



## Kjeldahl Equipment

For food analysis

The Macro & Micro-Kjeldahl equipment consists of multi-mantles with 2 or 6 positions which heat to an ultra-high temperature. Both can be used for the Kjeldahl analysis to determine protein content in food.

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# MQ Series

## Macro-Kjeldahl Equipment

The Electrothermal MQ Series of Macro-Kjeldahl Equipment has been designed for Kjeldahl extraction on a macro scale.

These multibank units with either 2 or 6 recesses, have a stainless steel outer casing with back-mounted brackets (supplied with each unit), which can hold support rods of 12.7mm diameter max. There are 2 volume sizes available for both the 2 and 6 recess models, one for 100-300ml vessels and the second for 500-800ml vessels.

Each heating mantle has its own energy regulator incorporating an On/Off switch and a "Mains to Heater" amber neon indicator. There is also a "Mains On" clear neon indicator on the front panel.

The lower part of the unit houses dedicated controllers for each recess. This "cool zone" housing is separated from the heating element by a stainless steel screen and a well-ventilated air space. The heating element consists of thermally insulated element wire stitched into a cartridge, and operates in the temperature range of 550°C to 800°C max.

All MQ Macro-Kjeldahl Equipment models (except MQ3868B/E) incorporate an earth screen to protect the user from electric shocks and are double-fused for extra safety. The rugged stainless steel outer casing is durable and easy to clean.

## Technical Specification

Heating element temp	550°C - 800°C maximum
Case material	Stainless steel
Thermal insulation	Ceramic fibre/mineral wool
Clamps for support rods	Fitted with adjustable clamps to accept the standard arms supplied
Wells capacity, ml	100-300
Wells dimensions, mm	89 x 45 (diameter x depth)
Wells capacity, ml	500-800
Wells dimensions, mm	117 x 59 (diameter x depth)

## Key Features

- Rugged, easy to clean stainless steel construction
- Back-mounted brackets hold flask support rods (supplied with each unit)
- Choice of 2 or 6 positions
- Choice of 2 flask capacity sizes: 100 - 300ml and 500 - 800ml for both the 2 & 6 position models
- Dedicated controllers for each recess are housed in a "cool zone"
- Grounded stainless steel earth screen covering the heating element.
- Units are double fused for added safety (except for MQ3868B/E which is only available as the 230V model)



## Key Features

- Rugged, easy to clean stainless steel construction
- Back-mounted brackets hold flask support rods (supplied with each unit)
- 6 positions which can accommodate flasks of between 18ml - 50ml capacity
- Dedicated controllers for each recess are housed in a "cool zone"
- Grounded stainless steel earth screen covering the heating element
- Units are double fused for added safety

### MM2313/E



## MM Series

### Micro-Kjeldahl Equipment

The Electrothermal Micro-Kjeldahl Equipment has been designed for Kjeldahl extraction on a micro scale.

These multibank units have 6 recesses in a stainless steel outer casing with back-mounted brackets (supplied with each unit), which can hold support rods of 12.7mm diameter max. This 6 recess model accommodates flasks of between 18-50ml only.

Each heating position has its own energy regulator incorporating an On/Off switch and a "Mains to Heater" amber neon indicator. There is also a "Mains On" clear neon indicator on the front panel.

The lower part of the unit houses dedicated controllers for each recess. This "cool zone" housing is separated from the heating element by a stainless steel screen and a well-ventilated air space. The heating element consists of thermally insulated element wire stitched into a cartridge, and operates in the temperature range of 550°C to 800°C max.

The MQ Micro-Kjeldahl Equipment models incorporate an earth screen to protect the user from electric shocks and are double-fused for extra safety.

The rugged stainless steel outer casing is durable and easy to clean.

### Technical Specification

Heating element temp	550°C - 800°C maximum
Case material	Stainless steel
Thermal insulation	Ceramic fibre/mineral wool
Clamps for support rods	Fitted with adjustable clamps to accept the standard arms supplied
Wells capacity, ml	18-50ml



# Macro and Micro-Kjeldahl Equipment

## Ordering Information

### Macro-Kjeldahl Extraction Heaters

Model	No of Recesses	Capacity (ml)	Operating Temperature	Electrical Requirements	Dimensions (d x w x h), mm	Weight (kg)
MQ3822B/E	2	100 to 300ml	550°C - 800°C	230V 50/60Hz, 600W	260 x 320 x 165	2kg
MQ3822B/EX1	2	100 to 300ml	550°C - 800°C	115V 50/60Hz, 600W	260 x 320 x 165	2kg
MQ3822B/EX6*	2	100 to 300ml	550°C - 800°C	230V 50/60Hz, 600W	260 x 320 x 165	2kg
MQ3824B/E	2	500 to 800ml	550°C - 800°C	230V 50/60Hz, 1100W	260 x 320 x 165	2kg
MQ3824B/EX1	2	500 to 800ml	550°C - 800°C	115V 50/60Hz, 1100W	260 x 320 x 165	2kg
MQ3824B/EX6*	2	500 to 800ml	550°C - 800°C	230V 50/60Hz, 1100W	260 x 320 x 165	2kg
MQ3866B/E	6	100 to 300ml	550°C - 800°C	230V 50/60Hz, 1800W	260 x 970 x 165	5.8kg
MQ3866B/EX1	6	100 to 300ml	550°C - 800°C	115V 50/60Hz, 1800W	260 x 970 x 165	5.8kg
MQ3866B/EX6*	6	100 to 300ml	550°C - 800°C	230V 50/60Hz, 1800W	260 x 970 x 165	5.8kg
MQ3868B/E**	6	500 to 800ml	550°C - 800°C	230V 50/60Hz, 3300W	260 x 970 x 165	5.8kg

## Ordering Information

### Micro-Kjeldahl Extraction Heaters

Model	No of Recesses	Capacity	Operating Temperature	Electrical Requirements	Dimensions (d x w x h), mm	Weight (kg)
MM2313/E	6	18 to 50ml	550°C - 800°C	230V 50/60Hz, 600W	160 x 520 x 162	3.5kg
MM2313/EX1	6	18 to 50ml	550°C - 800°C	115V 50/60Hz, 600W	160 x 520 x 162	3.5kg
MM2313/EX6	6	18 to 50ml	550°C - 800°C	230V 50/60Hz, 600W	160 x 520 x 162	3.5kg

\*NOTE: Codes ending with the suffix EX6 come with EU Plug fitting

\*\*NOTE: Wired in directly and are not double-fused

## Kjeldahl Method for Protein Content

The method consists of heating a substance with sulphuric acid, which decomposes the organic substance by oxidation to liberate the reduced nitrogen as ammonium sulphate. In this step potassium sulphate is added to increase the boiling point of the medium (from 169°C to 189°C). Chemical decomposition of the sample is complete when the medium has become clear and colourless (initially very dark).

The solution is then distilled with sodium hydroxide (added in small quantities) which converts the ammonium salt to ammonia. The amount of ammonia present (hence the amount of nitrogen present in the sample) is determined by back titration. The end of the condenser is dipped into a solution of boric acid. The ammonia reacts with the acid and the remainder of the acid is then titrated with a sodium carbonate solution with a methyl orange pH indicator.

Degradation:  $\text{Sample} + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4 + \text{CO}_2 + \text{SO}_2 + \text{H}_2\text{O}$

Liberation of ammonia:  $(\text{NH}_4)_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O} + 2\text{NH}_3$

Capture of ammonia:  $\text{B(OH)}_3 + \text{H}_2\text{O} + \text{NH}_3 \rightarrow \text{NH}_4^+ \text{B(OH)}_4^-$

Back-titration:  $\text{B(OH)}_3 + \text{H}_2\text{O} + \text{Na}_2\text{CO}_3 \rightarrow \text{NaHCO}_3 + \text{NaB(OH)}_4 + \text{CO}_2 + \text{H}_2\text{O}$

The Kjeldahl method's universality, precision and reproducibility have made it the internationally-recognized method for estimating the protein content in foods and it is the accepted standard method.



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