Power Injectors for Diagnostic Imaging

Contrast under Control
Mallinckrodt provides contrast delivery systems for Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and Angiography. Our range of injectors has been developed from a heritage of innovation and technology.

Providing valuable assistance to contrast delivery, each injector features integrated technological advancements, all designed to enhance ease of set up, operation and procedural time efficiencies.

1  Computed Tomography
2  Magnetic Resonance Tomography
3  Angiography
The advanced dual head CT injector

Dual Head Versatility
- Performs up to 6 phases of contrast, saline or Simultaneous.
- Faceplates for both pre-filled and empty syringes.

Fully Programmable Powerhead
- Enables you to select and amend protocols whilst remaining at the patients side.
- Intuitive user interface.
- Step by step set up to help prevent air embolism.

Patency Check™ Feature
- The Patency Check™ feature allows the operator to inject saline at the maximum protocol flow rate to confirm a patent fluid pathway to the patient prior to contrast injection. This is carried out at the patients side for better control.

Timing Bolus™ Feature
- Perform a Timing Bolus™ injection of contrast medium followed by a saline flush to determine ideal scan delay for optimum image quality.

Tilt Enable
- An injection cannot be started until the correct enabling sequence has been completed, including purging air and tilting the powerhead downward to avoid injection of air bubbles.

Simultaneous Injection (optional)
- Delivery of dual injection of contrast media and saline.

Optibolus™ Software (optional)
- Optibolus™ Bolus Shaping Software automatically optimises your injection protocol for dynamic scanning procedures.
- Consistently provides uniform contrast enhancement and can support improved image quality.
Built-In Heater Blanket
Faceplate options for both pre-filled syringes and empty syringes are quick and easy to change.

Pre-filled syringe faceplate has an integrated heater blanket to maintain contrast at ideal temperature in order to reduce viscosity.

Intuitive User Interface
Easy to use menu allows you to quickly change protocols, flow rates and injection volumes.

Auto purge function.
Quick and efficient auto-fill of empty syringes.
Homing sequence of rams after injection.

Manual Flow Knob
Calibrated for easy quarter-turn priming, and colour coded for saline and contrast.

Display Orientation
With just the touch of a powerhead key, the display graphics flip 180° to provide proper orientation for easy reading.

Mounting Options
The Optivantage™ DH is available in pedestal or ceiling mounted configurations.

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Multiple Phase Programming
- As many as four phases can be programmed for each injection protocol.
- As many as 40 injection protocols can be stored in memory.

Timing Bolus™ Feature
- Perform a Timing Bolus™ injection of contrast medium followed by a saline flush to determine ideal scan delay for optimum image quality.
- This feature allows the operator to inject a specified amount of contrast medium during a test scan to determine optimum transit time of the contrast medium to the region of interest thus helping to maximise the diagnostic information.

Enable from console
- The injector can be enabled from either the control room at the remote console, or from the powerhead, which may increase the efficiency.

Battery Free Operation
- The first AC powered injector for the MR suite. Eliminates time and cost associated with battery charging and replacement.

3T compatible/non-ferrous dual powerhead
- The powerhead, power control unit, and remote stand are designed for use in the MR suite.
Powerhead Keys
- Large keys on the powerhead ensure ease of use.
- The injector can be enabled, started and stopped directly from the powerhead.

Check For Air Feature
- System will not enable until steps have been followed and the operator has confirmed that they have ‘checked for air’.

Auto retract
- Rams are positioned to allow the insertion of full syringes by activating the auto retract function.

Easy Drop-In Syringe Loading
- Results in faster procedures.
- Syringe filling can be performed in either the control room or the scan room.
- Powerhead is designed to accept empty syringes or pre-filled syringes.

Variable Drip Mode
- Switch between injection and drip mode at any time, to help ensure IV line patency throughout the procedure.
- Adjustable flowrate, volume and interval. Display shows remaining time and volume available for drip mode.
CT 9000™ ADV
Single Head Contrast Delivery System in CT

Simplicity – for single head delivery

Touchscreen
- New easy to read colour touchscreen.
- Requires only 3 simple key strokes to activate injection.
- Programme up to four phases with inject or scan delay features.
- Protocol manager to store and recall up to 12 user defined protocols.

Syringes
- The system accommodates front loading 200 ml disposable syringes or pre-filled syringes.

Powerhead
- The powerhead LED display provides a highly visible indication of remaining volume.
- The programmable Auto-Fill feature automatically moves the syringe to the selected volume.

OptiBolus™ software was designed to employ multiphasic injection, to expand the window of enhancement for contrast procedures. OptiBolus™ software optimizes the contrast media injection process through:

- **Uniform Distribution**
  Deliver contrast media at a controlled flow rate and volume, to help ensure uniform vascular enhancement of the pulmonary arterial system throughout the scan. This helps decrease the possibility of missing the bolus.

- **Optimize the Utility of Contrast Volume**
  Potentially reduce IV contrast agent volume. This can allow you to use contrast media more efficiently, while also improving visualization at the bolus peak.¹

- **Ease of Use**
  Your existing protocol converts to an OptiBolus™ protocol at the touch of a button.

Order Information:
Optional OptiBolus Activation Key: # 844210

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¹ Bae KT, Tran HQ, Heiken JP. Uniform vascular contrast enhancement and reduced contrast medium volume achieved by using exponentially decelerated contrast material injection method. Radiology. 2004;231:732-736.
Digital Powerhead Display
- The LED display automatically “flips” as the powerhead is rotated - ensuring proper orientation for viewing.
- Indicates programmed protocol and volume remaining in the syringe.

Fill Control Bar
- Allows easy, one finger operation.
- Variable speed control of ram for syringe filling, pull-back, or infusion.

Syringes
- The latex free and transparent syringes provide a crystal clear view of the contrast medium.
- Compatible with pre-filled syringes.

Air Detection Device
- The optional Air Detection and Warning System (ADAWS) detects empty syringes and air bolus.

Touchscreen
- The pressure sensitive touchscreen display makes the injection setup direct and easy.
- Protocol manager to store and recall user-defined protocols.

Multimodality
- With just a touch of a button the injector switches between Angio and CT modes.
Optivantage™ DH

Product Information

Delivery System

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Pedestal</strong></td>
</tr>
<tr>
<td>V8401</td>
<td>Optivantage™ - Dual Head CT Contrast Delivery System</td>
</tr>
<tr>
<td>V8411</td>
<td>Optivantage™ - Dual Head CT Contrast Delivery System with OEM interface</td>
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<tr>
<td>V8431</td>
<td>Optivantage™ - Dual Head CT Contrast Delivery System with Simultaneous Injection and OEM interface</td>
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<tr>
<td></td>
<td><strong>Ceiling Mount</strong></td>
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<tr>
<td>V8402</td>
<td>Optivantage™ - Dual Head CT Contrast Delivery System</td>
</tr>
<tr>
<td>V8412</td>
<td>Optivantage™ - Dual Head CT Contrast Delivery System with OEM interface</td>
</tr>
<tr>
<td>V8432</td>
<td>Optivantage™ - Dual Head CT Contrast Delivery System with Simultaneous Injection and OEM interface</td>
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Disposables

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Multipack</strong></td>
</tr>
<tr>
<td>844021</td>
<td>Syringe - Multipack 200 ml (Dual Check Valve Y Tubing)</td>
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<tr>
<td>844020</td>
<td>Syringe - Multipack 200 ml (No Check Valve Y Tubing)</td>
</tr>
<tr>
<td>844015</td>
<td>Syringe - Multipack 200 ml (Dual Check Valve Y Tubing)</td>
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<tr>
<td>800099</td>
<td>CT9000™ ADV - Multipack 200 ml (Coiled tubing)</td>
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<tr>
<td></td>
<td><strong>Dual Pack</strong></td>
</tr>
<tr>
<td>844023</td>
<td>Syringes - Dualpack 200 ml (Dual Check Valve)</td>
</tr>
<tr>
<td>844022</td>
<td>Syringes - Dualpack 200 ml (No Check Valve)</td>
</tr>
<tr>
<td>844016</td>
<td>Syringe - Dualpack 200 ml (Dual Check Valve Y Tubing)</td>
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<tr>
<td></td>
<td><strong>Syringe and J-Straw only</strong></td>
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<tr>
<td>800096</td>
<td>CT9000™ ADV - Front load Syringe with Handi-Fil™</td>
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<tr>
<td></td>
<td><strong>Y-connection tubing</strong></td>
</tr>
<tr>
<td>844012</td>
<td>CT Y Tubing Dual Check Valves - 152 cm (60&quot;)</td>
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<tr>
<td>844011</td>
<td>CT Y Tubing Single Check Valve - 152 cm (60&quot;)</td>
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<tr>
<td>844010</td>
<td>CT Y Tubing No Check Valve - 152 cm (60&quot;)</td>
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<tr>
<td></td>
<td><strong>Y-connector only</strong></td>
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<tr>
<td>810555</td>
<td>Extension Y Tubing Adapter - Dual Check Valves</td>
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<tr>
<td></td>
<td><strong>Extension tubing</strong></td>
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<tr>
<td>601195</td>
<td>Coiled Extension Tubing - 152 cm (60&quot;)</td>
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<tr>
<td>CTL150N</td>
<td>Straight Extension Tubing 150 cm (60&quot;)</td>
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<td></td>
<td><strong>Transfer Set</strong></td>
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<td>810551</td>
<td>Transfer Set</td>
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<tr>
<td>CTF015N</td>
<td>Automatic filling Tubing with Dripping Chamber</td>
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</tbody>
</table>

Technical Specifications

- **Flow Rate**: 0.1 - 10.0 ml/sec
- **Pressure Limit**: 50 - 325 peak psi
- **Syringe Sizes**: 200 ml empty syringes, 50, 75, 100, 125 ml high pressure prefilled syringes
- **Syringe Heater**: 37°C nominal, Minimises the loss of heat from preheated contrast
- **Volume**: 1 mL to volume in syringe, Up to 200 ml
- **Scan Delay**: 0 - 600 sec
- **Inject Delay**: 0 - 600 sec
- **Phase Delay**: 0 - 600 sec
- **Number of Phases**: 6
- **Protocol Memory**: 40
- **Inject Results**: Last 24 injected protocols
- **Si contrast % ratio**: 10% to 90% in 5% steps

Product availability and Summary of Product Characteristics may differ from one country to another. For your country’s specific information, please contact your local Mallinckrodt Office or Representative.
Optistar™ ELITE
Product Information

Delivery System

<table>
<thead>
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<th>Code</th>
<th>Description</th>
<th>QTY</th>
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<tbody>
<tr>
<td></td>
<td><strong>Pedestal</strong></td>
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<tr>
<td>M5200</td>
<td>Optistar™ ELITE- MR Contrast Delivery System - Rolling Stand</td>
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</tbody>
</table>

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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Multipack</strong></td>
<td></td>
</tr>
<tr>
<td>801800</td>
<td>Optistar™ MR Syringe 60/60/90 Multipack</td>
<td>50 each</td>
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<tr>
<td></td>
<td><strong>Syringe with Spike</strong></td>
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<tr>
<td>801801</td>
<td>Optistar™ MR Syringe Lateral Flow Needle 60 ml</td>
<td>50 each</td>
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<tr>
<td></td>
<td><strong>Y - Connection Tubing</strong></td>
<td></td>
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<tr>
<td>801106</td>
<td>Y - Tubing - Single Check Valve 152 cm (60°)</td>
<td>100 each</td>
</tr>
<tr>
<td>801107</td>
<td>Y - Tubing - Single Check Valve 229 cm (90°)</td>
<td>100 each</td>
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<tr>
<td></td>
<td><strong>Y - Connection only</strong></td>
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</tr>
<tr>
<td>801555</td>
<td>Extension Y Tubing Adapter - Dual Check Valves</td>
<td>50 each</td>
</tr>
<tr>
<td></td>
<td><strong>Extension tubing</strong></td>
<td></td>
</tr>
<tr>
<td>601195</td>
<td>Coiled Extension Tubing - 152 cm (60°)</td>
<td>50 each</td>
</tr>
</tbody>
</table>

Technical Specifications

Flow Rate
0.1 to 10 ml/sec

Pressure Limit
60 ml syringe: 150 psi
10, 15, 20, 30 ml PFS: 200 psi

Syringe Sizes
60 ml empty syringes
10, 15, 20, 30 ml PFS

Volume
A Side: Up to 60 ml
10, 15, 20, 30 ml PFS
B Side: Up to 60 ml

Scan Delay
0 - 60 sec

Inject Delay
0 - 300 sec

Number of Phases
6

Phase Delay
0 - 600 sec

Protocol Memory
40

Inject Result
Last 48 injected protocols

MR Compatibility
Up to 3 Tesla Scanner

Power supply
AC Powered. No battery

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## Technical Specifications

### Flow Rate
- Angio Mode: 0.1 – 40.0 ml/s
- CT Mode: 0.1 – 10.0 ml/s

### Pressure Limit
- Angio Mode: 75 – 1200 psi
- CT Mode: 75 – 300 psi

### Syringe Sizes
- 150, 200 ml - empty syringes
- 50, 75, 100, 125 ml - PFS

### Syringe Heater
- 37°C nominal.
- Minimises the loss of heat from preheated contrast

### Inject Delay
- 0 – 300 sec

### X-ray Delay
- 0 – 300 sec

### Scan Delay (CT-Mode)
- 0 – 300 sec

### Rate Rise
- 0 – 10 sec

### Phase Delay
- 0 – 300 sec

### Number of Phases
- 1, 2 or 3–4

### Protocol Memory
- Angio Modes: 45 protocols
- CT modes: 45 protocols

## Delivery System

### Pedestal
- **7261** Illumena™ - Contrast Delivery System with Rolling Pedestal
- **7261-S** Illumena™ - Contrast Delivery System with Rolling Pedestal - Siemens Interface

### Ceiling Mount
- **7272** Illumena™ - Contrast Delivery System with Ceiling Suspension and Rack Mount
- **7272-S** Illumena™ - Contrast Delivery System Fixed Ceiling Suspension - Siemens Interface

### Table Mount
- **7267** Illumena™ - Contrast Delivery System with Table Mount
- **7267-S** Illumena™ - Contrast Delivery System Fixed Table Mount Rack - Siemens Interface

### Faceplate (Optional)
- **900480** Illumena™ - Faceplate Assembly - 125 ml (PFS)
- **900491** Illumena™ - Faceplate Assembly with Air Detection System - 150 ml
- **900477** Illumena™ - Faceplate Assembly - 200 ml

### Heater Blanket (Optional)
- **900430** Illumena™ - Heater Blanket Assembly

## Disposables

### Syringe and J-straw
- **900101** Syringe with handiﬁl - quick connector 150 ml
- **900102** Syringe with handiﬁl - quick connector 150 ml with Coiled Extension Tubing - 152 cm (60”)
- **900103** Linden Luer Syringe with Handi-Fill™ Straw 150 ml
- **900104** Linden Luer Syringe with Handi-Fill™ Straw 150 ml with Coiled Extension Tubing - 152 cm (60”)
- **900105** Syringe with Handi-Fill™ Straw - 200 ml

### Extension Tubing
- **FLEX120N** High Pressure Connection Line 120 cm
- **FLEX120RAN** High Pressure Connection Line with Rotating Adaptor 120 cm
- **FLEX75RAN** High Pressure Connection Line with Rotating Adaptor 75 cm
- **HP120RAN** Flexible high pressure tube with rotating Adaptor 120 cm

### Optional interfaces available. For references please contact your local Mallinckrodt Office or Representative.