

BP3S

SAFETY ENCODER PROFILE

FEATURES

- ◆ BiSS Safety Encoder
- ◆ Safety Position Word (SPW) related information
- ◆ Linear and rotary encoder
- ◆ Compatibility within a group
- ◆ Combinable with BP1 and BP3
- ◆ Standardized data format
- ◆ Simple control configuration
- ◆ EDS definition for this profile

APPLICATIONS

- ◆ Fast and simple motion controller configuration
- ◆ Intelligent absolute rotary safety encoder
- ◆ Intelligent absolute linear safety encoder
- ◆ BiSS Safety applications
- ◆ Safety relevant applications

BLOCK DIAGRAM



DESCRIPTION

This document describes the profile definition of the BiSS Safety Encoder Profile BP3S 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 BP3S 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 Safety Encoder Profile BP3S 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, warning and Sign-Of-Life counter information.

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 SPW position is 1 ... 40 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.

Sign-Of-Life Counter

With every SCD cycle the Sign-Of-Life counter(LC) counter is incremented. An overflow of the LC counter results in counter value 0x01.

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.

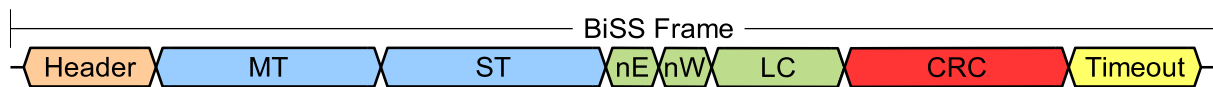


Figure 1: Data format BP3S (no error)

Definitions

MT	Multiturn
ST	Singleturn
nE	Error bit (low active)
nW	Warning bit (low active)
LC	Sign-Of-Life counter

DL_POS	Position data length MT + ST (1 ... 40 bit)
DL	Total length of the data channel
ID	Identifier
VER	Version
CRC	Cyclic redundancy check

BP3S

SAFETY ENCODER PROFILE



Rev A1, Page 3/7

IDENTIFIER SCHEME: BiSS PROFILE BP3S

OVERVIEW								
Addr	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Definition BP3S 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 BP3S identifier								
0x42	0	1	1	1	VER			C
0x43	0	DL						

Table 2: Register layout

ID	Addr. 0x42; bit 7:4	R
0b0111	Identifier 0b0111 = 0x07 for BiSS Safety Absolute Encoder Profile BP3S	

Table 3: Identifier

VER	Addr. 0x42; bit 3:1	R
0x0	Not allowed	
0x1	Version 1 (current Version)	
0x2	Reserved for updated versions of BP3S	
... 0x7		

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	
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 ... 0x17	Not allowed	
0x18 ... 0x40	Data length DL with CRC, with condition C = 1	

Table 6: Data Length

LC(5:0)	R
0 ... 1	Counter value after power up depends on the used device and it's definition
0x1	After 0x3F or 0x00, next is 0x02
0x2	After 0x01, next is 0x03
0x3	After 0x02, next is 0x04
...	Counting LC(i+1) = LC(i) + 1
0x3D	After 0x3C, next is 0x3E
0x3E	After 0x3D, next is 0x3F
0x3F	After 0x3E, next code depends on the used device and it's definition

Table 7: Sign-Of-Life Counter

BP3S

SAFETY ENCODER PROFILE



Rev A1, Page 4/7

DATA CHANNEL PARAMETER

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

Transmission direction and type	SCDS (Single Cycle Data Sensor)
Number of bits	DL DL = DL_POS + 2(feedback bits) + 6(LC bits) + 16(CRC bits), with condition C = 1
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	$0x190D9 = X^{16} + X^{15} + X^{12} + X^7 + X^6 + X^4 + X^3 + X^0$, with condition C = 1
CRC start value	0x00 The CRC start value range is limited by the BiSS Safety Profile Definition.

BP3S

SAFETY ENCODER PROFILE

ELECTRONIC DATA SHEET: DEFINITIONS FOR BP3S

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 BP3S Version	ORGA	U8	-	1
0x01	BP_LEN	Length of this profile	ORGA	U8	Banks	1
0x02	BP_ID	Profile identification BP3S (content also available in address 0x42 and 0x43)	ORGA	U8	-	0x83
0x03				U8	-	25 ... 64
0x04	FB1	Feedback bit 1 low active error status nE	ORGA	U8	Table B	1
0x05	FB2...8	Feedback bit 2...8: low active warning status nW, sign-of-life counter LC(5:0)	ORGA	U8	Table B	5
0x06	PON_PDL	Maximum "power on delay" until position data are available	TIMING	U8	ms	1 ... 254
0x07		Reserved		U8		
0x08	EN_TYP	Encoder type	ORGA	U8	Table T	0 ... 1
0x09	POS_NUM	Position value 2 (SPW)	SAFETY	U8	Table N	1 ... 2
0x0A	MT_LEN	Data length MULTITURN	ORGA	U8	bit	0 ... 64
0x0B	MT_FMT	Data format MULTITURN	MEAS	U8	Table F	0 ... 1
0x0C	CO_LEN	Data length COARSE	ORGA	U8	bit	0 ... 64
0x0D	CO_FMT	Data format COARSE	MEAS	U8	Table F	0 ... 1
0x0E	FI_LEN	Data length FINE	ORGA	U8	bit	0 ... 64
0x0F	FI_FMT	Data format FINE	MEAS	U8	Table F	0 ... 1
0x10	MT_CNT	Number of distinguishable revolutions/ periods	MEAS	U32 ¹⁾	-	1 ...
0x11						2 ³² -2
0x12						
0x13						
0x14	SIP_CNT	Number of signal periods per revolution/length of signal period	MEAS	U32 ¹⁾	PPR (rotary) nm (linear)	1 ...
0x15						2 ³² -2
0x16						
0x17						
0x18	SIP_RES	Resolution factor per signal period (LSB of the interpolation)	MEAS	U32 ¹⁾	LSB	1 ...
0x19						2 ³² -2
0x1A						
0x1B						
0x1C	CPOLY	CRC polynomial (32:1) ²⁾	ORGA	U32 ¹⁾	-	0xC86C
0x1D						
0x1E						
0x1F						
0x20	CSTART	CRC start value ³⁾	ORGA	U32 ¹⁾	-	0
0x21						
0x22						
0x23						
0x24	ABS_ACU	Absolute accuracy	MEAS	U16 ¹⁾	LSB/2 µm	1 ... 2 ¹⁶ -2
0x25						

BP3S

SAFETY ENCODER PROFILE

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 acceleration/ 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 - 0x3E		Reserved		U8	-	0
0x3F	CHKSUM	Checksum (addition of all bytes in this bank)	Orga	U8	-	0 ... 255

Table 9: 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
0x01	Error bit nE(0), low active	
0x05	Warning bit nW(0), low active; Sign-Of-Life bits, LC(5:0)	

Table 10: Functions of Feedback Bits

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

Table 12: Encoder Type

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

Table 11: Data Format

Table N	Addr. ...; bit ...	R
0x02	Position value 2 SPW	

Table 13: Position Value

A SPW content of the position values is not restricted.
 The SPW may be position value 2 or position value 1.

BP3S

SAFETY ENCODER PROFILE



Rev A1, Page 7/7

REVISION HISTORY

Rel.	Rel. Date*	Chapter	Modification	Page
A1	2017-11-23	all	Initial release	

iC-Haus expressly reserves the right to change its protocols and/or specifications. An Infoletter gives details as to any amendments and additions made to the relevant current specifications on our internet websites www.ichaus.com/infoletter and www.BiSS-Interface.com/ and is automatically generated and shall be sent to registered users by email. Copying - even as an excerpt - is only permitted with iC-Haus' approval in writing and precise reference to source.

The data specified is intended solely for the purpose of description and shall represent the usual quality of the protocols. In case the specifications contain obvious mistakes e.g. in writing or calculation, iC-Haus reserves the right to correct the specification and no liability arises insofar that the specification was from a third party view obviously not reliable. There shall be no claims based on defects as to quality in cases of insignificant deviations from the specifications or in case of only minor impairment of usability. No representations or warranties, either expressed or implied, of merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to information/specification or the protocols to which information refers and no guarantee with respect to compliance to the intended use is given. In particular, this also applies to the stated possible applications or areas of applications of the protocols. iC-Haus conveys no patent, copyright, mask work right or other trade mark right to those protocols. iC-Haus assumes no liability for any patent and/or other trade mark rights of a third party resulting from processing or handling of the protocols and/or any other use of the protocols. The protocols and their documentation is provided by iC-Haus GmbH or contributors "AS IS" and is subject to the ZVEI General Conditions for the Supply of Products and Services with iC-Haus amendments and the ZVEI Software clause with iC-Haus amendments (www.ichaus.com/EULA).

The protocols described here are multifunctional BiSS interface protocols. The BiSS protocols are protected by patents and registered trademarks owned by iC-Haus GmbH and its application requires the conclusion of a license (free of charge). BiSS is protected by the German process patent DE 10310622 B4 (BiSS C Patent) of iC-Haus GmbH (Licensor), Am Kuemmerling 18, 55294 Bodenheim, Germany. The BiSS Line protocol is protected by patents and further patents pending of the Licensor. Request or download the license at www.biss-interface.com/. The Licensor grants to Licensee a License to use produced for the application of the BiSS C interface and the the BiSS Line interface. A annihilation or revocation of the BiSS C Patent or the BiSS Line Patent does not constitute claims of the User. With termination of the License the permission of the Licensee to use the invention protected by the BiSS Patents expires. Any further liability for legal defects is excluded. Governing law is solely and exclusively German law. Regarding all disputes arising in connection with this agreement or its validity the courts at Düsseldorf/Germany have got exclusive jurisdiction, if the Licensee is a merchant, a juridical person governed by public law or a public special property with domicile respectively registered office in Germany. Furthermore the courts at Düsseldorf/Germany have got exclusive jurisdiction, if the Licensee has got his domicile respectively registered office outside Germany.

* Release Date format: YYYY-MM-DD