GEFRAN

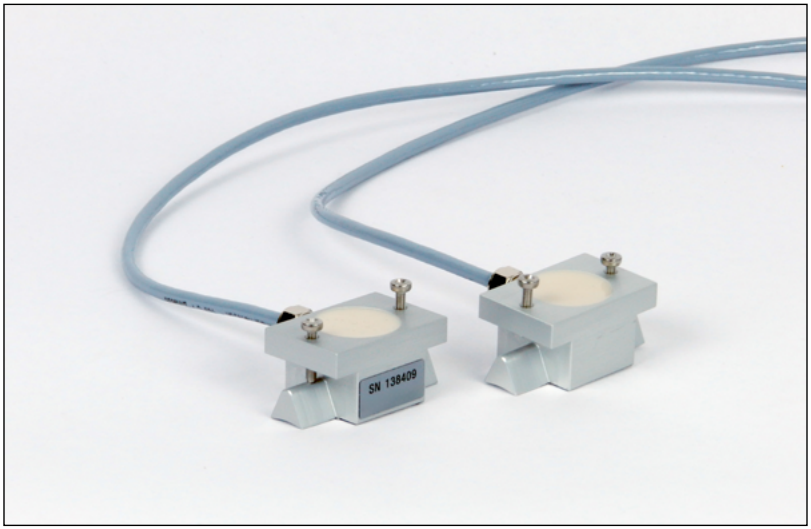
GE1029

TIE-BAR STRAIN SENSOR

DU-4D

4- CHANNEL DIGITAL MONITOR

Operating manual



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WEEE Information

IT

“Attuazione della direttiva 2012/19/UE sui rifiuti di apparecchiature elettriche ed elettroniche (RAEE)”

Il simbolo del cassonetto barrato riportato sull’apparecchiatura o sulla sua confezione indica che il prodotto alla fine della propria vita utile deve essere raccolto separatamente dagli altri rifiuti.

La raccolta differenziata della presente apparecchiatura giunta a fine vita è organizzata e gestita dal produttore.

L’utente che desideri disfarsi dell’apparecchiatura dovrà quindi contattare il produttore per ricevere indicazioni sul sistema da quest’ultimo adottato per consentire la raccolta separata dell’apparecchiatura giunta a fine vita.

L’adeguata raccolta differenziata per l’avvio successivo dell’apparecchiatura dismessa al riciclaggio, al trattamento e allo smaltimento ambientalmente compatibile contribuisce ad evitare possibili effetti negativi sull’ambiente e sulla salute e favorisce il reimpiego e/o riciclo dei materiali di cui è composta l’apparecchiatura.

EN

“Implementation of Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)”

The symbol showing a crossed-out wheeled bin on equipment or its packaging indicates that the product must be collected separately from other waste at the end of its useful life.

The manufacturer is responsible for organising and managing the separate collection of this piece of equipment at the end of its useful life.

Users wishing to dispose of the equipment must therefore contact the manufacturer to obtain instructions from the same on how to have the equipment collected separately at the end of its useful life.

By collecting the disused equipment separately, it can be recycled, treated or disposed of in an environmentally friendly manner, thus helping to prevent the environment and public health from being affected negatively and enabling reuse and/or recycling of the materials forming the same equipment.

DE

„Umsetzung der Richtlinie 2012/19/EU über Elektro- und Elektronik-Altgeräte (EEA)“

Das Symbol der durchgekreuzten Mülltonne auf dem Gerät oder der Geräteverpackung weist darauf hin, dass Sie das Produkt am Ende seines Lebenszyklus separat entsorgen müssen.

Die Getrenntsammlung dieses Geräts an seinem Lebenszyklusende wird vom Hersteller organisiert und besorgt.

Der Nutzer, der das Gerät entsorgen möchte, muss sich daher an den Hersteller wenden, um Auskunft über seine Vorgehensweise zur Getrenntsammlung des Geräts an dessen Lebenszyklusende zu erhalten.

Die entsprechende Getrenntsammlung für die anschließende Zuführung des Altgeräts zum Recycling, zur Wiederaufbereitung und zur umweltverträglichen Entsorgung trägt dazu bei, negative Auswirkungen auf die Umwelt und die Gesundheit zu unterbinden und begünstigt die Wiederverwendung und/oder das Recycling von Werkstoffen, aus denen das Gerät besteht.

FR

“Transposition de la Directive 2012/19/UE relative aux déchets d’équipements électriques et électroniques (RAEE)”

Le pictogramme de la poubelle barrée, figurant sur l’équipement ou sur son emballage, indique que le produit en fin de vie doit être traité séparément des autres déchets.

Le ramassage sélectif de cet équipement en fin de vie est organisé et géré par le constructeur.

Tout utilisateur qui souhaiterait se débarrasser de l’équipement devra donc contacter le constructeur pour obtenir des informations concernant la méthode adoptée pour permettre le ramassage sélectif de l’équipement en fin de vie.

Un ramassage sélectif correct, en vue de l’acheminement de l’équipement vers des opérations de recyclage, de traitement et de mise au rebut respectueuses de l’environne-ment, contribue à réduire les impacts poten-tiellement néfastes sur l’environnement et la santé, outre à favoriser la réutilisation des matériaux/composants dont l’équipement est constitué.

GE1029
TIE-BAR STRAIN SENSOR

Main features:

- Direct measurement of surface strain
- Quick and easy non-destructive assembly
- High accuracy and linearity in tension and pressure (like bonded strain gauges)
- Ideal for use on presses, injection-moulding and die-casting machines
- One system for many different tie bar diameters (25…400mm)
- Dynamic applications
- Without amplifier (passive)
- Ideal for online monitoring of clamping force
- Ideal for self-made load cells

Product description

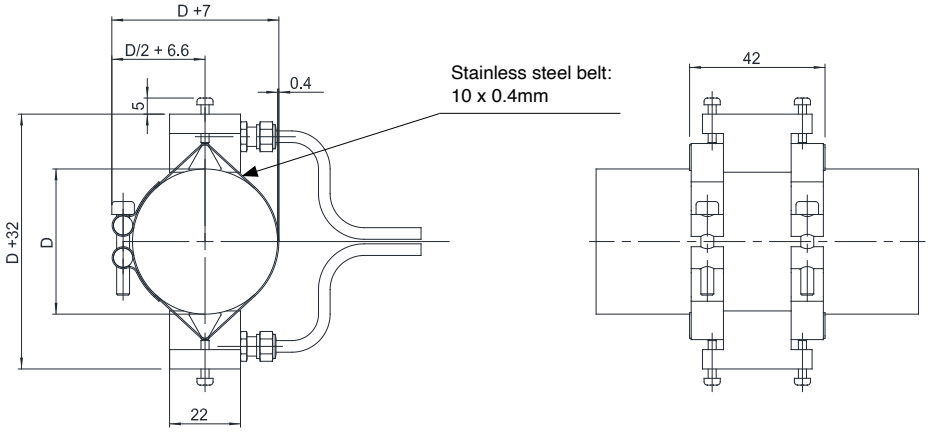
The strain gauge sensor GE1029 measure the surface-strain directly at the mounting location in the same quality as bonded strain gages. The press-on technology, developed by Gefran Schweiz AG, presses the strain gauges under the stainless protective film so strongly against the surface to be measured that frictional contact occurs.

The sensor does not have to be recalibrated between remove and re-installation. The sensor is mounted using stainless steel straps, is non-destructive, very fast and simple. For each tie-bar diameter outside tolerance of ± 2.5mm a different pair of steel straps is required. The sensor can not be overloaded. The GE1029 sensors require a cyclic reset.

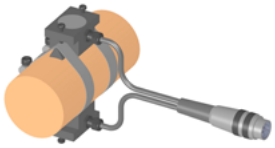
Technical Data	
Strain gauge type	Foil (GF = 2.0)
Bridge resistance	350Ω
Measuring range	± 1000 με
Sensitivity tolerance	± 0.2%
Transverse sensitivity	0.9 ± 0.2 %
Accuracy	<± 0,5% FS
Linearity	<± 0,5% FS
Hysteresis	<± 0,2% FS
Repeatability	< 0,1% FS
Supply voltage	5VDC (max. 8VDC)
Supply current	< 15mA
Operating temperature range	-20...+70°C
Storage temperature range	-20...+70°C
Overload capabilitiy	indefinite (offset occurs)
Protection class	IP64
Case material	Anodised aluminium
Weight, including cable	200g

Dimensions

Installation requirements	
Press-on torque (M4 screws)	**2.0 Nm**
Surface installation spot	**N7**



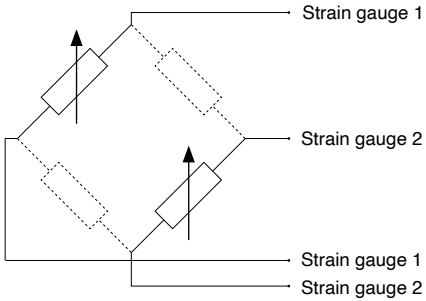
Application: Self-made load-cell



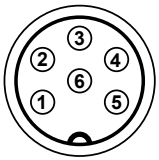
Dimensions in mm

Electrical Connection

2/4 Bridge

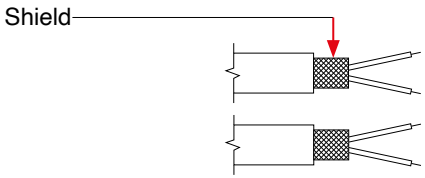


Option C: cable with connector



Option C Connector Pin	Option O open leads	Function
1	red	Strain gauge1
2	red	Strain gauge1
3	-	n.a.
4	yellow	Strain gauge 2
5	yellow	Strain gauge 2
6	-	n.a.

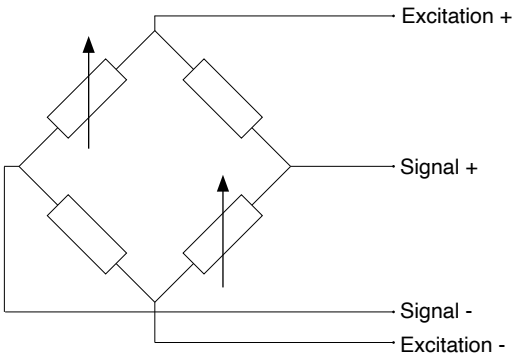
Option O: cable with open leads



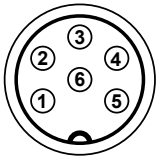
2x PVC screened cable (standard); 2 x 0.14 mm§; Ø 3.5mm

Electrical Connection

4/4 Bridge



Option C: cable with connector



Option C Connector Pin	Function
1	Excitation +
2	Excitation +
3	Excitation -
4	Signal +
5	Signal -
6	Excitation -

Assembly

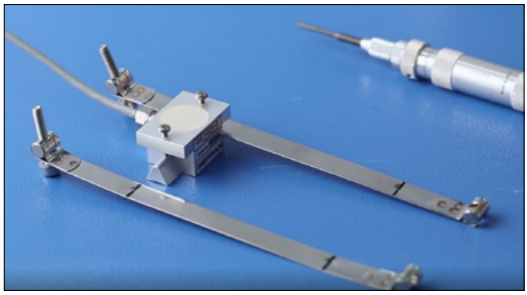
These sensors are precision instruments. The devices must be handled with the appropriate care. These instructions must be read and understood by every user.

Preparation

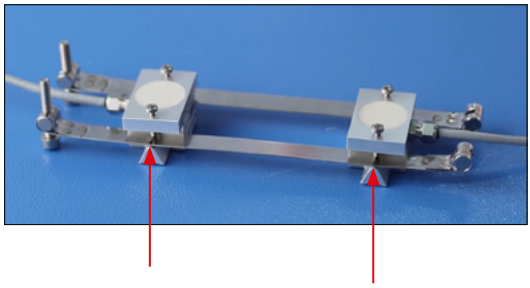
- Oil and other surface impurities as well as paint must be removed from the place of installation.
- The surface roughness of the place of installation has not to be rougher than N7.
- Check the foil of the sensor GE1029 for damage.
- The foil of the sensor GE1029 must be absolutely clean.

Assembly procedure

1.
There are markings on the stainless steel bands.
(The distance between these markings depends on the diameter of the object to be measured)



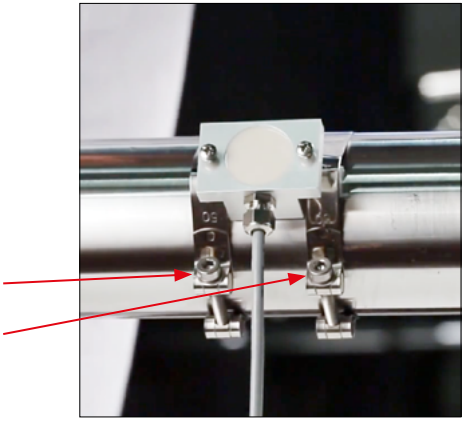
2.
The stainless steel strips are fixed at the marked position with the individual measuring modules.



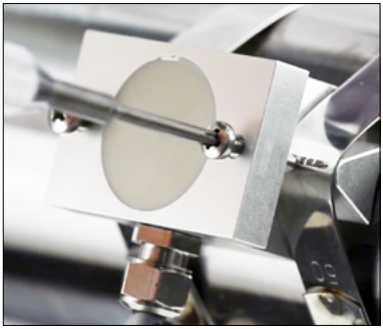
3.
Place the sensor around the object to be measured and screw it on carefully.

Do not tighten with final torque yet!

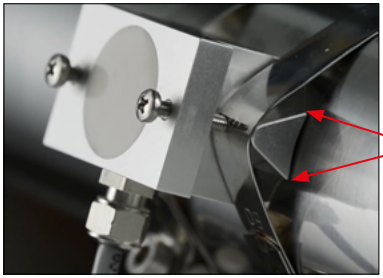
Cables must not be jammed.



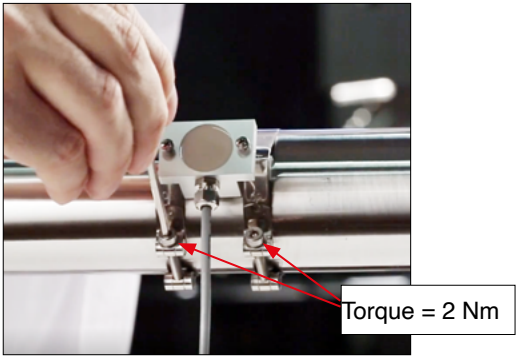
4.
Slightly loosen the fixing so that the individual measuring modules can rest perfectly on the circumference of the measuring object.



5.
The contact points must lie exactly in the axial direction on the surface to be measured.



6.
Screw the sensors hand-tight.
Torque = 2 Nm
The two measuring modules must be exactly opposite each other.



The system is now ready to measure.

Attention:
It is important that the screws are checked with the above torque after the machine has warmed up or after two days of operation at the latest.

Maintenance

4.1 Inspection

To prevent damage to the film, it should always be checked before using the sensor. Remove any impurities immediately.

4.2 Maintenance

The sensor GE1029 should be checked every 12 months. For maintenance the sensor must be sent to Gefran Schweiz AG.

DU-4D

4- CHANNEL DIGITAL MONITOR

Main features:

- Available for all Sensormate sensors (2/4 bridges)
- Direct display of the measured values in με, kN or t
- High accuracy and stable reset
- Very bright displays and robust aluminum housing (IP52); Ideal for rough environments
- USB connection for tie bar adjustment software (optional)
- Analog output 0...10VDC (optional)

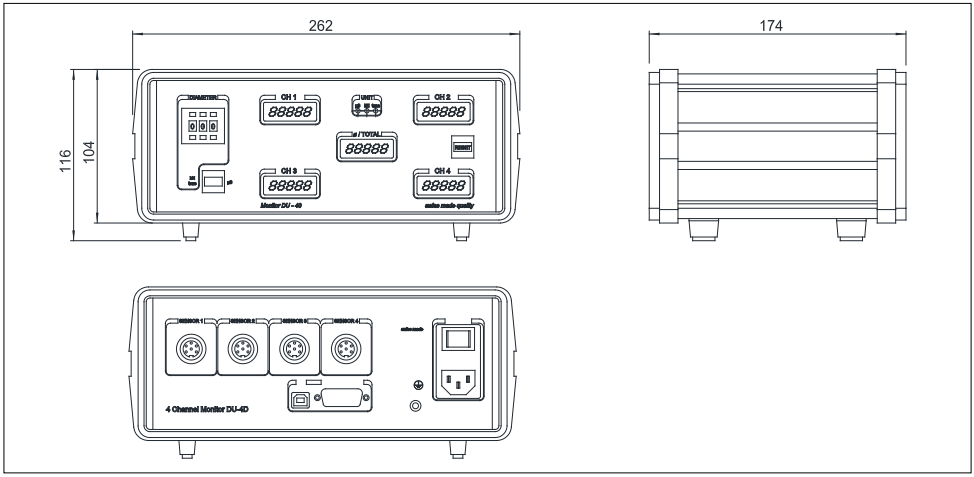
Product description

The DU-4D Monitor is an industrial signal amplifier and monitor for strain gauges and strain sensors. It has integrated functions for external reset. Force measurement on tie bars displays in kN or tons and diameter input. Strain measurement displays in με (micro strain). Direct switch units and change parameters. The handling is very user-friendly, the robust aluminium housing ideal for harsh environments.

Application: The device DU-4D is used in conjunction with tie bar strain-sensors of the Gefran Schweiz AG for the control of the clamping force on presses, injection-moulding and die-casting machines. Ideal to retrofit on existing machines.

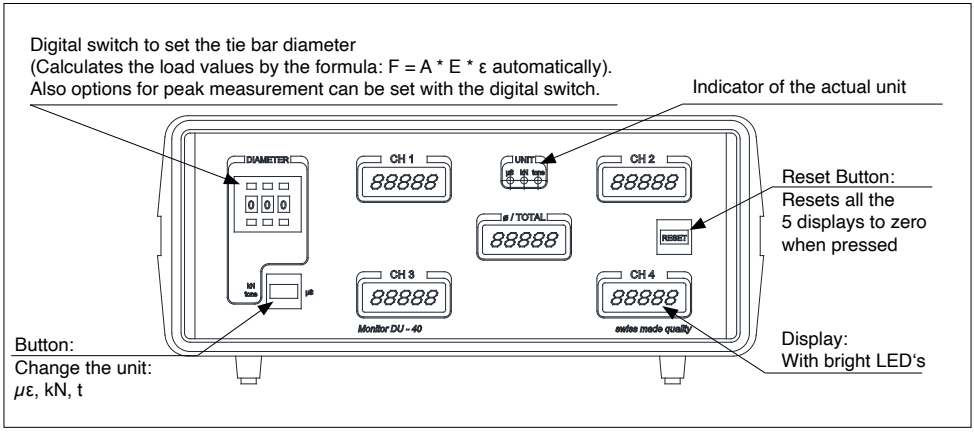
Technical Data	
Input Bridge resistance	120...1000Ω
Signal input range (FS)	0.1...1mV/V
Resolution ADC	16-Bit
Resolution DAC	16-Bit (only if ANO)
Sampling rate	60Hz
Output rate	5Hz
Display refresh	100Hz
Output signal	Display (± 9999 digit, 4 channel & average channel) 0...10VDC (ANO)
Noise	<= 1 digit, <20mV (only if ANO)
Accuracy	< ± 0.05% FS
Accuracy of zero point	<= 1 digit, <20mV (only if ANO)
Linearity	< ± 0.5% FS
Response time of the alarm	> 25ms
Reset time	> 200ms
Supply voltage	85...260VAC, 50/60 Hz (±5%)
Supply current	< 200mA
Inverse polarity protection	Yes
Accidental short-circuit protection	Yes
Operating temperatur range	0...+65°C
Storage temperatur range	-40...+80°C
Temperature coefficient at 10°C	< 0.1 (0.05 typical)
Protection class	IP54
EMC	2014/30/EU
Case material	Aluminium
Weight	2450g

Dimensions

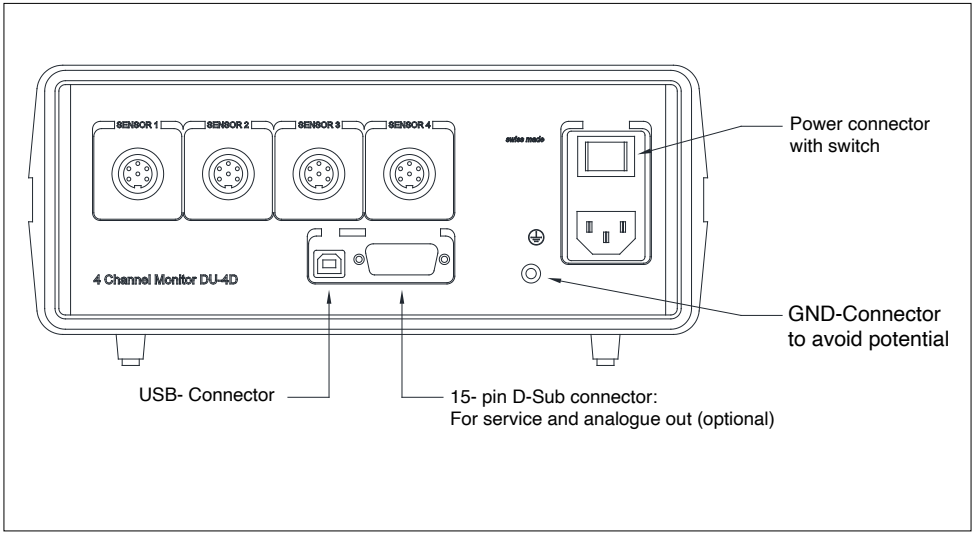


Dimensions in mm

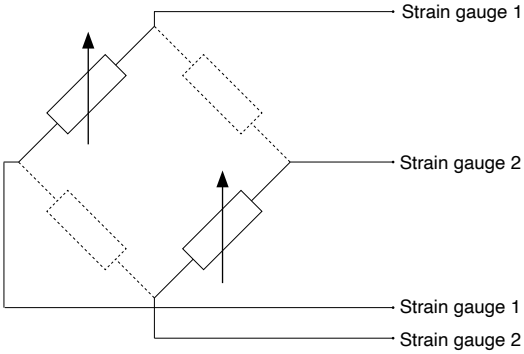
Faceplate Description



Electrical Connection



2/4 Bridge sensor



Connector PIN	Function
1	Strain gauge 1
2	Strain gauge 1
3	n.c.
4	Strain gauge 2
5	Strain gauge 2
6	n.c.

Operating the monitor

- Plug in the Power Cord
- Connect the sensors to the 6-pin-connector on the rear
- Switch on the unit
- Select the tie bar diameter to be measured
  (The standard setting of the young's modulus is 210'000N/mm^2)
- There is no need to warm up the monitor. 2 seconds after switch-on, it is ready to measure
- Choose the desired display value (με -> kN -> ton) by pushing the unit button
- Push the reset button
- The instrument is now ready to take measurements

Additional information

- Unused sensor inputs are indicated by „E01".
- For measurements in kN or tons, the middle display shows the total sum.
- For measurements in microstrain, the middle display shows the average.
- The middle display only considers connected sensors. No „E01".

E-Module:
The elastic modulus or Young's module E is a measure of the stiffness.
It's defined as the ratio of the stress to the strain.

$\varepsilon = \frac{F}{A \cdot E}$	Higher force effects higher strain
	Higher cross section or E-module effects lower strain

K-Factor (gauge factor):
The K-Factor is the ratio of relative change in electrical resistance R,
to the mechanical strain [ε].

$$\frac{\Delta R}{R} = k \cdot \frac{\Delta \ell}{\ell}$$

The K-Factor is determined by the strain gauge grid material.

Customer specific settings

The following procedures will change the factory setting to customer specific settings.
For these settings, diameter numbers > 920 are used, as there are no such tie bars in the market.

IMPORTANT NOTES:
This functions are available from Firmware Version 3.3 and higher
Changes of settings are only stored when 968 is set before switching off!

947 - Factory Reset

Sets the monitor back to the settings ex factory:
--> (microstrain; Young's modulus 210'000; Auto-Reset = OFF)

- the monitor is switched ON
- set the digital switch to: 947
- press the Unit Button AND the Reset Button for 5 seconds at the same time
- All displays show "-----" for 2 seconds --> the monitor reboots

960 - Get Firmware Version

To get the software version, in case you have a question on the instrument to your supplier. Always supply the Firmware Version and Serial Number with any inquiry:

- the monitor is switched ON
- set the digital switch to: 960
- press the Unit Button AND the Reset Button for 5 seconds at the same time
- Now, the Firmware Version appears for 2 seconds

961 - Get the actual Young's modulus

To find out the actual setting of the young's modulus:

- the monitor is switched ON
- set the digital switch to: 961
- press the Unit Button AND the Reset Button for 5 seconds at the same time
- Now, the actually used young's modulus appears in the middle display for 2 seconds

962 - Change the Young's modulus

Some steel types have different Young's modulus from the standard setting of 210'000N/mm2. The Young's modulus can be changed from 150'000 to 250'000N/mm2:

- the monitor is switched ON
- set the digital switch to: 962
- press the Unit Button AND the Reset Button for 5 seconds at the same time
- Display 5 shows the actual young's modulus
- Set the digital switch to the desired value and press the reset button
- Press Reset: Display 5 shows the new young's modulus for 2 seconds

965 - Switch Auto-Reset ON/OFF

The Auto-Reset is a function which allows you to use the DU-4D for continuous monitoring of your clamping force without any external signal for the reset. The monitor-Firmware detects the cycle and resets the signal after each cycle automatically.

- the monitor is switched ON
- set the digital switch to: 965
- press the Unit Button AND the Reset Button for 5 seconds at the same time
- Now, 'AUTO' appears

966 - Peak measurement

To get the peak measurement:

- the monitor is switched ON
- set the digital switch to: 966
- press the Unit Button AND the Reset Button for 5 seconds at the same time
- now „P on" appears in the center in the middle display for 2 seconds and the peak measurement is activated
- The Peak version works only with positive signals.

968 - Store actual configuration

Any function which has been changed, can be stored that it will not be deleted even once the monitor is switched off. As soon as the monitor is switched off, all settings will be set to the standard value if they are not stored:

- the monitor is switched ON
- set the digital switch to: 968
- press the Unit Button AND the Reset Button for 5 seconds at the same time
- Now, "saved" appears, and all new functions are stored

969 - Set the monitor functions back to the standard values

All the above functions will be set back to the standard values ex factory (only functions, no calibration values):

- the monitor is switched ON
- set the digital switch to: 969
- press the Unit Button AND the Reset Button for 5 seconds at the same time
- Now, "OFF" or "AUTO" appears, the monitor reboots, and the functions are set back to the standard values:
  --> Young's modulus: 210'000N/mm2
  --> no Auto-Reset function
  --> Unit = microstrain

Error Messages

E01: This Message occurs when:
- there is no sensor connected
- the sensor cable is broken
- strain gage broken or bridge-offset too large (> 6 times measuring range)

E04: Young's modulus not in range of 150'000 to 250'000N/mm2
E05: Factory Reset not possible
E06: Error during calibration --> start calibration again
E99: Error after calibration (EEPROM Error) --> calibrate again

Maintenace

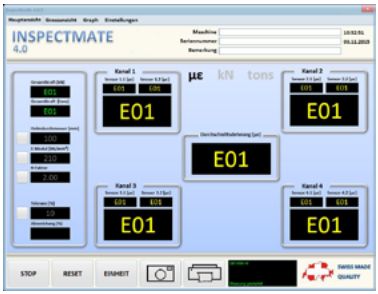
Calibration intervalls:
This measuring instrument should be calibrated every 12 months. The sensors, monitors and cables should then be sent to the manufacturer.

Options

Analog Output:
Signal output of 0...±10 VDC for external data collection on the D-Sub connector.

Digital Output
USB-Output for tie bar adjustmentsoftware „INSPECTMATE".

Refer to the „INSPECTMATE" software guide for more information on operating the software.



INSPECTMATE Main Features:

- Control the sensormate product (reset, unit, tie bar diameter, k-factor, e-modul)
- Alarm / accuracy test function (limit %, over limit, under limit, in limit)
- Display the measure values directly in µε, kN or tons (4 channel, single strain gauges, total force [kN], total force [tons] and average strain [µε])
- Save (bmp), print and comment your measurement
- Big view for better overview at large distance

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