



Welcome to E-XFL.COM

What is "[Embedded - Microcontrollers](#)"?

"[Embedded - Microcontrollers](#)" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "[Embedded - Microcontrollers](#)"

Details

Product Status	Active
Core Processor	PIC
Core Size	8-Bit
Speed	32MHz
Connectivity	I ² C, LINbus, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, POR, PSMC, PWM, WDT
Number of I/O	24
Program Memory Size	7KB (4K x 14)
Program Memory Type	FLASH
EEPROM Size	256 x 8
RAM Size	512 x 8
Voltage - Supply (Vcc/Vdd)	2.3V ~ 5.5V
Data Converters	A/D 11x12b; D/A 1x8b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 125°C (TA)
Mounting Type	Through Hole
Package / Case	28-DIP (0.300", 7.62mm)
Supplier Device Package	28-SPDIP
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic16f1783-e-sp

PIC16(L)F1782/1783

28-Pin 8-Bit Advanced Analog Flash Microcontroller Product Brief

High-Performance RISC CPU:

- Only 49 Instructions
- Operating Speed:
 - DC – 32 MHz clock input
 - DC – 125 ns instruction cycle
- Interrupt Capability with Automatic Context Saving
- 16-Level Deep Hardware Stack with optional Overflow/Underflow Reset
- Direct, Indirect and Relative Addressing modes:
 - Two full 16-bit File Select Registers (FSRs)
 - FSRs can read program and data memory

Extreme Low-Power (XLP) Management:

- Standby Current (PIC16LF1782/1783):
 - 50 nA @ 1.8V, typical
- Watchdog Timer Current (PIC16LF1782/1783):
 - 500 nA @ 1.8V, typical
- Timer1 (32.768 kHz Real-Time Clock) Oscillator Current (PIC16LF1782/1783):
 - 500 nA @ 1.8V, typical
- Operating Current (PIC16LF1782/1783):
 - 4 μ A @ 32 kHz, 1.8V, typical
- Operating Current (PIC16LF1782/1783):
 - 150 μ A @ 1 MHz, 1.8V, typical

Memory Features:

- Up to 4 KW Flash Program Memory:
 - Self-programmable under software control
 - Programmable code protection
 - Programmable write protection
- 256 Bytes of Data EEPROM
- Up to 512 Bytes of RAM

High-Performance PWM Controller:

- Two Programmable Switch Mode Controller (PSMC) modules:
 - Digital and/or analog feedback control of PWM frequency and pulse begin/end times
 - 16-bit Period, Duty Cycle and Phase
 - 16 ns clock resolution
 - Supports single PWM, complimentary, push-pull and three-phase modes of operation
 - Dead-band control with 8-bit counter
 - Auto-shutdown and restart
 - Leading and falling edge blanking
 - Burst mode

Analog Peripheral Features:

- Analog-to-Digital Converter (ADC):
 - Fully differential 12-bit converter
 - 100 ksps conversion rate
 - 11 single-ended channels
 - 5 differential channels
 - Positive and negative reference selection
- 8-bit Digital-to-Analog Converter (DAC):
 - Output available externally
 - Positive and negative reference selection
 - Internal connections to comparators, op amps, Fixed Voltage Reference (FVR) and ADC
- Three High-Speed Comparators:
 - 30 ns response time
 - Rail-to-rail inputs
 - Software selectable hysteresis
 - Internal connection to op amps, FVR and DAC
- Two Operational Amplifiers:
 - Rail-to-rail inputs/outputs
 - High/Low selectable Gain Bandwidth Product
 - Internal connection to DAC and FVR
- Fixed Voltage Reference (FVR):
 - 1.024V, 2.048V and 4.096V output levels
 - Internal connection to ADC, Comparators and DAC

Digital Peripheral Features:

- Timer0: 8-Bit Timer/Counter with 8-Bit Programmable Prescaler
- Enhanced Timer1:
 - 16-bit timer/counter with prescaler
 - External Gate Input mode
 - Dedicated low-power 32 kHz oscillator driver
- Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler
- Two Capture/Compare/PWM modules (CCP):
 - 16-bit Capture, maximum resolution 12.5 ns
 - 16-bit Compare, max resolution 31.25 ns
 - 10-bit PWM, max frequency 32 kHz
- Master Synchronous Serial Port (SSP) with SPI and I²C™ with:
 - 7-bit address masking
 - SMBus/PMBus™ compatibility
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART):
 - RS-232, RS-485 and LIN compatible
 - Auto-baud detect
 - Auto-wake-up on start

PIC16(L)F1782/1783

Oscillator Features:

- Operate up to 32 MHz from Precision Internal Oscillator:
 - Factory calibrated to $\pm 1\%$, typical
 - Software selectable frequency range from 32 MHz to 31 kHz
- 31 kHz Low-Power Internal Oscillator
- 32.768 kHz Timer1 Oscillator:
 - available as system clock
 - Low power RTC
- External Oscillator Block with:
 - 4 crystal/resonator modes up to 32 MHz using 4x PLL
 - 3 external clock modes up to 32 MHz
- 4x Phase-Locked Loop (PLL)
- Fail-Safe Clock Monitor:
 - Detect and recover from external oscillator failure
- Two-Speed Start-up:
 - Minimize latency between code execution and external oscillator start-up

I/O Features:

- Up to 24 I/O Pins and 1 Input-only Pin:
 - High current sink/source for LED drivers
 - Individually programmable interrupt-on-change pins
 - Individually programmable weak pull-ups
 - Individual input level selection
 - Slew rate control on selected output pins
 - Open drain outputs on selected output pins

General Microcontroller Features:

- Power-Saving Sleep mode
- Power-on Reset (POR)
- Power-up Timer (PWRT)
- Oscillator Start-up Timer (OST)
- Brown-out Reset (BOR) with Selectable Trip Point
- Extended Watchdog Timer (WDT)
- In-Circuit Serial Programming™ (ICSP™)
- In-Circuit Debug (ICD)
- Enhanced Low-Voltage Programming (LVP)
- Operating Voltage Range:
 - 1.8V to 3.6V (PIC16LF1782/1783)
 - 2.3V to 5.5V (PIC16F1782/1783)

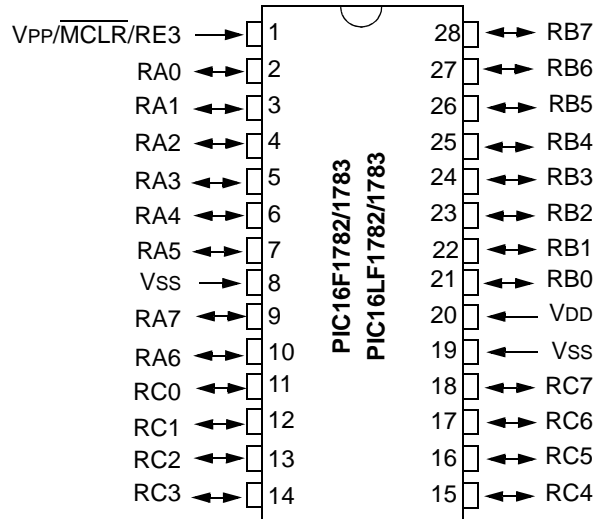
TABLE 1: PIC16(L)F1782/1783 FAMILY TYPES

Device	Program Memory Flash (words)	Data EEPROM (bytes)	SRAM (bytes)	I/Os	12-bit A/D (ch)	Comparators	Operational Amplifiers	8-bit DAC	Timers 8/16-bit	Programmable Switch Mode Controllers (PSMC)	CCP	EUSART	MSSP (I ² C™/SPI)
PIC16F1782	2048	256	256	25	11	3	2	1	2/1	2	2	1	1
PIC16LF1782	2048	256	256	25	11	3	2	1	2/1	2	2	1	1
PIC16F1783	4096	256	512	25	11	3	2	1	2/1	2	2	1	1
PIC16LF1783	4096	256	512	25	11	3	2	1	2/1	2	2	1	1

Note: Pin details are subject to change.

FIGURE 1: 28-PIN DIAGRAM FOR PIC16(L)F1782/1783

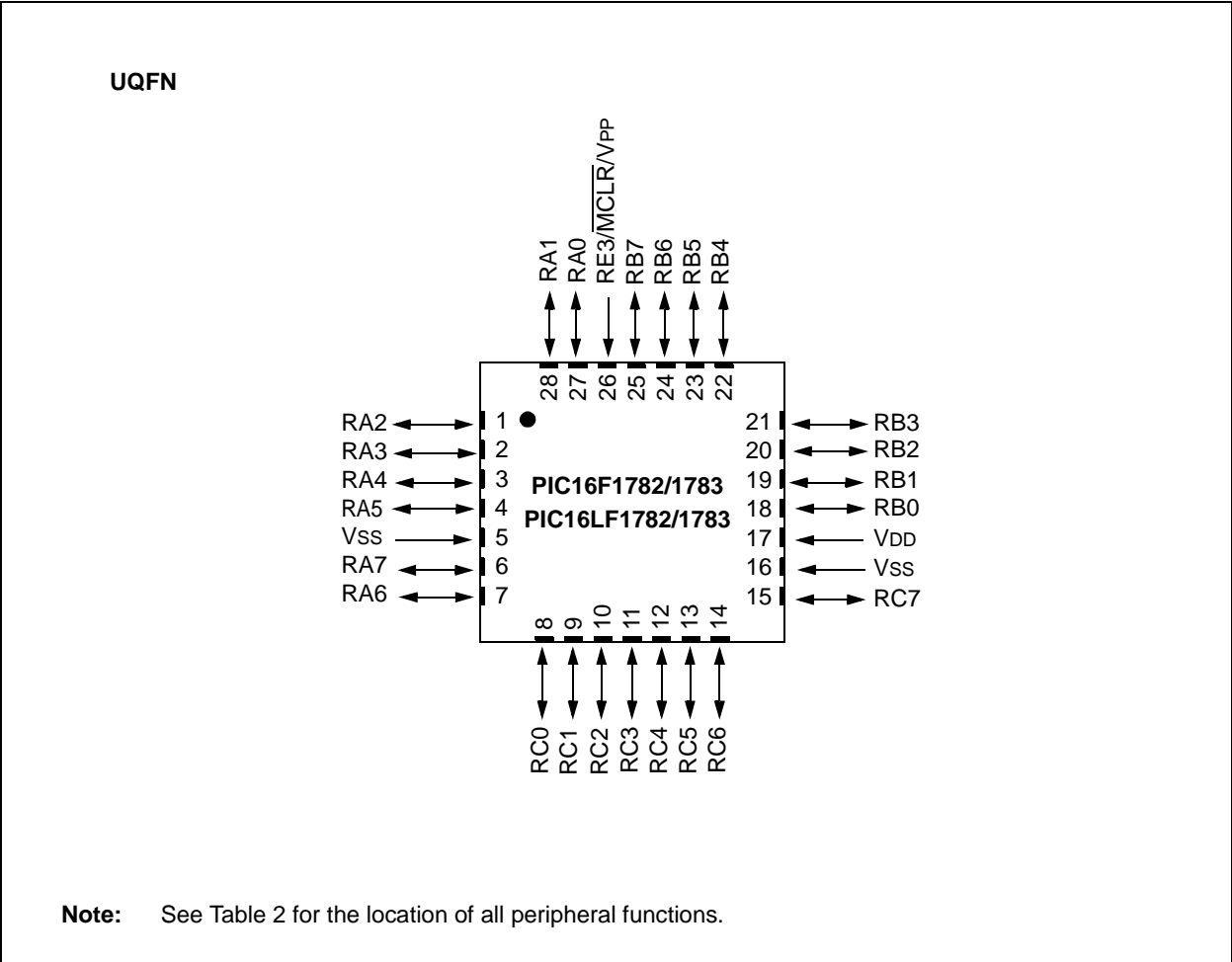
SPDIP, SOIC, SSOP



Note: See Table 2 for the location of all peripheral functions.

PIC16(L)F1782/1783

FIGURE 2: 28-PIN DIAGRAM FOR PIC16(L)F1782/1783



PIC16(L)F1782/1783

TABLE 2: 28-PIN ALLOCATION TABLE (PIC16(L)F1782/1783)

I/O	28-Pin SPDIP, SOIC, SSOP	28-Pin QFN	ADC	Reference	Comparator	Operation Amplifiers	8-bit DAC	Timers	PSMC	CCP	EUSART	MSSP	Interrupt	Pull-up	Basic
RA0	2	27	AN0+ AN0-	—	C1IN0- C2IN0- C3IN0-	—	—	—	—	—	—	—	IOC	Y	—
RA1	3	28	AN1+ AN1-	—	C1IN1- C2IN1- C3IN1-	OPA1OUT	—	—	—	—	—	—	IOC	Y	—
RA2	4	1	AN2+ AN2-	VREF-	C1IN0+ C2IN0+ C3IN0+	—	DAC1OUT1 DAC1VREF-	—	—	—	—	—	IOC	Y	—
RA3	5	2	AN3+ AN3-	VREF+(1)	C1IN1+	—	DAC1VREF+	—	—	—	—	—	IOC	Y	—
RA4	6	3	—	—	C1OUT	OPA1IN+	—	T0CKI	—	—	—	—	IOC	Y	—
RA5	7	4	AN4+ AN4-	—	C2OUT(1)	OPA1IN-	—	—	—	—	—	SS	IOC	Y	—
RA6	10	7	—	—	C2OUT(1)	—	—	—	—	—	—	—	IOC	Y	OSC2/ CLKOUT
RA7	9	6	—	VREF+(1)	—	—	—	—	PSMC1CLK PSMC2CLK	—	—	—	IOC	Y	OSC1/ CLKIN
RB0	21	18	AN12+ AN12-	—	C2IN1+	—	—	—	PSMC1IN PSMC2IN	CCP1(1)	—	—	INT/ IOC	Y	—
RB1	22	19	AN10+ AN10-	—	C1IN3- C2IN3- C3IN3-	OPA2OUT	—	—	—	—	—	—	IOC	Y	—
RB2	23	20	AN8+ AN8-	—	—	OPA2IN-	—	—	—	—	—	—	IOC	Y	CLKR
RB3	24	21	AN9+ AN9-	—	C1IN2- C2IN2- C3IN2-	OPA2IN+	—	—	—	CCP2(1)	—	—	IOC	Y	—
RB4	25	22	AN11+ AN11-	—	C3IN1+	—	—	—	—	—	—	—	IOC	Y	—
RB5	26	23	AN13+ AN13-	—	C3OUT	—	—	T1G	—	—	—	SDO(1)	IOC	Y	—
RB6	27	24	—	—	—	—	—	—	—	—	TX(1) CK(1)	SDI(1) SDA(1)	IOC	Y	ICSPCLK
RB7	28	25	—	—	—	—	DAC1OUT2	—	—	—	RX(1) DT(1)	SCK(1) SCL(1)	IOC	Y	ICSPDAT
RC0	11	8	—	—	—	—	—	T1OSO T1CKI	PSMC1A	—	—	—	IOC	Y	—
RC1	12	9	—	—	—	—	—	T1OSI	PSMC1B	CCP2(1)	—	—	IOC	Y	—
RC2	13	10	—	—	—	—	—	—	PSMC1C	CCP1(1)	—	—	IOC	Y	—
RC3	14	11	—	—	—	—	—	—	PSMC1D	—	—	SCK(1) SCL(1)	IOC	Y	—
RC4	15	12	—	—	—	—	—	—	PSMC1E	—	—	SDI(1) SDA(1)	IOC	Y	—
RC5	16	13	—	—	—	—	—	—	PSMC1F	—	—	SDO(1)	IOC	Y	—
RC6	17	14	—	—	—	—	—	—	PSMC2A	—	TX(1) CK(1)	—	IOC	Y	—
RC7	18	15	—	—	—	—	—	—	PSMC2B	—	RX(1) DT(1)	—	IOC	Y	—
RE3	1	26	—	—	—	—	—	—	—	—	—	—	IOC	Y	MCLR/ VPP
VDD	20	17	—	—	—	—	—	—	—	—	—	—	—	—	VDD
VSS	8, 19	5, 16	—	—	—	—	—	—	—	—	—	—	—	—	VSS

Note 1: Pin functions can be assigned to one of two pin locations via software.

PIC16(L)F1782/1783

NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC³² logo, rfPIC and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MXDEV, MXLAB, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, Application Maestro, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniscient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICTail, REAL ICE, rLAB, Select Mode, Total Endurance, TSHARC, UniWinDriver, WiperLock and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

All other trademarks mentioned herein are property of their respective companies.

© 2011, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

Printed on recycled paper.

ISBN: 978-1-60932-881-8

Microchip received ISO/TS-16949:2002 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

Worldwide Sales and Service

AMERICAS

Corporate Office

2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://support.microchip.com>
Web Address:
www.microchip.com

Atlanta

Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Boston

Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago

Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Cleveland

Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

Dallas

Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit

Farmington Hills, MI
Tel: 248-538-2250
Fax: 248-538-2260

Kokomo

Kokomo, IN
Tel: 765-864-8360
Fax: 765-864-8387

Los Angeles

Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608

Santa Clara

Santa Clara, CA
Tel: 408-961-6444
Fax: 408-961-6445

Toronto

Mississauga, Ontario,
Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office

Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

Australia - Sydney

Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing

Tel: 86-10-8528-2100
Fax: 86-10-8528-2104

China - Chengdu

Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing

Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Hong Kong SAR

Tel: 852-2401-1200
Fax: 852-2401-3431

China - Nanjing

Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao

Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai

Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang

Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen

Tel: 86-755-8203-2660
Fax: 86-755-8203-1760

China - Wuhan

Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian

Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

China - Xiamen

Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai

Tel: 86-756-3210040
Fax: 86-756-3210049

ASIA/PACIFIC

India - Bangalore

Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi

Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune

Tel: 91-20-2566-1512
Fax: 91-20-2566-1513

Japan - Yokohama

Tel: 81-45-471- 6166
Fax: 81-45-471-6122

Korea - Daegu

Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul

Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur

Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang

Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila

Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore

Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu

Tel: 886-3-6578-300
Fax: 886-3-6578-370

Taiwan - Kaohsiung

Tel: 886-7-213-7830
Fax: 886-7-330-9305

Taiwan - Taipei

Tel: 886-2-2500-6610
Fax: 886-2-2508-0102

Thailand - Bangkok

Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels

Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen

Tel: 45-4450-2828
Fax: 45-4485-2829

France - Paris

Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Munich

Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy - Milan

Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands - Drunen

Tel: 31-416-690399
Fax: 31-416-690340

Spain - Madrid

Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

UK - Wokingham

Tel: 44-118-921-5869
Fax: 44-118-921-5820

08/04/10