

# BORESIGHT DEVICES HIPAD



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## **With compliments**

Subject to design and construction modifications

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## Boresight Telescope 4x A1

### Brief description

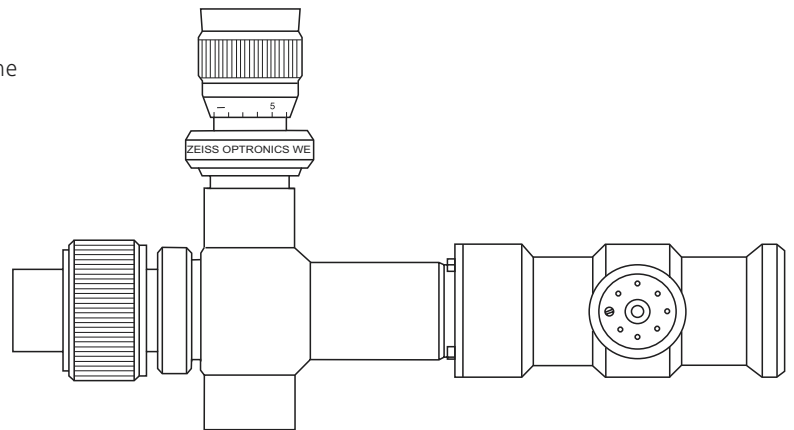
The boresight telescope 4x A1 in conjunction with the relevant calibre bar represents the bore of weapons to test and adjust the line of sight of aiming devices.

The optical system may be infinitely varied in a range from 0.6 m to  $\infty$ .

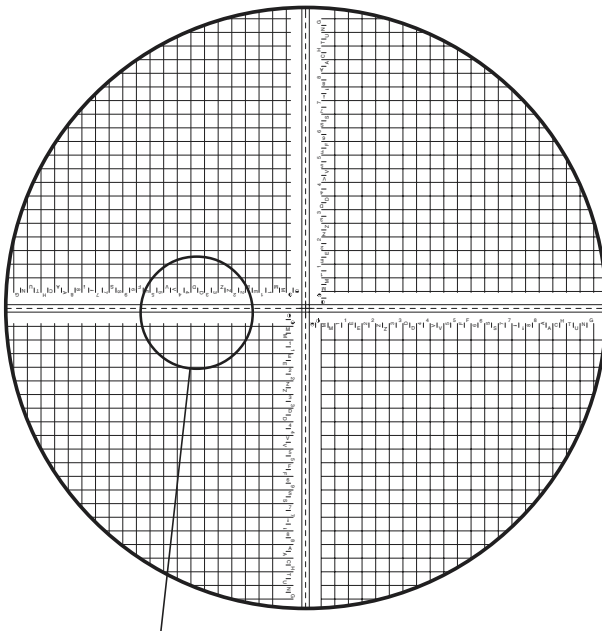
The ocular contains a reticle coordinated with the collimator reticle of the K 18m, KTW 18m and K 12m. In order to balance a visual error of the viewer, a diopter adjustment is available.

The mounting bore of the support corresponds to the standard journal of the muzzle boresight program. The longitudinal axis of the boresight is parallel adjusted to the mounting bore to  $< 0.25$  mrad.

The boresight telescope 4x A1 may be fixed to the standard journal using a locking screw.

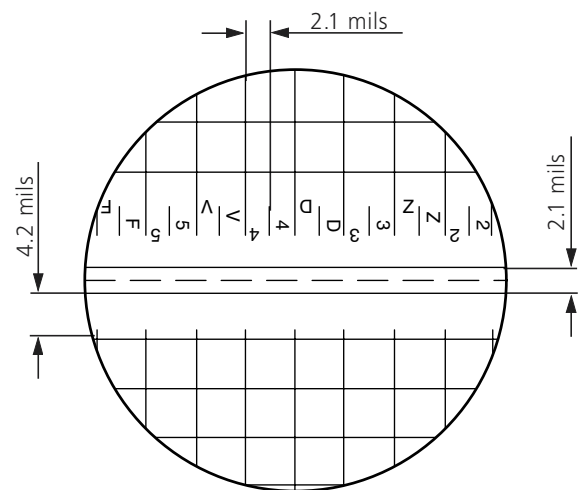


### Reticle



Enlarged view

Enlarged view



# Technical data

## Mechanical data

Mounting bore	$25^{+0.028}_{+0.007}$ mm
Adjustment of opt. axis relative to mounting bore	< 0.25 mil

## Optical data

Boresight enlargement	4x
Field of view	187 mrad
Exit pupil diameter	2 mm
Focus range	0.6 m to $\infty$
Diopter setting	$\pm 5$ dpt
Overall angle of collimator division	$177.8 \pm 0.3$ mrad

## Reticle

Line thickness crossbeam	0.1 mil
Line thickness crosshairs	0.2 mil
Line thickness matrix	0.1 mil

## Dimensions

	Length	Width	Height
Boresight telescope 4x A1	240 mm	$\varnothing$ 50 mm	150 mm

## Weight

Boresight telescope 4x A1	0.9 kg
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## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No./ Part No.
Boresight telescope 4x A1	1240-12-166-1023 009-505.003-000

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## Boresight Telescope 4x A2

### Brief description

The boresight telescope 4x A2 in conjunction with the relevant calibre bar represents the bore of weapons to test and adjust the line of sight of aiming devices.

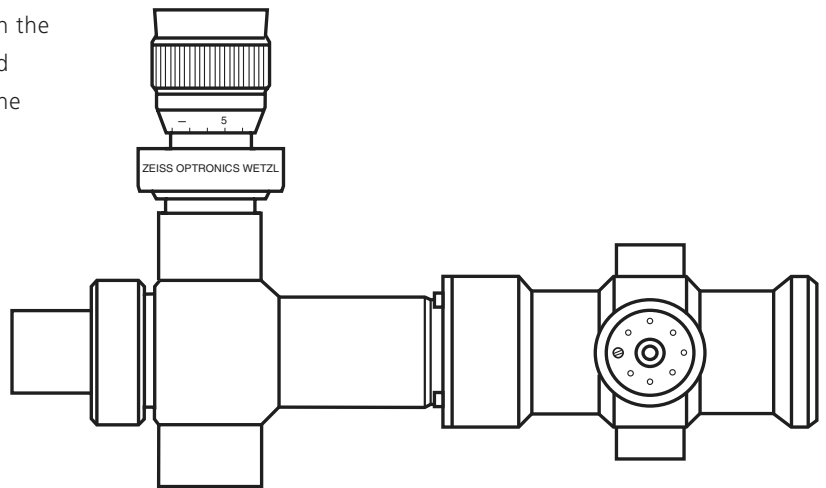
The optical system is adjusted to 1500 m.

The ocular contains a reticle coordinated with the collimator reticle of the K 18m, KTW 18m and K 12m. In order to balance a visual error of the viewer, a diopter adjustment is available.

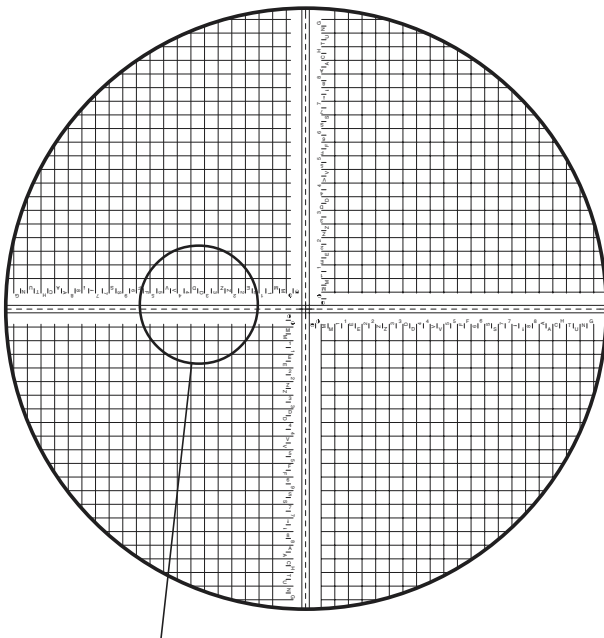
The tilt angle of the weapons system is transferred to the support of the boresight using the *Bubble Level, Adjustable* to which the reticle is set with an accuracy of  $< 0.9$  mrad.

The mounting bore of the support corresponds to the standard journal of the muzzle boresight program. The longitudinal axis of the boresight is parallel adjusted to the mounting bore to  $< 0.05$  mrad.

The boresight telescope 4x A2 may be fixed to the standard journal using a locking screw.

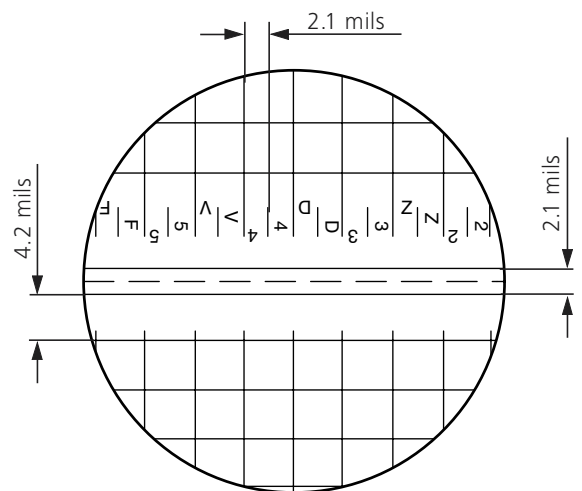


### Reticle



Enlarged view

Enlarged view



# Technical data

## Mechanical data

Mounting bore	25 $\pm$ 0.028 / $\pm$ 0.007 mm
Adjustment of opt. axis relative to mounting bore	< 0.05 mil

## Optical data

Boresight enlargement	4x
Field of view	187 mrad
Exit pupil diameter	2 mm
Adjustment of optical system	1500 m
Tolerance range	400 m to $\infty$
Diopter setting	$\pm$ 5 dpt
Overall angle of collimator division	177.8 $\pm$ 0.15 mrad

## Reticle

Line thickness crossbeam	0.1 mil
Line thickness crosshairs	0.2 mil
Line thickness matrix	0.1 mil

## Dimensions

	Length	Width	Height
Boresight telescope 4x A2	217 mm	70 mm	148 mm

## Weight

Boresight telescope 4x A2	1.0 kg
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## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No./ Part No.
Boresight telescope 4x A2	4933-12-189-6105 009-097.100-000

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# Technical data

## Mechanical data

Mounting bore	25 $\pm 0.028$ $\pm 0.007$ mm
Adjustment of opt. axis relative to mounting bore	< 0.13 mil

## Optical data

Boresight enlargement	4x
Field of view	187 mrad
Exit pupil diameter	2 mm
Focus range	0.6 m to 400 m
Diopter setting	$\pm 5$ dpt
Overall angle of collimator division	177.8 $\pm 0.3$ mrad

## Reticle

Line thickness crossbeam	0.1 mil
Line thickness crosshairs	0.2 mil
Line thickness matrix	0.1 mil

## Dimensions

	Length	Width	Height
Boresight telescope 4x A3	240 mm	70 mm	150 mm

## Weight

Boresight telescope 4x A3	1.0 kg
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## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No./ Part No.
Boresight telescope 4x A3	1240-12-195-3582 009-138.100-000

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## Boresight Telescope 10x

### Brief description

The boresight telescope 10x in conjunction with the relevant calibre bar represents the bore of weapons to test and adjust the line of sight of aiming devices.

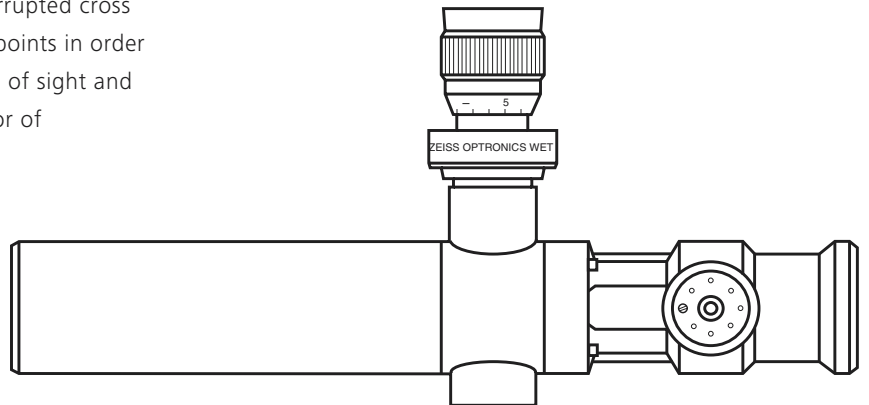
The optical system is adjusted to 1500 m.

The ocular contains a reticle with an interrupted cross hair. This allows acquiring distant target points in order to determine deviations between the line of sight and the bore. In order to balance a visual error of the viewer, a diopter adjustment is available.

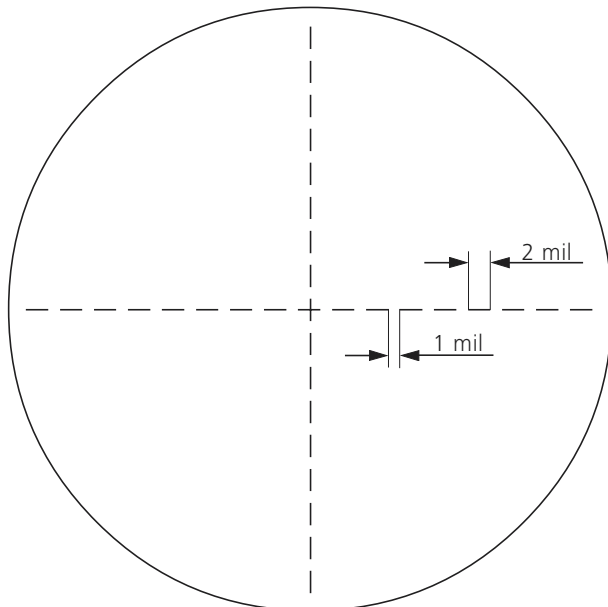
The mounting bore of the support corresponds to the standard journal of the muzzle boresight program.

The longitudinal axis of the boresight is parallel adjusted to the mounting bore to  $< 0.05$  mrad.

The boresight 10x may be fixed to the standard journal using a locking screw.



### Reticle



# Technical data

## Mechanical data

Mounting bore	25 $\pm$ $\frac{0.028}{0.007}$ mm
Adjustment of opt. axis relative to mounting bore	< 0.05 mil

## Optical data

Boresight enlargement	10x
Field of view	74 mrad
Exit pupil diameter	3.6 mm
Adjustment of optical system	1500 m
Tolerance range	500 m to $\infty$
Diopter setting	$\pm$ 5 dpt

## Reticle

Line thickness crosshairs	0.05 mil
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## Dimensions

	Length	Width	Height
Boresight telescope 10x	308 mm	62 mm	148 mm

## Weight

Boresight telescope 10x	1.1 kg
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## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No./ Part No.
Boresight telescope 10x	4933-12-189-6104 009-081.100-000

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# BT 10X MOD

## Boresight Telescope 10x, modified

### Brief description

The telescope 10x, modified, together with the corresponding boresights, shows the muzzle tangent of weapons for testing and adjusting the line of sight of optical aiming devices.

An additional in elevation adjustable reticle enables that the telescope not only can be used for distant target adjustment, but also for adjusting weapon with given elevation angles.

Both reticles are located in the eyepiece flange. The fixed reticle has broken reticle cross lines.

The adjustable reticle has a step pattern with an adjusting range of  $-5^{\circ}$  to  $+30^{\circ}$ . The horizontal line at scale value „0“ is required for aiming.

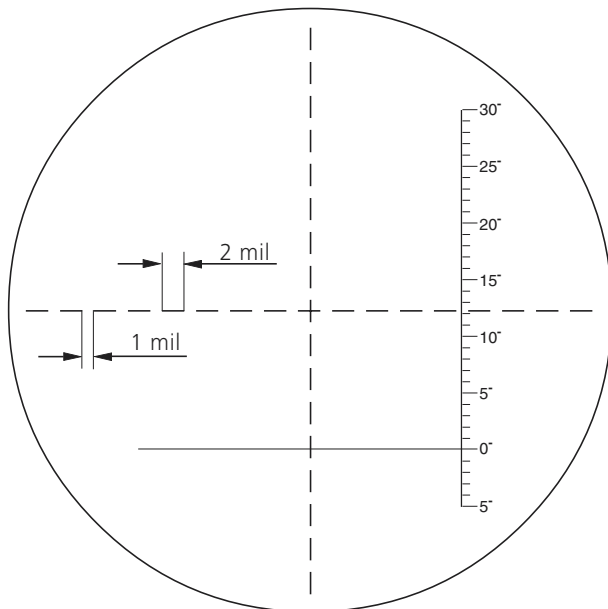
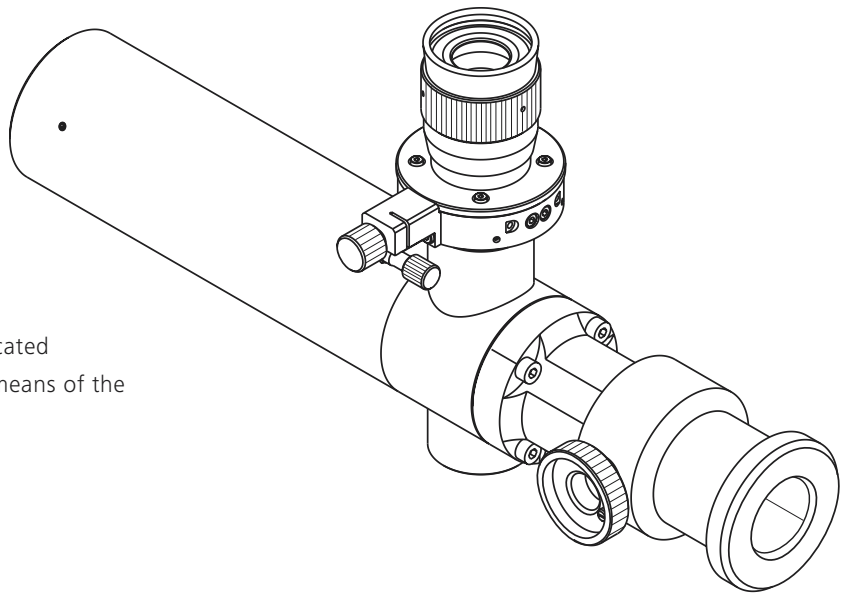
The adjustment for the movable reticle is located at the eyepiece flange and can be fixed by means of the attachment screw.

The optical system is adjusted to 1500 m.

For compensating eye deficiencies an diopter adjustment exists.

The mounting bore of holder corresponds to the standard spigot of the boresight program and is parallel adjusted to telescope longitudinal axis at  $< 0,05$  mil.

By means of the attachment screw the telescope 10x mod can be mounted on standard spigot.



Reticle pattern



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# Technical data

## Mechanical data

Mounting bore	25 $^{+0.028}_{+0.007}$ mm
Adjustment of opt. axis relative to mounting bore	< 0.05 mil
Regulating range of reticle	-5 mil until +30 mil

## Optical data

Boresight enlargement	10x
Exit pupil diameter	3.6 mm
Field of view	74 mrad
Adjustment of optical system	1500 m
Tolerance range	500 m to $\infty$
Diopter setting	$\pm 5$ dpt

## Reticle

Line thickness crosshairs	0.05 mil
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## Dimensions

	Length	Width	Height
Boresight telescope 10x, mod	306 mm	84 mm	149 mm

## Weight

Boresight telescope 10x, mod	1.680 kg
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## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No./ Part No.
Boresight telescope 10x, mod	009-084.100-000

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## Calibre Bar 25

### Brief description

The calibre bar cal. 25 mm is used, in conjunction with the boresight telescope, to image the bore while testing and adjusting the aiming devices of weapons; its application for 25 mm.

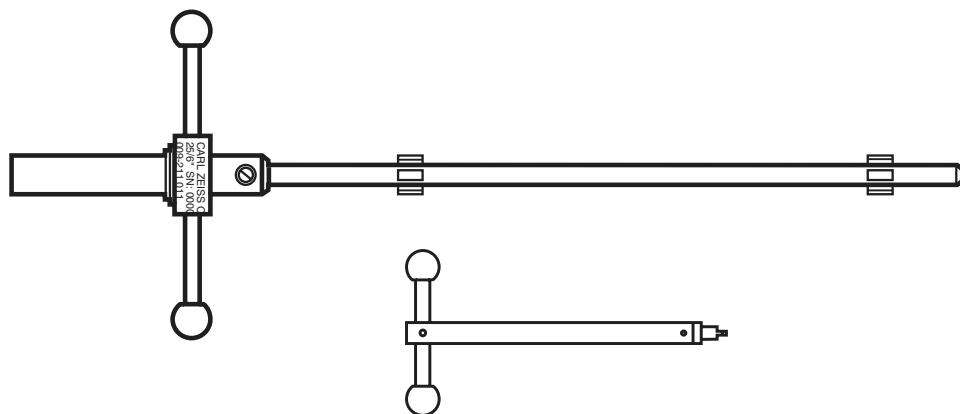
There are two times three jaws, offset by 120°, arranged at a distance of 300 mm within the tube. These are pressed toward two tapered surfaces of the gripping bar by means of springs.

The calibre bar is introduced into the muzzle.

By rotating the applied socket wrench until the stop, the jaws are brought into their latched position. Each of the two jaw systems operates independently from the other, in order to provide a central seating of the calibre bar 25 mm in case of a possible difference in diameter.

The angle error of the calibre bar relative to the muzzle amounts to  $\leq 0.03$  mrad at a spreaded position of 25 mm.

The standard journal on the calibre bar is used to mount the relevant muzzle boresight device.



# Technical data

## Mechanical data

Angle error relative to the muzzle	≤ 0.03 mil
Tensioning diameter at smallest angle error	25 mm
Tensioning range	24.8 mm to 27.5 mm
Distance between jaws	300 mm
Number of jaws	2 x 3 ea.
Diameter of standard journal	25 <sup>0</sup> <sub>-0.013</sub> mm

## Dimensions

	Length:	Width:	Height:
Calibre bar	603 mm	Ø 48 mm	-/-
- with handles		235 mm	48 mm
Socket wrench	170 mm	140 mm	25 mm

## Weight

Calibre bar	1.2 kg
Socket wrench	0.3 kg

## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No./ Part No.
CB 25 calibre bar, cal 25 mm	4933-12-344-9941
included socket wrench	009-211.011-000

Subject to design and construction modifications

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## Calibre Bar 35

### Brief description

The calibre bar cal. 35 mm is used, in conjunction with the boresight telescope, to image the bore while testing and adjusting the aiming devices of weapons; its application ranges from cal. 34.5 mm to cal. 37.5 mm.

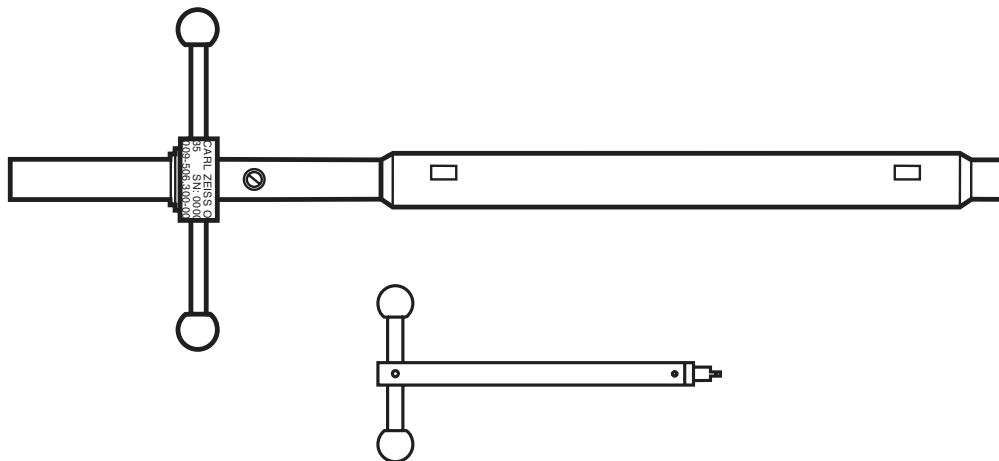
There are two times three jaws, offset by 120°, arranged at a distance of 300 mm within the tube. These are pressed toward two tapered surfaces of the gripping bar by means of springs.

The calibre bar is introduced into the muzzle.

By rotating the applied socket wrench until the stop, the jaws are brought into their latched position. Each of the two jaw systems operates independently from the other, in order to provide a central seating of the calibre bar 35 mm in case of a possible difference in diameter.

The angle error of the calibre bar relative to the muzzle amounts to  $\leq 0.25$  mrad at a spreaded position of 35 mm.

The standard journal on the calibre bar is used to mount the relevant muzzle boresight device.



## Technical data

### Mechanical data

Angle error relative to the muzzle	≤ 0.25 mil
Tensioning range	34.5 mm to 37.5 mm
Distance between jaws	300 mm
Number of jaws	2 x 3 ea.
Diameter of standard journal	25 <sup>0</sup> <sub>-0.013</sub> mm

### Dimensions

	Length:	Width:	Height:
Calibre bar	603 mm	Ø 48 mm	-/-
- with handles	603 mm	235 mm	48 mm
Socket wrench	170 mm	140 mm	25 mm

### Weight

Calibre bar	2.7 kg
Socket wrench	0.3 kg

### Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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## Scope of delivery

Article	NATO Stock No./ Part No.
CB 35 calibre bar, cal 35 mm	4933-12-161-6808 009-506.300-000
Socket wrench, short	5120-12-332-7494 009-506.220-000

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## Calibre Bar 40

### Brief description

The calibre bar cal. 40 mm is used, in conjunction with the boresight telescope, to image the bore while testing and adjusting the aiming devices of weapons; its application ranges from cal. 39.5 mm to cal. 42.5 mm.

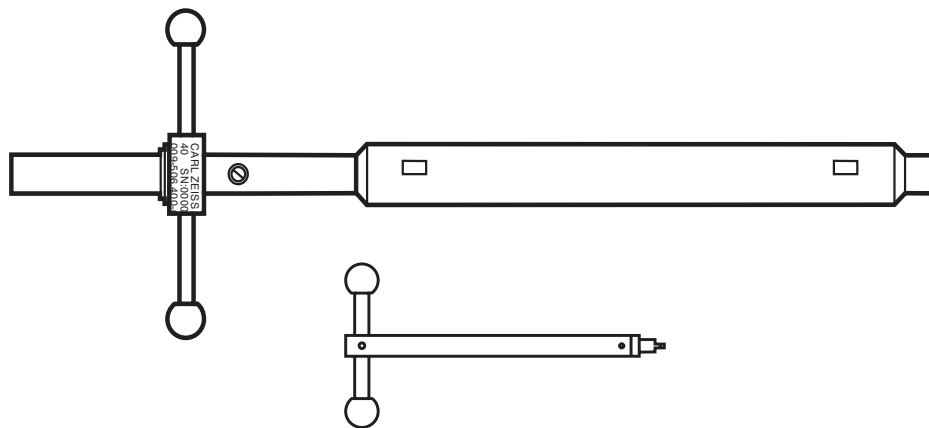
There are two times three jaws, offset by 120°, arranged at a distance of 300 mm within the tube. These are pressed toward two tapered surfaces of the gripping bar by means of springs.

The calibre bar is introduced into the muzzle.

By rotating the applied socket wrench until the stop, the jaws are brought into their latched position. Each of the two jaw systems operates independently from the other, in order to provide a central seating of the calibre bar 40 mm in case of a possible difference in diameter.

The angle error of the calibre bar relative to the muzzle amounts to  $\leq 0.25$  mrad at a spreaded position of 40 mm.

The standard journal on the calibre bar is used to mount the relevant muzzle boresight device.



# Technical data

## Mechanical data

Angle error relative to the muzzle	≤ 0.25 mil
Tensioning range	39.5 mm to 42.5 mm
Distance between jaws	300 mm
Number of jaws	2 x 3 ea.
Diameter of standard journal	25 $_{-0.013}^0$ mm

## Dimensions

	Length:	Width:	Height:
Calibre bar	603 mm	Ø 48 mm	-/-
- with handles		235 mm	48 mm
Socket wrench	170 mm	140 mm	25 mm

## Weight

Calibre bar	3.3 kg
Socket wrench	0.3 kg

## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No./ Part No.
CB 40 calibre bar, cal 40 mm	009-506.400-000
Socket wrench	5120-12-332-7494 009-506.220-000

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## Calibre Bar 120

### Brief description

The calibre bar CB 120 mm is used, in conjunction with the boresight telescope, to image the bore while testing and adjusting the aiming devices of weapons; its application ranges from approx. 100 to cal. 127 mm.

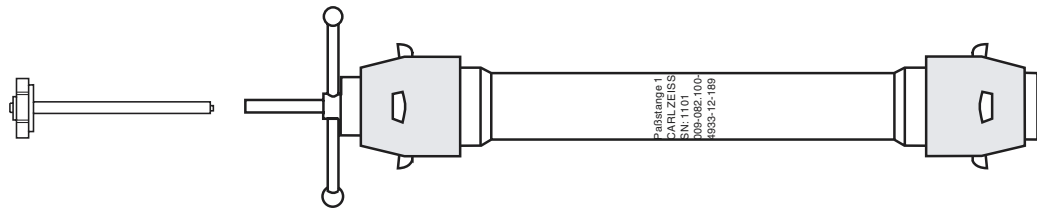
The calibre bar is introduced into the muzzle and clamped tight with the socket wrench. In doing so, three stays offset by 120° each are pressed against the inner wall of the barrel. The front stays move independently of the rear stays.

This ensures a centered fit even when the diameter of the barrel of the weapon varies.

The angle error of the calibre bar relative to the muzzle amounts to  $\leq 0.03$  mrad at a spreaded position of 120 mm.

The standard journal on the calibre bar is used to mount the relevant muzzle boresight device.

In order to prevent any excessive load on the mechanical system during the clamping of the calibre bar, the socket wrench has been fitted with a sliding clutch with responds when a specific torque is exceeded.



# Technical data

## Mechanical data

Angle error relative to the muzzle	≤ 0.03 mil
Tensioning diameter at smallest angle error	120 mm
Tensioning range	100 mm to 127 mm
Distance between stays	500 mm
Number of stays	2 x 3 ea.
Diameter of standard journal	25 <sup>0</sup> <sub>-0.013</sub> mm

## Dimensions

	Length:	Width:
Calibre bar	745 mm	Ø 94 mm
- with handles		258 mm
Socket wrench	175 mm	Ø 80 mm

## Weight

Calibre bar	4.8 kg
Socket wrench	0.6 kg

## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No./ Part No.
CB 120, calibre bar, cal 120 mm	4933-12-189-5193
included	009-082.100-000
- Socket wrench	5120-12-189-7506
	009-082.200-000
- Handgrip, two each	5315-12-173-7361
	009-515.122-000

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## Calibre Bar 138

### Brief description

The calibre bar CB 138 for cal. 74 mm to 138 mm is used, in conjunction with the boresight telescope, to image the bore while testing and adjusting the aiming devices of weapons.

The calibre bar is introduced into the muzzle and clamped tight with the socket wrench. In doing so, three stays offset by 120° each are pressed against the inner wall of the barrel. The front stays move independently of the rear stays.

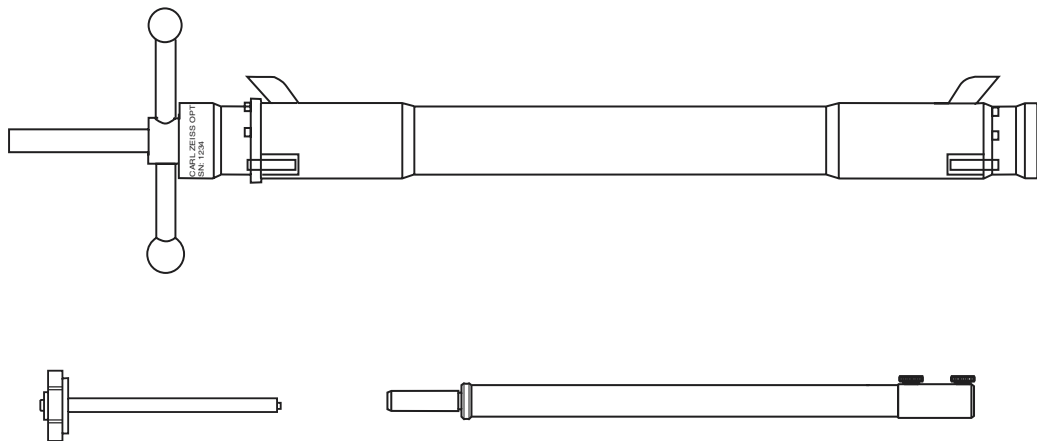
This ensures a centered fit even when the diameter of the barrel of the weapon varies.

The angle error of the calibre bar relative to the muzzle amounts to  $\leq 0.25$  mrad for each spreaded position.

The standard journal on the calibre bar is used to mount the relevant muzzle boresight device.

In order to prevent any excessive load on the mechanical system during the clamping of the calibre bar, the socket wrench has been fitted with a sliding clutch which responds when a specific torque is exceeded.

For barrels of weapons with a muzzle brake, an extension rod and a longer socket wrench are available.



# Technical data

## Mechanical data

Angle error relative to the muzzle	≤ 0.25 mil
Tensioning range	74 mm to 138 mm
Distance between stays	500 mm
Number of stays	2 x 3 ea.
Diameter of standard journal	25 <sup>0</sup> <sub>-0.013</sub> mm

## Dimensions

	Length:	Width:	Height:
Calibre bar	745 mm	Ø 73 mm	
- with handles		258 mm	
Socket wrench, short	338 mm	Ø 78 mm	
Socket wrench, long	738 mm	Ø 78 mm	
Extension rod 500 mm	500 mm	61.5 mm	47.5 mm

## Weight

Calibre bar	4.8 kg
Socket wrench, short	0.6 kg
Socket wrench, long	0.7 kg
Extension rod 500 mm	1.2 kg

## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No./ Part No.
CB 138 calibre bar, cal 74 mm to 138 mm	4933-12-168-0640 009-515.101-000
Socket wrench, short	5120-12-173-5048 009-515.130-000
Socket wrench, long	5120-12-173-6913 009-515.140-000
Extension rod 500 mm	4933-12-168-2516 009-510.501-000

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## Calibre Bar 155

### Brief description

The calibre bar CB 155 is used, in conjunction with the boresight telescope, to image the bore while testing and adjusting the aiming devices of weapons; its application ranges from approx. 119,5 mm to cal. 260 mm.

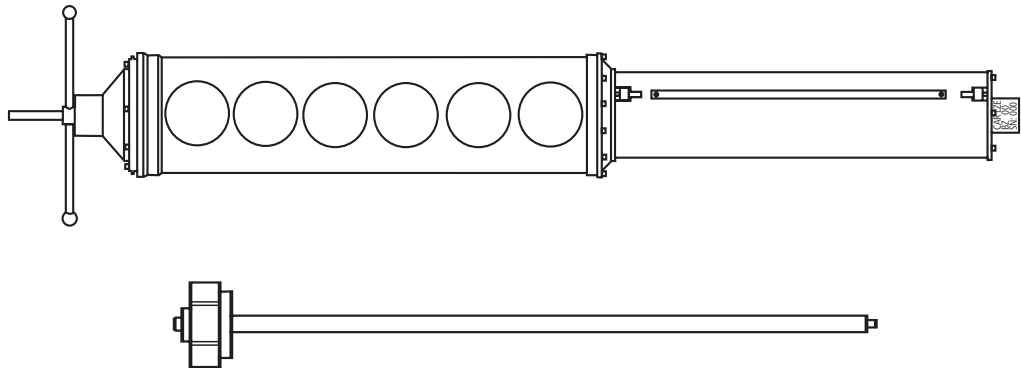
The calibre bar is introduced into the muzzle and clamped tight with the socket wrench. In doing so, three stays offset by 120° each are pressed against the inner wall of the barrel. The front stays move independently of the rear stays.

This ensures a centered fit even when the diameter of the barrel of the weapon varies.

The angle error of the calibre bar relative to the muzzle amounts to  $\leq 0.03$  mrad at a spreaded position of 155 mm.

The standard journal on the calibre bar is used to mount the relevant muzzle boresight device.

In order to prevent any excessive load on the mechanical system during the clamping of the calibre bar, the socket wrench has been fitted with a sliding clutch which responds when a specific torque is exceeded.



# Technical data

## Mechanical data

Angle error relative to the muzzle	≤ 0.03 mil
Tensioning diameter at smallest angle error	155 mm
Tensioning range	155 mm to 260 mm
Distance between stays	500 mm
Number of stays	2 x 3 ea.
Diameter of standard journal	25 <sup>0</sup> <sub>-0,013</sub> mm

## Dimensions

	Length:	Width:
Calibre bar	1526 mm	Ø 154 mm
- with handles		400 mm
Socket wrench	1160 mm	Ø 78 mm

## Weight

Calibre bar	14.9 kg
Socket wrench	0.8 kg

## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	Part No.
CB 155 calibre bar, cal 155 mm to 260 mm	009-229.100-000
Socket wrench	009-229.200-000

Subject to design and construction modifications

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## Calibre Bar 260

### Brief description

The calibre bar CB 260 for cal. 119.5 mm to 260 mm is used, in conjunction with the boresight telescope, to image the bore while testing and adjusting the aiming devices of weapons.

The calibre bar is introduced into the muzzle and clamped tight with the socket wrench. In doing so, three stays offset by 120° each are pressed against the inner wall of the barrel. The front stays move independently of the rear stays.

This ensures a centered fit even when the diameter of the barrel of the weapon varies.

The angle error of the calibre bar relative to the muzzle amounts to  $\leq 0.25$  mrad for each spreaded position.

The standard journal on the calibre bar is used to mount the relevant muzzle boresight device.

In order to prevent any excessive load on the mechanical system during the clamping of the calibre bar, the socket wrench has been fitted with a sliding clutch which responds when a specific torque is exceeded.

For barrels of weapons with a muzzle brake, an extension rod and a longer socket wrench are available.



# Technical data

## Mechanical data

Angle error relative to the muzzle	≤ 0.25 mil
Tensioning range	119.5 mm to 260 mm
Distance between stays	500 mm
Number of stays	2 x 3 ea.
Diameter of standard journal	25 $^{+0}_{-0.013}$ mm

## Dimensions

	Length:	Width:	Height:
Calibre bar	820 mm	Ø 119 mm	
- with handles		400 mm	
Socket wrench, short	428 mm	Ø 78 mm	
Socket wrench, long	838 mm	Ø 78 mm	
Extension rod 500 mm	500 mm	61.5 mm	47.5 mm

## Weight

Calibre bar	10.2 kg
Socket wrench, short	0.6 kg
Socket wrench, long	0.7 kg
Extension rod 500 mm	1.2 kg

## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No./ Part No.
CB 260 calibre bar, cal 119.5 mm to 260 mm	4933-12-168-2313 009-516.101-000
Socket wrench, short	5120-12-173-5673 009-516.130-000
Socket wrench, long	5120-12-173-5674 009-516.140-000
Extension rod 500 mm	4933-12-168-2516 009-510.501-000

Subject to design and construction modifications

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## Collimator K 18m

### Brief description

The collimator 18 m is used to test and adjust the line of sight of aiming devices relative to the boresight line of barrel fitted weapons when relevant muzzle boresight devices are employed. A plumb line test can be performed as well.

Its short setup distance of up to a maximum of 18 m, allows testing or adjusting during inclement vision and weather conditions, in cramped space (e.g., in a hall or in a gun position) and with the gun canted. Nevertheless, an adjustment accuracy of 0.1 mrad is achieved.

A reticle exchange system allows optionally a point or a parallel adjustment. Special reticles relevant for the appropriate weapons system are available.

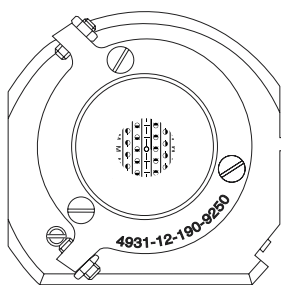
The optics module of the K 18m consists of a collimator coordinated to 1500 m and a sighting telescope to align the collimator.

When using the circular bubble which is aligned to the rotary axes and which may be balanced out via two adjusting screws at the foot of the platform, the K 18m is adjusted for horizon.

### Reticles

The standard reticle is used for parallel adjustment of weapons systems and to sight guns.

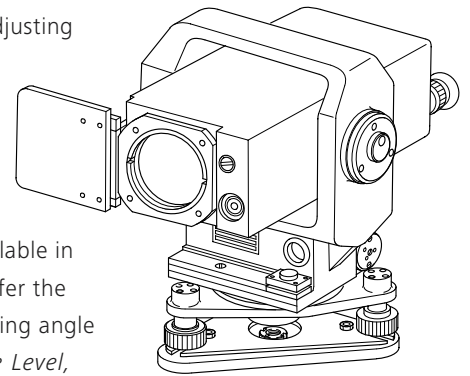
The graduation is subdivided into 85 columns (only a small section is pictured here). The distance of the delineation lines from the middle of the line to the middle of the line amounts to 2.1 mrad.



The collimator signs located between the delineation lines are used for orientation on the graduation. Each sign within a column repeats itself regularly.

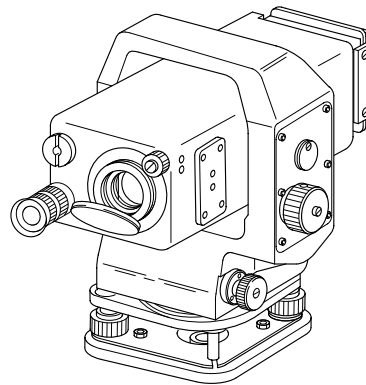
The reticle is traversable by 90°. The delineation lines must be just for lateral adjustment and for sighting guns in a vertical position; when adjusting for height in a horizontal position.

In order to guarantee testing and adjusting of a weapons system canted to the side, a reference surface is available in order to transfer the weapons canting angle via the *Bubble Level, Adjustable*.



Adjusting the horizon of the weapon is not necessary.

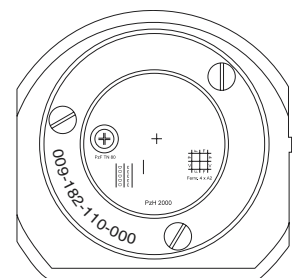
With good illumination, the reticle of the collimator is illuminated via a folding mirror. If the environmental light is insufficient, an illumination facility may be used.



The special reticles are used for point adjustment of weapons systems.

The reticles show all required marks to adjust the relevant system (shown as an example is the special reticle for Self-Propelled Howitzer 2000).

In contrast to the standard reticle, the special reticles can perform lateral adjustment and adjustment for height at the same time. This is feasible by the arrangement and design of the adjustment marks corresponding to the view coordinates of the aiming device relative to the weapon.



# Technical data

## Mechanical data

Plumb line error, traversing range $\pm 20^\circ$	0.1 mrad
Horizontal sequence error	0.5 mrad

## Optical data

### Daylight collimator

Focal distance of lens	174 mm
Free aperture of the collimator	78 mm
Overall angle of the collimator sign	177.8 mrad
Coordination of optical system	1500 m
Tolerance range	750 m to $\infty$

### Sighting telescope

Enlargement	4x
Exit pupil	3 mm
Field of view	6°
Adjustment range, ocular	$\pm 5$ dpt

## Dimensions

	Length:	Width:	Height:
K 18m	335 mm	230 mm	330 mm
Case	600 mm	400 mm	500 mm
Tripod diameter	$\varnothing$ 200 mm	1050-1700 mm	

## Weight

KTW 18m	13.0 kg
Case with accessories	17.0 kg
Tripod with carrying facility	6.2 kg

## Environmental conditions

Environmental test	MIL-STD-810E (in extracts)
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## Scope of delivery

Article	NATO Stock No. Part No.
K 18 m with accessories in case, without tripod	4931-12-193-5001 009-098.010-000

### Consisting of:

1 case	4931-12-199-7369 009-098.008-000
1 K 18m with standard reticle	4931-12-300-1923 009-098.001-000

### Special accessories on order:

1 tripod with carrying facility	1290-12-135-3408 009-110.060-000
1 special reticle Self- Propelled Howitzer 2000	009-182.110-000
1 special reticle PERI-Z11 (DK)	009-182.071-000

Additional special reticles as per specifications of customer.

Subject to design and construction modifications

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## Collimator day/thermal imaging 18m

### Brief description

The collimator daylight/thermal imaging 18 m is used to test and adjust the line of sight of long-range optical daylight and thermal imaging devices relative to the bore of barrel-fitted weapons when relevant line of sight test units are employed. A plumb line test can be performed as well.

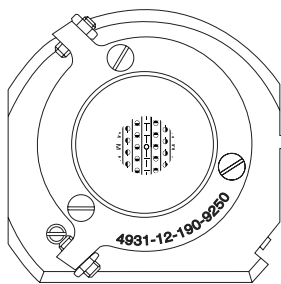
Its short setup distance of up to a maximum of 18 m, allows testing or adjusting during inclement vision and weather conditions, in cramped space (e.g., in a hall or in a gun position) and with the gun canted. Nevertheless, an adjustment accuracy of 0.1 mrad is achieved.

A reticle exchange system in the daylight collimator allows optionally a point or a parallel adjustment. Special reticles relevant for the appropriate weapons system are available.

The optics module of the KTW 18m consists of a daylight and a thermal imaging collimator coordinated to 1500 m and a sighting telescope to align the collimator. Depending on the lateral setup of the daylight and thermal imaging units at the weapons system, the optics module may be moved from one side to the other without problems.

### Reticles

The standard reticle is used for parallel adjustment of weapon systems and to sight guns.



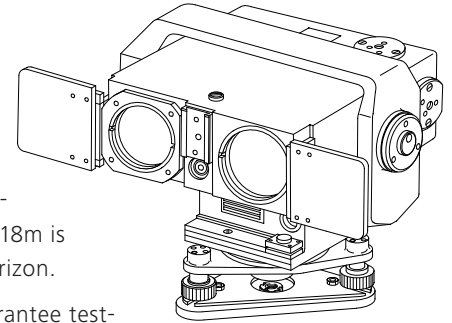
The graduation is subdivided into 85 columns (only a small section is pictured here). The distance of the delineation lines from the middle of the line to the middle of the line amounts to 2.1 mrad.

The collimator signs located between the delineation

lines are used for orientation on the graduation. Each sign within a column repeats itself regularly.

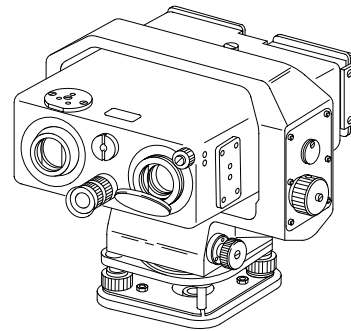
The reticle is traversable by 90°. The delineation lines must be just for lateral adjustment and for sighting guns in a vertical position; when adjusting for height in a horizontal position.

When using the circular bubble which is aligned to the rotary axes and which may be balanced out via two adjusting screws at the foot of the platform, the KTW 18m is adjusted for horizon.



In order to guarantee testing and adjusting of a weapons system canted to the side, a reference surface is available in order to transfer the weapons canting angle via the *Bubble Level, Adjustable*. Adjusting the horizon of the weapon is not necessary.

With good illumination, the reticle of the daylight collimator is illuminated via a folding mirror. If the environmental light is insufficient, an illumination facility may be used. For the thermal imaging collimator, an illumination facility with a permanently integrated thermal module is available.

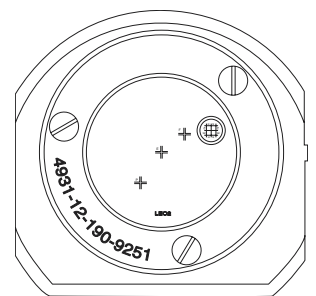


The special reticles are used for point adjustment of weapon systems.

The reticles show all required marks to adjust the relevant system (shown as an example is the special reticle for MBT Leopard 2).

In contrast to the standard reticle, the special reticles can perform lateral adjustment and adjustment for height at the same time.

This is feasible by the arrangement and design of the adjustment marks corresponding to the view coordinates of the aiming device relative to the weapon.



# Technical data

## Mechanical data

Plumb line error, traversing range $\pm 20^\circ$	0.1 mrad
Horizontal sequence error	0.5 mrad

## Optical data

Daylight collimator	
Focal distance of lens	174 mm
Free aperture of the collimator	78 mm
Overall angle of the collimator sign	177.8 mrad
Coordination of optical system	1500 m
Tolerance range	750 m to $\infty$
Thermal imaging collimator	
Focal distance of lens	580 mm
Free aperture of the collimator	78 mm
Coordination of optical system	1500 m
Tolerance range	750 m to $\infty$

## Sighting telescope

Enlargement	4x
Exit pupil	3 mm
Field of view	6°
Adjustment range, ocular	$\pm 5$ dpt

## Dimensions

### KTW 18m

Length:	335 mm
Width:	355 mm
Height:	320 mm

### Case

Length:	600 mm
Width:	500 mm
Height:	500 mm

### Tripod diameter

Width:	$\varnothing$ 200 mm
Height:	1050-1700 mm

## Weight

KTW 18m	18.0 kg
Case with accessories	24.0 kg
Tripod with carrying facility	6.2 kg

## Environmental conditions

Environmental test	MIL-STD-810E (in extracts)
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# Scope of delivery

Article	NATO Stock No.Part No.
KTW 18 m with accessories in case, without tripod	4931-12-187-147 009-110.010-000

### Consisting of:

1 case	4931-12-199-7368 009-110.008-000
1 KTW 18m with standard reticle	4931-12-300-1493 009-110.001-000

### Special accessories on order:

1 tripod with carrying facility	1290-12-135-3408 009-110.060-000
1 special reticle Leopard 2	4931-12-190-9251 009-098.003-000
1 special reticle Leopard 1	4931-12-197-5531 009-098.004-000
1 special reticle Marder/Luchs	4931-12-197-5532 009-098.005-000

Article	NATO Stock No. Part No.
1 special reticle Leopard 1 (NL)	4931-12-197-5533 009-098.006-000
1 special reticle Bradley M2 (USA)	009-182.030-000
1 special reticle PERI-Z11 (DK)	009-182.071-000
1 special reticle Challenger 1 (GB)	009-182.123-000
1 mounting for lighting system	4931-12-198-9780 009-110.025-000

Additional special reticles as per specifications of customer.

Subject to design and construction modifications

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# K 18M WITH FMA

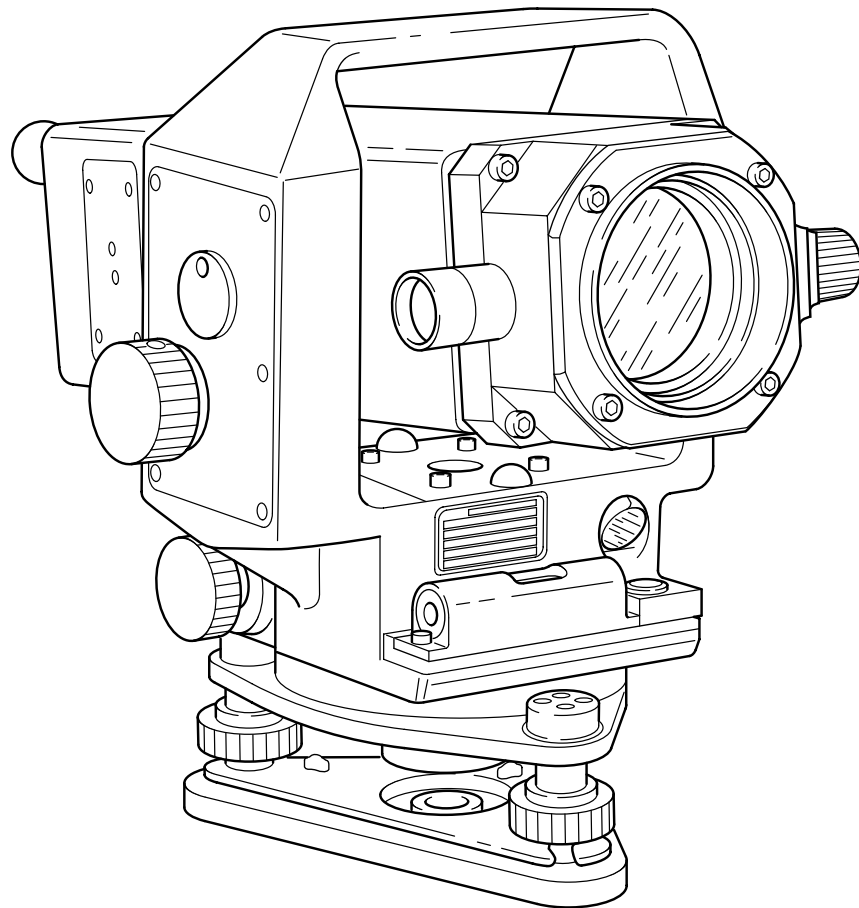
## **Collimator 18m with Front Measuring Attachment**

### **Brief description**

The basic of this equipment is the collimator K18m. The K 18m is described in the data sheet K 18m.

The front measuring attachment for the collimator 18m is used in conjunction with the relevant line of sight testers to determine the azimuth deviation values of remote viewing optics referred to the azimuth centre of arc of the weapon system. The determined deviation values can, for example, be entered in the relevant system computer as correction values

The front measuring attachment is mounted axially in front of the collimator exit window. Its principal components are the housing, two glass optical wedges, each mounted in a bevel pinion, an adjusting knob, a measuring magnifier and a protective cover. Both optical wedges are located in ball bearings in the housing and driven by a bevel pinion using the adjusting knob on the right. The optical wedges are displaced in relation to each other, permitting +45 mrad lateral deflection of the optical axis. The determined deviation value can be read off the measuring magnifier on the left with an accuracy of 0.5 mrad.



We make it visible.

## Technical data

### Performance characteristics

Deflection fault with index position "0"	$\pm 10''$
Deflection fault in the entire adjustment range	$\leq 30''$

### Dimensions

	Length	Width	Height
Front measuring attachment	182 mm	68 mm	111 mm

## Scope of delivery

Article	Part No.
K 18 m with front measuring attachment and accessories in case	009-163.000-000

Subject to design and construction modifications

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## Tripod 9

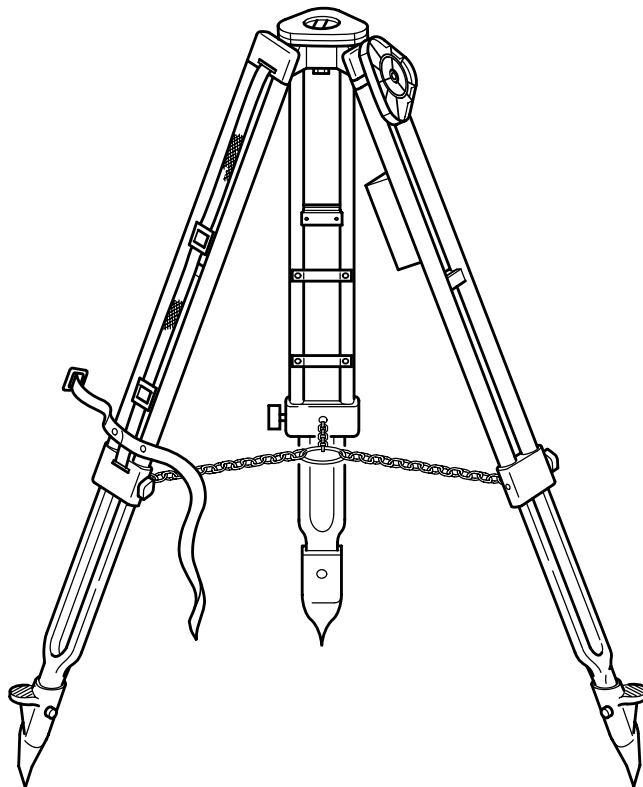
### Brief description

The SST9 as a universal tripod is recommended for a broad variety of different instruments and applications, e.g. aiming circles, goniometers, theodolites, gyros, target acquisition system, collimators,

such as:

Wild G11, G2, T2S, ARK, SKK7, TAS10, K 18m, KTW 18m, etc.

The very useful accessories like safety chain, plumb bob and hexagonal key are stored in a pouch which is fixed to one of the telescopic legs. Additionally they are equipped with brackets to carry an external battery and also a target rod.



# Technical data

## Mechanical data

Tripod head with flat dish	Ø 130 mm
- central fixing screw	16 mm thread, on request 5/8" thread
- centring range	54 mm
Legs	telescopic
- inclination range	0° to 85°

## Dimensions

Height of tripod dish above ground, open out, safety device connected	1.01 m to 1.66 m
Length of tripod, legs extended	1.80 m
Length of tripod, legs retracted	1.08 m
Cardboard box with styropor inserts	1.17 m x 0.23 m x 0.25 m

## Materials

Main metal parts	Aluminium (amagnetic)
Legs	Wood
Paint	RAL 6031-F9
Connection between wood legs and boots	Sealed
Protective cover	Plastic
Packing for delivery	Cardboard box with styropor inserts

## Weight

Weight with shoulder carrying strap tripod accessories pouch protective cover	6.7 kg
Cardboard box with styropor inserts	1.5 kg

# Scope of delivery

Article	Part No.
SST9 tripod with shoulder carrying strap protective cover tripod accessories pouch with - Safety chain - Plumb bob - Hexagonal key	009-110.065-000

Subject to design and construction modifications

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## Bubble Level, Adjustable

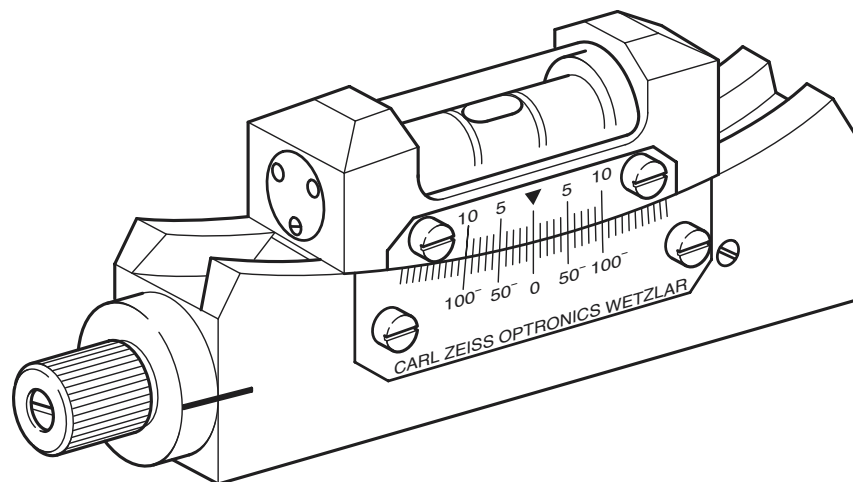
### Brief description

The Bubble level, adjustable is used as a goniometer to measure the tilt angle of the trunnion axis. This angular value is transferred during testing and adjusting of the line of sight of aiming devices to the bore of weapons onto the relevant boresight and the appropriate collimator.

The weapon need not be adjusted for horizon.

A prismatic support allows using this bubble level even on cylindrical objects for measurement. The support surface of the Bubble level, adjustable and the prismatic support are fitted with permanent magnets in order to guarantee a secure adhesion even in a tilted position.

The bubble level, which is to be equipped to  $< 0.1$  mrad, may be reset to the left and right via a worm pinion by 100 mrad per side. The tilt angle may be read at the lateral scale via a nonius with an accuracy of 1 mrad.



# Technical data

## Mechanical data

Measuring range	± 100 mrad
Division bubble level	0.15 mrad
Reading accuracy	1 mrad

## Dimensions

	Length	Width	Height
Bubble level, adjustable	120 mm	23 mm	45.0 mm
Support area	100 mm	20 mm	
Prismatic support	102 mm	30 mm	16.5 mm
Container	165 mm	110 mm	55.0 mm

## Weight

Bubble level, adjustable	0.5 kg
Prismatic support	0.4 kg
Container	0.2 kg

## Environmental conditions

Environmental test	MIL-STD-810E (in extracts)
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# Scope of delivery

## Article

## NATO Stock No./ Part No.

Bubble level, adj. with prism support	1290-12-187-3212 009-131.000-000
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### Consisting of:

1 Container without inset	8115-12-195-1978 009-131.850-000
1 Container inset (to be fitted)	8135-12-195-1977 009-131.810-000
1 Bubble level, adjustable	1240-12-187-3514 009-099.100-000
1 Prismatic support	1240-12-187-3839 009-131.200-000
Bubble level, adjustable without prism support	1290-12-186-5614 009-099.000-000

### Consisting of:

1 Container without inset	8115-12-306-9596 009-099.850-000
1 Container inset (to be fitted)	009-099.810-000
1 Bubble level, adjustable	1240-12-187-3514 009-099.100-000

The "Bubble level, adjustable" is also part of the K 18m and KTW 18m and will be supplied with these without the "prismatic support" together with other test devices in a transport and storage container.

Subject to design and construction modifications

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## Bubble Level Quadrant T

### Brief description

The bubble level quadrant T is a goniometer for an accurate transfer and measurement of tilt angles.

The design of the prismatic support allows measuring on level surfaces or cylindrical journals. For narrow surfaces, an adapter is available. Both, support and adapter are fitted with permanent magnets in order to ensure reliable adhesion even in a tilted position.

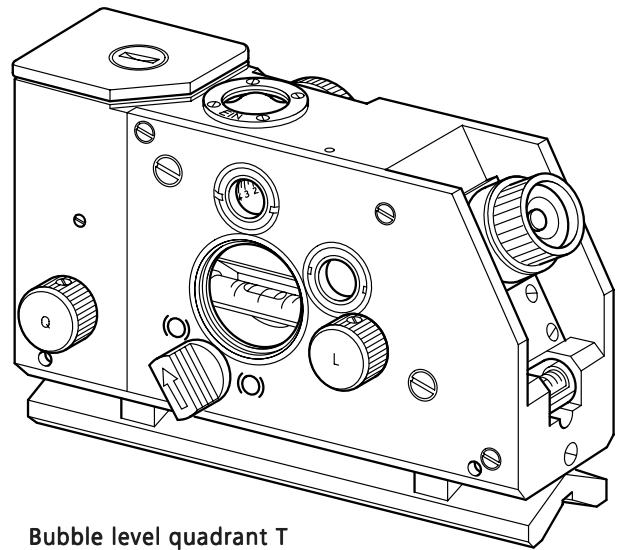
With a lateral tilt of up to  $10^\circ$  of the object to be measured, the bubble level quadrant may be placed vertically using the rotary knob Q. The longitudinal bubble level is equipped with the knurled disk for rough adjustment and with the rotary knob L for vernier adjustment. A catch to secure the set value is provided.

The tilt angle may be read on a rough and on a vernier division. The rough division, starting with 0 mrad, is marked to the left as a minus range and to the right as a plus range at intervals of 50 mrad.

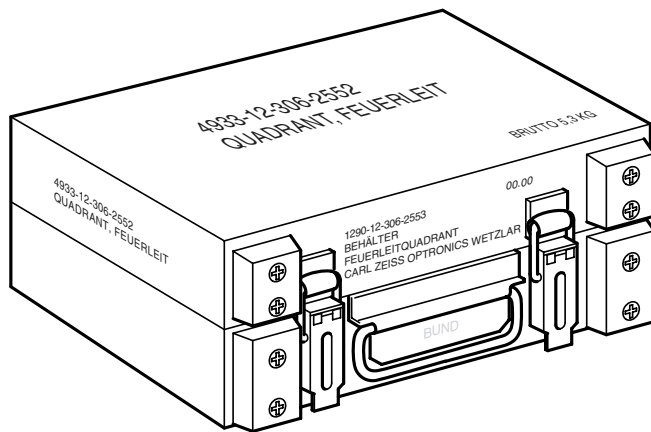
An eyepiece enlarges the nonius of the vernier division 50 times, allowing a reading of the measured value with an accuracy of 0.1 mrad.

For working at dawn and at night, the rough and the vernier division and the longitudinal and the transverse bubble level may be illuminated by LED'S.

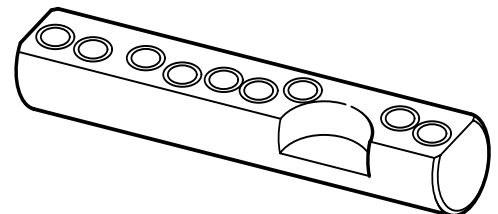
Power supply, three 1.5 V mignon cells, is interrupted by a timer after an operating time of 2.5 minutes.



Bubble level quadrant T



Storage Container



Prismatic support



# Technical data

## Mechanical data

Measuring range	3200 mrad
Division interval, rough scale	50 mrad
, vernier scale	1 mrad
, longitudinal bubble level	0.2 mrad
, transverse bubble level	1.2 mrad

## Electrical data

Illumination	Daylight or 4 LED's
Power supply	3 Dry batteries 1.5 V mignon cells

## Dimensions

	Length	Width	Height
Bubble level quadrant T	160 mm	55 mm	112 mm
Adapter	160 mm	Ø 25 mm	21 mm
Container	260 mm	202 mm	108 mm

## Weight

Bubble level quadrant T	1.7 kg
Adapter	0.5 kg
Storage container	3.1 kg
Total weight	5.3 kg

## Environmental conditions

Environmental test	MIL-STD-810C (in extracts)
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# Scope of delivery

Article	NATO Stock No. Part No.
Bubble level quadrant T with accessories	4933-12-306-2552 009-133.000-000

### Consisting of:

- 1 Container	1290-12-306-2553 009-133.850-000
- 1 Bubble level quadrant T	1290-12-306-2557 009-133.100-000
- 1 prismatic support	1290-12-306-3354 009-133.300-000
- 3 Dry batteries 1.5 V	6135-12-189-4186

Subject to design and construction modifications

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## Synchronous Operation Tester GPG ASP

### Brief description

The Synchronous Operation Tester GPG ASP is used to inspect the primary sights of armoured vehicles such as the Leopard 1 and 2 MBTs.

The following functions can be tested:

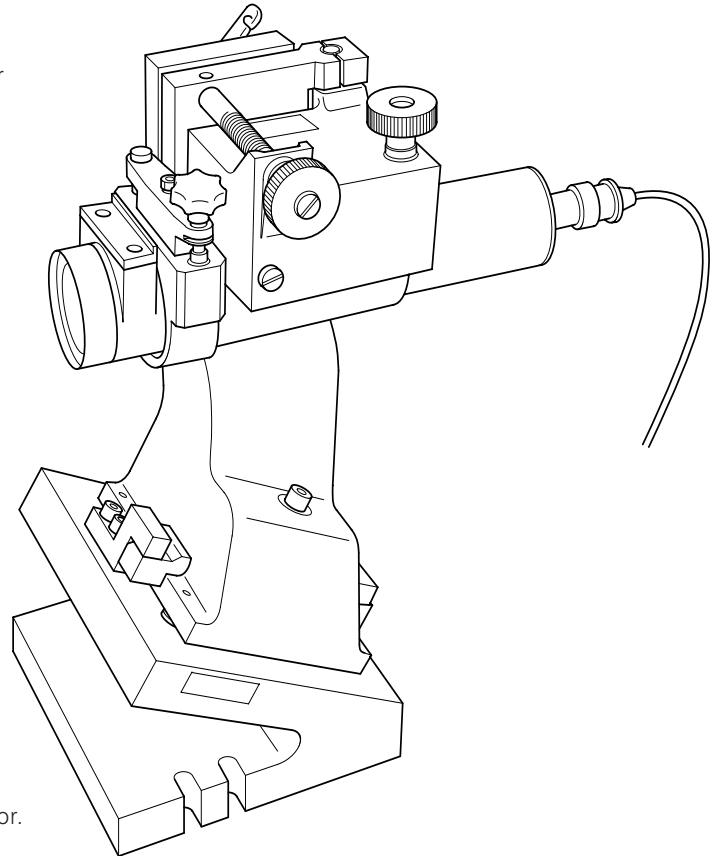
- Synchronous and parallel operation of the primary or commander periscope in "elevation" and "azimuth" in relation to the main weapon.
- Angle of elevation and lead angle and their correct transmission by the resolver chain.
- Parallax equalization, including the resolver chain and thus a computer function at a defined range.

The GPG ASP consists of:

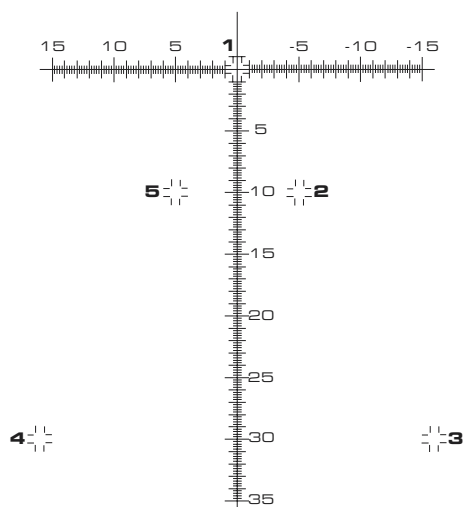
- Collimator
- Lighting unit
- Positioning device
- Various mounts.

A baseplate with retaining claws for securing the relevant mount is provided on the turret screen or main weapon. The mount accommodates a seat with sliding block for locating the universal positioning device with collimator. The positioning device allows horizontal, vertical and axial adjustment of the collimator.

The collimator is provided with a bubble level mount set parallel to the collimator cross hairs. The *Bubble Level, Adjustable* can be used to transmit the MBT angle of cant from a position on the trunnion axis to the collimator and to check the cross hair alignment of the relevant sight.



### Reticle



The collimator reticle contains cross hairs with divisions for any angle of elevation or lead angle as well as five apex bars with tolerance fields which are controlled using the test system of the fire control installation. The division of the cross hairs permits a reading accuracy of 0.2 mrad. The size of the apex bar tolerance fields is  $\pm 0.25$  mrad. The collimator reticle can be modified in accordance with customers' wishes.

The collimator reticle light is powered by the tank's electrical system.



# Technical data

## Mechanical data

### Collimator mount adjusting angle:

- Axial	± 4°
- Vertical	± 2.5°
- Horizontal	± 2.5°

## Optical data

Collimator focal length	282 mm
Entrance pupil diameter	50 mm

## Dimensions

### Case

Length:	560 mm
Width:	400 mm
Height:	402 mm

### Mount ASP, EMES 18

Length:	170 mm
Width:	160 mm
Height:	366 mm

### Mount ASP, TRP

Length:	228 mm
Width:	160 mm
Height:	596 mm

## Positioning device

Length:	171 mm
Width:	161 mm
Height:	149 mm

## Collimator

Length:	296 mm
Width:	68 mm
Height:	76 mm

## Cable for lighting unit

Length:	8000 mm
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## Weight

Case	21.5 kg
Mount ASP, EMES 18	4.2 kg
Mount ASP, TRP	6.5 kg
Positioning device	3.5 kg
Collimator	0.3 kg
Accessories	0.1 kg

## Electrical data

Lighting unit	28 V / 3 W
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## Environmental conditions

Environmental test	MIL-STD-810E (in extracts)
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# Scope of delivery

Article	NATO Stock No. Part No.
Synchronous operation tester, GPG ASP, complete in case	4931-12-310-6410 009-149.000-000

### Consisting of:

- 1 Mount ASP, EMES 18	4931-12-310-6411 009-149.110-000
- 1 Mount ASP, TRP	4931-12-310-6413 009-149.210-000
- 1 Positioning device	4931-12-310-6412 009-149.120-000
- 1 Collimator	4931-12-192-6322 009-083.150-000
- 1 Lighting unit	6220-12-309-2566 009-083.191-000

Article	NATO Stock No. Part No.
- 1 Case	8145-12-329-6686 009-149.700-000
- 2 Padlocks	5340-12-139-2844 DIN7465-E1-30-BK
- 1 Allan key DIN 911-8-Ni8	5120-12-121-1058 705-376.605-000
- 1 Bulbs, 28 V / 3 W	6240-12-144-9773 038-101.120-000
- 1 Cleaning brush	7920-12-120-0355 001-202.026-000
- 1 Cleaning cloth	6640-12-137-2580 001-202.027-000

Subject to design and construction modifications

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## Synchronous Operation Tester GPG EMES 15

### Brief description

The Synchronous Operation Tester GPG EMES 15 is used to inspect the sight system EMES 15 for the Leopard 2 MBT up to version A4.

The following functions can be tested:

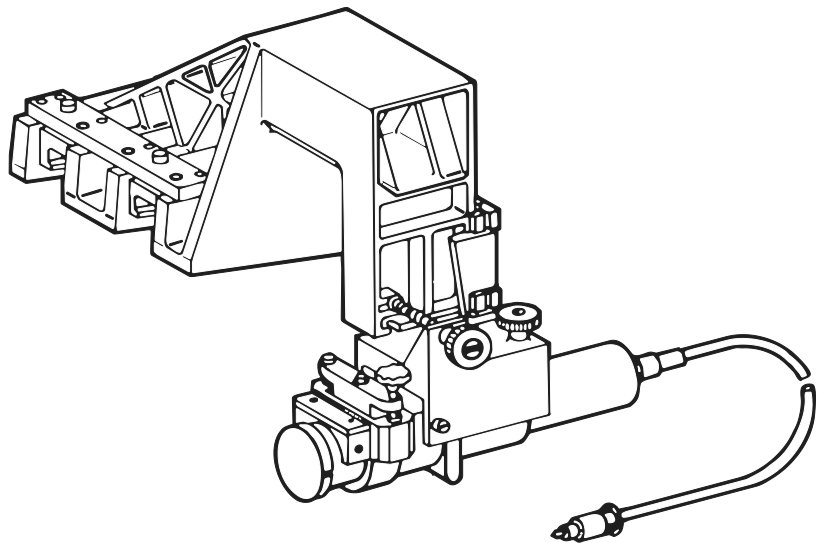
- Synchronous and parallel operation of the sight system EMES 15 in "elevation" and "azimuth" in relation to the main weapon.
- Angle of elevation and lead angle and their correct transmission by the resolver chain.
- Parallax equalization, including the resolver chain and thus a computer function at a defined range.

The GPG EMES 15 consists of:

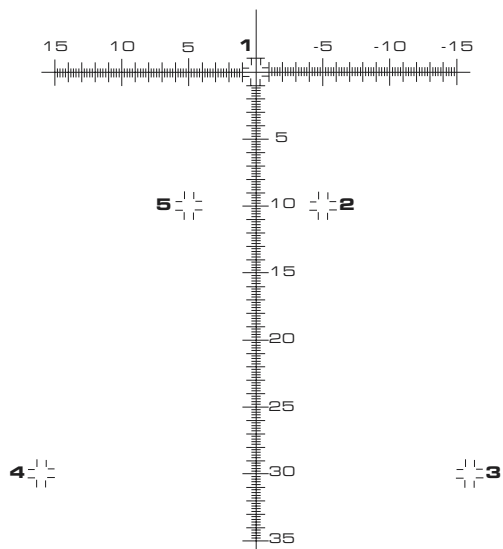
- Support
- Positioning device
- Collimator
- Lighting unit

The support will be fixed on the turret screen. The positioning device allows horizontal, vertical and axial adjustment of the collimator. The collimator is provided with a bubble level mount set parallel to the collimator cross hairs.

The *Bubble Level, Adjustable* can be used to transmit the MBT angle of cant from a position on the trunnion axis to the collimator and to check the cross hair alignment of sight system EMES 15.



### Reticle



The collimator reticle contains cross hairs with divisions for any angle of elevation or lead angle as well as five apex bars with tolerance fields which are controlled using the test system of the fire control installation. The division of the cross hairs permits a reading accuracy of 0.2 mrad. The size of the apex bar tolerance fields is  $\pm 0.25$  mrad. The collimator reticle can be modified in accordance with customers' wishes.

The collimator reticle light is powered by the tank's electrical system.



# Technical data

## Mechanical data

Collimator mount adjusting angle:

- Axial	± 4°
- Vertical	± 2.5°
- Horizontal	± 2.5°

## Optical data

Collimator focal length	282 mm
Entrance pupil diameter	50 mm

## Dimensions

	Length:	Width:	Height:
GPG EMES 15	315 mm	494 mm	336 mm
Case	560 mm	400 mm	402 mm
Cable for lighting unit	8000 mm		

## Weight

GPG	12 kg
Case	19 kg

## Electrical data

Lighting unit	28 V / 3 W
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## Environmental conditions

Environmental test	MIL-STD-810E (in extracts)
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# Scope of delivery

Article	NATO Stock No. Part No.
Synchronous operation tester, GPG EMES 15, complete in case	4931-12-187-1480 009-083.000-000

### Consisting of:

- 1 GPG EMES 15	4931-12-306-7411 009-083.100-000
- 1 Case	4931-12-198-7587 009-083.800-000
- 1 Padlocks	5340-12-139-2844 DIN 7465-E1-30-BK
- 1 Allan key	5120-12-121-1058 8DIN911GALN18
- 1 Bulbs, 28 V / 3W, BA7s	6240-12-144-9773 038-101.120-000
- 1 Cleaning brush	7920-12-120-0355 001-202.026-000
- 1 Cleaning cloth	6640-12-137-2580 001-202.027-000

Subject to design and construction modifications

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# GPG EMES 15 KWS

## Synchronous Operation Tester GPG EMES 15 KWS

### Brief description

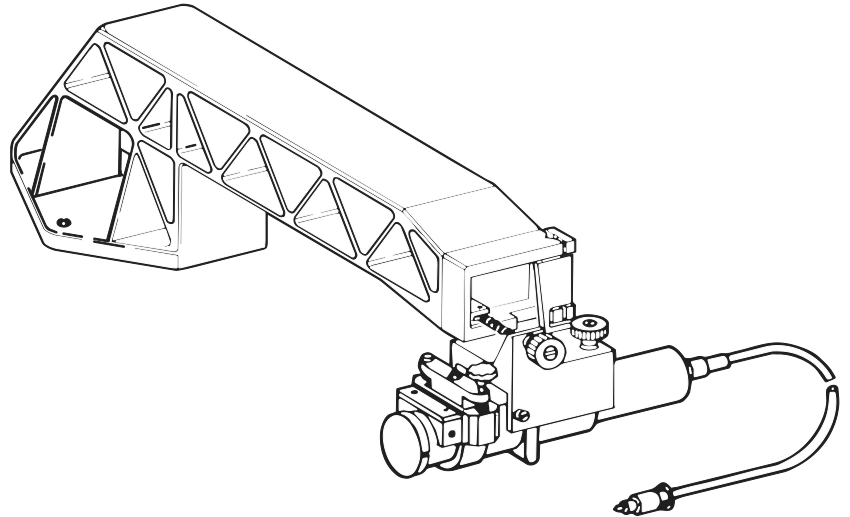
The Synchronous Operation Tester GPG EMES 15 KWS is used to inspect the sight system EMES 15 for the Leopard 2 MBT A5.

The following functions can be tested:

- Synchronous and parallel operation of the sight system EMES 15 in "elevation" and "azimuth" in relation to the main weapon.
- Angle of elevation and lead angle and their correct transmission by the resolver chain.
- Parallax equalization, including the resolver chain and thus a computer function at a defined range.

The GPG EMES 15 consists of:

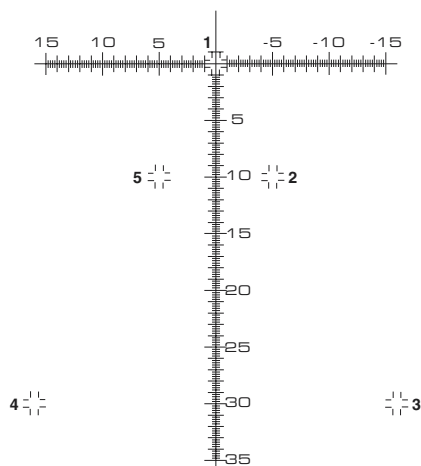
- Support
- Positioning device
- Collimator
- Lighting unit



The support will be fixed on the turret screen. The positioning device allows horizontal, vertical and axial adjustment of the collimator. The collimator is provided with a bubble level mount set parallel to the collimator cross hairs.

The *Bubble Level, Adjustable* can be used to transmit the MBT angle of cant from a position on the trunnion axis to the collimator and to check the cross hair alignment of sight system EMES 15.

### Reticle



The collimator reticle contains cross hairs with divisions for any angle of elevation or lead angle as well as five apex bars with tolerance fields which are controlled using the test system of the fire control installation. The division of the cross hairs permits a reading accuracy of 0.2 mrad. The size of the apex bar tolerance fields is  $\pm 0.25$  mrad. The collimator reticle can be modified in accordance with customers' wishes.

The collimator reticle light is powered by the tank's electrical system.



We make it visible.

# Technical data

## Mechanical data

Collimator mount adjusting angle:

- Axial	± 4°
- Vertical	± 2.5°
- Horizontal	± 2.5°

## Optical data

Collimator focal length	282 mm
Entrance pupil diameter	50 mm

## Dimensions

	Length:	Width:	Height:
GPG EMES 15	315 mm	740 mm	255 mm
Case	850 mm	400 mm	310 mm
Cable for lighting unit	8000 mm		

## Weight

GPG	11,5 kg
Case	25 kg

## Electrical data

Lighting unit	28 V / 3 W
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## Environmental conditions

Environmental test	MIL-STD-810E (in extracts)
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# Scope of delivery

Article	NATO-Stock No. Part No.
Synchronous operation tester, GPG EMES 15 KWS, complete in case	4931-12-341-5916 009-240.010-000

### Consisting of:

- 1 GPG EMES 15 KWS	009-240.100-000
- 1 Case	8115-17-919-2869 009-240.800-000
- 1 Padlocks	5340-12-139-2844 DIN 7465-E1-30-BK
- 1 Allan key, DIN911-8-Ni8	5120-12-121-1058 8DIN911GALNI8
- 1 Bulbs, 28 V / 3W, BA7s	6240-12-144-9773 038-101.120-000
- 1 Cleaning brush	7920-12-120-0355 001-202.026-000
- 1 Cleaning cloth	6640-12-137-2580 001-202.027-000

Subject to design and construction modifications

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# GPG, UNIVERSAL

## Synchronous Operation Tester, universal

### Brief description

The GPG synchronous operation tester is used to test the synchronous elevation of the weapon tube and the line of sight of optical targeting equipment in weapon systems.

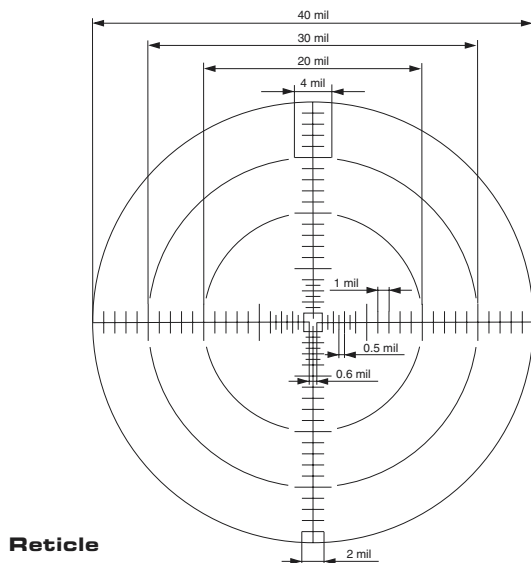
The optical principle is collimation.

The GPG comprises a mount with integral collimator and two scissor arms with the optical deflection system.

The adapter, which is inserted in the weapon mount instead of the tube, holds the GPG.

The adapter can be modified to match other weapon systems.

When the two arms are spread, the optical deflection system displays the collimator boresight cross in the lens of the targeting device being examined. In order to align the boresight cross of the GPG with the aiming cross of the targeting device, the reticle can be adjusted in elevation and azimuth and the collimator can be rotated about its longitudinal axis. Deviations at various elevations can be read off the collimator reticle as absolute values. A maximum radius of 1.02 m can be bridged between the middle of the weapon tube and the sight. Friction couplings in the pivot bearings ensure exact positional stability when the arms are spread.

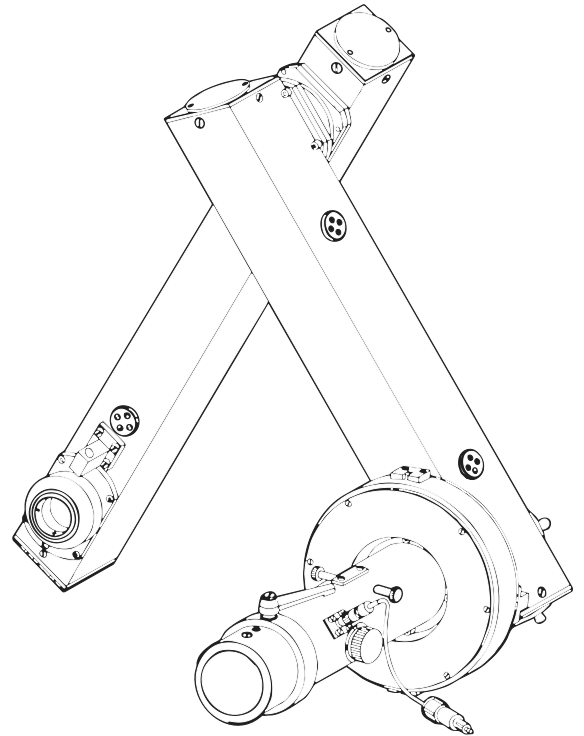


Reticle

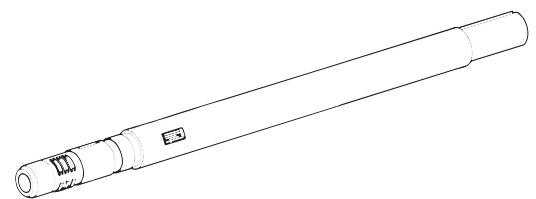
The operating personnel can inspect and calibrate the GPG quickly and reliably without additional equipment.

The pattern of the reticle consists of cross-hairs with rake graduations as well as three concentric rings. The values of the rake graduations are shown in the figure

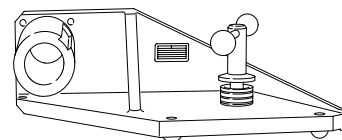
The collimator reticle light is powered by the tank's electrical system.



### Example for Weapon Adapter



Weapon adapter 20 mm MK20 DM6



Weapon adapter Self Propelled Howitzer 2000



We make it visible.

# Technical data

## Mechanical data

Deviation up to 20° tube elevation max.	± 0.1 mrad
Deviation above 20° tube elevation max.	± 0.3 mrad
Measuring field	40 mrad
Field of vision	60 mrad
Length when extended	1020 mm

## Optical data

Collimator focal length	120 mm
Lens diameter	38 mm
Self-calibration, entrance to exit	± 0.05 mrad
Adjustment of the optical system	∞
Tolerance range	500 m to ∞

## Dimensions

	Length:	Width:	Height:
GPG	708 mm	240 mm	550 mm
Case	800 mm	400 mm	800 mm
Connecting cable	8000 mm		

## Weight

GPG	18 kg
Case	27 kg

## Electrical data

Illumination	28 V / 3W
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## Environmental conditions

Environmental test	MIL-STD-810E (in extracts)
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# Scope of delivery

Article	NATO Stock No. Part No.
1 GPG, universal in case	4933-12-344-9085 009-213.010-000
Weapon adapter 20 mm MK 20 DM6 in case	4933-12-324-7555 009-162.020-000
Weapon adapter 25mm M242 in case	009-213.020-000
Weapon adapter 25mm KBA in case	4933-12-332-7631 009-162.030-000
Weapon adapter Self Propelled Howitzer 2000 in case	4933-12-345-7683 009-230.000-000

Additional special reticles and weapon adapters as per specifications of customer.

Subject to design and construction modifications

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