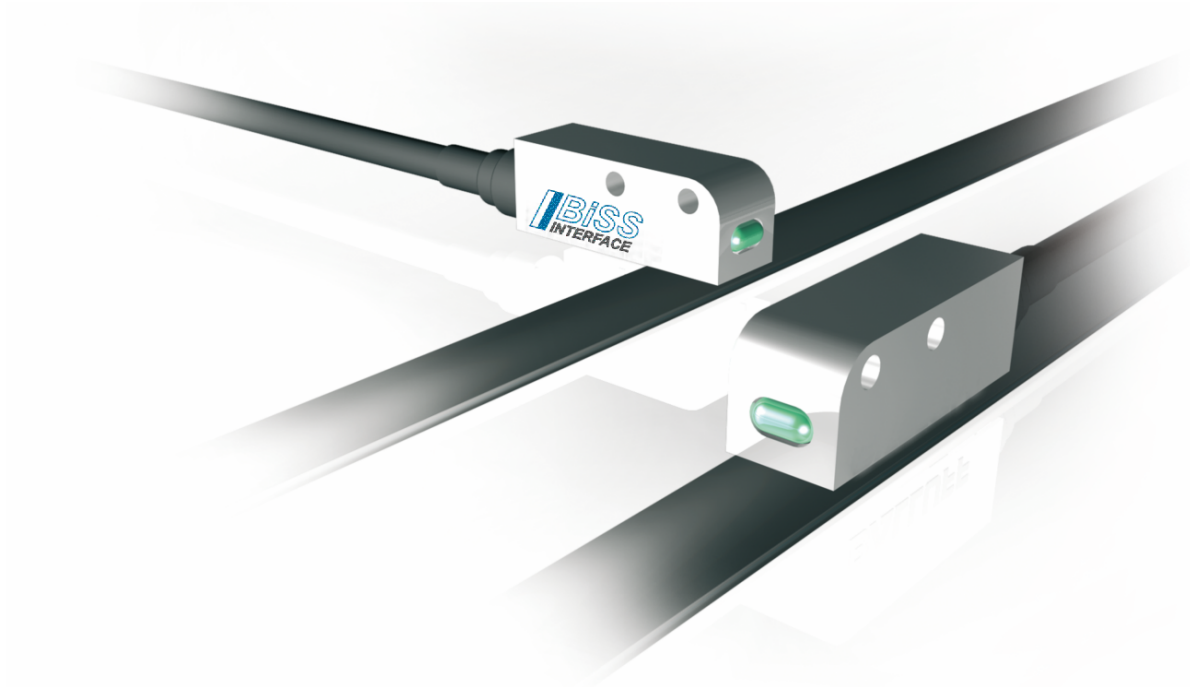
BP3
STANDARD ENCODER PROFILE

FEATURES

- BiSS Standard Encoder
- Control Position Word (CPW)
- Linear and rotary encoder
- Compatibility within a group
- Combinable with BP3S
- Standardized data format
- Simple control configuration
- EDS definition for this profile

APPLICATIONS

- Fast and simple motion controller configuration
- Intelligent absolute rotary encoder
- Intelligent absolute linear encoder



BP3
STANDARD ENCODER PROFILE

DESCRIPTION

This document describes the profile definition of the BiSS Standard Encoder Profile BP3 for absolute linear and absolute rotary encoder with BiSS C interface.

The profile defines the data channel parameters and device attributes. This information is placed in the electronic datasheet in a general way and can be implemented easily with the BP3 profile ID on the control side. With the definition of an application specific profile it is possible to define manufacturer independent standardized data communication format for identical devices.

The BiSS Standard Encoder Profile BP3 is identified with reading the 2 bytes in the register addresses 0x42 and 0x43 to provides the data length and the standardized format. The transmitted data over the BiSS interface assembles from position value and optional additional information as are error and warning information.

The BiSS Standard Encoder that provides one position word. The position measure transmitted over the BiSS interface assembles from position value and additional information as are error and warning. The EDS of the BiSS Standard Encoder has one EDS common part and one EDS BiSS profile specific part: BP1 or BP3 for position word.

The BiSS Safety Encoder that provides two position words: Control Position Word (CPW) and Safety Position Word (SPW). The SPW measure transmitted over the BiSS interface assembles from position value and additional information as are error, warning and Sign-Of-Life counter. The CPW measure transmitted over the BiSS interface assembles from position value and additional information as are error and warning. The EDS of the BiSS Safety Encoder has one EDS common part and two EDS BiSS profile specific parts: BP3S for SPW and BP1 or BP3 for CPW.

Position
The data length for the position is 1 . . . 55 bit.

Error and Warning
Modern absolute linear and absolute rotary encoder do monitor internal system components and failures. The two feedback bits are transmitted low active: an error or a warning are indicated by a 0. The measured position is valid with a warning and may be invalid with an error.

CRC
To increase the transmission reliability the data is extended by a CRC. The CRC is calculated with a standardized generator polynomial and a standardized start value. The CRC bits are transmitted inverted.

Figure 1: Data format BP3 (no error)

Definitions

MT	Multiturn
ST	Singleturn
nE	Error bit (low active)
nW	Warning bit (low active)

DL_POS	Position data length MT + ST (1 . . . 55 bit)
DL	Total length of the data channel
ID	Identifier
VER	Version
CRC	Cyclic redundancy check

IDENTIFIER SCHEME: BiSS PROFILE BP3

OVERVIEW								
Addr	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Definition BP3 identifier								
0x42	ID				VER			C
0x43	0	DL						

Table 1: Register layout

OVERVIEW								
Addr	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Defined values of the BP3 identifier								
0x42	0	1	1	0	VER			C
0x43	0	DL						

Table 2: Register layout

ID	Addr. 0x42; bit 7:4	R
0b0110	Identifier 0b0110 = 0x06 for **BiSS Absolute Encoder Profile BP3**	

Table 3: Identifier

VER	Addr. 0x42; bit 3:1	R
0x0	Not allowed	
0x1	Version 1 (current Version)	
0x2 ... 0x7	Reserved for updated versions of BP3	

Table 4: Version

C	Addr. 0x42; bit 0	R
0	CRC is separated from the data. Verification is performed by the BiSS master Not allowed within BiSS Safety Encoder Expected within BiSS Standard Encoder	
1	Mandatory within BiSS Safety Encoder	

Table 5: Cyclic Redundancy Check

The bit C indicates if there CRC result is remaining to the data (C = 1) or not (C = 0). If there is no CRC verification by the master required, the count of used CRC bits needs to be added to the count of total data.

DL	Addr. 0x43; bit 6:0	R
0x00 ... 0x01	Not allowed	
0x02 ... 0x39	Data length DL without CRC, with condition C = 0	
0x02 ... 0x3F	Data length DL without CRC, with condition C = 1	

Table 6: Data length

DATA CHANNEL PARAMETER

The data channel parameters need to be set in the BiSS master configuration to access this slaves single cycle data (SCD).

Transmission direction and type	SCDS (Single Cycle Data Sensor)
Number of bits	DL DL = DL_POS (position data bits) + 2 bit (feedback bits), with condition C = 0
Stop bit	1
Processing time	Defined in the EDS BiSS Interface - BiSS_EDS_common_part: TBUSY_S and BUSY_S
Data alignment	right-justified (MT is right-justified with leading zero bits) (ST is left-justified with trailing zero bits)
CRC polynomial	0x43 = $X^6 + X^1 + X^0$, with condition C = 0
CRC start value	0x00

ELECTRONIC DATA SHEET DEFINITION BP3

The profile EDS contains, depending on the BiSS profile, required information about data transmission, product and process relevant information for the motion control system. Hereto belong mechanical data, accuracy, structure of position words and product attributes. The specification of the first part of the EDS, the BiSS EDS (common) part, is located in the applied BiSS EDS (common part) document.

Adr.	Symbol	Description	Group	Format	Unit	Values
0x00	BP_VER	BiSS Profile 3 Version	ORGA	U8	-	1
0x01	BP_LEN	Length of this profile	ORGA	U8	Banks	1
0x02 0x03	BP_ID	Profile identification BP3 (content also available in address 0x42 and 0x43)	ORGA	U8 U8	- -	0x62 = DL = 1 . . . 57
0x04	FB1	Feedback bit 1 low active error status nE	ORGA	U8	Table B	1
0x05	FB2	Feedback bit 2 low active warning status nW	ORGA	U8	Table B	2
0x06	PON_PDL	Maximum "power on delay" until position data are available	TIMING	U8	ms	1 . . . 254
0x07		Reserved				
0x08	EN_TYP	Encoder type	ORGA	U8	Table T	0 . . . 1
0x09	POS_NUM	Position value	SAFETY	U8	Table N	1 . . . 2
0x0A	MT_LEN	Data length MULTITURN	ORGA	U8	bit	0 . . . 57
0x0B	MT_FMT	Data format MULTITURN	MEAS	U8	Table F	0 . . . 1
0x0C	CO_LEN	Data length COARSE	ORGA	U8	bit	0 . . . 57
0x0D	CO_FMT	Data format COARSE	MEAS	U8	Table F	0 . . . 1
0x0E	FI_LEN	Data length FINE	ORGA	U8	bit	0 . . . 57
0x0F	FI_FMT	Data format FINE	MEAS	U8	Table F	0 . . . 1
0x10 0x11 0x12 0x13	MT_CNT	Number of distinguishable revolutions/ periods	MEAS	U32 [1)]	-	1 . . . 2^{32}-2
0x14 0x15 0x16 0x17	SIP_CNT	Number of signal periods per revolution/ length of signal period	MEAS	U32 [1)]	PPR (rotary) nm (linear)	1 . . . 2^{32}-2
0x18 0x19 0x1A 0x1B	SIP_RES	resolution factor per signal period (LSB of the interpolation)	MEAS	U32 [1)]	LSB	1 . . . 2^{32}-2
0x1C 0x1D 0x1E 0x1F	CPOLY	CRC polynomial (32:1) [2)]	ORGA	U32 [1)]	-	0x21 . . .
0x20 0x21 0x22 0x23	CSTART	CRC start value[3)]	ORGA	U32 [1)]	-	0
0x24 0x25	ABS_ACU	Absolute accuracy	MEAS	U16 [1)]	LSB/2 µm	1 . . . 2^{16}-2
0x26 0x27	REL_ACU	Repeat accuracy	MEAS	U16 [1)]	LSB/2	1 . . . 2^{16}-2

0x28 0x29	SPD_ACU	Angular speed/ speed depending accuracy	MEAS	U16 [1)]	LSB/2	1 . . . 2^{16}-2
0x2A 0x2B	HYST	Hysteresis	MEAS	U16 [1)]	LSB/2	1 . . . 2^{16}-2
0x2C 0x2D	SPD_MAX	Maximum revolution speed/ maximum speed	MECH	U16 [1)]	1/min m/min	1 . . . 2^{16}-2
0x2E 0x2F	ACC_MAX	Maximum angular accelleration/ maximum acceleration	MECH	U16 [1)]	1/min^2 m/min^2	1 . . . 2^{16}-2
0x30 0x31	TMP_MIN	Minimum operating temperature	MECH	U16 [1)]	K	1 . . . 2^{16}-2
0x32 0x33	TMP_MAX	Maximum operating temperature	MECH	U16 [1)]	K	1 . . . 2^{16}-2
0x34 0x35	VLT_MIN	Minimum operating voltage	ELEC	U16 [1)]	mV	1 . . . 2^{16}-2
0x36 0x37	VLT_MAX	Maximum operating voltage	ELEC	U16 [1)]	mV	1 . . . 2^{16}-2
0x38 0x39	CUR_MAX	Maximum current consumption	ELEC	U16 [1)]	mA	1 . . . 2^{16}-2
0x3A . . . 0x39		Reserved				
0x3F	CHKSUM	Checksum (sum of bytes in 0x00 . . . 0x3E)	ORGA	U8	-	0 . . . 255

Table 8: EDS for BP3 address mapping

[1)] The U32 and U16 values are saved as a Big Endian, i.e. with the highest-value byte at the lowest-value address.
[2)] The CRC is located 32:1 as least significant bit is on active CRC checking always 1.
[3)] The CRC start value range is limited by the BiSS Safety Profile Definition.

Table B	Addr. . . . ; bit . . .	R
0x00	No function, any value possible	
0x01	Error bit, low active (nE)	
0x02	Warning bit, low active (nW)	

Table 9: Functions of Feedback Bits

Table F	Addr. . . . ; bit . . .	R
0x00	Right-aligned	
0x01	Left-aligned	

Table 10: Data Format

Table T	Addr. . . . ; bit . . .	R
0x00	Rotary encoder	
0x01	Linear encoder	

Table 11: Encoder Type

Table N	Addr. . . . ; bit . . .	R
0x00	Position value not defined	
0x01	Position value 1	
0x02	Position value 2	

Table 12: Position Value

A Control Position Word (CPW) content of the position values is not restricted. The CPW may be position value 1 or position value 2.

REVISION HISTORY

Rel.	Rel. Date*	Chapter	Modification	Page
A1	2015-01-01	All	Initial release	all

Rel.	Rel. Date*	Chapter	Modification	Page
A2	2015-02-02	BiSS PROFILE BP3 IDENTIFIER SCHEME	EDS definition, not only EDS BP3	3
		ELECTRONIC DATA SHEET DEFINITION BP3	Added Note: Big Endian for U16, U32	4, 5
			CPOLY = 0x21 CPOLY = 0x8810	4, 5, 7, 9, 11
		EXAMPLE III EDS BP3 CONFORM: ROTARY ENCODER	FBx: error(nE) = 1; warning(nW) = 2	7, 9
		EXAMPLE IV EDS BP3 CONFORM: LINEAR ENCODER	Example IV added	13

Rel.	Rel. Date*	Chapter	Modification	Page
A3	2017-11-24	DESCRIPTION		2
		ELECTRONIC DATA SHEET DEFINITION BP3	Meas replaces Mess	5, 6
		ELECTRONIC DATA SHEET DEFINITION BP3	Table values / ranges updated following definitions of BiSS and BP3.	5, 6
		EXAMPLE I EDS BP3 CONFORM: LINEAR ENCODER	Example moved to BiSS AN application note	7, 8
		EXAMPLE II EDS BP3 CONFORM: LINEAR ENCODER	Example moved to BiSS AN application note	9, 10
		EXAMPLE III EDS BP3 CONFORM: ROTARY ENCODER	Example moved to BiSS AN application note	11, 12
		EXAMPLE IV EDS BP3 CONFORM: LINEAR ENCODER	Example moved to BiSS AN application note	13, 14
		All	Minor text updates	all
		All	BP3S and BiSS Safety information added	all

* Release Date format: *YYYY-MM-DD*