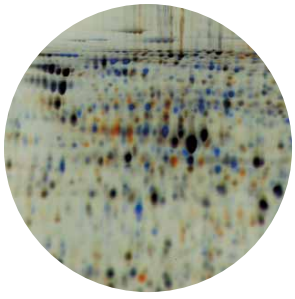
# Typhoon

## Variable Mode Imager



View it all from your benchtop

Amersham Biosciences

63-0028-39/Rev AC/09-02

# Typhoon 9410

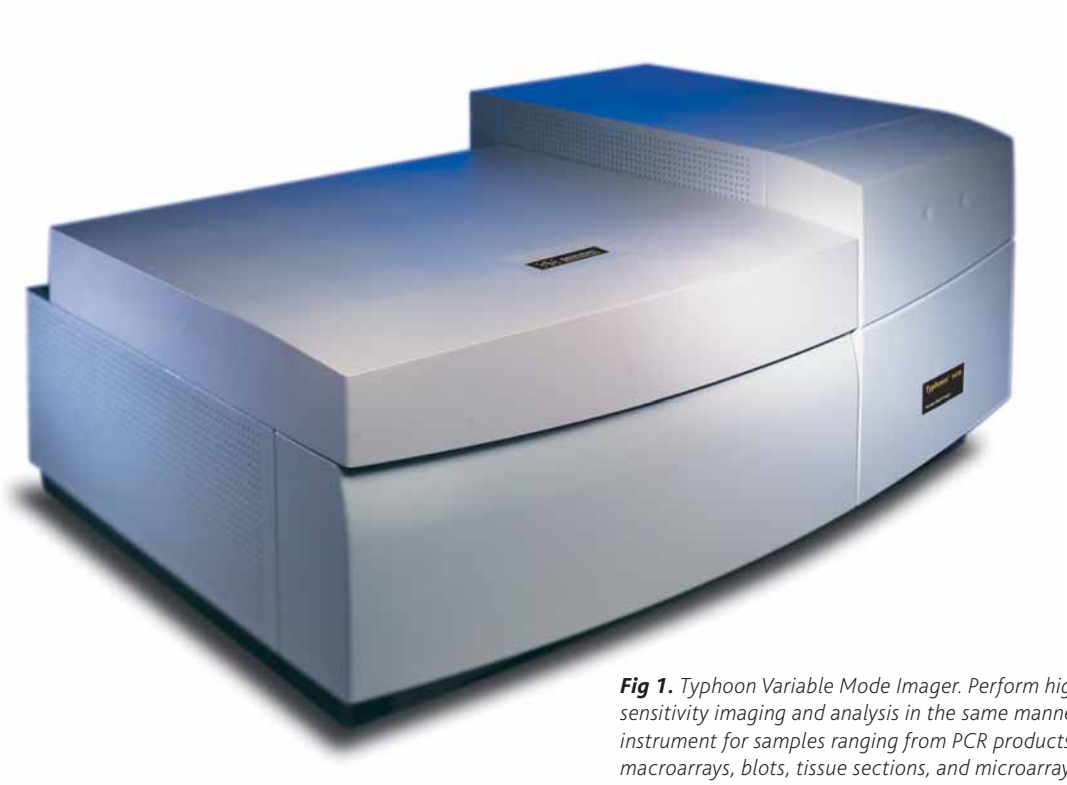


***Fig 1.*** *Typhoon Variable Mode Imager. Perform high-resolution, high-sensitivity imaging and analysis in the same manner and on the same instrument for samples ranging from PCR products, 2-D protein gels, macroarrays, blots, tissue sections, and microarrays.*

***Why use multiple instruments when you can view it all from your benchtop***

Built upon Molecular Dynamic's laser-based scanning technology, Typhoon™ 9410 Variable Mode Imager is the next generation imaging solution (Fig 1). Whether you are working with DNA, gene expression, or proteins, Typhoon offers three proven imaging methods in one high-throughput platform plus the ability to image microarrays. Typhoon has also been optimized to image 2-D DIGE gels with the Ettan™ DIGE system. All Typhoon models can be seamlessly integrated with DeCyder™ Differential Analysis Software.

***Wide variety of sample types and detection modes***

Enhanced sensitivity and added functionality make Typhoon 9410 one of the most flexible scanners on the market today (Table 1). Typhoon 9410 is capable of scanning mounted and unmounted storage phosphor screens, gels, blots, tissue sections, microplates, microarrays and now, protein DIGE gels. For DNA, RNA and protein samples, choose from one of the following scanning methods:

- Storage phosphor autoradiography
- Chemiluminescence
- Direct red excited fluorescence (633 nm)
- Direct green excited fluorescence (532 nm)
- Direct blue excited fluorescence (488 nm)
- Direct blue excited fluorescence (457 nm)


***Table 1.*** *Selection guide shows each Typhoon model's capabilities. For a complete application guide, refer to the Fluorescence Imaging Handbook.*

# DNA gels

***Detect pg levels of DNA***

Typhoon 9410 lets you detect picogram levels of DNA. The limit of detection for ethidium bromide stained agarose gels is at least 60 pg per band of DNA. For Vistra Green,™ the limit of detection is 10 pg, and fluorescent covalent labels can be detected down to amole levels.

***Increase productivity and accuracy of your experiment***

Many current DNA-based assays use PCR to specifically amplify one or more desired DNA targets from small amounts of starting material. Because of the variety of fluorescent labels that can be attached to individual PCR primers, these assays are ideally suited for multi-channel fluorescence analysis (Figs 2-3).

Typhoon offers increased flexibility and reliability with its enhanced excitation and emission choices (Fig 4). Four excitation sources (457, 488, 532, and 633 nm laser lines) and seven standard emission filters—plus the ability to add up to 13 filters—makes detection simple for all popular dyes including: fluorescein, HEX,™ TET,™ JOE, ROX,™ CyDye,™ and the Alexa Fluor™ dye series. Moreover, by resolving unknown fragments in the same gel lane as the standards, you can most accurately determine their size.

***Read acrylamide gels sandwiched between glass plates***

Typhoon's patented confocal optical components adjust automatically to read acrylamide gels sandwiched between glass plates (Fig 5). This reduces fluorescent background by eliminating signal from the sample support. Monitor the run without ruining the gel, and image the gel without introducing bubbles or tears. After imaging you can return the gel to the electrophoresis unit and continue the run.



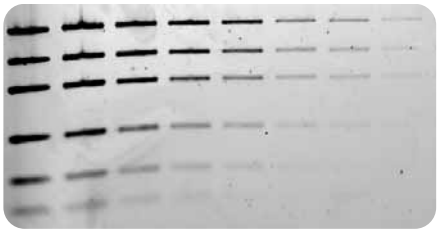


***Fig 2.*** *Two-fold serial dilutions of the DNA mass ladder. 1% agarose gels were cast with ethidium bromide. Starting quantities were 20 ng of 200 bp, 12 ng of 1200 bp, 8 ng of 800 bp, 4 ng of 400 bp, 2 ng of 200 bp, and 1 ng of 100 bp.*

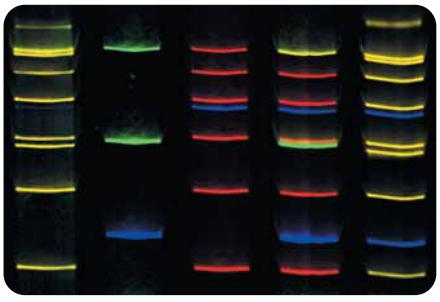


***Fig 3.*** *Multi-color fluorescence. End-labelled DNA fragments were resolved in a 6% denaturing polyacrylamide gel. The image was acquired using the 488 nm excitation with 520 BP 40 emission filter, 532 nm excitation with 580 BP 30 and 610 BP 30 emission filters, and 633 nm excitation with 670 BP 30 emission filters. Fluorochrome separation was done using FluorSep™ software. Fluorescein (blue), Cy3 (green), ROX (yellow), and Cy™5 (red) labels were used.*

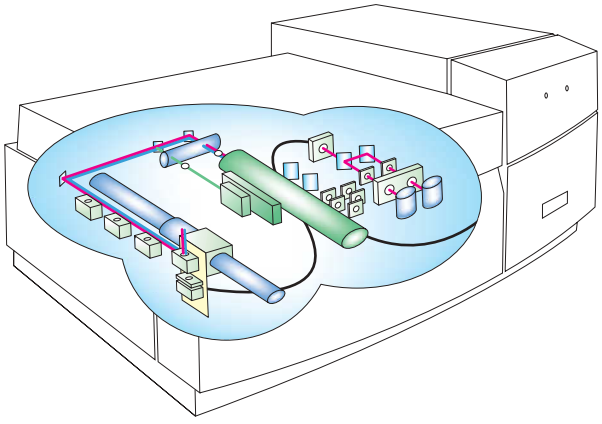


***Fig 4.*** *Typhoon optical assembly. Short path lengths and sealed, dust-free optical surfaces constitute the powerful light-handling systems of Typhoon. Components are tested and permanently fixed in optimum alignment at the factory to give every user the benefits of the system's high-performance design.*

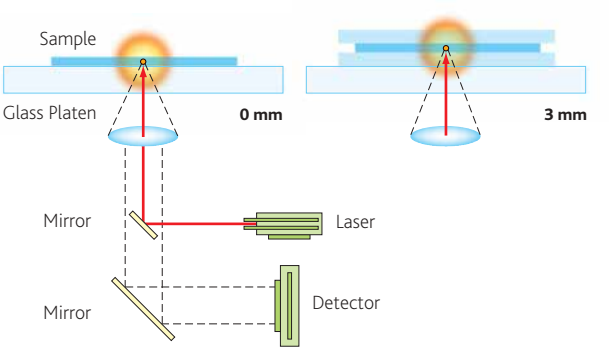



***Fig 5.*** *Scan thick and thin gels. The optics of Typhoon adjust automatically to read acrylamide gels sandwiched between glass plates.*

# Microarrays

***Detect expression from low level samples***

Typhoon ensures a high signal-to-noise ratio and very low levels of background (Fig 6). Due to the high quality of its optical lenses, confocal light collection, highly efficient photomotoplier tubes, and discriminating emission filters, Typhoon provides accurate representation of sample expression. Detect Cy3 and Cy5 with standard settings or other labels with flexible fluorescence options.

***Automated four-color fluorescence scanning***

With two standard photomultiplier tubes and up to five user-selectable dichroic beamsplitters, Typhoon can automatically scan four-color fluorescence samples, thereby increasing throughput and saving time. Use this feature to perform differential analysis on expression samples.

***Simple and precise scanning***

The microarray slide tray is included to hold slides for precise scanning (Fig 7). Simply place the tray on the glass plate, select scan parameters and scan to create the image.



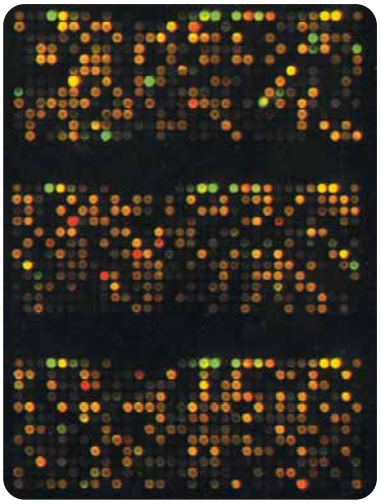
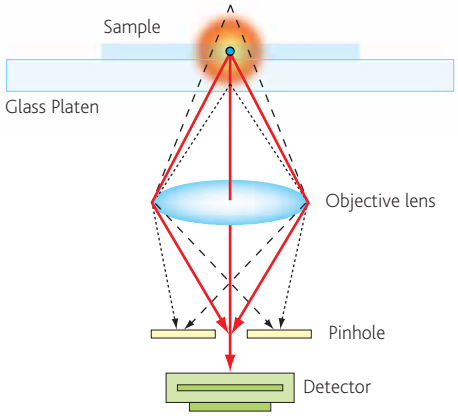


***Fig 6.*** *Microarray image. A microarray slide, spotted with cDNA from Lucidea™ Microarray ScoreCard™ control plate and cDNA from Incyte Genomics using a Gen III Array Spotter from Amersham Biosciences, was hybridized with 25 pmole of Cy3-labelled skeletal muscle mRNA and Cy5-labelled liver mRNA. The slide was scanned on Typhoon 9410 at 10 µm pixel size resolution.*


***Fig 7.*** *Microarray slide holder. Designed to hold most standard 25 × 75 mm glass slides, the microarray slide holder positions slides to ensure optimal scanning.*

***Fig 8.*** *Confocal optics. Fluorescence from the sample is collected by an objective lens and directed toward a pinhole aperture. The pinhole allows the emitted light from a narrow focal plane (red solid lines) to pass to the detector, while blocking most of the out-of-focus light (black dashed lines). Confocal scanning ensures artifact-free images.*



# 2-D Protein gels

***Identify low abundance targets***

Typhoon utilizes confocal optical elements that detect light from only a narrow vertical plane in the sample (Fig 8). This improves sensitivity by focusing and collecting emission light from the point of interest while reducing the background signal and noise from out-of-focus regions. Using Typhoon you have the highest detection limit possible for SYPRO™ Ruby or $^{35}S$ metabolic labelling.

***Accurately quantify protein expression levels***

Typhoon uses an optical mechanism that moves parallel to the sample. This means that the angle of the laser beam is perpindicular to the sample at any point. This eliminates variations in excitation power and spatial distortion common with galvanometer-based systems. Typhoon creates artifact-free images, enabling spots to be identified with high precision for further analysis using mass spectrometry.

***Ettan DIGE enabled***

The multiplexing capability of Ettan 2-D fluorescence difference gel electrophoresis (DIGE) enables full standardization of 2-D results (Fig 9).Typhoon is one of the only imagers fully tested to meet this application's requirements for sensitivity, linearity, and accuracy. All models integrate seamlessly with DeCyder Differential Analysis Software. DeCyder software derives statistical data from within and between gels to eliminate gel-to-gel variation—a major source of error in a 2-D experiment.

After 2-D eletrophoresis is performed, two standard 2-D gels can be scanned simultaneously using the 35 × 43 cm scan area without sacrificing resolution. Simply place your samples directly on a glass plate without the need for a sample tray, or use the Gel Alignment Guides for higher throughput and convenience (Fig 10).



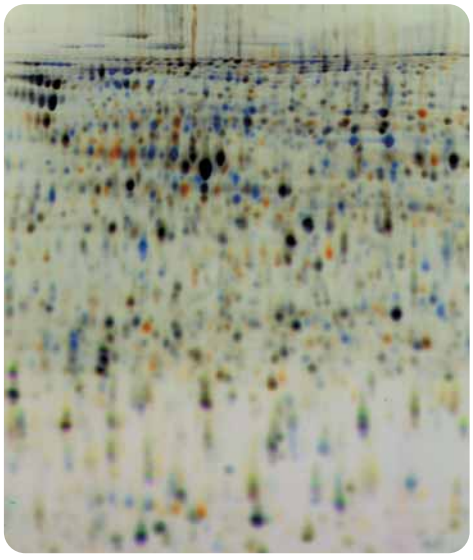


***Fig 9.*** *A three-color Typhoon image of a 2-D gel of E. coli samples pre-labelled by CyDye DIGE Fluors.* ***E. coli*** *control sample was pre-labelled with Cy3 minimal dye (red), benzoic acid-treated* ***E. coli*** *sample was pre-labelled with Cy5 minimal dye (blue). A standard sample was made by pooling the control, treating, and pre-labelling with Cy2 minimal dye (green).*

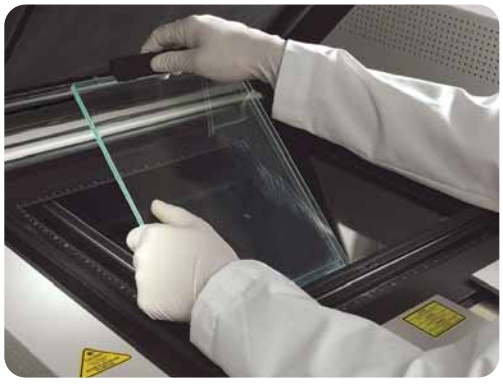


***Fig 10.*** *Gel Alignment Guides.*

# Western blots

***Detect your target while conserving valuable antibodies***

Using Typhoon to image Western blots developed with ECL Plus™ results in detection limits that match those obtained with 8 min of film-based chemiluminescence detection. Sensitive optics allow you to achieve similar levels of detection with direct fluorescent labels. Use less of your valuable primary antibody, and see more of your target with Typhoon (Fig 11).

***Choose the method that suites your needs***

Chemiluminescence: The ultrasensitive optics of Typhoon read your chemiluminescent samples directly. No intermediate film or storage phosphor step is required. The system generates an accurate image of your experiment in just one scan. You no longer need to waste time and materials doing multiple film exposures to "bracket" the chemiluminescent signal.

Direct fluorescence: Typhoon flexible excitation and emission options allow for sensitive detection of direct labels such as fluorescein, CyDye and the Alexa Fluor dye series. Use direct fluorescence labels for a simpler and rapid method for Western blot detection and for simultaneous detection of multiple protein targets (Fig 12).

Chemifluorescence: Chemifluorescence detection of Western blots combines the advantages of signal stability and wider linear range from fluorescence and signal amplification from chemiluminescence. Use a variety of popular enzyme-amplified systems with ECL Plus, ECF,™ and DDAO phosphate (Fig 13).

***Increase throughput and save time***

You can detect up to four different targets with Typhoon's automated four-color fluorescence scanning, thereby increasing productivity and efficiency.



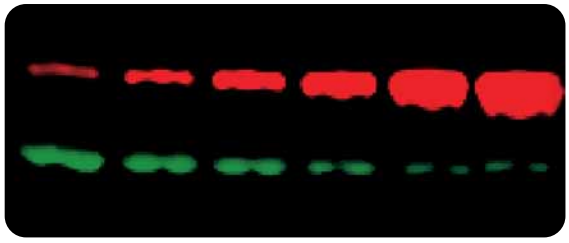


***Fig 11.*** *Dual target Western blot. Tubulin (red) detected with anti-ßtubulin monoclonal antibody and Cy5 linked anti-mouse IgG. Actin (green) detected with rabbit anti-actin antibody and Cy3-linked anti-rabbit IgG and imaged with Typhoon.*

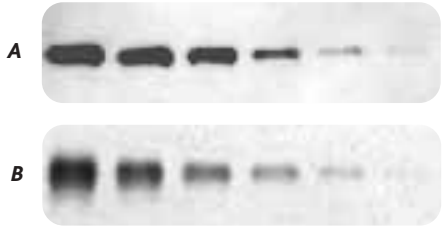



***Fig 12.*** *Typhoon images. (a) Chemifluorescent Western blot of serial two-fold dilutions of tubulin using ECL Plus substrate. Lanes from left to right contain 16, 8.4, 2, 1, and 0.5 ng of ßtubulin. (b) Fluorescein-labelled fluorescent Western blot of serial two-fold dilutions of tubulin. Lanes from left to right contain 32, 16, 8, 4, 2, and 1 ng of ßtubulin.*

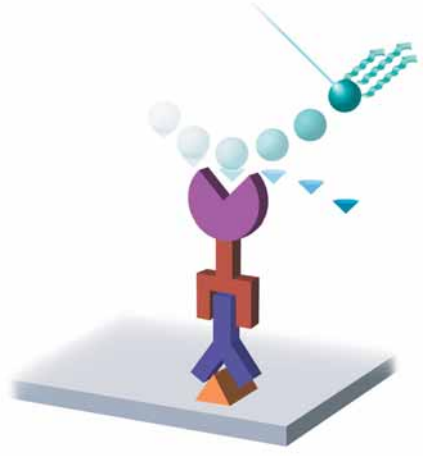


***Fig 13.*** *Schematic diagram of the ECF Western blot detection. Proteins are detected by chemifluorescence using alkaline phosphatase-labelled secondary antibody. Alkaline phosphatase cleaves a phosphate group from the ECF substrate to yield a highly fluorescent product.*

# Macroarray

***Accurately identify differential gene expression***

For many applications, radioactive labelling is still unrivalled for high sensitivity and a large dynamic range with minimal changes to the labelled probe. Storage phosphor technology allows full advantage of these features. Macroarray hybridization and $^{35}S$ metabolic labelling studies are especially demanding and require high levels of uniformity in both delivered and collected light levels for accurate signal quantification. The perpendicular scanning mechanism of Typhoon eliminates spatial distortion and laser bleed, allowing you to obtain uniform images (Fig 14). Resolve closely spaced array elements with Typhoon's high-resolution mode, and detect $^{32}P$ and $^{33}P$ with unsurpassed sensitivity due to low, uniform background (Fig 15).

***Image any array format***

Typhoon's 35 × 43 cm scan area allows for convenient imaging of a variety of array formats including standard 22.5 × 22.5-cm arrays.

***Generate useful information quickly***

Use proven storage phosphor technology—screens that do not require special, light-tight handling. The advantage over using film is that you obtain a digital image and wider linear dynamic range for quantitative analysis (Fig 16). Save time and storage space by decreasing the exposure time and archiving a digital file rather than film.



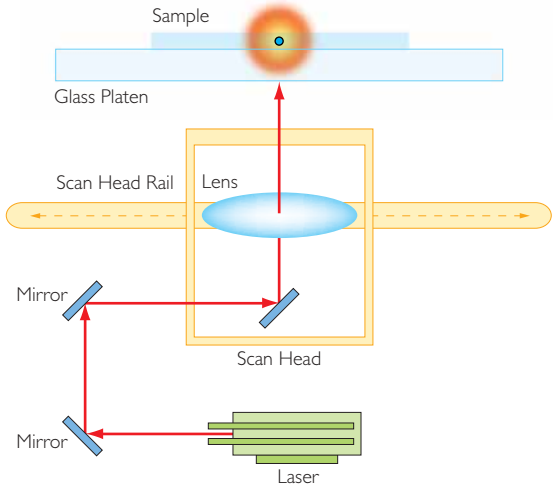



***Fig 14.*** *Moving-head scanning mechanism. The light beam is folded by a series of mirrors and ultimately reflected onto the sample. The sample is illuminated across its width as the scan head moves along the scan head rail (X-axis). The entire sample is illuminated by the scan head, laser, and mirrors tracking along the length of the sample (Y-axis).*

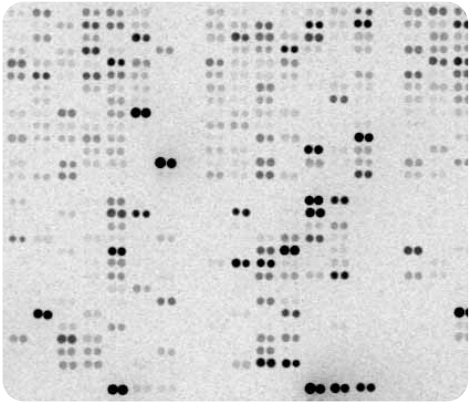


***Fig 15.*** *Macroarray image. Hybond™ Atlas™ Array hybridized with $^{33}P$-labelled cDNA probe and imaged on a GP storage phosphor screen.*

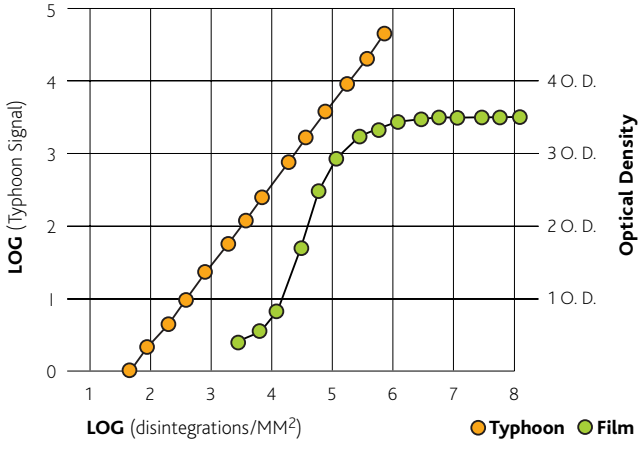



***Fig 16.*** *With five orders of linear dynamic range, Typhoon captures the image from both strong and weak signals in a single exposure.*

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Asia Pacific
Tel: +852 2811 8693
Fax: +852 2811 5251

Australasia
Tel: +61 2 9899 0999
Fax: +61 2 9899 7511

Austria
Tel: 01 576 0616 24
Fax: 01 576 0616 27

Belgium
Tel: 0800 73 888
Fax: 03 272 1637

Canada
Tel: +1 800 463 5800
Fax: +1 800 567 1008

Central, East, and Southeast Europe
Tel: +43 1 982 3826
Fax: +43 1 985 8327

Denmark
Tel: 45 16 2400
Fax: 45 16 2424

Finland & Baltics
Tel: +358 (0)9 512 39 40
Fax: +358 (0)9 512 17 10

France
Tel: 01 69 35 67 00
Fax: 01 69 41 96 77

Germany
Tel: 0761 4903 402
Fax: 0761 4903 405

Italy
Tel: 02 27322 1
Fax: 02 27302 212

Japan
Tel: +81 3 5331 9336
Fax: +81 3 5331 9370

Latin America
Tel: +55 11 3667 5700
Fax: +55 11 3667 87 99

Middle East & Africa
Tel: +30 (1) 96 00 687
Fax: +30 (1) 96 00 693

Netherlands
Tel: 0165 580 410
Fax: 0165 580 401

Norway
Tel: 2318 5800
Fax: 2318 6800

Portugal
Tel: 21 417 7035
Fax: 21 417 3184

Russia and C.I.S. and N.I.S.
Tel: +7 (095) 232 0250, 956 1137
Fax: +7 (095) 230 6377

Southeast Asia
Tel: +60 3 8024 2080
Fax: +60 3 8024 2090

Spain
Tel: 93 594 49 50
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Tel: 018 612 1900
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Tel: 0800 616928
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