

# Product Data

## Thermal Comfort Data Logger — Type 1221

Including Application Software Type 7301

### USES:

- For measuring all physical parameters necessary to evaluate heat stress and thermal comfort
- For evaluating heating and ventilation system performance
- For calculating comfort indices PMV, PPD and DR
- For calculating heat stress indices WBGT and required sweat rate
- For calculating ET\*
- For displaying measurement data and calculated indices as graphs in exportable formats
- For long-duration (weeks) monitoring of the time history of thermal parameters
- For logging data from third party transducers with analog outputs
- As front end for a central data logger system

### FEATURES:

- Complies with: ISO 7730/CEN 27730; ISO 7726; ISO 7243/CEN 27243; ASHRAE 55; SAE J2234
- Modular system incorporating four slots for simultaneous connection of up to 12 transducers
- Four modules available: Comfort Module UA 1276, Heat Stress Module UA 1277, Dry Heat Loss Module UA 1278 and Analog Interface Module UA 1346
- Operates as both a stand-alone and an on-line instrument
- Data can be read and displayed on-line, from a memory dump after off-line measurement, or from a disk file
- Data is stored in spreadsheet format and can be re-used to calculate other indices
- Applications software runs under Windows™ and supports Clipboard function for graphs
- Input for up to 6 analog signals (V or mA)
- Analog output of six measured values (V)

The Thermal Comfort Data Logger Type 1221 enables you to evaluate the thermal comfort of indoor climates as well as workplace-related heat stress.

The data logger is a black box thermal platform built up modularly with up to four input modules.

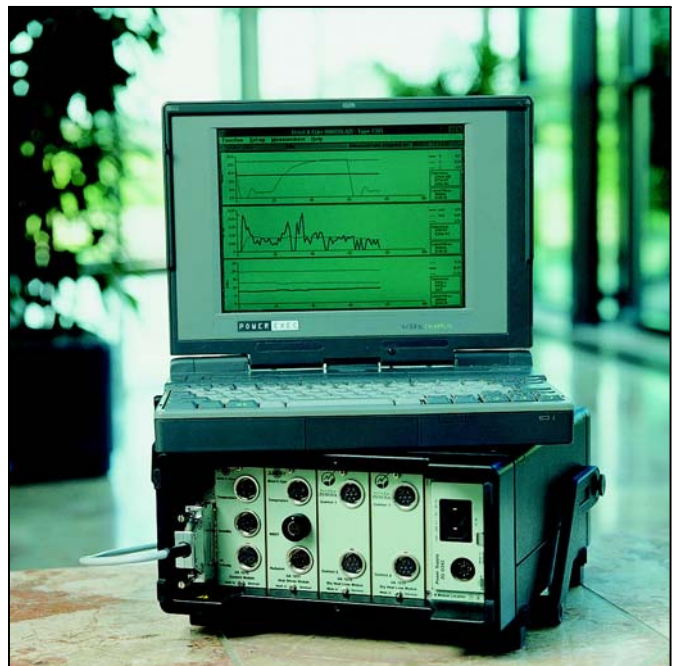
The Type 1221 can be used in the field to collect data without any additional software or hardware, or it can be used in connection with a PC and Type 7301 software to view data on-line.

The Type 1221 is supplied with a battery pack for use in the field. A mains transformer is also available.

Applications Software Type 7301 is a software package for use exclusively with Thermal Comfort Data Logger Type 1221. Type 7301 software runs under Windows™ 3.1.

The software retrieves data from the 1221 via the RS-232 interface on the host computer. The measured data is shown on the computer screen along with calculations of a number of indices. The Type 1221 is set up via the 7301 software.

Measured data and results are stored to disk in spreadsheet format.



## Introduction

The Type 1221 enables you to measure all the physical parameters necessary to evaluate thermal comfort according to ISO 7730 and ISO 7726, as well as evaluate heat stress according to ISO 7243 and ISO 7933.

The Type 1221 is built up modularly, allowing installation of up to four input modules. The types of transducers that can be connected depend on the input module; these are described later on in this literature.

The Type 1221 can operate as a stand-alone data logger or on-line together with a PC, where data can be displayed and processed. The Type 1221 also supplies the necessary power to the transducers connected to the modules and controls the measurement.

## Power Supply

The Type 1221 can use two separate power supplies; a battery pack or a mains power supply.

The battery pack, depending on the configuration of the Type 1221 and the transducers used, enables up to 18 hours of measurements to be made. A mains power supply fits neatly into the same slot as the battery box, enabling mains power to be used.

## Set-up Type 1221

The following parameters are set up inside the Type 1221 via the RS-232 interface:

### Transducers

You define which, if any, transducer is connected to the sockets. You also decide what measurement data is stored to, or retrieved from, the Type 1221. Five types of data are measured: Instantaneous values (i), Mean values (m), Max. values (h), Min. values (l) and the standard deviation (s).

### Measurement Interval

While the transducers for the Type 1221 have a fixed sampling rate, depending on the transducers chosen, a measurement interval of as little as one tenth of a second can be specified in the applications software.

### Averaging Time

This option allows you to specify over how long a period the maximum, minimum, mean values and standard deviation are to be calculated.

### Automatic Measurements

The start and stop times for the measurement are entered, enabling the Type 1221 to operate as a self-contained, stand-alone instrument.

Both before and after measurement the Type 1221 is in a passive state. This ensures that there is power available from the battery pack when required.

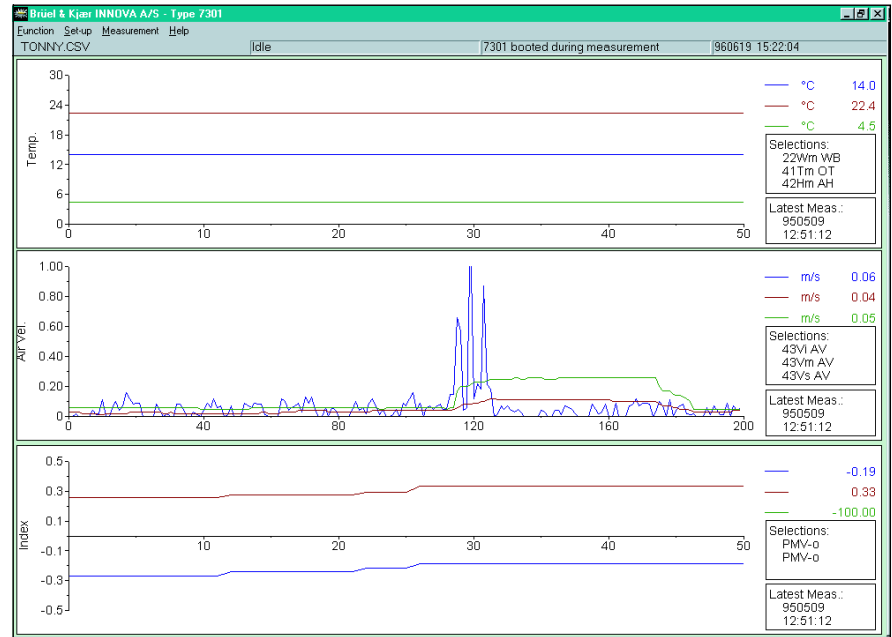


Fig.1 Application Software Type 7301, running on a PC, provides the user interface for Thermal Comfort Data Logger Type 1221

## Data Format

When measurement data is to be exported, the file format that best suits your spreadsheet, or other word-processing software, can be specified.

## Interface

The Type 1221 comes complete with an RS-232 serial interface socket.

This interface is used to transfer measurement data from the data logger to the PC and to set up the Type 1221 from the PC.

All measurement data is transferred in spreadsheet format, which makes it easy to use with PC software packages.

## Two Modes of Operation

### Stand-alone

Once the measurement set-up has been defined for the Type 1221 and the transducers, the PC can be disconnected, allowing the Type 1221 to operate as a stand-alone unit. All the measurement data from the transducers is transferred to the Type 1221 and stored in its internal memory, which can, for example, store up to one week's measurement data (when a 10 minute measurement interval is selected).

### On-line

If you wish to display measurement data in real-time, simply retain the PC/1221 connection. The RS-232 interface enables

real-time measurement data to be transferred to the PC and displayed on screen as graphs.

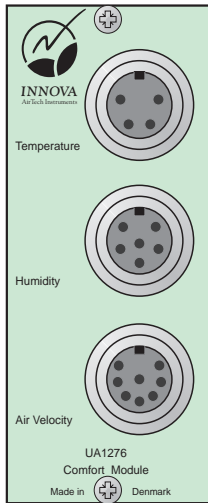
If on-line data transmission is interrupted, the Type 1221 will continue measuring and store the data internally. When data transmission is restored, the stored data is read out.

## Data Handling

The Type 1221 provides instantaneous measurement data as well as values calculated over a user-defined time window, for the mean, maximum, minimum and standard deviation.

All the measurement data is stamped with a time and date tag to aid identification during post-processing. The data is transferred from the data logger in spreadsheet format.

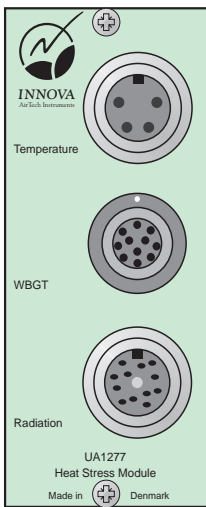
**Comfort Module — UA 1276**



This module enables transducers to be connected that will provide measurement data for the majority of the physical parameters required to evaluate thermal comfort.

The module has three sockets, enabling a Temperature Transducer, a Humidity Transducer and an Air Velocity Transducer to be connected.

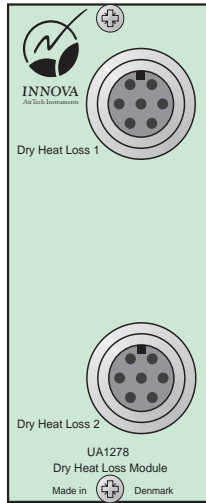
**Heat Stress Module — UA1277**



This module is able to connect the transducers that will provide measurement data to evaluate heat stress.

The module has three sockets, enabling a Temperature Transducer (with a wider measurement range than UA 1276), a WBGT Transducer and a Radiant Asymmetry Temperature Transducer to be connected.

**Dry Heat Loss Module — UA1278**



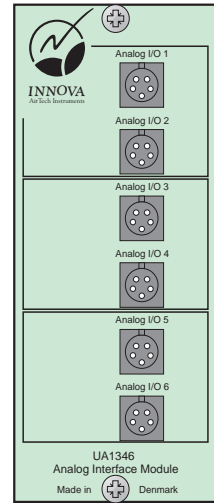
This module enables two Dry Heat Loss Transducers MM0057 to be connected.

The transducer can be operated in the normally heated mode where it measures dry heat loss and equivalent temperature, or in an unheated mode where it measures operative temperature.

Due to the power consumption, it is recommended that the number of UA1278 modules fitted in the 1221 is limited to three.

If conditions are outside the dry heat loss transducer's direct measurement range, the module will set up a warning flag and predict the result from the measured parameter.

**Analog Interface Module — UA1346**



This module enables six analog signals to be sampled from six non-specific measuring instruments. The data is sampled, stored and displayed just like data from the other measurement modules.

The module has six sockets. Each of which has an analog input and an analog output. The output values are linked to the measured parameters through a user-defined setup. This allows every measured value to be output as a voltage value.

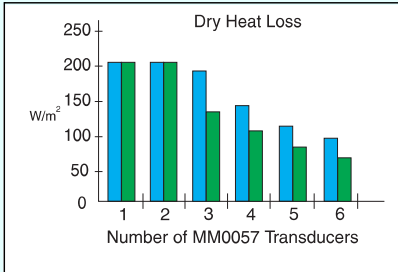
When Innova transducers are used the output voltage is linearized.

# Specifications 1221, UA 1276, UA 1277, UA 1278 and UA 1346

## DIMENSIONS:

**Height:** 138 mm (5.4")  
**Width:** 285 mm (11.2")  
**Depth:** 300 mm (11.8")  
**Weight:** 4.0 kg (8.8lb.) excl. power supply

**MEASUREMENT RANGE:** for Dry Heat Loss Module — UA 1278 (when mains power supply is connected)



Cyan shading:  $t_{amb} > 45^{\circ}\text{C}$   
 Green shading:  $t_{amb} < 45^{\circ}\text{C}$

## POWER SUPPLY:

**Internal Power Supply:** plug-in battery pack (ZG 0146) containing 6 IEC R20 alkaline batteries or 6 NiCd rechargeable cells

**External Power Supply (optional):** plug-in power supply ZG 0342. This is powered from 90 to 264 V AC mains supply at 47 to 65 Hz or 360 to 444 Hz

**Power Consumption:** Type 1221 alone 1.8 W, UA 1276 alone (without transducers) 0.4 W, UA 1277 alone (without transducers) 0.2 W UA 1278 alone (without transducers) 0.4 W

**Battery Lifetime (typical):** 18 hours with alkaline batteries, 9 hours with rechargeable Ni-Cd batteries installed (with one UA 1276 and one UA 1277 installed)

10 hours with alkaline batteries, 5 hours with rechargeable Ni-Cd batteries installed (with one UA 1276 and one UA 1278 installed)

## Data Transfer:

Takes place via the RS-232 interface.

## Communication Parameters:

Baud Rate: 9600  
 Data Bits: 8  
 Stop Bits: 1  
 Parity: none  
 Handshake: Hardwire/switched line

## DATA STORAGE 1221:

Type 1221 can store at least 10240 measured values. These values can be instantaneous, mean, standard deviation, maximum or minimum values

## COMPLIANCE WITH

<b>CE</b>	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive.
<b>Safety</b>	EN 61010-1 (1993) & IEC 1010-1 (1990): Safety requirements for electrical equipment for measurement, control and laboratory use.
<b>EMC Emission</b>	EN 50081-1 (1992): Generic emission standard. Part 1: Residential, commercial and light industry. FCC Class B limits.
<b>EMC Immunity</b>	EN 50082-2 (1995): Generic immunity standard. Part 2: Industrial environment. <b>Note:</b> The above is guaranteed using accessories listed in this Product Data sheet only.
<b>Temperature</b>	IEC 68-2-1 & IEC 68-2-2: Environmental Testing. Cold and Dry Heat. Operating Temperature: +5°C to +50°C (+41°F to +122°F)** Storage Temperature: -25°C to +70°C (-13°F to +158°F)
<b>Humidity</b>	IEC 68-2-3: Operating 90% RH (non-condensing at 30°C) Storage 90% RH (non-condensing at 40°C)
<b>Enclosure</b>	IEC 529: IP 20
<b>Mechanical</b>	IEC 68-2-6: Vibration: 0.3 mm, 20 m/s <sup>2</sup> , 10-500 Hz IEC 68-2-27: Shock: 750 m/s <sup>2</sup> IEC 68-2-29: Bump: 2 x 1000 at 400 m/s <sup>2</sup>

## MODULES:

Comfort Module – UA 1276			
Socket	Transducers	Measurement*** Range (UA1276)	Resolution
Temperature	MM0034, MM0035, MM0060	-20 to 100°C	0.1°C
Humidity	MM0037	-20 to 100°C	0.1°C
Air Velocity	MM0038	See transducer's Product Data Sheet	

Heat Stress Module – UA 1277			
Socket	Transducers	Measurement*** Range (UA1277)	Resolution
Temperature	MM0034, MM0035, MM0060	-40 to 150°C	0.1°C
WBGT	MM0030	-40 to 150°C	0.1°C
Radiation	MM0036	See transducer's Product Data Sheet	

Dry Heat Loss Module – UA 1278			
Sockets (2)	Transducers	Measurement*** Range (UA1278)	Resolution
Dry Heat Loss	MM0057 Operative Temp.	-20 to 50°C	0.1°C
	MM0057 Dry Heat Loss	0 to 205W/m <sup>2</sup> *	0.1W/m <sup>2</sup> *

Analog Interface Module – UA 1346		
Sockets (6) (both input & output)	Measurement Range (UA1346)	Resolution
Analog In	Voltage: 0 to 10V (Current: 0 to 20mA)	0 to 4V: 1mV 4 to 10V: 2.5mV
Analog Out	Voltage: 0 to 10V	2.5mV (12 bits)

\*\* If an extended operation range is necessary, contact Innova.

\* At 0.5 CLO. Only one UA1278 installed  
 \*\*\* Indicates the measurement range of the module and not the range for the individual transducers. For additional specifications, see the individual Product Data Sheets for the transducers

## Software

### Introduction

Applications Software Type 7301 enables you to set up the measurement parameters of the Type 1221 Thermal Comfort Data Logger, receive data from the Type 1221 and display this data as graphs on screen.

The software is also able to calculate a variety of thermal indices from the measurement data it receives.

Measurement data can come from three separate data sources: on-line from 1221, as a block data dump from 1221 or recalled from a file on disk.

### Data Transfer

Two types of data transfer are possible. Data can be transmitted from the 1221 to the PC in real-time via the RS-232 interface, or the Type 1221 can operate as a stand-alone instrument, "dumping" stored data to the PC after the measurement has been

completed. In the latter case, the RS-232 is disconnected after the 1221 set-up has been communicated to the 1221, and re-connected later when the measurement is finished. Dumped data is handled and displayed in exactly the same way as on-line data.

### Calculated Indices

The software uses the measurement data to calculate a variety of indices for thermal comfort evaluations (PMV, PPD and DR) and for heat stress evaluations (WBGT, required sweat rate and ET\*). To provide the greatest flexibility, you decide which indices are to be calculated by the program.

### Data Storage

Data from the Type 1221 is transferred in spreadsheet format. The software stores the measurement data in a file of the same format. This enables it to be used in other programs, if necessary.

An additional way to use the data through the applications software is via the clipboard provided by Windows™. This enables you to copy graphs displayed by the program, and include them in various word processing programs — a useful feature when writing reports.

### Graphic Displays

Measurement data is presented simultaneously in up to three graph display windows (see Fig. 1). Each graph window has an axis which reflects the selected display parameters, and can display up to three curves. The upper graph displays temperature and dry heat loss data, the middle graph displays air velocity data and the lower graph displays the calculated indices.

The manner in which the graphs are displayed can be fine-tuned from within each window.

## Specifications 7301

Supplied on a 3.5 inch, 1.44 MB disk

### COMPUTER REQUIREMENTS:

#### Hardware:

A 386 (20MHz) processor or better  
Min. 4 Mbytes of RAM  
Min. 5 Mbytes of space available on the disk  
VGA monitor or better (colour monitor recommended)  
One RS-232 port for communication  
One RS-232 or mouse port for mouse, which must be installed to use this software  
One 3.5 inch disk drive (1.44MB)

#### Software:

DOS (version 3.3 to 6.2) and Windows™\* 3.1 or 3.11 or Windows 95™†

#### Interface:

RS-232

### Communication Parameters:

Baud Rate: 9600  
Stop Bit: 1  
Data Bit: 8  
Parity: none  
Handshake: Hardwire/switched line

The communication port is selected from within the software (COM 1 or 2)

### DATA TRANSFER:

#### Set-up Data:

Sends data about the measurement set-up from the software to the Type 1221

#### Measurement Data:

Data is transferred in a spreadsheet format, direct from disk or from the Type 1221. Two types of transfer over the interface are available: block data transfer and on-line transfer. The latter provides up to 10 transmissions of data per second

#### Data Functions:

Calculate Indices  
Display measured and calculated values  
Store all measured and calculated data on disk

### MEASUREMENT DATA:

#### Calculated Indices:

PMV-o (Predicted Mean Vote)<sup>#</sup>

<sup>#</sup> Calculated using operative temperature transducer

PMV-d (Predicted Mean Vote)<sup>\*\*</sup>  
PPD-o (Predicted Percentage of Dissatisfied)<sup>#</sup>  
PPD-d (Predicted Percentage of Dissatisfied)<sup>\*\*</sup>  
DR (Draught Rating)  
WBGT (Wet Bulb Globe Temperature)  
ET\* (Effective Temperature)  
SR (Required Sweat Rate)  
TI (Turbulence Intensity)  
PTD (Plane Radiant Temperature Difference)  
TD (Air Temperature Difference)  
EqT-o (Equivalent Temperature)<sup>#</sup>  
EqT-d (Equivalent Temperature)<sup>\*\*</sup>  
RH (Relative Humidity)  
VP (Vapour Pressure)  
OOT (Optimal Operative Temperature)  
Td-d (Comfort Temp. - EqT-d)<sup>\*</sup>

### GRAPHIC DISPLAYS:

(The user defines the units for the measured and calculated values)  
Up to 3 temperature and dry heat loss curves on same axes  
Up to 3 air velocity curves on same axes  
Up to 3 index curves on same axes

<sup>\*\*</sup> Calculated using dry heat loss transducer

\* Windows is a trademark of Microsoft Corporation

† Windows 95 is a trademark of Microsoft Corporation

# Ordering Information

<p>Type 1221: Thermal Comfort Data Logger</p> <p><b>Includes the following accessories:</b> Type 7301: Application Software for Type1221 ZG 0146: Battery box Instruction Manual</p> <p><b>Basic System Requirements</b></p> <p>Requires one or more of these modules: UA 1276: Comfort Module UA 1277: Heat Stress Module UA 1278: Dry Heat Loss Module UA 1346: Analog Interface Module</p> <p>Requires one or more of these transducers: MM 0030: WBGT Transducer MM 0034: Air Temperature Transducer MM 0035: Surface Temperature Transducer MM 0036: Radiant Temperature Asymmetry Transducer MM 0037: Humidity Transducer MM 0038: Air Velocity Transducer MM 0057: Dry Heat Loss Transducer MM 0060: Operative Temperature Transducer One of the following cables: WL 0945: RS-232 Cable (25- to 9-pin)</p>	<p>WL 0946: RS-232 Cable (25- to 25-pin)</p> <p><b>Configured Systems</b></p> <p>Type 3710: Basic Thermal Comfort Data Logging System comprises: Type 1221 + UA 1276 + MM0034 + MM0037 + MM0038 + MM0060 + WL0945 + KE0357 + UA0803 + UA1348 + DH0492 + 4 x UA0588</p> <p><b>Optional Accessories</b></p> <p>ZG 0342: Mains power supply AQ 0157: Charging adaptor DH 0492: Tripod Mounting Adaptor for 3 Transducers UA 1347: Tripod Mounting Adaptor for 4 Transducers KE 0357: Transducer Carrying Case KE 0401: WBGT Transducer Carrying Case UA 0803: Tripod UA 1348: Tripod Extension Rods (3) UA 0588: Transducer Mounting Adaptor</p>	<p>AO 1429: Adaptor Cable for MM0023 to UA1278 JP 0500: Analog Connector (male), 5-pin cable mounting</p>
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Innova AirTech Instruments A/S reserves the right to change specifications and accessories without notice



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