JAMES INSTRUMENTS INC.
NON DESTRUCTIVE TESTING SYSTEMS

T-C-20

Cementometer™ L
Operating Instructions

Original Instructions: Revision: May 2019

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T-C-20 Cementometer™ L Instruction Manual

GENERAL OVERVIEW

The James® Instruments Cementometer™- L is a revolutionary digital meter for low Water/Cement (or w/c) ration concrete. It allows the user to measure the complex dielectric constant of the mixture of water and material under investigation. As it has been shown in many studies that the complex dielectric constant is directly related to the amount of water present, the built-in microprocessor can convert this value directly into the percentage of moisture.

The Cementometer™ L consists of a 100 MHZ probe and logging unit that can process the data from the unit and can store it for later retrieval.

The Cementometer™ L probe has 5 stainless steel prongs to insert in the material to get a moisture content reading. Each prong is 3.5 inches in length with a diameter of 0.125 inches. They should be inserted so that the entire prong is covered by the material under investigation. The volume tested is that enclosed by the four outer prongs of the sensor unit. The robust prongs have been designed to be inserted into various materials. Most commonly used materials are sand, aggregate, and gravel.

Proper cleaning and maintenance of probes is required for accurate readings. Any contaminating material attached to the probes can influence subsequent readings.

Stainless steel probes should be cleaned before and after testing has been completed. The Cementometer™ L prongs cover a surface depth of about 5 inches. Keep in mind that moisture always flows to the bottom of these materials. The more moisture suspected in the material, the deeper the depth you want your testing to be.

The unit comes from the factory with a variety of modes to assist the user in determining the water/cement ratio. The unit comes preprogrammed to analyze mixes of both Type I and Type III cement. There is also a mode to read the output of the sensor directly. The Cementometer™ L can also be programmed with up to ten different user programs. These are correlation factors that pertain to the direct material the user is dealing with and should be

used for the most accurate readings. There are also the capabilities to upload the data stored in the unit to a P.C. for later analysis, as well as a clock to help synchronize and differentiate the data.

Finally, the unit comes with our P.C. software which simplifies uploading of data to a Windows Compatible P.C. and analyzing the data for later programming of the unit. When required, the software will automatically monitor the serial communication port specified by the user. Once transmission of data from the Cementometer™ L unit has occurred, this information will appear in the edit window in the software. This data can then be analyzed by the built in software of the program or with a common spread sheet. The built-in software will take the user step by step through each record and allow the user to enter the moisture percentage associated with each reading. Once all the readings have an associated moisture percentage, the data can be graphically displayed, and the optimal correlation relationship determined. Coefficients representing this relationship are displayed for subsequent loading into the Cementometer™ L unit.

The Cementometer™ L is an easy and accurate way of testing for water / cement ratio in a controlled or uncontrolled environment. Every effort has been made in providing a user friendly robust and accurate system for the measurement of water / cement ratios in fresh concrete. A robust sensor which responds to water content has been created. This feeds into the main microprocessor unit of the Cementometer™ L allowing the user an instantaneous direct reading of the moisture under test.

Calibration Procedure
Preparation of Concrete Sample

Fine Aggregate (Sand)
We advise using ASTM C-128 & ASTM C-127 when preparing a cement mix for calibration of a user mode for the Cementometer™ unit. A Saturated-Surface Dry (or *SSD*) condition is very important.

ASTM-C-128-15: Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate.

Step 1
Drying of the specimen is a very important step in this procedure as values for absorption (*SSD*) may be higher for aggregates not dried before soaking. This higher number could lead to erroneous water/cement ratio reading when calibration is in progress. Dry 1kg of fine aggregate in a suitable pan at a temperature of 110 deg Celsius. Dry for 24 hours or until sample stops losing water weight.

Step2
Remove sample from oven a let stand to cool to handling temperature (approximately 50 deg C).

Step 3
Weigh and record the sample. Per ASTM C 128-15 8.1; which states the following "…cover with water, either by immersion or by the addition of at least 6% moisture to the fine aggregate, and permit to stand for 24 ± 4 hours…".

Step 4
Remove excess water from sample but be careful not to lose fine aggregate, now spread the sample on a flat non-absorbent. Allow a warm breeze from a small table top fan to flow through the sample. Stir the sample frequently to allow homogeneous drying. This procedure should be done until sample shows signs that it has reached *SSD (*step 6).

Step 5

For proper *SSD* determination a commercially bought cone should be used, ASTM C 128-15, 6.4 specs the mold as follows.

"6.4 *Mold and Tamper for surface Moisture Test* - The metal mold shall be in the form of a frustum of a cone with dimensions as follows: 40 ± 3 mm inside diameter at the top, 90 ± 3 mm inside diameter at the bottom, and 75 ± 3 mm in height, with the metal having a minimum thickness of 0.8 mm. The metal tamper shall have a mass of 340 ± 15 g and a flat circular tamping face 25 ± 3 mm in diameter."

Step 6

ASTM C-128-15, 8.3 "*Test for Surface Moisture* - Hold the mold firmly on a smooth nonabsorbent surface with the large diameter down. Place a portion of the partially dried fine aggregate loosely in the mold by filling it to overflowing and heaping additional material above the top of the mold by holding it with the cupped fingers of the hand holding the mold. Lightly tamp the fine aggregate into the mold with 25 lights drops of the tamper. Start each drop approximately 5 mm above the top surface of the fine aggregate. Permit the tamper to fall freely under gravitational attraction on each drop. Adjust the starting height to the new surface elevation after each drop and distribute the drops over the surface. Remove loose sand from the base and lift the mold vertically. If surface moisture is still present, the fine aggregate will retain the molded shape. Slight slumping or the molded fine aggregates indicates that it has reached a surface-dry condition."

Step 7

SSD (Saturated–Surface Dry) the fine aggregate.

Absorption, % = [(B - A) / A] x 100

A = mass of oven dry test sample in air, g.

B = mass of surface-saturated-dry test sample in air, g.

Note: Allow your coarse aggregate to *SSD* for 24 hours prior to adding to your mixture. (See below for more information.)

(EQUATION SHALL BE ADDED, SO CUSTOMER CAN DETERMINE THEIR SSD VALUE.)

Coarse Aggregate

The following procedure is used to determine the *SSD* of Coarse Aggregate using ASTM C-127 standard. It is advised to use this standard when preparing a cement mix for the calibration of a user mode of the Cementometer™ L unit.

Step 1

Place the course aggregate sample in an oven safe tray and dry the sample for 24 hr ± 4 hrs at 110 ± 5 deg C.

Step 2

Remove the coarse aggregate from the oven and let cool to room temperature for 1 to 3 hrs for samples of 3.7 mm. (Note: Larger size aggregates may require a longer cooling time.) Record the aggregate weight at this point.

Step 3

After cooling, immersion of the coarse aggregates is necessary. A sample container is required.
See ASTM C-127-15, 6.2 to 6.3 which specifies the sample container and water tank as follows.

"6.2 *Sample Container*- A wire basket of 3.35 mm (No.6) or finer mesh, or a bucket of approximately equal breath and height, with a capacity of 4 to 7 L for 37.5 mm (1 ½ in.) nominal maximum size aggregate or smaller, and a larger container as needed for testing larger maximum size aggregate. The container shall be constructed so as to prevent trapping air when the container is submerged."

"6.3 *Water Tank* - A water tight tank into which the sample container is placed while suspended below the balance."

The course aggregate sample should be immersed in the water tank for 24 hr ± 4 hrs. The purpose of the 24 hr immersion is to allow the aggregate's pores to essentially fill.

Step 4

Remove the coarse aggregate from the sample container and roll in a towel to dry until all visible films of water are gone. Record the weight of the aggregate sample at this point.

Having your aggregates at SSD when mixing is very important and the following equation should be used to determine the percentage of moisture required to *SSD* your aggregate.

Absorption, % = [(B - A) / A] x 100
A = mass of oven dry test sample in air, g.
B = mass of surface-saturated-dry test sample in air, g.
Allow your coarse aggregate to SSD *(*Saturated-Surface Dry) for 24 hours ± 4 hours prior to adding to your mixture.

Mixing Your Sample

Proper mixing of your concrete sample is a very important process for the calibration of a user mode in the Cementometer™ unit. Your mixture should be that of 1 cubic foot and it is suggested to start at the 0.20 W/C ratio.

Example mixture design

* Material needed for approx. 1 cubic foot of concrete:

2 cubic feet commercially available tilting mixer

59 lbs surface-saturated-dry fine aggregate

46 lbs surface-saturated-dry coarse aggregate

29 lbs cement paste

5.8 lbs of water

As stated in an earlier paragraph the material above equals a 1 cubic foot of 0.20 w/c concrete mix. The following order should be followed to properly mix the concrete.

Step 1
Spray down inner dome of tilting mixer to moisten drum.

Step 2
Remove any excess water from the drum and start revolving the mixer.

Step 3
Add 10 % of the water and coarse aggregate in to the drum.

Step 4
Add 50 % of the fine aggregate and cement into the drum.

Step 5
Add 60 % of the coarse aggregate and the remaining water until approximately 1/4 to 1/3 of the water is remaining in the reservoir being used to contain water.

Step 6
Add the remaining fine aggregate and cement to the drum followed by the remaining coarse aggregate and water.

Step 7
Let sample mix properly until a proper paste has been achieved.

Again, this is a 0.20 w/c ratio mix. Remove enough the fresh concrete from mixer and place in a nonconductive bucket (1 gallon or more, 4 liters or more) for testing with the Cementometer™.

Using up or down arrows, scroll through the menu selection until Direct mode appears on the T-C-20 display. (It is recommended to erase all prior data saved in the T-C-20).

Take 10 readings for this w/c mixture, store each reading by pressing enter. Then the readings can be uploaded to the PC. The readings can be recorded manually with the corresponding w/c ratio.

Uploading can be done by connecting the instrument to the P.C. using the supplied USB cable.

Step 8
Once the sample has been put back into the drum, start rotating drum.

Step 9
For the mixture design presented in the example, add 1.45 lbs of water to the mix, or the corresponding amount of water to increase the w/c of your mix to 0.25 and let the drum rotate for 1 minute.

This is now 0.25 w/c ratio concrete mix, and it is ready for testing with the Cementometer™. Repeat steps 7-9 until value on Cementometer™ display reaches 409.5. This is the saturation point of sensor probe.
* Materials used for research and development may vary depending on aggregate types.

After the data has been collected, a correlation relationship needs to be established. This is a linear relationship of the form **w/c ratio = Gain * Direct Reading + Offset**

Where:
W/C ratio – Final Value
Gain – Multiplier obtained from the Data
Direct Reading – Value obtained from the meter
Offset – additive factor from gathered data

From the data generated above a best fit line through data can be generated. This can be accomplished either with a spreadsheet, or with the accompanying software. When inserting the moisture percentage with the software, the time and date stamp field can be used to identify which tests were associated with which moisture percentages.

The Gain and Offset parameters are the two values that need to be programmed into the Cementometer™ to define the User program (see Ch. User prog).

Once the analysis has been completed with the T-C-20 P.C. Software, the Gain and Offset values will be displayed. Write these values down for future reference; in the event they are ever lost.

Return to the T-C-20 and enter a user program. (See T-C-20 manual “Change user program”)
Once the Gain and Offset values have been entered into the T-C-20, the calibration has been completed.

Menu Items

1. UNIT OPERATION

The Cementometer™ L was designed for simple operation. Upon start up, the unit should show a brief (five second) display of our company name and the software version. The unit will then proceed directly to the menu item it was last on before it was turned off. The menu structure is as follows:

* Type I
* Type II
* Direct
* User 1-10
* Ch. User Mat.
* Upload Data
* Change Date

You can scroll through the menu by pressing an arrow key. Either Up or Down arrow key will allow you to scroll through the memory. Type I, Type III, Direct, and User menu items will each simply show the instantaneous reading of the sensor, menu item selected, and the date/time. Pressing the “Enter” key while in any of these modes will record the reading, the menu item selected, and date/time that the reading was taken in the main memory for later upload to a personal computer. The memory is non–volatile and will not be erased by turning off the power.

2. Type I

The Cementometer™ L has a factory calibration for Concrete using Type I material. More accurate readings can be obtained by pre-calibrating the unit to the specific mix being tested.

3. Type III

This is the general category for concrete using Type III cement. More accurate readings can be obtained by pre-calibrating the unit to the specific mix being tested.

4. DIRECT

This mode is used when calibrating the unit directly to a user material. This shows the raw mV reading coming to the A-D converter of the unit from the sensor. By recording the value for a range of moistures and correlating this value, the unit will then be calibrated for the specific material being monitored by the Cementometer™ L.

5. USER PROGRAM

The Cementometer™ L can be programmed with up to ten different user materials for subsequent testing.

These are labeled in the unit as 0 – 9 and are displayed in sequential order. Their programming is performed in the "*Ch. User Mat."* section. The final value from the user generated calibration function will be displayed instantaneously with different outputs from the probe.

6. CHANGE USER PROGRAM

To change the user program please follow these steps:

Use the plus and minus keys to select the menu item "*Ch. User Mat.?*" (Press Enter for Yes)

- Pressing enter will bring up the following message:
  User Pog.? X (0-9)
  Where: X is the user program number you wish to change to (ranging from 0 to 9).
- Use the plus and minus keys to change the value of X until you have reached the user program # you are interested in.
- Pressing Enter now brings the message: OFFSETsXX.XX
  Where: s is the sign either + or –, and X is the value
- Pressing the plus or minus keys will increment this value. Pressing and holding the plus or minus key will rapidly increment this value.
- Once the proper value has been reached, press the enter key. The unit will display the following: GAIN x.xxx
  Where: x is the value to be entered.
- Again pressing the plus or minus keys will increment this value. Pressing and holding the plus or minus key will rapidly increment this value.
- Finally pressing the enter key enters these values into memory and sets up the user program for subsequent use.

For further information regarding the meaning of the OFFSET and GAIN parameters, please refer to the "*General Notes on the User Program."*

7. UPLOAD DATA

Please follow the bottom steps in order to upload the data stored in the unit to a P.C.

- Connect the unit to a USB serial port on the P.C. using the USB serial cable supplied with the unit.
- Use the plus or minus keys until the following message is displayed: Upload Data (Press "Enter" to begin.)
- Pressing "Enter" will also display the following message: Erase Data? + for Y (yes), – for N (no)
- Pressing either the + or - button will commence the upload process and will display the message: "Data Upload in Process"
- Once the process is complete, the following message will be displayed for a few seconds: "Upload Complete"!

For more information regarding uploading the data to a personal computer please refer to the Software section or go to "*Tools".*

8. CHANGE DATE

To change date and time please follow these steps:

- Press the + or – arrow key until you get to Change Date? (press "Enter" for Yes)
- Pressing "Enter" will display the date and time in the following format: hh:mm MM/DD/YY

  Where:
  hh - hour range 0 – 24
  mm - minute range 1 – 60
  MM - Month range 1 – 12
  DD - Day range 1 – 31
  YY - Year range 00 – 99
  The cursor should be blinking over the two hour digits.

- Pressing the plus or minus keys will increment the digits at the cursor. Holding the plus or minus key will increment the value rapidly.
- Pressing the enter Key will store the value selected and move the cursor to the next proper position.
- Pressing the enter key at the year position will bring the user to the “Change Date” menu screen describes above.

Power Key, Plus Key, Average Key, Minus Key & Enter Key

- **Power Key –** Momentarily push this key to turn ON the unit. Pressing it again turns OFF the unit. The unit will power up displaying the same menu selection as when it was powered down.
- **Average Key –** Depressing this key holds the current value and an “A” appears next to this value on the display. This then displays a running average of readings entered by pressing this key.
- **Enter Key –** This key can be used to store data points in the units. Depressing this will display an “S” next to the value being read for a few seconds. The reading will then be stored in the unit along with the type of material being used and the date and time. This can subsequently uploaded to the P.C. for later retrieval. It is also used in various ancillary functions such as changing the date and the time, uploading the data to a P.C., and programming the unit for user materials.
- **Plus Key –** This key is used to scroll through various settings.
- **Minus Key –** This key is used to scroll through various settings.
- X – Menu item currently being used
- n – Current moisture reading
- A – auxiliary character used to show data being stored and held
- hh – Current hour
- mm – Current time
- MM – Current month
- DD – Current day

P.C. SOFTWARE Functions

- **Open** (Ctrl + O)

Opens previously saved files containing data.

- **Close**

Closes currently open files

- **Save**
- **Saves As**

Saves uploaded data. Files are saved as *.TXT file for later analysis via spreadsheet, or insertion into a word processor program.

- **Exit**

Terminates the program and returns to your operating system.

TOOLS

- **Upload** (Ctrl + U)

This command is used to upload data from module to the CPU.

For the proper upload of data to a P.C. please follow the steps below:

- Open the Cementometer™ L software (title of screen should read Cementometer™ L Regression Analysis) on the P.C.
- Connect P.C. and Cementometer™ L using the USB cable and the serial port on the Cementometer™ L. Use the + or – arrow keys on the unit until the "Upload Data screen appears on the display.
- Press Enter.
- Go to the Cementometer™ L software (needs to be installed on P.C.) click on the upload icon or press CTRL + U
- Cementometer™ L software will ask you to "Please start upload."
- At this moment, press the + arrow to erase data, or the – arrow to save data after upload (The Cementometer™ L software will wait 10 seconds for the upload information. If no data is received after 10 seconds, a "No data received" sub screen will appear.)
- Data will appear on the screen after the + or – arrow key selection was made.
- Save data in desired folder.

- **Analyze** (Ctrl + A)

Allows the user to view individual records, graph data, and determine the correct coefficients for the user program. This key should only be used when data is uploaded from the unit that was saved in direct mode. It is then used to analyze the data and generate a user program. This feature is not enabled until a data file has been brought up on the screen.

This shows the record number, date the record was taken, time the record was taken, value of the direct readout, and a corresponding percentage moisture (w/c ratio) that needs to be completed by the user in order to generate a correlation curve.

Pressing the OK button updates the data in the file and brings up the next record in the file. Pressing the cancel button cancels the entire operation. Once the last data point has been entered, the Finish button can be pressed to generate a correlation curve.

This will produce a display of the correlated data and the appropriate OFFSET and GAIN parameters to be entered in the Cementometer™ L.

- **Ports**

This command allows setting the correct (USB) Comport. It can be Com 1 through Com 20. The default setting is Com 1. (See your PC's Device Manager / Ports - to confirm what Comport is used for the Cementometer™ L unit. This Comport setting will need to be set whenever installing the program on a new computer. Once set, it does not change for that PC.)

LEAST SQUARES ANALYSIS OF A STRAIGHT-LINE FIT

For this method, we assume that there exists a linear relationship between the output of the probe, and the amount of moisture in the material to be tested. This relationship takes the following form:
w/c ratio = Gain * Direct Reading + Offset
(or y = a * x + b) (aka. the slope intercept formula)

What needs to be determined are the parameters for ***Gain*** & ***Offset*** (or a and b) from a given set of points determined by testing.
We can then define: (Note: S means "sum up", or ∑.)

$Sxx = x_i2 - (x_i)2/n$

$Syy = y_i2 - (y_i)2/n$

$Sxy = x_iy_i2 - (x_i\ y_i)/n$

Where x_i and y_i are individual pairs of values for x and y; each defining the pairs of the points to be plotted.

The quantity n is the number of points.

The **Gain** of the line, "a" is now simply: a = Sxy/Sxx
The **Offset**, "b" can be calculated as: $b = y_i/n - ax_i/n$

This is performed automatically by the accompanying software and is also available in most spread sheet programs.

Warranty Information

1. **Contract**

Unless otherwise stated all sales transactions are expressly subject to these terms and conditions. Modification or additions will be recognized only if accepted in writing by an authorized Officer of James® Instruments Inc. (hereinafter referred to as “James®” or the “Company”), or an officially designated representative. PROVISIONS OF BUYER'S PURCHASE ORDER OR OTHER DOCUMENTS THAT ADD TO OR DIFFER FROM THESE TERMS AND CONDITIONS ARE EXPRESSLY REJECTED. NO WAIVER OF THESE TERMS AND CONDITIONS OR ACCEPTANCE OF OTHERS SHALL BE CONSTRUED AS FAILURE OF THE COMPANY TO RAISE OBJECTIONS.

2. **Warranties**

The Company only warrants the equipment manufactured or supplied by the Company as set forth herein. James® makes no other warranties, either expressed or implied (including without limitation, warranties as to merchantability or fitness for a particular purpose). In no event shall James® be liable for any type of special, consequential, incidental, or penal damages, whether such damages arise out of or are a result of breach of contract, warranty, negligence, strict liability or otherwise. Warranty shall not apply where the equipment manufactured or supplied has been subject to accident, alteration, misuse, abuse, improper storage, packing, force majeure, improper operation, installation, or servicing. In addition, the following shall constitute the sole and exclusive remedies of Buyer for any breach by James® of its warranty hereunder.

a. **New Products**

James® warrants the equipment manufactured or supplied by James® as set forth herein. This limited warranty can only be exercised by the original purchaser of the equipment from James® or authorized James® Agent and is not transferable to any subsequent owner or party. This limited warranty gives you specific legal rights, and you may also have other rights which vary from case to case.

i. **For James® Equipment**

James® warrants that James®'s equipment will be free from defects in materials and workmanship for a period of twenty-four (24) months on the electronic portion and six (6) months on the mechanical portion from the date of shipment of equipment from James® to Buyer. Should any defects be found and reported by the Buyer during the applicable limited warranty period, the defect will be corrected upon return of the item to James®. James® will, during the applicable new equipment warranty period, provide the necessary replacement parts and labor to correct the defect.

Excluded from the new equipment warranty are all consumable and wear and tear items such as impact bodies, penetrators, connection cables, etc. These items are subject

to usual wear and tear during usage. Refer to the Consumable, Wear and Tear Items section of this warranty document.

Option for Extended Limited Warranty Coverage

The original purchaser of any new equipment of James® which have been identified or labeled by James® from time to time in James®'s sole discretion as being eligible for extended warranty coverage shall have the option to purchase certain extensions of the applicable limited warranty provided hereunder to the electronic portion of any such items for either a twelve (12), twenty-four (24) or thirty-six (36) month period (up to a possible maximum limited warranty coverage period for the electronic portions of such new James® equipment of sixty (60) months) by purchasing any such twelve (12), twenty-four (24) or thirty-six (36) month limited warranty extension period either all the time of the purchase of any such item(s) or within ninety (90) days from the date of delivery of the subject item(s) of the original purchaser of such item(s). The price for each such extended limited warranty coverage period shall be as determined by the Company from time to time and all such purchases of any extended warranty coverage periods shall only be effective upon a completed purchase order and payment directly between James® and the original purchaser of any such item(s). The extended warranty coverage periods are only valid with respect to the original purchaser of such item(s) from the Company and such extended warranty coverage is not transferable to subsequent owners of the subject item(s) or any other parties. Upon the purchase of any extended limited warranty coverage period, the Company will issue a certificate to Buyer evidencing the details of the applicable extended warranty coverage period purchased by the Buyer.

ii. **For Other Manufacturer's Products Supplied by James®**

Products of other manufacturers supplied as such by James® are warranted by James® only to the extent of any warranty provided by the original manufacturer, if any.

iii. **For Parts and Sub-Assemblies**

Parts or sub-assemblies purchased by the Buyer to perform its own repair work etc. are warranted as provided hereunder by James® for six (6) months from date of shipment of material from James® to Buyer.

iv. **For Consumables, Wear and Tear Items**

James® supplies consumable items and items subject to wear and tear during normal usage of James® supplied products. These items are not covered under warranty. Buyer is to check for proper fit, form and function of such items upon receipt of such items. In case of a defect condition, Buyer can return the item to James® for evaluation within thirty (30) days of the date of shipment to the Buyer. James® reserves the exclusive right to issue full, partial, or no credit to the Buyer based on the condition of the returned item and circumstances related to the return. Examples of items in this category: connection cables, test blocks, impact bodies, penetrators, probes, extraction liquids, calibration liquids, pins, recording paper, test plugs, etc.

b. **Calibration and Repair**

i. **For Calibration Services**

James® does not warrant the calibration of any equipment. James® does however warrant the equipment manufactured by it, in proper working condition, to be capable of being adjusted to meet James® printed specifications, if any, for accuracy and performance as to the particular model type during the period of warranty applicable as stated above.

ii. **For Repair Services**

James® warrants repair work performed under the direct control and supervision of James® personnel for a period of three (3) months from the date repairs are completed either at James® or at the customer site. Should the defect for which the repair work was performed reoccur within this period, James® will supply the necessary parts and labor (repair at James® facility) or parts (repair at Buyer facility) required to repair the original equipment defect for which the repair parts and labor were required. Additional repair charges that may be incurred in conjunction with any repair service warranty event will be invoiced at the James® customer service rates and policies in effect at the time of the event.

Excluded are all consumable and wear and tear items such as impact bodies, probes, connection cables, etc. These items are subject to usual wear and tear during usage. Refer to the Consumable Wear and Tear Item section of this warranty document.

c. **Warranty Claims**

i. **For Warranty Claim Processing**

James® has established James® organizations in the Americas, and Europe. Please visit the James® web site www.ndtJames®.com for latest address and contact information for the James® organization nearest you.

3. **Regulatory Laws and/or Standards**

The performance of the parties hereto is subject to the applicable laws of the United States. The Company takes reasonable steps to keep its products in conformity with various nationally recognized standards and such regulations, which may affect its products. However, the Company recognizes that its products are utilized in many regulated applications and that from time to time standards and regulations are in conflict with each other. The Company makes no promise or representation that its product will conform to any federal, provincial, state or local laws, ordinances, regulations, codes or standards except as particularly specified and agreed upon for compliance in writing as a part of the contract between Buyer and the Company. The Company prices can not include the cost of any related inspections or permits or inspection fees.

4. **Notices**

Notice by either the Company or Buyer will be made only by facsimile or similar electronic transmission, effective on the first business day after confirmed receipt, or by letter addressed to the) other party at its address as provided in this Agreement, effective three (3) business days after deposit with the U.S. Postal Services, postage prepaid, or one (1) business day after deposit with a recognized overnight express service.

5. **Interpretation**

Should any term or provision contained in the contract contravene or be invalid under applicable law, the contract shall not fail by reason thereof but shall be construed in the same manner as if such term or provision had not appeared therein.

6. **Assignability**

Neither this contract nor any claim arising directly or indirectly out of or in connection herewith shall be assignable by Buyer or by operation of law, without the prior written consent of Company. This document shall be binding upon and inure to the benefit of each party hereto and their respective permitted successors and assigns.

7. **Governing Law**

This Agreement shall be governed by and construed in accordance with the internal laws of the State of Illinois, without regard to its conflict of law's provisions. Buyer and the Company expressly agree to submit to the personal jurisdiction of the federal and/or stale courts silting in Chicago, Illinois, U.S.A. and agree that such courts may be utilized if necessary to obtain injunctive or

any other relief. The Hague Convention and the United Nations Convention on Contracts for the International Sale of Goods shall not apply to the construction or interpretation of these Standard Terms and Conditions or affect any of its provisions.

END.

Repair Policy

United States | Canada | International

Ship the instrument in a box that meets UPS, Fed Ex, and standard shipping regulations. Enclose a note describing the problem(s) you are having. Include the name and phone number of the contact person in your organization.

The instrument will be evaluated within one week of receipt. The contact person will be notified with an estimate of the cost of the repair.

Upon receipt of your authorization of repair and payment terms, delivery time will be 2 weeks from that day.

If you need the repair back sooner than this, you have the option of paying an express service fee of 10 percent of the purchase price of said instrument, plus the repair cost. With this service, you can receive the instrument back within 3 working days in the USA (5 working days for Europe).

International repair shipments must contain a commercial invoice listing the instrument being returned and must contain the words:

Country of manufacture: USA

Instrument being returned to manufacturer for repair – no value for customs, value for carriage only.

Ship the complete system to:

Attn: Repair Department James® Instruments, Inc. - USA 3727 North Kedzie Avenue Chicago, IL 60618-4503 USA	Attn: Repair Department James® Instruments, Inc.– Europe Windmolen 22 7609 NN Almelo The Netherlands

Home page: www.ndtJames.com

E-mail: info@ndtJames.com

europe@ndtJames.eu

James® Instruments Inc.
3727 N.Kedzie Ave.
Chicago, IL 60618-4503
USA
Tel: (773) 463-6565
Fax: (773) 463-0009

James® Instruments Inc. - Europe
Windmolen 22
7609 NN Almelo
The Netherlands
Tel: +31 (0)548 659032
Fax: +31 (0)548 659010

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