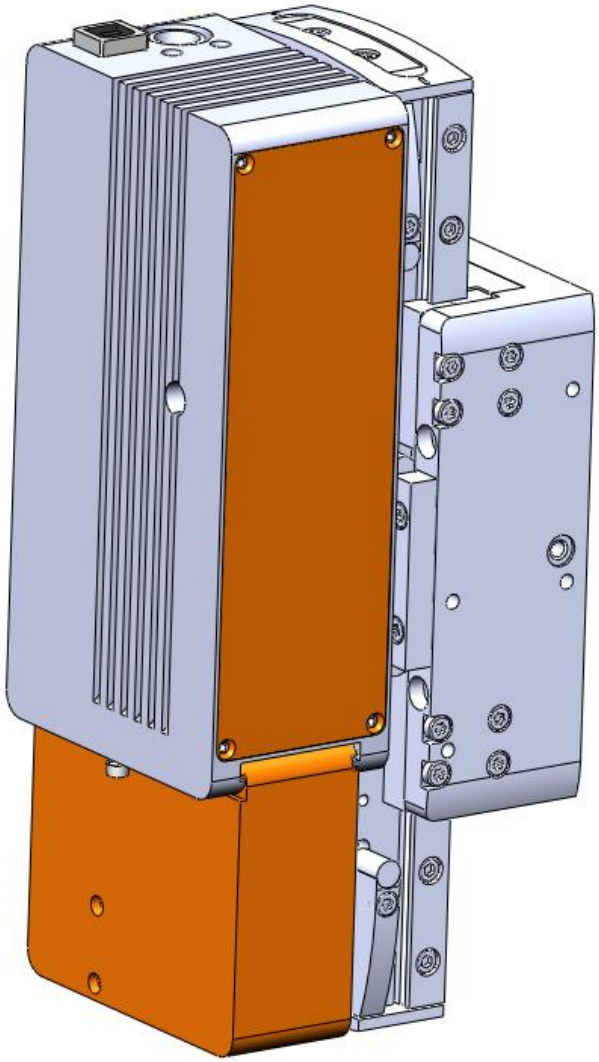
heliotis
advancing 3D metrology

heliInspect™ H6



SYSTEMS GUIDE

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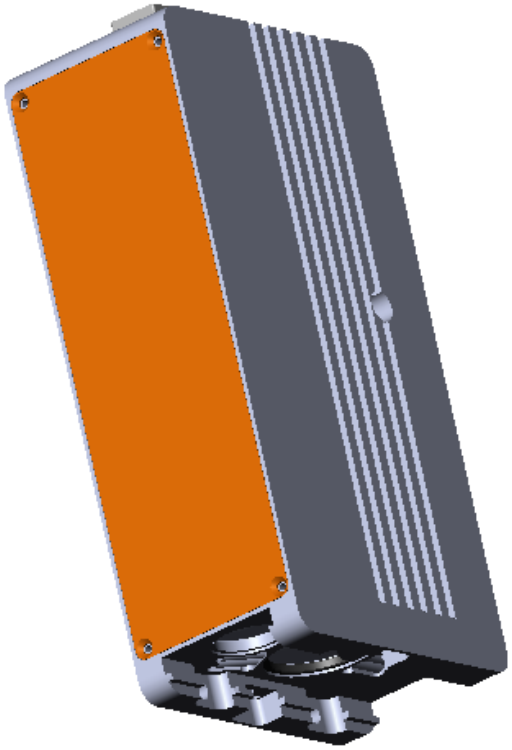
(A) Configuration Options

1) heliInspect™ H6 - 3D-measurement head

The H6 measurement head is the core component from which high resolution 3D-measurement systems can be built. The H6 unit can be complemented with an interferometer module, driver electronics and a scanner axis. Complementary hardware options are described on the following pages.



heliInspect™ H6.2-LED-DO-USB

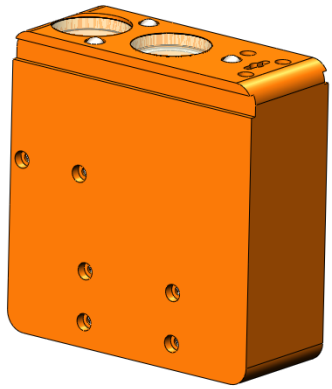
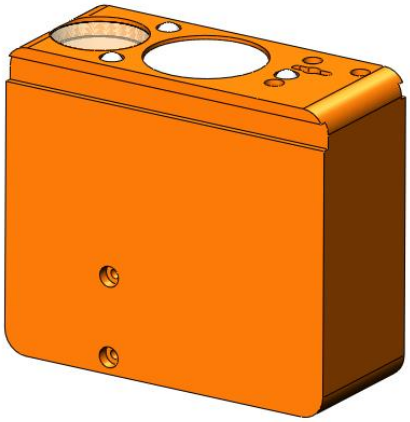
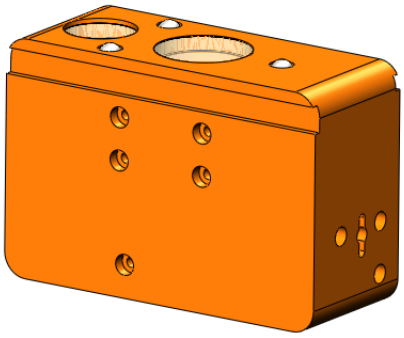
3D-measurement head with integrated

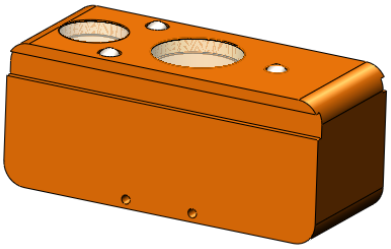
- high-speed 3D-imager heliSens™ S3
- high-speed camera board B3
- power LED with collimation optics
- imaging optics
- precision 3 point WLI adapter

The H6 is compatible with all WLI 6 interferometer modules.

2) heliOptics™ WLI6
White Light Interferometer

The H6 measurement head can be configured with any of the following White Light Interferometer modules. The WLI modules can be changed over by the operator within seconds (precision 3 point adapter).

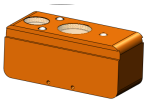
	heliOptics™ WLI6.0-TG-R20 WLI-interferometer module for heliInspect™ H6
	heliOptics™ WLI6.0-TG-R10 WLI-interferometer module for heliInspect™ H6
	heliOptics™ WLI6.0-TG-R05 WLI-interferometer module for heliInspect™ H6



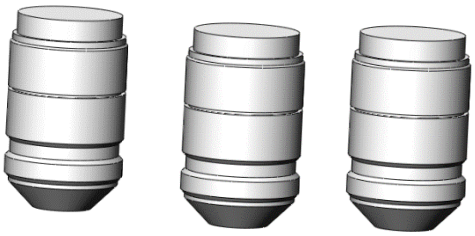
heliOptics™ WLI6.0-MIRAU-Rx

WLI-interferometer module for heliInspect™ H6

NOTE:
This module requires one of the MIRAU objectives below


+ =

10X 20x 50x



Leica Microsystems
LM-MIRAU-X10

Leica Microsystems
LM-MIRAU-X20

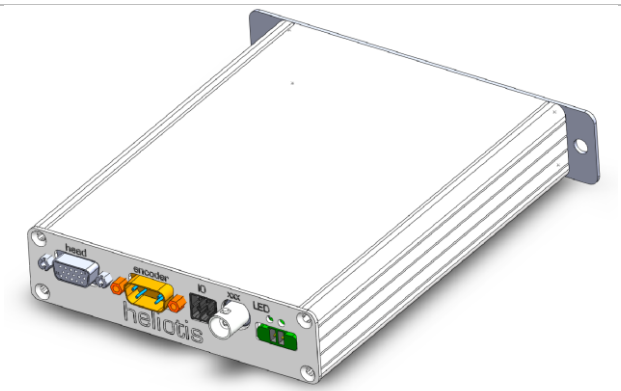
Leica Microsystems
LM-MIRAU-X50

Performance

Interferometer	Mirau 50x	Mirau 20x	Mirau 10x	Michelson 8x	Michelson 4x	Michelson 2x
field of view	232 x 222 µm²	580 x 556 µm²	1.16 x 1.11 mm²	1.47 x 1.41 mm²	2.93 x 2.81 mm²	5.86 x 5.62 mm²
working distance	2.52 mm	3.57 mm	3.57 mm	14.1 mm	55.8 mm	56.6 mm
WLI module	MIRAU-X50	MIRAU-X20	MIRAU-X10	TG-R5	TG-R10	TG-R20
numerical aperture	0.5	0.4	0.3	0.17	0.11	0.07
lateral resolution	0.8 µm	2 µm	4 µm	5 µm	10 µm	20 µm
resolution RMS (phase mode)	50 nm (1 nm)	70 nm (1 nm)	100 nm (1 nm)	100 nm (2 nm)	100 nm (2 nm)	100 nm (2 nm)
repeatability	100 nm (2 nm in phase mode)			100 nm (5 nm in phase mode)		
reflectivity of sample	< 0.1% to 100%					

3) Driver Electronics heliDriver™ D1

The heliDriver™ supplies the H6 measurement head with power and serves to condition signals for trigger and position encoders. It can be configured to adapt to various input voltages and signal levels.



heliDriver™ D1.2.2

features
- voltage controlled power supply for the H6
- current controlled power supply for H6 power LED
- signal conditioning of trigger and AB encoder inputs

Note:
Please contact Heliotis in case of integration with 3rd scanners or motor controllers.

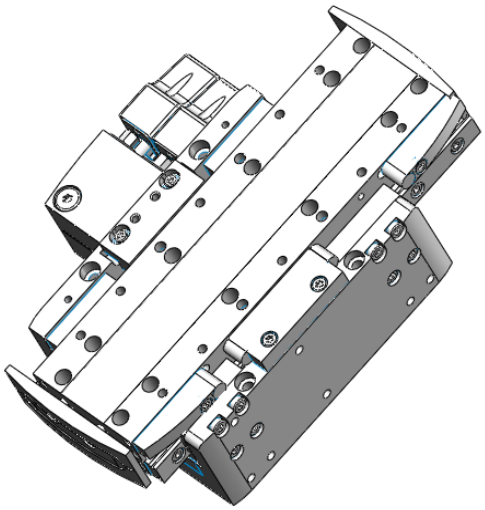
4) Scanner

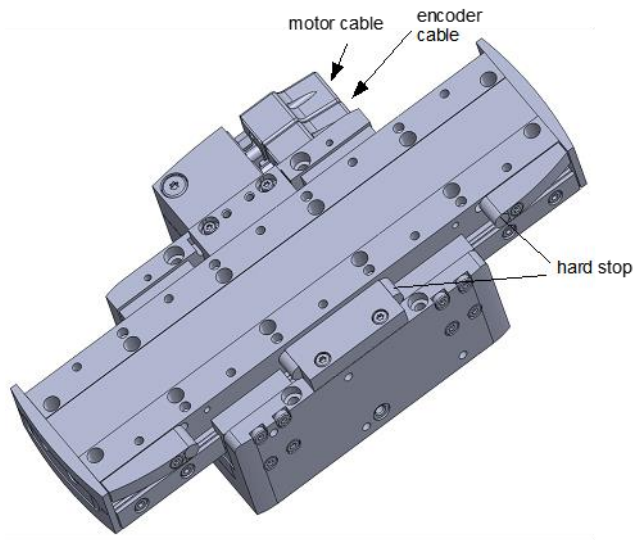
The measurement principle of the heliInspect™ H6 (i.e. scanning white light interferometry) requires a precise axial movement. Heliotis recommends the following precision linear motors with integrated optical encoders. Their long and precise stroke accomplishes positioning and scanning operations in a single unit.

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

- For small height ranges (<500 micrometers) piezo based scanners may result in higher accuracy and shorter measurement times.
- For Mirau type WLI piezo focus units may move the objective only.
- 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.

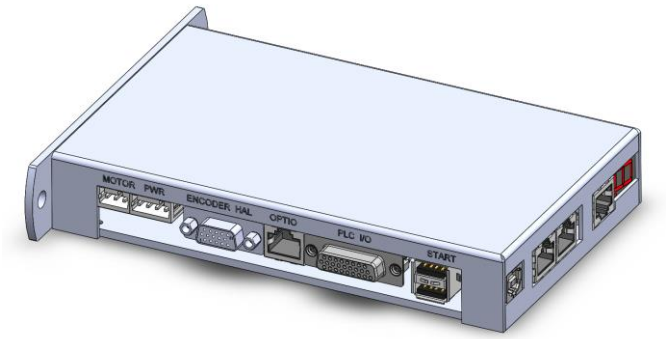
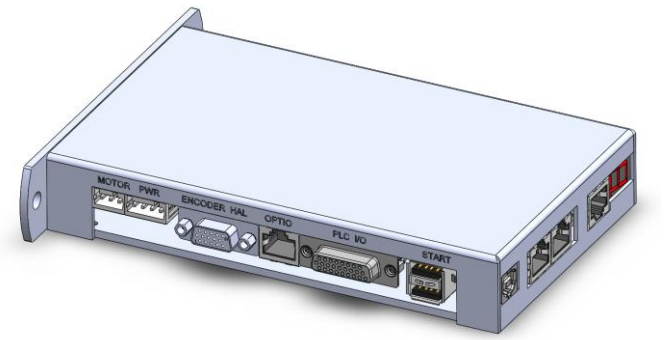
Please contact Heliotis in case alternative scanner stages should be used. Our engineers can recommend scanners and settings.

	J-Lxu40F60-E01 linear motor axis with precise, self-lubrication ball bearing guide, stroke 40 mm, integrated optical measurement system with 100 nm resolution

	J-Lxu80F60-E01 linear motor axis with precise, self-lubrication ball bearing guide, stroke 80 mm, integrated optical measurement system with 100 nm resolution

5) Axis Controller

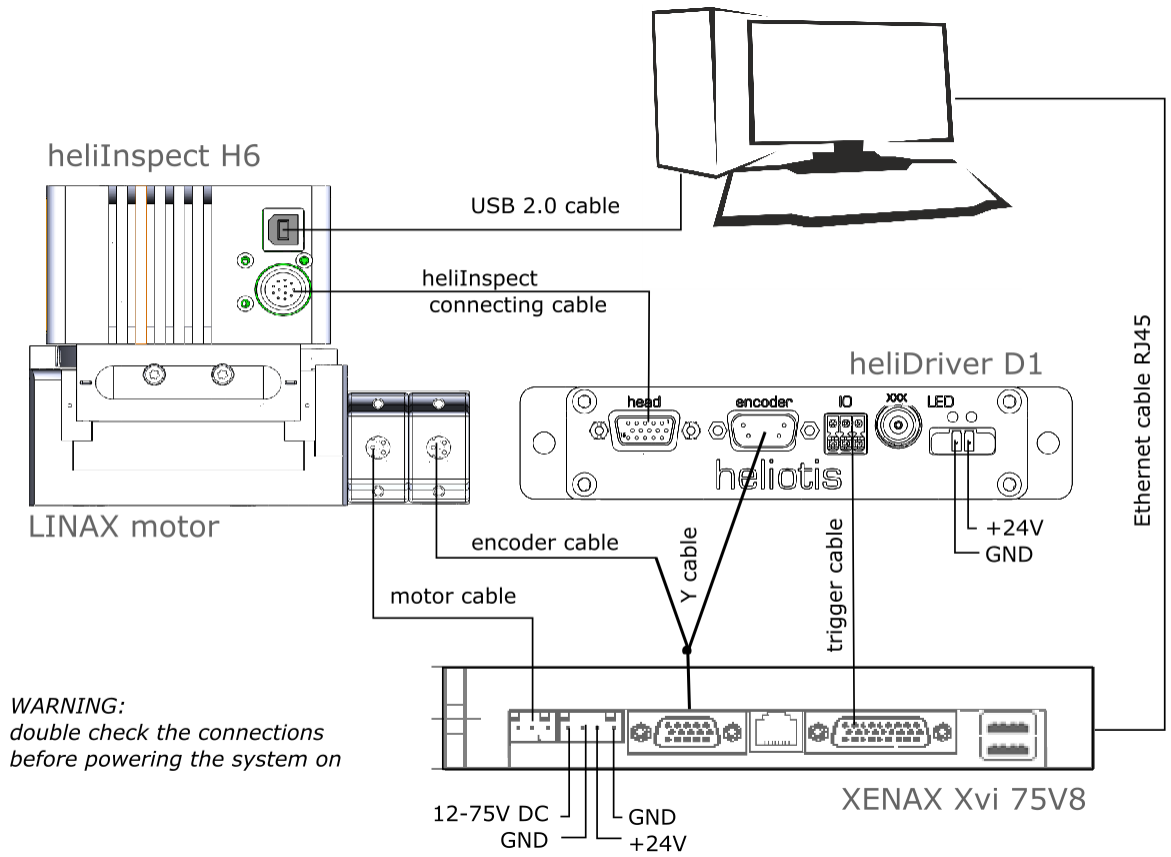
To control the linear motors of the previous section, we recommend the servo controller below. This model is fully supported by the Heliotis' software development kit and software applications.

	JXvi-75V8 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-48V6 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.

6) Cabling

The heliInspect™ system should be wired as shown below. Cables come in standard length of 1.5 m, 3 m and 5 m. Please contact Heliotis in case of different length requirements.

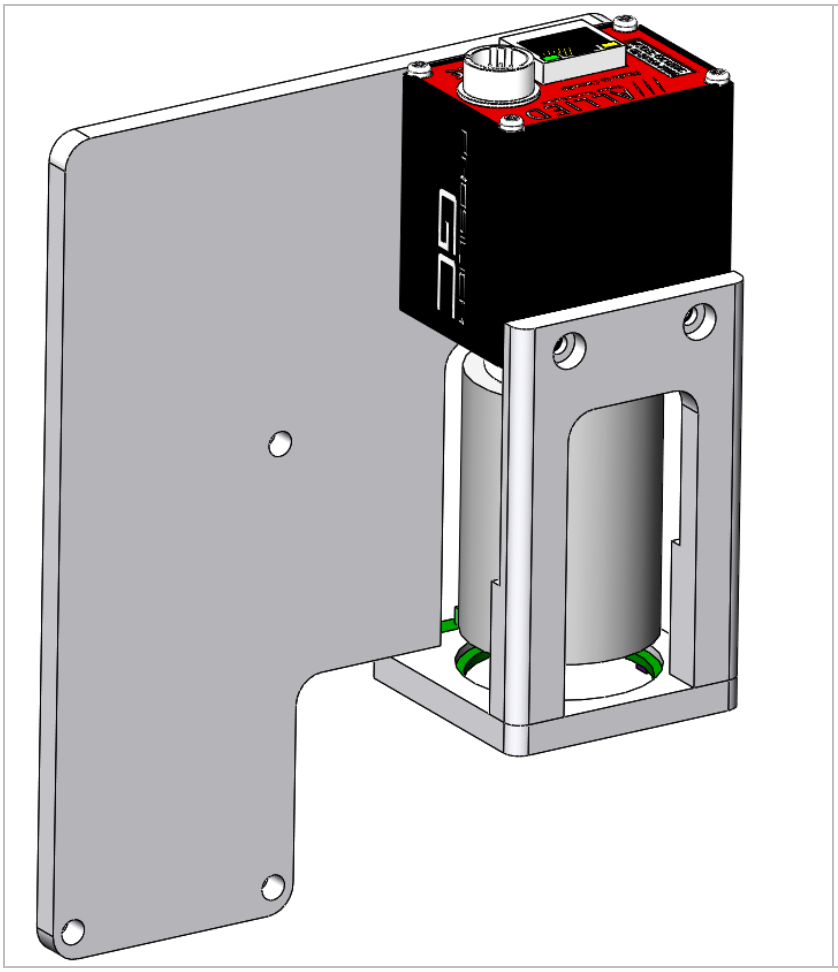
For compatibility with drag chains the 'high-flex' cables should be chosen.
Note that the 'trigger cable' comes with the heliDriver™ D1 by default.



connecting cable heliInspect™ HD D-Sub 15P Male --12x0.14mm2— Hirose HR10-10P-12PA	standard cable HI-CC-L1.5-ST (length 1.5m) HI-CC-L3.0-ST (length 3.0m) HI-CC-L5.0-ST (length 5.0m) chain-flex cable HI-CC-L1.5-CF (length 1.5m) HI-CC-L3.0-CF (length 3.0m) HI-CC-L5.0-CF (length 5.0m)
motor cable D-Sub 9 pole ---3x0.75mm2--- Wago 3.5mm	standard cable F-LINAX-CCM-L1.5-ST (length 1.5m) F-LINAX-CCM-L3.0-ST (length 3.0m) F-LINAX CCM-L5.0-ST (length 5.0m) chain-flex cable F-LINAX-CCM-L1.5-CF (length 1.5m) F-LINAX CCM-L3.0-CF (length 3.0m) F-LINAX CCM-L5.0-CF (length 5.0m)
encoder cable HD D-Sub 15 pole jack ---12x0.14mm2--- HD D-Sub 15 pole pins	standard cable F-LINAX-CCE-L1.5-ST (length 1.5m) F-LINAX CCE-L3.0-ST (length 3.0m) F-LINAX CCE-L5.0-ST (length 5.0m) chain-flex cable F-LINAX-CCE-L1.5-CF (length 1.5m) F-LINAX CCE-L3.0-CF (length 3.0m) F-LINAX CCE-L5.0-CF (length 5.0m)
Y-cable for XENAX encoder 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	F-Y-CABLE-D-SUB-L0.5
USB cable, length = 4.5m high-flexibility (compatible with drag chains)	X-USB-L4.5-CF
GigE cable Length = 5m	X-RJ45-L5-5E

7) 2D-Camera-Module

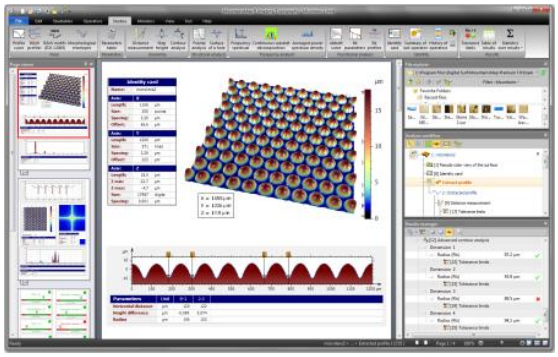
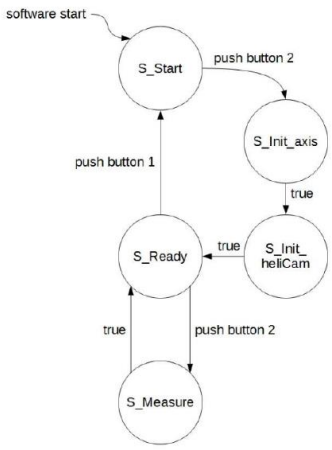
The heliInspect™ H6 can be equipped with a 2D-Camera-Module to aid interactive operation. It consists of an industrial grade GigE camera, a high resolution objective, LED illumination and mounting parts.
The module provides a live view of the sample under test. In conjunction with the application software heliCommander™ the 2D live view can also be used to define the area of interest for 3D measurements and for capturing color images for evaluation and documentation purposes.



PX-2D1.0

- industrial grade GigE camera
- high resolution objective
- LED ring illumination
- set of cables
- mounting bracket

8) Software

	heliCommander™ 3.3 PX-HC3.3 Graphical User Interface and application framework supporting - 3 axis portal - heliInspect™ 3D-sensors - 2D-camera module - interactive operation - automated operation (recipes) - TCP/IP socket interface
	MountainsMap™ Imaging Topography DS-MM-TOPO - comprehensive report generation - large number of operators, e.g. surface parameters ISO 25178 and ISO 4287 - WYSIWYG report editor
	Software Development Kit heliSDK1.6 - for integration into client applications based on C++, LabVIEW®, Halcon™ or Python - available on Windows and Linux - free of charge

(B) Configuration Sheet

Function	Configuration	Selection
3D-measurement head	H6.2-LED-DO-USB 40 04 60	x
WLI-interferometer (select at least one)	WLI6.0-TG-R20 60 06 20	
	WLI6.0-TG-R10 60 06 10	
	WLI6.0-TG-R5 60 06 05	
	WLI6.0-MIRAU-Rx 60 06 00	
	LM-MIRAU-X10 90 02 10	
	LM-MIRAU-X20 90 02 20	
	LM-MIRAU-X50 90 02 50	
Driver electronics	D1.2.2 40 00 01	x
Scanner	J-Lxu40F60-E0.1 90 01 11	
	J-Lxu80F60-E0.1 90 01 10	
Axis controller	J-Xvi-75V8 90 01 15	
	J-Xvi-48V6 90 01 16	
Connecting cable	HI-CC-L1.5-ST 40 03 65	
	HI-CC-L3.0-ST 40 03 66	
	HI-CC-L5.0-ST 40 03 67	
	HI-CC-L1.5-CF 40 03 60	
	HI-CC-L3.0-CF 40 03 61	
	HI-CC-L5.0-CF 40 03 62	
Motor cable	F-LINAX-CCM-L1.5-ST 90 01 30	
	F-LINAX-CCM-L3.0-ST 90 01 31	
	F-LINAX CCM-L5.0-ST 90 01 32	
	F-LINAX-CCM-L1.5-CF 90 01 35	
	F-LINAX CCM-L3.0-CF 90 01 36	
	F-LINAX CCM-L5.0-CF 90 01 37	

Encoder cable	F-LINAX-CCE-L1.5-ST 90 01 40	
	F-LINAX CCE-L3.0-ST 90 01 41	
	F-LINAX CCE-L5.0-ST 90 01 42	
	F-LINAX-CCE-L1.5-CF 90 01 45	
	F-LINAX CCE-L3.0-CF 90 01 46	
	F-LINAX CCE-L5.0-CF 90 01 47	
Y-cable	F-Y-CABLE-D-SUB-LO.5 90 01 50	
USB cable	X-USB-L4.5-CF 90 00 00	
GigE cable	X-RJ45-L5-5E 90 00 10	
2D-camera module (optional)	PX-2D1.0 50 80 20	
Software	heliCommander3.3 50 90 20	
	heliViewer3.2 50 90 10	X (free)
	heliSDK1.6 50 90 00	X (free)
	DS-MM-TOPO 90 04 00	