Magna3® Wet Rotor Circulator

Part I – GENERAL

1.1 WORK INCLUDED

A. Contractor shall furnish and install Grundfos Magna3® variable speed wet rotor in–line circulator pumps in accordance with manufacturer's recommendations and plans.

1.2 REFERENCE STANDARDS

The work in this section is subject to the requirements of applicable portions of the following standards:

A. Hydraulic Institute
B. ANSI – American National Standards Institute
C. ASTM – American Society for Testing and Materials
D. IEEE – Institute of Electrical and Electronics Engineers
E. NEMA – National Electrical Manufacturers Association
F. NEC – National Electrical Code
G. ISO – International Standards Organization
H. UL – Underwriters Laboratories, Inc.
I. CSA –Canadian Standards Association
J. ETL – ETL Listed Mark by Intertek Testing Services

1.3 INSTALLATION REFERENCES

The wet runner pump manufacturer shall have minimum 10 years of experience in the country of the installation.

Part 2 – PRODUCTS

2.1 VARIABLE SPEED WET ROTOR CIRCULATOR PUMPS

A. Pump shall be of the in-line wet rotor design. Oil lubricated pumps and shaft coupled pumps shall not be accepted.
B. The pump shall be a standard product of a single pump manufacturer. The pump, motor, and variable speed drive shall be an integral product designed and built by the same manufacturer.
C. The enclosure shall be marked "Enclosure Type 2."
D. The pump shall be certified and listed by a Nationally Recognized Test Laboratory (NRTL) for U.S. and Canada to comply with:
    a. UL778
    b. UL 60730-1A
    c. CAN/CSA No. 108

E. The pump shall be labeled on the nameplate as having an Energy Efficiency Index (EEI) of no greater than 0.20.

2.1.1 Ratings

A. Maximum Pressure:	175 PSIG
B. Minimum Media Temperature:	14 °F
C. Maximum Media Temperature	230 °F
D. Maximum Sound Pressure Level:	43dB(A)
E. Voltage:	[1x115V +/-10%][1x208-230V +/-10%]
F. Maximum Energy Efficiency Index:	0.20

2.1.2 Pump Construction

A. Pump housing:	Cast Iron:	EN-JGL-250 with Cataphorese surface treatment
	Stainless Steel:	304 Stainless
B. Impellers:		Composite PES 30% GF
C. Rotor Can:		PPS reinforced with Carbon Fiber(Fortran MT9141L PPS-GF40)
D. Rotor Cladding:		316 Stainless Steel
E. Stator Housing:		Aluminum
F. Shaft:		316L Stainless Steel
G. Thrust Bearing:		Axial: Carbon Graphie, Radial: ceramic Alumina Hilox 961
H. O-Rings:		EPDM
I. Bearing Plate:		304 Stainless Steel
J. Neck Ring:		304 Stainless Steel
K. Control Box:		Polycarbonate

2.1.3 Motor

A. Motor shall be 4-pole permanent-magnet (PM motor) and tested with the pump as one unit by the same manufacturer. Conventional asynchronous squirrel-cage motors shall not be acceptable.

B. Each motor shall be of the integrated Variable Speed Drive design consisting of a motor and a Variable Frequency Drive (VFD) built and tested as one unit by the same manufacturer.

C. The stator housing shall be made of pressure die cast aluminum.

D. The motor shall be cooled by the pumped fluid

E. The power electronics shall be cooled to the ambient air.

F. The Motor shall be self-ventilating.

G. Minimum insulation class for the motor shall be Class F.

H. The integrated VFD control shall utilize an energy optimization algorithm to minimize energy consumption by reducing the factory-set setpoint and adjust to system characteristics. This shall be accomplished without the need of any external sensors or input.

2.1.4 Operating Modes

The pump shall have the following control mode and operating modes:

A. AUTO*ADAPT* – During operation, the pump automatically reduces the factory-set setpoint and adjusts it to the actual system characteristic. Manual setting of the setpoint is not possible.

B. FLOW*LIMIT* - It shall be possible for the user to select a maximum flow that the pump shall not exceed in order to eliminate the need for additional throttling valves. The pump shall operate per selected control mode but will limit speed to not exceed the user specified flow limit

C. FLOW*ADAPT* – The pump shall operate in the AUTOADAPT control mode with FLOWLIMIT enabled.

D. Proportional Pressure – The head delivered shall be reduced from a manual setpoint linearly in accordance with decrease in flow demand in the system

E. Constant Pressure – A manual set, constant head is maintained, irrespective of flow up to the maximum speed of the pump.

F. Constant Curve – The pump runs as an uncontrolled pump by the means of a set of pump curves. The pump curve adjustable between maximum and minimum from the control panel or through a wireless remote control.

G. Constant Temperature – the pump shall adjust speed to maintain a constant media temperature in the flow pipe in which the pump is installed.

H. Constant Differential Temperature - the pump shall adjust speed to maintain a constant temperature drop between the flow pipe in which the pump is installed and a user installed temperature sensor.

I. Alternating Operation – Two single head pumps or two heads of a dual head pump shall communicate wirelessly to one another. In alternating operation, only one pump shall operating at a time. The operation shall alternate based on time or energy to ensure even run time of both pumps. If a pump stops due to fault the other pump shall take over automatically.

J. Back-Up Operation – Two single head pumps or two heads of a dual head pump shall communicate wirelessly to one another. In Back-Up operation one pump shall operate continuously. If the duty pumps stops due to fault the back-up pump shall take over automatically.

K. Cascade Operation - Two single head pumps or two heads of a dual head pump shall communicate wirelessly to one another. Two pumps shall operate together in constant pressure control. The pump controller shall determine when to operate a single pump or both pumps to meet demands. While both pumps operate they shall run at the same speed.

2.1.5 Interface and Communication

A. The pump shall have an integrated operator interface consisting of:

   i. Minimum 2.4” (measured diagonally) color TFT display

   ii. 7 push buttons for navigation of menu

iii. Push Buttons must be able to operate at minimum 25,000 times
iv. Push Buttons must be isolated from the main supply by reinforced insulation according to UL60730
v. LEDs to signal pump status for quick indication

B. The pump shall have a sensor integrated directly into the pump housing with 4 lines consisting of Ground, Supply, and two signals for Differential Pressure and Media Temperature.
    i. Sensor Supply shall be 4.8V DC +/- 2% at 20mA referenced to Ground. The supply must be able to withstand a permanent short circuit.
    ii. The electrical values for the signal shall be 4.8V DC +/-2% referenced to ground.

C. The pump module shall have one analog input configurable for either 4-20mA or 0-10VDC input signal configurable for external Temperature or Pressure sensor, or Setpoint influence. Sensor input shall have three wires for Ground, Supply, and Signal. The Supply for external analog input shall be 24V DC +/-10% at 22mA reference to Ground. The supply must be able to withstand a permanent short circuit. Connection can be made to a screw terminal capable of wire sizes up to AWG16.

D. The pump shall have 3 Digital Inputs galvanically isolated from the main supply by a reinforced insulation according to UL60730.
    i. Start/Stop –Used to start or start the pump. The pump shall be enabled when connected to common ground by an external potential free short circuit. An open circuit to this input shall disable the pump. Connection can be made to a screw terminal capable of wire sizes up to AWG16.
    ii. Minimum – used to force the pump to run at minimum load (curve). When connected to common ground by an external potential free short circuit the pump must run at minimum load. Connection can be made to a screw terminal capable of wire sizes up to AWG16.
    iii. Maximum - used to force the pump to run at maximum load (curve). When connected to common ground by an external potential free short circuit the pump must run at maximum load. Connection can be made to a screw terminal capable of wire sizes up to AWG16.

E. The pump module shall have two Output Relays. Each relay shall be configurable for Alarm, Reading, or Operating indication. Each relay must have three screw terminals see above. Output relays contacts shall be rated for maximum 250VAC at 2A and minimum 5VDC at 20mA. Each must have galvanic isolation from the internal supply by reinforced insulation according to UL60730.

F. Shall be capable of accepting an optional add-on module for integration into Building Management Systems:
    i. LonWorks
    ii. Bacnet

iii. Modbus

iv. Profibus

G. The pump module shall have wireless connectivity for two pumps to communicate with one another or for the pump to communicate to a mobile device with additional hardware.

i. Communication range shall at minimum within 30ft of the pump without walls or barriers.

ii. Two identical pumps shall be capable of wireless communication with one another to operate as a two pump system in:

1. Duty/Standby
2. Alternating Mode, pumps alternate operation every 24 hours
3. Cascade operation with both pumps running simultaneously in constant differential pressure mode.

2.2 INSTALLATION

The pump shaft shall be installed horizontally per manufacturer's recommendations. The terminal box shall be located as per manufacturer's recommendations. The system shall be vented out from a higher location form the pump. The required inlet pressure by the pump shall be available at the pump inlet.

2.3 TESTING

A. The pumps shall be factory performance and hydrostatic tested as a complete unit prior to shipment. The testing shall be done in accordance with ISO 9906 Annex A. No test certificate is required.

2.4 WARRANTY

A. The warranty period shall be a non-prorated period of 24 months from date of installation, not to exceed 30 months from date of manufacture. Warranty shall cover pump, motor and terminal box as a complete unit.