# X-SIGHT

# X-SIGHT 2D DIC DYNAMIC

## Optical Measuring System for Dynamic Testing

X-Sight 2D DIC DYNAMIC comes with camera, lens, lighting and calibrating grid. ▶

## FEATURES

- Universal solution for in-plane deformation and deflection measurements
- High-performation acquisition
- Ideal for dynamic testing
- Adjustable for wide range of applications

## SOFTWARE

- X-Sight Alpha DIC®
- Full software capabilities

## SUPPORTED OPERATING SYSTEMS

- Win 11 64bit / Win 10 64bit
- Win Server 2019 / Win Server 2022

Latest Release on date of purchase

# COMPLETE OPTICAL SYSTEM FOR MEASURING DYNAMIC IN-PLANE DEFORMATIONS

# OVERVIEW

X-Sight 2D DIC DYNAMIC is a high-performance system designed for precise strain and deflection measurements in both real-time and post-process applications. Equipped with advanced camera, it enables accurate in-plane dynamic analysis by capturing fast events with exceptional detail. Its modular design allows it to function also as a powerful dynamic video extensometer with single or multiple cameras, providing comprehensive strain data ideal for validating finite element models (FEM).

Engineered for versatility, speed, and accuracy, the X-Sight 2D DIC DYNAMIC system is also upgradeable to the X-Sight 3D DIC DYNAMIC system, and it is the ultimate solution for demanding dynamic testing and measurement applications.

# MODELS

Experience precision and flexibility with the X-Sight 2D DIC DYNAMIC system, available in three standard camera configurations to meet your specific speed requirements. Whether you prioritize resolution, measurement area, or sampling rate, this system delivers tailored performance.

| XS-DIC2D-DYNAMIC-X600 | XS-DIC2D-DYNAMIC-X2300 | XS-DIC2D-DYNAMIC-X3700 |

The numeric value at the end of the model designation represents the camera's frame rate at full resolution, ensuring clarity in dynamic measurements.

The system is customizable through the selection of cameras (Above mentioned models are standardized, more options can be quoted), lenses, and auxiliary hardware to suit your experiment the best.

# MEASURING AREA

Measuring area is determined by the required resolution of the DIC system. The better the resolution, the smaller the measuring area, and vice versa.

The optical system does not have any maximum or minimum measuring area, as this value depends on the optics used for the specific experiment. Therefore, the following chart shows the field of view size equivalent to 1 and 0.5 micron resolution respectively.

| Model Designation | Model Resolution [Mpx] | Measurement Area at 1 micron (0.04 mils) resolution in mm (in) | Measurement Area at 0.5 micron (0.02 mils) resolution in mm (in) |
|---|---|---|---|
| XS-DIC2D-DYNAMIC-X600 | 10 | 580 (22.8) | 290 (11.4) |
| XS-DIC2D-DYNAMIC-X2300 | 2.1 | 240 (9.4) | 120 (4.7) |
| XS-DIC2D-DYNAMIC-X3700 | 1.1 | 160 (6.3) | 80 (3.1) |

# WORKING DISTANCE

The working distance, meaning the distance from the camera to the measured object, is in a triangle selection together with a measuring area and focal length of the lens. By selecting two of these values, the third becomes driven.

The following table presumes a 1-micron resolution and use of default supplied lenses and is, therefore, illustrative:

| Model Designation (at 1 μm resolution) | Typical Lenses used | Working distance in mm [in] |
|---|---|---|
| XS-DIC2D-DYNAMIC-X600 | XH16 | 529 (20.8) |
| XS-DIC2D-DYNAMIC-X2300 | XH16 | 300 (11.8) |
| XS-DIC2D-DYNAMIC-X3700 | XH16 | 458 (18.0) |

For detailed Field of View and Working Distance values, refer to the end of this datasheet.

# SAMPLING RATE

The sampling rate depends on the camera resolution and can be increased by reducing the image size. The chart below displays sampling rates for some common image resolutions. Be aware that the image can be cropped according to specific needs. For detailed sampling rate values, refer to the end of this datasheet.

| Model Designation | Frame Rate at Full Image [kHz] | Frame rate at Full HD [kHz][1] | Frame rate at VGA [kHz][2] | Image size at 10 kHz (width × height) [px] |
|---|---|---|---|---|
| XS-DIC2D-DYNAMIC-X600 | 0.63 | 1.2 | 2.6 | 4 608 × 64 |
| XS-DIC2D-DYNAMIC-X2300 | 2.17 | 2.17 | 4.1 | 1 920 × 232 |
| XS-DIC2D-DYNAMIC-X3700 | 3.52 | -* | 6.3 | 1 280 × 304 |

[1]The Full HD resolution corresponds to 1 920 × 1 080 px
[2]The VGA resolution corresponds to 640 × 480 px
*The resolution of the camera sensor is smaller than Full HD designation

Be aware that described frame rate values are only achievable using the High-Speed Alpha SW functionality, as the Real-time measurement do not guarantee lossless acquisition above **200 Hz**.

# MECHANICAL INTERFACE

Cameras are mounted to bracket with two M4 screws. Standard interface is that the camera is attached to a tripod ball head with a tripod using 1/4″ screw and quick-release fixing plate. Both the ball head and tripod are part of the system.

Interface is also possible with camera bracket designed for mounting to the carbon fiber stereo-bar using M8 hand-tightening screw and T-slot nut. Stereo-bar with camera bracket is not part of the 2D DIC DYNAMIC set, and is only applicable in this system via 3D expansion kit or in standard 3D DIC DYNAMIC System.



▲ High-intensity LED Light



▲ Tripod with a tripod ball head

# LIGHTING OPTIONS

The X-Sight 2D DIC DYNAMIC system features a powerful LED light, providing professional-grade illumination with a maximum output power of 200 W and up to 60 700 lux at 1 meter with the reflector. By pressing and holding the brightness adjustment knob and the color temperature adjustment knob, the LED light switches to a MAX mode with the maximum output power of 320 W and illumination up to 85 800 lux at 1 m with the reflector. The Max mode is automatically disabled after reaching a certain temperature level.

A light controller allows precise adjustment of colour temperature between 2 700 K and 6 500 K, as well as brightness control from 0 - 100%. Powered by the electrical grid, the LED light is equipped with integrated active cooling technology to ensure consistent performance during extended use.



► High-intensity LED Light

| Parameter | Value |
|---|---|
| Light temperature | 2 700 – 6 500 K |
| Intensity (normal mode) | 60 700 Lumens on 1 $m^2$ |
| Intensity (MAX mode) | 85 800 Lumens on 1 $m^2$ |
| Max power (normal mode) | 200 W |
| Max power (MAX mode) | 320 W |
| Power source | Electrical Grid |

Each high-intensity LED light comes with its own magic arm and can be equipped with a tripod allowing the flexible positioning of the light source.

# PC CONNECTION

The camera is connected to the measuring computer via PCIe Gen3 x8 bus with a bandwidth of 64 Gbit/s, assuring high-speed data transfer.

The system can be equipped with either copper or optic fibre cable, providing flexibility to adapt to different installation needs and distances.

| Cable Type | Lengths |
|---|---|
| Copper | 3, 5, 7 m |
| Optic fibre | 10, 30, 50 m |

Depending on the selected cable type, the system is configured with an appropriate host adapter with the PCIe Gen.3 x8 interface.

# MEASURED DATA TRANSFER (I/O)

Every X-Sight DIC DYNAMIC system is equipped with an AD/DA converter. This device has two single-ended output channels with selectable output range up to ±10 V, and sixteen single-ended or eight differential input channels with selectable input range up to ±10 V.

Multiple ways exist to **OUTPUT** the measured data to the machine control unit or the testing machine software.

- **Digital**
  DOLI Binary, MODBUS, HP VIDEO, TCP/IP, RS232
- **API**
  Alpha API (JSON), MRT API
- **Analog**
  Auxiliary AD/DA converters
- **Pulse Incremental**
  Quadrature encoder-like pulse communication with the use of a PULSEGEN device (not included)

NOTE: Be aware that High-Speed mode does not support value output and it is only possible in Real-time recording mode.

**INPUT** of external data to X-Sight Alpha DIC software (force, temperature, pressure, excitation frequency) is also possible.

- **Digital**
  MODBUS, TCP/IP, RS232
- **API**
  Alpha API (JSON), MRT API
- **Analog**
  Auxiliary AD/DA converters

The API communication allows the DIC System to operate remotely. This feature includes commands like Start/Stop, Method Switch, Set Gauge Length, and others. For more info, check out the **Communication Options** document.

# POWER CONNECTION AND SYNCHRONIZATION

The camera is powered by its own power supply using a 3-meter power cable, which also serves for camera synchronization. To ensure accurate synchronization, the camera is triggered by the supplied control box with USB-2 interface.

# OPERATION CONDITIONS

The X-Sight 2D DIC DYNAMIC system is designed for indoor use, but outdoor applications under supervision are permissible. Do not allow the unit to get wet.

| Conditions | Permissible value |
|---|---|
| Temperature | 5–40 °C |
| Humidity | 30–70 % |

The system allows measurement through the glass or the use of a mirror. In such cases, these optical elements must be of a high optical quality so as not to introduce unwanted disturbance to the measurement.

When measuring through the glass, a polarization set may be required to reduce/eliminate the light reflections.

When measuring with a climatic chamber, be aware that the vibrations and heat turbulence may introduce a raised noise base to your signal.

This product complies with EU Directive 2014/30/EU and 2014/35/EU.

# PACKAGE CONTENTS

Each X-Sight 2D DIC DYNAMIC system is supplied in a dust-proof case, except for the PC. The outer dimensions of the case are 687 × 528 × 366 mm, with a total weight of approximately 18 kg.

High-intensity LED light and tripod for LED light come in separate packages. For convenient transportation, the LED light and tripod can be supplied on request in the second dust-proof case with outer dimensions of 687 x 528 x 276 mm and the total weight of approximately 12 kg



▶ XS - 2D DIC DYNAMIC dustproof case

Note: The above-depicted case is an illustration of a standard configuration; the content of the case may vary based on the customer's needs..

| Item | No. of pieces |
|---|---|
| Dust-proof Case | 1 |
| Camera | 1 |
| Lens | 1 |
| Passive cooling | 1 |
| Camera bracket - Tripod head installation | 1 |
| Tripod + Head | 1 |
| Magic Arm for LED light | 1 |
| Camera Data Cable | 1 |
| Sync and power cable | 1 |
| Control box for camera synchronization | 1 |
| Power Supply for Camera | 1 |
| Calibration Grid | 3 |
| PCIe Host Adapter | 1 |
| AD/DA Converter | 1 |
| Lens cleaning cloth | 1 |
| Quad-port USB 3.0 hub | 1 |
| Installation USB | 1 |
| USB License Key | 1 |

▲ Package contents of 2D DIC DYNAMIC case

| Item | No. of pieces |
|---|---|
| Dust-proof Case (upon request) | 1 |
| High-intensity LED light | 1 |
| Tripod for LED light (upon request) | 1 |

▲ Contents of other packages

# MODULARITY AND PROBES
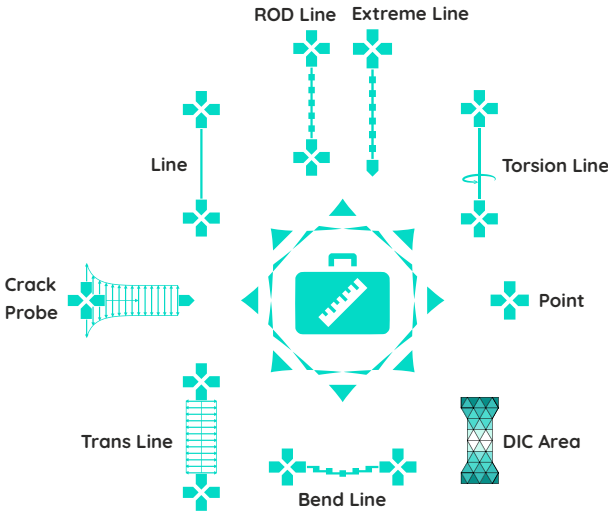


The X-Sight 2D DIC DYNAMIC system includes all software modules and, in addition to a standard 2D DIC system, a High-Speed (HS) recorder functionality, allowing dynamic events to be captured at high frame rates without data loss.

The measurements are primarily conducted during post-processing, which enables to increase the number of line-based probes or switch them for an area strain or displacement mapping function. The X-Sight 2D DIC DYNAMIC system is also capable of measuring in a Real-time fashion and outputting selected values to 3RD party software or devices.

# HIGH-SPEED RECORDER

The High-Speed Recorder is a specialized software tool designed for capturing dynamic phenomena where real-time visualization is impractical. To enable higher recording frequencies, ALPHA DIC automatically disables measurement probes and saves the selected settings, significantly increasing the recording rate.

The High-Speed recorder module offers two recording modes for added flexibility. The "One Off" mode starts acquisition immediately upon recording, capturing the event as it unfolds. Alternatively, the "Pre-Trigger" mode lets users set a pre-trigger length, capturing a selected percentage of frames before the desired event, ensuring no critical data is missed. Once recorded, data can be immediately pre-processed and transferred for post-processing, using all available Alpha SW tools. The recording process can also be triggered via the Alpha API, allowing integration into automated workflows and providing engineers with precise control over data acquisition and analysis.
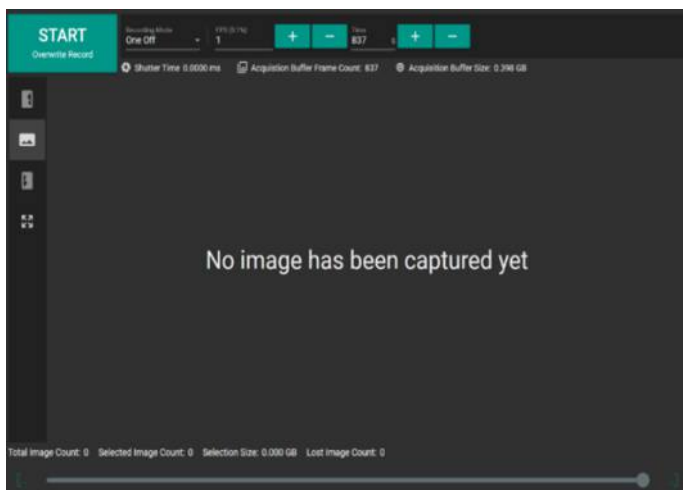
▲ User interface of High-speed Recorder

## LICENCING

The 2D DIC DYNAMIC system comes with X-Sight Alpha software license bonded to a HW USB dongle. This allows the user to install the software on unlimited computers and use only the one where the license key is plugged in. This way of licensing makes it easy to switch the computer in case of a PC breakdown.

Alternatively, a network license is available upon request, which allows the software to be used on multiple devices within the same network without the need for physical key transfers.

| Software Module | Point | Line | Extreme Line | Trans Line | Bend Line | Torsion Line | Crack Probe | ROD Line | DIC Area |
|---|---|---|---|---|---|---|---|---|---|
| AX | • | • | • | | | | | | |
| TR | | | | • | • | | | | |
| TO | | | | | | • | | | |
| CR | | | | | | | • | | |
| ITT | | | | | | | | • | |
| DIC | | | | | | | | | • |
| PP | Post-processing of recorded measurements (different probes or layouts) | | | | | | | | |
| HS | High-speed recorder functionality | | | | | | | | |
| DI | Possibility to input auxiliary signals (digital and analog) | | | | | | | | |
| LVD | Color value distribution along Extreme, ROD, or Bend Line | | | | | | | | |

## SYSTEM REQUIREMENTS

| System requirements | System requirements | Recommended |
|---|---|
| CPU | Intel i5 3.0GHz (>3000 points – Average CPU Mark *) \| Intel/AMD 4GHz >16-core (>3300 points – Single Thread Rating **) |
| GPU | NVidia/AMD/Intel OpenGL 3.0 1024×768px (>300 points ***) \| NVidia/AMD/Intel OpenGL 3.0 1920×1200px (>5000 points ****) |
| Memory | 8GB \| 128GB DDR4 |
| Disk | 8GB HDD free \| 2TB SSD / M.2 |
| Ports | 1× USB (HW key) 1x PCIe Gen.3 x8 slot for each camera (Optional) 1× USB for peripheral data transfer device (Optional) 1× Ethernet Port of MODBUS or TCP/IP communication |
| Operating System | Windows 11 64-bit ***** or Windows 10 64-bit ***** Windows Server 2019 ***** or Windows Server 2022 ***** |

\* MID CPU BENCHMARK www.cpubenchmark.net
\*\* HIGH-END CPU BENCHMARK www.cpubenchmark.net
\*\*\* MIDLOW GPU BENCHMARK www.videocardbenchmark.net

\*\*\*\* HIGH-END GPU BENCHMARK www.videocardbenchmark.net
\*\*\*\*\* Latest Release on date of purchase

# MEASURING STATION

This system is designed to operate with a high-performance computer that surpasses the capabilities of standard hardware typically used for Static DIC or video extensometry. A computer is not included in the standard configuration; however, various options are available upon request — including a convenient rack system that integrates the measurement PC and provides storage for additional accessories not included in the standard dust-proof case. Computer is also available as a free standing unit for laboratory use.

Detailed specifications for the measurement PC and the portable station are available in a separate datasheet.

# RESOLUTION & FRAME RATE

Bellow charts show the dependency of Frame Rate on the Resolution (Height) of the sensor for each camera.



X600: Resolution vs Frame Rate



X2300: Resolution vs Frame Rate



X3700: Resolution vs Frame Rate
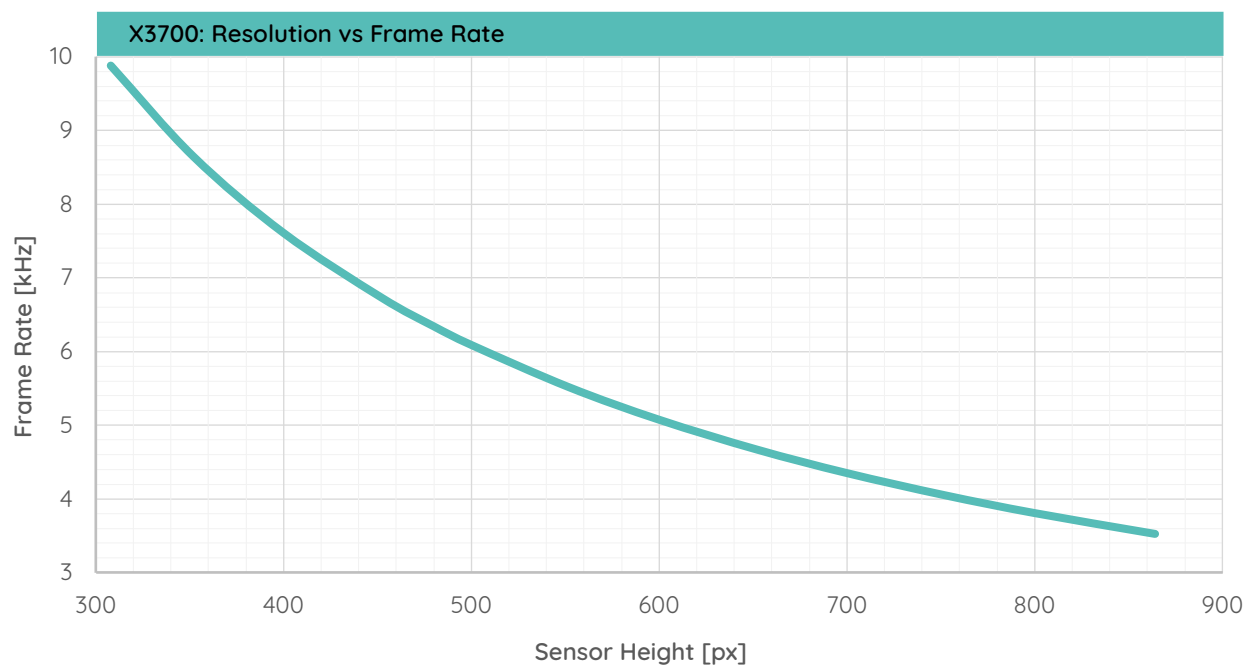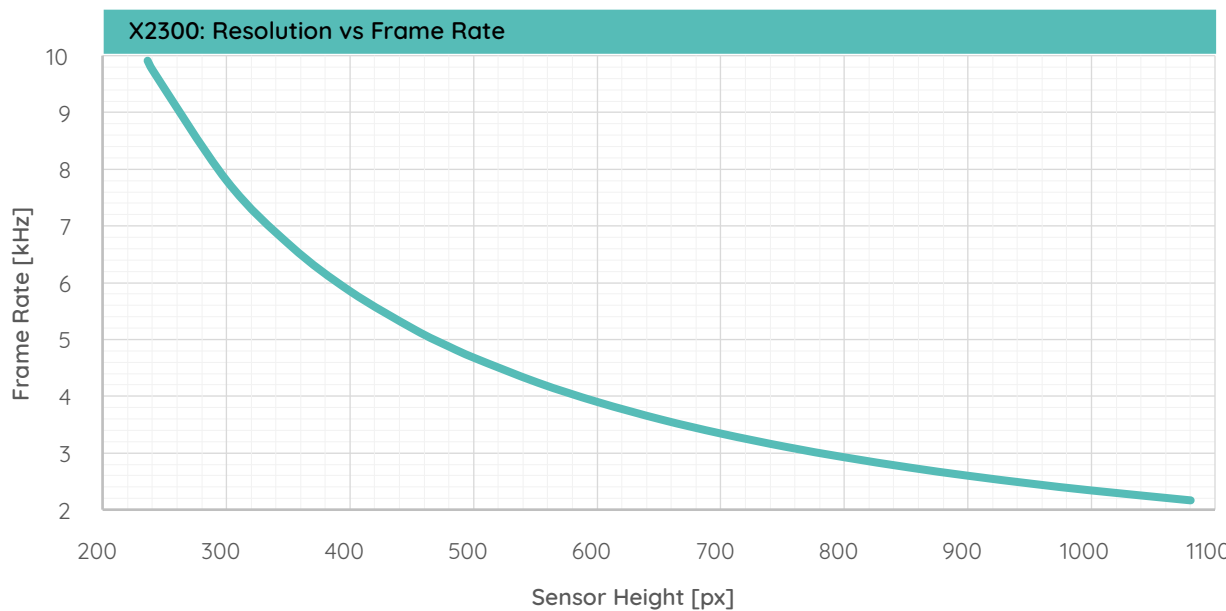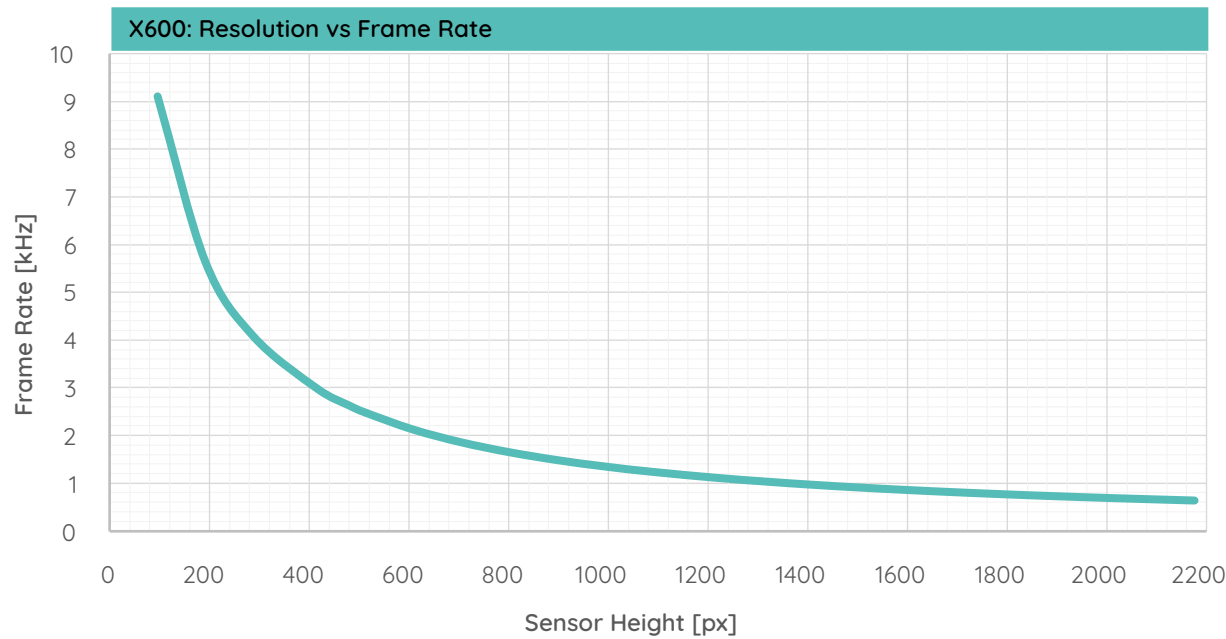
# FIELD OF VIEWS & WORKING DISTANCE

Bellow charts show the dependency of working distance on the field of view for each X-Sight system with various lens models.



Dependence of Field of vision on Working Distance for X600



Dependence of Field of vision on Working Distance for X2300



Dependence of Field of vision on Working Distance for X3700