

USER MANUAL



OM PROFI

PROTOCOL
DESCRIPTION/COMMUNICATIONS

PROFIBUS
PROFINET



Outstanding Measurement Value

SAFETY INSTRUCTIONS

Please read and observe the enclosed safety instructions carefully!

Installation, all operations, maintenance and service must be carried out by qualified personnel only and in accordance with the enclosed information and safety regulations.

The manufacturer is not responsible for any damage caused by improper installation, configuration, maintenance and service of the device.

The device must be installed correctly according to the actual application. Improper installation may cause malfunction, which may result in damage to the unit or an accident.

The device uses dangerous voltage that can cause a fatal accident. The unit must be disconnected from the power supply before starting troubleshooting (in case of malfunction) or before dismantling the unit. For safety information, EN 61 010-1 + A2 must be observed.

When removing or inserting an electronics card, observe the safety instructions and follow the recommended procedures. Disconnect the unit from power supply before inserting / extracting any electronics cards.

Do not attempt to repair or modify the device yourself. In case of malfunction the device must be dismantled and submitted to the manufacturer for repair.

These devices should be protected by either individual or shared fuses (circuit breakers)!

The device is not intended for installation in explosive areas. Use the device only outside the explosive areas.

 ⚠ DANGER ⚠	 ⚠ WARNING ⚠	 ⚠ ATTENTION
RISK OF ELECTRIC SHOCK - Disconnect all power supply and live wires before servicing. Failure to follow this instruction will result in death or serious injury.	RISKS ASSOCIATED WITH USE - Do not use this product in a safety critical system. - Do not disassemble, repair or modify the product. - Do not use the product outside the recommended operating conditions. Failure to follow these instructions may result in death, serious injury, or damage to the equipment	RISKS ASSOCIATED WITH USE - Install a 100 mA fuse Failure to observe this precaution could result in personal injury or equipment damage.

This electrical equipment may be installed, operated and maintained only by qualified personnel. ORBIT MERRET assumes no responsibility for any consequences arising from the use of this equipment.

1.1 CONNECTION OF THE INSTRUMENT

The connection of ORBIT MERRET devices to the Profibus data link is implemented by an internal card with the SPC 3 control circuit.

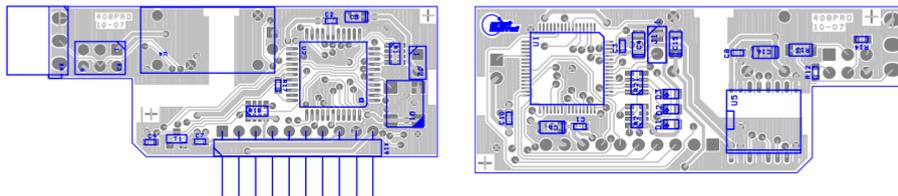
Profibus card in instruments of these models: OM 402, 502 and 602



Connector arrangement

B - Positive	(original Cannon - pin 3)
A - Negative	(original Cannon - pin 8)
GND	(original Cannon - pin 5)

Data card in OMU 408



Connector arrangement

GND	(original Cannon - pin 5)
A - Negative	(original Cannon - pin 8)
B - Positive	(original Cannon - pin 3)

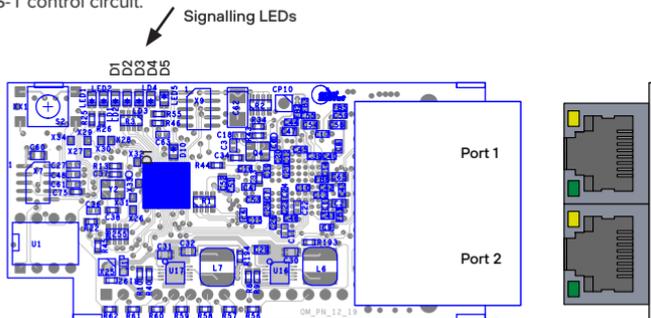
Line termination



Ends of the Profibus line (bus segment) need to be equipped with terminal resistors, please see the diagram. Terminal resistors may either be part of the connectors or wired to the data card. Termination in the Profibus card is performed by plugging in all three jumpers next to the connector X3

2. DESCRIPTION OF COMMUNICATION

The connection of ORBIT MERRET devices to the ProfiNet data line is implemented by an internal card with the TPS-1 control circuit.



The order of connected lines does not matter

2.1 LED SIGNALISATION

STATUS - Profibus	„D 1“ LED green OM communicat.	„D 2“ LED gelb Profibus line	„D 3“ LED red Error
Start – initial delay and initialisation	flashing	flashing	flashing
Start – identification of OM instruments	light on	light on	light on
Communication with OM instruments	light on (flashing)	light off	light off
Communication via Profibus line	light off	light on (flashing)	light off
The set function is unknown	light off	light on	light off
Error in communication with OM instruments	light on	light off	light on
Error in communication via Profibus line	light off	light on	light on
Error of OM instrument (communication speed is out of range)	light off	light off	light on

STATUS - Profinet	„D 1“ LED gelb	„D 2“ LED green	„D 3“ LED red	„D 4“ LED red	„D 5“ LED green
Setup Requirement	flashing				
Profinet driver error		light off			
No communication with the processor		flashing			
Everything is ok		light on			
System error			light on		
OM device is not on line				light on	
OM on the line but the controller is not activated				flashing	
OM device connected and communicating				light off	
Error					light on
Bootloader					flashing - fast
Everything is ok					flashing - slow

2.1.1 PROFIBUS AND OM LINE INTERFACE STATUS

After a switch-on the Profibus card initialises, tests itself and then connects to the Profibus interface.

Initially during the testing and connection all LEDs are on. Red LEDs flash. The display reads: „PB“. In instruments with 6 digit display it reads

„99“ (instrument with internal Profibus card) and the address of OM instrument divided by space. In instruments with 4 or 3 digit displays only the Profibus address is shown. Profibus address is entered directly into the instrument's menu. If the instrument is set for a mode, which cyclically reads or sets an OM xxx device, LEDs „D1“ a „D2“ start flashing alternatively.

In a mode in which the OM xxx is set in a single step, or when information is read out from the OM Profibus card only LED „D2“ flashes, signalling that the Profibus communication line is on.

In the event of an error LED „D3“ lights up, indicating an error as per table.

2. DESCRIPTION OF COMMUNICATION



2.2 DESCRIPTION OF COMMUNICATION ON THE LINE

2.2.1 CONNECTION OF OM XXX INSTRUMENTS TO OM PROFIBUS CARD

OM ProfiBus card supports the following interprocessor communication speeds: 600, 1 200, 2 400, 4 800, 9 600, 19 200, 38 400, 57 600, 115 200 Baud.

When initialised, the card reads out identification of the device (i.e. "OM 402UNI"), also the information about the number of measuring channels, mathematical channel and integral and the number of relay outputs.

2.2.2 OM PROFIBUS CARD MODES AND DATA STRUCTURE OF RECEIVED AND TRANSMITTED TELEGRAM - IN

Telegram transmitted into OM instrument

Addr.	Data type	Function	Note
0	Byte	„Function“	Defines „Function“ (the Profibus card's behaviour mode) - downloading values + setting limits - displaying values Float (Real)/Signed Long - displaying texts - sending OM ASCII commands
1	Byte	Adress = 00	00 (used only with OMX Profibus)
2	Byte	Function + Address EEPROM	Downloading /recoding Profibus card paramters stored in its EEPROM (< 128 = downloading, >127 = recording + downloading)
3	Byte	Value to EEPROM	Value to which Profibus card parameter is to be set in EEPROM
4...7	Float	Display value	Decimal number, which is displayed through functions 10 to 15, 20
4...7	signed long	Display value	Integer number with 4 byte sign, which is displayed through function 30
8...15	8x Char	Display text	Text displayed on OM instrument through function 100
The following values are valid only when selecting GSD file types in the instrument (MENU/OUTPUT/DATA/GSD) - „Channel + limits“			
16...47	8x Float	Value of limits 1...8	Values to which limits are set in current instrument by means of configuration byte „Relay Mask“
16...47	32x Char	OM Command	Text of command for OM instruments sent by functions 129, 130, 229 and 230
48	Byte	Relay mask	Permission to change limit values 1 to 8 as per significance of bits 0 to 7

Telegram transmitted into OM instrument (older version or selection of GSD file in menu - OLD)

Addr.	Data type	Function	Note
0	Byte	„Function“	Defines „Function“ (the Profibus card's behaviour mode) - downloading values + setting limits - displaying values Float (Real)/Signed Long - displaying texts - sending OM ASCII commands
1	Byte	Adress = 00	00 (used only with OMX Profibus)
2...5	Float	Display value	Decimal number, which is displayed through functions 10 to 15, 20
2...5	signed long	Display value	Integer number with 4 byte sign, which is displayed through function 30
6...37	8x Float	Value of limits 1...8	Values to which limits are set in current instrument by means of configuration byte „Relay Mask“
6...37	32x Char	OM Command	Text of command for OM instruments sent by functions 129, 130, 229 and 230
38...45	8x Char	Display text	Text displayed on OM instrument through function 100
46...49	Float	Rezerva	
50	Byte	Function + Address EEPROM	Downloading / recoding Profibus card paramters stored in its EEPROM (< 128 = downloading, >127 = recording + downloading)
51	Byte	Value to EEPROM	Value to which Profibus card parameter is to be set in EEPROM
52	Byte	Relay mask	Permission to change limit values 1 to 8 as per significance of bits 0 to 7
53	Byte	Reserve	

2.2.3 OM PROFIBUS MODES AND DATA STRUCTURE OF RECEIVED AND TRANSMITTED TELEGRAM - OUT

Telegram transmitted from OM apparatus

Addr.	Data type	Function	Note
0	Byte	„Function“	Mirrored value of set "Function"
1	Byte	„Adress“	Mirrored value of set Address
2	Byte	1	Identified number of connected OM xxx instruments (used only with OMX Profibus)
3	Byte	Flag	Valid data market
4	Byte	Number of channels	Number of measuring channels of current instrument
5	Byte	Number of relays	Number of relays of current instrument
6	Byte	Value from EEPROM	Value of Profibus card parameters stored in its EEPROM
7	Byte	Index	Value increasing upon every data transmission

The following values are valid only when selecting GSD file types in the instrument (MENU/OUTPUT/DATA/GSD)

8...11*	1x Float*	Value of channels 1...9	Value of measuring channels of OM xxx instrument in 0 mode
8...27**	5x Float**		
8...43***	9x Float***		
8...11*	4x Char*	Response OM xxx Data	Response to command sent to OM xxx instrument through functions 129, 130 returned data through functions 128, 131 až 134
8...27**	5x Char**		
8...43***	9x Char***		

* when selecting the GSD file setting in the instrument menu to "1 Channel" or "1 Channel + Limit"

** when selecting the GSD file setting in the instrument menu to "5 Channels" or "5 Channels + Limit"

*** when selecting the GSD file setting in the instrument menu to "9 Channels" or "9 Channels + Limit"

2. DESCRIPTION OF COMMUNICATION

Telegram transmitted from OM apparatus (older version or selection of GSD file in menu - OLD)

Addr.	Data type	Function	Note
0	Byte	„Function“	Mirrored value of set "Function"
1	Byte	„Adress“	Mirrored value of set Address
2...37	9x Float	Value of channels 1...9	Value of measuring channels of OM xxx instrument in 0 mode
2...37	36x Char	Response OM xxx Data	Response to command sent to OM xxx instrument through functions 129, 130 returned data through functions 128, 131 až 134
38	Byte	1	Identified number of connected OM xxx instruments (used only with OMX Profibus)
39	Byte	Flag	Valid data market
40	Byte	Number of channels	Number of measuring channels of current instrument
41	Byte	Number of relays	Number of relays of current instrument
42	Byte	Value from EEPROM	Value of Profibus card parameters stored in its EEPROM
43	Byte	Index	Value increasing upon every data transmission

OM Profibus card parameters stored in EEPROM

Addr.	Record value	Function	Manufact. value	Note
3	131	TimeOut - OM xxx	4 197...260 ms	Delay for reporting errors in communication with OM xxx instruments $X * 66$ ms (inaccuracy from $X - 1$ to X)
4	132	TimeOut - Profibus	76 aprox. 5 s	Delay for reporting errors in communication to ProfiBus $X * 66$ ms (inaccuracy from $X - 1$ to X)
5	133	Transmiss. delay	8 aprox. 0,6 s	Delay used for downloading in cycles or display projection ($66...131$ ms) + $X * 66$ ms
6	134			Unused (Only for OMX Profibus)
7	135			Unused (Only for OMX Profibus)
8	136	Error display "PB OFF"	0	0 - in the event of an error on the PROFIBUS line, the „PB OFF“ message is permanently displayed on the instrument display 1 - If an error occurs on the PROFIBUS line, the „PB OFF“ message appears once on the instrument display 2 - the error on the PROFIBUS line is indicated only by the LED
9	139	Setting the length of the received and transmitted telegram	1	0 - NoLim_1xvalue input 16B output 12B 1 - NoLim_5xvalue input 16B output 28B 2 - NoLim_9xvalue input 16B output 44B 3 - Limits_1xvalue input 16B output 12B 4 - Limits_5xvalue input 16B output 12B 5 - Limits_9xvalue input 16B output 12B
10...29	138...147	Reserve		May be used to record values (Max. 100 000 records (100k Write Cycles))

OM Profibus card parameters stored in EEPROM [older version or selection of GSD file in menu - OLD]

Addr.	Record value	Function	Manufact. value	Note
3	131	TimeOut - OM xxx	4 197...260 ms	Delay for reporting errors in communication with OM xxx instruments $X * 66$ ms (inaccuracy from $X - 1$ to X)
4	132	TimeOut - Profibus	76 aprox. 5 s	Delay for reporting errors in communication to Profibus $X * 66$ ms (inaccuracy from $X - 1$ to X)
5	133	Transmiss. delay	8 aprox. 0,6 s	Delay used for downloading in cycles or display projection $(66...131 \text{ ms}) + X * 66 \text{ ms}$
6	134			Unused (Only for OMX Profibus)
7	135			Unused (Only for OMX Profibus)
10...29	138...147	Reserve		May be used to record values (Max. 100 000 records (100k Write Cycles))

List of modes („Functions“)

„Function“	Function	Note
0	Downloading values from OM xxx instruments	Channel values are downloaded in cycles from the OM xxx instrument with set Address. Between downloadings there is a delay inserted, which is set in „Transmission delay“ in EEPROM of the OM Profibus card.
10...15	Displaying numbers on OM xxx instrument	Setting display onto decimal number value is repeated in cycles (function 10 = w/o d.p., 5 = 5 decimal places) After function termination (interrupted communication, change of address) the number stops displaying itself after approx. 2,5 s
20	Inserting and projecting decimal number in OM xxx instrument	Functions are designed for OM xxxRS instruments, which are able to receive and process the value (re-calculate, evaluate limit statuses, set the analog output, display the value in relevant format, change the display colour as per value size). The value stays projected in the instrument until another value is recorded or the instrument switches off.
30	Inserting and projecting integer number in OM xxx instrument	Functions are designed for OM xxxRS instruments, which are able to receive and process the value (re-calculate, evaluate limit statuses, set the analog output, display the value in relevant format, change the display colour as per value size). The value stays projected in the instrument until another value is recorded or the instrument switches off.
100	Projection of text on display	Projection of text on OM xxx instrument display is repeated in cycles.
128	Projection of OM xxx instrument identification	Projection of current OM xxx instrument identification ascertained after the Profibus card is switched on.
129...130 229...230	Sending OM command	Upon the change of function OM command is sent to RS 485 line. Functions 129 and 130 are waiting for response from OM xxx instrument. Received answer is stored in transmitted telegram.
131	Bulk parameter downloading	The telegram area designed for data is completed with the EEPROM content of OM Profibus card, in which the card's parameters are stored
132	Downloading SW version	The telegram area designed for data is completed with SW identification of the OM Profibus card e.g.: „V.1.1.2 - 11/16/07 16:47:20(B737)“, the brackets give a check sum of the card's program memory
133	EEPROM check sum	The telegram area designed for data is completed with a check sum of the EEPROM memory in which the OM Profibus card parameters are stored. E.g.: „1327“
134	Downloading counters	The telegram area designed for data is completed with service counters readings (card's number of switch-on cycles and total running time) E.g.: „000012;000006“

No data is downloaded unless the „Flag“ value is set to 1 and the „Function“ and „Address“ values are not identical in both telegrams (the received and the transmitted).

Similar rule applies to an executed command: unless the „Function“ and „Address“ values are not identical in both telegrams (the received and the transmitted), the function is not performed

2. DESCRIPTION OF COMMUNICATION



2.2.4 CONNECTION OF OM XXX DEVICES TO THE INTERNAL OM PROFIBUS DATA CARD

Downloading from OM instruments is performed through the „0“ function. If the function is active, downloading channel values from OM xxx instrument with set address is performed in cycles. Between downloadings there is a delay inserted, which is set in „Transmission delay“, in EEPROM of the OM Profibus card.

No data is downloaded unless the „Flag“ value is set to 1 and the „Function“ and „Address“ values are identical in both telegrams (the received and the transmitted).

The values are in Float (4 byte) format.

2.2.5 CHANGE OF RELAY OUTPUTS LIMIT MARGINS

Under item „Number of relays“ you learn how many and which relay outputs does the current instrument contain. The value is determined according to the significance of individual bits from 0 to 7 if the instrument contains relays 1 to 8.

In case there are relay outputs in the instrument, the limit margins may be readjusted. For values of the limits 1 to 8 the required values are entered in the Float (4 byte) format. The value is sent to the instrument after setting the relevant relay bit in „Relay mask“. After recording the mask should restore the 0 value..

2.2.6a PROJECTION OF TEXT IN OM XXX INSTRUMENTS

Every OM xxx instrument supporting Profibus includes the option of text projection on display. Projection is performed in cycles with delay „Transmission delay“ by means of command „100“. Displayed are the characters stored under „Display text“. Projection is performed for characters with code > 31. First character < 31 terminates the text processing and the text is sent to display. The stop character is tagged on to the previous character.

For projection of a 6 character text the text is displayed for approx. 2,5 s unless another command arrives.

For projection of a text exceeding 6 character the text gets displayed for approx. 1 minute.

For instruments with fewer than 6 characters the texts need to be completed from the front with gaps up to 6 characters.

2.2.6b PROJECTION OF NUMBERS IN OM XXX INSTRUMENTS

There are three options for projection of numbers in OM xxx instruments. Two apply solely for OM xxxRS instruments (monitors and RS communication display devices).

1. Number projection (Float 4 byte) to set number of decimal places for a period of approx. 2,5 s.

Projection is performed through functions „10“ to „15“ (function „10“ = w/o d.p., „15“ = 5 decimal places). Profibus card displays this data in cycles with inserted „Transmission delay“

2. Inserting and projecting decimal number (Float 4 byte) to OM xxx instrument through function „20“.

Number is sent to OM xxxRS instrument where the value is received and processed:

Recalculates with the set minimum and maximum,

May be recalculated with linearisation table, Mathematic function

evaluates limit statuses, sets the analog output,

projects the value in relevant format,

allows for changing the display colour in relation to value significance

The value stays projected in the instrument until another value is recorded or the instrument switches off.

3. Inserting and projecting integer number (signed long 4 byte) to OM xxx instrument through function „30“.
Number is sent to OM xxxRS instrument where the value is received and processed:

- Recalculates with the set minimum and maximum,
- May be recalculated with linearisation table, Mathematic function evaluates limit statuses, sets the analog output,
- projects the value in relevant format,
- allows for changing the display colour in relation to value significance

The value stays projected in the instrument until another value is recorded or the instrument switches off.

2.2.6c DOWNLOADING OF OM XXX INSTRUMENT IDENTIFICATION

Function „128“ enables to find out the identification of a connected OM xxx instrument with currently set address. Identification is filled in under „Response OM xxx/Data“. Identification is obtained upon initialisation after supply switch-on.

2.2.6d DOWNLOADING OF SW IDENTIFICATIONS OF OM PROFIBUS CARD

Function „132“ enables to find out the SW identification of OM Profibus card
e.g.: „V.1.1.2 - 11/16/07 16:47:20(B737)“ In brackets there is the check sum of the OM Profibus card program memory

Identification is filled in under „Response OM xxx/Data“.

2.2.6e DOWNLOADING OF CHECK SUM OF THE EEPROM, STORED PARAMETERS OF OM PROFIBUS CARD

Function „133“ enables to find out the check sum of EEPROM memory, in which the OM Profibus card parameters are stored.

This function together with function „132“ always has to return the same information. In case the information value changes, it is not certain the the OM Profibus card will function properly.

Check sum shall be filled in under „Response OM xxx/Data“.

2.2.6f DOWNLOADING OF COUNTER STATUS

Function „134“ enables finding out the service counters' statuses (number of switch-ons and total running time)
The counters status is filled in under „Response OM xxx/Data“. E.g.: „000012;000006“

2.2.7 WORKING WITH OM PROFIBUS CARD PARAMETERS IN EEPROM

The card retains several parameters affecting communication via RS 485. These parameters are listed in the table above.

The parameters may be changed, however, from manufacture they are set for optimum values for communication with OM xxx instruments. Parameters may be downloaded by entering address under „Function + EEPROM Address“ and downloading from „Value from EEPROM“ or by using function „131“.

The change is performed by recording the new value under „Value to EEPROM“ and by storing an address by 128 higher to „Function + EEPROM address“. After the completion of recording the value into the EEPROM please check that the value has been recorded correctly by reading out the „Value to EEPROM“. If all is correct, the „Function + EEPROM address“ needs to be set to a number <128

2. DESCRIPTION OF COMMUNICATION

2.2.7 SENDING OM COMMANDS

For the sake of use of older types of OM instruments and use of further functions of the instruments the OM Profibus card allows also for sending commands of a standard OM ASCII protocol. Functions „129“/„130“ and „229“/„230“ serve this purpose. The first two wait for response from OM xxx instrument and the others do not wait.

Functions send out command recorded character by character under „OM Command“. Only characters with code > 31 are sent out.

First character < 32 terminates the OM command processing and sends it out to the RS 485 line.

OM command is sent out after a change of function to one of the listed. The response will be stored under „Response OM xxx/ Data“.

The lists of OM Instrument functions may be obtained from the OM Link program, which is available on the web site of the company ORBIT MERRET, s.r.o...

<http://www.merret.cz/en/home/search/om-link/podpora>



3. TECHNICAL DATA

PROFIBUS INTERFACE

Pripojeni:	screw-in terminals
Standard interface	EIA RS-485
Interface protocol	Profibus-DP
Recommend. cable	shielded twisted double-line characteristic resistance: 135...165 Ω cable capacity: < 30 pF/m conductor cross section: > 0,32 mm ² loop resistance (2 wires): < 110 Ω /km
Transmission rate	9.6 kBit/s až 12 000 kBit/s
Max. cable length	1 200 m at baud rate 9.6 / 19.2 / 93.75 kBit/s 1 000 m at baud rate 187.5 kBit/s 400 m at baud rate 500 kBit/s 200 m at baud rate 1 500 kBit/s 100 m at baud rate 3 000/6 000/12 000 kBit/s
Flexible connection	permitted up to transmission rate of max. 1 500 kBit/s, for security purposes should not be used for transmission rates higher than 500 kBit/s
Insulation resistance	for pollution degree II, meas.category III. > 300 V (ZI), 150 V (DI)
Status projection	3 LED (on the communication card)
No. of participants in one network segment (master/slave):	max. 32
No. of participants when repeaters used:	max. 126

INTERNAL COMMUNICATION

Baud rate	600 Bit/s to 115 200 Bit/s (default 9600)
How often	0,1s to 17s + communication time according to Baud rate (default 0,6s)

PROFINET INTERFACE

Connection	2x RJ45, isolated
Interface protocol	ProfiNet
Transmission rate	100 MBit / s
Insulation resistance	for pollution degree II, meas.category III. > 300 V (ZI), 150 V (DI)



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