Structural Solutions Private Limited

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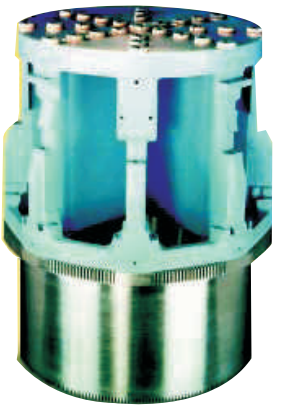
Technology News

INDUCT - A- RING TECHNOLOGY

Unholtz-Dickie Corporation, founded in 1959 has achieved leadership in the Vibration Test Industry, with over 5000 installations in more than 35 countries. **Unholtz-Dickie (UD)** systems combine strong performance specifications with proven reliability-a combination that represents solid value to customers.

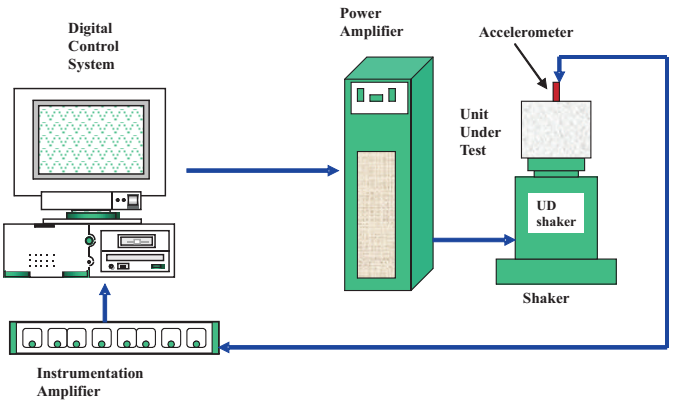
UD designs and manufacturers complete systems for vibration and shock testing which include: Electro Dynamic shakers, Power Amplifiers, PC-based Controllers, Head expanders and Charge Amplifier instrumentation.

Structural Solutions Private Limited exclusively represents **Unholtz-Dickie Corporation in India. Structural Solutions Private Limited** is a professional engineering company engaged in offering high end technology intensive products and system solutions to Indian industry for vibration & shock testing, and analysis.



Vibration System

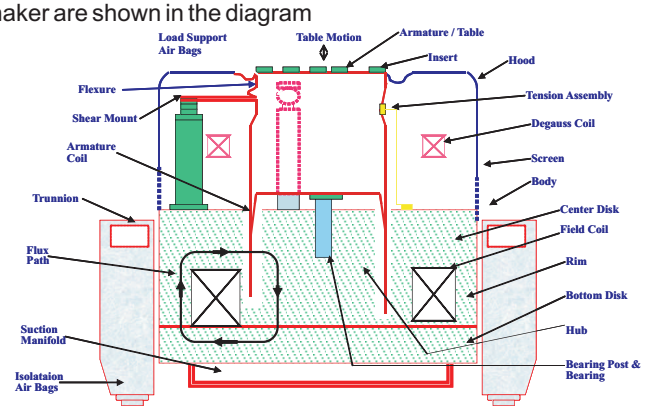
Typical Vibration system components



The Diagram above represents a typical vibration test system. A vibration test system is comprised of: An Electro dynamic shaker, A Power Amplifier, Digital Control System and support instrumentation. Together these items form a complete “closed loop” system that can accurately reproduce a defined vibration environment.

Shaker

The shaker is the heart of the system. It provides Vibrations to the armature to which the items to be tested are attached. The parts of a shaker are shown in the diagram



The field coils energize the shaker body with flux paths as shown, creating a high magnetic flux density in the annular air gap. The field coils are connected to the DC field supply. The armature assembly, consisting of the table and the driver coil, is suspended in the annular air gap of the shaker. When an alternating current is passed through the driver coil, electrodynamic forces are generated on the driver coil wire causing the table to move up and down.

Electronic Power Amplifier

The power amplifier input is connected to the controlling drive signal source and the output is connected to the driver coils of the shaker. The controller generates a low power, low voltage signal which is amplified by the electronic power amplifier. The amplifier has the necessary power to cause the AC currents to flow through the driver coils to generate the necessary force

Control Console

The control console houses the intelligence of the system. Accelerometers detect the motion of the shaker table and send it to the amplifiers. The output of the amplifiers is then connected to the controller. The Controller works to maintain a predetermined reference level. If the signal from the amplifier is incorrect, the controller will change its out put accordingly to obtain the desired level

Working

The drive signal out of the Digital Signal Processing Controller is the input to the amplifier. The Amplifier takes input from the controller and converts it to higher voltages and currents for the shaker. The moving element of the shaker is suspended in a strong magnetic field. The current from the amplifier flows through the coil of the moving element and a force is generated on the coil (F=BIL).

The vibration at the table is sensed by the accelerometer. The accelerometer produces an output proportional to the measured acceleration. The Instrumentation amplifier converts the output of the accelerometer to a normalized voltage for the controller. The controller compares the signal coming from the signal conditioner to a pre-defined reference level. The controller continually adjusts the drive signal to the amplifier to maintain the desired reference level.

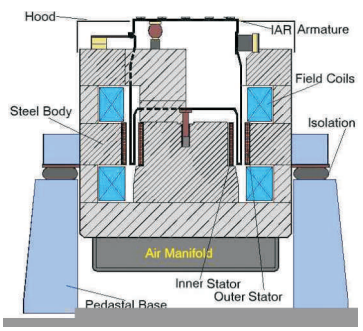
Induct-A-Ring

Induct-A-Ring is an advanced armature design available only from UD .The Induct-A-Ring is Unholtz-Dickie's trade name for a revolutionary armature design that utilizes the principle of Transformer action.

IAR features:

- Solid Aluminum Armature Coil (No Multiple Windings)
- No Electrical Current Connections
- No Cooling Water Connections
- 2 Inch pk-pk Displacement Standard, 3 inch Optional
- Rated Acceleration: 200g Sine / 600g Shock
- Full Rated Performance to 2,000 Hz
- 29 Stainless Steel Replaceable Inserts
- All Points at Ground Potential
- Low Weight (250 - 385 lbs) and Superior Strength

This design uses the principle of transformer coupling to transfer energy from stationary AC driver coils (stators coils) to the actual moving element (see diagram at right). Electrically, the configuration is a transformer with a single turn secondary. The primary in this "transformer" is a pair of stator coils rigidly mounted to the shaker iron structure. The single turn secondary is the armature ring suspended in the annular air gap between the two stator coils.



Through transformer coupling, AC currents flow in the single turn secondary. Field coils in the shaker generate a concentrated DC magnetic field in the air gap where the armature is suspended. The current in the armature ring reacts with the magnetic field generating a force on the moving element. This interaction generates AC forces on the INDUCT-A-RING, thus causing motion of the armature

Advantages of Induct-A-Ring Armature Design

1.**High Reliability:** Conventional shaker utilize a wound coil construction attached to the lower end of the moving armature which require high current and water carrying linkages. These linkages are subjected to large acceleration at high frequencies and are flexed up to full stroke at low frequencies. These linkages are the main cause of many failures.

However IAR utilize a conductive cylinder which is designed as a shorted secondary of a transformer thus eliminating the need for a current linkage. This conductive cylinder does not require any electrical insulation and epoxy bonding of wires thus allowing effective heat transfer with air cooling and hence also eliminating the need for water linkages.

The combination of these features is yielding an extremely reliable armature.

2. Innovative Design: Many wound coil shaker systems utilize a transformer between the shaker and the amplifier for impedance matching. The innovative concept is to place the transformer inside the shaker.

3. Electrical simplicity: The solid conductive cylinder has uniformly distributed electrical properties. Any unit length along the circumference has a voltage and impedance induced proportionally to its length. Thus, the voltage potential between any two points on IAR circumference is always zero.

Because of this, the conductive cylinder does not require any electrical insulation and its one-piece construction eliminates the need for epoxy bonding of wires thus making the IAR armature electrically simple.

4. Efficiency: Inductively coupled shakers enjoy a unique electrical resonance in the 50-100Hz range which greatly reduces the current required and significantly boosting the efficiency.

5. Low armature weight: Elimination of Electrical and cooling water connection to the armature in the hollow cylinder design reduces the weight of the armature significantly.

	INDUCT-A-RING	Conventional Armature Design
Armature Construction	A simple two piece solid metal structure, forged aluminum ring bolted to upper casting	Insulated copper wire is held together with epoxy joints. Armature is epoxy bonded to upper casting
Electrical Connection	Inductively coupled	Fragile 1000 Amp current connection bridging shaker suspension required
Armature Cooling	Air Cooled	Water Cooled
Armature Weight	45 Kg moving element	>57 kg moving element
Rated Acceleration	200 g sine / 600 g shock	100-150 g max sine
Rated Stroke	2 inches pk-pk(51mm) 3 inches pk-pk(76mm)	1.5-2 inches pk-pk max(38-51mm)
Operating temperature	The high temperature area of the cylinder can be operated at 600° F or higher	Operating temperature Is limited to 250°F

Complete range of Electrodynamic Vibration Test Systems with a force rating from 50 to 50,000 lbs, including Power Amplifiers, Shakers, Slip Tables, Long Stroke Thrusters, Vibration controllers, Head expander and Instrumentation will be offered in Rupees or in Foreign Exchange at competitive prices by **Structural Solutions Private Limited**

For further product & application details please contact:

Structural Solutions Private Limited

Bangalore
Sugnana, Ist Floor
9,Ist Main Road, Ganganagar
Bangalore -560 032
Ph: 080-2354 8889
Fax: 080-2354 7505
Email:bangalore@stsols.com

Chennai
Saijothi, A-F1, 1,3rd Street
Satyavathi Nagar
Officer's Colony, Anna nagar West Extn.,
Chennai -600 101
TeleFax 044 - 2654 9409
Email: chennai@stsols.com

Delhi
6478, Sector C, Pocket 6 & 7
Vasant Kunj,New Delhi-110 070
Ph: 011 - 5176 7790
Fax :011- 5176 7791
Email:delhi@stsols.com

Kolkata
51/3B,Karaya Road First Floor
Kolkata Pin-700 019
Ph:033-2247 2993,2283 6735
Fax:033-2283 6734
Email:kolkata@stsols.com

Hyderabad (Head office)
301 & 303 - Eldorado Estate, 3-6-526
Himayath Nagar, Hyderabad-500 029
Ph:040-2763 6433 , 2762 0569
Fax:040 -2763 6435
Email:sales@stsols.com

Pune
Block: II, Office No: 504, fifth Floor,
Lloyds Chambers 409, Mangalwar Peth,
Pune - 411 011.
Cell: 93733 13907, 9370658126, 9370659222
Email :pune@stsols.com

CISQ CERT ISO 9001:2000 Certified Company
Registration No: EA : 34 - 39646

Email: sales@stsols.com, URL: www.stsols.com