

Nedo Precision Invar Levelling Staffs



**NEDO PRECISION INVAR
LEVELLING STAFFS**

The European research centre **CERN** operates the world's largest particle accelerator. Here elementary particles are accelerated to nearly the speed of light and then made to collide. Scientists use these experiments to explore conditions at the time of the Big Bang, when matter came into being.

The experiments are performed in a 27 km ring of superconducting magnets.

These magnets as well as countless of sensors must be kept in perfect alignment.

Exact horizontal positioning of these components over a distance of 27 km was a huge technical challenge. It was solved with Nedo precision Invar levelling staffs. The photo shows the inside of the tunnel. A Nedo precision Invar levelling staff has been placed at a reference point on the pipe.



Nedo Precision Invar Levelling Staffs

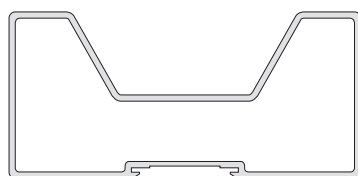
Nedo **precision Invar levelling staffs** are used for first-order levelling and for challenging work on large scale construction sites, for example tunnels, roads, dams or power plants.

The graduation of the **precision Invar levelling staffs** is engraved in the paint coating with an interferometrically controlled laser beam, ensuring superior graduation accuracy and edge sharpness. The permissible deviation is $|\Delta L| \leq 0.01 + l \cdot 10^{-5}$. Nedo Invar levelling staffs thus conform to the highest accuracy class A as per DIN ISO 12858-1.



Features:

- Body of Invar staff made of rigid aluminium profile with anodised surface
- Yellow lacquered graduation side; print protected by a 0.1 mm polyester coating
- Invar tape seated in protected groove of staff profile and tensioned by soft spring to compensate the extension coefficient of the staff profile. Coefficient of thermal expansion < 1,5 ppm/k
- Foot plate slightly protrudes from staff body
- The foot plate is made of stainless chrome steel and is hardened and ground.
- Equipped with circular bubble and fold-away handles as a standard. The handles are zinc and powder-coated.



Staff profile

Available Invar staff graduations



15a
0.5 cm

17a
1.0 cm

19a
1.0 cm

Nedo precision Invar levelling staffs are used for first-order levelling, for example in the construction and monitoring of dams.



Universal Adapter for Standard Staff Shoes

The universal adapter can be used to compensate for small wall projections or similar shapes.

Ref.-No. 393 006

Nedo Invar Levelling Staffs

Staff Shoes	Ref.-No. Graduation 15a	Ref.-No Graduation 19a	Length	Weight
Standard staff shoes		391 189	1 m	3.0 kg
Standard staff shoes	392 185	392 189	2 m	4.3 kg
Standard staff shoes		393 189	3 m	5.5 kg

Calibration Certificate

As an option, each Invar staff can be supplied with a calibration certificate, issued by the Technische Universität Munich. Certificates are issued by the Technical University of Munich or by Nedo, depending on the customer's requirements..

Ref.-No. 399 511	Length calibration without temperature cycle, adjuster Nedo Dornstetten
Ref.-No. 399 519	Length calibration without temperature cycle, adjuster Technical University of Munich
Ref.-No. 399 521	Length calibration with temperature cycle, adjuster Technical University of Munich

The positions of the magnets and sensors in the CERN accelerator had to be measured with maximum precision under unfavourable lighting conditions. The LEDs on the staff gave uniform illumination to the bar-code without emitting thermal radiation.

LED staff illumination is ideally suited for use with precision Invar levelling staffs. It permits precise measurements even with poor lighting.

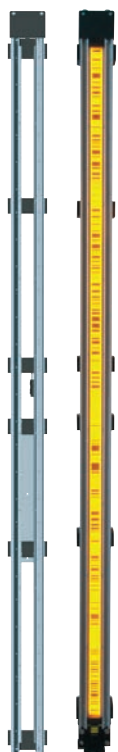


Precision Invar Levelling Staff Accessories

Nedo LED Invar Staff Illumination

LED Invar staff illumination for Nedo high precision Invar staffs. The **Invar staff illumination** allows measurements to be taken with the Invar staff and a digital level in absolute darkness.

It can be used for example in mines, tunnels, night-time construction sites and for building monitoring. The measurement results are just as precise as measurements in daylight. Thanks to its compact design and integrated power supply, the mobility of the Invar staff is not reduced. Highly efficient LEDs in combination with specially designed optics and an optimized electronic unit ensure a long operating life. The lighting does not weaken during the battery running time, so dependable measurement is always possible. The system can be fitted to an Invar staff by the customer himself using standard tools, and requires no maintenance. The circular level of the Invar staff is additionally lit to permit precise measurements.



Staff lighting in operation.

(Invar levelling staff is not included in scope of delivery)



Features:

- Protection class IP 54
- Operating temperature -10°C to +50°C
- Level lighting
- Battery status display
- Detachable rechargeable battery with low self-discharge
- Battery life 5 to 10 hours depending on length
- Supplied with rechargeable batterie and charger

Nedo LED Invar Staff Illumination

Ref.-No.	Length
396 115	suitable for 3 m Leica bar code Invar staff
396 116	suitable for 2 m Leica bar code Invar staff
396 117	suitable for 3 m Trimble bar code Invar staff
396 118	suitable for 2 m Trimble bar code Invar staff

Base Plate (Frog)

The base plate is made of powdercoated grey cast iron.

Features:

- Spike
- Weight: 2.7 kg

Ref.-No. 333 121



Precision Invar Levelling Staff Accessories



Nedo Telescopic Struts

Telescopic struts are available as accessories for 2 m and 3 m precision Invar levelling staffs. The easy to handle telescopic struts ensure a secure stand of the precision Invar levelling staffs.

Nedo Telescopic Struts

Ref.-No.	Length
399 211	2 m
399 311	3 m

Nedo Transport Case for 2 Invar Staffs

Case for safe transport and storage of Nedo precision Invar levelling staffs. The **transport case** is made up of a sturdy aluminium frame and strong plastic honeycomb structured wall panels. The corners feature robust protectors. Handles allow for an easy handling. In addition, the case has a foam lining to protect the precision Invar levelling staffs. The transport case can accommodate two precision Invar levelling staffs, one precision Invar levelling staff with telescopic struts or one precision Invar levelling staff with illumination.



Nedo Transport Case for 2 Invar Staffs

Ref.-No.	Length
395 111	for 1 m staff length
395 121	for 2 m staff length
395 131	for 3 m staff length

Nedo Case for 2 Invar Staffs with Wide Staff Shoes

Ref.-No.	Length
395 221	for 2m staff length
395 231	for 3m staff length





Precise surveying and measuring

Nedo GmbH & Co. KG

Hochgerichtstrasse 39-43

D-72280 Dornstetten

Phone +49 (0) 7443 24 01-0

Fax +49 (0) 7443 24 01-45

info@nedo.com

www.nedo.com