EG Controls

Digi-Gage Plus
Pump Control Panel
Specification for
City of

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A. Pump Station Controller

B. The specified equipment shall be a Digi-Gage Plus pump controller manufactured by EG Controls of Jacksonville, Florida.

   a. Equipment Description

      i. The controller shall utilize a microprocessor with a color graphical touch screen display to control from one (1) up to six (6) pumps in a variable speed mode. All operator adjustable setpoints and features shall be accessible from the face of the microprocessor through the soft touch keys.

      ii. Accurate measurement of the liquid level or pressure shall be made by a compatible analog level or pressure transmitter. The transmitter range shall be configured in the setup menu.

      iii. The controller shall automatically alternate two (two) and up to six (6) pumps in the automatic operation mode. The controller shall include the capability of selecting any pump for the lead position(s) with or without alternation.

      iv. Lag pump start time delays shall be provided to prevent simultaneous pump starts on power up or the restoring of power after a power outage. The lag pumps time delay shall be adjustable from the graphical display screen.

      v. Controller shall be able to group any number of the six (6) pumps and alternation groups.

      vi. Controller shall be able operate pumps in groups of any combination. (Example: a 5-pump system can be operated as a duplex and triplex within the same controller).

      vii. Controller shall be able to operate as a stand-alone controller and be able to integrate into a SCADA system.

      viii. Controller shall be able to be remotely viewed, operated & controlled.

      ix. Controller shall be able to be log data locally and be able to provide logged information remotely.

      x. Controller shall have web server features.

      xi. Controller shall be able to be configured for different modes of operation:

         1. Pump Down
         2. Pump Up
         3. Booster

4. PID Control
    a. Constant Pressure
    b. Constant Level
5. Flow Matching

b. Controller to have optional features that are enabled/disabled and should be part of the base controller:
    i. Runtime Equalization
    ii. Float Control
    iii. Float Monitoring
    iv. Timed Alternation
    v. Flush
    vi. Fog Reduction
    vii. Advanced Grouping (up to 3 distinct groups of control)
    viii. Mixer Control

c. Controller shall be able to be configured for selectable monitoring modes.
d. The controller shall be capable of calculating both station inflow and outflow while dynamically displaying both flows in configurable engineering units.
e. The controller shall display the total pump or run time hours, total starts and starts per hour for each pump and combination of pumps. These values shall be re-settable from the graphical display screen.
f. The controller shall allow for the entry of wet well geometry for use in the controller's flow calculations.
g. Relay outputs for system fault, pump start/stop, common alarm high level and low level shall be available from the controller.
h. The following alarm (configurable) conditions shall be annunciated on the graphical screen display. Detailed alarm information can be viewed in the Alarm History screen.
    1. Phase Failure
    2. High Level Alarm
    3. Low Level Alarm

4. Common Alarm
5. Controller Fail
6. Transducer Fail
7. Backup Transducer Fail
8. Float out of Sequence
9. Float System Online
10. Pump Failed To Start
11. Pump Fault
12. High Level Alarm (Float)
13. Phase Failure
14. Float System Fault
15. Bubbler System Fault

ii. The controller shall be backward compatible with control panels using the VARI-GAGE 3300 as manufactured by EG Controls of Jacksonville, Florida or pre-approved equal.

iii. The controller shall be the VARI-GAGE PLUS as manufactured by EG Controls of Jacksonville, Florida or pre-approved equal.

i. Process Features

i. Clean-Out (Flush Mode) – Simple time or cycle-based conditions
ii. Grease Build Up Prevention Mode
iii. Clog Prevention Mode – Simple time or cycle-based conditions
iv. PID Control
v. Pressure
vi. Level
vii. Flow
viii. Multi-Functional Control
ix. Pump Up
x. Pump Down
xi. PID
xii. Combinations

xiii. Grouping Features

xiv. Mixer Start Control

j. Clean Out (Flush) Mode Description (For Lift Stations):

i. Purpose of this feature is to provide an automatic custom scheduled clean out mode to reduce solids and the sludge buildup in the sump of a lift station wet well.

k. Theory of operation:

i. As the lift station operates based on configured level set points, the pumps go through the automated operations to pump down the lift station to the configured low-level pump shut off set point.

ii. A screen is provided for the customer configured pump down cycles, number of days of operation and a Clean Out (enable/disable) mode.

iii. Once this mode in enabled and the number of cycles or number of days is configured, the system will operate as follows:

iv. Once the customer configured set point (either the number of cycles or number of days) is reached, the system will ignore the normal start/stop pump set points and allow station to fill to the “Flush” high level set point. Once this “Flush” high level is reached, the system will start the customer selected available pumps to pump down the lift station and flush the station wet well.

l. Grease Buildup Reduction Description (For Lift Stations):

i. Purpose of this feature is provide the system with a varying start level (percentage based) mode to help prevent FOG (Fat, Oil, Grease) build up due to the wet well level reaching the same point, causing an accumulation of FOG on the sides of the lift station.

ii. A screen is provided for the customer to enable/disable this feature and to set the % variation allowed to vary the level.

m. Theory of operation:

i. When this mode is enabled the % variable is set, each time the pump down cycle is initiated, a calculation will be performed to adjust the customer defined level set point by the % entered into the variance field. The next cycle will wait until this “calculated”

level value is reached and start the pump down cycle. The system will run through a series of these calculations to allow a semi random level for starting the pump down cycle.

n. Clog Prevention (De-Matter) Mode (Keyed shaft pumps only):
   i. Purpose of this feature is allowing the system to provide an autonomous means of helping to prevent clogs that build up on a pump's impeller.
   ii. Theory of operation:

   A screen is provided for to enable/disable this mode of operation. "De-Matter" operation is based on a configurable number of pumping cycles or number of days. Once this mode is enabled and the settable number of cycles or number of days is set, the system will operate as normal until the set point is reached. A "De-Matter" clog prevention cycle will initiate, and the pump will reverse direction and then run forward (based on the number of cycles set by the customer) to attempt to clean the pump impeller. This is an open loop automatic mode that does not use any feedback to determine a clog or matter buildup.

o. Features Detail
   i. Pump System:
      1. No user selectable I/O –Use Standard fixed I/O assignments
      2. Pump Grouping Feature
      3. Clog Prevention Feature
      4. Grease Buildup Feature
      5. Clean Out Feature

   ii. Pump System:
      1. Allows for 3 station level user selectable inputs (i.e. Dry well flood, Generator Fault, etc.)
      2. Allows for 1 station level user selectable output (i.e. System fault, remote reset, etc.)
      3. Pump Grouping Feature

4. Clog Prevention Feature
5. Grease Buildup Feature
6. Clean Out Feature

iii. Pump System:

1. Allows for 6 station level user selectable inputs (i.e. Dry well flood, Generator Fault, etc.)
2. Allows for 2 station level user selectable outputs (i.e. System fault, remote reset, etc.)
3. Pump Grouping Feature
4. Clog Prevention Feature
5. Grease Buildup Feature
6. Clean Out Feature

iv. Pump System:

1. Allows for 9 station level user selectable inputs (i.e. Dry well flood, Generator Fault, etc.)
2. Allows for 3 station level user selectable outputs (i.e. System fault, remote reset, etc.)
3. Pump Grouping Feature
4. Clog Prevention Feature
5. Grease Buildup Feature
6. Clean Out Feature
7. Float Monitoring Feature
    a. If enabled, 5 of the user selectable inputs will be predefined as Float feedback inputs.

(3, 2 and 1 pump systems will use predefined I/O mapping based on the 3-pump system. No additional user I/O points will be available below a 3-pump system)

p. Hardware Ratings:

i. The hardware ratings shall be as follows:

1.	Operating Temperature	0 to +60°C (32 to 140°F)
2.	Storage Temperature	-20 to +60°C (-4 to 140°F)
3.	Relative humidity (RH)	10% to 95% (non-condensing)
4.	NEMA/IP Rating	NEMA4X/IP65/66
5.	Voltage range	10.2 to 28.8VDC <10% ripple
6.	Power consumption	NPN inputs 280mA @ 24VDC
		PNP inputs 190mA @ 24VDC
		Backlight 20mA @ 24VDC
		Ethernet card 35mA @ 24VDC
		Relay Outputs (ea.) 8mA @ 24VDC

q. System Configuration:

i. The Controller shall include an integrated processor, Ethernet, modular I/O and color touchscreen panel. The controller shall allow for expansion input/output modules and communication modules.

ii. System Ratings shall be as follows:

1. Input / Output Capacity capable of supporting up to 702 I/O points (8 I/O Local modules and 8 I/O Remote modules maximum)
2. Scan Rate of 15µs per 1kb ladder logic
3. Adjustable white LED backlight TFT LCD display
4. Up to 1024 displays
5. Colors 65,536 (16-bit)
6. 3.5” viewing area resistive, analog touchscreen

iii. Controller shall support the following features:

1. Remote access
2. Micro SD Card backup/ upload/ logging
3. Data logging
4. OPC Server compliant
5. DDE format read/ write

r. System Processor:

i. Processor shall be as follows:

1. Memory: 1MB Application, 512k Fonts, 3MB Images.
2. Removable memory: Standard SD or SDHC (32GB max)
3. Real Time Clock
4. Battery backup (7 years typical at 25°C)
5. Replaceable, coin type, Lithium battery (CR2450)
6. Base Features:
7. Base Features shall be as follows:
8. Input voltage 24VDC
9. Twelve (12) digital inputs rated 24VDC (2 configurable as analog current / voltage)
10. Six (6) Relay Outputs rated 5 amp at 250VAC/ 30VDC
11. Comm Port 1: RS232/ RS485 (up to 32 nodes)
12. Ethernet: RJ45 10/100Mbps

s. Communication Interfaces (optional):

i. Comm Port 1

1. RS232/485 baud rates between 300 to 115200 bps
2. RS485 up to 32 nodes/ 1200m (4000') maximum
3. USB 2.0 compliant; full speed

ii. Ethernet

iii. Comm Port 2 (Optional)

1. RS232/485 module
2. CANbus module

t. SCADA Communications

i. The pump station controls shall be SCADA ready and the Contractor shall integrate the station to the Owner's existing SCADA system. The pump station will be furnished with a 9810 radio. There shall also be a 12"x12" area on the back panel for a future cellular

addition. The pump system must be designed to integrate with future cellular technologies.

ii. The pump station control panel shall be connected to the plant SCADA system via an RTU interfaced modem and controller. The controller shall monitor:

1. Pump 1 or 2 on
2. Pump 1 or 2 failure
3. Low level alarm
4. Pump off
5. High level alarm
6. Float activation
7. Amperage of each pump
8. Pump run time
9. Wet well level
10. Operator on site

END OF SECTION