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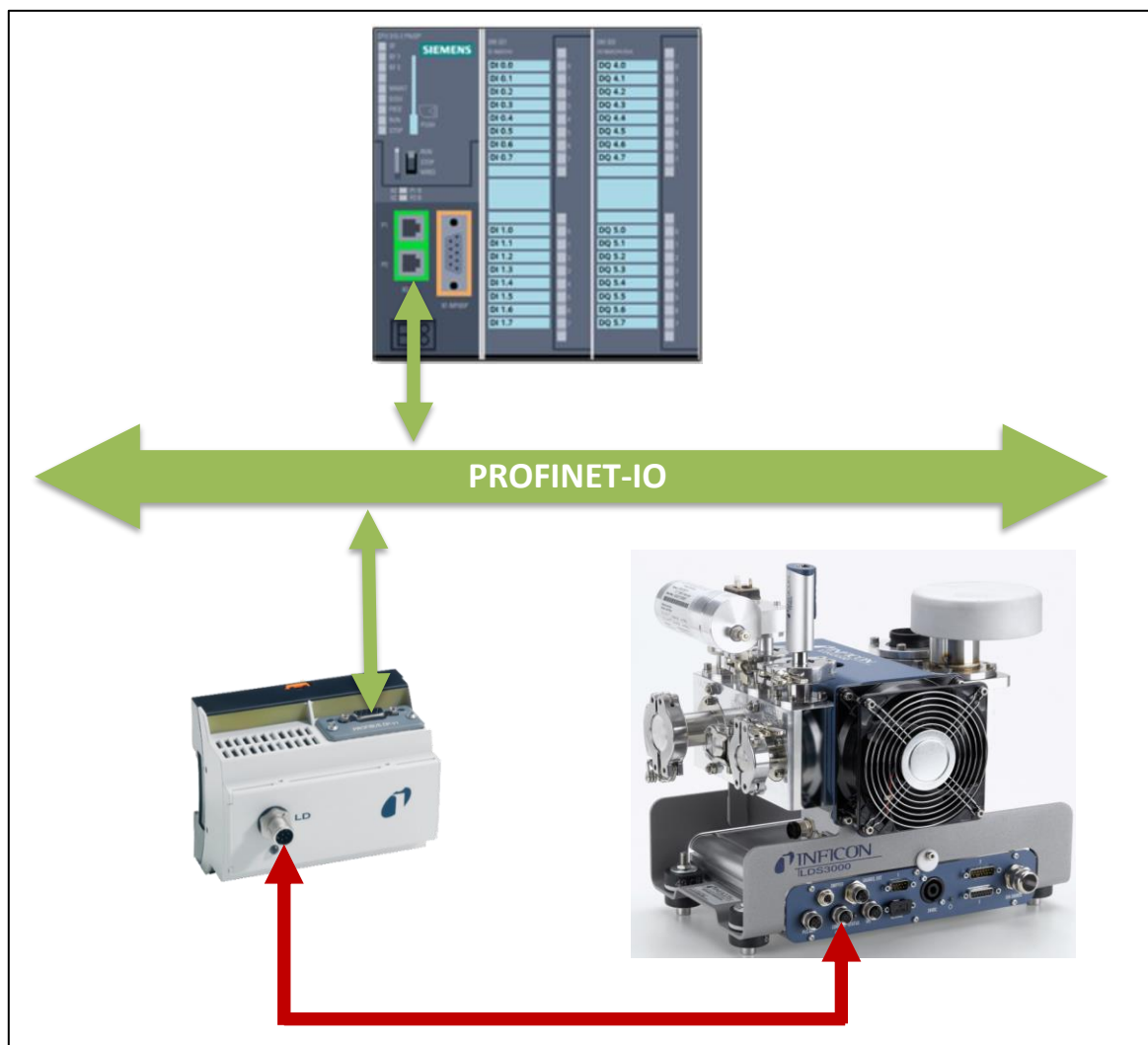
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May 2023

# LDS3000 platform – BM1000

## PROFINET-IO configuration with

### SIMATIC STEP 7 V5.5



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## 1 Preface

In order to use PROFINET-IO fieldbus communication, an INFICON Bus-Module BM1000 PROFINET-IO need to be connected to the I/O port of the Leak Detector.

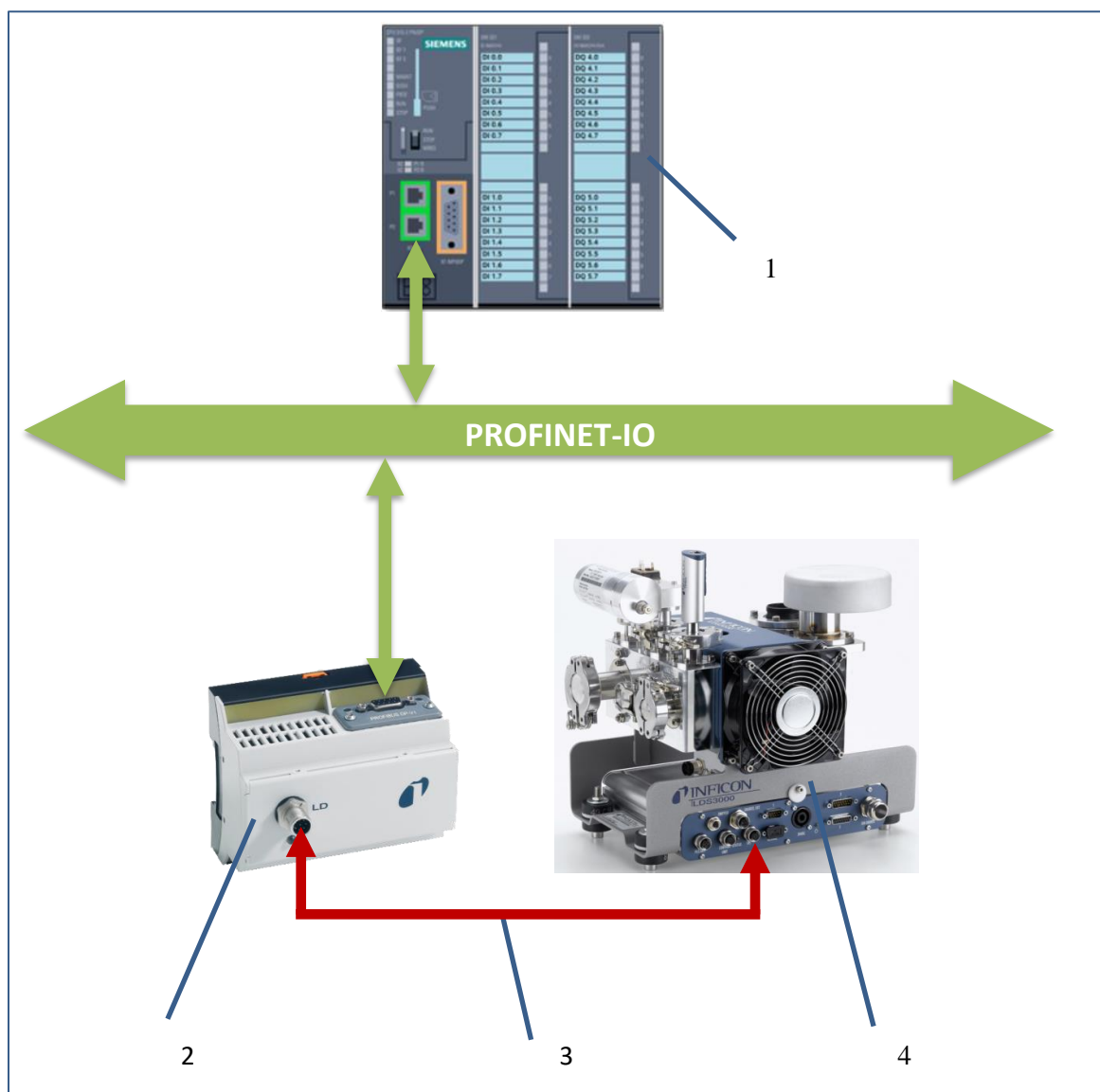


Figure 1 PROFINET-IO overview

POS	Catalog number	
1	PROFINET-IO Master (e.g. S7-300)	---
2	BM1000 PROFINET-IO Module	560-316 BM1000 PROFINET-IO module
3	Data Cable	560-332 Data Cable 2 m 560-335 Data Cable 5 m 560-340 Data Cable 10 m
4	Leak Detector (e.g. LDS3000)	560-300

Fieldbus systems normally support device-specific configuration files e.g. GSD files for the PROFINET-IO field bus system.

The appropriate configuration files will be found on the USB memory stick which is supplied with your Leak Detector.

**\\LDS3000(AQ)-Documentation-Vxx\Manuals\LDS3000 Interface Description\Profinet\GSD INFICON Profile**

**xx = version number**

The LDS3000 platform contains the following devices:

POS		Catalog number
<b>1</b>	LDS3000	560-300
<b>2</b>	LDS3000 XL	560-300 560-319
<b>3</b>	LDS3000 AQ	560-600
<b>4</b>	XL3000flex	520-200

This manual is valid for all the devices listed above.

This manual is based on the following version numbers:

POS		Version
<b>1</b>	LDS3000	MSB 2.72 or higher
<b>2</b>	CU1000	2.72 or higher
<b>3</b>	BM1000 PROFINET-IO	
<b>4</b>	LDS3000 Protocol Description	jira54en1-07 (1803)
<b>5</b>	SIMATIC Step 7	V5.5

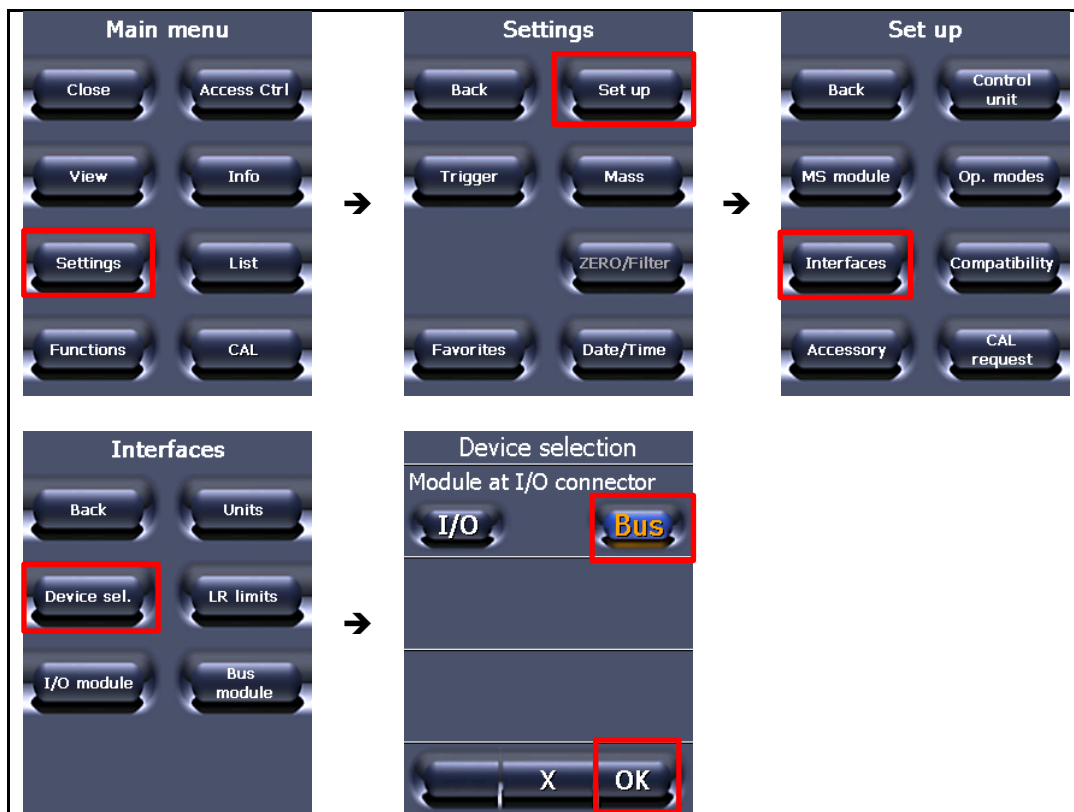
If one of the devices are used listed in the above table with the described software version or higher all explained functions in this document should be possible.

## 2 Set up BM1000 PROFINET-IO configuration of the LDS3000 platform

In order to set up the PROFINET-IO configuration a CU1000 control unit is required.

### 2.1 Set up BM1000 Bus interface

In order to activate the BM1000 Bus communication, the module at the I/O connector needs to be set to "**Bus**"



## 2.2 Set up the BM1000 PROFINET-IO address

### Attention:

The BM1000 PROFINET-IO IP address can only be set with the SIMATIC Step7 hardware configuration tool. It is not possible to set or change the IP address via the CU1000!

Please look at chapter **Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden.**

## 2.3 Set up the BM1000 field bus profile

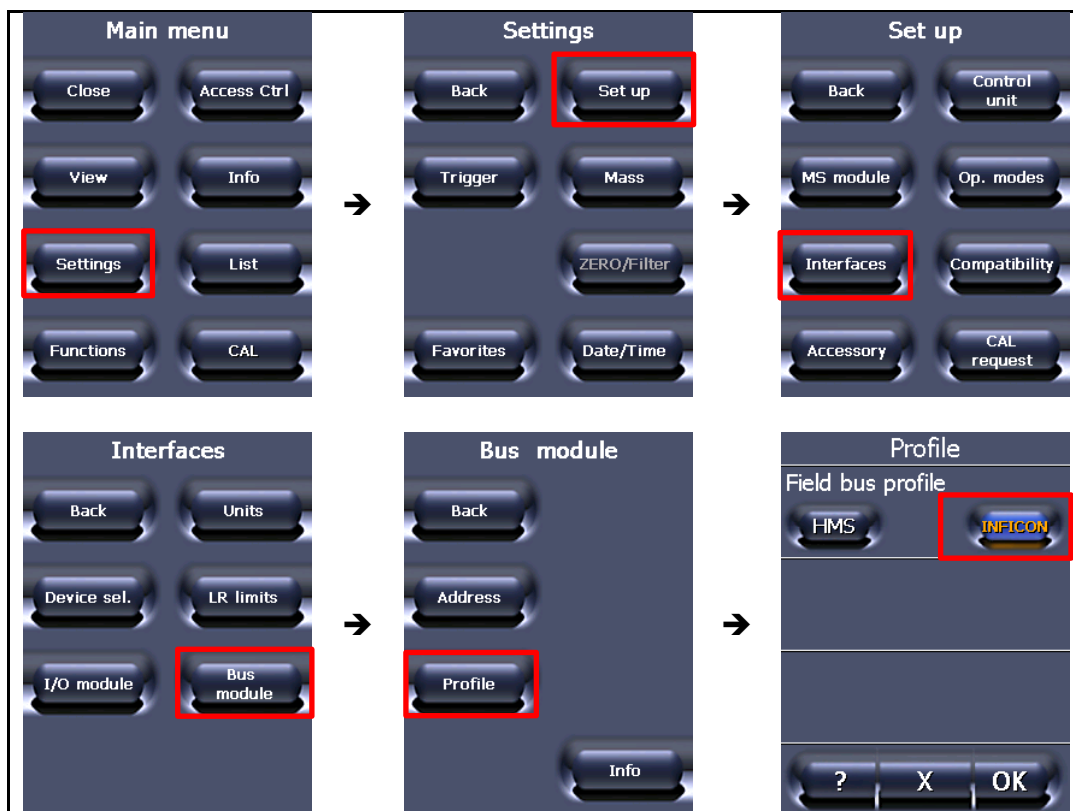


Figure 2 Set up BM1000 Field bus profile

### Attention!

Use "INFICON" profile only.

## 2.4 Activate the BM1000 PROFINET-IO set up

**Attention!**

**Address and profile do not come into effect until a restart of the leak detector (power off/power on)!**

To make the changes effective, the BM1000 Bus module needs to be restarted. Therefore, do the following steps:

1. Disconnect the data connection cable between the Leak Detector and the BM1000 Bus module
2. Wait 10 seconds
3. Connect the data connection cable between the Leak Detector and the BM1000 Bus module again

Alternatively, the Leak Detector can also be switched off and on again. The Leak detector needs to be switched off for minimum 10 seconds.

**Attention!**

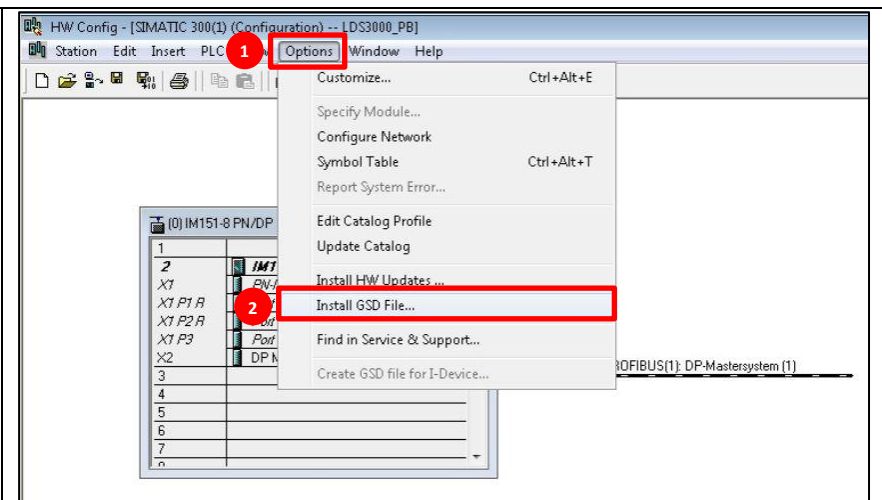
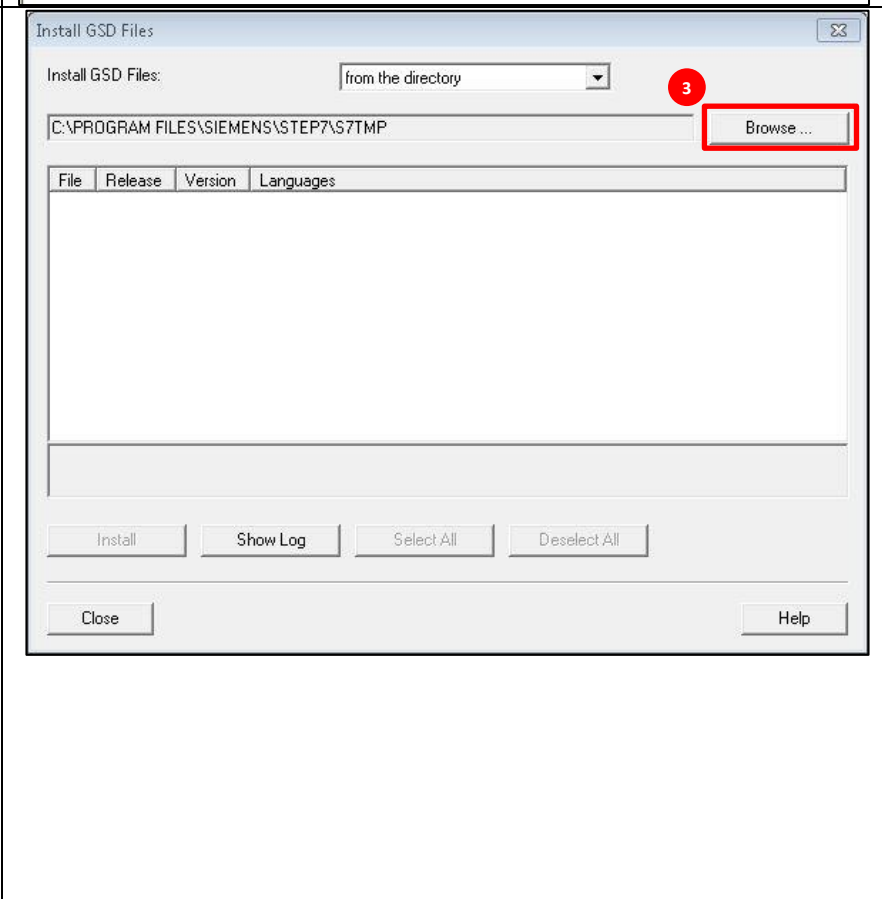
**After each change of the fieldbus profile or the configuration of the BM1000 in the device configuration of STEP 7, the device must be restarted!**

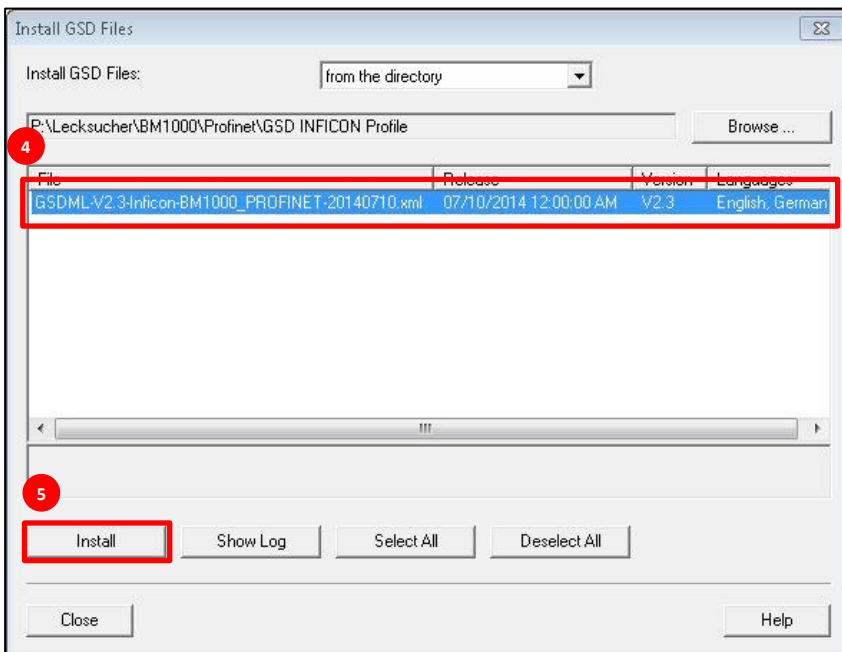



### 3 SIMATIC Step 7

#### 3.1 Installation GSDML-File BM1000 PROFINET-IO module

1. Open Siemens SIMATIC Step 7
2. Open or create a new Step 7 project the BM1000 PROFINET-IO Module should be used
3. Install GSDML File

<ol style="list-style-type: none"> <li>1. Select <b>"Options"</b></li> <li>2. Select <b>"Install GSD File..."</b></li> </ol>	
<ol style="list-style-type: none"> <li>3. Select the source path of the GSD file and select the file <b>"IFCN0E8D.gsd"</b></li> </ol>	

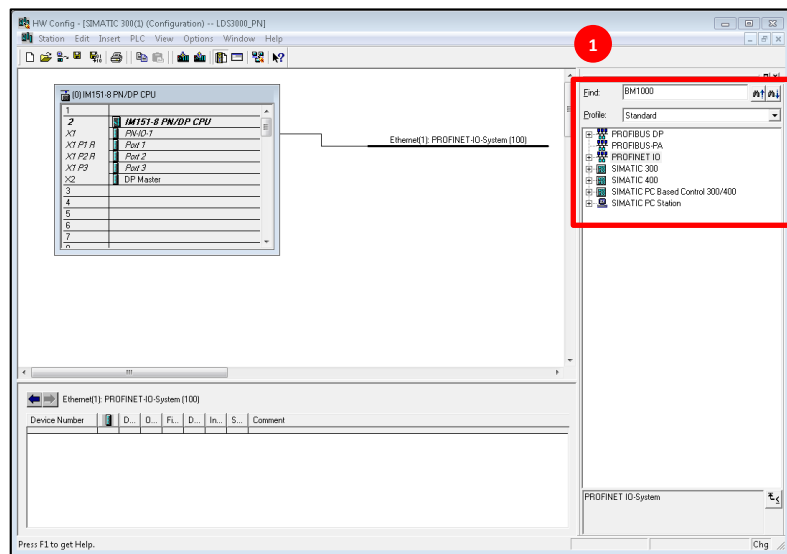
	<p>The GSD file is on the USB memory stick which is supplied with the BM1000 bus module.</p> <p>Source path:  <b>\LDS3000(AQ)-Documentation-V<del>xx</del>\Manuals\LDS3000 Interface Description\Profinet\GSD INFICON Profile\GSDML-V2.3-Inficon-BM1000_PROFINET-20140710.xml</b></p> <p><b>xx = version number</b></p>
<p>4. Select the GSD file <b>"GSDML-V2.3-Inficon-BM1000_PROFINET-20140710.xml"</b></p> <p>5. Press the <b>"Install"</b> button</p>	
<p>6. After installing the GSD press <b>"OK"</b> button</p>	

4. The INFICON BM1000 PROFIBUS module is now installed and can be used

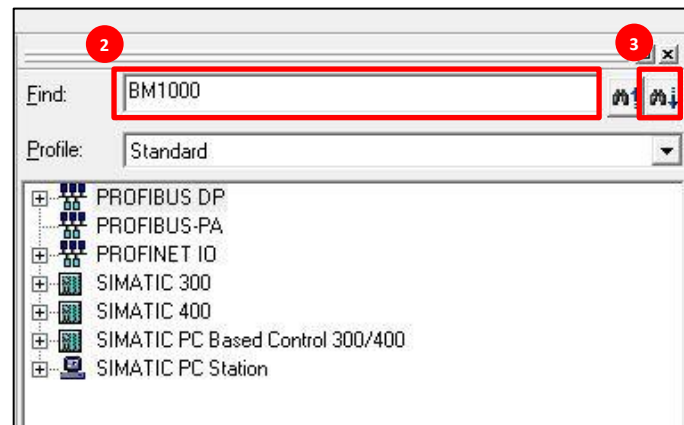
### 3.2 Add BM1000 PROFINET-IO module to PROFINET-IO network

1. Open Siemens SIMATIC Step 7
2. Open or create a new TIA project the BM1000 PROFIBUS Module should be used
3. Open the Hardware Configuration Manager

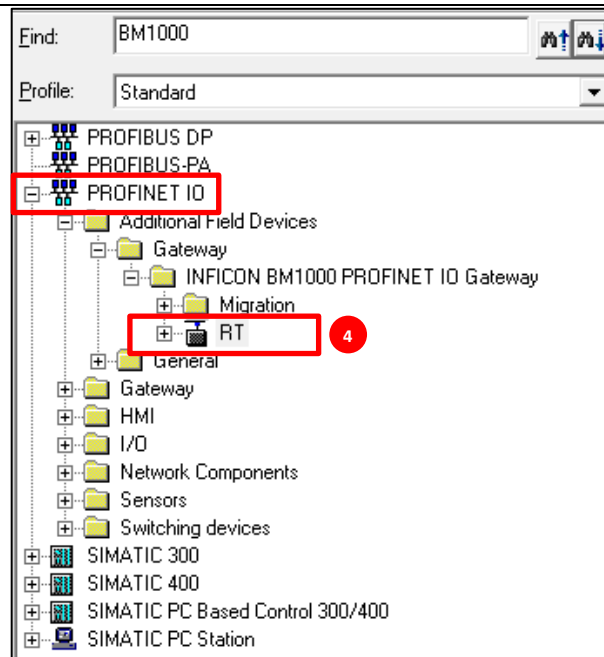
1. Search for BM1000 PROFINET-IO Module in the hardware catalog



2. Use the search section of the catalog in order to find the BM1000 PROFINET-IO module. Therefore, enter into the "Find" text field "BM1000"
3. Select "Search down"



4. Select “RT” in the  
PROFINET-IO  
"INFICON BM1000  
PROFINET IO  
Gateway" folder

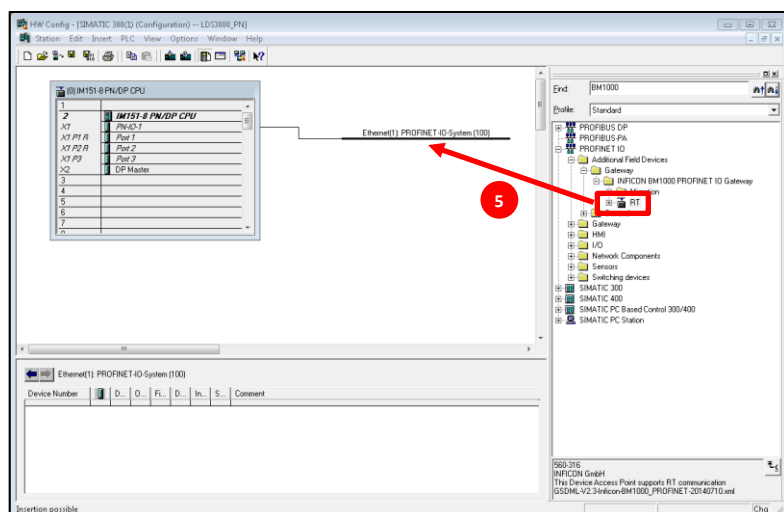


#### Attention!

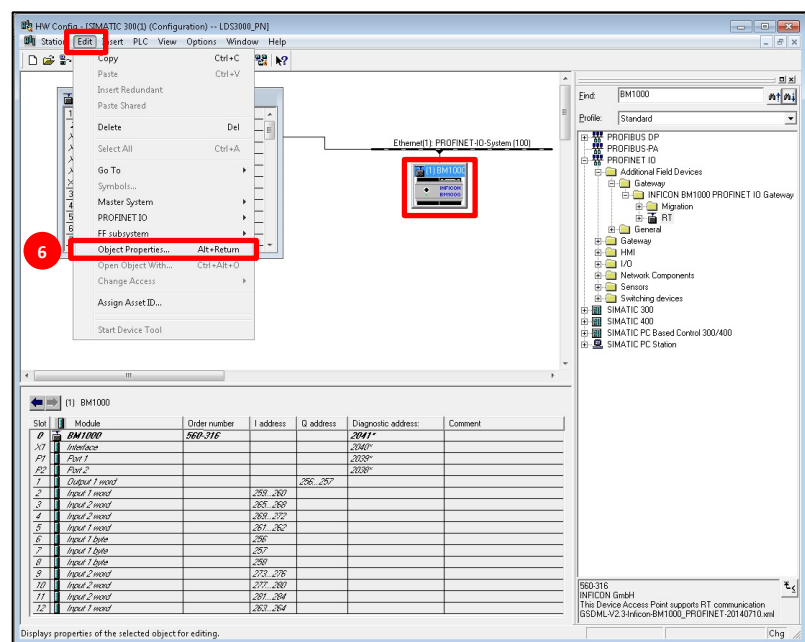
Please use “RT” only from the folder "**INFICON BM1000 PROFINET IO Gateway**" as BM1000 PROFINET-IO module.

If using the module "RT" from the subfolder “Migration” the cyclic communication between the PROFINET-IO Master (e.g. PLC controller) and the BM1000 PROFINET-IO module does not work completely!

5. Drag and drop the  
“BM1000 PROFINET-IO”  
module to the  
“PROFINET-IO-System”



## 6. Setting the IP address of the BM1000 PROFINET-IO Module.

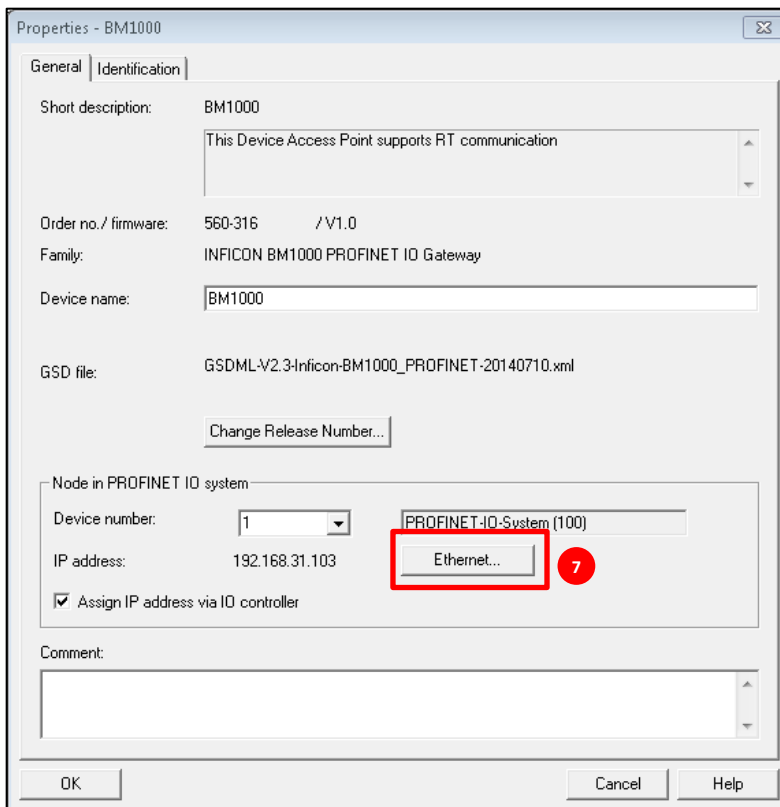


Select the **“BM1000 PROFINET-IO module”** and open the drop down menu **“Edit – Object Properties”**.

Alternatively, the properties window can be opened by double-clicking on the **“BM1000 PROFINET-IO module”**.

In the section **“Note in PROFINET IO-system”** all necessary parameters are able to be set.

7. Press the button  
**“Ethernet...”** to change  
the IP-Address of the  
**“BM1000 PROFINET-IO  
bus module”**



Properties - BM1000

General | Identification

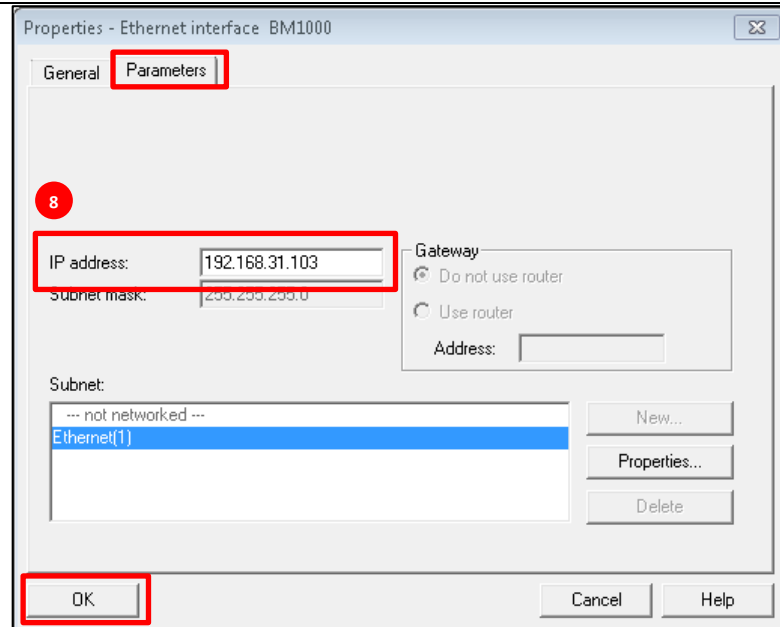
Short description: BM1000  
This Device Access Point supports RT communication

Order no. / firmware: 560-316 / V1.0  
Family: INFICON BM1000 PROFINET IO Gateway  
Device name: BM1000  
GSD file: GSDML-V2.3-Inficon-BM1000\_PROFINET-20140710.xml  
Change Release Number...

Node in PROFINET IO system:  
Device number: 1  
PROFINET-IO-System (100)  
IP address: 192.168.31.103  
☐ Assign IP address via IO controller  
Comment:

OK Cancel Help

8. In the section  
**“Parameters”** the IP-  
address can be changed



Properties - Ethernet interface BM1000

General | Parameters

IP address: 192.168.31.103  
Subnet mask: 255.255.255.0  
Subnet: --- not networked ---  
Ethernet[1]

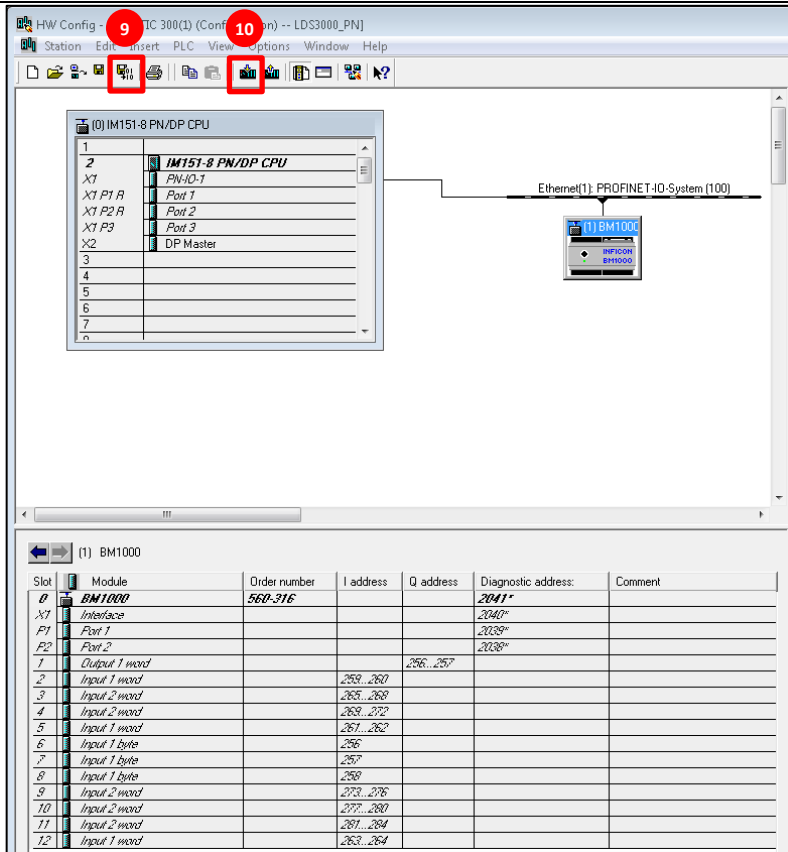
Gateway:  
☒ Do not use router  
☐ Use router  
Address:

New... Properties... Delete

OK Cancel Help

After changing the IP address please click the **“OK”** button

9. Safe hardware configuration
10. Download hardware configuration to the PLC controller



The screenshot shows the SIMATIC Manager HW Config interface. The top menu bar includes 'Station', 'Edit', 'Insert', 'PLC', 'View', 'Options', 'Window', and 'Help'. The main window displays the hardware configuration of a SIMATIC 300 station. The CPU is an IM151-8 PN/DP CPU, and the BM1000 module is connected to the PROFINET-IO-System (100). The bottom window shows the detailed configuration of the BM1000 module, including its I/O addresses and diagnostic addresses.

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		258...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		266			
7	Input 1 byte		267			
8	Input 1 byte		268			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		283...284			

### Attention!

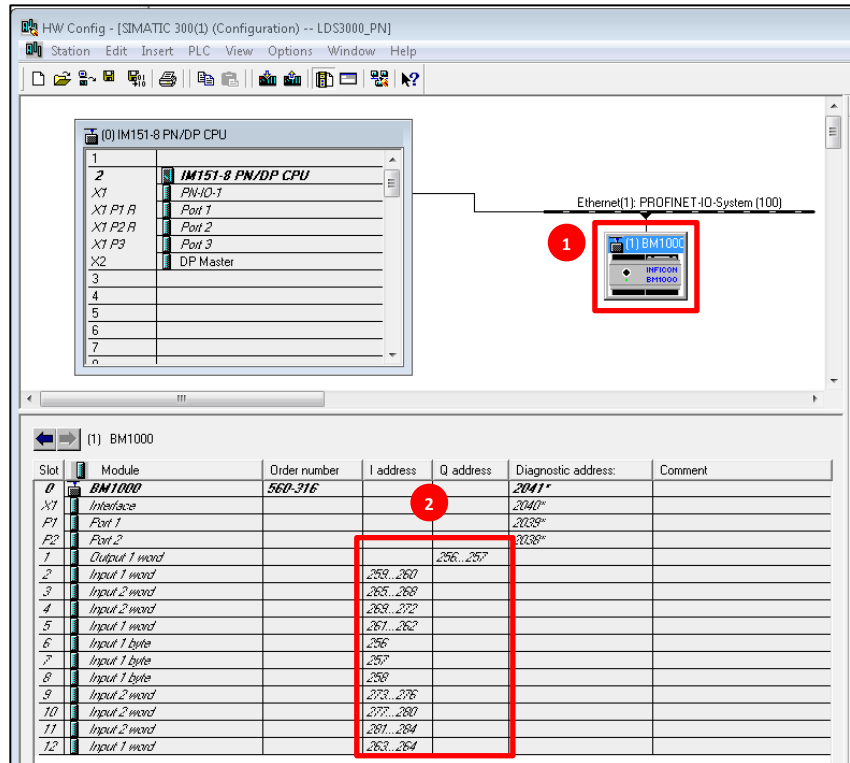
Address and profile do not come into effect until a restart of the leak detector (power off/power on)!

Please have a look at chapter Fehler! Verweisquelle konnte nicht gefunden werden.

### 3.3 Change I/O addresses of BM1000 PROFINET-IO module

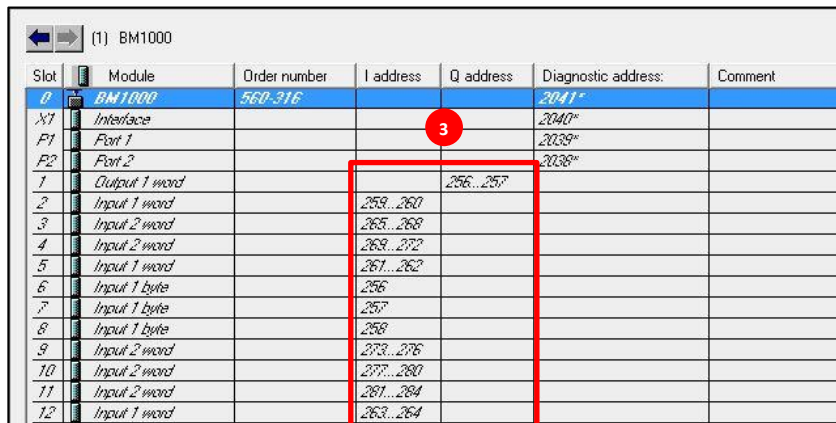
If required, the input or output addresses of the BM1000 PROFINET-IO bus module can be adapted for cyclic data exchange. Therefore, open Hardware Configuration Manager of SIMATIC Step 7.

1. Select "**INFICON BM1000**" PROFIBNET-IO module
2. The input and output addresses of each slot of the cyclic data exchange is shown



Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

3. Double click the address (I or Q address) to change the address of an input or output slot



Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

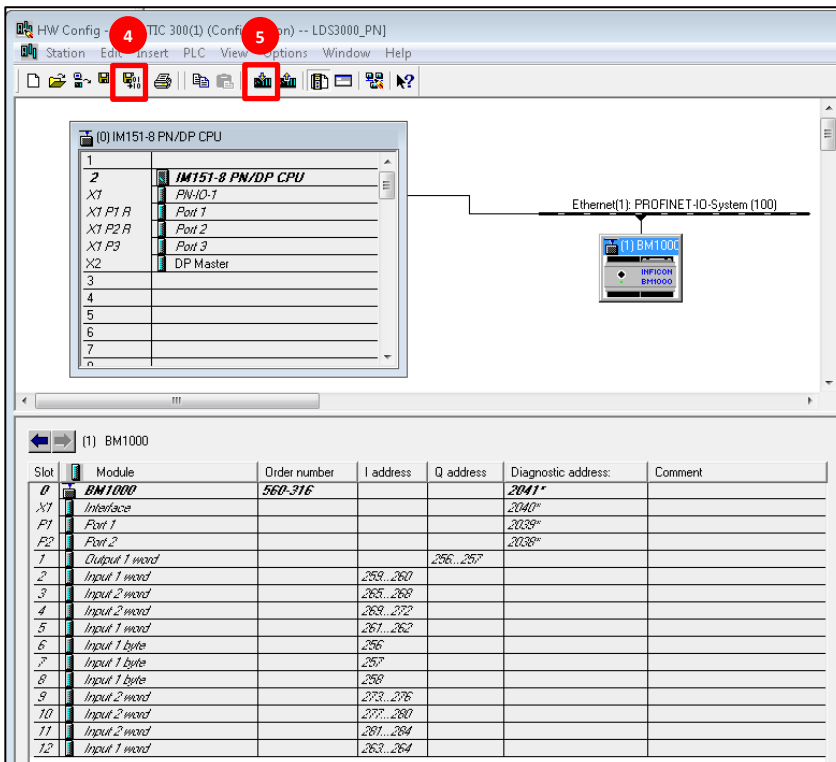


**Note:**

The input and output address needs to be in the same address range, if using acyclic data exchange!

In this example, the input address and also the output address are both in the same address range 256..257

4. Safe hardware configuration
5. Download hardware configuration to the PLC controller



The screenshot shows the SIMATIC Manager HW Config interface. The main window displays the hardware configuration of a SIMATIC station. The CPU is an IM151-8 PN/DP CPU, and the BM1000 module is connected to it. The CPU's I and Q addresses are shown as 256..257. The BM1000 module's I and Q addresses are also shown as 256..257. The toolbar at the top contains various icons, with the 'HW Config' and 'Download' buttons highlighted by red circles.

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256..257		
2	Input 1 word		256..257			
3	Input 2 word		258..259			
4	Input 2 word		260..261			
5	Input 1 word		262..263			
6	Input 1 byte		264			
7	Input 1 byte		265			
8	Input 1 byte		266			
9	Input 2 word		267..268			
10	Input 2 word		269..270			
11	Input 2 word		271..272			
12	Input 1 word		273..274			

### 3.4 Change the device name of the BM1000 PROFINET-IO bus module

Depending on the application it could be necessary to change the name of the BM1000 Bus module. The device name of the BM1000 Bus module is set by factory default to “**BM1000**”.

#### Attention!

It should be noted that the name of the device must be unambiguous. If several BM1000 PROFINET-IO modules are used, each module must be assigned a unique device name. Within the PROFINET-IO system, the device name may only occur once.

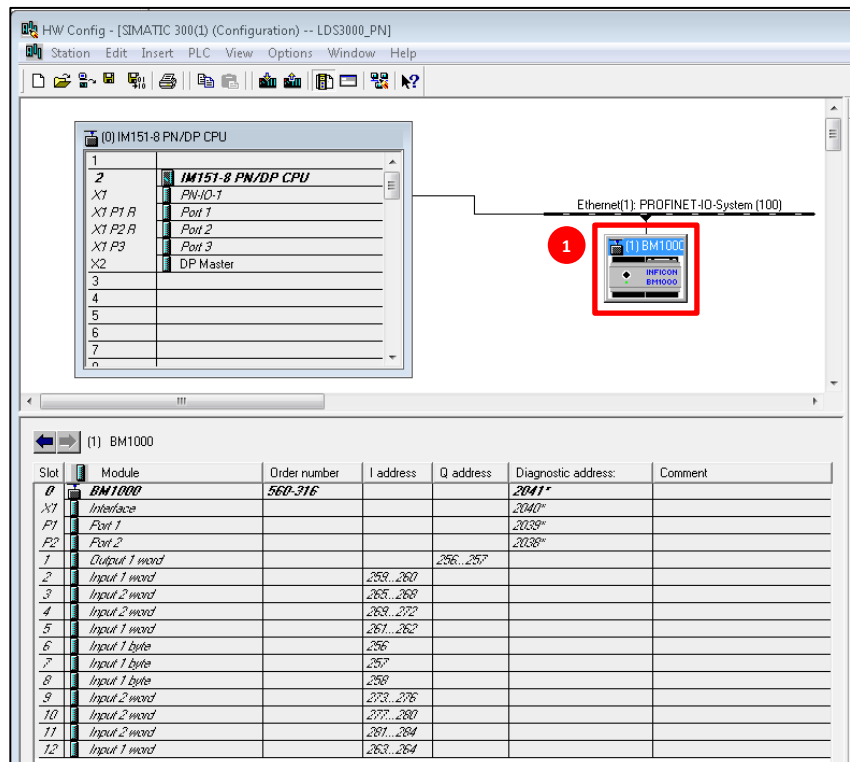
If the configured device name is different than the name of the device itself no PROFINET communication will be established between the PROFINET-IO master and the PROFINET-IO slave. The configured device name needs to be equal to the name of the device.

The device name can only be changed via the hardware configuration. Therefore, are two basic requirements necessary:

- The hardware configuration is finished and has been downloaded to the PLC controller
- The PROFINET-IO connection between the PLC controller and the BM1000 PROFINET-IO module is established and works without any problems

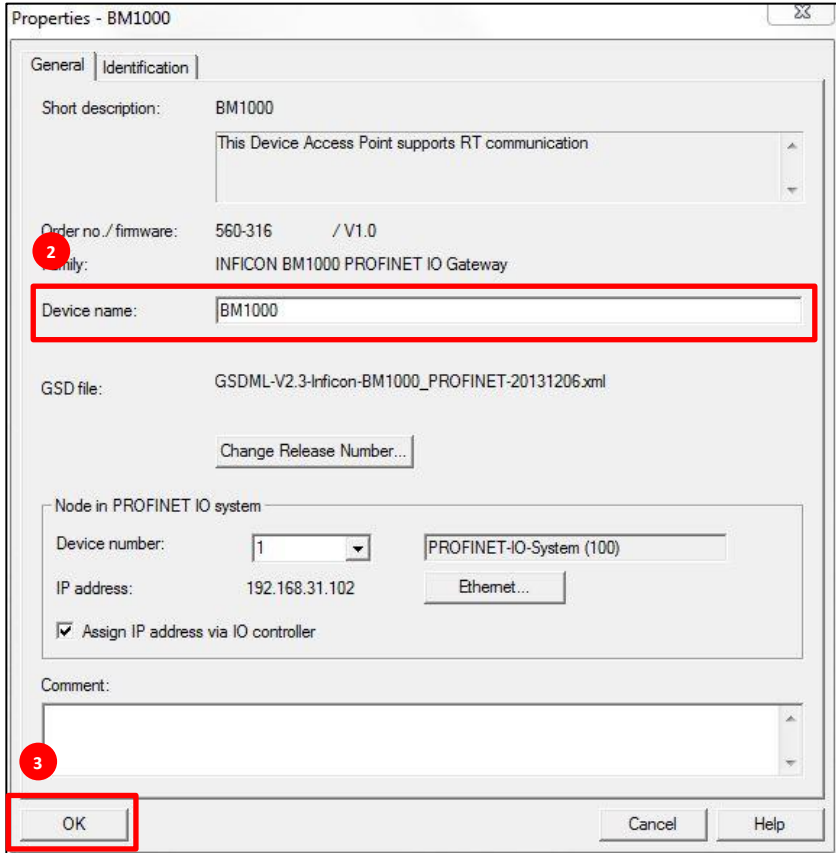
To change the device name please do the following steps:

1. Select “**INFICON BM1000**” PROFIBNET-IO module and double click to open the properties



Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	<b>BM1000</b>	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		266			
7	Input 1 byte		267			
8	Input 1 byte		268			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

2. Change to Device name
3. Press “OK” after changing



Properties - BM1000

General | Identification

Short description: BM1000

This Device Access Point supports RT communication

Order no./firmware: 560-316 / V1.0

Family: INFICON BM1000 PROFINET IO Gateway

Device name: **BM1000**

GSD file: GSDML-V2.3-Inficon-BM1000\_PROFINET-20131206.xml

Change Release Number...

Node in PROFINET IO system

Device number: 1 PROFINET-IO-System (100)

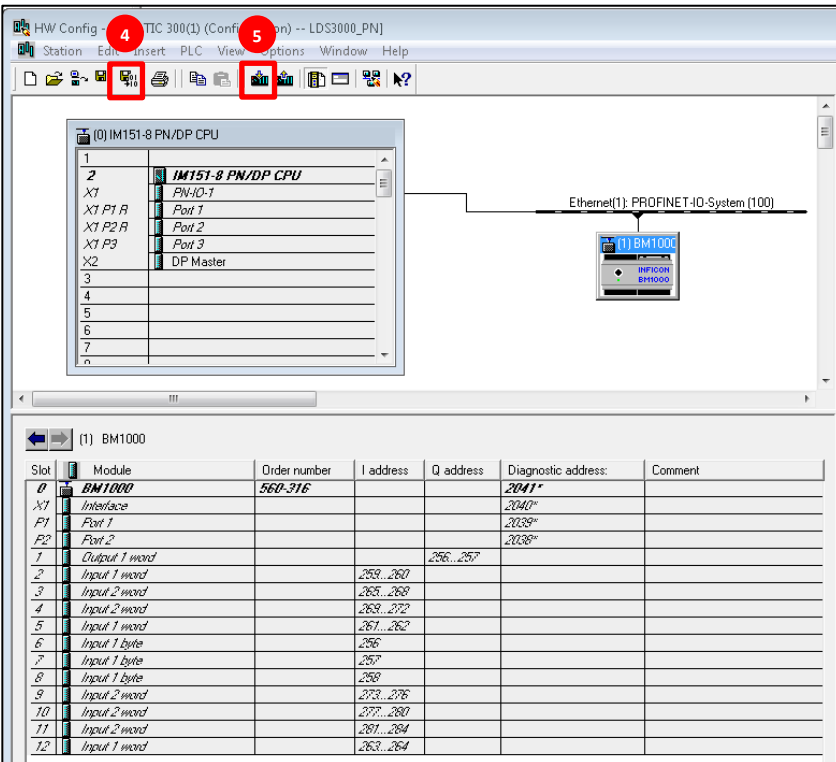
IP address: 192.168.31.102 Ethernet...

☒ Assign IP address via IO controller

Comment:

OK Cancel Help

4. Save hardware configuration
5. Download hardware configuration to the PLC controller



HW Config - TIC 300(1) (Configuration) -- LDS3000\_PNJ

Station Edit Insert PLC View Options Window Help

IM151-8 PN/DP CPU

1

2 IM151-8 PN/DP CPU

X1 PN-IO-1

X1 P1 A Port 1

X1 P2 A Port 2

X1 P3 Port 3

X2 DP Master

3

4

5

6

7

8

Ethernet(1): PROFINET-IO-System (100)

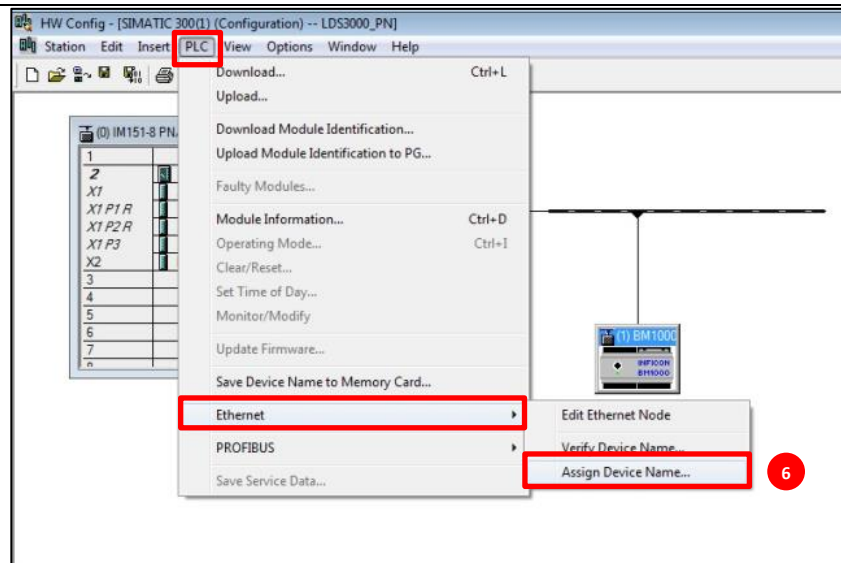
BM1000

INFICON BM1000

(1) BM1000

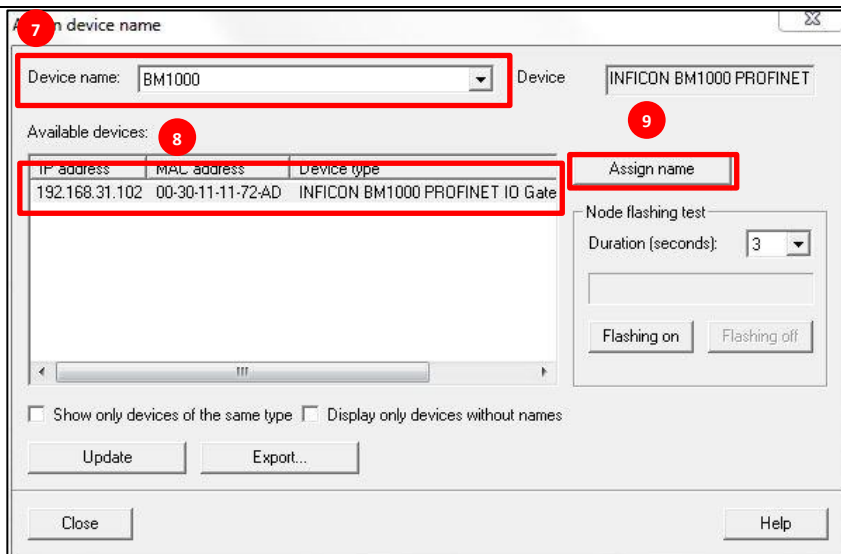
Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2038*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		266			
7	Input 1 byte		267			
8	Input 1 byte		268			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		283...284			

6. Select in the dropdown menu **"PLC" → "Ethernet" → "Assign Device Name"**


**Attention!**

The BM1000 Bus module must be reachable via the PROFINET-IO system

7. Select the **"Device name"**
8. Select in the table **"Available devices"** the device type **"INFICON BM1000 PROFINET IO Gateway"** which should be assigned
9. Press the button **"Assign name"**


**Note:**

It could be necessary to power off/on the leak detector to get the changing into effect

### 3.5 Activate the BM1000 PROFINET-IO set up

**Attention!**

**Address and profile do not come into effect until a restart of the leak detector (power off/power on)!**

To make the changes effective, the BM1000 Bus module needs to be restarted. Therefore, do the following steps:

4. Disconnect the data connection cable between the Leak Detector and the BM1000 Bus module
5. Wait 10 seconds
6. Connect the data connection cable between the Leak Detector and the BM1000 Bus module again

Alternatively, the Leak Detector can also be switched off and on again. The Leak detector needs to be switched off for minimum 10 seconds.

**Attention!**

**After each change of the fieldbus profile or the configuration of the BM1000 in the device configuration of Step 7, the device must be restarted!**

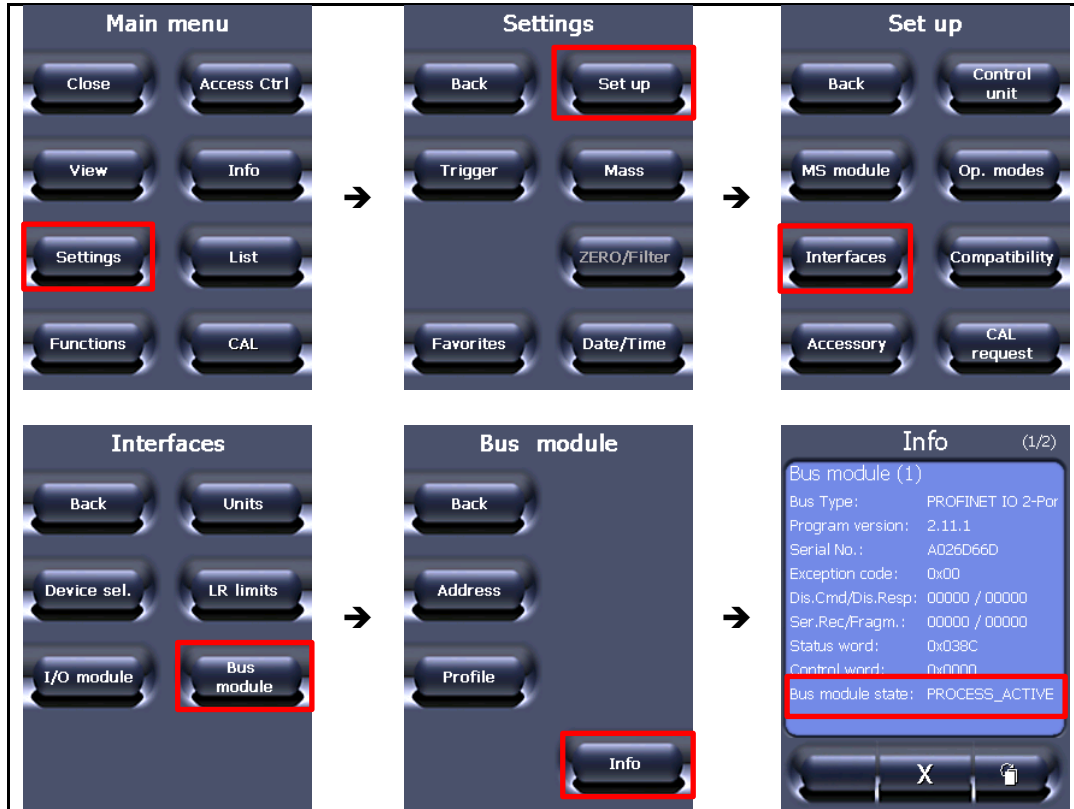
### 3.6 Check PROFINET-IO communication between the PROFINET-IO Master and the INFICON BM1000 PROFINET-IO slave

After finishing the PROFINET-IO configuration of the PROFINET-IO System in the SIMATIC hardware configuration and set up the PROFINET-IO adjustments of the Leak Detector the PROFINET-IO communications needs to be tested.

Therefore, the following steps needs to be done:

1. Connect the Leak Detector with the BM1000 PROFINET-IO Module by using the Data cable
2. Connect the BM1000 PROFINET-IO Module with the PROFINET-IO Master (e.g. PLC controller)
3. Connect the CU1000 to the leak detector by using the Data cable
4. Switch on the Leak Detector and wait till the leak detector is ready to operate
5. Switch on the PLC controller and set the PLC controller to "RUN"

To check the status of the PROFINET-IO communication between the PROFINET-IO master (e.g. PLC controller) and the BM1000 PROFINET-IO bus module the info section of the CU1000 can be used. Therefore, the following menu needs to be opened:



As soon as a PROFINET-IO connection has been established between the PROFINET-IO master (PLC control) and the PROFINET-IO slave (BM1000 PROFIBUS-IO bus module), the status of the "Bus module state" changes to "**PROCESS\_ACTIVE**".

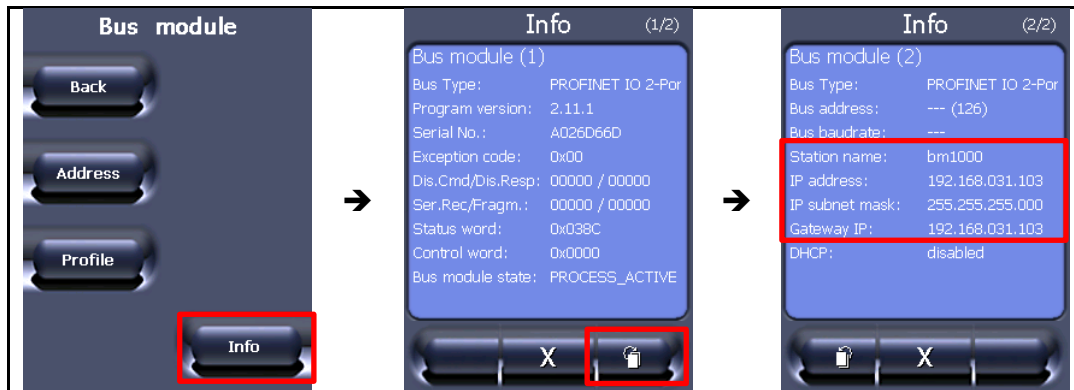
If the status of the "Bus module status" differs from "**PROCESS\_ACTIVE**", there is an error in the PROFINET-IO communication with the PROFINET-IO master (e.g. PLC controller).

The status of the "Bus module status" can assume the following states:

Bus module state	Status
NW_INIT	Initialization of the bus module
WAIT_PROCESS	Waiting for PROFINET-IO master (e.g. (PLC controller) until a PROFINET-IO connection is established.
ERROR	Configuration error
PROCESS_ACTIVE	PROFINET-IO connection with PROFINET-IO master (e.g. PLC controller) is established
IDLE	PROFINET-IO master (e.g. PLC controller) is in STOP mode or has not delivered a valid output at least.
EXECPTION	Error

The second info menu displays

- Station name
- IP address
- IP subnet mask
- Gateway IP



The station name must be equal to the PROFINET device name set up in the SIMATIC configuration manager of the BM1000 bus module.

#### Attention!

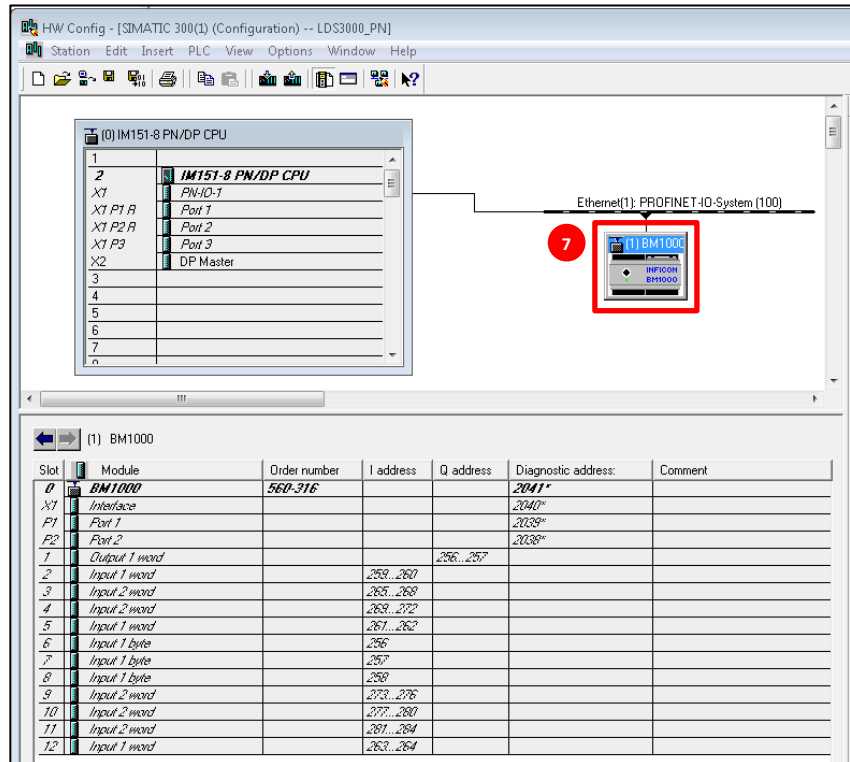
If the displayed station name differs to the PROFINET device name set up in the SIMATIC configuration manager no PROFINET-IO communication can be established.

The communication status between the PROFINET-IO Master and the INFICON BM1000 PROFINET-IO slave can also be checked with the SIMATIC configuration manager

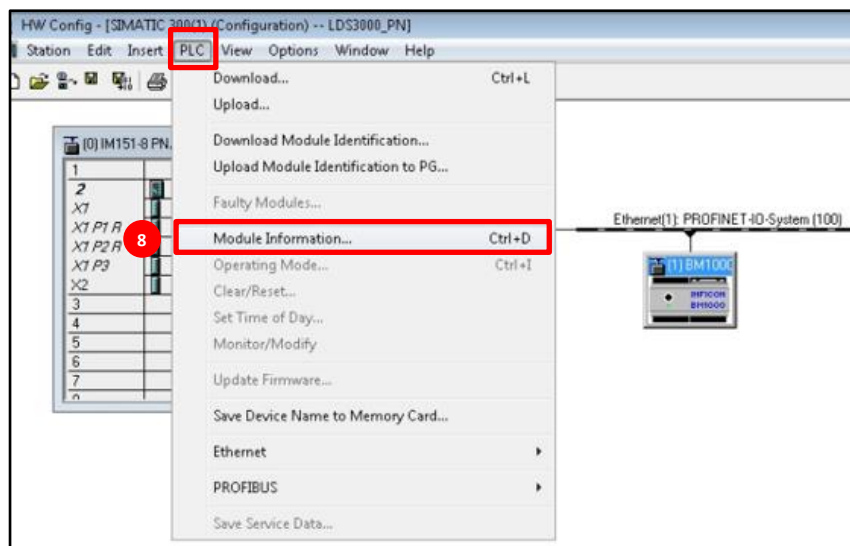
Therefore, the following steps needs to be done:

1. Connect the Leak Detector with the BM1000 PROFINET-IO Module by using the Data cable
2. Connect the BM1000 PROFINET-IO Module with the PROFINET-IO Master (e.g. PLC controller)
3. Connect the CU1000 to the leak detector by using the Data cable
4. Switch on the Leak Detector and wait till the leak detector is ready to operate
5. Switch on the PLC controller and set the PLC controller to "RUN"
6. Open SIMATIC configuration manager

7. Select “**INFICON BM1000**” PROFIBNET-IO module and double click to open the properties



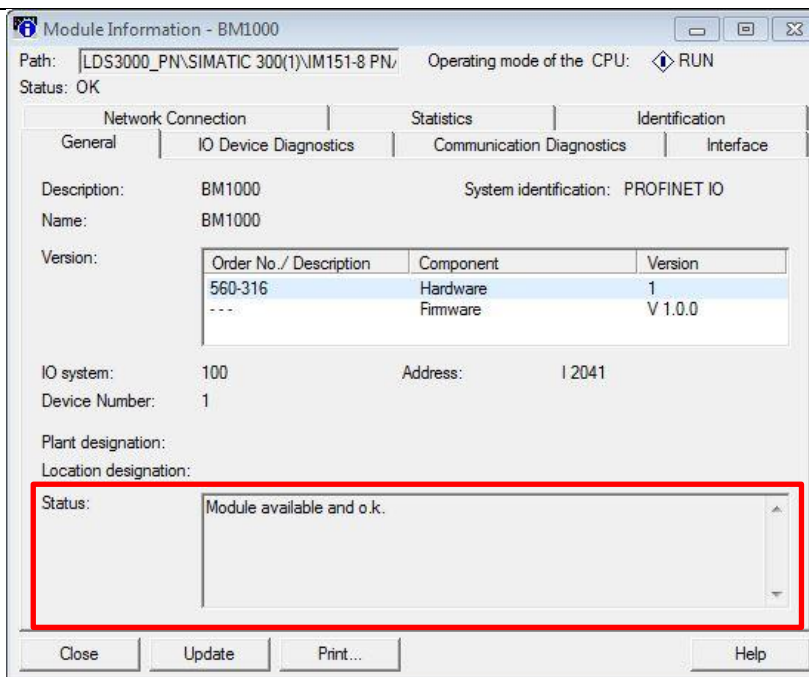
8. Open the “**Module Information**” in the “**PLC**” drop down menu



Also the shortcut “Ctrl + D” can be use after selecting the BM1000 PROFINET-IO Module in the configuration manager in order to read the module information’s



9. Read status of the BM1000 PROFINET-IO bus module



The Status of the BM1000 PROFINET-IO module needs to be **“Module available and o.k.”**

If the module is not available please check

- PROFINET-IO connection
- PROFINET-IO IP-address
- Device name in the hardware configuration of STEP 7 and also the device of the BM1000 itself at the Leak Detector. If the device name is not the same on both sides (hardware configuration and BM1000 bus module) no communication can be established

### 3.7 Cyclic data exchange between the PROFINET-IO Master and the INFICON BM1000 PROFINET-IO slave

The PROFINET-IO master (e.g. PLC controller) cyclically exchanges data with the slaves on the PROFINET-IO. Each slave has its own telegram structure.

The INFICON profile is a special bus telegram which contains a control word and a status word. The control word sends data to the leak detector, the status word reads data from the leak detector. The control and status word is updated cyclically via the BM1000 PROFINET-IO module.

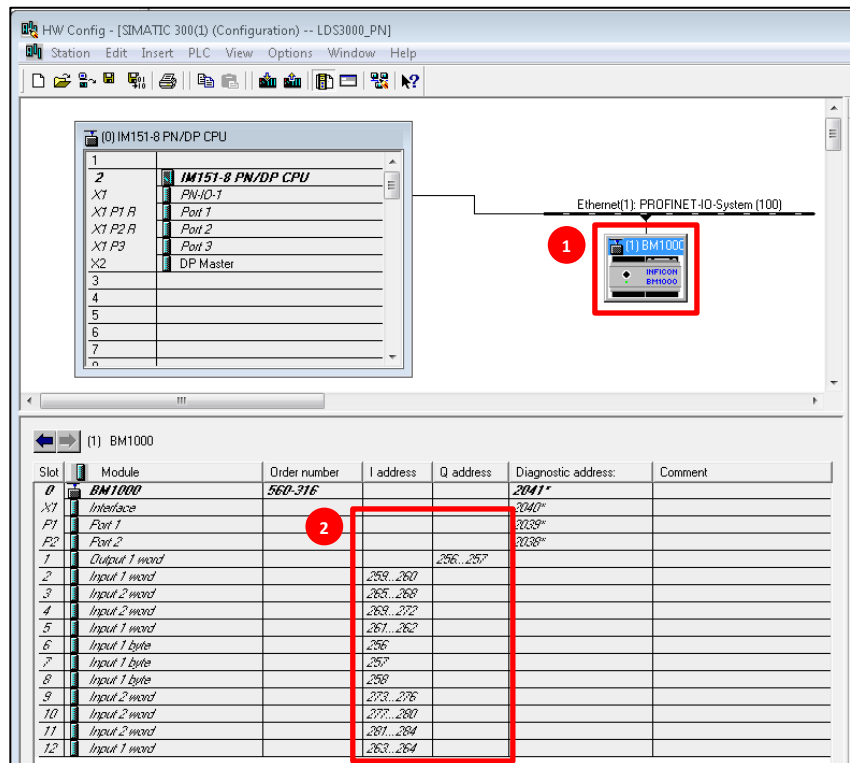
#### Note:

The structure of the INFICON telegram (control and status word) is identical for the following devices:

- **LDS3000**
- **LDS3000 AQ**
- **LDS3000 XL**
- **XL3000flex**

The cyclic data exchange from the BM1000 PROFINET-IO Module is shown in the hardware configuration. To see the input and output data's the INFICON BM1000 PROFINET-IO Module needs to be selected. Therefore, open Hardware Configuration Manager of SIMATIC Step 7.

1. Select "**INFICON BM1000**" PROFIBUS module
2. The input and output addresses of each slot of the cyclic data exchange is shown



Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		258...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

### 3.7.1 Control word – Write Process Data (PLC → Leak Detector)

The control word (write process data) contains 2 bytes and is send periodically from the PROFIBUS master (e.g. programmable logic controller) to the leak detector.

These 2 bytes contains 16 bits with different kind of functions in order to control the leak detector by the PLC controller via the PROFIBUS system.

The next figure shows the bitwise structure of the control word in detail. This information is taken out of the protocol description.

Byte	Bit	Name	Meaning
1 (high byte)	0	(not used)	
	1	Zero	Transition 0 -> 1: 0x02 = Zero on Transition 1 -> 0: 0x00 = Zero off
	2	Clear	Transition 0 -> 1: 0x04=Clears errors and warnings
	3	Start/Stop	Transition 0 -> 1: 0x08= Start Transition 1 -> 0: 0x00= Stop
	4	CAL intern	Transition to 0: 0x00 = Cancel internal calibration
	5		Transition to 1: 0x10 = Start internal calibration
	6	CAL extern	Transition to 0: 0x00 = Cancel external or dyn. calibration
	7		Transition to 1: 0x40 = Start external or. dyn. calibration Transition to 2: 0x80 = Acknowledge closed test leak
2 (low byte)	0	Gas ballast	Transition 0 -> 1: 0x01 = Gasballast on
	1		Transition 1 -> 0: 0x00 = Gasballast off (if Gasballast mode != GASBALLAST_ON)
	2	Zero mode	0 = normal
	3		0x04 = 1 ... 2 dec.
			0x08 = 2 ... 3 dec.
			0x0C = 19/20 part of the value
	4	CAL mode	0 = external CAL
	5		0x10 = dyn. CAL 0x20 = not used 0x30 = Peak find (AQ mode only)
	6	Sniff/Vac	0 = VAC
	7		0x40 = SNIF 0x80 = according to PLC-Input 0xC0 = not used

The assignment of the bitwise control word to the output address of the BM1000 PROFIBUS module is as follows:

Byte	Bit	Name	Meaning
1 (high byte)	0	(not used)	
	1	Zero	Transition 0 -> 1: 0x02 = Zero on Transition 1 -> 0: 0x00 = Zero off
	2	Clear	Transition 0 -> 1: 0x04 = Clears errors and warnings
	3	Start/Stop	Transition 0 -> 1: 0x08 = Start Transition 1 -> 0: 0x00 = Stop
	4	CAL intern	Transition to 0: 0x00 = Cancel internal calibration Transition to 1: 0x10 = Start internal calibration
	5		
	6	CAL extern	Transition to 0: 0x00 = Cancel external or dyn. calibration Transition to 1: 0x40 = Start external or dyn. calibration
	7		Transition to 2: 0x80 = Acknowledge closed test leak
2 (low byte)	0	Gas ballast	Transition 0 -> 1: 0x01 = Gasballast on Transition 1 -> 0: 0x00 = Gasballast off (if Gasballast mode != GASBALLAST_ON)
	1		
	2	Zero mode	0 = normal 0x04 = 1 ... 2 dec. 0x08 = 2 ... 3 dec. 0x0C = 19/20 part of the value
	3		
	4	CAL mode	0 = external CAL 0x10 = dyn. CAL 0x20 = not used 0x30 = Peak find (AQ mode only)
	5		
	6	Sniff/Vac	0 = VAC 0x40 = SNIF 0x80 = according to PLC-Input 0xC0 = not used
	7		

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM 1000	560 316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
7	Output 1 word			206, 25*		
8	Input 1 word		255, 260			
9	Input 2 word		265, 260			
4	Input 2 word		265, 272			
5	Input 1 word		267, 262			
6	Input 1 byte		266			
7	Input 1 byte		267			
8	Input 1 byte		268			
9	Input 2 word		273, 276			
10	Input 2 word		277, 280			
11	Input 2 word		281, 284			
12	Input 1 word		283, 284			

#### Attention:

The BM1000 PROFINET-IO module will send the high byte to the PROFINET-IO master (e.g. PLC Controller) first.

### 3.7.2 Status word – Read Process Data (Leak Detector → PLC)

The status word of the INFICON profile includes 29 bytes in total. The first 2 bytes of the status word are the status information of the leak detector, which contains 16 bits with different kind of status information's from the leak detector.

The next figure shows the bitwise structure of the first 2 bytes of status word in detail. This information is taken out of the protocol description.

Byte	Bit	Name	Meaning
1 (high byte)	0	not used	always 1
	1	Zero active	0 = off 0x02 = on
	2	Error	0 = no error 0x04 = error
	3	Warning	0 = no warning 0x08 = warning
	4	State internal calibration	0 = inactive 0x10 = active 0x20/0x30 = not used
	5		
	6	State external calibration	0 = inactive 1 = 0x40 = active 2 = 0x80 = waiting for test leak closed 3 = 0xC0 = not used
	7		
2 (low byte)	0	Calibration request	0 = CAL request function disabled 1 = 0x01 = CAL request function enabled but no CAL requested 2 = 0x02 = CAL request function enabled and CAL requested 3 = 0x03 = not used
	1		
	2	Emission	0 = 0x00 = Emission off 1 = 0x04 = Cathode 1 fixed 2 = 0x08 = Cathode 2 fixed 3 = 0x0C = Cathode 1 auto 4 = 0x10 = Cathode 2 auto
	3		
	4		
	5	State	0 = 0x00 = Standby 1 = 0x20 = Error 2 = 0x40 = Calibration 3 = 0x60 = Runup 4 = 0x80 = Measure 5 = 0xA0 = Emission Off 6 ... 7 = 0xC0 ... 0xE0 = not used
	6		
	7		

The next bytes 3 to 29 of the status word containing the leak rate, pressure, error codes and so on, which is shown in the next figure.

Title	Byte	Bit	Name	Meaning
leak rate	3 ... 6		Leak rate (mbar*l/s)	Actual leak rate in mbar l/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level
		1	Status of Trigger 2	1 = Leak rate higher than trigger level
		2	Status of Trigger 3	
		3	Status of Trigger 4	
		4 ... 7	not used	always 0
calibration_status	14		calibration_status	For possible values please refer to command 260 in table 3.4, "Commands," page 26.
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

The assignment of the 29 bytes of the status word to the input addresses of the BM1000 PROFIBUS module is shown as follows:

#### Status word:

Byte	Bit	Name	Meaning
1 (high byte)	0	not used	always 1
	1	Zero active	0 = off 0x02 = on
	2	Error	0 = no error 0x04 = error
	3	Warning	0 = no warning 0x08 = warning
	4	State internal calibration	0 = inactive 0x10 = active 0x20/0x30 = not used
	5		
	6	State external calibration	0 = inactive 1 = 0x40 = active 2 = 0x80 = waiting for test leak closed 3 = 0xC0 = not used
	7		
2 (low byte)	0	Calibration request	0 = CAL request function disabled 1 = 0x01 = CAL request function enabled but no CAL requested 2 = 0x02 = CAL request function enabled and CAL requested 3 = 0x03 = not used
	1		
	2		
	3		
	4	Emission	0 = 0x00 = Emission off 1 = 0x04 = Cathode 1 fixed 2 = 0x08 = Cathode 2 fixed 3 = 0x0C = Cathode 1 auto 4 = 0x10 = Cathode 2 auto
	5		
	6		
	7		
	5	State	0 = 0x00 = Standby 1 = 0x20 = Error 2 = 0x40 = Calibration 3 = 0x60 = Runup 4 = 0x80 = Measure 5 = 0xA0 = Emission Off 6 ... 7 = 0xC0 ... 0xE0 = not used
	6		
	7		
	7		

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560...516			2041*	
X1	Interface				2040*	
P1	Port 1				2038*	
P2	Port 2				2038*	
1	Output 4 word			256...260		
2	Input 1 word		259...260			
3	Input 2 word		261...262			
4	Input 2 word		263...262			
5	Input 1 word		261...262			
6	Input 1 byte		266			
7	Input 1 byte		267			
8	Input 1 byte		268			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		283...284			

### Leak rate [mbar\*I/]:

Title	Byte	Bit	Name	Meaning
leak rate	3 ... 6		Leak rate (mbar*I/s)	Actual leak rate in mbar I/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level
		1	Status of Trigger 2	
		2	Status of Trigger 3	
		3	Status of Trigger 4	
calibration_status	14	4 ... 7	not used	always 0
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			206...207		
2	Input 1 word		209...210			
3	Input 2 word		205...206			
4	Input 1 word		207...208			
5	Input 1 word		207...208			
6	Input 1 byte		206			
7	Input 1 byte		207			
8	Input 1 byte		208			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		283...284			

### Pressure or flow:

Title	Byte	Bit	Name	Meaning
leak rate	3 ... 6		Leak rate (mbar*I/s)	Actual leak rate in mbar I/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level
		1	Status of Trigger 2	
		2	Status of Trigger 3	
		3	Status of Trigger 4	
calibration_status	14	4 ... 7	not used	always 0
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			206...207		
2	Input 1 word		209...210			
3	Input 1 word		207...208			
4	Input 2 word		205...206			
5	Input 1 word		207...208			
6	Input 1 byte		206			
7	Input 1 byte		207			
8	Input 1 byte		208			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		283...284			

### Error code:

Title	Byte	Bit	Name	Meaning
leak rate	3 ... 6		Leak rate (mbar*I/s)	Actual leak rate in mbar I/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level
		1	Status of Trigger 2	
		2	Status of Trigger 3	
		3	Status of Trigger 4	
calibration_status	14	4 ... 7	not used	always 0
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			206...207		
2	Input 1 word		209...210			
3	Input 2 word		205...206			
4	Input 2 word		207...208			
5	Input 1 word		207...208			
6	Input 1 byte		206			
7	Input 1 byte		207			
8	Input 1 byte		208			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		283...284			



### Trigger status:

Title	Byte	Bit	Name	Meaning
leak_rate	3 ... 6		Leak rate (mbar/l/s)	Actual leak rate in mbar l/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level
		1	Status of Trigger 2	
		2	Status of Trigger 3	
		3	Status of Trigger 4	
calibration_status	14	4 ... 7	not used	always 0
			calibration_status	For possible values please refer to command 260 in table 3.4, "Commands," page 26.
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			206, 205*		
2	Input 1 word		269, 260			
3	Input 2 word		265, 268			
4	Input 2 word		269, 272			
5	Input 1 word		261, 262			
6	Input 1 byte		266			
7	Input 1 byte		267			
8	Input 1 byte		260			
9	Input 2 word		273, 276			
10	Input 2 word		277, 280			
11	Input 2 word		281, 284			
12	Input 1 word		283, 284			

### Calibration status:

Title	Byte	Bit	Name	Meaning
leak_rate	3 ... 6		Leak rate (mbar/l/s)	Actual leak rate in mbar l/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level
		1	Status of Trigger 2	
		2	Status of Trigger 3	
		3	Status of Trigger 4	
calibration_status	14	4 ... 7	not used	always 0
			calibration_status	For possible values please refer to command 260 in table 3.4, "Commands," page 26.
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			206, 205*		
2	Input 1 word		269, 260			
3	Input 2 word		265, 268			
4	Input 2 word		269, 272			
5	Input 1 word		261, 262			
6	Input 1 byte		266			
7	Input 1 byte		267			
8	Input 1 byte		260			
9	Input 2 word		273, 276			
10	Input 2 word		277, 280			
11	Input 2 word		281, 284			
12	Input 1 word		283, 284			

### Leak detector ID:

Title	Byte	Bit	Name	Meaning
leak_rate	3 ... 6		Leak rate (mbar/l/s)	Actual leak rate in mbar l/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level
		1	Status of Trigger 2	
		2	Status of Trigger 3	
		3	Status of Trigger 4	
calibration_status	14	4 ... 7	not used	always 0
			calibration_status	For possible values please refer to command 260 in table 3.4, "Commands," page 26.
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			206, 205*		
2	Input 1 word		269, 260			
3	Input 2 word		265, 268			
4	Input 2 word		269, 272			
5	Input 1 word		261, 262			
6	Input 1 byte		266			
7	Input 1 byte		267			
8	Input 1 byte		260			
9	Input 2 word		273, 276			
10	Input 2 word		277, 280			
11	Input 2 word		281, 284			
12	Input 1 word		283, 284			



### Device specific float 1:

Title	Byte	Bit	Name	Meaning
leak_rate	3 ... 6		Leak rate (mbar/l/s)	Actual leak rate in mbar l/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level
		1	Status of Trigger 2	
		2	Status of Trigger 3	
		3	Status of Trigger 4	
calibration_status	14	4 ... 7	not used	always 0
			calibration_status	For possible values please refer to command 260 in table 3.4, "Commands", page 26.
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			206...207*		
2	Input 1 word		209...210			
3	Input 2 word		205...208			
4	Input 2 word		209...212			
5	Input 1 word		207...206			
6	Input 1 byte		206			
7	Input 1 byte		207			
8	Input 1 byte		208			
9	Input 2 word		213...216			
10	Input 2 word		217...220			
11	Input 2 word		207...204			
12	Input 1 word		203...204			

### Device specific float 2:

Title	Byte	Bit	Name	Meaning
leak_rate	3 ... 6		Leak rate (mbar/l/s)	Actual leak rate in mbar l/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level
		1	Status of Trigger 2	
		2	Status of Trigger 3	
		3	Status of Trigger 4	
calibration_status	14	4 ... 7	not used	always 0
			calibration_status	For possible values please refer to command 260 in table 3.4, "Commands", page 26.
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			206...207*		
2	Input 1 word		209...210			
3	Input 2 word		205...208			
4	Input 2 word		209...212			
5	Input 1 word		207...206			
6	Input 1 byte		206			
7	Input 1 byte		207			
8	Input 1 byte		208			
9	Input 2 word		213...216			
10	Input 2 word		217...220			
11	Input 2 word		207...204			
12	Input 1 word		203...204			

### Device specific float 3:

Title	Byte	Bit	Name	Meaning
leak_rate	3 ... 6		Leak rate (mbar/l/s)	Actual leak rate in mbar l/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level
		1	Status of Trigger 2	
		2	Status of Trigger 3	
		3	Status of Trigger 4	
calibration_status	14	4 ... 7	not used	always 0
			calibration_status	For possible values please refer to command 260 in table 3.4, "Commands", page 26.
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			206...207*		
2	Input 1 word		209...210			
3	Input 2 word		205...208			
4	Input 2 word		209...212			
5	Input 1 word		207...206			
6	Input 1 byte		206			
7	Input 1 byte		207			
8	Input 1 byte		208			
9	Input 2 word		213...216			
10	Input 2 word		217...220			
11	Input 2 word		207...204			
12	Input 1 word		203...204			

**Device specific word:**

Title	Byte	Bit	Name	Meaning
leak_rate	3 ... 6		Leak rate (mbar/s)	Actual leak rate in mbar/s (IEEE 754 float value)
pressure_or_flow	7 ... 10		Pressure	Pressure p1 in mbar (IEEE 754 float value)
error_code	11 ... 12		Actual error number	Error/warning code (16 bit unsigned integer)
trigger_status	13	0	Status of Trigger 1	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level
		1	Status of Trigger 2	
		2	Status of Trigger 3	
		3	Status of Trigger 4	
calibration_status	14	4 ... 7	not used	always 0
			calibration_status	For possible values please refer to command 260 in table 3.4, "Commands," page 26.
leak_detector ID	15		leak_detector ID	always 45 for LDS3000 MSB
device specific float 1	16 ... 19		device specific float 1	Pressure p2 in mbar (IEEE 754 float value)
device specific float 2	20 ... 23		device specific float 2	Pressure p3 in user specific unit (IEEE 754 float value)
device specific float 3	24 ... 27		device specific float 3	Pressure p4 in user specific unit (IEEE 754 float value)
device specific word	28 ... 29		device specific word	reserved for further use, always 0

(1) BM1000						
Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			206, 207		
2	Input 1 word		269, 260			
3	Input 2 word		265, 266			
4	Input 2 word		269, 272			
5	Input 1 word		267, 262			
6	Input 1 byte		266			
7	Input 1 byte		267			
8	Input 1 byte		260			
9	Input 2 word		273, 276			
10	Input 2 word		277, 280			
11	Input 2 word		281, 284			
12	Input 1 word		263, 264			

**Attention:**

The BM1000 PROFINET-IO module will send the high byte to the PROFINET-IO master (e.g. PLC Controller) first.

### 3.8 Acyclic data exchange – PROFINET-IO Master and the INFICON BM1000 PROFINET-IO slave

Acyclic data exchange between PROFINET-IO Master (e.g. PLC controller) and the INFICON BM1000 PROFINET-IO Module slaves is supported. If parameters should be read or write, which are not included inside the cyclic data, an acyclic data exchange needs to be done.

The acyclic data exchange between PROFINET-IO Master (e.g. PLC controller) and the INFICON BM1000 PROFINET-IO Module is based on the LD Protocol and the LD command numbers.

Almost all parameter of the leak detector could be read or write via the BM1000 PROFINET-IO Module. The data records and their structure are explained in the protocol descriptions of the used leak detector. Detailed information's can be found in the chapter "**LD Protocol**".

All parameters of the leak detector are listed down in the LD command table. Parameters, which cannot be read or write acyclically are marked with "**No fieldbus support**" in the LD Protocol table.

3.4 Commands									
Command		Class	Name	R/W	Data type	Min-, Def., Max- value LDS3000	LDS3000 MSB	No fieldbus support	
dez	hex								
0	0	Control	NOP	R	NO_DATA		"No operation", replies without data	X	

Figure 3 LD command table 1

Command	Description
<b>Command</b>	LD command number in decimal or hexadecimal notation
<b>Class</b>	Class of the LD command
<b>Name</b>	Name of the LD command
<b>R/W</b>	Access possibility to the parameter (read/write) R = parameter can be read W= parameter can be write
<b>Data type</b>	Data type of the parameter
<b>Min-, Def.-, Max-Value LDS3000</b>	Factory setting (Def.) and limit values (min max) and of the LD command
<b>LDS3000 MSB</b>	Description of the LD command
<b>No fieldbus support</b>	X = LD command is not able to be read or write acyclically

### 3.8.1 Acyclic data exchange addressing rules

The LD command numbers will be mapped to the PROFINET-IO master (e.g. PLC controller) via the INFICON BM1000 PROFINET-IO module by the following addressing rule:

- **Application Process Instance (API) = 0**
- **Slot = 0**
- **Subslot = 1**
- **Index = LD\_command\_number**

### 3.8.2 Reading data from leak detector acyclically

Acyclic reading of parameters is limited. A maximum of 4/8 (depending on the CPU type) acyclic calls can be made simultaneously with a PLC control of type S7-300 /S7-400.

If more than 4/8 parameters must be read acyclically, the access must be programmed accordingly in the PLC program so that the maximum number of simultaneous read accesses is not exceeded.

System function (SFC)/ System function block (SFB) / Instruction	"RDREC" (SFB 52) / "WRREC" (SFB 53)	"RD_REC" (SFC 59) / "WR_REC" (SFC 58)
Meaning	Data record to/from central or remote slotted module (PROFIBUS DP or PROFINET IO)	
IM 154 (ET 200pro) IM 151 (ET 200S) IM 147 (ET 200X)	4 jobs in total (RDREC, WRREC, RD_REC and WR_REC)	
CPU 312, CPU 313, CPU 314, CPU 315, CPU 316	4 jobs in total (RDREC, WRREC, RD_REC, WR_REC)	
CPU 317, CPU 319, CPU 318-2	8 jobs in total (RDREC, WRREC, RD_REC, WR_REC)	
CPU 41x <sup>1)</sup>	8 jobs each per PROFIBUS DP segment and PROFINET IO system	
CPU 121x	4 jobs in total (RDREC, WRREC)	Not available
CPU 151x up to and including firmware V1.8	10 jobs each in total	10 jobs each in total
CPU 151x firmware V2.0 and higher	20 jobs each in total	10 jobs each in total

Table 1

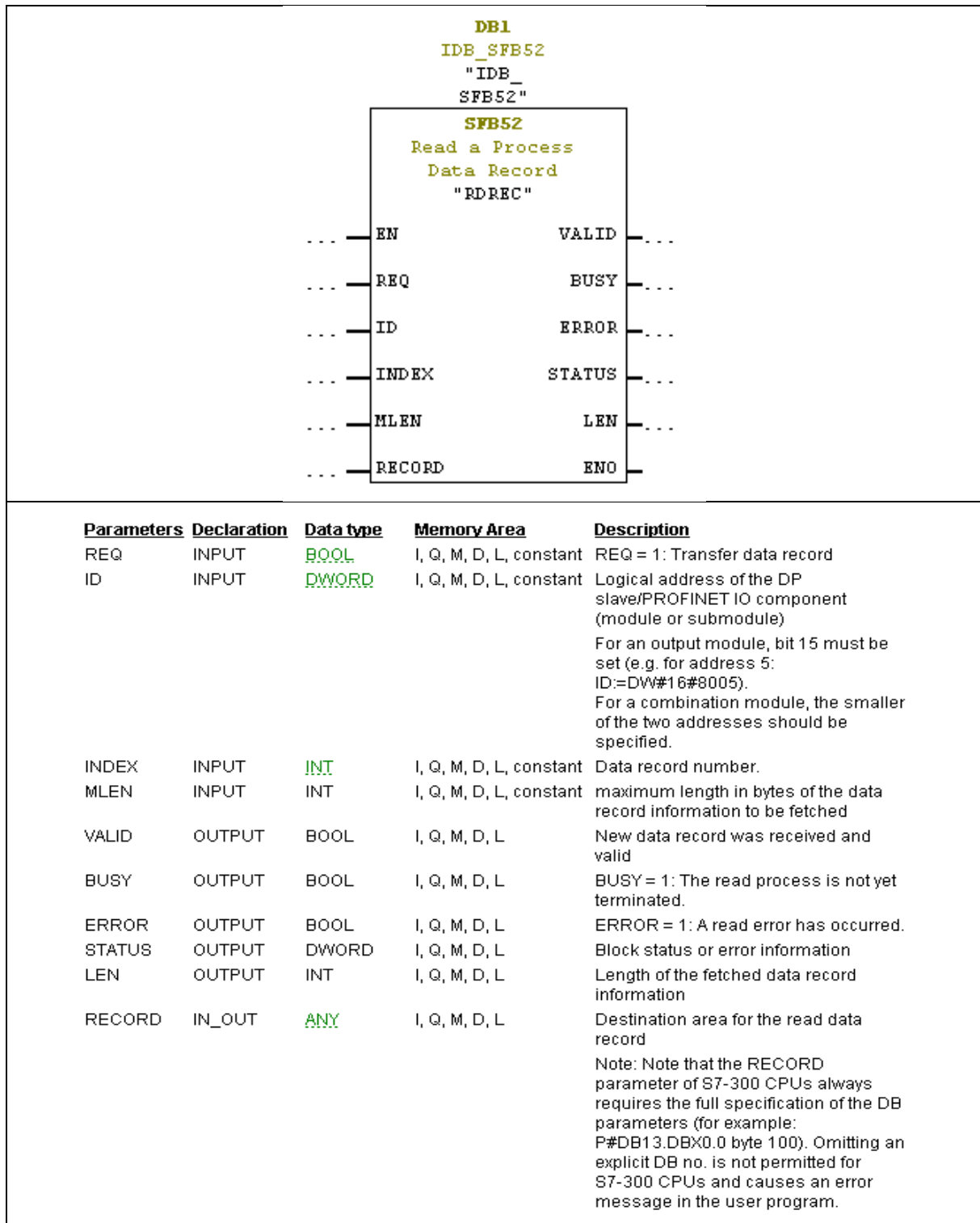
<sup>1)</sup> The number of simultaneous jobs on external PROFIBUS DP segments and PROFINET IO systems must not exceed 32 jobs per SFC/SFB. External PROFIBUS DP segments and external PROFINET IO systems are connected via the interfaces of CPs/CMs.

This information is taken from:

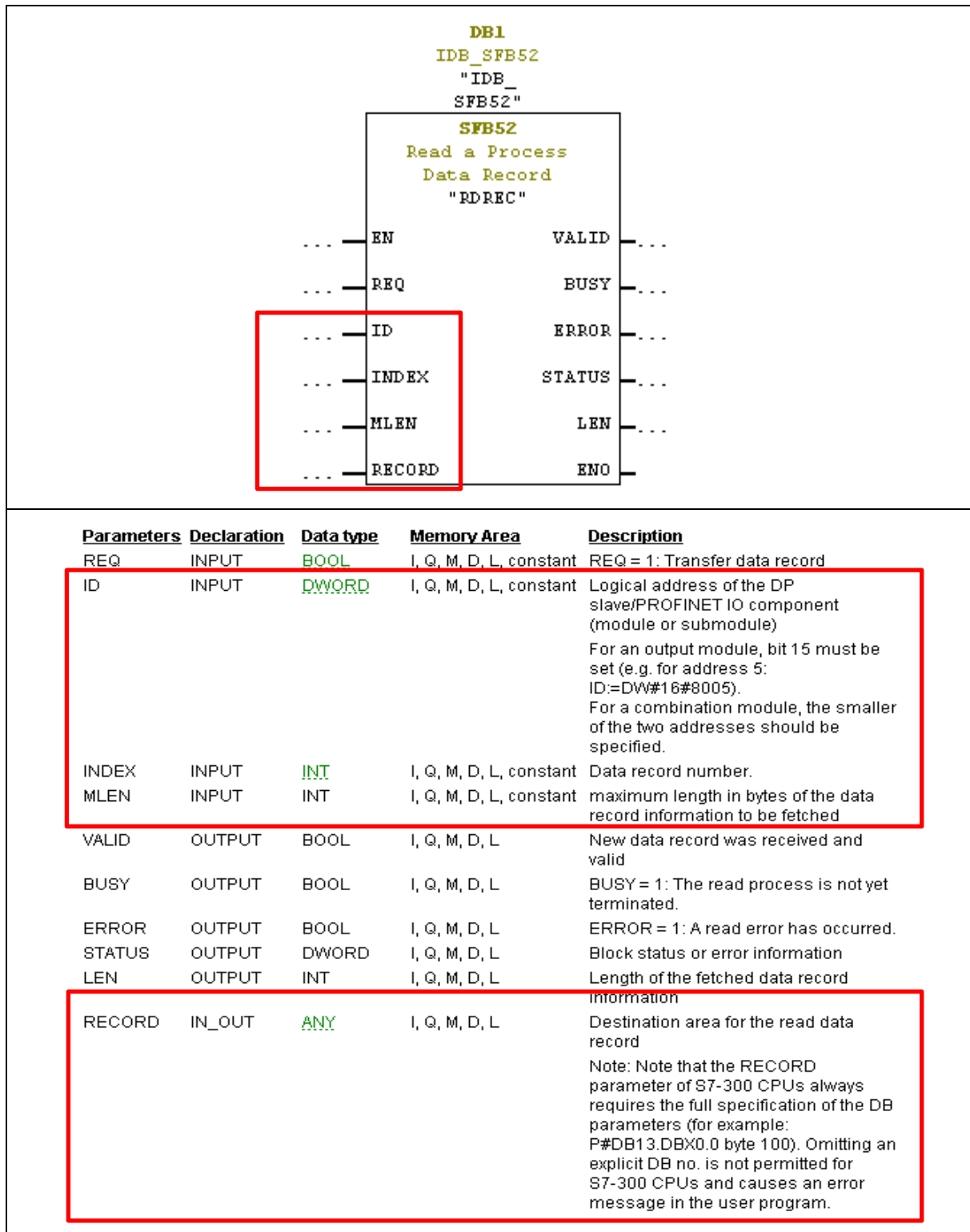
[https://support.industry.siemens.com/cs/document/15364459/what-restrictions-are-there-for-active-jobs-when-communicating-with-wr\\_rec-rd\\_rec-and-rdrec-wrrec-via-profibus-dp-and-profinet-io-?dti=0&lc=en-WW](https://support.industry.siemens.com/cs/document/15364459/what-restrictions-are-there-for-active-jobs-when-communicating-with-wr_rec-rd_rec-and-rdrec-wrrec-via-profibus-dp-and-profinet-io-?dti=0&lc=en-WW)

### 3.8.2.1 Using Siemens standard function block SFB52 "RDREC"

In order to read a data record acyclically from a PROFINET-IO Slave, Siemens offers the Standard Function Block **SFB52 "RDREC"** in the library of the Step7 Manager.



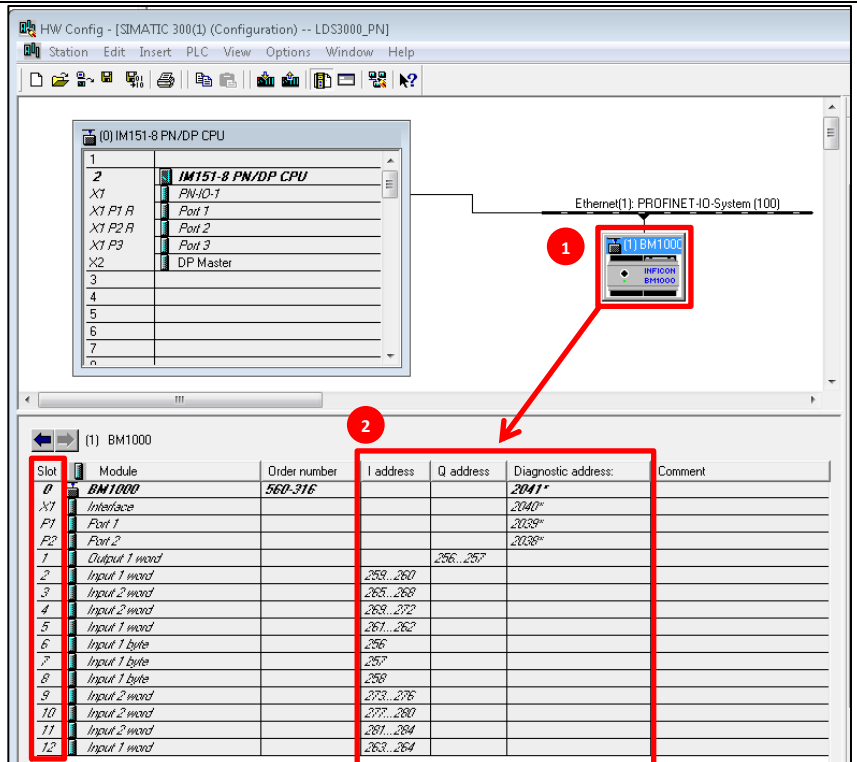
To read a parameter acyclically from the leak detector via the BM1000 PROFINET-IO Module, the following input parameters of the **SFB52 "RDREC"** needs to be set correspondingly to the LD command to be read:



### 3.8.2.1.1 Parameter ID

The parameter **ID** represents the logical address of the PROFINET-IO -Slave. To get the **ID** of an PROFINET-IO -Slave the hardware configuration needs to be opened and the corresponding PROFINET-IO -Slave needs to be selected (e.g. BM1000 PROFINET-IO Module).

1. Select "**INFICON BM1000**" PROFINET-IO module
2. The starting address of the input and output addresses of each slot are representing the **ID**



The screenshot shows the HW Config window for a SIMATIC 300 station. The rack configuration is as follows:

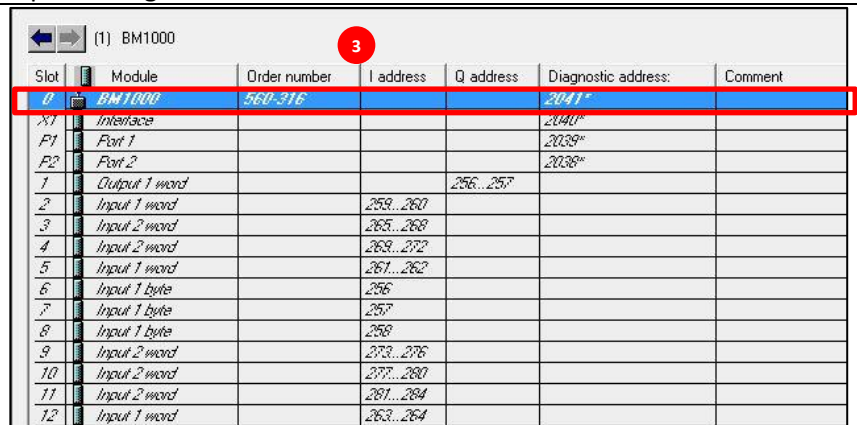
Slot	Module	Order number
1	IM151-8 PN/DP CPU	
2	PN-IO-1	
X1	P1 R	
X1	P2 R	
X1	P3	
X2	DP Master	

The configuration table for the selected (1) BM1000 module is shown below:

Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

Each slot of the PROFINET-IO slave has its own logical address range. The starting address of the input and output addresses of each slot are representing the **ID**

3. The "**Diagnostic address**" of Slot 0 needs to be chosen as "**ID**"



The configuration table for the selected (1) BM1000 module is shown below, with the diagnostic address of Slot 0 highlighted:

Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

To address the INFICON BM1000 PROFINET-IO slave the "**Diagnostic address**" of Slot 0 needs to be taken.

ID = 2041<sub>Dec</sub> = 7F9<sub>Hex</sub>

### 3.8.2.1.2 Parameter INDEX

The parameter **INDEX** needs to be set to the decimal LD command number to be read, based on the LD Protocol taken from the LD command table of the protocol descriptions.

**INDEX = decimal LD command number**

Command		Class	Name	R/W	Data type	Min-, Def-, Max- value LDS3000	LDS3000 MSB	No fieldbus support
dez	hex							
502	1F6	Param	Amplifier range	R/W	UINT8	0, 3, 3	Amplifier range Amplifier control location 508 automatically set (not auto) 0 = 13 MOhm 1 = 470 MOhm 2 = 15 GOhm 3 = 500 GOhm	
504	1F8	Param	500GOhm value	R/W	FLOAT	4.5E1, 5E11, 5.5E11Ohm	500GOhm value	
506	1FA	Param	Mass	R/W	UINT8	2, 4, 4	2 = Mass 2 (H2) 3 = Mass 3 4 = Mass 4 (Helium)	

### 3.8.2.1.3 Parameter MLEN

The parameter **MLEN** specifies the length of the data to be read in bytes. The length of the LD command to be read based on the LD Protocol is taken from the LD command table of the protocol descriptions.

The parameter **MLEN** needs to be calculated based on the data type of the LD command to be read.

Command		Class	Name	R/W	Data type	Min-, Def-, Max- value LDS3000	LDS3000 MSB	No fieldbus support
dez	hex							
502	1F6	Param	Amplifier range	R/W	UINT8	0, 3, 3	Amplifier range Amplifier control location 508 automatically set (not auto) 0 = 13 MOhm 1 = 470 MOhm 2 = 15 GOhm 3 = 500 GOhm	
504	1F8	Param	500GOhm value	R/W	FLOAT	4.5E1, 5E11, 5.5E11Ohm	500GOhm value	
506	1FA	Param	Mass	R/W	UINT8	2, 4, 4	2 = Mass 2 (H2) 3 = Mass 3 4 = Mass 4 (Helium)	

Data type	Meaning	MLEN [bytes]
<b>SINT8</b>	Signed 8 bit integer	1
<b>SINT16</b>	Signed 16 bit integer	2
<b>SINT32</b>	Signed 32 bit integer	4
<b>UINT8</b>	Unsigned 8 bit integer	1
<b>UINT16</b>	Unsigned 16 bit integer	2
<b>UINT32</b>	Unsigned 32 bit integer	4
<b>FLOAT</b>	Floating point / real number	4
<b>CHAR</b>	Character	1



Some LD commands are of the array data type. This is indicated by a square bracket after the data type itself (e.g. FLOAT[3]). The number in the brackets indicates the number of array elements (e.g. [3] = 3 array elements).

If the LD command is of the array data type, the parameter **MLEN** needs to be calculated by the following rule:

**MLEN = Data type length in bytes \* number of array elements**

Example:

520	208	Calibration factors vacuum	R/W	<div style="border: 2px solid red; padding: 2px;">FLOAT[3]</div>	Calibration factors for vacuum mode (and for AQ-mode) Index 0: mass 2 Index 1: mass 3 Index 2: mass 4
-----	-----	----------------------------	-----	--	---

The LD command 520 "Cal factors vacuum" is an array with 3 array elements of data type FLOAT. The data type FLOAT has a length of 4 bytes.

In order to calculate the parameter **MLEN**, the length of the data type needs to be multiplied by the number of array elements:

**MLEN = 4 bytes \* 3 = 12 bytes**

#### Attention!

If the data type of the LD command to be read is an array, it is not possible to read only one of the array elements. It must be always read the whole array with all array elements.

The index of arrays always starts with index[0].

### 3.8.2.1.4 Parameter RECORD

The parameter **RECORD** specifies the target for the data to be read. For this reason, the data type of the parameter **RECORD** need to be the same like the data type of the LD command.

Please use the data types in the corresponding list below.

Data type leak detector	Meaning	Data type Step7
<b>SINT8</b>	Signed 8 bit integer	<b>Byte / INT</b>
<b>SINT16</b>	Signed 16 bit integer	<b>INT</b>
<b>SINT32</b>	Signed 32 bit integer	<b>DINT</b>
<b>UINT8</b>	Unsigned 8 bit integer	<b>Byte / INT</b>
<b>UINT16</b>	Unsigned 16 bit integer	<b>WORD</b>
<b>UINT32</b>	Unsigned 32 bit integer	<b>DWORD</b>
<b>FLOAT</b>	Floating point / real number	<b>REAL</b>
<b>CHAR</b>	Character	<b>CHAR</b>

If the LD command to be read is an array, please also use an array with the same array dimensions and the corresponding data type.

#### Example:

520	208	Calibration factors vacuum	R/W	FLOAT[3]	Calibration factors for vacuum mode (and for AQ-mode) Index 0: mass 2 Index 1: mass 3 Index 2: mass 4
-----	-----	----------------------------	-----	----------	---

The LD command 520 "Cal factors vacuum" is an array with 3 array elements of data type FLOAT. The data type FLOAT corresponds to the data type REAL in Step7.

Please use as **RECORD** value: Array[0..2] of Real.

LD520_CAL_factors_VAC	ARRAY[0..2]		LD 520: Calibration factors vacuum
	REAL		

### 3.8.3 Example 1: Acyclically read Mass by using LD command 506

To read the parameter “**Mass**” from the leak detector to the PLC controller acyclically, use LD command table in the protocol description with the parameter to be read.

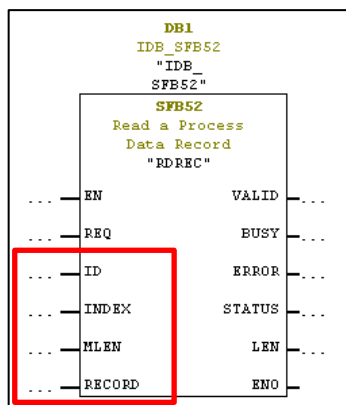
1. Open the LD command table in the protocol description with the parameter to be read

Command		Class	Name	R/W	Data type	Min-, Def-, Max- value LDS3000	LDS3000 MSB	No fieldbus support
dez	hex							
502	1F6	Param	Amplifier range	R/W	UINT8	0, 3, 3	Amplifier range Amplifier control location 508 automatically set (not auto) 0 = 13 MOhm 1 = 470 MOhm 2 = 15 GOhm 3 = 500 GOhm	
504	1F8	Param	500GOhm value	R/W	FLOAT	4.5E1, 5E11, 5.5E11Ohm	500GOhm value	
506	1FA	Param	Mass	R/W	UINT8	2, 4, 4	2 = Mass 2 (H2) 3 = Mass 3 4 = Mass 4 (Helium)	

Figure 4 LD command table LD command 506

2. Using Siemens standard Function Block **SFB52 “RDREC”** to read acyclically a data record

To read the Trigger values by using the **LD command number 506** from the Leak Detector via the BM1000 PROFINET-IO Module, the following input parameters of the **SFB52 “RDREC”** needs to be set correspondingly to the LD command number:



- **ID (logical address of the PROFINET-IO-Slave)**

To get the ID of an PROFINET-IO Slave the hardware configuration needs to be opened and the corresponding Slave needs to be selected (e.g. BM1000 PROFINET-IO Module)

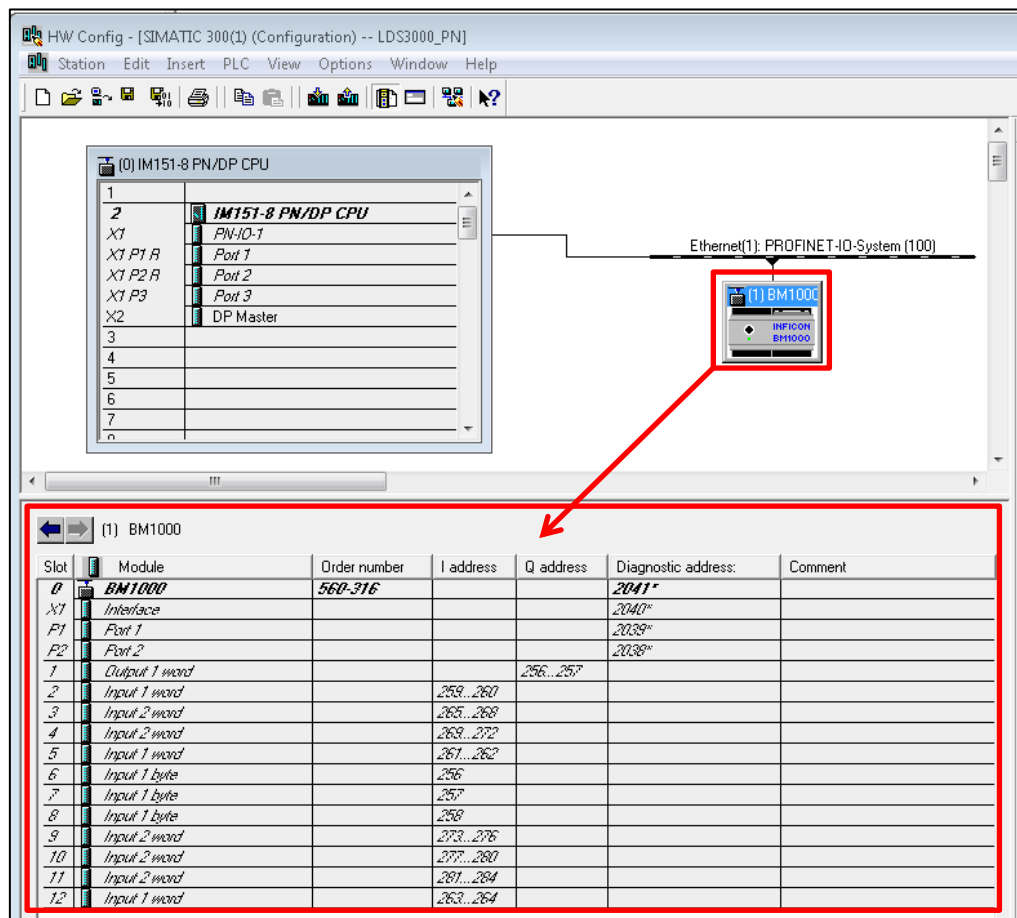


Figure 5 Hardware configuration 11

Each slot of the PROFINET-IO slave has its own logical address range. The logical address ranges of the PROFINET-IO BM1000 Module are shown in the following figure.

(1) BM1000						
Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

Figure 6 Hardware configuration logical addresses 4

To address the INFICON BM1000 PROFINET-IO slave the “Diagnostic address” of **Slot 0** needs to be taken.

**ID = 2041**

- **INDEX**

The INDEX needs to be set to the LD command which should be read or write.

**INDEX = 506**

- **MLEN**

The parameter **MLEN** defines the maximum length (in bytes) of the data record that wants to be read.

The maximum length of the data record needs to be taken out from the LD Commands table of the protocol description.

506	1FA	Param	Mass	R/W	UINT8	2, 4, 4	2 = Mass 2 (H2) 3 = Mass 3 4 = Mass 4 (Helium)
-----	-----	-------	------	-----	-------	---------	--

Figure 7 LD command table LD command 506

The parameter **MLEN** corresponded with the data type of the LD command table. In this case the data type of **LD command number 506** is **UINT8**, which corresponds to a length of 1 byte.

**Attention:**

If the data type of an LD command is an array all array entries will be transferred. The length of the data type in bytes needs to be multiplied with the array entries

Calculation the parameter MLEN:

**MLEN = UINT8 = 1 byte**

- **RECORD**

The parameter “RECORD” specifies the destination for the read data record. For this reason the parameter “RECORD” needs to be the same data type with also the same length like in the LD command table of the Protocol description.

506	1FA	Param	Mass	R/W	UINT8	2, 4, 4	2 = Mass 2 (H2) 3 = Mass 3 4 = Mass 4 (Helium)
-----	-----	-------	------	-----	-------	---------	--

+28.0	LD_506_Mass	BYTE	B#16#0	LD command 506: Mass (2 = Mass 2 (H2), 3 = Mass 3, 4 = Mass 4 (Helium))			
-------	-------------	------	--------	---	--	--	--

3. Insert Siemens standard Function Block **SFB52 “RDREC”** into the PLC program

The Function Block SFB52 is called in a normal Function (e.g. FC1000). To be flexible, all input and output parameters are parameterized to a Data Block (e.g. DB1000).

```

Netzwerk 4 : Read acyclic Data Record: LD Command 506 Mass

U      "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.REQ      DB1000.DBX0.0
FP     "HM_IMP_RD_REQ"                                     M10.0
=      "IMP_RD_REQ"                                         M10.1

CALL   "RDREC" , "IDB_SFB52"                               SFB52 / DB1
REQ    := "IMP_RD_REQ"                                     M10.1
ID     := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.ID    DB1000.DBD2
INDEX  := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.INDEX DB1000.DBW6
MLEN   := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.MLEN  DB1000.DBW8
VALID  := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.VALID DB1000.DBX10.0
BUSY   := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.BUSY DB1000.DBX10.1
ERROR  := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.ERROR DB1000.DBX10.2
STATUS := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.STATUS DB1000.DBD12
LEN    := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.LEN  DB1000.DBW16
RECORD := "DB_Acyclic_Data".LD_506_Mass                   DB3001.DBB28

```

Figure 8 Step7 Function SFB52

#### 4. Setting the input parameters of Siemens standard Function Block **SFB52 "RDREC"**

The input parameters **ID**, **INDEX**, **MLEN** and **RECORD** needs to be set based on the command number of the LD protocol of the Leak Detector.

- ID = 2041
- INDEX = 506
- MLEN = 1
- RECORD = 1 byte

All other parameters of **SFB52** must be set user-dependently

### 3.8.4 Example 2: Acyclically read Trigger values by using LD command 385

To read the parameter “**Trigger**” from the leak detector to the PLC controller acyclically, use LD command table in the protocol description with the parameter to be read

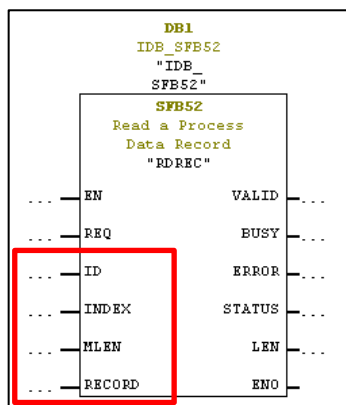
1. Open the LD command table in the protocol description with the parameter to be read

Command		Class	Name	R/W	Data type	Min-, Def-, Max- value LDS3000	LDS3000 MSB	No fieldbus support
dez	hex							
370	172	Param	Amp test	R/W	UINT8		0 = no test with calibration 1 = test with calibration	
371	173	Status	Run Amp test	R/W	UINT8		write: 1 = test now read: 0 = Ready 1 ... 13 test running	
380	17C	Param	Search active	R/W	UINT8	0, 0, 1	0 = Off 1 = ON trigger2 for search in HIGHFLOW SL3000XL only	
385	181	Param	Trigger [mbar"/s]	R/W	FLOAT[4]	1E-12, 1E-5, 1E3	Trigger in mbar"/s	
387	183	Status	Trigger status	R	UINT8		Trigger status: 0 = Leak rate < trigger level 1 = Leak rate > trigger level Bit 0 = Trigger1 Bit 1 = Trigger2 Bit 2 = Trigger3 Bit 3 = Trigger4	
390	186	Param	Test leak extern vacuum [mbar"/s]	R/W	FLOAT[3]	1E-9, 9.9E-1, 9.9E-1	Test leak extern Vacuum [mbar"/s] (Also valid for AQ mode) Index 0: Mass 2 Index 1: Mass 3 Index 2: Mass 4 Helium	
392	188	Param	Test leak extern sniff [mbar"/s]	R/W	FLOAT[3]	5.0E-6, 9.9E-1, 9.9E-1	Test leak extern for sniff mode in mbar"/s Index [0] = Mass2 forming gas 5/95 Index [1] = Mass 3 Index [2] = Mass 4 Helium	X
394	18A	Param	Testleak intern [mbar"/s]	R/W	FLOAT	1E-9, 9.9E-1, 9.9E-1	Testleak intern in mbar"/s	

Figure 9 LD command table LD command 385

2. Using Siemens standard Function Block **SFB52 “RDREC”** to read acyclically a data record

To read the Trigger values by using the **LD command number 385** from the Leak Detector via the BM1000 PROFINET-IO Module, the following input parameters of the **SFB52 “RDREC”** needs to be set correspondingly to the LD command number:







- **ID (logical address of the PROFINET-IO-Slave)**

To get the ID of an PROFINET-IO Slave the hardware configuration needs to be opened and the corresponding Slave needs to be selected (e.g. BM1000 PROFINET-IO Module)

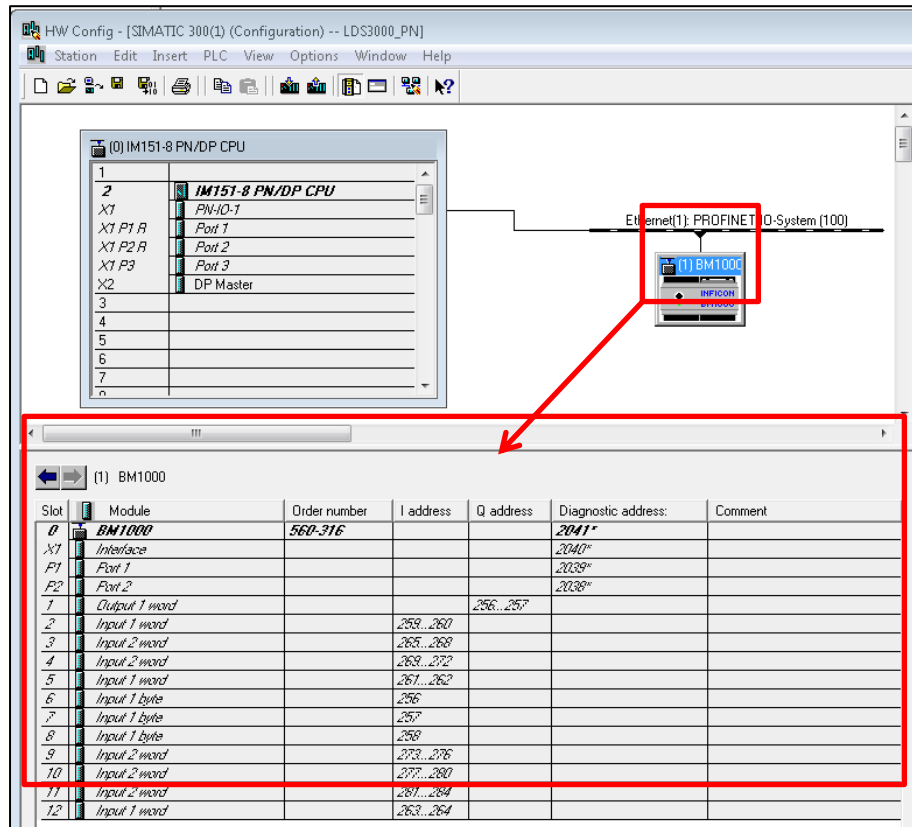


Figure 10 Hardware configuration 11

Each slot of the PROFINET-IO slave has its own logical address range. The logical address ranges of the PROFINET-IO BM1000 Module are shown in the following figure.

Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

Figure 11 Hardware configuration logical addresses 4

To address the INFICON BM1000 PROFINET-IO slave the “Diagnostic address” of **Slot 0** needs to be taken.

**ID = 2041**

- **INDEX**

The INDEX needs to be set to the LD command which should be read or write.

**INDEX = 385**

- **MLEN**

The parameter **MLEN** defines the maximum length (in bytes) of the data record that wants to be read.

The maximum length of the data record needs to be taken out from the LD Commands table of the protocol description.

385	181	Param	Trigger [mbar*l/s]	R/W	FLOAT[4]	1E-12, 1E-5, 1E3	Trigger in mbar*l/s
-----	-----	-------	--------------------	-----	----------	------------------	---------------------

Figure 12 LD command table LD command 385

The parameter **MLEN** corresponded with the data type of the LD command table. In this case the data type of **LD command number 385** is an array of FLOAT with 4 array entries, which corresponds to a length of 16 bytes.

**Attention:**

If the data type of an LD command is an array all array entries will be transferred. The length of the data type in bytes needs to be multiplied with the array entries

Calculation the parameter MLEN:

**MLEN = 4 \* 4 bytes = 16 bytes** (the data type float corresponds to 4 byte)

- **RECORD**

The parameter “RECORD” specifies the destination for the read data record. For this reason the parameter “RECORD” needs to be the same data type with also the same length like in the LD command table of the Protocol description.

385	181	Param	Trigger [mbar*l/s]	R/W	FLOAT[4]	1E-12, 1E-5, 1E3	Trigger in mbar*l/s
-----	-----	-------	--------------------	-----	----------	------------------	---------------------

+0.0	LD_385_Trigger	ARRAY[0..3]		LD command 385: Trigger [mbar*l/s]
*4.0		REAL		

3. Insert Siemens standard Function Block **SFB52 “RDREC”** into the PLC program

The Function Block SFB52 is called in a normal Function (e.g. FC1000). To be flexible, all input and output parameters are parameterized to a Data Block (e.g. DB1000).

```

Netzwerk 3 : Read acyclic Data Record: LD Command 385 Trigger

  U      "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.REQ      DB1000.DBX0.0
  FP     "HM_IMP_RD_REQ"                                     M10.0
  =      "IMP_RD_REQ"                                       M10.1

  CALL   "RDREC" , "IDB_SFB52"                               SFB52 / DB1
  REQ    := "IMP_RD_REQ"                                     M10.1
  ID     := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.ID    DB1000.DBD2
  INDEX  := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.INDEX DB1000.DBW6
  MLEN   := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.MLEN DB1000.DBW8
  VALID  := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.VALID DB1000.DBX10.0
  BUSY   := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.BUSY DB1000.DBX10.1
  ERROR  := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.ERROR DB1000.DBX10.2
  STATUS := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.STATUS DB1000.DBD12
  LEN    := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.LEN DB1000.DBW16
  RECORD := "DB_Acyclic_Data".LD_385_Trigger                P#DB3001.DBX0.0
  
```

Figure 13 Step7 Function SFB52

#### 4. Setting the input parameters of Siemens standard Function Block **SFB52 "RDREC"**

The input parameters **ID**, **INDEX**, **MLEN** and **RECORD** needs to be set based on the command number of the LD protocol of the Leak Detector.

- ID = 2041
- INDEX = 385
- MLEN = 16
- RECORD = 16 bytes or an array[4] of floating point values

All other parameters of **SFB52** must be set user-dependently

### 3.8.5 Example 3: Acyclically read Calibration factors Vacuum by using LD command 520

To read the parameter “**Calibration factors vacuum**” from the leak detector to the PLC controller acyclically, use LD command table in the protocol description with the parameter to be read.

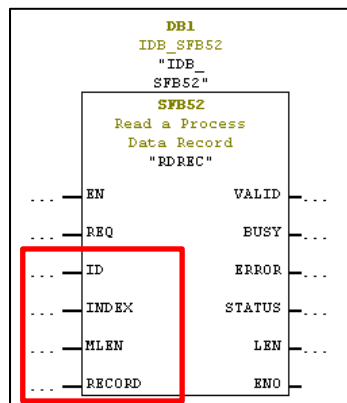
1. Open the LD command table in the protocol description with the parameter to be read

Command	dez	hex	Class	Name	R/W	Data type	Min-, Def-, Max- value LDS3000	LDS3000 MSB	No fieldbus support
502		1F6	Param	Amplifier range	R/W	UINT8	0, 3, 3	Amplifier range Amplifier control location 508 automatically set (not auto) 0 = 13 MOhm 1 = 470 MOhm 2 = 15 GOhm 3 = 500 GOhm	
504		1F8	Param	500GOhm value	R/W	FLOAT	4.5E1, 5E11, 5.5E11Ohm	500GOhm value	
506		1FA	Param	Mass	R/W	UINT8	2, 4, 4	2 = Mass 2 (H2) 3 = Mass 3 4 = Mass 4 (Helium)	
508		1FC	Param	Amplifier control location	R/W	UINT8	0, 1, 1	Amplifier control location 1 = automatic on (default) 0 = automatic off Write access only possible if "Manual control for service" is active	
519		207	Param	Cal factors sniff high flow	R/W	FLOAT[3]	0.01, 1, 100	Calibration factors for sniff mode high flow Index [0] = mass 2 Index [1] = mass 3 Index [2] = mass 4	
520		208	Param	Calibration factors vacuum	R/W	FLOAT[3]	0.01, 1, 5000	Calibration factors for vacuum mode (and for A-Q-mode) Index 0: mass 2 Index 1: mass 3 Index 2: mass 4	
521		209	Param	Calibration factors sniff	R/W	FLOAT[3]	0.01, 1, 100	Calibration factors for sniff mode Index [0] = mass 2 Index [1] = mass 3 Index [2] = mass 4	
522		20A	Param	Machine factors vacuum	R/W	FLOAT[3]	1E-4, 1, 1E5	Machine factors for vacuum mode Index [0] = mass 2 Index [1] = mass 3 Index [2] = mass 4	

Figure 14 LD command table LD command 520

2. Using Siemens standard Function Block **SFB52 “RDREC”** to read acyclically a data record

To read the Calibration factors vacuum by using the **LD command number 520** from the Leak Detector via the BM1000 PROFINET-IO Module the following input parameters of the **SFB52 “RDREC”** needs to be set, correspondingly to the LD command number:



- **ID (logical address of the PROFINET-IO Slave)**

To get the ID of an PROFINET-IO Slave the hardware configuration needs to be opened and the corresponding Slave needs to be selected (e.g. BM1000 PROFINET-IO Module)

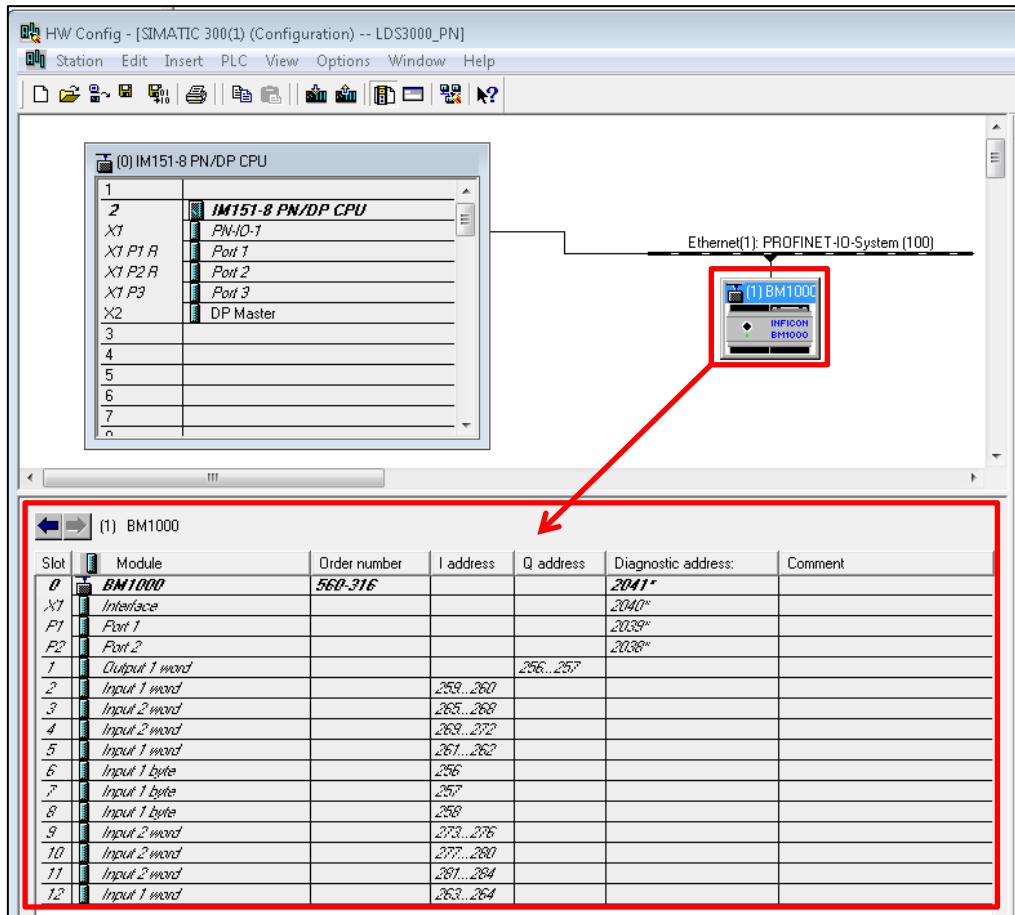


Figure 15 Hardware configuration 13

Each slot of the PROFINET-IO slave has its own logical address range. The logical address ranges of the PROFINET-IO BM1000 Module are shown in the following figure.

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
F1	Port 1				2039*	
F2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

Figure 16 Hardware configuration Diagnostic address

To address the INFICON BM1000 PROFINET-IO slave the “Diagnostic address” of **Slot 0** needs to be taken.

**ID = 2041**

- INDEX**

The INDEX needs to be set to the LD command which should be read or write.

**INDEX = 520**

- MLEN**

The parameter **MLEN** defines the maximum length (in bytes) of the data record that wants to be read.

The maximum length of the data record needs to be taken out from the LD Commands table of the protocol description.

520	208	Param	Calibration factors vacuum	R/W	FLOAT[3]	0.01, 1, 5000	Calibration factors for vacuum mode (and for AQ-mode) Index 0: mass 2 Index 1: mass 3 Index 2: mass 4
-----	-----	-------	----------------------------	-----	----------	---------------	---

Figure 17 LD command table LD command 520

The parameter **MLEN** corresponded with the data type of the LD command table. In this case the data type of **LD command number 520** is an array of FLOAT with 3 array entries, which corresponds to a length of 12 bytes.

**Attention:**

If the data type of an LD command is an array all array entries will be transferred. The length of the data type in bytes needs to be multiplied with the array entries

Calculation the parameter MLEN:

**MLEN = 3 \* 4 bytes = 12 bytes** (the data type float corresponds to 4 byte)

- **RECORD**

The parameter "RECORD" specifies the destination for the read data record. For this reason the parameter "RECORD" needs to be the same data type with also the same length like in the LD command table of the Protocol description.

520	208	Param	Calibration factors vacuum	R/W	Float[3]	0.01, 1, 5000	Calibration factors for vacuum mode (and for AQ-mode) Index 0: mass 2 Index 1: mass 3 Index 2: mass 4
+30.0		LD_520_Cal_Fac_VAC	ARRAY[0..2]				
*4.0			REAL				

LD command 520: Calibration factor vacuum

### 3. Insert Siemens standard Function Block **SFB52 "RDREC"** into the PLC program

The Function Block SFB52 is called in a normal Function (e.g. FC1000). To be flexible, all input and output parameters are parameterized to a Data Block (e.g. DB1000).

```

Netzwerk 2 : Read acyclic Data Record: LD Command 520 Calibration factors VAC

U      "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.REQ      DB1000.DBX0.0
FP      "HM_IMP_RD_REQ"                                     M10.0
=      "IMP_RD_REQ"                                         M10.1

CALL    "RDREC" , "IDB_SFB52"                               SFB52 / DB1
REQ     := "IMP_RD_REQ"                                     M10.1
ID      := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.ID   DB1000.DBD2
INDEX   := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.INDEX DB1000.DBW6
MLEN    := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.IN.MLEN DB1000.DBW8
VALID   := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.VALID DB1000.DBX10.0
BUSY    := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.BUSY DB1000.DBX10.1
ERROR   := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.ERROR DB1000.DBX10.2
STATUS  := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.STATUS DB1000.DBD12
LEN     := "DB_Acyclic_Data_Exchange".SFB_52_RDREC.OUT.LEN DB1000.DBW16
RECORD  := "DB_Acyclic_Data".LD_520_Cal_Fac_VAC            P#DB3001.DBX30.0
  
```

Figure 18 Step7 Function SFB52

### 4. Setting the input parameters of Siemens standard Function Block **SFB52 "RDREC"**

The input parameters **ID**, **INDEX**, **MLEN** and **RECORD** needs to be set based on the LD command number from the LD protocol of the Leak Detector.

- ID = 2041
- INDEX = 520
- MLEN = 12
- RECORD = 12 bytes or an array[3] of floating point values

All other parameters of **SFB52** must be set user-dependently.

### 3.9 Writing data to leak detector acyclically

Acyclic writing of parameters is limited. A maximum of 4/8 (depending on the CPU type) acyclic calls can be made simultaneously with a PLC control of type S7-300 /S7-400.

If more than 4/8 parameters must be read acyclically, the access must be programmed accordingly in the PLC program so that the maximum number of simultaneous read accesses is not exceeded.

System function (SFC)/ System function block (SFB) / Instruction	"RDREC" (SFB 52) / "WRREC" (SFB 53)	"RD_REC" (SFC 59) / "WR_REC" (SFC 58)
Meaning	Data record to/from central or remote slotted module (PROFIBUS DP or PROFINET IO)	Data record to/from IO
IM 154 (ET 200pro) IM 151 (ET 200S) IM 147 (ET 200X)	4 jobs in total (RDREC, WRREC, RD_REC and WR_REC)	
CPU 312, CPU 313, CPU 314, CPU 315, CPU 316	4 jobs in total (RDREC, WRREC, RD_REC, WR_REC)	
CPU 317, CPU 319, CPU 318-2	8 jobs in total (RDREC, WRREC, RD_REC, WR_REC)	
CPU 41x <sup>1)</sup>	8 jobs each per PROFIBUS DP segment and PROFINET IO system	
CPU 121x	4 jobs in total (RDREC, WRREC)	Not available
CPU 151x up to and including firmware V1.8	10 jobs each in total	10 jobs each in total
CPU 151x firmware V2.0 and higher	20 jobs each in total	10 jobs each in total

Table 1

<sup>1)</sup> The number of simultaneous jobs on external PROFIBUS DP segments and PROFINET IO systems must not exceed 32 jobs per SFC/SFB. External PROFIBUS DP segments and external PROFINET IO systems are connected via the interfaces of CPs/CMs.

Figure 19 number of active jobs for "RDREC" (SFB52) / "RD\_REC" (SFC59) and "WRREC" (SFB53) / "WR\_REC" (SFC58) depends on the CPU used

This information is taken from:

[https://support.industry.siemens.com/cs/document/15364459/what-restrictions-are-there-for-active-jobs-when-communicating-with-wr\\_rec-rd\\_rec-and-rdrec-wrrec-via-profibus-dp-and-profinet-io-?dti=0&lc=en-WW](https://support.industry.siemens.com/cs/document/15364459/what-restrictions-are-there-for-active-jobs-when-communicating-with-wr_rec-rd_rec-and-rdrec-wrrec-via-profibus-dp-and-profinet-io-?dti=0&lc=en-WW)



### 3.9.1 Limited write operations to leak detectors

The writing of parameters from a higher-level control system (e.g. PLC controller) to the leak detector is limited. Each parameter sent to the leak detector by a higher-level control system is stored directly in the EEPROM (Memory) of the leak detector's MSB, even if the parameter value has not been changed.

The EEPROM manufacturer guarantees 1.000.000 write cycles per memory address at room temperature.

If more write operations per memory address have been performed, there's no guarantee that the EEPROM continues to store the parameters correctly.

This may cause the leak detector to become unusable for your application.

If memory locations in the EEPROM are defective, the leak detector reports this via a warning message immediately after power on.

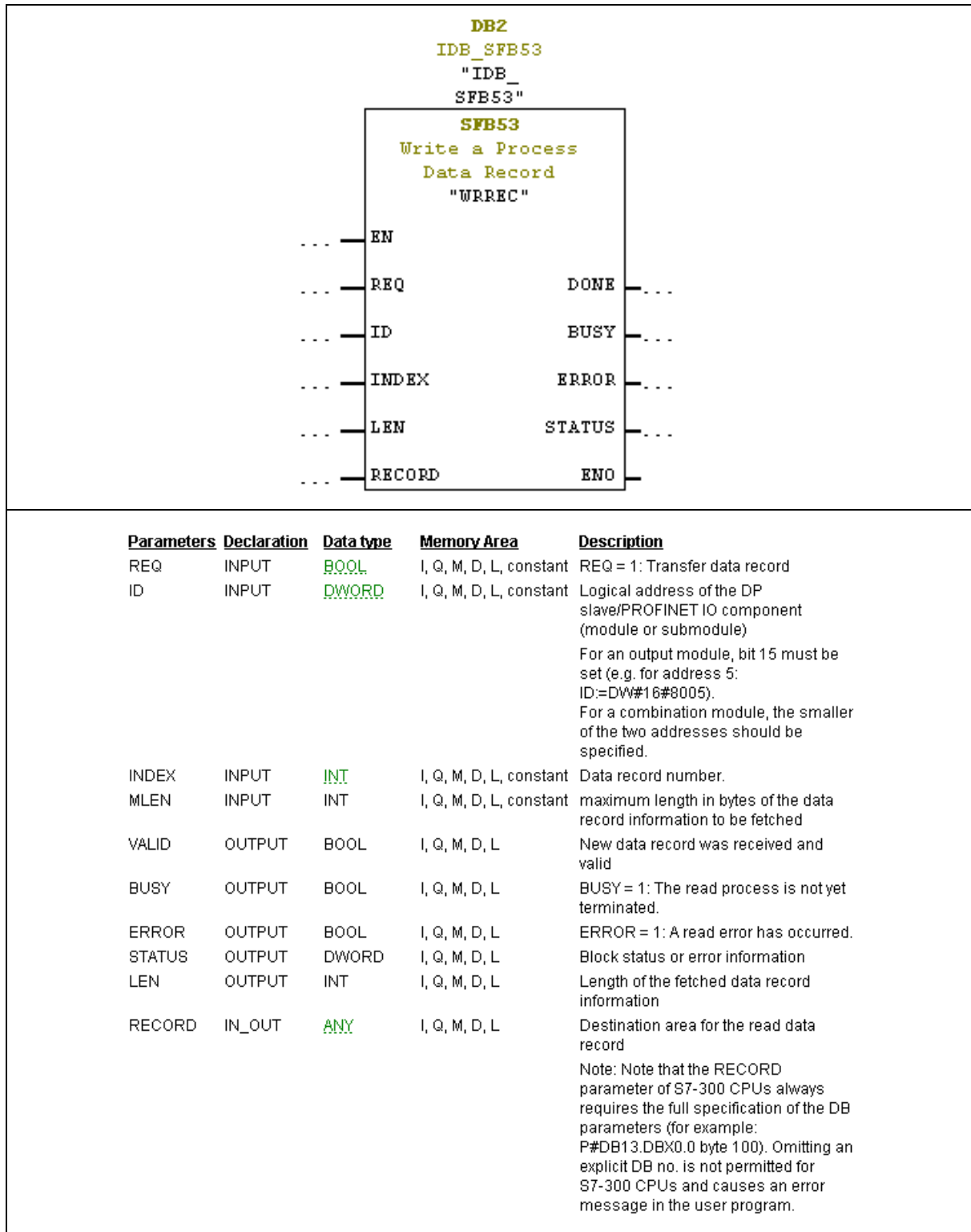
To protect the EEPROM of the leak detector's MSB, unnecessary write operations from a higher-level control system (e.g. PLC controller) to the leak detector should be avoided (under any circumstances).

Please find below some rules that must be observed when transferring parameters from a higher-level controller to the leak detector:

- Do not send a list of parameters where not all parameter values may have been changed. Only send parameters that have actually been changed.
- Do not send parameters that have not been changed
- Only send parameters that really need to be changed.
- Set the time interval between each transmission as long as possible. A good rule of thumb is not to write parameters more often than every 6 minutes.

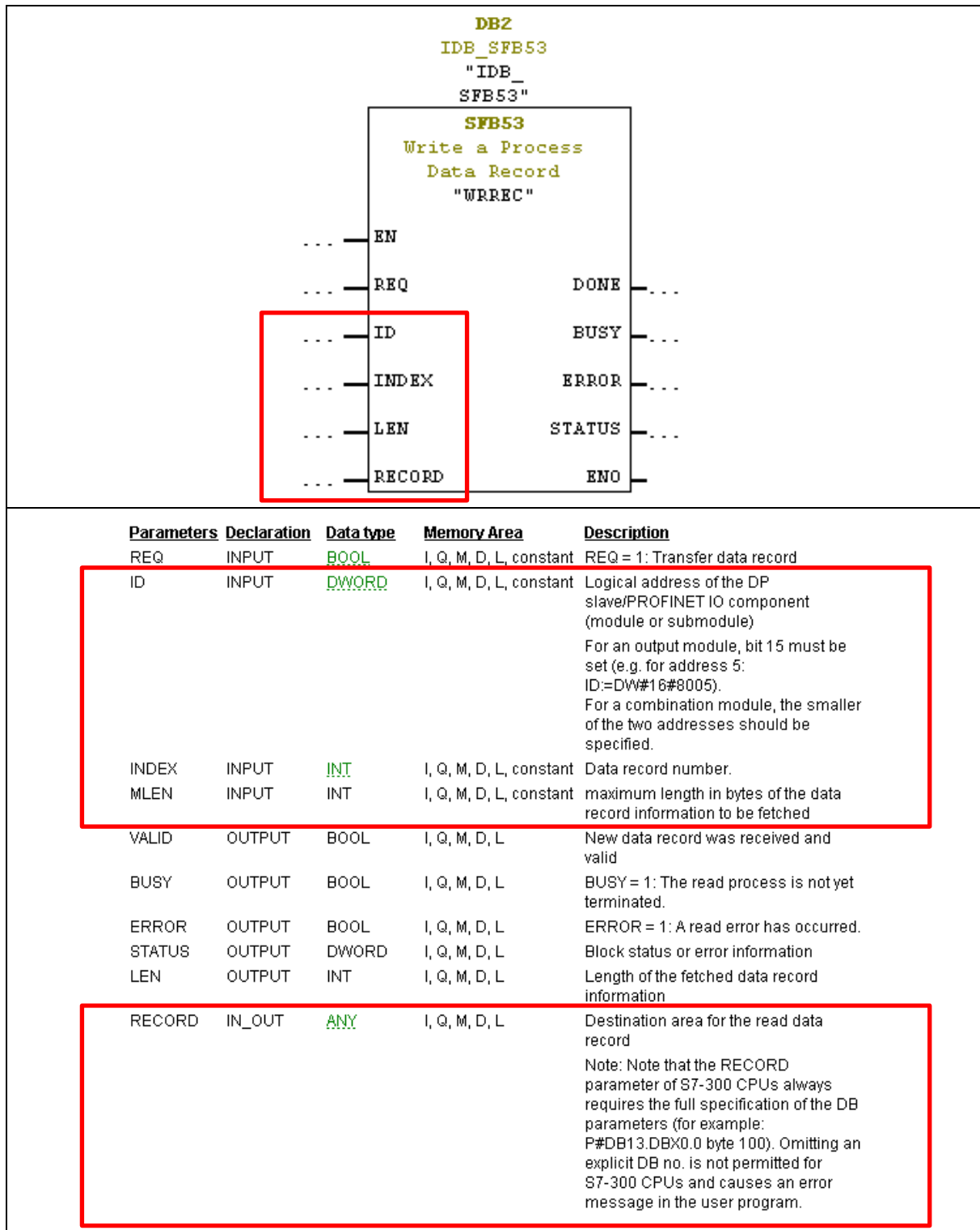
### 3.9.2 Using Siemens standard function block SFB53 "WRREC"

In order to read a data record acyclically from a PROFINET-IO Slave, Siemens offers the Standard Function Block **SFB53 "WRREC"** in the library of the Step7 Manager.





To write a parameter acyclically from the leak detector via the BM1000 PROFINET-IO Module, the following input parameters of the "WRREC" needs to be set correspondingly to the LD command to be write:



### 3.9.2.1 Parameter ID

To get the **ID** (logical address of the PROFINET-IO-Slave) of an PROFINET-IO Slave the hardware configuration needs to be opened and the corresponding Slave needs to be selected (e.g. BM1000 PROFINET-IO Module)

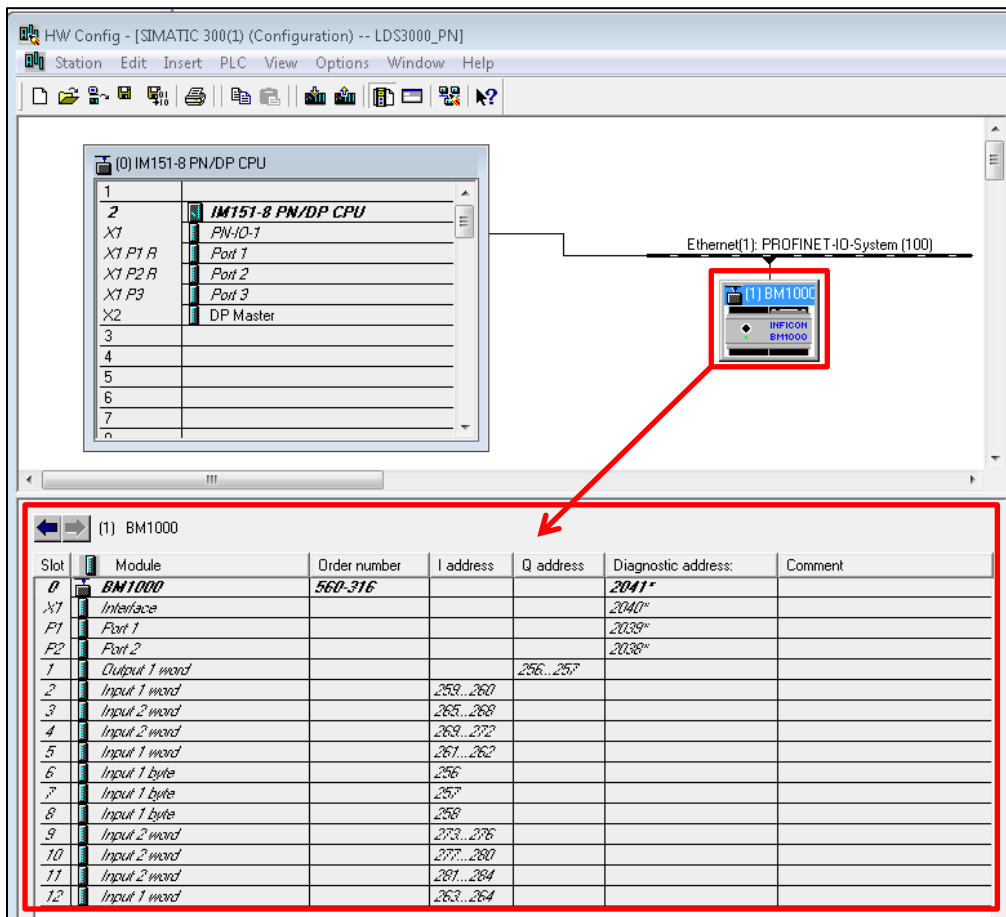


Figure 20 Hardware configuration 11

Each slot of the PROFINET-IO slave has its own logical address range. The logical address ranges of the PROFINET-IO BM1000 Module are shown in the following figure.

Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

Figure 21 Hardware configuration logical addresses 4

To address the INFICON BM1000 PROFINET-IO slave the “Diagnostic address” of **Slot 0** needs to be taken.

**ID = 2041**

### 3.9.2.2 Parameter INDEX

The parameter **INDEX** needs to be set to the decimal LD command number to be read, based on the LD Protocol taken from the LD command table of the protocol descriptions.

**INDEX = decimal LD command number**

Command	Class	Name	R/W	Data type	Min-, Def-, Max- value LDS3000	LDS3000 MSB	No fieldbus support
dez hex							
502 1F6	Param	Amplifier range	R/W	UINT8	0, 3, 3	Amplifier range Amplifier control location 508 automatically set (not auto) 0 = 13 MOhm 1 = 470 MOhm 2 = 15 GOhm 3 = 500 GOhm	
504 1F8	Param	500GOhm value	R/W	FLOAT	4.5E1, 5E11, 5.5E110hm	500GOhm value	
506 1FA	Param	Mass	R/W	UINT8	2, 4, 4	2 = Mass 2 (H2) 3 = Mass 3 4 = Mass 4 (Helium)	

### 3.9.2.3 Parameter LEN

The parameter **LEN** specifies the length of the data to be write in bytes. The length of the LD command to be write based on the LD Protocol is taken from the LD command table of the protocol descriptions.

The parameter **LEN** needs to be calculated based on the data type of the LD command to be write.

Command		Class	Name	R/W	Data type	Min-, Def-, Max- value LDS3000	LDS3000 MSB	No fieldbus support
dez	hex							
502	1F6	Param	Amplifier range	R/W	UINT8	0, 3, 3	Amplifier range Amplifier control location 508 automatically set (not auto) 0 = 13 MOhm 1 = 470 MOhm 2 = 15 GOhm 3 = 500 GOhm	
504	1F8	Param	500GOhm value	R/W	FLOAT	4.5E1, 5E11, 5.5E11Ohm	500GOhm value	
506	1FA	Param	Mass	R/W	UINT8	2, 4, 4	2 = Mass 2 (H2) 3 = Mass 3 4 = Mass 4 (Helium)	

Data type	Meaning	LEN [bytes]
<b>SINT8</b>	Signed 8 bit integer	1
<b>SINT16</b>	Signed 16 bit integer	2
<b>SINT32</b>	Signed 32 bit integer	4
<b>UINT8</b>	Unsigned 8 bit integer	1
<b>UINT16</b>	Unsigned 16 bit integer	2
<b>UINT32</b>	Unsigned 32 bit integer	4
<b>FLOAT</b>	Floating point / real number	4
<b>CHAR</b>	Character	1

Some LD commands are of the array data type. This is indicated by a square bracket after the data type itself (e.g. FLOAT[3]). The number in the brackets indicates the number of array elements (e.g. [3] = 3 array elements).

If the LD command is of the array data type, the parameter **LEN** needs to be calculated by the following rule:

**LEN = Data type length in bytes \* number of array elements**

**Example:**

520	208	Calibration factors vacuum	R/W	<div style="border: 2px solid red; padding: 2px;">FLOAT[3]</div>	Calibration factors for vacuum mode (and for AQ-mode) Index 0: mass 2 Index 1: mass 3 Index 2: mass 4
-----	-----	----------------------------	-----	--	---

The LD command 520 "Cal factors vacuum" is an array with 3 array elements of data type FLOAT. The data type FLOAT has a length of 4 bytes.

In order to calculate the parameter **LEN**, the length of the data type needs to be multiplied by the number of array elements:

**LEN = 4 bytes \* 3 = 12 bytes**

**Attention!**

If the data type of the LD command to be write is an array, it is not possible to write only one of the array element. It must be always write the whole array with all array elements.

The index of arrays always starts with index[0].

### 3.9.2.4 Parameter **RECORD**

The parameter **RECORD** specifies the data to be write to the leak detector. For this reason, the data type of the parameter **RECORD** need to be the same like the data type of the LD command.

Please use the data types in the corresponding list below.

Data type leak detector	Meaning	Data type Step7
<b>SINT8</b>	Signed 8 bit integer	<b>Byte</b>
<b>SINT16</b>	Signed 16 bit integer	<b>INT</b>
<b>SINT32</b>	Signed 32 bit integer	<b>DINT</b>
<b>UINT8</b>	Unsigned 8 bit integer	<b>Byte</b>
<b>UINT16</b>	Unsigned 16 bit integer	<b>INT</b>
<b>UINT32</b>	Unsigned 32 bit integer	<b>DINT</b>
<b>FLOAT</b>	Floating point / real number	<b>REAL</b>
<b>CHAR</b>	Character	<b>CHAR</b>

If the LD command to be write is an array, please also use an array with the same array dimensions and the corresponding data type.

**Example:**

520	208	Calibration factors vacuum	R/W	<b>FLOAT[3]</b>	Calibration factors for vacuum mode (and for AQ-mode) Index 0: mass 2 Index 1: mass 3 Index 2: mass 4
-----	-----	----------------------------	-----	-----------------	---

The LD command 520 "Cal factors vacuum" is an array with 3 array elements of data type FLOAT. The data type FLOAT corresponds to the data type REAL in Step7.

Please use as **RECORD** value: Array[0..2] of Real.

Adresse	Name	Typ	Anfangswert	Kommentar
0.0		STRUCT		
+0.0	Calibration_factors_VAC	ARRAY[0..2]		LD520: Calibration factors for vacuum mode
*4.0		REAL		
=12.0		END_STRUCT		



Adresse	Name	Typ	Anfangswert	Aktualwert	Kommentar
0.0	Calibration_factors_VAC[0]	REAL	0.000000e+000	0.000000e+000	LD520: Calibration factors for vacuum mode
4.0	Calibration_factors_VAC[1]	REAL	0.000000e+000	0.000000e+000	
8.0	Calibration_factors_VAC[2]	REAL	0.000000e+000	0.000000e+000	

### 3.9.3 Example 1: Acyclically write Trigger values by using LD command 385

To write the parameter “**Trigger**” from the PLC controller to the leak detector acyclically, use LD command table in the protocol description with the parameter to be write

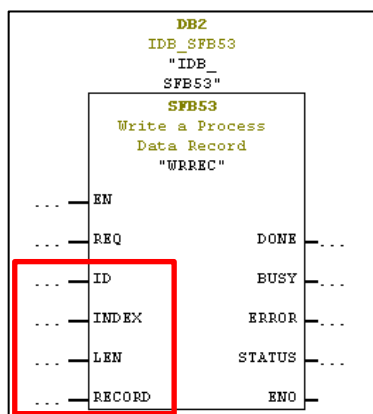
1. Open the LD command table in the protocol description with the parameter to be write

Command		Class	Name	R/W	Data type	Min-, Def-, Max- value LDS3000	LDS3000 MSB	No fieldbus support
dez	hex							
370	172	Param	Amp test	R/W	UINT8		0 = no test with calibration 1 = test with calibration	
371	173	Status	Run Amp test	R/W	UINT8		write: 1 = test now read: 0 = Ready 1 ... 13 test running	
380	17C	Param	Search active	R/W	UINT8	0, 0, 1	0 = Off 1 = ON trigger2 for search in HIGHFLOW SL3000XL only	
385	181	Param	Trigger [mbar"/s]	R/W	FLOAT[4]	1E-12, 1E-5, 1E3	Trigger in mbar"/s	
387	183	Status	Trigger status	R	UINT8		Trigger status: 0 = Leak rate < trigger level 1 = Leak rate > trigger level Bit 0 = Trigger1 Bit 1 = Trigger2 Bit 2 = Trigger3 Bit 3 = Trigger4	
390	186	Param	Test leak extern vacuum [mbar"/s]	R/W	FLOAT[3]	1E-9, 9.9E-1, 9.9E-1	Test leak extern Vacuum [mbar"/s] (Also valid for AQ mode) Index 0: Mass 2 Index 1: Mass 3 Index 2: Mass 4 Helium	
392	188	Param	Test leak extern sniff [mbar"/s]	R/W	FLOAT[3]	5.0E-6, 9.9E-1, 9.9E-1	Test leak extern for sniff mode in mbar"/s Index [0] = Mass2 forming gas 5/95 Index [1] = Mass 3 Index [2] = Mass 4 Helium	X
394	18A	Param	Testleak intern [mbar"/s]	R/W	FLOAT	1E-9, 9.9E-1, 9.9E-1	Testleak intern in mbar"/s	

Figure 22 LD command table LD command 385

2. Using Siemens standard Function Block **SFB53 “WRREC”** to write acyclically a data record.

To write the Trigger values by using the **LD command number 385** from the Leak Detector via the BM1000 PROFINET-IO Module, the following input parameters of the **SFB53 “WRREC”** needs to be set correspondingly to the LD command number:



- ID (logical address of the PROFINET-IO Slave)

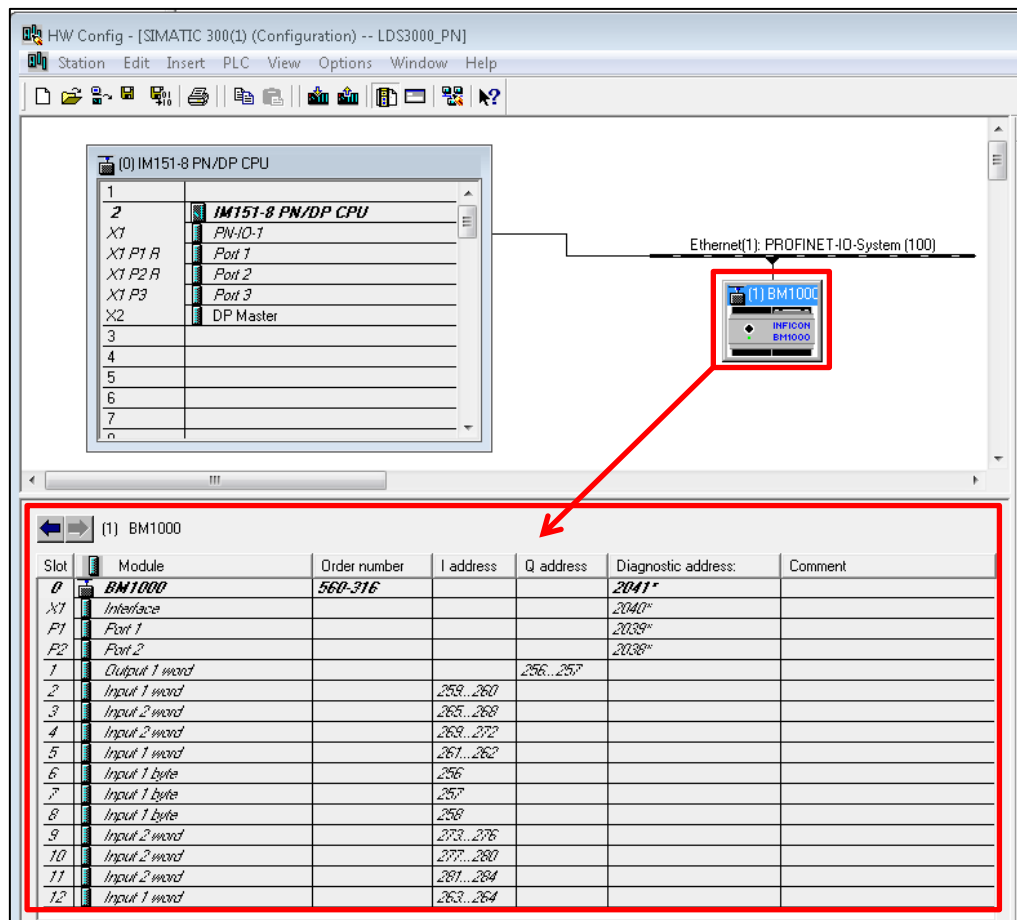


Figure 23 Hardware configuration 12

Each slot of the PROFINET-IO slave has its own logical address range. The logical address ranges of the PROFINET-IO BM1000 Module are shown in the following figure.

(1) BM1000						
Slot	Module	Order number	I address	Q address	Diagnostic address	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

Figure 24 Hardware configuration logical addresses 4

To address the INFICON BM1000 PROFINET-IO slave the “Diagnostic address” of **Slot 0** needs to be taken.

**ID = 2041**

- **INDEX**

The INDEX needs to be set to the LD command which should be read or write.

**INDEX = 385**

- **LEN**

The parameter **LEN** defines the maximum length (in bytes) of the data record that wants to be read.

The maximum length of the data record needs to be taken out from the LD Commands table of the protocol description.

385	181	Param	Trigger [mbar*l/s]	R/W	FLOAT[4]	1E-12, 1E-5, 1E3	Trigger in mbar*l/s
-----	-----	-------	--------------------	-----	----------	------------------	---------------------

Figure 25 LD command table LD command 385

The parameter **LEN** corresponded with the data type of the LD command table. In this case the data type of **LD command number 385** is an array of FLOAT with 4 array entries, which corresponds to a length of 16 bytes.

**Attention:**

If the data type of an LD command is an array all array entries will be transferred. The length of the data type in bytes needs to be multiplied with the array entries

Calculation the parameter LEN:

**LEN = 4 \* 4 bytes = 16 bytes** (the data type float corresponds to 4 byte)

- **RECORD**

The parameter “**RECORD**” specifies the source for the write data record. For this reason the parameter “**RECORD**” needs to be the same data type with also the same length like in the LD command table of the Protocol description.

385	181	Param	Trigger [mbar*l/s]	R/W	FLOAT[4]	1E-12, 1E-5, 1E3	Trigger in mbar*l/s
-----	-----	-------	--------------------	-----	----------	------------------	---------------------

+0.0	LD_385_Trigger	ARRAY[0..3]	LD command 385: Trigger [mbar*l/s]
*4.0		REAL	

3. Insert Siemens standard Function Block **SFB53 "WRREC"** into the PLC program

The Function Block **SFB53 "WRREC"** is called in a normal Function (e.g. FC1000). To be flexible, all input and output parameters are parameterized to a Data Block (e.g. DB1000).

**Rising edge only!**

```

Netzwerk 6 : Write acyclic Data: LD command 385 Trigger
U      "DB_Acyclic_Data_Exchange".SFB_53_WRREC.IN.REQ      DB1000.DBX18.0
FP     "HM_IMP_WR_REQ"                                     M10.4
=      "IMP_WR_REQ"                                         M10.5

CALL   "WRREC"      "TDB_SFB53"                           SFB53 / DB2
REQ    := "IMP_WR_REQ"                                     M10.5
ID     := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.IN.ID    DB1000.DBD20
INDEX  := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.IN.INDEX DB1000.DBW24
LEN    := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.IN.LEN   DB1000.DBW26
DONE   := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.OUT.DONE  DB1000.DBX28.0
BUSY   := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.OUT.BUSY  DB1000.DBX28.1
ERROR  := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.OUT.ERROR DB1000.DBX28.2
STATUS:= "DB_Acyclic_Data_Exchange".SFB_53_WRREC.OUT.STATUS DB1000.DBD30
RECORD:= "DB_Acyclic_Data".LD_385_Trigger                  P#DB3001.DBX0.0
  
```

Figure 26 Step7 Function SFB53

**Attention:**

Use only one rising edge to transfer data to the leak detector. Otherwise, the parameter will be transferred several times!

4. Setting the input parameters of Siemens standard Function Block **SFB53 "WRREC"**

The input parameters **ID**, **INDEX**, **LEN** and **RECORD** needs to be set based on the LD command number from the LD protocol of the Leak Detector.

- ID = 2041
- INDEX = 385
- LEN = 16
- RECORD = 16 bytes or an array[4] of floating point values

All other parameters of **SFB53** must be set user-dependently.

**Attention:**

The parameter "RECORD" must be filled with data before sending

### 3.9.4 Example 2: Acyclically write Test leak extern vacuum by using LD command 390

To write the parameter “**Test leak extern vacuum**” from the PLC controller to the leak detector acyclically, use LD command table in the protocol description with the parameter to be write

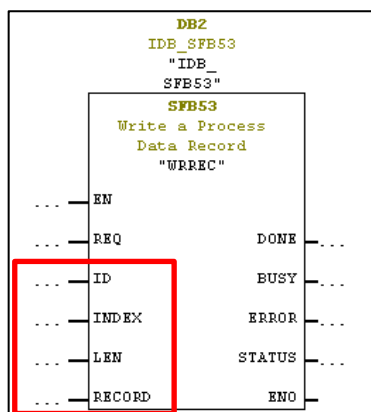
1. Open the LD command table in the protocol description with the parameter to be write

Command		Class	Name	R/W	Data type	Min-, Def., Max- value LDS3000	LDS3000 MSB	No fieldbus support
dez	hex							
370	172	Param	Amp test	R/W	UINT8		0 = no test with calibration 1 = test with calibration	
371	173	Status	Run Amp test	R/W	UINT8		write: 1 = test now read: 0 = Ready 1 ... 13 test running	
380	17C	Param	Search active	R/W	UINT8	0, 0, 1	0 = Off 1 = ON trigger2 for search in HIGHFLOW SL3000XL only	
385	181	Param	Trigger [mbar"/s]	R/W	FLOAT[4]	1E-12, 1E-5, 1E3	Trigger in mbar"/s	
387	183	Status	Trigger status	R	UINT8		Trigger status: 0 = Leak rate < trigger level 1 = Leak rate > trigger level Bit 0 = Trigger1 Bit 1 = Trigger2 Bit 2 = Trigger3 Bit 3 = Trigger4	
390	186	Param	Test leak extern vacuum [mbar"/s]	R/W	FLOAT[3]	1E-9, 9.9E-1, 9.9E-1	Test leak extern Vacuum [mbar"/s] (Also valid for AQ mode) Index 0: Mass 2 Index 1: Mass 3 Index 2: Mass 4 Helium	
392	188	Param	Test leak extern sniff [mbar"/s]	R/W	FLOAT[3]	5.0E-6, 9.9E-1, 9.9E-1	Test leak extern for sniff mode in mbar"/s Index [0] = Mass2 forming gas 5/95 Index [1] = Mass 3 Index [2] = Mass 4 Helium	X
394	18A	Param	Testleak intern [mbar"/s]	R/W	FLOAT	1E-9, 9.9E-1, 9.9E-1	Testleak intern in mbar"/s	

Figure 27 LD command table LD command 385

2. Using Siemens standard Function Block **SFB53 “WRREC”** to write acyclically a data record.

To write the Trigger values by using the **LD command number 390** from the Leak Detector via the BM1000 PROFINET-IO Module, the following input parameters of the **SFB53 “WRREC”** needs to be set correspondingly to the LD command number:





- ID (logical address of the PROFINET-IO Slave)

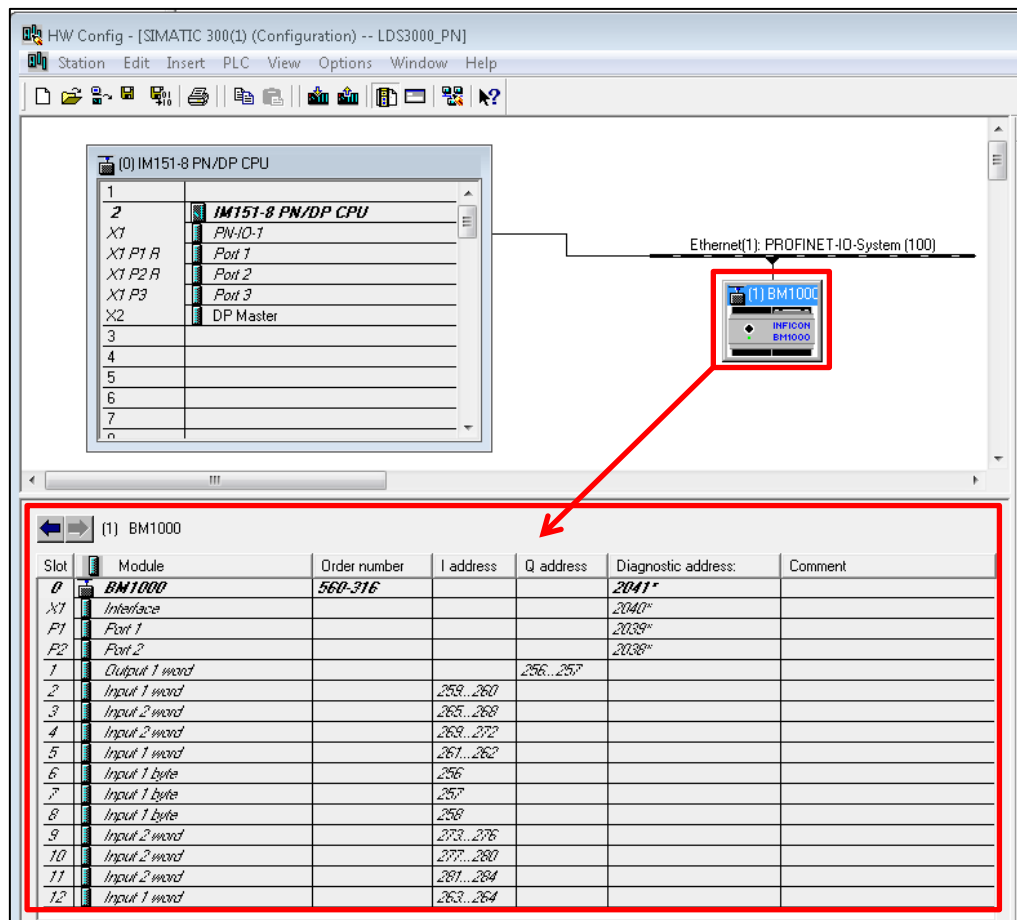


Figure 28 Hardware configuration 12

Each slot of the PROFINET-IO slave has its own logical address range. The logical address ranges of the PROFINET-IO BM1000 Module are shown in the following figure.

(1) BM1000						
Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	<b>BM1000</b>	<b>560-316</b>			<b>2041*</b>	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Output 1 word			256...257		
2	Input 1 word		259...260			
3	Input 2 word		265...268			
4	Input 2 word		269...272			
5	Input 1 word		261...262			
6	Input 1 byte		256			
7	Input 1 byte		257			
8	Input 1 byte		258			
9	Input 2 word		273...276			
10	Input 2 word		277...280			
11	Input 2 word		281...284			
12	Input 1 word		263...264			

Figure 29 Hardware configuration logical addresses 4



To address the INFICON BM1000 PROFINET-IO slave the “Diagnostic address” of **Slot 0** needs to be taken.

**ID = 2041**

- **INDEX**

The INDEX needs to be set to the LD command which should be read or write.

**INDEX = 390**

- **LEN**

The parameter **LEN** defines the maximum length (in bytes) of the data record that wants to be read.

The maximum length of the data record needs to be taken out from the LD Commands table of the protocol description.

390	186	Test leak extern vacuum [mbar*l/s]	R/W	FLOAT[3]	Test leak extern Vacuum [mbar*l/s] (Also valid for AQ mode) Index 0: Mass 2 Index 1: Mass 3 Index 2: Mass 4 Helium
-----	-----	------------------------------------	-----	----------	--

Figure 30 LD command table LD command 385

The parameter **LEN** corresponded with the data type of the LD command table. In this case the data type of **LD command number 390** is an array of FLOAT with 3 array entries, which corresponds to a length of 12 bytes.

**Attention:**

If the data type of an LD command is an array all array entries will be transferred. The length of the data type in bytes needs to be multiplied with the array entries

Calculation the parameter LEN:

**LEN = 3 \* 4 bytes = 12 bytes** (the data type float corresponds to 4 byte)

- **RECORD**

The parameter “**RECORD**” specifies the source for the write data record. For this reason the parameter “**RECORD**” needs to be the same data type with also the same length like in the LD command table of the Protocol description.

390	186	Test leak extern vacuum [mbar*l/s]	R/W	<div style="border: 2px solid red; padding: 2px;">           FLOAT[3]         </div> Test leak extern Vacuum [mbar*l/s] (Also valid for AQ mode) Index 0: Mass 2 Index 1: Mass 3 Index 2: Mass 4 Helium
+0.0	LD_385_Trigger	<div style="border: 2px solid red; padding: 2px;">           ARRAY[0..3]         </div>		LD command 385: Trigger [mbar*l/s]
*4.0		<div style="border: 2px solid red; padding: 2px;">           REAL         </div>		

- Insert Siemens standard Function Block **SFB53 "WRREC"** into the PLC program

The Function Block **SFB53 "WRREC"** is called in a normal Function (e.g. FC1000). To be flexible, all input and output parameters are parameterized to a Data Block (e.g. DB1000).

Rising edge only!

```

Netzwerk 6 : Write acyclic Data: LD command 385 Trigger

U      "DB_Acyclic_Data_Exchange".SFB_53_WRREC.IN.REQ      DB1000.DBX18.0
FP     "HM_IMP_WR_REQ"                                     M10.4
=      "IMP_WR_REQ"                                         M10.5

CALL   "WRREC"      "IDB_SFB53"                           SFB53 / DB2
REQ    := "IMP_WR_REQ"                                     M10.5
ID     := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.IN.ID    DB1000.DBD20
INDEX  := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.IN.INDEX DB1000.DBW24
LEN    := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.IN.LEN   DB1000.DBW26
DONE   := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.OUT.DONE  DB1000.DEX28.0
BUSY   := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.OUT.BUSY  DB1000.DBX28.1
ERROR  := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.OUT.ERROR  DB1000.DEX28.2
STATUS := "DB_Acyclic_Data_Exchange".SFB_53_WRREC.OUT.STATUS DB1000.DBD30
RECORD := "DB_Acyclic_Data".LD_385_Trigger                  P#DB3001.DBX0.0
          
```

Figure 31 Step7 Function SFB53

#### Attention:

Use only one rising edge to transfer data to the leak detector. Otherwise, the parameter will be transferred several times!

- Setting the input parameters of Siemens standard Function Block **SFB53 "WRREC"**

The input parameters **ID**, **INDEX**, **LEN** and **RECORD** needs to be set based on the LD command number from the LD protocol of the Leak Detector.

- ID = 2041
- INDEX = 385
- LEN = 16
- RECORD = 16 bytes or an array[4] of floating point values

All other parameters of **SFB53** must be set user-dependently.

#### Attention:

The parameter "RECORD" must be filled with data before sending