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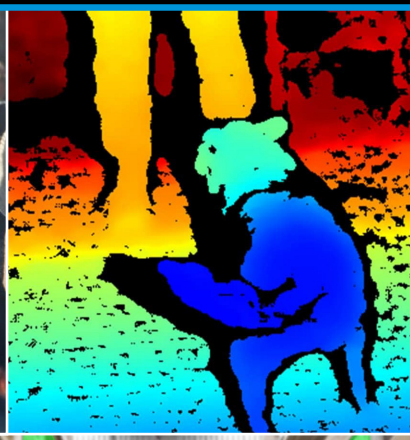
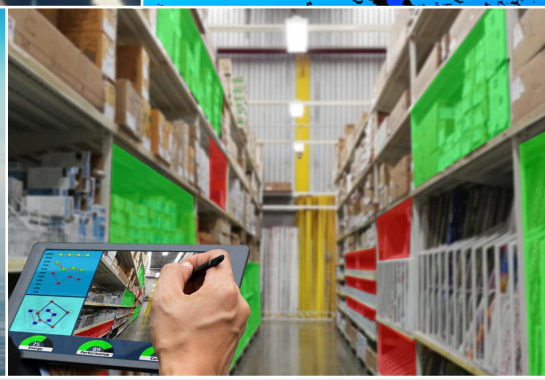
ELECTRONICS WORLDWIDE





Intel® RealSense™ Stereo Depth

Intel® RealSense™ Product Overview

V3.0

intel.
REALSENSE™

Intel® RealSense™ Stereo Depth Technology

Bringing 3D vision to devices and machines that only see 2D today

Stereo Depth Cameras enable devices to see, understand, interact with, and learn from their environment. The onboard Intel® RealSense™ Vision Processor D4 performs all the depth calculations on the camera, allowing for low power, platform agnostic devices. Stereo image sensing technologies work both indoors and outdoors in a wide variety of lighting conditions and can also be used in multiple camera configurations without the need for custom calibration.

Experience the world in 3D with the Intel® RealSense™ products, available from stock at Rutronik. Based on Stereo image sensing technology, the Intel® RealSense™ Cameras provide a solution for a wide range of different applications. Supported by Intel's open-source SDKs, it's fast and easy to build your future vision solution.

Industry-leading depth-sensing technology

Why Intel® RealSense™ Technology?

- Wide range of stereo-based products to align to your specific needs
- On-board vision processor for calculation of depth
- High quality, competitively priced depth cameras
- Designed into hundreds of robotics products worldwide

15+ years developing and selling vision processing technology

3M+ units shipped and designed into working solutions

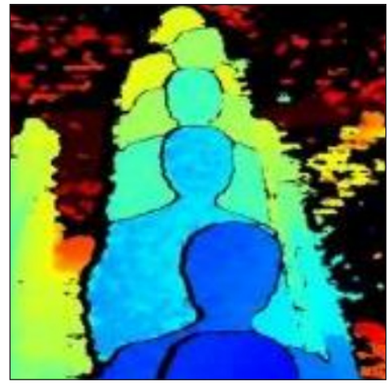
Advantages of 3D and Depth Data

3D depth cameras provide information that 2D cameras are unable to deliver without extensive AI and modeling support. Depth cameras provide real-time depth and RGB information about every point or pixel. This provides a device with human-like vision, enabling movement or scene understanding in any environment.

Depth data communicates distance. This enables:

- Collision avoidance for robots and drones
- Multiple cameras increase accuracy without interference
- Better inference from more data, resulting in improved machine learning
- Reduced compute and time requirements with on board vision processor
- IMU synchronized with depth and wide FOV for VSLAM

This 2D Color image is showing an optical illusion.



The depth Image shows individual objects and their position. Faux color represents range to object (red=far, blue=near)

Discover endless possibilities of cutting edge Intel® RealSense™ technology. Adding computer vision to your project, whatever it is, will elevate it to the next level. Here are some application examples accelerated by Intel® RealSense™ solutions.

Robotics & AMRs | **3D Scanning** | **Recognition & Interaction** | **Facial Authentication** | **Measurement & Logistics**

Depth Cameras

Intel® RealSense™ D400 Series

Designed for easy setup and portability, Intel® RealSense™ D400 series cameras feature high depth resolution and include active infrared (IR) stereo with standard or wide field of view.

Type	D405	D415	D435 / D435i / D435f / D435if	D455 / D457 / D455f / D456
				
Typical Use Cases	Pick & Place Defect Detection	Collision avoidance / Recognition and Interaction / Scanning		
Value	Shortest Range	Mid-Range Value	Mid-Range WFOV/Flexibility (IMU or IR Pass Filter optional)	Longest Range / Matched Depth & RGB FOV
Ideal Range	7 cm to 50 cm	0.5 m to 3 m	0.3 m to 3 m	0.6 m to 6 m
Depth Accuracy[2]	1.4 % at 20 cm	2 % at 2 m		2 % at 4 m
Min Z @Max Resolution	Sub-mm @7 cm	Min Z ~45 cm	Min Z ~28 cm	Min Z ~52 cm
Depth Technology	Stereoscopic	Active IR Stereo	Active IR Stereo	Active IR Stereo
Max Depth Resolution	1280x720 @ 30fps 640x360 @ 90fps	1280x720 @ 30fps / 840x480 @90fps		
Depth FOV[1] HD / Shutter	87° x 58° / Global	65° x 40° / Rolling	87° x 58° / Global	
RGB FOV[1] / Shutter	1MP 87° x 58° Global via Left Depth Imager	2MP 69° x 42° Rolling	2MP 69° x 42° Rolling	1MP 90° x 65° Global
Dimensions (WxHxD mm)	42 x 42 x 22	99 x 23 x 20	90 x 25 x 25 / 90 x 25 x 25 / 90 x 25 x 26 / 90 x 25 x 26	124 x 29 x 26 / 124 x 29 x 36 / 124 x 29 x 27 / 124 x 29 x 26
Main Components	D401 Depth Module D4 Vision Processor V4	D415 Depth Module D4 Vision Processor	D430 Depth Module D4 Vision Processor	D450 Depth Module D4 Vision Processor V3/V5
IMU	No	No	Optional (D435i & D435if)	Yes
Depth Filter	IR Cut	No	IR Pass (D435f & D435if)	IR Pass (D455f)
IP rate	No	No	No	IP65 (D456 & D457)
Connectors	USB3 Micro-B	USB-C 3.1 Gen 1		USB-C 3.1 Gen 1 / GMSL FAKRA
Use Environment	Indoor / Outdoor			

1) measured +/-3° of stated value 2) measured as out of the factory

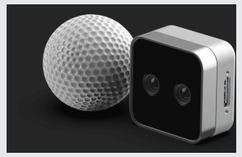
D405

Short-range stereo depth

D405 is a short-range stereo camera with sub-millimeter detection accuracy for close-range computer vision needs.

Key features:

- Passive stereo
- Global shutter
- 87° x 58° FOV (HxV)
- Min Z: 7 cm



D405 (Bulk)
82635DSD405MP

D405 (Retail)
82635DSD405

D415

Cost-efficient stereo depth

D415 offers high-value precision and accuracy across a multitude of use cases at low cost.

Key features:

- Active stereo
- Rolling shutter
- 65° x 40° FOV (HxV)

D415 (Bulk)
82635ASRCDVKMP

D415 (Retail)
82635ASRCDVKHV

Retail: Package contains camera, USB cable and Tripod | **Bulk:** Package contains only the camera

D435, D435i and D455

Broadest vision + optional IMU

D435 features a wide FOV for high-speed depth applications and refined depth awareness in situations where the camera is moving. An inertial measurement unit (IMU) provides position information along with depth data. D455 improves this design with several enhancements.

Key features:

- Active stereo
- Global shutter
- 87° x 58° FOV (HxV)
- Integrated IMU (D435i & D455)
- 2% at 4 m Z-Error (D455)

D435

D435 (Bulk)
82635AWGDVKPM

D435 (Retail)
82635AWGDVKPR

D435i (Bulk)
82635D435IDKMP

D435i (Retail)
82635D435IDK5P

D455 (Bulk)
82635DSD455MP

D455 (Retail)
82635DSD455

D435f, D435if and D455f

IR Pass Vision + optional IMU

An IR pass filter over the depth lenses increases the relative strength of the textured IR projector pattern, improving depth noise quality and performance range. D455f is ideal for use cases such as fast-moving robotics or drones where reflective light or transparency can be a problem.

Key features:

- Active stereo
- Global shutter
- 87° x 58° FOV (HxV)
- Integrated IMU (D435if & D455f)
- 2% at 4 m Z-Error (D455f)
- IR Pass Filter

D455f

D435f (Bulk)
82635D435FDKMP

D435f (Retail)
82635D435FDK

D435if (Bulk)
82635D435IFMP

D435if (Retail)
82635D435IF

D455f (Bulk)
82635DSD455FMP

D455f (Retail)
82635DSD455F

D456

IP65 rated long range depth camera

D456 is Intel's longest-range widest field of view global shutter camera with IP65 enclosure and USB interface.

Key features:

- Active stereo
- Global shutter depth and RGB
- 87° x 58° FOV (HxV)
- Integrated IMU
- USB interface
- IP65 enclosure

D456 (Bulk)
82635DSD456MP

D456 (Retail)
82635DSD456

D457

High bandwidth with GMSL/FAKRA interface

D457 is ideal for applications that require large amounts of data to be transmitted, especially over long distances. The stereo depth camera also has an IP65 grade enclosure.

Key features:

- Active stereo
- Global shutter w/ IMU
- 87° x 58° FOV (HxV)
- GMSL/FAKRA interface
- Supports 15 m cable length
- IP65 enclosure

D457 (Bulk)
82635DSD457MP

D457 (Retail)
82635DSD457

Retail: Package contains camera, USB cable and Tripod | **Bulk:** Package contains only the camera

Depth Modules & Processors

Intel® RealSense™ D400 Series

For the integration of Intel® RealSense™ technology into higher volume products, depth modules can offer the best compromise between price and flexibility. Multiple different configurations are offered to better suit your needs and product requirements. Designed for easy system integration, all modules feature an imaging sub-system with stereo sensors. When paired with an Intel® RealSense™ Vision Processor, depth data can be output via USB to any platform.

Type	D401	D415	D430	D450
				
Use Environment	Indoor/Outdoor			
Image Sensor Technwology	Global Shutter			
Depth FOV (H x V)	84° x 58°	65° × 40°	87° × 58°	87° × 58°
Depth Resolution	1280x720			
Depth Frame Rate	Up to 90 fps			
RGB Sensor Technology	Global Shutter	- / Rolling Shutter	–	Global Shutter
RGB Frame Rate & Resol.	1280 x 720 at 30 fps	1920 × 1080 at 30 fps	–	1280 × 800 at 30 fps
Interface	50-pin Board to Board Connector			
Dimensions (L x D x H)	42 x 42 x 23 mm	99 x 20 x 23 mm	90 x 25 x 25 mm	124 x 26 x 29 mm

Also available: Phased-out Depth Module D410

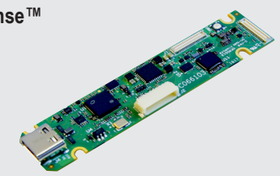
Ordering Information

Intel® RealSense™ Depth Modules

D401 (Bulk)	D415 (Bulk)	D430 (Bulk)	D450 (Bulk)
82635DSD401	82635DSASRCPRQ	82635DSAWGPRQ	82635DSD450

Recommended Accessories

D415 & D430 - Intel® RealSense™ Vision Processor D4 Board
82635DSASMDLPRQ



D450 - Intel® RealSense™ Vision Proc. D4 Board V3
82635DSASICBDIF

D450 - Intel® RealSense™ Vision Processor D4 Board V5 (GMSL/FAKRA)
82635DSD457ASIC

Intel® RealSense™ D400 Interposer Rigid
82635DSITR50P

D405 - Intel® RealSense™ Vision Processor D4 Board V4
82635DSASICBDV4

Intel RealSense SDK 2.0

- Intel® OpenVINO™ integration
- Fast and easy data integration tool
- Open Source cross platform library

More information
www.intelrealsense.com/sdk-2

intel. REALSENSE™ with OpenVINO™

Operating Systems
- Windows
- Linux
- mac OS
- Android

Programming Languages
- Python
- C/C++
- C#/.NET
- Node.js

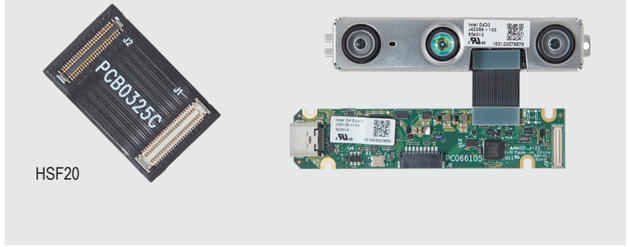
Frameworks and Wrappers
- ROS
- OpenNI
- PCL
- LabVIEW
- OpenCV
- MATLAB
- UnrealEngine4
- Unity

High Speed Flexi Cables for Intel® RealSense™

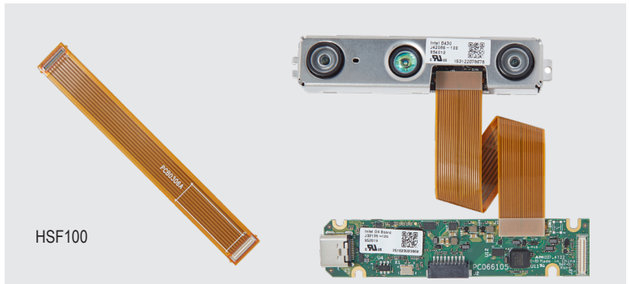
Cocom® High Speed Flexi (HSF) Cables

Rutronik offers Cocom® High Speed Flexi (HSF) Cables for Intel® D4xx Series Stereo Vision products. HSF cables are used to connect RealSense Depth Modules to the Vision Processor Boards. The wide variety of Cocom's HSF cable portfolio enables easy and flexible system integration of Intel® RealSense D4xx Series products, according to your specific product requirements. Datasheets and 3D step files for further information are linked in the table below.

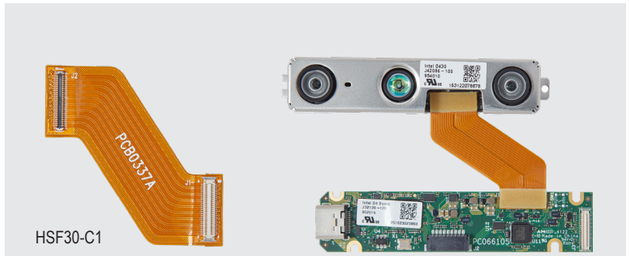
Description	Number	Datasheet	3D Step file
HSF20	PCB0325C	Link	Link
HSF50	PCB0305A	Link	Link
HSF88	PCB0265A	Link	Link
HSF100	PCB0306A	Link	Link
HSF150	PCB0307A	Link	Link
HSF200	PCB0308A	Link	Link
HSF25-C1	PCB0361A	Link	n/a
HSF30-C1	PCB0337A	Link	Link
HSF50-C2	PCB0332B	Link	Link
HSF55-C1	PCB0324A	Link	Link
HSF60-C1	PCB0384A	Link	Link
HSF125-CJ1	PCB0358A	Link	Link



HSF20



HSF100



HSF30-C1

Custom shapes, sizes available on request. Designed and made in UK. Signal descriptions and information available in the Intel RealSense datasheets.

Specifications subject to change without notice | Please note, there could be some limitations for some franchised product lines in several countries | For more information, please contact our sales team

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