

GRIN Endoscopic Rod Lens Systems

GRIN endoscopic systems, which combine a GRIN objective lens, a GRIN relay lens and a GRIN eyepiece. Combining the system with a prism enables the change of the direction of view (see Fig. 2). Standard diameters are 0.5, 1.0 und 2.0 mm. We offer the systems in two different principle design options:

- A. The objective lens creates a reduced intermediate image at the exit surface of the objective lens, which will be imaged by the relay lens 1:1 (if the lens length of the relay lens is a multiple of the period) or - 1:1 (if the lens length of the relay lens is an odd multiple of the half period) to the exit surface of the relay lens.
- B. The objective lens creates a reduced intermediate image at the exit surface of the objective lens, which will be imaged by the relay lens (including the eyepiece in form of a $\frac{1}{4}$ pitch-lens (e.g. 0.75 pitch, 1.25 pitch, 1.75 pitch etc.) at infinity. Such a lens system is a complete endoscopic imaging system. It allows the direct observation with the human eye or the use of a conventional camera system (including camera lens).

Schematic view of the two designs:

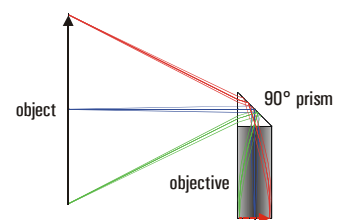
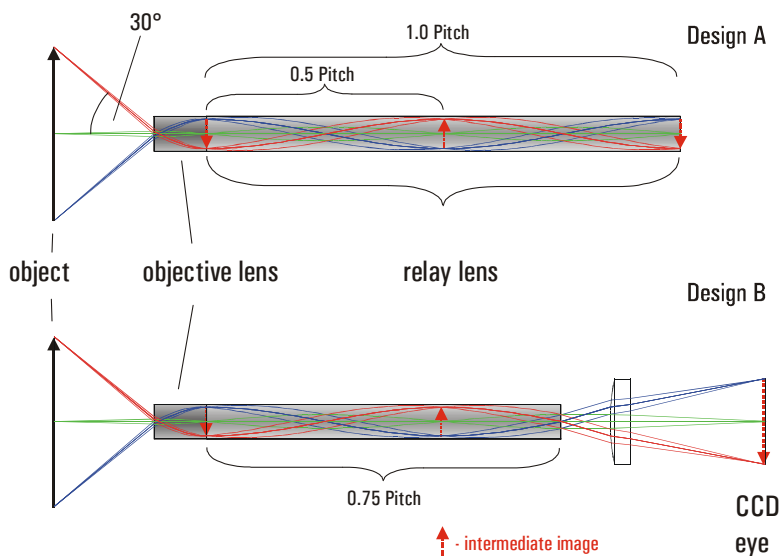


Fig. 2: Changing the direction of view of a GRIN lens by a 90° prism

Fig. 1: Examples of designs for GRINTECH endoscopic systems. The pitch length can be increased by a whole number of the half pitch length in dependence on the requested endoscope length. Details are shown in table 1.

Table 1: Example configurations of endoscopic systems

| Design [Ø - pitch] | Diameter [mm] | Image orientation | System length [mm] | Comment |
|--------------------|---------------|----------------------|--------------------|------------------|
| 0.5 - 0.75 | 0.5 | like Design B | approx. 23.9 | with eyepiece |
| 0.5 - 1.0 | 0.5 | like Design A | approx. 31.5 | without eyepiece |
| 0.5 - 1.25 | 0.5 | inverted to Design B | approx. 39.1 | with eyepiece |
| 0.5 - 1.5 | 0.5 | inverted to Design A | approx. 46.6 | without eyepiece |
| 0.5 - 1.75 | 0.5 | like Design B | approx. 54.1 | with eyepiece |
| 1.0 - 0.75 | 1.0 | like Design B | approx. 36.0 | with eyepiece |
| 1.0 - 1.0 | 1.0 | like Design A | approx. 47.0 | without eyepiece |
| 1.0 - 1.25 | 1.0 | inverted to Design B | approx. 58.5 | with eyepiece |
| 1.0 - 1.5 | 1.0 | inverted to Design A | approx. 69.5 | without eyepiece |
| 1.0 - 1.75 | 1.0 | like Design B | approx. 80.0 | with eyepiece |
| 2.0 - 0.75 | 2.0 | like Design B | approx. 81.0 | with eyepiece |
| 2.0 - 1.00 | 2.0 | like Design A | approx. 106.5 | without eyepiece |
| 2.0 - 1.25 | 2.0 | inverted to Design B | approx. 132.0 | with eyepiece |
| 2.0 - 1.5 | 2.0 | inverted to Design A | approx. 157.0 | without eyepiece |
| 2.0 - 1.75 | 2.0 | like Design B | approx. 183.0 | with eyepiece |

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We are happy to advise you. Please contact us.