

# DIN EN ISO 52016-1:2018-04 (E)

## Energy performance of buildings - Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads - Part 1: Calculation procedures (ISO 52016-1:2017)

---

<b>Contents</b>		Page
European foreword.....		4
Foreword.....		6
Introduction.....		7
<b>1</b>	<b>Scope</b> .....	<b>10</b>
<b>2</b>	<b>Normative references</b> .....	<b>10</b>
<b>3</b>	<b>Terms and definitions</b> .....	<b>11</b>
3.1	Building.....	11
3.2	Indoor and outdoor conditions.....	15
3.3	Technical building systems.....	17
3.4	Energy.....	18
3.5	Energy performance.....	20
3.6	Energy calculation.....	21
<b>4</b>	<b>Symbols, subscripts and abbreviations</b> .....	<b>23</b>
4.1	Symbols.....	23
4.2	Subscripts.....	24
4.3	Abbreviations.....	26
<b>5</b>	<b>Description of the methods</b> .....	<b>26</b>
5.1	Output of the method.....	26
5.2	General description of the method.....	26
5.2.1	Hourly calculation procedures.....	26
5.2.2	Monthly calculation procedures.....	27
5.2.3	Input data and assumptions for hourly and monthly method.....	27
5.2.4	Choices between methods.....	28
<b>6</b>	<b>Calculation method</b> .....	<b>28</b>
6.1	Output data.....	28
6.1.1	General data on the assessed object and application.....	28
6.1.2	Calculated data.....	29
6.2	Calculation time intervals and calculation period.....	34
6.3	Input data.....	34
6.3.1	Source of data; general.....	34
6.3.2	General data on the assessed object and application.....	34
6.3.3	Geometrical characteristics.....	35
6.3.4	Thermophysical parameters of the building and building elements.....	35
6.3.5	Operating and boundary conditions.....	41
6.3.6	Constants and physical data.....	49
6.3.7	Input data from <a href="#">Annex A</a> ( <a href="#">Annex B</a> ).....	50
6.4	Zoning of the assessed object.....	50
6.4.1	General.....	50
6.4.2	Thermal zoning procedures.....	50
6.4.3	Size of the thermal zones and thermal envelope.....	55
6.4.4	Heat exchange between thermal zones and service areas.....	55
6.4.5	Adjacent thermally unconditioned zones.....	55
6.4.6	Residential buildings or building units, adjustment for spatial average temperature.....	59
6.4.7	Thermally coupled or uncoupled zones.....	60
6.5	Hourly calculation procedures.....	60
6.5.1	Principle.....	60
6.5.2	Applicable time interval and calculation period.....	61
6.5.3	Assumptions and specific conditions.....	61
6.5.4	Calculation procedure.....	63
6.5.5	Calculation of (sensible) heating and cooling loads and temperatures.....	69
6.5.6	Overall energy balance of a thermal zone.....	75

6.5.7	Type of construction dependent properties of the nodes.....	80
6.5.8	Thermal transmission properties.....	85
6.5.9	Temperature of adjacent thermally unconditioned zone.....	87
6.5.10	Ventilation heat transfer coefficient, supply temperature and moisture content.....	89
6.5.11	Thermal capacity of the internal environment of the thermal zone.....	90
6.5.12	Internal heat gains.....	90
6.5.13	Solar gains.....	92
6.5.14	Moisture content and latent heat load.....	93
6.5.15	Calculation of key monthly data from hourly output.....	98
6.6	Monthly calculation procedures.....	101
6.6.1	Principle.....	101
6.6.2	Applicable time interval and calculation period.....	101
6.6.3	Assumptions.....	102
6.6.4	Energy need for space heating and cooling.....	102
6.6.5	Heat transfer by transmission.....	106
6.6.6	Heat transfer by ventilation.....	106
6.6.7	Internal heat gains.....	111
6.6.8	Solar heat gains.....	113
6.6.9	Internal effective heat capacity of a zone.....	116
6.6.10	Utilization factors.....	117
6.6.11	Calculation temperature and intermittency modes.....	119
6.6.12	Overheating indicator.....	125
6.6.13	Length of the heating and cooling season for operation of season-length-dependent provisions.....	126
6.6.14	Humidification and dehumidification.....	127
<b>7</b>	<b>Quality control.....</b>	<b>128</b>
7.1	Calculation report.....	128
7.1.1	General.....	128
7.1.2	Energy need calculation.....	128
7.1.3	Internal temperature calculation.....	130
7.1.4	Design heating and cooling load calculation.....	130
7.2	Hourly method: verification cases.....	131
7.2.1	Scope and limitations.....	131
7.2.2	Verification procedure for the whole calculation method.....	131
7.2.3	Description of the verification test cases.....	139
7.2.4	Results of the verification test cases.....	139
7.3	Hourly method: validation in case of specific alternative calculation procedures.....	143
<b>8</b>	<b>Compliance check.....</b>	<b>143</b>
	<b>Annex A (normative) Input and method selection data sheet — Template.....</b>	<b>144</b>
	<b>Annex B (informative) Input and method selection data sheet — Default choices.....</b>	<b>160</b>
	<b>Annex C (normative) Regional references in line with ISO Global Relevance Policy.....</b>	<b>181</b>
	<b>Annex D (normative) Multi-zone calculation with thermal coupling between zones.....</b>	<b>182</b>
	<b>Annex E (normative) Heat transfer and solar heat gains of windows and special elements.....</b>	<b>185</b>
	<b>Annex F (normative) Calculation of solar shading reduction factors.....</b>	<b>192</b>
	<b>Annex G (normative) Dynamic transparent building elements.....</b>	<b>207</b>
	<b>Bibliography.....</b>	<b>213</b>