



VIBRATION TEST SYSTEMS



Selection Guide

26 ±0.1 26 ±0.1





Vibration Testing Equipment

The System at a glance

As a worldwide supplier of measuring and testing systems for industry and research, TIRA operates from a number of sites and is active in the development and production of advanced equipment (including application-specific software) for simulating environmental conditions, testing the properties of materials, and eliminating undesirable vibrations.

Product range:

- Electrodynamic vibration systems, 9N - 245 kN
- Servohydraulic vibration systems, max. 1,000 kN
- Modal thrusters
- Long stroke systems, max. stroke 600 mm
- linear/digital amplifiers
- Vibration control systems for sine/random/shock/mixed mode
- Slip tables, linear/hydrostatic guided
- Climatic/temperature systems
- Head expanders/special-purpose units
- Calibration systems



TIRA on the Hannover Trade Fair

A variety of applications, all from one source

The **TIRA** group is structured for maximum flexibility and production depth, an effect reinforced by interaction between such product lines as vibration testing and environmental simulation, a company-owned mechanical manufacturing center, and divisions for material testing and balancing equipment. Records have been kept for the last 50 years and include design data, past experience and the latest findings regarding the industry as a whole, all designed to form the best technological standards and reliable performance. Customers can thus expect customized and/or standardized system solutions from one source, and advice from the development, planning and design stages through to assembly, installation, startup and after-sales services.

TIRA equipment has proven its worth in industry and at universities and research institutes worldwide. In order to provide product-specific consulting, assistance and know-how on a global scale, the company works through selected distributors and service partner in over 60 countries.

$$\text{Force (N)} = \text{acceleration (m/s}^2\text{)} \times \text{mass (kg)}^*$$

**General formula for calculation
the force vector of vibration systems**

*Mass = moving element + device under test + fixture, where applicable:
slip table + driver bar + thermobarrier

Vibration Systems



Vibration systems from 9 N (2 lbf) to 440 N (100 lbf)

TIRA products are subject to strict quality assurance procedures designed to meet CE requirements as well as national and international norms. This also applies to our proven testing and measuring systems where feedback from our customers helps us to retain high standards of quality and profitability now and in the future.

Quality management has been certified in terms of DIN ISO 9001 since 1995, and DIN EN ISO 9001:2000 since June 2003.

From **TIRA** use permanent magnets and are available as portable and stationary systems for simulating ambient vibration conditions. Robust construction ensures a long service life, and typical applications include **structure analysis**, sensor **calibration** and testing **smaller subassemblies**. These exciters are characterized by **high lateral and axial stiffness** and come in **lightweight construction** as specified by industrial users.

New rare earth magnets have been added to the range of conventional Alnico magnets, **reducing weight** from 30 kg to 10 kg for **easy handling** particularly in **mobile applications**.

Our vibration generators have proven their worth in environmental labs, universities and industrial production lines both for components and calibration. These complete systems enable testing in accordance with national and international standards such as DIN, ISO, BS, MIL, IEC....

System Shaker Amplifier		TV 50009		TV 50018		TV 51075		TV 51110	
		S 503 BAA 60		S 504 BAA 60		S 511 BAA 120		S 513 BAA 120	
		Metric	American	Metric	American	Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random	9/-	2/-	18/-	4/-	75/40	16/8	100/70	22/15
Frequency range (Hz)		2 - 18000	2 - 18000	2 - 18000	2 - 18000	2 - 7000	2 - 7000	2 - 7000	2 - 7000
Max. rated travel (mm)/(inch)	Pk - Pk	3	0.12	5	0.20	10	0.39	13	0.51
Max. velocity (m/s)/(inch/sec)	Sine/Random	1.5/-	59/-	1.5/-	59/-	1.5/1.5	59/59	1.5/1.5	59/59
Max. acceleration (g)	Sine/Random	60	60	65	65	50/30	50/30	45/30	45/30
Rated current (A)		2.7	2.7	3.8	3.8	5.5	5.5	5.5	5.5
Nominal impedance (Ohm)		4	4	4	4	4	4	4	4
Suspension Stiffness (N/mm) (lbf/inch)		4	22.8	4.4	25.1	6.5	37.1	8	45.7
Effective moving mass (kg)/(lb)		0.015	0.033	0.028	0.062	0.15	0.331	0.23	0.507
Main resonance frequency (Hz)		>16000	>16000	>17000	>17000	>5500	>5500	>6500	>6500
Weight with trunnion (kg)/(lb)		1.9	4.2	4.5	9.9	18	39.7	10	22.0
Armature (ø/mm)/(ø/inch)		7	0.28	7	0.28	40	1.57	60	2.36
Cooling (m ³ /h)/(ft ³ /min)		-	-	-	-	-	-	-	-

System Shaker Amplifier Blower		TV 51120		TV 52110		TV 52120		TV 51144	
		S 514 BAA 500 SB 0080		S 521 BAA 120 -		S 522 BAA 500 SB 0080		S 540 BAA 1000 SB0140	
		Metric	American	Metric	American	Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random	200/140	44/31	100/50	22/11	200/100	44/22	440/311	99/70
Frequency range (Hz)		2 - 7000	2 - 7000	2 - 7000	2 - 7000	2 - 7000	2 - 7000	2 - 6500	2 - 6500
Max. rated travel (mm)/(inch)	Pk - Pk	13	0.5	15 *(25)	0.6	15 *(25)	0.6	25.4	1.0
Max. velocity (m/s)/(inch/sec)	Sine/Random	1.5/1.5	59/59	1.5/1.5	59/59	1.5/1.5	59/59	1.5/1.5	59/59
Max. acceleration (g)	Sine/Random	89/62	89/62	50/25	50/25	100/50	100/50	110/80	110/80
Rated current (A)		11.2	11.2	5.5	5.5	11.2	11.2	8	8
Nominal impedance (Ohm)		4	4	4	4	4	4	4	4
Suspension Stiffness (N/mm) (lbf/inch)		8	45.7	5	28.6	5	28.6	5	28.6
Effective moving mass (kg)/(lb)		0.23	0.51	0.2	0.44	0.2	0.44	0.4	0.88
Max. weight tested (kg)/(lb)		3.0	6.6	3.0	6.6	3.0	6.6	6.0	13.2
Main resonance frequency (Hz)		>6500	>6500	>5700	>5700	>5700	>5700	> 5500	> 5500
Weight with trunnion (kg)/(lb)		10	22.0	30	66.1	30	66.1	21	46.3
Armature (ø/mm)/(ø/inch)		60	2.36	60	2.36	60	2.36	60	2.36
Cooling (m ³ /h)/(ft ³ /min)		40	24	-	-	40	24	60	35

* Increased displacements available on request



Vibration Systems

Vibration systems from 650 N (146 lbf) to 1600 N (360 lbf)

TIRA vibration generators reproduce ambient conditions for studies of endurance and reliability in all fields of vibration testing.

Designed for **long-time operation**, they are characterized by **high cross axial stiffness**. The electrodynamic generator is supported in a rugged revolving frame for excitation in vertical or horizontal direction.

Nominal displacement is automatically achieved by **pneumatic load compensation** even for heavy test loads. As a standard feature, the frame is provided with vibration isolators which minimize vibration transfer to the floor so that in most cases no extra foundation is needed. The generator is cooled by a maintenance-free fan, with cooling air entering through a filter assembly.



TIRA vibration generators, amplifiers and vibration control systems form complete test systems to document product quality in conformity with international standards (such as DIN, ISO, BS, MIL, IEC, ASTM).

System Shaker Amplifier Blower		TV 50101 TV 50100 BAA 1000-E SB0140		TV 50101/LS TV 50100/LS BAA 1000-E SB0140		TV 5220 TV 5200 BAA 1000-E SB 0140	
		Metric	American	Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock	650/420/840	146/94/189	650/420/840	146/94/189	1000/650/1300	225/146/292
Frequency range (Hz)		DC - 7000	DC - 7000	DC - 7000	DC - 7000	DC - 7000	DC - 7000
Max. rated travel (mm)/(inch)	Pk - Pk	25.4	1.0	50.8	2.0	25.4	1.0
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock	1.5/1.5/2.0	59/59/79	1.5/1.5/2.0	59/59/79	1.5/1.5/2.0	59/59/79
Max. acceleration (g)	Sine/Random/Shock	51/33/65	51/33/65	42/27/54	42/27/54	73/47/95	73/47/95
Rated current (A)		18	18	18	18	18	18
Nominal impedance (Ohm)		4	4	4	4	4	4
Suspension Stiffness (N/mm) (lbf/inch)		22	125.6	-	-	22	125.6
Effective moving mass (kg)/(lb)		1.3	2.9	1.6	3.5	1.4	3.1
Max. weight tested (kg)/(lb)		25	55.1	25	55.1	25	55.1
Main resonance frequency (Hz)		>4800	>4800	>4700	>4700	>5000	>5000
Weight with trunnion (kg)/(lb)		80	176.4	80	176.4	80	176.4
Stray magnetic field (mT)	without/with degauss kit	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5
Armature (ø/mm)/(ø/inch)		80	3.15	80	3.15	120	4.72
Cooling (m ³ /h)/(ft ³ /min)		80	47	80	47	80	47
Interlocks		Temperature Overtravel Airflow		Temperature Overtravel Airflow		Temperature Overtravel Airflow	

System Shaker Amplifier Blower		TV 5220/LS TV 5200/LS BAA 1000-E SB 0140		TV 54216 TV 54216 BAA 1000-E SB 0140		TV 54216/LS TV 54216/LS BAA 1000-E SB 0140	
		Metric	American	Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock	1000/650/1300	225/146/292	1600/1000/2000	360/225/450	1600/1000/2000	360/225/450
Frequency range (Hz)		DC - 7000	DC - 7000	DC - 4000	DC - 4000	DC - 4000	DC - 4000
Max. rated travel (mm)/(inch)	Pk - Pk	50.8	2.0	25.4	1.0	50.8	2.0
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock	1.5/1.5/2.0	59/59/79	1.5/1.5/2.0	59/59/79	1.5/1.5/2.0	59/59/79
Max. acceleration (g)	Sine/Random/Shock	60/39/79	60/39/79	82/52/103	82/52/103	72/60/90	72/60/90
Rated current (A)		18	18	18	18	18	18
Nominal impedance (Ohm)		4	4	4	4	4	4
Suspension Stiffness (N/mm) (lbf/inch)		-	-	22	125.6	-	-
Effective moving mass (kg)/(lb)		1.7	3.7	2	4.4	2.3	5.1
Max. weight tested (kg)/(lb)		25	55.1	25	55.1	25	55.1
Main resonance frequency (Hz)		>5000	>5000	>3500	>3500	>3000	>3000
Weight with trunnion (kg)/(lb)		80	176.4	135	297.6	135	297.6
Stray magnetic field (mT)	without/with degauss kit	<8.5/<0.5	<8.5/<0.5	<8.5/<1	<8.5/<1	<8.5/<1	<8.5/<1
Armature (ø/mm)/(ø/inch)		120	4.72	130	5.12	130	5.12
Cooling (m ³ /h)/(ft ³ /min)		80	47	80	47	80	47
Interlocks		Temperature Overtravel Airflow		Temperature Overtravel Airflow		Temperature Overtravel Airflow	

Vibration systems from 2 kN (450 lbf) to 2.7 kN (610 lbf)

TIRA vibration generators, amplifiers and vibration control systems form complete test systems to document product quality in conformity with international standards (such as DIN, ISO, BS, MIL, IEC, ASTM).



System		TV 50303		TV 50303/LS	
		TV 50300		TV 50300/LS	
Shaker		BAA 2000-E		BAA 2000-E	
Amplifier		SB 0200		SB 0200	
Blower					
		Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock	2000/1000/2000	450/225/450	2000/1000/2000	450/225/450
Frequency range (Hz)		DC - 4000	DC - 4000	DC - 4000	DC - 4000
Max. rated travel (mm)/(inch)	Pk - Pk	25.4	1.0	50.8	2.0
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock	1.5/1.5/2.0	59/59/79	1.5/1.5/2.0	59/59/79
Max. acceleration (g)	Sine/Random/Shock	82/41/82	82/41/82	73/39/73	73/39/73
Rated current (A)		18	18	18	18
Nominal impedance (Ohm)		4	4	4	4
Suspension Stiffness (N/mm) (lbf/inch)		22	125.6	-	-
Effective moving mass (kg)/(lb)		2.5	5.5	2.8	6.2
Max. weight tested (kg)/(lb)		35	77.2	35	77.2
Main resonance frequency (Hz)		>4000	>4000	>3700	>3700
Weight with trunnion (kg)/(lb)		270	595.2	270	595.2
Stray magnetic field (mT)	without/with degauss kit	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5
Armature (ø/mm)/(ø/inch)		120	4.72	120	4.72
Cooling (m ³ /h)/(ft ³ /min)		100	59	100	59
Interlocks		Temperature Overtravel Airflow		Temperature Overtravel Airflow	

System		TV 50350		TV 50350/LS	
		TV 50301		TV 50301/LS	
Shaker		A 51260		A 51260	
Amplifier		SB 0310		SB 0310	
Blower					
		Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock	2700/2000/4000	607/450/899	2700/2000/4000	607/450/899
Frequency range (Hz)		DC - 4000	DC - 4000	DC - 4000	DC - 4000
Max. rated travel (mm)/(inch)	Pk - Pk	25.4	1.0	50.8	2.0
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock	1.5/1.5/2.5	59/59/98	1.5/1.5/2.5	59/59/98
Max. acceleration (g)	Sine/Random/Shock	110/110/163	110/110/163	98/74/148	98/74/148
Rated current (A)		36	36	36	36
Nominal impedance (Ohm)		2	2	2	2
Suspension Stiffness (N/mm) (lbf/inch)		22	125.6	-	-
Effective moving mass (kg)/(lb)		2.5	5.5	2.8	6.2
Max. weight tested (kg)/(lb)		35	77.2	35	77.2
Main resonance frequency (Hz)		>4000	>4000	>3700	>3700
Weight with trunnion (kg)/(lb)		270	595.2	270	595.2
Stray magnetic field (mT)	without/with degauss kit	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5
Armature (ø/mm)/(ø/inch)		120	4.72	120	4.72
Cooling (m ³ /h)/(ft ³ /min)		200	118	200	118
Interlocks		Temperature Overtravel Airflow		Temperature Overtravel Airflow	



Vibration Systems

Vibration systems from 4 kN (900 lbf) to 8 kN (1800 lbf)

TIRA vibration generators reproduce ambient conditions for studies of endurance and reliability in all fields of vibration testing. Designed for **long-time operation**, they are characterized by high cross axial stiffness. The electrodynamic generator is supported in a rugged revolving frame for **excitation in vertical or horizontal** direction. **Nominal displacement** is automatically achieved by **pneumatic load compensation** even for heavy test loads. As a standard feature, the frame has vibration isolators which minimize vibration transfer to the floor so that in most cases no extra foundation is needed. The generator is cooled by a maintenance-free fan, with cooling air entering through a filter assembly. **TIRA** vibration generators, amplifiers and vibration control systems form a complete test system to document product quality in conformity with international standards (such as DIN, ISO, BS, MIL, IEC, ASTM).



System Shaker Amplifier Blower	TV 5550/LS TV 5500/LS A 51312 SB 0310		TV 56263/LS S 561/LS A 52312 SD 9		TV 56263/LS-340 S 561/LS-340 A 52312 SD 9	
	Metric	American	Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random 4000/4000/8000	899/899/1798	6300/6300/12600	1416/1416/2833	6300/6300/12600	1416/1416/2833
Frequency range (Hz)	DC - 3000	DC - 3000	DC - 3000	DC - 3000	DC - 3000	DC - 3000
Max. rated travel (mm)/(inch)	Pk - Pk 50.8	2.0	50.8	2.0	50.8	2.0
Max. velocity (m/s)/(inch/sec)	Sine/Random 1.7/1.7/2.0	67/67/79	1.7/1.7/2.5	67/67/98	1.7/1.7/2.5	67/67/98
Max. acceleration (g)	Sine/Random 54/54/108	54/54/108	81/81/161	81/81/161	75/75/151	75/75/151
Rated current (A)	90	90	90	90	90	90
Nominal impedance (Ohm)	0.9	0.9	0.5	0.5	0.5	0.5
Suspension Stiffness (N/mm) (lbf/inch)	50	285.5	50	285.5	50	285.5
Effective moving mass (kg)/(lb)	7.5	16.5	8	17.6	8.5	18.7
Max. weight tested (kg)/(lb)	100	220.5	150	330.7	150	330.7
Main resonance frequency (Hz)	>3000	>3000	>3000	>3000	>2700	>2700
Weight with trunnion (kg)/(lb)	750	1653.5	1000	2204.6	1000	2204.6
Stray magnetic field (mT)	without/with degauss kit <8.5/<0.5	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5
Armature (ø/mm)/(ø/inch)	180	7.09	180	7.09	340	13.39
Cooling (m³/h)/(ft³/min)	200	118	500	294	500	294
Interlocks	Temperature Overtravel Airflow		Temperature Overtravel Airflow		Temperature Overtravel Airflow	

System Shaker Amplifier Blower	TV 56280/LS TV 56280/LS A 52318 SD 9		TV 56280/LS-340 TV 56280/LS-340 A 52318 SD 9	
	Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock 8000/8000/16000	1798/1798/3597	8000/8000/16000	1798/1798/3597
Frequency range (Hz)	DC - 3000	DC - 3000	DC - 3000	DC - 3000
Max. rated travel (mm)/(inch)	Pk - Pk 50.8	2.0	50.8	2.0
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock 1.7/1.7/2.5	67/67/98	1.7/1.7/2.5	67/67/98
Max. acceleration (g)	Sine/Random/Shock 93/93/186	93/93/186	88/88/175	88/88/175
Rated current (A)	140	140	140	140
Nominal impedance (Ohm)	0.5	0.5	0.5	0.5
Suspension Stiffness (N/mm) (lbf/inch)	50	285.5	50	285.5
Effective moving mass (kg)/(lb)	8.8	19.4	9.3	20.5
Max. weight tested (kg)/(lb)	150	330.7	150	330.7
Main resonance frequency (Hz)	>3000	>3000	>3000	>3000
Weight with trunnion (kg)/(lb)	1000	2204.6	1000	2204.6
Stray magnetic field (mT)	without/with degauss kit <8.5/<0.5	<8.5/<0.5	<8.5/<0.5	<8.5/<0.5
Armature (ø/mm)/(ø/inch)	180	7.09	340	13.39
Cooling (m³/h)/(ft³/min)	500	294	500	294
Interlocks	Temperature Overtravel Airflow		Temperature Overtravel Airflow	

Vibration systems from 11 kN (2500 lbf) to 15 kN (3350 lbf)

TIRA vibration generators reproduce ambient conditions for studies of endurance and reliability in all fields of vibration testing. Sine/random/mixed mode and shock tests are simulated in a lab, using complete systems which are indispensable for **quality assurance, research and development**. Designed for **long-time operation**, the generators are characterized by **high cross axial stiffness**. Electrodynamic generators are supported in a rugged construction with a maximum of stability and are rotatable for horizontal or vertical operation. **Nominal displacement** is automatically achieved **by pneumatic load compensation** even for heavy test loads. Vibration transfer to the floor can be reduced by a **swivel-frame (RIT)** which

has vibration isolators as a standard feature. The generator is cooled by a maintenance-free fan, with cooling air entering through a filter assembly.

System Shaker Amplifier Blower	TV 51010/LS TV 51000/LS A 53318 SD 120		TV 51010/LS-340 TV 51000/LS-340 A 53318 SD 120	
	Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random 11000/11000/22000	2473/2473/4946	11000/11000/22000	2473/2473/4946
Frequency range (Hz)	DC - 3000	DC - 3000	DC - 3000	DC - 3000
Max. rated travel (mm)/(inch)	Pk - Pk 50.8	2.0	50.8	2.0
Max. velocity (m/s)/(inch/sec)	Sine/Random 1.8/1.8/2.5	71/71/98	1.8/1.8/2.5	71/71/98
Max. acceleration (g)	Sine/Random 102/102/204	102/102/204	90/90/179	90/90/179
Rated current (A)	140	140	140	140
Nominal impedance (Ohm)	0.5	0.5	0.5	0.5
Suspension Stiffness (N/mm) (lbf/inch)	75	428.3	75	428.3
Effective moving mass (kg)/(lb)	11	24.3	12.5	27.6
Max. weight tested (kg)/(lb)	150	330.7	150	330.7
Main resonance frequency (Hz)	>2500	>2500	>2500	>2500
Weight with trunnion (kg)/(lb)	1450	3196.7	1450	3196.7
Stray magnetic field (mT)	without/with degauss kit <8.5/<1	<8.5/<1	<8.5/<1	<8.5/<1
Armature (ø/mm)/(ø/inch)	220	8.66	340	13.39
Cooling (m ³ /h)/(ft ³ /min)	500	294	500	294
Interlocks	Temperature Overtravel Airflow		Temperature Overtravel Airflow	

System Shaker Amplifier Blower	TV 57315/LS S 572/LS A 53330 SD 120		TV 57315/LS-340 S 572/LS-340 A 53330 SD 120	
	Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock 15000/15000/30000	3372/3372/6744	15000/15000/30000	3372/3372/6744
Frequency range (Hz)	DC - 3000	DC - 3000	DC - 3000	DC - 3000
Max. rated travel (mm)/(inch)	Pk - Pk 50.8	2.0	50.8	2.0
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock 1.8/1.8/2.5	71/71/98	1.8/1.8/2.5	71/71/98
Max. acceleration (g)	Sine/Random/Shock 117/117/235	117/117/235	102/102/204	102/102/204
Rated current (A)	230	230	230	230
Nominal impedance (Ohm)	0.5	0.5	0.5	0.5
Suspension Stiffness (N/mm) (lbf/inch)	75	428.3	75	428.3
Effective moving mass (kg)/(lb)	13	28.7	15	33.1
Max. weight tested (kg)/(lb)	250	551.2	250	551.2
Main resonance frequency (Hz)	>2500	>2500	>2500	>2500
Weight with trunnion (kg)/(lb)	1450	3196.7	1450	3196.7
Stray magnetic field (mT)	without/with degauss kit <20/<1	<20/<1	<20/<1	<20/<1
Armature (ø/mm)/(ø/inch)	220	8.66	340	13.39
Cooling (m ³ /h)/(ft ³ /min)	510	300	510	300
Interlocks	Temperature Overtravel Airflow		Temperature Overtravel Airflow	



Vibration system 20 kN (4500 lbf)

TIRA vibration generators reproduce ambient conditions for studies of endurance and reliability in all fields of vibration testing. Sine/random/mixed mode and shock tests are simulated in a lab, using complete systems which are indispensable for **quality assurance, research and development**. Designed for **long-time operation**, the generators are characterized by **high cross axial stiffness**. Electrodynamic generators are supported in a rugged construction with a maximum of stability and are rotatable for horizontal or vertical operation. Built-in **pneumatic load compensation** ensures that nominal displacement is automatically achieved even for heavy test loads. Vibration transfer to the floor can be reduced with a **swivel-frame (RIT)** which has vibration isolators as a standard feature. The generator is cooled by a maintenance-free fan, with cooling air entering through a filter assembly.

TIRA's "AIT" system - built into the frame - **provides integrated vibration isolation** for vertical and horizontal body operation. The AIT system ensures optimal vibration isolation at low frequencies and precisely guides the generator body in the direction of excitation. **Low Base "LB"** generators are available with vibration dampers or rail systems for better mobility.

TIRA vibration generators, amplifiers and vibration control systems form a complete test system to document product quality in conformity with international standards (such as DIN, ISO, BS, MIL, IEC, ASTM).



System	TV 59320/*-340		TV 59320/*-440		TV 59320/*-640	
	S595/*-340 A 54324 RD 8		S595/*-440 A 54324 RD 8		S595/*-640 A 54324 RD 8	
Shaker	Metric	American	Metric	American	Metric	American
Rated peak force (N)/(lbf)	20000/20000/40000		20000/20000/40000		20000/20000/40000	
Frequency range (Hz)	DC - 3000		DC - 3000		DC - 2000	
Max. rated travel (mm)/(inch)	50.8		50.8		50.8	
Max. velocity (m/s)/(inch/sec)	1.8/1.8/2.5		1.8/1.8/2.5		1.8/1.8/2.5	
Max. acceleration (g)	82/82/163		73/73/146		50/50/101	
Rated current (A)	200		200		200	
Nominal impedance (Ohm)	0.3		0.3		0.3	
Suspension Stiffness (N/mm) (lbf/inch)	150		150		150	
Effective moving mass (kg)/(lb)	25.0		28.0		40.5	
Max. weight tested (kg)/(lb)	410		410		410	
Main resonance frequency (Hz)	>2400		>2400		>2000	
Weight with trunnion (kg)/(lb)	2350/2500/2100		2350/2500/2100		2350/2500/2100	
Stray magnetic field (mT)	<20/<1		<20/<1		<20/<1	
Armature (ø/mm)/(ø/inch)	340		440		640	
Cooling (m³/h)/(ft³/min)	510		510		510	
Interlocks	Temperature Overtravel Airflow		Temperature Overtravel Airflow		Temperature Overtravel Airflow	

Vibration system 26.7 kN (6000 lbf)

TIRA vibration generators reproduce ambient conditions for studies of endurance and reliability in all fields of vibration testing. Sine/random/mixed mode and shock tests are simulated in a lab, using complete systems which are indispensable for **quality assurance, research and development**. Designed for **long-time operation**, the generators are characterized by **high cross axial stiffness**. Electrodynamic generators are supported in a rugged construction with a maximum of stability and are rotatable for horizontal or vertical operation. Built-in **pneumatic load compensation** ensures that nominal displacement is automatically

achieved even for heavy test loads. Vibration transfer to the floor can be reduced with a **swivel-frame (RIT)** which has vibration isolators as a standard feature. The generator is cooled by a maintenance-free fan, with cooling air entering through a filter assembly.

TIRA's "AIT" system - built into the frame - **provides integrated vibration isolation** for vertical and horizontal body operation. The AIT system ensures optimal vibration isolation at low frequencies and precisely guides the generator body in the direction of excitation. **Low Base "LB"** generators are available with vibration dampers or rail systems for better mobility.

TIRA vibration generators, amplifiers and vibration control systems form a complete test system to document product quality in conformity with international standards (such as DIN, ISO, BS, MIL, IEC, ASTM).



System Shaker Amplifier Blower	TV 59327/*-340		TV 59327/*-440		TV 59327/*-640	
	S596/*-640 A 54336 HRD 7/FU/11		S596/*-640 A 54336 HRD 7/FU/11		S596/*-640 A 54336 HRD 7/FU/11	
	Metric	American	Metric	American	Metric	American
Rated peak force (N)/(lbf)	26700/26700/53400 6002/6002/12005		26700/26700/53400 6002/6002/12005		26700/26700/53400 6002/6002/12005	
Frequency range (Hz)	DC - 3000 DC - 3000		DC - 3000 DC - 3000		DC - 2000 DC - 2000	
Max. rated travel (mm)/(inch)	50.8 2.0		50.8 2.0		50.8 2.0	
Max. velocity (m/s)/(inch/sec)	1.8/1.8/2.5 71/71/98		1.8/1.8/2.5 71/71/98		1.8/1.8/2.5 71/71/98	
Max. acceleration (g)	84/84/167 84/84/167		79/79/158 79/79/158		66/66/131 66/66/131	
Rated current (A)	330 330		330 330		330 330	
Nominal impedance (Ohm)	0.3 0.3		0.3 0.3		0.3 0.3	
Suspension Stiffness (N/mm) (lbf/inch)	150 856.5		150 856.5		150 856.5	
Effective moving mass (kg)/(lb)	32.5 71.7		34.5 76.1		41.5 91.5	
Max. weight tested (kg)/(lb)	610 1345		610 1345		610 1345	
Main resonance frequency (Hz)	>2400 >2400		>2400 >2400		>2000 >2000	
Weight with trunnion (kg)/(lb)	2650/2880/2300 5842/6349/5071		2650/2880/2300 5842/6349/5071		2650/2880/2300 5842/6349/5071	
Stray magnetic field (mT)	without/with degauss kit <20/<1 <20/<1		<20/<1 <20/<1		<20/<1 <20/<1	
Armature (ø/mm)/(ø/inch)	340 13.4		440 17.3		640 25.2	
Cooling (m³/h)/(ft³/min)	1560 918		1560 918		1560 918	
Interlocks	Temperature Overtravel Airflow		Temperature Overtravel Airflow		Temperature Overtravel Airflow	



Vibration Systems

Vibration system 35 kN (6000 lbf)

TIRA vibration generators reproduce ambient conditions for studies of endurance and reliability in all fields of vibration testing. Sine/random/mixed mode and shock tests are simulated in a lab, using complete systems which are vital for **quality assurance, research and development**. Designed for **long-time operation**, the generators are characterized by high cross axial stiffness. Electrodynamic generators are supported in a rugged construction with a maximum of stability and are rotatable for horizontal or vertical operation. Built-in **pneumatic load compensation** ensures that **nominal displacement** is automatically achieved even for heavy test loads. Vibration transfer to the floor can be reduced with a **swivel-frame (RIT)** which has vibration isolators as a standard feature. The generator is cooled by a maintenance-free fan, with cooling air entering through a filter assembly.



TIRA's "AIT" system - built into the frame - provides **integrated vibration isolation** for vertical and horizontal body operation. The AIT system ensures optimal vibration isolation at low frequencies and precisely guides the generator body in the direction of excitation. **Low Base "LB"** generators are available with vibration dampers or rail systems for better mobility.

TIRA vibration generators, amplifiers and vibration control systems form a complete test system to document product quality in conformity with international standards (such as DIN, ISO, BS, MIL, IEC, ASTM).

System	TV 59335/*-340		TV 59335/*-440		TV 59335/*-640	
	S597/*-640 A 54342 HRD 7/FU/11		S597/*-640 A 54342 HRD 7/FU/11		S597/*-640 A 54342 HRD 7/FU/11	
Shaker	Metric	American	Metric	American	Metric	American
Rated peak force (N)/(lbf)	35000/35000/70000	7868/7868/15737	35000/35000/70000	7868/7868/15737	35000/35000/70000	7868/7868/15737
Frequency range (Hz)	DC - 3000	DC - 3000	DC - 3000	DC - 3000	DC - 2000	DC - 2000
Max. rated travel (mm)/(inch)	50.8	2.0	50.8	2.0	50.8	2.0
Max. velocity (m/s)/(inch/sec)	1.8/1.8/2.5	71/71/98	1.8/1.8/2.5	71/71/98	1.8/1.8/2.5	71/71/98
Max. acceleration (g)	110/110/220	110/110/220	104/104/207	104/104/207	86/86/172	86/86/172
Rated current (A)	385	385	385	385	385	385
Nominal impedance (Ohm)	0.3	0.3	0.3	0.3	0.3	0.3
Suspension Stiffness (N/mm) (lbf/inch)	150	856.5	150	856.5	150	856.5
Effective moving mass (kg)/(lb)	32.5	71.7	34.5	76.1	41.5	91.5
Max. weight tested (kg)/(lb)	610	1345	610	1345	610	1345
Main resonance frequency (Hz)	>2400	>2400	>2400	>2400	>2000	>2000
Weight with trunnion (kg)/(lb)	RIT/AIT/LB 2650/2880/2300	5842/6349/5071	2650/2880/2300	5842/6349/5071	2650/2880/2300	5842/6349/5071
Stray magnetic field (mT)	without/with degauss kit <20/<1	<20/<1	<20/<1	<20/<1	<20/<1	<20/<1
Armature (ø/mm)/(ø/inch)	340	13.4	440	17.3	640	25.2
Cooling (m³/h)/(ft³/min)	1560	918	1560	918	1560	918
Interlocks	Temperature Overtravel Airflow		Temperature Overtravel Airflow		Temperature Overtravel Airflow	

Vibration Systems

Vibration system 50 kN (11128 lbf)

TIRA vibration generators reproduce ambient conditions for studies of endurance and reliability in all fields of vibration testing. Sine/random/mixed mode and shock tests are simulated in a lab, using complete systems which are vital for **quality assurance, research and development**. Designed for long-time operation, the generators are characterized by high cross axial stiffness and. Electrodynamic generators come in rugged con-

struction with a maximum of stability and are rotatable for horizontal or vertical operation. Built-in **pneumatic load compensation** ensures that **nominal displacement** is automatically achieved even for heavy test loads.

TIRA's "AIT" system - built into the frame - provides **integrated vibration isolation** for vertical and horizontal body operation. The **"AIT"** system ensures optimal vibration isolation at low frequencies and precisely guides the generator body in the direction of excitation. **Low Base "LB"** generators are available with vibration dampers or rail systems for better mobility.

TIRA vibration generators, amplifiers and vibration control systems form a complete test system to document product quality in conformity with international standards (such as DIN, ISO, BS, MIL, IEC, ASTM). The generator is cooled by a maintenance-free fan, with cooling air entering through a filter assembly.



System		TV 59349/*-440		TV 59349/*-640	
Shaker		S598/*-440		S598/*-640	
Amplifier		A54370		A54370	
Blower		HRD 7/FU/20		HRD 7/FU/20	
		Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock	49500/49500/99000	11128/11128/22256	49500/49500/99000	11128/11128/22256
Frequency range (Hz)		DC - 3000	DC - 3000	DC - 2000	DC - 2000
Max. rated travel (mm)/(inch)	Pk - Pk	50.8	2.0	50.8	2.0
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock	1.8/1.8/2.5	71/71/98	1.8/1.8/2.5	71/71/98
Max. acceleration (g)	Sine/Random/Shock	112/112/224	112/112/224	93/93/187	93/93/187
Rated current (A)		420	420	420	420
Nominal impedance (Ohm)		0.3	0.3	0.3	0.3
Suspension Stiffness (N/mm) (lbf/inch)		150	856.5	150	856.5
Effective moving mass (kg)/(lb)		45.0	99.2	54.0	119.0
Max. weight tested (kg)/(lb)		910	2006	910	2006
Main resonance frequency (Hz)		>2100	>2100	>2000	>2000
Weight with trunnion (kg)/(lb)	AIT/LB	4500/3500	9921/7716	4500/3500	9921/7716
Stray magnetic field (mT)	without/with degauss kit	<20/<1	<20/<1	<20/<1	<20/<1
Armature (ø/mm)/(ø/inch)		440	17.3	640	25.2
Cooling (m³/h)/(ft³/min)		4200	2472	4200	2472
Interlocks		Temperature Overtravel Airflow		Temperature Overtravel Airflow	



Modal Thrusters

Modal thrusters from 75 N (17 lbf) to 2,7 kN (607 lbf)



These exciters are specifically designed for **modal and structure analysis**. Modal thrusters up to 75 N are excited by permanent magnets, with **light-weight** rare earth magnets provided for mobile use. These thrusters are characterized by **high cross axial stiffness**. From 1,600 N onwards, modal thrusters permit a max. displacement of 50.8 mm due to **TMC control**. TMC is an **electronic armature position control system** for precisely coupling the modal thruster to the specimen. The armature datum adjustment allows the operator to offset the nominal position of the armature in relation to the body. A preload can easily be set. The axial stiffness can also be adjusted electronically.

A standard feature on all modal generators is a swivel-frame. This allows a great variety of coupling options.

System	TV 51075-M		TV 54216-M		
	S 511-M		TV 54216-M		
Shaker	BAA 120		BAA 1000-ET		
Amplifier	-		SB0140		
Blower	-		-		
		Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random	75/40	20/10	1600/1000	360/220
Frequency range (Hz)		DC - 5000	DC - 5000	DC - 4000	DC - 4000
Max. rated travel (mm)/(inch)	Pk - Pk	10	0.4	50.8	2.0
Max. velocity (m/s)/(inch/sec)	Sine/Random	1.5/1.5	59/59	1.5/1.5	59/59
Max. acceleration (g)	Sine/Random	60/35	60/35	85/55	85/55
Rated current (A)		5.5	5.5	18	18
Suspension Stiffness (N/mm) (lbf/inch)		3	17.1	**	**
Effective moving mass (kg)/(lb)		0.125	0.28	1.9	4.2
Armature (ø/mm)/(ø/inch)		M6	M6	M8	M8
Main resonance frequency (Hz)		>5000	>5000	>3000	>3000
Weight with trunnion (kg)/(lb)		18	39.7	135	297.6
Cooling (m ³ /h)/(ft ³ /min)		-	-	80	47

System	TV 50303-M		TV 50350-M		
	TV 50300-M		TV 50301-M		
Shaker	BAA 2000-ET		A 51260		
Amplifier	SB 0200		SB 0310		
Blower	-		-		
		Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random	2000/1000/2000	450/220/450	2700/2000/4000	610/450/900
Frequency range (Hz)		DC - 3000	DC - 3000	DC - 3000	DC - 3000
Max. rated travel (mm)/(inch)	Pk - Pk	50.8	2.0	50.8	2.0
Max. velocity (m/s)/(inch/sec)	Sine/Random	1.5/1.5	59/59	1.5/1.5	59/59
Max. acceleration (g)	Sine/Random	95/45	95/45	120/90	120/90
Rated current (A)		18	18	36	36
Suspension Stiffness (N/mm) (lbf/inch)		**	**	**	**
Effective moving mass (kg)/(lb)		2.2	4.9	2.3	5.1
Armature (ø/mm)/(ø/inch)		M8	M8	M8	M8
Main resonance frequency (Hz)		>3000	>3000	>3000	>3000
Weight with trunnion (kg)/(lb)		270	595.2	270	595.2
Cooling (m ³ /h)/(ft ³ /min)		100	59	200	118

* Electronic 0 - point regulation with adjustable stiffness

Modal thrusters from 4 kN 900 lbf) to 15 kN (3370 lbf)



Specially to meet the requirements for **modal** and **structure analysis**, **TIRA** offer a range of modal thrusters from 4 kN up to 15 kN. These generators are characterized by **high cross axial stiffness** and permit a max. displacement of up to 102 mm (pk-pk) due to **TMC control**.

TMC is an **electronic armature position control system** for precisely coupling the modal generator to the specimen. The armature datum adjustment allows the operator to offset the nominal position of the armature in relation to the body A preload can easily be set. The axial stiffness can also be adjusted electronically.

The power amplifier can be run in **current- or voltage mode**.

A standard feature on all modal generators is a **svifel-frame**. This allows a great variety of coupling options.

System Shaker Amplifier Blower		TV 5550-M/LSS TV 5550-M/LSS A 52324 SB 0310		TV 56263-M/LSS S561-M/LSS A 52324 SD 9		TV 56280-M/LSS TV 56280-M/LSS A 52330 SD 9	
		Metric	American	Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock	4000/4000/8000	900/900/1800	6300/6300/12600	1420/1420/2830	8000/8000/8000	1800/1800/1800
Frequency range (Hz)		DC - 2000	DC - 2000	DC - 3000	DC - 3000	DC - 3000	DC - 3000
Max. rated travel (mm)/(inch)	Pk - Pk	102	4.0	102	4.0	102	4.0
	Overtravel	107	4.21	107	4.21	107	4.21
	Mechanical stop	112	4.41	112	4.41	112	4.41
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock	3.0/3.0/4.5	118/118/177	3.0/3.0/4.5	118/118/177	3.0/3.0/4.5	118/118/177
Max. acceleration (g)	Sine/Random/Shock	37/37/74	37/37/74	54/54/107	54/54/107	68/68/136	68/68/136
Rated current (A)		220	220	220	220	275	275
Suspension Stiffness (N/mm) (lbf/inch)		**	**	**	**	**	**
Effective moving mass (kg)/(lb)		11.0	24.3	12.0	26.5	12.0	26.5
Main resonance frequency (Hz)		>2500	>2500	>2500	>2500	>2500	>2500
Weight with trunnion (kg)/(lb)		750	1653	1000	2205	1000	2205
Armature (a/mm)/(a/inch)		M10	M10	M10	M10	M10	M10
Cooling (m ³ /h)/(ft ³ /min)		280	165	500	294	500	294

System Shaker Amplifier Blower		TV 51010-M/LSS TV 51000-M/LSS A 53330 SD 120		TV 57315-M/LSS S572-M/LSS A 53342 SD 120	
		Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock	11000/11000/22000	2470/2470/4950	15000/15000/15000	3370/3370/3370
Frequency range (Hz)		DC - 2000	DC - 2000	DC - 2000	DC - 2000
Max. rated travel (mm)/(inch)	Pk - Pk	102	4.0	102	4.0
	Overtravel	107	4.21	107	4.21
	Mechanical stop	112	4.41	112	4.41
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock	3.0/3.0/4.5	118/118/177	3.0/3.0/4.5	118/118/177
Max. acceleration (g)	Sine/Random/Shock	80/80/160	80/80/160	85/85/170	85/85/170
Rated current (A)		275	275	385	385
Suspension Stiffness (N/mm) (lbf/inch)		**	**	**	**
Effective moving mass (kg)/(lb)		14.0	30.9	18.0	39.7
Main resonance frequency (Hz)		>2500	>2500	>2500	>2500
Weight with trunnion (kg)/(lb)		1450	3197	1450	3197
Armature (a/mm)/(a/inch)		M10	M10	M10	M10
Cooling (m ³ /h)/(ft ³ /min)		500	294	500	294

** Electronic 0 - pointregulation with adjustable stiffness



Inertial systems from 100 N (30 lbf) to 650 N (150 lbf)



TIRA produce inertial systems (IN) in the range from 100 N to 650 N, which can be bolt directly to the structure on and aligned at any angle within 360°. The generators have an **excellent lateral and axial stiffness**. Excitation is made by permanent magnets, and a special spring system provides optimal guidance so that the full body mass can impact on the structure.

The generator is cooled by a maintenance-free fan, with cooling air entering through a filter assembly. As inertial generators from **TIRA** can efficiently apply dynamic forces to large structures, they have found their applications in common production, aerospace, buildings, civil engineering and shipbuilding.

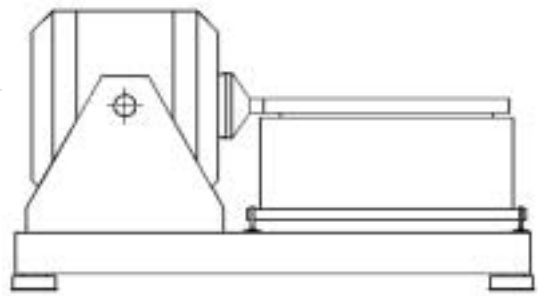
System		TV 51112-IN		TV 51125-IN	
		S 512-IN		S 515-IN	
Shaker		BAA 120		BAA 500	
Amplifier		-		SB 0080	
Blower					
		Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random	125/70	30/20	250/150	60/30
Frequency range (Hz)		DC - 2000	DC - 2000	DC - 2000	DC - 2000
Max. rated travel (mm)/(inch)	Pk - Pk	9	0.4	9	0.4
Max. velocity (m/s)/(inch/sec)	Sine/Random	1.5/1.5	59/59	1.5/1.5	59/59
Max. acceleration (g)	Sine/Random	0.98/0.54	0.98/0.54	2/1.2	2/1.2
Rated current (A)		11	11	11	11
Suspension Stiffness (N/mm) (lbf/inch)		20	114.2	20	114.2
Effective moving mass (kg)/(lb)		0.35	0.8	0.35	0.8
Armature (ø/mm)/(ø/inch)		M12	M12	M12	M12
Weight with trunnion (kg)/(lb)		13	28.7	13	28.7
Cooling (m ³ /h)/(ft ³ /min)		-	-	40	24

System		TV 51144-IN		TV 51165-IN	
		S 516-IN		S 517-IN	
Shaker		BAA 1000		BAA 1000	
Amplifier		SB0140		SB0140	
Blower					
		Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random	440/311	100/70	650/420	150/90
Frequency range (Hz)		DC - 2000	DC - 2000	DC - 2000	DC - 2000
Max. rated travel (mm)/(inch)	Pk - Pk	9	0.4	9	0.4
Max. velocity (m/s)/(inch/sec)	Sine/Random	1.5/1.5	59/59	1.5/1.5	59/59
Max. acceleration (g)	Sine/Random	2.8/2	2.8/2	2.8/1.8	2.8/1.8
Rated current (A)		18	18	18	18
Suspension Stiffness (N/mm) (lbf/inch)		56	319.8	98	559.6
Effective moving mass (kg)/(lb)		0.63	1.4	0.85	1.9
Armature (ø/mm)/(ø/inch)		M12	M12	M12	M12
Weight with trunnion (kg)/(lb)		16	35.3	24	52.9
Cooling (m ³ /h)/(ft ³ /min)		80	47	80	47

OUR CONCEPT

TIRA slip tables are clearly designed and functional, which makes them easy to handle for smooth testing. Turning the shaker will not limit conventional testing on the vibrating fixture. Stiffened and welded structures at the base increase the reaction mass, while any undesirable transfer of vibration is damped. The linear guide system guarantees high stiffness of the slip plate and minimize cross vibration if the test setup is not symmetrical.

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SLIP TABLE MINIBASE

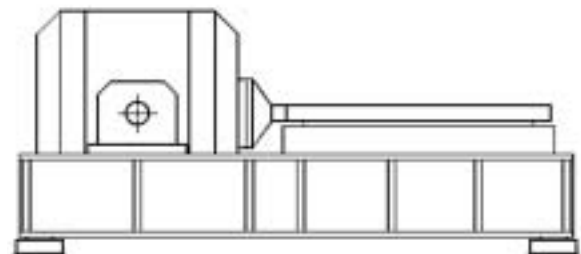
TIRA MINIBASE slip table: shaker in the original frame and sliding table module mounted together on a base plate.



Slip plate 12"

TIRA's Monobase slip tables are available in different versions:

- Index XS: for vibration systems: TV50101, TV5220
- Index S: for vibration systems: TV50303, TV50350
- Index M: for vibration systems: TV5550, TV 56263, TV 5880
- Index L: for vibration systems: TV51010, TV57315
- Index XL: for vibration systems: TV59320, TV59327, TV 59335
- Index XXL for vibration systems: TV59350



SLIP TABLE MONOBASE

TIRA MONOBASE slip table: shaker and slip plate are integrated in a common frame.

- made solutions - our key to success
- price solutions from TIRA can meet any requirements you specify, with slip tables adjusted to all existing vibration/climatic chamber systems. Our products use high-grade materials and reliable components for long-time use at low operating costs.



Slip plate 24"

Vibration technology enables testing in research, development and quality assurance. As test objects become heavier and larger, electrodynamic generators can no longer be used.



TIRA slip tables

TESTING UNDER STRESS

Today's equipment has to work in all kinds of environments including changes of temperature, vibration, and high humidity. From the design stage right through to final inspection, combined vibration/climatic test systems can simulate the effect of ambient conditions on electric, electronic and mechanical components. Weak points can thus be detected at an early point and eliminated at low cost. Properly designed key parts will prevent expensive downtimes and/or damage. Such multi-test systems are indispensable for **quality assurance, research and development.**

DRIVER BARS

TIRA driver bars provide the link between shaker and slip plate. They are FEM designed and made of magnesium. Depending on size they are single pieces or welded together. Their geometric design enables perfect force transmission while minimizing the moving mass.

- Driver bars for vibration generators with armature diameter of 120 mm
- Driver bars for vibration generators with armature diameter of 220 mm
- Driver bars for vibration generators with armature diameter from 340 - 640 mm

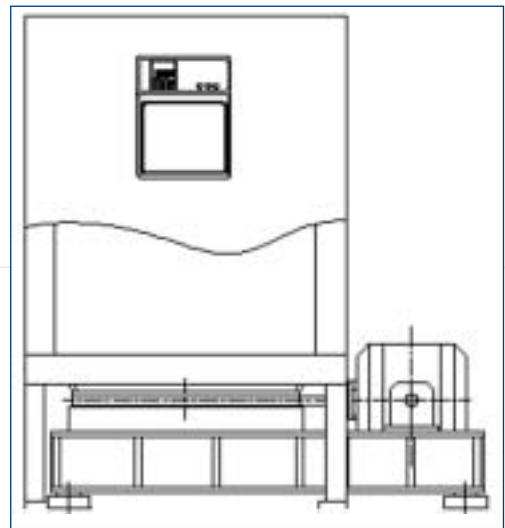
Our test systems guarantee your product functions

VIBRATION ISOLATION, SAFE INSTALLATION

Pneumatic isolation elements makes it possible to install slip tables without expensive foundations. Due to the low natural frequency of isolators (3 - 5 Hz), a wide test spectrum is applicable.

TEST OBJECT FIXING

To simulate practical conditions, devices under test have to be excited in their working position. and TIRA has specific magnesium fixtures for all applications.



Minibase Slip tables



magnesium plate sliding on an oil film. Four linear guides guarantee the lateral guidance of the slip plate and **minimize** transverse motion. **Horizontal and vertical excitation** is possible so that specimens may be tested in their working position. **Hydrostatic plain bearings** allow to apply the **high yaw, roll and pitch moments** as they appear with heavy test items or **very large loads** which may have a **high centre of gravity**. Hydrostatically guided slip tables are used to test specimen in horizontal direction.

With growing requirements on vibration testing systems, there is a need for slip table systems which can hold large and heavy specimens in a mounting position for testing in horizontal direction. The two designs available from **TIRA** are **Minibase**, a stand alone model, and **Monobase**, a slip table integrated in a steel frame together with the vibration generator.

Minibase has the same basic features as a Monobase system and is designed for retrofitting existing vibration generators by mounting the Minibase frame on a base plate together with the generator.

As a standard feature, the slip tables have a working area of max. 2,000 mm x 2,000 mm. Other (and larger) sizes will be made to customer specifications. Oil film slip tables consist of a precision grinded and lapped natural granite block with a



	Moving plate working area (mm)/(inch)		Bearings	Limit (mm)/(inch)		Slip plate weight (kg)/(lb)		Slip plate thickness (mm)/(inch)		Max. testing objekt weight (kg)/(lb)		Dimension L*W*H (mm)/(inch)	Max. pitch moment (Nm)/(lb inch+1000)		Max. roll moment (Nm)/(lb inch+1000)		Max. yaw moment (Nm)/(lb inch+1000)	
	Metric	American		Metric	American	Metric	American	Metric	American	Metric	American		Metric	American	Metric	American	Metric	American
TGT MI 12	305*305	12*12	-	62	2.44	8.5	18.7	40	1.57	100	220.4623	**	550	4868	550	4868	250	2213
TGT MI 18	458*458	18*18	-	62	2.44	18	39.7	40	1.57	300	661.3869	**	1600	14160	1600	14160	250	2213
TGT MI 20	508*508	20*20	-	62	2.44	21.5	47.4	40	1.57	400	881.8492	**	2400	21240	2400	21240	250	2213
TGT MI 24	610*610	24*24	-	62	2.44	30	66.1	40	1.57	550	1212.54265	**	3880	34338	3880	34338	250	2213
TGT MI 30	762*762	30*30	-	62	2.44	57	125.7	50	1.97	1000	2204.623	**	7600	67260	7600	67260	250	2213
TGT MI 36	915*915	36*36	-	62	2.44	80.5	177.5	50	1.97	1750	3858.09025	**	12670	112130	12670	112130	250	2213
TGT MI 39	991*991	39*39	-	62	2.44	94	207.2	50	1.97	2200	4850.1706	**	16700	147795	16700	147795	250	2213
TGT MI 48	1200*1200	48*48	-	62	2.44	99	218.3	50	1.97	2400	5291.0952	**	19500	172575	19500	172575	250	2213
TGT MI 60	1500*1500	60*60	-	62	2.44	227	500.4	50	1.97	3500	7716.1805	**	25600	226560	25600	226560	250	2213
TGT MI 70	1800*1800	70*70	-	62	2.44	302	665.8	50	1.97	4000	8818.492	**	30000	265500	30000	265500	250	2213
TGT MI 78	2000*2000	78*78	-	62	2.44	390	859.8	50	1.97	4500	9920.8	**	34000	300900	34000	300900	250	2213
TGT MIH 24	610*610	24*24	2	62	2.44	49	108.0	50	1.97	1100	2425.0853	**	26500	234525	25000	221250	22300	197355
TGT MIH 30	762*762	30*30	2	62	2.44	68.5	151.0	50	1.97	2000	4409.246	**	32200	284970	34000	300900	24700	218595
TGT MIH 36	915*915	36*36	2	62	2.44	92	202.8	50	1.97	3500	7716.1805	**	47900	423915	45700	404445	34700	307095
TGT MIH 39	991*991	39*39	2	62	2.44	106	233.7	50	1.97	4400	9700.3412	**	66500	588525	59800	529230	44700	395595
TGT MIH 48	1200*1200	48*48	3	62	2.44	115.2	254.0	50	1.97	6000	13227.738	**	91400	808890	82200	727470	56000	495600
TGT MIH 60	1500*1500	60*60	3	62	2.44	249	549.0	50	1.97	8000	17636.984	**	167000	1477950	143000	1265550	99600	881460

MI - oil film Minibase slip tables / MIH - hydrostatically guided Minibase slip tables



Guided oil film slip tables



sizes will be made to customer specifications. Oil film slip tables consist of a precision grinded and lapped natural granite block with a magnesium plate that slides on an oil film. **Four linear guides** guarantee the lateral guidance of the slip plate and **minimize transverse motion**. **Horizontal and vertical excitation** is possible so that specimens may be tested in their working position.

Vibration isolators are provided on the underside of the frame as a standard feature to prevent vibration transfer to the building.

With growing requirements on vibration test systems, there is a need for **slip table systems** which can hold large and heavy specimens in a mounting position for testing in horizontal direction.

With **Monobase** designs, you can quickly align and precisely couple vibration generators to sliding tables. These are available with standard working areas of max. 2,000 x 2,000 mm, other

	Moving plate working area (mm)/(inch)		Limit (mm)/(inch)		Slip plate weight (kg)/(lb)		Slip plate thickness (mm)/(inch)		Max. testing objekt weight (kg)/(lb)		Dimension L*W*H (mm)/(inch)		Max. pitch moment (Nm)/(lbf inch)		Max. roll moment (Nm)/(lbf inch)		Max. yaw moment (Nm)/(lbf inch)	
	Metric	American	Metric	American	Metric	American	Metric	American	Metric	American	Metric	American	Metric	American	Metric	American	Metric	American
TGT MO 12 XS	305*305	12*12	62	2.44	8.5	18.7	40	1.57	100	220	900*500*500	35.4*19.7*19.7	550	4868	550	4868	250	2213
TGT MO 12 S											1100*500*500	43.3*19.7*19.7						
TGT MO 12 M											1300*800*700	51.2*31.5*27.6						
TGT MO 18 XS	458*458	18*18	62	2.44	18	39.7	40	1.6	300	661	1200*550*500	47.2*21.7*19.7	1600	14161	1600	14161	250	2213
TGT MO 18 S											1300*700*500	51.2*27.6*19.7						
TGT MO 18 M											1300*780*700	51.2*30.7*27.6						
TGT MO 18 L											1300*800*1000	51.2*31.5*39.4						
TGT MO 20 XS	508*508	20*20	62	2.44	21.5	47.4	40	88.2	400	882	1300*600*500	51.2*23.6*19.7	2400	21242	2400	21242	250	2213
TGT MO 20 S											1300*800*500	51.2*31.5*19.7						
TGT MO 20 M											1400*900*700	55.1*35.4*27.6						
TGT MO 20 L											1590*900*1000	62.6*35.4*39.4						
TGT MO 20 XL											1590*950*1200	62.6*37.4*47.2						
TGT MO 24 S	610*610	24*24	62	2.44	30	66.1	40	88.2	550	1213	1400*900*500	55.1*35.4*19.7	3880	34341	3880	34341	250	2213
TGT MO 24 M											1500*900*700	59.1*35.4*27.6						
TGT MO 24 L											1700*800*1000	66.9*31.5*39.4						
TGT MO 24 XL											1700*900*1000	66.9*35.4*39.4						
TGT MO 30 M	762*762	30*30	62	2.44	57	125.7	50	110.2	1000	2205	1600*1000*1000	63*39.4*39.4	7600	67266	7600	67266	250	2213
TGT MO 30 L											1900*1000*1000	74.8*39.4*39.4						
TGT MO 30 XL											2000*1400*1200	78.7*55.1*47.2						
TGT MO 36 L	915*915	36*36	62	2.44	80.5	177.5	50	110.2	1750	3858	2000*1200*1000	78.7*47.2*39.4	12670	112139	12670	112139	250	2213
TGT MO 36 XL											2200*1400*1200	86.6*55.1*47.2						
TGT MO 36 XXL											2400*1700*1400	94.5*66.9*55.1						
TGT MO 39 L											2100*1300*1000	82.7*51.2*39.4						
TGT MO 39 XL	991*991	39*39	62	2.44	94	207.2	50	110.2	2200	4850	2300*1400*1260	90.6*55.1*49.6	16700	147807	16700	147807	250	2213
TGT MO 39 XXL											2500*1700*1400	98.4*66.9*55.1						
TGT MO 48 L	1200*1200	48*48	62	2.44	99	218.3	50	110.2	2400	5291	2150*1350*1000	84.6*53.1*39.4	19500	172589	19500	172589	250	2213
TGT MO 48 XL											2350*1400*1200	92.5*55.1*47.2						
TGT MO 48 XXL											2700*1700*1400	106.3*66.9*55.1						
TGT MO 60 L	1500*1500	60*60	62	2.44	227	500.4	50	110.2	3500	7716	2700*1800*1000	106.3*70.9*39.4	25600	226579	25600	226579	250	2213
TGT MO 60 XL											2900*1800*1200	114.2*70.9*47.2						
TGT MO 60 XXL											3000*1700*1400	118.1*66.9*55.1						
TGT MO 70 L											3000*2100*1000	118.1*82.7*39.4						
TGT MO 70 XL	1800*1800	70*70	62	2.44	302	665.8	50	110.2	4000	8818	3100*2100*1200	122*82.7*47.2	30000	265522	30000	265522	250	2213
TGT MO 70 XXL											3300*2000*1400	129.9*78.7*55.1						
TGT MO 78 XL	2000*2000	78*78	62	2.44	390	859.8	50	110.2	4500	9921	3400*2300*1400	133.9*90.6*55.1	34000	300925	34000	300925	250	2213
TGT MO 78 XXL											3500*2300*1400	137.8*90.6*55.1						

Hydrostatically guided slip tables

Oil film slip tables with **hydrostatic** guidance from **TIRA** give you a compact system for a variety of vibration tests, including those of **large** and **heavy specimens** which generate **high yaw, roll and pitch moments** due to their **high centers of gravity** above the slip plate.

These tables use high-pressure bearings with a separate hydraulic supply unit.

The **Monobase design** enables rapid conversion from **horizontal to vertical testing** and the accurate alignment of vibration generators relative to slip tables. Magnesium slip plates are available in different sizes, up to a working area of max. 2,000 x 2,000 mm. Other (and larger) sizes will be made to customer specifications. Oil film slip tables consist of a precision grinded and lapped natural granite block with a magnesium plate sliding on an oil film.

Hydrostatic slide bearings make it possible to apply the **high yaw, roll and pitch moments** as they appear with heavy test items or very large loads which may have a high centre of gravity. Hydrostatically guided slip tables are used to test specimens in a horizontal direction.

Vibration isolators are provided on the underside of the frame as a standard feature to prevent vibration transfer to the building.



	Moving plate working area		Bearings	Limit		Slip plate weight		Slip plate thickness		Max. testing objekt weight		Dimension L*W*H		Max. pitch moment		Max. roll moment		Max. yaw moment	
	(mm)/(inch)	(mm)/(inch)		(mm)/(inch)	(mm)/(inch)	(kg)/(lb)	(mm)/(inch)	(mm)/(inch)	(kg)/(lb)	(kg)/(lb)	(mm)/(inch)	(mm)/(inch)	(Nm)/(lbf inch)	(Nm)/(lbf inch)	(Nm)/(lbf inch)	(Nm)/(lbf inch)	(Nm)/(lbf inch)	(Nm)/(lbf inch)	
TGT MOH 24 M	610*610	24*24	2	62	2.44	30	66.1	40	1.57	550	1213	1500*900*700	59.1*35.4*27.6	26500	234544	25000	221268	22300	197371
TGT MOH 24 L												1700*800*1000	66.9*31.5*39.4						
TGT MOH 24 XL												1700*900*1000	66.9*35.4*39.4						
TGT MOH 30 M												1600*1000*1000	63*39.4*39.4						
TGT MOH 30 L	762*762	30*30	2	62	2.44	57	125.7	50	1.97	1000	2205	1900*1000*1000	74.8*39.4*39.4	32200	284994	34000	300925	24700	218613
TGT MOH 30 XL												2000*1400*1200	78.7*55.1*47.2						
TGT MOH 36 L												2000*1200*1000	78.7*47.2*39.4						
TGT MOH 36 XL	915*915	36*36	2	62	2.44	80.5	177.5	50	1.97	1750	3858	2200*1400*1200	86.6*55.1*47.2	47900	423950	45700	404478	34700	307120
TGT MOH 36 XXL												2400*1700*1400	94.5*66.9*55.1						
TGT MOH 39 L												2100*1300*1000	82.7*51.2*39.4						
TGT MOH 39 XL	991*991	39*39	2	62	2.44	94	207.2	50	1.97	2200	4850	2300*1400*1260	90.6*55.1*49.6	66500	588574	59800	529274	44700	395628
TGT MOH 39 XXL												2500*1700*1400	98.4*66.9*55.1						
TGT MOH 48 L												2150*1350*1000	84.6*53.1*39.4						
TGT MOH 48 XL	1200*1200	48*48	3	62	2.44	115.2	254.0	50	1.97	6000	13228	2350*1400*1200	92.5*55.1*47.2	91400	808957	82200	727530	56000	495641
TGT MOH 48 XXL												2700*1700*1400	106.3*66.9*55.1						
TGT MOH 60 L												2700*1800*1000	106.3*70.9*39.4						
TGT MOH 60 XL	1500*1500	60*60	3	62	2.44	249	549.0	50	1.97	8000	17637	2900*1800*1200	114.2*70.9*47.2	167000	1478072	143000	1265654	99600	881533
TGT MOH 60 XXL												3000*1700*1400	118.1*66.9*55.1						
TGT MO 70 L												3000*2100*1000	118.1*82.7*39.4						
TGT MO 70 XL	1800*1800	70*70	5	62	2.44	332	731.9	50	1.97	10000	22046	3100*2100*1200	122*82.7*47.2	260000	2301190	215000	1902907	125000	1106341
TGT MO 70 XXL												3300*2000*1400	129.9*78.7*55.1						
TGT MO 78 XL												3400*2300*1400	133.9*90.6*55.1						
TGT MO 78 XXL	2000*2000	78*78	5	62	2.44	422	66.1	50	1.97	12000	26455	3500*2300*1400	137.8*90.6*55.1	320000	2832234	272000	2407399	182000	1610833

Effective frequency range 0 - 2000 Hz / please inquire for larger sliding plates/other sizes



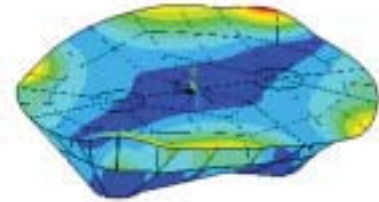
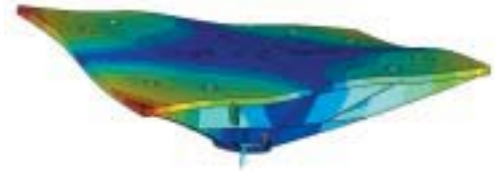
Head Expander And Fixtures

Load Bearing Platform (guided head expander) FEM designed Head Expander

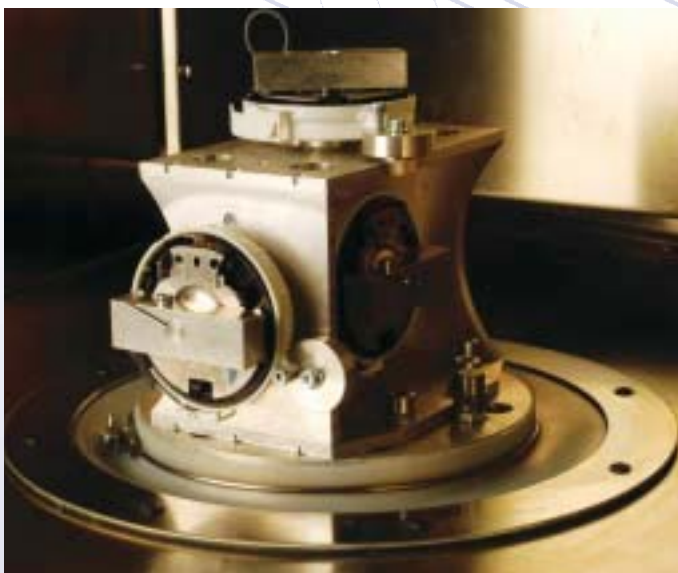
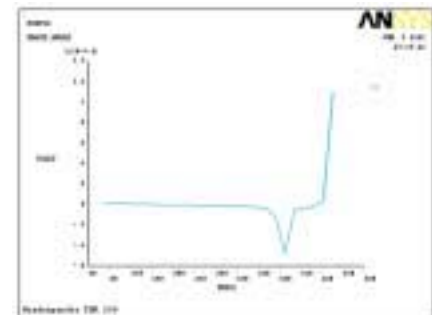
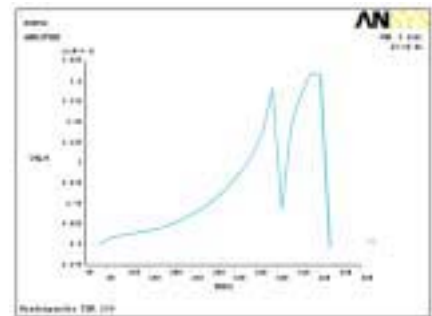
TIRA offer a wide range of head expander, L and T-type fixtures, cubes and special support systems. The latest software for FEM calculation and analysis is used so that customers get specifically designed fixture assemblies with optimized and predicted dynamic performance to produce the best result.

Fixtures are often main items of application conditions in industrial testing where specimens are tested to high standards of precision. This means that the fixture has to be optimized for both the specimen and the test parameters. Many customers, however, can't do these sophisticated calculations to produce a suitable fixture. **TIRA** has faced up to this challenge and will develop, calculate and manufacture any type of special-purpose fixtures for your application, with the emphasis on minimizing its weight and optimize its dynamic performance.

Monobase systems with horizontal slip table and vertically guided load bearing platform make it possible to test extremely large and heavy loads in direction of x, y and z axis. Special-designed slip tables and loading bearing platforms are available with a working area of max. of 2,000 mm x 2,000 mm (78 x 78"). Slip plate and load bearing platform are accurately aligned in a common base frame. Conversion from horizontal to vertical operation is easy and takes a minimum of time.



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Head Expanders

TIRA head expanders are manufactured from magnesium and provide an expansion of the armature table up to a ratio of 2:1. The unique design of the head expanders allows tests up to 2,000 Hz. Head Expanders especially provided with 'vibro-damp' can be subjected to test frequencies above 1,000 Hz. This damping process reduces amplification of upper frequency resonances.

Apart from the range of standard head expanders **TIRA** also offer customer engineered fixtures for round, square or rectangular working areas.



CIRCULAR VERSION without vibrodamp								
Size		Typ	Armature		Height		Weight	
mm	inch		mm/ø	inch/ø	mm	inch	kg	lb
250	10	THR 25-120	120	4.7	80	3.1	3.7	8.2
		THR 25-180	180	7.1	80	3.1	4.3	9.5
300	12	THR 30-180	180	7.1	80	3.1	5.6	12.3
		THR 30-220	220	8.7	80	3.1	26.7	58.9
400	16	THR 40-180	180	7.1	120	4.7	10.0	22.0
		THR 40-220	220	8.7	120	4.7	12.0	26.5
500	20	THR 50-180	180	7.1	150	5.9	20.0	44.1
		THR 50-220	220	8.7	150	5.9	24.0	52.9
		THR 50-330	340	13.4	150	5.9	28.0	61.7
600	24	THR 60-180	180	7.1	210	8.3	29.0	63.9
		THR 60-220	220	8.7	210	8.3	40.0	88.2
		THR 60-330	340	13.4	210	8.3	48.0	105.8
		THR 80-330	340	13.4	230	9.1	69.0	152.1
800	31	THR 80-440	440	17.3	245	9.6	82.0	180.8
		THR 80-640	640	25.2	180	7.1	67.0	147.7
		THR 100-440	440	17.3	305	12.0	143.0	315.3
1000	39	THR 100-640	640	25.2	235	9.3	126.0	277.8

CIRCULAR VERSION with vibrodamp								
Size		Typ	Armature		Height		Weight	
mm	inch		mm/ø	inch/ø	mm	inch	kg	lb
400	16	THR 40-180V	180	7.1	120	4.7	15.0*	33.1*
		THR 40-220V	220	8.7	120	4.7	18.0*	39.7*
		THR 50-180V	180	7.1	150	5.9	30.0*	66.1*
500	20	THR 50-220V	220	8.7	150	5.9	36.0*	79.4*
		THR 50-330V	340	13.4	150	5.9	42.0*	92.6*
		THR 60-180V	180	7.1	210	8.3	43.5*	95.9*
600	24	THR 60-220V	220	8.7	210	8.3	60.0*	132.3*
		THR 60-330V	340	13.4	210	8.3	72.0*	158.7*
		THR 80-330V	340	13.4	230	9.1	103.5*	228.2*
800	31	THR 80-440V	440	17.3	245	9.6	123.0*	271.2*
		THR 80-640V	640	25.2	180	7.1	100.5*	221.6*
		THR 100-440V	440	17.3	305	12.0	214.5*	472.9*
1000	39	THR 100-640V	640	25.2	235	9.3	189.0*	416.7*

* may vary by 10 %

SQUARE VERSION without vibrodamp								
Size		Typ	Armature		Height		Weight	
mm	inch		mm/ø	inch/ø	mm	inch	kg	lb
250 x 250	10 x 10	THS 25-120	120	4.7	100	3.9	6.9	15.2
300 x 300	12 x 12	THS 30-120	120	4.7	100	3.9	7.1	15.7
		THS 30-180	180	7.1	100	3.9	7.55	16.6
400 x 400	16 x 16	THS 40-180	180	7.1	100	3.9	16	35.3
		THS 40-220	220	8.7	100	3.9	13.5	29.8
500 x 500	20 x 20	THS 50-180	180	7.1	120	4.7	23.5	51.8
		THS 50-220	220	8.7	150	5.9	28	61.7
		THS 50-330	340	13.4	180	7.1	34	75.0
600 x 600	24 x 24	THS 60-180	180	7.1	180	7.1	36	79.4
		THS 60-220	220	8.7	180	7.1	39	86.0
		THS 60-330	340	13.4	180	7.1	54	119.0
		THS 60-440	440	17.3	180	7.1	54	119.0
800 x 800	31 x 31	THS 80-440	440	17.3	180	7.1	95	209.4
		THS 80-640	640	25.2	120	4.7	80	176.4
1000 x 1000	39 x 39	THS 100-440	440	17.3	200	7.9	134	295.4
		THS 100-640	640	25.2	140	5.5	153	337.3

SQUARE VERSION with vibrodamp								
Size		Typ	Armature		Height		Weight	
mm	inch		mm/ø	inch/ø	mm	inch	kg	lb
300 x 300	12 x 12	THS 30-120V	120	4.7	100	3.9	17.0*	37.5*
		THS 30-180V	180	7.1	100	3.9	24.0*	52.9*
400 x 400	16 x 16	THS 40-180V	180	7.1	100	3.9	20.3*	44.8*
		THS 40-220V	220	8.7	120	4.7	35.3*	77.8*
500 x 500	20 x 20	THS 50-180V	180	7.1	150	5.9	42.0*	92.6*
		THS 50-220V	220	8.7	180	7.1	51.0*	112.4*
		THS 50-330V	340	13.4	180	7.1	54.0*	119.0*
600 x 600	24 x 24	THS 60-180V	180	7.1	180	7.1	58.5*	129.0*
		THS 60-220V	220	8.7	180	7.1	81.0*	178.6*
		THS 60-330V	340	13.4	180	7.1	81.0*	178.6*
		THS 60-440V	440	17.3	180	7.1	81.0*	178.6*
800 x 800	31 x 31	THS 80-440V	440	17.3	180	7.1	142.5*	314.2*
		THS 80-640V	640	25.2	120	4.7	120.0*	264.6*
1000 x 1000	39 x 39	THS 100-440V	440	17.3	200	7.9	201.0*	443.1*
		THS 100-640V	640	25.2	140	5.5	229.5*	506.0*

* may vary by 10 %

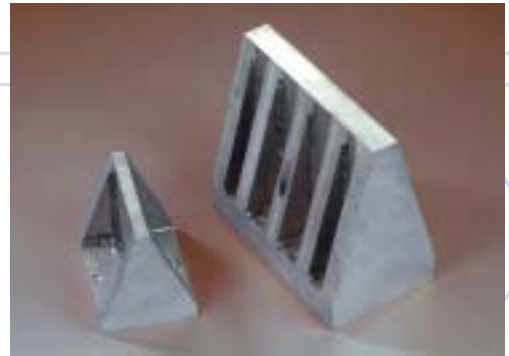


Fixtures

To perform multi-axis vibration testing, L & T fixtures or cubic designs, as well as specially engineered support fixtures can be produced to meet any particular test requirements.

The unique design of the fixtures allows tests up to 2,000 Hz.

TIRA also offer customer engineered fixtures for round, square or rectangular working areas.



L-fixtures

L - Fixture		
Type	Size mm	Size inch
Fix-L 20	200 x 200 mm	8 x 8 inch
Fix-L 26	260 x 260 mm	10 x 10 inch
Fix-L 30	300 x 300 mm	12 x 12 inch
Fix-L 40	400 x 400 mm	16 x 16 inch



T-fixtures

T - Fixture		
Type	Size mm	Size inch
Fix-T 20	200 x 200 mm	8 x 8 inch
Fix-T 26	260 x 260 mm	10 x 10 inch
Fix-T 30	300 x 300 mm	12 x 12 inch
Fix-T 40	400 x 400 mm	16 x 16 inch

Cube

Cube - Fixture		
Type	Size mm	Size inch
Fix-C 20	200 x 200 mm	8 x 8 inch
Fix-C 25	250 x 250 mm	10 x 10 inch
Fix-C 30	300 x 300 mm	12 x 12 inch
Fix-C 40	400 x 400 mm	16 x 16 inch

The Quality, reliability, and safety of products require utmost care from the concept to the end-user.

To meet this pretentious requirement, one nowadays investigates the interactions between objects and their direct or indirect environment by means of environment testing systems. Based upon such experience, Products are developed with reference to specific applications as well as high quality and long lifetime achieved. Such flaws as material and production faults can be detected early and costly breakdowns or callback actions avoided.

In practical use, the products are exposed to various environmental influences at the same time such as e.g. temperature, humidity, vibrations, and transport loads. User-specific one-sided test systems are used as combinations in the test setup and linked to form full test systems. **TIRA** delivers full test systems from one hand.

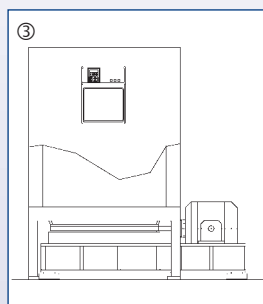
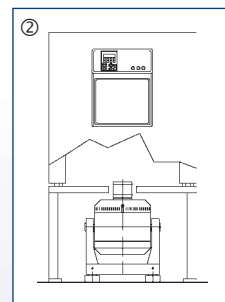
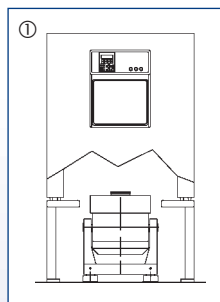
Production program

- Chambers for simulating environmental conditions (temperature, air humidity, pressure, irradiation, vibration)
- Temperature shock testing installations (air/air, liquid/liquid, horizontal, vertical)
- Corrosion test chambers and devices for artificial weathering (salt nebulization, air pollutants, ultraviolet irradiation)
- Combined vibration chamber systems (complete vertical and horizontal solutions)
- Passable special installations (air-bag test chambers, sunlight simulation, open-plan cells)



With **TIRAvibro** a series of vibration testing chambers for combined testing procedures under climatic and thermic influences and mechanical and dynamic loading was developed.

The climate- and temperature-testing chambers can be adapted to any vertical and horizontal vibration system. They are especially optimised for the operation with **TIRA** vibration testing installations and for the integration in complete **TIRA** systems. Due to the integration in system solutions the testing chamber and the shaker can be operated by a common test software (TEC). Exchangeable or fixed base plates are the interface for coupling the shaker to the test chamber. In dependence on the kind of vibration test a permanently installed base plate or two flexible base plates are inserted into the test chamber.



- ① Integration of vibration generator into climatic chamber
- ② Head extender
- ③ Integration of slip table into climatic cabinet



Temperature/Climatic Test Systems

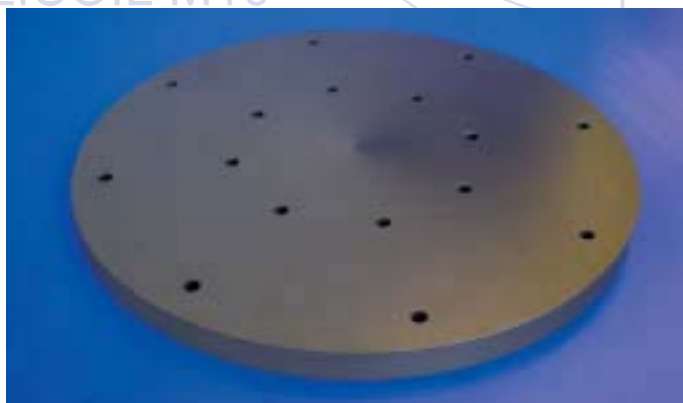
If combined test problems with vibration and temperature conditions have to be solved we offer our customers complete solutions. With the help of the **TIRA** software for controlling the vibration testing installation and the vibration climatic chamber we have developed a comfortable software interface.

Due to the simple operation of the software **TIRA** offers its customers a perfect solution for long-time tests. The simple entry of test parameters and the combination with test profiles of the vibration control system make a fast and individual test preparation possible.



Seal test cabinet

Head extender



Thermobarrier

The outstandingly designed screen presentation offers the customer a constant survey of

- the temperature testing**
- o current test time
 - o current temperature
 - o current humidity values

- the vibration testing**
- o current test time
 - o current acceleration
 - o current test rate
 - o status of control unit

The flexible drawing-up of reports offers you the possibility to display the test procedure graphically and in table form.

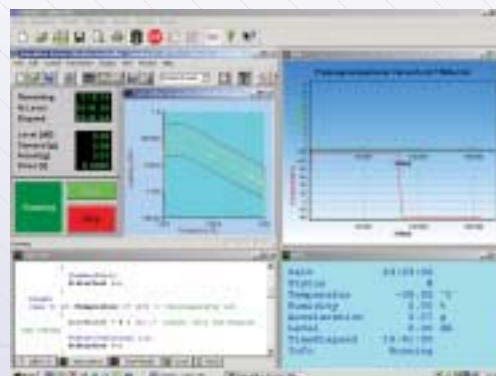
Climatic cabinet leadthroughs					
Size		Height		Weight	
mm	inch	mm	inch	kg	lb
120	4.7	160	6.3	2.5	5.5
180	7.1	160	6.3	4	8.8
220	8.7	160	6.3	5	11.0
340	13.4	160	6.3	7.4	16.3
440	17.3	160	6.3	20.8	45.9
640	25.2	160	6.3	40.2	88.6

Thermobarriers for fixtures					
Size		Height		Weight	
mm	inch	mm	inch	kg	lb
120	4.7	20	0.8	0.5	1.1
180	7.1	20	0.8	1.1	2.4
220	8.7	20	0.8	1.7	3.7
340	13.4	20	0.8	3.8	8.4
440	17.3	20	0.8	7.3	16.1
640	25.2	20	0.8	15.4	34.0

Thermobarriers for sliding plates					
Size		Height		Weight	
mm	inch	mm	inch	kg	lb
305 x 305	12 x 12	20	0.8	4.5	9.9
458 x 458	18 x 18	20	0.8	10.1	22.3
508 x 508	20 x 20	20	0.8	12.4	27.3
610 x 610	24 x 24	20	0.8	17.9	39.5
762 x 762	30 x 30	20	0.8	27.9	61.5
915 x 915	36 x 36	20	0.8	40.2	88.6
991 x 991	39 x 39	20	0.8	47.1	103.8
1200 x 1200	48 x 48	20	0.8	72.1	159.0
1500 x 1500	60 x 60	20	0.8	112.5	248.0
1800 x 1800	70 x 70	20	0.8	162.4	358.0

Thermobarriers for clamping tables					
Size		Height		Weight	
mm	inch	mm	inch	kg	lb
300 x 300	12 x 12	20	0.8	4.3	9.5
400 x 400	16 x 16	20	0.8	7.7	17.0
500 x 500	20 x 20	20	0.8	12	26.5
600 x 600	24 x 24	20	0.8	17.3	38.1
800 x 800	31 x 31	20	0.8	30.7	67.7
1000 x 1000	39 x 39	20	0.8	51.1	112.7

Thermobarriers for clamping tables					
Size		Height		Weight	
mm	inch	mm	inch	kg	lb
250	9.8	20	0.8	2.4	5.3
300	11.8	20	0.8	3.4	7.5
400	15.8	20	0.8	6	13.2
500	19.7	20	0.8	9.4	20.7
600	23.6	20	0.8	13.6	30.0
800	31.5	20	0.8	24.1	53.1
1000	39.4	20	0.8	37.7	83.1



Blower

Blowers are used for cooling the shakers. **TIRA** exclusively offers radial-flow fans that dispose of an above-average cooling performance in comparison with axial blowers.

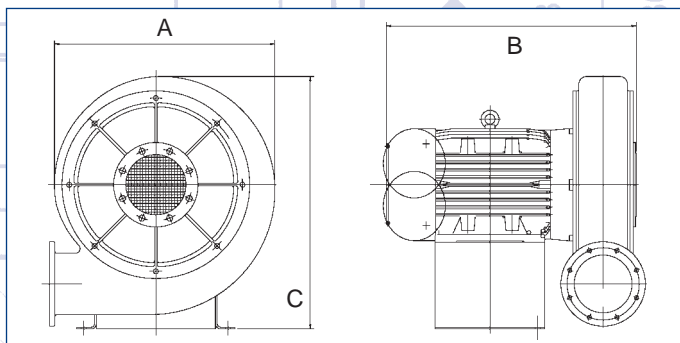
In addition to this, silencers for damping the blow-off noise are offered.

An aerated sound-absorbing chamber is offered for installing the cooling blower in closed rooms. The low-maintenance blower can also be installed outdoors.



enclosure

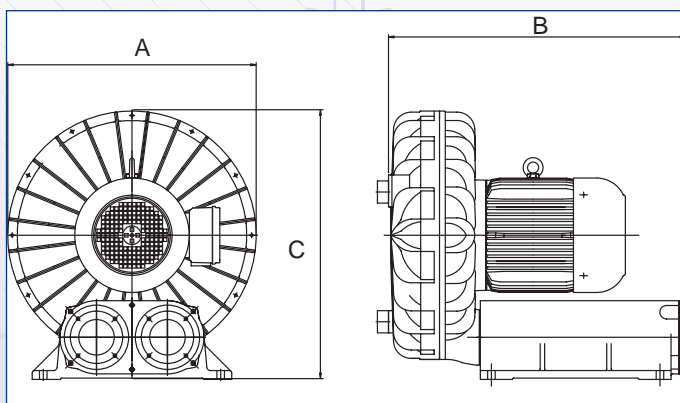
Blower Designation	Blower		Engine			Dimension		Air Hose		Weight		Soundpressure		
	air amount m ³ /h	Performance kW	Phase	Voltage V	Frequency Hz	A/B/C		Diameter		length		Level dB(A)		
SB 0080	80	0.37	1	115/230	50	246/256/247	9.7/10.1/9.7	40	1.57	3	118	10	22.0	58
SB 0140	140	1.1	1	115/230	50	285/269/302	11.2/10.6/11.9	50	1.97	3	118	16	35.3	63
SB 0200	210	1.3	3	230/400	50	334/314/337	13.1/12.4/13.3	60	2.36	5	197	20	44.1	66
SB 0310	315	2.2	3	230/400	50	381/377/384	15/14.8/15.1	60	2.36	5	197	29	63.9	70
SB 0530	500	5.5	3	230/400	50	498/496/516	19.6/19.5/20.3	60	2.36	5	197	112	246.9	71
SD 9	870	7.0	3	400	50	560/695/650	22/27.4/25.6	100	3.94	5	197	104	229.3	84
SD120	1140	11.5	3	400	50	600/676/675	23.6/26.6/26.6	100	3.94	5	197	131	288.8	84
RD 8	3300	5.5	3	400	50	845/540/915	33.3/21.3/36	150	5.91	5	197	95	209.4	98
HRD 7/FU/11	5820	11	3	400	50	611/692/700	24.1/27.2/27.6	150	5.91	5	197	157	346.1	98
HRD 7/FU/20	5820	20	3	400	50	611/692/700	24.1/27.2/27.6	150	5.91	5	197	157	346.1	98



Type: HRD



Silencer



Type: SE/SD



Silencer



Linear Power Amplifiers

TIRA offers a **new series** of analogue amplifiers with a **rated sinusoidal power** output up to **2,000 VA**. The modules control all permanent magnetic shakers as well as shakers in connection with an internal field excitation up to 1,600 N.

These amplifiers equipped with highly-advanced MOSFET transistors can be run in the **current or the voltage mode**, as desired. The amplifiers are user-friendly because of their background-lit multifunctional display.

A safety management system monitors such functions like temperature, overcurrent and overtravel and avoids the destruction of the amplifier in case of short circuit.

A **high signal-to-noise ratio** and a **low distortion factor** are outstanding features. **Selectable ranges of operating voltage** and current range limiting are preconditions for the fact that **TIRA** amplifiers can be readily adapted to other shakers from other manufactures.

According to standard, the amplifiers are designed for connecting the electronic zero-adjustment control unit TMC. Thus, even with small shakers a load compensation for achieving the nominal vibration



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Amplifier	BAA60		BAA120		BAA500	
KVA Ratings	60 VA		120 VA		500 VA	
Frequency Range	DC- 20 kHz		DC- 20 kHz		DC- 20 kHz	
Voltage-/Current mode	yes/no		yes/yes		yes/yes	
Voltage, max.	16 V		22 V		45 V	
Current, max.	3.8 A		5.5 A		11.2 A	
Load Resistance	4 Ohm		4 Ohm		4 Ohm	
Input Voltage	< 5V		< 5V		< 5V	
Distortion	< 0.1 %		< 0.1 %		< 0.1 %	
Signal to Noise Ratio	> 90 dB		> 90 dB		> 90 dB	
Field Supply	no		no		no	
Voltage, max.	-		-		-	
Current, max.	-		-		-	
Weight (kg) (lb)	12	26.5	15	33.1	25	55.1
Size (WxHxD) (mm) (inch)	483 x 90 x 450	19 x 3.5 x 17.7	483 x 90 x 450	19 x 3.5 x 17.7	483 x 90 x 450	19 x 3.5 x 17.7
Interlocks	Overload Temperature Clipping		Overload Temperature Clipping		Overload Temperature Clipping	

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Amplifier	BAA1000		BAA1000-E		BAA 2000-E	
KVA Ratings	1000 VA		1000 VA		2000 VA	
Frequency Range	DC- 20 kHz		DC- 20 kHz		DC- 4 kHz	
Voltage-/Current mode	yes/yes		yes/yes		yes/opt.	
Voltage, max.	70 V		70 V		110 V	
Current, max.	18 A		18 A		18 A	
Load Resistance	4 Ohm		4 Ohm		4 Ohm	
Input Voltage	< 5V		< 5V		1/2/5/10 V	
Distortion	< 0.1 %		< 0.1 %		< 0.1 %	
Signal to Noise Ratio	> 90 dB		> 90 dB		> 70 dB	
Field Supply	no		yes		yes	
Voltage, max.	-		30 V		100 V	
Current, max.	-		5 A		6 A	
Weight (kg) (lb)	45	99.2	72	158.7	230	507.1
Size (WxHxD) (mm) (inch)	483 x 190 x 600	19 x 7.5 x 23.6	483 x 320x 600	19 x 12.6 x 23.6	600 x 1600 x 800	23.6 x 63 x 31.5
Interlocks	Overload Temperature Clipping		Overload Temperature Clipping		Overload Temperature Clipping Output stage	

TIRA power amplifiers are built with cascadable 6 kVA modules, designed according to the latest technological developments. Highly-advanced MOSFET power transistors combined with a complete module management guarantee a high output power at highest safety.

On the **LCD-Touch screen** display the module status with current indication, the percental modulation of the modules and the error diagnostics are shown. A safety monitoring unit protects the amplifier from short circuit and from a possible destruction of the modules.

Error indication and system parameters in plain text increase the availability due to a faster diagnostics. The high clock frequency of 80 kHz realizes test frequencies of more than 4,000 Hz without any decrease in power possible. The cascading of the modules allows an amplifier **design up to 240 kVA** at low floor space requirement.

The output voltage of the modules can be modified so that **TIRA** amplifiers can be adapted to almost all shakers existing on the market.



Amplifier	A51260		A 51312		A 51324		A 52312	
KVA Ratings	6 KVA		12 kVA		24 KVA		12 KVA	
Frequency Range	DC - 4 kHz		DC - 4 kHz		DC - 4 kHz		DC - 4 kHz	
Voltage, max.	110 V		110 V		110 V		110 V	
Current, max.	55 A		110 A		220 A		110 A	
Load Resistance	2 Ohm		1 Ohm		2 Ohm		1 Ohm	
Input Voltage	1/2/5/10 V		1/2/5/10 V		1/2/5/10 V		1/2/5/10 V	
Distortion	< 1 %		< 1 %		< 1 %		< 1 %	
Signal to Noise Ratio	> 70 dB		> 70 dB		> 70 dB		> 70 dB	
Field Supply	yes		yes		yes		yes	
Voltage, max.	100/180V		180 V		180 V		280 V	
Current, max.	6 A		6 A		6 A		6 A	
Weight (Kg) / (lb)	230	507.1	280	617.3	350	771.6	290	639.3
Size (W x H x D) (mm)/(inch)	600 x 1600 x 800	23.6 x 63.0 x 31.5	600 x 1600 x 800	23.6 x 63.0 x 31.5	600 x 2100 x 800	23.6 x 82.6 x 31.5	600 x 1600 x 800	23.6 x 63.0 x 31.5
Interlocks	Overload Temperature Clipping Output stage		Overload Temperature Clipping Output stage		Overload Temperature Clipping Output stage		Overload Temperature Clipping Output stage	

Amplifier	A 52318		A 52324		A 52330		A 53312	
KVA Ratings	18 kVA		24 kVA		30 kVA		12 kVA	
Frequency Range	DC - 4 kHz		DC - 4 kHz		DC - 4 kHz		DC - 4 kHz	
Voltage, max.	110 V		110 V		110 V		110 V	
Current, max.	150 A		220 A		330 A		110 A	
Load Resistance	0.7 Ohm		0.7 Ohm		0.5 Ohm		1 Ohm	
Input Voltage	1/2/5/10 V		1/2/5/10 V		1/2/5/10 V		1/2/5/10 V	
Distortion	< 1 %		< 1 %		< 1 %		< 1 %	
Signal to Noise Ratio	> 70 dB		> 70 dB		> 70 dB		> 70 dB	
Field Supply	yes		yes		yes		yes	
Voltage, max.	280 V		280 V		280 V		140 V	
Current, max.	6 A		6 A		6 A		8 A	
Weight (Kg) / (lb)	360	793.7	400	881.8	480	1058.2	290	639.3
Size (W x H x D) (mm)/(inch)	600 x 1600 x 800	23.6 x 63.0 x 31.5	600 x 2100 x 800	23.6 x 82.6 x 31.5	600 x 2100 x 800	23.6 x 82.6 x 31.5	600 x 1600 x 800	23.6 x 63.0 x 31.5
Interlocks	Overload Temperature Clipping Output stage		Overload Temperature Clipping Output stage		Overload Temperature Clipping Output stage		Overload Temperature Clipping Output stage	



Digital Power Amplifiers

TIRA power amplifiers are built with cascadable 6 kVA modules, designed according to the latest technological developments. Highly-advanced MOSFET power transistors combined with a complete module management guarantee a high output power at highest safety.

On the **LCD-Touch screen display** the module status with current indication, the percental modulation of the modules and the error diagnostics are shown. A safety monitoring unit protects the amplifier from short circuit and from a possible destruction of the modules.

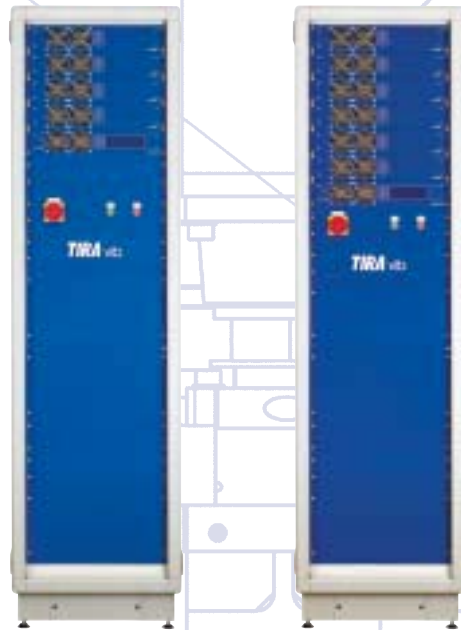
Error indication and system parameters in plain text increase the availability due to a faster diagnostics. The high clock frequency of 80 kHz realizes test frequencies of more than **4,000 Hz** without any decrease in power possible. The cascading of the modules allows an **amplifier design up to 240 kVA** at low floor space requirement.

The output voltage of the modules can be modified so that **TIRA** amplifiers can be adapted to almost all shakers existing on the market.

Zentrierleisten
für Deckel

Befestigungswinkel
für Deckel

Blech für
Schallschutz



Blechdicke auf 2mm
geändert !

Amplifier	A 53318	A 53330	A 53342	A 54324
KVA Ratings	18 kVA	30 kVA	42 kVA	24 kVA
Frequency Range	DC - 4 kHz	DC - 4 kHz	DC - 4 kHz	DC - 4 kHz
Voltage, max.	110 V	110 V	110 V	110 V
Current, max.	165 A	275 A	380 A	220 A
Load Resistance	0.7 Ohm	0.5 Ohm	0.3 Ohm	0.5 Ohm
Input Voltage	1/2/5/10 V	1/2/5/10 V	1/2/5/10 V	1/2/5/10 V
Distortion	< 1 %	< 1 %	< 1 %	< 1 %
Signal to Noise Ratio	> 70 dB	> 70 dB	> 70 dB	> 70 dB
Field Supply	yes	yes	yes	yes
Voltage, max.	140 V	140 V	140 V	70 V
Current, max.	8 A	8 A	8 A	100 A
Weight (Kg) / (lb)	380 / 837.8	490 / 1080.3	480 / 1058.2	350 / 771.6
Size (W x H x D) (mm)/(inch)	600 x 1600 x 800 / 23.6 x 63.0 x 31.5	600 x 2100 x 800 / 23.6 x 82.6 x 31.5	600 x 2100 x 800 / 23.6 x 82.6 x 31.5	600 x 2100 x 800 / 23.6 x 82.6 x 31.5
Interlocks	Overload Temperature Clipping Output stage	Overload Temperature Clipping Output stage	Overload Temperature Clipping Output stage	Overload Temperature Clipping Output stage

Amplifier	A 54336	A 54342	A 54372	A 54420
KVA Ratings	36 kVA	42 kVA	72 kVA	192 kVA
Frequency Range	DC - 4 kHz	DC - 4 kHz	DC - 4 kHz	DC - 4 kHz
Voltage, max.	110 V	110 V	110 V	140 V
Current, max.	330 A	385 A	660 A	1320 A
Load Resistance	0.3 Ohm	0.3 Ohm	0.3 Ohm	0.3 Ohm
Input Voltage	1/2/5/10 V	1/2/5/10 V	1/2/5/10 V	1/2/5/10 V
Distortion	< 1 %	< 1 %	< 1 %	< 1 %
Signal to Noise Ratio	> 70 dB	> 70 dB	> 70 dB	> 70 dB
Field Supply	yes	yes	yes	yes
Voltage, max.	100 V	100 V	100 V	
Current, max.	90 A	90 A	90 A	
Weight (Kg) / (lb)	540 / 1190.5	600 / 1322.8	750 / 1653.5	950 / 2094.4
Size (W x H x D) (mm)/(inch)	600 x 2100 x 800 / 23.6 x 82.6 x 31.5	600 x 2100 x 800 / 23.6 x 82.6 x 31.5	600 x 2100 x 800 / 23.6 x 82.6 x 31.5	1800 x 2100 x 800 / 23.6 x 82.6 x 31.5
Interlocks	Overload Temperature Clipping Output stage	Overload Temperature Clipping Output stage	Overload Temperature Clipping Output stage	Overload Temperature Clipping Output stage

Stromanschluß

The Sine Controller Model SVC 01 incorporates the latest in microprocessor technology to provide an economical solution to modern sinusoidal vibration testing requirements with a remarkably convenient operator interface. A dual microprocessor design ensures that all commands bring immediate control response without degrading the performance of the testing system. DSP controlled digital synthesis and filtering insures that the SVC 01 has the performance specifications found only in the best controllers available.

Two channel acceleration input meets the requirements for average control of large shakers, slip plates or large fixtures.

The difference output makes transfer function determination and calibration tests as easy as running a simple sine test. Flexible programming allows internal storage of up to four independent 1, 2, 3 or 4 level test profiles. Stored test profiles are easy to modify or replace and are maintained internally when the power is removed. This feature eliminates the need for external disks or memory cards and there are no batteries to wear down or replace. Large displays indicate the frequency, acceleration, and displacement at all times without the need to manually switch the display function after a cross-over. A programmable test cycle counter keeps track of the accumulated test time and can be set to terminate the test after a specific number of test sweep cycles. Optional the SVC 01 can be controlled remotely by PC via serial interface (RS 232, function includes programming and data transfer) Features:

- Wide frequency range and high resolution: 2.0 Hz to 6550 Hz with 0.1 resolution.
- Two independent input channels/amplifiers.
- Frequency, acceleration and displacement with test cycle counter displayed on LCD display.
- Control modes: Channel 1, Channel 2 or Average (Channel 1 + Channel 2)
- Analysis data can be copied to a PC and displayed/printed as graphs or inclusion on other Windows based applications.
- Convenient user interface: requires short documentation to set or run.
- Integral input amplifier with adjustable sensitivity and current source accepts voltage acceleration signals or direct ICP accelerometer inputs.
- Four program storage in internal non-volatile memory facilitates often used test.



534,5

534,5



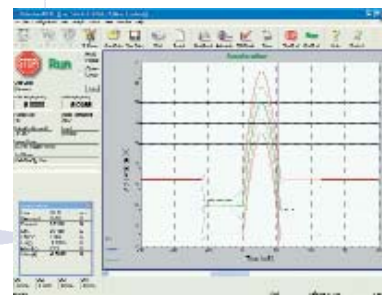
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Vibration Control System

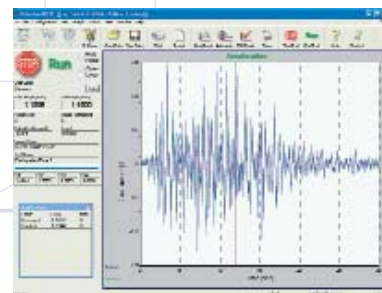


For sine, random, shock, mixed-mode and road simulation

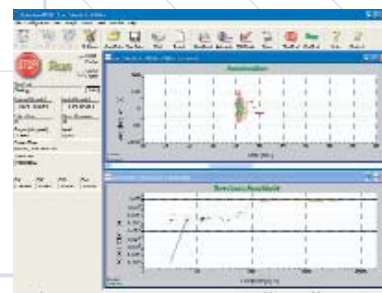
The computer-aided vibration control system meets all requirements for an advanced shaker control. It combines a highly-developed and powerful DSP hardware with a personal computer that is simple to operate. The system covers the entire test range with the modes of operation random, sine, shock and mixed-mode and offers a simple operation with an outstanding graphic user environment. Within the control system the PC carries out the test preparation, the indication of the test data and the very flexible report generation.



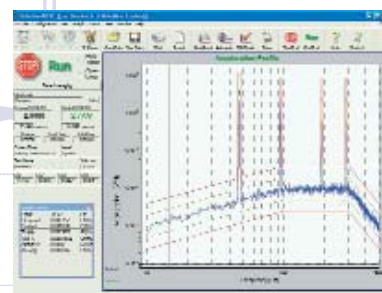
Shock



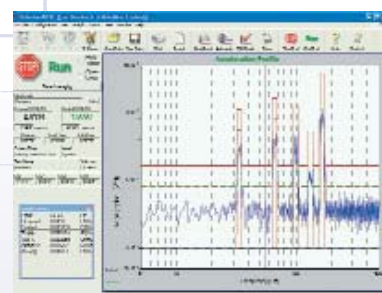
Transient



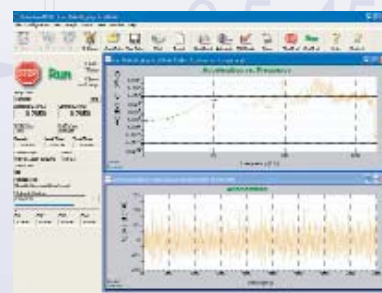
SRS



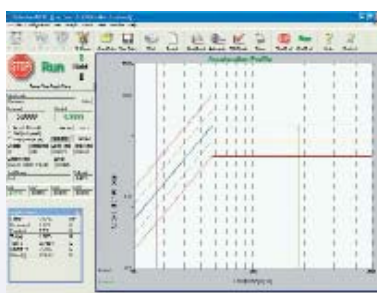
Sine wave-on-random



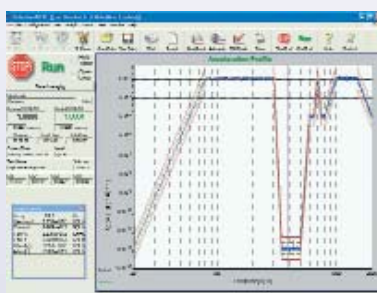
random-on-random



Road simulation



Sine wave



Random

Ø53, 010, R1, M6



Calibration Shaker

In all fields of industry, in aviation, the automotive industry and in power stations vibration analyses and measurements for determining the vibration transmission are increasingly carried out. A large variety of measuring sensors is necessary to realize such investigations. These measuring sensors have to be checked for their accuracy and calibrated in defined time intervals. As most of the measuring sensors have a large measuring range and large frequency ranges special shakers for calibrating these sensors are required.

TIRA has risen to this challenge and designed a unique shaker which meets these requirements. This newly developed shaker is equipped with a special guide system and a vibration system made of ceramic material. It is characterized by a very high utilizable frequency range up to 25 kHz and with the appropriate measuring equipment it is optimally suitable for professional calibration applications.



System		TV 51110-C		TV 51120-C		TV 51140-C	
		S513-C		S514-C		S540-C	
Shaker		BAA 120		BAA 500		BAA 1000	
Amplifier		-		SB 0080		SB0140	
Blower							
Rated peak force (N)/(lbf)	Sine/Random	Metric 100/50	American 20/10	Metric 200/100	American 40/20	Metric 400/200	American 90/40
Frequency range (Hz)		40 - 25000	40 - 25000	40 - 25000	40 - 25000	40 - 25000	40 - 25000
Max. rated travel (mm)/(inch)	Pk - Pk	4	0.2	4	0.2	4	0.2
Max. velocity (m/s)/(inch/sec)	Sine/Random	1.2/1.2	47/47	1.2/1.2	47/47	1.2/1.2	47/47
Max. acceleration (g)	Sine/Random	25/19	25/19	51/39	51/39	92/61	92/61
Rated current (A)		5.5	5.5	11.2	11.2	18	18
Nominal impedance (Ohm)		4	4	4	4	4	4
Effective moving mass (kg)/(lb)		0.40	0.88	0.40	0.88	0.44	0.97
Main resonance frequency (Hz)		>25000	>25000	>25000	>25000	>19000	>19000
Weight with trunnion (kg)/(lb)		33	72.8	33	72.8	16	35.3
Armature (ø/mm)/(ø/inch)		54	2.1	54	2.1	54	2.1
Cooling (m ² /h)/(ft ² /min)		-	-	40	24	80	47

Long stroke Shaker with 100 mm displacement (pk-pk)

Due to the ever increasing safety requirements the industry develops more and more sensor technology and components that have to be tested under extreme stress conditions.

The test parameters are developing up to higher and higher accelerations in combination with large impact ranges. These tests cannot be realized with conventional standard systems with a displacement of 50.8 mm (2").

TIRA has met the requirements of the industry to manufacture test installations that can imitate extreme shock simulations. It developed a series of long-stroke shakers with a displacement of 100 mm (peak -peak).

Apart from their application in laboratories for testing development problems the integration of these shakers in complete production lines has optimally proved.



System Shaker Amplifier Blower		TV 5550/LSS TV 5500/LSS A 51324 SB 0310		TV 56263/LSS S561/LSS A 52324 SD 9		TV 56280/LSS TV 56280/+LSS A 52330 SD 9	
		Metric	American	Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock	4000/4000/8000	900/900/1800	6300/6300/12600	1420/1420/2830	8000/8000/8000	1800/1800/1800
Frequency range (Hz)		DC - 1000	DC - 1000	DC - 1000	DC - 1000	DC - 1000	DC - 1000
Max. rated travel (mm)/(inch)	Pk - Pk	102	4.0	102	4.0	102	4.0
	Overtravel	107	4.21	107	4.21	107	4.21
	Mechanical stop	112	4.41	112	4.41	112	4.41
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock	3.0/3.0/4.5	118/118/177	3.0/3.0/4.5	118/118/177	3.0/3.0/4.5	118/118/177
Max. acceleration (g)	Sine/Random/Shock	37/37/74	37/37/74	54/54/107	54/54/107	68/68/136	68/68/136
Rated current (A)		220	220	220	220	275	275
Suspension Stiffness (N/mm) (lbf/inch)		**	**	**	**	**	**
Effective moving mass (kg)/(lb)		11.0	24.3	12.0	26.5	12.0	26.5
Main resonance frequency (Hz)		>2000	>2000	>2000	>2000	>2000	>2000
Weight with trunnion (kg)/(lb)		750	1653	1000	2205	1000	2205
Armature (ø/mm)/(ø/inch)		250	9.8	250	9.8	250	9.8
Cooling (m ³ /h)/(ft ³ /min)		280	165	500	294	500	294

System Shaker Amplifier Blower		TV 51010/LSS TV 51000/LSS A 53330 SD 120		TV 57315/LSS S572/LSS A 53342 SD 120	
		Metric	American	Metric	American
Rated peak force (N)/(lbf)	Sine/Random/Shock	11000/11000/22000	2470/2470/4950	15000/15000/15000	3370/3370/3370
Frequency range (Hz)		DC - 1000	DC - 1000	DC - 1000	DC - 1000
Max. rated travel (mm)/(inch)	Pk - Pk	102	4.0	102	4.0
	Overtravel	107	4.21	107	4.21
	Mechanical stop	112	4.41	112	4.41
Max. velocity (m/s)/(inch/sec)	Sine/Random/Shock	3.0/3.0/4.5	118/118/177	3.0/3.0/4.5	118/118/177
Max. acceleration (g)	Sine/Random/Shock	80/80/160	80/80/160	96/96/191	96/96/191
Rated current (A)		275	275	385	385
Suspension Stiffness (N/mm) (lbf/inch)		**	**	**	**
Effective moving mass (kg)/(lb)		14.0	30.9	16.0	35.3
Main resonance frequency (Hz)		>2000	>2000	>2000	>2000
Weight with trunnion (kg)/(lb)		1450	3197	1450	3197
Armature (ø/mm)/(ø/inch)		300	11.8	300	11.8
Cooling (m ³ /h)/(ft ³ /min)		500	294	500	294

** Electronic 0 - pointregulation with adjustable stiffness



Servo hydraulic Test Systems

Servo hydraulic test systems may be used in a wide range of material and component testing tasks. Therefore, **TIRA-WPM** offers a modular structured program of servo hydraulic test machines of the SHM series. Configuration of a servo hydraulic machines can be carried out according to the unitized construction principle. **TIRA-WPM** offers various sizes and design various of machine frames and clamping fixtures for tensile, compressive and bending tests. Special sample locations, e.g. for fracture mechanics testing are also available.



Essential features of a new generation of servo hydraulic test systems are:

- digital-modular electronic measuring and control equipment based upon a multi-processor system with VME bus
- user-friendly WINDOWS Software
- improved series of test cylinders with significantly better dynamics and functional safety
- hydraulic power packs with the latest technical solutions capable of meeting the requirements for reliable and efficient operation of servo-hydraulic test system.

TEST CYLINDER - A DECISIVE COMPONENT

The standard series comprises a force range of 6 kN to 1000 kN. The respective sizes can easily be expanded according to demands. The nominal pressure is 210 bar. Test cylinders can also be delivered with a working pressure of 280 bar.

Test cylinders are equipped with:

- hydrostatic bearing with special metallic antifriction coating
- leak proof sealing of piston rod
- inductive displacement transducer
- terminal block for reception from various servo valves of different dynamics and though put rates
- accumulator and scavenging plate

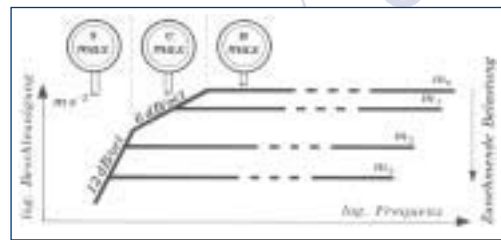
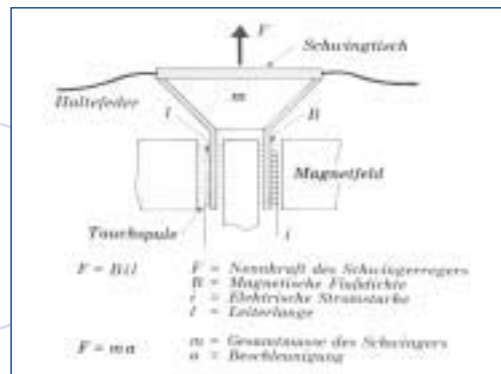


How Does an Exciter Work?

In principle the electromagnetic vibration exciter operates like a loudspeaker, where the movement is produced by a current passing through a coil in a magnetic field. The force used to accelerate the moving element is proportional to the drive current and the magnetic flux. Therefore by controlling the current, the vibration level of the exciter can be controlled.

In small exciters the magnetic field is produced by a permanent magnet, whereas in the larger ones electromagnets are necessary. The maximum current and the load determines the acceleration level which can be obtained. At low frequencies, however, this acceleration level will decrease due to displacement limitations of the moving element. Resonances in the moving element will set the upper frequency limit.

The performance of an exciter is presented in a diagram, showing the maximum acceleration as a function of frequency. With double logarithmic scales the displacement limit will be represented by a straight line with a slope of 12 dB/octave. A velocity limit is often also found, especially with the larger exciters, and this is indicated by a line with a slope of 6 dB/octave.



The Power Amplifier

The frequency response for an exciter driven by a constant current will show three regions of different nature. The first two regions represent the spring-mass system of the moving element and its suspension with a resonance of typically 20 Hz. In the third region, typically above 3 kHz for big exciters, axial resonances in the moving element will occur, setting the upper operational frequency of the exciter.

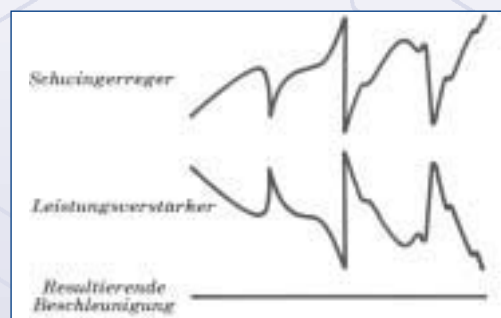
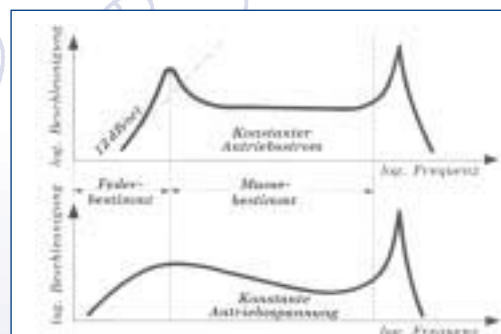
A response curve for an exciter with a constant voltage input will show the same regions of control, but the lower resonance is considerably damped, giving an easier control of the level. The voltage control, obtained by a low impedance amplifier is normally preferred. In some cases, however, a current control will be advantageous, primarily when the exciter is used as a force generator or where non-feedback control is required using the mid frequency range of the exciter. This demands a high impedance output and therefore amplifiers will often have selectable impedance outputs.

The Exciter Control

The use of a vibration exciter assumes a constant vibration level at the table. The frequency response curve is not flat, it contains resonances, and other resonances will be introduced when a test object is mounted on the exciter. When used throughout a frequency range the gain of the amplifier must consequently vary with frequency.

This gain is set by a controller, receiving feedback information from the test object. The main elements of an exciter control must therefore be a frequency generator, a vibration meter and a level controlling 4 circuit.

5



TIRA Vibration Test Systems

Member of the **TIRA** Group



- **TIRA** Vibration Test Systems
- **TIRA** Balancing Systems
- **TIRA** Environmental Simulation
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