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Installation Procedure of IRMA-7 Model D

The moisture meter **IRMA-7-D** can be mounted to many kinds of web and sheet machines. To ease the burden of new designers, we have written this short note. It applies in many respects to installing all other **IRMA-7** meter models too.

Perform the following steps in a reasonable order to obtain a perfectly working system. Note that ordering the various subsystems in addition to the meter will always require some time with unexpected delays. Expect to see the system working within six months, usually much sooner.

0. Fill in the forms in the Appendix to cover the most important details of the application, like the paper machine, the paper grade and working conditions. These constitute the basics for designing the whole system. It pays to be accurate in details at this stage. It would be a good idea of going to the mill and make practical temperature and humidity measurements yourself. If the customer allows it, take your camera with you. Ask for mechanical drawings and make some critical measurements yourself. It would be wise to discuss with the manufacturer at this stage. Procure the moisture meter which will be manufactured according to the data given. One of the most important factors is the working distance. Also one should recognize any needs for putting the meter to an angle (20 deg) when measuring glossy grades. The final user usually has a number of design targets for the system. Write them down and get his signature for acceptance of the target. This is to avoid any misunderstandings and is regular project control. Full documentation is recommended at every stage. Write a user's guide for using the final system.

1. Find out the actual **selection of paper grades** to be used in the near future. The manufacturer will make any calibrations if you do not have the experience/facilities yourself. Deliver paper samples to the manufacturer. A few A4-sized sheets per grade is quite sufficient.

2. Before entering any of the steps below, connect the moisture meter with the cables delivered and test all aspects which might be used in your application. The purpose is to give you the confidence that the system really works and if you get into any trouble, you may be able to locate its causes faster.

3. Decide the user interface to be mainly used: RS232 for PC, LAN and a LAN server with private software and possibly a PC or a terminal, Profibus DP fieldbus, voltage output for some data acquisition unit or an integral/separate keyboard/display unit and perhaps a large numeric display.

3.A RS232 for PC (one to eight meters): Procure a PC with a suitable display and at least one serial port. Any available graphic display type will do. Install the meter's software **IRMA7Basic** or **Advanced** or **Moisture Profiler** and test it with the meter. Save the program settings. This option can be extended to cover up to eight meters by using the **LAN232** unit. Possible problems: Port selection incorrect at the time of starting the program.

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3.B LAN and a LAN server (RS485-based) with private software and possibly a PC or a terminal (a varying number of meters): Procure the RS485 LAN server board which may be a separate self-contained controller unit whose program you should be able to build in some way or let somebody else finish. Test the total system completely before delivering. Possible problems: Cable polarity incorrect, master software timing and delay settings.

3.C Profibus DP fieldbus (a varying number of meters): Procure the DP Master unit and its software. You probably need a basic driver software and a system building tool. Connect the meter and the master together, load in the GSD file sent with the meter and do some simple data retrieval testing with the polled data. Then you can start building the final application with the master software with graphics and archiving. Possibly connections to other mill automation systems are required. You can control many other systems via DP with your master, like motor controllers, intelligent sensors etc. Possible problems: Cable polarity incorrect, master software incompatible with true Profibus DP operation, timing and delay settings.

3.D Voltage output for some data acquisition unit (one meter): Procure the data acquisition system for reading the analog voltage. Change the voltage scaling in the meter if it does not suit the system. The output range can be jumper selected and the actual data conversion factor can be scaled (see the moisture meter's user's guide). Make sure that the signal you are directing to the voltage line is really moisture, not any of the other options available (unless required). This can easily be changed, though. Test the system operation with some paper sample in front of the meter. Possible problems: Cable polarity incorrect, noise from long cables, voltage range incompatibility, incorrect calibration table in use, meter in Low Power mode.

3.E An integral/separate keyboard/display unit and possibly a large numeric display. Possible problems: Little problems are associated with this option as everything can be seen and changed as long as the user is besides the display. Option available at this time: **TEA-K30.**

4. Plan the **mounting distance and position** to the web at a suitable location. A free draw of web is usually the best spot unless the web has a strong vibration there. Vibration will increase noise, especially, if the amplitude exceeds the working range. Measuring over a cylinder is all right but one has to be a little cautious with that to avoid any direct reflections from the cylinder with thin grades. Moist felts under the web usually affect the moisture reading with thin grades (< 80g/m2) but the result is in good accordance with true moisture. Take into account the limited space, air temperature, humidity and flying rubbish and water. A very important aspect in many mills is paper "runnability". The personnel has to be able to run a new paper end after a web break without having any troubles at all with the moisture meter. It must not be too close to the web. It would be recommended to have the meter sense the web break, inform it to the system and then the system itself would retract the meter head to a safe position. After the user allows it, the head is placed over the web.

5. Design meter mounting hardware and cables taking into consideration the following:

5.A Cooling of the meter in warm positions. It is done with regular pressurized air (no oil). Refer to the meter's user's guide for specifications of the meter in this respect. Build a safety shutoff system which senses the meter and surroundings temperature. If the pressurized air is shut off for some reason, the system should warn the user of this immediately and turn itself off. The moisture meter itself has the last resort, turning to Low Power mode when the meter's own

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temperature limit has been exceeded. Use some external temperature sensors to watch over the situation. Double check this to make sure. Else the customer may loose his meter when the pressure drops.

5.B Splash protection to keep the meter clean. This is usually done with pressurized air directed in front of the meter's optical surfaces in a skewed way towards the web.

5.C Service access must be available for the meter to clean it up after some bad web break with lots of pieces of paper flying around. It would be recommended to have some sort of hinge or pivot for turning the meter to a service position. Regular cleaning would be advised for the customer.

5.D A general protection cover against difficult conditions. It could be a simple box with a proper opening for the infrared beams. This will give the meter extra protection and keep it cleaner. Also the cables and connectors stay in good condition in this way. Arrange air flow inside the box.

5.E The cabling should be designed so that it will cover any future needs and to work reliably for a long time. Make sure to use cable with a proper wire gauge to prevent any electrical losses which might cause hesitating bootups of the meter. The moisture meter requires a lot of current when it tries to boot (minimum 10V at 5A at the meter end). The normal operating current of the meter is much lower, of the order of 0.9 A if no electric cooler is installed. Remember that cable losses increase with temperature. This is not an issue for short cables (< 10 meters). Cabling schematics are required in many mills after successful installation.

5.F Security is a serious issue. The system must be absolutely safe for all users. No loose bolts or parts are allowed at any time, not even while the system is installed. No sharp edges, no covers falling on the user.

5.G In a scanning system, all of the above should be taken into account while designing the scanner, its meter holder bracket and cables. The cable should be a special type for robot use to tolerate the continuous bending for a few years. The cable has to be replaced regularly.

6. Discuss with the manufacturer about your hardware design and then **build/procure** subsystems needed. Make a schedule for each delivery and subsystem design/building phase. Most of the software can be implemented while the hardware is under construction.

7. Mount all subsystems, when possible, first in your lab to a working system. Test all aspects possible and see if you can reach the design targets set by the customer. Everything should now be working except the moisture signal may be far off from true due to lack of proper web target.

8. Mount all subsystems to the production machine. Connect the cables and test all aspects possible. Check to see if you can reach the design targets set by the customer. Everything should be working now and you should get the proper moisture signal. Web temperature signal should be working all right too. Check it with an IR hand thermometer. The full system should be run for a few days or weeks before you hand over the system to the customer. This

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is to make sure the start phase problems are fixed right away and the customer is not annoyed by them. Do not be too hasty in this! There always are some minor problems due to unexpected phenomena, like excessive splashes, higher machine vibrations, higher temperature than expected etc. Select the proper digital filtering in the meter to suit the situation and customer's needs. Avoid using slower filter than is necessary.

9. Check the calibration table to be used. Fine tune the calibrations to match the real moisture level for each calibration. Create a few more of them with the **Composer** expert system to cover any possible needs predicted in the near future. In this way, you can help the customer immediately, even in the phone, if sudden requests appear. In board machines (BW < 110 g/m2) this is no issue at all as one can probably use the same calibration all the time. Make backup copies of the resulting library to various places.

10. Leave the system to the customer and be ready to serve him afterwards with expanded software features and more moisture meters in other positions etc. When the customer calls being in a trouble, **serve him right away**. **Never leave him in the dark**.

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