ARIS

WEB POSITION SENSOR

ARIS Web Position Sensor

Product Manual

Copyright Information

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INTRODUCTION

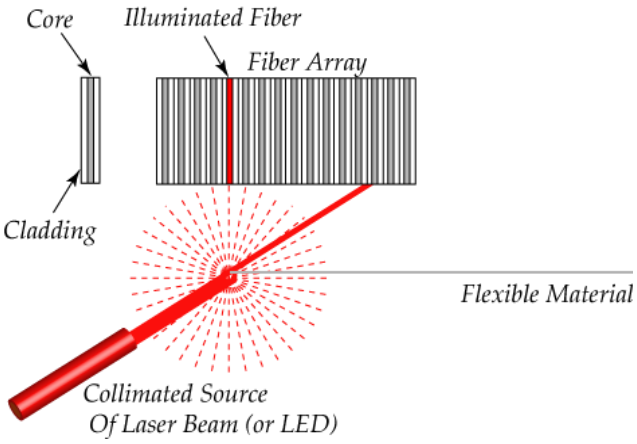
This product manual provides information about installation, use and maintenance of ARIS Web Position Sensor. The sensor is designed for use in indoor industrial and laboratory equipment that process materials in web form as they move through a converting or raw material manufacturing process.

The sensor is powered by a patented sensor technology that does not require any setup or re-calibration when different materials are used. The web position sensor technology adjusts automatically to the physical characteristics of the web material and provides a true web position measurement.

Working principle

The ARIS Web Position Sensor uses LED light source (infrared, white and ultraviolet) and fiber optic technology to accurately measure the position of the web. The sensing principle relies on light scattering and spatial filtering properties of fiber optics to accurately determine the web position. The spatially filtered light is projected onto a one dimensional line scan camera and the image recorded by the camera is processed using advanced digital signal processing algorithms to accurately determine the position of the material. Since any material, be it opaque, transparent, porous and nonporous, scatters light the sensor is not affected by the material properties. The intelligent digital signal processing automatically adapts to any changes to provide a true measurement.

A schematic of the basic working principle is shown below:



Sensor Working Principle

A light source, such as laser or LED is used illuminate the area near the edge of the web. As the light falls on the web, the light is scattered in all directions. The scattering of light is then filtered using fiber optics before it is projected onto a camera. Since the optical fibers are directionally sensitive, light is spatially filtered such that only fiber(s) directly inline with the scattered light get illuminated. All other fibers do not couple light since the scattered light falls on them at an angle. Since any material irrespective of its opacity and porosity scatters (or reflects) light the sensing principle is unaffected by the material properties. Moreover, the measurement is an absolute measurement because of spatial filtering.

ARIS Web Position Sensor features

ARIS Web Position Sensor is essentially an one-dimensional vision based sensing system which has advantages over the conventional fork/U-shaped sensors as well as camera based sensors. The following table compares the different sensor technologies and their capabilities.

Sensor Characteristics	ARIS WPS	U-Shaped Infrared	U-Shaped Ultrasonic	U-Shaped Pneumatic	Camera
Unaffected by Opacity	✔	X	✔	✔	X
Unaffected by Porosity	✔	✔	X	X	✔
Unaffected by Splices	✔	X	X	X	✔
Unaffected by Dust	✔*	X	X	✔	X
Unaffected by Temperature Change	✔	✔	X	✔	✔
Unaffected by Vacuum	✔	✔	X	X	✔
Unaffected by Ambient Light	✔	✔	✔	✔	X
Unaffected by Vibration or Ringing	✔	✔	X	✔	✔
Analog or Digital Measurement	Digital	Analog	Analog	Analog	Digital
Line Detection	✔	X	X	X	✔
Contrast Detection	✔	X	X	X	✔
Resolution Unaffected by Range	✔	X	X	X	✔
Automatic Calibration	✔	X	X	X	X

* The dust issue can be reduced by using intelligent digital processing algorithms.

The main advantage of the fork/U-shaped sensors, that work on the principle of blocking/unblocking, is their simplicity. The simple sensor principle is cost effective and provides a robust measurement as long as the material properties do not change. However, they require setup and calibration whenever the material or environmental conditions change, as shown above in the table. While the camera based sensors have better functionality than the traditional fork/U-shaped sensors, they are expensive and typically require calibration because of the effect of ambient light; focusing is often another issue with camera based sensors. The unique sensing principle of the ARIS Web Position Sensor essentially overcomes the limitations of traditional sensors, as well as the camera based sensor.

SAFETY INSTRUCTIONS

The ARIS Web Position Sensor is an electronic device operating under low voltage (24 VDC). However, it does present a few safety requirements that must be followed in order to assure safe operation.

Instructions for use

The ARIS Web Position Sensor must be properly transported and stored. Sensors with any sign of physical damage must not be used. Only persons who have the necessary qualifications should work on the installation, commissioning, operation, and maintenance of the sensor.
Notes:

- Please read the product manual and properly follow its instructions.
- Be aware of all national, state, and local requirements for accident prevention and environmental protection.

Proper use

The ARIS Web Position Sensor is made for indoor uses only. The sensor is designed for use in industrial and lab equipment that process materials in web form as they move through a converting or raw material manufacturing process. Other applications include non-web based industrial measurement and sensing applications.

Improper use

- The sensor uses high powered LED light source (visible or invisible) that may be harmful to human eye. Staring directly at the light source may harm vision and should be avoided.
- Outdoor use is considered improper.
- Any use outside the technical specifications shall be considered improper use and voids any warranty of the equipment.
- Any replacement parts or modification necessaries should be made by Roll-2-Roll Technologies LLC.

Static discharges and grounding

The electronic elements of the sensor are sensitive to static discharges. Make sure that the sensor control unit, the power supply, and the machine on which the sensor operates is properly grounded to avoid shock and the effect of static discharge.

INSTALLATION AND COMMISSIONING

There are two main components of the sensing system: a sensor head and a sensor control unit.

Sensor Head

The sensor head houses the LED light source, the optics and the camera sensor. The sensor head is connected to the controller unit through a 10 conductor shielded cable secured by a cable gland. The sensor head assembly is mounted onto an off-shelf aluminum rail (igus drylin N low profile linear rails with using NW-22-17-40 carriage) secured by M3 thumb screws as shown below. Other options for mounting are also available upon request. All these elements are factory shipped assembled as a ready to install unit.

Sensor Head Assembly with Mounting Rail

- Each sensor slide carriage will have a locking thumbscrew. Unscrew both thumbscrews to allow the carriage to slide in the rail.
- The sensor face has a acrylic filter lid. Make sure that the filter lid faces the web material when the sensor assembly is slid into the guide rail.
- Carefully slide the sensor carriages into the sensor slide.
- Once the sensor has been installed in the sensor slide, install the plastic end caps (NSKB-17) on the ends of the rail.

Attention:

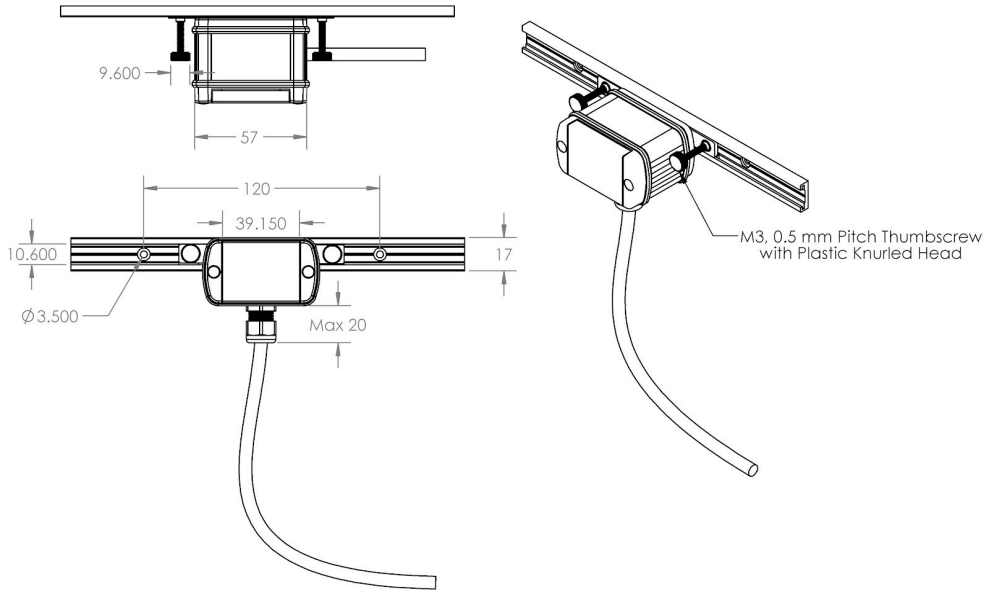
- The sensor should be installed such that the web material is about 5 to 10 mm from the filter lid for the most accurate measurement.
- The length of the sensor should be parallel to the width of the web and the sensor should be positioned normal to the plane of the web.
- The standard convention for the sensor is such that the bottom of the sensor has the cable gland nut and the left/right side are oriented while facing the sensor (as shown above).
- Ensure that no object is behind the web, in the viewing direction of the sensor, for a distance of about 150 mm. The presence of any such object within the 150 mm distance may affect the sensor output.

Three different sensor size options are available; the size corresponds to the sensing range.

Top Left: ARIS WPS 16; Top Right: ARIS WPS 48; Bottom: ARIS WPS 221. Pictures are not to scale.

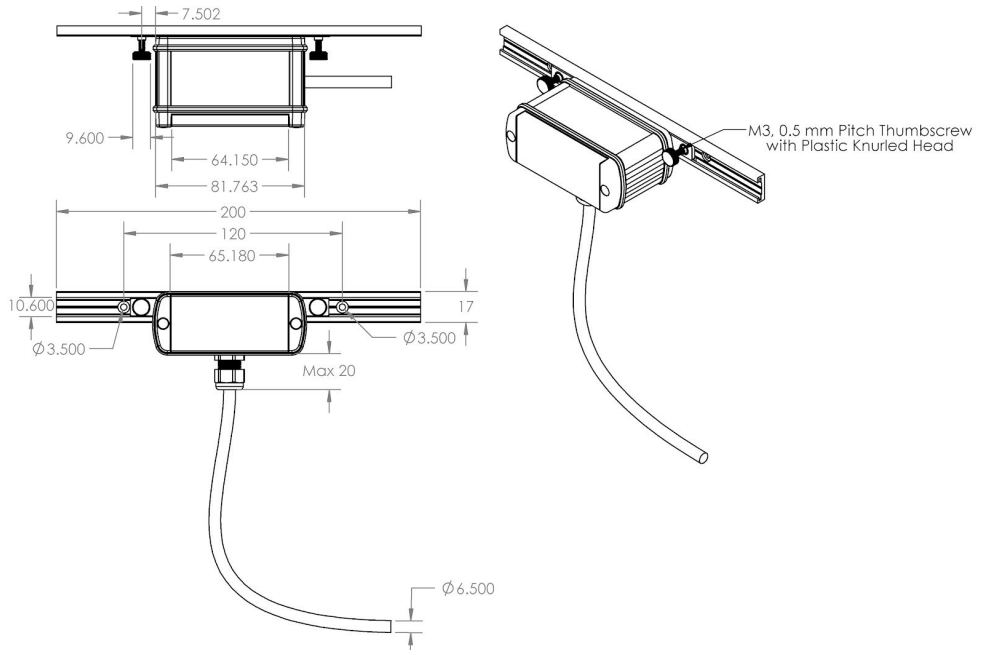
The physical dimensions of the sensor head, the assembly and the rail are shown next.

Physical Dimensions of ARIS WPS 16



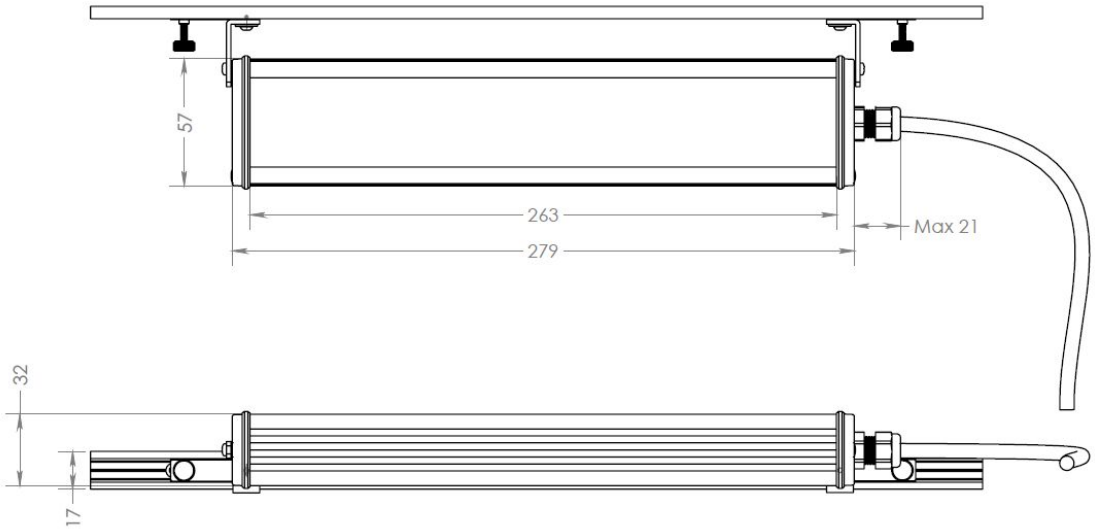
16 mm Sensor Head Assembly Dimensions (All Dimensions are in mm)

Physical Dimensions of ARIS WPS 48



48mm Sensor Head Assembly Dimensions (All Dimensions are in mm)

Physical Dimensions of ARIS WPS 221



221 mm Sensor Head Assembly Dimensions (All Dimensions are in mm)

Sensor Configuration and Terminologies

The sensor configuration and terminologies for proper installation and use of the sensor is provided in this section.

Left Sensor

Right Sensor

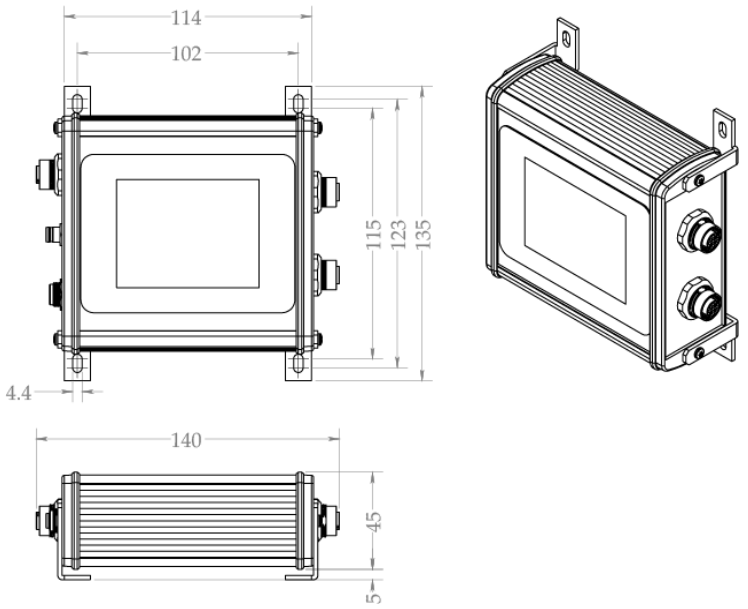
The front view of the sensor is the orientation in which the cable gland is at the bottom while viewing the filter on the sensor.

- Left Sensor: When the sensor is positioned to the left edge of the web the orientation corresponds to a left sensor.
- Right Sensor: When the sensor is positioned to the right edge of the web the orientation corresponds to a right sensor.

The sensor orientation can be automatically detected by the intelligent sensor control unit whenever a sensor is plugged into the controller.

Sensor Control Unit

The Low Profile Web Guide is powered by the ARIS SCU5 controller. The controller can be mounted remotely from the web guide mechanism at a safe location (outside guard doors) that is easily accessible to the operator. Wall mounting brackets are provided on the controller for installation as shown in Fig. 9. M3 or M4 mounting screws may be used to securely mount controller. Do not drill any additional holes on the enclosure. Appropriate grounding methods should be followed to ground the metal enclosure to the earth ground for safe operation.



ARIS WPS Sensor Control Unit (All Dimensions are in mm)

Power Input

The ARIS Web Position Sensor operates under 24 VDC (± 5%) power with a maximum current of 3 Amps. There are two power port options available: (1) pre-wired or (2) power jack connector.

Prewiring

In the pre-wired option, the unit may come with a 2.5 meter long power cable (through a gland nut) for the customer to connect to an appropriately grounded 24 VDC power source. There are three conductors in the power cable. The red colored conductor is the 24V power, the black colored conductor is the DC return or electronic circuit ground, and the white colored conductor is the earth ground or PE. For safety and for normal operation, the ARIS web sensing system, the equipment to which the sensor is installed must be properly grounded.

Switchcraft DC Connector

Sealed Switchcraft L712AS power jack port option is available on the SCU. A mating Switchcraft 761KS12 plug connector or a pre-assembled Switchcraft CARA761KS07984 or a pre-assembled Switchcraft CA761KS07984 can be used to supply power. For the plug connector the 24 VDC power should be supplied

to the tip/center pin and electronic ground on the sleeve pin. For the cable assembly the 24 VDC should be connected to the red cable and the electronic ground connected to the black cable.

Industrial DIN Rail Power Supply

Industrial DIN rail mountable power supply such as Mean Well SDR-75-24 can be used to supply the 24VDC power. This is an available purchase option.

Grounding

For safety and for normal operation, the Low Profile Web Guide, the equipment to which the web guide is installed must be properly grounded. The controller should also be appropriately grounded. The metal enclosure surface or the mounting screws may be used to properly earth ground the controller.

WARNING: *Even though the mounting holes provide grounding of the Low Profile Web Guide, please use all possible options to safely earth the web guide. Improper grounding may result in static buildup that can potentially result in malfunction of the web guiding system.*

Desktop Adaptor

AC-DC desktop adaptor such as Mean Well GS90A24-P1M can be used to supply the 24VDC power. This is an available purchase option.

Sensor Ports

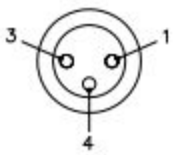
Two sensor ports labeled Sensor 1 and Sensor 2 have industry standard 12-pin M12 connectors to connect the 12-pin connector on the sensor cable. Either sensor ports can be used to connect the sensor(s) and the controller will automatically recognize the connection. The connectors are key and please do not force the connectors.

NOTE: *If two sensors are connected the web guide will automatically configure the appropriate guiding mode based on the sensor installation. If both the left and the right edge is seen by the sensor, the center guiding mode will be enabled. If both the sensors see the same edge of the web then an average of the sensor measurement will be used to guide the web.*

WARNING: *Only the sensors and cables provided by Roll-2-Roll Technologies LLC should be connected to the sensor ports. Third-party cables and sensors may damage the controller and will void warranty.*

Analog Output

Analog output from the module is available a 3-pin M8 connector. The pinouts for the connector is shown below.



1 = BROWN
3 = BLUE
4 = BLACK

Pin	Color	Signal
1	Brown	Voltage
3	Blue	Current
4	Black	Ground/Common

The outputs can be pre-programmed at the factory to any of the following available output options:

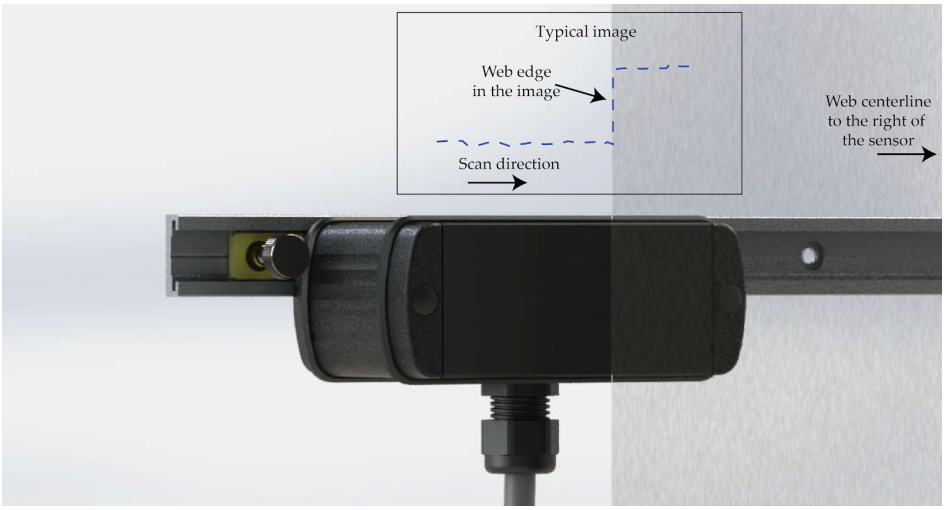
Voltage	Current
0 - 5 V, 0 - 10 V, ± 5 V, ± 10 V	4 - 20 mA, 0 - 20 mA, 0 - 24 mA

The analog output from the sensor depends on the sensor orientation, configuration and sensing mode.

Edge Sensing Applications

Left Sensor

In the left sensor orientation the digital signal processing algorithm will process the captured image from left to right to determined the first edge in the scan direction (left to right). The digital output of the edge position or the web position is the pixel where the edge transition is observed.



The analog output from the sensor will provide a signal proportional to the web edge position. Specifically the analog output is proportional to the portion of the image covered by the web. For example, with a left sensor orientation if the edge is located at the 569th pixels (with ARIS WPS 48), the analog output would be the percentage of sensor covered by the web multiplied by the output voltage range.

% of image covered by web = (N - P)/N; where P is edge location in pixels, N is the total number of pixels

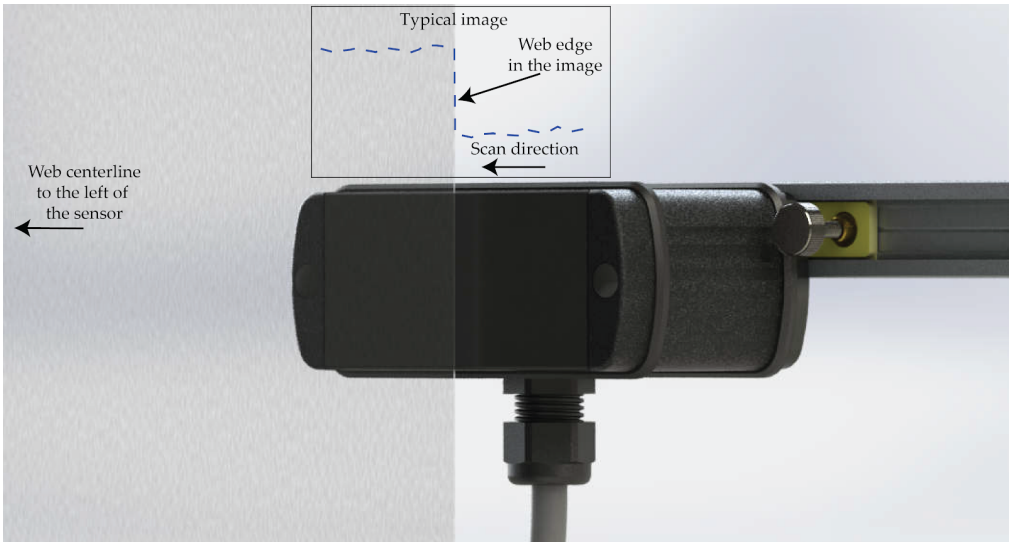
Analog output = 10*0.2591 V = 2.591 V

As the web moves from right to left the percentage of coverage by the web increases thereby the analog voltage output will also increase.

In the left sensor orientation the analog output will be zero when the web is completely outside the sensing window. As the web moves from right to left the analog output from the sensor increase proportionally to the percentage of the sensing window covered by the web. Note that the actual voltage or current output will depend on the analog voltage and current range setting in the controller.

Right Sensor

In the right sensor orientation the digital signal processing will process the image from right to left to determine the first edge in that scan direction (right to left).



The digital web position or the edge position is the pixel number at which the edge transition is seen. The corresponding analog output is proportional to the percentage of the sensing window covered by the web. For example, if the digital edge position is at 256th pixel (with ARIS WPS 48), the analog output is 33.33% of the output range or 3.333 V for a sensor with 0 to 10 V output range.

% of image covered by the web = P/N; where P is edge location in pixels, N is the total number of pixels

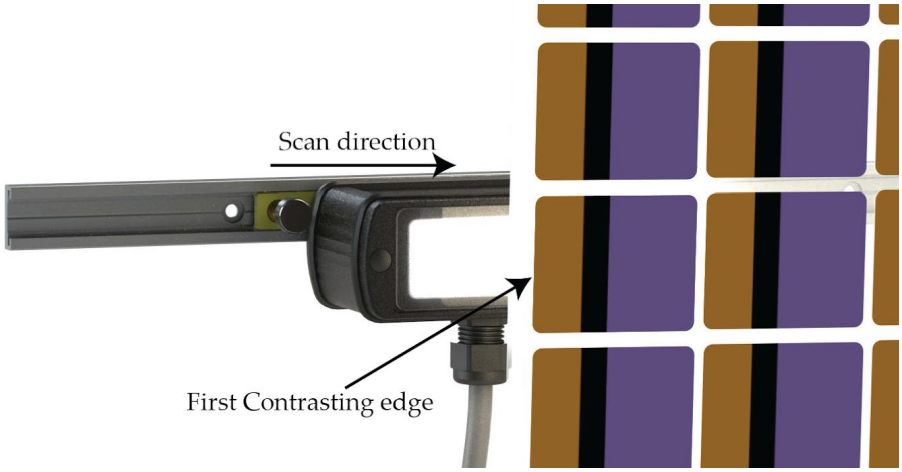
Analog output = 10*0.3333 V = 3.333 V.

In the right sensor orientation the analog output will be zero when the web is completely outside the sensing window. As the web moves from left to right the analog output from the sensor increase proportionally to the percentage of the sensing window covered by the web.

Note that the sensor determines the location of the first edge in the scan direction. Therefore, even the edge of porous and low density webs with voids can be detected with the ARIS WPS.

Contrast Position Sensing

Similar to edge sensing the contrast sensing algorithm determines the position of the first contrasting feature in the direction of scan. For a left sensor orientation the scan direction is from left to right and for right sensor orientation the scan direction is right to left. The intelligent digital signal processing algorithm automatically disregards the edge of the web during the scan and can detect a contrast transition from bright to dark or dark to bring color automatically.



The digital output of the sensor is the pixel number where the first contrasting edge transition is seen in the scan direction. While the analog output is the proportional position within the sensor sensing window where the contrast transition is seen. For example, if the digital position of the contrasting edge is located at 256th pixel then the analog output for a left sensor orientation would be 66.67% of the full scale analog output (with ARIS WPS 48). Note that the analog output is calculated in the same manner as in the edge sensing application.

When a contrasting edge is not seen then the digital output from the sensor is set to the total number of pixels while the analog output is set to zero. It has to be noted that with a digital output the sensor can provide information that can distinguish between (1) lack of contrast in the web and (2) absence of the web. This additional information can enable smart sensor applications especially with intermittent contrasting features on the web such as barcodes or intermittent contrasting features.

Web Width Measurement (Single Sensor)

Apart from measuring edge position the ARIS Web Position Sensor can also measure web width. The position of the two edges of the web material is used to determine the web width.
The digital output from the sensor provides the web width measurement in pixels. The digital number can be converted into physical units based on the pixel resolution.

The analog output from the sensor is proportional to the ratio of web width to the width of the sensing window. For example, if the digital output of the sensor is 200 pixels (with ARIS WPS 48) then the width in millimeters is:

web width = 200*.0635 = 12.7 mm

The corresponding analog output is:
analog output = (full-scale output)*(digital width measurement/total number of pixels) = 10*(200/768) = 2.604 V

Web Centerline Measurement (Single Sensor)

Apart from measuring edge position the ARIS Web Position Sensor can also measure web centerline based on the position of the two edges of the web material. The digital output from the sensor provides the web width measurement in pixels. The digital number can be converted into physical units based on the pixel resolution. The centerline position output is the average of the two edge position measurements.

Web Width Monitoring (Single Sensor)

Web width changes can be monitored in real-time for quality control purposes using the ARIS Web Position Sensor. An upper and a lower limit for web width can be set to generate a trigger signal. Whenever the web width goes above the upper limit or whenever the web width goes below the lower limit a corresponding trigger signal is output by the sensor. When the width is within the upper and lower limit tolerance the sensor output is zero.

The valid setting for analog output for width monitoring purposes are ± 10 V or ± 5 V. The analog output of the sensor is zero when the web width is within the upper and lower limits. Whenever the web width goes below the lower limit the negative full scale is output. Similarly when the web width goes above the upper limit the positive full scale is output from the sensor.

Web Width Measurement (Two Sensors)

If the width of the web is greater than the width of the sensing window, two sensors can be used in parallel to measure and monitor the web width (as shown later). By knowing the distance between the two sensors the actual web width can be determined.
The actual width = PL + PR + CD – N*R

- PL is the portion of the web covering the left sensor
- PR is the portion of the covering the right sensor
- CD is the center-to-center distance between the two sensors
- N is the number of pixels of the two sensors
- R is the pixel resolution

Note that once the sensors are installed securely CD is a constant that depends on the physical installation. PL and PR are the measurements from the sensor that change based on the actual web width changes. The digital output of the sensor is the sum PL + PR in pixels.
The analog output = (full-scale output range)*(PL + PR)/(2*N). For example, if the digital output is 890 pixels (with two ARIS WPS 48) the corresponding analog output is 10*(890)/(2*768) = 5.945 V.

Web Centerline Measurement (Two Sensors)

If the width of the web is greater than the width of the sensing window, two sensors can be used in parallel to measure and monitor the centerline of the web. The two sensors are mounted such that one sensor sees the left edge while the other sensor sees the right edge. The centerline output is the average of the two sensor measurements. It has to be noted that the two sensors should be positioned such that they are equidistant from the machine centerline so that the sensor output matches the actual centerline position.

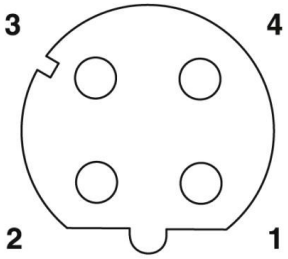
Web Width Monitoring (Two Sensors)

Two sensors in combination can also be used for width monitoring. With a lower and an upper limit set the sensor can output a positive full scale or a negative full scale based on the actual width. For example, if the nominal width is set to 890 pixels and the upper and lower limits are set to 20 pixels then if the web width goes below 870 pixels a negative full scale voltage is output and if the web width goes above 910 pixels then a positive full scale voltage is output. If the web width is between 870 and 910 then the output is held at 0 V.

Web Width Measurement and Monitoring with two sensors

Industrial Ethernet

An optional industrial ethernet connection to the ARIS SCU is available on certain models. A 4-pin D-coded M12 socket connect is provided for ethernet connection. Standard network cables such as Phoenix Contact NBC-MSD/ 1,0-93E/R4AC SCO - 1407360 or VS-MSD-IP20-93E/5,0 - 1403500 can be used to connect the ARIS SCU to an ethernet network using RJ45 plug.



4- Pin Industrial Ethernet Connector.

A set of input and output registers are available to monitor and control the ARIS SCU.

Sensor output registers

The output registers from the sensor provide information from the sensor. The data include status/fault information, sensor position information and sensor measurement quality information. The data from the sensor is organized in the following registers:

Register #	bit15	bit 14	bit 13	bit 12	bit 11	bit10	bit 9	bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit1	bit 0
0	Sensor 1 status/fault register															
1	Sensor 2 status/fault register															
2	Sensor 1 position output															
3	Sensor 2 position output															
4	Sensor 1 quality factor								Sensor 2 quality factor							
5	Ethernet Heartbeat Counter															

Status and fault registers

The sensor status/fault register is organized as follow. The eight least significant bits correspond to fault information while the eight most significant bits correspond to status information.

Bit #	Value	Label	Description
0	0/1	No sensor	0: if a sensor is present 1: if no sensor is connected
1	0/1	Low contrast	0: if measurement contrast is high 1: if measurement contrast is low
2	0/1	No web	0: if web is detected by the sensor 1: if the sensor cannot detect a web
3	0/1	Wrong orientation	0: if sensor orientation is correct 1: if the sensor see an edge in the opposite orientation to which it is set up
4	NA		Reserved for future use

5	0/1	Flutter	0: if no flutter is detected 1: if the sensor detects flutter or out of plane movement in the web
6-7	NA		Reserved for future use
8	0/1	Left Sensor	0: if the sensor not set as a left sensor 1: if the sensor is set as a left sensor
9	0/1	Right Sensor	0: if the sensor not set as a right sensor 1: if the sensor is set as a right sensor
10-12	0-4	Number of pixels	The number of pixels in the sensor 0: 256 1: 768 2: 1774
13-15	0/2	Sensing mode	0: edge sensing mode 2: contrast position sensing mode

Note: If both the left sensor and the right sensor bits are set then the configuration corresponds to center sensor mode. For wide sensors (such as ARIS WPS 221) a single sensor may be used to measure the position of the two edges of the web, if the width of the web is smaller than the sensing window of the sensor.

Sensor position output register

The sensor position output register provides the absolute measurement in pixels. The output ranges from 0 to number of pixels in the sensor, and depending on the sensor orientation the output corresponds to edge position or contrast position. In order to convert the position into a physical unit, such as millimeters or inches, the sensor resolution and the total pixel number of the sensor head are necessary. The following table provides a summary of the resolution and pixel count information for the different ARIS WPS models.

Model	Resolution	Total Pixel Count
ARIS WPS 16	0.0635 mm or 0.0025 in	256
ARIS WPS 48	0.0635 mm or 0.0025 in	768

ARIS WPS 221	0.125 mm or 0.005 in	1774

In either sensor orientation (left or right) the measured position increases as the web moves from left to right.

Note: The output when the web completely covers the sensor or when the web is completely outside the sensor window would be different based on the sensor orientation.

Sensor Orientation	Completely open	Fully covered
Left sensor orientation	Number of pixels	0
Right sensor orientation	0	Number of pixels

If no sensor is present then the value in the sensor position output register is meaningless.

With a wide sensor (such as ARIS WPS 221) center guiding with one sensor is possible if the width of the web is smaller than the sensing window of the sensor. When a single sensor acts as center sensor both the left and the right edge will be output via the industrial ethernet option. Irrespective of the sensor number the output for the left edge of the web is always available at the Sensor 1 position output register and the right edge of the web is available at the Sensor 2 position output register.

Note: If two sensors are connected and both are in center sensor mode the Sensor 1 position output and Sensor 2 position output will always correspond to the left and the right edge of the web seen by Sensor 1. Likewise for guiding purposes, the web guide will guide to the center of the web as measured by Sensor 1. The Sensor 2 output will be disregarded.

Quality factor registers

The quality of the sensor measurement from the two sensors are provided in register 4. Higher number corresponds to good quality measurement while a low number indicates lower quality. The value of the quality factor ranges from 0 to 256. The eight most significant bits of register 4 corresponds to the 8-bits quality factor from sensor 1 while the eight least significant bits corresponds to the quality factor of sensor 2.

Ethernet Heartbeat Counter

A 16-bit counter is available as a heartbeat to ensure functionality and communication between the sensor control unit and the PLC. The 16-bit unsigned integer is update by the controller every 20 ms and the value is sent over the Ethernet to the PLC. If the value of the counter stops updating then either the Ethernet connection is lost or the controller is frozen.

Sensor input registers

Sensor input registers are control registers that are used to control/configure the parameters of each sensor. One 16-bit command register for each sensor is available for an external device to set the sensor parameters. The input registers are mapped as shown below:

Register #	bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
0	Sensor 1 command register															
1	Sensor 2 command register															

The bits in the command register are organized as follow:

Bit #	Value	Label	Description
0-2	0, 2 or 3	Sensor orientation	0: set sensor orientation to be right sensor 2: set sensor orientation to be left sensor 3: set sensor orientation to be center sensor
3	0/1	Sensing mode	0: set the sensing mode to be edge mode 1: set the sensing mode to be contrast mode
4-6	0-6	Analog mode	0: Analog output is disabled. 1: Analog output is enabled and zero scale voltage/current is output. Note: This mode can be using during calibration while connecting the controller to a third-party controller that requires calibration. During the calibration, this mode can be selected to calibrate for zero scale output. 2: Analog output is enabled and full scale voltage/current is output. Note: This mode can be using during calibration while connecting the controller to a third-party controller that requires calibration. During the calibration, this mode can be selected to calibrate for full scale output. 3: Analog output is enabled and the analog output corresponds to the left edge position. Note: When the sensor is uncovered by the web the zero scale analog value would be output. As the web moves left to cover the web, the analog value would increase and reach the full scale value when the web completely covers the sensor. 4: Analog output is enabled and the right edge position is output. Note: When the sensor is uncovered by the web the zero scale analog value would be output. As the web moves right to cover the web, the analog value would increase and reach the full scale value when the web completely covers the sensor. 5: Analog output is enabled and the center line position is output. The centerline position is the average of the left and the right edge position of the web. Note: If only one edge is seen the output would be the average of the edge position within the window and the extreme position corresponding to the unseen edge.

			6: Analog output is enabled and the percentage coverage of the web is output. Note: There is only one analog output while two sensors can be connected to the controller. Please be aware that enabling the analog output for the sensors would result in unpredictable results. Always disable one sensor while selecting the output of the other sensor. Note: If the sensor orientation is left sensor or right sensor then the analog mode selection value of 3 - 6 will have no effect. The analog output would always correspond to the respective orientation. Note: The analog mode 2 has the highest priority followed by mode 1. If any one of the sensors have these bits enabled then the analog output will always provide the high or low output based on the priority. Always disable one sensor while selecting the output for the other sensor.
7	0/1	Find sensor	0: Disable find sensor operation 1: Enable find sensor operation by resetting the orientation and allowing the sensor to detect the web orientation. Note: This bit is momentary when set to one. Every time the find sensor operation needs to be enabled the bit needs to be cleared to zero before setting it to one.
8-15	0-255	Minimum contrast	Minimum contrast: Minimum contrast required to accept an edge in contrast mode Default value is 50.

Commissioning

The ARIS Web Position Sensor is real plug-and-play system. The following section describes the steps and conditions required for automatic operation of the ARIS Web Position Sensor.

1. Connect the sensor cable to the 12 pin M12 connector to the sensor controller unit.
2. Power ON the unit.
3. From the factory the sensor is always configured to either left or right sensor orientation.
4. If sensor configuration needs to be changed, unplug the sensor cable (while the power is ON) and position the sensor such that the web is in the middle of the sensor window for the appropriate configuration.
5. Plug the sensor cable into the 12 pin M12 connector. The sensor will automatically detect the correct configuration.
6. If an operator interface is available then the find sensor button can be used to automatically detect the correct configuration without unplugging the sensor cable.
7. If the industrial ethernet is available, the the orientation of the sensor can be forced through the industrial ethernet communication option.

A sensor configured for one configuration will not work properly for the other configuration.

General Maintenance

The ARIS Web Position Sensor is virtually maintenance free. However, the sensor lid can be cleaned to remove any dust particles that might accumulate on the surface.

- You may use any lens cleaning solutions available in the market.
- Do not use use petroleum based products as these can damage the sensor cover and affect its performance.

This cleaning can be done as part of a weekly maintenance schedule.

TROUBLESHOOTING

Problem	Probable Cause	Action
Sensor indicator does not light up and the sensor does not find the web.	Background or faulty sensor cable or connection.	* Ensure that the background in the field of view of the sensor is dark. Any bright surfaces may reduce the contrast levels and can prevent automatic find sensor operations. * Ensure that the sensor cable is properly connected. Disconnect the cable and reconnect it and use the find sensor button procedure. * If that does not fix the problem try a different sensor head. * If that does not fix the problem please call support.
The touch screen does not work and the communication indicator is not blinking.	Communication between the electronic hardware and the operator interface is lost.	Power cycle the web guiding system to see if the communication is reestablished. If that does not fix the problem please call support.

APPLICABLE MODELS

Sensor Head

Model Number	Description	Part Number
ARIS WPS 16-IR	Light source: Infrared; Width: 16 mm	3-000011
ARIS WPS 16-WL	Light source: White light; Width: 16 mm	3-000021
ARIS WPS 48-IR	Light source: Infrared; Width: 48 mm	3-000012
ARIS WPS 48-WL	Light source: White light; Width: 48 mm	3-000022
ARIS WPS 48-UV	Light source: Ultraviolet; Width: 48 mm	3-000032
ARIS WPS 221-IR	Light source: Infrared; Width: 221 mm	3-000014
ARIS WPS 221-WL	Light source: White light; Width: 221 mm	3-000016

Sensor Control Unit

Model Number	Description	Part Number
ARIS SCU5	Stand alone basic controller with analog output	4-100222
ARIS SCU5 D	Basic controller + integrated touch screen display	4-100221
ARIS SCU5 C(E)	Basic controller + industrial ethernet (Ethernet/IP)	4-100212
ARIS SCU5 C(P)	Basic controller + industrial ethernet (PROFINET)	4-101212
ARIS SCU5 C(E)D	Basic controller +Ethernet/IP + integrated touchscreen display	4-100211
ARIS SCU5 C(P)D	Basic controller +PROFINET + integrated touchscreen display	4-101211

TECHNICAL SUPPORT AND SERVICE

Contact information

Roll-2-Roll Technologies LLC is dedicated to providing exceptional service and support to its customers. Please feel free to contact us for any technical support, installation support and service requirements.

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Technical Support Email: engineering@r2r-tech.com
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Return shipping instructions

Please contact us to obtain a return merchandise authorization (RMA) number before returning the product to us. If returning the product please follow the instructions on the RMA form for quick and efficient service.

REVISION HISTORY

Document Revision

Version	Date	Author	Description
1.0	Nov 2015	AS	Initial Release Version
1.1	Jan 2016	AS	RS485/Modbus RTU Protocol
1.2	May 2016	AS	Added analog output and modified SCU dimensions
2.0	Dec 2016	AS, CB	Additional cable options, sensor digital I/O options.
2.4	Jun 2017	AS	Updated the documentation for new hardware and firmware
2.4a	Dec 2017	AS	Updated for new registers for Ethernet communication.

Hardware Revision

Version	Date	Description
SCU V2	Dec 2014	Initial version with 12 VDC input
SCU V3	Jun 2015	Expanded version with 24 VDC input
SCU V4 Rev B	Oct 2015	Two sensor option, WDT, RTCC
SCU V4 Rev C	Mar 2016	Analog Output
SCU V4 Rev D	July 2016	Industrial ethernet option
SCU5	May 2017	Updated hardware with smaller form factor
SCU5 Rev B	Nov 2017	Minor hardware changes
SCU5 Rev C	Dec 2017	Hardware changes with new LCD connector and ESD improvements

Firmware Revision

Version	Date	Description
1.0	Jan 2015	Initial version, single sensor
1.1	Aug 2015	Firmware update for SCU V3, automatic sensor state detection
1.2	Nov 2015	Firmware update for SCU V4 Rev B. Modified sensor algorithm to increase precision and accuracy
1.3	Dec 2015	Two sensor option with automatic pixel detection
1.4	Mar 2016	Background suppression algorithm

1.5	Apr 2016	Analog output
2.1a	Aug 2016	Firmware update for SUC Rev4 D
2.2b	Dec 2016	Ethernet/IP implicit messaging, edge detection algorithm updates
2.4a	May 2017	Updates to edge detection algorithm and industrial ethernet capabilities
2.4a	Dec 2017	Updates to the industrial ethernet capabilities

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