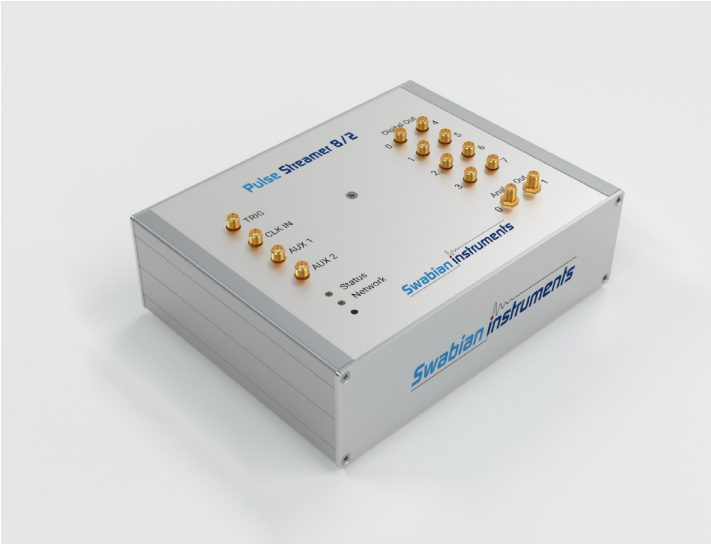
Swabian instruments



PULSE STREAMER 8/2

Synchronous digital pattern generator and arbitrary waveform generator

The Pulse Streamer 8/2 is a synchronous digital pattern and arbitrary waveform generator with 8 digital and 2 analog output channels. Its versatile user interface allows you to define complex pulse sequences and arbitrary waveforms efficiently.

1 GSa/s	125 MSa/s	1 M pulses
digital sampling rate	analog sampling rate	pattern memory

Implement your ideas within minutes

An intuitive encoding lets you design digital patterns and analog waveforms of any complexity within minutes. Instead of just sample points, it allows you to define segments.

Be synchronous to start with

The Pulse Streamer's digital and analog outputs are always synchronous. Skip all efforts with synchronization across distinct hardware. Instead, output precisely timed synchronous digital and analog signals right away.

Stick to your favorite programming language

Control your experiment in your preferred programming language with our included native software libraries covering Python, Matlab, and LabVIEW.

Set your Pulse Streamer anywhere in your lab

You talk to your Pulse Streamer via Ethernet.
Set it anywhere in your lab and use it from anywhere.

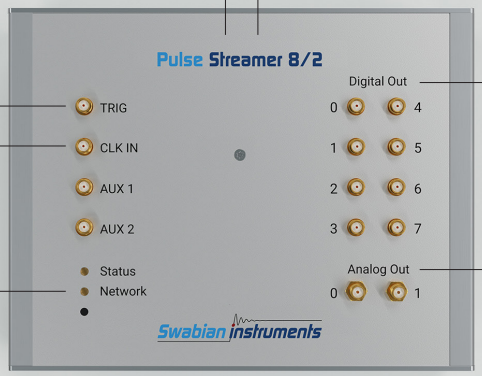
Segments instead of sample points
Work with segments instead of sample points to describe complex digital patterns intuitively and efficiently.

512 MB internal memory and 3 repetition modes
Define digital patterns with up to 1 million segments and play them once, N times, or with indefinite repetition.

Low-latency trigger input
Start pulse sequences with a low latency external trigger.

Reference or sampling clock input
Synchronize your output signals to external hardware.

1 Gbit/s network
Upload and run your patterns and waveforms within milliseconds.



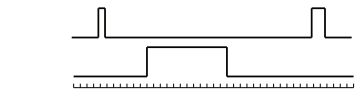
8 digital outputs
Generate complex digital patterns with 1 ns timing resolution.

2 analog outputs
Generate arbitrary waveforms with 14 bit vertical resolution and 8 ns timing resolution.

Intuitive digital pattern design

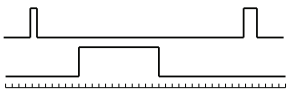
Traditional pattern generators expect the output data on each channel as a series of sample points – one point for each tick of the sample clock.

The output is specified individually for each channel and the sample length can be chosen only within specific constraints. This makes traditional digital pattern generators inflexible and hard to program.



ch1 data = 0000010000000000000000000000000000000000110000
ch2 data = 0000000000011111111111100000000000000000000

traditional pattern generator



[(4, none), (1, ch1), (6, none), (12, ch2), (13, none), (2, ch1), (4, none)]

encoding with the Pulse Streamer 8/2

The Pulse Streamer 8/2 takes digital pattern design to the next level. Instead of using sample points, you describe your digital pattern as a series of segments. Each segment encodes a duration and the levels on one or more channels.

This encoding enables you to represent your digital patterns in a clean and readable way. No huge arrays with 0's and 1's anymore, no data blocks, no constraints. Just freedom of design. On top of that, this encoding is also memory efficient, ensuring fast upload of your data to the device.

Orchestrate your experiment

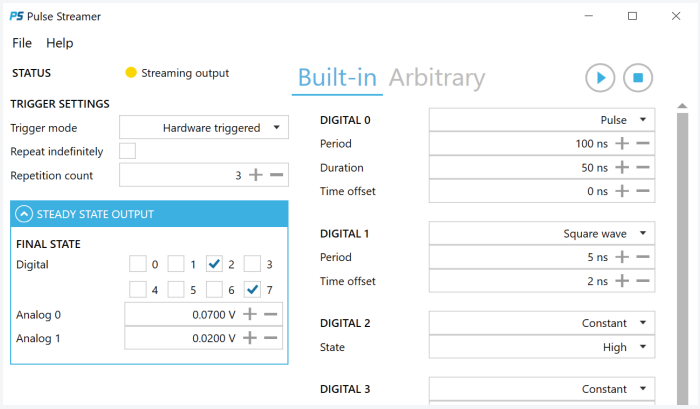
Pulse Streamer 8/2 is the ultimate tool to solve your experiment control challenges. Its intuitive encoding lets you generate accurately timed high resolution digital patterns and analog waveforms within minutes.

It is the preferred choice for demanding scientific applications across disciplines ranging from pulsed EPR and NMR, solid state defects and quantum dots to ultracold atoms and ions research.

Learn more about the Pulse Streamer's versatile programming interface on our website.

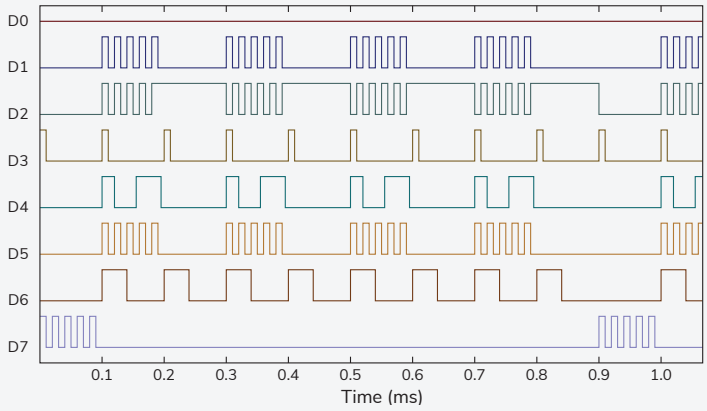
www.swabianinstruments.com

Get started immediately with the Pulse Streamer Application



The Pulse Streamer Application provides fast and easy control over basic digital and analog output signals without any programming.

Matlab client interface



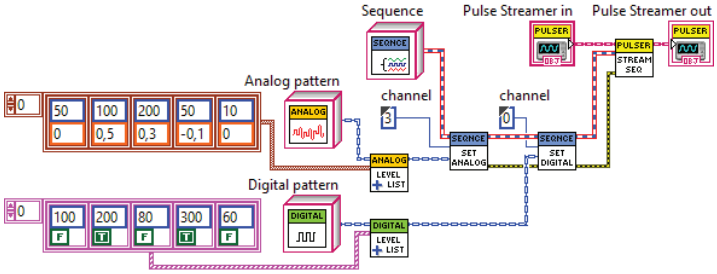
Install the *Pulse Streamer Toolbox* and program your pulse sequences natively. Visualizing your pattern helps you verify your intended design.

Benefit from the native Python libraries

```
# connect to the Pulse Streamer over network
ps = PulseStreamer(ip=192.168.1.100)

# create a sequence-object
sequence = ps.createSequence()

# set digital output patterns individually for two channels
sequence.setDigital(1, pattern=[(100,0), (400,1), (400,0), (200,1)])
sequence.setDigital(2, pattern=[(10,1), (10,0), (50,1), (50,0)])

# run the sequence with indefinite repetition
ps.stream(sequence, -1)
```

This example uses the Pulse Streamer to run digital patterns on two channels with the native *Python libraries*.

Get the LabVIEW package



Get the latest Pulse Streamer VIs from the *VI Package Manager* and design digital and analog patterns within minutes.

Specifications

Digital output

output channels	8 x SMA
sampling rate	1 GSa/s
voltage levels (into 50 Ω)	0 and 2.6 V
rise and fall time (20%-80%)	< 300 ps
minimum pulse width [1]	2 ns
RMS jitter	< 50 ps

Analog output

output channels	2 x SMA
sampling rate	125 MSa/s
voltage range	– 1.0 to 1.0 V
bandwidth (-3 dB)	50 MHz
resolution	14 bit
offset error	< 2 mV
gain error	< 1%
rise and fall time (20%-80%)	< 7 ns
step response overshoot (typ.)	25 %
output settling time (1%)	< 100 ns

[1] a nominal 1 ns pulse with rising edge first will output an approx. 1 ns wide pulse; a nominal 1 ns wide pulse with falling edge first will output no pulse (see typical pulse response figures below)

[2] a trigger-to-data jitter below 100 ps can be achieved with an external sampling clock and a synchronous trigger (see *Documentation* for details)

Pattern generation

max. pattern length	1 M pulses
repeat modes	1, N, infinite
trigger modes	external, internal

Trigger input

max. voltage range (no damage)	– 0.3 to 5.3 V
voltage range	0 to 5 V
trigger level	0.5 V
minimum pulse width	5 ns
trigger-to-data delay (typ.)	65 ns
trigger-to-data jitter [2]	±4 ns

External clock input

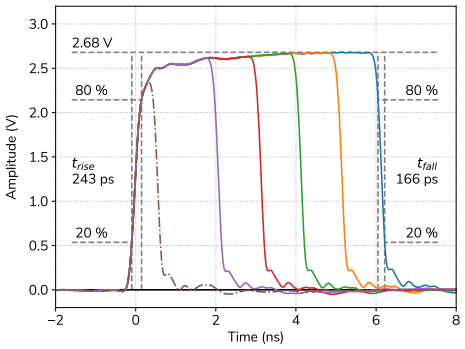
coupling	AC
amplitude	0.2 to 5 Vpp
frequency	10 MHz ref. clock or 125 MHz sample clock

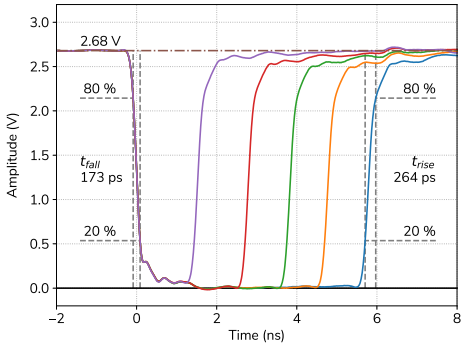
General parameters

data interface	Ethernet (1 Gbit/s)
size (L x W x H) in mm	185 x 145 x 65

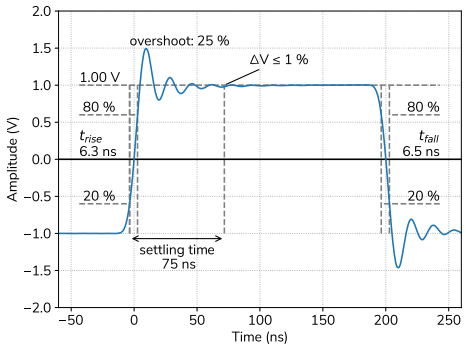
Specification values are given for hardware version 3.1, the values for older hardware may differ.

Typical pulse response (digital output)

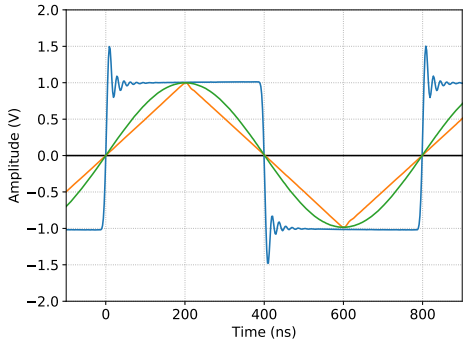




Typical pulse response (analog output)



Waveform examples (analog output)



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