
Fitting of Magnifying Vision Aids

**A guide for the correct fitting of telescope
magnifying systems**

Galileo systems and Kepler systems

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Safety instructions

- **Danger of fire.**
Lenses used in optical equipment may cause considerable damage through their „burning glass effect“ if used or stored incorrectly. Ensure that optical lenses are never left uncovered in the sunlight.
- **Make sure that other people and especially children are aware of this.**
- **Danger of blinding or injury.**
Never look at the sun through any optical equipment.
- **Protect magnifying vision aids against jolts or impact and excessive heat!**
Never place magnifying vision aids on heating elements or in the sun!
- **Magnifying vision aids are only suitable for reading and may not be used for driving!**
- **The safety and care instructions listed must be explained to the user by the fitter!**

Magnifying vision aids

The term magnifying vision aid refers to all optical and electronic aids which assist a visually impaired individual in seeing better through the use of his remaining visual acuity. This already includes reading glasses with improved addition, simple hand magnifying glasses, illuminated magnifying glasses or telescope magnifying systems of Kepler or Galileo designs which contribute to improved vision.

The market even offers optical and electronic visual aids for the severely visually impaired who have a remaining visual acuity of less than 10%. Of course, not every visual problem can be solved or every desired acuity obtained. Generally, magnifying visual aids can be fitted such that the daily work of the visually impaired individual within his household environment can be performed without assistance from others. This restores more quality of life to the visually impaired individual.

Consultation with an ophthalmologist is indispensable for providing visually impaired individuals with magnifying visual aids.

Definition of visual impairment and its significance for the affected individual

An eye suffers from blunt vision - amblyopia -, if nothing approaching normal visual acuity can be achieved even with full correction (visual acuity below 0.4). A visual impairment is always a pathological change in the eye or an inner change resulting from an injury which must be treated by an ophthalmologist. A decision regarding whether a magnifying vision aid will even provide an improvement in vision can already be made to some extent after diagnosis by a doctor. Frequently, a visually impaired individual goes directly to an optician without a diagnosis; in this case, an ophthalmologist must be consulted at least during the phase of the final decision. Without a doubt, the fitting of magnifying vision aids is significantly more difficult than the fitting of normal corrective lenses, but can certainly be accomplished through the selection of the correct method and the correct means (system or magnifying glass). The fitting of magnifying vision aids places high demands on the work of the ophthalmologist and optician.

Basic remarks on the provision of magnifying vision aids

Many diseases of the eye lead to a reduction in visual acuity. Diseases of the retina (macula degeneration or retina deformation) and the optic nerves are the primary causes. Magnifying vision aids have the task of compensating for this reduction in acuity through a corresponding magnification of the retinal images.

- A visual acuity of approximately 0.1 (remaining visual acuity of 10%) is generally sufficient for orientation in the open in daylight.
- In order to be able to clearly read newspaper print, a visual acuity of 0.4 – 0.5 is typically sufficient under good lighting conditions (Telephone book: 0.6 – 0.7 / timetable: 0.8).
- However, the acuity alone is not the only factor, reading ability is also important. Reading is only possible if a minimum (5° diameter) amount of functional retina is present.
- The fitting of magnifying vision aids is called for with an acuity_{cc} of less than 0.4.

Although many visually impaired individuals are primarily interested in obtaining help with reading, a distance test must be performed. The determination of the refraction for the visually impaired is intended to determine an optical correction with the best possible visual acuity_{cc}.

- The acuity_{cc} always remains the basis for the fitting of the magnifying vision aids.

Fundamentals

Before the fitting of magnifying vision aids, previously worn systems, glasses or magnifying glasses must be inspected and the following values determined:

- Diopter values (sphere, cylinder, axis)
- Position of the optical center
- Vertex distance
- Addition (for bifocals, the seat of the near portion)
- Seat of the glasses frame, system support
- Diopter values of a previously used magnifying glass (diopter and magnification)
- Data of a previously used system (magnification and useful distance)

The comparison of these values with the measurement results of the optometric examination can provide important information as to whether the provision or prescription of a new aid will be useful and effective.

Fitting systematic

1. The **consultation** with the visually impaired individual and the creation of a file:
 - Name, address, telephone, personal data
 - Is the customer being treated by an ophthalmologist? (diagnosis, if available)
 - Name and address of the treating doctor
 - Form a basis of trust with the customer, clarify his problems.
 - What does the customer want to read? (desired vision)
 - Is he still interested in reading or does he only want distance vision?

- For how long has he not been reading? (very important!)
- Evaluation of his activity level
- 2. **Explain** about magnifying optical vision aids
 - Weight
 - Appearance (very important!) Comments from practice: „Are they funny-looking glasses” or „Are these glasses ugly” ... and the entire success is put into question.
 - Working distance - reading is only possible from a certain distance
 - Limitation of the field of vision
 - Good lighting (halogen side lamp)
 - Reading material positioned as vertically as possible with respect to the viewing angle (reading stand for comfortable support of material)
- 3. **Selection of the required magnification** in conn. with the existing acuity ($acuity_{cc}$)

The required magnification for a vision aid is determined by the relationship between the desired acuity (vision requirements) and the existing acuity ($acuity_{cc}$ with the best possible glasses lenses).

$$\text{Required magnification} = \frac{\text{Required acuity}}{\text{Acuity}_{cc}}$$

Fitting of telescope magnifying glasses

Example: Galileo system 1621

Mr. Miller comes from an ophthalmologist with a prescription for monocular telescope magnifying glasses for the right eye.

Indication: Retinal degeneration from diabetes.

We begin with the discussion and explanation of telescope magnifying glasses. Mr. Miller is 60 years old and would like to be able to read the newspaper again.

In order to achieve the maximum visual capacity with a magnifying vision aid, it is necessary to precisely determine the distance correction. First, one determines the unaided acuity and then shifts to determination of the distance correction lens. If the inner conditions of the eye (clouding of the media) permit that the corrective value (lens) can be determined in connection with the refractometer or skiascope, one makes use of these values for the subjective refraction (today a computer vision test).

The subjective refraction is determined in the same manner as for normal glasses lenses (according to the grading table for sph. and cyl. lenses).

Grading table for the best spherical lens

Acuity	Grading
under 0.05	2.0 dpt min.
0.05–0.2	1.0 dpt
0.2–0.5	0.5 dpt
above 0.05	0.25 dpt

Cylinder estimation table

Acuity	Cylinder
1.0	0
0.5	± 1.0
0.25	± 2.0
0.12	± 3.0
0.06	± 4.0

Mr. Miller has an unaided acuity of 0.08/7m. The objective measurement yields approximately -2.0 dpt sph. According to the grading table for sph. lenses, we select for the first lens -2.0 dpt sph. .

With the valued used, -2.0 sph. , we obtain an acuity of 0.2/7m. Through the subjective comparison, we achieve no better acuity. Do not choose refraction steps which are too small; the subject barely reacts to them and it can prolong the work unnecessarily.

The cylinder examination also yielded no improvement in acuity.

● **Therefore, always proceed according to the grading table.**

As significantly reduced acuity levels are often involved, it is useful to make use of a visual examination board for the visually impaired. It is also possible to reduce the test distance (which is often the simplest method). The acuity displayed by the projector is then no longer valid. If the test distance and the projection distance are not equal, the following formula applies:

$$\text{Acuity} = \frac{\text{Test distance}}{\text{Projection distance}} \times \text{stated acuity}$$

(Test distance = reduced distance)

Example:

Reduced distance = 2 m

Projection distance = 8 m

Stated acuity = 0.8

$$\text{Acuity} = \frac{2 \text{ m}}{8 \text{ m}} \times 0,8 = 0,2$$

The reduced refraction distance must be compensated for dioptrically (e.g. for 2 m = +0.50 dpt). In our example (Mr. Miller), test distance = projection distance. Therefore, we do not need to compensate for a reduced test distance.

We have now determined the best corrective glasses lens and the examination with the magnifying system is performed. A magnifying system is used on the right side of the refraction measurement glasses and the opposite side is covered with an opaque lens.

For non-focusable systems, it is always necessary to completely apply the distance correction (sph. and cyl.) and to attach it to the system on the eye side.

What acuity can you expect with the Galileo system, modular linseatic, 2.2x?

$$\text{Acuity with system}_{\text{far}} = \cdot \text{Acuity without system} \times \text{system magnification}_{\text{far}}$$

(Acuity without system = best possible acuity with glasses lenses)

In our example:

Acuity with system_{far} = 0,2 x 2,2 = 0,44 (app. 0,5)

For Mr. Miller, we obtain an acuity (with system) of 0,5 at 7m. However, because the system is corrected to infinity and one observes with finite distance, for instance at 4 m, it is necessary to take into account the accommodative conditions of the eye in connection with the system. Expressed as a formula:

$$Required\ accommodation = \frac{(System\ magnification)^2}{Distance} \left[\frac{1}{m} \right]$$

Observation at finite distance	Accommodation (dpt) with		
	Galilean system 2,0x	Galilean system 2,2x	Galilean system 2,5x
1 m	+4.00	4.84 ~ +4.75	+6,25
2 m	+2.00	2.42 ~ +2.50	+3,13 ~ +3,25
3 m	1.33 ~ +1.25	1.61 ~ +1.50	+2,08 ~ +2,00
4 m	+1.00	1.21 ~ +1.25	+1,56 ~ +1,50
5 m	0.80 ~ +0.75	0.97 ~ +1.00	+1,25
6 m	0.66 ~ +0.75	0.81 ~ +0.75	+1,04 ~ +1,00
7 m	0.57 ~ +0.50	0.69 ~ +0.75	+0,89 ~ +1,00

Example:

System magnification_{distance} = 2.2x

Distance = 4 m

Accommodation = $\frac{(2,2)^2}{4}$ = 1,25 dpt.

The required accommodation with a 2.2x system, which is set to infinity, is +1.25 dpt for a distance of 4 m.

Example:

Mr. Miller would like to watch television at a distance of 4 m

required accommodation with system = +1.25 dpt.

best possible glasses lens = -2.0 dpt.

This results in a remaining correction of -2.0 + 1.25 = -0.75 dpt.

From this follows:

If Mr. Miller would like to use his system for a distance of 4 m, we must insert an eye-side correction (glasses lens of -0.75 dpt) in the adapter.

General:

If the 2.2x system is used for distance only in the room, it is possible to overcome the distance from 4 to 7 meters with an accommodation addition of +1.0 dpt. Precise calculations are required for a distance less than 4 meters.

This accommodation addition with the system must be offset with the best possible glasses lens (distance correction).

Magnification for the near area with the Galileo system 1621

In the near area, the various magnifications are achieved with various add-on lenses. The total magnification of a system for close up viewing can be expressed formulaically as follows:

$$V_{tot.} = \text{System magnification}_{far} \times V_{Near \text{ add-on lens}}$$

$$V_{Near \text{ add-on lens acuity}} = \frac{D}{4} (\text{Magnifying glass normal magnification})$$

Add-on lens	Achievable magnification with			Working distance
	Galilean system 2,0x	Galilean system 2,2x	Galilean system 2,5x	
3 diopter	1.50 x	1.65 x	1,88 x	330 mm
4 diopter	2.00 x	2.20 x	2,50 x	250 mm
5 diopter	2.50 x	2.75 x	3,13 x	200 mm
6 diopter	3.00 x	3.30 x	3,75 x	167 mm
8 diopter	4.00 x	4.40 x	5,00 x	120 mm
10 diopter	5.00 x	5.50 x	6,25 x	100 mm
12 diopter	6.00 x	6.60 x	7,50 x	83 mm
16 diopter	-----	8.80 x	10,00 x	63 mm

Example:

Mr. Miller would like to work with a working distance of 20 cm.

Add-on lens for 20 cm = 5 dpt

$$V_{Near \text{ add-on lens}} = \frac{5 \text{ dpt.}}{4} = 1,25$$

This results in a near area magnification of:

$$\text{System magnification}_{distance} = 2.2$$

$$V_{Add-on \text{ glass close up}} = 1.25$$

$$V_{tot.} = 2,2 \times 1,25 = 2,75$$

$$\text{Near acuity} = \text{Acuity with system}_{far} \times V_{Add-on \text{ lens}}$$

In our example (Mr. Miller), this results in:

$$\text{acuity with system}_{distance} = 0.44$$

$$V_{Add-on \text{ glass close up}} = 1.25$$

$$\text{Near acuity} = 0,44 \times 1,25 = 0,55 \text{ (app. 0,6)}$$

Mr. Miller achieves an acuity of 0.6 with an add-on lens of 5 dpt at a distance of 20 cm. He can read a telephone book and timetable with good lighting. Through accommodation, the acuity and the distance in the near area can easily be modified.

Summary for our example (Mr. Miller):

Distance: Acuity with system to infinity = 0.5

Close up: Acuity with system + 5 dpt add-on lens at 20 cm approximately 0.6.

Fitting of prismatic magnifying glasses

What acuity can you expect with the Kepler system, modular prismatic?

Example: Kepler system 2.8x

$$Acuity\ with\ system_{far} = Acuity_{cc} \times System\ magnification_{far}$$

In our example, this results in:

$$Acuity_{cc} = 0.20$$

$$System\ magnification_{distance} = 2.8$$

$$Acuity\ with\ system_{far} = 0,2 \times 2,8 = 0,56\ (app.\ 0,6)$$

For Mr. Miller, we obtain an acuity of 0.6 at 7 m.

Magnification for the near area with the Kepler system 2.8x focusable

The asymmetrical correction and the accommodation addition need not be present for focusable systems. The compensation is performed by turning the lens. However, stronger cylinder lenses must be incorporated on the eye side. The maximum near magnification is achieved by screwing out the lens the full distance.

$$Near = Corrected\ acuity_{cc} \times near\ magnification_{system}$$

For a focusable Kepler system, the near magnification is provided by the system (manufacturer information). The Kepler system 2.8x has a near magnification of 3.4x.

In our example, this results in:

$$Acuity_{cc} = 0.20$$

$$Near\ magnification_{system} = 3.40$$

$$Nahvisus = 0,2 \times 3,4 = 0,70$$

Mr. Miller achieves an acuity of 0.7 at 20 cm with the focusable system.

Summary for our example:

Distance: Acuity with system to infinity = 0.6

Close up: Acuity with system near area = 0.7

Our new Kepler systems can be supplemented with the various add-on lenses through the use of an intermediate adapter.

This allows an increased magnification in the near area (→ table page 15).

The fitting process (For Kepler and Galileo systems)

Selection of the system support

- Size of the mounting, stability, support surface in near area
- Bridge width
- Hoop length
- Mount inclination
- Vertex distance (smaller corneal vertex distance)

Before we determine the centering data, the mount is fitted precisely.

Centering

- Use centering foil
- Determine the eye distance according to the Victorin method
- Observe rotation point requirement
- If necessary, inspect the centering with perforated labels

In centering systems, the rotation point requirement must absolutely be met! Please note that the mount inclination is the basis for a comfortable head posture. (Important!) The main viewing angle and the axis of the system must be aligned. The mounting level must be set such that it lies perpendicular to the main viewing angle, taking comfortable head posture into account.

Determination of the visual points

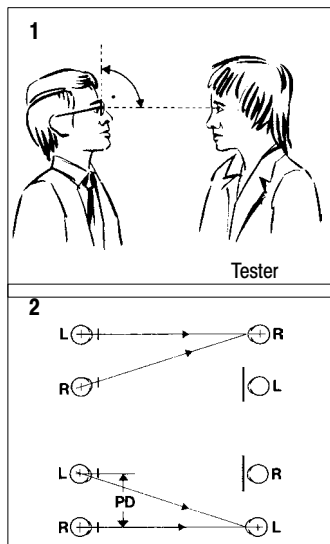
In principle, the vertical visual points are drawn on with zero viewing angle into the distance. For drawing on the visual points (vertical), the subject raises his head until the mount level lies parallel to a vertical edge (image 1). In this position (zero viewing angle), we draw on the visual points.

The horizontal visual points (distance PD) are drawn on according to the Victorin method (image 2).

The eyes of the subject and the tester are directly opposite each other. The subject looks with both eyes first to the opened left eye of the tester, then to the opened right eye of the tester.

The precision of the drawn on points can be checked with perforated labels which are adhered to a centering foil centered on the visual points.

All Eschenbach systems (Kepler and Galileo) can be mounted in a stable support frame or a special support system. All mechanical parts required for mounting, such as support discs, adapters, spacers, locking rings, mounting tools, etc. are contained in the Eschenbach mounting box 1625.



Grinding and insertion of the support discs

The support discs consist of CR-39 material and can be ground down to any desired form in the machine.

In special cases, for instance for severe glare sensitivity, the support discs can be tinted by the leading lens manufacturers according to specifications, such as brown 75%.

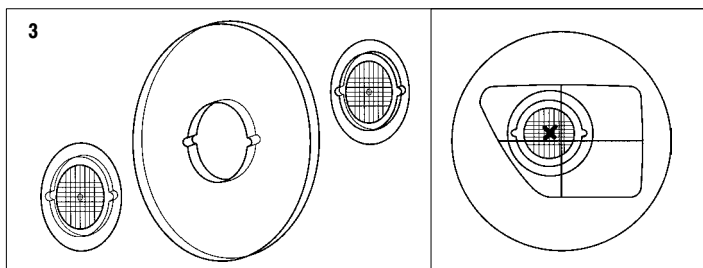
1. First, 2 centering inserts are pressed into the support disk, one from each side.
2. Transfer the determined centering data to the support disc with the centering device (Notches of the support disc along zero axis).
3. Apply clamping seal (blocking).
4. Grind the shape on the machine.
5. Insert the edged support disc into the frame.
6. Press in the required adapter for mounting the optical system from the rear, for instance for distance ∞ , in the viewing direction. Here it is important that the elements snap together tightly.

The mounting process described is protected by patent DBP 3530649 and the registered utility patent G 9205623.7.

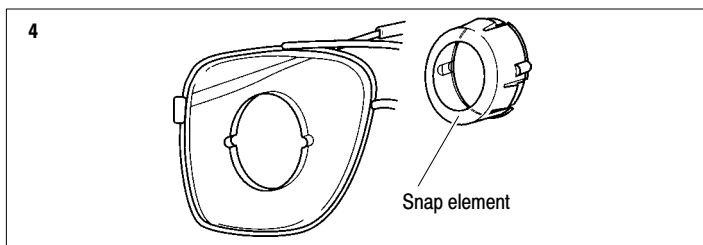
Grinding of the support disc

Due to the larger hole in the support disc, we need 2 centering inserts for grinding.

1. Press the centering inserts into the support disc.



2. The finished support disc is now inserted into the frame. Insert the adapter for ∞ (distance) or the adapter for convergence into the hole of the support disc with the 3 snap elements. Here it is important that the elements snap together tightly.



Advantages of these support discs

- Smaller corneal vertex distance is possible
- Incorporation of stronger corrective lenses, e.g. +12.0/ +2.0/90°
- Correction for eyes with exophthalmic goiter is easily possible.

Grinding and insertion of the corrective lens (accommodation addition)

The corrective lens with the required accommodation addition for the system is incorporated and mounted in an adapter on the eye side for all incorporated Galileo systems.

For Kepler systems, no accommodation addition is required due to the focussing ability, however, any required cylinder correction is incorporated in the same manner.

The corrective lens with the required accommodation addition is ground to a diameter of 22 mm on the grinding machine with the special shaped disc provided with the system. These corrective lenses can also be ordered from some lens suppliers already with the 22 mm diameter (for special vision aids).

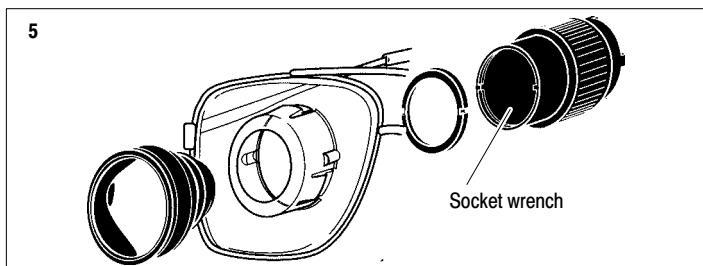
For cylinder correction, it is important to mark the cylinder axis in order to make it easier to check the axis later.

The corrective lens is then locked into the correction adapter (mounting ring) with the previously mounted sealing ring (image 5).

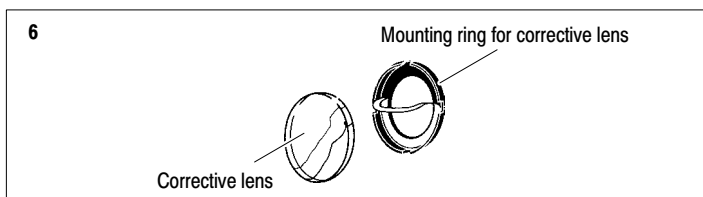
Mounting process

Using a Galileo system with special support disc as an example

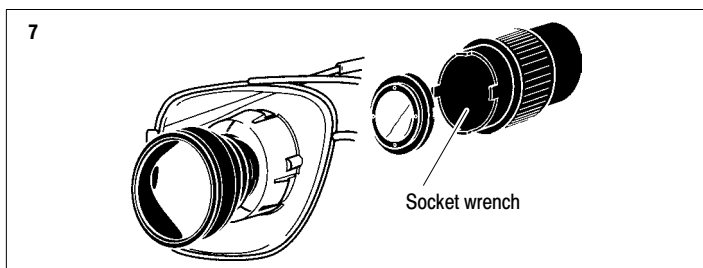
Plug the system with the spacer through the adapter and lock it with the locking ring: Insert the locking ring into the small diameter of the socket wrench and screw in tight (image 5).



Lock the corrective lens in the locking ring for the corrective lens (integrated sealing ring) (image 6).



Screw on the mounting ring with the corrective lens: Insert the mounting ring with the corrective lens into the large diameter of the socket wrench and screw tight (image 7).



Kepler systems are mounted in the same manner.

Final examination

Concluding inspection

When we provide the finished vision aid, the following are checked once again:

- Seat of the frame
- Vertex distance
- Centering of the system
- Any refraction
- Binocular vision (if possible)
- Final visual capacity for distance
- Final visual capacity for close up
- Instructions for the fitted system

It is recommended to examine the customer again after approximately 8 – 14 days to guarantee an optimal service (schedule date in writing).

Through the development of the new, high-performance telescope systems, it is possible to guarantee optimal service for the visually impaired. Due to their education, every ophthalmologist can successfully participate in the service and care for the visually impaired, thereby providing an important contribution to improving the quality of life of the visually impaired.

Instructions for care

- **Never use alcohol or organic solvents to clean magnifying vision aids!**
- **Do not use any soap solutions that contain softeners, alcohol based solvents or abrasive cleaning products. These may damage the lenses.**

Clean the lenses with a soft cotton or linen cloth (e. g. lens cleaning cloth), moisten the cleaning cloth for particularly dirty lenses.

Technical data for Kepler design monocular systems

System	Magnification		Add-on lens [dpt]	Magnification with add-on lens	Working distance [mm]		Field of vision [m]	
	Di-stance	Close up			∞	Close up	∞	Close up
16731 2.8 x 9	2.8 x	3.4 x	+3	2.10 x	337	90	77.0	17.5
			+4	2.80 x	260	83	60.0	16.0
			+5	3.50 x	207	76	48.0	15.0
			+6	4.20 x	173	70	40.0	14.0
			+8	5.60 x	124	60	18.0	12.0
			+10	7.00 x	100	53	23.0	11.0
			+12	8.40 x	80	48	18.5	9.5
			+16	11.20 x	61	40	14.0	8.0
16732 4.2 x 10	4.2 x	5.5 x	+3	3.15 x	317	133	55.0	20.0
			+4	4.20 x	241	117	42.0	18.0
			+5	5.25 x	190	104	33.0	16.0
			+6	6.30 x	165	95	28.0	14.5
			+8	8.40 x	119	78	21.0	12.0
			+10	10.50 x	97	67	17.0	10.5
			+12	12.60 x	79	58	14.0	9.0
			+16	16.80 x	60	47	10.5	7.0
16733 4.2 x 12	4.2 x	5.0 x	+3	3.15 x	323	112	70.0	20.0
			+4	4.20 x	245	101	53.0	18.0
			+5	5.25 x	191	91	41.0	16.0
			+6	6.30 x	166	83	36.0	15.0
			+8	8.40 x	122	71	26.0	12.5
			+10	10.50 x	97	61	21.0	11.0
			+12	12.60 x	78	53	17.0	9.5
			+16	16.80 x	60	44	13.0	8.0
16734 6 x 16	6 x	7.6 x	+3	4.50 x	333	128	53.0	16.0
			+4	6.00 x	249	113	40.0	14.0
			+5	7.50 x	196	101	32.0	13.0
			+6	9.00 x	166	92	27.0	12.0
			+8	12.00 x	122	76	20.0	10.0
			+10	15.00 x	97	66	16.0	8.0
			+12	18.00 x	79	57	13.0	7.0
			+16	---	---	---	---	---

Technical data for Galilean and Keplerian systems

Article number	Magnification	Field of vision	Viewing angle	Working distance
1621	2.20x distance	250 m / 1000 m *)	14.0°	∞
1621 + 16213	1.65x close up	67 mm *)	12.0°	330 mm
1621 + 16214	2.20x close up	54 mm *)	12.0°	250 mm
1621 + 16215	2.75x close up	44 mm *)	12.0°	200 mm
1621 + 16216	3.30x close up	35 mm *)	12.0°	167 mm
1621 + 16218	4.40x close up	25 mm *)	12.0°	125 mm
1621 + 162110	5.50x close up	22 mm *)	12.0°	100 mm
1621 + 162112	6.60x close up	18 mm *)	12.0°	83 mm
1621 + 162116	8.80x close up	14 mm *)	12.0°	63 mm
16225	2.30x distance	230 m / 1000 m *)	13.0°	∞
16225 + 16213	1.90x close up	64 mm *)	11.0°	ca. 330 mm
16225 + 16214	2.50x close up	48 mm *)	11.0°	250 mm
16225 + 16215	3.15x close up	38 mm *)	11.0°	200 mm
16225 + 16216	3.75x close up	32 mm *)	11.0°	167 mm
16225 + 16218	5.00x close up	24 mm *)	11.0°	125 mm
16225 + 162110	6.25x close up	19 mm *)	11.0°	100 mm
16225 + 162112	7.50x close up	16 mm *)	11.0°	83 mm
16225 + 162116	10.00x close up	12 mm *)	11.0°	63 mm
1623	2.00x distance	380 m / 1000 m *)	22.0°	∞
1623 + 16233	1.50x close up	110 mm *)	18.5°	ca. 330 mm
1623 + 16234	2.00x close up	84 mm *)	18.5°	250 mm
1623 + 16235	2.50x close up	72 mm *)	18.5°	200 mm
1623 + 16236	3.00x close up	57 mm *)	18.5°	167 mm
1623 + 16238	4.00x close up	45 mm *)	18.5°	125 mm
1623 + 162310	5.00x close up	32 mm *)	18.5°	100 mm
1623 + 162312	6.00x close up	30 mm *)	18.5°	83 mm
16731	2.80x distance	220 m / 1000 m	12.5°	150 mm – ∞
	3.40x close up	26 mm / 150 mm	10.0°	
16732	4.20x distance	175 m / 1000 m	10.0°	200 mm – ∞
	5.50x close up	25 mm / 200 mm	7.2°	
16733	4.20x distance	220 m / 1000 m	12.5°	200 mm – ∞
	5.00x close up	32 mm / 200 mm	9.2°	
16734	6.00x distance	175 m / 1000 m	10.0°	250 mm – ∞
	7.60x close up	26 mm / 250 mm	6.0°	

*) For the Galileo systems, the effective field of vision depends on the eye/eyepiece distance (measured with a corneal vertex distance of 10 mm).
For this reason, the field of vision figures are average values.

Lens Ø	Weight	Exit pupil / position for ∞ or 200 mm	Diopter com- pensation	Article number
23.0 mm	16 g			1621
25.5 mm	22 g			1621 + 16213
25.5 mm	22 g			1621 + 16214
25.5 mm	22 g			1621 + 16215
25.5 mm	22 g			1621 + 16216
25.5 mm	22 g			1621 + 16218
25.5 mm	22 g			1621 + 162110
25.5 mm	22 g			1621 + 162112
25.5 mm	22 g			1621 + 162116
25.0 mm	12 g			16225
25.5 mm	18 g			16225 + 16213
25.5 mm	18 g			16225 + 16214
25.5 mm	18 g			16225 + 16215
25.5 mm	18 g			16225 + 16216
25.5 mm	18 g			16225 + 16218
25.5 mm	18 g			16225 + 162110
25.5 mm	18 g			16225 + 162112
25.5 mm	18 g			16225 + 162116
37.0 mm	17 g			1623
42.0 mm	24 g			1623 + 16233
42.0 mm	24 g			1623 + 16234
42.0 mm	24.5 g			1623 + 16235
42.0 mm	25 g			1623 + 16236
42.0 mm	25.5 g			1623 + 16238
42.0 mm	26 g			1623 + 162310
42.0 mm	26.5 g			1623 + 162312
9 mm	25 g	Ø 3.2 mm / 13.0 mm	± 9 dpt	16731
		Ø 2.6 mm / 10.5 mm		
10 mm	30 g	Ø 2.4 mm / 13.5 mm	+ 40 / -30 dpt	16732
		Ø 1.8 mm / 9.5 mm		
12 mm	55 g	Ø 2.9 mm / 11.5 mm	± 12 dpt	16733
		Ø 2.4 mm / 9.5 mm		
16 mm	60 g	Ø 2.8 mm / 7.0 mm	± 18 dpt	16734
		Ø 2.2 mm / 6.0 mm		



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