

Welcome to the webinar: “How to Properly Install Strain Gauges”

A graphic featuring the word "WEBINAR" in a dark blue, sans-serif font. The "WEB" portion is enclosed within a dark blue circle, and the entire graphic is set against a light gray rounded rectangle with a subtle reflection below it.

WEBINAR

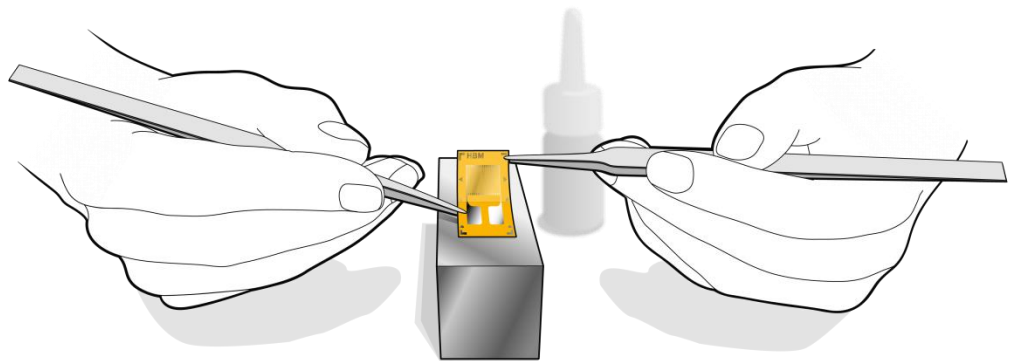
Dirk Eberlein

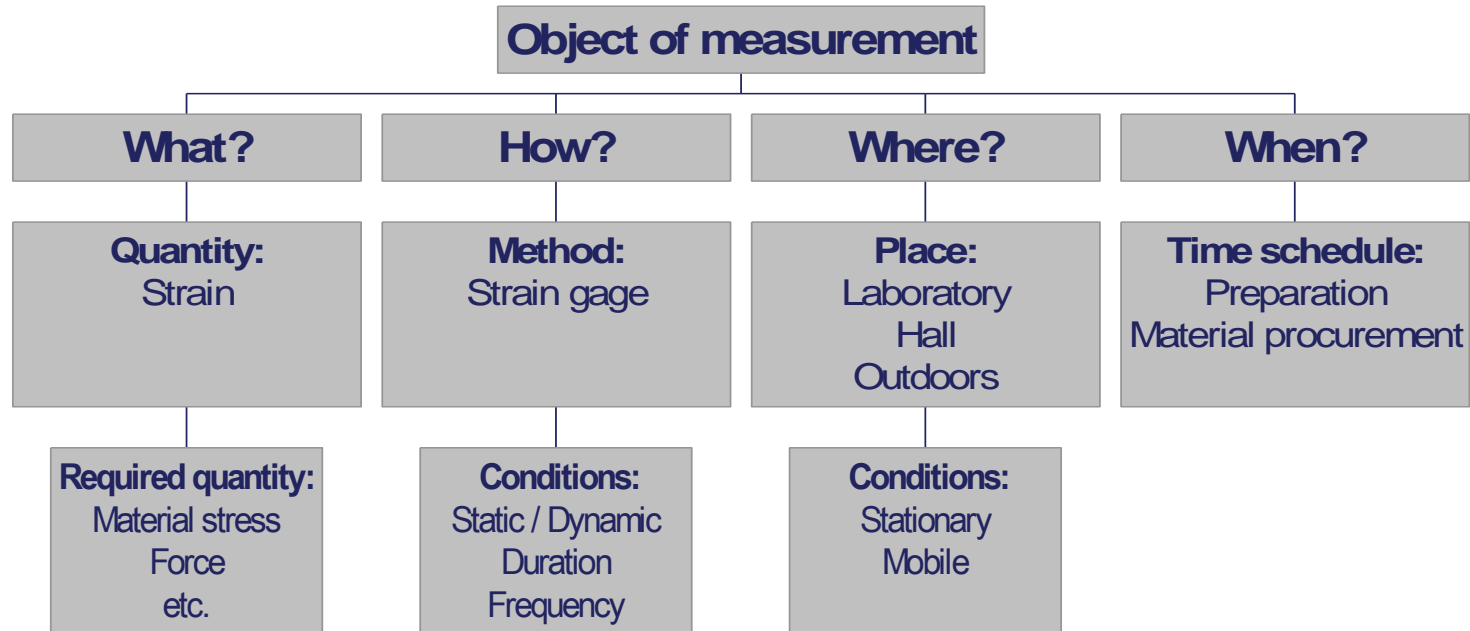
- **Product and Application Manager**
- Diploma in Engineering
- 20 years of experience in test and measurement
- Product Manager for electrical strain gauges
- **E-Mail:** dirk.eberlein@hbm.com

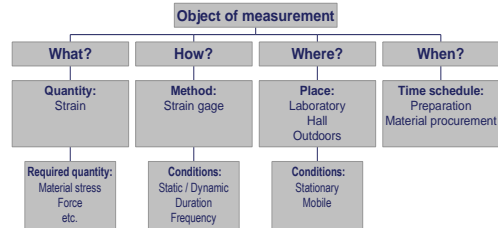


Dirk Eberlein

1. Installation planning
2. Installation of strain gauges
 - Preparation of strain gauges
 - Preparation of bonding surface
 - Installation
 - Cable connection
 - Inspection of installation
 - Measuring point protection





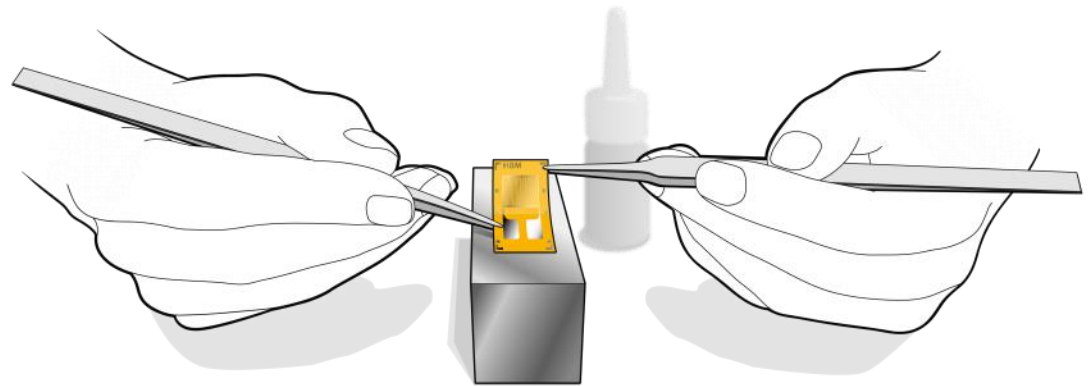


- | | |
|--|---|
| Personnel | ▪ Necessary knowledge available? |
| Instrumentation | ▪ Sample rate
▪ Bandwidth
▪ Data storage (Logger?) |
| Material procurement | ▪ Strain gauge type selection
▪ Adhesive selection
▪ Coating selection
▪ Availability check and procurement |
| Installation plan, incl.
circuit- and cabling
plan | ▪ Location of installation
▪ Equipment available?
▪ Cable material, cable fixture
▪ Connection to measuring device |
| Protective measures | ▪ Covering agent
▪ Shielding |

Strain gauge measuring point	=	Strain gauge	+	Bonding	+	Coating
Duration of measurement		Max. elongation		Material surface		Environmental influences (oil, water, steam, ...)
Measurement task		Fatigue life		Hot curing installation possible?		Temperature range
Required accuracy		Temperature range of matching		Temperature range		
		Temperature range				

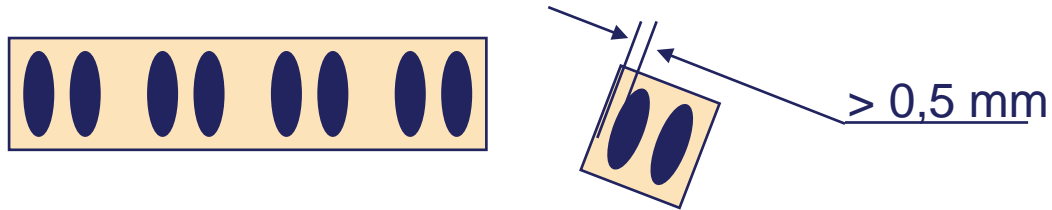
Required steps:

- Preparation of strain gauge and if necessary of solder terminals
- Preparation of bonding surface
- Installation (bonding)
- Connecting cables
- Electrical and visual inspection of installation
- Functional test (connection to measuring device)
- Measuring point protection/ Covering agent



Preparation of strain gauge and solder terminals*

- Cut off a pair of solder terminals

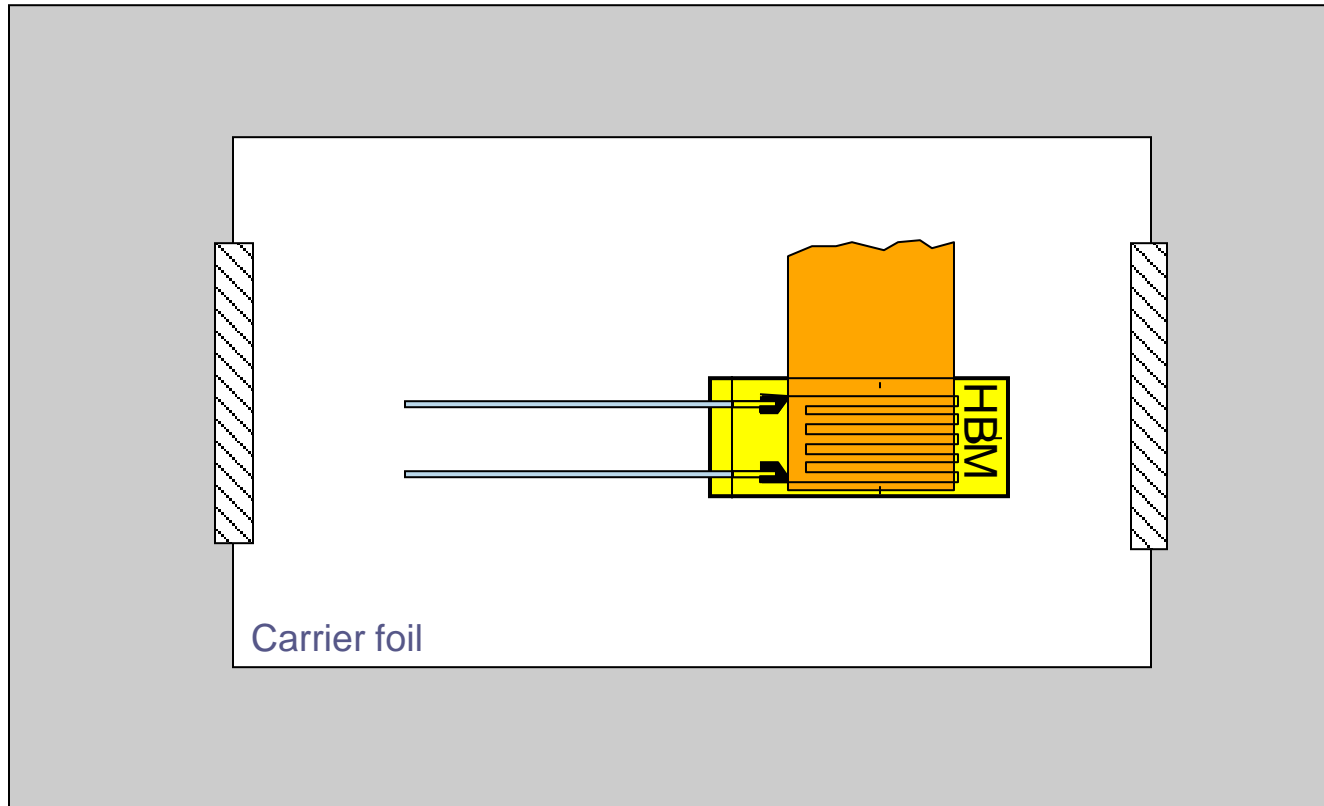


- Remove any oxide from the metal surfaces (eraser pen)
- Clean solder terminals on top and bottom (RMS1)
- Fix solder terminals and strain gauge with adhesive tape



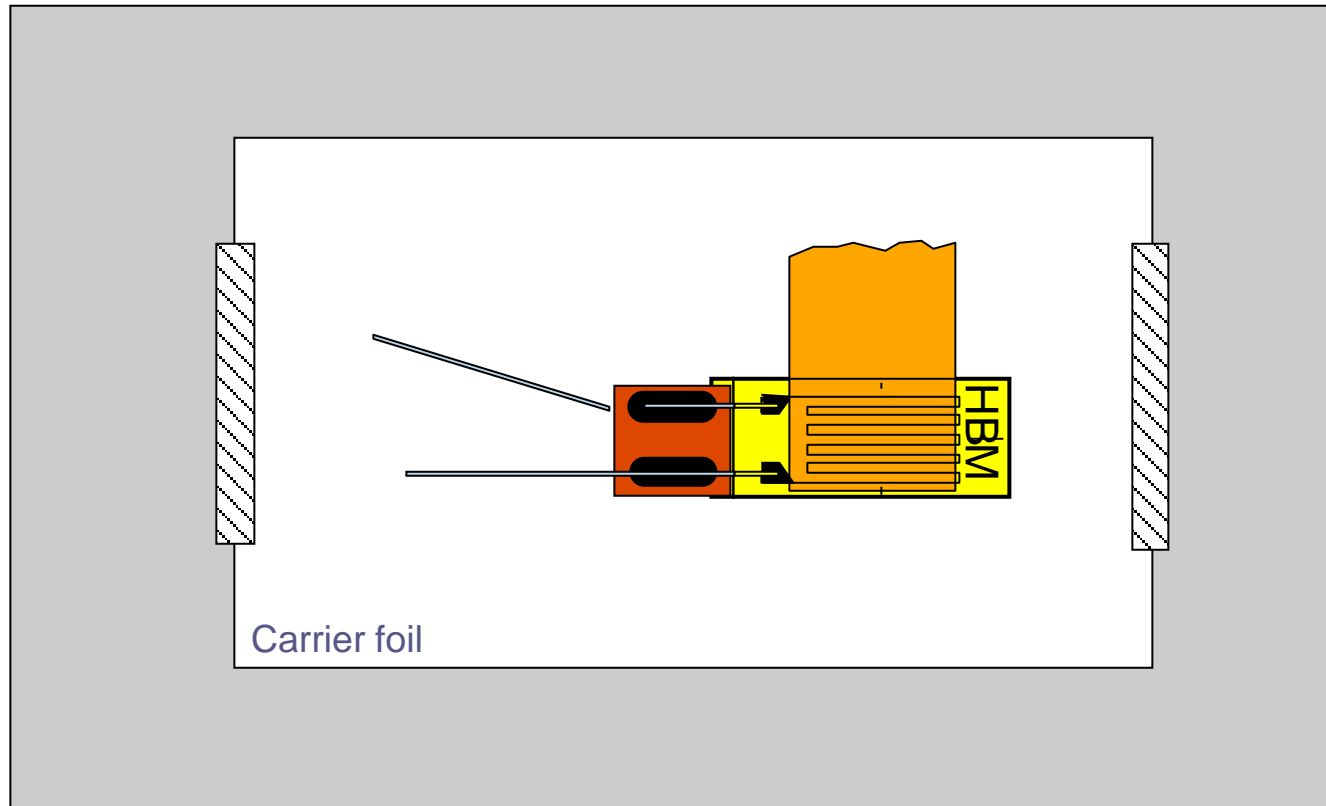
* when using strain gauges with leads

Preparation strain gauge and solder terminals*



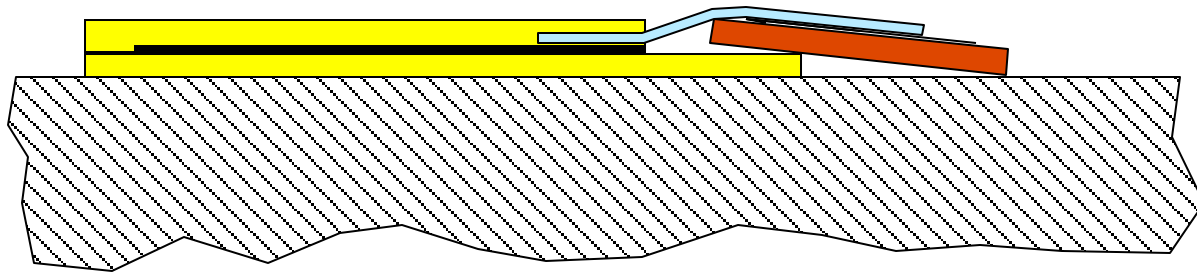
* when using strain gauges with leads

Preparation strain gauge and solder terminals*



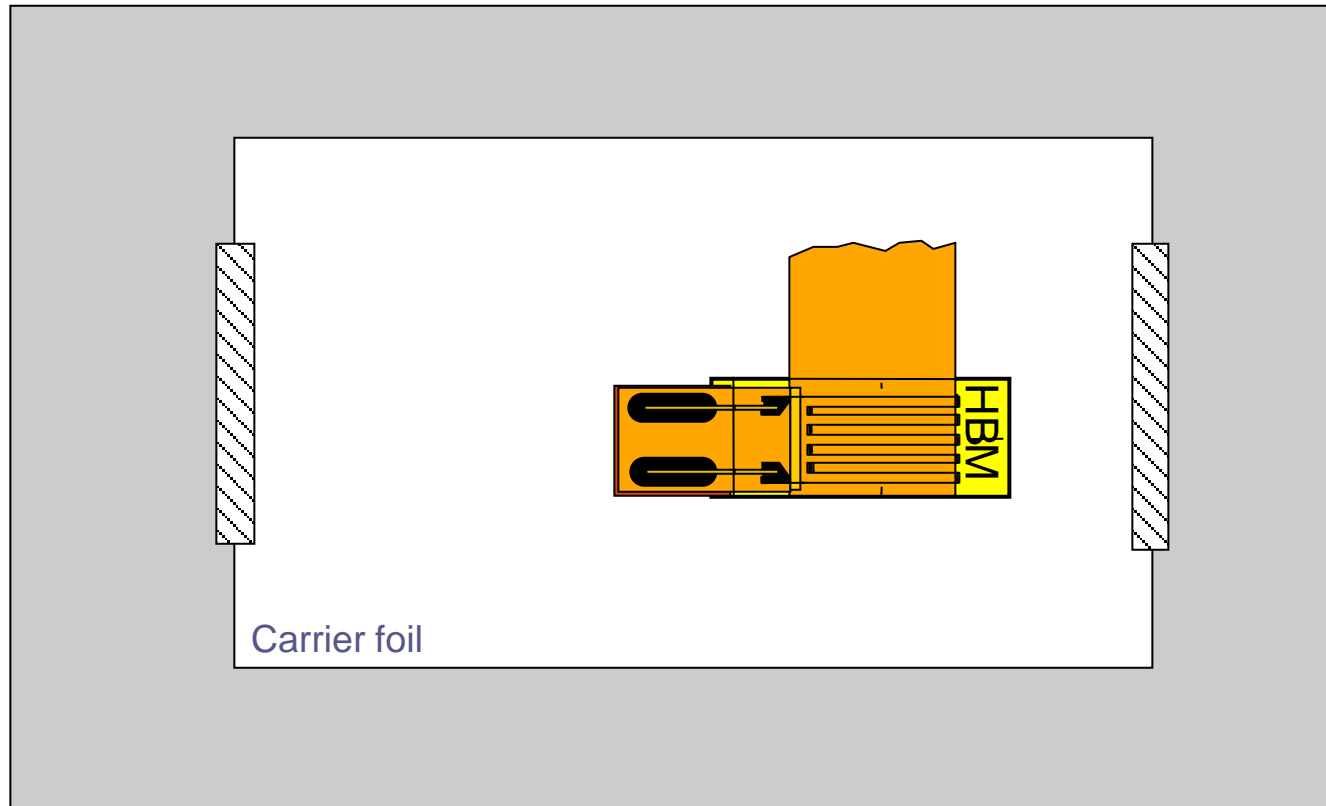
* when using strain gauges with leads

Preparation strain gauge and solder terminals*



* when using strain gauges with leads

Preparation strain gauge and solder terminals*



* when using strain gauges with leads

Bonding surface preparation

Material-dependent; example for metals:

- Coarse cleaning (remove rust, scale etc. around broad area)
- Remove lubricants (household detergents)
- Cleaning
- Smoothing / Grinding
- Cleaning (remove dirt and grinding dust)
- Roughening (sandblasting, grinding)
- Cleaning
- Marking (indication of exact strain gauge position)
- Fine cleaning

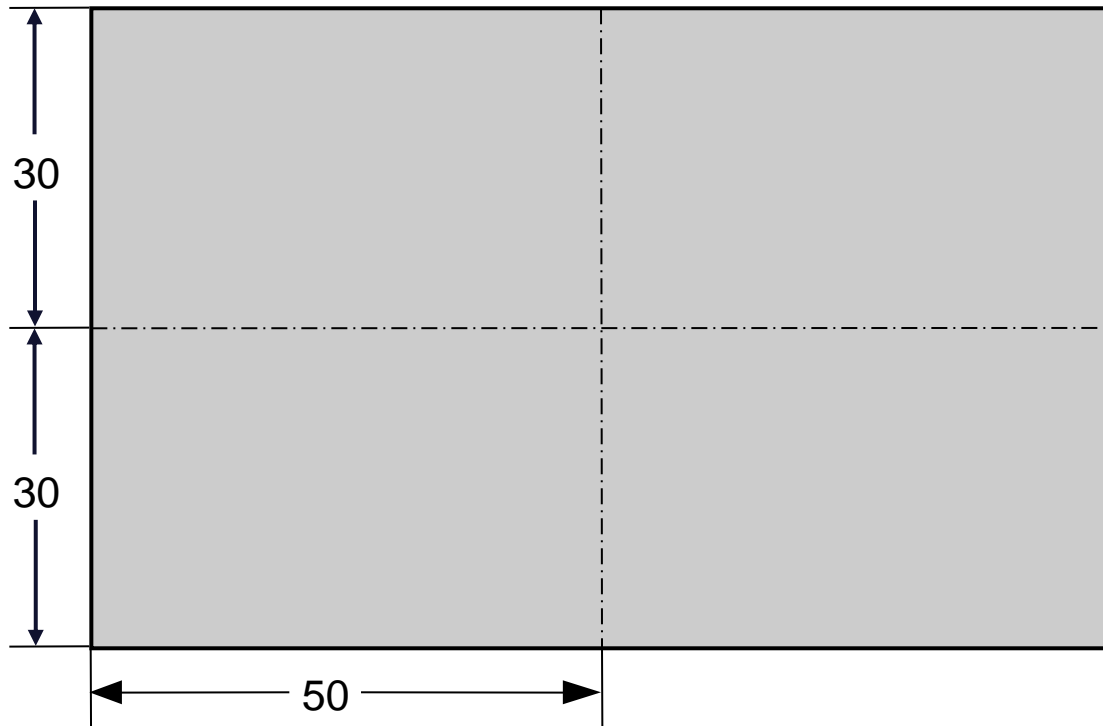
The Do's and Don'ts for Preparing a Successful Installation

Check the table below for a quick overview and suggestions on how to prepare your material for an effective strain gauge installation.

Concrete					
Concrete	Pretreatment	Cleaning	Primer	Adhesive	Notice
(Click here for more info)					
Concrete with different grain sizes	Cast with dry molds: remove concrete laitance; Cast with oil molds: oil-soaked layer must be removed;	Blow off grinding dust with oil and water-free compressed air; Degreasing with solvent is not recommended	-	X60	Concrete requires a strong pore-filling adhesive
Fiber-reinforced plastics					
Glass					
Plastics					
Rubber					
Wood					

www.hbm.com/en/7116/how-to-prepare-material-for-a-gauge-installation

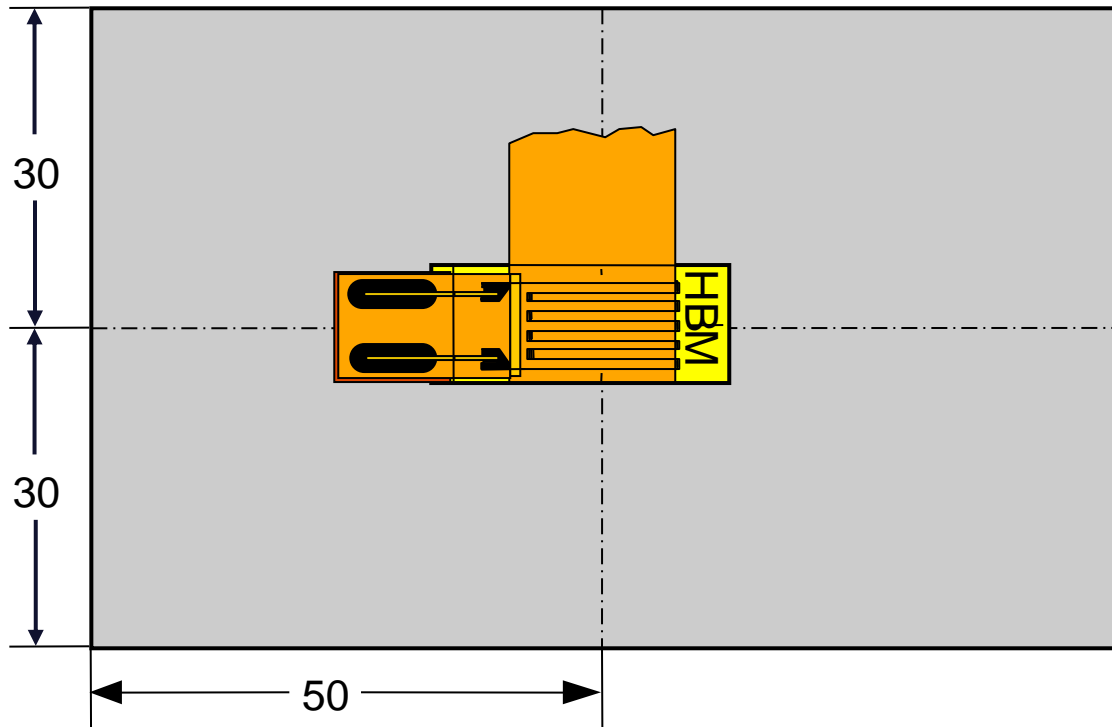
- Use empty ballpoint pen
- Do not use scribing iron!



Example

Positioning

- Fix strain gauge onto the component with adhesive tape
- Work only with tweezers!



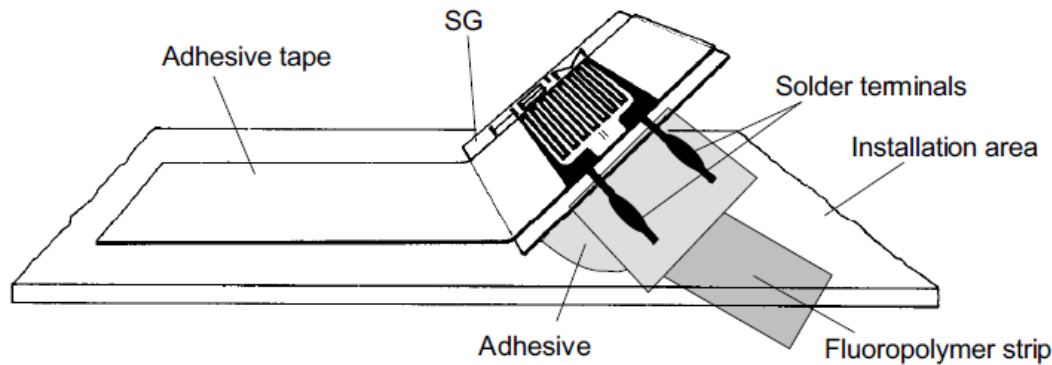
Example

Example: Bonding with Z70

- Lift up the strain gauge with solder terminal
- Place adhesive onto the component
- Fold down the strain gauge
- Press down evenly
 - Do not forget the separating foil



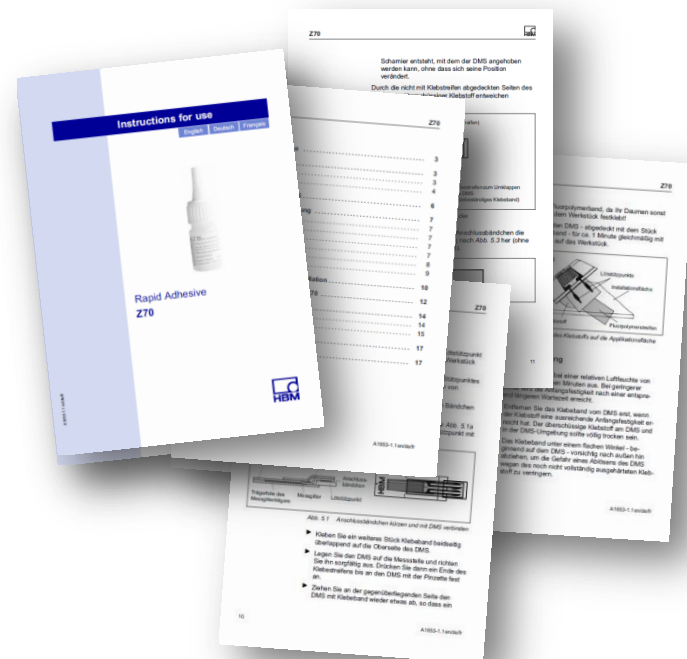
Superglue Z70



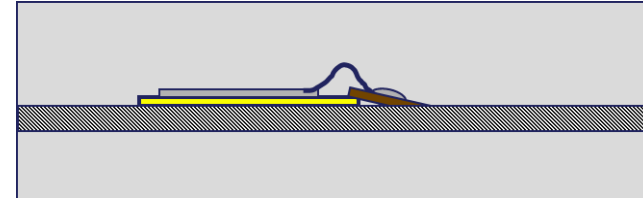
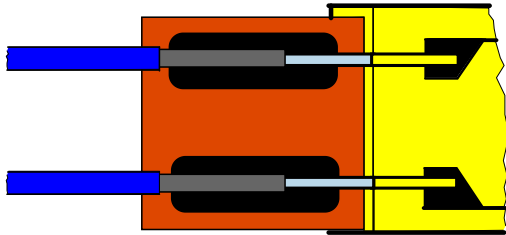
- Obtain instructions in provided manual
 - Different processing for different adhesives
- Further information:
<https://www.hbm.com/en/0128/how-to-install-a-strain-gauge-video/>



Different HBM adhesives

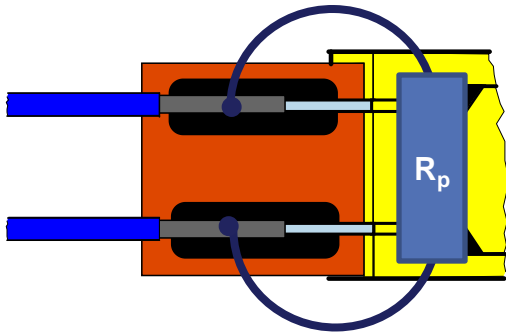


- Lead wire insulation to carrier foil of solder terminal
- Strain relief of leads and cable
- Cleaning of solder terminals with RMS1
 - Flux residues cause variations in insulation resistance (see example below)



- Decline in insulation resistance from 1,000 M Ω to 1 M Ω causes a zero drift of:
 - -60 $\mu\text{m/m}$ for 120 Ω -strain gauge
 - -175 $\mu\text{m/m}$ for 350 Ω -strain gauge
 - -350 $\mu\text{m/m}$ for 700 Ω -strain gauge

- Insulation resistance
 - Insulation resistance min. 20,000 M Ω
 - 2,000 M Ω at outdoor installations
- Strain gauge resistance
 - Still 120 Ω ? Or whatever strain gauge resistance is (350 Ω , 700 Ω , ...)



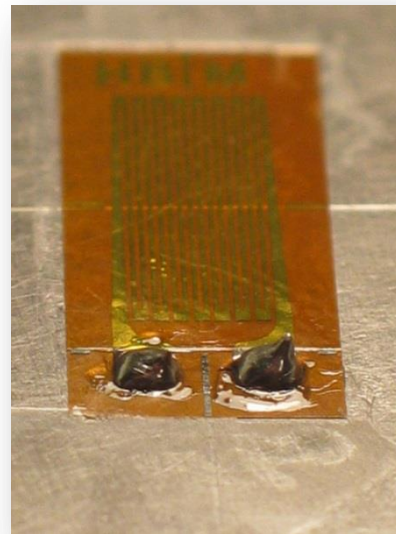
Inspection of installation (visual)

- Air bubbles / foreign objects under strain gauge
- Poorly bonded edges
- Unreliable solder connections
- Flux residues



Example of incorrect installation:

- Not correctly aligned
- Adhesive layer under measuring grid not even
- Broken leads



Example of incorrect installation

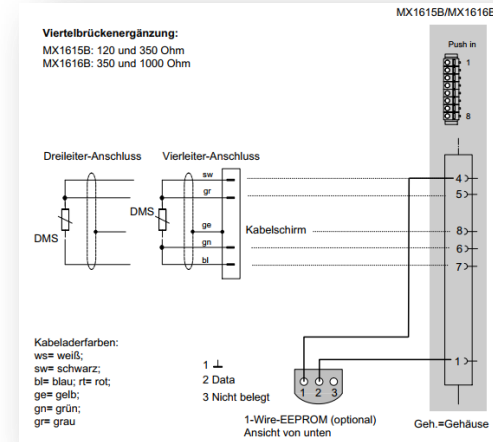
- Too much solder
- Flux residues not removed

Functional test

- Connection to measuring device
 - E.g. shunt calibration



QuantumX MX1615B



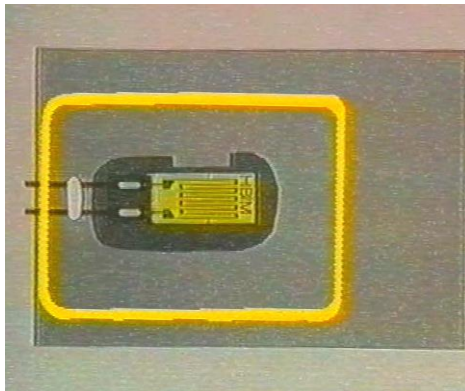
Measuring point protection

Hints for the selection of covering agents:

- Ambient conditions
- Duration of measurement or required service life of measuring point
- Measuring object must not be stiffened
- Material that comes in contact with measuring point must have a very **high insulation resistance** and must **not trigger any chemical reactions** or corrosion
- **Only use covering agents recommended by strain gauge manufacturers!**

Measuring point protection

- Cover measuring point directly after the strain gauge installation
- Measuring point must be in perfect condition
 - Dry
 - Clean
- Dry measuring point if strain gauge installation happens under humid conditions
- Seal cable entries very carefully
- Cover sufficient area
 - Cover adhesive residues completely
- For several layers: upper layer covers the underlying layer





More information can be found on our website:

- <https://www.hbm.com/en/0224/seminars-trainings-events-tradeshows/>



HBM Academy Seminars and Trainings

Learning, practicing and understanding: The HBM Academy offers seminars and trainings for all knowledge levels from beginner to measurement application professional.

In three steps to the successful measurement result – with the HBM Academy

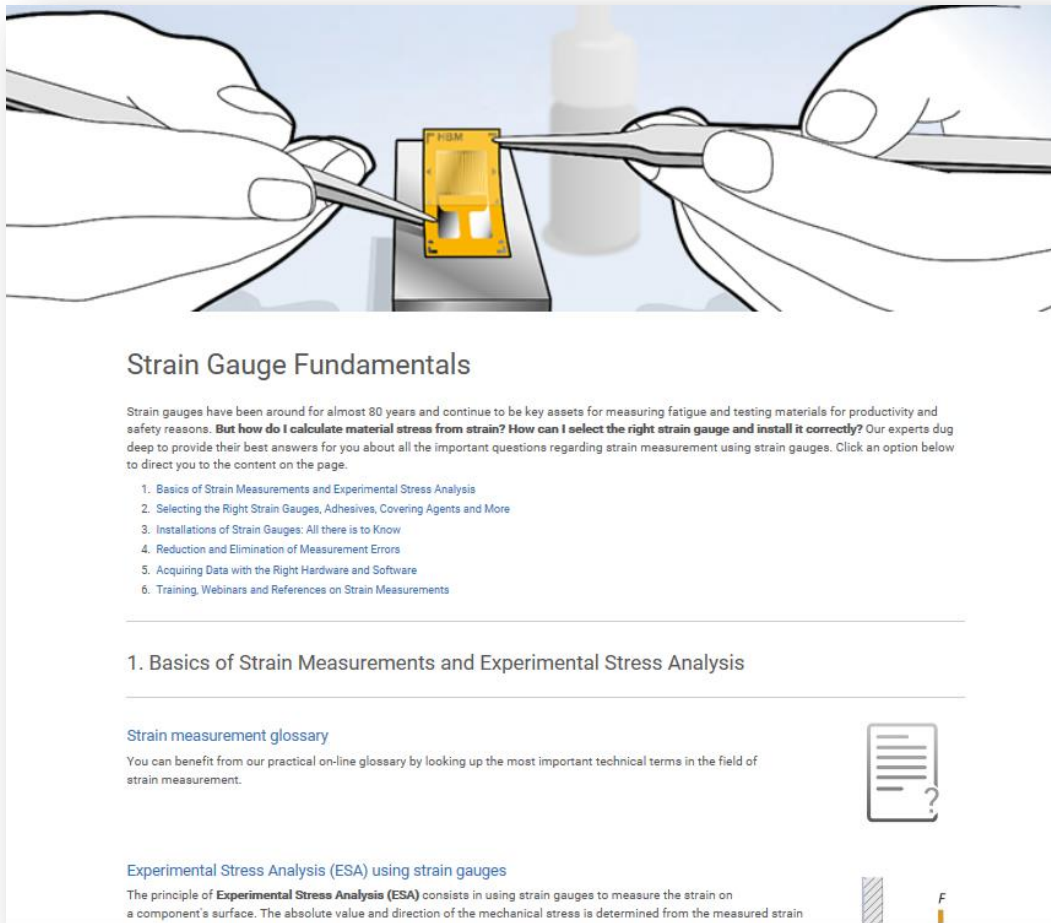
Measurement data are the key to further develop your products. In the seminars of the HBM Academy, our trainers and measurement technicians accompany you on the way to the "right" result: from the selection and installation of the sensor system, the safe measurement data acquisition, to the evaluation and evaluation of your results.

-  **Starter seminars** in which we highlight the most important "basics" of measurement technology to obtain reliable results. Basic, but important!
-  **Advanced seminars** for different measurands and sensor technology (e.g. on strain gauge installation, torque measurement, weighing technology). Let's go into details
-  **Expert seminars** for the use of the entire measurement chain from sensor to software, and on complex measurement setups.

-  Annually more than **5,000 satisfied seminar participants** worldwide
-  More than **95 percent** of our seminar participants recommend us!
-  All seminar topics **specially designed for measurement engineers** and users of measurement technology. A unique offer worldwide!

More information can be found on our website:

- <https://www.hbm.com/en/7074/strain-gauge-fundamentals/>



Additional information (products)

More information can be found on our website:

- <https://www.hbm.com/en/0014/strain-gauges/>

HBM Strain Gauges: First Choice for Strain Measurements

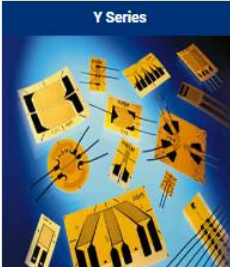
Selected:

Application ▼ Temperature ▼ Protection ▼ Connection Type ▼

Resistance ▼

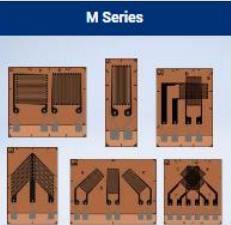
Your selection returned 6 results.

Y Series




More than 2,000 different types of strain gauges available for nearly any measurement task.

M Series




M series strain gauges can withstand high temperatures and many load cycles. They have a high resistance to alternating loads.

C Series



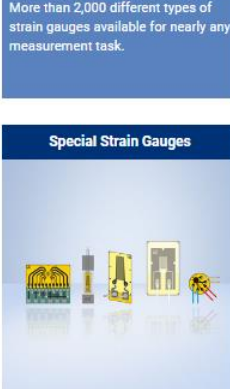
The strain gauges of HBM's C series are the low-cost specialists for high and, above all, very low temperatures - and are also particularly flexible.

Transducer Strain Gauges




Strain gauges available with various creep compensation values specifically designed for transducer manufacturing.

Special Strain Gauges



Strain Gauge Accessories



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- Or email the presenter directly: dirk.eberlein@hbm.com



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