MICRORADAR
Laboratory and on-line microwave moisture meters

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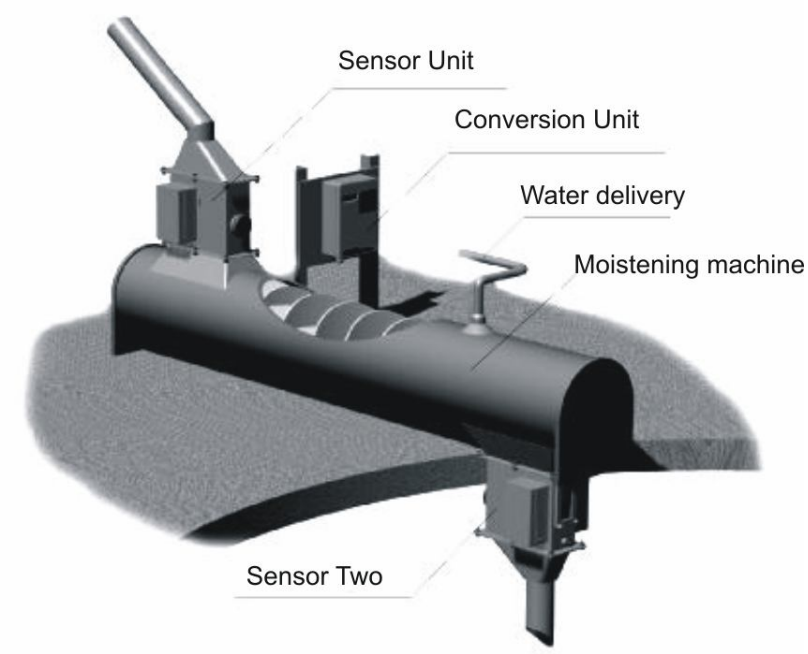
System of automatic additional moistening of grain before grinding MICRORADAR 200-01



The system of moisture measurement and moisture regulation of grain during the process of its additional moistening before grinding MICRORADAR 200-01 is based on duplex on-line grain moisture meter MICRORADAR 113-2. MICRORADAR 113 -2 is the only devise among present moisture meters designed for moisture measurement of wet and freshly-moisten grain. It gives the opportunity to fulfill regulation of the process on basis of the main characteristic – moisture of grain at the output of the system, what essentially distinguish this devise from other automatic systems, functioning on the basis of indirect indications, such as moisture of grain at the entrance, consumption of grain and use of water. The appliance MICRORADAR 113-2 consists of two moisture meters MICRORADAR 113, one of them links up at the entry to the moistening machine, and another one – at the output. (Look Picture 1). Signals of both Sensor Units are processed in Microprocessor Unit on the basis of particular algorithm, allowing to determine separate moisture of dry grain coming to the moistening machine, and moisture of grain after the moistening.

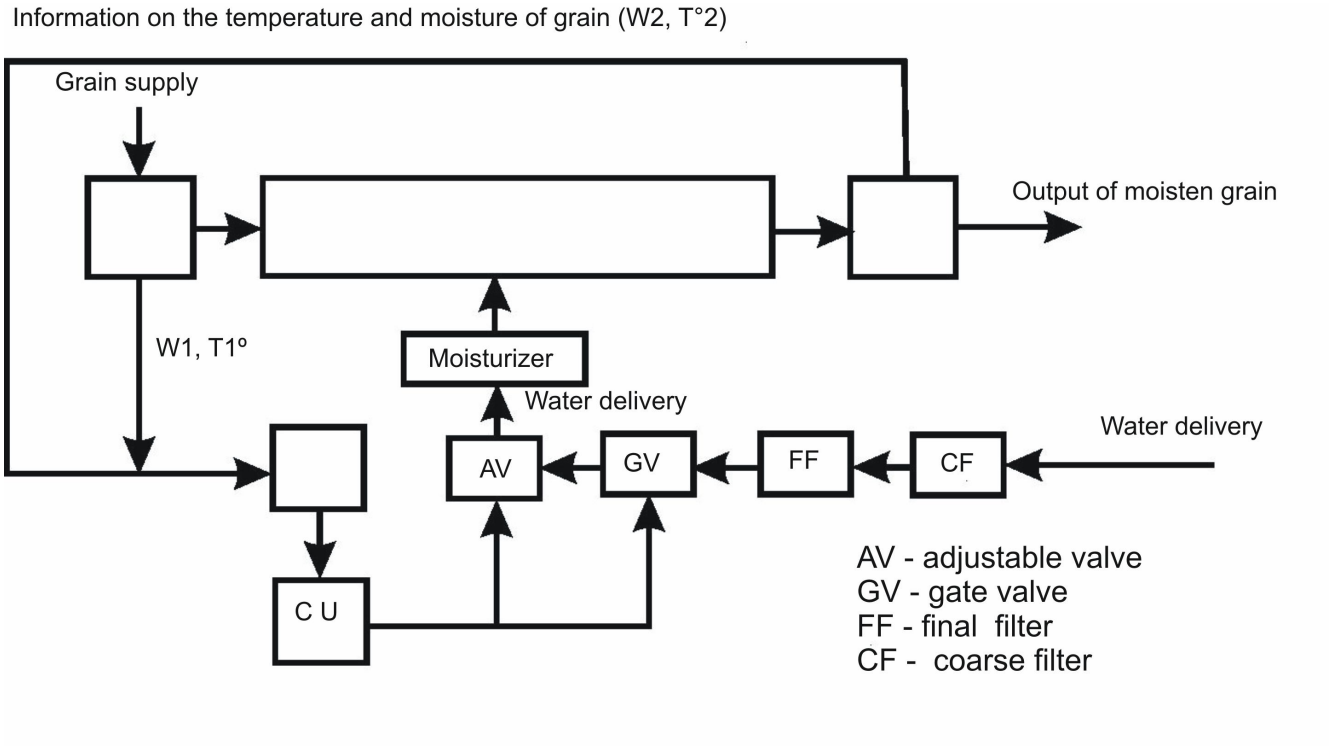
The system of moisture measurement and moisture regulation of grain during the process of additional moistening before grinding is delivered in next configuration:

Denomination	Notation	Quantity (pieces)
Moisture meter, consisting of:	«Microradar-113.2M»	1 set
Sensor Unit	BS1(2)	2
Control Unit	CPC	1
Operations manual	РЭ113М.000-03	1
Registration certificate	ПС113М.000-03	1
Hydraulic board, consisting of:	ПГ	1
Adjustable valve	VVG44.15-0.63	1
Gate valve ½"	ESM86	1
Coarse filter		1
Final filter		1*
Flow meter		1*
Unit of Commutation and Signaling	БКС	1
Computer		1*
Operations manual	РЭ200-01.000-03	1
Registration certificate	ПС200-01.000-03	1

* - delivered as additional equipment according to the agreement with customer

Picture 2. Main units of the System – Unit of Commutation and Signaling, Moisture meter MICRORADAR 113-2, Hydraulic board, Computer.

Structure chart of the System is represented on Picture 3.



Functioning of the System

The system operates in two modes: manual and automatic.
In the automatic mode on the basis of measured moisture and temperature of grain at the entrance to **BSD** (W1, T°1) and at the output from **BSD** (W2, T°2) Conversion Unit (Controller) according to required prescribed value of moisture at the output … gives out proportional signal to … for water delivery regulation.

Main technical information

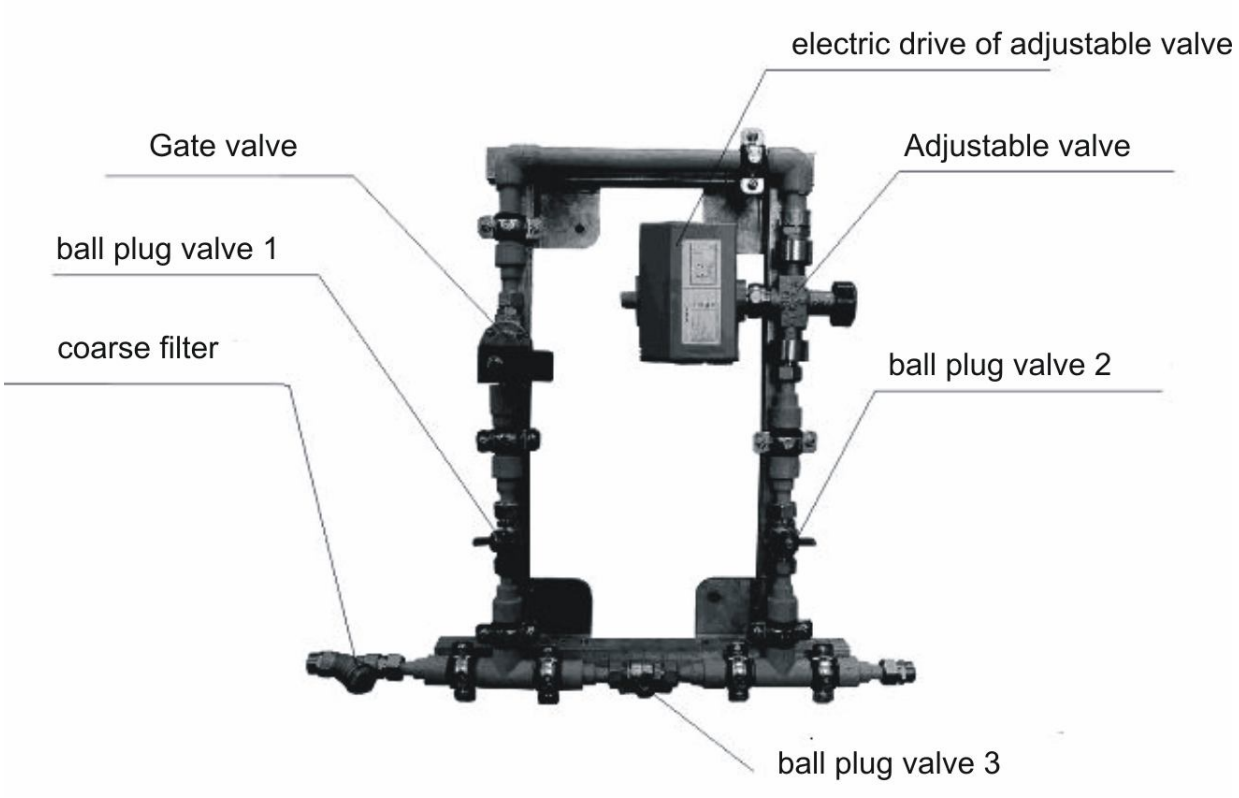
1. Main control characteristics:
   - Moisture and temperature of grain,
   - Presence of grain in moisture sensor,
   - Presence of grain movement in moisture sensor.
2. Main and controlled characteristics:
   - Grain moisture at the system outlet.
3. Moisture measurement range: from 10 to 20%.
4. Sensitivity – 0,1%.
5. Precision of moisture measurement ±0,5%.
6. Temperature measurement range 0 +80 °C .
7. Precision of temperature measurement ±0,5 °C.
8. Continuous around-the-clock work.
9. Setting range of ultimate moisture: from 10 to 20%.
10. Setting error ±0,1%.
11. Accuracy of ultimate moisture ±0,2%.
12. Operating conditions – manual and automatic.
13. Control object – **A1-BSD-1 или A1-BSD-2.**
15. Water flow quantity 0 … 600 liters/hour.
16. Grain moistening from 0 to 5%.
17. Quantity of moisture control points - 2.
18. Quantity of temperature control points - 2.
19. Quantity of grain presence testing points - 2.
20. Quantity of grain movement testing points - 1.
21. Characteristics of pilot valve:
    - port size 1/2";
    - regulation curve– linear;
    - coupling rod travel – 5,5 mm;
    - overall dimensions: 146 x 121 x 39 mm;
    - electric drive SQS35.00:
    - supply voltage 220V, 50Hz;
    - control function – three-position;
    - time of motion 120 sec.
22. Characteristics of the gate valve:
    - port size 1/2";
    - overall dimensions : 61 x 89 x 48 mm;
    - normally closed;
    - supply voltage 220V, 50Hz.

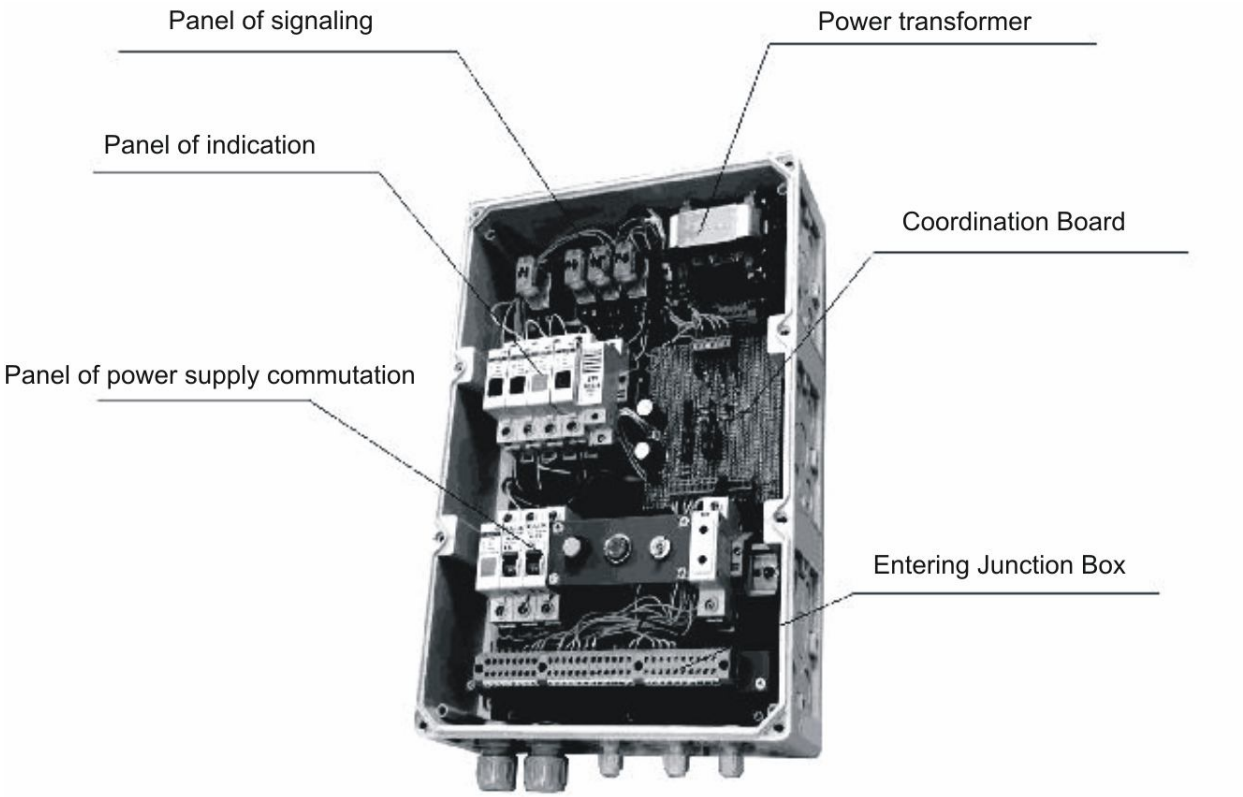
Increasing or decreasing the water delivery to moisturizer by influence to the adjustable valve, Conversion Unit maintains the output moisture in compliance with established task. As a result of contingency Conversion Unit can decide to stop the process. In this situation Unit of Commutation and Signaling gives a signal, which closes the gate valve. The water delivery is carried out through the final filter. Sometimes the system of water delivery is additionally equipped by coarse filter.
Information about the system work gets to the remote computer by bus-bar RS485.
In manual mode the regulation of water delivery is carried out by operator, who controls moisture of grain at the entrance and at the output from additional moistening machine according to the indications of moisture meter. Regulation of water delivery, entering of moisture values, and correction of moisture meter indications can be carried out both from remote computer and from keyboard of the Controller (Conversion Unit). From the symbolic circuit represented at the display, operator can observe the process of moistening, look through the previous recordings of technical process. The data on moisture and temperature of grain at the entrance and the output of adding moisture machine, as well as water consumption, are collected and represented at the display in form of trends.

The Controller continuously analyzes the condition of the system, and in case of contingency gives a signal of attention, which represents a two-digit code. This signal comes to Unit of Commutation and Signaling, where it is interpreted, and depending on the situation the signals of control and signaling are produced.

Before the starting the operator makes the following steps:

- Chooses the operating mode of the system (manual or automatic),
- Establishes the moisture of grain at the output from the moistening machine.
- Establishes the range of admissible values of working characteristics: moisture and temperature at the entrance and at the output of moistening machine. Overrun of any of these values is considered as contingency of 1st or 2nd type. In case of contingency of the 1st type the system gives a signal, but continues to work, as there is no danger of over-moistening; in case of contingency of the 2nd type the system gives a signal and closes the cutoff valve and stops the process.





Picture 4. Structure of Hydraulic board and Unit of Commutation and Signaling.

Main technical features of the moisture meter

Uniform analog output (at option)	Current (4 … 20; 0-5; 0-20) mA
Output capability of current terminal , Ohm	< 500
Communications channel to Computer	RS-485
Setup time of operating mode	no more than 20 min
Operating conditions	continuous
Supply voltage	220 V (+22 V…-33V)
Power consumption	no more than 50 B*A
Overall dimensions of Conversion Unit	255 x 180 x 90 mm
Weight of Conversion Unit	no more than 1,0 kg
Overall dimensions of Sensor Unit	175 x 234 x 274 mm
Weight of Sensor Unit	no more than 6,0 kg
Distance of Sensor Unit from Conversion Unit	no more than 25,0 m
Distance of Conversion Unit from BI	no more than 100 m
Fulfillment of the frame of units	IPI54

Construction of moisture sensors