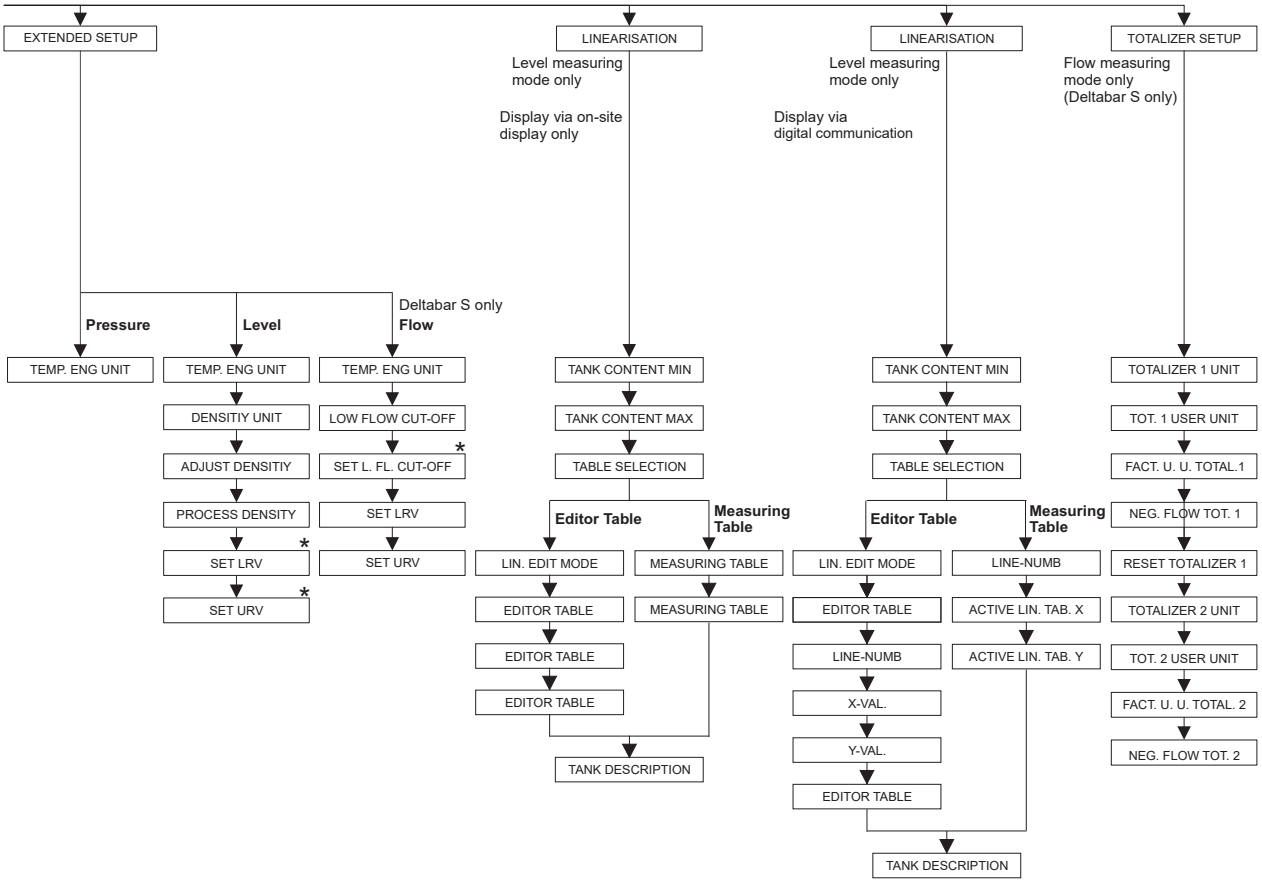

There are parameters that are only displayed if other parameters are appropriately configured.
For example the TOT. 1 USER UNIT parameter is only displayed if the "User unit" option was selected for the TOTALIZER 1 UNIT parameter.
These parameters are indicated with a "*".

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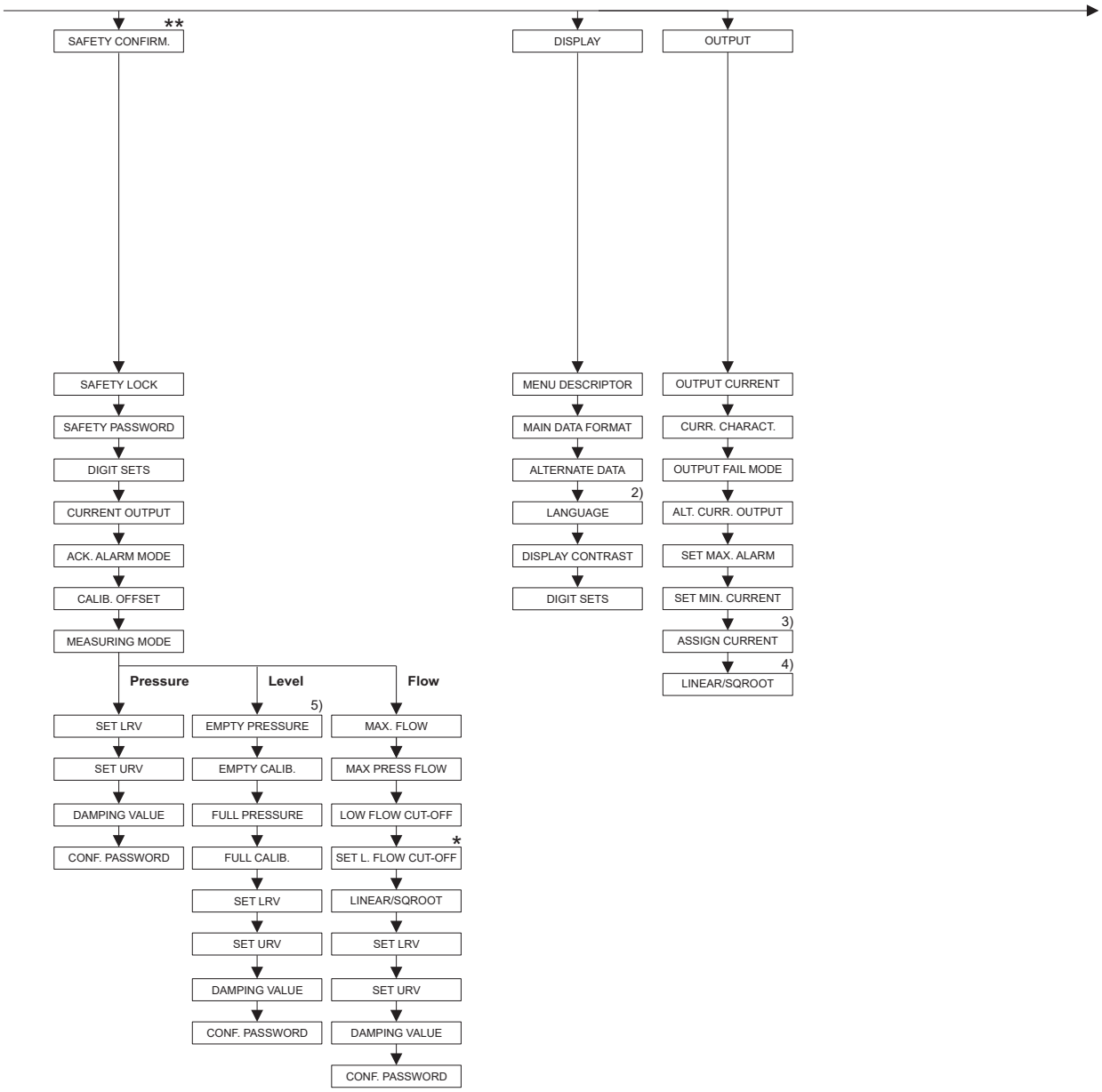

2) Display via digital communication

3) Level measuring mode only

4) Flow measuring mode only

5) only LEVEL SELECTION = Level Easy Pressure

There are parameters that are only displayed if other parameters are appropriately configured.
These parameters are indicated with a "*".

** See Safety Manual SD190P for Cerabar S, SD189P for Deltabar S or SD213P for Deltapilot S.

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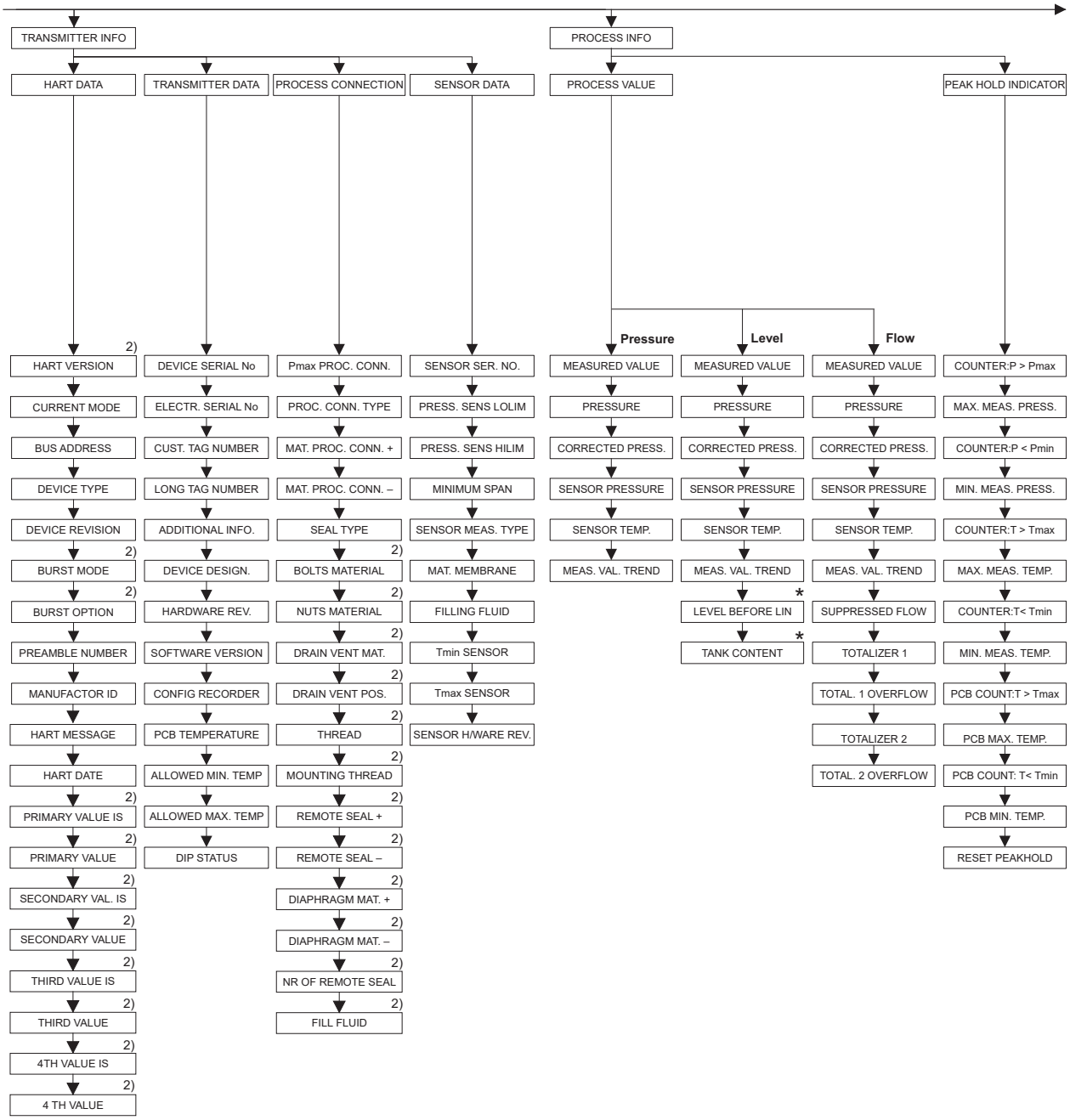

2) Display via digital communication

* There are parameters that are only displayed if other parameters are appropriately configured.
These parameters are indicated with a "*".

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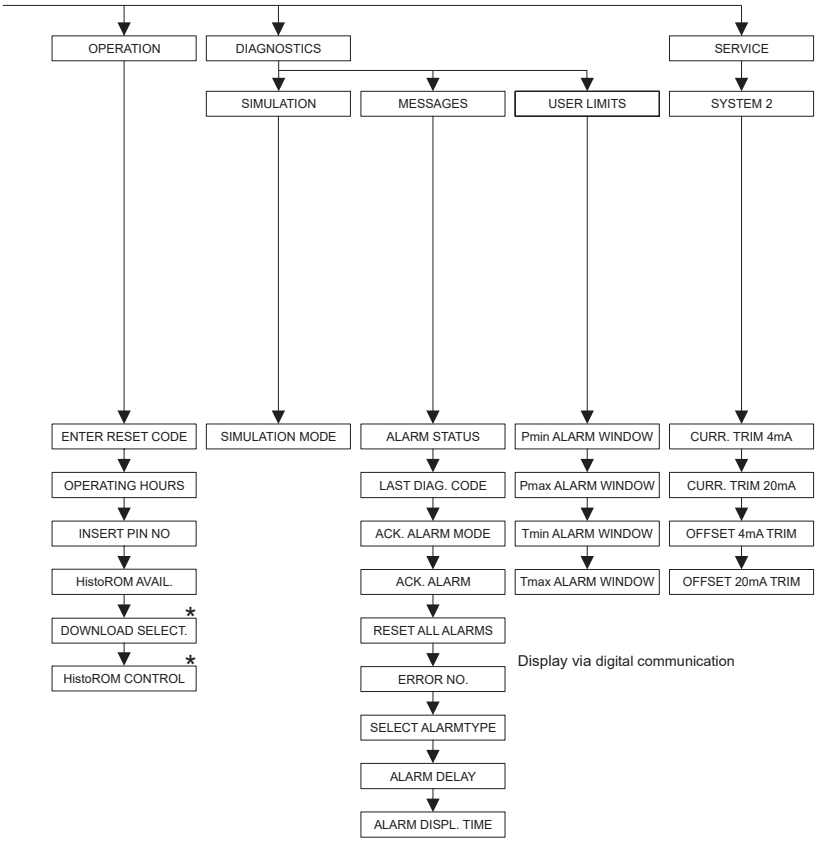

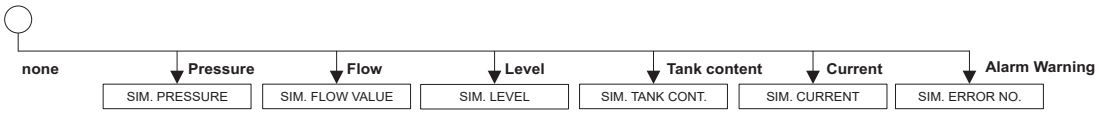

* There are parameters that are only displayed if other parameters are appropriately configured.
These parameters are indicated with a "*".

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CCS/FM+SGML 9

ENVIREQUIP

SERIES EVG/EVGX, MIXERS

LEFT BLANK

ENVIREQUIP **(Division 6445772 Canada Inc)**
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Cornwall, Ontario, Canada K6H 7L3 ***Cell:*** 514.349.3116
e-mail: envirequip@cogeco.ca
internet: http://www.envirequip.com

INSTRUCTION & OPERATING MANUAL

ENVIREQUIP - MIX-TECH MIXERS

SEE SECTION FOR AGITATOR / GEAR REDUCER DESIGN: (at end of Manual)

EVG	**(Parallel Shafts with Hollow Output Shafts & Tapered Roller Bearings)**
EVGX	**(Parallel Shafts with Hollow Output Shafts & High Capacity Upper Cylindrical & Lower (2) - Row Spherical Roller Bearings**
EHG	**(Worm drives for Small Top Entry & Portable Mixers with Hollow Output Shafts)**
EHGB	**Helical / Bevel gearing with Hollow Output Shafts & Tapered Roller Bearings)**
EVGFS	**Helical in-line gears with Solid Output Shaft Tapered Roller or Spherical Roller Bearings - Refer to Nord Installation & Operation Manual**

NOTE: For Units with Solid Output Shafts, Refer to the Nord Manual

Env-IOM.EngJuly.2015.wpd

ENVIREQUIP / MIX-TECH MIXERS - INDEX I.O.M.

– For mixer(s) installed in OPEN TANKS -

– See Section for Mechanical seals & Packing (Stuffing boxes) at end of I.O.M. PAGE (S)

E N V I R E Q U I P **(Division 6445772 Canada Inc)** **Page 1**
MIX-TECH DYNAMIC MIXERS
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INSTALLATION & OPERATION MANUAL
MIX-TECH MIXERS

S E C T I O N 1 - INSPECTION

- Make sure that all mixer parts have been removed from the crate(s) before discarding.
- Each mixer should be carefully checked for any possible shipping damage. Any shipping damage should be reported to the TRANSPORT COMPANY immediately.
- Check the paint and make any necessary touch-ups.

S E C T I O N 2 - INSTALLATION

- Most mixer problems can be avoided by following proper installation and operation instructions. The following is a list of hints to help insure proper installation and therefore satisfactory mixer service.
- Please read all appropriate instruction manuals prior to proceeding with the installation of the mixers.

C AU T I O N

- Lock-out the motor starter if any person is in the tank.
- Remove wick from the breather vent plug.
- DO NOT Paint breather / vent plug

MOST COMMON PROBLEMS: Mixer Shaft(s) not vertical; Impeller going through liquid level

- Make sure the impeller blades have been installed onto the hubs in the proper position with regards Rotation and Direction of flow. Please also note that the impellers blades are installed with the hubs ears always backing the blade into the flow. Also be sure that the leading edge and not the trailing edge is presented into the flow and that the angle at the impeller tip (angle of attack) from the horizontal is closer to 15° rather than to 75°.

C A U T I O N

- If the angle of attack (at the impeller tip is closer to 75°, either an incorrect hub in combination with the correct impeller blade (OR VICE VERSA) has been incorrectly assembled to make an incorrect matching of possible hub and blade combinations. For help in determining what the correct combination should be, Please refer to the mixer nameplate that will have the Rotation and direction of thrust written. Once you know the combination, refer to the pictorial guide of impeller / hub installation positions A, B, C or D.

- Depending on whether the concave or the convex surface is facing the fluid, if the angle of attach at the impeller is closer to 75°, the HP drawn will be 2 to 3 times greater than what it should be. This could result in overloading the motor and damaging the mixer.

- Make sure that the impeller blades are installed in the correct position for the required rotation. e.g. if the impeller blades are installed up-side-down, the pumping capacity will be reduced by about 65%. Check the mixer nameplate for the flow direction and install the impeller blades to suit.

C A U T I O N

POTENTIALLY DAMAGING SITUATIONS FOR MIXERS

- Prolonged operation of the mixer (impeller) at the liquid interface causes increased stress on the shaft & impeller for which the system was not designed to accommodate. Damage could result.
- Installations where there is a large hydraulic flow (or Velocity) in the mixer reservoir. : Make sure that if should such a flow is present, that the flow is baffled or dispersed over a larger area (as opposed to directed flow via a pipe), or that the flow be re-directed away form the impeller/shaft assembly, or is introduced evenly e.g via a weir. If this cannot be done, this external hydraulic flow will exert additional un-designed for stress loads and deflection on the mixer shaft and impeller which could result in component failure.

C A U T I O N

- Before permanently wiring the motor, check for the correct rotation of the low speed shaft. Normal is Clock-wise looking down from the top of the tank, although the reverse may also be required. Please check mixer nameplate for other instructions. (e.g. Letters A, B, C or D)

- Read and follow the instructions of all tags and nameplates before operating.
- Check the mixer full load motor amperage and voltage before operating any mixer.
- It is recommended that the mixer impeller be rotated by hand in order to check for smooth operation. **N.B**: For crown & worm drives, remove the fan cover and rotate the fan manually.
- Always operate the mixer in a fluid which had a specific gravity and viscosity less than or equal to the design specific gravity and viscosity.
- Do not dump the contents of large bags of chemicals directly onto the rotating mixer impeller(s); but add the contents into the reservoir gradually. This will also promote better mixing.
- Before starting the mixer, make sure the impeller is not buried in solids or a "set-up" fluid Note: If solids have settled-out, then dilute or jog the mixer clockwise then counterclockwise
- Please check that there is no directed flow from an external source at the impeller or shaft unless the mixer was specifically designed to accommodate these additional stress loads, as mixers could be damaged.
- During START-UP, please listen for unusual noises and check for excessive vibration.
- Check the temperature of the motor and gear reducer. The temperature should not exceed 180º F. (82ºC) If they are too hot, please stop the operation of the mixer and contact MIX-TECH immediately.
- Measure the motor amperage. The measured amperage must be less than the nameplate rating nameplate value. If the amps are over, please check the rotational speed of the gear reducer/mixer output shaft. Place a piece of tape onto the shaft (or use an RPM counter if available, and count the number of revolutions for a period of e.g. 10 seconds using your watch second hand. Multiply the result by (6) for 60 Hz operation and this will provide you with the rotational speed of the mixer. Check Rotation, & impeller blade installation to be sure they are correct. If the power draw remains high, please check with MIX-TECH

Note: - Record the full load motor amperage (FLA) and measure them every (3) months.
- Some motor amperage readings are poor indicators at low loads

C A U T I O N:

- **DO NOT STAY IN THE TANK DURING MIXER ROTATION**
- Never use the mixer impeller as a foot stand or support for body weight - as such actions could damage the mixer as well as result in serious bodily injury.

- As with any rotating equipment, in order to avoid injury, extreme care should be taken to avoid contacting the rotating parts including not connecting the motors to the electrical power source until the mixer is completely assembled. Then, vacate the tank prior to operating the mixer.

- Before making field changes of motor horsepower, mixer speed, shaft length, impeller diameter or width, etc. be sure to consult with ENVIREQUIP, MIX TECH DIVISION.

- After any plant electrical work has been done, check that the mixer(s) rotation(s) are correct as power lines may have been reversed**.**

S E C T I O N 3 - MIXER ASSEMBLY: - Closed tanks are Flange Mounted

- Open tank models usually are mounted on a steel structure. Level the drive as closely as possible. This assures that the shaft will turn in a true vertical position. Incorrect mounting is often a cause of mechanical difficulty with a mixer. Unless specified on the mixer assembly drawing, the mixer extension shaft is designed to run in a true vertical position. Never angle or side mount the mixers.

- While operating, there is random fluid motion in the vessel that exerts great forces on the extension shaft of the mixer. The mixer accommodates these forces since they are transmitted directly to the support mounting(s). Therefore, the mounting system must be rigid. It must support the static mixer weight as well as live mixer reactions that result from Torque and Bending Moment. It is not enough to design the support system for acceptable levels of stress. It must be rigid enough to take care of Start-up torque load (2.5 times the Torque), and preclude large deflections that may result in mixer vibration.

- When designing the support structure to accommodate bending moments, be sure that the structure is sufficiently rigid so that the mixer extension shaft will not move more than 1/32" per (10) feet (0.8 m per 3.05 meters) of shaft length due to deflection of the support structure.

- After the gear drive (with the motor already flange mounted onto the drive) has been properly installed, the mixer extension shaft should be installed into the gear drive's hollow output shaft (quill shaft) and fastened in the quill shaft with the thrust plate and secured in position with the threaded bolt provided - use Locktite Blue (or equivalent), or in the case of an output shaft coupling, bolt the mating flanges together.

- Mixer blades over 20" in diameter are generally bolted to a welded hub. Check the welds on the hub on your yearly overall inspection.

- These mixers are supplied with the finest electric motors available. They are manufactured by a nationally known manufacturer, (e.g. NORD, WEG, Brook etc). Under normal operating conditions, within specified temperatures, proper installation and maintenance, these motors are guaranteed to deliver rated output.

- In order to get top performance from any electric motor, be sure that there is plenty of air circulation and a minimum of obstructions. On fan cooled motors, be sure not to choke off the suction inlets, also be sure to check the allowable temperature that's indicated on the motor nameplate. Don't decrease the service life of a motor by operating it at excessively high ambient temperature.

- In order to avoid damage to the motor during temporary overloads, jams, etc. be sure that correctly sized overload protection is provided. Starter overload heater elements can be sized from the full load current of the motor as shown on the motor nameplate. It is advisable to consult a supplier of motor control equipment when selecting thermal overload heaters.

- Before the motor is permanently wired, check to be sure that the output shaft rotation is correct (Normally clockwise looking down from the mixer drive, but sometimes counterclockwise depending on the process requirements)

C A U T I O N:

- Make sure to check rotation of the mixer before it is operated. To reverse the rotation of standard 3 phrase electric motors, simply switch any two power leads.

M O T O R S P E C I F I C A T I O N S: 1800 RPM - (4) pole

- NORD motors carry the CE mark in accordance with the Low Voltage Directive
- NORD motors are designed to operate at elevations up to 1000 m (3300 ft) above sea level

Altitude:		
up to 1000 m	= 100% output	Ambient Temp = 40° C
Above 1000 up to 2000 m	= 92% output	Ambient Temp.= 32° C
Above 2000 up to 3000 m	= 83% output	Ambient Temp = 24° C
Above 3000 up to 4000 m	= 74% output	Ambient Temp = 16° C

- NORD motors are designed to operate with a maximum ambient temperature of 40° C (104°F) - for higher temperatures, motors have to be de-rated or an upgraded insulation used.

Ambient Temperature:	(104°F)
	40° C = 100%
	45° C = 95%
	50° C = 89%
	55° C = 83%
	60° C = 67%
	70° C = 64%

EXAMPLE: A motor designed for an output of 100 HP to operate in the mining area of Bolivia (altitude 4000 m above sea level). **NOTE**: 1000 meters = 3281 Feet
Output reduction: the maximum allowable output of the motor would be 74% (74 HP)

Ambient temperature limit: the motor may operate at its rated output of 100 HP provided that the ambient temperature does not exceed 16° C

Note: You can operate over 3300 feet, but you have to de-rate the motor

– Voltages: Canada 575/3/60,TEFC; USA 460/3/60, TEFC; Europe 400/3/50, IP55 ; Australia 415/3/50

– **Tolerances Voltage & Frequency**: ± 10% based on rated voltage; Line frequency tolerance ± 5%. Combined **MAXIMUM** variation in voltage and frequency ± 10%

-- MG1 Part 31 suitable for inverter service

– Insulation Class is Class F (non organic)

-- High-efficiency design for motors 1 HP and up

– Service Factor 1.15

– The Standard Nord motor fan is a non-sparking

– Each Nord motor uses a terminal block

– Integral Nord motor (unless Nema motor with "C" flange)

S E C T I O N 5 - Pedestals: Shaft & Gearbox Removal - EVG SERIES

• Series EVG standard design of the dry-well pedestal and shaft catcher is one where the flinger (for the dry well) and the shaft catcher are one-in-the-same part serving both purposes.

SHAFT REMOVAL AND / OR TO REMOVE THE GEAR REDUCER:- **See assembly dwg**

i) Lock-out electrical power to the electric motor.

ii) If the electrical wiring is not long enough to allow removal of the gear reducer, dis-connect the motor wiring.

iii) Remove the safety cover located on top of the gear reducer exposing the bolt (# 3) and top plate (# 4) which holds the shaft (# 12).

iv) Slowly remove the top bolt.(# 3).

v) As the bolt is loosened, the shaft and impeller assembly will be lowered a distance of about 0.125" (3.175 mm).

vi) After the bolt has been loosened sufficiently, the flinger (# 8) will come into contact with the Pedestal to the inner support pipe (# 11) and stop there.

vii) Remove the bolts holding together the Adaptor plate Reducer to Pedestal top plate (# 7).

viii) Lift-off the complete gear reducer unit the gearbox clears the shaft.

ix) Inside of the Pedestal (# 10), you can now see the flinger (#8) which rests on the Collar / Clamp (2) Bolts / Shaft catcher (# 9).

x) Prior to un-doing the set screws on the collar / Clamp, make preparation to handle the shaft which will now fall through the dry well (# 11) and into the tank.

xi) Once the shaft is secured loosen the set screws on the Flinger assembly or Clamp bolts (# 9).

xii) **To Reinstall the shaft** (et al) follow the above procedure in Reverse.

Note: In older designs, the flinger was welded-onto the shaft. In that case, the shaft can only be removed vertically through the top of the Pedestal.

C A U T I O N:

- Prior to loosening the (3) set screws on the flinger/shaft-catcher, please ensure that there is some means of holding the shaft in-place (if no Clamp supplied, use (2) pieces of wood 4" x 4" or 6" x 6" with tightening bolts to hold the shaft in place via friction) IF NOT, THE SHAFT WILL DROP INTO THE TANK possible causing damage to the equipment or vessel and bodily injury. Shafts are often of sufficient weight to cause serious bodily injury or even death were it not properly secured.

- You may want to install a plastic hose in the pedestal so that you can monitor if the gear reducer is losing oil and collecting in the dry-well pedestal.

A Split Collar is used to prevent the shaft from accidentally falling from the gear reducer:

NOTE: On older Series EVG, there may not be a Split Ring but rather a flinger that rests on the dry well seal to hold the shaft in-place

– (i) Insert eye-bolt in top centre of the impeller shaft.
(ii) Slowly lift up the complete impeller shaft assembly a distance of 6 mm (0.25").
(iii) Remove the split collar that rests against the top of the quill shaft of the gearbox.
(iv) Slowly lower the complete shaft/impeller assembly a distance of 10 to 12 mm (0.375"to 0.50".
(v) At this point, the flinger/clamp ass'y will come into contact with the pedestal top inner support pipe/Dry-well
(vi) Remove bolts.
(vii) Lift off the complete gear reducer until the gearbox clears the shaft and eye-bolt.
(viii) The reinstall the gear drive, follow the above procedure in reverse

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S E C T I O N 5 - SHAFTS, IMPELLERS & FLANGED COUPLINGS

SHAFT - STRAIGHTNESS:

- When shipped, the mixer extension shaft was straight to within 0.003" per foot (0.25 mm per meter) of shaft length for mixers equipped with centre-less ground shafts (Special Order/ uncommonly used). If the shaft does not appear to be damaged, but the run-out is greater than the above standard, the shafting supplied may have been "smooth-turn" (more commonly used), which might not be dimensionally
the same over the entire length of the shaft. This is probably still acceptable. In such cases, or where it might be difficult to obtain an accurate shaft run-out value, we may apply another rule: 0.25 to 0.50% of the impeller diameter = the maximum shaft run-out at the bottom of the shaft. e.g:

50" diameter impeller	0.14 to 0.28"
100" diameter impeller	0.26 to 0.53"
150"diameter impeller	0.40 to 0.67"

S E C T I O N 5 - SHAFTS, IMPELLERS & FLANGED COUPLINGS

- Flanges are used as shaft couplings when shaft extensions exceed approx 12'-0" (3.65 m) Ensure that the bolts are tightened and that a product like Never Seize (or equivalent) is used. Refer to the table (in this manual) for torque tightening values

  Recheck bolt tightness after 1500 hours (or (3 months)

These couplings are welded onto the shafts with (4 to 6) gussets and are not removable.

C A U T I O N:

- Handle the shaft carefully to be sure that it is not bent.

- After the shaft has been installed, check it for straightness. Storage and handling may have resulted in a bend. To check it, an indicator is placed at the end of the shaft, and the high speed shaft is then rotated by hand. Runout of the total shaft should not be greater than the above \references values. If the runout is greater than the above values, the shaft can be re-straightened in the field. To re-straighten the shaft, follow this procedure:

- Where the maximum, positive readout is found, place the indicator on that side of the shaft.

- Heat the shaft at a point of 180° from the indicator, (and just below the first in-tank coupling if applicable), apply heat just below the mounting nozzle.

- The shaft will grow toward the indicator as heat is applied to it. However, DO NOT permit the surface temperature to go over 500° F (260° C). Use Tempilstics or equivalent

- The shaft will straighten since it will draw more than it grows.

- After each heating process, rotate the shaft and recheck until the straightness is within tolerance to meet the allowable tolerance

- To install any impeller, simply slide the impeller hub onto the extension shaft above the shaft keyway. Install Hook type (Gib) key into the keyway making sure that the pin is inserted into the

  correct hole for proper impeller location. Lower the hub (with or without blades bolted-on) down onto the key. Tighten set screw. Bolt -on blades if not already done.

NOTE: All MIX-TECH Portable mixers operate at least 35% below the 1st Critical speed or harmonic frequency - There is no danger of "hitting-on" or approaching the 1st Critical speed - (Unless specifically mentioned otherwise)

- Please refer to the specific manufacturer's installation and operating manual.
- Correct lubrication practices are essential to long life and satisfactory performance of a gear drive. Be sure to use the right lubricants as recommended. With proper lubrication

maintenance, the gear drive will carry its rated design load and provide years of satisfactory operation.

SECTION 6 - SHAFTS, IMPELLERS & COUPLINGS

IMPELLERS

- Make sure that the impeller blades have been installed onto the hubs in the proper position with regard Rotation and Direction of flow. Please also note that the impellers blades are installed with the hubs ears always backing the blade into the flow. Also be sure that the leading edge and not the trailing edge is presented into the flow and that the angle at the impeller tip (angle of attack) from the horizontal is closer to 15° rather than to 75°.

CAUTION

- If the angle of attack (at the impeller tip is closer to 75°, either an incorrect hub in combination with the correct impeller blade (OR VICE VERSA) has been incorrectly assembled to make an incorrect matching of possible hub and blade combinations. For help in determining what the correct combination should be, please refer to the mixer nameplate that will have the Rotation and direction of thrust written. Once you know the combination, refer to the pictorial guide of impeller / hub installation positions A, B, C or D.

- Depending on whether the concave or the convex surface is facing the fluid, if the angle of attach at the impeller is closer to 75°, the HP drawn will be 2 to 3 times greater than what it should be. This could result in overloading the motor and damaging the mixer.

- Make sure that the impeller blades are installed in the correct position for the required rotation. e.g. if the impeller blades are installed up-side-down, the pumping capacity will be reduced by about 65%. Check the mixer nameplate for the flow direction and install the blades to suit.

SECTION 7 - GEAR DRIVE MAINTENANCE

CAUTION:

- By following instructions, many premature gear and bearing failures can be avoided.

- Keeping a maintenance log is highly recommended.

- Lubricant used in the gear case must be free of dirt, metal particles and other contaminants. Use only new oil. Strain the oil if there is any possibility that it contains contaminants.

- To equalize pressure inside and outside the gear case, a breather vrnt is installed on top of the unit. This breather normally requires no maintenance, and must not be blocked. Check hole for free breathing.

PORTABLE MIXERS:

Lubrication For PORTABLE MIXERS (**Series "EHG"**), the Crown & worm gear reducers are filled for life (20,000 hours or (4) years) with synthetic oil

C A U T I O N:

- For shipment, the gear-case is drained of oil (EXCEPT FOR NORD drives) - Be sure to fill the gear case with the proper lubricant to the proper level. Install breather. DO NOT OVERFILL - N.B: if the reducer is already filled, (as is the case with NORD drives), Do not forget to install the breather(s) or the seals may fail.

- **RECOMMENDED LUBRICANTS FOR NORD HELICAL GEARING**:
  These Nord Gear reducers are factory-filled with Shell Omala 220 mineral oil or with Chevron ISO FM 220 food grade oil (if required), or equivalent:
  or with Shell Omala 220 regular mineral oil fill when the mixer is provided with a dry well seal unless otherwise specified:

  N.B: A reducer previously filled with Shell Omala 220 mineral can be drained (as much as practical to achieve), and Chevron ISO FM 220 substituted without any harmful chemical reactions or reduction to the lubricating quality of the new (or old) oil.

- Please note that the gear reducers for MIX-TECH'S "EVG" series are Nord Parallel shaft drives. The top output bearing is grease packed although there is not grease nipple. Please remove the seal and re-pack the bearing with grease. (please refer to NORD instruction attached)

- The output shaft seals are "Quadrilip" having (2) discrete grease filled pockets

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S E C T I O N 7 - GEAR DRIVE MAINTENANCE FOR SERIES EVG & EVGX parallel Shaft design gear reducers:

- **RECOMMENDED OIL CHANGE INTERVALS IN NORD IOM: -**
  Synthetic lubricants should be changed every 20,000 service hours or (4) years;
  Mineral oils should be changed every 10,000 service hours or after (2) years. See gear reducer service manual (IOM).

C A U T I O N:

Units should be checked out periodically for increased noise, surface temperature, vibration, shaft

movement, and amperage draw. Units with inspection covers should not be operated with the inspection covers removed.

PROCEDURE FOR RE-GREASING THE UPPER OUTPUT BEARING equipped with Tapered roller bearing option:

- Remove upper output shaft seal(s).
- Inspect bearing cavity for presence of grease. The bearing cavity should be packed to approximately 1/3 full with grease.
- If required, inject grease into the taper roller bearing until the cavity is filled to 1/3. A Needle Nozzle is generally required on the grease gun, because the shim(s) partially cover the access to the bearing cavity**.**
- Install new upper output seals**.**

Note: The other bearings in these gearboxes are open and are submerged in oil.

The recommended interval for changing the gearbox oil is every 10,000 hours of operation.

- The standard ambient temperature selected is 15 to 125° F (9 to 52° C) for the gear reducer**.**
- Some Gear reducers are equipped with bulls-eye oil level indicators**, others have a plug.**

S E C T I O N 8 - BOLTS

- Impeller blades & other in-tank fasteners are supplied as standard with lock-washers.

C A U T I O N:

- Extreme care should be taken to see that locking devices are properly installed and to be sure that the bolts/studs are properly tightened and lubricated.

It is recommended that all in-tank fasteners (and all other bolts), be rechecked for tightness after the first 1500 hours of operation and subsequently, at each scheduled shut-down and that a suitable lubricant be used e.g. Never seize or equivalent.

RECOMMENDED BOLT TORQUE VALUES:

BOLT SIZE	TIGHTENING TORQUE (Foot Pounds)		
½" - 13	50	1.25" - 7	580
5/8" - 11	100	7/8" - 9	190
3/4" - 10	190	1.50" - 6	1000
1" - 8	290		

NOTE: Tighten all bolts as specified. Lubricate all fasteners with an anti-seize product. If no lubrication is used when tightening the bolts as specified, multiply the table values by 1.3

GEAR REDUCER & MOUNTING PLATE BOLTS:

These bolts are also subject to high loads and should be properly torqued to prevent bolt stretch and/or reducer wobble. For situations with large reducers or long shafts with large reducers, use additional care to make sure that these bolts are installed and torqued properly

This "Turn of the nut Method" can be summed up in one sentence: "Turn the Nut ½ to 2/3 turns beyond the snug tight position, "this applies to any bolt of any size. However, fasteners should be clean, rust free and lightly oiled.

In cases where the nut is not accessible, the bolt may be turned ½ to 3/4 turn beyond snug tight.

LEVER ARM SYSTEM	Bolt size	Lever Arm
	1/4 - 3/8"	6" handle
	7/16" - 5/8"	12" handle
	3/4" - 1.125"	24" handle
	1.25" and over	36" handle

Note: This lever arm system should be used with or without lock-washers. If lock-washers show sign of splitting or fatigue, they must be replaced

S E C T I O N 9 - OPERATION

- The mixers that you have purchased have been designed to accommodate all the loads that will be encountered in the normal course of operation.

C A U T I O N:

- Care must be taken to avoid prolonged operation of the mixer impeller(s) at liquid interface. These mixers were not designed to operate under those severe conditions and could become damaged.

S E C T I O N 10 - MOTOR REMOVAL & INSTALLATION OF MOTORS:

- For Nema "C " Flanged motors (not integral motors)
  The motors supplied have been installed onto the reducers. In the event of motor maintenance, remove the bolts which hold the gear reducer's Nema "C" flange adaptor to the motor's "C" face. Remove the coupling half and service the standard NEMA motor as required. INSTALLATION: reverse the procedure. Please refer to **"COUPLING ENCLOSED"** cross sectional drawing which shows the mounting distance 1 13/16" (46.03 mm). Note that the coupling is keyed onto the motor shaft (key provided).

- In the case of NORD integral motors, remove the bolts. The motor can then be removed exposing the high speed pinion gear mounted on the motor shaft. The motor can then be serviced as required.

S E C T I O N 11 - TROUBLE-SHOOTING / MIXER PERFORMANCE

- **PERFORMANCE**: If you find that the mixer is not performing according to your expectations, one of the things that directly affects mixer performance is Baffles (or lack thereof)

Note: Also check that the impeller blades are in the correct configuration A, B, C or D, that the correct blades are matched to the correct hubs and that the rotation is correct.(Please refer to Section 6 Pages 7, 8 & 9 for more information.

N.B: Baffles always help any mixer application by providing the means to convert rotational motion into to top-to-bottom- pumping/mixing.

- If the viscosity of the fluid is over 25,000 cp, then baffles are not necessary.

- If the vessel is rectangular in shape, baffles may not be necessary.

- In circular or square vessels, the use of baffles is mandatory.

- OTHER METHODS of achieving top-to-bottom motion without using baffles:
  - Off-centering the mixer by 20% (uses the vessel as a baffle)
  - Angle mounting (into a quadrant)- often seen on Portable mixers. If you want to angle-mount a larger mixer, please check to be sure that the shaft was designed to accept these additional stress loads.

- **OIL LEAK(S)** problems with Nord Gear reducers: In order to be able to address the

- **OIL LEAK(S)** For Series EVG supplied with a flinger / shaft Catcher & dry well seal:

NOTE: For Series **EVGX**, There is an oil overflow plastic pipe indicating oil leak>

- If one of the (2) output oil seals were to fail (very rare), then the oil would migrate down the output shaft, and be pumped by the flinger into the moat surrounding the dry well pipe. Any such leak would be contained by our sealed pedestal. (access to it is by a plug). Any other oil leak will be visible on the outside of the gear reducer

SYMPTOM	REASON(S)	SOLUTION
Oil leak on the reducer	Vent plug not installed Vent plug painted over Vent plug failure	Clean up oil and remove the vent plug If this stops the leak, change the vent plug
Oil leak on top of the reducer	Motor and/or top bolts not tightened	Use Teflon tape and tighten bolts
Oil leak on top of reducer	Too much oil in the reducer will be forced out of the vent	Check oil level and adjust to site glass
Oil leak on end plate	Bolts loose	Tighten bolts
Oil leak on top of the reducer	Gasket between motor and the reducer failed	Replace gasket and silicone dealant
Sign of oil on the reducer	Drain pipe & valve damaged	Use Teflon tape /sealant to try to reseal
Oil leaking on reducers with "C" flanged motor(s)	if the vent was not installed, plugged or faulty, the oil presure in the reducer might have exceeded 2 psi causing the input oil seal to "blow-out"	Change the input oil seal

- **NOISE**: Under normal circumstances, Mix-Tech mixers operate quietly and without vibration. If there is a metal-on-metal noise, check to see if the top bolt # 3 is properly tightened to the shaft. If the bolt is not, the shaft will lower than it should be and the flinger/shaft catcher may be touching the dry well pipe

- **HEAT**: Check the temperature of the Reducer and motor. If hot, check the oil level.

NOTE: On Series EVG & EVGX, an oil expansion chamber is supplied to minimize problems with over-filling of oil into the gearcase

- These mixers should provide long and satisfactory service. Only the finest materials were employed in their manufacture. However, if any defects in materials or workmanship occur, the defective part(s) must be returned to ENVIREQUIP (div 6335772 Canada Inc), **MIX TECH Division**, freight prepaid. ENVIREQUIP reserves the right to repair or replace, at its discretion, any part that proves to have been defective in materials or workmanship.

- ENVIREQUIP is not responsible for the warranties on components purchased, e.g. motors, but will endeavour to help to obtain resolution of any problem(s) with any of our sub-supplier(s) as regards their warranties.

- ENVIREQUIP specifically excludes any liability as to loss of production, improper use of the equipment, abuse, any other liability expressed or implied that exceed the limited warranty given as applies to the equipment being free of defects in materials and/or workmanship.

- ENVIREQUIP's warranty is for (2) years against defects in materials or workmanship and also includes a process warranty.

- This Process warranty only applies to the actual conditions that were specified at the time of bidding.

- Please refer to the terms and conditions as well as to the warranty for complete details.

CONVERSION FACTORS

1 inch	=	25.4 mm
1 kilogram	=	2.205 lbs
1 U.S. gallon	=	3.785 litres
U.S. gallons x 0.2642	=	litres
1 m^3	=	264.2 U.S. gal
1 ft^3	=	7.481 usg
1 ft^3 of water	=	62.4 lbs
1 foot	=	0.3048 meters
1 psi	=	6.895 Kpa
1 Kpa	=	0.145 psi
1 K Cal	=	3.967 BTU
1 HP	=	0.7457 kW
1 kW	=	1.341 HP
1 Bar	=	14.5 psi
1 kg /m^2	=	14.22 psi
1 Newton	=	0.2248 pounds (force)
1 lb in	=	0.1129 Newton-meter (Nm) force
1 lb in	=	1.1519 kg-cm
1 kg/cm^2	=	14.23 psi

MAINTENANCE LOG

TASK	BY: DATE:				Signed
CHECK OIL					
CHANGE OIL					
CHECK PEDESTAL for OIL LEAKAGE					
CHECK FOR HEAT					
CHECK FOR NOISE					
CHECK FOR VIBRATION					
CHECK BOLT TIGHTNESS: Top bolt & Pedestal bolts Base bolts Clamp Coupling Hub & blades Reducer end cover bolts					
CHECK MOTOR AMPERAGE					
CHECK ROTATION AFTER ELECTRICAL WORK					
OTHER					

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MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL

AMARUQ WTP – NUNAVUT

VEOLIA PROJECT: 5000 218 009

FLOWROX

SERIES PVE, PINCH VALVE

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PVPVE-190911-EN

Installation, operation, and maintenance instructions for Flowrox valves Open Valve (PV) & Enclosed Valve (PVE)

NOTE	These instructions must be read carefully and understood prior to the installation, use, and servicing of this product.

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TABLE OF CONTENTS

1 GENERAL

1.1 General safety instructions for PV & PVE valves

In this manual, the following symbols are used to highlight the parts requiring particular attention:

SYMBOL	DESCRIPTION
	**Risk to personal safety:** Neglecting the safety measures can cause serious personal injury or death.
	**Electrical safety:** Neglecting the safety measures can cause serious personal injury or death.
	**Machinery or environmental risk:** Incorrect maintenance or operation of the product can harm the environment or the product.
	**Read the operation and maintenance instructions:** Read and understand the operation and maintenance instructions before using the product.

2 INTRODUCTION TO DEVICE

2.1 Intended use

Open type PV.
The open body is available in diameters starting from 80mm.
The open body construction is designed for applications with:

- Low pressures
- Low temperatures
- Non-hazardous media

The open body construction is light and simple, which makes it easy to access for service. The open body also tolerates misalignment and vibration.

Enclosed type PVE.
The valve sleeve is covered by the body housing and thus protected from the environmental impacts and sunlight.

- Body construction prevents leakage of flowing media to the environment
- The valve body can be equipped with a gauge indicating pressure changes inside the body

2.2 Construction of device

Flowrox valves are made of three main components:

- flanged valve sleeve
- valve body, either open PV or enclosed PVE
- actuator and actuator control components, if applicable

The valve sleeve is the only part of the valve which is in contact with the medium flowing in the pipeline.
All valve bodies are flange ended. The standard flange drillings can be made to meet all standards (e.g. DIN, ANSI, BS, AS, JIS).
The face to face dimensions of Flowrox valves are according to ANSI/ISA 75.10.02:

- 165 mm for valves DN25…DN65
- 2 ½ times the nominal diameter for valves DN80 and bigger

2.2.1 Open body valve PV

In the open body model the body and the actuator are connected only to one of the end flanges (Fig. 1.). The construction allows a slight deviation in the pipe angle and the valve can act as a vibration absorber.

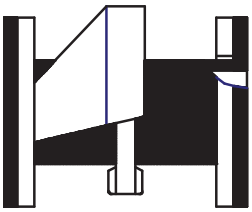


Fig. 1.

	Note that in case of a sleeve breakage, the flowing liquid will leak to the environment.

2.2.2 Enclosed body valve PVE

The body of the enclosed model prevents leakage of flowing media to the environment (Fig. 2.). The lower part of the body has a plug, which can be opened to check for sleeve failure.

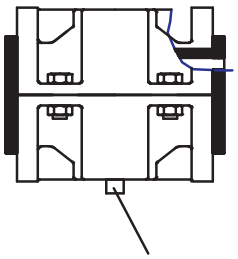


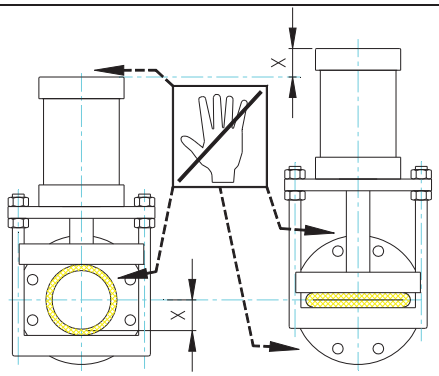
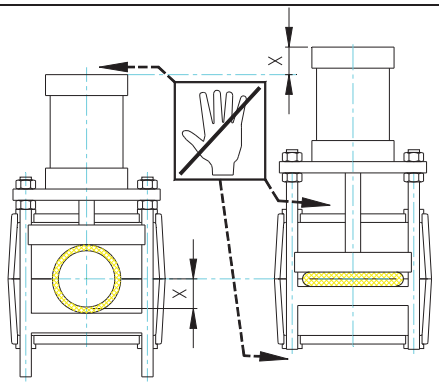
Fig. 2. plug

	In case of a sleeve failure, slight leakage will occur through the bushings. If you open the plug for checking, be careful as the medium may flow out.

	Changing the sleeve at appropriate intervals prevents leakages.

2.3 Valve function

DANGER	When the valve closes the actuator moves. Do not put tools or parts of your body between the moving valve parts. Note the injury risks (see drawings 3A and 3B).

Note the dangerous places (see drawings 3A and 3B)! When the pinch valve closes, two pinch bars, moved by the actuator, squeeze the sleeve, closing on the center line. As the valve is fully closed, the actuator has raised one half of the valve diameter. The actuator raises in both models (PV and PVE) 0.5 x valve nominal diameter (measure X). In the open model the space between the pinch bars, the space between the upper pinch bar and fixing plate of the actuator and the space below the lower pinch bar.	
	Fig. 3A - PV open model
In the enclosed model the space between the valve body and the fixing plate of the actuator and the ends of the guide bars of lower pinch bar below the valve body.	
	Fig. 3B - PVE enclosed model

Regarding the actuators, follow the instructions of the manufacturer.

NOTE	Note the possible remote control of automatic valves and turn it off before starting maintenance.

3 TRANSPORTATION, STORAGE AND LIFTING

3.1 Receiving

Check the condition of the valve package on arrival. If it shows signs of transport damage, check the operation of the valve carefully. Normally, a visual inspection of the valve is sufficient. However, if valve has been damaged during transport, contact your nearest Flowrox sales office immediately.

3.2 Storage

The sleeves must be stored as follows:

- The storing temperature should not exceed +25°C, preferably below +15°C but not under +5 °C. Keep the storage temperature as constant as possible.
- Store the sleeves in a dry place. Prevent water from condensing on sleeve surfaces.
- Avoid ultraviolet light. Protect the sleeves against straight sunlight. Use warehouse instead of storing outside.
- Remove all equipment generating ozone from the room where sleeves are stored. Minimize the store room ventilation.
- Store sleeves so that they are free from tension. Sleeves should be stored in vertical position on smooth support. Do not store sleeves one on top of another.
- Keep the sleeves off the chemical effect of solutions, semi-solids, impurities and solvent vapours during storing.
- Try to keep the storing time of sleeves as short as possible. Always use first the material which has been longest in stock.

3.3 Lifting

When lifting the valve, fasten the ropes to the valve body or around it. Note the center of gravity and support the valve to avoid it turning around. In some models the center of gravity is located towards the actuator.

4 INSTALLATION

4.1 Open body model (PV)

The sleeve has not been designed to withstand axial forces. The pipes must therefore be supported properly so that neither tension nor compression is caused. Use cross-tightening for flange bolts. Do not overtighten bolts.

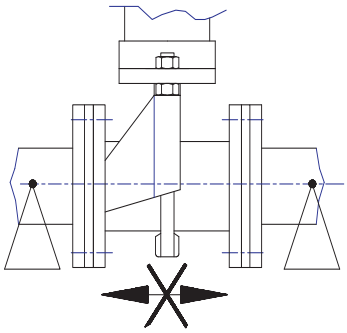


Fig. 4.

Make sure that no inappropriate items get between the pinch bars and the sleeve.

If possible, protect the sleeve from direct sunlight. Direct sunlight and UV light deteriorate certain rubber qualities; this must also be considered during normal use.

A lengthwise angle deviation of max. 5º in the pipe is allowed (Fig. 5).

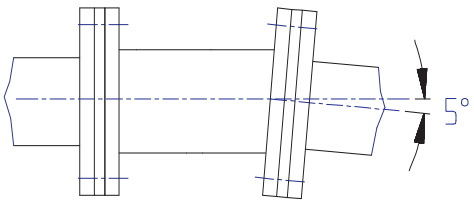


Fig. 5.

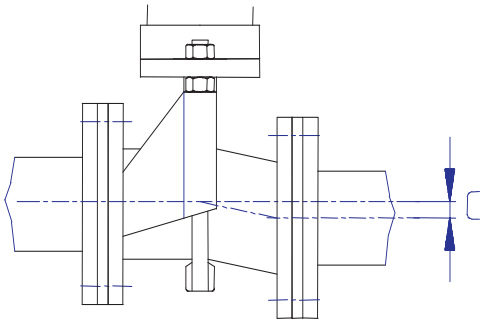


Fig. 6.

Deviation in the center line of the pipe (C), (Fig. 6):

PV 80...100	max. 5 mm
PV 125...250	max.10 mm
PV 300...500	max. 15 mm
PV 550...1000	max. 20 mm

4.2 Enclosed body model (PVE)

Make sure that no inappropriate items get between the valve body and the actuator.

4.3 Both models (PV and PVE)

The valve nominal size means the inner diameter of the sleeve. The pipe inner diameter should match this diameter as closely as possible. Whenever possible, install the actuator in a vertical position. Valve can be assembled either way in terms of flow direction.

If you have to install the actuator horizontally, it has to be supported to ensure the operation, especially if the actuator is heavy. Install a sliding surface under the actuator (Fig 7).

The support can be fixed on the wall (1), on the floor (2) or the pipeline (3).

The valve can be installed in either way depending on the flow direction.

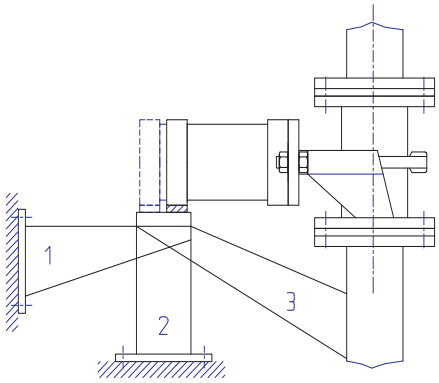


Fig. 7.

When installing the valve to the pipeline, it has to be in the open position. Tighten the flange bolts smoothly crosswise

	Do not fasten actuator or any part of it to the support.

5 OPERATION

5.1 First use

Flowrox valves are normally delivered fully assembled and ready to use. Check the condition of the valve visually.
After installation to the pipeline, check that all connections are leak-proof.

5.2 During operation

During the operation the valve does not normally require any maintenance. The sleeve change is described in 6.2.

To ensure smooth operation, it is recommended to change the valve sleeve regularly.

Regarding the actuators, follow the instructions of the manufacturer.

	Note the valve functions, see 2.3.

6 MAINTENANCE

6.1 Schedule

The sleeve is the only part of the valve which is in contact with the medium flowing in the pipeline. With regular sleeve changing, the likelihood of malfunctions in the process decreases. Wear resistance of the sleeve depends on the circumstances of the process and may vary a lot.
If there is a flow through closed valve or leakage through bushings (PVE) or through damaged sleeve (PV), change the sleeve immediately.

	PVE: In case of a sleeve failure, slight leakage can occur through bushings. PV: In case of a sleeve breakage, the flowing liquid will leak into the environment.

6.2 Changing the valve sleeve

	Control the valve functions (see 2.3) and follow the instructions for adjusting of valve (6.3) to prevent accidents and to ensure the correct operation of the valve.

6.2.1 Changing the valve sleeve in open model valve (PV)

See appendix A. Open the valve and detach it from the pipeline. If the valve is equipped with opening tags, loosen the fixing screws (8 pcs) at the pinch bars and pull out the opening tags (Fig. 8).

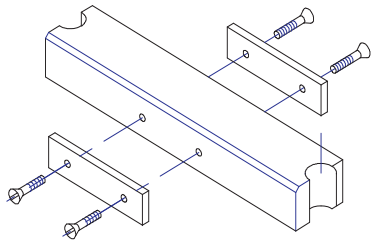


Fig. 8.

Remove the broken sleeve by bending the rubber flange of the sleeve and by wrenching it e.g. with a pry bar / bending iron.

Put in the new sleeve by pressing the rubber flange on the opposite sides together, pushing its edge as far as possible through the steel flange and wrenching the rest of the sleeve through the flange e.g. with a pry bar / bending iron (see Fig. 9).

NOTE	The rubber flange of the sleeve allows bending. Do not damage the sleeve with a sharp tool.

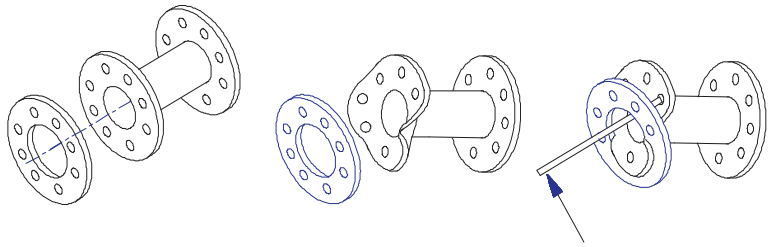


Fig. 9.

After putting in the new sleeve, fix the opening tags to the pinch bars. The excessive length of the tags can be cut away. Adjust the pinch bars before installing to the pipeline.

NOTE	At sleeve change, it is always important to check and adjust the position of the pinch bars. See 6.3.

6.2.2 Changing valve sleeve with enclosed model valve PVE

See appendix B. (Part numbers refer to drawing number 410006 in appendix A). Open the valve and detach it from the pipeline. Open the bolts (6.) between the valve body halves and detach the lower part of the body. If the valve has opening tags, detach them (16.) from upper (2.) and lower pinch bars (3.), 8 pcs screws (Fig.8). Take out the damaged sleeve and put in a new one. If the sleeve is stiff, detach the lower pinch bar. Remember to fix the opening tags if applicable. Check the body sealing (15.) between the body halves and the condition of the bushings (4.). A worn sealing and/or worn bushings may cause leakage to the environment in the event of a sleeve breakage. Assemble the valve and adjust the pinch bars before installing the valve to the pipeline.

NOTE	At sleeve change, it is always important to check and adjust the position of the pinch bars. See 6.3.

6.3 Adjusting the valve

After every sleeve change, the closing of the valve has to be checked and adjusted. A wrong adjustment may shorten the lifetime of the sleeve and cause leakage from the valve when the actuator is in the closed position.

	Control the valve functions (see 2.3). Do not put tools or parts of your body between the moving valve parts.

Before reinstallation of the valve into the pipeline:

- Close the valve by using the actuator. Adjust the pinch bars parallel to each other with the nuts, which are on both sides of actuator fixing plate (Fig.10, nuts 1 and 2), so that from one end of the sleeve an even, narrow light strip (appr. 0.5 mm) is shown on the whole squeezed point of the sleeve or symmetrically on both sides (Fig. 10.1).
- Tighten both nuts (1) equally so, that the strip of light disappears.
- Unscrew the lower nuts (Fig. 10.2, nut 2) X mm from the attachment plate (see the dimension X in the table, Fig. 11).
- When the nuts (Fig. 10.3, nut 1) on the upper side of the attachment plate are tightened, the lower pinch bar rises and causes a sufficient squeeze on the sleeve to close the flow against the pressure in the pipeline. After this has been done, open the valve and it is ready to be installed to the pipeline.

If the valve is hand wheel operated, it is enough to check that the pinch bars are parallel and the light slit is shown (Fig. 10.1). A sufficient squeeze is achieved by turning the hand wheel 1/3...3/4 rounds after the valve feels tight: if the pressure in the pipeline is 1 bar - appr. 1/3 of a hand wheel rotation; PN 10 bar - appr. 1/2 of a hand wheel rotation; PN 25 bar - appr. 3/4 of a hand wheel rotation. If the valve is supplied with a reduction gear, the number of rotations is multiplied by the gear ratio.

A. Attachment plate
B. Upper pinch bar
C. Sleeve
D. Lower pinch bar

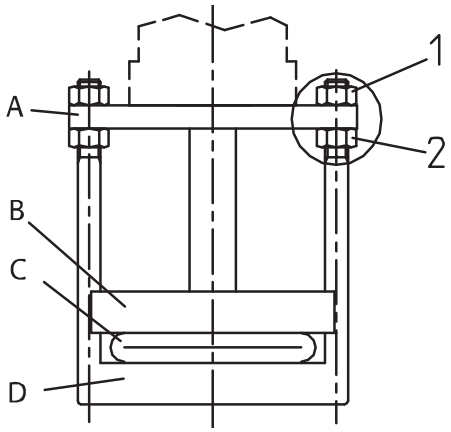


Fig. 10.

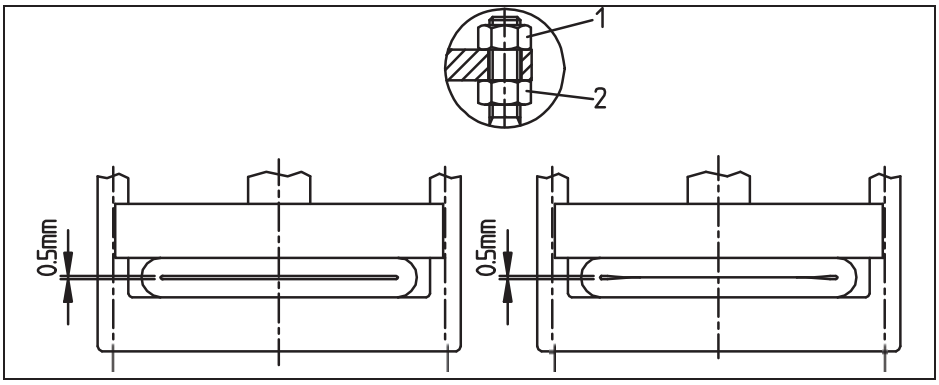


Fig. 10.1.

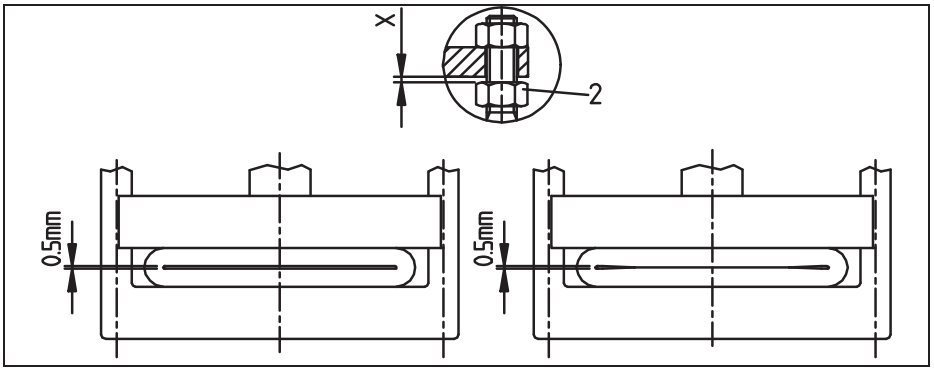


Fig. 10.2.

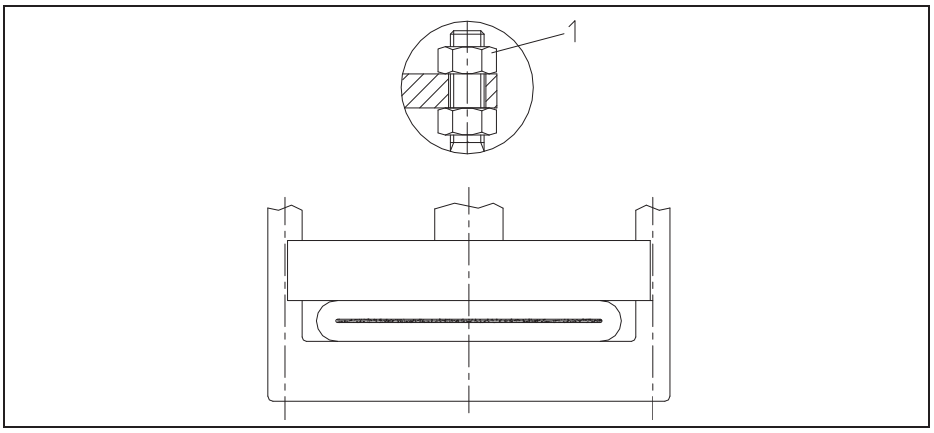


Fig. 10.3.

DIMENSION X [mm]

VALVE SIZE (mm)	PRESSURE CLASS (Bar)		
	1	6...10	16...25
25...100	1.5	2.5	3.5
125...250	2.0	3.0	4.0
300...500	3.0	4.0	
550...	4.0		

Fig. 11.

6.4 Troubleshooting

PROBLEM	POSSIBLE REASON	ACTION
Valve leaks into the environment.	1. Sleeve breakage. 2. End flanges loosely tightened.	1. Change and make adjustment of sleeve 2. Tighten the flange end screws
Leakage or flow through the valve when valve should be closed.	Sleeve breakage.	(models PVE, PVS): check by the plug - change and make adjustment of sleeve
	Sleeve is not closed with sufficient squeeze.	Manual valves - turn the hand wheel more tight. Pneum. and hydr. actuators - check the supply pressure for cylinder; if the pressure is too low, the sufficient squeeze for the sleeve cannot be reached. Check the compactness of the cylinder seals.
	Wrong adjustment of the sleeve.	Make the adjustment
Shorter lifetime of the sleeve than before.	Sleeve is not closed with sufficient squeeze.	Manual valves - turn the hand wheel more tight. Pneum. and hydr. actuators - check the supply pressure for cylinder; if the pressure is too low, the sufficient squeeze for the sleeve cannot be reached. Check the compactness of the cylinder sealings.
	Wrong adjustment of the sleeve.	Make the adjustment.
	1. Pneum. valves: wrong adjustment of the end cushioning in front end-block of cylinder. 2. Wrong adjustment of the pneum. spring.	1. End cushioning in front end-block of cylinder should be fully open. 2. Check adjustment of pneumatic spring .
	Changes in customer process e.g. * composition of medium / temperature * flow capacity	Check the best rubber qualityl with FLOWROX. Select another valve size with FLOWROX (particularly valves with positioners).
Sleeve is flapping and/or flow capacity is not sufficient.	Vacuum or pressure shocks in pipeline, rubber has hardened and does not open totally.	Check that the opening tags are fixed.

In case you cannot find the solution to your problem in the above table, please turn to the nearest Flowrox representative. The serial number and type identification of the valve in question will help getting the prompt answer.

7 TECHNICAL DATA

7.1 Model and spare part codes

7.1.1 Valve model selection

PVE	100	AK	10	-	2	0	3	L	R
TYPE	**SIZE (DN)**	**ACTUATOR**	**PRESSURE CLASSES (PN)**	-	**FLANGE DRILLINGS**	**BODY MATERIAL**	**SHAPE OF FLANGE**	**OPENING TAGS**	**AUXILIARIES**
PV = open PVE = enclosed PVS = sealed PVE/S = enclosed/sealed	25-1000	M=handwheel A=pneumatic AB=with manual override AK=with el.pneum. positioner AN=with pneum. positioner AU=with pneum. spring AV=with mech. spring H=hydraulic HP=with hydraulic positioner E=electro mechanical EO=electric for control	1= 1bar 6= 6 bar 10= 10 bar 16= 16 bar 25= 25 bar 40= 40bar 64= 64 bar 100 =100bar		1 = - 2 = DIN PN 10 3 = DIN PN 16 4 = DIN PN 25 5 = DIN PN 40 6 = ANSI 150 7 = ANSI 300 8 = BS TABLE D 9A = AS TABLE D 9B = AS TABLE E 9C = JIS 10 9D = JIS 16 Other on request	0 = Cast iron / Welded steel 1 = - 2 = AISI 316 3 = aluminium 4 = other 5 = plastic	types 1 - 4 Determined by the valve manufacturer	L = opening tags	Q = quick exhaust valve R= inductive limits S= magnetic proximity limits T= mechan. limits Z= solenoid valve X = must be specified

7.1.2 Sleeve model selection

SBRT	10	100	/	250	/	3	L	2
SLEEVE MATERIALS	**PRESSURE CLASSES (PN)**	**SLEEVE INNER DIA (mm)**		**SLEEVE LENGTH (mm)**		**SHAPE OF FLANGE**	**OPENING TAGS**	**FLANGE DRILLINGS**
SBRT = styrene butadiene EPDM=ethylene propylene CR = chloroprene CSM = chloro-sulphone-ethene FPM = fluorine rubber HNBR = hydrogenated nitrile IIR = butyl NBR = nitrile NBRF = nitrile foodstuff quality NR = natural rubber NRF = natural rubber foodstuff quality PU = polyurethane _/PU = PU-coating inside the sleeve _/M = Flowrox SensoMate sleeve _/VAC = Vacuum sleeve	1= 1bar 6= 6 bar 10= 10 bar 16= 16 bar 25= 25 bar 40= 40bar 64= 64 bar 100 =100bar	25-1000		Depend on the sleeve inner diameter according to ANSI/ISA 75.10.02:		type 1 - 4 Determined by the valve manufacturer (depending on the valve diameter / pressure class)	L = yes	1 = - 2 = DIN PN 10 3 = DIN PN 16 4 = DIN PN 25 5 = DIN PN 40 6 = ANSI 150 7 = ANSI 300 8 = BS TABLE D 9A = AS TABLE D 9B = AS TABLE E 9C = JIS 10 9D = JIS 16 X = Other, must be specified
In spare sleeve orders, please use 4- or 5- figure code marked on the sleeve.								

7.1.3 Sleeve materials for Flowrox valves

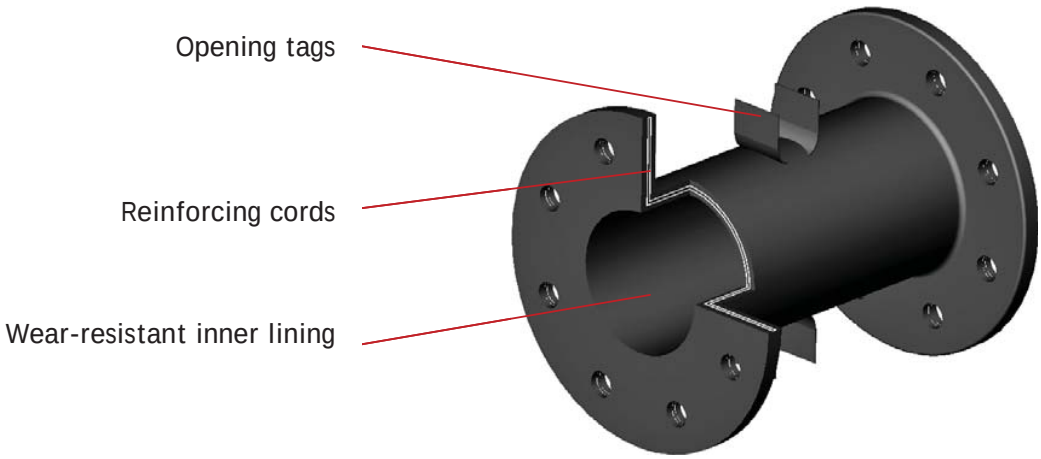
STANDARD SLEEVE MATERIALS FOR FLOWROX VALVES

RUBBER QUALITY	APPLICATION EXAMPLES	TEMPERATURE RANGE	TYPICAL MEDIA
SBRT Styrene Butadiene, Flowrox Blend	Heavy wearing High cycle frequency	-40°C - +110°C	Abrasive materials Diluted acid, alkali and chemical applications
EPDM Ethylene Propylene	Chemical applications • Applicable to 75% of all industrial chemical applications	-40°C - +120°C	Concentrated and oxidizing chemicals

OTHER SLEEVE MATERIAL OPTIONS

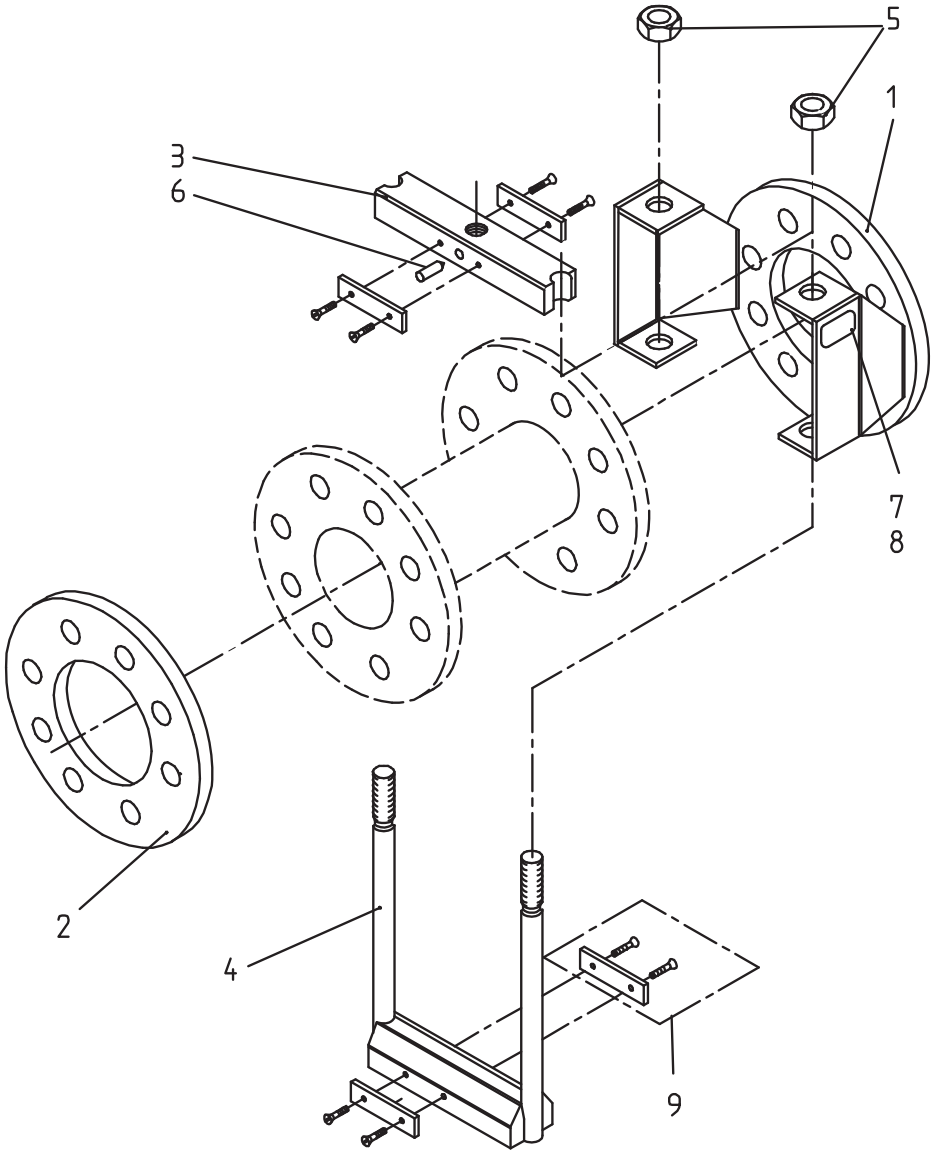
RUBBER QUALITY	APPLICATION EXAMPLES	TEMPERATURE RANGE	TYPICAL MEDIA
NBR Nitrile Rubber	Applications involving oils, fats and hydrocarbons	-30°C - +100°C	Oils, Fats, Fuels Hydrocarbon, Lubricants
NR Natural Rubber	High wear applications	-40°C - +75°C	Abrasive materials Diluted acids, alkali and chemicals
HNBR Hydrogenated Nitrile	High temperature Applications	-30°C - +160°C	Oils, Fats, Fuels Hydrocarbon, Lubricants
NRF Natural Rubber Foodstuff Quality White inner lining	Foodstuff applications Fulfils FDA (Food and Drug Administration) requirements	-40°C - +75°C	Media used in food and other CIP (clean-in-place) processes Alcohols
NBRF Nitrile Rubber White inner lining	Applications involving fatty foodstuff Fulfils FDA (Food and Drug Administration) requirements	-30°C - +100°C	Vegetable and animal oils and fats
EPDM/B Ethylene Propylene, Flowrox Blend	Pulp and paper industry's green liquor applications	-40°C - +100°C	Green liquor Alkaline and extraneous matter in green liquor processes
CR Chloroprene Rubber	Special-purpose chemical applications • Resilient to ozone and averse weather	-40°C - +100°C	Chemicals, Acids Several solvents Aliphatic oils Fats, Lubricants
FPM Fluorine Rubber (Viton®)	Special-purpose chemical applications • Resilient to ozone and averse weather	-20°C +120°C	Chemicals Aliphatic oils Aromatic and halogenated hydrocarbon
CSM Chloro-sulphone-ethylene (Hypalon®)	Special-purpose chemical applications • Resilient to ozone and averse weather	-40°C - +100°C	Chemicals, Acids Several solvents Aliphatic oils Fats, Lubricants
IIR Butyl	Special-purpose chemical applications • Impermeable to gas	-40°C - +100°C	Concentrated and acidic chemicals Vegetable oils
PU Polyurethane • With PU lining or solid PU	Abrasive media applications	-10°C - +80°C	Abrasive materials Diluted chemicals Hydrocarbons Oils, Lubricants

For more information on sleeve materials for Flowrox valves, contact your nearest Flowrox representative.


Opening tags
Reinforcing cords
Wear-resistant inner lining

8 APPENDIXES

8.1 APPENDIX A: PV- Open Body Assembled



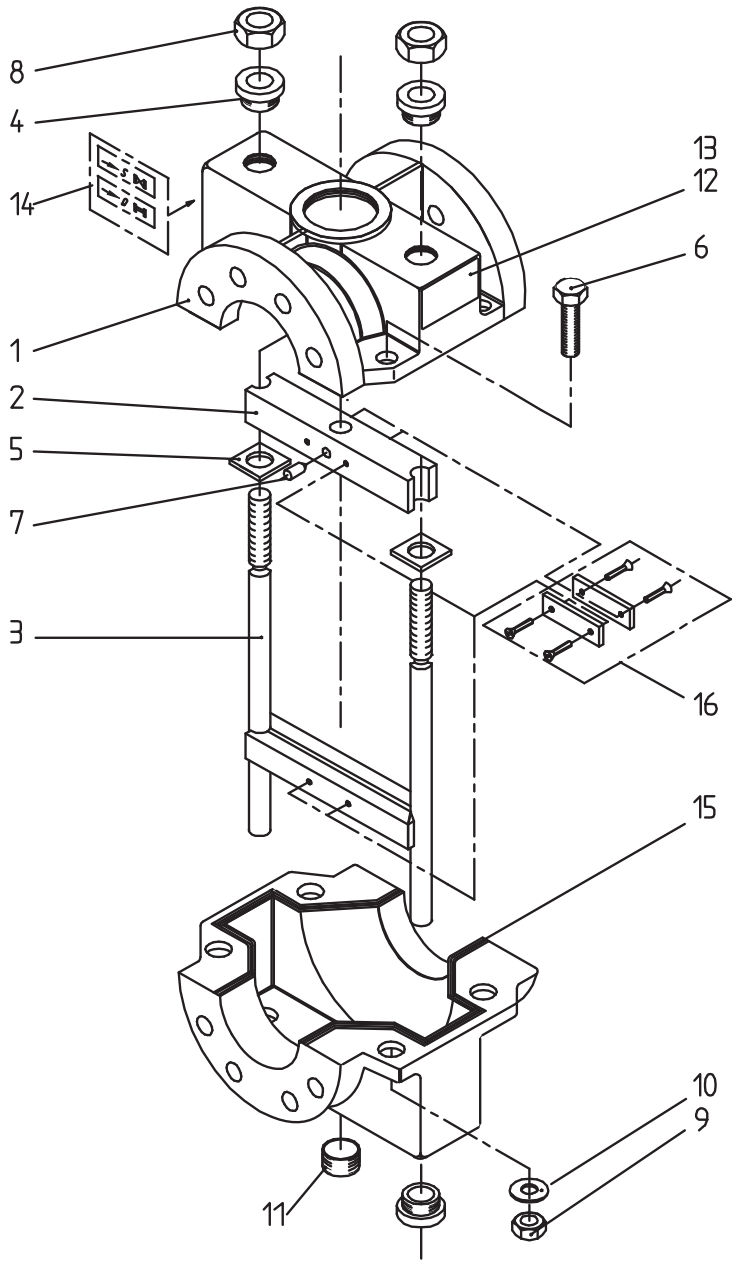
FLOWROX

PV-OPEN BODY ASSEMBLED

Dwg. no. 410158b

1. Valve body
2. Flange
3. Upper pinch bar
4. Lower pinch bar
5. Hex. nut
6. Allen screw
7. Valve plate
8. Drive screw
9. Fix. parts for opening tags

8.2 APPENDIX B: PVE-Enclosed Body Assembled



FLOWROX

PVE- ENCLOSED BODY ASSEMBLED

Dwg. no. 410006a

1. Valve body
2. Upper pinch bar
3. Lower pinch bar
4. RCH-bushing
5. Guide
6. Hex screw
7. Allen screw
8. Hex nut
9. Hex nut
10. Washer
11. Plug
12. Valve plate
13. Drive screw
14. Sticker open-closed
15. Sealing
16. Fix. parts for opening tags

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FLSMIDTH KREBS

MODEL U10-GMAX-9.5 SQIN, HYDROCYCLONE

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FLSmidth
5505 W Gillette Rd • Tucson, AZ 85743-9501 • USA
Tel +1 520 744 8200 • Fax +1 520 744 8300
www.flsmidth.com

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

4 MODEL U10-GMAX-3037 KREBS® CYCLONES
SERIAL NUMBERS: g169408U – g169411U
EQUIPMENT TAG NUMBERS: C2-011, C2-012, C2-021, C2-022

FOR
VEOLIA WATER TECHNOLOGIES OF CANADA
PO NUMBER: 18000759 HD 05000
PROJECT NUMBER: 5000218009

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FLSMIDTH KREBS
URETHANE IOM

GENERAL

FLSmidth Krebs Cyclones are the result of an intensive research and development program initiated in 1950. Each unit represents a product of advanced design, careful engineering, quality materials and the finest workmanship.

The information in the following pages is directed toward a better understanding of cyclone principles and operation, so that the potential for every FLSmidth Krebs Cyclone is realized.

FLSmidth Krebs engineers cyclone installations by studying the operating data and customer objectives. The cyclone selections are based on the large amount of operating data accumulated by our staff of engineers and our continuing research. When data is not available or is incomplete, studies in our laboratory and pilot plant are recommended. The pilot plant is equipped for complete, full-scale cyclone classification studies. Predictable performances resulting from these studies have been proven in numerous subsequent field installations. An important part of this service is the analysis of the test results by our staff of metallurgical and chemical engineers as related to the overall plant operation.

You are invited to avail yourself of these facilities and services for the study of your classification problems.

Cyclone Identification

FLSmidth Krebs cyclones are designated by Model Numbers, Serial Numbers, size and style. This information is stamped on an identification plate.

Permanent records for this cyclone are kept by the serial number; therefore, the serial number must be used with all correspondence and spare parts orders.

Receiving Instructions

Smaller FLSmidth Krebs Urethane Cyclones are crated and shipped completely assembled. Larger units are generally shipped dismantled as two pieces in order to reduce the size of the shipping crate. When removing the cyclone from the shipping crate, care should be taken to account for all of the parts. This can be checked against the packing slip.

Storage Requirements

FLSmidth Krebs Cyclones, any items with elastomer or polymer components, and auxiliary equipment such as valves, should always be stored:

- out of direct sunlight;
- away from heat and;
- protected from extreme weather conditions.

The preferred storage area will be a cool, well-ventilated building.

If outside storage is mandatory, the equipment should be totally covered over with heavy, opaque, plastic weather covering. It is essential that the plastic be opaque so as to cut out direct sunlight. In addition, a light color opaque material is desirable, to avoid heat build-up under the covering.

The covering should be spread over the equipment with allowance for underside ventilation to avoid excessive heat build-up and moisture condensation. Elevating the equipment a minimum of 2 inches above ground level should ensure adequate ventilation and prevention of moisture condensation.

The polyurethane employed in the manufacture of the cyclones is adversely affected by heat. However, if stored exactly as described above, ambient temperatures of less than 120°F (preferably less than 100°F) can be maintained.

The equipment will not be damaged by freezing conditions as long as it is kept dry. If below freezing conditions are involved, care should be taken when handling to avoid damage to urethane components as they become brittle at very low temperatures.

Installation

Cyclone Mounting

Each cyclone should be securely mounted on a soundly constructed frame so that stresses on the overflow/underflow piping are minimized.

During assembly, care must be taken such that the urethane flanges are not stressed. Assemble the inlet flange to its mating piping without over torqueing to the point of urethane deformation. Follow the same procedure for the overflow connection and lastly the cyclone mounting plate. Do not force the urethane cyclone into an unnatural position.

Sump

Correct design of the pump sump is probably the most important factor in establishing an efficient cyclone operation.

Conversion of flow and velocity to kinetic energy in a cyclone is derived from the energy supplied from the pump. Each adjustment of the cyclone variables will influence the pumping to some degree. This will be discussed in the section entitled “Operation”. A constant volume to the cyclone is important. Momentary fluctuations are generally the result of entrained air in the slurry.

A constant level in the sump is critical, but by no means an indication that the cyclone is receiving a constant and uniform volume of feed. If the needle of the cyclone inlet pressure gauge fluctuates rapidly, it is a definite indication that there is entrained air in the pump discharge slurry. To correct this problem, the entering stream should be prevented from carrying entrapped air to the suction of the pump. This can be done by mounting a sloping plate in the sump, well below the normal level of the slurry. An annular opening between the plate and the edges of the sump of about one inch around its entire periphery will generally be sufficient to allow the total volume of slurry to pass from the upper compartment to the lower section.

It is permissible to return part or the entire overflow product to the sump to maintain a constant level. It should be noted that the greater the slime content of the feed slurry to a cyclone, the more difficult it becomes to make a given separation. The use of recycled overflow product should be handled with caution, as there is always a danger of recirculating an excess quantity and consequently increasing the slime content of the feed slurry.

Where water is available and the overflow product is an important consideration, fresh water should

be added to the feed as a means of volume control.

The overflow product should discharge to atmosphere as close to the cyclone as possible. If the overflow pipe is carried directly to an elevation below the inlet of the cyclone, a siphoning action can be created. This will cause coarser particles to be carried to the cyclone overflow product.

The underflow discharge should be open for visual inspection, as it is important to be able to observe the characteristics of this flow. The underflow should be maintained with a 20-30 degree spray discharge. A “rope” discharge is an indication that there is excess crowding of solids at the apex orifice. This will cause coarse oversize solids to be carried into the overflow product.

Both the overflow and underflow should be available for sampling.

Pumping

Pumping to a cyclone, or battery of cyclones, must be carefully engineered to the job both as to size and type of the pump, and to size and length of the pipe line. Wear results in a much higher pump maintenance cost than cyclone maintenance cost.

Wear on a pump varies approximately proportionately to the cube of the velocity. In order to minimize the pump speed and pump maintenance, the cyclone should be as near to the pump as possible. A certain inlet pressure at the cyclone will be required, so there is also a power saving by having the static and friction head as low as possible.

If adequate pressure is available in the cyclone feed line, a pump may not be required.

Piping

When designing cyclone piping, the most important consideration is to establish a velocity that will prevent particle segregation in the pipe line, and at the same time hold the velocity to a minimum to reduce wear, which increases rapidly with increase in velocity.

With a large majority of installations for pumping slurries, the velocity range falls between a low of 5 ft/s and a high of 15 ft/s.

Major factors in determining the optimum velocity in a pipeline are:

- particle size
- angularity of the coarser fractions
- specific gravity of solids
- slimes content
- pulp density
- viscosity

Multiple Installations

FLSmidth Krebs has the ability to design and fabricate cyclone manifolds as per the project

requirements, with various styles including: radial, “spider”, and inline.

A radial manifold system assures an even feed distribution to each cyclone. The take-offs should be equally spaced around the perimeter of the central distribution pot. The overflow and underflow launders must be properly sized to allow for collection and distribution of the streams.

An inline manifold system can be used if the feed is very dilute and not subject to segregating in the system. An inline system is generally easier to design and build than a radial system and consequently is less expensive. However, an inline system does not assure equal feed to each cyclone.

Operation

The FLSmidth Krebs Urethane Cyclones are chemical resistant in some cases. The maximum recommended operating temperature is 140 °F. Available sizes include: ½" up to 15" diameter.

The primary consideration in selecting the proper size and design of cyclone is the classification objective, not the capacity. The proper relationship between the inlet orifice size, the vortex finder diameter, and the apex diameter is engineered by the staff of FLSmidth Krebs for each specific classification objective.

There is seldom any necessity for changing the size of these orifices unless the classification objectives or plant operating conditions are altered.

Numerous factors influence the operation of a cyclone. Following is a brief discussion of some factors influencing cyclone operation (which the operator is normally able to control while the cyclone is operating).

Feed Dilution

Feed dilution is the most effective control available. The use of additional dilution water will always result in a finer and sharper separation. The dilution water can also be adjusted to maintain a constant level in the sump, although the operator must be aware of the potential change in the separation. For very dilute feeds, the change in the separation will be minimal.

Pressure Management

Pressure drop across the cyclone is the pressure differential between the cyclone inlet and overflow. When the cyclone discharges to atmosphere, a condition we usually recommend, the inlet pressure (gauge reading) is equal to the pressure drop.

The pressure drop is merely an indication of the energy required to force a given volume through the cyclone fitted with a certain combination of orifices. It is not an indication of a developed force-pattern or throughput, except as related to that one particular set of operating conditions. Excessive pressure results in high pump operating and maintenance costs and should be avoided. We generally do not recommend pressure drops above 40 psi.

In general, the higher the pressure drop, the greater the throughput capacity of the cyclone. A higher pressure drop will also produce a finer separation.

Cyclone Orifices

The following describes the effect the various orifices have on the cyclone performance. Changing

the orifice requires shutting down the system.

Inlet Orifice

The main function of the inlet orifice is to provide a smooth flow pattern at the point of entry into the cyclone. All FLSmidth Krebs Cyclones are designed with an involute entry that pre-orients the solids prior to reaching the tangential point of contact with the cylinder wall. This minimizes turbulence and allows FLSmidth Krebs Cyclones to produce finer and sharper separations.

An increase in the inlet area will increase the capacity of the cyclone. It will also coarsen the separation slightly. All of FLSmidth Krebs Urethane Cyclones, four inches and smaller in diameter, have fixed inlet areas. For larger diameter urethane cyclones, various inlet head sizes are available for each size cyclone. If a different inlet area is required, the complete inlet head can be replaced as the inlet area is integral to the part.

Vortex Finder

The vortex finder has the greatest impact on the operating results of all the orifices. The vortex finder size has a major effect on the cyclone capacity at a fixed pressure drop and also affects the cyclone separation significantly.

The larger the vortex finder diameter, the greater the cyclone capacity at a given pressure drop. A larger diameter vortex finder will also coarsen the cyclone separation and send a larger proportion of solids to the overflow. Various vortex finder sizes are available and the entire part can be replaced.

Apex Orifice

The main function of the apex orifice is to discharge the coarse solids in such a manner that the maximum underflow density and smoothness of discharge are obtained. The apex should be large enough to produce a 20-30 degree conical-shaped discharge, but should not be used to control the cyclone separation. The apex should never be so small that a “rope” discharge exists. A “rope” discharge is an indication that the apex is not allowing all of the coarse solids to exit out the underflow and consequently some are being forced out the cyclone overflow.

Both fixed and manually adjustable apexes are available on FLSmidth Krebs Urethane Cyclones, although fixed apexes are more common. Various apex sizes are available and the entire part can be easily replaced to optimize the underflow solids.

Maintenance

It is important to maintain smooth surfaces on the interior of the cyclone. If possible, the cyclones should be inspected on a regular basis. When the interior surfaces become worn or uneven, the part should be replaced. After experience has been gained in operating the cyclones under given conditions, a regular maintenance schedule can be determined.

Once the apex opens more than 10% of its original size, it should be replaced. Once worn, these urethane parts are 'disposable'.

Please note that for urethane cyclones, the entire part (i.e. cone section, vortex finder, and apex) can be replaced. This is opposed to the replaceable elastomer or ceramic liners used by standard cyclones with steel housing.

The FLSmidth Krebs Urethane cyclones are very lightweight which makes maintenance easier. For cyclone sizes 6" and smaller, the cone sections are generally connected by SS clamps for ease of connection by operators.

FLSmidth Krebs Urethane Cyclones are available in various materials of construction which include:

- Urethane (RU)
- Food-grade Urethane (RT90)
- High-Temp. Urethane (RI)
- Ultrane (RW)*
- Royal Cast (RC)*
- Natural Gum Rubber (apex liner and adjustable apex only)

*Multi-component urethane used for gMAX cyclone sizes 10" and larger

**Other urethane materials are available upon special request

Common Problems and Solutions

Problem 1:

There are very coarse solids in the cyclone overflow.

Solution:

This is normally an indication that the apex is too small and coarse solids are being forced to the cyclone overflow. The apex diameter should be increased until a constant 30 degree cone angle is obtained on the discharge. Certain styles of the urethane fixed apexes can be cut to increase the diameter. An adjustable apex will have to be replaced with a larger one if it is in the full open position.

Another possible solution is to reduce the pressure drop by reducing the flow to the cyclone or by operating additional cyclones (for multiple installations).

Problem 2:

The cyclone pressure drop fluctuates wildly.

Solution:

This is an indication that a constant level in the sump is not being maintained or that air is entrained in the slurry. If the pump is pumping more feed volume than is going to the slump, the sump level will go down. Eventually the pump will cavitate and the pressure drop across the cyclone will be very erratic. Slowing the pump down or increasing the dilution water to the sump will maintain a constant sump level.

Air usually enters the pump suction because the feed to the sump is pointing directly down into the pump suction. Change the feed so that it angles against a side wall of the sump or install a baffle plate as described in the installation section.

Problem 3:

The separation is not fine enough.

Solution:

Increase the dilution water to the feed. If the feed is already dilute or if diluting the feed is not possible, increase the cyclone pressure drop. This will require speeding up the pump and installing a smaller diameter vortex finder. If the separation is still not fine enough, smaller diameter cyclones will probably be required.

Problem 4:

The underflow is too dilute.

Solution:

This is an indication that the apex is too large. Decrease the apex diameter until a 30 degree cone discharge is obtained. Do not decrease the apex diameter to the point of “roping” the discharge. The adjustable apexes can be decreased by tightening the worm

driven clamp. The fixed apexes will have to be replaced with a smaller size.

If smaller apexes are not readily available, another option is to increase the pressure drop by increasing the flow to the cyclone or by operating fewer cyclones (for multiple installations).

Calculations

TONNAGE:

1) Solids: $TPH = GPM\ SLURRY \times S.G\ SLURRY \times \%\ SOLIDS$

Slurry: $\frac{TPH\ SOLIDS}{\%\ SOLIDS}$

2) PULP SPECIFIC GRAVITY:

S.G. PULP =

$$\frac{100 \times S.G.\ SOLIDS \times S.G.\ LIQUID}{100 \times S.G.\ SOLIDS - \%\ SOLIDS\ (S.G.\ SOLIDS - S.G.\ LIQUID)}$$

3) PERCENT SOLIDS IN PULP

$$\% = \frac{TPH\ SOLIDS}{TPH\ SLURRY} \times 100$$

4) GALLONS PER MINUTE:

$$GPM\ SLURRY = \frac{TPH\ SOLIDS \times 4}{S.G.\ SLURRY \times \%\ SOLIDS}$$

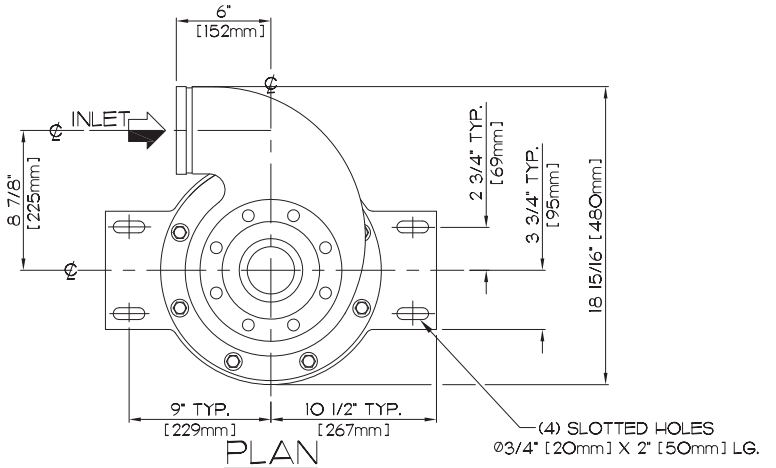
5) $$\%\ SOLIDS\ BY\ VOLUME = \frac{\%\ SOLIDS\ BY\ WEIGHT \times S.G.\ PULP}{S.G.\ SOLIDS}$$

6) $$\frac{GPM}{ONE\ TPH\ SOLIDS} = \frac{4}{\%\ SOLIDS \times S.G.\ PULP}$$

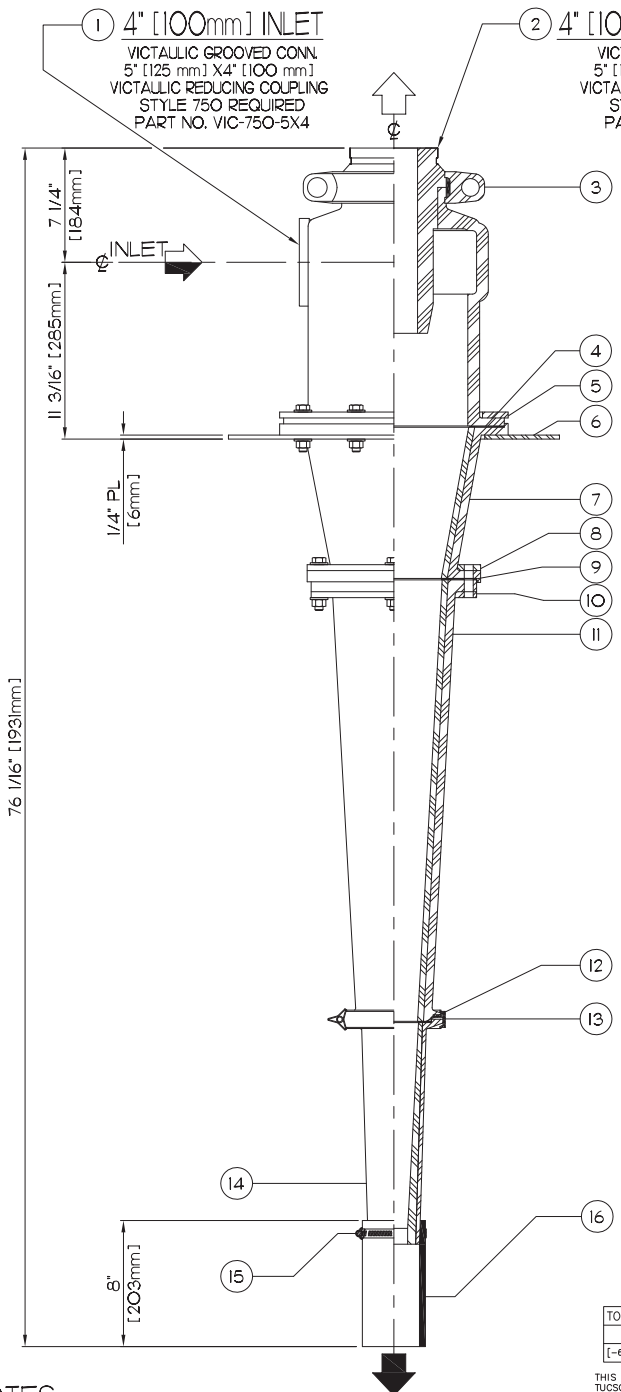
FASTENER REQUIREMENTS				
CONNECTION	DESCRIPTION	SIZE	LENGTH	QTY
1, 4 TO 6, 7	HEX BOLT & NUT	1/2-13	2 3/4"	8
7, 8 TO 10, 11	HEX BOLT & NUT	1/2-13	3"	4
	WASHER	1/2		24

FASTENER NOTES:

1. ALL BOLTS AND NUTS, TO BE SAE IMPERIAL 304 STAINLESS STEEL. (OTHER GRADE/PLATING CAN BE OFFERED)
2. NUTS SUPPLIED TO BE FINISH NUTS.
3. WASHERS TO BE USED ON ALL SLOTTED HOLES.
4. PLEASE NOTIFY CUSTOMER SERVICES OF ANY DEVIATION IN THIS LIST.
5. NO PAYMENT FOR CUSTOMER MODIFICATIONS, BACK CHARGES, OR ANY OTHER CHANGES WILL BE ACCEPTED, UNLESS PREVIOUSLY AUTHORIZED BY FLSmidth KREBS.
6. QUANTITIES SHOWN ARE FOR THE ASSEMBLY OF ONE CYCLONE.



PLAN
(VICTAULICS NOT SHOWN)



VEOLIA WATER TECHNOLOGIES OF CANADA
PROJECT NO: 5000218009 / SERIAL NO: GI69408U - GI6941IU

PART No : U10-GI69408

ITEM No.	PART NUMBER	DESCRIPTION
1.	C2293-RU-9.5	INLET HEAD WITH 4" VICTAULIC INLET CONNECTION, . 9.5 SQUARE INCH INLET NOZZLE ORIFICE SIZE, URETHANE.
2.	C2294-RU-3	VORTEX FINDER, 3" SIZE, URETHANE.
3.	VIC-75-6	VICTAULIC COUPLING, 6" SIZE, STEEL.
4.	G7-1004-RN	GASKET, NEOPRENE.
5.	C2176-ST	BACKING PLATE HALF RING, STEEL. (2=SET)
6.	C2175-ST-MF	BACKING PLATE / MOUNTING PLATE, STEEL.
7.	G65-209560-RCS	CONE SECTION, ROYAL CAST / ULTRANE II.
8.	C1846-ST	BACKING FLANGE HALF RING, STEEL. 2 = SET.
9.	G7-1005-RN	GASKET, NEOPRENE.
10.	G63-066130A-ST	BACKING FLANGE, STEEL.
11.	G65-066130-RCS	CONE SECTION, ROYAL CAST / ULTRANE II.
12.	G7-1006-RN	GASKET, NEOPRENE.
13.	C7712-SS	CLAMP WITH HAND WHEEL, STAINLESS STEEL.
14.	G85-30ARCS-1.75	APEX, 1.75" SIZE, ROYAL CAST / ULTRANE II.
15.	C7728-SS	CLAMP, STAINLESS STEEL.
16.	C8135R-RS-8	SPLASH SKIRT, 3.25" I.D. X 8" LONG, ULTRANE II.

TAG NO.
C2-011
C2-012
C2-021
C2-022

FINAL CERTIFICATION

CERTIFIED FOR Veolia Water Technologies of Canada
P.O. No. 18000759 HD 05000
S.O. No. 0219283
BY _____ DATE 31-August-2018
5505 WEST GILLETTE ROAD
TUCSON, ARIZONA 85743
PHONE: (520) 744-8200 FAX: (520) 744-8300
FLSmidth

NOTES:

1. PAINT: EN-SPEC-4-3041 (FOR STEEL PARTS ONLY)
2. BARE WEIGHT: 65# [30kg]

TOLERANCE SCHEDULE: UNLESS OTHERWISE SPECIFIED.		
-24"=±1/4"	+24" thru 100"=±1/2"	+100"=±1"
[-600mm = ±6mm]	[+600mm thru 2500mm = ±12mm]	[+2500mm = ±25mm]

REVISION
Rev. By: 6

FLSmidth KREBS
5505 WEST GILLETTE ROAD
TUCSON, AZ 85743
www.krebs.com

Rev. Date:	Scale:	Dwn. By:	Date Drawn:	Appvd. By:	Sheet:
04/27/2018	— — —	ISN	04-27-18	GS ADG	1 OF 1

Appvd. By: 0

GENERAL PARTS ARRANGMENT
KREBS CYCLONE MODEL U10-gMAX-3037
WITH FIXED APEX ASSEMBLY NO. G85-30A
(SO: 0219283)

C DWG. NO. S3037-G169408U

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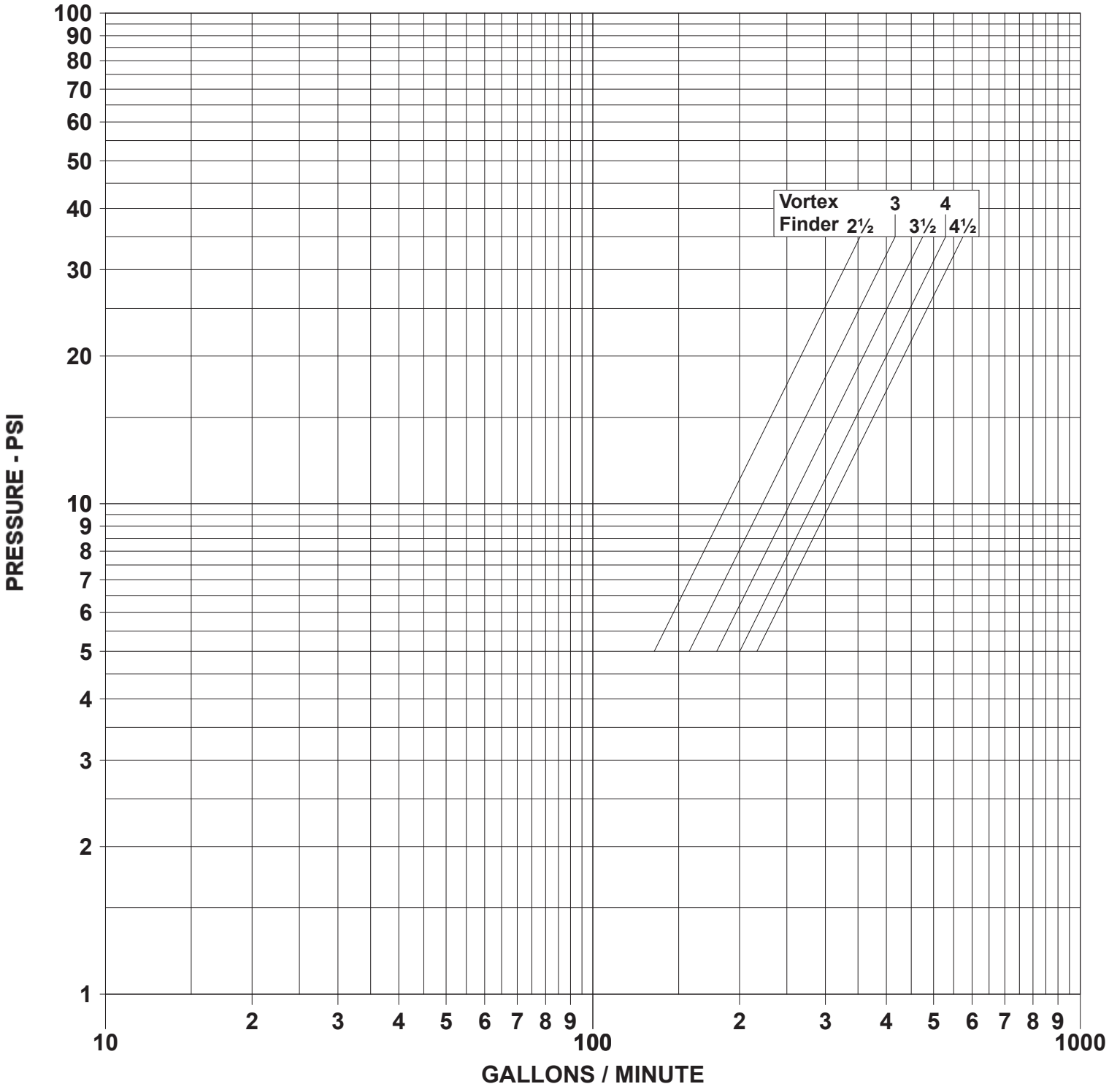
Krebs Cyclone
Model No.: U10-gMAX

CAPACITY CURVE
No.: U10-gMAX-950-601

9.50 SQ. IN. INLET ORIFICE



CAPACITY IS BASED ON WATER AT AMBIENT TEMPERATURE AND APEX DIAMETER EQUAL TO ONE HALF THE VORTEX FINDER DIAMETER, AND MAY VARY AT DIFFERENT RATIOS

KREBS ENGINEERS
5505 West Gillette Road
Tucson, AZ 85743
TEL: (520) 744-8200
FAX: (520) 744-8300
e-mail: www.krebs.com

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FLYGT

ENM-10, LEVEL SWITCH

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Installation, Operation
and Maintenace Manual

ENM 10

FLYGT
a xylem brand

Table of Contents

Introduction and Safety

Introduction

CAUTION:

- Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.
- Observe accident prevention regulations in force.
- Save this manual for future reference, and keep it readily available at the location of the unit.

Purpose of this manual

The purpose of this manual is to provide the necessary information for:

- Installation
- Operation
- Maintenance

Safety

Precautions

WARNING:

- The operator must be aware of safety precautions to prevent physical injury.
- You must observe the instructions contained in this manual. Failure to do so could result in physical injury, damage, or delays.
- Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.[R]
- A certified electrician must supervise all electrical work. Comply with all local codes and regulations. [R]

Safety terminology and symbols

About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product
- Product malfunction

Hazard levels

Hazard level	Indication
 DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury

Hazard level	Indication
WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury
NOTICE:	• A potential situation which, if not avoided, could result in undesirable conditions • A practice not related to personal injury

Electrical hazards

Electrical hazards are indicated by the following specific symbol. This symbol warns for presence of a dangerous voltage.

Electrical Hazard:

User safety and health

Introduction

All government regulations, local health and safety directives must be observed.

Prevent danger due to electricity

All danger due to electricity must be avoided. Electrical connections must always be carried out in compliance with the following:

- The standard connections shown in the product documentation that is delivered together with the product
- All international, national, state, and local regulations. (For details, consult the regulations of your local electricity supplier.)

For more information about requirements, see sections dealing specifically with electrical connections.

Product warranty

Coverage

Xylem undertakes to remedy faults in products from Xylem under these conditions:

- The fault is due to defects in design, materials, or workmanship.
- The fault is reported to a Xylem representative within the warranty period.
- The product is used only under the conditions described in this manual.
- All service and repair work is done by qualified and authorized personnel. All modifications must be done by qualified technicians.
- Genuine Xylem parts are used.

Limitations

The warranty does not cover faults caused by these situations:

- Deficient maintenance
- Improper installation
- Modifications or changes to the product and installation made without consulting Xylem

- Incorrectly executed repair work
- Normal wear and tear

Xylem assumes no liability for these situations:

- Bodily injury
- Material damage
- Economic loss

Warranty claim

Xylem products are high quality products with expected reliable operation and long life. However, should the need arise for a warranty claim, then contact your Xylem representative.

Qualification of personnel

All work on the product should be carried out by certified electricians or Xylem authorized mechanics.

Xylem disclaims all responsibility for work done by untrained, unauthorized personnel.

Support

Xylem only supports products that have been tested and approved. Xylem does not support unapproved equipment.

Product Description

Introduction

Product description

The ENM-10 is the simplest possible method for level control. A mechanical switch in a plastic casing, freely suspended at the desired height from its own cable. When the liquid level reaches the regulator, the casing will tilt and the mechanical switch will close or break the circuit, thereby starting or stopping a pump or actuating an alarm device. No wear, no maintenance. In sewage pumping stations, for ground water and drainage pumping – in fact, for most level control applications – the ENM-10 is the ideal solution.

Liquid density

The product is available in different versions for different liquid densities.

Temperature limit

The regulator can withstand up to 60°C (140°F).

Manual coverage

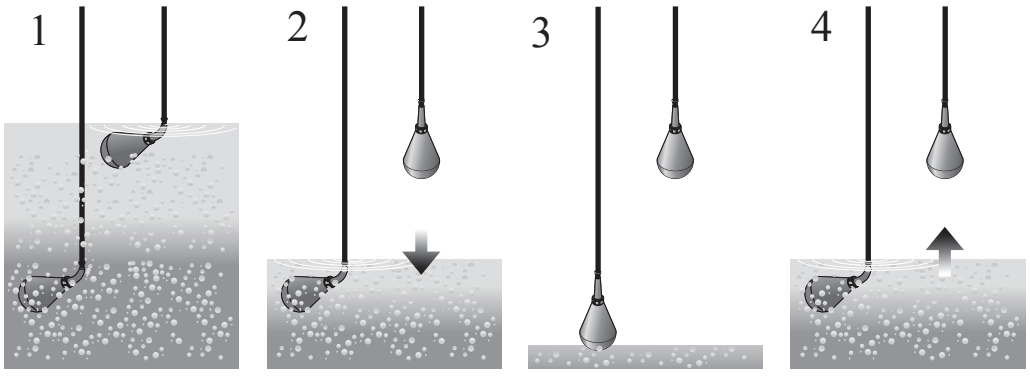
This manual is applicable to the following versions:

- Standard version Blue casing of ENM-10
- EX-version Black casing of ENM-10.

Available languages

For manuals in other languages, visit *tpi.xyleminc.com*

Process description



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1. When the pumped media reaches a predetermined level, the upper level regulator tips over to horizontal position and the pump starts to drain the basin.
2. The basin is drained of fluid.
3. The pump stops when the lower level regulator returns to the vertical position.
4. The basin fills up again. The process restarts.

Material

Standard version

Part	Material
Regulator casing	Polypropylene
Cable sheath	PVC or Nitrile/PVC rubber compound

The plastic components are welded and screwed together. Adhesive is never used. Impurities and deposits will not adhere to the smooth casing.

EX-version

The version for Ex-applications has a black casing, made conductive by adding carbon to the polypropylene.

Cable lengths

For liquids with specific density between 0.95 and 1.10 g/cm^3, the following cables are available:

Version	Lengths m (ft)
Standard	• 6 m (20 ft) • 13 (42) • 20 (65) • 30 (100) • 50 (167)
Ex-version	• 6 m (20 ft) • 13 (42) • 20 (65) Nitrile/PVC rubber cable

Electrical data

Country	Electrical data
Canada	5 A, 250 V, DC 10 A, 250 V, AC
Denmark	10 A, 250 V, AC
Switzerland	6 A, 250 V, AC
Sweden	10 A, 230 V, AC Resistive load 3 A, 250 V, AC Inductive load 5 A, 30 V, DC Resistive load *1 mA, 5 V, DC, Gold Contact

* Part no: 594 79 19 and 594 79 20

Micro switch

The level regulator contains a micro switch, max rated 250 VAC/10 A.

Low-voltage supply

In many cases, local codes require that the regulator is connected to a low-voltage supply, even though it is approved for a higher voltage.

It is recommended that the regulator is connected to a low-voltage supply, 48 V or 24 V, and a protective transformer.

Electrical data for Ex-approved installation

Description	Data
Maximum input voltage, U_i	30 V
Maximum input current, I_i	100 mA
Maximum input power, P_i	1.2 W
Depth of immersion	Max 20 m

For cable

Description	Data
Maximum internal capacitance, C_i:	1.8 nF
Maximum internal inductance, L_i:	10 µH

Installation

There are special rules that apply to installation in an explosive atmosphere. Intrinsically safe circuits are normally required: Ex i. Use a EX-safety barrier, for example, Prod. No. 84 01 07.

Approvals

CE, CSA, SEMKO, NEMKO, DEMKO, EX

LVD approval according to EN61058

CSA approval: Cert No. 1330172

Cl.I Zone 0, Gr. IIC;

CL.I Div.1 Gr A, B, C and D

Cl.II Gr. E, F and G

Cl.III when installed to the certified Intrinsically Safe relay, Ex ia, rated for the locations per submitter control drawing and installation manual.

Ex-approvals

IECEx ia IIC T4 Ga: -20°C<Ta<60°C

IECEx NEMKO 09.008

ATEX II 1G ia IIC T4

NEMKO 10ATEX 1082

Applied standards

- EN 60079-0:2009/IEC 60079-0:2007
- EN 60079-11:2007/IEC 60079-0:2006
- EN 60079-26:2007/IEC 60079-26:2006

Intrinsically safe circuits are required for the automatic control system.

Use a Ex-safety barrier: For example, Prod. No. 84 01 07

0080

Mechanical Installation

Precautions

CAUTION:

- Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.
- The operator must be aware of safety precautions to prevent physical injury.

General

To conform to local regulations, the regulators are normally connected through a transformer to a low-tension control circuit.

Make sure that two regulators are used, one for starting and one for stopping.

If an alarm is required at a given level, then connect a third regulator.

Identical regulators can be used for all functions.

Make sure that the cables do not become tangled during the installation.

The regulator cables must hang freely from each other.