



BACHES Info Summary

A highly efficient Échelle-Spectrograph




Optical System

Wavelength Coverage	392 – 800nm	A sensor like the KAF1603 (13.8 mm x 9.2 mm) will cover 400 – 700nm in one exposure
Efficiency	$\geq 30\%$	Of 100 photons passing the entrance slit, ≥ 30 will reach the sensor.
Average Resolving Power	$\geq 18.000 \frac{\Delta\lambda}{\lambda}$ ≈ 5.000	Using the 25x125 μ m slit. Using the 50x125 μ m slit.
Collimator focal ratio	f/10	Optimized for f/10 telescopes. Full resolution from f/8 to /12. Focal ratio converters available.
Suited Telescopes sizes	$\leq 0.5m$	Optimized for telescope diameters $\leq 0.5m$, but is usable on bigger telescopes accepting a certain loss of light.

Mechanical System

Weight	1.3kg	Lightweight & stiff, FEM optimized structure.
Size	300 x 100 x 50 mm	Small footprint
Adaptation	Standard T2 adapters are included. Adapters for common telescopes and cameras are in stock. Other adaptations can be made to customers specification.	

Wavelength Calibration & Autoguiding

Calibration Source	Thorium-Argon hollow cathode lamp	Provides several thousand reference lines spread across the whole wavelength range. This enables a calibration accuracy of $\leq 10^{-4}nm$ mean RMS.
Remote Calibration	Baches RCU 	The <i>Remote Calibration Unit</i> houses a Thorium-Argon hollow cathode lamp as well as halogen flat-field lamp. The calibration light is brought to the spectrograph via fiber. The RCU is controlled via Ethernet.
Calibration Software	MIBAS 	High- and lowlevel-API for semi-automatic and full-automatic calibration available free of charge. Detailed calibration reports ensure data transparency.
Autoguiding Software	SpecTrack 	The <i>SpecTrack</i> Software can keep the object of interest on the spectrographs entrance slit, even without additional reference stars.

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Features and Benefits

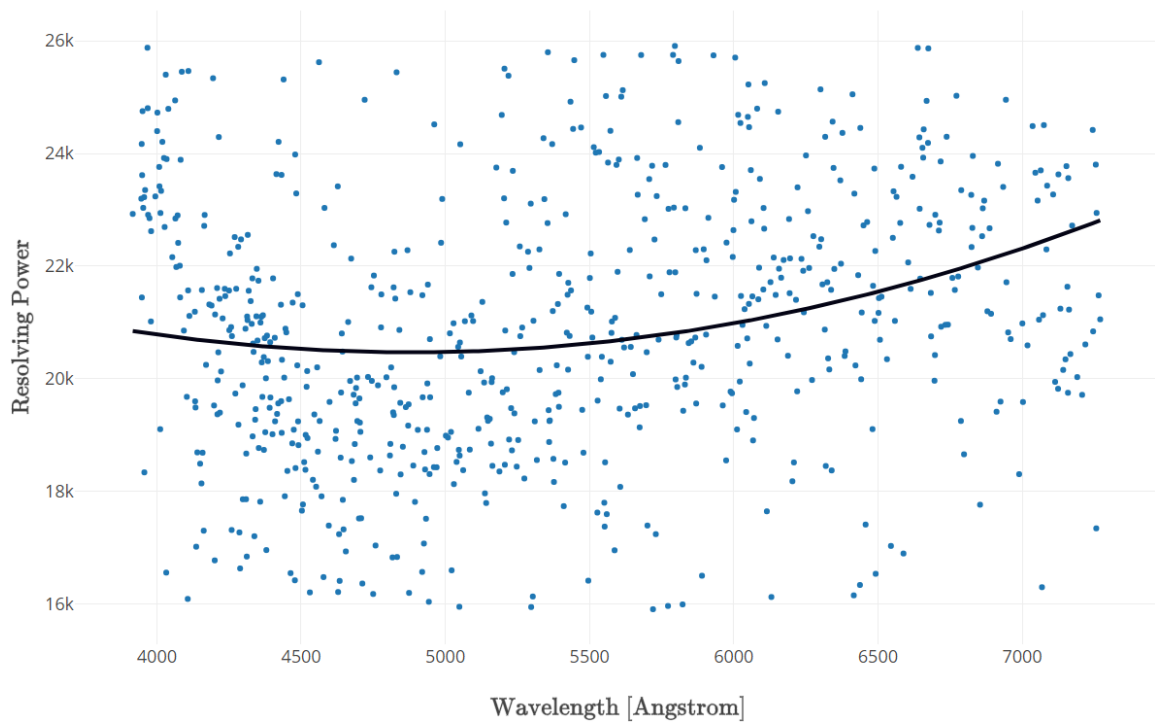
Designed for highest efficiency	With more than 30% efficiency, BACHES enables the observation up to 10 mag objects at full resolution, in conjunction with a 0.5m telescope. (see Kozłowski et.al.) [↗]
Fully remote operation	With the RCU calibration unit, BACHES is ready for fully remote operation.
High resolving power	An average resolving power of $\geq 18.000 \frac{\Delta\lambda}{\lambda}$, BACHES delivers high resolving spectra over the whole wavelength range.
Dedicated Software	Dedicated Software for BACHES facilitates observation of objects, otherwise difficult to guide (eg. guiding a satellite on the spectrograph's slit). → <i>SpecTrack</i> , as well as calibration and reduction of obtained spectra → <i>MIBAS</i> .
Price-Performance	Currently there is no other spectrograph available which can compete in terms of efficiency and resolving power per price.

Downloads

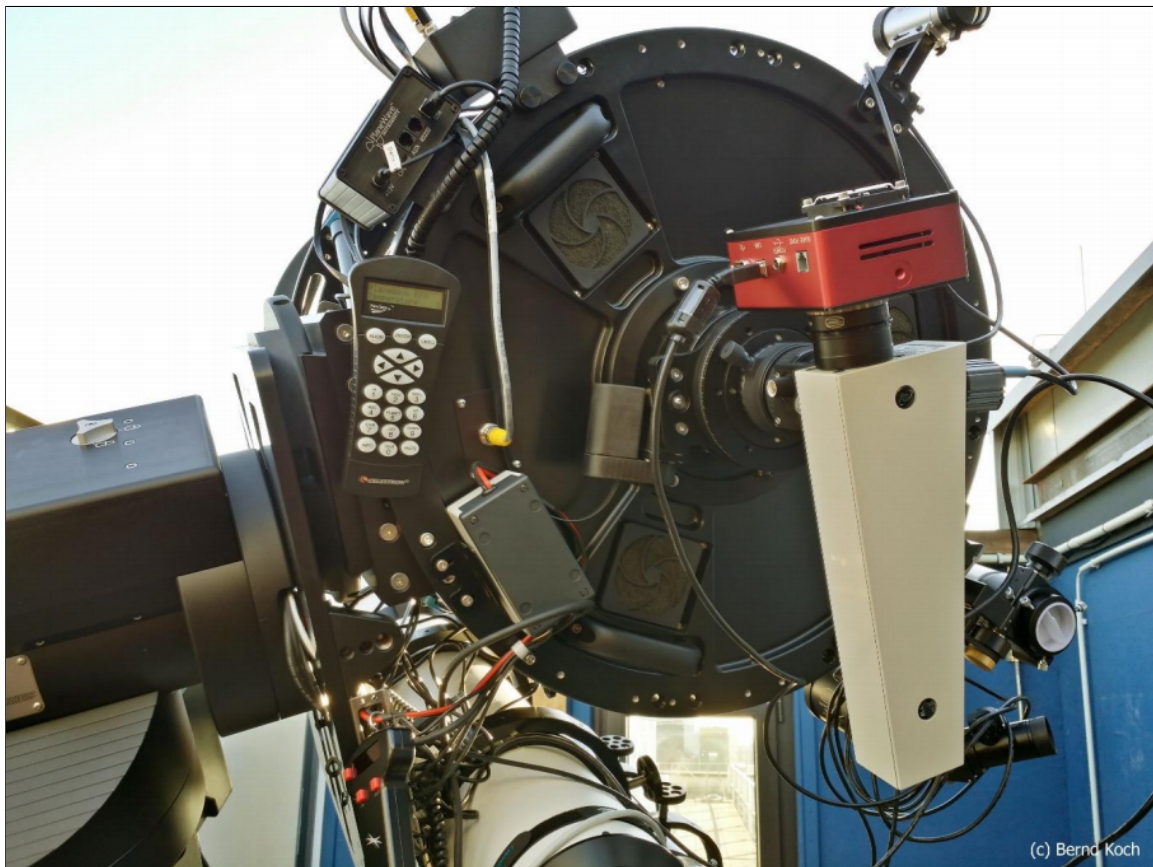
Instruction Manual [↗]	The Instruction Manual covers the physical setup of the instrument.
MIBAS Tutorial [↗]	The MIBAS tutorial covers the automatic wavelength calibration and data reduction process.
SpecTrack Manual [↗]	The manual covers the setup and operation of the SpecTrack Autoguiding software.
BACHES Tutorial (german) [↗]	BACHES & RCU hands-on tutorial, intended for teachers and student level beginners.

BACHES in research and education:

Avila et al.: BACHES-A Compact Light-Weight Echelle Spectrograph [↗]	An introduction of the BACHES spectrograph and its capabilities by its developers.
Kozłowski et al.: A compact echelle spectrograph for radial velocity surveys with small telescopes. [↗]	The authors evaluate BACHES usefulness for remote and autonomous radial velocity surveys of binary stars with small telescopes. The spectrograph was used at a remote 0.5m telescope at a remote location, without any temperature stabilization.
Planewave CDK 20 with BACHES First Light at College CFG Wuppertal [↗]	BACHES is used for student education at the Carl-Fuhlrott-Gymnasium in Wuppertal, Germany.

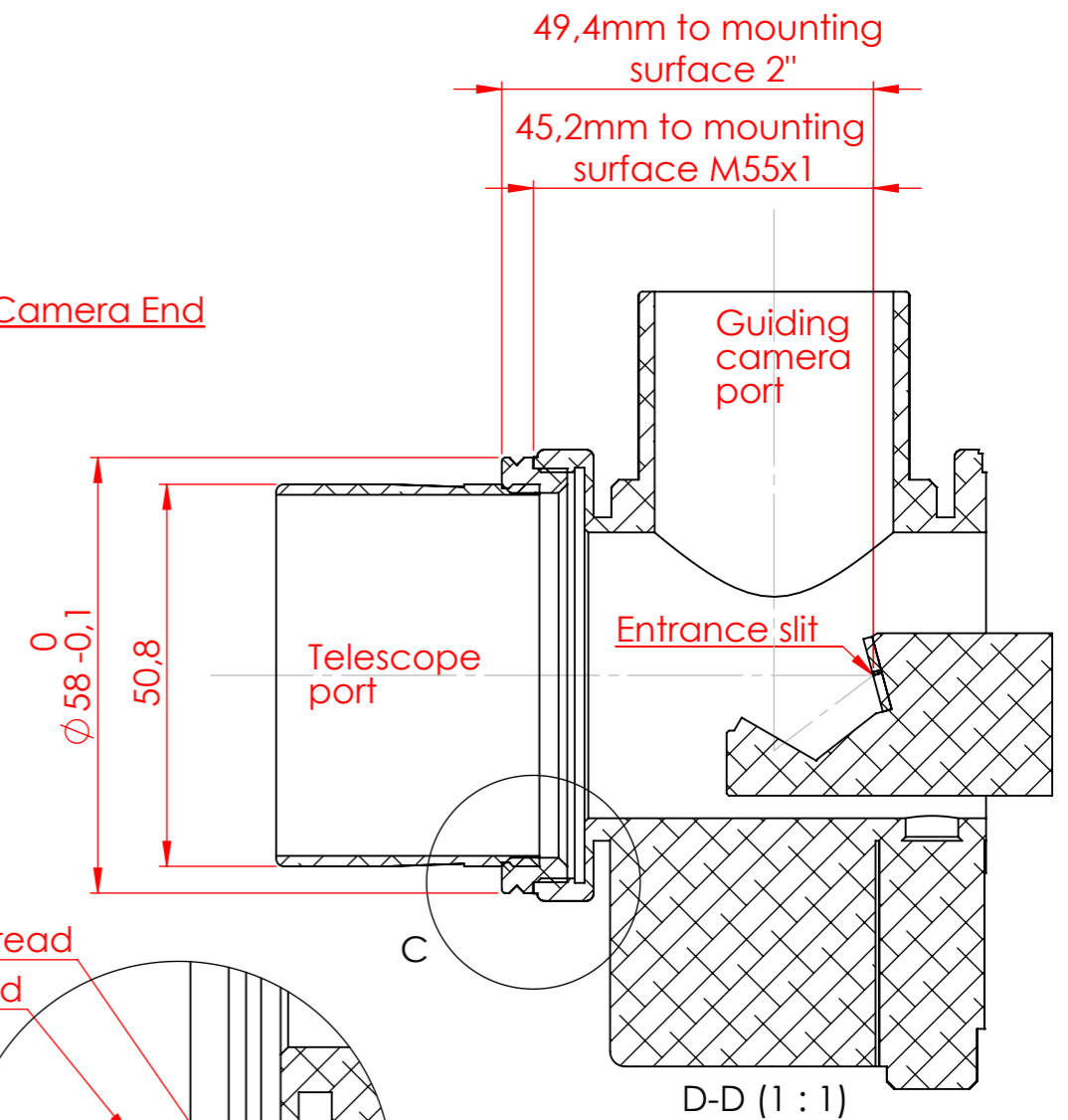
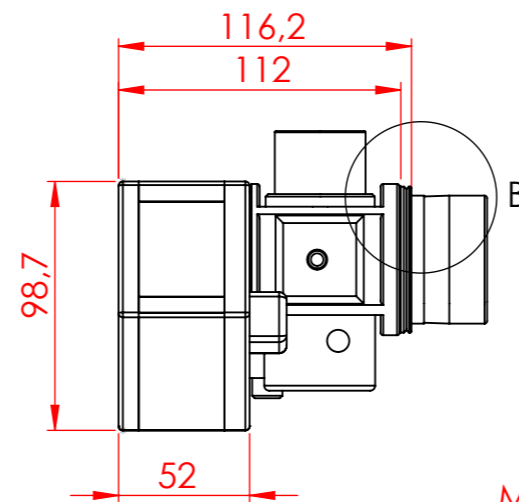
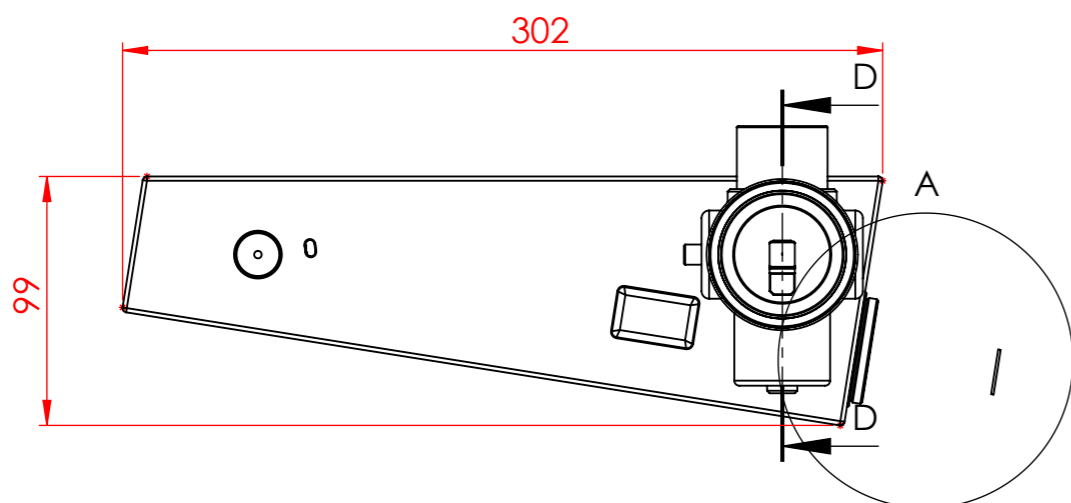
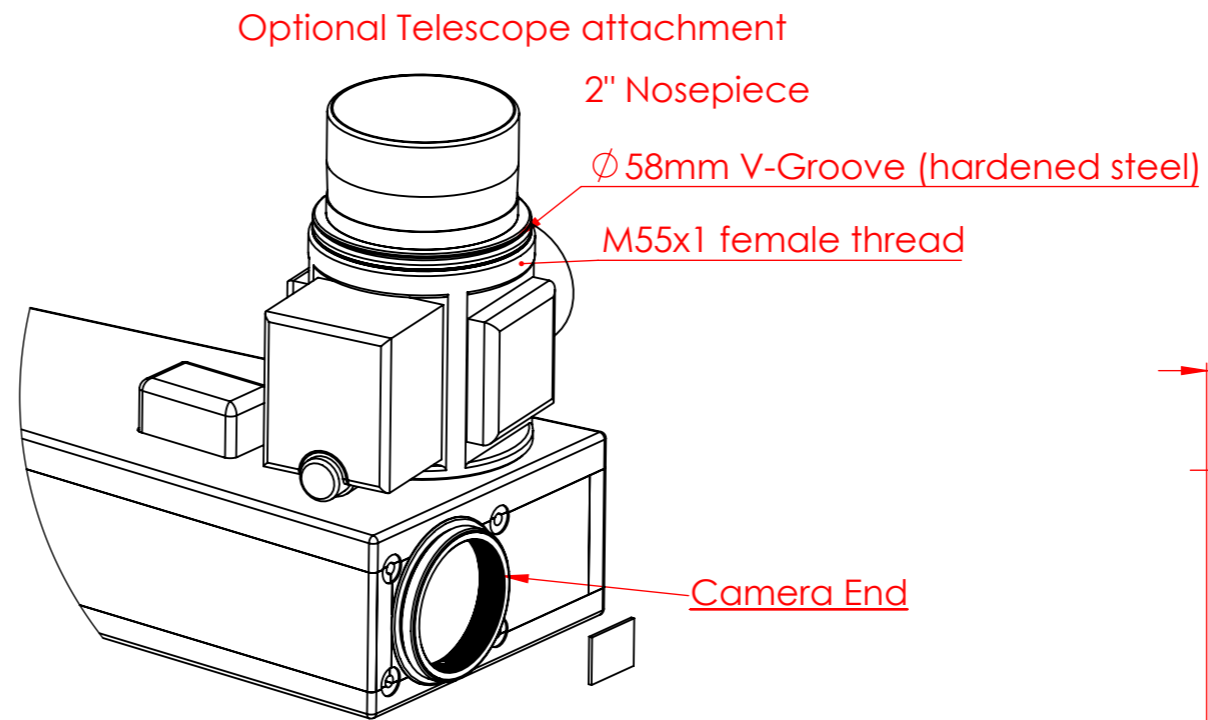
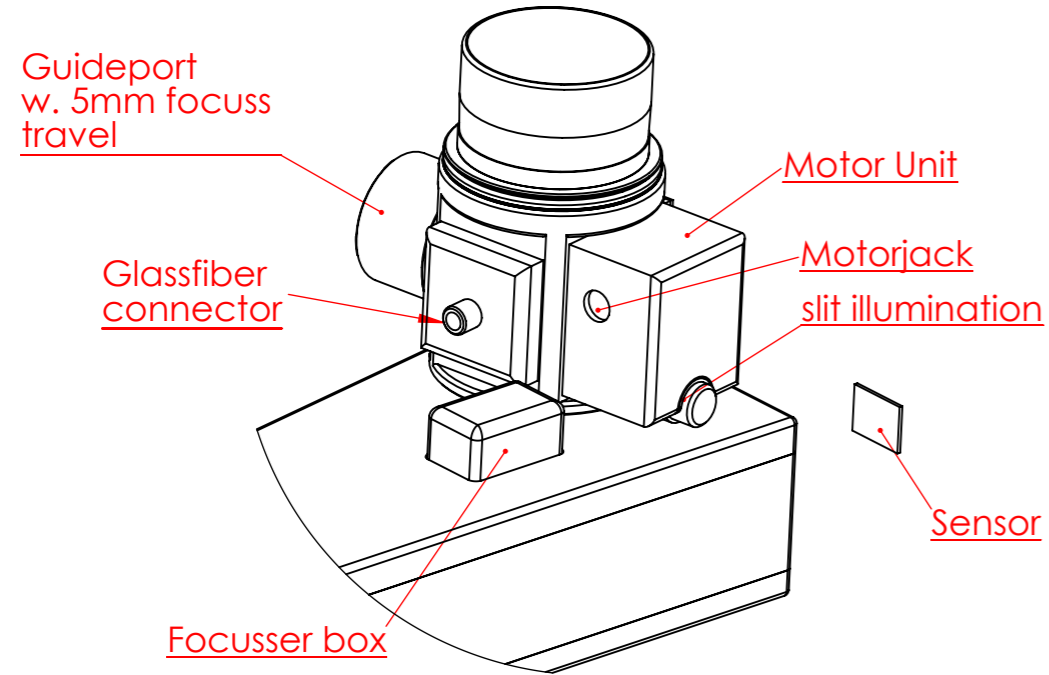


Example of a common BACHES resolving power graph
(measured at 1000 Th/Ar lines)

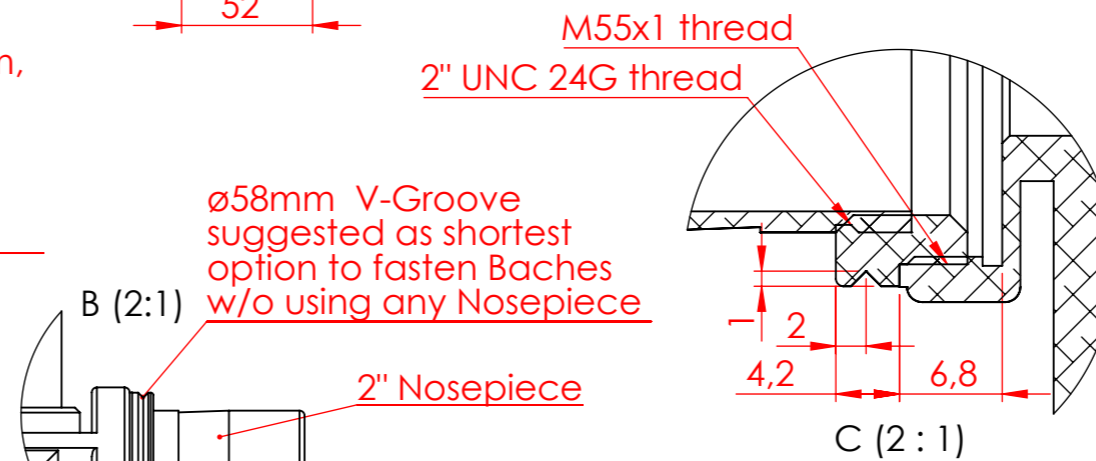
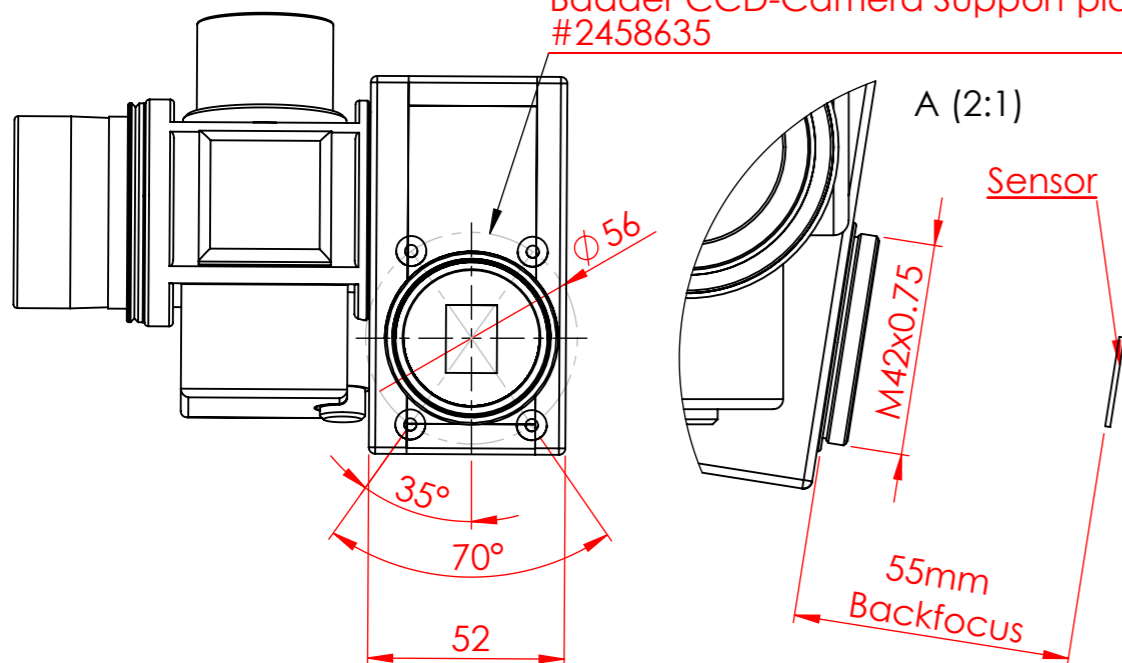


BACHES spectrograph on Planewave CDK20

(c) Bernd Koch

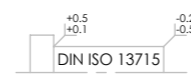


M4 mounting holes 4x, depth 5.5mm, recessed 0.5mm by 8mm diam., to accept customized holding structure for camera or Baader CCD-Camera Support plate #2458635



Dimensions without given tolerance have a tolerance of $\pm 0.1\text{mm}$.

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Surface: Scale: 1:1 WEIGHT: A4

MATERIAL:

ARTICLE: **Baches Echelle Spectrograph**

DRAWING NO.:

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