

# D-100 Application Diagrams

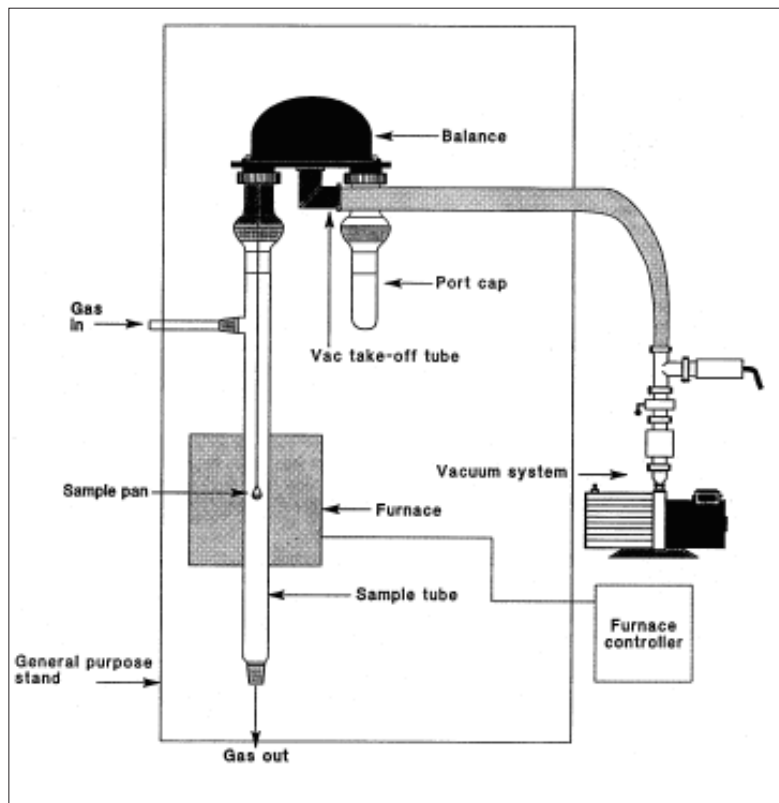
## 101 Adsorption with flowing Gas

The purpose of an adsorption experiment is to determine the amount of a gas that is adsorbed on the surface of the sample. This usually requires that the sample is first cleaned of any existing gases by heating and/or using a vacuum. Then an adsorbate is flowed over the sample to determine the amount adsorbed on the sample.

The setup on the reverse side allows the use of samples up to 100 grams while detecting an adsorbate in the microgram range. Though the D-100 is highly corrosion-resistant, the adsorbate should not be particularly aggressive. The use of a large sample requires the use of 48 and 54 mm diameter sample tubes which can restrict the ultimate sensitivity of the balance due to noise.

Thermo Fisher Scientific does not supply any furnace for this setup. If you are only going to 200-300 °C, heating tapes can be used. Tube furnaces, with a 2 1/4 inch hole and an outside diameter of 9 inches or less, can be used to any temperature desired. Regardless of the heating method used, a temperature controller is required since adsorption is very temperature dependent. A thermocouple can be installed to run down the sample tube parallel to the extension wire. The D-100 has two pairs of type K feed-through in the base plate that allow the thermocouple signal from inside the balance to be passed to the outside. This signal can be used by the programmer to accurately control the temperature of the sample. To record the temperature along with the weight data, use the Temperature Input Module.

The adsorbate gas enters the sample tube above the sample and flows down and out the bottom of the tube. If high vacuum is to be used



D-100: Flowing non-corrosive gas, large sample with vacuum and heat for degassing sample.

The following components are used for this setup:

Balance:	Model D-100
Stand:	General Purpose No.3405-01
Port Cap:	N.2481-01
Vacuum Take-off Tube:	Elbow No.13364-01
Temperature Input Module (not shown):	No12986-01

Sample Tubes:

Tube No.	Material	Temperature	Length	Diameter
2487-01	Pyrex	550 °C	585 mm	54 mm
2716-01	Quartz	1100 °C	825 mm	48 mm

to clean the sample, vacuum valves should be installed at these ports. Pressure regulators and a flow meter should be used to control the rate of flow past the sample. Usually flow rates of 10 to 40 cm<sup>3</sup>/min will supply ample adsorbate to the sample while producing very little noise. Please refer to Thermo Scientific paper No.1003 for information on planning a flowing gas experiment.

The vacuum system should normally

have a through-put of about 100 l/min capable of 10<sup>-6</sup> torr. We suggest that you use a turbo-molecular pump and cold traps to prevent oil back streaming. Any oil in the sample chamber could contaminate your sample. The large diameter sample tubes should make it easier to reach high vacuum. Your vacuum equipment supplier should be able to supply a system that can be attached to the KF NW25 vacuum take-off tube. For more information about

using vacuum with recording balances refer to Thermo Scientific paper No.1710.

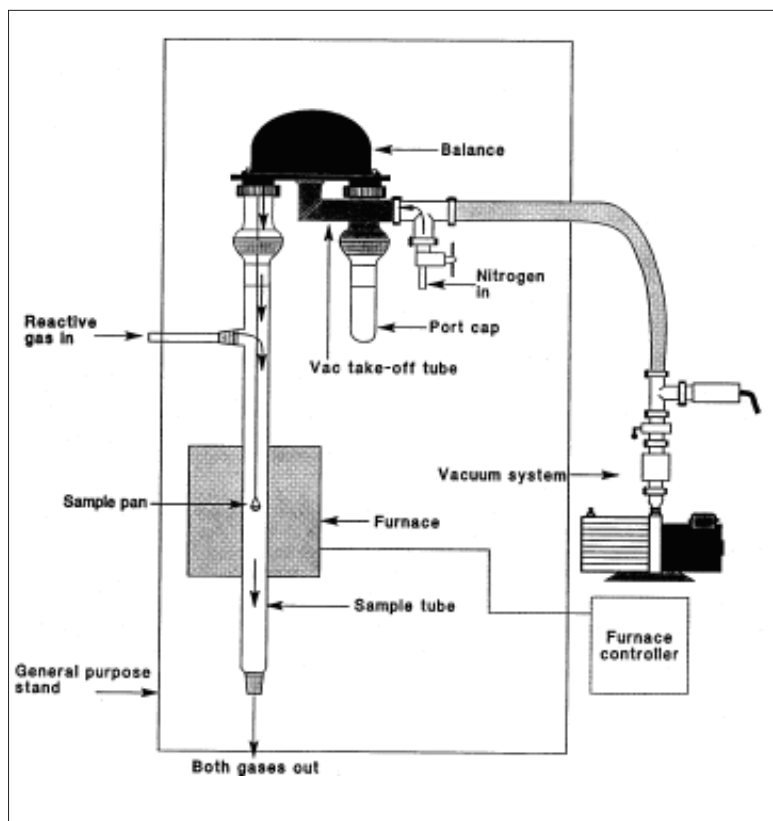
For more detailed information concerning the D-100, please refer to the Thermo Scientific RECORDING BALANCES Product Note. For information concerning the many accessories available, please refer to the Consolidated Accessory Brochure.

## 102 Adsorption with flowing Gas

The purpose of an adsorption experiment is to determine the amount of a gas that is adsorbed on the surface of the sample. This usually requires that the sample is first cleaned of any existing gases by heating and/or using a vacuum. Then an adsorbate is flowed over the sample to determine the amount adsorbed on the sample.

The setup on the reverse side allows the use of samples up to 100 grams while detecting an adsorbate in the microgram range. This setup provides for a protective nitrogen gas flow through the balance chamber while the aggressive reactive gas enters the side port of the sample tube. Both gases flow down past the sample and out the bottom. Pressure regulators and a flow meter should be used to control the rate of flow past the sample. Usually flow rates of 10 to 40 cm<sup>3</sup>/min will supply ample adsorbate to the sample while producing very little noise. Please refer to Thermo Scientific paper No. 1003 for information on planning a flowing gas experiment. The use of a large sample requires the use of large diameter sample tubes which may restrict the ultimate sensitivity of the balance due to noise.

Thermo Scientific does not supply any furnace for this setup. If you are only going to 200-300 °C, heating tapes can be used. Tube furnaces, with a 2 1/4 inch hole and an outside diameter of 9 inches or less, can be used to any temperature desired. Regardless of the heating method used, a temperature controller is required since adsorption is very temperature dependent. A thermocouple can be installed to run down the sample tube parallel to the extension wire. The D-100 has two pairs of type K feed-through in the base plate that allow the thermocouple signal from inside the balance to



*D-100: Flowing corrosive gas, large sample with vacuum and heat for degassing sample.*

The following components are used for this setup:

Balance:	Model D-100
Stand:	General Purpose No.3405-01
Port Cap:	N.2481-01
Vacuum Take-off Tube:	Elbow No.13364-01
Temperature Input Module (not shown):	No12986-01

### Sample Tubes:

Tube No.	Material	Temperature	Length	Diameter
2487-01	Pyrex	550 °C	585 mm	54 mm
2716-01	Quartz	1100 °C	825 mm	48 mm

be passed to the outside. This signal can be used by the programmer to accurately control the temperature of the sample. To record the temperature along with the weight data, use the Temperature Input Module.

The vacuum system should normally have a through-put of about 100 l/mm capable of 10<sup>-6</sup> torr. We suggest that you use a turbo-molecular pump and cold traps to prevent oil back streaming. Any oil in the sample chamber could contaminate your sample. The large diameter sample tubes should make it easier to reach high vacuum. Your vacuum equipment supplier should be able to supply a system that can be attached to the KF NW25 vacuum take-off tube. For more information about using vacuum with recording balances refer to Thermo Scientific paper No.1710.

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### 103 Desorption

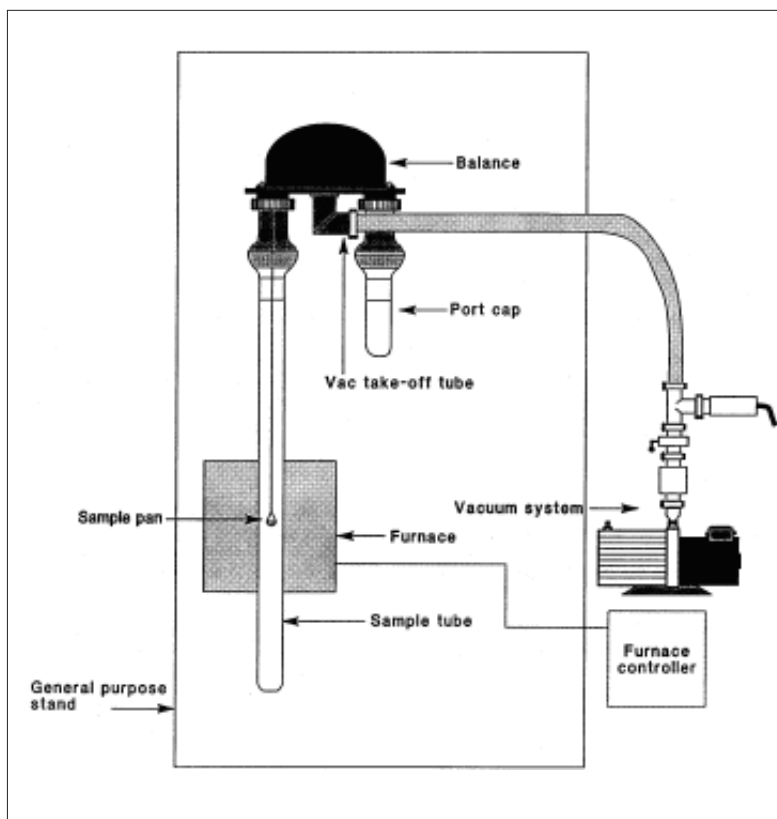
The purpose of a desorption experiment is to determine the amount of gas that is desorbed from the surface of the sample. This usually requires that the sample is subjected to heating and/or using a vacuum.

The setup on the reverse side allows the use of samples up to 100 grams while detecting a weight loss in the microgram range. Though the D-100 is highly corrosion-resistant, the evolved vapors should not be particularly aggressive. The use of a large sample requires the use of 48 and 54 mm diameter sample tubes which can restrict the ultimate sensitivity of the balance due to noise if the sample is not in high vacuum.

Short sample tubes should only be used when the sample is being heated to only a few hundred degrees C.

Thermo Scientific does not supply any furnace for this setup. If you are only going to 200-300 °C, heating tapes can be used. Tube furnaces, with a 2 1/4 inch hole and an outside diameter of 9 inches or less, can be used to any temperature desired. Regardless of the heating method used, a temperature controller is required since adsorption is very temperature dependent. A thermocouple can be installed to run down the sample tube parallel to the extension wire. The D-100 has two pairs of type K feed-through in the base plate that allow the thermocouple signal from inside the balance to be passed to the outside. This signal can be used by the programmer to accurately control the temperature of the sample. To record the temperature along with the weight data, use the Temperature Input Module.

The vacuum system should normally have a through-put of about 100 l/min capable of  $10^{-6}$  torr. We suggest that you use a turbo-molecular pump and cold traps to prevent oil back streaming. Any oil in the sample chamber could contaminate your sample. The large diameter sample tubes should make it easier to reach high vacuum. Your vacuum equipment supplier should be able to supply a system that can be attached to the KF NW25 vacuum take-off tube. For more information about using vacuum with recording balances refer to Thermo Scientific paper No.1710.



*D-100: Large sample with no corrosive evolved gases, with vacuum and heat.*

The following components are used for this setup:

Balance:	Model D-100
Stand:	General Purpose No.3405-01
Port Cap:	N.2481-01
Vacuum Take-off Tube:	Elbow No.13364-01
Temperature Input Module (not shown):	No12986-01

#### Sample Tubes:

Tube No.	Material	Temperature	Length	Diameter
2482-01	Pyrex	550 °C	213 mm	54 mm
2483-01	Pyrex	550 °C	500 mm	54 mm
2485-01	Quartz	1100 °C	280 mm	48 mm
2486-01	Mullite	1700 °C	550 mm	54 mm

For more detailed information concerning the D-100, please refer to the Thermo Scientific RECORDING BALANCES Product Note. For information concerning the many accessories available, please refer to the Consolidated Accessory Brochure.

## 104 TGA

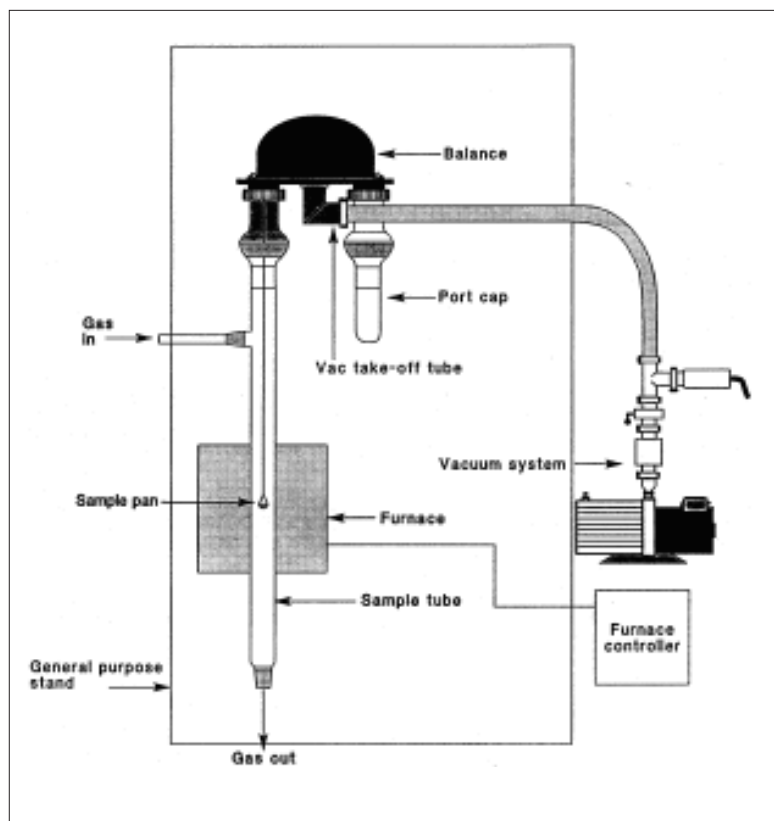
The purpose of a TGA experiment is to measure the decomposition of a material during controlled heating. This usually requires a furnace controlled by a temperature programmer. Thermo Scientific does not supply a furnace or a programmer for this setup. Tube furnaces, with a 2 1/4 inch hole and an outside diameter of 9 inches or less, can be used to any temperature desired.

A thermocouple can be installed to run down the sample tube parallel to the extension wire. The D-100 has two pairs of type K feed-through in the base plate that allow the thermocouple signal from inside the balance to be passed to the outside. This signal can be used by the programmer to accurately control the temperature of the sample. To record the temperature along with the weight data, use the Temperature Input Module.

The setup on the reverse side allows the use of samples up to 100 grams while detecting a weight loss in the microgram range. Though the D-100 is highly corrosion-resistant, the flowing gas should not be particularly aggressive. The use of a large sample requires the use of 48 and 54 mm diameter sample tubes which can restrict the ultimate sensitivity of the balance due to noise.

The flowing gas enters the sample tube above the sample and flows down and out the bottom of the tube. If high vacuum is to be used to clean the sample, vacuum valves should be installed at these ports. Pressure regulators and a flow meter should be used to control the rate of flow past the sample. Usually flow rates of 10 to 40 cm<sup>3</sup>/min will supply ample reactive or purge gas to the sample while producing very little noise. Please refer to Thermo Scientific paper No. 1003 for information on planning a flowing gas experiment.

The vacuum system should normally have a through-put of about 100 l/min capable of 10<sup>-6</sup> torr. The large diameter sample tubes should make it easier to reach high vacuum. Your vacuum equipment supplier should be able to supply a system that can be attached to the KF NW25 vacuum take-off tube. For more information about using vacuum with recording



D-100: Flowing non-corrosive gas, large sample with vacuum.

The following components are used for this setup:

Balance:	Model D-100
Stand:	General Purpose No.3405-01
Port Cap:	N.2481-01
Vacuum Take-off Tube:	Elbow No.13364-01
Temperature Input Module (not shown):	No12986

### Sample Tubes:

Tube No.	Material	Temperature	Length	Diameter
2487-01	Pyrex	550 °C	585 mm	54 mm
2716-01	Quartz	1100 °C	825 mm	48 mm
8517-01	Mullite	1700 °C	825 mm	48 mm

balances refer to Thermo Scientific paper No.1710.

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## 105 TGA

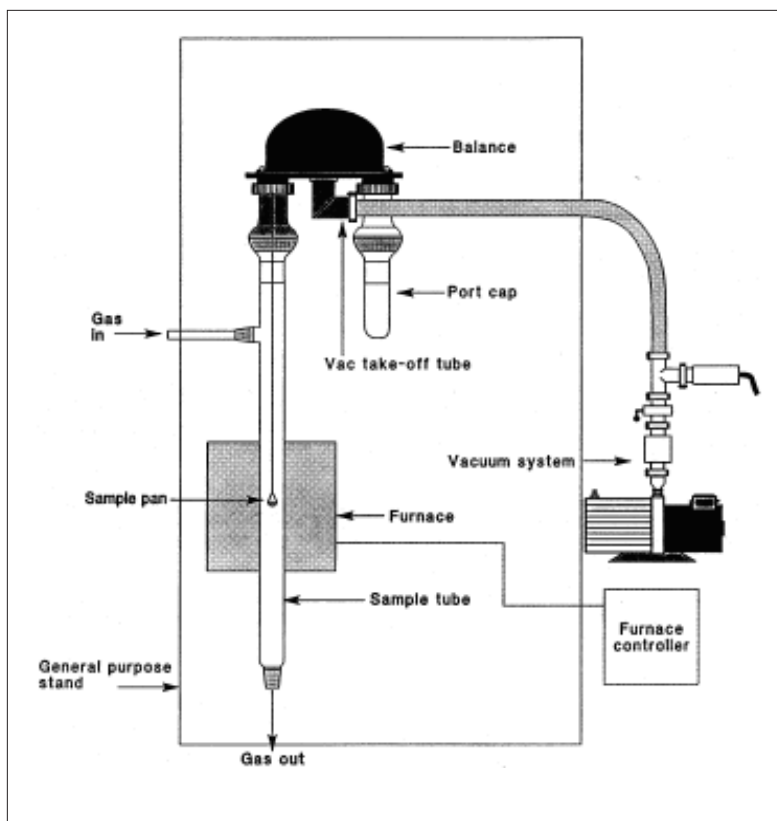
The purpose of a TGA experiment is to measure the decomposition of a material during controlled heating. This usually requires a furnace controlled by a temperature programmer. Thermo Scientific does not supply a furnace or a programmer for this setup. Tube furnaces, with a 2 1/4 inch hole and an outside diameter of 9 inches or less, can be used to any temperature desired.

A thermocouple can be installed to run down the sample tube parallel to the extension wire. The D-100 has two pairs of type K feed-through in the base plate that allow the thermocouple signal from inside the balance to be passed to the outside. This signal can be used by the programmer to accurately control the temperature of the sample. To record the temperature along with the weight data, use the Temperature Input Module.

The setup on the reverse side allows the use of samples up to 100 grams while detecting a weight loss in the microgram range. Though the D-100 is highly corrosion-resistant, the evolved vapors should not be particularly aggressive. The use of a large sample requires the use of 48 and 54mm diameter sample tubes which can restrict the ultimate sensitivity of the balance due to noise.

The vacuum system should normally have a through-put of about 100 l/min capable of  $10^{-6}$  torr. The large diameter sample tubes should make it easier to reach high vacuum. Your vacuum equipment supplier should be able to supply a system that can be attached to the KF NW25 vacuum take-off tube. For more information about using vacuum with recording balances refer to Thermo Scientific paper No.1710.

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D-100: Large sample with vacuum.

The following components are used for this setup:

Balance:	Model D-100
Stand:	General Purpose No.3405-01
Port Cap:	N.2481-01
Vacuum Take-off Tube:	Elbow No.13364-01
Temperature Input Module (not shown):	No12986-01

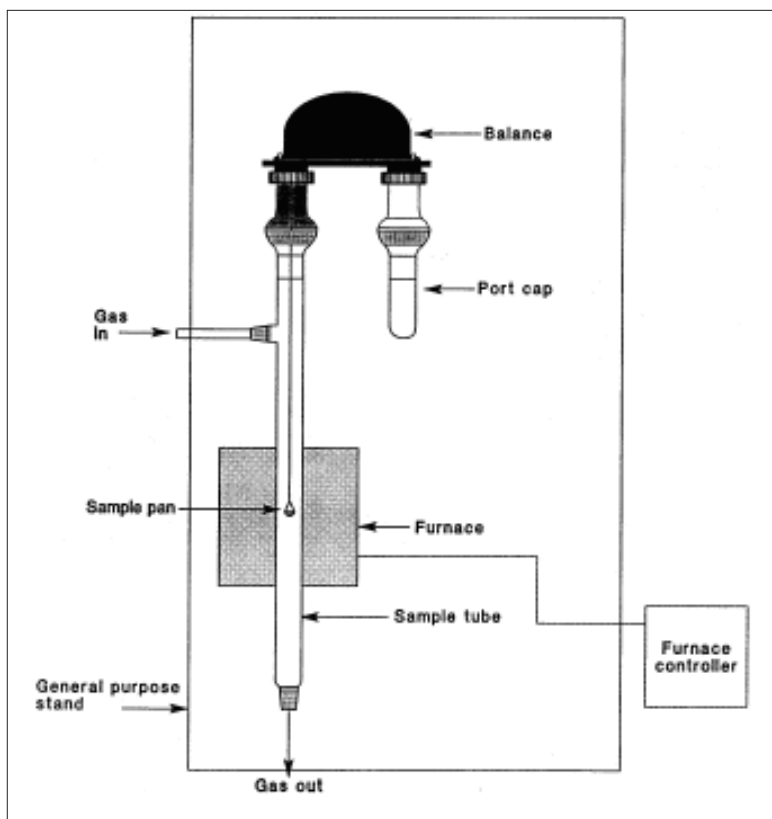
### Sample Tubes:

Tube No.	Material	Temperature	Length	Diameter
2482-01	Pyrex	550 °C	213 mm	54 mm
2483-01	Pyrex	550 °C	500 mm	54 mm
2485-01	Quartz	1100 °C	280 mm	48 mm
2486-01	Mullite	1700 °C	550 mm	54 mm

## 106 TGA

The purpose of a TGA experiment is to measure the decomposition of a material during controlled heating. This usually requires a furnace controlled by a temperature programmer. Thermo Scientific does not supply a furnace or a programmer for this setup. Tube furnaces, with a 2 1/4 inch hole and an outside diameter of 9 inches or less, can be used to any temperature desired.

A thermocouple can be installed to run down the sample tube parallel to the extension wire. The D-100 has two pairs of type K feed-through in the base plate that allow the thermocouple signal from inside the balance to be passed to the outside. This signal can be used by the programmer to accurately control the temperature of the sample. To record the temperature along with the weight data, use the Temperature Input Module.



*D-100: Flowing non-corrosive gas, large sample.*

The setup on the reverse side allows the use of samples up to 100 grams while detecting a weight loss in the microgram range. Though the D-100 is highly corrosion-resistant, the flowing gas should not be particularly aggressive. The use of a large sample requires the use of 48 and 54 mm diameter sample tubes which can restrict the ultimate sensitivity of the balance due to noise.

The flowing gas enters the sample tube above the sample and flows down and out the bottom of the tube. If high vacuum is to be used to clean the sample, vacuum valves should be installed at these ports. Pressure regulators and a flow meter should be used to control the rate of flow past the sample. Usually flow rates of 10 to 40 cm<sup>3</sup>/min will supply ample reactive or purge gas to the sample while producing very little noise. Please refer to Thermo Scientific paper No. 1003 for information on planning a flowing gas experiment.

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Vacuum Take-off Tube:	Elbow No.13364-01
Temperature Input Module (not shown):	No12986-01

Sample Tubes:

Tube No.	Material	Temperature	Length	Diameter
2487-01	Pyrex	550 °C	585 mm	54 mm
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8517-01	Mullite	1700 °C	825 mm	48 mm

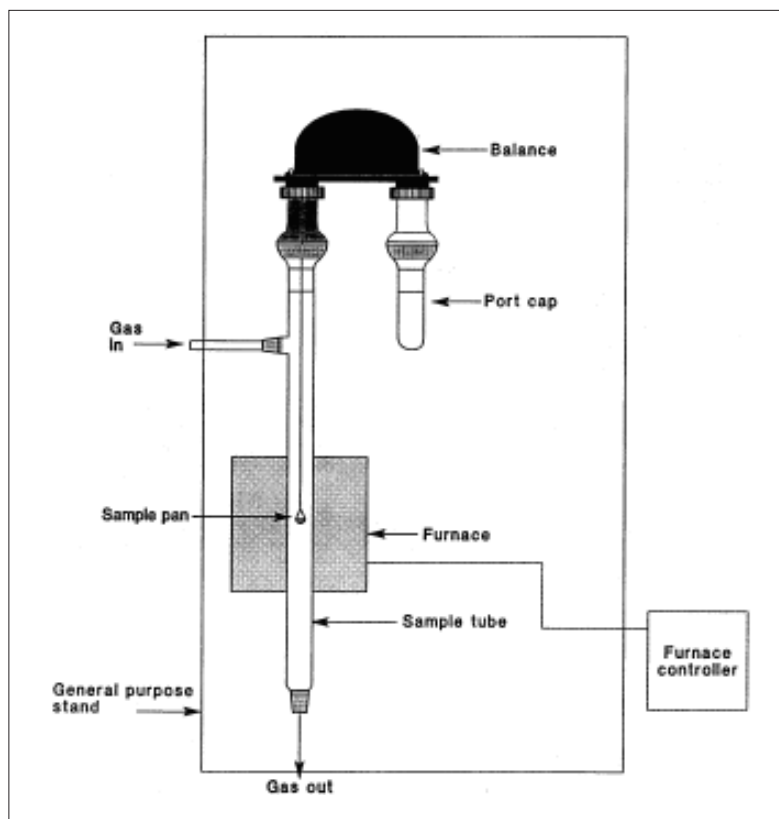
## 107 TGA

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D-100: Large sample

The following components are used for this setup:

Balance:	Model D-100
Stand:	General Purpose No.3405-01
Port Cap:	N.2481-01
Vacuum Take-off Tube:	Elbow No.13364-01
Temperature Input Module (not shown):	No12986-01

### Sample Tubes:

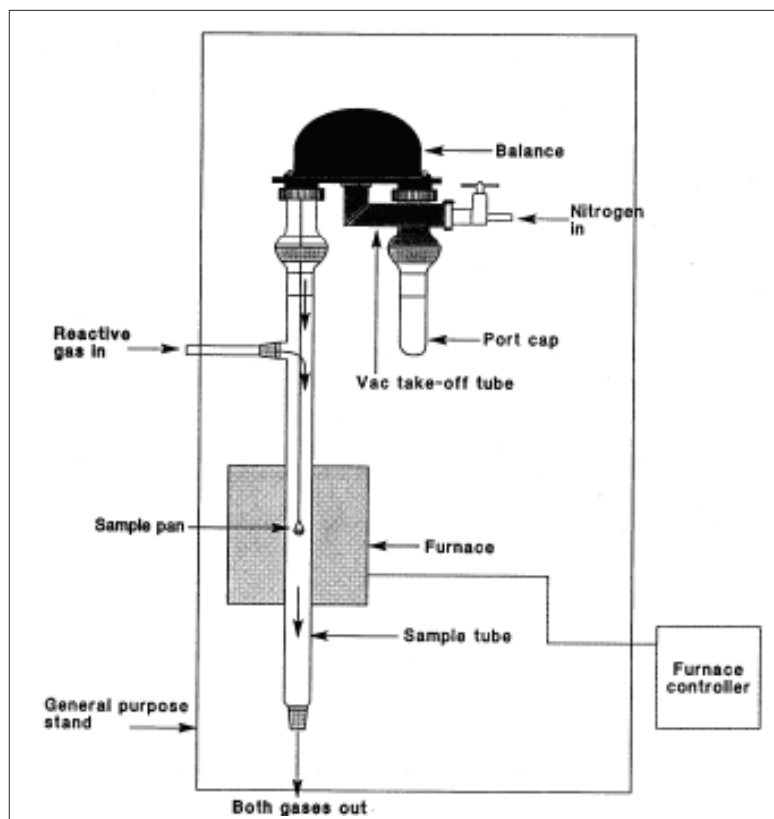
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For more detailed information concerning the D-100, please refer to the Thermo Scientific RECORDING BALANCES Product Note. For information concerning the many accessories available, please refer to the Consolidated Accessory Brochure.



D-100: Flowing corrosive gas, large sample.

The following components are used for this setup:

Balance:	Model D-100
Stand:	General Purpose No.3405-01
Port Cap:	N.2481-01
Vacuum Take-off Tube:	Elbow No.13364-01
Temperature Input Module (not shown):	No12986-01

Sample Tubes:

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2716-01	Quartz	1100 °C	825 mm	48 mm
8517-01	Mullite	1700 °C	825 mm	48 mm

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