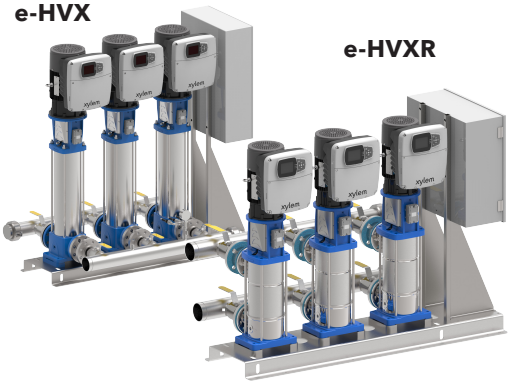
Bell & Gossett
a xylem brand

SPECIFICATIONS
BGe-HVXSP-100047 R1



TECHNOFORCE e-HVX/e-HVXR
Packaged Booster Systems

PART 1 **GENERAL**

1.1 SECTION INCLUDES

A. Variable Speed Pumping Package
B. Pump Control Panel
C. Variable Frequency Drive
D. Sensor Transmitters
E. Sequence of Operation

1.2 REFERENCES

A. AWWA - American Water Works Association
B. ANSI - American National Standards Institute
C. ASTM - American Standards for Testing Materials
D. HI - Hydraulic Institute
E. ASME - American Society of Mechanical Engineers
F. UL - Underwriters Laboratories
G. ISO - International Standards Organization
H. NEMA - National Electrical Manufacturers Association
I. ETL - Electrical Testing Laboratories
J. CSA - Canadian Standards Association
K. NEC - National Electrical Code
L. IEC - International Electrotechnical Commission
M. NSF - NSF International

1.3 SUBMITTALS

A. SUBMITTALS SHALL INCLUDE THE FOLLOWING:

1. System summary sheet
2. Sequence of operation (see specifications)
3. Shop drawing indicating dimensions, required clearances and location and size of each field connection
4. Power wiring diagrams

5. System profile analysis including variable speed pump curves and system curve. The analysis shall also include pump, motor, pump efficiencies, horsepower and kilowatt/hour consumption.
6. Pump data sheets

B. Submittals must be specific to this project. Generic submittals will not be accepted.

1.4 QUALITY ASSURANCE

A. The pumping package shall be assembled by the pump manufacturer. An assembler of pumping systems not actively engaged in the design and construction of centrifugal pumps shall not be considered a pump manufacturer. The manufacturer shall assume "Unit Responsibility" for the complete pumping package. Unit responsibility shall be defined as responsibility for interface and successful operation of all system components supplied by the pumping system manufacturer.

B. The manufacturer shall have a minimum of 30 years experience in the design and construction of packaged pumping systems, and over 50 years in active design/ production of centrifugal pumps.

C. The pumping system shall be factory tested to the job specific condition points prior to shipment.

D. Bidders shall comply with all sections of this specification relating to packaged pumping systems. Any deviations from this specification shall be bid as a voluntary alternate clearly defined in writing. If no exceptions are noted, the supplier or contractor shall be bound by these specifications.

E. A copy of manufacturer's certificate of insurance shall be made available upon request showing as a minimum, general liability coverage of $1,000,000, and an excess liability coverage of $10,000,000.

F. The pumping package shall be certified by an approved independent testing and certification organization as being compliant with the requirements of NSF/ANSI 61 & 372 for potable drinking water and low lead content for a wetted area, weighted average lead content < 0.25%. Packages that are not certified shall NOT be considered equal.

G. Manufacturer shall be listed by UL as a manufacturer of packaged pumping systems under UL/cUL category QCZJ.

H. Manufacturer shall be listed by UL as a manufacturer of control panels under UL 508A.

I. The manufacturing facility shall be subjected to periodic inspections and audits.

J. The manufacturer's production facility shall be ISO-9001:2008 certified

PART 2 **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

Subject to compliance with these specifications, the following manufacturers shall be acceptable:

1. Goulds Water Technology
2. Pre-approved equal

2.2 MANUFACTURED UNITS

A. Furnish and install as shown on the plans a TECHNOFORCE e-HVX Variable Speed Booster System as manufactured by Goulds Water Technology.

B. Manufacturer shall be listed by Underwriters Laboratories as a manufacturer of packaged pumping systems.

C. The pump logic control system shall include, at a minimum, drive integrated programmable logic station controller with Multi-Pump and Multi-Master Capability, motor mounted/integrated variable frequency drives, manifold mounted 4-20mA pressure transducers, one per pump, and any additional equipment as specified or as required to properly execute the sequence of operation.

D. System shall require only suction, discharge and drain connections and single point power connections from a service entrance disconnect.

E. All components shall be mounted and shipped as a single unit.

F. Pumps shall be manufactured by Xylem Inc.

G. The discharge of each pump shall be fitted with a control valve appropriate for station operation. Each pump and discharge valve assembly shall also be equipped with isolation valves so that the pump can be serviced while system is still filled.

H. Pressure gauges shall be installed on the suction and discharge headers.

I. Piping shall be sized so that water velocity shall not exceed 10.0 ft/sec in either the branches or manifolds.

J. Pumps shall be protected from thermal accumulation via individual thermal relief mechanisms.

2.3 COMPONENTS

A. hydrovar X Smart Motor

1. The hydrovar X shall be one completely integrated motor and variable frequency drive unit. The unit shall be programmable with pump specific control logic and include a NEMA 4 / IP55 enclosure.
2. Additional control panels, PLCs or other external controls shall NOT be necessary to accomplish complete pump programming and variable speed control of the pump system.
3. The integrated microprocessor shall provide automatic start and stop of up to 8 variable speed controlled pumps, and enable automatic changeover for lead and lag pump sequencing, without the use of external devices (PLC's) or timers.
4. The hydrovar X unit shall be listed/recognized by and bear the label of Underwriter's Laboratory, Inc. (UL/cUL).
5. The hydrovar X smart motor will conform to standard NEMA TEFC (totally enclosed fan cooled) dimensions.
6. The hydrovar X unit will be configured in the Multi-Master configuration to ensure complete control redundancy. Systems utilizing standalone PLC or Master-Slave arrangement shall NOT be considered equal.
7. The hydrovar X unit shall function to a proven program that safeguards the pumps/system against damaging hydraulic conditions.
8. The hydrovar X unit shall be capable of accepting up to 4 configurable analog inputs with maximum power supply of +24 VDC, 60 mA and up to 3 configurable digital inputs with internal pull-up +24 VDC and 6mA contact current. hydrovar X units shall be supplied with 2 additional digital inputs for external lack of water (low water level) control and external start/stop control with internal pull-up +24 VDC and 6mA contact current. The unit shall be provided with 1 configurable analog output. Accepted analog I/O scales include: 0-20 mA. 4-20 mA, 0-10V, 2-10V. hydrovar X units shall contain a standalone +10 VDC, max 3mA. power supply, 2 RS485 ports for multipump control, 2 RS485 ports for communication (Modbus standard), and 2 configurable relays.
9. Hydraulic stabilization program shall utilize a proportional-integral-derivative control function. The proportional, integral and derivative values shall be user adjustable over an infinite range. The scan and compare rate that selects the command set point and process variable signal shall be continuous and automatically set for optimum performance.
10. The hydrovar X unit shall provide a full color display with programming keypad for data entry. The default language shall be English with options of up 6 additional languages. The display shall have the ability to digitally rotate.
11. The hydrovar X unit shall utilize a Quickstart Genie to simplify initial setup and programming of the unit. The feature shall be specific to pump systems and use suitable pump terminology.
12. The unit shall be capable of communicating with the Building Automation System (BAS) by both hard-wired and serial communications via either BACnet MS/TP or Modbus RTU protocols.

13. The unit shall be rated to operate from 3-phase power at 200-240VAC or 380-480V VAC (+/- 10%) and 50/60Hz supply with leakage current less than 3.5 mA AC. Each motor-drive unit efficiency shall be classified as IE5 - IES2 (IEC 61800-9-2).
14. The motor-drive unit shall be suitable for elevations up to 3281 ft (1000 m) above seal level without derating. Maximum operating ambient temperature rating shall be -4F to +122F (-20C to +50C) and maximum storage temperature -40F to +158F (-40C to +70C). The unit shall be suitable for operation in environments up to 95% non-condensing humidity.
15. The unit shall have the ability to automatically restart after a motor Overload, Over-Voltage, Under-voltage, Inverter Overheat, Phase Loss, Communication Loss, Lack of Water, and Failure of Sensor 1. When enabled, the unit will allow an automatic restart (5) times when an error occurs. On the sixth occurrence, the unit will shut off and display an error message with the appropriate terminology.
16. Protective Functions
    a. Built-in protection for following conditions:
        1. Over/Under voltage
        2. Over-current/output short
        3. Low water (requires low water pressure switch)
        4. Sensor failure
        5. Motor over-temperature
        6. Inverter over-temperature
        7. Minimum threshold/conveyer limit.
    b. For each programmed warning and fault protection function, the hydrovar X unit shall display a message in complete English words or Standard English abbreviations and provide an error code for reference within the hydrovar X programming instruction manual.. The three (3) most recent fault messages along with time, current, speed, voltage, frequency and DI Status shall be stored in the Drive's fault history. The last five (5) fault names shall be stored in Drive memory.
    c. The Drive shall include internal MOV's for phase to phase and phase to ground line voltage transient protection.
    d. Output short circuit withstand rating and ground fault protection rated for 100,000 AIC shall be provided without relying on line fuses. Motor phase loss protection shall be provided.
    e. The hydrovar X unit shall provide electronic motor overload protection (Class 20).
    f. Protection shall be provided for AC line or DC bus overvoltage at 130% of maximum rated or under voltage at 65% of min. rated and input phase loss.
    g. The individual hydrovar X unit shall NOT be equipped with overcurrent and short-circuit prevention to prevent the overheating of the power supply cables. Line fuses or automatic switches must be installed by the installer in accordance with the recommendations outlined within the hydrovar X programming manual.
17. Variable Speed System Sequence of Operation
    a. The system shall consist of a hydrovar X pump logic controller with multi-pump / multi-master parallel operation control, duty-standby pump selection, automatic alternation and automatic transfer to the secondary master control upon pump/VFD failure.
    b. The pumping system shall start via the ON/OFF button located on the drive.
    d. Each sensor/transmitter shall send a signal to the hydrovar X unit, indicative of process variable condition.
    e. When the set point is satisfied by the process variable, the pump speed shall remain constant at the optimum energy consumption level.
    f. The pump controller shall automatically start the lag pumps as necessary to satisfy system demand.
    g. As demand is satisfied, the controller shall automatically stop lag pumps as necessary to conserve energy.

h. In the event of a pump failure or a VFD fault, the pump logic controller automatically initiates a timed sequence of operation to start the redundant pump/VFD set in the variable speed mode.

i. In the event of the failure of a zone sensor/transmitter, its process variable signal shall be removed from the scan/compare program. The redundant zone sensor/transmitters, if available, shall remain in the scan/compare program for control.

j. PUMP or hydrovar X unit fault shall be continuously scrolled through the display on the operator interface of the pump logic controller until the fault has been corrected and the controller has been manually reset.

k. When the system is satisfied, the pump controller shall shut down the single running lead pump and enter energy saving / no flow shutdown mode.

B. ELECTRICAL

1. Station Panel Enclosure.

   The main station disconnect shall be sized as shown in the technical data sheet. Individual integrated circuit breaker disconnects shall have exterior operators, and shall be sized as shown in the technical data sheet. Station disconnect panel shall be housed in a NEMA 12 enclosure with integral latches.

2. Controls and Enclosure.

   The control panel with controls shall be built in accordance with NEC, and shall comply with UL standards. Pump station manufacturer shall be authorized under UL508A to manufacture its own control panels. All equipment and wiring shall be mounted within the enclosure and each device shall be labeled with proper identification. All adjustments and maintenance shall be accessible from the front of the control enclosure. A complete wiring circuit diagram and legend with terminals, components, and wiring completely identified shall be provided. Main disconnect shall be interlocked with door.

3. Pump Disconnects

   Individual circuit breaker service disconnects for each pump are provided in the main station panel. The disconnects are approved under UL and CSA for use in systems rated up to 600VAC and are sized accordingly up to 200A. Disconnects are accessible without disengaging the main station disconnect to ensure that operation of the Booster is not interrupted during individual pump service. Stations that do not provide external access to individual pump disconnects without disengaging the main station disconnect shall NOT be considered equal.

4. Station shall have a short circuit current rating (SCCR) OF 5000A

5. Sensor / Transmitters

   a. Pressure transducers shall be utilized for providing all pressure signals for the pump control logic. Pressure transducer shall be a solid-state bonded strain gage type with an accuracy of < ±0.5% BFSL and constructed of 316 stainless steel. Transducer shall be rated for a pressure of 300 psi and shall provide gauge pressure output, rather than an absolute. Pressure transducer constructed of plastic is not acceptable. Pressure transducer shall be 4-20mA analog type with 10-28 VDC supply range shall utilize a packard type connector to prevent moisture intrusion and include surge protection against voltage spikes.

   b. Flowmeter, when specified and shown in the plans

      i. Provide a Bell & Gossett ST-104 field mounted flow sensor transmitter as indicated on the plans. Unit shall transmit an isolated 4-20 mA dc signal indicative of process variable to the pump logic controller via standard two wire 24 VDC system. Unit shall consist of an insertion probe and separately mounted transmitter. The unit shall be accurate to within 1% of flow rate from 1.0 ft/sec to 30.0 ft/sec and shall withstand a static pressure of 200.0 psi g with negligible change in output.

C. MECHANICAL

1. Station Frame
   a. The pump station frame shall be constructed from A36 structural steel and designed to provide structural support for all attached equipment and provide anchor bolt support. The base shall supply sufficient rigidity to withstand the stresses of reasonable and competent transportation to site, off-loading, installation and operation. Base shall be powder coated for rust prevention.
2. Manifolds and Piping
   a. All piping shall be constructed from 304 stainless steel, schedule 10 or heavier pipe as required to maintain a 3 to 1 pressure safety factor (including 0.062 in corrosion allowance).
3. Isolation ball valves
   a. Isolation ball valves shall be certified to NSF-61 for use with potable drinking water.
   b. Isolation ball valves shall be certified as low lead having wetted surface area with a weighted average lead content<0.25%.
   c. Valves shall be rated for 600.0 psi g WOG / 150.0 psi g WSP for valves 0.25 in to 2.0 in and 400.0 psi g WOG / 125.0 psi g WSP for valves 2.5 in to 4.0 in.
   d. Seats and stem packing shall be virgin PTFE. Stem shall be bottom loaded blowout proof design with fluorocarbon elastomer O-ring to prevent stem leaks.
   e. Valves shall be 2-piece full port design.
4. Isolation Grooved Butterfly Valves
   a. Valves shall be certified to NSF-61 for use with potable drinking water.
   b. Valve bodies shall be nylon coated ductile iron conforming to ASTM A536 with integral neck and ISO mounting top.
   c. The disc shall be encapsulated with Gr. E EPDM for cold and hot water services.
   d. Valves shall be rated for 300.0 psi g CWP
5. Threaded check valves
   a. Body shall be stainless steel
   b. Dome shall be Delrin
   c. Disc shall be Buna-n
   d. Guide shall be Delrin
   e. Screw shall be stainless steel
   f. Spring shall be stainless steel
6. Wafer Style Silent check valves
   a. The valve body shall be constructed of ASTM A126 Class B cast iron for Class 125/250 (Lead free).
   b. The seat and double guided disc shall be ASTM B584, C87600 silicon bronze.
   c. The compression spring shall be ASTM A313 Type 316 Stainless Steel.
   d. Valve shall be NSF/ANSI 61 & 372 certified.
   e. The valve design shall incorporate a center guided, spring loaded disc, guided at opposite ends and having a short linear stroke that generates a flow area equal to the nominal valve size.
   f. The operation of the valve shall not be affected by the position of installation. The valve shall be capable of operating in the horizontal or vertical positions with the flow up or down.
   g. All component parts shall be field replaceable without the need of special tools. A replaceable guide bushing shall be provided and held in position by the spring. The spring shall be designed to withstand 100,000 cycles without failure and provide a cracking pressure of 0.5 psi g.

Valve Size Inches (mm)	**Wafer Style Cv**
2 (50)	43
2.5 (65)	88
3 (80)	130
4 (100)	228
5 (125)	350
6 (150)	520

h. The valve disc shall be concave to the flow direction providing for disc stabilization, maximum strength, and a minimum flow velocity to open the valve.

i. The valve disc and seat shall have a seating surface finish of 16 micro-inch or better to ensure positive seating at all pressures. The leakage rate shall not exceed the allowable rate for metal seated valves allowed by AWWA Standard C508 or 1 oz (30 ml) per hour per inch (mm) of valve diameter.

j. The valve flow way shall be contoured and unrestricted to provide full flow areas at all locations within the valve. Cv flow coefficients shall be equal to or greater than specified below and verified by an independent testing laboratory.

k. The valves shall be hydrostatically tested at 1.5 times their rated cold working pressure and seat tested at the valve CWP.

7. Pumps
   a. Stainless Steel Vertical Multistage, Goulds Water Technology e-SV
   b. AISI 304 wetted components
   c. Impellers: AISI 304
   d. Diffuser: AISI 304
   e. External Sleeve: AISI 304
   f. Pump Body: ASTM Class 35/40B Cast Iron / 304 SS
   g. Seal Housing: AISI 304
   h. Mechanical Seal: Carb-SilCarb-Viton
      Access to mechanical seal shot not require removing the motor.
8. Pressure Gauges
   a. Gauges shall be provided for the suction and discharge manifold.
   b. Accuracy shall be ±1.5%
   c. Bourdon tube and connection shall be constructed of 316SS.
   d. Case, bezel and internals shall be constructed of 316SS.
   e. Gauge shall be filled with glycerin in order to dampen pulsation and vibration and to provide lubrication to the internal parts.
   f. Gauge range shall be selected to cover the largest operating range for the specific conditions and pump selected.
9. Flange Bolts
   a. Bolts shall be zinc plated and shall meet ASTM Grade A193 B7.

PART 3 **EXECUTION**

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions. The contractor shall determine the appropriate method for mounting, securing and plumbing the package in accordance with applicable state, federal and local building and plumbing codes. Isolation valves are required by the manufacturer on suction and discharge lines, valves by others.

B. The contractor shall align the pump and motor shafts to within the manufacturer's recommended tolerances prior to system start-up.

C. Power supply wiring, as required, as well as installation methods, shall be the responsibility of the electrical contractor. All wiring shall be performed per applicable state, federal and local codes.

D. Control wiring for remote mounted switches and sensor / transmitters shall be the responsibility of the controls contractor. All wiring shall be performed per manufacturer's instructions and applicable state, federal and local codes.

3.2 DEMONSTRATION

A. Start-up and training of the packaged pumping system shall be the responsibility of the distributor.

3.3 WARRANTY

A. The manufacturer shall warrant the water pumping system to be free of defects in material and workmanship for one year (12 months) from date of authorized start-up, not to exceed eighteen (18) months from date of manufacturer's invoice. Complete terms and conditions will be provided upon request.

3.4 START-UP SERVICE

A. Owner start up assistance shall be arranged by the distributor or channel partner. The duration of start-up assistance as well as testing parameters and package capabilities shall be confirmed to the owner by the distributor or channel partner.

Xylem Product Cybersecurity
Xylem values your system security and the availability of your critical services. For more information on Xylem cybersecurity practices or to contact the cybersecurity team please visit xylem.com/security.

xylem
Let's Solve Water

Xylem Inc.
www.xylem.com/bellgossett

Learn more about
e-HVX and e-HVXR Packaged
Booster Systems