

FL-DIGI-SMART BASIC



LCD-Display optional

When starting-up the FL-DIGI-SMART or FL-DIGI-MODUL please pay attention to:

- Before starting the evaluating software, connect the SMART to the evaluation unit to avoid an error message after opening the software.
- To enable a communication with the SMART, a COM-PORT has to be selected in the evaluation software:
- **FL-DIGI-SMART:**
„Service“ > enter „Password: 55124“ > select COM-PORT

Index

General Function Description	P. 2
Technical Data	P. 2
Process Integration	P. 2
1. Parametering of FL-DIGI-SMART BASIC	P. 3
1.1 Generals	P. 3
1.2 System Requirements	P. 3
1.3 Installation Instructions	P. 3
1.4 Display of Measured Values and Mixing Data	P. 4
1.5 Calibration	P. 5
1.5.1 Automatically Calibration	P. 5
1.6 Protocolling	P. 6
1.7 Probe Check	P. 6
2. Serial Interface	P. 7
3. Terminal Occupation	P. 8
Probe connection	P. 9
4. Service (FL-DIGI-SMART Configuration)	P. 10-13
5. Selection of Installation Place	P. 14-15
6. Exchange of the Measure Head	P. 16
7. Interference of ISM-Frequencies	P. 16
8. Error Shooting	P. 17

GENERAL FUNCTION DESCRIPTION

The FL-DIGI-SMART BASIC supports the digital measure value processing of one directly connected microwave moisture probe. The high calculation capacity guarantees a fast measured value grasping and evaluation. Special software filters are correcting material flow spaces and irregular pressure conditions on the probe optimally. The FL-DIGI-SMART BASIC is working in MASTER-SLAVE-operation. Only if the control asks for, the moisture values will be given out. The steady system control connection as well as the parametering are proceeded via serial interface (RS 232/ 485 or USB 2.0). Via switch contacts the analog output and measurement start can even be realized.

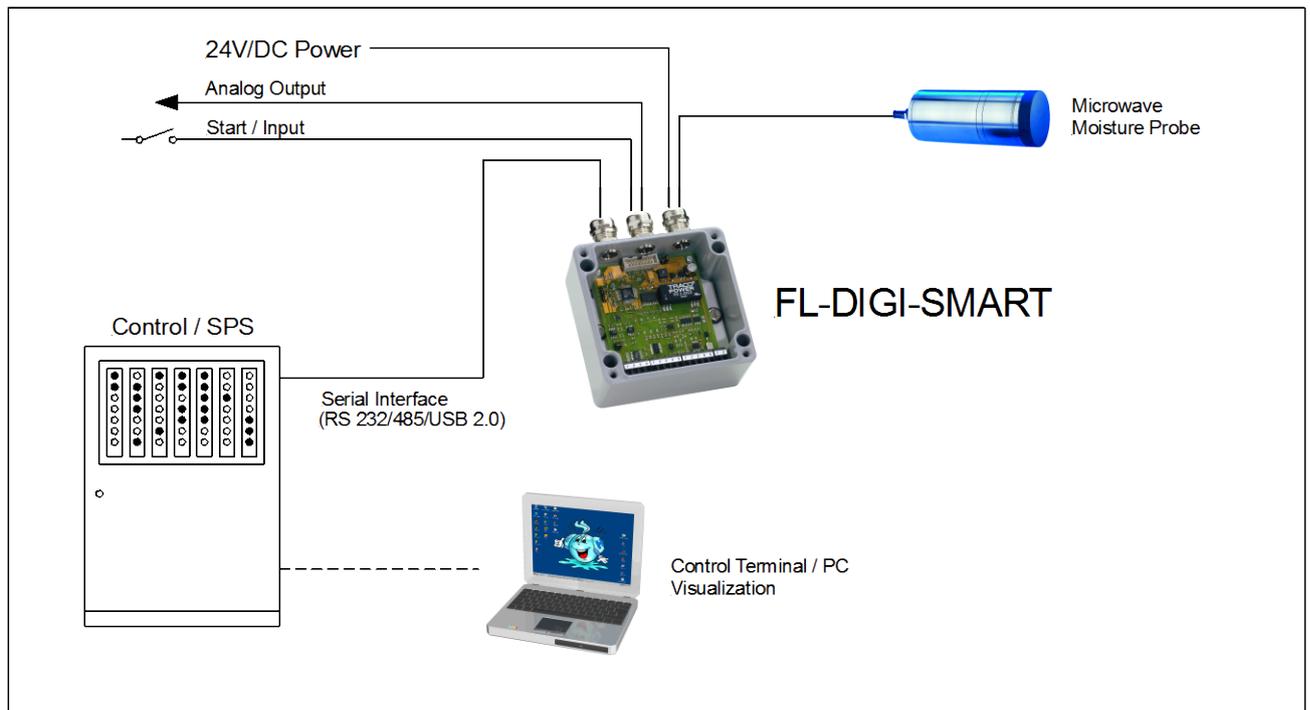
TECHNICAL DATA

Dimensions:	H: 90 mm ; L: 122 mm ; D: 120 mm
Cover:	Polyester mounting cover (IP 66) for installation on a mounting rail 35mmDIN EN 50 022
Power Supply:	24V/DC (+/- 10%)
Power Absorption:	5 W
Temperature Range:	0° - 50°C
Measure Range:	0 - 15% / 0 - XX.X% (depending to the material to measure)
Accuracy:	Depending to measure range and material (approx. +/- 0,3%)
Calculation Speed:	4 mips (Millionen Calculation Statements per Second)
System Connection:	Serial Interface (RS232 optionally RS485 or USB 2.0) for data exchange during current processing and for parametering
Digital Inputs:	One digital Input to start the measurement via hardware contact
Output:	One analog Output: 4-20 mA / 0-20 mA

!!! For absolute attention !!!

The power consumption 24VDC for the the probe(s) has to correspond to the EMV guidelines. In case of doubt the power consumption has to be guaranteed via separate power supply through a mains suppression. The probe cable should not be laid together with load carrying cables.

PROCESS INTEGRATION



1. PARAMETERING OF FL-DIGI-SMART BASIC VIA EXTERNAL PC

1.1 GENERALS

The FL-DIGI-SMART is calibrated and parametered with the supported operation surface and a separate PC. Measured values can be queried and the measure course can be graphically displayed additionally.

1.2 SYSTEM REQUIREMENTS

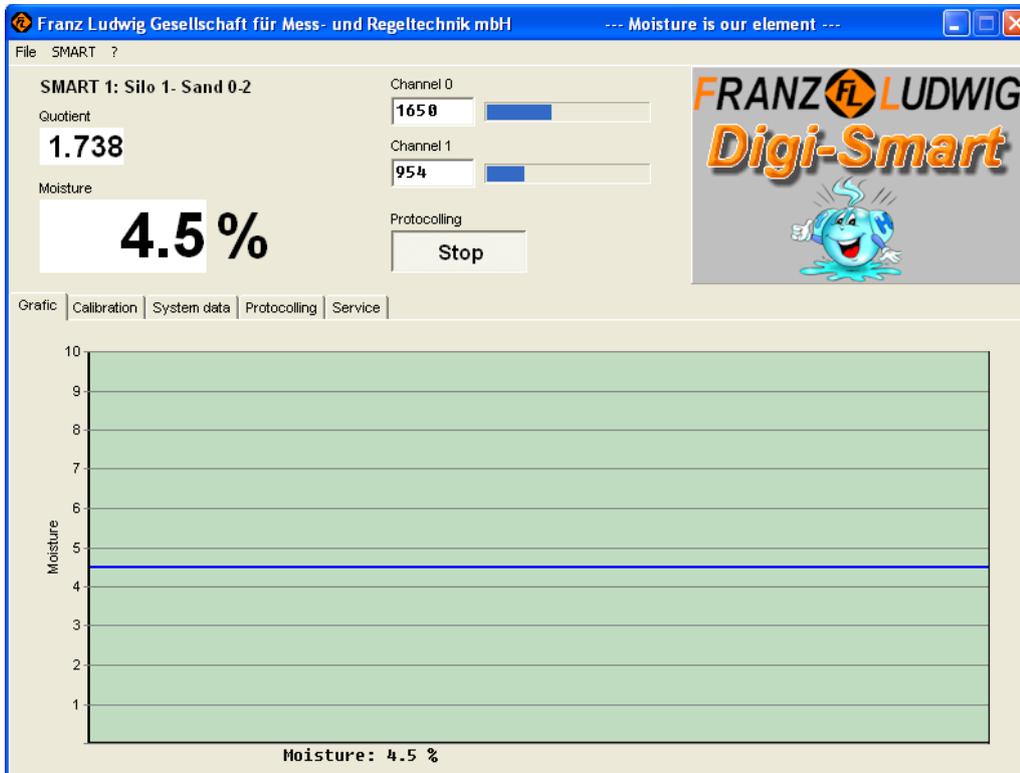
- Windows-Operation System (min. WINDOWS 2000 / NT / XP / 7)
- Processor min. PENTIUM 400 MHz
- 5 MB free hard disk memory
- Serial interface RS232 (COM)or USB 2.0

1.3 INSTALLATION INSTRUCTIONS

First choose "Digi – Smart" at the setup – menu. With "install" the software will be installed. A desktop – icon and a start – menu entry is created automatically. Please pay attention to set the COM-PORT the PC is communicating with the FL-DIGI-SMART in the directory SYSTEM DATA.

1.4 DISPLAY OF MEASURED VALUES AND MIXING DATA

After the program starts the following display appears:



In the upper quarter the current data occur:

QUOTIENT:

Shows the non-calibrated measured value supported from the probe.

MOISTURE:

Shows the percent moisture value calculated by the stored calibration graph of the quotient value.

This value is updated when the measurement is started via hardware contact or the FL-DIGI-SMART is set to 'Permanent'-Measurement in System Data.

CHANNEL 0 / 1:

Both probe measure channels are displayed. They are important for function checking of the probe and should range from 0 to 4095.

PROTOCOLING: START / STOP

Only after this switch panel is touched, the displays QUOTIENT and CHANNEL 0 / 1 are updated. To update the MOISTURE %-value, additionally activate the FL-DIGI-SMART measurement via hardware contact or 'Permanent'.

SMART:

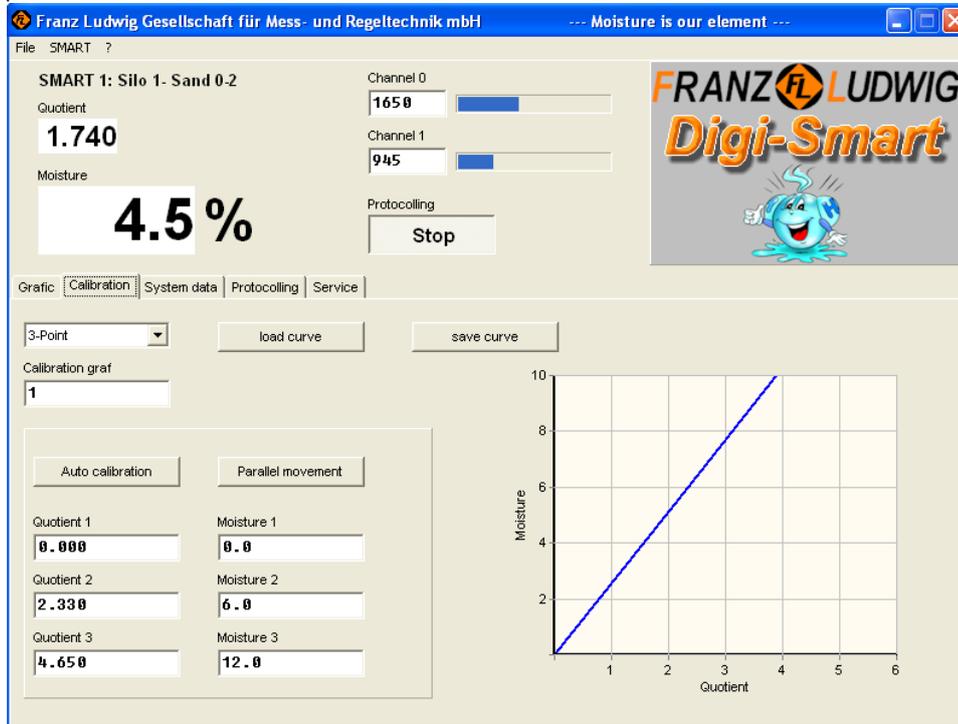
All settings of the connected FL-DIGI-SMART are read out and displayed on the PC with „Read“. With 'Write', all your PC-changing are written to a connected FL-DIGI-SMART.

FILE:

All settings can be saved in a separate file on the PC. Open this file with ,OPEN', to save the settings in this file, touch ,SAVE' and quit this file with ,QUIT'.

1.5 CALIBRATION

In the tab CALIBRATION the calibration graphs are stored the microwave moisture probe's measure values can be adapted to the product characteristics.



LOAD CURVE:

You can read out and display an already set FL-DIGI-SMART calibration graph when touching 'LOAD CURVE'.

SAVE CURVE:

If a calibration graph has been evaluated through a calibration process (see end of chapter) and has been entered in QUOTIENT 1-3 / MOISTURE 1-3, this graph can be finally stored in the FL-DIGI-SMART with 'SAVE CURVE'.

SELECTION OF CALIBRATION METHOD

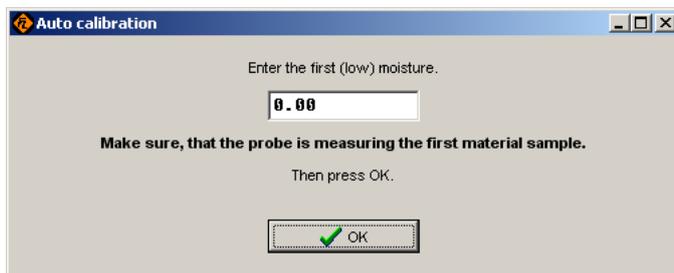
Choose, if you want to proceed a classic calibration via 3 measure values with assigned moisture (3-point) or a calibration via a polynomial function. More details please find at the following points.

CALIBRATION GARG

Shows the present chosen calibration curve of the measurement. For changes use mouse click. Choose the calibration curve (1-50) you want to calibrate. For changing the calibration curve number (f.ex. from curve 1 to curve 2) enter the new calibration curve number and save it.

1.5.1 AUTOMATIC CALIBRATION (3-point)

Take some material to be measured from the current processing, (e.g. 5kg). Determine the material's moisture when drying with the DARR-method (e.g. 4%). Moisture the dried material in 2 steps to the corresponding material's total moisture range during the following calibration processing (e.g. 2 % and 8 %). Remove the probe of its holder and press it under softly turns into the prepared material sample (2%). Touch now the calibration field. Enter the moisture (2.0) in the appearing window and press OK.



Example:

1. Moisture 2 % assumed material sample: 5 kg
 2. Moisture 8 % Difference 6 %
- Added Water Quantity: $(5000 \text{ g} / 100) \times 6 = 300 \text{ g}$

Add now 300 g water to the material sample and homogenize well to receive a moisture of 8%. Press now the probe under soft turns into the sample again and enter the second moisture (8.0) in the window. Press OK again. The calibration graph will be calculated automatically. Press only 'SAVE CURVE' to save the graph in the FL-Digi-Smart.

Touch now the field PARALLEL MOVEMENT and enter in the upper field at DISPLAY 3% and in the lower field DRYING 4%. With OK the parallel movement of the total graph is processed and stored immediately. Stop the processing with CANCEL.



1.6 PROTOCOLLING

DIAGRAM:
The selected data will be displayed in a diagram (see picture below).

PRINT SELECTED VALUES:
You see a print-preview of the selected data.

EXPORT SELECTED VALUES:
The selected data will be saved in an EXCEL-COMPATIBLE CSV-Format.

DELETE SELECTED VALUES:
After a security request all marked entries will be deleted.

SELECT ALL:
All entries of the chosen period will be marked. Multiple selections are also possible with help of the shift- or ctrl-key.

COMMENT: To make a comment choose one data set and click the comment button or double click the data set and enter the text in the appearing window.

FROM / TO DATE: Choose the time period of which the stored data should be displayed.

1.7 PROBE CHECK

With the channel displayings in the upper screen the connected moisture probe (s) can be checked to their functionality. First start a measurement with 'PROTOCOLLING / START' in the upper screen.

Probe check instructions:

1. Clean the probe's measure surface (e.g. with a dry cloth).
2. Note down the values of Channel 0 and Channel 1.
3. An employee should press now his palm (or a wet cloth) tightly to the probe's measure surface.
4. Note down the values of Channel 0 and Channel 1 again.

You will receive the following values for example:

	Probe free	Probe covered
Channel 0	ca. 1800 – 2200	ca. 1800 – 2200
Channel 1	ca. 3200 – 4300	ca. 200 – 600

- Check the probe's surface for damages and cracks.
- Check all terminal and plug junctions of the probe's cable.
- Check the probe's cable for cracks or damages.

If you can not get a clear error, please get in touch with one of our technicians for further steps.

2. SERIAL INTERFACE

Generals:

RS232/485/USB 2.0:

Data bits: 8

Parity: keine (none)

Stop bits: 1

Baud rate: 19,2 kBps

no response of received signs

Transmitted signs in ASCII –size

ASCII – range: 00h – 7Fh (MSB everytime 0, even at check summary)

PROTOCOL: Please ask for detailed information the FRANZ LUDWIG COMPANY.

Remark:

The PC software is only functioning with RS 232. If a converter is used, the RTS-signal has to be switched independently. A corresponding converter can be ordered over the Franz Ludwig Company.

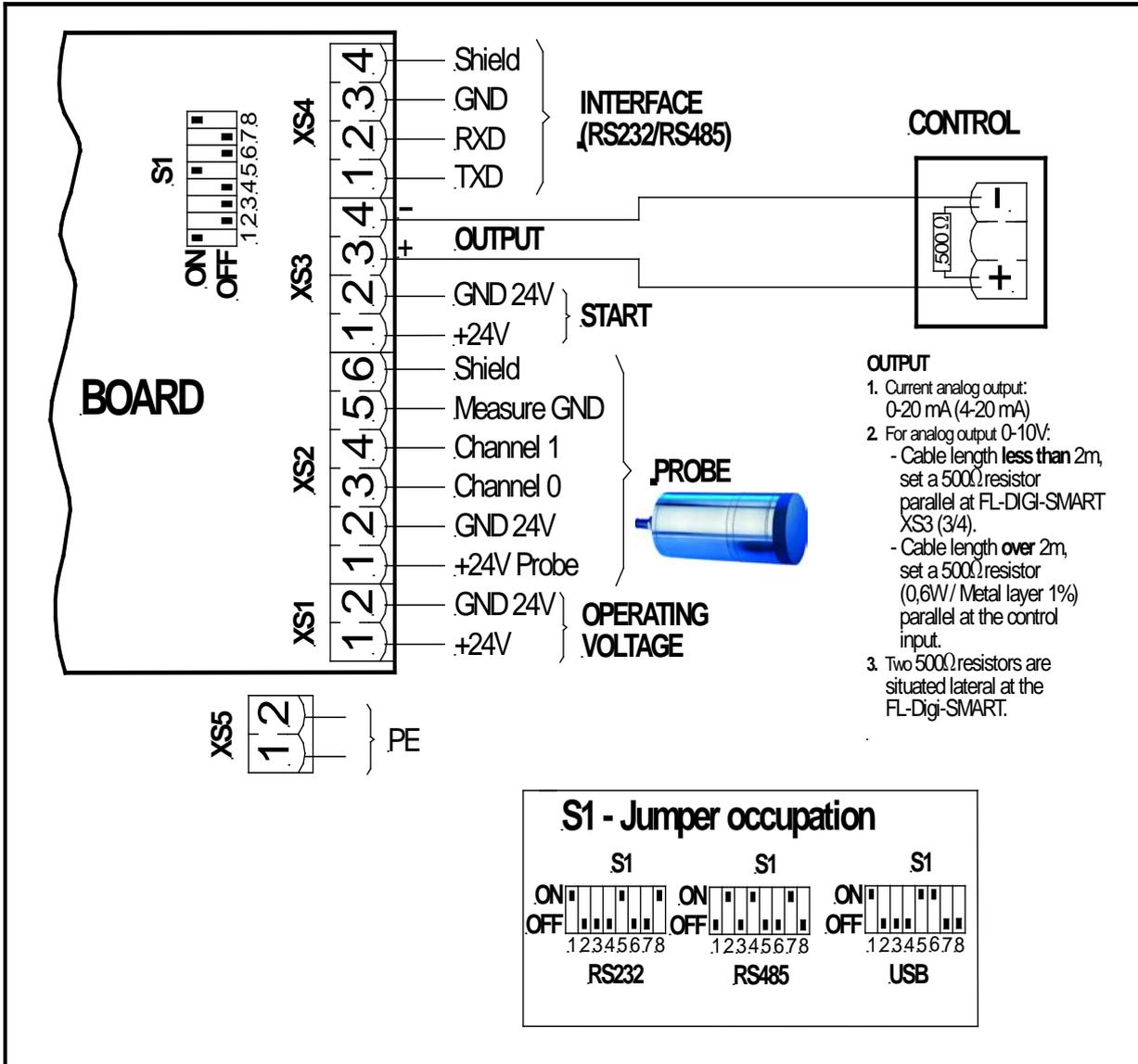
Several possibilities for reading the moisture:

You can use a hardware start signal or you can start via serial interface.

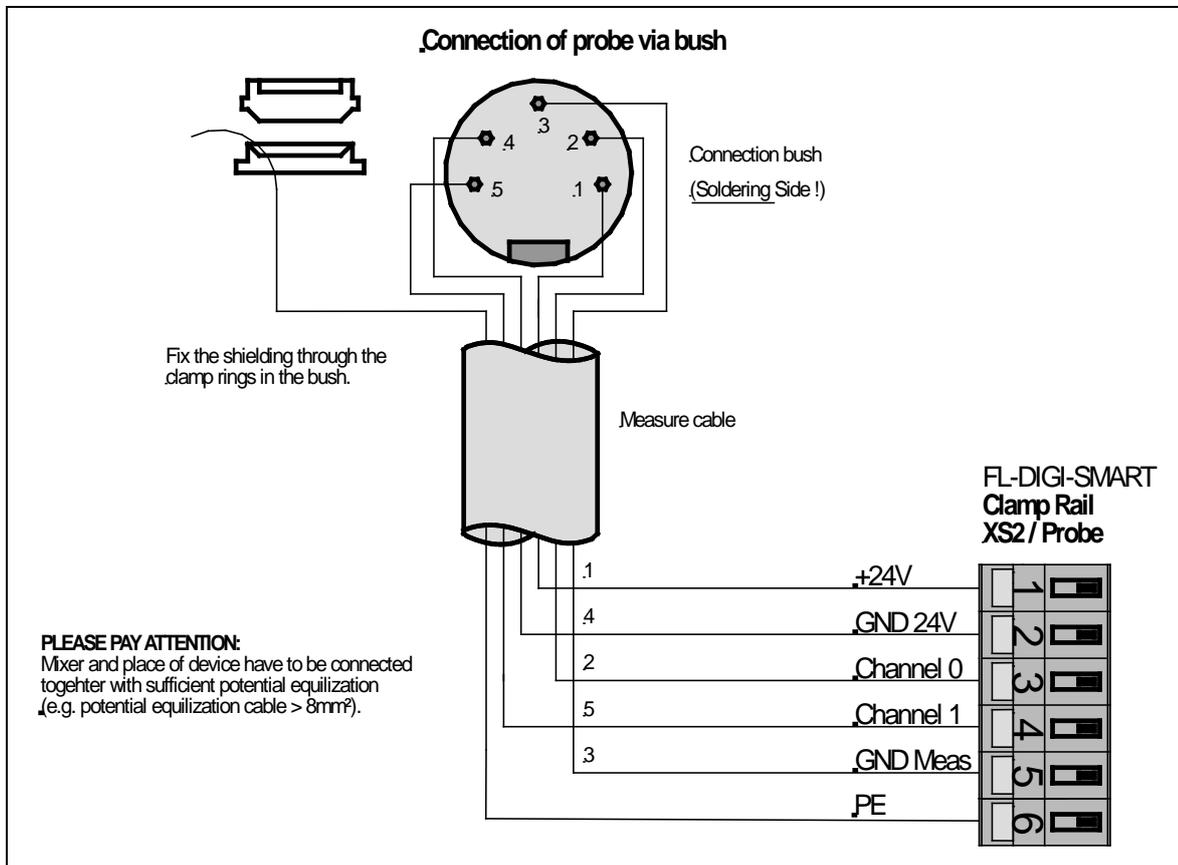
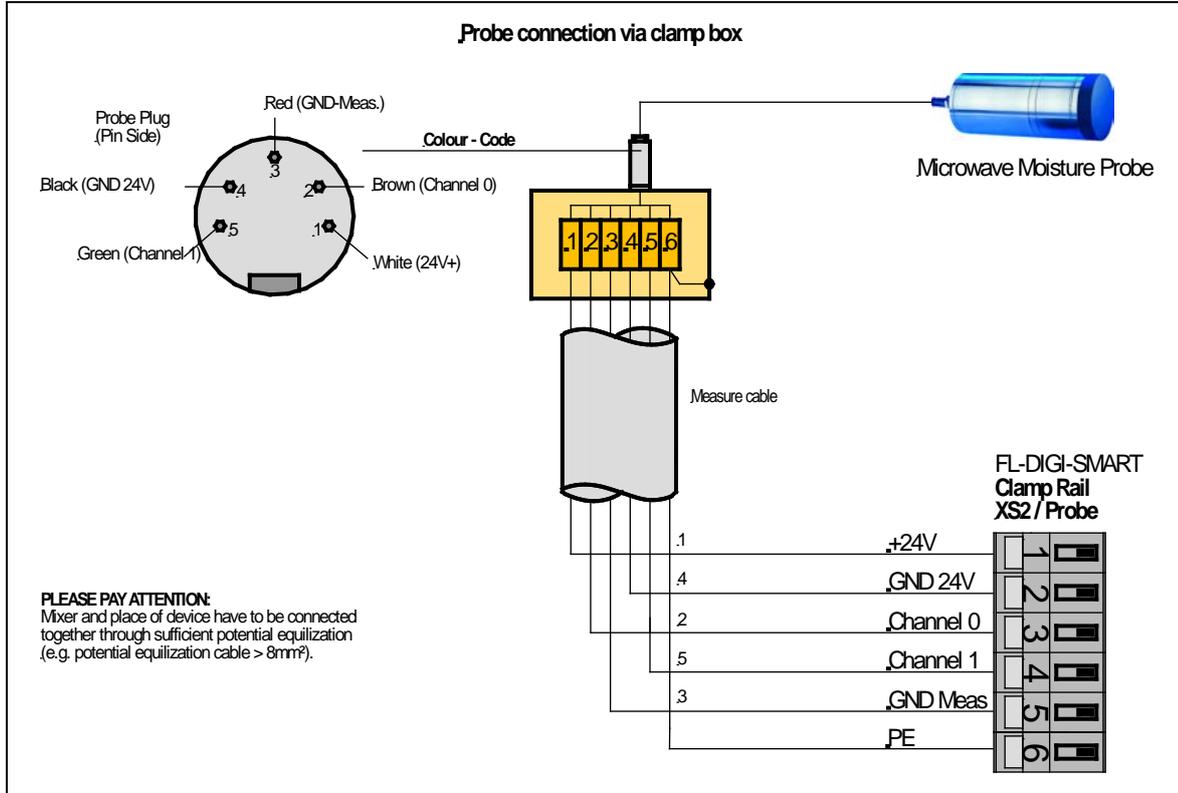
If the measurement is started (STM=1 or upward slope) and the measure time is set to , 0', the measurement goes on until the start contact is connected (STM=0 or downward slope). The output actualization (serial and analog) follows after the end of the measurement. If the measurement is started and the measure time is set to a certain value, it is measured with the upward slope of the start contact for the pre-set measure time. Than the output values are updated. If the start stays on, this procedure is started again. If the sand measurement is set to „permanent“, no start signal is requested and the moisture is continuously updated at the output and the display. A continuous averaging during a pre-set time is following (AVG). This value names the number of the values to be averaged (max. 20 = 2 sec.).

3. TERMINAL OCCUPATION

MAINBOARD



PROBE CONNECTION

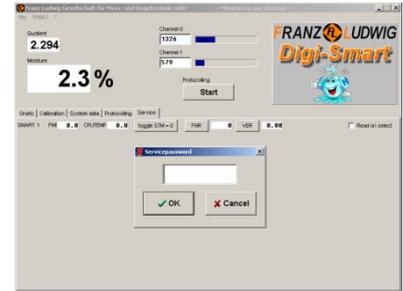


FL-DIGI-SMART-BASIC

4. SERVICE (FL-DIGI-SMART CONFIGURATION)

This tab is **only for technicians of the Franz Ludwig Company and for control manufacturers**. It's password is „55124“.
We are not responsible for any failure settings from your side.

This Smart's language is english, no others are to choose.
Entered changes must be saved with "save Name, IP & set IP".



Functions:



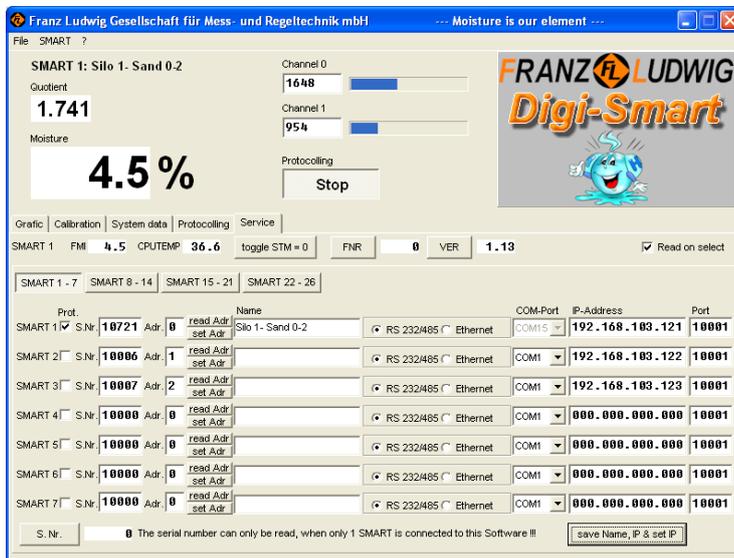
CHOOSEN SMART (these functions are only available for the selected SMART):

- FMI:** The momentally measured moisture is displayed, regardless if a measurement has been started or not. Non-averaged value.
- CPUTEMP:** The current FL-DIGI SMART's processor temperature.
- toggle STM:** When touching this button, the ,start contact' is switched via serial interface. The present status is displayed on the button itself.
- FNR:** Reading out of error number. If a present error is readed out with this function, it is deleted and can not been read out again.
- VER:** Queries the present software version of the FL-DIGI-SMART.
- Read on select:** When selecting of an other SMART in SYSTEM DATA the settings of the selected SMART are readed at first, if "Read on select" is activated. If it is not selected, the current software settings are used.



ATTENTION:

The settings of SMART and SOFTWARE can be different in this case !!!!
Enter "SERVICE PASSWORD" and confirm with "OK". The following site appears:



Setting of SMART's actuation:

Enter the assigned serial number of the selected SMART (Please see the sticker on the SMART).

SMART actuation via BRS 485 BUS-system:

	RS 232	RS 422 / 485	Intern USB
DIP	DIP	DIP	DIP
1	ON		ON
2		OFF	OFF
3		OFF	OFF
4		OFF	OFF
5	ON		ON
6		OFF	ON
7		OFF	OFF
8	ON		OFF

Use a separate address for every connected SMART (0-25 corresponds to an addressing "AA"- "ZZ").
Reading out of the pre-set SMART's address: "read Adr".
Setting of the pre-set SMART's address: "set Adr".

Name:

Every SMART can be named by a 20-digit string. The chosen SMART is displayed at the quotient display.

SMART actuation via RS 232 (separate COM-Ports):

Choose the corresponding COM-Port for every SMART connected.

SMART actuation via Ethernet (optionally):

Set the IP-Adress and the Port-No. for every connected SMART, then change from RS232/485 to Ethernet.
If You only change the IP-adress, push the save & set IP button, to save the new settings.

 Pay attention of the correct addressing!!!!

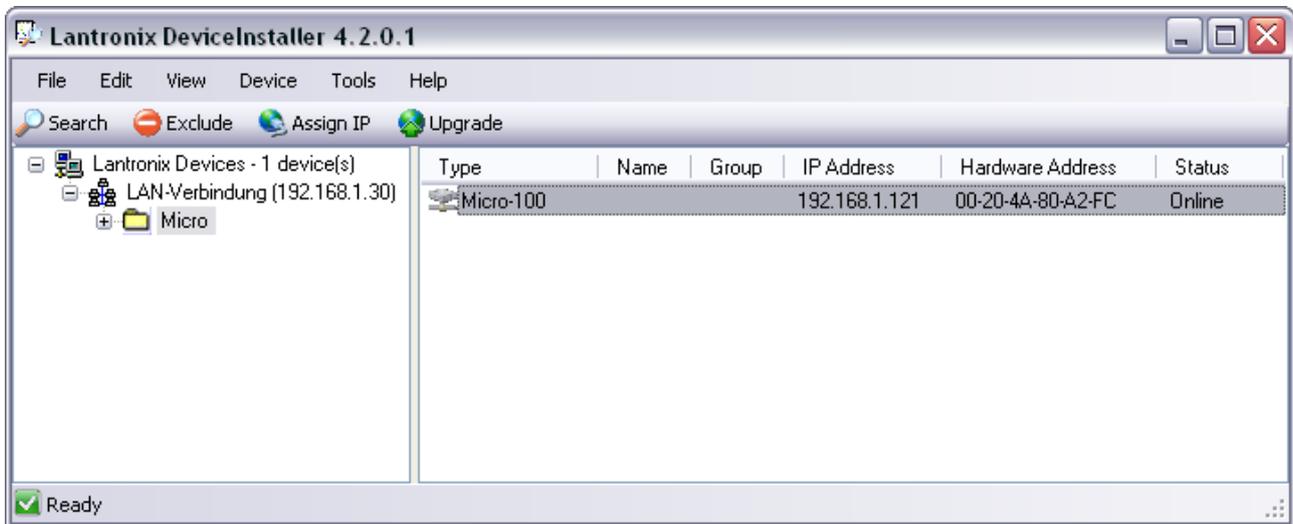
Reading out the serial number:

The serial number of the selected SMART can be readed out with the button „S. Nr.“.

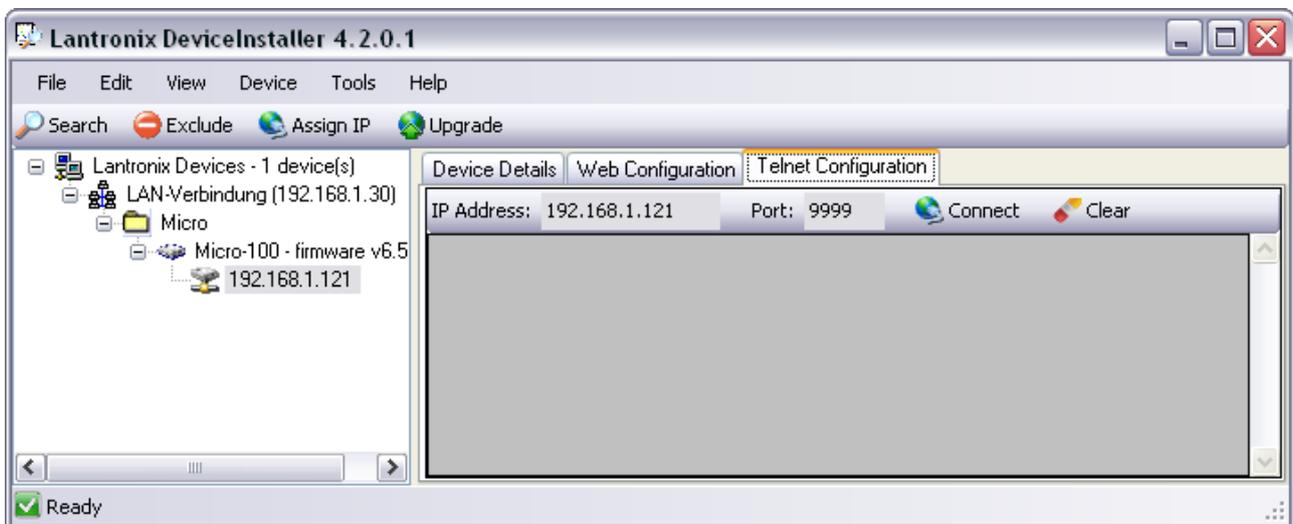
 REMARK: For reading out the serial number, only one FL-DIGI-SMART has to be connected, because all Smarts are answering this call.

Ethernet Interface Setting Up

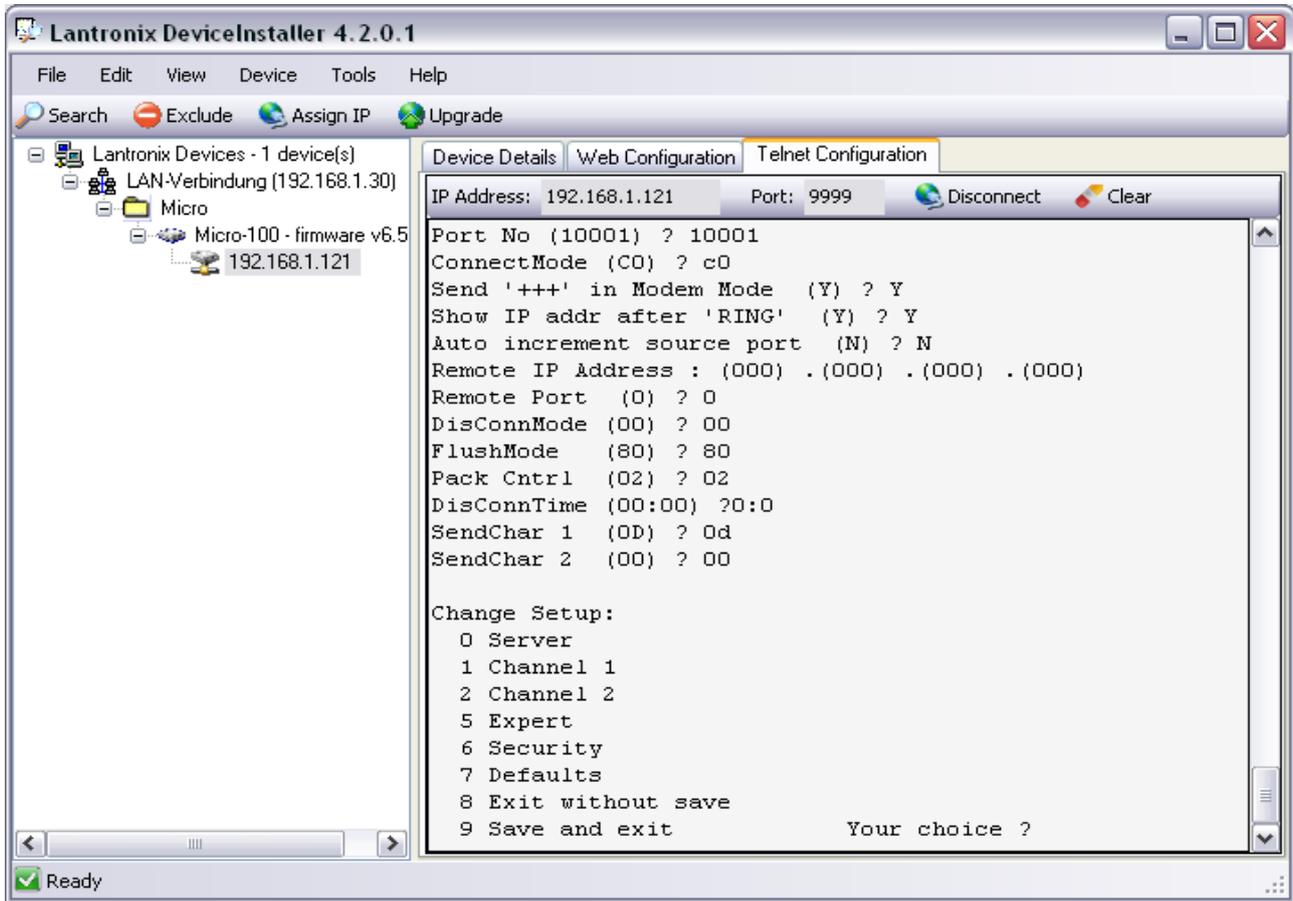
For identification of the IP-Address the delivered „Device Installer“ is necessary to be installed. For installing this program, *Microsoft DotNet Version 2.0* has to be installed in advance. Check first, if Microsoft DotNet 2.0 is installed on your PC. If not, install the delivered version 2.0 with 'dotnetfx.exe'. Follow the steps.
Install now 'Device Installer' with 'Setup.exe' in the directory 'Device Installer' and follow the steps.
Start now Device Installer and click the 'Search'-Button:



All connected modules are now displayed. If the Sub Net Mask is not corresponding to your network the module is shown in red.
To assign a new IP-Address to a module, click 'Assign IP'. Choose 'Assign a specific IP-Address' and enter the new address. The Sub Net Mask is determined automatically. When clicking 'Assign' and 'Finish' the IP-Address is assigned.
For setting of the ports, choose a module by opening all sub menus on the left side and open a Telenet Connection via port 9999 by choosing the tab Telenet Configuration on the right side and then clicking on Connect:



As soon as the connection is available and the module is answering, press the ,Enter'-key within **five seconds**. A selection menu appears:



Choose now point 1 and 2 one after the other. Do the following settings or take over pre-selected values with ,Enter':

Parameter	Value
Baud rate	19200
I/F Mode	4C
Flow	00
Port No.	For channel 1 set the port to the PC-Software (e.g. 10001) For channel 2 set the port the control should use
ConnectMode	C0
Send '+++' in Modem Mode	Y
Show IP addr after 'Ring'	Y
Auto increment source port	N
Remote IP Address	000.000.000.000 (Enter-key 4 times)
Remote Port	0
DisConnMode	00
FlushMode	80
Pack Cntrl	02
DisConnTime	00:00
SendChar 1	0D
SendChar 2	00

IMPORTANT

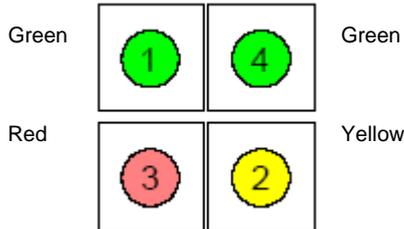
**Do not change any settings except the port numbers!!
The other settings are for connection configuration of the Digi-Module.**

For closing the connection choose point 9 (save and exit). Now the message 'Parameters stored...' appears.

Go on with the next module by choosing it on the left side, until all modules are configured and close the 'Device Installer'.

Status-LEDs

The Ethernet – Module has four status LEDs: serial port (Channel) 1 status, serial port (Channel) 2 status, diagnostics, and network link status. See the following table for a complete description of status LED pinout location and function.



LED	Description	LED Functions
1	Serial Port (Channel) 1 Status	Lights solid green to indicate Channel 1 is <i>idle</i> . Blinks green to indicate Channel 1 is connected to the network and <i>active</i> .
2	Serial Port (Channel) 2 Status	Lights solid yellow to indicate Channel 2 is <i>idle</i> . Blinks yellow to indicate Channel 2 is connected to the network and <i>active</i> .
3	Diagnostics	<p>Blinks or lights solid red in combination with the green (Channel 1) LED to indicate diagnostics and error detection.</p> <p>Red solid, green (Channel 1) blinking: 1x: EPROM checksum error 2x: RAM error 3x: Network controller error 4x: EEPROM checksum error 5x: Duplicated IP address on the network* 6x: Software does not match hardware*</p> <p>Red blinking, green (Channel 1) blinking: 4x: Faulty network connection* 5x: No DHCP response received*</p>
4	Network Link Status	Lights solid green to indicate network port is connected to the network.

*non-fatal error

5. SELECTION OF INSTALLATION PLACE

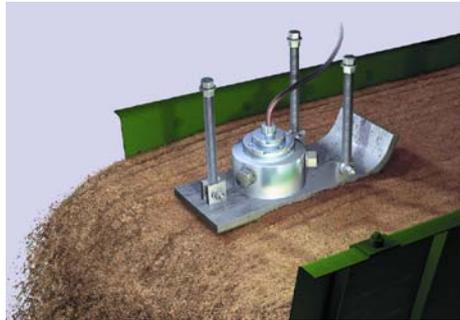
To guarantee optimal measure results the probe has to be free of material storage anytime.

INSTALLATION WITH PROTECTION TUBE IN THE SILO OUTLET



- The probe's measure surface has to be situated in the current material flow.
- Do not assign the probe's measure surface too high above the silo outlet.
- Do not assign the probe's measure surface directly to bracings or steam jets.
- Pay attention when filling the silo that no material falls from high above onto the probe (do not empty the silo totally).

INSTALLATION AT A SLIDE ONTO CONVEYER BELT



- Fix the installation set absolutely stable and vibration-free.
- Press the slide as deep in the material as the measure surface is covered with the material even when material height variations occur.
- *Relief:* The material flow's height can be optimized to approx. 8-10 cm when affixing deflector or dust plates on the dosing belt.
- The angle should be 10° (visual effect „skiing“).
- Hold a constant conveying speed of the measure medium.
- Do not assign the probe directly over a guide roller.

INSTALLATION WITH A WEAR PROTECTION TILE UNDERNEATH A SILO OUTLET



- The probe's measure surface has to be situated in the middle of the current material flow.
- The probe's surface should be totally covered with material to measure. Measured value variations result, if the probe's measure surface is not covered enough.
- Evaluation of a reliable measured value requests a sufficient dosing time (2 sec. min.).

USEFUL TIPS

- The **probe** has to be installed in min. **1 meter** distance to **electric motors (p.E. mixer drive)**.
- The **holder surface and the probe's surface** have to be installed the same level.
- The **probe cable** has not to be layed together with load carrying cables.
- **Before** installing in the holder, the **probe** should be lubricated with high-performance grease.
- **Welding working** in the probe's environment only with uninstalled probe.
- The clamp box (screwing and plug mounted face down) should be fixed **with screws to the cover in a max. distance of 1,5m** to the probe.

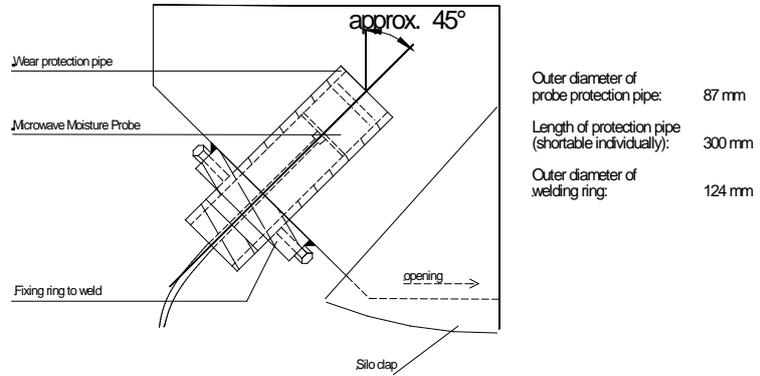
HOLDER SYSTEMS

For protecting the probe optimally against wear and interference effects, one of the following holder systems should be installed:

Wear Protection Tube



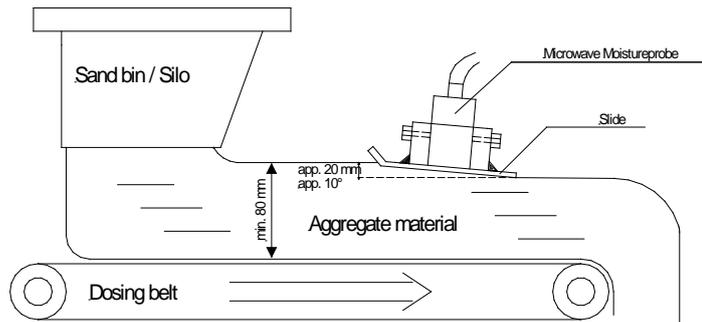
Installation Microwave Moisture Probe with Wear Protection Tube at the silo outlet



Slide



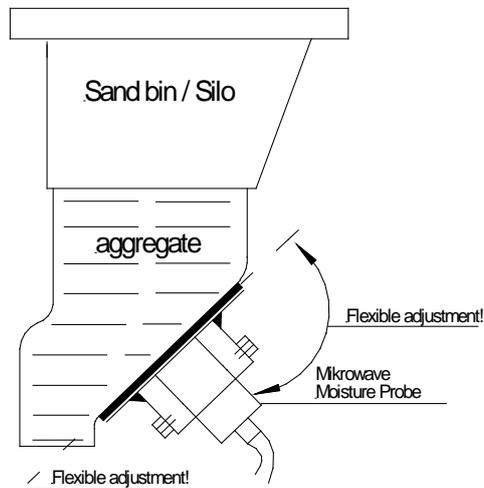
Installation Microwave Moisture Probe at a slide



Wear Protection Tile



Installation Microwave Probe with wear protection tile underneath silo outlets

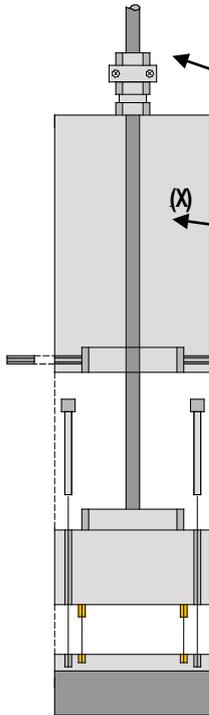


6. EXCHANGE OF WEAR AND TEAR MEASURE HEAD



Design: _____

- WHITE
- GREEN
- BLACK



Probe extension (X) only optionally.

1. Device has to be switched off. !!!
2. Remove probe plug or disconnect the probe from the clamp connection box.
3. Unscrew tension.
4. Loose internal hexagon screws.
5. Unscrew extension from the probe
(Attention: turn only the extension to avoid cable damage
6. Loose non-sealed cylinder screws (4 pc.).
7. Remove wear and tear head.

Fix the new wear and tear head carefully without tilting.

Please pay attention to pass the fixing pins exactly into the existing holes.

When fixing please use new cylinder screws and fix them tightly to avoid water flow into the probe.

IMPORTANT:

Always exchange the wear and tear head in a proper place because dirt particles can cause probe's error performance.

7. INTERFERENCE OF ISM-FREQUENCIES

Radio frequency devices use particular ISM-Frequencies (Industrial Scientific and Medical), which are international prescribed. Our Microwave Moisture Probe, which counts as this type of device, is operated inside the frequency range from 433,05 to 434,79 MHz. Radio frequency ranges are utilized in many commonly known devices. An example of these devices are as follows.

- Radio Alarm Systems
- Mobile Transmitters
- Remote Controls
- Vehicle Opener
- Garage door Opener
- Wireless Movement Detectors

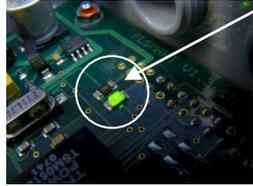
On account to the huge number of ISM-Devices it can lead to mutual influences or interferences, if they are operated in direct environment. The radio signals might be received from others as the expected receiver. To avoid each kind of interferences, we recommend, that your other operating ISM-devices, which use the range from 433,05 – 434,79 MHz as well, not be used in immediate vicinity of our Microwave Moisture Probes resp. be laid out for other ISM-Frequencies. This goes especially for possible danger zones as for example cranes, roll-doors, buckle conveyor belts, e.g. In researches and tests, which had been done by us and outside institutes, have been found out, that the from us used frequency range from 433,05 to 434,79 MHz is the most advantageous to get reliable and accurate Moisture Measurement with our Microwave Moisture Probes.

Please feel free to contact us. We look forward to answering any questions you may have.

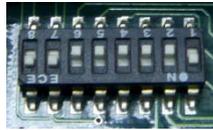
8. ERROR SHOOTING

No communication :

- First, check the operation voltage with a multi meter: 24VDC at clamp block XS1 (cl.1=+24V / 2=GND24V)
- Check if the operation LED is lighting.



- Check with a multi meter, if 24 DC voltage is present at clamp block XS1 & XS2 (cl.1=(+24V) / 2=(GND24V)).
- Check if the jumper occupation of the DIP switch is corresponding to the settings at site 26 (S1 - Occupation).



- Start the The FL-DIGI-MODULE software again. Choose the COM-Port at service page and click "Start Protocolling". If there is no connection, change clamps 1 & 2 at clamp block XS4 and repeat this step again.

