Change No.	Rev.	Description	Author	Date	Approved	Date
10513	D	Revise Pressure Specification	JWS	4/26/13	JWS	4/29/13
DCR	E	Added Ordering Information for DX1, Updated Format	AC/AS	6/12/2020	ARK	6/16/2020

## <u>Purpose</u>

This specification defines the requirements and design for Series 46 silicon diode temperature probes.

## **Standards and Referencing Documents**

Specifications:

MIL-DTL-38999	Detail Specification: Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect
MIL-C-5015	Connectors, Electric, Circular Threaded, AN Type
AS1043	Safety Wire Holes, Fitting, Location of Design Standard

Standards:

KSC-S-126	Sealing of Electrical Components and Enclosures
KSC-STD-E-0010	Soldering of Electrical Connections (Hand or Machine)
ANSI B46.1	Surface Texture (Surface Roughness, Waviness, and Lay)
MIL-STD-130	Identification Marking



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<u>Requirem</u>	<u>ents</u>											
Materials:			The housing is 316 stainless steel (excluding the connector shell which is 303 or better).									
Sensing Element:			The sensing element is a silicon diode supported and contained in a well closed housing.									
Interchange	eabilit	у:	The unit is designed to permit intercha	ngeability	of units wit	h the same	e number.					
Service Media:			The unit will operate in the following gaseous or liquid media where compatible with the sheath-housing material and within the temperature range of the unit:AlcoholNeon (Ne)Ammonia (NH_3)Nitrogen (N_2)Helium (He)Nitrogen teroxide (N_2O_4)Hydrogen (H_2)Oxygen (O_2)Hydrazine (N_2H_4)Unsymmetrical dimethylhydrazine (UDMH)Monomenthylhygrazine (MMH)Water (H_2O)									
Performance	e Char	acteristics:	: Each unit shall exhibit the following performance characteristics (refer to <b>Ordering</b> <b>Information</b> ) for appropriate letter and number designators)									
Operating C	Curren	ıt:	The operating current of the unit should be 10 microamperes ( $\mu$ A) ± 0.1 $\mu$ A for the 46D units and 100 $\mu$ A ± 1 $\mu$ A for 46DX and 46DX1 units (the sensor excitation is supplied by an external signal conditioner).									
Overcurren	t:		The unit is capable of withstanding 1 m	A continu	ously witho	ut damage	1 <b>.</b>					
Insulation Resistance:			The insulation resistance between each connector pin with respect to the case shall be 100 megohms minimum 50 volts direct current (VDC) applied by a megohmmeter.									
Repeatability:			The unit is capable of repeating test parameter results under identical test conditions, within $\pm$ 0.1K ( $\pm$ 5 mVDC) at the boiling point of liquid helium and within $\pm$ 0.5K (1.2 mVDC) from 25 K to 400 K.									
Accuracy:			The unit shall be accurate to within $\pm$ 0.25K ( $\pm$ 12.8 mVDC) from 1.5K to 25K and within $\pm$ 0.5K (1.2 mVDC) from 25K to 400K. (46DX and 46DX1, within $\pm$ 0.75K from 273K to 400K)									

SCIENTIFIC INSTRUMENTS

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Self-Heatin	σ.		The unit shall have a temperature self-heating error, within the operating									
	ρ.		temperature range as follows.									
			Unit <u>Temperature Error</u> <u>I<sup>2</sup> Power</u>									
			46D	±0.	.01 K maximum		0.2 milli	watts				
			46DX (46DX1)	±0.	10 K maximum		2.0 milli	watts				
Response T	ime:		The unit shall respond within 63.2 percent of total temperature change, for a step									
			change in temperature from 293.15 K $\pm$ 3K to 77.35 K $\pm$ 3K, within 15 seconds.									
Thermal Cy	cle:		The probe shall perform within requirements following ten alternating exposures									
			to two different	temp	eratures with a diffe	erential	of not less t	than 273 K,	using pre-			
			and post- therm		cie outputs at any gr	ven tem	perature as	compariso	<b>)</b> n.			
Bending:			Support the pro	be in	a rigid test fixture.	Apply a	load of 453	6 grams (1	0 pounds)			
			plus or minus 22	27 gra	ims (0.5 pound) per	pendicul	ar to the lo	ngitudinal	axis of the			
			probe at a poin	t 1.50	D centimeters (cm)	(0.59 inc	ch) plus or	minus 0.2	5 cm (0.10			
			inch) from the supported point. The load shall not cause a deflection of more than									
			0.038 cm (0.15 inch) at the applied load point. When the load is removed, this									
			point shall return to its initial position within plus or minus 0.008 cm (0.003 inch).									
Drossuro Sa	alı		The probes shall show no leakage at the operating pressures below (depending op									
Flessule Se	:dl.		the safety factor required for the application). See Below Table.									
			the surery factor required for the application, see below fusic.									
			Press	1.5X Applications	s 1.2X Applications							
			ME	OP	2000 psi		2500 psi					
			Pr	oof	3000 psi		3000 psi					
			Βι	urst	4000 psi		4000 psi					
Environme	ntal Co	onditions:	Each unit is capa	able o	of operating within the second second	he follov	ving enviro	nmental co	onditions.			
			a. Temperature:									
			Each uni	it is c	apable of operating	g within	an environ	imental te	mperature			
			range of	1.5 K	(-271.66°C) to 400 l	K (126.85	5°C).					
Vibration			Each unit is can	ablo o	of operating under vi	ibration	up to 20g r	ms at 200-	20004-			
						IDIATION	up to Sog I	1115 at 200-	2000112.			
		This do	cument is uncontrolle	ed whe	en printed. Verify currer	nt revision	before use.					



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Connector:		The connector shall mate with an MIL38 assignment is as follows.	999/26-A	-35 Series I	Il connecto	or. Pin			
PinFunction1Signal Output (positive)2Excitation (positive)3Not used4Excitation (return)5Signal Output (negative)6Not used									
Size:		The size is in accordance with Figures 1 length).	and 2. (re	efer to <b>Orde</b>	ering Infor	mation for			
Identificatio	on:	<ul> <li>The following information is permanent specified in MIL-STD-130.</li> <li>a. Serial number</li> <li>b. Manufacturer</li> <li>c. Model number</li> <li>d. Contract number</li> <li>e. Date the unit was manufactured</li> <li>f. Unit name</li> </ul>	y applied (month a	to the surf	ace of the	unit as			
Ordering Information:		tion: The following information provides the designators to order the unit with the d	The following information provides the correct part number with appropriate designators to order the unit with the desired characteristics.						

Pro	Probe Model Number								
46									
	Prob	Probe Type							
	D	For use with 10µA excitation							
	DX	For use	<i>For use with</i> 100μA excitation (Typ response curve: 018-045)						
	DX1	<i>For use with</i> 100µA excitation (Typ response curve: 018-045-1)							
		Probe length							
		XXX	Length: Tenths of Inches						

Example								
46	D	025	10μA Probe with 2.5inch Immersion Length					



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DCR	E	Added C	Jrdering I	nformatio	on for DX1, (	Updated Fo	ormat	AC/AS	6/12/2020	ARK	6/16/2020	
Calibration	:		Each unit is calibrated, and the data recorded on a calibration table that indicates voltage output versus temperature.									
Calibration	Point	:	1.	With a 46DX ( points. <b>a.</b> Boil <b>b.</b> Boil <b>c.</b> Trip	constant (46DX1), t ing point of ing point of le point of	current c he unit of Helium of Nitrog f water	of <b>10µA ±</b> is calibra n en	<b>0.1μΑ</b> f ated as 4.22F 77.35 273.2	for a 46D or follows usin K (-268.93 ° 5K (-195.8° 15K (0.0°C)	<sup>•</sup> 100μA ± 1 ng the foll C) C)	L.OµA for a lowing set	
Data Sheet:			The data sheet is in tabular form in Kelvin versus voltage in 1 Kelvin increments from 1K to 400K.									
			1.	The da a. b. c. d. e.	ta sheet s Serial nu Manufac Model ni Date the Unit nam	hall also mber cturer umber unit was ne	include t s calibrat	he follov ed	wing inform	ation.		
Equipment:	:		Equipr and Te	nent us chnolog	ed for cali gy.	bration is	s traceab	le to the	e National I	nstitute of	Standards	
		This do	cument is	uncontro	olled when p	orinted. Ve	erify currer	nt revision	before use.			



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Figure 1. S NOTES: 1. SURF ANSI 2. SENS LENC WELL 3. DIME	FACE FI B46.1 SOR HO GTHS LE BES AR DED EX INSIONS	IGD Probe Configuration, Probes 3 NISH IN ACCORDANCE WITH USING IS ONE PIECE FOR ESS THAN 3,0 INCHES, LONGER E FITTED WITH THREADED AND TENSION TUBES. S ARE IN INCHES.	8 Inches or Less Ø.140 <u>+.000</u>	.625	5 <u>+.000</u> X,X ±( NU	0.02 REFER	TO PART /ALUE
		1 2 4 5 BOSS SEAL PER MS33656E4	R.125	0.	53 MAX		
		Ø0.047 LOCK WIRE HOLES PER AS1043			0.65 MIN		
	ID	ENTIFICATION DATA TO BE LOCATED IN APPROXIMATE POSITION SHOWN			1.56	REF	
		STAINLESS STEEL HERMETICALL SEALED ELECTRICAL RECEPTACL			CONNEC MIL3899	FUSE WELD CTOR TO MA 9/26FA35SN	TE WITH



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Figure 2. S	eries 4	46D Probe Configuration, Probes Grea	ater Than 3 Inch	ies						
NO 1. 2. 3.	TES: SURFA SENSC ARE TV WITH 1 DIMEN	Ø. ACE FINISH IN ACCORDANCE WITH ANSI B46.1 OR HOUSINGS WITH 3.0 < X.X ≤ 6.0 INCHES WO PIECES, LONGER PROBES ARE FITTED THREADED AND WELDED EXTENSION TUBES. SIONS ARE IN INCHES. SIONS ARE IN INCHES. JOINT WITH GTAW - BUTT WELD FOR HERMETIC SEAL.	.140*.000	.625 1.000 1 1 1 1 1 1 1 1 1 1 1 1 1	XTENSION UBE AS EQ. X.X ±0.02 F		ιT			
	¥ ¥	— 1 2 4 5 BOSS SEAL PER MS33656E4 — ,		- Ø.340 <u>+.00</u>	NUMBER	RFOR VALUE				
		Ø0.047 LOCK WIRE HOLES PER AS1043		0	.65 MIN					
		APPROXIMATE POSITION SHOWN								
		STAINLESS STEEL HERMETICALLY SEALED ELECTRICAL RECEPTACLE			<ul> <li>GTAW FUSE</li> <li>CONNECTOR MIL38999/26F</li> </ul>	WELD R TO MATE WIT A35SN	н			
		This document is uncontrolled when prir	nted. Verify curren	t revision	before use.					



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