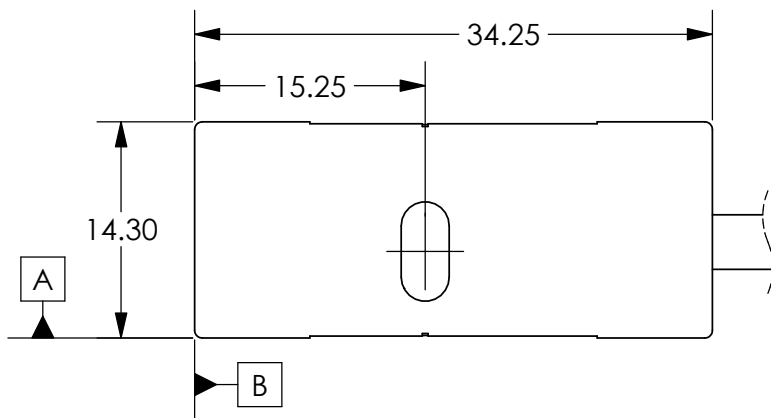
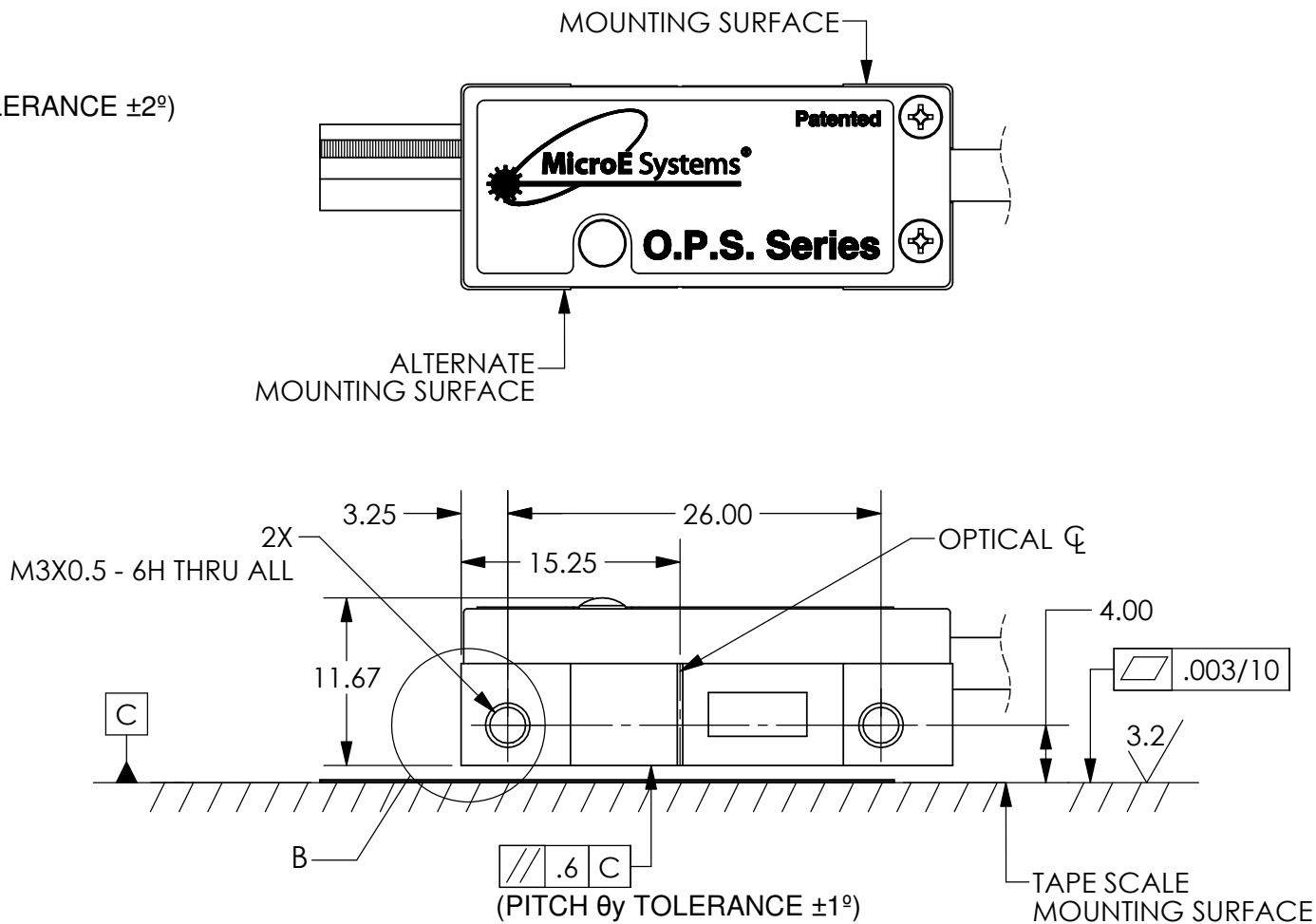
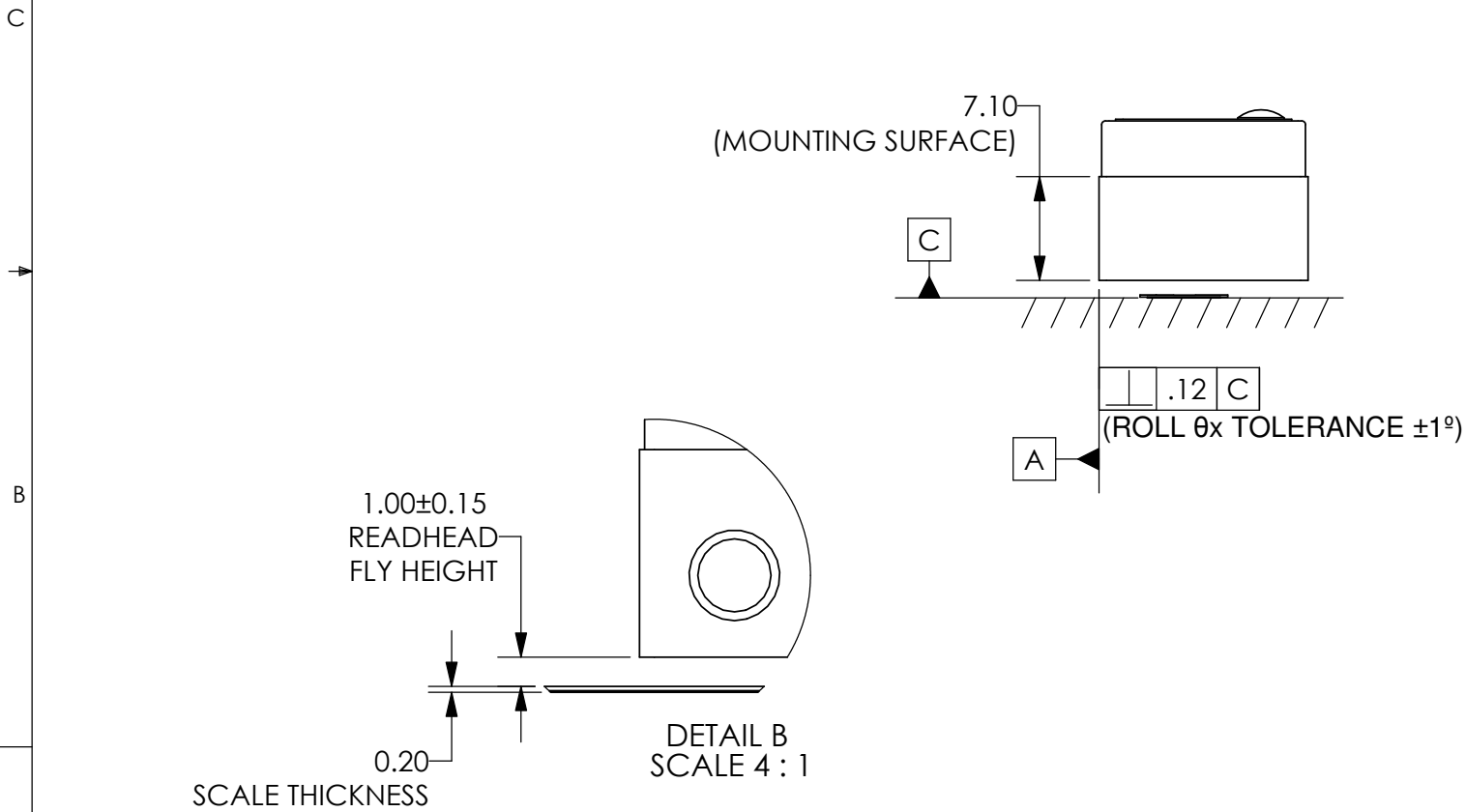
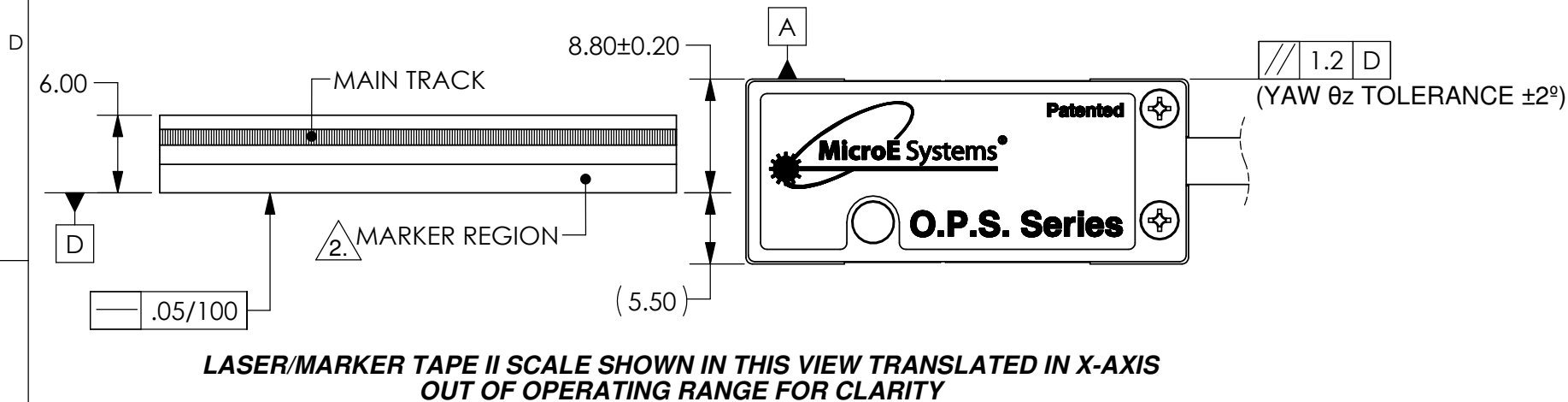


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3.
DIRECTION "A"

REVISIONS				
LTR	ECO	DESCRIPTION	DATE	APPROVED
1	---	INITIAL	6/4/13	VB
2	2586	REVISE DIMENSIONS, REMOVED BROKEN VIEW LINES, SEE ECO	6/14/13	SB
3	2632	ADDED WIRE COLORS, REVISED VIEWS FOR CLARITY, SEE ECO	10/28/13	VB
4	2643	REVISED NOTES/ADDED MISSING DIMS. SEE ECO	11/26/13	VB



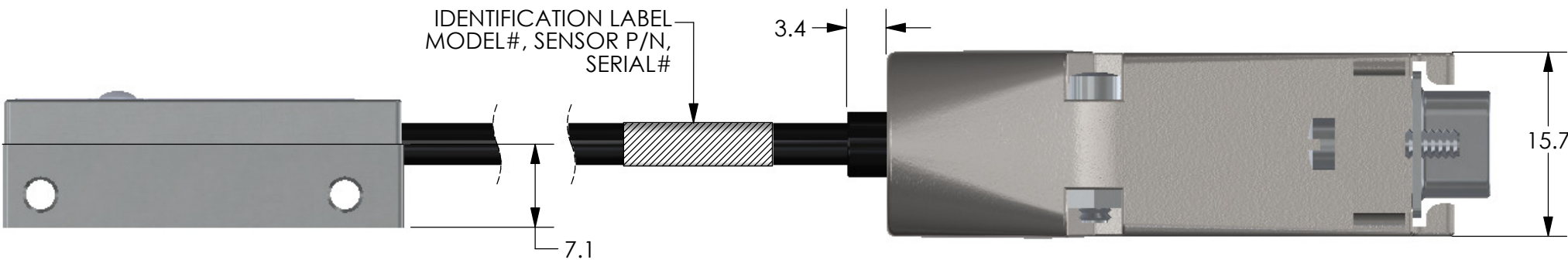
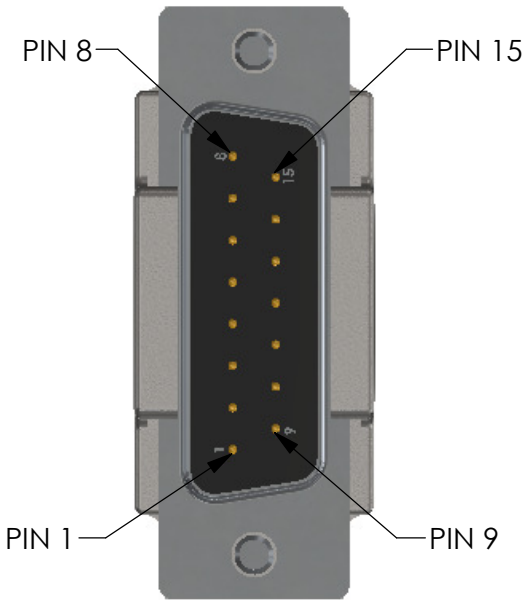
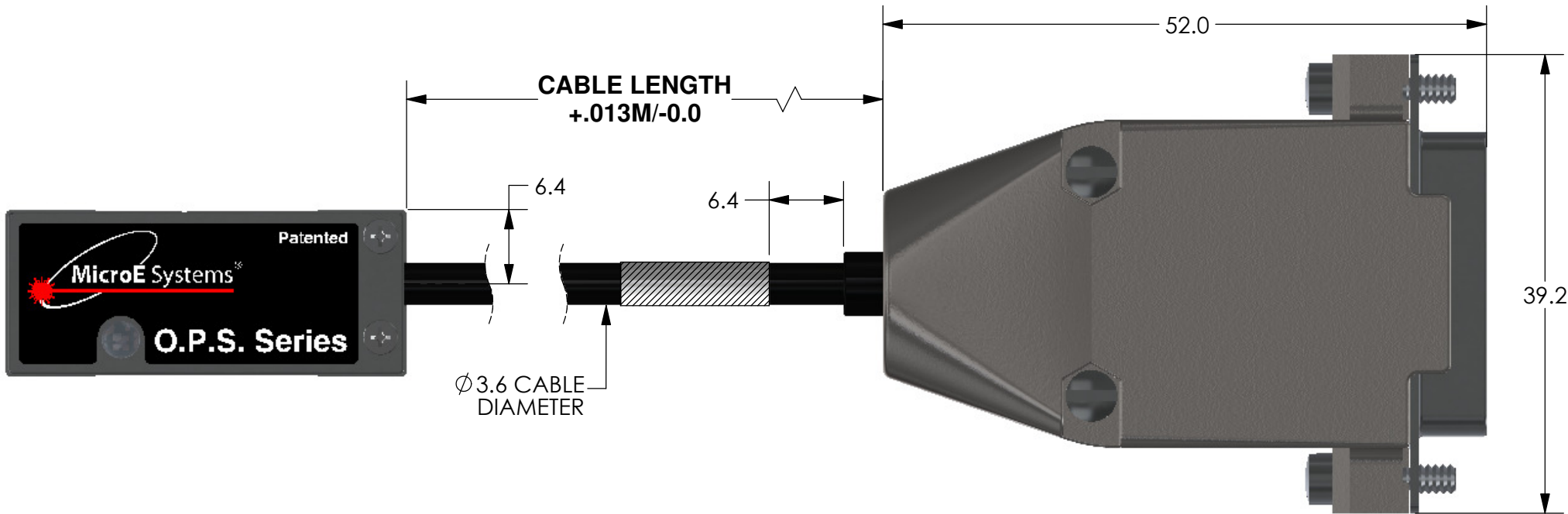
NOTES:

- FOR TAPE SCALE INSTALLATION INSTRUCTIONS SEE INSTALLATION MANUAL.
- SEE SHEETS 3 AND 4 FOR DIMENSIONS AND LOCATIONS OF MARKERS.
- WHEN SENSOR MOVES IN DIRECTION "A" WITH RESPECT TO A STATIONARY LASER/MARKER TAPE II SCALE, OUTPUT SIGNAL A+ (PIN 14) LEADS OUTPUT SIGNAL B+ (PIN 13).
- RECOMMENDED MOUNTING HARDWARE:
M3x0.5 SCREWS
M2X0.5 SCREWS ARE RECOMMENDED IF USING THE OPS-SM MOUNTING HOLES AS THRU-HOLES.

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MILLIMETERS DIM. APPLY AFTER PROCESSING INTERPRET ALL GEOMETRIC TOLS. PER ANSI Y14.5M-1994	APPROVALS		DATE	
	DRAWN P DEVINE		5/20/13	
	CHECKED			
	ENGRG.			
TOLERANCES ARE: DECIMALS: .X ±.25 .XX ±.13	ANGULAR: ±30 MIN.			
SUBJECT TO CHANGE WITHOUT NOTIFICATION	SIZE B		DWG. NO. ID-00397	
	SCALE:		REV. 4	
		CAD FILE:		3rd ANGLE PROJECTION SHEET 1 OF 4

MicroE Systems® 125 Middlesex Tpk.
Bedford, MA 01730


DESCRIPTION:
INTERFACE, ENCODER, 20um,
LASER TAPE II/MARKER TAPE II
SCALE, OPS-SM SENSOR



OPS 15P D-SUB		
Pin#	Function	Wire Color
1	Do Not Connect	
2	GND	Black
3	Do Not Connect	
4	IW-	Brown
5	B-	Blue
6	A-	Yellow
7	+5V	Red
8	+5V	
9	GND	
10	RL	Gray
11	LL	White
12	IW+	Orange
13	B+	Violet
14	A+	Green
15	Do Not Connect	

NOTE: GND AND INNER SHIELD ARE INTERNALLY CONNECTED.

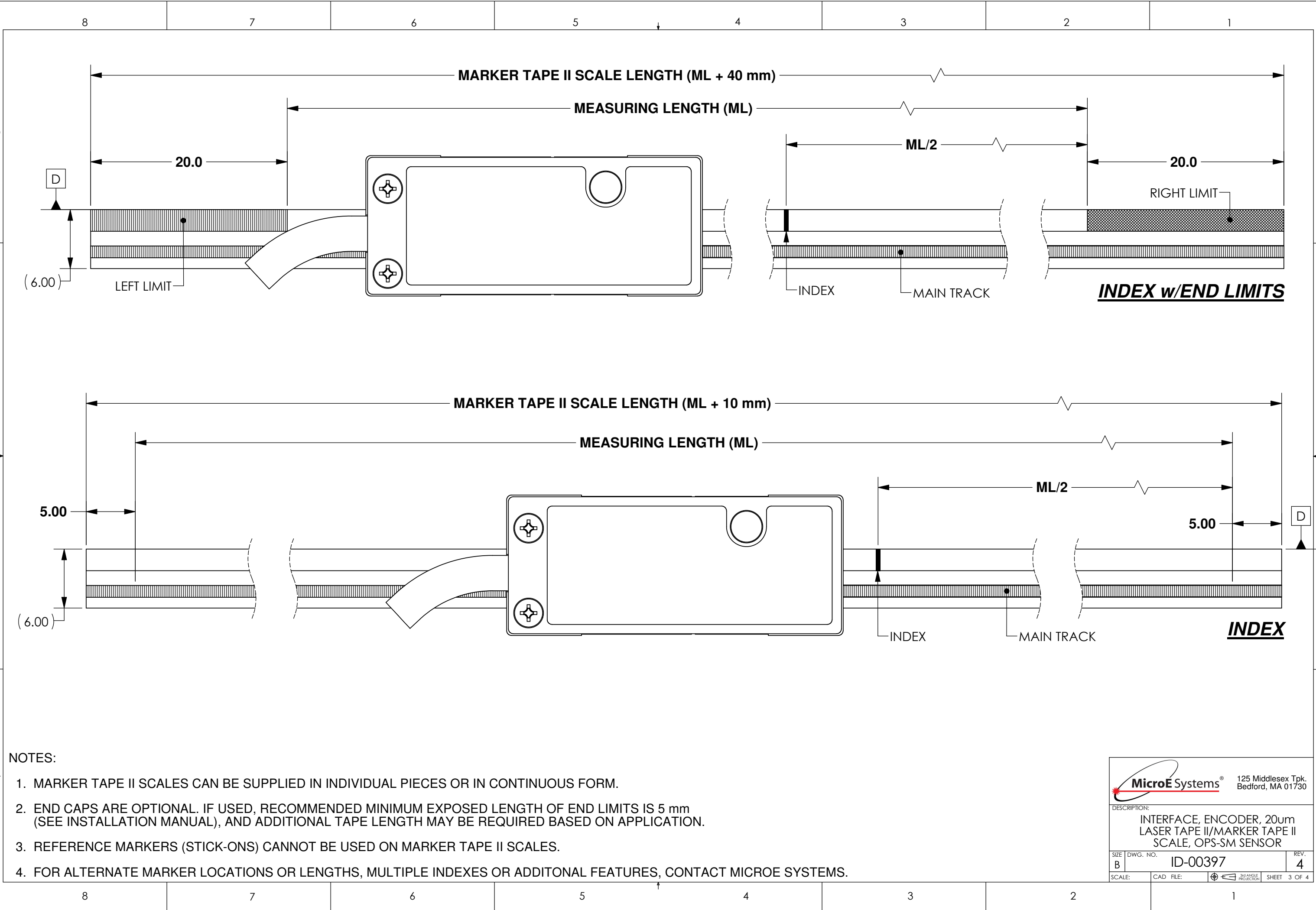
Cable Lengths	
1 Meter	
3 Meter	
5 Meter	
Custom	



125 Middlesex Tpk.
Bedford, MA 01730

DESCRIPTION:
INTERFACE, ENCODER, 20um,
LASER TAPE II/MARKER TAPE II
SCALE, OPS-SM SENSOR

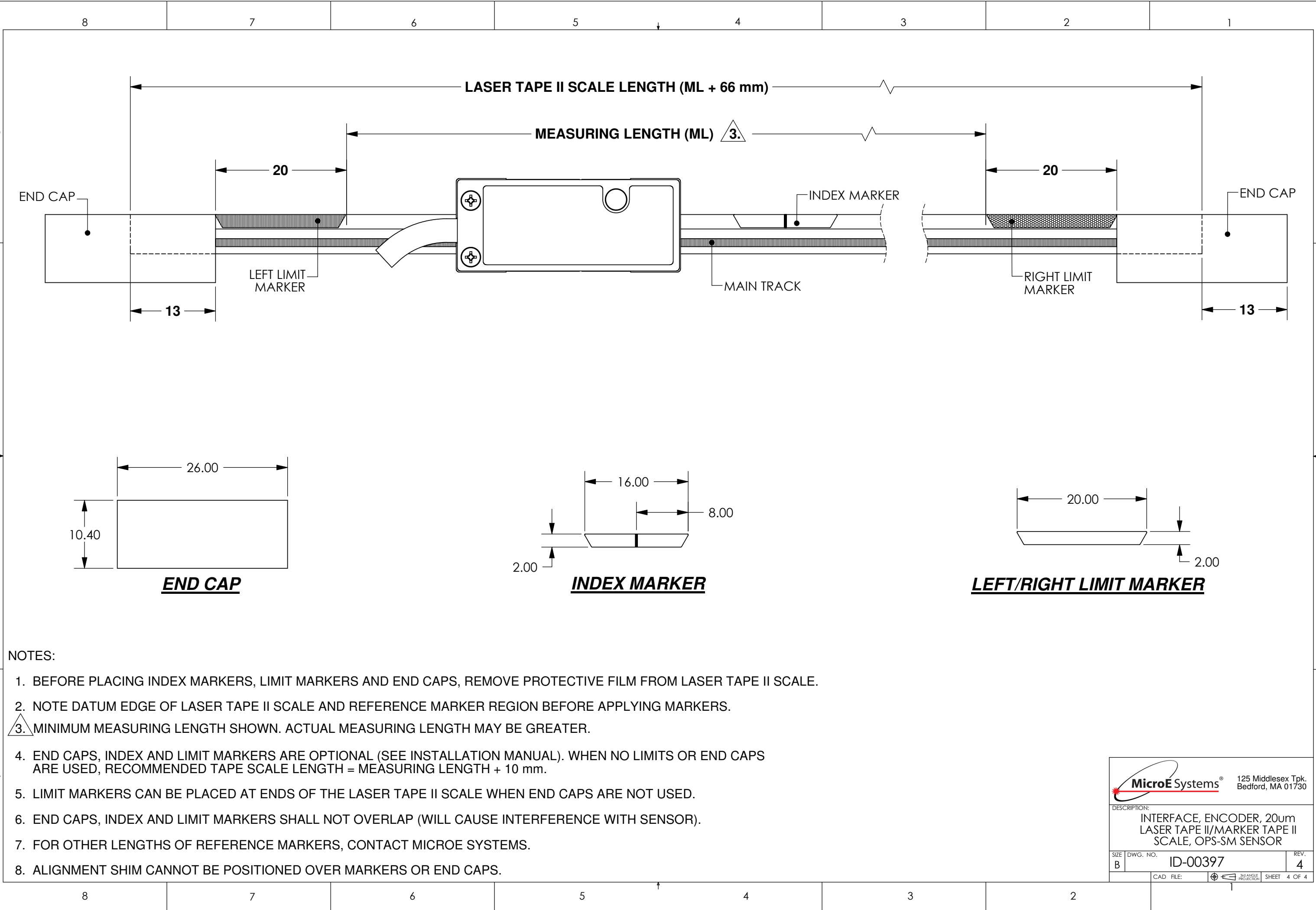
SIZE B	DWG. NO. ID-00397	REV. 4
SCALE:	CAD FILE:	3rd ANGLE PROJECTION SHEET 2 OF 4



NOTES:


1. MARKER TAPE II SCALES CAN BE SUPPLIED IN INDIVIDUAL PIECES OR IN CONTINUOUS FORM.
2. END CAPS ARE OPTIONAL. IF USED, RECOMMENDED MINIMUM EXPOSED LENGTH OF END LIMITS IS 5 mm (SEE INSTALLATION MANUAL), AND ADDITIONAL TAPE LENGTH MAY BE REQUIRED BASED ON APPLICATION.
3. REFERENCE MARKERS (STICK-ONS) CANNOT BE USED ON MARKER TAPE II SCALES.
4. FOR ALTERNATE MARKER LOCATIONS OR LENGTHS, MULTIPLE INDEXES OR ADDITONAL FEATURES, CONTACT MICROE SYSTEMS.

		125 Middlesex Tpk. Bedford, MA 01730	
DESCRIPTION: INTERFACE, ENCODER, 20um LASER TAPE II/MARKER TAPE II SCALE, OPS-SM SENSOR			
SIZE B	DWG. NO. ID-00397	REV. 4	
SCALE:	CAD FILE:	 3rd ANGLE PROJECTION	SHEET 3 OF 4



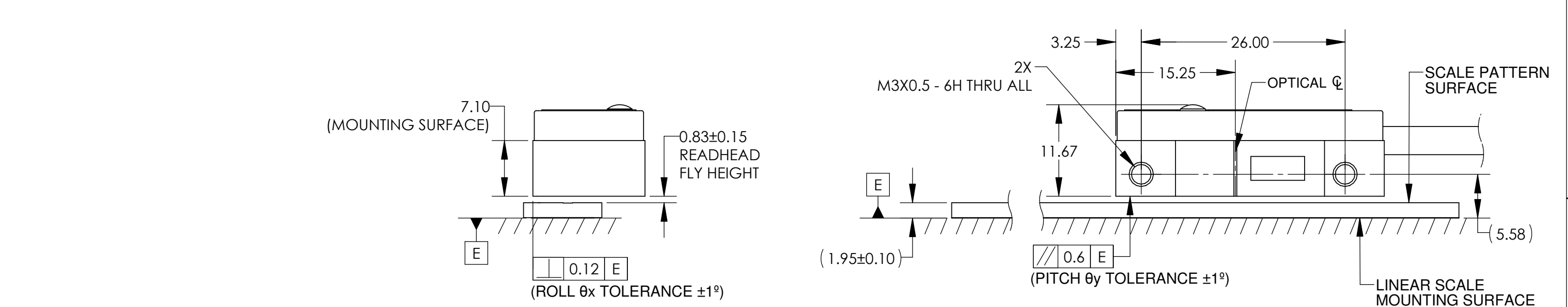
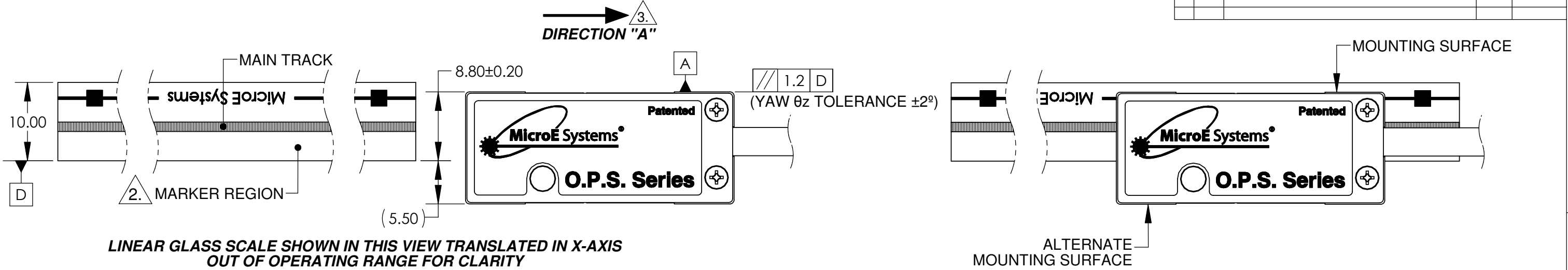
NOTES:

1. BEFORE PLACING INDEX MARKERS, LIMIT MARKERS AND END CAPS, REMOVE PROTECTIVE FILM FROM LASER TAPE II SCALE.
2. NOTE DATUM EDGE OF LASER TAPE II SCALE AND REFERENCE MARKER REGION BEFORE APPLYING MARKERS.
3. MINIMUM MEASURING LENGTH SHOWN. ACTUAL MEASURING LENGTH MAY BE GREATER.
4. END CAPS, INDEX AND LIMIT MARKERS ARE OPTIONAL (SEE INSTALLATION MANUAL). WHEN NO LIMITS OR END CAPS ARE USED, RECOMMENDED TAPE SCALE LENGTH = MEASURING LENGTH + 10 mm.
5. LIMIT MARKERS CAN BE PLACED AT ENDS OF THE LASER TAPE II SCALE WHEN END CAPS ARE NOT USED.
6. END CAPS, INDEX AND LIMIT MARKERS SHALL NOT OVERLAP (WILL CAUSE INTERFERENCE WITH SENSOR).
7. FOR OTHER LENGTHS OF REFERENCE MARKERS, CONTACT MICROE SYSTEMS.
8. ALIGNMENT SHIM CANNOT BE POSITIONED OVER MARKERS OR END CAPS.

		125 Middlesex Tpk. Bedford, MA 01730	
DESCRIPTION: INTERFACE, ENCODER, 20um LASER TAPE II/MARKER TAPE II SCALE, OPS-SM SENSOR			
SIZE B	DWG. NO. ID-00397	REV. 4	
CAD FILE:		3rd ANGLE PROJECTION SHEET 4 OF 4	



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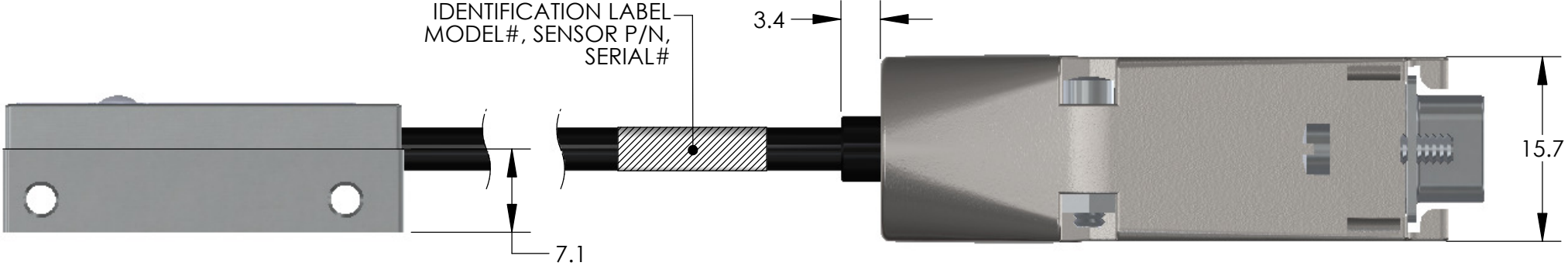
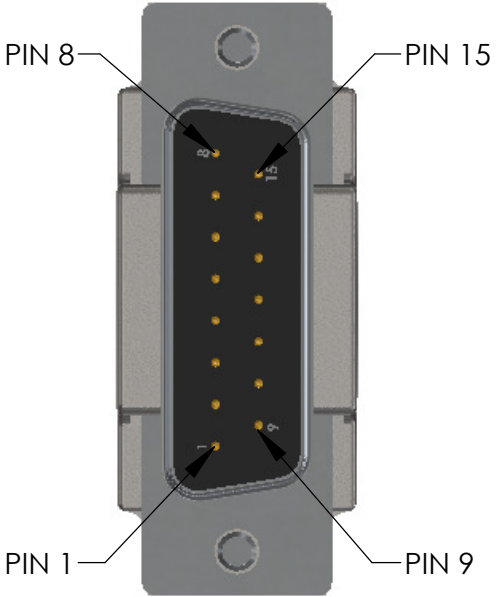
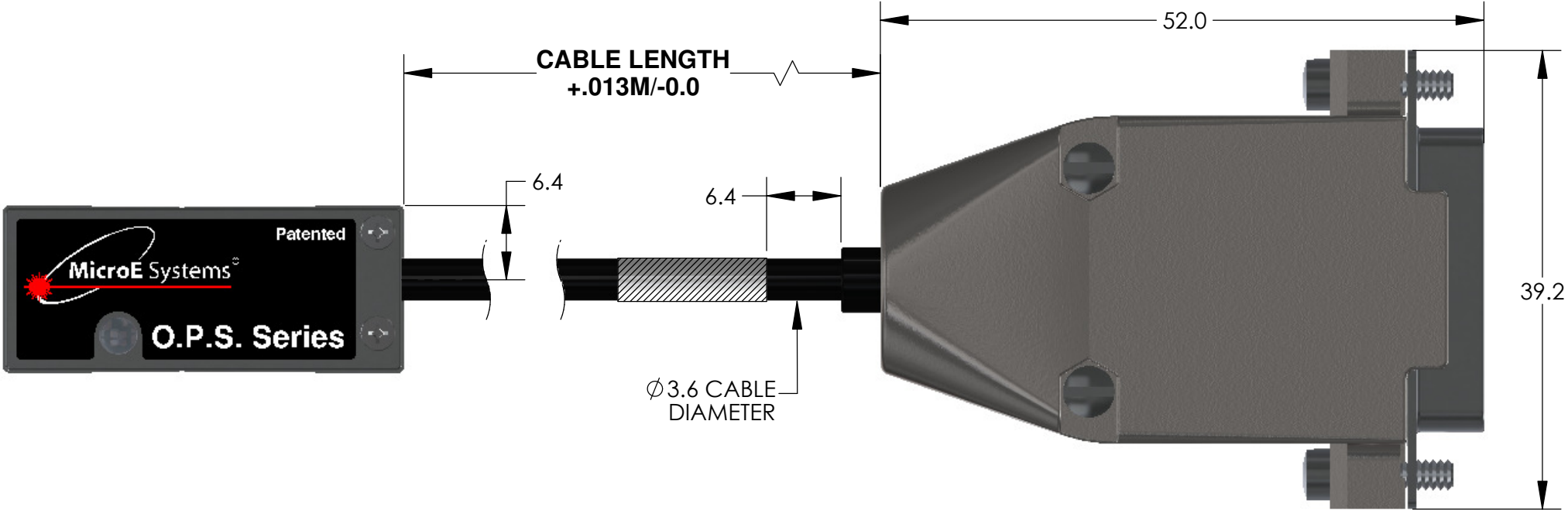
REVISIONS				
LTR	ECO	DESCRIPTION	DATE	APPROVED
1	---	INITIAL	11/26/13	VB



NOTES:

- HEIGHT OF LINEAR SCALE BENCHING PINS NOT TO EXCEED THE THICKNESS OF THE SCALE.
- SEE SHEETS 3 FOR DIMENSIONS AND LOCATIONS OF MARKERS.
- WHEN SENSOR MOVES IN DIRECTION "A" WITH RESPECT TO A STATIONARY LASER/MARKER TAPE II SCALE, OUTPUT SIGNAL A+ (PIN 14) LEADS OUTPUT SIGNAL B+ (PIN 13).
- RECOMMENDED MOUNTING HARDWARE:
M3x0.5 SCREWS
M2x0.5 SCREWS ARE RECOMMENDED IF USING THE OPS-SM MOUNTING HOLES AS THRU-HOLES.


UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES [MILLIMETERS] DIM. APPLY AFTER PROCESSING INTERPRET ALL GEOMETRIC TOLS. PER ANSI Y14.5M-1994	APPROVALS		DATE	 MicroE Systems® 125 Middlesex Tpk. Bedford, MA 01730	
	DRAWN S.BUTURLIA		11/8/13		
	CHECKED				
	ENGRG.				
	MFG ENG				
TOLERANCES ARE: DECIMALS: .XX [.X] ±.01 [.25] .XXX [.XX] ±.005 [.13]	ANGULAR: ±30 MIN.		DESCRIPTION: INTERFACE, ENCODER, 20um, LINEAR GLASS SCALE w/STICK-ON INDEX & LIMITS, OPS-SM SENSOR		
QA					
SUBJECT TO CHANGE WITHOUT NOTIFICATION					
SIZE B	DWG. NO. ID-00398		REV. 1		
SCALE:		CAD FILE:		 3RD ANGLE PROJECTION	SHEET 1 OF 3



OPS 15P D-SUB		
Pin#	Function	Wire Color
1	Do Not Connect	
2	GND	Black
3	Do Not Connect	
4	IW-	Brown
5	B-	Blue
6	A-	Yellow
7	+5V	Red
8	+5V	
9	GND	
10	RL	Gray
11	LL	White
12	IW+	Orange
13	B+	Violet
14	A+	Green
15	Do Not Connect	

NOTE: GND AND INNER SHIELD ARE INTERNALLY CONNECTED.

Cable Lengths	
1 Meter	
3 Meter	
5 Meter	
Custom	

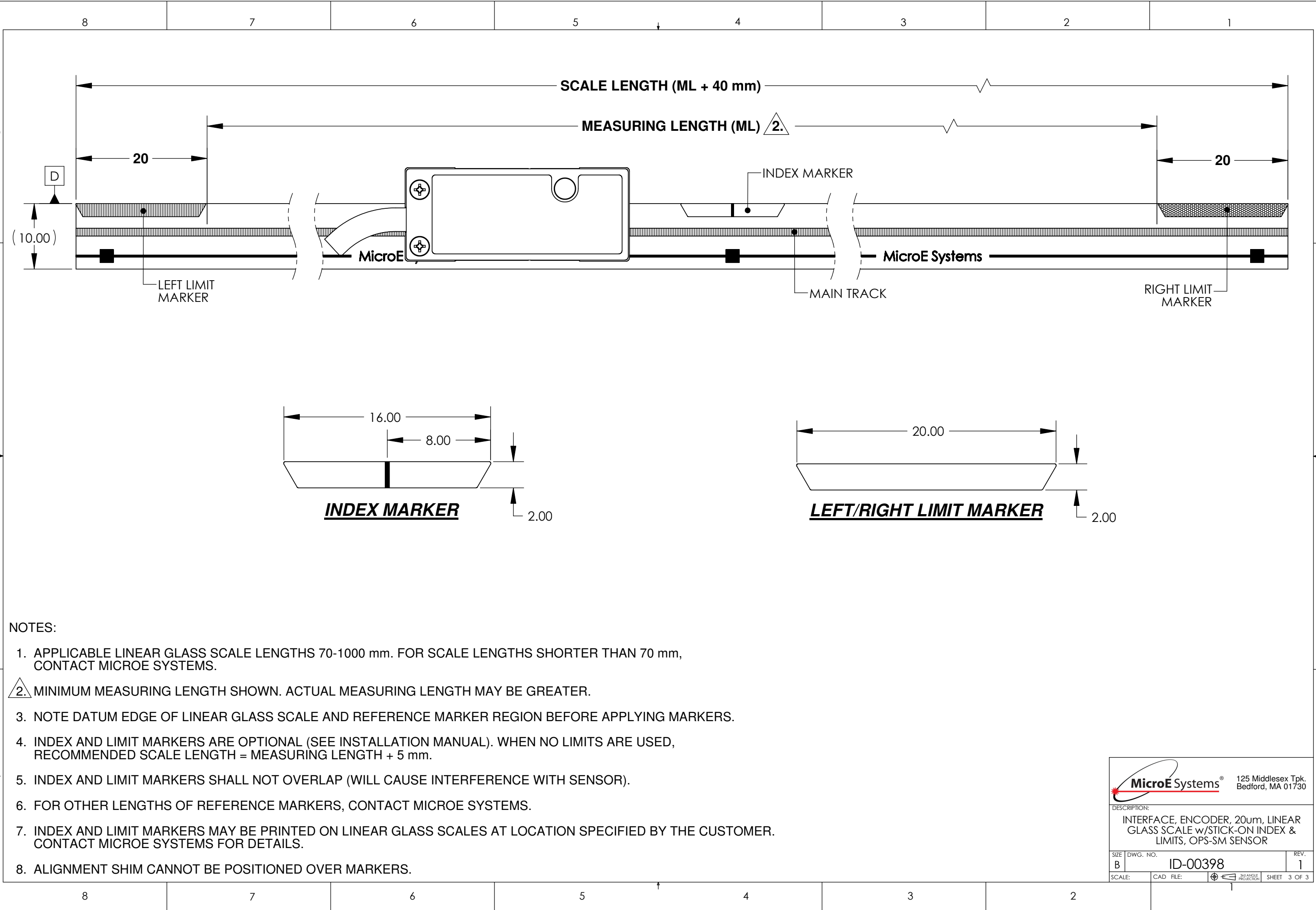


125 Middlesex Tpk.
Bedford, MA 01730

DESCRIPTION:
INTERFACE, ENCODER, 20um, LINEAR
GLASS SCALE w/STICK-ON INDEX &
LIMITS, OPS-SM SENSOR

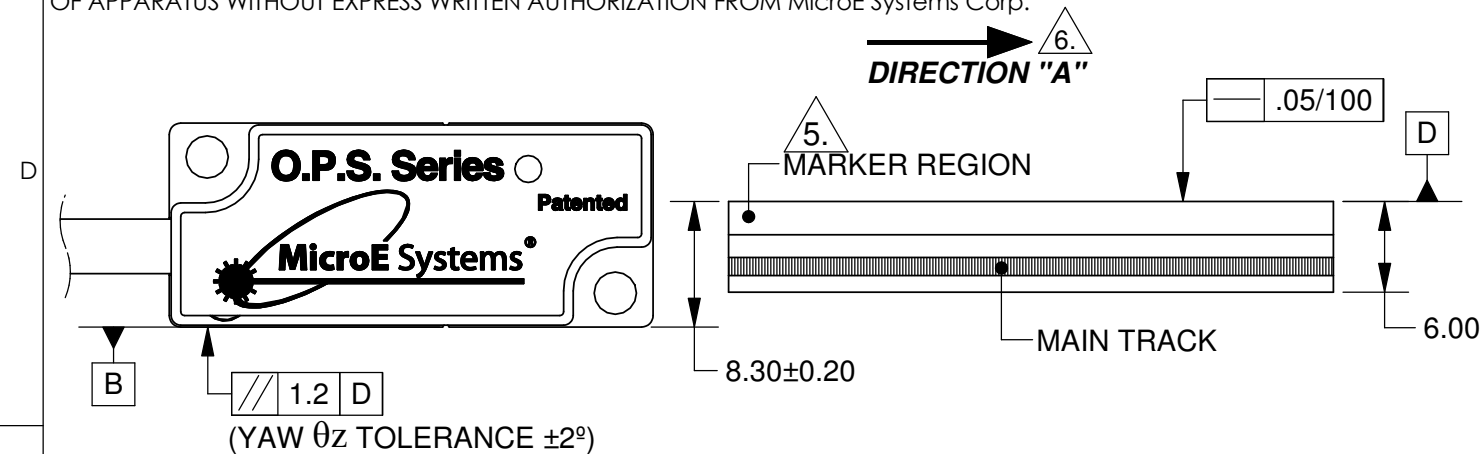
SIZE B	DWG. NO. ID-00398	REV. 1
SCALE:	CAD FILE:	3rd ANGLE PROJECTION

SHEET 2 OF 3

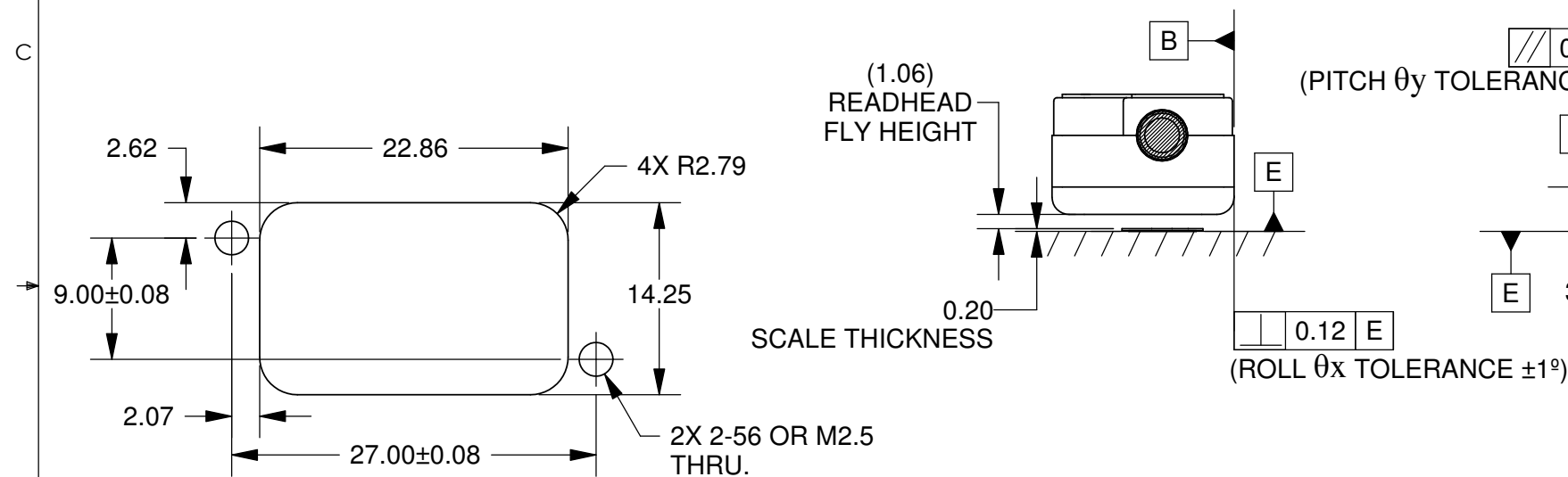


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REVISIONS				
LTR	ECO	DESCRIPTION	DATE	APPROVED
2	2514	FIXED TOLERANCE ERROR ON MOUNTING RECOMMENDATION, 9.00±.08 WAS ±.80. REVISED VIEWS/DETAILS. SEE ECO	11/30/12	VB
3	2643	ADDED GEO TOL., REVISED NOTES/VIEWS. SEE ECO	11/26/13	VB



**LASER/MARKER TAPE II SCALE SHOWN IN THIS VIEW TRANSLATED IN X-AXIS
OUT OF OPERATING RANGE FOR CLARITY**

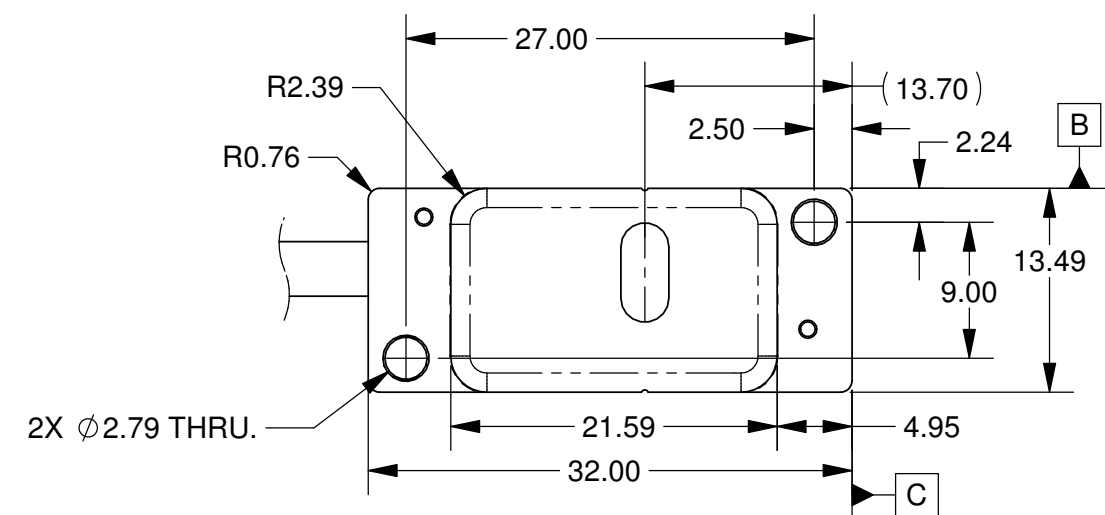
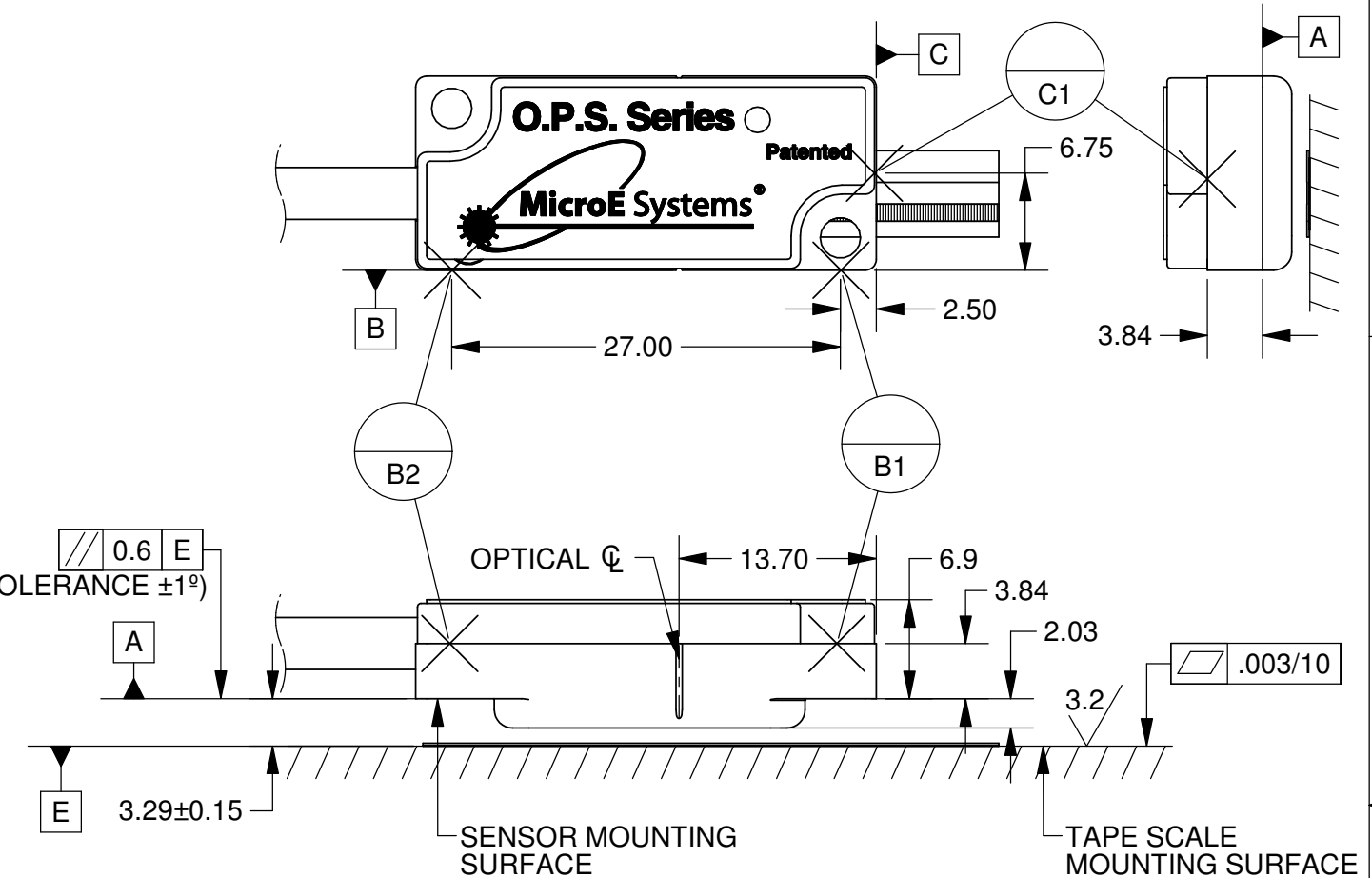


SENSOR MOUNTING PLATE RECOMMENDATION



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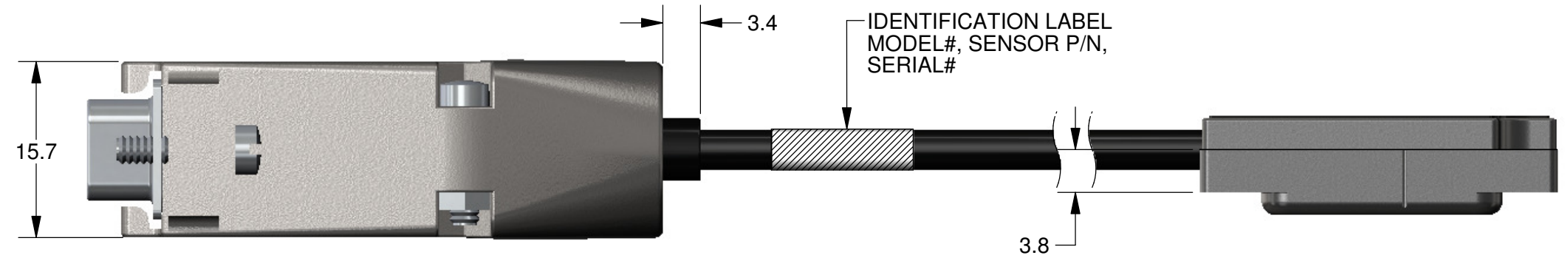
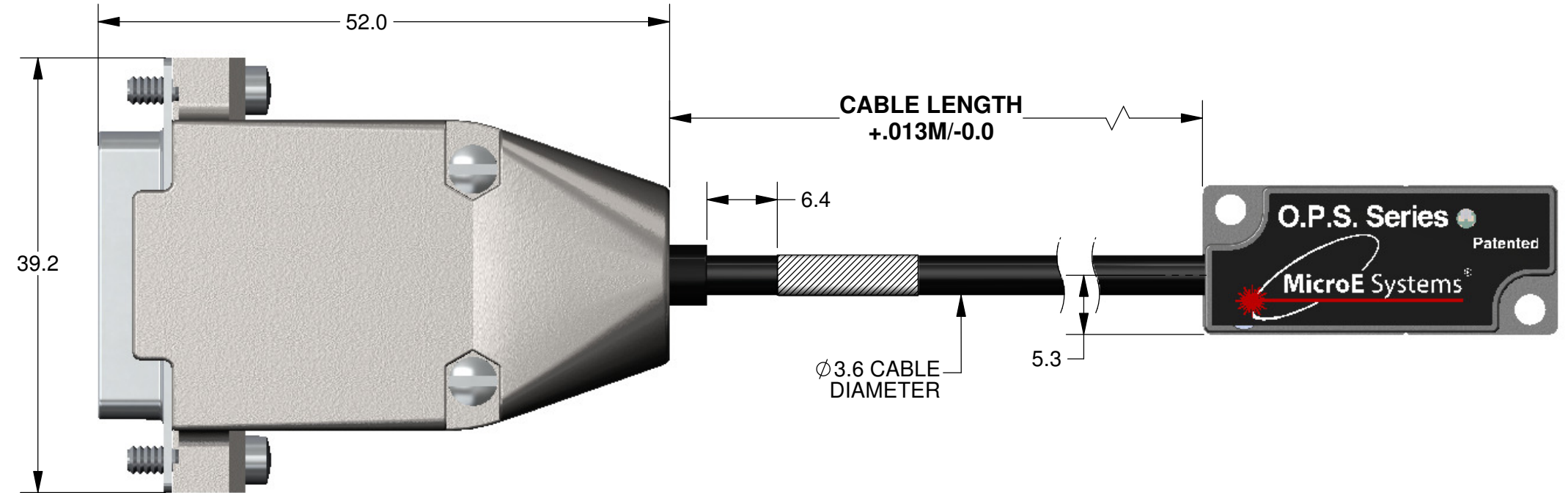
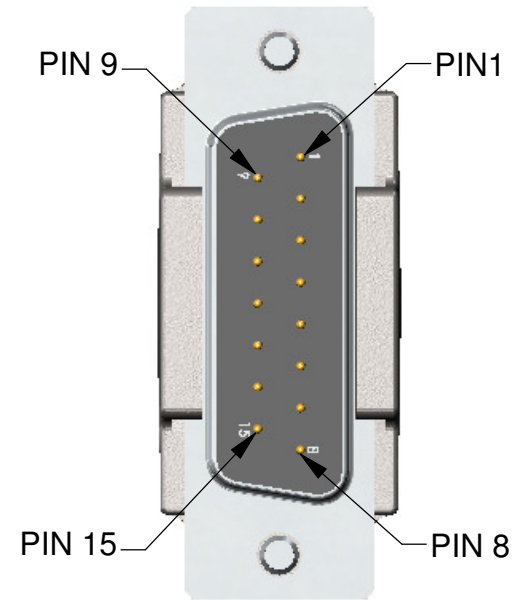
1. RECOMMENDED MOUNTING HARDWARE:
2-56 OR M2.5 SOCKET HEAD CAP SCREWS.
2. IF BENCHING PINS ARE TO BE USED, PINS MUST BE PLACED ALONG DATUM EDGES OF SENSOR FOR PROPER ALIGNMENT (REFERENCE DATUMS B1, B2 AND C1).
3. HEIGHT OF SENSOR BENCHING PINS MUST BE A MINIMUM OF 4.06 mm IN HEIGHT FROM DATUM A.
4. RECOMMENDED SENSOR MOUNTING PLATE THICKNESS:
MINIMUM: 4 SCREW THREADS.
MAXIMUM: ALLOW FOR CLEARANCE TO SCALE AND SCALE MOUNTING HARDWARE (BENCHING SURFACE, TRENCHES, ETC).

5. SEE SHEETS 3 AND 4 FOR DIMENSIONS AND LOCATIONS OF MARKERS.
6. WHEN LASER/MARKER TAPE II SCALE MOVES IN DIRECTION "A" WITH RESPECT TO A STATIONARY SENSOR, OUTPUT SIGNAL A+ (PIN 14) LEADS OUTPUT SIGNAL B+ (PIN 13).



UNITS: mm

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MILLIMETERS DIM. APPLY AFTER PROCESSING INTERPRET ALL GEOMETRIC TOLS. PER ANSI Y14.5M-1994		APPROVALS DRAWN S.BUTURLIA CHECKED ENGRG. MFG ENG QA		DATE 6/27/12		 125 Middlesex Tpk. Bedford, MA 01730	
TOLERANCES ARE: DECIMALS: .X ±.25 .XX ±.13		ANGULAR: ±30 MIN.		DESCRIPTION: INTERFACE, ENCODER, 20um LASER TAPE II/MARKER TAPE II SCALE, OPS SENSOR			
SUBJECT TO CHANGE WITHOUT NOTIFICATION				SIZE B	DWG. NO. ID-00392		REV. 3
SCALE:		CAD FILE:		 3rd ANGLE PROJECTION		SHEET 1 OF 4	



OPS 15P D-SUB		
Pin#	Function	Wire Color
1	Do Not Connect	
2	GND	Black
3	Do Not Connect	
4	IW-	Brown
5	B-	Blue
6	A-	Yellow
7	+5V	Red
8	+5V	
9	GND	
10	RL	Gray
11	LL	White
12	IW+	Orange
13	B+	Violet
14	A+	Green
15	Do Not Connect	

NOTE: GND AND INNER SHIELD ARE INTERNALLY CONNECTED.

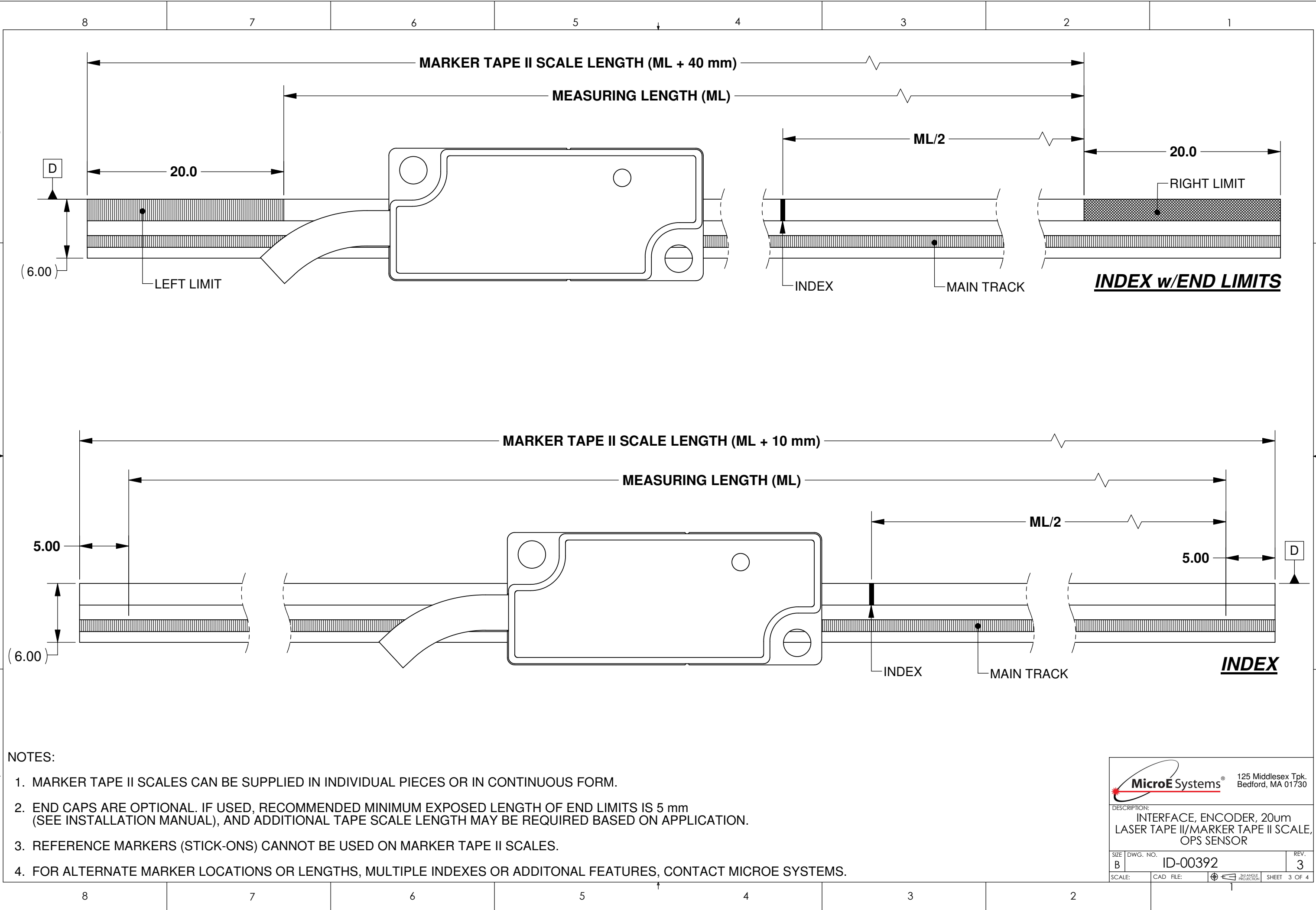
Cable Lengths	
1 Meter	
3 Meter	
5 Meter	
Custom	



125 Middlesex Tpk.
Bedford, MA 01730

DESCRIPTION:
INTERFACE, ENCODER, 20um
LASER TAPE II/MARKER TAPE II SCALE,
OPS SENSOR

SIZE B	DWG. NO. ID-00392	REV. 3
SCALE:	CAD FILE:	3rd ANGLE PROJECTION SHEET 2 OF 4



NOTES:

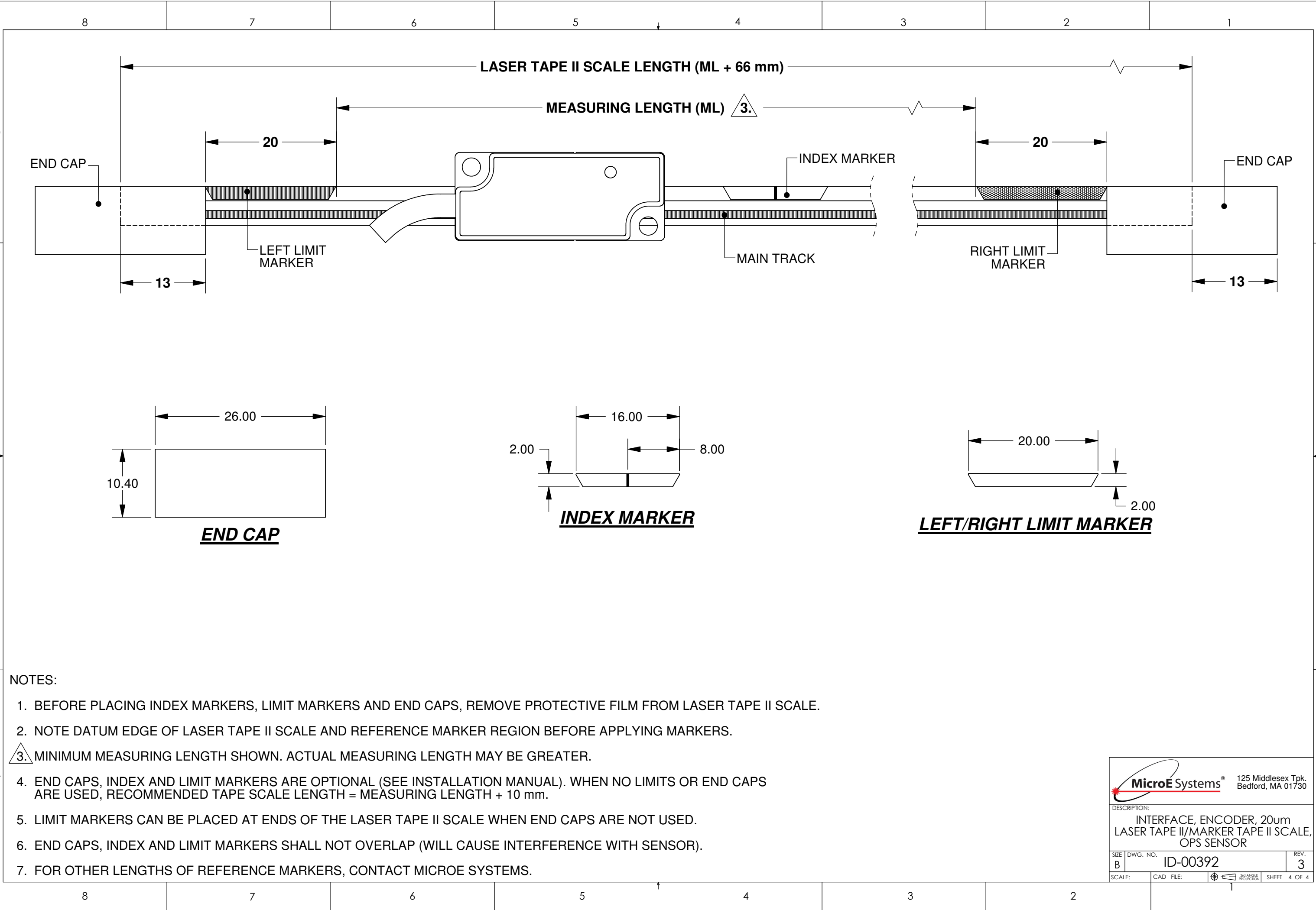
1. MARKER TAPE II SCALES CAN BE SUPPLIED IN INDIVIDUAL PIECES OR IN CONTINUOUS FORM.
2. END CAPS ARE OPTIONAL. IF USED, RECOMMENDED MINIMUM EXPOSED LENGTH OF END LIMITS IS 5 mm (SEE INSTALLATION MANUAL), AND ADDITIONAL TAPE SCALE LENGTH MAY BE REQUIRED BASED ON APPLICATION.
3. REFERENCE MARKERS (STICK-ONS) CANNOT BE USED ON MARKER TAPE II SCALES.
4. FOR ALTERNATE MARKER LOCATIONS OR LENGTHS, MULTIPLE INDEXES OR ADDITONAL FEATURES, CONTACT MICROE SYSTEMS.



125 Middlesex Tpk.
Bedford, MA 01730

DESCRIPTION:
INTERFACE, ENCODER, 20um
LASER TAPE II/MARKER TAPE II SCALE,
OPS SENSOR

SIZE B	DWG. NO. ID-00392	REV. 3
SCALE:	CAD FILE:	3rd ANGLE PROJECTION SHEET 3 OF 4



NOTES:

1. BEFORE PLACING INDEX MARKERS, LIMIT MARKERS AND END CAPS, REMOVE PROTECTIVE FILM FROM LASER TAPE II SCALE.
2. NOTE DATUM EDGE OF LASER TAPE II SCALE AND REFERENCE MARKER REGION BEFORE APPLYING MARKERS.
3. MINIMUM MEASURING LENGTH SHOWN. ACTUAL MEASURING LENGTH MAY BE GREATER.
4. END CAPS, INDEX AND LIMIT MARKERS ARE OPTIONAL (SEE INSTALLATION MANUAL). WHEN NO LIMITS OR END CAPS ARE USED, RECOMMENDED TAPE SCALE LENGTH = MEASURING LENGTH + 10 mm.
5. LIMIT MARKERS CAN BE PLACED AT ENDS OF THE LASER TAPE II SCALE WHEN END CAPS ARE NOT USED.
6. END CAPS, INDEX AND LIMIT MARKERS SHALL NOT OVERLAP (WILL CAUSE INTERFERENCE WITH SENSOR).
7. FOR OTHER LENGTHS OF REFERENCE MARKERS, CONTACT MICROE SYSTEMS.



125 Middlesex Tpk.
Bedford, MA 01730

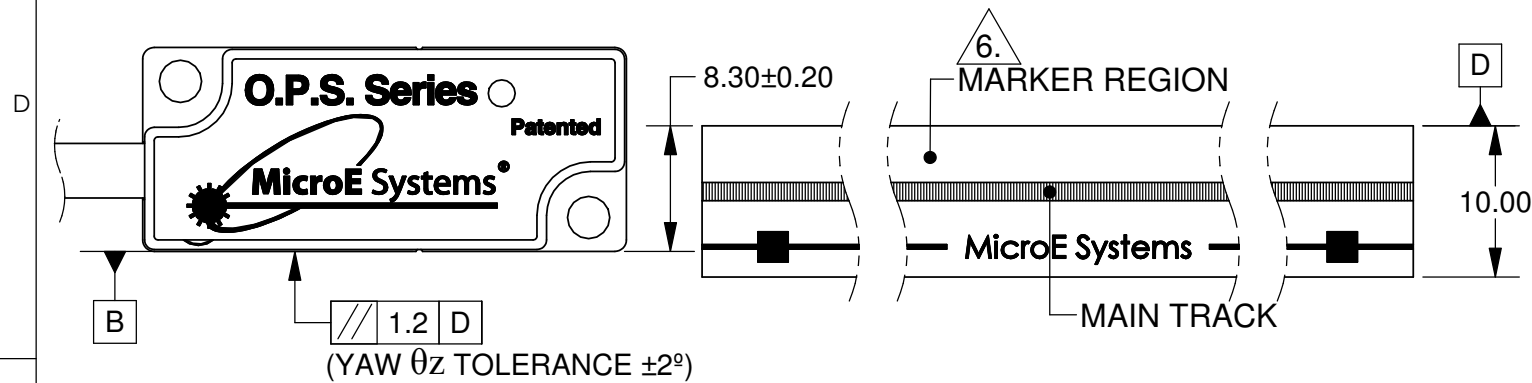
DESCRIPTION:
INTERFACE, ENCODER, 20um
LASER TAPE II/MARKER TAPE II SCALE,
OPS SENSOR

SIZE B	DWG. NO. ID-00392	REV. 3
SCALE:	CAD FILE:	3rd ANGLE PROJECTION
SHEET		4 OF 4

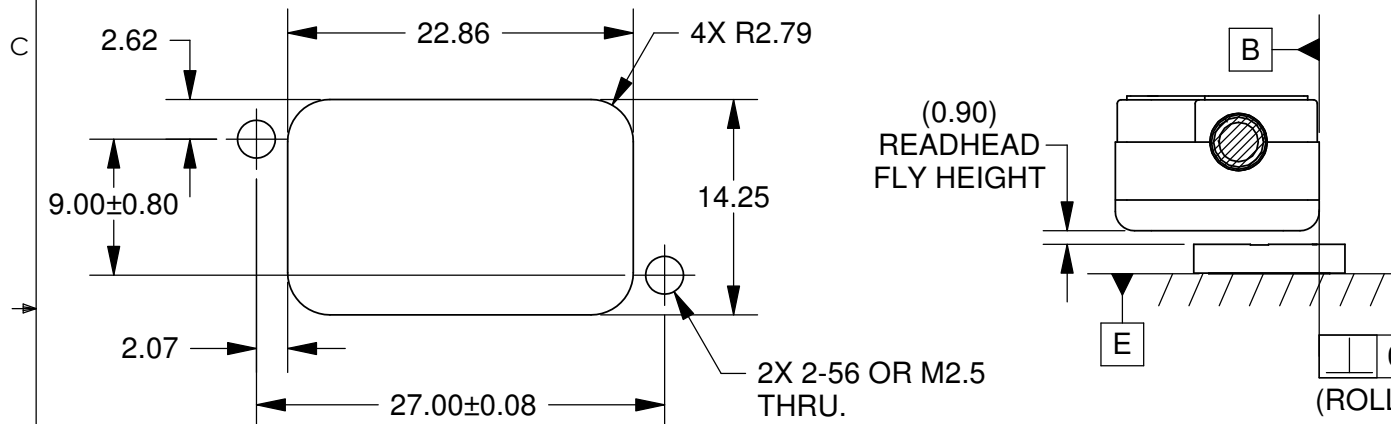
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DIRECTION "A"

REVISIONS				
LTR	ECO	DESCRIPTION	DATE	APPROVED
2	---	REVISED VIEWS/NOTES AND DIMENSIONS.	11/26/13	VB

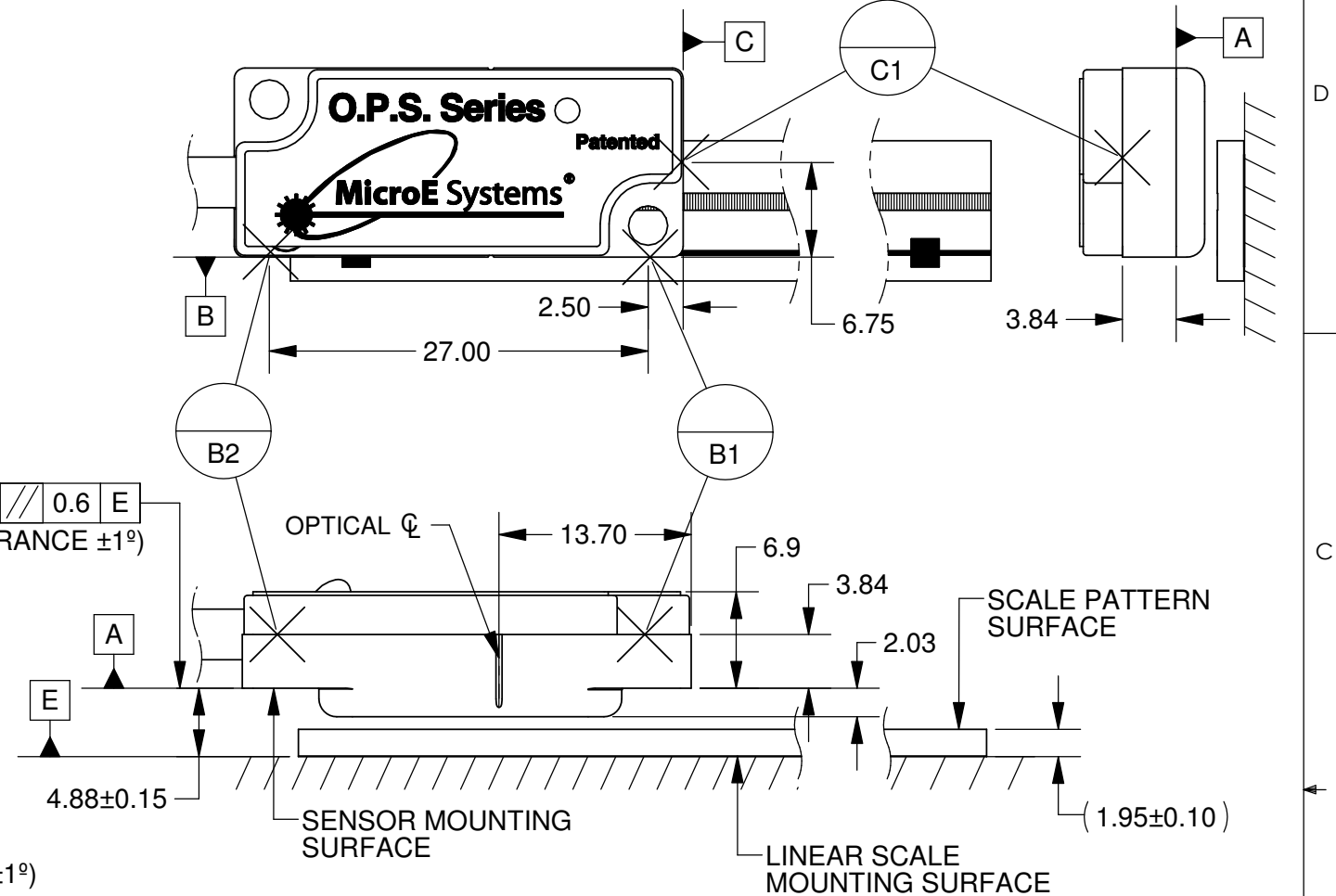


LINEAR GLASS SCALE SHOWN IN THIS VIEW TRANSLATED IN X-AXIS OUT OF OPERATING RANGE FOR CLARITY



SENSOR MOUNTING PLATE RECOMMENDATION

(PITCH θ_y TOLERANCE $\pm 1^\circ$)

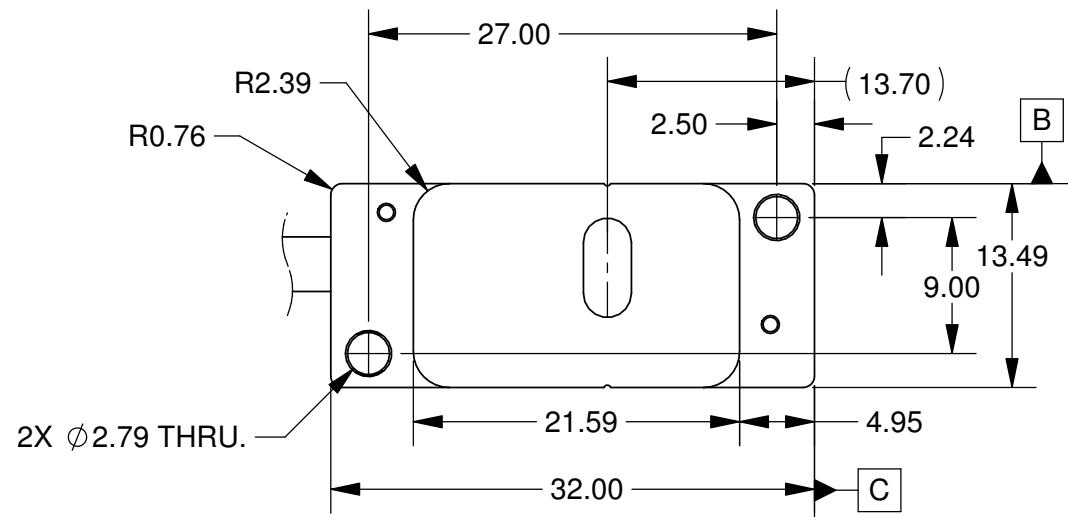


NOTES:


1. RECOMMENDED MOUNTING HARDWARE:
2-56 OR M2.5 SOCKET HEAD CAP SCREWS.
2. IF BENCHING PINS ARE TO BE USED, PINS MUST BE PLACED ALONG DATUM EDGES OF SENSOR FOR PROPER ALIGNMENT (REFERENCE DATUMS B1, B2 AND C1).
3. HEIGHT OF SENSOR BENCHING PINS MUST BE A MINIMUM OF 4.06 mm IN HEIGHT FROM DATUM A.
4. HEIGHT OF LINEAR GLASS SCALE BENCHING PINS NOT TO EXCEED THE THICKNESS OF THE SCALE.
5. RECOMMENDED SENSOR MOUNTING PLATE THICKNESS:
MINIMUM: 4 SCREW THREADS.
MAXIMUM: ALLOW FOR CLEARANCE TO SCALE AND SCALE MOUNTING HARDWARE (BENCHING SURFACE, TRENCHES, ETC).

6. SEE SHEETS 3 FOR DIMENSIONS AND LOCATIONS OF MARKERS.

7. WHEN LINEAR GLASS SCALE MOVES IN DIRECTION "A" WITH RESPECT TO A STATIONARY SENSOR, OUTPUT SIGNAL A+ (PIN 14) LEADS OUTPUT SIGNAL B+ (PIN 13).



UNITS: mm

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MILLIMETERS DIM. APPLY AFTER PROCESSING INTERPRET ALL GEOMETRIC TOLS. PER ANSI Y14.5M-1994 TOLERANCES ARE: DECIMALS: .X ±.25 .XX ±.13		APPROVALS	DATE	 125 Middlesex Tpk. Bedford, MA 01730 DESCRIPTION: INTERFACE, ENCODER, 20um LINEAR GLASS SCALE w/STICK-ON INDEX & LIMITS, OPS SENSOR	
		DRAWN S.BUTURLIA	6/29/12		
		CHECKED			
		ENGRG.			
SUBJECT TO CHANGE WITHOUT NOTIFICATION		MFG ENG		SIZE B	DWG. NO. ID-00393
		QA		SCALE:	REV. 2
		CAD FILE:		3rd ANGLE PROJECTION SHEET 1 OF 3	

D

D

C

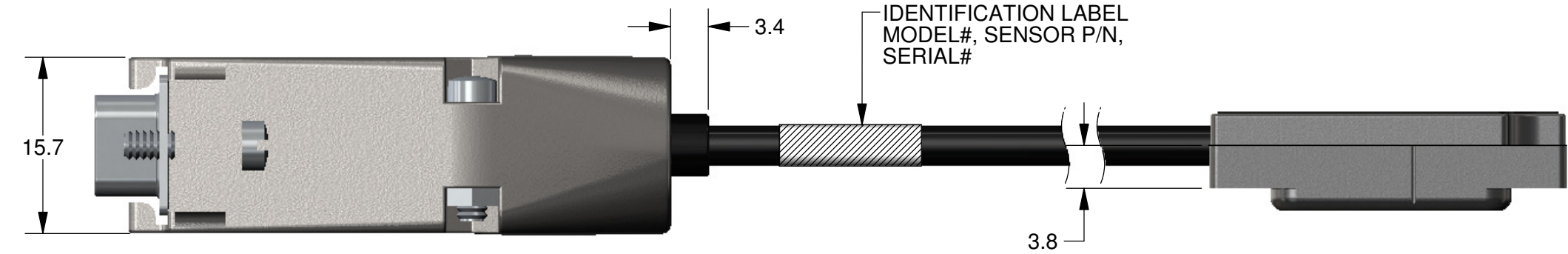
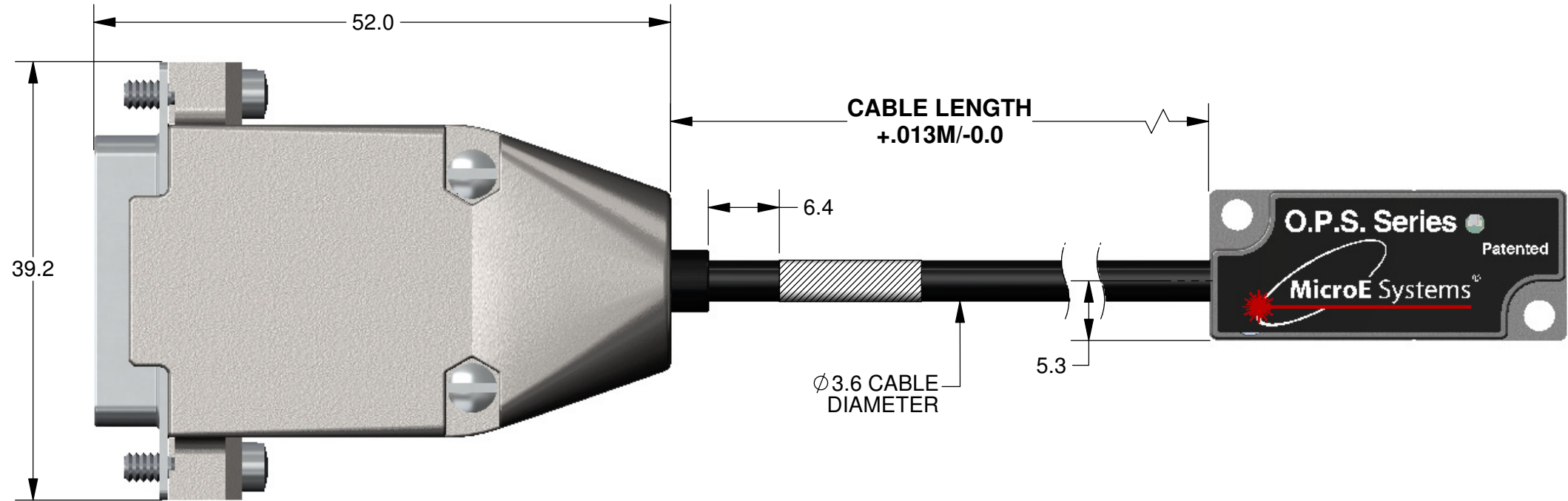
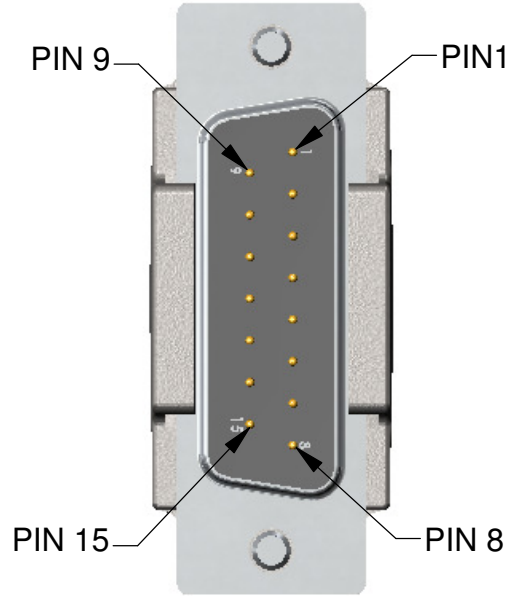
C

B

B

A


A



OPS 15P D-SUB		
Pin#	Function	Wire Color
1	Do Not Connect	
2	GND	Black
3	Do Not Connect	
4	IW-	Brown
5	B-	Blue
6	A-	Yellow
7	+5V	Red
8	+5V	
9	GND	
10	RL	Gray
11	LL	White
12	IW+	Orange
13	B+	Violet
14	A+	Green
15	Do Not Connect	

NOTE: GND AND INNER SHIELD ARE INTERNALLY CONNECTED.

Cable Lengths	
1 Meter	
3 Meter	
5 Meter	
Custom	



125 Middlesex Tpk.
Bedford, MA 01730

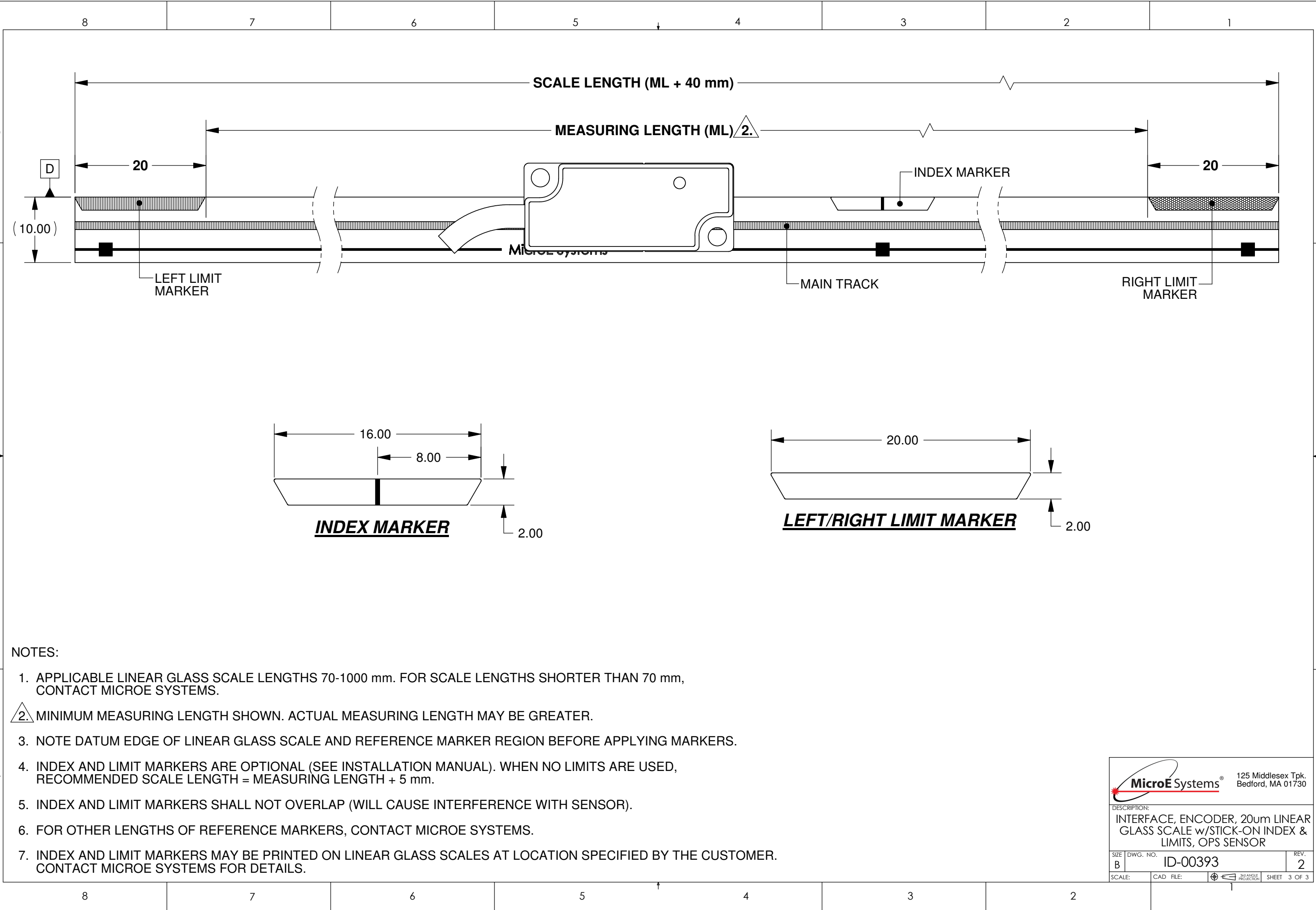
DESCRIPTION:
INTERFACE, ENCODER, 20um LINEAR
GLASS SCALE w/STICK-ON INDEX &
LIMITS, OPS SENSOR

SIZE
B



DWG. NO.
ID-00393

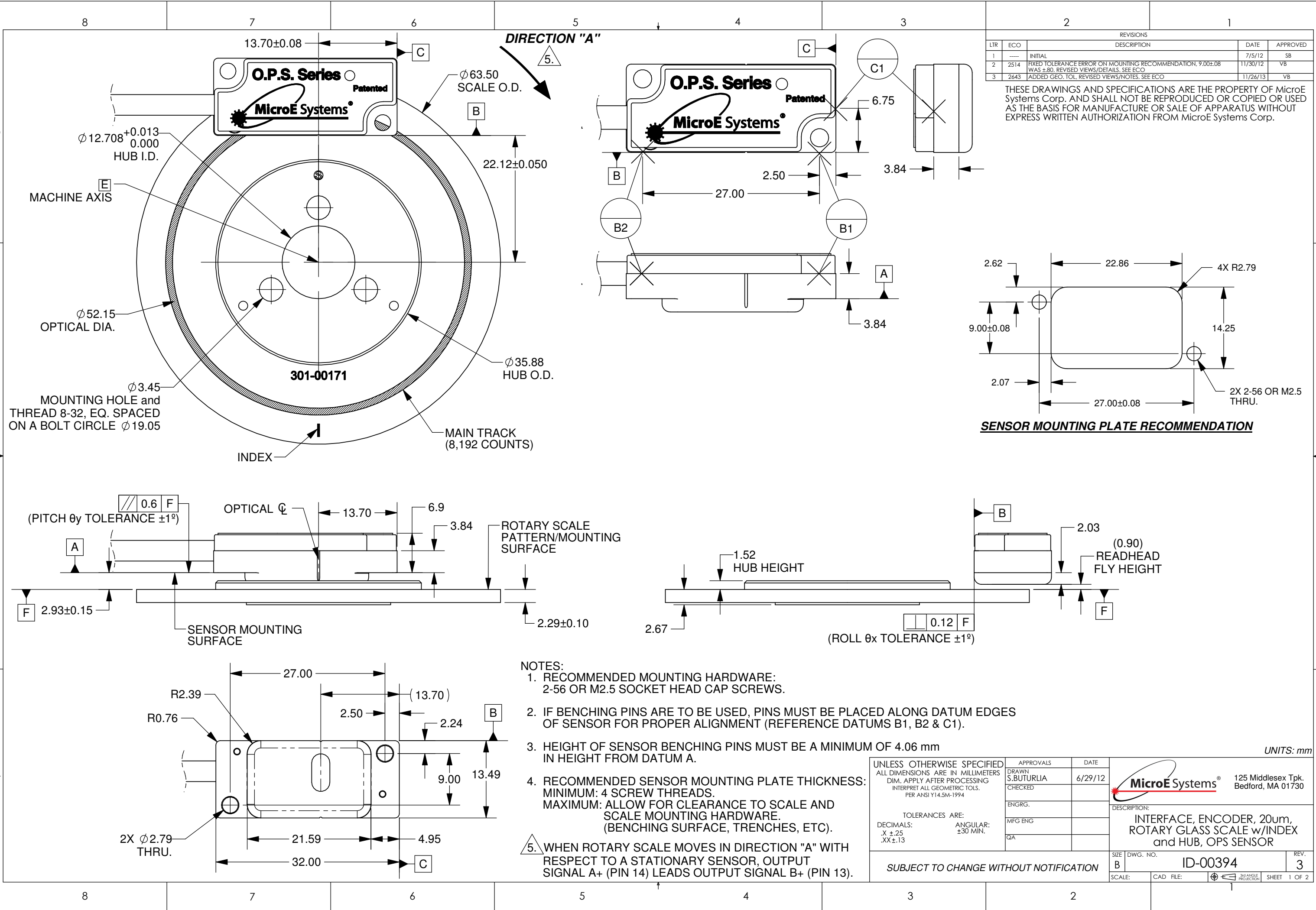
REV.
2

SCALE: CAD FILE: 3rd ANGLE PROJECTION SHEET 2 OF 3



- NOTES:
1. APPLICABLE LINEAR GLASS SCALE LENGTHS 70-1000 mm. FOR SCALE LENGTHS SHORTER THAN 70 mm, CONTACT MICROE SYSTEMS.
 2. MINIMUM MEASURING LENGTH SHOWN. ACTUAL MEASURING LENGTH MAY BE GREATER.
 3. NOTE DATUM EDGE OF LINEAR GLASS SCALE AND REFERENCE MARKER REGION BEFORE APPLYING MARKERS.
 4. INDEX AND LIMIT MARKERS ARE OPTIONAL (SEE INSTALLATION MANUAL). WHEN NO LIMITS ARE USED, RECOMMENDED SCALE LENGTH = MEASURING LENGTH + 5 mm.
 5. INDEX AND LIMIT MARKERS SHALL NOT OVERLAP (WILL CAUSE INTERFERENCE WITH SENSOR).
 6. FOR OTHER LENGTHS OF REFERENCE MARKERS, CONTACT MICROE SYSTEMS.
 7. INDEX AND LIMIT MARKERS MAY BE PRINTED ON LINEAR GLASS SCALES AT LOCATION SPECIFIED BY THE CUSTOMER. CONTACT MICROE SYSTEMS FOR DETAILS.

		125 Middlesex Tpk. Bedford, MA 01730	
DESCRIPTION: INTERFACE, ENCODER, 20um LINEAR GLASS SCALE w/STICK-ON INDEX & LIMITS, OPS SENSOR			
SIZE B	DWG. NO. ID-00393	REV. 2	
SCALE:	CAD FILE:		SHEET 3 OF 3

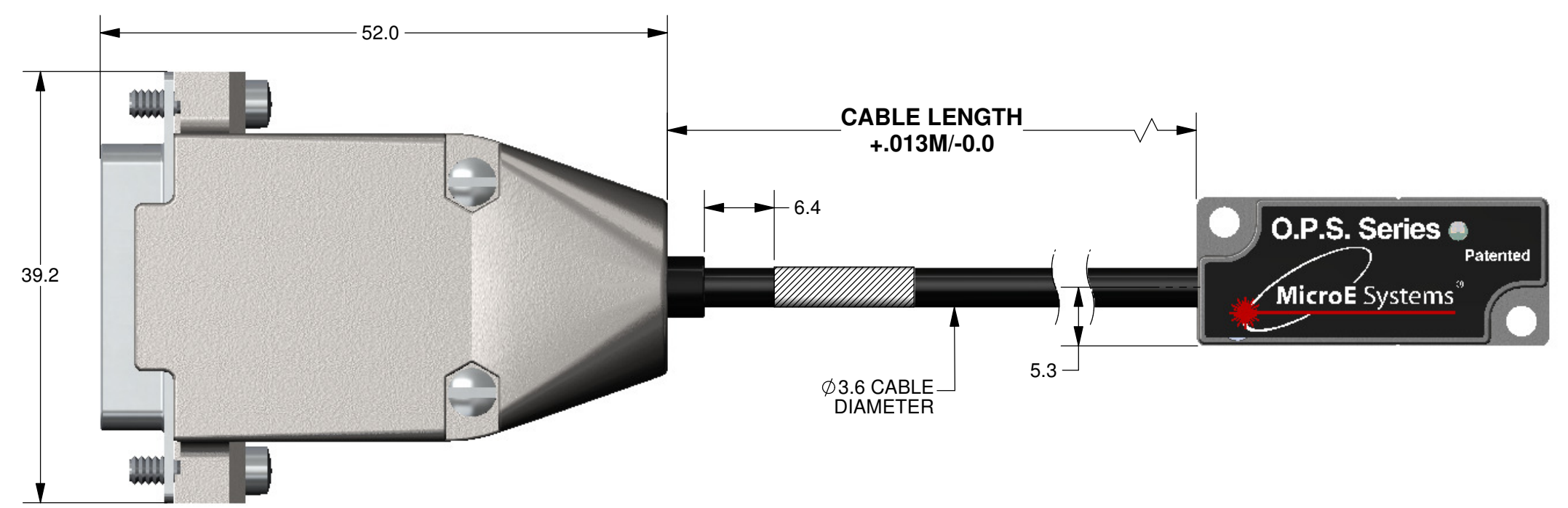
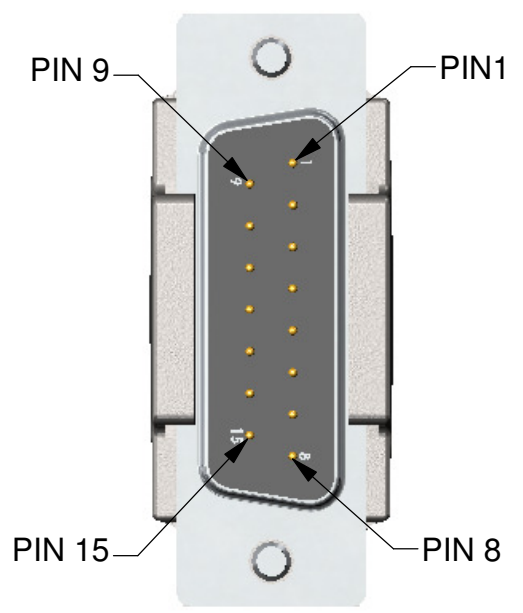


D

C

B

A

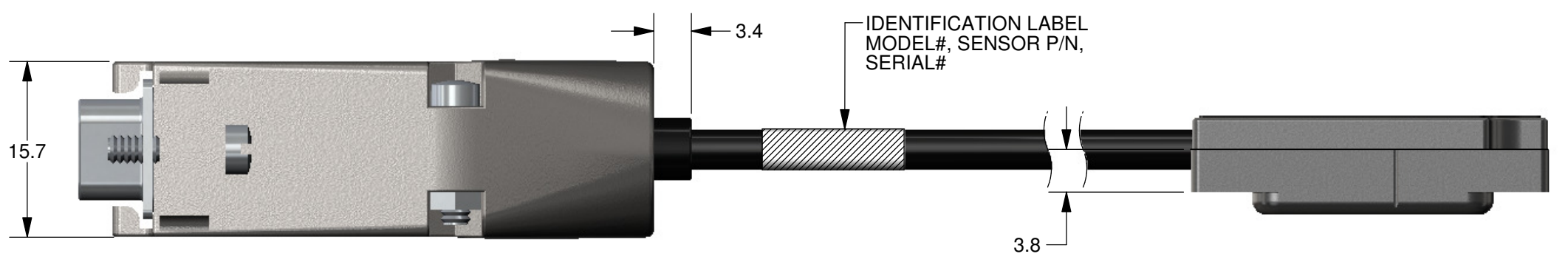


D

C

B


A



OPS 15P D-SUB		
Pin#	Function	Wire Color
1	Do Not Connect	
2	GND	Black
3	Do Not Connect	
4	IW-	Brown
5	B-	Blue
6	A-	Yellow
7	+5V	Red
8	+5V	
9	GND	
10	RL	Gray
11	LL	White
12	IW+	Orange
13	B+	Violet
14	A+	Green
15	Do Not Connect	

NOTE: GND AND INNER SHIELD ARE INTERNALLY CONNECTED.

Cable Lengths
1 Meter
3 Meter
5 Meter
Custom



125 Middlesex Tpk.
Bedford, MA 01730

DESCRIPTION:
INTERFACE, ENCODER, 20um,
ROTARY GLASS SCALE w/INDEX
and HUB, OPS SENSOR


SIZE
B

DWG. NO.
ID-00394

REV.
3

SCALE:

CAD FILE:

 3rd ANGLE
PROJECTION

SHEET 2 OF 2