



**Duro-Sense Corporation**

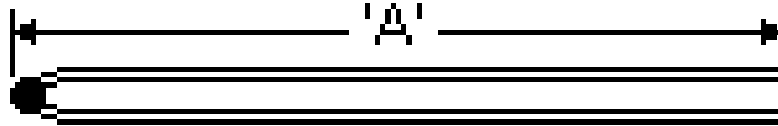


# **BASE METAL & INDUSTRIAL THERMOCOUPLES**

# BASE METAL THERMOCOUPLES

## Thermocouple Ordering Information

### Bare Element



<b>Part #:</b>	<b>BE-</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	*SP = Special Limits of Error  If standard limits of error is desired, omit this field.
	Calibration (Table 1)	Wire Gauge (Table 2)	Length (inches)	SP*	Cold End Termination (Table 3)				

NOTE: For any additional modifications to this assembly, add "-MOD" to the end of the part number and provide a physical description of the modification.

**Table 1**  
**Calibration**

P/N	Description
J	Type 'J'
K	Type 'K'
T	Type 'T'
E	Type 'E'
N	Type 'N'
X	Special

**Table 2**  
**Wire Gauge**

P/N	Description
8	8 Gauge
14	14 Gauge
16	16 Gauge
18	18 Gauge
20	20 Gauge
X	Special

**Table 3**  
**Cold End Termination**

P/N	Description
A	Stripped Leads Only
B	Ceramic Terminal Block
C	Standard Plug *
D	Jab-In Plug*
E	Hi-Temp Plug *
F	Hi-Temp Jab-In Plug*
G	Ceramic Plug*
H	Ceramic Jab-In Plug*
J	Standard Jack *
K	Jab-In Jack*
L	Hi-Temp Jack *
M	Hi-Temp Jab-In Jack*
N	Ceramic Jack*
P	Ceramic Jab-In Jack*
Q	Spade Lug †
R	Ring Lug †
X	Special

\* = Not available on 8 gauge

† = Not available on 8 or 14 gauge

### Example:

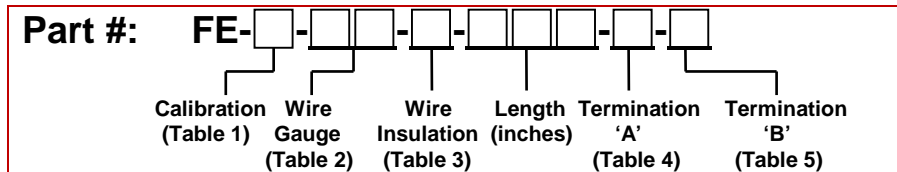
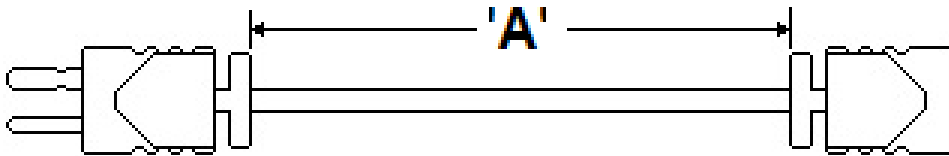
**BE-K14-12-SP-C**

Bare Element Style, Type 'K', 14 Gauge, 12" active length, special limits of error, standard male connector.

# BASE METAL THERMOCOUPLES

## Thermocouple Ordering Information

### Flexible Extension



*NOTE: For any additional modifications to this assembly, add "-MOD" to the end of the part number and provide a physical description of the modification.*

Table 1 Calibration		Table 2 Wire Gauge		Table 3 Wire Insulation		Table 4 Termination 'A'		Table 5 Termination 'B'	
P/N	Description	P/N	Description	P/N	Description	P/N	Description	P/N	Description
J	Type 'J'	14	14 Gauge	A	P/P	A	Standard Plug	A	Standard Plug
K	Type 'K'	16	16 Gauge	B	TEX/TEX	B	Hi-Temp Plug	B	Hi-Temp Plug
T	Type 'T'	20	20 Gauge	C	TEX/TEX-SS	C	Miniature Plug	C	Miniature Plug
E	Type 'E'	24	24 Gauge	D	KFT/KFT	D	Standard Jack	D	Standard Jack
N	Type 'N'	28	28 Gauge	E	GB/GB	E	Hi-Temp Jack	E	Hi-Temp Jack
X	Special	30	30 Gauge	F	GB/GB-SS	F	Miniature Jack	F	Miniature Jack
		X	Special	G	HTGB/HTGB	G	Spade Lug	G	Spade Lug
				H	HTGB/HTGB-SS	H	Ring Lug	H	Ring Lug
				X	SPECIAL	J	Stripped Leads Only	J	Stripped Leads Only
						X	Special	X	Special

### Example:

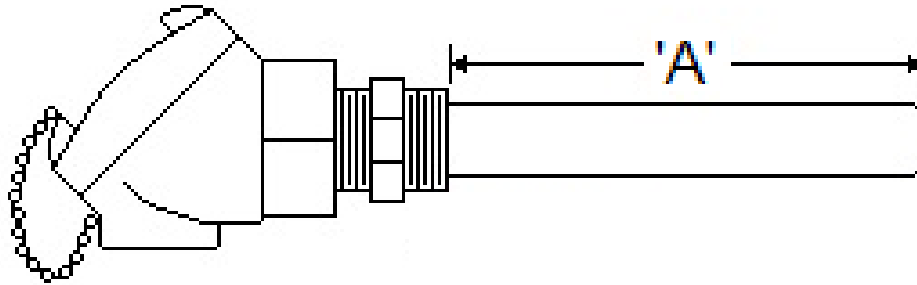
### **FE-J-20-E-300-A-D**

Flexible Extension Style. Type 'J', 20 Gauge, Fiberglass insulation, 300" active length, Standard male plug termination at one end, Standard female jack termination at other end.

# BASE METAL THERMOCOUPLES

## Thermocouple Ordering Information

### Industrial Assembly



Part #:

**IA-**    **-PT-**

Calibration (Table 1)    Wire Gauge (Table 2)    Material (Table 3)    Diameter (Table 4)    Length (inches)    SP\*    Process Fitting (Table 5)    Cold End Termination (Table 6)

\*SP = Special Limits of Error

If standard limits of error is desired, omit this field.

NOTE: For any additional modifications to this assembly, add "-MOD" to the end of the part number and provide a physical description of the modification.

**Table 1**  
Calibration

P/N	Description
J	Type 'J'
K	Type 'K'
T	Type 'T'
E	Type 'E'
N	Type 'N'
X	Special

**Table 2**  
Wire Gauge

P/N	Description
8	8 Gauge
14	14 Gauge
16	16 Gauge
18	18 Gauge
20	20 Gauge
X	Special

**Table 3**  
Material

P/N	Description
1	Silicon Carbide
2	Mullite
3	Alumina
4	Inconel
5	304 SS
6	316 SS
7	310 SS
8	321 SS
9	446 SS
X	Special

**Table 4**  
Diameter

P/N	Description
1	1/4" †
2	1/4" IPS †
3	3/8" *
4	3/8" IPS
5	1/2"
6	1/2" IPS
7	3/4"
8	3/4" IPS
9	1" IPS
X	Special

**Table 5**  
Mounting Fitting

P/N	Description
A	1/4" NPT †
B	3/8" NPT †
C	1/2" NPT
D	3/4" NPT
E	1" NPT
F	1 1/4" NPT
G	1 1/2" NPT
H	None
X	Special

**Table 6**  
Cold End Termination

P/N	Description
A	Cast Aluminum Head
B	Miniature Aluminum Head
C	Cast Iron Head
D	Polypropylene Head
E	Miniature Plastic Head
F	Explosion Proof Head
G	Canister Style Head
H	Terminal Block
X	Special

† = Not available on 8 or 14 gauge  
\* = Not available on 8 gauge

**Example:**

**Single Element:      IA-K14-PT-2-5-12-C-A**

Industrial Assembly Style, Type 'K', 14 gauge, 1/2" OD Mullite Protection Tube, 12" active length, 1/2" NPT Process Fitting, Cast Aluminum Head.

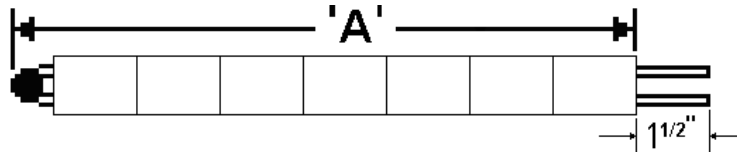
**Dual Element:        IA-2K14-PT-2-5-12-C-A**

Industrial Assembly Style, Type 'K', 14 gauge, 1/2" OD Mullite Protection Tube, 12" active length, 1/2" NPT Process Fitting, Cast Aluminum Head.

# BASE METAL THERMOCOUPLES

## Thermocouple Ordering Information

### Insulated Element



<b>Part #:</b>	IE-										*SP = Special Limits of Error  If standard limits of error is desired, omit this field.
	Calibration (Table 1)	Wire Gauge (Table 2)	Insulator Shape (Table 3)	Length (inches)	SP*	Cold End Termination (Table 4)					

NOTE: For any additional modifications to this assembly, add "-MOD" to the end of the part number and provide a physical description of the modification.

**Table 1**  
Calibration

P/N	Description
J	Type 'J'
K	Type 'K'
T	Type 'T'
E	Type 'E'
N	Type 'N'
X	Special

**Table 2**  
Wire Gauge

P/N	Description
8	8 Gauge
14	14 Gauge
16	16 Gauge
18	18 Gauge
20	20 Gauge
X	Special

**Table 3**  
Insulator Shape

P/N	Description
OV	Oval
RO	Round

**Table 4**  
Cold End Termination

P/N	Description
A	Standard Plug *
B	Jab-In Plug*
C	Hi-Temp Plug*
D	Hi-Temp Jab-In Plug*
E	Ceramic Plug*
F	Ceramic Jab-In Plug*
G	Miniature Plug†
H	Miniature Hi-Temp Plug†
J	Miniature Ceramic Plug†
K	Standard Jack *
L	Jab-In Jack*
M	Hi-Temp Jack *
N	Hi-Temp Jab-In Jack*
P	Ceramic Jack*
Q	Ceramic Jab-In Jack*
R	Miniature Jack†
S	Miniature Hi-Temp Jack†
T	Miniature Ceramic Jack†
U	Ceramic Terminal Block
V	Spade Lug †
W	Ring Lug †
Y	Stripped Leads Only
X	Special

\* = Not available on 8 gauge  
 † = Not available on 8 or 14 gauge

**Example:**      **Single Element:**      **IE-K14-OV-12-SP-C**

Insulated Element Style, Type 'K', 14 gauge, oval insulators, 12" active length, special limits of error. Standard male connector.

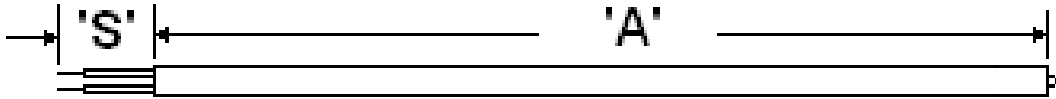
**Dual Element:**      **IE-2K14-RO-12-SP-CC**

Insulated Element Style, Type 'K', 14 gauge, round insulators, 12" active length, special limits of error. Standard male connectors.

# BASE METAL THERMOCOUPLES

## Thermocouple Ordering Information

### Loadcouple



Part #: LC-    -    /    -    -    -

Wire Gauge      S\*      Calibration\*\* (Table 1)      Wire Insulation (Table 2)      Active Length (inches)      Strip Length (inches)      Cold End Termination (Table 3)

\* = If wire is stranded, enter the letter 'S' in this field.

\*\* = If Special Limits of Error wire is required, enter the calibration letter twice in this field. (Example: "JJ" or "KK")

NOTE: For any additional modifications to this assembly, add "-MOD" to the end of the part number and provide a physical description of the modification.

**Table 1**  
Calibration

P/N	Description
1	Type 'J'
2	Type 'K'
3	Type 'T'
4	Type 'E'
5	Type 'N'
X	Special

**Table 2**  
Leadwire Type

P/N	Description
TEX/TEX	FEP Teflon
TEX/TEX-SS	FEP w/ SS Overbraid
PFA/PFA	PFA Teflon
PFA/PFA-SS	PFA w/ SS Overbraid
KFT/KFT	Kapton Fused Tape
KFT/KFT-SS	Kapton w/ SS Overbraid
GB/GB	Fiberglass
GB/GB-SS	Fiberglass w/ SS Overbraid
HTGB/HTGB	Hi-Temp Fiberglass
HTGB/HTGB-SS	Hi-Temp Fiberglass w/ SS Overbraid
VSF/VSF	Vitreous Silica Fiber
VSF/VSF-SS	Vitreous Silica Fiber w/ SS Overbraid
CF/CF	Ceramic Fiber
CF/CF-SS	Ceramic Fiber w/ SS Overbraid
CF/CF-IB	Ceramic Fiber w/ Inconel Overbraid
XXX/XXX	Special

**Table 3**  
Cold End Termination

P/N	Description
A	Standard Plug
B	Hi-Temp Plug
C	Ceramic Plug
D	Miniature Plug
E	Miniature Hi-Temp Plug
F	Miniature Ceramic Plug
G	Standard Jack
H	Hi-Temp Jack
J	Ceramic Jack
K	Miniature Jack
L	Miniature Hi-Temp Jack
M	Miniature Ceramic Jack
N	Spade Lug
P	Ring Lug
R	Stripped Leads Only
X	Special

**Example:**

**LC-20-JJ-GB/GB-SS-12-1-R**

20 Gauge, Type 'J', Special Limits of Error, Fiberglass Insulation w/ SS Overbraid  
12" Active Length, 1" Strip Length, Stripped leads Only.



## PROTECTION TUBES

Both ceramic and metal protection tubes are used to protect the temperature sensor from harsh and/or caustic environments.

Unlike thermowells, protection tubes are not primarily designed for pressure-tight applications.

Protection tube construction styles are more limited than thermowells, but they tend to be more economical.

They can also offer the advantages of corrosion resistance and, in some cases, higher temperature capabilities.

Protection Tube material selected for installation is governed primarily by temperature,  
corrosion resistance to gas or liquid and mechanical strength.

### MATERIAL SELECTION GUIDE

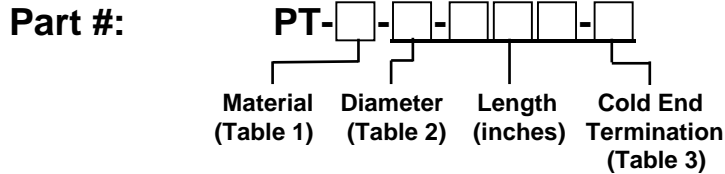
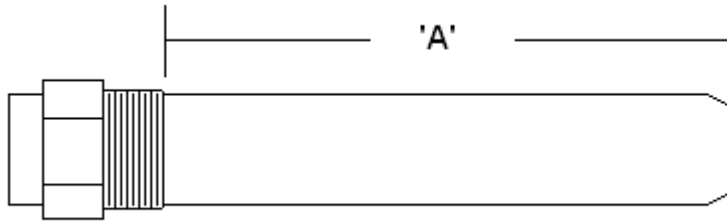
<u>Material</u>	<u>Composition</u>	<u>Temperature Rating</u>	<u>Remarks</u>
Alumina	99.8% Recrystallized Alumina Oxide	3450°F (1899°C)	Excellent electrical insulation properties. Fair resistance to thermal & mechanical shock. Impervious to gases at high temperature. Creeps (sags) at 3452°F (1900°C).
Hexoloy SA	Sintered Alpha Silicon Carbide	3000°F (1650°C)	Excellent corrosion resistance. High thermal conductivity. High thermal shock resistance. Good mechanical strength. Does not creep (sag). Attacked by halides, fused caustics & ferrous metals.
Mullite	63% Alumina	3100°F (1700°C)	Excellent electrical insulation properties. Impervious to gases at high temperatures. Poor thermal & mechanical shock resistance. Attacked by halides. Contains silica. Creeps (sags) at 3092°F (1700°C)..
Silicon Carbide	90% Silicon Carbide, 9% Silicon Dioxide, 1% Alumina Oxide	3000°F, (1650°C)	Can withstand direct flame impingement. Good thermal shock resistance. Permeable. Because of its permeability, an inner tube of Alumina or Mullite is recommended when used in atmosphere.
Aluminum	Various Grades	1000°F (538°C)	Good thermal conductivity. Good mechanical strength. Oxidation can arise when not anodized or protected.
Brass	Various Grades	1000°F (538°C)	Good thermal conductivity. Good mechanical strength.
Carbon Steel	99% Iron, 0.8% Manganese, 0.2% Carbon, Trace amounts of Phosphorus & Sulfur	1000°F (538°C)	Temperature rating based on use in non-oxidizing environments. Areas of usage include molten metals and petroleum refinery applications.
Cast Iron		1300°F (708°C)	Temperature rating based on use in oxidizing environments. Can be used up to 1600°F (871°C) under reducing conditions.
Copper	Various Grades	500°F (260°C)	Excellent thermal conductivity. Poor mechanical strength.
Hastelloy B	67% Nickel, 28% Molybdenum, 10% Silicon, 2% Iron, 1% Cobalt, 1% Chromium, 1% Manganese, 0.02% Carbon	1500°F (815°C) In inert or vacuum atmospheres 1000°F (538°C) - In air	Excellent resistance to pitting & stress-corrosion cracking, Suitable for most chemical applications. Excellent in Hydrochloric Acid
Hastelloy C	62.5% Nickel, 16% Chromium, 15.5% Molybdenum, 3% Iron, 2% Cobalt, 1% Manganese, .08% Silicon, .015Carbon	1900°F (1038°C)	Temperature rating based on use in oxidizing environments. Exceptional resistance to a wide variety of chemical environments.

## MATERIAL SELECTION GUIDE (continued)

Inconel 600	76% Nickel, 16% Chromium, 8% Iron	2100°F (1149°C) under oxidizing conditions 1900°F, (1038°C) under reducing conditions	Excellent corrosion & oxidation resistance. Must not be placed in Sulfurous environments above 1000°F (538°C)
Inconel 601	61% Nickel, 23% Chromium, 14% Iron, 1.35% Aluminum	2100°F (1149°C) under oxidizing conditions 1900°F, (1038°C) under reducing conditions	Similar properties to Inconel 600, but with superior resistance to Sulphur. Also has a higher temperature oxidation resistance to 2300°F (1260°C).
Incoloy 800	46% Iron, 32.5% Nickel, 21% Chromium, .75% Manganese, .5% Silicon, .38% Aluminum, .38% Copper, .38% Titanium, .15% Carbon	1500°F (816°C)	Strong resistance to oxidation & carburization at high temperatures. Resists Sulfur attack, internal oxidation & scaling in a wide variety of atmospheres.
Molybdenum	99.95% Molybdenum, .03% Tungsten	3500°F (1926°C) in inert atmospheres 3400°F (1871°C) in vacuum at 10 <sup>-4</sup> torr.	Oxidizes in air above 800°F (426°C). Poor mechanical shock resistance after being heated to 1900°F (1038°C).
Monel	66.5% Nickel, 31.5% Copper, 1.25% Iron, 1% Manganese, .25% Silicon, .15% Carbon	1000°F (538°C)	Temperature rating based on use in a Sulfur-free environment. Excellent resistance to corrosion.
Platinum		2500°F (1374°C)	Temperature rating based on use in continuous oxidizing conditions. Good thermal conductivity. Used in applications where high temperature but no vacuum or inert atmosphere is available.
304 SS	19% Chromium, 10% Nickel, 2% Manganese, 1% Silicon, .08% Carbon. Trace amounts of Phosphorus & Sulfur. Balance Iron.	1650°F (899°C)	Temperature rating based on use in oxidizing environments. Has good oxidation & corrosion resistance in a wide range of industrial environments. Subject to carbide precipitation, which can reduce corrosion resistance between 800°F-1000°F (427°C-538°C). Good mechanical properties from -300°F-1450°F (-184°C-788°C).
310 SS	25% Chromium, 21% Nickel, 2% Manganese, 1.5% Silicon	2100°F (1149°C)	Mechanical & corrosion resistance similar to and better than 304 stainless steel.
316 SS	17% Chromium, 12% Nickel, 2.5% Molybdenum, 2% Manganese, 1% Silicon, .08% Carbon, Trace amounts of Phosphorus & Sulfur. Balance Iron.	1700°F (927°C)	Temperature rating based on use in oxidizing environments. Similar properties as 304 stainless steel, but with improved resistance to mild acid and pitting corrosion.
321 SS	18% Chromium, 10% Nickel, 2% Manganese, 1% Silicon, .4% Titanium, .04% Phosphorus, .03% Sulphur	1600°F (871°C)	Good corrosion resistance, Used where conditions are too severe for low Carbon stainless steel.
446 SS	27% Chromium, 1.5% Manganese, 1% Silicon, .25% Nitrogen, . 2% Carbon, Trace amounts of Phosphorus & Sulfur. Balance Iron.	2000°F (1093°C)	Temperature rating based on use in oxidizing environments. Excellent high temperature corrosion & oxidizing resistance. Not for use in carburizing environments.
Tantalum		4350°F (2349°C)	Good resistance to corrosion. Quick heat conductivity. Good mechanical strength.
Titanium		2300°F (1260°C)	Temperature rating based on use in inert or vacuum environments. Acid and chemical resistant. Oxidation resistance to 1000°F (538°C).

# PROTECTION TUBES

## Ordering Information



*NOTE: For any additional modifications to this assembly, add "-MOD" to the end of the part number and provide a physical description of the modification.*

**Table 1**  
**Material**

P/N	Description
1	Silicon Carbide
2	Mullite
3	Alumina
4	Inconel
5	304 S.S.
6	316 S.S.
7	310 S.S.
8	321 S.S.
9	446 S.S.
X	Special

**Table 2**  
**Diameter**

P/N	Description
1	1/4"
2	1/4" IPS
3	3/8"
4	3/8" IPS
5	1/2"
6	1/2" IPS
7	3/4"
8	3/4" IPS
9	1" IPS
X	Special

**Table 3**  
**Cold End Termination**

P/N	Description
A	Plain
B	Threaded End
C	1/4" NPT Fitting
D	3/8" NPT Fitting
E	1/2" NPT fitting
F	1/2" x 3/4" NPT Fitting
G	3/4" NPT Fitting
H	1" NPT Fitting
J	1 1/4" NPT Fitting
K	1 1/2" NPT Fitting
X	Special

**Example:**

**PT – 2 – 7 – 36 – F**

Protection Tube. Mullite. 3/4" OD x 36" long. 1/2"x 3/4" NPT mounting fitting at cold end.

# TERMS AND CONDITIONS

**WARRANTY:**

Duro-Sense Corporation products and related parts are sold under the foregoing warranties, which extend only to the first buyer of said products as new merchandise directly from Duro-Sense Corporation or from an authorized distributor, representative or reseller.

Duro-Sense Corporation products and related parts are warranted to be free from defects in workmanship and material at the time of manufacture, and will conform to specifications set forth in relevant Duro-Sense Corporation catalog pages for such products.

Duro-Sense Corporation's sole and exclusive obligation and the purchaser's sole and exclusive remedy under the above warranty is limited to repair or replacement, at Duro-Sense Corporation's option. All claims hereunder shall be deemed waived unless made in writing, within thirty days of delivery, to Duro-Sense Corporation's main office at 869 Sandhill Avenue, Carson, CA 90746, and which, if so advised by Duro-Sense Corporation, are returned to the designated facility during normal business hours, transportation prepaid, and which, upon examination by Duro-Sense Corporation, are found to be non-compliant with the above warranty.

Duro-Sense Corporation sells products only under the above terms and conditions, which are expressly in lieu of all other warranties whatsoever, expressed, implied or statutory, including without limitation the implied warranties of merchantability and fitness for a particular purpose. Duro-Sense Corporation will not be bound by terms and conditions stated by any purchaser in any offer, acceptance or other contractual document, nor shall purchaser be entitled to incidental, special or consequential costs, expenses or damages excepting only the repair or replacement described above.

**PAYMENT TERMS:**

Net 30 Days (Pending Credit Approval). Account balances that are past due will be charged a \$1.00 service charge or a 1.5% finance charge per month, of the outstanding balance, whichever is greater.

**ORDER MINIMUM:**

\$25.00 Net per order.

**PRICING:**

Prices are subject to change without notice. There is no published price list. Please contact the sales department or your local sales representative for current pricing.

# TERMS AND CONDITIONS

## SHIPPING TERMS:

All orders are shipped F.O.B. Duro-Sense Corporation factory. All shipments are made prepaid and additional, unless otherwise negotiated in advance. Packing and handling charges are included in the shipping charges. Insurance charges are added only at the request of the purchaser.

Drop shipments will be made at the purchaser's request, providing that the invoice is issued to the "purchaser" and not to the "receiver".

Damage to shipments beyond the F.O.B. point is the responsibility of the carrier. Shipments should be opened promptly upon receipt and any claim for damage is to be initiated by the purchaser with the carrier. Replacement shipments will be made on a chargeable basis.

Each shipment should be examined by the purchaser promptly upon receipt. Any claims for shipment shortages must be made to Duro-Sense Corporation within 72 hours of receipt of shipment.

## MATERIAL RETURNS:

Returns for credit, evaluation or repair will not be allowed without prior factory authorization. Purchaser must contact the factory for a "Return Merchandise Authorization" (RMA) number, and clearly describe the item, the reason for its return, the original purchase order number, order date, invoice number, and any other pertinent information germane to the item(s) in question.

## RESTOCKING CHARGES:

Products and related parts that are returned to Duro-Sense Corporation in unused and like-new condition, that are returned for credit, will be subject to a minimum 20% restocking charge. The actual charges will be determined, by Duro-Sense Corporation, based on the type of material, its resale value and inspection and evaluation of the material in question.

## CERTIFICATION:

N.I.S.T. traceable calibration and certification is available for thermocouples, RTD's and thermocouple wire. Certifications are limited to temperatures between -109°F and 2650°F (-78°C and 1454°C). Certifications are dependent upon calibration limitations of element materials and sheaths where applicable. The minimum sensor assembly length for certification is 18 inches of sheath length and the minimum length for certifying insulated thermocouple wire is 24 inches. Thermocouple wire is certified by making thermocouples from each end of the wire spool and evaluating them at specified temperatures. Lead-time for certification is dependent upon the quantity of items being certified as well as the capacity of the calibration laboratory at the time. Purchaser should contact Duro-Sense Corporation directly for current certification lead times.

## COMPLIANCE:

Duro-Sense Corporation is dedicated to maintaining the highest level of quality in both manufacturing and testing. Duro-Sense Corporation operates under its own quality standard, DSQ-2000, which is compliant with the following quality and testing standards:

ISO-9001, AS-9100, MIL-I-45208, MIL-STD-45662A, ISO 10012-1:2003, ANSI/NCSL Z-540-3-2006, AMS2750E, ASTM E 220-7A, ASTM E 230-03, ASTM E 207-08, ANSI/ASQC Z1.4-1993.

Copies of the Duro-Sense Corporation quality manual and any existing certifications are available upon request.



***Duro-Sense Corporation***

**869 Sandhill Avenue  
Carson, California 90746**

Phone: **(310) 533-6877**

Fax: **(310) 533-0330**

**[sales@duro-sense.com](mailto:sales@duro-sense.com)**