

# **Technical Documentation**

## **HYDRO-PORT® Pulse**

**Version 1.0**

2001-05-29

© HYDROMETER GmbH, 2000 - 2001, M.Rac, Team GY

## Content

<b>1</b>	<b>Introduction</b>	<b>4</b>
<b>2</b>	<b>Descriptions</b>	<b>4</b>
<b>3</b>	<b>Versions and Accessories</b>	<b>5</b>
<b>4</b>	<b>Applications</b>	<b>5</b>
<b>5</b>	<b>HYDRO-PORT Pulse Block Diagram</b>	<b>8</b>
5.1	Simplified Electrical Schematic	8
5.2	Simplified Logical Schematic	9
5.3	Pulse Detection	10
<b>6</b>	<b>HYDRO-PORT Pulse Housing and Connections</b>	<b>11</b>
<b>7</b>	<b>M-Bus and Optical Communication</b>	<b>12</b>
7.1	Primary Addressing	12
7.2	Secondary Address Selection	12
7.3	Deselection	13
7.4	Status Request	13
7.5	Programming HYDRO-PORT Pulse Parameters	15
7.6	Programming New Meter Count	16
7.7	Optical Communication	17
<b>8</b>	<b>List of all M-Bus Commands</b>	<b>18</b>
<b>9</b>	<b>Technical Data</b>	<b>19</b>
<b>10</b>	<b>Version History of this Document</b>	<b>21</b>

© HYDROMETER GmbH Ansbach / Germany / 2000 - 2001

The name HYDRO-PORT®, the HYDRO-PORT® software and this manual are protected by copyright laws. Copying, translating, transferring to other media like microfiches and other electromagnetic or optical storage media without the written permission of HYDROMETER is prohibited.

Trademarks or registered trademarks may be used throughout this manual. Even if it is not shown explicitly, they are protected by copyright laws and belong to their respective owners.

The HYDRO-PORT and this documentation were developed with great precision and tested extensively for being free of errors. However, it might be possible that undetected errors appear. HYDROMETER is not liable for any incidental, indirect or consequential damages whatsoever regarding this product, the use of this product or the inability to use this product (including, but not limited to, damages for loss of business profits, business interruption, loss of business information or any other pecuniary loss). HYDROMETER's entire liability is limited to the price paid for this product.

HYDROMETER GmbH  
Industriestr. 13  
91522 Ansbach  
Germany

[www.hydrometer.de](http://www.hydrometer.de)  
[www.hydrometer.de/downloadcenter\\_english.html](http://www.hydrometer.de/downloadcenter_english.html)

## 1 Introduction

This document contains a technical description of the HYDROMETER HYDRO-PORT Pulse.

The HYDRO-PORT Pulse is an M-Bus device which is able to convert pulse interfaces of resource consumption meters (e.g. electricity, heat, water, and other meter) into the M-Bus protocol. The HYDRO-PORT Pulse has got two independent pulse inputs. Alternatively pulse contacts without power (Reed, Open Collector Transistor) or current loop pulses (0 mA / 20 mA, S0, Namur) may be connected. The pulses from the meters are counted up and can be read out using the M-Bus protocol. Additionally, each pulse counter has got an user-definable physical medium and physical unit according to EN1434-4.

The HYDRO-PORT Pulse is also able to multiply the counted pulses with an integer value and divide the result by an integer. Therefore, even non-integer pulse ratios (e.g. 1.5 pulses / litre) can be displayed correctly. The internal pulse accumulation register is not altered by this operation, therefore, the correct number of pulses is counted always. The multiplier and divisor can be altered without changing the pulse accumulation register.

The HYDRO-PORT software is used for configuration of the HYDRO-PORT Pulse and runs with Windows® 95 / 98 / ME / NT SP4 / 2000.

To understand this document you should be familiar with the basic concepts of the M-Bus. Useful are the documents provided on the official M-Bus homepage (<http://www.m-bus.com>), especially "The M-Bus, A Documentation".

## 2 Descriptions

The following terms and phrases (M-Bus specific and not M-Bus specific) are used throughout this document. The following list gives an overview with explanation.

M-Bus Level Converter / Repeater	Device which converts the electrical signals of a RS232 (V.24) PC interface to M-Bus signals. This device is necessary to connect a PC to an M-Bus network. Usually a level converter is a "dumb" device which is not optimising the signal quality and a repeater is more sophisticated device which enhances the signal quality.
M-Bus Slave / Device	Devices which are connected to the M-Bus. The M-Bus is a hierarchical bus system which has got exactly one master and several slaves (or devices). The HYDRO-PORT Pulse is an M-Bus slave (device).
RS232	One of the PC data interfaces. Works with -12 .. -3 V and +3 V.. +12 V voltage levels. The transmission type is bit serial with a user defined number of bits per data word. Usually 8 bits (= 1 byte) are used per data word and additionally 1 start bit and 1 stop bit. There may also be a parity bit, therefore, a data word may contain 10 or 11 bits. The M-Bus is always using 1 start bit, 8 data bits, 1 parity bit (parity even), and 1 stop bit (8E1). 8N1 (= 8 data bits, no parity bit, and 1 stop bit) is also very common.

ZVEI, Optical Interface	Optical interface which converts the data signals of a RS232 interface to optical light pulses (on / off). The ZVEI interface is standardized in respect of transmission distance, light intensity, frequency and protocol. The HYDRO-PORT Pulse has got an optical interface which is similar to the ZVEI interface but is not using the ZVEI protocol but the M-Bus protocol.
Modem (AT commands)	Modulator / demodulator. A device capable of transmitting digital signals using a standard, analogue phone line, a digital phone line (ISDN), or a wireless phone connection (e.g. GSM network). Most modems understand the so called Hayes AT command set. The PC is using this command set to control a modem.

### 3 Versions and Accessories

The HYDRO-PORT Pulse is available in one version with two pulse inputs:

HYDRO-PORT Pulse	Pulse to M-Bus converter with 2 pulse inputs. HYDROMETER part number: <b>535 000 56</b>
------------------	--

HYDRO-PORT Pulse accessories:

HYDROMETER Optotransceiver	Optical interface device according to ZVEI HYDROMETER part number: <b>535 000 43</b>
HYDRO-CENTER 60	M-Bus Level Converter / Repeater for connecting up to 60 M-Bus devices. HYDROMETER part number: <b>535 000 50</b>
HYDRO-CENTER 60 Memory	M-Bus Level Converter / Repeater with 2 MByte non-volatile Flash memory for connecting up to 60 M-Bus devices. HYDROMETER part number: <b>535 000 51</b>
HYDRO-CENTER 250	M-Bus Level Converter / Repeater for connecting up to 250 M-Bus devices. HYDROMETER part number: <b>535 000 52</b>
HYDRO-CENTER 250 Memory	M-Bus Level Converter / Repeater with 2 MByte non-volatile Flash memory for connecting up to 250 M-Bus devices. HYDROMETER part number: <b>535 000 53</b>
HYDRO-CENTER Power Supply	230 V AC power supply, 24 V AC / 1 A output (24 W), with cable and German mains power supply connector. Rail mounting housing HYDROMETER part number: <b>535 000 54</b>

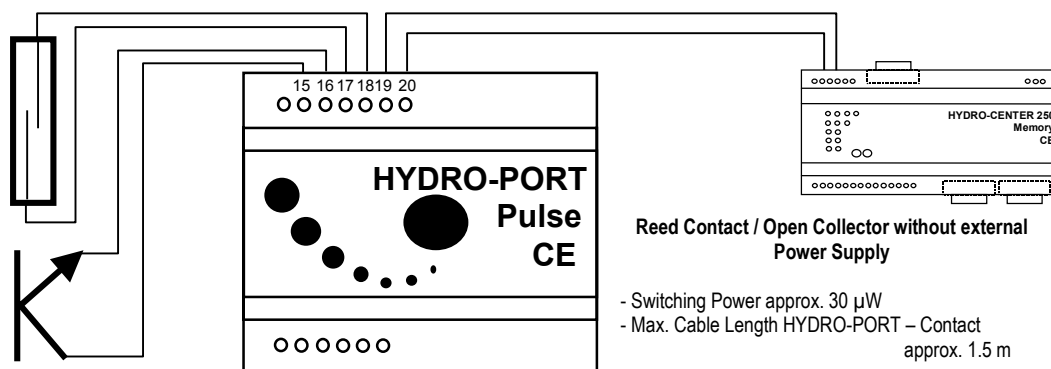
### 4 Applications

The HYDRO-PORT Pulse is used in places where a resource meter with pulse interface has to be connected to an M-Bus network. In general the HYDRO-PORT Pulse is able to convert two different pulse interfaces into M-Bus protocol:

- Voltage-free pulse contacts (e.g. Reed contact, relay contact, Open Collector Transistor output), contact inputs **P1** and **P2**
- Current loop pulses (0 mA / 20 mA, S0, Namur), current loop inputs **Z1** and **Z2**

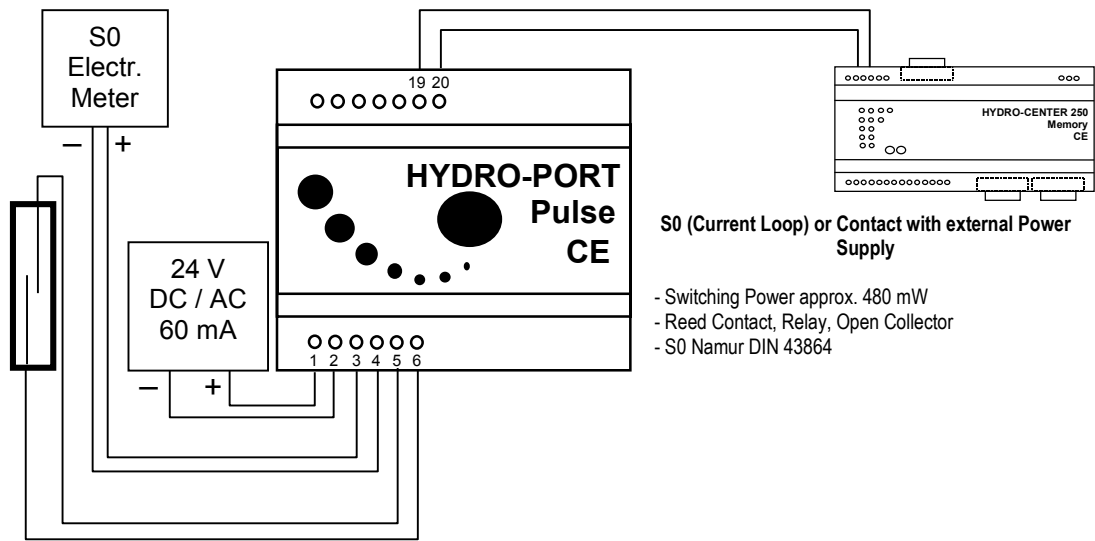
In the first case the current necessary to recognize a closed pulse contact comes from the M-Bus power supply or the internal backup battery (in case of M-Bus failure). Therefore, no additional power supply is necessary. The contact current is very low (approx. 10  $\mu$ A) which may cause electromagnetic influence on the counted pulses in areas with high electromagnetic fields. However, using short, shielded cables may overcome this problem. Due to the internal backup battery the HYDRO-PORT Pulse is continuing the pulse counting even if the M-Bus power supply fails temporarily.

The picture beneath shows the wiring of two resource meters with Reed contact and Open Collector Transistor, respectively, using the contact inputs **P1** and **P2** of the HYDRO-PORT Pulse.

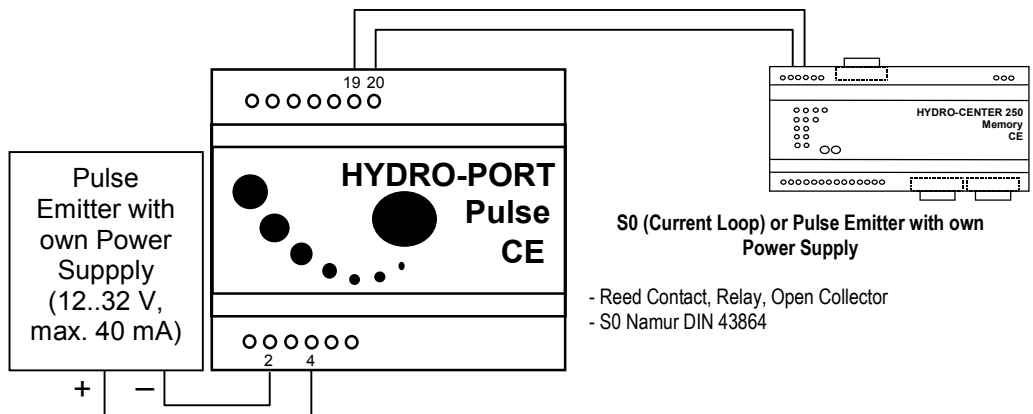


The second option (current loop pulses) is used for meters with a so called S0 or Namur interface. A 24 V AC / DC power supply has to be connected to the HYDRO-PORT Pulse. The contact current is 20 mA (max.). Therefore, electromagnetic interference is not much of a concern. Additionally, the pulse inputs and the main parts of the HYDRO-PORT (including the microcontroller, and M-Bus interface) are completely isolated from each other. However, if the 24 V AC / DC power supply fails no more pulses are counted.

The picture beneath shows the wiring of two resource meters with Reed contact and S0 interface using the current loop pulse inputs **Z1** and **Z2**. Using this option a 24 V AC / DC power supply has to be connected.

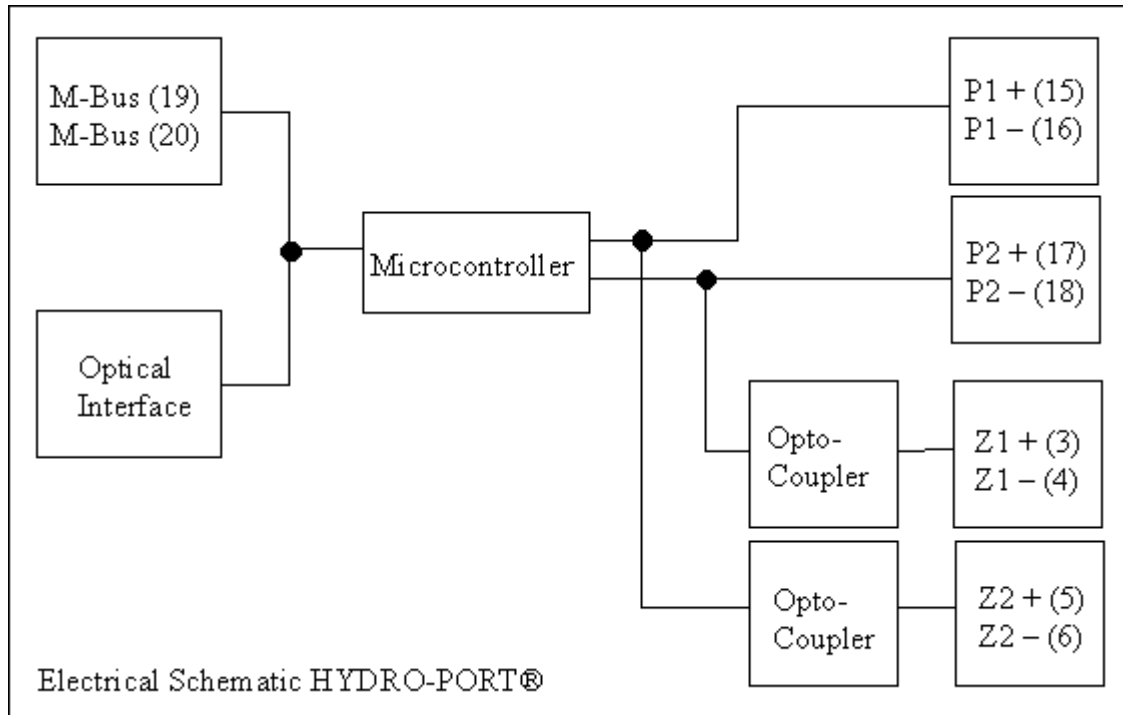


If the resource meter is supplying the current loop voltage itself the wiring beneath is used.



## 5 HYDRO-PORT Pulse Block Diagram

### 5.1 Simplified Electrical Schematic



The core part of the HYDRO-PORT Pulse is a Microchip PIC microcontroller with 4 MHz clock speed. The PIC performs the following tasks:

- Counting the pulses on both pulse inputs and storing the results to a 48 bit pulse accumulator register each.
- Controlling the M-Bus communication (300 and 2400 baud auto baud detect). If an M-Bus telegram with the address of the HYDRO-PORT Pulse is detected the respective answer is generated and sent. The meter counts can be multiplied with an integer value (8 bit, 1..255) and divided by an integer value (7 bit, 1..127). Therefore, even non-integer pulse ratios (e.g. 1.5 litre / pulse) can be displayed with their correct physical unit.
- Controlling the optical communication. The optical communication is the same as the M-Bus communication except that the optical transmit diode has to be switched on using a special command (see 7.7).
- Controlling the M-Bus voltage. At M-Bus power fail the microcontroller switches to a low-power state in which it is only able to count pulses from the contact pulse inputs. Communication is no longer possible.

The microcontroller of the HYDRO-PORT Pulse has got two pulse inputs which are connected to the contact inputs (P1, P2) and the current loop pulse inputs (Z1, Z2):

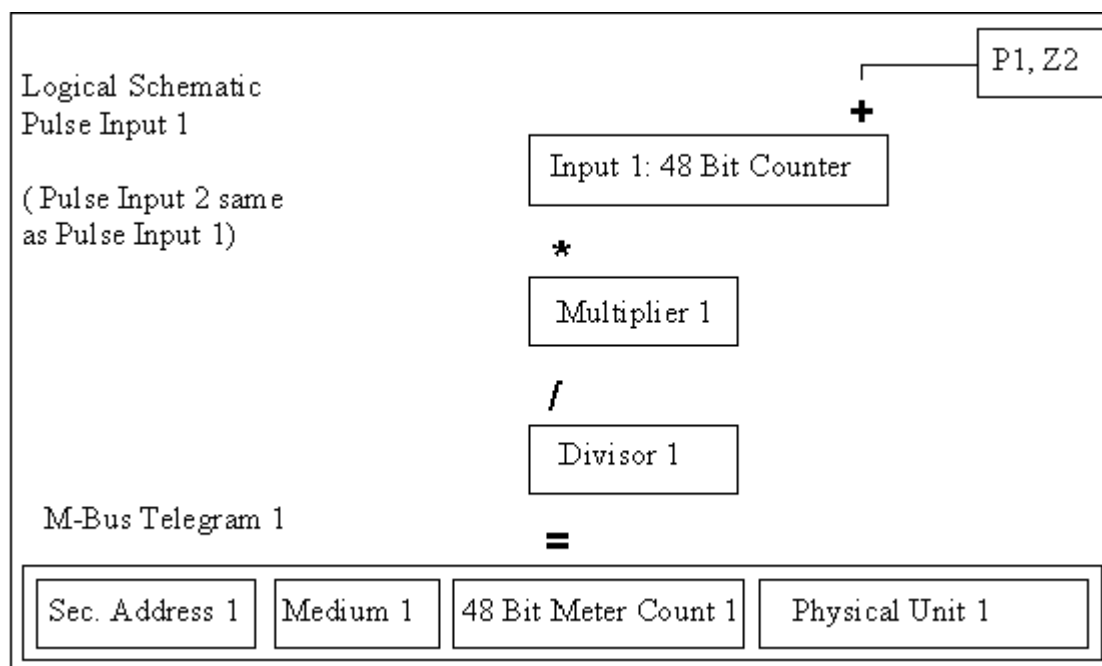
Microcontroller Input	Contact Pulse Input	Current Loop
1	P1	Z2
2	P2	Z1

Therefore, the contact inputs and the current loop pulse inputs may only be used alternatively. Only the combination of inputs shown beneath may be used simultaneously:

- P1 and P2
- Z1 and Z2
- P1 and Z1
- P2 and Z2

As soon as one current loop input is used the external 24 V DC / AC power supply has to be connected to the HYDRO-PORT Pulse.

## 5.2 Simplified Logical Schematic



The simplified logical schematic shows one of the two pulse inputs (P1, Z2). Any pulse detected at the input is added to the 48 bit internal pulse accumulation register of input 1. If during an M-Bus communication the meter count is requested the content of the pulse accumulation register is multiplied with Multiplier 1 (range: 1..255) and divided by Divisor 1 (range: 1..127). The result is the 48 bit meter count 1 which is returned in an M-Bus data record with user-definable physical unit and medium. The pulse

accumulation register is not altered by the arithmetical operations and, therefore, contains always the correct pulse count regardless of the multiplier or divisor.

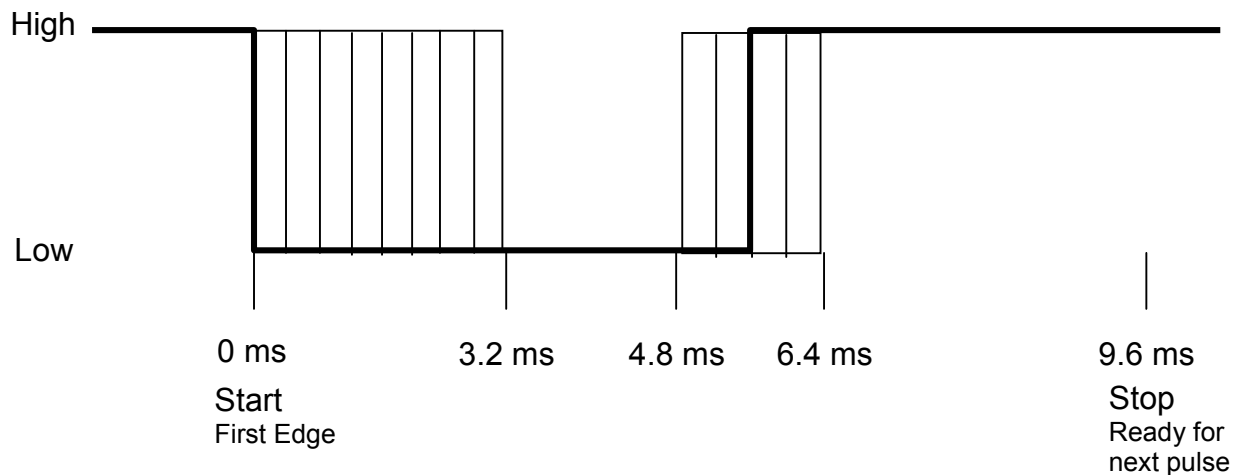
### 5.3 Pulse Detection

The pulse detection algorithm of the HYDRO-PORT Pulse is shown in principal beneath. There is no difference between pulse input 1 and 2:

**Start:** Wait for a falling edge at the pulse input

- Detect a falling edge at the pulse input (High -> Low)
- Wait 3.2 ms
- For 1.6 ms check every 256  $\mu$ s if the pulse input is still Low. If the pulse input is not Low -> go back to **Start**
- Pulse accumulation register = pulse accumulation register + 1
- Wait until the pulse input is High again.
- If the pulse input is High again check every 3.2 ms if the pulse input is still high. If yes -> go back to **Start**

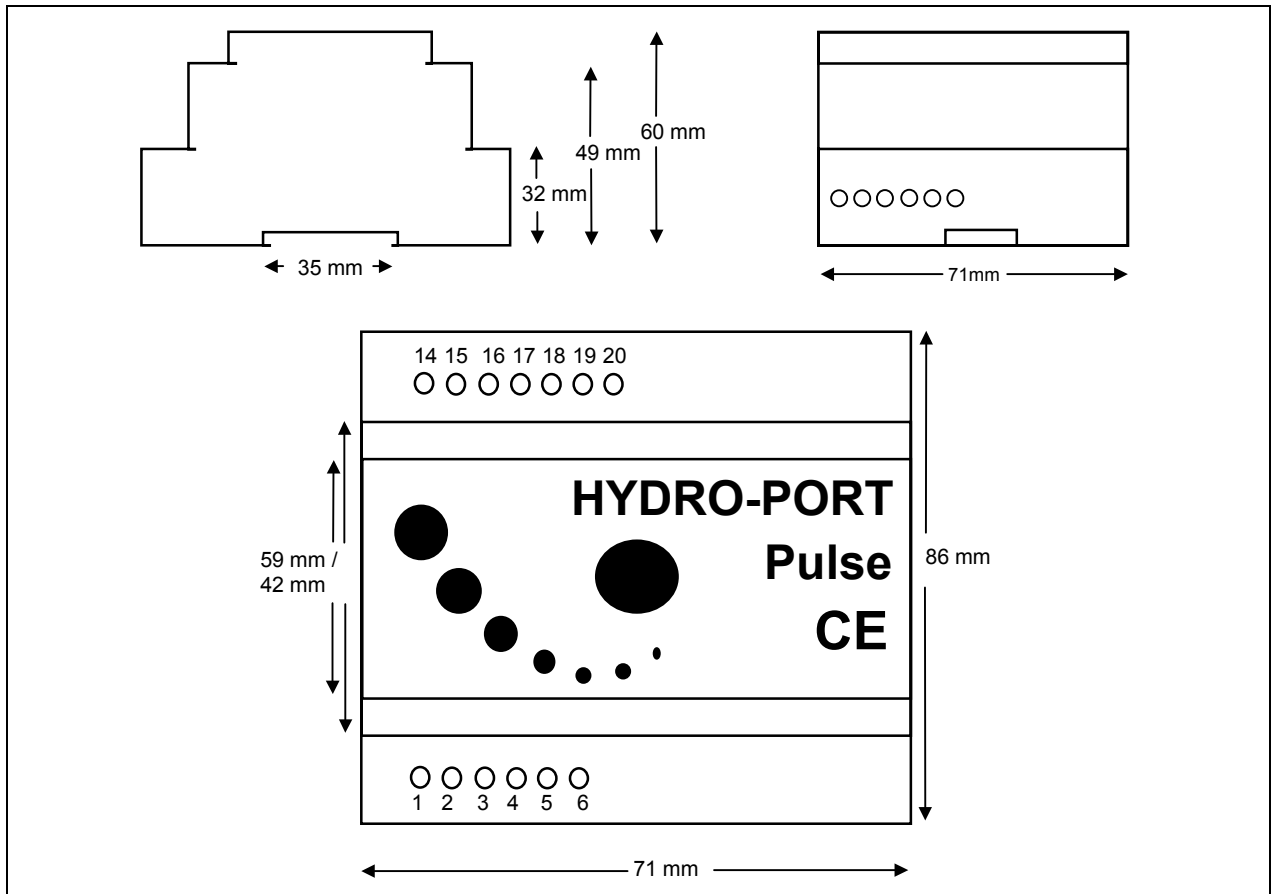
Therefore, the minimum pulse width is 4.8 ms (specified: 7.5 ms) and the maximum frequency is approx. 100 Hz (specified: 50 Hz).



The hatched area in the time diagram above shows where a e.g. a contact bounce may appear which is not counted.

## 6 HYDRO-PORT Pulse Housing and Connections

The HYDRO-PORT Pulse has got a rail mounting housing with standard fuse profile. The housing has got a width of 4 fuses (approx. 71 mm). The HYDRO-PORT Pulse is designed for mounting on a standard rail mount.



Drawing is not to scale.

Number		Description
1	U+	+ 24 V AC / DC Power Supply for S0 Pulse Inputs
2	U-	- 24 V AC / DC Power Supply for S0 Pulse Inputs
3	Z1+	S0 (Current Loop 20 mA) Pulse Input 1 +
4	Z1-	S0 (Current Loop 20 mA) Pulse Input 1 -
5	Z2+	S0 (Current Loop 20 mA) Pulse Input 2 +
6	Z2-	S0 (Current Loop 20 mA) Pulse Input 2 -
14		Shielding for Contact Inputs
15	P1+	Contact Input 1 +
16	P1-	Contact Input 1 -
17	P2+	Contact Input 2 +
18	P2-	Contact Input 2 -
19	M-Bus	M-Bus Input
20	M-Bus	M-Bus Input

## 7 M-Bus and Optical Communication

The HYDRO-PORT Pulse communicates using the M-Bus protocol according to EN1434-4. Both interfaces (M-Bus and optical) are in principle identical. The optical interface is permanently ready to receive and must not be triggered with a special wake up light pulse sequence. However, the transmit diode is usually switched off and, therefore, the first M-Bus telegram sent via the optical interface should be the command to switch on the optical transmit diode (see 7.7). The optical transmit diode is switched off if the HYDRO-PORT Pulse receives a SND\_NKE (to its own M-Bus address or 254 / FE or 255 / FF) or is deselected. Only if the M-Bus is connected and supplies the power to the HYDRO-PORT Pulse optical communication is possible.

Data Word Format: 8 data bits, 1 stop bit, 1 parity bit (even)  
Baudrate: 300, 2400 baud, automatic detecting and switching  
Data Format: LSB first always

Secondary Address: User definable  
Manufacturer Code: HYD (2324)  
Medium: User definable  
Generation: 95

All figures in the next chapters are hexadecimal, "ChS" stands for the checksum of the M-Bus telegram, "PA" for the primary address, "SA" for the secondary address, "Med" for the medium:

### 7.1 Primary Addressing

The HYDRO-PORT Pulse has got one primary address for both pulse inputs. The primary address is user definable via M-Bus command. By default the primary address of the HYDRO-PORT Pulse is set to 1.

Apart from his primary address the HYDRO-PORT Pulse answers to M-Bus addresses FE (M-Bus broadcast to all devices with answer from the devices) and FF (M-Bus broadcast to all devices without answer from the devices). On request to M-Bus address FD the HYDRO-PORT Pulse answers only if it is selected (see 7.2).

### 7.2 Secondary Address Selection

#### Request (Selection):

68 0B 0B 68 73/53 FD 52 SA0 SA1 SA2 SA3 24 23  
95 Med ChS 16

#### Answer:

E5 or none

#### Remark:

The HYDRO-PORT Pulse has got two different user definable secondary addresses (SA) with media (Med) for both of its pulse inputs.

If both pulse inputs are selected simultaneously (e.g. by using joker / wildcards (“F”) in the secondary address), the HYDRO-PORT Pulse answers with two E5 to simulate a collision.

If SAd and Med fit the secondary address of one of the pulse inputs of the HYDRO-PORT Pulse the respective pulse input is selected and answers to all request to M-Bus address FD.

If SAd and Med do not (or no longer) fit the secondary address the HYDRO-PORT Pulse deselects itself and is no longer answering to requests to M-Bus address FD.

By default the secondary address for pulse input 1 is the serial number on the housing of the HYDRO-PORT Pulse. The secondary address for pulse input 2 is (serial number + 1).

Instead of the complete secondary address M-Bus joker / wildcards (“F”) in SAd and Med may also be used.

### 7.3 Deselection

#### Request (SND-NKE):

10 40 FD ChS 16

#### Answer:

E5 or none

#### Remark:

If the HYDRO-PORT Pulse was selected it is deselected and answers with E5. In other cases there is no answer. The HYDRO-PORT Pulse is deselected also if it receives a selection telegram (see 7.2) with another address than its own. The optical transmit diode is switched off if the HYDRO-PORT Pulse is deselected (see 7.7).

### 7.4 Status Request

#### Request (REQ-UD2):

10 7B/5B PAd/FE ChS 16

#### Answer 1 (RSP-UD with primary addressing):

68 36 36 68 08 PAd 72 SAd0 SAd1 SAd2 SAd3 24 23 95 Med 01 00 00  
 00

06 06 00 00 00 00 00 00

1. Meter count pulse input 1  
 (Example: 0 energy [kWh])

02 86 28 01 01

2. Multiplier and divisor for pulse input 1  
 (Example: multiplier: 1, divisor: 1)

86 40 16 03 00 00 00 00

3. Meter count pulse input 2  
 (Example: 3 volume [m3])

82 40 96 28 01 01

4. Multiplier and divisor for pulse input 2  
 (Example: multiplier: 1, divisor: 1)

87 40 79 00 00 00 18 24 23 95 07 5. Secondary address pulse input 2  
 (Secondary address: 18000000,

Manufacture Code: HYD (2324)  
 Medium: Water (07)  
 Generation: 95)

ChS 16

**Remark:**

Using primary addressing the HYDRO-PORT Pulse answers a REQ\_UD2 with a RSP\_UD which contains the values for both pulse inputs. The datarecords are shown in the table beneath:

Unit	Tariff	Storage	Data	Function	VIB	Description
0	0	0	INT6	Instant.	06 XX	Meter count pulse input 1 VIF is user defined
0	0	0	INT2	Instant.	02 XX 28	8 bit multiplier (LSB) and 7 bit divisor (MSB) for pulse input 1
1	0	0	INT6	Instant.	06 XX	Meter count pulse input 2 VIF is user defined
1	0	0	INT2	Instant.	82 40 XX 28	8 bit multiplier (LSB) and 7 bit divisor (MSB) for pulse input 2
1	0	0	INT8	Instant.	87 40 79	Secondary address pulse input 2 (SAd, Manufacturer Code, Generation, Medium)

**Request (REQ-UD2):**

10 7B/5B FD ChS 16

**Answer 2 (RSP-UD with secondary addressing):**

68 36 36 68 08 PAd 72 SAd0 SAd1 SAd2 SAd3 24 23 95 Med 01 00/01  
 00 00

06 06 00 00 00 00 00 00

1. Meter count pulse input 1 (status 00) or pulse  
 input 2 (status 01)

(Example: 0 energy [kWh])

02 86 28 01 01

2. Multiplier and divisor for  
 pulse input 1 (status 00)  
 or pulse input 2 (status 01)

(Example: multiplier: 1, divisor: 1)

ChS 16

**Remark:**

Using secondary addressing the HYDRO-PORT Pulse answers a REQ\_UD2 with a RSP\_UD which contains only the values for one pulse input (the one selected).

To diversify between pulse input 1 and pulse input 2 the status byte is used. **Status = 00 stands for pulse input 1, Status = 01 stands for pulse input 2.** The datarecords are shown in the table beneath:

Unit	Tariff	Storage	Data	Function	VIB	Description
0	0	0	INT6	Instant.	06 XX	Meter Count 1 or Meter Count 2 VIF is user defined
0	0	0	INT2	Instant.	02 XX 28	8 bit multiplier (LSB) and 7 Bit divisor (MSB) for pulse input 1 or pulse input 2

## 7.5 Programming HYDRO-PORT Pulse Parameters

### Request (SND-UD):

```
68 37 37 68 53/73 PAd 51
01 7A PAD
07 79 SAd0 SAd1 SAd2 SAd3 24 23 95 Med
87 40 79 SAd0 SAd1 SAd2 SAd3 Man0 Man1 Gen Med
02 VIF 28 ML DV
82 40 VIF 28 ML DV
06 VIF 00 00 00 00 00 00
86 40 VIF 00 00 00 00 00 00
ChkS 16
```

1. New primary address
2. New secondary address pulse input 1
3. New secondary address pulse input 2
4. New multiplier / divisor pulse input 1  
(VIF is user definable)
5. New multiplier / divisor pulse input 2  
(VIF is user definable)
6. New meter count pulse input 1 (corrected)  
New VIF pulse input 1
7. New meter count pulse input 2 (corrected)  
New VIF pulse input 2

### Answer:

E5 or none

### Remark:

For programming the HYDOR-PORT Pulse parameters the SND\_UD telegram shown above must be sent completely with all datarecords. The HYDRO-PORT Pulse **does not** understand any other SND\_UD telegrams e.g. with less datarecords or with the datarecords in a different order. If you want to alter only some of the parameters you may insert invalid values for the parameters not to be programmed. Invalid values are:

FF for primary address

FF FF FF FF FF FF FF FF      for secondary address pulse input 1 and 2  
00 00                              for multiplier / divisor pulse input 1 and 2  
FF FF FF FF FF FF              for meter count pulse input 1 and 2

Example telegram where only the meter count of pulse input 1 is programmed.

Request (SND-UD):

68 37 37 68 53/73 PAd 51	
01 7A FF	1. Invalid primary address
07 79 FF FF FF FF FF FF FF FF	
	2. Invalid secondary address pulse input 1
87 40 79 FF FF FF FF FF FF FF FF	
	3. Invalid secondary address pulse input 2
02 VIF 28 00 00	4. Invalid multiplier / divisor pulse input 1
82 40 VIF 28 00 00	5. Invalid multiplier / divisor pulse input 2
06 VIF 65 03 00 00 00 00	6. New meter count pulse input 1 (corrected) New VIF pulse input 1
86 40 VIF FF FF FF FF FF FF FF	7. Invalid meter count pulse input 2
ChkS 16	

Answer:

E5 or none

**Note:** The HYDRO-PORT Pulse answers all SND\_UD telegrams to his address with E5 as long as the M-Bus frame is correct. This is independent from the point if the telegram could be interpreted and the new parameters are set or not. To check whether the new parameters are set or not the HYDRO-PORT Pulse has to be read with a REQ\_UD2 afterwards.

## 7.6 Programming New Meter Count

The new meter count of both HYDRO-PORT Pulse inputs must be programmed "corrected". This means that the raw value of the pulse accumulation register must be programmed (value before multiplication and division).

Example:

Multiplier: 3  
Divisor: 2  
Meter Count: 123456      (the meter count to be displayed in a REQ\_UD2 telegram)

Hence the raw value to be programmed is:

Meter Count \* Divisor / Multiplier

->  $123456 * 2 / 3 = 82304$

The HYDRO-PORT Pulse will then return as meter count:

$$82304 * 3 / 2 = 123456$$

## 7.7 Optical Communication

Before an optical communication is possible the transmit diode of the HYDRO-PORT Pulse must be switched on. The receive diode is always active. The HYDRO-PORT Pulse is not able to communicate via M-Bus and optical interface simultaneously. If there are requests on both interfaces simultaneously the HYDRO-PORT Pulse is not answering.

### Switching on the Optical Transmit Diode (SND-UD, optical communication):

```
68 37 37 68 53/73 FE 51
01 7A FF
07 79 FF FF FF FF FF FF FF FF
87 40 79 FF FF FF FF FF FF FF FF
02 VIF 28 00 00
82 40 VIF 28 00 00
06 VIF FF FF FF FF FF FF FF
86 40 VIF FF FF FF FF FF FF FF
ChkS 16
```

### Answer:

E5 or none

The command to switch on the optical transmit diode is, therefore, a parameter programming SND\_UD command with invalid values only.

The optical transmit diode is switched of if:

- a) the HYDRO-PORT Pulse is deselected (see 7.3)
- or
- b) the HYDRO-PORT Pulse receives a SND\_NKE to its own primary address.
- or
- c) the HYDRO-PORT Pulse receives a SND\_NKE to addresses FE or FF.

## 8 List of all M-Bus Commands

HYDRO-PORT Pulse Functions Selection-Telegrams 7.2, 7.3						
Description	Telegram Type	CI	Address	Manufact.	Gen.	Medium
Selection	SND_UD	52	Serial N.	23 24 (HYD)	95	Medium
Deselection	SND_NKE	40	FD (253)			

HYDRO-PORT Pulse Functions Status Request 7.4				
Description	Telegram Type			
Request 7.4	REQ_UD2			

HYDRO-PORT Pulse Functions SND_UD Telegrams 7.5, 7.6, 7.7				
Description	Telegram Type	CI		
Parameter Programming 7.5	SND_UD	51		

## 9 Technical Data

<b>General</b>	
<b>Power Supply</b>	M-Bus for microcontroller, contact pulse inputs 12..32 V AC / DC (nominal 24 V DC) max. 80 mA (nominal 40 mA) power supply for current loop pulse inputs (S0)
<b>Housing</b>	Rail mounting housing with standard fuse profile heat resistant plastic (width approx. 4 fuses: 71 mm)
<b>Protective Class</b>	IP20
<b>Operating Temperature</b>	+0°C .. +60°C
<b>Humidity</b>	10% .. 70% air humidity, non condensing
<b>Weight</b>	approx. 150 g

<b>EMV Tests (CE)</b>	
<b>Emissions</b>	EN 50081-1:1992 (Home and Office Use)
<b>EMC</b>	EN 50082-1:1997
	Electrostatic Discharge, EN 61000-4-2:1995 Contact: 4 KV, Air: 8 KV
	Electromagnetic Fields, EN 61000-4-3:1996+A1/1998 EN 50204:1995 80-1000 MHz: 3 V/m, 900 +/-5 MHz 3 V/m (Real Achieved: 80-1000 MHz: 9 V/m)
	Bursts, EN 61000-4-4:1995 M-Bus Lines / Pulse Inputs: 0.5 KV
	Discharge EN 61000-4-5:1995 Symmetric Coupling: 0.5 KV Asymmetric Coupling: 0.5 KV
	Inductive, EN 61000-4-6:1996 0.15 - 80 MHz: 3 Veff
<b>Assessment</b>	SENTON GmbH / EMV-Prüfzentrum / Straubing / Germany

<b>Pulse Inputs</b>	
<b>Inputs</b>	2 contact inputs for Reed contact, relay or Open Collector Transistor alternatively 2 current loop pulse inputs for 0 / 20 mA, S0, Namur
<b>Contact Inputs</b>	Max. 30 µW (3 V, 10 µA) contact power per input Inactive: contact resistance > 500 K Active: contact resistance < 1 K
<b>Current Loop</b>	Max. 1,28 W (32 V, 40 mA) contact power per input Nominal 0,48 W (24 V, 20 mA) contact power per input Power supply to HYDRO-PORT Pulse with 24 V AC / DC or by external device Inactive: current loop < 2 mA Active: current loop > 8 mA
<b>Min. Pulse Duration</b>	> 7,5 ms
<b>Max. Pulse Frequency</b>	< 50 Hz (per input)
<b>Pulse Accumulation</b>	48 Bit signed integer value (per input)
<b>Factor</b>	User defined 8 bit multiplier (1..255) and 7 bit divisor (1..127) Integer multiplication and division performed at each M-Bus request for meter values. Pulse accumulation register is not altered by arithmetic operations.

<b>Communication (M-Bus , optical)</b>	
<b>Baudrates</b>	300, 2400 baud, automatic detection and switching
<b>Data Word Format</b>	8 data bits, even parity, 1 stop bit (8E1)
<b>M-Bus Load</b>	1 standard load
<b>Backup Time while M-Bus Failure</b>	> 3 moth (pulse frequency 50 Hz) > 5 years (pulse frequency 0 Hz)
<b>Optical Interface</b>	Geometry and light density similar to standard ZVEI data transmission protocol M-Bus (300, 2400 baud)

## 10 Version History of this Document

2001-01-31	First Version
2001-02-17	Mistake in sending telegram corrected (one byte was missing, 7.5, 7.6, 7.7). HYDRO-PORT is only checking secondary selection telegrams with CI=52H and not with CI=55H (7.2).
2001-04-21	Results of CE tests added (9)
2001-05-29	HYDRO-PORT Mini renamed to HYDRO-PORT Pulse