NETZSCH
Proven Excellence.

Accessories for Differential Scanning Calorimeters and Thermobalances

Crucibles, Sensors, Sample Carriers, Calibration Kits
for DSC, TGA and STA Systems

Analyzing & Testing

Introduction

Accessories for Thermal Analysis – DSC/DTA, TGA and STA

At NETZSCH, we always strive to be a step ahead. We place as much importance on the development and production of accessories as on that of new instruments. Accessories in contact with the sample or in close proximity to it require special attention. Potential reactions between the sample material and instrument parts must be prevented while ensuring that the test results remain reliable and accurate. For these reasons, one of our primary areas of focus is crucibles and sensors for DTA/DSC, TGA and STA instruments.

This catalogue provides an overview of all such crucibles and sensors for DTA, DSC, TGA and STA measurements. You will find many different crucible materials listed, and a variety of types and special shapes. From among these, we can help you find the right crucible size and material for any application, be it standard or special. In addition to standard aluminum crucibles, our portfolio includes autoclaves with low to medium or high pressure-tightness, as well as ones for determining the oxidative-induction time (OIT) and solid fat index (SFI). We offer crucibles made of ceramics or metals covering a wide temperature range. In the high-temperature range, special TGA and DTA crucibles, slip-on plates, meshes and baskets are available to accommodate specific sample dimensions and densities.

Lately, the demand for special crucibles has been increasing. Of course, measurements can only be carried out when the right sensor or sample carrier for these special crucibles is available. We have therefore listed these special cases here, often providing application examples to demonstrate their characteristic advantages.

Our accessories can open up a world of possibilities for your thermoanalytical needs. It is our hope that this catalogue will serve to acquaint you with these. If you have any questions, or if you require something specific which you cannot find in the following tables, please simply contact us – NETZSCH welcomes the challenge of working out a solution tailored to your application, and we are always happy to hear from you.

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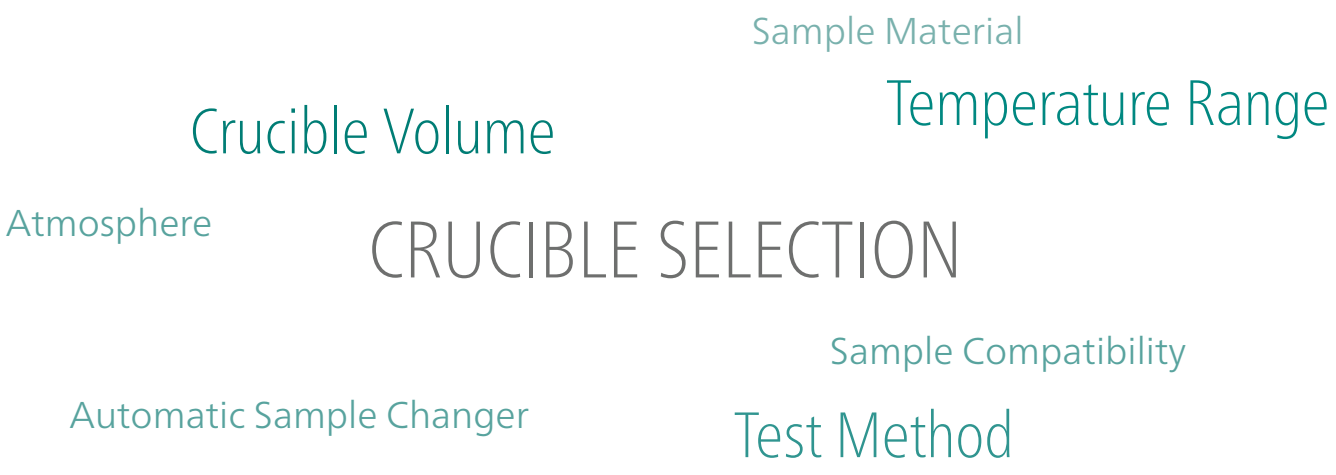
Crucibles

Crucibles and Their Selection

Crucibles and their lids are made of materials resistant to high temperatures, usually porcelain or an inert metal. Ceramics such as alumina, zirconia, and especially magnesia will tolerate the highest temperatures. One of the first metals used in crucible production was platinum; more recently, metals such as nickel and zirconium have also been used. The type of crucible used for thermo-analytical measurements can have a strong influence on the measurement results obtained. Additionally, the crucible can also influence the characteristics of the instrument's measuring cell.

Important Factors for Selection of Suitable DSC, TGA and STA Crucibles for Your Sample

- The DSC crucible should have a flat bottom and be made of a material with a high thermal conductivity. This guarantees optimum heat transfer and low temperature gradients between the sample, crucible and sensor.
- The crucible should be made of an inert material in order to prevent reactions with the sample in the programmed temperature range. Exceptions are crucibles for which a catalytic effect on the sample is desired (e.g., copper crucible for OIT tests, etc.).
- The crucible should not exhibit anyphase transitions or other effects in the programmed temperature range; the melting point or fusion temperature must exceed the maximum application temperature to a sufficient degree.
- The dimension, shape and specific heat of the crucible should be optimized to achieve and/ or maintain the highest caloric sensitivity and lowest time constant for the measuring system. Optimized parameters will result in sharp, well-defined and clearly separated peaks.
- Crucibles should be reusable, especially special ones for specific applications.



Standard Aluminum Crucibles

Crucibles for the DSC 204 ***F1*** *Phoenix*®, DSC 200 ***F3*** *Maia*®, DSC 3500 *Sirius* and DSC 214 *Polyma*

The following tables list the crucibles for the low-temperature DSC systems DSC 204 ***F1*** *Phoenix*®, DSC 200 ***F3*** *Maia*®, DSC 3500 *Sirius* and DSC 214 *Polyma*. Many of these crucibles can also be used for the high-temperature DSC and STA systems and can be found in those tables as well.

Please note that the temperatures listed indicate the maximum temperature ranges of the crucible material but not of the DSC systems.

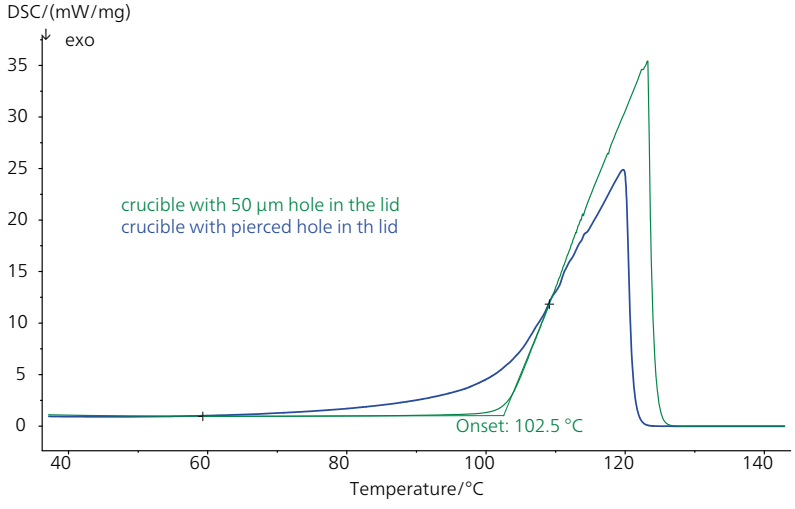
Some of the crucibles made of aluminum can be cold-welded with a sealing press. The standard Al crucibles and lids can be sealed to obtain a volume of either 40 µl or 25 µl by simply reversing the lid.

This ensures that samples of various shapes, such as pellets or fibers, can make optimum contact with the crucible bottom.

The premium *Concavus* pans have a unique geometry which features a concave bottom. The pans are delivered in the antistatic 3in1 Box. This elaborate packing prevents deformation of the pans, while allowing easy access of them and providing a fully functional archiving system.

For special applications such as boiling point determination for volatile substances or gypsum investigations, Al lids with a laser-cut hole (50 µm) can be used. The lids can be cold-welded to the standard Al crucible.

Our high pressure crucibles are capable of withstanding a maximum of 100 bar of internal pressure. A single sealing tool handles the job identically for all high-pressure crucible varieties. Each crucible comes with a seal. The gold seals will be expended but can be ordered separately in order to continue using the crucible. The medium-pressure crucible withstands pressures up to 20 bar.



Using Al crucibles and lid with laser-cut hole (ø 50-µm hole) suppresses evaporation of solvents and other volatiles. Furthermore, these lids can be used for gypsum investigations.

Al Lid with Laser-Cut Hole

Evaporation of volatile substances usually starts before the boiling point of the volatile is reached. This measurement shows that the evaporation of water can be suppressed by using a cold weldable aluminum lid with a defined hole (ø 50 µm, green curve). The comparison measurement uses a lid with a punched hole. Here, evaporation already begins at slightly above 60°C (blue curve). Cold weldable lids with laser-cut holes can also be used for gypsum applications. The separation of dihydrate (DH) and half hydrate (HH) can be achieved.

Standard Crucibles Made of Aluminum for the DSC 204 ***F1*** *Phoenix®*, DSC 200 ***F3*** *Maia®*, DSC 3500 *Sirius*, DSC 214 *Polyma* , DSC 214 *Nevio*, DSC 204 ***F1*** *Nevio*					
Material (Purity)	Temperature Range	Consisting of	Dimension/ Volume	Remarks	Order Number
Al (99.5)	Max. 600°C	Crucible + lid	ø 6 mm; 25/40 µl*	Set of 100 pcs., cold weldable**	**6.239.2-64.5.00**
Al (99.5)	Max. 600°C	Crucible + lid	ø 6 mm; 25/40 µl*	Set of 500 pcs., cold weldable**	**6.239.2-64.51.00**
Al (99.5)	Max. 600°C	Crucible	ø 6 mm; 25/40 µl*	100 pieces	**6.239.2-64.5.01**
Al (99.5)	Max. 600°C	Lid		Set of 100 pcs. for 6.239.2-64.5.01	**6.239.2-64.5.02**
Al (99.5)	Max. 600°C	Crucible + lid with laser-cut hole (50 µm)	ø 6 mm; 40 µl	Set of 100 pcs., cold weldable**	**6.239.2-64.8.00**
Al (99.5)	Max. 600°C	Crucible + lid with laser-cut hole (50 µm)	ø 6 mm; 40 µl	Set of 500 pcs., cold weldable**	**6.239.2-64.81.00**
Al (99.5)	Max. 600°C	Crucible + lid***	ø 5 mm; 30/40 µl	1 Set, 3in1 Box (archiving system)	**DSC21400A66.010.00**
Al (99.5)	Max. 600°C	Crucible + lid***	ø 5 mm; 30/40 µl	5 Sets of 96 pieces incl. 3in1 box	**DSC21400A66.020-00**
Al (99.5)	Max. 600°C	*Concavus* pan***	ø 5 mm; 30/40 µl	96 pieces including 3in1 box	**NGB814672**
Al (99.5)	Max. 600°C	Crucible + lid***	ø 5 mm; 30/40 µl	Set of *Concavus* pans and lids, 100 pieces each, without tray	**DSC21400A66.030-00**
Al (99.5)	Max. 600°C	Crucible + lid***	ø 5 mm; 30/40 µl	Set of *Concavus* pans and lids, 500 pieces each, without tray	**DSC21400A66.040-00**
Al (99.5)	Max. 600°C	Crucible + lid*** with lasercut hole (50 µm)	ø 5 mm; 30/40 µl	Set of 100 *Concavus* pcs. + lid, cold weldable**	**DSC21400A66.050-00**
Al (99.5)	Max. 600°C	Lid with laser-cut hole (50 µm)***		Pierced lids for *Concavus* crucibles, 100 pcs.	**DSC21400A66.051-00**
Al (99.5)	Max. 600°C	*Concavus* pan***	ø 5 mm; 30/40 µl	Set of 100 pcs.	**NGB817525**
Al (99.5)	Max. 600°C	*Concavus* lid***		Set of 100 pcs.	**NGB817526**
Al (99.5)	Max. 600°C	Slide-in lid	For *Concavus* pans; allows sample to be pressed onto crucible bottom, set of 100 pcs., especially for foils and fibers; requires tool kit DSC21400A80.030-00 for sealing press 6.240.10-80.0.00A		**NGB815051**
Al (99.5)	Max. 600°C	Crucible	ø 6.7mm; 85 µl	Set of 100 pieces	**NGB810405**
Al (99.5)	Max. 600°C	Set***	2 x 3in1 boxes, *Concavus* sealing tool, *Concavus* calibration set		**DSC21400A91.010-00**
Al (99.5)	Max. 600°C	Lid		100 pieces, for NGB810405	**NGB810406**

* Crucible volumes of either 25 µl or 40 µl can be achieved by simply reversing the lid.
** One and the same sealing press is capable of sealing all standard Al crucibles; order no. 6.240.10-80.0.00A.
*** Using *Concavus* pans with ASC instrument which were delivered before 2014 may require re-adjustment of the ASC gripper.

Concavus pans with lids

Al crucibles with lids

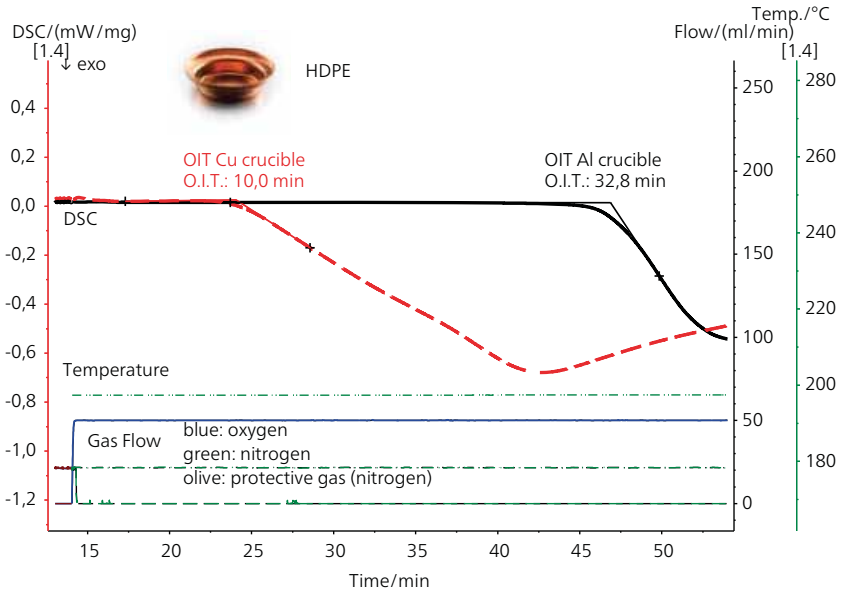
Al crucible with laser-cut Al lid

Slide-in lid for *Concavus* pan;
for demonstration purposes, the covers are colored

Crucibles for General and Special Applications

Crucibles for General Applications – DSC 204 ***F1*** *Phoenix®*, DSC 200 ***F3*** *Maia®*, DSC 3500 *Sirius*, DSC 214 *Polyma* , DSC 214 *Nevio*, DSC 204 ***F1*** *Nevio*					
Material (Purity)	Temp. Range	Consisting of	Dimension/ Volume	Remarks	Order Number
Al_2O_3 (99.7)	Max. 1700°C	Crucible	ø 6.8 mm/85 µl		**GB399972**
Al_2O_3 (99.7)	Max. 1700°C	Lid		For GB399972	**GB399973**
Fused silica	Max. 1000°C	Crucible	ø 6.7 mm/85 µl		**GB399974**
Fused silica	Max. 1000°C	Lid		For GB399974	**GB399975**
Pt/Rh (80/20)	Max. 1700°C	Crucible	ø 6.8 mm/85 µl		**GB399205**
Pt/Rh (80/20)	Max. 1700°C	Crucible	ø 6.8 mm/190 µl		**NGB801556**
Pt/Rh (80/20)	Max. 1700°C	Lid		For GB399205 and NGB801556	**GB399860**
Gold (99.9)	Max. 900°C	Crucible + lid	ø 6.7 mm/85 µl		**6.225.6-93.3.00**
Silver	Max. 750°C	Crucible + lid	ø 6.7 mm/85 µl		**6.225.6-93.4.00**

Ampoules made of Duran glass or fused silica are available.



Comparison of the oxidative-induction time in open copper and aluminum crucibles.

Influence of the Crucible on the Oxidative-Induction Time (OIT)

The oxidative-induction time (OIT) canbe determined in standard aluminum or in open copper crucibles in accordance with ASTM D3895.

This plot represents an OIT measure-mentm of HDPE carried out in open copper (red) and Al (black) crucible respectively. It can clearly be seen that, under isothermal conditions, oxidation of HDPE begins approximately 23 min earlier in the copper crucible than in the Al crucible.

Special Crucibles for Special Applications – DSC 204 ***F1*** *Phoenix®*, DSC 200 ***F3*** *Maia®*, DSC 3500 *Sirius*, DSC 214 *Polyma* , DSC 214 *Nevio*, DSC 204 ***F1*** *Nevio*					
Material (Purity)	Temperature Range	Consisting of	Dimension/ Volume	Remarks	Order Number
Cu	Max. 600°C	Crucible	ø 6 mm/25/40 µl	For OIT measurements according to ASTM D3895 (Oxidative-Induction Time), Set of 25	**6.239.2-64.6.00**
Duran glass	Max. 600°C	Ampoule	80 µl	Set of 100, not available for DSC 214 *Polyma*, after sealing ampoule length ≈ 19 mm	**6.240.1-93.2.00**
Fused silica	Max. 1000°C	Ampoule	80 µl	After sealing ampoule length ≈ 19 mm	**NGB815223**
For DSC 204 ***F1***: Auxiliary kit for glass ampoules		▪ Seal-off support for glass ampoules ▪ Small welder with butane and oxygen gas bottles ▪ Inner lid for measuring cell for use with glass ampoules			**6.240.10-93.1.00**
For DSC 200 ***F3*** *Maia®*: Auxiliary kit for glass ampoules		▪ Seal-off support for glass ampoules ▪ Small welder with butane and oxygen gas bottles ▪ Inner lid for measuring cell for use with glass ampoules ▪ 100 ampoules			**6.240.20-93.1.00**
For DSC 204 ***F1*** *Phoenix®* with τ-sensor and DSC 214 *Polyma*: Al (99.5)	Max. 600°C	Crucible	ø 6.7 mm/85 µl	Especially for determination of the OIT of lubricants and grease in accordance to ASTM D5483-5 and Solid Fat Index (SFI) in accordance to ASTM D6186 Required accessories to obtain OIT/SFI crucible design: ▪ Sealing press 6.240.10-80.0.00A ▪ Stamping toolkit 6.240.10-84.0.00 ▪ Lid NGB810406	**NGB810405**

Special crucibles made of copper and aluminum for OIT tests

Sealing Press, Sample Preparation and Pressure-Tight Crucibles

Sealing Press/Tools

- The sealing press (order no. 6.240.10-80.0.00A) can be equipped with five toolkits for sealing and stamping of different crucible types:
  - Toolkit for *Concavus* pan: order no. 6.240.10-85.0.00
  - Toolkit for Al crucible: order no. 6.240.10-81.0.00
  - Toolkit for low-pressure Al crucible: order no. 6.240.10-82.0.00
  - Toolkit for sealing of mediumpressure crucibles: order no. 6.240.10-83.0.00
  - Stamping toolkit 6.240.10-84.0.00 for SFI crucible NGB810405
  - Toolkit for inserting slidein lid (order no. NGB815051) into *Concavus* pan: order no. DSC21400A80.030-00
- Sealing tool for the high-pressure crucibles, order no. 6.239.2-92.4.00

Sample Preparation

For the sample preparation, we offer two kits for the low- and high-temperature range:

- Kit for low-temperature range: cutting board, scissors, hollow punch, scriber, glass-fiber brush, tweezers, spatula, scalpel, 5 scalpel blades, 5 single-edge blades, ball pen, post-it, space for business card of the NETZSCH contact, manual order no. 6.240.12-99.0.00
- Kit for high-temperature range: cutting board, scissors hollow punch, scriber, glass-fiber brush, tweezers, spatula, scalpel, 5 scalpel blades, 5 single-edge blades, shaping tool, crucible holder, weighing support, crucible box with 4 Al_2O_3 crucibles, post-it, manual order no. DSC404F1A99.000-00

- *SampleCutter* tool for cutting and creating of plane-non-metallic samples (e.g., polymer granulates), order no. NGB814695
  - 10 spare blades for *SampleCutter*, order no. NGB 814821

Medium-pressure crucible (right) and high-pressure crucible (left)

Crucibles Made of Aluminum – Low-Pressure*					
Material (Purity)	Temperature Range	Consisting of	Dimension/ Volume	Remarks	Order Number
Al (99.5)	Max. 600°C	Crucible + Lid	ø 6 mm/35 µl; 3 bar	Set of 100 pieces, cold weldable	**6.240.10-65.1.00**
Al (99.5)	Max. 600°C	Crucible + Lid	ø 6 mm/35 µl; 3 bar	Set of 500 pieces, cold weldable	**6.240.10-65.11.00**
Al (99.5)	Max. 600°C	Crucible	ø 6 mm/35 µl; 3 bar	100 pieces	**NGB810419**
Al (99.5)	Max. 600°C	Lid	For crucibles of ø 6 mm	100 pieces	**NGB810420**

* Please note, the low-pressure crucibles made of Al are not available for the automatic sample changer (ASC) for 192 sample pans.

Medium- and High-Pressure Crucibles					
Material (Purity)	Temperature Range	Consisting of	Dimension/ Volume	Remarks	Order Number
CrNi steel (AISI 304)	Max. 250°C	Crucible + lid + elastomer seal	120 µl; 20 bar	Set of 25 pieces; seal made of FPM	6.240.1-68.1.00
O-ring seal	Max. 230°C	O-ring	Max. 20 bar	Seal made of PCTFE	NGB801765
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, gold-plated surface, reusable	ø 6 mm, 27 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-92.3.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, gold-plated surface, reusable	ø 6 mm, 27 µl, max. 100 bar	10 crucibles + 50 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-92.31.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, gold-plated surface, reusable	ø 6 mm, 100 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-92.8.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6 mm, 27 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-93.3.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6 mm, 27 µl, max. 100 bar	10 crucibles + 50 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-93.31.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6 mm, 100 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-93.4.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6 mm, 100 µl, max. 100 bar	10 crucible + 50 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-93.41.00
Titanium (Grade 4)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6 mm, 27 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-92.6.00
Titanium (Grade 4)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6 mm, 100 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-92.9.00
Au seals (Au 585)	Max. 500°C	For all high-pressure autoclaves, alloy: Au 58.5%, Ag 26%, Cu 15.5%			6.240.1-91.1.00
Sealing press		For crucibles: 6.239.2-92.3.00, -92.31.00, -92.6.00, -92.8.00, -92.9.00, -93.3.00, -93.31.00, -93.4.00, -93.41.00			6.239.2-92.4.00

Crucibles for Operation with the Automatic Sample Changer (ASC) for 20 Sample Pans

Crucibles for DSC 200 ***F3*** *Maia*®, DSC 3500 *Sirius*, DSC 214 *Polyma* and DSC 214 *Nevio* in ASC Operation				
Crucible Material (Purity/%), Volume Lid	ASC Gripper DSC 200 ***F3***	Carousel Standard Crucibles	Carousel Large Crucibles	Order Number
Al (99.5), 30/40 µl (*Concavus* pan)	x*	x	x	DSC21400A66.010-00[1] DSC21400A66.020-00[1] DSC21400A66.030-00[1] DSC21400A66.040-00[1] DSC21400A66.050-00[1] NGB817525
Crucible with welded lid	x*	x	x	
Al (99.5), 30/40µl, slide-in lid for *Convacus* pan	x	x	x	NGB815051
Al (99.5), 30/40 µl, crucible and lid with laser-cut-hole	x			DSC21400A66.050-00
Al (99.5), 25/40 µl	x	x	x	6.239.2-64.5.00
Crucible with welded lid	x	x	x	
Al (99.5), 25/40 µl (500/pkg.)	x	x	x	6.239.2-64.51.00
Crucible with welded lid	x	x	x	
Al (99.5), 25/40 µl	x	x	x	6.239.2-64.8.00
Crucible and lid with laser-cut-hole	x	x	x	
Al (99.5), 25/40 µl (500/pkg.)	x	x	x	6.239.2-64.81.00
Crucible and lid with laser-cut-hole	x	x	x	
Al (99.5), low-pressure, 35 µl	x	x	x	6.240.10-65.1.00
Crucible with welded lid	x	x	x	
CrNi steel (AISI 304), medium-pressure, 120 µl, 20 bar	x	x	Only for manual operation	6.240.1-68.1.00
Crucible with lid	x	x		
Copper, 25 µl	x	x	Only for manual operation	6.239.2-64.6.00
CrNi steel (AISI 316L), high-pressure, 27 µl, gold-plated, 100 bar	x	x	Only for manual operation	6.239.2-92.3.00
CrNi steel (AISI 316L), high-pressure, 27 µl, 100 bar	x	x	Only for manual operation	6.239.2-93.3.00
CrNi (AISI 316L), high-pressure, 100 µl, gold-plated, 100 bar	x	x	Only for manual operation	6.239.2-92.8.00
CrNi (AISI 316L), high-pressure, 100 µl, 100 bar	x	x	Only for manual operation	6.239.2-93.4.00
Ti (Grade 4), high-pressure, 27 µl, 100 bar	x	x	Only for manual operation	6.239.2-92.6.00

[1] Please see crucible details on page 7

Crucible Material (Purity/%), Volume Lid	ASC Gripper DSC 200 ***F3***	Carousel Standard Crucibles	Carousel Large Crucibles	Order Number
Ti (Grade 4), high-pressure, 100 µl, 100 bar	x	x	Only for manual operation	6.239.2-92.9.00
Al_2O_3 (99.7), ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399972
Crucible with lid (note: lid order no.)	x	x		GB399973
Fused silica, ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399974
Crucible with lid (note: lid order no.)	-	x		GB399975
Fused silica, ø 8 mm, 300 µl	x	-		NGB812506
Pt/Rh (80/20), ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399205
Crucible with lid (note: lid order no.)	-	x		GB399860
Pt/Rh (80/20), ø 6.8 x 6 mm, 190 µl	x	x	Only for manual operation	NGB801556
Crucible with lid (note: lid order no.)	-	x		GB399860
Al (99.5), ø 6.7 mm, 85 µl	x	x	Only for manual operation	NGB810405
Crucible with lid (note: lid order no.)	-	x		NGB810406
Graphite, ø 6.8mm, 85 µl	x	x	Only for manual operation	GB399956
Crucible with lid (note: lid order no.)	-	x		GB399957
Gold (99.9), ø 6.8 mm, 85 µl,	x	x	Only for manual operation	6.225.6-93.3.00
Crucible with lid (99.9)	-	x		
Silver, ø 6.8 mm, 85 µl	x	x	Only for manual operation	6.225.6-93.4.00
Crucible with lid	-	x		
ZrO_2, ø 6.8mm, 85 µl	x	x	Only for manual operation	GB397053
Crucible with lid (note: lid order no.)	-	x		GB397052
Y_2O_3,[1] ø 6.8mm, 85 µl	x	x	Only for manual operation	NGB812636
Crucible with lid [1] (note: lid order no.)	x	x		NGB812635
MgO, ø 6.8mm, 85 µl	x	x	Only for manual operation	NGB812639
Crucible with lid (note: lid order no.)	x	x		NGB812637
Al_2O_3 (99.7), ø 8 x 8 mm, 300 µl	x	-	x	NGB803698
Crucible with lid (note: lid order no.)	-	-	-	NGB808209
Pt/Rh/Al_2O_3 system with lid	-	x	Only for manual operation	6.225.6-93.2.00

* Using *Concavus* pans with ASC instrument which were delivered before 2014 may require re-adjustment of the ASC gripper.
[1] May not be used with Al_2O_3, e.g., sensor plate, sapphire disc, etc.

Concavus pans with lids, 30 µl or 40 µl

Al crucibles with lids, 25 µl or 40 µl

Crucibles for Operation with the Automatic Sample Changer (ASC) for 64 Sample Pans

Crucibles for DSC 200 ***F3*** *Maia*®, DSC 3500 *Sirius*, DSC 214 *Polyma* and DSC 214 *Nevio* in ASC Operation				
Crucible Material (Purity/%), Volume Lid	ASC Gripper DSC 200 ***F3***	Carousel Standard Crucibles	Carousel Large Crucibles	Order Number
Al (99.5), 30/40 µl (*Concavus* pan)	x*	x	x	DSC21400A66.010-00[1] DSC21400A66.020-00[1] DSC21400A66.030-00[1] DSC21400A66.040-00[1] DSC21400A66.050-00[1] NGB817525
Crucible with welded lid	x*	x	x	
Al (99.5), 30/40µl, slide-in lid for *Convacus* pan	x	x	x	NGB815051
Al (99.5), 30/40 µl, crucible and lid with laser-cut-hole	x			DSC 21400A66.050-00
Al (99.5), 25/40 µl	x	x	x	6.239.2-64.5.00
Crucible with welded lid	x	x	x	
Al (99.5), 25/40 µl (500/pkg.)	x	x	x	6.239.2-64.51.00
Crucible with welded lid	x	x	x	
Al (99.5), 25/40 µl	x	x	x	6.239.2-64.8.00
Crucible and lid with laser-cut-hole	x	x	x	
Al (99.5), 25/40 µl (500/pkg.)	x	x	x	6.239.2-64.81.00
Crucible and lid with laser-cut-hole	x	x	x	
Al (99.5), low-pressure, 35 µl	x	x	x	6.240.10-65.1.00
Crucible with welded lid	x	x	x	
CrNi steel (AISI 304), medium-pressure, 120 µl, 20 bar	-	x	Only for manual operation	6.240.1-68.1.00
Crucible with lid	-	x		
Copper, 25 µl	x	x	Only for manual operation	6.239.2-64.6.00
CrNi steel (AISI 316L), high-pressure, 27 µl, gold-plated, 100 bar	x	x	Only for manual operation	6.239.2-92.3.00
CrNi steel (AISI 316L), high-pressure, 27 µl, 100 bar	x	x	Only for manual operation	6.239.2-93.3.00
CrNi (AISI 316L), high-pressure, 100 µl, gold-plated, 100 bar	x	x	Only for manual operation	6.239.2-92.8.00
CrNi (AISI 316L), high-pressure, 100 µl, 100 bar	x	x	Only for manual operation	6.239.2-93.4.00

[1] Please see crucible details on page 7

Crucible Material (Purity/%), Volume Lid	ASC Gripper DSC 200 ***F3***	Carousel Standard Crucibles	Carousel Large Crucibles	Order Number
Ti (Grade 4), high-pressure, 27 µl, 100 bar	x	x	Only for manual operation	6.239.2-92.6.00
Ti (Grade 4), high-pressure, 100 µl, 100 bar	x	x	Only for manual operation	6.239.2-92.9.00
Al_2O_3 (99.7), ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399972
Crucible with lid (note: lid order no.)	x	x		GB399973
Fused silica, ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399974
Crucible with lid (note: lid order no.)	-	x		GB399975
Fused silica, ø 8 mm, 300 µl	-	-	Only for manual operation	NGB812506
Pt/Rh (80/20), ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399205
Crucible with lid (note: lid order no.)	-	x		GB399860
Pt/Rh (80/20), ø 6.8 mm, 85 µl	x	x	Only for manual operation	NGB801556
Crucible with lid (note: lid order no.)	-	x		GB399860
Al (99.5), ø 6.7 mm, 85 µl	x	x	Only for manual operation	NGB810405
Crucible with lid (note: lid order no.)	-	x		NGB810406
Graphite, ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399956
Crucible with lid	-	x		GB399957
Gold, ø 6.8 mm, 85 µl	x	x	Only for manual operation	6.225.6-93.3.00
Crucible with lid	-	x		
Silver, ø 6.8 mm, 85 µl	x	x	Only for manual operation	6.225.6-93.4.00
Crucible with lid (note: lid order no.)	-	x		
ZrO_2, ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB397053
Crucible with lid (note: lid order no.)	-	x		GB397052
Y_2O_3,[1] ø 6.8 mm, 85 µl	x	x	Only for manual operation	NGB812636
Crucible with lid [1] (note: lid order no.)	x	x		NGB812635
MgO, ø 6.8 mm, 85 µl	x	x	Only for manual operation	NGB812639
Crucible with lid (note: lid order no.)	x	x		NGB812637
Al_2O_3 (99.7), ø 8 x 8 mm, 300 µl	-	-	Only for manual operation	NGB803698
Crucible with lid (note: lid order no.)	-	-		NGB808209
Pt/Rh/Al_2O_3 system with lid	-	x	Only for manual operation	6.225.6-93.2.00

* Using *Concavus* pans with ASC instrument which were delivered before 2014 may require re-adjustment of the ASC gripper.
[1] May not be used with Al_2O_3, e.g., sensor plate, sapphire disc, etc.

Crucibles for Operation with the Automatic Sample Changer (ASC) for 204 Sample Pans

Crucibles for DSC 204 ***F1*** *Phoenix*® and DSC 204 ***F1*** *Nevio* for 204 Sample Pans, possible for τ-sensor		
Crucible Material (Purity/%), Volume Lid	ASC Gripper	Order Number
Al (99.5), 30/40 µl (*Concavus* pan)	x	DSC21400A66.010-00[1] DSC21400A66.020-00[1] DSC21400A66.030-00[1] DSC21400A66.040-00[1] DSC21400A66.050-001, NGB817525
Crucible with welded lid	x	
Al (99.5), 30/40 µl, slide-in lid for *Concavus* pan	x	NGB815051
Al (99.5), 30/40 µl, crucible and lid with laser-cut-hole	x	DSC21400A66.050-00
Al (99.5), 25/40 µl	x	6.239.2-64.5.00
Crucible with welded lid	x	
Al (99.5), 25/40 µl (500/pkg.)	x	6.239.2-64.51.00
Crucible with welded lid	x	
Al (99.5), 25/40 µl	x	6.239.2-64.8.00
Crucible and lid with laser-cut-hole	x	
Al (99.5), 25/40 µl (500/pkg.)	x	6.239.2-64.81.00
Crucible and lid with laser-cut-hole	x	
CrNi steel (AISI 304), medium-pressure, 120 µl, 20 bar	x	6.240.1-68.1.00
Crucible with lid	x	
Copper, 25 µl	x	6.239.2-64.6.00
CrNi steel (AISI 316L), high-pressure, 27 µl, gold-plated, 100 bar	x	6.239.2-92.3.00
CrNi steel (AISI 316L), high-pressure, 27 µl, 100 bar	x	6.239.2-93.3.00
CrNi (AISI 316L), high-pressure, 100 µl, gold-plated, 100 bar	x	6.239.2-92.8.00
CrNi (AISI 316L), high-pressure, 100 µl, 100 bar	x	6.239.2-93.4.00
Ti (Grade 4), high-pressure, 27 µl, 100 bar	x	6.239.2-92.6.00
Ti (Grade 4), high-pressure, 100 µl, 100 bar	x	6.239.2-92.9.00
Al_2O_3 (99.7), ø 6.8 mm, 85 µl	x	GB399972
Crucible with lid (note: lid order no.)	x	GB399973
Fused silica, ø 6.8 mm, 85 µl	x	GB399974
Crucible with lid (note: lid order no.)	x	GB399975
Fused silica, ø 8 mm, 300 µl	x	NGB812506
Pt/Rh (80/20), ø 6.8 mm, 85 µl	x	GB399205
Crucible with lid (note: lid order no.)	x	GB399860

[1] Please see crucible details on page 7

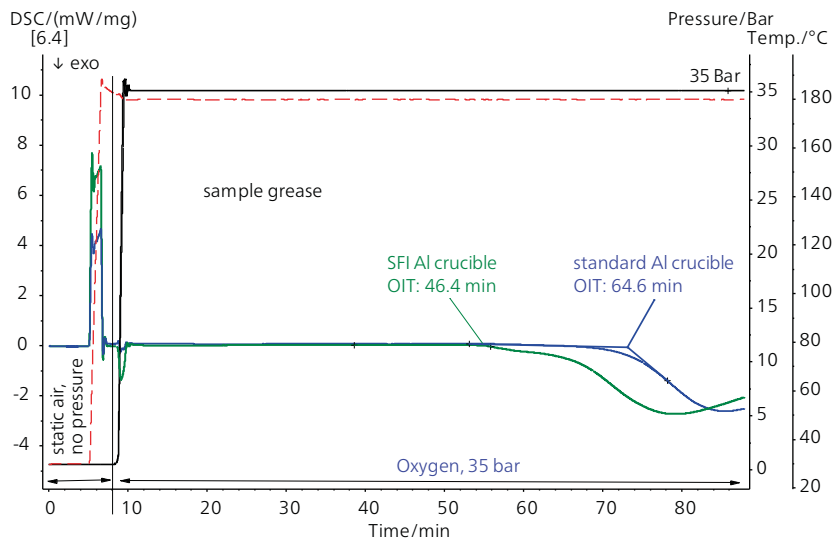
Crucible Material (Purity/%), Volume Lid	ASC Gripper	Order Number
Pt/Rh (80/20), ø 6.8 mm, 190 µl	x	NGB801556
Crucible with lid (note: lid order no.)	x	GB399860
Al (99.5), ø 6.7 mm, 85 µl	x	NGB810405
Crucible with lid (note: lid order no.)	x	NGB810406
Graphite, ø 6.8 mm, 85 µl	x	GB399956
Crucible with lid	x	GB399957
Gold, ø 6.8 mm, 85 µl	x	6.225.6-93.3.00
Crucible with lid	x	
Silver, ø 6.8 mm, 85 µl	x	6.225.6-93.4.00
Crucible with lid	x	
ZrO_2, ø 6.8 mm, 85 µl	x	GB397053
Crucible with lid (note: lid order no.)	x	GB397052
Y_2O_3,[1] ø 6.8 mm, 85 µl	x	NGB812636
Crucible with lid [1] (note: lid order no.)	x	NGB812635
MgO, ø 6.8 mm, 85 µl	x	NGB812639
Crucible with lid (note: lid order no.)	x	NGB812637
Al_2O_3 (99.7), ø 8 x 8 mm, 300 µl	x	NGB803698[2]
Crucible with lid (note: lid order no.)	x	NGB808209
Pt/Rh/Al_2O_3 system with lid	x	6.225.6-93.2.00

[1] May not be used with Al_2O_3, e.g., sensor plate, sapphire disc, etc.
[2] May be used in the row for calibration materials or in the 96 sample tray without a sample pan in direct neighborhood

Special Crucibles for Special Applications

Oxidative-Induction Time (OIT) and Solid Fat Index (SFI) Tests on Lubricating Greases

Grease and wax samples can be prepared with more consistent surface areas when using SFI crucibles instead of flat-bottom crucibles. The results show an increased reproducibility. In this example, an OIT measurement on grease was carried out with the DSC 204 HP *Phoenix*® with a standard Al crucible and the SFI crucible under an oxygen pressure of 35 bar as per ASTM D5483-5. The difference in the OIT is clearly visible. The oxidative-induction time of the grease in the SFI crucible is approximately 21 min shorter than the one in the standard Al crucible. This effect results from the more consistent sample surface area made possible by use of the SFI crucible.



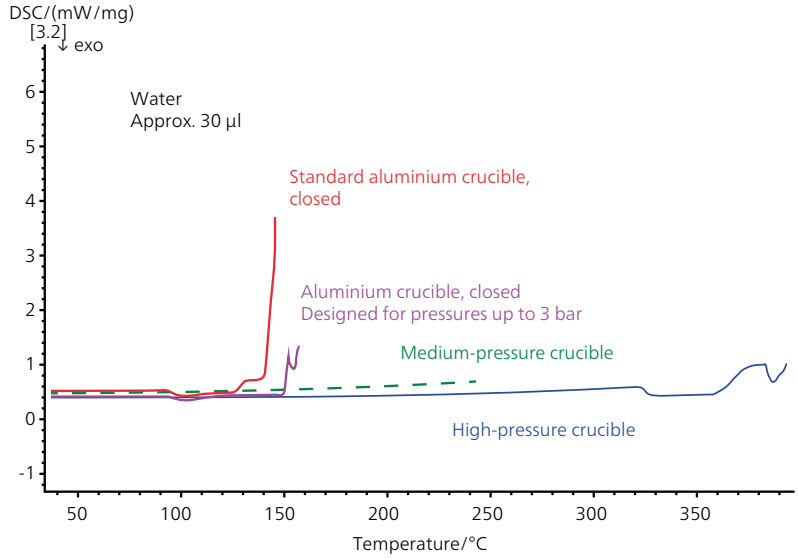
Oxidation stability in two different Al crucibles

SFI crucible for an OIT test of lubricants and greases on special stamping tool for sealing press 6.240.10-80.0.00A

Internal Pressure Capabilities of Sealed Al, Fine Steel, and CrNi Steel Crucibles

A material's potential reaction and/or type of investigation being conducted (e.g., denaturation of starch, curing of phenolic resin), may warrant the use of crucibles capable of certain levels of internal pressure. The plot shows four measurements on water, of approximately 30 µl each, in different crucible types: Al standard, Al low-pressure (max. 3 bar), fine steel medium-pressure, and CrNi steel autoclaves.

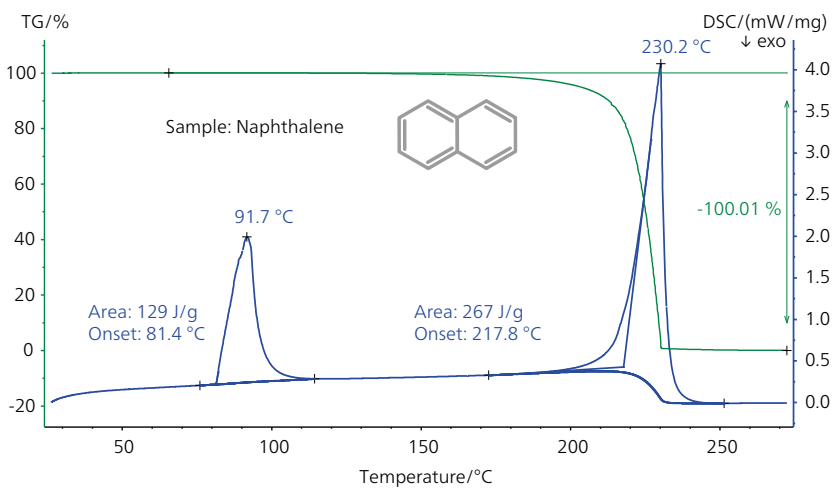
It can be observed that the standard Al crucible starts to leak at approxmately 125°C, while the low-pressure Al pan opens above 150°C when water is trapped inside. The mediumpressure crucibles (20 bar) withstand the inner pressure increase up to their maximum temperature. The high-pressure crucibles begin to leak around 300°C.



Comparison of measurements done in crucibles capable of withstanding various levels of internal pressure

Melting and Boiling Point Determination for a Polycyclic Aromatic Hydrocarbon

Polycyclic aromatic hydrocarbons (PAHs), such as naphthalene, are formed during natural and anthropogenic processes like volcanic eruptions, forest fires, etc. They are released into the atmosphere and, due to their hydrophobicity, accumulate in soil and may enter into the food chain. This measurement was designed to determine the melting and boiling point of naphthalene. A sealed Al crucible with a 50-µm laser-cut hole was used. At an extrapolated onset temperature of 81°C, melting occurred with an enthalpy of 129 J/g. Amass-loss step of 100% took place between 150°C and 230°C; this reflects evaporation of the sample. This effect was accompanied by an endothermic DSC peak with an enthalpy of 267 J/g and an extrapolated onset of 218°C. The latter reflects the boiling point of naphthalene. These results correspond to the nominal values.



STA 449 ***F3*** *Jupiter*® measurement using the TGA-DSC sensor for determination of the melting and boiling points of naphthalene (sample mass 22.66 mg, heating rate 10 K/min, 70 ml/min nitrogen atmosphere)

Al crucible with laser-cut Al lid

Crucibles for General Applications

Crucibles for the TG 209 ***F1*** *Libra*® and TG 209 ***F3*** *Tarsus*®

The TG 209 ***F1*** *Libra*® and TG 209 ***F3*** *Tarsus*® both offer sample carriers for regular and large sample masses, guaranteeing broad applications in the temperature range from room temperature to 1000°C and 1100°C, respectively.

A large variety of crucibles is available to cover the temperature range for different materials, including large crucibles required for substances with a high sample mass and low density (e.g., foams, aerogels, etc.).

Crucibles for General Applications – TG 209 ***F1*** *Libra* and TG 209 ***F1*** *Nevio*					
Material (Purity/%)	Temperature Range	Consisting of	Dimension/ Volume	Remarks	Order Number
Al_2O_3 (99.7)	Max. 1700°C	Crucible	ø 6.8 mm/85 µl		GB399972
Al_2O_3 (99.7)	Max. 1700°C	Lid		For GB399972	GB399973
Fused silica	Max. 1000°C	Crucible	ø 6.8 mm/85 µl		GB399974
Fused silica	Max. 1000°C	Lid		For GB399974	GB399975
Pt/Rh (80/20)	Max. 1700°C	Crucible	ø 6.8 mm/85 µl		GB399205
Pt/Rh (80/20)	Max. 1700°C	Lid		For GB399205 and NGB801556	GB399860
Pt/Rh (80/20)	Max. 1700°C	Crucible	ø 6.8 mm/190 µl		NGB801556
Al (99.5)	Max. 610°C	Crucible	ø 6.7 mm/85 µl	Set of 100 pieces	NGB810405
Al (99.5)	Max. 610°C	Lid		For NGB810405	NGB810406
Gold (99.9)	Max. 900°C	Crucible + lid	ø 6.7 mm/85 µl		6.225.6-93.3.00
Silver	Max. 750°C	Crucible + lid	ø 6.7 mm/85 µl		6.225.6-93.4.00
ZrO_2	Max. 2000°C	Crucible	85 µl	CaO-stabilized	GB397053
ZrO_2	Max. 2000°C	Lid		For GB397053	GB397052
Graphite	Max. 2200°C	Crucible	85 µl		GB399956
Graphite	Max. 2200°C	Lid		For GB399956	GB399957
Al_2O_3 (99.8)	Max. 1700°C	Crucible	ø 9 mm, height 7 mm, volume 350 µl	Sample holder for large samples required	NGB800453
Al_2O_3 (99.8)	Max. 1700°C	Lid			NGB800454
Al_2O_3 (99.7)	Max. 1700°C	Crucible	ø 8 mm, height 8 mm, volume 300 µl	Sample holder for large samples required, ASC-compatible	NGB803698
Al_2O_3 (99.7)	Max. 1700°C	Lid		For crucible NGB803698	NGB808209

Large crucible made of Al_2O_3, volume 350 ul

Large crucible made of Al_2O_3, volume 300 ul

Crucibles made of Pt

Crucibles for Operation with the Automatic Sample Changer (ASC) for 64 Sample Pans

Crucibles for TG 209 ***F1*** *Libra* and TG 209 ***F1*** *Nevio* in ASC Operation				
Crucible Material (Purity/%), Volume Lid	ASC Gripper	Carousel Standard Crucibles	Carousel Large Crucibles	Order Number
Al (99.5), 30/40 µl (*Concavus* pan)*	x*	x	x	DSC21400A66.010-00[1] DSC21400A66.020-00[1] DSC21400A66.030-00[1] DSC21400A66.040-00[1] DSC21400A66.050-00[1] NGB817525
Crucible with welded lid	x	x	x	
Al (99.5), 30/40µl, slide-in lid for *Convacus* pan	x	x	x	NGB815051
Al (99.5), 30/40 µl, crucible and lid with laser-cut-hole	x			DSC21400A66.050-00
Al (99.5), 25/40 µl	x	x	x	6.239.2-64.5.00
Crucible with welded lid	x	x	x	
Al (99.5), 25/40 µl	x	x	x	6.239.2-64.8.00
Crucible and lid with laser-cut-hole	x	x	x	
Al (99.5), low-pressure, 35 µl	x	x	x	6.240.10-65.1.00
Crucible with welded lid	x	x	x	
CrNi steel (AISI 304), medium-pressure, 120 µl, 20 bar	-	x	Only for manual operation	6.240.1-68.1.00
Crucible with lid	-	x		
Copper, 25 µl	x	x	Only for manual operation	6.239.2-64.6.00
CrNi steel (AISI 316L), high-pressure, 27 µl, gold-plated, 100 bar	x	x	Only for manual operation	6.239.2-92.3.00
CrNi steel (AISI 316L), high-pressure, 27 µl, 100 bar	x	x	Only for manual operation	6.239.2-93.3.00
CrNi (AISI 316L), high-pressure, 100 µl, gold-plated, 100 bar	x	x	Only for manual operation	6.239.2-92.8.00
CrNi (AISI 316L), high-pressure, 100 µl, 100 bar	x	x	Only for manual operation	6.239.2-93.4.00
Ti (Grade 4), high-pressure, 27 µl, 100 bar	x	x	Only for manual operation	6.239.2-92.6.00
Ti (Grade 4), high-pressure, 100 µl, 100 bar	x	x	Only for manual operation	6.239.2-92.9.00

[1] Please see crucible details on page 7

Crucible Material (Purity/%), Volume Lid	ASC Gripper	Carousel Standard Crucibles	Carousel Large Crucibles	Order Number
Al_2O_3 (99.7), 6.8 mm, 85 µl	x	x	Only for manual operation	GB399972
Crucible with lid (note: lid order no.)	-	x		GB399973
Fused silica, ø 8 mm, 300 µl	-	-	x	NGB812506
Fused silica, ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399974
Crucible with lid (note: lid order no.)	-	x		GB399975
Pt/Rh (80/20), ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399205
Crucible with lid (note: lid order no.)	-	x		GB399860
Pt/Rh (80/20), ø 6.8 x 6 mm, 190 µl	x	x	Only for manual operation	NGB801556
Crucible with lid (note: lid order no.)	-	x		GB399860
Al (99.5), ø 6.7 mm, 85 µl	x	x	Only for manual operation	NGB810405
Crucible with lid (note: lid order no.)	-	x		NGB810406
Graphite, ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399956
Crucible with lid (note: lid order no.)	-	x		GB399957
Gold, ø 6.8 mm, 85 µl	x	x	Only for manual operation	6.225.6-93.3.00
Crucible with lid	-	x		
Silver, ø 6.8 mm, 85 µl	x	x	Only for manual operation	6.225.6-93.4.00
Crucible with lid	-	x		
ZrO_2, ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB397053
Crucible with lid (note: lid order no.)	-	x		GB397052
Y_2O_3,[1] ø 6.8 mm, 85 µl	x	x	Only for manual operation	NGB812636
Crucible with lid [1] (note: lid order no.)	x	x		NGB812635
MgO, ø 6.8 mm, 85 µl	x	x	Only for manual operation	NGB812639
Crucible with lid (note: lid order no.)	x	x		NGB812637
Al_2O_3 (99.7), ø 8 x 8 mm, 300 µl	x	-	x	NGB803698
Crucible with lid (note: lid order no.)	-	-	x	NGB808209
Pt/Rh/Al_2O_3 system with lid	-	x	Only for manual operation	6.225.6-93.2.00

* Using *Concavus* pans with ASC instrument which were delivered before 2014 may require re-adjustment of the ASC gripper.
[1] May not be used with Al_2O_3, e.g., sensor plate, sapphire disc, etc.

Crucibles for Operation with the Automatic Sample Changer (ASC) for 204 Sample Pans

Crucibles for TG 209 ***F1*** *Libra* and TG 209 ***F1*** *Nevio* in ASC Operation		
Crucible Material (Purity/%), Volume Lid	ASC Gripper	Order Number
Al (99.5), 30/40 µl (*Concavus* pan)*	x	DSC21400A66.020-00[1] DSC21400A66.030-00[1] DSC21400A66.040-00[1] DSC21400A66.050-00[1] NGB817525
Crucible with welded lid	x	
Al (99.5), 30/40µl, slide-in lid for *Convacus* pan	x	NGB815051
Al (99.5), 30/40 µl, crucible and lid with laser-cut-hole	x	DSC21400A66.050-00
Al (99.5), 25/40 µl	x	6.239.2-64.5.00
Crucible with welded lid	x	
Al (99.5), 25/40 µl	x	6.239.2-64.8.00
Crucible and lid with laser-cut-hole	x	
Al (99.5), low-pressure, 35 µl	x	6.240.10-65.1.00
Crucible with welded lid	x	
CrNi steel (AISI 304), medium-pressure, 120 µl, 20 bar	x	6.240.1-68.1.00
Crucible with lid	x	
Copper, 25 µl	x	6.239.2-64.6.00
CrNi steel (AISI 316L), high-pressure, 27 µl, gold-plated, 100 bar	x	6.239.2-92.3.00
CrNi steel (AISI 316L), high-pressure, 27 µl, 100 bar	x	6.239.2-93.3.00
CrNi (AISI 316L), high-pressure, 100 µl, gold-plated, 100 bar	x	6.239.2-92.8.00
CrNi (AISI 316L), high-pressure, 100 µl, 100 bar	x	6.239.2-93.4.00
Ti (Grade 4), high-pressure, 27 µl, 100 bar	x	6.239.2-92.6.00
Ti (Grade 4), high-pressure, 100 µl, 100 bar	x	6.239.2-92.9.00
Al_2O_3 (99.7), 6.8 mm, 85 µl	x	GB399972
Crucible with lid (note: lid order no.)	x	GB399973
Fused silica, ø 6.8 mm, 85 µl	x	GB399974
Crucible with lid (note: lid order no.)	x	GB399975
Fused silica, ø 8 mm, 300 µl	x	NGB812506

[1] Please see crucible details on page 7

Crucible Material (Purity/%), Volume Lid	ASC Gripper	Order Number
Pt/Rh (80/20), ø 6.8 mm, 85 µl	x	GB399205
Crucible with lid (note: lid order no.)	x	GB399860
Pt/Rh (80/20), ø 6.8 x 6 mm, 190 µl	x	NGB801556
Crucible with lid (note: lid order no.)	x	GB399860
Al (99.5), ø 6.7 mm, 85 µl	x	NGB810405
Crucible with lid (note: lid order no.)	x	NGB810406
Graphite, ø 6.8 mm, 85 µl	x	GB399956
Crucible with lid (note: lid order no.)	x	GB399957
Gold, ø 6.8 mm, 85 µl	x	6.225.6-93.3.00
Crucible with lid	x	
Silver, ø 6.8 mm, 85 µl	x	6.225.6-93.4.00
Crucible with lid	x	
ZrO_2, ø 6.8 mm, 85 µl	x	GB397053
Crucible with lid (note: lid order no.)	x	GB397052
Y_2O_3, [1] ø 6.8 mm, 85 µl	x	NGB812636
Crucible with lid [1] (note: lid order no.)	x	NGB812635
MgO, ø 6.8 mm, 85 µl	x	NGB812639
Crucible with lid (note: lid order no.)	x	NGB812637
Al_2O_3 (99.7), ø 8 x 8 mm, 300 µl	x	NGB803698
Crucible with lid (note: lid order no.)	x	NGB808209
Pt/Rh/Al_2O_3 system with lid	x	6.225.6-93.2.00

[1] May not be used with Al_2O_3, e.g., sensor plate, sapphire disc, etc.

Crucibles for Operation with the Automatic Sample Changer (ASC) for 20 Sample Pans - Applications

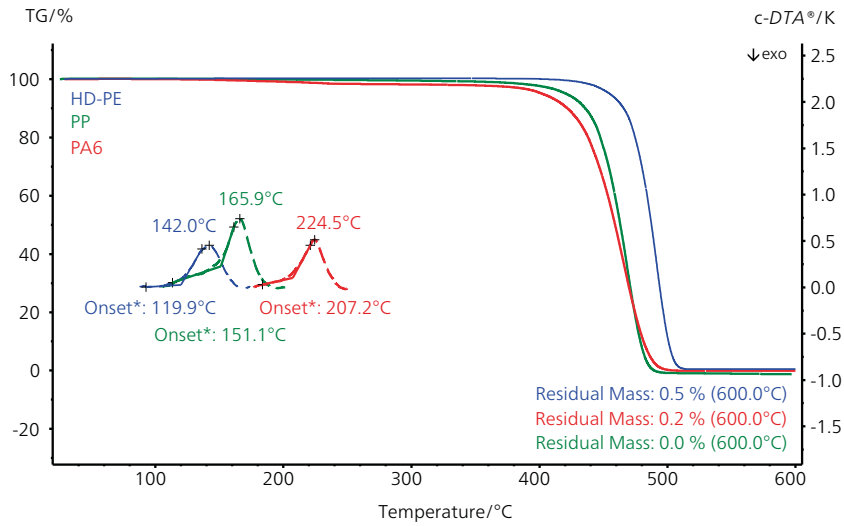
Crucibles for TG 209 ***F3*** *Tarsus* and TG 209 ***F3*** *Nevio* in ASC Operation				
Crucible Material (Purity/%), Volume Lid	ASC Gripper TG 209 ***F3***	Carousel Standard Crucibles	Carousel Large Crucibles	Order Number
Al (99.5), 30/40 µl (*Concavus* pan)	x*	x	x	DSC21400A66.010.00 NGB817525
Crucible with welded lid	x	x	x	
Al (99.5), 30/40µl, slide-in lid for *Concavus* pan	x			NGB815051
Al (99.5), 30/40 µl, crucible and lid with laser-cut-hole	x			DSC21400A66.050-00
Al_2O_3 (99.7), ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399972
Crucible with lid (note: lid order no.)	x	x		GB399973
Fused silica, ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399974
Crucible with lid (note: lid order no.)	-	x		GB399975
Pt/Rh (80/20), ø 6.8 mm, 85 µl	x	x	Only for manual operation	GB399205
Crucible with lid (note: lid order no.)	-	x		GB399860
Pt/Rh (80/20), ø 6.8 x 6 mm, 190 µl	x	x	Only for manual operation	NGB801556
Crucible with lid (note: lid order no.)	-	x		GB399860
Al (99.5), ø 6.7 mm, 85 µl	x	x	Only for manual operation	NGB810405
Crucible with lid (note: lid order no.)	-	x		NGB810406
Graphite, ø 6.8mm, 85 µl	x	x	Only for manual operation	GB399956
Crucible with lid (note: lid order no.)	-	x		GB399957
Gold (99.9), ø 6.8 mm, 85 µl	x	x	Only for manual operation	6.225.6-93.3.00
Crucible with lid (99.9)	-	x		
Silver, ø 6.8 mm, 85 µl	x	x	Only for manual operation	6.225.6-93.4.00
Crucible with lid	-	x		
ZrO_2, ø 6.8mm, 85 µl	x	x	Only for manual operation	GB397053
Crucible with lid (note: lid order no.)	-	x		GB397052
Y_2O_3, [1] ø 6.8mm, 85 µl	x	x	Only for manual operation	NGB812636
Crucible with lid [1] (note: lid order no.)	x	x		NGB812635
MgO, ø 6.8mm, 85 µl	x	x	Only for manual operation	NGB812639
Crucible with lid (note: lid order no.)	x	x		NGB812637
Al_2O_3 (99.7), ø 8 x 8 mm, 300 µl	x	-	x	NGB803698
Crucible with lid (note: lid order no.)	-	-	x	NGB808209
Pt/Rh/Al_2O_3 system with lid	-	x	Only for manual operation	6.225.6-93.2.00

* Using *Concavus* pans with ASC instrument which were delivered before 2014 may require re-adjustment of the ASC gripper.
[1] May not be used with Al_2O_3, e.g., sensor plate, sapphire disc, etc.

Please note: Other crucibles suitable for ASC operation are listed in the ASC table for the DSC 200 ***F3*** *Maia*®, DSC 3500 *Sirius* and DSC 214 *Polyma*, see page 12

c-*DTA*® for Polymer Identification

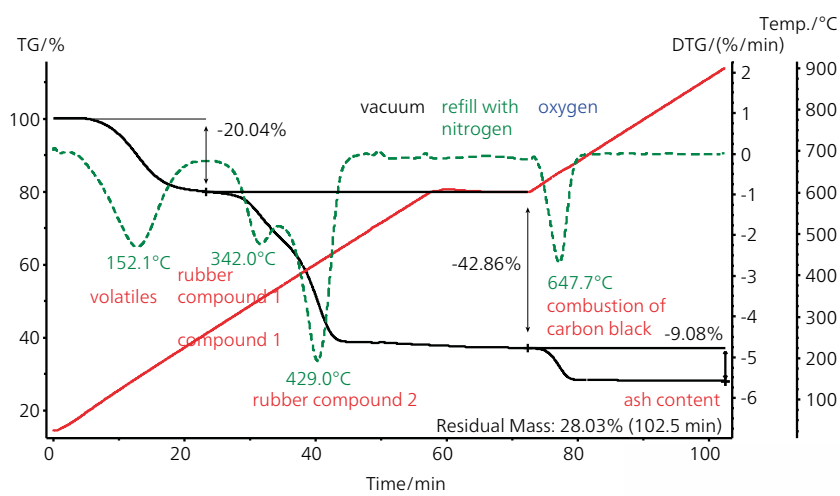
HD-PE, PP and PA 6 exhibit very similar decomposition behavior with regard to temperature and residual mass, which makes it difficult to distinguish between them. However, when using the TGA sensor for c-*DTA*® calibration in combination with a platinum crucible, the characteristic melting peaks of these components can be monitored – even in a TGA system. The melting peak detected at 142°C can be clearly ascribed to HD-PE; the peak at 166°C, to PP; and the peak at 225°C, to PA 6.



The measurements were carried out using approximately 10 mg of the rubber mixture in a platinum crucible under a nitrogen atmosphere.

Precise Determination of the Plasticizer Content of a Tire Mixture

The plasticizer content can be determined precisely by carrying out a TGA measurement under vacuum priorto the decomposition of the rubber mixture. Because the boiling point is depressed under vacuum, the release of the plasticizer at 152°C is clearly separated from the decomposition of the rubber – which consists of two compounds, as indicated by the DTG peaks at 342°C and 429°C. After the decomposition under vacuum, at 600°C, nitrogen is filled into the TGA system. After 20 min stabilization time, the atmosphere is changed to oxygen and the measurement proceeds at a linear heating rate (10 K/min). Under an oxygen atmosphere, carbon black immediately combusts to 9%. The residue in the crucible is the ash content, which was determined here to be 28%.



This measurement was performed in the TG ***F1*** *Libra*®, using a 10-mg sample mass in an Al_2O_3 crucible.

Crucibles for the STA 2500 *Regulus*

Cap-type lid madeof alumina
order no. JA000981

Slip-on-plate

The STA 2500 *Regulus* is a standard simultaneous thermal analyzer with trend-setting technology. This top-loading unique differential balance arrangement is delivered with slip-on plates which allow for nearly all kinds of sample pans. A large slip-on plate is available for a large volume crucible.

Crucibles, Lids/Caps and Slip-on Plates for the STA 2500 *Regulus*

Material (Purity/%)	Temperature Range	Consisting of	Dimension/ (ø x Height)/ Volume	Remarks	Order Number
Al (99.5)	600°C	Crucible	ø 5.2 x 2.6 mm/45 µl	Set of 100 pieces	J1560179
Al (99.5)	600°C	Crucible	ø 5.2 x 5.1 mm/95 µl	Large crucible, set of 100 pieces	J1560180
Al (99.5)	600°C	Lid, drop-in type	ø 4.8 mm	For Al crucibles, Set of 100 pieces	J1560184
Al_2O_3 (99.7)	1700°C	Crucible	ø 5.2 x 2.6 mm/40 µl	Set of 2 pieces	J1560181
Al_2O_3 (99.7)	1700°C	Crucible	ø 5.2 x 5.1 mm/80 µl	Large crucible, set of 2 pieces	J1560182
Al_2O_3 (99.7)	1700°C	Cap-type lid	ø 5.7 x 2.25 mm	For Al_2O_3 crucibles J1560181 and J1560182, set of 2 pieces	JA000981
Pt(Pt90/Rh10)	1600°C	Crucible	ø 5.2 x 2.6 mm/45 µl	Set of 2 pieces	J5900905
Pt(Pt90/Rh10)	1600°C	Crucible	ø 5.2 x 5.1 mm/95 µl	Large crucible, set of 2 pieces	J5900879
Pt(Pt90/Rh10)	1600°C	Cap-type lid	ø 5.5 x 2.1 mm	Set of 2 pieces	JA000982
Pt(Pt90/Rh10)	1600°C	Lid, drop-in type	ø 4.8 mm	For Pt crucibles, set of 2 pieces	J5900906
		Reshaping tool for Pt crucible			J7672306
Fused silica	1000°C	Crucible	ø 5.2 x 2.6 mm/25 µl	Set of 10 pieces	J5900881
Fused silica	1000°C	Crucible	ø 5.2 x 5.1 mm/55 µl	Large container, Set of 10 pieces	J1560183
Al_2O_3 (99.7)	1700°C	Slip-on-plate		Standard, set of 2 pieces	JA003598
Al_2O_3 (99.7)	1700°C	Flat slip-on plate	ø 6.8 mm	Set of 2 pieces, for crucibles with ø 6.8 mm	JA006844
Al_2O_3 (99.7)	1700°C	Crucible	ø 6.8 mm/85 µl	Only available with flat slip-on plate JA006844	GB399972
PtRh	1700°C	Crucible	ø 6.8 mm/85 µl	Only available with flat slip-on plate JA006844	GB399205
Al_2O_3 (99.7)	1700°C	Corrosive slip-on-plate		Set of 2 pieces, for ø 5.2 mm crucibles	J1670612
Al_2O_3 (99.7)	1700°C	Large volume slip-on-plate		For sample position	JA004734
Al_2O_3 (99.7)	1700°C			For reference position	JA004735
Al_2O_3 (99.7)	1700°C	Crucible	ø 8.0 x 10.0 mm/400 µl	Only available for large slip-on plate JA004734	JA004738

Large crucible made of Al, order no. J1560180

Cucible and lid made of Al, order no. J1560179 and J1560184

Large Al_2O_3 crucible, order no. J1560182

Cap-type lids made of Al_2O_3, order no. JA000981

Crucible made of Al_2O_3, order no. J1560181

Crucible made of fused silica, order no. J5900881

Spare Parts for the STA 2500 *Regulus*		
Spare parts	Remark	Order Number
Radiation shield	Standard version	JA003597
Radiation shield	Special version	JA004827
Sample carrier receiver		JA003596
TGA-DTA sample holder rod	Type P, 1100°C; set of 2 pieces	J1670610
TGA-DTA sample holder rod	Type S, 1600°C; set of 2 pieces	JA004768

Large crucible made of Pt, order no. J5900879

Reshaping tool for crucible made of Pt, order no. J7672306

Standard radition shield, order no. JA003597

Special raditon shield, order no. JA004827

Slip-on plates for measurements in corrosive atmospheres, order no. JA004768

Sample carrier receiver, order no. JA003596

Slip-on plates made of Al_2O_3, order no. JA003598

Slip-on plates made of Al_2O_3,for sample and reference position, order no. JA004734 and JA004735

Large crucible made of Al_2O_3, order no. JA004738

Crucibles Made for Aluminum

Crucibles for the STA 449 ***F1/F3*** *Jupiter®* and DSC 404 ***F1/F3*** *Pegasus®*

What sets the STA 449 ***F1/F3*** *Jupiter®* and DSC 404 ***F1/F3*** *Pegasus®* systems apart is not only their flexibility in furnaces and sensors but also the huge variety of possible crucibles. For the broad temperature range from -150°C to 2400°C, the crucible materials vary from aluminum to magnesium oxide and tungsten to zirconium oxide.

Besides DSC and TGA (for STA) crucibles, plates and net-shaped plates are also available in different materials and dimensions.

For inhomogeneous samples and those with an extremely low density, special TGA sample holders and large crucibles are available. The automatic sample changer (ASC) with its gripper and carousel allows for the use of nearly any crucible type including specialties such as low-, medium- and high-pressure crucibles.

Crucibles Made of Aluminum for the STA 449 ***F1/F3/F5*** *Jupiter®*, STA 449 ***F3*** *Nevio* and DSC 404 ***F1/F3*** *Pegasus®*					
Material (Purity/%)	Temperature Range	Consisting of	Dimension/ (ø x Height)/ Volume	Remarks	Order Number
Al (99.5)	Max. 600°C	*Concavus* pan* + lid	ø 5 mm/30/40 µl	Set of 96, 3in1 Box, cold weldable**	DSC21400A66.010.00
Al (99.5)	Max. 600°C	*Concavus* pan*	ø 5 mm/30/40 µl	3in1 Box, 96 pieces	NGB814672
Al (99.5)	Max. 600°C	*Concavus* pan	ø 5 mm/30/40 µl	Set of 100 pcs.	NGB817525
Al (99.5)	Max. 600°C	*Concavus* lid		Set of 100 pcs.	NGB817526
Al (99.5)	Max. 600°C	Crucible + lid	ø 6 mm/25/40 µl	Set of 100, cold weldable**	6.239.2-64.5.00
Al (99.5)	Max. 600°C	Crucible + lid	ø 6 mm/25/40 µl	Set of 500, cold weldable**	6.239.2-64.51.00
Al (99.5)	Max. 600°C	Crucible + punched lid (0.05 mm)	ø 6 mm/40 µl	Set of 100, cold weldable**	6.239.2-64.8.00
Al (99.5)	Max. 600°C	Crucible + punched lid (0.05 mm)	ø 6 mm/40 µl	Set of 500, cold weldable**	6.239.2-64.81.00
Al (99.5)	Max. 600°C	Crucible	ø 6.7 mm/85 µl	Set of 100 pieces, non-weldable	NGB810405
Al (99.5)	Max. 600°C	Lid		Set of 100 pieces, for NGB810405	NGB810406

* Using *Concavus* pans with ASC instrument which were delivered before 2014 may require re-adjustment of ASC gripper.
** Please note: One and the same sealing press is capable of sealing all the Al crucibles, order no. 6.240.10-80.0.00A, see optional toolkits, page 12

Concavus pans in the antistatic 3in1 Box

Low-Pressure Crucibles Made of Aluminum for TGA-DSC Sensors of the STA 449 ***F1/F3/F5*** *Jupiter®*[1], STA 449 ***F3*** *Nevio*[1] and DSC Sensors of the DSC 404 ***F1/F3*** *Pegasus®*[2]					
Material (Purity/%)	Temperature Range	Consisting of	Dimension/ (ø x Height)/ Volume	Remarks	Order Number
Al (99.5)	Max. 600°C	Crucible + lid	ø 6 mm/35 µl; 3 bar	Set of 100 pieces, cold weldable	6.240.10-65.1.00
Al (99.5)	Max. 600°C	Crucible + lid	ø 6 mm/35 µl; 3 bar	Set of 500 pieces, cold weldable	6.240.10-65.11.00
Al (99.5)	Max. 600°C	Crucible	ø 6 mm/35 µl; 3 bar	100 pieces	6.240.10-65.1.01
Al (99.5)	Max. 600°C	Lid	For crucibles of ø 6 mm	100 pieces	6.240.10-65.1.02

[1] STA 449 ***F1/F3*** *Jupiter®* sensors: HTP40000AXX.000-00 (XX = 78, 77, 73, 74, 79 or 63),
STA 449 ***F5*** *Jupiter®* sensor HTP40000AXX.000-00 (XX=69, 73)
[2] DSC 404 ***F1/F3*** *Pegasus®* sensors: DSC404F1AXX.000-00 (XX = 78, 77, 73, 74, 79 or 75)

DSC Crucibles for Measurements in a Pressure-Tight Environment, Large TGA Crucibles and Slip-On Plates

Medium- and High-Pressure Crucibles for TGA-DSC Sensors (HTP 40000A69/70/71/72.000-00) of the STA 449 ***F1/F3/F5*** *Jupiter®*, STA 449 ***F3*** *Nevio* and DSC sensors of the DSC 404 ***F1/F3*** *Pegasus®*

Material (Purity/%)	Temperature Range	Consisting of	Dimension/ (ø x Height)/ Volume	Remarks	Order Number
CrNi steel (AISI 304)	Max. 250°C	Crucible + lid + seal	120 µl; 20 bar	Set of 25 pieces, seal made of FPM	6.240.1-68.1.00
O-ring seal	Max. 230°C	O-ring	Max. 20 bar	Seal made of PCTFE	NGB801765
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, gold-plated surface, reusable	ø 6 mm, 27 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-92.3.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, gold-plated surface, reusable	ø 6 mm, 27 µl, max. 100 bar	10 crucible + 50 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-92.31.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6 mm, 27 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-93.3.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6 mm, 27 µl, max. 100 bar	10 crucible + 50 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-93.31.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6mm, 100 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-93.4.00
CrNi steel (AISI 316L)	Max. 500°C	Crucible + lid, hexagonal, gold-plated surface, reusable	ø 6mm, 100 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-92.8.00
Titanium (Grade 4)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6mm, 27 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-92.6.00
Titanium (Grade 4)	Max. 500°C	Crucible + lid, hexagonal, reusable	ø 6mm, 100 µl, max. 100 bar	1 crucible + 5 Au sealing disks (sealing press 6.239.2-92.4)	6.239.2-92.9.00
Au seals (Au585)	Max. 500°C	For all high-pressure autoclaves, alloy: Au 58.5%, Ag 26%, Cu 15.5%			6.240.1-91.1.00
Sealing press		For crucibles: 6.239.2-92.3.00, -92.31.00, -92.6.00, -92.8.00, -92.9.00, -93.3.00, -93.31.00, -93.4.00, -93.41.00			6.239.2-92.4.00

Sealing tool for the high-pressure crucibles, order no. 6.239.2-92.4.00

Medium-pressure crucible (right) and high-pressure crucible (left)

Crucibles for TGA Sample Carrier (HTP40000A58.000-00) of the STA 449 ***F1/F3/F5*** *Jupiter®*, STA 449 ***F3*** *Nevio*					
Material (Purity/%)	Temperature Range	Consisting of	Dimension/ (ø x Height)/ Volume	Remarks	Order Number
Al_2O_3 (99.7)	Max. 1700°C	Slip-on plate, flat	ø 10 mm		GB343550
Al_2O_3 (99.7)	Max. 1700°C	Slip-on plate	ø 17 mm		GB445240
Al_2O_3 (99.7)	Max. 1700°C	Crucible	0.9 ml		GB445215
Al_2O_3 (99.7)	Max. 1700°C	Lid		For GB445215	GB445216
Al_2O_3 (99.7)	Max. 1750°C	Crucible	0.9 ml	Highly sintered	NGB820039
Al_2O_3 (99.7)	Max. 1750°C	Lid		For NGB820039	NGB820040
Al_2O_3 (99.7)	Max. 1700°C	Crucible	3.4 ml		GB445213
Al_2O_3 (99.7)	Max. 1700°C	Lid		Lid without hole, for GB445213	GB445214
Al_2O_3 (99.7)	Max. 1750°C	Crucible	3.4 ml	Highly sintered	NGB820041
Al_2O_3 (99.7)	Max. 1750°C	Lid		Lid without hole, for NGB820041	NGB820042
Al_2O_3 (99.7)	Max. 1700°C	Crucible	5.0 ml		NGB809163
Al_2O_3 (99.7)	Max. 1700°C	Lid		Lid without hole, for NGB809163	NGB814785
Al_2O_3 (99.7)	Max. 1750°C	Crucible	5.0 ml	Highly sintered	NGB820037
Al_2O_3 (99.7)	Max. 1750°C	Lid		Lid without hole, for NGB820037	NGB820038
Al_2O_3 (99.7)	Max. 1750°C	Crucible	10.0 ml	Crucible mass approx. 8 g	NGB820017
Al_2O_3 (99.7)	Max. 1700°C	Crucible	For sample dimension: ø 15 mm; hight 25 mm		NGB811934
Al_2O_3 (99.7)	Max. 1700°C	Crucible	ø 18 mm; $ø_{inner}$ 14.5 mm; total height 14.5 mm; filling height 3 mm; volume 0.53 ml	For glove box applications	NGB811194
Repository	Crucible repository with handling tool, for glove box crucible NGB811194				HTP40000 A91.000-00
Pt/Ir (90/10)	Max. 1600°C	Net-shaped slip-on plate	ø 17 mm (100 meshes/cm²)		GB398029
Pt/Ir (90/10)	Max. 1600°C	Net-shaped slip-on plate	ø 17 mm (225 meshes/cm²)		GB398030
Pt/Ir (90/10)	Max. 1600°C	Slip-on plate	ø 10 mm		GB348834
Pt/Ir (90/10)	Max. 1600°C	Slip-on plate	ø 17 mm		GB348835

Al_2O_3 crucibles with different volumes (0.9 ml, 3.4 ml, 5 ml)

Al_2O_3 slip-on plates (ø 10 mm, 17 mm)

Pt/Ir net-shaped slip-on plates (ø 17 mm, 100/225 meshes/cm²)

Al_2O_3 crucible for glove box applications

Knudsen Cells (TGA), TGA and TGA-DTA Crucibles Through to the Highest Temperature Range

Crucible for TGA Sample Carrier (HTP40000A64.000-00/-010.00)				
Material	Temperature Range	Sample Chamber Dimension	Remarks	Order Number
Fused Silica*	Max. 1100°C	3.4 ml	Only for TGA-sample carrier HTP40000A64.000-00	NGB811507

* Not available for STA 449 ***F5*** *Jupiter®*

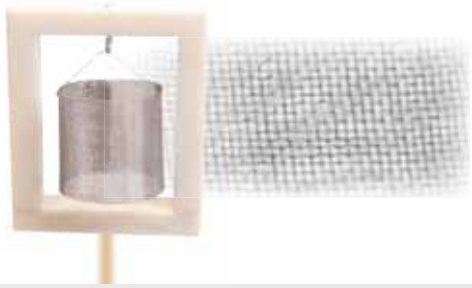
Crucibles for TGA Sample Carriers of the STA 449 ***F1/F3*** *Jupiter®* with Turbo Pump – Knudsen Cells				
Material	Temperature Range	Sample Chamber Dimension	Remarks	Order Number
ZrO_2[1]	Max. 2000°C	ø 12 mm x 3.7 mm high; orifice ø 2.896 mm (optically dimensioned)	Crucible + lid	6.226.1-69.5.00
Al_2O_3[2] (99.7)	Max. 1700°C	ø 12 mm x 3.7 mm high; orifice ø 2.896 mm (optically dimensioned)	Crucible + lid	6.226.1-67.1.00
Al_2O_3[2] (99.7)	Max. 1700°C	Outlet ø 0.3 mm (optically dimensioned)	Crucible + lid; also for carrier: 6.226.1-58.0.00+S	6.226.1-69.1.00
Al_2O_3[2] (99.7)	Max. 1700°C	Outlet ø 0.1 mm (optically dimensioned)	Crucible + lid	6.226.1-69.2.00
Molybdenum[1]	Max. 2000°C	ø 12 mm x 3.7 mm high; orifice ø 2.896 mm (optically dimensioned)	Crucible + lid	6.226.1-69.4.00
MgO[2]	Max. 1500°C	Outlet ø 0.3 mm (optically dimensioned)	Crucible + lid*	6.226.1-68.1.00

* depending on the atmosphere, the cell can potentially withstand 1650°C for short periods
[1] For sample carrier HTP40000A52.000-00
[2] For sample carrier HTP40000A58.000-00

Knudsen cells with different dimensions and orifice diameters

Crucibles for TGA Sample Carrier (HTP40000A52.000-00) of the STA 449 ***F1/F3*** *Jupiter®*				
Material	Temp. Range	Consisting of	Dimension/Volume	Order Number
Tungsten	Max. 2400°C	Crucible	0.3 ml	NGB809001
Graphite	Max. 2200°C	Crucible	0.3 ml	GB445333

Tungsten crucible (right) and graphite crucible (left)



Crucibles for TGA Sample Carrier (HTP40000A60.000-00) for Hanging Samples of the STA 449 ***F1/F3*** *Jupiter®* and STA 449 ***F3*** *Nevio* – Cage				
Material	Temp. Range	Consisting of	Dimensions	Order Number
Pt	Max. 1650°C	Cage, net-shaped	Cage ø 12 mm, height 12 mm, wire ø 0.04 mm, mesh width 0.12 mm	NGB813037
Pt	Max. 1650° C	Cage, net-shaped	Cage ø 12 mm, height 12 mm, wire ø 0.06 mm, mesh width 0.25 mm	NGB813036

Crucibles for DTA Sensor[1] of the DSC 404 ***F1/F3*** *Pegasus®* and for TGA[2], TGA-DTA[3] Sensor of the STA 449 ***F1/F3/F5*** *Jupiter®*, STA 449 ***F3*** *Nevio*					
Material (Purity/%)	Temp. Range	Consisting of	Dimension/ Volume	Remarks	Order Number
Duran glass	Max. 600°C	Ampoule	Length after sealing ≈ 34 mm		GB461185
Fused silica	Max. 1000°C	Ampoule	Length after sealing ≈ 34 mm		GB461177
Al_2O_3 (99.7)	Max. 1700°C	Slip-on plate	ø 10 mm		GB343550
Al_2O_3	Max. 1700°C	Crucible	0.2 ml		GB445172
Al_2O_3	Max. 1700°C	Crucible	0.3 ml	100 pieces	NGB810411
Al_2O_3	Max. 1700°C	Lid		for NGB810411, GB445172; pierced, ø 0.5 mm hole	GB445175
Al_2O_3	Max. 1750°C	Crucible	0.3 ml	100 pieces, highly sintered	NGB820035
Al_2O_3	Max. 1750°C	Lid		for NGB820035, pierced	NGB820036
Al_2O_3 (99.7)	Max. 1700°C	Crucible	0.3 ml; inner ø 6 mm	sixfold pierced	NGB813974
Al_2O_3 (99.7)	Max. 1700°C	Crucible	0.9 ml		GB445215
Al_2O_3 (99.7)	Max. 1700°C	Lid		for GB445215	GB445216
Pt/Ir	Max. 1600°C	Crucible	0.3 ml		GB280062
Pt/Ir	Max. 1600°C	Lid for GB280062			GB280066
Graphite	Max. 2400°C	Crucible	0.3 ml	> 2200°C evaporation may occur[4]	GB399222
Fine steel	Max. 600°C	Crucible	0.3 ml	Only in inert atmosphere	GB440112
Fine steel	Max. 600°C	Lid		for GB440112	GB440113

1 DTA sample carrier of the DSC 404 ***F1/F3*** *Pegasus®*: order no. DSC404F1A**XX**.000-00 (**XX** = 56, 57 or 68)
2 TGA sample carrier of the STA 449 ***F1/F3/F5*** *Jupiter®*: order no. HTP40000A58.000-00
3 TGA-DTA sample carrier of the STA 449 ***F1/F3/F5*** *Jupiter®*: order no. HTP40000A**XX**.000-00 (**XX** = 56, 68, 51, 50 or 65)
4 Direct contact between crucible/sensor parts containing platinum should be avoided.
>800°C, Al_2O_3 washer (NGB811071) must be used when crucible is placed on TGA-DSCsensor.

Ampoules for TGA
and TGA-DTA measurements

TGA-DTA crucibles
and slip-on plates

TGA-DTA, DSC and TGA-DSC Crucibles

Crucibles for TGA-DTA Sensor (HTP40000A53.000-00) of the STA 449 ***F1/F3*** *Jupiter®* and DSC 404 ***F1/F3*** *Pegasus®* (DSC404F1A53.000-00)					
Material (Purity/%)	Temp. Range	Consisting of	Dimension/ Volume	Remarks	Order Number
Tungsten	Max. 2400°C	Crucible	80 µl	Wall thickness 0.3 mm, only for STA 449 ***F3*** *Jupiter®*	GB453520
Tungsten	Max. 2400°C	Crucible	80 µl	Wall thickness 0.2 mm, BN liner available	NGB808999
Tungsten	Max. 2400°C	Lid		Pierced, for NGB808999	NGB809406
BN	Max. 1600°C	Liner	80 µl	For NGB808999	NGB805943
Glassy carbon	Max. 2000°C	Crucible	60 µl	Up to 500°C stable in oxidizing atmosphere	GB395116
Graphite	Max. 2400°C	Crucible	0.15 ml		GB427607
Graphite	Max. 2400°C	Lid		Pierced, for GB427607	NGB814940
Al_2O_3	Max. 1700°C	Crucible	0.15 ml		GB399147
Al_2O_3	Max. 1700°C	Lid		Pierced lid for GB399147	GB399973
ZrO_2	Max. 2000°C	Crucible	0.15 ml		GB399148

TGA-DTA crucibles for highest temperatures

Crucibles for All DSC and TGA-DSC Sensors of the STA 449 ***F1/F3/F5*** *Jupiter®*, STA 449 ***F3*** *Nevio* and DSC 404 ***F1/F3*** *Pegasus®*					
Material (Purity/%)	Temperature Range	Consisting of	Dimension/ Volume	Remarks	Order Number
PtRh/Al_2O_3	Max. 1700°C	Crucible + liner + lid	For metal melts and other reactive materials		6.225.6-93.2.00
Al_2O_3	Max. 1700°C	Crucible liner (spare for 6.225.6-93.2.00)			6.225.6-93.1.00
Yttriumoxid-Spray*	-	Content 360g	-	Coating of crucibles for increased oxidation stability	NGB804075
MgO	Max. 1500°C	Crucible liner (spare for GB399205)		Minimum sale 10 pieces	NGB812638
BN[1]	Max. 1600°C	Crucible liner for NGB399205			NGB809833
Y_2O_3[2]	Max. 1700°C	Crucible liner (spare for GB399205)			NGB812634
Tool	Max. 1700°C			For reshaping of Pt crucibles	GB397964
Al_2O_3 (99.7)	Max. 1700°C	Crucible	ø 6.8 mm/85 µl		GB399972
Al_2O_3 (99.7)	Max. 600°C	Lid		For GB399972	GB399973
Duran glass	Max. 1000°C	Ampoule		Length after sealing ≈19 mm	6.240.1-93.2.00
Fused silica		Ampoule		Length after sealing ≈19 mm	NGB815223

Crucibles for All DSC and TGA-DSC Sensors of the STA 449 ***F1/F3/F5*** *Jupiter*®, STA 449 ***F3*** *Nevio* and DSC 404 ***F1/F3*** *Pegasus*® (Continuation)					
Material (Purity/%)	Temperature Range	Consisting of	Dimension/ Volume	Remarks	Order Number
Fused silica	Max. 1000°C	Crucible	ø 6.7 mm/85 µl		GB399974
Fused silica	Max. 1000°C	Lid		For GB399974	GB399975
Pt/Rh (80/20)	Max. 1700°C	Crucible	ø 6.8 mm/85 µl		GB399205
Pt/Rh (80/20)	Max. 1700°C	Crucible	ø 6.8 mm/0.19 ml	Height 6 mm	NGB801556
Pt/Rh (80/20)	Max. 1700°C	Lid		For GB399205 and NGB801556	GB399860
Al (99.5)	Max. 600°C	*Concavus* pan**	ø 5 mm/30/40 µl		NGB814672
Al (99.5)	Max. 600°C	Crucible	ø 6.7 mm/85 µl	Set of 100 pieces	NGB810405
Al (99.5)	Max. 600°C	Lid		For NGB810405	NGB810406
Gold (99.9)	Max. 900°C	Crucible + lid	ø 6.7 mm/85 µl		6.225.6-93.3.00
Ag	Max. 750°C	Crucible + lid	ø 6.7 mm/85 µl		6.225.6-93.4.00
ZrO_2	Max. 2000°C	Crucible	85 µl	CaO-stabilized	GB397053
ZrO_2	Max. 2000°C	Lid		For GB397053	GB397052
Graphite[3]	Max. 2400°C	Crucible	85 µl	>2200°C evaporation may occur	GB399956
Graphite	Max. 2400°C	Lid		For GB399956	GB399957
Glassy carbon[3]	Max. 2400°C	Crucible	ø 6 mm/50 µl		NGB811386
Glassy carbon[3]	Max. 2400°C	Lid		For NGB811386	NGB812613
Al_2O_3	Max. 1700°C	Washer	ø 6.8 mm, thick 0.2 mm	Inhibits sticking of Pt onto sensor type S and B	NGB811071
MgO	Max. 1500°C	Crucible	ø 6.7 mm, 85 µl	Minimum sale 10 pieces	NGB812639
MgO	Max. 1500°C	Lid		For NGB812639, min. sale 10 pieces	NGB812637
Y_2O_3 [2]	Max. 1700°C	Crucible	ø 6.7 mm, 85 µl		NGB812636
Y_2O_3 [2]	Max. 1700°C	Lid		For NGB812636	NGB812635
BN[1]	Max. 1600°C	Crucible	ø 6.7 mm, 85 µl	Inert gas required	NGB808836
BN[1]	Max. 1600°C	Lid		For NGB808836	NGB808835
Mo	Max. 2000°C	Crucible	ø 6.4 mm, 85 µl		NGB808165
Mo	Max. 2000°C	Lid		For NGB808165	NGB820241

[1] Maximum temperature when in contact with Pt, W and Rh or Pt/Rh alloys: 1600°C. For other materials getting in contact with BN, reactions have to be avoided which might damage crucible or liner. In the presence of He, Ar or vacuum, tungsten embrittles and hardens in contact with BN.
[2] May not be used with Al_2O_3, e.g., sensor plate, sapphire disc, etc.
* Hazardous material, shipment will cause additional costs.
** Using *Concavus* pans with ASC instrument which were delivered before 2014 may require re-adjustment of the ASC gripper.
[3] Direct contact between the crucible and sensor parts containing platinum should be avoided. Above 800°C, a washer from Al_2O_3 (NGB811071) must be used for TGA-DSC sample carriers.

DSC and TGA-DSC crucible variety

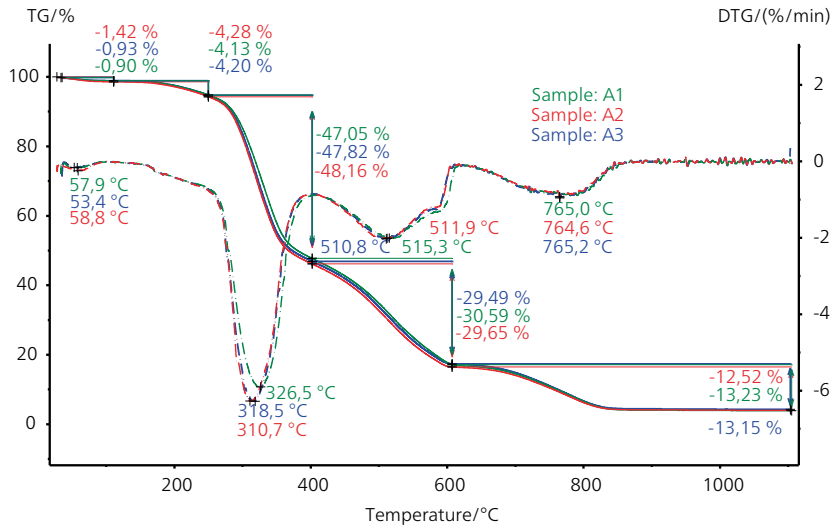
Crucibles for Operation with the Automatic Sample Changer (ASC)

Crucibles for STA 449 ***F1/F3/F5***, STA 449 ***F3*** *Nevio* and DSC 404 ***F1/F3*** in ASC Operation				
Crucible Material (Purity/%), Volume Lid	ASC Gripper STA 449 ***F1/F3*** DSC 404 ***F1/F3***	TGA-DSC Sensor* DSC Sensor**	TGA Sensor[2] HTP40000A 67.000-00 HTP40000A 75.000-00	Order Number
Al (99.5), 30/40 µl (*Concavus* pan)	-[3]	x	x	DSC21400A66.010-00[4] DSC21400A66.020-00[4] DSC21400A66.030-00[4] DSC21400A66.040-00[4] DSC21400A66.050-00[4] NGB817525
Crucible with welded lid	-[3]	x	x	
Al (99.5), 30/40µl, slide-in lid for *Concavus* pan	-[3]	x	x	NGB815051
Al (99.5), 25/40 µl	-[1]	x	x	6.239.2-64.5.00
Crucible with welded lid	-	x	x	
Al (99.5), 25/40 µl (500/pkg.)	x	x	x	6.239.2-64.51.00
Crucible with welded lid	x	x	x	
Al (99.5), 25/40 µl	-[1]	x	x	6.239.2-64.8.00
Crucible and lid with laser-cut-hole	-	x	x	
Al (99.5), 25/40 µl (500/pkg.)	x	x	x	6.239.2-64.81.00
Crucible and lid with laser-cut-hole	x	x	x	
Al (99.5), low-pressure, 35 µl	-[1]	x	x	6.240.10-65.1.00
Crucible with welded lid	-	x	x	
CrNi steel (AISI 302), medium-pressure, 120 µl	x	x	x	6.240.1-68.1.00
Crucible with lid	x	x	x	
Copper, 25 µl	-	x	x	6.239.2-64.6.00
CrNi steel (AISI 316L), high-pressure, 27 µl, gold-plated, 100 bar	x	x	Only for manual operation	6.239.2-92.3.00
CrNi steel (AISI 316L), high-pressure, 27 µl, 100 bar	x	x	Only for manual operation	6.239.2-93.3.00
CrNi (AISI 316L), high-pressure, 100 µl, gold-plated, 100 bar	x	x	Only for manual operation	6.239.2-92.8.00
CrNi (AISI 316L), high-pressure, 100 µl, 100 bar	x	x	Only for manual operation	6.239.2-93.4.00
Ti (Grade 4), high-pressure, 27 µl, 100 bar	x	x	Only for manual operation	6.239.2-92.6.00

Crucibles for STA 449 ***F1/F3/F5***, STA 449 ***F3*** *Nevio* and DSC 404 ***F1/F3*** in ASC Operation				
Crucible Material (Purity/%), Volume Lid	ASC Gripper STA 449 ***F1/F3*** DSC 404 ***F1/F3***	TGA-DSC Sensor* DSC Sensor**	TGA Sensor[2] HTP40000A 67.000-00 HTP40000A 75.000-00	Order Number
Ti (Grade 4), high-pressure, 100 µl, 100 bar	x	x	Only for manual operation	6.239.2-92.9.00
Al_2O_3 (99.7), ø 6.8 mm, 85 µl	x	x	x	GB399972
Crucible with lid (note: lid order no.)	x	x	x	GB399973
Fused silica, ø 6.8 mm, 85 µl	x	x	x	GB399974
Crucible with lid (note: lid order no.)	x	x	x	GB399975
Fused silica, ø 8 mm, 0.3 ml, open	x	-	x	NGB812506
Pt/Rh (80/20), ø 6.8 mm, 85 µl	x	x	x	GB399205
Crucible with lid (note: lid order no.)	x	x	x	GB399860
Pt/Rh (80/20), ø 6.8 x 6 mm, 190 µl	x	x	x	NGB801556
Crucible with lid (note: lid order no.)	x	x	x	GB399860
Al (99.5), ø 6.7 mm, 85 µl	x	x	x	NGB810405
Crucible with lid (note: lid order no.)	x	x	x	NGB810406
Graphite[6], ø 6.8mm, 85 µl	x	x	x	GB399956
Crucible with lid (note: lid order no.)	x	x	x	GB399957
Gold (99.9), ø 6.8 mm, 85 µl	x	x	x	6.225.6-93.3.00
Crucible with lid	x	x	x	
Silver, ø 6.8 mm, 85 µl	x	x	x	6.225.6-93.4.00
Crucible with lid	x	x	x	
ZrO_2, ø 6.8 mm, 85 µl	x	x	x	GB397053
Crucible with lid (note: lid order no.)	x	x	x	GB397052
Y_2O_3, [5] ø 6.8 mm, 85 µl	x	x	x	NGB812636
Crucible with lid [5] (note: lid order no.)	x	x	x	NGB812635
MgO, ø 6.8mm, 85 µl	x	x	x	NGB812639
Crucible with lid (note: lid order no.)	x	x	x	NGB812637
Al_2O_3 (99.7), ø 8 x 8 mm, 300 µl	x	-	x	NGB803698
Crucible with lid (note: lid order no.)	x	-	x	NGB808209
Pt/Rh/Al_2O_3 system with lid	x	x	x	6.225.6-93.2.00
Mo, ø 6.4 mm, 85 µl	x	x	-	NGB808165
Crucible with lid (note: lid order no.)	x	x	x	NGB820241
BN, ø 6.7 mm, 85 µl	x	x	only for manual operation	NGB808836
Crucible with lid (note: lid order no.)	-	x	-	NGB808835

[1] Special gripper for Al crucibles on request
[2] For the listed crucibles, the TGA-Sensor requires the slip-on plate made of Al_2O_3, oder no. NGB809010
[3] Using *Concavus* pans with ASC require re-adjustment of ASC gripper.
[4] Please see crucible details on page 7
[5] May not be used with Al_2O_3, e.g., sensor plate, sapphire disc, etc.
* TGA-DSC Sensor: HTP40000A**XX**.000-00 (**XX** = 63, 66, 73 or 74)
** DSC Sensor: DSC404F1A**XX**.000-00 (**XX** = 63, 66, 7
[6] Direct contact between the crucible and sensor parts containing platinum should be avoided.
> 800°C, a washer from Al_2O_3 (NGB811071) must be used for TGA-DSC sample carriers.

Applications – Special Crucibles for Large



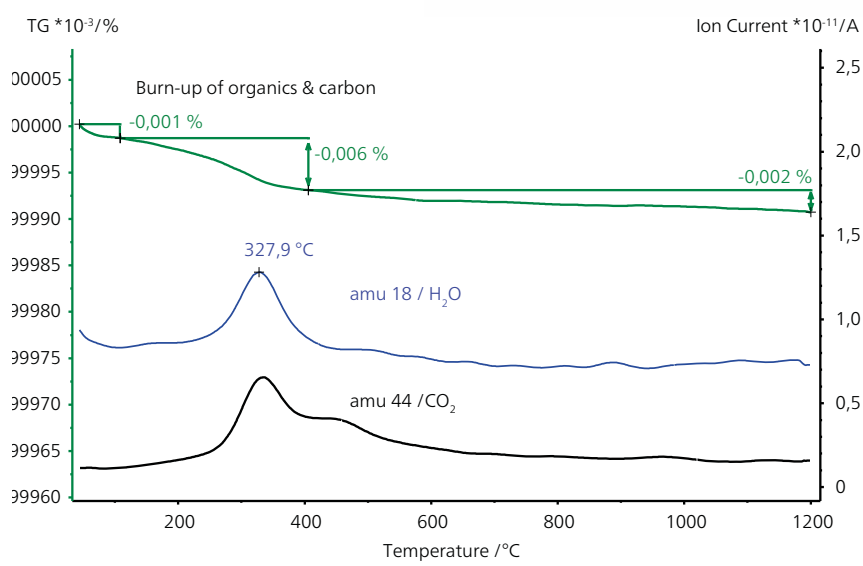
A ceramic mass (approx. 130 mg) was tested here in the alumina beaker crucible for TGA measurements (heating rate 10 K/min, synthetic air atmosphere)

Test on a Fire Insulating Material

For TGA measurements on inhomogeneous materials or ones with low densities (e.g., foams), very large crucibles are available. The example shows three samples of a heavily foaming fire insulation material. It can clearly be seen that these three samples exhibit identical TGA behavior. Therefore, no significant fluctuations in the composition of the lot are to be expected.

Burn-Up of Organics and Carbon

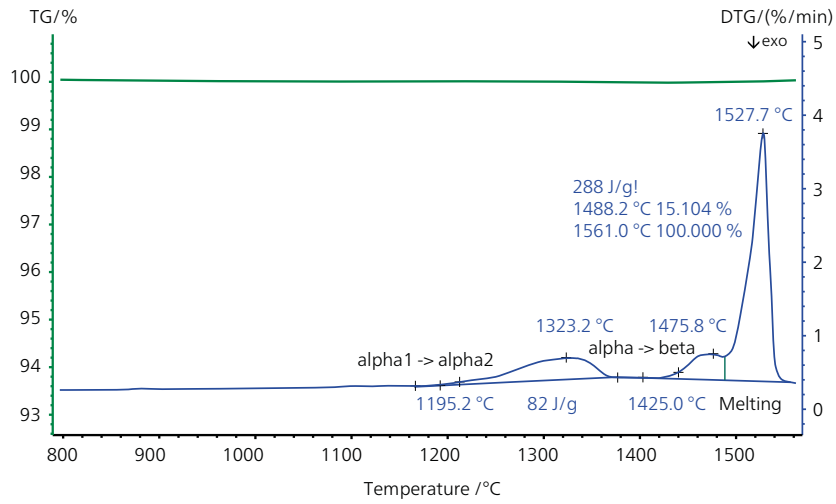
Resolution for the smallest of TGA steps can be achieved by increas-ing the sample mass. In this example, quartz sand was heated at a rate of 20 K/min in synthetic air. The results demonstrate that extremely small mass-loss steps can be resolved by using a sample mass of more than 4000 mg. The evolved gases in this example were detected using our QMS 403 *Aëolos*. The second mass-loss step amounts to 0.006% and is mainly due to the burn-up of organics and carbon (CO_2: u 44 and water: u 18).



Quartz sand (4099.46 mg) was tested here in the alumina beaker crucible for TGA measurements

Please note:
In applications where even larger crucibles are required, we recommend our Multiple-Module Calorimeter, MMC 274 *Nexus*®. This tabletop instrument bridges the gap between large adiabatic reaction calorimeters and small differential scanning calorimeters. It allows for large sample volumes, while quickly and precisely analyzing properties such as heat capacities. It is also capable of quantitatively characterizing exothermic and endothermic effects.

Samples, Oxygen-Sensitive Alloys



Phase transitions in γ-TiAl. Only a pure oxygen-free atmosphere leads to well-defined phase transitions at higher temperatures because oxidation of the metal alloy is inhibited.

The crucible combination of PtRh/Al_2O_3 (order no. 6.225.6-93.2.00) can be used for samples which may react with Pt up to 1700°C. In addition to the Al_2O_3 liner, MgO and Y_2O_3 liners are also available.

Furthermore, these crucible combinations are suitable for c_p determination on metals or other oxygen-sensitive materials up to 1400°C.

The reshaping tool for the PtRh crucible (order no. GB397964) can be used to reshape it after measurement, allowing it to be used multiple times.

Phase Transformation of an Oxygen-Sensitive Material

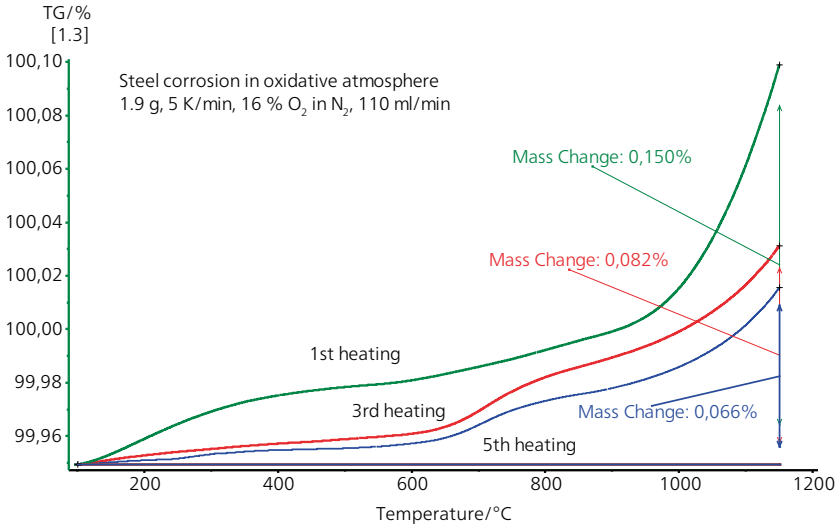
The high-performance metal γ-TiAl is resistant to corrosion and high temperatures and has a low specific weight. However, it is highly sensitive to oxygen, so DSC measurements have to be carried out in a very pure atmosphere. Additionally, measurement results can be improved by using the right crucible. Metallic crucibles with high thermal conductivities and low time constants cannot be used for metals. In order to maintain the advantages of a Pt crucible and to prevent reaction between the sample and crucible material, a special Pt crucible with an Al_2O_3 liner is available. The DSC 404 ***F3*** *Pegasus*®, with its vacuum-tight design and various sensor and crucible types, completely fulfills all measurement requirements for highly oxygen-sensitive materials. In addition, an oxygen trap system (*OTS*®) is available to further reduce oxygen traces in the atmosphere.

The DSC curve of γ-TiAl shows an endothermic effect at a peak temperature of 1323°C. This is due to the α2 → α transition. At 1476°C, the α → β transition occurs and is followed by melting of the sample.

Applications – Special Crucibles for High Temperatures

Oxidation and Corrosion Studies on Metals

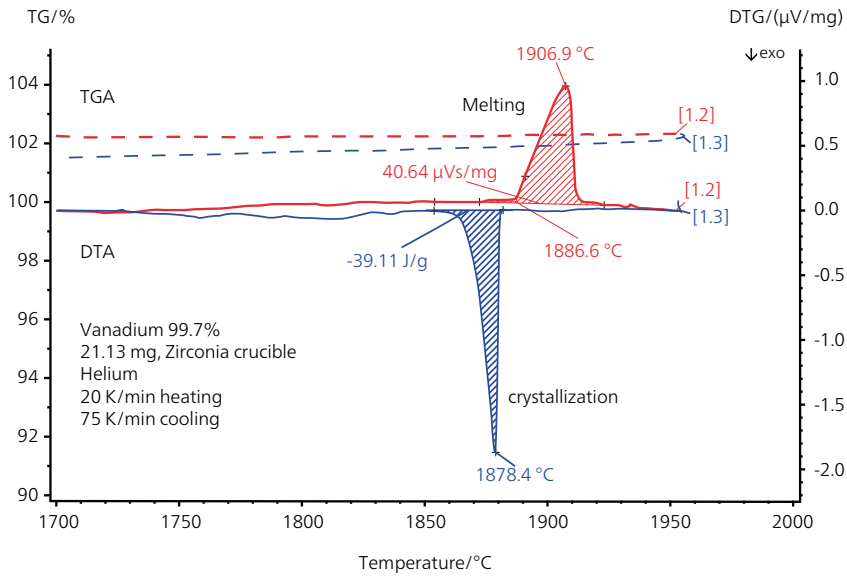
For oxidation and corrosion studies, it is preferable to have a large sample surface in order to maximize the gas access. TGA and TGA-DTA sample holders are available which allow the sample to be attached in a hanging position (TGA: HTP40000A60.000-00; TGA-DTA: HTP40000A61.000-00). The samples can be a plate, mesh, or a compact body which can be encased in a platinum basket.



Increased sample surface for oxygen access improves oxidation tests

Steel Corrosion

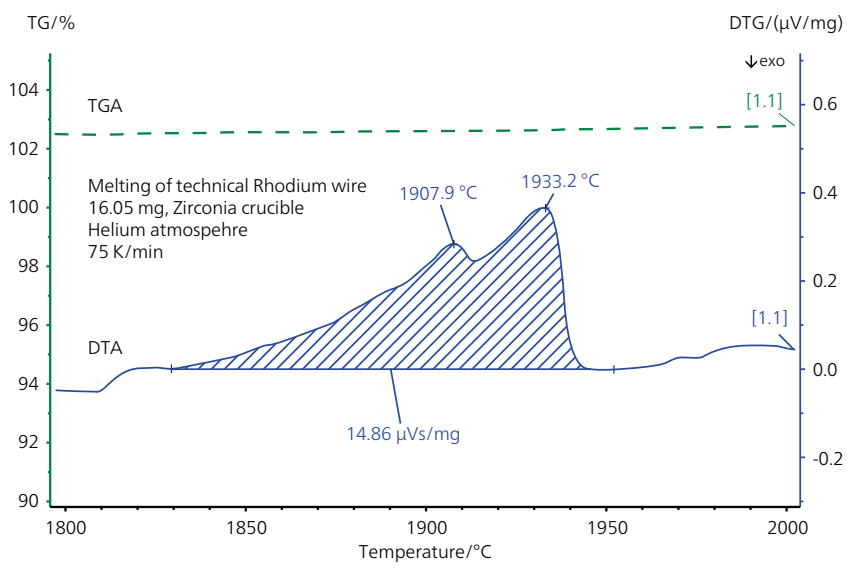
This TGA measurement shows several heating cycles on a hanging steel sample. The steel sheet was heated at a rate of 5 K/min in a nitrogen atmosphere with 16% oxygen. Oxidation (mass increase) decreases with each subsequent heating cycle. At the beginning of the test, oxidation of the sheet surface occurs. This can be observed in the early onset and rapid mass increase for the first heating. After a couple of heating cycles, inner oxidation occurs, which is indicated by a slower, diffusion-dependent mass increase. Hanging the sample in the special holder maximizes the accessible sample surface and therefore improves oxygen access to all sample sides. This is a prerequisite for certain analyses, such as kinetic studies of the oxidation behavior.



Vanadium melting point determination in ZrO_2 crucibles

Melting Point Determination on Vanadium

In this example, the melting point of a vanadium sample (99.7%) was determined with the STA 449 ***F1*** *Jupiter*®. ZrO_2 crucibles were used.Melting occurs at an onset temperature of 1886°C. During cooling, the sample recrystallizes with only a small supercooling effect at 1878°C.



Double melting peak of a technical rhodium wire

Technical Rhodium Wire – Failure Analysis at High Temperatures

Here, a failure analysis on a rhodium wire was carried out with the STA 449 ***F1*** *Jupiter*®. The wire material was measured in ZrO_2 crucibles up to 2000°C in a helium atmosphere. The broad double peak and temperatures (1908°C and 1933°C) confirm that the wire material is not made of pure rhodium.

Sensors and Sample Carriers

DSC, TGA-DSC Sensors and TGA Sample Carriers

Nearly all DSC, TGA and STA instruments allow measurements with exchangeable DSC and DTA or TGA, TGA-DTA and TGA-DSC sensors and sample carriers which cover different temperature ranges.

Additionally, the instruments differ in the types of thermocouple which are compatible with them, as well as their ability to accommodate large crucibles. The type of thermocouple selected influences the sensitivity and resolution of a given DSC or STA system.

Choosing the right thermocouple can thus improve the measurement curve and also the evaluated test results, so this should be as carefully considered as the temperature range.

The following pages give an overview of the DTA, DSC, TGA, TGA-DSC and TGA-DTA sensors and sample carriers for these instruments:

- DSC 204 ***F1*** *Phoenix®*
- DSC 404 ***F1/F3*** *Pegasus®*
- STA 449 ***F1/F3/F5*** *Jupiter®*
- TG 209 ***F3*** *Tarsus®*
- TG 209 ***F1*** *Libra®*

DSC 204 ***F1*** *Phoenix®* Sensors, TG 209 ***F1*** *Iris®/Libra®*, TG 209 ***F3*** *Tarsus®* and TG 209 ***F1/F3*** *Nevio* Sample Carriers

DSC 204 ***F1*** *Phoenix®*			
Sensor Type*	Temperature Range	Remarks	Order Number
τ-sensor	-180°C to 700°C	Complete system, ready for installation → High-resolution sensor	6.240.10-09.0.00
μ-sensor	-150°C to 400°C	Complete system, ready for installation → High-sensitivity sensor	6.240.10-11.0.00

* From instrument series no. 240 10 034 on

τ-sensor with low time constant and very good sensitivity for standard applications

μ-sensor with extremely high sensitivity

TG 209 ***F1*** *Iris®* – Up to instrument No. 220 10 076			
Sample Carrier Material	Temperature Sensor Type	Remarks	Order Number
Al_2O_3	Type P	SiO_2-coated, up to instrument No. 220 10 031	6.220.10-57.1.00
Al_2O_3	Type P	SiO_2-coated, from instrument No. 220 10 032 on	6.220.10-57.5.00
Al_2O_3	Type P	SiO_2-coated, for large samples, up to instrument No. 220 10 031	6.220.10-58.1.00
Al_2O_3	Type P	SiO_2-coated, for large samples, from instrument No. 220 10 032 on	6.220.10-58.5.00
Radiation shield		Made of Al_2O_3, complete with metallic flange	6.220.10-04.4.00

Standard sample carrier and radiation shield for corrosive media

TG 209 ***F1*** *Libra*® – All instruments, TG 209 ***F1*** *Iris*® – As of instrument No. 220 10 077*, TG 209 ***F3*** *Tarsus*® – As of instrument No. 220 20 010*			
Sample Carrier Material	Temperature Sensor Type	Remarks	Order Number
Al_2O_3	Type P	Higher sensitivity for c-*DTA*®, with SiO_2 coating, including radiation shield	6.220.10-60.0.00
Al_2O_3	Type P	Higher sensitivity for c-*DTA*®, with SiO_2 coating,without radiation shield	6.220.10-60.1.00
Al_2O_3	Type P	Higher sensitivity for c-*DTA*®, for large samples, including radiation shield	6.220.10-61.0.00
Al_2O_3	Type P	Higher sensitivity for c-*DTA*®, with SiO_2 coating, without radiation shield	6.220.10-61.1.00
Al_2O_3	Type P	Sample support made of Al_2O_3, including radiation shield	6.220.10-62.0.00
Al_2O_3	Type P	Sample support made of Al_2O_3, without radiation shield	6.220.10-62.1.00
Al_2O_3	Type P	For large samples, sample supports made of Al_2O_3, radiation shield	6.220.10-63.0.00
Al_2O_3	Type P	For large samples, sample supports made of Al_2O_3, without radiation shield	6.220.10-63.1.00
Al_2O_3	Type P	For crucible up to an outer diameter of 9 mm, with protected thermocouple, particulary suitable for corrosive media, including radiation shield and crucible made of Al_2O_3 with ø 8 mm (0.3 ml, order no. NGB803698)	6.220.10-66.0.00
Al_2O_3	Type P	For crucible up to an outer diameter of 9 mm, with protected thermocouple, particulary suitable for corrosive media	6.220.10-66.1.00
Al_2O_3	Type P	Standard sample carrier with closed stuck head plate, particularly suitable for corrosive media, including radiation shield	6.220.10-65.0.00
Radiation shield		Made of Al_2O_3, for TG 209 ***F1*** *Iris*®, from instrument No. 220 10 077 up to 158; for TG 209 ***F3*** *Tarsus*® from instrument No. 220 20 010 up to 048	6.220.10-60.2.00
Radiation shield		Made of Al_2O_3, for TG 209 ***F1*** *Libra*® (all instruments); for TG 209 ***F1*** *Iris*® from instrument No. 220 10 159 onwards; for TG 209 ***F3*** *Tarsus*® from No. 220 20 049 onwards	6.220.10-60.3.00

* Sample carriers for TG 209 ***F1*** *Iris*® up to instruments No. 220 10 076 see previous page.
Please contact us for sample carriers for TG 209 ***F3*** *Tarsus*® up to instrument No. 220 20 009.

Sample carrier type P and radiation shield

c-*DTA*® – More Than an

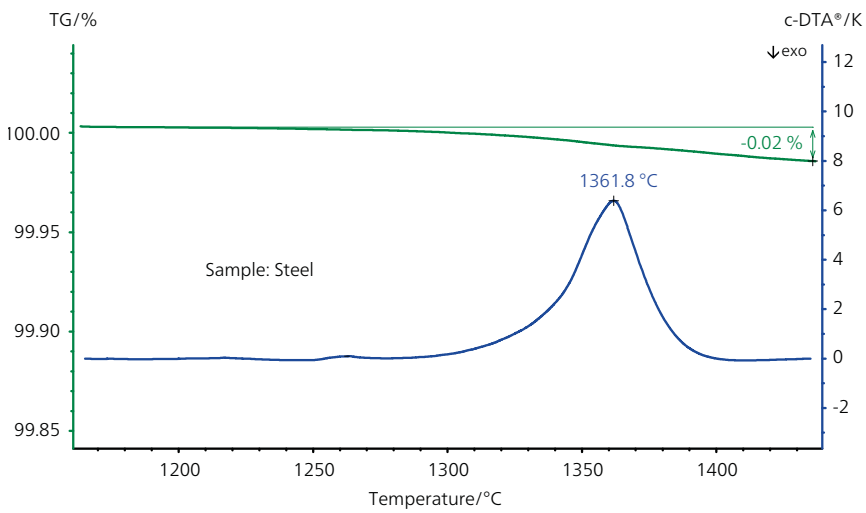
c-*DTA*® – Temperature Calibration and Determination of Caloric Effects in TGA Measurements

The calculated DTA/DSC-signal, c-*DTA*®, is ideal for easy temperature calibration without the need for magnetic Curie point standards, which would often necessitate partial disassembling of the thermobalance. In addition, signals of mass change together with endo- and exothermal behaviors (e.g., vaporization with mass loss or melting without mass change) can be obtained without any hardware add-ons.

Thus, correlation of such results is not influenced by the hardware. All TGA sample carriers (TG 209 ***F1*** *Iris*®/*Libra*®, TG 209 ***F3*** *Tarsus*®, STA 449 ***F1/F3*** *Jupiter*®) allow for c-*DTA*® determination.

Ceramic and metallic crucibles are available to achieve optimum peak temperature results together with the caloric information on the tested sample.

Easy Calibration Routine

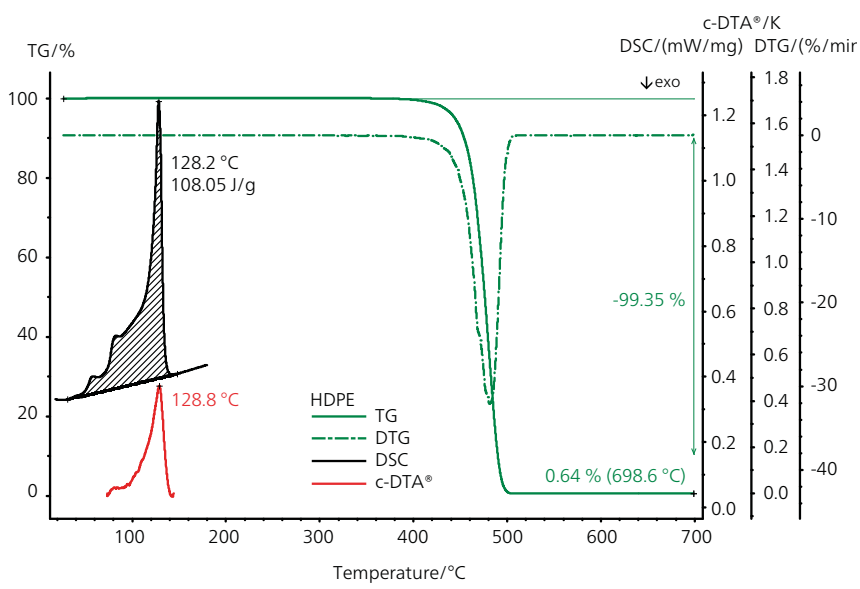


Measurements of large sample masses can be done with slip-on plates. Various dimensions of such plates are available.

Thermal Behavior of a Large Steel Sample

In this example, a large steel sample (1018.59 mg) was tested with the STA 449 ***F1*** *Jupiter®* at a heating rate of 20 K/min in an argon atmosphere. A slip-on plate made of alumina (ø 17 mm) was used to carry the sample.

The c-*DTA®* curve (blue) shows an endothermic effect at 1362°C which corresponds to melting of the sample. In the same tempe ature range, the TGA curve (green) indicates some minor mass loss (0.02%) which is due to a small evaporation effect.



Very good correlation between calculated and measured melting peak temperature

Melting and Decomposition of HDPE with the TG 209 ***F1*** *Libra®*

High density polyethylene (HDPE)was here measured with the TG 209 ***F1*** *Libra®* at a heating rate of 10 K/min in an N2 atmosphere. The sample mass amounted to 10.31 mg. Before decomposition started at approx. 420°C (green), the c-*DTA®* curve (red) detected the melting peak at 128.8°C. Under the same conditions, the melting peak temperature of HDPE was determined with the DSC 200 ***F3*** *Maia®* (black curve). As can be observed, the two sets of results are in perfect agreement.

DTA and DSC Sensors

DTA Sensors for the DSC 404 ***F1/F3*** *Pegasus®*				
Sensor Type	Temperature Range	Crucible/Volume/ Order Number	Radiation Shield	Order Number
Type S	25°C to 1650°C	2x Al_2O_3, 0.3 ml, NGB810411	Integrated	DSC404F1A56.000-00
Type S, protected thermocouples	25°C to 1650°C	2x Al_2O_3, 0.3 ml, NGB810411	Integrated	DSC404F1A68.000-00
Type B	25°C to 1750°C	2x Al_2O_3, 0.3 ml, NGB820035	Integrated	DSC404F1A57.000-00
W3%Re/W25%Re (exchangeable)	25°C to 2000°C	2x tungsten, GB453520	Integrated	DSC404F1A53.000-00

DSC Sensors for the DSC 404 ***F1/F3*** *Pegasus®* – for Standard & c_p Measurements*				
Sensor Type	Temperature Range	Crucible/Volume/Order Number	Radiation Shield	Order Number
Type S	25°C to 1650°C	2x Al_2O_3 crucible GB399972 and lid GB399973	Integrated	DSC404F1A69.000-00
Type S, octagonal design	25°C to 1650°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A54.000-00
Type P	-150°C to 1000°C	2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A59.000-00
Type E	-150°C to 700°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A70.000-00
Type K	-150°C to 800°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A71.000-00
Type S	25°C to 1650°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A72.000-00
Type B	25°C to 1750°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A76.000-00
Type K, octagonal	-150°C to 800°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A77.000-00
Type S, octagonal	25°C to 1650°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A78.000-00
Type E, octagonal	-150°C to 700°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A79.000-00

* c_p recommended up to 1400°C

DSC Sensors for the DSC 404 ***F1/F3*** *Pegasus®* – for ASC Operation, Octagonal Design					
Sensor Type	c_p	Temperature Range	Crucible/Volume/ Order Number	Radiation Shield	Order Number
Type S	Yes	25°C to 1650°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A73.000-00
Type P	Yes	-150°C to 1000°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A75.000-00
Type K	Yes	150°C to 800°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3 crucible, GB399972, lid GB399973	Integrated	DSC404F1A74.000-00

DTA sensor with protected thermocouples

DSC sensor in round design with Pt crucibles

DSC sensor

DSC sensor in octagonal design for ASC operation

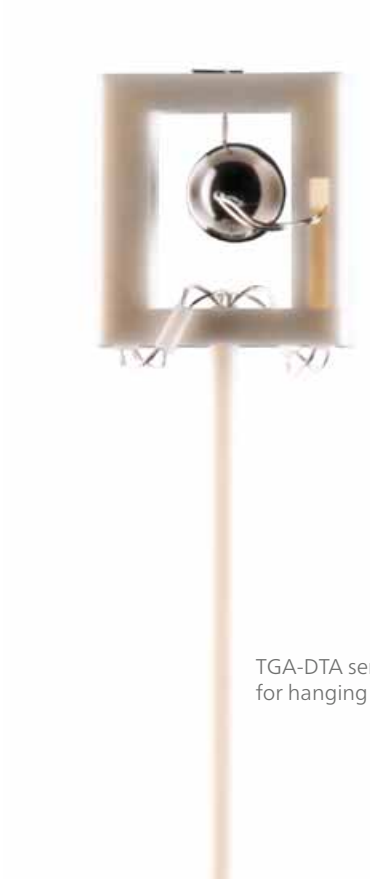
TGA Sample Carriers and TGA-DTA Sensors

TGA Sample Carriers for the STA 449 ***F1/F3*** *Jupiter*® and STA 449 ***F3*** *Nevio* – for Standard Measurements				
Material/ Sensor Type	Temperature Range	Crucible/Volume/Order Number	Radiation Shield	Order Number
Type P	-150°C to 1000°C	Al_2O_3, 3.4 ml, GB445213	Included	HTP40000A55.000-00
Type P	-150°C to 1000°C	-	Without	HTP40000A55.010-00
Type S	25°C to 1650°C	Al_2O_3, 3.4 ml, GB445213	Included	HTP40000A58.000-00
Type S	25°C to 1650°C	-	Without	HTP40000A58.010-00
Type B	25°C to 1750°C	Al_2O_3, 3.4 ml, NGB820041	Included	HTP40000B58.000-00
Type B	25°C to 1750°C	-	Without	HTP40000B58.010-00
Made of Al_2O_3, W3%Re/W25%Re	25°C to 1650°C	Al_2O_3, 3.4 ml, GB445213	Included	HTP40000A62.000-00
Made of Al_2O_3, W3%Re/W25%Re	25°C to 1650°C	-	Without	HTP40000A62.010-00
Made of fused silica, type S	25°C to 1100°C	Crucible required: Fused silica, 3.4 ml, NGB811507	Included	HTP40000A64.000-00
Made of fused silica, type S	25°C to 1100°C	-	Without	HTP40000A64.010-00
W3%Re/W25%Re	25°C to 2400°C	Tungsten, NGB809001	Included	HTP40000A52.000-00
W3%Re/W25%Re	25°C to 2400°C	-	Without	HTP40000A52.010-00
Radiation shield from tungsten	25°C to 2400°C	-	Complete	HTP40000A53.020-00

TGA type S sample carrier with different crucibles and plates, TGA type W sample carrier (W3%Re/W25%Re); for more crucibles and plates, see TGA crucibles table.

TGA Sample Carriers and TGA-DTA Sensors for the STA 449 ***F1/F3*** *Jupiter*® and STA 449 ***F3*** *Nevio* – with Special Design

Material/ Sensor Type	Temperature Range	Crucible Type	Radiation Shield	Order Number
TGA, type S, length 250 mm, for water vapor furnace HTP40000A88	25°C to 1650°C	Al_2O_3 slip-on plate, ø 17 mm	Included	HTP40000A57.000-00
TGA, type S, length 250 mm, for water vapor furnace HTP40000A88	25°C to 1650°C	-	Without	HTP40000A57.010-00
TGA, made of Al_2O_3, type S, for hanging samples, sample size max. 13 x 20 mm	25°C to 1650°C	Options: net-shaped cage made of Pt, order no. NGB813036 or order no. NGB813037 (see page 29)	Included	HTP40000A60.000-00
TGA, made of Al_2O_3, type S, for hanging samples, sample size max. 13 x 20 mm	25°C to 1650°C		Without	HTP40000A60.010-00
TGA, made of Al_2O_3, type S, for measurements in an immersion bath (e.g., salt solution), for hanging samples	25°C to 1650°C	Special container made of Al_2O_3, 3 immersion container made of Pt and 5 immersion container made of BN	tube made of glass (single order no. NGB801706)	HTP40000B60.000-00
TGA-DTA, type S, hanging samples	25°C to 1650°C		Included	HTP40000A61.000-00
TGA-DTA, type S, hanging samples	25°C to 1650°C		Without	HTP40000A61.010-00



TGA-DTA sensor for hanging samples

TGA sample carrier for hanging samples

TGA sample carrier for measurements in an immersion bath

TGA-DTA and TGA-DSC Sensors

TGA-DTA Sensors for the STA 449 ***F1/F3*** *Jupiter®* – for Standard Measurements				
Sensor Type	Temperature Range	Crucible/Volume/Order Number	Radiation Shield	Order Number
Type E	-150°C to 700°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3, 0.3 ml, NGB810411	Included	HTP40000A50.000-00
Type E	-150°C to 700°C, inert -150°C to 500°C, oxidizing	-	Without	HTP40000A50.010-00
Type K	-150°C to 700°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3, 0.3 ml, NGB810411	Included	HTP40000A51.000-00
Type K	-150°C to 700°C, inert -150°C to 500°C, oxidizing	-	Without	HTP40000A51.010-00
Type P	-150°C to 1000°C	2x Al_2O_3, 0.3 ml, NGB810411	Included	HTP40000B56.000-00
Type P	-150°C to 1000°C	-	Without	HTP40000B56.010-00
Type P, protected thermocouples	-150°C to 1000°C	2x Al_2O_3, 0.3ml, NGB810411	Included	HTP40000B59.000-00
Type P, protected thermocouples	-150°C to 1000°C	-	Without	HTP40000B59.010-00
Type S	25°C to 1650°C	2x Al_2O_3, 0.3 ml, NGB810411	Included	HTP40000A56.000-00
Type S	25°C to 1650°C	-	Without	HTP40000A56.010-00
Type S, protected thermocouples	25°C to 1650°C	2x Al_2O_3, 0.3 ml, NGB810411	Included	HTP40000A68.000-00
Type S, protected thermocouples	25°C to 1650°C	-	Without	HTP40000A68.010-00
Type B	25°C to 1750°C	2x Al_2O_3, 0.3ml, NGB820035	Included	HTP40000B57.000-00
Type B	25°C to 1750°C	.	Without	HTP40000B57.010-00
Type W, protected thermocouples	25°C to 1500°C	2x Al_2O_3, 0.3 ml, NGB810411	Included	HTP40000A94.000-00
Type W, protected thermocouples	25°C to 1500°C	-	Without	HTP40000A94.010-00
W3%Re/W25%Re	25°C to 1650°C, not for oxidizing atmospheres!	2x Al_2O_3, 0.3 ml, NGB810411	Included	HTP40000A65.000-0
W3%Re/W25%Re	25°C to 1650°C, not for oxidizing atmospheres!	-	Without	HTP40000A65.010-0
W3%Re/W25%Re	25°C to 2400°C, not for oxidizing atmospheres!	2x tungsten, NGB808999, wall thickness 0.2 mm; optional for STA 449 ***F3*** *Jupiter®*: tungsten crucible, with wall thickness 0.3 mm, GB453520	Included	HTP40000A53.000-00
W3%Re/W25%Re	25°C to 2400°C, not for oxidizing atmospheres!	-	Without	HTP40000A53.010-00
Radiation shield from tungsten	25°C to 2400°C	-	Complete	HTP40000A53.020-00

TGA-DSC Sensors for the STA 449 ***F1/F3*** *Jupiter®* – for Standard Measurements				
Sensor Type	Temperature Range	Crucible/Volume/Order Number	Radiation Shield	Order Number
Type K octagonal	-150°C to 800°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3, 85 µl, crucible GB399972, lid GB399973	Included	HTP40000A77.000-00
Type K octagonal	-150°C to 800°C, inert -150°C to 500°C, oxidizing	-	Without	HTP40000A77.010-00
Type P	-150°C to 1000°C	2x Al_2O_3, 85 µl, crucible GB399972, lid GB399973	Included	HTP40000A59.000-00
Type P	-150°C to 1000°C	-	Without	HTP40000A59.010-00
Type S	25°C to 1650°C	2x Al_2O_3, 85 µl, crucible GB399972, lid GB399973	Included	HTP40000A69.000-00
Type S	25°C to 1650°C	-	Without	HTP40000A69.010-00
Type E	-150°C to 700°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3, 85 µl, crucible GB399972, lid GB399973	Included	HTP40000A70.000-00
Type E	-150°C to 700°C, inert -150°C to 500°C, oxidizing	-	Without	HTP40000A70.010-00
Type E octagonal	-150°C to 700°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3, 85 µl, crucible GB399972, lid GB399973	Included	HTP40000A79.000-00
Type E octagonal	-150°C to 700°C, inert -150°C to 500°C, oxidizing	-	Without	HTP40000A79.010-00
Type K	-150°C to 700°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3, 85 µl, crucible GB399972, lid GB399973	Included	HTP40000A71.000-00
Type K	-150°C to 700°C, inert -150°C to 500°C, oxidizing	-	Without	HTP40000A71.010-00

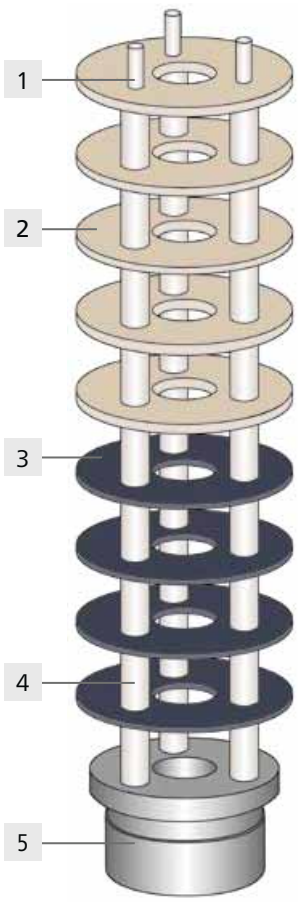
TGA-DTA sensors with different crucibles and plates; for more crucibles, please see TGA

TGA-DTA sensor Type W (W3%Re/ W25%Re)

TGA-DTA sensor Type S, protected thermocouples

Different TGA-DSC Sensors

Radiation Shield for STA Systems

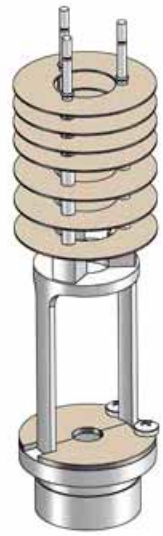


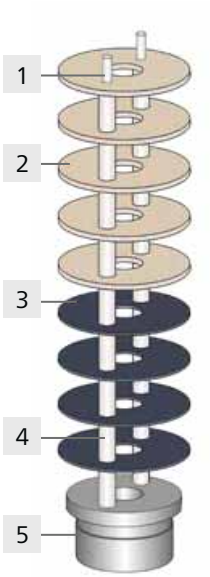
Radiation Shield with 3 Supporting Bars

Component parts		Order number
Radiation shield – Complete		HTP40000A72.040-00
1	Supporting bar made of Al_2O_3	GB348216
2	Disk for radiation shield made of Al_2O_3	NGB809780
3	Disk for radiation shield made of nickel	NGB809779
4	Spacing tube made of Al_2O_3	GB351383
5	Metal base for radiation shield	NGB809778

Radiation Shield for TGA Sample Carrier and TGA-DTA Sensor Type W (W3%Re/W25%Re)

Component parts	Order number
Radiation Shield For TGA sampple carrier HTP40000A52.000-00 and TGA-DTA sensor HTP40000A53.000-00	HTP4000A53.020-00





Component parts		Order number
1	Supporting bar made of Al_2O_3	GB348216
2	Disk for radiation shield made of Al_2O_3	NGB806979
3	Disk for radiation shield made of nickel	NGB806987
4	Distance tube made of Al_2O_3	GB351383
5	Metal base for radiation shield	HTP40000A72.020-01

TGA and TGA-DSC Sensors for c_p Determination and Operation with the Automatic Sample Changer (ASC)

TGA-DSC Sensors for the STA 449 ***F1/F3/F5*** *Jupiter®* and STA 449 ***F3*** *Nevio* – for c_p Determination (Recommended up to 1400°C)				
Sensor Type	Temperature Range/ Atmosphere	Crucible/Volume/ Single Order Number	Radiation Shield	Order Number
Type S, round design, especially for c_p	25°C to 1650°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Included	HTP40000A54.000-00
Type S, round design, especially for c_p	25°C to 1650°C	-	Without	HTP40000A54.010-00
Type S	25°C to 1650°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Included	HTP40000A72.000-00
Type S	25°C to 1650°C	-	Without	HTP40000A72.010-00
Type S octagonal version	25°C to 1650°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Included	HTP40000A78.000-00
Type S octagonal version	25°C to 1650°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Without	HTP40000A78.010-00
Type B	25°C to 1750°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Included	HTP40000A76.000-00
Type B	25°C to 1750°C	-	Without	HTP40000A76.010-00

TGA-DSC sensors for c_p determination

TGA, TGA-DTA and TGA-DSC Sensors for the STA 449 ***F1/F3/F5*** *Jupiter®* and STA 449 ***F3*** *Nevio* – for Operation with the Automatic Sample Changer (ASC)				
Sensor Type	Temperature Range/ Atmosphere	Crucible/Volume/ Single Order Number	Radiation Shield	Order Number
TGA-DSC, Type P	-150°C to 1000°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972,lid GB399973	Included	HTP40000A63.000-00
TGA-DSC, Type P	-150°C to 1000°C	-	Without	HTP40000A63.010-00
TGA-DSC, Type E	-150°C to 700°C, inert 150°C to 500°C, oxidizing	2x Al_2O_3, 85 µl, crucible GB399972, lid GB399973	Included	HTP40000A66.000-00
TGA-DSC, Type E	-150°C to 700°C, inert -150°C to 500°C, oxidizing	-	Without	HTP40000A66.010-00
TGA-DSC, Type S, for c_p	25°C to 1650°C	2x PtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Included	HTP40000A73.000-00
TGA-DSC, Type S, for c_p	25°C to 1650°C	-	Without	HTP40000A73.010-00
TGA-DSC, Type K	-150°C to 700°C, inert -150°C to 500°C, oxidizing	2x Al_2O_3, 85 µl crucible GB399972,lid GB399973	Included	HTP40000A74.000-00
TGA-DSC, Type K	-150°C to 800°C, inert -150°C to 500°C, oxidizing	-	Without	HTP40000A74.010-00
TGA, type S	25°C to 1650°C	Spare part: slip-on plate made of Al_2O_3, NGB809010 Crucible: Al2O3, 85 µl, GB399972 Lid: GB399973	Included	HTP40000A75.000-00
TGA, type S	25°C to 1650°C	-	Without	HTP40000A75.010-00
TG-DTA, Type S, with protected thermocouples and slip-on plates	25°C to 1650°C	Spare part: slip-on plate made of Al_2O_3, NGB815222; 2x Al_2O_3 crucible, GB399972, lid GB399973	Included	HTP40000B68.000-00
TG-DTA, Type S, with protected thermocouples and slip-on plates	25°C to 1650°C	Spare part: slip-on plate made of Al_2O_3, NGB805010	Without	HTP40000B68.010-00
TGA, type P	-150°C to 1000°C	Spare part: slip-on plate made of Al_2O_3, NGB809010 Crucible: Al_2O_3, 85 µl, GB399972	Included	HTP40000A67.000-00
TGA, type P	-150°C to 1000°C	-	Without	HTP40000A67.010-00
TGA-DSC, Type B	25°C to 1750°C	2xPtRh crucible, GB399205, lid GB399860 2x Al_2O_3 crucible, GB399972, lid GB399973	Included	HTP40000B73.000-00
TGA-DSC, Type B	25°C to 1750°C	-	Without	HTP40000B73.010-00

TGA-DSC sensor for ASC operation

TGA-DTA sample carrier (with protected thermocouples) and slip-on plates for ASC operation

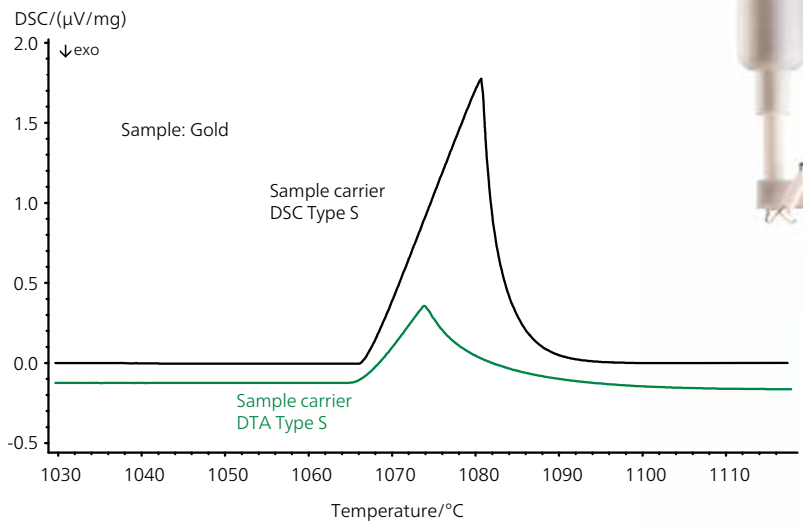
Different Sensor Types – The Right Sensor

The STA 449 ***F1/F3*** *Jupiter*®, STA 449 ***F3*** *Nevio* and DSC 404 ***F1/F3*** *Pegasus*® systems are unique in their flexibility. One of their out-standing features is their capability for easy insertion of different sensor types and sample carriers in a matter of only a few seconds.Selection of the right crucible, together with the most appropriate furnace out of nine options, allows a single instrument to cover an extremely broad application range.Of course, the vacuum-tight design of these instruments further extends the measurement capabilities in the temperature range between -150°C and 2400°C.

Advantages of True DSC Measurements

True DSC measurements require special sensors with optimized design and thermocouple posit-ioning. They are not the same as a calibrated DTA test.

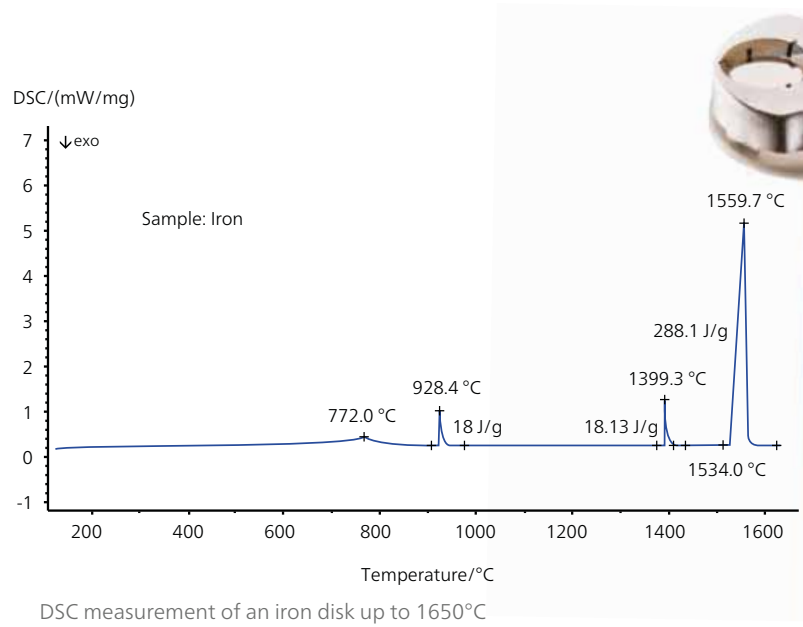
- DSC sensors offer a more stable baseline, a higher sensitivity, an improved detection limit, and a shorter time constant.
- Therefore, transition peaks are sharp, reliable and easy to separate from the baseline curvature.
- DSC sensors can detect weak transitions and glass transition steps and offer excellent reproducibility.
- DSC-c_p sensors are capable of measuring the specific heat (c_p).



DSC and DTA type S sensor comparison

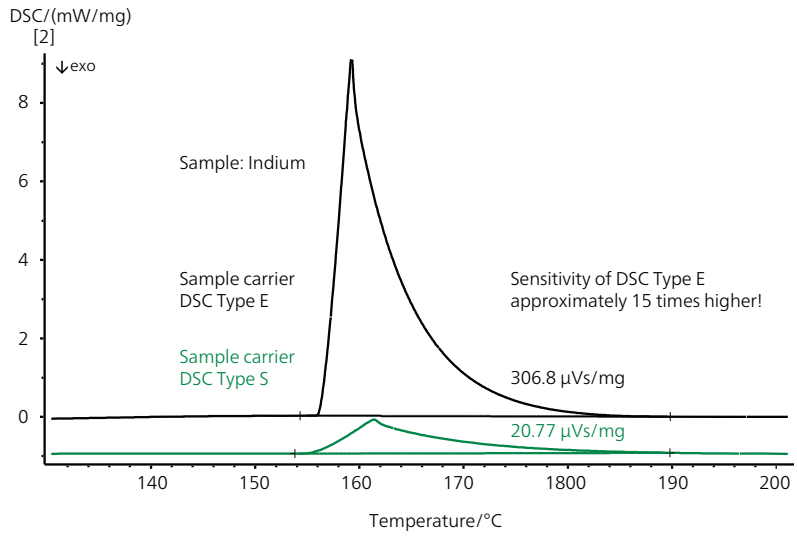
Detection of Weak Effects with the High-Temperature DSC Sensor

This example shows a DSC measurement of an iron disk between room temperature and 1650°C. The iron disk was placed in a Pt+Al_2O_3 liner closed with a Pt lid. The sample mass amounted to 129.68 mg and was heated in an argon atmosphere at a rate of 20 K/min. The DSC type S sensor is especially designed for c_p determination and exhibits out-standing sensitivity. Even the weakest of effects such as iron solid-solid transitions can clearly be detected. Melting occurs at 1534 °C (onset).



DSC measurement of an iron disk up to 1650°C

for Each Application



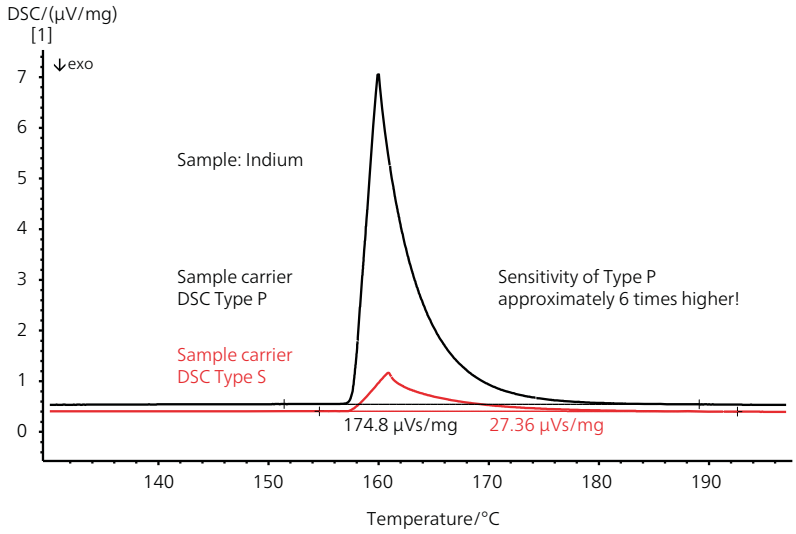
DSC sensor types E and S comparison

DSC Sensor Types E and S

DSC sensor types E, K and P allow measurements with extremely high sensitivity.

DSC type S and B sensors have the advantage of a wide temperature range and a short time constant.

The DSC signal in the lower temperature range is approx. 15 times higher for sensor type E than for type S. On the other hand, the resolution of type S is very high.



Comparison of DSC sensor types P and S

DSC Sensor Types P and S

In the lower temperature range up to 1000°C, the DSC sensor type P has excellent sensitivity and well-pronounced resolution compared to the hightemperature sensor type S. The latter is designed for measurements up to 1650°C. Its sensitivity increases with temperature.

This example shows that the DSC sensor type P is a good alternative to the DSC sensors type E and K (max. 700°C/800°C in an inert atmosphere) when temperatures up to 1000°C are required.

DSC sensor types E and S comparison

Tungsten for Highest Temperature Applications

Basic Requirements for Highest Temperature Applications

For applications at very high temperatures, critical hardware issues have to be resolved. Ceramic insulation materials become electrically conductive, thermo- couple wires become very brittle, and for most materials, a potentially high level of vapor pressure needs to be taken into consideration. Additionally, metallic parts are sensitive to oxygen and the heat transfer is dominated by conduction and radiation. These problems have certain cons quences for the design of the high-temperature instruments, their sample holders and crucibles by making it necessary to ensure the following:

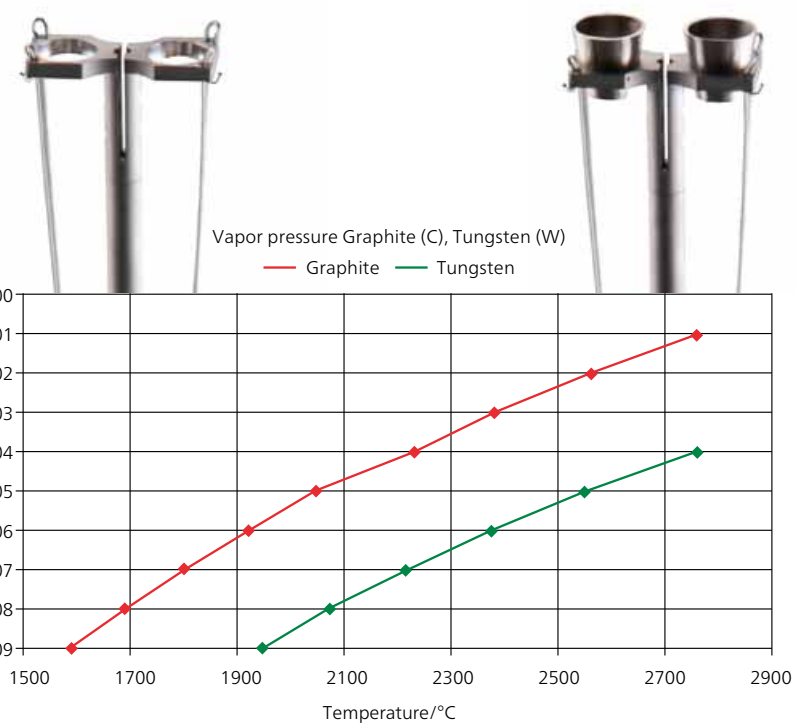
- No insulation of thermocouples in the hot zone
- Possibility of repairing thermo-couples on site
- Free access to the sample holder for loading sample and reference crucibles
- Good vertical upward purge gas flow to take away all vaporized sample products
- Vacuum-tight instrument construction
- Contact between crucible and sample carrier independent of the atmosphere, radiation and temperature condition
- Possibility of covering samples for unchanged radiation behavior

Low-Mass Sample Holder Made of Tungsten

The low-mass tungsten sample holder has well-defined heat flow paths and a split geometry for high calorimetric sensitivity. The conical sample crucible fits safely into the massive sample holder plate. The thermocouple connection is designed such that no welding is necessary. It is thus possible to measure the temperature and DTA signal directly and with high accuracy. Additionally, this sample holder allows for a "crucible-incrucible" arrangement in order to handle critical samples.

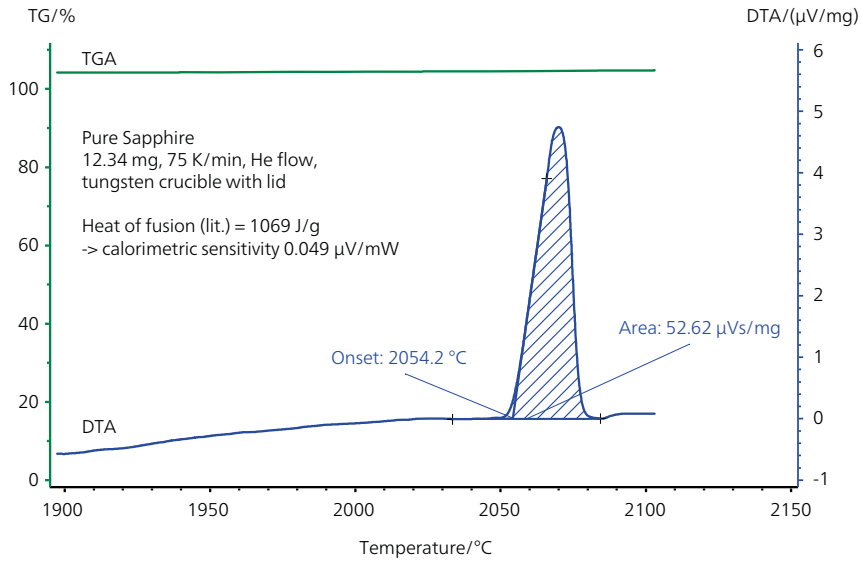
Tungsten – The Material of Choice for Highest-Temperature Measurements

At 2400°C, the vapor pressure of graphite is 10^{-3} Torr, therefore no high vacuum can be applied. The tungsten furnace of the STA 449 ***F1*** *Jupiter®* allows measurements in high vacuum (10^{-5} Torr) up to 2400°C. This is essential for clean atmospheres and Knudsen cell tests.



Pure Sapphire at the Highest Temperatures: Tungsten Furnace, Sensor, and Tungsten Crucibles

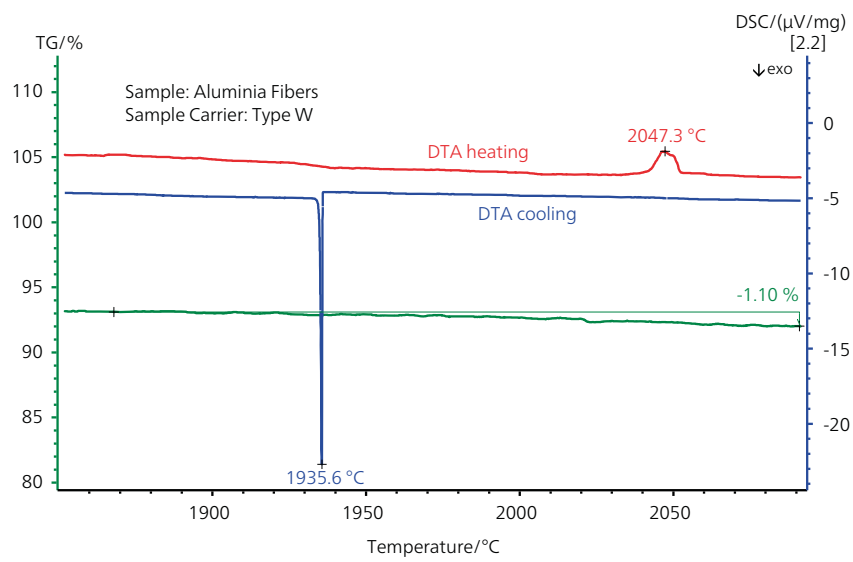
This TGA-DTA measurement on pure sapphire was performed in the tungsten furnace up to 2100°C. The crucibles were closed with lids, both made of tungsten. Melting of the pure material occurred at 2054°C (extrapolated onset). Determination of the calorimetric sensitivity of the TGA-DTA sensor Type W was based on this measurement in a helium atmosphere. The calorimetric sensitivity was determined to be 0.049 µV/mW. As expected for the pure material, the TGA curve (green) shows no mass loss before and during melting.



Melting of a pure sapphire sample

Alumina Fibers at the Highest Temperatures: Tungsten Sensor and Tungsten Crucibles

Tungsten has a lower vapor pressure compared to graphite and is therefore the material of choice when very high-end temperatures are required. This TGA-DTA measurement was performed with the tungsten furnace and sensor type W3%Re W25%Re. Alumina fibers (6.8 mg) in the tungsten crucible were heated to 2100°C and then cooled in a helium atmosphere. Upon heating, an endothermic effect occurred at 2047°C (peak temperature) which can be attributed to melting of the alumina fiber sample. Upon cooling, recrystallization occurred at 1936°C (peak temperature). A slight mass loss was detected above 1900°C which was probably due to partial evaporation of the sample.



Melting and recrystallization of alumina fibers observed in the DTA signal. Small mass loss indicates evaporation of the sample.

Special Sample Carriers for Special Applications – *OTS*®

Oxygen Trap System – *OTS*®

The *OTS*® oxygen trap system, for the STA 449 ***F1/F3*** *Jupiter*® and DSC 404 ***F1/F3*** *Pegasus*® systems removes traces of residual oxygen in the gas atmosphere inside the instrument. A residual oxygen content of <1ppm can be achieved.

A ceramic substrate bearing a getter ring is mounted on the sample carrier or in the sample carrier tube.

This getter ring is capable of almost entirely eliminating the residual oxygen after evacuation.

Such low oxygen concentrations cannot be achieved unless the instrument is vacuum-tight and equipped with an evacuation system. Both of these requirements are fulfilled by the STA 449 ***F1/F3*** *Jupiter*® and DSC 404 ***F1/F3*** *Pegasus*® systems.

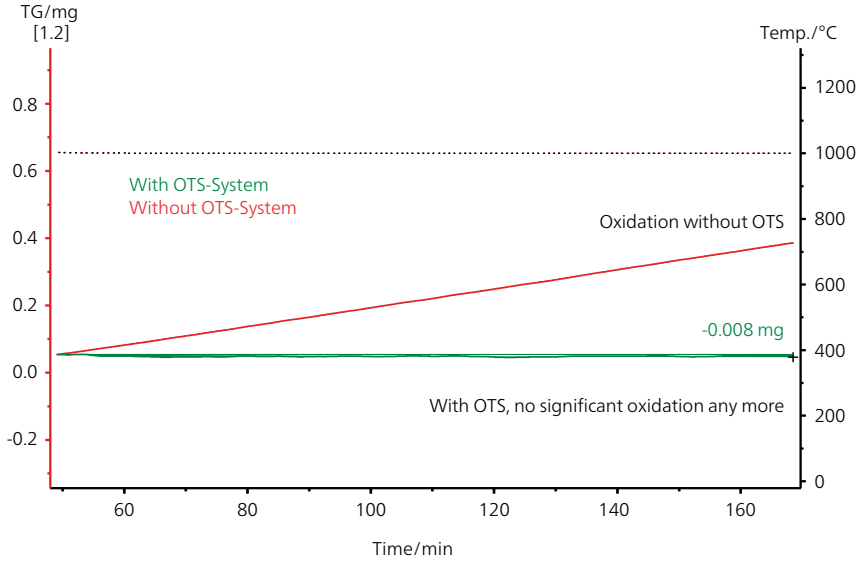
Residual O_2 level is a function of:

- Vacuum tightness of the instrument
- Desorption of O_2 from the walls
- Vacuum tightness of the gas supply
- Purity of the purge gas

DSC Sensor

OTS® – for STA 449 ***F1/F3/F5*** *Jupiter*®, STA 449 ***F3*** *Nevio* and DSC 404 **F1/F3** *Pegasus*®	
Instrument	Order Number
STA – *OTS*® getter support and ring; incl. 3 rings	HTP40000A97.010-00
DSC – *OTS*® getter support and ring	HTP40000A98.010-00
STA/DSC – getter ring (for ordering separately)	NGB809270

Please note: The *OTS*® system can be used with all sensor types. Restrictions may occur with sensor type P when used with the steel and silver furnace. Please contact your sales & service representative for details.



STA measurement of zirconium under isothermal conditions

Oxidation of Zirconium

In this example, a zirconium sample (190.0 mg) was measured with the STA 449 ***F1*** *Jupiter*® in a helium atmosphere under isothermal conditions (1000°C).

After three hours, oxidation of the Zr sample (red curve) led to a total mass increase of approx. 0.38 mg when no *OTS*® was used.

When the *OTS*® system was applied to the sample carrier for a measurement on the same sample mass, however, no significant oxidation occurred (green curve). The mass increase was determined to amount to only 0.008 mg.

Special Sample Carriers for Special Applications – Hanging Samples

Large Sample Surface – Excellent Atmospheric Access

The special TGA sample carrier and TGADTA sensor for hanging or suspended samples allow perfect access to all sample surfaces by the atmosphere.

These Al_2O_3 sample carriers and sensors with Al_2O_3 frame are available for the STA 449 ***F1/F3/F5*** *Jupiter®* systems (TGA order no. HTP40000A60.000-00; TGA-DTA order no. HTP40000A61.000-00).

The sample carrier is easy to handle and allows selection of the hanging wires according to the sample properties.

Advantages of the Sample Carrier for Hanging Samples

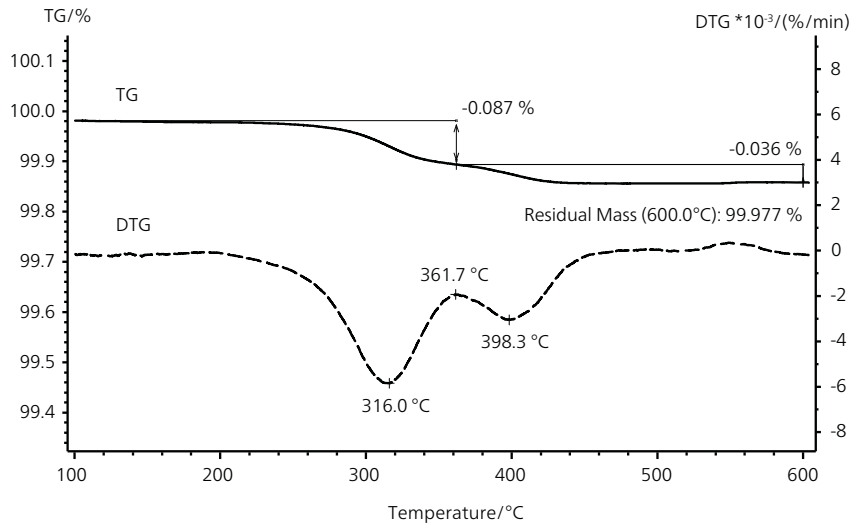
- Sample can be hung down directly
- Bendable thermocouple type S
- Improved contact between the sample and purge gas
- Sample dimensions up to 13 x 20 mm
- Very slow mass increase detectable (µg/hour range)
- Long-term signal stability, typical drift less than 0.1µg/h
- Choice of atmosphere:
  - O_2
  - Corrosive
  - Controlled humidity

TGA-DTA sensor
for hanging samples

TGA Measurement of a Hanging Coated Glass Sample

In this example, two sheets of a coated glass sample were pierced and fixed into the special TGA sample holder for suspended samples. The total sample mass amounted to 274.99 mg. The two sheets were heated up to 600°C in synthetic air (heating rate 5 K min).

The improved contact between the sample surface and purge gas resulted in the detection of very weak mass-loss steps at 316°C (0.087%) and 398°C (0.036%).



Mass-loss behavior of coated glass sheets

TGA sample carrier

TGA-DTA sample carrier

Calibration

Calibration is a fundamental requirement for thermoanalytical investigations. The knowledge of a quantitatively defined relationship between the value indicated by the measuring instrument and the correct value is essential.

Calibration of modern Differential Scanning Calorimeters (DSC) and Simultaneous Thermal Analyzers (STA) is achieved by quantification of the produced signal when a known quantity of energy is generated within the system. The calibration procedure consists of measuring thermal properties of standard materials which are well known.

Experimental conditions of calibration and measurement should be matched as closely as possible: not only the quantity of energy to be measured must be similar but the site and kinetics of the generation and temperature range should be as close as possible in both calibration and measurement experiments. All the results of subsequent measurements depend on the validity of the calibration. Therefore, it is mandatory to carefully carry out all calibration procedures.

Thermal Conductivity of Crucible

Type of Instrument

DSC/TGA INFLUENCING

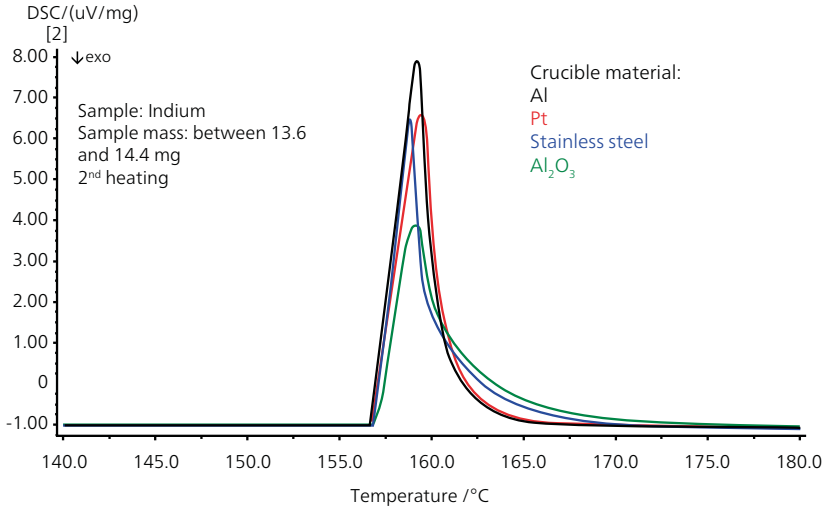
Kind & Dimension of Crucible

Crucible Selection

DSC and STA (TGA-DSC/DTA) measurements are strongly influenced by the crucible material.

The measurements shown here on indium in Al, Pt, stainless steel and Al_2O_3 crucibles clearly demonstrate that both the thermal conductivity and the mass of the crucible have an effect on the DSC and DTA peak shape.

The calibration procedures take these effects into consideration and eliminate the influence of the crucible material on the measurement results.



Indium measurements in different crucible materials

Calibration

Type of Cooling System

Heating & Cooling Rate

CALIBRATION FACTORS

Type & Flow Rate of Purge Gas

Mass of Sample

Calibration Materials and Kits

Reference materials must be homogeneous and stable, and the certified values must be accurate. Finding a material that can be used as a reference for more than one property is one of the goals of current research.

Various calibration kits and individual standards are available for each thermoanalytical method presen-ted (DSC, TGA and STA) allowing the instrument to be calibrated across its entire temperature range and allowing for the use of different crucible types. The table gives an overview of possible combinations of calibration and crucible materials.

Calibration Materials										
Common Calibration Materials/Phase Transition Temperature		Crucible Materials								
		Al_2O_3	C	SiO_2	Al	Ag	Au	Stain-less Steel	Pt	W
C10H16	-64.5°C	✓	✓	✓	✓	✓	✓	✓	✓	✓
H_2O	0.0°C	-	-	✓	✓	✓	✓	✓	✓	-
Biphenyl	69.2°C	✓			✓				✓	
$RbNO_3$	164.2°C	!			✓	✓	✓		✓	
Benzoic acid	122.4°C	✓			✓				✓	
In	156.6°C	✓	✓	✓	✓	-	!	✓	!	
Sn	231.9°C	✓	✓	✓	✓	-	-	!	-	
Bi	271.4°C	✓			✓	-	-	✓	-	
$KClO_4$	300.8°C	✓			✓	✓	✓		✓	
Pb	327.5°C	✓	✓	✓	✓	-	-	✓	-	!
Zn	419.5°C	✓	✓	✓	✓*	-	-	-	-	✓
Ag_2SO_4	426.4°C	✓			✓			-	✓	
CsCl	476.0°C	✓			✓	✓	✓	✓	✓	
Li_2SO_4	578.0°C	✓	✓	✓	✓		✓		✓	
Al	660.3°C	✓	✓	!	-	-	-	-	-	✓
K_2CrO_4	668.0°C	✓			-	✓		-	✓	
$BaCO_3$	808.0°C	✓		-	-	-		-	✓	
Ag	961.8°C	✓	✓	✓	-	-	-	-	-	✓
Au	1064.2°C	✓	-	✓	-	-	-	-	-	✓
Ni	1455.0°C	!	-	-	-	-	-	-	-	

✓ No solubility or effects on the melting temperature expected
! Corrosion reactions possible with negligible changes in the melting temperature
- Melt or transformation product reacts with the crucible material. Changes in the melting temperature can be expected.
Compatibility unknown
* Special preparation of the crucible necessary

Calibration Kits for DSC and DTA

Various calibration kits for different temperature ranges, methods, and crucible materials are available. The following tables show the common calibration kits for DSC and DTA measurements with their order numbers,materials transition temperatures (e.g., melting point), lid perf ration, and compatibility with crucible material. These kits are used for temperature and enthalpy calibration.

Mass calibration of the TGA systems can usually be done automatically with an internal weight. For temperature calibration via the c-*DTA*® feature, the DSC/DTA calibration kits can be used.

Reference Materials for the STA 2500 *Regulus*

Transition (°C)	Material			Quantity	Single Order No.
156.6	Indium	In	Granules	5 g	J1560142
231.9	Tin	Sn	Granules	5 g	J1560143
327.5	Lead	Pb	Granules	5 g	J1560144
660.3	Aluminum	Al	Wire	0.1 g	J1560296
1064.2	Gold	Au	Wire	2.5 cm	J1560209
2072	Alumina	Al_2O_3	Powder	50 cc	J1560146

DSC Sets for C_p, Sensitivity and Enthalpy Calibration

Material	Disc ø	Thickness	For crucible type	Order No.
Sapphire	6 mm	0.25, 0.5, 0.75, 1.0 mm	Metallic	6.235.1-91.1.00
Sapphire	5.2 mm	0.25, 0.5, 0.75, 1.0 mm	Al_2O_3	6.235.1-91.2.00
Sapphire	4 mm	0.25, 0.5, 0.75, 1.0 mm	Cold-weldable Al crucibles	6.239.2-91.5.00

DSC/DTA Set* for the Use in Al_2O_3 Crucibles Individual Substances in Glass Vials Order No.: 6.223.5-91.3.00

Transition (°C)	Material		Quantity	Single Order No.
156.6	Indium	In	400 mg	6.223.5-91.3.01
231.9	Tin	Sn	400 mg	6.223.5-91.3.02
271.4	Bismuth	Bi	400 mg	6.223.5-91.3.04
419.5	Zinc	Zn	400 mg	6.223.5-91.3.03
660.3	Aluminum wire	Al	400 mg	6.223.5-91.3.05
961.8	Silver wire	Ag	400 mg	6.223.5-91.3.06
1064.2	Gold wire	Au	400 mg	6.223.5-91.3.07
1455.0	Nickel wire	Ni	400 mg	6.223.5-91.3.08

* Standard set can be used with high-pressure DSC

DSC Standard Set* – Substances in Sealed Al Crucibles **Order No.: 6.239.2-91.3.00**
(Volume 25 µl, sample mass minimum 10 mg) For HP-DSC also

Transition (°C)	Material		Pierced lid	Single Order No.
-64.5	Adamantane**	$C_{10}H_{16}$		n/a
156.6	Indium	In	x	n/a
231.9	Tin	Sn	x	n/a
271.4	Bismuth	Bi	x	n/a
419.5	Zinc	Zn	x	n/a
476.0	Cesium chloride	CsCl	x	n/a

* Standard set can be used with high-pressure DSC ** HP-DSC: only atmospheric pressure

DSC Standard Set* – Substances in Sealed Al *Concavus* Crucibles Made of Al
(sample mass approx. 10 mg) **Order No. DSC21400B00.913-00**

Transition (°C)	Material		Pierced lid	Single Order No.
-64.5	Adamantane**	$C_{10}H_{16}$		n/a
156.6	Indium	In	x	n/a
231.9	Tin	Sn	x	n/a
271.4	Bismuth	Bi	x	n/a
419.5	Zinc	Zn	x	n/a
476.0	Cesium chloride	CsCl	x	n/a

* Standard set can be used with high-pressure DSC ** HP-DSC: only atmospheric pressure

DSC Low Pressure Set – Substances in Al Low-Pressure Crucibles **Order No.: 6.240.10-90.3.00**
(Volume 35 µl, max. 3 bar, sample mass minimum 10 mg)

Transition (°C)	Material		Pierced lid	Single Order No.
-64.5	Adamantane	$C_{10}H_{16}$		n/a
156.6	Indium	In	x	n/a
231.9	Tin	Sn	x	n/a
271.4	Bismuth	Bi	x	n/a
419.5	Zinc	Zn	x	n/a
476.0	Cesium chloride	CsCl	x	n/a

DSC High-Pressure Set – Substances in CrNi Steel Crucibles **Order No.: 6.240.1-91.4.00**
(Volume 27 µl, max. 100 bar, sample mass minimum 10 mg)

Transition (°C)	Material		Pierced lid	Single Order No.
-64.5	Adamantane	$C_{10}H_{16}$		n/a
156.6	Indium	In		n/a
231.9	Tin	Sn		n/a
271.4	Bismuth	Bi		n/a
476.0	Cesium chloride	CsCl		n/a

DSC High-Pressure Set – Substances in CrNi Steel Crucibles **Order No.: 6.240.1-91.5.00**
(Volume 100 µl, sample mass minimum 10 mg)

Transition (°C)	Material		Pierced lid	Single Order No.
-64.5	Adamantane	$C_{10}H_{16}$		n/a
156.6	Indium	In		n/a
231.9	Tin	Sn		n/a
271.4	Bismuth	Bi		n/a
476.0	Cesium chloride	CsCl		n/a

DSC Medium-Pressure Set – Substances in CrNi Steel Crucibles **Order No.: 6.240.1-91.6.00**
(Volume 120 µl , max. 20 bar, sample mass minimum 10 mg)

Transition (°C)	Material		Pierced lid	Single Order No.
-64.5	Adamantane	$C_{10}H_{16}$		n/a
0.0	Water	H_2O		n/a
156.6	Indium	In		n/a
231.9	Tin	Sn		n/a

DSC µ-Sensor Set* – Substances in Al Crucibles (volume 25 µl) **Order No.: 6.240.3-91.3.00**

DSC µ-Sensor Set* – Substances in Al Concavus crucibles **Order No.: DSC204F1A00.913-00**

Transition (°C)	Material		Pierced lid	Single Order No.
-64.5	Adamantane	$C_{10}H_{16}$		n/a
156.6	Indium	In	x	n/a
231.9	Tin	Sn	x	n/a
271.4	Bismuth	Bi	x	n/a

* Calibration set only for DSC ***F1*** with µ-sensor

DSC/DTA Set for the Use in Al_2O_3 Crucibles, Individual Substances in Glass Vials **Order No.: 6.223.5-91.1.00**

Transition (°C)	Material		Quantity	Single Order No.
-64.5	Adamantane (Powder)	$C_{10}H_{16}$	400 mg	6.217.1-92.1.09
156.6	Indium	In	400 mg	6.223.5-91.3.01
231.9	Tin	Sn	400 mg	6.223.5-91.3.02
271.4	Bismuth	Bi	400 mg	6.223.5-91.3.04
419.5	Zinc	Zn	400 mg	6.223.5-91.3.03
476.0	Cesium chloride	CsCl	400 mg (for individual order, vial contains 500 mg)	6.223.5-91.2.05
660.3	Al wire	Al	400 mg	6.223.5-91.3.05

DSC/DTA Individual Substances in Glass Vials for Use in Pt Crucibles				
Transition (°C)	Material		Quantity	Single Order No.
69.2	Biphenyl*	$C_{12}H_{10}$	500 mg	6.223.5-91.2.01
122.4	Benzoic acid	C_6H_5COOH	500 mg	6.223.5-91.2.02
300.8	Potassium perchlorate*	$KClO_4$	500 mg	6.223.5-91.2.04
426.2	Silver sulfate	$AgSO_4$	500 mg	6.223.5-91.2.08
476.0	Cesium chloride	CsCl	500 mg	6.223.5-91.2.05
808.0	Barium carbonate	$Ba\ CO_3$	500 mg	6.223.5-91.2.07

* Hazardous material
Please note that, due to very high cargo surcharges, we do not offer hazardous calibration materials together with the instrument. These reference materials will be offered separately.

Calibration Kits for TGA and STA

Temperature Calibration via Magnetic Transitions	
TG 209 ***F1*** *Libra®*, TG 209 ***F3*** *Tarsus*	Order Number
5 Curie Standards	6.221.2-91.3.00
Calibration supplement for magnetic transition (magnets) TG 209 ***F1*** *Libra®* TG 209 ***F3*** *Tarsus*	6.220.10.-93.1.00 TGA209F3A96.020-00

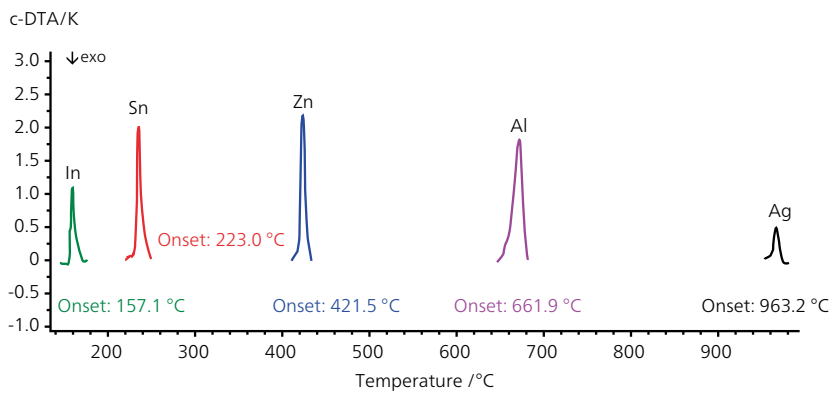
STA 449 ***F1/F3*** *Jupiter®*	Order Number
5 Curie Standards	6.221.2-91.3.00
Calibration supplement for magnetic transition (magnets)	HTP40000A96.030-00

Verification of Mass Changes for STA 449 ***F1/F3/F5*** *Jupiter®* and TG 209 ***F1*** *Libra®*/***F3*** *Tarsus®* - Substance in Glass Vial			
Material		Quantity	Single Order No.
Calcium oxalate monohydrate	$C_2H_2CaO_5$	2 g	6.223.5-91.2.10

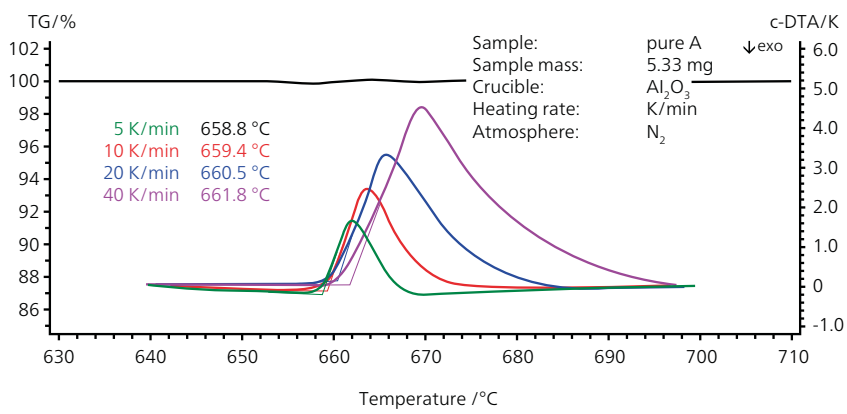
c-*DTA®* Set (TGA) for the Use in Al_2O_3 Crucibles, Substances in Glass Vials **Order No.: 6.221.5-91.1.00**				
Transition (°C)	Material		Quantity	Single Order No.
156.6	Indium	In	400 mg	6.223.5-91.3.01
231.9	Tin	Sn	400 mg	6.223.5-91.3.02
271.4	Bismuth	Bi	400 mg	6.223.5-91.3.04
419.5	Zinc	Zn	400 mg	6.223.5-91.3.03
660.3	Aluminum wire (ø 1 mm)	Al	400 mg	6.223.5-91.3.05
961.8	Silver wire (ø 0.5 mm)	Ag	400 mg	6.223.5-91.3.06

c-*DTA*® Set* (TGA) for the Use in Al_2O_3 Crucibles, Substances in Glass Vials **Order No.: TGA209F1D91.010-00**				
Transition (°C)	Material		Quantity	Single Order No.
156.6	Indium	In	400 mg	6.223.5-91.3.01
231.9	Tin	Sn	400 mg	6.223.5-91.3.02
271.4	Bismuth	Bi	400 mg	6.223.5-91.3.04
419.5	Zinc	Zn	400 mg	6.223.5-91.3.03
660.3	Aluminum wire (ø 1 mm)	Al	400 mg	6.223.5-91.3.05
961.8	Silver wire (ø 0.5 mm)	Ag	400 mg	6.223.5-91.3.06
1064.2	Gold (ø 1.0 mm)	Au	400 mg	6.223.5-91.3.07

* This calibration set is recommended for the TG 209 ***F1*** *Libra*®



There are various reference materials which can be used for c-*DTA*® calibration routines.



c-*DTA*® calibration in the TG 209 ***F1*** and ***F3*** systems. Excellent coupling of the Platinel sensor with the crucible guarantees that the influence of the heating rate will be small.

Chemical Behavior of Pt, Al_2O_3 and Graphite Crucibles and Sensors

Environmental Effects: Chemical Behavior of Crucibles and Sensors Made of Pt, Al_2O_3 and C

In practice, the service life of sensors (thermocouples) and crucibles is most heavily impacted by interactions with the environment. Diffused impurities, released from the samples, change the thermal tension or may even cause initial cracking of the thermocouple wire and crucible wall. The following tables give some details on the chemical compatibility of Pt, Al_2O_3 and C thermocouples and crucibles with other sample materials and gas atmospheres. The following lists also serve to illustrate how important regular inspections and calibration measurements are.

These overviews are not exhaustive, but meant rather as a guideline for the user. The temperatures given are primarily literature values. Temperatures under test conditions might shift to lower values. It is always advisable to run preliminary tests in separate furnaces.

Chemical Behavior of Platinum (Pt)		
Critical	No resistance	Limited resistance
▪ Halogens (Cl_2, F_2, Br_2), aqua regia ▪ Li_2CO_3, prior to emission of CO_2 (decomposition) ▪ PbO, $FeCl_2$ ▪ Be alloys (evaporation) ▪ HCl with oxidants (e.g., chromic acid, manganates, ▪ iron (III) and molten salts); reducing atmospheres ▪ Metals and metal vapors (e.g., B, Pb, Zn, Sn, Ag, Au, ▪ Li, Na, K, Sb, Bi, Ni, Fe, etc.;m Se > 320°C (evaporation) ▪ Metals and metal oxides with reducing sub- stances such as C, organic compounds or H_2 ▪ Oxides in an inert gas atmosphere at higher temperatures (reduction) ▪ Sulfur (roughening of the surface, embrittlement) ▪ Alkali hydroxides, -carbonates, -sulfates, -cyanides and rhodanides at higher temperatures ▪ $KHSO_4$ at higher temperatures ▪ Carbon black or free carbon >1000°C ▪ SiO_2 under reducing conditions ▪ SiC and Si_3N_4 >1000°C (release of elementary Si) ▪ HBr, KCl solution at high temperatures	▪ Mixtures of KNO_3 and NaOH at 700°C under exclusion of air ▪ Mixtures of KOH and K_2S at 700°C under exclusion of air ▪ LiCl at 600°C; $MgCl_2$, $Ba(NO_3)_2$ at 700°C ▪ HBr, HI, H_2O_2 (30%); HNO_3 at 100°C ▪ KCl decomposition products which form during melting at 768°C	▪ KHF_2, LiF_2, NaCl at 900°C ▪ Mixtures of NaOH and $NaNO_3$ at 700°C under exclusion of air

DSC sample carrier type S (Pt-Pt10%Rh)

Chemical Behavior of Alumina (Al_2O_3)

Critical

- N_2 in the presence of carbon (formation of AlN; not
- recommended to measure carbon black in N_2 atmosphere at elevated temperatures)
- F_2: formation of AlF_3 and O_2
- Cl_2: formation of $AlCl_3$ at >700°C
- Sulfur: no reaction with liquid sulfur; formation of sulfides occur in the presence of carbon in the gas phase
- H_2S: when heated, formation of Al_2S_3
- C: formation of carbides and Al above 1400°C
- HF: reaction to AlF_3 and H_2O at higher temperatures
- $CuSO_4$: above 1000°C, diffusion through the bottom of the crucible
- Compounds containing Si, e.g., $MoSi_2$; contamination of Al_2O_3 > 1200°C
- Metal fluorides: formation of $[AlF_6]^{-3}$ anions and salts similar to cryolites
- SiO_2 glass: melt dissolves Al_2O_3
- Hydrogen sulfates of alkaline metals and alkaline-earth metals
- HCl: above 600°C, reactions in the presence of carbon
- B_2O_3 (Borax): melt dissolves Al_2O_3; formation of Al-borates and -borides
- Alkaline and alkaline-earth oxides and their salts with volatile anions; important for hydroxides, nitrides, nitrates, carbonates, peroxides, etc.
- CaC_2: when heated, formation of Al_4C_2
- PbO: reaction above 700°C
- $Me^{II}O$: Me= Fe^{2+}, Cu^{2+}, Ni^{2+}, etc., formation of spinels, CaO formation above 1200°C
- Alkaline and alkaline-earth ferrites: melt dissolves Al_2O_3
- Ti-alloys (very high oxygen affinity)
- Reactions with Fe-Ni- and Mg-alloys possible at higher temperatures

Chemical Behavior of Graphite (C)

Critical

- O_2: reaction above 400°C
- N_2: reaction starting at 1700°C (formation of small amounts of cyanides)
- Oxides
- Water vapor
- F_2, Br_2: reaction at room temperature
- Sulfur
- Si: formation of SiC at approx. 1400°C
- Chromic acid
- Chlorosulfonic acid $ClSo_3H$
- SiO_2: formation of SiC: formation of SiC via intermediate product SiO (technical production of SiC above 1800°C; however, reaction between SiO_2 and C begins at lower temperature).
- Nitrous gases (NO, NO_2)
- Sulfuric acid, H_2SO_4: concentrated acid critical above 150°C, fuming acid already at room temperature
- Nitric acid, HNO_3: diluted acid critical at 90°C, fuming acid already at room temperature
- SO_3: critical above 100°C
- Danger of explosion with perchloric acid, $HClO_4$
- NaOCl: critical above 50°C

Special Crucibles for Special Applications – BN and ZrO_2

ZrO_2 Crucibles

Due to the higher melting point in comparison to Al_2O_3, the applications temperature is about 2000°C. In an inert or reductive atmosphere, darkening of the crucibles may occur due to oxygen losses (ZrO_{2-x}).

This changes also the absorption of the thermal radiation coming from the furnace. This might also result in lower chemical resistance. Not useful for the melting of Ti or Zr alloys.

BN Crucibles

Not recommended for oxidizing atmospheres. Oxidizes in air at about 800°C.

In the presence of Ar, He, or in vacuum, tungsten embrittles and hardens when in contact with BN. Maximum temperature when in contact with tungsten (W), platinum (Pt), rhodium (Rh) or platinum/rhodium alloys: 1600°C

For other materials which get in contact with boron nitride (BN), the user has to ensure that no reactions occur damaging crucibles or liners. Delivered in a bag with Ar protective atmosphere. Might pick up moisture due to B_2O_3 impurity. It is recommended to store the BN crucibles in a desiccator in an Ar atmosphere after opening the bag.

Suitable for high melting fluorides as LiF, NaF etc.
Also appropriate for Si, MgAl alloys.

Material Compatibility – Sample in Crucible

Material Compatibility

The right crucible must always be chosen for the given experiment. Crucible materials should be specially selected depending on the application and sample materials in order to prevent reactions between the sample and crucible.

These tables serve to indicate which of the common crucible types can be used for each application, including ceramics, metals, inorganics and other more general applications.

General Applications						
Materials/ Crucible Types	Pt/Rh	Al_2O_3	Al	Pt+Al_2O_3 liner	Al_2O_3 crucible sprayed with Y_2O_3	Graphite
Clays	✓	✓*	✓	✓*	✓*	No
Minerals	✓	✓*	✓	✓*	✓*	No
Oxide ceramics	✓	✓*	✓	✓*	✓*	No
Salts	✓	No	✓	No	No	No
Glasses	✓	No	✓	No	No	✓*
Metals	No**	✓	No	✓	✓	No
Polymers	✓	✓	✓	✓	✓	✓
Carbon materials	✓*	✓*	✓	✓*	✓*	✓
Inorganics	✓*	✓*	✓*	✓*	✓*	✓*

Ceramics

Materials/ Crucible Types	Pt/Rh	Al_2O_3	Al	Pt+Al_2O_3 liner	Al_2O_3 crucible sprayed with Y_2O_3	Graphite
Alumina (Al_2O_3)	✓	✓	✓	✓	✓	✓*
Zirconia (ZrO_2)	✓	✓	✓	✓	✓	✓*
MgO	✓	✓	✓	✓	✓	✓*
Y_2O_3	✓	No	✓	✓	✓	✓*
Silicon dioxide (SiO_2)	✓	No	✓	No	No	No
Silicon nitride (Si_3N_4)	No	✓*	✓	✓*	✓*	✓*
Aluminum nitride (AlN)	✓*	✓*	✓*	✓*	✓*	✓*
Boron nitride (BN)	✓*	✓*	✓*	✓*	✓*	✓*
Silicon carbide (SiC)	No	✓*		✓*	✓*	✓*
Titanium oxide (TiO_2)	✓	✓	✓	✓	✓	✓*

Metals

Materials/ Crucible Types	Pt/Rh	Al_2O_3	Al	Pt+Al_2O_3 liner	Al_2O_3 crucible sprayed with Y_2O_3	Graphite
Al and Al-alloys	No**	✓	No	✓	✓	✓
Mg and Mg-alloys	No**	✓*	No	✓*	✓*	✓
Cu and Cu-alloys	No**	✓	No	✓	✓*	✓
Fe and Fe-alloys	No**	✓*	No	✓*	✓	No
Ni and Ni-alloys	No**	✓*	No	✓*	✓	No
Ti and Ti-alloys	No**	✓*	No	✓*	✓	No
Sn and Sn-alloys	No**	✓	No	✓	✓	✓
Au- and Ag-alloys	No**	✓	No	✓	✓	✓*
Cr-, Mo-, Co-alloys	No**	✓*	No	✓*	✓	No

Inorganics

Materials/ Crucible Types	Pt/Rh	Al_2O_3	Al	Pt+Al_2O_3 liner	Al_2O_3 crucible sprayed with Y_2O_3	Graphite
Silicon	No	No	✓	No	No	✓*
Iron oxide	✓	No	✓	No	No	No
Lead oxide	No	✓*		✓*	✓*	No
Magnesium fluoride	✓	No	✓	No	No	No information
Calcium fluoride	✓	No	✓	No	No	✓
Copper oxide	✓	No	✓	No	No	No
Graphites	✓*	✓*	✓*	✓*	✓*	✓
Carbonates	✓	✓*	✓	✓*	✓*	No
Sulphates	✓	✓*	✓	✓*	✓*	No

✓ No reaction expected
✓* Reactions possible at high temperatures
No** Not recommended; reactions may occur prior to or during melting.
This could lead to damage to the crucible and/or sensor. Extreme caution advised.

Recommendations for Cleaning Al_2O_3 and Pt Crucibles

Recommendations for Cleaning Al_2O_3 and Pt Crucibles

In most cases, the majority of ceramic and metallic crucibles and their lids can be reused many times. In order to ensure a long lifetime of proper use, the following cleaning recommendationsare given for the most common crucibles, made of alumina (Al_2O_3) and platinum (Pt).

Acids must be handled very carefully under a fume hood. Use protective glasses, gloves and apron and read the MSD sheets. Acids should only ever be handled by a person experienced in the handling of chemicals.

All acids (especially HF) are very dangerous and can cause extremely serious injuries or death if they come in contact with the skin or are inhaled.

Work with acids is at the user's own risk. NETZSCH can assume no liability for damage or injury resulting from the use of acids.

Al_2O_3 Crucibles

- Contamination with organics (polymers, organic pyrolysis products, carbon black, etc.)
  Heat crucibles in air or oxygen to approx. 900°C to burn off the organics. If there are oxide fillers present, be careful with the end temperature, as there might be a reaction with alumina (lower the temperature and work in oxygen). Use a separate furnace, if available.
- Contamination with metals and alloys
  Clean with HCl acid (concen-tration 25% or higher). If there is no reaction with the contaminant, heat the beaker with the acid. If HCl alone does not work, use a mixture of HCl/ HNO3 (1:1) (both concentrated). This may be heated as well. oxides, but also the alumina.
- Oxides and other salts
  Some salts are water soluble. Boil the crucibles in distilled water. Use HCl or a mixture of HCl/ HNO3 (1:1) (both concentrated). Oxides are often very stable or have already reacted with the alumina. It could easily be the case that it is impossible to remove the deposits. In that case, the crucible must be discarded. HF dissolves oxides, but also the alumina.

Following these cleaning pro-cedures, rinse the crucibles several times with distilled water and let them dry at room tempera-ture. Then heat them in a separate furnace in air to 1500°C.

Pt Crucibles

- Contamination with organics (polymers, etc.)
  Heat crucibles in air or oxygen to approx. 900°C to burn off the organics. If oxide fillers are present, attempt to remove them mechanically or use HF (see next procedure) .
- Contamination with metals and alloys
  There is often no way of removing metals, as Pt will alloy with most metals at higher temperatures. However, make an attempt with HCl acid (concentration 25% or higher). If there is no reaction with the contaminant, try heating the beaker with the acid. Do not use a mixture of HCl/HNO3 (1:1). This would also dissolve the Pt!
- Oxides and other salts
  Some salts are water soluble. Boil the crucibles in distilled water. Most oxides can be dissolved in HF. In some cases, it is helpful to warm the acid. Some salts can be dissolved in HCl.

Notes

Notes

The NETZSCH Group is an owner-managed, international technology company with headquarters in Germany. The Business Units Analyzing & Testing, Grinding & Dispersing and Pumps & Systems represent customized solutions at the highest level. More than 3,800 employees in 36 countries and a worldwide sales and service network ensure customer proximity and competent service.

Our performance standards are high. We promise our customers Proven Excellence – exceptional performance in everything we do, proven time and again since 1873.

When it comes to Thermal Analysis, Calorimetry (adiabatic & reaction), the determination of Thermophysical Properties, Rheology and Fire Testing, NETZSCH has it covered. Our 50 years of applications experience, broad state-of-the-art product line and comprehensive service offerings ensure that our solutions will not only meet your every requirement but also exceed your every expectation.

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