PAS4000 Software functions/functionblocks for Standard Part

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Product

Type:	PAS4000
Name:	Software function/-blocks for Standard Part
Manufacturer:	Pilz GmbH & Co. KG, Safe Automation

Document

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Release Date:	31 May 2019

Document Revision History

Release	Date	Changes	Chapter
01	2016-11-25	Creation	all
02	2019-05-31	Editorial	2

Validity of Application Note

This present Application Note is valid until a new version of the document is published.
This and other Application Notes can be downloaded in the latest version and for free from www.pilz.com.
For a simple search, use our content document (1002400) or the direct search function in the download area.

Exclusion of liability

We have taken great care in compiling our application note. It contains information about our company and our products. All statements are made in accordance with the current status of technology and to the best of our knowledge and belief.
While every effort has been made to ensure the information provided is accurate, we cannot accept liability for the accuracy and entirety of the information provided, except in the case of gross negligence. In particular, all information on applicable standards, safety-related classifications and time characteristics should be viewed as provisional. In particular it should be noted that statements do not have the legal quality of assurances or assured properties.
We are grateful for any feedback on the contents.

May 2019

Abbreviations

Abbreviation / term	Description	Source
AN	**A**pplication **N**ote	www.pilz.com > AN content (1002400)
PNOZ	Pilz E-STOP positive-guided (DE: **P**ilz **NO**T-AUS-**Z**wangsgeführt)	www.pilz.com > PNOZ
PSS	Programmable control system (DE: **P**rogrammierbares **S**teuerungs**s**ystem)	www.pilz.com > PSS
PSS u2	**PSS**universal, **2**nd generation	www.pilz.com > PSS u2
POU	**P**rogram **O**rganisation **U**nit	
NC	**N**ormally **C**losed	
NO	**N**ormally **O**pen	
.par	**P**ilz **Ar**chive	
LSB	**L**east **S**ignificant **B**it	
MSB	**M**ost **S**ignificant **B**it	

Definition of symbols

- Information that is particularly important is identified as follows:

CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.

NOTICE

This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken.
It also highlights areas within the text that are of particular importance.

INFORMATION

This gives advice on applications and provides information on special features.

Contents

1. Useful documentation

Reading the documentation listed below is necessary for understanding this Application Note. The availability of the indicated tools and safe handling are also presupposed with the user.

1.1. Documentation from Pilz GmbH & Co. KG

No.	Description	Item No. /Download
1	Pilz international homepage, download section	www.pilz.com

2. Introduction

This application note provides the description on a number of functions and function blocks which may be useful for writing applications for the Pilz Automation System PSS4000 using the programming tool PAS4000.

CAUTION!

The blocks are intended to be used in the standard part of the PSS4000 automation system.
The use of these functions/functionblocks or code fragments (snippets) of them for another PLC system can lead to other behaviors.

Please make sure that you are using the latest version of the application note and the PAS4000 project with the function/-blocks. Alternatively, download the latest versions from the PILZ website:

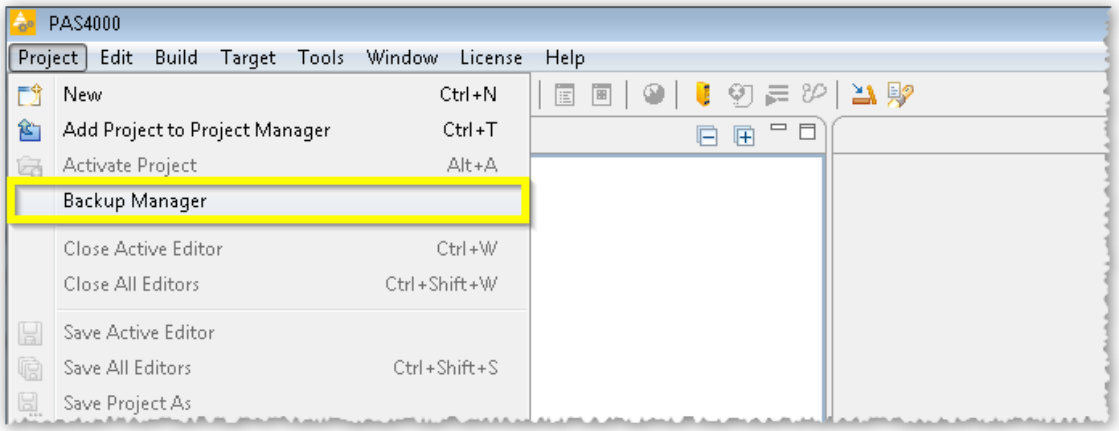
Link to this application note on the PILZ website

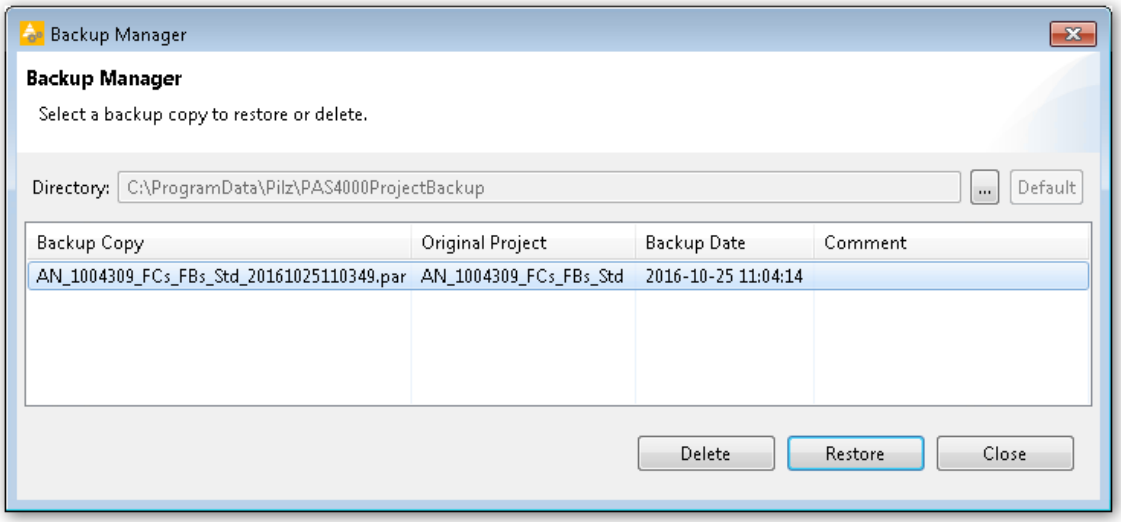
2.1. Opening the PAS4000 Project

The PASS4000 Project is stored as a backup copy. This is a single file with the extension *.par (**P**ilz **Ar**chive).

To make a backup copy available in the Project Manager, follow the instructions below:

1. Copy the backup copy into the directory stated as the target directory in ***Tools → Tool Settings*** under ***General, Backup Manager***.
2. Select ***Project → Backup Manager*** and select the required backup copy.

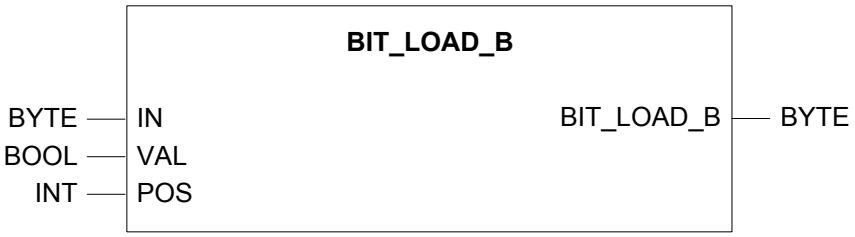




3. Logical bit operations

3.1. BIT_LOAD_B

3.1.1. Schematic representation



3.1.2. Input Interface

Variable	Datatype	Value range	Comment
IN	BYTE	0..255	Input
VAL	BOOL	TRUE/FALSE	Value of the bit to load
POS	INT	0..7	Position of the bit to load.
		< 0	Value must not be less than zero, otherwise there is a runtime error (task enters the STOP state).
		> 7	The output of the function corresponds to IN

3.1.3. Output Interface

Variable	Type	Value range	Comment
BIT_LOAD_B	BYTE	0..255	Output

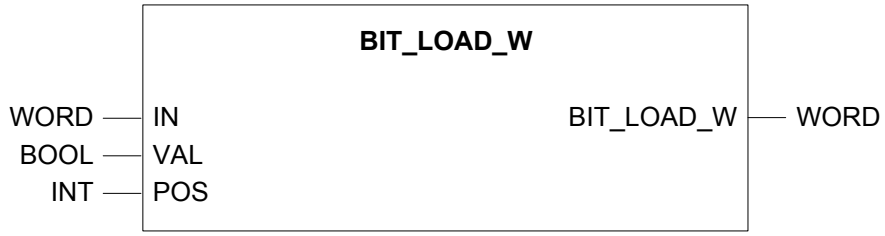
3.1.4. Description

Typname: BIT_LOAD_B
Block type: Function

BIT_LOAD_B copies the bit signal at VAL to the position POS in byte IN. The least significant bit is denoted of 0.

3.2. BIT_LOAD_W

3.2.1. Schematic representation



3.2.2. Input Interface

Variable	Datatype	Value range	Comment
IN	WORD	$0..2^{16}-1$	Input
VAL	BOOL	TRUE/FALSE	Value of the bit to load
POS	INT	0..15	Position of the bit to load
		< 0	Value must not be less than zero, otherwise there is a runtime error (task enters the STOP state).
		> 15	The output of the function corresponds to IN

3.2.3. Output Interface

Variable	Type	Value range	Comment
BIT_LOAD_W	WORD	$0..2^{16}-1$	Output

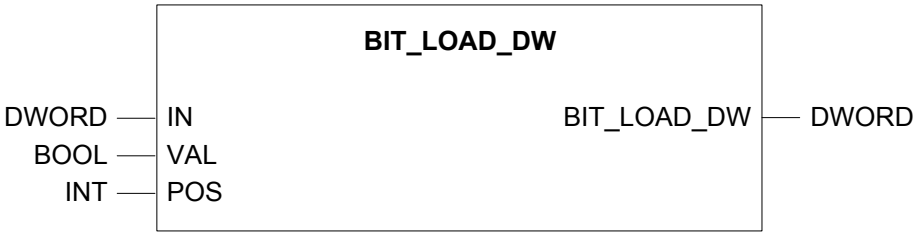
3.2.4. Description

Typname: BIT_LOAD_W
Block type: Function

BIT_LOAD_W copies the bit signal at VAL to the position POS in word IN. The least significant bit is denoted of 0.

3.3. BIT_LOAD_DW

3.3.1. Schematic representation



3.3.2. Input Interface

Variable	Datatype	Value range	Comment
IN	DWORD	$0..2^{32}-1$	Input
VAL	BOOL	TRUE/FALSE	Value of the bit to load
POS	INT	0..31	Position of the bit to load
		< 0	Value must not be less than zero, otherwise there is a runtime error (task enters the STOP state).
		> 31	The output of the function corresponds to IN

3.3.3. Output Interface

Variable	Type	Value range	Comment
BIT_LOAD_DW	DWORD	$0..2^{32}-1$	Output

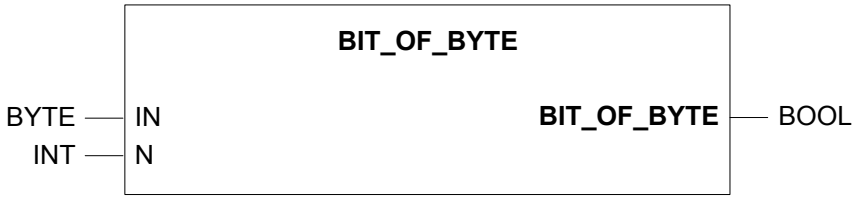
3.3.4. Description

Typname: BIT_LOAD_DW
Block type: Function

BIT_LOAD_DW copies the bit signal at VAL to the position POS in word IN. The least significant bit is denoted of 0.

3.4. BIT_OF_BYTE

3.4.1. Schematic representation



3.4.2. Input Interface

Variable	Datatype	Value range	Comment
IN	BYTE	0..255	Input
N	INT	0..7	Position of the bit value to return
		< 0	Value must not be less than zero, otherwise there is a runtime error (task enters the STOP state).
		> 7	The output of the function is FALSE

3.4.3. Output Interface

Variable	Type	Value range	Comment
BIT_OF_BYTE	BOOL	TRUE/FALSE	Output

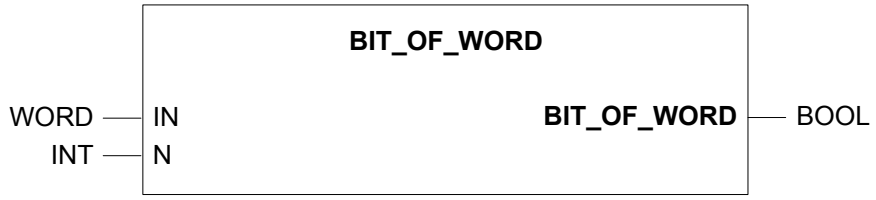
3.4.4. Description

Typname: BIT_OF_BYTE
Block type: Function

BIT_OF_BYTE extracts a single bit from the N-th position from right (right is least significant bit). The least significant bit (Bit 0 from IN) is selected with N=0.

3.5. BIT_OF_WORD

3.5.1. Schematic representation



3.5.2. Input Interface

Variable	Datatype	Value range	Comment
IN	WORD	$0..2^{16}-1$	Input
N	INT	0..15	Position of the bit value to return
		< 0	Value must not be less than zero, otherwise there is a runtime error (task enters the STOP state).
		> 15	The output of the function is FALSE

3.5.3. Output Interface

Variable	Type	Value range	Comment
BIT_OF_WORD	BOOL	TRUE/FALSE	Output

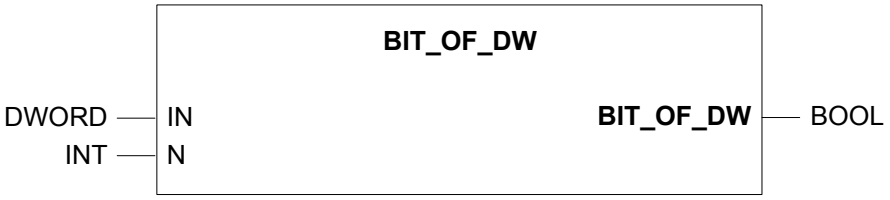
3.5.4. Description

Typname: BIT_OF_WORD
Block type: Function

BIT_OF_WORD extracts a single bit from the N-th position from right (right is least significant bit). The least significant bit (Bit 0 from IN) is selected with N=0.

3.6. BIT_OF_DW

3.6.1. Schematic representation



3.6.2. Input Interface

Variable	Datatype	Value range	Comment
IN	DWORD	$0..2^{32}-1$	Input
N	INT	0..31	Position of the bit value to return
		< 0	Value must not be less than zero, otherwise there is a runtime error (task enters the STOP state).
		> 31	The output of the function is FALSE

3.6.3. Output Interface

Variable	Type	Value range	Comment
BIT_OF_DW	BOOL	TRUE/FALSE	Output

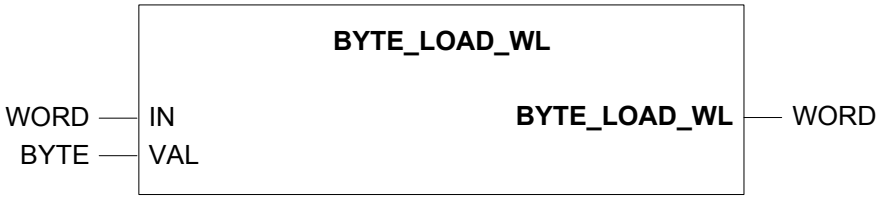
3.6.4. Description

Typname: BIT_OF_DW
Block type: Function

BIT_OF_DW extracts a single bit from the N-th position from right (right is least significant bit). The least significant bit (Bit 0 from IN) is selected with N=0.

3.7. BYTE_LOAD_WL

3.7.1. Schematic representation



3.7.2. Input Interface

Variable	Datatype	Value range	Comment
IN	WORD	$0..2^{16}-1$	Input word where the high byte has to be set
VAL	BYTE	0..255	Value of the byte to be written into the left byte of the input word

3.7.3. Output Interface

Variable	Type	Value range	Comment
BYTE_LOAD_WL	WORD	$0..2^{16}-1$	Output

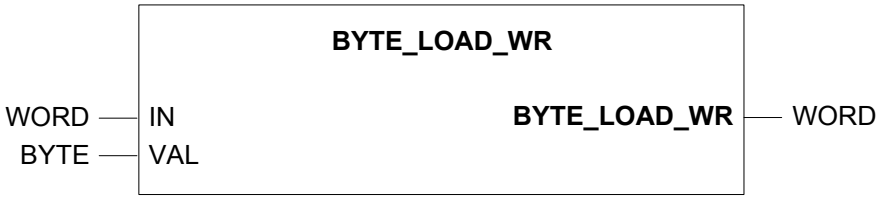
3.7.4. Description

Typname: BYTE_LOAD_WL
Block type: Function

Function to load a byte (VAL) into the left part (high byte) of the word (IN). The right part of the word (IN) remains unchanged.

3.8. BYTE_LOAD_WR

3.8.1. Schematic representation



3.8.2. Input Interface

Variable	Datatype	Value range	Comment
IN	WORD	$0..2^{16}-1$	Input word where the low byte has to be set
VAL	BYTE	0..255	Value of the byte to be written into the right byte of the input word

3.8.3. Output Interface

Variable	Type	Value range	Comment
BYTE_LOAD_WR	WORD	$0..2^{16}-1$	Output

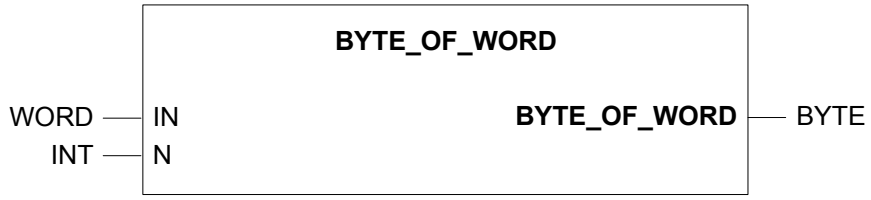
3.8.4. Description

Typname: BYTE_LOAD_WR
Block type: Function

Function to load a byte (VAL) into the right part (low byte) of the word (IN). The left part of the word (IN) remains unchanged.

3.9. BYTE_OF_WORD

3.9.1. Schematic representation



3.9.2. Input Interface

Variable	Datatype	Value range	Comment
IN	WORD	$0..2^{16}-1$	Input word from which a byte has to be read
N	BYTE	0..8	Position of the least significant bit of the wanted byte in the input word IN. Position counting starts with zero from the least significant bit of IN.
		< 0	Value must not be less than zero, otherwise there is a runtime error (task enters the STOP state).
		> 8	The output of the function will be affected due to the inserted null values.

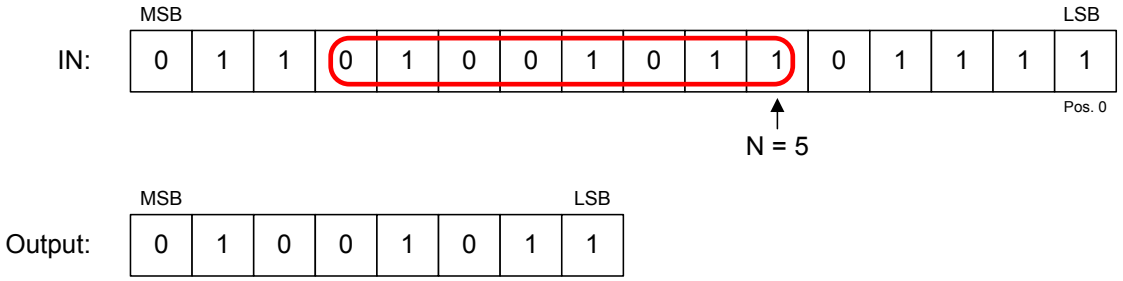
3.9.3. Output Interface

Variable	Type	Value range	Comment
BYTE_OF_WORD	BYTE	0..255	Output

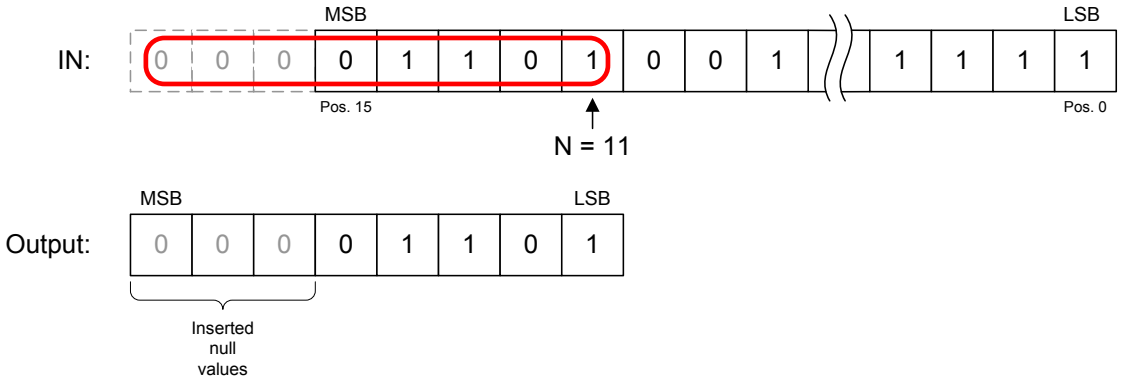
3.9.4. Description

Typname: BYTE_OF_WORD
Block type: Function

Function for reading out one byte at a particular position (N) of a word (IN).

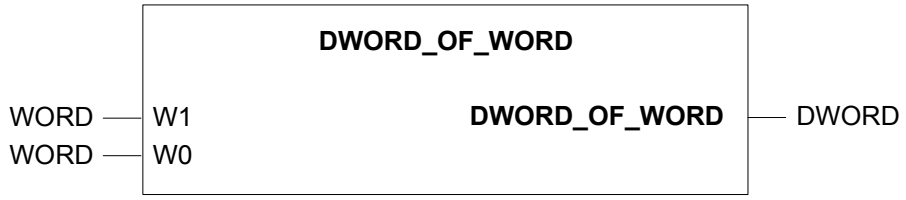


For N greater than 8, the result is impaired due inserted null values.



3.10. DWORD_OF_WORD

3.10.1. Schematic representation



3.10.2. Input Interface

Variable	Datatype	Value range	Comment
W1	WORD	$0..2^{16}-1$	Input word 1 for the position of high word
W0	WORD	$0..2^{16}-1$	Input word 0 for the position of low word

3.10.3. Output Interface

Variable	Type	Value range	Comment
DWORD_OF_WORD	DWORD	$0..2^{32}-1$	Output

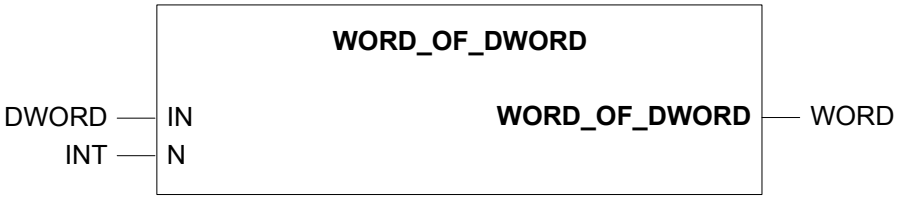
3.10.4. Description

Typname: DWORD_OF_WORD
Block type: Function

Function combines two words W1 and W0 into a double word. Value for W1 takes position of the high word, value for W0 takes position of the low word.

3.11. WORD_OF_DWORD

3.11.1. Schematic representation



3.11.2. Input Interface

Variable	Datatype	Value range	Comment
IN	DWORD	$0..2^{32}-1$	Input double word from which a word has to be read
N	BYTE	0..16	Position of the byte
		< 0	Value must not be less than zero, otherwise there is a runtime error (task enters the STOP state).
		> 16	The output of the function will be affected due to the inserted null values.

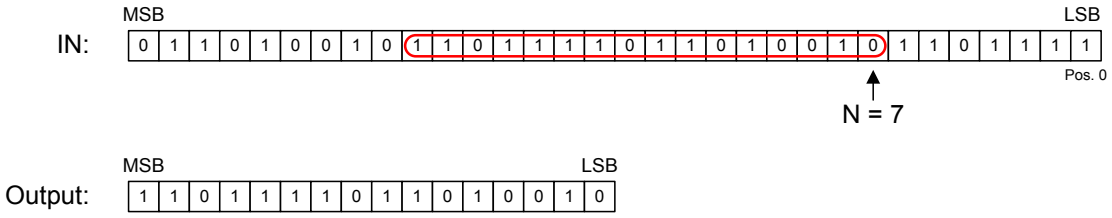
3.11.3. Output Interface

Variable	Type	Value range	Comment
WORD_OF_DWORD	WORD	$0..2^{16}-1$	Output

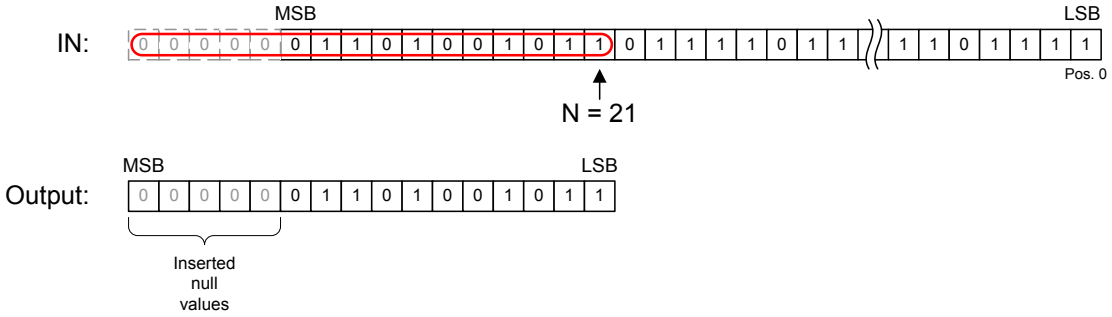
3.11.4. Description

Typname: WORD_OF_DWORD
Block type: Function

Function for reading out one word at a particular position (N) of a double word (IN).

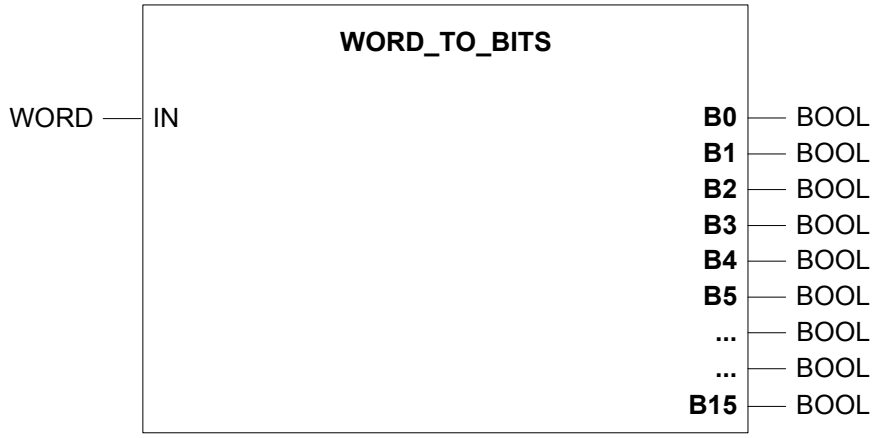


For N greater than 16, the result is impaired due inserted null values



3.12. WORD_TO_BITS

3.12.1. Schematic representation



3.12.2. Input Interface

Variable	Datatype	Value range	Comment
IN	WORD	$0..2^{16}-1$	Input word that is decomposed into bits

3.12.3. Output Interface

Variable	Type	Value range	Comment
WORD_TO_BITS	BOOL	TRUE	n/a (always TRUE)
B0 … B15	BOOL	TRUE/FALSE	Value of the bit. B0 represents the significance of 2^0 of IN, B1 represents the significance of 2^1 of IN etc.

3.12.4. Description

Typname: WORD_TO_BITS
Block type: Function

Function to separate a word into its individual bits.

Support

Technical support is available from Pilz round the clock.

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Energy saving by Pilz

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