

ORPHEUS

The **IBAK ORPHEUS** is a camera that can be operated with all IBAK camera tractors in DN 150 pipes upwards. It is available in both an SD and a HD version and is suitable for the inspection of large-diameter pipes. Features such as the optional Ex protection, the detector transmitter or 3D sensors for pipe run measurement make the ORPHEUS a versatile all-rounder. In addition, with the integrated laser, it provides the possibility of measuring the deformation and the pipe profile over the entire length of the sewer section.

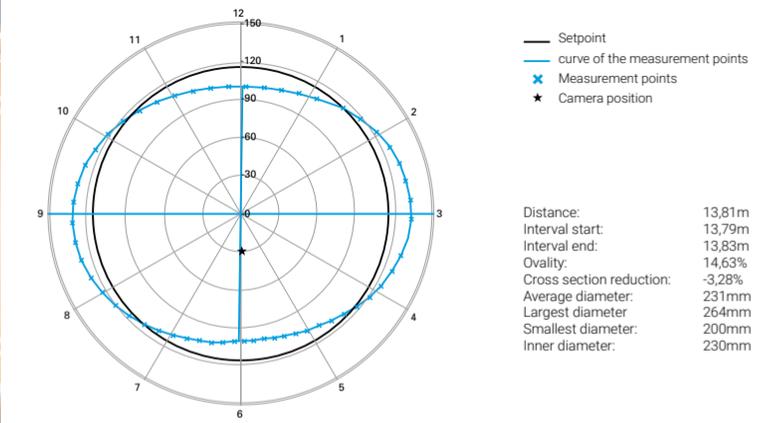
The IBAK ORPHEUS stands out with its high light sensitivity and strong illumination with 12 power LEDs so that even pipes with big diameters can be inspected without additional lighting. The power LEDs can be switched on and off flexibly and are equipped with integrated joint gap lighting and an automatic lighting control system that adapts the brightness of the LEDs to the pipe environment. Factors such as the pipe diameter and material have an effect on the amount of light required; with the automatic lighting control system, only as much power is used as is actually required, thus preventing unnecessary heating and dazzle. The camera head can rotate endlessly and has an automatic panning function to inspect joints. In addition, the ORPHEUS is equipped with a 10x optical zoom.

At a Glance

- 360° panning function to inspect joints
- Automatic return to default position
- Pre-programmed viewing directions selectable by shortcut key
- Flexibly switchable power LED lighting
- Lighting control system
- Joint gap lighting
- Upright Picture Control (UPC)
- One-push autofocus
- Integrated detector transmitter
- Ex protection optional (ORPHEUS 3)
- Internal pressure monitoring
- 3D GeoSense optional

Technical System Data	ORPHEUS 2	ORPHEUS 3	ORPHEUS 2 HD	ORPHEUS 3 HD
Type of camera	Pan and rotate camera	Pan and rotate camera	Pan and rotate camera	Pan and rotate camera
Inspection range	DN 150 upwards	DN 150 upwards	DN 150 upwards	DN 150 upwards
Diameter	110 mm	110 mm	110 mm	110 mm
Length	160 mm	160 mm	170 mm	170 mm
Push rod operation	no	no	no	no
Camera tractor operation	yes	yes	yes	yes
UPC	yes	yes	yes	yes
Non-inverted image	yes (e-Flip) ¹	yes (e-Flip) ¹	yes (e-Flip) ¹	yes (e-Flip) ¹
Zoom	10x optical 16x digital optional			
Angle of rotation	endless	endless	endless	endless
Focus range	10 mm – infinite			
Focus function	remote-controlled, manual/ automatic focus	remote-controlled, manual/ automatic focus	remote-controlled, manual/ automatic focus	remote-controlled, manual/ automatic focus
TV standard	NTSC or PAL	NTSC or PAL	Full HD (SDI)	Full HD (SDI)
Horizontal resolution	< 720 TVL (Television lines)	< 720 TVL (Television lines)	800 TVL (Television lines)	800 TVL (Television lines)
Integrated laser	yes, 2 lasers	yes, 2 lasers	yes, 2 lasers	yes, 2 lasers
Integrated detector transmitter	optional	optional	optional	optional
Ex protection	no	yes	no	yes
3D GeoSense	optional	optional	optional	optional
Kombinierbar mit				
IBAK camera tractors	T66, T76, T86	T66, T76, T86	T 66 HD, T 76 HD, T 86 HD	T 66 HD, T 76 HD, T 86 HD
IBAK control systems	BS 3.5, BS 5, BS 7, BS 10, BP 100	BS 3.5, BS 5, BS 7, BS 10, BP 100	BS 5, BS 7	BS 5, BS 7
Zubehör (optional)				
Manhole adapter	yes	yes	yes	yes

¹ e-Flip: As soon as the angle of the camera surpasses 180°, the camera rotates automatically such that the image returns to a non-inverted, erect position. e-Flip can be switched on optionally.



IBAK – Made in Germany

All IBAK products have one thing in common: They are “Made in Germany”. All system components are developed, produced, fitted and tested by IBAK. With their high quality standards IBAK products are a benchmark for investment security and economy – since 75 years.



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Änderungen vorbehalten | 220627_ORPHEUS_10s_EN

LaserScan Measurement and 3D GeoSense

The ORPHEUS is equipped with two integrated lasers with which **LaserScan deformation and profile measurements** can be performed. This makes it possible to generate an analysis of the pipe profile or the deformation over the entire length of the sewer section. Pipes with circular and oval cross-sections are supported (in the latter case, the inside width and height of the pipe are indicated instead of the diameter).

Measurements are performed via two laser points projected onto the pipe wall at an angle of 90° while the camera is reversing through the pipe. The camera is set into rotation and scans the complete profile of the sewer section. This generates a spiral of laser measuring points which are then analysed by the software and displayed both in graphical and report form.

If, in addition to the analysis of the pipe profile, the position and height coordinates of the sewer network are required, a **3D-GeoSense pipe run measurement** can also be performed to capture the x,y,z coordinates. Especially where it is assumed that a pipe does not run straight, a precise geodetic position measurement can provide relevant data for rehabilitation planning.

The stated measurements generate information by far in excess of that gained from purely optical inspections. The results of the measurements provide an essentially important basis for the choice, cost estimation and planning of the most suitable technical and economical rehabilitation measures.

Measuring Accuracy

The accuracy of the measuring system is vital to allow reliable conclusions to be drawn from the inspections.

The **IKT** (Institute for Underground Infrastructure, Exterbruch 1, 45886 Gelsenkirchen) performed an independent test of the measuring accuracy of the diameter measurement system in April 2017 (inspection number: P06753).

Measurements were performed with the ORPHEUS 2 HD in pipes with the following conditions:

- Internal pipe diameters: DN150 to DN2200
- Pipe materials: concrete, vitrified clay, cast iron, PVC, PP and PE-HD
- Profiles: smooth, rough and slightly corrugated surfaces (e.g. spiral pipes)
- Dry and wet surfaces

All measured values were verified by reference measurements with a calibrated measuring instrument.

The IKT came to the following result¹:

The system with the ORPHEUS 2 HD camera is capable of measuring the internal diameter of standard circular-section pipes with the following average accuracy:

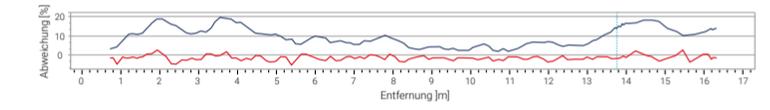
- > DN150 to DN300: average deviation of up to 0.5%
- > DN300 to DN800: average deviation of up to 1.0 %
- > DN800 to DN2200: average deviation of up to 1.5 %

Furthermore, it was ascertained that the different pipe materials had no effect on the accuracy of the measurements. Similarly, the results of a comparison measurement in a wet concrete pipe did not differ from those of a measurement in a dry pipe.

Multiple repeat measurements finally confirm the consistency of the high measuring accuracy.

¹ The measurement was performed at a defined point in the pipe.

Top: The graphic shows the **cross-section of the pipe** generated from the measuring points of the spiral (blue line). The measured actual profile of the pipe is shown in comparison to the desired geometry.



- Ovality
- Cross section reduction
- Actual position

Top: **Graphical representation of the sewer section profile:** The dark blue line shows the ovality, the red line the reduction of cross-section over the entire sewer section. The vertical dotted line indicates the position of the cross-section currently shown.