

NDT

JAMES INSTRUMENTS
Non Destructive Test Equipment



C-CL-3000

Chlorimeter™

Operator's Manual

Original Instructions: Revision June 2021

Notice



The Chlorimeter™ has been tested in accordance with the EU regulations governing Electro-Magnetic compliance and it meets required directives.

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We: James® Instruments Inc.

Of: Chicago, IL

In accordance with the following Directive(s):

2014/35/EU Low Voltage Directive

hereby declare that:

Equipment Chlorimeter™

Model Number C-CL-3000

is in conformity with the applicable requirements of the following documents

Ref. No.	Title	Edition/date
EN 61000-6-3	Electromagnetic compatibility (EMC). Generic standards. Emission standard for residential, commercial and light-industrial environments.	2007
EN 61000-6-2	Electromagnetic Compatibility (EMC) Part 6-2: Generic Standards—Immunity for Industrial Environments.	1999

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable Essential Requirements of the Directives.

Signed:



Name: Michael Hoag

Position: President, James® Instruments, Inc.

Location: Chicago, IL

On: 8/1/2018

Introduction

The CL Test System offers a fast, accurate and in-place (in-situ) determination of the total content (or more precisely the acid soluble content) of chlorides contained in concrete.

The test is easy to perform and requires only the test equipment contained entirely in a small briefcase.

Using a masonry drill bit, concrete is pulverized at the required sample depth and collected in the dustpan provided. An accurately weighed 3 gram sample is dissolved in 20 ml of extraction liquid; consisting of a precisely measured acid concentration. The chloride ions in the sample then react with the acid in the digestive solution; in an electrochemical reaction.

An electrode, with an integral temperature sensor, is inserted into the liquid solution and the electrochemical reaction is measured. This uniquely designed instrument then converts the voltage generated by the chloride concentration, and automatically applies a temperature correction factor. The percentage of chloride by weight of the 3g sample (or the lbs. of chloride per cubic yard); can then be viewed on the LCD display. The CL unit displays the Free CL Ions in an acid solution.

When performed on-site, the test provides immediate and direct information regarding the chloride content in critical locations prior to surface repair.

In the laboratory, the test may be used to measure the chloride content of materials. These materials must first be pulverized to a consistency (or fineness) equal to that of concrete powder; as obtained with a masonry drill. The CL-3000 test is designed to correlate to a water soluble titration method.

(Note: This test may also be used on fresh concrete mix.)

Instrument Contents List

Each James® Instruments Chlorimeter™ comes with the following items included in the carrying case.

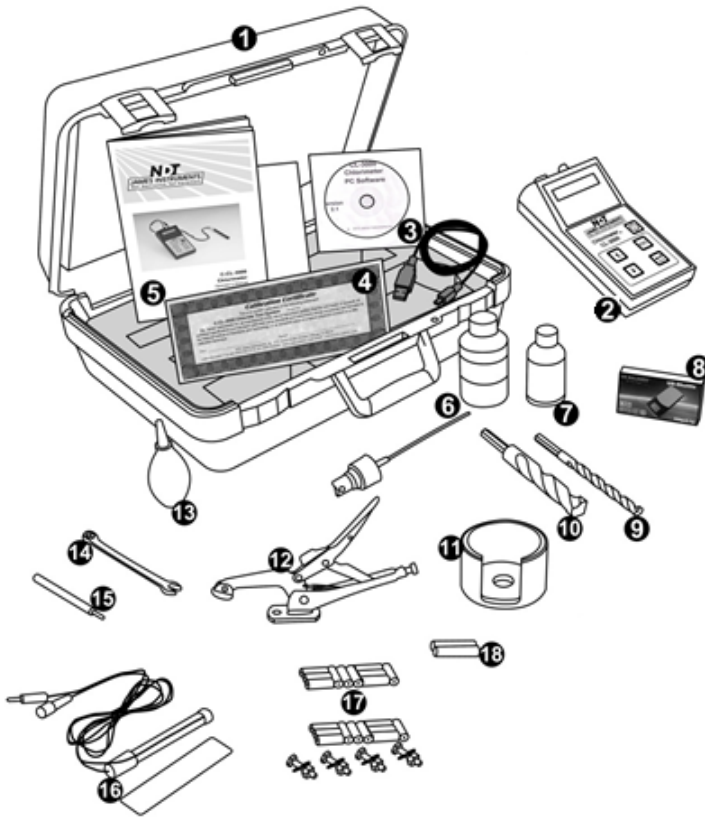


Figure 1: Chlorimeter™ Contents

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Contents List

Item #	Description
1	Carrying Case.
2	Chlorimeter™ Test Unit.
3	Software Disk and USB Cable.
4	Calibration Certificate.
5	Instruction Manual.
6	Distilled Water with Spray Cap.
7	Electrode Wetting Agent.
8	Digital Scale.
9	3/8" Drill Bit.
10	3/4" Drill Bit.
11	Sampling Pan.
12	Clamping Pliers
13	Blower.
14	7/16" Combo Wrench.
15	Anchor Set Tool.
16	Chloride Electrode with Polish Strip.
17	20 Anchors with 4 Nuts and Bolts.
18	AA Batteries.

Chlorimeter™ Overview

The following is an overview of all of the external features of the Chlorimeter™.

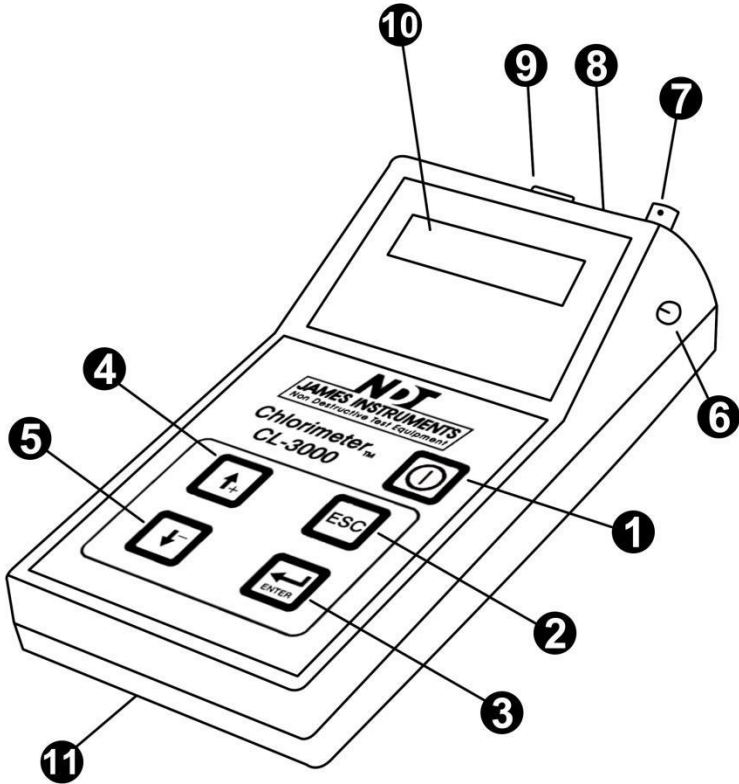


Figure 2: Chlorimeter™ Overview

Instrument Functions

Item #	Description
1	On-Off Power Button.
2	Escape Button.
3	Enter Button.
4	Up / Plus Arrow Button.
5	Down / Minus Arrow Button.
6	DC Input Jack.
7	Electrode Connector (BNC).
8	Temperature Input Jack.
9	USB Port.
10	LCD Display.
11	Battery Compartment (on back).

Obtaining a Concrete Sample

Locate the position and depth of any reinforcement bars using a James® Rebar Locator. When drilling for a concrete sample, attention should be paid to avoid the reinforcement bars found. With the clamping pliers (fig.4), mark the surface location for the bolt-hole in the pliers' base and remove. Using the 3/8 inch masonry bit supplied, insert it into a masonry drill and drill a hole 1_1/16" (or 1.0625") deep at the marked location (fig. 3-1). Place a drop-in anchor and tap the anchor flush to the surface (fig. 3-2). Expand and secure anchor using the set tool supplied (fig. 3-3). Place the clamping pliers back in the desired position. Prepare a clamp bolt, using a hex nut and washer, and insert this through the pliers down into the anchor (fig.4). Drive the bolt completely into the anchor using the supplied wrench. The clamping pliers are set in place by tightening the hex nut.

Set the dust collecting pan in the test area and clamp it down in place. Now, using the larger 3/4 inch masonry bit, drill down to the required depth and collect the concrete dust. (**Note:** Friction from drilling will remove excessive water from the concrete dust. This dust should immediately be protected, and placed in plastic bags.)

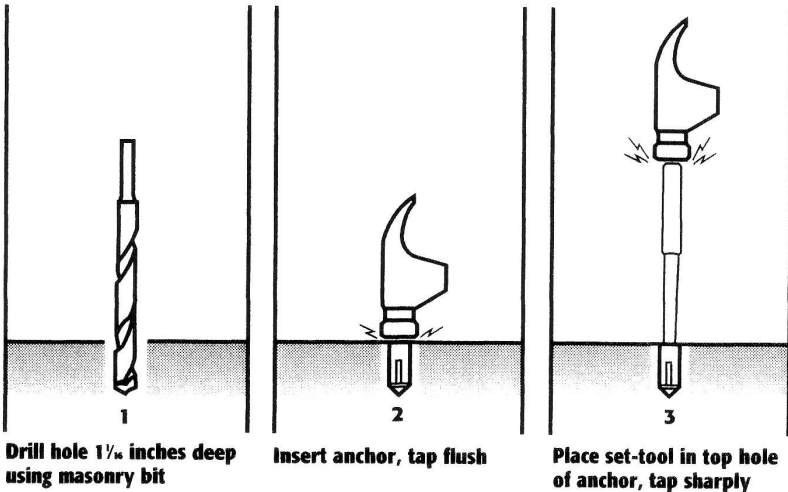


Figure 3: Anchor Setup

It is advisable to select at least three test locations, and drill $\frac{1}{4}$ inch down for a concrete sample. This will produce approximately 20 grams of dust, which is a common sample size.

To produce a chloride profile through a concrete slab, it is advisable to drill at three different levels. For example, near the top surface, close to the rebar position and 1.5 inches below the reinforcement bars. Then, mix the dust samples on a flat clean surface, and quarter carefully to ensure the sample's homogeneity. Weigh two separate 3 gram samples, using the digital scale provided in the kit. Keep one sample in a sealed plastic bag marked with the test location, and the other sample to be used for the chloride field test.

Add the 3g field test sample to one of the 12 plastic jars containing 20 ml of chloride extraction liquid. (**Warning:** Add the dust sample SLOWLY into the liquid, and in stages to avoid excessive fizzing from the limestone present in concrete.)

When testing several locations by this method, be careful to avoid cross-contamination of the samples taken.

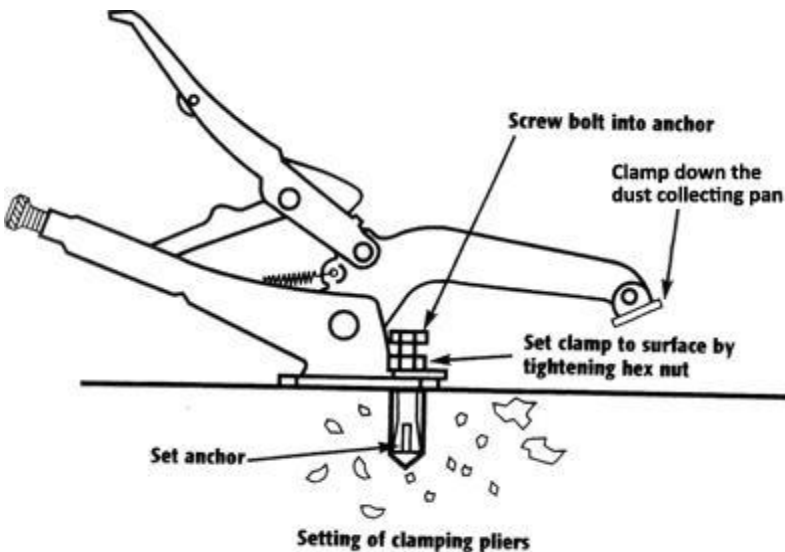


Figure 4: Clamping Pliers

Tips for Successful Chloride Testing

Exert only moderate pressure on the drill when drilling for the sample dust. This keeps the dust particles fine, and ensures they will dissolve easily in the extraction liquid.

Do not test wet dust, or the water weight will be included in the CL calculations. If the dust collected is wet, it should be dried prior to proceeding. One way of doing this is to place it on blotting paper.

When collecting dust samples at different depths, be sure the drill bit is perpendicular to the surface. This will ensure the dust comes from the bottom of the drilled hole, and not from the sides of the hole.

Avoid drilling only one hole when collecting a dust sample. The reason being, you may drill through a coarse aggregate particle, and the test sample will not be representative of the test area. Instead, drill three holes about four inches apart, and mix the collected dust samples together; creating a homogeneous mix.

Upon adding the dust sample to the extraction liquid jars, close the container and shake vigorously for about 1 minute. Stop. Wait several minutes for the solution to stabilize. Carefully open the cover, and release any built-up pressure. Again wait 2-3 minutes before inserting the CL electrode.

Inspect the electrode tip for scratches and etching. If seen, use the polishing paper to remove them. (See p.18, in Maintenance section) If the tip is OK, lower the electrode gently into the test bottle(s). Keep the electrode tilted, and avoid touching the concrete dust particles at the bottom. This will prevent scratching the tip.

For the most accurate results, it is recommended users wait until the readings in the sample bottles stabilize. This is because James® uses a mild acid solution, and it may take a short time for the chlorides in the sample to completely dissolve. The CL unit then displays the Free CL Ions in the mild acidic solution; as a percentage of weight (of the 3g sample).

Note: Although the electrode can be used at temperatures ranging from 0 – 60 deg. C, when used at temperatures substantially different than room temperature (or ~ 72 deg. F / 22 deg. C), the user should allow for an equilibrium time period. At the extremes of this temperature range, a time frame of one hour is recommended. Also, if temperature changes occur between the test unit and the electrode, the system should be recalibrated before use.

Preparation of Electrode for Calibration

The CL Electrode is shipped without filling solution in the reference chamber. To fill this chamber, use the bottle marked “Electrode Wetting Agent” (aka Filling Solution), and proceed as follows:

1. Add the Wetting Agent to a plastic syringe, or if possible, use the flip spout on the wetting agent bottle.
2. Insert the syringe (or flip spout) into the Fill Hole on the outer sleeve (see p.18, fig. 5), and add a small amount of Wetting Agent in the reference chamber.
3. Holding the electrode at an angle with one hand, push down the top White cap, and allow the wetting agent to wet the cone-shaped tip. (**Note: The tip must be wet with “Wetting Agent” before using.**) The black (rubber) cap should be removed to allow for sufficient travel of the cone-shaped tip. The user may need to slightly un-screwed the White cap to allow for movement. Although, during testing, the white cap should be screwed down; finger tight is good.
4. After wetting the tip, release the White cap, and the cone tip should quickly return to its original “closed” position.
5. Now, fill the reference chamber with Wetting Agent up to the Fill Hole location. (To ensure a proper flow rate, and avoid erratic electrode potentials; this level should be maintained throughout the testing process.)

(Do not substitute Distilled Water for the Wetting Agent. If this is



done, the display readings will all be negative numbers.)

Calibration


Upon Power Up the meter will display the main menu:

MEASURE



Use the  (plus arrow) or  (minus arrow) buttons to navigate to the CALIBRATE menu screen.



Press  (enter) to select.

Meter will now display: 0.005% Solution
xxx.x mV NOTOK

Remove Black Cover Cap and place the probe filled with the electrode wetting agent in the 0.005% solution. Wait until the mV value (xxx.x in above diagram) is stable and OK appears in lower right corner of the display.




Press  (enter)

Meter will now display: Saving Value
Then: 0.01% Solution
xxx.x mV NOTOK

Rinse the probe in distilled water and thoroughly blot dry. Now place the probe filled with the electrode wetting agent in the 0.01% solution. Wait until the mV value (xxx.x in above diagram) is stable and OK appears in lower right corner of the display.



Press  (enter)

Meter will now display Saving Value
Then: 0.05% Solution
xxx.x mV NOTOK

Rinse the probe in distilled water and thoroughly blot dry. Place the probe filled with electrode wetting agent in the 0.05% solution. Wait until mV value (xxx.x in above diagram) is stable and the same as above.

Press  (enter)

Meter will now display: Saving Value
Then: 0.1% Solution
xxx.x mV NOTOK

Rinse the probe in distilled water and thoroughly blot dry. Place the probe filled with electrode wetting agent in the 0.1% solution. Wait until mV value (xxx.x in above diagram) is stable.

Press  (enter)

Meter will now display: Saving Value
Then: 0.3% Solution
xxx.x mV NOTOK

Rinse the probe in distilled water and thoroughly blot dry. Place the probe filled with electrode wetting agent in the 0.3% solution. Wait until mV value (xxx.x in above diagram) is stable.



Press  (enter)


Meter will now display: Saving Value
Then: 0.005% Solution
xxx.x mV NOTOK

Finally press  (escape)

Your meter is now properly calibrated and ready for operation.

Note: If at any time, during the calibration procedure an error was made, use the following...

Press the  (plus arrow) or  (minus arrow) to repeat a solution procedure.

Also, pressing the  (escape) key at any time, will return you to the main menu.

Note: This Calibration procedure should be performed prior to any actual measurements, and should be repeated after every two hours of testing.

Also, over time, the calibration liquids may become contaminated or weakened; especially the lower concentrations. This can affect the unit's calibration. To avoid this, follow the rinsing and blotting procedures above, and/or discard the calibration liquid – recommended after about 12 calibration tests.

Contact James® Instruments for replacement Calibration solutions (C-CL-2012 or C-CL-2096).

Measurement

Upon Power Up the meter will display the main menu:

MEASURE



Press the  (enter key)

The CL-3000 will now display your chosen : Units
% Lb/cu. yd. Or % Cl

The meter will now display: zz.z deg. C
 y.yyy (Cl or lb./yd.3)

Where zz.z is the temperature display, and y.yyy is the value of the chloride ion content expressed in either percentage by weight or lbs. per cubic yard.

Maintenance

General Maintenance

- A 'Low battery' indication on the display indicates a battery change is needed. Replace batteries with two fresh "AA" size batteries.
- To remove scratches from electrode tip, cut off a 1 inch length of polishing strip. Hold the electrode with the membrane facing upwards and place a few drops of distilled water on the membrane surface. Lightly press the strip on the membrane with the abrasive side facing downward and rotate the electrode for about 30 seconds. Rinse and soak in distilled water for about two minutes before use.

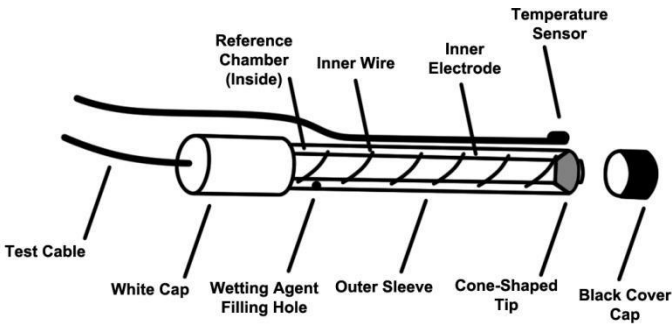


Figure 5: Electrode Overview

Note: The electrode tip may suffer etching if stored for a long period of time in the extraction liquid bottles. To avoid etching, clean the electrode tip carefully with distilled water, or place it in a container of distilled water when not in use.

Electrode Disassembly and Cleaning

Disassembly of the electrode is not normally required. Yet, if the area between the electrode sleeve and the inner electrode tip has become clogged with sample or impurity buildup, the interior reference chamber should be cleaned out and flushed with distilled water.

If a more detailed cleaning is required, the electrode can be disassembled using the following steps:

1. Hold the electrode body above a disposable container and push down on the top white cap. This will drain the electrode reference chamber of filling solution from the bottom.
2. Completely unscrew the white cap (CCW), and slide it up along the test cable.
3. Now firmly hold the outer sleeve of the electrode and push down on the (threaded) cable end to remove the inner electrode from the outer sleeve.
4. When possible, grab the electrode's cone-shaped tip, and slowly pull out completely. (**Note:** Do not touch the inner wire, as this may cause damage to it.) Rinse off all body parts of the electrode with distilled water, and allow to air dry.
5. Reassemble electrode for storage or before using again. (Refer to Figure 5)

Electrode Storage

For short periods, like 2 – 3 days, store the electrode (without the Black Cap) with the tip submerged in a cup of distilled water. For longer storage periods, it is necessary to thoroughly clean the electrode to prevent any impurity buildup. (Follow procedure above)

Safety

The Chlorimeter™ is a relatively safe product with minimal risk, but the operator should be aware of the potential chemical hazards listed below:

- Some of the included chemicals are poisonous, and should not be ingested at any time. (i.e. the extraction liquid)
- In case of accidental eye or skin contact with the chemicals, the user should immediately rinse or wash off with water. Continue to wash with water if an itching or burning sensation is felt.
- The chemicals included will stain both concrete and clothing.

Specifications

Chlorimeter™ C-CL-3000

Power	2 AA Batteries
Display	LCD
Data Link	USB
Weight	.8 lbs. (.36 kg)

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 laws provisions. Buyer and the Company expressly agree to submit to the personal jurisdiction of the federal and/or state courts sitting 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:

<p>Attn: Repair Department James Instruments, Inc. - USA 3727 North Kedzie Avenue Chicago, IL 60618-4503 USA</p>	<p>Attn: Repair Department James Instruments, Inc. – Europe Windmolen 22 7609 NN Almelo The Netherlands</p>
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Home page: www.ndtjames.com

E-mail: info@ndtjames.com

europe@ndtjames.eu



James Instruments Inc.

3727 N.Kedzie

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

Purchase Date: _____

Serial Number: _____