Focus on
Solar Tracking
Improving energy efficiency

Global warming and the drive to minimise greenhouse gas emissions has put the focus on how to make the most of natural energy sources. Solar tracking is an obvious way to improve the efficiency of solar power plants. As the sun moves across the sky, an electric actuator system makes sure that the solar panels follow automatically and maintain the optimum angle to make the most of the sunbeams.

In recent years, the TECHLINE® team of engineers and consultants have given solar tracking their special attention. The well-proven reliability and long maintenance-free lifetime of LINAK actuators even under extremely rough conditions make TECHLINE electric actuator solutions particularly well suited for this kind of application.

Flexibility is a keyword. You get excellent stepless positioning and feedback to your control system - both digital and analogue. When the main power is not available, LINAK actuators can run on battery backup and manual override is also available.

Creating value for our customers – by cooperating with LINAK® you get:

- Dedicated worldwide sales and service teams in more than 30 countries.
- Quality actuator solutions developed to meet the harsh environments to which solar parks are exposed.
- Complete and simple solutions from one supplier. As an option our actuators come with embedded Modbus technology for ease of communication and less component complexity.

LINAK® industrial actuators offer a versatile array of movement solutions for solar tracking, with the overall goal of improving the yield from PV installations.

LINAK offers service worldwide

Please contact your local LINAK office with your enquiry
Actuators with embedded Modbus communication

Modbus is part of our IC™ programme and is a well-known communication technology that has been on the market for years. Modbus simplifies the communication, meaning you can connect several solar trackers in serial and thereby eliminate the need for lots of signal cables and still control the whole park from a central point.

Besides from improving your return on investment, Modbus has many other advantages:

**Lower investment**
- Less complex system
- Less cables due to BUS topology
- Less need for I/O boxes
- Less programming time due to standard communication language
- Less installation time as the number of components are reduced and the control of the solution is embedded

- Everything programmable and controllable from a central controller
- One scalable solution for different sizes of installations

**Longer lifetime**
- Electronic overload protection protects the actuator. The current can be adjusted in both directions.
- Lowering of speed and soft-start and stop reduce the wear on mechanical parts
- Temperature surveillance and alarm
Imagine...

...if LINAK could reduce your maintenance costs by 50%?

**Lower maintenance and operational costs**
- Less components
- Maintenance-free mechanics
- Easy integration with SCADA systems through BUS interface
- Integrated diagnostics enable preventive maintenance.
  - E.g. log of current, cycles and temperature
- Remote monitoring of installation by use of an Ethernet-BUS gateway

**Improved yield of PV installations**
- Accurate positioning of solar panels or mirrors improve return of investment
- Enhancement of solar algorithm from a central point

**What is Modbus**
Modbus Protocol is a messaging structure developed by Modicon in 1979. It is used to establish master-follower communication between intelligent devices. It is a de facto standard, truly open and the most widely used network protocol in the industrial manufacturing environment. It has been implemented in different devices to provide reliable data transport between devices.
At the Actuator Academy™, you will find a library of videos and information about actuator components, actuator testing, and intelligent actuator control.

Find out what you should expect of a good industrial actuator, what affects its performance and efficiency, and how to best utilise your linear motion actuator.

We hope to inspire you and ultimately make you wiser on the moving electric revolution we are all part of.

Happy exploring!

Check out the Actuator Academy
LINAK.COM/AUTO-ACADEMY
Enhance the value and performance of your application with the intelligent movement of IC actuators.
LINAK® actuators with Integrated Controllers (IC) present you with various feedback outputs, smart actuator control, customisation, and monitoring possibilities.

IC actuators unlock the benefits of a true Plug & Play™ solution, making external control boxes and relays superfluous and reducing the wiring complexity.

A comprehensive testing programme ensures that the integrated electronics are well protected for use in tough environments.

If you are looking for a movement solution that will help you stay competitive in the future, then go for LINAK actuators with integrated controller, and Move for the Future.

For solar tracking, actuators with IC provide intelligent and cost-effective performance:

- Simple installation with built-in electronics.
- Precise control of actuator movement
- Feedback and movement customisation
- On-site configuration
- Easy actuator status monitoring

For more information on IC, please visit LINAK.COM or scan the QR code.
LINAK® industrial actuators offer a versatile array of movement solutions for solar tracking.

With **thrusts up to 15,000 N, max speeds up to 160 mm/s, and strokes between 20 and 999 mm**, the actuators are highly adaptable for a wide variety of applications.

Industrial actuators with **heavy-duty aluminium housings** are very suitable for use in corrosive environments. Having been thoroughly salt spray and chemical resistance tested and approved for ratings up to **IP66 and IP69K static**, these actuators will work reliably for years, even when exposed to salt, water, wind, and sun.

**Operating temperatures between -40°C to +85°C** make them fit for work in numerous settings.

By using an integrated controller, industrial actuators are **configurable** and offer **relative or absolute position feedback** as well as **performance monitoring**.

*Product is shown with optional trunnion mounting*
The LINAK solar park

At LINAK, we want to showcase our flexible actuator solutions in action. Therefore, we have developed a solar tracking solution based on our LA35 and LA36 actuators for our solar park at LINAK headquarters in Guderup.

The park has been successfully up and running since 2011 and in 2014 we added an additional 5,000 square meters of photovoltaic (PV) panels on the roof of our new factory.

By tracking the movement of the sun, we are able to get 30 - 40 % extra output from the panels. There are three different trackers, all single axis and all using Modbus communication.

Thanks to the integrated Modbus, we were able to daisy chain the actuators - making the cabling and overall installation easier. Furthermore, the Modbus communication allows us to remotely monitor the status of each solar panel and ensure that they are automated based on seasons and weather conditions.

At this point, the entire PV facility covers approx. 12 % of our total power consumption.

Video - LINAK solar park
LINAK.COM/BUSINESS-AREAS/ENERGY/SOLAR-TRACKING
Testing programme

In each industrial application, the actuator is just one component of many, but at LINAK® we fully appreciate that it is of utmost importance to you and your customers. Not a single actuator leaves the factory until it has undergone a 100% function test.

Depending on the actuator type, various tests have been carried through. Please consult your local LINAK office or take a look at the actuator data sheet in question to get a thorough test overview.

This is your guarantee that a solution based on LINAK TECHLINE electric actuator systems is a solution that will work reliably for years and years.

“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

Climatic tests:
In the climatic test the actuators are tested to operate in extreme temperatures as well as to endure rapid changes in temperature. In a dunk test, the actuators have to withstand repeating temperature fluctuations between +85°C to -40°C and still maintain full functionality and ingress protection.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Test Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN60529-IP6X</td>
<td>Dust</td>
</tr>
<tr>
<td>EN60529-IPX6</td>
<td>Water</td>
</tr>
<tr>
<td>ISO16750-IP69K</td>
<td>High pressure cleaning</td>
</tr>
<tr>
<td>IEC60068-2-3</td>
<td>Moisture storage</td>
</tr>
<tr>
<td>IEC60068-2-30</td>
<td>Operation in moisture</td>
</tr>
<tr>
<td>ISO16750-4:2010</td>
<td>Dunk test</td>
</tr>
<tr>
<td>EN60068-2-52</td>
<td>Salt spray</td>
</tr>
<tr>
<td>BS7691 Section 6.11.2.4</td>
<td>Chemicals</td>
</tr>
</tbody>
</table>
Electrical tests:
All electrical parts are tested i.e. power supply, power and signals cables, control signals etc. Electrical immunity is tested according to industrial standards i.e. for radio noise, electrical discharge and burst.*

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>EN/IEC 61000-6-4</td>
<td>Generic standard emission industry</td>
</tr>
<tr>
<td>EN/IEC 60204</td>
<td>Electrical equipment of machinery</td>
</tr>
<tr>
<td>EN 50121-3-2</td>
<td>Railway applications - Rolling stock apparatus</td>
</tr>
<tr>
<td>94/25/EC</td>
<td>Recreational crafts directive</td>
</tr>
<tr>
<td>EN/ISO 13766</td>
<td>Earth moving machinery</td>
</tr>
<tr>
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<td>Generic standard immunity industry</td>
</tr>
<tr>
<td>2004/104/EC</td>
<td>Automotive Directive</td>
</tr>
<tr>
<td>EN/ISO 14982</td>
<td>Agricultural and forestry machines</td>
</tr>
<tr>
<td>EN/ISO 13309</td>
<td>Construction machinery</td>
</tr>
</tbody>
</table>

Mechanical tests:

**Vibration:** The actuator must withstand continuous vibration in three directions.

**Shock:** The shock test puts the actuator through 3 shocks of up to 50 G in each of six directions.

**Bump:** The actuator receives bumps of up to 30 G in each of six directions several hundred times.

<table>
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<th>Standard</th>
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<tbody>
<tr>
<td>EN60068-2-64 (Fh)</td>
<td>Random vibration</td>
</tr>
<tr>
<td>EN60068-2-27 (Ea)</td>
<td>Shock</td>
</tr>
<tr>
<td>EN60068-2-29 (Eb)</td>
<td>Bump</td>
</tr>
</tbody>
</table>

* These tests do not apply to third party products!
For further information, please visit our website:
LINAK.COM/BUSINESS AREAS/ENERGY/SOLAR TRACKING/

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Built on state-of-the-art technologies and refined processes by competent people, you can expect the same quality worldwide.

Innovation is in our core. We have the curiosity to think innovatively and the power to make it real on all levels.

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

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