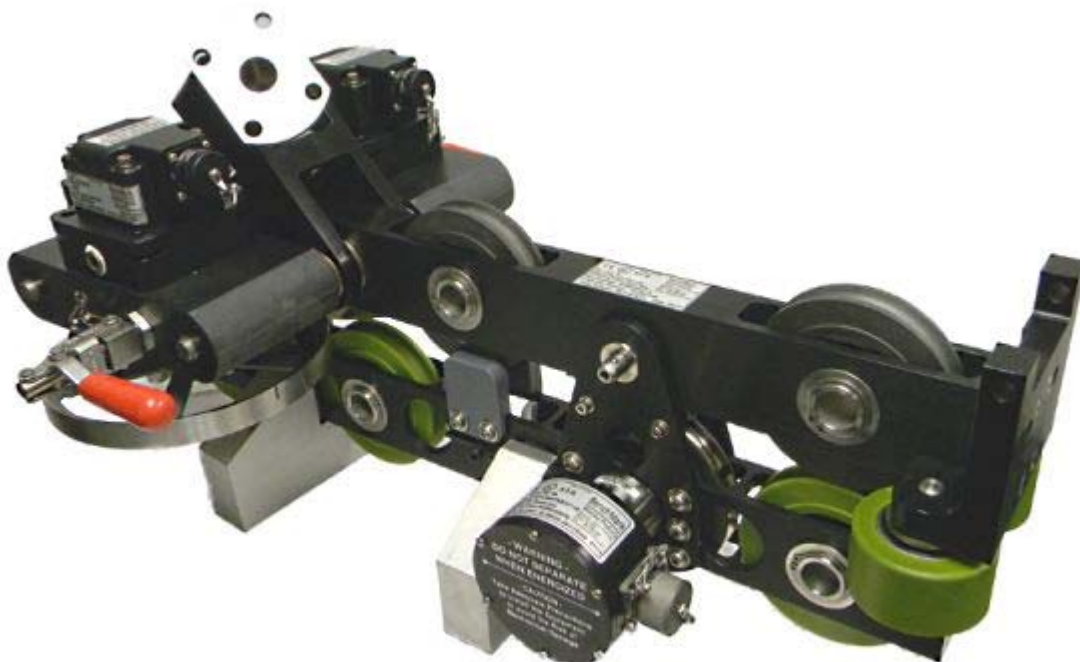


AM5K COMBINED DEPTH/TENSION MEASUREMENT DEVICE ATEX ZONE 2 CE

HALLIBURTON ENERGY SERVICES CONFIGURATIONS

- **AM5KA512 one encoder, no MMD (CH) SAP # 101321352**
- **AM5KA507 dual encoders, MMD (OH) Zone 2 SAP # 101281049**
- **AM5KA524 dual encoders, no MMD (CH)**
- **AM5KA529 dual encoders, no MMD (CH) Zone 2 SAP # 101286954**



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- 1.0 GENERAL**
- 2.0 SYSTEM DESCRIPTION**
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Manual Revision Log

Revision R - Jun 2010

Page 12	Added contact information for customer support
Pages 24-27	Added Options and Accessories section
Pages 43-48	Added new ATEX Zone 2 Certificates Updated parts lists and numbers

1.0 GENERAL

The AM5K Wireline Measuring Device is a compact and lightweight device for measuring both wireline depth and tension. The device is designed to be mounted to the spooling arm of a wireline unit. It is unique to other measuring devices in that it measures both depth and tension on wireline cables from .190" to .494". This device will work on both open and cased hole wireline units which allows standardization on a measuring head for all types of operations.

FEATURES AND BENEFITS:

- **Straight-line measurement** - (cable sizes can be changed without affecting depth measurement)
- **Dual Tangential Measuring Wheels** - made from specially hardened steel
- **Accepts cable sizes** - from .190" to .494" diameter (4.8 mm to 12.55 mm)
- **Optional guide wheels** - available for wirelines upto .650" diameter
- **Lightweight design with integral tension** - makes for easier high angle rigup
- **Device opens up** - to provide easy cable installation and removal, by removing a single pin
- **Includes both horizontal and vertical guide rollers** - to minimize measuring wheel loading
- **Rollers are oversized** - to increase reliability and reduce maintenance
- **Guide rollers are made from composite material** - to reduce weight and cable wear
- **Rear or Center spooling arm mount** - to minimize head "jerking"
- **Tension Load Axle and amplifier** - can be configured for different outputs.
- **Digital Magnetic Mark Detector**
- **Accepts single or dual encoders**
- **Supports fully independent backup depth measuring system** - using a magnetic pickup
- **Backup depth system** - reduces drag on measuring wheel by eliminating mechanical drive cable
- **Encoder, Mark Detector, and Tension amplifier** - certified for Zone II area use
- **Anodized aluminum frame** - All steel parts are plated or SST
- **All bearings are SST**

2.0 SYSTEM DESCRIPTION

DEPTH MEASUREMENT:

The AM5K Measuring Head uses dual spring-loaded measuring wheels to measure the amount of wireline moving to and from the borehole. The measuring wheels are coupled to one or two optical encoders that transmit electrical signals via a cable to the hoistman's panel and/or logging computer. An independently powered magnetic encoder is used for back up depth indication.

The hardened measuring wheels are 2.0000 ft. (.609600 m) in circumference. Springs are used to hold the measuring wheels in contact with the wireline. The springs are sized to provide the appropriate friction between the wheels and wireline. The frame members are anodized 6061-T6 aluminum.

Under ideal conditions, without magnetic marks, the measuring heads have an accuracy of +/- 3 m in 3000 m (10 ft in 10,000 ft.). With magnetic marks and accurate line stretch calculations, an accuracy of .3 m in 3000 m (1 ft in 10,000 ft) can be achieved. The Hoistman's panel is required to fully utilize the mark detection and stretch correction algorithms.

TENSION MEASUREMENT:

The AM5K uses an electronic load axle to measure line tension. Three wheels are used to create a force on the load axle. To generate this force the wheel mounted on the load axle is offset from the other two slightly. This offset creates a slight bend in the cable.

As wireline tension increases the small offset creates a corresponding bending force on the strain-gauged load axle. An electronic signal is transmitted via cable to the hoistman's panel and/or logging computer representing wireline tension. A calibrate resistor is included in the load pin to send out a signal to calibrate the computer system.

GENERAL SPECIFICATIONS:

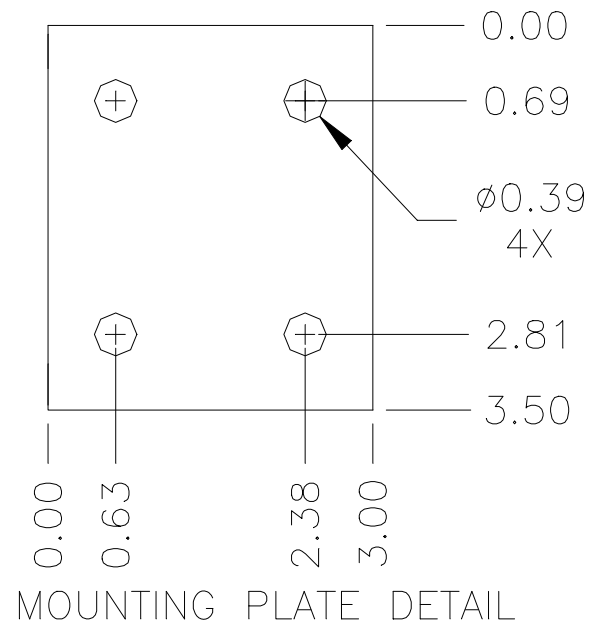
WEIGHT:	58 lbs	26.3 kg
LENGTH:	26.5"	673 mm
HEIGHT:	10.8"	274 mm
WIDTH:	15.3"	389 mm
MAXIMUM TENSION:	20,000 lbs	9072 kg
MEASURING WHEEL SIZE:	24.000"	609.60 mm
CABLE SIZES:	.190" to .494"	4.8 mm to 12.55mm
CABLE BEND OVER TENSION WHEEL:	2.5 – 7.5 degrees (depends on cable) Minimal or no affects on magnetic marks	

3.0 OPERATION

3.1 SPOOLING ARM INSTALLATION – OVERHEAD SPOOLING ARM

Take Adequate Precautions when installing the Measuring Head to Avoid the Risk of Mechanical Damage

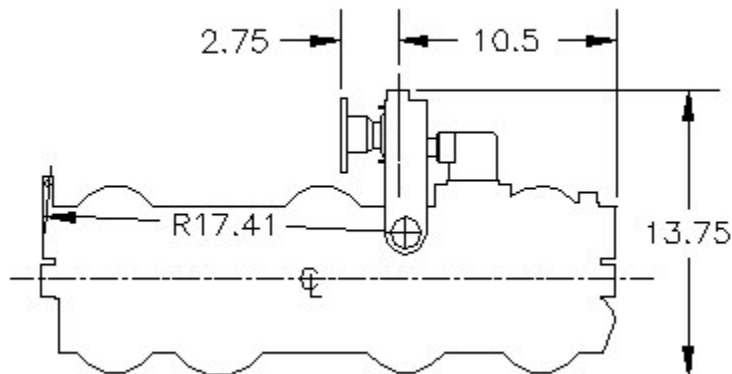
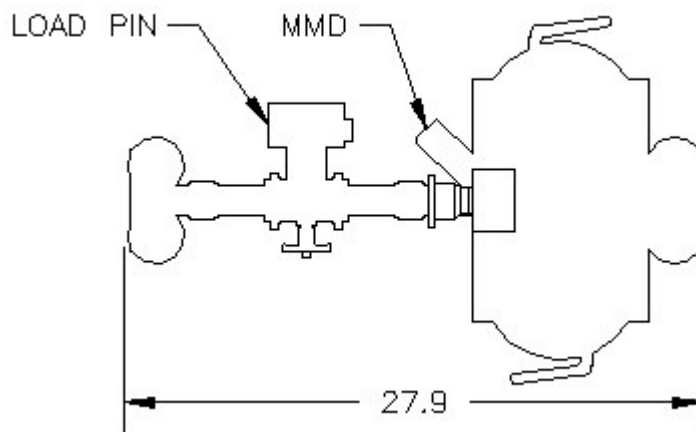
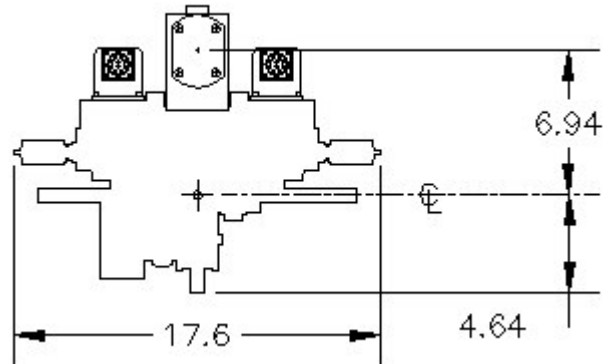
Install the measuring head on to the spooling arm by using the top adapter mount assembly to mount to an overhead spooling arm. The mount is designed to mount with a standard U-joint yoke.





MOUNTING YOKE

Make sure that the head can freely sit on the wireline. If the mounting arrangement will not let the head travel up and down freely and if the cable puts an upward or downward force on the measuring head, this force will cause an offset to the tension measurement which will result in an incorrect tension reading.



3.2 CABLE INSTALLATION

To install cable, first open the wheels by shifting the red release handles.

Next, remove the push pin, and hinge the head open.

Lifting up on the wireline cable makes it easier to remove the push pin.



The cable can now be inserted or removed.

Close the red release handles to tighten the wheels against the wireline.

Swing the head closed and reinsert the pin.

3.3 CABLE REMOVAL UNDER LOAD

3.3.1 If under load, the load will need to be removed from the device prior to removing the retaining pin. A "C-clamp" or a nylon "ratchet strap" can be used to remove the load.

3.3.2 Install a C-Clamp across the top and bottom frames as shown in the drawing below. The ratchet strap can be installed in a similar way.

3.3.3 Tighten the C Clamp until the load is removed from the retaining pin. Remove the retaining pin then loosen and remove the C Clamp.

3.4 CHANGING CONFIGURATION BETWEEN OPEN HOLE AND CASED HOLE

A measuring head configured for open hole will typically contain a magnetic mark detector and a 2nd encoder. Cased hole operations rarely require a magnetic mark detector and typically use only one encoder.

If the head is configured for open hole, no changes are required to run it on a cased hole unit. You may elect to remove the magnetic mark detector if you have no plans to use the head on an open hole unit any time in the near future.

The cased hole head can be configured with a different wear plate. The cased hole wear plate is thicker and stepped on one end to keep the line from riding near the top of the wheels. This can occur when going in the hole with a small cable (7/32") with a very light load. The open hole wear plate is flat. Both plates are made from hardened tool steel. The wear plate is mounted on the upper frame above the measure wheels.

Part number for the open hole wear plate is: AM5KM034

Part number for the cased hole wear plate is: AM5KM074

3.4.1 To remove the magnetic mark detector, refer to item 12 of drawing 6.2. Remove the four screws holding the detector in place then remove the detector. To install a magnetic mark detector, reverse this procedure.

3.4.2 To remove an encoder, remove the four screws securing the encoder adapter to the head. Remove the encoder and adapter. Remove the coupling from the measuring wheel shaft.

3.5 INSTALLING THE DEEP GROOVED TENSION WHEEL

3.5.1 A deep grooved "High Tension" wheel is available for use when line tension greater than 12,000 lbs is commonly encountered. This wheel is grooved to better support the wireline at high tensions. The groove also reduces the radius of the wheel which lowers the bend angle of the wireline. This wheel is only for use with 15/32" or larger cables and cannot be used with smaller cable sizes.

The normal shallow grooved wheel can be used at high loads for short pull durations but should not be used when loads exceed 12,000 lbs for an extended period of time.



DEEP GROOVED HIGH TENSION WHEEL



STANDARD SHALLOW GROOVED TENSION WHEEL

3.5.2 To install the deep grooved tension wheel, replace the standard shallow grooved tension wheel with the deep grooved tension wheel. The load pin does not need to be changed. To account for the decreased bend angle of the cable, the Load Cell Angle value will need to be changed when using this wheel (refer to page 11). The SDDP calibrate value should remain at 3250.

Ensure that the slot in the bushing of the tension wheel is aligned with the roll pin on the side of the frame. The roll pin is only installed on one side of the frame and it needs to be inserted in the slot.

Also ensure that the grease hole in the tension wheel is installed on the opposite side as the load pin amplifier.

3.6 SYSTEM OPERATION

3.6.1 Determine cable size to be used – .490" to .190". Since the wireline cable actually bends over the tension wheel, the bend radius of the wireline cable will affect the tension measurement.

3.6.2 Enter tension calibrate factor. These corrections are automatically made in the WSDP Hoistman's panel by selecting the proper cable size from the menu. If a different panel is used, enter the tension factor at this time.

SDDP Calibrate Values:	VALUES	CABLE SIZE
	3250	15/32" through .472"
	3480	7/16"
	4171	3/8"
	4656	5/16"
	4808	9/32"
	6187	7/32"

"Comprobe" Calibrate Values:	VALUES	CABLE SIZE
	10000	15/32" through .472"
	10700	7/16"
	12800	3/8"
	14300	5/16"
	14800	9/32"
	19000	7/32"

SDDP-A or SDDP-B Load Cell Angle

Standard Shallow Groove Tension Wheel = 0

.472 cable with Severe Load (Deep Groove) Tension Wheel = 131

.484 cable with Severe Load (Deep Groove) Tension Wheel = 128

.490 cable with Severe Load (Deep Groove) Tension Wheel = 125

Note: As the groove in the tension wheels wears deeper, the angle will decrease causing the output signal to decrease. To compensate for this the Load Cell Angle will need to be increased.

3.6.3 Install line in measuring head (refer to section 3.2).

3.6.4 Make sure line is lying slack and head is free to move. Press the Ten Zero Cal button and tension value should read 0.

3.6.5 Press the Ten Cal button and tension should read the value indicated in paragraph 3.6.2.

3.6.7 At this point, the system is ready to log. Watch for visual indications of problems such as excessive vibration, wheel or roller slippage or lockups that signify bearing or shaft failures, or cable tracking problems.

4.0 MAINTENANCE AND REPAIR

4.1 OBTAINING TECHNICAL ASSISTANCE

Call BenchMark Wireline Products Inc. at +1 281 346 4300
Or contact by email mail@benchmarkwireline.com
Or fax in request at +1 281 346 4301

Information in the form of user manuals and instructional videos are also available on our website www.benchmarkwireline.com

Parts can be ordered by email, phone, or fax

Equipment can be returned for repair and maintenance. Please notify us by Phone, email, or fax before sending any equipment.

To return equipment to BenchMark, ship it to:
BenchMark Wireline Products
36220 FM 1093
Simonton, Texas 77476
U.S.A.

4.2 PRE-JOB CHECK

Each time the system is used perform the following steps:

Verify that the AM5K is properly and securely attached to the spooling arm. Several different mounting kits are available for different types of spooling arms.

Verify that the depth measuring wheels are clean and that no groove has been worn into the measuring wheel surface. Check the measuring and guide wheels for looseness, play, out-of-roundness, worn or rough sounding bearings, or other mechanical conditions that could affect measurement accuracy. Ensure that the wheel bearings inner race is not spinning on the shaft and that the shaft is not spinning in the bushings.

Verify that all fasteners are tight and that the ball lock pushpin is secure. Verify that the encoder, electronic load pin, and backup counter cable are installed and properly routed. Verify that the depth system is working by turning the wheel and observing the hoistman's panel and backup display unit to indicate cable movement. The hoistman's panel and backup display should measure 2' for each rotation of the wheel. If more than one encoder is installed check both encoders by turning each wheel and verifying that the hoistman's panel will read 2' for each rotation of either wheel.

4.3 POST-JOB MAINTENANCE

At the completion of each job, thoroughly clean and dry the device as soon as possible. This avoids problems caused from borehole residues transferred from the wireline onto the measuring device. Borehole residues should be washed from the device with a cleaning solvent such as Varsol or an equivalent type. Rinse the device with water, dry, and wipe down with an oily rag.

Do not pressure wash

4.4 MONTHLY MAINTENANCE

Visually inspect the interiors of the electrical connectors for the encoders and electronic load axle for dirt and evidence of insulation breakdown. Clean or replace as necessary. Install dust caps on the connectors if the cables are removed.

Manually rotate each wheel by hand to verify its condition. Inspect the depth measuring wheels for signs of abnormal wear, diameter changes, or shaft/bearing play that can affect measurement accuracy. The wheel should be replaced if it is grooved more than .005". The wheel should be 7.639 / 7.640" (194 mm) in diameter with a 24" circumference (609.6 mm).

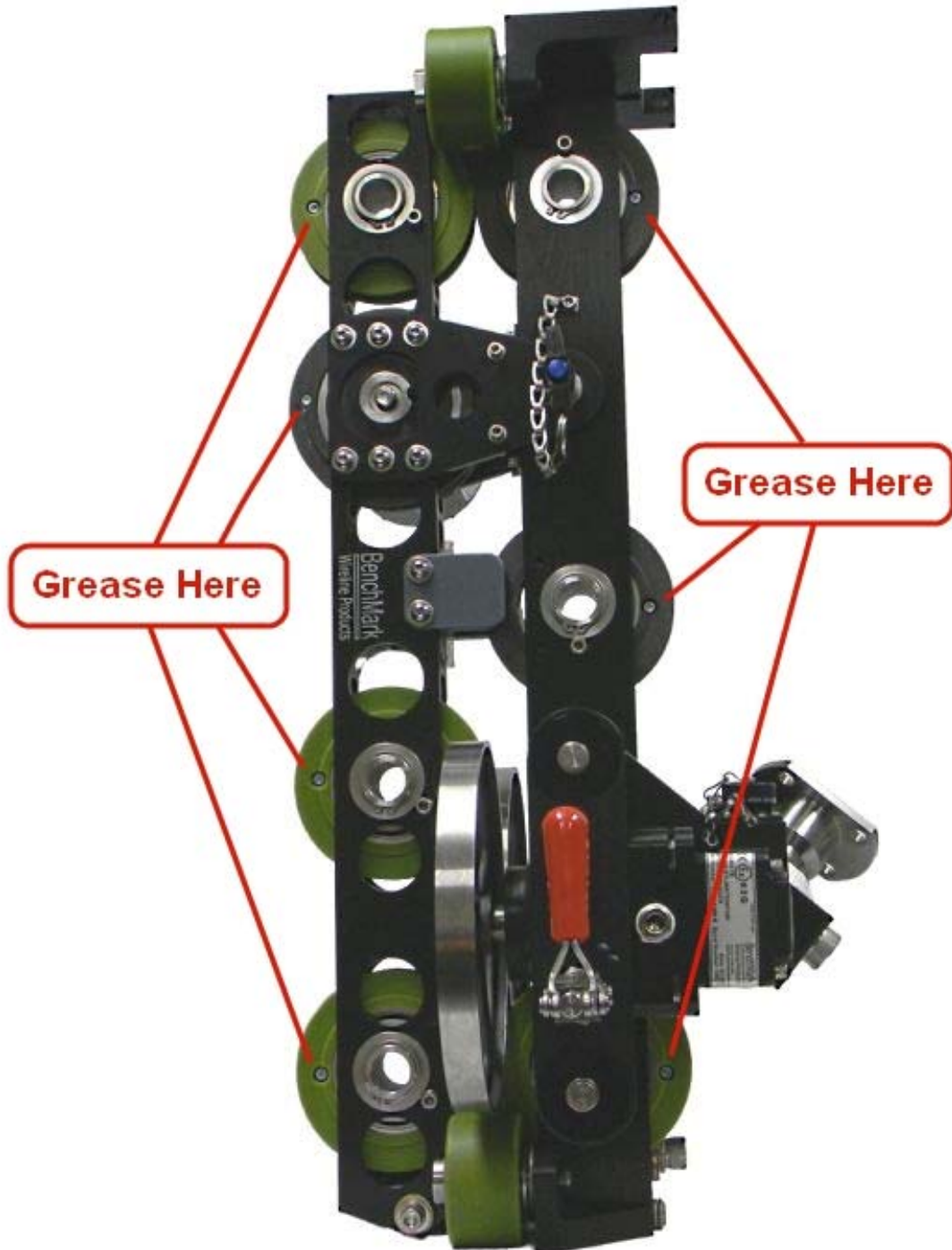
Inspect the tension wheel for signs of abnormal wear, diameter changes, or shaft and bearing play that could affect tension measurement accuracy. The shallow groove tension wheel (item 33 in section 6.1 of this manual) should be 5" in diameter at the bottom of the groove. It should be replaced if it is worn more than .010".

The deep grooved tension wheel (item 33 in section 6.1 of this manual) should be 4.375" in diameter at the bottom of groove. It should be replaced if it is worn more than .010".

Inspect the two grooved guide wheels on either side of the tension wheel (items 34 in section 6.1 of this manual). They should be 4" (101.6 mm) in diameter (bottom of groove). They should be replaced if they are worn more than .010".

NOTE: If the tension wheels or guide wheels mentioned above are worn more than .010" then the tension reading will be less than the actual line tension. The amount of error is relative to the amount of wear.

Grease all the wheels and bearings that are fitted with a flush mount grease fitting (see following diagram). Use a water-proof, marine grade grease. An inverted grease nozzle (p/n AM5KP130) is supplied with each head. This nozzle will fit any standard grease gun.



4.5 ASSEMBLY / DISASSEMBLY PROCEDURES

WARNING – DO NOT SEPARATE CONNECTORS WHEN ENERGIZED

4.5.1 MEASURING WHEEL, SHAFT, AND BEARING REMOVAL

Either measuring wheel can be removed from the measuring head. First shift the red release handle to move the wheel away from the frame. Next remove the encoder with its adapter.

On the later model heads, the wheels are keyed onto the shaft and can be removed simply by removing the screw holding the wheel to the shaft.

On earlier model heads, the wheels are pressed on to the shaft. The lower snap ring between the wheel and the bearing must first be removed. Pull the wheel and shaft from the mount. Reassemble in the opposite order. The bearing should also be replaced at this time.

4.5.2 ELECTRONIC LOAD PIN REMOVAL

The electronic load pin is held in place by one retaining ring on the outer end of its shaft. Remove the retaining ring by using a small screw driver to lift one end of the ring out of the groove then “walk” the ring off of the pin. The load pin can then be removed from the mounting frame.

4.5.3 BACKUP DEPTH MAGNETIC PICKUP REMOVAL AND INSTALLATION

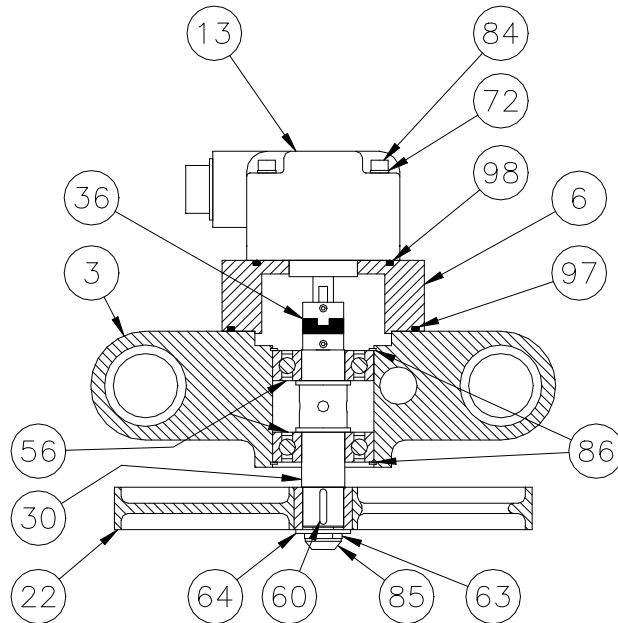
The backup depth magnetic pickup is mounted to the encoder adapter. It is held in place by four screws. Remove the screws and the pickup can then be removed. The pickup must be properly oriented to work correctly. The slot should be oriented to the top. The top side is the encoder side. Ensure that an o-ring is inserted between the plastic housing and the mount. An additional o-ring is used between the connector and the housing to keep moisture out.

If the backup display is counting backward (i.e. counting negative when going down hole), simply rotate the pickup 180 degrees to change the direction.

4.5.4 ENCODER COUPLING INSTALLATION

To install the encoder coupling, first remove the plug in the encoder adapter. Install one of the metal parts of the three piece coupling (item 36) to the wheel shaft and tighten it using a hex wrench. Next, install the center plastic piece of the coupling onto the wheel shaft coupling. Place the other metal coupling on the encoder shaft and set the encoder on the mount. Snug up the encoder coupling then remove the encoder and tighten the coupling.

Reinstall the encoder with o-rings (item 98) and tighten it to the encoder mount (item 6). Next tighten the plug.

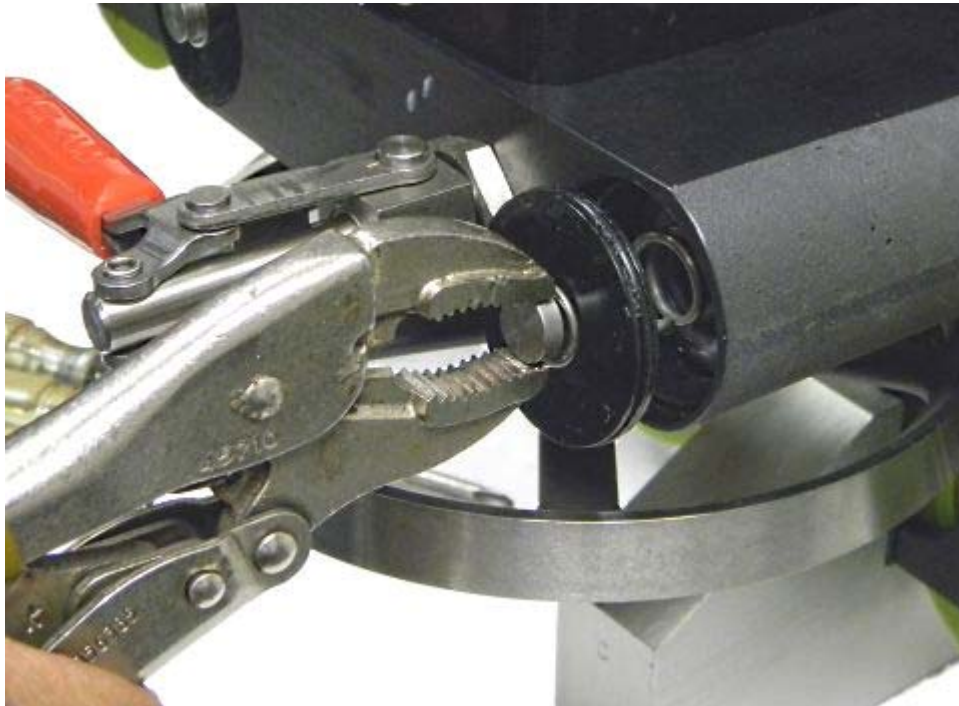


See Parts List in Section 8.1

4.5.5 ENCODER MOUNT REMOVAL

Follow these steps to remove the encoder mounts.

1. Using a pair of vice grips, grab the end of the pin and pull on it.



2. Use a screw driver to capture the end of the spring.



3. The end cap and the pin can now be removed.



- 4 Use a hook to pull the spring out far enough to remove the screwdriver (Careful not to bend the spring).



5. Remove the floating encoder assembly.



6. Repeat for the other side.

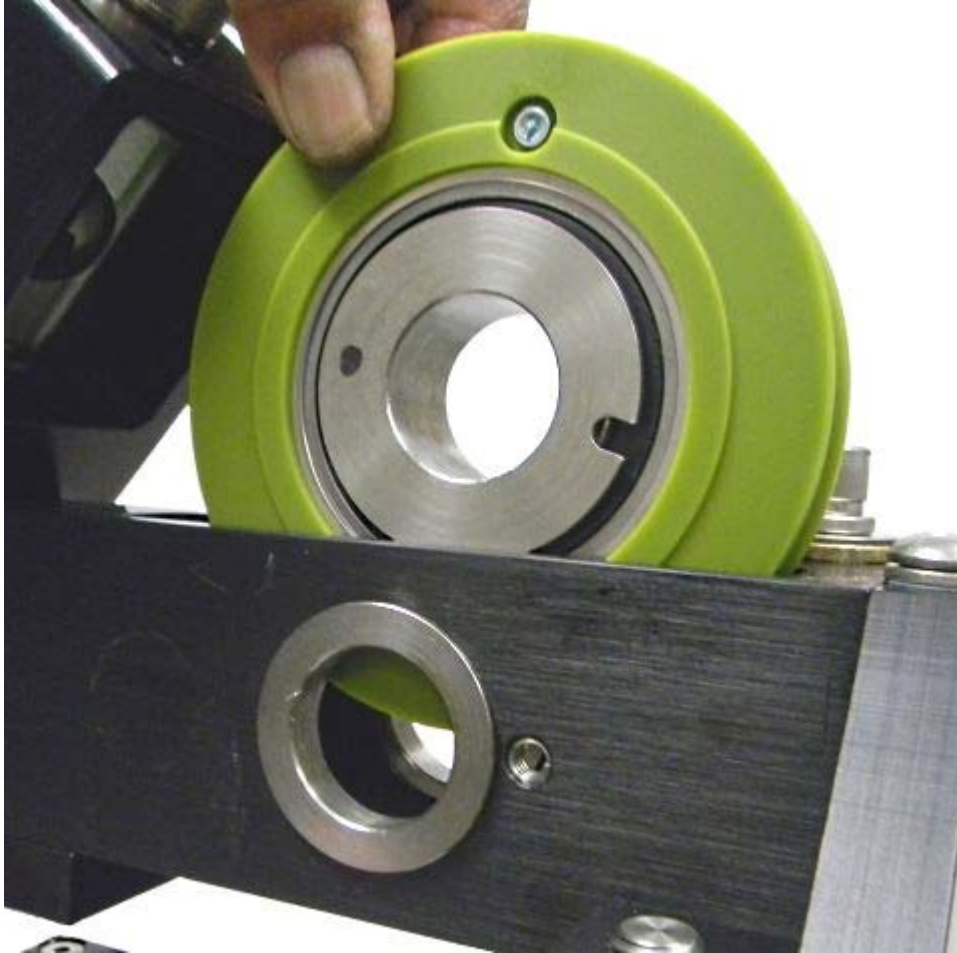
7. Remove anti-rotation screw (if equipped).



8. Remove snap ring and pull out sliding shaft.



9. Remove the wheel assembly.



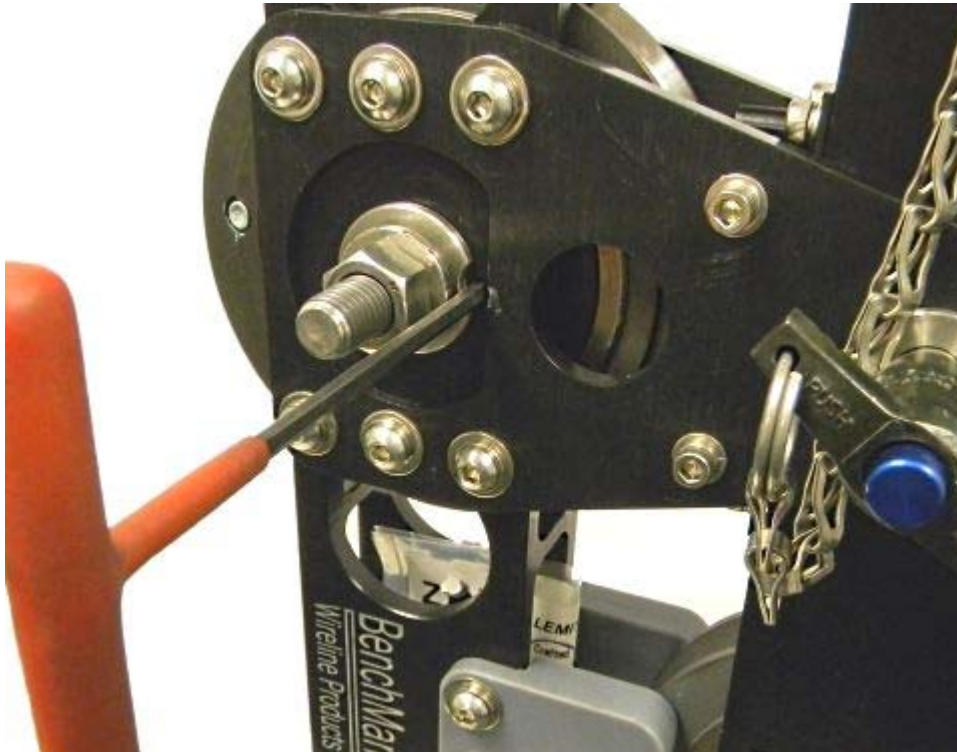
10. Re-assemble in reverse order making sure that slot in the bearing lines up with the anti rotation screw hole (if equipped).

4.5.6 INSTALLING THE LOAD AXLE WHEEL

1. Insert the tension wheel into the frame. Make sure the slotted hole in the tension wheel bushing is on the same side as the roll pin hole in the frame and the grease hole is on the opposite side.



2. Use a bolt in place of the load pin to hold it in place. Install an Allen wrench or other long tool to align the hole in the bearing with the slotted hole in the frame.



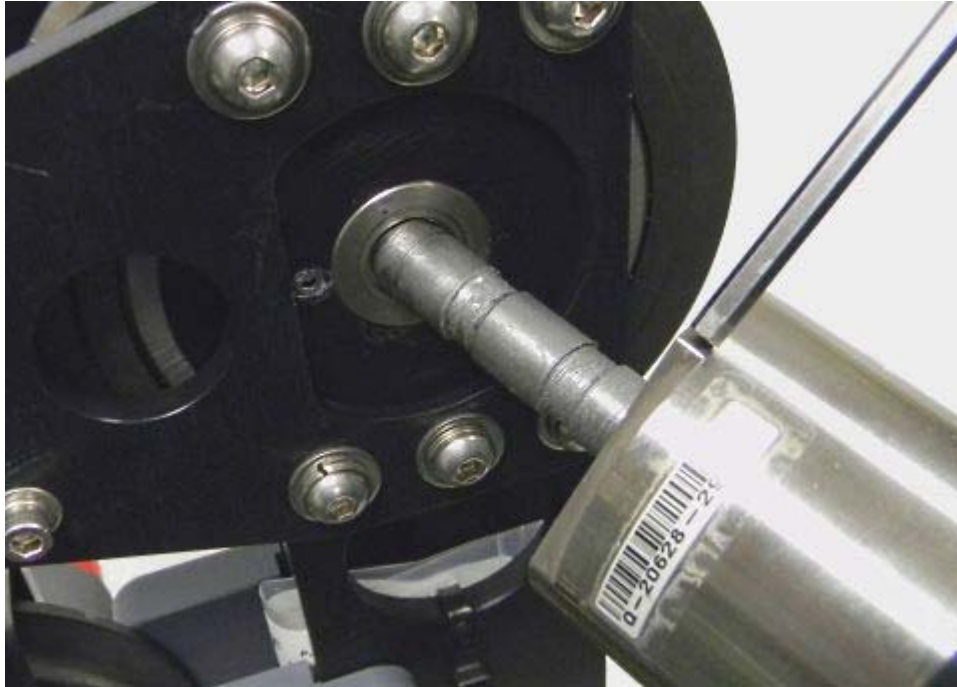
3. Insert a 3/16" x 1/2" long roll pin into the hole. Do not use a longer roll pin as it will bind the wheel.



4. Drive the roll pin flush. Make sure that the wheel can freely slide up and down in the frame.



5. Remove the bolt and install the load pin. Align the notch in the load pin with the flat side on the frame.



AFTER ASSEMBLY IS COMPLETE THE LOAD PIN SHOULD BE CONFIGURED AS SHOWN BELOW



5.0 OPTIONS AND ACCESSORIES

5.1 SHIPPING CASE AM5KM197

This case is designed to help easily transport the measuring head.

CUSTOM FOAM LINED FOR AM5K

RETRACTABLE HANDLE

ROLLER WHEELS

OUTSIDE DIMENSIONS: 31.5L X 22.88W X 18.88

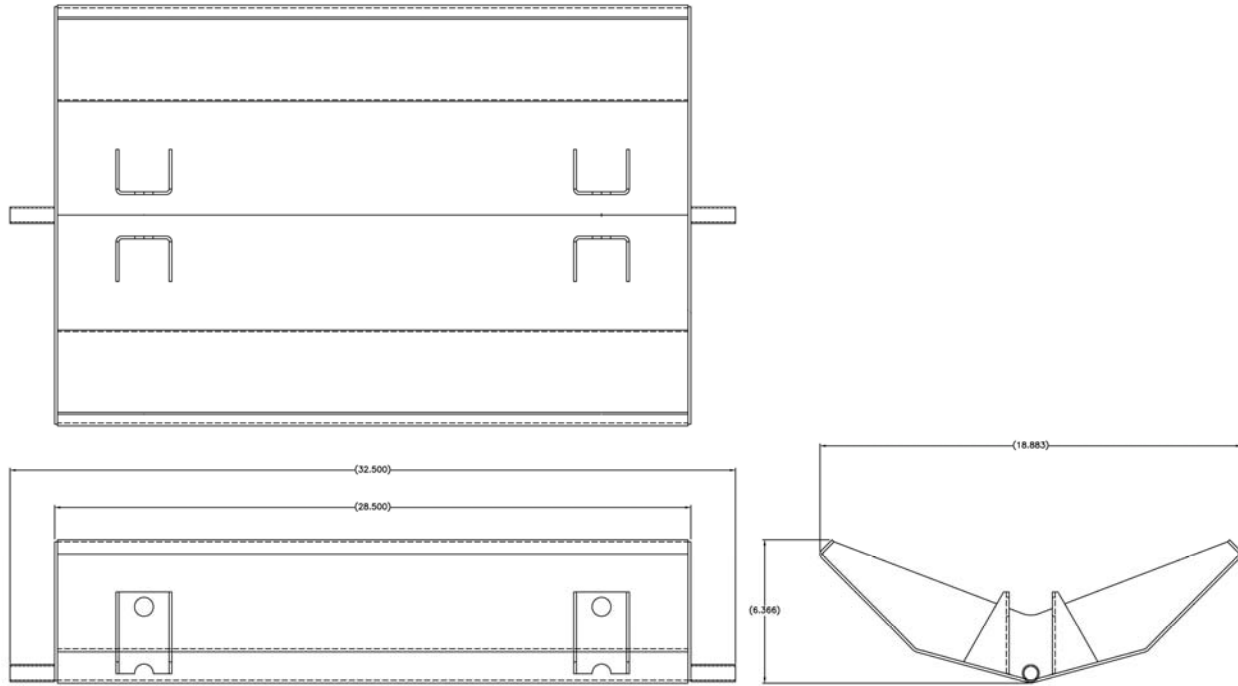




AM5K SHIPPING CASE

5.2 AM5KA090 DRIP PAN KIT

This drip pan will mount to the bottom of the AM5K measuring head. It is designed to capture fluids and debris that drip or fall from the measuring head. A hose is provided as a means to drain the pan into an external container.



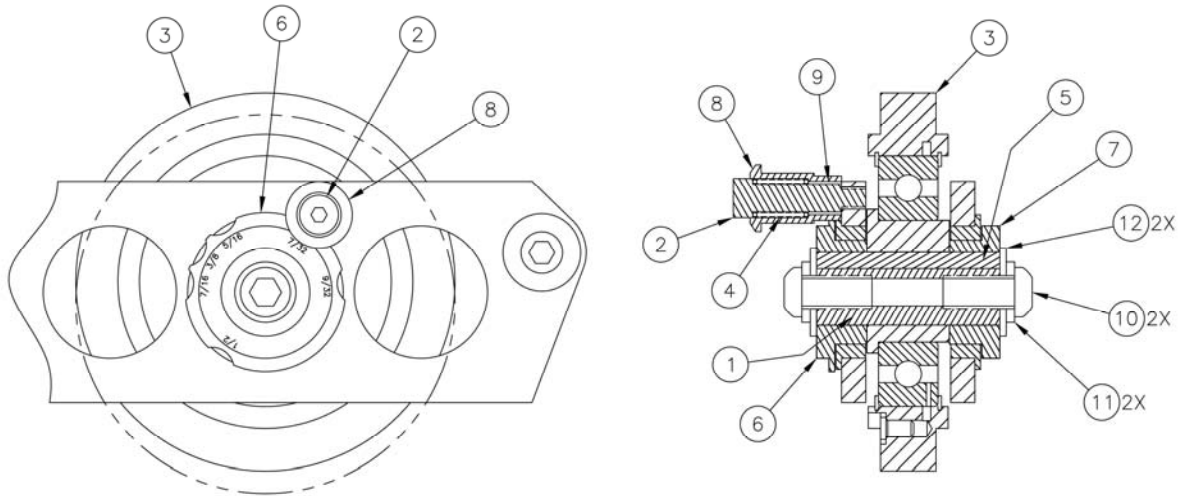
P/N	DESCRIPTION	QTY
AM5KM090	PAN DRIP ALUMINUM AM5K	1
AM5KM092	PIN CLEVIS 13/16 X 2-3/4 SST	2
AM5KP205	PIN HAIR 0.125 X 5/8-7/8 SST	4
AM5KP209	TEE 3/4 MALE PUSH-ON NYLON	1
AM5KP208	CLAMP HOSE 0.56-1.06 SST	5
AM5KP207	TBG PVC .75ID X 1.00OD CLEAR	12

5.3 AM5KA239 ADJUSTABLE GUIDE ROLLER KIT

This kit is designed to force smaller sizes of wireline to run straight across the measuring wheels. Large wirelines (7/16" or larger) are stiff enough so they will run straight but smaller lines such as 7/32" can walk up/down the measuring wheel if they are not under much tension. This can occur when running into the well with pressure through grease tubes. This will cause a depth error (less depth measured than actual) because any vertical movement of the wireline will not turn the measuring wheel as far as it should.

This roller is mounted on an adjustable cam shaft. The shaft can be turned to raise or lower the roller to press the wireline against the bottom of the groove in the upper guide roller. This assures that the wireline will run straight across the measuring wheels.





AM5KA239 ADJUSTABLE GUIDE WHEEL PARTS LIST

P/N	DESCRIPTION	ITEM	QTY
AM5KM231	SHAFT KEYED 3/4 ADJ RLR SST	1	1
AM5KM232	BOLT MOD SHOULDER 5/16 X 1 SST	2	1
AM5KA144	ASSY WHEEL GUIDE 4.266 SST	3	1
AM5KP234	SPRING COMP 7/8 OAL 0.42 OD	4	1
AM5KP235	KEY 3/16 SQUARE SST	5	2
AM5KM146	BUSHING INDEXED KEYED 30MM	6	1
AM5KM147	BUSHING 30MM KEYED 3/4 SHAFT	7	1
AM5KM148	COLLAR LATCH ADJ ROLLER SST	8	1
AM5KP236	BEARING BRZ .314 ID X .378 OD	9	1
AM5KP181	SCREW 3/8-16 X 3/4 BUTTON HD	10	2
AMS1P058	WASHER 3/8 LOCK SS	11	2
C276P513	WASHER 3/8 FLAT SST	12	2

5.4 550 WHEELS AM5KK550

This kit includes guide wheels and tension wheel that are grooved to fit wirelines from .500" up to .550" diameter.

The kit includes 6 steel guide wheels. It replaces the two steel guide wheels and four plastic guide wheels on the standard head. A new tension wheel is also included.

The tension "K" factor is different with this wheel.

<u>P/N</u>	<u>DESCRIPTION</u>	<u>QTY</u>
AM5KA091	ASSY WHEEL TENSN FIXD 35MM BRG	6
AM5KA095	ASSY WHEEL TENS 0.550 LOAD AXL	1

5.5 650 WHEELS AM5KK650

This kit includes guide wheels and tension wheel that are grooved to fit wirelines from .550" up to .650" diameter.


The kit includes 6 steel guide wheels. It replaces the two steel guide wheels and four plastic guide wheels on the standard head. A new tension wheel is also included.

The tension "K" factor is different with this wheel.

<u>P/N</u>	<u>DESCRIPTION</u>	<u>QTY</u>
AM5KA092	ASSY WHEEL TENSN FIXD 35MM BRG	6
AM5KA096	ASSY WHEEL TENS 0.650 LOAD AXL	1

6.0 CERTIFICATION DOCUMENTATION

6.1 MEASURING HEAD ATEX Conformity Certificate



ATEX Conformity Variation Certificate

Epsilon Certificate Number:
Epsilon 02ATEX1144/1

This certificate is issued for the following equipment:
5 Wheel Cable Measurement Device.
Inline Tension Device.

Manufactured and submitted by:
Kerr Measurement Systems, Inc.
6415 Reading Road
Rosenberg
Texas 77471
USA


The equipment shall be designed and constructed in accordance with the specification set out in the schedule herein and documents referred to therein.

This Certificate is issued subject to the conditions of Epsilon Compliance and any additional conditions as may be prescribed.

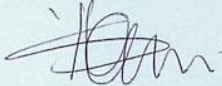
This Certificate does not imply that the equipment meets all statutory requirements in any particular industry or circumstance.

Directive/s:
ATEX Directive, 94/9/EC


Standard/s:
EN50021: 1999

Coding:
CE  EEx nA II T6


Project Number: ETS0412	Report Number: ETS(A)0412/B/1
Issue Date: 01 November 2004	On Behalf of Epsilon Compliance



S L D'Henin
Certification Manager




This certificate may only be used in its entirety and without change



Epsilon Compliance (UK),
Drury Lane, Drury, Buckley, CH7 3DU, UK.
Telephone: +44(0)1244 541551
Fax: +44(0)1244 543888

1/2

6.2 MEASURING HEAD ATEX Conformity Certificate – Sheet 1



ATEX Variation Conformity Certificate Schedule

Epsilon Certificate Number:
Epsilon 04ATEX1144/1

Variation 1 Description:
The 5 wheel measuring device range is extended to include the following versions:

- 512/780PPR 0-1.5V
- 2X1200PPR MS16 0-1.5V DIFF
- 2X1200PPR MS16 2.0mV/V

An inline tension device of the following types is included in the scope of the certificate:


- 0-1.5V DIFF
- 2.0mV/V

Drawings:


Number	Rev	Date	Title
AMTKA105	A	4/03	DEVICE ASSY INLINE TENSION 0-1.5V DIFF EEx nA
AMTKA106	A	4/03	DEVICE ASSY INLINE TENSION 2.0 mV/V EEx nA
AM5KA107	B	4/03	DEVICE ASSY 5 WHEEL 2 X 1200PPR MS16 2.0mV/V EEx nA
AM5KA110	B	4/03	DEVICE ASSY 5 WHEEL 2 X 1200PPR MS16 0-1.5V DIFF EEx nA
AM5KA117	A	4/03	DEVICE ASSY 5 WHEEL 512/780PPR 0-1.5V EEx nA
AM5KA121	A	4/03	DEVICE ASSY 5 WHEEL BASE MODEL EEx nA
AM5KA507	A	8/04	DEVICE ASSY 5 WHEEL 2 X 1200PPR MS16 2.0mV/V EEx nA GEN II
AM5KA510	A	8/04	DEVICE ASSY 5 WHEEL 2 X 1200PPR MS16 0-1.5V DIFF EEx nA GEN II
AM5KA517	A	8/04	DEVICE ASSY 5 WHEEL 512/780PPR 0-1.5V EEx nA GEN II
AM5KA521	A	8/04	DEVICE ASSY 5 WHEEL BASE MODEL EEx nA GEN II

Conditions of Certification:
None

Special Conditions of Certification:
None



This certificate may only be used in its entirety and without change



Epsilon Compliance (UK),
Drury Lane, Drury, Buckley, CH7 3DU, UK.
Telephone: +44(0)1244 541551
Fax: +44(0)1244 543888

2/2

MEASURING HEAD ATEX Conformity Certificate – Sheet 2

ATEX Certificate Schedule



Epsilon Certificate Number:

Epsilon Ex 02ATEX1144

Equipment Description:

The Type 2MV EX 5 Wheel Cable Measurement Device consist of the following certified parts:
 Optical Encoder 1200 Pulse/Rev Ex, Magnetic Mark Detector EX and Load Axle 2MV/V EX.
 The device is designed to measure various cable parameters using the listed sensors.

Drawings:

Number	Rev	Date	Title
AM5KA110 2 Shts.	A	May 02	DEVICE ASSY 5 Wheel Zone 2
AM5KM620	A	May 02	LABEL 5 Wheel 2MV EX
AM5KA527	A	April 06	DEVICE ASSY 5 WHL
AM5KA529	A	April 06	DEVICE ASSY 5 WHL
AM5KA521	A1	April 06	DEVICE ASSY 5 WHL

Conditions of Certification:

None

Special Conditions of Certification:

None

Note:

Certificate re issued in June 2006 to include additional drawings in the schedule list. These drawings have no affect on the original certification of the equipment.



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6.3 ENCODER ATEX Conformity Certificates

		
<p>1. TYPE EXAMINATION CERTIFICATE</p>		
<p>2. Equipment or Protective System Intended for use in Potentially Explosive Atmospheres</p>		
<p>3. Type Examination Certificate Number: ETL09ATEX41116</p>		
<p>4. Equipment or Protective System: 2.0 mV/V Load Pin Assembly, model numbers AM5KA067, AM5KA072, AM5KA087, AM5KA313</p>		
<p>5. Manufacturer: Benchmark Wireline Products</p>		
<p>6. Address: 36220 FM 1093 P.O. Box 850 Fulshear, Texas, TX 77441 USA</p>		
<p>7. This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.</p>		
<p>8. Intertek declares that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive 94/9/EC of 23 March 1994</p> <p>The examination and test results are recorded in confidential Report: 3183344DAL-001 dated December 03, 2009. The investigation was begun on 07/21/09 and concluded on 11/30/09. A type sample was made available and tested at the Intertek, Dallas, TX location.</p>		
<p>9. Compliance with the Essential Health and Safety Requirements has been assured by compliance with standards EN 60079-0:2006, and EN 60079-15:2005 except in respect of those requirements referred to at item 16 of the Schedule.</p>		
<p>10. If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.</p>		
<p>11. This Type examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.</p>		
<p>12. The marking of the equipment or protective system shall include the following:-</p>		
		
<p>Intertek 1809 10th Street, Suite 400 Plano, TX 75074, USA Tel: (972) 202-8800 Fax: (972) 202-8801 http://www.intertek.com</p>		 <hr/> <p>Ryan Parks Hazardous Locations Team Leader Date: 2009/12/03</p>
<p><small>This certificate may only be reproduced in its entirety and without any change, schedule included, and is subject to Intertek Testing Services NA, Inc. Testing and Evaluation Terms and Conditions.</small></p>		
<p>Sheet 1 of 3</p>		
<p>Benchmark ATEX Cert ETL09ATEX41116 12/03/09</p>		

Intertek



SCHEDULE
TYPE EXAMINATION CERTIFICATE NUMBER: ETL09ATEX41116

13. Description of Equipment or Protective System

The 2.0 mV/V Load Pin Assembly is a device to translate force or weight into an electrical signal (mV). The internal strain gauges change their electrical resistance in proportion to the strain placed on them. The resulting small signal is amplified and output as a voltage. This unit is constructed from high strength alloys and is powered from a suitable DC power supply -15V & +15V via an 8 or 10 pin military style circular connector.

Connector Pin	Description	
G	CAL	Calibration
F	SIG-	SIG_OUT- Amplifier o/p
E	SIG+	SIG_OUT+ amplifier o/p
C	-15V	-15V Power rail
D	GND	Power supply 0V.
B	+15V	+15V Power rail

Each 2.0 mV/V Load Pin Assembly has a ½-inch load pin, high strength alloy housing containing a 350 Ohm bridge, and a military style twist-lock connector.

14. Report NUMBER

Intertek Report 3183344DAL-001, dated 03 December 2009.

15. Conditions for use:

a. Special Conditions for safe use

There are no special conditions for safe use

b. Conditions for use (Routine Tests)

There are no routine tests

16. Essential Health and Safety Requirements (EHSR's)

The relevant EHSR's that have not been addressed by the standards listed in this certificate have been identified and assessed in Intertek Report 3183344DAL-001, dated 03 December 2009.

17. DRAWINGS

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Sheet 2 of 3

Benchmark ATEX Cert ETL09ATEX41116

12/03/09



SCHEDULE
TYPE EXAMINATION CERTIFICATE NUMBER: ETL09ATEX41116

Number	Issue	Date	Description
C276A032	B	08/01	Shaft. Load Pin (W/Sleeve)
AMS7M010	F	08/17/00	Load Pin E-1 Converter PCB Housing
AM5KM062	A	02/05	Lid Load Pin Housing
AMTKA013	B	12/18/01	Low Voltage Load Cell Amp Kerr Measurement Systems
AM5KM464	A	07/29/09	Label Load Pin 09ATEX41116 Ex nA
AM5KA067	D	08/19/09	Assy Load Pin 2mV/V ½ Dia CWL18 10 Pin EX 09ATEX41116
Bill of Material	A	08/19/09	Bill of Material AM5KA067D
AM5KA072	B	08/19/09	Assy Load Pin 2mV/V ½ Dia CWL18 10P HT EX 09ATEX41116
Bill of Material	A	08/19/09	Bill of Material AM5KA072D
AM5KA087	B	08/19/09	Assy Load Pin 2mV/V ½ Dia CWL18 10PIN EX 09ATEX41116
Bill of Material	A	08/19/09	Bill of Material AM5KA087D
AM5KA313	B	08/19/09	Assy Load Pin 2mV/V ½ Dia KP 16 8PIN EX 09ATEX41116
Bill of Material	A	08/19/09	Bill of Material AM5KA313D

On the basis of the referenced test report(s), the type sample(s) of the product has(have) been found to comply with the relevant harmonized standard(s) listed on this certificate at the time the tests were carried out.

This Certificate is for the exclusive use of Intertek's client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this Certificate. Only the Client is authorized to permit copying or distribution of this Certificate and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test/inspection results referenced in this Certificate are relevant only to the type sample tested/inspected. This Certificate by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program

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Sheet 3 of 3

Benchmark ATEX Cert ETL09ATEX4116

12/03/09

6.4 LOAD PIN ATEX Conformity Certificates

		
<p>1. TYPE EXAMINATION CERTIFICATE</p>		
<p>2. Equipment or Protective System Intended for use in Potentially Explosive Atmospheres</p>		
<p>3. Type Examination Certificate Number: ETL09ATEX41116</p>		
<p>4. Equipment or Protective System: 2.0 mV/V Load Pin Assembly, model numbers AM5KA067, AM5KA072, AM5KA087, AM5KA313</p>		
<p>5. Manufacturer: BenchMark Wireline Products</p>		
<p>6. Address: 36220 FM 1093 P.O. Box 850 Fulshear, Texas, TX 77441 USA</p>		
<p>7. This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.</p>		
<p>8. Intertek declares that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive 94/9/EC of 23 March 1994</p> <p>The examination and test results are recorded in confidential Report: 3183344DAL-001 dated December 03, 2009. The investigation was begun on 07/21/09 and concluded on 11/30/09. A type sample was made available and tested at the Intertek, Dallas, TX location.</p>		
<p>9. Compliance with the Essential Health and Safety Requirements has been assured by compliance with standards EN 60079-0:2006, and EN 60079-15:2005 except in respect of those requirements referred to at item 16 of the Schedule.</p>		
<p>10. If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.</p>		
<p>11. This Type examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.</p>		
<p>12. The marking of the equipment or protective system shall include the following:-</p>		
		
<p>Intertek 1809 10th Street, Suite 400 Plano, TX 75074, USA Tel: (972) 202-8800 Fax: (972) 202-8801 http://www.Intertek.com</p>	 <hr/> <p>Ryan Parks Hazardous Locations Team Leader Date: 2009/12/03</p>	
<p>This certificate may only be reproduced in its entirety and without any change, schedule included, and is subject to Intertek Testing Services NA, Inc. Testing and Evaluation Terms and Conditions.</p>		
<p>Sheet 1 of 3</p>		
Benchmark ATEX Cert ETL09ATEX41116	12/03/09	

Intertek



SCHEDULE
TYPE EXAMINATION CERTIFICATE NUMBER: ETL09ATEX41116

13. Description of Equipment or Protective System

The 2.0 mV/V Load Pin Assembly is a device to translate force or weight into an electrical signal (mV). The internal strain gauges change their electrical resistance in proportion to the strain placed on them. The resulting small signal is amplified and output as a voltage. This unit is constructed from high strength alloys and is powered from a suitable DC power supply -15V & +15V via an 8 or 10 pin military style circular connector.

Connector Pin	Description	
G	CAL	Calibration
F	SIG-	SIG_OUT- Amplifier o/p
E	SIG+	SIG_OUT+ amplifier o/p
C	-15V	-15V Power rail
D	GND	Power supply 0V.
B	+15V	+15V Power rail

Each 2.0 mV/V Load Pin Assembly has a 1/2-inch load pin, high strength alloy housing containing a 350 Ohm bridge, and a military style twist-lock connector.

14. Report NUMBER

Intertek Report 3183344DAL-001, dated 03 December 2009.

15. Conditions for use:

a. Special Conditions for safe use

There are no special conditions for safe use

b. Conditions for use (Routine Tests)

There are no routine tests

16. Essential Health and Safety Requirements (EHSR's)

The relevant EHSR's that have not been addressed by the standards listed in this certificate have been identified and assessed in Intertek Report 3183344DAL-001, dated 03 December 2009.

17. DRAWINGS

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Sheet 2 of 3

Benchmark ATEX Cert ETL09ATEX41116

12/03/09

Intertek



SCHEDULE
TYPE EXAMINATION CERTIFICATE NUMBER: ETL09ATEX41116

Number	Issue	Date	Description
C276A032	B	08/01	Shaft. Load Pin (W/Sleeve)
AMS7M010	F	08/17/00	Load Pin E-1 Converter PCB Housing
AM5KM062	A	02/05	Lid Load Pin Housing
AMTKA013	B	12/18/01	Low Voltage Load Cell Amp Kerr Measurement Systems
AM5KM464	A	07/29/09	Label Load Pin 09ATEX41116 Ex nA
AM5KA067	D	08/19/09	Assy Load Pin 2mV/V 1/2 Dia CWL18 10 Pin EX 09ATEX41116
Bill of Material	A	08/19/09	Bill of Material AM5KA067D
AM5KA072	B	08/19/09	Assy Load Pin 2mV/V 1/2 Dia CWL18 10P HT EX 09ATEX41116
Bill of Material	A	08/19/09	Bill of Material AM5KA072D
AM5KA087	B	08/19/09	Assy Load Pin 2mV/V 1/2 Dia CWL18 10PIN EX 09ATEX41116
Bill of Material	A	08/19/09	Bill of Material AM5KA087D
AM5KA313	B	08/19/09	Assy Load Pin 2mV/V 1/2 Dia KP 16 8PIN EX 09ATEX41116
Bill of Material	A	08/19/09	Bill of Material AM5KA313D

On the basis of the referenced test report(s), the type sample(s) of the product has(have) been found to comply with the relevant harmonized standard(s) listed on this certificate at the time the tests were carried out.

This Certificate is for the exclusive use of Intertek's client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this Certificate. Only the Client is authorized to permit copying or distribution of this Certificate and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test/inspection results referenced in this Certificate are relevant only to the type sample tested/inspected. This Certificate by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program

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Sheet 3 of 3

Benchmark ATEX Cert ETL09ATEX41116

12/03/09

6.5 MARK DETECTOR ATEX Conformity Certificates



ATEX Conformity Certificate



Epsilon Certificate Number:
Epsilon Ex 02ATEX1143

This certificate is issued for the electrical equipment:
Magnetic Mark Detector EX

Manufactured and submitted by:
Kerr Measurement Systems, Inc.
6415 Reading Road
Rosenberg
Texas 77471
USA

The equipment shall be designed and constructed in accordance with the specification set out in the schedule herein and documents referred to therein.

This Certificate is issued subject to the conditions of Epsilon Certification Service and any additional conditions as may be prescribed.

This Certificate does not imply that the equipment meets all statutory requirements in any particular industry or circumstance.

Directive/s:
ATEX Directive - EU 94/9/EC

Standard/s
EN 50021:1999

Coding:
 II 3 G EEx nA II T6

Epsilon Project Number: ETS0412	Epsilon Report Number: ETS(A)0412/C/1
---	---

Issue Date: 22 May 2002

On Behalf of Epsilon Certification Service


 S L D'Henin
 Certification Manager

This certificate may only be used in its entirety and without change




Epsilon Technical Services Limited is certified against the requirements of ISO 9002 for assessment of products against EU Standards and Directives and is accredited for test and inspection by N.A.P.I.T. Epsilon is accredited as a Certification Body by the ASCB(E) (Accreditation Service for Certifying Bodies (Europe)).



Sheet 1 of 2

ATEX Certificate Schedule



Epsilon Certificate Number:

Epsilon Ex 02ATEX1143

Equipment Description:

The magnetic mark detector is a device which makes use of the Hall effect, for the purpose of generating a direct current voltage in the presence of a magnetic field, in this case a 5VDC electrical pulse. This unit operates between 9-30 volts DC with differential signals via a plug and socket arrangement.

Drawings:

Number	Rev	Date	Title
98600001	F	April 01	Mark Detector
AM5KM635	A	April 02	Cover Magnetic Mark Detector EX

Conditions of Certification:

None

Special Conditions of Certification:

None

Epsilon



Epsilon Certification Service Limited
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Sheet 2 of 2

7.0 RECOMMENDED SPARE PARTS

It is recommended that the following list of parts be kept on hand for remote locations.

ITEM	P/N	SAP P/N	DESCRIPTION	QTY	REF
10	AM5KA067	101392411	ASSY LOAD AXLE 2MV/V EEx nA	1	REPLACES AM5KA013
12	AM5KA066	101392415	ASSY MAG MARK DETECTOR EEx Na	1	REPLACES AMS1A039
13	AM5KA068	101392416	ENCODER HD2.5D-0-SS-1200- EEx nA	1	REPLACES AM5KP161
14	AM5KA058	101392417	ASSY BACKUP MAGNETIC EEx Na	1	REPLACES AM5KA055
22	AM5KM001	101393725	WHEEL MEASURING 2FT 5 SPOKE	2	SEE NOTE 1 BELOW
31	AM5KA137	101393735	ASSY WHEEL GUIDE PLAS 35MM BRG	4	SEE NOTE 2 BELOW
33	AM5KA063	101392449	ASSY WHEEL TENSN SHALLOW GROOVE	1	
33	AM5KA073	101393736	ASSY WHEEL TENSN DEEP GROOVE	1	OPTION (HI TENSION)
34	AM5KA164	101393737	ASSY WHEEL TENSN FIXD 35MM BRG	2	
35	AM5KA065	101392451	ASSY ROLLER SPOOLNG 2.75" PLAS	4	
36	AM5KM073	101392452	COUPLING MOD ENCDR 0.250/0.375	2	
51	AMS1P009	101392486	RETAINING PIN (T HANDLE)	1	
54	AM5KM157	101393742	BEARING BALL 35MM ID MOD	6	
55	AM5KP088	101392479	BEARING LINEAR 30MMID X 40MMOD	8	
56	AM3KP204	101392480	BEARING BALL 20MM FAFNIR 204PP	4	
58	AM5KM134	101393747	BEARING BALL 40MM ID MOD	1	
59	AM5KP229	101392483	CLAMP TOGGLE PUSH/PULL SST	1	
101	AM5KP130	101393769	NOZZLE GREASE FITTNG FLUSH	1	

NOTE 1:

Heads manufactured before Nov 2002 required the shaft to be replaced when the measuring wheels were replaced. All later model heads (SN 5K0229) and after come with keyed shafts that allow the wheel to be replaced without the shaft.

The P/N for wheel and shaft assembly is AM5KA025 (wheel and shaft without magnets - Encoder Wheel 1) and AM5KA060 (wheel and shaft with magnets - Encoder Wheel 2). If these P/Ns are ordered, they will automatically be supplied with the new keyed shafts. From that point forward, the AM5KM001 (101393725) wheels can be used.

NOTE 2:

Heads manufactured before Feb 2004 did not have greaseable bearings. We have since created a greaseable version for all 7 wheels. All later model heads (SN 5K0412) and after come with the greaseable bearings.

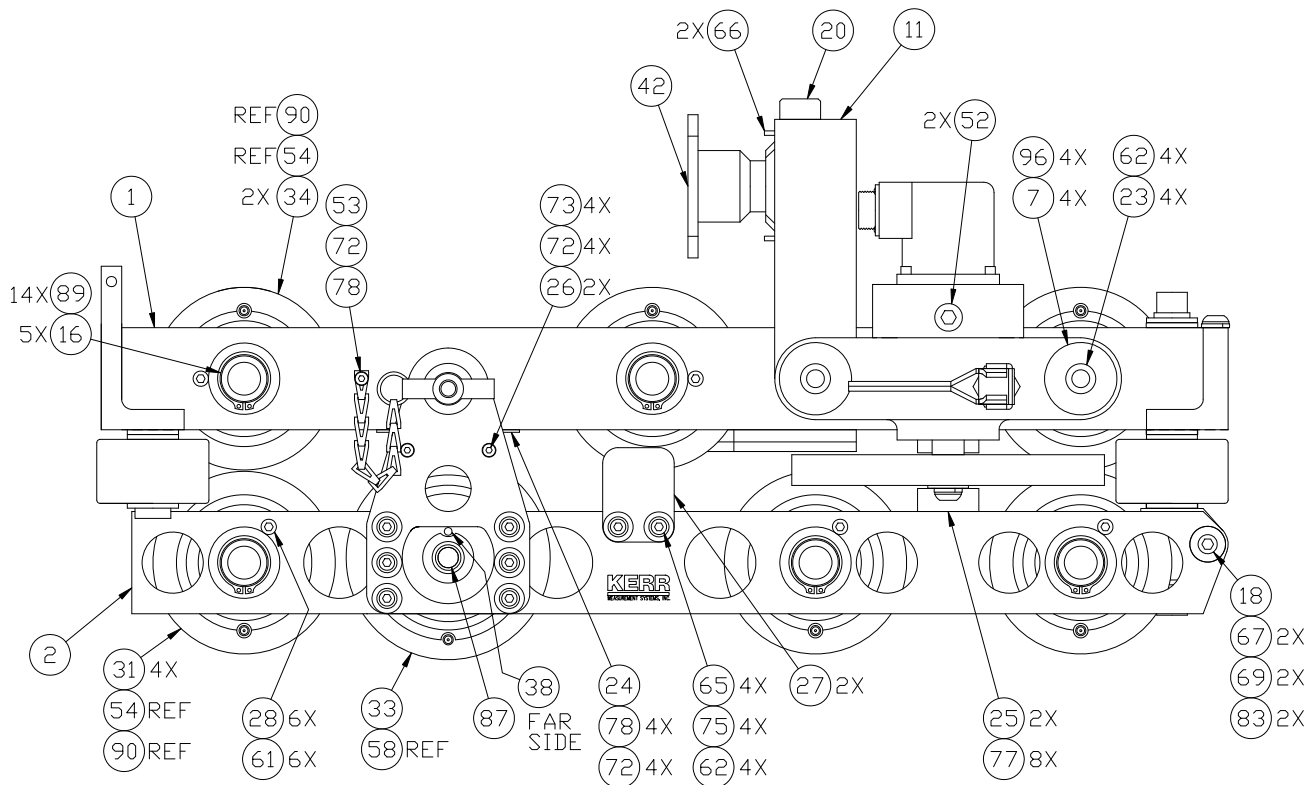
The top 4 wheels on both old and new heads are interchangeable with the new greaseable wheels. The bottom three plastic wheels in the old measuring heads are different than the wheels in new Measuring heads. The diameter of the wheel shaft is 20mm for the old measuring head and 35mm for the new measuring head.

- The P/N for this wheel assembly with the 20mm shaft is AM5KA139 (101414395)
- The P/N for the 20mm shaft only is AM5KM012 (101414399)

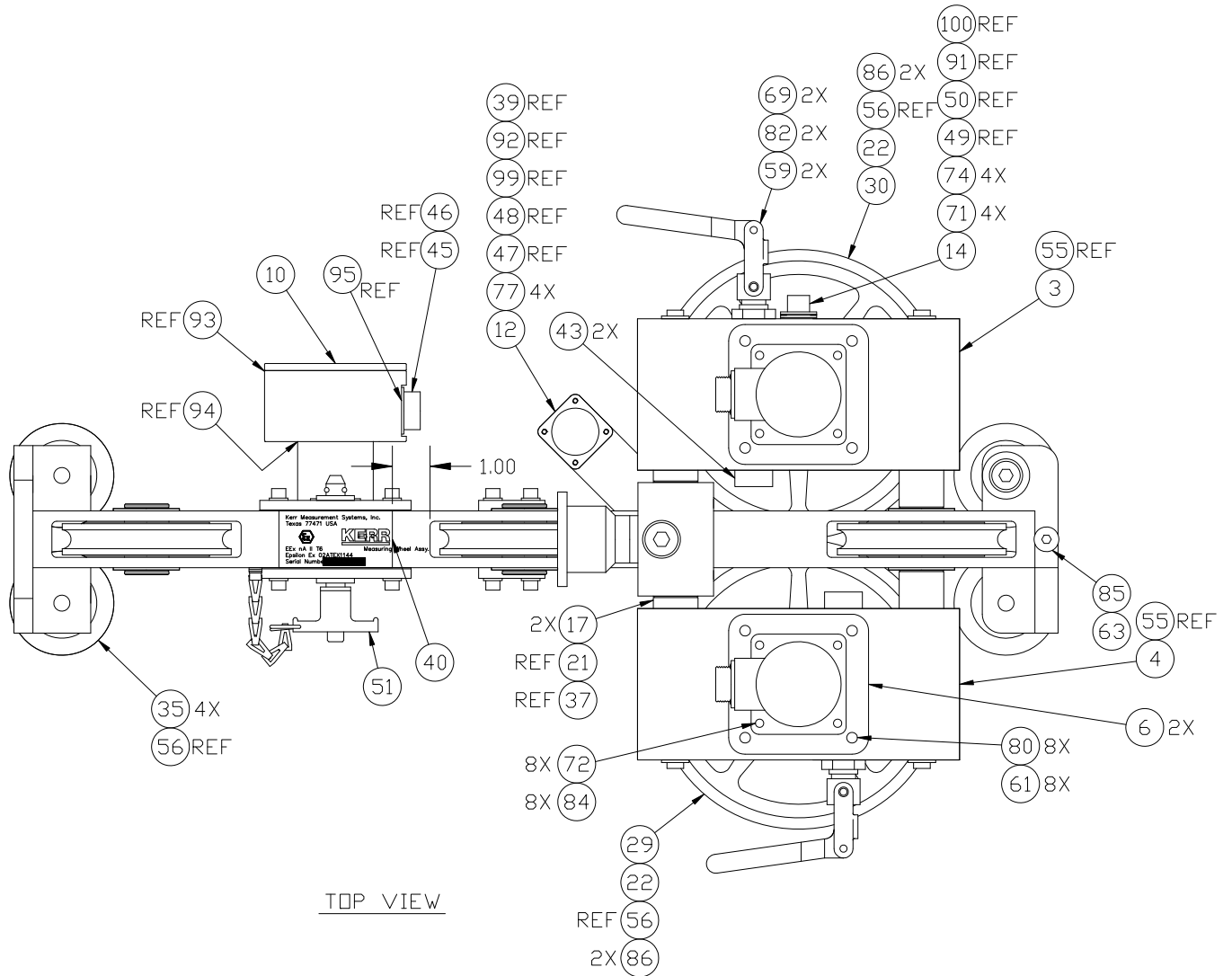
8.0 DRAWINGS AND PARTS LISTS

8.1 MEASURE HEAD ASSEMBLY

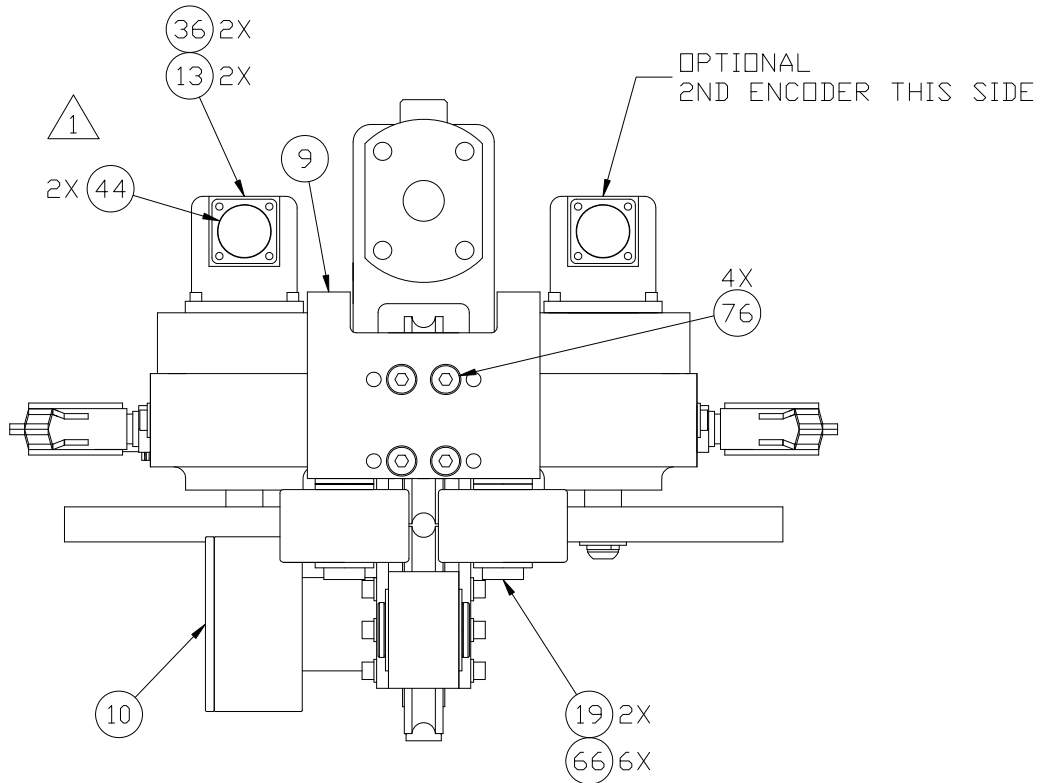
AM5K - SIDE VIEW



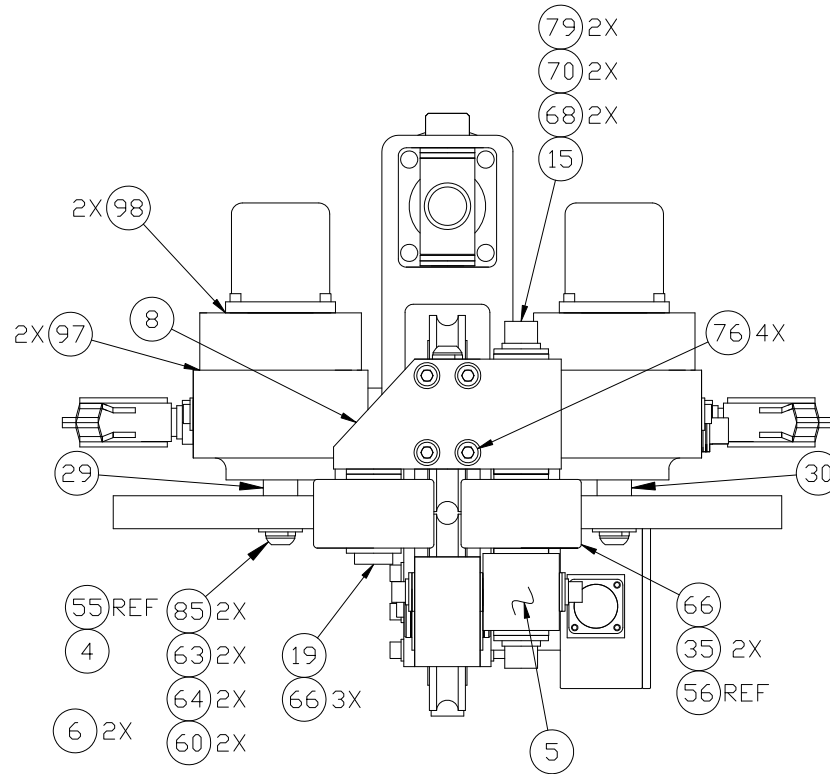
AM5K - TOP VIEW



AM5K - FRONT VIEW



AM5K - REAR VIEW



PARTS LIST

ITEM	P/N	SAP P/N	DESCRIPTION	QTY	REF
1	AM5KA131	101392401	ASSY FRAME BACKBONE UPPER W/BUSHINGS	1	
2	AM5KA332	101392402	ASSY LOWER FRAME W/BUSHINGS AND WEAR BLOCKS	1	
3	AM5KA052-1	101392403	ASSY MOUNT FLTNG ENCDR WHL W/	1	OPTION
4	AM5KA052-2	101392721	ASSY MOUNT FLTNG ENCDR WHL W/0	1	
5	AM5KA053	101392404	ASSY BLOCK PIVOT HORIZ/VERT	1	
6	AM5KM057	101392405	ADAPTER ENCODER H37C/H25D	2	OPTION
6	AM5KM058	101393722	COVER ENCODER ADAPTER	1	OPTION
7	AM5KM020	101392408	ENDCAP FLOATING ENCODER MOUNT	4	
8	AM5KA057	101392409	ASSY MOUNT SPOOLNG ROLLR FRNT	1	
9	AM5KM026	101392410	MOUNT SPOOLING ROLLER REAR	1	
10	AM5KA067	101392411	ASSY LOAD AXLE 2MV/V EEx nA	1	REPLACES AM5KA013
11	AM5KA040	101393723	ASSY MOUNT CENTER YOKE 5 WHEEL	1	OPTION
12	AM5KA066	101392415	ASSY MAG MARK DETECTOR EEx Na	1	REPLACES AMS1A039
13	AM5KA068	101392416	ENCODER HD2.5D-0-SS-1200- EEx nA	1	REPLACES AM5KP161
14	AM5KA058	101392417	ASSY BACKUP MAGNETIC EEx Na	1	REPLACES AM5KA055
15	AM5KM024	101392418	SHAFT PIVOT VERTICAL 20MM SST	1	
16	AM5KM011	101392419	SHAFT TENSION ROLLER 30MM SST	5	
17	AM5KA059	101392423	ASSY SHAFT ENCODER SLIDE 30MM	2	
18	AM5KM023	101392424	SHAFT PIVOT HORIZONTAL 1/2 SST	1	
19	AM5KM013	101392425	SHAFT SPOOLING ROLLER 20MM	3	
20	AM5KP023	101392503	BOLT SHOULDER 3/4 X 3 SST	1	
21	AM5KP002	101392427	SPRING EXT 4" OAL 47/64 DIA SST	4	
22	AM5KM001	101393725	WHEEL MEASURING 2FT 5 SPOKE	2	
23	AM5KM141	101393727	ANCHOR SPRING 1/2" FLOATING	4	
24	AM5KM034	101392436	PLATE WEAR 1/16 X 1.5 X 3.5	1	
25	AM5KM049	101392437	BLOCK WEAR 1.50 X 1.50 X 0.56 STL	2	LARGE LINES
25	AM5KM074	101393728	BLOCK WEAR UPPER TOOL STL CH	1	SMALL LINES ONLY
26	AM3KM134	101393729	BLOCK WEAR 0.75 X 2.50 TOOLSTL	2	
27	AM5KM159	101393730	BLOCK GUIDE TENSION WHEEL PLAS	2	
28	AM5KM084	101393731	SCREW ANTI-ROTATION TENS WHEEL	6	
29	AM5KM010	101393733	SHAFT WHEEL CANTILEVERED 5 WHL	1	
30	AM5KM060	101393734	SHAFT WHEEL CANTLVRD MAG 5 WHL	1	OPTION
31	AM5KA137	101393735	ASSY WHEEL GUIDE PLAS 35MM BRG	4	
33	AM5KA063	101392449	ASSY WHEEL TENSN SHALLOW GRV	1	OPTION
33	AM5KA073	101393736	ASSY WHEEL TENSN DEEP GRV	1	OPTION (HI TENSION)
34	AM5KA164	101393737	ASSY WHEEL TENSN FIXD 35MM BRG	2	
35	AM5KA065	101392451	ASSY ROLLER SPOOLNG 2.75" PLAS	4	
36	AM5KM073	101392452	COUPLING MOD ENCDR 0.250/0.375	2	OPTION
37	AM5KP124	101393738	PIN COILED SPRING 1/4 X 1-1/8	2	ENCODER SLIDE
38	AM5KP125	101393739	PIN COILED SPRING 3/16 X 1/2	1	TENSION WHEEL PIN
42	AM5KM138	101393741	YOKE PIVOT CENTER MOUNT SST	1	
43	AM5KM040	101392459	PUSHROD TOGGLE CLAMP PLASTIC	2	
51	AMS1P009	101392486	RETAINING PIN (T HANDLE)	1	
52	AMS1P072	101392476	PLUG 3/8 NPT SS	2	

53	AM5KP075	101392485	CHAIN SASH #35 SST	6	
54	AM5KM157	101393742	BEARING BALL 35MM ID MOD	6	
55	AM5KP088	101392479	BEARING LINEAR 30MMID X 40MMOD	8	
56	AM3KP204	101392480	BEARING BALL 20MM FAFNIR 204PP	4	
58	AM5KM134	101393747	BEARING BALL 40MM ID MOD	1	
59	AM5KP229	101392483	CLAMP TOGGLE PUSH/PULL SST	2	
60	AM5KM055	101393748	KEY 1/8 X 1/8 X 0.625L SST	2	
61	AM5KP144	101393749	WASHER 1/4 LOCK SS HIGH COLLAR	4	
62	ACMU2P31	101392487	WASHER 1/4 FLAT SS	8	
63	AMS1P058	101392488	WASHER 3/8 LOCK SS	3	
64	C276P513	101393750	WASHER 3/8 FLAT SST	2	
65	C276P036	101392496	WASHER 1/4 LOCK SS	4	
66	AM5KP011	101392497	WASHER 20MM FLAT SST	12	
67	C276P039	101393751	WASHER 5/16 FLAT SST	2	
68	AMS1P066	101392499	WASHER 1/2 LOCK SS	2	
69	AMS1P047	101392500	WASHER 5/16 LOCK SS	4	
70	C276P037	101392511	WASHER 1/2 FLAT SST	2	
71	C276P046	101393753	WASHER #6 LOCK SS	4	
72	C276P035	101392502	WASHER #10 LOCK SS	7	
73	AMS1P052	101392522	SCREW 10-24 X 5/8 SOC HD SST	4	
74	C276P331	101393754	SCREW 6-32 X 1/2 PHIL PAN SST	4	
75	AM5KP117	101392505	SCREW 1/4-20 X 5/8 BTN HD SST	4	
76	AM5KP038	101392506	SCREW 5/16-18 X 7/8 FH SOC SS	8	
77	AM5KP039	101392512	SCREW 10-24 X 7/8 FH SOC SST	2	
78	AM5KP040	101392513	SCREW 10-24 X 3/8 SOC HD SST	5	
79	AM5KP042	101392514	SCREW 1/2-13 X 3/4 SOC HD SST	2	
80	AMS1P048	101393767	SCREW 1/4-20 X 3/4 SOC HD SST	4	OPTION W/COVER
80	C276P031	101393767	SCREW 1/4-20 X 1-1/4 SOC HD SS	8	
82	AM5KP037	101392520	SCREW 5/16-18 X 4-1/2 SOC HD	2	
83	AM3KP028	101393756	SCREW 5/16-18 X 1/2 SHCS SST	2	
84	AMS1P052	101392522	SCREW 10-24 X 5/8 SOC HD SST	8	OPTION
84	AMS1P053	101392531	SCREW 10-24 X 2 SHCS SST	8	OPTION W/HD ENCDR
85	AM5KP043	101392523	SCREW 3/8-16 X 1/2 BUTTON HD	3	
86	AMS1P006	101392531	RING RETNG INT UR187S	4	
87	AM5KP033	101392532	RING RETNG EXT 0.500 SHAFT SST	1	
89	AM3KP018	101392534	RING RETNG EXT 1.188 SHAFT SST	14	
90	AM5KP168	101393762	RING RETNG INT 2.875 LT DUTY	12	
91	C276P041	101393763	O-RING 2-017 BUNA N	1	BACKUP HSG
92	AM5KP072	101392539	O-RING 2-046 BUNA N MMD COVER	1	
93	C276P040	101392540	O-RING 2-235 BUNA N L/P LID	1	
94	AMS8P066	101392541	O-RING 2-136 BUNA N L/P HSG	1	
95	AM5KP118	101392542	O-RING 2-023 BUNA N L/P CONN	1	
96	AM5KP020	101392543	O-RING 2-030 BUNA N ENDCAP	4	
97	AMS1P014	101392544	O-RING 2-152 BUNA N ENC ADPTR	2	
98	AM5KP071	101392545	O-RING 2-141 BUNA N H25 ENCDR	2	
99	AM5KP119	101392546	O-RING 2-026 BUNA N MMD CONN	1	
100	C276P042	101393764	O-RING 2-016 BUNA N	1	BACKUP CONN
101	AM5KP130	101393769	NOZZLE GREASE FITTNG FLUSH	1	NOT SHOWN

8.2 MAGNETIC MARK DETECTOR SPECIFICATION

1. General

This specification describes the latest magnetic mark detector. It replaces the original AMS100 detector, p/n AMS1A003. The performance characteristics emulate the original unit.

2. Mechanical

The mark detector will work in both the original housing p/n AMS1M022 and the AM5K versions using p/n AM5KM029. The pc board is potted to prevent damage from shock, vibration, or humidity.

3. Power

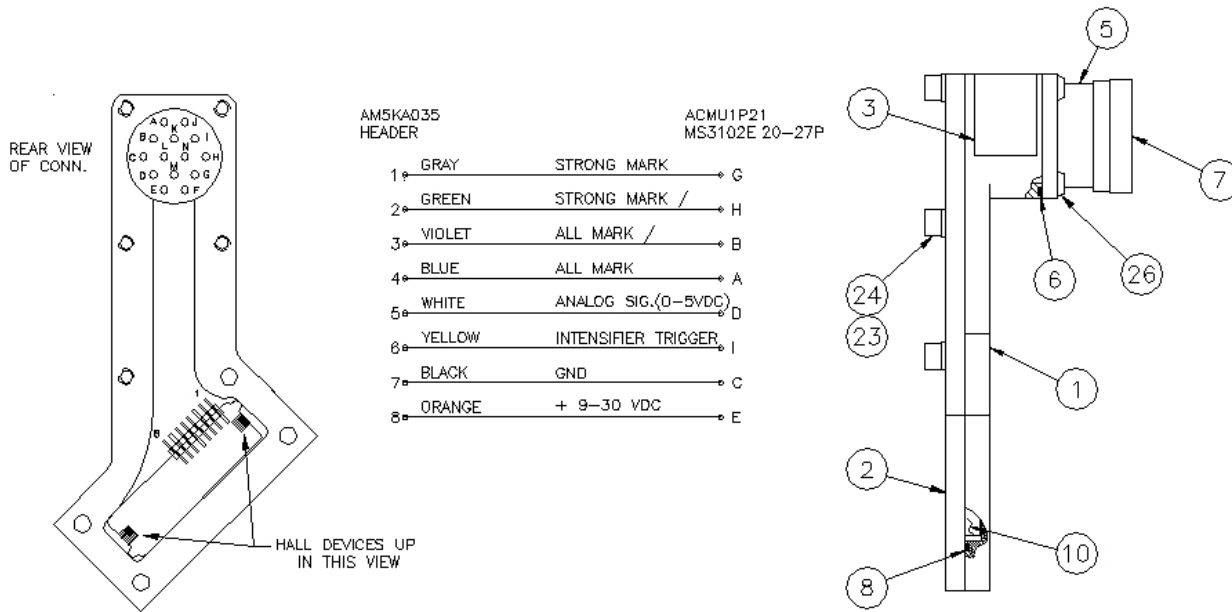
Input power is 9 - 30vdc at 100ma max.

4. Outputs

Digital line driver out for strong & strong\ and also weak & weak\ where a weak mark is 4 gauss or less and a strong mark is greater than 4.1 gauss measured 0.10 inch from cable surface. The signals are a +5vdc digital pulse. A digitized 0-5vdc representation of the analog signal is provided.

5. Performance

- a) Operating temperature -40 to +120 f. compensated and stable. Storage temperature -60 to +180 f.
- b) Magnetic mark detection at cable line speeds of 1 to 1000 feet per minute.
- c) Auto cal feature removes offset of the electronics and any constant magnetic field less than 1 gauss every 100ms. If in a greater field, it will auto calibrate every 11 seconds.
- d) Detection of apparent zero gauss (at high/low crossing) is within 0.1 inch and repeatable so as any error is not accumulative.
- e) Will survive a gauss level exposure of 60 gauss.



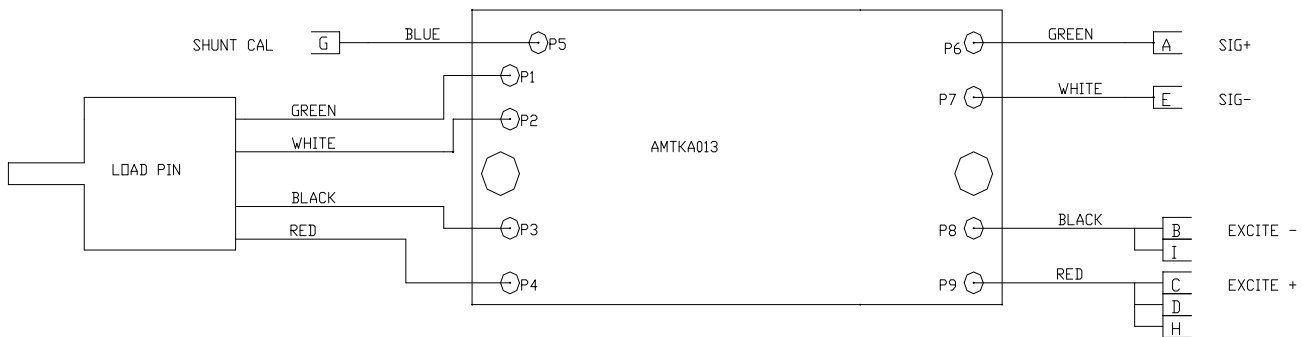
AM5KA066 (101392415) ASSY MMD EEx Na

1	AM5KM029	101392756	ENCLSR MAGNETIC MARK DETECTOR	1	EA
2	AM5KM035	101392757	COVER MAGNETIC MARK DETECTOR	1	EA
5	ACMU1P21	101392470	CONN MS3102E-20-27P 14 PIN RECEPT	1	EA
6	AM5KP119	101392546	O-RING 2-026 BUNA N MMD CONN 1-1/4 X 1-3/8 X 1/16	1	EA
7	ACMU1P22	101392471	DUST CAP MS25D43-20DA	1	EA
8	AM5KP072	101392539	O-RING 2-046 BUNA N MMD COVER 4.239ID X 4.379OD X 0.070	1	EA
10	AM5KA035	101392456	PCB MMD POTTED, AM5K OR AMS100	1	EA
23	C276P035	101392502	WASHER #10 LOCK SS	5	EA
24	AMS8P029	101392758	SCREW 10-24 X 1/2 SOC HD SST	5	EA
26	AMS1P040	101392504	SCREW 6-32 X 3/8 PAN HD SST	4	EA

8.3 LOAD PIN AM5KA067

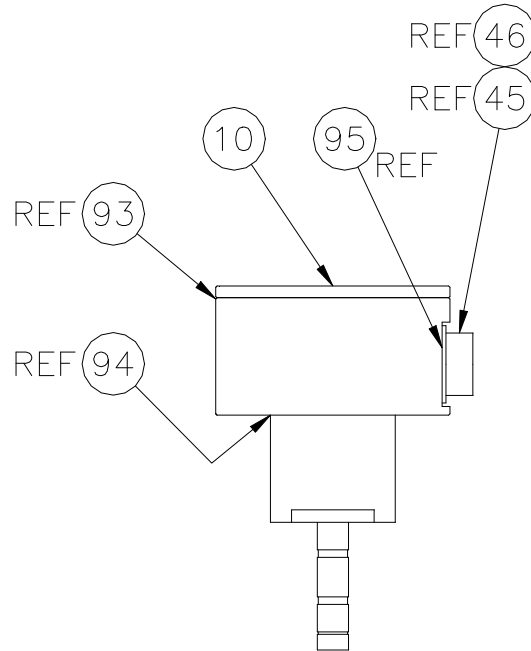
TENSION SPECIFICATIONS:

Power Requirements:	12 vdc excitation	
Interface:	Proprietary circuit board which buffers the load pin signals and provides a 3mv/v output	
Temperature stability:	\leq .015% full scale / deg F on zero \leq .02% full scale / deg F on output	
Accuracy:	Within 150 lbs or 3% of actual, whichever is greater	
Maximum load (tested):	16,000 lbs	7,258 kg
(theoretical):	20,000 lbs	9,072 kg



Take Adequate Precautions when Installing the Load Pin to Avoid the Risk of Mechanical Damage

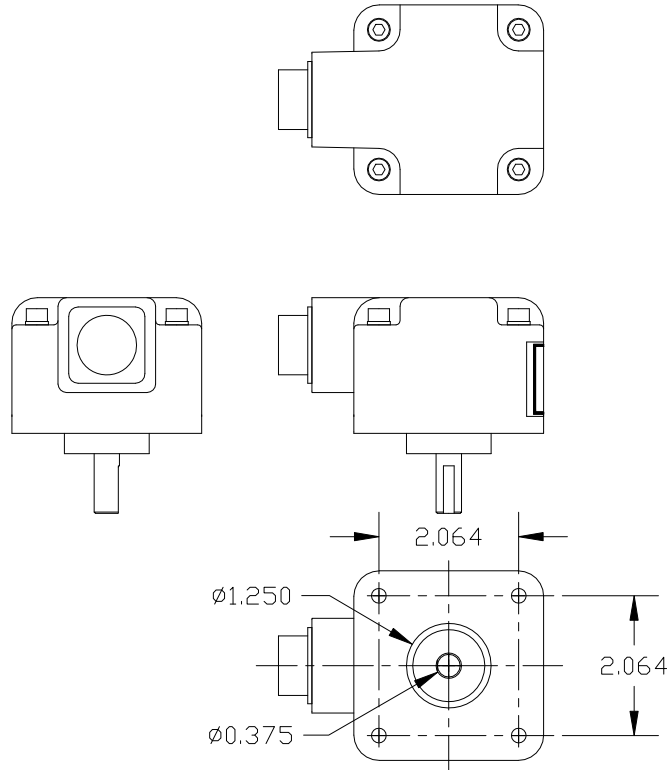
WARNING – DO NOT SEPARATE CONNECTORS WHEN ENERGIZED



AM5KA067 (101392411) ASSY LOAD AXLE 3MV/V

45	AM5KP068	101392468	CONN 10-107218-1P BENDIX QWL COURSE THD 10 PIN	1 EA
46	AM5KP067	101392469	DUST CAP CW49N16C CANNON CWL COURSE THREAD	1 EA
93	C276P040	101392540	O-RING 2-235 BUNA N L/P LID 3-1/8 X 3-3/8 X 1/8	1 EA
94	AMS8P066	101392541	O-RING 2-136 BUNA N L/P HSG 1.98ID X 2.19OD X 0.103W	1 EA
95	AM5KP118	101392542	O-RING 2-023 BUNA N L/P CONN 1-1/16 X 1-3/16 X 1/16	1 EA

8.4 ENCODER AM5KA068



13	AM5KP161	101392416	ENCODER H25D-SS-1200-ABC-4469 EEx nA	2	EA
36	AM5KM073	101393736	COUPLING MOD ENCDR 0.250/0.375 BORE	2	EA
44	AMS1P071	101216841	DUST CAP MS25043-16DA (HES)	2	EA

Specifications

1200 Pulses per revolution

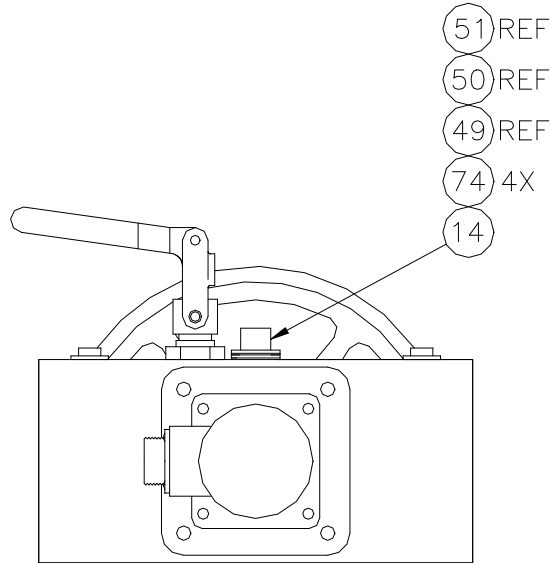
5 – 15 vdc power

Differential Quadrature output (A – A not, B – B not)

Pin Out

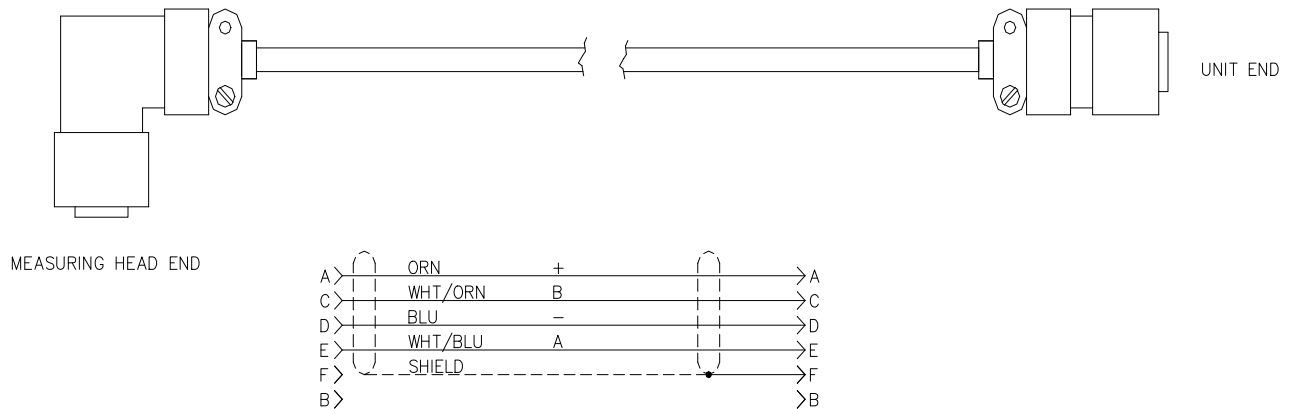
E	-	A
C	-	A\
G	-	B
D	-	B\
A	-	+ 5v
B	-	Gnd
F	-	Case

8.5 BACKUP ODOMETER CABLE AND WIRING



14	AM5KA058	101392417	ASSY ENCODER BACKUP MAGNETIC	1	EA
49	AM5KP027		CONN KPT02E10-6P RECEPTACLE MS3112	1	EA
50	AM5KP034	101392474	DUST CAP KPT8110C CANNON SHELL SIZE 10	1	EA
51	C276P041	101393763	O-RING 2-017	2	EA
74	AMS1P040	101392504	SCREW 6-32 X 3/8 PAN HD SST	4	EA

AM5KA024-20 BACKUP ODOMETER CABLE 101343792



1	AMS7P062		CABLE 24/2P STNDED TC PE/PVC AL/MY SHLD W/DW NEC CMUL2919	20	FT
2	AM5KP057		CONN KPT06F10-6P STR PLUG	1	EA
3	AM5KP058		CONN KPT08F10-6S RT ANGLE PLUG	1	EA
4	AM5KP059		DUST CAP KPT8010C CANNON	2	EA
5	AM5KA034		BUSHING #9779-513-4 AMPHENOL	2	EA