Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

Certificate of Approval

NMI 5/6E/15

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that an approval for use for trade has been granted in respect of the instruments herein described.

THS Model PIPER-PD340-C76 Milk Flowmetering System

submitted by Transport Hydraulic Solutions Pty Ltd
34B Randor Street
Campbellfield VIC 3061

NOTE: This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

This approval has been granted with reference to document NMI R 117 Measuring Systems for Liquids Other than Water, dated June 2011.

This approval becomes subject to review on **1/01/21**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variants 1 to 3 approved – interim certificate issued	2/12/10
1	Pattern & variants 1 to 3 approved – certificate issued	10/12/10
2	Pattern & variants 1 to 3 reviewed & updated – variant 4 approved – interim certificate issued	7/05/15
3	Pattern & variants 1 to 3 reviewed & updated – variant 4 approved – certificate issued	8/10/15

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 5/6E/15' and only by persons authorised by the submittor.

It is the submittor's responsibility to ensure that all instruments marked with this approval number are constructed as described in the documentation lodged with the National Measurement Institute (NMI) and with the relevant Certificate of Approval and Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act and may result in cancellation or withdrawal of the approval, in accordance with document NMI P 106.

Auxiliary devices used with this instrument shall comply with the requirements of General Supplementary Certificates No S1/0/A or No S1/0B.

Signed by a person authorised by the Chief Metrologist to exercise their powers under Regulation 60 of the *National Measurement Regulations 1999*.

Dr A Rawlinson

TECHNICAL SCHEDULE No 5/6E/15

1. Description of Pattern **approved on 2/12/10**

A THS model PIPER-PD340-C76 vehicle-mounted milk flowmetering system using a Proces-Data model PD340-C76 electromagnetic flowmeter (Figure 1 and Table 1) approved for measuring the milk collected from a milk tank.

1.1 Field of Operation

The field of operation of the measuring system is determined by the following characteristics:

- Minimum measured quantity (V_{min}) 100 L
- Maximum flow rate (Q_{max}) 2000 L/min
- Minimum flow rate (Q_{min}) 200 L/min
- Maximum pressure of the liquid (P_{max}) 800 kPa
- Ambient temperature range -25°C to 55°C
- Accuracy class 0.5
- Vehicle-mounted operation
- Product – milk at nominal controlled temperature

The flowmeter is adjusted to be correct for the liquid (milk) for which it is to be verified as marked on the data plate.

1.2 The System (Figure 1)

(i) A supply tank

The supply tank is a milk tank or a vat to which the metering system is temporarily connected. The base of these tanks slopes towards the outlet to facilitate emptying of the contents during the measuring process.

(ii) Pump

A centrifugal type or a positive displacement pump of sufficient capacity may be used to draw the milk from the supply tank outlet, which may be located lower than the inlet of the pump; however, unless a priming pump is used, for the centrifugal type pump the level of milk in the supply tank is higher than the pump inlet.

A check valve at the inlet of the pump may be required to prevent draining of liquid. Flexible piping may be used with an appropriate adaptor/reducer to connect the pump to the outlet of the supply tank.

(iii) Priming Pump

The priming pump (Figure 2a) is a THS model PD2000 hydraulically-driven flexible impeller pump, or any other compatible priming pump that meets the minimum required flow rate, used to flood the centrifugal pump.

(iv) Check Valves

To prevent reverse flow, a spring-loaded non-return valve is located immediately downstream of the flowmeter, which opens at pressures above 20 kPa. Additional check valves upstream of the flowmeter may be required to prevent reverse flow. An optional product sampler and/or strainer may be fitted between the pump and the gas separator, or before the pump.

(v) Gas Elimination Device

The gas elimination device is a THS model AEV-60L (*) float-operated gas separator fitted between the pump and the meter. This device incorporates a round float that has a shaft through its centre which allows the float to move in a vertical plane. At the top of this shaft is a 'needle' that operates a seat assembly designed to seal off the vent located at the top of the gas separator.

As the liquid level in the gas separator rises, the float rises until the seat assembly seals off the vent and the flow is directed to the flowmeter. When the supply tank is emptied, pumping continues until the liquid level (and the float) in the gas eliminator drops, causing the 'needle' to lose contact with the vent seat, which allows the air to be vented to atmosphere and the flow to the meter stopped.

The point at which the 'needle' loses contact with the vent seat defines the 'liquid reference level' in the gas separator for the start and end of the delivery. The spring-loaded vent valve located at the top of the gas separator can be operated manually or pneumatically for facilitating the clean-in-place (CIP) operation.

(*) The submittor should be consulted regarding the acceptability of alternative gas elimination devices.

(vi) Temperature Sensor

A Piper model E0465 PT100 temperature transmitter is used, typically located as shown in Figure 1.

(vii) Measurement Transducer

The measurement transducer is a Proces-Data model PD340-C76 electromagnetic flowmeter (Figure 2b) installed in a vertical position downstream of the gas separator. The flow through the flowmeter is in the upward direction.

The system has 3 × pipe diameters of straight pipe fitted upstream and downstream of the flowmeter.

(viii) Transfer Point

The transfer point is defined by both the liquid detect probe (located after the flowmeter) and the flowmeter itself in conjunction with the 'liquid reference level' established automatically by the gas separator. The quantity required to establish the 'liquid reference level' is known as the priming quantity, which is determined for each metering system.

(ix) Calculator/Indicator

The calculator/indicator has two components (usually in the same housing as indicated in Figure 1, and which also houses the printer), namely a Proces-Data model PD600 controller (Figure 3a) and a Proces-Data model PD681 indicator (Figure 3b) or any other NMI-approved calculator/indicator compatible for use with an electromagnetic flowmeter and configured for displaying the volume in 1 L increments.

The calculator/indicator uses version M4 software or equivalent (refer to Transport Hydraulic Solutions document '*Checking Program Versions on M Series DPI*') and has the following features:

- A liquid crystal display (LCD) with four arrow keys to navigate when prompted, an alphanumeric keypad, 'Function', 'open', 'start', 'stop' and 'quit' keys and a key-lock switch, with up to eight digital inputs and outputs (controlling pumps, valves and sampler) and four analogue inputs for temperature measurement.
- A programmable security level feature. Access to meter calibration is only possible via the Program Enable 'ON/OFF' switch located on the PD 381-03 circuit board (the PD381-03 (Figure 4) is mounted within the terminal box attached to the PD340-C76 flowmeter (on top as shown in Figure 2b); it is accessed by unscrewing this unit from the flowmeter). During normal operation the switch is set to 'OFF' which locks access to calibration parameters.
- Allows input of driver number, load number and supplier number.
- Displays the quantity and temperature of the milk collected.

After the last load:

- Empty the gas separator.
- Discharge the milk collected and initiate data transfer sequence.
- Initiate CIP (clean-in-place) operation.

(x) Flow Control

A flow control valve/device may be fitted downstream of the flowmeter.

(xi) Power Supply

The power supply is provided by the vehicle to ensure the system operates on a voltage between 18 and 32 volts DC.

(xii) Printer

A Piper model M0300 printer or equivalent (*) is located within the same enclosure as the calculator/indicator.

(*) "Equivalent" is defined to mean other proprietary equipment of the same or better specifications requiring no changes to software for satisfactory operation of the complete system including all checking facilities.

1.3 Verification Provision

Provision is made for the application of a verification mark.

1.4 Sealing Provision

Access to the Program Enable 'ON/OFF' switch situated on the PD 381-03 circuit board (refer cl. 1.2 (ix) and (Figure 4) can be secured by a sealing wire through the two sealing screws provided on the terminal box, or alternatively by means of one or more destructible adhesive labels. Note that the 'Program Enable' switch must be set to the 'OFF' position during normal operation.

1.5 Descriptive Markings and Notices

(a) Each measuring system shall bear the following information, placed together either on the indicating device or on a data plate:

Pattern approval mark	NMI 5/6E/15
Manufacturer's identification mark or trade mark	…..
Meter model	…..
Serial number of the instrument	…..
Year of manufacture	…..
Maximum flow rate, Q_{max}	….. L/min
Minimum flow rate, Q_{min}	….. L/min
Minimum measured quantity (V_{min})	….. L
Priming quantity	….. L
Approved for use with milk	…..

(b) The minimum measured quantity must be displayed in the vicinity of the indication in the form of 'V_{min} (or 'MMQ' or 'Minimum Delivery') 100 L'.

2. Description of Variant 1 **approved on 2/12/10**

With alternative electromagnetic flowmeters as listed in Table 1. The calculator/indicator is configured to display the volume at least in 1 litre increments. Figure 2b shows a Proces-Data model PD340-C76 flowmeter.

TABLE 1

Meter Model	Maximum Flow Rate (L/min)	Minimum Flow Rate (L/min)	Minimum Quantity (L)
PD340-C25	116	16	5
PD340-C38	333	33	10
PD340-C51	666	66	50
PD340-C63	1333	83	50
PD340-C76 (*)	**2000**	**200**	**100**
PD340-C102	3332	300	100

(*) **The pattern**.

All systems have 3 × pipe diameters of straight pipe fitted upstream and downstream of the flowmeter.

3. Description of Variant 2 **approved on 2/12/10**

For use with a self-priming main pump (Figure 5) that meets the minimum flow rate.

4. Description of Variant 3 **approved on 2/12/10**

For use with a self-priming Lobe type pump (Figure 6) that meets the minimum flow rate.

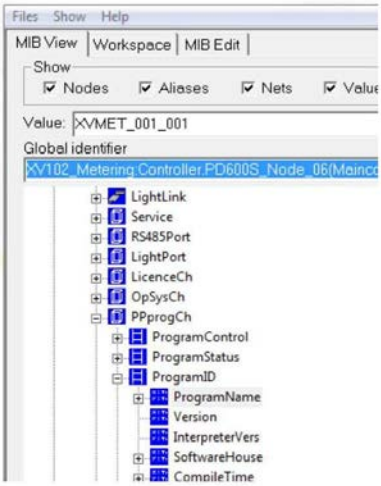
5. Description of Variant 4 approved on 8/10/15

For use with a PIPER model XV-102 PLC/HMI interface (Figures 7 and 8) instead of the calculator/indicator described for the pattern. The HMI touch screen interface has various functions to navigate the touch screen, with up to ten digital inputs and outputs (controlling pumps, valves and sampler) and four analogue inputs for temperature measurement.

5.1 Software

The PIPER PD600 software provides an interface between the PD340 flowmeter and the XV102 PLC/HMI interface.

The PD600 software version can be read via the 'Vigo' field bus management system for P-Net devices and is the format $$$$$_XXX_xxx where $$$$$ is the program description XXX is the major version and xxx is the minor version. The image below shows the current version 1.1 ('XVMET_001_001').



TEST PROCEDURE

Instruments should be tested in accordance with any relevant tests specified in the Uniform Test Procedures. Instruments are to be tested with milk and the system either primed with milk before commencing the delivery, or the priming quantity marked on the data plate is added to the quantity measured.

NOTE: The quantity required to prime the system shall be determined at verification and shall be stamped on the nameplate. Complete one or more deliveries and check the volume indicated against the actual volume.

Maximum Permissible Errors at Verification

The maximum permissible errors are:

±0.5% for in service inspection (without introducing air/gas)
±0.3% for calibration adjustment of the meter.

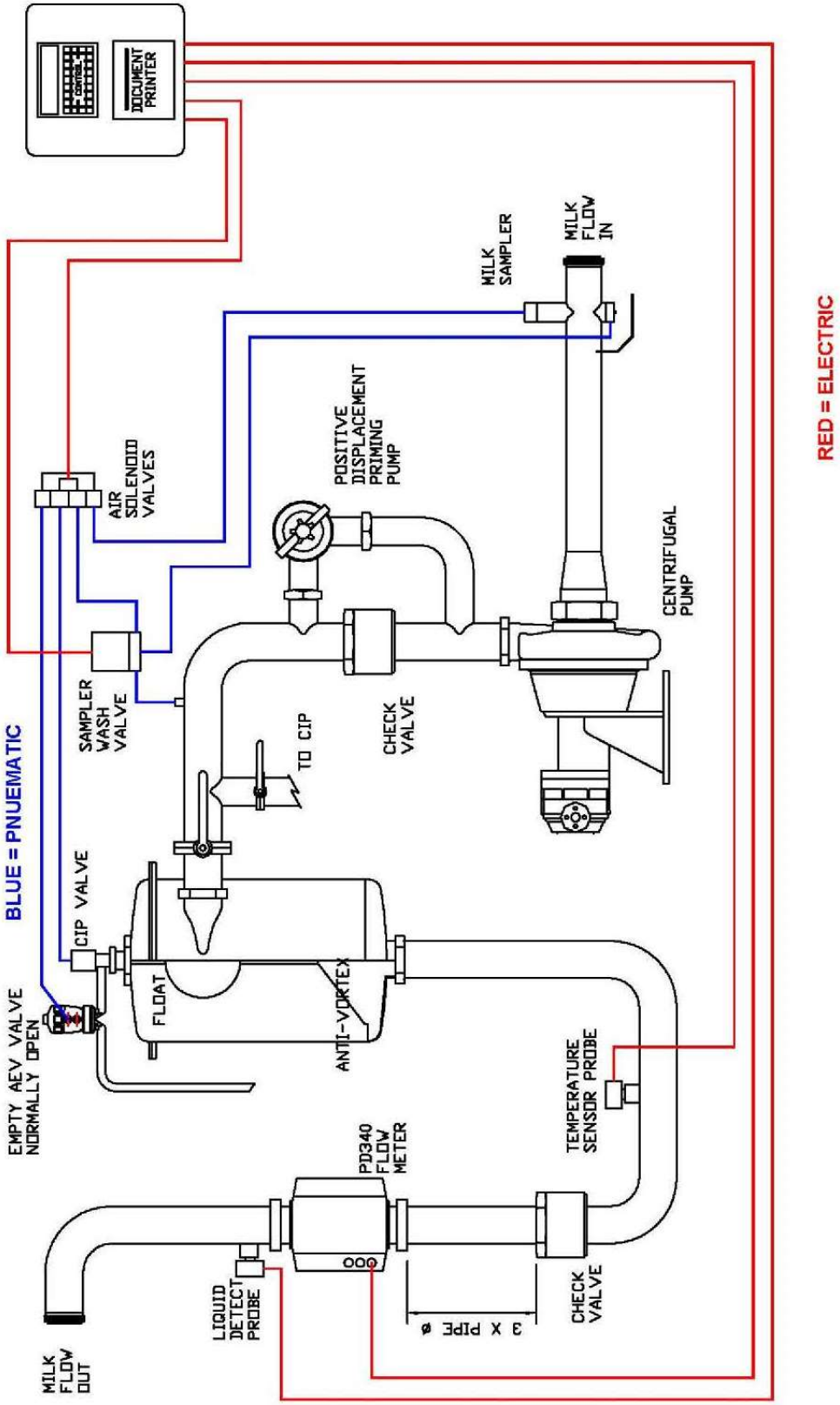
1. Empty Compartment Test

(a) Allow the supply to run dry during a test delivery; stop the pump motor and refill or change either the supply tank or the proving measure. Then start the pump motor to allow the delivery into the proving measure to continue; or

(b) Allow the proving measure to run dry during a test delivery.

NOTE: This test should only be carried out where it could be expected that the tank will be completely emptied during a normal day's operation. The maximum allowable difference between metering with no air/gas and introducing air/gas is 1%.

FIGURE 5/6E/15 – 1



THS Model PIPER-PD340-C76 Milk Flowmetering System (Pattern)

FIGURE 5/6E/15 – 2

(a) A THS Model PD2000 Priming Pump

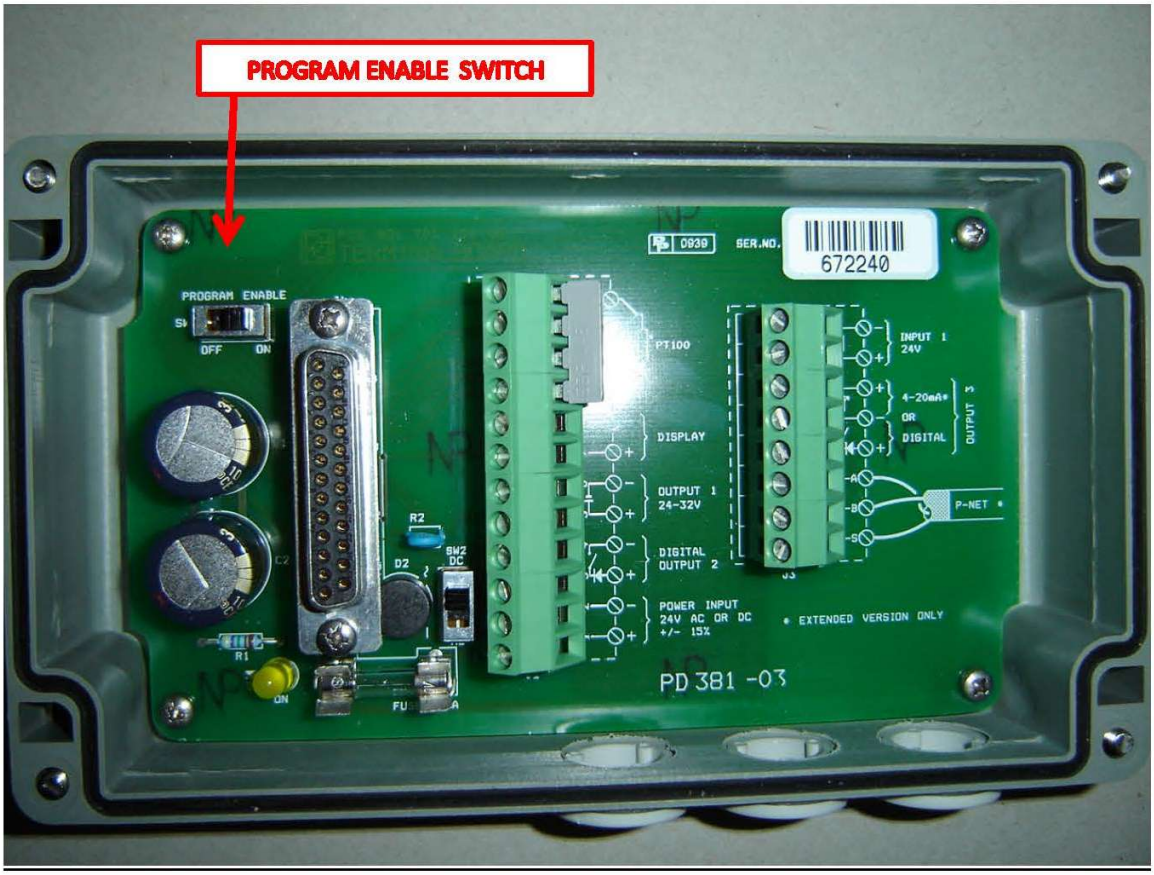
(b) A Proces-Data Model PD340-C76 Electromagnetic Flowmeter

FIGURE 5/6E/15 – 3

A Proces-Data Model PD600 Controller

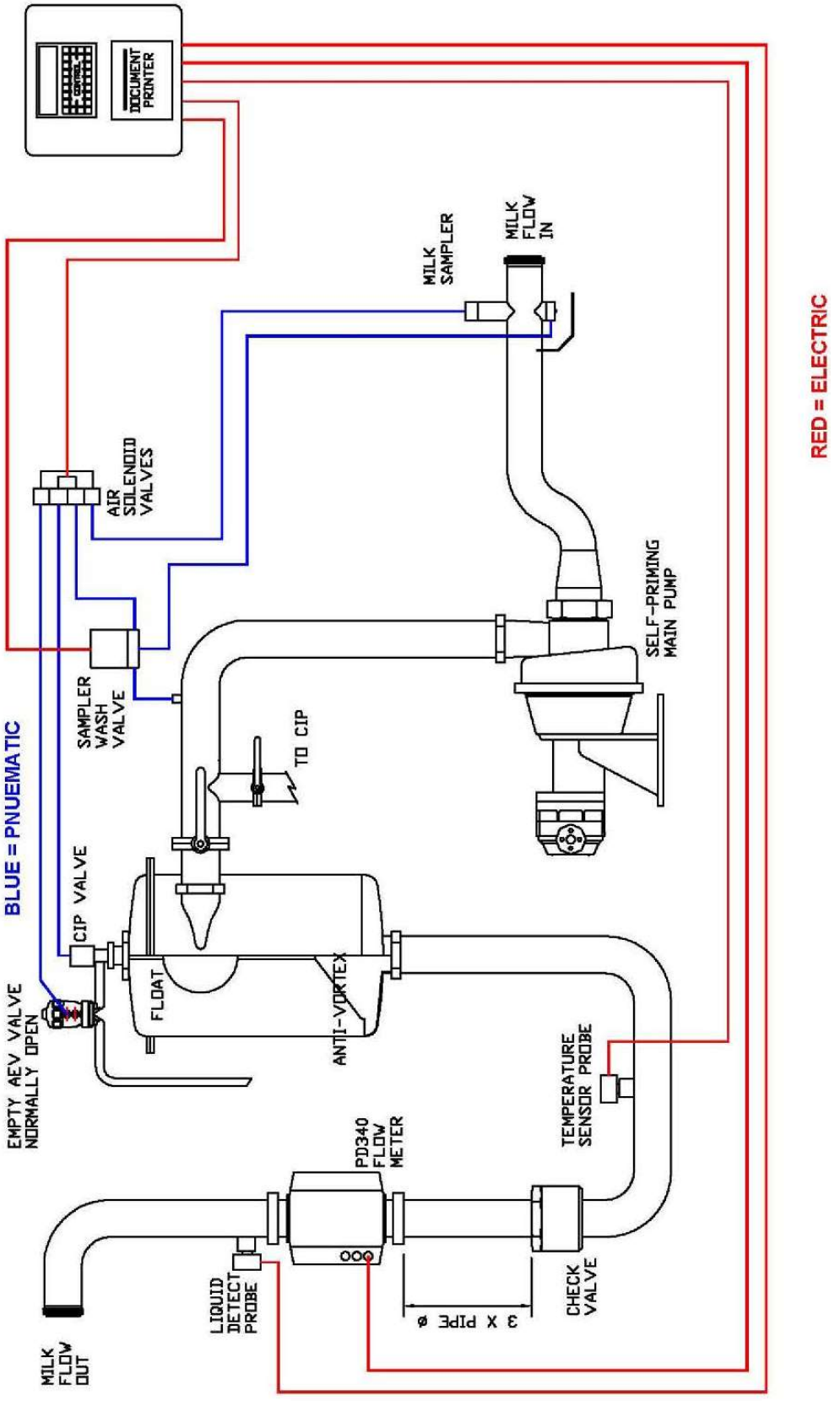
A Proces-Data Model PD681 Indicator

FIGURE 5/6E/15 – 4



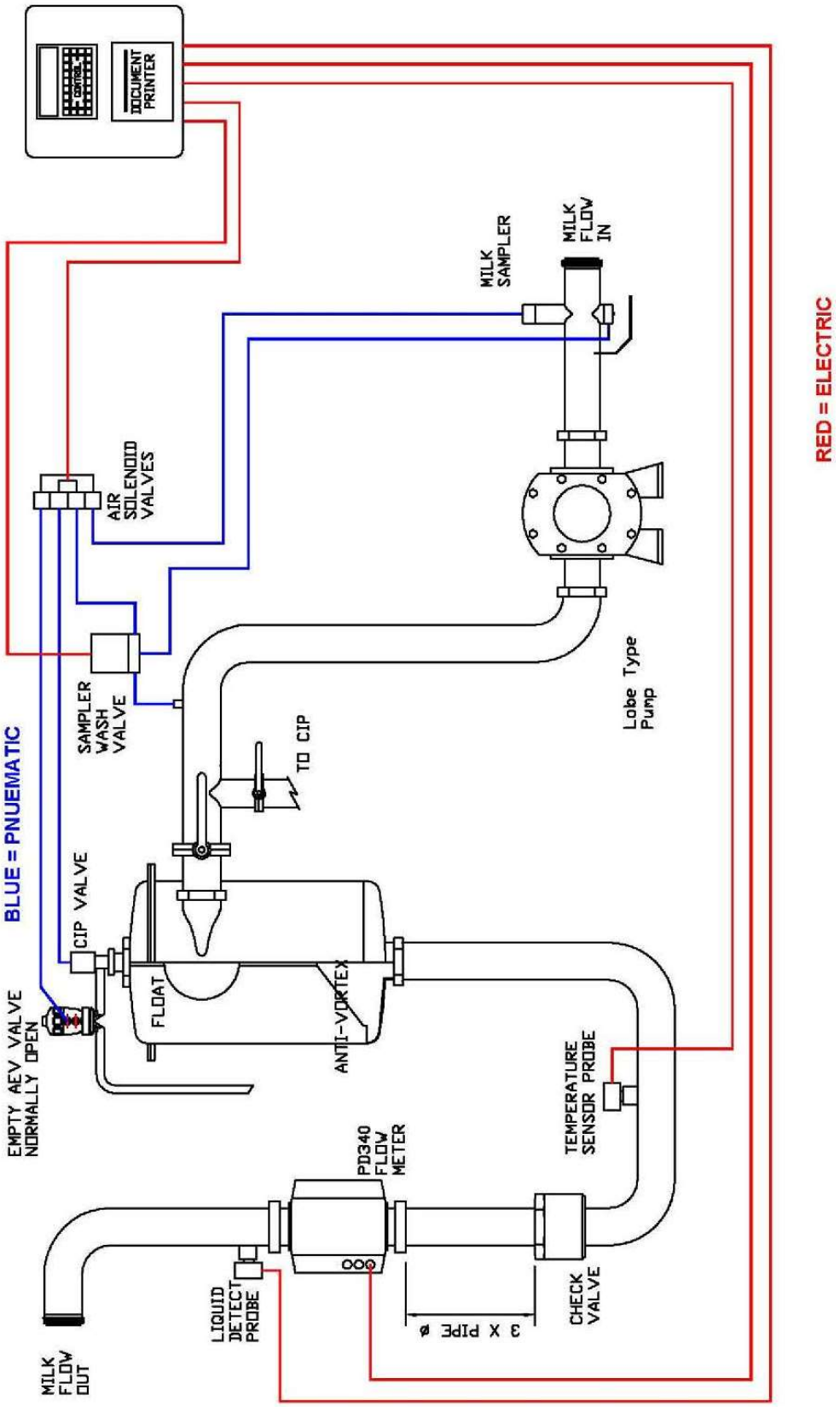
Program Enable ‘ON/OFF’ Switch Located on the PD 381-03 Circuit Board

FIGURE 5/6E/15 – 5



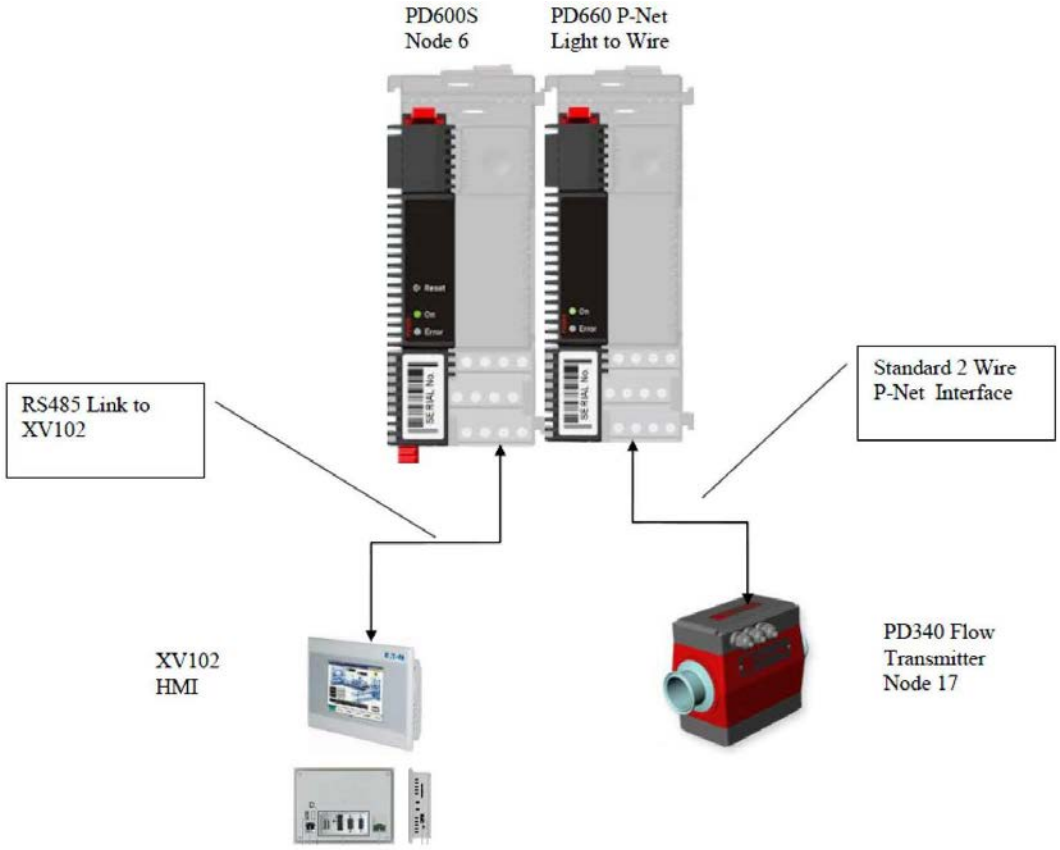
Typical System With a Self-priming Liquid Ring Pump (Variant 2)

FIGURE 5/6E/15 – 6

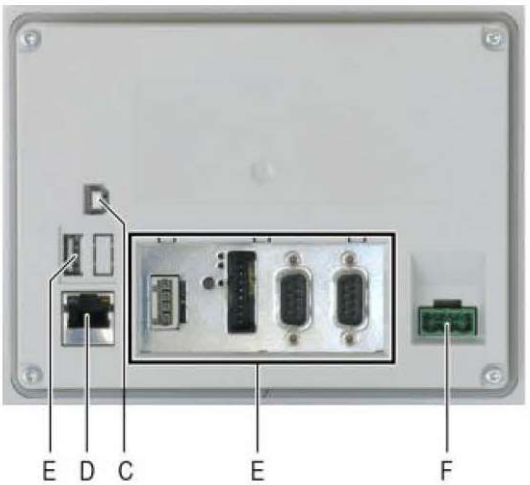


Typical System With a Self-priming Lobe Pump (Variant 3)

FIGURE 5/6E/15 – 7



(a) PIPER Model XV-102 PLC/HMI Interface System Layout (Variant 4)



(Figure 3d) A XV-102 Interface

Interface Interface description
A Jumper UPD/RUN
B DIAG
C USB Device
D Ethernet
E Interfaces, depending on the device version:
USB Host
SmartWire-DT Master
CAN
Profibus
RS232 (System Port)
RS485
F Power supply

(b) PIPER Model XV-102 PLC/HMI Interface (Variant 4)

FIGURE 5/6E/15 – 8

Typical PIPER Model XV-102 HMI Touch Screen Display Units (Variant 4)

~ End of Document ~