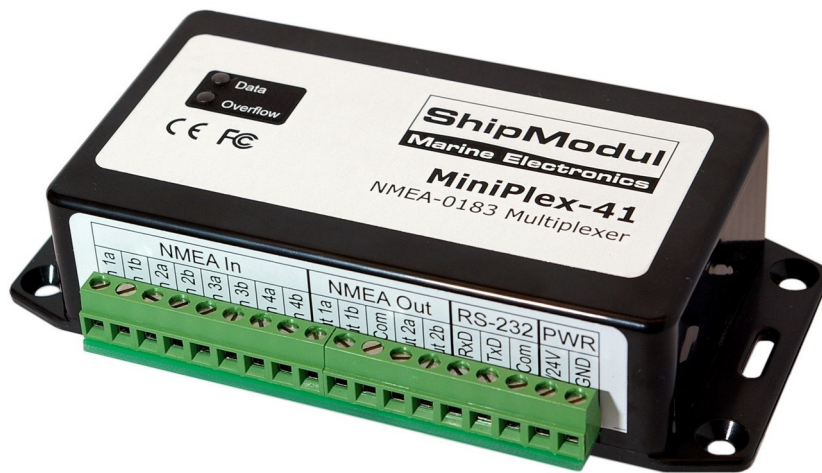


## MiniPlex-41 NMEA-0183 multiplexer Manual



MiniPlex-41, V1.0  
Firmware V2.3.1  
Art.no.: 101

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# Introduction

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The MiniPlex-41 is a four-channel NMEA multiplexer, enabling the connection of multiple NMEA-0183 instruments to each other and a computer. Available are four NMEA inputs (*listener*-ports), two NMEA outputs (*talker*-ports) and one RS-232 port for connection with a computer. The MiniPlex-41 also offers a SeaTalk to NMEA translation in order to read data from Raymarine instruments like the ST40, ST50 and ST60 series.

## Specifications:

Supply voltage:	8 – 30 V <sub>DC</sub> , protected against reversed polarity.
Current consumption:	40 mA (70 mA max. with fully loaded talker ports).
Inputs:	4 x NMEA-183/RS-422, galvanically isolated. 1 input can be set to SeaTalk mode.
Input resistance:	>800 Ohm.
Outputs:	1 x RS-232, 2 x NMEA-183/RS-422.
Buffers:	5 buffers of 1000 characters (4 x NMEA, 1 x RS-232).
NMEA Out1:	Combined data from NMEA inputs.
NMEA Out2:	Combined data from NMEA and RS-232 inputs or only from RS-232 input.
Speed NMEA in:	4800 Baud.
Speed NMEA1/RS-232 out:	4800, 9600, 19200 or 38400 Baud.
Speed NMEA2 out:	4800 Baud.
Indicators:	Overflow and Data.
Dimensions:	138 x 72 x 33 mm.
Housing:	Flame retardant ABS.

## Operation

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The MiniPlex-41 reads NMEA sentences from the listener ports and stores them in a buffer, one for each input. The sentences are read from the buffers in a round robin fashion, one sentence at a time, giving each listener port equal priority. Each sentence is then sent to the talker ports and the RS-232 port.

The speed of the listener ports is fixed to 4800 Baud (= bits per second), which equals 480 characters per second. When all listener ports receive data at this rate, the buffers will not be emptied in time and an overflow situation occurs. The red LED indicates this situation. When a buffer is full, a partially received sentence will be discarded, to ensure that the MiniPlex-41 only sends complete and valid NMEA sentences.

There are two ways to resolve this overflow situation:

1. Configure the instruments on the listener ports to send less data or with greater intervals. It is often possible to disable non-relevant sentences.
2. Increase the speed of the RS-232 port on the MiniPlex-41. The maximum speed is 38400 Baud. From 19200 Baud and up (4 x 4800!) an overflow will never occur (except when in Hub Mode).

The MiniPlex-41 has two talker ports, 'Out 1' and 'Out 2'. All received sentences from the listener ports are available on talker port 'Out 1'. Talker port 'Out 2' can be configured either to output all received sentences from the listener ports and the RS-232 port (Hub Mode), or only sentences from the RS-232 port (Server Mode).

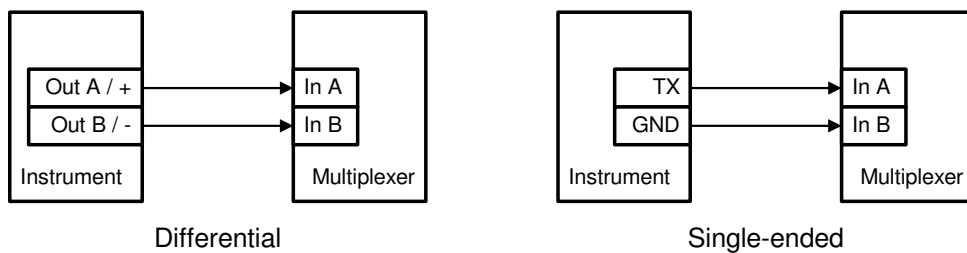
# Connections

## NMEA Listener Ports

The MiniPlex-41 has four listener ports, 'In 1' to 'In 4'. Each listener port should be connected to one instrument only. These inputs are galvanically isolated from the multiplexer, as specified in the NMEA-0183 standard.

Connect the 'a' and 'b' terminals of the listener port on the MiniPlex-41 to the 'a' and 'b' terminals of the talker port on the instrument. Other designations used are 'Data +' and 'Data -', 'TX+' and 'TX-' or 'Out +' and 'Out -'.

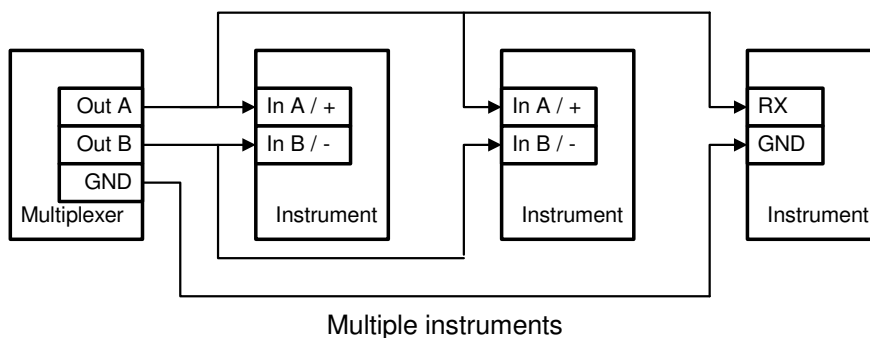
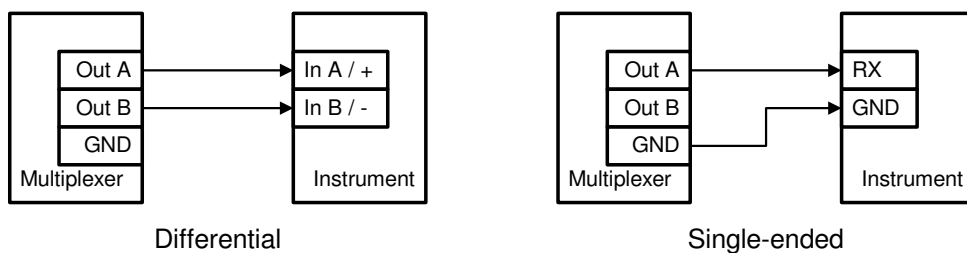
Some instruments have single ended talker ports, with only one data terminal. Connect this terminal to the 'a' terminal on the MiniPlex-41, and connect the 'b' terminal on the MiniPlex-41 with the instrument ground.



## NMEA Talker Ports

Both talker ports can be connected to up to four instruments. Connect the 'a' and 'b' terminals of the talker port on the MiniPlex-41 to the 'a' and 'b' terminals of the listener port(s) on the instrument(s). Other designations used are 'Data +' and 'Data -', 'RX+' and 'RX-' or 'In +' and 'In -'.

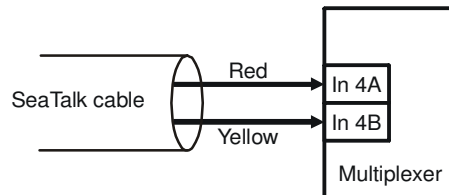
Some instruments have single ended listener ports, with only one data terminal. Connect this terminal to the 'a' terminal on the MiniPlex-41, and leave the 'b' terminal on the MiniPlex-41 unconnected. Connect the 'Com' terminal on the MiniPlex-41 with the instrument ground.



## SeaTalk

SeaTalk is a proprietary protocol developed by Raymarine®. This protocol is used for communication between Raymarine navigation instruments like the ST40, ST50 and ST60 series. To be able to use this data with commonly available navigation programs or to feed this data to other, non-Raymarine instruments, it needs to be translated to NMEA. Even Raymarine's own navigation software, Raytech Navigator, needs this translation.

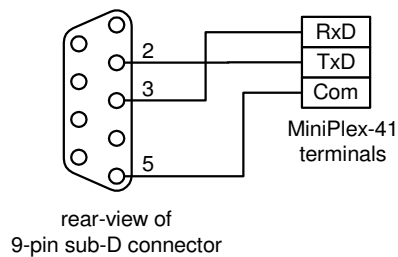
The MiniPlex-41 can be connected to the SeaTalk bus and translate all SeaTalk data required for navigation into NMEA sentences. NMEA Input 4 can be switched to SeaTalk mode and should be connected as follows:



Connecting SeaTalk

## RS-232 Computer Port

The RS-232 port on the MiniPlex-41 can be connected directly with the serial port of a computer, as shown in the diagram below.



rear-view of  
9-pin sub-D connector

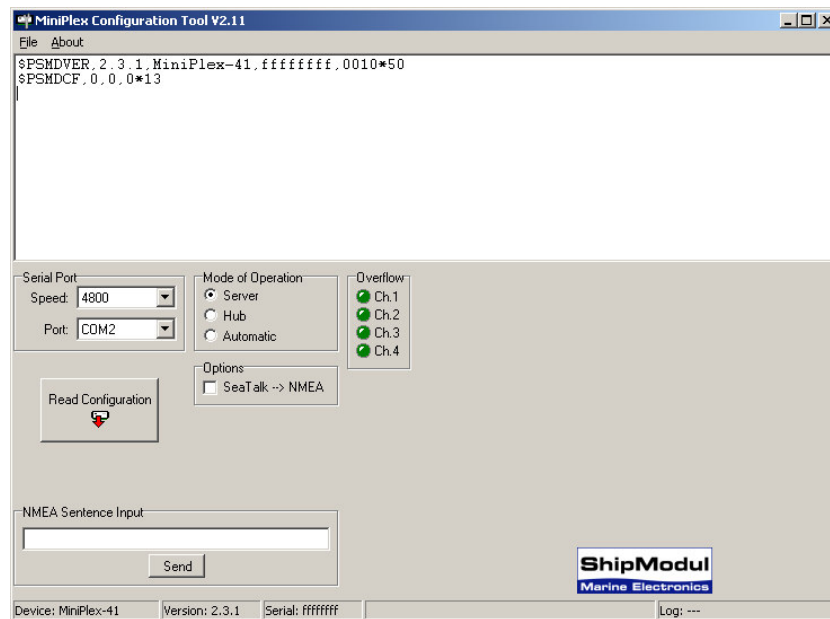
## Power Supply

The MiniPlex-41 operates from a DC supply voltage from 8 to 30V and is protected against reversed polarity. It is recommended to connect the MiniPlex-41 to the same power source or circuit breaker as the ships instruments and/or computer.

# Configuration

Various options can be configured on the MiniPlex-41, using the supplied configuration program MPX-Config. There is no installation procedure for this utility, just start it from the CD or copy it to a suitable folder on the harddisk of your computer. The top part of MPX-Config shows the NMEA sentences which are received by the multiplexer. The bottom part has the configuration controls.

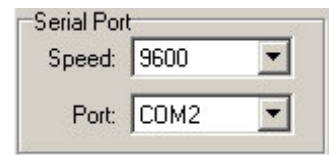
The MiniPlex-41 is configured with proprietary NMEA sentences. MPX-Config sends these sentences to the multiplexer but they can also be issued with a terminal program. See Appendix B for a complete reference of the supported proprietary sentences.



Screenshot of MPX-Config

## Serial Port

Before being able to configure the MiniPlex-41, select the COM port to which the multiplexer is connected. When selecting the baudrate, either choose 4800 (factory default) or choose 'Automatic' to let MPX-Config detect to what speed the multiplexer has been set. This may take a few seconds, especially when instruments are sending data to the multiplexer. When a 'Multiplexer does not respond' - message appears, disconnect or shut down any connected instrument. Another option is to try every possible setting from 4800 to 38400 baud, until NMEA data appears in the top window of MPX-Config. When the right baudrate has been found, the multiplexer will follow any change you make: when you set MPX-Config to 38400 baud, the multiplexer will also be set to this value, in order to keep 'synchronized' with MPX-Config. If you exit MPX-Config, the settings will be saved.



## Read Configuration

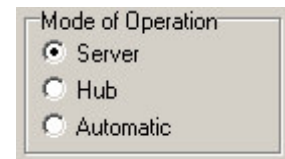
Every time you start MPX-Config, it will request the current configuration from the MiniPlex-41. When this is unsuccessful (various controls on the MPX-Config window are greyed), you can manually request the current configuration with this button.



The status line on the bottom of the MPX-Config window will show the name of the multiplexer, the internal software version and the serial number.

## Mode of Operation

The MiniPlex-41 can operate in three different modes: Server, Hub and Automatic. Basically, these modes determine which NMEA data is available on NMEA Out2.

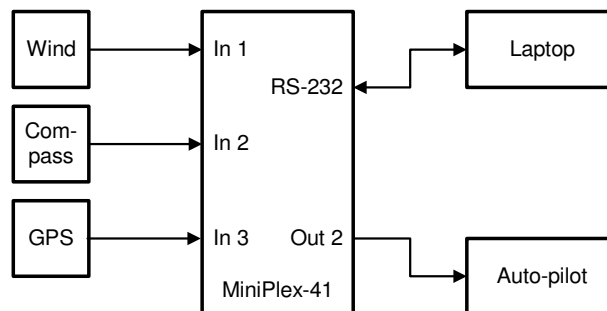


**Server mode:** In this mode, the combination of computer and multiplexer acts as an NMEA server. Incoming NMEA data from NMEA In1 to In4 is sent to the computer on the RS-232 port. Only NMEA data from the computer is available on NMEA Out2.

**Hub mode:** In Hub mode, the multiplexer acts as a hub where all NMEA data comes together and is sent out again. All incoming NMEA data, from NMEA In1 to In4 and the computer, is available on NMEA Out2. This mode has one limitation: since the NMEA data is sent to the RS-232 port *and* NMEA Out2, the total throughput is limited by the speed of NMEA Out2, which is fixed to 4800 baud. Even when the RS-232 port is set to 38400 baud, the throughput will be 480 characters per second, the same as on NMEA Out2.

**Auto mode:** When Auto mode is selected, the multiplexer automatically switches between Hub- and Server mode, depending on the presence of computer generated data. When the computer sends NMEA data to the multiplexer (on the RS-232 interface), the multiplexer is in Server mode. When no data is received on the RS-232 interface, the multiplexer will switch to Hub mode after a time out of 10 seconds.

Auto mode is very useful when sailing alternately with our without a laptop. Consider a typical setup as shown below:



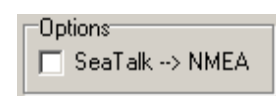
When the laptop is connected, it will receive all information from the instruments and the running navigation software is able to calculate the course to steer and drive the autopilot accordingly. Because the laptop is sending NMEA data, the multiplexer is in server mode and the autopilot will therefore receive information from the laptop only.

When the laptop is not connected, the multiplexer switches to in hub mode and sends all data from the instruments directly to the autopilot. This way, the autopilot will receive course information directly from the GPS.

NMEA Out1 is not affected by the mode setting. On this output, only NMEA data from the NMEA inputs is available. Since this output is connected in parallel with the RS-232 port, it will operate at the same speed as the RS-232 port. When the RS-232 port is set to 38400 baud, NMEA Out1 will also run at 38400 baud.

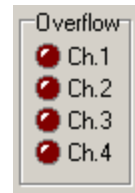
## SeaTalk --> NMEA

To enable translation of SeaTalk into NMEA, check this option. Incoming SeaTalk data from Raymarine instruments like the ST40, ST50 or ST60 series is translated into NMEA sentences which can be used by other instruments or navigation software. Even Raymarine's own Raytech Navigator software works with NMEA only and needs some form of translation from SeaTalk into NMEA. Appendix C lists the SeaTalk data that is translated into NMEA.



## Overflow

The overflow indicators on the MPX-Config screen indicate which channel is causing the overflow. Running the multiplexer at a serial port speed of 19200 baud or higher will never result in overflow or long delays.



## Manual NMEA input

MPX-Config allows manual entry of NMEA sentences for testing, configuration etc.

Type the desired NMEA sentence in the edit box as shown on the right and press the Send button or the enter key. Do not precede the NMEA sentence with a '\$' as MPX-Config will do this for you. The input is case sensitive, so whatever you type will be sent literally to the



multiplexer. Since all NMEA commands are uppercase, you have to enter them as uppercase.

## Indicators

The MiniPlex-41 has two LED's. The green LED indicates the reception of valid NMEA data on the listener ports or the RS-232 port. The LED only blinks on valid NMEA sentences that start with a '\$' or '!' and end with a LF character, thus indicating a proper connection and polarity of the connected instrument. In case of a reverse polarity, the green LED will not blink.

The red LED indicates a buffer overflow, in case more data is coming in than can be transmitted. When a buffer is full, a partially received sentence will be discarded, to ensure that the MiniPlex-41 only passes complete and valid sentences.

There are three ways to resolve this overflow situation:

1. Configure the instruments on the listener ports to send less data or with greater intervals. It is often possible to disable non-relevant sentences.
2. Increase the speed of the talker port and the RS-232 port on the MiniPlex-41. The maximum speed is 38400 Baud. From 19200 Baud and up (4 x 4800!) an overflow will never occur (except when in Hub Mode).

Both LED's will blink once when the power is applied to the MiniPlex-41. When the red LED stays lit, a hardware error is found during execution of the self-test.

When SeaTalk translation is selected, the red LED will also blink when a data collision occurs on the SeaTalk bus or when the SeaTalk bus is not connected properly. An occasional blink during operation is normal; collisions do occur on the SeaTalk bus. However when constantly lit, there could be a short circuit on the SeaTalk bus or it could be miswired.

## Mounting

The MiniPlex-41 is not waterproof. It should be mounted at a dry place, like behind the instrument panel, on a flat surface.

## **Appendix A:**

### **MPX-Config Registry keys**

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The serial port settings of MPX-Config are stored in the Windows registry, using the following keys:

```
HKEY_CURRENT_USER\Software\CustomWare\MPXConfig\BaudRate  
HKEY_CURRENT_USER\Software\CustomWare\MPXConfig\SerialPort
```

## Appendix B:

### MiniPlex-41 Proprietary NMEA commands

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The MiniPlex-41 multiplexer supports some NMEA commands through proprietary NMEA sentences. It also generates certain proprietary NMEA sentences in some modes of operation or as a response to NMEA commands.

All commands have the following format:

\$PSMDxx

\$P: Start of a proprietary command. Dicateded by the NMEA standard.  
SMD: ShipModul manufacturer's mnemonic.  
xx: Two- or three character command code.

For ease of manual configuration, the commands issued to the multiplexer do not require a checksum. Sentences output by the multiplexer always contain a checksum, denoted with \*hh in the descriptions below.

#### Command reference

##### VER – Get Version

Retrieves version information from the multiplexer. The multiplexer responds with the following version sentence:

\$PSMDVER,2.3.1,MiniPlex-41,10025943,0010\*hh<CR><LF>

2.3.1: software version number  
MiniPlex-41: product descriptor  
10025943: serial number  
0010: Multiplexer capabilities. This is a 4 digit, 16-bit field represented as a hexadecimal number. Each bit identifies a capability of the multiplexer. The following bits are defined:  
2-0: Interface type, 0 = serial, 1 = USB, 2 = Bluetooth  
3: -42 model  
4: Seataalk -> NMEA conversion

hh: checksum

##### CF – Configuration

This sentence sets the configuration of the multiplexer. The same sentence is sent by the multiplexer in response to a CFQ sentence.

Command: \$PSMDCF,b,m,s[\*hh]<CR><LF> (-41 models)  
\$PSMDCF,b,m,s,p,n,i,rrrr,h[\*hh]<CR><LF> (-42 models)

b: baudrate selector: 0 = 4800 baud  
1 = 9600 baud  
2 = 19200 baud  
3 = 38400 baud

m: mode selector: 0 = Server mode  
1 = Hub mode  
2 = Auto mode

s: Seataalk translation: 0 = off  
1 = on

- 2 = dump all unknown Seataalk datagrams (PSMDST,xx,xx,...)
- 3 = dump all Seataalk datagrams

hh: optional checksum

When sending this command to the multiplexer, it is not necessary to specify every field when only one configuration parameter has to be changed. Fields preceding the one to be changed can be left blank. Fields after the one to be changed may be omitted. When for example only the mode must be changed, the command "\$PSMDCF,,1" may be sent. The fields 'b' is left blank while the fields for 's' is omitted.

The 's' field will always return a 0 or 1 in response to a CFQ command.

### **CFQ – Request current configuration**

This sentence requests the current configuration settings from the multiplexer.

\$PSMDCFQ<CR><LF>

The multiplexer responds with a CF sentence.

### **OV – Overflow**

In case of a buffer overflow (blinking red LED on the multiplexer), an overflow sentence is output, to indicate on which input buffer the overflow occurred. To conserve bandwidth, this sentence has no checksum.

\$PSMDOV,x<CR><LF>

x: Binary field. The first four bits indicate on which input buffer the overflow occurred.

## Appendix C

### Translated Seatalk datagrams

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When the Seatalk translation is enabled, the following datagrams are translated into NMEA sentences:

SeaTalk	NMEA	Description
00	DBT	Depth below transducer
10	MWV	Wind angle, (10 and 11 combined)
11	MWV	Wind speed, (10 and 11 combined)
20	VHW	Speed through water
21	VLW	Trip mileage (21 and 22 combined)
22	VLW	Total mileage (21 and 22 combined)
23	MTW	Water temperature
25	VLW	Total and Trip mileage
26	VHW	Speed through water
27	MTW	Water temperature
50	---	Latitude, value stored
51	---	Longitude, value stored
52	---	Speed over ground, value stored
53	RMC	Course over ground. RMC sentence is generated from stored values from 5x datagrams.
54	---	GMT time, value stored
56	---	Date, value stored
58	---	Lat/Long, values stored
89	HDG	Magnetic heading, including variation (99)
99	---	Magnetic variation, value stored

As appears from the table, not all datagrams result in an NMEA sentence. Some datagrams are only used to retrieve a certain value to be combined into one NMEA sentence.

When the Seatalk translation is enabled with with option 2 (the 's' parameter in the CF sentence is 2), unlisted datagrams are translated into a proprietary NMEA sentence with the following format:

```
$PSMDST,aa,bb,cc,dd...*hh<CR><LF>
```

aa,bb,cc,dd... represent the hexadecimal value of the bytes from the received Seatalk datagram.

## Declaration of Conformity

We,

CustomWare  
Roggehullen 8  
9403 WG Assen  
The Netherlands  
Tel.: +31 592 375700  
Fax: +31 592 375550

Declare under our sole responsibility that the product

ShipModul MiniPlex-41

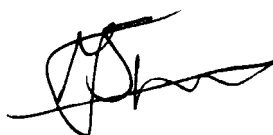
to which this declaration relates is in conformity with the following specifications:

EN/IEC61000-6-1:1997 and EN/IEC61000-6-3:1996  
FCC Title 47 CFR, Part 15 Class B

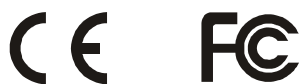
The product herewith complies with the requirements of the EMC Directive 89/336/EEC and carries the CE-marking accordingly.

Assen, 13-12-2005

M. Sprang



This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:  
(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



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