Operation manual
Alignment Telescope
FFR 300/40/14,7

Ident-No. 231 702

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1. GENERAL

An Alignment Telescope is an optical ruler with which objects can be aligned along a reference line (line of sight) with higher precision.
The MÖLLER-WEDEL OPTICAL Alignment Telescope establishes precise reference lines of sight. Its focusing range is from Zero to infinity.

The telescope line of sight is the basic reference for all measurements and the exact location of it relative to the workpiece must be known with great accuracy.

Alignment Telescopes are set to a finite range not emitting parallel light beam (only at setting infinity the outgoing beam is parallel). A lateral displacement of the targets Z will be observed with the aid of the Alignment Telescope. The effect of such a lateral displacement precisely can be evaluated when viewing through the eyepiece of the Alignment Telescope. In this case, both the center intersection of the target and of the Alignment Telescope reticle will appear displaced. The target has no lateral displacement if the center intersection print of the target and the center of the crosshair reticle of the Alignment Telescope coincide. (Figure 2)

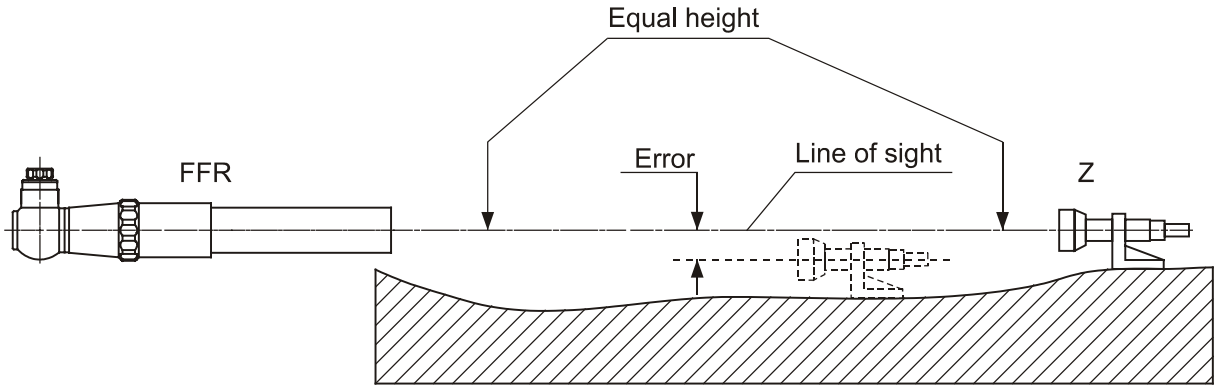

Figure 1: Principle of use of an Alignment Telescope

With the aid of an Alignment Telescope it is only possible to observe the lateral displacement of a target, but **not** the angular displacement (as shown in Figure 2 for target Z2).

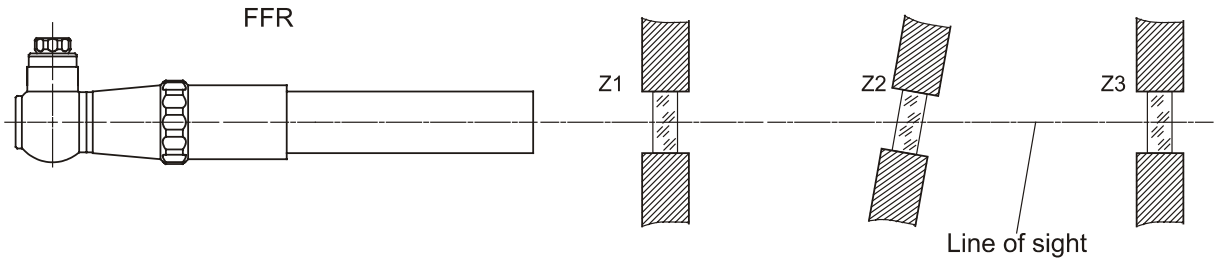

Figure 2: Alignment of targets with the aid of an Alignment Telescope

2. UNPACKING AND CLEANING

The Alignment Telescope is a precision measurement instrument.
Unpack equipment carefully.

☞ No humidity, no shock stress!

☞ Keep clean the optical components such as lenses of the objective and of the eyepiece, and targets. Remove dust protection cap of the objective only for use of the equipment and attach after use.

☞ No finger prints!

For cleaning glass surfaces from dust best a blower or painting brush with soft and grease-free hairs. If the contamination is of rigid nature breathe to the glass surface to produce a thin liquid coating and wipe off using a piece of soft leather- do not use force!

or

Use a mixture of approx. 20 parts ether and one part alcohol and wipe off-but only after having removed dust beforehand.

When realizing damages when unpacking don't repair yourself otherwise our guarantee will expire. Contact our distributor or our factory.

☞ Important hint for the use in tropic regions

The equipment is not tested to be used permanently under tropical conditions. In case the instruments are used under tropical conditions, after usage the instrument should be stored in rooms with a relative humidity not exceeding 75%.

3. PREPARATION FOR OPERATION

Temperature equalization

Even slight temperature differences in glass lead to stress which will reduce by annealing. For accurate measurements it is, therefore, recommended to store the Alignment Telescope one day beforehand in the measuring room.

If the temperature of the telescope is below 15°C, the image quality may be deteriorated. In this event the telescope should be kept approx. 30 minutes with room temperature till the telescope has adopted the required temperature through and through. The objective should have the same temperature inside and outside.

Setting into an fixture or holder

First of all, a suitable positioning for the telescope should be chosen. The type of the positioner is determined by the measuring set-up. Unless prepared in anticipation by the user clamp fixtures are recommended.

☞ When using the clamp fixtures take care when tightening the clamping screws: Do not fasten the barrel clamp screws with excessive force to avoid strain being transmitted to the telescope objective. This would lead to deterioration of the image quality.

☞ Important hint for fixing and rotating the Alignment Telescope

When rotating the Alignment Telescope in a fixture rotate the objective tube only, in no case the adapter sleeve with eyepiece (3.1 with 3.2) has to be used to rotate the Alignment Telescope to avoid that the adapter sleeve with the eyepiece will loosen (alignment of the Alignment Telescope will be lost)

Adjustment of eyepiece

The diopter setting of the eyepiece must be used to focus the eyepiece that the eyepiece reticle can be seen sharply.

4. FUNCTION DESCRIPTION OF THE INSTRUMENT

Construction feature

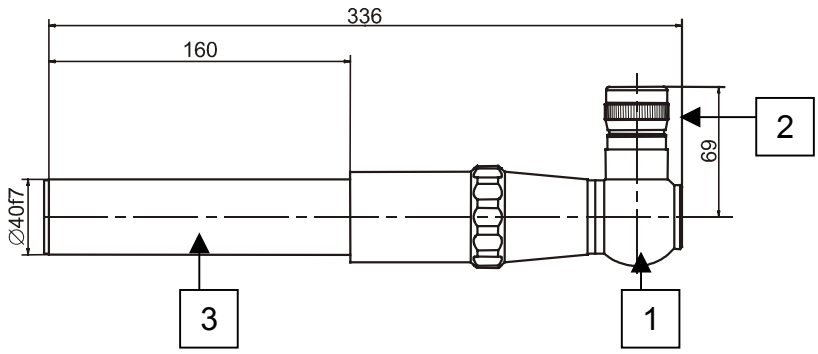

Figure 3: Basic components of Alignment Telescope FFR 300/40/14,7
1 – Rectangular sleeve with reticle S111
2 – Eyepiece f=14,7 mm
3 – Alignment objective tube

The Alignment Telescope FFR 300/40/14,7 consists of an alignment objective tube (3.3), a rectangular adapter sleeve with reticle (3.1) and an eyepiece (3.2).

☞ Important hint
Do not disconnect Rectangular sleeve from alignment objective tube!

Figure 4: Focusing sleeve as part of the alignment objective tube
1 – Focusing sleeve
2 – marks indicating direction of rotation for focusing

The focus setting of the Alignment Telescope is carried out by using the focusing sleeve (4.1) of the objective tube. The marks (4.2) on the focusing sleeve indicates into which direction the knob must be rotate for focusing towards zero or infinity distance.
The line of sight runs concentrically in relation to the tube. This greatly facilitates the use of the Alignment Telescope for aligning boreholes, bearings etc., since with precise holding of the reference bearing the line of reference is already determined.

The robust construction with the stainless steel outside surface guarantee the maintenance of precision even in rough outside conditions.

The Alignment Telescope FFR 300/40/14,7 determines whether there is an alignment error or not.

As support for the Alignment Telescopes different holders are available, well matched to the diameter of the Alignment Telescope.
Frequently the outer bearing or hole serves as reference for the measurement. Master dimensions permit to easily place the Alignment telescope in bores etc. by means of simple additional spacer rings to be placed in the corresponding aperture.

5. TECHNICAL DATA

Description	Data
Focusing range	0 m to infinity
Accuracy of line of sight	10 µm, denotes the deviation to a straight line measured in the image plane
Magnification of the reticle image at 0.5 m at 1 m at 10 m at 20 m	 6,1x 8,6x 44x 82x
Field of View at 0.5 m at 1 m at 10 m at 20 m at infinity	 61 mm 86 mm 440 mm 820 mm 1.95°
Objective focal length	85 mm (0m setting) to approx. 290 mm (infinity setting)
Free aperture of objective	26 mm
Objective tube diameter	40f7
Objective tube material	Stainless steel
Focal length of eyepiece	14,7 mm
Image erection	laterally correct, right way up
Eyepiece reticle	S111 (dark cross on bright ground, line width 10 µm)
Overall Dimensions (LxWxH)	Approx. 330x55x84 mm
Weight	Approx. 1.5 kg (without storage box)

6. MAINTENANCE

If the instrument is treated carefully as is usual with optical instruments the Alignment Telescope will not need maintenance.
Outer surfaces of objective and eyepiece may be contaminated in the course of the time. If so, clean as follows:

First remove particles from the dust from the surfaces using a blower. Wipe over with a dry piece of fine linen. If this fails, but only then, the surface should be cleaned with a mixture of approx. 8 parts by volume of ether and one part of alcohol.

☞ Handle with care! The mixture is inflammable.

The outer surface of the objective tube does not need maintenance.

7. SPARE PARTS FFR 300/40/14,7

Ident -No.	Description	Quantity
217 015	Eyepiece f=14,7 mm	1
135 101 02	Objective cover	1