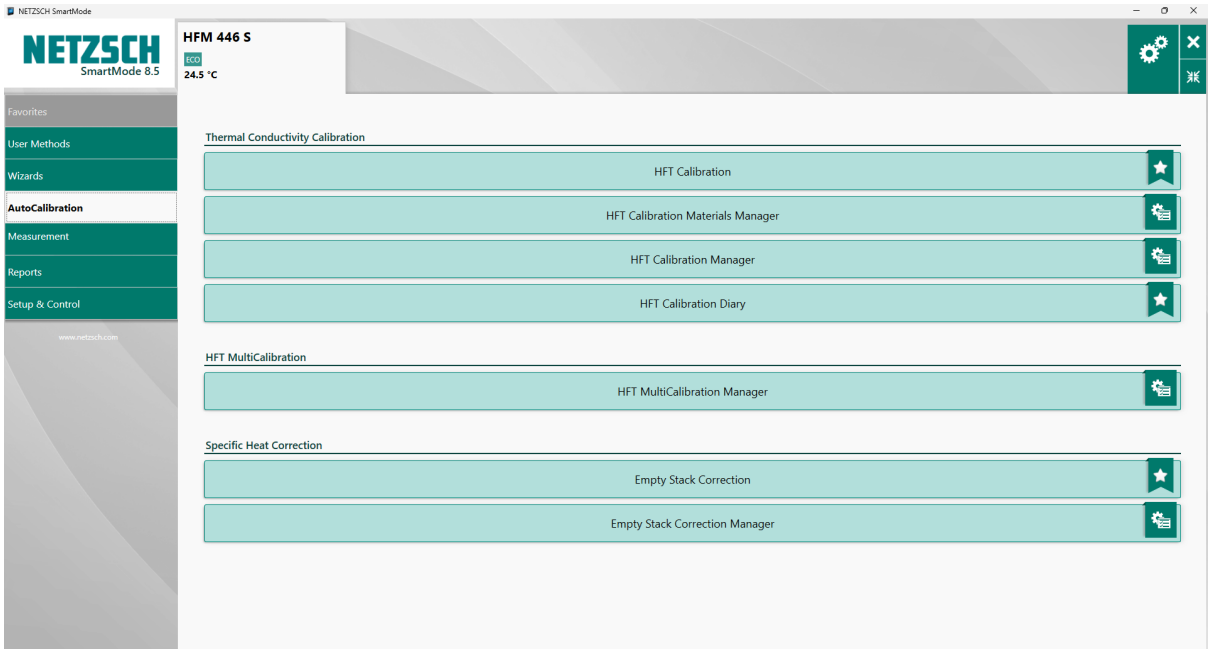
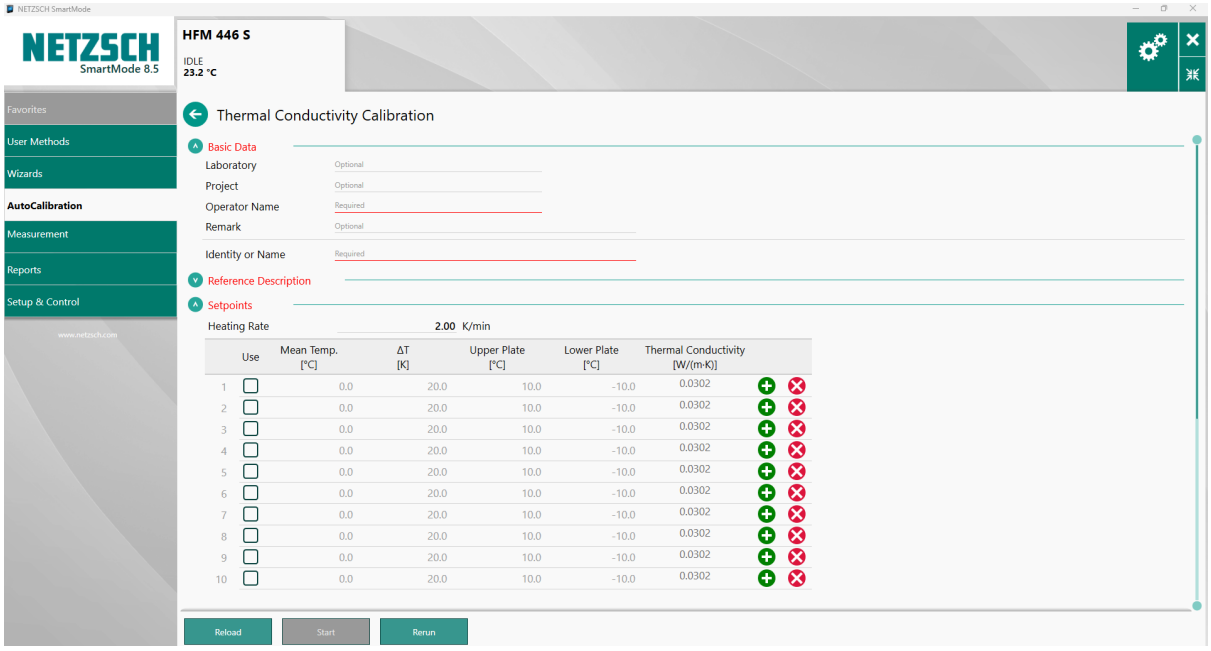
Supplementary File 1 – HFM Proteus SmartMode 8.5 Measurement Screenshots

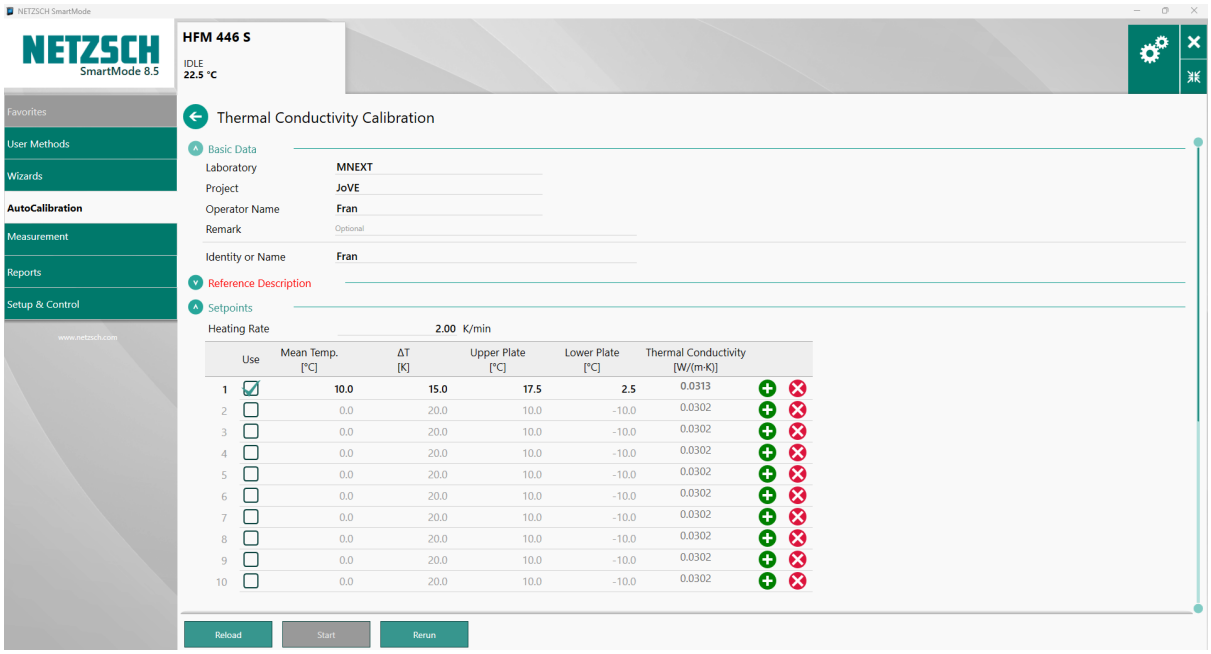
2.1.1



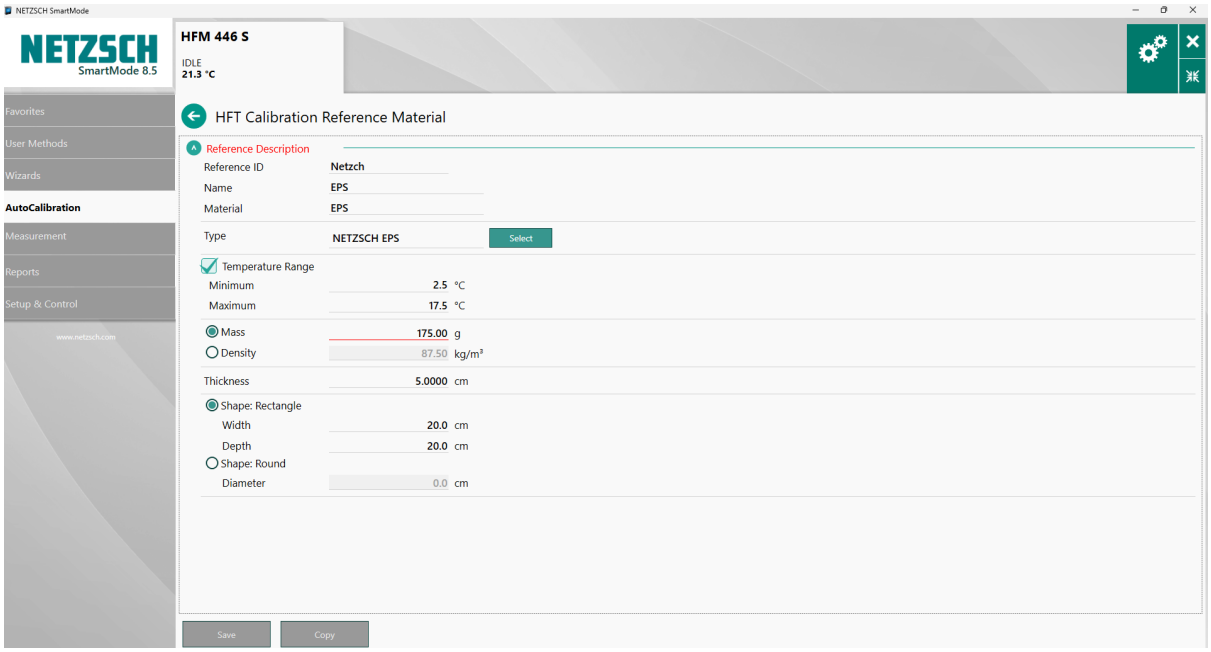
2.1.2



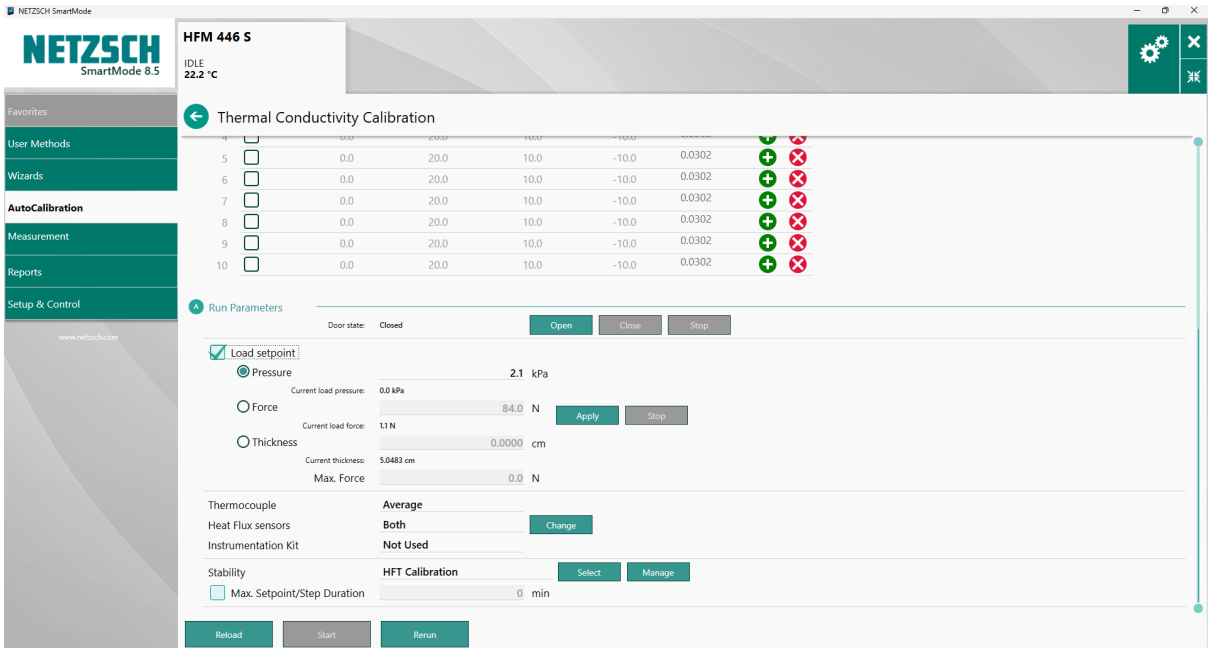
2.1.3


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
IDLE
22.5 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
Thermal Conductivity Calibration
Basic Data
Laboratory MNEXT
Project JoVE
Operator Name Fran
Remark Optional
Identity or Name Fran
Reference Description
Setpoints
Heating Rate 2.00 K/min
Use | Mean Temp. [°C] | ΔT [K] | Upper Plate [°C] | Lower Plate [°C] | Thermal Conductivity [W/(m·K)]
1 | 10.0 | 15.0 | 17.5 | 2.5 | 0.0313
2 | 0.0 | 20.0 | 10.0 | -10.0 | 0.0302
3 | 0.0 | 20.0 | 10.0 | -10.0 | 0.0302
4 | 0.0 | 20.0 | 10.0 | -10.0 | 0.0302
5 | 0.0 | 20.0 | 10.0 | -10.0 | 0.0302
6 | 0.0 | 20.0 | 10.0 | -10.0 | 0.0302
7 | 0.0 | 20.0 | 10.0 | -10.0 | 0.0302
8 | 0.0 | 20.0 | 10.0 | -10.0 | 0.0302
9 | 0.0 | 20.0 | 10.0 | -10.0 | 0.0302
10 | 0.0 | 20.0 | 10.0 | -10.0 | 0.0302
Reload
Start
Rerun

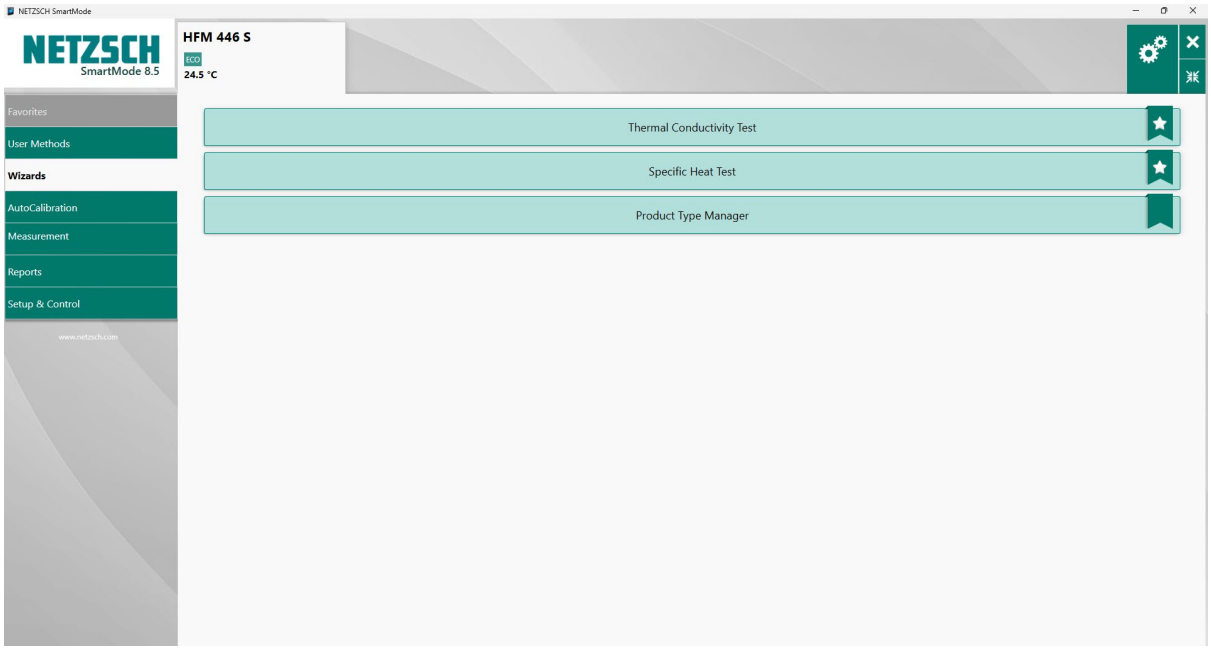
2.1.4


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
IDLE
21.3 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
HFT Calibration Reference Material
Reference Description
Reference ID Netzch
Name EPS
Material EPS
Type NETZSCH EPS
Select
Temperature Range
Minimum 2.5 °C
Maximum 17.5 °C
Mass 175.00 g
Density 87.50 kg/m³
Thickness 5.0000 cm
Shape: Rectangle
Width 20.0 cm
Depth 20.0 cm
Shape: Round
Diameter 0.0 cm
Save
Copy

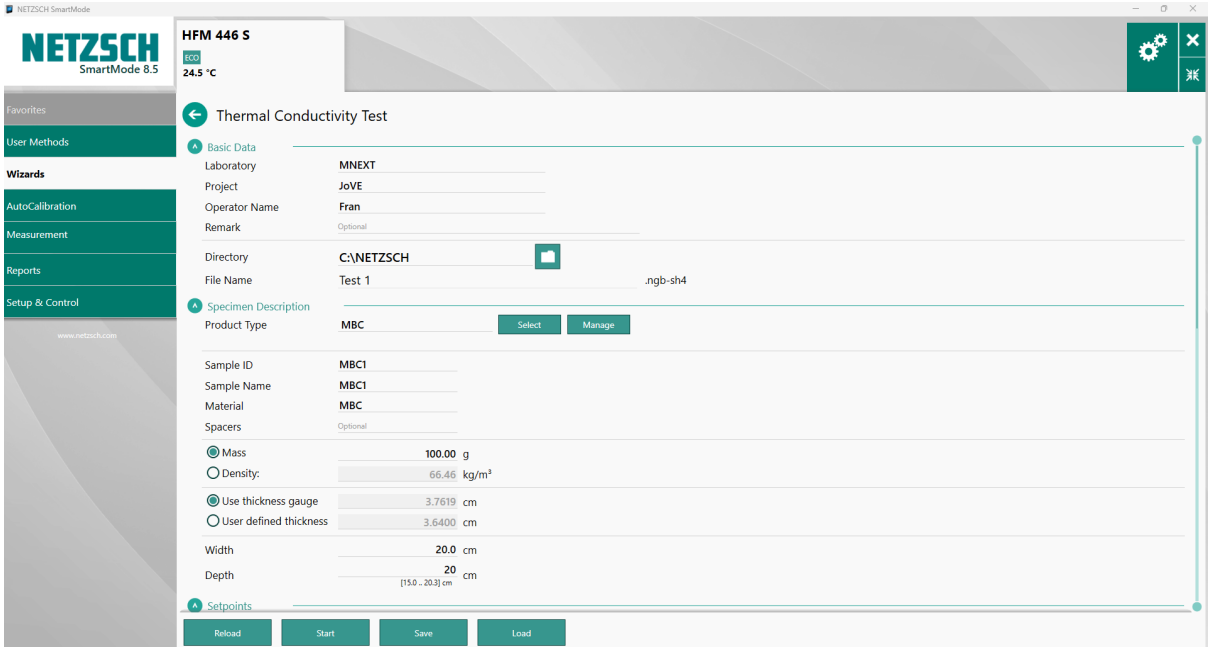
2.1.5


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
IDLE
22.2 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
Thermal Conductivity Calibration
Run Parameters
Door state: Closed
Open
Close
Stop
Load setpoint
Pressure
2.1 kPa
Current load pressure: 0.0 kPa
Force
84.0 N
Apply
Stop
Current load force: 1.1 N
Thickness
0.0000 cm
Current thickness: 5.0483 cm
Max. Force
0.0 N
Thermocouple
Average
Heat Flux sensors
Both
Change
Instrumentation Kit
Not Used
Stability
HFT Calibration
Select
Manage
Max. Setpoint/Step Duration
0 min
Reload
Start
Rerun

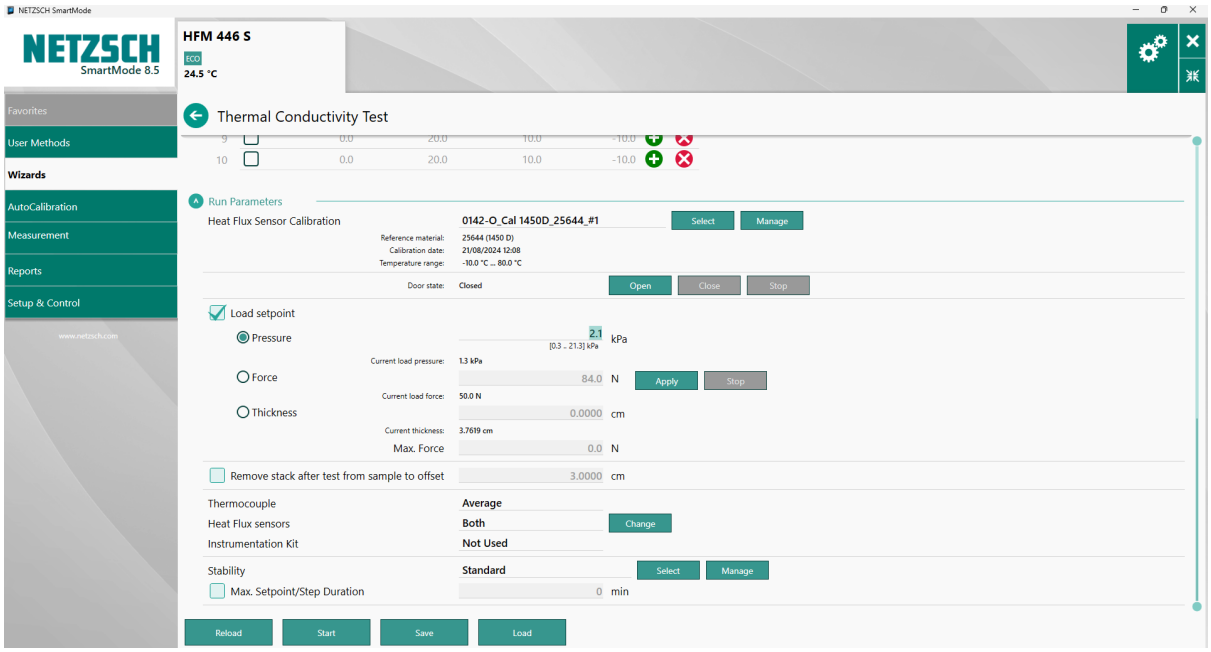
2.1.6


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
ECO
24.5 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
Thermal Conductivity Test
Specific Heat Test
Product Type Manager

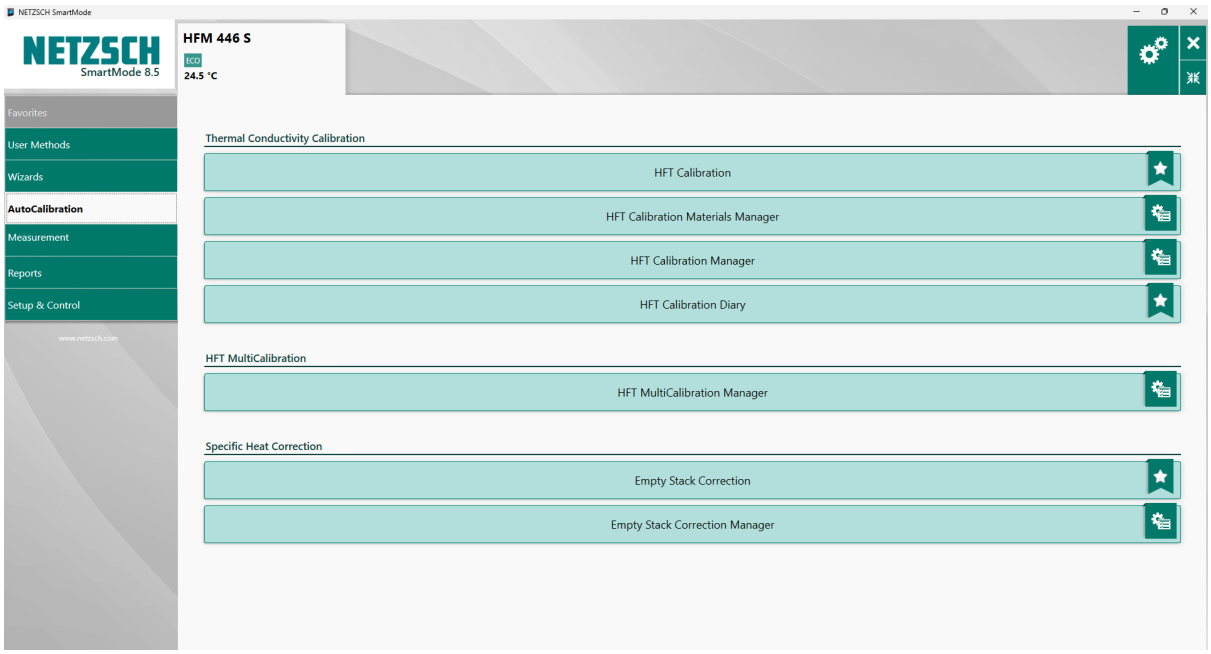
2.1.7


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
ECO
24.5 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
www.netzsch.com
Thermal Conductivity Test
Basic Data
Laboratory MNEXT
Project JoVE
Operator Name Fran
Remark Optional
Directory C:\NETZSCH
File Name Test 1 .ngb-sh4
Specimen Description
Product Type MBC Select Manage
Sample ID MBC1
Sample Name MBC1
Material MBC
Spacers Optional
Mass 100.00 g
Density: 66.46 kg/m³
Use thickness gauge 3.7619 cm
User defined thickness 3.6400 cm
Width 20.0 cm
Depth 20 [15.0 .. 20.3] cm
Setpoints
Reload Start Save Load

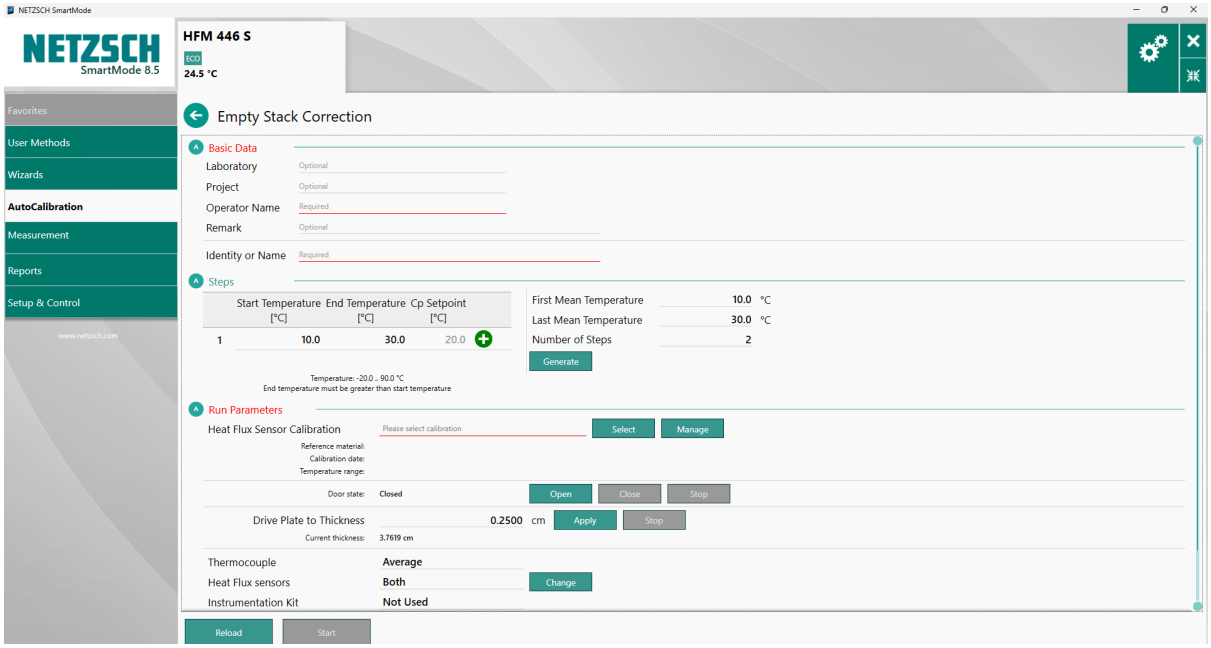
2.1.9


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
ECO
24.5 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
www.netzsch.com
Thermal Conductivity Test
9 0.0 20.0 10.0 -10.0
10 0.0 20.0 10.0 -10.0
Run Parameters
Heat Flux Sensor Calibration 0142-O_Cal 1450D_25644_#1 Select Manage
Reference material: 25644 (1450 D)
Calibration date: 21/08/2024 12:08
Temperature range: -10.0 °C ... 80.0 °C
Door state: Closed Open Close Stop
Load setpoint
Pressure 2.1 [0.3 .. 21.3] kPa
Current load pressure: 1.3 kPa
Force 84.0 N Apply Stop
Current load force: 50.0 N
Thickness 0.0000 cm
Current thickness: 3.7619 cm
Max. Force 0.0 N
Remove stack after test from sample to offset 3.0000 cm
Thermocouple Average
Heat Flux sensors Both Change
Instrumentation Kit Not Used
Stability Standard Select Manage
Max. Setpoint/Step Duration 0 min
Reload Start Save Load

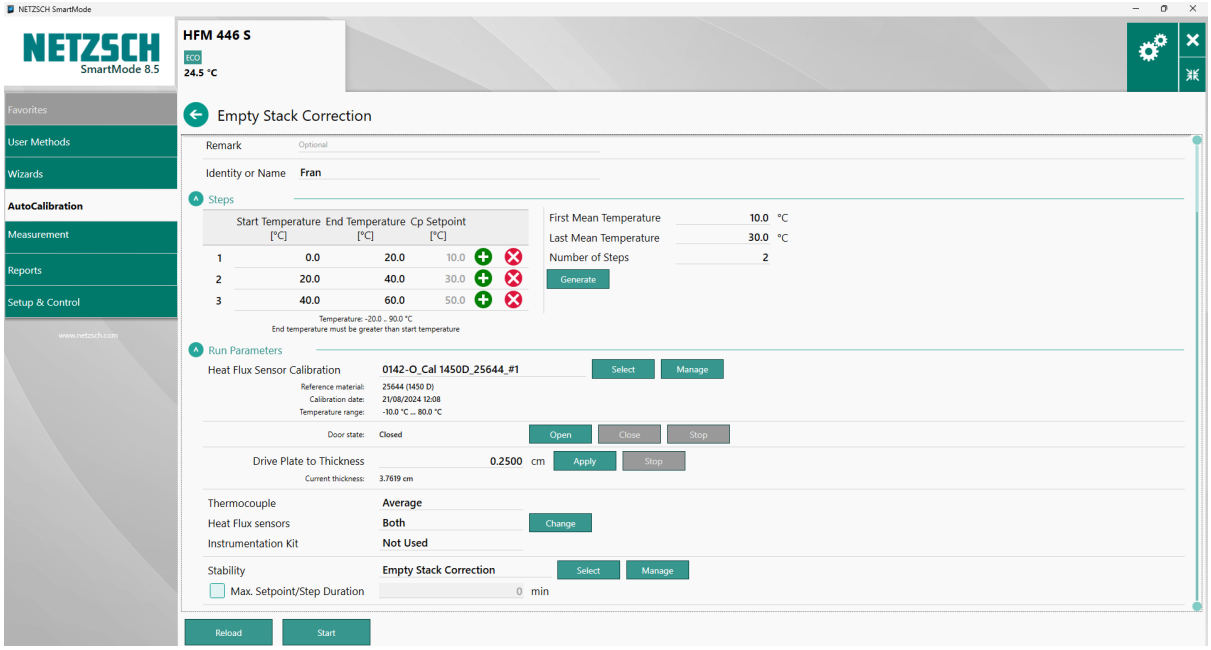
2.2.1


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
ECO
24.5 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
www.netzsch.com
Thermal Conductivity Calibration
HFT Calibration
HFT Calibration Materials Manager
HFT Calibration Manager
HFT Calibration Diary
HFT MultiCalibration
HFT MultiCalibration Manager
Specific Heat Correction
Empty Stack Correction
Empty Stack Correction Manager

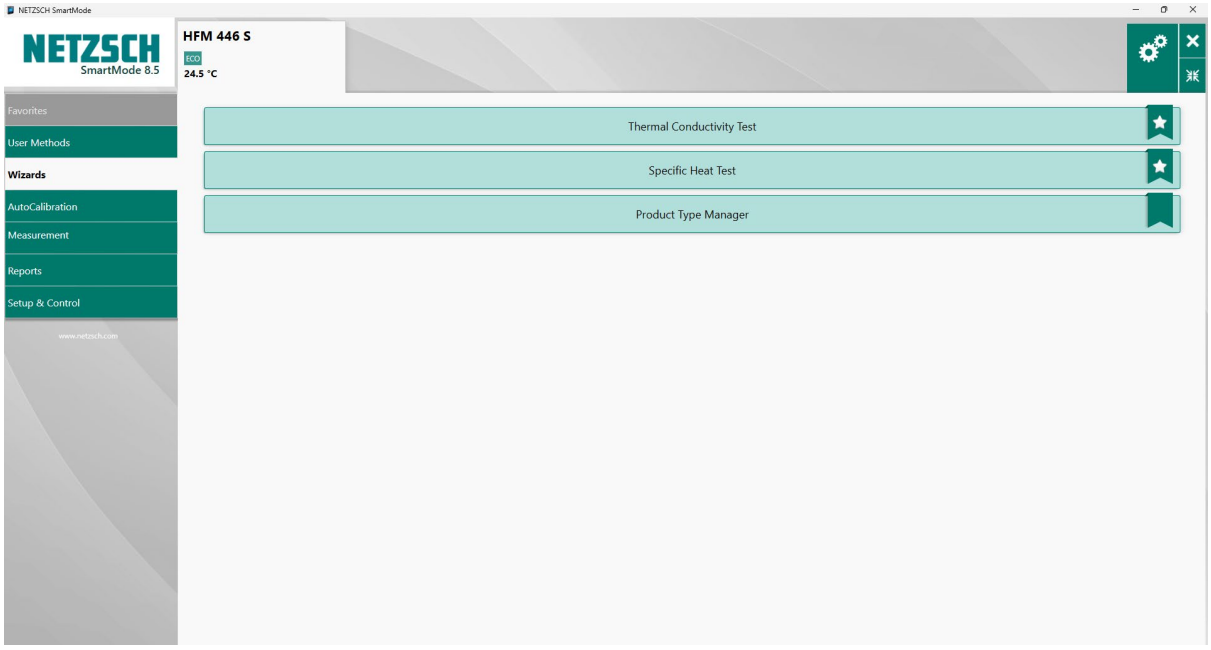
2.2.2


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
ECO
24.5 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
www.netzsch.com
Empty Stack Correction
Basic Data
Laboratory
Project
Operator Name
Remark
Identity or Name
Steps
Start Temperature [°C]
End Temperature [°C]
Cp Setpoint [°C]
1
10.0
30.0
20.0
First Mean Temperature
Last Mean Temperature
Number of Steps
Generate
Run Parameters
Heat Flux Sensor Calibration
Select
Manage
Door state:
Closed
Open
Close
Stop
Drive Plate to Thickness
0.2500 cm
Apply
Stop
Thermocouple
Average
Heat Flux sensors
Both
Change
Instrumentation Kit
Not Used
Reload
Start

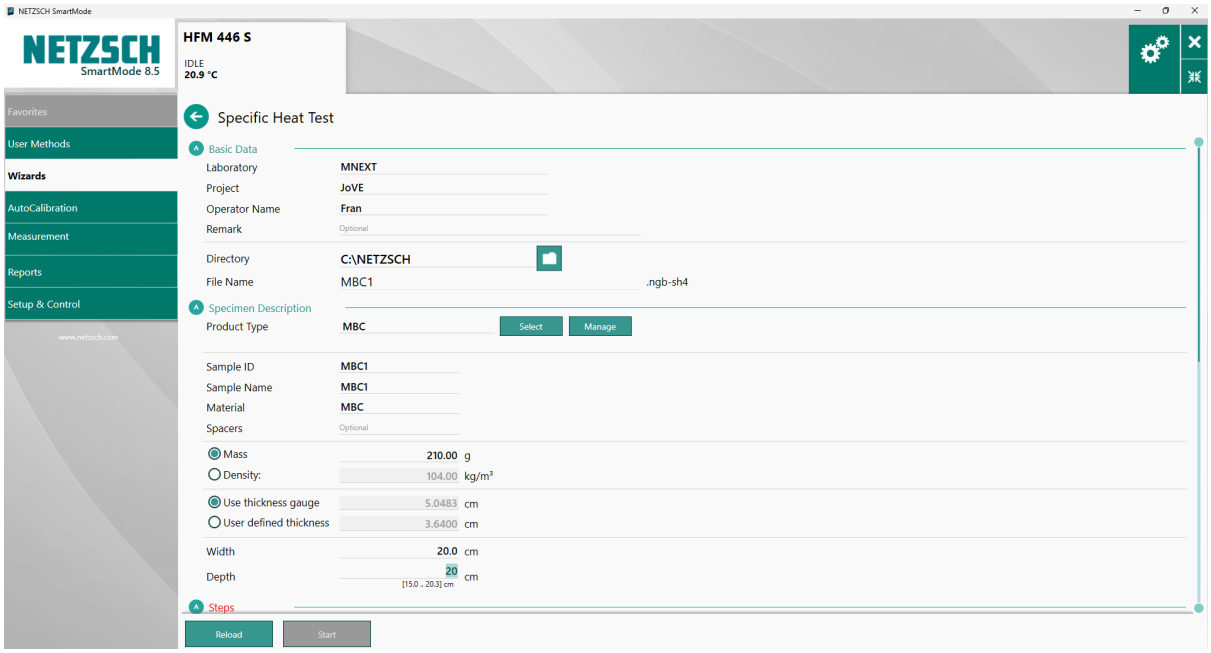
2.2.3


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
ECO
24.5 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
www.netzsch.com
Empty Stack Correction
Remark
Optional
Identity or Name
Fran
Steps
Start Temperature [°C]
End Temperature [°C]
Cp Setpoint [°C]
1 0.0 20.0 10.0
2 20.0 40.0 30.0
3 40.0 60.0 50.0
Temperature: -20.0 .. 90.0 °C
End temperature must be greater than start temperature
First Mean Temperature 10.0 °C
Last Mean Temperature 30.0 °C
Number of Steps 2
Generate
Run Parameters
Heat Flux Sensor Calibration
0142-O_Cal 1450D_25644_#1
Select
Manage
Reference material: 25644 (1450 D)
Calibration date: 21/08/2024 12:08
Temperature range: -10.0 °C .. 80.0 °C
Door state: Closed
Open
Close
Stop
Drive Plate to Thickness
0.2500 cm
Apply
Stop
Current thickness: 3.7619 cm
Thermocouple
Average
Heat Flux sensors
Both
Change
Instrumentation Kit
Not Used
Stability
Empty Stack Correction
Select
Manage
Max. Setpoint/Step Duration
0 min
Reload
Start

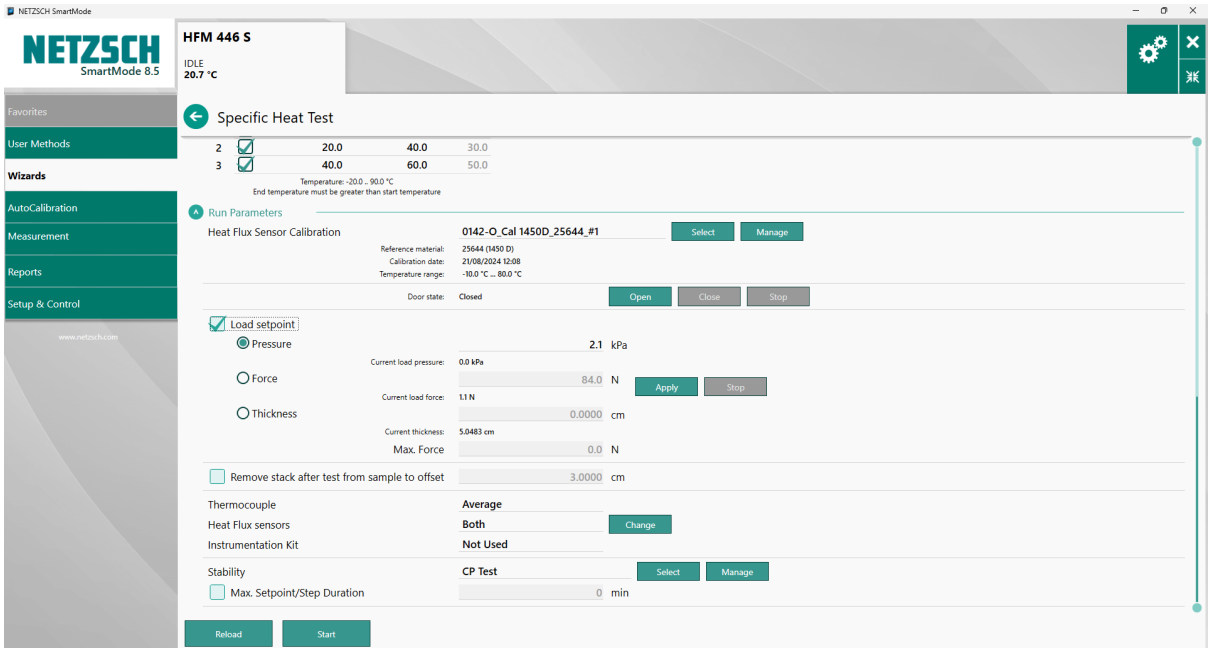
2.2.4


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
ECO
24.5 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
www.netzsch.com
Thermal Conductivity Test
Specific Heat Test
Product Type Manager

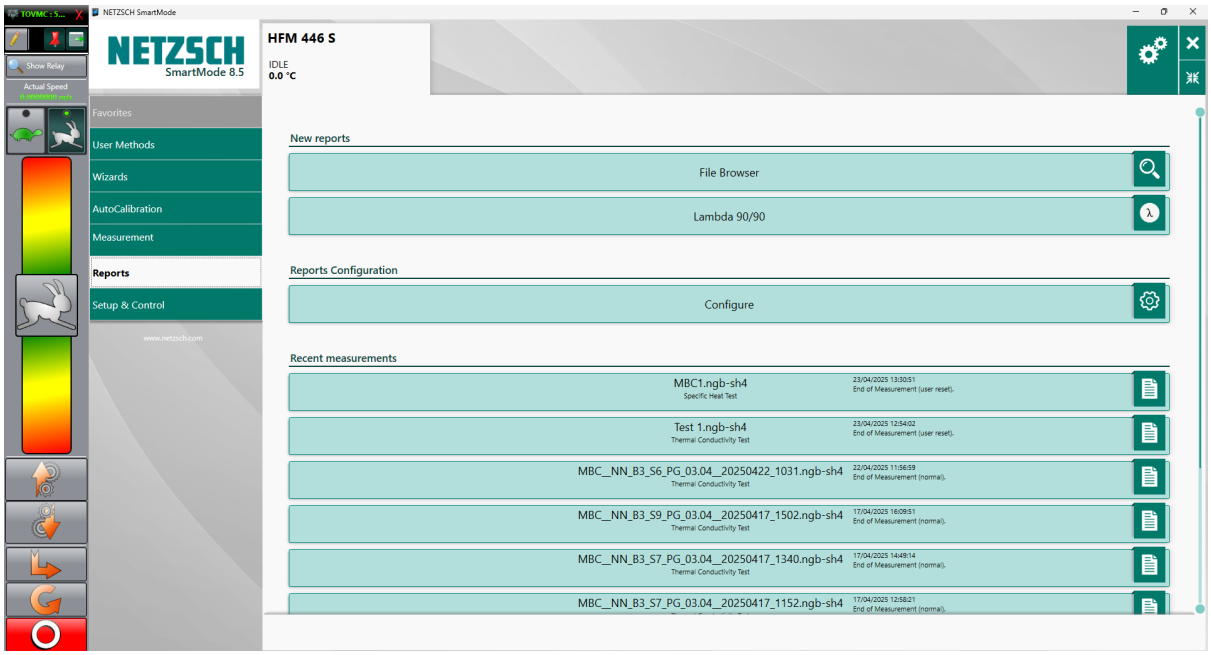
2.2.6


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
IDLE
20.9 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
www.netzsch.com
Specific Heat Test
Basic Data
Laboratory MNEXT
Project JoVE
Operator Name Fran
Remark Optional
Directory C:\NETZSCH
File Name MBC1 .ngb-sh4
Specimen Description
Product Type MBC Select Manage
Sample ID MBC1
Sample Name MBC1
Material MBC
Spacers Optional
Mass 210.00 g
Density: 104.00 kg/m³
Use thickness gauge 5.0483 cm
User defined thickness 3.6400 cm
Width 20.0 cm
Depth 20 cm
[15.0 .. 20.3] cm
Steps
Reload
Start

2.2.7


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
IDLE
20.7 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
www.netzsch.com
Specific Heat Test
2 20.0 40.0 30.0
3 40.0 60.0 50.0
Temperature: -20.0 .. 90.0 °C
End temperature must be greater than start temperature
Run Parameters
Heat Flux Sensor Calibration 0142-O_Cal 1450D_25644_#1 Select Manage
Reference material: 25644 (1450 D)
Calibration date: 21/08/2024 12:08
Temperature range: -10.0 °C ... 80.0 °C
Door state: Closed Open Close Stop
Load setpoint
Pressure 2.1 kPa
Current load pressure: 0.0 kPa
Force 84.0 N Apply Stop
Current load force: 1.1 N
Thickness 0.0000 cm
Current thickness: 5.0483 cm
Max. Force 0.0 N
Remove stack after test from sample to offset 3.0000 cm
Thermocouple Average
Heat Flux sensors Both Change
Instrumentation Kit Not Used
Stability CP Test Select Manage
Max. Setpoint/Step Duration 0 min
Reload
Start

2.2.8


NETZSCH SmartMode
NETZSCH
SmartMode 8.5
HFM 446 S
IDLE
0.0 °C
Favorites
User Methods
Wizards
AutoCalibration
Measurement
Reports
Setup & Control
New reports
File Browser
Lambda 90/90
Reports Configuration
Configure
Recent measurements
MBC1.ngb-sh4
Specific Heat Test
Test 1.ngb-sh4
Thermal Conductivity Test
MBC__NN_B3_S6_PG_03.04__20250422_1031.ngb-sh4
Thermal Conductivity Test
MBC__NN_B3_S9_PG_03.04__20250417_1502.ngb-sh4
Thermal Conductivity Test
MBC__NN_B3_S7_PG_03.04__20250417_1340.ngb-sh4
Thermal Conductivity Test
MBC__NN_B3_S7_PG_03.04__20250417_1152.ngb-sh4