

3D STAND FOR SEISMIC TESTS

INTRODUCTION:

Both the general and strategic aim of majority of countries, highly developed (USA, West European countries, Russia etc.) or less developed, is to maintain the own energetic self-sufficiency and not to be dependent on the energy delivery from neighbouring states, what mean certain risks in many cases. Various types of power stations are built or upgraded for the purpose of maintain the own energetic self-sufficiency, as thermal, hydroelectric, and especially nuclear power plants.

447 nuclear reactors in 30 countries were in operation to 1st May 2017 according to the WNA (World Nuclear Association) and their total installed capacity was 392 080 MWe. 59 nuclear reactors are actually built in 14 countries. The building of 170 reactors is planned. Further 372 reactors should be planned in the future, with the total installed power of 426 595 MW.

Certain qualification requirements of majority of technologies required for the failure-free operation of these installations must be fulfilled in case of building or updating of actual power plants (armatures, pipe systems, turbines, reactor vessels, systems of control, monitoring, communication and other devices).

The qualification requirements for reliability and failure-free operation of these technologies are given by the type of power plant, in which they should be installed. The highest level of requirements is, of course, for the qualification of the nuclear power plants and the prerequisite is, that the consequences of nuclear power plant failure could be fatal (high number of victims, essential influence on the environment – houses, villages, cities in the vicinity).

The qualification as such contains, in line with valid and always stronger legislation, the procedures proving the correct functionality and failure-free operation of technologies installed into the power plants. Verification of mechanical resistance (vibration ageing) and seismic qualification (level of earthquake) of these technologies belong to these procedures too. These verifications are carried out by accredited testing laboratories, owning the necessary technical equipment for securing of required tests. One of these laboratories are also operated by Vojenský technický ústav, s.p., Czech Republic, which owns the accredited testing laboratory No. 1103, VTÚPV Branch in Vyškov.

Various types of vibration exciters belong among the devices allowing assessing, if the particular technology is able to fulfil its functions during vibrations and seismic event. These exciters are, depending on their physical principle, electro-dynamic or hydro-dynamic. These exciters could further be mono-axial or multi-axial.

Concerning the as precise as possible approximation of the test to the reality, a testing device is actually required more and more, allowing as possible as accurate reproduction of the calculating situation. This can be realised only on the 3-axis test stands.

The worldwide trend of qualification testing of mechanical resistance (vibration ageing) consists in mono-axial test stands. But, an independent three-axial excitation interpreting reliably the seismic event is necessary actually.

The accredited testing laboratory No. 1103 has started in June 2016, as the first accredited testing laboratory in the Czech Republic, the operation of the testing stand with the independent three-axial excitation. The demand of our customers shows that the decision to provide such a testing device was correct, as the testing laboratory registers huge interest of customers and the waiting time is few months.

Scope of Accreditation:

IEC 980:1993, EN 60068-3-3:1999, EN 60068-2-6 ed.2, IEEE Std. 344:2013, IEEE Std. 382:2006, IEEE Std. 693:2005, GOST 17516.1-90.



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Technical Parameters of the Hydro-Dynamic Stand:

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| Frequency Range | 0.1 – 200 Hz |
| Maximal Desk Load | 10 000 kg |
| Desk Dimensions | 2 000 × 2 000 mm |
| Degree of Freedoms of the Desk | 3 |
| Maximal Power of Cylinders in Axis X, Y, Z | 640 kN, 400 kN, 640 kN |
| The 3D stand is programmable for tests by sinusoidal vibrations, random vibrations, shocks and RRS transformation. | |



Upgrading of the Testing Laboratory by 3D Stand Operation:

Thanks to the putting of three-axial seismic hydro-dynamic stand into operation, a unique workplace on the top European level is available in the Czech Republic. This workplace is able to secure the large extent of services in the area of mechanical resistance, vibration ageing and test of seismic qualification under significantly improved conditions. This device can be used not only in the area of energy industry (especial nuclear industry), but also in many other areas. Some examples are e.g. testing for automotive industry and tractors – simulated operational tests (agricultural machinery), building industry – testing of concrete modules (interesting for universities), army etc.

References – list of our customers:

GUTOR Electronics LLC, Swiss; Starkstrom-Gerätebau GmbH, Germany; Enersys Hawker GmbH, Germany; PPA Controll, a.s., Slovakia; 3D Dianiška, s.r.o., Slovakia; ELTECO, a.s., Slovakia; Rizzo Association, a.s., Plzeň, Electro Kroměříž, a.s., Sechéron Tchequie, s.r.o., Praha, Armatury Group, a.s., Dolní Benešov, Schneider Electric CZ, s.r.o., Praha, MSA, a.s., Dolní Benešov, ÚJV Řež, a.s.