BiSS Interface

BP0: UNIVERSAL PROFILE

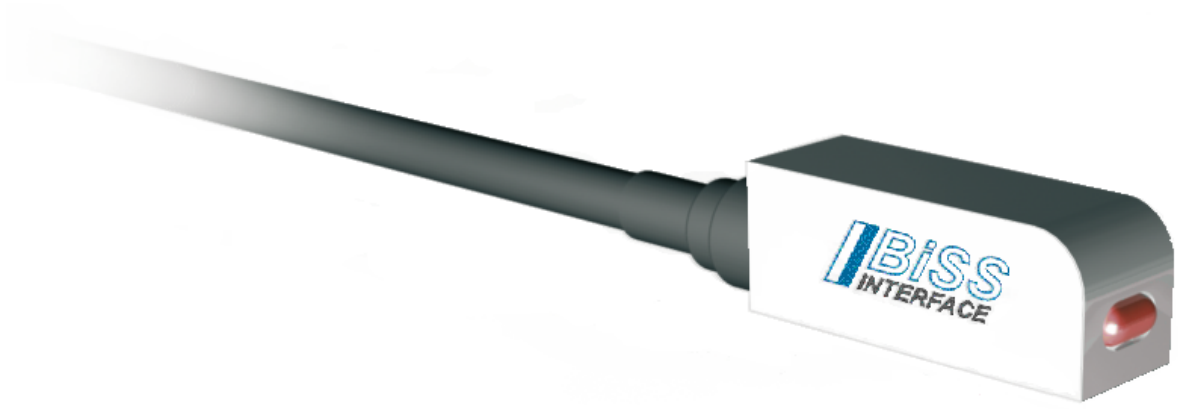
preliminary

FEATURES

- Grouping of sensors an actuators
- Compatibility within a group
- Standardized data format
- Simple control configuration

APPLICATIONS

- Fast and simple motion controller configuration
- Intelligent sensors an actuators



DESCRIPTION

The *BiSS* Universal Profile BP0 describes a standardized interface configuration for sensors and actuators with *BiSS* C interface.

The *BiSS* interface is primarly used for the transfer of measured data from sensors to the control and actuating variables from teh control to the actuators. The specification (see *BiSS* C Protocol Description) defines the framework for this data transmission but does not assign data lengths and content. The *BiSS* interface permits powerful, flexible and cost efficient solutions required in the automation industry. The two bytes of the profile identification describes only a basic configuration of the communication protocol. With using the XML file or EDS comprehensive device attributes are described.

Defining an application specific profile, standardized and manufacturer independent data communication is available and the data channel parameters and device attributes are defined. This information is not needed to be placed in the electronic data sheet and can be implemented easily in the control system. The 2 bytes in the adresses 0x42 and 0x43 are defined for profile identification.

The *BiSS* slaves are classifiable in three groups:

- **Sensors**
  provide measured data that is updated in every cycle and transmitted completely from the slave to the master.
- **Actuators**
  processes actuator variables that are updated in every cycle and transmitted completely from the master to the slave. For verification the actuator variables are completely transmitted from the slave back to the master in the following cycle.
- **Slaves without data channel**
  do not have any sensor nor actuator data. The data transmission is only available via control communication. As an example bus couplers are only able to receive and process control communication from the master.

The *BiSS* profile BP0 does only support slaves with a maximum of one data channel.

The transmitted data over the BiSS interface is composed of process data and additional information for error and warning. Process data are physical values as are measurements from sensors or actuator values for actuators.

Process data
The process data length is 1 bit . . . 24 bit. If a particpant does use a smaller count of process data bits the process data is used right aligned and missing bits are padded with ”0”. If 24 bit is insufficent and no other profile available, the process data may be splitted into multiple slaves.

Error and warning
Modern sensors and actuators typically bring a resource monitoring on changing attributes and failures. Typical application example: power supply monitoring. Both bits are transmitted inverted. An error or a warning is indicated by a ”0”. The measured data is valid on warning and invalid on error.

CRC
To increase the transmission reliability the data is extended by a CRC. The CRC is generated with the start value ”0” and the generator polynome $X^5 + X^2 + X^0$ = 0x25 and these CRC bits are transmitted inverted. The data word length (data bits, error bit and warning bit) may not exceed the maximum configuration of 26 bit. The transmitted data (measured data/actuator variables + CRC) do have a Hamming distance of 3, that means all 2 bit errors are detectable and 1 bit errors are correctable.

The sequence is process data, error, warning and CRC as a single cycle data transmitted in one cycle.

DEFINITIONS

DL_P	**Process data length** Data length für measured data and actuator variables
nE	**Error bit** 1 bit, inverted transmission, with an error the measured data is invalid
nW	**Warning bit** 1 bit, inverted transmission, with a warning the measured data is valid
DL	**Data length** Complete length of the data channel

IDENTIFICATION

OVERVIEW

Addr	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x42	0 0 0			DL(4:0)				
0x43	APL_TYPE	APL_ID(6:0)						

Table 1: Profile identification

ID	Addr. 0x42; bit 7:5	R
0x00	The sequence 0 0 0 identifies the *BiSS* Universal Profile BP0	

Table 2: Identification

DL	Addr. 0x42; bit 4:0	R
0x00	0 bit data length, no data channel present	
0x01	1 bit data length, data channel present	
. . .	. . .	
0x1A	26 bit data length, data channel present	

Table 3: Data Length

APL_TYPE	Addr. 0x43; bit 7:7	R
0x00	Sensor	
0x01	Actuator	

Table 4: Application Type Identification: actuator/sensor identification

APL_ID	Addr. 0x43; bit 6:0	R
0x00	Free to use while this application not defined	
0x01	Standard Temperature Sensor	
0x02 . . . 0x7E	Reserved	
0x7F	Not permitted to use	

Table 5: Application Identification

DATA CHANNEL PARAMETER

The data channel parameter need to be set in the *BiSS* master configuration.

Data transmission direction and type	SCDS (for sensors) SCDA (for actuators)
Bit count	DL
Stop bit	1
Propagation delay	Defined in the EDS (see *BiSS* EDS Common Part)
Data alignment	Right aligned
CRC polynome	$X^5 + X^2 + X^0$ = 0x25, inverted transmission
CRC start value	”0”

APL_ID 1: STANDARD TEMPERATURE SENSOR

OVERVIEW								
Addr	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x42	*BiSS* Universal Profile BP0 = 0 0 0			DL(4:0) = DL_P + 2				
0x43	Sensor = 0	Standard Temperature Sensor = 1						

Table 6: Application Type Indentification AP1: Standard Temperature Sensor

The BP0 Standard Temperature Profile permits process data lengths of 8 bit, 12 bit and 16 bit and is defined in the following table.

DL_P	8 bit	12 bit	16 bit
Resolution	1 °C	1/4 °C	1/10°C
range of values	-128 °C .. +127 °C	-512 °C .. +511 °C	-3276,8 °C .. +3276,7 °C
200 °C		0011 0010 0000	0000 0111 1101 0000
150 °C		0010 0101 1000	0000 0101 1101 1100
120 °C	0111 1110	0001 1110 0000	0000 0100 1011 0000
100 °C	0110 0100	0001 1001 0000	0000 0011 1110 1000
4 °C	0000 0100	0000 0001 0000	0000 0000 0010 0100
1.00 °C	0000 0001	0000 0000 0100	0000 0000 0000 1010
0.25 °C		0000 0000 0001	
0.20 °C			0000 0000 0000 0010
0.10 °C			0000 0000 0000 0001
0.00 °C	0000 0000	0000 0000 0000	0000 0000 0000 0000
-0.01 °C			1111 1111 1111 1111
-0.02 °C			1111 1111 1111 1110
-0.25 °C		1111 1111 1111	
-1.00 °C	1111 1111	1111 1111 1100	1111 1111 1111 0110
-4 °C	1111 1100	1111 1111 0000	1111 1111 1101 1000
-25 °C	1110 0111	1111 1001 1100	1111 1110 0000 0110
-40 °C	1101 1000	1111 0110 0000	1111 1110 0111 0000

Example of a temperature sensor
The system uses a 12 bit ADC and transmittes this as 12 bit process data, using error and warning bits and assumes to a data length of 14 bit = DL(4:0) = DL_P + 2.

	Adr. 0x42								Adr. 0x43							
Electrical Identifier	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1

Data format	T(11:0)	nE	nW	CRC(4:0)

REVISION HISTORY

Rev	Memo	Page	Details
A1			First release version
A2		4/5 5/5	Data alignment: was left aligned but needs to be right aligned Example APL_ID 1 byte 0x42 was 0b0000.1100 but needs to be 0b0000.1110 .

Table 7: Revision History