Manual Oxilyser3

For Passivity Testing of Stainless Steel Alloys

INTRODUCTION

With the Oxilyser3 you can measure the surface quality of stainless steel alloys in a reliable and accurate way.
The measuring principle is based upon rest potential measurement of the stainless steel surface in a specially developed electrolyte.
Minor surface activity, i.e. solution of only atoms of metal, will be indicated directly.
After several years of scientific research, supported by the European Commission, the Oxilyser was successfully introduced to the world market in 1992, succeeded by the Oxilyser2 in 2004 and the Oxilyser3 in 2009.

The Oxilyser3 is not a corrosion measuring instrument. It might not react properly on colouring along welds because the factor of time will play a too significant role. The Oxilyser only works reliably on surfaces that are clean. **The first quality control for stainless steel surface quality is a visual check. However, a surface that looks good might be active.**

INSTRUMENT DESCRIPTION

The Oxilyser is switched ON by choosing the proper alloy-group with a rotary switch. After switching on, the LCD display will show a slight negative value, this has no meaning.
The same goes for the LED, which will be red after switching the instrument ON.
The delivery includes a reference electrode with black cable and a red 'anode clamp' with red cable. During the measuring, over a scale from 0-100, a 'passivity signal' will be generated.
The LED will automatically change from red to green after reaching an acceptable passivity signal. The acceptance level depends on the alloy group that has been selected with the rotary switch.

BATTERY

A battery symbol in the LCD displays indicates LOW BATTERY. For changing the battery, unscrew the Lid and loose the battery clip from the old battery, replacing it with a new battery. Preferably use Alkaline batteries.

REFERENCE ELECTRODE

The reference electrode has been made of plastic in order to make it suitable for industrial use. A reference electrode only can give a signal if the small ceramic membrane in the tip of the probe is in contact with a electrolyte and an anode. **The paper must be wetted thoroughly to ensure good contact of the membrane with the liquid!**
If the reference electrode gives no signal, it could be blocked with an air bubble against the ceramic membrane on the inside of the electrode. In that case, shake the bubble out in the same way as this is done to get the mercury in the reservoir of a thermometer.
The life time of the reference will be at it's best if the ceramic membrane is in contact with a potassium chloride solution. For longer term storage of the reference electrode, we recommend to fill the little plastic cap with a drip of potassium chloride and place it on the tip of the probe. **During the measurement, the tip of the reference electrode must have been cleaned thoroughly with water and a clean tissue.**

ELECTROLYTE STAINLESS STEEL

The electrolyte 'stainless steel' is based upon a 5% acetic acid solution.
It is **not harmful and not flammable or explosive.** Nevertheless it is not suitable for internal use and we recommend to wash hands after contact with the liquid and to clean spilled liquid immediately.
Further, the electrolyte contains a small but well balanced quantity of salts. In order not to contaminate the electrolyte during the measurement, the tip of the reference electrode must be clean as well as the measuring surface and the filter papers. For that reason keep the lid on the filter paper box.

HOW TO DO THE MEASUREMENT

On the other side of this manual chart, you find a stepwise manual on how to do the measurement. Prior to measuring it must be known which alloy is going to be measured (0% Molybdenum, 2% Molybdenum or 6% Molybdenum/duplex stainless steel).

MAINTENANCE AND CALIBRATION

The Oxilyser3 does not require much maintenance. Please keep the instrument and suitcase interior free of chemicals and dust. We recommend a calibration once every 2 years. During storage the tip of the reference electrode must be protected with the little plastic cap, filled with a drop of potassium chloride.

TEST WITH SCOTCH-BRITE

You can activate the surface with the Scotch-Brite grinding cloth as delivered. If you measure immediately after grinding, the Oxilyser3 value will be very low. You will see the value increasing slowly due to natural passivation. After 2-24 hours, full repassivation has occurred on air.

SPECIFICATIONS

Temperature Limits		
	Minimum ℃	*Maximum* ℃
Electronics (operational)	-10	+40
Electronics (in rest)	-20	+50
Measuring surface**	**+5**	**+30**
Electrolyte stainless steel	0	+40
Electrolyte stainless steel >2 year tenability	0	+15

**** If necessary, cool surface with cold water and dry it.**

TROUBLE SHOOTING

- ***No signal LCD display and/or LED***
  - Check the battery and change if necessary.
  - Send instrument back for repair.
- ***Passivity value on LCD remains around zero.***
  - Check the contacts.
  - Be sure that the filter paper has been sufficiently wetted with electrolyte and that the tip of the reference electrode is in contact with the liquid.
  - Check alloy on transparent coatings.
  - Check the reference electrode. Is there an air bubble in the tip? Shake the air bubble out in the same way as this is done with mercury thermometers.
  - Send instrument back for repair

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HOW TO DO THE MEASUREMENT

1. Conduct the stainless steel surface on a visual check. The Oxilyser3 might not indicate properly on surface defects such as clearly visible weld colorings or scaling on the surface. Such defects are inspected visually.
   The first quality control of a stainless surface is a visual inspection. The Oxilyser3 measures effectively on clean looking surfaces and defects such as scratches.
2. The measuring surface must be clean and dry.
3. Connect the reference electrode to the black connector and the anode clamp to the red connector. Remove the little plastic cap from the tip of the reference electrode. Clean the tip of the reference electrode properly with water and a tissue.
4. Connect the red electrode clamp to the to investigate surface.
5. Switch the instrument on by selecting the correct alloy group. 0-Mo/304 means all austenitic stainless steels with <0,5% Mo. Examples are AISI 304, 304L, 321, Wst. Nr. 1.4306, 1.4541 and Wst. Nr. 1.4301.
   2-Mo/316 stands for all austenitic stainless steels with 2-3% Mo. Examples are AISI 316, 316L, 316Ti, Wst. Nr. 1.4571, 1.4404, 1.4432, 1.4435. 6-Mo/duplex stands for all stainless steels with 4-8% Mo and duplex stainless steels. Examples are 254 SMO, 6 hMo, duplex 2205, duplex 2507 and AISI 904L.
6. Moisten a filter paper strip with electrolyte 'stainless steel' fluid and place the paper on the stainless steel surface as well as the reference electrode tip on the properly wetted paper. The ceramic membrane in the tip must contact the fluid properly. If necessary (the paper must be thoroughly wetted), add an extra drip of fluid to the tip.
7. In general, the LCD value will rapidly increase to a value well above 60, the LED will change to green. The LED must stay green, which means that the LCD value should not drop significantly during the measurement.
   Whether the LCD value will start to decrease again, will be clear within 10 seconds. If the value decreases, it may not fall back in the 'red area' again.

Passivity Value on LCD Display after ~3-10 seconds			Interpretation	
0% Mo (304 a.o.)	2% Mo (316 a.o.)	6% Mo/ duplex		
< 30	< 35	< 40	AND ↓	Bad passivity, surface will not repassivate.
30 - 55	35 - 60	40 - 65	AND ↑	Wait until stable value has been reached.
30 - 55	35 - 60	40 - 65	AND ↓ OR ▭	Bad passivity, surface will not repassivate.
> 55	> 60	> 65	AND ↓	Wait until stable value has been reached.
> 55	> 60	> 65	AND ↑ OR ▭	Good passivity.

Table 1Limit values

↑= Value rises

↓= Value falls

▭=Stable value (or value varies slightly up and down)

- The LED switches from red to green at value 55 for 0% Mo alloys, 60 for 2% Mo alloys and 65 for 6% Mo and duplex stainless steels. This is valid for a temperature of 18 °C. At other temperatures, the switch limit red/green can differ slightly.
- The best passivity has been achieved if the value is higher than respectively 55, 60 or 65 and if the value remains STABLE.

8. Stable values up to 90 are possible. If a value after 20 seconds still is unstable and goes down, the passivity is not good. In that case normally the LED will be RED. Normally a measurement takes 3-10 seconds. NOTE: the paper must be thoroughly wetted, add an extra drip of fluid to the tip if necessary.

- If a surface recently has been pickled or blasted, it will be ACTIVE. This means that the surface needs time to repassivate. Dependent on the alloy quality, temperature and presence of moist (rinsing water) this takes 1-24 hours.
- If a surface has been contacted with a corrosive fluid during longer time, it might have been activated, which means that corrosion can start. Cleaning this surface after, e.g. unloading a storage or transport tank, will allow repassivation. The Oxilyser3 can confirm the repassivation process and indicate when the tank can be reloaded with the corrosive product.
- The Oxilyser3 reacts very sensitively to free iron (e.g. due to contact of the stainless steel with carbon steel tools). In the case of presence of free iron, the Oxilyser3 LCD value can be very low, sometimes even negative. In this case the LCD value will not go up. A clean active surface on the other hand will repassivate naturally.

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