GLÖTZL Baumeßtechnik

CONVERGENCE MEASURING DEVICE

System Behensky / Glötzl

- Practicable, compact model for a site oriented application
- Light model and easily understandable handling
- Supply is done in transport case with test frame
- Optionally equipped with either mechanical dial gauge or digital measuring unit
- Measuring tape available in lengths of 20 and 30 m in standard steel execution
- Proved and successfully used measuring device
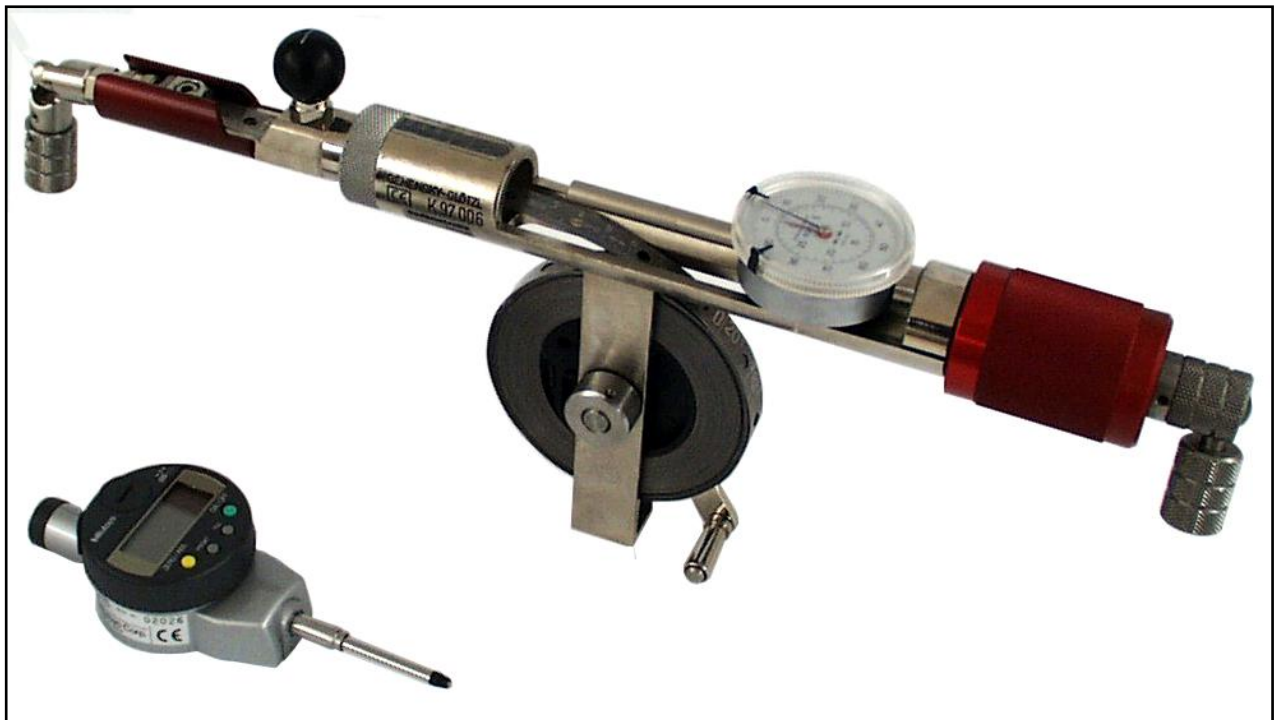
Type: BGKM …
Art. No. 90.70.....

Figure: Convergence measuring device equipped with mechanical dial gauge, digital dial gauge at the left

Description:

The convergence measuring device is a precision measuring instrument for measurement of displacements and deformations. At the construction, special measuring bolts are fitted at which the unit for measurement is fixed. According to the respective measuring job, a series of measuring bolts in different versions are availabe.

Technical data:

Delivery extent:	Convergence meas. device, test frame and transport case	
Measuring ranges:	BGKM 20	1 up to 20 m
	BGKM 30	1 up to 30 m
Adjustment of meas. value:		
	with analog dial gauge	BGKM .A
	with digital dial gauge	BGKM .D
Steel meas. tape:	Coefficient of longitudinal deformation 10.2×10^{-6} m/m°C, perforation 25 mm	
Measuring accuracy:	Resolution up to 5 m ± 0.05 mm, more than 5 m ± 0.1 mm	
Weight:	Measuring device	2.2 kgs
Weight:	Unit with accessories	6.0 kgs

Figure: Convergence meas. device with meas. tape and dial gauge, test frame and assembly tool in transport case
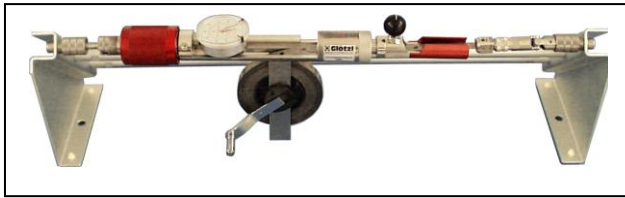
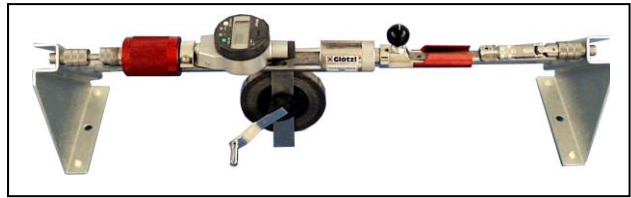**Figure:** Convergence measuring device in test frame with analog dial gauge

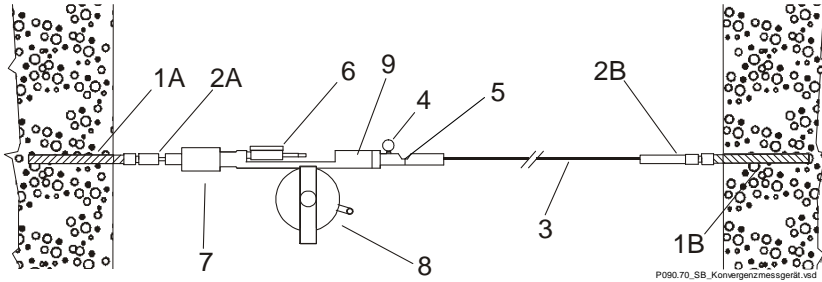**Figure:** Convergenc measuring device in test frame with digital dial gauge

Figure at the left:
(1A) Convergence measuring bolt
(1B) Convergence measuring bolt
(2A) Ball joint with connection
(2B) Coupling with connection
(3) Meas. tape with perforation
(4) Locking peg
(5) Measuring tongue
(6) Dial gauge mechanical/digital
(7) Clamping device
(8) Meas. tape with crank handle
(9) Housing with tension spring and marking of tension

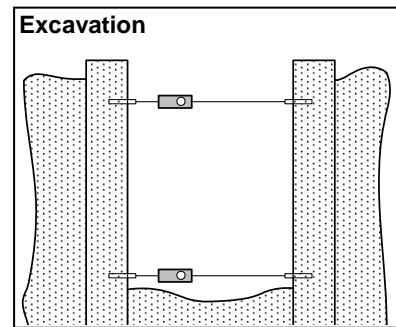**Application examples:**

Tunnel

Building

Excavation
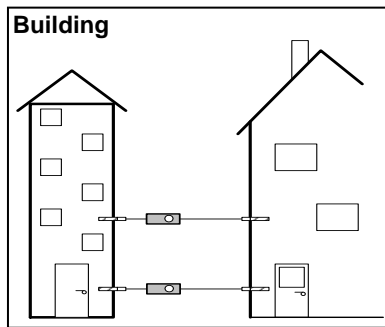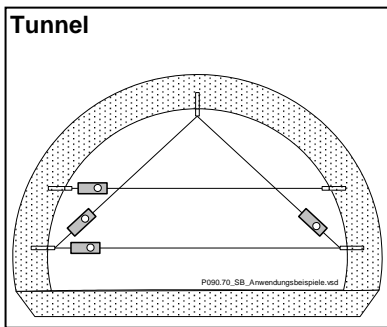
Figure below: Standard convergence bolts with protection caps, length 250 mm for embedding in concrete and 50 mm for welding of steel galvanized – Measuring connection and thread also available as complete bolts in stainless steel.

Diagram for determination of temperature influence of a steel measuring tape
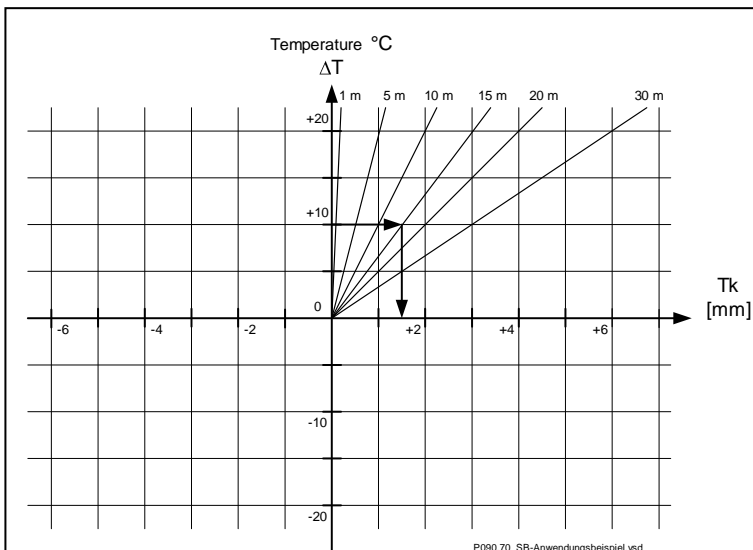
Calculation example:

1st measurement T_i, at 15 °C
2nd measurement T_0, at 25 °C

$\Delta T = T_i - T_0 = -10$ °C
$T_k = -1.53$ mm for a meas. distance $M_W = 15$ m
(see arrows in diagram)

$M_k = M_W \pm T_k$
$M_k = 15.000$ mm ± 1.53 mm

$T_0 =$ Temperature at zero measurement
$T_i =$ Temperature at any sequence measurement

Instead of the calculated temperature correction, also the correction value can be read from beside diagram.

General remarks to handling

Meas. tape value (B$_W$)	Value readable at meas. tape in steps of 25 mm at the meas. tongue besides perforation
Dial gauge value (U$_W$)	Reading at the inside circle of scale in mm, at outer circle in 0.1 and 0.01 mm
Frame value (R$_W$)	Measure to be taken at test frame. It corresponds to the distance of the two measuring bolts, area-area
Instrument value (GW	**(calibration value)**
	It is recorded in calibration frame and results from: GW = Tape value – gauge value.
Correction value (KW)	For real value of longitudinal measurement calculation is done:
	KW = Frame value – instr. value
Meas. Value (MW)	Real bolt distance is calculated from: MW = Correction value + instrument value
	Measuring value 1 – measuring value 2 = deformation ±

Measurement in test frame for determination of calibration value

- Install test frame and carefully screw it. Please take care that all components have the same temperature, if possible.
- Screw out clamping device (7) by turning to the left till dial gauge is in zero position..
- Totally contract measuring tape (3) with crank handle.
- Put locking peg (4) with marking longitudinally to measuring direction.
- Screw on convergence measuring device to the bolt (1A) with side of ball joint connection.
- Pull measuring tape with perforation (3) and screw on connection part with coupling (2B) at bolt (1B). Keep convergence measuring device horizontally to frame.
- Retract measuring tape with crank handle and put locking peg (4) with marking transversally to measuring direction.
- Srew in clamping device (7) by turning to the right till the locking peg is locking into position of the perforation. For this, slightly press the locking peg in its locking direction. The locking point can easily be recognized by the following tape perforation which is covering with the noticeable thread below the tape.
- Turn clamping device (2) more to the right and tighten measuring tape till the vertical marking is exactly in the middle of the cross marking in visible window. Look for the max. middle point by turning to the right and left.

By moving up and down of the convergence measuring device you will find the shortest meas. tape distance and can correct the optimal position of the vertical marking in the cross marking by the clamp bolt.
- Take reading of measuring tape value and dial gauge value and note and fix as calibration value.
- We recommend to repeat this procedure several times for exercise and for secure handling by adjustment of clamping device with new determination of measuring value. For this, cover dial gauge with a paper. The repetition accuracy should be around ±003 mm.
- Release clamping device (7) by turning to the left, draw locking peg and put it longitudinally to measuring direction/measuring tape direction.
- Put dial gauge in zero direction.
- Release coupling with connection (2B) from convergence bolt (1B) and retract measuring tape with crank handle.
- Release coupling with ball joint (2A) from convergence bolt (1A) and put device back into the transport case.
- Then the test measurement is finished.

Please have attention to the fact that the convergence measuring device is a precision instrument and has to be operated resp. handled very carefully.

Measurement at construction

- Screw out clamping device (7) by turning to the left till dial gauge is in zero position resp. check it.
- Put locking peg in longitudinal position to measuring direction. Draw coupling with connection (2B) somewhat out of the device and fix at measuring bolt (1B).
- Move with the convergence measuring device to the opposite bolt and fix ball joint with connection (2A) at the convergence bolt (1A). Take care that the measuring tape always remains tightened and is not polluted.
- Tighten measuring tape with crank handke and make sure that the locking peg (4) with marking is in transverse direction to measuring direction.
- Slightly press on locking peg and draw at the measuring tape till it is locking into the next perforation. The locking point can easily be recognized when the following tape perforation is covering with the visible thread below the tape.
- Turn clamping device (7) somewhat more to the right and tighten measuring tape till the vertical marking is exactly in the middle of the cross marking in visible window. Look for the max. middle point by turning to the right and left. By moving up and down of the convergence measuring device you will find the shortest meas. tape distance and can also correct

the optimal position of the vertical marking in the cross marking by clamp bolt.
- Take reading of measuring tape value and dial gauge value and note and fix as instrument value.
- It is recommended to repeat measurement twice and to note the means value as measured value.
- If higher temperature differences can be foreseen between measurements, the temperature has to be recorded and calculated according to the measuring accuracy, if required.
- Release clamping device (7) by turning to the left and additionally put dial gauge in zero position.
- Draw locking peg and put it longitudinally to measuring direction/measuring tape direction.
- Release coupling with connection (2A) from convergence bolt (1A) and retract measuring tape with crank handle.
- Release coupling with ball joint (2B) from convergence bolt (1B) and put device back into transport case.

The convergence measuring device is a precision instrument and has to be protected against pollution and to be operated resp. handled very carefully.

Measuring records for convergence measurements (pattern for copying)

GLÖTZL Gesellschaft für Baumeßtechnik mbH

Convergence measuring   MP 90.01.03

Site: _____   Measuring distance: _____

Person in charge:	Carryover:	Control remark	Code:	Measuring cross section:	Page No:

No:	Date	Time	T [°C]	T [°C]	T_k [1] [mm]	Reading values in Situ in mm			K_W [3] [mm]	M_W [4] [mm]	M_K [5] [mm]	M_k [mm]	Resp.
						B_W	U_W	G_{WB} [2]					
	Example		22	0,0	0,000	15.025	22,50	15.002,50	497	15.499,50	15.499,50	0,00	
	Example		12	-10,0	-1,530	15.025	21,40	15.003,60	497	15.500,60	15.499,07	0,43	

Calibration
R_W Frame value [mm]
G_{WK} Instrumation value calibration frame [mm]
K_W Correction value [mm]
K_W [3] = R_W - G_{WK}

Measuring at construction
B_W Mesauring Tape value [mm]
U_W Dial gauge value [mm]
G_{WB} Instrument value at construction [mm]
G_{WB} [2] = B_W - U_W

Temperature correction
$_T = 10,2 \times 10^{-6}$ m/m°C   T > 0 = +T_k
T_k Temperature correction [mm]
T_k [1] = G_{WB} x $_T$ x T
T_k [1] = G_{WB} x 0,0000102 x T
T = T_i-T_0
T_i Sequence measuring T_0 Zero measuring

Evalution
Measuring length absolute
M_W Measuring length absolute [mm]
M_W [4] = G_{WB} + K_W
M_k Measuring length temperature compensated [mm]
M_k [5] = M_W + T_k

Order model: (by Fax) to Glötzl, Gesellschaft für Baumesstechnik mbH   Fax No.   +49 721 51 66 30

We ask for delivery of below ticked articles to:

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Please request in advance the actual prices by phone or Fax qutotation.

Availabe convergence measuring devices   ☐ **Please tick when ordering**

Art-No.	Description	Meas. tape/kind of steel		Analogue/digital	Type	Remarks
• 90.70.01	Convergence meas. device	20 m	steel	analog	BGKM 20 A	
• 90.70.03	Convergence meas. device	30 m	steel	analog	BGKM 30 A	
• 90.70.11	Convergence meas. device	20 m	steel	digital	BGKM 20 A	
• 90.70.13	Convergence meas. device	30 m	steel	digital	BGKM 30 A	

Spare parts:

• 90.70.50.01	Analog dial gauge			analog 0 - 25 mm	BGKM AM	
• 90.70.50.02	Digital dial gauge			digital 0 - 25 mm	BGKM AI	
• 90.70.50.11	Spare meas. tape	20 m	steel		BGKM M20	
• 90.70.50.12	Spare meas. tape	30 m	steel		BGKM M30	

Subject to technical alternations