FOSS

Tecator™ Line Digestion Systems

Tecator™ Line

Tecator™ Line Digestors 2508, 2520 and 2540 are based on a digestion unit and tube rack, allowing fully automated digestion for convenient, safe and flexible Kjeldahl analysis. Two way PC communication supports traceability and GLP. These versatile digestion systems are capable of handling eight, twenty or forty tubes in volumes of 100 ml, 250 ml or 400 ml. dependant on chosen configuration.

Samples	Parameters
• Raw materials and finished products in food, feed, agriculture and related matrices • Water & wastewater and a wide range of industrial compounds • Also used in a wide range of industrial applications	• Kjeldahl digestions • Chemical oxygen demand & other reflux chemistries • Trace metal analysis by AAS or ICP instruments • Often used in combination with FIA and SFA systems

Making Kjeldahl more convenient

Tecator™ Line Digestors 2508, 2520 and 2540 offer a range of options for convenient, safe and flexible Kjeldahl analysis. Two way PC communication supports traceability and GLP. Tecator™ Line digestors are available in two versions: Auto digestor with lift system and auto digestor with rack system. Digestor with lift systems facilitate highly automated procedures and eliminate handling of hot chemicals. Digestor with rack system involve more manual operation.

Products in the Tecator™ Line range can be combined to match individual needs, from units capable of handling just a few samples a day up to fully automated systems for high sample throughput.

Efficient and cost-effective operations

Smooth operations save chemicals, energy, labour, space and time. Efficient fume containment is provided through an optional exhaust and fumes can be removed via the optional Scrubber 2501. Tecator™ Line digestors, with integrated programmable controllers, can be combined with a range of accessories offering:

- Fully automated digestors with user interface adapting to actual product configuration
- Convenient, safe and flexible operation
- GLP-support through two way PC communication
- Economy of chemicals, energy, labour, space and time
- Efficient fume containment through optional exhaust
- Efficient fume removal through optional scrubber

The systems come with extensive application support and are compatible with Kjeltec™ distilling units and those of other manufacturers.

All digestion systems are based on one of the digestion units for either 400ml, 250ml or 100ml tubes.*
** Tube volume to be specified when ordering your digestion unit.*

Technology

Digestors are insulated to minimise heat transfer to the surroundings and allow fast, even heating, thus giving good working conditions as well as saving energy. They are designed for batches of either eight, twenty or forty test tubes with two different levels of control.

The auto versions have an integrated all activity controller, that adapts to the actual product configuration and is programmable using the software supplied. When a lift or scrubber unit is connected they are controlled by the selected application program, which is stored in the digestion unit memory, allowing fully unattended operation.

Software

There are two separate software systems in Tecator™ Line digestors. The embedded software controls all necessary functions of the digestion system on a routine basis. The PC application software, delivered on CD, is system management software which enables default values to be modified according to the needs of the authorized user.

To process different type of samples a wide range of applications can be downloaded from the database included on the CD. Up to 254 applications can be stored in the digestor at any one time, of which half can be standard FOSS format and half can be user defined. Each application can control up to 23 steps including all temperature; ramp and time; lift and scrubber steps.

The software supports Good Laboratory Practice (GLP) routines and accreditation procedures. Data for date, time, temperature, application used, operator, batch number, and ID number are constantly logged. The 32 most recent data logs can be stored in the digestion unit. All this information can be transferred to a PC for archiving and generation of up to seven different reports. Original FOSS applications cannot be changed. They can be adapted and saved as different files or the user can design their own applications. To prevent unauthorized changes, and comply with GLP routines, the software is password protected at different authority levels.

Audible alerts

Audible "ready" or "cycle over" alerts advise the user when the digestion application is completed.
Audible "alarm" alerts advise the user when errors/interruptions occur within the running application program. Alerts can be adjusted High, Low or Off.

Power failure or interruption of power supply

In the event of power failure the digestor operation is automatically handled in the safest way. If the failure or interruption occurs at any time up to or during preheating, before digestion has started, the cycle will continue when power is restored. Following a power failure or interruption, after the digestion cycle has started, the unit stops heating immediately and the lift goes to the cooling position with exhaust in place, upon restoration of power. This complies with GLP and Health & Safety routines. These interruptions will be recorded in the data logging function.

Communication with PC

The PC application software communicate with the digestor via the serial RS232 cable supplied as standard.

Language versions

The software is available in the following languages: Chinese (simplified), Dutch, English, French, German, Italian, Japanese, Korean, Polish, Russian, Spanish, and Swedish. Other languages can be accommodated in co-operation with your local supplier.

Lift system

The lift system facilitate highly automated procedures, eliminating heavy and risky handling of hot chemicals. Valuable bench space is saved, as the tube rack and exhaust manifold are positioned above the digestor. A tube rack with 8, 20 or 40 tubes is placed in the lift. The application selected then fully controls the entire process. The exhaust manifold docks automatically with the tube rack as they move down into the preheated digestor; and the scrubber, if connected, starts. The scrubber capacity is automatically adjusted during the cycle to contain fumes and minimise acid losses. When the digestion is completed the combined tube rack and exhaust manifold move to the cooling position with the scrubber still running until no further fumes are evolved. An adjustable audible signal in the digestion unit indicates "cycle over". To avoid any spillage a drip tray, supplied with the exhaust manifold, is inserted underneath the exhaust manifold when it is separated from the tube rack after cooling.

The lift eliminates heavy handling.

Rack system

When the rack system is used in place of the lift system the typical procedure is as with the lift system with the exception that the combining/separating of tube rack and exhaust manifold and the movement to the cooling position is performed manually when the signal is heard. The application selected controls all other functions as with the lift system.

There is an exhaust for each digestor.

Fume removal and containment systems exhaust manifolds

Many digestion applications, e.g. Kjeldahl, produce fumes that are unpleasant and corrosive. Exhaust manifolds designed for each digestor facilitate fume removal and containment and are strongly recommended for use with all digestion procedures. The cost of replacement of a fume cupboard which has been corroded by inefficient fume handling is very much greater than the relatively low cost of an approved exhaust. Whilst many users choose to operate integrated systems in the open laboratory, we strongly recommend the use of both exhaust systems and fume cupboards for these operations. This is simply Good Laboratory Practice (GLP) and avoids conflict with local Health & Safety (H&S) requirements.

The exhaust manifolds should be connected to the water aspirator supplied, or to a suitable scrubber.

Accessories

Scrubber

Where water is a scarce or expensive commodity, or simply when a higher level of automation is desired, the water aspirator should be replaced with an efficient scrubber unit. Exhaust manifolds and scrubber units which require an external water source are subject to variation in vacuum efficiency due to fluctuations in local water pressure.

The Tecator™ Line Scrubber 2501 neutralizes the corrosive fumes.

The compact bench top Tecator™ Line Scrubber 2501 is self contained and is therefore unaffected by water supply issues. During digestion moist, acidic fumes from the connected exhaust are drawn through the scrubber. Acid vapours are first condensed and diluted in a large acid trap.

Any residual fumes are collected, washed and neutralised before passing through a second small acid trap which protects the vacuum pump in the event that the scrubbing agents are exhausted. The cleaned air is then vented via a tubing outlet. In the interest of GLP and H&S this venting tube should be directed into a fume cupboard. When the scrubber is connected to the lift or rack system the program will fully control the function including switching from high to low aspiration settings.

Reflux heads

When a digestor is used for reflux chemistries, such as Chemical Oxygen Demand (COD), a reflux head connected to a suitable cold water supply should be used in place of the exhaust manifold. Reflux heads are conveniently mounted in handling racks which match the tube rack in the digestion unit.
The ball jointed condensers are designed for use with ball jointed digestor tubes. The reflux heads are compatible with lift, rack and Labtec™ Line systems.

Digestion tubes

To suit different applications and manual/automatic handling systems, tubes for the digestion units are available in three sizes (400 ml, 250 ml and 100 ml) and three shapes. Straight sided tubes are recommended for the majority of digestion applications. Volumetric tubes with a constriction at the neck are recommended for applications where the digestate requires dilution to a fixed volume before analyses such as FIA, SFA, and AA etc.
Ball jointed tubes, available in 250 ml size only, are required for reflux chemistries using the reflux condenser heads. The larger 250 ml straight sided tubes are recommended for Kjeldahl, as they can hold samples of widely varying sizes. Samples of heterogeneous material often need to be fairly large to ensure that they are representative. There is no lower limit of sample size in the 250 ml tubes; they simply allow greater flexibility for most type of samples. The 100 ml straight sided tubes can be used where the material is homogeneous and small samples are fully representative or where they are specified by the approved method. A special 400 ml tube which fits in 250 ml systems is designed for handling large liquid volumes, typically 50 or 100 ml in water and beer applications.

Select the correct tube for your application.

Kjeltabs

A salt, to increase the boiling point, and a catalyst, to increase the speed of reaction, are used for Kjeldahl digestions. As a convenient way to obtain the correct dosage, FOSS supplies Kjeltabs – tablets containing potassium sulphate and a catalyst (copper, selenium, or copper/titanium). Digestion time may depend on the catalyst used. Historically mercury has been used as the most efficient catalyst. Today it has been replaced largely by copper, or other metals, due to safety and environmental considerations.
Kjeltabs are supplied in several weights, typically 3.5 g and 1.5 g for different demands. One or more tablets are combined with the acid to obtain an optimal salt/acid ratio. The smaller 1.5 g size is designed for the 100 ml tubes.

Kjeltabs, salt and catalyst in tablet form.

Secure your investment with a FossCare™ Support Agreement

Let FOSS take care of you for a maximum return on your analytical investment. Get a four year warranty as part of the new FossCare Premium Preventive Maintenance Agreement or two years as part of any other FossCare agreement. In addition to the peace of mind afforded by the warranty period, the continual preventive maintenance pays off by keeping your analytical instruments working perfectly every day, year after year.

Why preventive maintenance?

As with any analytical solution, it is essential that your FOSS instrument receives regular maintenance to ensure optimal performance and extended lifetime. Avoiding expensive downtime is a matter of following factory standards and preventively replacing parts before they wear out. In turn, this helps ensure reliable and consistent results at the highest level.

Preventive and predictive maintenance combined with global support from 300 dedicated service, application, software and calibration specialists keeps your instrument running perfectly all year round.

Benefits of a FossCare™ Support Agreement:

- Extended Warranty (two or four years depending on the chosen agreement)
- Regular maintenance; the instrument is diagnosed, cleaned, adjusted, tested, fine tuned and recalibrated
- Minimal downtime from replacing components before they are worn out
- Consistent, accurate and reliable results you can always trust
- Preventative maintenance visits when it suits you (your business)
- 24/7 phone support - no need to worry about closing hours or PO
- Low, fixed service budget prevents unexpected expenses
- Discounts on additional services, spares, training, reagents, consumables and software upgrades

Contact your local Foss office for more information.

System description

Digestors:
All models are delivered with a tube rack with integrated heat shields. They should always be combined with a matching exhaust manifold or reflux head and test tubes – 100 ml, 250 ml or 400 ml volume.
For Kjeldahl digestions the Scrubber 2501 should always be considered for safe and efficient neutralisation of corrosive gases. This replaces the water aspirator, supplied as standard.

Lift models, complete with lift and integrated controller for fully automatic control of digestion applications, including the operation of the lift and a scrubber unit (optional extra). The digestor can be connected to PC for application updates, traceability and logging purposes.
NOTE. An appropriate exhaust manifold or reflux head MUST be added for an automatic system.

Rack models, complete with rack and integrated controller for full control of digestion applications, including the operation of a scrubber (optional extra). The digestion unit can be connected to PC for application updates, traceability and logging purposes.
Can be upgraded to an auto lift system by addition of the lift.
NOTE. An appropriate exhaust manifold or reflux head MUST be added for an automatic system.

Versions for Digestor 2508:
- Digestor 2508 lift system, 250 ml tubes, 115 V or 230 V 50-60 Hz
- Digestor 2508 rack system, 250 ml tubes, 115 V or 230 V 50-60 Hz

Versions for Digestor 2520:
- Digestor 2520 lift system, 250 ml tubes, 230 V 50-60 Hz
- Digestor 2520 rack system, 250 ml tubes, 230 V 50-60 Hz

Versions for Digestor 2540:
- Digestor 2540 lift system, 100 ml tubes, 230 V 50-60 Hz
- Digestor 2540 system, 100 ml tubes, 230 V 50-60 Hz

Fume removal and containment systems:
- Exhaust manifold for Digestor 2508 for 100 ml. or 250 ml. tubes are used. Complete with water aspirator and drip tray.
- Exhaust manifold for Digestor 2520, 250 ml tubes. Complete with water aspirator and drip tray.
- Exhaust manifold for Digestor 2540. Complete with water aspirator and drip tray.
- Scrubber 2501 110/230 V 50-60 Hz. For neutralization of fumes in acid digestions. It can be combined with any of the exhaust manifolds. Up to 100 samples without changing of reagent. Fully automatic operation when connected to an auto digestion unit.

Lift and rack systems:
- **LS 2500 Lift System** for the auto version of Digestor 2508, 2520 and 2540. The application run in the digestor fully controls the lift.
- **RS 2500 Rack System** for all versions of Digestor 2508, 2520 and 2540 without lift. Enables manual positioning of components in a similar way as the lift.

Reflux condensers:
- **RH 2508 Reflux Head** COD Digestor 2508. Water-cooled condensers for 8x250 ml tubes.
- **RH 2520 Reflux Head** COD Digestor 2520. Water-cooled condensers for 20x250 ml tubes.
- **Reflux Condenser**, air cooled. 700 mm. With ground joint for 250 ml tubes.

Handling Systems
Digestors are delivered complete with one tube rack. It may be found convenient to order extra so that all tubes normally in use in the laboratory are placed in a rack.
8 & 20 place tube racks for 250 ml and 400 ml tubes fit Kjeltec™ 2460, Kjeltec™ 8420 & Kjeltec™ 8460 samplers.

- Tube rack for 8 digestion tubes for 100 ml, 250 ml and 400 ml.
- Tube rack for 20 digestion tubes 250 ml or 400 ml.
- Tube rack for 40 digestion tubes 100 ml.
- Retainer plate for washing; Digestor 2520, 250 ml tubes.
- Retainer plate for washing; Digestor 2540, 100 ml tubes.
- Boiling rod. To avoid bumping when digesting large volumes of water.
- Handling device for digestion tube
- Dispenser 2-10 ml, 1000 ml bottle
- Dispenser 10-30 ml, 2000 ml bottle
- Condensation flask 5L. Used in conjunction with scrubber when large liquid samples are digested.

Cont. System description

Test tubes

Straight model test tubes, often used for Kjeldahl determination.

- Digestion tubes straight 100 ml or 250 ml 8/pkg
- Digestion tubes straight 100 ml 40/pkg
- Digestion tubes straight 250 ml 20/pkg
- Digestion tubes 400 ml 20/pkg

With constriction and volume mark, used in applications where the digest is diluted to volume and an aliquot is taken for analysis.

- Digestion tubes with mark 250 ml 20/pkg

With ground joint for air-cooled reflux condensers.

- Digestion tubes - ground joint 250 ml 20/pkg

With ball joint for water-cooled reflux condensers.

- Digestion tubes - ball joint 250 ml 20/pkg
- Dummy tubes 5/set for 250 ml system only

Kjeltabs:

Most types are delivered in boxes of 1000.

- Selenium, tablets with 1.5 g K_2SO_4 + 7.5 mg Se.
- Selenium, tablets with 5 g K_2SO_4 + 5 mg Se.
- Selenium, tablets with 3.5 g K_2SO_4 + 3.5 mg Se.
- Copper/titanium, tablets with 5 g K_2SO_4 + 0.15 g $CuSO_4.5H_2O$ + 0.15 g TiO_2.
- Copper/titanium, tablets with 3.5 g K_2SO_4 + 0.105 g $CuSO_4.5H_2O$ + 0.105 g TiO_2.
- Copper, tablets with 3.5 g K_2SO_4 + 0.4 g $CuSO_4.5H_2O$.
- Copper, tablets with 1.5 g K_2SO_4 + 0.15 g $CuSO_4.5H_2O$.
- Copper, tablets with 4.5 g K_2SO_4 + 0.5 g $CuSO_4.5H_2O$.

Other types are available upon request

Performance data:	Digestor 2508	Digestor 2520	Digestor 2540
Temperature range	Ambient - 440°C	Ambient - 440°C	Ambient - 440°C
Temperature setting repeatability	1°C	1°C	1°C
Temperature readout	Digital	Digital	Digital
Heater indication	LED	LED	LED
Heater warning	Text in display	Text in display	Text in display
Over temperature protection	Yes	Yes	Yes
Temperature stability at 100°C	± 2°C	± 2°C	± 2°C
Temperature stability at 400°C	± 1°C	± 1°C	± 1°C
Heating time 20 to 400°C at 230 V	~35 min	~40 min	~35 min
Time setting per step	1 - 999 min	1 - 999 min	1 - 999 min
Ramp control (Rate of heating)	Yes	Yes	Yes
Digestion applications memory	Up to 254	Up to 254	Up to 254
Digestion steps per application	Up to 23	Up to 23	Up to 23
Lift connection	Yes, full control	Yes, full control	Yes, full control
Scrubber	Yes, full control	Yes, full control	Yes, man control
Tubes / batch	8	20	40
Typical sample capacity			
Tube size	**250 ml**	**250 ml**	-
Sample size* solids	up to 5 g	up to 5 g	-
Sample size* liquids	up to 15 ml	up to 15 ml	-
Tube size	**100 ml**	-	**100 ml**
Sample size* solids	up to 1 g	-	up to 1 g
Sample size* liquids	up to 3 ml	-	up to 3 ml

**Note: Larger samples require special procedures. Please see the relevant application notes or consult our Customer Service Laboratory.*

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