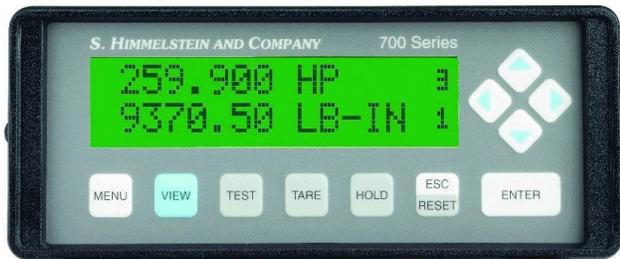


Models 708+ & 788+ DC Strain Gage Conditioners Model 728+ Mechanical/Fluid Power Instrument



Model 728+ - Power Instrument for a directly wired strain gage load sensor, and a frequency output transducer.



Model 788+ 2 channel dc strain gage signal conditioner - for directly wired torque, flow, pressure, and head transducers.

- **Model 728+ reads, displays, processes and outputs**
 - **shaft torque, speed, power**
 - **pump/motor head, flow, fluid power**
 - **drawbar force, velocity, power**
- **All Models have shunt, load and 0.01% accurate mV/V calibration***
 - **7,800 samples/sec. for strain gage channels**
 - **1 millisecond response for speed, flow or velocity input**
 - **6 full digit engineering unit display with user definable legends**
 - **RS232, RS422 or RS485 serial communication**
 - **auto-scaled selectable Voltage or Current analog outputs**
 - **assignable logic I/O's, fast max/min capture, real time calculations**
 - **protected excitation supplies, no pots, no batteries, no fans, no maintenance**

*NIST Traceable mV/V calibration performed in our NVLAP accredited laboratory (Lab Code 200487-0)

These advanced instruments provide engineering unit display of one (Models 708+ and 728+) or two (Model 788+) directly wired strain gage transducers, and one frequency input (Model 728+). What's more, 20 of the most useful processing functions plus real-time calculations are built in. Those capabilities, and the embedded State Machine, make these Instruments powerful testers easily configured to handle complex, Event Driven Testing.

The alphanumeric readout can display measured and computed data, units of measure and test status. During setup, it guides you with English language prompts. There are no manual adjustments. To calibrate, enter the full scale value in engineering units and the instrument provides 0.001% resolution and voltage or current analog outputs (user selectable). The keyboard accesses measured data, held data, max/min data, data spread, limit status, and/or I/O status without test disruption. Password protection may be used, if needed.

The strain gage mV/V calibrator has NIST* Traceable 0.01% absolute accuracy. Manual adjustments aren't needed. Constant delay, Bessel filters are used to suppress noise without introducing overshoots or delay distortion. The frequency conditioner uses a proprietary algorithm to achieve fast response and 0.01% resolution at any full scale. With a quadrature input, it outputs magnitude and direction.

Excitation is furnished for both sensors; no need for external power. Models 708+, 788+ and 728+ are easy to use, have high signal-to-noise ratio, high line frequency common mode rejection, offer great stability and require no maintenance - there are no batteries, fans or pots.

Select either RS232, RS422, or RS485 communications to remotely acquire data, and setup and control the instrument modes. Input actions and output events can be controlled by user configurable logic I/O's. When used in its State Mode, Event Driven Tests can be done - without special hardware or software. That is, the Instrument setup automatically changes as the test moves between states; up to 8 states are possible - see AN7000 for details.

The unprecedented absolute accuracy of the mV/V calibration function eliminates any need for a mV/V transfer standard. Applications for these flexible Instruments run the gamut from an accurate, stable transducer readout to a sophisticated tester capable of complex, event driven testing. No other device offers such power and versatility.

Included software remotely controls all instrument functions from a Windows based PC. It displays, plots and saves real-time data, does X-Y plots, and will also save and download the instruments setup parameters.

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Specifications for Models 708+, 788+, and 728+ Instruments

Strain Gage Input(s) (directly wired, not transformer coupled)

Resistance	80 to 2000 Ω with 5V excitation, 170 to 2000 Ω with 10V excitation.
Connections	Provision for 4, 6, or 7 wire circuits.
Maximum Cable Length	500ft.
Transducer Excitation	5V or 10V DC, user selected. Regulated, and short circuit protected.
Input	
Sensitivity	1 to 4.5mV/V with 150% overrange; automatically scaled.
Differential Impedance	100M Ω .
Automatic Zero Range	$\pm 10\%$ of Full Scale (with 150% overrange), $\pm 60\%$ of Full Scale (with no overrange).
Tare Range (Tare may be actuated from keypad or remotely via logic I/O or serial communication port)	$\pm 100\%$ of Full Scale.
Auto Calibration	
Shunt and Load Type	Dual polarity calibration with provision for CAL resistor feedback.
mV/V Type	$\pm 1\text{mV/V}$ to $\pm 4.5\text{mV/V}$. Absolute accuracy is $\pm 0.01\%$ typical, 0.02% worst case.
Spurious Signal Rejection	130dB for 60Hz common mode signal.
Antialias Filter	200Hz, 5 pole Bessel response filter.
Low Pass Filtering	4 pole Bessel response digital filters with 11 cutoff frequencies from 0.1 to 200Hz in 1-2-5 steps.
Signal-to-Noise Ratio ¹	@ 1mV/V F.S. and 5V Excitation: 80/70/59/56dB with 1/10/100/200Hz filters. @ 1mV/V F.S. and 10V Excitation: 80/74/65/60dB with 1/10/100/200Hz filters. @ 4.5mV/V F.S. and 5V Excitation: 86/74/68/65dB with 1/10/100/200Hz filters. @ 4.5mV/V F.S. and 10V Excitation: 86/86/74/68dB with 1/10/100/200Hz filters.
Resolution	0.001% of Full Scale.
Overall Accuracy (at 77°F/25°C)	0.01% of Full Scale typical; 0.02% of Full Scale, worst case.
Temperature Effects	Zero: $\pm 0.001\%$ of Full Scale/°F (max); Span: $\pm 0.001\%$ of Full Scale/°F.
Frequency Input	Any one uni-directional or bi-directional (quadrature) source including self generating and zero velocity speed pickups, optical encoders, flowmeters, etc. When used with bi-directional sensors, the conditioner outputs both <u>direction</u> and <u>magnitude</u> .
Input Impedance and Configuration	Differential or single ended inputs. 100k Ω differential, 50k Ω single ended.
Input Threshold (keypad selectable)	10, 20, 50, 100 or 200mVp-p (between inputs) or TTL.
Maximum Input Voltage	$\pm 130\text{VDC}$ or 130Vrms.
Input Signal Bandwidth	0.001 to 200kHz (10 to 200mVpk-pk threshold), 0.001 to 400kHz (TTL threshold).
Low Pass Filter (keypad selectable)	20kHz (-3dB) or none. This filter is not available for TTL inputs.
Common Mode Rejection	80dB (dc to 60Hz), 55dB (at 10kHz).
Display Ranges and Resolution	Rangeless (use any F.S. Engineering Unit value) with 150% overrange. Resolution is 0.01% of F.S.
Response Time	Greater of: 1 ms, typical (2ms, worst case) or the input pulse length.
Low Pass Filtering of Sampled Data	Unfiltered or 4 pole Bessel filter. Cutoff frequencies from 0.1 to 100 Hz in 1-2-5 steps.
Overall Accuracy	$\pm 0.01\%$ of F.S.
Excitation Supplies ²	+12V@125mA or +5V@250mA short circuit (current limit) and overvoltage (fuses) protected.
Maximum Transducer Cable Length	1000ft.
System Display	2 line by 16 alphanumeric characters, each 0.2" wide by 0.3" high. Backlit LCD with adjustable contrast.
Views	Select either 2 Channels, 1 Channel with Limit Status, or 1 Channel with I/O Status.
Data Displayed	Select from Current, Max, Min, Spread, Held data and Tare value.
Data Format	Engineering units with 6 digits (1-2-5 format) and 5 character, upper/lower case, user-entered legend/descriptor.
System Response (per channel)	
Data Sampling & Max/Min Update Rates	7,800Hz (hardware channels and CH3 calculation).
Limit Checking Rate	2,600Hz (hardware channels and CH3 calculation).
Logic I/O Response Time	384 μs (hardware channels and CH3 calculation).
Update Rate for Each Analog Output	2,600Hz.
System Control	All I/O functions can be OR'd in any combination. The <i>pattern</i> function adds ANDing capabilities.
Input Actions/Channel	Logic inputs, outputs, and internal Matrix signals control following actions. Tare, Clear Tare, Hold, Clear Hold, Reset Max/Min, Clear Latched Limits, Check Limits, Do Max/Mins, Apply + CAL, Apply -CAL.
Output Events/Channel	The following events drive Logic outputs and internal Matrix signals. HI Limit, NOT HI Limit, IN Limit, NOT IN Limit, LO Limit, NOT LO Limit, At Max, NOT At Max, At Min, NOT At Min.
Eight User-defined Patterns	Patterns of Logic inputs, outputs and Matrix signals drive Logic outputs and internal Matrix signals.
State Machine Capability	User enabled/disabled. Permits up to eight states and allows event driven testing. See AN7000 for details.
Limit Checking	Each channel has a HI and LO limit which may be latched or unlatched, absolute or signed, and with or without hysteresis. Select either Current, Max, Min, Spread or Held data for limit checking. Limit violations on any or all channels can be set to trigger backlight flashing in any of the display view modes.
Four Logic Inputs	Each with programmable destination, protected to $\pm 48\text{V}$.
Type	TTL compatible, low-true with 2k Ω pull-up. Input current is -1.5mA @ 0V.
Six Logic Outputs	Each with programmable source, short circuit (current and thermal limits) and overvoltage protected.
Type	Open collector, low-true. Operating @ 24V (max) and 0.3A max sink current.
External +5VDC Power (on I/O connector)	250mA, short circuit (current limit) and overvoltage (fuse) protected.
Serial Communication Port (selectable as RS232, RS422, or RS485. Supports 32 devices on RS485 port and 1 device on RS232/422)	
BAUD Rate	1.2to 230.4kBaud. Maximum Cable Length: 4000ft (RS422/RS485), 50ft (RS232).
120 Ω Termination Resistors (RS485)	User selectable for RXD and TXD.
RS422/485 Transceivers	Slew-rate limited, short circuit protected (current & thermal limits).
RS232 Drivers	Short circuit protected (current limit).
Serial I/O's	Use a 9 pin D connector. They are $\pm 15\text{kV}$ ESD protected and float (100k Ω) with respect to Earth Ground.
Commands	Control of all modes, settings, and measurements.
Non-Volatile Memory Storage for System Settings	EEPROM, batteries are not used.
Dual Analog Outputs	Each assignable to any of the 3 channels are short circuit (current limit) and overvoltage (fuse) protected.
Output Impedance/Minimum Load Resistance	< 1 Ω /10k Ω .
Full Scale ³	Selectable from 0 to $\pm 10\text{V}$ (maximum) or 0 to 20mA. Resolution is 0.5mV or 0.5 μA .
Overrange	Voltage overrange is 150% of Full Scale (F.S.) Or $\pm 15\text{V}$ Max. Current overrange is 150% or F.S. or 23.2 mA.
Non-linearity	$\pm 1\text{mV}$ or $\pm 1\mu\text{A}$
Protection	Short circuit (current limit) and overvoltage protected to $\pm 32\text{V}$.
Size and Weight	6.5" wide, 2.9" high, 8.7" deep. Weight is 3 pounds.
Operating Temperature	+41°F to +122°F (+5°C to +50°C).
Input Power	90VAC to 250VAC, 50/60Hz @ 25VA, max. Two 2A/250V fuses, line filter, and rear power switch. Option 12D1 converts from AC line power to 10 to 15VDC operation @ 15 Watts, max. It includes a rear power switch, fuse & filter.

- Notes:
1. The ratio expressed in decibels (dB), of full scale (F.S.) signal to noise spread. Measurements are made for a 1 minute interval using a 100 Ω source impedance.
 2. Both excitation voltages can be used simultaneously with the following restrictions: $4.8 \times (12\text{V current}) + (5\text{V current}) \leq 700\text{mA}$.
AND 12V current $\leq 125\text{mA}$ AND 5V current $\leq 250\text{mA}$.
 3. Specification is subject to change without notice.