



## Product Change Notification - SYST-24YKWZ812

---

**Date:**

29 Jan 2020

**Product Category:**

16-Bit - Microcontrollers and Digital Signal Controllers

**Affected CPNs:****Notification subject:**

ERRATA - dsPIC33CK64MP1xx Family Silicon Errata and Data Sheet Clarification Document Revision

**Notification text:**

SYST-24YKWZ812

Microchip has released a new Product Documents for the dsPIC33CK64MP1xx Family Silicon Errata and Data Sheet Clarification of devices. If you are using one of these devices please read the document located at [dsPIC33CK64MP1xx Family Silicon Errata and Data Sheet Clarification](#).

**Notification Status:** Final

**Description of Change:** Added silicon issue 17 (I 2C).

**Impacts to Data Sheet:** None

**Reason for Change:** To Improve Productivity

**Change Implementation Status:** Complete

**Date Document Changes Effective:** 29 January 2020

**NOTE:** Please be advised that this is a change to the document only the product has not been changed.

**Markings to Distinguish Revised from Unrevised Devices:** N/A

**Attachment(s):**

[dsPIC33CK64MP1xx Family Silicon Errata and Data Sheet Clarification](#)

Please contact your local [Microchip sales office](#) with questions or concerns regarding this notification.

**Terms and Conditions:**

If you wish to [receive Microchip PCNs via email](#) please register for our PCN email service at our [PCN home page](#) select register then fill in the required fields. You will find instructions about registering for Microchips PCN email service in the [PCN FAQ](#) section.

If you wish to [change your PCN profile, including opt out](#), please go to the [PCN home page](#) select login and sign into your myMicrochip account. Select a profile option from the left navigation bar and make the applicable selections.

Affected Catalog Part Numbers (CPN)

DSPIC33CK32MP102-E/2N  
DSPIC33CK32MP102-E/SS  
DSPIC33CK32MP102-H/2N  
DSPIC33CK32MP102-H/SS  
DSPIC33CK32MP102-I/2N  
DSPIC33CK32MP102-I/SS  
DSPIC33CK32MP102T-I/2N  
DSPIC33CK32MP102T-I/SS  
DSPIC33CK32MP103-E/M5  
DSPIC33CK32MP103-H/M5  
DSPIC33CK32MP103-I/M5  
DSPIC33CK32MP103T-I/M5  
DSPIC33CK32MP105-E/M4  
DSPIC33CK32MP105-E/PT  
DSPIC33CK32MP105-H/M4  
DSPIC33CK32MP105-H/PT  
DSPIC33CK32MP105-I/M4  
DSPIC33CK32MP105-I/PT  
DSPIC33CK32MP105T-I/M4  
DSPIC33CK32MP105T-I/PT  
DSPIC33CK64MP102-E/2N  
DSPIC33CK64MP102-E/SS  
DSPIC33CK64MP102-H/2N  
DSPIC33CK64MP102-H/SS  
DSPIC33CK64MP102-I/2N  
DSPIC33CK64MP102-I/SS  
DSPIC33CK64MP102T-I/2N  
DSPIC33CK64MP102T-I/SS  
DSPIC33CK64MP103-E/M5  
DSPIC33CK64MP103-H/M5  
DSPIC33CK64MP103-I/M5  
DSPIC33CK64MP103T-I/M5  
DSPIC33CK64MP105-E/M4  
DSPIC33CK64MP105-E/PT  
DSPIC33CK64MP105-E/PTVAO  
DSPIC33CK64MP105-H/M4  
DSPIC33CK64MP105-H/PT  
DSPIC33CK64MP105-I/M4  
DSPIC33CK64MP105-I/PT  
DSPIC33CK64MP105T-E/PT  
DSPIC33CK64MP105T-I/M4  
DSPIC33CK64MP105T-I/PT

## dsPIC33CK64MP105 Family Silicon Errata and Data Sheet Clarification

The dsPIC33CK64MP105 family devices that you have received conform functionally to the current Device Data Sheet (DS70005363C), except for the anomalies described in this document.

The silicon issues discussed in the following pages are for silicon revisions with the Device and Revision IDs listed in [Table 1](#). The silicon issues are summarized in [Table 2](#).


The errata described in this document will be addressed in future revisions of the dsPIC33CK64MP105 silicon.

**Note:** This document summarizes all silicon errata issues from all revisions of silicon, previous as well as current. Only the issues indicated in the last column of [Table 2](#) apply to the current silicon revision (**A0**).

Data Sheet clarifications and corrections start on [page 6](#), following the discussion of silicon issues.

The silicon revision level can be identified using the current version of MPLAB® IDE and Microchip's programmers, debuggers, and emulation tools, which are available at the Microchip corporate website ([www.microchip.com](http://www.microchip.com)).

For example, to identify the silicon revision level using MPLAB IDE in conjunction with a hardware debugger:

1. Using the appropriate interface, connect the device to the hardware debugger.
2. Open an MPLAB IDE project.
3. Configure the MPLAB IDE project for the appropriate device and hardware debugger.
4. Based on the version of MPLAB IDE you are using, do one of the following:
  - a) For MPLAB IDE 8, select *Programmer > Reconnect*.
  - b) For MPLAB X IDE, select *Window > Dashboard* and click the **Refresh Debug Tool Status** icon (  ).
5. Depending on the development tool used, the part number *and* Device Revision ID value appear in the **Output** window.

**Note:** If you are unable to extract the silicon revision level, please contact your local Microchip sales office for assistance.

The DEVREV values for the various dsPIC33CK64MP105 silicon revisions are shown in [Table 1](#).

**TABLE 1: SILICON DEVREV VALUES**

Part Number	Device ID <sup>(1)</sup>	Revision ID for Silicon Revision
		A0
dsPIC33CK32MP102	0x8E00	0x0000
dsPIC33CK32MP103	0x8E01	
dsPIC33CK32MP105	0x8E02	
dsPIC33CK64MP102	0x8E10	
dsPIC33CK64MP103	0x8E11	
dsPIC33CK64MP105	0x8E12	

**Note 1:** The Device IDs (DEVID and DEVREV) are located at the last two implemented addresses of configuration memory space. They are shown in hexadecimal in the format “DEVID DEVREV”.

# dsPIC33CK64MP105

**TABLE 2: SILICON ISSUE SUMMARY**

Module	Feature	Item Number	Issue Summary	Affected Revisions
				A0
I <sup>2</sup> C	Interrupt	1.	In Slave mode, an incorrect interrupt is generated when DHEN = 1.	X
I <sup>2</sup> C	Idle	2.	Module SFR registers are reset in Idle mode.	X
I <sup>2</sup> C	SMBus 3.0	3.	When Configuration bit, SMB3EN (FDEVOP[10]) = 1, the SMBus 3.0 V <sub>IH</sub> minimum specification may not be met.	X
Oscillator	XT, HS	4.	The Primary Oscillator Start-up Timer (OST) may indicate the oscillator is ready for use too early.	X
PWM	Dead Time	5.	When feed-forward PCI is used for dead-time compensation (DTCMPSEL = 1), the PWMx outputs are overridden.	X
UART	Frame Error	6.	FERR bit will not get set if a Stop bit is received.	X
UART	Sleep	7.	SLPEN needs to be set when waking from Sleep with a UART reception.	X
UART	Address Detect	8.	When writing to UxP1 with UTXBRK = 1, the content of P1 will not get transmitted.	X
UART	IrDA <sup>®</sup>	9.	When the UART is operating in IrDA mode, the received data may be corrupted.	X
I/O	POR	10.	Spike on I/O at POR.	X
ICSP <sup>™</sup> Flash Write Inhibit	Flash Write Inhibit	11.	Flash memory cannot be protected against reprogramming.	X
CPU	FLIM Instruction	12.	When the operands are of different signs, the FLIM instruction may not force the correct data limit.	X
CPU	DIV.SD Instruction	13.	Overflow bit is not getting set when an overflow occurs.	X
CPU	MAXAB/MINAB/ MINZAB Instructions	14.	MAXAB, MINAB and MINZAB do not work for different sign operands.	X
CPU	Byte Mode Instructions	15.	Upper byte of the destination register may not be persistent.	X
DMA	ADC Triggers	16.	DMA is triggered continuously from ADC.	X
I <sup>2</sup> C	I <sup>2</sup> C	17.	All instances of I <sup>2</sup> C may exhibit errors and should not be used.	X

## Silicon Errata Issues

**Note:** This document summarizes all silicon errata issues from all revisions of silicon, previous as well as current. Only the issues indicated by the shaded column in the following tables apply to the current silicon revision (A0).

### 1. Module: I<sup>2</sup>C

In Slave mode with DHEN = 1 (Data Hold Enable), if software sends a NACK, a Slave interrupt is asserted at the 9th falling edge of the clock.

#### Work around

Software should ignore the Slave interrupt that is asserted after sending a NACK.

#### Affected Silicon Revisions

A0								
X								

### 2. Module: I<sup>2</sup>C

In Slave mode, the SFRs are reset when the device is in Idle and the module is set for discontinuous in Idle (I2CSIDL = 1).

#### Work around

None.

#### Affected Silicon Revisions

A0								
X								

### 3. Module: I<sup>2</sup>C

When selecting SMBus 3.0 operation using Configuration bit, SMB3EN (FDEVOP[10]), the Voltage Input High (V<sub>IH</sub>) of the SMBus 3.0 specification minimum may not be met.

#### Work around

None.

#### Affected Silicon Revisions

A0								
X								

### 4. Module: Oscillator

The Primary Oscillator Start-up Timer (OST) may indicate the oscillator is ready for use too early. Clocking the device before the oscillator is ready may result in incorrect execution and exceptions. This issue exists when the POSC is requested at power-on, during clock switching, when waking from Sleep or when a peripheral module requests the POSC directly. This issue affects XT and HS modes only.

#### Work around

Make sure that the Primary Oscillator clock is ready before using it by following these steps:

1. Running on a non-POSC source, request the POSC clock using a peripheral such as REFO.
2. Provide a delay to stabilize the POSC.
3. Then, switch to the POSC source.

#### Affected Silicon Revisions

A0								
X								

### 5. Module: PWM

When feed-forward PCI is used for dead-time compensation (DTCMPSEL = 1), the PWMx outputs are overridden.

#### Work around

Use Sync PCI (DTCMPSEL = 0) for dead-time compensation.

#### Affected Silicon Revisions

A0								
X								

### 6. Module: UART

When UART is operating with STSEL[1:0] = 2, (two Stop bits sent, two checked at receive) and STPMD = 0, the FERR bit will not get set if a Stop bit is received.

#### Work around

Use STPSEL = 3 instead of STSEL = 2. When operating with STSEL = 3 mode, the UART will be configured to send two Stop bits, but check one at receive.

#### Affected Silicon Revisions

A0								
X								

# dsPIC33CK64MP105

## 7. Module: UART

When waking from Sleep with a UART reception, SLPEN needs to be set in addition to WAKE = 1.

### Work around

Set the SLPEN bit in addition to WAKE before entering Sleep.

### Affected Silicon Revisions

A0								
X								

## 8. Module: UART

In UART Address Detect mode, writing to UxP1 with UTXBRK = 1 should cause a Break to be transmitted, followed by the content in P1, but the content of P1 will not get transmitted.

### Work around

After writing to P1, wait for UTXBRK to get clear and then rewrite to P1.

### Affected Silicon Revisions

A0								
X								

## 9. Module: UART

When the UART is operating in IrDA<sup>®</sup> mode, the received data may be corrupted.

### Work around

None.

### Affected Silicon Revisions

A0								
X								

## 10. Module: I/O

At device power-up, the I/O pins may drive a pulse up to 0.8V for a duration of up to 100  $\mu$ Sec.

### Work around

It is recommended to ensure the circuitry that is connected to the pins can endure this pulse.

Example applications affected may include complementary power switches, where a transient current shoot-through might occur.

High-voltage applications with complementary switches should power the high-voltage 200  $\mu$ Sec later than powering the dsPIC<sup>®</sup> DSC to avoid the issue.

Behavior is specific to each part and not affected by aging.

### Affected Silicon Revisions

A0								
X								

## 11. Module: ICSP<sup>™</sup> Flash Write Inhibit

The ICSP Write Inhibit feature does not prevent ICSP Flash erase and program operations, even if the lock values are written.

### Work around

None.

### Affected Silicon Revisions

A0								
X								

## 12. Module: CPU

The FLIM instruction may incorrectly limit the data range when operating on signed operands of different sign values. If the operands are either all negative or all positive, the limit is correct.

### Work around

None.

### Affected Silicon Revisions

A0								
X								

## 13. Module: CPU

When using the Signed 32-by-16-bit Division instruction, `DIV.SD`, the Overflow bit may not always get set when an overflow occurs.

### Work around

Test for and handle overflow conditions outside of the `div.sd` instruction.

### Affected Silicon Revisions

A0								
X								

## 14. Module: CPU

When operating on signed operands of different sign values, the output for `MAXAB`, `MINAB` and `MINZAB` instructions may be incorrect. If the operands are either all negative or all positive, the output is correct.

### Work around

None.

### Affected Silicon Revisions

A0								
X								

## 15. Module: CPU

When using Byte mode instructions, the upper byte of the destination register may not be persistent.

### Work around

None.

### Affected Silicon Revisions

A0								
X								

## 16. Module: DMA

The DMA receives multiple continuous triggers from ADC until the trigger event from ADC is cleared. The `OVRUNIF` flag (`DMAINTn[3]`) will be set. When the `OVRUNIF` bit changes state, from '0' to '1', a DMA interrupt is generated.

### Work around

Ignore the `OVRUNIF` bit and the first DMA interrupt. Clear the ADC trigger source, `ANxRDY`, with a DMA read of the ADC buffer, `ADCBUFx`, for the corresponding ADC channel.

### Affected Silicon Revisions

A0								
X								

## 17. Module: I<sup>2</sup>C

All instances of I<sup>2</sup>C/SMBus may exhibit errors and should not be used. When operating I<sup>2</sup>C/SMBus in a noisy environment, the I<sup>2</sup>C module may exhibit various errors. These errors may include, but are not limited to, corrupted data, unintended interrupts or the I<sup>2</sup>C bus getting hung up due to injected noise. Examples of system noise include, but are not limited to, PWM outputs or other pins toggled at high speed adjacent to the I<sup>2</sup>C pins. Both Master and Slave I<sup>2</sup>C/SMBus modes may exhibit this issue.

### Work around

If I<sup>2</sup>C is required, use a software I<sup>2</sup>C implementation. An example I<sup>2</sup>C software library is available from Microchip:

[www.microchip.com/dsPIC33C\\_I2C\\_SoftwareLibrary](http://www.microchip.com/dsPIC33C_I2C_SoftwareLibrary)

### Affected Silicon Revisions

A0								
X								

# dsPIC33CK64MP105

---

## Data Sheet Clarifications

The following typographic corrections and clarifications are to be noted for the latest version of the device data sheet (DS70005363C):

<p><b>Note:</b> Corrections are shown in <b>bold</b>. Where possible, the original bold text formatting has been removed for clarity.</p>
---

None.



## APPENDIX A: DOCUMENT REVISION HISTORY

### Rev A Document (1/2019)

Initial version of this document; issued for revision A0.

### Rev B Document (2/2019)

Updated device data sheet revision from B to C.

### Rev C Document (3/2019)

Added silicon issue 16 ([DMA](#)).

### Rev D Document (1/2020)

Added silicon issue 17 ([I<sup>2</sup>C](#)).

# dsPIC33CK64MP105

---

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 unless otherwise stated.

### Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Klear, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PackeTime, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TempTracker, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, FlashTec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, Vite, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, INICnet, Inter-Chip Connectivity, JitterBlocker, KlearNet, KlearNet logo, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, 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.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

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

© 2019-2020, Microchip Technology Incorporated, All Rights Reserved.

ISBN: 978-1-5224-5527-1

For information regarding Microchip's Quality Management Systems, please visit [www.microchip.com/quality](http://www.microchip.com/quality).



# MICROCHIP

## 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://www.microchip.com/support>  
Web Address:  
[www.microchip.com](http://www.microchip.com)

#### Atlanta

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

#### Austin, TX

Tel: 512-257-3370

#### Boston

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

#### Chicago

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

#### Dallas

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

#### Detroit

Novi, MI  
Tel: 248-848-4000

#### Houston, TX

Tel: 281-894-5983

#### Indianapolis

Noblesville, IN  
Tel: 317-773-8323  
Fax: 317-773-5453  
Tel: 317-536-2380

#### Los Angeles

Mission Viejo, CA  
Tel: 949-462-9523  
Fax: 949-462-9608  
Tel: 951-273-7800

#### Raleigh, NC

Tel: 919-844-7510

#### New York, NY

Tel: 631-435-6000

#### San Jose, CA

Tel: 408-735-9110  
Tel: 408-436-4270

#### Canada - Toronto

Tel: 905-695-1980  
Fax: 905-695-2078

### ASIA/PACIFIC

**Australia - Sydney**  
Tel: 61-2-9868-6733

**China - Beijing**  
Tel: 86-10-8569-7000

**China - Chengdu**  
Tel: 86-28-8665-5511

**China - Chongqing**  
Tel: 86-23-8980-9588

**China - Dongguan**  
Tel: 86-769-8702-9880

**China - Guangzhou**  
Tel: 86-20-8755-8029

**China - Hangzhou**  
Tel: 86-571-8792-8115

**China - Hong Kong SAR**  
Tel: 852-2943-5100

**China - Nanjing**  
Tel: 86-25-8473-2460

**China - Qingdao**  
Tel: 86-532-8502-7355

**China - Shanghai**  
Tel: 86-21-3326-8000

**China - Shenyang**  
Tel: 86-24-2334-2829

**China - Shenzhen**  
Tel: 86-755-8864-2200

**China - Suzhou**  
Tel: 86-186-6233-1526

**China - Wuhan**  
Tel: 86-27-5980-5300

**China - Xian**  
Tel: 86-29-8833-7252

**China - Xiamen**  
Tel: 86-592-2388138

**China - Zhuhai**  
Tel: 86-756-3210040

### ASIA/PACIFIC

**India - Bangalore**  
Tel: 91-80-3090-4444

**India - New Delhi**  
Tel: 91-11-4160-8631

**India - Pune**  
Tel: 91-20-4121-0141

**Japan - Osaka**  
Tel: 81-6-6152-7160

**Japan - Tokyo**  
Tel: 81-3-6880-3770

**Korea - Daegu**  
Tel: 82-53-744-4301

**Korea - Seoul**  
Tel: 82-2-554-7200

**Malaysia - Kuala Lumpur**  
Tel: 60-3-7651-7906

**Malaysia - Penang**  
Tel: 60-4-227-8870

**Philippines - Manila**  
Tel: 63-2-634-9065

**Singapore**  
Tel: 65-6334-8870

**Taiwan - Hsin Chu**  
Tel: 886-3-577-8366

**Taiwan - Kaohsiung**  
Tel: 886-7-213-7830

**Taiwan - Taipei**  
Tel: 886-2-2508-8600

**Thailand - Bangkok**  
Tel: 66-2-694-1351

**Vietnam - Ho Chi Minh**  
Tel: 84-28-5448-2100

### EUROPE

**Austria - Wels**  
Tel: 43-7242-2244-39  
Fax: 43-7242-2244-393

**Denmark - Copenhagen**  
Tel: 45-4450-2828  
Fax: 45-4485-2829

**Finland - Espoo**  
Tel: 358-9-4520-820

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

**Germany - Garching**  
Tel: 49-8931-9700

**Germany - Haan**  
Tel: 49-2129-3766400

**Germany - Heilbronn**  
Tel: 49-7131-72400

**Germany - Karlsruhe**  
Tel: 49-721-625370

**Germany - Munich**  
Tel: 49-89-627-144-0  
Fax: 49-89-627-144-44

**Germany - Rosenheim**  
Tel: 49-8031-354-560

**Israel - Ra'anana**  
Tel: 972-9-744-7705

**Italy - Milan**  
Tel: 39-0331-742611  
Fax: 39-0331-466781

**Italy - Padova**  
Tel: 39-049-7625286

**Netherlands - Drunen**  
Tel: 31-416-690399  
Fax: 31-416-690340

**Norway - Trondheim**  
Tel: 47-7288-4388

**Poland - Warsaw**  
Tel: 48-22-3325737

**Romania - Bucharest**  
Tel: 40-21-407-87-50

**Spain - Madrid**  
Tel: 34-91-708-08-90  
Fax: 34-91-708-08-91

**Sweden - Gothenberg**  
Tel: 46-31-704-60-40

**Sweden - Stockholm**  
Tel: 46-8-5090-4654

**UK - Wokingham**  
Tel: 44-118-921-5800  
Fax: 44-118-921-5820