DN6.22x - 24 channel 8 bit digitizerNETBOX up to 5 GS/s

- 12, 16, 20 or 24 channels with 1.25 GS/s up to 5 GS/s
- Full signal bandwidth up to 1.5 GHz
- Simultaneously sampling on all channels
- Separate ADC and amplifier per channel
- Complete on-board calibration
- 4 input ranges: ±200 mV up to ±2.5 V
- Low voltage input option: ±40 mV up to ±500 mV
- Programmable input offset of ±200%
- 12, 16, 20 or 24 GSample standard acquisition memory
- Window, re-arm, hysteresis, OR/AND trigger
- Features: Single-Shot, Streaming, ABA mode, Multiple Recording, Gated Sampling, Timestamps

FPGA Options:
- Block Average up to 128k
- Block Statistics/Peak Detect

- Ethernet Remote Instrument
- LXI Core 2011 compatible
- GBit Ethernet Interface
- Sustained streaming mode up to 100 MB/s

Operating Systems
- Windows 7 (SP1), 8, 10, Server 2008 R2 and newer
- Linux Kernel 2.6, 3.x, 4.x, 5.x
- Windows/Linux 32 and 64 bit

Sbench 6 Professional Included
- Acquisition, Generation and Display of analog and digital data
- Calculation, FFT
- Documentation and Import, Export

Drivers
- LabVIEW, MATLAB, LabWindows/CVI
- C/C++, GNU C++, VB.NET, C#, J#, Delphi, Java, Python
- NI

General Information
The digitizerNETBOX DN6.22x series allows recording of up to 24 channels with sampling rates of up to 5 GS/s and a bandwidth of up to 1.5 GHz. These Ethernet Remote instruments offer outstanding A/D features both in bandwidth and signal quality. The combination of high sampling rate and resolution makes these digitizers the top-of-the-range for applications that require high speed signal acquisition. The digitizerNETBOX can be installed anywhere in the company LAN and can be remotely controlled from a host PC.
Software Support

Windows Support
The digitizerNETBOX/generatorNETBOX can be accessed from Windows 7, Windows 8, Windows 10 (each 32 bit and 64 bit). Programming examples for Visual C++, C++ Builder, LabWindows/CVI, Delphi, Visual Basic, VB.NET, C#, J#, Python, Java and IVI are included.

Linux Support
The digitizerNETBOX/generatorNETBOX can be accessed from any Linux system. The Linux support includes SMP systems, 32 bit and 64 bit systems, versatile programming examples for Gnu C++, Python as well as drivers for MATLAB for Linux. SBench 6, the powerful data acquisition and analysis software from Spectrum is also included as a Linux version.

Discovery Protocol
The Discovery function helps you to find and identify any Spectrum LXI instruments, like the digitizerNETBOX and generatorNETBOX, available to your computer on the network. The Discovery function will also locate any Spectrum card products that are managed by an installed Spectrum Remote Server somewhere on the network.

After running the discovery function the card information is cached and can be directly accessed by SBench 6. Furthermore the qualified VISA address is returned and can be used by any software to access the remote instrument.

SBench 6 Professional
The digitizerNETBOX and generatorNETBOX can be used with Spectrum’s powerful software SBench 6 – a Professional license for the software is already installed in the box. SBench 6 supports all of the standard features of the instrument. It has a variety of display windows as well as analysis, export and documentation functions.

- Available for Windows XP, Vista, Windows 7, Windows 8, Windows 10 and Linux
- Easy to use interface with drag and drop, docking windows and context menus
- Display of analog and digital data, X-Y display, frequency domain and spread signals
- Designed to handle several GBytes of data
- Fast data preview functions

IVI Driver
The IVI standards define an open driver architecture, a set of instrument classes, and shared software components. Together these provide critical elements needed for instrument interchangeability. IVI’s defined Application Programming Interfaces (APIs) standardize communication and reduce the time needed to learn a new IVI instrument.

The Spectrum products to be accessed with the IVI driver can be locally installed data acquisition cards, remotely installed data acquisition cards or remote LXI instruments like digitizerNETBOX/generatorNETBOX. To maximize the compatibility with existing IVI based software installations, the Spectrum IVI driver supports IVI Scope, IVI Digitizer and IVI FGen class with IVI-C and IVI-COM interfaces.

Third-party Software Products
Most popular third-party software products, such as LabVIEW, MATLAB or LabWindows/CVI are supported. All drivers come with examples and detailed documentation.

Embedded Webservice
The integrated webservice follows the LXI standard and gathers information on the product, set up of the Ethernet configuration and current status. It also allows the setting of a configuration password, access to documentation and updating of the complete instrument firmware, including the embedded remote server and the webservice.

Hardware features and options

LXI Instrument
The digitizerNETBOX and generatorNETBOX are fully LXI instrument compatible to LXI Core 2011 following the LXI Device Specification 2011 rev. 1.4. The digitizerNETBOX/generatorNETBOX has been tested and approved by the LXI Consortium.

Located on the front panel is the main on/off switch, LEDs showing the LXI and Acquisition status and the LAN reset switch.

Front Panel
Standard SMA connectors are used for all analog input signals and all trigger and clock signals. No special adapter cables are needed and the connection is secure even when used in a moving environment.

Custom front panels are available on request even for small series, be it BNC, LEMO connectors or custom specific connectors.

Ethernet Connectivity
The GBit Ethernet connection can be used with standard COTS Ethernet cabling. The integration into a standard LAN allows to connect the digitizerNETBOX/generatorNETBOX either directly to a desktop PC or laptop or it is possible to place the instrument somewhere in the company LAN and access it from any desktop over the LAN.
Boot on Power on Option
The digitizerNETBOX/generatorNETBOX can be factory configured to automatically start and boot upon availability of the input power rail. That way the instrument will automatically become available again upon loss of input power.

Input Amplifier
The analog inputs can be adapted to real world signals using a wide variety of settings that are individual for each channel. By using software commands one can select a matching input range and the signal offset can be compensated by programmable AC coupling or offset shifting.

Software selectable lowpass filter
Each analog channel contains a software selectable low-pass filter to limit the input bandwidth. Reducing the analog input bandwidth results in a lower total noise and can be useful especially with low voltage input signals.

Automatic on-board calibration
Every channel of each card is calibrated in the factory before the board is shipped. However, to compensate for environmental variations like PC power supply, temperature and aging the software driver includes routines for automatic offset and gain calibration. This calibration is performed on all input ranges of the "Buffered" path and uses a high precision onboard calibration reference.

Digital inputs
This option acquires additional synchronous digital channels phase-stable with the analog data. As default a maximum of 3 additional digital inputs are available on the front plate of the card using the multi-purpose I/O lines. An additional option offers 16 more digital channels.

Ring buffer mode
The ring buffer mode is the standard mode of all oscilloscope instruments. Digitized data is continuously written into a ring memory until a trigger event is detected. After the trigger, post-trigger samples are recorded and pre-trigger samples can also be stored. The number of pre-trigger samples available simply equals the total ring memory size minus the number of post trigger samples.

FIFO mode
The FIFO mode is designed for continuous data transfer between remote instrument and PC memory or hard disk. The control of the data stream is done automatically by the driver on interrupt request. The complete installed on-board memory is used for buffer data, making the continuous streaming extremely reliable.

Channel trigger
The data acquisition instruments offer a wide variety of trigger modes. Besides the standard signal checking for level and edge as known from oscilloscopes it's also possible to define a window trigger. All trigger modes can be combined with the pulselength trigger. This makes it possible to trigger on signal errors like too long or too short pulses. In addition to this a re-arming mode (for accurate trigger recognition on noisy signals) the AND/OR conjunction of different trigger events is possible. As a unique feature it is possible to use deactivated channels as trigger sources.

External trigger input
All boards can be triggered using up to two external analog or digital signals. One external trigger input has two analog comparators that can define an edge or window trigger, a hysteresis trigger or a rearm trigger. The other input has one comparator that can define an edge or window trigger, a hysteresis trigger or a rearm trigger. The other input has one comparator that can be used for standard edge and level triggers.

Multiple Recording
The Multiple Recording mode allows the recording of several trigger events with an extremely short re-arming time. The hardware doesn't need to be restarted in between. The on-board memory is divided in several segments of the same size. Each of them is filled with data if a trigger event occurs. Pre- and post trigger of the segments can be programmed. The number of acquired segments is only limited by the used memory and is unlimited when using FIFO mode.

Gated Sampling
The Gated Sampling mode allows data recording controlled by an external gate signal. Data is only recorded if the gate signal has a programmed level. In addition a pre-area before start of the gate signal as well as a post area after end of the gate signal can be acquired. The number of gate segments is only limited by the used memory and is unlimited when using FIFO mode.

Timestamp
The timestamp function writes the time positions of the trigger events in an extra memory. The timestamps are relative to the start of recording, a defined zero time, externally synchronized to a radio clock, an IRIG-B a GPS receiver. Using the external synchronization gives a precise time relation for acquisitions of systems on different locations.

ABA mode
The ABA mode combines slow continuous data recording with fast acquisition on trigger events. The ABA mode works like a slow data logger combined with a fast digitizer. The exact position of the trigger events is stored as timestamps in an extra memory.

Firmware Option Block Average
The Block Average Module improves the fidelity of noisy repetitive signals. Multiple repetitive acquisitions with very small dead-time are accumulated and averaged. Random noise is reduced by the averaging process improving the visibility of the repetitive signal. The complete averaging process is done inside the FPGA of the digitizer generating no CPU load at all. The amount of data is greatly decreased as well as the needed transfer bandwidth is heavily reduced.

Please see separate data sheet for details on the firmware option.
**Firmware Option Block Statistics (Peak Detect)**

The Block Statistics and Peak Detect Module implements a widely used data analysis and reduction technology in hardware. Each block is scanned for minimum and maximum peak and a summary including minimum, maximum, average, timestamps and position information is stored in memory. The complete averaging process is done inside the FPGA of the digitizer generating no CPU load at all. The amount of data is greatly decreased as well as the needed transfer bandwidth is heavily reduced.

Please see separate data sheet for details on the firmware option.

**Option Embedded Server**

The option turns the digitizerNETBOX/generatorNETBOX in a powerful PC that allows to run own programs on a small and remote data acquisition system. The digitizerNETBOX/generatorNETBOX is enhanced by more memory, a powerful CPU, a freely accessible internal SSD and a remote software development access method.

The digitizerNETBOX/generatorNETBOX can either run connected to LAN or it can run totally independent, storing data to the internal SSD. The original digitizerNETBOX/generatorNETBOX remote instrument functionality is still 100% available. Running the embedded server option it is possible to pre-calculate results based on the acquired data, store acquisitions locally and to transfer just the required data or results parts in a client-server based software structure. A different example for the digitizerNETBOX/generatorNETBOX embedded server is surveillance/logger application which can run totally independent for days and send notification emails only over LAN or offloads stored data as soon as it’s connected again.

Access to the embedded server is done through a standard text based Linux shell based on the ssh secure shell.

**External clock input and output**

Using a dedicated connector a sampling clock can be fed in from an external system. Additionally it’s also possible to output the internally used sampling clock on a separate connector to synchronize external equipment to this clock.

**Reference clock**

The option to use a precise external reference clock (normally 10 MHz) is necessary to synchronize the instrument for high-quality measurements with external equipment (like a signal source). It’s also possible to enhance the quality of the sampling clock in this way. The driver automatically generates the requested sampling clock from the fed in reference clock.
DN2 / DN6 Technical Data

Analog Inputs

- **Trigger**
  - Resolution: 8 Bit
  - Input Type: Single-ended
  - ADC Differential non linearity (DNL): ±0.35 LSB
  - ADC Integral non linearity (INL): ±0.9 LSB
  - ADC Bit Error Rate (BER): sampling rate 1.25 GS/s 10^-16
  - Channel selection: software programmable
  - Analog Input impedance: fixed 50 Ω
  - Input Ranges (standard ranges): ±200 mV, ±500 mV, ±1 V, ±2.5 V (programmable input offset at 0%)
  - Input Ranges (Low Voltage Option): ±40 mV, ±100 mV, ±200 mV, ±500 mV (programmable input offset at 0%)
  - Programmable Input Offset: software programmable ±200% of input range (allowing bi-polar ranges to become uni-polar)
  - Input Coupling: software programmable AC/DC
  - Max DC voltage if AC coupling active: ±30 V
  - Offset error (full speed): after warm-up and calibration < 0.5 LSB
  - Gain error (full speed): after warm-up and calibration < 2.0 LSB
  - Crosstalk 20 MHz sine signal (standard ranges) ≥ ±500 mV standard range < -96 dB (all channel same input range)
  - Crosstalk 20 MHz sine signal (standard ranges) = ±200 mV standard range < -88 dB (all channel same input range)
  - Crosstalk 100 MHz sine signal (standard ranges) ≥ ±500 mV standard range < -78 dB (all channel same input range)
  - Crosstalk 100 MHz sine signal (standard ranges) = ±200 mV standard range < -65 dB (all channel same input range)
  - Over voltage protection (standard ranges) input range ±200 mV ±500 mV ±1 V ±2.5 V
    - max. continuous input power 22.5 dBm 27.0 dBm 27.0 dBm 27.0 dBm
    - max. peak input voltage ±3 V ±7.5 V ±15 V ±30 V
  - Over voltage protection (low voltage option) input range ±40 mV ±100 mV ±200 mV ±500 mV
    - max. continuous input power 21.0 dBm 27.0 dBm 22.5 dBm 27.0 dBm
    - max. peak input voltage ±2.5 V ±6.25 V ±3 V ±7.5 V

- **Trigger**
  - Available trigger modes: software programmable
  - Channel trigger level resolution: software programmable 14 bit
  - Trigger engines: 1 engine per channel with two individual levels, 2 external triggers
  - Trigger edge: software programmable Rising edge, falling edge or both edges
  - Trigger delay: software programmable
    - Multi, ABA, Gate: re-arming time 1.25 GS/s or below: 80 samples (= programmed pretrigger)
    - 2.5 GS/s: 160 samples (= programmed pretrigger)
    - 5 GS/s: 320 samples (= programmed pretrigger)
  - Pretrigger at Multi, ABA, Gate, FIFO: software programmable 32 up to 8192 Samples in steps of 32
  - Posttrigger: software programmable 32 up to 160 samples in steps of 32 (defining pretrigger in standard scope mode)
  - Memory depth: software programmable 64 up to [installed memory / number of active channels] samples in steps of 32
  - Multiple Recording/ABA segment size: software programmable 64 up to [installed memory / 2 / active channels] samples in steps of 32
  - Trigger accuracy: software programmable 1.25 GS/s or below: 80 samples (= programmed pretrigger)
    - 2.5 GS/s: 160 samples (= programmed pretrigger)
    - 5 GS/s: 320 samples (= programmed pretrigger)
  - Timestamp modes: software programmable
    - Standard, Startreset, external reference clock on X0 (e.g. PPS from GPS, IRIG-B)
  - Data format
    - Std., Startreset: 64 bit counter, increments with sample clock (reset manually or on start)
    - RefClock: 24 bit upper counter (increment with RefClock)
    - 40 bit lower counter (increments with sample clock, reset with RefClock)
  - Extra data: software programmable none, acquisition of X0/X1/X2 inputs at trigger time, trigger source (for OR trigger)
  - Size per stamp: 128 bit = 16 bytes

- **External trigger**
  - External trigger impedance: software programmable 50 Ω / 1 kΩ
  - External trigger coupling: software programmable AC or DC
  - External trigger type: software programmable Window comparator
  - External input level: ±10 V (1 kΩ), ±2.5 V (50 Ω), ±10 V
  - External trigger sensitivity: 2.5% of full scale range
  - (minimum required signal swing)
  - External trigger level: software programmable ±10 V in steps of 1 mV
  - External trigger maximum voltage: ±30 V
  - External trigger bandwidth DC: 50 Ω DC to 200 MHz
  - External trigger bandwidth AC: 1 kΩ DC to 150 MHz, 50 Ω 20 kHz to 200 MHz
  - Minimum external trigger pulse width: ≥ 2 samples
**Clock**

Clock Modes: software programmable
- Internal PLL, external reference clock, Star-Hub sync (M4i only), PXI Reference Clock (M4x only)

Internal clock accuracy: ≤ ±20 ppm

Clock setup granularity: divider: maximum sampling rate divided by: 1, 2, 4, 8, 16, ... up to 262144

External reference clock range: ≥ 10 MHz and ≤ 1.25 GHz

External reference clock input impedance: 50 Ω fixed

External reference clock input coupling: AC coupling

External reference clock input edge: Rising edge

External reference clock input type: Single-ended, sine wave or square wave

External reference clock input swing: 0.3 V peak-to-peak up to 3.0 V peak-to-peak

External reference clock input max DC voltage: ±30 V (with max 3.0 V difference between low and high level)

External reference clock input duty cycle requirement: 45% to 55%

Clock setup granularity when using reference clock: divider: maximum sampling rate divided by: 1, 2, 4, 8, 16, ... up to 262144

Internal reference clock output type: Single-ended, 3.3V LVPECL

Internal reference clock output frequency: 2.5 GHz / 64 = 39.0625 MHz

Star-Hub synchronization clock modes: software selectable
- Internal clock (standard clock mode only), External reference clock

ABA mode clock divider for slow clock: software programmable
- 16 up to (128k - 16) in steps of 16

Channel to channel skew on one card: < 60 ps (typical)

Skew between star hub synchronized cards: < 130 ps (typical, preliminary)

<table>
<thead>
<tr>
<th>ADC Resolution</th>
<th>M4i 223x</th>
<th>DN2 223-xx</th>
<th>M4i 222x</th>
<th>DN2 222-xx</th>
<th>M4i 221x</th>
<th>DN2 221-xx</th>
<th>DN6 225-xx</th>
</tr>
</thead>
<tbody>
<tr>
<td>max sampling clock</td>
<td>5 GS/s</td>
<td>2.5 GS/s</td>
<td>1.25 GS/s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>min sampling clock</td>
<td>4.768 kS/s</td>
<td>4.768 kS/s</td>
<td>4.768 kS/s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lower bandwidth limit (DC coupling)</td>
<td>0 Hz</td>
<td>0 Hz</td>
<td>0 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lower bandwidth limit (AC coupling)</td>
<td>&lt; 30 kHz</td>
<td>&lt; 30 kHz</td>
<td>&lt; 30 kHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-3 dB bandwidth (no filter active), Standard input ranges</td>
<td>1.5 GHz</td>
<td>1.5 GHz</td>
<td>500 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-3 dB bandwidth (no filter active), small input ranges, ir40m option installed</td>
<td>1.2 GHz</td>
<td>1.2 GHz</td>
<td>500 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-3 dB bandwidth (BW filter active)</td>
<td>~400 MHz</td>
<td>~400 MHz</td>
<td>~370 MHz</td>
<td></td>
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</tr>
</tbody>
</table>

Firmware ≥ V1.14 (since August 2015)
- 32 bit mode only

Firmware < V1.14
- 32 bit mode only

Block Average Signal Processing Option M4i.22xx/DN2.22xx/DN6.22xx Series

Data Mode (resulting sample width): software programmable
- 32 bit mode
- 16 bit mode

Minimum Waveform Length: 64 samples

Maximum Waveform Length: 4 or more channels active
- 16 kSamples
- 32 kSamples

Maximum Number of Averages: 2

Re-Arming Time between waveforms:
- 1.25 GS/s or below: 80 samples (+ programmed pretrigger)
- 2.5 GS/s: 160 samples (+ programmed pretrigger)
- 5 GS/s: 320 samples (+ programmed pretrigger)

Re-Arming Time between end of average to start of next average: Depending on programmed segment length, max 50 µs

Re-Arming Time between waveforms:
- 1.25 GS/s or below: 80 samples (+ programmed pretrigger)
- 2.5 GS/s: 160 samples (+ programmed pretrigger)
- 5 GS/s: 320 samples (+ programmed pretrigger)

Block Statistics Signal Processing Option M4i.22xx/DN2.22xx Series/DN6.22xx Series

<table>
<thead>
<tr>
<th>Statistics Information Set per Waveform</th>
<th>Average, Minimum, Maximum, Position Minimum, Position Maximum, Trigger Timestamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-Arming Time between waveforms:</td>
<td>1.25 GS/s or below: 80 samples (+ programmed pretrigger)</td>
</tr>
<tr>
<td>Re-Arming Time between waveforms:</td>
<td>2.5 GS/s: 160 samples (+ programmed pretrigger)</td>
</tr>
<tr>
<td>Re-Arming Time between waveforms:</td>
<td>5 GS/s: 320 samples (+ programmed pretrigger)</td>
</tr>
</tbody>
</table>

Data Output Format: fixed

Statistics Information Set per Waveform: Average, Minimum, Maximum, Position Minimum, Position Maximum, Trigger Timestamp

Re-Arming Time between waveforms:
- 1.25 GS/s or below: 80 samples (+ programmed pretrigger)
- 2.5 GS/s: 160 samples (+ programmed pretrigger)
- 5 GS/s: 320 samples (+ programmed pretrigger)
Multi Purpose I/O lines (front-plate)

Number of multi purpose lines: three, named X0, X1, X2
Input: available signal types: software programmable
- Asynchronous Digital-In, Synchronous Digital-In, Timestamp Reference Clock
- Input impedance: 10 kΩ to 3.3 V
- Input: maximum voltage level: 0.5 V to +4.0 V
- Input: signal levels: 3.3 V LVTL
- Input: bandwidth: 125 MHz
Output: available signal types: software programmable
- Asynchronous Digital-Out, Trigger Output, Run, Arm, PLL Refclock, System Clock
- Output: impedance: 50 Ω
- Output: signal levels: 3.3 V LVTL
- Output: type: 3.3V LVTL, TTL compatible for high impedance loads
- Output: maximum voltage level: -0.5 V to +4.0 V
- Output: signal levels: 3.3 V LVTTL
- Output: bandwidth: 125 MHz
- Output: drive strength: Capable of driving 50 Ω loads, maximum drive strength ±48 mA
- Output: update rate: 14bit, 16 bit ADC resolution
- Sampling clock
- Output: update rate: 8 bit ADC resolution
- Current sampling clock < 1.25 GS/s: sampling clock
- Current sampling clock > 1.25 GS/s and < 2.50 GS/s: ½ sampling clock
- Current sampling clock > 2.50 GS/s and < 5.00 GS/s: ¼ sampling clock

Connectors

Analog Channels: SMA female (one for each single-ended input)
- Cable-Type: Cab-3mA-xxxx
Clock Input: SMA female
- Cable-Type: Cab-3mA-xxxx
Clock Output: SMA female
- Cable-Type: Cab-3mA-xxxx
Trg0 Input: SMA female
- Cable-Type: Cab-3mA-xxxx
Trg1 Input: SMA female
- Cable-Type: Cab-3mA-xxxx
X0/Trigger Output/Timestamp Reference Clock: programmable direction
- SMA female
- Cable-Type: Cab-3mA-xxxx
X1: programmable direction
- SMA female
- Cable-Type: Cab-3mA-xxxx
X2: programmable direction
- SMA female
- Cable-Type: Cab-3mA-xxxx

Option digitizerNETBOX/generatorNETBOX embedded server (DN2.xxx-Emb, DN6.xxx-Emb)

CPU: Intel Quad Core 2 GHz
System memory: 4 GByte RAM
System data storage: Internal 128 GByte SSD
Development access: Remote Linux command shell (ssh), no graphical interface (GUI) available
Accessible Hardware: Full access to Spectrum instruments, LAN, front panel LEDs, RAM, SSD
Integrated operating system: OpenSuse 12.2 with kernel 4.4.7
Internal PCIe connection: DN2.20, DN2.46, DN2.47, DN2.49, DN2.60 PCIe x1, Gen1
- DN2.66
- DN2.59
DN2.22, DN2.44, DN2.66 PCIe x1, Gen2
- DN6.59
- DN6.22, DN6.44, DN6.66
LAN Connection: Standard RJ45
LAN Speed: Auto Sensing: GBit Ethernet, 100BASE-T, 10BASE-T
Sustained Streaming speed: DN2 20, DN2 46, DN2 47, DN2 49, DN2 59, DN2 60 up to 70 MByte/s
- DN6 46, DN6 49
- DN6 59, DN6 66
- DN6 59, DN6 66
Used TCP/UDP Ports: Webserver: 80
- mDNS Daemon: 5353
- VISA Discovery Protocol: 111, 9757
- UPNP Daemon: 1900
- Spectrum Remote Server: 1026, 5025

Power connection details

Mains AC power supply: Input voltage: 100 to 240 VAC, 50 to 60 Hz
AC power supply connector: IEC 60320-C14 (PC standard coupler)
Power supply cord: power cord included for Schuko contact (CEE 7/7)

Certification, Compliance, Warranty

EMC Immunity: Compliant with CE Mark
EMC Emission: Compliant with CE Mark
Product warranty: 5 years starting with the day of delivery
Software and firmware updates: Lifetime, free of charge
Dynamic Parameters

<table>
<thead>
<tr>
<th>Input Path</th>
<th>Test signal frequency</th>
<th>DC or AC coupled, fixed 50 Ohm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 MHz</td>
<td>40 MHz</td>
</tr>
<tr>
<td></td>
<td>±200 mV</td>
<td>±500 mV</td>
</tr>
<tr>
<td>THD (typ)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SNR (typ)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SFDR (typ), excl. harm. (dB)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SFDR (typ), incl. harm. (dB)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SINAD/THD+N (typ) (dB)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>ENOB based on SINAD (bit)</td>
<td>bit</td>
<td>bit</td>
</tr>
<tr>
<td>ENOB based on SNR (bit)</td>
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<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SNR (typ)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SFDR (typ), excl. harm. (dB)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SFDR (typ), incl. harm. (dB)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SINAD/THD+N (typ) (dB)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>ENOB based on SINAD (bit)</td>
<td>bit</td>
<td>bit</td>
</tr>
<tr>
<td>ENOB based on SNR (bit)</td>
<td>bit</td>
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<td></td>
<td>10 MHz</td>
<td>40 MHz</td>
</tr>
<tr>
<td></td>
<td>±40 mV</td>
<td>±100 mV</td>
</tr>
<tr>
<td>THD (typ)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SNR (typ)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SFDR (typ), excl. harm. (dB)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SFDR (typ), incl. harm. (dB)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>SINAD/THD+N (typ) (dB)</td>
<td>dB</td>
<td>dB</td>
</tr>
<tr>
<td>ENOB based on SINAD (bit)</td>
<td>bit</td>
<td>bit</td>
</tr>
<tr>
<td>ENOB based on SNR (bit)</td>
<td>bit</td>
<td>bit</td>
</tr>
</tbody>
</table>

Dynamic parameters are measured at ±1 V input range (if no other range is stated) and 50Ω termination with the samplerate specified in the table. Measured parameters are averaged 20 times to get typical values. Test signal is a pure sine wave generated by a signal generator and a matching bandpass filter. Amplitude is >99% of FSR. SNR and RMS noise parameters may differ depending on the quality of the used PC. SNR = Signal to Noise Ratio, THD = Total Harmonic Distortion, SFDR = Spurious Free Dynamic Range, SINAD = Signal Noise and Distortion, ENOB = Effective Number of Bits.
### RMS Noise Level (Zero Noise)

<table>
<thead>
<tr>
<th>Input Range</th>
<th>±200 mV</th>
<th>±500 mV</th>
<th>±1</th>
<th>±2.5 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage resolution (1 LSB)</td>
<td>1.6 mV</td>
<td>3.9 mV</td>
<td>7.8 mV</td>
<td>19.3 mV</td>
</tr>
<tr>
<td>DC, fixed 50 Ω, typical</td>
<td>&lt;0.5 LSB</td>
<td>&lt;0.5 mV</td>
<td>&lt;0.3 LSB</td>
<td>&lt;1.2 mV</td>
</tr>
<tr>
<td>DC, fixed 50 Ω, maximum</td>
<td>&lt;0.6 LSB</td>
<td>&lt;0.9 mV</td>
<td>0.6 LSB</td>
<td>&lt;2.3 mV</td>
</tr>
</tbody>
</table>

### Environmental and Physical Details DN6.xxx

- **Dimension of Chassis without connectors or bumpers** L x W x H 464 mm x 431 mm x 131 mm
- **Dimension of Chassis with 19” rack mount option** L x W x H 464 mm x TBD mm x 131 mm (3U height)
- **Weight (3 internal acquisition/generation modules)** 12.1 kg, with rack mount kit: TBD kg
- **Weight (4 internal acquisition/generation modules)** 12.5 kg, with rack mount kit: TBD kg
- **Weight (5 internal acquisition/generation modules)** 12.9 kg, with rack mount kit: TBD kg
- **Weight (6 internal acquisition/generation modules)** 13.4 kg, with rack mount kit: TBD kg
- **Warm up time** 10 minutes
- **Operating temperature** 0°C to 40°C
- **Storage temperature** -10°C to 70°C
- **Humidity** 10% to 90%
- **Dimension of packing (single DN6)** L x W x H 580 mm x 580 mm x 280 mm
- **Volume weight of Packing (single DN6)** 19.0 kgs

### Power Consumption

<table>
<thead>
<tr>
<th>Channel Versions</th>
<th>12 channel versions</th>
<th>16 channel versions</th>
<th>20 channel versions</th>
<th>24 channel versions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Consumption</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

### DN6 specific Technical Data

#### Standard Version M4i.221x, M4x.221x and DN2.221-xx, 8 Bit 1.25 GS/s

<table>
<thead>
<tr>
<th>Input Range</th>
<th>±200 mV</th>
<th>±500 mV</th>
<th>±1</th>
<th>±2.5 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage resolution (1 LSB)</td>
<td>0.3 mV</td>
<td>0.8 mV</td>
<td>1.6 mV</td>
<td>3.9 mV</td>
</tr>
<tr>
<td>DC, fixed 50 Ω, typical</td>
<td>&lt;0.4 LSB</td>
<td>&lt;0.8 mV</td>
<td>&lt;0.4 LSB</td>
<td>&lt;3.6 mV</td>
</tr>
<tr>
<td>DC, fixed 50 Ω, maximum</td>
<td>&lt;0.5 LSB</td>
<td>&lt;1.2 mV</td>
<td>0.5 LSB</td>
<td>&lt;2.1 mV</td>
</tr>
</tbody>
</table>

#### Low Voltage Version M4i.221x, M4x.221x and DN2.221-xx, 8 Bit 1.25 GS/s

<table>
<thead>
<tr>
<th>Input Range</th>
<th>±40 mV</th>
<th>±100 mV</th>
<th>±200 mV</th>
<th>±500 mV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage resolution (1 LSB)</td>
<td>0.3 mV</td>
<td>0.8 mV</td>
<td>1.6 mV</td>
<td>3.9 mV</td>
</tr>
<tr>
<td>DC, fixed 50 Ω, typical</td>
<td>&lt;0.4 LSB</td>
<td>&lt;0.8 mV</td>
<td>&lt;0.4 LSB</td>
<td>&lt;3.6 mV</td>
</tr>
<tr>
<td>DC, fixed 50 Ω, maximum</td>
<td>&lt;0.5 LSB</td>
<td>&lt;1.2 mV</td>
<td>0.5 LSB</td>
<td>&lt;2.1 mV</td>
</tr>
</tbody>
</table>

### MTBF

| MTBF | TBD hours |
The number of maximum channels and internal digitizer modules and existence of a synchronization Star-Hub is model dependent.
Order Information

The digitizerNETBOX is equipped with a large internal memory for data storage and supports standard acquisition (Scope), FIFO acquisition (streaming), Multiple Recording, Gated Sampling, ABA mode and Timestamps. Operating system drivers for Windows/Linux 32 bit and 64 bit, drivers and examples for C/C++, IVI [Scope and Digitizer class], LabVIEW [Windows], MATLAB [Windows and Linux], LabWindows/CVI, .NET, Delphi, Java, Python and a Professional license of the oscilloscope software SBench 6 are included.

The system is delivered with a connection cable meeting your countries power connection. Additional power connections with other standards are available as option.

digitizerNETBOX DN6 - Ethernet/LXI Interface

<table>
<thead>
<tr>
<th>Order no.</th>
<th>A/D Resolution</th>
<th>Bandwidth</th>
<th>Channels @ Sampling Rate</th>
<th>Installed Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN6.221-12</td>
<td>8 Bit</td>
<td>500 MHz</td>
<td>12 ch @ 1.25 GS/s</td>
<td>3 x 4 GS</td>
</tr>
<tr>
<td>DN6.221-16</td>
<td>8 Bit</td>
<td>500 MHz</td>
<td>16 ch @ 1.25 GS/s</td>
<td>4 x 4 GS</td>
</tr>
<tr>
<td>DN6.221-20</td>
<td>8 Bit</td>
<td>500 MHz</td>
<td>20 ch @ 1.25 GS/s</td>
<td>5 x 4 GS</td>
</tr>
<tr>
<td>DN6.221-24</td>
<td>8 Bit</td>
<td>500 MHz</td>
<td>24 ch @ 1.25 GS/s</td>
<td>6 x 4 GS</td>
</tr>
<tr>
<td>DN6.225-12</td>
<td>8 Bit</td>
<td>1.5 GHz</td>
<td>12 ch @ 1.25 GS/s</td>
<td>3 ch @ 2.5 GS/s</td>
</tr>
<tr>
<td>DN6.225-16</td>
<td>8 Bit</td>
<td>1.5 GHz</td>
<td>16 ch @ 1.25 GS/s</td>
<td>4 ch @ 2.5 GS/s</td>
</tr>
<tr>
<td>DN6.225-20</td>
<td>8 Bit</td>
<td>1.5 GHz</td>
<td>20 ch @ 1.25 GS/s</td>
<td>5 ch @ 2.5 GS/s</td>
</tr>
<tr>
<td>DN6.225-24</td>
<td>8 Bit</td>
<td>1.5 GHz</td>
<td>24 ch @ 1.25 GS/s</td>
<td>6 ch @ 2.5 GS/s</td>
</tr>
</tbody>
</table>

Options

- M6.22xx-in40m: Low voltage input range option for 22xx series. 4 Input ranges with ±40 mV, ±100 mV, ±200 mV, ±500 mV, bandwidth limited. One option is required for each internal digitizer module.

Options

- DN6.xxx-Rack: 19" rack mounting set for self mounting
- DN6.xxx-Emb: Extension to Embedded Server: CPU, more memory, SSD. Access via remote Linux secure shell (ssh)
- DN6.xxx-sprg: Signal Processing Firmware Option: Block Average [later installation by firmware - upgrade available]
- DN6.xxx-sprst: Signal Processing Firmware Option: Block Statistics/Peak Detect [later installation by firmware - upgrade available]
- DN6.xxx-BTPWR: Boot on Power On: the digitizerNETBOX/generatorNETBOX automatically boots if power is switched on.

Calibration

- DN6.xxx-Recal: Recalibration of complete digitizerNETBOX/generatorNETBOX DN6 including calibration protocol

Standard SMA Cables

The standard adapter cables are based on RG174 cables and have a nominal attenuation of 0.3 dB/m at 100 MHz and 0.5 dB/m at 250 MHz. For high speed signals we recommend the low loss cables series CHF.

<table>
<thead>
<tr>
<th>Connections</th>
<th>Connection Length</th>
<th>to BNC male</th>
<th>to BNC female</th>
<th>to SMB female</th>
<th>to MMCX male</th>
<th>to SMA male</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>SMA male</td>
<td>80 cm</td>
<td>Cab-3mA-9m-80</td>
<td>Cab-3mA-9f-80</td>
<td>Cab-3f-3mA-80</td>
<td>Cab-3mA-3mA-80</td>
</tr>
<tr>
<td>All</td>
<td>SMA male</td>
<td>200 cm</td>
<td>Cab-3mA-9m-200</td>
<td>Cab-3mA-9f-200</td>
<td>Cab-3f-3mA-200</td>
<td>Cab-3mA-3mA-200</td>
</tr>
<tr>
<td>Probes (short)</td>
<td>SMA male</td>
<td>5 cm</td>
<td>Cab-3mA-9f-5</td>
<td>Cab-3mA-9f-5</td>
<td>Cab-3mA-9f-5</td>
<td>Cab-3mA-3mA-80</td>
</tr>
</tbody>
</table>

Low Loss SMA Cables

The low loss adapter cables are based on MF141 cables and have an attenuation of 0.3 dB/m at 500 MHz and 0.5 dB/m at 1.5 GHz. They are recommended for signal frequencies of 200 MHz and above.

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF-3mA-3mA-200</td>
<td>Low loss cables SMA male to SMA male 200 cm</td>
</tr>
<tr>
<td>CHF-3mA-9m-200</td>
<td>Low loss cables SMA male to BNC male 200 cm</td>
</tr>
</tbody>
</table>

Technical changes and printing errors possible

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