

GEN series Calibration Kit

Calibration and Verification Software

Special features

- (Inter)national traceable results
- Power calibration
- Voltage calibration
- Sensor oriented calibration
- All GEN DAQ cards supported
- Fully automated
- Supports all adjustments
- Verification using published GEN series specifications
- PASS/FAIL report generation
- Test fixtures available
- Uses commercial industry standard calibrators (Not supplied by HBM)

The GEN series calibration kit enables the user to perform a full calibration or just a verification of any GEN series acquisition card.

The calibration kit consists of the calibration and verification software, a manual, an USB IEEE-488 converter and a ceramic trimmer. Dedicated cable sets and/or fixtures required to calibrate and verify specific acquisition cards can be ordered based on the GEN series configuration in use.

The calibration kit uses commercially available industry standard calibrators (not supplied by HBM) to create (inter)national traceable results.

The calibration protocols support power calibration, voltage calibration as well as all calibration of all signal conditioner types supported by GEN series systems.

This combination of tools creates the option to perform on-site self-calibration of GEN series systems and significantly reduces downtime by preventing the system from being shipped to HBM for verification or adjustments or both.

The calibration software not only calibrates and tests in accordance with specifications published by HBM, but it also automatically or semi-automatically adjusts the system back to the best accuracy possible. For users who only want to verify that the system still meets the specifications but do not want to change anything, the verification procedure does the job and is included in the package as well.

GEN series Calibration Kit Setup Overview

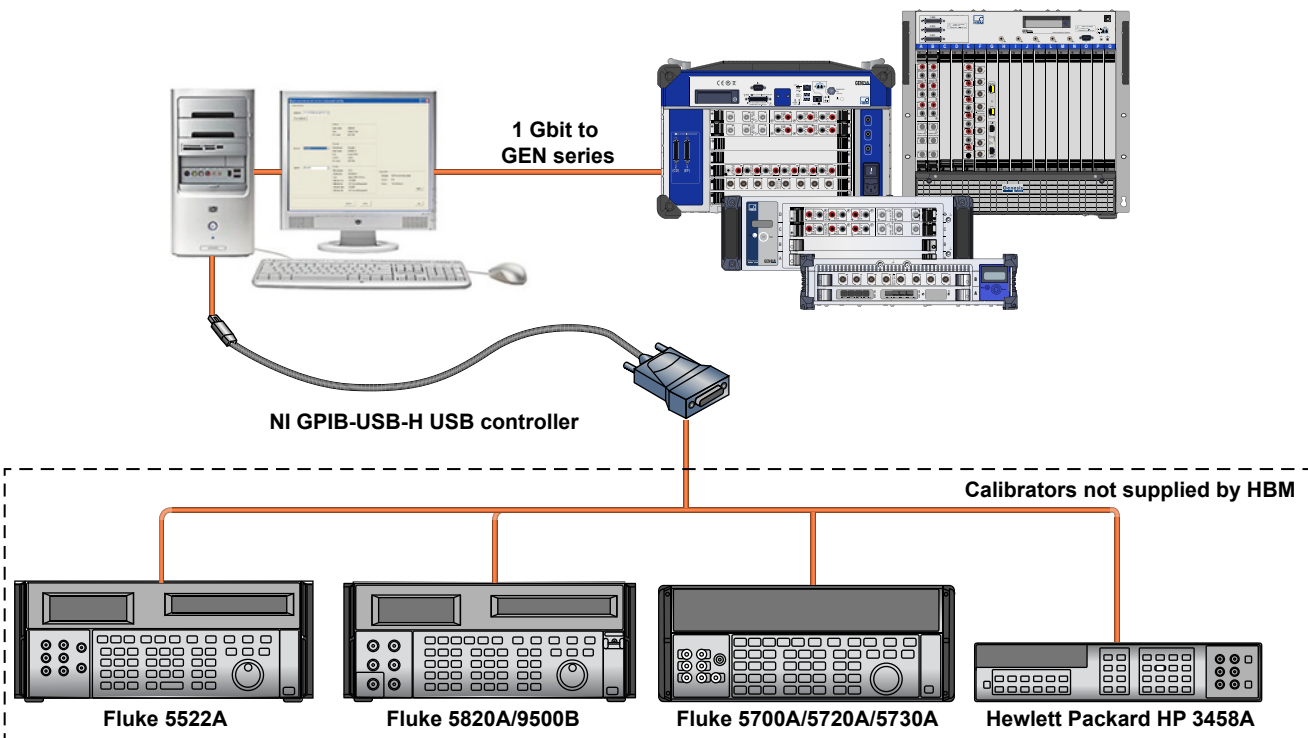


Figure 1.1: GEN series calibration kit setup

Calibration and Verification Software

The software comes on a CD with a PDF manual and is ready to run after installation.⁽¹⁾

Software language	English
Manual language	English
Software requirements	
Microsoft® Windows®	WIN8 and WIN10 Works in 32 bit mode on 64 bit versions of Windows®
PC requirements	
Minimum CPU	Intel® Pentium® 4 class PC
Minimum RAM memory	1 GB
Minimum free hard disk size	200 MB
Minimum graphics card	16 bit color with 64 MB video memory and DirectX 9 hardware support
Minimum screen resolution	1024 x 768 pixels
Free network interface	1; 1 GB recommended (100 Mbit minimum)
Free USB 2.0 port	1; for use with the NI GPIB-USB-HS controller Optional: one free COM (serial) port for the IOtech serial to GPIB interface
Others	CD-ROM drive to install the software Internal or external speakers for alerts and warnings
GEN DAQ series	
Supported mainframes	GEN2i, GEN3i, GEN3iA, GEN5i, GEN7i, GEN7iA, GEN2tB, GEN3t, GEN4tB, GEN7t, GEN7tA, GEN16t and GEN17tA. Software updates might be required to support mainframes released after the current software version. ⁽¹⁾
Supported input cards	All GEN DAQ series input cards supported. Software updates might be required to support input cards released after the current software version. ⁽¹⁾

(1) **Note** As the software is not downloadable, software updates are not distributed to customers. Request an update from your local sales engineer.

Calibration Equipment (Not supplied by HBM)

In addition to the calibration kit itself, the following calibration equipment is needed in order to perform a calibration or verification:

LF generator	Fluke 5700A/Fluke 5720A/Fluke 5730A
HF generator	Fluke 5820A/Fluke 9500B
Multimeter	HP 3458A

For power verification, the following calibration equipment is needed in order to perform a calibration or verification:

Power generator	Fluke 5502A/Fluke 5522A
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Calibration Fixtures and Cables (Options, to be ordered separately)

As calibration voltages range from mV to tens of V and go up to MHz, the proper input connections are essential to get repeatable and reliable results. Therefore, a special fixture kit for each of the GEN series input cards can be ordered separately.

A cable kit containing all the cables, adapters and termination resistors that are required to ensure a proper connection between the calibrator and the GEN series system can also be ordered separately.

The calibration software refers to the fixtures and gives on-line help on how to use and how to wire them properly. The software also indicates whenever voltages are used above the accepted safe levels so that operators can take proper safety precautions.

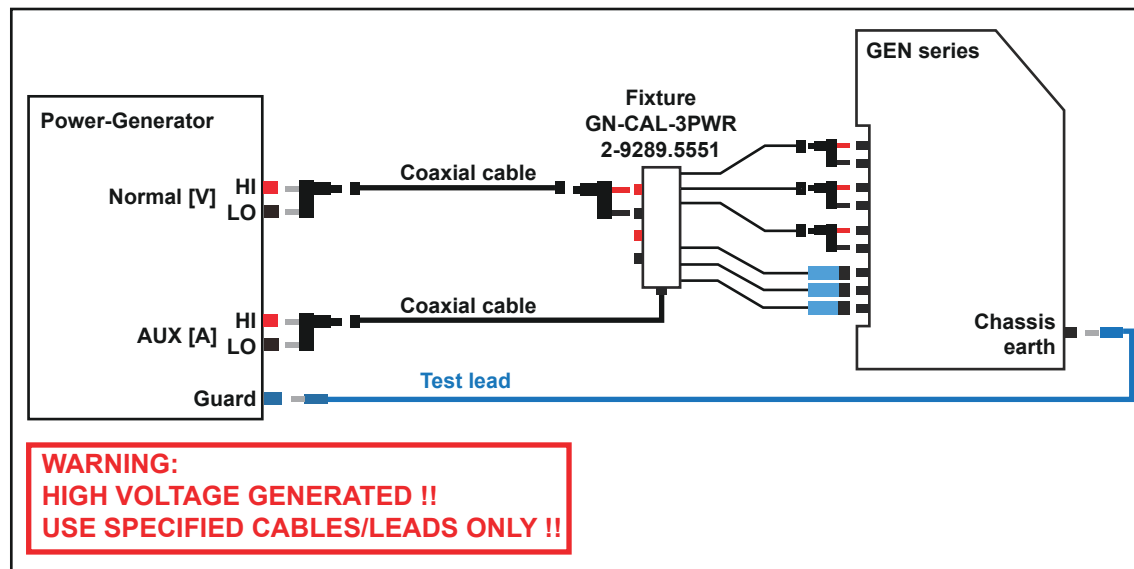


Figure 1.2: Example of a GEN series power connection window

Calibration Process

The complete verification process is fully automated and delivers PASS/FAIL information with the press of a button.

The same applies to most of the calibration process, for which electronic intelligence is used to retain the best performance possible. Most of this is fully automated and no user interaction is needed to restore the GEN DAQ systems to the best achievable accuracy.

Only for rare cases in which the AC bandwidth could be improved is manual user interaction required. Then, the manual and the software help as a guide through the necessary steps. Exact process descriptions and direct readouts make even manual procedures easy to work with.

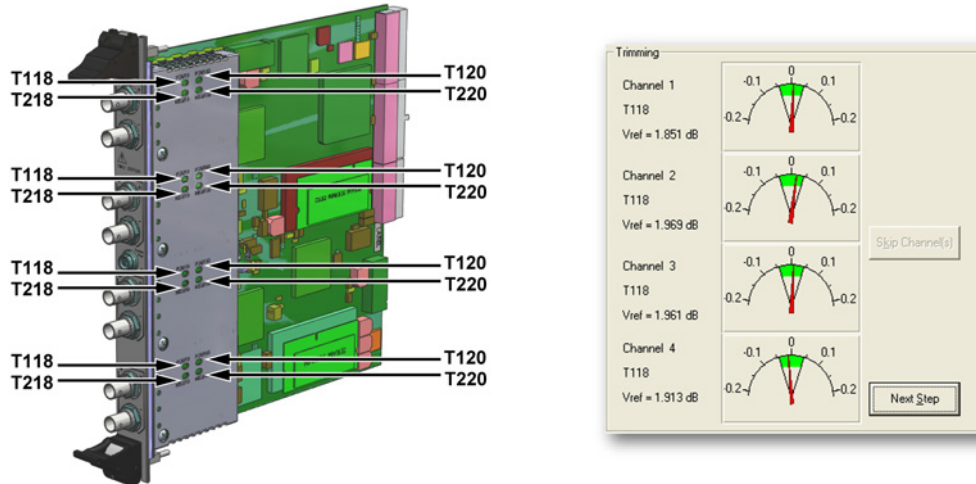


Figure 1.3: Example of adjustment locations (left) and Channel adjustment feedback (right)

Verification Process

During the fully automated verification, no changes are made to any settings. The end result of the verification is a listing of all findings and an overall PASS/FAIL result. The manual explains every verification process that the software uses, including a detailed description of the calculation methods to establish the specifications.

Supported verification steps
(Not every card requires all steps)

AC coupling
Amplifier internal Reference Signal
Bridge balance Gain and Offset accuracy
Bridge completion resistor (quarter mode)
Bridge Shunt resistance
Charge AC gain
Cold junction
CMRR (Common Mode Rejection Ratio)
Current DC gain, Offset, Linearity and MSE
DC Output Gain and Offset
Excitation Voltage and Current
IEPE Excitation and AC gain
HV Probe
Input Bandwidth
Input Noise
Output Bandwidth
Output Noise
TEDS data readout
Voltage DC gain, Offset, Linearity and MSE (Maximum Static Error)
XT Probes (DC and AC)

Power calibration steps
(Requires Fluke 5522A Multi Product Calibrator)

AC Power
DC Power
Power versus frequency
Power versus phase
Power Factor

Calibration Report

As an end result, the GEN series system saves all the results in a text file (RTF). From there, it can be stored for later reference or printed out.

GEN series calibration and verification software : V3.00

Verification results (Manufacturing Specifications)

Verification Date : Jan 15, 2017
 SPEC-File version : 2.00

Mainframe Interface Info

Serialnumber : IDJ0600293
 Type : GEN7tA
 SW version : 7.00.16366

Recorder Info

Physical Name : Recorder G
 Serialnumber : IDV0500119
 Type : GEN series 1MS/s
 SW version : 7.00.16366
 No. channels : 4
 Channel Type : Diff Amplifier

Card Test **PASSED**

Used Equipment for testing card:

DC reference : Fluke 5700A
 Voltmeter : HP3458A
 LF generator : Fluke 5700A
 HF generator : Fluke 5820A
 Generator (HV) : Fluke 5700A
 PWG : Unspecified (manual)
 Multimeter : HP3458A
 Signal Switch : Unspecified (manual)

 Filter: Butterworth_AA

Input: 1

Span (V)	Offset (%)	DCGain (%)	SINL (%)	MSE (%)	BWdth (kHz)	CMRR (dB)	Noise (%)	ACCpl
0.02	-0.022	-0.030	0.016	0.050	NA	NA	0.084	NA
0.04	-0.022	0.007	0.020	0.045	NA	NA	0.043	NA
0.1	-0.017	0.004	0.029	0.047	NA	NA	0.017	NA
0.2	-0.021	-0.030	0.027	0.054	NA	NA	0.009	NA
0.4	-0.017	0.015	0.032	0.056	NA	-129.7	0.010	NA
1.0	-0.018	-0.006	0.023	0.044	NA	NA	0.005	NA
2.0	-0.024	-0.016	0.030	0.053	NA	NA	0.004	NA
4.0	-0.019	0.034	0.032	0.067	355.6	-81.5	0.004	Passed
10.0	-0.022	0.003	0.025	0.046	NA	NA	0.005	NA
20.0	-0.020	-0.009	0.032	0.048	NA	NA	0.004	NA
40.0	-0.017	0.033	0.035	0.066	NA	-80.8	0.006	NA
100.0	-0.016	0.000	0.024	0.040	NA	NA	0.005	NA
200.0	-0.022	-0.010	0.032	0.049	NA	NA	0.004	NA

Figure 1.4: Standard verification test result report (example)

Power Calibration Report (Part 1)

When calibrating the GEN DAQ power cards a dedicated power report is saved in a rich text format file.

GEN series Calibration and Verification Software : V4.00

Power verification results (Manufacturing Specifications)

Verification Date : Feb 25, 2020
SPEC-File version : 4.00.20048

Mainframe Interface Info

Serialnumber : IHE1500101
Type : GEN7tA
SW version : 7.99.20055

Recorder Info

Physical Name : Recorder A
Serialnumber : IPA2000124
Type : GEN series 2MS/s
SW version : 7.99.20055
No. channels : 6
Channel Type : PowIso Amplifier B Type

Test Info

Sample rate : 2.0 MS/s
Cycle average : 5 cycles (for AC power measurements)
Filter : see details in result table(s)

Card Test **PASSED**

Used Equipment for testing card:

DC reference : Fluke 5700A SN#: 7485603
LF generator : Fluke 5700A SN#: 7485603
HF generator : Unspecified (manual)
Generator (HV) : Fluke 5700A SN#: 7485603
Multimeter : HP3458A SN#: 2823A16099
Power generator : Fluke 5522A SN#: 4544901

Uncertainty: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

AC Power

Filter: Bessel (IIR) @ 200 kHz

Phase 1: u1 & i1

Range	Frequency	Input	Power factor	Nominal power	Actual power	Tolerance	Deviation	MU
50 V / 0.075 A	53 Hz	31.82 V / 0.0477 A	1.00	1.5188 W	1.5190 W	0.07 %	0.02 %	0.0015 W
50 V / 0.15 A	53 Hz	31.82 V / 0.0955 A	1.00	3.0375 W	3.0380 W	0.07 %	0.02 %	0.0022 W
50 V / 0.3 A	53 Hz	31.82 V / 0.1909 A	1.00	6.0750 W	6.0757 W	0.07 %	0.01 %	0.0038 W
50 V / 0.6 A	53 Hz	31.82 V / 0.3818 A	1.00	12.150 W	12.151 W	0.07 %	0.01 %	0.011 W
50 V / 1.0 A	53 Hz	31.82 V / 0.6364 A	1.00	20.250 W	20.252 W	0.12 %	0.01 %	0.016 W
50 V / 1.2 A	53 Hz	31.82 V / 0.7637 A	1.00	24.300 W	24.301 W	0.07 %	0.00 %	0.018 W
50 V / 2.0 A	53 Hz	31.82 V / 1.2728 A	1.00	40.500 W	40.503 W	0.12 %	0.01 %	0.033 W

Figure 1.5: Power verification test result report (example part 1)

Power Calibration Report (Part 2)

When calibrating the GEN DAQ power cards a dedicated power report is saved in a rich text format file.

Power vs. Freq.

Range	Frequency	Input	Power factor	Nominal power	Actual power	Tolerance	Deviation	MU
1000 V / 0.6 A	0 Hz	900.0 V / 0.54 A		486.00 W	485.89 W	0.04 %	-0.02 %	0.15 W
	53 Hz	636.4 V / 0.3818 A	1.00	243.00 W	243.02 W	0.07 %	0.01 %	0.23 W
	100 Hz	636.4 V / 0.3818 A	1.00	243.00 W	243.02 W	0.07 %	0.01 %	0.23 W
	500 Hz	636.4 V / 0.3818 A	1.00	243.00 W	242.99 W	0.08 %	-0.01 %	0.23 W
	1 kHz	636.4 V / 0.3818 A	1.00	243.00 W	242.93 W	0.10 %	-0.03 %	2.45 W
	5 kHz	636.4 V / 0.3818 A	1.00	243.00 W	242.92 W	0.26 %	-0.03 %	10.79 W
1500 V / 0.6 A	0 Hz	1020.0 V / 0.54 A		550.80 W	550.69 W	0.05 %	-0.02 %	0.18 W
	53 Hz	954.59 V / 0.3818 A	1.00	364.50 W	364.52 W	0.07 %	0.01 %	0.35 W
	100 Hz	954.59 V / 0.3818 A	1.00	364.50 W	364.50 W	0.07 %	0.00 %	0.35 W
	500 Hz	954.59 V / 0.3818 A	1.00	364.50 W	364.48 W	0.08 %	-0.01 %	0.35 W
	1 kHz	954.59 V / 0.3818 A	1.00	364.50 W	364.38 W	0.10 %	-0.03 %	3.67 W
	5 kHz	954.59 V / 0.3818 A	1.00	364.50 W	364.36 W	0.26 %	-0.04 %	16.19 W

Power vs. Phase

Range	Frequency	Input	Power factor	Nominal power	Actual power	Tolerance	Deviation	MU
1000 V / 0.6 A	53 Hz	636.4 V / 0.3818 A	1.00	243.00 W	243.02 W	0.07 %	0.01 %	0.23 W
		636.4 V / 0.3818 A	0.50 ind	121.50 W	121.51 W	0.12 %	0.00 %	0.44 W
		636.4 V / 0.3818 A	0.50 cap	121.50 W	121.57 W	0.12 %	0.06 %	0.44 W
		636.4 V / 0.3818 A	0.10 ind	24.30 W	24.29 W	1.00 %	-0.04 %	0.49 W
		636.4 V / 0.3818 A	0.10 cap	24.30 W	24.39 W	1.00 %	0.39 %	0.49 W
		636.4 V / 0.3818 A	0.05 ind	12.15 W	12.09 W	1.99 %	-0.49 %	0.49 W
		636.4 V / 0.3818 A	0.05 cap	12.15 W	12.22 W	1.99 %	0.58 %	0.49 W
		636.4 V / 0.3818 A	0.01 ind	2.43 W	2.40 W	9.89 %	-1.05 %	0.49 W
		636.4 V / 0.3818 A	0.01 cap	2.43 W	2.49 W	9.89 %	2.31 %	0.49 W
1500 V / 0.6 A	53 Hz	954.59 V / 0.3818 A	1.00	364.50 W	364.54 W	0.07 %	0.01 %	0.35 W
		954.59 V / 0.3818 A	0.50 ind	182.25 W	182.21 W	0.12 %	-0.02 %	0.66 W
		954.59 V / 0.3818 A	0.50 cap	182.25 W	182.37 W	0.12 %	0.07 %	0.66 W
		954.59 V / 0.3818 A	0.10 ind	36.45 W	36.48 W	1.00 %	0.08 %	0.74 W
		954.59 V / 0.3818 A	0.10 cap	36.45 W	36.64 W	1.00 %	0.52 %	0.74 W
		954.59 V / 0.3818 A	0.05 ind	18.23 W	18.18 W	1.99 %	-0.22 %	0.74 W
		954.59 V / 0.3818 A	0.05 cap	18.23 W	18.38 W	1.99 %	0.86 %	0.74 W
		954.59 V / 0.3818 A	0.01 ind	3.65 W	3.62 W	9.89 %	-0.74 %	0.74 W
		954.59 V / 0.3818 A	0.01 cap	3.65 W	3.75 W	9.89 %	2.79 %	0.74 W

PowerFactor

Range	Frequency	Input	Power factor	Act. cosPhi	Tolerance	Deviation	MU
100 V / 0.6 A	53 Hz	63.64 V / 0.3818 A	1.00	1.0000	0.0100	0.0000	0.0000
			0.80	0.8002	0.0100	0.0002	0.0012
			0.60	0.6003	0.0100	0.0003	0.0016
			0.50	0.5003	0.0100	0.0003	0.0018
			0.40	0.4004	0.0100	0.0004	0.0019
			0.20	0.2004	0.0100	0.0004	0.0020
			0.10	0.1006	0.0100	0.0006	0.0020
			0.00	0.0004	0.0100	0.0004	0.0020

Figure 1.6: Power verification test result report (example part 2)

Input Card Fixture Requirement Overview

Extensive use of the fixtures impacts the reliability of the results. Yearly preventive inspection and/or testing of the fixtures improves reliability.

Acquisition cards and options		1-GN-CAL1	1-GN-CAL-CABLES	1-GN-CAL2A	1-GN-CAL7	1-GN-CAL9	1-GN-CAL-3PWR	1-GN-CAL-TEDS
1-G045	Impulse attenuator	✓	✓					
1-GN110	HV6600 100M	✓	✓					
1-GN111	HV6600 25M	✓	✓					
1-GN112	MV6600 100M	✓	✓					
1-GN113	MV6600 25M	✓	✓					
1-GN310B	Power 2M ISO	✓	✓				✓	
1-GN311B	Power 200k ISO	✓	✓				✓	
1-GN610B	ISO 1kV 2M	✓	✓	✓				
1-GN611B	ISO 1kV 200k	✓	✓	✓				
1-GN815	Basic/IEPE 2M ISO	✓	✓	✓				✓
1-GN816	Basic/IEPE 200k ISO	✓	✓	✓				✓
1-GN840B	Uni ISO 500k-8	✓	✓			✓		✓
1-GN1202B	Receiver 100M	✓	✓					
1-GN1640B	Uni ISO 500k-16	✓	✓			✓		✓
1-GN3210	HiRes 250k-32	✓	✓		✓			✓
1-GN3211	Basic 20k-32	✓	✓		✓			
1-GN8101B	Basic 250M	✓	✓	✓				
1-GN8102B	Basic 100M	✓	✓	✓				
1-GN8103B	Basic 25M	✓	✓	✓				



CAUTION

Inspect your calibration cables, connectors and adapters regularly for wear or damage and replace them if required. Regular preventive replacement is strongly advisable since the cost involved in an investigating usually is way higher than the cost of replacement. For example, in an intensive usage scenario a half yearly replacement could be advisable.


Legacy Card Fixtures Overview

Acquisition cards and options		1-GN-CAL1	1-GN-CAL-CABLES	1-GN-CAL2A	1-GN-CAL3	1-GN-CAL5	1-GN-CAL6	1-GN-CAL-TEDS
1-G041-2	1kv DC probe	✓	✓		✓			
1-G042-2	1kv AC probe	✓	✓		✓			
1-GN114	7600 100M	✓	✓					
1-GN401-2	6600 Receiver	✓	✓					
1-GN402-2	7600 Receiver	✓	✓					
1-GN410-2	Bridge 200k ISO	✓	✓			✓		
1-GN411-2	Bridge 1M ISO	✓	✓			✓		
1-GN412-2	HiSpeed 100M	✓	✓	✓				
1-GN413-2	HiSpeed 25M	✓	✓	✓				
1-GN440-2	Uni 200k ISO	✓	✓	✓				
1-GN441-2	Uni 1M ISO	✓	✓	✓				
1-GN610-2	ISO 1kV 2M	✓	✓	✓				
1-GN611-2	ISO 1kV 200k	✓	✓	✓				
1-GN810-2	Basic 200k	✓	✓	✓				
1-GN811-2	Basic 1M	✓	✓	✓				
1-GN812-2	Basic 1M ISO	✓	✓	✓				
1-GN813-2	Basix XT 1M ISO	✓	✓	✓				
1-GN814-2	Basic XT 200k ISO	✓	✓	✓				
1-GN1610	HiRes 250k-16	✓	✓				✓	✓
1-GN1611	Basic 20k-16	✓	✓				✓	
LDS version	FastSE 25M	✓	✓	✓				
LDS version	FastSE 100M	✓	✓	✓				








CAUTION


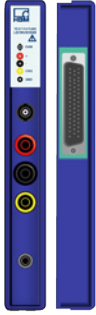
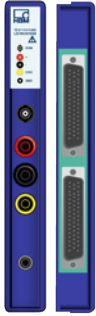
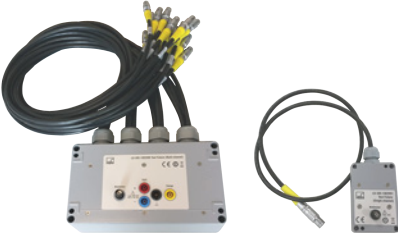
Inspect your calibration cables, connectors and adapters regularly for wear or damage and replace them if required. Regular preventive replacement is strongly advisable since the cost involved in an investigating usually is way higher then the cost of replacement. For example, in an intensive usage scenario a half yearly replacement could be advisable.

Ordering Information ⁽¹⁾		
Article	Description	Order No.
Calibration and verification software	 <p>GEN series calibration and verification software. Comes with a software CD, an electronic user manual, a USB to GPIB converter and an AC trimmer.⁽¹⁾</p>	1-GN-CAL1

(1) **Note** As the software is not downloadable, software updates are not distributed to customers. Request an update from your local sales engineer.

Options, to be ordered separately ⁽¹⁾		
Article	Description	Order No.
GEN series calibration basic cable set	 <p>GEN series calibration basic cable set contains cables, adapters and termination resistors to ensure a proper connection between the calibrator and any GEN series acquisition card</p>	1-GN-CAL-CABLES
GEN DAQ power fixture	 <p>GEN DAQ power calibration fixture for GEN series power cards. Connects up to 3 power channels (Voltage and Current) to the power calibrator source. It connects to both the 4mm banana and LEMO inputs. Can only be used with GEN series calibration and verification software 1-GEN-CAL.</p>	1-GN-CAL-GN31XB
GEN DAQ TEDS database BNC fixture	 <p>GEN DAQ TEDS sensor emulator using a BNC connector. Dedicated fixture for GEN series input cards. Supports TEDS database readout testing during verification process.</p>	1-GN-CAL-TEDS
GEN DAQ Basic/Fast Diff/Uni/HV fixture	 <p>Female isolated BNC IN connector to eight isolated male BNC OUT connectors, including six 4 mm banana plugs and a female-female BNC adapter. CAT II, 600 V RMS isolated. Can only be used with GEN series calibration and verification software.</p>	1-GN-CAL2A
GEN DAQ 1kV DC/AC probe cables	 <p>Eight additional black/red lead sets. 600 V RMS CAT II, 1.5 meter (4.9 ft) with safety-shrouded banana plugs. Eight lead sets to support eight 1kV DC/AC probes in parallel.</p>	1-GN-CAL3

Options, to be ordered separately ⁽¹⁾

Article		Description	Order No.
GEN DAQ bridge 16 pin LEMO fixture		GEN DAQ 16 pin LEMO bridge calibration and verification fixture set. Basic fixture supports four channels in parallel during accuracy tests. Sensor emulator fixture supports single channel testing only.	1-GN-CAL5
GEN DAQ 16 channel HDSUB50 fixture		GEN DAQ 16 channel calibration and verification fixture using an HDSUB50 output connector. Dedicated fixture for GEN series input cards. Supports 16 channels in parallel during calibration and verification tests.	1-GN-CAL6
GEN DAQ 32 channel HDSUB50 fixture		GEN DAQ 32 channel calibration and verification fixture using two HDSUB50 output connectors. Dedicated fixture for GEN series input cards. Supports 32 channels in parallel during calibration and verification tests.	1-GN-CAL7
GEN DAQ universal fixture		GEN DAQ 16 and 8 channel universal calibration and verification fixtures. Dedicated fixture for GN1640B and GN840B cards. Supports 16 channels in parallel during calibration and verification tests.	1-GN-CAL9

(1) As calibration voltages range from mV to tens of V and go up to MHz, the proper input connections are essential to get repeatable and reliable results. The use of an HBM calibration fixture guarantees validated setups.

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measure and predict with confidence

