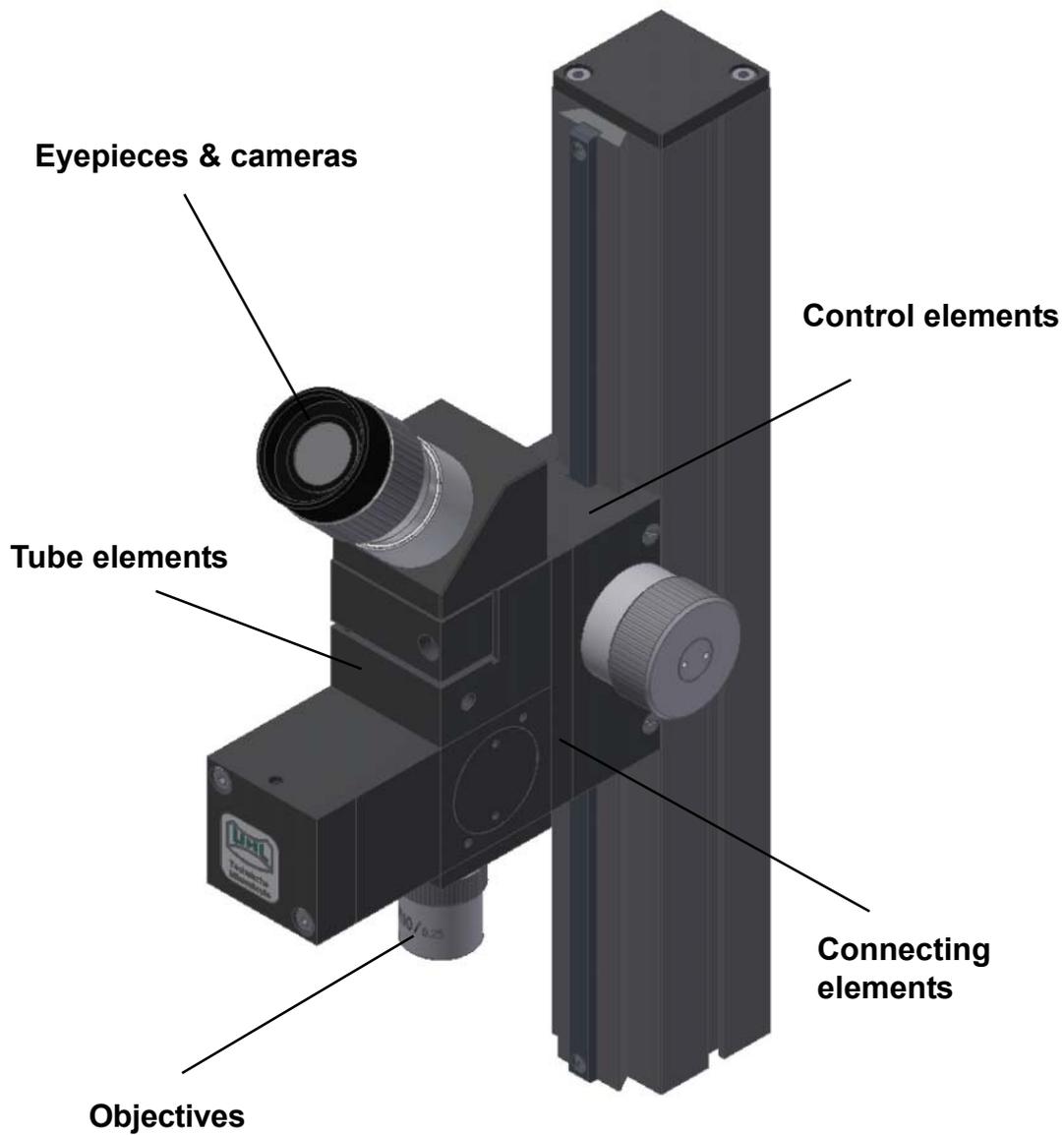


# Components



Revision No.: 12

Components for application in Microscopy

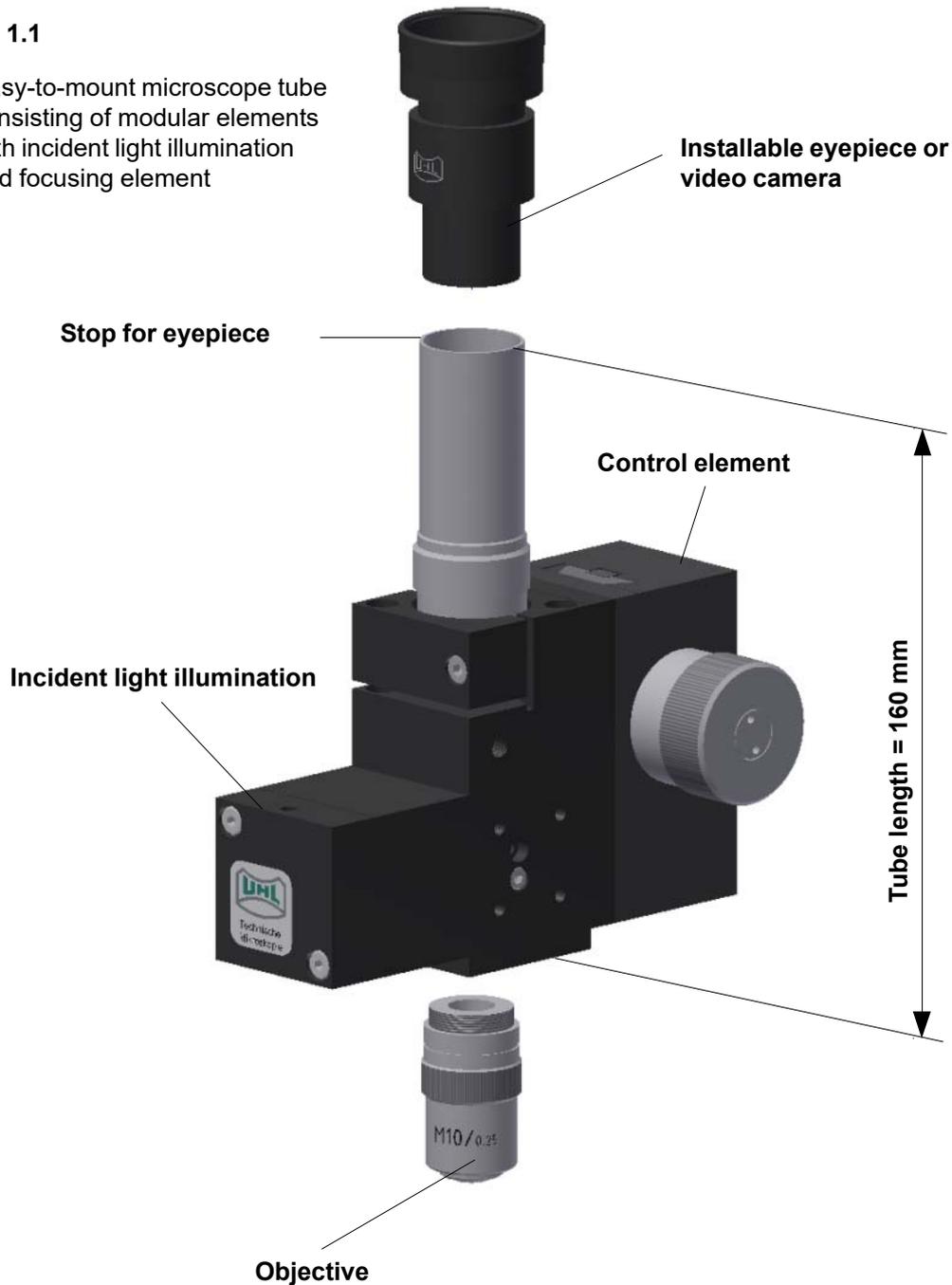


## Basic ideas of Microscopy

Microscopes represent the purpose of magnifying small objects. A microscope consists mainly of three components i.e. the objective, the tube and the eyepiece (see illustration ill 1.1). With a video microscope, the eyepiece is replaced by a high resolution camera and the image is displayed on a monitor. For the viewing of objects, lighting systems are necessary. The illumination differentiates between incident light and transmitted light systems. The type of illumination is dependable on where the light falls on the object. With high magnification, the mechanical focusing element plays an essential role. The focusing element should not show any backlash especially by high magnification otherwise defocusing occurs.

ill: 1.1

Easy-to-mount microscope tube consisting of modular elements with incident light illumination and focusing element



# Basic ideas of Microscopy

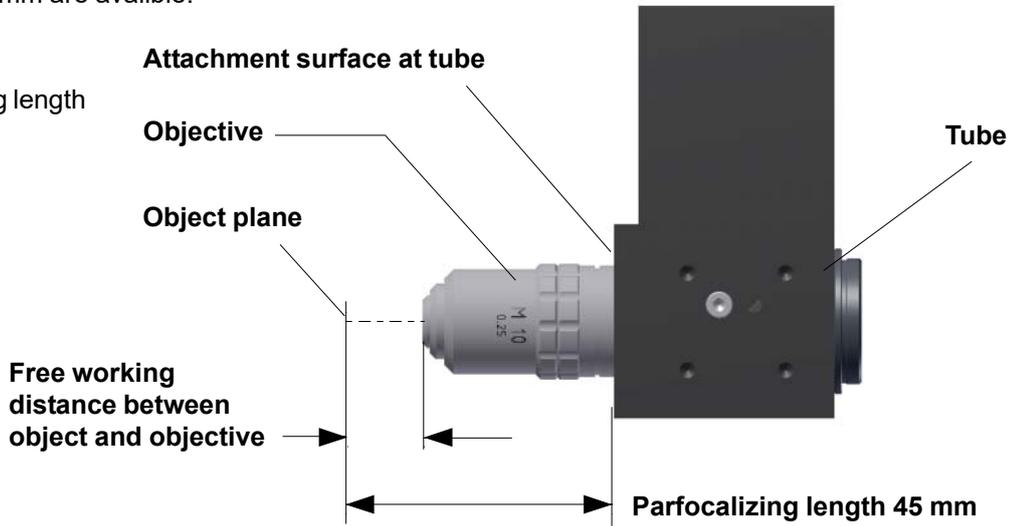
## Objective:

The demand for objectives applicable in the microscopy is very high. Having a large field of view, simultaneously the curvature of the field should be kept as low as possible. The objectives used in the microscopy possess a nominal so-called parfocalizing length of 45 mm. This is the distance between the object plane and the attachment surface of the objective at the tube.

For applications which require a reasonable bigger free working distance, lenses with a parfocalizing length of 95 mm are available.

### ill.: 2.1

Parfocalizing length

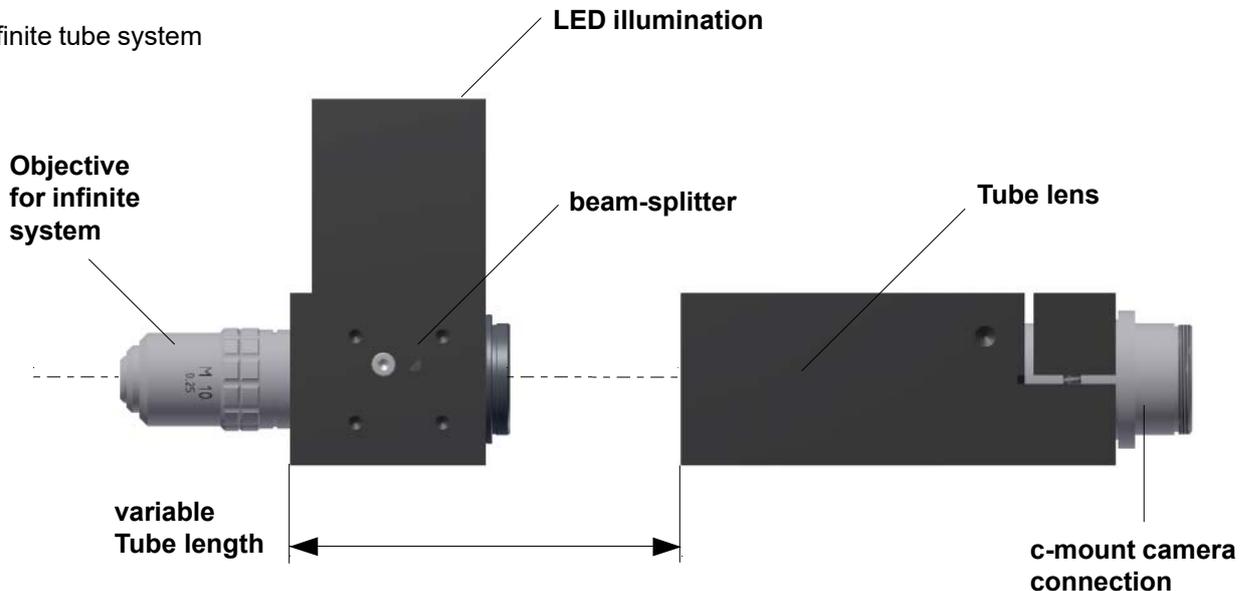


## Tube length:

The mechanical tube length for conventional microscopy lies at 160 mm. This measurement was determined for the very first microscope and adopted for the future microscopy. With modern microscopes, a variable tube length has been achieved which permits an on/off reflection from the path of rays. Such systems are known as infinite systems. For such tubes special objectives are necessary which depict the object infinitely. A tube lens focused these rays, retaining the image in the eyepiece or in the camera chip.

### ill.: 2.2

Infinite tube system



# Basic ideas of Microscopy

## Eyepieces:

The eyepieces differentiate between two designs i.e. per Ramsden and per Huygens.  
The eyepiece per Huygens allows a lower magnification and has the advantage on spherical and chromatic aberrations. Ramsden eyepieces are essentially in application for the viewing of large object fields.

Eyepieces with integrated graticules or scales allow a direct measuring of the objects during beaming. To correct visionary error a diopter compensation can be taken on the eyepiece.

Nowadays the eyepiece design gets more and more complex by using new calculation and production methods, so that they can not be classified like that any more.

Guidlines to choose the proper eyepiece for the application:

## Optimum magnification

The resolution of a microscope is defined by the objective.  
The eyepiece does only a post-magnification of the image.

A multiplication of the objective and eyepiece magnifications results into the total magnification of the microscope.

The total magnification should not be higher than 500x - 1000x of the numerical aperture of the objective (range of the optimum magnification).

A so called empty magnification is reached with a total magnification 1000x higher than the numerical aperture. The resolution (detail grade) can not be improved any more.

*Example1:* OP1-VX50 with NA 0.55 and eyepiece 15x  
 $NA \times 1000 = 550$   
objective magnification x eyepiece magnification =  $50 \times 15 = 750$   
->  $750 > 550$  empty magnification!

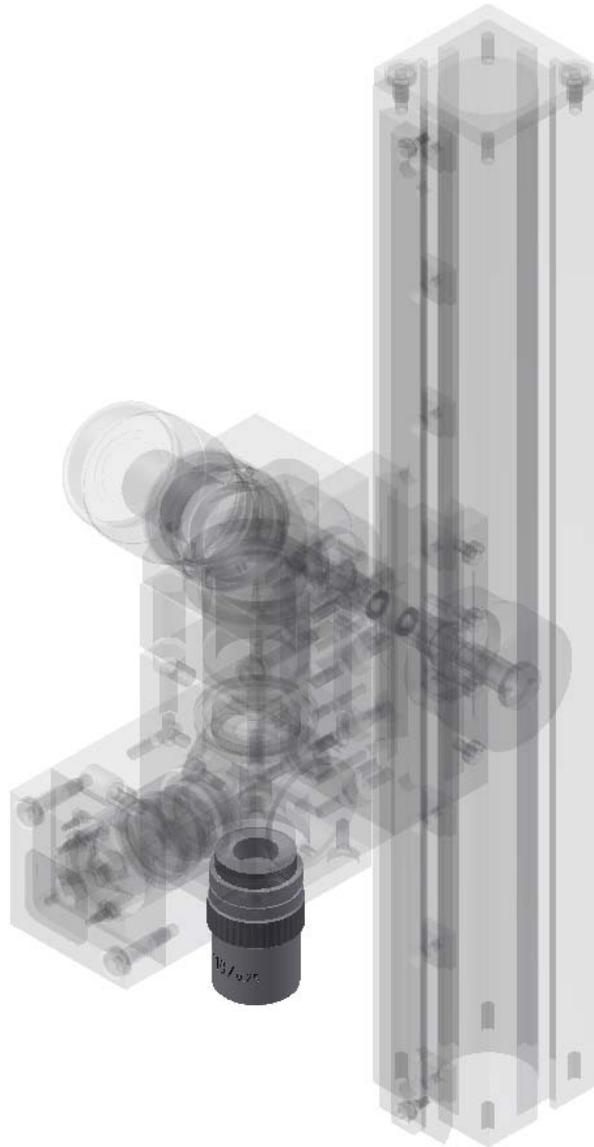
*Example2:* OP1-A01 with NA 0.04 and eyepiece 20x  
 $NA \times 1000 = 40$   
objective magnification x eyepiece magnification =  $1 \times 20 = 20$   
->  $20 < 40$  OK

*Example3:* OP1-M02 with NA 0.06 and eyepiece 15x  
 $NA \times 1000 = 60$   
objective magnification x eyepiece magnification =  $2 \times 15 = 30$   
->  $30 < 60$  OK



# Objectives

---



Revision No.: 12

From simple achromatical objectives through to telecentrical measuring objectives and up to plane-apochromatic correctable objectives with extra long working distances, the objective programme fulfills all desirable demands.



Technische  
Mikroskopie

## Microscope objectives for tube length 160



### Achromatical objectives (RMS thread, not for incident light)

Order no.	Magnification	Focal length	Numerical aperture	Working distance (mm)	Theoretical sharpness depth (mm)	Parfocalizing length
OP1-A01	1 : 1	73	0.04	125	0.172	194
OP1-A02	2 : 1	53	0.05	68	0.110	92
OP1-A03	3 : 1	38	0.07	26	0.056	50
OP1-A04	4 : 1	30	0.10	13	0.028	37
OP1-A05	5 : 1	25	0.10	13	0.028	37
OP1-A06	6 : 1	22	0.15	13	0.012	37
OP1-A10	10 : 1	16,5	0.25	5,5	0.004	37



### Achromatical incident light objectives (RMS thread, parfocalizing length = 45 mm)

Order no.	Magnification	Focal length	Numerical aperture	Working distance (mm)	theoretical sharpness depth (mm)
OP1-AL02*	2 : 1	75.59	0.08	5	0.043
OP1-AL05	5 : 1	25.39	0.10	18.5	0.028
OP1-AL10	10 : 1	16.56	0.25	6.7	0.004
OP1-AL20	20 : 1	7.84	0.40	1.8	0,002
OP1-AL40	40 : 1	4.52	0.65	0.6	0.001

\*applicable only for high reflective surfaces



## Microscope objectives for infinite tube length



Achromatized incident light objectives (RMS thread, parfocalizing length = 45 mm)

Order no.	Magnification	Numerical aperture	Working distance (mm)	Object field with 1/2" CCD [mm]	theoretical sharpness depth (mm)
OP1-V2*	2 : 1	0.06	5.8	3.2 x 2.4	0.077
OP1-V5	5 : 1	0.18	14.5	1.4 x 1.0	0.008
OP1-V10	10 : 1	0.25	11.0	0.7 x 0.5	0.004
OP1-V20	20 : 1	0.40	1.0	0.3 x 0.2	0.002
OP1-V50	50 : 1	0.65	0.4	0.15 x 0.1	0.001
OP1-V99	100:1	0.95	0.5	0.07 x 0.05	0.0005

\*applicable only for high reflective surfaces



Plane-apochromatic incident light objectives with extra long working distances (RMS thread, parfocalizing length = 95 mm)

Order no.	Magnification	Numerical aperture	Working distance (mm)	Object field with 1/2" CCD [mm]	theoretical sharpness depth (mm)
OP1-VX02	2 : 1	0.06	35.6	2.8 x 1.8	0.076
OP1-VX05	5 : 1	0.14	35.0	1.4 x 0.9	0.014
OP1-VX10	10 : 1	0.28	35.0	0.7 x 0.4	0.004
OP1-VX20	20 : 1	0.42	20.2	0.3 x 0.2	0.002
OP1-VX50	50 : 1	0.55	13.1	0.15 x 0.1	0.001

## Telecentrical measuring objectives only for tube MS4-311, B40-MT or component B60

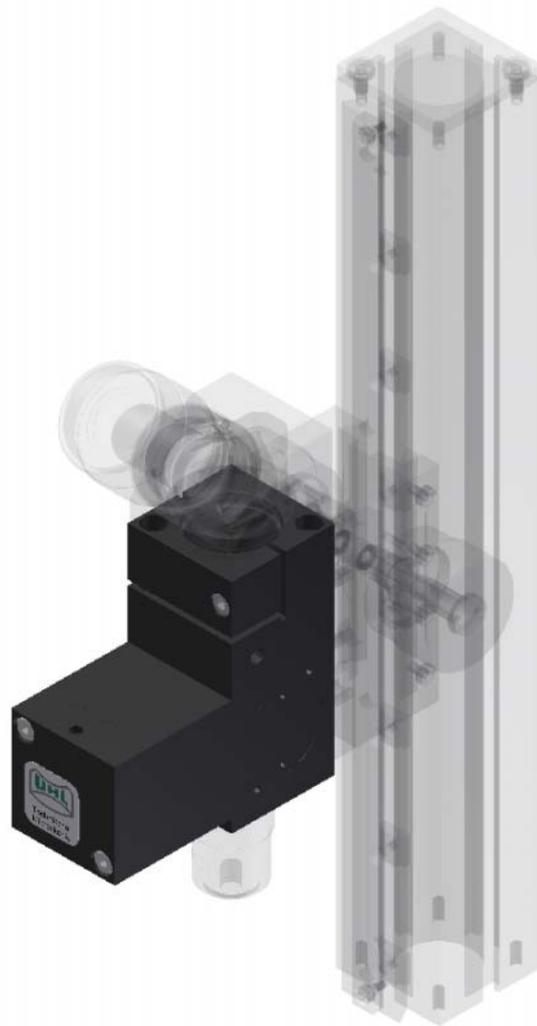


Telecentrical measuring objectives with longer working distances  
parfocalizing length = 122.5 mm, Bayonet connection

Order no.	Magnification	Numerical aperture	Working distance (mm)	Object field with 1/2" CCD [mm]	theoretical sharpness depth (mm)
OP1-M01	1 : 1	0,03	88	6,3 x 4,7	0,306
OP1-M02	2 : 1	0,06	85	4,1 x 2,3	0,076
OP1-M05	5 : 1	0,13	62	1,2 x 0,9	0,016
OP1-M10	10 : 1	0,20	52	0,6 x 0,45	0,007



## Tube elements



Revision No.: 12

In order to possibly achieve large multiple variance, the microscope tube has been intersected to allow the essential accessories to be offered as elements. The user has therefore complete freedom of choice concerning tube length, deflection and beam-splitting. Three sizes are available: B30, B40 and B60. With bores and threads in fixed rasters, the elements can be connected to one another. Flange bushing provides for an exact and light-tight alignment of the centre bores. Threaded bores are located on minimum each one external surface for mounting the parts on raster plates for guide boxes or on apertured plates.



## Example 1

### Incident light microscope from B40

Assembly of a monocular incident light microscope with 160 mm tube length and LED illumination for mounting on a motion box B40-G

Order no.: **B40-ELZ1**

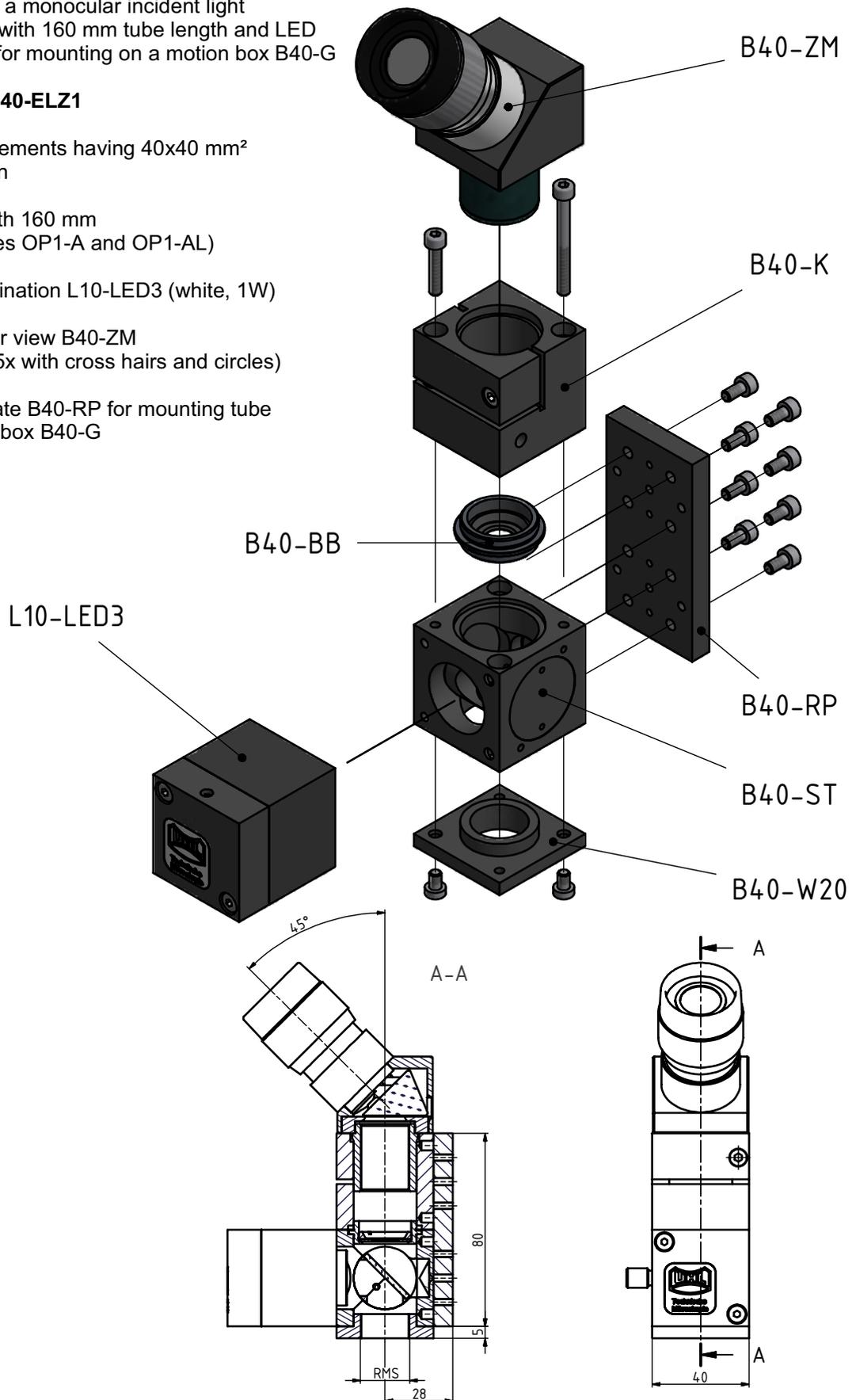
**B40**: tube elements having 40x40 mm<sup>2</sup> cross-section

**E**: tube length 160 mm  
(for objectives OP1-A and OP1-AL)

**L**: LED illumination L10-LED3 (white, 1W)

**Z**: monocular view B40-ZM  
(eyepiece 15x with cross hairs and circles)

**1**: Raster plate B40-RP for mounting tube on a motion box B40-G



## Example 2

### Incident light microscope from B40

Assembly of a video microscope with infinite tube length and fibre glass incident light illumination for mounting on a linear stage LT5

Order no.: **B40-UGV2**

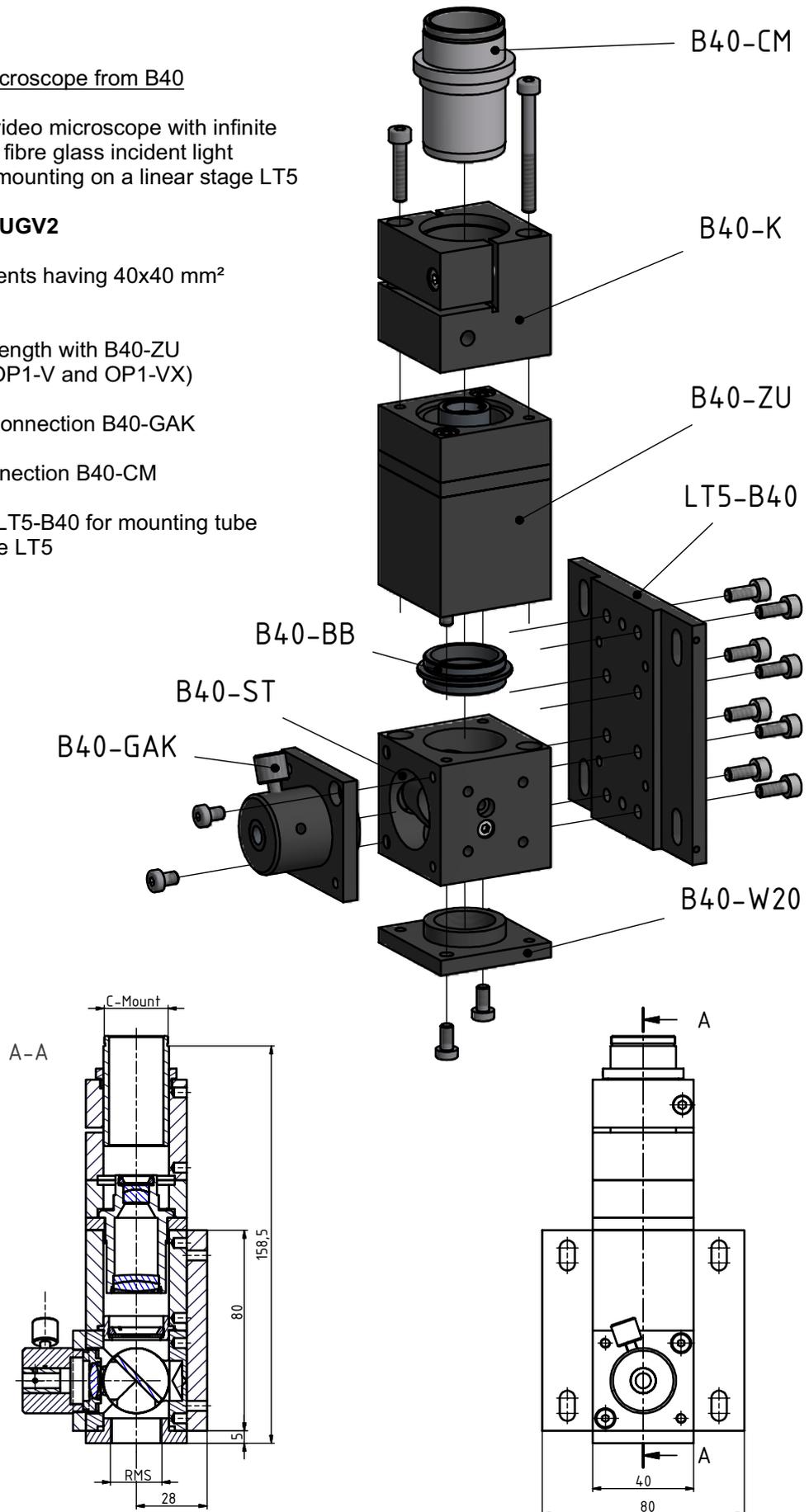
**B40**: tube elements having 40x40 mm<sup>2</sup> cross-section

**U**: infinite tube length with B40-ZU (for objectives OP1-V and OP1-VX)

**G**: Fibre glass connection B40-GAK

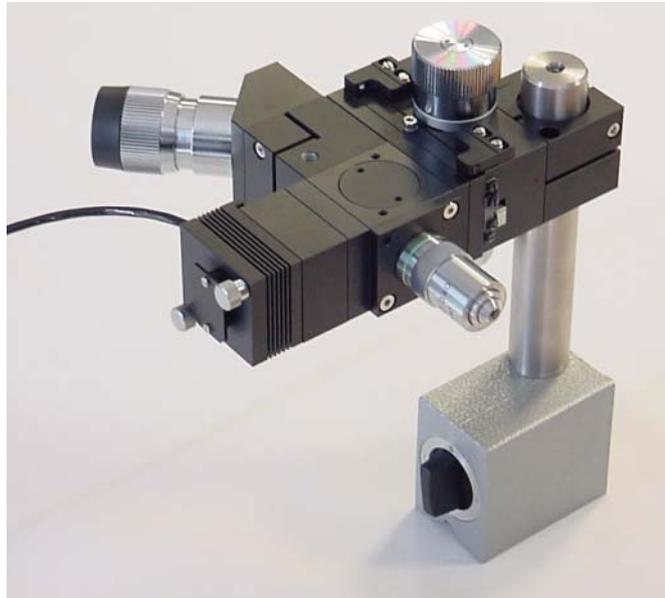
**V**: C-mount connection B40-CM

**2**: Raster plate LT5-B40 for mounting tube on a linear stage LT5

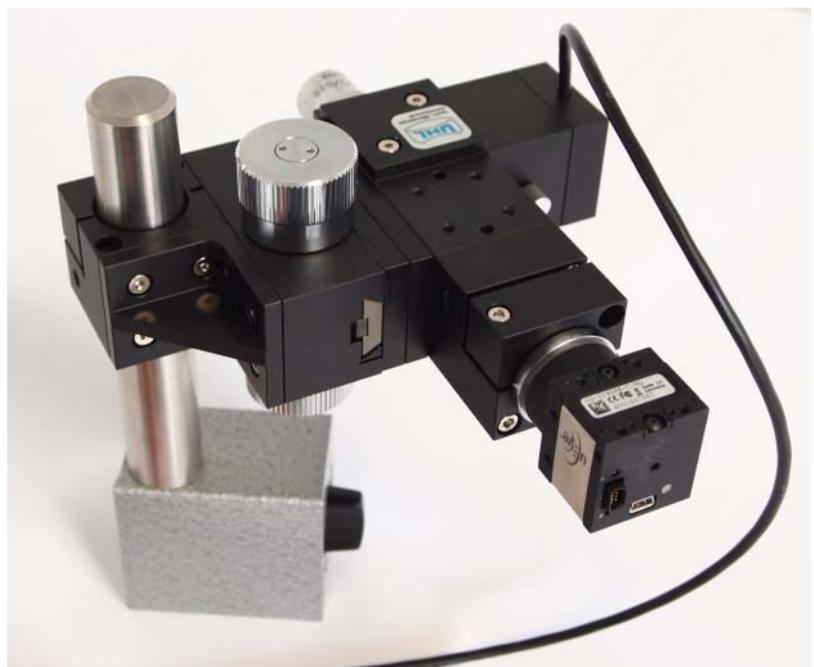


## Other application examples

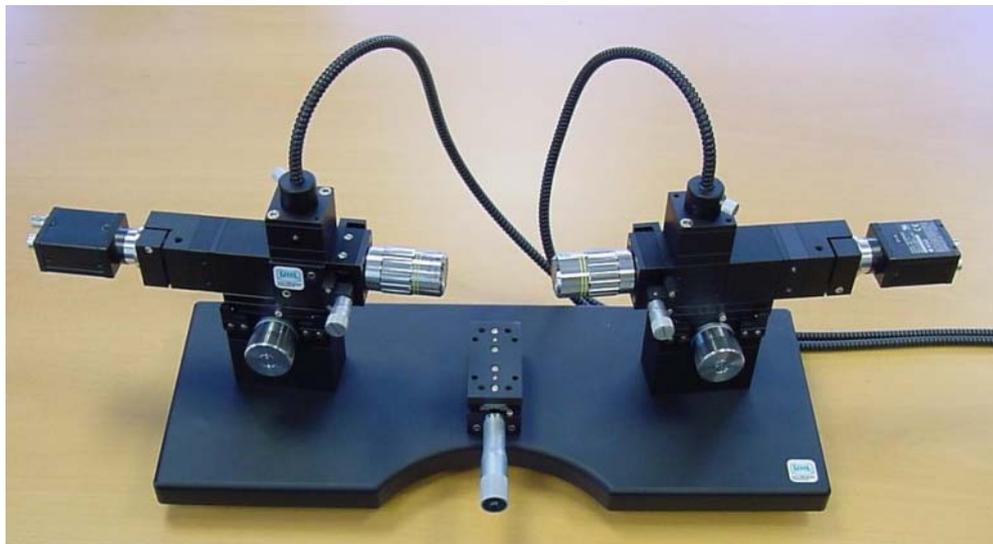
Monocular incident light microscope with 160 mm tube length, coaxial motion box, halogen illumination and objectives OP1-AL20



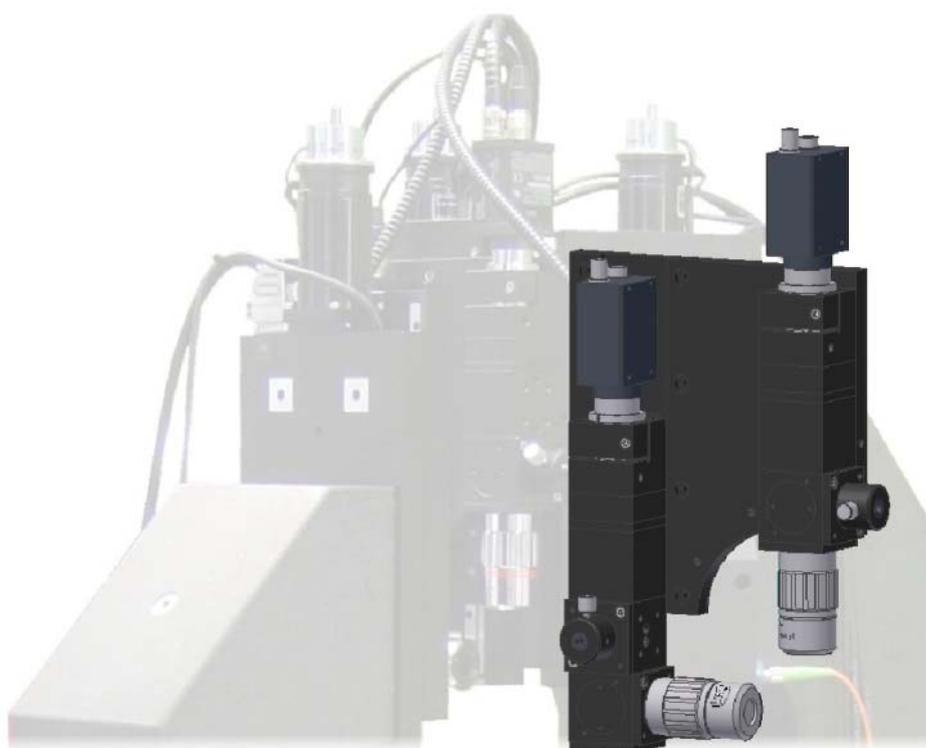
Video incident light microscope with 160 mm tube length, guide box, LED illumination and objective OP1-AL10



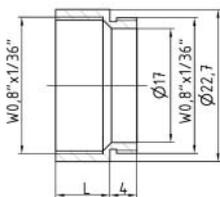
Special assembly of a video microscope with 2 cameras for both sides viewing of razor blades using coaxial fibre glass incident light illumination, 2 coaxial motion boxes, 2 micro-tables for the cross-adjustment and 2 objectives OP1-VX.



Special assembly of a video measuring microscope with 2 cameras for vertical and horizontal viewing using coaxial fibre glass incident light illumination.



## Objective turrets



### Objective turret for objectives OP1-ALxx and OP1-Vxx

Order no.	
B031	3-fold turret
B041	4-fold turret
B041-C	4-fold turret (encoding by Hall sensors)
B051	5-fold turret

### Objective turret for objectives OP1-VXxx

Order no.	
RV4	4-fold turret
RV4-C	4-fold turret (encoding by microswitch)
RV4-S	4-fold turret, stepper motor drive
RV4-W26	4-fold turret (with RMS connection, for objectives with W26x1/36")
RV4-C26	4-fold turret (RV4-W2,6 encoding by microswitch)
RV5-W26	5-fold turret (with RMS connection, for objectives with W26x1/36")
RV5-C26	5-fold turret (RV5-W26, encoding by microswitch)
RV5-S26	5-fold turret (RV5-W26, stepper motor drive)

### Objective centering mount for RMS objectives

Order no.	
RV4-ZF	centering mount

### Extender tubes for RMS objectives

Order no.:	Shaft length "L" [mm]
B010.201	1
B010.206	6
B010.208	8
B010.210	10
B010.214	14
B010.218	18
B010.220	20
B010.225	25
B010.230	30

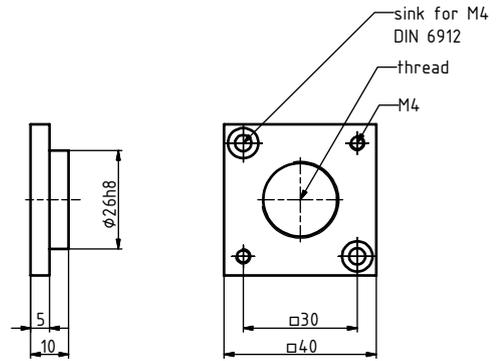
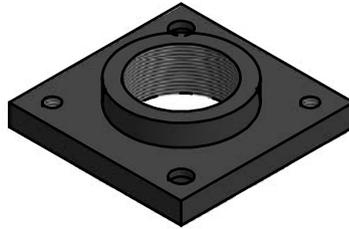


### Threaded plate with flange

with RMS thread (W0,8"x1/36")  
Order no.: **B40-W20**

with thread M22x0,5  
Order no.: **B40-M22**

with thread M25x0,5  
Order no.: **B40-M25**



also available in size **B30**

### Threaded plate without flange

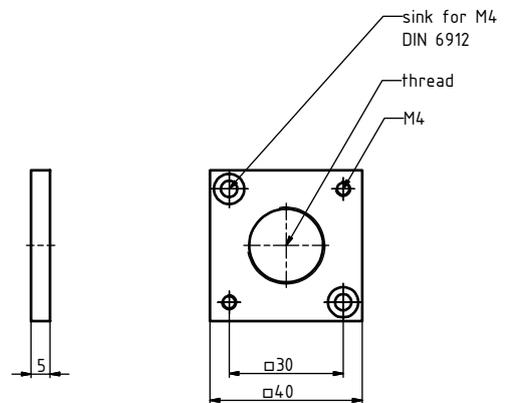
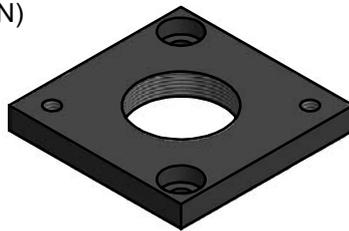
with RMS thread (W0,8"x1/36")  
Order no.: **B40-W200**

with thread M25x0,75  
Order no.: **B40-M257**

with thread W26x1/36"  
Order no.: **B40-W26**

with C-Mount thread (1-32 UN)  
Order no.: **B40-MCM**

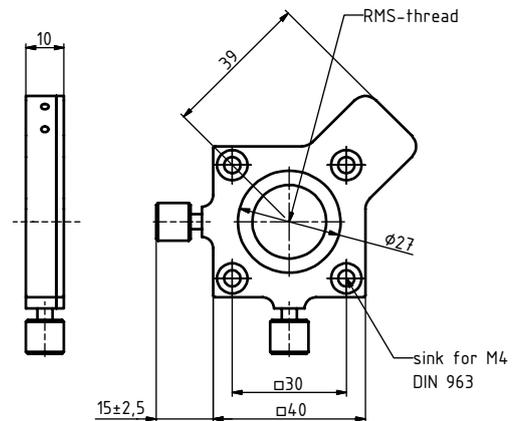
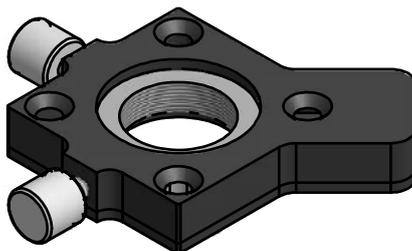
with thread M30x0,5  
Order no.: **B40-M30**



### Threaded plate adjustable

with RMS thread (W0,8"x1/36")  
Adjustable range depending on diameter of objective.  
For larger objectives an adapter **B010.208** ( $\phi 23$ ) can be used

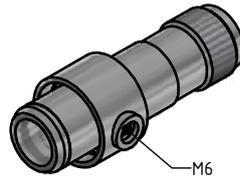
Order no.: **B40-W20J**



### Incident light illumination

Condenser lens  
for light guide GF4 or GF4/2,  
for mounting on jointed arms LG

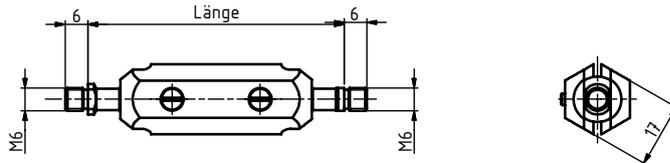
Order no.: **L005-GF**



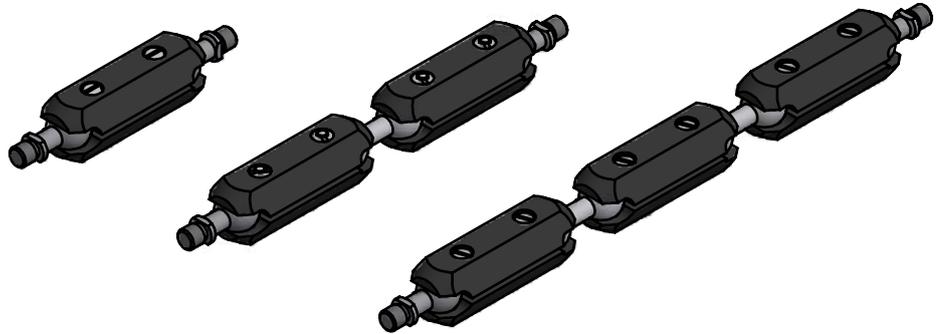
### Joints for lamps

for the fixing of incident light  
illumination L005

1 joint  
length: 67 mm  
Order no.: **LG1**



2 joints  
length: 127 mm  
Order no.: **LG2**

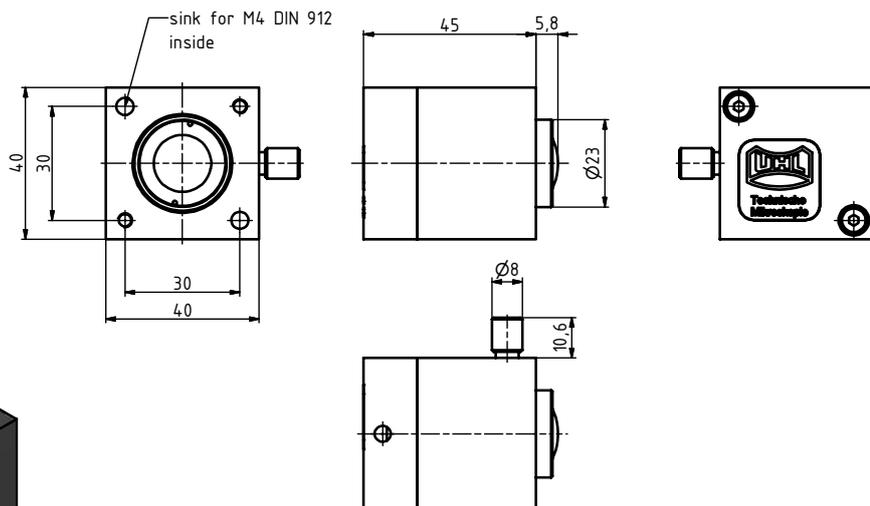


3 joints  
length: 187 mm  
Order no.: **LG3**

### LED lamp

white, 1W with  
single condenser  
Order no.:  
**L10-LED3**

suitable for  
Transformer **TR7**



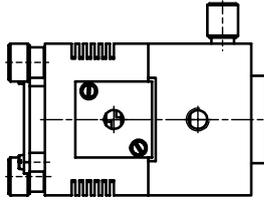
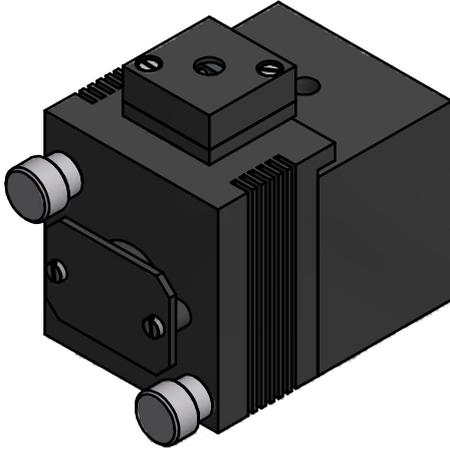
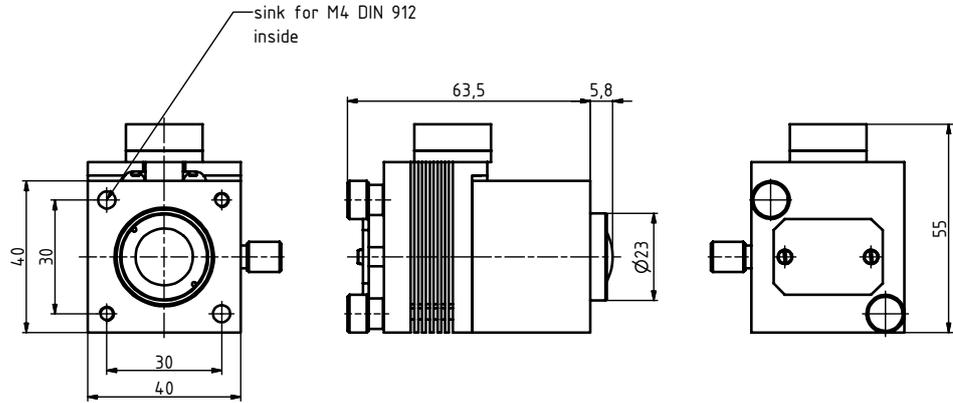
also available in size **B30**



### Halogen lamp

6V 10W with  
single condenser  
Order no.: **L10**

suitable for  
Transformer **TR7**

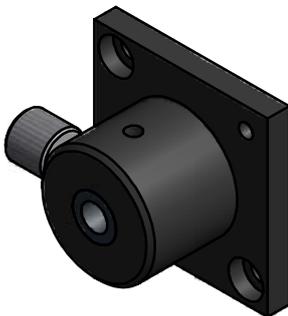
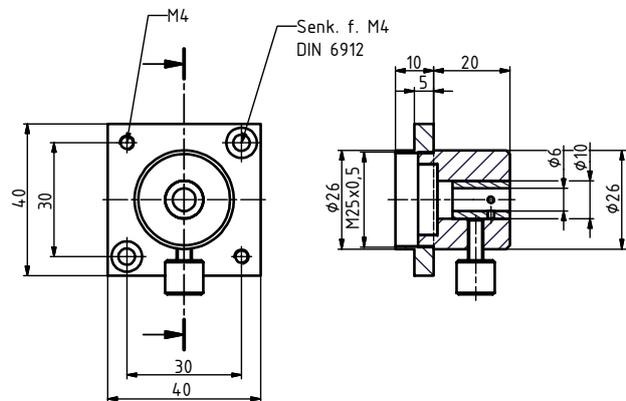


Revision No.: 12

### Fibre glass connection

for B40 tube elements,  
suitable for GF4 and GF7  
Order no.: **B40-GA**

Version with condenser lens  
Order no.: **B40-GAK**



also available in size **B30**



## Light sources



**Order No.:**

**TR7-N**

1-channel transformer for halogen lamps L005/L10 (max. 6V, 10W) and LEDs e.g. RL4-LED (up to 35 mA) stepless brightness control via adjusting knob



**Order No.:**

**TR7-NU**

1-channel transformer, remote controllable by USB, for halogen lamps L005/L10 (max. 6V, 10W) and LEDs e.g. RL4-LED (up to 35 mA) stepless brightness control via UHL measuring software or adjusting knob



**Order no.:**

**VMP-GLL**

LED cold light source, approx. 640 lumen, stepless brightness control via USB and UHL measuring software or adjusting knob



## Light sources



**Order no.:**

**GF4**

Fibre optic light guide, single-armed  
Length: 2 m  
Diameter of fibre: 4 mm  
Connection: Volpi (Ø 15) and Ø 6

**Order no.:**

**GF7**

Fibre optic light guide, single-armed  
Length: 1.6 m  
Diameter of fibre: 7 mm  
Connection: Volpi (Ø 15) and Ø 10



**Order no.:**

**GF4x2**

Fibre optic light guide, single-armed  
Length: 2 m  
Diameter of fibre: 4 mm  
Connection: Volpi (Ø 15) and 2x Ø 4



**Order no.:**

**MS2-503**

Fibre optic light guide for  
objectives OP1-Axx  
and OP1-ALxx  
Connection: Volpi (Ø 15)



**Order no.:**

**MS4-506**

Fibre glass ring light for  
objective OP1-VX  
Connection: Volpi (Ø 15)



**Order no.:**

**VM4-506**

Fibre glass ring light for  
objective OP1-M  
Connection: Volpi (Ø 15)



**Order No.:**

**RL4-LED**

LED ring light for objectives  
OP1-Axx with 8 LEDs



**Order No.:**

**RL4-ALV**

LED ring light for objectives  
OP1-AL and OP1-V  
(from 5:1 to 20:1)



**Bestell Nr.:**

**RL8-LED**

LED ring light for objectives  
OP1-VX  
with 16 LEDs





**Order no.:**

**VM4-508**

LED ring light for objectives  
OP1-M  
with power supply and  
intensity control electronic



**Order no.:**

**VM4-508Q**

4 segment LED ring light for  
objectives OP1-M  
with power supply and  
intensity control electronic



**Order no.:**

**VM4-509**

4 segment LED ring light with  
80 LEDs for objectives OP1-M  
with power supply and  
intensity control electronic



**Order no.:**

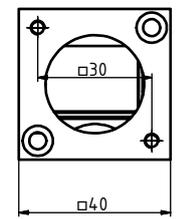
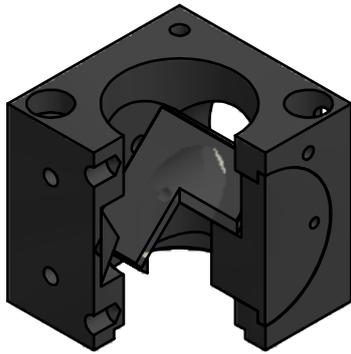
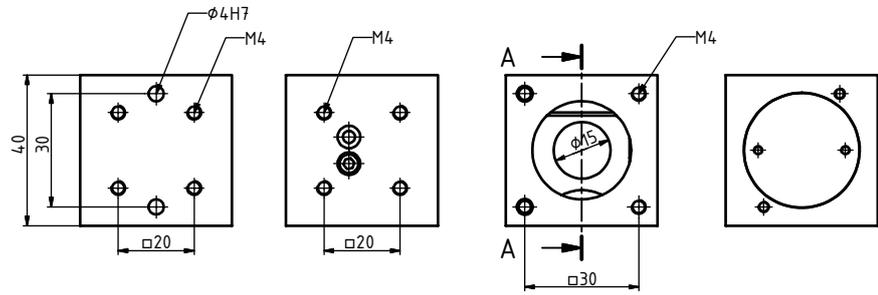
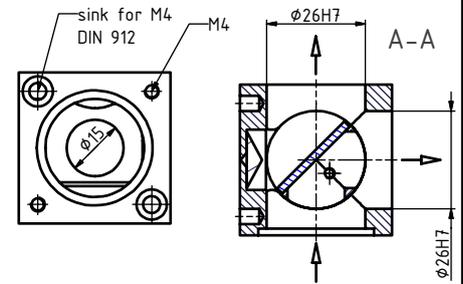
**VM4-507**

4 segment LED ring light for  
objectives OP1-M  
with power supply and intensity  
remote control electronic for  
IMS/OMS Software by USB/RS232

Reflector cube

with beam splitter 50:50  
Order no.: **B40-ST**

with mirror  
Order no.: **B40-S**

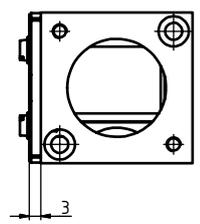
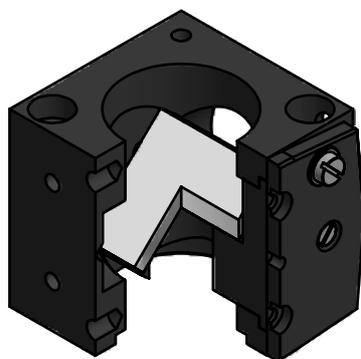
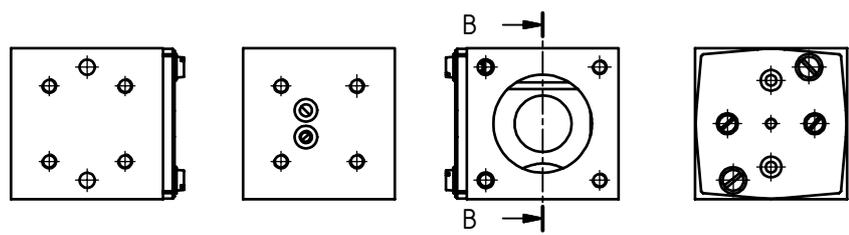
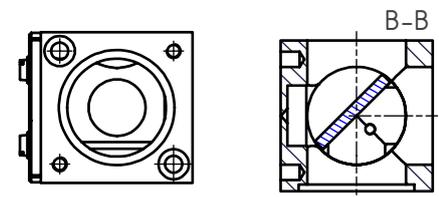


also available in sizes **B30** and **B60**

Reflector cube, adjustable

with full mirror  
Order no.: **B40-SJ**

with beam splitter 50:50  
Order no.: **B40-STJ**



also available in sizes **B30** and **B60**



### Reflector cube

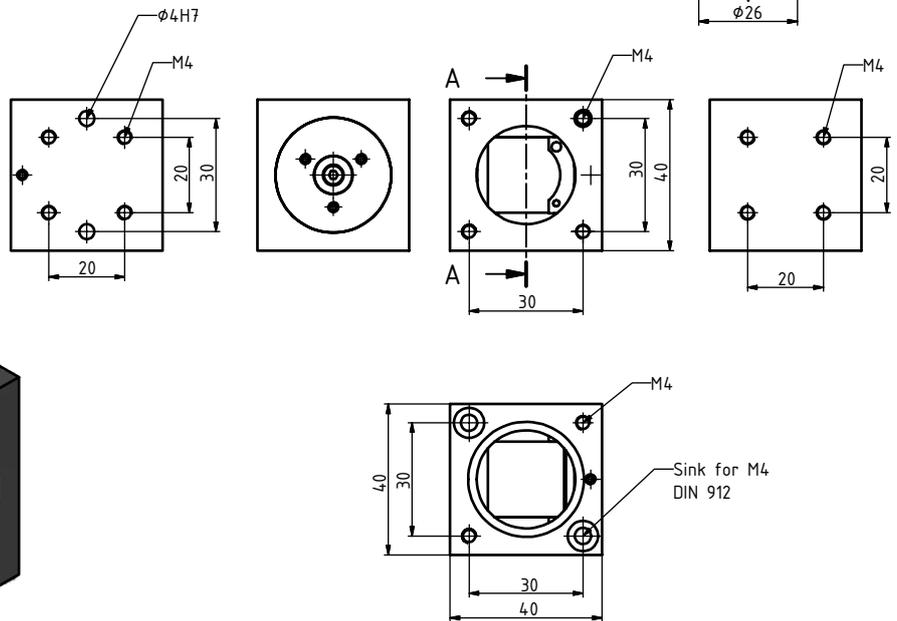
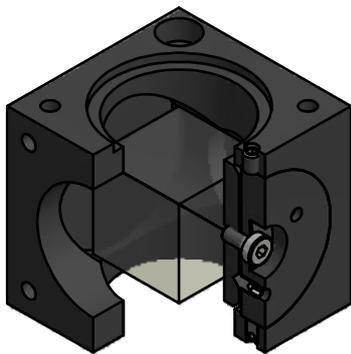
in ratio  
transmission/reflection

10/90 Order no.: **B40-SW10**

50/50 Order no.: **B40-SW50**

80/20 Order no.: **B40-SW80**

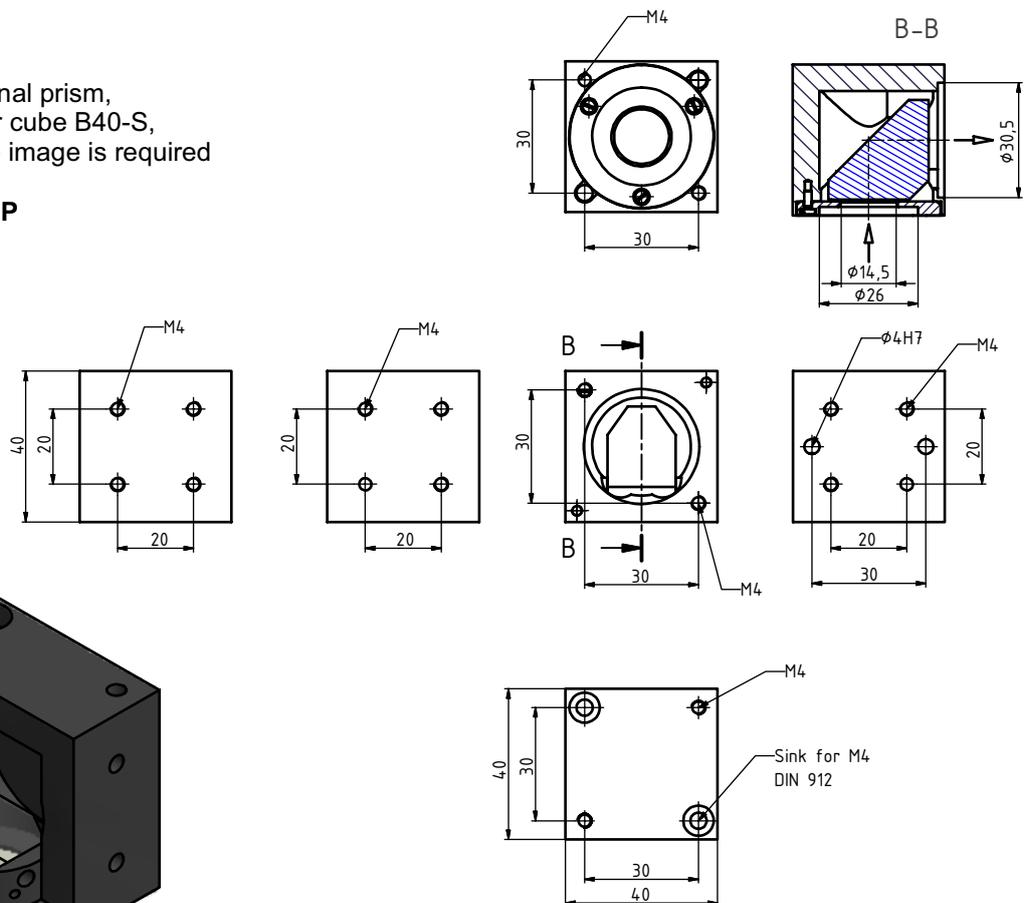
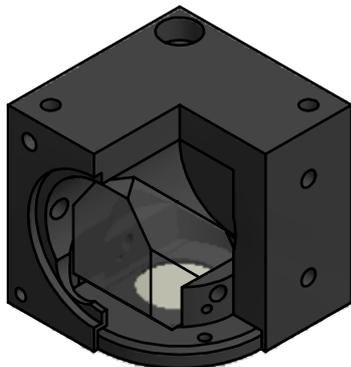
90/10 Order no.: **B40-SW90**



### Prism cube

with 90° pentagonal prism,  
replaces reflector cube B40-S,  
when true to side image is required

Order no.: **B40-SP**

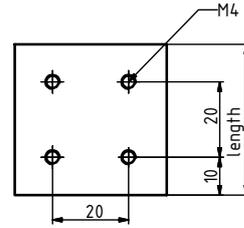
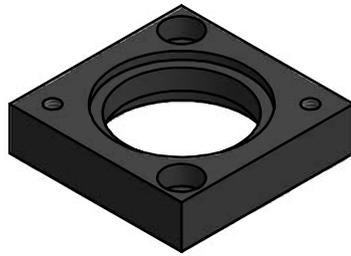


Revision No.: 12

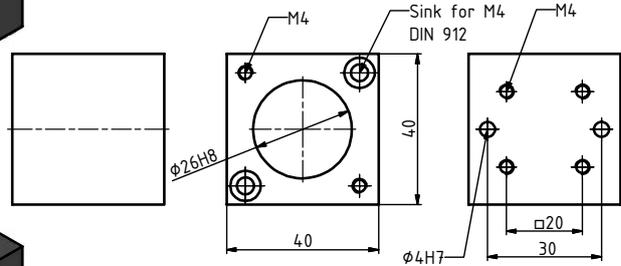
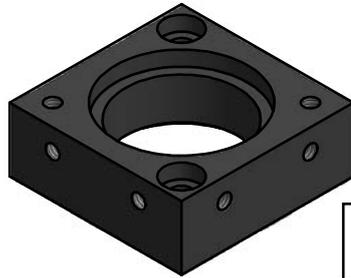


Tube elements  
With bore  $\varnothing 26$  and  
shoulder for  
flange bushing

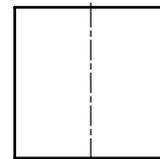
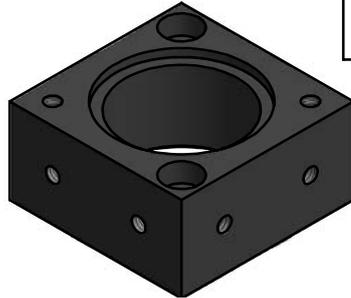
length 10 mm  
Order no.: **B40-V10**



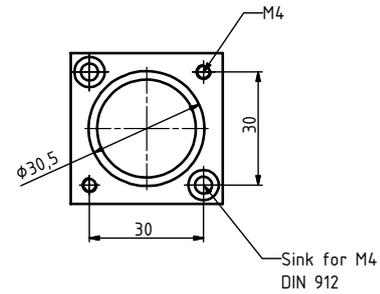
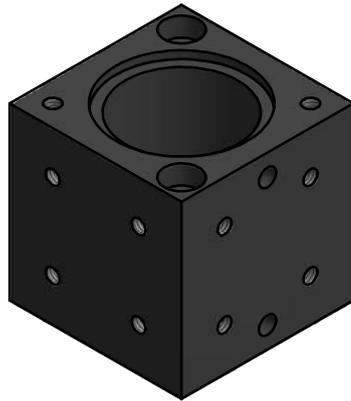
length 15 mm  
Order no.: **B40-V15**



length 20 mm  
Order no.: **B40-V20**



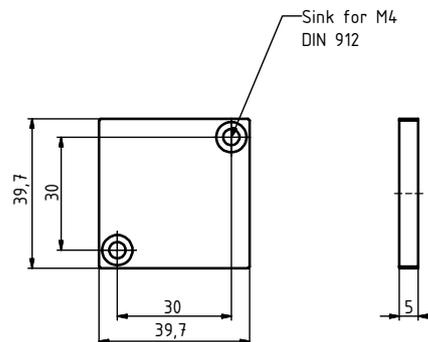
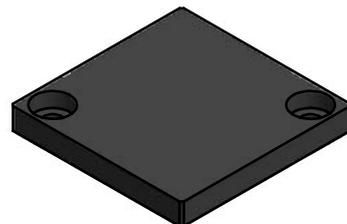
length 40 mm  
Order no.: **B40-V40**



also available in sizes **B30** and **B60**

Cover

For closing unused apertures in tube  
elements e.g. B40-S or use as end plate on  
profile columns B40-P  
Order no.: **B40-D**



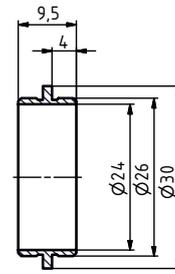
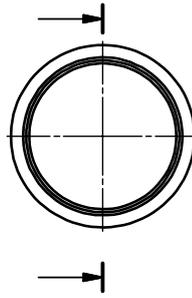
also available in sizes **B30** and **B60**



### Flange bushing

for light-tight and  
centralize connection  
of tube elements

Order no.: **B40-B**

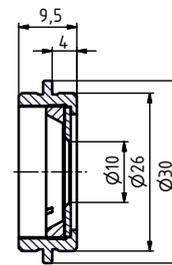
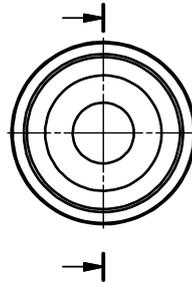


also available in sizes **B30** and **B60**

### Flange bushing with diaphragm

for reducing diffused light  
and reflections in B40 tube  
diaphragm diameter: 10mm  
Order no.: **B40-BB**

Other diaphragm diameters  
upon inquiry

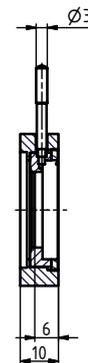
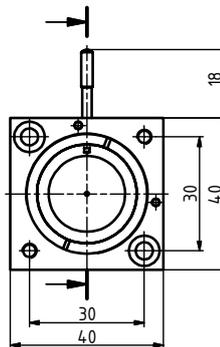


also available in sizes **B30** and **B60**

### Iris diaphragm

Manually-adjustable  
iris diaphragm  
aperture 0,8 - 20 mm

Order no.: **B40-IB**



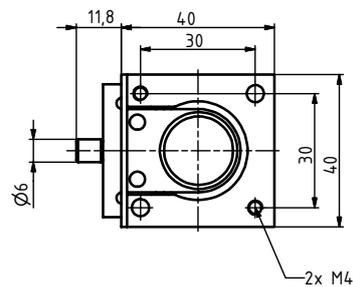
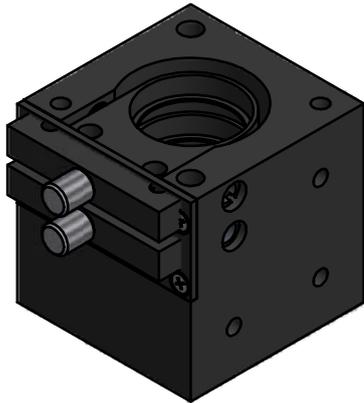
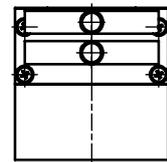
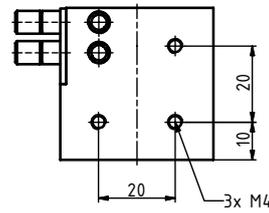
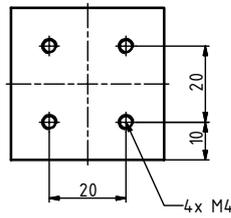
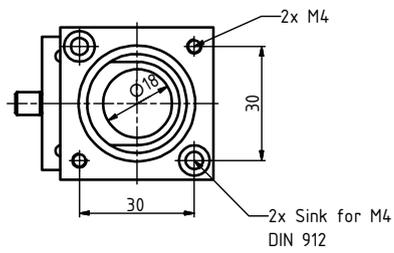
also available in size **B30**



### Filter cube

Tube element with two filter slides for filter with  $\varnothing 20$  mm

Order no.: **B40-FS**

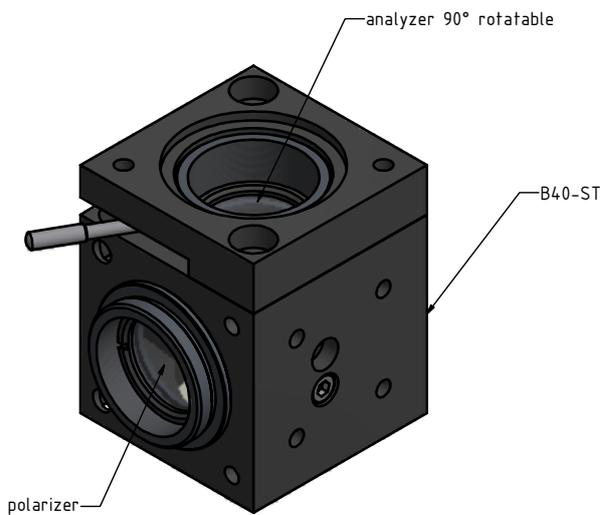
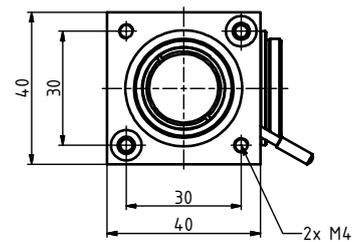
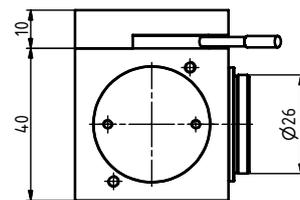
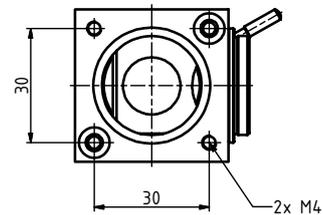


also available in size **B30**

### Polarizing device

B40 reflector cube with polarizer and analyzer

Order no.: **B40-POLT**

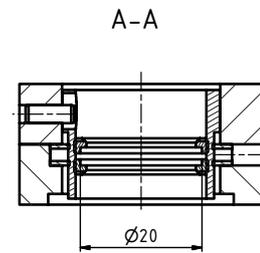
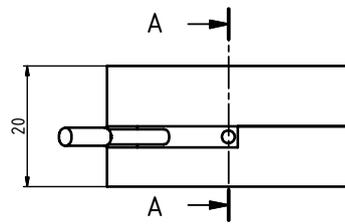


Axial fine adjustment

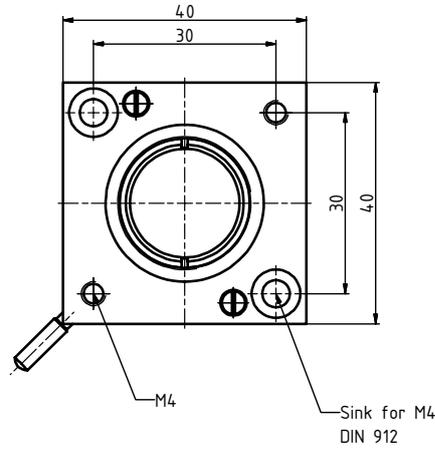
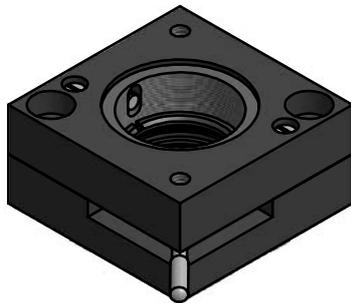
of optical elements

adjustment range: 2 mm

Order no.: **B40-FE**



other diameters on request

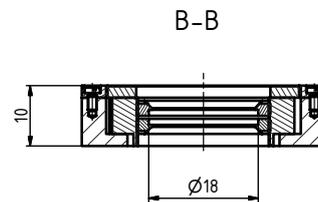
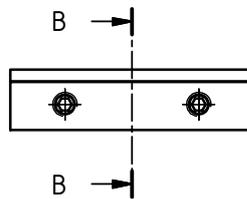


Centring mount

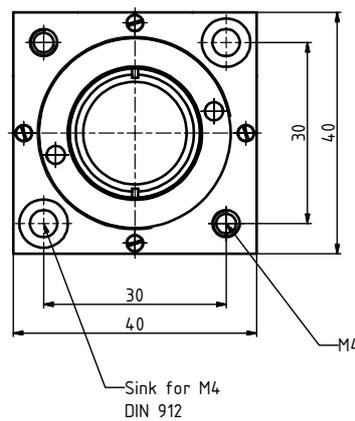
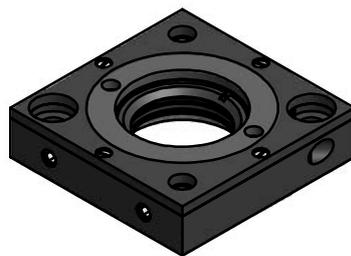
for centre fine adjustment  
of optical elements

adjustment range:  $\pm 1$  mm

Order no.: **B40-TF**



andere Durchmesser auf Anfrage



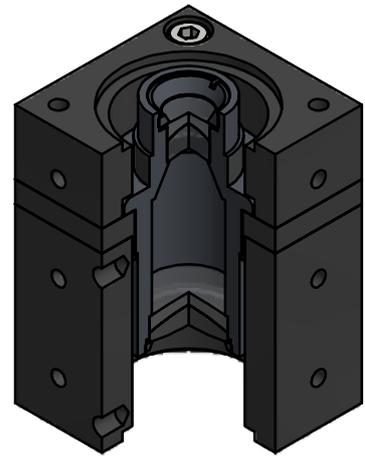
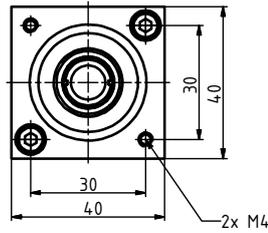
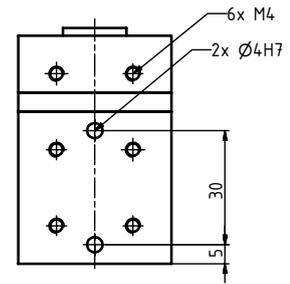
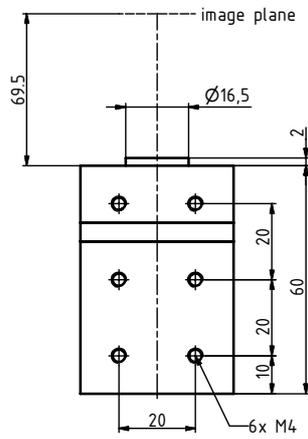
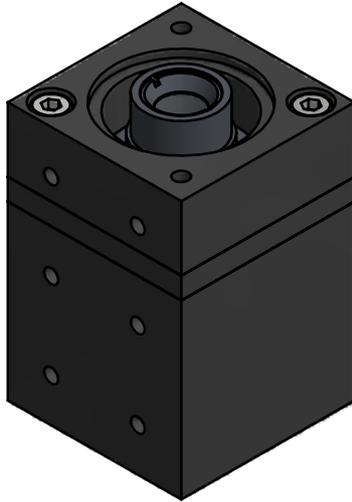
Revision No.: 12



Intermediate optic

Tube lens 1x for infinite objectives, series OP1-V and OP1-VX

Order no.: **B40-ZU**

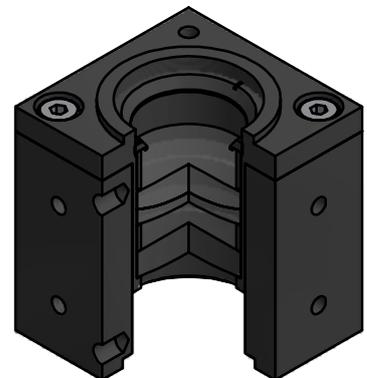
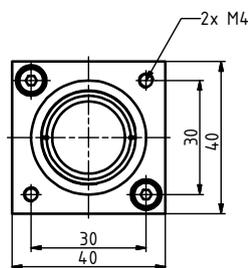
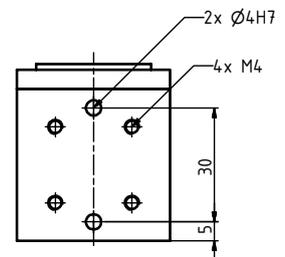
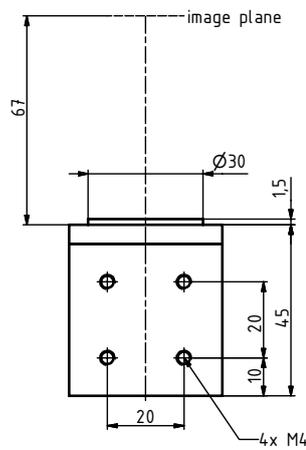
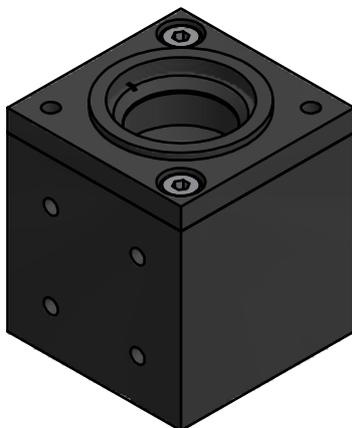


also available in size **B30**

Intermediate optic

Tube lens 0.5x for infinite objectives, series OP1-V and OP1-VX

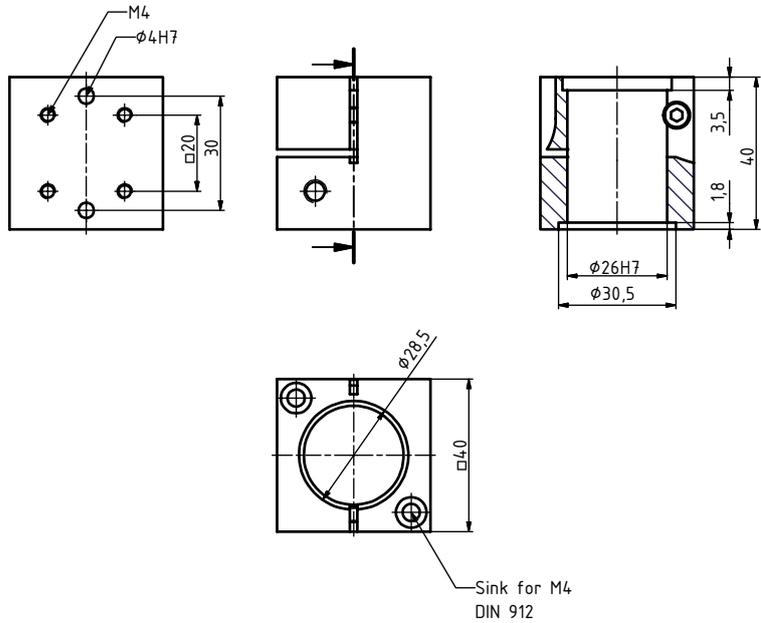
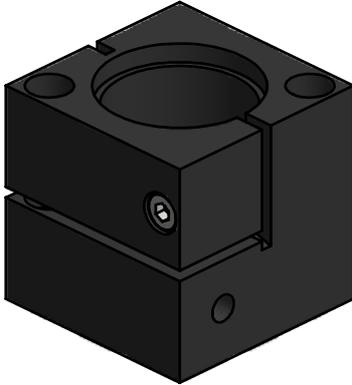
Order no.: **B40-ZU05**



### Clamping piece 40

For connecting viewing systems, tube sockets and camera systems

Order no.: **B40-K**

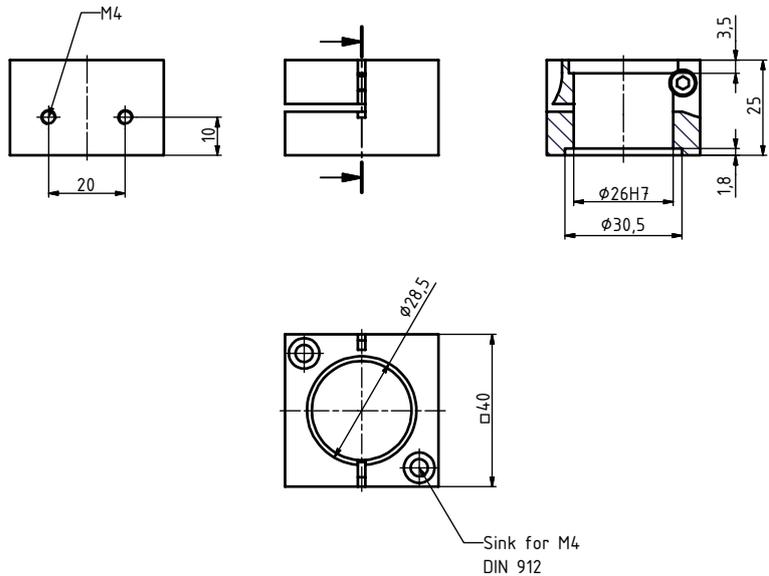
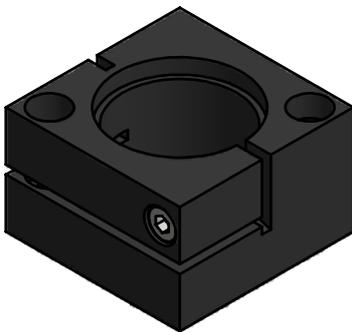


also available in sizes **B30** and **B60**

### Clamping piece 25

Short version with 25 mm length

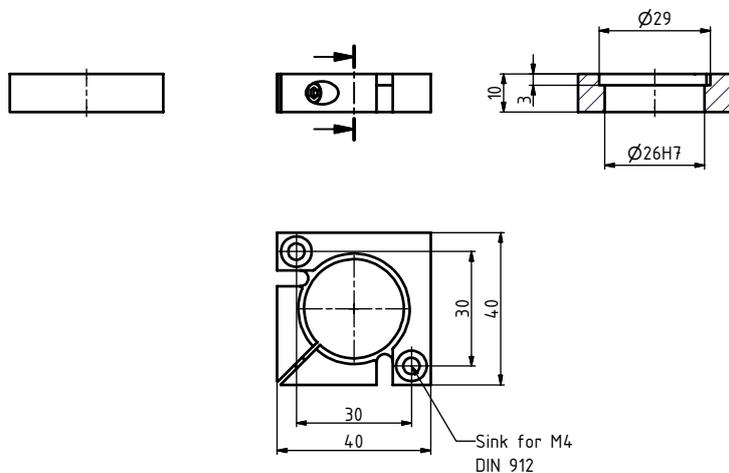
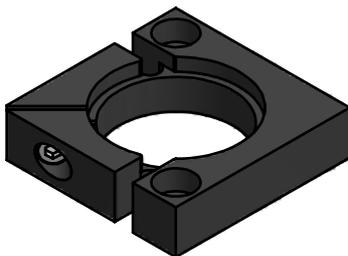
Order no.: **B40-K25**



### Clamping piece 10

Shortest version with 10 mm length

Order no.: **B40-K10**



Inclined monocular 45°

Viewing system with eyepiece 15x suitable for clamping piece B40-K

True levelling and laterally-true images  
Graticule with cross hairs and circles

Order no.: **B40-ZM**



Inclined monocular

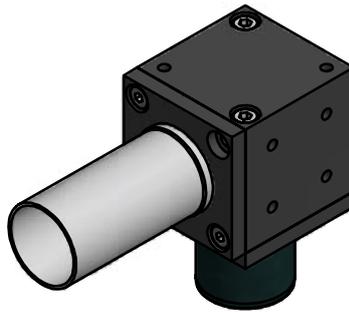
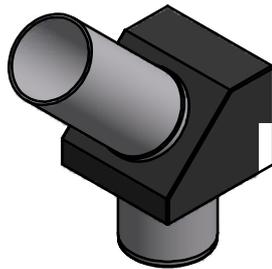
Viewing system with with standardized eyepiece reception suitable for clamping piece B40-K

True levelling and laterally-true images  
Graticule with cross hairs and circles

Viewing angle 45°  
Order no.: **B40-W45**

Viewing angle 90°  
Order no.: **B40-W90**

Viewing angle 0°  
Order no.: **B40-W0**  
(without image erection)



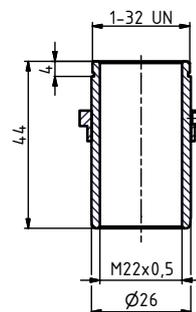
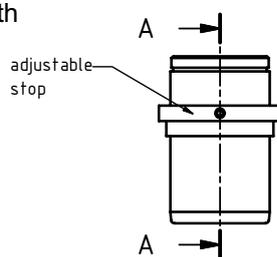
C-mount socket

Suitable for clamping piece B40-K, for mounting CCD cameras with c-mount thread

Order no.: **B40-CM**

Adjustable version  
max. eccentricity 0.5 mm  
For camera alignment to optical axis when using an objective turret or zoom objectives

Order no.: **B40-CMJ**



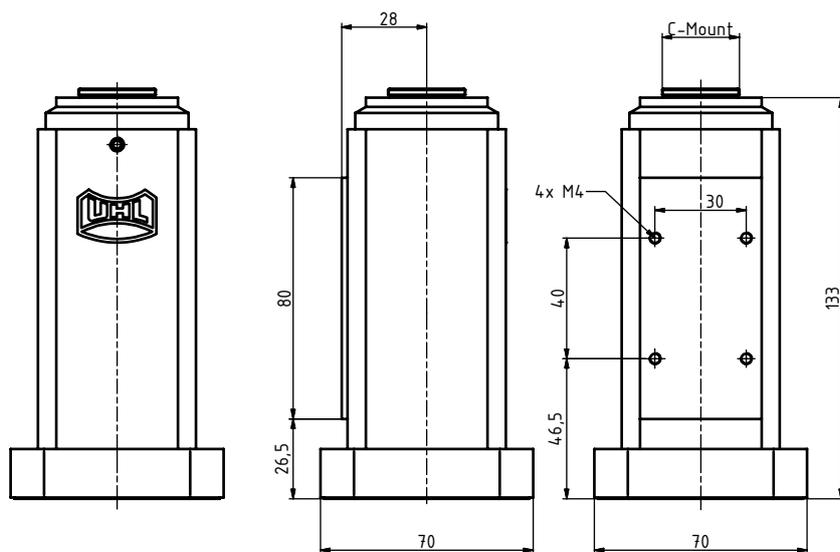
also available in size **B30**



### Microscope tube M

Videotube for use with telecentric lenses of the OP1-M series, direct attachment to adjustment elements B40, C-Mount camera connector

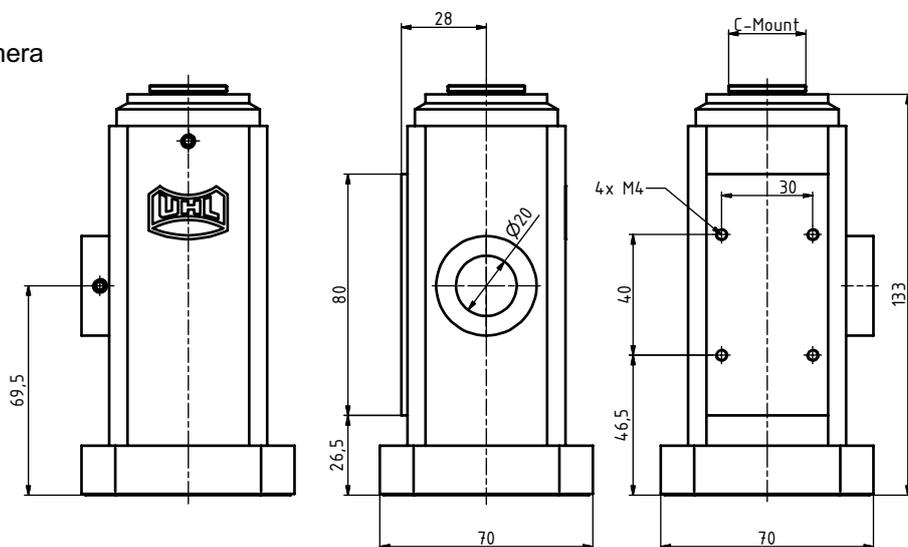
Order no.: **B40-TM**



### Microscope tube M

Incident light videotube for use with telecentric lenses of the OP1-M series, direct attachment to adjustment elements B40, C-Mount camera connector

Order no.: **B40-TMA**



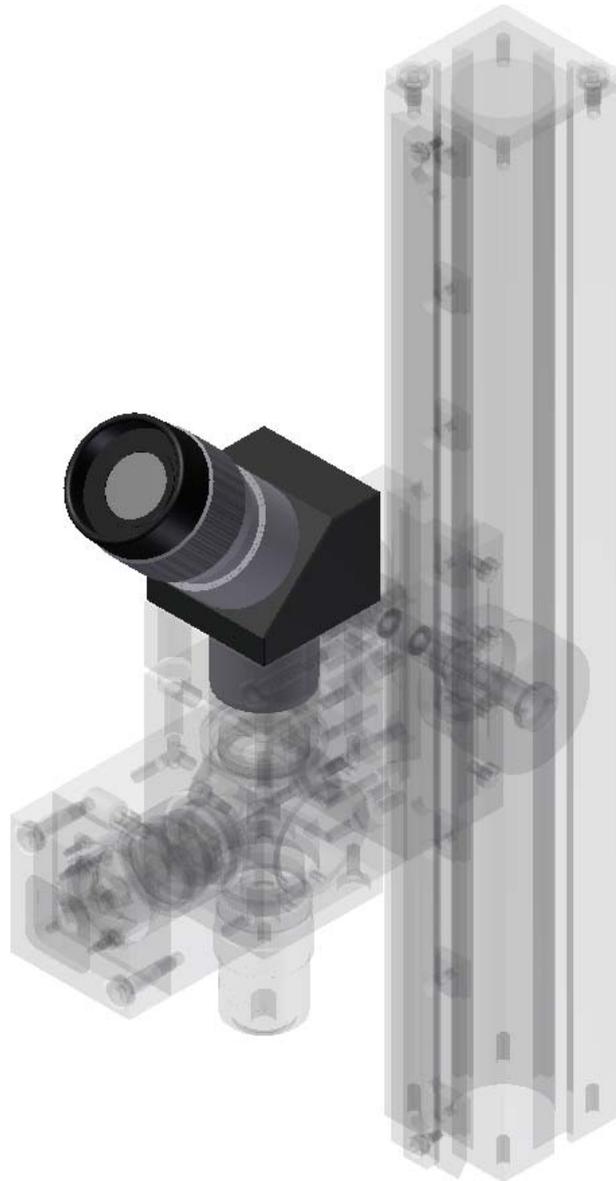
Matching incident light elements:  
VM3-502 (incident illumination with glass fiber)  
VM3-504 (incident illumination with LED)

Revision No.: 12





# Eyepieces and Cameras



Revision No.: 12

Various exchangeable eyepieces with crosshairs or measuring scales, fixed and aligned eyepieces with crosshairs and concentric circles or different industrial video cameras are applicable for the imaging.



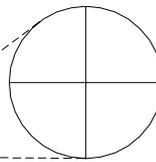
## Measuring and special eyepieces

For the assessment of objects, dimensional embodiment generally graticules in beam path are imperative. For special requirements, a linear measuring system can also be provided. All eyepieces are suitable for the standardized socket diameter of 23.2 mm.



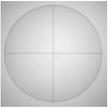
### Wide-field eyepieces

Order no.	Magnification	Diopter compensation
WF10XL	10x	-
WF15XL	15x	-
WFP20x	20x	-

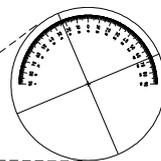
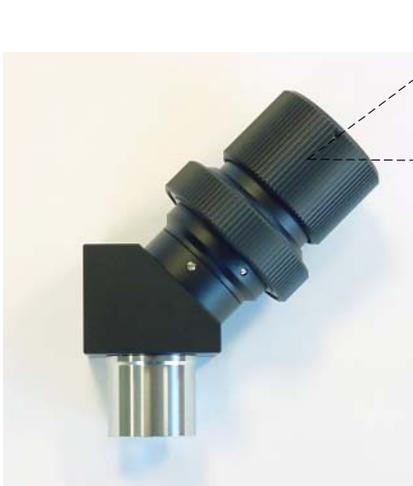


Graticule

### Wide-field eyepieces with graticule

Order no.	Magnification	Diopter compensation	Graticule
WF10XL/+ WF15XL/+ WF20XL/+	10x 15x 20x	✓	crosshair 
WF10XL/FK WF15XL/FK WF20XL/FK	10x 15x 20x	✓	crosshair with concentric circles 
WF10XL/10 WF15XL/10 WF20XL/10	10x 15x 20x	✓	scale 10 mm into 100 lines 

different graticules upon request



Angular graticule with crosshair

Order no.:

**B40-ZMW**

**Angular measuring eyepiece with viewing 45°**

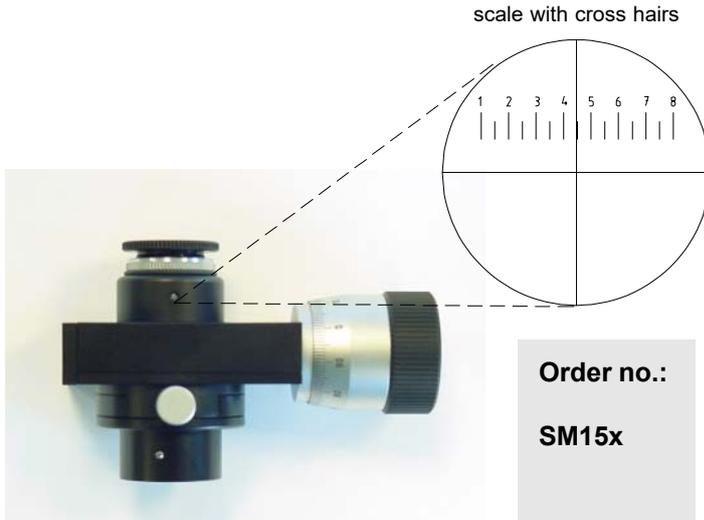
Diopter compensation

Magnification: 10x

Reading: 20'

(shank diameter 26 mm)





**Order no.:**

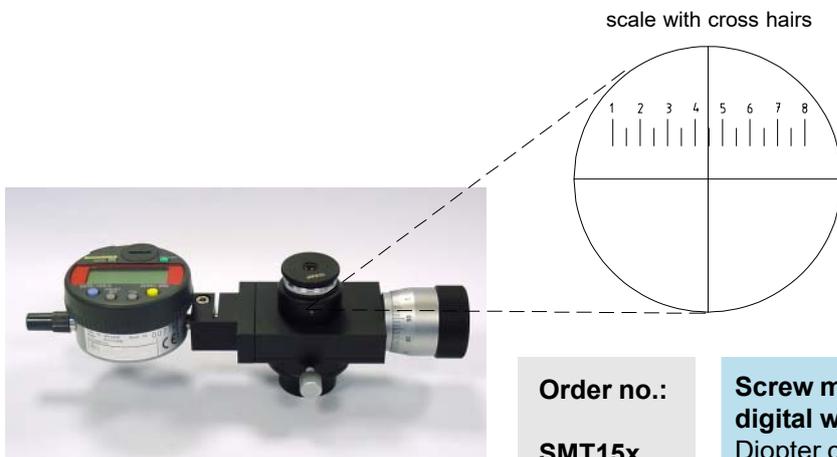
**SM15x**

**Screw micrometer eyepiece,  
mechanical**

Diopter compensation

Magnification: 15x

Resolution: 0,005 mm



**Order no.:**

**SMT15x**

**Screw micrometer eyepiece,  
digital with programmable dial gauge**

Diopter compensation

Magnification: 15x

Resolution: 0,0005 mm



## Video components

Industrial video monitors with sheet metal case, optional with touch, HDMI, VGA, BNC and RCA-cinch connector, stand and VESA-mount:

**Order No.:**      **Resolution**      **Dimensions (W x H x D)**

*Format 4:3*

<b>TFT-08</b>	1024 x 768 (native) 1920 x 1200 (max) 640 x 480 (min)	189 x 150 x 34
<b>TFT-10</b>	1024 x 768 (native) 1920 x 1200 (max) 640 x 480 (min)	225 x 176 x 32
<b>TFT-12</b>	1024 x 768 (native) 1920 x 1200 (max) 640 x 480 (min)	275 x 213 x 36
<b>TFT-15</b>	1024 x 768 (native) 1920 x 1200 (max) 640 x 480 (min)	335 x 259 x 36



*Format 16:9 (4:3 adjustable)*

<b>TFT-12W</b>	1920 x 1080 (native) 1920 x 1080 (max) 640 x 480 (min)	279 x 179 x 33
<b>TFT-15W</b>	1920 x 1080 (native) 1920 x 1080 (max) 640 x 480 (min)	384 x 240 x 38
<b>TFT-17W</b>	1920 x 1080 (native) 1920 x 1080 (max) 640 x 480 (min)	422 x 259 x 38
<b>TFT-19W</b>	1920 x 1080 (native) 1920 x 1080 (max) 640 x 480 (min)	471 x 281 x 38



Cameras with analog or digital video signal (for use without PC):

**Order No.:**

<b>VM4-VGA</b>	Color camera with VGA-signal, 1280x1024 Pixel, 60 frames/s, up to 4 crosshair lines available sensor size 1/2,5" (5,32 x 4,5 mm)
<b>VM4-HDMI</b>	Color camera with HDMI-interface, 1920x1080 Pixel, 60 frames/s, up to 2 crosshair lines available, sensor size 1/2,8" (5,44 x 3,09 mm)





**Order no.:**

**VM4-USB**

Video cameras with USB connection:

color, USB 3, 1/1.8"  
2048x1536 pixel,  
maximum 58 images / second

**VM4-USBM**

monochrome, USB 3, 1/1.8"  
2048x1536 pixel,  
maximum 58 images / second

**VM4-USB5**

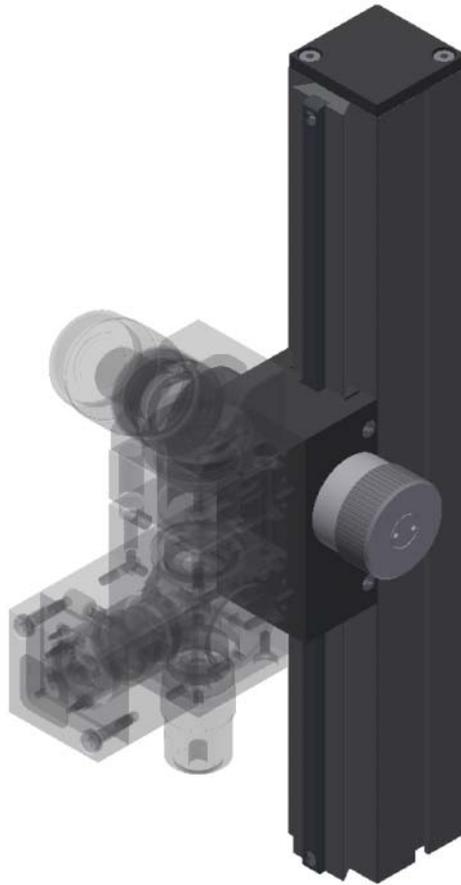
color, USB 3, 1"  
2592 x 2048 pixel,  
maximum 72 images / second

all cameras are supplied with  
interface cable and PC  
software for image aquisition



## Moving elements

---



Revision No.: 12

The control elements are equipped with dovetail guides or cross roller guides. Rack and pinion, micrometer or worm serve as driving elements. The dovetail is furnished with a hard-slide coating. All guides are subsidiary. The pinion knobs are fixed through collets on the smooth driving shaft. The bearing is situated exclusively within the guide boxes. The control elements can be supplied with one or two knobs or without any knobs. Through corresponding intermediate elements, the guide systems can be combined into multi-axis designs. For the mounting of tube elements, an intermediate plate (B40-RP) is required.



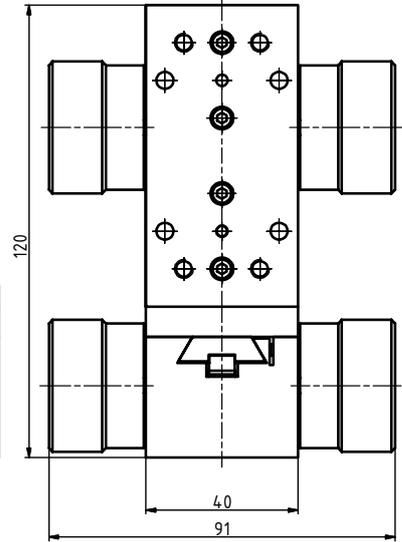
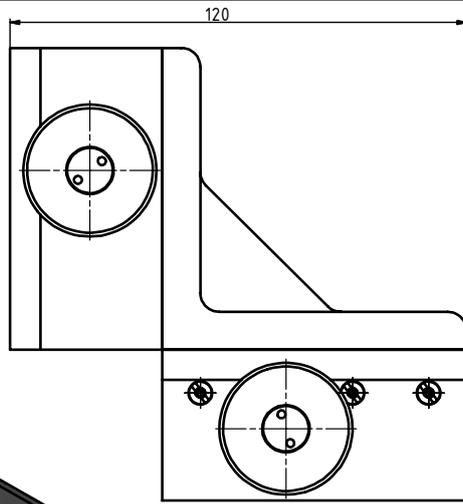
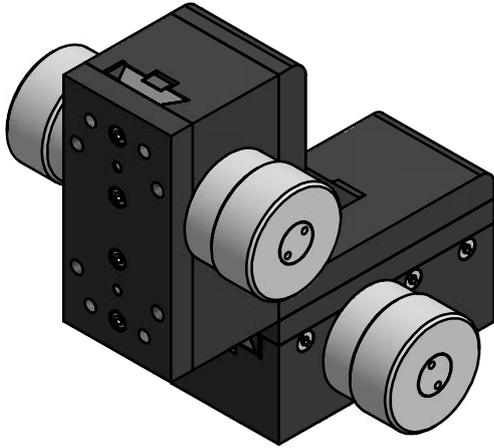


Angular drive

consisting of two B40-G  
connected by an elbow

Stroke X: 50 mm  
Stroke Y: 50 mm

Order no.: **B40-WT**



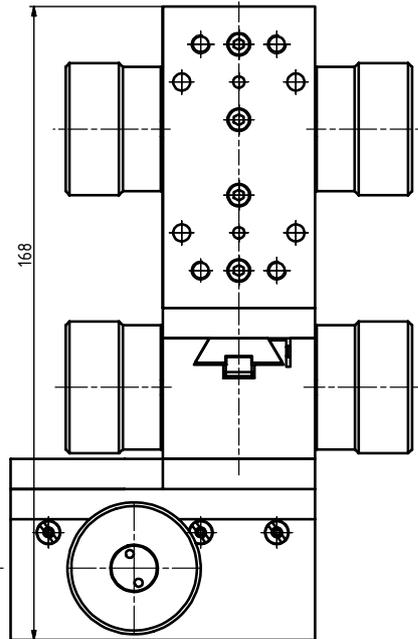
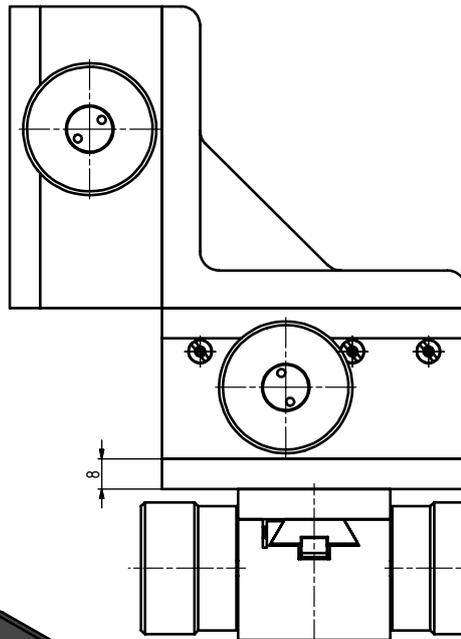
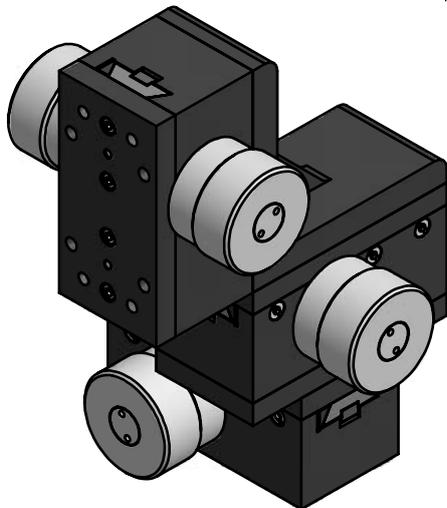
also available in sizes **B30** and **B60**

Manipulator

consisting of three B40-G  
connected by an elbow  
and a T-plate

Stroke X: 50 mm  
Stroke Y: 50 mm  
Stroke Z: 50 mm

Order no.: **B40-M3**



also available in sizes **B30** and **B60**

Revision No.: 12

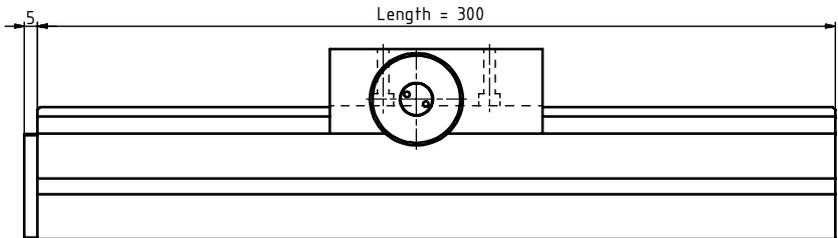
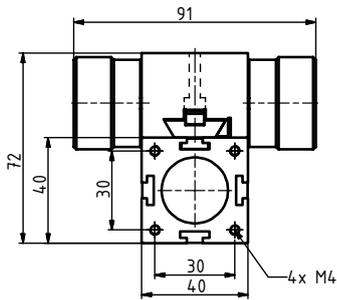
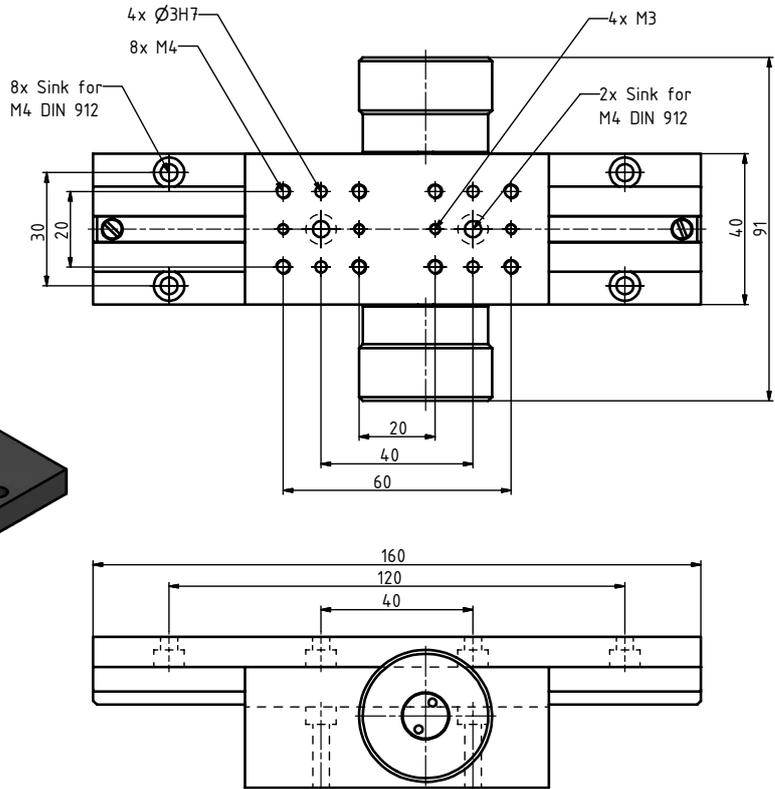
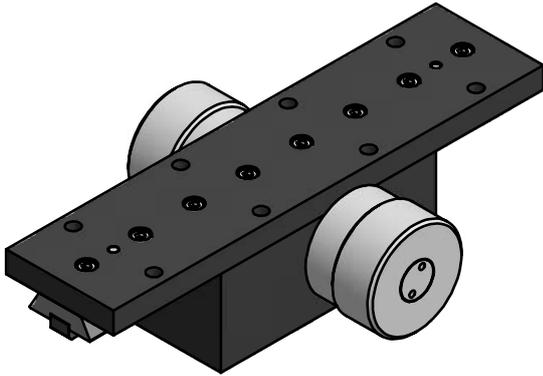


Guide box

with rack, dovetail guide  
and two knurled knobs.  
Backlash-free drive and guiding.  
Displacement per knob turn 23.1 mm.

Stroke: 100 mm  
Length: 160 mm  
Order no.: **B40-G100**

Stroke: 240 mm  
Length: 320 mm  
Order no.: **B40-G240**



Guide box

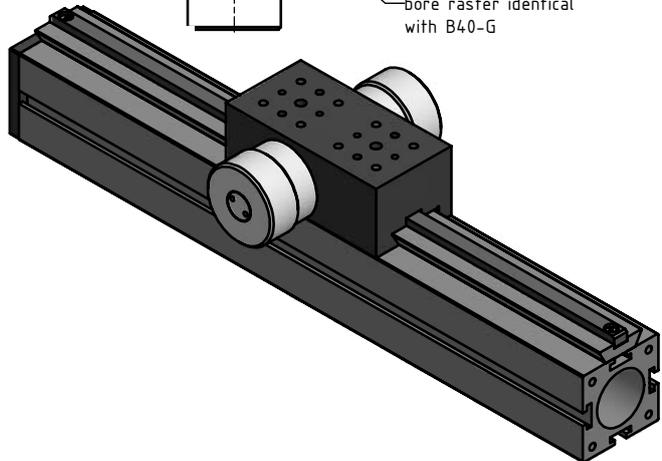
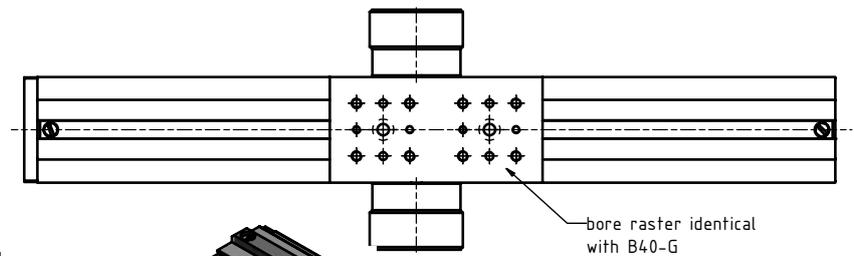
with rack and dovetail guide  
on a profile column,  
two knurled knobs.  
Backlash-free drive and guiding.  
Displacement per knob turn 23.1 mm.

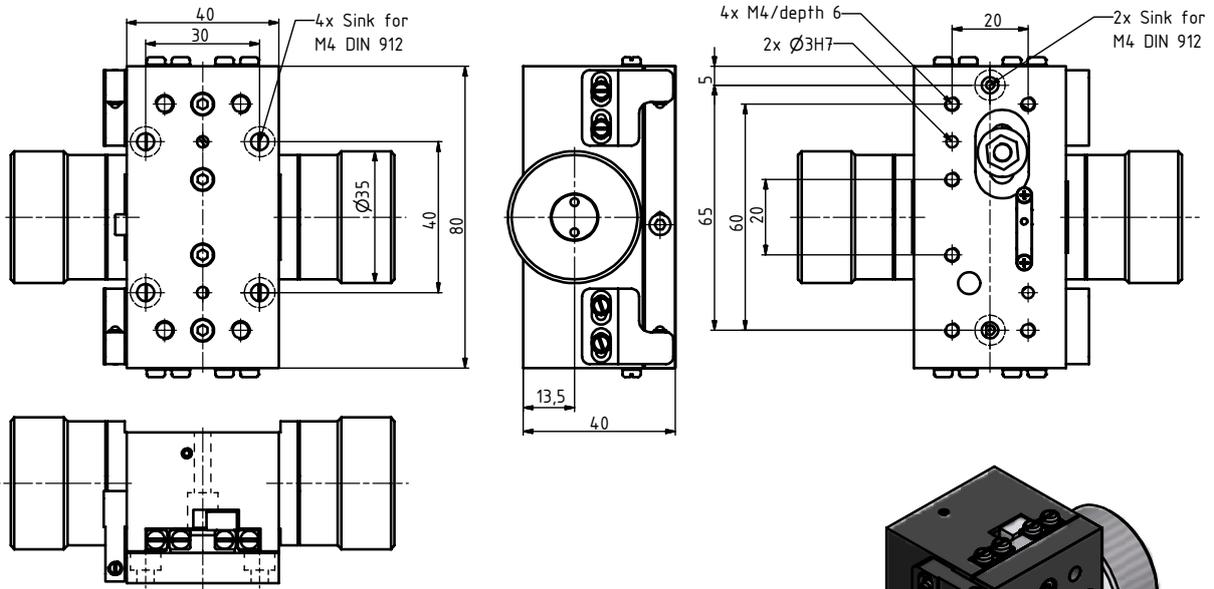
Length: 200  
Stroke: 110 mm  
Order no.: **B40-G200**

Length: 300  
Stroke: 220 mm  
Order no.: **B40-G300**

Length: 384  
Stroke: 300 mm  
Order no.: **B40-G380**

Other lengths upon inquiry



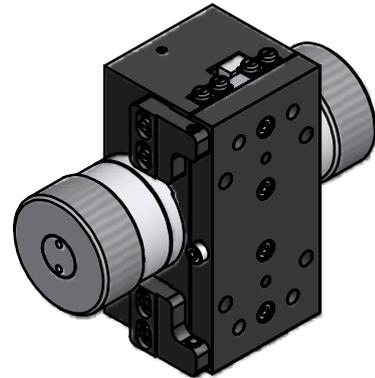


**Coarse & Fine Drive**

with worm drive, cross roller guide and fine adjustment range (0.28mm / 270°) coarse adjustment 2.3 mm / turn

Stroke: 50 mm

Order no.: **B40-KR**



also available in size **B60**

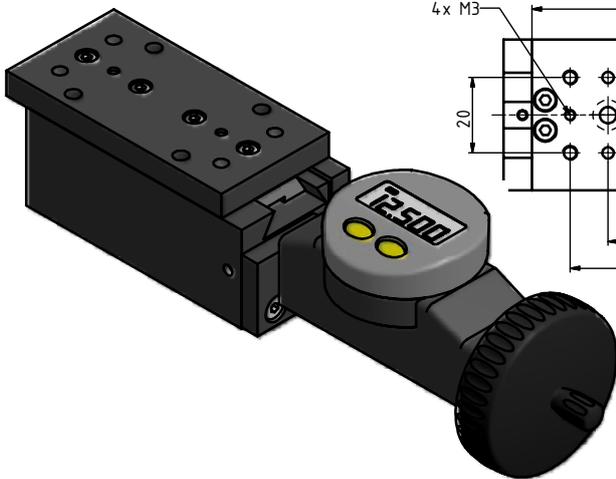
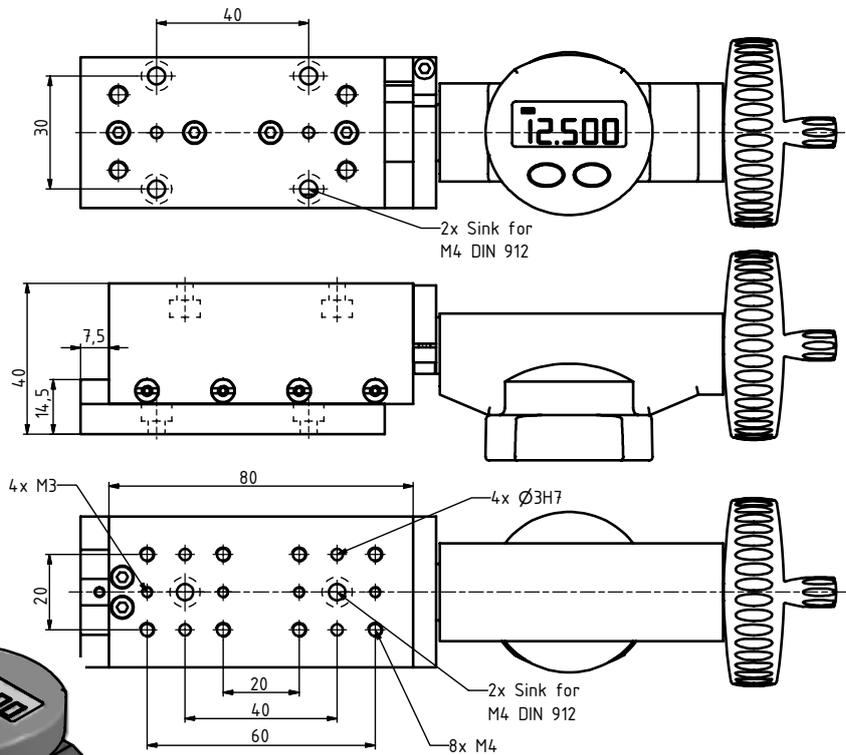
**Linear Stage**

with spring reset and micrometer

Stroke: ±12,5 mm

Version with digital micrometer  
Order no.: **B40-GMD**

Version with analog micrometer  
Order no.: **B40-GM**

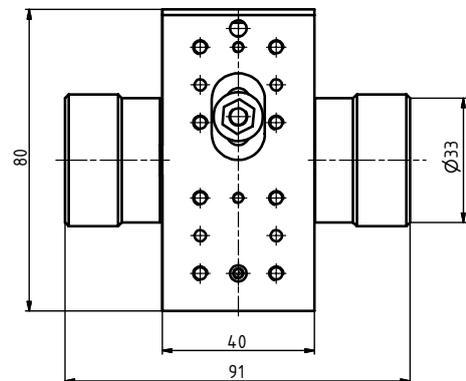
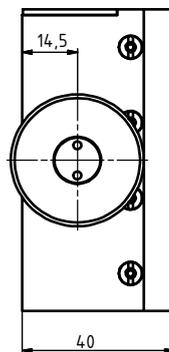
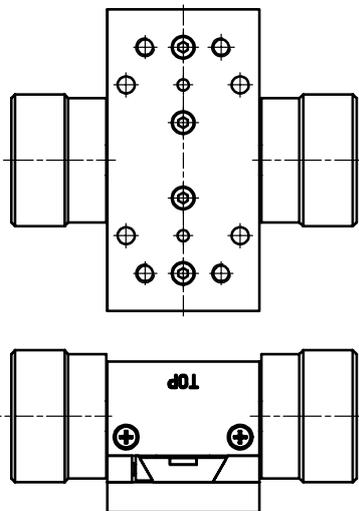
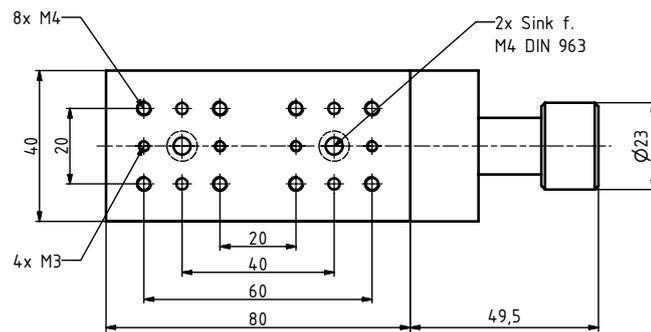
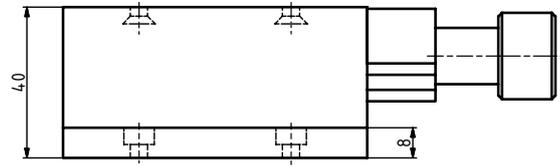
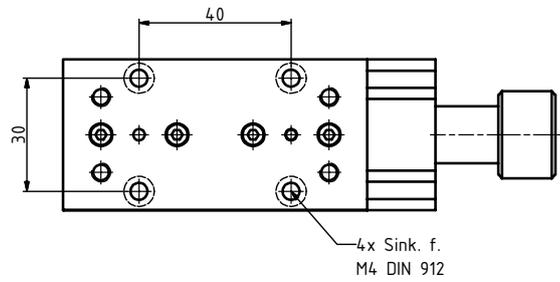
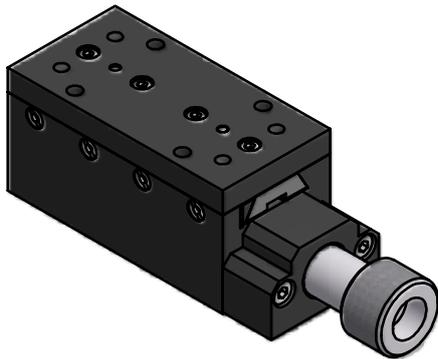


## Linear Stage

with backlash-free  
leadscrew (0.5 mm / tr..)

Stroke:  $\pm 25$  mm

Order-Nr.: **B40-GMS**

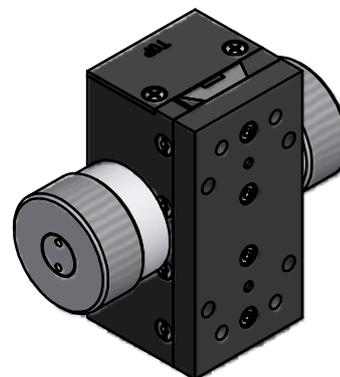


## Fine adjustment

Focus control with  
fine adjustment (0.2 mm / turn)

Stroke: 3 mm

Order no.: **B40-FT**



### Micro-stage

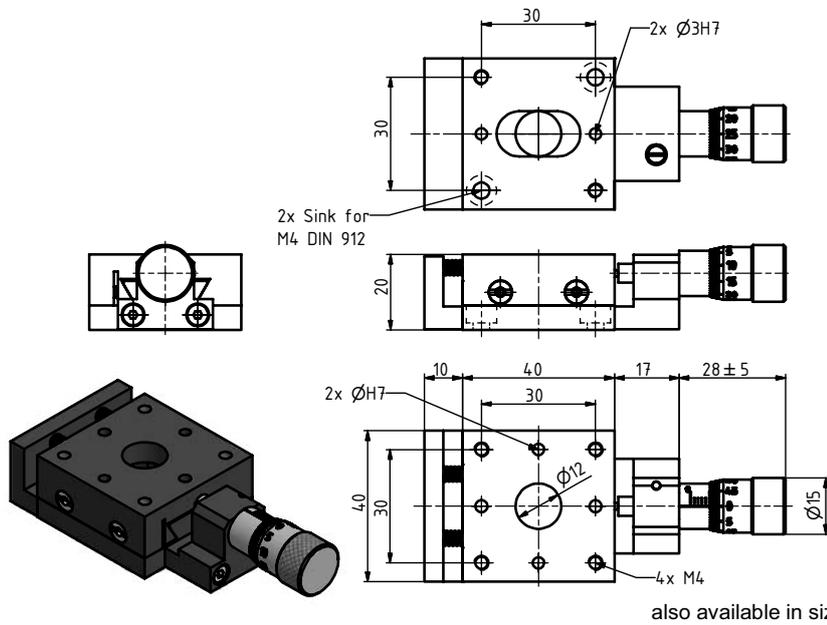
with auxiliary dovetail guide,  
centre bore and micrometer

Stroke: 10 mm

Order no.: **B40-MT**

Version with threaded pin  
instead of micrometer

Order no.: **B40-MTS**



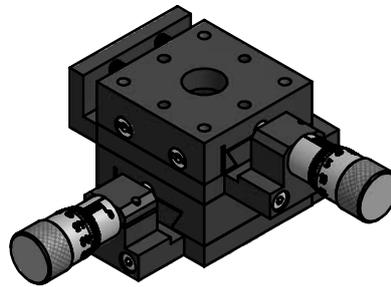
### Cross stage

assembled from two B40-MT,  
directly screwed-on

Stroke X: 10 mm

Stroke Y: 10 mm

Order no.: **B40-MT2**



also available in size **B60**

### Micromanipulator

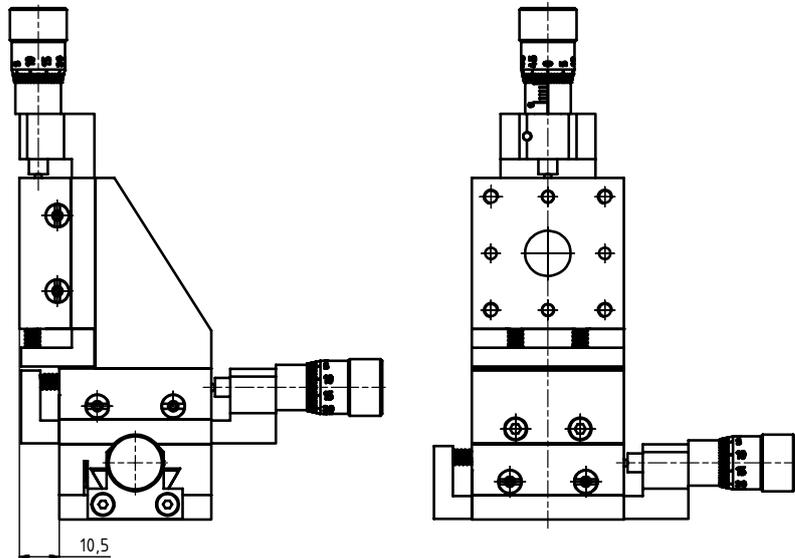
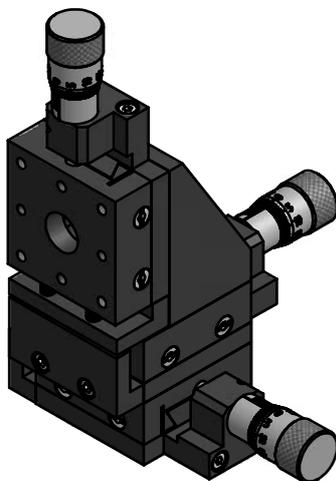
assembled from three B40-MT  
connected by an elbow

Stroke X: 10 mm

Stroke Y: 10 mm

Stroke Z: 10 mm

Order no.: **B40-MT3**



also available in size **B60**

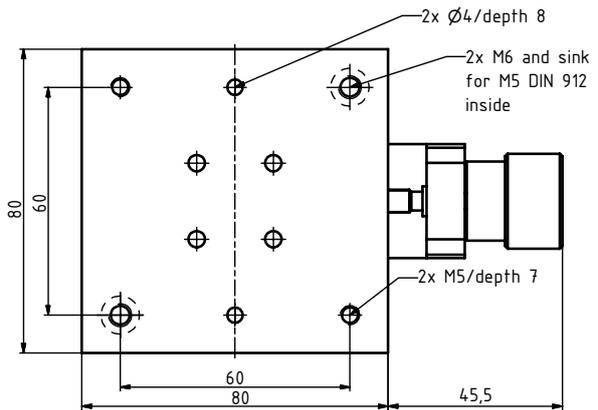
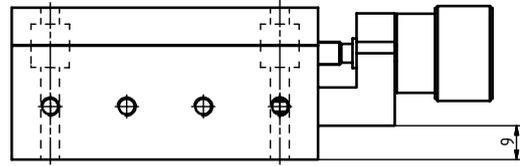
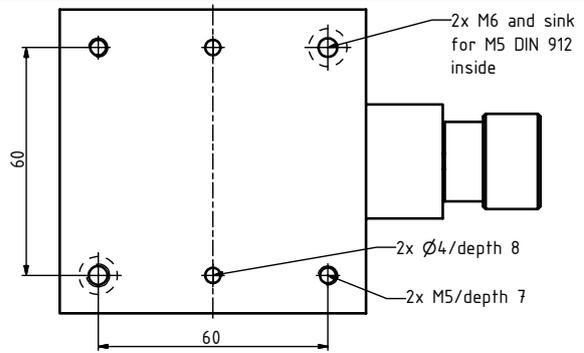
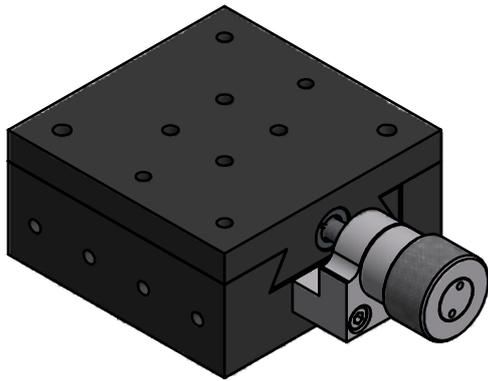
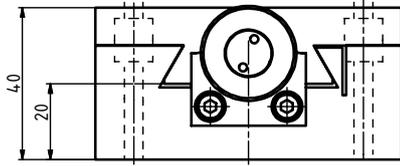


### Micrometer stage

with fine screw threaded spindle  
pitch 0.5 mm  
dovetail guide without scale

Stroke: 10 mm

Order no.: **B80-MTK**



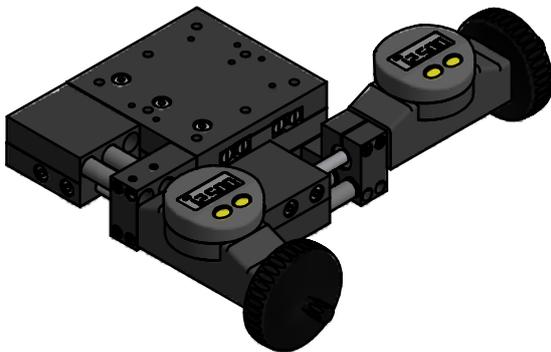
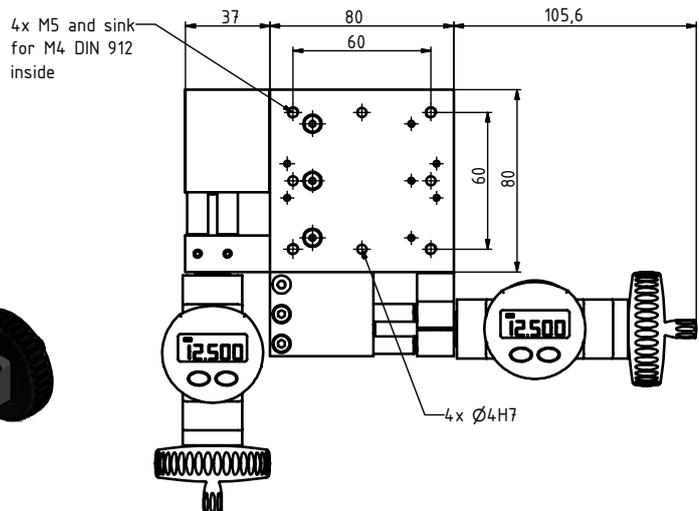
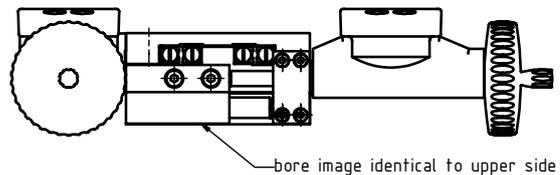
### Cross stage

with micrometers and  
dovetail guides

Stroke: 25 x 25 mm<sup>2</sup>

Version with digital  
installed micrometer  
Order no.: **KT4-NMLC**

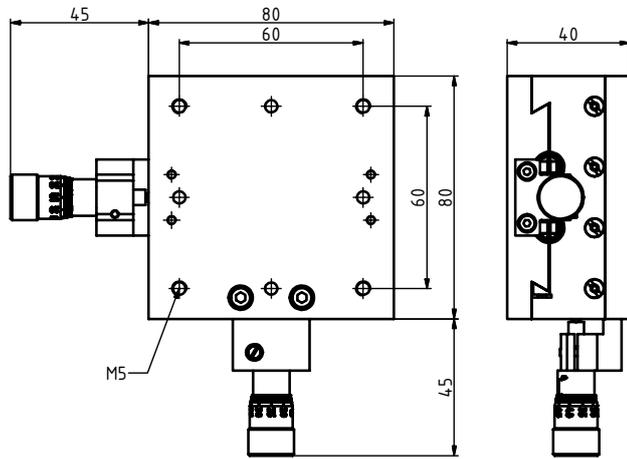
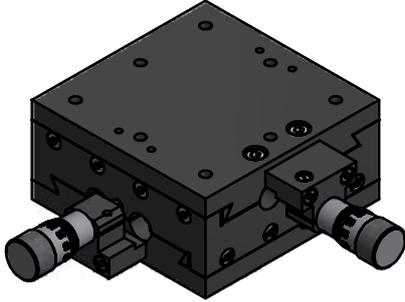
Version with analog  
installed micrometer  
Order no.: **KT4-NMAC**



### Kreuztisch mit Schwalbenschwanzführung

mit analogen Einbaumessschrauben  
Hub 10 x 10 mm<sup>2</sup>

Bestell-Nr.: **GT4-SM1C**



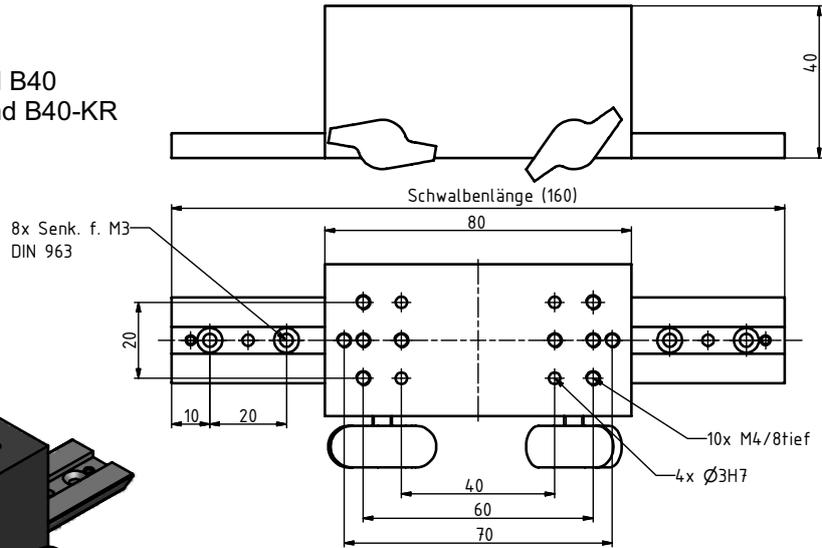
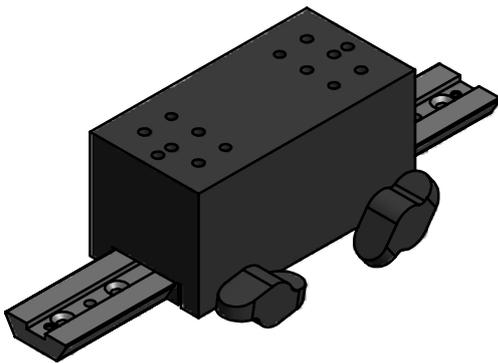
### Einhängesystem mit Schwalbe

zum Anbau an Konstruktionsprofil B40  
mit Anschrauberaster für B40-G und B40-KR

mit Schwalbenlänge 160 mm  
Bestell-Nr.: **B40-ES16**

mit Schwalbenlänge 300 mm  
Bestell-Nr.: **B40-ES30**

andere Längen auf Anfrage



### Einhängesystem ohne Schwalbe

Bestell-Nr.: **B40-ES**

### Konstruktionsprofile B40

Al-Profil mit vier T-Nuten zur  
Befestigung von Eihängesystemen

Standardlängen [mm]: 100, 200, 300  
350, 480, 520

Bestell-Nr.: **B40-P(Länge in mm)**

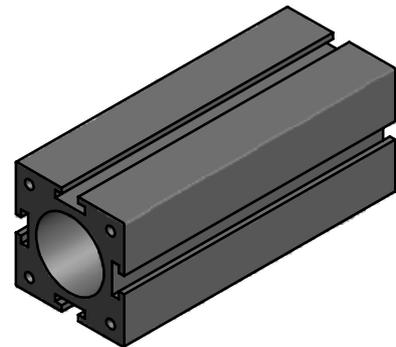
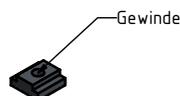
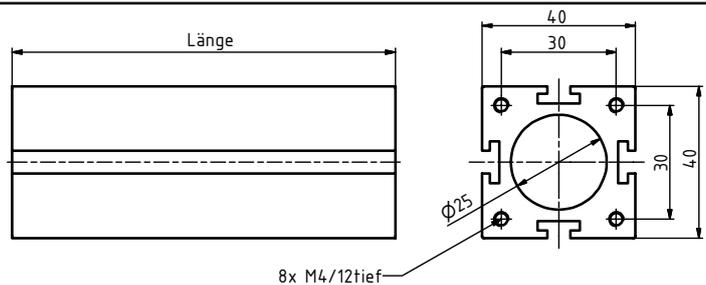
andere Längen auf Anfrage

### Nutenstein

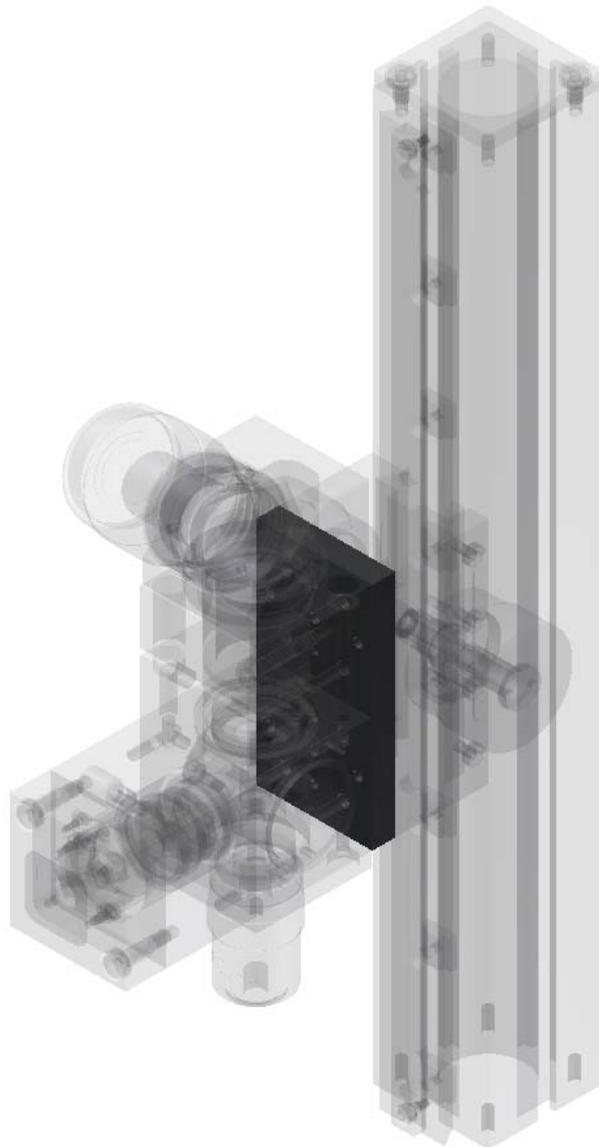
für Konstruktionsprofil B40

Gewinde M4  
Bestell-Nr.: **B40.51**

Gewinde M3  
Bestell-Nr.: **B40.55**



# Connecting elements



Revision No.: 12

In order for complex systems to be easily feasible, guide and tube elements can be combined with one another through connecting elements.



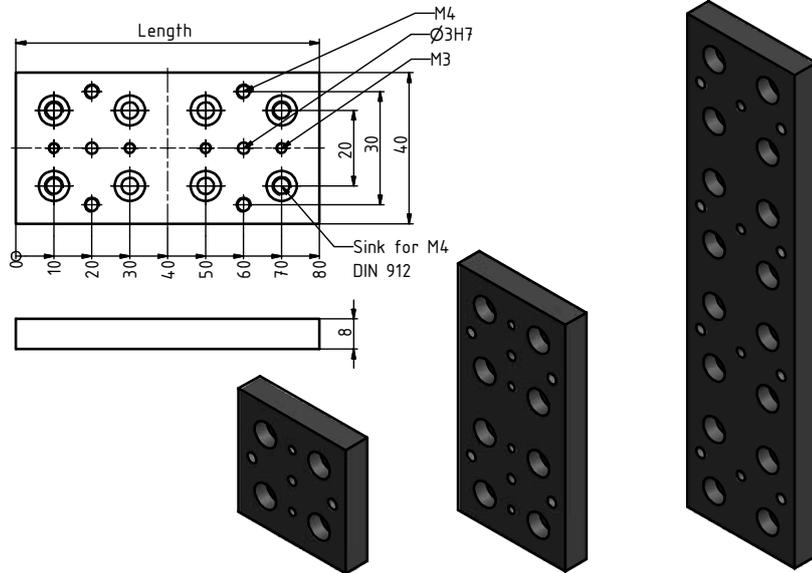
### Raster plate

for mounting  
B40 tube designs  
on B40 moving elements

Order no.: **B40-RP**  
Length 80 mm

Order no.: **B40-RPK**  
Length 40 mm

Order no.: **B40-RPL**  
Length 160 mm

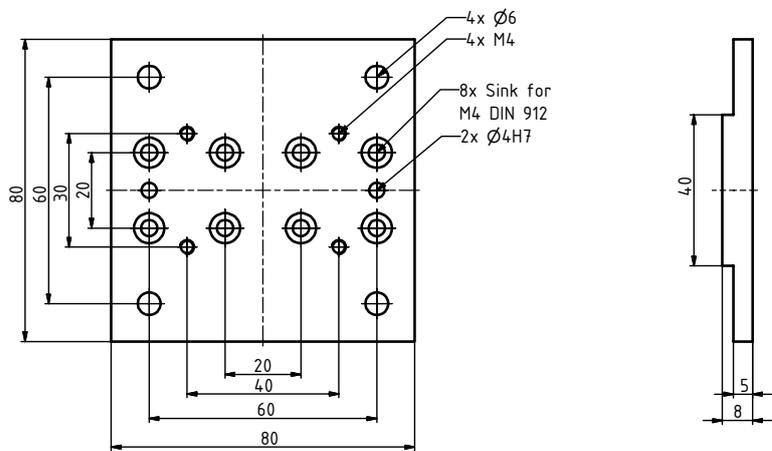
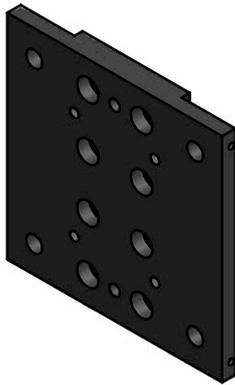


also available in sizes **B30** and **B60**

### Adapter plate

for mounting B40 tube designs  
on linear stages LT5, LTZ and M80

Order no.: **LT5-B40**

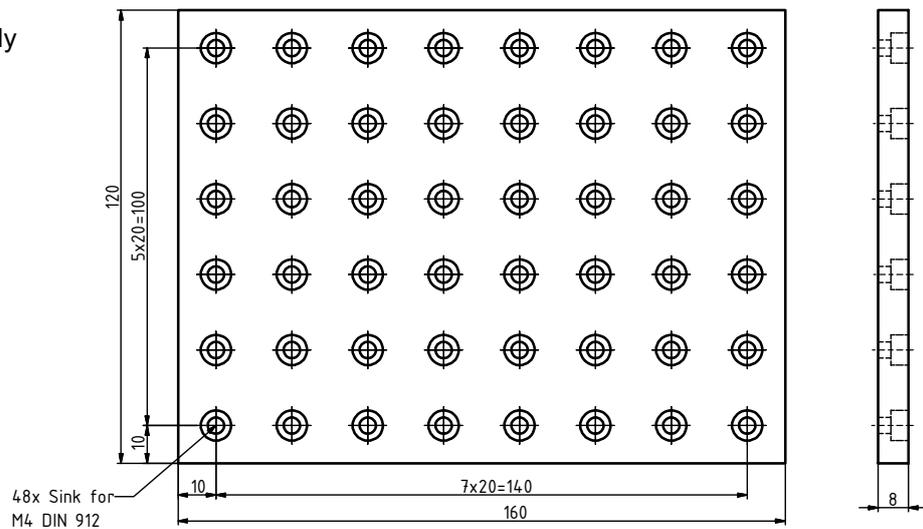


### Aperture plate

for extensive assembly  
of B40 tube elements

Plate 160 x 120  
Order no.: **B40-LP**

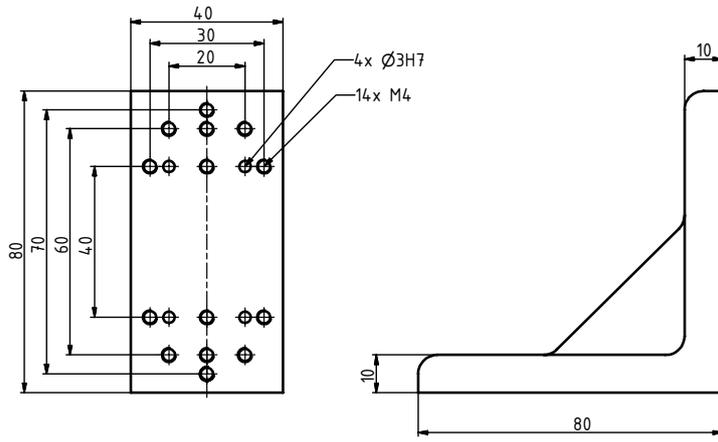
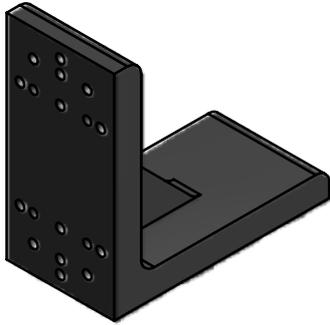
Plate 200 x 160  
Order no.: **B40-LPG**



### Angle Bracket

for connecting B40 moving elements to multi-axis systems

Order no.: **B40-W**

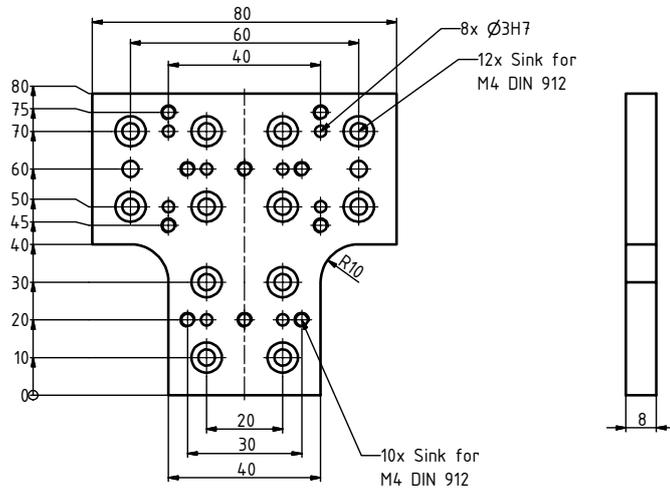
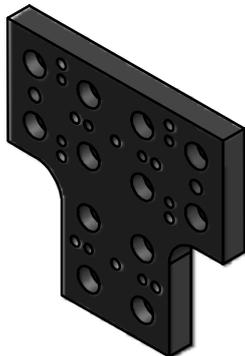


also available in sizes **B30** and **B60**

### T-plate

for connecting B40 moving elements to multi-axis systems

Order no.: **B40-TP**

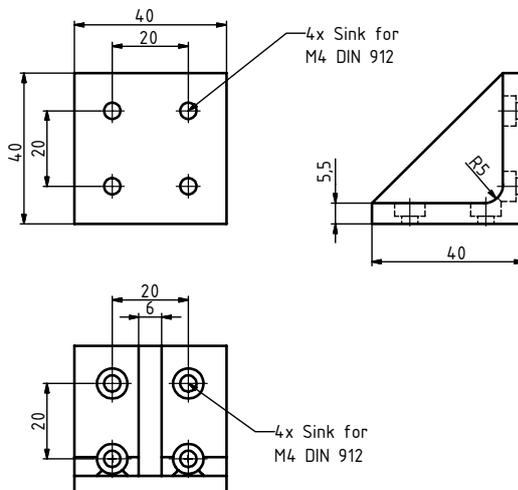
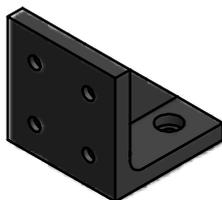


Revision No.: 12

### Angle Bracket

for connecting B40 tube elements to triaxial systems

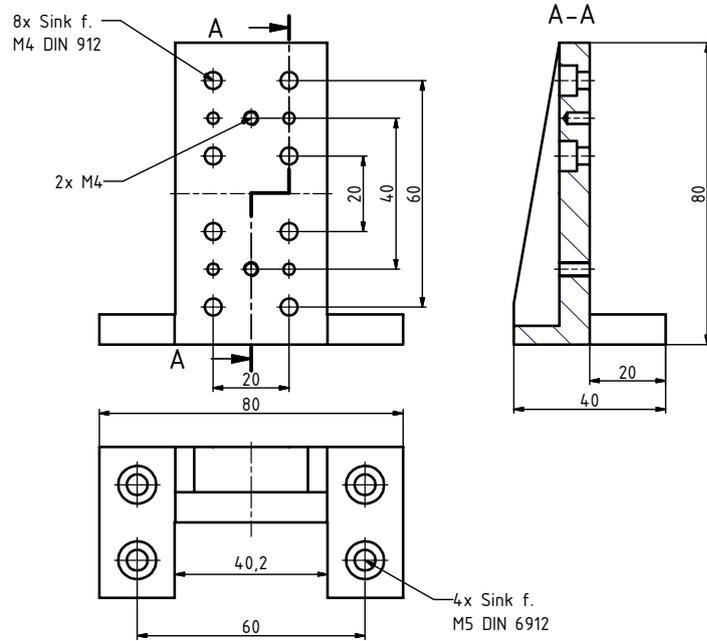
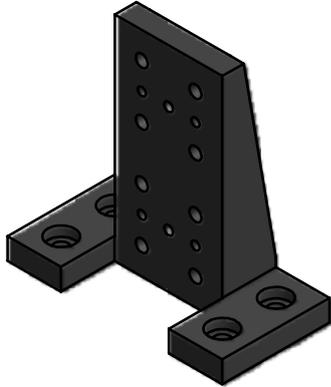
Order no.: **B40-WK**



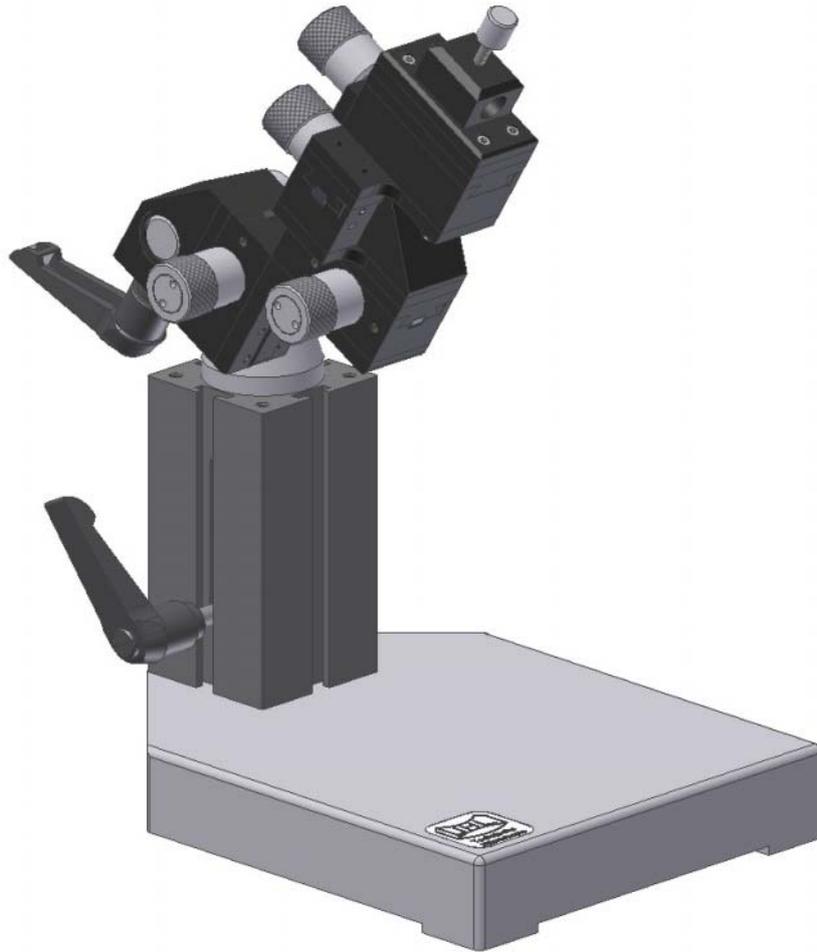
### Angle Bracket

for connecting B40  
moving elements to  
multi-axis systems

Order no.: **B40-W1**



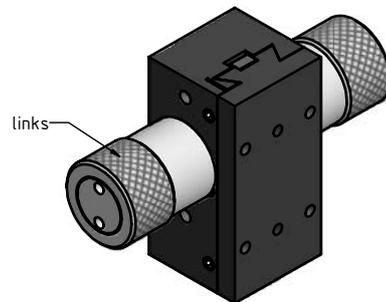
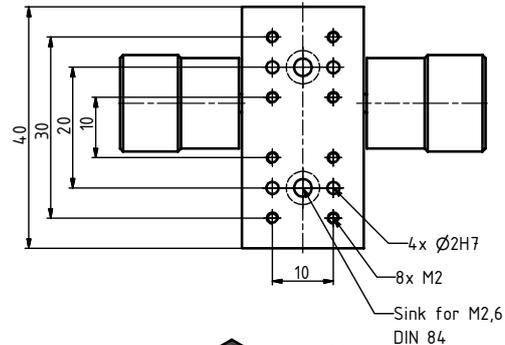
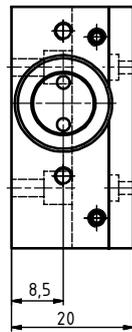
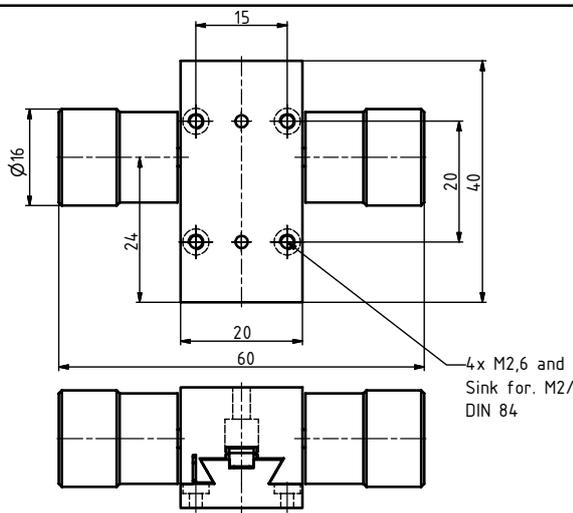
## Components B20



Revision No.: 12

The conception of the driving boxes B40 is further extended through miniaturized fine regulating elements of the Series B20: Precise dovetail guiding, manual and motorized controls and multiple assembly possibilities with grid boards and angles.





**Guide box**

with rack, dovetail guide and two knurled knobs, backlash-free drive and guiding.

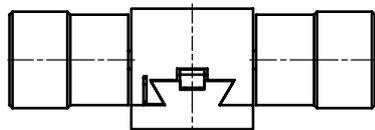
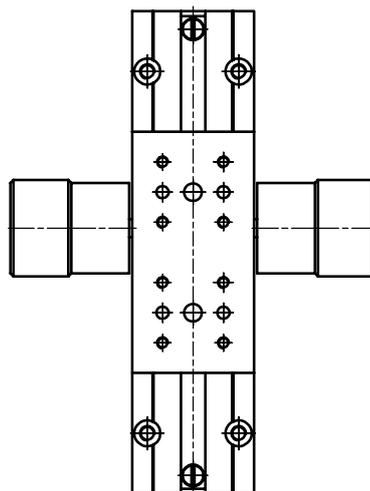
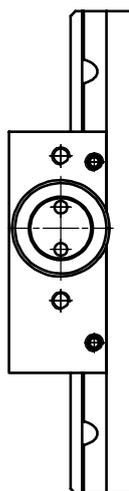
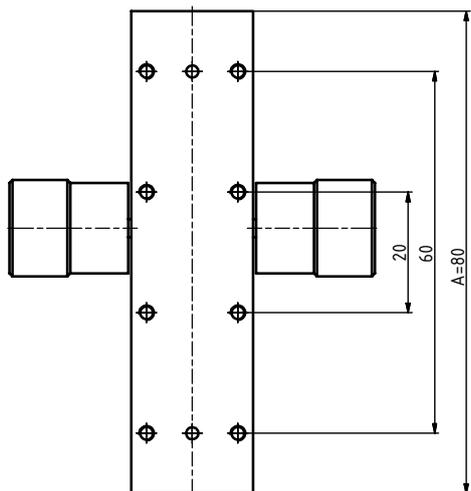
Displacement per knob turn 13.04 mm  
Stroke: 25 mm

Order no.: **B20-G**

Version without left knurled knob  
Order no.: **B20-G1R**

Version without right knurled knob  
Order no.: **B20-G1L**

Version without knurled knobs  
Order no.: **B20-GO**



**Guide box**

with rack, dovetail guide and two knurled knobs, backlash-free drive and guiding.

Displacement per knob turn 13.04 mm  
Stroke: 60 mm

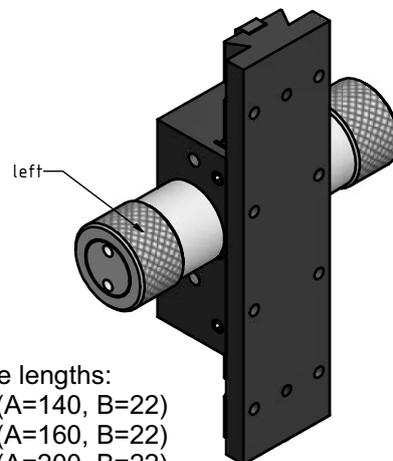
Order no.: **B20-G60**

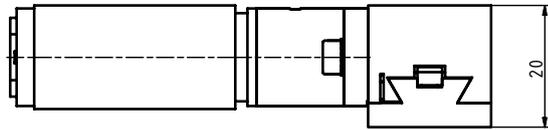
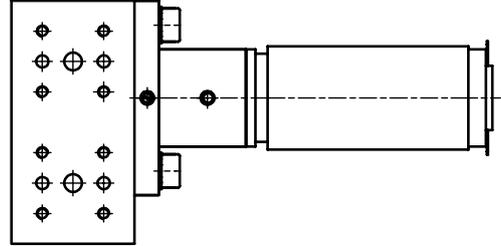
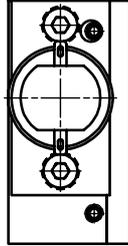
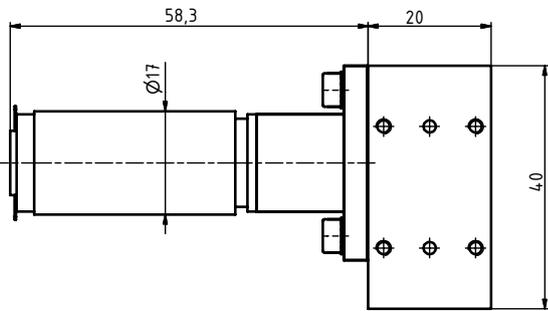
Version without left knurled knob  
Order no.: **B20-G61R**

Version without right knurled knob  
Order no.: **B20-G61L**

Version without knurled knobs  
Order no.: **B20-G600**

Other stroke lengths:  
**B20-G120** (A=140, B=22)  
**B20-G140** (A=160, B=22)  
**B20-G180** (A=200, B=22)

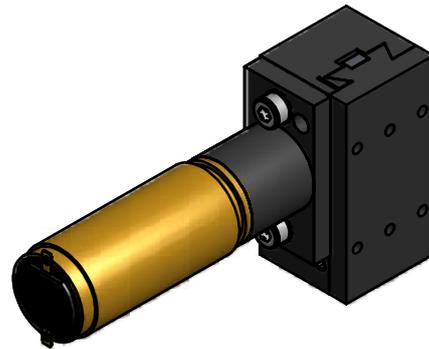




Guide box

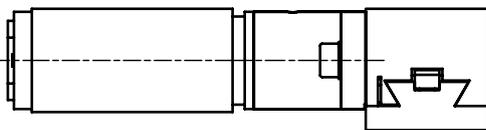
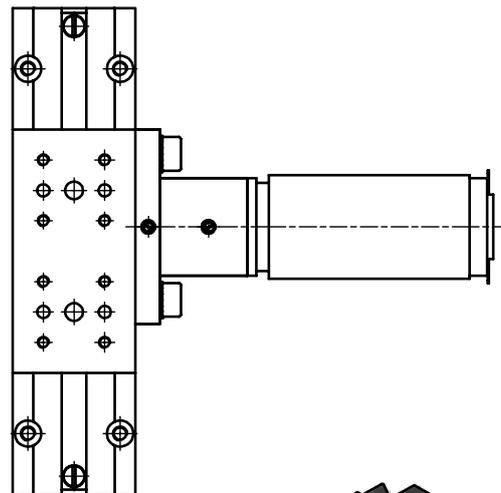
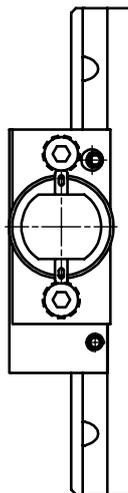
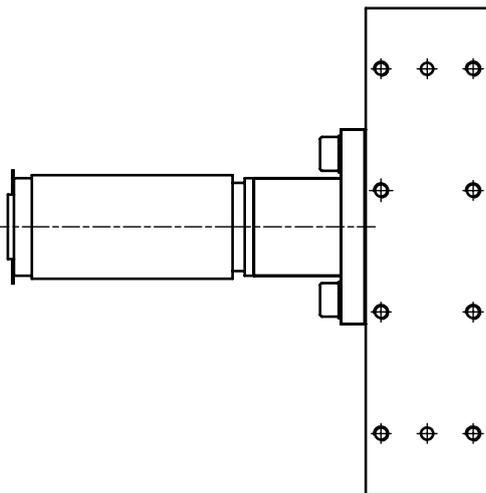
with rack, dovetail guide  
and motorize drive via  
D.C. geared motor (12V/900:1)  
backlash-free guiding  
Stroke: 25 mm

Order no.: **B20-G20M**



other motor/drive combination upon inquiry

Revision No.: 12

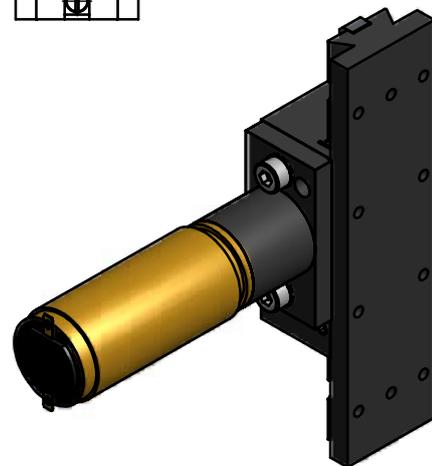


Guide box

with rack, dovetail guide  
and motorize drive via  
D.C. geared motor  
(12V/900:1)  
backlash-free guiding  
Stroke: 60 mm

Order no.: **B20-G60M**

other stroke lengths:  
**B20-G12M** (A=140, B=22)  
**B20-G14M** (A=160, B=22)  
**B20-G18M** (A=200, B=22)



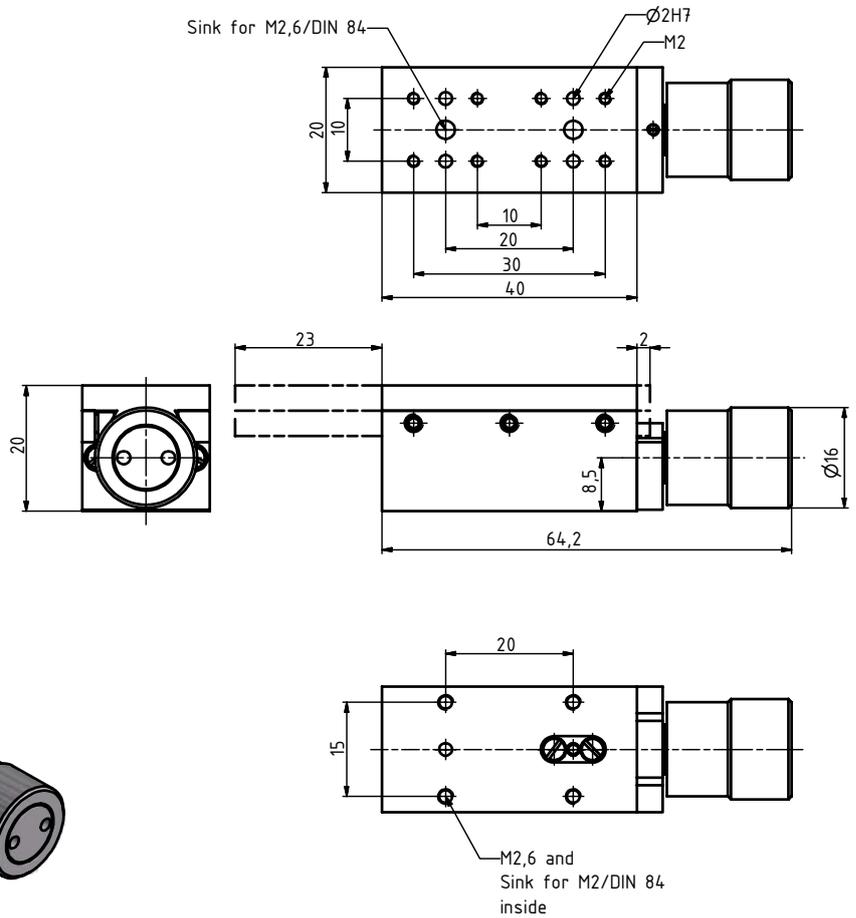
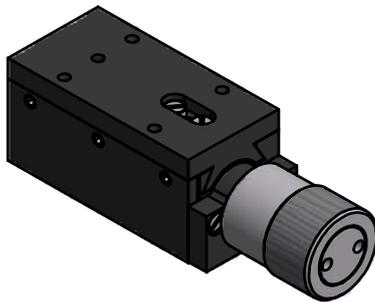
other motor/drive combination upon inquiry



Guide box

with micrometer spindle,  
spindle pitch 0.5 mm  
backlash-free guiding  
Stroke: 25 mm

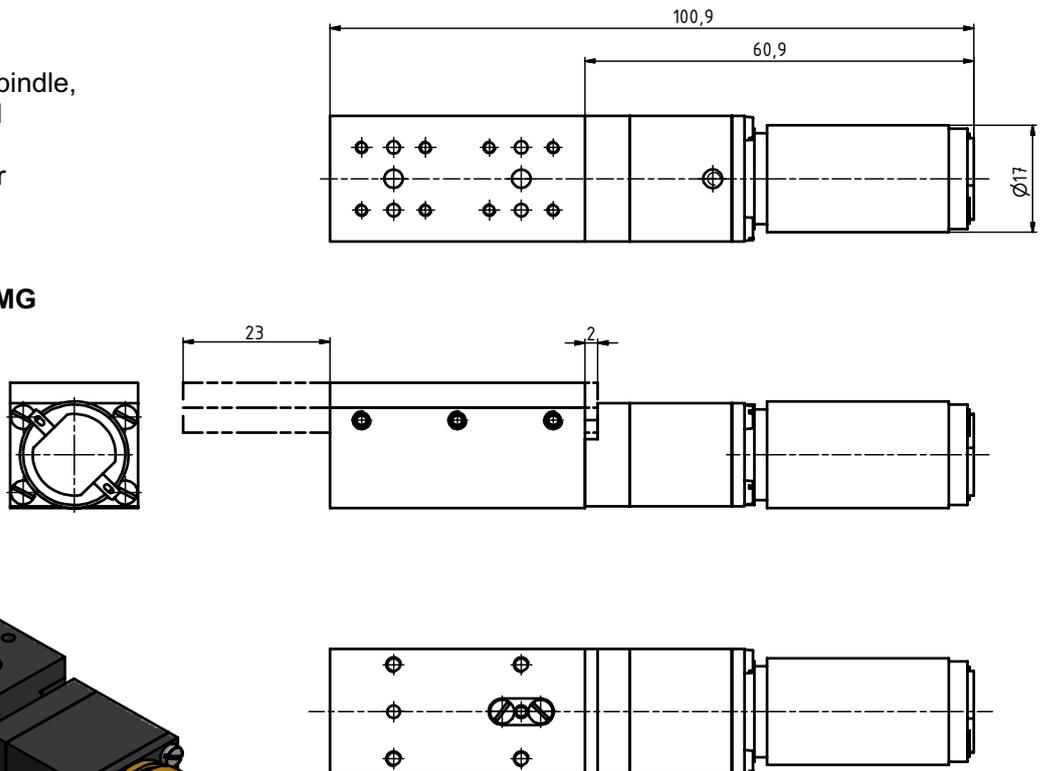
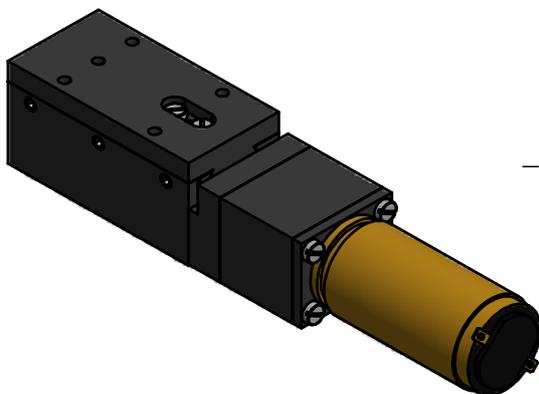
Order no.: **B20-GM**



Guide box

with micrometer spindle,  
dovetail guide and  
motorize drive via  
D.C. geared motor  
(12V/76:1)  
Stroke: 25 mm

Order no.: **B20-GMG**



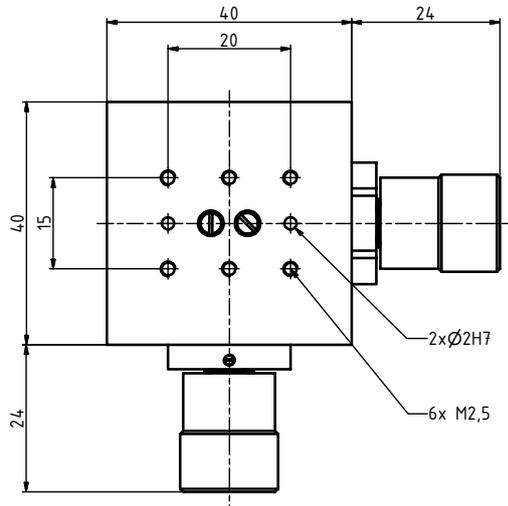
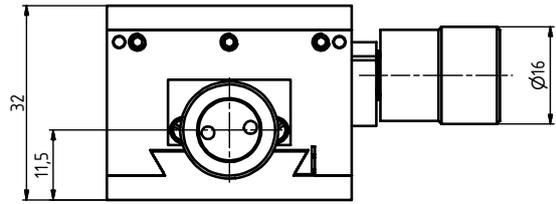
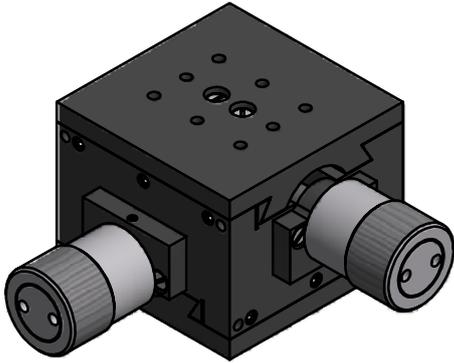
other motor/drive combination upon inquiry



### XY stage

with micrometer spindle,  
spindle pitch 0.5 mm,  
backlash-free dovetail guide  
Stroke: 20 x 20 mm

Order no.: **B20-KT**

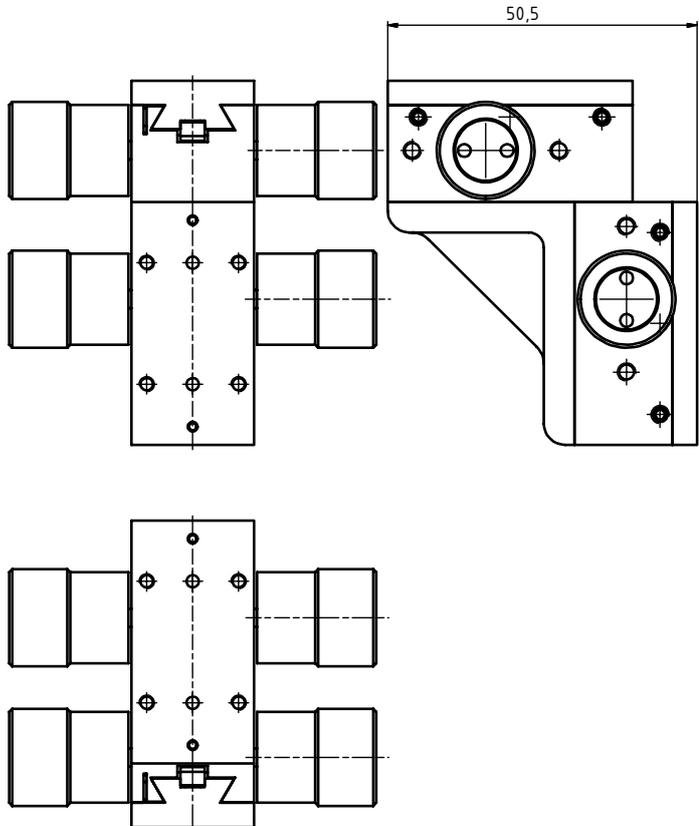
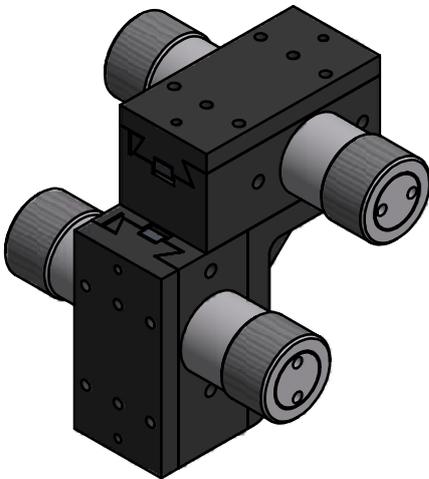


Revision No.: 12

### Angular drive

consisting of two B20-G1R  
connected with a bracket

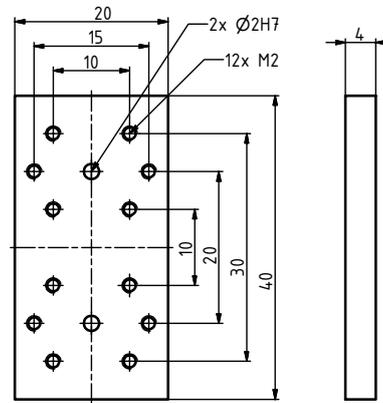
Order no.: **B20-WTR**



### Grid board

for mounting structural components on B20 moving elements

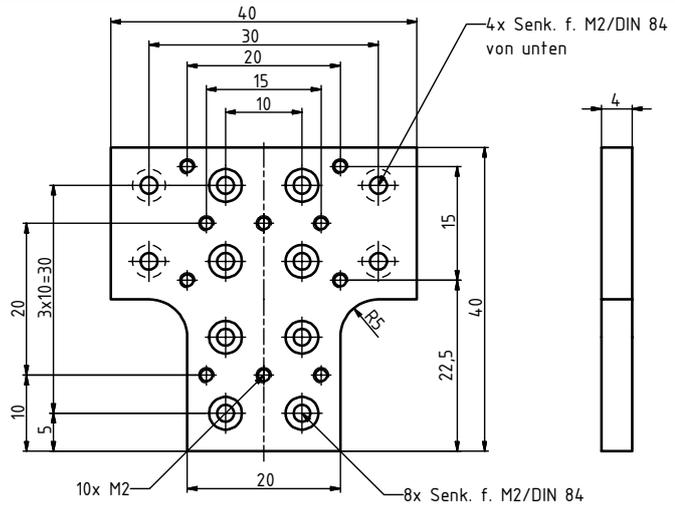
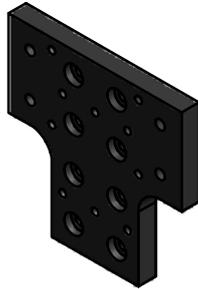
Order no.: **B20-RP**



### T-Plate

for connecting B20 moving elements to multi-axis systems

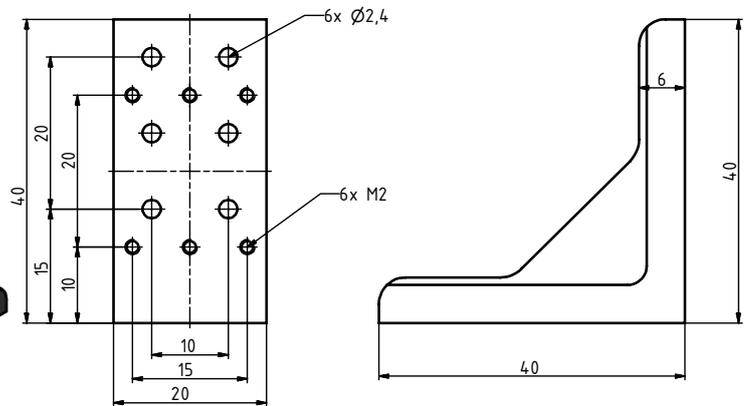
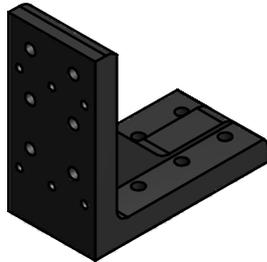
Order no.: **B20-TP**



### Bracket

for connecting B20 moving elements to multi-axis systems

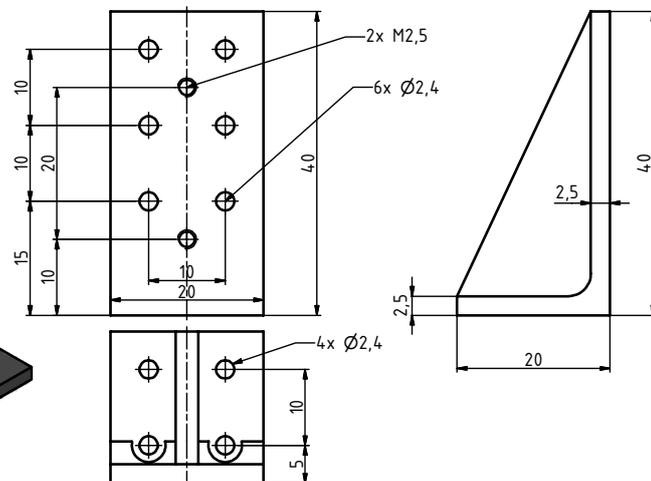
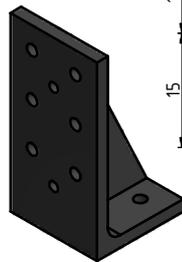
Order no.: **B20-W**



### Bracket

for connecting B20 moving elements to multi-axis systems

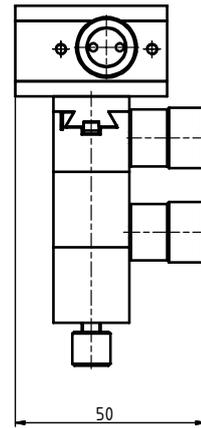
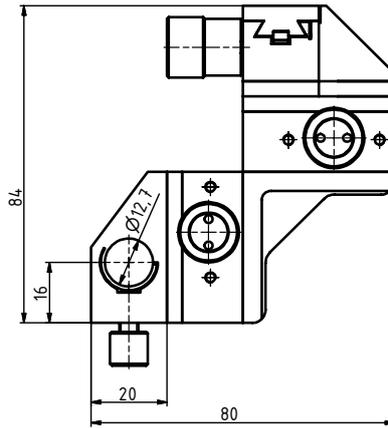
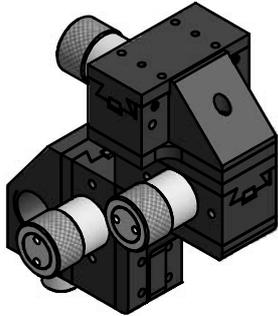
Order no.: **B20-WZ**



### Micromanipulator

consisting of three  
B20-G1R

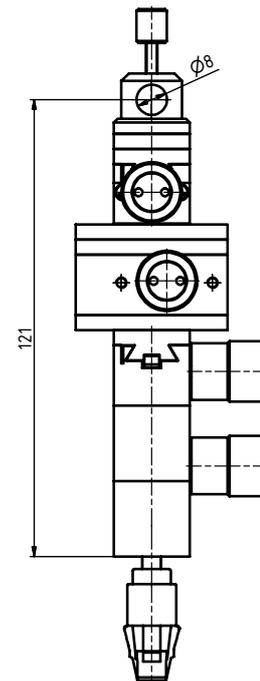
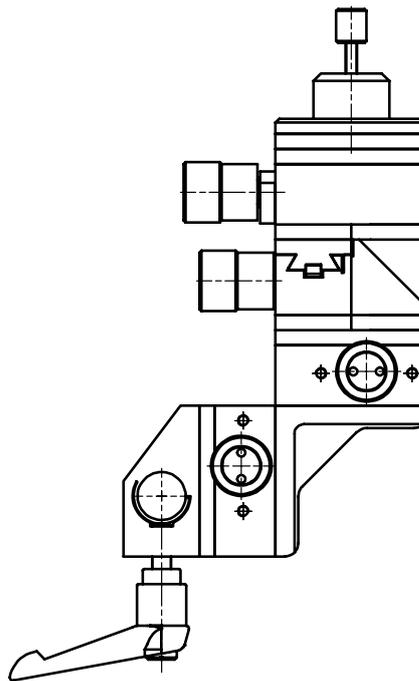
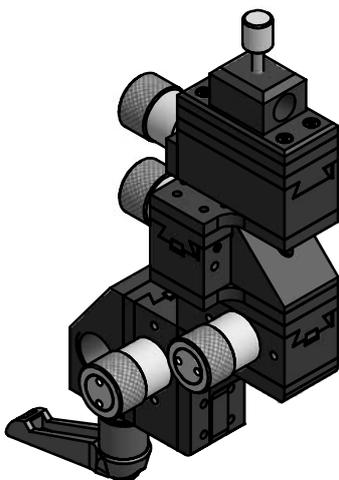
Order no.: **B20-MML**  
(left version)



### Micromanipulator

consisting of three  
B20-G1R and one  
B20-GM with  
electrode holder

Order no.: **B20-MM3L**  
(left version)



## Stand

with base,  
stroke 40 mm and  
swivelling device,  
reception bolts for  
manipulators

Order no.: **B20-MMST**

