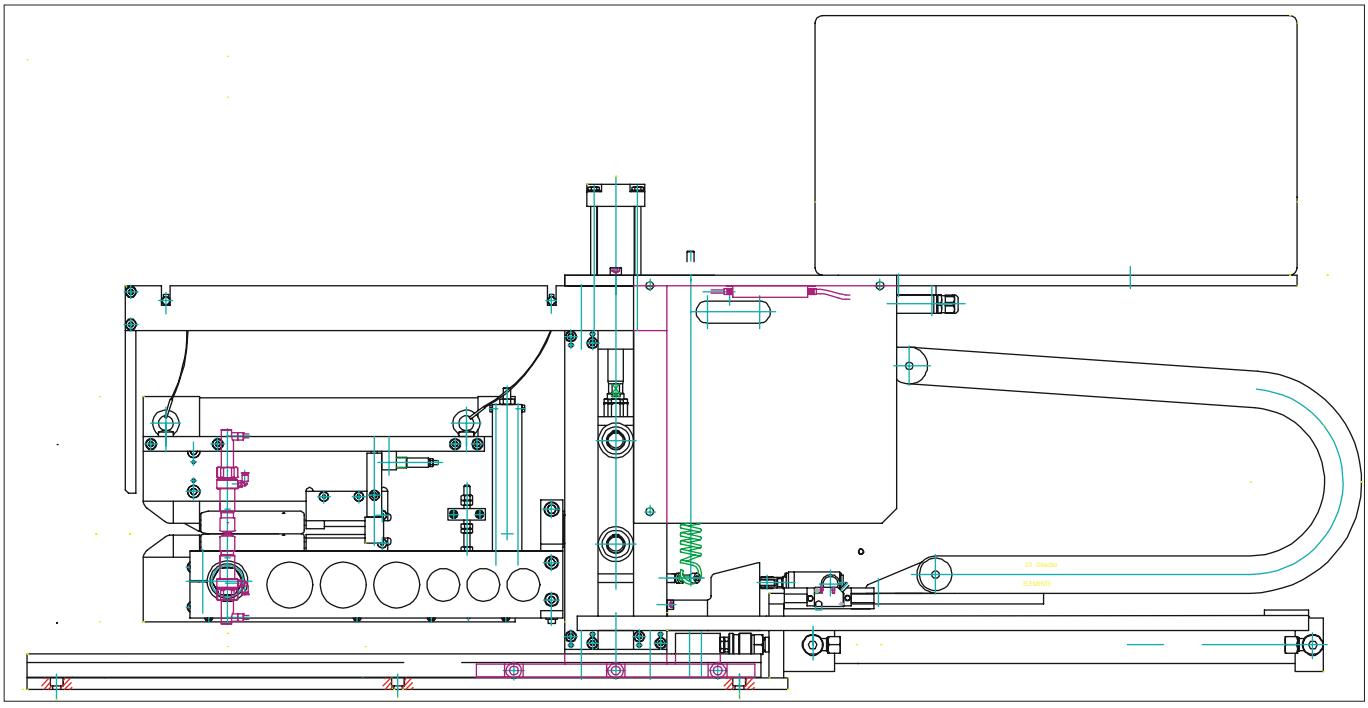
# Automatic Thickness Gauge
# for
# Cold Strip

# *VBM xx76*



## Operation and Service Manual

(Übersetzung der Originalanleitung)

| | | | | |
|---|---|---|---|---|
| VBMxx76_e_rev_03<br>Seiten:48 | erstellt am: 16AUG2011<br>Name: Rietdorf | geprüft am: 17AUG2011<br>Name: Rellensmann | freigegeben am: 17AUG2011<br>Name: König | Bemerkungen: VTS, Dig-Tas<br>für P 21239-Z4A |

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*Subject to change without prior notice*

## Intended use of this machine

This gauge must be used exclusively for the measurement of cold strip. It must be firmly installed in its intended position in the mill as intended and electrically, electronically, hydraulically and pneumatically connected as intended by the Vollmer company. Any alteration might cause severe damage.

The application specifications for your gauge are described in the specification note which is part of the documentation.

## Spares

Please order spares referring to the part number and drawing number of the enclosed documentation drawings. To speed up our work, please do also state the Project number which is written as P-No. on the identity plate of the gauge.

## Qualified Users

This product must be used and installed only by qualified users. A qualified user, in the sense of this manual, is a person, who has performed an apprenticeship as skilled worker, comparable to what can usually be expected in Germany and who is authorized by the employer to operate this product. In addition, to be a qualified user, a person needs be familiar with the safety standards on which the manufacturer has based the design and the construction of the product (and the machine into which the product is integrated).

## Warranty Note

In order to maintain the warranty, the gauge must be orderly stored, installed, used, cleaned and serviced. Please regard the document “Important Notes about Maintaining the Warranty” which is part of the documentation.

## Safety Precautions, please read carefully!

This manual has to be handed to the machine operator, and one copy must be permanently available to operator and service personnel.

Nobody is allowed to work on or with this gauge, before he has read and understood this manual. Feel free to call the Vollmer company in case of any questions (phone +49 2334 507 0).

**Warning, Crushing Hazard !**This gauge has a hydraulic traverse unit. It has to be switched to the mode 'Service I', before anybody enters the danger zone. When operating in the standard mode ('Service 0') the gauge might rush back or forward unexpected and uncontrollable.

WE CARE ABOUT YOUR HEALTH.

PLEASE FOLLOW THE SAFETY PRECAUTIONS.

ESPECIALLY IF YOU HAVE MANY YEARS OF PROFESSIONAL EXPERIENCE, YOU WILL BE A GOOD EXAMPLE FOR YOUNGER COLLEAGUES

The warning sign "Crushing Hazard ...." which was sent with the gauge must be installed on a sensible and well visible position after the machine was installed. Contact the manager in charge for safety in the production department for installation of the sign. The sign 'Somebody is working on the gauge...' must lay in the electronic cabinet, so that it is always at hand to be hung up onto the service switch or close to it.

Hands or fingers which are put into the vertical guiding behind the gauge or into the slidebase below the gauge, might get caught and heavily injured if the gauge head moves up/down or is traversed.

The pneumatic vertical guiding and pneumatically operated guide rolls might cause injuries on hands and fingers. The gauge head might leap up and/or down in the vertical guiding. Crushing hazard for hands and fingers when put into the vertical guiding or when put between the top of the gauge head and the top plate of the gauge head suspension. Under certain conditions, the gap between the guide rolls might close unexpectedly. Therefore the pneumatic system must be depressurized before anybody starts to work on the gauge.

The gauge head might get hot. Therefore check the temperature before trying to handle the gauge head.

The gauge head is heavy (over 30 kgs). Therefore get a secure footing and if possible work with two persons when you have to handle the gauge head without lifting device.

There are gear wheels accessible when the measurement module has been removed from the gauge head. To avoid injuries, secure long hair and wear tight clothing.

If the gauge head is operated automatically or semiautomatically, the documentation contains a description of the control program for this application. Nobody is allowed to work on the gauge unless he knows the control program sequences. For your own safety, please make sure to get familiar with the control program sequences before you start to work on the gauge !

## Operation mode selector 'Service I/0'

There is a switch 'Service I/0' in the pneumatic cabinet. 'Service 0' is the mode for normal operation in which the gauge is traversed back and forward automatically. If e.g. when the strip tension breaks down or when the strip moves laterally the gauge head is traversed off the strip into its rear limit position with double speed.

### Danger: Crushing Hazard!

*Nobody is allowed in the danger zone as long as the system in the 'Service 0' mode.*

*When switching to 'Service 1', hang up the warning sign 'Somebody is working on the gauge...' at the touchpanel or close to it.*

'Service I' is the mode for service operation. The gauge head can only be traversed in inching service by manual controls. The automatic traverse controlling is switched off, so that the gauge will not move automatically.

### Caution: crushing hazard for hands and fingers!

*Do not put hands or fingers into the vertical guide or the slidebase.*

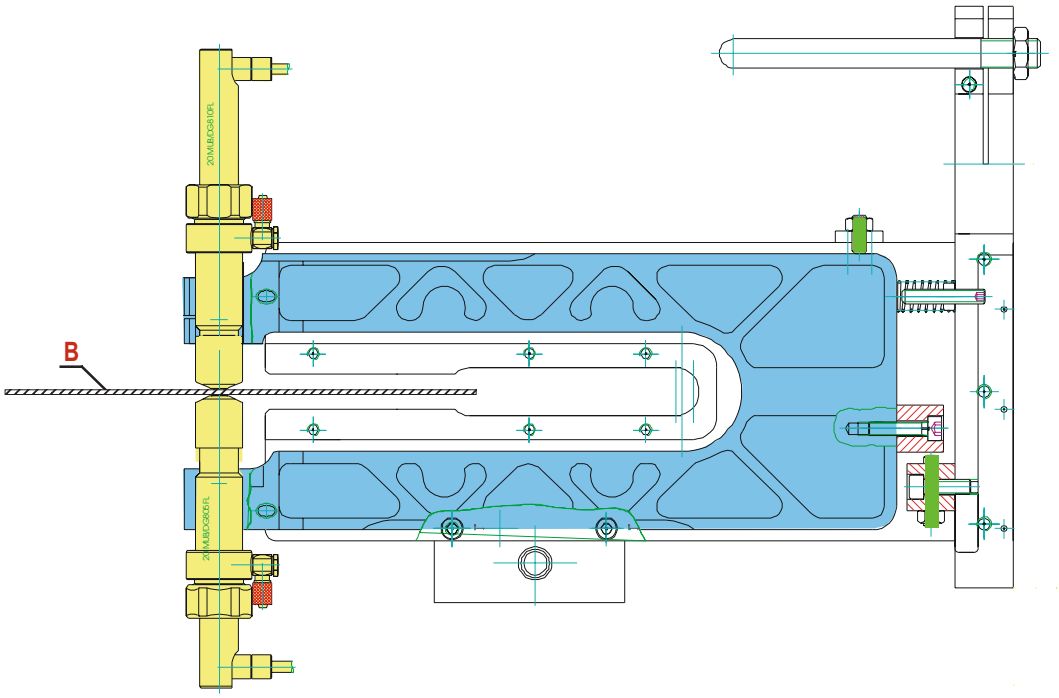
## Design and function

The VBM 1076(2076) is designed to measure strip thickness on high quality strip in cold rolling mills. The gauge measures the passing material continuously in its measurement mouth which has a depth of 100 (200)mm (appr. 3,9" /7.8 ").The difference between VBM 1076 and VBM 2076 is only the size of a number of parts, but the design and function of the parts in these gauges are identical. The different dimensions are regarded in the drawings and in the parts lists, but they have no influence on the operating and service instructions.

The strip passes the C-shaped thickness measurement frame with two thickness feelers which are measuring the passing strip simultaneously from the top and from the bottom. Due to strip thickness changes, the transducer tips are pushed apart or come closer. The transducer tips are crowned and polished diamonds, which do not leave any marks on the strip.

Each transducer has a digital position encoder inside its rear end. The inner measurement stroke of the of the transducers 805 and 812 is 5 resp. 12 mm, however, the available measurement stroke is a little smaller.

All changes within the two transducers or the single transducer are passed to the VTS, or to a PC with the optional Vollmer data evaluation software VGraph or VRecoS, where they are added (for sum measurement). The measurement result is indicated as deviation from zero, i.e. the difference to the preset nominal size. The nominal size is set via the VTS




*Longitudinal sectional view of a VBM 1076 measurement module: The two thickness measurement transducers (yellow), installed in the measurement frame (blue) are measuring the passing strip (B).*

or optionally by means of an external source. The indication is zero as long as the measured strip meets the nominal size.

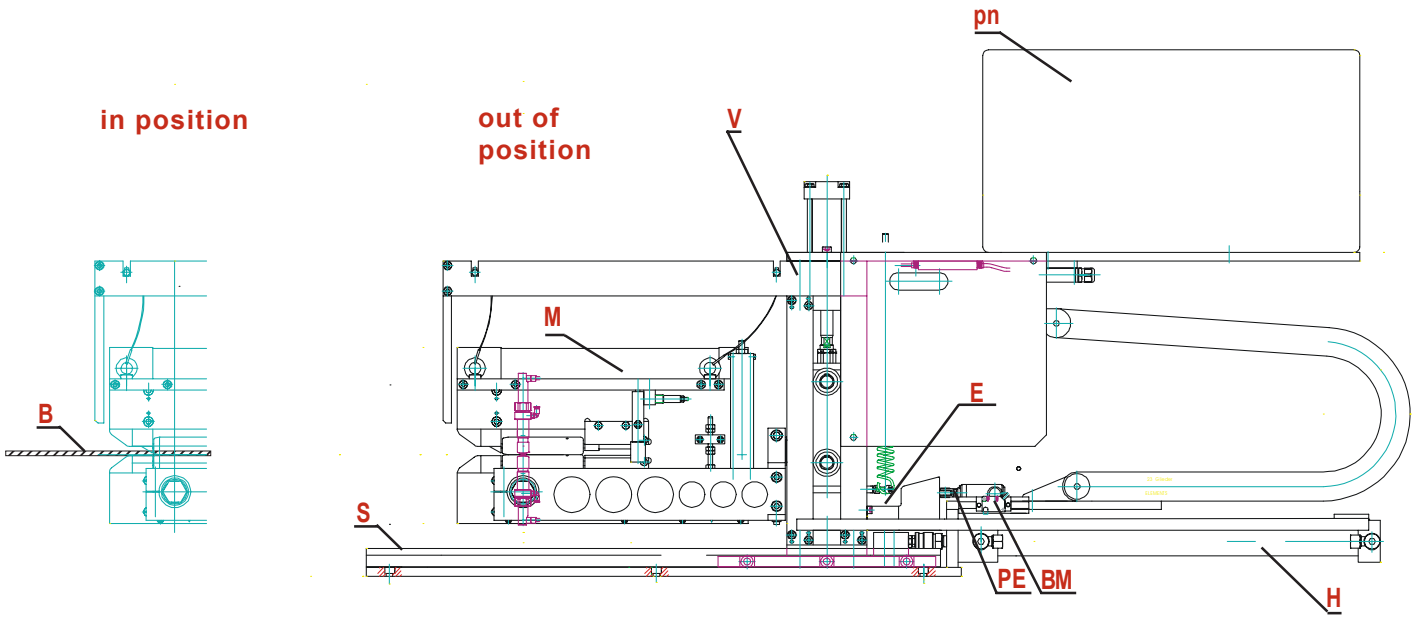
The C-shaped measurement frame in the VBM 1076 gauge has an extremely low temperature extension. This leads to an optimum reproducibility of the measurement results. The frame is not installed in the gauge head itself, but in a measurement module. This module can easily be replaced by a spare module, so that there occurs no long mill downtime because the measurement can go on while the first module is being serviced.

The gauge head is held in the passline by a spring suspended and pneumatically operated vertical guiding. Pneumatic guide rolls hold it always parallel to the strip surface.

The gauge is positioned (i.e. traversed across the strip) by a hydraulic traversing unit (HWSt). An initiator at the sled detects the measurement position, a second one at the gauge is usually not actuated. It forms a measurement mouth limiter. If it is actuated when the strip is laterally misplaced, the gauge is automatically pulled back to its rear limit position at double speed.

The rear limit position is as well monitored by a limit switch. It starts the automatic zero setting and automatically switches off the DAV when the gauge is in the rear limit position.

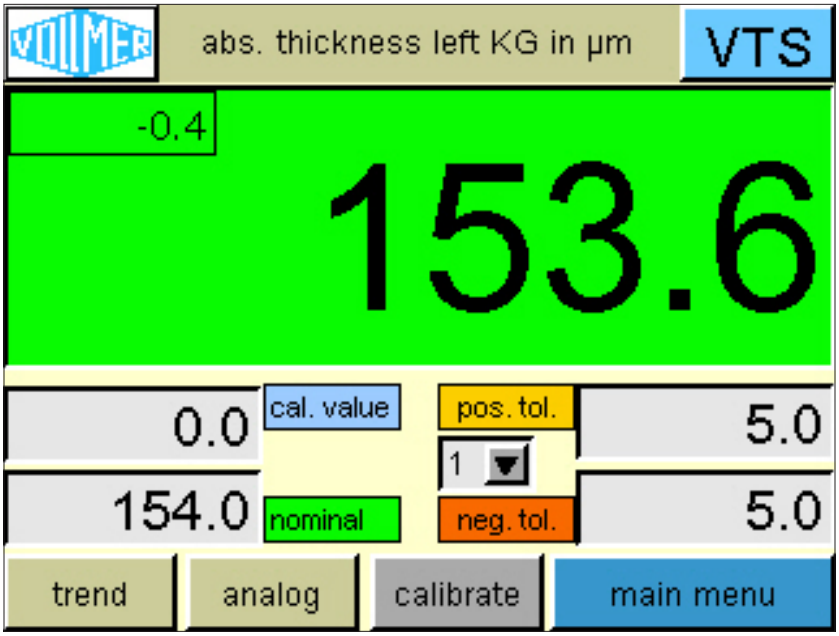
The pushbuttons "Gauge Forward" and "Gauge Backwards" are installed in the operator desk or are displayed on the screen of the optional PC.



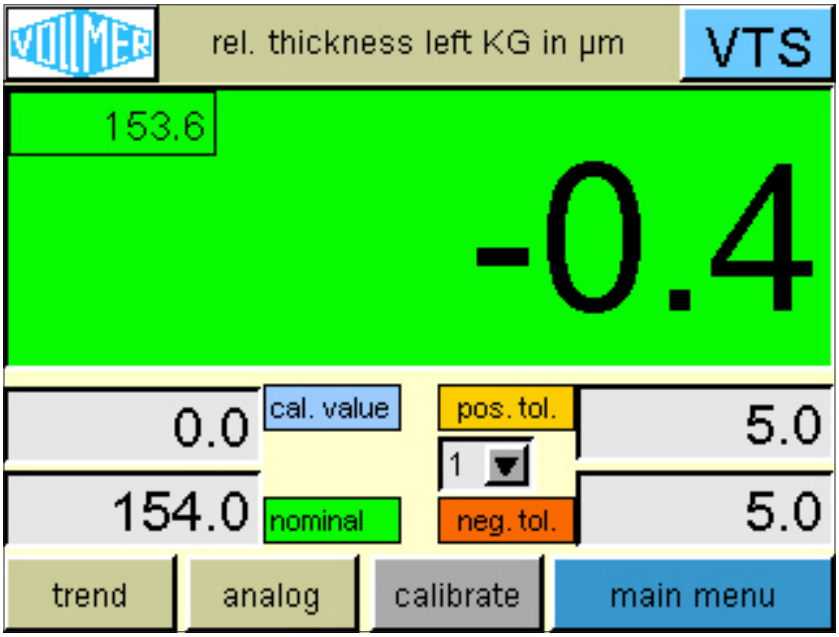

*Lateral view of a VBM 2076 with pV-B: The Gauge head M is suspended by vertical guiding V. The vertical guiding is traversed in the slidebase S by the hydraulic cylinder H between the rear limit position (out of Position) and the measurement position (in position) on the strip B. During traversing, the pneumatic cylinder E lifts the gauge head up to the passline. The limit switch BM stops the forward traversing when the gauge has reached the measurement position, and the limit switch PE moniitors the rear limit position. The pneumatic valves are in the pn-cabinet, except for some gauges which have the DAV-valves installed at the rear of the vertical guiding.*

## System

This gauge is installed with a VTS module. The VTS indicates the measured strip thickness (as absolute thickness or as deviation from nominal size) and if the thickness is in or out of tolerance.




*Example for a typical VTS indication: The green background indicates, that the measured thickness is in tolerance. Depending on the application, the Thickness is indicated as absolute thickness (see above) or as difference to the nominal size (relative thickness, see below). The function "reset to zero" is not used during normal operation, since the gauge is automatically set to zero when it is in the rear limit position. "Set to zero" is used when the transducers are reinstalled into the gauge after service.*



In addition, the VTS does indicate the nominal size as well as negative and positive tolerances.

Depending on the application, these data are entered via the VTS (**V**ollmer **T**ouch **S**creen) or/and read from an external source via the Profibus or Ethernet.

A separate instruction for the VTS part of the documentation. The separate manual is only mentioned here because this manual refers to on some pages.

## Types

e.g.: **VBM 2076 E/Su-Dig/VTS/PN/KA/pV-B/T/K/A0/DAV/Hwst600.**

Meaning of the abbreviations:

**VBM2076 E:**
Electronic strip thickness gauge for cold rolling mills, measurement depth up to 200 mm from the strip edge (100mm for the VBM 1076).

**Su-DIG:**
Measurement by 2 transducers in sum (Su); accurate measurement values even in case of strip vibration, digital type transducers (Dig).

**VTS:**
**V**ollmer-**T**ouch-**S**creen for the input of nominal size and tolerances, thickness data indication, provides interfaces to external computers of the customer

**PN:**
The upper guide rolls are pneumatically pushed down onto the strip (i.e. the gap between upper and lower guide rolls is closed) when the gauge is in On Strip position (measuring position).

**KA:**
With this cardanic suspension the gauge measures precisely, even when the strip lies in a hollow shape.

**pV-B:**
pneumatic vertical guiding system (PV), pneumatic height control for adjustment of the gauge head to the passline; pneumatic traversing help which lifts the gauge into the exact height of the passline while the gauge is traversed on strip; installed at the rear of the gauge head (B)

**pV-S:**
pneumatic vertical guiding, similar function as standard pV-B, but the vertical guiding is installed beside (not behind) the gauge head.

**T:**
Heating elements in the gauge head for keeping a constant temperature, against long-term drift because of heat coming from the strip into the gauge.

**K:**
Air cooling of the transducer's measurement tips, against short-term drift if the measurement tips are heated by the strip.

**A0:**
Electronic adjustment system, operating when the gauge is in its rear limit position. The gauge is set to zero. Beside the automatic zero setting in the rear limit position, this procedure can be started during a measurement (option). Then the gauge is traversed back, automatically set to zero, and is then automatically traversed back onto the strip.

**DAV:**
The diamond measurement tips of the two transducers are pneumatically pulled apart when the gauge is traversed, in order not to damage them at the strip edge. For measurement of wavy or vibrating strip the measurement pressure can be pneumatically increased to prevent the measurement tips from losing contact to the surface.

**Hwst 600:**
Hydraulic traverse unit consisting of a control unit and a slidebase with roll guiding, stroke of the hydraulic cylinder is 600 mm.

# Operation / Measurement

Depending on the application the gauge operates manually, half automatically or automatically controlled. The internal sequences are PLC-controlled.

During manual operation it is most important, to traverse the gauge off the strip before the strip end runs through it. The strip end would severely damage the gauge.

## Gauge forward / backward

If, in the standard mode (Service 0), the forward command is put out, the gauge is traversed to the measurement position and stops there. When ready to measure, the electronic puts out an enabling signal.

While the gauge is traversed forwards or backwards, the Diamond Lifting Device (DAV) does automatically pull back the transducer rams and the upper guide rolls are pushed down at reduced pressure (traversing or inlet pressure). This prevents the transducer rams from hitting the strip edge during the forward traversing. While the gauge moves back, it prevents the diamonds from clicking together when they cross the strip edge. The reduced traversing pressure on the guide rolls allows the roll gap to slip onto the strip easily, but still to guide the gauge head into the passline.

When the gauge is in measurement position, the DAV is automatically switched off, so that the transducer rams are released and contact the strip with the selected measurement pressure. Simultaneously, the pneumatics of the upper guide rolls are pressurized with their full working pressure, so that the rolls are pushed against the lower rolls with increased load. The rolls hold on to the strip, so that the gauge head inclines following the strip shape and the transducers are measuring perpendicular to the strip surface.

“Gauge backwards“ traverses the gauge to its rear position immediately, independent of the actual position.

In the "Service I" mode the gauge head can be hydraulically moved back and forward by inching operation. In this mode the compressed air supply is switched off, i.e. the pneumatic guide rolls cannot be closed and the DAV is not operational.

Various electronic interlocks are optionally available to avoid damage. For example a strip tension breakdown may be the trigger for moving back the gauge. Or the gauge moves only on strip and remains there, if a certain rolling speed is exceeded.

## Measurement mouth limiter

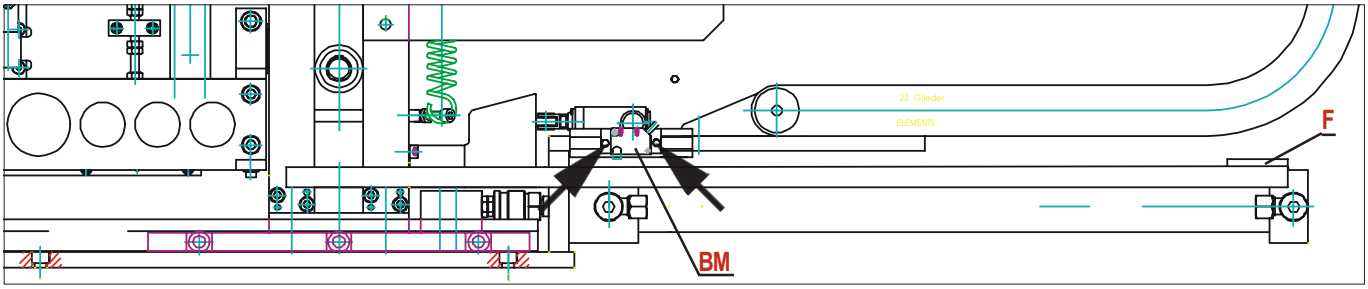
The limit switch on the right side of the gauge is a limiter for the measurement depth. If it is actuated by the laterally dislocated strip, the gauge is automatically pulled back to its rear limit position at double speed.

## Crushing Hazard ! Note on Safety

*The gauge must be switched to the "Service I" mode, before somebody goes close to the gauge or starts to work on it. In the "Service I" mode, the gauge will not automatically rush back when this limit switch is actuated.*

## To set the measurement position

The limit switch strip center (BM) can be adjusted within a small range. It determines the measurement position, so that the thickness is measured at the intended distance to the strip edge. Once the initiator is actuated, the traversing is stopped.




To determine the measurement position: Loosen the two screws (see arrows) and shift the initiator BM to meet the intended measurement position. BM is actuated by the flag F.

## Zero check

The gauge sets itself automatically to zero as long as it is in the rear limit position. To check the constancy of the zero, switch the gauge to the "Service I" mode, and then traverse it off the rear limit position for a few centimetres so that the rear limit switch is no longer actuated. The transducer rams remain released since the DAV is not active in this mode and the upper guide rolls are not under pressure.

Then put a thin piece of material in between the transducer rams and pull it out again. The indication must return to zero (+/- 1µm). If not, check the gauge.

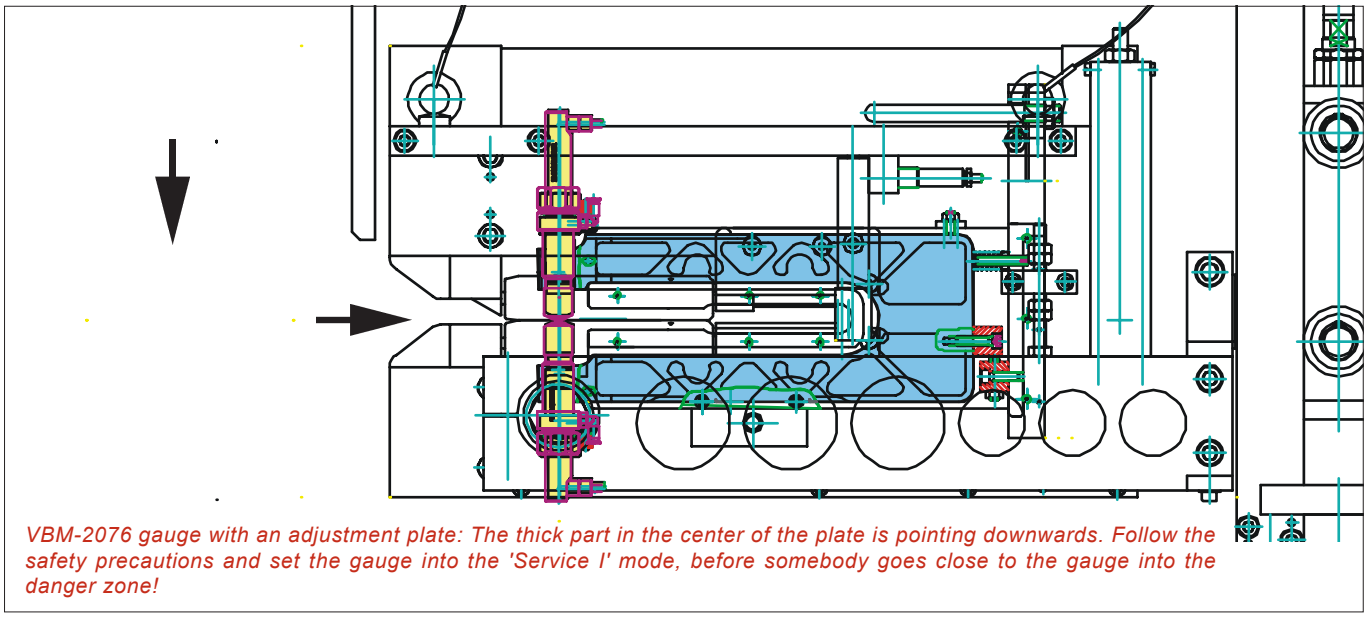
## Indication check

If the previous test results in a constant zero, the gauge calibration can be checked with a slip gauge or an adjustment plate with integrated slip gauge (optional addition). This test should be made daily, or more frequently when rolling tight tolerances. Step by step instruction:

- traverse gauge to rear limit stop
- switch the gauge to the mode "Service I"
- check if there is no strip in the mill
- press "gauge forward",**the gauge must move only slow by inching service!** After this, press "gauge backward" and hold this button until the gauge returned to the rear limit position or traverse the gauge to any convenient position.
- set the nominal size to the thickness of the slip gauge and, if applicable, read this nominal size into the system

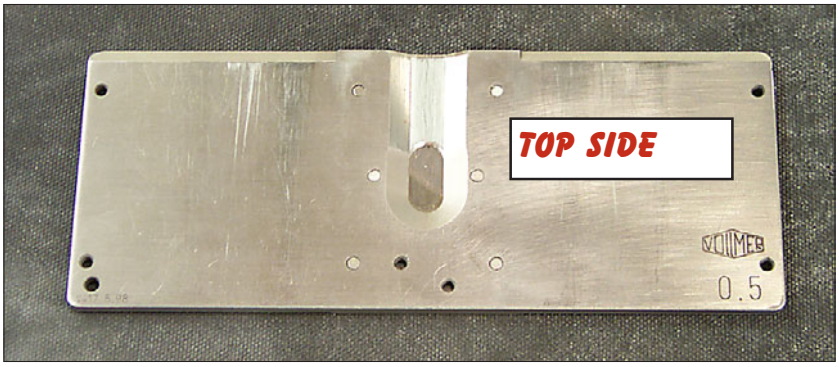
- insert the slip gauge plate between the guide rolls as shown below

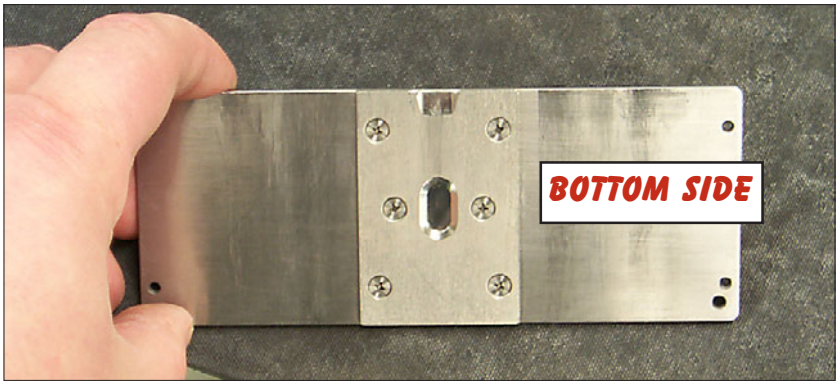
- check indication, it should be very close to zero (+/- 1µm), if not try to move the plate for a little. If necessary, check the entire gauge



*VBM-2076 gauge with an adjustment plate: The thick part in the center of the plate is pointing downwards. Follow the safety precautions and set the gauge into the 'Service I' mode, before somebody goes close to the gauge into the danger zone!*

- remove the adjustment plate, if switched off, switch on the working pressure of the pneumatic guide rolls.




*Adjustment plate with integrated slip gauge (option): The top side (upper photo) is flush except for the hollow part with the slip gauge. The underside has a screwed on plate in the middle which is holding the slip gauge (lower photo).*

## Nominal size and tolerance limits

After the zero check, set nominal thickness and tolerances at the VTS or, depending on the application, by an external source via Profibus or Ethernet.

## Measurement start and end

**Measurement start:**

- set nominal thickness and tolerances

- press "gauge forward", the gauge is traversed to the "on strip" position (the upper guide rolls are low pressurized and the DAV pulls back the transducer rams, the thickness indication is over 9000µm minus nominal size).

  Once the gauge is in measurement position (initiator BM is actuated),- the upper guide roll pneumatics are pressurized with their working pressure and the optional traversing help is depressurised, so that the gauge is free to follow the up and down motions of the strip. The springs of the vertical guiding carry most of the weight of the gauge head, so that it hangs light in the vertical guiding and is able to follow easily the strip's up and down motions. The vertical guiding's pneumatic cylinder is pressurized with max. 0.5 bar to lift the lower guide rolls against the underside of the strip. The diamond lifting device (DAV) is switched off, so that the transducer rams are released and contact the strip with the selected measurement pressure.

  The VTS display indicates how much the strip thickness differs from the nominal size and whether the thickness is in tolerance or not.

**Measurement end:**

- press "gauge backward", the DAV pulls back the transducer rams, the upper guide rolls and the vertical guide are depressurized, the traversing help lifts the gauge into the passline and the gauge is traversed to the rear limit position.

- at the rear limit position, the DAV is automatically switched off and the gauge is set to zero.

## Important note for manually controlled gauges

*The gauge must always be traversed off the strip before the strip tension is switched off! The strip end must never pass through the gauge, as it will cause serious damage.*

## Continuous checking

**Temperature**: (*only applicable for systems which have no heating control via Profibus, since otherwise the heater control as shown right, is not existing in the electronic cabinet*) The automatic heater control is installed in the electronic cabinet. It controls the heater in such a way that the gauge head temperature remains constant after the gauge was pulled off the strip and traversed into the rear limit position. This is to avoid a long-term-drifting of the gauge zero. The display indicates the actual gauge temperature. The heating is set correctly if the temperature remains constant when the gauge was moved off the strip after e measurement.


If the temperature decreases in the rear limit position, rise the nominal size in small steps. Allow one or two hours for temperature adjustment inside the gauge body before the next step.

If the gauge temperature rises in the rear limit position,, the nominal temperature is set too high. It should be set lower.

To set the nominal temperature:
- press and hold button K1 > indication changes from actual to nominal temperature
- turn button W1 to set new nominal temperature
- release K1, new temperature is activated immediately
- the LED K1 is on as long as the nominal temperature is not reached

The internal heater parameters were carefully set during the manufacturing of the gauge. They should not be altered afterwards. Therefore do not operate the potentiometers at the top side of the controller. The button K2 is not in use in this application and therefore it should not be operated.

### Note on operation of the heating control

*The control item as shown here is only installed in the electronic cabinet if the heating is not controlled by a Vollmer Software control.*

### Safety Precautions

*Nobody is allowed work on the gauge unless it has been switched into the 'Service I' mode. This mode makes sure, that the gauge will not be automatically traversed and the pneumatic guide rolls will not close unexpectedly (Danger of hand injuries).*

*Caution: Crushing hazard ! Never traverse the gauge as long as somebody is in the danger zone ! The hydraulic cylinder which is traversing the gauge has great power. If the gauge is in the normal operation mode (Service 0), the hydraulic cylinder may push the gauge unexpectedly and uncontrollably (except Emergency Stop) fast and powerful and back or forth to the limit position. This motion can only be stopped by the "Emergency Stop" button.*

In between the service intervals, check the gauge regularly for:

**Accuracy check with slip gauge:** Set the gauge to the nominal size of the slip gauge, and insert the adjustment plate with integrated slip gauge between the transducer tips. The indication should be zero. In case of tight tolerances check daily, otherwise weekly.

**Guide rolls:** Check for easy motion (sliding up/down and rotation).

**Passline**: Check the correct height of the gauge to the strip

**Transducer lifting device:** When the gauge is traversing, the thickness indication must be over 9000µm minus nominal size. This is a secure indication, that both of the transducers rams are fully pulled in. If not, check the easy motion of the transducer rams, then the compressed air pipes and the working pressure of the DAV.

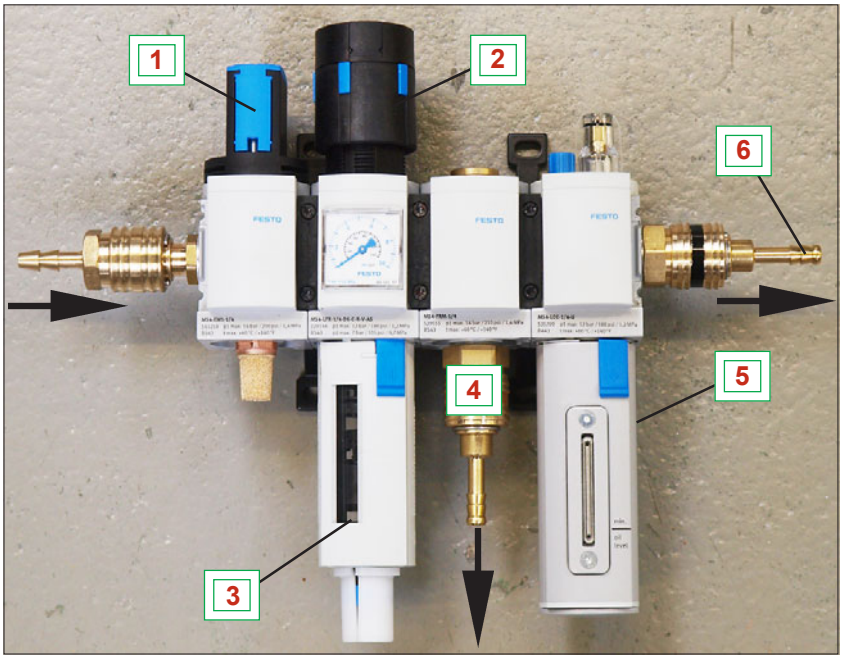
## To check the DAV function

Check the DAV for proper function after the module was inserted. Connect the pneumatics and - before traversing the gauge on strip for the first time - check, if the DAV fully pulls in both of the transducer rams.

Lift the upper guide rolls and put a thin plate onto the lower guide rolls. The underside of this plate forms the passline. The ram of the lower transducer must be about 2mm (0,08") below the plate when the DAV is active. If the ram protrudes too much, e.g. because the transducer was installed too high or because DAV is not connected, the transducer will get damaged at the first attempt when the gauge is traversed on strip

## Pneumatics

The compressed air from the local compressed air supply is fed into the system via a pneumatic reducing and filter station (service unit).

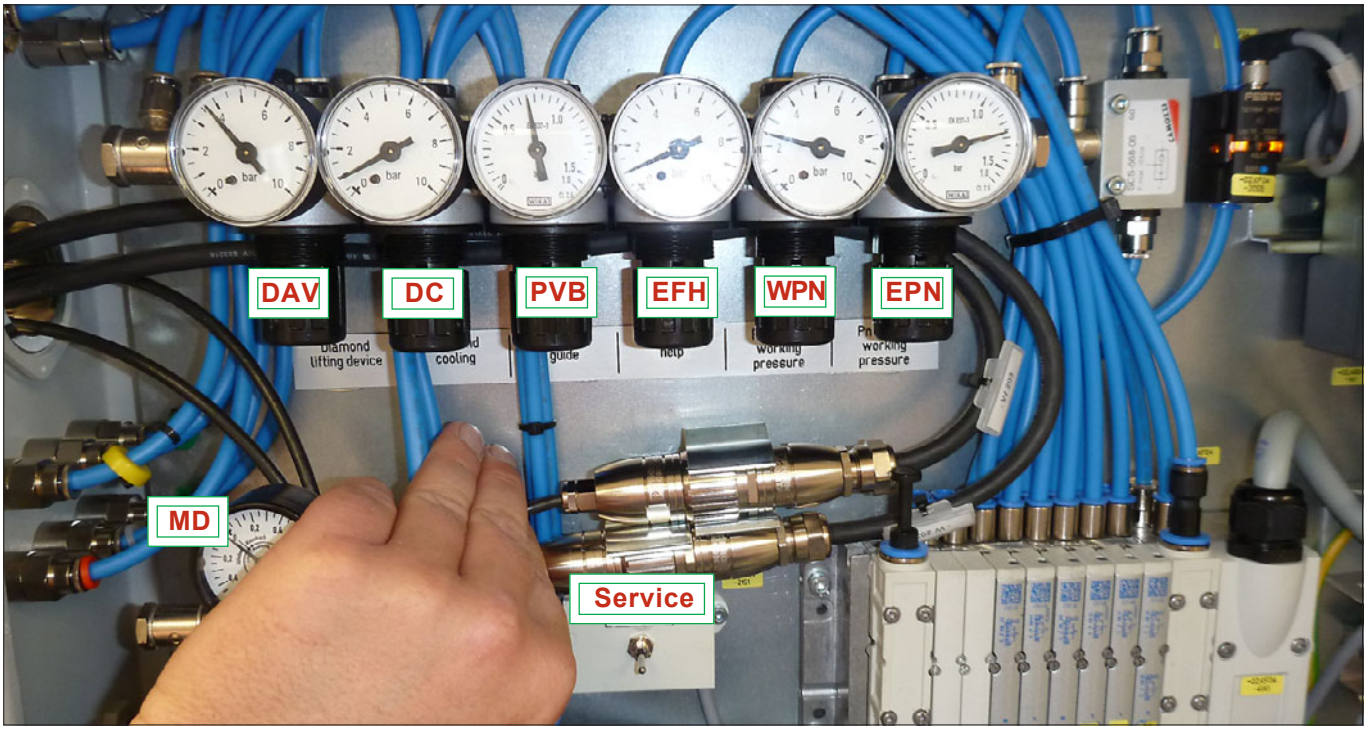



*Pneumatic service unit: 1= Lock and bleed valve (to depressurize the gauge), 2 = working pressure adjustment valve, 3 = separator with automatic condensate discharge, 4 = output of dry compressed air, not oiled, 5 = oiler (not required on all gauges) , 6 = output of oiled compressed air*

Compressed air quality requirements:
- supply pressure at least 5 bar
- compressed air quality according to DIN ISO 8572-1:
  hard substances grade 4 = max. 40µm, particle density <10 mg/m3
  water content grade 5 = 9,4 g/m3 at 10 C°
  oil content grade 4 = oil content < 5 mg/m3
- automatic discharge of the condensate
- use only oil according to ISO 3448, viscosity 32cSt at 40°C (e.g. MOBIL DTE24 or similar).

Max. consumption of compressed air: < 7m$^3$/h.

**Compressed air supply:** Permanent pressure for the entire gauge is set to 5 bar at the service unit (see above)




*Example for a pneumatic box on a vertical guiding with traversing help: The switch for the service mode is in the center; at the top are the valves to set the working pressure for the pneumatic gauge functions.*

**Diamond lifting device (DAV):** The DAV requires a supply pressure of 3.5 bar.

**Measurement pressure enhancement MD**: The pneumatic measurement pressure enhancement is in common for both transducers at the valve at the rear of the gauge. A typical setting is 0.4 to 1.1 bar. Adjust this pressure to the individual requirements. If the measurement data records show sudden peaks, increase the pressure, if the strip is marked, reduce the pressure. In order to extend the life of the measurement diamonds, it is recommended to set the pneumatic measurement pressure enhancement as low as possible.

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**Diamond cooling (DC)**: Working pressure is 0.5 to 2 bar. Select appropriate pressure to avoid short-term drift (see "Trouble Shooting")

**Pneumatic vertical guiding (PVB):** The vertical guiding requires a pressure of approx. 0.5 bar (to be set on the corresponding valve in the pneumatic cabinet) to lift the gauge so that it floats in the passline. Adjust the spring tension in such a way that the pneumatic cylinder does not require more than 0,5 bar working pressure to lift the gauge head into the passline. If the pneumatic pressure is set too high, the suspension would be not flexible enough to let the gauge easily float up and down with the strip's movements and the lower guide rolls might mark the strip. The working pressure for the pV needs to be set the lower the thinner the strip is. The lower guide rolls must always run, driven by the strip.

This PV has a relief valve. If the gauge head is pushed down by a strip wave, the pressure in the pV cylinder increases, so that the suspension

**Note**

*If the gauge has a pneumatic box at the top of the gauge, all of the pneumatic valves are in that cabinet.*

*If the gauge has a separate pneumatic cabinet instead of the box on the gauge, then the valves for the pneumatic measurement pressure enhancement are installed at the rear of the gauge.*

becomes harder and may not be able to follow the strip movements flexible enough. The relief valve opens when the pressure exceeds the set pV working pressure for more than 0.2 bar.

**Traversing help (EFH)**: This valve in the pneumatic cabinet controls the pneumatic pressure for the traversing help cylinder. Set the pressure not unnecessary high. Usually a pressure of 1,5 to 2 bar is sufficient to lift the gauge swiftly into the passline. The traversing help should lift the gauge head relatively soft, so that it can be pushed down by one hand without much force.

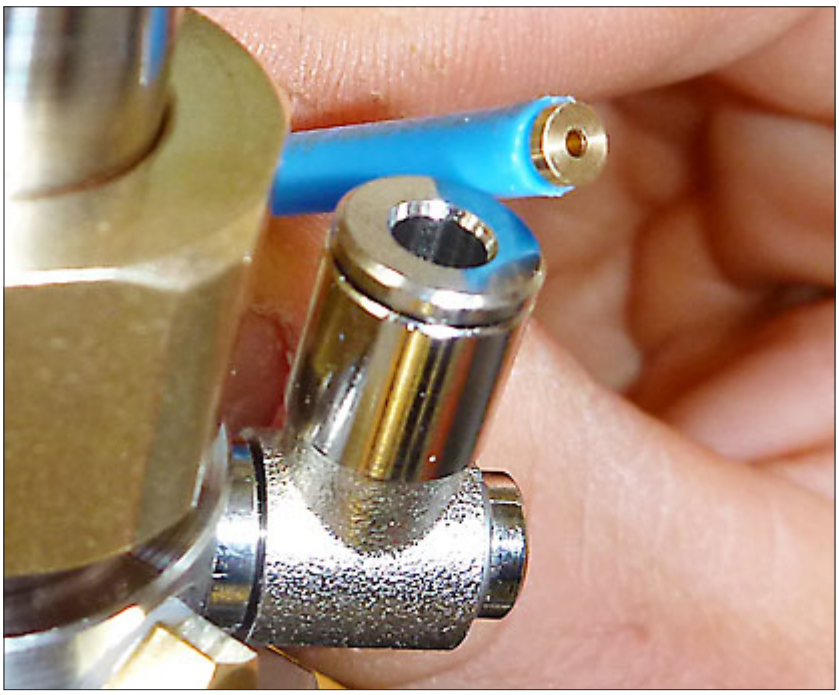
**Working pressure for the pneumatic guide rolls (WPN):** set the working pressure during the measurement to 1 - 3 bar, depending on the strip material.

**Inlet (traversing) pressure for the pneumatic guide rolls (WPN):** set the pressure during the traversing to 0.5 to 1bar, depending on the strip material.

## Pneumatic damping of the DAV

The diamond lifting device (DAV) pulls the ram into the transducer housing against the force of the measurement spring. When the vacuum is switched off, the spring presses the ram out of the housing and if the pneumatic measurement force enhancement is switched on, the ram is pushed out harder.

If the measurement diamonds of the two rams click together too hard, this might result in cracked measurement tips. In order to avoid damage, this motion is damped by a nozzle (diameter 0,3mm) in the DAV connector.



# Trouble shooting

## If the gauge measures wrong

❍ Wrong point remeasured ?
Cross profile strip thickness varies in many cases. If the gauge is checked, strip thickness must be measured at the same distance from the edge as the transducers have measured.
⇨ Check the strip thickness at correct edge distance

❍ Transducers dirty ?
In a very dirty environment, the rams of the transducers sometimes get too sticky, so that they do not shut completely. If the gauge is then set to zero, the indication of a following measurement is too low. After cleaning, any transducer ram should slide easy in its bushing or bearing for a quite long period of time.
⇨ Increase cleaning frequency

❍ Transducers clamped too hard?
If the clamp screws in the C-frame are tightened too hard, they possibly distort the transducer housing which increases the friction in the ram guiding.
⇨ Loosen the clamp screw and re-tighten with moderate force

❍ Oil in the DAV-tube?
The oil increases the friction of the ram guide bushing or ball bearing. In that case the transducers cannot continuously keep contact to a vibrating strip. The measurement then indicates “too thick”. Oil in the tube does choke the diamond lifting when the tube is partly filled.
⇨ Remove the module from the gauge, remove transducers, pull off the tubes and blow the clean with compressed air, clean the transducers and improve the quality of the compressed air.

❍ Gauge zero not constant?
If the screws, which connect the measurement tip with the guide ram, are not tight, the measurement ram might move against the guide ram. If, for example, DAV was activated or material was placed between the transducers and then removed, the zero point changes. The indication is incorrect even if the symmetry is correct.
⇨ Fasten the grub screws in the guide ram (see transducer manual)

❍ Long-term drift of the zero point?
An integrated heater heats the gauge so that the temperature does not change whether the gauge is measuring or not. The temperature control should be adjusted so that the gauge always keeps the same temperature when it is moved off the strip or when the measurement starts after a long stop. The temperature should not drift for more than 2°C degrees.

❍ Short-term drift of zero point?
Can be noticed, if the rolling has been finished and the gauge in its rear position is directly set to nominal size zero without performing A0 with the gauge in the service mode. If then the indication drifts away to plus

or minus, the cooling of the diamonds does not work correctly. Check, if the compressed air supply is correctly connected. Readjust the cooling at the 'pneumatic diamond cooling' valve in the pneumatic cabinet.

⇨ Connect the air supply correctly or adjust air pressure
(if the display drifts away to minus - increase cooling,
if the display drifts away to plus - reduce it).

❍ Indication too low?
If the transducers in the C-frame are clamped not tight enough, they might be shifted in their bore. Gauge zero is then shifted too.

**Note**

*Set the gauge to the mode "Service I", before performing this test. This makes sure that the gauge will not traverse unexpectedly and the upper guide rolls are depressurized. In addition, it is necessary to traverse the gauge off the rear limit position, so that the automatic zero setting is switched off.*

❍ Indication too large?
Put an adjustment plate onto the lower guide rolls and set the gauge to zero. Tip the plate it to both sides as well as forward and backward. The indication should deflect only towards + (see under "to check the C-frame position"). If not,

⇨ check the complete gauge (measurement tips for wear, C-frame for 90° position and C-frame distortion). For your convenience, the Vollmer company offers a special adjustment plate with an integrated slip gauge, which is individually selected to match the thickness of that strip which is usually rolled on your mill (see picture under 'Measurement / Indication Check').

❍ Indication too large?
After strip breaking or when the strip end passed through the gauge, the C-frame is possibly bent. The indication is too high. Check as before and

⇨ check the alignment of transducer clamping bores with a 20 mm inspection pin.

## If the gauge marks the strip ?

❍ Diamond with small cracks ?
If hit too hard, the diamonds in the transducer measurement tips might get tiny ring-shaped cracks, which are hardly visible. Sometimes such cracks mark the strip
⇨ Replace the measurement tip

❍ Diamond broken out?
In case of strip breaking a diamonds might break out of a transducer measurement tip.
⇨ Replace the measurement tip

❍ Roll blocked ?
⇨ Replace the roll. If the roll surface is not damaged, replace only the bearings.

❍ Working pressure guide rolls set too high ?
Might cause slight marking on extremely soft strip material.
⇨ reduce working pressure

❍ Working pressure of the pneumatic vertical guiding set too high ?
Might cause slight marking on extremely soft strip material.
⇨ reduce working pressure as far as possible, but the lower rolls must always be driven by the strip

## Maintenance

The thickness gauge does not need much maintenance. Only the measurement tips with the diamonds and the guide rolls are subject to wear. The gauge requires regular cleaning to avoid firm dirt deposits which might block movable parts.

For servicing, replace the measurement module by the spare module. Then the rolling can be continued after a short check while the service department has sufficient time to check and to clean the other module.

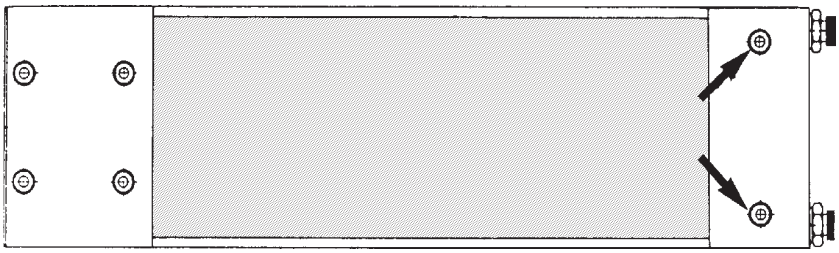
### Safety Precautions

*Nobody must work on the gauge unless it has been switched into the 'Service I' mode. This mode makes sure, that the gauge will not be automatically traversed and the pneumatic guide rolls will not close unexpectedly.*

*Caution: Crushing hazard ! Never traverse the gauge as long as somebody is in the danger zone !*

### Module replacement

The sketch shows the VBM gauge head seen from above:



Unscrew the two Allen bolts (arrows) in the crowned lid of the housing. First remove the rear bright part of the cover, then take off the dark one.

### Important Note !

*First disconnect the power supply for the measurement electronics, then remove or install a transducer. Otherwise the electronics might get damaged and the counter might put out erratic pulses when the transducer connectors are life plugged or unplugged.*

The cables from the transducers to the counter boxes IB are long enough o allow to put the measurement module on top of the gauge head. To remove the module (for replacement or servicing), the cables and the counter boxes need to be removed with it.

That means to undo the cables and the counter boxes and then to disconnect the plugs at the connector plate. Lift the module off the gauge housing by the handle, and disconnect the pneumatic tubes at the module.

Check the underside of the module and the module bed in the housing for dirt deposits and clean thoroughly if necessary. The module needs to rest well set in the housing without any play or wobbling.

### Note

*The support surfaces for the measurement module need to be clean. Always, clean those surfaces in the gauge housing before inserting the module.*

Then connect the pneumatic tubes to the spare module and insert it into the gauge housing. Afterwards fasten the transducer cables and the counter boxes and connect the transducer plugs at the connector plate.

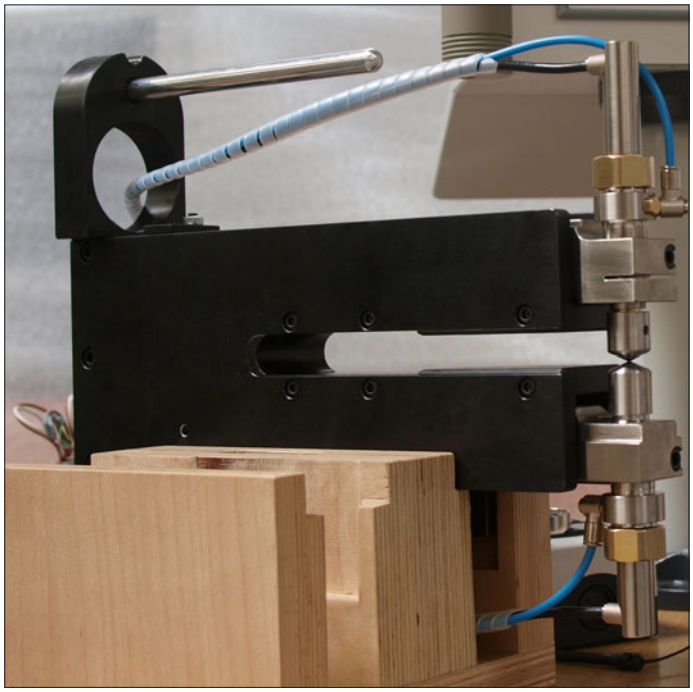
Check the DAV for proper function after the module was inserted (see under "To check the DAV function").

Finally traverse the gauge to the rear limit position and switch it to the "Service 0" mode.

**Now the gauge is ready for measurement.**

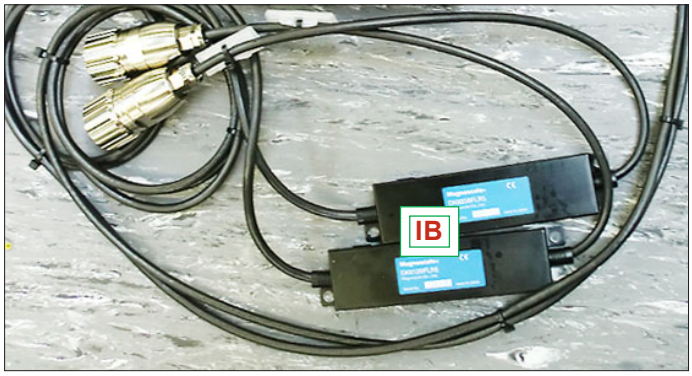
**AVOID DAMAGE:**

**CHECK THE POSITION OF THE LOWER TRANSDUCER BEFORE START-ING THE FIRST MEASUREMENT !**



*Top: VBM 1076 spare module with transducers*

*Bottom: Each transducer with cable and counter box forms a unit which can only be replaced as a whole. The counter boxes are installed in the pneumatic cabinet on top of the vertical guiding.*



## Servicing in general

At least the following points must be checked regularly, even if measurement results are correct.

## Guide rolls

❍ Clearance?
The rolls have to move freely. They should have only little axial clearance. Blocking rolls mark the strip.
⇨ Replace defective rolls

❍ Deposits on the surface?
Some strip materials tend to leave deposits on the rolls. They cannot run smooth and might mark the strip.
⇨ Replace rolls (rework if possible)

❍ Roll support defective?
The upper guide rolls can be shifted up/down in a sliding guide. On strip, the pneumatic guide rolls are pressed down. Check regularly, if the upper guide rolls can be moved smoothly by hand up to their mechanical limit stop when the compressed air is switched off.

Check the lower guide rolls for parallel adjustment (see under ‘Continuous checking / Transducer position to strip’. The plate indicates if the rolls are not parallel. This happens very rarely, sometimes after strip breaking.
⇨ Replace and or adjust (see under 'Maintenance/Repairs').

## Housing

❍ Module support surface even and free of deposits?
Considerable dirt deposits on the support of the module do affect measurement accuracy
⇨ Clean it, or have it repaired by Vollmer

## C-frame

❍ Easy movable?
The C-frame might get stuck due to large dirt deposits in the gauge mechanics or if, after a very long time of operation, the C-frame bearings are worn. The C-frame must rest against its bottom limit stop. In that position, the alignment pin must slide easily into the adjustment hole on the right side of the gauge head until its end comes out on the opposite side. Without adjustment pin, try to lift the front of the C-frame. It should have 1-2 mm clearance. If not,
⇨ clean gauge; adjust 90° set screws; if necessary replace bearings

## Gauge cleaning

For cleaning based on e regular schedule, remove the module from the gauge head. Wipe all parts clean with lint-free cloths but do not use aggressive solvents. This is to avoid dirt deposits which might block movable parts. Do not use aggressive degreasing agents, since those will harden such deposits which are not completely removed and then might disturb the mechanics of the gauge. In addition, such agents and solvents may damage the transducers or other electronic parts.

When cleaning the gauge housing, the main target is to remove dirt and emulsion deposits from the module bed.

## To remove the transducers

The transducers need only to be removed if they have to be serviced themselves, or if the module has to be taken apart. Put the module in the supplied wooden holding, loosen the clamp screw holding each transducer and pull the transducers off the measurement frame.

## To check the transducer alignment

If there was any wrong measurement result, e.g. after a strip break, the alignment of the transducer clamps should be checked with a 20mm inspection bolt (available from Vollmer). It must slide easily through the two clamps. If not, have the C-frame aligned at Vollmer, or replace it.

## Transducer check

This is just a basic check of the transducer function. Please read the separate transducer service manual for service and repair.

❍ Ram easy movable ?
The transducer rams must be easy to be pushed in and spring back immediately.

❍ Measurement tips worn or damaged?
If the measurement result of the slip gauge plate is not 0, but the other checks are all right, remove the transducers and check the measurement tips:

❍ Diamonds worn?
The diamonds should be crowned to achieve accurate measurement results. Worn diamonds with flat spots may cause measurement errors.
⇨ Replace and possibly get the old diamonds reworked

❍ Broken diamonds?
Cause incorrect measurement results and mark the strip
⇨ Replace

❍ Measurement tips with broken-out diamonds? (after strip breaking or when the strip end has passed through the gauge)
⇨ Replace

## To install the transducers

This gauge has a measurement module which is lifted out of the gauge head for servicing, such as cleaning or replacing the transducer measurement tips. This means, the transducers are installed without having the guide rollers forming the passline level which is needed to position the lower transducer. An adjustment plate is used instead. This plate is inserted into the measurement mouth of the module.

The digital transducers (type Dig) have an extended stroke, the lower transducer 4.5mm (appr. 0.18") and the upper transducer 9.5mm (appr 0.37"). This allows to measure strip up to 7mm (appr. 0.27") thickness without the standard installation comprising a mechanical adjustment of the upper transducer. Therefore this design has no stepper motor and no gear and drive shaft. A VTS unit or a computer with the optional software VGraph or VRecoS is used instead of the standard VMF amplifier.

In order to indicate the measurement data of the single transducers separately, select the option "Gauge Overview" or " switch the VRecoS to the "Service" mode. VGraph offers this function under "Mill2Graph" (for details see the corresponding manual: VTS, VRecoS or VGraph). However, the selection of the single transducer data display is not required when following the instructions in this manual.

**Important issues regarding digital transducer installation**
To points are especially important for the installation of digital transducers:

1. First disconnect the power supply for the measurement electronics, then remove or install a transducer. Otherwise the electronics might get damaged and the counter might put out erratic pulses when the transducer connectors are life plugged or unplugged.

2. The lower transducer needs to have 2mm reserve stroke below the passline. Reason: The ram of the lower transducer must be able to dive below the passline, so that it is not damaged when the gauge is traversed on strip.

3. When the ram of the lower transducer is pushed down well below the passline, the upper transducer ram must follow for 2mm below the passline without losing contact between the two measurement diamonds. Reason: If the upper ram cannot follow the lower one, but lifts off from the lower ram, the gauge would indicate wrong strip thickness data.

**First connect the transducers:** First switch off the power supply for the measurement electronics, then connect the two transducers. They both need to stay connected until they are correctly positioned in the C-frame. Reason: The counter will loose its zero when it is disconnected. However, after the two transducers were correctly positioned, the power can be switched off and then the module can be disconnected from the VTS or from the PC.

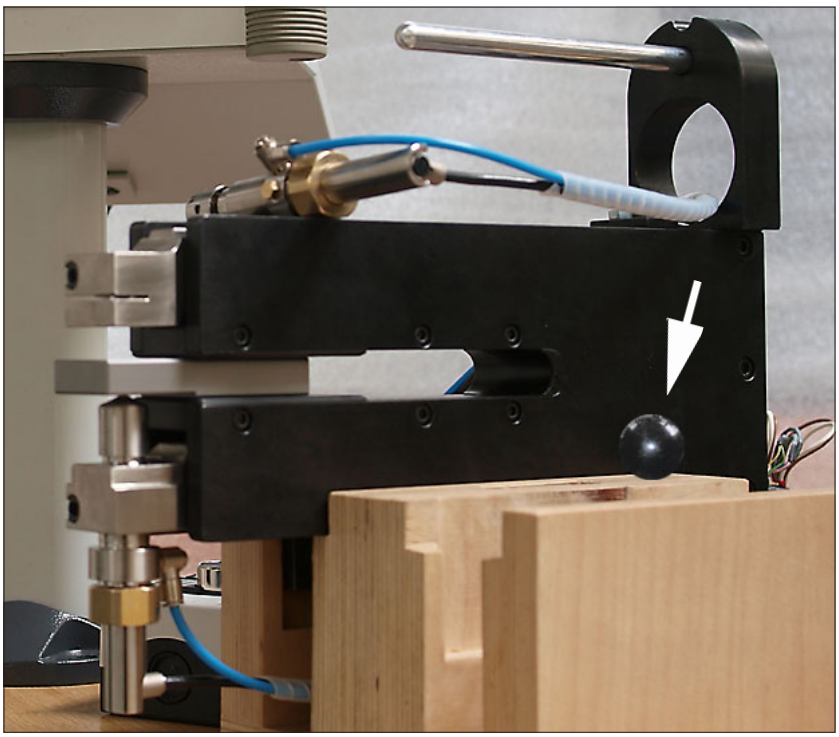

Put the transducers into a position where their rams are released. Then set the indicator in such a way that it shows the sum data of the two transducers.**Set the indication to zero.**

**To check the stroke of the transducers:** Now push the ram of the transducers in - only one at a time - and check the indication (mod. 805 approx. 4,5mm ; mod 810/812 approx. 9,5mm)

**Insert the adjustment pin** into the adjustment hole in order to lock the measurement frame. Then**insert the alignment block** into the mouth of the module with its step pointing downwards. Both items came with the gauge.

**To install the lower transducer (4,5mm stroke):** Insert the lower transducer carefully into the bottom clamp hole of the C-frame, with the cable entrance and the DAV connector pointing backwards.

*Adjustment pin to lock the C-frame in the 90°-position.*



*VBM 2076 module: The module is put in the wooden service holding that came with the gauge. The adjustment pin (see arrow) is put in the adjustment bore in order to lock the C-frame in the 90°-position. The alignment block, is inserted with its step is on the underside.*

**Note**

*Both transducers must be inserted in such a way that the locking screw (if the transducer has one) in the transducer housing points parallel with the passline and not across the strip!*

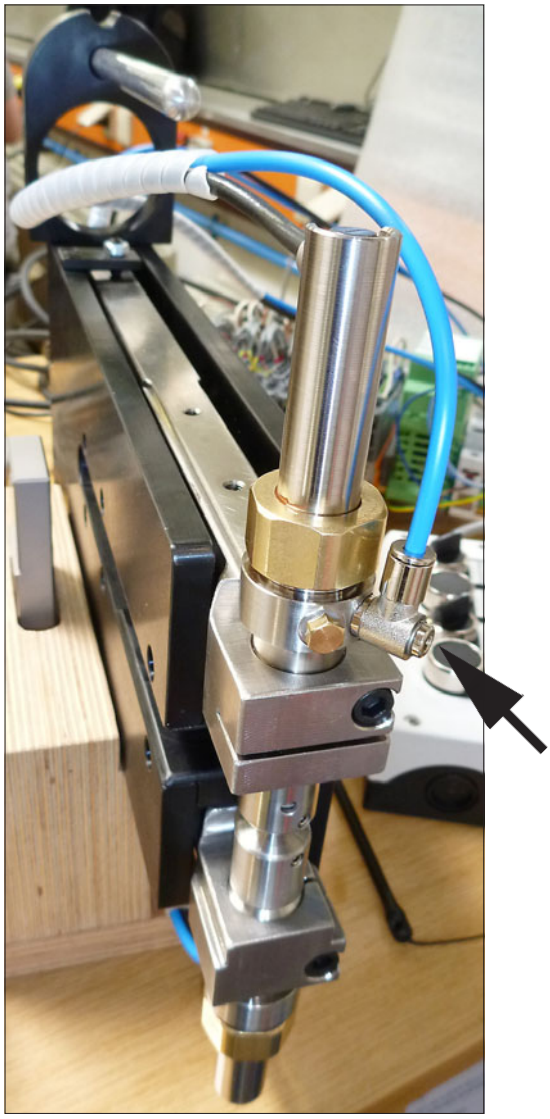
**To install the lower transducer (4,5mm stroke):** Insert the transducer carefully into the bottom clamp hole of the C-frame and push it up. The alignment

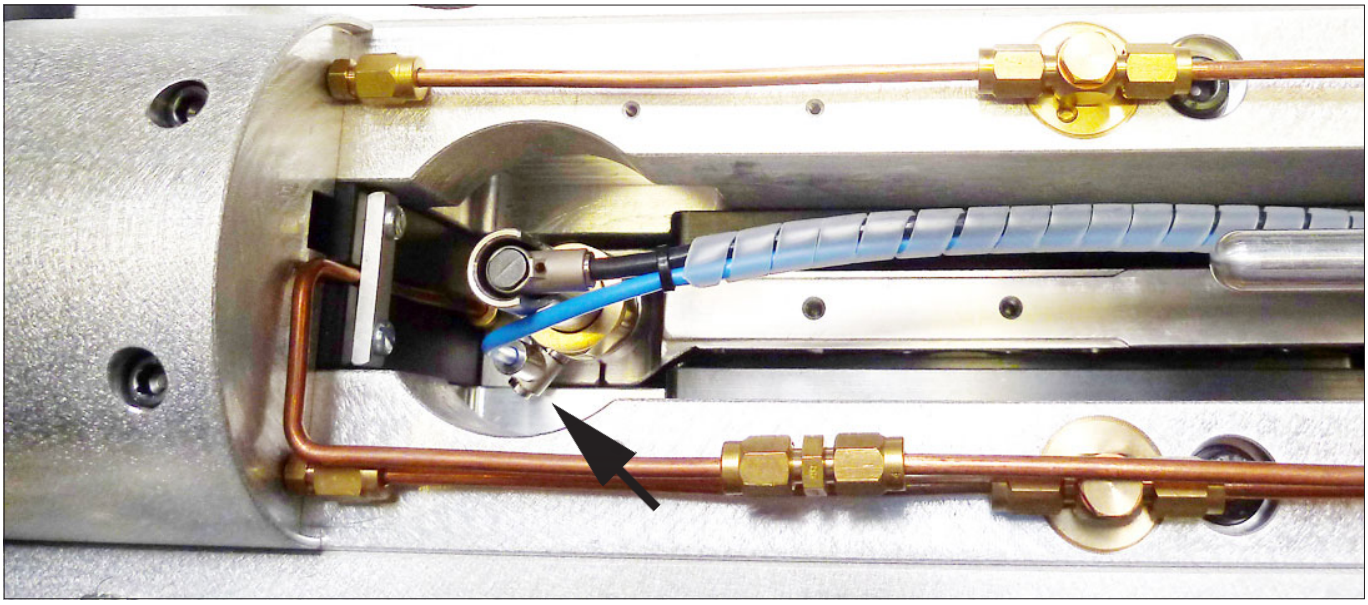

block simulates the passline (strip underside). Clamp the transducer with moderate force when the indication is approx. 2500µm. **Then set the indication to zero.**

**Special issue on installation of the upper transducer:** On VBM x76 gauges, the lower transducer is installed in such a way, that the cable entrance and the DAV-connector is pointing to the rear of the module, the same as with all other digital transducers in all other gauges.

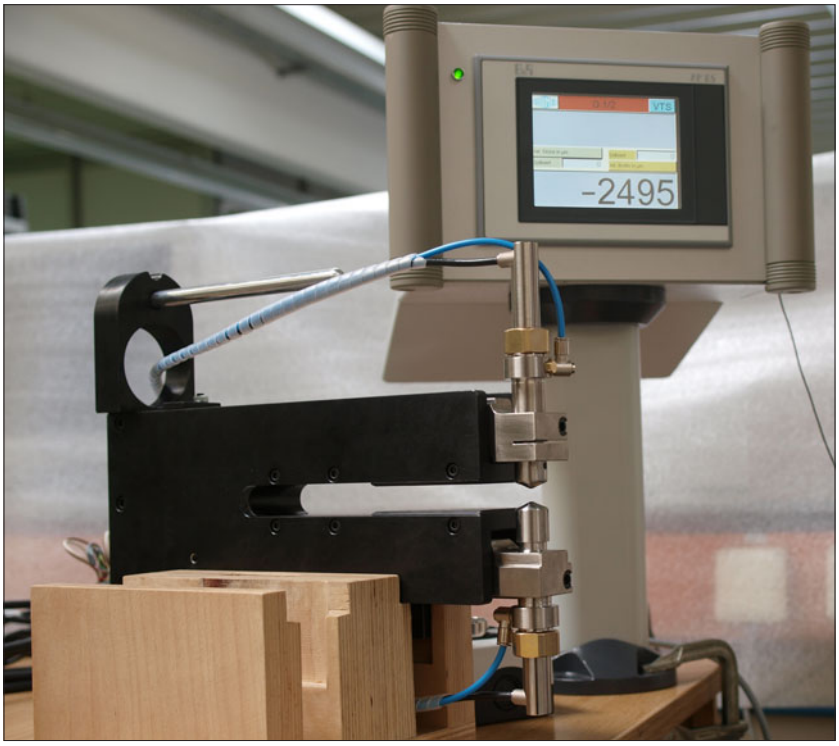
Contrary to other gauges, the upper transducer in VBM x76 gauges needs to be installed as shown on the right. The cable entrance points towards the rear, but the DAV connector (see arrow) points at an angle of approx. 45° towards the front.

Pointing towards the rear, the DAV connector would contact the C-frame, before the transducer could be pushed in far enough into its clamp hole. If the connector would point straight forward, it would contact the gauge housing when the module is installed.

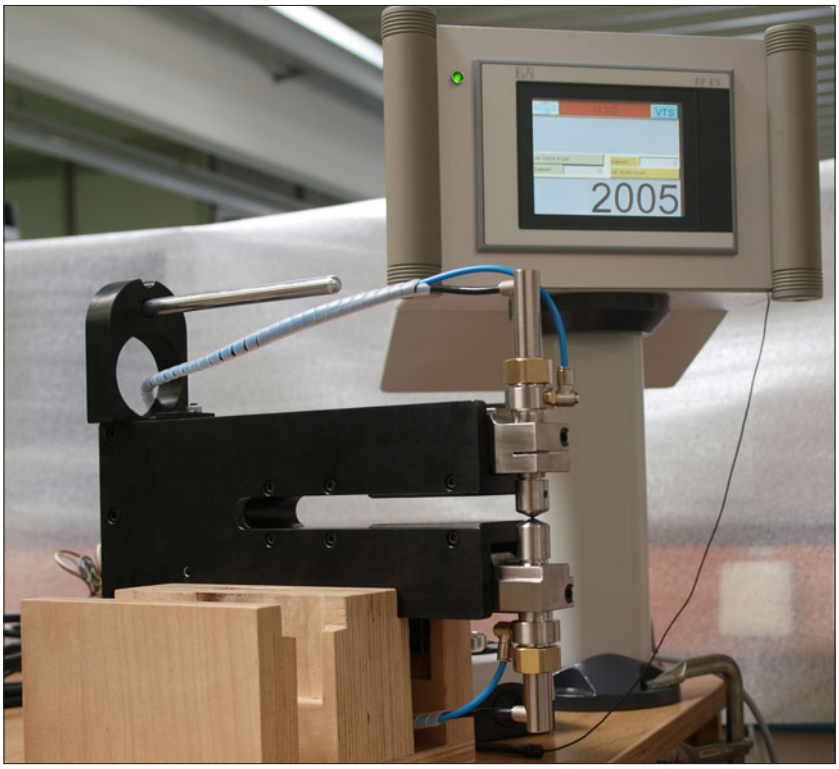




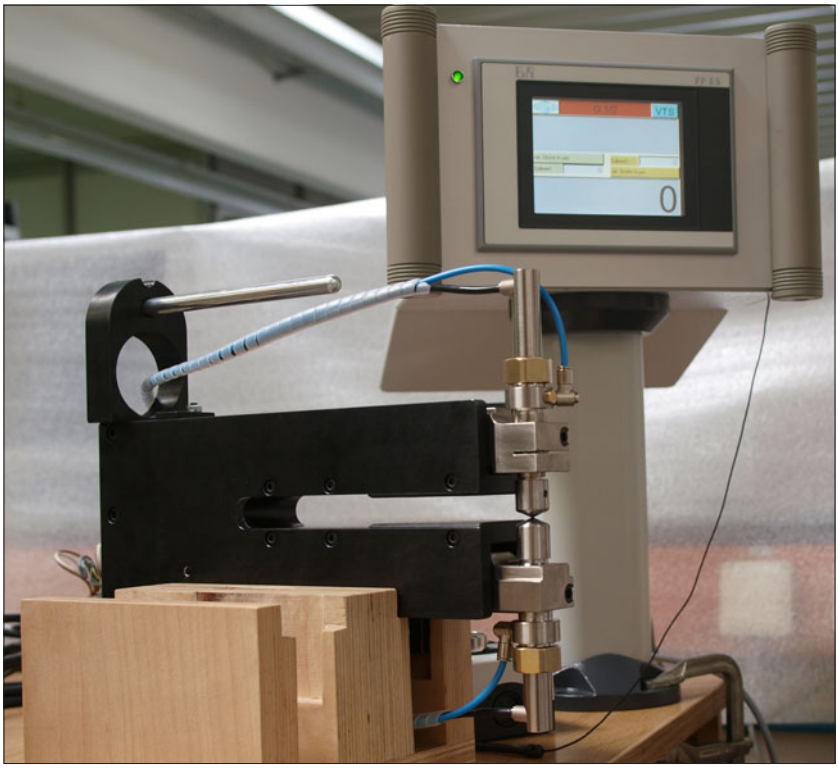
Then **remove the alignment block** (indication will change to minus 2500µm) and insert the **upper transducer (approx. 9.5mm stroke)** into its clamp hole in the C-frame.




Now **push the upper transducer down in position.** Clamp it with moderate force when the indication is approx. +2000µm.



**Set the indication to zero** and **check the gauge zero**. Insert a thin piece of




material between the transducer tips and pull it out again. The indication must return to zero (+/- 1µm).

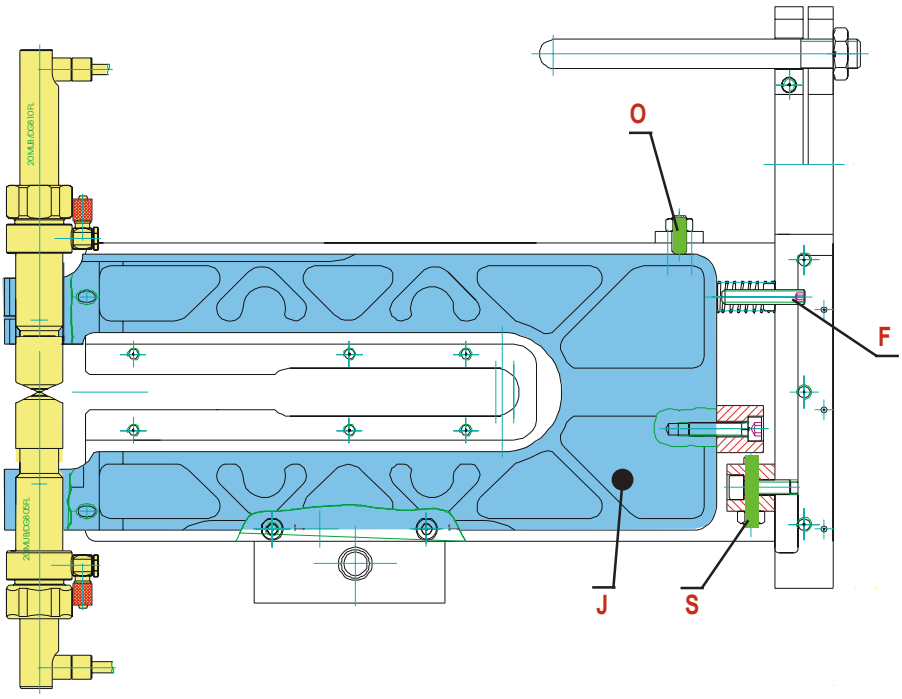
**Now the module is ready for measurement.**

## C-Frame adjustment

The inclination of the measurement frame in the module is determined by two pin screws on the top and at the lower end of the rear plate. Pin O holds the C-frame in a position where transducers are exactly 90° towards the strip surface. This is the so-called 90° position. Pin S forms a limit stop for the upwards movement of the measurement's frame front end. Both pin screws are secured by a lock nut.

Pin F carries a pressure spring, which pushes the C-frame forward, so that it rotates around bearing D into the 90°-position. The front end of the C-frame can move only upwards, as a protection against damage.

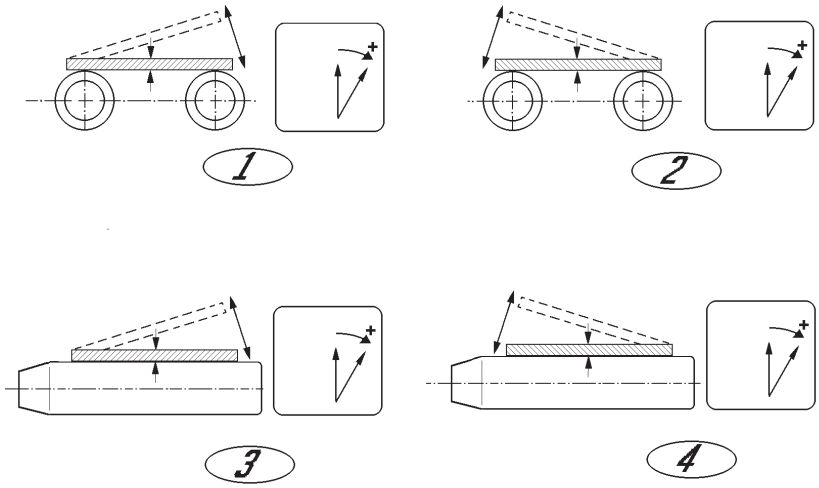
After the lower transducer was inserted against the adjustment plate (see under 'To install the transducers') insert the alignment pin J into the alignment hole J and turn the pin screw O clockwise, until it *slightly* stops because it is contacting the C-frame. The adjustment pin must now easily to be pulled out, and the front end of the measurement frame must not move down. The measurement frame is then resting against pin screw O. The screw is adjusted correctly, if the indication of the lower transducer (while it is measuring the alignment block) does not change when the adjustment pin is pulled off.




*Longitudinal sectional view of the VMF 1076 measurement module: The limit stops for the C-frame usually do not need re-adjustment as part of the normal service.*

## To check the C-frame position

The module needs to be inserted into the gauge housing and the upper guide rolls need be lifted or removed for this check. Put the adjustment plate onto the lower guide rolls and tip it into all four directions. The indicator must go any time only towards the + side. If not, the gauge needs service




*If "minus" is indicated when the plate is tilted towards one side (sketches 1+2), either the transducer tips are worn, the C-frame is distorted or the lower guide rolls are not parallel.*

*If "minus" is indicated when the plate is tilted towards the front or the back sketches 3 + 4), it is also possible, that the 90°-position of C-frame was not correctly adjusted.*

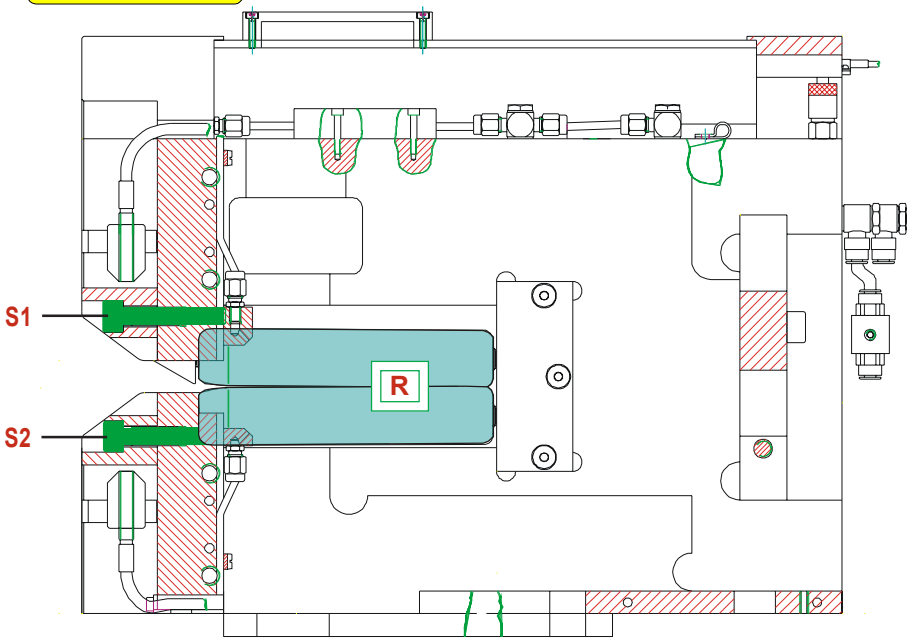
If a diamond is not supported exactly in its center, the indication deflects to minus. In this very rare case, the mistake changes with the transducer when rotating it by 90 or 180 degrees.

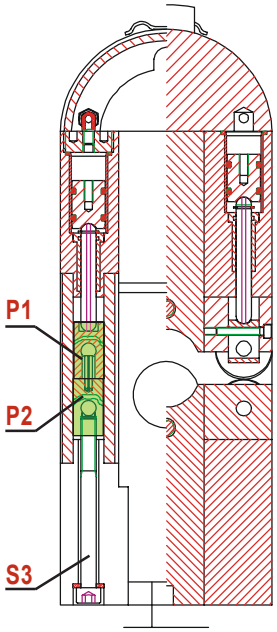
For your convenience, the Vollmer company offers a special adjustment plate with an integrated slip gauge, which is individually selected to match the thickness of that strip which is usually rolled on your mill (see picture under 'Measurement / Indication Check'.

# Repairs

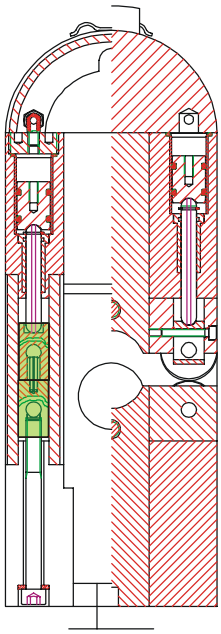
## Safety Precautions

*Switch the gauge into the 'Service I' mode before starting to work on it. This makes sure that the gauge will not move unexpectedly.*




## To replace the guide rolls



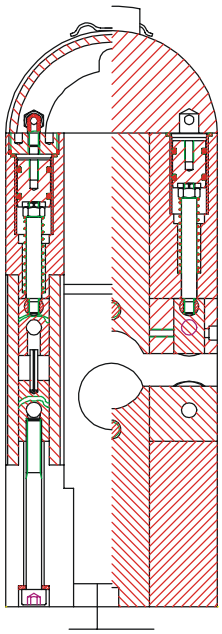
*pneumatic guide rolls, without active opening*

The guide rolls R need to be removed only if they are to be replaced. It is not necessary to remove them for taking out the module. Guide rolls must never fall down, as this might damage their bearings and/or their surface.

**Bottom rolls:** Remove screw S2 and take off the lower guiding shoe. Insert the new rolls into the brass bearings in the guiding shoe and put the guiding shoe with the new rolls back in place. Use the adjustment plate which was supplied with the gauge to check if the rolls are parallel. The plate must contact them over its entire width, so that in cannot be tilted. If there is any wobbling, remove the rear plungers P2 (screw S 3) and adjust their position by putting in a spacer washer or grinding off a little from their bottom side.

**Upper rolls: Remove** screw S1 and take off the upper guiding shoe. Insert the new rolls into the brass bearings which are in the guiding shoe and put the shoe back in place together with the new rolls. When tightening S1 push the guiding shoe up firmly in order to position it in the uppermost position.

For non opening rolls: Replacing the rear plungers P1 of the upper rolls requires to remove the screws S3 which are accessible from below. Then remove the rear plungers P1 and P2 for both rolls together. For opening rolls: additionally open the upper pn-cylinder, insert screw into piston and pull out piston, use flat screw driver to unscrew piston rod from the upper plunger.



*pneumatic guide rolls, springing up when pneumatics are depressurized*

## To disassemble the measurement module,

## to replace the C-frame bearings

## Important Note !

*The disassembling of the measurement module is a sophisticated repair which should usually not be performed by people without special service training. Without such training it is most likely that you will cause a considerable loss of measurement accuracy.*

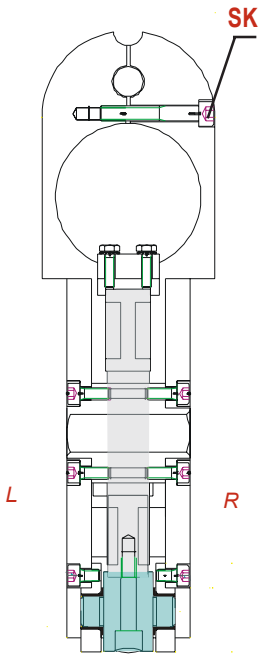
*Do not remove the left side panel of the module. If this cannot be avoided, always remove only one side panel at a time. Before loosening the screws of the second panel, reassemble the housing, so that the remaining parts guide the reassembled parts into their position. If both side panels are loose at the same time, the alignment drills in the module housing and measurement frame become useless.*

Insert the module in the supplied wooden housing, loosen the two clamping screws remove the transducers.

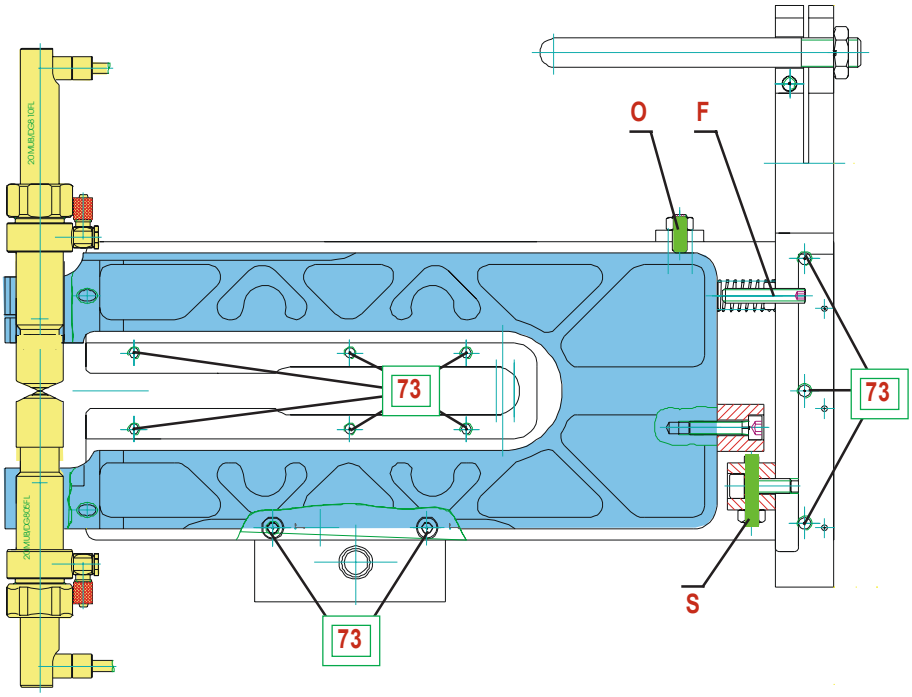
Put the module on the left hand side. Unscrew the 6 hexagonal socket bolts 73 from the right hand side of the measurement mouth, and the three bolts 73 at the rear. The two bolts 73 from the holding of the C-frame bearing need to be removed as well.

Remove the right side housing panel, this will separate the right side of the bearing. Note the number of the spacer washers (if there are any) between the bearing bushing and the C-frame. Take note of the number and possibly different thickness of the washers.

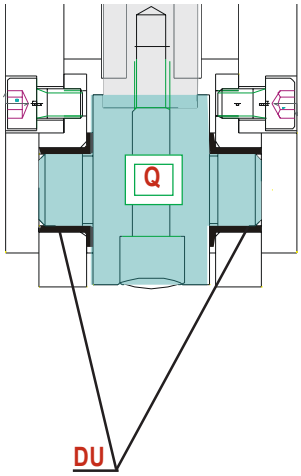
Now remove the C-frame from the module. Get hold on pressure spring D. There are no spacer washers on the left side.




*Cross sectional view of the measurement module, front view, blue = bearing rod, grey = C-frame*




*Longitudinal sectional view of the measurement module, right hand side at the top*




*Cross sectional view of the measurement module, front side view, blue = bearing rod Q, black = DU sleeve bearings*

Clean C-frame, housing and bearing with a non-corrosive solvent and dry them completely with compressed air.

The sleeve bearings were pressed into the holes in the side panel. Worn bearings should be carefully bored out and replaced by new ones (insert by hand and drive in with a plastic hammer). In most cases the bearing bolt does not need to be replaced.

Check the C-frame alignment before re-installing the C-frame. Due to severe overstressing e.g. in case of a strip braking, the bearing rod might get deformed as well.

## To reassemble the module

Put the spring D back into position while inserting the C-frame, so that the frame is pushed against pin O.

Put on the right half of the module housing and press everything together. Insert the screws 73 and tighten them while moving the C-frame in its bearings. Turn the module to the stand-up position.

The C-frame must remain easy movable, but no lateral clearance is allowed. Adjust this by removing or adding spacer(s) on the bearing rod. Note: Free motion of the C-frame is more important than a minimum of lateral clearance.

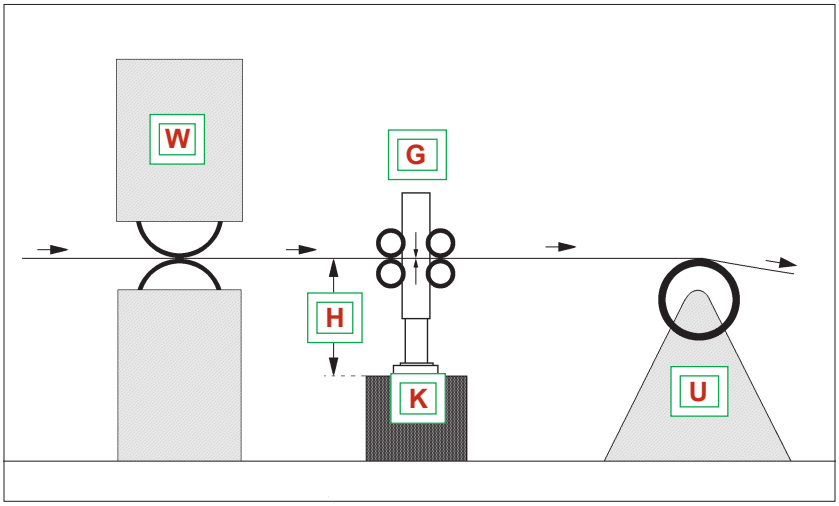
Then insert and correctly position the transducers and then check the C-frame position (see under 'C-frame adjustment'). There is no need to set the two set screws O and S as long as their original setting has not been altered.

# Suspension, Installation, Gauge Head Alignment

## Installation

When the gauge is installed into an inspection line, installation height and levelling of the gauge are derived from the inspection table. If the gauge was removed from its position, take care to reinstall the slidebase angular to the passline.

In rolling mills the gauge should be installed as described in the following sketch:

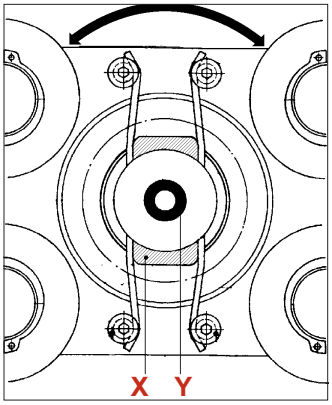



*If possible, the gauge should be positioned between the roll gap (mill = W) and the deflector roll U. Base and the bracket K are so high that they lie under the strip by the "passline height" H (see data drawing in the documentation). Here the stroke of the vertical guiding is able to follow the expected range of strip movement.*

Additional conditions are:

- base parallel to roll axes in the mill
- slidebase rectangular to the strip
- gauge must be able to traverse towards the roll middle

## Levelling




If the strip does not run horizontally the gauge head can be rotated around its longitudinal axis.

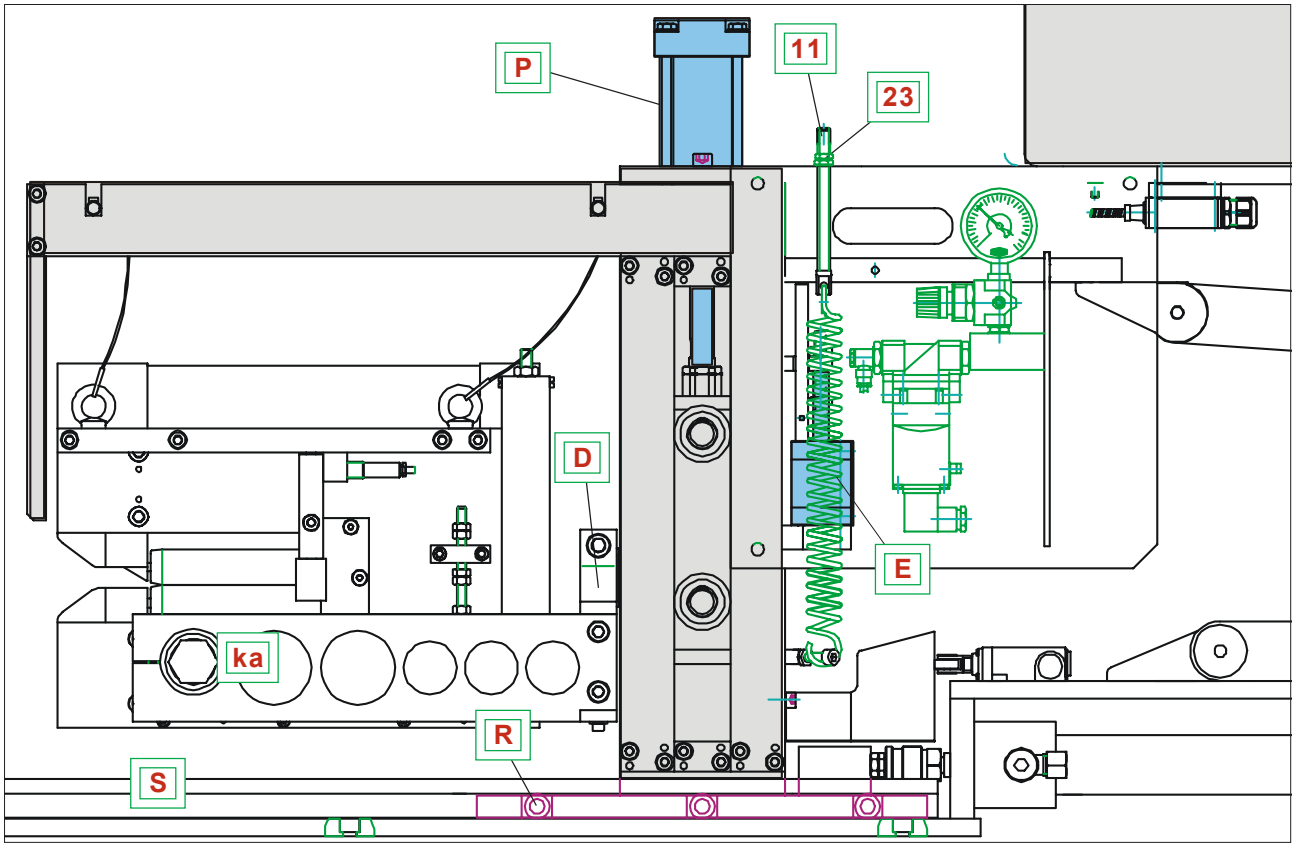
*View from the rear: The gauge head can be rotated after clamp screw Y on the rear of the rotary bearing has bee loosened (which is holding the gauge head in the vertical guiding). Align the gauge head with the strip angle and tighten the screw Y. Key X between the two flat springs is then flexibly holding the gauge head in the set angle.*

## Suspension and passline setup

**Suspension setup for pV-B:** The gauge hangs spring suspended in its vertical guiding, with depressurized pneumatics approx. 5mm (app. 2") below the passline. A pneumatic cylinder (P) lifts the gauge head to such a position, that the lower guide rolls are in the passline and touch the strip. This is to keep the gauge from swinging heavily up and down during the measurement. The pneumatic guide rolls guide the gauge head along the passing strip.

The tension of the spring suspension can be adjusted on the rods 11 with the nuts 23. A new adjustment might become necessary if the springs have weakened after a long time of operation and if then the pneumatic cylinder lacks of power to lift the gauge head into passline height. Adjust the spring tension so that the pneumatic cylinder needs no more than 0.5bar of pressure to lift the gauge head into the passline. If the pneumatic pressure is higher, the gauge head would not be suspended flexible enough to follow strip movements easily.

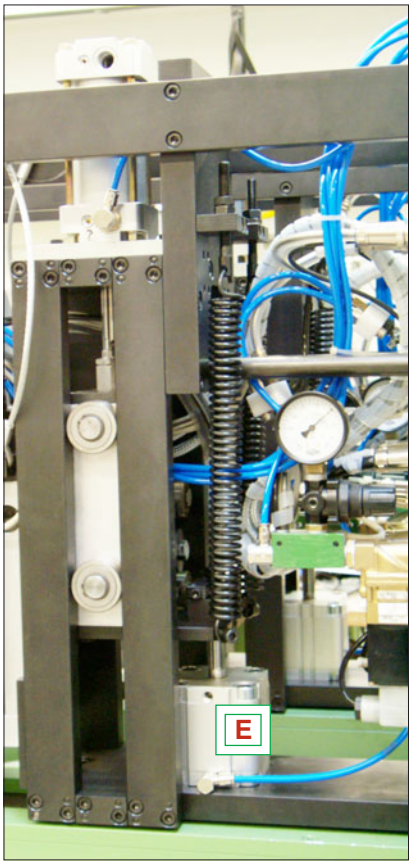
Cylinder P is pressurized only when the gauge is in measurement position. P is depressurized in the rear limit position and while the gauge is traversed. During the traversing, cylinder E (traversing help) lifts the gauge head into the passline. E is depressurized in the measurement position while there the pneumatic guide rolls and P are pressurized.

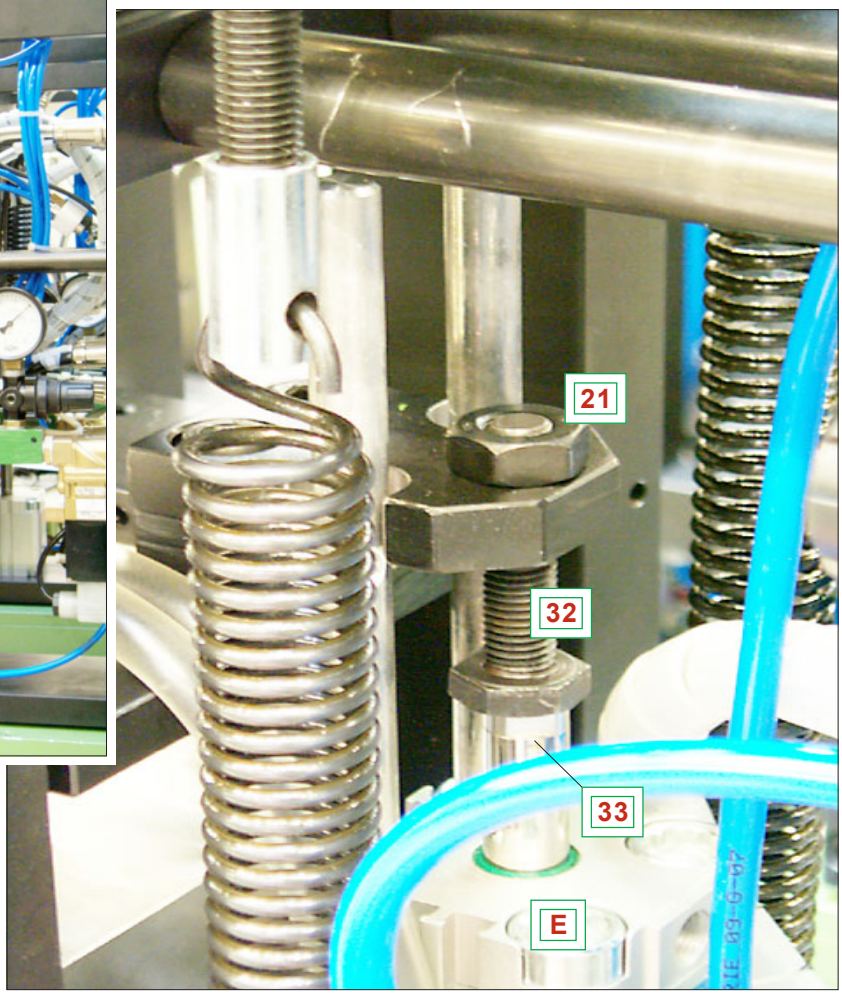



*Lateral view vertical guiding pV-B: The gauge head is fastened by rotary bearing D in the cardanic ('ka') suspension, the rolls R run in the slidebase; all other elements are described in the text.*

Set the pressure for the pneumatic vertical guide (valve PVB) in such a way, that the gauge during measurement is neither visibly pulled down nor pushed up by the strip. However, it is important, that the lower guide rolls are permanently driven by the strip. If the pressure is set too high, the lower guide rolls might mark the strip.

**Traversing help setup:** During the gauge traversing, the traversing help cylinder E (see sketch previous page and photo below) lifts the gauge into the passline. The piston rod 33 of cylinder E pushes up the bolt 32. The bolt 32 is set during the commissioning when rolling thin strip (at the lowest passline) to such a position, where the lower guide rolls just touch the underside of the strip when E is pressurized. The position of bolt 32 is secured by lock nut 21. This setting is correct, when the lower guide rolls slightly touch the strip while the gauge is traversed in position. The height of the traversing help needs to be adapted when the passline is altered.

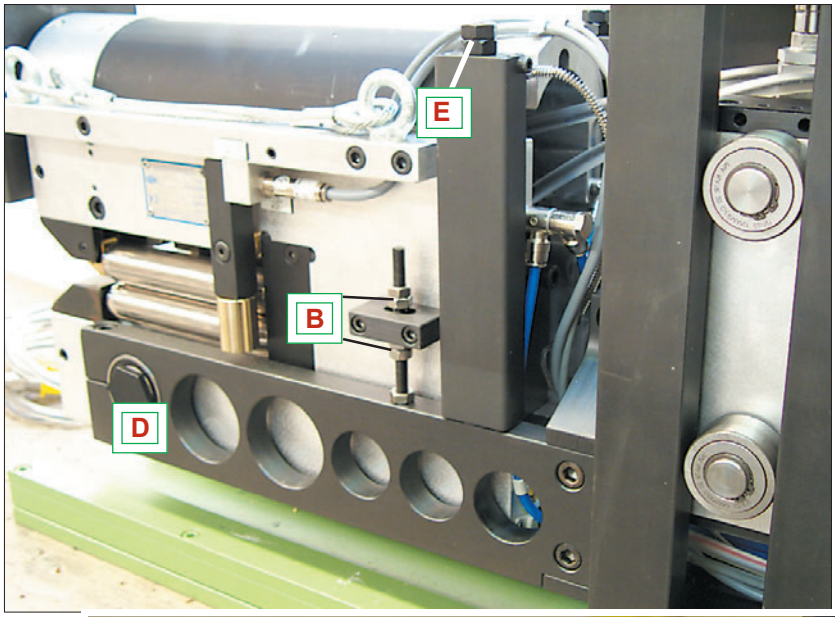


## Ka-device

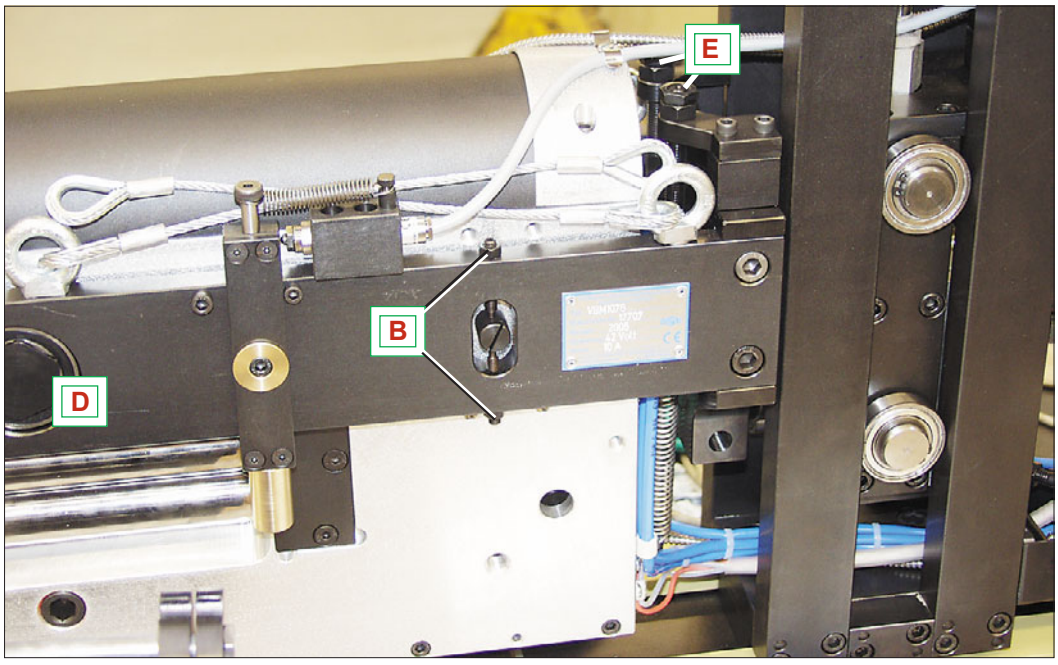
The ka-device is part of the cardanic suspension of the gauge. It allows the inclination of the gauge head, so that the guide rolls can lie flat on the strip, even when the strip does not run flat, e.g. when thick strip shows a crossbow.

**ka pV-B** (vertical guiding behind the gauge):The cardanic suspension is set up by the tension of two springs. Two set screws E inside the black cover are set so that the guide rolls are parallel to the strip. If the gauge head cannot not follow the strip's bow, extend the ka-limits by setting the nuts B. This setup needs to be done on both sides of the gauge head.

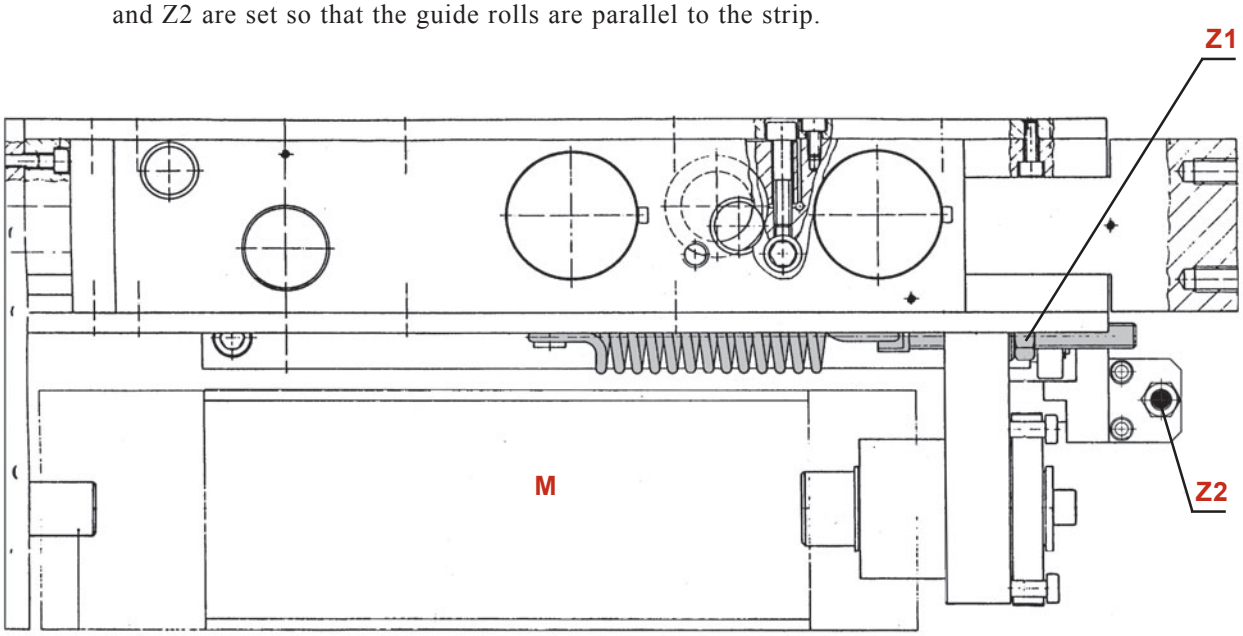



*Setting of the cardanic suspension (ka) on a gauge with a pV-B type vertical guiding: The set nuts E and the corresponding springs are behind the black cover, accessible from above. The nuts B set the limit stops for the gauge head rotation around the rotary bearing D.*

*If a set of two tandem gauges is installed close beside each other, one of the gauges gets a raised ka-device, as shown in the lower picture. Its limit stops and the springs are installed in a slightly different way.*

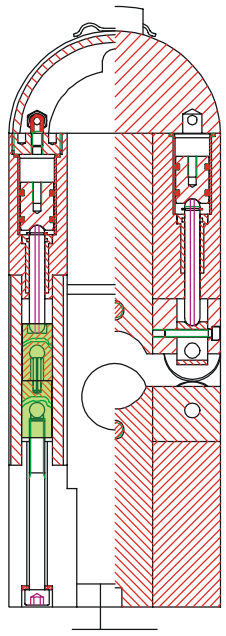


**ka pV-S** (vertical guiding beside the gauge): The cardanic suspension (see sketch below) is determined by the tension of a spring. The two nuts Z1 and Z2 are set so that the guide rolls are parallel to the strip.




*Setting the gauge head inclination in the ka of a pV-S type vertical guiding (sketch shows view from above): Each of the two set nuts Z1 and Z2 determines the tension of a spring which is tilting the gauge head M towards the strip*

## Pneumatic guide rolls



*pneumatic guide rolls, without active opening*

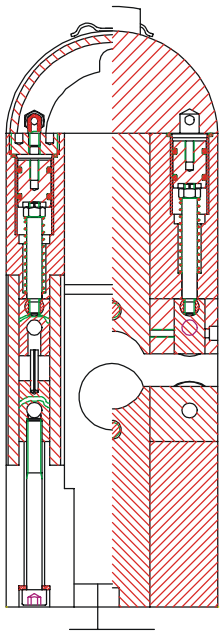
The guide rolls hold the gauge parallel to the strip and , in connection with the ka-device, they ensure that the transducers stand permanently perpendicular to the strip surface.

There are different types: standard pneumatic guide rolls, pneumatic rolls that open for 8mm (appr. 0.31") and rolls that open for 13,8mm ( appr. 0.53").

If their pneumatic cylinder is not under pressure, the upper rolls should be easy to move up and down by hand (pull down opening rolls against spring pressure).

The upper guide rolls are pressed down pneumatically during the measurement. Opening rolls spring up when the compressed air supply for the pneumatic cylinders is switched off. The cylinders of the standard rolls without active opening, are permanently pressurized with a basic pressure of approx. 1 bar, and in measurement position, the selected working pressure is applied in addition.

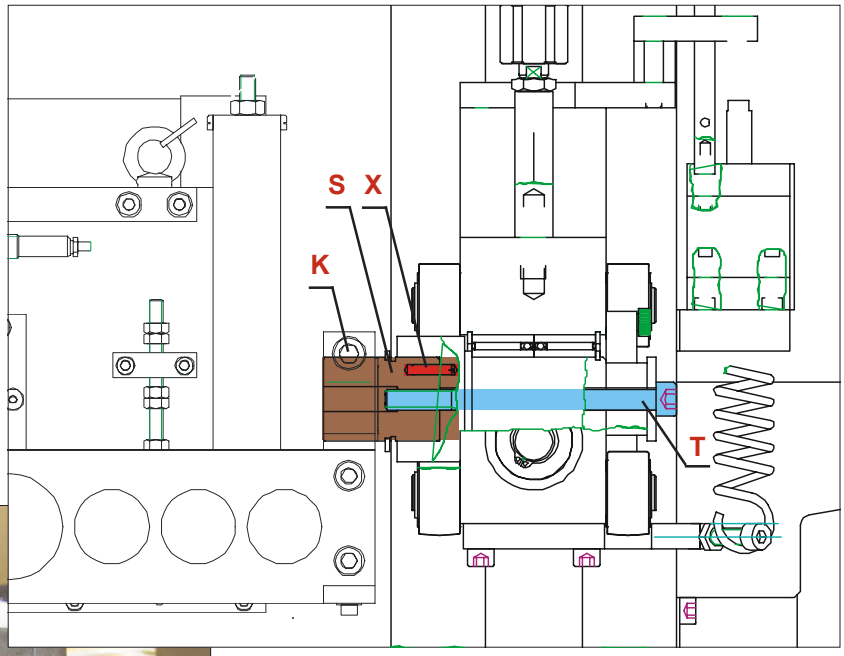
The working pressure is between 3 and 5 bar, depending on the kind of material which is being measured. Pressure is set by the valve 'Pneumatic Guide Rolls' in the pneumatic cabinet (see section 'Pneumatic guide rolls' under 'Continuous checking / Pneumatics').

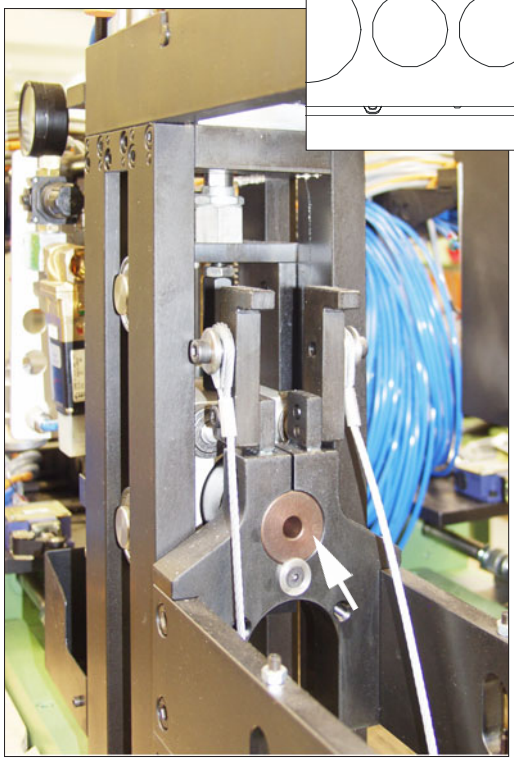


*pneumatic guide rolls, springing up when their pneumatics are depressurized*

## Strip breaking

Both types of vertical guides have a shear block helping to prevent the gauge and its suspension from destruction in case of strip breaking.



**Type pV-B** (vertical guide at the rear of the gauge): Shear block S breaks and the gauge, hanging from 4 wire cables, can move away from the pushing strip. For replacement, unscrew bolt T and remove the old shear bolt. Insert a new shear bolt, so that the locking pin can engage into the locking hole.

The ka-device is fastened to the other end of the shear bolt by clamp screw K.

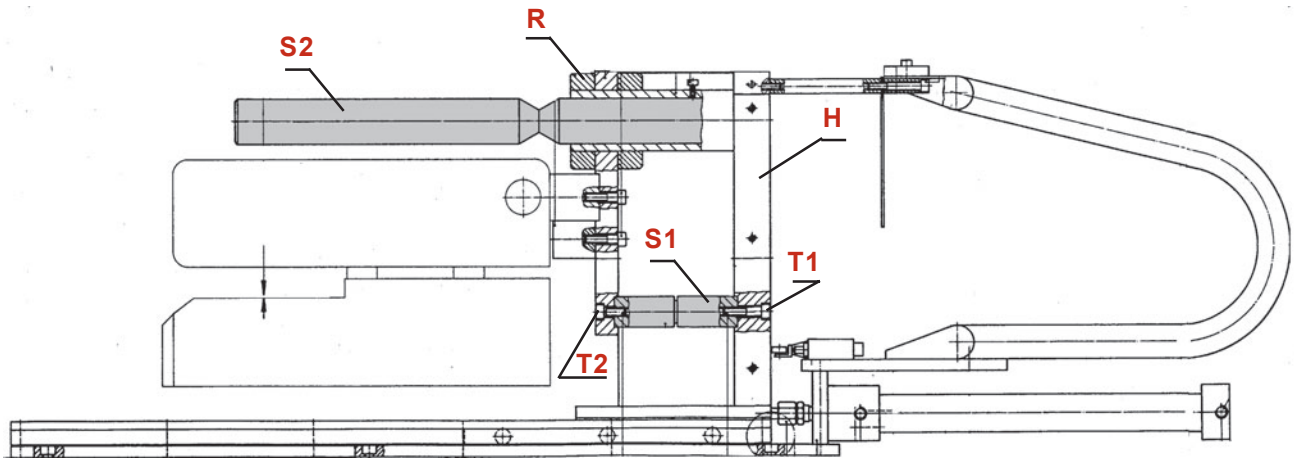
The photo left shows the shear bolt inserted with the ka-device clamped on the shear bolt.

### Safety precautions

*The aluminium gauge head might get hot. Therefore check the temperature before trying to handle the gauge head. The gauge head is heavy (minimum 30 kgs). Therefore get a secure footing and if possible work with two persons when you have to handle the gauge head without lifting device.*

**Type pV-S** (vertical guiding beside the gauge head): Shear block S1 (see below) breaks and the gauge with its base plate H can swing around the rod S2. The rod S2 is designed to bend under a certain load in order not to damage the vertical guiding.

The shear block can be replaced after ring R was removed and the gauge head with plate H has been pulled towards the front for a few centimetres. Remove the remaining parts of the broken bolt S1 and fasten the new bolt with screw T1. Then push the gauge head and plate H back to their original position and fasten the other end of the shear block with screw T2. At last, fasten the ring R in its original position.




## After each strip breakage

**Please check the gauge zero after each strip breaking, no matter whether mechanical damage is visible or not. Set the nominal size to zero and then check the zero point. If it has not changed, measurement can continue immediately.**

If the gauge zero has shifted for a minor amount, set the gauge to zero and check the gauge zero. Then check the gauge with an adjustment plate with integrated slip gauge (optional addition, available from Vollmer). If these points are all right, measurement can go on.

If the measurement does not indicate the exact thickness of the sample, insert the spare measurement module and check the used module. Pay special attention to the diamonds, the easy movement of the transducer rams and the alignment of the transducer holes in the C-frame.

**Notes**