



Product Information

## SF1-STUDIO

**CompactPCI® Serial** • Industrial Ethernet & Fieldbus Module Carrier

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## General

*On the process control level, the IoT speaks many idioms. With the SF1-STUDIO, EKF offers a solution to this problem. The CompactPCI® Serial carrier board accommodates up to two mezzanine I/O adapter modules based on the PCI Express® Mini Card form factor, suitable for real-time industrial Ethernet and fieldbus applications. Up to four front panel I/O connectors are available for direct attachment of a variety of machines and systems.*

The SF1-STUDIO is optimized for *Hilscher* real-time Ethernet & fieldbus modules. Many popular protocols are supported. With respect to Ethernet, mezzanine modules are available for EtherCAT, EtherNet/IP, Open-Modbus/TCP, POWERLINK, PROFINET IO, Sercos, and VARAN. In addition, there are also I/O modules disposable for the classic interfaces Profibus DP, CANopen, DeviceNet and CC-Link. A suitable configuration of ports allows applications as bridge or router.



SF1-0200-STUDIO

## Theory of Operation

The SF1-STUDIO is a peripheral slot board for PICMG® CompactPCI® Serial systems and acts as carrier card for two PCI Express® Mini Card mezzanine modules, with focus on industrial Ethernet and fieldbus. As of current, suitable interfaces are available for Real-time Ethernet, Profibus DP, CANopen, DeviceNet and CC-Link (master/slave and single/dual port in each case).

The SF1-STUDIO is equipped with 4-port PCI Express® Gen2 packet switch and can be installed into any PCIe enabled peripheral slot of a CompactPCI® Serial backplane. In addition to the PCI Express® lane associated to each PCIe Mini Card socket, an optional on-board USB controller is used for employment of either USB or PCIe controlled mezzanine modules.



SF1-0100-STUDIO w. I/O Module

The SF1-STUDIO requires a single PCI Express® lane from the backplane, passed over across the backplane connector P1 to the on-board PCIe Gen2 packet switch (upstream port). Three downstream ports are connected to the PCIe Mini Card sockets, and the optional on-board USB host controller.

The SF1-STUDIO is equipped with two PCI Express® Mini Card connectors according to the PCI-SIG Mini Card electromechanical specification Rev. 2.0, for usage with appropriate industrial I/O modules. A front panel assembly is available to each I/O module, providing the suitable I/O connectors.





SF1-STUDIO w. Profibus Master Module

## Feature Summary

### Dimensions

- ▶ PICMG® CompactPCI® Serial standard (CPCI-S.0) peripheral slot card
- ▶ Single size Eurocard 3U 4HP 100x160mm<sup>2</sup>
- ▶ CPCI-S backplane connector P1 (peripheral slot PCIe x 1)

### PCI Express® Mini Card Connectors

- ▶ 2 x Card sockets 52-pin (SF1-0200-STUDIO)
- ▶ 1 x Card socket 52-pin (SF1-0100-STUDIO)
- ▶ Suitable for full- or half-mini cards either 30mm x 50.95mm or 30mm x 26.80mm
- ▶ USB 2.0 support (option)
- ▶ PCI Express® Gen2 support
- ▶ PCB design with respect to additional front I/O modules (cable and connector assembly)
- ▶ Mix of any two industrial I/O mini cards with associated front I/O

### Real-Time I/O Modules \*

- ▶ EtherCAT master/slave
- ▶ EtherNet/IP scanner/adaptor
- ▶ Open-Modbus/TCP gateway/slave
- ▶ POWERLINK controlled node
- ▶ PROFINET IO controller/device
- ▶ Sercos master/slave
- ▶ VARAN client
- ▶ PROFIBUS DP master/slave
- ▶ CANopen master/slave
- ▶ DeviceNet master/slave
- ▶ CC-Link slave

\* The SF1-STUDIO is suitable for Hilscher PCIe Mini Card real-time Ethernet & fieldbus modules ([www.hilscher.com](http://www.hilscher.com)). EKF offers ready for use assemblies comprised of the SF1-STUDIO together with Hilscher Mini Card(s) and front I/O modules - please contact [sales@ekf.com](mailto:sales@ekf.com).

## Feature Summary

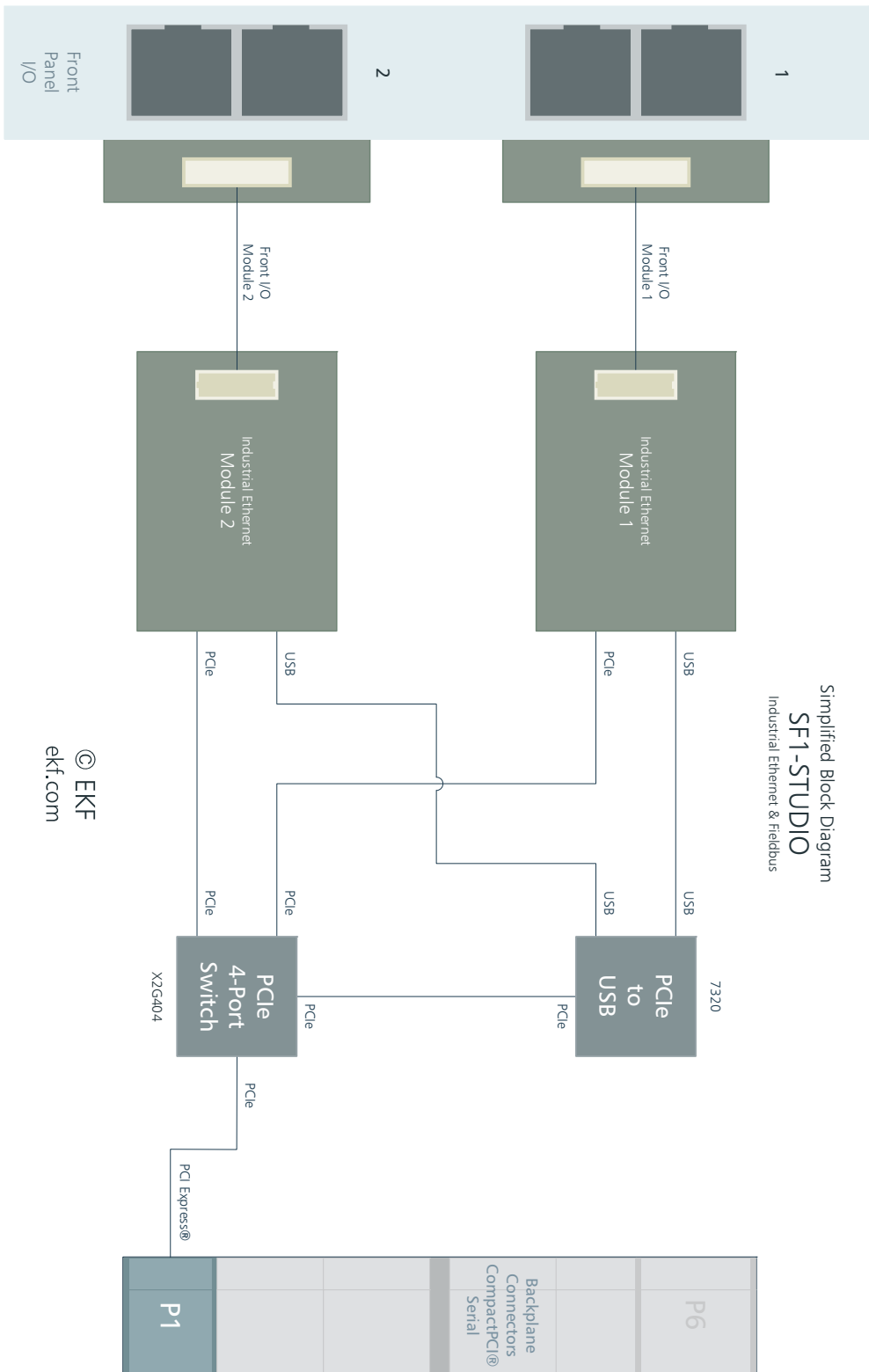
## Regulatory, Environment

- ▶ Designed & manufactured in Germany
- ▶ ISO 9001 certified quality management system
- ▶ Long term availability
- ▶ Coating, sealing, underfilling on request
- ▶ RoHS compliant 2011/65/EC
- ▶ Operating temperature -40°C to +85°C (industrial temperature range)
- ▶ Storage temperature -40°C to +85°C, max. gradient 5°C/min
- ▶ Humidity 5% ... 95% RH non condensing
- ▶ Altitude -300m ... +3000m
- ▶ Shock 15g 0.33ms, 6g 6ms
- ▶ Vibration 1g 5-2000Hz
- ▶ MTBF 95.9 years
- ▶ EC Regulatory EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)

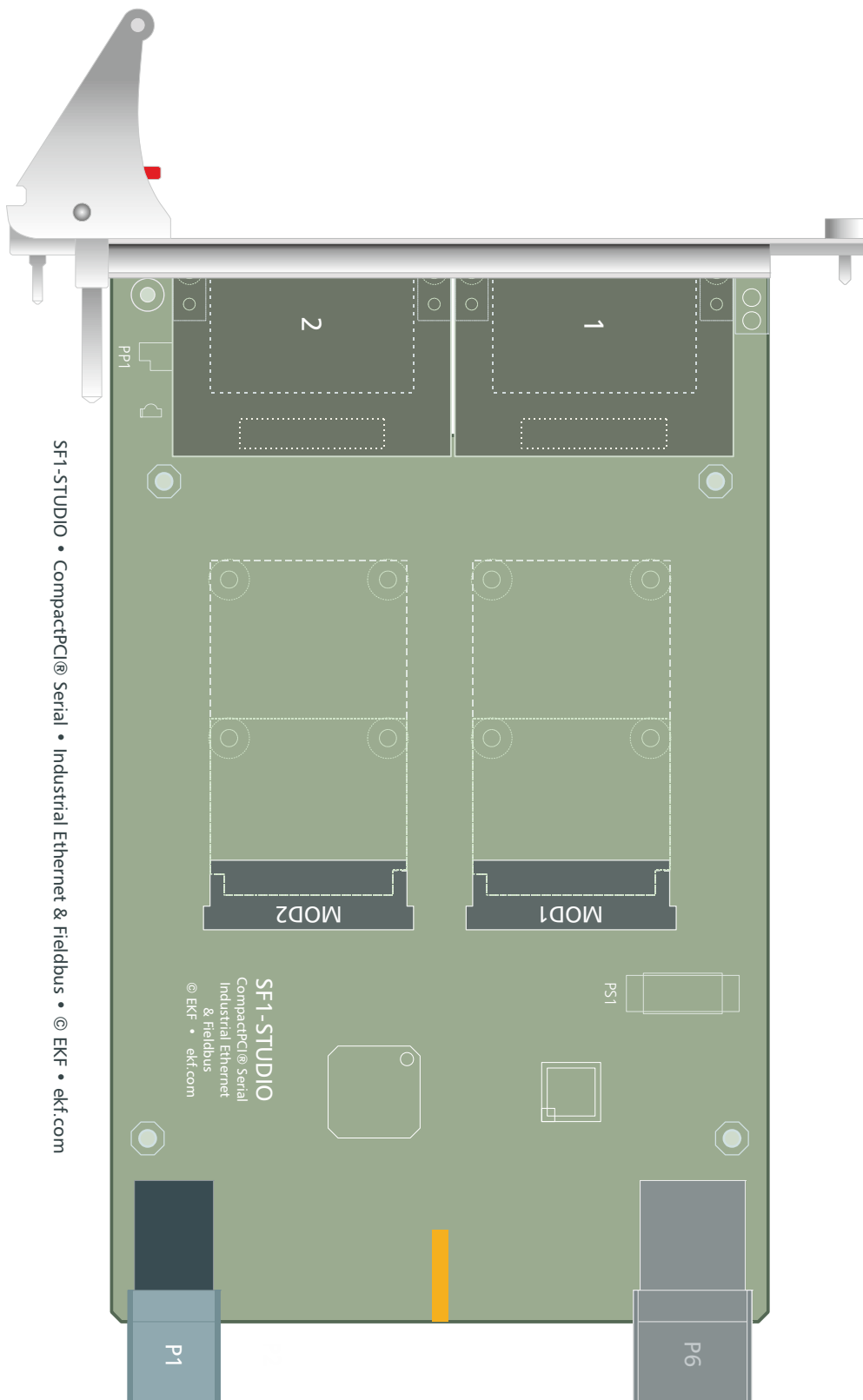


SF1-0100-STUDIO

### Block Diagram



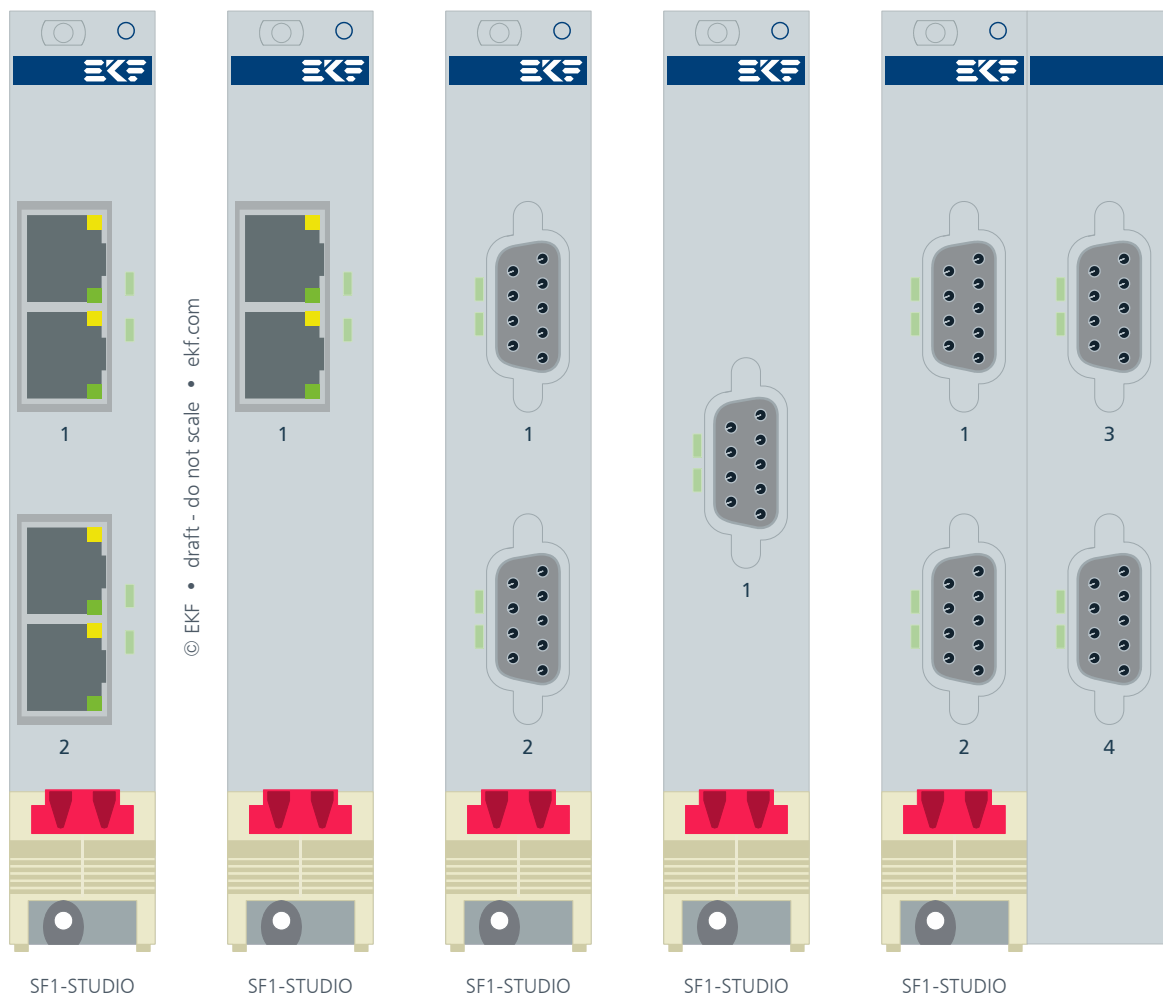
### Board Assembly



SF1-STUDIO • CompactPCI® Serial • Industrial Ethernet & Fieldbus • © EKF • ekf.com



### Front Panel



the actual front panel configuration depends on the type and number of modules in use

## PCIe Mini Card Host Connectors

The SF1-STUDIO is provided with two PCI Express® Mini Card host connectors, according to the PCI Express® Mini Card Electromechanical Specification Revision 2.0. These sockets are suitable for PCIe based modules, and also USB 2.0 driven mini cards (option). After inserted, the mini card has to be fixed by a snap-in latch (full-size modules 50.80mm length), or will have to be secured manually by screws (mini size modules 26.80mm length), in order to withstand shock and vibration.

With respect to the real-time Ethernet & fieldbus modules available as of current, the USB channel is not required. All these modules are PCI Express® based, for maximum performance. Hence, all USB related components on the SF1-STUDIO will be provided as an ordering option only.

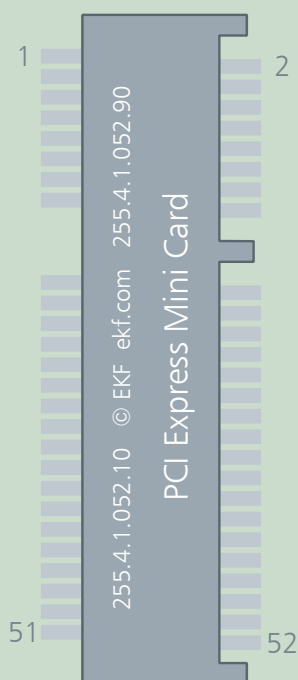
If populated, the on-board dual port USB controller is a Texas Instruments TUSB7320 which is USB 2.0 & USB3.0 compliant. With respect to the mini card sockets, only the USB 2.0 high speed internal controller section is in use, with native driver support by any recent operating system. Windows® however may show an alert in its device manager table for the xHCI (SuperSpeed) USB 3.0 controller section, which could be ignored. Just in order to remove this misleading alert, a suitable xHCI driver can be downloaded from <http://www.ti.com/product/tusb7340#toolssoftware>. Installation of this driver should have no further impact otherwise on the SF1-STUDIO mini card sockets.

There are three pins (42, 44, 46) on the connector which may be used deviant from the specification. Please refer to the particular real-time Ethernet or fieldbus mini card description for details.

Each socket MC1 - MC2 can supply a mini card with +3.3V/1.5A (3A max. in total) and (as an ordering option only) +1.5V/1A (2A max. in total).

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MC1 - MC2			
PCI Express® Mini Card Socket (255.4.1.052.14) & Latch (255.4.1.052.94)			
<i>PCIE_WAKE#</i>	1	2	+3.3V
<i>COEX1</i>	3	4	GND
<i>COEX2</i>	5	6	+1.5V 2)
<i>CLKREQ#</i>	7	8	<i>UIM_C1</i>
GND	9	10	<i>UIM_C7</i>
<i>PCIE_CLK-</i>	11	12	<i>UIM_C3</i>
<i>PCIE_CLK+</i>	13	14	<i>UIM_C2</i>
GND	15	16	<i>UIM_C6</i>
<i>UIM_C8</i>	17	18	GND
<i>UIM_C4</i>	19	20	<i>W_DIS1#</i>
GND	21	22	RST#
<i>PCIE_RN</i>	23	24	+3.3V
<i>PCIE_RP</i>	25	26	GND
GND	27	28	+1.5V 2)
GND	29	30	<i>SMB_CLK</i>
<i>PCIE_TN</i>	31	32	<i>SMB_DAT</i>
<i>PCIE_TP</i>	33	34	GND
GND	35	36	USB_D- 1)
GND	37	38	USB_D+ 1)
+3.3V	39	40	GND
+3.3V	41	42	Bootstart * <i>LED_WWAN#</i>
GND	43	44	IO_SYNC1 * <i>LED_WLAN#</i>
<i>RSV</i>	45	46	IO_SYNC0 * <i>LED_WPAN#</i>
<i>RSV</i>	47	48	+1.5V 2)
<i>RSV</i>	49	50	GND
<i>W_DIS2#</i>	51	52	+3.3V



*signals shown italic/grey are not connected*

\* proprietary use signals on some fieldbus mini cards

- 1) USB support is an ordering option - not available by default
- 2) +1.5V power supply is an ordering option - not available by default

## P1 CompactPCI® Serial Backplane Connectors

P1 CompactPCI® Serial Peripheral Slot Backplane Connector												
EKF Part #250.3.1206.20.02 • 72 pos. 12x6, 14mm Width												
P1	A	B	C	D	E	F	G	H	I	J	K	L
6	GND	PE TX02+	PE TX02-	GND	PE RX02+	PE RX02-	GND	PE TX03+	PE TX03-	GND	PE RX03+	PE RX03-
5	PE TX00+	PE TX00-	GND	PE RX00+	PE RX00-	GND	PE TX01+	PE TX01-	GND	PE RX01+	PE RX01-	GND
4	GND	USB2+	USB2-	GND	PE CLK+	PE CLK-	GND	SATA TX+	SATA TX-	GND	SATA RX+	SATA RX-
3	USB3 TX+	USB3 TX-	GA0	USB3 RX+	USB3 RX-	GA1	SATA SDI	SATA SDO	GA2	SATA SCL	SATA SL	GA3
2	GND	I2C SCL	I2C SDA	GND	RSV	RSV	GND	RST#	WAKE#	GND	PE EN#	SYS EN#
1	+12V	STBY	GND	+12V	+12V	GND	+12V	+12V	GND	+12V	+12V	GND

pin positions printed gray: not connected

### SF1-STUDIO Links

SF1-STUDIO Home

[www.ekf.com/s/sf1/sf1.html](http://www.ekf.com/s/sf1/sf1.html)

### Related Links

CompactPCI® Serial Overview

[www.ekf.com/s/smart\\_solution.pdf](http://www.ekf.com/s/smart_solution.pdf)

## Ordering Information

### Ordering Information

For popular SF1-STUDIO SKUs please refer to  
[www.ekf.com/liste/liste\\_21.html#SF1](http://www.ekf.com/liste/liste_21.html#SF1)





Sample Custom Configuration





Industrial Computers Made in Germany  
boards. systems. solutions.

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Philipp-Reis-Str. 4 (Haus 1)  
Lilienthalstr. 2 (Haus 2)  
59065 HAMM  
Germany



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