# Presentation from EN 15265-2007 with VIP-Energy version 3

Standard EN15265-2007 contains a validation program with comparisons towards standardized results. The standard is used as a quality control for dynamic simulation programs in Europe. Programs consistent with test cases are classified according to the percentage deviation from the standard results.

The standard contains no background information to the standardized and nor is there diagnostic test cases or detail data that can explain the deviations, which restricted the use of the standard. Several important inputs as ground reflection, atmospheric pressure etc are not defined which gives an uncertainty. The standard does not provide any guidance in the development of calculation software and the ability to analyze the causes of abnormalities are limited. The overall standard EN13790 treats mainly static calculation methods. For dynamic computational program EN13790 refers to EN15265.

# Input data

## Climate

Values for direct solar radiation are given as intensity perpendicular to the direction of radiation, so-called normal radiation. For diffuse radiation is given values for horizontal global radiation. The input format for the VIP-Energy contains a value for total horizontal global radiation and direct radiation has, therefore, been restated to horizontal radiation to be used in vipclimate format.

The standard also provides data for global radiation towards west facade that can be used as a reference. By making comparisons between diffuse horizontal global radiation and global radiation towards the exterior, we have estimated that ground reflection 20% has been used for reference results. The standard has no indication of air pressure. We've set it to 950 hPa on the basis of data on air density in EN15265.

## Test building

Some of the test building's walls are in standard defined as adiabatic which means that there is no energy exchange to the surroundings from the wall outside. VIP-Energy does not contain input data for adiabatic construction parts, and that issue has been solved by supplementing walls with an additional external layer with extreme high heat resistance.

The standard specifies the fixed values on convective heat transfer rates which vary with the surface orientation. VIP-Energy has not input data for individual transfer rates for individual surfaces. As input is the mean of these heat transfer numbers used.
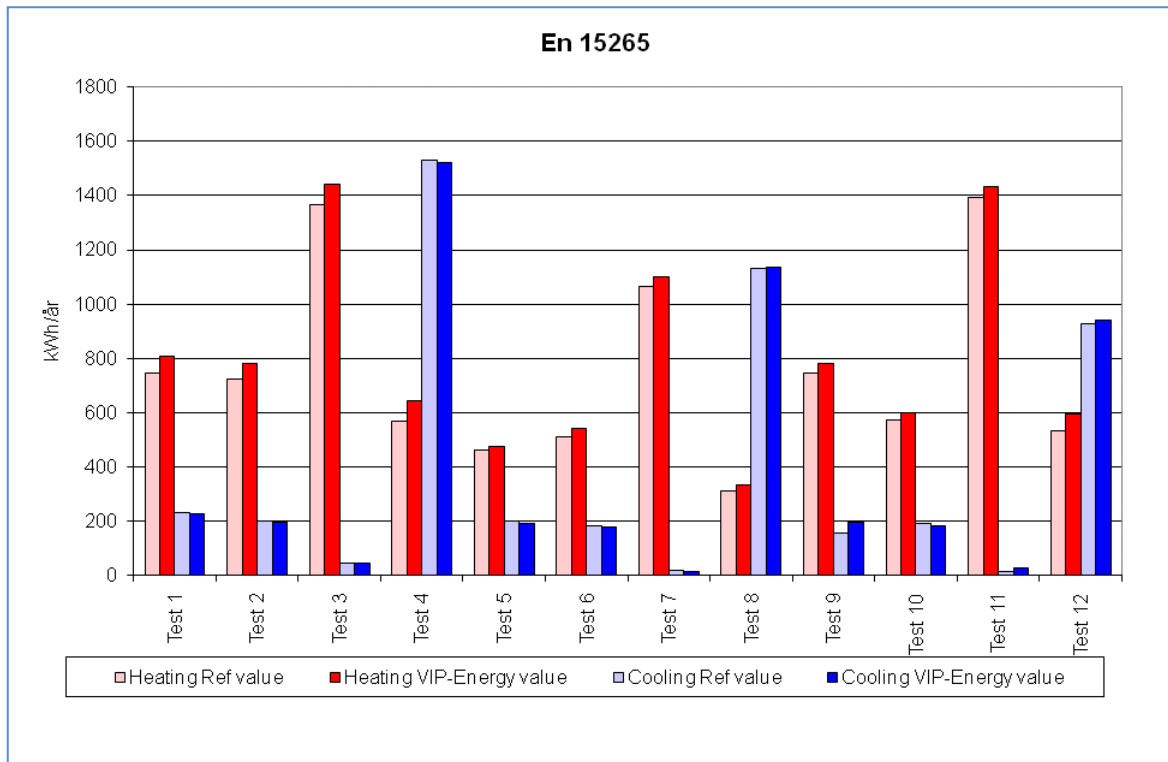
# Result

## Classification

The table shows results for the twelve test cases. Energy consumption is presented as kWh/year. Deviation for heating and cooling shall be calculated as the percentage difference in relation to total consumption for heating and cooling.

Heavy/Light relates to the building's internal heat capacity. In tests with solar protection windows g-value is 20% and for other 77%. In cases with internal heat load adds 20 W/m². Intermittent heating and cooling take place Monday to Friday from 8-18. In test case 9-12 roof is oriented towards outdoor environment and in other cases construction elements are defined as adiabatic.

| Test case | Heating | | | Cooling | | | Heavy /Light | Solar protection | Internal gain | Intermittent heating & cooling | Roof | Reference value Heating + Cooling | Classification Level |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Reference value | VIP-Energy value | Difference | Reference value | VIP-Energy value | Difference | | | | | | | |
| 1 | 748 | 807 | 6% | 233,8 | 228 | -1% | L | x | x | | | 981,8 | 1) |
| 2 | 722,7 | 782 | 6% | 200,5 | 196 | 0% | H | x | x | | | 923,2 | 1) |
| 3 | 1368,5 | 1440 | 5% | 47 | 47 | 0% | L | x | | | | 1415,5 | 1) |
| 4 | 567,4 | 643 | 4% | 1530,9 | 1522 | 0% | L | | x | | | 2098,3 | 1) |
| 5 | 463,1 | 474 | 2% | 201,7 | 194 | -1% | L | x | x | x | | 664,8 | A |
| 6 | 509,8 | 541 | 4% | 185,1 | 179 | -1% | H | x | x | x | | 694,9 | A |
| 7 | 1067,4 | 1099 | 3% | 19,5 | 17 | 0% | L | x | | x | | 1086,9 | A |
| 8 | 313,2 | 336 | 2% | 1133,2 | 1134 | 0% | L | | x | x | | 1446,4 | A |
| 9 | 747,1 | 782 | 4% | 158,3 | 199 | 4% | L | x | x | x | x | 905,4 | A |
| 10 | 574,2 | 598 | 3% | 192,4 | 182 | -1% | H | x | x | x | x | 766,6 | A |
| 11 | 1395,1 | 1435 | 3% | 14,1 | 27 | 1% | L | x | | x | x | 1409,2 | A |
| 12 | 533,5 | 594 | 4% | 928,3 | 940 | 1% | L | | x | x | x | 1461,8 | A |

1) Test cases 1-4 are informative diagnostic cases and are not included in the classification

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The chart is clarifying discrepancies in the results. VIP-Energy produces systematically 23-76 kWh higher heat consumption compared to standard output. A similar bias doesn't exist for cooling. If lowest permissible temperature for heating is reduced from 20 to 19.5 °C the systematic difference is smoothed. It could be conceivable then temperature limits has been given without decimals.

## Calculated monthly values

The table shows monthly values for heating.

| Month | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 | Test11 | Test12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Heating Monthly Results | | | | | | | |
| 1 | 184 | 184 | 275 | 187 | 130 | 158 | 221 | 119 | 208 | 155 | 302 | 198 |
| 2 | 125 | 124 | 201 | 91 | 75 | 87 | 154 | 41 | 125 | 95 | 206 | 87 |
| 3 | 74 | 69 | 145 | 20 | 36 | 39 | 109 | 4 | 62 | 50 | 141 | 13 |
| 4 | 54 | 49 | 124 | 6 | 26 | 27 | 98 | 1 | 44 | 37 | 121 | 2 |
| 5 | 7 | 4 | 42 | 0 | 1 | 1 | 33 | 0 | 3 | 3 | 34 | 0 |
| 6 | 0 | 0 | 10 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 3 | 0 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 1 | 0 | 9 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 3 | 0 |
| 9 | 2 | 0 | 31 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 22 | 0 |
| 10 | 52 | 46 | 127 | 24 | 18 | 18 | 97 | 4 | 38 | 28 | 126 | 11 |
| 11 | 139 | 138 | 223 | 138 | 85 | 96 | 170 | 74 | 139 | 106 | 228 | 127 |
| 12 | 169 | 169 | 252 | 176 | 101 | 115 | 185 | 93 | 162 | 124 | 248 | 155 |

The table shows monthly values for cooling

| Month | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 | Test11 | Test12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Cooling Monthly Results | | | | | | | |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| 3 | 2 | 0 | 0 | 100 | 1 | 0 | 0 | 68 | 0 | 1 | 0 | 32 |
| 4 | 0 | 0 | 0 | 77 | 0 | 0 | 0 | 51 | 0 | 0 | 0 | 16 |
| 5 | 15 | 7 | 1 | 203 | 11 | 6 | 0 | 148 | 7 | 9 | 0 | 116 |
| 6 | 49 | 41 | 7 | 303 | 41 | 36 | 1 | 223 | 41 | 3 | 2 | 204 |
| 7 | 96 | 91 | 30 | 407 | 80 | 81 | 11 | 304 | 95 | 38 | 21 | 299 |
| 8 | 54 | 47 | 8 | 260 | 49 | 45 | 4 | 210 | 48 | 79 | 4 | 191 |
| 9 | 13 | 10 | 1 | 130 | 12 | 9 | 0 | 101 | 9 | 46 | 0 | 78 |
| 10 | 0 | 0 | 0 | 28 | 0 | 0 | 0 | 22 | 0 | 10 | 0 | 4 |
| 11 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 1 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |