

**Thermo Scientific
DFS High Resolution GC/MS**



Designed for Highest Sensitivity

DFS — HIGH RESOLUTION MAGNETIC SECTOR GC/MS

In continuation of a 50 year history in high performance magnetic sector mass spectrometers, Thermo Fisher Scientific advances this technology by introducing the DFS double focusing, high resolution magnetic sector.



The DFS delivers

- Highest sensitivity
- Highest signal/noise
- Lowest limits of detection
- Lowest limits of quantitation
- Highest specificity
- Highest sample throughput
- Unattended automatic operation

Running the DFS is as simple and straightforward as operating a low resolution benchtop MS.

- Automatic tuning
- Automatic universal mass calibration
- Intuitive user interface
- Intuitive method and sequence set-up
- Comprehensive and flexible data evaluation and reporting

The DFS is friendly...

- Fits into a small laboratory
- Uses less power
- Quieter
- Requires little installation time
- Immediately productive

...and it is versatile

- Highest sensitivity EI/CI
- Positive and negative ions
- Solids probe
- FAB

...and other ionization and inlet techniques

The Thermo Scientific DFS is a high resolution magnetic sector mass spectrometer like none before. It is the highest performance MS ever built for target compound analysis, and the first completely new double focusing instrument of its class in more than 15 years.

The DFS has all the best performance of a magnetic sector MS, but it neither looks nor feels like one.

The Thermo Scientific DFS neither looks nor feels like a traditional magnetic sector MS. It defines a new class of high performance mass spectrometers.

EXPERIENCE THE NEW DIMENSION

The revolutionary ion optics and the intuitive user interface make operation of the instrument easy and straightforward.

Technology

Several new technologies have been incorporated in this revolutionary mass spectrometer. All these combined, provide the most powerful GC/MS mass spectrometer ever designed.

Novel Analyzer

The newly designed analyzer is the first with virtually no image aberrations. It is perfectly double focusing, employing an ultra high precision toroidal electrostatic analyzer and a carefully refined magnetic analyzer. This directly translates into stability and ruggedness

- **Tuning for highest sensitivity does not influence the preset resolution**
- **Fully automatic ion source tuning**
- **Automatic setting of mass resolution**
- **No tuning of other ion optical elements**
- **Mass calibration completely independent from ion**
- **Single universal mass calibration for all modes of operation**

The DFS is forgiving and robust while delivering the highest sensitivity and specificity.

Ion Source

The ion source has been designed with special emphasis on sensitivity, durability and ease of maintenance. Low maintenance and short downtime increase productivity.

- **Exchange of ion volume and filament without venting**
- **Plug-in ion source for easy maintenance**
- **Optimized long lifetime filaments for EI and CI**
- **New easy-to-use high stability reference inlet system**

Electronics

The DFS has completely new, state-of-the-art electronics. It uses dedicated micro-controllers on all boards, enabling efficient and fast computer control and read-back of all important parameters and voltages through a common interconnect bus. It is verified to be completely immune against high voltage arcing—another contribution to robustness and reliability. The magnetic field regulator is fast and stable, yet very energy efficient, utilizing 'power-on-demand' switching power supplies. It fully complies with the EU power factor correction directive. The magnetic field is controlled with 20 bit digital resolution and receives its feedback from a unique magnetic field probe, supporting the single universal mass calibration.

Chassis and Cabinet

The new small-footprint cabinet is aesthetic and functional. It contains the analyzer, the electronics, and the complete pumping system, including roughing pumps. No precious space is wasted. Through its ingenious design it allows the DFS to be shipped completely assembled with the magnet in place. This means very short installation time, no need for a crane, and the security that the system arrives exactly the way it has been tested in the factory. Due to the innovative technology the mass spectrometer weighs less than conventional magnetic sector instruments, thus minimizing the demands on the laboratory environment.

Tune Software

Thermo Scientific TunePlus™ is the renowned user interface for ion trap and triple quadrupole MS (LCQ™, LTQ™, LXQ™, TSQ Quantum™). For the first time, a magnetic sector mass spectrometer uses the same concept, making tuning, experiment and sequence set-up intuitive and simple. High resolution MID is an integral part of the user interface.

GC/MS Productivity

The DFS delivers unprecedented flexibility and productivity for large sample series. It can be optionally equipped with two Thermo Scientific TRACE GC Ultra™ units. The two GC units are simultaneously installed at the same ion source for separation on two independent GC setups.

It is a system designed for unattended operation, in which the Thermo Scientific TriPlus™ autosampler offers highest sample capacity and ultimate sampling flexibility while serving one or two TRACE GC units from shared sample trays.

GCs can be equipped with a wide range of injectors, from cold on-column and split/splitless injectors, going to advanced temperature programmed injectors (PTV), utilizing latest developments in large volume injection techniques.



DFS
High Resolution Magnetic Sector MS

THERMO SCIENTIFIC DFS — HIGH RESOLUTION
MAGNETIC SECTOR GC/MS

With its innovative ion optics and revolutionary design,
the DFS is the new **gold standard** in POP analysis.



THE THERMO SCIENTIFIC DFS REDEFINES PERFORMANCE

The innovative analyzer design provides the sensitivity to routinely analyze compounds in the low femtogram range.

Performance

The DFS redefines performance. The innovative analyzer design provides the sensitivity to routinely analyze compounds in the low femtogram range.

100 fg of 2,3,7,8-tetrachloro dibenzo-*p*-dioxin injected on-column will give a signal-to-noise ratio of better than 800:1 on unsmoothed data, when measured in high resolution lock mode MID.

The unprecedented performance of the DFS will help you to gain the largest amount of data from precious samples and lets you cut down on the amount of sample to extract. This is especially important in the ultra trace analysis of lipophilic POPs. The cleanup for these compounds is a lengthy and cost-intensive process employing several chromatographic steps.

In cases where sensitivity is not sufficient, a higher amount of sample needs to be cleaned up, which in certain cases can only be accomplished by parallelization of the process. The sensitivity of DFS allows the lowest amount of sample use for quick cleanup.

DFS FEATURES

- Mass Range of 2-6000 Da
- Scan speeds continuously variable from 0.1-10,000 sec/decade
- Radially laminated magnet
- Field based calibration, i.e. mass calibration is independent of scan speed, polarity, ionization mode
- High performance toroidal ESA
- Detection system with $\pm 20\text{kV}$ conversion dynode and long-life secondary electron multiplier for efficient detection of ions
- Full range of ionization modes available: EI, CI, FAB, ESI, APCI, FD/FI
- Pneumatically actuated exchange lock for ventless exchange of ionization volumes
- Water cooled DI probe and DCI probe available
- Ultra low detection limits: 100 fg TCDD on-column in high resolution MID mode gives S/N > 800:1
- Dual TRACE GC Ultra configuration with one TriPlus XT autosampler allows GC columns of different polarity used in one sequence. Samples can be injected from one vial into two different GCs in fully automated fashion
- Removable ion volumes for easy source maintenance



THERMO SCIENTIFIC XCALIBUR — A UNIFIED PLATFORM FOR MS

One intuitive platform for GC/MS, LC/MS, and Advanced MS instruments provides confident control from method development to reporting.

Xcalibur Platform

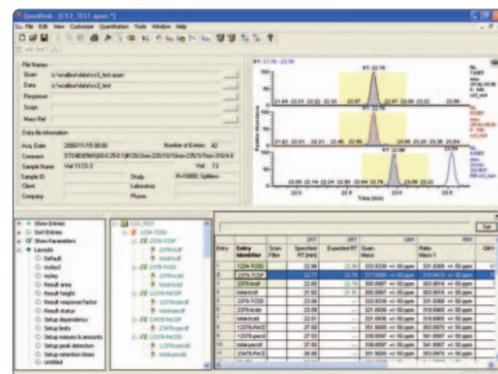
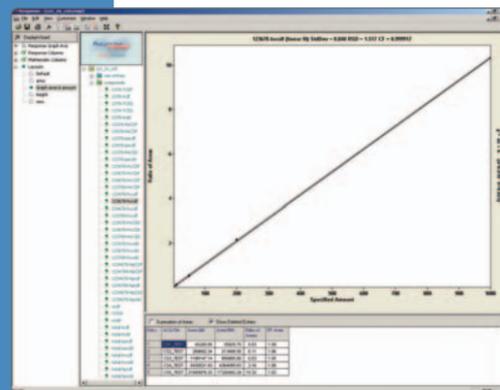
Xcalibur™ is the most powerful data system available today, delivering a unique combination of functionality, system control, and ease of use. The software is designed to guide you through your daily analytical tasks. This powerful simplicity combined with the advanced features of the Microsoft® Windows® operating system and Microsoft Office productivity tools provides an analytical platform that's second to none.

The DFS generates high quality data regardless of matrix and concentration, low or high resolution, scanning or MID data. The enormous amount of information hidden in the data can be revealed using the built-in features of Xcalibur.

Xcalibur provides complete control of the DFS, the TRACE GC Ultra, and the TriPlus autosampler, as well as other devices. Xcalibur contains a built-in audit trail to ensure compliance with your laboratory's SOPs and quality programs.

Generating reports from your data has never been easier than with XReport™, Xcalibur's new reporting application.

Designed with ease of use in mind, XReport provides a flexible visual interface for intuitive report template creation and report generation. Simple drop-down menus and 'drag-and-drop' objects provide complete flexibility for your reporting needs.



Integrates layered applications, including

- **Mass Frontier™** – Simplifies interpretation of mass spectra with improved predictive fragmentation tools, and user friendly classification modules.
- **EnviroLab™ Forms** – Automated reporting forms package designed for the regulated environmental laboratory.

THERMO SCIENTIFIC TARGETQUAN

The dedicated quantitation package is specifically designed for the isotope dilution technique, covering protocols like EPA 1613, JIS K 0311/0312, or EN 1948.

Dedicated Quantitation Package

TargetQuan, a dedicated quantitation package specifically designed for isotope dilution quantitation is available as part of Xcalibur. It has been tailored to the EPA, EN, and JIS protocols for analysis of persistent organic pollutants, such as halogenated dioxins and furans, polychlorinated biphenyls, brominated flame retardants, and many more. The software package consists of three individual programs, QuanDesk, Response, and Reporter. QuanDesk is the main quantitation application, which includes the user interface for method setup, peak integration, and result viewing. Response deals with calibration curves, while Reporter helps to create printed or electronic chromatogram documents.

Features

- **Quantitation based on relative response factors (RRF)**
- **User definable dependency of standards**
- **One quantitation mass and up to two ratio masses for confirmation based on isotopic abundance**

- **Freely configurable spreadsheet for data viewing and method setup**
- **Automated or manual peak integration**
- **Retention time correction**
- **Toxicity equivalents (TEQ) according to WHO definition including lower, medium, and upper boundary calculation**
- **User definable summation of calculated amounts or TEQs for reporting of sum TEQ values**
- **Allows quantitation based on average response of selected compound (for EPA 1613)**

Ready To Go

The software comes with templates for quantitation of polychlorinated dioxins, furans (EPA 1613 and others), and other POPs.

Automation

Built-in scripting allows for full automation from creating a calibration curve to measuring samples unattended. The simple scripting functionality enables you to tailor the software to follow the workflow of your laboratory.

Reporting

Spreadsheets can be printed, saved, exported, or emailed directly from the QuanDesk application. The look of these spreadsheets are user definable, such that columns (representing values), rows (representing individual compounds), headings, and display settings can be arranged in any desired arrangement, and can be saved as layout files for easy access. The Reporter application comes with an intuitive editor for creating reporting templates using 'drag-and-drop' objects. Using the templates, chromatogram reports can be either printed or stored as document files automatically from a sequence.

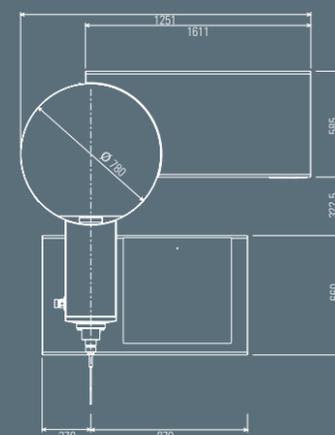
LIMS Export

Any selected set of parameters and compound can be exported to a LIMS system using CSV, ASCII, or XLS file export. File export can be initiated automatically through a sequence, or manually.

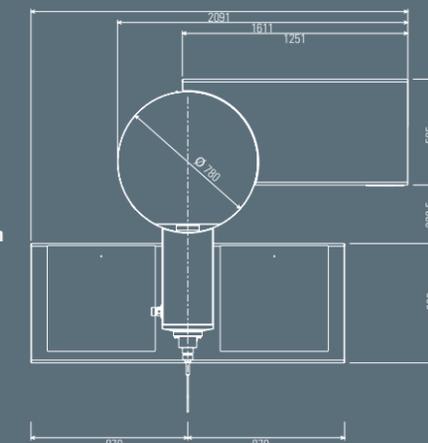
Installation Requirements

Power	3-phase, 230/400V ± 10% 50/60 Hz, fused 25A per phase
Temperature	15-29 °C (59-79 °F) Air conditioning with better than 2 °C stability recommended
Humidity	30-70%, non-condensing, non-corrosive
Cooling Water	ca. 13 L/min, Temperature 20-25 °C 3-5 bar (43-65 psi)
Helium	For GC carrier gas: 99.996% or better, ultra-high purity. Total hydrocarbons should be less than 2.0 ppm
Cl Gases	Methane, isobutane, or ammonia; 99.8% or better
Compressed Air	For operation of the pneumatic valves: 6-8 bar, filtered for particulate matter, oil mist and moisture
Pump Exhaust	25 mm, 1 L/min

Single GC configuration



Dual GC configuration



Laboratory Solutions Backed by Worldwide Service and Support

Tap our expertise throughout the life of your instrument. Thermo Scientific Services extends its support throughout our worldwide network of highly trained and certified engineers who are experts in laboratory technologies and applications. Put our team of experts to work for you in a range of disciplines – from system installation, training and technical support, to complete asset management and regulatory compliance consulting. Improve your productivity and lower the cost of instrument ownership through our product support services. Maximize uptime while eliminating the uncontrollable cost of unplanned maintenance and repairs. When it's time to enhance your system, we also offer certified parts and a range of accessories and consumables suited to your application.

To learn more about our products and comprehensive service offerings, visit us at www.thermo.com.



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