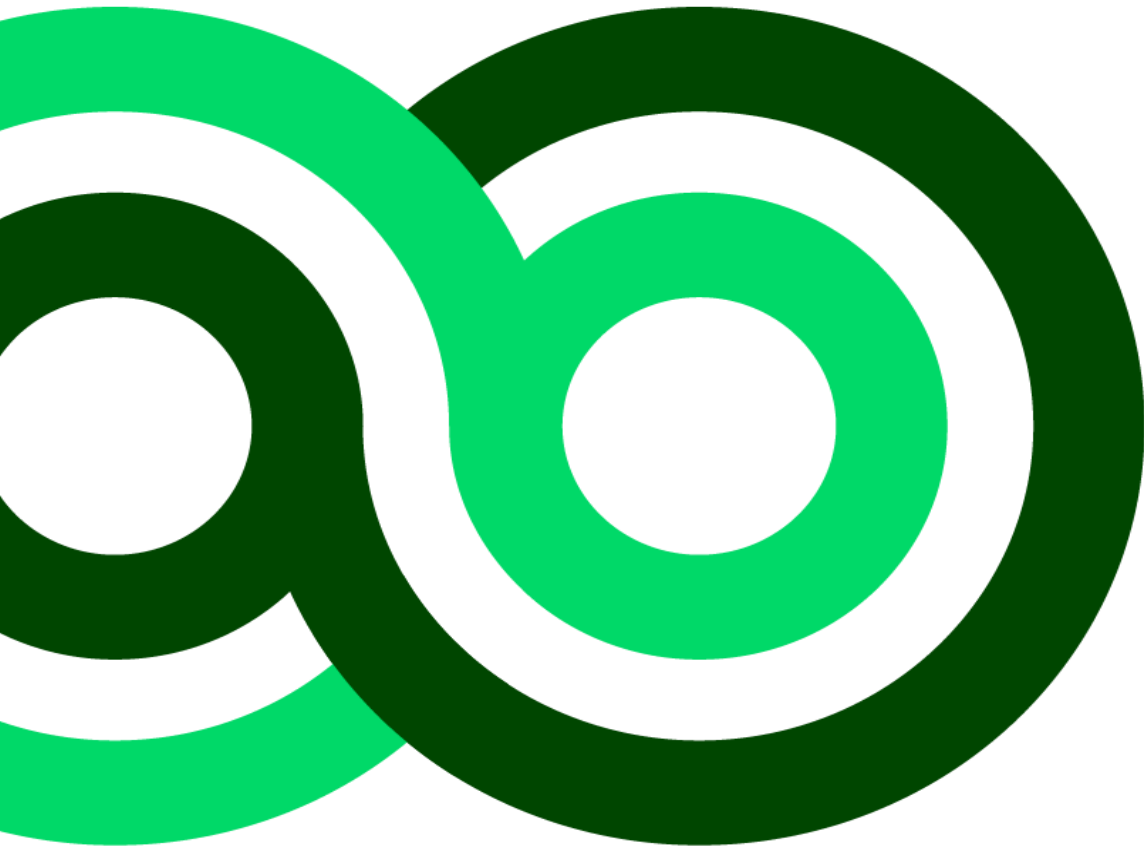


TEST PROCEDURE

BAB Motorway Test Cycle





Disclaimer: Currently this test procedure is not applicable to Plug-In Hybrid (PHEV) Electric Vehicles.

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Version 1.0.1 November 2020

GNT BAB motorway cycle BAB130

Test procedure on the emissions test stand

General testing requirements

The test cycles include the emission test stand measurement of pollutants such as carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx), of particulate matter (PM) and particle number (PN), as well as of carbon dioxide (CO₂), a green-house gas. Fuel consumption is calculated on the basis of carbonaceous emissions.

The following requirements have been defined for the test procedure to replicate reality as closely as possible:

- All vehicles are driven under harsh acceleration in kick-down.
- Vehicles with a gear-shift indicator are measured shifting the gears as recommended.
- Reference fuel has to be used for tests. A corresponding certification document has to be provided with the measurement results.
- Target room temperature in the emissions laboratory is 14 °C +/- 3 °C during soak phases and at the start of the test. During the test the temperature set point is 14 °C +/- 5 °C.
- Daytime running lights (or, alternatively, low beam) are on.
- The air condition is operated with the following settings:

Manual air condition:

- A/C switch: on
- Temperature: Temperature ½ (middle position) recorded by measurement tip according to *GNT_Overview_Test_Sequence*; if necessary readjusted until 23 °C ± 3 °C are met
- Fan speed: 1/3 ... 1/4
- Air flow: floor/windscreen

Automatic air condition:

- A/C switch: on
- Temperature: 23°C +/- 3 °C recorded by measurement tip according to *GNT_Overview_Test_Sequence*
- Fan speed: AUTO
- Air flow: AUTO
- Measurements are performed with both vehicle axles on the test bench.
- There is no special test bench mode.
- As for vehicles with several operating modes to choose from, measurements are performed in the mode automatically activated after starting. Where a pre-set mode should be maintained, we select the most ecological mode.

Test procedure for petrol/diesel/ pure electric vehicles

There is a specific chronological order in which the individual test cycles should be run for measuring petrol and diesel vehicles. The BAB motorway cycle must be run after a WLTC+, according to the *GNT_Overview_Laboratory_Test_Sequence*.

Test procedure for gaseous vehicles (CNG, LPG)

The test procedure is similar to the requirements for petrol and diesel vehicles. Regardless of the type of gas used (CNG, LPG), the vehicles are measured and evaluated only in the gas-powered mode of operation, if technologically feasible.

The Figure below shows the BAB motorway cycle. Ratings are based on the average of phase 1 and phase 2. This additional test developed by ADAC is designed to show whether the exhaust emission control system also performs well outside the legally prescribed test. The motorway cycle reflects the fact that in most European countries the motorway speed limit is 130kph. In addition, it also includes full-load acceleration.

The cycle consists of a short preconditioning phase, which will not be included in the measurement, and of two identical test phases. The two phases make it possible to rule out that a vehicle is presently in a regeneration phase (particulate filter burn-off, SCR system regeneration). If the emissions in both phases differ greatly, regeneration may have occurred and the test has to be repeated. The distance covered per phase of the BAB motorway cycle is 10km. For a warm up of the engine, the vehicle shall be driven at a speed of 100 km/h until the engine oil temperature has reached 90 °C or for a maximum of 5 minutes, whatever comes first. Therefore, a thermocouple has to be installed to the oil sump. The engine oil temperature at the start of the cycle must be at 90 °C +/- 5 °C. If the installation of a thermocouple isn't possible, it shall be ensured (e.g. by the vehicle's gauges), that the vehicle has reached its standard operation temperature.

A complete cycle shall consist of two exact same phases and a pre-con phase as shown in figure A5/1. The two same phases help to recognize regenerations and other anomalies. If such anomalies will be recognized, the test is void.

Gear shift instructions

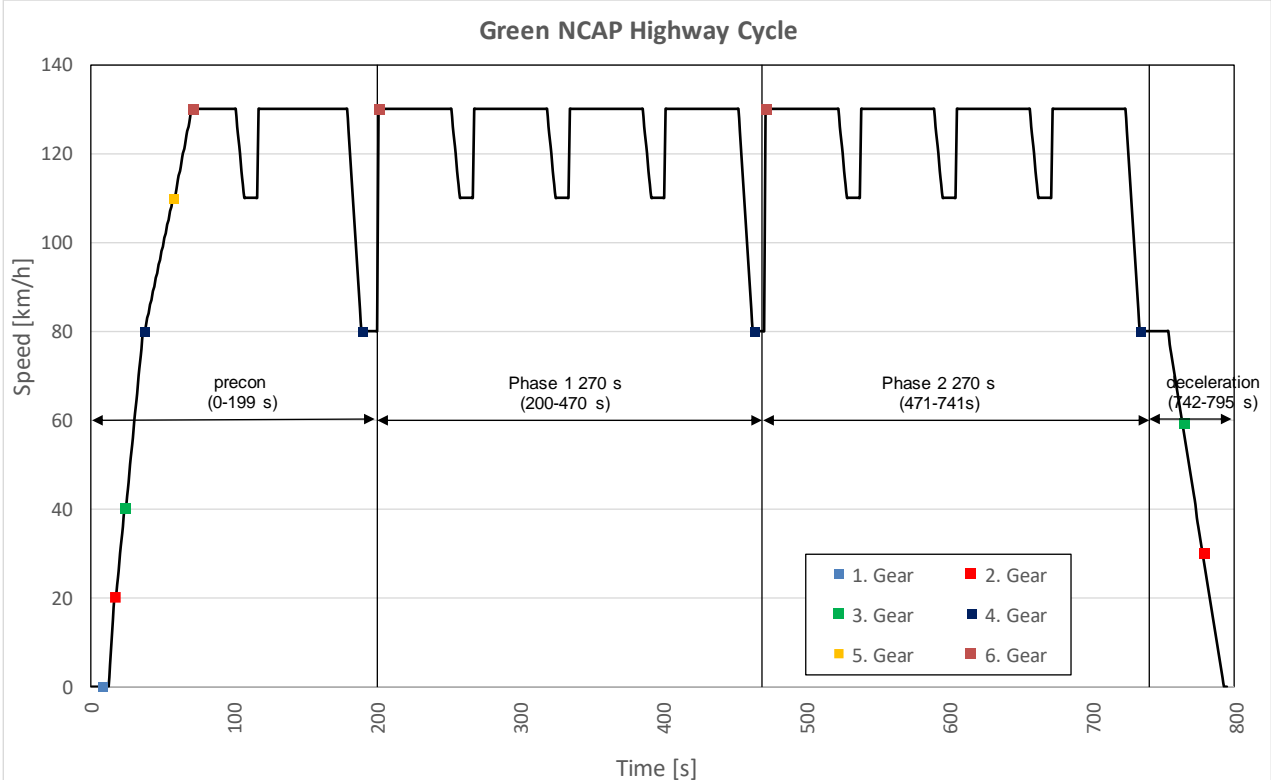
With manual gearbox, the accelerations from 110 kph up to 130 kph have to be driven in the highest gear and throttle pedal fully stepped on.

The accelerations from 80 kph up to 130 kph have to be driven in 4th gear and throttle pedal fully stepped on.

With automatic gearbox, the accelerations from 80 kph up to 130 kph as well as the accelerations from 110 kph up to 130 kph have to be driven in automatic gear and throttle pedal fully stepped on ("kick-down").

Speed trace tolerances and driving instructions shall be followed according to *GNT_WLTC+*. The maximum acceleration parts are excluded from these driving instructions.

Figure A 5/1: Green NCAP Highway Cycle



Remark: Accelerations from 110 km/h up to 130 km/h have to be driven in the highest applicable gear – not necessarily the 6th as shown in the graphics.

Table A5/1: Green NCAP Motorway Cycle

| Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h |
|-----------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 0 | 0 | 47 | 92 | 94 | 130 | 141 | 130 |
| 1 | 0 | 48 | 93 | 95 | 130 | 142 | 130 |
| 2 | 0 | 49 | 95 | 96 | 130 | 143 | 130 |
| 3 | 0 | 50 | 96 | 97 | 130 | 144 | 130 |
| 4 | 0 | 51 | 98 | 98 | 130 | 145 | 130 |
| 5 | 0 | 52 | 99 | 99 | 130 | 146 | 130 |
| 6 | 0 | 53 | 101 | 100 | 130 | 147 | 130 |
| 7 | 0 | 54 | 102 | 101 | 130 | 148 | 130 |
| 8 | 0 | 55 | 104 | 102 | 130 | 149 | 130 |
| 9 | 0 | 56 | 105 | 103 | 130 | 150 | 130 |
| 10 | 0 | 57 | 107 | 104 | 126 | 151 | 130 |

| Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h |
|-----------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 11 | 0 | 58 | 108 | 105 | 123 | 152 | 130 |
| 12 | 0 | 59 | 110 | 106 | 120 | 153 | 130 |
| 13 | 5 | 60 | 110 | 107 | 116 | 154 | 130 |
| 14 | 10 | 61 | 111 | 108 | 113 | 155 | 130 |
| 15 | 15 | 62 | 113 | 109 | 110 | 156 | 130 |
| 16 | 20 | 63 | 115 | 110 | 110 | 157 | 130 |
| 17 | 20 | 64 | 116 | 111 | 110 | 158 | 130 |
| 18 | 23 | 65 | 118 | 112 | 110 | 159 | 130 |
| 19 | 26 | 66 | 120 | 113 | 110 | 160 | 130 |
| 20 | 30 | 67 | 121 | 114 | 110 | 161 | 130 |
| 21 | 33 | 68 | 123 | 115 | 110 | 162 | 130 |
| 22 | 36 | 69 | 125 | 116 | 110 | 163 | 130 |
| 23 | 40 | 70 | 126 | 117 | 110 | 164 | 130 |
| 24 | 40 | 71 | 128 | 118 | 110 | 165 | 130 |
| 25 | 43 | 72 | 130 | 119 | 130 | 166 | 130 |
| 26 | 46 | 73 | 130 | 120 | 130 | 167 | 130 |
| 27 | 50 | 74 | 130 | 121 | 130 | 168 | 130 |
| 28 | 53 | 75 | 130 | 122 | 130 | 169 | 130 |
| 29 | 56 | 76 | 130 | 123 | 130 | 170 | 130 |
| 30 | 60 | 77 | 130 | 124 | 130 | 171 | 130 |
| 31 | 63 | 78 | 130 | 125 | 130 | 172 | 130 |
| 32 | 66 | 79 | 130 | 126 | 130 | 173 | 130 |
| 33 | 70 | 80 | 130 | 127 | 130 | 174 | 130 |
| 34 | 73 | 81 | 130 | 128 | 130 | 175 | 130 |
| 35 | 76 | 82 | 130 | 129 | 130 | 176 | 130 |
| 36 | 80 | 83 | 130 | 130 | 130 | 177 | 130 |
| 37 | 80 | 84 | 130 | 131 | 130 | 178 | 130 |
| 38 | 81 | 85 | 130 | 132 | 130 | 179 | 130 |

| Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h |
|-----------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 39 | 83 | 86 | 130 | 133 | 130 | 180 | 130 |
| 40 | 84 | 87 | 130 | 134 | 130 | 181 | 130 |
| 41 | 86 | 88 | 130 | 135 | 130 | 182 | 125 |
| 42 | 87 | 89 | 130 | 136 | 130 | 183 | 120 |
| 43 | 89 | 90 | 130 | 137 | 130 | 184 | 115 |
| 44 | 90 | 91 | 130 | 138 | 130 | 185 | 110 |
| 45 | 91 | 92 | 130 | 139 | 130 | 186 | 105 |
| 46 | 92 | 93 | 130 | 140 | 130 | 187 | 100 |
| 188 | 95 | 237 | 130 | 286 | 130 | 335 | 110 |
| 189 | 90 | 238 | 130 | 287 | 130 | 336 | 110 |
| 190 | 85 | 239 | 130 | 288 | 130 | 337 | 130 |
| 191 | 80 | 240 | 130 | 289 | 130 | 338 | 130 |
| 192 | 80 | 241 | 130 | 290 | 130 | 339 | 130 |
| 193 | 80 | 242 | 130 | 291 | 130 | 340 | 130 |
| 194 | 80 | 243 | 130 | 292 | 130 | 341 | 130 |
| 195 | 80 | 244 | 130 | 293 | 130 | 342 | 130 |
| 196 | 80 | 245 | 130 | 294 | 130 | 343 | 130 |
| 197 | 80 | 246 | 130 | 295 | 130 | 344 | 130 |
| 198 | 80 | 247 | 130 | 296 | 130 | 345 | 130 |
| 199 | 80 | 248 | 130 | 297 | 130 | 346 | 130 |
| 200 | 80 | 249 | 130 | 298 | 130 | 347 | 130 |
| 201 | 80 | 250 | 130 | 299 | 130 | 348 | 130 |
| 202 | 80 | 251 | 130 | 300 | 130 | 349 | 130 |
| 203 | 130 | 252 | 130 | 301 | 130 | 350 | 130 |
| 204 | 130 | 253 | 130 | 302 | 130 | 351 | 130 |
| 205 | 130 | 254 | 130 | 303 | 130 | 352 | 130 |
| 206 | 130 | 255 | 126 | 304 | 130 | 353 | 130 |
| 207 | 130 | 256 | 123 | 305 | 130 | 354 | 130 |

| Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h |
|-----------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 208 | 130 | 257 | 120 | 306 | 130 | 355 | 130 |
| 209 | 130 | 258 | 116 | 307 | 130 | 356 | 130 |
| 210 | 130 | 259 | 113 | 308 | 130 | 357 | 130 |
| 211 | 130 | 260 | 110 | 309 | 130 | 358 | 130 |
| 212 | 130 | 261 | 110 | 310 | 130 | 359 | 130 |
| 213 | 130 | 262 | 110 | 311 | 130 | 360 | 130 |
| 214 | 130 | 263 | 110 | 312 | 130 | 361 | 130 |
| 215 | 130 | 264 | 110 | 313 | 130 | 362 | 130 |
| 216 | 130 | 265 | 110 | 314 | 130 | 363 | 130 |
| 217 | 130 | 266 | 110 | 315 | 130 | 364 | 130 |
| 218 | 130 | 267 | 110 | 316 | 130 | 365 | 130 |
| 219 | 130 | 268 | 110 | 317 | 130 | 366 | 130 |
| 220 | 130 | 269 | 110 | 318 | 130 | 367 | 130 |
| 221 | 130 | 270 | 130 | 319 | 130 | 368 | 130 |
| 222 | 130 | 271 | 130 | 320 | 130 | 369 | 130 |
| 223 | 130 | 272 | 130 | 321 | 130 | 370 | 130 |
| 224 | 130 | 273 | 130 | 322 | 126 | 371 | 130 |
| 225 | 130 | 274 | 130 | 323 | 123 | 372 | 130 |
| 226 | 130 | 275 | 130 | 324 | 120 | 373 | 130 |
| 227 | 130 | 276 | 130 | 325 | 116 | 374 | 130 |
| 228 | 130 | 277 | 130 | 326 | 113 | 375 | 130 |
| 229 | 130 | 278 | 130 | 327 | 110 | 376 | 130 |
| 230 | 130 | 279 | 130 | 328 | 110 | 377 | 130 |
| 231 | 130 | 280 | 130 | 329 | 110 | 378 | 130 |
| 232 | 130 | 281 | 130 | 330 | 110 | 379 | 130 |
| 233 | 130 | 282 | 130 | 331 | 110 | 380 | 130 |
| 234 | 130 | 283 | 130 | 332 | 110 | 381 | 130 |
| 235 | 130 | 284 | 130 | 333 | 110 | 382 | 130 |

| Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h |
|-----------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 236 | 130 | 285 | 130 | 334 | 110 | 383 | 130 |
| 384 | 130 | 433 | 130 | 482 | 130 | 531 | 110 |
| 385 | 130 | 434 | 130 | 483 | 130 | 532 | 110 |
| 386 | 130 | 435 | 130 | 484 | 130 | 533 | 110 |
| 387 | 130 | 436 | 130 | 485 | 130 | 534 | 110 |
| 388 | 130 | 437 | 130 | 486 | 130 | 535 | 110 |
| 389 | 126 | 438 | 130 | 487 | 130 | 536 | 110 |
| 390 | 123 | 439 | 130 | 488 | 130 | 537 | 110 |
| 391 | 120 | 440 | 130 | 489 | 130 | 538 | 110 |
| 392 | 116 | 441 | 130 | 490 | 130 | 539 | 110 |
| 393 | 113 | 442 | 130 | 491 | 130 | 540 | 110 |
| 394 | 110 | 443 | 130 | 492 | 130 | 541 | 130 |
| 395 | 110 | 444 | 130 | 493 | 130 | 542 | 130 |
| 396 | 110 | 445 | 130 | 494 | 130 | 543 | 130 |
| 397 | 110 | 446 | 130 | 495 | 130 | 544 | 130 |
| 398 | 110 | 447 | 130 | 496 | 130 | 545 | 130 |
| 399 | 110 | 448 | 130 | 497 | 130 | 546 | 130 |
| 400 | 110 | 449 | 130 | 498 | 130 | 547 | 130 |
| 401 | 110 | 450 | 130 | 499 | 130 | 548 | 130 |
| 402 | 110 | 451 | 130 | 500 | 130 | 549 | 130 |
| 403 | 110 | 452 | 130 | 501 | 130 | 550 | 130 |
| 404 | 130 | 453 | 130 | 502 | 130 | 551 | 130 |
| 405 | 130 | 454 | 130 | 503 | 130 | 552 | 130 |
| 406 | 130 | 455 | 130 | 504 | 130 | 553 | 130 |
| 407 | 130 | 456 | 125 | 505 | 130 | 554 | 130 |
| 408 | 130 | 457 | 120 | 506 | 130 | 555 | 130 |
| 409 | 130 | 458 | 115 | 507 | 130 | 556 | 130 |
| 410 | 130 | 459 | 110 | 508 | 130 | 557 | 130 |

| Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h |
|-----------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 411 | 130 | 460 | 105 | 509 | 130 | 558 | 130 |
| 412 | 130 | 461 | 100 | 510 | 130 | 559 | 130 |
| 413 | 130 | 462 | 95 | 511 | 130 | 560 | 130 |
| 414 | 130 | 463 | 90 | 512 | 130 | 561 | 130 |
| 415 | 130 | 464 | 85 | 513 | 130 | 562 | 130 |
| 416 | 130 | 465 | 80 | 514 | 130 | 563 | 130 |
| 417 | 130 | 466 | 80 | 515 | 130 | 564 | 130 |
| 418 | 130 | 467 | 80 | 516 | 130 | 565 | 130 |
| 419 | 130 | 468 | 80 | 517 | 130 | 566 | 130 |
| 420 | 130 | 469 | 80 | 518 | 130 | 567 | 130 |
| 421 | 130 | 470 | 80 | 519 | 130 | 568 | 130 |
| 422 | 130 | 471 | 80 | 520 | 130 | 569 | 130 |
| 423 | 130 | 472 | 80 | 521 | 130 | 570 | 130 |
| 424 | 130 | 473 | 80 | 522 | 130 | 571 | 130 |
| 425 | 130 | 474 | 130 | 523 | 130 | 572 | 130 |
| 426 | 130 | 475 | 130 | 524 | 130 | 573 | 130 |
| 427 | 130 | 476 | 130 | 525 | 130 | 574 | 130 |
| 428 | 130 | 477 | 130 | 526 | 126 | 575 | 130 |
| 429 | 130 | 478 | 130 | 527 | 123 | 576 | 130 |
| 430 | 130 | 479 | 130 | 528 | 120 | 577 | 130 |
| 431 | 130 | 480 | 130 | 529 | 116 | 578 | 130 |
| 432 | 130 | 481 | 130 | 530 | 113 | 579 | 130 |
| 580 | 130 | | | | | | |
| 581 | 130 | | | | | | |
| 582 | 130 | | | | | | |
| 583 | 130 | | | | | | |
| 584 | 130 | | | | | | |
| 585 | 130 | | | | | | |

| Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h |
|-----------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 586 | 130 | | | | | | |
| 587 | 130 | | | | | | |
| 588 | 130 | | | | | | |
| 589 | 130 | | | | | | |

| Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h |
|-----------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 590 | 130 | 637 | 130 | 684 | 130 | 731 | 105 |
| 591 | 130 | 638 | 130 | 685 | 130 | 732 | 100 |
| 592 | 130 | 639 | 130 | 686 | 130 | 733 | 95 |
| 593 | 126 | 640 | 130 | 687 | 130 | 734 | 90 |
| 594 | 123 | 641 | 130 | 688 | 130 | 735 | 85 |
| 595 | 120 | 642 | 130 | 689 | 130 | 736 | 80 |
| 596 | 116 | 643 | 130 | 690 | 130 | 737 | 80 |
| 597 | 113 | 644 | 130 | 691 | 130 | 738 | 80 |
| 598 | 110 | 645 | 130 | 692 | 130 | 739 | 80 |
| 599 | 110 | 646 | 130 | 693 | 130 | 740 | 80 |
| 600 | 110 | 647 | 130 | 694 | 130 | 741 | 80 |
| 601 | 110 | 648 | 130 | 695 | 130 | 742 | 80 |
| 602 | 110 | 649 | 130 | 696 | 130 | 743 | 80 |
| 603 | 110 | 650 | 130 | 697 | 130 | 744 | 80 |
| 604 | 110 | 651 | 130 | 698 | 130 | 745 | 80 |
| 605 | 110 | 652 | 130 | 699 | 130 | 746 | 80 |
| 606 | 110 | 653 | 130 | 700 | 130 | 747 | 80 |
| 607 | 110 | 654 | 130 | 701 | 130 | 748 | 80 |
| 608 | 130 | 655 | 130 | 702 | 130 | 749 | 80 |
| 609 | 130 | 656 | 130 | 703 | 130 | 750 | 80 |
| 610 | 130 | 657 | 130 | 704 | 130 | 751 | 80 |
| 611 | 130 | 658 | 130 | 705 | 130 | 752 | 80 |
| 612 | 130 | 659 | 130 | 706 | 130 | 753 | 80 |
| 613 | 130 | 660 | 126 | 707 | 130 | 754 | 80 |
| 614 | 130 | 661 | 123 | 708 | 130 | 755 | 80 |

| Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h |
|-----------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 615 | 130 | 662 | 120 | 709 | 130 | 756 | 80 |
| 616 | 130 | 663 | 116 | 710 | 130 | 757 | 77 |
| 617 | 130 | 664 | 113 | 711 | 130 | 758 | 75 |
| 618 | 130 | 665 | 110 | 712 | 130 | 759 | 73 |
| 619 | 130 | 666 | 110 | 713 | 130 | 760 | 71 |
| 620 | 130 | 667 | 110 | 714 | 130 | 761 | 69 |
| 621 | 130 | 668 | 110 | 715 | 130 | 762 | 67 |
| 622 | 130 | 669 | 110 | 716 | 130 | 763 | 65 |
| 623 | 130 | 670 | 110 | 717 | 130 | 764 | 63 |
| 624 | 130 | 671 | 110 | 718 | 130 | 765 | 61 |
| 625 | 130 | 672 | 110 | 719 | 130 | 766 | 59 |
| 626 | 130 | 673 | 110 | 720 | 130 | 767 | 57 |
| 627 | 130 | 674 | 110 | 721 | 130 | 768 | 55 |
| 628 | 130 | 675 | 130 | 722 | 130 | 769 | 53 |
| 629 | 130 | 676 | 130 | 723 | 130 | 770 | 51 |
| 630 | 130 | 677 | 130 | 724 | 130 | 771 | 49 |
| 631 | 130 | 678 | 130 | 725 | 130 | 772 | 47 |
| 632 | 130 | 679 | 130 | 726 | 130 | 773 | 45 |
| 633 | 130 | 680 | 130 | 727 | 125 | 774 | 43 |
| 634 | 130 | 681 | 130 | 728 | 120 | 775 | 41 |
| 635 | 130 | 682 | 130 | 729 | 115 | 776 | 38 |
| 636 | 130 | 683 | 130 | 730 | 110 | 777 | 36 |
| 778 | 34 | | | | | | |
| 779 | 32 | | | | | | |
| 780 | 30 | | | | | | |
| 781 | 28 | | | | | | |
| 782 | 26 | | | | | | |
| 783 | 24 | | | | | | |
| 784 | 22 | | | | | | |
| 785 | 20 | | | | | | |
| 786 | 18 | | | | | | |
| 787 | 16 | | | | | | |

| Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h | Time in s | Speed in km/h |
|-----------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| 788 | 14 | | | | | | |
| 789 | 12 | | | | | | |
| 790 | 10 | | | | | | |
| 791 | 8 | | | | | | |
| 792 | 6 | | | | | | |
| 793 | 4 | | | | | | |
| 794 | 2 | | | | | | |
| 795 | 0 | | | | | | |
| 796 | 0 | | | | | | |
| 797 | 0 | | | | | | |