Thermal Diffusivity and Thermal Conductivity Analysis

Dear Customer,

As of September 12, 2025, connected products and related services fall under the EU Data Act.
The following NETZSCH instruments for the determination of thermal diffusivity and thermal conductivity belong to the category ´connected products´ (table 1).

Table 1: Thermal diffusivity and thermal conductivity analysis – connected products by NETZSCH

Method	Instrument Type	Device	Software
Thermal Diffusivity	Light/Laser Flash Analysis (LFA)	LFA 717 *Hyperflash*®, LFA 717 HT *Hyperflash*®, LFA 727	*Proteus*®
Thermal Conductivity	Heat Flow Meter (HFM)	HFM 706 *Lambda Medium*, HFM 706 *Lambda Large*, HFM 446 *Lambda Small* Eco-Line	*Proteus*®
		HFM 783	*Lambda2015*
	Guarded Heat Flow Meter (GHFM)	TCT 716 *Lambda*	TCT 716 *Lambda*
	Guarded Hot Plate (GHP)	GHP 456 *Titan*®	*Proteus*®
		GHP 500, GHP 600, GHP 800, GHP 900	*Lambda / Lambda2012*
	Guarded Hot Pipe (GHP)	TLR 1000	*Lambda*
Hotbox	Hotbox Test Chamber	TDW 4040 and TDW 4240	*Hotbox2018*

The corresponding software packages are related services.

When one of the aforementioned NETZSCH instruments incl. software is purchased, the new owner gains complete control over the data generated with this device. The customer can decide how the data should be handled and with whom it should be shared.

In order to access data (raw data, calculated data, results) also outside the NETZSCH software, the software packages offer a range of export options in various text and graphic formats.

A) Light/Laser Flash Analysis (LFA) Instrument Type
Method: Determination of Thermal Diffusivity

The data listed in table 2 are recorded and/or calculated by the *Proteus*® software and subsequently stored in the corresponding measurement file.

Table 2: LFA data

Data	Storage Location
General information such as instrument, database, date, user name, material, reference temperature, reference density, sample name, sample dimensions, sample position, detector type, filter, used table of specific heat capacity values, used expansion data of the sample, sample density; sample holder type, applied corrections; used calculation model; temperature program; signal amplification; Recorded and calculated signals such as time*/**, temperature*, measurement duration, number of repeat measurements, lamp/laser voltage, detector signal*, pulse signal*, pulse width, pulse integral, half time; Measurement results such as thermal diffusivity, thermal conductivity, specific heat capacity (c_p), information on fit quality between experimental and calculated data; measurement uncertainty;	Locally on the measurement computer or in a (at customer´s site) pre-defined server directory

* Primary data
** The time is taken from the measurement computer

The time and detector signal are recorded following a light/laser shot (pulse).

The measured and evaluated LFA data are archived in databases which can be created by the user. The databases can be found under C:\NETZSCH/Proteus90/data.

It is possible to export pulse data, detector curves (incl. fitting data) and results as tables or graphics in various formats (cf. table 3)

Table 3: Export formats of the NETZSCH *Proteus*® software

Instrument software	Export formats
Proteus®	Graphic: emf, png, tif, jpg, bmp, pdf Data, results: csv, txt, pdf

Under the path C:\NETZSCH/Proteus 90/LFA logs, the user has access to additional information about the course of the furnace temperature, the sample temperature and the gas flow during the measurement. These files, which will automatically be overwritten after some time, can be loaded into the *Proteus*® software of another NETZSCH instrument, for example, a DSC or a TGA. LFA users, who are interested in such data but do not have an additional device, are requested to contact their responsible service engineer.

The log files documenting the operations performed are stored under C:\NETZSCH/Proteus 90/configuration/log-files. These are text files that can be opened with an editor.

B) Heat Flow Meter (HFM) Instrument Type
Method: Thermal Conductivity Determination

1) Devices with *Proteus*® software

The data listed in table 4 are recorded and/or calculated by the *Proteus*® software and subsequently stored in the corresponding measurement file.

Table 4: HFM data generated with *Proteus*® software

Data	File Storage Location
General information such as instrument, user name, project, laboratory, start and end of a measurement, sample name, sample ID, sample dimensions, sample mass, material, spacer, status of the initial door state (open, closed); information on calibration and the used reference sample; information on measurement conditions incl. temperature points and stability criteria; information of the used thermostat; Recorded and calculated signals such as time*/**, measurement duration*, temperature(s)* (upper plate, lower plate, mean value), temperature difference ΔT, heat flow* (upper plate, lower plate, mean value), heat flow rate, standard deviation. pressure*, force*, position of the upper plate*, position of the lower plate*, sample thickness; Measuring results such as thermal conductivity λ, thermal resistance, measurement uncertainty;	Locally on the measurement computer or in a (at customer´s site) pre-defined server directory

* Primary data
** The absolute time (start and end of a measurement) is taken from the measurement computer

The pressure, the force applied on the sample, the time, the temperature(s), the heat flows and the plate positions are continuously recorded every 3 seconds.
A comparison with stability criteria takes place every minute (equilibrium data).

The measured and evaluated data are stored as files. Whether and how measurement files and analysis states can be deleted from the predefined storage locations depends largely on the local IT requirements and thus on the respective company guidelines and the requirements of various regulations that must be complied with.

The export options provided by the *Proteus*® software can be found in table 5.

Table 5: Export formats of HFM devices with *Proteus*® software

Instrument software	Export formats
Proteus®	Raw data: csv, txt; Results/completely: Excel

In addition, the NETZSCH *Proteus*® software also generates so-called log files. These serve as documentation of all operations performed by the device. Via the >Collect diagnostic data< command within *Proteus*® *Analysis,* information from different folders are compiled in one zip file and stored on the local computer under the path C:\NETZSCH\Proteus90. If necessary, this zip file can be sent to the NETZSCH customer service to determine the cause of malfunction.

2) Devices with *Lambda2015* software

The data listed in table 6 are collected by the *Lambda* software and subsequently stored.

Table 6: HFM 783 data (*Lambda2015* software)

Data	Primary Storage Location
Information entered by the user such as sample name, material, sample dimensions, sample mass, sample thickness, applied force, measurement time, number of measurement points; Measured data: surface temperature, temperature difference, heating current, voltage, power, thermal conductivity	Local SBC* (Windows)

* SBC = inbuilt Single Board Computer

The data is stored under C:\Lambda2015.
Access to the data is possible via the device's user interface, via USB interface or (optionally) via local network.

The export options of the *Lambda* software are listed in table 7.

Table 7: HFM 783 – Export formats provided by the *Lambda* software

Geräte-Software	Exportformate
Lambda	Bin, csv, pdf

In addition, the NETZSCH *Lambda* software also generates so-called log files. They serve as a time-stamped documentation of operations such as starting a measurement, ending a measurement, errors or operator actions.

C) Guarded Heat Flow Meter (GHFM) Instrument Type
Method: Thermal Conductivity Determination

The data listed in table 8 are recorded and/or calculated by the TCT 716 *Lambda* software and subsequently stored in the corresponding measurement file.

Table 8: TCT 716 *Lambda* data

Data	Storage Location
General information such as instrument, test name, test number, date, material, sample name, sample description, sample dimensions, pressure, used calibration, measuring parameters/test temperatures; Recorded and calculated signals such as time*, measurement duration, temperature(s)* (cold plate, hot plate), mean sample temperature, temperature gradient, heat flows* (upper plate, lower plate); Measurement results such as thermal conductivity λ, thermal resistance (measured and fitted);	Locally on the measurement computer

* Primary data
The absolute time (start and end of a measurement) is taken from the measurement computer

The data are stored in files. Whether and how measurement files and analysis states can be deleted from the predefined storage locations depends largely on the local IT requirements and thus on the respective company guidelines and the requirements of various regulations that must be complied with.

The raw data (in csv format) can be accessed at C:\NETZSCH/Documents/Thermal Conductivity /SW version (for example, 2.1.3.0)/Thermal Conductivity 2.0 Files/Tests. The data are not stored under the corresponding file name, but with an automatically assigned, consecutive test number.

In addition, the TCT 716 *Lambda* software offers several export options summarized in table 9.

Table 9: Export format of the TCT 716 *Lambda*

Instrument software	Export formats for results and graphics
TCT 716 *Lambda*	pdf, html, MHT, RTF, docx, xls, Excel, csv, txt. Image

D) Guarded Hot Plate (GHP) Instrument Type with *Proteus*® Software Method: Determination of Thermal Conductivity

The data listed in table 10 are recorded and/or calculated by the *Proteus*® software and subsequently stored in the corresponding measurement file.

Tabelle 10: GHP 456 *Titan*® data

Data	File Storage Location
General information such as instrument, serial number, measuring mode, measuring area, laboratory, project, user name, file name, folder, applied method, start and end of the measurement (date and time), sample name, material, sample dimensions, sample density, sample mass, measuring parameters, atmosphere, temperature points, information on stability criteria, information on the used cooling configuration; Recorded and calculated signals such as time*, measurement duration*, sensor temperatures*, plate temperatures*, mean temperature value, temperature difference ΔT, heating power*, cooling behavior, standard deviations of the determined temperature values; Measuring results such as thermal conductivity λ, thermal resistance, standard deviations, measuring uncertainties;	Locally on the measurement computer or in a (at customer´s site) pre-defined server directory

* Primary data
The absolute time (start and end of a measurement) is taken from the measurement computer

The measured and evaluated data are stored in files. Whether and how measurement files and analysis states can be deleted from the predefined storage locations depends largely on the local IT requirements and thus on the respective company guidelines and the requirements of various regulations that must be complied with.

In order to access data (raw data, calculated data, results) also outside the NETZSCH software, *Proteus*® offers a range of export options in various formats. These are summarized in table 11.

Table 11: Export formats of the GHP 456 *Titan*® with *Proteus*® software

Instrument software	Export formats
Proteus®	Raw data: csv, txt; Results/completely: Excel

In addition, the NETZSCH *Proteus*® software also generates so-called log files. They serve as documentation of all operations performed by the device. Via the >Collect diagnostic data< command within *Proteus*® *Analysis,* information from different folders is compiled in one zip file and stored on the local computer under the path C:\NETZSCH\Proteus90. If necessary, this zip file can be sent to the NETZSCH customer service to determine the cause of malfunction.

E) Guarded Hot Plate (GHP) and Guarded Hot Pipe Instrument Types with *Lambda and Lambda2012 Software*
Method: Determination of Thermal Conductivity

This applies to the GHP 500, GHP 600 (*Lambda* software), GHP 800, GHP 900 (*Lambda2012* software) and TLR 1000 (*Lambda* software).
Any differences between these devices are described below.

The following data are collected by the *Proteus*® instrument software and subsequently stored:

Table 12: GHP 500/600/800/900 and TLR 1000 data provided by the *Lambda* / *Lambda2012* software

Data	Primary Storage Location
Information entered by the user such as sample name, material, sample dimensions, sample mass, sample thickness, applied force, measurement time, number of measurement points; Collected (measured) data: surface temperature, temperature difference, heating current, voltage, power, thermal conductivity;	GHP 500/600 and TLR 1000: Local SBC* (Windows); GHP 800/900: External PC (Windows)

* SBC = inbuilt Single Board Computer

Table 13 lists the various paths under which the data is stored.

Table 13: Paths for data storage

Instruments	Paths
GHP 500/600	C:\Users\USERNAME\AppData\Roaming\Taurus Instruments\Lambda
GHP 800/900	C:\Lambda2012
TLR 1000	C:\Users\USERNAME\AppData\Roaming\Taurus Instruments\Lambda

Concerning the GHP 500/600 and TLR 1000, the user can access the data via the device's user interfaces, via USB interface or (optionally) via the local network. Regarding the GHP 800/900, it is possible to access the file system of the external PC. All data are locally stored in the given software folder (cf. table 13).

The various export options of the *Lambda* / *Lambda2012* software for GHP and TLR instruments are shown in table 14.

Table 14: Export formats for GHP 500/600, GHP 800/900 and TLR 1000 instruments

Instruments	Export formats
GHP 500/600	gdc, csv, pdf
GHP 800/900	drc, txt, erg, dat, v6.drc
TLR 1000	tdc, csv, pdf

Formats such as drc, v6.drc, gdc are device-specific binary files. While they can be opened with an editor, they only reveal their true purpose when they are read back into the device software.

In addition, the NETZSCH *Lambda* software also generates so-called log files. Associated with the GHP 500/600 and TLR 1000, they serve as a time-stamped documentation of operations such as starting a measurement, ending a measurement, recording errors or operator actions.
The GHP 800/900 do not record log files.

F) Hotbox Test Chamber Instrument Type with Hotbox Software
Method: Determination of Stationary Heat Transfer Properties
(effective thermal conductivity or heat transmission coefficient (U or k value)

This includes two test chambers: the TDW 4040 and TDW 4240
Instruments according to the hotbox method measure and analyze the heat transfer properties of brickwork, doors or windows. The TDW 4040 works according to the principle of a heat flow meter, while the TDW 4240 works with a controlled hotbox.

The test chambers do not only consider the heat transfer through the sample but also the heat transfer conditions (material properties and environmental conditions) such as surface structures of wall constructions or air flow.

The data listed in table 15 are collected by the Hotbox software and subsequently stored in the corresponding measurement file.

Table 15: Hotbox data

Data	Primary Storage Location
Information entered by the user such as sample name, material, sample dimensions, sample weight, sample thickness, measurement time, number of temperature points; Collected (measured) data: Surface temperature, air temperature, velocity of air flow, temperature difference, heat flux;	External PC (Windows), Path: C:\Hotbox2018

Regarding hotbox systems, it is possible to access the data directly via the file system of the external computer. All files are stored locally in the aforementioned folder.

Table 16 lists the various export options of the Hotbox software.

Table 16: Export formats of the TDW 4040 und TDW 4240 with Hotbox software

Instruments	Export formats
TDW 4040/4240	drc, txt, msg, pdf

Formats such as drc are device-specific binary files. They can be opened with an editor but reveal their true purpose only when they are read back into the device software.

Hotbox systems do not record log files.