



ACCUSPEED ASDH OPTICS HEAD

ACCUSPEED ASD-EU ELECTONICS UNIT



1 DESCRIPTION

The ACCUSPEED Laser Velocimeter ASDH, is a non-contact, opto-electronic speed and length measurement device. It uses unique technology developed by KELK engineers to deliver outstanding performance in the harsh environment of steel rolling mills.

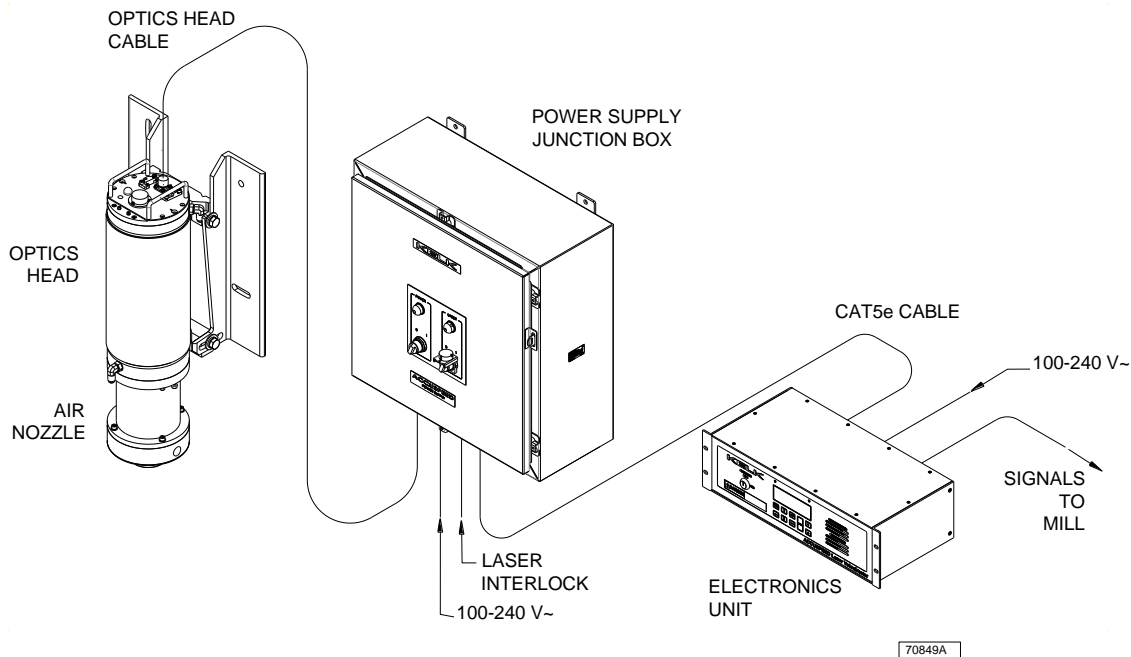
ACCUSPEED ASDH is specifically designed for use in hot strip mill applications. The ACCUSPEED ASDH is available in a variety of configurations, including a choice of 3 standoff distances and 3 different air purge nozzles, allowing users to select the best mounting arrangement for each application. The ACCUSPEED ASDH is designed to be mounted above the passline, but if configured appropriately may also be mounted below the passline, i.e. under the roll table.

Available configurations and options also enable the ACCUSPEED ASDH to be used in cold strip mills, tube mills, rod/bar mills, section mills, plate mills, and processing lines, as well as in other industrial applications outside metals rolling. Please contact KELK for more information about these applications and other KELK products that may be better suited for these applications.

The ACCUSPEED ASDH is suitable for measurement and control applications throughout the metals rolling process, including:

- Transfer bar tracking for Crop Optimization
- Length tracking for Feed-Forward Automatic Width Control
- Length measurement for Quality Verification
- Length measurement for Cut-to-Length Control
- Speed measurement for Mass Flow Automatic Gage Control
- Multi-velocimeter synchronized differential speed measurement for Elongation Control
- Flaw tracking for Surface Inspection

2 SYSTEM CONFIGURATION



2.1 MILL MOUNTED PARTS

2.1.1. OPTICS HEAD

The ACCUSPEED ASDH Optics Head is designed for use in a metals rolling mill environment. The optical and signal processing components are hermetically sealed in a robust, water-cooled stainless steel enclosure that is filled with dry nitrogen. The ACCUSPEED ASDH Optics Head is available in the following three standard standoff distances¹: 1000 mm (39.4 in), 2100 mm (82.6 in) or 3500 mm (137.8 in). The sealed optics head contains no user serviceable components.

2.1.2. AIR NOZZLE

The ACCUSPEED ASDH Air Nozzle keeps the optical window free of oxide and steam in environments like those in Hot Strip Mills. In addition to the standard nozzle, two optional nozzles are available to accommodate reduced visibility environments, like those found in Tandem Cold Mills.

2.1.3. OPTICS HEAD MOUNT

The ACCUSPEED ASDH Optics Head Mount is a rugged device used for mounting the ACCUSPEED ASDH Optics Head on the user's support structure. It allows alignment of the Optics Head to the mill pass line. An optional vibration isolating head mount is available for use when the head must be mounted on a vibrating structure.

2.1.4. HIGH TEMPERATURE CABLE ASSEMBLY

A standard 15 meter (50 ft) Optics Head Cable is used to carry power and data to the ACCUSPEED ASDH Optics Head. It is supplied with a 2 m (6 ft) length of liquid tight, flexible armored conduit and fittings to protect the cable between the optics head and customer supplied rigid conduit.

¹ Other standoff distances are available on a special order basis; consult KELK Sales for more details.

2.1.5. POWER SUPPLY / JUNCTION BOX

A wall mount junction box is used to house the optics head power supply, interconnect terminal blocks and power/laser lockout switches.

2.2 ACCUSPEED ELECTRONICS UNIT

- Receives processed velocity data from the optics head
- Monitors and reports on the quality of the optics head signals
- Monitors and compensates for changes in the internal temperature of the optics head
- Derives length measurement by integrating velocity over time
- Outputs the measured data and status information
- Provides user access for system setup, communication and diagnostics
- Provides all necessary features for safe laser operation
- Building block for the standard and optional Interfaces

The 3U high ACCUSPEED Electronics Unit mounts in a standard 19-inch rack, or can stand on a bench top as a stand alone device.

2.3 STANDARD INTERFACES

The ACCUSPEED Electronics Unit includes the following standard interfaces:

2.3.1. ETHERNET MODBUS/TCP

All measurement and status data from the system are available on a network connection via the Ethernet Modbus/TCP Protocol. (Reference KELK Document No.TS502)

2.3.2. HOST PROTOCOL

In addition to the Modbus/TCP protocol, the system provides a simple KELK standard TCP Messaging Protocol for connection to PLCs that do not support Modbus/TCP. (Reference KELK Document No.TS479)

2.3.3. QUADRATURE

The Quadrature interface provides a two phase output which emulates a pulse tachometer. This output comprises two differential RS-422 signal outputs (A, B). An additional quadrature output is available as an option. Optional external level converters are also available where higher voltage outputs are required.

2.3.4. LOGIC I/O

The following eight solid-state relay outputs are provided:

- System Healthy
- Laser On
- Laser On Warning Lamp Control
- Material in View (MIV)
- Data Valid
- Length Reached
- System Warning
- Head Overheat

The following optical isolated digital inputs are provided:

- Start Enable / Start Acquisition
- Material Direction
- Remote Laser Enable
- Ghost Rolling Enable

A separate, dedicated interface is provided for multi-unit synchronization to produce the highest accuracy in elongation applications.

2.4 OPTIONAL / ADDITIONAL INTERFACES

2.4.1. PROFIBUS

A condensed set of measurement and status data from the system are available on a Profibus network connection. (Reference KELK Document No.TS504)

2.4.2. ETHERNET MODBUS/TCP

A condensed set of measurement and status data from the system are available on a dedicated network connection via the Modbus/TCP Protocol. (Reference KELK Document No.TS503)

2.4.3. ANALOG OUTPUTS

Two, four or six analog outputs are available as an option. The output assignment, scaling, span and zero levels for each channel are field-adjustable using the User Access Program.

2.4.4. ADDITIONAL QUADRATURE OUTPUTS

A single quadrature output is provided as standard, a second quadrature output is available as an option. (Optional external Level Converters are available where higher voltage outputs are required.)

2.5 USER ACCESS PROGRAM

The system hosts a User Access Program that uses pull-down menus and computer graphics to provide quick and convenient access to the ACCUSPEED Laser Velocimeter system during commissioning, operation and service. It allows the user to:

- Monitor measurements and status
- Configure network connections
- Configure I/O assignments and scaling
- Configure filtering and signal processor setting
- Save and restore configurations to a file
- Log measurement data to a file

Users can access these features using a Windows-based computer equipped with a 100Mb/s Ethernet port and capable of running Java 7, or later.

2.6 DOCUMENTATION PACKAGE

The Accuspeed documentation package is provided on a CD in .pdf format and contains the following documents:

- UAP Install File
- ASD Communication Protocol Documents
- User Manual
- Installation and Commissioning Manual
- Standard Drawing Set
- Reduced Visibility Drawing Set
- Below Table Drawing Set

3 LASER WARNING STATEMENT

This unit is a class 3B laser product.

This unit complies with IEC 60825-1:2014 and 21CFR 1040.10.

The following safety features required to comply with the Bureau of Radiological Health Class 3B laser requirements are included:

- Key-operated power switch
- Laser indicator light on supply and optics head (laser)
- Delayed laser startup-laser indicator light on prior to laser radiation
- Interlock capability for remote shut-off



4 SCOPE OF SUPPLY

4.1 COMPONENTS OF THE ACCUSPEED ASDH SYSTEM

Each ACCUSPEED Laser Velocimeter ASDH-B00 system will consist of the following:

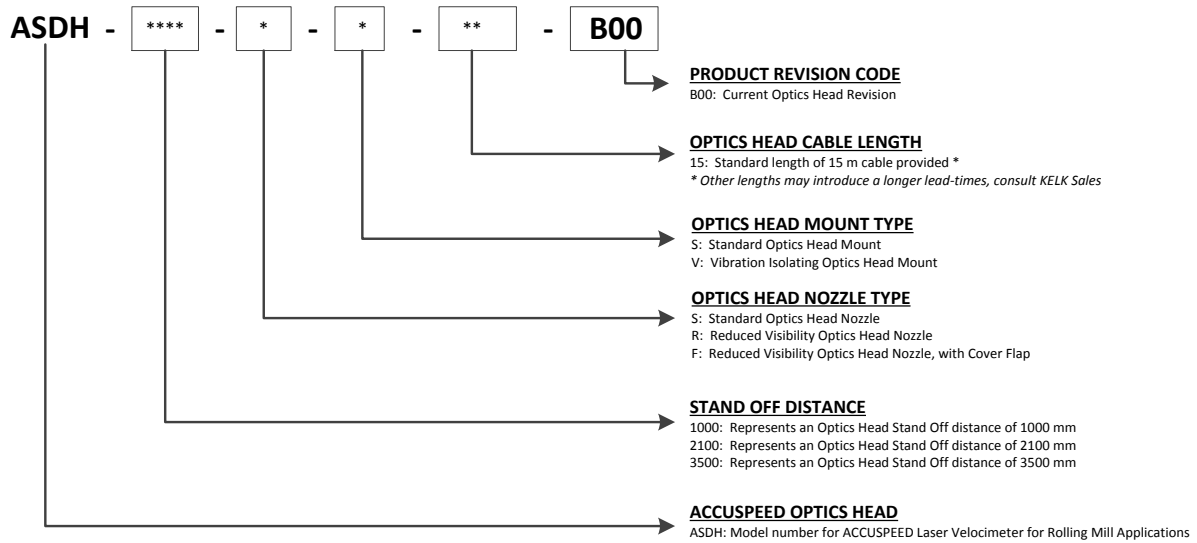
- 1x ACCUSPEED ASDH-B00 Laser Velocimeter Optics Head
- 1x ACCUSPEED ASD-EU Electronics Unit
- 1x ACCUSPEED Power Supply / Junction Box
- 1x ACCUSPEED ASD-CBL Electronics Unit Cable / Harness Kit
- 1x Commissioning Service²

A choice of additional optional equipment to provide a full system solution is also available.

² Travel expenses extra

4.2 ACCUSPEED ASDH OPTICS HEAD

4.2.1. OPTICS HEAD ORDER CODE



4.2.2. COMMON OPTICS HEAD ORDER CODES³

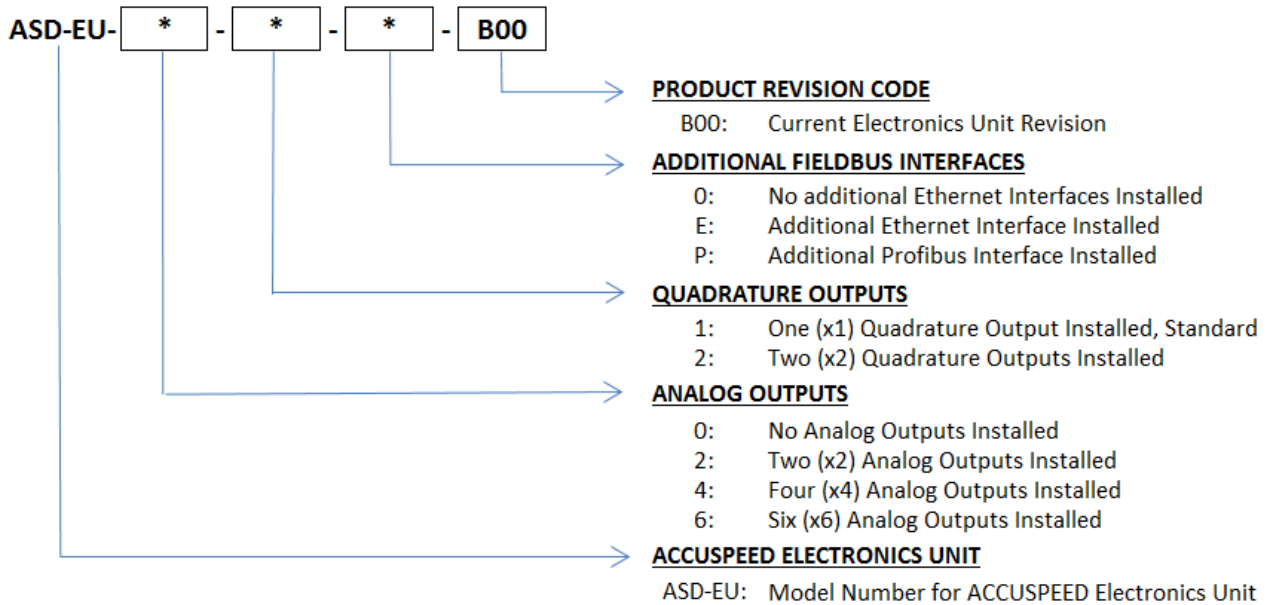
<u>Order Code</u>	<u>Description</u>
ASDH-1000-S-S-15-B00	ACCUSPEED ASDH-B00 Laser Velocimeter ASDH Optics Head, 1000 mm (39.4 in) standoff distance, standard Nozzle, standard Head Mount, 15 m (50 ft) OH Cable
ASDH-1000-R-S-15-B00	ACCUSPEED ASDH-B00 Laser Velocimeter ASDH Optics Head, 1000 mm (39.4 in) standoff distance, Reduced Visibility Nozzle, standard Head Mount, 15 m (50 ft) OH Cable
ASDH-2100-S-S-15-B00	ACCUSPEED ASDH-B00 Laser Velocimeter ASDH Optics Head, 2100 mm (82.7 in) standoff distance, standard Nozzle, standard Head Mount, 15 m (50 ft) OH Cable
ASDH-2100-S-V-15-B00	ACCUSPEED ASDH-B00 Laser Velocimeter ASDH Optics Head, 2100 mm (82.7 in) standoff distance, standard Nozzle, Vibration Isolating Head Mount, 15 m (50 ft) OH Cable
ASDH-3500-S-S-15-B00	ACCUSPEED ASDH-B00 Laser Velocimeter ASDH Optics Head, 3500 mm (137.8 in) standoff distance, standard Nozzle, standard Head Mount, 15 m (50 ft) OH Cable
ASDH-3500-S-V-15-B00	ACCUSPEED ASDH-B00 Laser Velocimeter ASDH Optics Head, 3500 mm (137.8 in) standoff distance, standard Nozzle, Vibration Isolating Head Mount, 15 m (50 ft) OH Cable
ASDH-1000-F-S-30-B00 ⁴	ACCUSPEED ASDH-B00 Laser Velocimeter ASDH Optics Head, 1000 mm (39.4 in) standoff distance, Reduced Visibility Air Nozzle with Cover Flap, standard Head Mount, 30 m (98 ft) of OH cable

³ Consult KELK Sales for other order codes.

⁴ Space permitting, this configuration may be suitable for mounting below the table or passline.

4.3 ACCUSPEED LASER VELOCIMETER ELECTRONICS UNIT

4.3.1. ELECTRONICS UNIT ORDER CODE

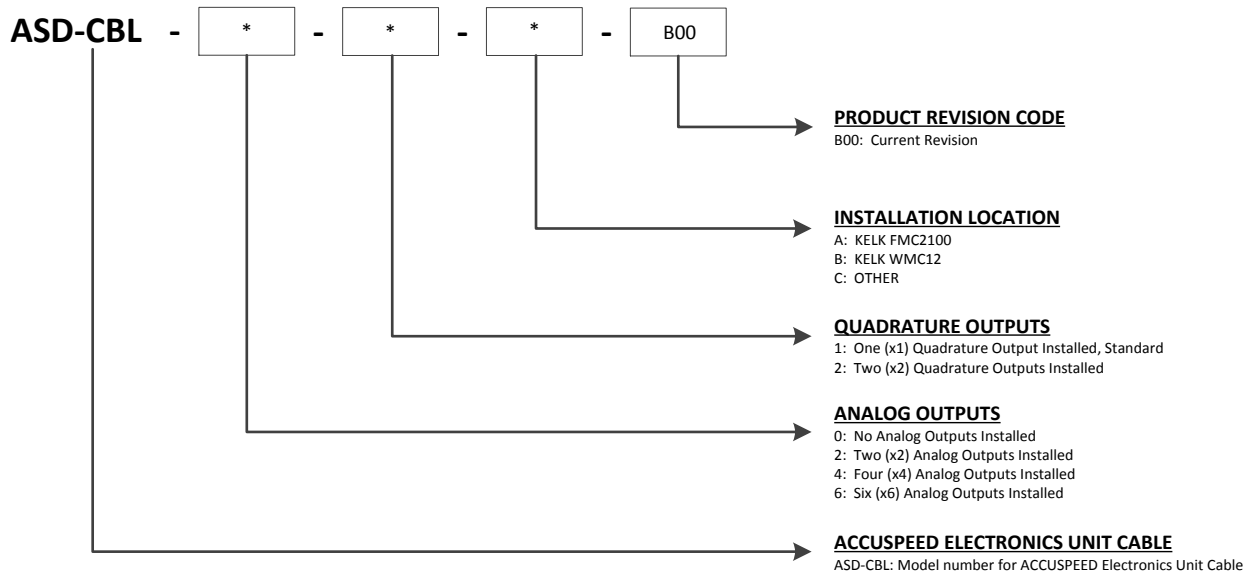


4.3.2. COMMON ELECTRONICS UNIT ORDER CODES⁵

<u>Order Code</u>	<u>Description</u>
ASD-EU-0-1-0-B00	ACCUSPEED ASD-EU Electronics Unit with 1 Quadrature Output Installed
ASD-EU-0-1-P-B00	ACCUSPEED ASD-EU Electronics Unit with 1 Quadrature Output and Profibus Interface Installed
ASD-EU-2-1-0-B00	ACCUSPEED ASD-EU Electronics Unit with 2 Analog and 1 Quadrature Outputs Installed
ASD-EU-2-1-P-B00	ACCUSPEED ASD-EU Electronics Unit with 2 Analog Outputs, 1 Quadrature Output and Profibus Interface Installed

⁵ Consult KELK Sales for other order codes.

4.3.3. CABLE ORDER CODE



4.3.4. COMMON CABLE ORDER CODES ^{5,6}

<u>Order Code</u>	<u>Description</u>
ASD-CBL-0-1-A-B00	ACCUSPEED ASD-CBL Electronics Unit Cable / Harness Kit, supports 1 Quadrature Output, for installation in KELK FMC2100 cabinet
ASD-CBL-2-1-A-B00	ACCUSPEED ASD-CBL Electronics Unit Cable / Harness Kit, supports 2 Analog Outputs and 1 Quadrature Output, for installation in KELK FMC2100 cabinet
ASD-CBL-0-1-B-B00	ACCUSPEED ASD-CBL Electronics Unit Cable / Harness Kit, supports 1 Quadrature Output, for installation in KELK WMC12 cabinet
ASD-CBL-2-1-B-B00	ACCUSPEED ASD-CBL Electronics Unit Cable / Harness Kit, supports 2 Analog Outputs and 1 Quadrature Output, for installation in KELK WMC12 cabinet
ASD-CBL-0-1-C-B00 ⁷	ACCUSPEED ASD-CBL Electronics Unit Cable / Harness Kit, supports 1 Quadrature Output, for installation in an 'Other' cabinet
ASD-CBL-2-1-C-B00 ⁷	ACCUSPEED ASD-CBL Electronics Unit Cable / Harness Kit, supports 2 Analog Outputs and 1 Quadrature Output, for installation in an 'Other' cabinet

⁶ All other combinations are available but have increased lead-times, consult KELK

⁷ 'Other' refers to either 'Non KELK Cabinets' or KELK cabinets that do not have shield and grounding mechanisms as provided on FMC2100; this harness is provided with additional grounding bus bars and shield clamps, harness length of 1.82 m [approx. 72 in] and rail length of 624 mm [approx. 24 in]

4.4 OPTIONAL EQUIPMENT AND ACCESSORIES

<u>Part Number</u>	<u>Description</u>
PL055979	ACCUSPEED Heat Insulation Jacket
PL055640-1	KELK Instrumentation Panel Software Kit, CD
PL058734	Valve and Filter Kit, Standard
PL058736	Valve and Filter Kit, Reduced Visibility
063680	24 VDC Level Shifter for Quadrature Output
WMC12	Wall Mount Cabinet, refer to DS.WMC.552.1
FMC2100-*-*	Floor Mount Cabinet, refer to DS.FMC.551.2

Consult KELK Sales for additional details regarding heater/chiller for coolant temperature stabilization of Optics Head.

4.5 COMMON SPARES

<u>Part Number</u>	<u>Description</u>
PL059040-3500	ASDH Optics Head, 3500 mm (137.8 in) Standoff
PL059040-2100	ASDH Optics Head, 2100 mm (82.7 in) Standoff
PL059040-1000	ASDH Optics Head, 1000 mm (39.4 in) Standoff
PL059057-15M ⁸	ASDH Optics Head High Temperature Cable / Hose Assembly, 15 m (50 ft)
*08627	Shock Mounts (Qty = 1) for Vibration Isolating Mount, recommended to order 4
*08674	Optic Wipes, Box of 50
PL052077	O-Ring Kit, Standard Nozzle
PL058959	Seal Kit, Reduced Visibility Nozzle
*07617	NIR Sensor Card
*08155	Power Supply Module, 24 V DC, 1.75 A
*08646	Filter Element, 5 µm
*08648	Filter Element, 0.01 µm
PL058672	Ethernet Interface Card, Spare Kit for ASD-EU
PL058674	Profibus Interface Card, Spare Kit for ASD-EU
PL058673	Analog Output Card, Spare Kit for ASD-EU
PL058678	Quadrature Interface, Spare Kit for ASD-EU
PL058682-1.82M	Quadrature Cable Assembly, for installation in KELK FMC2100
PL051406-1.82M ⁹	Quadrature Cable Assembly, for installation in KELK WMC12 cabinet or 'Other' cabinet
PL046986-1.82M	Analog Output Cable Assembly, for installation in KELK FMC2100
PL046940-1.82M ⁹	Analog Output Cable Assembly, for installation in KELK WMC12 cabinet or 'Other' cabinet
PL059277	Logic I/O Cable Assembly, for installation in KELK FMC2100
PL051405 ⁹	Logic I/O Cable Assembly, for installation in KELK WMC12 cabinet or 'Other' cabinet
063680	24 VDC Level Shifter for Quadrature Output
PL058755	Documentation Package, English, ASDC/ASDH

⁸ Other lengths are available, consult KELK Sales

⁹ 'Other' refers to either 'Non KELK Cabinets' or KELK cabinets that do not have shield and grounding mechanisms as provided on FMC2100

5 SPECIFICATIONS

Measurement Range	Standoff Distance¹⁰	1000 mm (39.3 in), 2100 mm (82.7 in) , 3500 mm (137.8 in)			
	Depth of Field	± 50 mm (± 2 in), (± 100 mm (± 4 in) with reduced accuracy – See “Accuracy” below)			
	Velocity Range	0.01 to 42 m/sec			
	Length Range	± 32757 m (± 107500 ft)			
Performance	Accuracy	± 0.025 % within ± 50 mm (± 2 in) depth of field ± 0.05 % within ± 100 mm (± 4 in) depth of field			
	Repeatability	≤ 0.02 %			
Communication	Mill Computer Interface	Physical Layer	Cat5e		
		Link Layer	Ethernet		
		Network Layer	MODBUS/TCP ¹⁰		
Input / Output	Digital Inputs	Quantity	4		
		Rating	3-30 V DC, 5 mA		
	Digital Outputs	Quantity	8		
		Rating	30 V DC, 350 mA		
		Load Type	Resistive		
	Analog Outputs	Quantity	6 (up to)		
		Rating	± 10 V or 4-20 mA		
		Resolution	16 bit		
Quadrature Outputs	Quantity	2 (up to)			
	Rating	100 Ω, ±2 V DC, 10 Hz to 5 MHz			
	Scaling	10 kHz per m/s			
Dimensions	Equipment Size L x W x H	Units	Optics Head	Power Supply/ Junction Box	Electronics Unit
		mm	250 x 370 x 725	500 x 500 x 250	484 x 229 x 132
		in	10 x 14.5 x 28.5	20 x 20 x 10	19 x 9 x 5.2
	Equipment Weight	kg	23	23	4.5
		lbs	51	50	10
	Input Power		N/A	100-240 V~, 75 VA, 50/60 Hz	100-240 V~, 75 VA, 50/60 Hz
Operating Environment	Maximum Ambient Temperature	°C	70 ¹¹	50	40
		°F	158	122	104
	Maximum Humidity		100%, condensing	90%, non-condensing	90%, non-condensing
	NEMA Rating		6	4	N/A
	IP Rating		67	65	
	Vibration Rating		0.0127 g ² /Hz PSD (5.05 Grms), 5-2000Hz, MIL-STD-810G, Method 514 ¹²	N/A	N/A
Safety Hazards	Light Source	Laser Diode, Class 3B (typ. 785nm, < 35mW), complies with: IEC 60825-1:2014 21CFR 1040.10			

¹⁰ Others available on a special order basis—consult KELK Sales.

¹¹ Will operate above a 1250 °C (2280 °F) strip with coolant flow.

¹² Installed on a standard head mount. For installations where vibrations may exceed the rating, vibration isolating head mount is required.

6 WHAT USERS MUST PROVIDE

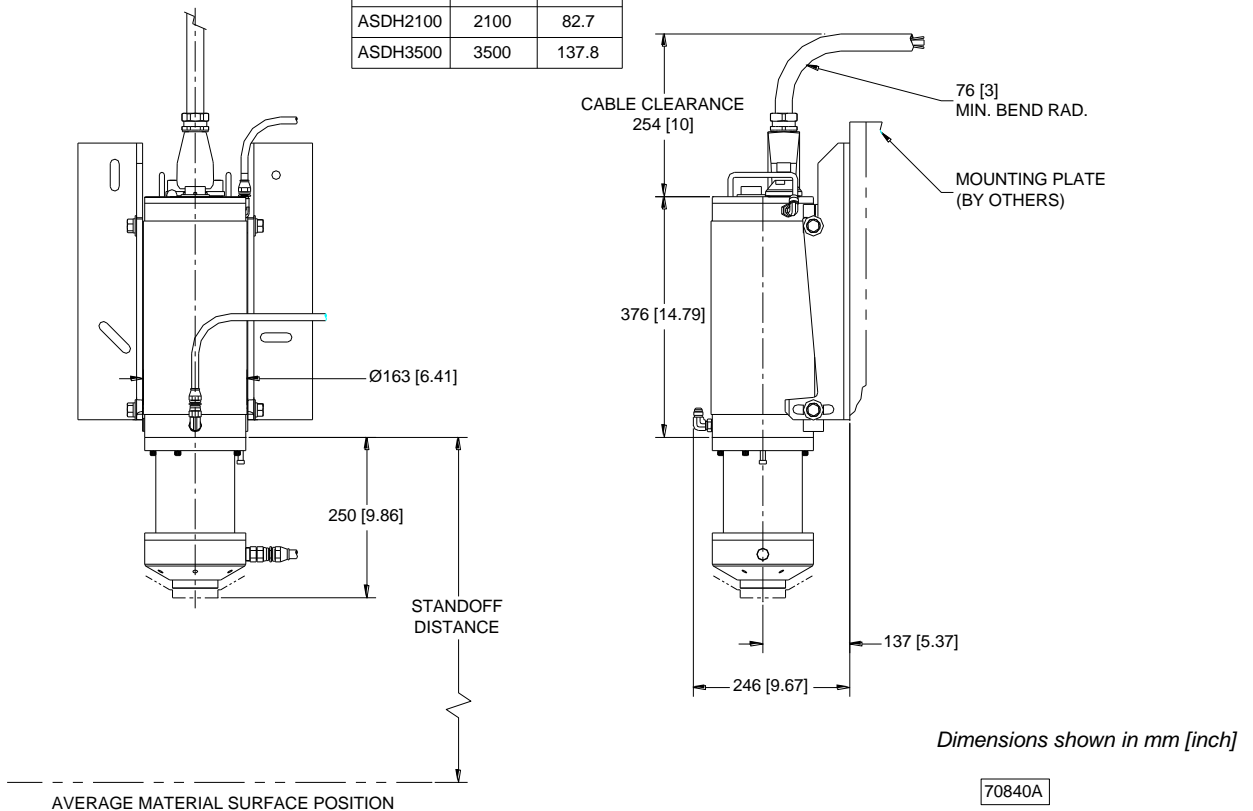
Installation	Mechanical	<ul style="list-style-type: none"> • Mounting structure with access for maintenance • An unobstructed clear view from Optics Head to material surface • Installation of air nozzles may be required to clear any liquid on the strip
	Electrical	<ul style="list-style-type: none"> • Power to the Power Supply / Junction Box • Power to the Electronics Unit • Interconnecting power and signal cables not specified in scope of supply
System Services	Air (at 20 °C / 68 °F)	• Compressed Air: 93 l/min at 310 kPa (3.3 CFM at 45 psi), Filtered (40 µm), free of oil
	Water	• 4 l/min, 5 - 40 °C (1gpm, 41 - 104 °F)
User Access Program		• Windows-based computer equipped with a 100 Mb/s Ethernet port, capable of running Java 7

7 DIMENSIONS

7.1 ASDH OPTICS HEAD WITH STANDARD HEAD MOUNT AND AIR NOZZLE

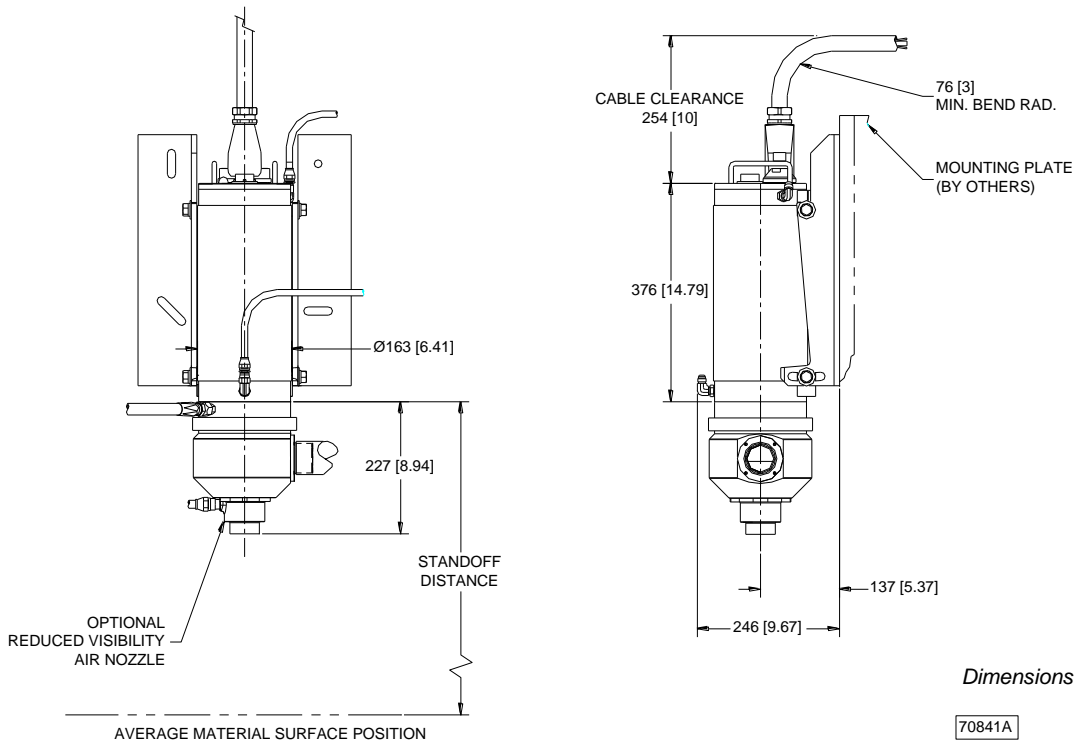
NOTES:
 TOTAL WEIGHT OF OPTICS HEAD:
 - 23 kg [51 lbs] - EMPTY,
 - 26 kg [57 lbs] - WATER JACKET FULL.

MODEL	STAND-OFF DISTANCE (SOD)	
	mm	INCHES
ASDH1000	1000	39.4
ASDH2100	2100	82.7
ASDH3500	3500	137.8



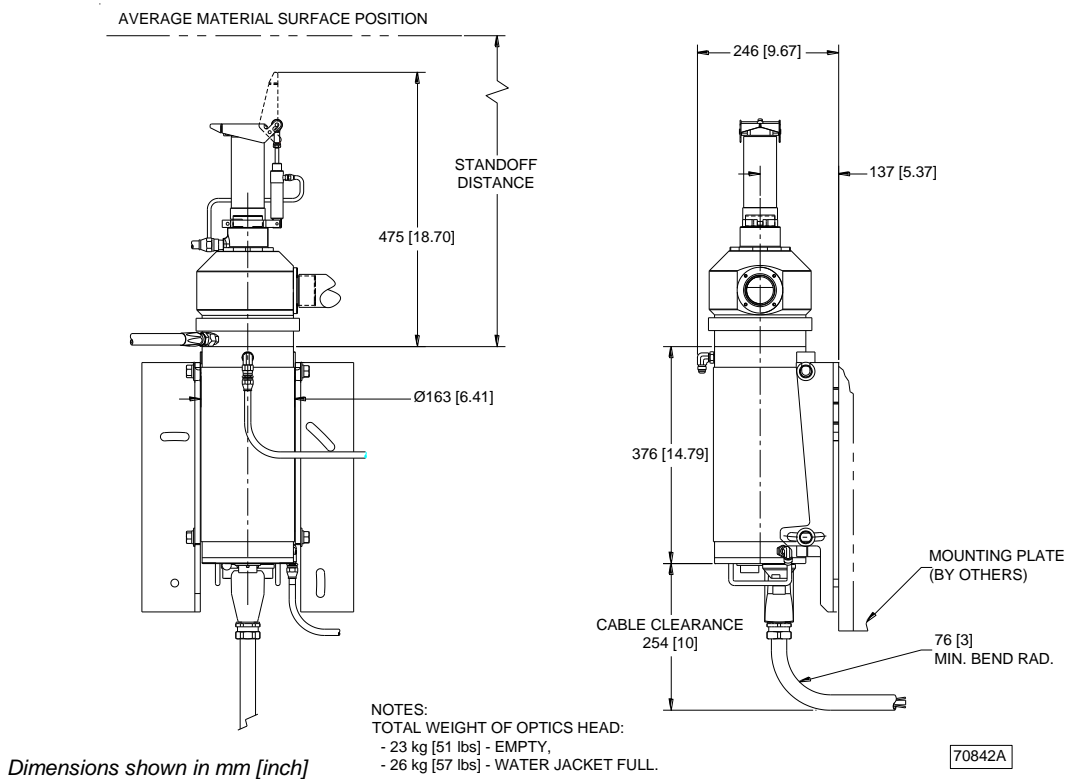
7.2 ASDH OPTICS HEAD WITH STANDARD HEAD MOUNT AND REDUCED VISIBILITY AIR NOZZLE

NOTES:
 TOTAL WEIGHT OF OPTICS HEAD:
 - 23 kg [51 lbs] - EMPTY,
 - 26 kg [57 lbs] - WATER JACKET FULL.

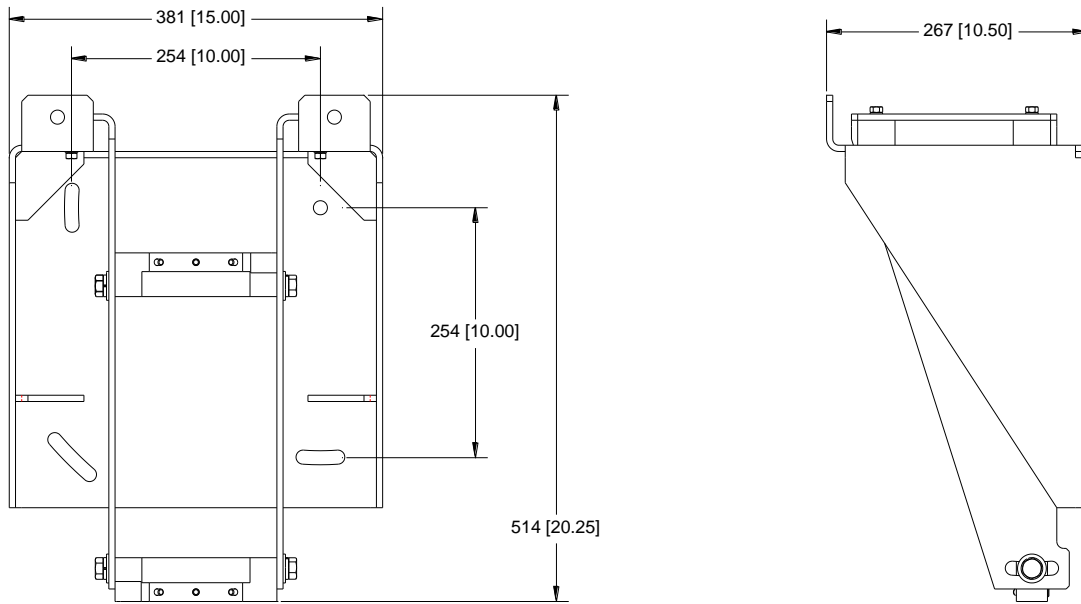


7.3 ASDH OPTICS HEAD, BELOW TABLE HEAD MOUNT

(Shown with Reduced Visibility Air Nozzle with Cover Flap)



7.4 OPTIONAL VIBRATION ISOLATING HEAD MOUNT



NOTES:
1) WEIGHT: 23 kg [50 LBS]

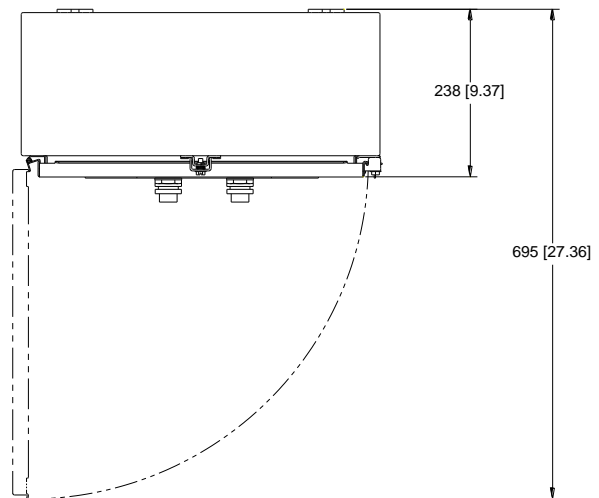
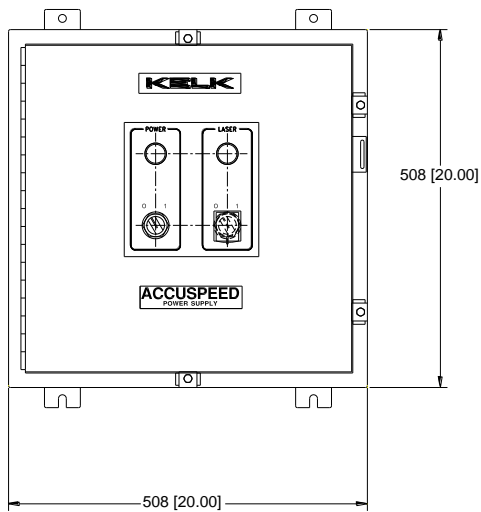
Dimensions shown in mm [inch]

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7.5 POWER SUPPLY / JUNCTION BOX

FRONT VIEW

TOP VIEW



NOTES:
1) POWER REQUIREMENTS:
100-240 V-, 75 VA, 50/60 Hz.
2) APPROXIMATE WEIGHT: 23 kg [51 lbs].

Dimensions shown in mm [inch]

70843A