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# BLOOD GROUPING REAGENT

Intended for Use in the  
United States

## Anti-D (DVI) (Monoclonal)

## ORTHO™ Sera

REF

6904624

MEETS FDA POTENCY REQUIREMENTS

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## INSTRUCTIONS FOR USE

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### Intended Use

For *in vitro* diagnostic use only  
For use with the ID-Micro Typing System™ Buffered Gel Card  
For Direct Agglutination Test

The Anti-D (Monoclonal) reagent (Anti-RH1) is for the qualitative *in vitro* detection of human RhD positive red blood cells by the direct agglutination test. This Anti-D reagent will detect D category DVI cells.

The Anti-D (Monoclonal) reagent (Anti-RH1) is indicated for the determination of the RhD status for donors and neonates born to Rh negative women for RhIG therapy assessment.

This Anti-D (Monoclonal) reagent (Anti-RH1) is not indicated for pre-transfusion testing of patients as the reagent detects partial RhD (DVI) by direct agglutination.

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### Summary and Explanation

First described in 1939, the RhD (RH1) antigen is surpassed in importance only by the antigens of the ABO blood group system. Transfusion of RhD positive blood to an RhD negative recipient or failure to administer prophylactic anti-D to an RhD negative woman can result in the production of anti-D. Consequently, establishing the correct RhD group is fundamental to safe transfusion and perinatal practice. Certain individuals exhibit a quantitative reduction in the expression of their RhD antigen and are categorized as weak D. Others display a qualitative variation in RhD antigen expression and are referred to as partial RhD. Weak D individuals may also be partial RhD.<sup>1</sup>

**NOTE:** This Anti-D will detect DVI by a direct agglutination test. Patients and neonates who are potential blood transfusion candidates or mothers who are being evaluated for RHIG should not be tested with this reagent as they will be identified as RhD positive even when the expression of RhD antigen is only from the presence of DVI. Individuals who are RhD (DVI positive) may become sensitized to the RhD antigen if designated as being RhD positive and transfused with RhD positive units of blood or are exposed to an RhD fetus and do not receive RHIG. Therefore, a reagent that does not detect RhD DVI using a direct test should be used to test pre-transfusion candidates and mothers and neonates in the evaluation of RHIG administration.

To confirm the RhD type obtained with this reagent, samples should be tested using another Anti-D reagent that does not detect RhD (DVI). A patient who types as RhD negative with the second reagent but RhD positive with this Anti-RhD(VI) reagent may be RhD (DVI).

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### Principles of Procedure

When used by the recommended technique, this reagent will cause agglutination (clumping) of red blood cells carrying the RhD antigen. Lack of agglutination of the red blood cells demonstrates the absence of the RhD antigen.

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### Reagent

Anti-D (Monoclonal) is supplied as one reagent.

- 1 vial containing 5 mL of human monoclonal antibodies of type IgM (cell line ESD1M) containing 0.1% (w/v) sodium azide, potentiators, and bovine material (i.e., bovine serum albumin, fetal bovine serum).

Any bovine material used in the manufacture of these products is sourced from USDA approved facilities.

No preparation of the reagent is required. Use directly from the vial. Do not dilute.

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### Storage Requirements

Store at 2–8 °C.

Do not freeze.

Do not use beyond expiration date. The format of the expiration date is expressed as YYYY-MM-DD (year-month-day).

May be at 18–25 °C while in use.

Replace cap when not in use.

## Specimen Collection

- No special preparation of the patient/donor is required prior to specimen collection.
- Specimens should be collected by aseptic technique with an anticoagulant.
- The specimen should be tested as soon as possible after collection. If testing is delayed, the specimen should be stored at 2–8 °C.
- Do not use collection tubes that contain plasma/cell separation media.
- Samples collected in EDTA should be tested within seven days from collection.
- Donor blood collected in ACD, CPD, CP2D, CP2D with AS-3 and CPDA-1 may be tested until the expiration date of the donation.
- Clotted, hemolyzed, grossly icteric, or contaminated blood specimens should not be used.
- Grossly lipemic samples containing particulates that clog the gel, as indicated by diffuse blotches of red blood cells in the microtube, may be clarified by centrifugation or filtration and retested.
- Specimens should not be exposed to extreme heat.

## Precautions

Do not use if turbid.

Do not dilute.

Do not freeze.

Do not use beyond the expiration date.

This reagent contains 0.1% (w/v) sodium azide.

Handle and dispose of reagents as potentially infectious, in accordance with local, state, and national laws.

This reagent is for *in vitro* diagnostic use only.

**CAUTION:** Sodium azide may be toxic if ingested and may react with lead and copper plumbing to form explosive compounds. If discarded into sink, flush with a large volume of water to prevent azide buildup.

**CAUTION:** Source material from which this product is derived was found non-reactive for HBsAg, Anti-HIV 1/2 and Anti-HCV. No known test methods can offer complete assurance that products derived from human blood will not transmit infectious disease. Appropriate care should be taken in the use and disposal of this product. Source materials may include human components and antibody producing cells that are used in the manufacture of polyclonal and monoclonal products.

## Procedure

### Material Provided

ORTHO™ Sera Anti-D (DVI)

### Materials Required but not Provided

- Isotonic saline
- Reagent red blood cells suitable for the control of Anti-D (DVI)
- MTS™ Buffered Gel Card

**NOTE:** Store cards upright at 2–25 °C.

**CAUTION:** Inspect the condition of the card before use.  
Do not use gel cards that have not been shipped in an upright position.  
Do not use cards beyond expiration date.  
Do not freeze or expose cards to excessive heat.  
Use reagents as furnished.

- Micropipettors for delivery of 25 µL and 50 µL
- Pipet tips
- Marking pen
- ORTHO™ Workstation  
or ORTHO VISION® Analyzer  
or ORTHO VISION® Max Analyzer  
or ORTHO Optix™ Reader

**Test Procedure****NOTE:**

This reagent has been standardized for use by the technique described below.

The direct agglutination test procedure listed below is for manual testing only. When using instruments (see Materials Required but not Provided), follow the procedures that are contained in the operator's manual provided by the device manufacturer.

**Direct Agglutination Test**

1. Prepare an approximate 0.8% red blood cell suspension from patient or donor cells, using isotonic saline.
2. Allow the card and reagent to come to 18–25 °C before use. A clear liquid layer should appear on top of the opaque gel in each microtube.
3. Visually inspect gel cards before use.

**CAUTION:** Do not use gel cards if the gel matrix is absent or the liquid level in the microtube is at or below the top of the gel matrix.  
Do not use gel cards that show signs of drying, discoloration, bubbles, crystals, or other artifacts.  
Do not use cards if foil seals appear damaged or opened.

**NOTE:** Refer to the ID-Micro Typing System™ Interpretation Guide<sup>2</sup> for additional information related to the visual inspection of gel cards before use.

4. Label the card appropriately with a sample identifier.
5. Remove the foil seal from the MTS™ Buffered Gel Card or from the individual microtubes to be used for testing.  
**CAUTION:** Do not remove card foil seal until ready to use. Foil should be removed immediately before testing or within 1 hour of testing. Once opened, the gel may begin to dry out which could affect test results (refer to Limitations of the Procedure). After removing the foil, visually inspect all gel cards to ensure that residual film does not block the opening of any microtube.
6. Add 25 µL of the reagent to the appropriate reaction chamber(s) of the opened card.  
**CAUTION:** Do not touch the pipet to the side of the reaction chamber. If this occurs, change the pipet tip before proceeding to the next chamber.
7. Add 50 µL of 0.8% red blood cell suspension to the appropriate reaction chamber(s) of the card.  
**CAUTION:** Do not touch the pipet to the side of the reaction chamber. If this occurs, change the pipet tip before proceeding to the next chamber.
8. Observe that the contents of the reaction chamber(s) are combined. If necessary tap gently.  
**NOTE:** Assure that the reagents remain in the reaction chamber. There should be no mixing of reactants with reagents in the column prior to centrifugation.
9. Centrifuge the card at the preset conditions, as installed by the instrument manufacturer.
10. Read the front and back of the individual columns for macroscopic agglutination or hemolysis upon test completion.
11. Record the reaction strength.

## Interpretation of Results

**Negative Result** = No agglutination and no hemolysis of the red blood cells is a negative test result. A complete sedimentation of all red blood cells is present in the bottom of the microtube.

**Positive Result** = Agglutination of the red blood cells is a positive test result. Red blood cells may remain suspended on the top of the gel or are dispersed throughout the gel in varying degrees. A few red blood cells may form a button in the bottom of the microtube in some positive reactions.

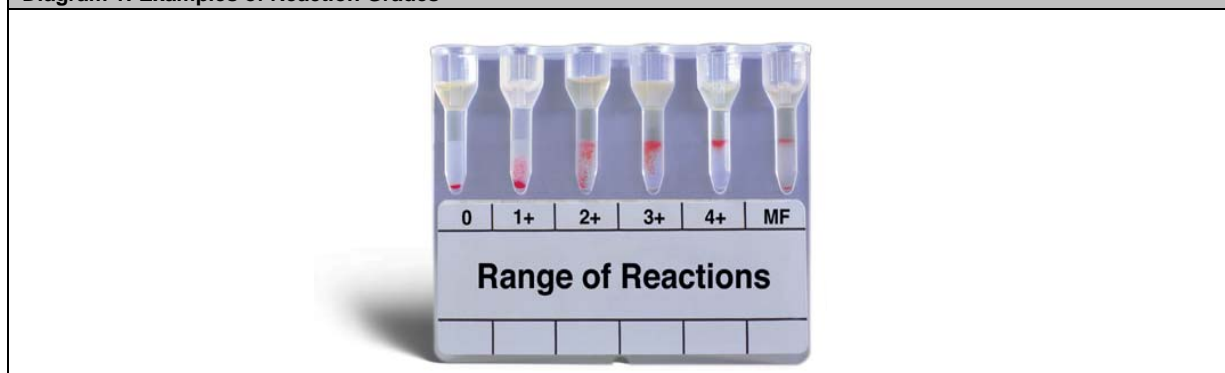
### Reaction Grading Guide (Use in conjunction with Diagram 1)

<b>0 Negative</b>	Unagglutinated red blood cells form a well-defined button at the bottom of the microtube.
<b>1+ Reaction</b>	Red blood cell agglutinates are observed predominantly in the lower half of the gel microtube. Unagglutinated red blood cells form a button in the bottom of the microtube.
<b>2+ Reaction</b>	Red blood cell agglutinates are dispersed throughout the length of the gel microtube. Few unagglutinated red blood cells may be observed in the bottom of the microtube.
<b>3+ Reaction</b>	The majority of red blood cell agglutinates are trapped in the upper half of the gel microtube.
<b>4+ Reaction</b>	Solid band of red blood cell agglutinates on top of the gel. A few agglutinates may filter into the gel but remain near the predominant band.
<b>Mixed Field</b>	Red blood cell agglutinates at the top of the gel or dispersed throughout the gel microtube accompanied by a button of negative red blood cells in the bottom of the microtube. See Note below.

**NOTE:** Caution must be taken in interpreting a reaction as mixed field. Additional patient history and testing will be necessary for resolution. However, not all mixed cell situations have a sufficient minor population to be detected.

**CAUTION:** Clots, particulates or other artifacts may cause some red blood cells to be entrapped at the top of the gel that may cause an anomalous result in a negative test (refer to Limitations of the Procedure, item 5.)

**Diagram 1: Examples of Reaction Grades**



**NOTE:** Refer to ID-Micro Typing System™ Interpretation Guide<sup>2</sup> for additional information.

### Stability of Reaction

For best results, it is recommended that reactions should be read immediately following centrifugation.

## Quality Control

Quality Control (QC) of reagents is required. Quality Control should be performed on each lot of reagent on each day of use according to standard operating procedures.

Reagent red blood cells may be used direct from the vial as control cells in ORTHO Sera tests, including 0.8% Resolve® Panel A, 0.8% Resolve® Panel B, 0.8% Resolve® Panel C (Untreated Only), 0.8% Selectogen® and 0.8% Surgiscreen®.

**Limitations of the Procedure**

1. Strict adherence to the procedures and recommended equipment is essential.
  2. Proper centrifuge calibration is particularly important to the performance of the MTS™ Buffered Gel Card. The MTS™ Centrifuge and ORTHO™ Workstation have been exclusively designed to provide the correct time, speed, and angle.
  3. The expression of certain red blood cell antigens may diminish in strength during storage, particularly in EDTA samples. Better results will be obtained with fresh samples.
  4. Suppressed or weak expression of blood group antigens may give rise to false-negative reactions.
  5. Anomalous results may be caused by the following:
    - Fibrin or particulate matter
    - Red blood cells sticking to the sides of the reaction chamber
    - Do not use cards that appear damaged (i.e., break in foil seal or break, crack or bubble in the column), exhibit drying (i.e., liquid level is at or below the top of the gel matrix) or exhibit discoloration (due to bacterial contamination, which can cause false reactions).
    - Loss of fluid in the card column may cause (weak) false positive results.
    - J reactions may occasionally be observed with high red blood cell concentrations. J reactions may also be observed if during centrifugation the card is not seated properly in the holder or not allowed to spin at a 90° angle.
- NOTE:** A J reaction consists of cells forming a button at the bottom of the gel matrix or microtube when either end of the cell button goes up the side of the column. The cell button may be disrupted. A J reaction may represent a weakly positive reaction.
- False positive or false negative test results can occur from bacterial or chemical contamination of test materials, inadequate incubation time or temperature, improper centrifugation, improper storage of materials, or omission of test samples.
6. Tests with these or other anomalous results should be repeated.
  7. Erroneous results could occur if final reactions are not read upon completion of centrifugation.
  8. Mixed cell populations may be encountered as a result of, for example, transfusion, fetal maternal hemorrhage, or transplantation. Consult patient history when results of this nature are encountered before assigning an antigen type.
  9. This Anti-D reagent will not detect the partial D expression of RhD antigen associated with DIV.
  10. Donor/Patient red blood cells must be diluted with isotonic saline, before adding the red blood cells to the microtube.

**Performance Characteristics**

**Comparator Study Results**

During comparator studies (data on file at Alba Bioscience Limited), blood samples were tested with ORTHO™ Sera Anti-D (DVI) Monoclonal by ID-Micro Typing System™ Column Agglutination Technology (CAT) as follows:

Test	Positive			Negative		
	N	% Agreement*	One-Sided Exact 95% LCL (%)	N	% Agreement*	One-Sided Exact 95% LCL (%)
Anti-D(DVI)	2699	99.7	99.5	921	100	99.7

LCL: lower confidence limit

\* % Agreement between the ORTHO™ Sera Anti-D (DVI) Monoclonal and comparator reagents only and does not indicate which reagents gave the correct results.

In performance evaluation studies, 3620 samples were tested with ORTHO™ Sera Anti-D (DVI) Monoclonal using the MTS™ Centrifuge. The one-sided exact 95% LCL of positive percent agreement was ≥99% for agglutination tests based on a comparison of interpreted results. The one-sided exact 95% LCL of negative percent agreement was ≥99% for agglutination tests based on a comparison of interpreted results. Although both the positive and negative percent agreement at the one-sided exact 95% LCL met the acceptance criteria, there were seven discrepant results (see sample classification and comments in the summary table below). The discordance between the trial and the comparator reagent could be attributed in five instances to the sample itself being category DIV. One discrepant sample was confirmed as a weak category DVI on investigation, whilst one discrepancy was not noted at the time by the trial site, therefore, no investigational testing was performed on this sample.

**INSTRUCTIONS FOR USE**

Classification	Number of Discrepancies	Comment
DIV variant	5	ORTHO™ Sera Anti-D (DVI) reagent does not detect DIV variant.
Weak DVI variant	1	ORTHO™ Sera Anti-D (DVI) reagent did not detect weak sample. Comparator and Resolver reagent were positive by IAT only.
Unresolved	1	ORTHO™ Sera Anti-D (DVI) reagent and comparator reagent showed a different result during initial testing, however, no investigation was performed.

Results were evaluated against comparable FDA approved products using the appropriate methods for the comparators.

Migration studies have been performed using the ORTHO™ Workstation and results were as follows:

Reagent	Number of samples tested	Concordance*	Positive Samples	
			N	Frequency (%)
Anti-D (DVI)	100	100%	80	80

\*Concordance indicates agreement between the ORTHO™ Workstation and the MTS™ Centrifuge only and does not indicate which systems gave the correct results.

Further migration studies have been performed for the ORTHO VISION® and ORTHO VISION® Max Analyzer. Comparator studies were performed using random samples and a screening test method was used to identify additional random samples of low antigen frequency. The performance of total samples is reported in the following paragraphs, as the unscreened and screened random sample totals show similar performance.

The results of these migration studies performed using the ORTHO VISION® Analyzer were as follows:

Test	Positive			Negative		
	N	% Agreement*	One-Sided Exact 95% LCL (%)	N	% Agreement*	One-Sided Exact 95% LCL (%)
Anti-D (DVI)	633	100.0	99.5	622	100.0	99.5

LCL: lower confidence limit

\* Concordance indicates agreement between the ORTHO™ Workstation and the ORTHO VISION® Analyzer only and does not indicate which system gave the correct results.

In these migration studies, 1255 samples were tested with ORTHO™ Sera Anti-D (DVI) (Monoclonal) using the ORTHO™ Workstation and the ORTHO VISION® Analyzer. The one-sided exact 95% LCL of positive percent agreement was 99.5% for agglutination tests based on a comparison of interpreted results. The one-sided exact 95% LCL of negative percent agreement (NPA) was 99.5% for agglutination tests based on a comparison of interpreted results.

The results of the migration studies performed using the ORTHO VISION® Max Analyzer were as follows:

Test	Positive			Negative		
	N	% Agreement*	One-Sided Exact 95% LCL (%)	N	% Agreement*	One-Sided Exact 95% LCL (%)
Anti-D (DVI)	650	100.0	99.5	696	100.0	99.6

LCL: lower confidence limit

\* Concordance indicates agreement between the ORTHO VISION® Analyzer and the ORTHO VISION® Max Analyzer only and does not indicate which system gave the correct results.

In these migration studies, 1346 samples were tested with ORTHO™ Sera Anti-D (DVI) (Monoclonal) using the ORTHO VISION® Analyzer and the ORTHO VISION® Max Analyzer. The one-sided exact 95% LCL of positive percent agreement was 99.5% for agglutination tests based on a comparison of interpreted results. The one-sided exact 95% LCL of negative percent agreement (NPA) was 99.6% for agglutination tests based on a comparison of interpreted results.

**INSTRUCTIONS FOR USE**

A further migration study where a matrix approach test strategy was utilized was performed using the ORTHO Optix™ Reader. Four representative ORTHO™ Sera assays were selected for testing to migrate all 13 ORTHO™ Sera with the focus on comparable intended use and design characteristics (card types (buffered gel card and Anti-IgG gel card), special reagents (Papain) and test types (DAT and IAT)).

The results of the migration study using the ORTHO Optix™ Reader were as follows:

Card Type	Test	Positive			Negative		
		N	% Agreement*	One-Sided Exact 95% LCL (%)	N	% Agreement*	One-Sided Exact 95% LCL (%)
Buffered Gel	Anti-D (DVI) and Anti-Jk <sup>a</sup>	838	100.0	99.6	415	100.0	99.1
Anti-IgG	Anti-D (IAT) and Anti-S	647	100.0	99.4	393	99.8	98.6

LCL: lower confidence limit

\*Concordance indicates agreement between the ORTHO VISION® Analyzer and the ORTHO Optix™ Reader only and does not indicate which system gave the correct results.

In these migration studies, a total of 2293 test results were generated from 861 samples using the ORTHO Optix™ Reader and the ORTHO VISION® Analyzer. These comparator studies demonstrated greater than 95% negative percent agreement (NPA) and greater than 95% positive percent agreement (PPA) at the one-sided exact 95% LCL between the ORTHO Optix™ Reader and the ORTHO VISION® Analyzer.

**Precision Study Results**

As part of the performance evaluation, precision and lot to lot studies were performed using multiple operators, days and runs to confirm repeatability and reproducibility of test results in the same run, day and with the same operator and between runs, days and operators. The study took account of variables such as days of the week, times of day and supplementary reagents used in the testing. There were no discordant results; all expected positive test outcomes generated unequivocal positive reactions and all expected negative test outcomes generated unequivocal negative reactions.

**Specific Performance Characteristics**

Prior to release, each lot of ORTHO™ Sera Anti-D (DVI) (Monoclonal) is tested in alignment with FDA recommendations against a panel of antigen-positive and antigen-negative red blood cells to ensure suitable reactivity.

ORTHO™ Sera Anti-D (DVI) (Monoclonal) Blood Grouping Reagent has been tested using the ID-Micro Typing System™ and when stored and used according to the recommended instructions for use, found to specifically agglutinate human red blood cells with the corresponding antigen.

The ORTHO™ Sera Anti-D (DVI) (Monoclonal) reagent reacts with cells expressing the D antigen and meets FDA potency requirements.

This monoclonal IgM anti-D will directly agglutinate red blood cells from most D variants (except DIV) including DVI.























For additional information or technical support, contact Ortho Care™ Technical Solutions Center at 1-800-421-3311.

**Bibliography**

1. Daniels, G. (2012). Human Blood Groups, 3rd ed. Oxford; Malden MA: Blackwell Science.
2. ID-Micro Typing System™ Interpretation Guide (6902201), Ortho Clinical Diagnostics.

**Glossary of Symbols**

The following symbols may have been used in the labeling of this product.

	Do Not Reuse		Contains Sufficient for "n" Tests		Fragile, Handle with Care.
	Use by or Expiration Date (Year-Month-Day)		<i>In vitro</i> Diagnostic Medical Device		Keep Dry
	Batch Code or Lot Number		Upper Limit of Temperature		This end up
	Serial Number		Lower Limit of Temperature		Do Not Use if Damaged
	Catalog Number or Product Code		Temperature Limitation		Cassettes/Cards
	Date of Manufacture		Consult instructions for use		Concentration
	Manufacturer		Biological Risks		Der Grüne Punkt (the Green Dot). Manufacturer follows certain packaging material waste disposal management regulations.
	Authorized Representative in the European Community				

**Summary of Revisions**

Date of Revision	Version	Section	Description of Technical Changes*
2021-03-12	5.0	Materials Required but not Provided	Addition of ORTHO Optix™ Reader and removal of MTST™ Centrifuge
		Performance Characteristics Comparator Study Results	Addition of Performance Characteristics for ORTHO Optix™ Reader.
2019-07-26	4.0	Materials Required but not Provided	Addition of ORTHO VISION® Max Analyzer.
		Performance Characteristics Comparator Study Results	<ul style="list-style-type: none"> <li>Added statement for migration study data performed on ORTHO VISION® and ORTHO VISION® Max Analyzer.</li> <li>Updated statement for migration study data for ORTHO VISION® Analyzer.</li> <li>Addition of migration study data for ORTHO VISION® Max Analyzer.</li> </ul>
2019-01-30	3.0	Materials Required but not Provided	Addition of ORTHO VISION® Analyzer.
		Test Procedure	Updated statement regarding using instruments.
		Quality Control	Addition of statement regarding use of 0.8% red cells as a control when used directly from the vial.
		Limitations of the Procedure	Changed limitation #10 to: Donor/Patient red blood cells must be diluted with isotonic saline, before adding the red blood cells to the microtube.
		Limitations of the Procedure	Step 11 removed as it does not apply to this section and is already presented in the Test Procedures section.
2018-08-01	2.0	Performance Characteristics Comparator Study Results	Addition of migration study data for ORTHO VISION® Analyzer.
		Front page	Added Intended for Use in the United States to the header and US to the footer of the document.
		Specific Performance Characteristics	Changed OCD Customer Technical Support to Ortho Care™ Technical Solutions Center.

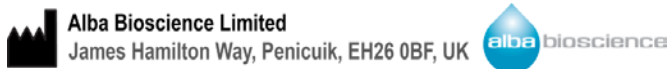


**INSTRUCTIONS FOR USE**

Date of Revision	Version	Section	Description of Technical Changes*
		Bibliography	Removed 'J' from Interpretation Guide publication number.
		Glossary of Symbols	Serious Health Hazards and Caution symbols removed.
		Back page	Manufacturer's address updated. Changed from © Ortho-Clinical Diagnostics, Inc. to © Ortho Clinical Diagnostics.
2015-07-20	1.0		Initial version of Instructions for Use.

\* The change bars indicate the position of a technical amendment to the text with respect to the previous version of the document.

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