Technical News Bulletin

Clearwater, 21 January 2008

Reference Contact: Mike Rentschler, Product Manager

Veritas™ iM Application Notes

Section 1 Overview

Main Assembly Drawing: 9600D

The Veritas iM is a five-station, servo-indexing, rotary inspection system designed to inspect glass containers. As a stand-alone system it is capable of inspecting round and non round ware at speeds of up to 320 containers per minute (see ware range and machine speed information below).

In addition to the Veritas iM, there are two other machines in the Veritas series.

The Veritas iB is a six-station stepper motor belt-handler, vision inspection system offering sealing surface, base, base stress, vision plug, and vision dip/saddle inspections, as well as vision mold number reading.

The Veritas iC is a completely non-contact sidewall, dimensional and sidewall stress inspection system.

This document applies to the Veritas iM only.
The Veritas iM is capable of performing the following inspections:

- **Plug/ring (standard)** – Mechanical go/no-go inspection. Min/Max Plug and Ring located at first station.

- **Vision Ring (option)** – High-resolution camera, with LED backlighting, measures finish T and E dimensions, as container rotates in place. Can be installed at any of the machine’s three rotate stations.

- **Check detection (standard)** – 3 rotate stations, modulated-light check detection system with five pre-set frequencies, also is available. Standard: 8 sensors 8 lights, up to 16 modulated channels (upgradeable to 27 channels).

- **Mold number reading (standard)** – heel dot code reader located at center check detection station.

- **Dip/saddle/height (standard)** – Mechanical inspection located at fifth station.

- **Optical wall thickness inspection (option)** – Up to 4 heads in one or two rotate stations. Four VMA systems are currently offered: WRH (round ware only, standard option), TMC 28 (for embossed areas, non-round corners, fluted ware), TMC 15 (recommended only for installations already equipped with TMC 15 heads), and TMC 15-Dark Ware.

## Section 2 Ware Range

The Veritas iM is designed to handle both round and non-round containers.

**Round containers** include nearly all cylindrical round shapes and most tapers within the ware range.

**Standard Specifications:**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter (9-pocket star wheel)</td>
<td>80-132 mm [3.15-to 5.19 in.]*</td>
</tr>
<tr>
<td>Diameter (18-pocket star wheel)</td>
<td>16-83 mm [0.625-3.3 in.]</td>
</tr>
</tbody>
</table>

* A 9-pocket star wheel can be configured to handle the entire ware range of the machine, however, because the iM will run faster in 18-pocket mode, it is unlikely that smaller ware (80mm diameter and smaller) would be set up to run in a 9-pocket star wheel.

<table>
<thead>
<tr>
<th>Height</th>
<th>38**-381 mm [1.5-15.0 in.].</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Height</strong></td>
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<td><strong>Height</strong></td>
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</tbody>
</table>

**Non-round containers** are limited to containers that have enough round surface area in the neck or body to allow rotation. Special tooling is required for handling rotateable non-round containers. See additional shape limitations for check inspection, mold number reading, and wall thickness measurement noted in the Inspection Notes section of this document. Containers also must be
capable of being delivered to the machine standing upright on a conveyor. Certain shapes with rounded bottoms, such as ampoules, light bulbs, etc. are excluded.

**Other Considerations**: Some containers (round or non-round) might cause handling problems and should be tested by Emhart Glass. Examples of these containers include:

- Containers with extreme tapers
- Odd round or non-round shapes
- Containers with handles and/or flat or curved label panels
- Small diameter tall, round containers that tend to be top heavy and unstable

**CAUTION**: Misshapen and structurally weak containers will break during handling in the Veritas iM. This can cause unscheduled down time and/or damage to handling components. The installation of a squeeze tester or freak detection device upstream of the Veritas iM is strongly recommended.

**Handling considerations for large and/or heavy ware**: The optional 17509B Intermediate Stripper Mount is available to provide a stronger mount for the strippers at the outfeed of the starwheels when the machine is set up to run large or heavy ware, such as wine jugs or Champagne bottles. The size and weight of these containers cause extra stress at this critical ware-handling area, which might cause stripper-mounting screws to bend or break. The Intermediate Stripper Mount allows the use of longer mounting screws; however, these mounts increase the minimum possible spacing between strippers and the minimum sidewall bottle by 13 mm [0.5 in.].
Section 3  Machine Speed

The Veritas iM is designed to run at a maximum speed of 320 bpm. Actual maximum speed is affected by container dimensions and shape, starwheel configuration, and plug penetration. The minimum speed that the Veritas iM is capable of is 60 bpm. The following chart is to be used as a guideline only.

<table>
<thead>
<tr>
<th>Starwheel Configuration</th>
<th>Maximum Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug Penetration</td>
<td>18-pocket</td>
</tr>
<tr>
<td>22 mm [0.875 in.]</td>
<td>320 bpm</td>
</tr>
<tr>
<td>38 mm [1.5 in.]</td>
<td>320 bpm</td>
</tr>
<tr>
<td>54 mm [2.125 in.]</td>
<td>280 bpm</td>
</tr>
<tr>
<td>70 mm [2.75 in.]</td>
<td>250 bpm</td>
</tr>
<tr>
<td>86 mm [3.375 in.]</td>
<td>220 bpm</td>
</tr>
<tr>
<td>102 mm [4.0 in.]*</td>
<td>200 bpm</td>
</tr>
</tbody>
</table>

NOTE:  The motion controller will prevent users from entering a machine speed and plug penetration that are not compatible. For example, if an operator tries to enter a machine speed of 320 and a plug penetration of 102mm, the motion controller will display an error message and will prevent operation of the machine in this configuration.

Section 4  Tooling

Tooling Overview: Tooling for the Veritas iM consists of an infeed screw, starwheel assemblies, strippers (guide bottles out of the starwheels and into the slowdown belts), plug/ring gages, and FFS heads (dip/saddle/height gauging). In an 18-pocket starwheel configuration, strippers are not used if the optional Live Belt Stripper mechanism is installed. In a 9-pocket starwheel configuration, strippers are used with the Live Belt Stripper.

Infeed Screws: Veritas iM infeed screws are bottle diameter-specific (refer to drawing 8882D).

Starwheels: Starwheel tooling usually consists of an upper and lower starwheel assembly, although some shorter ware might require only one starwheel assembly. Information concerning the specification of starwheel assemblies for various container diameters can be found in TW 2098, Veritas iM Job Change Tooling Manual. Starwheels are available in either 18- or 9-pocket configurations. The 18-pocket starwheels are designed for ware diameters of 16-80 mm [0.625-3.1 in.]; 9-pocket starwheels are designed for ware diameters of 80-132 mm [3.1-5.2 in.]. The 9-pocket starwheels can be used for the entire ware range; however, the maximum machine speed in
a 9-pocket configuration is 180 bpm (depending on container characteristics and inspection setup).
Lower starwheels are designed to handle a limited range of container diameters. A different lower
starwheel is usually required for each 2 mm change in container diameter. Upper starwheels are
generally container specific, depending on where they are to be placed on the neck of the container.

Starwheels are available as complete assemblies (three segments with roller wheels and hardware) or
as unfinished segments. Roller wheel hardware can be purchased separately.

**Strippers:** Strippers consist of two plates used to guide the bottles out of the starwheel and into the
outfeed belts. Strippers are specific to the bottle diameter.

**Plug/Ring Gages:** Plug and ring gages are specific to the acceptable dimensions of the finish.
Plug/Ring gages have Min and Max and length requirements that are container specific. Plug and
Ring gages can be purchased from Emhart Glass if specifications are provided, or blanks of these
gages can be purchased.

**FFS Heads:** FFS Heads are specific to the finish diameter of the container and the amount of
tolerance allowed for the defects.
Section 5 Inspection Notes

Check Detection: Inspection is limited to predominantly round surfaces on transparent containers. Containers that are opaque, translucent, or have very low light transmittance properties within the spectral range of standard lights and/or sensors cannot be inspected. Container surfaces that are not round can present difficulties in inspection. Inspection of these containers might not be possible. Containers that are heavily embossed or lettered may present difficulties in inspection, requiring additional setup time.

Mold Number Reading: The Veritas iM is capable of reading dots embossed on the heel or bottom (option special reader head needed, PN 6041C, for bottom code reading) of the container. Dots must be within proper specification, with proper clearance from other container markings, to allow proper sensing. The Veritas iM mold number reader cannot read “peanuts” or alphanumeric codes located on the base of the container. (Base codes, including peanut and alphanumeric, can be read by the vision mold number reader, which is available on the Veritas iB.) The dots must be positioned on a round surface on the container, usually in the heel area, although neck and shoulder areas are also suitable. The reader head must be placed perpendicular to the container at the elevation of the dots. Certain container shapes might cause the reader head to be positioned at an angle that conflicts with tooling (guide rails) requiring additional setup time. The Veritas Mold Number Reader supports the following code types:

- 9-dot heel code
- 6-dot Mini Code
- 10-dot heel code
- 8-dot BSN heel code
- 8- and 9-dot Owens heel code
- AGR Mini bottom code

Specifications for the engraving of the Emhart and SGCC codes are covered in the document, 16049A, Specifications for Emhart Glass Mold Number Reader, which can be obtained from an Emhart Glass representative.

Optical Wall Thickness Inspection (optional): The Veritas iM supports the VMA TM(C) Optical Wall Thickness Measurement Systems. Model WRH (round ware only) is provided as the standard option. Other optional models include: TMC 28 (for embossed areas, non-round corners, fluted ware), TMC 15 (recommended only for installations already equipped with TMC 15 heads), and TMC 15-Dark Ware. It also might be possible to install other manufacturers’ wall thickness inspection systems; however, only the VMA system application has been tested and approved for use on the Veritas iM at this time. Measurement accuracy on a range of containers has been tested, and is ±4.0% when set to reject “under minimum thickness;” ±11.0% when measuring for “over maximum thickness.” The measurement area can be any smooth circular area of the container, whether straight or contoured. The inspection head must be capable of being positioned perpendicular to the container surface at the desired elevation of inspection. As many as four inspection heads can be placed in up to two inspection stations. Machine tooling (guide rails, head mount) and other heads might not allow proper positioning of a specific head at certain elevations, or might cause additional setup time to resolve difficulties in positioning. With the TMC 15 and TMC 28 systems, certain container attributes
such as fluting, embossing, etc., can be measured. Inspection is limited to predominantly round surfaces on transparent containers. The system has an out-of-round tolerance of ±4mm. This means that after the inspection head position is set, the system will measure in a range of up to 8mm (4mm closer to the head; 4mm farther away from the head). Containers that are opaque, translucent, or have very low transmittance properties within the spectral range of the sensor cannot be inspected.

Section 6  Job Change

With proper training and experience, a crew of two technicians should be able to completely job change the Veritas iM in one hour or less, depending on the inspection configuration and requirements. Achieving this goal requires a strong preventive maintenance program and thorough training of all setup, maintenance, and operation techniques (see section on training for more information on Veritas iM training programs offered by Emhart Glass). Excluded from this setup time is the set up of check sensors and lights and other inspection options installed on the machine. Setup time for check detection varies considerably, depending on the inspection setup and the setup technician’s skill and experience.
Section 7  Conveyor Systems

The conveyor, while not part of the Veritas iM, serves a critical role in the timing of ware within the machine. At the infeed, ware engages the infeed screw running at the speed of the conveyor. At the screw’s outfeed, the conveyor carries ware into the first pocket on the machine’s starwheel. At the outfeed, a belt handler gently releases the ware back onto the conveyor system.

The customer conveyor runs independently from the Veritas iM, but its speed is monitored via an encoder mounted on its drive shaft. This encoder reference is used to serve as a master speed reference for the entire Veritas iM. Since many plant conveyor systems are interfaced to a master production line speed control, following the speed of the conveyor is the most practical way to control the speed of the Veritas iM relative to the speed of production.

As an alternative, the Veritas iM also has a potentiometer input that allows the machine speed to be controlled directly from manual input. However, the conveyor system will need to be synchronized manually or through other means to assure proper loading and unloading of containers in the Veritas iM.

**NOTE:** Emhart Glass cannot be responsible for the modification or performance of a conveyor control system. Our responsibility is limited to the supply and performance of the Veritas iM. Any conveyor/machine control issues must be reviewed and resolved during machine specification. These issues are part of site preparation, which are the customer’s responsibility and are covered in TW 2097 Veritas Site Preparation and Installation manual. Emhart Glass will work with customers and/or their conveyor supplier(s) to meet specific line requirements; however, the customer has the ultimate responsibility for any changes that must be made to the conveyor control to enable interface with the Veritas iM.

**Customer-Supplied Conveyors:** The Veritas iM is designed to be installed on an existing conveyor; it has no conveyor of its own. If you wish to install the Veritas iM on its own conveyor, you must ensure that there is chain-to-chain mating between the Veritas iM conveyor and the production line conveyor when the conveyor-to-conveyor transition is close to the Veritas iM infeed. The use of a dead plate between the two conveyors is not recommended because it can cause handling problems when containers to drag as they transition from the production line conveyor to the Veritas iM conveyor.
Section 8 Operating Environment

Enclosures: All electrical/electronic enclosures used in the Veritas iM should be considered rated for NEMA 1 and IP20.

NOTE: The Veritas iM is equipped with a fan-cooling system designed to for ambient temperatures (area around the outside of the machine) of up to 40°C [104°F]. For operation with ambient temperatures up to 50°C [122°F], the Veritas iM must be equipped with an optional air conditioning system, as well as the Servo Amp Cooling Kit (Part No. 26018A). The air conditioning system and servo amp cooling kit are designed to maintain the Veritas iM internal temperature at or below 40°C [104°F].

Operating Temperatures: The Veritas iM is controlled by electronic equipment that is designed to operate in the majority of glass plant environments without modification. However, since conditions can vary from one installation to another, the following operating conditions must be observed. Failure to maintain these requirements will affect the applicable warranties covering the Emhart Inex hardware and software associated with the Veritas iM. If the proper operating conditions are not maintained, the electronic hardware will not function as designed.

1. The internal temperature (with covers closed) must be maintained at or below 40°C [104°F].
2. The maximum allowable temperature inside the machine is 40°C [104°F]. Although control components can operate at this upper temperature, life expectancy of the electronic components will be reduced. The lowest recommended operating temperature is 5°C [41°F] (refer to illustration at right). Relative humidity must be maintained at 20 to 95%, non-condensing.

CAUTION! Operating conditions (temperature and environment) have a direct effect on the life expectancy of electronic equipment.
3. If in-plant ambient conditions normally exceed 40°C [104°F] and/or relative humidity exceeds 95%
(non-condensing), special cooling/dehumidification devices are required. For more information
about these devices contact an Emhart Glass representative.

CAUTION! Components within the electronic consoles must be kept clean. The life
expectancy of electronic components will be substantially reduced if they are
contaminated with plant dirt (swab oil, dust, etc.). The accumulation of these
substances on electronic components causes the actual temperature of these
components to be much higher than the temperature of air within the control
cabinet.

Container Temperature: The machine handling equipment is rated for 60°C [140°F] maximum
container temperature at machine infeed. Containers hotter than this can cause damage to handling
equipment and can cause the internal machine temperature to rise above acceptable limits as outlined
above.

Section 9 Utility Requirements

Operating Voltages and Currents. 230 VAC, 3 Phase, 25 Amps, 50/60 Hz standard. The following
line voltages can be handled with the optional multi-tap transformer (PN 13133P):

- 380 VAC 3 Phase, 15 Amps, 50/60 Hz
- 400 VAC 3 Phase, 15 Amps, 50/60 Hz
- 415 VAC 3 Phase, 15 Amps, 50/60 Hz
- 460 VAC 3 Phase, 12 Amps 50/60 Hz

Machine critical components are protected from surge, brownout and power loss by an uninterruptible
power supply (UPS).

Air Pressure. 3.5 bar [50 PSI] minimum, 7.0 bar [100 PSI] maximum: 0.8 to 0.85m3/minute [28-30
CFM] maximum consumption. Air regulation, lubrication, and filtering are provided within the machine.

Section 10 Maintenance Requirements

The following routine maintenance should be performed at regular intervals. The machine is equipped
with a Machine Cycles meter and an Hours Run meter to make preventive maintenance easier to
track. Detailed procedures for performing these and other maintenance tasks can be found in the
machine reference manual.

- Keep the machine clean of debris and broken glass daily or as needed.
- Inspect all ware contact surfaces for excessive wear and tear (rotator wheels, idler wheels, guide rails, tooling, strippers, belts, etc) daily.
- Check dead plate wear daily; replace when worn more than 0.127 mm [0.005 in.].
- Inspect all machine control switches and indicators for proper operation weekly.
- Lightly oil the Plug and Dip stroke mechanism rails weekly.
- Inspect the air line lubricator oil reservoir weekly.
- Check condition of all exposed cables weekly.
- Clean all filters weekly.
- Clean all lighting and sensing optics weekly.
- Check condition of all drive belts monthly.
- Drain fluid from the air tank monthly.
- Replace the air line filter at regular intervals.
- Perform normal Dip Head maintenance at regular intervals.

Section 11 Conformity Statement

The Veritas iM conforms to the provisions of the following European CE directives and standards:

- EN292 Parts 1 and 2
- EN50081-2 Part 2
- EN50082-2 Part 2
- EN60204 Part 1
- CEN TC151 WG13 PrEN13042 Part 6: Specific Safety Requirements for Hollow Glass – Part 6: Multi-Station Multi-Inspection Machines
Section 12 Installation Notes

- To ensure smooth installation and machine commissioning, a final inspection line layout must be provided. This line layout must show the following:
  - Dimensions, including conveyor height
  - Cross-section view of the main line conveyor where the Veritas iM is to be installed
  - Cullet chute location
  - Location of all inspection machines and handling devices upstream and downstream of the proposed location for the Veritas iM.

- For proper ware flow and machine operation, ample free line space must be provided upstream and downstream of the Veritas iM. For optimum operation, there must be, at least 5 meters [16.4 feet] of line space upstream and downstream of the Veritas iM. For more detailed installation notes, including power and air requirements and service connection locations, refer to the Installation Drawing 9016C.

- Because rear access to the Veritas iM is required for job change, proper cullet conveyor clearance is required. For specifications, refer to the installation drawing.

Section 13 Specifications Required for Order Entry

The following items are configurable and require specification when ordering:

- Machine hand
- Plant voltage
- Conveyor height
- Tooling - Container specifications required
- Options
- Line layout drawings
Section 14  Spare Parts

Spare parts kits are available for the base machine, as well as for the optional inspections. Although the Veritas iM is covered by a one-year parts and labor warranty, spare parts kits are highly recommended. If an adequate supply of spare parts is maintained, critical parts, when needed, will be available if they fail or wear out prematurely. An adequate spare parts inventory also helps reduce downtime or extended unsatisfactory machine operation caused by occasional out-of-stock conditions and time required to order and ship required parts. Parts failing within the specified warranty period will be replaced free of charge when returned to Emhart Glass under a Return Authorization number provided by Emhart Glass.

Spare parts have been organized in the following manner.

Basic Kit PN 25770A – This kit contains parts that are the recommended required parts for the base machine.

Minimum Spares Kit PN 26104A1 – This kit contains the minimum parts required for normal operation. It does not include a spare Veritas iM Supervisor Computer.

Minimum Spares with Supervisor Computer Kit PN 26104A – This kit contains the minimum parts required for normal operation, plus the Veritas iM Supervisor Computer.

Extended Kit PN 25735A – This kit contains both the minimum recommended parts for the base machine, as well as parts to cover almost all failure conditions. Parts that are not in the basic kit (but are included in the extended kit) are classified as “EP” parts and are inventoried in Elmira for shipment within one business day following receipt of order.

Wear Parts Kit PN 25736A – This kit contains wear parts for the base machine. This kit provides additional wear parts for each group of three to four machines, or for customers to order for future maintenance reasons.

Hardware Kit PN 24209A – This kit is for customers who might not have local access to metric hardware.

Standard Choice Kits – The required parts kits will be selected based on the sales questionnaire if spare parts are to be ordered. The kits are mainly for the guide rail and rotator options. These kits contain wear parts and replacement parts for each respective assembly.

Option Spare Parts – Kits are available and recommended for each option (VMA Wall Thickness, etc.).

Tooling Parts – None of the spare parts kits include tooling (starwheel, infeed screw, plug, ring, dip head, outfeed stripper plates). Additional tooling should be ordered as spares, as these parts are wear parts (dip heads, stripper plates).
NOTE: All of the spare parts kits and part numbers are referenced on drawing 25735A, Base Machine Extended Spare Parts Kit.

Section 15 Training

Setup operation and maintenance training by Emhart Glass personnel is mandatory for optimum machine operation and extended life. A machine-specific service program also is available for the Veritas iM. Training programs, offered either at an Emhart Glass training center, or at your plant, provide plant personnel with hands-on experience in all aspects of machine job change, maintenance, troubleshooting, and operation. We recommend training for all lead maintenance and setup personnel (at least one per shift). This helps facilitate optimum, 24-hour-a-day machine operation and can virtually eliminate costly machine maintenance and service calls.
## Revisions

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q</td>
<td>21 Jan., 2008</td>
<td>Sec: 1: added information to Check Detection; Sec. 2: added information to Other Considerations; Sec. 4: revised Infeed Screws; Sec. 5: revised Optical Wall Thickness Inspection; Sec. 7: added Customer-Supplied Conveyor; Sec. 8: revised Operating Environment; Sec. 14: added minimum spares kits; deleted SAR from Option Spare Parts.</td>
</tr>
<tr>
<td>P</td>
<td>31 Oct., 2007</td>
<td>Sec. 3: Corrected machine speed for nine-pocket configuration.</td>
</tr>
<tr>
<td>O</td>
<td>24 May, 2007</td>
<td>Sec. 1: Added Vision Ring, modulated-light check detection, and TMC 15 dark ware and WRH to Sec. 1 Overview; Sec. 5: Removed 10-dot bottom code, added information on WRH and TMC 15 dark ware systems; Sec. 9: removed multiple transformer part numbers, replaced with single part number for all.</td>
</tr>
<tr>
<td>N</td>
<td>28 Feb. 2007</td>
<td>Sec. 2: Added Caution note; Sec. 3: corrected maximum speed for 9-pocket starwheel configuration; Sec. 4: Added note on Live Belt Stripper; Sect. 8: Added item #4 under operating temperatures, deleted note, under Air Pressure corrected air consumption specification; Sec. 12: Added line spacing requirement (changed from recommendation); Sec. 14: clarified text.</td>
</tr>
<tr>
<td>M</td>
<td>26 July 2006</td>
<td>Corrected typographical errors</td>
</tr>
<tr>
<td>L</td>
<td>5 July 2006</td>
<td>Reformatted; corrected temperature conversions in Section 8 – Operating Environment</td>
</tr>
<tr>
<td>K</td>
<td>18 Jan 2006</td>
<td>Updated temperature specifications.</td>
</tr>
<tr>
<td>J</td>
<td>11 Aug 2005</td>
<td>Updated MCW – Removed infeed screw details, added required operating conditions information, clarified inspection information, clarified transformer kit information, added spare parts kit information.</td>
</tr>
<tr>
<td>H</td>
<td>10 March 2004</td>
<td>Updated RAS</td>
</tr>
<tr>
<td>G</td>
<td>11 Jun. 2003</td>
<td>Sec. 2: Added information concerning handling considerations for heavy and large ware</td>
</tr>
<tr>
<td>F</td>
<td>2 Jan. 2003</td>
<td>Sec. 2: Removed note; changed height specification (was 38mm).</td>
</tr>
<tr>
<td>E</td>
<td>31 Oct. 2002</td>
<td>Added section numbers; Sec. 3: speed for 9-pocket mode in plug gaging chart was 160 bpm; added Sec. 4 Tooling.</td>
</tr>
<tr>
<td>D</td>
<td>24 Sept., 2002</td>
<td>Corrected infeed screws section; was five infeed screws</td>
</tr>
<tr>
<td>C</td>
<td>20 Sept., 2002</td>
<td>Added information on Veritas iB &amp; iCto Overview Section; added sub-section on infeed screws.</td>
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### Revisions (continued)

<table>
<thead>
<tr>
<th>Rev.</th>
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<tbody>
<tr>
<td>B</td>
<td>24 July, 2002</td>
<td>Plug penetration chart changed; in 9-pocket mode, speed is not affected by plug penetration</td>
</tr>
<tr>
<td>A</td>
<td>17 June, 2002</td>
<td>Added note to Standard Specifications and Machine Speed; added out-of-round tolerance to information on VMA Optical Wall Thickness Measurement System</td>
</tr>
<tr>
<td></td>
<td>29 May, 2002</td>
<td>Initial release</td>
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