

MELISSA



TECHNICAL NOTE



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Functional tests results Waste Preparation Unit

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1. Introduction

In BELISSIMA Phase 1, a Waste Preparation Unit (WPU) was constructed by Packo Inox NV. The functional test plan for the unit including P&ID and component description was described in TN80.311.

The tests were organized in three phases. A first phase aimed to check the absence of leaks and to check functionalities and responses of components. In a second phase, the accuracy of the level transmitter indicating the actual liquid level in the homogenization tank of the WPU was verified. In a last phase, the adequacy of controller actions under normal and abnormal operation was checked.

The test record sheets were assembled in TN80.421. In this TN, the results are presented and discussed.

2. Functional test results Phase 1

The test records show that none of the components/connections showed leaks after a 24 h period of filling with water.

The main tank of the WPU contains a double jacket, in case temperature control would need to be implemented in the future. This feature is not installed yet. Therefore, the leak tightness of the two hand valves for circulating water through the double jacket, was not checked.

Functionalities and responses of all components were conform expectations.

Therefore, the tests were successfully passed and no deviations recorded.

3. Functional test results Phase 2

The level sensor LT_0004_01 indicating the liquid level in the homogenization tank of the WPU was calibrated according to manufacturer's instructions using a 9-points calibration. This was deemed to be most appropriate because of the non-linear increase in water volume with the height of the tank (round-bottomed tank and the presence of a recirculation pipe).

After this calibration, the tank was filled with 40 kg of water. The stability of the signal was monitored every 2 min for a total duration of 30 min. The level sensor indicated a signal of 40.85 ± 0.04 l. The procedure was repeated for a lower amount of water (weighed as 20 kg). In this case, the average signal was 20.72 ± 0.02 . In both cases, it was observed that the outgoing signal of the level transmitter LT_0004_01 corresponded with the measured value.

The following conclusions could be drawn:

- the level indicator correctly shows the actually added amount of water with a deviation which is well below the target of 10% (corresponding to ranges of 40 ± 4 and 20 ± 2 l respectively).

- The level transmitter also showed a stable signal. Again, the deviation was below the target of 10%.

This test phase was thus passed successfully and no deviations recorded.

4. Functional test results Phase 3

First, a series of tests was performed under ‘normal operation’.

The different pushbuttons and turning knobs of the control unit were activated and their response recorded. They all performed conform expectations. It must be noted that the original test plan description of TN80.311 (Functional test plan WPU) indicated that the cleaning tank could be filled by pushing button CO-03. This is not correct. The cleaning tank is filled by manually opening hand valve HV_0100_01.

Then, 2 different volumes of water were added sequentially to the homogenization tank of the WPU. It needs to be remarked that in the test protocols of TN80.311 (Functional test plan WPU), the required action for this was erroneously written to be ‘Button ‘Start filling CO-04’ is pushed’. This should rather be button CO-03.

After setting a target level of 20 l or 40 l of water, the installation was filled and emptied 3 consecutive times and the added water weighed. The volume readings and weighed volumes are shown in Table 1. It is clear that deviations are always below the 10% target.

Table 1: Volume readings and weighed water volumes for functional testing Phase 3.

Test	Volume reading LT_0004_01 (l)	Weighed water volume (kg)	Deviation (%)
1	20.15	20.09	0.3
2	20.07	20.15	0.4
3	20.00	20.29	1.5
4	40.02	40.70	1.7
5	40.13	40.91	1.9
6	40.25	41.10	2.1

A final test under ‘normal operation, was to set a first volume of 15 l and activate the pushbutton CO-03 to add the corresponding amount of water, then set a second volume of 32 l and add the additional water by activating the pushbutton. Erroneously, for the final setpoint no extra volume of 17 l was added but the final volume was set to 17 l. The results are recorded in Table 2. Deviations were always below the target of 10%.

Table 2: Volume readings and weighed water volumes for functional testing Phase 3.

Test	Volume reading LT_0004_01 (l)	Weighed water volume (kg)	Deviation (%)
1	15.09	/	/
	17.05	16.25	4.7
2	15.10	/	/
	17.07	15.98	6.4
3	15.06	/	/
	17.10	16.01	6.4

The tests under abnormal operation simulating low levels, opening of manhole, emergency stops and power failure, all showed the expected result.

This part of the tests was thus also passed successfully and no deviations recorded.

5. Conclusions

The Functional test plan for the WPU was executed successfully and no deviations were recorded.