

**Wallace & Tiernan<sup>®</sup>**  
an eVOQUA brand

## **V10K V-NOTCH CHLORINATOR**

**BOOK NO. WT.025.100.001.UA.IM.0614**

**V10K  
V-NOTCH  
CHLORINATOR**

BOOK NO. WT.025.100.001.UA.IM.0614

# V10K V-NOTCH CHLORINATOR

EQUIPMENT SERIAL NO. \_\_\_\_\_

DATE OF START-UP \_\_\_\_\_

START-UP BY \_\_\_\_\_

Prompt service available from nationwide authorized service contractors.

## ORDERING INFORMATION

In order for us to fill your order immediately and correctly, please order material by description and part number, as shown in this book. Also, please specify the serial number of the equipment on which the parts will be installed.

## WARRANTY

Seller warrants for a period of one year after shipment that the equipment or material of its manufacture is free from defects in workmanship and materials. Corrosion or other decomposition by chemical action is specifically excluded as a defect covered hereunder, except this exclusion shall not apply to chlorination equipment. Seller does not warrant (a) damage caused by use of the items for purposes other than those for which they were designed, (b) damage caused by unauthorized attachments or modifications, (c) products subject to any abuse, misuse, negligence or accident, (d) products where parts not made, supplied, or approved by Seller are used and in the sole judgment of the Seller such use affects the products' performance, stability or reliability, and (e) products that have been altered or repaired in a manner in which, in the sole judgment of Seller, affects the products' performance, stability or reliability. **SELLER MAKES NO OTHER WARRANTY OF ANY KIND, AND THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS OF THE MATERIAL OR EQUIPMENT FOR ANY PARTICULAR PURPOSE EVEN IF THAT PURPOSE IS KNOWN TO SELLER.** If Buyer discovers a defect in material or workmanship, it must promptly notify Seller in writing; Seller reserves the right to require the return of such defective parts to Seller, transportation charges prepaid, to verify such defect before this warranty is applicable. In no event shall such notification be received by Seller later than 13 months after the date of shipment. No action for breach of warranty shall be brought more than 15 months after the date of shipment of the equipment or material.

**LIMITATION OF BUYER'S REMEDIES.** The **EXCLUSIVE REMEDY** for any breach of warranty is the replacement f.o.b. shipping point of the defective part or parts of the material or equipment. Any equipment or material repaired or replaced under warranty shall carry the balance of the original warranty period, or a minimum of three months. Seller shall not be liable for any liquidated, special, incidental or consequential damages, including without limitation, loss of profits, loss of savings or revenue, loss of use of the material or equipment or any associated material or equipment, the cost of substitute material or equipment, claims of third parties, damage to property, or goodwill, whether based upon breach of warranty, breach of contract, negligence, strict tort, or any other legal theory; provided, however, that such limitation shall not apply to claims for personal injury.

Statements and instructions set forth herein are based upon the best information and practices known to Evoqua Water Technologies, but it should not be assumed that every acceptable safety procedure is contained herein. Of necessity this company cannot guarantee that actions in accordance with such statements and instructions will result in the complete elimination of hazards and it assumes no liability for accidents that may occur.



725 Wooten Road  
Colorado Springs, Co 80915

# V10K V-NOTCH CHLORINATOR

## INTRODUCTION

This manual includes a description of the Evoqua Water Technologies V10K Type V-Notch Gas Feeder (Chlorine) with installation, operating, and maintenance procedures. This equipment is designed to control and meter the flow of gas under vacuum and to mix the gas with water.

The complete gas feeder system consists of the control unit, an injector, and a vacuum regulator. Instructions for the vacuum regulator, optional vacuum switch, and optional automatic control (positioner and controller) are provided in separate instruction books supplied with those units.

For swimming pool, water park, or similar non-residential recreational applications, contact your Evoqua Water Technologies representative for information concerning specific systems designed for such use.



**WARNING: HAZARDOUS GAS IS PRESENT IN THIS EQUIPMENT DURING NORMAL OPERATION. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, READ THIS INSTRUCTION BOOK BEFORE CONNECTING THIS EQUIPMENT TO A VACUUM SUPPLY OF GAS. OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST BE RESTRICTED TO TRAINED, QUALIFIED PERSONNEL WHO ARE COMPLETELY FAMILIAR WITH THESE INSTRUCTIONS. CONSULT FACTORY FOR APPLICATIONS AGAINST A NEGATIVE HEAD (PARTIAL VACUUM) OR A POSITIVE BACK-PRESSURE OF LESS THAN 1.0 PSI (28 INCHES OF WATER) IN THE SOLUTION DISCHARGE LINE.**

More information may be given in this book than applies to a particular installation and the reader should determine and disregard that which does not apply.

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# V10K V-NOTCH CHLORINATOR

## VERY IMPORTANT SAFETY PRECAUTIONS

This and the following page entitled “Very Important Safety Precautions” provide, in brief, information of urgent importance relative to safety, installation, operation, and maintenance of this equipment.

### WARNING

TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, OBSERVE THE FOLLOWING:

THIS EQUIPMENT SHOULD BE INSTALLED, OPERATED AND SERVICED ONLY BY TRAINED, QUALIFIED PERSONNEL WHO ARE THOROUGHLY FAMILIAR WITH THE ENTIRE CONTENTS OF THIS INSTRUCTION BOOK.

HAZARDOUS GAS IS PRESENT IN THIS EQUIPMENT DURING NORMAL OPERATION. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, READ THIS INSTRUCTION BOOK AND THE APPROPRIATE GAS MANUAL BEFORE CONNECTING THIS EQUIPMENT TO VACUUM A SUPPLY OF GAS. OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST BE RESTRICTED TO TRAINED, QUALIFIED PERSONNEL WHO ARE COMPLETELY FAMILIAR WITH THESE INSTRUCTIONS.

TURN OFF THE GAS SUPPLY AT THE CONTAINER VALVE, WAIT UNTIL THE SUPPLY VACUUM GAUGE READS FULL SCALE AND THE ROTAMETER FLOAT RESTS ON THE BOTTOM STOP, AND THEN TURN OFF THE INJECTOR WATER SUPPLY BEFORE PERFORMING ANY DISASSEMBLY OPERATIONS FOR TROUBLESHOOTING PURPOSES.

DO NOT OPEN THE GAS SUPPLY CONTAINER VALVE MORE THAN ONE COMPLETE TURN. THIS WILL PERMIT MAXIMUM DISCHARGE AND CAN ALSO BE TURNED OFF QUICKLY IN CASE OF A GAS LEAK.

THE GAS CONTROL UNIT MUST BE CONNECTED TO A VACUUM GAS SUPPLY ONLY. DO NOT OPEN THE CYLINDER OR DRUM VALVE UNTIL THE SYSTEM HAS BEEN FULLY INSTALLED AND THE PRE-START CHECKS HAVE BEEN CARRIED OUT.

ESCAPED GAS MUST BE EXHAUSTED TO OUTSIDE ATMOSPHERE. THE EXHAUST SYSTEM MUST TERMINATE IN AN AREA WHERE GAS FUMES CANNOT CAUSE INJURY TO PERSONNEL OR PROPERTY DAMAGE. DO NOT TERMINATE THE EXHAUST SYSTEM AT A LOCATION ROUTINELY USED BY PERSONNEL, SUCH AS WORK AREAS OR PATHWAYS NOR NEAR WINDOWS OR VENTILATION SYSTEM INTAKES.

ALL CLEANING SHOULD BE CARRIED OUT IN AN OPEN AREA OR IN A WELL VENTILATED ROOM.

DO NOT USE WOOD ALCOHOL, ETHER, PETROL OR PETROLEUM DISTILLATES.

DO NOT USE HYDROCARBONS OR ALCOHOLS BECAUSE RESIDUAL SOLVENT MAY REACT WITH THE GAS. SOLVENTS CAN PRODUCE SERIOUS PHYSIOLOGICAL EFFECTS UNLESS USED IN STRICTEST COMPLIANCE WITH THE SOLVENT MANUFACTURER’S SAFETY RECOMMENDATIONS.

WHEN USING HYDROCHLORIC ACID, OBSERVE ALL SAFETY PRECAUTIONS RECOMMENDED BY THE ACID MANUFACTURER/SUPPLIER.

# V10K V-NOTCH CHLORINATOR

## VERY IMPORTANT SAFETY PRECAUTIONS (CONT'D)

SPRING IS IN A COMPRESSED CONDITION. DISASSEMBLE CAREFULLY TO PREVENT FORCEFUL EJECTION OF PARTS AND POSSIBLE SEVERE PERSONAL INJURY.

USE ONLY EVOQUA WATER TECHNOLOGIES LISTED PARTS EXCEPT FOR COMMERCIALY AVAILABLE PARTS WHICH ARE IDENTIFIED BY COMPLETE DESCRIPTION ON PARTS LIST. THE USE OF UNLISTED PARTS CAN RESULT IN EQUIPMENT MALFUNCTIONS HAVING HAZARDOUS CONSEQUENCES.

DO NOT DISCARD THIS INSTRUCTION BOOK UPON COMPLETION OF INSTALLATION. INFORMATION PROVIDED IS ESSENTIAL TO PROPER AND SAFE OPERATION AND MAINTENANCE.

ADDITIONAL OR REPLACEMENT COPIES OF THIS INSTRUCTION BOOK ARE AVAILABLE FROM:

Evoqua Water Technologies  
725 Wooten Road  
Colorado Springs, CO 80915  
Phone: (800) 524-6324

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### NOTE

Minor part number changes may be incorporated into Evoqua Water Technologies products from time to time that are not immediately reflected in the instruction book. If such a change apparently has been made in your equipment and does not appear to be reflected in your instruction book, contact your local Evoqua Water Technologies sales office for information.

Please include the equipment serial number in all correspondence. It is essential for effective communication and proper equipment identification.

# V10K V-NOTCH CHLORINATOR

## VERY IMPORTANT SAFETY PRECAUTIONS - CHLORINE

This and the following pages titled “Very Important Safety Precautions” provide, in brief, information of urgent importance relative to safety in the installation, operation, and maintenance of this equipment.

### WARNING

TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, OBSERVE THE FOLLOWING:

THIS EQUIPMENT SHOULD BE INSTALLED, OPERATED, AND SERVICE ONLY BY TRAINED, QUALIFIED PERSONNEL WHO ARE THOROUGHLY FAMILIAR WITH THE ENTIRE CONTENTS OF THIS INSTRUCTION BOOK AND THE CHLORINE GAS HANDLING MANUAL.

CHLORINE GAS IS A RESPIRATORY IRRITANT. EXPOSURE TO CHLORINE GAS IN SUFFICIENT CONCENTRATION PRODUCES IRRITATION OF THE MUCOUS MEMBRANES, THE RESPIRATORY SYSTEM, AND THE SKIN. IN EXTREME CASES, SUFFOCATION AND DEATH CAN OCCUR.

WHEN CHANGING CHLORINE CYLINDERS, IT IS RECOMMENDED PRACTICE TO HAVE AN APPROVED GAS MASK AVAILABLE THAT YOU HAVE BEEN TRAINED TO USE AND YOU MUST BE COMPLETELY FAMILIAR WITH YOUR LOCAL PLANT OPERATING AND EMERGENCY PROCEDURES AND CHLORINE INSTITUTE RECOMMENDED EMERGENCY PROCEDURES.

DO NOT TOLERATE ANY CHLORINE LEAKS. CHLORINE LEAKS NEVER GET BETTER. CHLORINE LEAKS ALWAYS GET PROGRESSIVELY WORSE IF THEY ARE NOT PROMPTLY CORRECTED. IT IS RECOMMENDED PRACTICE TO HAVE AN APPROVED GAS MASK AVAILABLE WHEN MAKING LEAK CHECKS.

AS SOON AS THERE IS ANY INDICATION OF CHLORINE IN THE AIR, TAKE IMMEDIATE STEPS TO CORRECT THE CONDITION.

IMPORTANT INFORMATION RELATED TO SAFETY OF CHLORINATION EQUIPMENT INSTALLATION IS PROVIDED IN THE CHLORINE GAS HANDLING MANUAL. IN THE INTEREST OF SAFE OPERATION, THIS INFORMATION MUST BE READ, UNDERSTOOD, AND PRACTICED BY EQUIPMENT OPERATORS AND THEIR SUPERVISORS.

AT TIME OF INITIAL INSTALLATION, WHEN CHLORINE SUPPLY LINES HAVE BEEN DISCONNECTED FOR ANY REASON AND ON A ROUTINE DAILY BASIS, THOROUGHLY CHECK ALL JOINTS, CONNECTIONS, AND EQUIPMENT FOR POSSIBLE CHLORINE LEAKS AND IMMEDIATELY CORRECT ANY THAT MAY BE FOUND.

WHEN ANY CONNECTION IS BROKEN EVEN FOR A SHORT TIME, IMMEDIATELY PLUG THE RESULTANT OPENINGS WITH A RUBBER STOPPER OR EQUIVALENT TO PREVENT THE ENTRANCE OF MOISTURE. MOISTURE MUST BE EXCLUDED FROM ANY PART OF THE EQUIPMENT THAT IS NORMALLY EXPOSED TO DRY CHLORINE ONLY. WHILE DRY CHLORINE IS NON-CORROSIVE, MOIST CHLORINE IS EXTREMELY CORROSIVE TO COMMON METALS, SUCH AS BRASS OR STEEL.

# V10K V-NOTCH CHLORINATOR

## VERY IMPORTANT SAFETY PRECAUTIONS - CHLORINE (CONT'D)

THE TWO MOST COMMON CAUSES OF CHLORINE PIPING LEAKS ARE:

1. RE-USE OF GASKETS. THIS SHOULD NEVER BE DONE. ALWAYS HAVE AN ADEQUATE SUPPLY ON HAND AND ALWAYS USE NEW GASKETS OF THE CORRECT MATERIAL AND SIZE AS IDENTIFIED ON THE EQUIPMENT PARTS DRAWING.
2. IMPROPERLY MADE-UP THREADED PIPE JOINTS. SEE CHLORINE GAS HANDLING MANUAL FOR RECOMMENDED PROCEDURE.

EXCEPT IN CASES OF LEAK DETECTION OR CALIBRATION ADJUSTMENTS, THE CHLORINE GAS SUPPLY MUST BE SHUT OFF AT THE GAS SUPPLY CONTAINERS AND THE CHLORINE GAS IN THE SYSTEM EXHAUSTED BEFORE SERVICING THE EQUIPMENT.

USE ONLY EVOQUA WATER TECHNOLOGIES LISTED PARTS, EXCEPT FOR COMMERCIALY AVAILABLE PARTS AS IDENTIFIED ON THE PARTS LIST. THE USE OF UNLISTED PARTS CAN RESULT IN EQUIPMENT MALFUNCTIONS HAVE HAZARDOUS CONSEQUENCES.

DO NOT DISCARD THIS INSTRUCTION BOOK UPON COMPLETION OF INSTALLATION. INFORMATION PROVIDED IS ESSENTIAL TO PROPER AND SAFE OPERATION AND MAINTENANCE.

ADDITIONAL OR REPLACEMENT COPIES OF THIS INSTRUCTION BOOK ARE AVAILABLE FROM:

Evoqua Water Technologies  
725 Wooten Road  
Colorado Springs, CO 80915  
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Please include the equipment serial number in all correspondence. It is essential for effective communication and proper equipment identification.



# V10K V-NOTCH CHLORINATOR



**PROTECT YOUR EQUIPMENT INVESTMENT**

**MINIMIZE DOWNTIME**

**ORDER A PREVENTIVE MAINTENANCE KIT NOW ...  
KEEP ONE ON HAND**

<b>Quality Equipment</b>	<b>+</b>	<b>Preventive Maintenance</b>	<b>=</b>	<b>Dependable Operation Minimum Downtime</b>
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There's no question about it.

Equipment that is properly maintained is dependable equipment.  
It will give optimum performance with minimum unscheduled downtime.

**Evoqua Water Technologies manufactures quality equipment designed for performance and reliability.** Each product is carefully tested and inspected before shipment to ensure that it meets our high standards.

**Our equipment is engineered for easy maintenance.** To ensure maximum service life and minimize unscheduled repairs, we recommend a program of regular preventive maintenance, as described in the Service section of this book. To support this program, we developed standard parts kits. These kits can also be used for minor emergency repairs to minimize downtime.

**We recommend that these kits be available in your stock at all times.** When the complete kit or any of its parts are used, the kit should be replaced immediately.

**Preventive maintenance kits may be ordered directly from the company that supplied your equipment, or they may be ordered directly from Evoqua Water Technologies.** For ordering numbers, refer to the parts list at the rear of this book.

# V10K V-NOTCH CHLORINATOR

## PREVENTIVE MAINTENANCE SCHEDULE AND RECORD OF PERFORMANCE

This equipment should receive preventive maintenance on a one (1) year cycle.\* It is recommended that the following table be used to plan, schedule, and record this important work.

<b>Date of Installation</b>	
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<b>Preventive Maintenance Log</b>	
<b>Schedule Date</b>	<b>Date Performed</b>

**\*NOTE:** This is the recommended cycle. Your local operating conditions may call for more frequent preventive maintenance.



**PROTECT YOUR EQUIPMENT INVESTMENT**

**MINIMIZE DOWNTIME**

**ORDER A PREVENTIVE MAINTENANCE KIT NOW ...  
KEEP ONE ON HAND**

# V10K V-NOTCH CHLORINATOR

## REGIONAL OFFICES

### INSTALLATION, OPERATION, MAINTENANCE, AND SERVICE INFORMATION

Direct any questions concerning this equipment that are not answered in the instruction book to the Reseller from whom the equipment was purchased. If the equipment was purchased directly from Evoqua Water Technologies, Colorado Springs, CO contact the office indicated below.

#### UNITED STATES

725 Wooten Road  
Colorado Springs, CO 80915  
TEL: (800) 524-6324

#### CANADA

If the equipment was purchased directly from Evoqua Water Technologies, Canada, contact the nearest office indicated below.

##### **ONTARIO**

Evoqua Water Technologies Ltd.  
2045 Drew Road  
Mississauga, Ontario  
L5S 1S4  
(905) 944-2800

##### **QUEBEC**

Evoqua Technologies des Eaux Itée  
505 Levy Street  
St. Laurent, Quebec  
H4R 2N9  
(450) 582-4266



# V10K V-NOTCH CHLORINATOR

## SECTION 1 - TECHNICAL DATA

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# V10K V-NOTCH CHLORINATOR

## 1.1 Technical Data

Versions:

200 or 750 PPD (3/4", 1" or 2" injector, respectively)  
manual or automatic  
wall or panel mounted  
5" or 10" flowmeter

## 1.2 General Data

<b>Accuracy</b>	±4% of indicated flow
<b>Operation Temperature</b>	10 - 131°F (-12 - 55°C)
<b>Operating Water Pressure at the Injector:</b>	1" injector: 300 psi (21 bar) maximum at 35 - 100°F (2 - 38°C) 150 psi (10 bar) maximum at 130°F (55°C) maximum (linearly derated from 100°F) 2" injector: See dwg. 25.055.190.010
<b>Pressure (at point of application):</b>	75 psi maximum with flexible polyethylene pipe for the solution line. 160 psi maximum with high pressure hose or rigid pipe.
<b>Minimum Injector Inlet Pressure</b>	20 psi is required by the 2" pressure-operated plug shut-off injector, as well as the 3/4" and 1" fixed throat anti-syphon injector
<b>Operating Vacuum:</b>	10-15" Water (H <sub>2</sub> O), supply vacuum Minimum 6" mercury injector vacuum
<b>Feed Range:</b>	Manual: 20 to 1 for any one rotameter Automatic: 10 to 1 for any one V-notch plug
<b>Airborne Noise Emission:</b>	Does not exceed 70dB (A)
<b>Dimensions:</b>	See mounting drawing
<b>Weight:</b>	Manual wall mount: 5.5 lb. (2.5 kg.) Automatic panel mount: 20 lb. (9 kg.)

# V10K V-NOTCH CHLORINATOR

## 1.3 Dosage Range

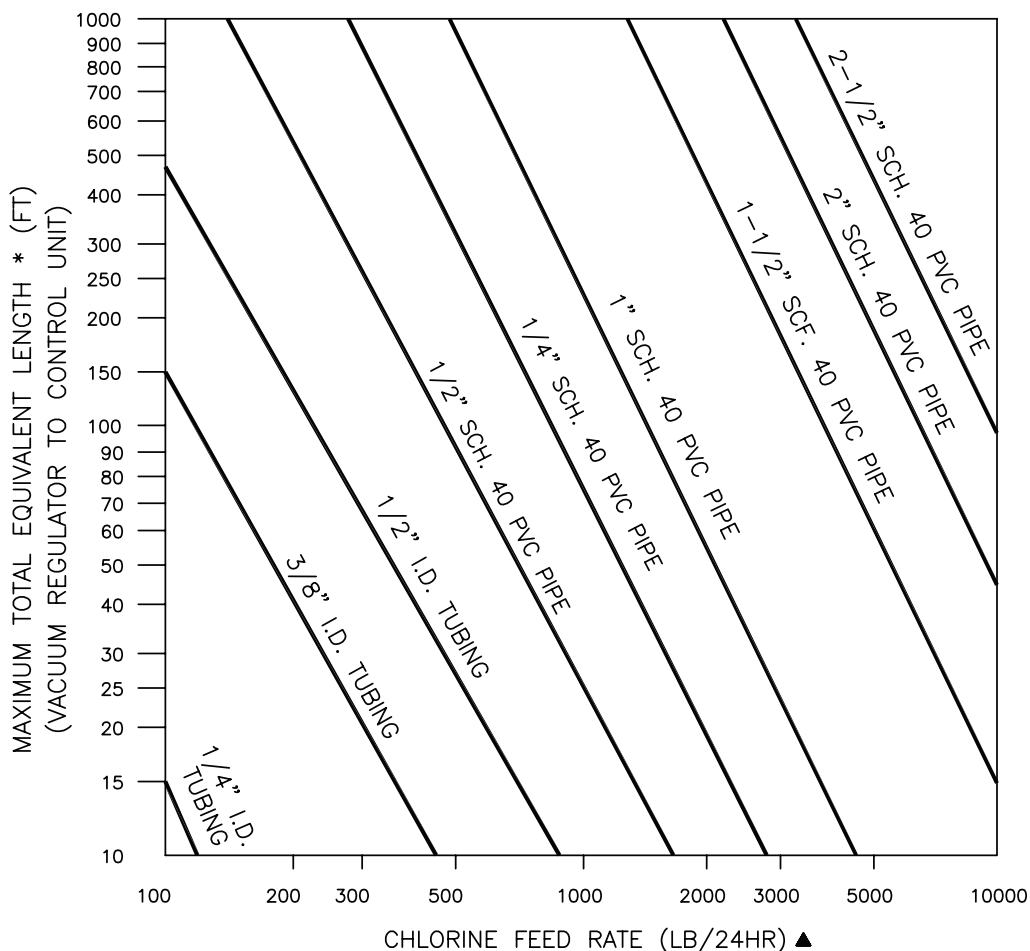
The V-notch plug unit for manual operation covers the dosage range of 0-200ppd or 0-750ppd.

The automatic V-notch plug covers the ranges of each rotameter.

The flowmeter is selected according to the desired dosage range of 3 to 750lb/24hr:

3 ppd	150 ppd
10 ppd	200 ppd
20 ppd	250 ppd
30 ppd	300 ppd
50 ppd	400 ppd
75 ppd	500 ppd
100 ppd	750 ppd

# V10K V-NOTCH CHLORINATOR



APPROXIMATE FRICTION LOSS IN PVC PIPE  
FITTING IN EQUIVALENT FEET OF PIPE:

NOMINAL PIPE SIZE, IN.	1/2	3/4	1	1-1/2	2	2-1/2
TEE, SIDE OUTLET	4	5	6	8	12	15
90° ELBOW	1-1/2	2	2-3/4	4	6	8
45° ELBOW	3/4	1	1-3/8	2	2-1/2	3

## NOTE:

\* TOTAL EQUIVALENT LENGTH = PIPE LENGTH PLUS EQUIVALENT LENGTH FOR EACH FITTING. SEE TABLE ABOVE. 1.) WITH AUTOMATIC SWITCHOVER VACUUM REGULATORS, USE THE LENGTH OF THE LONGER OF THE TWO VACUUM LINES, NOT BOTH, TO DETERMINE TOTAL LENGTH. 2.) TO KEEP THE PRESSURE LOSS WITHIN PERMISSIBLE LIMITS, A COMBINATION OF PIPE SIZES MAY BE USED. IF THIS IS DONE, FOR A GIVEN FLOW, THE LOSS THROUGH EACH FOOT OF 1/2" SCH. 40 PVC PIPE IS EQUIVALENT TO THE LOSS THROUGH : A.) 3FT. OF 3/4" SCH. 40 PVC PIPE; B.) 8 FT. OF 1" SCH. 40 PVC PIPE; C.) 45FT. OF 1-1/2" SCH. 40 PVC PIPE; D.) 122 FT. OF 2" SCH. 40 PVC PIPE; E.) 248 FT. OF 2-1/2" SCH. 40 PVC PIPE.

▲ FOR GASES OTHER THAN CHLORINE, USE THE FOLLOWING APPROXIMATE CONVERSIONS:

CHLORINE FEED RATE = SULFUR DIOXIDE FEED RATE (LB/24HR.)  
= 2.1 X AMMONIA FEED RATE (LB/24HR.)  
= 1.3 X CARBON DIOXIDE FEED RATE (LB/24HR.)

VACUUM LINE LENGTH LIMITS - PERFORMANCE  
Used In Remote Vacuum Gas Feeders

25.052.190.030

ISSUE 3 5-97



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## INJECTOR INLET PRESSURE VS. THROAT & TAILPIECE SELECTION

LB. CHLORINE PER DAY	INJECTOR INLET PRESSURE VS. THROAT & TAILPIECE SELECTION															
	0	2.5	5	10	20	40	60	80	100	120	140	160	180	200	220	240
500	50-242K 35-312L	60-242K 35-312L	90-193J 70-242K 45-312L	105-193J 85-242K 50-312L	125-193J 100-242K 70-312L	160-193J 120-242K 105-312L	185-193J 150-242K 130-312K	210-193J 185-242K 150-312K	240-193H 210-242J 175-312K	260-193H 230-242J 210-312K	300-193H 265-242J 245-312K					
400	40-242K 30-312L	45-242K 30-312L	105-165H 90-193J 50-242K 35-312L	95-193J 60-242K 40-312L	115-193J 70-242K 60-312L	170-165H 145-193J 110-242K 90-312K	190-165H 175-193J 135-242J 110-312K	225-165H 200-193H 160-242J 140-312K	280-165H 230-193H 190-242J 175-312K	260-193H 225-242J 205-312K	290-193H 255-242J 240-312K					
300	50-193J 30-242K 20-312L	55-193J 35-242K 25-312L	75-165H 60-193J 40-242K 30-312L	75-193J 45-242K 35-312L	100-165H 95-193J 60-242K 50-312K	180-140G 135-165H 120-193J 95-242J 80-312K	190-140G 170-165G 145-193H 120-242J 110-312K	235-140G 195-165G 170-193H 155-242J 140-312K	300-120F 275-140G 225-165G 205-193H 185-242J 75-312K	255-165G 235-193H 215-242J 205-312K	295-165G 270-193H 245-242J 230-312K	275-242J 270-312K				
250	40-193J 22-242K	40-193J 20-312L	55-165H 35-242K 20-312L	65-165H 40-242K 25-312L	125-140G 90-165H 80-193J 55-242K 50-312K	145-140G 125-165G 110-193H 90-242J 75-312K	210-120F 180-140G 150-165G 135-193H 120-242J 110-312K	255-120F 200-140F 180-165G 170-193H 150-242H 140-312K	290-120F 225-140F 200-193H 170-242H	260-140F 255-165G 220-193G 200-242H	300-140F 240-193G 230-242H	270-193G 260-242H				
200	45-165H 25-193J 19-242K	45-165H 35-193J 22-242K 17-312L	50-165H 30-242K 20-312L	80-140G 60-165H 50-193J 35-242K 25-312L	130-120F 95-140G 75-165H 70-193J 50-242K 45-312K	150-120F 135-140G 110-165G 105-193H 85-242K 75-312K	190-120F 155-140F 145-165G 130-193H 115-242J 105-312K	280-99E 230-120F 180-140F 175-165G 160-193G 140-242H 135-312K	290-99E 275-120F 220-140F 215-165G 200-193G 170-242H	255-140F 255-165F 210-193G 200-242H	290-140F 265-165F 240-193G 225-242H	295-165F 270-193G 255-242H				
150	40-140G 25-165H 19-193J 15-242J	45-140G 30-140G 30-193J 16-242J	75-120F 45-140G 40-165H 35-193J 19-242J	85-120F 55-140G 45-193J 30-242J 25-312L	95-120F 75-140G 70-165G 65-193J 45-242J 40-312K	135-120F 115-140F 100-165G 95-193H 75-242H	170-99E 145-140F 135-165G 130-193G 105-242H	215-99E 190-120E 175-140F 160-165F 150-193G 135-242H	260-99E 220-120E 210-140F 190-165F 170-193G 165-242H	300-99E 260-120E 250-140F 225-165F 200-193G 195-242H	290-120E 285-140F 255-165F 235-193G 225-242H	290-165F 270-193G 255-242H				
100	30-120F 20-165H 17-193J 11-242J	40-120F 30-140G 25-165H 20-193J 16-242J	70-99E 45-120F 40-140G 30-165H 18-242J	70-99E 60-120F 45-140F 40-165H 35-193J 25-242J	95-99E 80-120F 65-140F 55-165G 40-242J	125-99E 110-120E 105-140F 95-165F 80-193G 75-242H	255-70C 140-99D 120-120E 120-165F 110-193G 105-242H	275-70C 190-99D 170-120E 145-165F 140-193G 130-242H	300-70C 220-99D 205-120E 195-140E 180-165F 170-193G 165-242H	255-99D 235-120E 215-140E 210-165F 200-193G 195-242H	285-99D 270-120E 260-140E 245-165F 225-193G	290-165F 265-193G 255-242H				
75	45-99E 30-120F 24-140G 20-165H 16-193H 10-242J	50-99E 35-120F 25-140G 18-193H 12-242J	120-70C 55-99E 40-120F 30-140G 25-193H 18-242J	130-70C 60-99E 50-120F 40-140F 30-193H 25-242J	155-70C 80-99E 70-120F 55-140F 45-193G 40-242J	190-70C 110-99D 105-120E 95-140F 85-165F 80-193G 75-242H	255-70C 140-99D 135-120E 130-140F 115-165F 110-193G 105-242H	280-70C 175-99D 170-120E 155-140E 145-165F 135-193G 130-242H	245-99D 235-120E 210-140E 185-140E 180-165F 170-312K 165-193G	275-99D 270-120E 240-140E 225-193G	285-165F 260-193G 255-242H					
50	65-70C 30-99E 22-120F 18-140G 10-193H	65-70C 35-99E 35-120F 22-140G 15-193H	75-70C 40-99E 35-120F 30-140G 25-165F 20-193H	90-70C 55-99E 45-120F 40-140F 35-165F 30-193H 25-242H	115-70C 75-99D 65-120E 55-140F 50-165F 45-193H 40-242H	150-70C 105-99D 95-120E 90-140E 80-165F 70-242H	185-70C 130-99D 115-140E 110-165F 110-242H	220-70C 165-99D 155-120D 145-140E 135-193G 130-242H	265-70C 205-99D 180-120D 175-165F 165-193G 160-242H	285-70B 240-99D 210-120D 200-193G 195-242H	300-70B 275-99D 240-140E 235-170D 225-193G	300-99D 265-120D 260-193G 255-242H				
30	45-70C 20-99D 15-140G 12-165F	50-70C 30-99D 20-140G	55-70C 40-99D 25-140G 20-165F	70-70C 40-99D 35-140E 30-165F	90-70C 55-99D 50-140E 45-165F	125-70C 90-99D 80-140E 75-165F	160-70B 125-99D 115-120D 110-140E	185-70B 150-99C 145-120D 140-165F	210-70B 175-99C 170-140E	240-70B 205-99C	275-70B 240-165F 235-99C	270-99C 265-120D				
20	30-70C 20-99D 15-120E	40-70C 24-99D 18-120E	45-70C 30-99D 24-120E	55-70C 40-99D 35-120E 30-140E	80-70C 55-99D 50-120E 45-140E	115-70C 90-99C 85-120D 80-140E	145-70C 100-99C 115-120D 110-140E	170-70C 150-99C 145-120D	200-70B 175-99C 170-140E	235-70B 205-99C	270-70B 230-99C	270-140E 260-99C				
10	24-70C 15-99D	30-70C 20-99D 16-120D	35-70C 24-99D 20-120D	40-70C 30-99D	60-70C 45-99C	100-70B 75-99C	125-70B 110-99C 105-140E	160-70B 135-99C	195-70B 165-99C	225-70B 200-99C	265-70B 230-99C	260-99C				

## BACK PRESSURE, P.S.I.

- NOTE: 1. SELECTION DATA ABOVE REPRESENTS ACTUAL INJECTOR PERFORMANCE PLUS A SAFETY FACTOR ADDED TO THE OPERATING PRESSURE AND WATER FLOW REQUIREMENTS. THE SAFETY FACTOR ALLOWS FOR TYPICAL VARIATIONS IN OPERATING WATER SUPPLY OR DISCHARGE LINE HYDRAULICS AND FOR BOOSTER PUMP IMPELLER WEAR.
2. DATA APPLIES TO CHLORINE ONLY. FOR OPERATING REQUIREMENTS OF OTHER GAS FEEDERS. CONSULT FACTORY.
3. FOR FEED RATES OR BACKPRESSURES WHICH FALL BETWEEN THOSE INDICATED. IT IS RECOMMENDED THE NEXT HIGHEST VALUE BE USED.

## INJECTOR HYDRAULIC OPERATING REQUIREMENTS - INSTALLATION DATA

### 1" Fixed Throat Injector

25.100.190.010

ISSUE 0 10-08

# V10K V-NOTCH CHLORINATOR

INJECTOR INLET PRESSURE VS. THROAT & TAILPIECE SELECTION											
LB. CHLORINE PER DAY	200	150	100	50	20	10	0	5	10	20	40
	80-140G 45-165H	80-140G 55-165H 50-242J	85-140G 70-165H 60-193S 55-242J	95-140G 90-165H 80-193J 65-242J	135-140G 105-193H 95-242J	205-120F 175-140F 160-165G 140-193H 120-242H	230-120F 200-140F 185-165G 175-193G 155-242H	230-140F 220-165G 195-193G 185-242H	265-140F 220-193G	250-193G	280-193G
	55-140G 40-165H 35-242J	85-120F 55-140G 50-165H 45-193J 40-242J	95-120F 65-140G 60-165H 50-193J 45-242J	110-120F 80-140G 70-193H 55-242J	145-120F 115-140F 110-165G 95-193H 85-242H	175-120F 150-140F 140-165G 125-193G 115-242H	215-120E 185-140F 170-165F 150-193G	235-120E 220-140F 190-165F 180-193G	265-120E 220-165F 210-193G	255-165F 240-193G	300-165F 270-193G
	100-84D 80-99E 45-120F 30-165H 25-242J	100-99E 60-120F 50-140G 40-165H 35-193J 30-242J	150-84D 120-99E 70-120F 55-140G 50-165H 40-193J 35-242J	170-84D 145-99D 85-120F 75-140G 65-165G 55-193G 45-242J	200-84D 175-99D 125-120F 105-140F 130-165F 115-193S	185-99D 160-120E 140-140F 155-165F 135-193S	185-120E 170-140F 150-165F 135-193S	215-120E 205-140F 185-165F 160-193S	255-120E 245-140F 220-165F 190-193S	300-120E 285-140F 260-165F 220-193S	300-165F 250-193S
	75-70C 40-84D 35-120E 20-140F 15-193J	85-70C 65-84D 50-99D 40-120E 25-140F 20-193J	90-70C 75-84D 65-99D 45-120E 35-140F 25-242H	110-70C 95-84D 85-99D 55-120E 50-140F 40-193S	145-70C 130-84D 120-99D 95-120E 85-140F 80-165F 70-193S	155-84C 145-99D 135-120E 120-140F 150-165F 115-165F 95-193S	185-84C 165-99D 160-140F 150-165F 125-193S	215-84C 200-99D 185-165F 155-193S	240-99D 220-165F 185-193S	275-99D 260-165F 215-193S	300-165F 245-193S
	35-70C 25-84D 15-140F 10-193G	40-70C 35-84D 20-140F 15-193G	45-70C 40-84D 25-140G 20-193G	55-70C 50-99D 45-140F 35-193G	100-70B 80-99D 65-193S	135-70B 115-99D 95-193S	175-70B 150-99D 125-193S	230-70B 215-84B 190-99D 155-193S	260-84B 225-99D 185-193S	300-84B 265-99D 215-193S	300-99D 245-193S
	25-70C 15-84D 10-165F	30-70C 25-99D 20-165F	35-70C 30-99D 25-193S	55-70C 45-99D 35-193S	100-70B 80-99D 65-193S	135-70B 115-99D 95-193S	175-70B 150-99D 125-193S	230-70B 215-84B 190-99D 155-193S	260-84B 225-99D 185-193S	300-84B 265-99D 215-193S	300-99D 245-193S
BACKPRESSURE, PSI											

## NOTE:

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3. FOR FEED RATES OR BACKPRESSURES WHICH FALL BETWEEN THOSE INDICATED, IT IS RECOMMENDED THE NEXT HIGHEST VALUE BE USED.

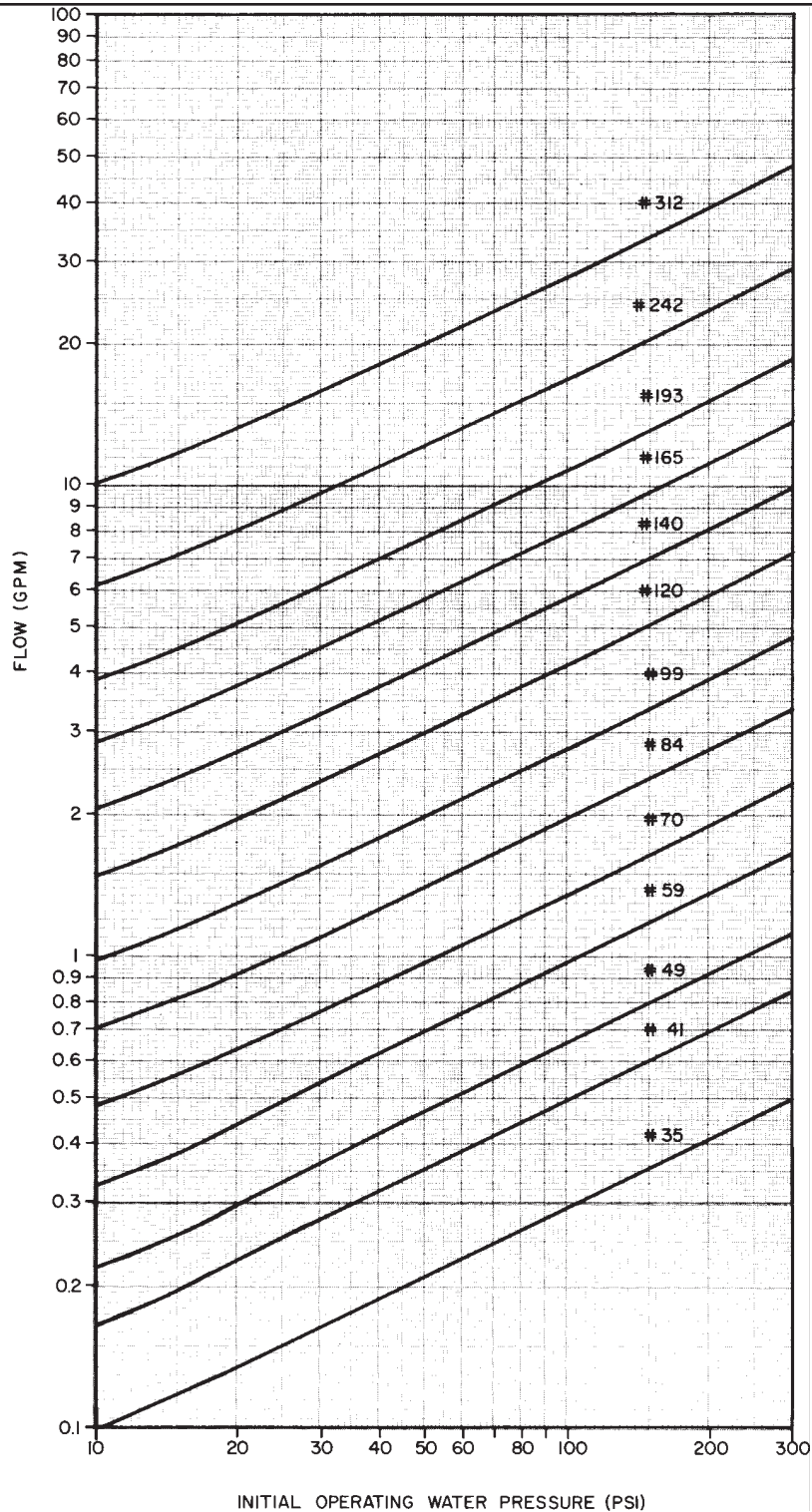
INJECTOR HYDRAULIC OPERATING REQUIREMENTS - INSTALLATION DATA  
3/4" Fixed Throat Injector

25.100.190.020

ISSUE 0 10-08



# V10K V-NOTCH CHLORINATOR



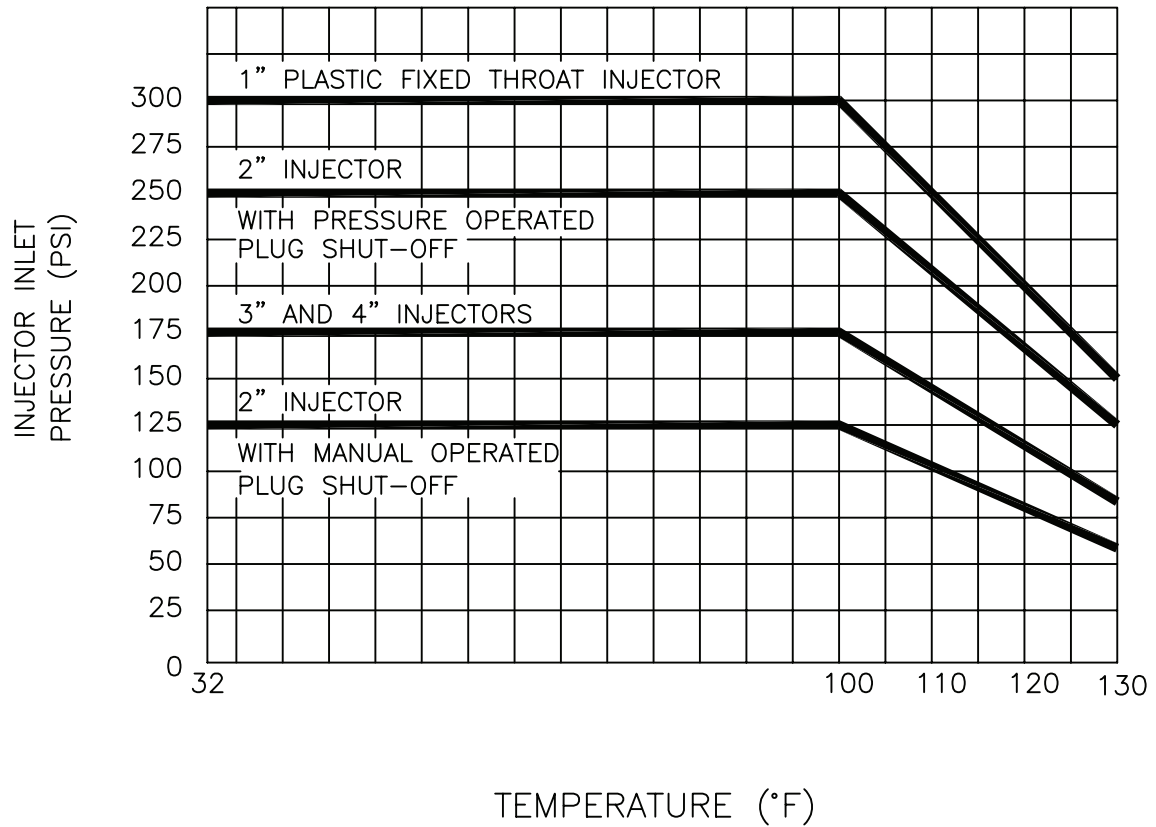
NOTE: NO SAFETY FACTOR INCLUDED.

INJECTOR OPERATING WATER - PERFORMANCE  
Fixed Throat Injectors

910.200.196.020

ISSUE 4 11-84

# V10K V-NOTCH CHLORINATOR

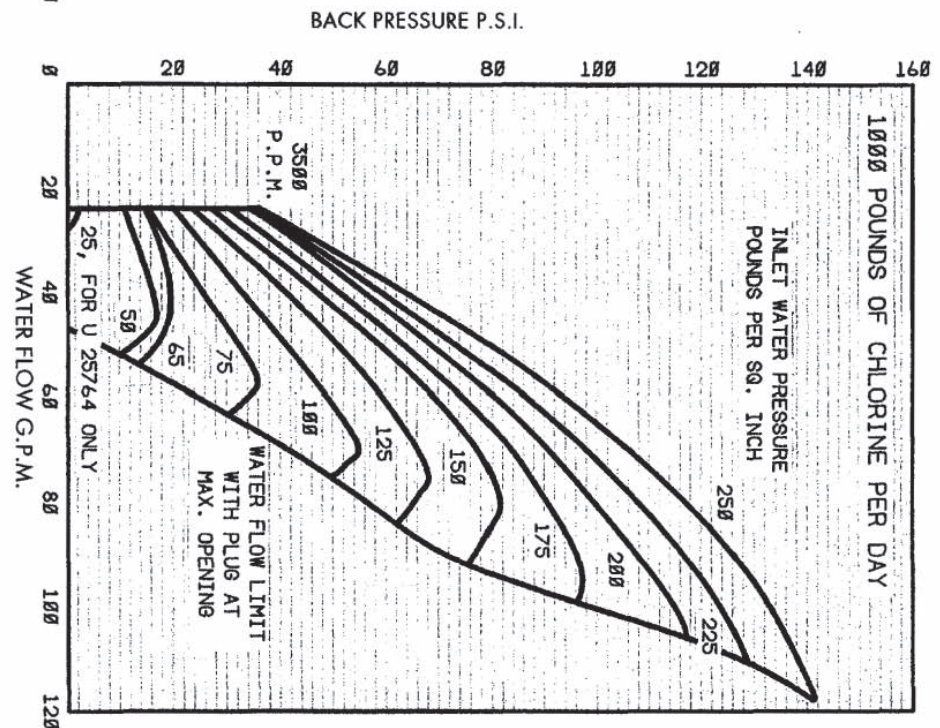
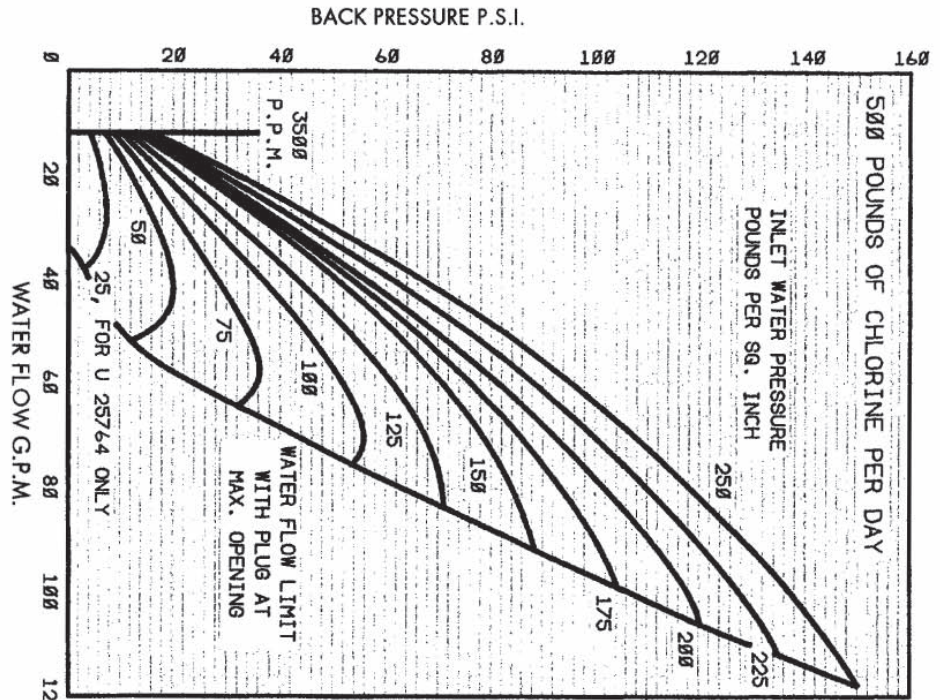


V-2000 INJECTOR INLET PRESSURE LIMITS  
- PERFORMANCE

25.055.190.010

ISSUE 2 7-05

# V10K V-NOTCH CHLORINATOR



- NOTE: 1. SELECTION DATA ABOVE REPRESENTS ACTUAL INJECTOR PERFORMANCE PLUS A SAFETY FACTOR ADDED TO THE OPERATING PRESSURE AND WATER FLOW REQUIREMENTS. THE SAFETY FACTOR ALLOWS FOR TYPICAL VARIATIONS IN OPERATING WATER SUPPLY OR DISCHARGE LINE HYDRAULICS AND FOR BOOSTER PUMP IMPELLER WEAR.
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3. FOR FEED RATES OR BACKPRESSURES WHICH FALL BETWEEN THOSE INDICATED, IT IS RECOMMENDED THE NEXT HIGHER EST VALUE BE USED.
4. PLASTIC BODY INJECTOR LIMITED TO INLET WATER PRESSURE 125 P.S.I. AT 70° AND 65 P.S.I. AT 130°. BRONZE BODY INJECTOR WITH BELLOFRAM REQUIRED FOR HIGHER WATER PRESSURES OR START-STOP OPERATION.

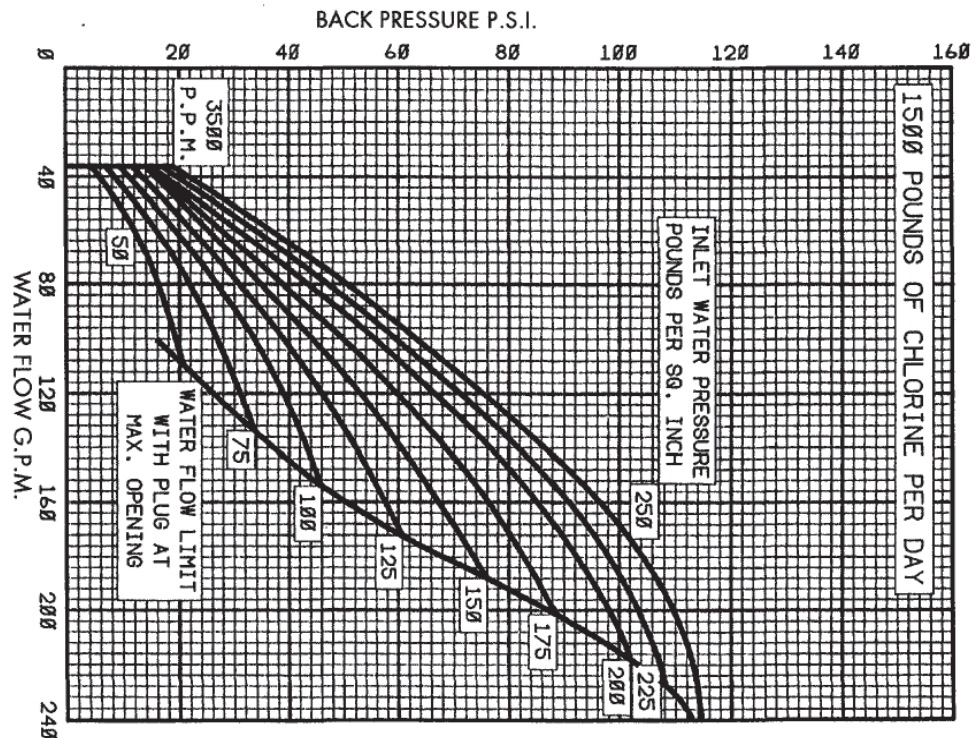
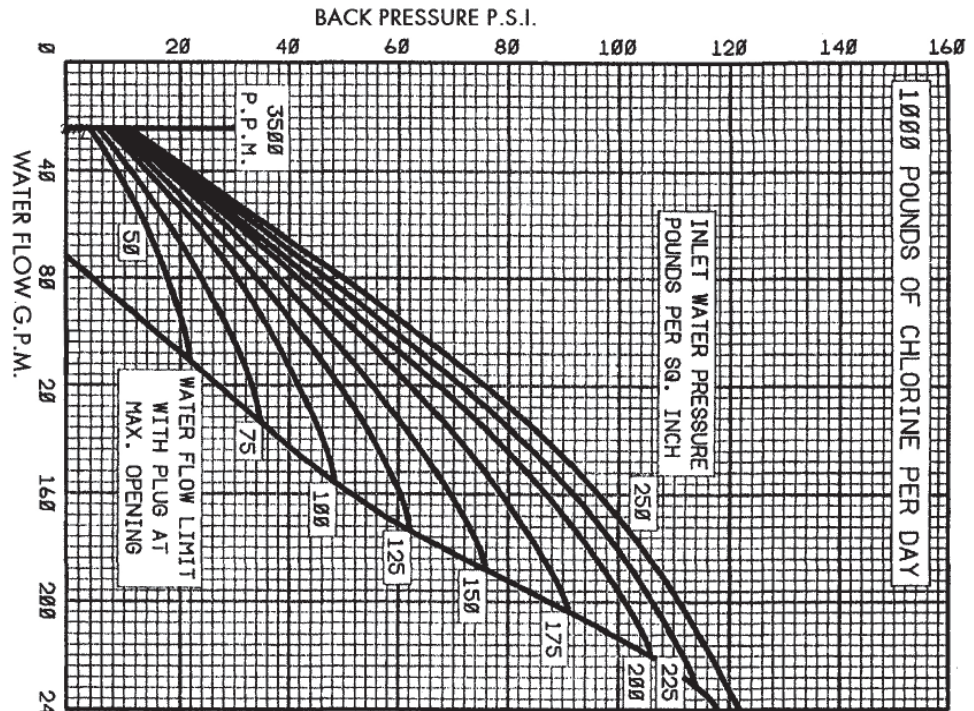
INJECTOR HYDRAULIC OPERATING REQUIREMENTS - INSTALLATION DATA  
2" Variable Throat Injector Small Throat

25.100.190.030

ISSUE 0 10-08



# V10K V-NOTCH CHLORINATOR



- NOTE:
1. SELECTION DATA ABOVE REPRESENTS ACTUAL INJECTOR PERFORMANCE, PLUS A SAFETY FACTOR ADDED TO THE OPERATING PRESSURE AND WATER FLOW REQUIREMENTS. THE SAFETY FACTOR ALLOWS FOR TYPICAL VARIATIONS IN OPERATING WATER SUPPLY OR DISCHARGE LINE HYDRAULICS AND FOR BOOSTER PUMP IMPELLER WEAR.
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  4. PLASTIC BODY INJECTOR LIMITED TO INLET WATER PRESSURE 125 P.S.I. AT 70° AND 65 P.S.I. AT 130°. BRONZE BODY INJECTOR WITH BELLOFRAM REQUIRED FOR HIGHER WATER PRESSURES OR START-STOP OPERATION.

INJECTOR HYDRAULIC OPERATING REQUIREMENTS - INSTALLATION DATA  
2" Variable Throat Injector Large Throat

25.100.190.040

ISSUE 0 10-08

## **SECTION 2**

# V10K V-NOTCH CHLORINATOR

## SECTION 2 - INSTALLATION

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**WARNING: THIS CONTROL UNIT IS DESIGNED TO OPERATE UNDER VACUUM ONLY. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, DO NOT CONNECT TO A SOURCE OF GAS UNDER PRESSURE.**

## 2.1 Unpacking

Unpack the equipment in a clean, dry area, preferably at the installation site. Check all items against the packing list to ensure that nothing is discarded with the packing materials.

To prevent damage during shipment the flowmeter is packed separately. Handle this glass tube very carefully.

**NOTE: Do not discard or remove this instruction book when the installation is completed.**

## 2.2 Location Requirements

- Unauthorized persons must be excluded from the installation.
- Adequate access should be available to permit ease of operation, routine maintenance and service. The gas control unit should be mounted with the rotameter at a height suitable for reading.
- Position of the equipment in the gas storage and operation room must correspond to local regulations.

Select a site that will meet the following requirements:

- An adequate supply of clean water is required to operate the injector. Install the solution discharge line to the point of application as directly as possible. A short run with a minimum of fittings is desirable (most direct route).
- Locate gas supply containers so as to require a minimum of handling. Support in such a manner as to prevent their being knocked over.
- Both in operation and in storage give the container the protection measures described in the Gas Handling Manual (at the rear of this book).

## 2.3 Mounting

### 2.3.1 Gas Control Unit

Mount the gas control unit on a vertical surface, wall, etc. with the flowmeter at a height suitable for reading. See the following illustration.

- Gas feeder (manual) without panel
  - a. Provide mounting holes in the locations and sizes shown in Figure 2.1.
  - b. Remove the cover of the control unit. The control unit has three holes for mounting.
  - c. Level the control unit (rotameter) before final tightening.
  - d. After the control unit has been leveled and tightened, replace cover.

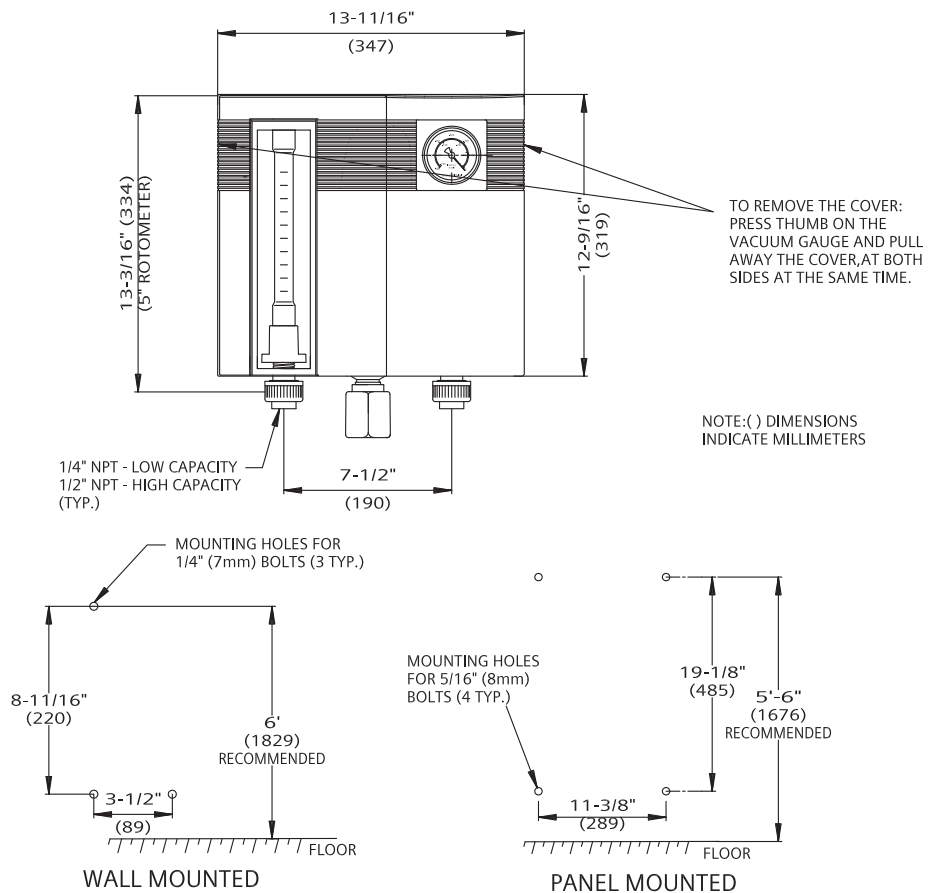


Figure 2.1

- Gas feeder with panel
  - a. Provide mounting holes in the locations and sizes shown in Figure 2.1.
  - b. Remove the cover of the control unit. The panel has four holes for mounting.
  - c. Level the control unit (rotameter) before final tightening.
  - d. After the control unit has been leveled and tightened, replace cover.

**NOTE:** If the control panel is being bolted to an uneven wall, shims must be added behind bolt hole pads to prevent the control panel from twisting when the bolts are tightened.



**CAUTION:** The axis of the rotameter in the control unit must be vertical in its mounted position. Use a weighted string or spirit level to check this.

Make the tube lines from the vacuum regulator to the control panel, and from all control units to injectors, as short as practicable. Select the control panel location to achieve this. See Dwg. 25.052.190.030 for maximum permissible lengths of tubing.

## 2.3.2 Rotameter

For protection in shipment, the rotameter and associated parts are separately packaged. Assemble and install as shown on Dwg. 25.100.150.020, in Section 4.

## 2.3.3 Injector

The injector is a key component, as it must develop the vacuum which makes the rest of the components work. It may be installed so that the tailway discharges either horizontally or vertically upward.

**NOTE:** Avoid any downward discharge because air or gas bubbles may accumulate and become trapped in the tailway, interfering with its hydraulic operation.

The injector diaphragm check valve will provide the greatest security against leakage if the injector is installed so that it is self-draining. This can be accomplished by observing the following:

- a. If the injector discharges horizontally, the diaphragm should be in a horizontal plane above the nozzle and tailway.
- b. If the injector discharges vertically upward, the connection to the control unit should be vertically upward.

- c. In all cases, the tubing from the control unit should enter the injector from above.
- d. For one-inch fixed throat injectors, a rigid PVC pipe or Evoqua Water Technologies solution hose is required between the injector discharge and the point of application. The pipe size depends on the size of the throat and tailway used in the injector, the operating water pressure, and the length of the solution line. Solution hose may be connected directly to the injector tailway. If rigid PVC pipe is used, a piece of straight pipe at least eight inches long should be coupled to the end of the injector tailway before any elbows, tees, or Saunders valves are used. This is to prevent any flow disturbances that could affect the hydraulic performance of tailway connections.
- e. For the two-inch variable throat injectors, two-inch polyethylene pipe or two-inch rigid PVC pipe is normally used. Solution hose may be connected directly to the injector tailway. If rigid PVC pipe is used, a piece of straight pipe at least 12 inches long should be coupled to the end of the injector tailway before any elbows, tees, or Saunders valves are used. This is to prevent any flow disturbances that could affect the hydraulic performance of tailway. Discharge in an upward direction.

**NOTE:** For measuring the injector vacuum a 1/4" NPT connection is provided.



**CAUTION:** If a corporation cock is used, pull out stem to full length of chain before closing valve.

**To install the 3/4-inch fixed throat injector, proceed as follows:**

Nozzle (with stamped number) and tailway (with stamped letter) are supplied loose. Place the O-rings on both and apply Halocarbon grease.

When assembling nozzle and tailway into the injector body pay attention to the flow direction. (Nozzle is placed first in the water flow path.)

**NOTE:** Do not cut off any portion of the tailway. To do so would interrupt flow in the pressure-recovery zone and prevent normal performance.

**NOTE:** Do not overtighten the nozzle or tailway of the 3/4" injector. Thread shoulder to stop on the body. For 1" injector, hand tightening of the retaining nut is sufficient.

- a. For main connection, install the injector tailway (beige color with letter designation) directly into a 3/4-inch NPT tap in a main which is eight inches or larger in size.



**CAUTION:** For proper dispersal of solution, the end of the tailway (beige) must extend into main, but not more than 1/3 the diameter of the main.

- b. If the main is smaller than eight inches, install the tailway in a tee, in a straight run section of the main.
- c. Where the injector is to be some distance away from the point of application, use adapters to connect to pipe or corporation cock type main connections, check valves, etc. Your dealer can provide whatever components are required.
- d. Where the injector is not installed directly into the application main, wall mounting of the injector may be required. To install the injector on a suitable wall, use the bracket holes as the drilling template. Secure the injector to the wall.
- e. The injector nozzle (black color with number size designation) is designed to accept 3/4-inch polyethylene tubing or 3/4-inch threaded pipe connection. For pipe thread connection, cut off the serrated section with a hacksaw and bevel the sharp corners at the ID and OD. Ensure that the interior of the nozzle is free from burrs or chips before installing it in the injector.

**NOTE: The polyethylene tubing is suitable for pressures up to 75 psi. Pressure in excess of 75 psi requires rigid pipe.**

- f. The nozzle and the tailway are sealed to the injector body by means of O- rings. Hand tightening is sufficient. Do not use a wrench or attempt to tighten beyond that point where the shoulder on the fitting touches the body of the injector. If the injector is not oriented as desired when fully installed over the tailway, use a suitable tool to turn the tailway with respect to the main (or next fitting in the assembly) until the orientation is proper with the gas inlet side on top or most accessible face.
- g. Install connection to water supply or to a booster pump, if required. The water supply valve can be a manual valve or solenoid valve. A water supply strainer is recommended. The water supply must be reasonably clean. If the injector is to be operated using clarified effluent, such as in a sewage treatment plant, use larger sizes of nozzles and tailways to minimize the likelihood of plugging.

**To install the one-inch fixed throat injector, proceed as follows:**

- a. The nozzle and the tailway are sealed to the injector body by means of O- rings. Hand tightening is sufficient. Do not use a wrench or attempt to tighten beyond that point where the shoulder on the fitting touches the body of the injector. If the injector is not oriented as desired when fully installed over the tailway, use a suitable tool to turn the tailway with respect to the main (or next fitting in the assembly) until the orientation is proper with the gas inlet side on top or most accessible face.

- b. Where the injector is to be some distance away from the point of application, use adapters to connect to pipe or corporation cock type main connections, check valves, etc (see dwg 50.845.06.111). Your dealer can provide whatever components are required.
- c. Where the injector is not installed directly into the application main, wall mounting of the injector may be required. To install the injector on a suitable wall, use the bracket holes as the drilling template. Secure the injector to the wall.
- d. The injector water inlet is designed to accept one-inch threaded pipe.
- e. Install connection to water supply or to a booster pump, if required. The water supply valve can be a manual valve or a solenoid valve. A water supply strainer is recommended. The water supply must be reasonably clean. If the injector is to be operated using clarified effluent, such as in a sewage treatment plant, use larger sizes of nozzles and tailways to minimize the likelihood of plugging.

**To install the two-inch fixed throat injector, proceed as follows:**

If the gas feeder is to be operated intermittently in conjunction with a pump or other equipment, this is usually accomplished by one of the following:

- Two-inch injectors with three-way shut-off valves may be fitted with solenoid valves as shown in Installation Piping Dwgs. 25.100.006.122, 25.100.006.142, or 25.100.006.152 in this section. Material for this purpose is furnished only when specifically listed in the order.
- Other injectors may be shut off by means of an electrically operated valve in the water supply line to the injector. In this case, flexible polyethylene or rigid PVC pipe is recommended for a minimum of three feet immediately upstream of the injector. This should reduce corrosion of metal pipe and components (valves, pump impellers, etc.) caused by diffusion of solution during shutdown periods.

**Adjustment of two-inch injector**

Injectors may be adjusted by means of an adjusting screw or knob at the bottom of the injector. A vacuum of at least six inches of mercury is required to obtain maximum feed. If the minimum vacuum cannot be obtained, check the actual hydraulic conditions against those specified on the order before attempting any service.

To adjust the injector for maximum suction power, start the gas feeder and set the feed rate at the maximum required. Turn the adjusting screw clockwise (up) or counterclockwise (down) until the highest vacuum is obtained. To adjust the injector for minimum water usage, start the gas feeder and set the feed

rate at the maximum required. Screw in (up) on the adjusting screw until the vacuum is just over the minimum required.

## 2.3.4 Point of Application

- Main Connection

If the point of application is a pressurized main, a suitable pipe tap is required in the main to accommodate the solution tube, corporation stop or diffuser. The solution tube should project into the main, approximately 1/3 to 1/2 the diameter of the main. If the tube is too long, shorten it by sawing off a portion. If the main connection includes a corporation cock, shorten the safety chain an equal amount, see dwg 50.845.06.011.

It is recommended that all solution delivery lines be fitted with a suitable valve and drain pipe to enable any pressure buildup to be safely released prior to maintenance work.

After the point of application a pipe length of at least 10 to 15 times the pipe diameter is necessary for a homogeneous mixing of the solution into the main water. After that, samples can be taken for residue control, etc.

- Open Well

If the point of application is into a basin, channel, etc. with negligible pressure, the line need only be supported so that its free end is adequately submerged (a minimum of six feet) and located in a non-stagnant area that best promotes rapid and thorough mixing of the solution into the water.

## 2.3.5 Water Supply and Solution Discharge Line

The injector requires a supply of reasonably clean water. The water line should include a suitable shut-off valve and a strainer.

Each installation is assembled to suit the operating water characteristics. The pressure and quantity of water required depends on the operating conditions (backpressure and gas feed rate). If the operating conditions change, it may be necessary to change the nozzle/injector throat and/or tailway to obtain optimum efficiency.

**NOTE: For intermittent start-stop operation, flexible polyethylene or rigid PVC pipe is recommended for a minimum of three feet immediately upstream of the injector. This should reduce corrosion of metal pipe and components (valves, pump impellers, etc.) caused by diffusion of solution during shut-down periods.**

It is recommended that all solution delivery lines be fitted with a suitable valve and drain pipe to enable any pressure buildup to be safely released prior to maintenance work.

If plastic flexible pipe is used, install it securely with clamps at the injector and the application point.



**CAUTION:** In all cases the solution discharge line must be supported and protected to avoid mechanical damage or kinking between the injector and the point of application.

Rigid PVC pipe or Evoqua Water Technologies solution hose is required between the injector discharge and the point of application. The size depends on the size of the throat and tailway used in the injector. Solution hose may be connected directly to the injector tailway. If rigid PVC pipe is used, a piece of straight pipe at least twelve inches long should be coupled to the end of the injector tailway before any elbows, tees or Saunders valves are used. This will prevent any flow disturbances that could affect the hydraulic performance of tailway connections.

## 2.4 Gas Connection



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, THE GAS CONTROL UNIT MUST BE CONNECTED TO A VACUUM GAS SUPPLY ONLY. DO NOT OPEN THE CYLINDER OR DRUM VALVE UNTIL THE SYSTEM HAS BEEN FULLY INSTALLED AND THE PRE-START CHECKS HAVE BEEN CARRIED OUT.

To reduce the pressure from the gas tanks, regulating valves and a safety relief valve are necessary (see typical installation). A vacuum regulator is connected to the control unit inlet. Install the vacuum regulator as directed in separate instruction book.

### 2.4.1 Gas Suction Line

The diameter of the vacuum line between regulating valve, control unit and injector depends on the gas flow and the distance and must not exceed the distance as determined on Dwg. 25.052.190.030.

If necessary, any size tubing or pipe can be installed which will not give more than five inches of water differential between control unit and vacuum regulator at maximum gas feed rate. Note that the equivalent length of the fittings must be added to the tubing length to obtain the total equivalent length.

The piping must be sized as required to obtain a minimum of six inches of mercury vacuum at the control unit.

When using polyethylene tubing, do not install it in narrow, poorly vented protection pipes or in the ground to prevent the tubing from fast embrittling under the influence of gas.

For gas supply installation details refer to the separate instruction book provided with vacuum regulator.



## 2.4.2 Safety Relief Valve and Vent Line



**CAUTION:** To avoid possible equipment damage, a pressure relief valve is required in the gas feed system. If the vacuum regulator does not provide pressure relief, a pressure relief valve must be installed at the control unit or in the vacuum gas supply line.

A pressure relief valve must be installed in the gas feed system, either at the vacuum regulator, the control unit, or in the vacuum line between the regulating valve and control unit.

There must not be any isolating valve between the pressure relief valve and the vacuum regulator.

A vent line is required from the pressure relief valve to a point outside the building where an occasional discharge of gas will not be objectionable. The proper installation of this line is important. The gradient of the line must be continuous without traps and down toward outside atmosphere. Point the atmospheric end down and screen it against the entrance of foreign materials. Where traps are unavoidable or a down gradient is not possible, provisions for condensate removal must be installed at all low points (drip leg). Suitable support for the vent is required throughout its entire length.



**WARNING:** THE PRESSURE RELIEF VALVE MUST BE VENTED TO OUTSIDE ATMOSPHERE. THE VENT LINE MUST TERMINATE IN AN AREA WHERE GAS FUMES CANNOT CAUSE INJURY TO PERSONNEL OR DAMAGE. DO NOT TERMINATE THE VENT LINE AT A LOCATION ROUTINELY USED BY PERSONNEL, SUCH AS WORK AREAS OR PATHWAYS NOR NEAR WINDOWS OR VENTILATION SYSTEM INTAKES.

## 2.5 Drain

A floor drain is always desirable to facilitate injector service.

## 2.6 Electrical Connections

If the gas feeder is furnished with other accessories requiring a power supply or wiring to other equipment, appropriate wiring diagrams will be found in the instructions for the accessory items. See the INSTALLATION WIRING diagrams for the electronic controller connections in the separate instruction book.

**NOTE:** Field wiring must conform to local electrical codes.

## 2.7 Vacuum Alarm Switch

If a vacuum alarm switch has been ordered, see separate Instruction Book.

## 2.8 Interconnection of Components

With the control unit(s), injector(s) and vacuum regulator(s) in place, a system is completed by installing the interconnecting tubing and vent tubing. Support long runs of tubing or pipe in a suitable manner, using tube clips or ties appropriate to the site.

For each tubing end to be connected, make a clean square cut at the end of the tubing using a sharp knife, then proceed as appropriate:

- For 1/4" x 3/8" tubing and the Evoqua Water Technologies PVC tubing connector:
  - a. Slip a union nut over the tubing, threaded end facing the tubing end.
  - b. Insert a common pencil into the end of the tubing to flare it outward slightly for easier installation on the half union.
  - c. Press the tubing onto the tapered end of the half union, tilting and pushing by hand until the end of the tubing touches the shoulder at the base of the taper.
  - d. Hold the tubing so the end remains in contact with the shoulder, while the thread is engaged and the union nut tightened.

**NOTE: Finger tightening is sufficient. Do not use pliers or wrench.**

- For tubing used with commercial connectors:
  - a. Slip a union nut with grab ring and support over the tubing, threaded end facing the tubing end.
  - b. Insert tubing end into connector.
  - c. Hand tighten nut.
- Install the following sections of tubing:
  - a. From the union on the right of the control unit to the union on the injector.
  - b. From the pressure relief valve (on the left of the control unit to the left of the rotameter, when installed at the control unit) to an outside point where an occasional odor will not be objectionable. Slope this section of tubing downward without traps to a point lower than the control unit. Do not run this end of the tube upward. Install the screen provided over the outer end of the tube to prevent insects from clogging it. Secure the screen with a clamp, wire or electrical tape.

## V10K V-NOTCH CHLORINATOR



**WARNING:** THE CONTROL UNIT MUST BE VENTED TO OUTSIDE ATMOSPHERE. THE VENT LINE MUST TERMINATE IN AN AREA WHERE GAS FUMES CANNOT CAUSE DAMAGE OR INJURY TO PERSONNEL. DO NOT TERMINATE THE VENT LINE AT A LOCATION ROUTINELY USED BY PERSONNEL, SUCH AS WORK AREAS OR PATHWAYS NOR NEAR WINDOW OR VENTILATION SYSTEM INTAKES.

- c. From the union on the left of the control unit below the rotameter to the vacuum regulator.

# V10K V-NOTCH CHLORINATOR

## **TEMPERATURE AND PRESSURE:**

PVC PIPE IS NOT RECOMMENDED FOR TEMPERATURES OVER 130°F OR BELOW 0°F, NOR FOR LINES THAT MAY BE EXPOSED TO PHYSICAL ABUSE (SEE MANUFACTURER'S RECOMMENDATIONS). ONE HUNDRED FEET OF PIPE WILL EXPAND OR CONTRACT APPROXIMATELY 0.7 INCHES FOR EVERY 10°F TEMPERATURE CHANGE. MANUFACTURER'S RECOMMENDED MAXIMUM WORKING PRESSURES SHOULD NOT BE EXCEEDED.

## **SUPPORT AND PROTECTION:**

IT IS PREFERABLE TO SUPPORT HORIZONTAL OVERHEAD LINES WITH A CHANNEL OR ANGLE IRON PARALLEL TO THE PIPE. IF STRAP HANGERS ARE USED, SPACE THEM AT 2- TO 4-FOOT INTERVALS, AS RECOMMENDED BY THE PIPE MANUFACTURER. PIPE SHOULD NOT REST DIRECTLY ON RODS OR WIRES. PIPE MAY BE LAID UNDERGROUND WITH NO SPECIAL PRECAUTIONS OTHER THAN THOSE USED FOR IRON PIPE.

## **THREADING:**

SCHEDULE 80 PVC PIPE CAN BE CUT AND THREADED WITH STANDARD PIPE TOOLS, EITHER HAND OR POWER DRIVEN. STANDARD DIES COMMONLY USED FOR METAL PIPE WILL PRODUCE SATISFACTORY THREADS, THOUGH A 5° NEGATIVE RAKE ANGLE IS PREFERRED. KEEP DIES CLEAN AND SHARP AT ALL TIMES. DIES THAT HAVE BEEN USED EXTENSIVELY FOR STEEL PIPE MAY NOT PRODUCE GOOD THREADS UNLESS RESHARPENED. USE NORMAL CUTTING SPEEDS; NO LUBRICANT OR CUTTING OIL IS REQUIRED. A TAPERED PLUG (AVAILABLE FROM THE MANUFACTURER, IF DESIRED) TAPPED FIRMLY INTO THE END OF THE PIPE PREVENTS DISTORTION OF THE PIPE AND DIGGING-IN BY THE DIE, AS WELL AS CORRECTS ANY SLIGHT OUT-OF-ROUND THAT MAY EXIST. TAKE CARE TO CENTER THE DIE ON THE PIPE AND ALIGN THE THREAD TO PREVENT REDUCING THE WALL EXCESSIVELY ON ONE SIDE. SCHEDULE 40 PVC CANNOT BE THREADED.

## **THREADED JOINTS:**

THREADED JOINTS IN PVC PIPE REQUIRE MORE CARE THAN THOSE IN SIMILAR SIZE METAL PIPE. IF A NON-LUBRICATING THREAD COMPOUND IS USED, THE JOINT MAY FEEL TIGHT WHEN ONLY 2 OR 3 THREADS ARE ENGAGED. IF TEFLON TAPE OR SIMILAR LUBRICATING THREAD COMPOUND IS USED, THE JOINT MAY NOT FEEL TIGHT AT ALL, AND OVERTIGHTENING—RESULTING IN CRACKED FITTINGS OR STRIPPED THREADS—CAN EASILY OCCUR. CARE MUST BE TAKEN TO ENGAGE THE JOINED PARTS TO A NORMAL ENGAGEMENT OF 5 TO 7 TURNS AND NO MORE. STRAP WRENCHES ARE PREFERRED FOR ASSEMBLY, AS THE SHARP EDGES ON PIPE WRENCHES MAY SCORE AND WEAKEN THE PIPE.

## **FLANGED JOINTS:**

FOR FLANGED JOINTS, USE A FULL-FACED RUBBER GASKET AND FLAT WASHERS UNDER BOLTS AND NUTS. TIGHTEN OPPOSITE FLANGE BOLTS TO COMPRESS THE GASKET TO A SLIGHT DEGREE, BUT DO NOT DISTORT THE FLANGE.

## **SOLVENT WELD OR CEMENT JOINTS:**

ALWAYS USE CEMENT RECOMMENDED BY THE MANUFACTURER. ADD THINNER IF CEMENT THICKENS FROM EXPOSURE TO THE AIR.

1. CUT PIPE WITH ORDINARY HAND OR POWER SAW. MAKE A SQUARE CUT AND REMOVE BURRS.
2. CLEAN AND DRY OUTSIDE OF PIPE AND INSIDE OF FITTING.
3. APPLY A THIN COAT OF CEMENT TO INSIDE OF FITTING AND OUTSIDE OF PIPE. USE A NATURAL BRISTLE PAINT BRUSH. CEMENT TO BE WITHIN 1/4" BUT NOT CLOSER THAN 1/8" FROM END OF PIPE TO PREVENT INTERNAL BEAD FROM FORMING.
4. WHILE THE CEMENT IS STILL WET, STAB THE PIPE INTO THE FITTING AND GIVE 1/8 TURN.
5. AVOID ROUGH HANDLING FOR ONE HOUR. DEPENDING ON ATMOSPHERIC CONDITIONS, APPROXIMATELY 50% STRENGTH WILL BE ATTAINED IN 2 HOURS AND FULL STRENGTH IN 48 HOURS.

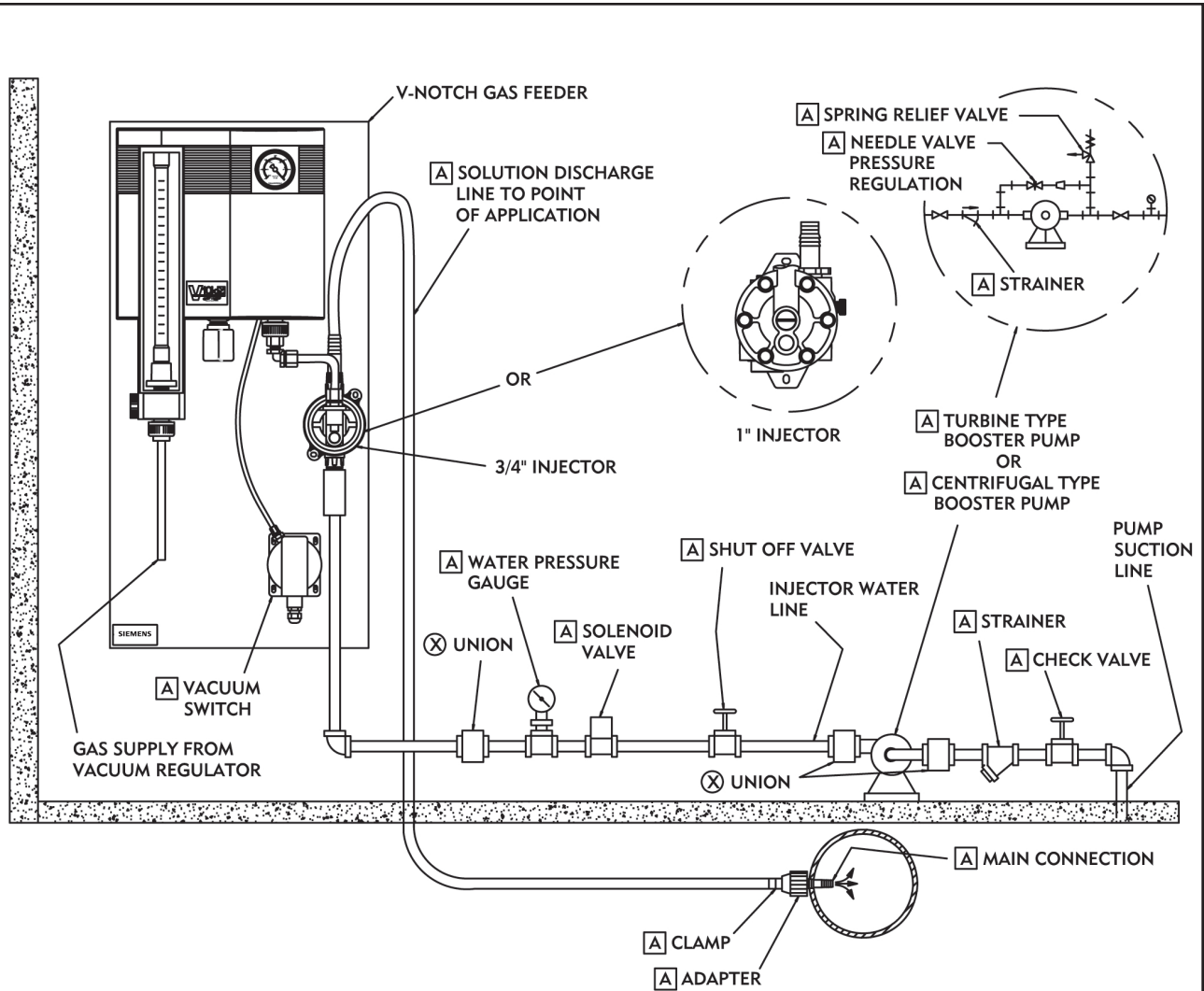
PIPE SIZE	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	3"	4"
JOINTS PER PINT OF CEMENT	50	50	35	35	25	25	16	12

CEMENT AVAILABLE FROM EVOQUA WATER TECHNOLOGIES IN PINT CANS (U24647). ALSO AVAILABLE COMMERCIALY IN PINT, QUART AND GALLON CANS.

**PVC PIPE - INSTALLATION**  
**Fabrication and Installation**

**50.830.110.011**  
ISSUE 14 6-14

# V10K V-NOTCH CHLORINATOR



**NOTE:** [A] ACCESSORY ITEM FURNISHED ONLY IF SPECIFICALLY LISTED IN QUOTATION.

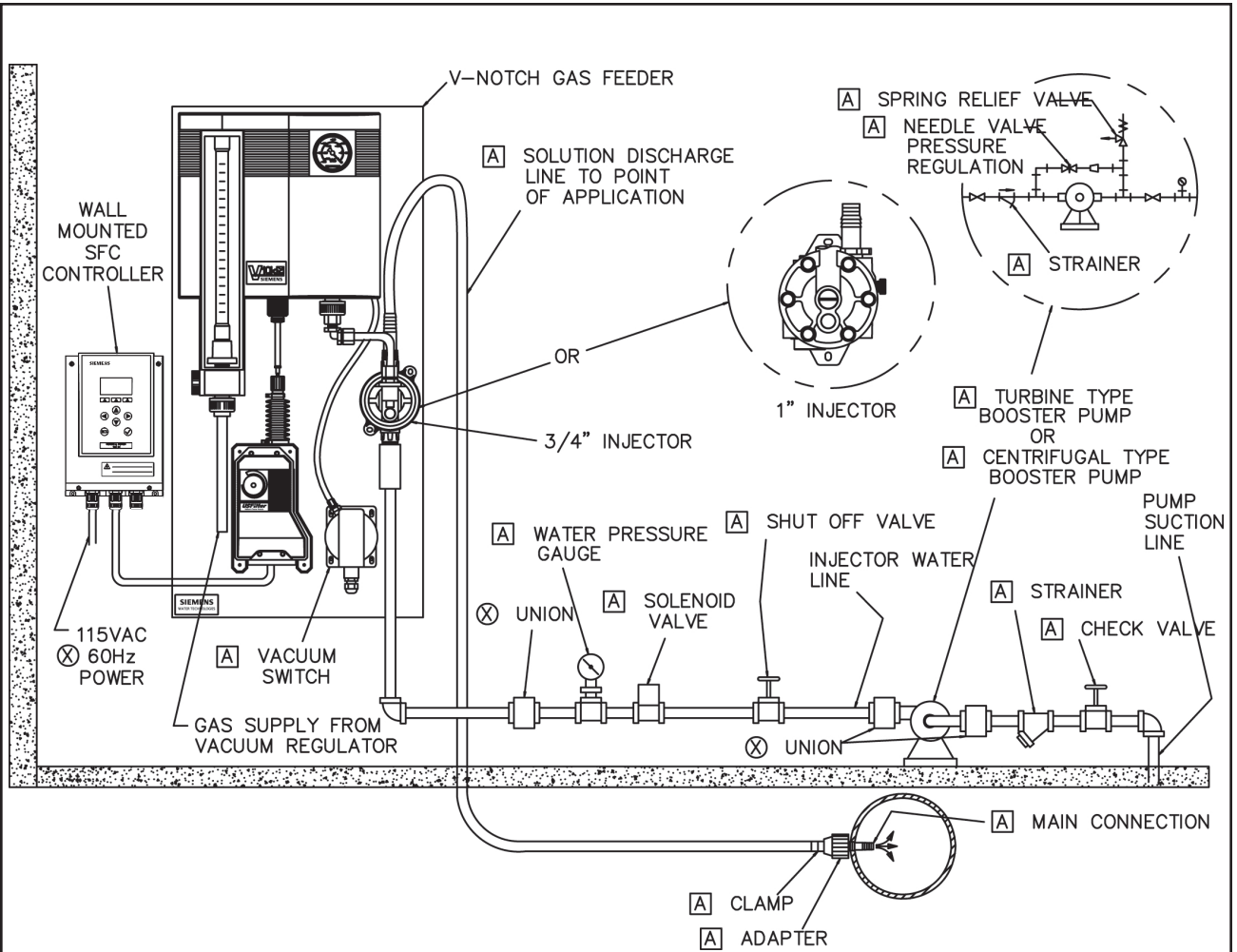
⊗ NOT FURNISHED BY EVOQUA WATER TECHNOLOGIES.

200PPD AND 500PPD V10k V-NOTCH GAS FEEDER  
- TYPICAL INSTALLATION

25.100.110.030

ISSUE 2 6-14

# V10K V-NOTCH CHLORINATOR



**NOTE:** [A] ACCESSORY ITEM FURNISHED ONLY IF SPECIFICALLY LISTED IN QUOTATION.

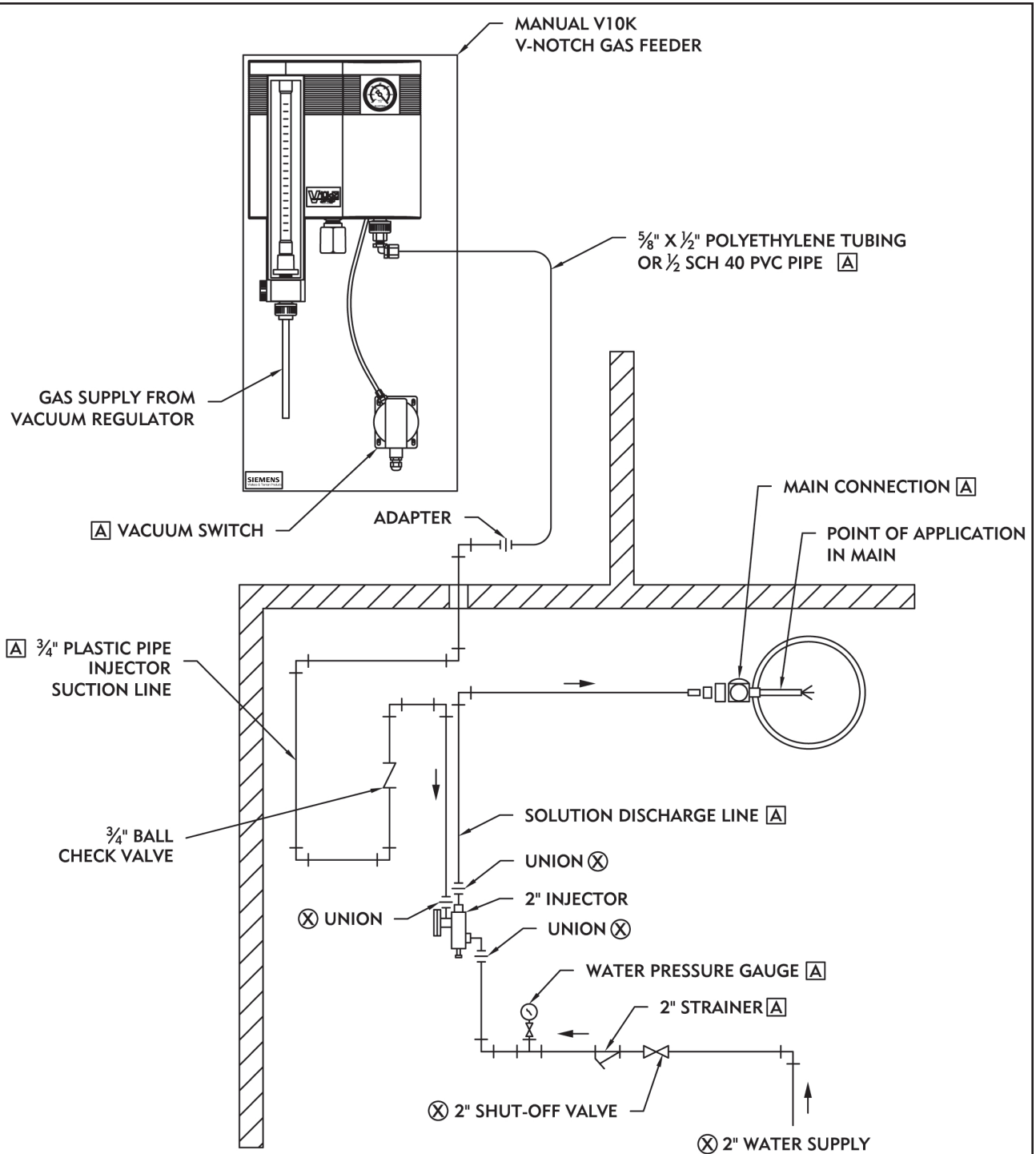
[X] NOT FURNISHED BY EVOQUA WATER TECHNOLOGIES.

200PPD AND 500PPD AUTOMATIC V10k V-NOTCH PANEL  
- TYPICAL INSTALLATION

25.100.110.040

ISSUE 2 6-14

# V10K V-NOTCH CHLORINATOR



**NOTE:** [A] ACCESSORY ITEM FURNISHED ONLY IF SPECIFICALLY LISTED IN QUOTATION.

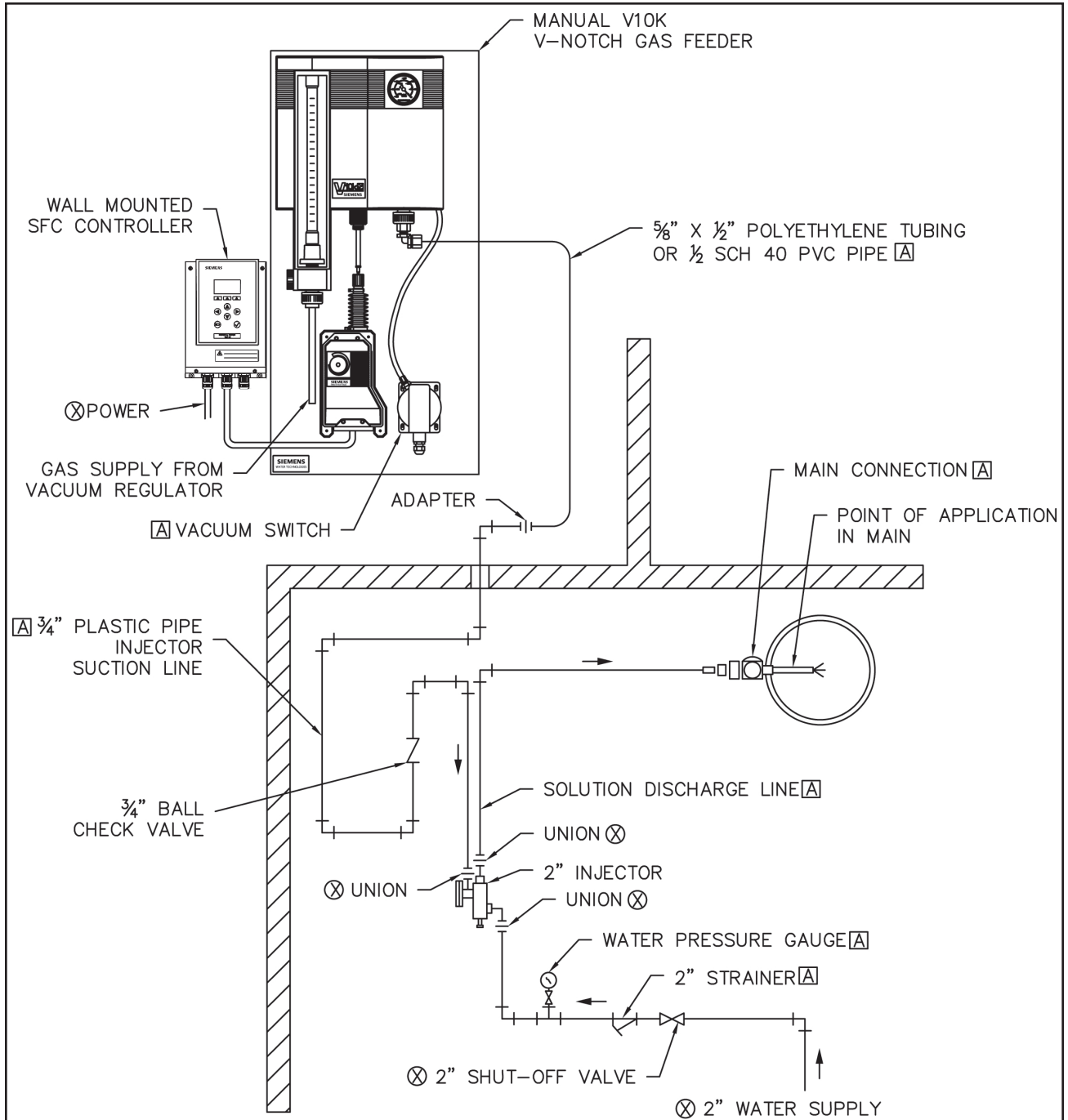
(X) NOT FURNISHED BY EVOQUA WATER TECHNOLOGIES.

750PPD V10k V-NOTCH GAS FEEDER - TYPICAL INSTALLATION  
Manual Arrangement

25.100.110.050

ISSUE 1 6-14

# V10K V-NOTCH CHLORINATOR



**NOTE:** ⊡ ACCESSORY ITEM FURNISHED ONLY IF SPECIFICALLY LISTED IN QUOTATION.

⊗ NOT FURNISHED BY EVOQUA WATER TECHNOLOGIES.

750PPD AUTOMATIC V10k V-NOTCH PANEL  
- TYPICAL INSTALLATION

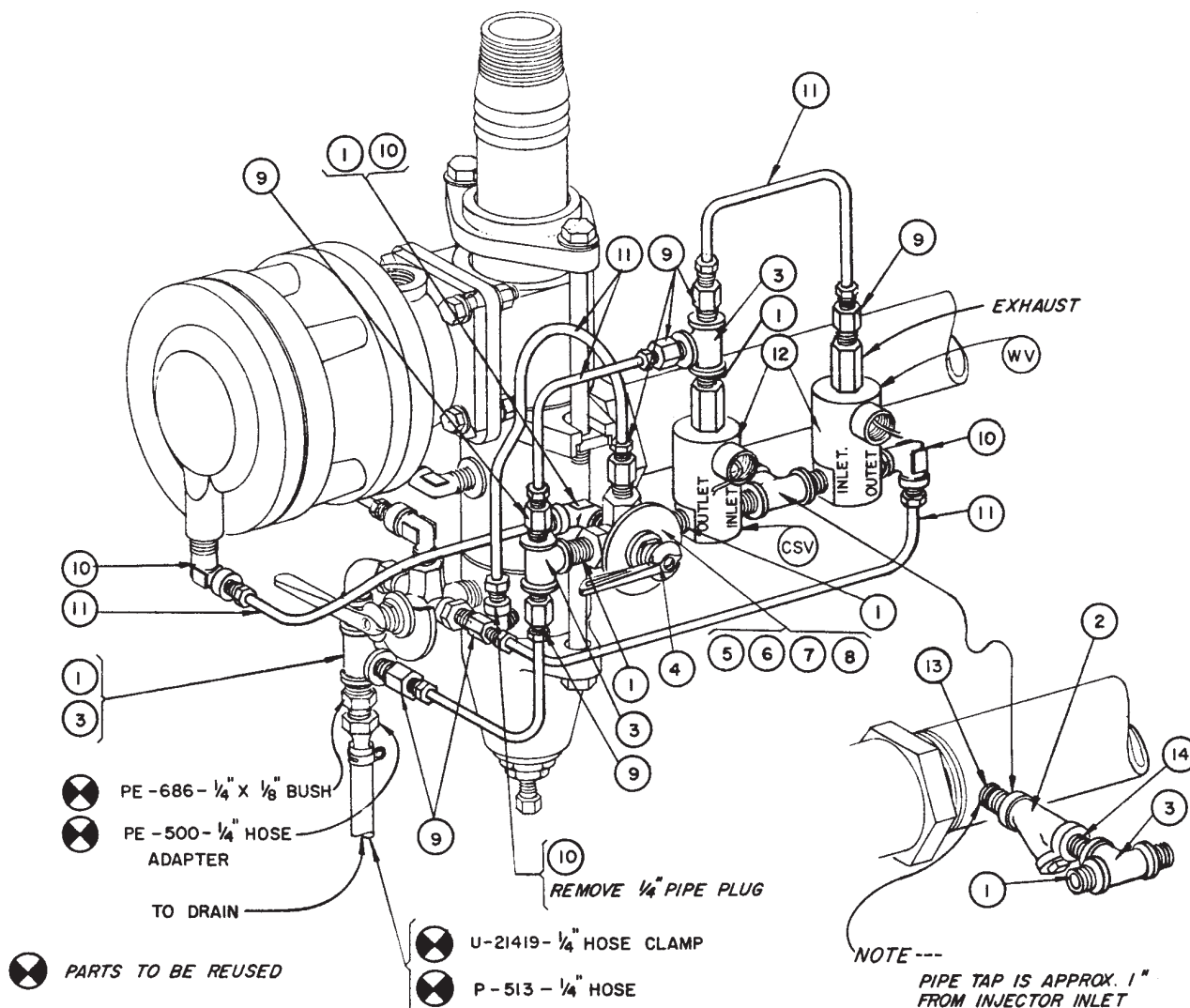
25.100.110.060

ISSUE 2 6-14



# V10K V-NOTCH CHLORINATOR

REF. NO.	PART NO.	DESCRIPTION	QTY.
1	P 629	1/4" CLOSE PIPE NIPPLE	7
2	U 9967	3/8" "Y" TYPE STRAINER	1
3	P 695	PIPE TEE	4
4	U 16435	SELECTOR VALVE	1
5	P 40633	INDICATOR PLATE	1
6	PE 28283	MACH. SCREW (RD. HD.,BRASS) 10 - 24 x 1/2" LG.	2
7	PE 5663	#10 WASHER	2
8	PE 14725	HEX.NUT (#10-24)	2
9	U 14710	1/4" PIPE x 1/4" TUBE HALF UNION	8
10	U 16096	1/4" PIPE x 1/4" TUBE HALF UNION ELBOW	4
11	RC59 4440	1/4" OD x .186" ID COPPER TUBING	6'-0"
12	U 19574	1/4" 3-WAY N.C. SOLENOID VALVE (115 V. 60 CYCLE)	2
13	P 1079	3/8" CLOSE PIPE NIPPLE	1
14	P 10917	3/8" x 1/4" PIPE REDUCING BUSHING	1



2" INJECTOR - INSTALLATION PIPING  
Connections for Prime and Flush Operation

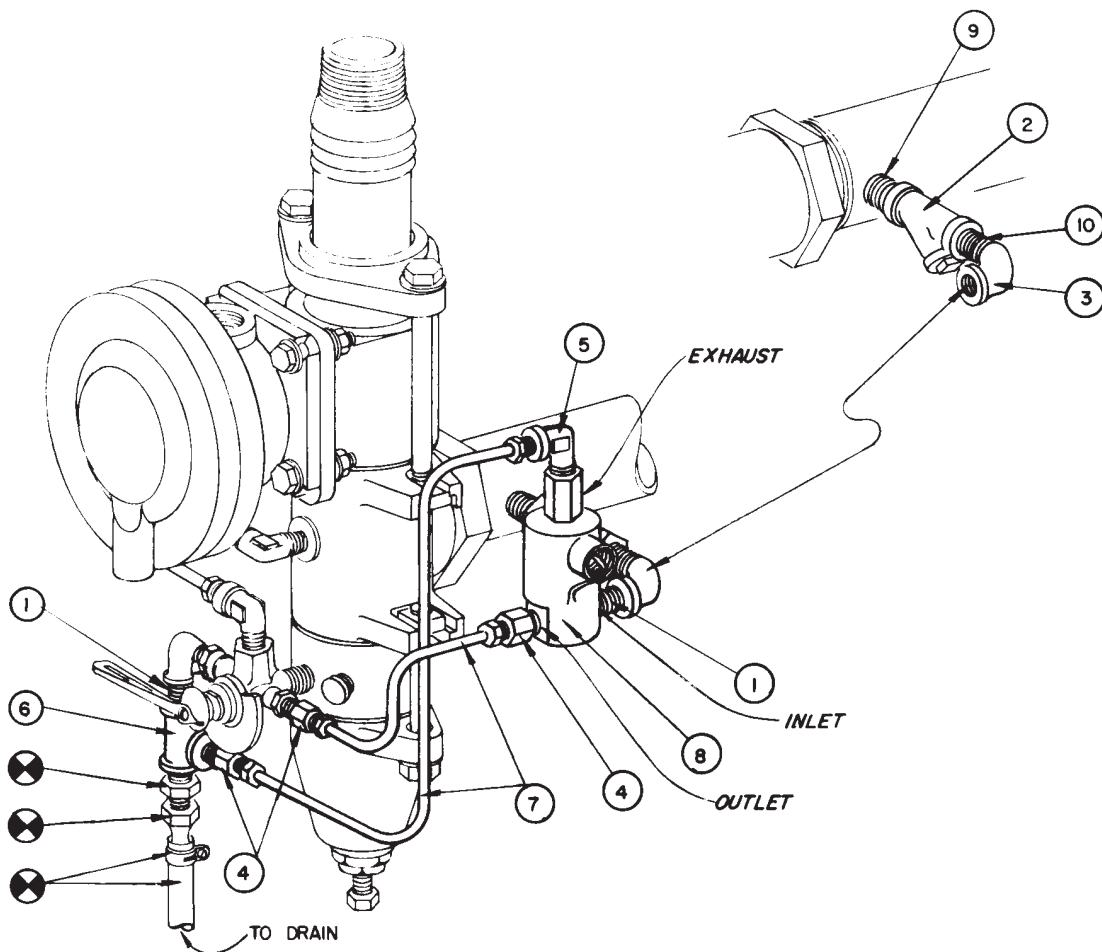
25.100.006.122

ISSUE 4 8-93

# V10K V-NOTCH CHLORINATOR

## PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QUANT.
1	P 629	1/4" CLOSE PIPE NIPPLE	2
2	U 9967	3/8" "Y" TYPE STRAINER	1
3	P 698	1/4" STREET ELBOW	1
4	U 14710	1/4" PIPE x 1/4" TUBE HALF UNION	3
5	U 16096	1/4" PIPE x 1/4" TUBE HALF UNION ELBOW	1
6	P 695	1/4" TEE	1
7	RC59 4440	1/4" OD x .186" ID COPPER TUBING	3'-0"
* 8	U 19574	1/4" THREE WAY N.C. SOLENOID VALVE (115 VOLT, 60 CYCLE)	1
9	P 1079	3/8" CLOSE PIPE NIPPLE	1
10	P 10917	3/8" x 1/4" PIPE REDUCING BUSHING	1



PARTS TO BE RELOCATED & REUSED

\* NOT INCLUDED IN G634

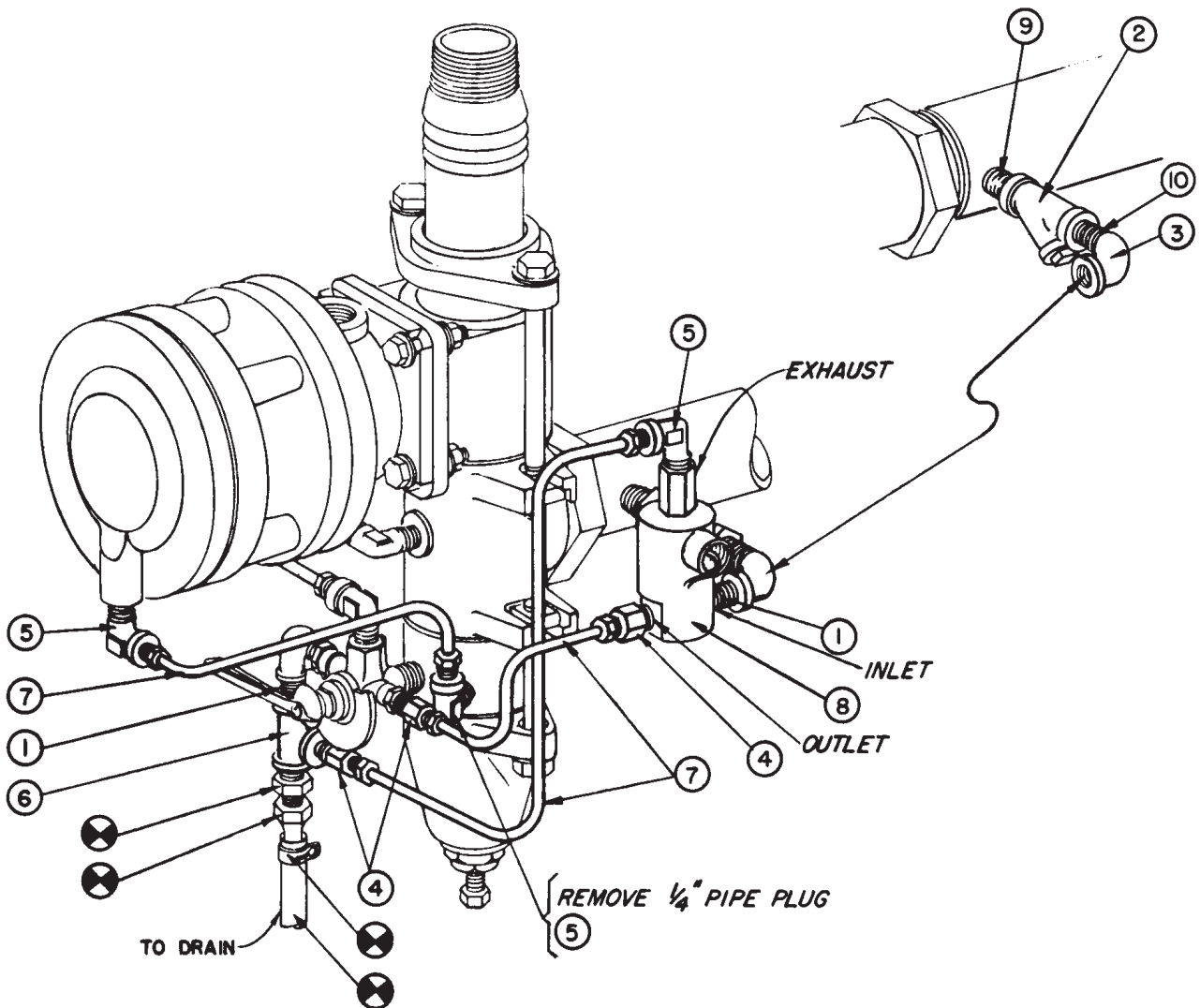
2" INJECTOR - INSTALLATION PIPING  
Connections for Intermittent Start-Stop Operation

25.100.006.142

ISSUE 2 4-93

# V10K V-NOTCH CHLORINATOR

REF. NO.	PART NO.	DESCRIPTION	QTY.
1	P 629	1/4" CLOSE PIPE NIPPLE	2
2	U 9967	3/8" "Y" TYPE STRAINER	1
3	P 698	1/4" STREET ELBOW	1
4	U 14710	1/4" PIPE x 1/4" TUBE HALF UNION	3
5	U 16096	1/4" PIPE x 1/4" TUBE HALF UNION ELBOW	3
6	P 695	1/4" TEE	1
7	RC59 4440	1/4" OD x .186" ID COPPER TUBING	4'-0"
□ 8	U 19574	1/4" 3-WAY N.C. SOLENOID VALVE (115 V. 60 CYCLE)	1
9	P 1079	3/8" CLOSE PIPE NIPPLE	1
10	P 10917	3/8" x 1/4" PIPE REDUCING BUSHING	1



⊗ PARTS TO BE RELOCATED & REUSED

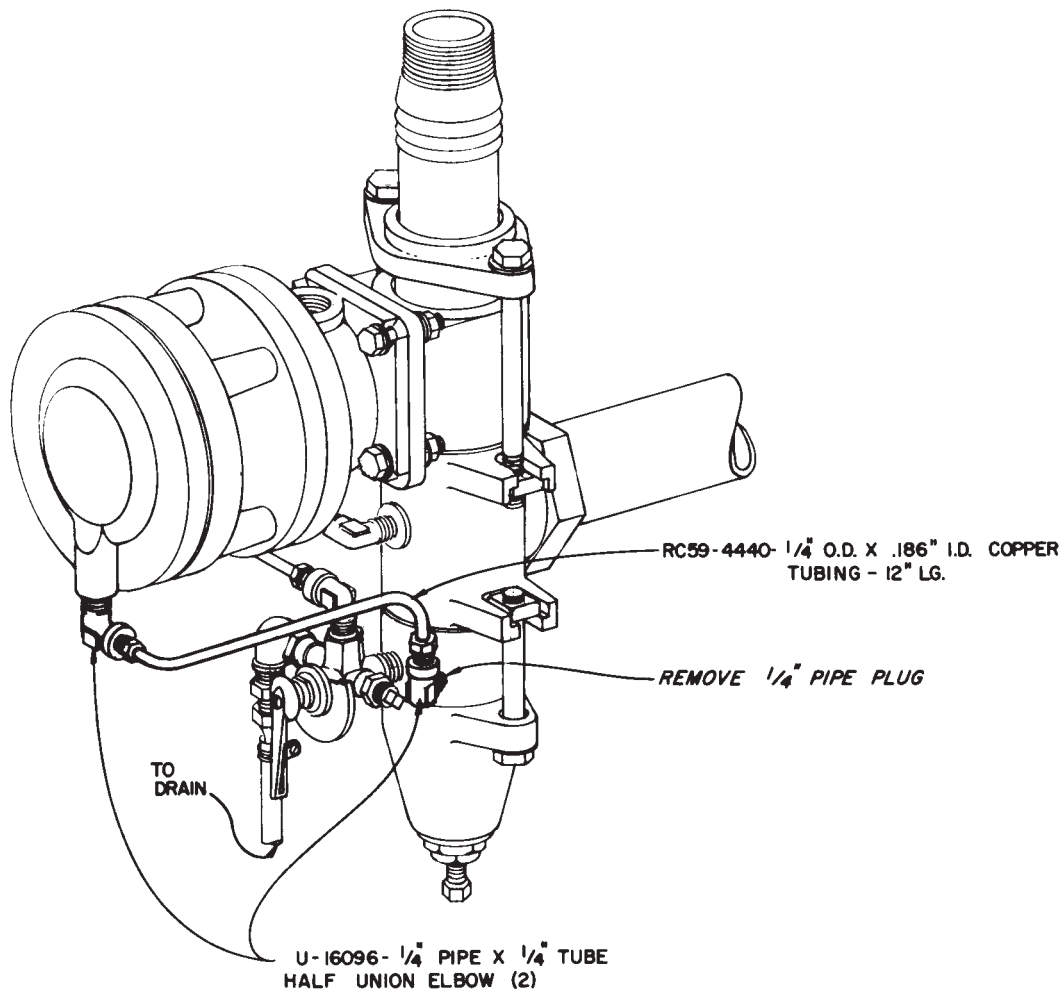
\* NOT INCLUDED IN G635

2" INJECTOR - INSTALLATION PIPING  
Connections for Intermittent Start-Stop Operation  
With Injector Suction Shut-Off Unit

25.100.006.152

ISSUE 2 8-92

# V10K V-NOTCH CHLORINATOR



2" INJECTOR - INSTALLATION PIPING  
Connections for Manual Suction Shut-Off Unit

25.100.06.131

ISSUE 3 1-90

# V10K V-NOTCH CHLORINATOR

# SECTION 3

# V10K V-NOTCH CHLORINATOR

## SECTION 3 - OPERATION

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## 3.1 Description

### 3.1.1 Intended Use

The V10k Gas Feeder is the central item of a disinfection system which doses gas under vacuum into a flow of water at rates ranging up to 750 ppd (15 kg/h). Other use is prohibited without permission from Evoqua Water Technologies.

### 3.1.2 Theory of Operation

The Evoqua Water Technologies V10k Gas Feeder is designed to control and indicate the rate of flow of gas under vacuum. It provides a simple means of setting the feed rate at any value within the range of the machine and mixes the gas with water.

Operating water passes through an injector to produce a vacuum which draws gas from the gas feeder. This gas mixes with the water flowing through the injector. A poppet check and diaphragm check are built into the fixed throat injector to prevent a backflow of water into the gas feeder should the injector water supply be shut off with pressure on the injector discharge, or should the injector discharge line be restricted. Proper operation of the injector is dependent on the inlet pressure being sufficiently higher than the discharge pressure. The differential regulating valve in the V10k control unit throttles the injector vacuum to maintain the proper operating vacuum on the downstream side of the V-notch variable orifice relative to the gas supply vacuum.

Gas under pressure enters the vacuum regulator. The gas pressure is reduced to less than atmospheric pressure as the gas passes through a valve seat which will not open unless an operating vacuum is produced by the injector. This provides a controlled vacuum on the upstream side of the V-notch variable orifice. In the extremely unlikely event that the valve passes gas under pressure, a pressure relief valve permits this gas to pass out the vent.

From the vacuum regulator, gas under a controlled vacuum passes through the rotameter (feed rate indicator) causing the float to indicate the rate of flow on an easily read scale. The rate of flow is controlled by the position of the V-notch variable orifice across which a constant differential at less than atmospheric pressure is maintained, by the combined operation of the differential regulating valve and the vacuum regulator.

In the event of gas supply exhaustion, the diaphragm check valve in the injector will close when the system reaches full vacuum.

If the operating water is shut off, the vacuum breaks down and the vacuum regulating valve interrupts the gas flow. In case of a leak in the tubing from the vacuum regulating valve to the injector or in the gas feeder, only air can enter into the system, but no gas can escape.



## 3.1.3 Control Possibilities

The gas flow is directly indicated on the flowmeter in ppd (pounds per day) or optional kg/24 hr. Within the feed range, every feed rate can be adjusted (750 PPD = maximum is 15 kg/h).

- Manual Adjustment

Manually: Adjustment of the feed rate is done manually.

Semi-Automatic: Adjustment of the feed rate is done by switching the injector on and off using a solenoid valve or booster pump.

- Automatic Adjustment

Automatically: Adjustment of the feed rate is done by an electric positioner activated by a controller.

Electric Manual: Adjustment of the feed rate is done by using the manual selection of the controller.

Manual: Pull out the knob on the positioner and turn to adjust the feed rate. To return to automatic control, push in the knob and slightly turn it until it snaps in.

The chlorinator can be fitted with different flowmeters and V-notch orifices. The dosage range can be changed by changing the flowmeter V-notch and, if necessary, the injector.

## 3.2 Preparation For Initial Operation



**WARNING: HAZARDOUS GAS IS PRESENT IN THIS EQUIPMENT DURING NORMAL OPERATION. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, READ THIS INSTRUCTION BOOK AND THE APPROPRIATE GAS MANUAL BEFORE CONNECTING THIS EQUIPMENT TO A SUPPLY OF GAS. OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST BE RESTRICTED TO TRAINED, QUALIFIED PERSONNEL WHO ARE COMPLETELY FAMILIAR WITH THESE INSTRUCTIONS.**

When all the connections in the INSTALLATION Section have been made, the following pre-start checks must be carried out before the system can be taken into operation.

### 3.2.1 Physical Check

- a. Ensure that the gas supply lines from the cylinder or ton containers are securely connected and that all valves in the system are closed.

- b. Check that the water inlet line from the source of supply to the injector is securely connected.
- c. Ensure the pressure relief vent line is securely connected to the pressure relief valve and that it is terminated correctly.
- d. Ensure the injector gas suction line is correctly fitted to the control unit gas outlet and to the injector.
- e. Check the solution line from the injector to the point of application.

### 3.2.2 Injector Vacuum and Leak Test

- a. Keep the valves on the gas supply tanks closed. Open the valves in the water supply line to the injector and at the point of application. Check for leaks. Ensure that there is water at the point of application ready for operation.
- b. Injector operating vacuum is indicated on the vacuum gauge of the control unit, the pointer should be full scale.
- c. Check that the flowmeter float remains at the bottom stop. Any movement of the float indicates an entrance of air in one of the following locations:
  - (1) Through the pressure relief valve seat. This can be determined by holding a finger over the vent connection on the pressure relief valve. Refer to Section 4, Service, for correction.
  - (2) Through the O-ring on the bottom of the flowmeter or through cracks in the flowmeter at the ring gasket at the bottom of the rotameter. This can be corrected by proper lubrication of the O-ring with a thin film of Halocarbon grease and ensuring that the rotameter is seated on the O-ring.
  - (3) Through the O-rings at the pipe connections or tubing connections.
  - (4) Through any incorrectly cemented joints at any tubing connector or pipe fitting in the gas supply line. This may be corrected by tightening the connector or fitting, or by replacing any defective connector O-ring. Apply a thin film of Halocarbon grease to all O-rings before installing.
- d. Check the following to ensure all connections are tight:
  - (1) The V-notch extension chamber through which the V-notch plug travels.
  - (2) The gasket at the bottom of the differential regulating valve and pressure relief valve.
  - (3) The connections of both ends of the plastic tubing on the gas discharge line to the injector.

**NOTE:** Vacuum leaks ahead of the rotameter (as listed in preceding step c) will result in errors in gas feed. Vacuum leaks after the rotameter (as listed in step d) may impair the performance of the injector.

### 3.2.3 Gas Supply Check for Leaks



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, DO NOT TOLERATE ANY GAS LEAKS. LEAKS ALWAYS GET PROGRESSIVELY WORSE AND MUST BE CORRECTED PROMPTLY.

After the vacuum regulator unit(s) is in place and before the gas tubing which will connect it to the control unit is installed, check for gas leaks as directed in the separate instruction book provided with the vacuum regulator.

## 3.3 Operating Procedure

### 3.3.1 To Start

- a. Open the point of application and the injector operating water valves.



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, DO NOT OPEN THE GAS SUPPLY CONTAINER VALVE MORE THAN ONE COMPLETE TURN. THIS WILL PERMIT MAXIMUM DISCHARGE AND CAN ALSO BE TURNED OFF QUICKLY IN CASE OF A GAS LEAK.

- b. Turn on the gas supply at the supply container valve and the vacuum regulator. If there are two units (automatic switchover system), turn on only the one on the supply container which is to be used first.
- c. Turn the feed rate adjuster knob counterclockwise (unscrew) to obtain maximum feed. The injector should develop a dynamic vacuum of at least six inches of mercury at maximum gas flow rate. If maximum indicated feed rate cannot be obtained:
  - (1) Ensure that no vacuum leaks exist. Refer to paragraph 3.2.2, Injector Vacuum and Leak Test.
  - (2) Refer to paragraph 4.9, Troubleshooting.
- d. Adjust the gas feed rate as desired. Rotation of the knob counterclockwise increases the feed rate.
- e. Check that the vacuum gauge pointer is in the green sector.
- f. If there are two vacuum regulators, turn on the gas supply at the second supply container valve and vacuum regulator.

## 3.3.2 To Stop for Short Periods

Reduce the feed rate to zero or close the injector operating water valve.

## 3.3.3 To Stop for Extended Periods

The following procedure must be carried out before any gas control unit servicing is undertaken.

- a. Turn off the gas supply at each supply container valve. Allow the control unit to operate until the flowmeter float remains on the bottom stop and the vacuum gauge reads full scale.
- b. Then, turn off the injector operating water.
- c. Shut off the vacuum regulator.

### 3.3.3.1 For Winter Shut-Down

If the gas feeder is to be shut down for an extended period during freezing weather, the following procedure must be followed:

- a. Operate the injector with the gas supply turned off at the supply container valve(s) until the vacuum supply gauge reads full scale and rotameter float settles on bottom stop.
- b. Shut off the water supply and drain the line to the injector.
- c. Drain the solution discharge line and prevent any water flow into discharge line.
- d. Drain any water in the injector.

**NOTE: If the gas feeder is to be removed for storage, the gas inlet fitting and all gas lines should be sealed with rubber stoppers to prevent the entrance of atmospheric moisture during the storage period. If a pump is being used, follow pump manufacturer instructions for extended shut-down.**

## 3.4 Intermittent Start-Stop Operation

Operation of the gas feeder in synchronism with a pump or other apparatus may be accomplished by installing an electrically operated solenoid valve in the injector water supply line and connecting it so the valve is open when the pump is running and closed when the pump is shut down.

## 3.5 Automatic Operation

Refer to the automatic controller book for automatic operation.

## 3.6 Changing Gas Supply Containers

Refer to the separate instruction book provided with vacuum regulator for detailed instructions and precautions.

## 3.7 2" Injector Manual Operation (See Dwg. 25.100.181.011)

- Application Against Pressure

When the three-way valve is in the ON position, water flows from the injector inlet through strainer (A) and three-way valve (B) to chamber (C). Pressure in chamber (C) overcomes the force of spring (D), opening plug (E) the distance determined by the setting on adjuster screw (F) and permitting water to flow through the injector. The flow of water through the injector creates a vacuum, which pulls diaphragm (G), which opens seat (H), and permits gas to be drawn from the gas feeder.

When the three-way valve is turned to the OFF position, pressure in chamber (C) is relieved and a spurt of water passes through the OFF port in the three-way valve to waste. Spring (D) closes plug (E) and, with no water flowing through the injector to create a vacuum, spring (J) closes seat (H) to prevent water on the injector discharge from backing up into the gas feeder.

- Application Against Negative Head

If the injector described above were used where a negative head existed at the injector discharge, when the injector was shut down, this suction might act on diaphragm (G) with sufficient force that spring (J) could not close seat (H) with the result that gas would be drawn from the gas feeder.

To prevent this, an injector suction shut-off unit is added to the injector. When the three-way valve is in the OFF position, this unit, by the force of spring (K) through diaphragm (L) and the attached linkage, exerts a pull on diaphragm (G) and holds seat (H) closed. When the three-way valve is in the ON position, pressure from chamber (C) is transmitted to diaphragm (L) and the injector operates as described above.

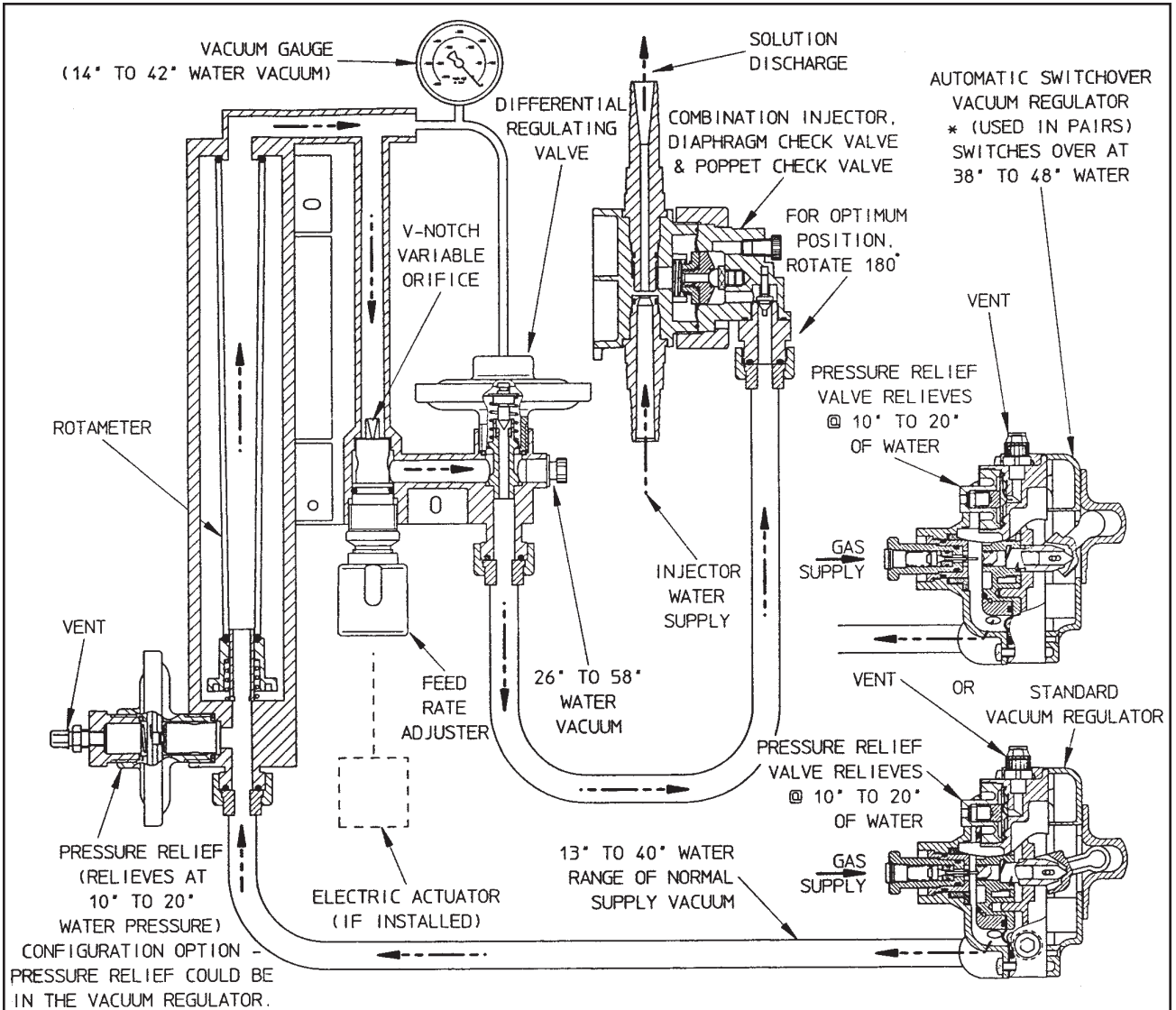
## 3.8 2" Injector Intermittent Start-Stop Operation (See Dwg. 25.100.181.021)

When the injector is connected to operate in conjunction with a pump, a solenoid valve is added so that, when the three-way valve is in the START-STOP position, electrical operation of the solenoid performs the same function as manual operation of the three-way valve as previously described. When the solenoid is energized, water passes from the injector water supply through strainer (M) through solenoid (N) and the three-way valve to chamber (C). When the solenoid is de-energized, the water supply is cut off and the exhaust port is opened permitting pressure chamber (C) to be relieved to waste.

## 3.9 2" Injector Prime and Flush Operation (See Dwg. 25.100.181.031)

In an application such as the intermittent de-sliming process, it is desirable to run water through the system before and after operation. This is accomplished with a two-solenoid system. Operation is as follows: Both three-way valves are set in the START-STOP position. Energizing only the right hand solenoid (WV) passes water to chamber (C) causing the plug in the injector to open and water to flow through the injector for priming. The injector suction shut-off unit prevents the flow of gas until the operation period when left-hand solenoid (CSV) is energized. At the end of the operation period, the left-hand solenoid is de-energized and the injector shut-off unit stops the flow of gas. Water continues to flow through the injector for flushing until the end of the cycle, when the right-hand solenoid is de-energized. Operation of the solenoids is usually accomplished by a program clock in which each portion of the cycle may be fixed by setting adjustable cams.

# V10K V-NOTCH CHLORINATOR



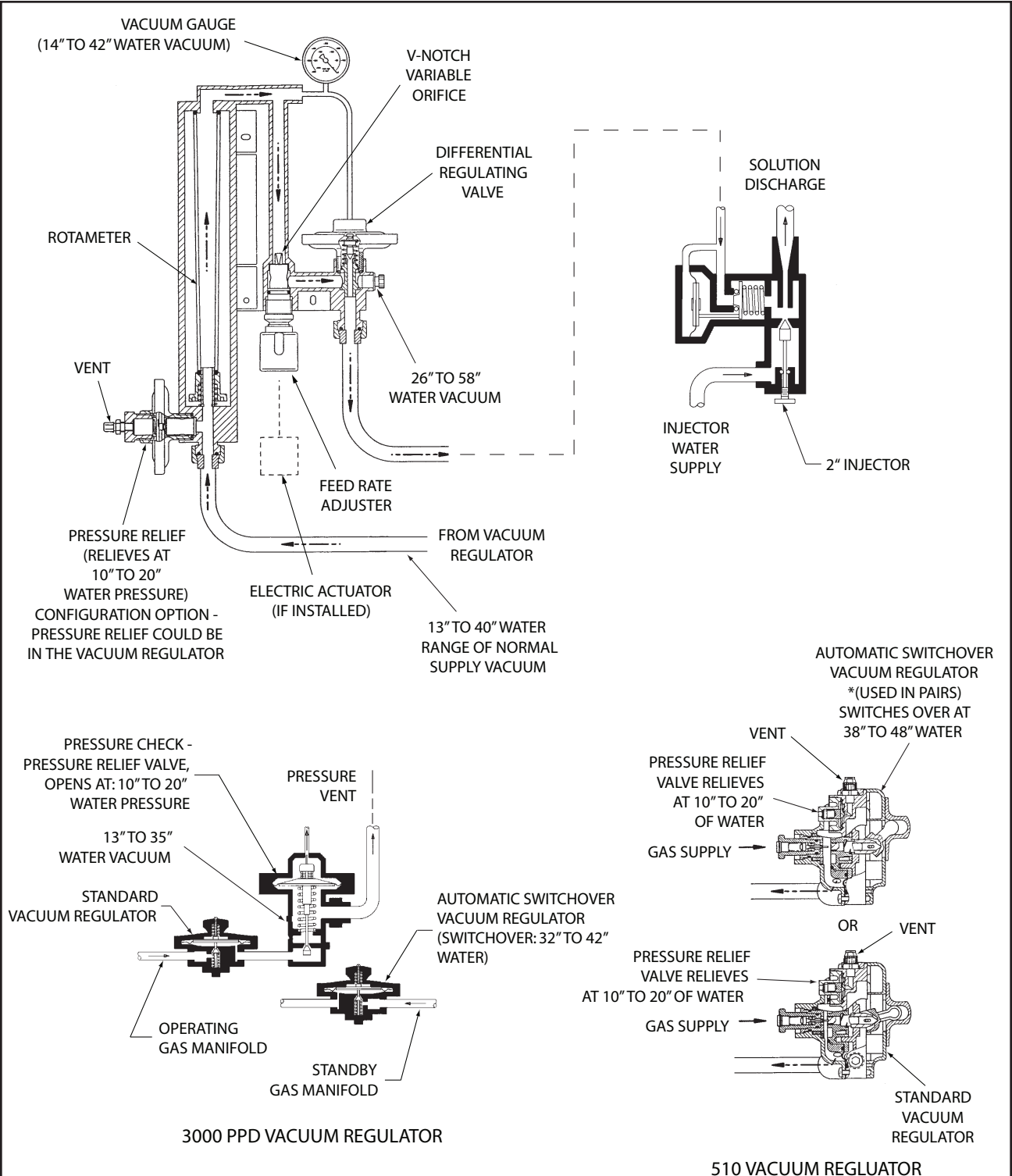
**NOTE:** \* SHOWN IN STANDBY POSITION.

200 - 500PPD UNITS  
 SERIES V10k V-NOTCH GAS FEEDER  
 - FLOW DIAGRAM

25.100.185.015

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# V10K V-NOTCH CHLORINATOR



**NOTE:** \* SHOWN IN STANDBY POSITION.

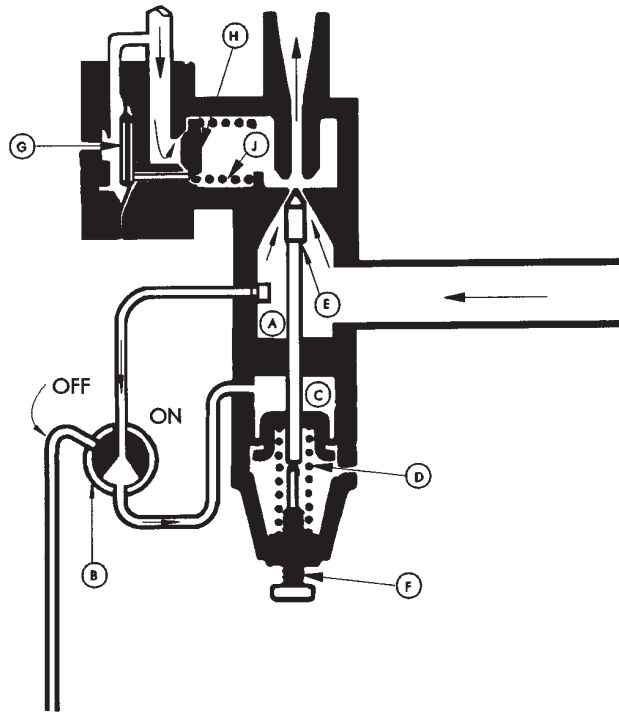
**750PPD UNITS**  
**SERIES V10k V-NOTCH GAS FEEDER**  
**- FLOW DIAGRAM**

**25.100.185.020**

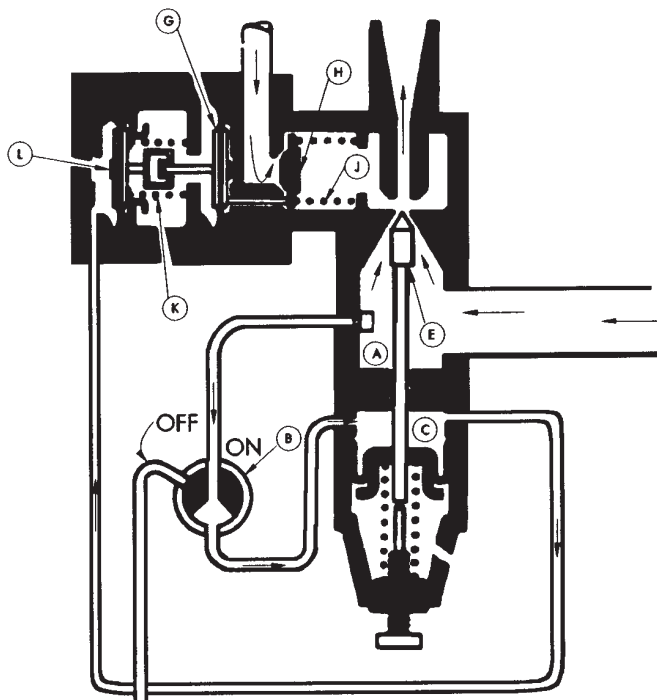
ISSUE 0 7-05



# V10K V-NOTCH CHLORINATOR



FOR APPLICATION AGAINST PRESSURE



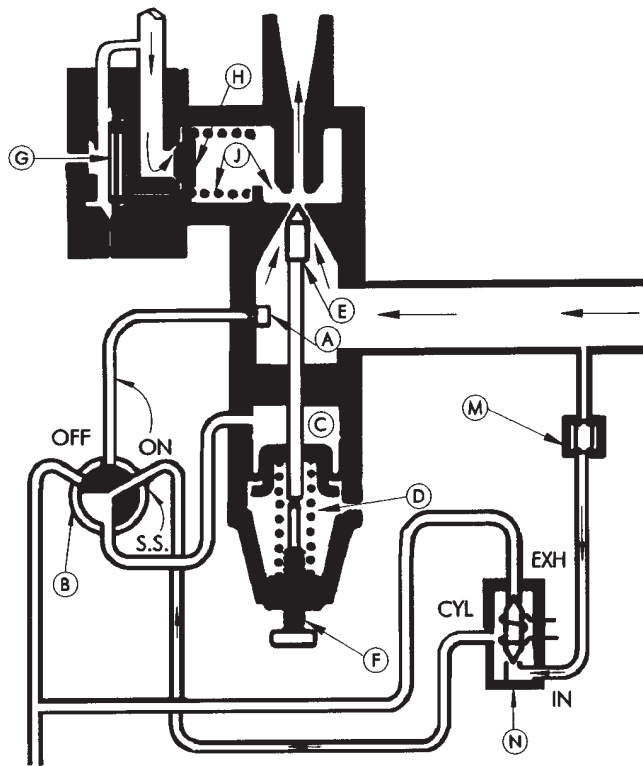
WITH SUCTION SHUT-OFF UNIT  
FOR APPLICATIONS NEGATIVE HEAD

2" INJECTOR - FLOW DIAGRAM  
Manually Operated

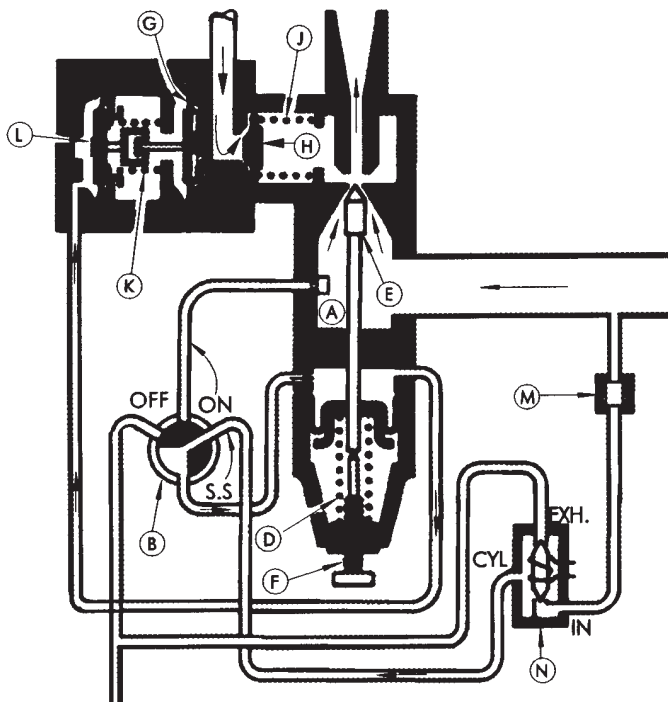
25.100.181.011

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# V10K V-NOTCH CHLORINATOR



FOR APPLICATION AGAINST PRESSURE



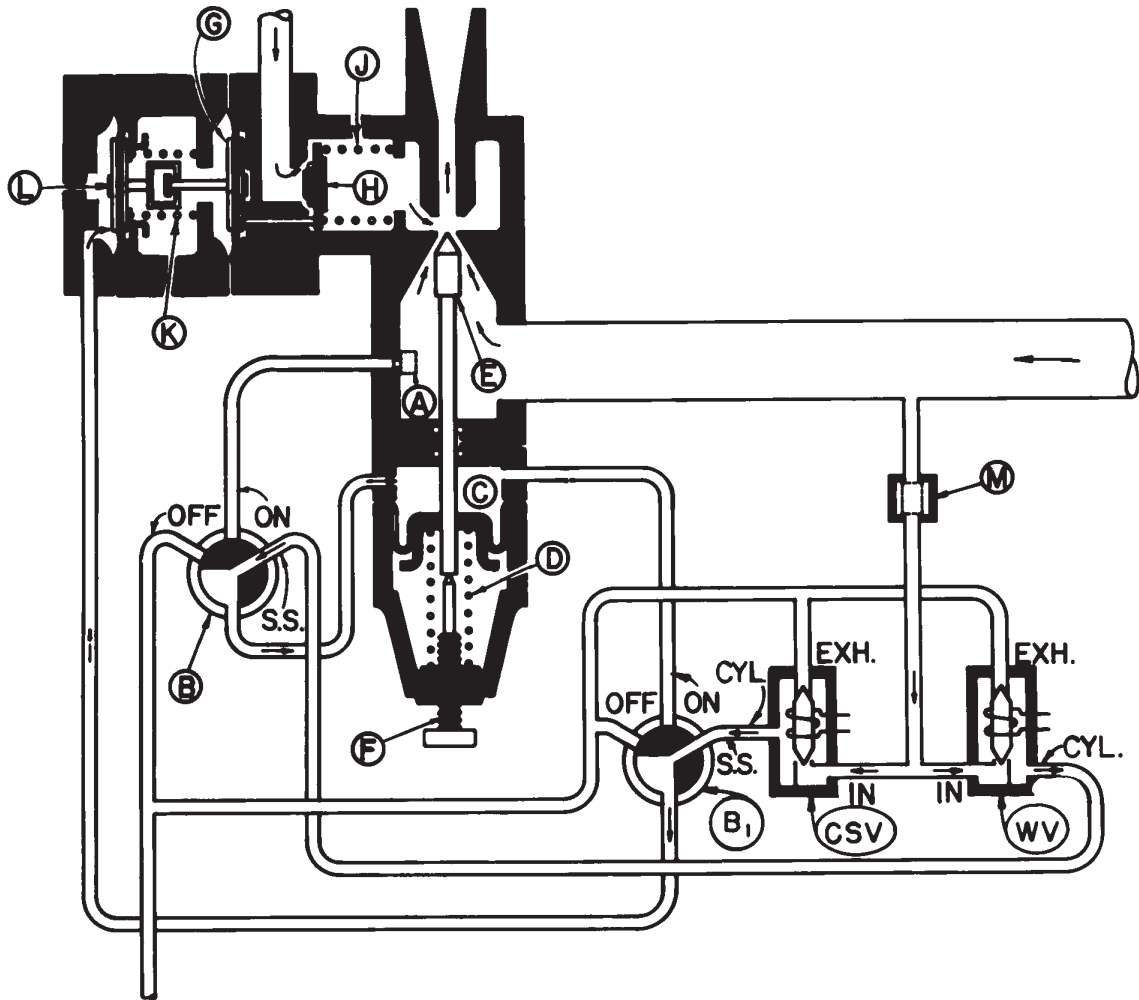
WITH SUCTION SHUT-OFF UNIT  
FOR APPLICATION AGAINST NEGATIVE HEAD

2" INJECTOR - FLOW DIAGRAM  
Intermittent Start-Stop Operation

25.100.181.021

ISSUE 3 5-97

# V10K V-NOTCH CHLORINATOR

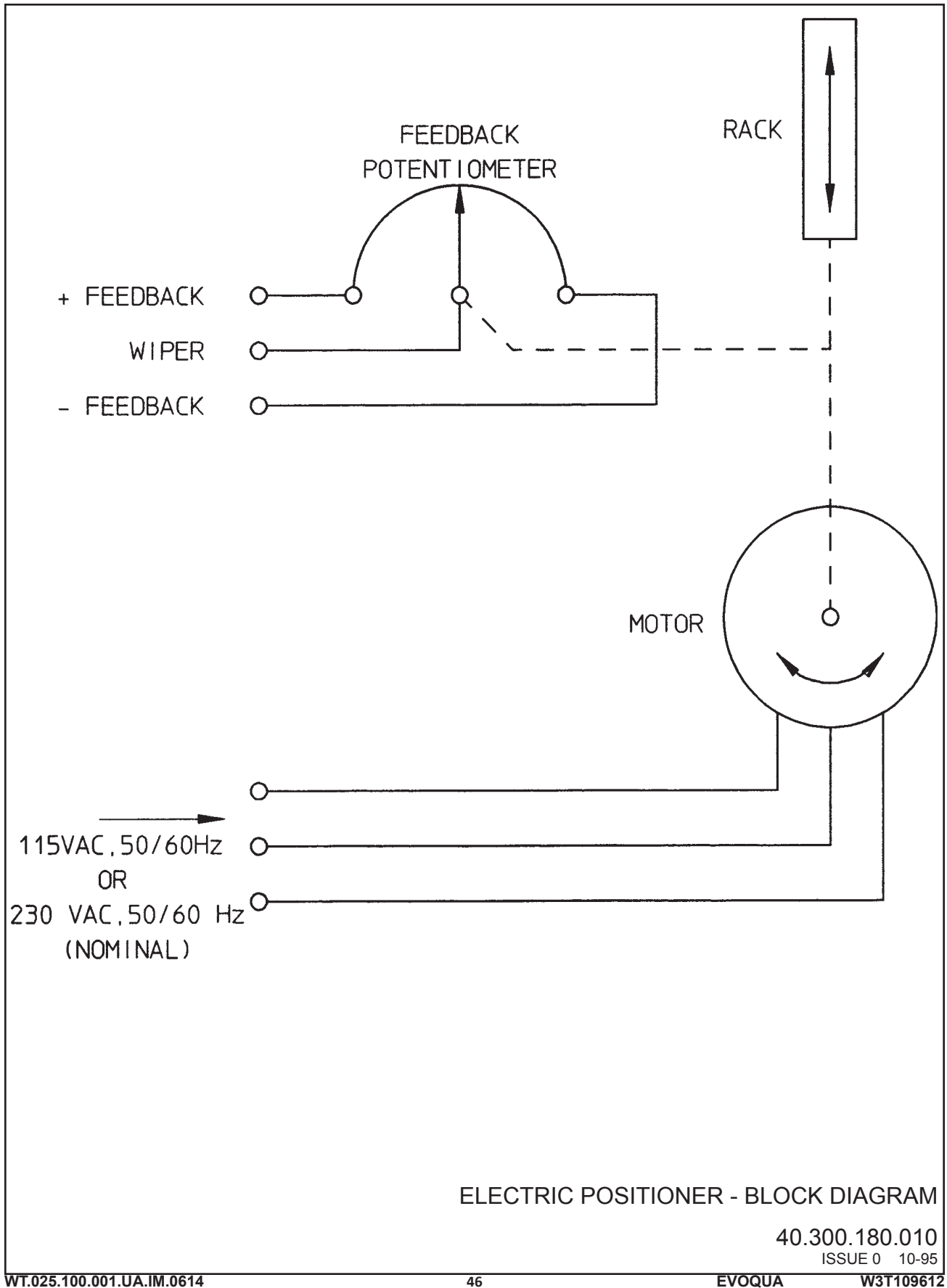


2" INJECTOR - FLOW DIAGRAM  
Prime & Flush Operation

25.100.181.031

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# V10K V-NOTCH CHLORINATOR



## **SECTION 4**

## SECTION 4 - SERVICE

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**WARNING:** HAZARDOUS GAS IS PRESENT IN THIS EQUIPMENT DURING NORMAL OPERATION. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, READ THIS INSTRUCTION BOOK AND THE APPROPRIATE GAS MANUAL BEFORE CONNECTING THIS EQUIPMENT TO A SUPPLY OF GAS. OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST BE RESTRICTED TO TRAINED, QUALIFIED PERSONNEL WHO ARE COMPLETELY FAMILIAR WITH THESE INSTRUCTIONS.

## 4.1 General



**WARNING:** EXCEPT WHEN DETECTING LEAKS OR MAKING CALIBRATION ADJUSTMENTS, TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, THE GAS SUPPLY MUST BE SHUT OFF AT THE GAS SUPPLY CONTAINER(S) AND THE GAS IN THE SYSTEM MUST BE COMPLETELY EXHAUSTED BEFORE BREAKING ANY CONNECTIONS AND SERVICING THE EQUIPMENT. TO DO THIS, TURN OFF THE GAS SUPPLY AT THE CONTAINER VALVE, WAIT UNTIL THE SUPPLY VACUUM GAUGE READS FULL SCALE AND THE ROTAMETER FLOAT RESTS ON THE BOTTOM STOP, AND THEN TURN OFF THE INJECTOR WATER SUPPLY.

**NOTE:** Refer to the automatic controller and the positioner Instruction Books for service instructions, if the automatic version is used.

Maintenance is simplified if certain general precautions are taken. These are usually easy to accomplish and will contribute to reducing maintenance costs by maintaining normal operating conditions. Before reassembling removed parts, apply Halocarbon grease U27546 to all ACME threads and Teflon tape to all tapered threaded joints.

### 4.1.1 Checking For Leaks



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY, IT IS GOOD PRACTICE TO HAVE AN APPROVED GAS MASK AVAILABLE WHEN MAKING LEAK CHECKS.

- Chlorine Leaks



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, DO NOT TOLERATE ANY LEAKS. THEY ALWAYS GET PROGRESSIVELY WORSE AND MUST BE CORRECTED PROMPTLY.

**NOTE:** For leak testing, use Evoqua Water Technologies U409 or Commercial 26° Baume' aqua ammonia. Household ammonia is not strong enough.

For checking leakage of chlorine gas at joints, valves etc., hold the moistened dauber of the ammonia close to the joint or suspected leakage area. If leakage exists, a white cloud will form. When a leak is found, immediately shut off the gas supply and remove the escaped gas by ventilation. Continue injector



operation until the supply vacuum gauge reads full scale and the rotameter float rests on the bottom stop to remove all gas from the equipment.



**WARNING: ESCAPED GAS MUST BE EXHAUSTED TO OUTSIDE ATMOSPHERE. THE EXHAUST SYSTEM MUST TERMINATE IN AN AREA WHERE GAS FUMES CANNOT CAUSE INJURY TO PERSONNEL OR PROPERTY DAMAGE. DO NOT TERMINATE THE EXHAUST SYSTEM AT A LOCATION ROUTINELY USED BY PERSONNEL, SUCH AS WORK AREAS OR PATHWAYS NOR NEAR WINDOWS OR VENTILATION SYSTEM INTAKES.**

Eliminate the leak before proceeding.

As a routine practice, check gas connections for leaks once a day. Green or reddish deposits on metal parts indicate possible leaks. No gas odor should be around equipment except when a joint is temporarily opened.



**WARNING: WHEN ANY CONNECTION IS BROKEN EVEN FOR A SHORT TIME, IMMEDIATELY PLUG THE RESULTANT OPENINGS WITH A RUBBER STOPPER OR EQUIVALENT TO PREVENT THE ENTRANCE OF MOISTURE. MOISTURE MUST BE EXCLUDED FROM ANY PART OF THE EQUIPMENT WHICH IS NORMALLY EXPOSED TO DRY CHLORINE ONLY. WHILE DRY CHLORINE IS NON-CORROSIVE, MOIST CHLORINE IS EXTREMELY CORROSIVE TO COMMON METALS, SUCH AS BRASS OR STEEL.**

- Water Leaks

As a matter of routine maintenance, tolerate no water leaks. Repair all water leaks as soon as they are discovered.

## 4.1.2 Plastic Parts

Whenever threaded plastic parts are assembled, use Teflon tape on NPT (National Pipe Taper) threads and Halocarbon grease on straight and ACME threads to prevent the parts from “freezing” together. In general, do not use tools to make up plastic connections. Make this type of connection by hand only.

## 4.1.3 Inspection

After any disassembled parts are cleaned and prior to reassembly perform the following:

- a. Check for physical damage to removed parts (chipped, cracked, damaged threads, etc.). Replace damaged parts.
- b. Discard and replace all removed O-rings, seals and gaskets.
- c. Check diaphragm for chafing or cracking. Replace damaged diaphragms.

## 4.2 Gaskets/O-Rings

Keep a supply of gaskets and O-rings so that gasketed joints can be maintained in proper condition. A regular replacement program for gaskets will do much to eliminate operating difficulties. The Preventive Maintenance Kit includes a set of gaskets.



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, NEVER REUSE GASKETS. ALWAYS REPLACE WITH A NEW GASKET OF THE PROPER SIZE AND MATERIAL AS IDENTIFIED ON THE EQUIPMENT PARTS DRAWING.**

## 4.3 Dirty Water Strainer

A strainer is required in the water line ahead of the injector to avoid plugging of the injector throat ports by foreign material. If sufficient material is allowed to build up on the strainer surfaces, the resultant pressure drop across the strainer reduces the injector operating water pressure. If the pressure drop is excessive, the injector will not be able to induct the required gas flow. Regular periodic inspection and cleaning of the strainer will minimize this possibility.

## 4.4 Maintenance

Maintenance of a Series V10k Gas Feeder system consists of three periodically performed operations:

- Periodic Performance Checks to detect the onset of any deteriorating conditions before their progress leads to serious malfunction.
- Periodic Cleaning to remove contaminants and deposits brought to the control unit(s) by the gas flow and to the injector by the water flow.
- Periodic Preventive Maintenance to disassemble, inspect, clean and accomplish recommended parts replacement. Kits of replacement parts required for this periodic maintenance are available and are listed in Section 6, PREVENTIVE MAINTENANCE KITS.

PROTECT YOUR EQUIPMENT INVESTMENT  
MINIMIZE DOWNTIME  
REORDER A PREVENTIVE MAINTENANCE KIT NOW  
KEEP ONE ON HAND

**NOTE: If the gas feeder is used seasonally or after a long-term shut-down, the preventive maintenance should be performed prior to startup.**

## 4.5 Periodic Performance Checks

To assure that all elements of your system are functioning in a normal manner, it is recommended that the following checks be made at approximately three-month intervals. These checks are easy to perform and require no tools.

- a. With the gas turned on at the supply container valve and at the vacuum regulator, and with the injector operating, turn the V-notch plug clockwise and then counterclockwise to vary the feed of the gas feeder through its full range. The gas feeder should feed steadily and hold any rate set from the maximum of the rotameter down to 1/20th of maximum. The rotameter float should not stick or behave erratically at any point.
- b. With the injector still operating, turn off the gas at the supply container valve. In a few moments the supply vacuum gauge should read full scale and the indicator on the front of the vacuum regulator should move to the empty position (S10k Vacuum Regulators) or the screw on top of the vacuum regulator should be depressed into the black knob (3000PPD Vacuum Regulators). After initially rising, the rotameter float will sink lower and lower in the tube until finally it is resting on the bottom stop. Partially close the V-notch if necessary to prevent the float from bouncing violently and damaging the glass tube. An incorrect vacuum reading indicates inadequate injector vacuum or an air leak into the system. Failure of the float to settle down indicates an air leak somewhere upstream of the rotameter.
- c. When the vacuum gauge reads full scale and the rotameter float has settled down, turn off the injector operating water. A rapid decrease in vacuum indicates an air leak somewhere in the system.
- d. If the system is equipped with the automatic switchover vacuum regulator, operate the gas feeder with only one unit turned on. Turn on the second unit and then close the gas supply container valve on the container originally feeding. The vacuum level should momentarily increase and then decrease. In the case of the S10k Vacuum Regulator, and the gray knob on the front of the second unit should be observed to snap down as it assumes the feeding function. For the 3000PPD Vacuum Regulator, the screw in the center of the knob of the second unit will be observed to snap down about 3/32 inch as it assumes the feeding function. Repeat the procedure, reversing which unit is turned on first to check that the opposite one will also pull in automatically. If either unit does not switch on automatically, refer to the vacuum regulator instruction book.
- e. Close the gas supply container valve. Shut off the injector and let normal backpressure remain. Remove the tubing from the connection at the injector. Note if any water drips from the end of the disconnected tubing (there should be none) and leave the tubing disconnected for approximately 10 minutes. Note if any water appears at the outer end of the connection fitting on the injector. If any water is seen, service the injector diaphragm check and poppet check.

- f. With the gas exhausted from the system, the injector shut off and the gas supply container valve closed, turn the vacuum regulator off. Remove the tubing from its connection on the unit. Open the gas container valve 1/8 turn, and use an ammonia dauber near the outlet of the unit to verify that the unit shuts off tightly (no white vapors). A slight trace of vapor at the moment of disconnection may be ignored, but any continuing vapor formation is an indication of gas passing the valve seat. If continuing vapor is observed, close the gas container valve, exhaust all gas as instructed in paragraph 3.3.3, To Stop for Extended Periods, and service the unit stem and seat parts (refer to vacuum regulator instruction book).

## 4.6 Periodic Cleaning

To ensure that all elements of your system are free of contaminants, it is recommended that the following checks be made at the stated intervals.

Perform at intervals as tabulated below:

MAINTENANCE ITEM	WHEN TO PERFORM
Vacuum Regulator	Refer to separate instruction book.
Rotameter	When deposits are seen inside the glass tube or the float sticks in one place.
V-Notch Plug	At same time as rotameter.
Injector Nozzle and Tailway	Every six months.

**NOTE:** The actual frequency of cleaning will depend on calendar time, the feed rate and amount of gas fed, the care exercised in container changing, the source of the gas and the quality of the operating water. The above maintenance schedule provides recommended cleaning intervals. However, your own operating experience is the best guide to preventive maintenance and may result in significant variations from the recommended schedule.

If the flowmeter tube, float, V-notch plug, or any valve seat becomes contaminated with impurities sometimes found in gases, it should be removed and cleaned.



**WARNING:** TO PREVENT POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, ALL CLEANING SHOULD BE CARRIED OUT IN AN OPEN AREA OR IN A WELL VENTILATED ROOM.

Most of the residue which accumulates can usually be removed with warm water and a detergent. Rubber parts should be cleaned only with warm water and a detergent.



**WARNING:** TO PREVENT POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, DO NOT USE WOOD ALCOHOL, ETHER, PETROL OR PETROLEUM DISTILLATES.

All traces of solvent and moisture must be removed from parts which come in contact with the gas before being returned to service. Do not use heat on plastic or hard rubber parts.

## 4.6.1 Cleaning Rotameter (See Dwg. 25.100.150.010)

If a milky white, powdery white, green slimy or brown oily deposit is visible inside the rotameter tube or if the float has particles clinging to it or tends to stick to the tube wall at lower feeds, it is time to clean the rotameter. Proceed carefully to avoid dropping the glass tube or losing the float down a floor drain or grating. Have a clean cup (such as a coffee cup or a small beaker) and a pair of tweezers at hand before starting. Proceed as follows:

- a. Turn the knob on the vacuum regulator(s) to the OFF position. After the supply vacuum gauge reads full scale and the rotameter float rests on the bottom stop, turn off the injector operating water.
- b. Exert downward force on lower bell of rotameter with one hand. Use two fingers of other hand to swing the top of rotameter outward. Lift rotameter. Take care not to lose the end stops or the float. Discard the removed O-rings.
- c. Place the end stops and float into the cup mentioned above.
- d. Many (but not all) contaminants are soluble in water. Hold the tube end under running warm (110-125°F) water so that the water enters the tube at one end and exits at the other to flush out deposits. Alternately, soak the tube in a container of warm water for about 30 seconds. Then hold the tube (half full with water) with palms or stoppers capping the ends and shake vigorously endwise for a few seconds. Discharge the water and repeat until clean. A common pipe cleaner may be used to scrub the interior. A detergent will promote cleaning action.



**WARNING: DO NOT USE HYDROCARBONS OR ALCOHOLS BECAUSE RESIDUAL SOLVENT MAY REACT WITH THE GAS. SOLVENTS CAN PRODUCE SERIOUS PHYSIOLOGICAL EFFECTS UNLESS USED IN STRICTEST COMPLIANCE WITH THE SOLVENT MANUFACTURER'S SAFETY RECOMMENDATIONS.**

- e. Drain and let dry. Do not use a pipe cleaner as a drying tool because the lint from it will stick to the tube interior. Place the tube at an angle between a horizontal and a vertical surface (as between a shelf and a wall) with both ends open so air can flow through. Drying will be hastened by heat, as from a light bulb nearby. Do not blow through the tube as moisture from the breath will condense on the tube walls.
- f. To clean the float pour about an inch of warm to hot (130-150°F) water into the cup containing the float. Grasp the float with tweezers and shake it side to side while submerged for a few seconds. Release the float and pick

it up again and repeat the action several times so all surfaces are washed. Hold the float with the tweezers, discard the wash water and repeat the above. A few drops of detergent will improve the process. Do not use your fingers to hold the float.



**WARNING: DO NOT USE HYDROCARBONS OR ALCOHOLS BECAUSE RESIDUAL SOLVENT MAY REACT WITH THE GAS. SOLVENTS CAN PRODUCE SERIOUS PHYSIOLOGICAL EFFECTS UNLESS USED IN STRICTEST COMPLIANCE WITH THE SOLVENT MANUFACTURER'S SAFETY RECOMMENDATIONS.**

- g. Allow the float to dry on a clean surface and then, with tweezers, place it in a clean dry cup.

**NOTE: Do not attempt to dry the float with a rag or paper towel as electrostatic forces will make lint and other particles stick to the float.**

- h. Clean stops with water and dry thoroughly before reassembly.



**WARNING: DO NOT USE HYDROCARBONS OR ALCOHOLS BECAUSE RESIDUAL SOLVENT MAY REACT WITH THE GAS. SOLVENTS CAN PRODUCE SERIOUS PHYSIOLOGICAL EFFECTS UNLESS USED IN STRICTEST COMPLIANCE WITH THE SOLVENT MANUFACTURER'S SAFETY RECOMMENDATIONS.**

- i. When tube, float, and stops are clean and dry, wipe a thin film of Halocarbon grease on the bottom O-ring and proceed with reassembly. Proceed to paragraph 4.6.2, Cleaning V-Notch Plug.

## 4.6.2 Cleaning V-Notch Plug

The same contaminants seen in the rotameter are in the gas stream flowing through the V-notch orifice and may also deposit at this point. When the rotameter is cleaned, clean the V-notch plug at the same time. If at any time float movement in the rotameter is not proportional to V-notch plug rotation (a sudden marked rise or drop for a small amount of plug turning), the V-notch plug requires cleaning.

- a. Turn the knob on the vacuum regulator(s) to the OFF position. After the supply vacuum gauge reads full scale and the rotameter float rests on the bottom stop, shut off the injector water supply.
- b. Manual: Remove the V-notch assembly completely from the control unit by unscrewing the extension chamber. Unscrew the adjusting knob completely and withdraw the V-notch plug.

Automatic: Put electric actuator in manual position as described in electric actuator book. Rotate knob to lower actuator shaft down as far as possible. Unscrew the clamping nut and push the V-notch up. Unscrew the V-notch plug chamber. Unscrew the V-notch plug. Reassemble in reverse order.

- c. Using running water or a cup full of water and a small, stiff brush (such as an old toothbrush), scrub out the V-notch groove and the shank of the plug.



**WARNING: DO NOT USE HYDROCARBONS OR ALCOHOLS BECAUSE RESIDUAL SOLVENT MAY REACT WITH THE GAS. SOLVENTS CAN PRODUCE SERIOUS PHYSIOLOGICAL EFFECTS UNLESS USED IN STRICTEST COMPLIANCE WITH THE SOLVENT MANUFACTURER'S SAFETY RECOMMENDATIONS.**

- d. Do not soak the plug in solvent. Do not use a knife or scraper or a file to clean out the groove. Dissolving action and scrubbing are all that is required.
- e. Dry the plug with a clean cloth or paper towel.
- f. Remove seal clamping screw. Clean and inspect orifice and O-rings and replace if necessary.
- g. Wipe a thin film of Halocarbon grease on the O-rings and the threads of the V-notch assembly. Reinstall it in the control panel and resume operation.

#### 4.6.3 Zero Position of V-Notch Plug for Electric Control

When the electronic controller is receiving a zero flow signal, adjust lock nut and coupling screw until the V-notch is at its zero position, then tighten.

To determine this position, proceed as directed in preceding Step b. Automatic. With the V-notch plug and plug stem in the extension chamber and the orifice seated, move the plug stem in or out as required until the scratch line on the bottom of the plug is even with the bottom of the orifice as viewed through the holes in the extension chamber. Make a pencil line around the plug stem even with the bottom of the seal clamping screw. This pencil line may then be used as a zero reference when the parts are reassembled in the control unit and the linkage is adjusted to match the zero of the electric actuator.

#### 4.6.4 Cleaning Injector Throat and Tailway

Water containing carbonates, manganese or iron will frequently leave a deposit in injector tailways. As this deposit increases in thickness it can become scaly and rough and adversely affect pressure recovery or increase backpressure so that the injector fails to develop adequate operating vacuum. If the upstream strainer becomes corroded or perforated and passes a small pebble or other tramped material, such particles can partially plug the throat and prevent adequate flow. Water containing suspended silt or sand particles can erode the opening in the throat. As this opening is enlarged, the water velocity decreases and the vacuum developed also decreased.

Deposits may be removed by immersing the throats in dilute (10%) hydrochloric acid, known commercially as muriatic acid.





**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE WHEN USING HYDROCHLORIC ACID, OBSERVE ALL SAFETY PRECAUTIONS RECOMMENDED BY THE ACID MANUFACTURER/SUPPLIER.**

## 4.6.5 Cleaning 3/4-Inch Fixed Throat Injector (Standard) (See Dwg. 25.200.002.010)

The check valve prevents water from the injector from being drawn back into the control unit and toward the vacuum regulator during the OFF period, by the vacuum prevailing at shut-down.

In continuous or nearly continuous operation, this valve is actuated very little, and the recommended annual check is principally to assure cleanliness. In automatic start-stop operation, the check valve can accumulate thousands of opening and closing cycles in six months or less and wear becomes a consideration in addition to clean surfaces. For either interval the procedure is as follows:

- Cleaning Injector Unit Diaphragm Backcheck.
  - a. Shut off injector operating water.
  - b. Take steps to prevent water from the point of application, flowing back toward the injector.
  - c. Unscrew gas line tubing nut and remove tubing.
  - d. Unscrew injector body union nut.
  - e. Unscrew valve stem in the center of the top of the upper body. Wipe the surface of the spherical tip of valve stem with a clean cloth or paper towel to remove any loose material. Soak briefly in 10% muriatic (hydrochloric) acid if there are any deposits which do not wipe away in plain water. If the spherical surface is indented, worn, eroded, or scratched, replace valve stem.



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE WHEN USING HYDROCHLORIC ACID, OBSERVE ALL SAFETY PRECAUTIONS RECOMMENDED BY THE ACID MANUFACTURER/SUPPLIER.**

- f. Using a blunt tool, remove the O-ring from the valve seat (diaphragm clamping screw). Discard the O-ring.
- g. Reassemble the valve stem to the upper body and replace the valve seat O-ring and diaphragm clamping O-ring (outer) prior to assembling the injector body union nut.

- Cleaning Poppet Check
  - a. Unscrew the inlet adapter and discard O-ring.
  - b. Remove the poppet and remove the O-ring from the poppet. Discard the O-ring.
  - c. Replace the poppet O-ring.
  - d. Replace the inlet O-ring. Wipe a thin film of Halocarbon grease on the O-ring before installing it.
  - e. Reassemble the poppet and inlet adapter.

#### 4.6.6 Cleaning 3/4" Fixed Throat Injector (Anti-Syphon) (See Dwg. 25.200.002.020)

The check valve prevents water from the injector from being drawn back into the control unit and toward the vacuum regulator during the OFF period, by the vacuum prevailing at shut-down.

In continuous or nearly continuous operation, this valve is actuated very little, and the recommended annual check is principally to assure cleanliness. In automatic start-stop operation, the check valve can accumulate thousands of opening and closing cycles in six months or less and war becomes a consideration in addition to clean surfaces. For either interval the procedure is as follows:

- Cleaning Injector Unit Diaphragm Backcheck
  - a. Shut off injector operating water.
  - b. Take steps to prevent water from the point of application, flowing back toward the injector.
  - c. Unscrew gas line tubing nut and remove tubing.
  - d. Unscrew injector body union nut.
  - e. Unscrew valve stem in the center of the top of the upper body. Wipe the surface of the spherical tip of valve stem with a clean cloth or paper towel to remove any loose material. Soak briefly in 10% muriatic (hydrochloric) acid if there are any deposits which do not wipe away in plain water. If the spherical surface is indented, worn, eroded, or scratched, replace valve stem.



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE WHEN USING HYDROCHLORIC ACID, OBSERVE ALL SAFETY PRECAUTIONS RECOMMENDED BY THE ACID MANUFACTURER/SUPPLIER.**

- f. Use a blunt tool, and remove the O-ring from the valve seat (diaphragm clamping screw). Discard the O-ring.
  - g. Reassemble the valve stem to the upper body and replace the valve seat O-ring and diaphragm clamping O-ring (outer) prior to assembling the injector body union nut.
- Cleaning Poppet Check
  - a. Unscrew the inlet adapter and discard O-ring.
  - b. Remove the poppet and remove the O-ring from the poppet. Discard the O-ring.
  - c. Replace the poppet O-ring.
  - d. Replace the inlet O-ring. Wipe a thin film of Halocarbon grease on the O-ring before installing it.
  - e. Reassemble the poppet and inlet adapter.
  - f. Proceed to paragraph c for anti-syphon portion of the injector.
- Cleaning Anti-Syphon Injector Lower Portion
  - a. Unscrew lower union nut and carefully remove bottom cap and take out diaphragm assembly. Clean off any deposits with warm (110-125°F) water. It is not necessary to disassemble the diaphragm unit to do this.
  - b. Clean O-ring groove on guide pins. Do not scrape with a knife blade or any such instrument. Only warm water (110-125°F) is permissible. Wipe a thin film of Halocarbon grease on the O-rings before installing them on the guide pins. Loosen screws 3/4 of a turn from their tight position, if disassembled.
  - c. Remove spring and wipe off any deposits found.
  - d. Reinstall spring and diaphragm assembly into bottom cap. Reassemble bottom cap to body with union nut.

## 4.6.7 Cleaning 1" Fixed Throat Injector (Standard) (See Dwg. 25.200.002.030)

- Cleaning Injector Unit Diaphragm Backcheck
  - a. Shut off injector operating water.
  - b. Take steps to prevent water from the point of application, flowing back toward the injector.

- c. Unscrew stem in the center of the top of the injector. Remove and discard O-ring.
- d. Wipe the surface of the spherical tip of stem with a clean cloth or paper towel to remove any loose material. Soak briefly in 10% muriatic (hydrochloric) acid if there are any deposits which do not wipe away in plain water. If the spherical surface is indented, worn, eroded or scratched, replace valve stem.



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE WHEN USING HYDROCHLORIC ACID, OBSERVE ALL SAFETY PRECAUTIONS RECOMMENDED BY THE ACID MANUFACTURER/SUPPLIER.**

- e. Wipe a thin film of Halocarbon grease on the O-ring before installing it on the stem.
- f. Look through the opening in the top of the injector with a flashlight and examine the conical hole and O-ring in diaphragm screw immediately below. If it is smooth and clean, merely reinstall the stem, making sure the large O-ring is under the head. If the conical hole and O-ring show film deposits, clinging particles, or a rough surface, disassemble the injector. Unscrew the gas line union nut and discard O-ring.
- g. Remove six bolts and lift off injector flange. Carefully remove the diaphragm assembly. Using a fine pointed tool, pierce the O-ring and remove it from the valve seat. Clean the conical hole in the diaphragm screw. Do not scrape with a knife blade or a tapered reamer. Scrub out with a cloth plug. Dissolve resistant deposit with 10% muriatic (hydrochloric) acid. It is not necessary to disassemble the diaphragm to do this.



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE WHEN USING HYDROCHLORIC ACID, OBSERVE ALL SAFETY PRECAUTIONS RECOMMENDED BY THE ACID MANUFACTURER/SUPPLIER.**

- h. Reassemble the valve stem to the upper body and replace the valve seat O-ring and diaphragm clamping O-ring (outer).
- i. Bolt the flange in place with six bolts.
- Cleaning Poppet Check
  - a. To clean poppet check unscrew adapter and remove O-ring. Discard the O-ring.
  - b. Remove poppet and remove O-ring. Discard the O-ring.

- c. Clean threads and O-ring groove by soaking in warm water. Wipe a thin film of Halocarbon grease on the O-ring and threads.
- d. Install a new O-ring on the poppet and insert the poppet into the holder.
- e. Assemble the holder to the injector body. Do not use excessive force when tightening the adapter.
- f. Replace the union nut O-ring before reconnecting the gas line.

## 4.6.8 Cleaning 1" Fixed Throat Injector (Anti-Syphon) (See Dwg. 25.200.002.040)

**NOTE: When removing O-rings, use a blunt tool to pull them out. Do not damage the tightening surfaces. Apply a thin film of Halocarbon grease to the new O-rings and to the threads.**

- a. Turn off the gas supply. Allow the gas feeder to run until the float drops and settles on the bottom stop.
- b. Drain the operation water tubes.
- c. Follow the directions in Cleaning One-Inch Fixed Throat Injector (Standard) for steps 3 through 9.
- d. Unscrew the clamping nut with the parts connected.
- e. Remove the poppet. Replace the O-ring.
- f. Remove the snap ring clip.
- g. Remove the clamping nut and spring.
- h. Remove the clamping washer and replace O-ring.
- i. Replace the diaphragm assembly. Assemble with clamping disc, clamping screw and spring. Secure with snap ring.
- j. Remove the plug and replace the O-ring.
- k. Press out the poppet seat. Replace the poppet seat along with the O-ring. Press in the new seat using a round rod or plastic tube (16 mm) with a flat front.
- l. Place the poppet into the guide and screw in the clamping nut with the assembled parts.
- m. Screw in the plug.

- n. Replace the O-ring in the gas inlet.
- o. Secure the tailway with the retaining nut and connect to the operation water tubing.
- p. Connect the gas line.
- q. Check for tightness and function.

## 4.7 Periodic Preventive Maintenance

Because of aging of elastomeric components and the desirability of checking internal zones for possible accumulations of deposits not seen in routine maintenance, it is recommended that at one-year intervals, each of the principal components of the system be completely disassembled. Before starting the work, ensure that the recommended spare parts are on hand. Refer to Section 6 - Preventive Maintenance Kits and Spare Parts List for appropriate maintenance kit numbers.

**NOTE: If the gas feeder is used seasonally or after a long-term shutdown, the preventive maintenance should be performed prior to startup.**

Disassembly and reassembly instructions necessary to install the maintenance kit parts are included in the kit(s).

Servicing of Evoqua Water Technologies equipment including installation of parts from maintenance kits should be restricted to trained, authorized personnel who are completely familiar with the entire contents of the equipment instruction book. The Evoqua Water Technologies sales office or the dealer from whom you purchased the equipment can provide the preventive maintenance kits or overhaul service.

## 4.8 Unscheduled Service

### 4.8.1 Auxiliary Cylinder Valve

See separate Instruction Book provided with Vacuum Regulator.

### 4.8.2 Supply Vacuum Gauge



**CAUTION: Do not disassemble the diaphragm unit from the supply vacuum gauge.**

### 4.8.3 Differential Regulating Valve (See Dwg. 25.152.001.011)

- Removal and Disassembly
  - a. Unscrew tubing union nut.

- b. Unscrew plug (1). Remove and discard gasket (2).



**WARNING: SPRING IS IN A COMPRESSED CONDITION. DISASSEMBLE CAREFULLY TO PREVENT FORCEFUL EJECTION OF PARTS AND POSSIBLE SEVERE PERSONAL INJURY.**

- c. Unscrew and remove valve body (3). Remove and discard gasket (2).
- d. Push stem holder (4) out of diaphragm. Remove and discard O-ring (10).
- e. Unscrew and remove seat unit (8). Remove and discard gasket (7).

- Reassembly

- a. The residue that accumulates on the valve seat can be removed with warm water and a detergent. Pipe cleaners or soft brushes may facilitate cleaning but wire brushes, scrapers and the like should be avoided as they will damage the parts.
- b. Wipe a thin film of Halocarbon grease onto all O-rings before reassembling.
- c. Apply a thin film of fluorocarbon oil (No. 6.3, Halocarbon Products) to gasket (7) before assembling.
- d. Reassemble in the reverse order of disassembly.

#### 4.8.4 Pressure Relief Valve (If Installed At Control Unit) (See Dwg. 25.100.001.040)

- Removal and Disassembly



**WARNING: SPRING IS IN A COMPRESSED CONDITION. DISASSEMBLE CAREFULLY TO PREVENT FORCEFUL EJECTION OF PARTS AND POSSIBLE SEVERE PERSONAL INJURY.**

- a. Unscrew plug (6). Remove and discard gasket (1).
- b. Unscrew and remove valve body (2). Remove and discard gasket (1).
- c. Push stem (4) out of diaphragm. Remove and discard O-ring (3).

- Reassembly

- a. Clean the residue that accumulates on the valve seat with warm water and a detergent. Pipe cleaners or soft brushes may facilitate cleaning but wire brushes, scrapers and the like should be avoided as they will damage the parts.

- b. Wipe a thin film of Halocarbon grease onto all O-rings and gaskets before reassembling.
- c. Reassemble in the reverse order of disassembly.

## 4.9 Troubleshooting

The following troubleshooting table is provided for determining and correcting most common troubles.



**Table 4.1 - Troubleshooting**

<p><b>Basic Instructions:</b></p> <ol style="list-style-type: none"> <li>1. Measure the vacuum over the full range of gas flow. (Low, half and full feed).</li> <li>2. Compare what you measure with figures given below. If the figures are right, leave that component alone and check the next element.</li> <li>3. Make additional checks (if necessary) to pin-point the problem.</li> <li>4. Refer to detailed instructions for component disassembly and repair if this check list indicates such work is appropriate.</li> </ol> <p><b>WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, TURN OFF THE GAS SUPPLY AT THE CONTAINER VALVE, WAIT UNTIL THE SUPPLY VACUUM GAUGE READS FULL SCALE AND THE ROTAMETER FLOAT RESTS ON THE BOTTOM STOP, AND THEN TURN OFF THE INJECTOR WATER SUPPLY BEFORE PERFORMING ANY DISASSEMBLY OPERATIONS FOR TROUBLESHOOTING PURPOSES. REFER TO OPERATION-STOPPING.</b></p>					
OPERATING SYMPTOMS	PROBABLE CAUSE	WHAT TO MEASURE	HOW TO MEASURE	TYPICAL VALUES FOR PROPER OPERATION	REMEDY
<b>GAS FEEDER WILL NOT FEED AT ALL (NO ROTAMETER INDICATION) -OR- WILL NOT COME UP TO FULL FEED. (GAS SUPPLY TO GAS FEEDER IS ADEQUATE.)</b>	Insufficient injector vacuum.	Injector vacuum	Connect vacuum gauge or mercury manometer to the plugged 1/4-inch port on front of injector. If no gauge or manometer is available, remove line from differential regulating valve to injector. Turn on water supply and place wet thumb over inlet to injector. Vacuum should pull thumb down firmly and raise a "bump" on thumb.	Requires six inches of mercury, minimum, for dynamic (gas flowing) conditions.  With gas shut off, should see 25 to 28 inches of mercury static vacuum.	Remove throat and tailway and clean or (if necessary) replace. Clean Y-strainer in water line. Check solution discharge line for accumulation of foreign material, hose kinks, or partially closed valve. With gauges, measure operating water pressure and pressure at point of application. Compare with previous data. If system has a booster pump, check pump for wear, buildup of deposits and air leaks. If it is a new installation, ensure that there is no elbow or reducing coupling immediately downstream of injector tailway. Run full size pipe straight up at least 8" before any elbow or reducer, or use poly pipe and arrange in a smooth curve, up, over and down, as required.

# V10K V-NOTCH CHLORINATOR

Table 4.1 - Troubleshooting (Cont'd)

OPERATING SYMPTOMS	PROBABLE CAUSE	WHAT TO MEASURE	HOW TO MEASURE	TYPICAL VALUES FOR PROPER OPERATION	REMEDY
<b>GAS FEEDER EITHER DOES NOT FEED AT ALL OR ONLY AT LOW RATES; REFUSES TO FEED AT HIGH RATES. INJECTOR VACUUM LEVEL IS CORRECT. ADEQUATE GAS IN CONTAINERS.</b>	Clogged vacuum regulator -OR- clogged gas line will not let gas through fast enough to satisfy demand -OR- vacuum regulator not opening due to an air leak from a perforated diaphragm or a loose or defective gasketed joint.	Gas inlet vacuum.	Read vacuum gauge on control unit or connect a single leg water manometer in the vacuum line. Close gas supply container valve. Rotameter float should drop to bottom stop. If it does not, it indicates an air leak upstream of the rotameter. Remove vent line and close off pressure relief nipple with finger. If float then drops it indicates a defective diaphragm or the stem plug is not sealing. If it does not drop, a loose or defective gasketed joint in tubing or vacuum regulator is indicated.	13 to 40 inches of water vacuum.	Clean vacuum regulator. Clean gas supply line.  Tighten gasketed joints or replace gaskets or diaphragm unit as indicated by tests at left.
<b>GAS FEEDS NORMALLY AT HIGH RATES, BUT WILL NOT CONTROL AT LOW RATES.</b>	Vacuum regulator not throttling sufficiently (held open by a particle of ferric chloride, rust, or dirt etc.); too much gas flowing.	Gas inlet vacuum. (Probably too low at low feed rates.)	Read vacuum gauge on control unit or connect a single leg water manometer in the vacuum line.	13 to 40 inches of water vacuum.	Clean vacuum regulator.

# V10K V-NOTCH CHLORINATOR

Table 4.1 - Troubleshooting (Cont'd)

OPERATING SYMPTOMS	PROBABLE CAUSE	WHAT TO MEASURE	HOW TO MEASURE	TYPICAL VALUES FOR PROPER OPERATION	REMEDY
ROTAMETER FLOAT DOES NOT DROP ALL THE WAY TO THE BOTTOM STOP WHEN THE GAS IS SHUT OFF AT THE CONTAINER AND THE INJECTOR IS OPERATING.	Air leak upstream of rotameter. -OR- dirty rotameter.	See if float is "alive" (i.e., spinning or free floating indicating air flow) or it drops to a constant point and is "dead" (indicating binding by dirt or foreign matter).	Visual appearance.	-	Check vacuum regulator diaphragms, including center seals. Check pressure relief diaphragm and seating surfaces. Clean the rotameter.
ROTAMETER FLOAT DOES NOT RISE AND FALL UNIFORM-LY IN PROPORTION TO V-NOTCH KNOB ROTATION BUT "JUMPS" UP OR DOWN SHARPLY WITH A SMALL CHANGE IN V-NOTCH SETTING.	Contamination in V-notch plug. V-notch orifice worn.	-	Visual	-	Remove V-notch assembly and clean V-shaped groove in V-notch plug. (A toothbrush and warm water are usually effective).  <b>CAUTION: Do not scrape or scratch groove with a sharp-edged tool.</b>  Replace orifice.
GAS FEEDS NORMALLY, BUT CONTAINER WEIGHT LOSS AS SHOWN BY SCALE IS LESS THAN THE ROTAMETER INDICATES MULTIPLIED BY TIME AT EACH SETTING.	Air leak upstream of rotameter.	-	-	-	For air leaks, check: Pressure relief valve diaphragm and seating surface, vacuum regulator diaphragms, including center seals and tubing connectors.

# V10K V-NOTCH CHLORINATOR

Table 4.1 - Troubleshooting (Cont'd)

OPERATING SYMPTOMS	PROBABLE CAUSE	WHAT TO MEASURE	HOW TO MEASURE	TYPICAL VALUES FOR PROPER OPERATION	REMEDY
GAS FEEDER DOES NOT FEED. GAS SUPPLY IS NORMAL. V-NOTCH IS CLEAN. ROTAMETER IS CLEAN. INJECTOR VACUUM IS NORMAL. INJECTOR CHECK IS OPENING PROPERLY.	Differential regulating valve spring defective or inadvertently left out. Fails to lift unit stem out of seat so gas cannot flow to injector.	Regulated vacuum.	Connect a single leg manometer at the plug opening just below the differential regulating valve.	48 to 62 inches of water vacuum.	<b>NOTE:</b> The spring should be under the diaphragm. If defective, replace differential regulating spring.
GAS FEEDS NORMALLY, BUT CONTAINER WEIGHT LOSS AS SHOWN BY SCALE IS GREATER THAN THE ROTAMETER INDICATES MULTIPLIED BY TIME AT EACH SETTING.	Defective O-ring on differential regulating valve stem -OR- hole in diaphragm.	Regulated vacuum.	Same as above.	Same as above.	If gas flow is restricted due to impurities, clean gas line and/or vacuum regulator. If differential regulating spring, O-ring or diaphragm unit are defective, replace parts as necessary.  <b>NOTE:</b> Gasket is required under diaphragm unit when reinstalled.

# V10K V-NOTCH CHLORINATOR

Table 4.1 - Troubleshooting (Cont'd)

OPERATING SYMPTOMS	PROBABLE CAUSE	WHAT TO MEASURE	HOW TO MEASURE	TYPICAL VALUES FOR PROPER OPERATION	REMEDY
V-NOTCH IS DIFFICULT TO TURN. WHEN FORCIBLY MOVED, AN AIR LEAK IS DETECTED.	Buildup of contaminant residue on V-notch plug shaft is binding in the seal - OR- has been forced past the seal, stretching it open.	No measurements required.	-	-	Remove entire V-notch assembly. Soak in warm water for about two minutes. Unscrew red knob until threads just disengage. Remove screw and washer which hold knob to V-notch shaft. Unscrew and remove seal clamp. Withdraw V-notch plug with seal and O-ring. Clean plug. Lubricate plug with a light film of Halocarbon grease. Reassemble all parts, tightening seal clamp just enough to give a smooth, firm, sliding grip on the plug. Replace seal if damaged.  <b>NOTE:</b> Running plug up and down through its full range once a month will "wipe off" any beginning residue before it becomes a sticky or hard, resistant accumulation.
WATER IN VACUUM LINE FROM CONTROL UNIT TO INJECTOR.	Defective check valve(s) in injector.	-	Visual check.	-	Service injector check valves.
ODOR OF GAS AT PRESSURE RELIEF VENT.	Leaking regulating valve.	-	Smell odor.	-	Service vacuum regulator.

# V10K V-NOTCH CHLORINATOR

## WARNING LABELS AND TAGS

The following warning labels and tags are attached to the equipment:

ACG4600: THIS UNIT IS DESIGNED TO OPERATE UNDER VACUUM ONLY. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO EQUIPMENT, DO NOT CONNECT TO A SOURCE OF GAS UNDER PRESSURE. SEE INSTRUCTION BOOK FOR FULL DETAILS BEFORE INSTALLATION.

AFM4995: INITIAL INSTALLATION & CHECK-OUT OF THIS EQUIPMENT MUST BE MADE FOLLOWING DETAILED INSTRUCTIONS CONTAINED IN THE EVOQUA WATER TECHNOLOGIES INSTRUCTION BOOK & SAFETY RELATED INFORMATION OBTAINED FROM YOUR GAS SUPPLIER. THESE CONDENSED OPERATING INSTRUCTIONS MAY THEN BE FOLLOWED FOR SUBSEQUENT GUIDANCE OF TRAINED EQUIPMENT OPERATORS.

AFM4634: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM ELECTRICAL SHOCK TURN POWER OFF BEFORE SERVICING. KEEP COVER SECURELY TIGHTENED WHEN EQUIPMENT IS IN OPERATION. THIS ENCLOSURE IS NEMA 4X RATED. GASKET SEAL MUST BE MADE IN ORDER TO PROTECT THE INTERNAL COMPONENTS FROM MOISTURE AND FUMES.

ACG4653: METAL CONDUIT MUST BE BONDED TO GROUND. OTHERWISE, USE NONMETALLIC CONDUIT.

AHS4646: HAZARDOUS GAS IS PRESENT IN THIS EQUIPMENT DURING NORMAL OPERATION. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, READ THE EVOQUA WATER TECHNOLOGIES INSTRUCTION BOOK AND THE APPROPRIATE GAS MANUAL BEFORE CONNECTING THIS EQUIPMENT TO A SUPPLY OF GAS. OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST BE RESTRICTED TO TRAINED, QUALIFIED PERSONNEL WHO ARE COMPLETELY FAMILIAR WITH THESE INSTRUCTIONS.

## WARNING LABELS AND TAGS (CONT'D)

L2708: CHLORINE, WHICH IS A HAZARDOUS CHEMICAL, IS PRESENT IN THIS EQUIPMENT DURING NORMAL OPERATION. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DEATH, YOU MUST OBSERVE THE FOLLOWING PRECAUTIONS:

1. When changing chlorine supply containers you must be completely familiar with your local plant operating and emergency procedures including the location and use of a gas mask. Recommended emergency procedures can be obtained from your chlorine supplier, the Chlorine Institute, Inc., or similar organization.
2. Do not open the chlorine supply container valve more than one complete turn. This will permit maximum discharge and can be turned off quickly in the event of a leak.
3. On a routine daily basis, starting at the chlorine supply container(s), thoroughly check all joints, connections and equipment for possible chlorine leaks and immediately correct any found. Do not tolerate any chlorine leaks.
4. Chlorine leaks never get better. Chlorine leaks always get progressively worse, if they are not promptly corrected.
5. Never re-use gaskets in chlorine piping systems. Always have an adequate supply on hand and always use new gaskets of the correct size and material as identified on the equipment parts drawings.
6. Except in cases of leak detection or calibration adjustments, the chlorine supply must be shut off at the supply container valve(s) and the chlorine in the system completely exhausted before servicing the equipment.
7. It is recommended practice to have an approved gas mask available, which you have been trained to use, when making chlorine leak checks and when changing chlorine supply containers.
8. The Evoqua Water Technologies instruction book provided with this equipment furnishes complete and detailed instructions for its installation, operation and maintenance and must be referred to for that detailed information.
9. The Evoqua Water Technologies instruction book provided with this equipment also furnishes technical information on the characteristics, storage and handling of chlorine, and must be referred to for that information. Contact your chlorine supplier, the Chlorine Institute, Inc., or similar organization to obtain more detailed information.

# V10K V-NOTCH CHLORINATOR

## WARNING LABELS AND TAGS (CONT'D)

10. Operation and maintenance of this equipment must be restricted to trained, qualified personnel who are completely familiar with these instructions.

DO NOT REMOVE THIS SIGN FROM THIS EQUIPMENT

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## CAUTION LABELS AND TAGS

The following caution labels and tags are attached to the equipment:

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P4373: PULL OUT STEM TO FULL LENGTH OF CHAIN BEFORE CLOSING VALVE.

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AFM4743: FOR CHLORINE, SULFUR DIOXIDE, AMMONIA OR CARBON DIOXIDE USE ONLY.

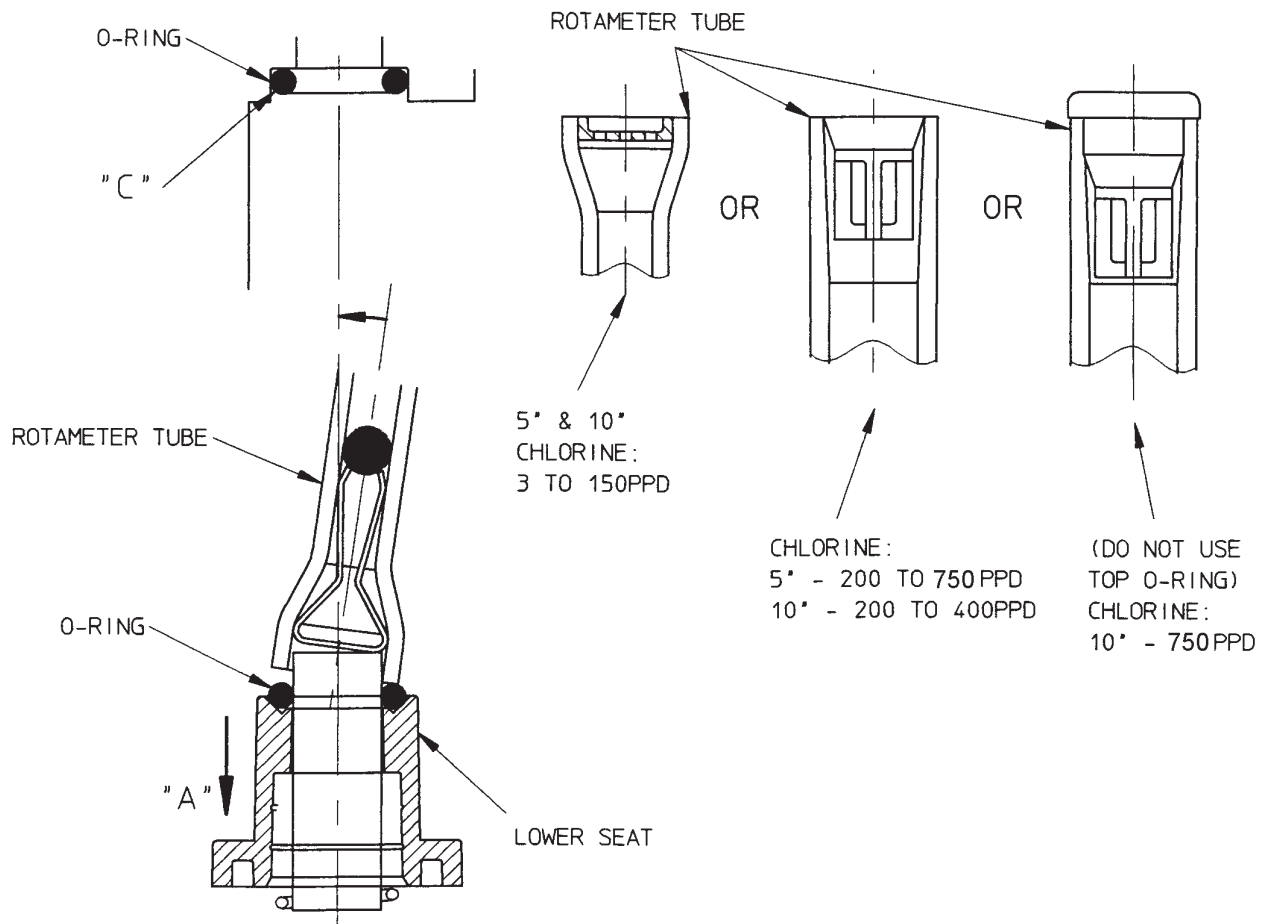
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ADH4733: FOR CHLORINE, SULFUR DIOXIDE OR CARBON DIOXIDE USE ONLY.

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# V10K V-NOTCH CHLORINATOR



## TO INSTALL ROTAMETER:

1. LUBRICATE O-RINGS WITH A LIGHT FILM OF HALOCARBON GREASE.
2. POSITION O-RINGS AS INDICATED. INSERT FLOAT AND STOPS IN ROTAMETER TUBE.
3. GRASP ROTAMETER BY THE TWO ENDS (HIGH VALUES OF THE SCALE ON TOP).
4. GUIDE LOWER END OF ROTAMETER WITH HAND "A" TO LOCATE ON O-RING.
5. EXERT DOWNWARD FORCE ON LOWER SEAT WITH TWO FINGERS OF HAND "A", TO COMPRESS SPRING. USE TWO FINGERS OF HAND "B" TO GUIDE TOP OF ROTAMETER INTO POSITION. ROTAMETER MUST TOUCH AT POINT "C" TO INSURE SEATING ON UPPER O-RING.
6. RELEASE DOWNWARD FORCE ON SPRING (HAND "A").
7. TURN THE TUBE UNTIL THE SCALE IS IN FRONT.

## TO REMOVE ROTAMETER:

1. EXERT DOWNWARD FORCE ON LOWER ROTAMETER SEAT WITH HAND "A".
2. USE TWO FINGERS OF HAND "B" TO SWING TOP OF ROTAMETER OUTWARD.
3. LIFT ROTAMETER.

READ SCALE OPPOSITE CENTER OF BALL.

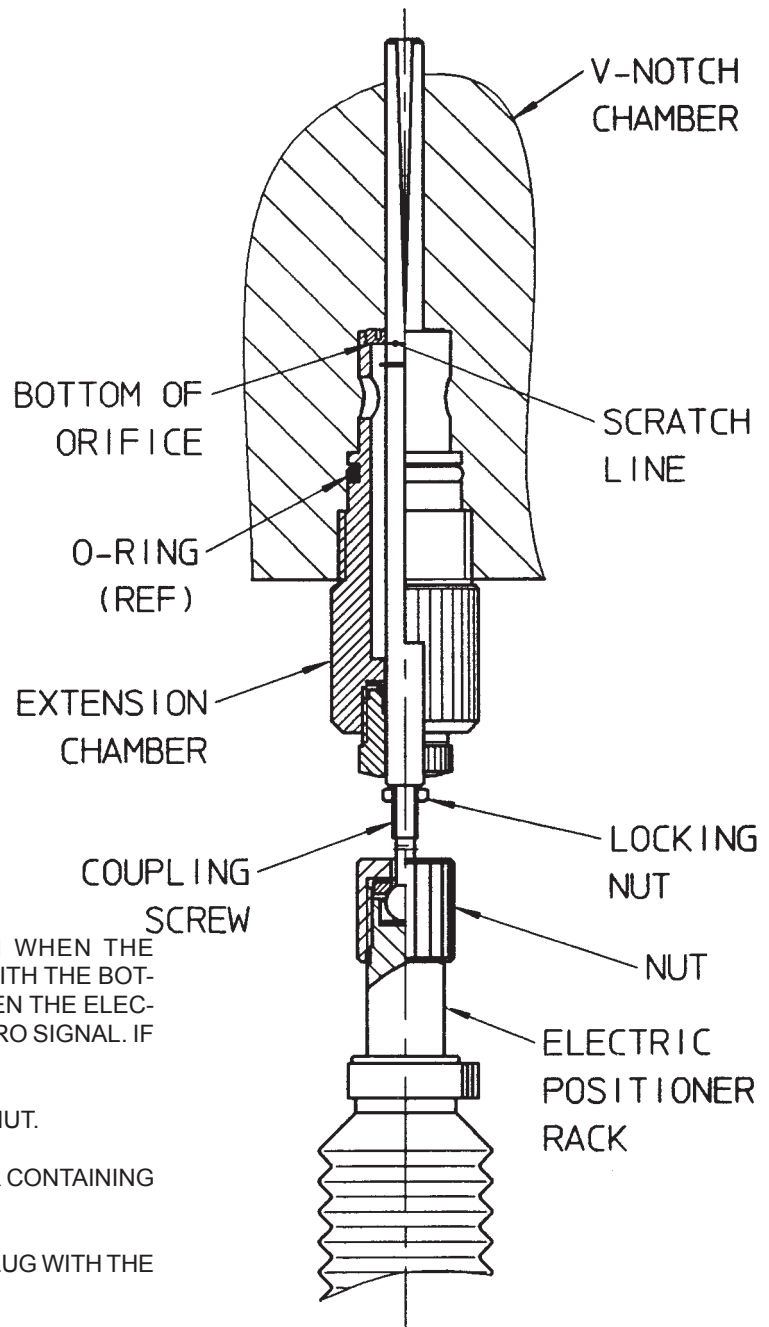
## INSTALLATION AND REMOVAL OF ROTAMETER - SERVICE

Used In V10k V-Notch Gas Feeders

25.100.150.020

ISSUE 0 7-05

# V10K V-NOTCH CHLORINATOR



THE PLUG IS AT THE ZERO POSITION WHEN THE SCRATCH LINE ON THE PLUG IS IN LINE WITH THE BOTTOM OF THE ORIFICE. THIS RESULTS WHEN THE ELECTRONIC CONTROLLER IS RECEIVING A ZERO SIGNAL. IF ADJUSTMENTS ARE NECESSARY:

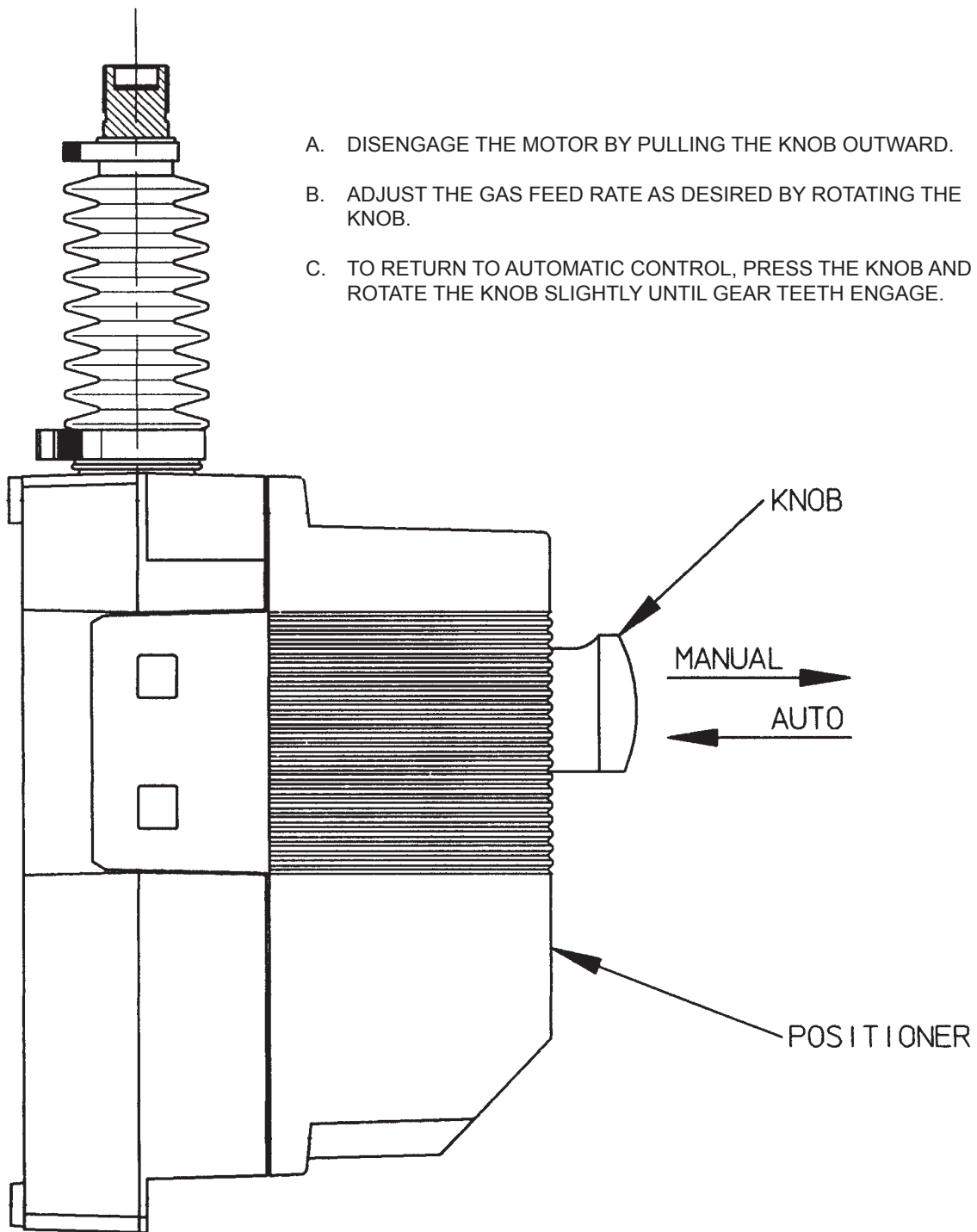
- A. RETRACT RACK AND THEN LOOSEN NUT.
- B. UNSCREW THE EXTENSION CHAMBER CONTAINING THE V-NOTCH PLUG AND ORIFICE.
- C. LINE UP THE SCRATCH LINE ON THE PLUG WITH THE BOTTOM OF THE ORIFICE.
- D. CAREFULLY REINSTALL THE EXTENSION CHAMBER INTO THE UNIT.
- E. LOOSEN LOCKING NUT AND SCREW COUPLING SCREW COMPLETELY IN.
- F. USE ELECTRICAL SIGNAL FROM CONTROLLER TO POSITION RACK AT ZERO FEED POSITION.
- G. ADJUST BALL AND SCREW FOR CORRECT ALIGNMENT BETWEEN THE ACTUATOR AND THE PLUG.
- H. ATTACH THE NUT AND TIGHTEN.

**AUTOMATIC CONTROL UNIT - SERVICE**  
Zero Position of Plug

25.200.150.010

ISSUE 0 10-95

# V10K V-NOTCH CHLORINATOR



INSTRUCTIONS FOR MANUAL OPERATION - OPERATION  
Positioner

40.300.170.010

ISSUE 0 10-95

# **SECTION 5**

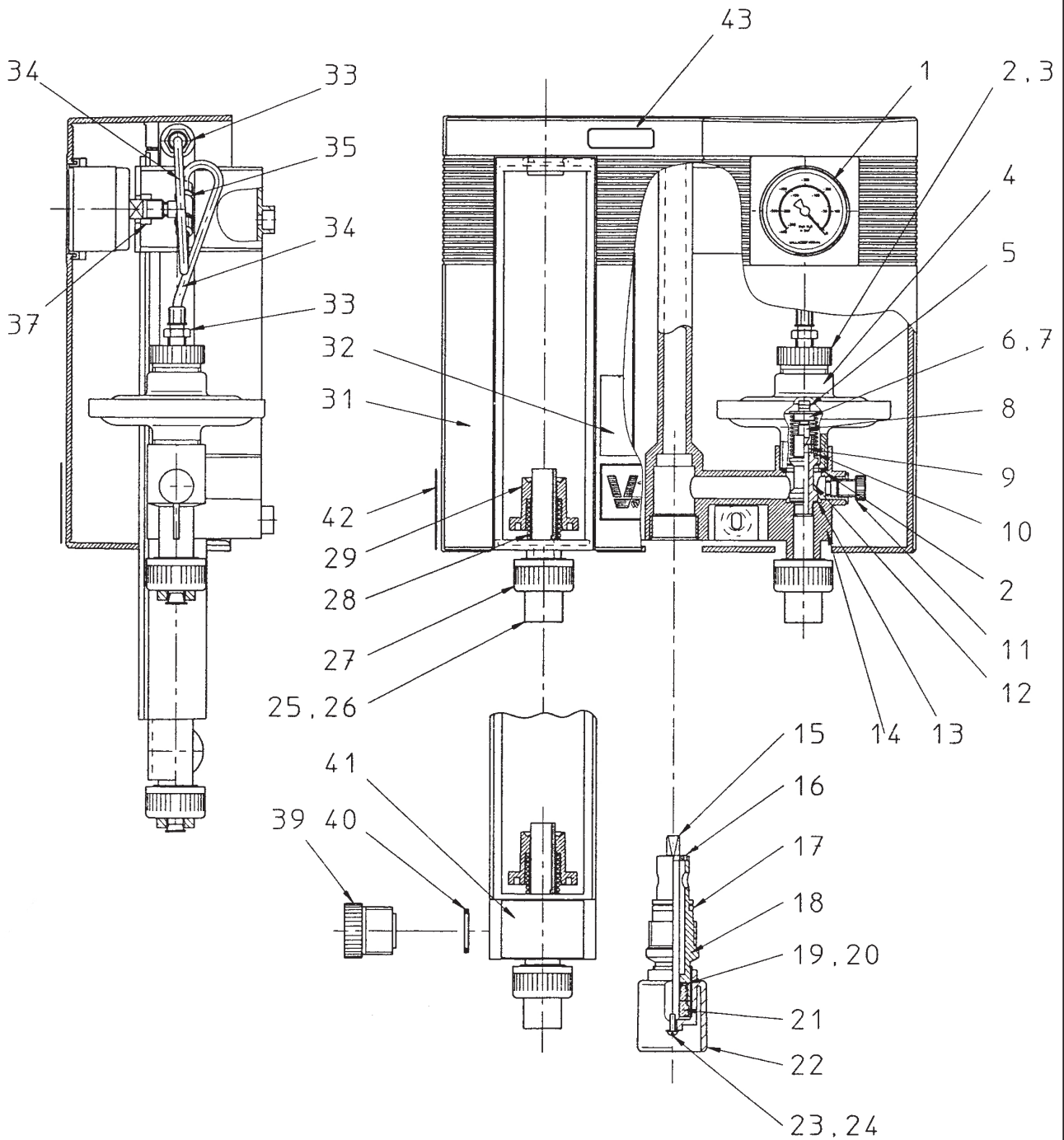
# V10K V-NOTCH CHLORINATOR

## SECTION 5 - ILLUSTRATIONS

### List Of Contents

	DRAWING NO.
Parts	
Control Unit, Wall-Mounted, Manual.....	25.100.000.040A-C
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Control Panel, Automatic Arrangement .....	25.100.000.060A-D
SFC Panel Mounting .....	25.100.000.070A&B
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Chlorinator - 10" Rotameter Components .....	25.100.001.220A&B
V-Notch Plugs, V10K Automatic Arrangement .....	25.100.001.035
Differential Regulating Valve .....	25.152.001.011
Pressure Relief Valve .....	25.100.001.040
AAA4310 3/4" Standard Injector.....	25.200.002.010A&B
AAA4307 3/4" Anti-Syphon Injector.....	25.200.002.020A&B
AAA4316 1" Standard Injector .....	25.200.002.030A&B
AAA4313 1" Anti-Syphon Injector .....	25.200.002.040A&B
Plastic 1" Fixed Throat Injector And Tailway Details .....	25.200.003.010A&B
Plastic Main Connection, For 3/4" Or 1" Solution Lines With 1" Corporation Cock.....	50.845.06.011
Main Connection, For 1" Solution Line And 1-1/2" Main Connection .....	50.845.06.012
Main Connection, For 3/4" Or 1" Solution Lines And 3/4" Or 1" Main Connections .....	50.845.06.032
2" Injector, With Manually Operated Plug Shut-Off .....	25.052.001.051A&B
2" Injector, With Pressure-Operated Plug Shut-Off .....	25.052.001.046A&B
U19315 Injector Shut-Off Unit.....	25.100.06.111
2" Main Connection, With Corporation Cock For 1-1/2" Or 2" Hose .....	50.845.002.022

# V10K V-NOTCH CHLORINATOR



**NOTE:** FOR PARTS LIST, SEE DWG. 25.100.000.040B.

5" AND 10" LOW CAPACITY (200PPD)  
 5" AND 10" HIGH CAPACITY(750PPD)  
 WALL-MOUNTED CONTROL UNIT - PARTS  
 Manual Arrangement

25.100.000.040A

ISSUE 1 10-08

# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	AAC6494	1	VACUUM GAUGE
2	P 44122	2	GASKET
3	PXA37688	1	PLUG
4	U 26664	1	DIAPHRAGM UNIT
5	P 44119	1	O-RING (009) HYPALON
6	P 37656	1	STEM HOLDER
7	P 37655	1	PIN
8	P 38409	1	STEM
9	P 37672	1	SEAT (LOW CAPACITY 200PPD AND BELOW)
	OR		
	P 38404	1	SEAT (HIGH CAPACITY 250PPD TO 750PPD)
10	P 37653	1	SPRING
11	P 31295	1	PLUG, 1/4" NPT
12	P 37671	1	HOUSING
13	P 37661	1	HOUSING SEAT GASKET
14	UXA96294	1	5" HEADBLOCK
	OR		
	UXA96295	1	10" HEADBLOCK
15	P 38071	1	V-NOTCH (LOW CAPACITY 200PPD AND BELOW)
	OR		
	P 48127	1	V-NOTCH (HIGH CAPACITY 250PPD TO 750PPD)
16	P 37657	1	ORIFICE
17	P 44045	1	EXTENSION CHAMBER O-RING
18	P 52146	1	EXTENSION CHAMBER
19	PXH26482	1	O-RING (012) HYPALON, 3/8" ID x 1/2" OD
20	P 34530	1	SEAL
21	P 37663	1	V-NOTCH SEAL SCREW
22	P 96959	1	MANUAL KNOB
23	P 35124	1	KNOB SCREW
24	P 35121	1	WASHER
25	AIA4701	2	O-RING
26	ALI4188	2	ADAPTER (LOW CAPACITY 200PPD AND BELOW)
	OR		
	AMK4218	1	ADAPTER (HIGH CAPACITY 250PPD TO 750PPD)
27	P 100363	2	UNION NUT
28	P 37880	1	ROTAMETER INLET SPRING
29	P 96960	1	ROTAMETER BASE
▲ 30	P 97018	1	LOGO
31	AAB8600	1	V10K COVER ASSEMBLY
32	ACG4600	1	WARNING LABEL (5" ONLY)
33	AAA1887	2	STRAIGHT FITTING
34	RP9024426	1.7FT	TUBING
35	AAA1884	1	TEE FITTING
▲ 36	P 96962	1	VACUUM GAUGE GASKET

▲ INCLUDED IN KEY NO. 31, AAB8600

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

5" AND 10" LOW CAPACITY (200PPD)

5" AND 10" HIGH CAPACITY(750PPD)

WALL-MOUNTED CONTROL UNIT - PARTS LIST

Manual Arrangement

25.100.000.040B

ISSUE 1 10-08

# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
37	P 97104	1	NUT
▲ 38	AHS4646	1	WARNING LABEL
39	RXA32525	1	PLUG (10" ONLY)
40	P 44122	1	GASKET (10" ONLY)
41	ACG4600	1	WARNING LABEL (10" ONLY)
42	ADH4733	1	CAUTION LABEL
43	P 54516	1	LABEL, CHLORINATOR
-	AFM4995	1	WARNING TAG (NOT SHOWN)
-	L 2709	1	WARNING TAG (NOT SHOWN)

▲ INCLUDED IN KEY NO. 31, AAB8600

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

5" AND 10" LOW CAPACITY (200PPD)

5" AND 10" HIGH CAPACITY(750PPD)

WALL-MOUNTED CONTROL UNIT - PARTS LIST

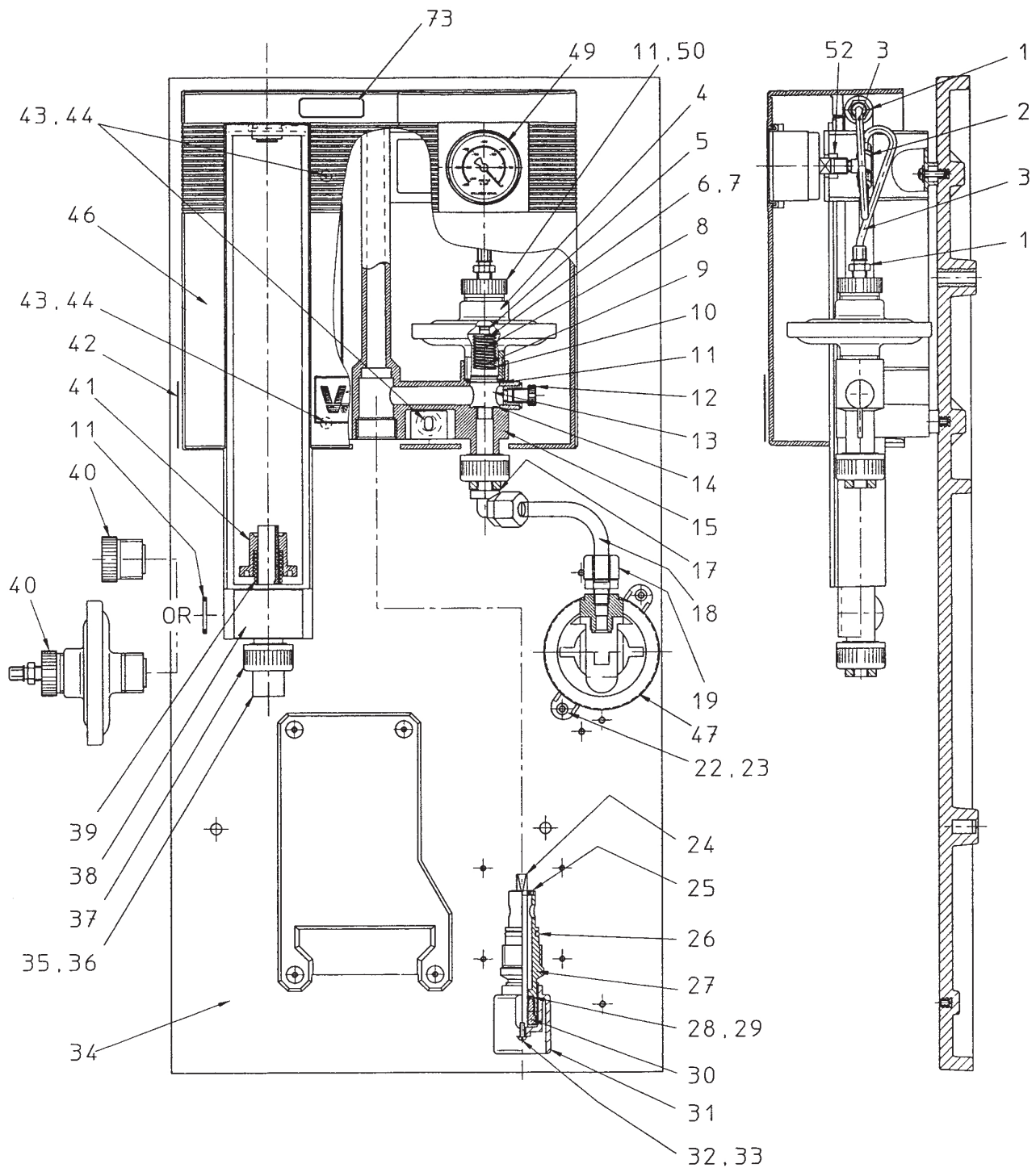
Manual Arrangement

25.100.000.040C

ISSUE 0 10-08



# V10K V-NOTCH CHLORINATOR



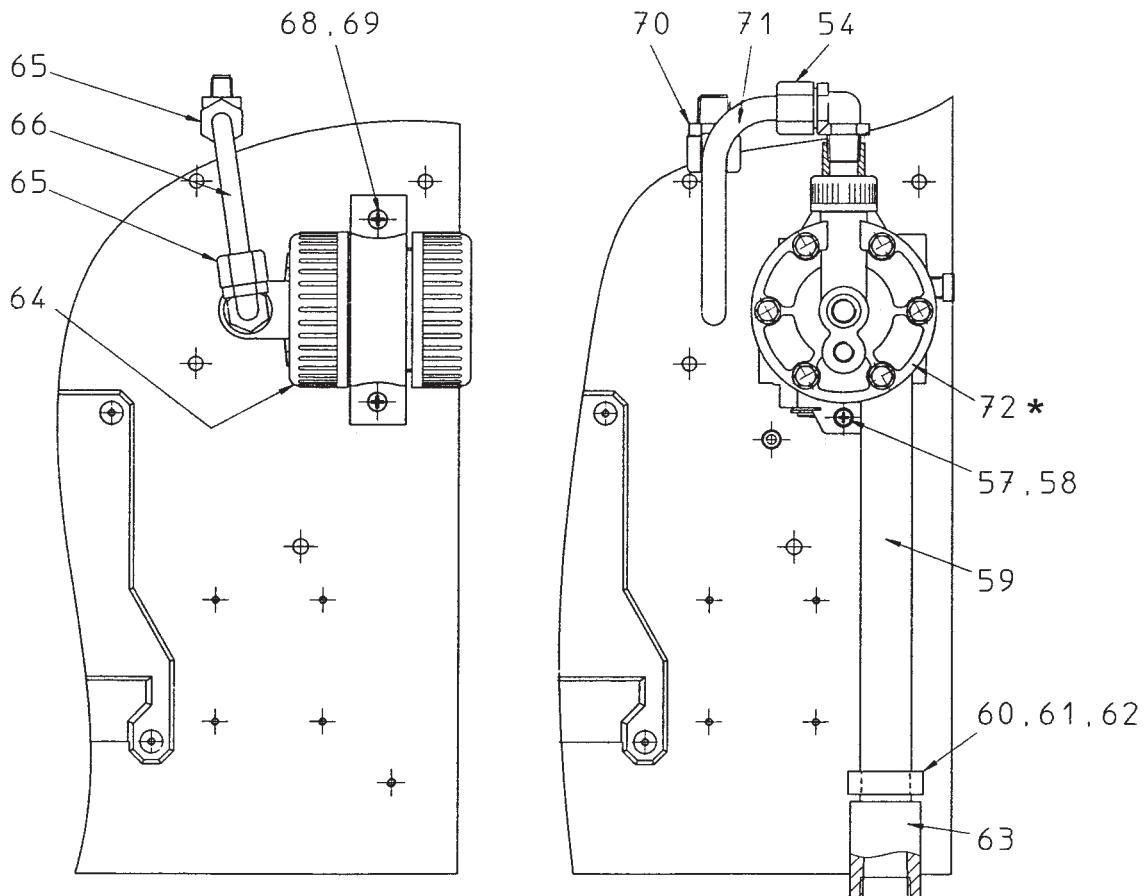
**NOTE:** FOR PARTS LIST, SEE DWGS. 25.100.000.050C&D.

10" LOW CAPACITY (200PPD) AND 10" HIGH CAPACITY(750PPD)  
 PANEL-MOUNTED CONTROL UNIT - PARTS  
 Manual Arrangement

25.100.000.050A

ISSUE 1 10-08

# V10K V-NOTCH CHLORINATOR



(3/4" ANTI-SYPHON  
INJECTOR SHOWN)

**NOTE:** \* FOR CAPACITIES HIGHER THAN 500PPD, USE A 2" INJECTOR. SEE TYPICAL INSTALLATION DWGS. IN SECTION 2.

FOR PARTS LIST, SEE DWGS. 25.100.000.050C&D.

10" LOW CAPACITY (200PPD) AND 10" HIGH CAPACITY(750PPD)  
PANEL-MOUNTED CONTROL UNIT - PARTS  
Manual Arrangement

25.100.000.050B

ISSUE 0 7-05

# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	AAA1887	2	STRAIGHT FITTING
2	AAA1884	1	TEE FITTING
3	RP9024426	1.7 FT	TUBING
4	U 26664	1	DIAPHRAGM UNIT
5	P 44119	1	O-RING (009) HYPALON, 7/32" ID x 11/32" OD
6	P 37656	1	STEM HOLDER
7	P 37655	1	PIN
8	P 38409	1	STEM
9	P 37672	1	SEAT (LOW CAPACITY 200PPD AND BELOW)
	OR		
	P 38404	1	SEAT (HIGH CAPACITY 250PPD TO 750PPD)
10	P 37653	1	SPRING
11	P 44122	3	GASKET
12	P 31295	1	PLUG, 1/4" NPT
13	P 37671	1	HOUSING (SEAT)
14	P 37661	1	SEAT GASKET HOUSING
15	UXA96295	1	10" HEADBLOCK
▲ 16	AHS4646	1	WARNING LABEL
17	AQA3847	1	TUBING CONNECTOR
18	AAA1532	1	INJECTOR LINE
19	U 24914	1	TUBING CONNECTOR
22	PXE96276	2	SCREW
23	P 19888	2	WASHER
24	P 38071	1	V-NOTCH (LOW CAPACITY 200PPD AND BELOW)
	OR		
	P 48127	1	V-NOTCH (HIGH CAPACITY 250PPD TO 750PPD)
25	P 37657	1	ORIFICE
26	P 44045	1	EXTENSION CHAMBER O-RING
27	P 52146	1	EXTENSION CHAMBER
28	PXH26482	1	O-RING
29	P 34530	1	SEAL, PTFE
30	P 37663	1	V-NOTCH SEAL SCREW
31	P 96959	1	MANUAL KNOB
32	P 35124	1	KNOB SCREW
33	P 35121	1	WASHER
34	PXB97066	1	PANEL
35	AIA4701	2	O-RING
36	ALI4188	2	ADAPTER (LOW CAPACITY 200PPD AND BELOW)
	OR		
	AMK4218	2	ADAPTER (HIGH CAPACITY 250PPD TO 750PPD)

▲ INCLUDED WITH KEY NO. 46, AAB8600

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

10" LOW CAPACITY (200PPD) AND 10" HIGH CAPACITY(750PPD)  
 PANEL-MOUNTED CONTROL UNIT - PARTS LIST  
 Manual Arrangement

25.100.000.050C

ISSUE 1 10-08

# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
37	P 100363	2	UNION NUT
38	ACG4600	1	WARNING LABEL
39	P 37880	1	ROTAMETER INLET SPRING
40	RXA32525	1	PLUG
	OR		
	AAA3365	1	PRESSURE RELIEF VALVE (SEE DWG. 25.100.001.040)
41	P 96960	1	ROTAMETER BASE
42	ADH 4733	1	CAUTION LABEL
43	PXF 96220	3	HEADBLOCK SCREW
44	PXF 92139	3	HEADBLOCK WASHER
▲ 45	P 97018	1	LOGO
46	AAB8600	1	V10K COVER ASSEMBLY
47	AAA 4310	1	3/4" INJECTOR (SEE SEPARATE DWG.)
49	AAC6494	1	VACUUM GAUGE
50	PXA 37688	1	PLUG
▲ 51	P 96962	1	VACUUM GAUGE GASKET
52	P 97104	1	VACUUM GAUGE NUT
54	U 24110	1	ELBOW TUBING CONNECTOR (5/8" OD x 1/2" NPT)
57	PXG 96276	2	SCREW
58	P 19888	2	WASHER
59	AAA 1607	1	1" DIA. PIPE NIPPLE
60	UXC 94333	1	1" DIA. PIPE CLAMP
61	AAA 1613	1	SPACER
62	AAA 2457	1	SCREW
63	P 43468	1	1" PIPE COUPLING
64	AAA 4307	1	3/4" ANTI-SYPHON INJECTOR (SEE DWG.25.200.002.020A&B)
65	AQA 3847	2	TUBING CONNECTOR (1/2" OD x 1/4" NPT)
66	AAA 1535	1	INJECTOR LINE
68	PXE 96276	2	SCREW
69	P 19888	2	WASHER
70	U 24102	1	STRAIGHT TUBING CONNECTOR (5/8" OD x 1/2" NPT)
71	AAA 1556	1	INJECTOR LINE
* 72	AAA 4316	1	1" INJECTOR (SEE SEPARATE DWG.)
	OR		
	AAA 4313	1	1" ANTI-SYPHON INJECTOR (SEE SEPARATE DWG.)
▲ 73	P 54516	1	LABEL, CHLORINATOR
-	AFM 4995	1	WARNING TAG (NOT SHOWN)
-	L 2709	1	WARNING TAG (NOT SHOWN)

**NOTE:** \* FOR CAPACITIES HIGHER THAN 500PPD, USE A 2" INJECTOR. SEE TYPICAL INSTALLATION DWGS. IN SECTION 2.

▲ INCLUDED WITH KEY NO. 46, AAB8600.

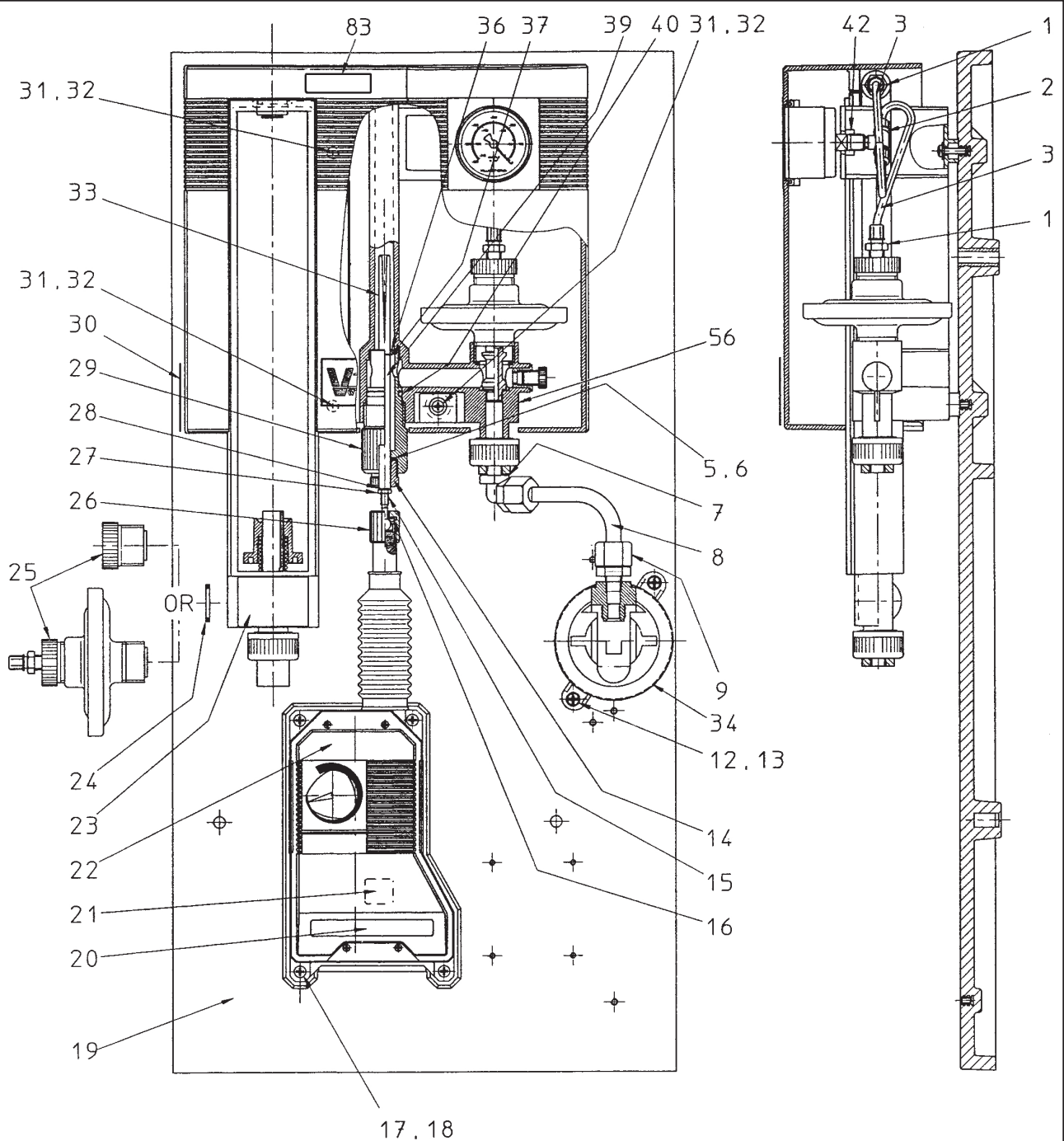
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

10" LOW CAPACITY (200PPD) AND 10" HIGH CAPACITY(750PPD)  
 PANEL-MOUNTED CONTROL UNIT - PARTS LIST  
 Manual Arrangement

25.100.000.050D

ISSUE 1 10-08

# V10K V-NOTCH CHLORINATOR



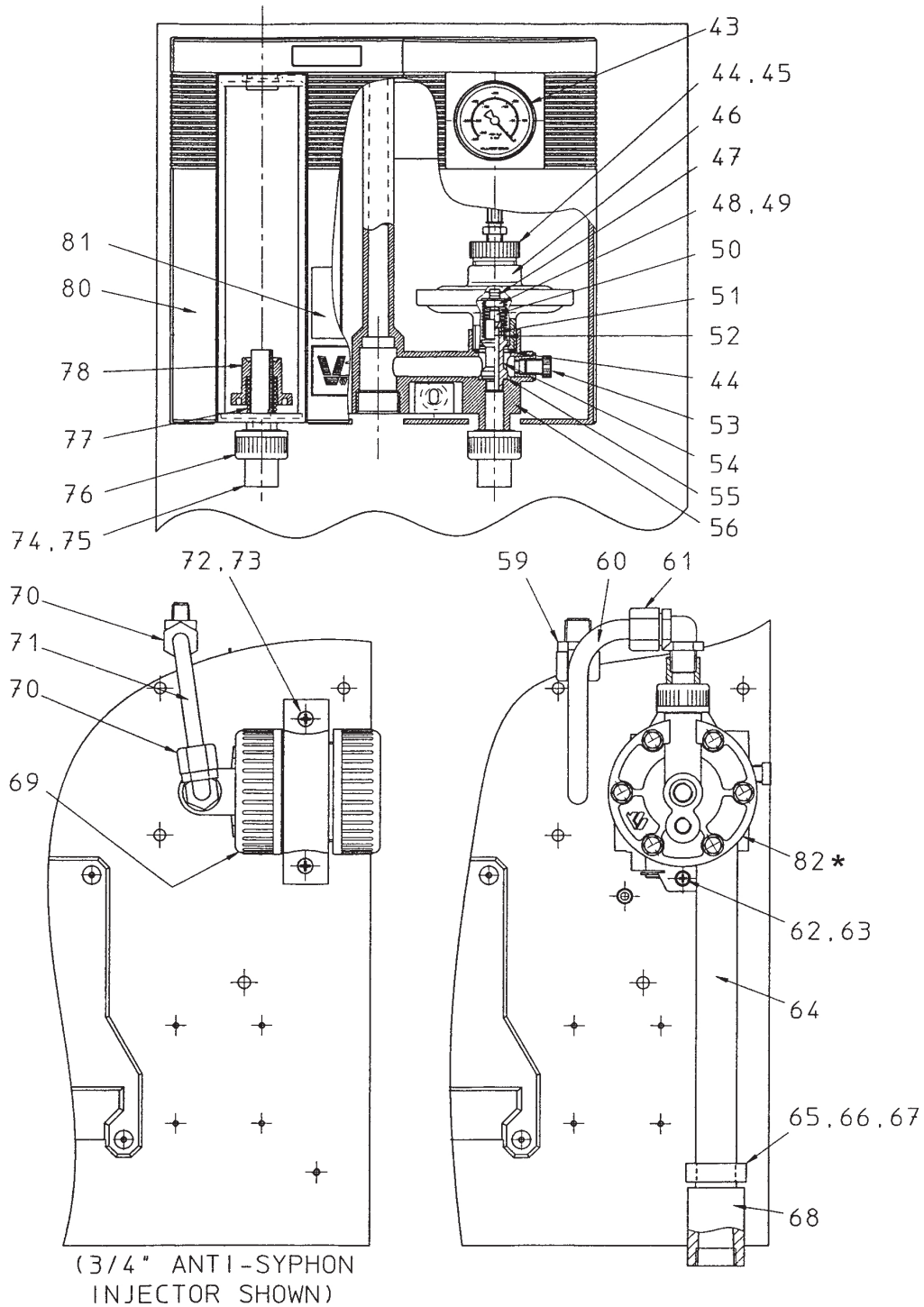
**NOTE:** FOR PARTS LIST, SEE DWGS. 25.100.000.060C&D.

5" AND 10" LOW CAPACITY (200PPD)  
 5" AND 10" HIGH CAPACITY (750PPD)  
 PANEL-MOUNTED CONTROL UNIT- PARTS  
 Automatic Arrangement

25.100.000.060A

ISSUE 1 10-08

# V10K V-NOTCH CHLORINATOR



**NOTE: \*** FOR CAPACITIES HIGHER THAN 500PPD, USE A 2" INJECTOR. SEE TYPICAL INSTALLATION DWGS. IN SECTION 2.

FOR PARTS LIST, SEE DWGS. 25.100.000.050C&D.

5" AND 10" LOW CAPACITY (200PPD)  
5" AND 10" HIGH CAPACITY (750PPD)  
PANEL-MOUNTED CONTROL UNIT

- PARTS  
Automatic Arrangement

25.100.000.060B

ISSUE 1 10-08

# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	AAA 1887	2	STRAIGHT FITTING
2	AAA 1884	1	TEE FITTING
3	RP9024426	1.7FT	TUBING
▲ 4	AHS 4646	1	LABEL, WARNING
5	PXH 26482	1	O-RING (012) HYPALON, 3/8" ID x 1/2" OD
6	P 34530	1	SEAL
7	AQA 3847	1	TUBING CONNECTOR
8	AAA 1532	1	INJECTOR LINE
9	U 24914	1	TUBING CONNECTOR
12	PXE 96276	2	SCREW
13	P 19888	2	WASHER
14	P 37663	1	V-NOTCH SEAL SCREW
15	P 97027	1	BALL AND SCREW
16	P 97028	1	DISC
17	PXM 96220	4	SCREW
18	P 92697	4	WASHER
19	PXB 97066	1	PANEL
20	AFM 4634	1	WARNING LABEL
21	ACG 4653	1	WARNING LABEL
22	UXB 96285	1	AUTOMATIC POSITIONER (115V)
	OR		
	UXC 96285	1	AUTOMATIC POSITIONER (230V)
23	ACG 4600	1	WARNING LABEL (10" ROTAMETER ONLY)
24	P 44122	1	GASKET (10" ROTAMETER ONLY)
25	RXA 32525	1	PLUG
	OR		
	AAA 3365	1	PRESSURE RELIEF VALVE (SEE DWG. 25.100.001.040)
26	P 97026	1	CLAMP NUT
27	P 16542	1	NUT
28	P 16556	1	WASHER
29	P 48157	1	EXTENSION CHAMBER
30	ADH 4733	1	CAUTION LABEL
31	PXF 96220	3	HEADBLOCK SCREW
32	PXF 92139	3	HEADBLOCK WASHER
33	-----	1	V-NOTCH PLUG (SEE DWG. 25.100.001.030)
34	AAA 4310	1	3/4" INJECTOR (SEE SEPARATE INSTRUCTION DWG.)
36	P 37657	1	ORIFICE
37	P 36861	1	WASHER (TEFLON)
39	AAA 4484	1	AUTOMATIC V-NOTCH STEM UNIT
40	P 44045	1	EXTENSION CHAMBER O-RING
▲ 41	P 96962	1	VACUUM GAUGE GASKET
42	P 97104	1	VACUUM GAUGE NUT
43	U 96376	1	VACUUM GAUGE
44	P 44122	2	GASKET
45	PXA37688	1	PLUG
46	U 26664	1	DIAPHRAGM UNIT

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

▲ INCLUDED WITH KEY NO. 46, AAB8600.

5" AND 10" LOW CAPACITY (200PPD)

5" AND 10" HIGH CAPACITY(750PPD)

PANEL-MOUNTED CONTROL UNIT- PARTS LIST

Automatic Arrangement

25.100.000.060C

ISSUE 1 10-08



# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
47	P 44119	1	O-RING (009) HYPALON, 7/32" ID x 11/32" OD
48	P 37656	1	STEM HOLDER
49	P 37655	1	PIN
50	P 38409	1	STEM
51	P 37672	1	SEAT (LOW CAPACITY 200PPD AND BELOW)
	OR		
	P 38404	1	SEAT (HIGH CAPACITY 250PPD TO 750PPD)
52	P 37653	1	SPRING
53	P 31295	1	PLUG, 1/4 NPT
54	P 37671	1	HOUSING
55	P 37661	1	HOUSING SEAT GASKET
56	UXA96294	1	5" HEADBLOCK
	OR		
	UXA96295	1	10" HEADBLOCK
59	U 24102	1	STRAIGHT TUBING CONNECTOR (5/8" OD x 1/2" NPT)
60	AAA1556	1	INJECTOR LINE
61	U 24110	1	ELBOW TUBING CONNECTOR (5/8" OD x 1/2" NPT)
62	PXG96276	2	SCREW
63	P 19888	2	WASHER
64	AAA1607	1	1" DIA. PIPE NIPPLE
65	UXC94333	1	1" DIA. PIPE CLAMP
66	AAA1613	1	SPACER
67	AAA2457	1	SCREW
68	P 43468	1	1" PIPE COUPLING
69	AAA4307	1	3/4" ANTI-SYPHON (SEE SEPARATE INSTRUCTION DWG.)
70	AQA3847	2	TUBING CONNECTOR (1/2" OD x 1/4" NPT)
71	AAA1535	1	INJECTOR LINE
72	PXE96276	2	SCREW
73	P 19888	2	WASHER
74	AIA4701	2	O-RING (211) HYPALON, 20.22 ID x 3.53 OD
75	ALI4188	2	1/4" ADAPTER (LOW CAPACITY 200PPD AND BELOW)
	OR		
	AMK4218	1	1/2" ADAPTER (HIGH CAPACITY 250PPD TO 750PPD)
76	P 100363	2	UNION NUT
77	P 37880	1	ROTAMETER INLET SPRING
78	P 96960	1	ROTAMETER BASE
▲ 79	P 97018	1	LOGO
80	AAB8600	1	V10K COVER ASSEMBLY
81	ACG 4600	1	WARNING LABEL
82 *	AAA 4316	1	1" INJECTOR (SEE SEPARATE INSTRUCTION DWG.)
	OR		
	AAA 4313	1	1" ANTI-SYPHON INJECTOR (SEE SEPARATE INSTRUCTION DWG.)
▲ 83	P 54516	1	LABEL, CHLORINATOR
-	AFM 4995	1	WARNING TAG (NOT SHOWN)
-	L 2709	1	WARNING TAG (NOT SHOWN)

**NOTE:** \* FOR CAPACITIES HIGHER THAN 500PPD, USE A 2" INJECTOR. SEE TYPICAL INSTALLATION DWGS. IN SECTION 2.

▲ INCLUDED WITH KEY NO. 80, AAB8600.

5" AND 10" LOW CAPACITY (200PPD)

5" AND 10" HIGH CAPACITY(750PPD)

WHEN ORDERING MATERIAL, ALWAYS SPECIFY  
MODEL AND SERIAL NUMBER OF APPARATUS.

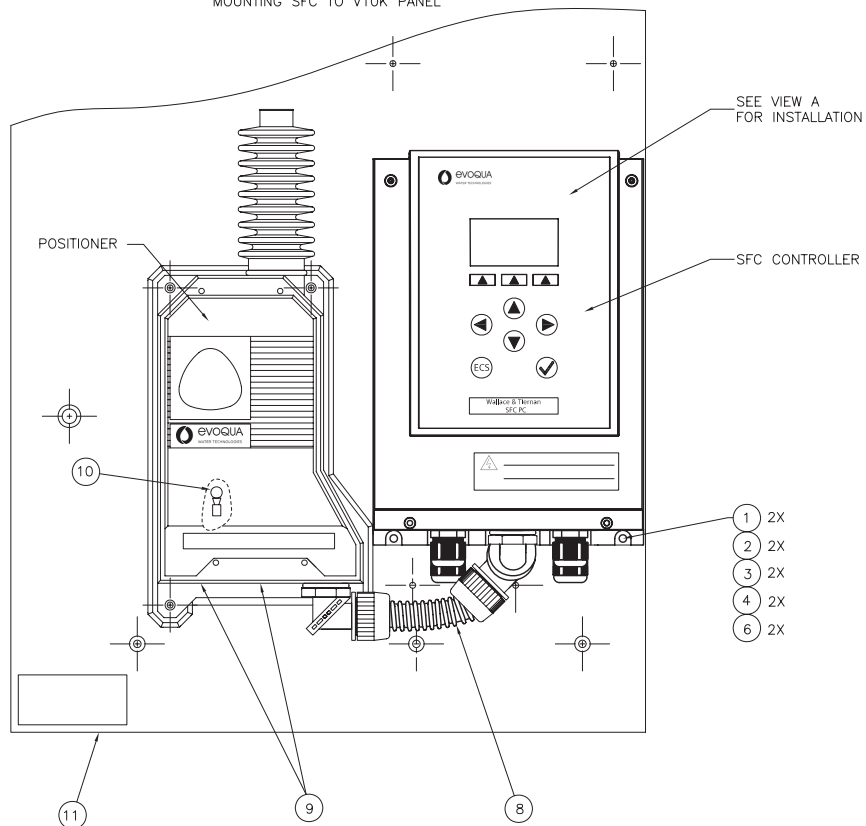
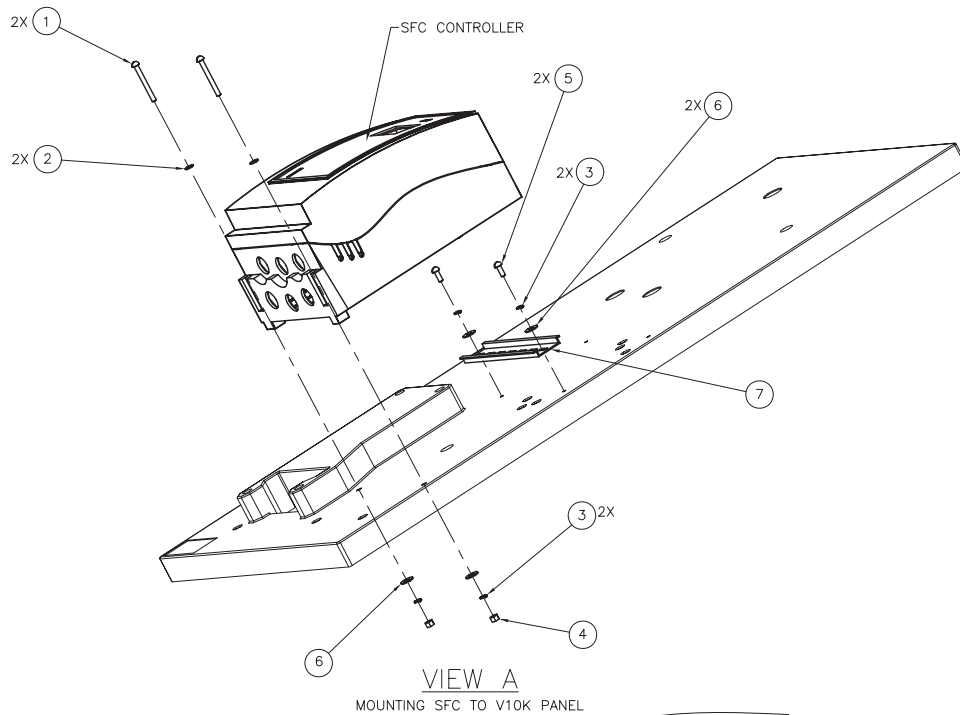
PANEL-MOUNTED CONTROL UNIT- PARTS LIST  
Automatic Arrangement

25.100.000.060D

ISSUE 1 10-08



# V10K V-NOTCH CHLORINATOR



**NOTE:** FOR PARTS LIST, SEE DWGS. 25.100.000.070B.

**SFC PANEL MOUNTING - PARTS**

**25.100.000.070A**

ISSUE 1 6-14

# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	P48658	2	SCREW, MCH, RD, HD, SLOT, 1-3/4" LG.
2	P92697	2	WASHER, FLT, #10 SS
3	P13619	4	WASHER, LOCK, #10 SS
4	P35110	2	NUT, SCR, HEX, SS
5	P19665	2	SCREW, MCH, RD, HD, SLOT, 5/8" LG.
6	PXF92139	4	WASHER, FLAT, #10 SS
7	AAD3941	1	DINRAIL, 6-7/8" LG., SS
8	AAD3947	1	V10K WIRING HARNESS PACKAGE SFC POSITIONER
9	P50388	1	HOLE SEAL
10	P36439	1	TERMINAL LUG
11	AAD3977	1	PANEL

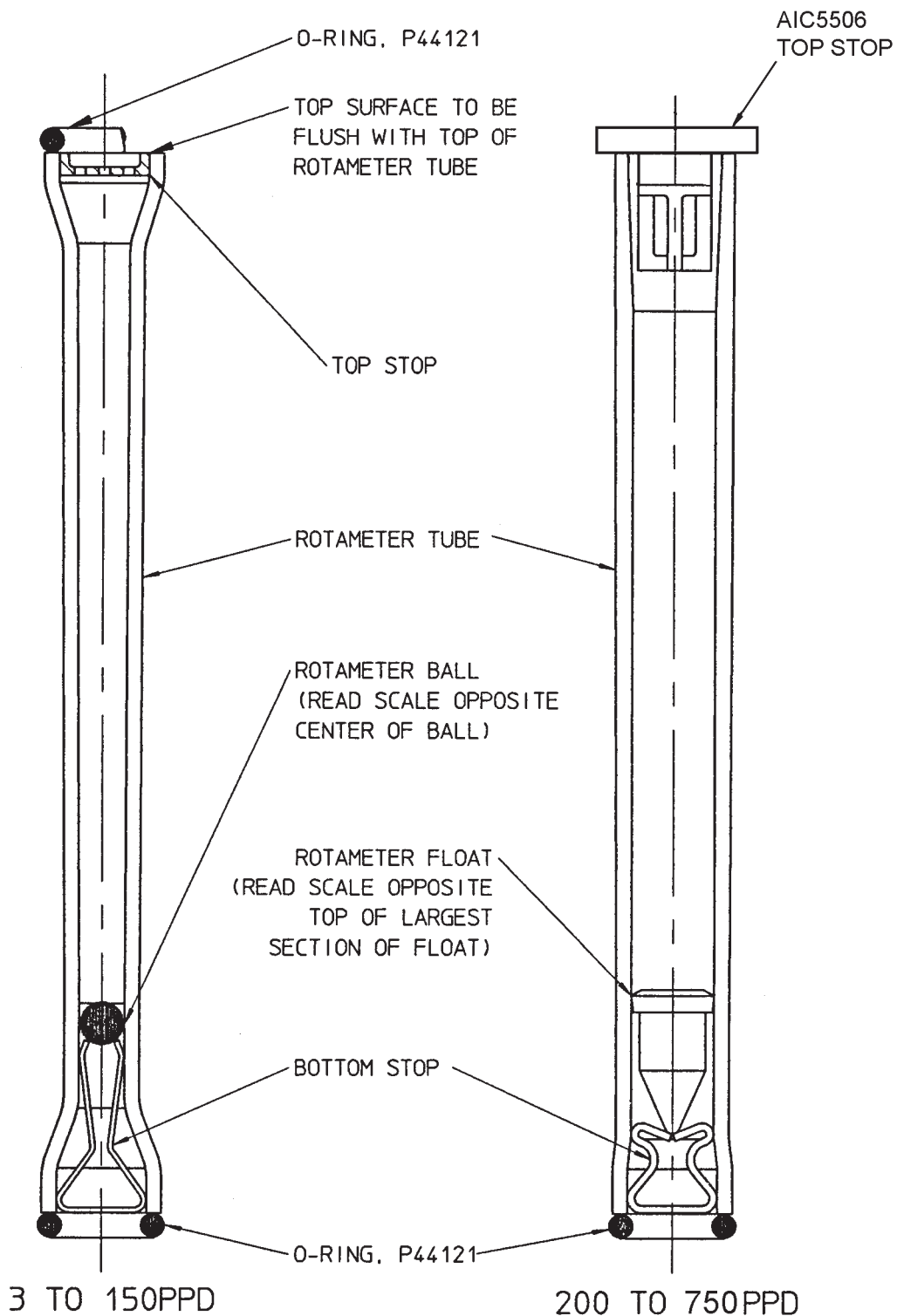
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

SFC PANEL MOUNTING - PARTS

25.100.000.070B

ISSUE 0 10-08

# V10K V-NOTCH CHLORINATOR



**NOTE:** FOR PARTS LIST, SEE DWG. 25.100.001.210B.

V10k CHLORINATOR - PARTS  
5" Rotameter Components

25.100.001.210A

ISSUE 0 7-05

# V10K V-NOTCH CHLORINATOR

MAX. CAPACITY LBS. PER 24 HRS.	ROTAMETER					
	COMPLETE UNIT	TUBE	FLOAT		STOPS	
			PART NUMBER	DESCRIPTION	TOP	BOTTOM
3	UXA25054	P52148	P37702	1/8" DIA. RED BALL	P41212	P38131
10	UXB25054	P52150	P37702	1/8" DIA. RED BALL	P41212	P38131
20	UXC25054	P52152	P37703	5/32" DIA. RED BALL	P41212	P38131
30	UXP25054	PXA52154	NPXA150	1/4" DIA. BLACK BALL	P41212	P38131
50	UXE25054	P52156	P37705	1/4" DIA. RED BALL	P41212	P38131
75	UXF25054	P51258	P37706	5/16" DIA. RED BALL	P41212	P38131
100	UXG25054	P52160	P37706	5/16" DIA. RED BALL	P41212	P38131
150	UXH25054	P52162	P37707	3/8" DIA. RED BALL	P41212	P38131
200	UXJ25054	P52164	P36376	9/16" DIA. GLASS FLOAT	AIC5506	P48140
250	UXK25054	P52166	P36376	9/16" DIA. GLASS FLOAT	AIC5506	P48140
300	UXL25054	P52168	P38256	5/8" DIA. GLASS FLOAT	AIC5506	P48140
400	UXM25054	P52170	P38256	5/8" DIA. GLASS FLOAT	AIC5506	P48140
500	UXN25054	P52172	P35103	11/16" DIA. CERAMIC FLOAT	AIC5506	P48140
750	AAC8090*	PXO97097*	AAD3799	.630" DIA. PEEK FLOAT	AIC5506	P48140

\* DUAL SCALE IN LBS/24HRS AND KG/H.

MAX. CAPACITY KGS. PER 24 HRS.	ROTAMETER					
	COMPLETE UNIT	TUBE	FLOAT		STOPS	
			PART NUMBER	DESCRIPTION	TOP	BOTTOM
1.3	UXA25146	P52331	P37702	1/8" DIA. RED BALL	P41212	P38131
4.5	UXB25146	P52333	P37702	1/8" DIA. RED BALL	P41212	P38131
9.0	UXC25146	P52335	P37703	5/32" DIA. RED BALL	P41212	P38131
13.5	UXP25146	PXA52337	NPXA150	1/4" DIA. BLACK BALL	P41212	P38131
22	UXE25146	P52339	P37705	1/4" DIA. RED BALL	P41212	P38131
34	UXF25146	P52341	P37706	5/16" DIA. RED BALL	P41212	P38131
45	UXG25146	P52343	P37706	5/16" DIA. RED BALL	P41212	P38131
68	UXH25146	P52345	P37707	3/8" DIA. RED BALL	P41212	P38131
90	UXJ25146	P52347	P36376	9/16" DIA. GLASS FLOAT	AIC5506	P48140
110	UXK25146	P52349	P36376	9/16" DIA. GLASS FLOAT	AIC5506	P48140
135	UXL25146	P52351	P38256	5/8" DIA. GLASS FLOAT	AIC5506	P48140
180	UXM25146	P52353	P38256	5/8" DIA. GLASS FLOAT	AIC5506	P48140
225	UXN25146	P52355	P35103	11/16" DIA. CERAMIC FLOAT	AIC5506	P48140

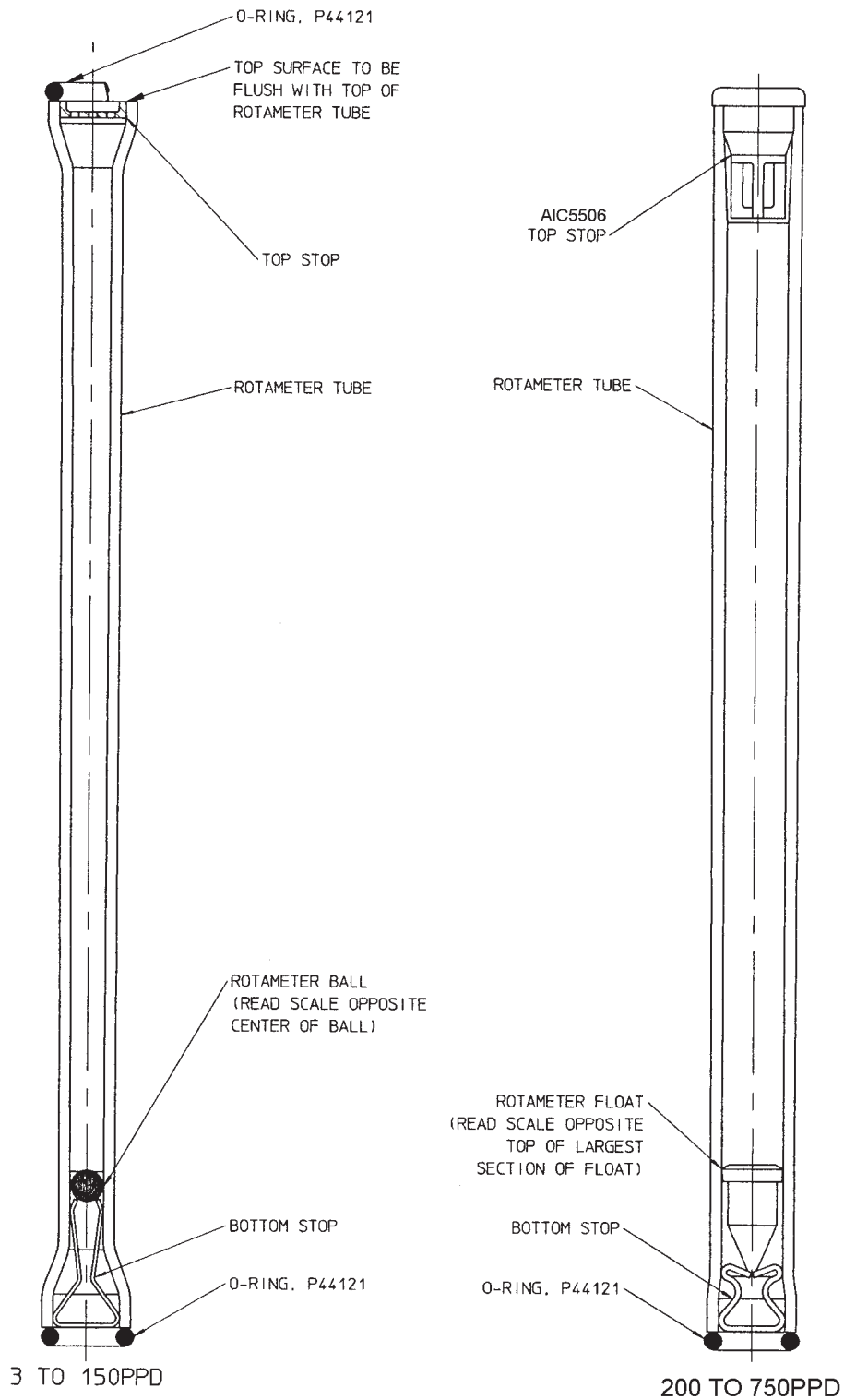
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

V10k CHLORINATOR - PARTS  
5" Rotameter Components

25.100.001.210A

ISSUE 1 10-08

# V10K V-NOTCH CHLORINATOR



**NOTE:** FOR PARTS LIST, SEE DWG. 25.100.001.220B.

V10k CHLORINATOR - PARTS  
10" Rotameter Components

25.100.001.220A

ISSUE 0 7-05

# V10K V-NOTCH CHLORINATOR

MAX. CAPACITY LBS. PER 24 HRS.	ROTAMETER					
	COMPLETE UNIT	TUBE	FLOAT		STOPS	
			PART NUMBER	DESCRIPTION	TOP	BOTTOM
3	U20947	P44058	P37702	1/8" DIA. RED BALL	P41212	P38131
10	UXA20947	P44059	P37702	1/8" DIA. RED BALL	P41212	P38131
20	UXB20947	P44060	P37703	5/32" DIA. RED BALL	P41212	P38131
30	UXN20947	PXA53673	NPXA150	1/4" DIA. BLACK BALL	P41212	P38131
50	UXD20947	P44062	P37705	1/4" DIA. RED BALL	P41212	P38131
75	UXE20947	P44063	P37706	5/16" DIA. RED BALL	P41212	P38131
100	UXF20947	P44064	P37706	5/16" DIA. RED BALL	P41212	P38131
150	UXG20947	P44065	P37707	3/8" DIA. RED BALL	P41212	P38131
200	UXH20947	P44066	P36376	9/16" DIA. GLASS FLOAT	AIC5506	P48140
250	UXJ20947	P44067	P36376	9/16" DIA. GLASS FLOAT	AIC5506	P48140
300	UXK20947	P44068	P38256	5/8" DIA. GLASS FLOAT	AIC5506	P48140
400	UXL20947	P44069	P38256	5/8" DIA. GLASS FLOAT	AIC5506	P48140
500	UXM20947	PXA48131	P35103	11/16" DIA. CERAMIC FLOAT	AIC5506	P48140
750	AAC8093*	PXO97098*	AAD3799	.630" DIA. PEEK FLOAT	AIC5506	P48140

\* DUAL SCALE IN LBS/24HRS AND KG/H.

MAX. CAPACITY KGS. PER 24 HRS.	ROTAMETER					
	COMPLETE UNIT	TUBE	FLOAT		STOPS	
			PART NUMBER	DESCRIPTION	TOP	BOTTOM
1.3	U20992	PXA44058	P37702	1/8" DIA. RED BALL	P41212	P38131
4.5	UXA20992	PXG44059	P37702	1/8" DIA. RED BALL	P41212	P38131
9.0	UXB20992	PXC44060	P37703	5/32" DIA. RED BALL	P41212	P38131
13.5	UXN20992	PXC53673	NPXA150	1/4" DIA. BLACK BALL	P41212	P38131
22	UXD20992	PXG44062	P37705	1/4" DIA. RED BALL	P41212	P38131
34	UXE20992	PXG44063	P37706	5/16" DIA. RED BALL	P41212	P38131
45	UXF20992	PXG44064	P37706	5/16" DIA. RED BALL	P41212	P38131
68	UXG20992	PXG44065	P37707	3/8" DIA. RED BALL	P41212	P38131
90	UXH20992	PXG44066	P36376	9/16" DIA. GLASS FLOAT	AIC5506	P48140
110	UXJ20992	PXG44067	P36376	9/16" DIA. GLASS FLOAT	AIC5506	P48140
135	UXK20992	PXG44068	P38256	5/8" DIA. GLASS FLOAT	AIC5506	P48140
180	UXL20992	PXG44069	P38256	5/8" DIA. GLASS FLOAT	AIC5506	P48140
225	UXM20992	PXG48131	P35103	11/16" DIA. CERAMIC FLOAT	AIC5506	P48140

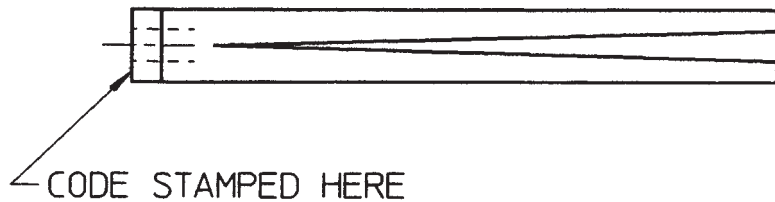
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

V10k CHLORINATOR - PARTS  
10" Rotameter Components

25.100.001.220B

ISSUE 1 10-08

# V10K V-NOTCH CHLORINATOR



CAPACITY Cl <sub>2</sub> (LB/24HR)	V-NOTCH PLUG			SPRING	SEAT
	PART NO.	CODE LETTER	NO. OF GROOVES		
3	PXA 39598	P	1	P 37700	P 37670
10	PXA 39598	P	1		
20	PXB 39598	Q	1		
30	PXC 39598	R	1		
50	PXD 39598	S	1		
75	PXE 39598	T	1		
100	PXF 39598	U	1		
150	PXG 39598	V	1		
200	PXH 39598	W	2		
250	PXJ 39598	X	2		
300	PXK 39598	Y	3		
400	PXL 39598	Z	4		
500	PXM 39598	AA	5		
750	PXO 97057	BO	6		

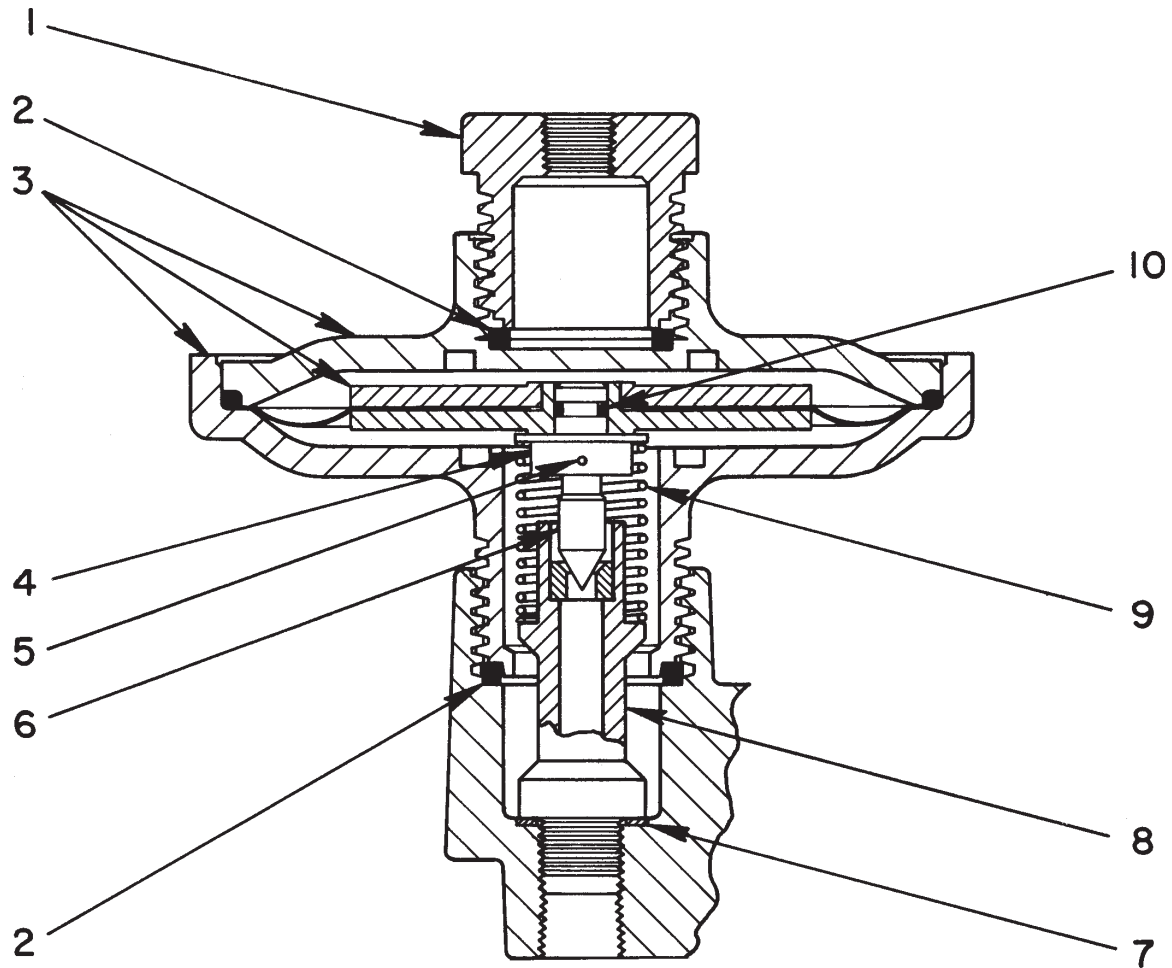
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

V10k V-NOTCH CHLORINATOR PLUGS - PARTS  
Automatic Arrangement

25.100.001.035

ISSUE 0 7-05

# V10K V-NOTCH CHLORINATOR



KEY NO.	PART NO.	QTY.	DESCRIPTION
1	PXA37688	1	PLUG (PVC)
2	P44122	2	GASKET (HYPALON) 1"ID x 1-1/4"OD
3	U26664	1	VALVE BODY
4	P37656	1	STEM HOLDER
5	P37655	1	PIN
6	P38409	1	STEM (PVC)
7	P37661	1	SEAT HOUSING GASKET (KOROSEAL)
8	U17642	1	SEAT UNIT (LOW CAPACITY 10 - 200 PPD)
	OR		
	U18075	1	SEAT UNIT (HIGH CAPACITY 250 - 500 PPD)
9	P37653	1	SPRING
10	PXA33051	1	O-RING (009) VITON 7/32"ID x 11/32"OD

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

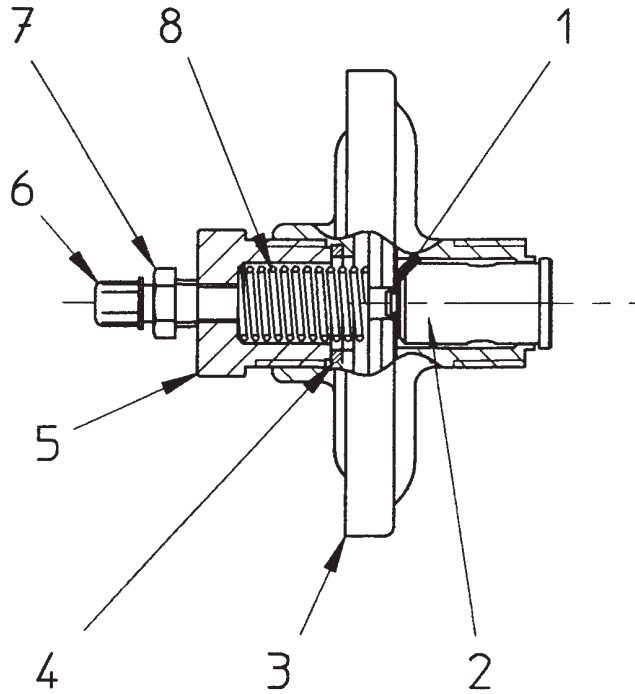
## DIFFERENTIAL REGULATING VALVE - PARTS

25.152.001.011

ISSUE 1 4-05



# V10K V-NOTCH CHLORINATOR



KEY NO.	PART NO.	QTY.	DESCRIPTION
1	P 44119	1	O-RING (009) HYPALON, 7/32" ID x 11/32" OD
2	P 56827	1	STEM
3	U 26664	1	VALVE BODY
4	P 44122	1	GASKET (HYPALON) 1" ID x 1-1/4" OD
5	PXA 37688	1	PLUG (PVC)
6	PXB 39234	1	UNION NUT (PVC) 3/8" TUBE
7	P 39233	1	HALF UNION (PVC) 3/8" OD TUBING x 1/4" NPT
8	P 48661	1	SPRING

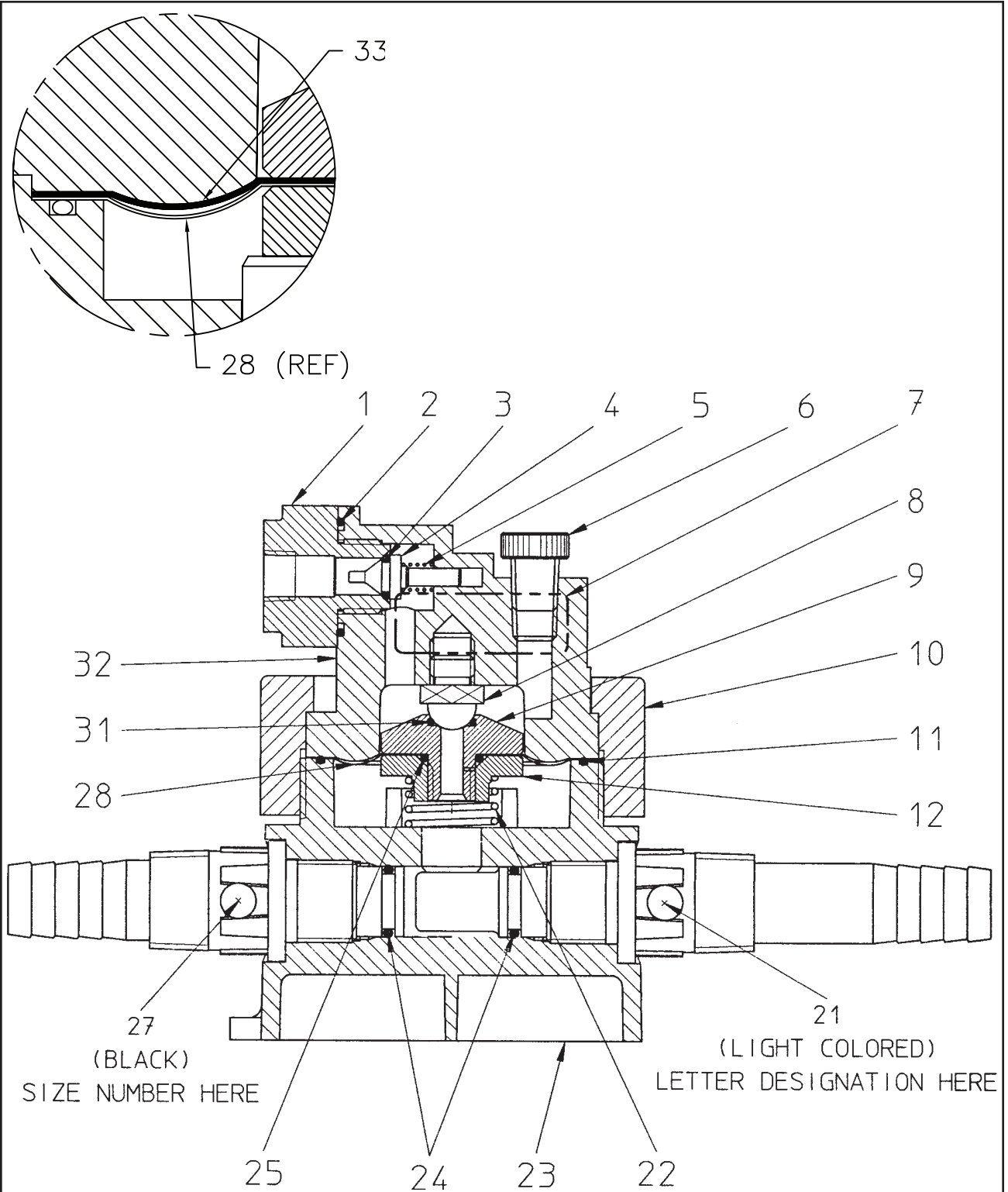
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

PRESSURE RELIEF VALVE - PARTS

25.100.001.040

ISSUE 1 8-08

# V10K V-NOTCH CHLORINATOR



**NOTE:** FOR PARTS LIST, SEE DWG. 25.200.002.010B.

AAA4310 3/4" STANDARD INJECTOR - PARTS

25.200.002.010A

ISSUE 2 5-04

# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	AAA1547	1	INLET/POPPET SEAT 1/4" NPT
2	PXA41332	1	O-RING (120) VITON, 1" ID x 1-3/16" OD
3	ANM3591	1	O-RING, POPPET
4	P97032	1	POPPET
5	P48655	1	SPRING, POPPET CK.
6	P31295	1	PLUG, 1/4 NPT
7	ADH4733	1	CAUTION LABEL
8	P97034	1	STEM
9	AAB4087	1	VALVE SEAT
10	P97164	1	UNION NUT
11	P94729	1	O-RING
12	AAB4090	1	NUT
21	(SEE TABLE)	1	TAILWAY
22	P48976	1	SPRING
23	P96972	1	LOWER BODY
24	PXA27409	2	O-RING (113) 9/16" ID x 3/4" OD
25	PXA26482	1	O-RING, DIAPH. CHECK
27	(SEE TABLE)	1	NOZZLE
28	P97063	1	DIAPHRAGM, TEFLON
31	P97342	1	O-RING, VITON
32	P96973	1	UPPER BODY
33	AAA4325	1	DIAPHRAGM, VITON

(21) TAILWAY	CODE
PXB 48962	B
PXC 48962	C
PXD 48962	D
PXE 48962	E
PXF 48962	F
PXG 48962	G
PXH 48962	H
PXJ 48962	J
PXS 48962	S

(27) NOZZLE	SIZE NO.
PXC 48961	70
PXD 48961	84
PXE 48961	99
PXF 48961	120
PXG 48961	140
PXH 48961	165
PXJ 48961	193
PXK 48961	242

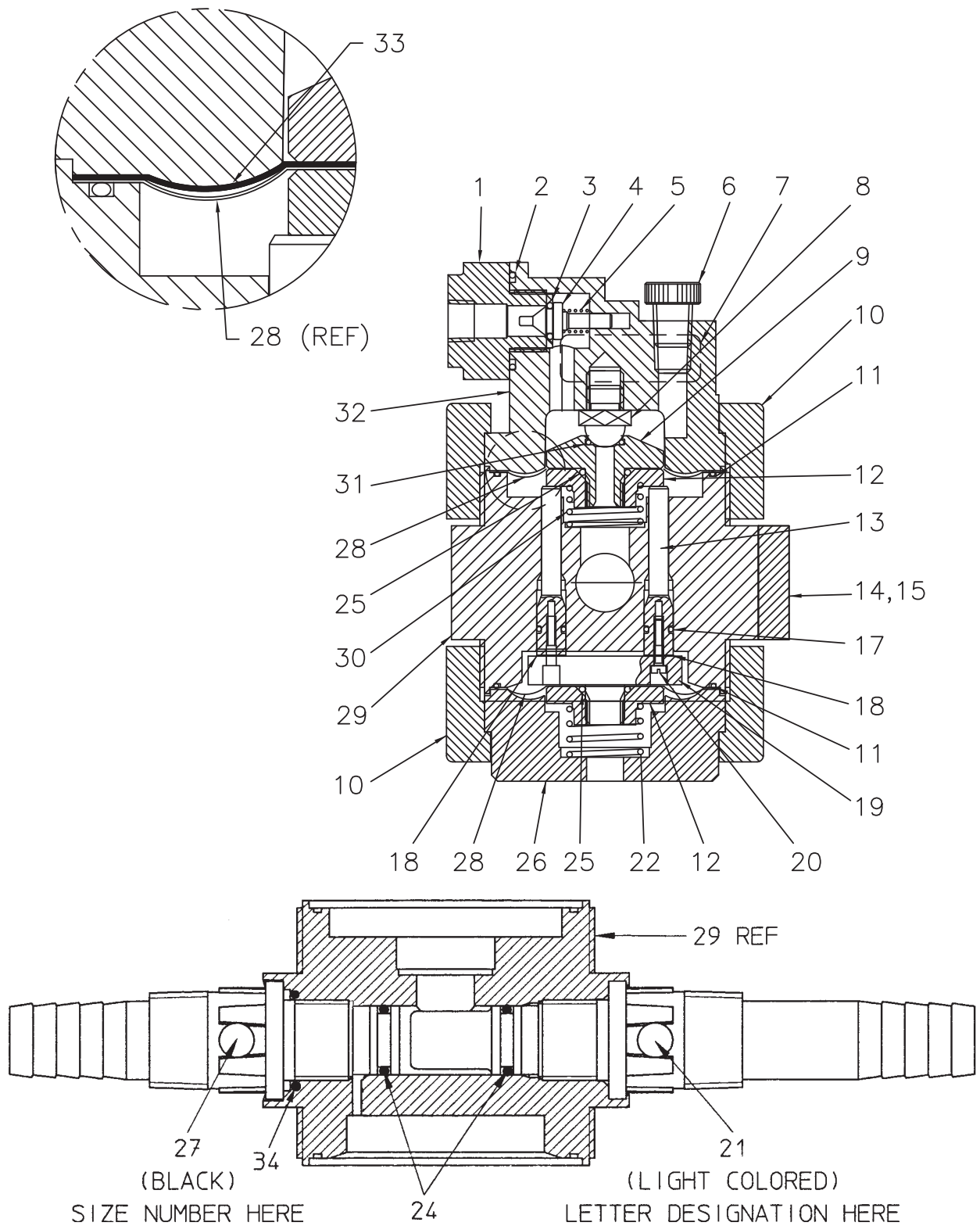
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

AAA4310 3/4" STANDARD INJECTOR - PARTS LIST

25.200.002.010B

ISSUE 4 4-05

# V10K V-NOTCH CHLORINATOR



**NOTE:** FOR PARTS LIST, SEE DWG. 25.200.002.020B.

AAA4307 3/4" ANTI-SYPHON INJECTOR - PARTS

25.200.002.020A

ISSUE 5 1-09

# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	AAA1547	1	INLET/POPPET SEAT 1/4" NPT
2	PXA41332	1	O-RING (120) VITON, 1" ID x 1-3/16" OD
3	ANM3591	1	O-RING, POPPET
4	P97032	1	POPPET
5	P48655	1	SPRING, CK. VALVE
6	P31295	1	PLUG, PVC, 1/4" NPT
7	ADH4733	1	CAUTION LABEL
8	P97034	1	VALVE STEM
9	AAB4087	1	VALVE SEAT
10	P97164	2	UNION NUT
11	P94729	2	O-RING
12	AAB4090	2	NUT
13	P97035	2	GUIDE PIN
14	P97038	1	BRACKET
15	P100178	2	SCREW, M6
17	PXA25900	2	O-RING (010) VITON, 1/4" ID x 3/8" OD
18	P52006	2	WASHER
19	P97037	1	BACKING PLATE
20	P33847	2	MACH. SCREW (SILVER) #4-36 x 19/32" LG.
21	(SEE TABLE BELOW)	1	TAILWAY
22	P97065	1	SPRING
24	PXA27409	2	O-RING (113) VITON, 9/16" ID x 3/4" OD
25	PXA26345	2	O-RING (112) VITON, 1/2" ID x 11/16" OD
26	P97036	1	END CAP
27	(SEE TABLE BELOW)	1	NOZZLE
28	P97063	3	DIAPHRAGM, TEFLON
29	P97058	1	MIDDLE BODY
30	P48976	1	SPRING
31	P97342	1	O-RING, VITON
32	P96973	1	UPPER BODY
33	AAA4325	1	DIAPHRAGM, VITON
34	PXA40040	1	O-RING (118) VITON, 7/8" ID x 1-1/16" OD

(21) TAILWAY	CODE
PXB 48962	B
PXC 48962	C
PXD 48962	D
PXE 48962	E
PXF 48962	F
PXG 48962	G
PXH 48962	H
PXJ 48962	J
PXS 48962	S

(27) NOZZLE	SIZE #
PXC 49042	70
PXD 49042	84
PXE 49042	99
PXF 49042	120
PXG 49042	140
PXH 49042	165
PXJ 49042	193
PXK 49042	242

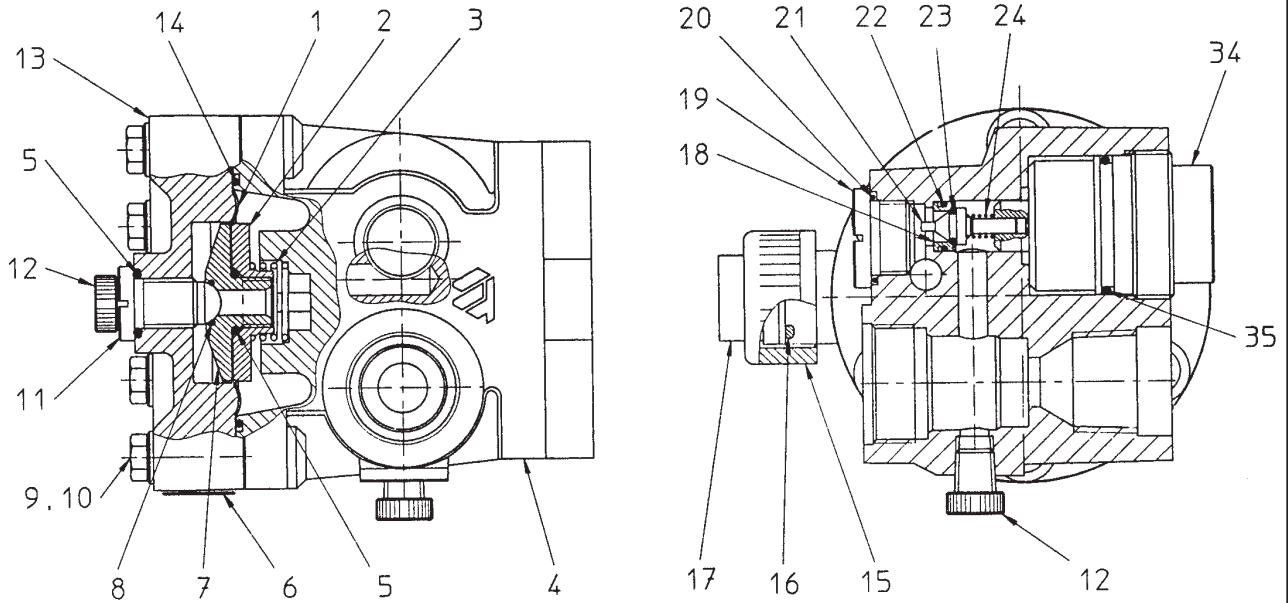
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

AAA4307 3/4" ANTI-SYPHON INJECTOR - PARTS LIST

25.200.002.020B

ISSUE 5 4-05

# V10K V-NOTCH CHLORINATOR



**NOTE:** FOR PARTS LIST, SEE DWG. 25.200.002.030B.

AAA4316 1" STANDARD INJECTOR - PARTS

25.200.002.030A

ISSUE 0 10-95

# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	P97062	1	DIAPHRAGM
2	P97045	1	NUT
3	ANM4147	1	SPRING
4	P97042	1	LOWER BODY
5	PXA26784	2	O-RING (114) VITON, 5/8" ID x 13/16" OD
6	ADH4733	1	CAUTION LABEL
7	AAD2584	1	SEAT
8	P97342	1	O-RING (VITON) 11 MM
9	AAA1905	6	SCREW, MONEL
10	P97046	6	WASHER
11	P97048	1	VALVE STEM
12	P31295	2	PLUG, 1/4 NPT
13	P96971	1	UPPER BODY
14	P50524	1	O-RING (151) VITON, 3" ID x 3-3/16" OD
15	P100363	1	UNION NUT
16	PXA40575	1	O-RING (211) VITON, 13/16" ID x 1-1/16" OD
17	AMK421 8	1	ADAPTER, 1/2 NPT
18	P97040	1	SEAT, POPPET
19	P97050	1	PLUG
20	PXA39892	1	O-RING (119) VITON, 15/16" ID x 1-1/8" OD
21	P97032	1	POPPET
22	P97041	1	O-RING, SEAT
23	ANM3591	1	O-RING, VITON
24	P48655	1	SPRING, POPPET
34	P97049	1	GUIDE PLUG POP.
35	P 1 00448	1	O-RING, VITON

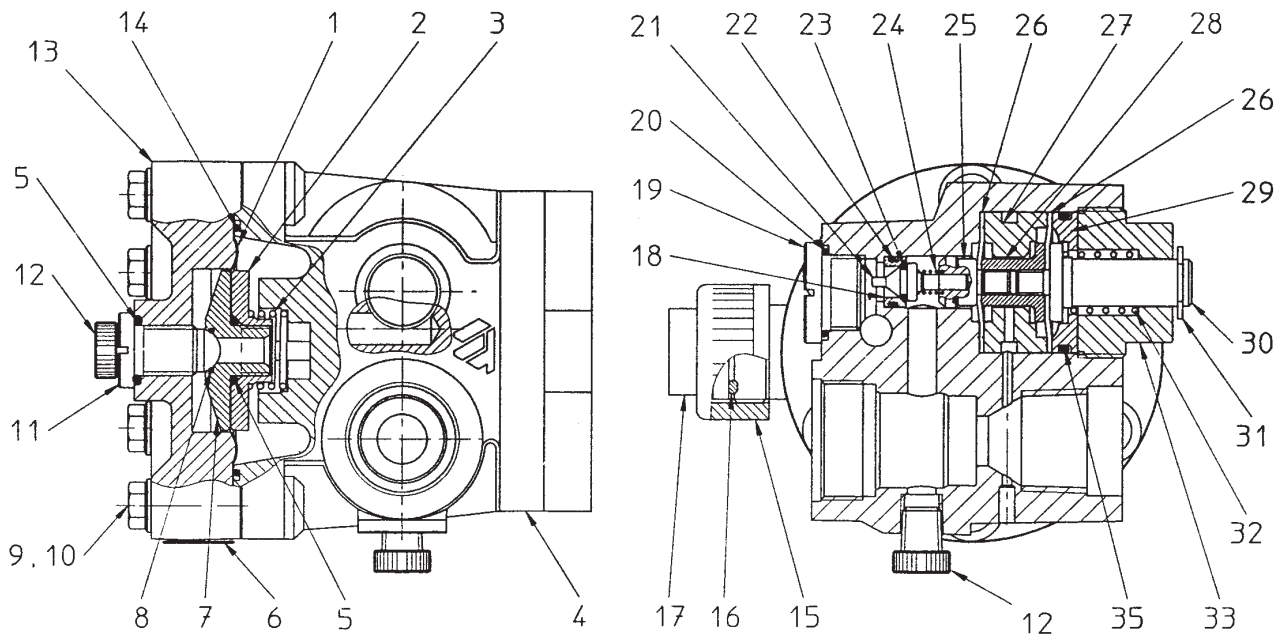
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

AAA4316 1" STANDARD INJECTOR - PARTS LIST

25.200.002.030B

ISSUE 1 8-08

# V10K V-NOTCH CHLORINATOR



**NOTE:** FOR PARTS LIST, SEE DWG. 25.200.002.040B.

AAA4313 1" ANTI-SYPHON INJECTOR - PARTS

25.200.002.040A

ISSUE 0 10-95



# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	P97062	1	DIAPHRAGM
2	P97045	1	NUT
3	ANM4147	1	SPRING
4	P96970	1	LOWER BODY
5	PXA26784	2	O-RING (114) VITON, 5/8" ID x 13/16" OD
6	ADH4733	1	CAUTION LABEL
7	AAD2584	1	SEAT
8	P97342	1	O-RING (VITON) 11 MM
9	AAA1905	6	SCREW, MONEL
10	P97046	6	WASHER
11	P97048	1	VALVE STEM
12	P31295	2	PLUG, 1/4 NPT
13	P96971	1	UPPER BODY
14	P50524	1	O-RING (151) VITON, 3" ID x 3-3/16" OD
15	P100363	1	UNION NUT
16	PXA40575	1	O-RING (211) VITON, 13/16" ID x 1-1/16" OD
17	AMK4218	1	ADAPTER, 1/2 NPT
18	P97040	1	SEAT, POPPET
19	P97050	1	PLUG
20	PXA39892	1	O-RING (119) VITON, 15/16" ID x 1-1/8" OD
21	P97032	1	POPPET
22	P97041	1	O-RING, SEAT
23	ANM3591	1	O-RING, VITON
24	P48655	1	SPRING, POPPET
25	P97054	1	GUIDE BUSHING
26	P97061	2	DIAPHRAGM
27	P97053	1	NUT, COUPLING
28	P97052	1	SPACER
29	P97055	1	CLAMPING WASHER
30	P97056	1	UNION
31	PXG95967	1	SNAP RING
32	P97064	1	SPRING
33	P97051	1	CLAMPING NUT
35	PI 00448	1	O-RING, VITON

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

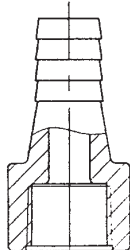
AAA4313 1" ANTI-SYPHON INJECTOR - PARTS LIST

25.200.002.040B

ISSUE 2 8-08

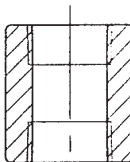
# V10K V-NOTCH CHLORINATOR

3/4" HOSE OR  
FLEXIBLE PIPE  
CONNECTION



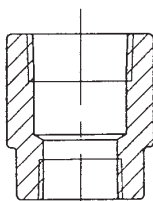
P47206

3/4" PIPE X  
3/4" HOSE  
ADAPTER



• P37599

3/4" PLASTIC PIPE  
ADAPTER



• P39771

3/4" X 1"  
PLASTIC PIPE  
ADAPTER

OR

OR

3/4" NPT

1" HOSE OR  
FLEXIBLE PIPE  
CONNECTION

TAIL PIECE

LETTER  
DESIGNATION  
LOCATED HERE

P38273  
RETAINING  
NUT

LARGER DIA.  
□ O-RING

THROAT

SMALLER DIA.  
□ O-RING

INJECTOR

1" NPT

SIZE NUMBER  
LOCATED HERE



THROAT  
(BOTTOM VIEW)

- SOLUTION HOSE MAY BE CONNECTED DIRECTLY TO THE INJECTOR TAILWAY. IF RIGID PVC PIPE IS USED, A PIECE OF STRAIGHT PIPE AT LEAST EIGHT INCHES LONG SHOULD BE COUPLED TO THE END OF THE INJECTOR TAILWAY BEFORE ANY ELBOWS, TEES, OR SIMILAR FLOW RESTRICTIONS ARE USED. THIS IS TO PREVENT ANY FLOW DISTURBANCES THAT COULD AFFECT THE HYDRAULIC PERFORMANCE OF TAILWAY CONNECTIONS.

**NOTE:** SIZE NUMBER STAMPED ON THROAT. LETTER DESIGNATION STAMPED ON TAILPIECE.  
WHEN REORDERING O-RINGS MARKED □ SPECIFY U21275 FOR PAIR. NOT SOLD SEPARATELY.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

PLASTIC 1" FIXED THROAT INJECTOR AND TAILWAY DETAILS - PARTS

25.200.003.010A

ISSUE 0 10-95

# V10K V-NOTCH CHLORINATOR

THROAT		TAIL PIECE		3/4" HOSE OR FLEXIBLE PLASTIC PIPE	3/4" RIGID PIPE	1" HOSE OR FLEXIBLE PLASTIC PIPE	1" RIGID PIPE
SIZE	PART NO	LETTER DESIG.	PART NO.				
70	PXC50094	B	PXB50093	X	X	O	O
		C	PXC50093	X	X	O	O
99	PXE50094	C	PXC50093	X	X	O	O
		D	PXD50093	X	X	X	O
		E	PXE50093	X	X	X	O
120	PXF50094	D	PXD50093	X	X	X	X
		E	PXE50093	X	X	X	X
		F	PXF50093	X	X	X	X
140	PXG50094	E	PXE50093	X	X	X	X
		F	PXF50093	X	X	X	X
		G	PXG50093	X	X	X	X
165	PXH50094	F	PXF50093	X	X	X	X
		G	PXG50093	X	X	X	X
		H	PXH50093	X	X	X	X
193	PXJ50094	G	PXG50093	-	X	X	X
		H	PXH50093	-	-	X	X
		I	PXJ50093	-	-	X	X
242	P XK50094	H	PXH50093	-	-	X	X
		I	PXJ50093	-	-	X	X
		K	P XK50093	-	-	X	X
312	PXL50094	K	P XK50093	-	-	X	X
		L	PXL50093	-	-	X	X

**ASSEMBLY NOTES:** ASSEMBLE THROAT, TWO O-RINGS, AND TAILPIECE AS SHOWN, BEFORE INSERTING IN INJECTOR BODY.

**ORDERING INFORMATION:**

- X** STANDARD COMBINATION WHEN HYDRAULIC CONDITIONS PERMIT.
- O** NON-STANDARD COMBINATION, MAY BE USED IF REQUIRED.
- IF NO SYMBOL IS INDICATED, COMBINATION CANNOT BE USED.

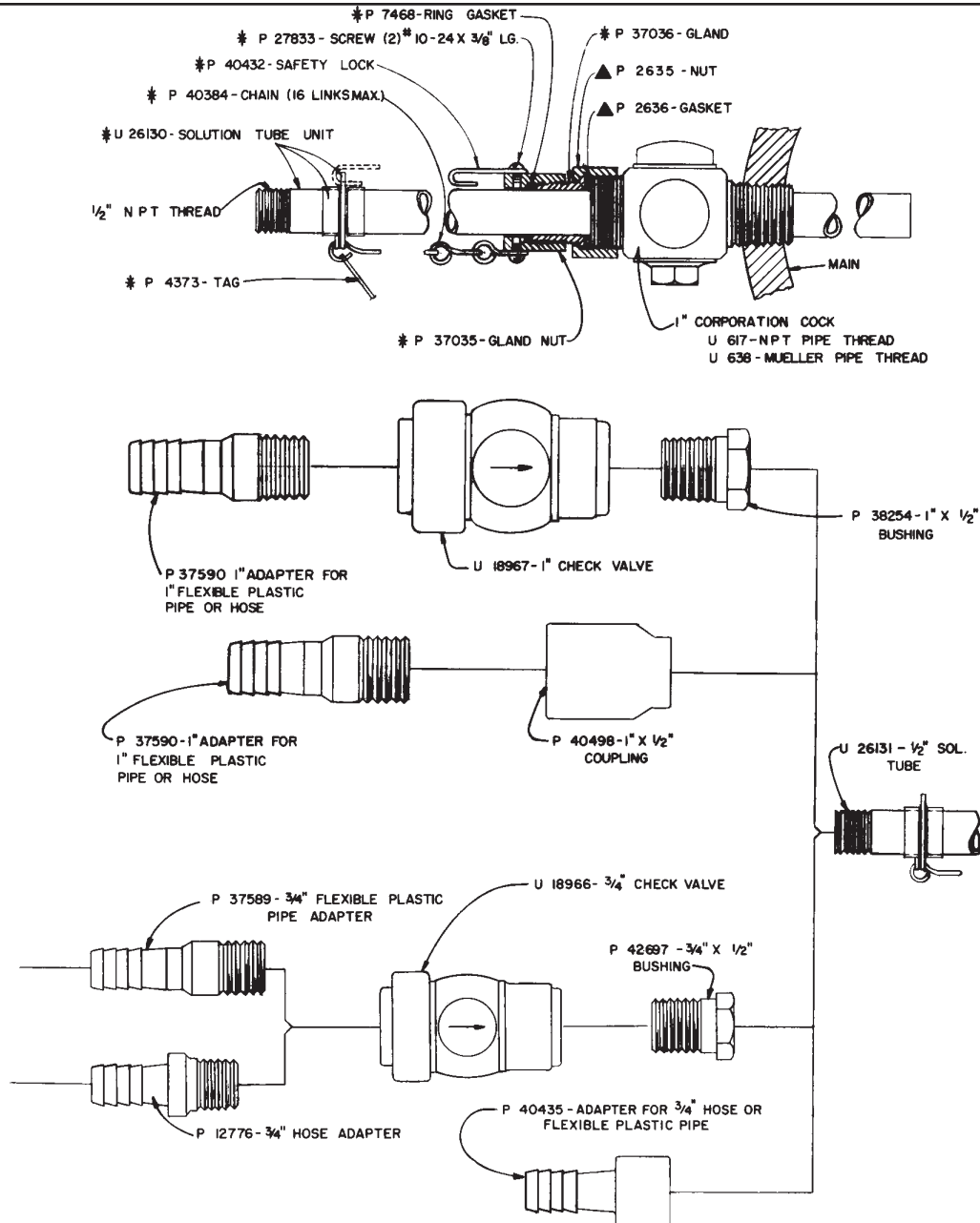
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

PLASTIC 1" FIXED THROAT INJECTOR AND TAILWAY DETAILS - PARTS LIST

25.200.003.010B

ISSUE 0 10-95

# V10K V-NOTCH CHLORINATOR



**NOTE:** \* PART OF SOLUTION TUBE U26131.

▲ PART OF CORPORATION COCK U617 OR U638.

**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO EQUIPMENT, DO NOT EXCEED WORKING PRESSURE OF HOSE OR FLEXIBLE PLASTIC PIPE. NEVER EXCEED 125 PSI AT 70° F. USE RIGID PIPE BETWEEN DISCHARGE AND MAIN CONNECTIONS WHEN PUMPING HAZARDOUS CHEMICALS.

**CAUTION:** FOR PROPER DISPERSION OF SOLUTION, THE END OF THE TUBE MUST EXTEND INTO THE MAIN, APPROXIMATELY 1/2 TO 1/3 THE DIAMETER OF THE MAIN. CUT OFF THE TUBE IF TOO LONG AND SHORTEN CHAIN AN EQUAL AMOUNT.

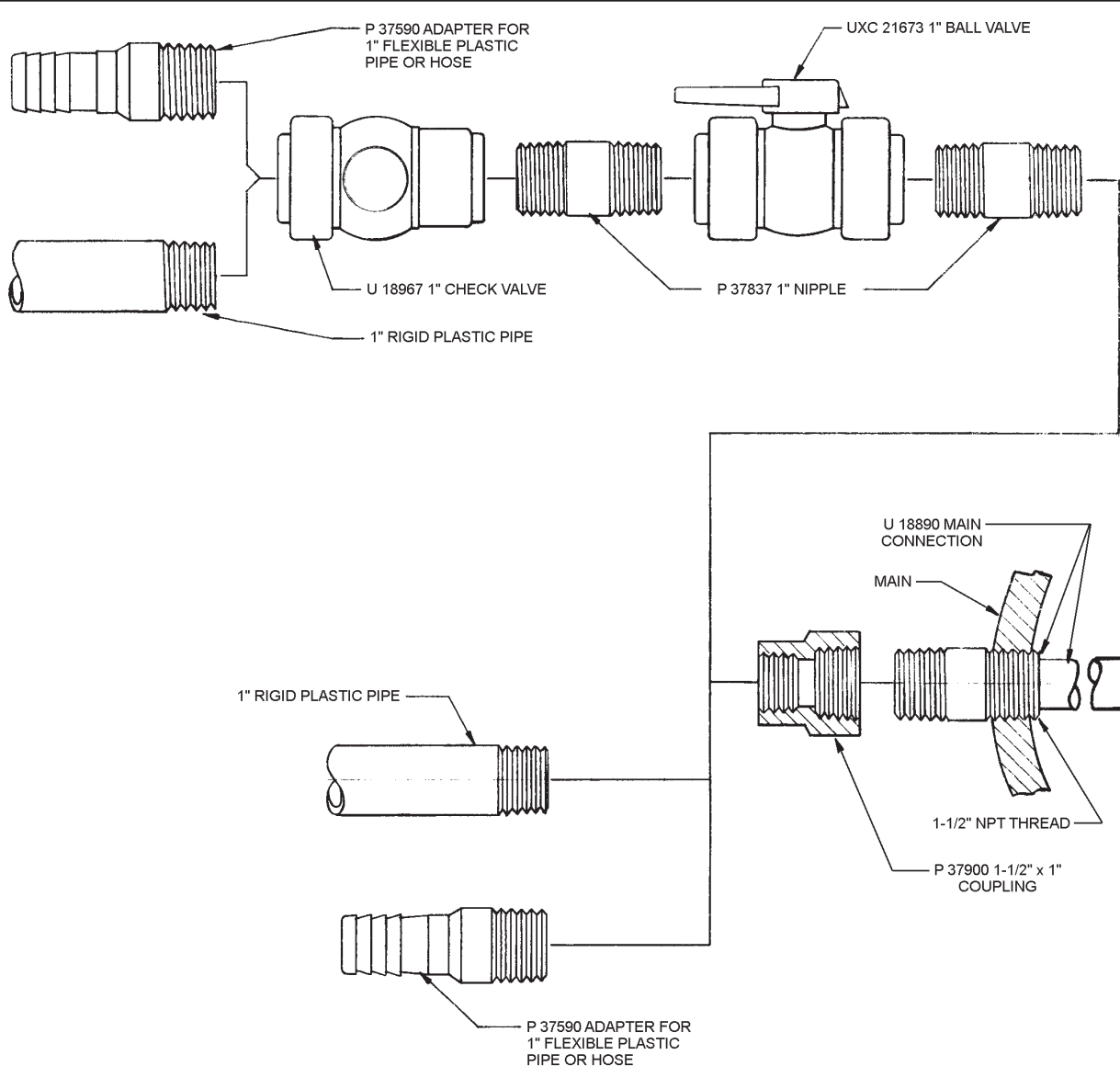
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

PLASTIC MAIN CONNECTION - PARTS  
For 3/4" Or 1" Solution Lines With 1" Corporation Cock

50.845.06.011

ISSUE 14 2-93

# V10K V-NOTCH CHLORINATOR



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO EQUIPMENT, DO NOT EXCEED WORKING PRESSURE OF HOSE OR FLEXIBLE PLASTIC PIPE. NEVER EXCEED 140 PSI AT 70° F. USE RIGID PIPE BETWEEN DISCHARGE AND MAIN CONNECTIONS WHEN PUMPING HAZARDOUS CHEMICALS.

**CAUTION:** FOR PROPER DISPERSION OF SOLUTION, THE END OF THE TUBE MUST EXTEND INTO THE MAIN, APPROXIMATELY 1/2 TO 1/3 THE DIAMETER OF THE MAIN. CUT OFF THE TUBE IF TOO LONG.

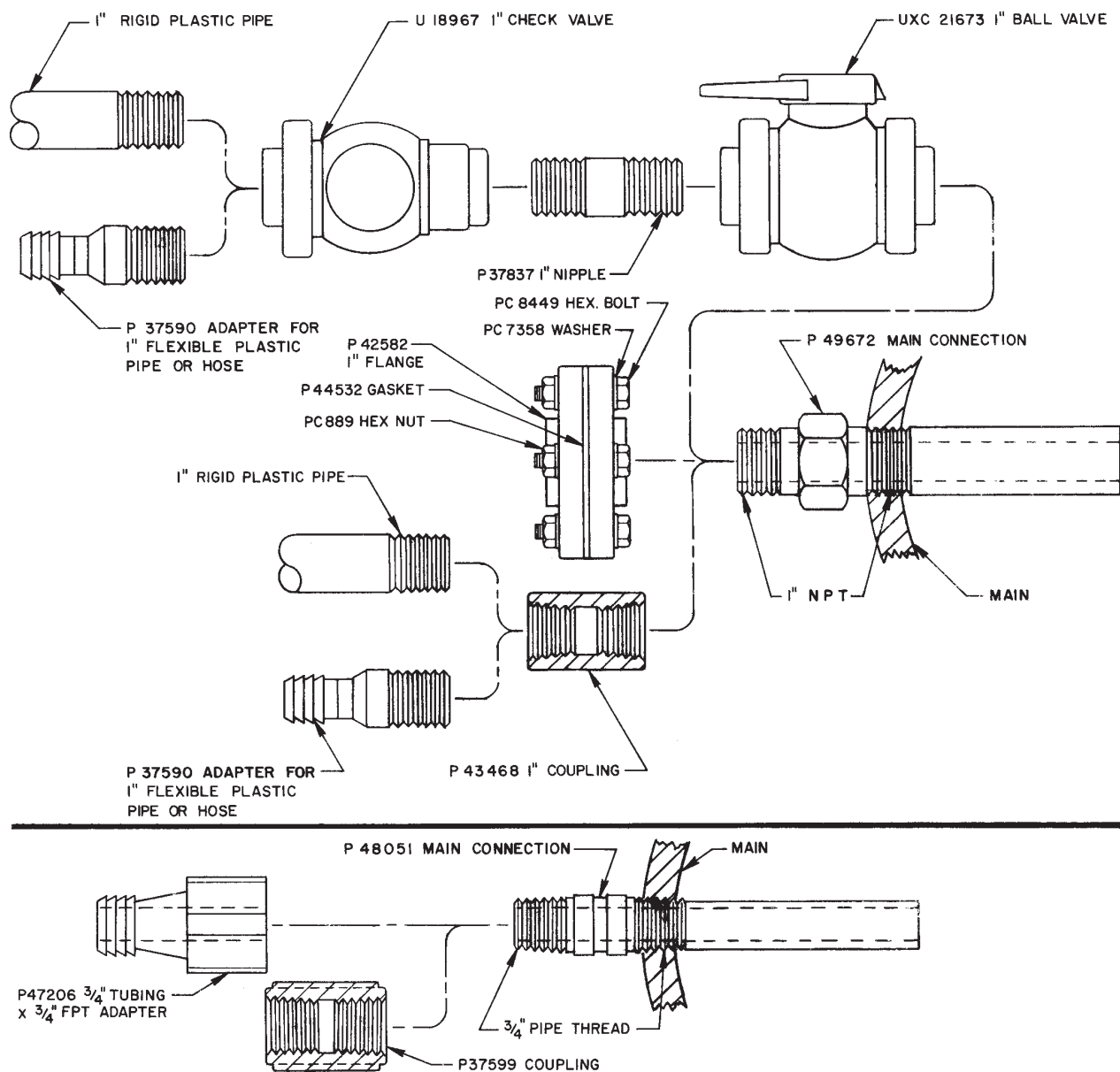
**WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.**

**MAIN CONNECTION - PARTS**  
For 1" Solution Line and 1-1/2" Main Connections

50.845.06.012

ISSUE 5 10-88

# V10K V-NOTCH CHLORINATOR



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO EQUIPMENT, DO NOT EXCEED WORKING PRESSURE OF HOSE OR FLEXIBLE PLASTIC PIPE. NEVER EXCEED 140 PSI AT 70° F. USE RIGID PIPE BETWEEN DISCHARGE AND MAIN CONNECTIONS WHEN PUMPING HAZARDOUS CHEMICALS.

**CAUTION:** FOR PROPER DISPERSION OF SOLUTION, THE END OF THE TUBE MUST EXTEND INTO THE MAIN, APPROXIMATELY 1/2 TO 1/3 THE DIAMETER OF THE MAIN. CUT OFF THE TUBE IF TOO LONG.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

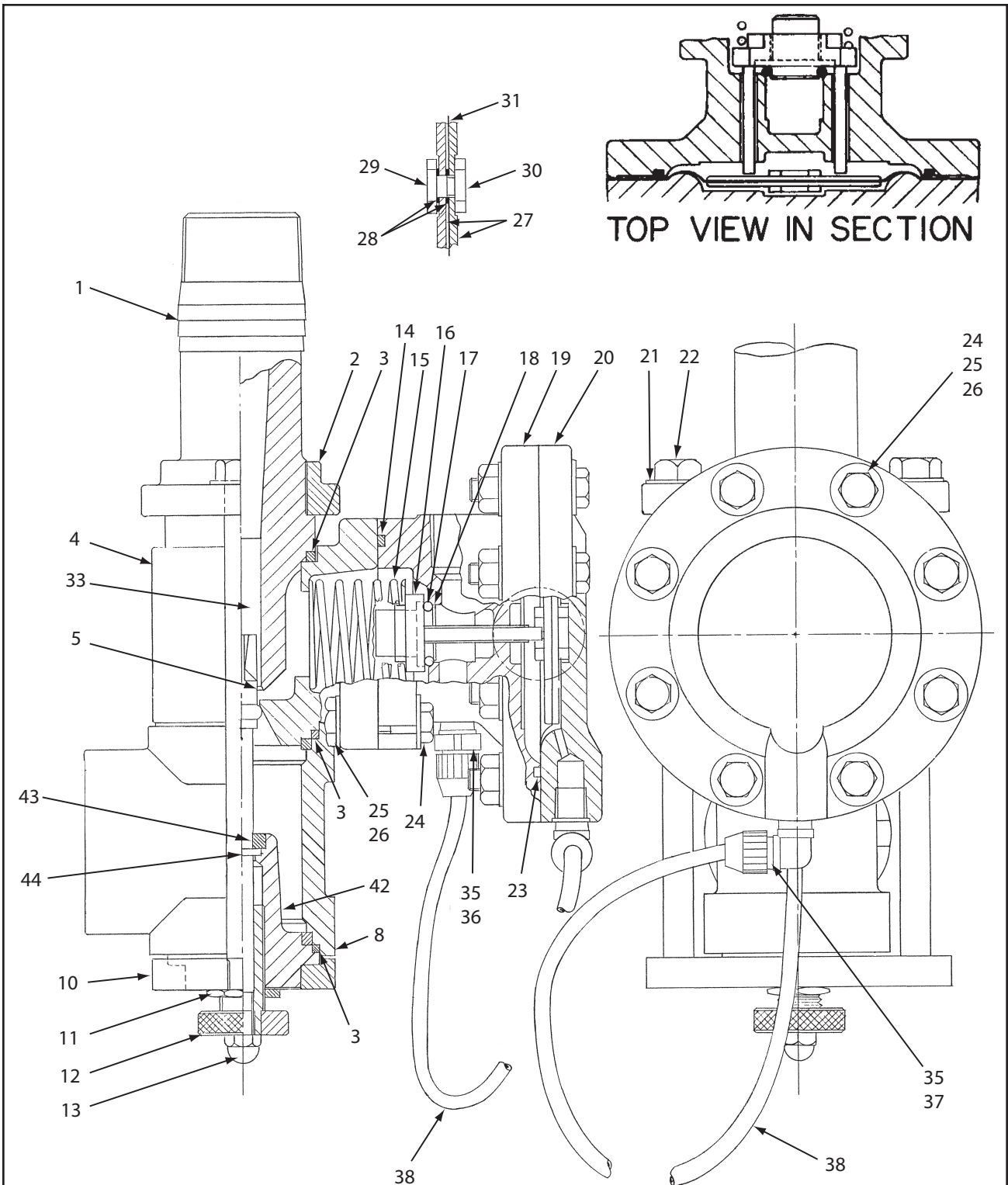
## MAIN CONNECTION - PARTS

For 3/4" or 1" Solution Lines and 3/4" or 1" Main Connections

50.845.06.032

ISSUE 6 7-89

# V10K V-NOTCH CHLORINATOR



**NOTE:** FOR PARTS LIST, SEE DWG. 25.052.001.051B.

U25764 SMALL THROAT; U25765 LARGE THROAT  
 2" INJECTOR - PARTS  
 With Manually Operated Plug Shut-Off

25.052.001.051A

ISSUE 9 7-05

# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	PXA40549 OR PXA40550	1	TAILWAY - SMALL THROAT - USED IN U25764
2	P34569	1	TAILWAY - LARGE THROAT - USED IN U25765
3	P41329	1	FLANGE
3	P41329	3	O-RING (228), BUNA-N, 2-1/4"ID x 2-1/2"OD
4	PXA40553 OR PXA40554	1	SMALL THROAT - USED IN U25764
5	AAC5921 OR AAC5918	1	LARGE THROAT - USED IN U25765
5	AAC5921	1	PLUG ASSY - SMALL THROAT - USED IN U25764
8	U22163	1	PLUG ASSY - LARGE THROAT - USED IN U25765
10	P40893	1	TEE INLET
11	P10619	1	PLATE
12	U19319	1	HEX NUT (BRASS) 3/4"-16
13	PN5873	1	KNOB
14	P40578	1	CAP NUT (BRASS) 5/16"-18
15	P40571	1	O-RING (148), BUNA-N, 2-3/4"ID x 2-15/16"OD
16	U20580	1	SPRING
17	AAC7568	1	STEM HOLDER & POST
18	P47225	1	O-RING (KALREZ), 3/4"ID x 1"OD
19	P53374	1	STEM
20	P40555	1	INLET BODY
21	PB33262	1	COVER
22	PB6686	2	1/2" WASHER (BRASS)
23	P50286	2	HEX. NUT (BRASS) 1/2-13
24	P17649	1	RING GASKET
25	P38100	12	BOLT (HEX.HD.,MONEL) 3/8-16 x 1-3/4" LG.
26	P16543	24	3/8" WASHER (MONEL)
27	P34488	12	HEX. NUT (MONEL) 3/8-16
28	P34487	2	DISC BACKING
29	P43132	2	GASKET SEAL
30	P43133	1	DIAPHRAGM SCREW
31	P43717	1	DIAPHRAGM NUT
33	P40892	1	DIAPHRAGM
35	P39213	2	STUD
36	P39233	2	UNION NUT
37	P39235	1	HALF UNION STRAIGHT
38	RP504464	1	HALF UNION ELBOW
42	U20100	2	TUBING
43	P42341	1	PACKING GLAND 2" INJECTOR
44	P31702	1	O-RING RETAINER
44	P31702	1	O-RING

NOTE: ■ PART OF KEY NO. 42.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

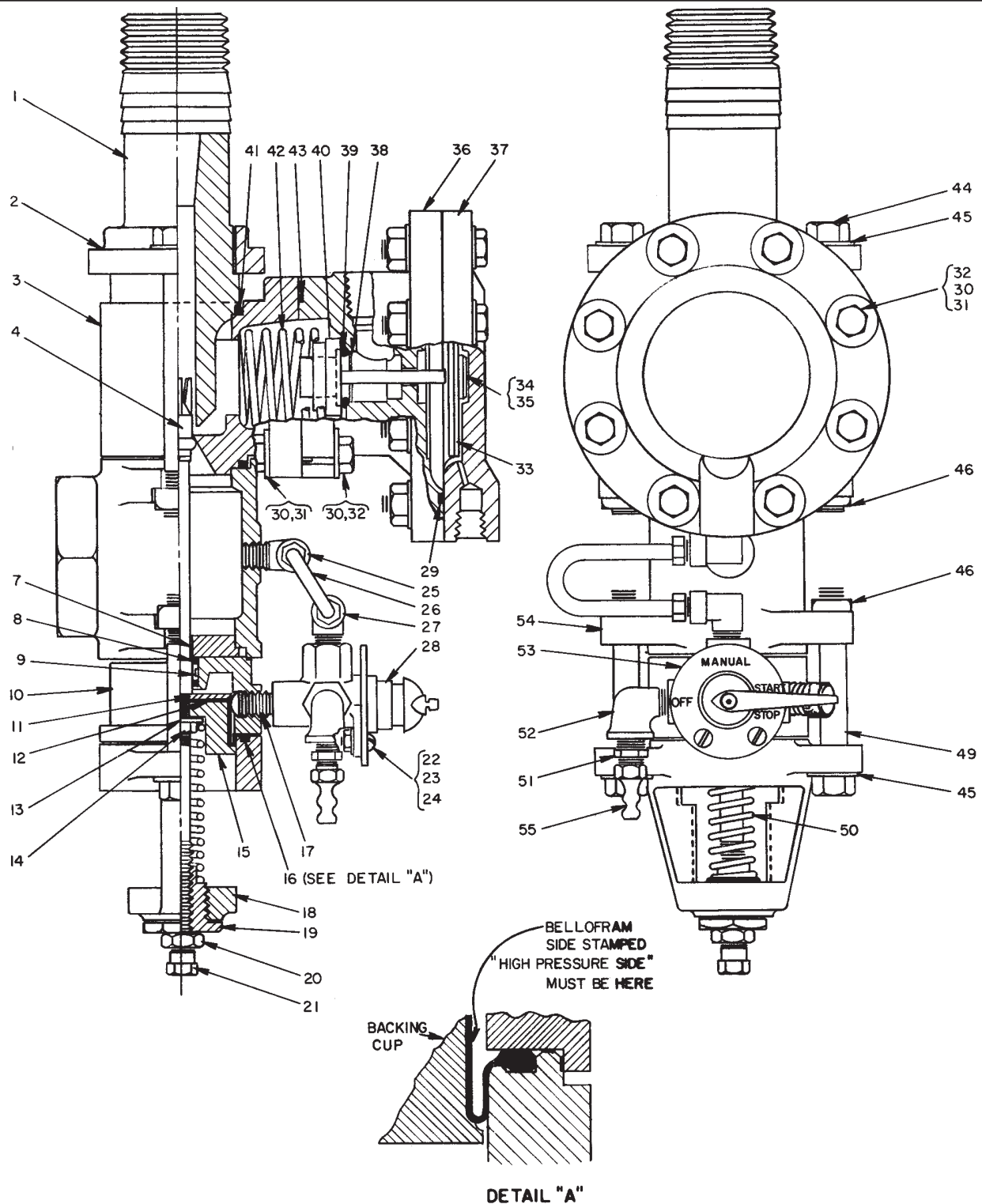
U25764 SMALL THROAT; U25765 LARGE THROAT  
2" INJECTOR - PARTS LIST  
With Manually Operated Plug Shut-Off

25.052.001.051B

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# V10K V-NOTCH CHLORINATOR



**NOTE:** FOR PARTS LIST, SEE DWG. 25.052.001.046B.

U25762 SMALL THROAT; U25763 LARGE THROAT  
2" INJECTOR - PARTS  
With Pressure-Operated Plug Shut-Off

25.052.001.046A

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# V10K V-NOTCH CHLORINATOR

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	PXA40550 OR PXA40549	1	TAILWAY - LARGE THROAT (USED IN U25763)
2	P34569	1	TAILWAY - SMALL THROAT (USED IN U25762)
3	P34569	1	FLANGE
	PXA40554 OR PXA40553	1	THROAT - LARGE (USED IN U25763)
4	AAC5921 OR AAC5918	1	THROAT - SMALL (USED IN U25762)
	AAC5918	1	PLUG - LARGE (USED IN U25763)
7	P42260	1	PLUG - SMALL (USED IN U25762)
8	P31702	1	DISC - O-RING
9	P42259	2	O-RING (110) BUNA-N, 3/8"ID x 9/16"OD
10	P42258	1	LANTERN RING
11	PXA34572	1	DIAPHRAGM BODY
12	P26234	1	BACKING WASHER
13	P22616	1	O-RING (011) BUNA-N, 5/16"ID x 7/16"OD
14	P26118	1	5/16" WASHER (S.S.)
15	P36610	1	HEX. NUT (S.S.) 5/16"-18
16	P34567	1	BACKING CUP
17	P 629	1	BELLOFRAM
18	PXA40563	1	CLOSE NIPPLE 1/4" NPT (BRASS)
19	P40572	1	BELLOFRAM YOKE
20	PN18680	1	ADJUSTING SCREW NUT
21	P40573	1	HEX. NUT (BRASS) 1/2"-13
22	PE28283	1	ADJUSTING SCREW
23	PE5663	2	MACH.SCREW (RD.HD.,BRASS)#10-24 x 1/2"LG.
24	PE14725	2	#10 WASHER (BRASS)
25	U19347	2	HEX. NUT (BRASS) #10-24
26	P40574	1	ELBOW WITH SCREEN
27	U16096	1	1/4" CONNECTING TUBE
28	U16435	1	ELBOW 1/4" TUBE x 1/4" NPT (BRASS)
29	P50286	1	SELECTOR VALVE
30	P38100	1	RING GASKET
31	P16543	24	3/8" WASHER (MONEL)
32	P17649	12	HEX. NUT (MONEL) 3/8-16
33	U17639	12	BOLT (HEX.HD.,MONEL) 3/8-16 x 1-3/4"LG.
34	P37641	1	DIAPHRAGM UNIT
35	P33051	1	PLUG
36	P53374	1	O-RING (009) BUNA-N, 7/32"ID x 11/32"OD
37	P40555	1	BODY
38	P47225	1	COVER
39	AAC7568	1	STEM
40	U20580	1	O-RING (KALREZ), 3/4"ID x 1"OD
41	P41329	1	STEM & POST UNIT
42	P40571	3	O-RING (228) BUNA-N, 2-1/4"ID x 2-1/2"OD
43	P40578	1	SPRING
44	PB40576	1	O-RING (148) BUNA-N, 2-3/4"ID x 2-15/16"OD
45	PB33262	2	BOLT (HEX.HD.,STEEL) 1/2-13 x 5" LG.
46	PB17493	4	1/2" WASHER (STEEL)
49	PB21381	4	SQUARE NUT (STEEL) 1/2-13
50	P34566	2	BOLT (HEX.HD.,STEEL) 1/2"-13 x 3-1/2"LG.
51	P686	1	SPRING
52	P698	1	BUSHING 1/4"NPT x 1/8"NPT (BRASS)
53	P40633	1	STREET ELBOW 1/4" NPT (BRASS)
54	P40556	1	INDICATOR PLATE
55	P500	1	INLET (BRONZE)
		1	ADAPTER 1/8"NPT TO 1/4"HOSE (BRASS)

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U25762 SMALL THROAT; U25763 LARGE THROAT

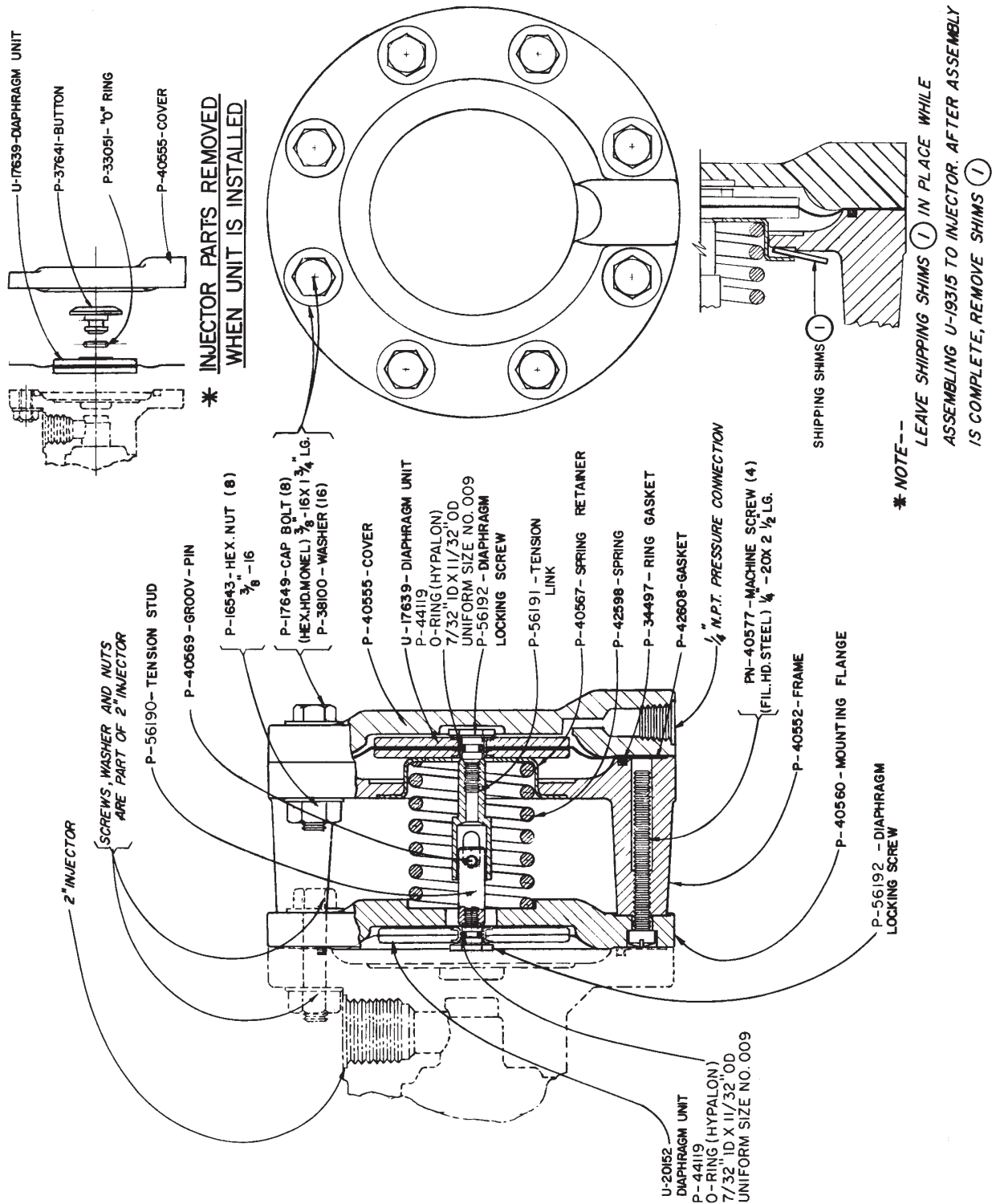
2" INJECTOR - PARTS LIST

With Pressure-Operated Plug Shut-Off

25.052.001.046B

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# V10K V-NOTCH CHLORINATOR



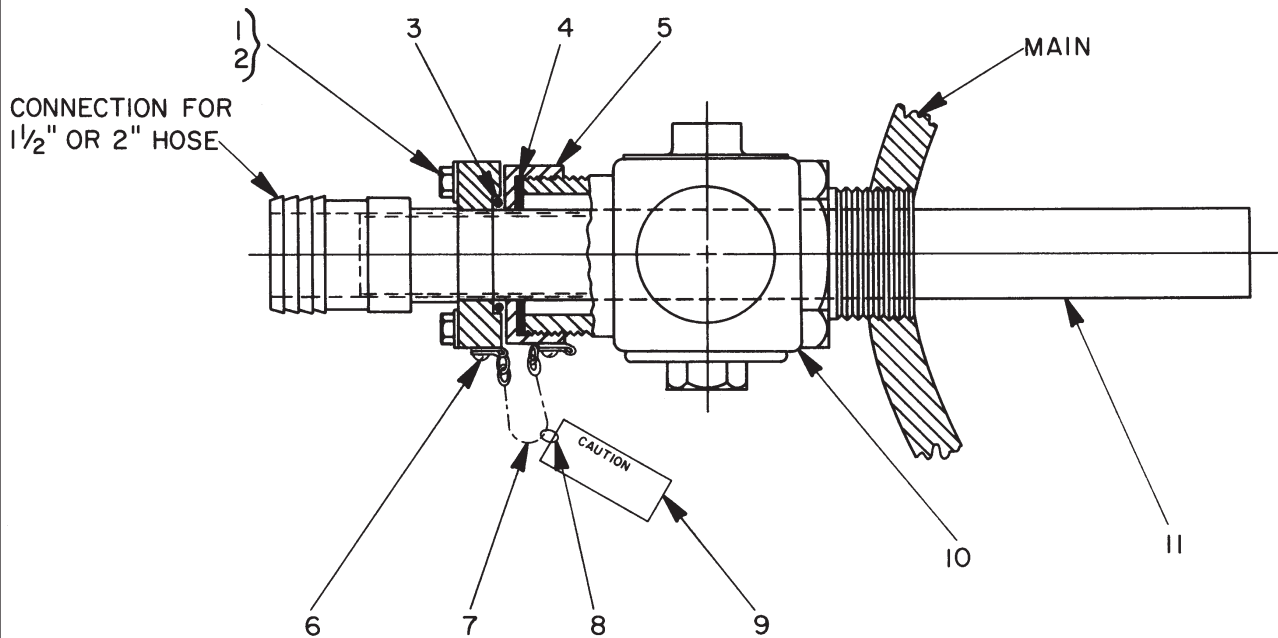
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

## U19315 INJECTOR SHUT-OFF UNIT - PARTS

25.100.06.111

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# V10K V-NOTCH CHLORINATOR



KEY NO.	PART NO.	QTY.	DESCRIPTION
1	P 5497	4	BOLT (H.H.,SILICON BRONZE) 5/16"-18 x 1-1/4" LG.
2	P 2475	4	5/16" BRASS WASHER
3	P 40374	1	O-RING (326) BUNA-N, 1-5/8" ID x 2" OD
4	P 38090	1	RUBBER GASKET
5	P 54418	1	NUT
6	P 746	2	MACH. SCREW (R.H.,BRASS) #10-32 x 3/8" LG.
7	P 49282	1	SINGLE JACK CHAIN
8	P 4283	1	RING FOR TAG
9	P 4373	1	CAUTION TAG
* 10	U 17877	1	2" CORPORATION COCK (NPT)
11	U 17878	1	SOLUTION TUBE FOR U26316
	OR		
	U 17882	1	SOLUTION TUBE FOR U26320

**CAUTION:** FOR PROPER DISPERSION OF SOLUTION, THE END OF THE TUBE MUST EXTEND INTO THE MAIN APPROXIMATELY 1/2 TO 1/3 THE DIAMETER OF THE MAIN. CUT OFF THE TUBE IF TOO LONG AND SHORTEN CHAIN ANEQUAL AMOUNT.

**NOTE:** MAXIMUM PRESSURE 25 PSI

\* FOR 2" CORPORATION COCK WITH MUELLER THREAD ORDER UXA 17877.  
COMPLETE UNITS - NPT THREAD ONLY U 26316 FOR 1-1/2" HOSE, U 26320 FOR 2" HOSE.

WHEN ORDERING MATERIAL ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

2" MAIN CONNECTION - PARTS  
With Corporation Cock For 1-1/2" Or 2" Hose

50.845.002.022

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## **SECTION 6**

# V10K V-NOTCH CHLORINATOR

## SECTION 6 - PREVENTIVE MAINTENANCE KITS AND SPARE PARTS LIST

### V10K V-NOTCH GAS FEEDER

<b>DESCRIPTION</b>	<b>PART NO.</b>
Preventive Maintenance Kit	AJA 4393
Preventive Maintenance Kit, 3/4" Injector	APQ 4389
Preventive Maintenance Kit, 1" Injector	AJE 4406
Preventive Maintenance Kit (3/4-inch Anti-Syphon Injector)	APP 4379
Preventive Maintenance Kit (one-inch Anti-Syphon Injector)	AJA 4403

### ADDITIONAL SPARE PARTS

<b>QTY.</b>	<b>DESCRIPTION</b>	<b>PART NO.</b>
(Specify length)	Polyethylene Tubing, 1/2" x 5/8"	RP68 4503
(Specify length)	Polyethylene Tubing, 3/8" x 1/2"	RP68 4821
(Specify length)	Polyethylene Tubing, 1/4" x 3/8"	RP68 4818
(Specify length)	1-inch Flexible Plastic Pipe	RP68 4106
(Specify length)	3/4-inch Flexible Plastic Pipe	RP68 4105
1	Halocarbon Grease	U 27546
1	Ball Check for use with 2" Injector	U 18966

### OPTIONAL EQUIPMENT

<b>DESCRIPTION</b>	<b>MODEL NO.</b>
Gas Flow Transmitter	55.114
Vacuum Switch	55.116

## **SECTION 7**

# **CHLORINE HANDLING MANUAL**

(Cl<sub>2</sub>)

BOOK NO. WT.025.000.001.UA.IM.0614



# CHLORINE HANDLING MANUAL

## REGIONAL OFFICES

### INSTALLATION, OPERATION, MAINTENANCE, AND SERVICE INFORMATION

Direct any questions concerning this equipment that are not answered in the instruction book to the Reseller from whom the equipment was purchased. If the equipment was purchased directly from Evoqua Water Technologies, Colorado Springs, CO contact the office indicated below.

#### UNITED STATES

725 Wooten Road  
Colorado Springs, CO 80915  
TEL: (800) 524-6324

#### CANADA

If the equipment was purchased directly from Evoqua Water Technologies, Canada, contact the nearest office indicated below.

##### **ONTARIO**

Evoqua Water Technologies Ltd.  
2045 Drew Road  
Mississauga, Ontario  
L5S 1S4  
(905) 944-2800

##### **QUEBEC**

Evoqua Technologies des Eaux Itee  
505 Levy Street  
St. Laurent, Quebec  
H4R 2N9  
(450) 582-4266

# CHLORINE HANDLING MANUAL

## CHLORINE HANDLING MANUAL

### WARNING:

CHLORINE IS A HAZARDOUS CHEMICAL THAT CAN CAUSE INJURY AND DEATH IF NOT HANDLED PROPERLY. THIS MANUAL CONTAINS ONLY GENERAL INFORMATION ON THE PHYSICAL PROPERTIES, STORAGE, AND HANDLING OF CHLORINE. IT IS NOT INTENDED TO REPLACE OR LIMIT SAFETY PROCEDURES IN YOUR FACILITY.

SAFETY PROCEDURES IN AN INDUSTRIAL SETTING MUST BE DESIGNED IN ACCORDANCE WITH ALL GOVERNMENTAL REGULATIONS AND NATIONAL SAFETY CODES, AFTER GIVING FULL CONSIDERATION TO THE SPECIFIC NEEDS OF THE INDUSTRIAL FACILITY INVOLVED.

EVOQUA WATER TECHNOLOGIES CANNOT ANTICIPATE THE SPECIFIC SAFETY PROCEDURES REQUIRED AT EVERY INDUSTRIAL FACILITY. ACCORDINGLY, EVOQUA WATER TECHNOLOGIES DOES NOT GUARANTEE THAT SAFETY PROCEDURES DESIGNED IN ACCORDANCE WITH THIS MANUAL WILL COMPLETELY ELIMINATE HAZARDS AND THUS ASSUMES NO LIABILITY FOR ACCIDENTS THAT MAY OCCUR IN YOUR FACILITY.

READ THIS ENTIRE MANUAL AND BE FULLY FAMILIAR WITH YOUR EQUIPMENT AND YOUR ENTIRE INDUSTRIAL SYSTEM SO THAT THE SAFETY PROCEDURES YOU ESTABLISH WILL MEET THE NEEDS OF THE EMPLOYEES IN YOUR FACILITY. READING ONLY PART OF THE MANUAL WILL NOT HELP YOU ANALYZE THE NEEDS OF YOUR FACILITY. CONTACT YOUR CHLORINE SUPPLIER, THE CHLORINE INSTITUTE, INC., OR SIMILAR ORGANIZATION TO OBTAIN A MATERIAL SAFETY DATA SHEET (MSDS) AND MORE DETAILED INFORMATION ON CHLORINE. INFORMATION IS AVAILABLE FROM: THE CHLORINE INSTITUTE, INC., 1300 WILSON BOULEVARD, ARLINGTON, VA 22209.

PLEASE NOTE THE PUBLICATION DATE AND POSSIBLE OBSOLESCENCE OF THIS MATERIAL AS A RESULT OF SCIENTIFIC AND MEDICAL DEVELOPMENTS AFTER THE DATE OF PUBLICATION. THIS APPLIES TO ALL MATERIALS YOU REVIEW IN THE COURSE OF DEVELOPING SAFETY PROCEDURES FOR USE AT YOUR FACILITY.

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# CHLORINE HANDLING MANUAL

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## 1 INTRODUCTION

This manual discusses the characteristics, storage and handling of chlorine used with Evoqua Water Technologies equipment. Chlorine is used with Evoqua Water Technologies equipment primarily as a disinfectant in water or wastewater treatment.

### **WARNING:**

**CHLORINE IS HAZARDOUS. TO AVOID SEVERE PERSONAL INJURY OR DEATH BY SUFFOCATION, READ THIS MANUAL AND THE CHLORINE SUPPLIER'S PRECAUTIONS BEFORE HANDLING OR CONNECTING CHLORINE TO EVOQUA WATER TECHNOLOGIES EQUIPMENT.**

### **WHEN WORKING WITH CHLORINE:**

**ENSURE THAT APPROVED, SELF-CONTAINED BREATHING APPARATUS IS ALWAYS AVAILABLE AND PERSONNEL ARE PROPERLY TRAINED IN ITS USE.**

**ENSURE THAT SAFETY EQUIPMENT, SUCH AS VENTILATION FANS AND BREATHING APPARATUS, IS INSPECTED AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.**

**ENSURE THAT APPROPRIATE PLACARDS AND WARNING SIGNS ARE IN PLACE AND PROMINENTLY DISPLAYED IN THE AREAS WHERE THE GAS IS STORED.**

### **IN CASES OF ACCIDENT:**

**USE SAFETY EQUIPMENT TO PROTECT THE RESCUER AND MOVE VICTIM TO FRESH AIR. IF BREATHING HAS STOPPED, START ARTIFICIAL RESPIRATION IMMEDIATELY.**

**IF HEART HAS STOPPED, START CPR (CARDIOPULMONARY RESUSCITATION) IMMEDIATELY. IN ALL CASES, OBTAIN MEDICAL ATTENTION AS SOON AS POSSIBLE.**

### **TO AVOID ACCIDENTAL GAS RELEASE:**

**KNOWLEDGEABLE DESIGN PERSONNEL SHOULD OVERSEE AND APPROVE EQUIPMENT INSTALLATION AND SUITABILITY OF THE SYSTEM FOR WHICH IT IS INTENDED. QUALIFIED PERSONNEL SHOULD PERFORM PERIODIC INSPECTION TO ENSURE PROPER MAINTENANCE OF THE EQUIPMENT.**

**MONITOR SAFETY PROGRAMS AND CONDUCT PERIODIC TRAINING PROGRAMS, ESPECIALLY ON EMERGENCY SITUATIONS. SAFETY PROGRAMS ARE AVAILABLE FROM YOUR GAS SUPPLIER.**

### **LOCAL LAWS:**

**UNDER NO CIRCUMSTANCES SHOULD THE INFORMATION IN THIS BOOK BE CONSTRUED AS SUBSTITUTING FOR OR SUPERSEDING ANY LOCAL, STATE, OR FEDERAL LAWS AND REGULATIONS CONCERNING THE STORAGE, HANDLING, OR USE OF CHLORINE.**

# CHLORINE HANDLING MANUAL

## 2 TECHNICAL DATA AND CHARACTERISTICS OF CHLORINE

The following general information on chlorine may be useful in planning a chlorinator installation; however, a specific application may require more information than that included here. For further information, consult your chlorine supplier, the Chlorine Institute, Inc., or similar organization.

Chlorine in commerce is a liquefied gas under pressure. It is a clear, amber-colored liquid. The gas has a greenish-yellow color and a strong, pungent odor. It is an irritant to the skin and respiratory system. In the moisture-free state at ordinary temperatures, it is relatively non-corrosive. In the presence of moisture, however, it is highly corrosive. Accordingly, every precaution should be taken to avoid leaks, to stop them promptly if they occur, and to keep moisture out of valves, tubing, etc., not specifically designed to handle moist chlorine. Among the important physical properties of chlorine are:

Specific Gravity, Dry Gas

2.48 at 32° F and 1 atm referred to air.

Specific Gravity, Liquid

1.47 at 32° F and 53 . 5 psia.

Liquid to Gas volume Ratio

1:456.5 at 32° F and 1 atm.

Latent heat of Vaporization

123.9 Btu per lb at boiling point, -29.2° F.

Specific Volume, Dry Gas

1 lb = 4.99 of at 32° F and 1 atm.

Specific Volume, Liquid

1 lb = 0.0109 cf at 32° F and 53.5 psia.

Weight, Dry Gas

1 cf = 0.2006 lb at 32° F and 1 atm.

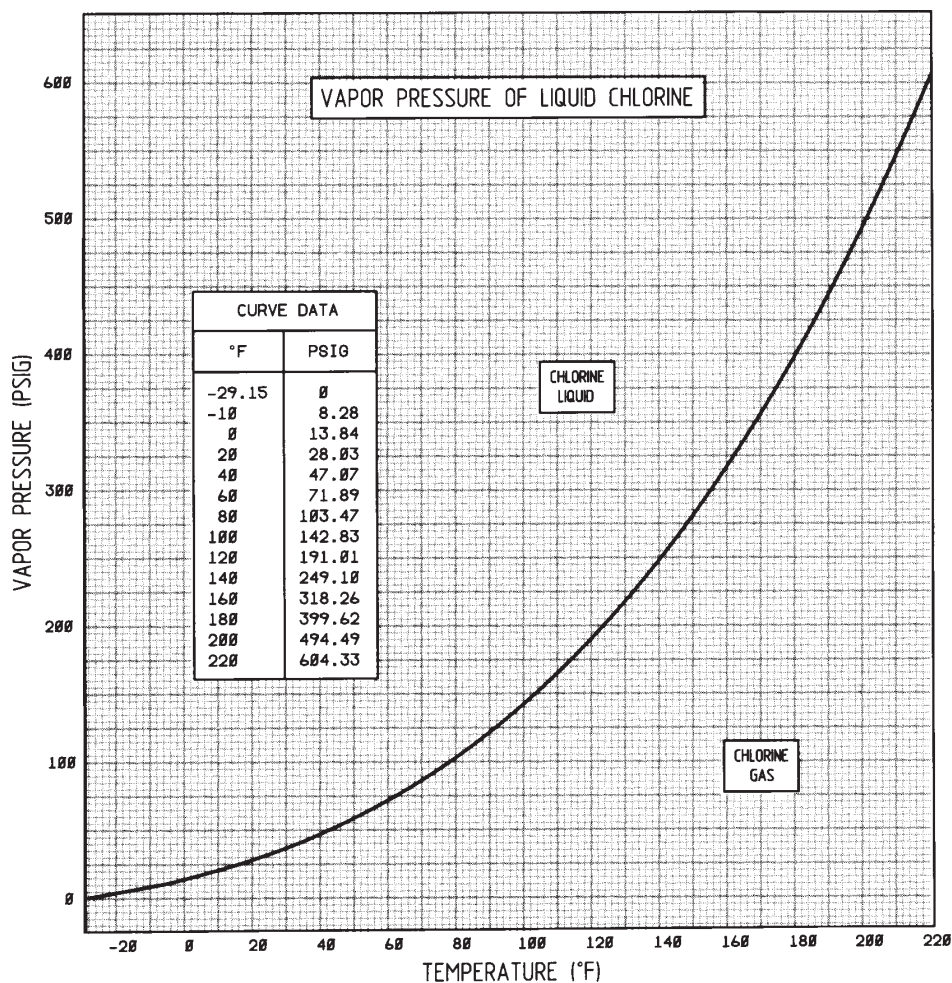


Figure 1 – Chlorine Pressure vs Temperature

SOURCE: THE CHLORINE MANUAL, FIFTH EDITION, PUBLISHED BY THE CHLORINE INSTITUTE, INC.

# CHLORINE HANDLING MANUAL

## Weight, Liquid

1 cf = 91.56 lb at 32° F.

## Solubility in Water\*

6.93 lbs./100 gals at 60° F and 1 atm.

## Pressure vs Temperature

See Figure 1

**\*NOTE: Theoretical values shown. Actual solubility in water based on chlorinator performance has proven to be 3500 ppm or 2.92 lbs/100 gals maximum.**

Chlorine is an oxidizing agent and will support combustion but is not explosive or flammable. Many organic chemicals will react with chlorine, some violently. Steel will ignite spontaneously in the presence of chlorine at 483° F.

## 3 SUPPLY CONTAINERS

Table 1 gives details on the supply containers most commonly used with Evoqua Water Technologies equipment.

Some large installations that would normally use single unit tank cars but are not serviced by railroad facilities use tank motor vehicles (tank trailers) which usually range in capacity from 15 to 22 tons.

All supply containers must conform to appropriate Department of Transportation (DOT) and Canadian Transport Commission (CTC) regulations. It is the responsibility of the supply container manufacturer and the chlorine supplier to meet these requirements.

## 3.1 RATES

In general, using a remote vacuum type chlorinator, the maximum sustained gas withdrawal rate at which chlorine may be taken from a 100 or 150 pound cylinder is one pound per day per degree Fahrenheit (1.0 lb/24 hrs/°F). The corresponding rate for ton containers is about 8.0 lbs/24 hrs/°F. At an assumed liquid temperature of 70° F (and using a remote vacuum type chlorinator) the above figures translate into 70 lbs/24 hrs for cylinders and 560 lbs/24 hrs for ton containers. For a direct feed cylinder pressure operated chlorinator these rates become 42 and 336 lbs/24 hrs respectively. These rates can be increased substantially for brief periods. Do not place containers in a water bath or apply direct heat in order to permit higher withdrawal rates.

It is not practical to withdraw chlorine as a gas from tank cars (or tank trailers).

### 3.1.1 MANIFOLDING FOR GAS WITHDRAWAL

When higher gas withdrawal rates are required, cylinders or the gas valves (upper) of ton containers may be manifolded. A typical arrangement for manifolding cylinders is shown in Figure 2.

If cylinders or ton containers are manifolded, it is essential that all supply containers be at the same temperature to prevent the transfer of liquid chlorine from a warmer container to a cooler container, possibly resulting in a container becoming overfilled through reliquefaction of chlorine in the cooler container.

**TABLE 1 - CHLORINE CONTAINER INFORMATION**

TYPE OF CONTAINER	NET WEIGHT	TARE WEIGHT	GROSS WEIGHT	OUTSIDE DIAMETER	LENGTH
CYLINDERS	100 lb	63 - 115 lb	163 - 215 lb	8-1/4" - 10-3/4"	3'3-1/2" - 4'11"
	150 lb	85 - 140 lb	235 - 290 lb	10-1/4" - 10-3/4"	4'5" - 4'8"
TON CONTAINER	2000 lb	1300 - 1650 lb	330 - 3650 lb	2'6"	6'7-3/4" - 6'10-1/2"
SINGLE UNIT TANK CARS	16 tons	-	-	10'5" - 12'0"	32'2" - 33'3"
	30 tons	-	-	12'4-1/2" - 13'7"	33'10" - 35'11-1/2"
	55 tons	-	-	14'3" - 15'1"	29'9" - 43'0"
	85 tons	-	-	14'11" - 15'1"	43'7" - 50'0"
	90 tons	-	-	14'11" - 15'1"	45'8" - 47'2"

Dimensional data from Chlorine Manual, Fifth Edition, published by the Chlorine Institute, Inc.

(1) The 150 lb cylinder is generally most readily available. Either the 100 lb or 150 lb size may be shipped full or empty via truck or rail in small lots or in full truck or carloads.

(2) Chlorine from Single Unit Tank Cars is generally unloaded directly from the car as needed in order to eliminate the necessity of storage tanks. Cars are leased to the consumer during this period and are consigned to private sidings only. Two parallel tracks are recommended to facilitate the handling of cars and to permit continuous operation without shut-down periods while cars are being switched.

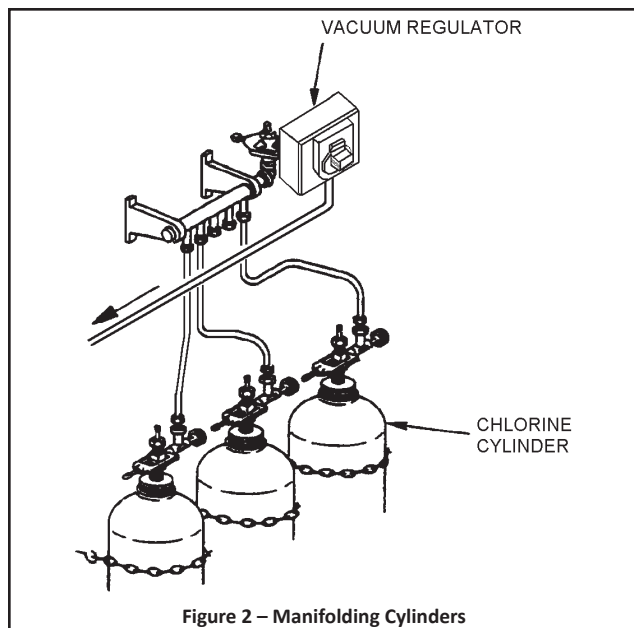


Figure 2 – Manifolding Cylinders

## 3.2 MAXIMUM LIQUID WITHDRAWAL RATE

The generally accepted alternate to manifolding ton containers is to withdraw liquid chlorine from the lower valve and use an evaporator. By this means, a ton container can be emptied in approximately five hours, which is equivalent to 9600 lbs/24 hrs.

Liquid can be withdrawn from tank cars at up to nearly 8,000 pounds per hour, or 192,000 pounds per 24 hours.

### 3.2.1 MANIFOLDING FOR LIQUID WITHDRAWAL

**WARNING:** IN ACCORDANCE WITH CHLORINE INSTITUTE RECOMMENDATIONS, DO NOT MANIFOLD TON CONTAINERS FOR SIMULTANEOUS LIQUID CHLORINE WITHDRAWAL. THIS MANIFOLDING CAN CAUSE OVER-PRESSURIZATION AND RUPTURE.

## 3.3 CONTAINER VALVES

Standard cylinder and ton container valves are identical in design, except that the cylinder valve includes a pressure relief device. Cylinder valves are shown in Figure 3 and ton container valves in Figure 4.

See Figure 5 for captive yoke type auxiliary container valves (valve connection style #820, recognized by the Compressed Gas Association as the only acceptable means of connecting to container valves). The external threads on the container valve are used only for securing the protective cap.

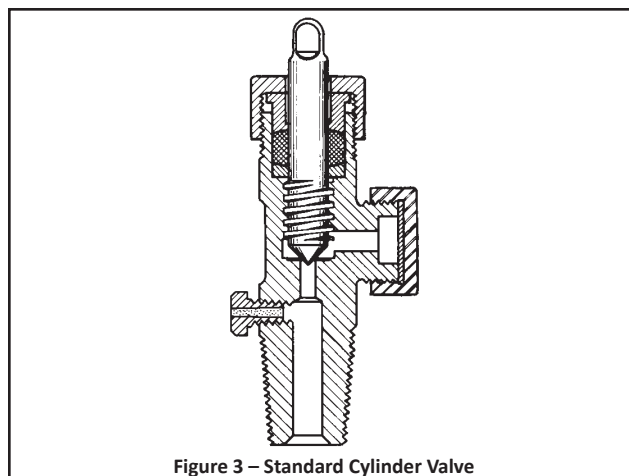


Figure 3 – Standard Cylinder Valve

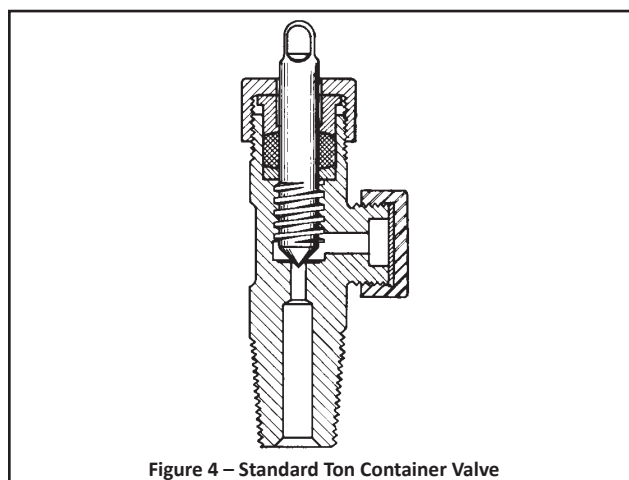


Figure 4 – Standard Ton Container Valve

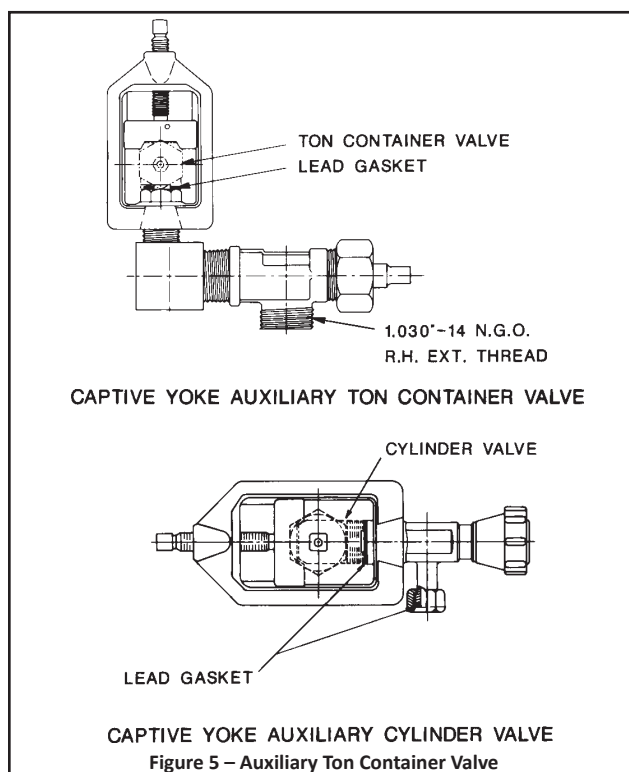
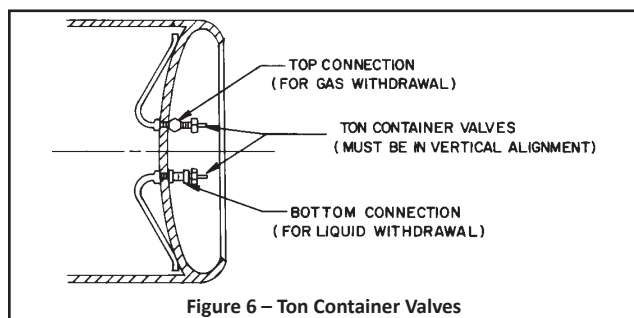


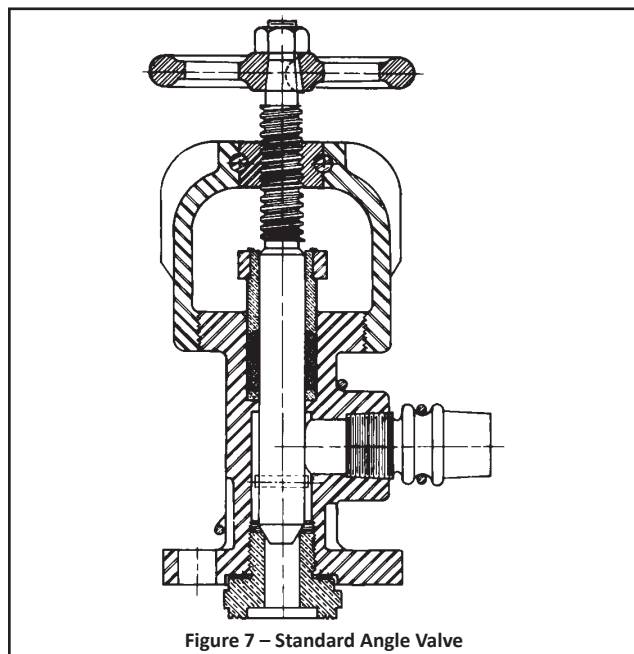
Figure 5 – Auxiliary Ton Container Valve



Cylinders are equipped with one valve that is normally used for gas withdrawal. Ton containers are equipped with two valves, as shown in Figure 6.



The upper valve is used for gas withdrawal and the lower valve for liquid withdrawal. Tank cars are equipped with four standard angle valves, as shown in Figure 7.



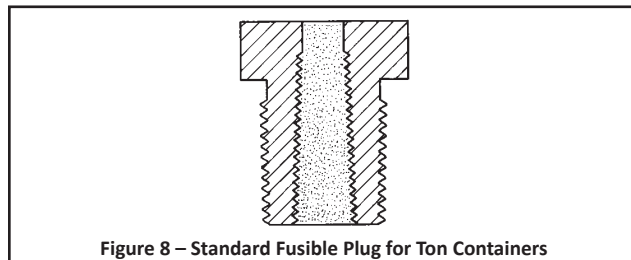
Outlet is one-inch female ANSI Standard taper pipe thread. The liquid withdrawal valves are located on the longitudinal center line of the tank car. The valves on the transverse center line are connected to the vapor space and are used to obtain chlorine gas under pressure for testing the piping or for air padding the tank car.

### 3.4 PRESSURE RELIEF DEVICES

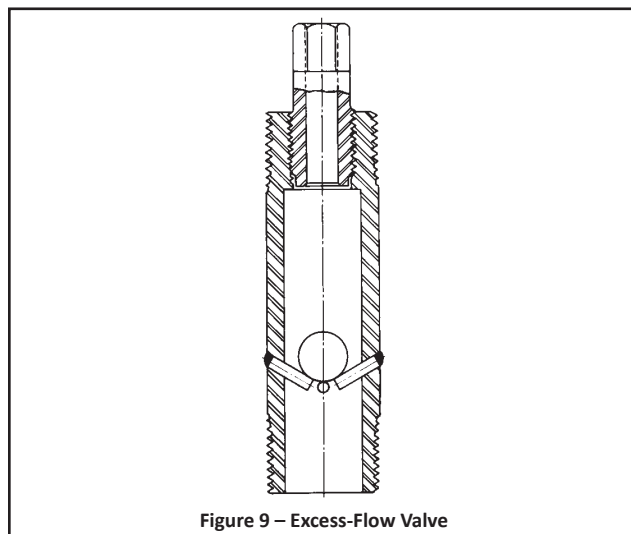
All chlorine supply containers are equipped with some type of device for relief of pressure. Cylinder valves have a fusible metal plug screwed into the body of the valve, as shown in Figure 3. The fusible metal melts when the temperature

increases to 158-165° F to relieve pressure and prevent rupture of the cylinder.

Ton containers are equipped with six fusible metal plugs (see Figure 8), three of which are in each end, spaced 120 degrees apart.



Tank cars have an excess-flow valve (see Figure 9) located under each liquid valve. While this valve may close during a catastrophic pipe line failure, its main function is to close automatically if the angle valve is broken off in transit. Tank cars also have a pressure relief device (see Figure 10) located in the center of the manway. The relief level varies with the type of car or tank.



### 3.5 STORAGE OF CONTAINERS

Store chlorine containers of any type under cover and in cool, well ventilated locations protected from fire hazards and adequately protected from extreme weather conditions. During the summer months, full containers should be shielded from the direct rays of the sun, otherwise a dangerous build-up of pressure might result (see Figure 1 and Paragraph 3.3). If stored out of doors, keep containers in fenced-off areas for protection. Avoid storage in subsurface areas because chlorine is heavier than air and will not readily rise from

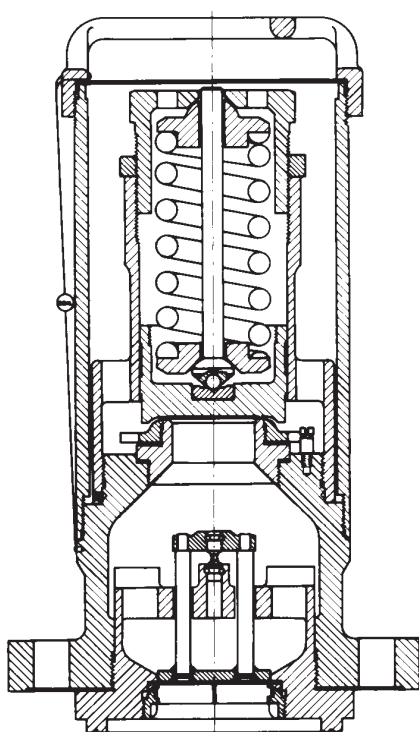


Figure 10 – Standard Safety Relief Device

subsurface locations should leaks occur. Do not store or use chlorine containers near other chemicals or gases.

**WARNING: STORE CYLINDERS IN AN UPRIGHT POSITION. TO AVOID SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, SUPPLY CYLINDERS MUST BE SECURED IN SUCH A MANNER (E.G., CHAIN) AS TO PREVENT THEIR BEING KNOCKED OVER. TON CONTAINERS MUST BE SECURED IN SUCH A MANNER (E.G., CROCKS) TO PREVENT THEIR ROLLING OUT OF PLACE.**

Do not remove the protective cap or hood from cylinders or ton containers until they are ready to be put in actual use. Do not store containers in a heavily traveled area where physical contact damage could occur.

It is essential that areas used to house chlorine containers or equipment be continuously monitored for the presence of chlorine in the air. This may be a requirement of applicable laws and/or regulations.

When containers are moved from a storage area to an area where they will be used, allow sufficient time to stabilize the temperature, and therefore the pressure, of the container and the chlorine before it is used.

The chlorine inventory depends to a large extent on local availability. Consult with chlorine suppliers in the area; review appropriate fire code requirements concerning storage of oxidizing materials and other applicable laws and regulations.

When planning space for stored containers, sufficient space must be allowed for empty containers. The best way to determine the amount of chlorine remaining in a container is to weigh the container continuously on a scale. This also makes it possible to record the amount of chlorine used. Portable or dormant scales in beam, dial, or digital types and with varying platform sizes are available.

**WARNING: ALWAYS REMOVE WHEELS AND AXLES OF PORTABLE SCALES SO THAT THE SCALE CANNOT MOVE WHEN CYLINDERS ARE ON THE PLATFORM.**

Preferably, scales for cylinders should be installed with their platform flush with the floor to eliminate the necessity of lifting the cylinders. Some low profile scales such as the Wallace & Tiernan® Cylinder Scale are low enough that cylinders can be placed on the scale without lifting. Others are installed with ramps. If scales are pit mounted, a trapped drain should be provided.

Scales for ton containers are usually installed above the floor, since ton containers are usually handled by overhead conveyor. Many of these scales do not have platforms since the ton containers are usually supported by cradles or trunnions.

Special high-capacity scales are provided at some installations using tank cars. These scales are usually pit mounted below the railroad siding with the dial or digital unit housed above ground beside the track.

Some of the dial or digital scales are equipped with loss-of-weight recording systems providing a permanent record of chlorine usage.

### 3.6 HANDLING CONTAINERS

Always handle chlorine containers with utmost care. To prevent injury or damage, do not drop chlorine containers and do not permit containers to strike each other or other objects. To prevent damage to the valve, valve protecting caps or hoods must always be in place when containers are moved.

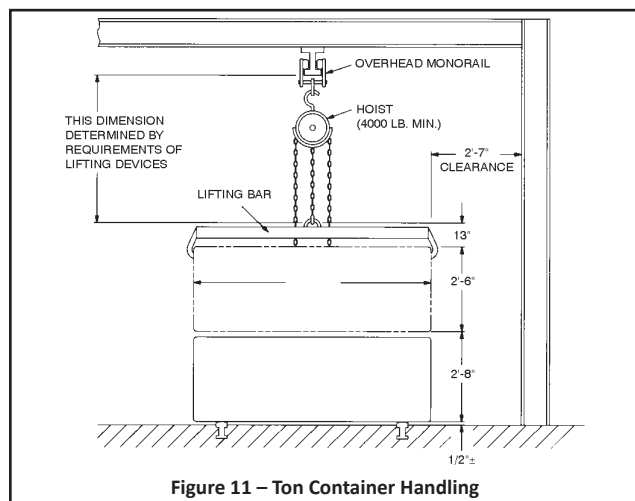
Handle cylinders with a simple two-wheel hand truck of the barrel pattern. Hand trucks should be well balanced and equipped with chains or clamps to prevent the cylinders from falling off the truck.



**WARNING: NEVER LIFT CYLINDERS BY THE VALVE PROTECTING HOOD. THE HOOD MAY SEPARATE FROM THE CYLINDER, CAUSING THE CYLINDER TO FALL.**

Never lift cylinders by sling or magnetic devices. If lifting is necessary, use a specially designed cradle. Contact your chlorine supplier for recommendations or information.

When moving ton containers, due consideration must be given to the fact that the liquid in the container represents a live load in addition to the dead load of the container and the liquid. The most accepted way of moving ton containers is by overhead conveyor and lifting beam (see Figure 11).



Rails or roller conveyors have also been used. Fork lift trucks, in addition to having adequate capacity, must have the containers restrained and be sufficiently stable to prevent tipping.

### 3.7 USING CONTAINERS

If containers have been stored in an area other than that in which they will be used, they should be allowed to stabilize at the new temperature before being used. Containers should always be used in the order in which they are received to avoid unnecessarily long storage and possible difficulty with valves that have not been opened or closed for too long a period.

**WARNING: CYLINDERS ARE NORMALLY USED IN AN UPRIGHT POSITION FOR GAS WITHDRAWAL. TO AVOID SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, SUPPLY CYLINDERS MUST BE SECURED IN SUCH A MANNER (E.G., CHAIN) AS TO PREVENT THEIR BEING KNOCKED OVER. TON CONTAINERS MUST BE USED IN A HORIZONTAL POSITION WITH THE TWO VALVES IN A VERTICAL LINE. TON CONTAINERS MUST BE SECURED IN SUCH A MANNER (E.G., CHOCKS) TO PREVENT THEIR ROLLING OUT OF PLACE.**

When withdrawing gas from a ton container, connection is made to the upper valve (see Figure 6). Liquid withdrawal is accomplished by connecting to the lower valve.

It is recommended that special 3/8-inch square box wrenches, rather than adjustable wrenches, be used for opening cylinder and ton container valves. Length of the wrench should not exceed eight inches. It is good practice to leave the wrench in place so the valve can be closed quickly in case of an emergency. Maximum discharge can be accomplished with one full turn of the valve. Excessive force must not be used in opening valves. Never strike the wrench with anything other than the heel of the hand. Loosening the packing nut a maximum of 1/2 turn is acceptable, provided the packing nut is tightened after the valve is operated. Contact your chlorine supplier if these procedures do not permit operation of the valve.

Angle valves on tank cars must be opened fully to aid the operation of the excess flow valve.

Always test for leaks before putting new containers in service. The system can be pressurized by opening the container valve and then closing it. The valve can be opened again after it is determined that there are no leaks.

**WARNING: ALWAYS WEAR PROTECTIVE CLOTHING WHEN CHECKING FOR LEAKS. REFER TO "PERSONNEL SAFETY" FOR INFORMATION ON HEALTH HAZARDS AND SAFETY PRECAUTIONS.**

It is not unusual during humid conditions for condensation to collect on the outside of the container. A buildup of frost on the container indicates that withdrawal rates are too high to permit the surrounding air to supply the heat necessary to evaporate the liquid chlorine. Increasing the circulation of room temperature air past the container may correct the condition. Do not apply direct heat to the container in any way. It may be necessary to shut off the container valve and permit it to warm up again before putting it back in service.

After emptying the container, the valve must be closed before disconnecting to prevent the entry of moisture. After disconnecting, the valve cap and the valve protecting cap or hood must be replaced before the container is moved. Empty containers should be segregated from full containers and should be tagged.

Tank cars are unloaded by means of one of the liquid valves. One of the gas valves can be connected to the system to permit pressure testing with gaseous chlorine rather than liquid. The flexible connection used for tank car unloading must be designed for and installed in such a manner to allow for the significant increase in height as the car unloads. Since

tank car pressure is the only force causing the chlorine to discharge, many cars are padded with dry air by the producer or the user. Reference to Chlorine Institute Pamphlet 66, Chlorine Tank Car Loading, Unloading, Air Padding, Hydrostatic Testing, should be made for information on user air padding. It is essential that air padding pressure be kept as low as possible for satisfactory operation of the chlorination equipment since excessive air padding pressures can have a negative impact on evaporator performance. The depletion of the liquid chlorine supply in the car is accompanied by a sharp drop in tank car pressure.

After the angle valve is closed and the discharge line emptied, the piping may be disconnected. The valve outlet plugs should be replaced and the discharge piping capped immediately.

## 4 PIPING

### 4.1 PIPING MATERIALS AND JOINTS

If the chlorinator capacity is low enough, the vacuum regulator or the complete chlorinator may be mounted directly on a cylinder or ton container valve, totally eliminating pressure piping. In this case, reference to the equipment instruction book provides all necessary details.

Pressure connections from all chlorine containers are normally made by means of flexible connections made of copper tubing. Use yoke type connections at container valves. The chlorinator or vacuum regulator instruction book should be referred to for details for use of flexible connections along with the required auxiliary cylinder or ton container valves, header valves, and auxiliary header valves (if required).

**WARNING: ALWAYS REPLACE FLEXIBLE CONNECTIONS ANNUALLY (OR SOONER IF THERE IS EVIDENCE OF DEGRADATION).**

The usual practice for chlorine liquid or gas pressure lines, at the commonly encountered pressures and temperatures at chlorinator installations, is the use of 3/4 or 1.0 inch schedule 80 carbon steel seamless pipe with Class 3000 forged steel fittings; two-bolt flanges (commonly referred to as oval ammonia unions) are also often used. Both screwed and socket welded construction are common. Threaded joints should be made up using litharge and glycerine for permanent joints, white lead or TFE tape for others.

To facilitate maintenance, the number of line valves should be kept to a minimum. Insulation is required only in those cases where it is necessary to prevent chlorine gas lines from becoming chilled, or liquid lines from becoming overheated.

More complete details, along with ASTM and ANSI specifications, can be obtained by referring to Chlorine Institute Pamphlet 6, Piping Systems For Dry Chlorine.

**WARNING: TWO COMMON CAUSES OF CHLORINE PIPING LEAKS ARE:**

**1. RE-USE OF GASKETS. THIS SHOULD NEVER BE DONE. ALWAYS HAVE AN ADEQUATE SUPPLY ON HAND AND ALWAYS USE NEW GASKETS OF THE CORRECT MATERIAL AND SIZE AS IDENTIFIED ON THE EQUIPMENT PARTS DRAWING.**

**2. IMPROPERLY MADE-UP THREADED PIPE JOINTS. SEE CHLORINE INSTITUTE MANUAL OR PAMPHLET 6 FOR RECOMMENDED PROCEDURE.**

### 4.2 GAS PIPING INSTALLATION REQUIREMENTS

Reliquefaction of a gas should be avoided. If liquid chlorine is carried downstream to the chlorinator or vacuum piping, it may soften the plastic components and affect their structural strength. Liquid can wash any collected contaminants into the vacuum regulator and can also cause erratic surging, freezing, and pressure release, which can damage the diaphragm and control valves. Cold conditions in a gas pipe line (cold to the touch, dripping of water condensed from the atmosphere, frost, ice) are an indication that liquid chlorine is present in the line and is flashing to gas. Refer to the proper guidelines that follow.

It is important to observe the correct temperature conditions in conducting chlorine gas under pressure from the location of the containers to the point of use. To avoid difficulty with reliquefaction of chlorine, pressure piping and control equipment receiving gas under pressure should be at a higher temperature than that of the chlorine containers. In general, a difference of 5° to 10° F is recommended.

Pitch pressure lines uphill from the gas source toward the chlorinators if possible.

Install a pressure reducing valve or the chlorinator vacuum regulator close to, but higher than, the source of gas. The use of a chlorine pressure reducing valve is also recommended in those localities where severe temperature changes are likely to be encountered during a 24-hour period.

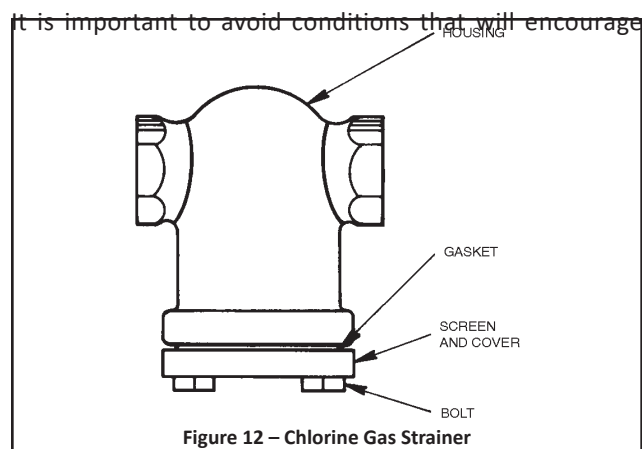
It is preferable to run chlorine pressure gas lines overhead through relatively warm areas rather than along the floor or through basement areas where lower temperatures may be encountered. Do not run these gas lines along exterior walls that may be cold in winter months. Do not run pressure gas lines under windows from which cold air descends in winter months.

If the source of gas is one or more ton containers connected to a manifold, install a drip leg of 1.0-inch schedule 80 seamless steel pipe approximately 18 inches long in a tee in the manifold with the lower end capped. Locate the drip leg immediately downstream of the last container connection to intercept the liquid that comes from the ton containers' gas education tubes when initially opened.

Gas may be withdrawn from two or more containers simultaneously provided all containers are at the same temperature. Refer to Paragraph 3.1.

The installation of chlorine gas strainers in pipe lines upstream from pressure reducing valves or vacuum regulators is a common practice. These strainers can also serve as traps for a small amount of liquid chlorine. Figure 12 illustrates a typical strainer.

### 4.3 LIQUID PIPING INSTALLATION REQUIREMENTS

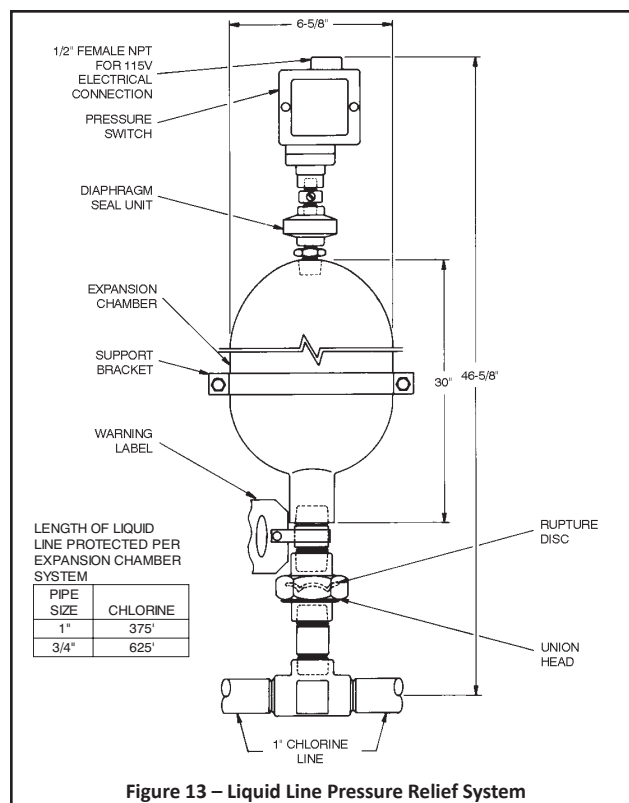


vaporization. Thus it is important to keep liquid chlorine lines as cool as, or cooler than, the containers themselves by eliminating restrictive fittings and always operating with fully opened line valves. Avoid running liquid chlorine lines through overheated areas where gasification is likely.

Valves in liquid chlorine lines should be kept to a minimum. It is particularly important to avoid situations where it is easy to close two valves in a line thus trapping liquid that, upon an increase in temperature, will expand and develop higher than acceptable pressures.

A liquid line pressure relief system (which includes a rupture disc and an expansion chamber) is required where liquid may be trapped in the line or where it is necessary to run lines a considerable distance. The relief system is detailed in Figure 13.

The expansion chamber provides an area for expansion in the event that valves at both ends of the line are closed. Relief system placement must be based not only on length of line but also placement of valves.



### 4.4 PRESSURE RELIEF AND VENT PIPING REQUIREMENTS

All pressure relief vent line systems must be treated as though they contain chlorine. Use the same materials for pressure relief vent lines as used for chlorine gas piping, unless the vent line is a combination pressure relief/vacuum relief line in which case the material must be suitable for moist chlorine gas (PVC or polyethylene tubing).

Vent lines must be run in such a way that moisture collecting traps are avoided. A continuous gradient is preferred. The end of all vent lines must be turned down and screened.

Manifolding of vent lines is an acceptable practice provided only like vents are manifolded (i.e., evaporator water vapor vents must be separate from gas pressure reducing valve pressure vents, etc.). The interior cross sectioned area of a common vent or pressure relief line should be approximately equal to the sum of the cross sectional areas of the individual vent lines.

**WARNING:** THE VENT LINE AND RELIEF LINE MUST TERMINATE IN AN AREA GAS FUMES CANNOT CAUSE INJURY TO PERSONNEL OR DAMAGE. DO NOT TERMINATE THE VENT LINE AND RELIEF LINE AT A LOCATION ROUTINELY USED BY PERSONNEL, SUCH AS WORK AREAS OR PATHWAYS NOR NEAR ANY WINDOWS OR VENTILATION SYSTEM INTAKES. IF AN AREA MEETING THESE REQUIREMENTS IS NOT AVAILABLE, REFER TO THE CHLORINE INSTITUTE'S CHLORINE MANUAL AND PAMPHLET NO. 9 FOR ALTERNATE METHOD OF RELIEF DISPOSAL.

## 4.5 VALVES

Yoke type auxiliary cylinder, yoke type auxiliary ton container, and header valves are described adequately in the chlorinator or vacuum regulator instruction book.

Line valves are used to isolate alternate sources of supply (manifolded banks of ton containers or tank cars), individual evaporators or pressure type chlorinators. Sufficient line valves should be provided for flexibility of system operation consistent with the recommended practice of eliminating redundant or unnecessary valves.

Valves are usually of approximately globe pattern as shown in Figure 14 or ball type as shown in Figure 15.

Care should be taken that only valves designed by the manufacturer specifically for chlorine service are used. Ball valves must include a provision for venting the cavity in the closed position to the upstream side.

## 4.6 PRESSURE GAUGES AND SWITCHES

Whenever pressure gauges and switches are used in chlorine liquid or gas lines, they must be of the type protected by a flanged diaphragm seal specifically designed for chlorine service to prevent the entry of chlorine into the gauge or

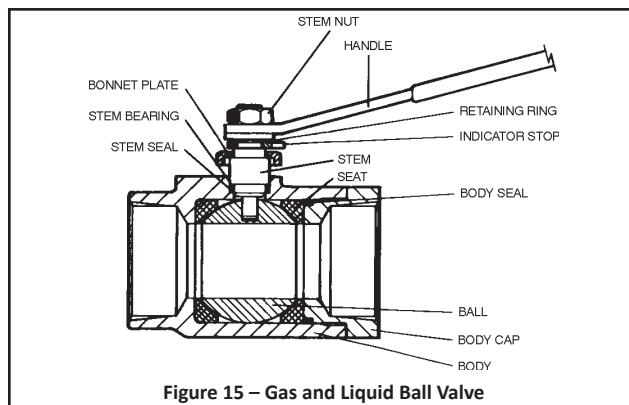


Figure 15 – Gas and Liquid Ball Valve

switch mechanism. The fill material must be suitable for chlorine service. The connection between the seal and the gauge or switch must not be broken. If the connection is inadvertently broken, the complete assembly must be discarded and replaced, unless it can be returned to the manufacturer for repair.

Frequently, valves are installed between chlorine lines and the gauge or switch diaphragm seal to permit removal without taking the line out of service. A means of relieving the pressure in the isolated piping, gauge, or switch is strongly recommended.

**WARNING:** RELEASING EVEN A SMALL AMOUNT OF LIQUID CHLORINE IS DANGEROUS AND REQUIRES EXTREME CAUTION TO AVOID SEVERE PERSONAL INJURY. ALWAYS USE PROTECTIVE EQUIPMENT WHEN RELIEVING PRESSURE, EVEN IN ISOLATED CHLORINE GAS PIPING.

Since small size line valves for chlorine are not readily available, many times a header valve is used as shown in Figure 16.

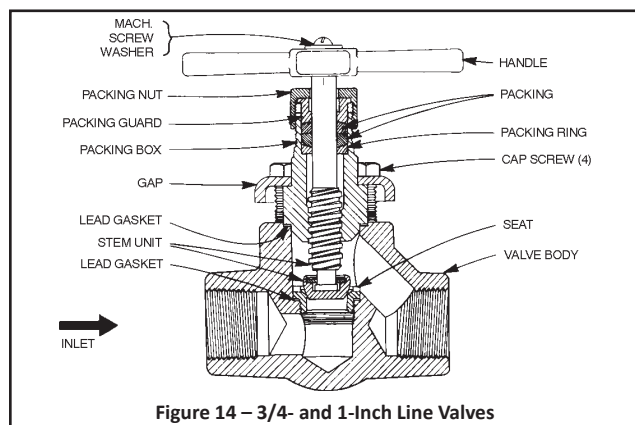


Figure 14 – 3/4- and 1-Inch Line Valves

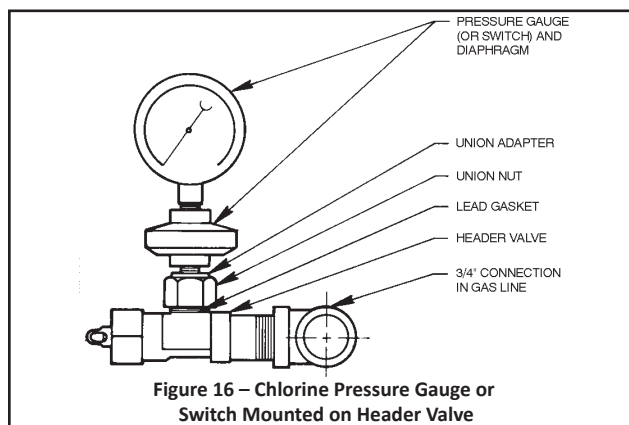


Figure 16 – Chlorine Pressure Gauge or Switch Mounted on Header Valve

## 4.7 PRESSURE RELIEF DEVICES

There are two types of pressure relief devices in use in chlorine piping systems. The first, as shown in Figure 13, is usually employed in liquid chlorine piping to protect the piping from rupture due to high pressure from thermal expansion of the liquid chlorine. It consists of a rupture disc that ruptures before the pipe line itself can rupture, an expansion chamber that allows for relief of the over-pressure condition without releasing chlorine to the atmosphere, and a pressure switch to warn of the disc rupture.

The second type, as shown in Figure 17, is usually used in gas piping at the evaporator discharge. This system consists of a rupture disc that keeps chlorine out of the valve during normal operation, a pressure relief valve, and a pressure switch to warn of disc rupture.

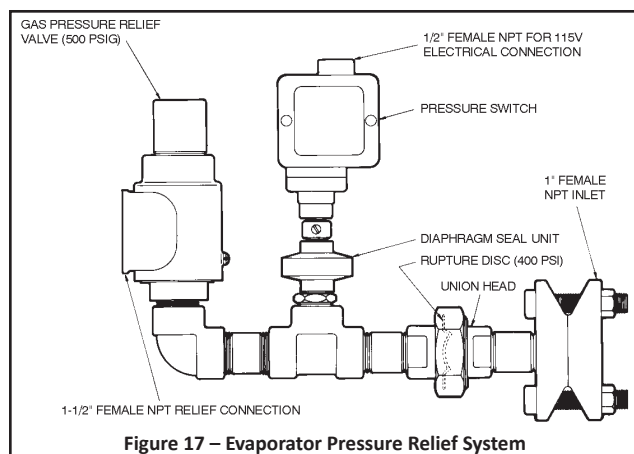


Figure 17 – Evaporator Pressure Relief System

**WARNING: THE RELIEF LINE MUST TERMINATE IN AN AREA WHERE GAS FUMES CANNOT CAUSE DAMAGE OR INJURY TO PERSONNEL. DO NOT TERMINATE THE RELIEF LINE AT A LOCATION ROUTINELY USED BY PERSONNEL, SUCH AS WORK AREAS OR PATHWAYS, NOR NEAR WINDOWS OR VENTILATION SYSTEM INTAKES. IF AN AREA MEETING THESE REQUIREMENTS IS NOT AVAILABLE, REFER TO THE CHLORINE INSTITUTE'S CHLORINE MANUAL AND PAMPHLET NO. 9 FOR AN ALTERNATE METHOD OF RELIEF DISPOSAL.**

## 4.8 PREPARATION FOR USE

Normal plumbing practices will result in the entry of cutting oils, greases, and other foreign materials into the piping.

In addition, the line will have been open to the atmosphere during construction, allowing moisture to enter. It is therefore essential that all piping be thoroughly cleaned and dried prior to exposure to chlorine.

**WARNING: INCOMPLETE CLEANING CAN RESULT IN VIOLENT REACTIONS BETWEEN CHLORINE AND THESE MATERIALS.**

Steam cleaning is an acceptable method for removal of the above materials. Provision must be made for removal of condensate and foreign materials. For alternate methods if steam is not available, refer to Chlorine Institute Pamphlet 6, Piping Systems for Dry Chlorine.

After proper cleaning, all chlorine piping should be hydrostatically tested to one and one half times the expected maximum operating pressure. Prior to testing, all gauges, switches, rupture discs, etc., that could be damaged during testing must be removed and connections plugged. Any moisture absorbing packing or gaskets left in the system during hydrostatic testing must be removed and replaced with new packing or gaskets. After hydrostatic testing, it is essential that all piping be thoroughly dried with inert gas (e.g., nitrogen) or dry air having a dew point of -40° F or below. The dew point of the air or gas leaving the piping must be checked and drying continued until the dew point is at or below -40° F, which may require quite some time.

**WARNING: MOISTURE MUST BE REMOVED FROM ANY PART OF THE EQUIPMENT THAT IS NORMALLY EXPOSED TO DRY CHLORINE ONLY. WHILE DRY CHLORINE IS NON-CORROSIVE, MOIST CHLORINE IS EXTREMELY CORROSIVE TO COMMON METALS, SUCH AS BRASS OR STEEL, POSSIBLY RESULTING IN A LEAK AND SEVERE PERSONAL INJURY. ALSO, IF WATER IS TRAPPED IN A SECTION OF PIPING OR EQUIPMENT, SUBSEQUENT HEATING OR FREEZING OF THE WATER MAY RESULT IN HIGH ENOUGH PRESSURE TO RUPTURE THE PIPING OR EQUIPMENT, POSSIBLY CAUSING SEVERE PERSONAL INJURY.**

A very acceptable alternate to hydrostatic testing, if proper facilities do not exist for drying, is to test with nitrogen or dry air having a dew point of -40° F or below. The same provision of removing equipment that could be damaged by test pressure applies.

**WARNING: TO AVOID SEVERE PERSONAL INJURY, BEFORE PLACING THE PIPING SYSTEM INTO SERVICE, PRESSURE TEST WITH CHLORINE GAS, NOT LIQUID. EACH VOLUME OF CHLORINE LIQUID THAT LEAKS AND THEN EVAPORATES RESULTS IN APPROXIMATELY 460 VOLUMES OF CHLORINE GAS.**

The chlorine container valve should be opened only slightly during this phase of testing or preferably closed again after pressurizing the system. The piping should be tested in the smallest sections permitted by the existing valves to minimize



the discharge of chlorine through any leaks.

**WARNING: IT IS ESSENTIAL THAT PROPER BREATHING APPARATUS BE AVAILABLE BEFORE CHLORINE IS ADMITTED TO ANY PIPING SYSTEM OR EQUIPMENT. THIS APPARATUS WILL BE DISCUSSED FURTHER UNDER "PERSONNEL SAFETY".**

Chlorine leaks are best located using a dauber moistened with commercial 26° Baume' aqueous ammonia (household ammonia is not strong enough) . A white cloud will be formed at the site of any leak. A plastic squeeze bottle that directs ammonia vapor, not liquid, at the joint being tested may also be used.

When a leak is detected, the system must be depressurized before corrective action is taken. The best method of depressurizing the system is through one of the chlorinators. At least one chlorinator must be readily available for this purpose before testing with chlorine begins.

## 5 PERSONNEL SAFETY

### 5.1 GENERAL

Proper consideration of personnel safety begins with the provision of properly sized and arranged housing so that operating personnel have adequate room to perform their duties. It is preferable that any room used for chlorine storage or equipment have two doors that open outward and that are equipped with panic bars.

Rooms housing chlorination equipment, and chlorine containers that are "in service" or "in reserve", should be heated when the room temperature falls below 50° F. Comfortable working temperatures of 65° to 75° F are recommended for the chlorine equipment room. The temperature of the chlorine container room (if separate) should normally be 5° to 10° F lower. All common methods of heating are acceptable, provided that care is taken to prevent overheating of chlorine containers. Radiators should not be located adjacent to containers. If space heaters are used, the warm air should be deflected away from the containers. Outside windows should be located or screened so that the rays of the sun do not fall directly on chlorine containers.

Natural ventilation may be adequate for a small chlorinator installation in a separate building when windows and doors can provide cross circulation; however, ventilation by means of a proper type electric fan is always recommended.

In all cases, installations must comply with appropriate regulations.

### 5.2 HEALTH HAZARDS

Exposure to a sufficiently high concentration of chlorine can result in difficulty in breathing and, if prolonged, finally death through suffocation. Chlorine's strong pungent odor may result in detection at levels as low as 1.0 ppm and most people will detect it by the time the concentration reaches 3.5 ppm. Concentrations of 5 ppm or more are so objectionable that only those who are unconscious or trapped will normally remain in the area. Increasing concentrations will produce eye irritation, coughing, throat irritation, vomiting, and labored breathing.

Even concentrations below the threshold of smell can result in minor eye and throat irritation if the exposure is long enough.

Liquid chlorine can cause burns and/or irritation when it is in contact with the skin or eyes.

Medical attention should be obtained immediately for personnel who have sufficient exposure to result in any symptoms beyond minor irritation. Properly trained and equipped first aid personnel are usually the first line of defense. While waiting for their arrival, the exposed individual must be removed to a safe area and be placed in a comfortable position. If breathing has stopped, artificial respiration must be started immediately. CPR administered by properly trained personnel is required if the heart has stopped.

If the exposed individual has difficulty breathing, oxygen should be administered only by those adequately trained in the procedure and the equipment used.

The proper procedure for emergency treatment of clothing or skin contaminated by chlorine is to flush the area with large quantities of water under a shower for at least 15 minutes. While still under the shower, affected clothing should be removed. No medical treatment or neutralization of the chlorine should be attempted except as directed by a physician.

Immediate flushing with tepid water should be administered if even small quantities of chlorine enter the eye or if the eye has been exposed to strong concentrations of chlorine. The eyelids must be parted and thorough flushing continued for at least 15 minutes. As mentioned previously for skin exposure, no medical treatment or neutralization should be attempted except as directed by a physician.

The attending physician may wish to refer to a Material Safety Data Sheet on chlorine as well as to the Chlorine Institute's Chlorine Manual and/or Pamphlet 63, First Aid and Medical Management of Chlorine Exposures.

## 5.3 SAFETY PRECAUTIONS

The first steps to be taken in providing proper safety precautions at any facility are the selection of safety equipment to be on hand, the proper location of the equipment, and the training of all personnel in proper procedures to avoid unnecessary chlorine releases and to deal with releases that occur.

Proper respiratory equipment is essential for all facilities regardless of size. For maximum safety, it is preferable to use air tank type pressure demand masks that have a self-contained air supply and, therefore, are suitable regardless of chlorine concentration.

All respiratory equipment must meet the requirements of the National Institute for Occupational Safety and Health. Following the respiratory equipment manufacturer's recommendation regarding maintenance and periodic testing is essential. This equipment should be stored outside the area containing chlorine or chlorine equipment in a manner protecting it from damage of any kind and so as to be readily available.

**WARNING: DO NOT LOCK CABINETS OR CLOSETS IN WHICH RESPIRATORY EQUIPMENT IS STORED, AS THE EQUIPMENT MUST BE READILY AVAILABLE.**

All personnel with no assigned responsibility for dealing with a chlorine release should be instructed to leave the area. Those responsible for correcting the situation should don respiratory equipment before doing so.

Protective clothing is recommended for handling even routine operations involving chlorine. In the event of a substantial release, protective clothing is required. Anyone desiring further information on protective clothing should refer to the Chlorine Institute Pamphlet 65, Protective Clothing for Chlorine.

Safety shoes, hard hats, and safety glasses should be used in accordance with standard plant practice.

Most leaks will occur in piping, valves, connections, and the pressurized portions of chlorine equipment. These leaks will usually be eliminated by tightening packing, replacing gaskets, or repairing the equipment.

**WARNING: REPLACE FLEXIBLE CONNECTIONS ANNUALLY, OR SOONER IF THERE IS EVIDENCE OF DETERIORATION.**

Emergency kits (meeting Chlorine Institute requirements) are available that can seal off most leaking areas of chlorine

containers (i.e., valves, fusible plugs, or container wall). If these are on hand they must be used only by personnel thoroughly familiar with their use. The chlorine supplier should be contacted immediately for information, assistance, and advice on the disposition of the leaking container. The container should always be repositioned, if possible, so the leak is gas rather than liquid.

**WARNING: NEVER UNDER ANY CIRCUMSTANCE SPRAY WATER ON A CHLORINE LEAK. THIS WILL ONLY MAKE IT WORSE.**

Wall charts are available from most chlorine suppliers that provide much of the information contained in this manual.

## 5.4 EMERGENCY ACTION PLANS

The best emergency plan includes routine practices that are designed to minimize emergencies. Proper maintenance of all equipment associated with the storage, handling, and use of chlorine in accordance with the manufacturer's instructions is essential.

All equipment and piping containing chlorine under pressure must be tested periodically for leaks following procedures covered in Paragraph 4.8. Since it is not unusual for areas used for chlorine storage and chlorine equipment to be relatively unattended, it is important for the air in these areas to be monitored continuously with chlorine detectors, so that warning of leaks is given as early as possible. As with most emergencies, the earliest detection helps to minimize the damage to equipment and personnel. In addition to warning of leaks when the areas are unattended, chlorine detectors should warn of the presence of minor amounts of chlorine that may not be detected by personnel in the area.

Some chlorine leaks are minor but all require immediate attention.

In the event of a major release of chlorine, there should be no delay in contacting the agency in the community that is responsible for handling hazardous material releases. Appropriate names and telephone numbers must be prominently posted.

The chlorine supplier is probably the best source of assistance for most chlorine users. In addition, the Chlorine Institute's Chlorine Emergency Plan (CHLOREP) can provide vital assistance. In the United States this plan is activated through CHEMTREC (toll free 800-4249300). In Canada, contact CANUTEC (call collect 613-996-6666). These names and numbers must also be posted prominently.

The person responsible for making any of the calls listed above must be sure to give the agency contacted complete details including facility name, address, telephone number, and the names(s) of personnel to contact for further information. The description of the emergency should include size of container, corrective action already taken, local weather conditions, injuries, proximity to populated areas, and directions for easiest access to the site.

It is vital that the emergency plan include use of the “buddy system”, i.e., no personnel should be allowed to work alone in an area with a chlorine leak even if the second person is only standing by. As indicated earlier, all personnel not involved in locating and correcting the leak should leave the area travelling in a crosswind direction to an area that is upwind and above the leak. Since it may not be possible for all personnel to be equipped with respiratory equipment, they should be instructed to use a wet cloth or handkerchief over the nose and mouth while leaving the area.

Chlorine Institute Pamphlet 64, Emergency Control Planning Checklist for Chlorine Facilities, may be of assistance in preparing the emergency plan. A Material Safety Data Sheet for Chlorine, available from the Institute or the supplier, should also be consulted.

No emergency plan should be implemented until it is reviewed by the chlorine supplier and the agency in the community having responsibility for hazardous material handling and disposal.

If it is apparent that fire will threaten or is present in a chlorine storage area, it is preferable to remove the containers. If this is not possible, the containers must be protected from the heat of the fire by spraying them with water. Do not spray water on any leaking container, however, since water will react with the chlorine, forming acids that will make the leak worse.

## 5.5 CHEMICAL DISPOSAL FACILITIES

Part of the planning for emergencies entails provision for disposal of any released chlorine. In most cases little can be done about the chlorine already released to the atmosphere except to try to prevent its dissipation into areas where damage to equipment and personnel will result.

At some large installations, scrubbers have been installed so that areas containing chlorine or chlorine equipment can be sealed off and the air removed to a process that will absorb the chlorine. The design of such a system is complex and should only be attempted by those thoroughly familiar with the process.

Absorption systems have been provided at some facilities to permit a leaking container to be emptied quickly if this is deemed essential. One pound of chlorine can be absorbed by 1.4 pounds of sodium hydroxide (caustic soda), 3.7 pounds of sodium carbonate (soda ash), or 1.3 pounds of calcium hydroxide (hydrated lime).

**WARNING: TO AVOID SEVERE PERSONAL INJURY WHEN USING CORROSIVE CHEMICALS, OBSERVE ALL SAFETY PRECAUTIONS RECOMMENDED BY THE CHEMICAL MANUFACTURER/ SUPPLIER.**

In each case, one pound of the material should be dissolved in one gallon of water. Lime will actually be suspended in, rather than dissolved in, the water and requires constant agitation.

The tank and other equipment provided for an absorption system must be fabricated of materials suitable for the chemicals involved.

Provision must be made for dissolving the chlorine in the alkaline solution in such a way that the solution cannot be sucked back into the container.

Actually the safest way of disposing of the chlorine in the leaking container might be through the chlorination process, particularly if the process can absorb the chlorine at higher than normal rates without creating damage.

It is not generally permissible to ship a container damaged by leak or fire if it contains chlorine. If for some reason this seems necessary, the chlorine supplier must be contacted.