DIN V 18599-8:2007-02 (E)

Energy efficiency of buildings - Calculation of the net, final and primary energy demand for heating, cooling, ventilation, domestic hot water and lighting - Part 8: Net and final energy demand of domestic hot water systems

Contents

Page

Foreword 5

Introduction 7

1 Scope 8

2 Normative references 9

3 Terms and definitions, symbols and units 11
3.1 Terms and definitions 11
3.2 Symbols, units and subscripts 14

4 Relationship between the parts of the DIN V 18599 series of prestandards 17
4.1 Input parameters from other parts of the DIN V 18599 series of prestandards 18
4.2 Output parameters for other parts of the DIN V 18599 series of prestandards 19
4.2.1 Generator heat 20
4.2.2 Delivered energy 21
4.2.3 Auxiliary energy 21
4.2.4 Uncontrolled heat gains 22
4.3 Calculation procedure 22
4.3.1 Calculation procedure for systems to meet the heating need for domestic hot water $Q_{w,b}$ 22

5 Principles and boundary conditions 23

6 Determination of characteristic values 25
6.1 Control and emission $Q_{w,ce}$ 25
6.2 Distribution $Q_{w,d}$ 25
6.2.1 Central domestic hot water supply in buildings 25
6.2.1.1 Thermal losses 25
6.2.1.2 Auxiliary energy for circulation of the heated domestic water 28
6.2.2 Decentralized and central domestic water heating in individual dwellings 31
6.3 Storage $Q_{w,s}$ 32
6.3.1 Indirectly heated domestic hot water storage tanks 32
6.3.1.1 Thermal loss 32
6.3.1.2 Auxiliary energy for charging an indirectly heated domestic hot water storage tank 35
6.3.2 Electrically-heated domestic storage water heaters 36
6.3.3 Gas-fired domestic storage water heaters 38
6.4 Heat generation 40
6.4.1 Solar systems for domestic water heating 41
6.4.2 Heat pumps with hot water preparation 47
6.4.2.1 Energy requirement for domestic hot water 48
6.4.2.2 Power and coefficient of performance (COP) of the heat pump in domestic hot water operation 52
6.4.2.3 Running time of the heat pump 54
6.4.2.4 Generator thermal losses 55
6.4.2.5 Calculation of the total energy consumption for domestic hot water operation 57
6.4.2.6 Auxiliary energy 58
6.4.2.7 Energy consumption of the back-up system 59
6.4.2.8 Total energy consumption 60
6.4.2.9 Contribution of ambient heat 60
6.4.2.10 Seasonal performance factor for the generator subsystem 60
6.4.3 Electric instantaneous heaters 61
6.4.4 Multiple boiler systems 61
6.4.5 Determination of the expenditure for heat generation for domestic hot water 61
6.4.5.1 Fuel-fired systems (boilers) 61
6.4.5.2 Auxiliary energy for operation of a heat generator 63
6.4.6 Direct-fired storage water heaters (gas) 69

6.4.7 District heating **69**
6.4.8 Combined heat and power **70**

Annex A (normative) **Energy use to meet the heating need** **71**
A.1 General information **71**
A.1.1 Principles of the calculation method **71**
A.2 Electrically driven heat pumps **71**
A.3 Heat pumps with combustion drive **72**

Annex B (normative) **Heat pumps** **73**
B.1 Coefficient of performance ($COP_{w,t}$) of domestic hot water heat pumps **73**
B.2 Electrical input energy to compensate for storage losses P_{es} **73**
B.3 Extract air domestic hot water heat pumps and extract air/supply air domestic hot water heat pumps **73**
B.4 Basement air domestic hot water heat pumps **74**

Annex C (normative) **Calculation procedures for systems to meet the heating need for domestic hot water $Q_{w,b}$** **75**
C.1 General information **75**
C.2 Calculation examples **75**

Annex D (informative) **Dimensioning of buildings** **78**
D.1 General information **78**

Bibliography **81**

Figures

Figure 1 — Overview of the parts of DIN V 18599 7
Figure 2 — Content and scope of DIN V 18599-8 (schematic diagram) 9
Figure 3 — Subscript system 17
Figure 4 — Example of a domestic hot water heating system 23
Figure 5 — Designation of pipes in domestic hot water pipe systems 27
Figure A.1 — Energy balance of an electrically driven heat pump with integrated domestic hot water storage tank 71
Figure C.1 — Example of the partitioning of a building into a number of areas (domestic water heating) 76
Figure C.2 — Example of the partitioning of a building into a number of domestic hot water supply lines (decentralized supply) 77
Figure D.1 — Building geometry 78

Tables

Table 1 — Symbols and units 14
Table 2 — Subscripts 16
Table 3 — Input parameters 18
Table 4 — Output parameters 20
Table 5 — General boundary conditions 24
Table 6 — General boundary conditions 27
Table 7 — Heat transfer coefficients U_i in W/(m · K) 28
Table 8 — Constants C_{p1}, C_{p2} for calculation of the expenditure factor of circulation pumps 31

Table 9 — General boundary conditions 32
Table 10 — Distribution of annual solar contribution over months 43
Table 11 — Correction factor for inclination and alignment 44
Table 12 — Default values 46
Table 13 — Monthly hours sum $n_{hours,i}$, in the individual bins, distributed according to the testing points from DIN EN 14511 (all parts) 49
Table 14 — Mean source temperature for ground and groundwater as a funciton of the average outdoor temperature 52
Table 15 — Mean source temperature for ground and groundwater as a function of the average monthly outdoor temperature 53
Table 16 — Source temperatures for extract air systems 53
Table 17 — Efficiency factors 65
Table 18 — Radiation loss factors 66
Table 19 — Stand-by heat factors 67
Table 20 — Auxiliary energy factors 68
Table 21 — D_{DS} as a function of primary temperature and the type of dwelling substation 70
Table 22 — Coefficient B_{DS} as a function of the class of insulation and the type of dwelling substation 70
Table B.1 — Default value for the coefficient of performance $(COP_{w,t})$ of domestic hot water heat pumps 73
Table B.2 — Default value for the electrical input energy to compensate for storage tank losses 73