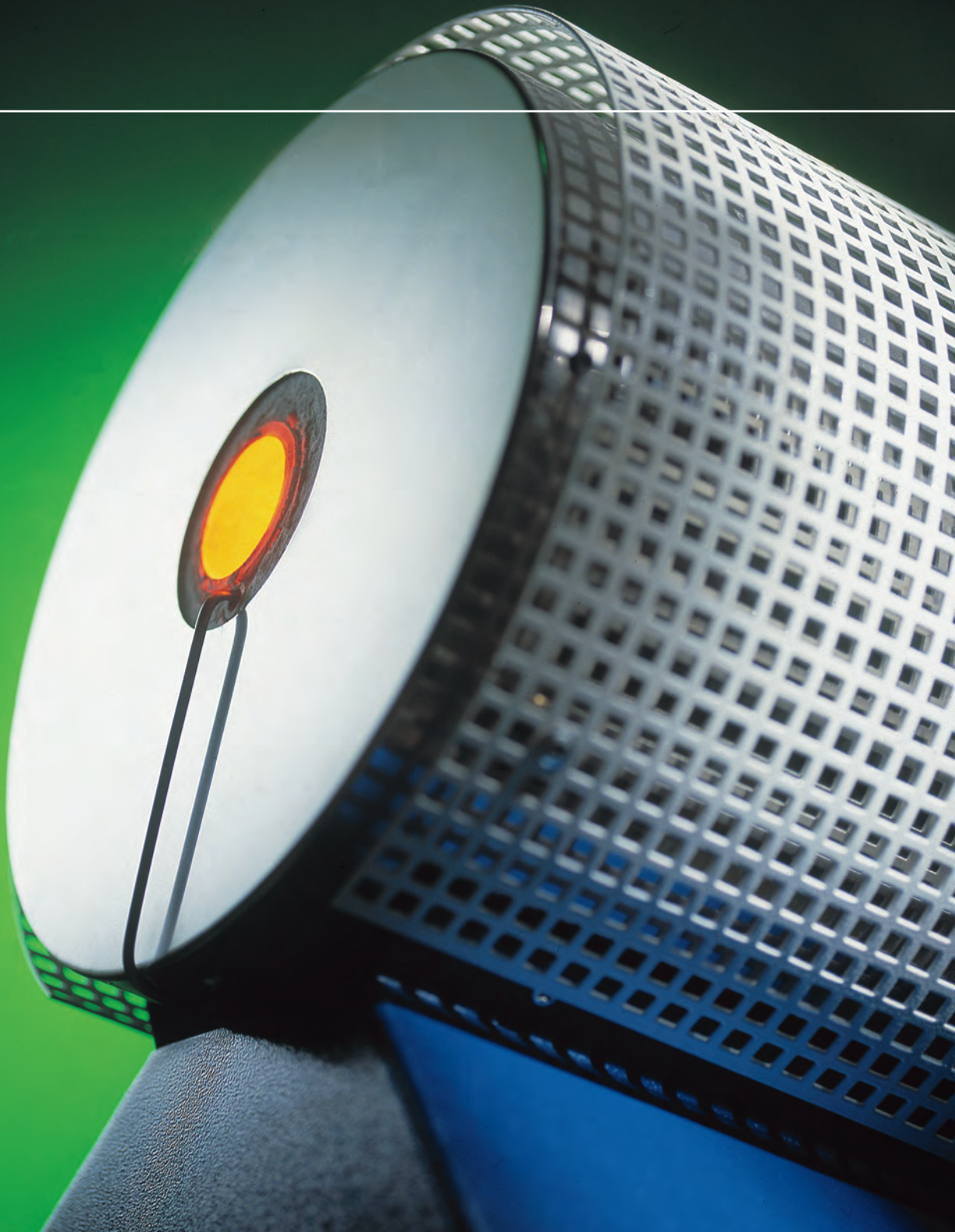




# Laboratory Furnaces



**For more than 30 years Lenton has built up an enviable reputation for innovative design, advanced technology and outstanding quality in the field of electric furnaces and ovens for research, quality control and pilot plant applications.**

The Lenton philosophy is to match proven design with quality at every stage. Only the finest materials are used and every component is tested throughout production to ensure that our products operate efficiently over a long working life. As part of our ongoing commitment to improve the quality of our products and services, Lenton is ISO 9001:2000 registered.

#### **Outstanding range of ovens**

The Welland series of ovens and incubators has been designed and engineered using the latest computer aided design systems to facilitate production of all metal components on the latest CNC controlled production equipment. Both gravity convection and forced air circulation models are included in the Welland series. The bench mounted models are available in four sizes with a maximum operating temperature of 300, 400, 500 or 600°C. Incubators have a maximum temperature of 80°C. The ovens are constructed for long term reliability. Depending on the choice of control system, they can perform simple drying processes or more complex and demanding heat treatment processes and long term stability testing of materials or components.

A separate ovens and incubators brochure is available containing full details of our range, please call Lenton for a copy or alternatively visit our website [www.lentonfurnaces.com](http://www.lentonfurnaces.com)

#### **Extensive furnace offering**

This brochure contains details of our range of standard laboratory furnaces, including chamber, tube, ashing and vacuum designs. Also on pages 18 and 19 you will see a selection of our custom built equipment, which has been designed to meet individual customer requirements.

Our products are available in the UK directly from our factory in Derbyshire or through our network of international distributors.

If you require information on any of our products please call Lenton or alternatively visit our website [www.lentonfurnaces.com](http://www.lentonfurnaces.com)



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## Air Recirculating Chamber Furnaces



ARF 7/22

Both models in the ARF range have a chamber fitted with a robust stainless steel liner enabling bulky loads to be treated. Optimum heat transfer, reduced heating times and maximum temperature uniformity are provided by a fan which circulates the air within the chamber. The fan and airguide system provide continuous movement of air around the workpiece. Heating is provided by mineral insulated sheathed elements, which are fully isolated from the liner.

A type 'K' thermocouple is incorporated for maximum life and stability.

This range of furnaces is particularly suitable for a wide range of low temperature heat treatment applications, such as:

- > Stress relieving
- > Melting low temperature alloys
- > Thermal ageing
- > Annealing
- > Tempering

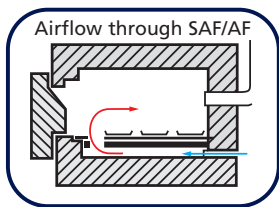
Model	Maximum operating temp (°C)	Maximum continuous temp (°C)	Time to temperature (minutes)	Internal dimensions (mm) h x w x d	External dimensions (mm) h x w x d	Chamber capacity (l)	Maximum power (kW)	Phase	Net weight (kg)
ARF 7/22	750	700	50	220 x 200 x 495	700 x 555 x 1015	22	3	1	88
ARF 7/45	750	700	50	295 x 265 x 575	755 x 605 x 1100	45	6	1 or 3	130

## Ashing Furnaces

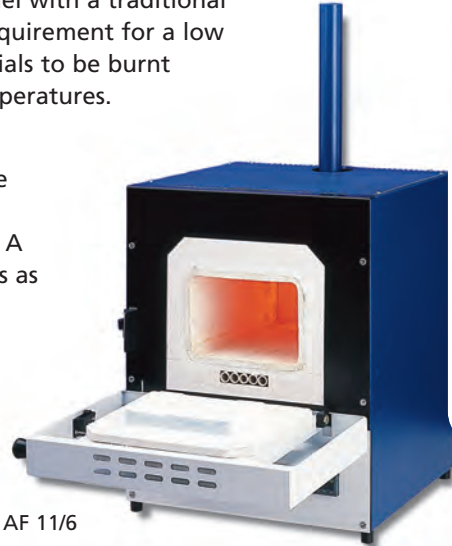
A choice of two models for ashing is available.

The **AF 11/6** is an economy model with a traditional muffle element. It meets the requirement for a low cost unit which will allow materials to be burnt rapidly at closely controlled temperatures.

The **SAF 11/1** is a more robust traditionally built muffle furnace capable of accepting up to 15 crucibles up to 50mm diameter. A chimney is fitted on both models as standard.



AF 11/6



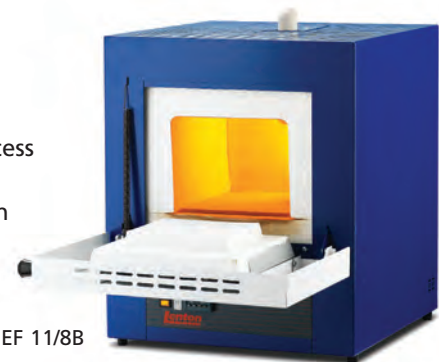
SAF 11/1

Model	Maximum temp (°C)	Maximum continuous temp (°C)	Time to temperature (minutes)	Internal dimensions (mm) h x w x d	External dimensions (mm) h x w x d	Chamber capacity (l)	Maximum power (kW)	Power to Hold Temp (kW)	Phase	Net weight (kg)
AF 11/6	1100	1050	115	125 x 178 x 305	495 x 420 x 490	6.0	2.2	1.0	1	33
SAF 11/1	1100	1050	155	90 x 170 x 455	700* x 550 x 765	7.0	3.9	1.6	1	76

\* - Height with chimney = 1100mm

## Economy Chamber Furnace

An economical, rapid heating and lightweight furnace incorporating a one-piece low thermal mass heating element for general laboratory use. The drop down door can be used as a shelf. If your process generates significant amounts of corrosive fumes, please discuss your application with our sales department.



EF 11/8B

Model	Maximum temp (°C)	Maximum continuous temp (°C)	Time to temperature (minutes)	Internal dimensions (mm) h x w x d	External dimensions (mm) h x w x d	Chamber capacity (l)	Maximum power (kW)	Power to Hold Temp (kW)	Phase	Net weight (kg)
EF 11/8B	1100	1050	25	180 x 190 x 235	495 x 420 x 490	8	1.8	0.85	1	19

# General Purpose Chamber Furnaces

A robust range of laboratory furnaces, providing an excellent level of versatility without compromising quality, safety or reliability.

All units in the ECF range have a maximum operating temperature of 1200°C. Heating is provided by two side-wall elements manufactured from high temperature resistance wire spirals embedded into cast refractory slabs. An exhaust chimney is fitted as standard.

The insulated door opens upwards and outwards keeping the hot face insulation away from the operator. A door switch isolates power from the heating elements whenever the door is opened for maximum operator safety. The use of double skin construction allows natural air convection to maintain a cool outer case.

## Optional extras

Metal retorts - a variety of metal retorts is available for use with this range of furnaces. This type of retort is generally used to cater for the following process conditions:

- A to maintain controlled atmospheres within the heated chamber;
- B to protect the heating elements and insulation from chemical attack by aggressive volatiles given off by fluxes, acids, etc.

Four sided heating - this option upgrades the standard two sided heating to four sided heating and is recommended in the following circumstances:

- A for use with metal retorts and ceramic liners;
- B to improve chamber temperature uniformity to meet specific process requirements;
- C to uprate the furnace power to cope with large loads.

## Typical applications include:

> General heat treatment > Melting > Thermal ageing > Annealing > Enamelling > Decomposition in chemical analysis

## Ashing option

The ECF chamber furnaces can be modified to incorporate an air exchange system, including a larger chimney, which makes them suitable for the small scale ashing of a wide variety of materials (this option can only be fitted at the time of order).

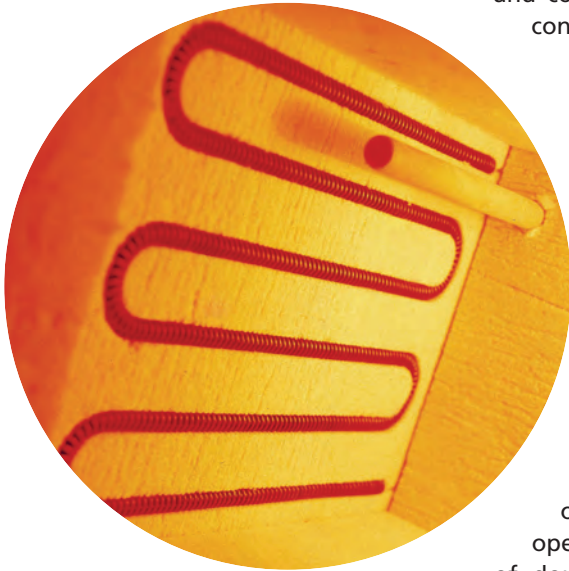


ECF 12/4

Model	Maximum temperature (°C)	Maximum continuous temperature (°C)	Time to temperature (minutes)	Internal dimensions (mm) h x w x d	External dimensions (mm) h x w x d	Chamber capacity (l)	Maximum power (kW)	Net weight (kg)
ECF 12/4	1200	1150	95	101 x 152 x 254	655 x 500 x 520	3.9	2.0	47
ECF 12/6	1200	1150	115	127 x 152 x 305	700 x 555 x 615	5.9	2.0	58
ECF 12/10	1200	1150	156	127 x 178 x 406	700 x 555 x 615	9.2	2.6	64
ECF 12/22	1200	1150	160	203 x 228 x 454	870 x 715 x 760	21	5.0	125
ECF 12/30	1200	1150	180	203 x 305 x 454	870 x 715 x 760	28	5.0	130
ECF 12/45	1200	1150	150	305 x 305 x 454	870 x 715 x 760	42	6.0	130

# Advanced Wire Chamber Furnaces

A range of high specification chamber furnaces developed to meet rigorous standards of quality, safety and reliability. These stylish furnaces provide rapid heating and cooling rates, exceptional temperature uniformity and low power consumption.



The AWF models are available with a maximum operating temperature of 1200°C or 1300°C. Rapid heating and maximum temperature uniformity are provided by two side panel heating elements of ceramic fibre containing wire spirals freely radiating from sinusoidal grooves.

The insulated door opens upwards and outwards keeping the hot face insulation away from the operator. A door switch isolates power from the heating elements whenever the door is opened for maximum operator safety. The use of double skin construction allows natural air convection to maintain a cool outer case.



AWF 12/5

## Typical applications include:

- > General heat treatment of ceramics and metals
- > Melting
- > Thermal ageing
- > Annealing
- > Enamelling
- > Decomposition in chemical analysis
- > Thermal shock testing

Model	Maximum temperature (°C)	Maximum continuous temperature (°C)	Time to temperature (minutes)	Internal dimensions (mm) h x w x d	External dimensions (mm) h x w x d	Chamber capacity (l)	Maximum power (kW)	Net weight (kg)
AWF 12/5	1200	1150	40	150 x 150 x 200	655 x 500 x 520	4.5	1.9	41
AWF 12/12	1200	1150	80	200 x 200 x 300	700 x 555 x 615	12	2.75	54
AWF 12/25	1200	1150	45	250 x 250 x 400	755 x 605 x 715	25	5.5	67
AWF 12/42	1200	1150	50	305 x 305 x 450	870 x 715 x 760	42	8.0	117
AWF 13/5	1300	1250	45	150 x 150 x 200	655 x 500 x 520	4.5	1.9	41
AWF 13/12	1300	1250	90	200 x 200 x 300	700 x 555 x 615	12	2.75	54
AWF 13/25	1300	1250	55	250 x 250 x 400	755 x 605 x 715	25	5.5	67
AWF 13/42	1300	1250	60	305 x 305 x 450	870 x 715 x 760	42	8.0	117

# High Temperature Chamber Furnaces



UAF 14/5

A range of advanced high temperature general purpose chamber furnaces for use in both laboratory and light production applications.

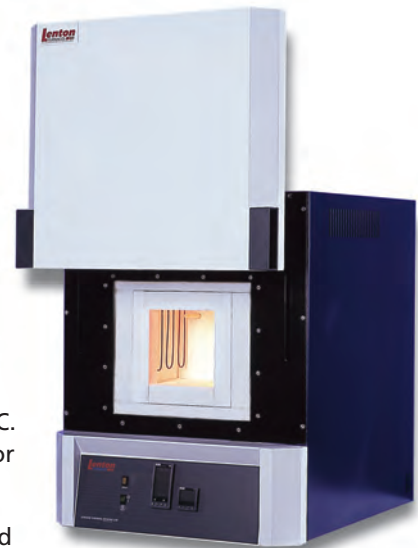
## Models UAF 14, 15 and 16

These models have maximum operating temperatures of 1400°C, 1500°C and 1600°C.

Low thermal mass ceramic fibre insulation and silicon carbide elements, which radiate heat directly onto the workpiece, provide rapid heating and cooling and low running costs.

The insulated door opens upwards and outwards keeping the hot face insulation away from the operator. A door switch isolates power from the heating elements whenever the door is opened for maximum operator safety. The use of double skin construction allows natural air convection to maintain a cool outer case.

A robust silicon carbide hearth tile is fitted as standard.



UAF 17/4

## Models UAF 17 and 18

These models have a maximum operating temperature of 1700°C and 1800°C. Models UAF 17/4 and 18/5 are bench mounted, while all other models are floor standing with lockable wheels as an optional extra.

Ultra-high purity alumina low thermal mass insulation and vertically suspended

Kanthal Super heating elements, which radiate heat directly onto the workpiece, provide rapid heating and cooling and low running costs. These models offer advanced chamber construction with modular roof system and removable hearth.

The insulated door opens upwards and outwards keeping the hot face insulation away from the operator. An electrically operated door is standard on the UAF 17/27 and UAF 18/27 models. A key switch is provided to prevent unauthorised opening. A door switch isolates power from the heating elements whenever the door is opened for maximum operator safety. Overtemperature protection is fitted as standard.

### Typical applications include:

- > General heat treatment
- > Thermal ageing
- > Sintering of ceramics
- > Processing of high temperature materials
- > Melting
- > Thermal shocking of components
- > Ceramics testing



Floor Mounted UAF17/27E

Model	Maximum temperature (°C)	Maximum continuous temperature (°C)	Internal dimensions (mm) h x w x d	External dimensions (mm) h x w x d	Maximum operating power	Chamber capacity (l) (kW)	Net weight (kg)
UAF 14/5	1400	1350	150 x 140 x 250	700 x 500 x 720	3.5	5.25	58
UAF 14/10	1400	1350	190 x 180 x 310	755 x 605 x 820	6.0	10.6	74
UAF 14/27	1400	1350	290 x 270 x 340	870 x 715 x 860	11.0	27.0	110
UAF 15/5	1500	1450	150 x 140 x 250	700 x 555 x 720	4.5	5.25	58
UAF 15/10	1500	1450	190 x 180 x 310	755 x 605 x 820	7.5	10.6	74
UAF 15/27	1500	1450	290 x 270 x 340	870 x 715 x 860	12.0	27.0	110
UAF 16/5	1600	1550	150 x 140 x 250	700 x 555 x 720	5.0	5.25	59
UAF 16/10	1600	1550	190 x 180 x 310	755 x 605 x 820	10.0	10.6	74
UAF 16/21	1600	1550	255 x 240 x 340	1070 x 950 x 860	14.0	21.0	236
UAF 17/4	1700	1650	150 x 150 x 150	755 x 605 x 720	3.7	3.4	128
UAF 17/12	1700	1650	230 x 230 x 230	1500 x 715 x 760	6.4	12.0	230
UAF 17/27E	1700	1650	300 x 300 x 300	1630 x 1050 x 825	12.0	27.0	316
UAF 18/5	1800	1750	170 x 150 x 200	755 x 605 x 720	4.5	5.1	170
UAF 18/13	1800	1750	220 x 200 x 300	1500 x 715 x 760	9.0	13.2	287
UAF 18/18	1800	1750	220 x 200 x 400	1500 x 715 x 860	12.0	17.6	365
UAF 18/27E	1800	1750	300 x 300 x 300	1630 x 1200 x 825	18.0	27.0	494

\* - E = Electric door

## Elevator Hearth Furnaces

By making use of the latest advances in thermal technology, Lenton has developed a small range of elevator hearth furnaces for operation in air or inert gas atmospheres. The range is available with maximum operating temperatures of 1700°C and 1800°C with capacities of 3.4 and 7.9 litres.

Optimum temperature uniformity is obtained by the inclusion of molybdenum disilicide heating elements which are positioned around the walls of the chamber ensuring uniform heating of the sample. A combination of dense refractory brick hot face insulation and a secondary low thermal mass layer of insulation provides a robust chamber with an efficient utilisation of power.

The electrically operated elevator hearth ensures operator safety and prevents direct radiation of heat from the chamber walls. It also ensures smooth loading and unloading of the workpiece or crucible and allows both heavy and delicate loads to be handled easily. Overtemperature protection is fitted as standard. The furnace can be adapted to accommodate an atmosphere other than air, by the use of an inverted alumina crucible in a groove in the hearth. Please enquire for further details.



### Typical applications include:

> Melting of high purity glass > Ceramic sintering and firing > Thermal shock testing > Firing in maintained atmospheres

Model	Maximum operating temperature (°C)	Litre capacity	Internal dimensions (mm) Height	Diameter	External dimensions (mm) h x w x d	Heat up time to 100°C below maximum temperature (minutes)	Maximum power (kW)
EHF 17/3	1700	3.4	190	150	975 x 750 x 530	80	5
EHF 17/8	1700	7.9	250	200	1950 x 1360 x 800	80	9
EHF 18/3	1800	3.4	190	150	975 x 750 x 530	110	6
EHF 18/8	1800	7.9	250	200	1950 x 1360 x 800	110	9



# Laboratory Tube Furnaces

For laboratory processes requiring the use of a tube furnace, Lenton offers a variety of tube diameters and lengths to meet most heat processing requirements. The tube furnace cases are manufactured from polished stainless steel with an outer enamelled mesh cover, which allows natural air cooling for maximum operating safety and comfort. All models are supplied horizontally as standard, but vertical options are also available.

## Optional fittings include:

- > A wide range of tubes
- > Insulating end plugs to minimise heat loss and thermal gradients
- > Gas tight end fittings for work in controlled atmospheres
- > For increased uniform temperature zone length, three zone versions are available - see the PTF range.



LTF 12/38/500

## Model LTF 12

This range of furnaces has a maximum operating temperature of 1200°C. Heating is provided by a resistance wire element wound on to the ceramic work tube which is an integral part of the furnace. Low thermal mass insulation is used throughout for rapid response rates and maximum thermal efficiency and stability. A rugged metal sheathed thermocouple is protected from accidental damage and allows full use of the work tube bore. If the tube is for use with an atmosphere or is likely to be contaminated by spillage, a separate worktube is required.

Horizontal models are supplied with the controls in the base, whilst vertical versions have a separate console.

Model	Maximum temperature (°C)	Maximum continuous temperature (°C)	Tube inside diameter (mm)	Heated length (mm)	Maximum power (kW)	External dimensions (mm - including console) h x l x d	Optional separate work tubes (mm - ID x length)
LTF 12/25/250	1200	1150	25	250	0.7	565 x 310 x 300	16 x 500
LTF 12/25/500	1200	1150	25	500	1.2	565 x 560 x 300	16 x 750
LTF 12/38/250	1200	1150	38	250	1.0	565 x 310 x 300	25 x 500
LTF 12/38/500	1200	1150	38	500	1.4	565 x 560 x 300	25 x 750
LTF 12/50/300	1200	1150	50	300	1.5	565 x 360 x 300	38 x 600
LTF 12/50/610	1200	1150	50	610	2.0	565 x 670 x 330	38 x 900
LTF 12/75/610	1200	1150	75	610	2.6	565 x 670 x 330	60 x 900
LTF 12/75/750	1200	1150	75	750	3.0	565 x 810 x 330	60 x 1000
LTF 12/100/940	1200	1150	100	940	4.0	625 x 1000 x 400	75 x 1500

• Other heated lengths can be made to special order

## Models LTF 14, 15 and 16

These models have a maximum operating temperature of 1400°C, 1500°C and 1600°C. Heating is provided by silicon carbide rod elements which are mounted parallel to the worktube; the worktube must be ordered separately. These elements radiate heat directly onto the tube for rapid response rates. Low thermal mass insulation is used throughout for maximum thermal efficiency and stability.

Horizontal models are supplied with the controls in the base, whilst vertical versions have a separate console.



Model	Maximum temperature (°C)	Maximum continuous temperature (°C)	Tube inside diameter (mm)	Heated length (mm)	Maximum power (kW)	External dimensions (mm - including console) h x l x d	Work tubes (mm - ID x length)	
							Short	Long
LTF 14/25/180	1400	1350	25	180	1.1	620 x 595 x 415	25 x 600	25 x 900
LTF 14/50/180	1400	1350	50	180	1.1	620 x 595 x 415	50 x 600	50 x 900
LTF 14/25/450	1400	1350	25	450	4.5	640 x 830 x 420	25 x 900	25 x 1200
LTF 14/50/450	1400	1350	50	450	4.5	640 x 830 x 420	50 x 900	50 x 1200
LTF 14/75/450	1400	1350	75	450	4.5	640 x 830 x 420	75 x 900	75 x 1200
LTF 14/25/610	1400	1350	25	610	5.5	640 x 1130 x 420	25 x 1200	25 x 1500
LTF 14/50/610	1400	1350	50	610	5.5	640 x 1130 x 420	50 x 1200	50 x 1500
LTF 14/75/610	1400	1350	75	610	5.5	640 x 1130 x 420	75 x 1200	75 x 1500

LTF 15/25/180	1500	1450	25	180	1.5	620 x 595 x 415	25 x 600	25 x 900
LTF 15/50/180	1500	1450	50	180	1.5	620 x 595 x 415	50 x 600	50 x 900
LTF 15/25/450	1500	1450	25	450	5.5	640 x 830 x 420	25 x 900	25 x 1200
LTF 15/50/450	1500	1450	50	450	5.5	640 x 830 x 420	50 x 900	50 x 1200
LTF 15/75/450	1500	1450	75	450	5.5	640 x 830 x 420	75 x 900	75 x 1200
LTF 15/25/610	1500	1450	25	610	6.0	640 x 1130 x 420	25 x 1200	25 x 1500
LTF 15/50/610	1500	1450	50	610	6.0	640 x 1130 x 420	50 x 1200	50 x 1500
LTF 15/75/610	1500	1450	75	610	6.0	640 x 1130 x 420	75 x 1200	75 x 1500

LTF 16/25/180	1600	1550	25	180	2.5	620 x 595 x 415	25 x 600	25 x 900
LTF 16/50/180	1600	1550	50	180	2.5	620 x 595 x 415	50 x 600	50 x 900
LTF 16/25/450	1600	1550	25	450	6.0	640 x 830 x 420	25 x 900	25 x 1200
LTF 16/50/450	1600	1550	50	450	6.0	640 x 830 x 420	50 x 900	50 x 1200
LTF 16/75/450	1600	1550	75	450	6.0	640 x 830 x 420	75 x 900	75 x 1200
LTF 16/25/610	1600	1550	25	610	7.0	640 x 1130 x 420	25 x 1200	25 x 1500
LTF 16/50/610	1600	1550	50	610	7.0	640 x 1130 x 420	50 x 1200	50 x 1500
LTF 16/75/610	1600	1550	75	610	7.0	640 x 1130 x 420	75 x 1200	75 x 1500

# Three-zone Tube Furnaces

## Models PTF 12, 15 and 16

These units have a maximum operating temperature of 1200°C, 1500°C and 1600°C.

For units at 1200°C, heating is by a resistance wire element wound on to the ceramic work tube which is an integral part of the furnace. At 1500°C and 1600°C, silicon carbide rod elements are mounted parallel to the tube.

The end zone controllers are coupled to a centre zone thermocouple enabling the centre zone temperatures to be closely linked. This system provides a longer uniform zone temperature than that achieved by the use of single zone furnace of the same length. Independent control of each zone is also available.



Model	Maximum temperature (°C)	Maximum continuous temperature (°C)	Tube inside diameter (mm)	Heated length (mm)	Maximum power (kW)	External dimensions (mm - including console) h x l x d	Optional separate work tubes (mm - ID x length)
PTF 12/38/500	1200	1150	38	500	1.5	565 x 560 x 300	25 x 750
PTF 12/50/610	1200	1150	50	610	2.0	565 x 670 x 300	38 x 900
PTF 12/75/750	1200	1150	75	750	2.75	565 x 810 x 300	60 x 1000
PTF 12/100/940	1200	1150	100	940	4.2	625 x 1000 x 400	75 x 1500

• Other heated lengths can be made to special order

Model	Maximum temperature (°C)	Maximum continuous temperature (°C)	Tube inside diameter (mm)	Heated length (mm)	Maximum power (kW)	External dimensions (mm - including console) h x l x d	Work tubes (mm - ID x length)	
							Short	Long
PTF 15/50/450	1500	1450	50	450	5.0	640 x 830 x 420	50 x 900	50 x 1200
PTF 15/75/450	1500	1450	75	450	5.0	640 x 830 x 420	75 x 900	75 x 1200
PTF 15/50/610	1500	1450	50	610	8.0	640 x 1130 x 420	50 x 1200	50 x 1500
PTF 15/75/610	1500	1450	75	610	8.0	640 x 1130 x 420	75 x 1200	75 x 1500
PTF 16/50/450	1600	1550	50	450	6.0	640 x 830 x 420	50 x 900	50 x 1200
PTF 16/75/450	1600	1550	75	450	6.0	640 x 830 x 420	75 x 900	75 x 1200
PTF 16/50/610	1600	1550	50	610	9.2	640 x 1130 x 420	50 x 1200	50 x 1500
PTF 16/75/610	1600	1550	75	610	9.2	640 x 1130 x 420	75 x 1200	75 x 1500

### Temperature uniformity

Temperature variation within the uniform zone is typically  $\pm 5^{\circ}\text{C}$ , with a significant proportion of the uniform zone length within  $\pm 1^{\circ}\text{C}$ . To improve the uniform zone length within a tube furnace, it is necessary to use multi-zone furnaces; the usual configuration is 3 zones.

Temperature uniformity will depend on the tube diameter and heated length.

# High Temperature Tube Furnaces

## Models LTF 17 and LTF 18

> maximum operating temperatures 1700°C and 1800°C

These furnaces are constructed using high grade insulation materials throughout for rapid response rates and maximum thermal efficiency and stability. Heating is provided by vertically suspended molybdenum disilicide elements.

## Model LTF 175

> maximum operating temperature 1750°C.

This model is available in vertical format only. Heating is by elements which are mounted parallel to the tube axis. The main constituent of the elements is lanthanum chromite, with other inclusions being added to provide them with their unique properties. Lanthanum chromite is naturally inert and does not form a crystalline layer on the element when operated in air or pure oxygen. These elements exhibit little or no ageing and their electrical characteristics remain constant throughout their life. In an LTF multi-element furnace, the replacement of a single element will not affect the future behaviour of the furnace.



Bench or Floor Mounted LTF 175  
(vertical tube furnace)

Model	Maximum temperature (°C)	Maximum continuous temperature (°C)	Tube inside diameter (mm)	Heated length (mm)	Maximum power (kW)	External dimensions (mm - h x l x d configuration)	Work tubes (mm - ID x length)	
							Short	Long
LTF 17/75/300	1700	1650	75	300	5.5	880 x 720 x 630 (horizontal)	75 x 900	75 x 1100
LTF 17/75/600	1700	1650	75	600	9.0	880x 1020 x 630 (horizontal)	75 x 1200	75 x 1500
LTF 175/50/200	1750	1700	50	200	8.3	860 x 660 x 660 (vertical)	50 x 850	50 x 1220
LTF 175/75/350	1750	1700	75	350	12.0	1010 x 660 x 660 (vertical)	75 x 1000	75 x 1350
LTF 175/125/350	1750	1700	125	350	12.0	1010 x 660 x 660 (vertical)	125 x 1000	125 x 1500
LTF 18/75/300	1800	1750	75	300	6.0	945 x 1020 x 630 (horizontal)	75 x 900	75 x 1200



Bench Mounted LTF 17 & LTF 18

# Split Tube Furnaces

These furnaces are ideal for processes requiring in-line heating for when rapid heating/cooling is essential.

## Model CSC12

- > maximum operating temperature 1200°C
- > spiral wire heating coils in low thermal mass insulation
- > split design for easy exchange of work tubes



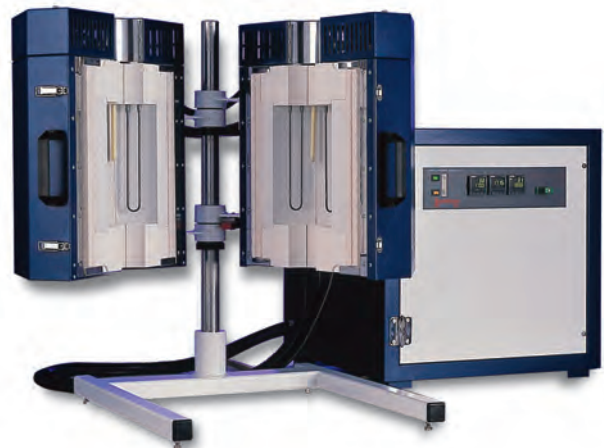
CSC 12/90/600

Model	Maximum temperature (°C)	Maximum continuous temperature (°C)	Tube inside diameter (mm)	Heated length (mm)	Maximum power (kW)	External dimensions (mm - excluding console) h x l x d	Work tubes (mm - ID x length)	
							Short	Long
CSC 12/90/300 (H)	1200	1150	75	300	1.5	350 x 425 x 410	75 x 450	75 x 750
CSC 12/90/300 (V)	1200	1150	75	300	1.5	650 x 350 x 360	75 x 450	75 x 750
CSC 12/90/450 (H)	1200	1150	75	450	2.25	350 x 575 x 410	75 x 600	75 x 900
CSC 12/90/450 (V)	1200	1150	75	450	2.25	800 x 350 x 360	75 x 600	75 x 900
CSC 12/90/600 (H)	1200	1150	75	600	3.0	350 x 725 x 410	75 x 750	75 x 1050
CSC 12/90/600 (V)	1200	1150	75	600	3.0	950 x 350 x 360	75 x 750	75 x 1050

(V) = Vertical (H) = Horizontal

## Model CSC17

- > maximum operating temperature 1700°C
- > molybdenum disilicide heating elements
- > 3 sizes, the largest floor standing



Vertical split CSC 17/32/250

Model	Max temp (°C)	Heat-up time (mins)	Max o/d accessory tube (mm)	Dimensions			External Furnace (inc stand) h x w x d (mm)	External Control module h x w x d (mm)	Max power (w)	Thermo-couple type	Weight (kg)	Power supply
				Heated	For work in air	**For modified atmosphere work						
CSC 17/32/250	1700	--	32	250	550	850	865 x 600 x 705 630 x 600 x 490	4500	B	173	single phase	
CSC 17/66/250	1700	--	66	250	550	850	865 x 600 x 705 630 x 600 x 490	4500	B	173	single phase	
CSC 17/90/250	1700	--	90	250	1050	1500	1560 x 750 x 890 630 x 600 x 490	4500	B	—	single phase	

- Other heated lengths are available on request (CSC 1200 models only)
- Adapters are available for smaller diameter tubes

# Furnaces for Extensometer Stress Testing

These products have been specially designed to be fitted to a wide variety of other manufacturers extensometer tensile and stress testing machines.

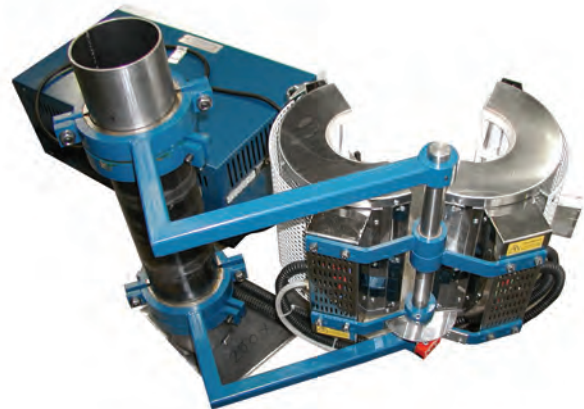
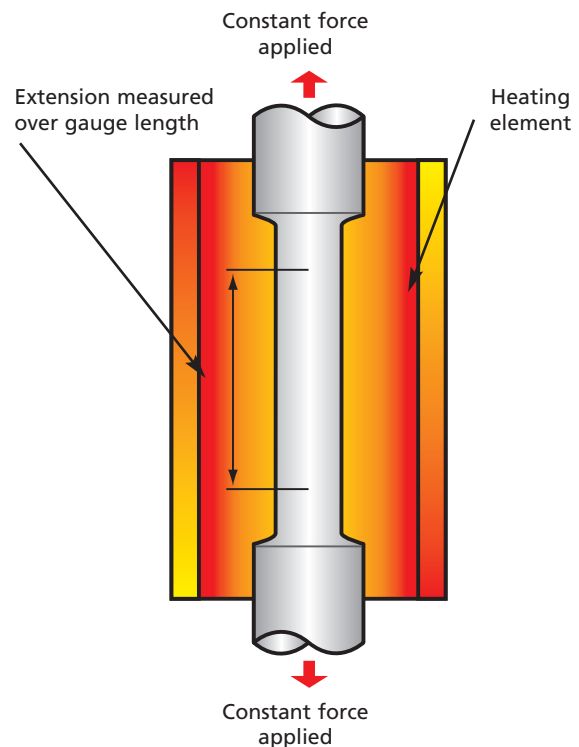
They have been designed to suit the heated length and temperature uniformity requirements demanded by this industry.

For the maximum temperatures of 800°C & 1100°C the element type are spiral wire coils embedded into vacuum formed ceramic fibre half cylinders. For use at the maximum temperature of 800°C three zone control is required, due to the relatively lower temperature, which then results in a very uniformly controlled central heated zone. At the higher maximum temperature of 1100°C three zone control is not required, and single zone control results in an equally uniformly controlled central heated zone. For the maximum temperature of 1500°C the 6 silicon carbide double coil elements are arranged symmetrically around the stacked ceramic fibre board half cylinders, which when coupled with single zone control results in a uniformly controlled central heated zone.

The split tube furnace allows easy loading and unloading of the sample and complete retraction when not required.

The furnace is normally supported via a 100mm diameter split bearing mounted around the machine cross head supports, but alternative mounting arrangements can be considered.

The CSC 8/115/220 three zone furnace is supplied with a master centre zone temperature controller (Eurotherm 3508P1) and two slave end zone controllers (Eurotherm 3216CC), which respond to the master to create the optimum uniformity. The temperature controllers are located in a control box, connected by 2m of flexible conduit which allows it to be easily sited nearby. The CSC 11/115/220 & CSC 15/115/220 single zone units are supplied with a single controller (Eurotherm 3216P1) located in a control box, also connected by 2m of flexible conduit.



Model	Number of zones	Maximum temperature (°C)	Maximum continuous temperature (°C)	Furnace bore (mm)	Heated length (mm)	Zone lengths (mm)	Maximum power (kW)	Overall dimensions (mm)
CSC 8/115/220	3	800	750	115	220	60/70/60	2.2	280 high x 255 diameter
CSC 11/115/220	1	1100	1050	115	220	-	2.2	280 high x 255 diameter
CSC 15/115/220	1	1500	1450	115	220	-	5.0	380 high x 355 diameter

# Vacuum Tube Furnaces

The high specification VTTF series of horizontal vacuum tube furnaces is available at 1200°C and 1500°C.

## Standard Features

- > Vacuum vessel - ceramic tube fitted with Stainless Steel end seals;
- > Rotary pump - two stage sliding vane type;
- > Turbo-molecular vacuum pump;
- > Manually operated backing/roughing and baffle valve;
- > Pirani gauge - low vacuum monitoring;
- > Penning gauge - high vacuum monitoring;
- > Ultimate vacuum - better than  $1 \times 10^{-5}$  mbar, with clean empty work tube.

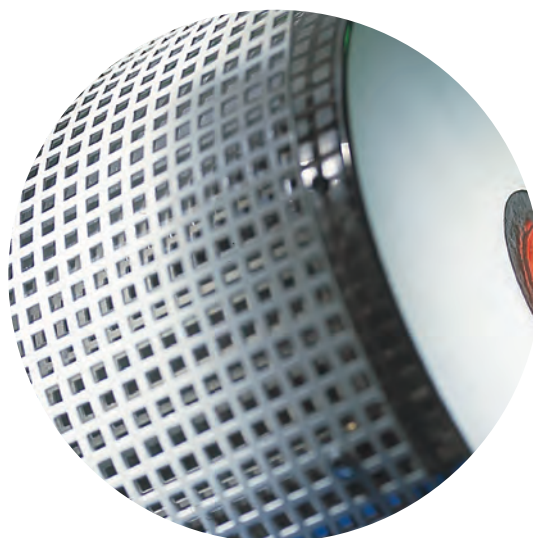
## Options

- > Gas inlet with additional safety system for use with combustible atmospheres;
- > Flowmeters and valves for control of gas throughput;
- > Three zone control;
- > Semi-automatic or fully automatic vacuum/heating cycles;
- > Vertical operation;
- > Water cooled oil diffusion pump.



Floor Mounted VTF 12/50/550  
(turbo molecular pump model)

Model	Maximum temperature (°C)	Maximum continuous temperature (°C)	Tube inside diameter (mm)	Heated length (mm)	Maximum power (kW)	External dimensions (mm - including console) h x l x d	Work tubes (ID x length nom - mm)
VTF 12/50/550	1200	1150	50	550	3.0	1450 x 1700 x 600	50 x 1200
VTF 12/60/700	1200	1150	60	700	4.0	1450 x 1700 x 600	60 x 1200
VTF 12/80/700	1200	1150	80	700	4.0	1450 x 1700 x 600	80 x 1200
VTF 15/50/450	1500	1450	50	450	6.0	1565 x 1700 x 600	50 x 1200
VTF 15/75/450	1500	1450	75	450	6.0	1565 x 1700 x 600	75 x 1200



# Tube Furnace Options

A variety of options is available to optimise the use of the tube furnaces:

## Work tubes:

a selection of work tubes is available in a variety of sizes with the most popular materials being recrystallised alumina (RCA), mullite, impervious aluminous porcelain (IAP), silica, sillimanite, metallic (APM, Inconel).

## Gas tight end seals:

tube furnaces can be adapted for use with controlled atmospheres and vacuum by fitting gas tight end seals. The choice is as follows:

**A** this design provides two stainless steel discs which are clamped onto the ends of the work tubes with a wormdrive clip, with a viton rubber ring forming the seal. This design accommodates wide tolerance tubes. Both designs can accommodate a variety of fittings for the introduction of gas and for vacuum connections;

**B** this design incorporates an 'O' ring seal clamped around the outside of the work tube for use with high vacuum applications.



Worktube  
End  
Flanges

It is recommended that a pair of insulation plugs or radiation shields is purchased to protect the end seals from radiant heat.

## Insulation plugs:

these are shaped ceramic fibre board plugs, incorporating a 6mm bore tube, which assist in reducing the possibility of the work tube cracking due to steep thermal gradients (ie thermal shock). They also prevent heat loss and improve temperature uniformity.



Insulation  
Plugs

## Radiation shields:

for applications where ceramic fibre plugs are unsuitable, e.g. where a high purity atmosphere or vacuum is required. Inconel or alumina discs are positioned along a stem.



Radiation  
Shields



# Temperature Control Systems

A choice of control systems is available including controllers which simply heat up the furnace and hold at one temperature indefinitely as well as more complex programming systems. Access to parameters is simple and easy to understand and is customised to present only those parameters which need to be viewed or adjusted.

## Eurotherm 3216 CC

The Eurotherm 3216CC is a dual display PID controller showing setpoint and furnace temperature. An adjustable ramp to setpoint feature is included.



## Eurotherm 3216P1

The Eurotherm 3216P1 is an advanced setpoint programming temperature controller with eight segment-pairs, each a ramp and a dwell. (This configuration of a ramp followed by a dwell cannot be altered). It is housed in a compact, quick release 1/16 din size, measuring 48 x 48mm, and features scrolling text to provide additional information of current status to the user. It provides precise control with an advanced PID control algorithm giving stable "straight - line" control of the process. Power feedback is used to stabilise the output power and hence the controlled temperature against supply voltage fluctuations. The controller continually corrects for drift and this gives high stability and rapid response to process changes.



## Eurotherm 3508P1

The Eurotherm 3508P1 is an advanced setpoint programming temperature controller with twenty segments, any of which may be a ramp, a step or a dwell. It is housed in a quick release 1/8 din size measuring 48 x 96mm high, and features large numeric and text displays to provide additional information of current status to the user. It provides the same precise control as the 3216CC or 3216P1 models.

## Overtemperature protection

An independent alarm instrument type 2132 and thermocouple are incorporated into the heating element circuit and, in the case of overtemperature of the furnace, power to the elements is switched off with lockout action so shutting down the furnace safely.



**Other options:** additional control systems can be supplied including cascade control, multi-segment programmers and process timers.

**Cascade control:** the standard control system senses the temperature close to the heating elements; the temperature of the load is usually slightly lower. To correct this, a second controller can be added; one senses the load the other the elements. The load controller sends signals to the element controller, which adjusts the element temperature accordingly. Faster warm up is achieved by boosting the element temperature when the load is cold and by reducing it as the load approaches the desired temperature. Available with Eurotherm 3508P1 only.

**Digital communications:** RS232 for single instrument communication and RS485 for multi instrument communication ports are available.

**Software packages:** iTools - a windows-based single port instrument configuration and data logging system, is ideal for laboratory applications.

Full SCADA packages are available for real time supervision from just a few instruments to complex systems.

## Optional extras

- > Process timers/time switches
- > Gas flow meters
- > Audible alarms
- > Probe thermocouples
- > Chart recorders
- > Viewing port

## Standard Electrical Supply

When ordering, always quote the model, controller and the preferred type of electrical supply from the list. Please indicate the frequency (50 or 60 Hertz) and number of phases. For 3-phase supplies (where applicable), please state whether a neutral is available (if so, please quote both the phase-to-phase and the phase-to-neutral voltages, eg 380.220V). Typical single phase voltages are 100, 110, 200, 208, 220, 240 and 254V. 3-phase voltages without neutral are typically 220, 380, 415 and 440V. 3-phase voltages with neutral are typically 220/127, 380/220, 415/240 and 440/254.

## Note

As a result of continuous product development, we reserve the right to change specifications and illustrations. In the unlikely event of one of our standard products not meeting your requirements, we have the capability to design and manufacture a unit specifically tailored to meet your needs.

Lenton manufactures in compliance with the relevant safety standards to BS EN 61010-1: 1993 & 61010-2-010: 1995. All products carry the CE mark which indicates compliance with all relevant European safety directives; ie Low Voltage Directive and ElectroMagnetic Compatibility directive.

## Custom Furnaces & Ovens

Lenton has the ability and capacity to design and build special designs of laboratory and pilot scale production furnaces and ovens, based on our customers' requirements. We have supplied a wide variety of products to suit various applications, and many examples are described in the Custom Built Equipment section on our website [www.lentonfurnaces.com](http://www.lentonfurnaces.com). Below you can see a selection of custom build furnaces that we have recently built.



Top hat chamber furnace



Elevator Hearth Furnace with Gas Tight Retort



De-binder furnace with mobile cooler



Rotating tube furnace



Crystal growth furnace



Vertical / horizontal tube furnace with 4 quartz viewing windows.



Rotating process furnace

Read the latest  
news from Lenton



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