

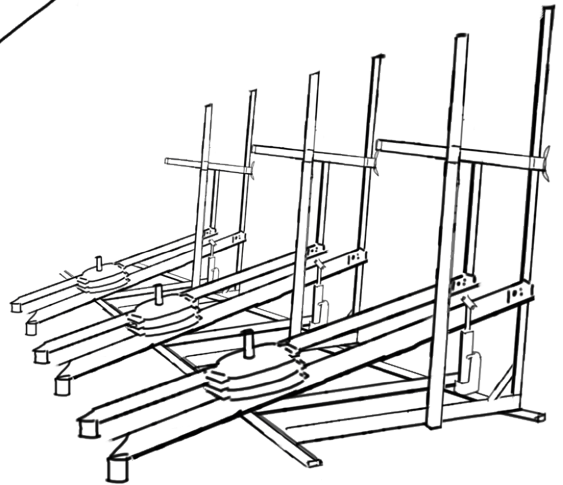
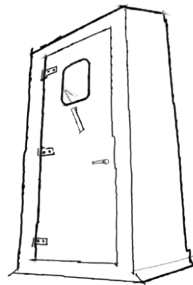
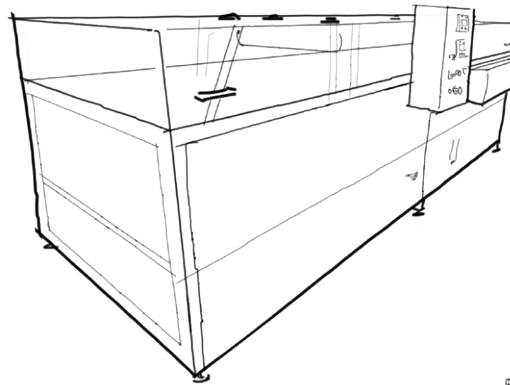
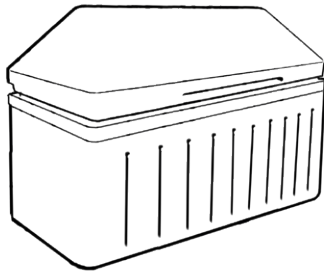
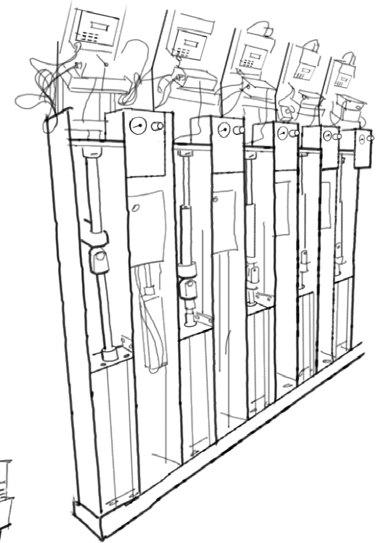
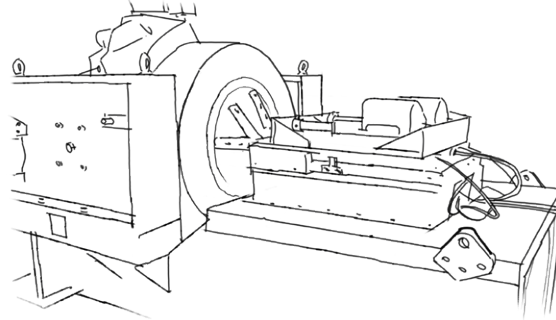
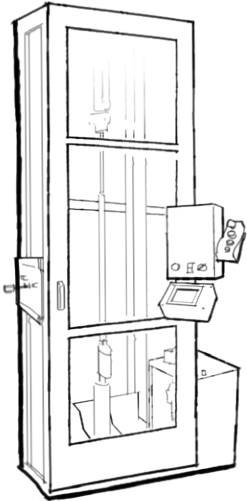


TECHLINE®
Testing programme

LINAK.COM/TECHLINE

LINAK® 
WE IMPROVE YOUR LIFE

Rely on your actuator



Testing random samples:

All actuators must pass a functionality test before leaving the production. To further ensure the highest possible product quality, LINAK continuously picks random actuators to be exposed to the comprehensive testing programme mentioned in this brochure.

TECHLINE testing programme - masters the details

At LINAK®, we specialise in supplying customised products and designs that function perfectly at all times. To ensure that this is in fact the case, each component in our actuators is subjected to comprehensive tests at our test centre where nothing is left to chance.

Our actuators must perform every time, no matter whether the actuator concerned is designed to guide corn through the unloading auger on a combine harvester during peak season, or it needs to perform in harsh and salty environments on a yacht. This is why - long before they come anywhere near a customer - we subject them to several tests.

At our test centre, a handful of development engineers perform a wide range of tests at the design and product development phases for each individual type of actuator. However, this does not mean that we only test prototype actuators during the design phase and when they are fitted. It is very simple: we subject each tiny component that will be used in our designs, because we believe that testing is not only a matter of making sure that the products function perfectly. It is also about maintaining our customers' confidence in the standards to which we test.

Therefore, it is important that all our products have been tested inside and out, and to the extreme in a range of tests that include twisting, vibration and shock, chemical baths, salt vapours, water spray and severe high and low temperatures for days, weeks, months and years on end. This way, we can ensure that our products comply with - and even exceed - all strict requirements that our customers and we expect of them.

"Our actuators must never malfunction. Therefore, it is important that all our products are tested inside and out, and to the extreme in a wide range of tests."

- Claus H. Sørensen, Director R&D

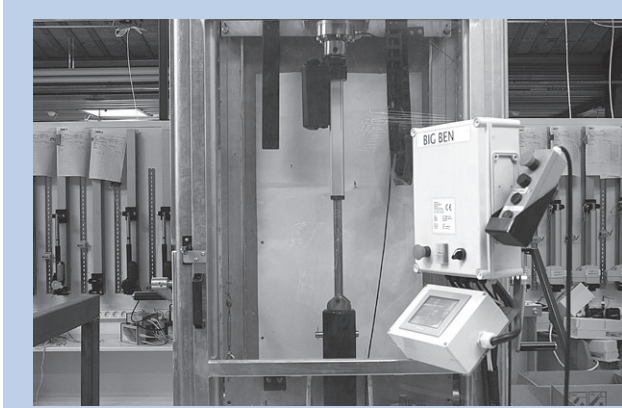
Please note:

LINAK offers a range of third party products compatible with our TECHLINE actuators.



Most third party products are not subject to the extensive test programme mentioned in this brochure.

Performance testing



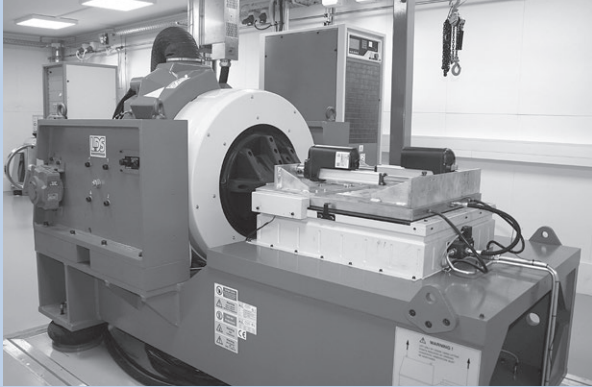
Durability

The bearings are tested for durability, rotation, pull and push. In our test centre all actuators regardless of size are subjected to mechanical testing. The largest test bench, is 4 m high and can push or pull a load of up to 5 tons.

It is used for safety factor tests, and here the actuators are subjected to continuous static pull and push combined with torsion until they disintegrate. As a rule of thumb, the actuators must be able to withstand a load of at least 2 times the rated maximum nominal load.

Durability tests:

Test	Test description	Standard
LINAK standard product life	Up to 20,000 cycles, 20% duty cycle at full load	LINAK test standard
Static push/pull test	100,000 cycles at full load in both push and pull	LINAK test standard
Abuse tests	100% duty cycle at full load for a minimum of 30 mins.	LINAK test standard
Safety factor test	Static pull or push combined with torsion until they disintegrate	LINAK test standard



Vibrations and shock

LINAK® industrial actuators must perform in dynamic and challenging environments. In our test centre we subject the actuators to both vibrations, shock/bump and drop tests. The actuators are tested to withstand constant vibrations from three directions and 50 G shock waves from six different directions.

The drop test ensures that, despite having visible external damage, the internal components must be in perfect working order when dismantled after the test.

Vibrations and shock tests:

Test	Test description	Standard
Random vibration	Test level: 6.9 G _{rms} Duration: 32 hours in each direction	ISO 16750-3 EN60068-2-64 (Fh)
Shock/bump	25 g, 6 ms, 2 x 1000 hours 30 g, 18 ms, 2 x 3 hours in each direction 50 g, 11 ms, 2 x 3 hours in each direction	EN60068-2-29 (Eb) NT ELEC 016G 1990-06 EN60068-2-27 (Ea)
Drop test	Drop to the concrete floor with a thud from a height of 40 cm Repeated 3 times each, on all 4 sides and both ends (total of 18 drops)	LINAK test standard

Climatic testing



IP ratings

To ensure the highest possible Ingress Protection (IP), we test the actuators for both fluid and dust ingress.

We test the actuator enclosures for watertightness in a specially designed water spray test rig, according to IPX6.

For applications demanding high-pressure cleaning, we recommend actuators with IP69K rating. Here, the actuator must withstand a high pressure spray of hot water without any water ingress.

Fluid and dust tests:

Test	Test description	Standard
IP6X - Dust	Dust tight, no ingress of dust	EN60529 - IP66
IPX6 - Water	Ingress of water in quantities causing harmful effects is not allowed. Duration: 100 l/min for 3 minutes	EN60529 - IP66
IPX6 - Connected actuator	Actuator is driven in and out for 3 minutes 100 l/min jet of water is placed at the wiper ring for 3 minutes	EN60529 - IP66
IP69K - High-pressure cleaning	100 bar, 80° C, 14-16 l/min, 30 sec. pr. spot	DIN40050-9 ISO16750 EN60529



Salt and chemical vapour

The actuator is exposed to the adverse effects of e.g. salt vapours, chemical substances, diesel oil, hydraulic fluid, nitrogen, inorganic fertilizers and agricultural lime. All these substances affect both the plastic and metal parts of the actuators, which means that we have to create very harsh test environments. The actuators are exposed to a humid environment with high concentrations of e.g. chemical vapours or concentrated salt vapours for up to 12 months.

Salt and chemical tests:

Test	Test description	Standard
Salt spray	500 hrs, operated with no load	EN60068-2-52
Chemical test	Chemicals: Diesel 100% Hydraulic oil 100% Ethylene glycol 50% Urea nitrogen saturated solution Liquid lime 10% (Super - Cal) NPK fertiliser (NPK 16-4-12) saturated Diesel exhaust fluid (DEF) 100%	BS7691 Section 6.11.2.4

Watch testing videos for industrial actuators at the TECHLINE testing webpage

www.linak.com/segments/techline/tech-trends/testing/



Climatic testing



Temperature fluctuations

We test our actuators in a sealed environment for periods up to 10 months, where both the temperature and the humidity is cycled between -55°C to 105° and up to 100% relative humidity. Many test patterns are performed to ensure that the actuators will survive all climatic conditions according to the specific applications. Most climatic test are performed according to recognized norms and standards. Based on our many years of experience we have designed special test patterns to ensure that very demanding applications are also covered in our test plan.

Temperature and humidity tests:

Test	Test description	Standard
Cold and heat - storage	Storage at static cold cycle -40 °C for 72 hrs and -55 °C for 24 hrs Storage at static heat + 85 °C for 72 hrs and +105 °C for 24 hrs	LINAK test standard
Operation in heat	+85 °C < 50% RF for 96 hrs	LINAK test standard
Operation in cold	Start-up control at -40 °C and feedback check	LINAK test standard
Thermal shock	-40 °C to +85 °C 100 cycles	LINAK test standard



UV radiation

Cables, plastic, and composite components are tested to fulfill sun and weather ageing. Our UV test chamber is capable of performing an accelerated UV test according to a specific standard or according to actual customer demands.

By performing both the temperature, humidity, IP and UV tests we ensure that our actuators always perform in dynamic and harsh environments. This is why we emphasize that you can rely on your actuator.

Temperature and humidity tests:

Test	Test description	Standard
Moisture - storage	Storage at static moisture +40 °C, 93% RF in 504 hrs	IEC60068-2-3
Operation at full performance	+5 °C and +40 °C with nominal load and duty cycle	LINAK test standard
Operation in moisture	+25 °C to +55 °C level 2	IEC60068-2-30
Dunk test	Preheated to +85 °C and submerged in ice water (0 °C) for 2 hours, repeated 5 times	ISO 16750-4:2010

Electrical demands



EMC tests

To live up to the specific Electromechanical standards for the industrial business area, the TECHLINE actuators LA14, LA25, LA33, LA36, and LA37 are all tested against the specific EMC related regulations of a wide range of industrial standards.

Please note that we only relate to the EMC part of the below mentioned standards.

EMC tests:

Test	Standard
EU EMC Directive	2014/30/EU
Agricultural and forestry machines	EN14982:2009
Road vehicles	ISO 16750:2012
Construction machinery	EN13309:2010
Earth moving machinery	ISO 13766:2006
Generic standard immunity light industry	EN61000-6-1:2007

EMC & Electrical test

	Immunity	Emission
Conducted	<p>ISO 16750-2 Road vehicles - Environmental conditions and testing for electrical and electronic equipment</p> <p>ISO 7637-2 Road vehicles - Electrical disturbances from conduction and coupling - Part 2: Electrical transient conduction along supply lines only</p> <p>ISO 10605 Road vehicles - Test methods for electrical disturbances from electrostatic discharge</p> <p>EN 61000-4-2 Testing and measurement techniques - Electrostatic discharge immunity test</p> <p>EN 61000-4-4 Electrical fast transient/burst immunity test</p> <p>EN 61000-4-5 Surge immunity test</p>	<p>ISO 7637-2 Road vehicles - Electrical disturbances from conduction and coupling - Part 2: Electrical transient conduction along supply lines only</p> <p>ISO 7637-3 Road vehicles - Electrical disturbances from conduction and coupling - Part 3: Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines</p> <p>CISPR 25 Vehicles, boats, and internal combustion engines - Radio disturbance characteristics</p> <p>EN 61000-6-3 Emission standard for residential, commercial, and light-industrial environments</p>
Radiated	<p>ISO 11452-1 Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 1: General principles and terminology</p> <p>ISO 11452-2 Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 2: Absorber-lined shielded enclosure</p> <p>ISO 11452-4 Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 4: Harness excitation methods</p> <p>EN 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity test</p> <p>EN 61000-4-8 Testing and measurement techniques - Power frequency magnetic field immunity test</p>	<p>CISPR 25 Vehicles, boats, and internal combustion engines - Radio disturbance characteristics</p> <p>EN 61000-6-3 Emission standard for residential, commercial, and light-industrial environments</p>



For further information, please visit our website:
[LINAK.COM/SEGMENTS/TECHLINE/TECH-TRENDS/TESTING](https://www.linak.com/segments/techline/tech-trends/testing)

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QUALITY

Built by market leading experts, using state-of-the-art technologies and perfected production methods, you can expect the same quality worldwide.



INNOVATION

Innovation is in our core. We take the lead and have the courage to make it real.



RESPONSIBILITY

We are responsible in what we do – towards customers, employees and environment. Creating trust and taking care is in our DNA.



**LOCAL
& GLOBAL**

From global presence to local understanding. We believe in world-wide support and being close to our customers.