPERIMENTAL - GRAPH, EQUATIONS, APPARATUS

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THEORETICAL - EQUATION, GRAPH

373 MILLIKAN,R.A.
UBER DEN WAHRSCHEINLICHSTEN WERT DES REIBUNGSKOEFFIZIENTEN DER LUFT.***MOST PROBABLE VALUE OF THE COEFFICIENT OF VISCOSITY OF AIR.
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VISCOSITY (GAS)(296 K)
EXPERIMENTAL - ONE TABULAR VALUE, EQUATIONS

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EXPERIMENTAL - TABLES (9 VALUES), EQUATIONS, GRAPH

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EXPERIMENTAL - TABLES (23 VALUES)

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CALCULATION - ONE TABULAR VALU E

377 MISSENARD,F.A.
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EXPERIMENTAL - ONE TABULAR VALUE, EQUATION

378 MOLES,E.
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DENSITY (GAS)(ASSUME ROOM TEMPERATURE AND 689 TO 771 MM HG)
EXPERIMENTAL - TABLE (13 VALUES)

379 MOODY,H.W.
EINE BESTIMMUNG DES VERHALTNISSES DER SPEZIFISCHEN WARMEN SOWIE DER SPEZIFISCHEN WARME BEI KONSTANTEM DRUCK FUR LUFT UND KOHLENSAURE.***A DETERMINATION OF THE RATIO OF THE SPECIFIC HEATS AND OF THE SPECIFIC HEAT AT CONSTANT PRESSURE OF AIR AND CARBON DIOXIDE.
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SPECIFIC HEAT (P = CONSTANT) (293 K AND 1 ATM)
EXPERIMENTAL - TABLES (45 VALUES), GRAPH, APPARATUS

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CORRELATION - TABLES (9000 VALUES), GRAPHS, EQUATIONS

381 MORSY,T.E.
TEMPERATURABHANGIGKEIT DER VISKOSITAT VON GASEN BEI ATMOSPHAREN-DRUCK***TEMPERATURE DEPENDENCE OF VISCOSITY OF GASES AT ATMOSPHERIC PRESSURE.
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VISCOSITY (GAS) (100 TO 1000 K)
COMPILATION - GRAPH , DATA FROM REFERENCE 512

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EXPERIMENTAL - TABLES (35 VALUES)

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EXPERIMENTAL - 1 TABULAR VALUE

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VISCOSITA DELL ARIA SINO A 200 ATM.***VISCOSITY OF AIR UP TO 200 ATMOSPHERES.
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EXPERIMENTAL - TABLE (18 VALUES), GRAPH, EQUATIONS

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CALCULATION - TABLE (60,000 VALUES)

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EQUATION OF STATE
CALCULATION - TABLE (65 VALUES), GRAPHS, EQUATIONS

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CRITICAL TEMPERATURE AND PRESSURE
CORRELATION - GRAPHS, TWO TABULAR VALUES

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CRITICAL TEMPERATURE AND PRESSURE
CORRELATION - GRAPHS

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C.A. 19, 3205-6

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CALCULATION - TABLE (19 VALUES), EQUATIONS

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DIE SPEZIFISCHEN WARMEN DER GASE FUR FEUERUNGSTECHNISCHE BERECHNUNGEN.***THE SPECIFIC HEAT OF GASES FOR TECHNICAL HEATING CALCULATIONS.
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REVIEW - TABLE (30 VALUES)

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COMPILATION - TABLE (60 VALUES)

392 NICKLIN,A.W.
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CORRELATION - GRAPHS

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EXPERIMENTAL - TABLE (32 VALUES), GRAPHS, EQUATIONS

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CALCULATION - GRAPHS, EQUATIONS

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DIELECTRIC CONSTANT (GAS)(284 K)
EXPERIMENTAL - TABLE (9 VALUES), APPARATUS

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THE DIELECTRIC CONSTANT OF AIR UP TO 350 ATMOSPHERES.
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EXPERIMENTAL - TABLE (11 VALUES)

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LA COSTANTE DIELETTRICA DELL ARIA FINO A 200 ATMOSFERE.***THE DIELECTRIC CONSTANT OF PURE AIR AT 200 ATMOSPHERES.
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EXPERIMENTAL - TABLES (42 VALUES), EQUATION, APPARATUS

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ZUR THERMODYNAMISCHEN ANALYSE, IX. EIN LUFT-ODER GASKALORIMETER.***THERMODYNAMIC ANALYSIS IX. AN AIR OR GAS CALORIMETER.
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EXPERIMENTAL - GRAPH, APPARATUS

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EXPERIMENTAL - TABLE (9 VALUES), EQUATIONS, APPARATUS

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TEMPERATURE AND CRITICAL PRESSURE OF AIR. RELATION BETWEEN TEMPERATURE AND EVAPORATION PRESSURE OF AIR.
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EXPERIMENTAL - TABLE (9 VALUES)

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EXPERIMENTAL - TABLE (5 VALUES), GRAPH

403 OPLADEN, M.
DIE ABHANGIGKEIT DES BRECHUNGSEXPONENTEN DER GASE VOM DRUCK ZWISCHEN 1 UND 10 ATM.***THE DEPENDENCE OF THE INDEX OF REFRACTION OF GASES ON PRESSURE BETWEEN 1 AND 10 ATMOSPHERES.
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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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CORRELATION - NOMOGRAM

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(173 TO 523 K AND 1 TO 800 ATM)
CALCULATION - EQUATIONS, TABLE (42 VALUES), GRAPHS

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REVIEW - TABLES, EQUATIONS

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CALCULATION - EQUATIONS, GRAPHS

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EXPERIMENTAL - THREE TABULAR VALUES

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EXPERIMENTAL - TABLE (27 VALUES), EQUATION, GRAPH, APPARATUS

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EXPERIMENTAL - TABLE (110 VALUES), GRAPHS, EQUATIONS, APPARATUS

411 PAWLOWITSCH,A.
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EXPERIMENTAL - GRAPH, EQUATIONS

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EXPERIMENTAL - TABLES (84 VALUES), GRAPHS

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EXPERIMENTAL - EQUATIONS

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REVIEW - TABLE (16 VALUES)

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COMPILATION - GRAPH, DATA FROM REFERENCES 10, 246, 413

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REVIEW - GRAPH, TABLE (3 VALUES)
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REVIEW - TABLE (16 VALUES)

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CALCULATION - EQUATIONS, GRAPHS

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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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EXPERIMENTAL - TABLE (9 VALUES), EQUATIONS

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EXPERIMENTAL - TABLE (31 VALUES), GRAPH
- OXYGEN-NITROGEN MIXTURES WITH CONCENTRATIONS OF OXYGEN FROM 0 TO 100 PERCENT -

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EXPERIMENTAL - TABLE (11 VALUES), EQUATION

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EXPERIMENTAL - TABLE (29 VALUES), GRAPH

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CALCULATION - TABLES (26 VALUES), GRAPH, EQUATION

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CALCULATION - TABLES (11000 VALUES), GRAPHS, EQUATIONS

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REVIEW - EQUATIONS

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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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EXPERIMENTAL - ONE TABULAR VALUE, EQUATIONS, APPARATUS

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EXPERIMENTAL - TABLE (2 VALUES)

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EXPERIMENTAL - TWO TABULAR VALUES, EQUATION

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EXPERIMENTAL - GRAPH, TABLE (3 VALUES)

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EXPERIMENTAL - ONE TABULAR VALUE, EQUATION

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EXPERIMENTAL - TABLE (3 VALUES)

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EXPERIMENTAL - TABLE (10 VALUES), EQUATION

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EXPERIMENTAL - EQUATION

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COMPILATION - TABLES (400 VALUES)

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UBER DIE TEMPERATURABHANGIGKEIT DER DIELEKTRIZITATSKONSTANTEN VON GASEN.*** THE DEPENDENCE OF THE DIELECTRIC CONSTANTS OF GASES UPON THE TEMPERATURE.
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EXPERIMENTAL - TABLE (4 VALUES)

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EXPERIMENTAL - TWO TABULAR VALUES

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EXPERIMENTAL - TABLES (32 VALUES), APPARATUS

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CALCULATION - TABLE (96 VALUES), EQUATIONS

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CALCULATION - TABLE (45 VALUES), EQUATIONS

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EXPERIMENTAL - TABLES (90 VALUES), GRAPHS, EQUATIONS

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EXPERIMENTAL - TABLES (300 VALUES), EQUATIONS, GRAPHS

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EXPERIMENTAL - TABLE (123 VALUES)

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EXPERIMENTAL - GRAPH

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EXPERIMENTAL - TABLE (23 VALUES)

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EXPERIMENTAL - TABLE (23 VALUES), APPARATUS

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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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EXPERIMENTAL - TABLE (10 VALUES)

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EXPERIMENTAL - TABLE (20 VALUES), GRAPH

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EXPERIMENTAL - TABLE (5 VALUES), GRAPH, APPARATUS

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REVIEW - GRAPH

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EXPERIMENTAL - ONE TABULAR VALUE FOR DRY AIR
A GRAPH SHOWS THE EFFECT OF WATER VAPOR ON DIELECTRIC CONSTANT

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EXPERIMENTAL - TABLES (6 VALUES), GRAPH

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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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CALCULATION - NOMOGRAM, EQUATIONS

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THEORETICAL - TABLE (11 VALUES), EQUATIONS

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CALCULATION - GRAPHS, EQUATIONS, TABLES OF COEFFICIENTS

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THEORETICAL - EQUATION, GRAPH

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THEORETICAL - EQUATION, TABLE OF COEFFICIENTS

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EXPERIMENTAL - TABLES (50 VALUES), GRAPH

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EXPERIMENTAL - TABLE (13 VALUES), GRAPHS, EQUATIONS

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DIE SPEZIFISCHE WARME DER LUFT BEI ZIMMERTEMPERATURE UND BEI TIEFEN TEMPERATUREN.***THE SPECIFIC HEAT C(P) AT ROOM TEMPERATURE AND AT LOWER TEMPERATURES.
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SPECIFIC HEAT ((P = CONSTANT) (90 TO 293 K AND 1 ATM)
EXPERIMENTAL - TABLE (3 VALUES), APPARATUS

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EXPERIMENTAL - TABLES (50 VALUES)

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CALCULATION - TABLE (2200 VALUES), EQUATIONS

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CALCULATION - GRAPH, EQUATIONS

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EXPERIMENTAL - TABLES (23 VALUES), GRAPH

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VISCOSITY (GAS)(177 TO 456 K AND 75.2 TO 76.1 CM HG)
EXPERIMENTAL - TABLE (10 VALUES)

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ÜBER DIE WÄRMELEITUNG VON LUFT UND WASSERSTOFF. CONCERNING THE HEAT TRANSFER OF AIR AND HYDROGEN.
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EXPERIMENTAL - TABLES (8 VALUES), EQUATIONS, APPARATUS

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REVIEW OF METHODS AND EXPERIMENTAL DETERMINATIONS

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EXPERIMENTAL - ONE TABULAR VALUE, EQUATIONS

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - ONE TABULAR VALUE

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EXPERIMENTAL - ONE TABULAR VALUE

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REFERENCE BOOK - TABLES (40 VALUES), GRAPHS

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EXPERIMENTAL - ONE TABULAR VALUE

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THEORETICAL - EQUATIONS, TABLE (12 VALUES), GRAPH

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REVIEW - TABLE (13 VALUES)

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EXPERIMENTAL - TABLE (24 VALUES)

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EXPERIMENTAL - TABLE (63 VALUES)

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EXPERIMENTAL - TABLE (90 VALUES) , GRAPH

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EXPERIMENTAL - TABLE (42 VALUES), GRAPH, APPARATUS

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THEORETICAL - EQUATIONS, TABLE OF COEFFICIENTS, TABLE (6 VALUES)

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EXPERIMENTAL - TABLES (15 VALUES), APPARATUS

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EXPERIMENTAL - TABLE (6 VALUES), APPARATUS

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EXPERIMENTAL - TABLE (7 VALUES), EQUATIONS

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CALCULATION - GRAPH, EQUATION

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EXPERIMENTAL - TABLE (3 VALUES)

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EXPERIMENTAL - TABLE (4 VALUES), APPARATUS

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VELOCITY OF SOUND (GAS)(50 TO 273 K AND 0.01 TO 1000 ATM)
COMPILATION - TABLES (230 VALUES), GRAPHS
DATA FROM REFERENCES 112, 233, 371

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EXPERIMENTAL - TABLES (31 VALUES), GRAPHS

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EXPERIMENTAL - GRAPH, EQUATION, TABLE OF COEFFICIENTS

505 STUART, H.A.
ÜBER DIE TEMPERATURABHANGIGKEIT DER DIELEKTRIZITATSKONSTANTEN VON GASEN UND DAMPFEN. I. METHODE UND ERGEBNISSE FUR KOHLENSAURE UND LUFT.***RELATION BETWEEN THE TEMPERATURE AND THE DIELECTRIC CONSTANT OF GASES AND VAPORS. I. METHOD AND RESULTS IN CARBON DIOXIDE AND AIR.
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EXPERIMENTAL - TABLE (4 VALUES), EQUATIONS, APPARATUS

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THEORETICAL - EQUATIONS, GRAPH

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EXPERIMENTAL - TABLE (7 VALUES), GRAPH

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CALCULATION - TABLES (14 VALUES)

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CALCULATION - TABLE (50 VALUES), EQUATIONS

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EXPERIMENTAL - TABLES (110 VALUES), APPARATUS

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THE DIELECTRIC CONSTANTS OF GASES UNDER HIGH PRESSURE.
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DIELECTRIC CONSTANT (GAS) (292 K AND 1 TO 100 ATM)
EXPERIMENTAL - TABLE (30 VALUES), APPARATUS

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EXPERIMENTAL - TABLES (30 VALUES), EQUATIONS, APPARATUS

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ÜBER DIE LICHTBRECHUNG IN WASSERSTOFF, SAUERSTOFF, ARGON UND STICKSTOFF.***CONCERNING THE REFRACTIONS OF LIGHT IN HYDROGEN, OXYGEN, ARGON, AND NITROGEN.
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EXPERIMENTAL - TABLE (16 VALUES)

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ÜBER DIE LICHTBRECHUNG IN WASSERSTOFF, SAUERSTOFF, ARGON UND STICKSTOFF. II. THE REFRACTION OF LIGHT IN HYDROGEN, OXYGEN, ARGON AND NITROGEN. II.
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EXPERIMENTAL - TABLE (4 VALUES)

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EXPERIMENTAL - TABLE (47 VALUES), GRAPH, APPARATUS

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EXPERIMENTAL - ONE TABULAR VALUE, EQUATIONS, APPARATUS

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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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CALCULATION - TABLE (55 VALUES), GRAPH, EQUATIONS

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EINE BESTIMMUNG DER SCHALLGESCHWINDIGKEIT IN LUFT VON 0 DEGREES.
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VELOCITY OF SOUND (GAS)(273 K)
EXPERIMENTAL - ONE TABULAR VALUE, EQUATION, APPARATUS

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DISCUSSION - ONE TABULAR VALUE

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EXPERIMENTAL - TABLES (11 VALUES), EQUATIONS, APPARATUS

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EXPERIMENTAL - TABLE (11 VALUES), APPARATUS, EQUATIONS

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EXPERIMENTAL - TABLE (3 VALUES)

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EXPERIMENTAL - TABLE (4 VALUES), EQUATIONS

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EXPERIMENTAL - TABLE (9 VALUES), EQUATION

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EXPERIMENTAL - TABLE (14 VALUES), EQUATIONS

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C.A. 29, 31-8

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CALCULATION - TABLE (19 VALUES), EQUATIONS, GRAPH

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ANN. PHYSIK VOL 2, 733-6 (1929)

VISCOSITY (GAS)(195 TO 523 K)
EXPERIMENTAL - TABLES (15 VALUES)

532 TRAUTZ, M. BINKELE, H.E.
DIE REIBUNG, WARMELEITUNG UND DIFFUSION IN GASMISCHUNGEN. VIII. DIE REIBUNG DES H2, HE, NE, AR UND IHRER BINAREN GEMISCHE.*** VISCOSITY, THERMAL CONDUCTIVITY AND DIFFUSION IN GAS MIXTURES. VIII. THE VISCOSITIES OF H2, HE, NE, AR AND THEIR BINARY MIXTURES
ANN. PHYSIK VOL 5, 561-80 (1930

VISCOSITY (GAS) (293 TO 523 K)
CALCULATED - TABLE (6 VALUES)

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SPECIFIC HEAT (V = CONSTANT) (GAS) (293 K AND 1 ATM)
EXPERIMENTAL - ONE TABULAR VALUE

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ANN. PHYSIK VOL. 5, 581-605 (1930)

SPECIFIC HEAT (V = CONSTANT) (GAS) (293 K)
EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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C.A. 24, 763-4

VISCOSITY (GAS) (287 TO 523 K)
EXPERIMENTAL - TABLE (17 VALUES), EQUATIONS

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VISCOSITY (GAS) (295 TO 550 K)
EXPERIMENTAL - TABLE (19 VALUES)
- NITROGEN-OXYGEN MIXTURES WITH NITROGEN CONCENTRATIONS OF 18.64, 24.08, 58.93, 59.20, AND 78.22 PERCENT -

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ANN. PHYSIK VOL 79, 637-72 (1926)

VISCOSITY (GAS) (285 AND 286 K AND 747 TO 758 MM HG)
EXPERIMENTAL - TABLE (6 VALUES)

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C.A. 29, 4227-7

SPECIFIC HEAT (V = CONSTANT) (GAS) (289 TO 291 K)
EXPERIMENTAL - TABLE (4 VALUES)

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DIE REIBUNG, WARMELEITUNG UND DIFFUSION IN GASMISCHUNGEN. XVI. DIE REIBUNG VON H2, CH4, C2H6, C3H8 UND IHREN BINAREN GEMISCHEN. THE VISCOSITY, THERMAL CONDUCTIVITY AND DIFFUSION IN GAS MIXTURES. XVI. THE VISCOSITY OF H2, CH4, C2H6, C3H8 AND THEIR BINARY MIXTURES.
ANN. PHYSIK VOL 10, 81-96 (1931)

VISCOSITY (GAS) (294 TO 523 K)
EXPERIMENTAL - TABLE (6 VALUES), EQUATION

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ANN. PHYSIK VOL 2, 737-42 (1929)

VISCOSITY (GAS) (195 TO 525 K)
EXPERIMENTAL - TABLE (23 VALUES)

541 TRAUTZ,M. WEIZEL,W.
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C.A. 20, 1007-1

VISCOSITY (GAS) (287 TO 473 K AND 747 TO 764 MM HG)
EXPERIMENTAL - TABLES (32 VALUES), EQUATION

542 TRAUTZ,M. ZINK,R.
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ANN. PHYSIK VOL 7, 427-52 (1930)
C.A. 25, 2034-3

VISCOSITY (GAS)(289 TO 1098 K)
EXPERIMENTAL - TABLES (28 VALUES)

543 TRAUTZ,M. ZUNDEL,A.
DIE MESSUNG DER WARMELEITUNG IN GASEN. MEASUREMENT OF THE HEAT CONDUCTIVITY OF GASES.
ANN. PHYSIK VOL. 17, NO. 4, 345-75 (JUN 1933)
C.A. 27, 4454-2

THERMAL CONDUCTIVITY (GAS) (273 K AND 500 MM HG)
EXPERIMENTAL - ONE TABULAR VALUE

544 TSEDERBERG,N.V. TIMROT,D.L.
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EXPERIMENTAL - TABLE (6 VALUES)

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EXPERIMENTAL - TABLES (7 VALUES)

546 UBBINK,J.B. DE HAAS,W.J.
AN APPARATUS TO MEASURE THE SPECIFIC THERMAL CONDUCTIVITY OF GASES AT LOW TEMPERATURES.
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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

547 ULSAMER,J.
DIE WARMELEITFAHIGKEIT DER LUFT UND ANDERER TECHNISCH WICHTIGER GASE.***THE THERMAL CONDUCTIVITY OF AIR AND OTHER TECHNICALLY IMPORTANT GASES.
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C.A. 30, 4363-2

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REVIEW - TABLE (10 VALUES), EQUATIONS, APPARATUS, DATA FROM 198, 232, 279, 478, 577

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VISCOSITY (GAS) (273 AND 296 K)
EXPERIMENTAL - TABLE (10 VALUES)

549 VAN ITTERBEEK,A. DEROP,W.
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EXPERIMENTAL - TABLE (44 VALUES), GRAPHS

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EXPERIMENTAL - GRAPH, TABLE (20 VALUES), EQUATIONS
- OXYGEN-NITROGEN MIXTURES WHERE THE CONCENTRATIONS OF OXYGEN ARE 20, 40, 50, 60, AND 80 PERCENT -

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VISCOSITY (GAS) (288 K AND 762 MM HG)
EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

552 VAN ITTERBEEK,A. SPAEPEN,J.
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C.A. 38, 5442-5

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EXPERIMENTAL - TABLE (4 VALUES), EQUATION, APPARATUS

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EXPERIMENTAL - TABLE (28 VALUES), EQUATIONS

553 VAN ITTERBEEK,A. VANDONINCK,W.
VITESSE DE PROPAGATION DU SON DANS L AIR ET DANS LES MELANGES AZOTE-HYDROGENE AUX BASSES TEMPERATURES CALCUL DES CHALEURS SPECIFIQUES.***SPEED OF PROPAGATION OF SOUND THROUGH THE AIR AND THROUGH NITROGEN-HYDROGEN MIXTURES AT LOW TEMPERATURES. CALCULATION OF SPECIFIC HEAT.
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VELOCITY OF SOUND (GAS) (294 K)
EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

554 VAN ITTERBEEK,A. VAN PAEMEL,O.
COMPARAISON DU MOUVEMENT AMORTI D UN DISQUE HORIZONTAL ET D UN DISQUE VERTICAL DANS LES GAZ.***COMPARISON BETWEEN THE DAMPING OF A HORIZONTAL AND A VERTICAL DISC IN GASES.
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EXPERIMENTAL - TABLE (3 VALUES), GRAPH

555 VARGAFTIG,N.B. OLESHUCK,O.M.
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THERMAL CONDUCTIVITY (GAS) (273 TO 1069 K AND 1 TO 75 CM HG)
EXPERIMENTAL - TABLES (20 VALUES), GRAPHS, EQUATIONS, APPARATUS

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EXPERIMENTAL - TABLES (36 VALUES), EQUATIONS, APPARATUS

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EXPERIMENTAL - ONE TABULAR VALUE

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P-V-T DATA, ENTHALPY, ENTROPY (GAS) (273 TO 1273 K AND 1 TO 1000 ATM)
CALCULATION - TABLES (900 VALUES), EQUATION, GRAPH

559 VASSERMAN,A.A.
THERMODYNAMIC PROPERTIES OF AIR UP TO 1000 DEGREES C AND 1000 BARS.
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CALCULATION - TABLES (1440 VALUES), EQUATIONS, GRAPHS

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THEORETICAL - EQUATIONS, TABLE (70 VALUES)

561 VASSERMAN,A.A. RABINOVICH,V.A.
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VISCOSITY (GAS) (273 TO 1273 K AND 10 TO 9869 ATM)
CALCULATION - EQUATIONS, TABLE (380 VALUES)

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EXPERIMENTAL - TABLES (235 VALUES), GRAPHS, EQUATIONS

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EXPERIMENTAL - GRAPH, EQUATION, APPARATUS

564 VINES,R.G.
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EXPERIMENTAL - TABLE (4 VALUES), GRAPH, APPARATUS

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THERMAL CONDUCTIVITY (GAS) (513 TO 1173 K)
EXPERIMENTAL - TABLE (4 VALUES), GRAPH, EQUATIONS, APPARATUS

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THEORETICAL - EQUATIONS, TABLE

567 VOGEL,H.
UBER DIE VISKOSITAT EINIGER GASE UND IHRE TEMPERATURABHANGIGKEIT BEI TIEFEN TEMPERATUREN. THE VISCOSITY OF CERTAIN GASES AND THE VARIATION WITH TEMPERATURE AT LOW TEMPERATURES.
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EXPERIMENTAL - ONE TABULAR VALUE, APPARATUS

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EXPERIMENTELLE BEITRAGE ZUR AUSBREITUNG DES SCHALLES IN DER FREIEN ATMOSPHARE.*** EXPERIMENTAL VALUE FOR THE PROPAGATION OF SOUND IN FREE AIR.
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EXPERIMENTAL - ONE TABULAR VALUE

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CALCULATION - MOLLIER DIAGRAM

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THEORETICAL - EQUATIONS, TABLES (216 VALUES)

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THEORETICAL - EQUATIONS, TABLE (162 VALUES)

572 WAGSTAFF,J.E.P.
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VISCOSITY (GAS)(291 K)
EXPERIMENTAL - ONE TABULAR VALUE, EQUATION, APPARATUS

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EXPERIMENTAL - TABLE (35 VALUES), APPARATUS

574 WALKER,G.W.
ON THE DEPENDENCE OF THE REFRACTIVE INDEX OF GASES ON TEMPERATURE
PHIL. TRANS. ROY. SOC. LONDON VOL 201, 435-55 (1903)

INDEX OF REFRACTION (GAS)(273 TO 373 K)
EXPERIMENTAL - TABLE (16 VALUES), GRAPH, EQUATIONS, APPARATUS

575 WATSON,H.E. RAO,G.G. RAMASWAMY,K.L.
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EXPERIMENTAL - TABLE (6 VALUES), APPARATUS

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SPECIFIC HEAT (P=CONSTANT)(GAS)(273 TO 1403 K AND 1 ATM)
CALCULATION - TABLE (27 VALUES)

577 WEBER, S.
UBER DIE WARMELEITFAHIGKEIT DER GASE.*** THE HEAT CONDUCTIVITY OF GASES.
ANN. PHYSIK VOL 82, 479-503 (1927)
C.A. 21, 2206-7

THERMAL CONDUCTIVITY (GAS)(273 K)
EXPERIMENTAL - ONE TABULAR VALUE, EQUATIONS, APPARATUS

578 WEBER, S.
EXPERIMENTELLE UNTERSUCHUNGEN UBER DIE WARMELEITFAHIGKEIT DER GASE. I.*** EXPERIMENTAL RESEARCHES ON THE THERMAL CONDUCTION OF GASES. I.
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EXPERIMENTAL - ONE TABULAR VALUE, EQUATIONS, APPARATUS

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EXPERIMENTAL - TABLE (20 VALUES), GRAPH

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CORRELATION - GRAPHS

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THE EFFECT OF TEMPERATURE ON THE VISCOSITY OF AIR.
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EXPERIMENTAL - TABLE (130 VALUES), GRAPH, EQUATIONS

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PROC. ROY. SOC. SER. A VOL 113, 233-7 (1926)
C.A. 21, 204-2

VISCOSITY (GAS)(288 TO 1275 K)
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CALCULATION - TABLES (260 VALUES), GRAPHS

584 WILNER,T. BORELIUS,G.
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MEASUREMENT OF THERMAL CONDUCTIVITY OF AIR-NITROGEN UP TO 500 DEGREES C.
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EXPERIMENTAL - TABLE (10 VALUES)

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EXPERIMENTAL - TABLES (2500 VALUES), GRAPHS, EQUATIONS
MIXTURES WITH MOLE FRACTIONS OF NITROGEN AND OXYGEN FROM 0 TO 1.0 AND OF ARGON FROM 0 TO 0.9 -

585 WINKELMANN,A.
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ANN. PHYSIK VOL 156, 497-531 (1875)

THERMAL CONDUCTIVITY (GAS) (273 K AND 1 TO 756 MM HG)
EXPERIMENTAL - TABLE (180 VALUES)

586 WINTLE,H.J.
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C.A. 54, 13789-E

VELOCITY OF SOUND (GAS) (303 K AND 1 ATM)
EXPERIMENTAL - ONE TABULAR VALUE

587 WITKOWSKI,A.W.
SUR LA VITESSE DU SON DANS L'AIR COMPRIME. THE VELOCITY OF SOUND IN COMPRESSED AIR.
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EXPERIMENTAL - TABLES (140 VALUES), EQUATIONS, GRAPHS

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PHIL. MAG. VOL 42, 1-37 (1896)

SPECIFIC HEAT (P = CONSTANT) (GAS) (129 TO 273 K AND 10 TO 100 ATM), P-V-T DATA (GAS) (128 TO 373 K AND 4 TO 125 ATM)
CALCULATION - TABLES (200 VALUES), GRAPH, EQUATIONS

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THERMODYNAMIC PROPERTIES OF AIR.
PHIL. MAG. VOL 41, 288-315 (1896)

P-V-T DATA (GAS) (128 TO 373 K AND 1 TO 130 ATM)
EXPERIMENTAL - TABLE (200 VALUES), EQUATIONS

590 WITT,G.
UBER DIE VERDAMPFUNGSWARME FLUSSIGER LUFT.***ON THE LATENT HEAT OF VAPORIZATION OF LIQUID AIR.
ARKIV. MAT. ASTRON. FYSIK VOL 7, NO. 32, 1-13 (1912)
C.A. 7, 568-9

HEAT OF VAPORIZATION (LIQUID) (79 TO 88 K)
EXPERIMENTAL - TABLE (21 VALUES), GRAPH, APPARATUS

591 WOBSER,R. MULLER,E.
DIE INNERE REIBUNG VON GASEN UND DAMPFEN UND IHRE MESSUNG IM HOPPLER-VISKOSIMETER.*** THE VISCOSITY OF GASES AND VAPORS AND THE MEASUREMENT OF VISCOSITY WITH THE HOPPLER VISCOMETER.
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C.A. 35, 3866-4

VISCOSITY (GAS) (293 AND 296 K)
COMPILATION - TABLES (13 VALUES), DATA FROM 20, 27, 51, 117, 240, 248, 291, 442, 448, 449, 568

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SOME THERMODYNAMIC PROPERTIES OF AIR AND OF CARBON DIOXIDE.
PHYS. REV. VOL 33, NO. 4, 217-67 (OCT 1911)
C.A. 6, 172-5

JOULE-KELVIN EFFECT, FREE-EXPANSION EFFECT (194 AND 273 K AND 0 TO 130 ATM)
CALCULATION - TABLE (23 VALUES), EQUATIONS

593 WROBLEWSKI, S.
UEBER DAS VERHALTEN DER FLUSSIGEN ATMOSPHARISCHEN LUFT. THE BEHAVIOR OF LIQUID ATMOSPHERIC AIR.
ANN. PHYSIK VOL 26, 134-44 (1885)

VAPOR PRESSURE (LIQUID) (73 TO 113 K AND 0.04 TO 31 ATM)
EXPERIMENTAL - TABLES (115 VALUES)

594 WROBLEWSKI,S.
SUR LA DENSITE DE L'AIR ATMOSPHERIQUE LIQUIDE ET DE SES COMPOSANTS, ET SUR LE VOLUME ATOMIQUE DE L'OXYGENE ET DE L'AZOTE.
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COMPT. REND. VOL. 102, 1010-12 (1886)

DENSITY (LIQUID) (127 K AND 45 ATM)
EXPERIMENTAL - ONE TABULAR VALUE

595 WROBLEWSKI,S.
SUR LA TEMPERATURE D'EBULLITION DE L'OXYGENE, DE L'AIR, DE L'AZOTE ET DE L'OXYDE DE CARBONE SOUS LA PRESSION ATMOSPHERIQUE.
THE BOILING TEMPERATURE OF OXYGEN, AIR, NITROGEN AND CARBON MONOXIDE AT ATMOSPHERIC PRESSURE.
COMPT. REND. VOL. 98, 982-85 (1884)

NORMAL BOILING TEMPERATURE (81 K)
EXPERIMENTAL - ONE TABULAR VALUE

596 WROBLEWSKI,S.
DIE ZUSAMMENDRUCKBARKEIT DES WASSERSTOFFES.*** THE COMPRESSIBILITY OF HYDROGEN.
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EXPERIMENTAL - TABLE (7 VALUES)

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EXPERIMENTAL - ONE TABULAR VALUE

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5. APPENDIX A

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9	28649	49	54009	89	41536	129	43943
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15	30928	55	6992	95	7062	135	19277
16	30133	56	10784	96	30354	136	795
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18	13045	58	54168	98	7070	138	54515
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20	27094	60	54478	100	27768	140	10914
21	--	61	45110	101	32164	141	25978
22	25721	62	5603	102	54006	142	6099
23	14543	63	28110	103	19279	143	1238
24	54438	64	9476	104	42280	144	54047
25	13824	65	10880	105	18950	145	54226
26	10658	66	10749	106	985	145+	48428
27	591	67	5600	107	983	146	55231
28	54593	68	26617	108	48451	147	56299
29	11005	69	27952	109	6622	148	12017
30	54479	70	29390	110	54012	149	16093
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32	6927	72	6174	112	11281	151	37209
33	43270	73	41837	113	36882	152	56298
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35	13848	75	14279	115	7127	154	14220
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167	42075	207	54173	247	54035	287	54483
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169	23055	209	67	249	8695	289	54042
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171	48521	212	34473	252	5997	292	10579
172	26476	213	14578	253	641	293	11832
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175	54482	216	44504	256	34521	296	25055
176	6029	217	54498	257	3276	297	146
177	25264	218	54566	258	332	298	5573
178	54169	219	55226	259	5897	299	21857
179	28646	220	54562	260	27471	300	28650
180	35639	221	6798	261	57142	301	26641
181	55720	222	6808	262	47579	302	6138
182	38568	223	32705	263	18526	303	33792
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333	673	373	54499	413	54160	453	38574
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337	6497	377	40751	417	55232	457	27935
338	10748	378	218	418	6049	458	41771
339	40787	379	41785	419	8703	459	8643
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341	24332	381	47200	421	18042	461	5736
342	28168	382	54505	422	--	462	2793
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353	32837	393	7594	432	9814	473	8110
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329	31490	369	663	409	54567	449	53551
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341	24332	381	17200	421	18042	461	5736
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343	20337	383	665	423	7652	463	54487
344	9486	384	43134	424	56464	464	39108
345	43261	385	25314	425	43639	465	6169
346	27514	386	45966	426	33122	466	6268
347	54165	387	50971	427	54502	467	35646
348	--	388	5542	428	54064	468	11021
349	207	389	55714	428+	5525	469	54159
350	25269	390	54596	429	17997	470	8645
351	6385	391	10699	430	6705	471	6097
352	--	392	5432	431	48909	472	5726
353	32837	393	7594	432	9814	473	8110
354	1104	394	7989	433	12539	474	8111
355	10436	395	54164	434	7749	475	41479
356	54013	396	14228	435	16889	476	55227
357	4403	397	33797	436	18015	477	23395
358	485	398	40734	437	26687	477+	17999
359	39327	399	6193	438	27121	478	26734
360	7528	400	26027	439	54039	479	19641
				440	54026	480	8112

Bib. No.	CDC Accession No.	Bib. No.	CDC Accession No.	Bib. No.	CDC Accession No.	Bib. No.	Acc
481	16879	521	8710	561	43160	601	7916
482	16880	522	54496	562	56335	602	14226
483	16886	523	54514	563	17968	603	4590
484	14990	524	56300	564	11461	604	54511
485	--	525	26026	565	54489		
486	55711	526	10605	566	45562		
487	24368	527	26011	567	5703		
488	29436	528	26919	568	--		
489	13378	529	54497	569	27378		
490	11825	530	55710	570	--		
491	54594	531	618	571	24298		
492	26708	532	18000	572	54513		
493	6841	533	39339	573	33664		
494	10752	534	18837	574	54595		
495	19306	535	17962	575	6044		
496	27095	536	604	576	--		
497	56336	537	26003	577	592		
498	35649	538	19301	578	723		
499	54503	539	26006	579	19459		
500	35654	540	26745	580	56343		
501	2274	541	26007	581	54516		
502	12704	542	615	582	54517		
503	11669	543	18843	583	730		
504	16898	544	717	584	34445		
505	54508	545	6316	585	6318		
506	6228	546	10739	586	54480		
507	6229	547	55224	587	24344		
508	27104	548	27954	588	6603		
509	26682	549	5758	589	16360		
510	36399	550	47789	590	5692		
511	16317	551	5711	591	374		
512	54518	552	5710	592	54565		
513	56369	553	3106	593	16369		
514	711	554	6177	594	19184		
515	14542	555	12631	595	19185		
516	10740	556	32864	596	16106		
517	19292	557	17730	597	7907		
518	11061	558	42121	598	52908		
519	46400	559	22220	599	664		
520	--	560	56674	600	47296		
			37889				

GPO 884-882