heliotis
advancing 3D metrology

# heliInspect™
# H9S

**SYSTEMS GUIDE**

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# (A) Configuration Options

## 1) heliInspect™ H9S 3D-Measurement Head

The heliInspect™ H9S offers high-resolution 3D profiling for inline applications that require large field of views and long working distances. The H9S is equipped with Heliotis' latest lock-in imager heliSens™ S4H which yields higher resolution and shorter acquisition times.

Furthermore, the H9S comes with the same advanced high-level application programming interface as the popular heliInspect™ H8 series. Thus, the effort for machine integration is reduced to a level comparable with that of a 2D camera.
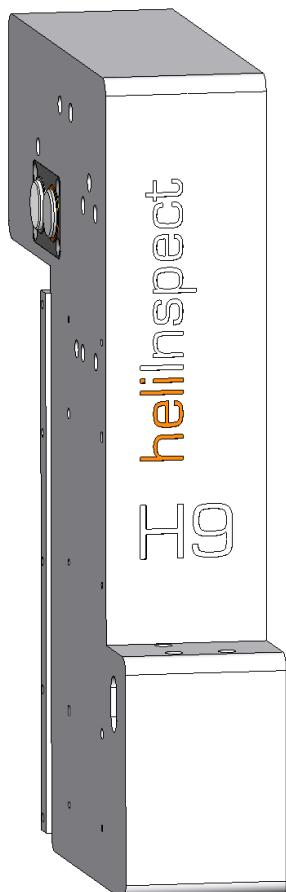


**heliInspect™ H9S**
**H9S.0-Sxx-Lxx-Xxx**

Features:
- high-speed 3D-imager heliSens™ S4H
- high-speed camera heliBoard™ B4
- power LED with collimation optics
- integrated Michelson interferometer
- integrated dovetail mount

Product Code:

| Category | xx | Description |
|---|---|---|
| S | 40 | heliSens™ S4H w/o micro lenses |
| L | R2 | LED red, type 2 |
| | B2 | LED blue, type 2 |
| X (*) | 0.5 | magnification 0.5x |
| | 0.8 | magnification 0.8x |
| | 1.0 | magnification 1.0x |
| | 1.5 | magnification 1.5x |
| | 2.0 | magnification 2.0x |
| | 3.0 | magnification 3.0x |

(*) For optical characteristics, see Table 1: Optical Characteristics for available magnifications

IMPORTANT NOTE:
The H9S is configured to control the scanner directly via the XENAX motor driver (CN Z1). For other configurations, please specify "CN Z0" or contact support@heliotis.com for further information.

*Table 1: Optical Characteristics for available magnifications*

| heliInspect™ H9S | Optical Characteristics | | | | | |
|---|---|---|---|---|---|---|
| Magnification | 3x | 2x | 1.5x | 1x | 0.8x | 0.5x |
| Field of View [mm x mm] | 4.10 x 4.35 | 6.14 x 6.53 | 8.19 x 8.70 | 12.29 x 13.06 | 15.36 x 16.32 | 24.58 x 26.11 |
| Lateral Resolution [um] | 8 | 12 | 16 | 24 | 30 | 48 |
| Working Distance [mm] | 49 | 49 | 51 | 51 | 51 | 51 |
| Numerical Aperture | 0.15 | 0.13 | 0.10 | 0.067 | 0.053 | 0.033 |
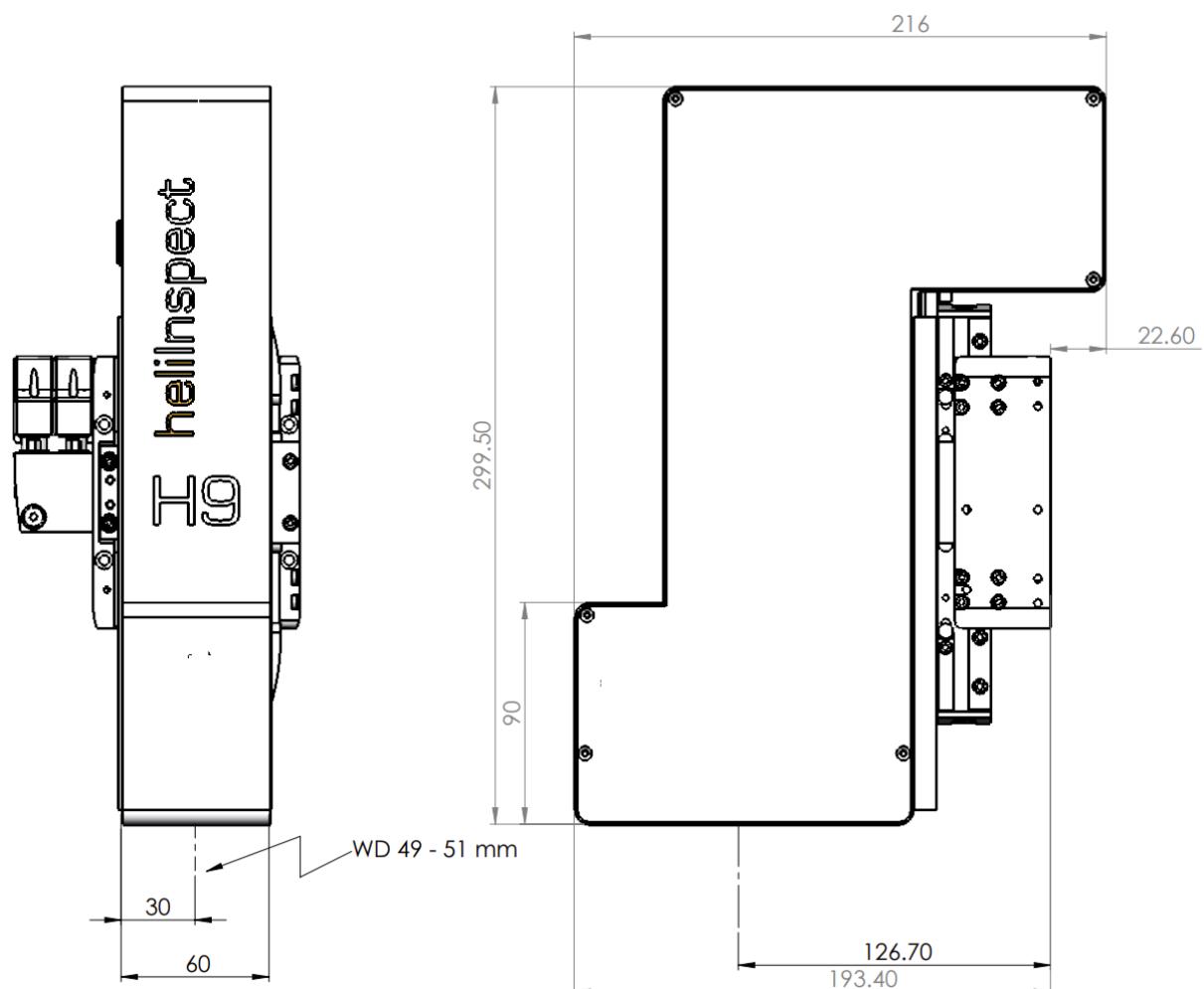


*Figure 1: Technical drawing (identical for all configuration)*
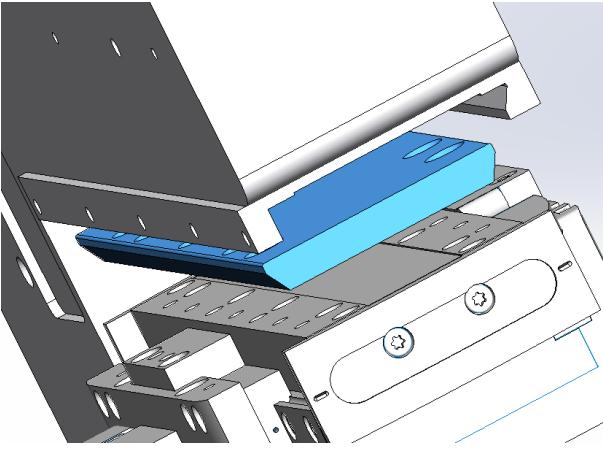
**Adapter Plate**
**AP1.0-H9DT-Mxx**

Features:
- dovetail mount for H9S
- hole and pin pattern for Lxu axes

Product Code:

| Category | xx | Description |
|---|---|---|
| M | 01 | compatible with Lxu40 |
| | 02 | compatible with Lxu80 |

# 2) Driver Electronics heliDriver™ D2

The heliDriver™ D2 supplies the H9S measurement head with power. It also features a low-noise current source to drive the high-power LED illumination of the H9S.

For the external scanner, the D2 conditions signals for trigger and position encoders. To support a great variety of 3rd party scanners and motion controllers, the D2 can be configured to adapt to various signal levels. Default settings support the XENAX motion controllers listed below.



**heliDriver™ D2**
**D2.1-Axx**

Features:
- controlled voltage supply for the H9S
- controlled current supply for H9S LED illumination
- signal conditioning of trigger and AB encoder inputs

Product Code:

| Category | xx | Description |
|---|---|---|
| A | 2 | LED driver with max 2 ampere |

Note:
Please contact Heliotis in case of integration with 3rd party scanners and motion controllers.

Typically, the heliDriver™ D2 is mounted in an electrical switch cabinet. A single cable connects the D2 to the H9S measurement head. Note that the H9S also needs to be connected to a vision PC or a switch via the HI-GE8 ethernet cable (see *Figure 2: Cabling*).

# 3) Scanner

The measurement principle of the heliInspect™ H9S (i.e. scanning white light interferometry) requires a precise axial movement. Heliotis recommends the following precision linear axes with integrated optical encoders. Their long and precise stroke accomplishes positioning and scanning operations in a single unit.

Note that the system performance may be optimized by selecting alternative scanners for a given application. Examples include:

- For high accuracy applications scanners with higher resolution and tighter tolerances should be considered.
- Spindle motors with a high-resolution measurement system may reduce system cost and complexity.

Please contact Heliotis in case alternative scanner stages should be used. Our engineers can recommend scanners and settings.



### J-Lxu(xx)F60-E01

Linear motor axis with precise, self-lubrication ball bearing guide, integrated optical measurement system with 100 nm resolution
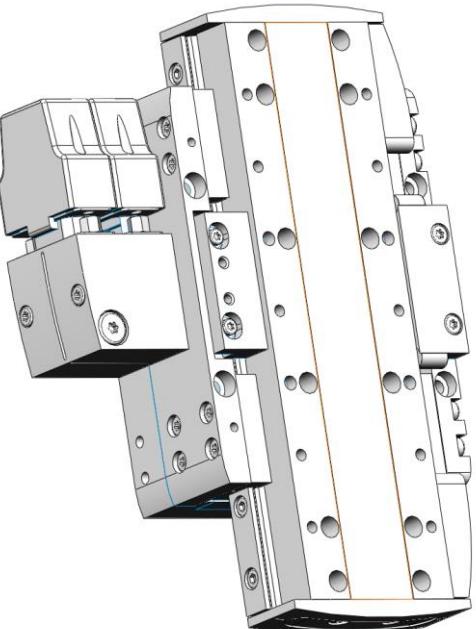
Product Code:

| Category | (xx) | Description |
|----------|------|-------------|
| Lxu | 40 | stroke of 40 mm |
| | 80 | stroke of 80 mm |
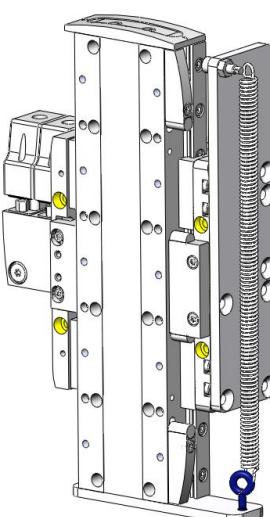
### Spring Weight Compensation WC1.0-Lxu(xx)-F25

Product Code:

| Category | (xx) | Description |
|---|---|---|
| Lxu | 40 | use with Lxu40 |
| | 80 | use with Lxu80 |

# 4) Axis Controller

To control the linear motor axes of the previous section, we recommend one of the servo controllers below. These models are fully supported by the Heliotis' software development kit and software applications. Optional bus modules allow for connecting to a PLC via EtherCAT, POWERLINK, CANopen, and PROFINET. Please contact support@heliotis.com for further details.
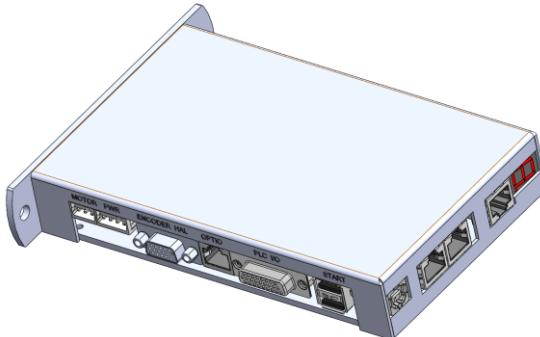


### JXvi-75V8

XENAX Servo controller with state-control and observer, S-curves profile generator incl. Web Server, Ethernet TCP/IP, RS232 and 12 Input, 8 Output 24V
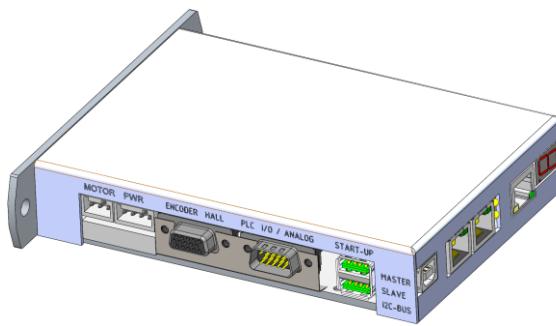


### JXvi-48V8 (recommended)

XENAX Servo controller with state-control and observer, S-curves profile generator incl. Web Server, Ethernet TCP/IP, RS232 and 4 Input, 2 Output 24V
LINAX license included

# 5) Cabling

The heliInspect™ H9S system requires 7 cables:

1. The connection Cable "HI-CC8" carries power supplies, IO-signals and the LED-current.
2. The cable "HI-GE8" provides a high-speed data link to the vision PC.
3. The "Motor Cable" carries the 3-phase motor current.
4. The "Encoder Cable" carries the AB-signals for position measurement
5. The "Y-Cable" connects the AB-signals to both heliDriver D2 and XENAX motor controller.
6. The "Trigger Cable" signals the start of a scan to the heliDriver D2.
7. The "GigE Cable" connects the motor controller XENAX to a PC or a PLC. With an additional bus module, the XENAX can be controlled by a PLC via EtherCAT, POWERLINK, CANopen, and PROFINET.

Cables 1 – 4 come in standard length of 1.5 m, 3 m, 5 m, 7.5 m and 10 m. Please contact Heliotis in case of different length requirements.

The figure below shows the typical wiring scheme for the heliInspect™ H9S series.
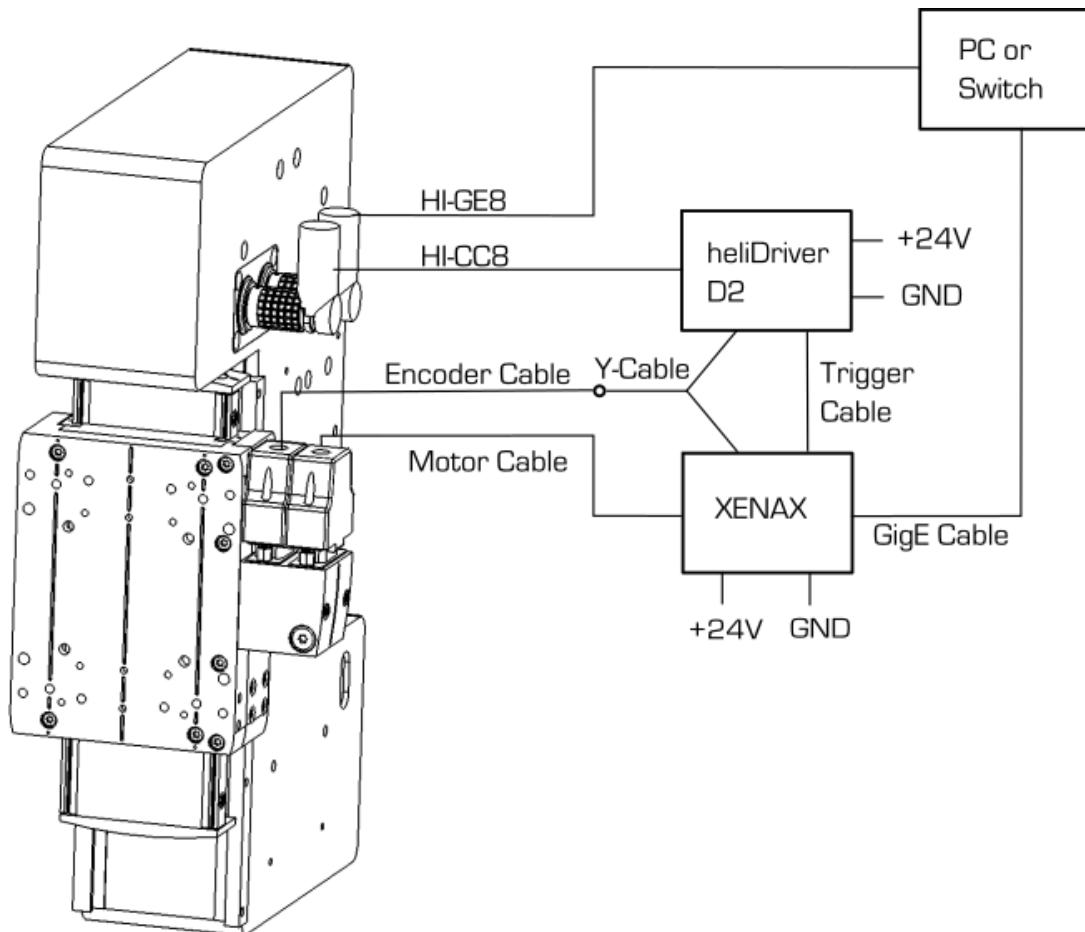


*Figure 2: Cabling*

Connection Cable and GigE Cable are available with straight and elbow connectors.
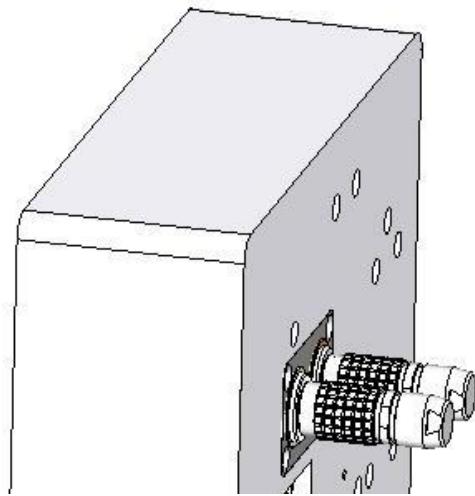


Figure 3: Straight Connectors
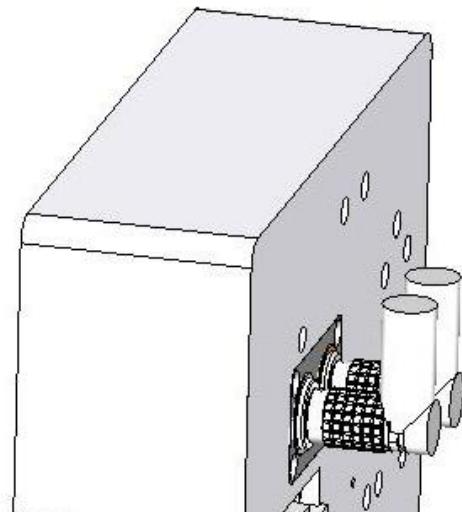


Figure 4: Elbow Connectors



## GigE Cable Straight
## HI-GE8-Lx.x-CF

Product Code:

| Category | x.x | Description |
|---|---|---|
| L | 1.5 | 1.5 m |
| | 3.0 | 3.0 m |
| | 5.0 | 5.0 m |
| | 7.5 | 7.5 m |
| | 10.0 | 10.0 m |
| | x.x | custom |
| CF | suitable for drag chains | |



## Connecting Cable Straight
## HI-CC8-Lx.x-CF

Product Code:

| Category | x.x | Description |
|---|---|---|
| L | 1.5 | 1.5 m |
| | 3.0 | 3.0 m |
| | 5.0 | 5.0 m |
| | 7.5 | 7.5 m |
| | 10.0 | 10.0 m |
| | x.x | custom |
| CF | suitable for drag chains | |

## Cables with Elbow Connectors
## HI-GE8R-Lx.x-CF
## HI-CC8R-Lx.x-CF

Product Code:

| Category | x.x | Description |
|----------|------|-------------|
| L | 1.5 | 1.5 m |
| | 3.0 | 3.0 m |
| | 5.0 | 5.0 m |
| | 7.5 | 7.5 m |
| | 10.0 | 10.0 m |
| | x.x | custom |
| CF | | suitable for drag chains |

For factory configuration, please specify the required angle with the configuration code "CN A0", "CN A1", … or "CN A7". Default configuration is "CN A0", i.e. upwards.

## Angle Adjustment Tool
## LEMO-DCP-91-001-TN



The outlet angle of elbow connectors can be adjusted by use of the Spanners WRENCH COLLET NUTS.

| | |
|---|---|
| D-Sub 9 pole<br>—3x0.75mm2—<br>Wago 3.5mm | **Motor Cable**<br>**F-LINAX-CCM-Lxx-CF**<br><br>Product Code:<br><br>| Category | x.x | Description |<br>|---|---|---|<br>| L | 1.5 | 1.5 m |<br>| | 3.0 | 3.0 m |<br>| | 5.0 | 5.0 m |<br>| | 7.5 | 7.5 m |<br>| | 10.0 | 10.0 m |<br>| | x.x | custom |<br>| CF | | suitable for drag chains | |
| HD D-Sub 15 pole jack<br>—12x0.14mm2—<br>HD D-Sub 15 pole pins | **Encoder Cable**<br>**F-LINAX CCE-Lxx-CF**<br><br>Product Code:<br><br>| Category | x.x | Description |<br>|---|---|---|<br>| L | 1.5 | 1.5 m |<br>| | 3.0 | 3.0 m |<br>| | 5.0 | 5.0 m |<br>| | 7.5 | 7.5 m |<br>| | 10.0 | 10.0 m |<br>| | x.x | custom |<br>| CF | | suitable for drag chains | |
| 1 x 15 pole HD D-Sub male, 1 x 15 pole HD D-Sub female, 1 x D-Sub 9 x pole female, length 0.25m | **Y-Cable for XENAX Encoder**<br>**F-Y-CABLE-D-SUB-PH-L0.5** |
| Connects Xenax and heliDriver | **Trigger cable**<br>**HI-TC2-Xxx-L1.0**<br><br>Product Code:<br><br>| Category | xx | Description |<br>|---|---|---|<br>| X | 48 | for use with Xenax Xvi48V8 |<br>| | 75 | for use with Xenax Xvi75V8 | |
| CAT5 RJ45 Ethernet Cable | **GigE Cable**<br>**X-RJ45-Lxx-5E**<br><br>Product Code:<br><br>| Category | x.x | Description |<br>|---|---|---|<br>| | 3.0 | 3.0 m |<br>| | 5.0 | 5.0 m |<br>| | 7.5 | 7.5 m |<br>| | 10.0 | 10.0 m | |

# 6) Software



**Software Development Kit**
**heliSDK4**

- GEN<i>CAM interface
- for integration into client applications
  based on C++, LabVIEW®, Halcon™ or
  Python
- available on Windows and Linux
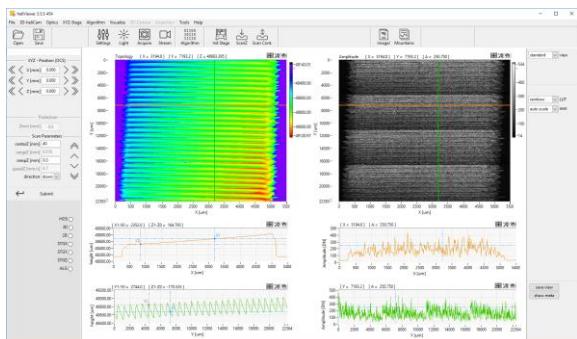


**heliViewer™ 3**
**HX-HV3.8**

Graphical User Interface for interactive
operation
- heliInspect™ 3D-sensors
- supports 3 axes portals (interactive)
- commissioning
- 3D visualization
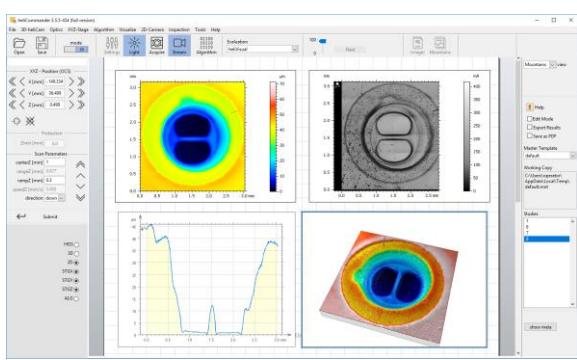


**heliCommander™ 3**
**PX-HC3.8**

Graphical User Interface and application
framework supporting
- heliInspect™ 3D-sensors
- 2D-camera module
- automated operation (recipes)
- 3 axes portals (automated, interactive)
- MountainsMap™ plugin interface
- TCP/IP socket interface
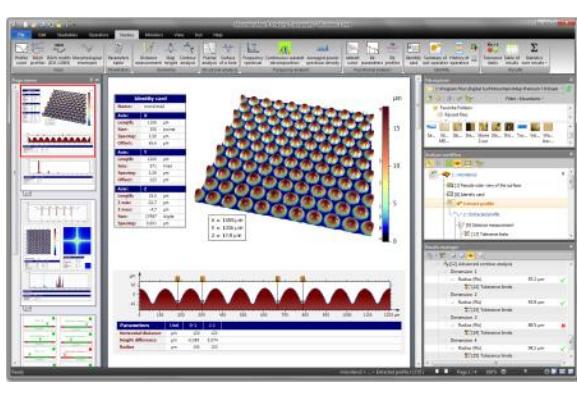


**MountainsMap™**
**Imaging Topography**
**DS-MM-TOPO**

Quantitative analysis of surfaces
- large number of operators, e.g. surface
  parameters ISO 25178 and ISO 4287
- WYSIWYG report editor
- comprehensive report generation

For advanced addons, see
www.digitalsurf.com

# (B) Configuration Sheet

| Function | Configuration | Selection |
|---|---|---|
| 3D-Measurement Head | H9S.0-S40-LR2-X0.5<br>40 92 05 CN | |
| | H9S.0-S40-LR2-X0.8<br>40 92 08 CN | |
| | H9S.0-S40-LR2-X1.0<br>40 92 10 CN | |
| | H9S.0-S40-LR2-X1.5<br>40 92 15 CN | |
| | H9S.0-S40-LR2-X2.0<br>40 92 20 CN | |
| | H9S.0-S40-LR2-X3.0<br>40 92 30 CN | |
| | H9S.0-S40-LB2-X0.5<br>40 93 05 CN | |
| | H9S.0-S40-LB2-X0.8<br>40 93 08 CN | |
| | H9S.0-S40-LB2-X1.0<br>40 93 10 CN | |
| | H9S.0-S40-LB2-X1.5<br>40 93 15 CN | |
| | H9S.0-S40-LB2-X2.0<br>40 93 20 CN | |
| | H9S.0-S40-LB2-X3.0<br>40 93 30 CN | |
| Driver Electronics | D2.1-A2<br>40 80 52 CN | |
| Scanner | J-Lxu40F60-E0.1<br>90 01 11 | |
| | J-Lxu80F60-E0.1<br>90 01 10 | |
| Adapter Plate | AP1.0-H9DT-M01<br>40 99 91 | |
| | AP1.0-H9DT-M02<br>40 99 92 | |
| Spring Weight Compensation | WC1.0-Lxu40-F25<br>90 05 26 | |
| | WC1.0-Lxu80-F25<br>90 05 28 | |
| Axis Controller | J-Xvi-75V8<br>90 01 15 | |
| | J-Xvi-48V6<br>90 01 16 | |

| Function | Configuration | Selection |
|---|---|---|
| Connecting Cable Straight | HI-CC8-L1.5-CF<br>40 80 61 | |
| | HI-CC8-L3.0-CF<br>40 80 63 | |
| | HI-CC8-L5.0-CF<br>40 80 65 | |
| | HI-CC8-L7.5-CF<br>40 80 67 | |
| | HI-CC8-L10.0-CF<br>40 80 69 | |
| | HI-CC8-Lx.x-CF<br>40 80 60 CN | |
| Connecting Cable Elbow | HI-CC8R-L1.5-CF<br>40 81 61CN | |
| | HI-CC8R-L3.0-CF<br>40 81 63 CN | |
| | HI-CC8R-L5.0-CF<br>40 81 65 CN | |
| | HI-CC8R-L7.5-CF<br>40 81 67 CN | |
| | HI-CC8R-L10.0-CF<br>40 81 69 CN | |
| | HI-CC8R-Lx.x-CF<br>40 81 60 CN | |
| GigE Cable Straight | HI-GE8-L1.5-CF<br>40 80 71 | |
| | HI-GE8-L3.0-CF<br>40 80 73 | |
| | HI-GE8-L5.0-CF<br>40 80 75 | |
| | HI-GE8-L7.5-CF<br>40 80 77 | |
| | HI-GE8-L10.0-CF<br>40 80 79 | |
| | HI-GE8-Lx.x-CF<br>40 80 70 CN | |
| GigE Cable Elbow | HI-GE8R-L1.5-CF<br>40 81 71 CN | |
| | HI-GE8R-L3.0-CF<br>40 81 73 CN | |
| | HI-GE8R-L5.0-CF<br>40 81 75 CN | |
| | HI-GE8R-L7.5-CF<br>40 81 77 CN | |
| | HI-GE8R-L10.0-CF<br>40 81 79 CN | |
| | HI-GE8R-Lx.x-CF<br>40 81 70 CN | |

| | | |
|---|---|---|
| Motor Cable | F-LINAX-CCM-L1.5-CF<br>90 01 35 | |
| | F-LINAX CCM-L3.0-CF<br>90 01 36 | |
| | F-LINAX CCM-L5.0-CF<br>90 01 37 | |
| | F-LINAX-CCM-L7.5-CF<br>90 01 38 | |
| | F-LINAX CCM-L10.0-CF<br>90 01 39 | |
| | F-LINAX CCM-x.x-CF<br>90 01 58 | |
| Encoder Cable | F-LINAX-CCE-L1.5-CF<br>90 01 45 | |
| | F-LINAX CCE-L3.0-CF<br>90 01 46 | |
| | F-LINAX CCE-L5.0-CF<br>90 01 47 | |
| | F-LINAX-CCE-L7.5-CF<br>90 01 48 | |
| | F-LINAX CCE-L10.0-CF<br>90 01 51 | |
| | F-LINAX CCE-Lx.x-CF<br>90 01 59 | |
| GigE Cable | X-RJ45-L3-5E<br>90 00 13 | |
| | X-RJ45-L5-5E<br>90 00 15 | |
| | X-RJ45-L7.5-5E<br>90 00 17 | |
| | X-RJ45-L10-5E<br>90 00 19 | |
| Y-Cable | F-Y-CABLE-D-SUB-PH-L0.5<br>90 01 82 | |
| Trigger Cable | HI-TC2-X48-L1.0<br>90 05 03 | |
| | HI-TC2-X75-L1.0<br>90 05 02 | |
| Software | heliViewer 3.8<br>50 90 10 | $X$ (free) |
| | heliCommander 3.8<br>50 90 20 | |
| | heliSDK4<br>50 90 04 | $X$ (free) |
| Mountains Software | DS-MM-TOPO<br>90 04 00 | |