**SYSTEM FUNCTIONALITY**

A SAMFlows control system will be provided. The control system will automatically control the following elements of the pumping process:

- Open tank to pump automatically and re-circulate water as needed to protect the pump
- Open discharge valves and charge lines to an operator's pre-set or manually set pressure and then maintain that pressure by gating the discharge valves as necessary and/or managing the pump discharge pressure
- Control engine speed as needed to maintain individual line discharge pressures set by the operator
- Automatically switch sources from tank to hydrant or from tank to draft functions at the operator request without requiring the operator to independently manipulate the valve positions
- Automatically refill the tank when secondary water supply is available
- When flowing from a pressurized source, the system will monitor the intake pressure and reduce engine speed so it does not drop below purchaser specified pressure 0.7 – 2.0 Bar and alert the user if the system has low supply pressure
- Alert the operator audibly and visually of any problems with the system or with water flow and pressure settings

The system will include automatic control of the following system components:

- Intake valve(s)
- Tank to pump valve
- Tank fill valve
- Discharge valve(s)
- Engine speed

The system will accomplish the above by linking the discharge valves, intake valves, and pressure governor on electrical networks with all components in constant communication with each other. These components must be configured, networked, and tested as part of the pump assembly prior to shipment to the OEM.

The system will operate in two modes – automatic and manual.
The system will include a control centre interface, a pump controller interface and a throttle control 'twister' which provide all necessary system control in both automatic and manual mode.

**SYSTEM CONTROL INTERFACE SCREENS**

**Control Centre**

Automatic mode: The interface will include the following available features

- Up to 6 active discharges with a discharge control box for each discharge, each showing the set pressure and the actual pressure of the discharge. Each discharge box shows a selectable color for the discharge, displays any status of the active discharges and displays a low flow indication if the nozzle is closed or there is a kink in the line. It will also indicate any problems with the valve and whether SmartCAFS is active (if installed).
- Available intakes and status of the intake valves.
- Water tank level and foam tank level
- Status of the tank and indicate whether the intake(s) is supplying water to the pump or whether the tank is supplying water to the pump
- The control centre will display the intake pressure on any intake valves that are open
- 4 configurable quickset circles are available to pre-set the desired pressure for each line and open individual discharge lines by dragging the quickset circles to the target in the discharge area of the display
- An information centre to indicate system managed events as they happen
- Pop-up warning boxes to indicate any problems with the system or warnings regarding water flow throughout the system

When in auto mode, the control centre interface allows the operator to do the following from the interface:

- set pressure on individual discharges
- adjust the set pressure
- close the discharge line
- select an intake to open
- select whether the intakes are set to draft or pressurized water source
- switch back to tank water and close the intake

When in automatic mode the operator will not be required to operate any individual discharge valves, governor settings, or any individual intake settings.

If SmartCAFS system is installed, the operator will be able to do the following from the control centre:

- Turn on SmartCAFS to wet, medium or dry or foam only
- Turn SmartCAFS off

Manual mode: The control centre interface includes a manual mode. When in manual mode, the operator has control over each of the intakes and discharges from the control centre. Each discharge valve will show line pressure and valve position and allow the operator to open and close the valve. The manual control screen includes an option to send the system back to auto mode when desired.

The control centre is housed in a 10.6" display with a bonded LCD, anti-glare coating and Projective Capacitive (PCAP) touch screen. It includes 2 CAN network inputs and a USB 2.0 connection. The operating voltage is 6-36VDC, with an operating temperature of -40°C to 85°C and an environmental rating of IP67.

**Pump Controller**

Automatic mode: When the system is in auto mode, the pump controller interface include the following features:

- A separate touch screen interface consisting of several pages that can be accessed by the operator. These pages include:
  - Home screen
  - Tank screen
  - Pump info screen
  - External camera video screen
  - Engine Data screen
- The home screen includes master intake pressure, master discharge pressure and engine speed, status of tank fill and tank to pump valves, pump flow rate and status box that indicates system is in AUTO mode. The flow readout updates automatically as conditions change.
- The tank screen indicates status of tank to pump and tank fill valves as well as an indication that tank to pump and tank fill valves are being automatically controlled by the system in auto mode.
- The pump information screen includes the following information:
  - Anode status for three (3) installed anodes
  - Gearbox oil status
  - Bearing housing oil status
  - Gearbox temperature
  - Pump temperature
  - Pump details including Pump Model, Rating, Gearbox, Gear Ratio, Pump Assy Plate No, Gearbox Assy Plate No, Manufacture date, Pump Factory Test Data
- The video screen features a display from an external video camera feed and allows the user to toggle between up to 3 available video inputs.
- The Engine Data screen includes battery voltage, coolant temperature, oil pressure, transmission temperature and warnings.

Manual mode: The pump controller interface will revert to standard pressure governor operations when manual mode is selected by the user or when the system defaults to manual mode.
The pump info, video and engine data screens will function as described in auto mode.
The home screen and tank screen will have the following functions:
The home screen includes pressure governor controls, pump flow readout and tank to pump and tank fill valve status indication. The home screen will include the following:

- Mode select. Allowing the user to select BAR (Pressure) or RPM (Engine Speed) mode
- Master intake and master discharge pressure display
- Increase and decrease buttons to increase and decrease the pressure or RPM depending on what mode is selected
- User configurable quickset circles for pressure and RPM
- Indication of set pressure when in BAR mode
- Status of tank fill and tank to pump valve and indication if system is recirculating

The tank screen will include control of the tank to pump and tank fill valves and indication of valve position. The operator is able to open or close the tank fill and tank to pump valve when in manual mode.

The pump controller will be a 7" display with a bonded LCD, anti-glare coating and PCAP touch screen. It includes three NTSC/PAL video inputs, 2 CAN network inputs and a USB 2.0 connection. The operating voltage is 6-36VDC, it has an operating temperature of -40°C to 85°C and an environmental rating of IP67.

**Throttle Control 'Twister'**

A throttle control 'Twister' will be provided as an optional manual backup control for engine speed. The throttle control 'Twister' includes a master IDLE button that sends the engine to IDLE and switches the SAMFlows system to manual mode when pressed. The throttle control 'Twister' communicates using J1939 CAN data link protocol. It features two indicator LEDs; one to indicate ACTIVE and the second to indicate THROTTLE READY. The operating voltage is 9-32VDC, it has an operating temperature of -40°C to 85°C and has an environmental rating of IP67.

**SYSTEM WARNINGS**

The system provides audible warnings when the following conditions occur:

- Pump Engaged, SAMFlows ready
- SAMFlows disabled
- Discharge Opening
- Low Intake Pressure (protection against cavitation)
- Low tank water
- Out of water
- Hydrant established
- Draft established
- Draft problem
- High Large Diameter Hose Pressure

**SYSTEM REQUIREMENTS**

The system allows for the following number of valves:

Up to 4 intake valves
Up to 12 discharge valves
1 tank to pump valve
1 tank fill valve

**The system has the following requirements and options:**

**1. Compatible Pumps:**

- Prima P1 2010 & P2 2010
- Prima P1 3010 & P2 3010
- Prima P1 4010 & P2 4010
- (Prima P1 6010 & P2 6010 planned for development)

**2. Pump Material:**

- Aluminium
- Bronze (Gunmetal)

**3. Bearing Housing Sensors:**

- Water in oil sensor
- Oil level sensor
- Oil temperature sensor

**4. Priming:**

- Piston priming as standard

**5. Voltage:**

- 24V

**6. Mounting Base:**

- Included as standard
- Manual oil and water drains included as standard

**7. Gearbox:**

- Optional, with all current Prima gearbox ratios available
- Water in oil sensor
- Oil level sensor
- Oil temperature sensor

**8. Drive Flange:**

- All current Prima options to be available

**9. Drive Rotation:**

- Clockwise on drive flange view to be available
- Counter-Clockwise on drive flange view to be available
- (Clockwise only with PrimaCAFS)

**10. Volute Outlet:**

- Prima 6-way Manifold
- Sacrificial anode (alloy) with intelligent monitoring
- Tank fill valve; 1.5” electronic valve located to allow air to escape pump on pump engagement

**11. Suction Inlet:**

- Electronic butterfly valve automatically controlled by SAMFlows. Size according to nominal flow of pump. Main intake for draft or pressure feed via AWG collecting head for multiple hoses.
- ¾” ‘pre-prime’ vacuum connection for evacuation of hard suction line
- ½” ‘air bleed’ connection for bleeding air from soft suction intake hose whilst filling
- ¼” pressure relief/drain connection for bleeding residual pressure in soft suction inlet hoses for safe disconnection
- Flanged intake for tank-to-pump line
- Flanged intake for auxiliary water feed (usually hydrant) to match flow requirements of pump
- Droop: $0^{o}$ or $22.5^{o}$
- Sacrificial anode (alloy) with intelligent monitoring
- SAMFlows can control up to 4 inlet valves

**12. Collecting Head:**
- 2.5" electronic valve for each auxiliary intake (usually hydrant)
- Single electronic valve for P2010 and P3010
- P4010 available with two electronic valves

**13. Thermal Relief Valve:**
- 42° C or 74° C
- Overheat audio/visual warning

**14. Manifold Check Valve**
- Not available

**15. Prima Multi Pressure (P2)**
- SAMFlows can control one High Pressure Outlet (enquire for twin HP requirement)
- Electro-pneumatic high pressure bypass valve
- Electro-pneumatic valve for high pressure hose reel

**16. Foam & CAFS**
- SAMFlows is compatible with SmartCAFS foam system only

**17. Instrument Panel**
- Instrument panel available
- SAMFlows control screens: UV1100 Control Centre, UV800 Pump Controller
  - Audio and visual warnings including cavitation detection and warning
  - Pump service and operational data
- Smart CAFS panel (if specified)
- Emergency shut-off
- Cut-outs for installation of 'Carling' switches (non-SAMFlows functions)
- 2 x Marine speakers (2 additional speakers supplied for OEM installation) and amplifier
- ITL40 display for each water tank and foam tank
- Test port for EN1028 compliant connections for intake and outlet pressure
- 'Twister' – manual throttle control

**18. Water Valves**
- Minimum 2 x 2" Navigator valves (Prima Select option = 4 x 2" Navigator valves)
- SAMFlows can manage up to 6 discharge valves
- SAMFlows is compatible with Monitor outlets
- Up to 12 discharge valves (manual control if more than 6 in operation)

**19. Pump Paint Colour**
- Same as Prima; Post box red is 'Select' option. Other colours available

**20. Languages (Screen and Audio)**
- English, German, French, Portuguese
- Other languages to be added as required

The system will include all necessary harnessing and electronic modules to provide system functionality described above. The system will be shipped from the pump manufacturer with all required valves, electronic modules, sensors, harnessing and panel mounted components necessary for the function of the system. The system will be configured and tested at the pump manufacturer prior to shipment to the OEM.

**Additional screen option:**

- Secondary Control Centre display that includes the same control as the primary control centre. A third vehicle mounted screen can also be added.