

OS0

Ultra-Wide View High-Resolution Imaging Lidar

FIRMWARE VERSION: 3.1.x

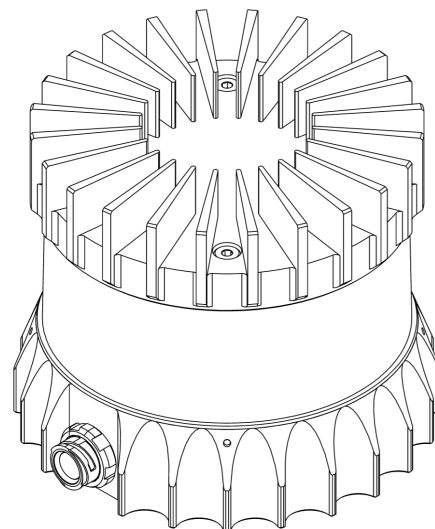
HARDWARE VERSION: REV7.0

SUMMARY

The short range OS0 delivers 35 m range on a dark 10% target and an ultra-wide 90.8° vertical field-of-view delivering an industry-leading combination of price, performance, reliability, size, weight, and power. The OS0 is designed for all-weather environments and due to its small size, can be easily integrated into autonomous vehicles, heavy machinery, robots, drones, and mapping solutions.

HIGHLIGHTS

- Configurable Minimum Range and Return Ordering
- Low Data Rate Profile now available with Dual Returns
- Camera-grade near-infrared and signal data
- Multi-sensor crosstalk suppression
- Ouster Studio for pointcloud evaluation
- Ouster SDK, ROS, and C++ drivers for SW development



OPTICAL PERFORMANCE

Range (80% Lambertian reflectivity, 1024 @ 10 Hz mode)	75 m @ 100 klx sunlight, >90% detection probability
Range (10% Lambertian reflectivity, 1024 @ 10 Hz mode)	35 m @ 100 klx sunlight, >90% detection probability
Minimum Range	0.0 m (0.3 m optional, and 0.5 m default)
Vertical Resolution	32, 64, or 128 channels
Horizontal Resolution	512, 1024, or 2048 (configurable)
Rotation Rate	10 or 20 Hz (configurable)
Field of View	Vertical: 90.8° ± 1.0° (+45.4° to -45.4°) Horizontal: 360°
Angular Sampling Accuracy	Vertical: ±0.01° / Horizontal: ±0.01°
False Positive Rate	1/10,000
Range Resolution	0.1 cm Note: For <i>Low Data Rate Profile</i> the Range Resolution = 0.8 cm
# of Returns	up to 2
Return Order	Strongest to Weakest, Farthest to Nearest, and Nearest to Farthest

<p>Range Precision (Typical on Lambertian and Retroreflective targets beyond 1 m, 1024 @ 10 Hz mode, 1 standard deviation)</p> <p>Note: Precision is calculated based on the standard deviation of 100 measurements on a static target at a given range</p>	<p>Min: ±0.8 cm, Max: ±4 cm</p> <table><caption>Standard deviation (cm) vs Target distance (m)</caption><thead><tr><th>Target distance (m)</th><th>10% (dotted)</th><th>90% (dashed)</th><th>Retro (solid)</th></tr></thead><tbody><tr><td>0</td><td>0.8</td><td>0.8</td><td>2.0</td></tr><tr><td>5</td><td>0.8</td><td>0.8</td><td>2.0</td></tr><tr><td>10</td><td>0.9</td><td>0.8</td><td>2.0</td></tr><tr><td>15</td><td>1.2</td><td>0.8</td><td>2.0</td></tr><tr><td>20</td><td>1.6</td><td>0.8</td><td>2.0</td></tr><tr><td>25</td><td>2.2</td><td>0.9</td><td>2.0</td></tr><tr><td>30</td><td>3.0</td><td>1.0</td><td>2.0</td></tr><tr><td>35</td><td>4.0</td><td>1.1</td><td>2.0</td></tr></tbody></table>	Target distance (m)	10% (dotted)	90% (dashed)	Retro (solid)	0	0.8	0.8	2.0	5	0.8	0.8	2.0	10	0.9	0.8	2.0	15	1.2	0.8	2.0	20	1.6	0.8	2.0	25	2.2	0.9	2.0	30	3.0	1.0	2.0	35	4.0	1.1	2.0
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<p>Range Accuracy (Typical on Lambertian and Retroreflective targets beyond 1 m, 1024 @ 10 Hz mode)</p> <p>Note: Accuracy is calculated based on the error between the mean of 100 measurements on a static target at a given range and the true range</p>	<p>±2.5 cm for lambertian targets, ±5 cm for retroreflective targets</p> <table><caption>Mean Range Error (cm) vs Target distance (m)</caption><thead><tr><th>Target distance (m)</th><th>Lambertian (0.1 to 100% reflectivity) (dotted)</th><th>Retroreflector (solid)</th></tr></thead><tbody><tr><td>0</td><td>2.5</td><td>5.0</td></tr><tr><td>5</td><td>2.5</td><td>5.0</td></tr><tr><td>10</td><td>2.5</td><td>5.0</td></tr><tr><td>15</td><td>2.5</td><td>5.0</td></tr><tr><td>20</td><td>2.5</td><td>5.0</td></tr><tr><td>25</td><td>2.5</td><td>5.0</td></tr><tr><td>30</td><td>2.5</td><td>5.0</td></tr><tr><td>35</td><td>2.5</td><td>5.0</td></tr></tbody></table>	Target distance (m)	Lambertian (0.1 to 100% reflectivity) (dotted)	Retroreflector (solid)	0	2.5	5.0	5	2.5	5.0	10	2.5	5.0	15	2.5	5.0	20	2.5	5.0	25	2.5	5.0	30	2.5	5.0	35	2.5	5.0									
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LASER

Laser Product Class	Class 1 eye-safe per IEC/EN 60825-1: 2014
Laser Wavelength	865 nm
Beam Diameter Exiting Sensor	5 mm
Beam Divergence	0.35° (FWHM)

LIDAR OUTPUT

Connection	UDP over gigabit Ethernet
Points Per Second	1,310,720 (32 channel) 2,621,440 (64 channel) 5,242,880 (128 channel)
Data Rate (megabits per second) (Low Data Rate Profile, 1 return, 1024 @ 10 Hz mode)	up to 11.83 Mbps (32 channel) up to 22.32 Mbps (64 channel) up to 43.29 Mbps (128 channel)
Data Rate (megabits per second) (Low Data Rate Profile, 2 returns, 1024 @ 10 Hz mode)	up to 22.32 Mbps (32 channel) up to 43.29 Mbps (64 channel) up to 85.24 Mbps (128 channel)

Data Rate (megabits per second) (Single Return Profile, 1024 @ 10 Hz mode)	up to 32.81 Mbps (32 channel) up to 64.26 Mbps (64 channel) up to 127.18 Mbps (128 channel)
Data Rate (megabits per second) (Dual Return Profile, 1024 @ 10 Hz mode)	up to 43.29 Mbps (32 channel) up to 85.24 Mbps (64 channel) up to 169.12 Mbps (128 channel)
Data Per Point	Range, Signal, Reflectivity, Near-infrared, Channel, Azimuth angle, and Timestamp
Timestamp Resolution	< 1 μ s
Data Latency	< 10 ms
Data Integrity	End to End CRC that covers entire data packet

IMU OUTPUT

Connection	UDP over 1000Base-T or 1000Base-T1
Samples Per Second	100
Data Per Sample	3 axis gyro, 3 axis accelerometer
Timestamp Resolution	< 1 μ s
Data Latency	< 10 ms
Additional Details	InvenSense IAM-20680HT; datasheet for more details: https://invensense.tdk.com/download-pdf/iam-20680ht-datasheet/

CONTROL INTERFACE




Connection	HTTP API	
Time Synchronization	Input sources: <ul style="list-style-type: none"> • IEEE1588 Precision Time Protocol (PTP); Accuracy: <1 ms error • gPTP; Accuracy: <1 ms error • NMEA \$GPRMC UART message support • External PPS; Accuracy: <1 ms error • Internal 10 ppm drift clock; Accuracy: <20 ppm error Output sources: <ul style="list-style-type: none"> • Configurable 1 - 60 Hz output pulse 	
Lidar Operating Modes	<ul style="list-style-type: none"> • x 512 @ 10 Hz or 20 Hz • x 1024 @ 10 Hz or 20 Hz • x 2048 @ 10 Hz 	
Additional Programmability	<ul style="list-style-type: none"> • Multi-sensor phase lock • Queryable intrinsic calibration information: <ul style="list-style-type: none"> • Beam angles • IMU pose correction matrix 	<ul style="list-style-type: none"> • Return ordering • Minimum range • Azimuth masking • Low-power standby mode

MECHANICAL/ELECTRICAL

Power Consumption	14 - 20 W <ul style="list-style-type: none"> • 16 W nominal • 28 W peak at startup if operating at -40 °C Note: Ouster recommends use of a power supply of no less than 30 W if using in cold conditions
Connector	Standard 1000BASE-T or Automotive Standard 1000BASE-T1
Operating Voltage	9.5 V - 51 V <ul style="list-style-type: none"> • Suitable for 12 VDC to 24 VDC nominal systems • Not suitable for 48 V nominal battery based systems • Under-voltage WARNING level alert occurs at 9.5 VDC at the connector • Under-voltage ERROR level alert occurs at 9.0 VDC at the connector • Below 9.0 VDC at connector, sensor may shutdown • Over-voltage conditions/alarms occur at 51 VDC at the connector • Over-voltage lockout onset at 58 VDC (± 1 V) at the connector • Over-voltage lockout release at 55 VDC (± 1 V) at the connector

Dimensions	Diameter: 87 mm (3.42 in) Height: <ul style="list-style-type: none"> • Without cap: 58.35 mm (2.3 in) • With thermal cap: 74.2 mm (2.9 in)
Weight	Without cap: 430 g (15.2 oz) With radial cap: 502 g (17.7 oz) With halo cap: 522 g (18.4 oz)
Mounting	Bottom: 4x M3 screws, 2x locating 2 mm pin holes Top: 4x M3 screws, 4x locating 2 mm pin holes, 1x M6 screw

OPERATIONAL

Operating Temperature	-40 °C to +60 °C (with mount) Between +53 °C and +60 °C, sensor automatically reduces range (max 20% range reduction)
Storage Temperature	-40 °C to +85 °C
Ingress Protection	IP68 (1 m submersion for 1 hour, with I/O cable attached) IP69K (with I/O cable attached)
MTTF	>250,000 hours
Shock	IEC 60068-2-27 (Amplitude: 100 g, Shape: 11 ms half-sine, 3 shocks x 6 directions)
Vibration	IEC 60068-2-64 (Amplitude: 3 G-rms, Shape: 10 - 1000 Hz, Mounting: sprung masses, 3 axes w/ 8 hr duration each)
Compliance Note: Ouster UK (Ltd): 125 Princes Street, Edinburgh EH2 4AD, Scotland, United Kingdom Contact: Neil Calder, Phone Number: +44(0).131.563.9078	<p>For US</p> <p>Laser Safety:</p> <ul style="list-style-type: none"> • IEC 60825-1:2014 • FDA US 21CFR1040 Notice 56 Class 1 <p>Product Safety:</p> <ul style="list-style-type: none"> • UL 62368-1 • UL 60950-22 (outdoor use) • CSA-C22.2 No. 62368-1-19 • CSA-C22.2 No. 60950-22-07 (outdoor use) <p>EMC: FCC 47CFR Part 15, Subpart B, Class A</p> <p>For EU</p> <p>Laser Safety:</p> <p>EN 60825-1:2014/A11:2021</p> <p>Product Safety:</p> <p>EN/IEC 62368-1</p> <p>EMC:</p> <ul style="list-style-type: none"> • EN 55032:2012/AC 2013; CISPR 32:2015 • EN 55035:2017/A11:2020 • EN 61000-3-2:2014 • EN 61000-3-3:2013 <p>For Korea</p> <ul style="list-style-type: none"> • KS C 9832:2023 • KS C 9835:2019 <p>For Australia</p> <p>AS/NZS CISPR 32: 2015</p> <div>    </div>

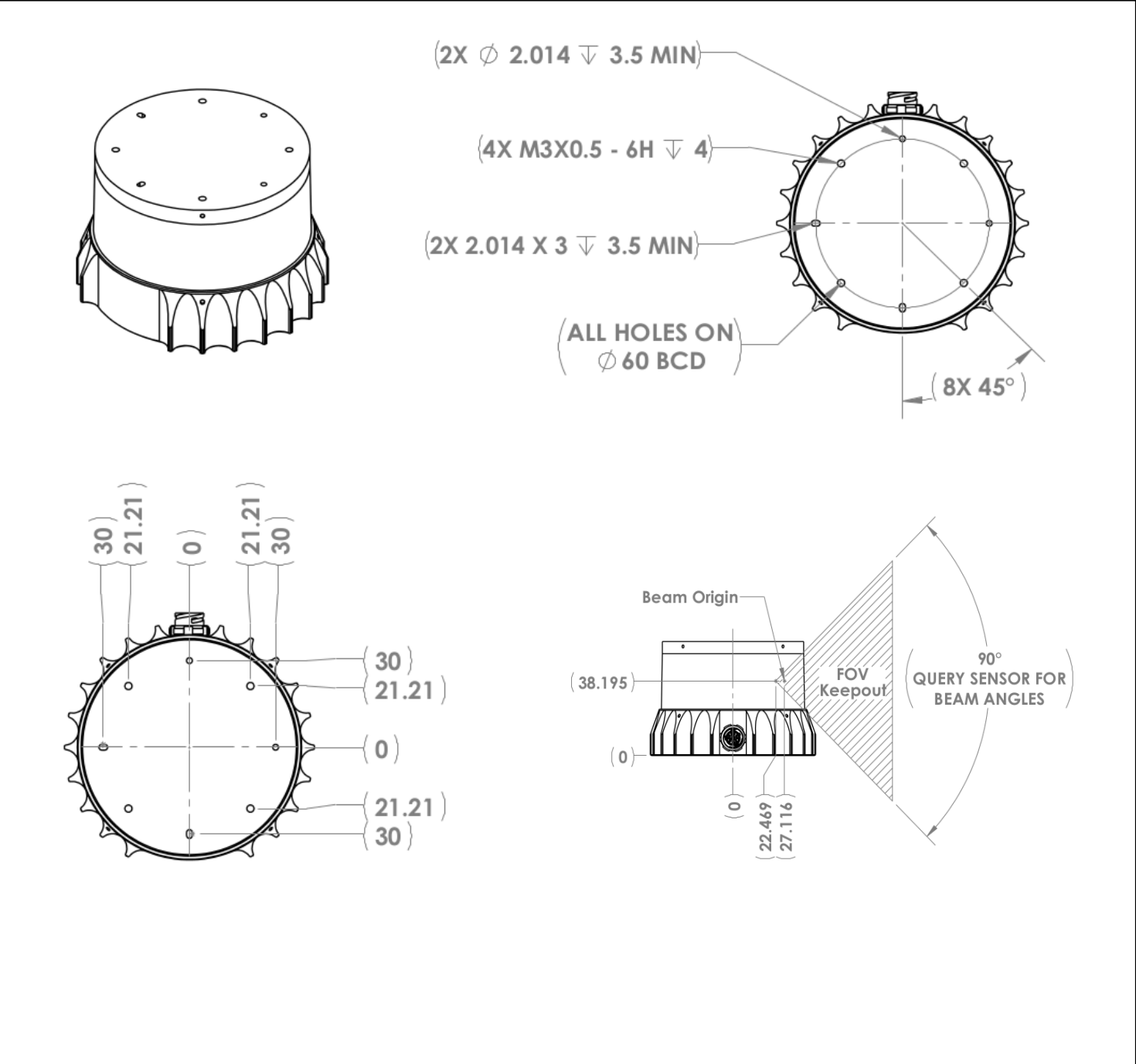
ACCESSORIES

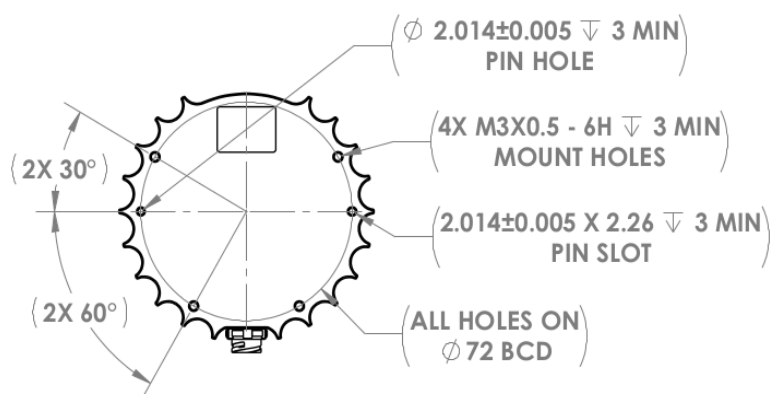
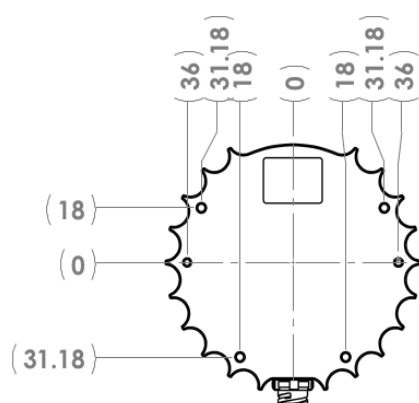
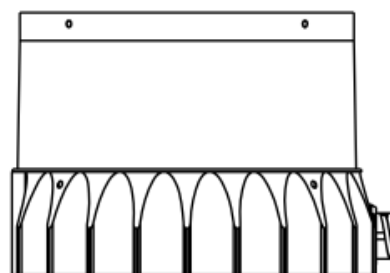
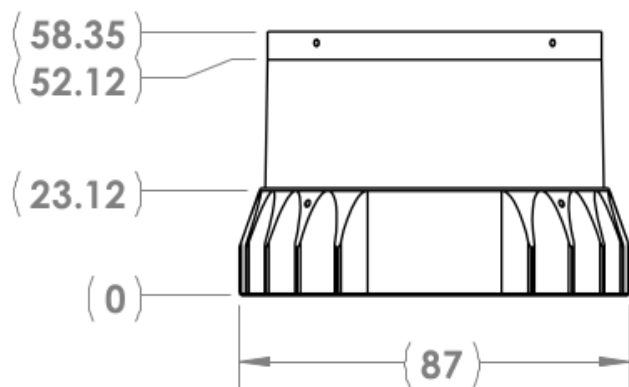
Interface Box	Polycarb/FR4, 100 g, 75 mm x 50 mm x 25 mm (LxWxH), 2 m CAT6 cable, 24 V power adapter, 5 m sensor cable
Mount	Aluminum, 530 g, 110 mm x 110 mm x 20.5 mm (LxWxH), 4 x M8 thru holes

SOFTWARE

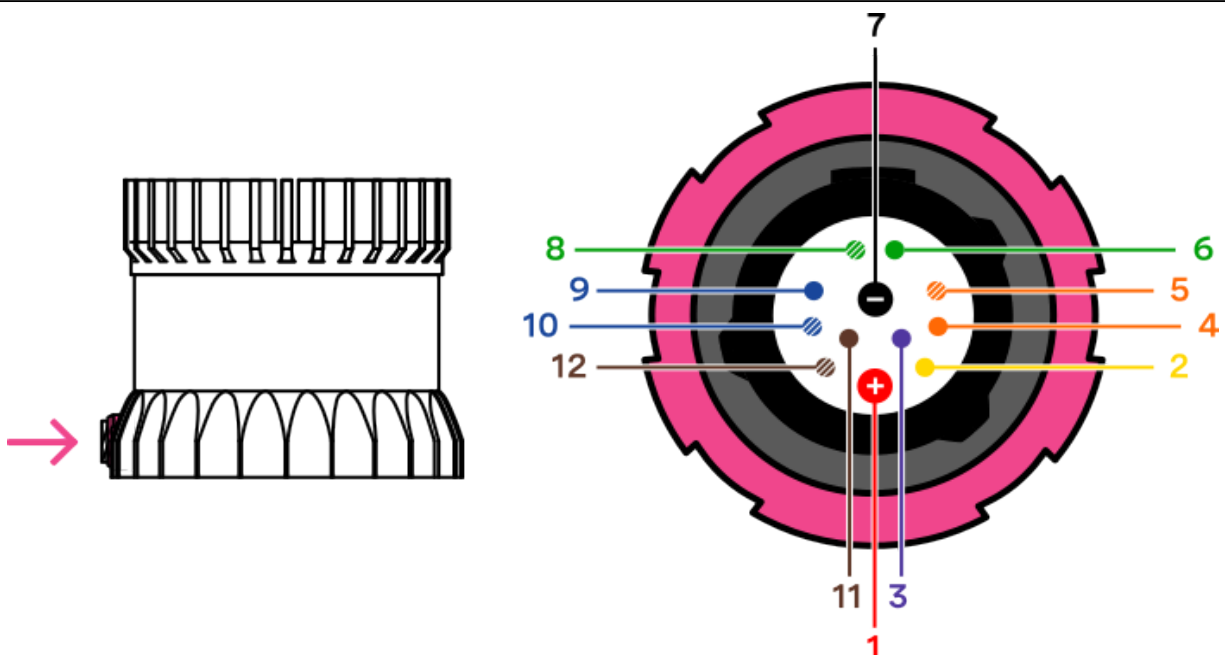
Sample Drivers	Ouster SDK, ROS, C++
Visualizer	Ouster Studio

EXTERIOR DIMENSIONS







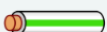









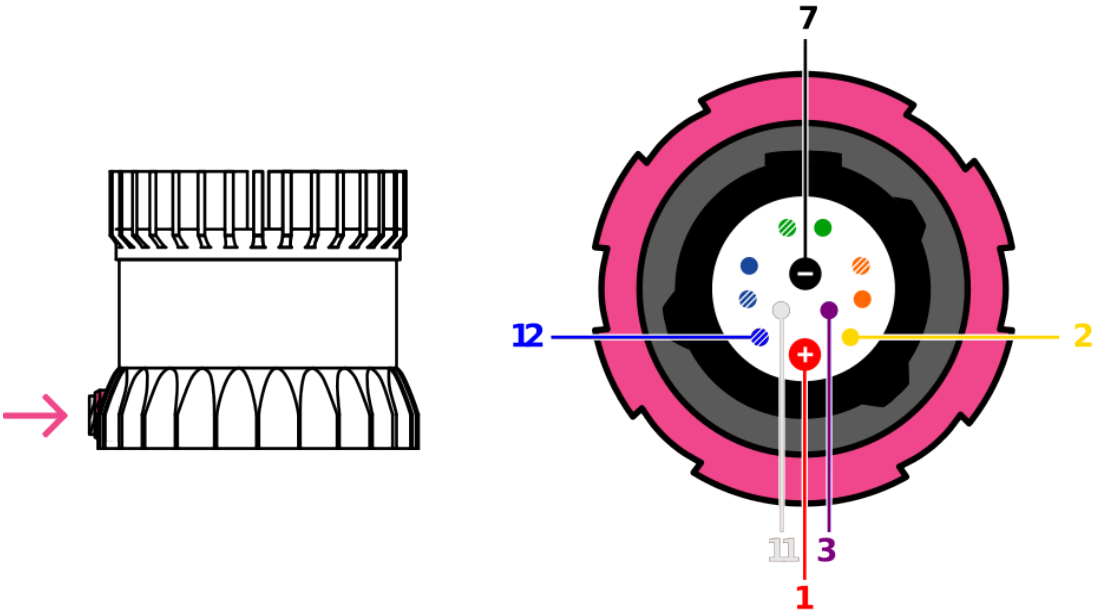
CABLE PINOUT DIAGRAM FOR TYPE 1, 2 and 3 (1000BASE-T)







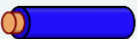

Pinout and wire gauges for Types 1, 2, and 3 (1000BASE-T) cables

Function	Pin No.	Wire Color	Type-1, 24V	Type-2, 24V	Type-3, 12V	Twisted with	Color (Display)
VCC	1	Red	22 AWG	22 AWG	18 AWG	N/A	
GROUND	7	Black	22 AWG	22 AWG	18 AWG	N/A	
MULTI-PURPOSE_IO	3	Purple	26 AWG	28 AWG	28 AWG	N/A	
SYNC_PULSE_IN	2	Yellow	26 AWG	28 AWG	28 AWG	N/A	
Ethernet BI_DA+	5	White /Orange	26 AWG	28 AWG	28 AWG	Orange	
Ethernet BI_DA-	4	Orange	26 AWG	28 AWG	28 AWG	White /Orange	
Ethernet BI_DB+	8	White /Green	26 AWG	28 AWG	28 AWG	Green	
Ethernet BI_DB-	6	Green	26 AWG	28 AWG	28 AWG	White /Green	
Ethernet BI_DC+	9	Blue	26 AWG	28 AWG	28 AWG	White /Blue	
Ethernet BI_DC-	10	White /Blue	26 AWG	28 AWG	28 AWG	Blue	
Ethernet BI_DD+	12	White /Brown	26 AWG	28 AWG	28 AWG	Brown	
Ethernet BI_DD-	11	Brown	26 AWG	28 AWG	28 AWG	White /Brown	

CABLE PINOUT DIAGRAM FOR TYPE 4 (1000BASE-T1)



Pinout and wire gauges for Type 4 (1000BASE-T1) cables

Net Name	Pin No.	Wire Color	Type-4, Base 1000 T1	Twisted with	Color (Display)
VCC	1	Red	18 AWG	NA	
GROUND	7	Black	18 AWG	NA	
MULTIPURPOSE_IO	3	Purple	28 AWG	NA	
SYNC_PULSE_IN	2	Yellow	28 AWG	NA	
Ethernet BI_DA+	12	Blue	26 AWG	White	
Ethernet BI_DA-	11	White	26 AWG	Blue	

*Specifications are subject to change without notice.