

# Serial Bus Analysis

## R&S®H0010, R&S®H0011, R&S®H0012

### Technical Data

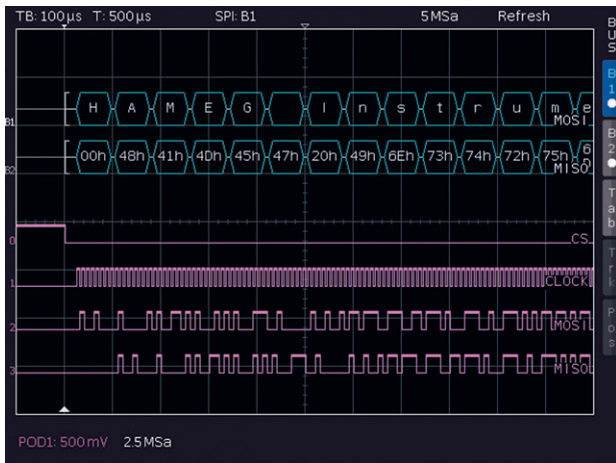
#### Key facts

- With Analog Channels and/or Logic Channels
- I<sup>2</sup>C, SPI, UART/RS-232, CAN, LIN Bus Trigger and Decode
- Hardware accelerated Decode in Real Time
- Color Coded Display of the Content for intuitive Analysis and easy Overview
- More Details of the decoded Values become visible with increasing Zoom Factor
- Bus Display with synchronous Display of the Data and, if selected, Clock Signal
- Decode into ASCII, Binary, Hexadecimal or Decimal Format
- Up to four Lines to comfortably show the decoded Values
- Powerful Trigger to isolate specific Messages
- Option for all Oscilloscopes of the HMO Series, retrofittable

#### Bus analysis options

Description	Option	Voucher
I <sup>2</sup> C, SPI, UART/RS-232 on analog and logic channels	R&S®H0010	R&S®HV110
I <sup>2</sup> C, SPI, UART/RS-232 on all analog channels	R&S®H0011	R&S®HV111
CAN and LIN on analog and logic channels	R&S®H0012	R&S®HV112

## Serial bus analysis with R&S®HOO10



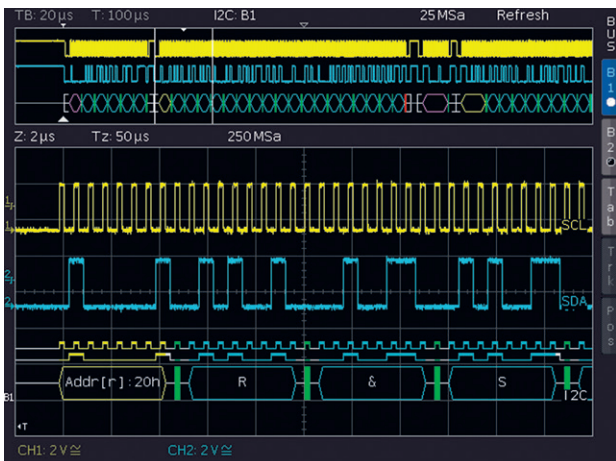
SPI bus signal, MISO / MOSI decoded.

### Analog- and logic channels

#### Trigger types

- **I<sup>2</sup>C**: Start, Stop, ACK, nACK, Address, Data
- **SPI**: Start, End, Serial Pattern (32Bit)
- **UART/RS-232**: Startbit, Frame Start, Symbol, Pattern

## Serial bus analysis with R&S®HOO11



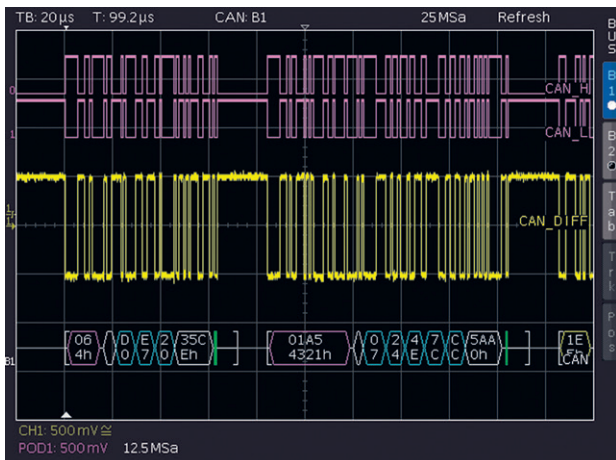
I<sup>2</sup>C bus signal in zoom view.

### Analog channels

#### Trigger types

- **I<sup>2</sup>C**: Start, Stop, ACK, nACK, Address, Data
- **SPI**: Start, End, Serial Pattern (32Bit)
- **UART/RS-232**: Startbit, Frame Start, Symbol, Pattern

## Serial bus analysis with R&S®HOO12



HEX decoded CAN bus signal.

### Analog- and logic channels

#### Trigger types

- **LIN**: Frame Start, Wake Up, Identifier, Data, Error
- **CAN**: Frame Start, Frame End, Data, Identifier, Error

# Technical Data

## I<sup>2</sup>C, SPI, UART/RS-232 Bus Analysis R&S® HOO10/R&S® HOO11

Bus Configuration	I <sup>2</sup> C Bus	SPI Bus	UART/RS-232 Bus
Bit/Baud rate	up to 10 Mbit/s (HMO352x/2524), up to 5 Mbit/s (HMO72x...202x)	up to 25 Mbit/s (HMO352x/2524), up to 12,5 Mbit/s (HMO72x...202x)	300, 600, 1.200, 2.400, 4.800, 9.600, 19.200, 38.400, 57.600, 115.200 Baud, up to 62,5 Mbit/s (HMO352x/2524), up to 31 Mbit/s (HMO72x...202x)
Number of Bit's	7 or 10 Bit for Address ID 8 Bit for Data	32 Bit for Data	8 Bit for Data 1, 1.5, 2 Bit for Stop Bit
Polarity	n/a	Chip Select, positive or negative, or without Chip Select (2-wire SPI) Clock rising or falling edge Data High or Low active	High or Low activ
Parity	n/a	n/a	none, odd or even
Trigger			
Source	<b>HOO10:</b> digital Channels LCH 0...15 (Opt. HO3508) analog Channels CH 1...2 [CH 1...4]  <b>HOO11:</b> analog channels CH 1...2 [CH 1...4]	<b>HOO10:</b> digital Channels LCH 0...15 (Opt. HO3508) analog Channels CH 1...2, external Trigger Entry for Chip Select, [CH 1...4]  <b>HOO11:</b> analog Channels CH 1...2, external Trigger Entry for Chip Select, [CH 1...4]	<b>HOO10:</b> digital Channels LCH 0...15 (Opt. HO3508) analog Channels CH 1...2 [CH 1...4]  <b>HOO11:</b> analog Channels CH 1...2 [CH 1...4]
Event	7 or 10 Bit Address ID 7 or 10 Bit Address ID with 8 Bit Data Start, Stop, Restart missing Acknowledge Address ID without Acknowledge	Data packets up to 32 Bit with positive or negative Chip Select or without Chip Select, (2-wire SPI)	Data packets up to 8 Bit
Input format	Hexadecimal or Binary	Hexadecimal or Binary	Hexadecimal or Binary
Hardware accelerated Decode			
Source	<b>HOO10:</b> digital Channels LCH 0...15 (Opt. HO3508) analog Channels CH 1...2 [CH 1...4]  <b>HOO11:</b> analog Channels CH 1...2 [CH 1...4]	<b>HOO10:</b> digital Channels LCH 0...15 (Opt. HO3508) analog Channels CH 1...2, external Trigger Entry for Chip Select, [CH 1...4]  <b>HOO11:</b> analog Channels CH 1...2, external Trigger Entry for Chip Select, [CH 1...4]	<b>HOO10:</b> digital Channels LCH 0...15 (Opt. HO3508) analog Channels CH 1...2 [CH 1...4]  <b>HOO11:</b> analog Channels CH 1...2 [CH 1...4]
Display	Bus display, color coded for  Read Address ID: Yellow Write Address ID: Magenta Data: Cyan Start: White Stop: White ACK/NACK: Green/Red Error: Red Trigger Condition: Green  up to four lines for decoded values, synchronous display of the Bit lines	Bus display, color coded for  Data: Cyan Start: White Stop: White  Error: Red Trigger Condition: Green  up to four lines for decoded values, synchronous display of the Bit lines	Bus display, color coded for  Data: Cyan Start: White Stop: White  Error: Red Trigger Condition: Green  up to four lines for decoded values, synchronous display of the Bit lines
Format	Address ID: hexadecimal Data: ASCII, binary, decimal, hexadecimal	n/a Data: ASCII, binary, decimal, hexadecimal	n/a Data: ASCII, binary, decimal, hexadecimal

## Differences HOO10/HOO11

Feature	HOO10	HOO11
Logic Channels (LCH 0...LCH 15) as source for serial bus trigger and decode	X	—
Analog Channels (CH 1...CH 4) as source for serial bus trigger and decode	X	X
Time synchronous decode of two serial busses	X	—

# Technical Data

## CAN/LIN Bus Analysis

### R&S®HOO12

Bus Configuration	CAN Bus	LIN Bus
Bit rates	Pre-Defined or User-Select, 100 Bit/s...4 Mb/s (HMO352x/2524), 100 Bit/s...2 Mb/s (HMO72x...202x)	Pre-Defined or User-Select, 100 Bit/s...4 Mb/s (HMO352x/2524), 100 Bit/s...2 Mb/s (HMO72x...202x)
Signal Type	CAN-L or CAN-H, Single Ended or Differential Probe (Analog Channels only)	N/A
Sample Point Range	25...90%	N/A
Threshold	Pre-Defined or User-Select	Pre-Defined or User-Select
Polarity	N/A	High or Low active
Protocol Version	N/A	1.x, 2.x, J2602, 1.x or 2.x
<b>Trigger</b>		
Source	digital Channel LCH 0...15 (Opt. HO3508), analog Channel CH 1...2 [CH 1...4]	digital Channel LCH 0...15 (Opt. HO3508), analog Channel CH 1...2 [CH 1...4]
Event	Start of Frame (SOF), End of Frame (EOF) Error Frame Error condition: Stuff Bit Error, CRC Error, Not Acknowledge, Form Error Overload Frame Data Frame (11 or 29Bit ID) Remote Frame (11 or 29Bit ID) Identifier: 0, 1, X (Don't Care) Pattern, Trigger when =, ≠, <, > Identifier and Data: ID and 64Bit data pattern (0, 1, X), trigger when =, ≠, <, >	Start of Frame (SOF), Wake Up Frame Error Frame Error condition: Checksum Error, Parity Error Synchronisation Error Identifier: 0, 1, X (Don't Care) Pattern, Trigger when =, ≠, <, > Identifier and Data: ID and 64Bit data pattern (0, 1, X), trigger when =, ≠, <, >
Input format	Hexadecimal or Binary	Hexadecimal or Binary
<b>Hardware accelerated Decode</b>		
Source	digital Channel LCH 0...15 (Opt. HO3508), analog Channel CH 1...2 [CH 1...4]	digital Channel LCH 0...15 (Opt. HO3508), analog Channel CH 1...2 [CH 1...4]
Display		
Bus	color coded for  Start and End of Frame: White brackets Data ID: Magenta, Remote ID: Yellow DLC: White, Data: Cyan, CRC: White ACK: Green, Overload: White, Error: Red	color coded for  Start and End of Frame: White brackets Break: Magenta, Synchronisation: White Identifier: Yellow, Parity: Green, Data: Cyan Checksum: White, Error: Red, Wake Up: Magenta
Table	up to four lines for decoded values, synchronous display of the Bit lines  Display of Bus 0 or 1  Frame Number State (Frame Type or Error Description) Start Time, Identifier, DLC, CRC, Data	up to four lines for decoded values, synchronous display of the Bit lines  Display of Bus 0 or 1  Frame Number State (Frame Type or Error Description) Start Time, Identifier, Length, Checksum, Data
Format	Identifier & other: hexadecimal Data: ASCII, binary, decimal, hexadecimal	Identifier & other: hexadecimal Data & Checksum: ASCII, binary, decimal, hexadecimal