

# ISO 21978:2023-12 (E)

## Air to water heat pumps - Testing and rating at part load conditions and calculation of seasonal coefficient of performance for space heating

### Contents

	Page
<b>Foreword</b>	<b>v</b>
<b>Introduction</b>	<b>vi</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>1</b>
<b>4 Symbols</b>	<b>8</b>
<b>5 Installation requirements</b>	<b>9</b>
5.1 Test apparatus and uncertainties of measurement	9
5.2 Test room for the airside	10
5.3 Installation and connection of the heat pump	10
5.4 Installation of heat pumps consisting of several parts	11
5.5 Environment conditions for indoor unit installation and electrical power supply requirements	11
<b>6 Setting and part load test conditions</b>	<b>11</b>
6.1 General	11
6.2 Setting for capacity ratio	11
6.3 Setting the external static pressure difference for ducted units	11
6.4 Setting of units with integral pumps	12
6.5 Part load test conditions	12
<b>7 Space heating test</b>	<b>15</b>
7.1 Heating capacity test	15
7.2 Heating capacity correction	16
7.2.1 General	16
7.2.2 Capacity correction due to indoor liquid pump	16
7.2.3 Effective power input	17
7.3 Test procedure	19
7.3.1 General	19
7.3.2 Permissible deviations	19
7.3.3 Preconditioning period	20
7.3.4 Equilibrium period	21
7.3.5 Data collection period	21
7.4 Heating capacity calculation	21
7.4.1 Steady state capacity test	21
7.4.2 Transient capacity test	21
7.5 Effective power input calculation	21
7.5.1 Steady state test	21
7.5.2 Transient capacity test	21
7.6 Determination of degradation coefficient $C_d$	21
7.7 Test methods for electric power input during thermostat-off mode, standby mode, crankcase heater mode and off mode	22
7.7.1 Uncertainties of measurement	22
7.7.2 Measurement of electric power input during thermostat-off mode	22
7.7.3 Measurement of electric power input during standby mode	23
7.7.4 Measurement of electric power input during crankcase heater mode	23
7.7.5 Measurement of electric power input during off mode	23

<b>8</b>	<b>Calculation methods for seasonal coefficient of performance (<math>S_{\text{COP}}</math>)</b>	<b>23</b>
8.1	General formula for calculation of $S_{\text{COP}}$ .....	23
8.2	Calculation of the reference annual heating demand, $Q_H$ .....	24
8.3	Calculation of the annual energy consumption, $Q_{\text{HE}}$ .....	24
8.4	Calculation of $S_{\text{COP},\text{on}}$ and $S_{\text{COP},\text{net}}$ .....	24
8.5	Calculation procedure for determination of $C_{\text{Pb}}$ values at part load conditions A to G.....	26
8.5.1	General .....	26
8.5.2	Calculation procedure for fixed capacity units.....	26
8.5.3	Calculation procedure for staged and variable capacity units .....	26
<b>9</b>	<b>Test results and test report</b> .....	<b>27</b>
9.1	Data.....	27
9.2	Test report.....	28
<b>10</b>	<b>Marking provisions</b> .....	<b>29</b>
10.1	General.....	29
10.2	Nameplate requirements.....	29
10.3	Nameplate information.....	29
<b>Annex A (normative) Heating capacity test procedures given in 7.3</b> .....		<b>30</b>
<b>Annex B (normative) Determination of the liquid pump efficiency</b> .....		<b>36</b>
<b>Annex C (informative) Examples of set of bin hours and hours for active mode, thermostat-off mode, standby mode, off mode and crankcase heater mode</b> .....		<b>40</b>
<b>Annex D (informative) <math>S_{\text{COP},\text{on}}</math> and <math>S_{\text{COP},\text{net}}</math> calculation for fixed capacity for 35 °C temperature application — Example</b> .....		<b>42</b>
<b>Annex E (informative) <math>S_{\text{COP},\text{on}}</math> and <math>S_{\text{COP},\text{net}}</math> calculation for variable capacity unit for 35 °C temperature application — Example</b> .....		<b>46</b>
<b>Bibliography</b> .....		<b>50</b>