



Schwingtechnik  
Vibration Test Systems



## TIRA Vibration Test Systems – Vibration Testing Equipment

# System overview

**TIRA** GmbH supplies measuring and testing systems for industry and research worldwide. At the Thuringia business location, we develop and manufacture modern plant engineering including application-specific software for testing the properties of materials and recording and eliminating undesirable vibrations.

### Our product- and delivery range:

- Electrodynamical vibration test systems, 9N - 300 kN
- Modal systems from 100 N - 15 kN
- Long stroke systems from 4 kN - 15 kN, max. stroke 100 mm
- Calibration shaker systems 100 N - 800 N
- Inertial shaker systems 125 N - 650 N
- Induction ring shaker systems 140 kN
- Analog/digital amplifiers
- Vibration control systems for sine/random/shock/mixed mode
- Slip tables, linear/hydrostatically guided
- Head expanders/special-purpose fixtures
- Elektrodynamical 3D vibration test systems
- Servomotor powered vibration test systems

### General formula for calculating the force vector of vibration systems:

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

\*Mass = moving element + device under test + fixture,

where applicable: slip table + driver bar + thermobarrier

### A variety of applications, all from one source.

The corporate structure of the **TIRA** Group with its product line of vibration testing technology, its own mechanical machining centre and the specialized departments of Material Testing Technology and Balancing Technology opens up the greatest possible flexibility and high manufacturing depth. More than 50 years of tradition, experience and the latest research in our sector form a solid base for first-class technology and reliable performance.

We offer tailor-made and standardized system solutions from one source. We also provide competent support to our customers, from concept and development, via construction, assembly, up to commissioning and support.

**TIRA** machines have proven themselves worldwide in industry, universities and institutes. Selected sales and service companies in more than 60 countries around the world represent the name and know-how of TIRA GmbH in order to advise and support users and prospective customers all over the world with regard to products.



TIRA booth at the trade show Productronica in Munich

# Vibration test systems from 9 N to 400 N

Our products are subject to strict quality control in accordance with the requirements of CE and national and international standards. The same care is given to the maintenance and modernisation of our traditional TIRA test and measurement technology, which has been proven over many years. In close cooperation with our customers, we maintain the progress, efficiency and quality of TIRA products and invest in the future of this potential. Our quality management has been certified according to DIN ISO 9001 since 1995 and according to DIN EN ISO 9001:2015 since February 2018.

TIRA permanent-magnet shakers are used as portable and stationary systems for the simulation of environmental influences. Typical applications are **structural analysis** and **testing of smaller assemblies**. The robust construction of the shakers guarantees a long service life. TIRA shakers are characterized by **high lateral stiffness**. TIRA has met the requirements of the industry for **lightweight construction** of the shakers. New rare earth magnets have been added to the usual Alnico magnets. This has resulted in a **reduction in mass** from 36 kg to 12 kg, which guarantees **easy handling** of the shakers especially **in mobile use**. These shakers have proven their worth in applications such as environmental laboratories and universities as well as in industrial production lines for component testing and calibration. These complete system offers allow users to test according to national and international standards such as DIN, ISO, BS, MIL, IEC and ASTM.



Shakers 9 N - 400 N

System	TV 50009	TV 50018	TV 51110
Shaker	S 50009	S 50018	S 51110
Amplifier	BAA 60 /DA 200	BAA 60/DA 200	BAA 120/DA 200
Rated peak force (N) Sine <sub>pk</sub> / Random <sub>RMS</sub>	9/-	18/-	100/70
Frequency range (Hz)	2 - 20000	2 - 20000	2 - 7000
Max. displacement (mm) Pk - Pk	3	5	13
Max. velocity (m/s)	1.5	1.5	1.5
Max. acceleration (g) Sine/Random	60/-	65/-	45/30
Suspension stiffness (N/mm)	4	4.4	8
Effective moving mass ±5% (kg)	0.015	0.028	0.23
Main resonance frequency (Hz)	>13000	>13000	>6500
Total shaker mass (without trunnion) (kg)	2.2 (1.7)	5.0 (3.7)	12
Coupling/Armature (ø/mm)	M4	M4	60
Max. power consumption at 230V (kVA)	0.05	0.05	0.08

System	TV 51120	TV 52110	TV 52120	TV 51140
Shaker	S 51120	S 52110	S 52120	S 51140
Amplifier	BAA 500	BAA 120/DA 200	BAA 500	BAA 1000
Blower	TB 0080	-	TB 0080	TB 0140
Rated peak force (N) Sine <sub>pk</sub> / Random <sub>RMS</sub>	200/140	100/50	200/100	400/311
Frequency range (Hz)	2 - 7000	2 - 7000	2 - 7000	2 - 6500
Max. displacement (mm) Pk - Pk	13	15	15	20
Max. velocity (m/s)	1.5	1.5	1.5	1.5
Max. acceleration (g) Sine/Random	89/62	50/25	100/50	100/50
Suspension stiffness (N/mm)	8	13.1	13.1	5
Effective moving mass ±5% (kg)	0.23	0.25	0.25	0.4
Main resonance frequency (Hz)	>6500	>5700	>5700	>5500
Total shaker mass (kg)	12	36	36	18
Armature (ø/mm)	60	60	60	60
Max. power consumption at 230V (kVA) Amplifier/Blower	0.35/0.46	0.08/-	0.35/0.46	2.7/1.4

General data - For detailed technical information see product data sheets  
(Download at <https://www.tira-gmbh.de/en/datasheets>)



## TIRA Vibration Test Systems

# Vibration test systems from 1000 N to 2700 N

- Automatic centering of the armature
- LS-shakers with up to 45 mm displacement and electronic zero-point regulation with adjustable stiffness
- Optional degauss kit to reduce stray magnetic field
- Multiple safety devices
- Coarse filter unit
- Squeak&Rattle Option (Low noise operation without blower)

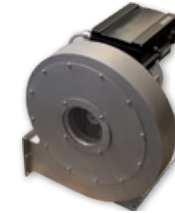
### TIRA Energy Management System

The TIRA Energy Management System enables for all vibration test systems with a force of 2.7 kN to 70 kN two possible energy saving options:

- operation with temperature-controlled cooling blower
- operation with temperature-controlled cooling blower and variable field power (+optional low degaussing kit)

Advantages: Reduction of costs, noise emission and environmental influences

# TIRA EMS



System	TV 5220-120	TV 5220/LS-120	TV 54216-130	TV 50350-120	TV 50350/LS-120
Shaker	S 5220-120	S 5220/LS-120	S 54216-130	S 50350-120	S 50350/LS-120
Amplifier	BAA 1000-E	BAA 1000-ET	BAA 1000-E	A 1 02 11 021 SV	A 1 02 11 021 T SV
Blower	TB 0140	TB 0140	TB 0140	TB 0310	TB 0310
Rated peak force (N) Sine <sub>pk</sub> / Random <sub>RMS</sub> / Shock <sub>pk</sub>	1000/650/1500	1000/650/1500	1600/1000/2000	2700/2000/5500	2700/2000/5300
Frequency range (Hz)	2 - 6500	2 - 6500	2 - 3500	2 - 4500	2 - 4500
Max. displacement (mm) Pk - Pk	25.4	45.0	25.4	25.4	45.0
Max. velocity (m/s) Sine/Random/Shock	1.5/1.5/2.0	1.5/1.5/2.0	1.5/1.5/2.0	1.5/1.5/2.5	1.5/1.5/2.5
Max. acceleration (g) Sine/Random/Shock	60/35/90	60/35/90	60/40/80	100/70/180	95/73/160
Suspension stiffness (N/mm)	22	Electr. adjustable	22	22	Electr. adjustable
Effective moving mass ±5% (kg)	1.75	1.75	2.6	2.7	2.9
Max. payload (kg)	20	20	20	25	25
Main resonance frequency (Hz)	>4800	>4600	>3000	>3800	>3700
Total shaker mass (kg)	122	122	188	280	280
Stray magnetic field (mT) without/with degauss kit	<8.5/<1.5	<8.5/<1	<8.5/-	<8.5/<1.4	<8.5/<1.4
Armature (ø/mm)	120	120	130	120	120
Max. power consumption at 230/400 V (kVA) incl. blower	5.1	5.2	5.2	17	17
Interlocks	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)



# Vibration test systems from 4 kN to 8 kN



- Clamping table ø180 mm with 21 threaded inserts or ø340 mm with 25 threaded inserts
- Long-time operation
- Minimum maintenance effort
- High cross-axial stiffness
- Supported by rugged frame with combined rubber/air isolators
- Automatic centering of the armature
- Fully automatic pneumatic load compensation for heavy test loads
- 50.8 mm (2 inch) displacement

- Standard degauss kit to reduce stray magnetic field
- Optional low degauss kit to reduce stray magnetic field to <0.8 mT
- Multiple safety devices
- Coarse filter unit
- Squeak&Rattle Option (Low noise operation without blower)
- Wheels&Rails Option (Shaker is maneuverable on rails)



Shaker S 55240/LS-340

System	TV 55240/LS-180	TV 55240/LS-340	TV 56280/LS-180	TV 56280/LS-340
Shaker	S 55240/LS-180	S 55240/LS-340	S 56280/LS-180	S 56280/LS-340
Amplifier	A 1 02 11 021 SV	A 1 02 11 021 SV	A 1 02 11 021 SV	A 1 02 11 021 SV
Blower	TB 0310	TB 0310	TB 9 FUK	TB 9 FUK
Rated peak force (N) Sinepk / RandomRMS / Shockpk	4000/3500/12000	4000/3600/12000	8000/7200/24000	8000/7200/24000
Frequency range (Hz)	2 - 3000	2 - 3000	2 - 3000	2 - 3000
Max. displacement (mm) Pk - Pk	50.8	50.8	50.8	50.8
Max. velocity (m/s) Sine/Random/Shock	2.0/2.0/2.4	2.0/2.0/2.4	2.0/2.0/3.5	2.0/2.0/3.5
Max. acceleration (g) Sine/Random/Shock	60/50/150	50/45/130	93/72/186	88/65/200
Suspension stiffness (N/mm)	50	50	50	50
Effective moving mass ±5% (kg)	6.8	8.3	8.1	9.6
Max. payload (kg)	250	250	250	250
Main resonance frequency (Hz)	>3000	>2700	>2900	>2500
Total shaker mass (kg)	700	780	765	780
Stray magnetic field (mT) Std./Low degaussing	<1.5/<0.8	<1.5/<0.8	<1.5/<0.8	<1.5/<0.8
Armature (ø/mm)	180	340	180	340
Max. power consumption at 400 V (kVA) incl. blower	17	17	17	17
Interlocks	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air

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## TIRA Vibration Test Systems

# Vibration test systems from 11 kN to 15 kN



See page 4

- Long-time operation
- Minimum maintenance effort
- High cross-axial stiffness
- Supported by rugged frame with vibration isolators
- Fully automatic pneumatic load compensation for heavy test loads
- Coarse filter unit
- 50.8 mm (2 inch) displacement
- Standard degauss kit to reduce stray magnetic field
- Optional low degauss kit to reduce stray magnetic field to <0.8 mT
- Wheels&Rails Option (Shaker is maneuverable on rails)
- Squeak&Rattle Option (Low noise operation without blower)



Shaker S 57315/LS-340

System	TV 51010/LS-230	TV 51010/LS-340	TV 57315/LS-230	TV 57315/LS-340
Shaker	S 51010/LS-230	S 51010/LS-340	S 57315/LS-230	S 57315/LS-340
Amplifier	A 1 02 11 021 SV	A 1 02 11 021 SV	A 3 01 11 042	A 3 01 11 042
Blower	TB 120 FUK	TB 120 FUK	TB 120 FUK	TB 120 FUK
Rated peak force (N)	Sine <sub>pk</sub> / Random <sub>RMS</sub> / Shock <sub>pk</sub>	11000/11000/33000	11000/11000/33000	15000/13000/45000
Frequency range (Hz)		2 - 3000	2 - 3000	2 - 3000
Max. displacement (mm)	Pk - Pk	50.8	50.8	50.8
Max. velocity (m/s)	Sine/Random/Shock	2.0/2.0/3.0	2.0/2.0/3.0	2.0/2.0/3.5
Max. acceleration (g)	Sine/Random/Shock	85/65/220	85/70/200	115/80/230
Suspension stiffness (N/mm)		75	75	75
Effective moving mass ±5% (kg)		13	14	13
Max. payload (kg)		250	250	250
Main resonance frequency (Hz)		>2300	>2400	>2300
Total shaker mass (kg)		1100	1100	1100
Stray magnetic field (mT)	Std./Low degaussing	<1.5/<0.8	<1.5/<0.8	<1.5/<0.8
Armature (ø/mm)		230	340	230
Max. power consumption at 400V (kVA) incl. blower		17	17	23.5
Interlocks		Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)



# Vibration test system 22 kN



- Long-time operation
- Minimum maintenance effort
- High cross-axial stiffness
- Supported by rugged frame with vibration isolators
- Automatic centering of the AIT-System and the armature
- Fully automatic pneumatic load compensation for heavy test loads
- AIT-System fixable to use the full displacement also at low frequencies and heavy loads

- Coarse filter unit
- Available as RIT or AIT trunnion system\*
- 76.2 mm (3 inch) displacement (Shock)
- Energy-saving mode (Field power reduction)
- Standard degauss kit to reduce stray magnetic field
- Wheels&Rails Option (Shaker is maneuverable on rails)
- Airglide option (Shaker is maneuverable on air cushions)



Shaker S 59322/AIT-340

System		TV 59322/*-340	TV 59322/*-440
Shaker		S 59322/*-340	S 59322/*-440
Amplifier		A 3 09 11 042	A 3 09 11 042
Blower		TB 7/FUK/11	TB 7/FUK/11
Rated peak force (N)	Sine <sub>pk</sub> / Random <sub>RMS</sub> / Shock <sub>pk</sub>	22000/15500/66000	22000/15500/66000
Frequency range (Hz)		5 - 3000	5 - 3000
Max. displacement (mm)	Sine/Random/Shock Pk - Pk	63.5/63.5/76.2	63.5/63.5/76.2
Max. velocity (m/s)	Sine/Random/Shock	2.0/2.0/3.5	2.0/2.0/3.5
Max. acceleration (g)	Sine/Random/Shock	80/55/200	80/55/200
Suspension stiffness (N/mm)		150	150
Effective moving mass (kg)		28.0	28.5
Max. payload (kg)		300	300
Main resonance frequency (Hz)		>2250	>2250
Total shaker mass (kg)	*RIT / AIT	1750/2000	1750/2000
Stray magnetic field (mT)		<1.5	<1.5
Armature (ø/mm)		340	440
Max. power consumption at 400V (kVA) Amp./Blower		29/17.5	29/17.5
Interlocks		Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air

General data - For detailed technical information see product data sheets  
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The transmission of vibrations to the installation site can be reduced by means of a corresponding trunnion mount ("**RIT**" = **Rigid Isolated Trunnion**). The frame is equipped with vibration isolators as standard.

The TIRA AIT-System ("**AIT**" = **Air Isolated Trunnion**) is a vibration isolation system integrated in the frame for vertical and horizontal guidance of the shaker. At low frequencies, it ensures optimal vibration isolation and precise guidance of the shaker body in the excitation direction.

**Low Base "LB"** vibration shakers for vertical test operation can be equipped with vibration damping elements or with rail systems for mobility. TIRA shakers, amplifiers and vibration control systems form a complete test system that allows users to verify the quality of their products in accordance with national standards (such as DIN, ISO, BS, MIL, IEC, ASTM).

## TIRA Vibration Test Systems

# Vibration test systems from 27 kN to 35 kN



See page 4

- Energy-saving mode (Field power reduction)
- Optional Dual Bearing-System for enhancement of cross axial stiffness and reduction of wear
- Airglide option (Shaker is maneuverable on air cushions)
- Multiple safety devices
- Clamping table  $\varnothing 340$  mm,  $\varnothing 440$  mm or  $\varnothing 640$  mm
- Long-time operation
- Minimum maintenance effort
- High cross-axial stiffness
- Supported by rugged frame with vibration isolators
- Automatic centering of the AIT-System and the armature
- AIT-System fixable to use the full displacement also at low frequencies and heavy loads
- Fully automatic pneumatic load compensation for heavy test loads
- Air-cooling blower with optional fan speed control
- Available as RIT, AIT or LB trunnion system\*
- Displacement of up to 76.2 mm (3 inch) (option for 440 mm CT)
- Standard degauss kit to reduce stray magnetic field
- Optional low degauss kit to reduce stray magnetic field to  $<0.8$  mT



Shaker S 59335/AIT-440

System		TV 59327/*-340	TV 59327/*-440	TV 59327/*-640	TV 59335/*-340	TV 59335/*-440	TV 59335/*-640
Shaker		S 59327/*-340	S 59327/*-440	S 59327/*-640	S 59335/*-340	S 59335/*-440	S 59335/*-640
Amplifier		A 3 08 11 042	A 3 08 11 042	A 3 08 11 042	A 3 08 11 063	A 3 08 11 063	A 3 08 11 063
Blower		TB 7/FUK/11	TB 7/FUK/11	TB 7/FUK/11	TB 7/FUK/11	TB 7/FUK/11	TB 7/FUK/11
Rated peak force (N)	Sine <sub>pk</sub> / Random <sub>RMS</sub> / Shock <sub>pk</sub>	27000/27000/80000	27000/27000/80000	27000/27000/80000	35000/32000/105000	35000/32000/105000	35000/32000/105000
Frequency range (Hz)		5 - 3000	5 - 3000	5 - 2000	5 - 3000	5 - 3000	5 - 2000
Max. displacement Pk-Pk (mm)	Sine/Random/Shock	50.8/50.8/50.8	50.8/50.8/50.8	50.8/50.8/50.8	50.8/50.8/50.8	50.8/50.8/50.8	50.8/50.8/50.8
Max. velocity (m/s)	Sine/Random/Shock	2.0/1.8/3.0	2.0/1.8/3.0	2.0/1.8/3.0	2.0/1.8/3.0	2.0/1.8/3.0	2.0/1.8/3.0
Max. acceleration (g)	Sine/Random/Shock	84/65/167	79/50/158	66/50/131	100/88/220	100/67/207	70/63/160
Suspension stiffness (N/mm)		150	150	150	150	150	150
Effective moving mass (kg)		29.0	36.5	40.5	29.0	36.5	40.5
Max. payload (kg)		610	610	610	610	610	610
Main resonance frequency (Hz)		>2400	>2400	>1900	>2400	>2400	2000
Total shaker mass (kg)	*RIT/AIT/LB	2350/2700/2250	2350/2700/2250	2350/2700/2250	2350/2700/2250	2350/2700/2250	2350/2700/2250
Stray magnetic field (mT)	Std./Low degaussing	<1.5/<0.8	<1.5/<0.8	<2/<1	<1.5/<0.8	<1.5/<0.8	<2/<1
Armature ( $\varnothing$ /mm)		340	440	640	340	440	640
Max. power consumption at 400V (kVA)	Amplifier/Blower	30/17.5	30/17.5	30/17.5	32/17.5	32/17.5	32/17.5
Interlocks		Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)





# Vibration test systems from 49.5 kN to 70 kN



- Clamping table ø480 mm
- Other clamping table sizes on request
- Long-time operation
- Minimum maintenance effort
- High cross-axial stiffness
- Supported by rugged frame with vibration isolators
- Automatic centering of the AIT-System and the armature
- AIT-System fixable to use the full displacement also at low frequencies and heavy loads
- Fully automatic pneumatic load compensation for heavy test loads

- Air-cooling blower with optional fan speed control
- Up to 76.2 mm (3") displacement
- Degauss kit to reduce stray magnetic field
- Energy-saving mode (Field power reduction)
- Dual Bearing-System for enhancement of cross axial stiffness and reduction of wear
- Airglide option (Shaker is maneuverable on air cushions)
- Multiple safety devices



Shaker S 59370/AIT-480

System	TV 59349/AIT-480	TV 59356/AIT-480	TV 59370/AIT-480
Shaker	S 59349/AIT-480	S 59356/AIT-480	S 59370/AIT-480
Amplifier	A 6 26 11 105	A 6 26 11 126	A 6 26 11 147
Blower	TB 7/FUK/20	TB 7/FUK/20	TB HR160
Rated peak force (N) Sine <sub>pk</sub> / Random <sub>RMS</sub> /Shock <sub>pk</sub>	49500/48000/148500	56000/56000/160000	70000/67000/210000
Frequency range (Hz)	5 - 2500	5 - 2500	5 - 2500
Max. displacement Pk-Pk (mm) Sine/Random/Shock	63.5/63.5/76.2	63.5/63.5/76.2	63.5/63.5/76.2
Max. velocity (m/s) Sine/Random/Shock	2.0/2.0/3.5	2.0/2.0/3.5	2.0/2.0/3.5
Max. acceleration (g) Sine/Random/Shock	91/75/224	100/80/350	100/80/350
Suspension stiffness (N/mm)	250	250	250
Effective moving mass (kg)	55.0	55.0	70.0
Max. payload (kg)	910	910	910
Main resonance frequency (Hz)	>2100	>2100	>2100
Total shaker mass (kg)	4800	4800	4800
Stray magnetic field (mT)	1.5	1.5	1.5
Armature (ø/mm)	480	480	480
Max. power consumption at 400V (kVA) Amplifier/Blower	56/27	66/27	82/30
Interlocks	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air	Temperature, overtravel, airflow, overcurrent, compressed air

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)



## TIRA Vibration Test Systems

# Water-cooled vibration test systems from 74 kN to 125 kN

Water-cooled **TIRA** shakers are guided hydrostatically and cooled by a closed water circuit. The external cooling unit also supplies the lubricant for the hydrostatic bearings, which enables frictionless positioning of the vibration armature. Water-cooled shakers have the advantage of generating high forces for testing heavy loads with high accelerations. Specimen masses up to 910 kg are possible. A fully automatic pneumatic load compensation system enables the nominal vibration displacement to be reached even at high specimen masses.

- Up to 76.2 mm (3 inch) displacement
- Shaker water circuit with overpressure

- Degauss kit to reduce stray magnetic field
- Dual Bearing-System for enhancement of cross axial stiffness and reduction of wear
- Automatic permanent conductance monitoring of the cooling water
- Automatic centering of the AIT-System and the armature
- AIT-System fixable to use the full displacement also at low frequencies
- Energy saving mode (Field power reduction)



Shaker S 59412/AIT-480

System	TV 59374/AIT-480	TV 59389/AIT-480	TV 59410/AIT-480	TV 59412/AIT-480
Shaker	S 59412/AIT-480	S 59412/AIT-480	S 59412/AIT-480	S 59412/AIT-480
Amplifier	A 6 00 11 210	A 6 00 11 252	A 6 00 11 273	A 6 00 11 315
Cooling Unit	C 59410	C 59410	C 59410	C 59410
Rated peak force (N) Sinepk / RandomRMS / Shockpk	74000/74000/222000	89000/89000/267000	100000/89000/300000	125000/110000/375000
Frequency range (Hz)	5 - 2500	5 - 2500	5 - 2500	5 - 2500
Max. displacement Pk-Pk (mm) Sine/Random/Shock	63.5/63.5/76.2	63.5/63.5/76.2	63.5/63.5/76.2	63.5/63.5/76.2
Max. velocity (m/s) Sine/Random/Shock	2.0/2.0/4.0	2.0/2.0/4.0	2.0/2.0/4.0	2.0/2.0/4.0
Max. acceleration (g) Sine/Random/Shock	99/90/300	100/90/300	100/90/300	100/90/300
Suspension stiffness (N/mm)	250	250	250	250
Effective moving mass (kg)	76	76	76	76
Max. payload (kg)	910	910	910	910
Main resonance frequency (Hz)	>2100	>2100	>2100	>2100
Total shaker mass (kg)	5300	5300	5300	5300
Stray magnetic field (mT)	<1.5	<1.5	<1.5	<1.5
Armature (ø/mm)	480	480	480	480
Max. power consumption at 400V (kVA) Amplifier incl. cooling unit / Field power unit	60/40	90/40	118/40	140/40
Interlocks	Temperature, overtravel, overcurrent, compressed air, water flow rate, differential pressure, conductance	Temperature, overtravel, overcurrent, compressed air, water flow rate, differential pressure, conductance	Temperature, overtravel, overcurrent, compressed air, water flow rate, differential pressure, conductance	Temperature, overtravel, overcurrent, compressed air, water flow rate, differential pressure, conductance

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)



# Water-cooled vibration test systems from 130 kN to 300 kN

- Up to 76.2 mm (3 inch) displacement
- Shaker water circuit with overpressure
- Degauss kit to reduce stray magnetic field
- Dual Bearing-System for enhancement of cross axial stiffness and reduction of wear
- Payloads of up to 2500 kg
- Automatic permanent conductance monitoring of the cooling water
- Automatic centering of the AIT-System and the armature
- AIT-System fixable to use the full displacement also at low frequencies
- Energy saving mode (Field power reduction)



Schwingereger S 59420/AIT-590

System	TV 59413/AIT-590	TV 59416/AIT-590	TV 59420/AIT-590	TV 59430/AIT-840	
Shaker	S 59420/AIT-590	S 59420/AIT-590	S 59420/AIT-590	S 59430/AIT-840	
Amplifier	A 6 00 11 336	A 6 00 11 378	A 6 00 11 462	A 6 00 11 483	
Cooling Unit	C 59430	C 59430	C 59430	C 59430	
Rated peak force (N)	Sine <sub>pk</sub> / Random <sub>RMS</sub> / Shock <sub>pk</sub>	130000/130000/390000	168000/168000/504000	200000/168000/600000	300000/270000/900000
Frequency range (Hz)		5 - 2000	5 - 2000	5 - 2000	5 - 2000
Max. displacement Pk-Pk(mm)	Sine/Random/Shock	63.5/63.5/76.2	63.5/63.5/76.2	63.5/63.5/76.2	63.5/63.5/76.2
Max. velocity (m/s)	Sine/Random/Shock	2.0/2.0/3.5	2.0/2.0/3.5	2.0/2.0/3.5	2.0/2.0/3.5
Max. acceleration (g)	Sine/Random/Shock	100/75/300	100/75/300	100/75/300	70/70/250
Suspension stiffness (N/mm)		250	250	250	450
Effective moving mass (kg)		125	125	125	275
Max. payload (kg)		1300 (7 bar)	1300 (7 bar)	1300 (7 bar)	2500
Main resonance frequency (Hz)		1700	1700	1700	1500
Total shaker mass (kg)		8450	8450	8450	18500
Stray magnetic field (mT)		1.5	1.5	1.5	5
Armature (ø/mm)		590	590	590	840
Max. power consumption at 400V (kVA) Amplifier incl. cooling unit / Field power unit		220/98	244/98	285/98	370/110
Interlocks		Temperature, overtravel, overcurrent, compressed air, water flow rate, differential pressure, conductance	Temperature, overtravel, overcurrent, compressed air, water flow rate, differential pressure, conductance	Temperature, overtravel, overcurrent, compressed air, water flow rate, differential pressure, conductance	Temperature, overtravel, overcurrent, compressed air, water flow rate, differential pressure, conductance

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)



Subject to change without notice. Errors and omissions excepted.

## TIRA Vibration Test Systems

# Induction ring vibration test systems 140 kN

Induction ring shakers operate with an all-metal moving coil with a single winding, in which an alternating voltage is induced by surrounding static coils, thus setting the moving coil in motion. Cooling is provided by a combined water/air cooler. The external cooling unit also provides the lubricant for the hydrostatic bearings, which enable friction-free mounting of the vibration armature.

- Advantages of induction ring shakers:
- No power connection to the vibration armature necessary -> Less failure susceptibility
  - High mechanical strength of the moving coil  
-> Greatly reduced maintenance requirements
  - High acceleration values
  - High resonance frequency of the vibrating armature



Shaker S 69440/AIT-480

System	TV 69440/AIT-480-IRS-210	TV 69440/AIT-480-IRS-315	TV 69440/AIT-480-IRS-402
Shaker	S 69440/AIT-480	S 69440/AIT-480	S 69440/AIT-480
Amplifier	A 6 00 11 210	A 6 00 11 315	A 6 00 11 402
Cooling Unit water/air	C 59412 / TB 7/FUK/20	C 59412 / TB 7/FUK/20	C 59412 / TB 7/FUK/20
Rated peak force (N) Sine <sub>pk</sub> / Random <sub>RMS</sub> / Shock <sub>pk</sub>	140000/130000/420000	140000/130000/420000	140000/130000/420000
Frequency range (Hz)	5 - 3000	5 - 3000	5 - 3000
Max. displacement Pk-Pk (mm) Sine/Random/Shock	63.5/63.5/76.2	63.5/63.5/76.2	63.5/63.5/76.2
Max. velocity (m/s) Sine/Random/Shock	2.0/2.0/4.0	2.0/2.0/4.0	2.0/2.0/4.0
Max. acceleration (g) Sine/Random	200/180	200/180	200/180
Max. acceleration (g) Shock (at payload)	3 ms: 300 (35 kg) 6 ms: 100 (230 kg) 11 ms: 100 (80 kg)	3 ms: 300 (60 kg) 6 ms: 100 (240 kg) 11 ms: 100 (300 kg)	3 ms: 300 (95 kg) 6 ms: 100 (240 kg) 11 ms: 100 (350 kg)
Suspension stiffness (N/mm)	99	99	99
Effective moving mass (kg)	53	53	53
Max. payload (kg)	610	610	610
Main resonance frequency (Hz)	2400	2400	2400
Total shaker mass (kg)	5300	5300	5300
Stray magnetic field (mT)	<1,5	<1,5	<1,5
Armature (ø/mm)	480	480	480
Max. power consumption at 400V (kVA) Amplifier incl. cooling unit / Field power unit	60/40	285/40	370/40
Interlocks	Temperature, overtravel, overcurrent, cooling air, compressed air, water flow rate, differential pressure, conductance	Temperature, overtravel, overcurrent, cooling air, compressed air, water flow rate, differential pressure, conductance	Temperature, overtravel, overcurrent, cooling air, compressed air, water flow rate, differential pressure, conductance

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)



# Calibration shakers from 100 N to 800 N

Measurements for determining vibration transmission and vibration analysis are increasingly being carried out in all areas of industry, aviation, the automotive industry and power plants.

In order to be able to carry out such tests, a large number of measuring sensors are necessary. The sensors must be checked and calibrated for accuracy at defined time intervals. Since most transducers have a high measuring range and wide frequency ranges, special shakers are required to calibrate the transducers.

**TIRA** has taken up this challenge and developed a shaker that meets these requirements. This newly developed shaker consists of a **ceramic vibration system** and a special guide system. This newly developed vibration system is characterized by its very high, usable frequency range up to 25 kHz and is ideally suited for professional calibration with the appropriate measuring equipment. Note: The calibration shakers are not designed for continuous operation at maximum power.

The "AC" calibration shaker additionally has a special air bearing which offers the advantage of friction and wear-free operation and also dampens interference vibrations.



Calibration Shaker S 51140-C

System		TV 51110-C	TV 51110-AC	TV 51120-C	TV 51140-C	TV 5220-C
Shaker		S 51110-C	S 51110-AC	S 51120-C	S 51140-C	S 5220-C
Amplifier		BAA 120/DA 200	BAA 500-T	BAA 500	BAA 1000	BAA 1000-ET
Blower		-	-	TB 0080	TB 0140	TB 0140
Rated peak force (N)	Sine <sub>pk</sub> / Random <sub>RMS</sub>	100/50	100/50	200/100	400/200	800/400
Frequency range (Hz)		10 - 25000	1 - 20000	10 - 25000	10 - 20000	1 - 20000
Max. displacement (mm)	Pk - Pk	4	25.4	4	4	25.4
Max. velocity (m/s)		1.2	1.2	1.2	1.2	1.5
Max. acceleration (g)	Sine/Random	25/12	17/8	51/25	68/34	60/30
Effective moving mass ±5% (kg)		0.40	0.53	0.40	0.50	1.35
Main resonance frequency (Hz)		>25000	>19000	>25000	>19000	>13000
Total shaker mass (kg)		33	18	42	21	110
Armature (ø/mm)		54	50	54	54	130
Compressed air (bar)			3 (app. 2.5 l/min)			
Max. power consumption at 230V (kVA)	Amplifier/Blower	0.08/-	0.35/-	0.35/0.46	2.7/1.4	2.7/2.5

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)



Subject to change without notice. Errors and omissions excepted.

## TIRA Vibration Test Systems – Modal systems

# Modal systems from 100 N to 2.7 kN

TIRA provides a series of modal exciters from 100 N to 2.7 kN specifically for the requirements of **modal and structural analysis**.

Up to 400 N, the modal exciters are excited by permanent magnets, whereby the exciters, which are manufactured especially with rare-earth magnets, convince by their **lightweight construction** in mobile use. The construction of the modal exciters is characterized by **high lateral stiffness**. Modal exciters from 1000 N upwards provide a vibration displacement of up to 45 mm. This is made possible by a TMC control. The **electronic zero point control TMC** enables an exact coupling of the modal exciter to the test object. The axial stiffness is also electronically adjustable.

All modal exciters are equipped with a trunnion as standard. A variety of coupling options are offered.

The modal exciter systems TV 51120-MNC and TV 51130-MSC are a special development of TIRA to **increase mobility**. The 200 N shaker does not require any additional cooling unit and the 350 N shaker has an integrated air cooling system, which eliminates the need for an additional external cooling unit.



Modal shaker S 51120-M



Modal shaker S 51130-MSC

System	TV 51110-M	TV 51120-M	TV 51120-MNC	TV 51130-MSC
Shaker	S 51110-M	S 51120-M	S 51120-MNC	S 51130-MSC
Amplifier	BAA 120/DA 200	BAA 500	BAA 500	BAA 500-MSC
Blower	–	TB 0080	–	internal
Rated peak force (N) Sine <sub>pk</sub> /Random <sub>RMS</sub>	100/70	200/140	200/100	350/200
Frequency range (Hz)	DC - 5000	DC - 5000	DC - 3000	DC - 4000
Max. displacement (mm) Pk - Pk	13	13	9	10
Max. velocity (m/s)	1.5	1.5	1.3	1.3
Suspension stiffness (N/mm)	8	8	70	70
Effective moving mass ±5% (kg)	0.23	0.23	0.5	0.55
Main resonance frequency (Hz) (free-swinging)	>2680	>2680	>4000	>2700
Total shaker mass (kg)	12	12	18	27
Coupling (Thread ø)	M6	M6	M8	M8
Max. power consumption at 230V (kVA) Amplifier/Blower	0.08/-	0.35/0.46	0.35/-	0.9 (incl. blower)

System	TV 51140-M	TV 5220-M	TV 50350-M
Shaker	S 51140-M	S 5220-M	S 50350-M
Amplifier	BAA 1000	BAA 1000-ET	A 1 02 11 021 T SV
Blower	TB 0140	TB 0140	TB 0310
Rated peak force (N) Sine <sub>pk</sub> /Random <sub>RMS</sub>	400/311	1000/650	2700/2000
Frequency range (Hz)	DC - 5000	1 - 5000	1 - 3000
Max. displacement (mm) Pk - Pk	20	45	45
Max. velocity (m/s)	1.5	1.5	1.5
Suspension stiffness (N/mm)	5	Electr. adjustable	Electr. adjustable
Effective moving mass ±5% (kg)	0.4	1.45	2.3
Main resonance frequency (Hz) (free-swinging)	>2450	>4000	>3000
Total shaker mass (kg)	18	122	280
Coupling (Thread ø)	M6	M8	M8
Max. power consumption at 230/400V (kVA) Amplifier/Blower (+FPS)	2.7/1.4	2.7/2.5	17 (total)

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)



# Modal systems from 100 N to 15 kN

TIRA offers a new range of special modal exciters for **mobile use**. The MOSP models feature a **large vibration displacement** of up to 25.4 mm. The low mass by using rare-earth magnets, the through hole in the center of the armature for **using piano-wire stingers** besides push/pull stingers and for accomplishing a variable adjustment of the distance to the test structure, are additional features of this series.

TIRA offers a series of modal exciters from 4 kN to 15 kN especially for modal excitation of **large structures** or structures with **high mass**. The construction of these modal exciters is characterized by **high lateral stiffness**. They provide a vibration displacement of up to 100 mm (pk-pk), which is achieved by the use of a TMC control. The **electronic zero point control TMC** enables an exact coupling of the modal exciter to the test object. The axial stiffness can be easily adjusted.



Modal shaker S 51110-MOSP

Modal shaker S 55240-M/LSS

System	TV 51110-MOSP	TV 51120-MOSP	TV 51140-MOSP
Shaker	S 51110-MOSP	S 51120-MOSP	S 51140-MOSP
Amplifier	BAA 120/DA 200	BAA 500	BAA 1000
Blower	–	TB 0080	TB 0140
Rated peak force (N) Sine <sub>pk</sub> / Random <sub>RMS</sub>	100/70	200/140	400/280
Frequency range (Hz)	DC - 5000	DC - 5000	DC - 5000
Max. displacement (mm) Pk - Pk	25.4	25.4	25.4
Max. velocity (m/s)	1.5	1.5	1.5
Suspension stiffness (N/mm)	4	4	4
Effective moving mass ±5% (kg)	0.23	0.23	0.4
Main resonance frequency (Hz) (free-swinging)	>6000	>6000	4000
Total shaker mass (kg)	21	21	21
Coupling (Thread ø)	M6	M6	M6
Max. power consumpt. at 230V (kVA) Amplifier/Blower	0.08/-	0.35/0.46	2.7/1.4

System	TV 55240-M/LSS	TV 56280-M/LSS	TV 57315-M/LSS
Shaker	S 55240-M/LSS	S 56280-M/LSS	S 57315-M/LSS
Amplifier	A 1 02 11 021 T SV	A 1 02 11 021 T SV	A 3 01 11 063 T
Blower	TB 0310	TB 9 FUK	TB 120 FUK
Rated peak force (N) Sine <sub>pk</sub> / Random <sub>RMS</sub>	4000/3400	8000/6000	15000/11000
Frequency range (Hz)	1 - 2000	1 - 2000	1 - 2000
Max. displacement (mm) Pk - Pk	100	100	100
Max. velocity (m/s)	2.0	2.0	2.0
Effective moving mass ±5% (kg)	11.0	12.0	18.0
Main resonance frequency (Hz) (free-swinging)	>2500	>2500	>2500
Total shaker mass (kg)	800	850	1200
Coupling (Thread ø)	M10	M10	M10
Max. power consumption at 400V (kVA) incl. blower	17	17	29

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)



## TIRA Vibration Test Systems – Inertial systems

# Inertial systems from 125 N to 650 N

**TIRA** manufactures a range of inertial exciters (IN) from 125 N to 650 N. The inertial exciters (IN) are screwed directly to the structure and can be coupled at any angle in 360 degrees to the structure.

These inertial exciters (IN) are characterized by **high lateral stiffness**. The permanent magnet driven inertial exciters are equipped with a special spring system which provides an optimal guidance. This allows the exciter to work on the structure with its full body mass with no problems.

A maintenance-free fan guarantees the cooling of the vibration exciter. The cooling air is suctioned through a coarse filter system. TIRA's inertial exciters (IN) are used in industry, aerospace, civil engineering and the shipbuilding industry, as they are a favourable and effective method for transferring dynamic forces into large structures.



Inertial shaker S 51140-IN

System		TV 51112-IN	TV 51125-IN
Shaker		S 51112-IN	S 51125-IN
Amplifier		BAA 120/DA 200	BAA 500
Blower		–	TB 0080
Rated peak force (N)	Sine <sub>pk</sub> / Random <sub>RMS</sub>	125/70	250/150
Frequency range (Hz)		2 - 2000	2 - 2000
Max. displacement (mm)	Pk - Pk	9	9
Max. velocity (m/s)		1.5	1.5
Max. acceleration (g)	Sine/Random	0.98/0.54	2/1.2
Suspension stiffness (N/mm)		20	20
Effective moving mass ±5% (kg)		0.35	0.35
Total shaker mass (kg)		13	13
Coupling (Thread ø)		M12	M12
Max. power consumption at 230V (kVA) Amplifier/Blower		0.1/-	0.4/0.46

System		TV 51140-IN	TV 51165-IN
Shaker		S 51140-IN	S 51165-IN
Amplifier		BAA 1000	BAA 1000
Blower		TB 0140	TB 0140
Rated peak force (N)	Sine <sub>pk</sub> / Random <sub>RMS</sub>	400/311	650/420
Frequency range (Hz)		2 - 2000	2 - 2000
Max. displacement (mm)	Pk - Pk	9	9
Max. velocity (m/s)		1.5	1.5
Max. acceleration (g)	Sine/Random	2.8/2	2.6/1.7
Suspension stiffness (N/mm)		56	98
Effective moving mass ±5% (kg)		0.63	0.97
Total shaker mass (kg)		16	26
Coupling (Thread ø)		M12	M12
Max. power consumption at 230V (kVA) Amplifier/Blower		2.7/1.4	2.7/1.4

General data - For detailed technical information see product data sheets  
(Download at <https://www.tira-gmbh.de/en/datasheets>)

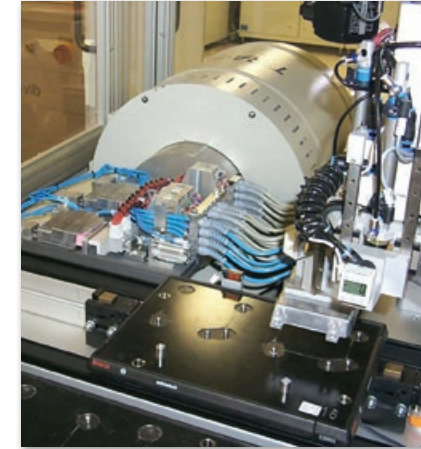




# Long stroke shaker with 100 mm displacement (pk-pk)

As a result of growing safety requirements, the industry is increasingly developing sensors and components that have to be tested under extreme stress conditions. The test parameters reach higher and higher accelerations combined with long shock duration - these tests are no longer possible with conventional standard systems with a vibration displacement of 50.8 mm.

TIRA has responded to the requirements of the industry for testing systems that can simulate extreme shocks by developing a series of long stroke exciters with 100 mm vibration displacement (pk-pk). In addition to their use in the laboratory for testing development tasks, these shakers have also proved their worth in the integration into complete production lines.



System	TV 55240/LSS-250	TV 56280/LSS-250	TV 57315/LSS-300
Shaker	S 55240/LSS-250	S 56280/LSS-250	S 57315/LSS-300
Amplifier	A 1 02 11 021 T SV	A 1 02 11 021 T SV	A 3 01 11 063 T
Blower	TB 0310	TB 9 FUK	TB 120 FUK
Rated peak force (N) Sine <sub>pk</sub> / Random <sub>RMS</sub> / Shock <sub>pk</sub>	4000/3400/10000	8000/6000/20000	15000/11000/37500
Frequency range (Hz)	1 - 2000	1 - 2000	1 - 2000
Max. displacement (mm) Pk - Pk	100	100	100
Max. velocity (m/s) Sine/Random/Shock	2.0/2.0/4.5	2.0/2.0/4.5	2.0/2.0/4.5
Max. acceleration (g) Sine/Random/Shock	37/30/74	60/45/136	60/50/210
Max. payload (kg)	50	50	80
Effective moving mass ±5% (kg)	12.0	13.0	17.0
Main resonance frequency (Hz)	>2000	>2000	>1700
Total shaker mass (kg)	800	850	1200
Stray magnetic field (mT)	n/a	n/a	<6
Armature (ø/mm)	250	250	300
Max. power consumption at 400V (kVA) incl. blower	17	17	29

General data - For detailed technical information see product data sheets (Download at <https://www.tira-gmbh.de/en/datasheets>)



## TIRA Vibration Test Systems – Slip Tables

# TIRA Slip Tables

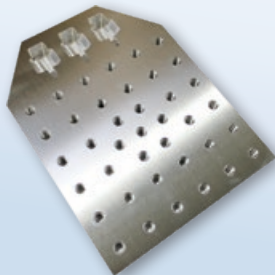
### OUR CONCEPT

The clear and functional design of TIRA slip tables enables **user-friendly handling and trouble-free testing**. Swiveling the shaker does not limit the possibility of conventional vibration tests on the vibration armature. Rigid welded structures as a basis increase the reaction mass of our systems. Undesirable vibrations on the surrounding area are damped. Linear guides guarantee the lateral stiffness of the slip plate and minimize lateral vibrations in asymmetrical test arrangements.

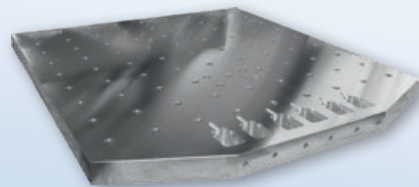
TIRA's Monobase slip tables are available in different versions:

Index XS:	for vibration systems:	TV 5220, TV 54216
Index S:	for vibration systems:	TV 50350
Index SM:	for vibration systems:	TV 55240
Index M:	for vibration systems:	TV 56280
Index L:	for vibration systems:	TV 51010, TV 57315
Index XL:	for vibration systems:	TV 59322, TV 59327, TV 59335
Index XXL:	for vibration systems:	TV 59349 - TV 59412, TV 69440
Index XXXL:	for vibration systems:	TV 59413, TV 59416, TV 59420
Index LX:	for vibration systems:	TV 59430

In vibration technology, testing tasks arise from applications in research, development and quality assurance. As the masses and dimensions of the test specimens increase, the testing tasks can no longer be performed on the armatures of electrodynamic shakers.

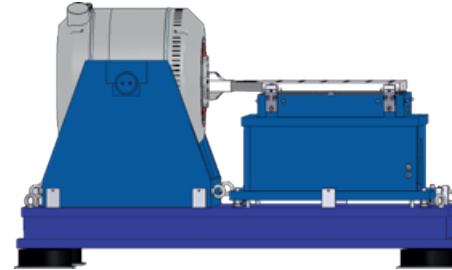


Slip plate 12"



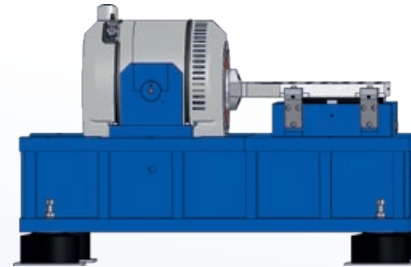
Slip plate 48"

### SLIP TABLE MINIBASE



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

### SLIP TABLE MONOBASE



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

Tailor-made manufacturing is our success. We offer customer-specific solutions which can be adapted to all special requirements. TIRA slip tables can be optionally adapted to all existing vibration and climate test systems. By the use of high-quality materials and reliable components, our products ensure long-term use at low operating costs.

TIRA Vibration Test Systems – Slip Tables

# TIRA Slip Tables



## TESTING UNDER STRESS

Modern systems and installations have to prove themselves in all areas under their operating conditions such as temperature changes, vibrations and high humidity. From the conceptual design stage to the final inspection of electrical, electronic or mechanical products, **combined vibration-climate testing systems** simulate environmental influences on the test object. Weak points can be detected early and optimized cost-effectively. Expensive downtimes and damage are avoided by the correct design of functionally relevant components. These multi-test systems are important elements of quality assurance in the production process.

## 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 are available for vibration generators with different armature diameters from 120 mm to 840 mm.

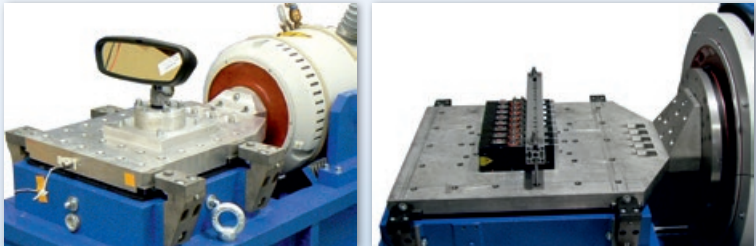
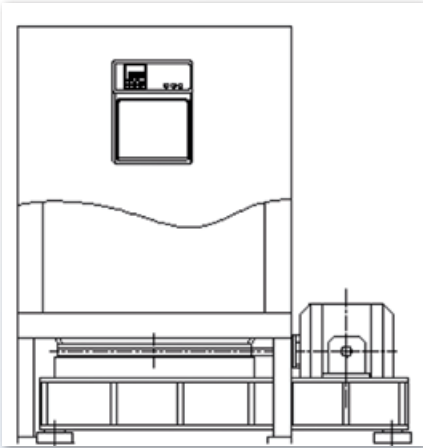
Driver bars		
Slip table version	Armature diameter (mm)	~Mass (kg)
XS	120	1.0
S	120	1.5
SM	180	3.0
	340	6.5
M	180	3.0
	340	6.5
L	230	3.5
	340	6.0
XL	340	8.0
	440	9.0
	640	10.0
XXL	340	15.0
	480	16.0
	640	20.0
XXXL	590	49.0
LX	840	96.0

## VIBRATION ISOLATION, SAFE INSTALLATION

Air spring elements allow the use of the slip tables without expensive foundations. Due to the low natural frequency of the isolators (3 - 5 Hz) a wide test spectrum can be applied.

## TEST OBJECT FIXING

Test objects must be excited in their final position for practice-oriented simulation. TIRA supplies individual clamping devices for each application.



## TIRA Vibration Test Systems – Slip Tables

# Oil-film slip tables

Increasing requirements in vibration testing demand additional slip table systems, which also allow testing of large and heavy specimens in horizontal mounting positions. The monobase design ensures fast and precise alignment and coupling of the shaker to the slip table. The slip tables are available as standard with slip table plates up to 2000 mm x 2000 mm. Different and larger tables are manufactured according to customer requirements. The oil film slip tables consist of a precision ground and lapped natural granite base plate on which a magnesium plate slides onto an oil film. 4 Linear guides ensure the lateral guidance of the slip plate and minimize lateral vibrations. The possibility of horizontal and vertical excitation al-



Shaker S 51010/LS-340  
with slip table TGT MO 20 L

lows tests in mounting position. Vibration isolators are mounted on the bottom of the frame as a standard feature to prevent vibration effects on the building.

- 100 mm displacement possible
- Integrated oil pan
- Non-contact displacement monitoring (only with AIT-systems)

	Moving plate working area (mm)	Slip plate mass ( $\pm 5\%$ ) (kg)	Slip plate thickness (mm)	Max. specimen mass (kg)	Dimension ~ L*W*H (mm)	Max. pitch moment (Nm)	Max. roll moment (Nm)	Max. yaw moment (Nm)
TGT MO 12 XS	305*305	8.5	40	100	950*600*550	550	550	250
TGT MO 12 S					1150*750*750			
TGT MO 12 SM					1500*1050*900			
TGT MO 12 M					1500*1050*900			
TGT MO 18 XS	458*458	18	40	300	1250*650*550	1600	1600	250
TGT MO 18 S					1350*950*750			
TGT MO 18 SM					1600*1050*900			
TGT MO 18 M					1700*1100*900			
TGT MO 18 L					1600*1200*950			
TGT MO 20 XS	508*508	22	40	400	1350*700*550	2400	2400	250
TGT MO 20 S					1350*850*750			
TGT MO 20 SM					1650*1100*900			
TGT MO 20 M					1650*1100*900			
TGT MO 20 L					1700*1200*950			
TGT MO 20 XL					2050*1350*1200			
TGT MO 24 S	610*610	31	40	550	1500*950*750	3880	3880	250
TGT MO 24 SM					1800*1100*900			
TGT MO 24 M					1800*1100*900			
TGT MO 24 L					1800*1250*950			
TGT MO 24 XL					2150*1600*1250			
TGT MO 30 M	762*762	47	40	1000	1950*1100*900	7600	7600	250
TGT MO 30 L					1950*1100*950			
TGT MO 30 XL					2500*1400*1250			
TGT MO 36 L	915*915	80.5	50	1750	2050*1250*1000	12670	12670	250
TGT MO 36 XL					2300*1600*1250			
TGT MO 36 XXL					2700*2000*1600			
TGT MO 39 L	991*991	100	50	2200	2150*1750*1000	16700	16700	250
TGT MO 39 XL					2450*1650*1250			
TGT MO 39 XXL					2800*2000*1600			
TGT MO 48 L	1200*1200	142	50	2400	2200*1800*1000	19500	19500	250
TGT MO 48 XL					2700*1600*1250			
TGT MO 48 XXL					3000*1950*1500			
TGT MO 60 L	1500*1500	243	50	3500	2850*1800*1000	25600	25600	250
TGT MO 60 XL					3050*1800*1200			
TGT MO 60 XXL					3150*1700*1400			
TGT MO 70 L	1800*1800	302	50	4000	3150*2100*1000	30000	30000	250
TGT MO 70 XL					3250*2100*1200			
TGT MO 70 XXL					3450*2000*1400			
TGT MO 78 XL	2000*2000	390	50	4500	3550*2300*1400	34000	34000	250
TGT MO 78 XXL					3650*2300*1400			

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

Subject to change without notice. Errors and omissions excepted.

# 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.

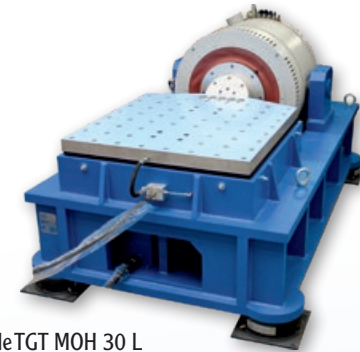
The monobase design enables rapid conversion from horizontal to vertical testing and the accurate alignment of vibration generators relative to slip tables. Magnesium slip plates are available in different sizes, up to a working area of max. 2000 x 2000 mm. Other (and larger) sizes can be produced on request.

Oil-film slip tables consist of a precision ground and lapped natural granite block with a magnesium plate sliding on an oil film.

Hydrostatic slide bearings make it possible to restrain 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.

- Enclosed oil aggregate with return flow pump
- Integrated oil pan
- Non-contact displacement monitoring (only with AIT-systems)
- 100 mm displacement possible



Shaker S 57315/LS-340 with slip table TGT MOH 30 L

	Moving plate working area (mm)	Bearings	Slip plate mass (±5%) (kg)	Slip plate thickness (mm)	Max. specimen mass (kg)	Dimension L*W*H (mm)	Max. pitch moment (Nm)	Max. roll moment (Nm)	Max. yaw moment (Nm)
TGT MOH 24 SM	610*610	2	48	50	550	1800*1100*900	26500	25000	22300
TGT MOH 24 M						1800*1100*900			
TGT MOH 24 L						1800*1250*950			
TGT MOH 24 XL						2150*1600*1250			
TGT MOH 30 M	762*762	2	72	50	1000	1950*1100*900	32200	34000	24700
TGT MOH 30 L						1950*1100*950			
TGT MOH 30 XL						2250*1650*1250			
TGT MOH 36 L	915*915	2	96	50	1750	2050*1250*1000	47900	45700	34700
TGT MOH 36 XL						2300*1600*1250			
TGT MOH 36 XXL						2700*2000*1600			
TGT MOH 39 L	991*991	2	105	50	2200	2150*1750*1000	66500	59800	44700
TGT MOH 39 XL						2450*1650*1250			
TGT MOH 39 XXL						2800*2000*1600			
TGT MOH 48 L	1200*1200	2	170	50	6000	2200*1800*1000	91400	82200	56000
TGT MOH 48 XL						2700*1600*1250			
TGT MOH 48 XXL						3000*1700*1500			
TGT MOH 60 L	1500*1500	3	252	50	8000	2850*1800*1000	167000	143000	99600
TGT MOH 60 XL						3050*1800*1200			
TGT MOH 60 XXL						3150*1700*1400			
TGT MOH 70 L	1800*1800	5	330	50	10000	3150*2100*1000	260000	215000	125000
TGT MOH 70 XL						3250*2100*1200			
TGT MOH 70 XXL						3450*2000*1400			
TGT MOH 78 XL	2000*2000	5	430	50	12000	3550*2300*1400	320000	272000	182000
TGT MOH 78 XXL						3650*2300*1400			

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

TIRA Vibration Test Systems – Headexpanders and Fixtures

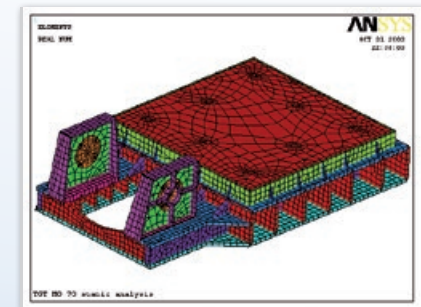
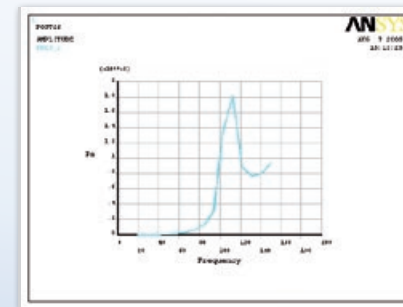
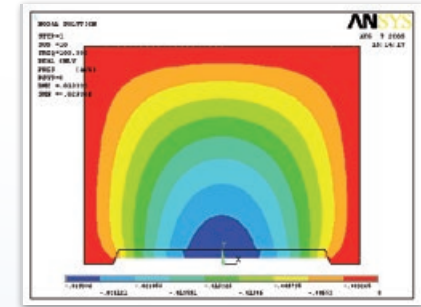
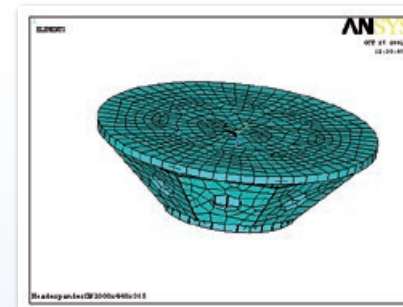
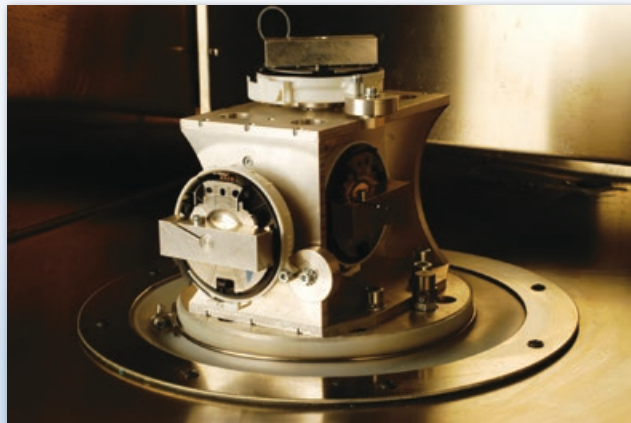
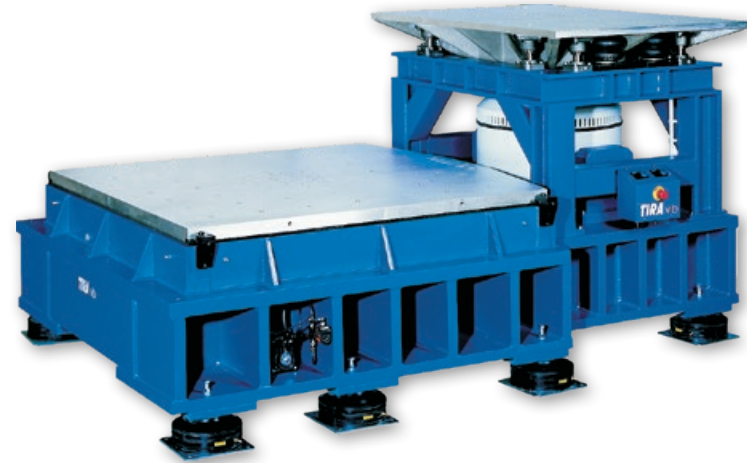
# Load-bearing platforms (guided head expanders)

## FEM-designed head expanders

TIRA offers a wide range of head expanders, 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 met this challenge and will develop, calculate and manufacture any type of special-purpose fixtures for your application, with the emphasis on minimizing its mass and optimize its dynamic performance.

Monobase systems with a 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. Specially-designed slip tables and load-bearing platforms are available with a working area of max. 2000 mm x 2000 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.

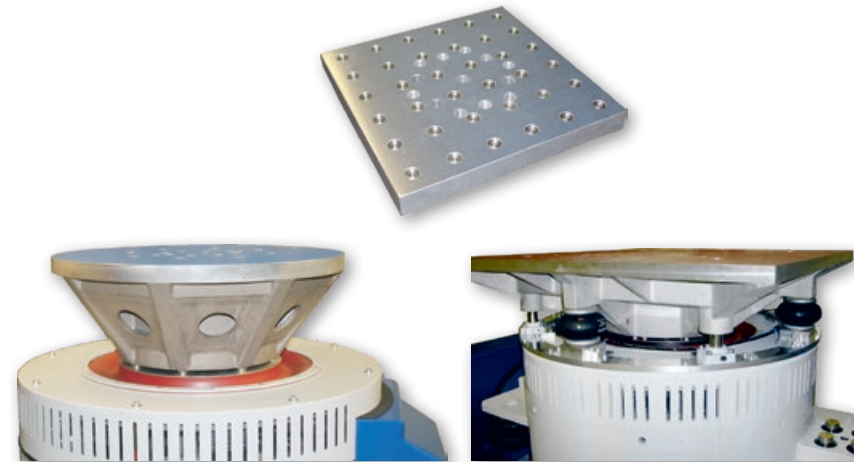


# Head Expanders

**TIRA** head expanders are manufactured from magnesium and provide an expansion of the armature table. The unique design of the head expanders and 3 channel control strategies allow tests up to a frequency of 2000 Hz (depends on resonance frequency). Head expanders especially provided with 'vibrodamp' can be subjected to test frequencies above 1000 Hz. This damping process reduces amplification of upper frequency resonances.

If a test object needs eccentric clamping or generates high transverse moments, Tira also offers guided head expanders.

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



CIRCULAR VERSION				
Size (ø/mm)	Type	Armature (ø/mm)	Height (mm)	Mass (kg)
250	THR 25-120	120	80	3.7
	THR 25-180	180	80	4.3
300	THR 30-180	180	80	5.6
	THR 30-230	230	80	6.7
400	THR 40-180	180	120	10.8
	THR 40-230	230	120	12.0
500	THR 50-180	180	150	20.5
	THR 50-230	230	150	22.0
	THR 50-340	340	150	24.4
600	THR 60-180	180	210	29.0
	THR 60-230	230	190	31.0
	THR 60-340	340	181	35.5
800	THR 80-340	340	210	51.0
	THR 80-440	440	200	62.0
	THR 80-640	640	130	47.0
1000	THR 100-440	440	340	122.0
	THR 100-590	590	305	125.0
	THR 100-640	640	185	91.0
1200	THR 120-440	440	335	172.0
	THR 120-590	590	350	184.0
	THR 120-840	840	280	169.0
1500	THR 150-590	590	286	282.0
	THR 150-840	840	275	280.0

Vibrodamp version on request

SQUARE VERSION				
Size (mm)	Type	Armature (ø/mm)	Height (mm)	Mass (kg)
300 x 300	THS 30-120	120	100	7.3
	THS 30-180	180	105	8.2
400 x 400	THS 40-180	180	100	14.0
	THS 40-230	230	100	14.5
500 x 500	THS 50-180	180	125	22.5
	THS 50-230	230	150	27.5
	THS 50-340	340	180	34.0
600 x 600	THS 60-180	180	180	36.0
	THS 60-230	230	180	39.5
	THS 60-340	340	180	47.5
	THS 60-440	440	180	49.0
800 x 800	THS 80-340	340	250	89.0
	THS 80-440	440	250	100.0
	THS 80-640	640	120	66.0
1000 x 1000	THS 100-440	440	230	129.0
	THS 100-590	590	285	155.0
	THS 100-640	640	175	135.0
1200 x 1200	THS 120-440	440	295	195.0
	THS 120-590	590	340	255.0
	THS 120-840	840	345	258.0
1500 x 1500	THS 150-440	440	380	286.0
	THS 150-590	590	340	345.0
	THS 150-840	840	380	385.0

Vibrodamp version on request

## TIRA Vibration Test Systems – Temperature/Climatic Test Systems

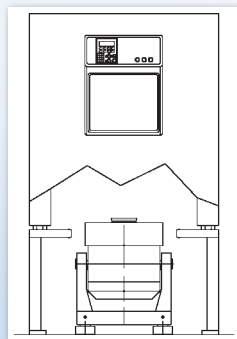
# TIRA Shakers and Vibration Test Chambers

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 environmental testing systems. Based upon such experience, products are developed with reference to specific applications as well as high quality and reliability. Utilizing combined temperature and vibration testing techniques our customers can detect material and workmanship defects at an early stage to minimize warranty costs.

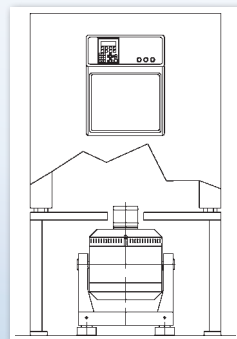
In practical use, the products are exposed to various environmental influences at the same time such as e.g. temperature, humidity, vibrations and transport loads.

TIRA offers individual fixtures, consisting of steel rings, fitting membranes and clamping ring, for the combination of our vibration exciters with climatic chambers of different manufacturers and allows a smooth process of the testing programs in vertical, horizontal and triaxial direction.

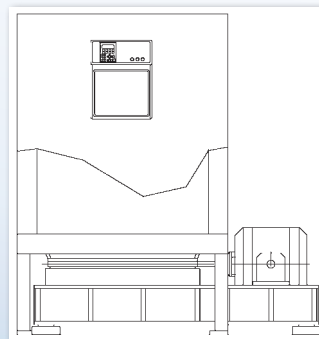
For the operation of our vibration exciters (27 to 70 kN) with low pressure chambers TIRA's product range includes a special low pressure unit with a diameter of 340 mm.



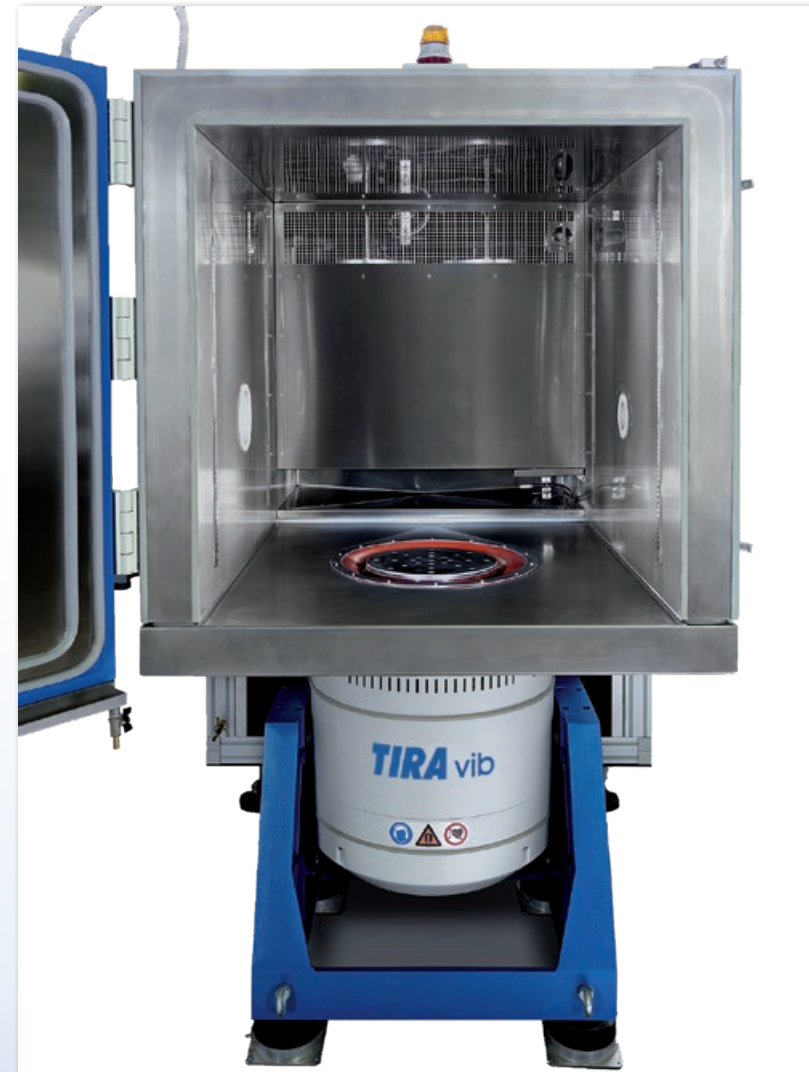
Integration of vibration generator into climatic chamber



Head extender



Integration of slip table into climatic chamber

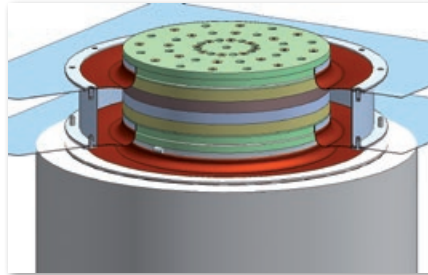




# Chamber leadthroughs

## TIRA chamber leadthroughs

TIRA has developed a new leadthrough for the operation of shakers with climatic chambers. This leadthrough allows in comparison to the previous systems with headextender and massive thermobarrier plate a significant better isolation at high temperature differences. This way an operation of sensitive climate with higher dew points is better possible.



Therefore more constant temperature conditions for the test material are present. The condensation of humidity out of the testing air is reduced considerably. At cooling operation of the chamber the shaker inside is better protected against condensation. The new model offers in addition to the significantly enhanced isolation attributes also a mass advantage of about 30%.

Thermobarriers (TBR, Circular version)		
Diameter mm	Height mm	Mass kg
60	20	0.1
80	20	0.2
120	20	0.5
180	20	1.0
230	20	1.6
250	20	2.0
300	20	3.0
340	20	3.5
400	20	5.0
440	20	5.8
500	20	8.0
590	20	10.5
600	20	11.5
640	20	12.3
840	30	31.5

Other sizes on request

## Climatic chamber leadthroughs (THX)

Armature diameter mm	Height (Standard) mm	for chamber floor thickness (Standard) mm	Mass* kg
120	100-200 (160)	40-140 (100)	2.5
180	100-200 (160)	40-140 (100)	5.6
230	100-200 (160)	40-140 (100)	7.8
340	100-200 (160)	40-140 (100)	17.5
440	100-200 (160)	40-140 (100)	25.0
590	100-200 (160)	40-140 (100)	52.0
640	100-200 (160)	40-140 (100)	59.0
840	100-200 (160)	40-140 (100)	107.0

Temperature range -40 °C to 160 °C  
\* Mass at standard height of 160 mm

## Thermobarriers (TBS, Square version)

Size mm	Height mm	Mass kg
300 x 300	20	3.6
400 x 400	20	6.4
500 x 500	20	10.0
600 x 600	20	14.4
800 x 800	20	25.6
900 x 900	20	32.4
1000 x 1000	20	40.0
1200 x 1200	20	57.6
1500 x 1500	20	90.0
1800 x 1800	20	129.6
2000 x 2000	20	160.0

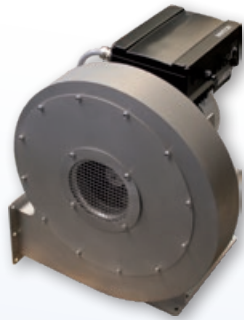
## TIRA Vibration Test Systems

# Blowers/Noise reduction

Blowers are used for cooling the shakers. TIRA mainly offers side channel blowers that provide 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.

The newly developed Air-Water-Heat exchanger WWT is used for cooling down the exhaust air of the vibration test system to room temperature. This allows the operation inside rooms without problems. The heat exchanger is additionally designed as a noise protection casing and therefore offers highly efficient silencing performance.



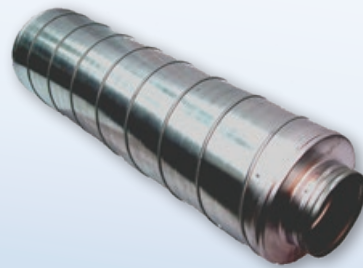
Blower TB 9 FUK



Air-Water-Heat exchanger WWT



Acoustic Enclosure TB 7/FUK-AE



Silencer TB 7/FUK-SI

Blower (free blowing)		Engine				Dimensions	Air hose		Mass	Sound-pressure
Designation	Volume flow m³/h	Performance kW	Phase	Voltage V	Frequency Hz	W/H/D mm	Diameter mm	Length m	kg	dB(A)
<b>TB 0080</b>	80	0.37	1	115/230	50/60	246/247/256	40	3	10	53
<b>TB 0140</b>	140	1.1	1	115/230	50/60	286/302/292	50	3	16	63
<b>TB 0310</b>	315	4.0	3	400	50/60	382/384/432	60	5	42	69
<b>TB 9 FUK</b>	1080	4.0	3	400	50/60	505/598/464	140	5	60	99
<b>TB 120 FUK</b>	1500	5.5	3	400	50/60	487/637/487	140	5	61	102
<b>TB 7/FUK/11</b>	1920	11	3	400	50/60	625/775/602	150	5	113	102
<b>TB 7/FUK/20</b>	5820	20	3	400	50/60	625/773/602	175	5	131	105
<b>TB HR160</b>	6600	25	3	400	50/60	672/760/730	175	5	97.5	105

Blower	Acoustic Enclosure				Silencer			
Designation	Designation	Dimension (LxWxH) mm	Mass kg	Noise Reduction* dB(A)	Designation	Dimension(LxD) mm	Mass kg	Noise Reduction* dB(A)
<b>TB 0080</b>	TB 0080-AE	860 x 650 x 760	45	15-23	TB 0080-SI	310 x 65	0.2	5
<b>TB 0140</b>	TB 0140-AE	860 x 650 x 760	45	15-23	TB 0140-SI	308 x 82	0.2	8
<b>TB 0310</b>	TB 0310-AE	860 x 650 x 760	55	15-23	TB 0310-SI	308 x 82	0.58	6
<b>TB 9 FUK</b>	TB 9-AE	1470 x 1250 x 1393	103	5-23	TB 9-SI	1012 x 150	1.2	3-6
<b>TB 120 FUK</b>	TB 120-AE	1470 x 1250 x 1393	103	5-23	TB 120-SI	1100 x 160	1.2	3-6
<b>TB 7/FUK</b>	TB 7/FUK-AE	1470 x 1250 x 1393	103	5-23	TB 7/FUK-SI	1120 x 280	9.2	9-15
<b>variable</b>	WWT	1200 x 1500 x 2080	800	30				

\*Depending on frequency

# Water Cooling Units

The cooling units include the complete primary circuit of shaker cooling system for the TIRA water-cooled shakers and the hydraulics of the shaker’s hydrostatic bearings.

The units are designed as compact mobile devices. Primary circuit is based on deionised water. The extraction of the heat is carried out by a customer-provided secondary-process water circuit. Pressure gauges and flow indicators are available at many positions.

The devices include their own control circuit based on PLC. The front and side walls are designed with swing doors to ensure a good accessibility to all built-in components. The connections to the shaker are accomplished by hoses with self-sealing couplings that are free from leakage.

Cooling Unit	C 59410	C 59430
Process water:		
Supply temperature (°C)	5-15	5-15
Volume flow at max. supply temperature (m³/h)	10	24
Supply pressure – static (bar)	≤ 8	≤ 10
Return - Dynamic differential pressure (bar)	≥ 3	≥ 3
Dissipated heat flow (kW)	110	220
ph-value	7 ±1	7 ±1
Dirt particle size (µm)	< 25	< 25
Water hardness - overall	< 1.4 mmol/l (< 140 ppm)	< 1.4 mmol/l (< 140 ppm)
Water hardness - carbonate	< 0.9 mmol/l (< 90 ppm)	< 0.9 mmol/l (< 90 ppm)
Hose connection - Nominal width - supply (mm)	32	40
Hose connection - Nominal width - return (mm)	32	40
Total mass (kg)	360	470
Dimensions W x H x D (mm)	620 x 2150 x 920	820 x 2150 x 920

The water cooling units have the following benefits compared to other known systems:

- The primary circuit is designed as closed system, which guarantees no evaporation loss of the water and no pollution of the circuit.
- The closed system operates at a higher pressure level. This way the usual interferences of the measuring signal by cavitation are eliminated.
- The flow rate of the splitted lines of the primary circuit to moving coil, field coil and short-circuit rings is monitored.
- The primary circuit features besides the conductance monitoring an integrated demineralization cartridge, which keeps the conductance low within the bypass flow for a long operation period.
- The primary circuit offers a fine filter with pollution monitoring.
- The units control the process water flow. This way the water consumption can be reduced at low process water temperatures and during part load operation.

If needed, an additional fine filter unit for heavier polluted process water is optionally available.



## TIRA Vibration Test Systems

# Power Amplifiers up to 1200 VA

**TIRA** offers a new series of amplifiers with a **rated sinusoidal power** output up to **1200 VA**. The modules control all permanent magnetic shakers as well as shakers in connection with an internal field excitation up to 1000 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 backgroundlit multifunctional display.

A safety management system monitors functions such as temperature, overcurrent and overtravel.

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 manufacturers.

Optionally, the amplifiers are designed for connecting the electronic zero-adjustment unit “Tira Middle Control” (TMC), which makes even with small longstroke-shakers a load compensation for achieving the nominal displacement possible.

A remote control in hardware or software is available on request (BAA 500 and BAA 1000).



Analog power amplifier BAA 1000-ET with Field Power Supply (FPS) and electronic zero-adjustment (TMC)

Amplifier	BAA 60	BAA 120	DA 200	BAA 500	BAA 1000	BAA 1000-E	BAA 1000-ET
Output power $RMS$ (VA)	60	120	200	500	1200	1200	1200
Frequency range (Hz)	2 - 20000	DC - 20000	1.5 - 22000	DC - 20000	DC - 20000	DC - 20000	2 - 20000
Voltage-/Current mode	yes/no	yes/yes	yes/no	yes/yes	yes/yes	yes/yes	yes/no
Voltage $RMS$ , max. (V)	16	22	30	45	72	72	72
Current $RMS$ , max. (A)	3.8	5.5	10	11.2	18	18	18
Signal input voltage $RMS$ (V)	< 5	< 5	7	< 5	< 5	< 5	< 5
Distortion (%)	< 0.1	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Signal to noise ratio (dB)	> 90	> 95	> 90	> 90	> 90	> 90	> 90
Field supply	no	no	no	no	no	yes (external)	yes (external+TMC)
Field voltage (V)	–	–	–	–	–	70	70
Field current (A)	–	–	–	–	–	3.2	3.2
Total mass (kg)	12	16	3.5	25	35	57	61
Size (WxHxD) (mm)	483 x 90 x 450	483 x 90 x 450	390 x 80 x 260	483 x 90 x 450	483 x 146 x 585	483 x 293 x 585	483 x 370 x 585
Interlocks	Overload, Temperature, Clipping	Overload, Temperature, Clipping	Overload, Temperature, Clipping	Overload, Temperature, Clipping	Overload, Temperature, Clipping	Overload, Temperature, Clipping	Overload, Temperature, Clipping

# Power Amplifiers 15 kVA

The Gradient Amplifier from **TIRA** is a single axis pulse width modulated amplifier. The Amplifier's exceptionally low output noise, extremely high bandwidth and excellent stability make it ideally suited for demanding power amplifier tasks found in laboratory and medical applications. Utilizing advanced hybrid digital and analog control architecture, the **TIRA** Power Amplifiers provide a host of powerful features.

On the **LCD-touch screen display** the module status with current indication 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 thanks to a faster diagnostics. The high clock frequency of up to 102 kHz allows test frequencies of up to **4000 Hz** without any decrease in output power. The cascading of the modules allows an **amplifier design up to 240 kVA** at low floor space requirements. The output voltage of the modules can be modified so that **TIRA** amplifiers can be adapted to almost all shakers existing on the market.



A 1 02 11 021 SV



A 6 00 11 210

Amplifier	A 1 02 11 021 SV	A 1 02 11 021 T SV
Sine output power, max. RMS (kVA)	15	15
Frequency range (Hz)	DC - 5000	DC - 5000
Voltage, max. RMS (V)	±212	±212
Current, max. RMS, max. (A)	40-100	40-100
Signal input voltage RMS (V)	10	10
Distortion (%)	< 0.2	< 0.2
Signal to noise ratio (dB)	> 80	> 80
Field supply	internal	internal
Field voltage* (V)	140-280	140-280
Field current* (A)	6-8	6-8
Total mass (kg)	330	330
Dimension (W x H x D) (mm)	600 x 1740 x 850	600 x 1740 x 850
Interlocks	Overcurrent, Temperature, Displacement, Cooling air, Compressed air, Phase monitoring	Overcurrent, Temperature, Displacement, Cooling air, Phase monitoring

\* variable according to customer specification

## TIRA Vibration Test Systems

## Power Amplifiers 22.5 to 150 kVA

Amplifier	A 3 01 11 042	A 3 09 11 042	A 3 08 11 042	A 3 08 11 063	A 6 26 11 105	A 6 26 11 126
Sine output power $RMS$ (kVA)	22.5	22.5	25	37.5	60	75
Frequency range (Hz)	DC - 5000	DC - 5000	DC - 5000	DC - 5000	DC - 5000	DC - 5000
Voltage $RMS$ , max. (V)	$\pm 212$	$\pm 212$	$\pm 212$	$\pm 212$	$\pm 212$	$\pm 212$
Current $RMS$ , max. (A)	200	200	200	300	500	600
Signal input voltage $RMS$ (V)	10	10	10	10	10	10
Distortion (%)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Signal to noise ratio (dB)	> 80	> 80	> 80	> 80	> 80	> 80
Field supply	internal	internal	internal	internal	internal	internal
Field voltage* (V)	140	140	105	105	250	250
Field current* (A)	8	62	75	75	103	103
Total mass (kg)	450	450	450	640	1050	1100
Dimension (WxHxD) (mm)	600 x 2200 x 800	600 x 2200 x 800	600 x 2200 x 800	600 x 2200 x 800	1800 x 2200 x 900	1800 x 2200 x 900
Interlocks (extract)	Overcurrent, Temperature, Displacement, Air supply	Overcurrent, Temperature, Displacement, Air supply	Overcurrent, Temperature, Displacement, Air supply	Overcurrent, Temperature, Displacement, Air supply	Overcurrent, Temperature, Displacement, Air supply	Overcurrent, Temperature, Displacement, Air supply

Amplifier	A 6 26 11 147	A 6 00 11 210	A 6 00 11 252	A 6 00 11 273	A 6 00 11 315
Sine output power $RMS$ (kVA)	90	120	135	150	150
Frequency range (Hz)	DC - 5000	DC - 5000	DC - 5000	DC - 5000	DC - 5000
Voltage $RMS$ , max. (V)	$\pm 212$	$\pm 212$	$\pm 212$	$\pm 212$	$\pm 212$
Current $RMS$ , max. (A)	700	1000	1200	1300	1500
Signal input voltage $RMS$ (V)	10	10	10	10	10
Distortion (%)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Signal to noise ratio (dB)	> 80	> 80	> 80	> 80	> 80
Field supply	internal	external	external	external	external
Field voltage* (V)	250	132	132	132	132
Field current* (A)	103	270	270	270	270
Total mass Amplifier/Field power unit (kg)	1150/-	1350/500	1400/500	1800/500	1900/500
Dim. Amplifier/Field unit (WxHxD) (mm)	1800x2200x900 / -	1800x2200x900 / 600x1740x850	1800x2200x900 / 600x1740x850	2400x2200x900 / 600x1740x850	2400x2200x900 / 600x1740x850
Interlocks (extract)	Overcurrent, Temperature, Displacement, Air supply	Overcurrent, Temperature, Displacement, Conductance	Overcurrent, Temperature, Displacement, Conductance	Overcurrent, Temperature, Displacement, Conductance	Overcurrent, Temperature, Displacement, Conductance

\* variable according to customer specification

# Power Amplifiers 165 to 240 kVA / TIRA Remote Control

**Features:**

- Flexible by modular design
- Integrated mains switch and line filter
- Multiple switchable field levels (for energy-saving)
- ESD monitoring (Protection of the system against damage)
- 4 sigma peak current



Amplifier	A 6 00 11 336	A 6 00 11 378	A 6 00 11 462	A 6 00 11 483
Sine output power RMS (kVA)	165	195	225	240
Frequency range (Hz)	DC - 5000	DC - 5000	DC - 5000	DC - 5000
Voltage RMS, max. (V)	±212	±212	±212	±212
Current RMS, max. (A)	1600	1800	2200	2300
Signal input voltage RMS (V)	10	10	10	10
Distortion (%)	< 0.2	< 0.2	< 0.2	< 0.2
Signal to noise ratio (dB)	> 80	> 80	> 80	> 80
Field supply	external	external	external	external
Field voltage* (V)	240	240	240	290
Field current* (A)	355	355	355	320
Total mass Amplifier / Field power unit (kg)	2450 / 1135	2500 / 1135	2600 / 1135	2700 / 1135
Dimension Amplifier / Field power unit (WxHxD) (mm)	2400 x 2200 x 900 / 1200 x 1740 x 850	2400 x 2200 x 900 / 1200 x 1740 x 850	3000 x 2200 x 900 / 1200 x 1740 x 850	3000 x 2200 x 900 / 1200 x 1740 x 850
Interlocks	Overcurrent, Temperature, Displacement, Differential pressure, Flow rate, Conductance, Phase monitoring, Compressed air, Emergency power-off switch	Overcurrent, Temperature, Displacement, Differential pressure, Flow rate, Conductance, Phase monitoring, Compressed air, Emergency power-off switch	Overcurrent, Temperature, Displacement, Differential pressure, Flow rate, Conductance, Phase monitoring, Compressed air, Emergency power-off switch	Overcurrent, Temperature, Displacement, Differential pressure, Flow rate, Conductance, Phase monitoring, Compressed air, Emergency power-off switch

\* variable according to customer specification

## TIRA Remote Control

The TIRA Remote Control is a Hardware/Software combination for remotely controlling a vibration test system. The hardware interface is easily plugged into a free USB-port of a PC.

**Features:**

- up to 800 m operating distance
- full gain control by mouse or numerical value
- shows errors of shaker, amplifier and cooling unit
- monitoring of voltage/current level over time
- support for all operating systems from Windows 2000 to Windows 11
- additional monitoring- and setting options on request, e.g. temperature monitoring, blower settings, power monitoring, field settings

## TIRA Vibration Test Systems

# Vibration Control Systems and Vibration Accelerometers

### Variable control hardware and vibration control software

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 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.

TIRA offers vibration control systems of various manufacturers with 4 to 32 simultaneous input channels, extensive signal analysing programs incl. Sine-, Transient-, and Modal analysis, acoustic analysis, signal generator. The vibration control systems offer a wide range of options for integration with conditioning cabinets and other test equipment. They allow monitoring and complete control of the test over network and even over internet.

The respective vibration control software finds in the hardware platforms an ideal completion for comprehensive vibration tests. The controller achieves excellent measuring accuracy and an impressive realtime performance by using state of the art technology. The hardware platforms support the extensive functionality of the software, which includes simple sine or random tests over complex tests with random signal excitation, that is overlaid with a multiple sine signal, up to a load simulation in time intervals. Of course all tests are accomplished according to the respective standards ISO, DIN, MIL, ASTM and IEC.

### Piezo-electric vibration accelerometers

Part of a complete vibration test system is besides the shaker and control system also a vibration accelerometer. These accelerometers are mostly of piezo-ceramic type. They are used as standard accelerometers for electrodynamic shakers due to their excellent linearity at wide dynamic range and large frequency range. TIRA offers a wide variety for all types of application.





# Kokusai / TIRA 3D-Shaker-System

## REPRODUCING THE REAL ENVIRONMENT

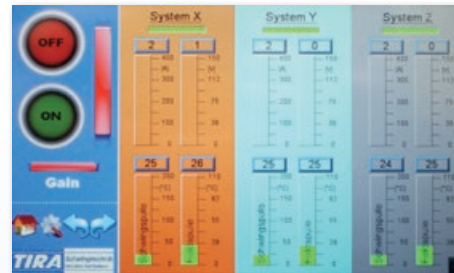
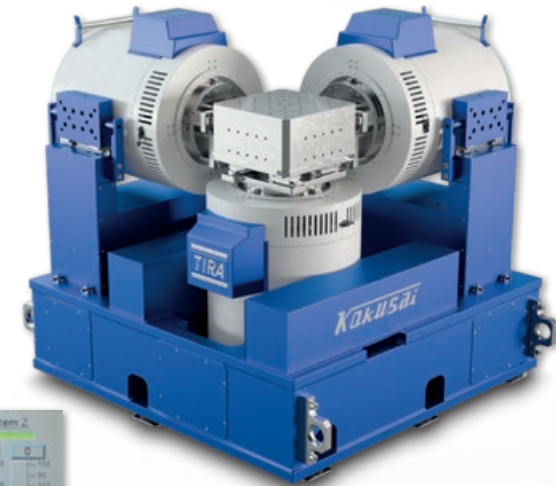
Due to the requirements of the automotive industry for a 3-axis simultaneous testing machine, which can cover a wide frequency range up to 2000 Hz, Kokusai developed a 3-axis testing machine with the aim of meeting the specifications according to MIL standard suitable for the automotive and aviation industries.

As a manufacturer of vibration testing systems, TIRA GmbH produces and supplies the necessary components such as shakers, amplifiers and cooling units in a joint project and also implements the necessary control hardware and software.

Features:

- Energy-saving mode (Field power reduction)
- Multiple safety devices
- Long-time operation
- High cross-axial stiffness
- Air-cooling blower with optional fan speed control

**3DED**  
TIRA X KOKUSAI



Model		EDS-27M0-3	EDS-35M0-3	EDS-49M0-3	EDS-55M0-3	EDS-70M0-3
Maximum force (N)	Sine	27000	35000	49500	55000	70000
Frequency range (Hz)		5 - 2000	5 - 2000	5 - 2000	5 - 2000	5 - 2000
Maximum acceleration (g)	Sine	12	16	21	24	27
Maximum displacement (mm)	pk-pk	50	50	50	50	50
Dimensions of vibration table (mm)		500 x 500	500 x 500	500 x 500	500 x 500	500 x 500

A wide range of models and configurations are available, contact us today for your personal quote.

TIRA Vibration Test Systems in Cooperation with *Kokusai*

## 3-Axis/4-poster Automobile Loaded Vibration Tester

Our servomotor-driven vibration testing systems cover a wide range of table sizes and excitation forces. These are extremely versatile and can be adapted to almost any application in the low to medium frequency range up to 500Hz, depending on size.

Due to the similar frequency range, customers often have to weigh servo motor systems against hydraulic solutions. A direct comparison illustrates many advantages of servo motor technology.

- More precision through position-based control
- Less maintenance
- No idling or warm-up time
- Lower energy consumption
- Clean and silent operation



Technical Data	Values
Maximum frequency (Hz)	100 (vertical and horizontal)
Maximum acceleration (g)	10 to 25
Maximum displacement (mm)	±50
Excitation direction	Vertical excitation (Z) Horizontal excitation (X,Y)
Maximum payload (kg)	1000 (single wheel)
Types of excitation	Sine, Random, Shock, Road simulation
Options	Wheelbase moving device (ST: 1000 mm/Standard) Tread width moving device (ST: 400 mm/Standard)

On customer request:  
We offer single/2D/3D-system for 4-poster-applications

# Large Size of 3-Axis Simultaneous Vibration Tester

Our servomotor-driven vibration testing systems cover a wide range of table sizes and excitation forces. These are extremely versatile and can be adapted to almost any application in the low to medium frequency range up to 500Hz, depending on size.

Due to the similar frequency range, customers often have to weigh servo motor systems against hydraulic solutions. A direct comparison illustrates many advantages of servo motor technology.

- More precision through position-based control
- Less maintenance
- No idling or warm-up time
- Lower energy consumption
- Clean and silent operation

Suitable for testing railway equipment and -parts

Technical Data	Values
Maximum force (N)	90000 (X/Y-Axis) 120000 (Z-Axis)
Excitation frequency (Hz)	200
Maximum acceleration (g)	1.5
Dimensions of vibration table (mm)	3000 x 2500 (2 units) Total: 6000 x 2500
Maximum payload (kg)	4000
Types of excitation	Sine, Random, Earthquake simulation

This system is suitable for the railway industry. Versions for the automotive industry are also available on request.



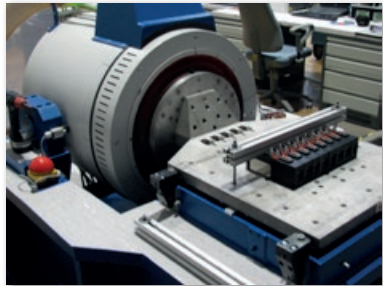
## Customer applications:



Modal examinations



Chassis tests in the automotive industry  
First publication in ATZworldwide 1-2013, pp. 18 - 21



Horizontal tests of electronic equipment



Integration in production lines

## Additional range of products by TIRA GmbH:

Extract of the production- and delivery program of our other product groups:

### TIRA Balancing Technology

- Hard-bearing and soft-bearing balancing machines
- Machines for small-, medium-, and large-batch production with unbalance compensating units

### TIRA Material Testing

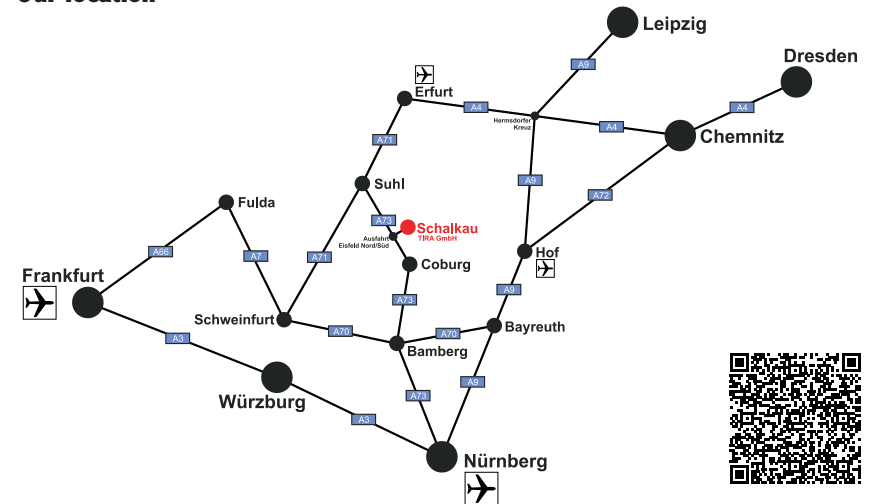
- Tensile-/compression-/bending machines with spindle drive
- Universal testing machines

### TIRA Mechanical Engineering

- Components and sub-assemblies for plant construction, technology, machine- and machine-tool building, jig-and-fixture and mold construction
- Welded structures and components for tank construction and machinery



## Our location



TIRA Schwingtechnik | Eisfelder Straße 23/25 | 96528 Schalkau

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version 11/2022