Carus Chemical Company’s Operating Philosophy-

“The mission of Carus Chemical Company is to excel in markets we participate in by providing innovative products and services to our customers which help them meet or exceed their business objectives. This will be accomplished by increasing our employees’ level of participation and influence within their respective areas, management staying on course with our vision and goals, maintaining the highest ethical, professional, and environmental standards, achieving profitable growth, and continuing support of our community.”
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</table>
Carus Chemical Company is the world’s largest manufacturer of potassium permanganate, distributed under the CAIROX®, trade name. Carus’ primary manufacturing plant and CAIROX® R&D laboratories are located in LaSalle, Illinois, USA. The Administrative Offices, Sales & Marketing, Customer Service, Technical Services, and Engineering Services are located in the Carus Corporate Headquarters building in Peru, Illinois, USA.

### Significant Carus Chemical Company Dates

<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1915-16</td>
<td>Dr. Edward H. Carus started production of potassium permanganate with makeshift equipment</td>
</tr>
<tr>
<td>1918</td>
<td>First manufacturing plant of KMnO₄ constructed in LaSalle, Illinois, USA using roasting (open-shelf furnaces) and disproportionation (with carbon dioxide)</td>
</tr>
<tr>
<td>1920-23</td>
<td>New process developed using the then, advanced rotary kiln-type roasters and electrolytic cells</td>
</tr>
<tr>
<td>1924</td>
<td>World’s first bipolar electrolytic permanganate cell, developed and used by Carus Chemical Company (Karl Kleimenhagen)</td>
</tr>
<tr>
<td>1932-36</td>
<td>Process developed and plant constructed for manufacture of hydroquinone/manganese sulfate</td>
</tr>
<tr>
<td>1940</td>
<td>Plant expanded to provide critical war needs of nylon production, as well as sodium permanganate, and calcium permanganate used to propel torpedoes</td>
</tr>
<tr>
<td>1944-45</td>
<td>Patented process for rare permanganates was developed</td>
</tr>
<tr>
<td>1953-57</td>
<td>Patented continuous cell/crystallizer system for K₃MnO₄ was pioneered and introduced into industrial practice, establishing a new state of the art in permanganate manufacturing technology</td>
</tr>
<tr>
<td>1955-58</td>
<td>World’s first continuous liquid-phase oxidizer system for the manganate step (patented) developed, pilot planted, and adopted for large-scale use</td>
</tr>
<tr>
<td>1961</td>
<td>First use of pure oxygen in conjunction with liquid-phase oxidation (major technological breakthrough)</td>
</tr>
<tr>
<td>1962</td>
<td>Free-flowing grade of K₃MnO₄ developed</td>
</tr>
<tr>
<td>1963</td>
<td>Bulk shipment of Carus’ K₃MnO₄ began</td>
</tr>
<tr>
<td>1964</td>
<td>Carus becomes the largest permanganate producer in the world. Also, CAIROX® trademark is registered for Carus’ potassium permanganate</td>
</tr>
<tr>
<td>1976</td>
<td>Production level of K₃MnO₄ raised to 12,000 tons/year to meet requirements for new uses</td>
</tr>
<tr>
<td>1980</td>
<td>Completed major expansion of CAIROX® plant capacity</td>
</tr>
<tr>
<td>1985</td>
<td>Major expansions of CARULITE® catalyst production; LIQUOX™ sodium permanganate was launched as an industrial chemical</td>
</tr>
<tr>
<td>1987</td>
<td>Chemical Manufacturers Association’s Lammont du Pont Safety Award was received for best industry five-year safety record</td>
</tr>
<tr>
<td>1997-98</td>
<td>Carus Chemical Company acquires TPC and Kjell Corporations specializing in corrosion inhibition in drinking water systems</td>
</tr>
<tr>
<td>1998</td>
<td>Patented process to produce lithium manganese dioxide spinels as rechargeable battery cathode material</td>
</tr>
</tbody>
</table>

As a major technical leader in potassium permanganate chemistry, Carus Chemical Company has provided CAIROX® feed and delivery systems to very diverse markets and applications. Carus Feed Systems range in dosage rates from grams per minute to tons per day.

Based on over 80 years experience, Carus Chemical Company has the expertise, to properly design and manufacture systems to safely and reliably prepare, store, and meter CAIROX® potassium permanganate as a solution and as a dry chemical. Carus Chemical’s staff of Sales Managers, Application Engineers, and System Engineers are available to provide support to the facility and design engineers who require CAIROX® potassium permanganate as a solution to their chemical treatment system. Carus also has a qualified staff of permanganate chemists and scientists to provide technical support for your application.
CAIROX® potassium permanganate

CAIROX® is the most widely used potassium permanganate in North America. CAIROX® has gained its acceptance and reputation by being the highest quality potassium permanganate produced. Not only does CAIROX® have a high assay for potassium permanganate, it is the most consistent product available, with the least amount of fine particles (i.e. less dustiness). Continual Quality Improvement programs at Carus Chemical Company guarantee that the quality and consistency of CAIROX® tomorrow will be even better than they are today.

There are many applications for CAIROX® ranging from treatment of drinking water to sludge dewatering and odor control in wastewater plants. Additional applications include the destruction of contaminant in effluent water systems, metals surface treatment, remediation of hazardous contaminants, and industrial waste treatment.

Below are some guidelines to use when evaluating CAURSMATIC™ Engineered Feed Systems. The first criteria that will enter into the selection of a system may be the quantity of drinking water or sludge that needs to be treated with CAIROX®. Contact a Carus Chemical Company representative for industrial applications, guidelines, and other technical assistance.

<table>
<thead>
<tr>
<th>Shipping Container</th>
<th>CAIROX® lb</th>
<th>3% Solution gal</th>
<th>Gallons (x10⁶) Water Treated @ 1 mg/L CAIROX®</th>
<th>CAIROX® kg</th>
<th>3% Solution L</th>
<th>Gallons (x10⁶) Water Treated @ 1 mg/L CAIROX®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Delivery</td>
<td>44,000</td>
<td>176,000</td>
<td>5,280</td>
<td>20,000</td>
<td>666,200</td>
<td>666,200</td>
</tr>
<tr>
<td>Cycle-Bin™</td>
<td>3,300</td>
<td>13,200</td>
<td>396</td>
<td>1,500</td>
<td>50,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Drum</td>
<td>330</td>
<td>1,320</td>
<td>39.6</td>
<td>150</td>
<td>5,000</td>
<td>12.5</td>
</tr>
<tr>
<td>Pail</td>
<td>55</td>
<td>220</td>
<td>6.6</td>
<td>25</td>
<td>833</td>
<td>.208</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shipping Container</th>
<th>CAIROX® lb</th>
<th>3% Solution gal</th>
<th>Gallons (x10⁶) Water Treated @ 1 mg/L CAIROX®</th>
<th>CAIROX® kg</th>
<th>3% Solution L</th>
<th>Gallons (x10⁶) Water Treated @ 1 mg/L CAIROX®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Delivery</td>
<td>44,000</td>
<td>176,000</td>
<td>44</td>
<td>20,000</td>
<td>666,200</td>
<td>666,200</td>
</tr>
<tr>
<td>Cycle-Bin™</td>
<td>3,300</td>
<td>13,200</td>
<td>3.3</td>
<td>1,500</td>
<td>50,000</td>
<td>1,390</td>
</tr>
<tr>
<td>Drum</td>
<td>330</td>
<td>1,320</td>
<td>0.33</td>
<td>150</td>
<td>5,000</td>
<td>1.25</td>
</tr>
<tr>
<td>Pail</td>
<td>55</td>
<td>220</td>
<td>.055</td>
<td>25</td>
<td>833</td>
<td>.208</td>
</tr>
</tbody>
</table>

The following sections of the guide will lead you through your equipment selection process for your CAIROX® potassium permanganate site requirements.
A system is selected starting with the appropriate CAIROX® package that will be delivered to the facility. Then select the options to make the CAIROX® solution and how that solution will be pumped to the appropriate application point. The CARUSMATIC™ Engineered Feed Systems selection guide is shown below.
Selection and Sizing of CARUSMATIC™ Systems

The graph below shows the cycle-time for complete use of each CAIROX® package option. Also shown are the cycle-times for several mix and storage tank options for a 3% CAIROX® solution. The cycle-times are shown as a function of dry CAIROX® dosing, or as a 3% CAIROX® solution.

The use of bulk delivery and silo storage is generally recommended for customers who will be feeding CAIROX® at 150 lbs or more per hour. Cycle-Bins™ are an effective alternative for applications that require up to 150 lbs of CAIROX® per hour. Drum and Pail usage is recommended for facilities that are making CAIROX® solutions manually.
The CARUSCoach™ Chemical Solution Control System is a state-of-the-art-technology system. It prepares chemical solutions to distribute them to any variety of application points in both municipal and industrial facilities. The CARUSCoach™ Chemical Solution Control System features “touch screen” technology which is integrated with Programmable Logic Controllers. This provides an intuitive interface in the automatic control of the CAIROX® solution preparation and distribution by the CARUSMATIC™ Engineered Feed System.

### Features/Benefits

The CARUSCoach™ program provides an intuitive interface for the operator to monitor and maintain the solution system.

- Similar to a local distributed control system at an affordable price
- Saves time and costs for operator training
- Frees operator’s time to monitor and maintain less automated processes

Can be configured to prepare solutions of any dry or liquid chemicals

- Flexible design allows changes in preparation and application strategies as warranted

Automatic audible and visual alarms for operator attention

- Minimizes operator time requirement to monitor system

Automatically cycles system through production sequence

- No operator required if the CAIROX® Cycle-Bin™ or silo system is used for solution makeup
- Saves 75% of the operator’s time normally needed for solution makeup from open top shipping containers

Automatic built-in safety and preventive maintenance features

- Maximizes service life of pumps and other components

### CARUSCoach™ CHEMICAL SOLUTION CONTROL SYSTEM

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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</thead>
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<td>TANKS</td>
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<tr>
<td>SOLUTION DOSSING CONTROL</td>
<td></td>
</tr>
<tr>
<td>BATCHING CONTROL</td>
<td></td>
</tr>
<tr>
<td>CALIBRATE PUMPS</td>
<td></td>
</tr>
</tbody>
</table>

### SOLUTION DOSING CONTROL

<table>
<thead>
<tr>
<th>CARUSCoach™</th>
<th>DESIRED DOSING CONCENTRN (mg/L)</th>
<th>METERING PUMP SETPOINT (gal/hr)</th>
<th>METERING PUMP IN AUTO</th>
<th>METERING PUMP STROKE SETTING, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.0</td>
<td>5.8</td>
<td>ON</td>
<td>50</td>
</tr>
<tr>
<td>DOSING PUMP OK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRESSURE SWITCH ENABLED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUMP SPEED IN MANUAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MANUAL METERING PUMP SPEED (gal/hr)</td>
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</table>

### BATCHING TANKS CONTROL

<table>
<thead>
<tr>
<th>CARUSCoach™</th>
<th>TANK 1</th>
<th>TANK 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVICE</td>
<td>1600</td>
<td>1200</td>
</tr>
<tr>
<td>STANDBY</td>
<td>1200</td>
<td>800</td>
</tr>
<tr>
<td>TANK 1</td>
<td>900</td>
<td>1320</td>
</tr>
<tr>
<td>TANK 2</td>
<td>1600</td>
<td>800</td>
</tr>
<tr>
<td>PRESS TO HALT BATCHING</td>
<td></td>
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</table>

Typical Screens for the Touch-screen Panel Display

CARUSCoach™ Chemical Solution Control System
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<tr>
<th>CARUSCoach™ Scope</th>
<th>Key Features</th>
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<tbody>
<tr>
<td>System Control</td>
<td>- Enable Overall System Control</td>
</tr>
<tr>
<td></td>
<td>- Disable Overall System Control</td>
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<table>
<thead>
<tr>
<th>System Indicators</th>
<th>Key Features</th>
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<tr>
<td></td>
<td>- Booster Pump Ready/In Use/Alarm Condition</td>
</tr>
<tr>
<td></td>
<td>- Mix Tank Batching/In Use/In Standby to Batch/Alarm Condition</td>
</tr>
<tr>
<td></td>
<td>- Mix Tank Level (height or volume/gallons or liters)</td>
</tr>
<tr>
<td></td>
<td>- Reserve Tank Ready/In Use/Alarm Condition</td>
</tr>
<tr>
<td></td>
<td>- Metering Pump 1 Ready/In Use/Alarm Condition</td>
</tr>
<tr>
<td></td>
<td>- Metering Pump 2 Ready/In Use/Alarm Condition</td>
</tr>
<tr>
<td></td>
<td>- Metering Pump 1 Hours of Operation and Time to Maintenance</td>
</tr>
<tr>
<td></td>
<td>- Metering Pump 2 Hours of Operation and Time to Maintenance</td>
</tr>
<tr>
<td></td>
<td>- Current Dosage Rate (gpm or l/min), or (lb/hr or kg/hr) of CAIROX®</td>
</tr>
<tr>
<td></td>
<td>- Daily Dosage Totals (gallons, pounds or liters, kilograms)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Automatic and Manual Controls</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Makeup Water Valve</td>
</tr>
<tr>
<td></td>
<td>- Mix Tank Agitator(s)</td>
</tr>
<tr>
<td></td>
<td>- Mix Tank Outlet Valve(s)</td>
</tr>
<tr>
<td></td>
<td>- Booster Pump(s)</td>
</tr>
<tr>
<td></td>
<td>- Metering Pump(s)</td>
</tr>
<tr>
<td></td>
<td>- Reserve Tank Outlet Valve</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Alarms</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Audible Signal for Alarms and Faults</td>
</tr>
<tr>
<td></td>
<td>- Shut-down Due to Eductor Low Pressure</td>
</tr>
<tr>
<td></td>
<td>- Shut-down Due to Eductor Over Pressure</td>
</tr>
<tr>
<td></td>
<td>- Mix Tank Low Level</td>
</tr>
<tr>
<td></td>
<td>- Mix Tank High High Level</td>
</tr>
<tr>
<td></td>
<td>- Metering Pump Failure</td>
</tr>
<tr>
<td></td>
<td>- Slow Transfer Fault out of Cycle-Bin™</td>
</tr>
<tr>
<td></td>
<td>- Slow Transfer Fault out of Silo</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault Indicators and Messages</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Eductor Alarm Fault</td>
</tr>
<tr>
<td></td>
<td>- Lead Metering Pump Failure/Standby Pump Operating</td>
</tr>
<tr>
<td></td>
<td>- Time to Re-Batch Solution</td>
</tr>
<tr>
<td></td>
<td>- Time to Change Cycle-Bin™</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm Indicators and Messages</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Booster Pump Performance Decay</td>
</tr>
<tr>
<td></td>
<td>- Metering Pump(s) Time to Maintenance Warning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maintenance Reminders</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Metering Pump(s) Duty Cycle (Select Equal Run Time or Manual Select/Alarm Condition Changeover Only)</td>
</tr>
<tr>
<td></td>
<td>- Motorized Valve Watchdog for Slow Operation</td>
</tr>
<tr>
<td></td>
<td>- Booster Pump Watchdog for Performance Drop</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operational Selections</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Note: Not all features are on every system</td>
</tr>
</tbody>
</table>
Carus Bulk Silo Storage

Carus Chemical Company recommends silos for bulk receipt and storage of CAIROX® potassium permanganate. A silo typically has CAIROX® storage capacities of 66,000 lb (30,000 kg) or greater, which allows receipt of 44,000 lb (20,000 kg) by bulk carrier while maintaining a reserve stock. The silo, in conjunction with a Carus Auto-Batch Control System, will provide the best overall system to reliably make and apply potassium permanganate solutions.

Features/Benefits

- Holds over 60,000 lb (27,000 kg) of Free-Flowing grade CAIROX® for automated use
- Operator does not have to handle the potassium permanganate
- Most economical method to purchase and handle CAIROX®
- Eliminates disposal costs and problems with KMnO₄ containers
- Eliminates nuisance dust for operators
- Loaded from dedicated Carus Chemical Company bulk hopper trucks
- Eliminates problems associated with product contamination
- Inventory of CAIROX® in silo can be automatically monitored
- Allows for easy determination of CAIROX® inventory and usage rates

Designed to rigid Carus Chemical Company's production plant experience

- Ensures trouble-free operation with only routine maintenance

Provided with air drier, vent bag house, CAIROX® product level indicators, and other auxiliary equipment

Gives one point responsibility in the selection and specification of all critical components
Carus Chemical Company’s Cycle-Bin™ is a returnable bulk container for CAIROX® potassium permanganate. The Cycle-Bin™ is delivered to the customer with 3300 lb (1500 kg) of CAIROX®, net weight. The Cycle-Bin™ system is specifically designed to meet stringent United States DOT Specification 56.

Features/Benefits

- Holds 3300 lb – 10 times the amount of CAIROX® in a drum
- Reduces operator time and effort to recharge makeup system versus open top shipping containers
- Self-sealing dust tight connection between Cycle-Bin™ and Carus Cycle-Bin™ Stand
- Dust free operation
- Load cells can determine weight of CAIROX® in Cycle-Bin™
- Facilitates accurate makeup batching and proper utilization of CAIROX®
- Allows for easy determination of CAIROX® inventory and usage
- Cycle-Bin™ is a reusable container for CAIROX®
- Eliminates disposal costs and problems with painted containers
- Welded watertight carbon steel construction with painted exterior
- Eliminated damage and spills
- Has both fork-truck lifting guides and overhead crane lifting eyes
- Safe and efficient movement of Cycle-Bin™ containers from trailer truck delivery and within the site

Note: Cycle-Bin™ gross weight: approx. 4100 lb (1850 kg)
CAIROX® Package Options

Carus 330lb (150 kg) Drum

Carus Chemical Company offers its 330 lb (150 kg) drum for users whose requirements do not warrant receipt of CAIROX® potassium permanganate in bulk or in a Carus Cycle-Bin™. When used in conjunction with the Carus Eductor Pump and Eductor System (EPES), drums can be emptied and rinsed to comply with current environmental regulations.

Features/Benefits

<table>
<thead>
<tr>
<th>Holds 330 lb (150 kg) of CAIROX®</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Makes 1320 gallons (5000 liters) of 3% CAIROX® solution</td>
</tr>
</tbody>
</table>

Drums are heavy gauge steel, painted

• Prevents damage and spills, during handling and storage

Designed for use with the Carus Eductor Pump & Eductor System (EPES)

• Allows operator to empty drum without touching KMnO₄

Carus 55lb (25 kg) Pail

Carus Chemical Company offers CAIROX® in plastic pails which are ideal for users who have small requirements for potassium permanganate, or who need to have operators hand-feed the dry chemical to solution makeup systems. The plastic pails contain 55lb (25 kg) of CAIROX® potassium permanganate.

Features/Benefits

<table>
<thead>
<tr>
<th>Contains 55lb (25 kg) of CAIROX® in easy to handle pails</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Makes 220 gallons (830 liters) of 3% CAIROX® solution</td>
</tr>
</tbody>
</table>

Plastic pail designed with screw-on-lid

• Easy to open, easy to empty, easy to clean

• Removable labels for disposal
The CARUSMATIC™ Engineered Feed Systems are available with integrated material handling systems, that will allow the user to safely meter CAIROX® potassium permanganate either by volume or by weight from the storage containers.

**CAIROX® Silo Feed System with Screw Conveyor, Transfer Hopper, Scale, and Transmitter**

The CAIROX® Silo Feed System with Screw Conveyor, Transfer Hopper, Scale, and Transmitter is the most practical method for large users of CAIROX® to handle and monitor their usage. This Silo Feed System can be integrated with CAIROX® Solution Tanks and a CAIROX® Chemical Solution Pump System so that the overall system automatically makes the CAIROX® solution and applies it where it is needed in the facility.

### Features/Benefits

**Automatic inventory monitoring system within silo**
- Gives CAIROX® potassium permanganate usage rates and inventory
- Used to signal re-order point so that system always has adequate CAIROX® inventory

**CAIROX® metering through the Screw Conveyor with Transfer Hopper**
- Safe, dust-free transfer of CAIROX® to make potassium permanganate solutions
- Instrumented to verify proper transfer of CAIROX® from the silo, and into and out of the Transfer Hopper

**Speed controlled stainless steel Screw Conveyor**
- Accurately meters batch weight into gravimetric Transfer Hopper which assures correct solution concentration
- Corrosive resistant construction ensures long service life and low maintenance

**Stainless steel Transfer Hopper with Scale and Transmitter**
- Scale accurately monitors weight of CAIROX® transferred into and out of Transfer Hopper
CAIROX® Material Handling System

CAIROX® Silo Feed System with Screw Conveyor

The Carus Silo Feed System with Screw Conveyor is a practical method for large users of CAIROX® to handle and monitor their usage of potassium permanganate. This system is commonly integrated with a Mechanical Helix Feeder and Loss-In-Weight Scale & Controller. This integrated system can accurately deliver CAIROX® at rates up to 300 lb/hr (136 kg/hr). In this configuration, CAIROX® potassium permanganate is not batched but accurately metered by the Mechanical Helix Feeder and Loss-In-Weight Scale & Controller.

### Features/Benefits

**Automatic inventory monitoring system within silo**

- Gives CAIROX® potassium permanganate usage rates and inventory
- Used to signal re-order point so that system always has adequate CAIROX® inventory

**CAIROX® metering through the stainless steel Screw Conveyor**

- Safe, dust-free transfer of CAIROX® to Helix Feeder to make potassium permanganate solutions
- Controlled by instrumentation to maintain proper transfer of CAIROX® from the silo
- Corrosive resistant construction ensures long service life and low maintenance

**Matches to a selection of Helix Feeders and downstream Dissolving Tanks and Pumps**

- Gives a wide range of application rates
- Helix Feeders can be duplexed to allow for both normal and peak dosage conditions or dosing to two application points
- Helix Feeders can also be duplexed to provide standby capacity
CAIROX® Cycle-Bin™ Stand with Load Cells, Screw Conveyor & Transfer Hopper

The Carus Cycle-Bin™ Stand with Load Cells, Screw Conveyor and Transfer Hopper gives high volume users of CAIROX® the capability to automate the batching of potassium permanganate with a minimum of operational effort. Coupled with the Carus Eductor Pump and Eductor System (EPES) and one of the CAIROX® Solution Pump Systems, the CAIROX® solution can be applied at the appropriate rate to any number of application points.

Features/Benefits

Entire Cycle-Bin™ on load cells

• Allows for the direct monitoring of the CAIROX® potassium permanganate in the Cycle-Bin™ at any time

Weight measurement with load cells

• Provides data used to accurately calculate usage rates and inventory, at any time

CAIROX® metering through screw conveyor and transfer hopper

• Safe, dust-free transfer of CAIROX® to make potassium permanganate solutions
• Instrumented to verify proper transfer of CAIROX® from the Cycle-Bin™, and into and out of the Transfer Hopper

Speed controlled stainless steel screw conveyor

• Accurately meters batch weight into Transfer Hopper and assures correct solution concentration
• Corrosive resistant construction ensures long service life and low maintenance

Also available in a Dual Cycle-Bin™ configuration
CAIROX® Cycle-Bin™ Stand with Screw Conveyor

The Carus Cycle-Bin™ Stand with Screw Conveyor can be used with the Carus Mechanical Helix Feeder with Loss-In-Weight Scale and Controller System to accurately meter CAIROX®. This is ideal for customers who want long service cycles without constant operator attention.

Features/Benefits

CAIROX® metering through the stainless steel Screw Conveyor

- Safe, dust-free transfer of CAIROX® to Helix Feeder to make potassium permanganate solutions
- Controlled by instrumentation to maintain proper transfer of CAIROX® from the Cycle-Bin™ into the Helix Feeder
- Corrosive resistant construction ensures long service life and low maintenance

Matches to a selection of Helix Feeders and downstream Dissolving Tanks and Pumps

- Gives a wide range of application rates
- Helical Feeders can be duplexed to allow for both normal and peak dosage conditions or dosing to two application points

Spring-loaded adapter provides an automatic seal between the Cycle-Bin™ and the stainless steel Screw Conveyor

- Ensures a secure matching connection that is reliable, dust-free, and safe
The Carus Dual Cycle-Bin™ Stand is designed for use with the Screw Conveyor and Transfer Hopper on a Load Cell that can be used to feed an Eductor Pump and Eductor System to automatically make 3% solutions. This is ideal for customers who want long application times without requiring operator attention.

### Features/Benefits

**Allows continuous batching of 6600 lb (3000 kg) CAIROX® without operator intervention**

- Makes over 26,400 gallons (100,300 liters) of 3% CAIROX® potassium permanganate solution
- Can be used to extend service cycle so that weekend change-outs can be avoided

Spring-loaded adapter provides an automatic seal between the Cycle-Bin™ and the stainless steel Screw Conveyor

- Ensures a secure matching connection that is reliable dust-free, and safe
- Facilitates quick Cycle-Bin™ change-outs

**Stainless steel Transfer Hopper with Scale**

- Scale accurately monitors weight of CAIROX® transferred into and out of Transfer Hopper

**CAIROX® metering through the Screw Conveyor with Transfer Hopper**

- Safe, dust-free transfer of CAIROX® to make potassium permanganate solutions
- Instrumented to verify proper transfer of CAIROX® from the Cycle-Bin™ assuring correct solution concentration

**Stainless steel Screw Conveyor**

- Corrosive resistant construction ensures long service life and low maintenance

Also available in a Single Cycle-Bin™ configuration
CAIROX® Material Handling System

CAIROX® Drums and Pails – Carus Eductor Pump & Eductor System

The operator can unload a 55 lb (25 kg) pail or a 330 lb (150 kg) drum of CAIROX® potassium permanganate with a vacuum wand that can be inserted into the open drum with the Carus Eductor Pump & Eductor System (EPES). The system is capable of transferring the contents of a 330 lb (150 kg) drum in less than 20 minutes. The system will vacuum both the dry CAIROX® and the final rinsate, to prepare the drum for disposal.

Features/Benefits

Sized to transfer 1320 lb/hr (600 kg/hr) of CAIROX® through eductor

- Allows for solution make-up to preset concentrations

Operator does not contact potassium permanganate

- Limits exposure of personnel to potassium permanganate dust

Available in duplex arrangement

- Redundancy assures system availability

CAIROX® Drums – Carus Drum Inverter

The Carus Drum Inverter will lift and rotate the 330lb (150 kg) drum so that it can be used as a large feed container for the Carus Helix Feeder. The Drum Inverter is battery operated with a built-in charger. The system can be packaged with a Carus Helix Feeder for almost any application.

Features/Benefits

Lifts and inverts full CAIROX® drums

- Allows operator to feed dry potassium permanganate directly from drums

Dust-tight connector between drum and Helix Feeder

- Minimizes potassium permanganate dust

Feed hopper level switch standard

- Alerts operator to change drum
Carus Chemical Company offers two basic systems to safely dissolve CAIROX® potassium permanganate in water. These systems have become the standards for making solutions of potassium permanganate.

**Carus EPES (Eductor Pump & Eductor System)**

The Carus Eductor Pump & Eductor System (EPES) has been proven to be the most reliable way to make permanganate solutions. Using the negative pressure principle created by water flowing through an eductor, the dry potassium permanganate is literally vacuumed out of the transfer hopper, drum or pail. By matching the water pump and eductor characteristics, long term reliable operation is assured.

<table>
<thead>
<tr>
<th>Features/Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comes as a complete system</td>
</tr>
<tr>
<td>• Assures proper operation with matched and proven components</td>
</tr>
<tr>
<td>System is skid-mounted as a component part of CARUSMATIC™ Feed System</td>
</tr>
<tr>
<td>• Quickly installed with anchor bolts and service hookups</td>
</tr>
<tr>
<td>Transfer rate of 1320 lb/hr (600 kg/hr)</td>
</tr>
<tr>
<td>• Operator can empty a 330 lb (150 kg) drum in less than 20 minutes</td>
</tr>
<tr>
<td>Can be operated to automatically educt CAIROX® from Silo and Cycle-Bin™ Feed Systems, or operated to manually educt from Drums and Pails.</td>
</tr>
<tr>
<td>• Allows for the use of drums or pails of CAIROX® during scheduled service or downtime of Silo or Cycle-Bin™ batching system</td>
</tr>
</tbody>
</table>
CAIROX® Solution Make-Up Systems

Carus Helix Feeder

The Carus Helix Feeder is the industry standard for metering dry CAIROX® potassium permanganate into applications where only approximate concentrations of CAIROX® are needed. Subsequent Dissolving Tanks with level controller provide initial dissolution of potassium permanganate and pumps distribute the solution to the application points. The Carus Helix Feeder will also feed the Carus vortex eductor, where the solution is directly transferred to the application point.

Features/Benefits

Comes as a complete package system with matched components to transfer potassium permanganate

- Assures proper operation of Helix Feeder with controls
- Transfer rates up to about 350 lb/hr (160 kg/hr)
- Cost effective system for all sizes of applications

All materials of construction compatible with CAIROX®

- NO combustion hazards due to incompatible materials

Stainless steel construction of housing and helix feed screw

- Corrosion free construction for extended service life
- Special coating on helix and spout
- Prevents feed failures due to fouled helix

Built-in hopper vibrator

- Prevents CAIROX® from bridging
- Minimizes inaccuracies in feeding

Optional Loss-In-Weight Scale and Controller

- Increases feed rate accuracy
- Calculates accurate usage rates and inventories
<table>
<thead>
<tr>
<th>Component Material of Construction</th>
<th>Component</th>
<th>Material of Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component</td>
<td>For PVC Piping</td>
<td>For Stainless Steel Piping</td>
</tr>
<tr>
<td>Centrifugal Booster Pump</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Centrifugal Dosing Pump</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Metering Pump (Hydroflo®)</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Metering Pump (Pulsafeeder®)</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Pulsation Dampener (Body)</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Back Pressure Valve (Body)</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Pressure Relief Valve (Body)</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Pressure Regulating Valve (Body)</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Tank Agitator (Shaft and Impeller)</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Calibration Column (Shaft)</td>
<td>PVC</td>
<td>PVC</td>
</tr>
<tr>
<td>Piping</td>
<td>PVC</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Manual Valves</td>
<td>PVC</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Automatic Valves</td>
<td>PVC</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Eductors</td>
<td>PVC</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Skid</td>
<td>Painted Hot Rolled Steel</td>
<td>Painted Hot Rolled Steel</td>
</tr>
</tbody>
</table>

Note: Not all components listed above included with every system.

PVC piping utilizes both glued and threaded connections. Stainless steel and black iron pipe connections are threaded. Black iron pipes are painted. Paints for the skid and the black iron pipes utilize a two-part epoxy coating system that provides superior corrosion resistance.
CAIROX® Mix and Storage Tanks

The Carus Chemical Solution Application Systems are normally designed with two agitated storage tanks to keep the solution well mixed prior to use. The duplex tank arrangement allows for the solution to be made in one tank while the prepared solution is being distributed to the application points from the second tank.

The tanks are available in either fiberglass-reinforced plastic (FRP) or high-density polyethylene (HDPE). The tank agitators are heavy-duty gear-reduced mixers with totally enclosed, fan cooled (TEFC) motors. Each tank is equipped with an ultrasonic level indicator system to detect the solution level at all times.

Examples of standard tanks for the Carus Chemical Solution Application Systems, other tank sizes can be provided upon request.

<table>
<thead>
<tr>
<th>Mix and Storage Tank</th>
<th>Model 1600</th>
<th>Model 550</th>
<th>Model 300</th>
<th>Model 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank volume</td>
<td>1600 gal (6000 l)</td>
<td>550 gal (2081 l)</td>
<td>300 gal (1140 l)</td>
<td>100 gal (375 l)</td>
</tr>
<tr>
<td>Working volume</td>
<td>1320 gal (4950 l)</td>
<td>440 gal (1672 l)</td>
<td>220 gal (836 l)</td>
<td>~80 gal (300 l)</td>
</tr>
<tr>
<td>CAIROX® to make work volume as 3% solution</td>
<td>330 lb (150 kg) (one drum)</td>
<td>220 lb (100 kg) (four pails)</td>
<td>55 lb (25 kg) (one pail)</td>
<td>Use as Day Tank</td>
</tr>
<tr>
<td>Nominal diameter height</td>
<td>86 in / 72 in (218 cm / 183 cm)</td>
<td>64 in / 46 in (163 cm / 117 cm)</td>
<td>33 in / 92 in (86 cm / 234 cm)</td>
<td>33 in / 37 in (84 cm / 94 cm)</td>
</tr>
</tbody>
</table>

Note: Without an agitator, the 300 gallons (1140 liters) tank and the 100 gallons (380 liters) tank are used as a “reserve tank” or “day tank”. This tank is filled from the larger mix/storage tank immediately after batching and then automatically valved off. Solution is normally fed from the mix and storage tank. When the mix/storage tank goes empty and while a new batch is being prepared, solution is fed from the reserve tank.
CAIROX® Dissolving Tanks

The CAIROX® Dissolving Tanks are used in conjunction with the Carus Helix Feeder. Dissolving Tanks differ from batching tanks in that water is continuously added along with CAIROX®, and the resulting CAIROX® potassium permanganate solution is pumped out of the tank to the application point. CAIROX® is metered into the tank using a Carus Helix Feeder. Metering is accomplished by varying the helix speed to vary the solution concentration to the application point, not the flow. Each tank has an integral agitator to assist in the dissolution of CAIROX® potassium permanganate. Note: Each Helix Feeder and Dissolving Tank can only be used for a single application point.

<table>
<thead>
<tr>
<th>Dissolving Tanks</th>
<th>Model 150</th>
<th>Model 50</th>
<th>Model 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank volume</td>
<td>150 gal (560 l)</td>
<td>50 gal (187 l)</td>
<td>15 gal (56 l)</td>
</tr>
<tr>
<td>Maximum CAIROX® Dosage/Hour</td>
<td>240 lb (109 kg)</td>
<td>100 lb (45 kg)</td>
<td>40 lb (18 kg)</td>
</tr>
<tr>
<td>Water Flow (Maximum)</td>
<td>48 gpm (182 l/min)</td>
<td>20 gpm (76 l/min)</td>
<td>8gpm (30 l/min)</td>
</tr>
<tr>
<td>Material of Construction</td>
<td>316SS</td>
<td>HDPE w/ 316SS Support Frame</td>
<td>HDPE</td>
</tr>
</tbody>
</table>

CAIROX® Jet Pump Eductor

The CAIROX® Jet Pump Eductor can be used to transfer CAIROX® solution from a Dissolving Tank without having to directly pump the solution.

Features/Benefits

- Uses eductor and water pressure as motive force to transfer CAIROX® from a Dissolving Tank
  - Booster Pump (if used) only exposed to water service
  - Eliminates maintenance service on solution pumps

Can transfer up to ½ lb CAIROX® per gallon of water (10 g/liter).

- With the 10 gallons (38 liters) wash-down eductor, up to 600 lb/hr (275 kg/hr) CAIROX® can be transferred to an application point

Flow Schematic of Jet Pump Eductor with Dissolving Tank
The CAIROX® Solution Pumps have been chosen because of their compatibility with potassium permanganate and long cycle times between services. The materials of construction have been especially chosen based on actual experience by Carus Chemical Company. It is important that the proper materials be chosen in order to eliminate any possibility of failure.

**Metering Pump System**

<table>
<thead>
<tr>
<th>Features/Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precise CAIROX® solution flow control of 0.25 gph (1.0 l/hr) and above to a single point per pump</td>
</tr>
<tr>
<td>• Reliably applies the required quantities of solution to the application points</td>
</tr>
<tr>
<td>Designed for high pressure output</td>
</tr>
<tr>
<td>• Assures adequate solution flows into pressurized piping systems</td>
</tr>
<tr>
<td>System comes with matched pressure regulator, pulsation dampener and relief valve</td>
</tr>
<tr>
<td>• Provides for specified system and safety performance</td>
</tr>
<tr>
<td>Materials of construction selected after many years of experience in both production and application of potassium permanganate</td>
</tr>
<tr>
<td>• Long service life with routine preventive maintenance</td>
</tr>
<tr>
<td>• All pumps provided with one maintenance kit</td>
</tr>
<tr>
<td>Flow control can be electronically adjusted and controlled with the CARUSCoach™ control system</td>
</tr>
<tr>
<td>• Operator can make all adjustments to flows directly at control panel or via remote signal saving time by avoiding readjustments</td>
</tr>
<tr>
<td>Shown in a duplex installation</td>
</tr>
<tr>
<td>• Redundancy allows for uninterrupted service while one pump is out of service for preventive maintenance or repair</td>
</tr>
</tbody>
</table>

**Performance Characteristics of Metering Pumps**

- Hydraulically actuated diaphragm
- Sized for no more than 125 strokes per minute for long life of gear train
- Output variable to 100% via remote signal
- All wetted parts are corrosion and wear resistant to potassium permanganate
- Check valves with O-ring type compression seats for ease of maintenance
Centrifugal Pump System

Features/Benefits

Provides variable volumes of CAIROX® solution flow at required high pressures to multiple dosing points with the use of flow meter assembly or assemblies

- Applies the required quantities of solution to multiple application points
- Ideal for multiple application points where manual flow control is acceptable

Multi-stage design for high pressure output

- Assures adequate solution flow into pressurized piping systems

Materials of construction developed after many years of experience

- Long service life with routine preventive maintenance
- Replaceable impeller assembly can be changed with removal of four bolts
- Each pump provided with a maintenance kit

Typical Performance Curve, English Units

Typical Performance Curve, Metric Units
CARUSConfigurator™

Request for Quotation

Send to: Carus Chemical Company, Fax Number 1-815-224-6663, USA

From: Name ____________________________ Title ____________________________ Date ____________________________

Project Name (for tracking purposes) ____________________________ Quote Needed by ____________________________

Company ____________________________ Address ____________________________________________________________

City ____________________________ State __________ Zip __________ Country __________

Telephone ____________________________ Fax ____________________________ E-Mail ____________________________

Application Type: ___ Drinking Water ___ Wastewater ___ Industrial ___ Other ____________________________

Anticipated Dosage Rate of CAIROX® potassium permanganate per Day __________ Kg/Lbs

Number of Application Points __________

For Immediate Service: Call Carus Chemical Company
Engineered Systems Group, Phone 1-800-435-6856 or 1-815-223-1500
Hours 0800 - 1700 Central Standard Time, USA

Please review the CARUSMATIC™ Product Code Key below, and then make your selection from the appropriate subsystems on the following pages.

CARUSMATIC™ Product Key

Enter Selections in the Following Product Key, and Submit for Quotation

CARUSMATIC™ Product Code: 2 - - - - - - -

Special Notes:
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

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CARUSMATIC® Subsystems — Selections and Options

Page 2 of 4

CARUSMATIC® Subsystems — Selections and Options
Special Note: Required Motor Starters (MS) and Variable Speed Controls (VSC) are shown within the Subsystem Selections, as [MS, VSC]. This information is used in pricing the CARUSMATIC® System.

2 ☐ = CAIROX® Packaging Options
A = Silo System, 1000 ft³, Carbon Steel, Painted Exterior (~80,000 lb Working Capacity, ~2 Bulk Shipments)
B = Silo System, 1200 ft³, Carbon Steel, Painted Exterior (~96,000 lb Working Capacity, ~2+ Bulk Shipments)
C = Silo System, 1400 ft³, Carbon Steel, Painted Exterior (~112,000 lb Working Capacity, ~2½ Bulk Shipments)
M = Manual Handling & Loading by Operator
1 = Cycle-Bin™ System
2 = Dual Cycle-Bin™ System
3 = Wand Eductor System
9 = Drum Inverter System: Must Select “9” in ☐☐= CAIROX Unloading, Dry Chemical Measurement, and Solution Makeup Systems
Z = Non-Standard Handling & Loading>>Send List of Special Requirements<<

2 ☐ = CAIROX® Material Handling Systems and Solution Make-Up Systems
Note: Silo Systems (Select Only G, H, J, K, L, N, P, Q)
Note: Cycle-Bin™ System, 2☐ = 1 then Select Only A thru S, excluding M
Note: Dual Cycle-Bin™, 2☐ = 2 then Select Only A thru P
Note: Drum and Pail Semi-Automatic Systems (Select Only 2 thru 9)
Non-Mechanical Eductor Solution Makeup - Note: Must Select from A thru P in ☐☐☐ = CAIROX Solution Tank and Mixing Systems
A = Cycle-Bin™ Stand with Load Cells, Screw Conveyor & Transfer Hopper, Eductor Pump & PVC Eductor System [2,0]
B = Cycle-Bin™ Stand with Load Cells, Screw Conveyor & Transfer Hopper, Eductor Pump & Stainless Steel Eductor System [2,0]
C = Cycle-Bin™ Stand with Load Cells, Screw Conveyor & Transfer Hopper, Eductor Pump & Black Iron Eductor System [2,0]
D = Cycle-Bin™ Stand with Load Cells, Screw Conveyor & Transfer Hopper, Duplex Eductor Pump & PVC Eductor System [3,0]
E = Cycle-Bin™ Stand with Load Cells, Screw Conveyor & Transfer Hopper, Duplex Eductor Pump & Stainless Steel Eductor System [3,0]
F = Cycle-Bin™ Stand with Load Cells, Screw Conveyor & Transfer Hopper, Duplex Eductor Pump & Black Iron Eductor System [3,0]
G = Cycle-Bin™ Stand with Screw Conveyor, Transfer Hopper with Scale and Transmitter, Eductor Pump & PVC Eductor System [2,0]
H = Cycle-Bin™ Stand with Screw Conveyor, Transfer Hopper with Scale and Transmitter, Eductor Pump & SS Eductor System [2,0]
J = Cycle-Bin™ Stand with Screw Conveyor, Transfer Hopper with Scale and Transmitter, Eductor Pump & Black Iron Eductor System [2,0]
K = Cycle-Bin™ Stand with Screw Conveyor, Transfer Hopper with Scale and Transmitter, Duplex Eductor Pump & PVC Eductor System [3,0]
L = Cycle-Bin™ Stand with Screw Conveyor, Transfer Hopper with Scale and Transmitter, Duplex Eductor Pump & SS Eductor System [3,0]
P = Cycle-Bin™ Stand with Screw Conveyor, Transfer Hopper with Scale and Transmitter, Duplex Eductor Pump & Black Iron Eductor System [3,0]
Mechanical Helix Feeder Solution Makeup - Note: Must Select from 1 thru 5 in ☐☐☐ = CAIROX Solution Tank and Mixing Systems
G = Transfer Screw, Loss in Weight (LIW) Helix Feeder (gravimetric) System [1,1]
R = Manual Feed Screw, Duplex Loss in Weight (LIW) Helix Feeders (gravimetric) System [2,2]
S = Direct Discharge into Helix Feeder (volumetric) [0,1]
T = Direct Discharge into Duplex Helix Feeders (volumetric) [0,2]
M = Manually Fed Volumetric Helix Feeder [1,0]
SemiAutomatic Solution Makeup - Note: Must Select from A thru P in ☐☐☐ = CAIROX Solution Tank and Mixing Systems
2 = Wand Eductor w/ Eductor Pump & PVC Eductor System [1,0]
3 = Wand Eductor w/ Eductor Pump & Stainless Steel Eductor [1,0]
4 = Wand Eductor w/ Eductor Pump & Black Iron Eductor System [1,0]
5 = Wand Eductor w/ Duplex Eductor Pump & PVC Eductor System [2,0]
6 = Wand Eductor w/ Duplex Eductor Pump & Stainless Steel Eductor System [2,0]
7 = Wand Eductor w/ Duplex Eductor Pump & Black Iron Eductor System [2,0]
9 = Drum Inverter System (Only for Drums, Includes Dedicated Control System with Helix Feeder (volumetric))[0,1] - Note: Must Select from 1 thru 5 in ☐☐☐ = CAIROX Solution Tank and Mixing Systems
N = None Selected
Z = Non-Standard Feed System>>Send List of Special Requirements<<

2 ☐ = CAIROX® Solution Tank and Mixing Systems
Note: Non-Mechanical or Semi-Automatic Solution Makeup Systems (Select Only A thru Q)
Note: Mechanical Helix Feeder Solution Makeup Systems (Select Only 1 thru 9)
A = Storage & Mix Tanks, Duplex 1600 gallons with Agitators, HDPE [2,0]
B = Storage & Mix Tanks, Duplex 1600 gallons with Agitators, FRP [2,0]
C = Storage & Mix Tanks, 1600 gallons with Agitator + 300 gallons with Agitator, HDPE [2,0]
D = Storage & Mix Tanks, 1600 gallons with Agitator + 300 gallons with Agitator, FRP [2,0]
E = Storage & Mix Tank, 1600 gallons with Agitator + 300 gallons Reserve/Day Tank, HDPE [1,0]
F = Storage & Mix Tank, 1600 gallons with Agitator + 300 gallons Reserve/Day Tank, FRP [1,0]
G = Storage & Mix Tanks, Duplex 550 gallons with Agitators, HDPE [2,0]
H = Storage & Mix Tanks, Duplex 550 gallons with Agitators, FRP [2,0]
J = Storage & Mix Tank, 550 gallons with Agitator + 100 gallons Reserve/Day Tank, HDPE [1,0]
K = Storage & Mix Tank, 550 gallons with Agitator + 100 gallons Reserve/Day Tank, FRP [1,0]
L = Storage & Mix Tanks, Duplex 300 gallons with Agitators, HDPE [2,0]
M = Storage & Mix Tanks, Duplex 300 gallons with Agitators, FRP [2,0]
1 = Dissolver Tank with Agitator, 150 gallons, 316SS (Simplex if ☐☐☐ = Q or S [1,0]; Duplex, if ☐☐☐ = R or T [2,0])
2 = Dissolver Tank with Agitator, 50 gallons, HDPE, 316SS Supt Frame and lid(Simplex if ☐☐☐ = Q or S [1,0]; Duplex, if ☐☐☐ = R or T [2,0])
3 = Dissolver Tank with Agitator, 15 gallons, HDPE, 316SS Lid (Simplex if ☐☐☐ = Q or S [1,0]; Duplex, if ☐☐☐ = R or T [0,0])
4 = Wash-down Eductor, 5 gallons, HDPE, PVC Eductor (Simplex if ☐☐☐ = Q or S [0,0]; Duplex, if ☐☐☐ = R or T [0,0])
5 = Wash-down Eductor, 5 gallons, 316SS Tank and Eductor (Simplex if ☐☐☐ = Q or S [0,0]; Duplex, if ☐☐☐ = R or T [0,0])
N = None Selected
Z = Non-Standard Tankage>>Send List of Special Requirements<<
### Metering Pumps

- **HAAx**: Metering Pump (Hydroflo Model 1077), Stainless Steel, 0-5 gph with PVC Piping & Valves [0,x]
- **HABx**: Metering Pump (Hydroflo Model 1077), Stainless Steel, 0-5 gph with Stainless Steel Piping & Valves [0,x]
- **HACx**: Metering Pump (Hydroflo Model 1077), Stainless Steel, 0-5 gph with Black Iron Piping & Valves [0,x]
- **HAXx**: Metering Pump (Hydroflo Model 1077), Stainless Steel, 0-10 gph with PVC Piping & Valves [0,x]
- **HBBx**: Metering Pump (Hydroflo Model 1077), Stainless Steel, 0-10 gph with Stainless Steel Piping & Valves [0,x]
- **HBCx**: Metering Pump (Hydroflo Model 1077), Stainless Steel, 0-10 gph with Black Iron Piping & Valves [0,x]
- **HCHx**: Metering Pump (Hydroflo Model 1077), Stainless Steel, 0-20 gph with PVC Piping & Valves [0,x]
- **HCCx**: Metering Pump (Hydroflo Model 1077), Stainless Steel, 0-20 gph with Black Iron Piping & Valves [0,x]
- **HDAx**: Metering Pump (Hydroflo Model 2000), Stainless Steel, 0-50 gph with PVC Piping & Valves [0,x]
- **HDBx**: Metering Pump (Hydroflo Model 2000), Stainless Steel, 0-50 gph with Stainless Steel Piping & Valves [0,x]
- **HDCx**: Metering Pump (Hydroflo Model 2000), Stainless Steel, 0-50 gph with Black Iron Piping & Valves [0,x]
- **HEAX**: Metering Pump (Hydroflo Model 3000), Stainless Steel, 0-100 gph with PVC Piping & Valves [0,x]
- **HEBX**: Metering Pump (Hydroflo Model 3000), Stainless Steel, 0-100 gph with Stainless Steel Piping & Valves [0,x]
- **HECX**: Metering Pump (Hydroflo Model 3000), Stainless Steel, 0-100 gph with Black Iron Piping & Valves [0,x]
- **HFXx**: Metering Pump (Hydroflo Model 3000), Stainless Steel, 0-140 gph with PVC Piping & Valves [0,x]
- **HFBx**: Metering Pump (Hydroflo Model 3000), Stainless Steel, 0-140 gph with Stainless Steel Piping & Valves [0,x]
- **HFCx**: Metering Pump (Hydroflo Model 3000), Stainless Steel, 0-140 gph with Black Iron Piping & Valves [0,x]
- **HGXx**: Metering Pump (Hydroflo Model 3000), Stainless Steel, 0-190 gph with PVC Piping & Valves [0,x]
- **HGCx**: Metering Pump (Hydroflo Model 3000), Stainless Steel, 0-190 gph with Black Iron Piping & Valves [0,x]
- **HHAx**: Metering Pump (Hydroflo Model 4000), Stainless Steel, 0-300 gph with PVC Piping & Valves [0,x]
- **HHBx**: Metering Pump (Hydroflo Model 4000), Stainless Steel, 0-300 gph with Stainless Steel Piping & Valves [0,x]
- **HCXx**: Metering Pump (Hydroflo Model 4000), Stainless Steel, 0-300 gph with Black Iron Piping & Valves [0,x]
- **PAAx**: Metering Pump (Pulsafeeder Series 680), Stainless Steel, 0-5 gph with PVC Piping & Valves [0,x]
- **PABx**: Metering Pump (Pulsafeeder Series 680), Stainless Steel, 0-5 gph with Stainless Steel Piping & Valves [0,x]
- **PACx**: Metering Pump (Pulsafeeder Series 680), Stainless Steel, 0-5 gph with Black Iron Piping & Valves [0,x]
- **PAEX**: Metering Pump (Pulsafeeder Series 7120), Stainless Steel, 0-50 gph with PVC Piping & Valves [0,x]
- **PEBX**: Metering Pump (Pulsafeeder Series 7120), Stainless Steel, 0-50 gph with Stainless Steel Piping & Valves [0,x]
- **PECx**: Metering Pump (Pulsafeeder Series 7120), Stainless Steel, 0-50 gph with Black Iron Piping & Valves [0,x]
- **PFBx**: Metering Pump (Pulsafeeder Series 7120), Stainless Steel, 0-140 gph with PVC Piping & Valves [0,x]
- **PFCx**: Metering Pump (Pulsafeeder Series 7120), Stainless Steel, 0-140 gph with Stainless Steel Piping & Valves [0,x]
- **PGAx**: Metering Pump (Pulsafeeder Series 7440), Stainless Steel, 0-190 gph with PVC Piping & Valves [0,x]
- **PGAX**: Metering Pump (Pulsafeeder Series 7440), Stainless Steel, 0-190 gph with Stainless Steel Piping & Valves [0,x]
- **PPHx**: Metering Pump (Pulsafeeder Series 7440), Stainless Steel, 0-300 gph with PVC Piping & Valves [0,x]
- **PPBX**: Metering Pump (Pulsafeeder Series 7440), Stainless Steel, 0-300 gph with Stainless Steel Piping & Valves [0,x]

### Centrifugal Pumps

- **GABx**: Centrifugal Pump (Grunfoss Model CRN2-30G), Stainless Steel, 8 gpm @ 40 psi, with SS Piping & Valves [x,0]
- **GAXB**: Centrifugal Pump (Grunfoss Model CRN2-30G), Stainless Steel, 8 gpm @ 40 psi, with SS Piping & Valves [x,0]
- **GACB**: Centrifugal Pump (Grunfoss Model CRN2-40G), Stainless Steel, 8 gpm @ 60 psi, with SS Piping & Valves [x,0]
- **GCAX**: Centrifugal Pump (Grunfoss Model CRN2-40G), Stainless Steel, 8 gpm @ 60 psi, with Black Iron Piping & Valves [x,0]
- **GDBx**: Centrifugal Pump (Grunfoss Model CRN4-30G), Stainless Steel, 20 gpm @ 40 psi, with SS Piping & Valves [x,0]
- **GDAX**: Centrifugal Pump (Grunfoss Model CRN4-30G), Stainless Steel, 20 gpm @ 40 psi, with Black Iron Piping & Valves [x,0]
- **GEBX**: Centrifugal Pump (Grunfoss Model CRN4-40G), Stainless Steel, 20 gpm @ 60 psi, with SS Piping & Valves [x,0]
- **GECx**: Centrifugal Pump (Grunfoss Model CRN4-40G), Stainless Steel, 20 gpm @ 60 psi, with Black Iron Piping & Valves [x,0]
- **GFXx**: Centrifugal Pump (Grunfoss Model CRN4-60G), Stainless Steel, 20 gpm @ 100 psi, with Black Iron Piping & Valves [x,0]

**Note:** Recommendation - To Calculate the Total Number of Pumps, Select One Pump per Application Point + One Spare/Standby for First Pump or Two Pumps, Then One Spare/Standby for Every Pump Thereafter

**Special Note:** \( x \) = Number of Pumps Required

Centrifugal Pumps are Multistage, High Pressure type for Multiple Application Points
= CAIROX® Solution Application Pumps Systems (Continued)

Regenerative Turbine Pumps: Single Stage, High Pressure, Low Flowrate — Selectable ONLY for Use with 2 Dissolving Tanks,

Choices =1 through 5, and Use One Pump for each Application Point

Note: Recommendation - Two Regenerative Turbine Pumps per Application Point (One On-Line Pump and One Spare/Standby Pump)

Note: Repair Kit is NOT Provided with the Regenerative Turbine Pumps

RGAx = Regenerative Turbine Pump (Model - Washdown Duty), Bronze, 4 gpm @ 60 psi, with Black Hose Connectors [x,0]

RHAx = Regenerative Turbine Pump (Model - Regular Duty), Bronze, 4 gpm @ 60 psi, with Black Hose Connectors [x,0]

Eductor and Booster Pump, — Selectable ONLY for Use with 2 Dissolving Tanks, Choice = 1 through 5, only One Application per Helix Feeder Allowed:

Note: Matched Eductor and Simplex Booster Pump are Priced Below

Note: One Repair Kit is Provided with Each Booster Pump

JAAx = Eductor, Suction Cap. 60 lb CAIROX®/hr @ min Total Flowrate 8 gpm, Pressure 70 psi, PVC with PVC Piping [x,0]

JBAx = Eductor, Suction Cap. 170 lb CAIROX®/hr @ min Total Flowrate 20 gpm, Pressure 70 psi, PVC with PVC Piping [x,0]

JCAx = Eductor, Suction Cap. 300 lb CAIROX®/hr @ min Total Flowrate 35 gpm, Pressure 70 psi, SS with SS Piping [x,0]

KABx = Eductor, Suction Cap. 60 lb CAIROX®/hr @ min Total Flowrate 8 gpm, Pressure 70 psi, SS with SS Piping [x,0]

KBBx = Eductor, Suction Cap. 170 lb CAIROX®/hr @ min Total Flowrate 20 gpm, Pressure 70 psi, SS with SS Piping [x,0]

KCBx = Eductor, Suction Cap. 300 lb CAIROX®/hr @ min Total Flowrate 35 gpm, Pressure 70 psi, SS with SS Piping [x,0]

N= None Selected

ZZ= Non-Standard Pump Selection >> Send List of Special Requirements <<

= CARUSMATIC® Control Panel and Control Package

Note: CARUSMATIC® Standard Control Package is –AAAA

- Control Panel Material and Rating

A = Panel, NEMA 4X, FRP (Standard)
B = Panel, NEMA 4X, Stainless Steel 316
C = Panel, NEMA 12, Painted Steel
J = Junction Box Only

Y= Carus 25-07 Standard Control Panel, Use Code - YNNM
N = Not Applicable
Z = Non Standard

- Breakers and Fuses

A = IEC, Breakers, VFD (Standard)
B = IEC, Fused, VFD
C = NEMA, Breakers, VFD
D = NEMA, Fused, VFD
E = IEC, Breakers, SCR

F = IEC, Fused, SCR
G = NEMA, Breakers, SCR
H = NEMA, Fused, SCR

- Programmable Logic Controller

A = PLC, OEM Alternate (Standard)
B = PLC, Allen Bradley 500
C = PLC, Allen Bradley 5/04
N = Not Applicable, No PLC (PLC Has To Be Selected if CARUSCoach is Being Selected)

- CARUSCoach™ and Control Switches

A = CarusCoach® Touch Screen Controls, 5-inch Color (Standard)
B = CarusCoach® Touch Screen Controls, 5-inch Monochrome
C = CarusCoach® Touch Screen Controls, 9-inch Color
D = CarusCoach® Touch Screen Controls, 9-inch Monochrome
M = Manual Handswitches and Indicator Lights Controls
N = Not Applicable
Z = Non Standard Control

Grundfos® is a registered trademark of Grundfos Pumps Corp.
Pulsafeeder® is a registered trademark of Pulsafeeder, Inc.
Hydroflo® is a registered trademark of Penn Process Technologies, Inc.
SLC™ is a registered trademark of Allen-Bradley Company Inc.
GENERAL NOTES:
1) INTERCONNECTING PIPING AND VALVES BETWEEN PUMPING SKID AND TANK PROVIDED BY CARUS CHEMICAL.
2) THE FOLLOWING ARE THE RESPONSIBILITY OF OTHERS;
   --EQUIPMENT INSTALLATION / ANCHORING
   --PIPING TO APPLICATION POINTS
   --INCOMING POWER (460 VAC 3 PHASE, 60 Hz)
   --MAKE-UP WATER (2", 50 GPM @ 10 PSI MINIMUM)
   --BACKFLOW PREVENTERS (IF REQUIRED)
3) START-UP AND OPERATOR TRAINING PROVIDED BY CARUS CHEMICAL.
4) EQUIPMENT ANCHOR BOLTS BY CARUS CHEMICAL.
5) ALL EQUIPMENT SHOWN IS PROVIDED BY CARUS CHEMICAL, UNLESS OTHERWISE NOTED.
6) OVERALL AGITATOR HEIGHT 8'-6" APPROX.
PLAN VIEW

CARUSMATIC™ PRODUCT KEY: 218E-HAB2-AAAA

GENERAL NOTES:
1.) INTERCONNECTING PIPING AND VALVES BETWEEN PUMPING SKID AND TANKS PROVIDED BY CARUS CHEMICAL.
2.) THE FOLLOWING ARE THE RESPONSIBILITY OF OTHERS;
   - EQUIPMENT INSTALLATION / ANCHORING
   - PIPING TO APPLICATION POINT(S)
   - INCOMING POWER (480 VAC 3 PHASE, 60 Hz)
   - MAKE-UP WATER (2") 50 GPM @ 1 PSI MINIMUM
   - BACKFLOW PREVENTERS (IF REQUIRED)
   - AIR REQUIREMENT, 20-70 PSI, 6.5 CFM - FOR DISCHARGE STAND VIBRATOR
3.) START-UP AND OPERATOR TRAINING PROVIDED BY CARUS CHEMICAL.
4.) EQUIPMENT ANCHOR BOLTS BY CARUS CHEMICAL.
5.) ENSURE THAT FORK LIFT CAPACITY IS ADEQUATE TO HANDLE 4100 LBS. (CYCLE BIN).
6.) ALL EQUIPMENT SHOWN IS PROVIDED BY CARUS CHEMICAL, UNLESS OTHERWISE NOTED.

ELEVATION VIEW A-A

CARUSMATIC™ PRODUCT KEY: 218E-HAB2-AAAA

2 = CARUSMATIC™ SERIES 2000 FEED SYSTEM
1 = CYCLE-BIN™ SYSTEM
B = FOUR(4) LOAD CELLS, ONE(1) SCREW CONVEYOR, TRANSFER HOPPER, GRUNDFOS CENTRIFUGAL EJUDCTION PUMP & SS EDUCTOR
E = ONE(1) 1600 GAL. HOPE MIX TANK W/ AGITATOR & 300 GAL. HOPE RESERVE TANK
HAB2 = TWO(2) HYDROFLLO MODEL 1077 METERING PUMPS RATED 0-10GPH C/W ONE(1) PULSATION DAMPENER, BACK PRESSURE VALVE & CALIBRATION COLUMN W/ SS PIPING & VALVES
AAAA = CARUS STANDARD CONTROL PACKAGE FEATURING CARUS COACH NEMA 4X ENCLOSURE, IEC BREAKERS & VFD, PLC & 5" COLOR CARUS TOUCH SCREEN

CARUS
Direction of Cancer Corporation
P.O. Box 539 - Peru, Illinois 61354 - 0539
Telephone: 815-253-7500

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SCALE: 1'-0" = 1'-0"
PLAN VIEW

CARUSMATIC® PRODUCT KEY: 234E—PBC2—AAAA

GENERAL NOTES:
1.) INTERCONNECTING PIPING, VALVES, AND SUPPORTS SHOWN ON THIS DRAWING BETWEEN PUMP SKID AND TANKS TO BE PROVIDED BY CARUS CHEMICAL.
2.) THE FOLLOWING ARE THE RESPONSIBILITY OF OTHERS
   - EQUIPMENT INSTALLATION/CONCRETE PADS/ANCHORING TO CONCRETE
   - POWER TO APPLICATION POINT(S)
   - INCOMING POWER (480 VAC, 3 PHASE, 60 HZ, 25 AMP)
   - MAKE-UP WATER PIPING, VALVES, AND SUPPORTS (2", 30 GPM @ 10 PSI MINIMUM)
   - BACKFLOW PREVENTERS
   - TANK OVERFLOW AND DRAINS TO FLOOR DRAINS
3.) START-UP AND OPERATOR TRAINING PROVIDED BY CARUS CHEMICAL.
4.) OVERALL HEIGHT TO TOP OF AGITATOR 8'-7" (APPRIOX.)
5.) ALL DIMENSIONS ARE APPROXIMATE, VERIFY ALL DIMENSIONS IN FIELD PRIOR TO EQUIPMENT ANCHORING.
6.) PS = PIPE SUPPORTS (TYP.) BY OTHERS.

ELEVATION VIEW

CARUSMATIC® PRODUCT KEY: 234E—PBC2—AAAA

2 = CARUSMATIC® SERIES 2000 FEED SYSTEM
3 = WAND EDUCTOR SYSTEM
4 = 304SS WAND, GRUNDFOS CENTRIFUGAL EDUCTION PUMP WITH BLACK IRON EDUCTOR & PIPING
E = ONE(1) 1600 GAL. HOPE MIX TANK WITH AGITATOR & 300 GAL. HOPE RESERVE TANK
PBC2 = TWO(2) PULSAFEEDER SERIES 880 METERING PUMPS RATED 0-200GPH C/W ONE(1) PULSAFEEDER DAMPENER, BACK PRESSURE VALVE, PRESSURE RELIEF VALVE & CALIBRATION COLUMN WITH BLACK IRON PIPING & VALVES
AAAA = CARUS STANDARD CONTROL PACKAGE FEATURING CARUS COACH NEMA 4X ENCLOSURE, IEC BREAKERS & VFD, PLC & 5" COLOR CARUS TOUCH SCREEN
SIDE ELEVATION
CARUS MATIC® PRODUCT KEY: 21Q2-GAB2-AAAA

GENERAL NOTES:
1. ENSURE THAT FORK LIFT CAPACITY IS ADEQUATE TO HANDLE 4100 lbs.
   CYCLE-BIN™ ON CURRENT GROUND CONDITIONS.
2. ALLOW ADEQUATE HEAD CLEARANCE FOR CYCLE-BIN™ HANGING ABOVE THE
   DISCHARGE STAND.
3. START-UP AND OPERATOR TRAINING PROVIDED BY CARUS CHEMICAL.
4. EQUIPMENT ANCHOR BOLTS BY CARUS CHEMICAL.
5. THE FOLLOWING SHALL BE THE RESPONSIBILITY OF OTHERS:
   - EQUIPMENT INSTALLATION
   - PIPING TO APPLICATION POINT(S)
   - INCOMING POWER (120VAC, 1PH, 80Hz)
   - MAKE-UP WATER
   - BACKFLOW PREVENTER (IF REQUIRED)
   - SYSTEM AIR REQUIREMENTS: 20-70 PSI 8.5 SCFM FOR STAND VIBRATOR

2 = CARUS MATIC® SERIES 2000 FEED SYSTEM
1 = CYCLE-BIN™ SYSTEM
Q = ONE(1) TRANSFER SCREW, LOSS-IN-WEIGHT SCALE & VOLUMETRIC FEEDER
2 = ONE(1) 50 GAL. HOPE DISSOLVER TANK C/W AGITATOR & 316SS SUPPORT FRAME & LIQ
   GAB2 = TWO(2) GRUNDFOS CENTRIFUGAL PUMPS RATED 50PM40P03 C/W 304SS PIPING & VALVES
   AAAA = CARUS STANDARD CONTROL PACKAGE FEATURING CARUS COACH NEMA 4X ENCLOSURE,
   IEC BREAKERS & VFD, PLC & 5" COLOR CARUS TOUCH SCREEN

FRONT ELEVATION
CARUS MATIC® PRODUCT KEY: 21Q2-GAB2-AAAA

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