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MATERIALS MANAGEMENT DIVISION
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16 Channel Universal Digital Amplifier (Qty-4)
Compression Force Transducer (Qty-14)
Compact Universal Force Transducer(Qty-2)

Sr. No	Parameters	Detailed Technical Specification	Technical Compliance (Yes / No)	Additional Information (if any)
1	**No. of input channels** 16 electrically isolated & individually configurable channels.	• Isolation to avoid inter-channel noise during Acquisition. • Individually configurable to have flexibility to use any bridge configuration / select any signal conditioner or completion resistance as per application demand. Avoids the need to buy extra modules. 16 channels in one housing makes the system compact and portable.		
2	**Transducers Supported** Strain Gauge in 3−wire regulated and 4−wire Quarter bridges; in 5 wire Half bridges; in 4 & 6 wire Full bridges ratiometric measurements, PT100, resistance & ±10 V	• The regulated 3 wire, 4 wire circuits for quarters & 6 wires for full bridge helps remove errors due to lead wire resistances. • 3 wire configurations have issue with Zero-point shift and changes in sensitivity with unsymmetrical/symmetrical cables and temperature changes during the day. This disadvantage is not there in 3ire regulated and 4 wire circuits. • HBM's 3-wire regulated configuration gives full compensation if wire resistances are symmetrical • HBM's 4-wire configuration (Patented) give full compensation of wire resistance and no changes in sensitivity with both symmetrical & unsymmetrical		

		• HBM 6wire the adjustment of excitation is done via additional sense leads and a comparator (C), thus cable resistance or temperature changes have no effect on measurement. • The excitation voltage is simultaneously measured, and the measured signal [mV/V] does not rely on high excitation stability leading to higher data fidelity. • PT 100 allows to do temperature compensation for strain gauges & ± 10V, resistance inputs give you flexibility to use potentiometer, DC LVDT's / accelerometers which are generally used together with strain gauges.		
3	**A/D Converter** Each channel should have its own 24-bit A/D with at least 19-bit resolution for synchronous, parallel & simultaneous measurements. No inter-channel skew.	• The 24-bit A/D converter gives high resolution & does away the need to range the signal. • An A/D & Signal conditioner in each channel does away with inter-channel skew, phase delays and channel synchronization errors. The 19-bit Measurement resolution helps in avoiding gain setting which cause gain errors.		
4	**Bridge Excitation Voltage** 0.5, 1, 2.5, 5V. Both DC & Carrier Frequency excitation required.	• Carrier frequency Amplifiers technique has the advantage of using long cable lengths with low errors, High noise immunity and EMC/EMI immunity. No influence of low frequency disturbances. • Use the DC amplifier when you need high bandwidth of 3KHz but are prone to noise and external influences. • The CF/AC amplifiers have very good for static and quasi-static measurements giving high fidelity data. Having both gives one the advantage of using the same system for different measurement tasks. 10V excitation heats up the strain gauges		
5	**Type of Excitation** DC Symmetric Excitation	• Symmetric circuit results in higher resistance against common mode. This is equivalent to having a high CMRR of 140dB amplifier which give better accuracy and lower noise.		

6	**Carrier frequency** 600Hz	The advantage of 600Hz CF amplifier over DC amplifier is : influence of temperature on zero point is 30x lower, influence of temperature on amplification is 2x lower & that on input noise is 6x lower		
7	**Accuracy class**	0.05		
8	**Quarter Bridge Completion** Internal Completion resistors of 120 & 350 ohm with 2 ppm/ºC temperature co-efficient. Software selectable.	• External bridge completion resistance produces errors due to lead resistance & temperature drifts on the external resistance. • Low temperature influence on ¼ bridge due to 5ppm completion resistors. Huge time saving as no need to manually wire large channel counts of 120/350 ohms resistance.		
9	**Range** 20 mV Bridge Measurement	Especially tuned for strain gauge-based sensors		
10	**Transducer input** 300…1000 Ω	Especially tuned for strain gauge-based sensors		
11	**Calibration** Inbuilt shunt with 2 ppm/ºC temperature co- efficient required giving 1mv/V on every channel. Software selectable. Auto calibration is required	• Is required to check the functioning & to calibrate the measurement chain before each test. This is done to have error free data. • It is important to have precision shunt to calibrate the measuring chain. • Huge time saving as no need to manually wire shunt to each channel and all channels can be done simultaneously. This is an indicator that every channel has its own signal conditioner. • More than one shunt is of no use. The auto calibration is useful in long term measurement to avoid zero drifts. The system checks the zero point when switched “on” and does not allow the amplifier to drift.		
12	Inbuilt Calibration certificate:	ISO 10012 or equivalent compliant Working Standard calibration certificate stored inside the module for mV/V, Voltage. Helps to identify		

	Capability to calibrate the amplifier in India in terms of mv/v (strain)	if one is using a calibrated system, is a test. • Today it is important to have the calibrated system to meet ISO requirements. This means the system needs to be calibrated locally • Expect HBM no other supplier in India is capable of calibrating strain channels Due to the non-linearity of gauge factor and Wheatstone bridge a strain channel cannot be calibrated as voltage/ resistance.		
13	**Sampling rate per channel** 20 K samples/sec/channel. Individually adjustable / channel	• Each channel is independent and individually configurable to use different sensors (¼ bridge, full bridge, voltage, resistance, PT100) with different sample rates. Hence, can be used for both static & dynamic measurement in Lab and on vehicle		
14	**Measurement frequency range** 0 ... 3 kHz for DC & 300Hz for Carrier	• For both static & dynamic strain measurements (fracture, cracks etc.)		
15	**Bessel & Butterworth Filters** 4 pole, 0.01 Hz to 3 kHz (−3 dB) individually adjustable per channel	• To filter unwanted signals and keep the data lean for quick analysis		
16	**Channel Isolation** All input channels to be electrically isolated	• Isolation to avoid inter-channel noise during Acquisition.		
17	**Transducer cable length up to** 80 meters	• To make sure that the system is capable of fully compensating lead wire resistance and has flexibility to use on larger structures (Bridges, trucks trailers, earth movers etc.)		
18	**TEDS (IEEE 1451.4)** Supported on every channel. Transducer Identification via 6 wire circuit. (0−wire full bridge transducers)	• TEDS allows automatic recognition of the sensors and sets up the required parameters (zero, span, calibration, units etc.) to save on setup time. • Capability to read & Write TEDS. Support full bridge TEDS in ≤ 6 wire circuit with no extra wire. • Supporting TEDS enables quick and correct setup of the sensor • Informs end-user if a calibrated sensor is being used in the test		

19	**Interface** Fire wire, Ethernet, PTP No CAN Interface for data interfacing or synchronization	• Via firewire for synchronization and Ethernet for fast data saving and have optional wireless connectivity. • PTP helps to synchronize with other latest DAQ's and cameras • To Distribute modules and shorten the cable length between Strain gauges and amplifier. • CAN data interface is capable of on 1 Mbaud, this limits the no of channels that can be connected together with useful sample rate.		
20	**Transducer connector** Push pull type connection/ RJ45	For quick and rugged connectivity		
21	**EMC requirements** Compliance to Standard IEC61326-1:2006 or equivalent and IEC 61000-4-2/3/4/5/6 or equivalent	• To avoid external noises due to EMC/EMI • CE, EMC, EMI compliances are important for ISO or equivalent and to have high fidelity data They also make sure the instrument is protected against spurious high voltage data coming from various sources		
22	**Distributed & Scalable** The system must be upgradeable to > 100 channels. Every 16-channel unit must be able to be used separately with a computer.	A distributed system saves on cable cost and brings down errors due to cable transmission. Having multiple separate unit capable of working together / separate gives you the flexibility to conduct many experiments of 16 channels each simultaneously or one experiment with 300+ channels.		
23	**Operating temperature range** -20 ... +65°C	For Indian conditions		
24	**Power Supply** 10 ... 30V DC with 230 VAC adapters.	AC for LAB and DC for mobile applications.		
25	**Size & Weight** Must be compact and portable. Weight < 5Kg and size < 5 liter.	Small, rugged &light weight to handle and carry around.		
26	**Software** The software should include: Hardware setup, simplified data Logging, simplified Data Viewing. Automatic sensor	In case your sensor is not TEDS enabled, then the hardware setup can still be automated from the sensor database (Virtual TEDS). The system is not required for doing the hardware setup. The setup can		

	recognition through TEDS, Labview & API drivers are essential. No programming knowledge should be required to work on the software. Webserver Software interface	also be done in EXCEL and transferred to the hardware to save on time. One can program the system and give it to a non-technical person to do the acquisition. No programming knowledge / computer knowledge is required to operate the system. A new person can start doing measurements in <half hour. To view on multiple computers & tablets		
27	**Online calculations** Arithmetic, exponent, root, root mean square value, logic, trigonometry, integral/differential, exponential, logarithm, limit values (connect digital output, play audio file via external speaker, entry in log file), software filters (moving averages, Bessel, Butterworth), Experimental stress analysis using SG	Easy online calculations. Pre-built one step Strain analysis software from a company with 60 years' experience in the field strain. Since we make the strain gauges, we know how they need to be compensated to achieve the best results.		
28	**Software Display Elements** Numeric display, line recorder (y−t, x−y, y−f / FFT), spreadsheet, indicator, bar graph, LED, polar diagram, switch (button), checkbox, selection box, background image, text	No programming or programming knowledge required to setup a visualization screen as per your requirement.		
29	**Data Storage Format** ASCII, Microsoft Excel, RPC III, MATLAB, nCode, MDF 4.0, NI DIAdem The complete meta data (sensors, measurement, configuration, test parameters), statistics log	For further analysis in Glyphworks / MATLAB or interface the data to external control systems like MOOG/ MTS/ INSTRON etc All parameters/ settings are saved with the data to have traceability and accountability of data. Easy to find any errors and compare two tests.		

	should be stored for data traceability.			
30	**Experience** Must give reference of at least 3 customers in India where 200+ strain measurement channels are used in a single system for structural testing for more than 3 years	This is to make sure that the system is capable, and the end customers have not issued in working with high channel count systems The supplier should have supplied such instruments in the R&D Institutes such as IIT-Madras, IIT-Roorkee, IIT-Bombay, IIT-Hyderabad, HAL-Bangalore, ISAC-Bangalore, SHAR-Sriharikota, Suzlon-Ahmedabad, HAL-Nasik etc.		
31	**Warranty**	2 years		