



Application Note

AN2005

S7 Profibus connection example

DLS / FLS

Abstract

This application notes describe the connection of the DIMS Profibus converter to a S7 PLC and a DLS / FLS laser distance sensor. The S7 sample project is also available for download on our web site

V1.00

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This application note is provided as is without any warranty for any problems this sample may cause.



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1 Introduction

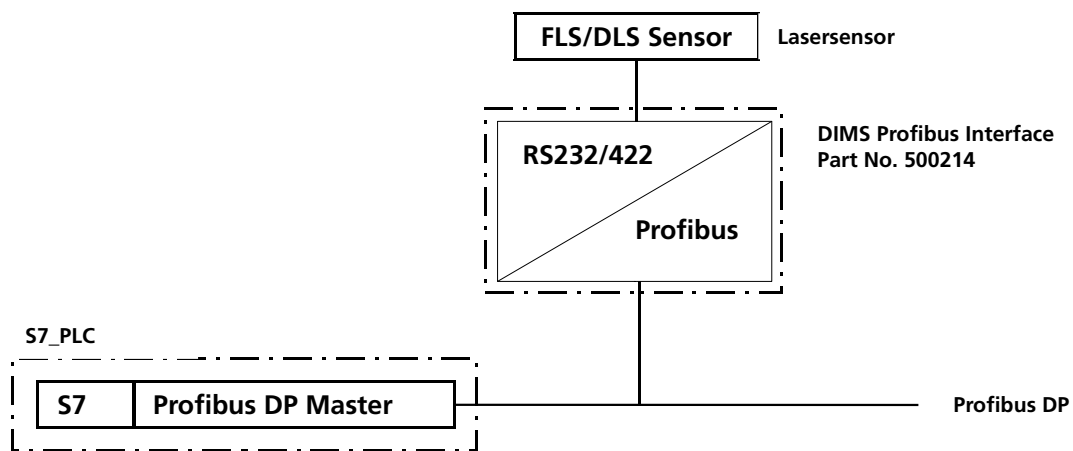
To connect a FLS / DLS-Distance sensor with a Siemens S7 PLC over the Profibus, the DIMS Profibus Interface (Par No. 500214) must be used. This example describe the configuration of the S7 PLC and the configuration of the FLS / DLS Sensor.

Further additional explanations about the example are also included. The example is available for download on www.dimetix.com.

It is essential, that you have some experience in programming of a Siemens S7 PLC and knowledge of the Profibus.

2 Structure

The following diagram demonstrates the connection of the FLS / DLS Sensor, DIMS Profibus Interface and S7:

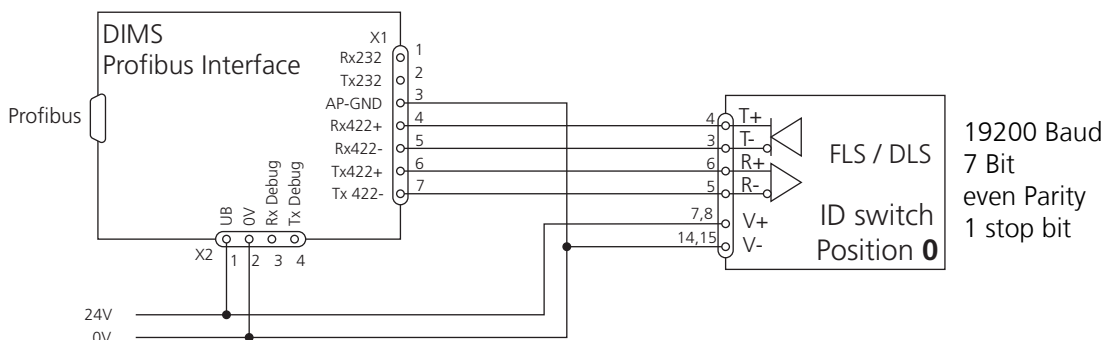


2.1 Multi-Sensor Mode

The DIMS is operated in Multi Sensor Mode. Additional information about this operation mode can be found in the DIMS User Manual.

2.2 Connection of the Sensor with the DIMS

The following diagram shows the connection of a Distance Sensor with the DIMS Profibus Interface by RS422 interface.





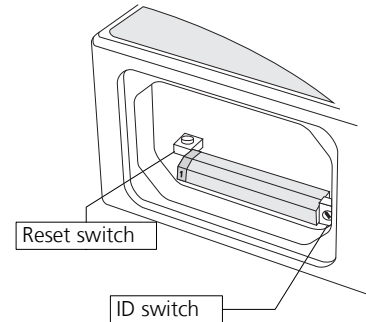
3 FLS / DLS configuration

Use the FLS / DLS Distance sensor with factory settings to use it in Multi-Sensor mode. In case you have to set the FLS / DLS Distance sensor back to factory settings, reset the device as described below.

3.1 Reset to factory default

To reset the device to factory settings do the following:

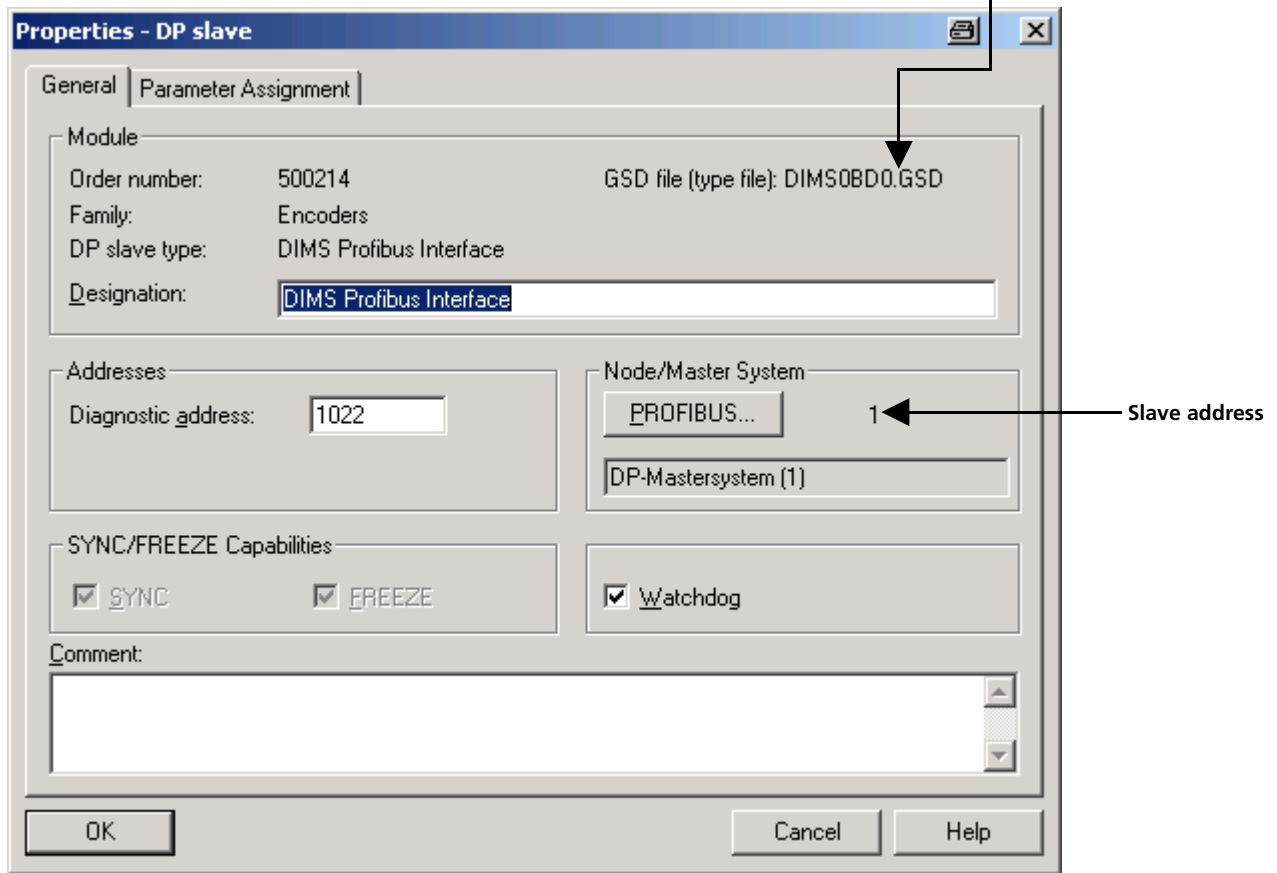
- Change ID Switch to position 0
- Switch OFF the power for the device
- Press the reset button and keep it pressed
- Switch on the power for the device
- Keep the reset button pressed until all LEDs on the device are illuminated
- Release the reset button
- Switch the power OFF and wait 5 seconds
- Switch on the power and wait until the green power LED is on



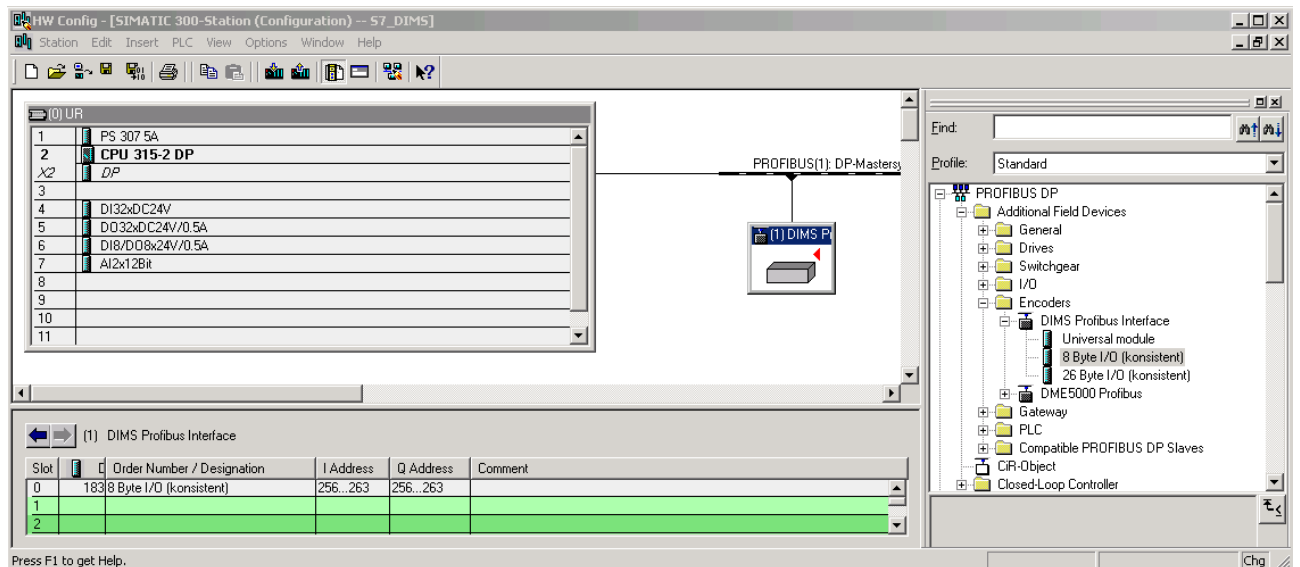


4 Projection (S7 configuration)

To project the DIMS Profibus Interface as DP-slave, the installation of the **GSD – data file** is necessary.



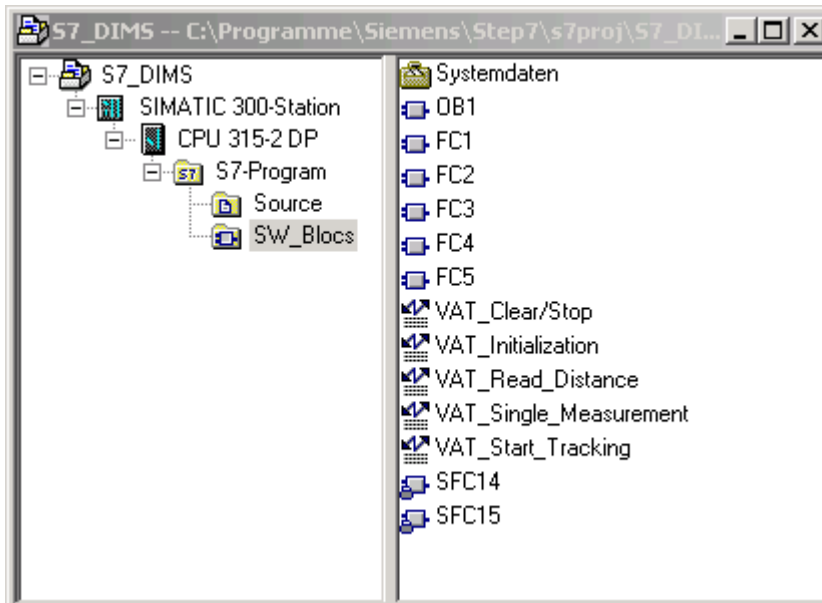
After the projection of the DIMS Profibus Interface, upload the appropriate module.





5 Project

The project includes all the necessary blocs for the operation of a FLS / DLS sensor.



5.1 Description of the blocs

The VAT-blocs are each the variable charts to their corresponding function.

OB1	"Main Program Sweep (Cycle)"	
FC1	Function Clear/Stop	VAT_Clear/Stop
FC2	Function Initialization	VAT_Initialization
FC3	Function Read_Distance	VAT_Read_Distance
FC4	Function Single_Measurement	VAT_SingleMeasurement
FC5	Function Start_Tracking	VAT_Start-Tracking
SFC14	System function „DPRD-DAT“	
SFC15	System function „DPWR-DAT“	

5.2 Startup

1. Connect the control, the DIMS Profibus Interface and the FLS / DLS sensor to the communication cables and the appropriate electric power supply.
2. Set the address of the Profibus at the front side of the DIMS Profibus Interface. It has to correspond to the S7-project.
3. Load all the blocs onto the control.
4. The inputs E0.1, E0.2, E0.3, E0.4 and E0.5 enable you now to preselect the function you wish.
Important! Preselect only one function at once!
 A pulse at the input E0.0 activates the function. (see code OB1)
5. In the appropriate table of variables, all the data is visualized.



5.3 Code: OB1

OB1 : "Main Program Sweep (Cycle)"

Comment:

Network 1: Title:

Comment:

//Toggle

```

A      "Trigger_Function"      //Function Trigger
CU    C      0                //current Toggle No.
L      C      0
L      10
>=I
R      C      0

```

//Funktionsaufruf

```

A      M      1.0              //Switch Initialization
CC     "Initialization"

A      M      1.1              //Switch Clear/Stop
CC     "Clear_Stop"

A      M      1.2              //Switch Single Measurement
CC     "Single_Measurement"

A      M      1.3              //Switch Start Tracking
CC     "Start_Tracking"

A      M      1.4              //Switch Read Distance
CC     "Read_Distance"

A      "Preselec_Initialization"
=      M      1.0
A      "Preselec_Clear/Stop"
=      M      1.1
A      "Preselec_Single Mesurem."
=      M      1.2
A      "Preselec_Tracking"
=      M      1.3
A      "Preselec_Read Distance"
=      M      1.4

```



5.4 Tables of variables of the different functions

5.4.1 Table of variables of the function „Initialization“

	Address	Symbol	Symbol comment	Display format	Status value	Modify value
1	MW 106	"ErrorNo. Initialization"		DEC		
2	MD 102	"State Info Sensoren"		BIN		
3						

5.4.2 Table of variables of the function „Clear/Stop“

Enter the ID you wish (number of sensor) as the value of control into the marker byte 136.

	Address	Symbol	Display format	Status value	Modify value
1	MD 122	"State Info Clear/Stop"	BIN		
2	MW 126	"ErrorNo. Clear/Stop"	DEC		
3					
4	MB 136	"ID_Clear/Stop"	DEC		1
5					

5.4.3 Table of variables of the function „Single Measurement“

Enter the ID you wish (number of sensor) as the value of control into the marker byte 156.

	Address	Symbol	Display format	Status value	Modify value
1	MD 142	"Distance Single_Measur."	FLOATING_POINT		
2	MW 146	"ErrorNo. Single_M"	DEC		
3					
4	MB 156	"ID_Single Measur."	DEC		1
5					

5.4.4 Table of variables of the function „Start Tracking“

Enter the ID you wish (number of sensor) as the value of control into the marker byte 176.

Enter the tracking time in msec (milliseconds) as the value of control into the marker double word.

	Address	Symbol	Display format	Status value	Modify value
1	MW 166	"ErrorNo. Tracking"	DEC		
2	MB 176	"ID_Start Tracking"	DEC		1
3	MD 172	"Time in ms"	DEC		
4					



5.4.5 Table of variables of the function „Read Distance“

Enter the ID you wish (number of sensor) as the value of control into the marker byte 196. This function can only be started, if „Start Tracking“ is active.

	Address	Symbol	Display format	Status value	Modify value
1	MB 181	"State Read Distance"	DEC		
2	MD 182	"Distance Tracking"	FLOATING_POINT		
3	MW 186	"ErrorNo. Read Distance"	DEC		
4	MB 196	"ID_Read Distance"	DEC		1
5					

5.5 Table of symbols

	Status	Symbol	Address	Data type	Comment
1		Initialization	FC 1	FC 1	
2		Clear_Stop	FC 2	FC 2	
3		Single_Measurement	FC 3	FC 3	
4		Start_Tracking	FC 4	FC 4	
5		Read_Distance	FC 5	FC 5	
6		Trigger_Function	I 0.0	BOOL	
7		Preselec_Initialization	I 0.1	BOOL	
8		Preselec_Clear/Stop	I 0.2	BOOL	
9		Preselec_Single Mesurem.	I 0.3	BOOL	
10		Preselec_Tracking	I 0.4	BOOL	
11		Preselec_Read Distance	I 0.5	BOOL	
12		ID_Clear/Stop	MB 136	BYTE	
13		ID_Single Measurement.	MB 156	BYTE	
14		ID_Start Tracking	MB 176	BYTE	
15		State Read Distance	MB 181	BYTE	
16		ID_Read Distance	MB 196	BYTE	
17		State Info Sensoren	MD 102	DWORD	
18		State Info Clear/Stop	MD 122	DWORD	
19		Distance Single_Measur.	MD 142	DWORD	
20		Time in ms	MD 172	DWORD	
21		Distance Tracking	MD 182	DWORD	
22		ErrorNo. Initialization	MW 106	WORD	
23		ErrorNo. Clear/Stop	MW 126	WORD	
24		ErrorNo. Single_M	MW 146	WORD	
25		ErrorNo. Tracking	MW 166	WORD	
26		ErrorNo. Read Distance	MW 186	WORD	
27		DPRD_DAT	SFC 14	SFC 14	Read Consistent Data of a Standard DP Slave
28		DPWR_DAT	SFC 15	SFC 15	Write Consistent Data to a Standard DP Slave
29		VAT_Initialization	VAT 1		
30		VAT_Single_Measurement	VAT 2		
31		VAT_Clear/Stop	VAT 3		
32		VAT_Start_Tracking	VAT 4		
33		VAT_Read_Distance	VAT 5		
34					



6 Listings

OB1 - <offline>

```

" "
Name:                Family:
Author:              Version: 0.1
                    Block version: 2
Time stamp Code:    11/07/2008 02:11:29 PM
                    Interface: 02/15/1996 04:51:12 PM
Lengths (block/logic/data): 00194 00076 00020

```

Name	Data Type	Address	Comment
TEMP		0.0	
OB1_EV_CLASS	Byte	0.0	Bits 0-3 = 1 (Coming event), Bits 4-7 = 1 (Event class 1)
OB1_SCAN_1	Byte	1.0	1 (Cold restart scan 1 of OB 1), 3 (Scan 2-n of OB 1)
OB1_PRIORITY	Byte	2.0	Priority of OB Execution
OB1_OB_NUMBR	Byte	3.0	1 (Organization block 1, OB1)
OB1_RESERVED_1	Byte	4.0	Reserved for system
OB1_RESERVED_2	Byte	5.0	Reserved for system
OB1_PREV_CYCLE	Int	6.0	Cycle time of previous OB1 scan (milliseconds)
OB1_MIN_CYCLE	Int	8.0	Minimum cycle time of OB1 (milliseconds)
OB1_MAX_CYCLE	Int	10.0	Maximum cycle time of OB1 (milliseconds)
OB1_DATE_TIME	Date_And_Time	12.0	Date and time OB1 started

```
Block: OB1 "Main Program Sweep (Cycle)"
```

```
Network: 1
```

```
//Toggle
```

```

A   "Trigger_Function"           //Function Trigger
CU  C    0                       //current Toggle No.
L   C    0
L   L   10
>=I
R   C    0

```

```
//Funktionsaufruf
```

```

A   M    1.0                       //Switch Initialization
CC  "Initialization"

A   M    1.1                       //Switch Clear/Stop
CC  "Clear_Stop"

A   M    1.2                       //Switch Single Measurement
CC  "Single_Measurement"

A   M    1.3                       //Switch Start Tracking
CC  "Start_Tracking"

A   M    1.4                       //Switch Read Distance
CC  "Read_Distance"

A   "Preselec_Initialization"
=   M    1.0
A   "Preselec_Clear/Stop"
=   M    1.1
A   "Preselec_Single Mesurem."
=   M    1.2
A   "Preselec_Tracking"
=   M    1.3
A   "Preselec_Read Distance"
=   M    1.4

```



FC1 - <offline>

"Initialization"
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 11/07/2008 02:15:13 PM
Interface: 10/04/2007 04:28:44 PM
Lengths (block/logic/data): 00282 00188 00014

Name	Data Type	Address	Comment
IN		0.0	
OUT		0.0	
IN_OUT		0.0	
TEMP		0.0	
RETURN		0.0	
RET_VAL		0.0	

Block: FC1 Initialization

Network: 1 Profibus to DLS

```

L   C   0
T   MB 110 //Byte0, Toggle
L   'i'
T   MB 111 //Byte1, Command
L   0
T   MB 112 //Byte2
L   0
T   MB 113 //Byte3
L   0
T   MB 114 //Byte4
L   0
T   MB 115 //Byte5
L   0
T   MB 116 //Byte6
L   0
T   MB 117 //Byte7, Reserve
    
```

Network: 2 Bus Data Read/Write

```

//Bus Data Read

CALL "DPRD_DAT"
LADDR :=W#16#100
RET_VAL:=MW20
RECORD :=P#M 100.0 BYTE 8

//Bus Data Write

CALL "DPWR_DAT"
LADDR :=W#16#100
RECORD :=P#M 110.0 BYTE 8
RET_VAL:=MW22
    
```



FC2 - <offline>

"Clear_Stop"
Name: Family:
Author: Version: 0.1
Block version: 2
Time stamp Code: 11/07/2008 02:16:38 PM
Interface: 10/04/2007 04:28:44 PM
Lengths (block/logic/data): 00276 00182 00014

Name	Data Type	Address	Comment
IN		0.0	
OUT		0.0	
IN_OUT		0.0	
TEMP		0.0	
RETURN		0.0	
RET_VAL		0.0	

Block: FC2 Clear/Stop

Network: 1 Profibus to DLS

```

L   C   0
T   MB  130 //Byte0, Toggle
L   'c'
T   MB  131 //Byte1, Command
L   0
T   MB  132 //Byte2
L   0
T   MB  133 //Byte3
L   0
T   MB  134 //Byte4
L   0
T   MB  135 //Byte5
//L  1
//T  MB  136 //Byte6, ID
L   0
T   MB  137 //Byte7, Reserve
    
```

Network: 2 Bus Data Read/Write

```

//Bus Data Read
CALL "DPRD_DAT"
LADDR :=W#16#100
RET_VAL:=MW24
RECORD :=P#M 120.0 BYTE 8

//Bus Data Write
CALL "DPWR_DAT"
LADDR :=W#16#100
RECORD :=P#M 130.0 BYTE 8
RET_VAL:=MW26
    
```



FC3 - <offline>

"Single_Measurement"

Name: Family:
Author: Version: 0.1
Block version: 2
Time stamp Code: 11/07/2008 02:17:41 PM
Interface: 10/04/2007 04:28:44 PM
Lengths (block/logic/data): 00276 00182 00014

Name	Data Type	Address	Comment
IN		0.0	
OUT		0.0	
IN_OUT		0.0	
TEMP		0.0	
RETURN		0.0	
RET_VAL		0.0	

Block: FC3 Single_Measurement

Network: 1 Profibus to DLS

```

L   C      0
T   MB 150 //Byte0, Toggle
L   'g'
T   MB 151 //Byte1, Command
L   0
T   MB 152 //Byte2
L   0
T   MB 153 //Byte3
L   0
T   MB 154 //Byte4
L   0
T   MB 155 //Byte5
//L 0
//T MB 156 //Byte6, ID
L   0
T   MB 157 //Byte7, Reserve
    
```

Network: 2 Bus Data Read/Write

```

//Bus Data Read

CALL "DFRD_DAT"
LADDR :=W#16#100
RET_VAL:=MW28
RECORD :=P#M 140.0 BYTE 8 //ab M 140.0 8 Byte

//Bus Data Write

CALL "DFWR_DAT"
LADDR :=W#16#100
RECORD :=P#M 150.0 BYTE 8 //ab M 150.0 8 Byte
RET_VAL:=MW30
    
```



FC4 - <offline>

"Start_Tracking"

Name: Family:
Author: Version: 0.1
Block version: 2
Time stamp Code: 11/07/2008 02:18:47 PM
Interface: 10/04/2007 04:28:44 PM
Lengths (block/logic/data): 00276 00182 00014

Name	Data Type	Address	Comment
IN		0.0	
OUT		0.0	
IN_OUT		0.0	
TEMP		0.0	
RETURN		0.0	
RET_VAL		0.0	

Block: FC4 Start Tracking

Network: 1 Profibus to DLS

```

L      C      0
T      MB 170 //Byte0, Toggle
L      'f'
T      MB 171 //Byte1, Command
L      0
T      MB 172 //Byte2
L      0
T      MB 173 //Byte3
L      0
T      MB 174 //Byte4
L      0
T      MB 175 //Byte5
//L    1
//T    MB 176 //Byte6, ID
L      0
T      MB 177 //Byte7, Reserve
    
```

Network: 2 Bus Data Read/Write

```

//Bus Data Read

CALL "DPRD_DAT"
LADDR :=W#16#100
RET_VAL:=MW32
RECORD :=P#M 160.0 BYTE 8

//Bus Data Write

CALL "DPWR_DAT"
LADDR :=W#16#100
RECORD :=P#M 170.0 BYTE 8
RET_VAL:=MW34
    
```



FC5 - <offline>

"Read_Distance"
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 11/07/2008 02:19:47 PM
Interface: 10/04/2007 04:28:44 PM
Lengths (block/logic/data): 00276 00182 00014

Name	Data Type	Address	Comment
IN		0.0	
OUT		0.0	
IN_OUT		0.0	
TEMP		0.0	
RETURN		0.0	
RET_VAL		0.0	

Block: FC5 Read Distance

Network: 1 Profibus to DLS

```

L      C      0
T      MB 190 //Byte0, Toggle
L      'q'
T      MB 191 //Byte1, Command
L      0
T      MB 192 //Byte2
L      0
T      MB 193 //Byte3
L      0
T      MB 194 //Byte4
L      0
T      MB 195 //Byte5
//L    1
//T    MB 196 //Byte6, ID
L      0
T      MB 197 //Byte7, Reserve
    
```

Network: 2 Bus Data Read/Write

```

//Bus Data Read

CALL "DPRD_DAT"
LADDR :=W#16#100
RET_VAL:=MW36
RECORD :=P#M 180.0 BYTE 8

//Bus Data Write

CALL "DPWR_DAT"
LADDR :=W#16#100
RECORD :=P#M 190.0 BYTE 8
RET_VAL:=MW38
    
```



7 Overview of the marker words

The following is a list of the used marker words. The DIMS functions are described in the DIMS Manual, which can be found on www.dimetix.com.

7.1 Sensor detection manual

Master -> DIMS

Toggle	'i'					reserve
110	111	112	113	114	115	116 117

DIMS -> Master

Toggle	'i'	status info (int 32 bit)			error number
100	101	102 103 104 105			106 107

7.2 Clear / Stop

Master -> DIMS

Toggle	'c'				ID	reserve
130	131	132	133	134	135	136 137

DIMS -> Master

Toggle	'c'	status info (int 32 bit)			error number
120	121	122 123 124 125			126 127

7.3 Distance Measurement

Master -> DIMS

Toggle	'g'				ID	reserve
150	151	152	153	154	155	156 157

DIMS -> Master

Toggle	'g'	distance (float 32 bit)			error number
140	141	142 143 144 145			146 147

7.4 Start Tracking with buffering

Master -> DIMS

Toggle	'f'	time in ms (int 32 bit)			ID	reserve
170	171	172 173 174 175			176	177

DIMS -> Master

Toggle	'f'				error number	
160	161	162	163	164	165	166 167

7.5 Read Distance

Master -> DIMS

Toggle	'q'				ID	reserve
190	191	192	193	194	195	196 197

DIMS -> Master

Toggle	'o'	distance (float 32 bit)			error number
180	181	182 183 184 185			186 187