



# **OM ProfiBus**

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DESCRIPTION OF COMMUNICATION  
ON THE LINE



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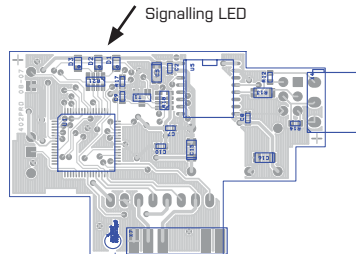
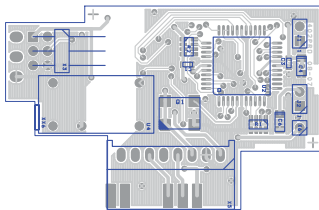
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## 1.1 INSTRUMENT CONNECTION

ORBIT MERRET Instruments are connected to Profibus data bus via an internal card with SPC3 control circuit.

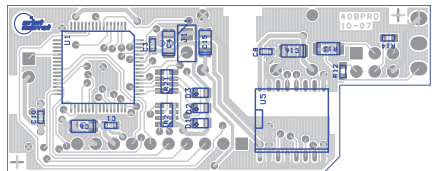
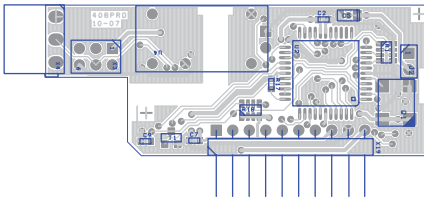
## Data card in OM, OMB and OMD



## Connector arrangement

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

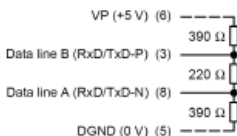
## Data card in OMU



## 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 INSTRUMENT FUNCTION



### 2.1 LED SIGNALISATION

STATUS	„D 1“ GREEN LED QM COMMUNICATION	„D 2“ YELLOW LED PROFI BUS LINE	„D 3“ RED LED ERROR
Start – initial delay and initialisation	flashing	flashing	flashing
Start – identification of QM instruments	light on	light on	light on
Communication with QM instruments	sviti (bliska)	light off	light off
Communication via Profibus line	light on (flashing)	light on (flashing)	light off
The set function is unknown	light off	light on	light off
Error in communication with QM instruments	light on	light off	light on
Error in communication via Profibus line	light off	light on	light on
Error of QM instrument (communication speed is out of range)	light off	light off	light on

#### 2.1.1 PROFIBUS AND QM 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 QM 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 QM xxx device, LEDs „D1“ a „D2“ start flashing alternatively.

In a mode in which the QM xxx is set in a single step, or when information is read out from the QM 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.

### 2.2 DESCRIPTION OF COMMUNICATION ON THE LINE

#### 2.2.1 CONNECTION OF QM XXX INSTRUMENTS TO QM PROFIBUS CARD

QM 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. "QM 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

## Telegram transmitted into OM instrument

ADDRESS	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	Address = 00	00 (used only with OMX Profibus)
2	Byte	Function + Address EEPROM	Downloading / recoding Profibus card parameters 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
<b>The following values are valid only when selecting types of GSD files in the instrument (MENU/OUTPUT/DATA/GSD) – "channels + limits"</b>			
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 selecting GSD file in the menu - OLD)

ADDRESS	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	Address = 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	Reserve	
50	Byte	Function + Address EEPROM	Downloading / recoding Profibus card parameters 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. DESCRIPTION OF INSTRUMENT FUNCTION



### 2.2.1 MODES OF OM PROFIBUS AND A DATA STRUCTURE OF BROADCAST AND RECEIVED TELEGRAM

#### Telegram transmitted from OM apparatus

ADDRESS	DATA TYPE	FUNCTION	NOTE
0	Byte	„Function“	Mirrored value of set „Function“
1	Byte	„Address“	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
<b>The following values depend on the GSD file selected in the instrument [MENU/OUTPUT/DATA/GSD]</b>			
8...11* 8...27** 8...43***	1x Float* 5x Float** 9x Float***	Value of channels 1..9	Value of measuring channels of OM xxx instrument in 0 mode
8...11* 8...27** 8...43***	4x Char* 5x Char** 9x 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

\* when selecting the GSD file in the instrument's menu to „1 Channel“ or „1 Channel + Limit“

\*\* when selecting the GSD file in the instrument's menu to „5 Channels“ or „5 Channels + Limit“

\*\*\* when selecting the GSD file in the instrument's menu to „9 Channels“ or „9 Channels + Limit“

#### Telegram transmitted from OM apparatus (older version or selecting GSD file in the menu - OLD)

ADDRESS	DATA TYPE	FUNCTION	NOTE
0	Byte	„Function“	Mirrored value of set „Function“
1	Byte	„Address“	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**

ADDRESS	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 cca 5 s	Delay for reporting errors in communication to Profi Bus X * 66 ms (inaccuracy from X – 1 to X)
5	133	Transmission delay	8 cca 0,6 s	Delay used for downloading in cycles or display projection (66...131 ms) + X * 66 ms
6	134			Unused (Only for QMX Profi Bus)
7	135			Unused (Only for QMX Profi Bus)
8	136	Projection of error message "PB OFF"	0	0 - In case of an error on the PROFIBUS bus the instrument displays permanently this text: "PB OFF" 1 - In case of an error on the PROFIBUS bus the instrument displays one time this text: "PB OFF" 2 - an error on the PROFIBUS bus is indicated only by a LED
9	139	Setting the length of a broadcast and received telegram	1	0 - WithoutLim_1xvalue input 16B output 12B 1 - WithoutLim_5xvalue input 16B output 28B 2 - WithoutLim_9xvalue input 16B output 44B 3 - Limit_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 selecting GSD file in the menu - OLD)**

ADDRESS	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 cca 5 s	Delay for reporting errors in communication to Profi Bus X * 66 ms (inaccuracy from X – 1 to X)
5	133	Transmission delay	8 cca 0,6 s	Delay used for downloading in cycles or display projection (66...131 ms) + X * 66 ms
6	134			Unused (Only for QMX Profi Bus)
7	135			Unused (Only for QMX Profi Bus)
10...29	138...147	reserve		May be used to record values (Max. 100 000 records [100k Write Cycles])

## 2. DESCRIPTION OF INSTRUMENT FUNCTION



### List of modes („Functions“)

„FUNCTION“	FUNCTION	NOTE
0	Downloading values from QM xxx instruments	Channel values are downloaded in cycles from the QM xxx instrument with set Address. Between downloadings there is a delay inserted, which is set in „Transmission delay“ in EEPROM of the QM Profibus card.
10...15	Displaying numbers on QM 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 QM xxx instrument	Functions are designed for QM 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).
30	Inserting and projecting integer number in QM xxx instrument	Functions are designed for QM 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 QM xxx instrument display is repeated in cycles
128	Projection of QM xxx instrum. identification	Projection of current QM xxx instrument identification ascertained after the Profibus card is switched on
129...130 229...230	Sending QM command	Upon the change of function QM command is sent to RS 485 line. Functions 129 and 130 are waiting for response from QM 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 QM 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 QM Profibus card e.g.: „V1.1.2 - 1\16\07 16:47:20[8737]“, 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 QM 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.

### 2.2.3 DOWNLOADING VALUES FROM QM INSTRUMENTS

Downloading from QM instruments is performed through the „0“ function. If the function is active, downloading channel values from QM 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 QM 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.



**2.2.4** 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.

**2.2.5a** 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. 1minute.

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

**2.2.5b** 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. DESCRIPTION OF INSTRUMENT FUNCTION



### 2.2.5c DOWNLOADING OF OM XXX INSTRUMENT IDENTIFICATION

Function „12B“ 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.

### 2.2.5d DOWNLOADING OF SW IDENTIFICATIONS OF OM PROFIBUS CARD

Function „132“ enables to find out the SW identification of OM Profibus card  
e.g.: „V1.1.2 - 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“.

### 2.2.5e DOWNLOADING OF CHECK SUM OF THE EEPROM MEMORY, 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“.

### 2.2.5f 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“

### 2.2.6 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.

**2.2.7** 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 DRBIT MERRET, s.r.o..

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



#### PROFIBUS INTERFACE

Connection:	screw-in terminals
Standard interface:	EIA RS-485
Interface protocol:	PROFIBUS-DP
Recomm. cable:	shielded twisted double-line characteristic resistance 135...165 $\Omega$ cable capacity < 30 pF/m conductor diameter Cu, Cu) > 0.64 mm conductor cross section > 0.32 mm <sup>2</sup> conductor resistance [1 wire] < 65 $\Omega$ /km loop resistance [2 wires] < 110 $\Omega$ /km
Transmission rate:	9.6 kBit/s to 12 000 kBit/s
Max. cable length:	1200 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 3000/6000/12000 kBit/s
Flexible connection:	permitted up to transmission rate of max. 1500 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 (Z), 150 V (D)
Status projection:	3 LED
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]