

Press Release Sensor Instruments

August 2023

Following color

24.08.2023. Sensor Instruments GmbH:

Sometimes it makes sense to follow. For example, your conscience or good advice from friends. But following people or brands on Instagram or LinkedIn? That is not obligatory. And what about the mainstream? "All is well! Just not always, just not everywhere and not for everyone" (to "follow" Novalis). At Sensor Instruments, although we prefer to choose our own path, we do see the need to follow certain things; for instance the colors.

Especially in terms of the color of recyclates, our esteemed market companions have been quite busy lately. Today, almost every company in the plastics recycling sector uses a portable device to measure the color of recyclates. These do their job, with the expected ease of use, at an affordable price and with precision. But are they really precise? Whilst the color of a plate can be measured



with a high degree of accuracy, the colour measurement of recyclates using portable devices often results in significant deviations between the color values determined for the recyclates and those for the plastic plates from the same batch. Moreover, changing the position of the pellets within the measuring spot probably means considerable color deviations, even between two immediately successive measurements. The reason for this is certainly not to be found in the inadequate measuring accuracy of the color measuring instruments, but rather in the form of the recycled

material grains, which deviate significantly from a flat surface. This is compounded by their random arrangement under the measuring spot.

Inline color measurement systems from Sensor Instruments

Should the recyclate manufacturer require an inline solution, the measurement results should ideally match those produced by the portable measuring device for the same plastic material. The laboratory can only obtain reliable color values from plastic plates using the portable color measuring devices.

Sensor Instruments now provides color measurement systems for inline color systems with front ends that are either pointed directly at the recyclate during production or at the plastic granulate through a sight glass. The movement of the pellets and the corresponding measuring time means that color measured values with a typical accuracy of $dE = 0.3$ are obtained. An optomechanical front end - i.e. there are no electronic components in the sensor head - means that the recyclate can also be measured at higher temperatures.



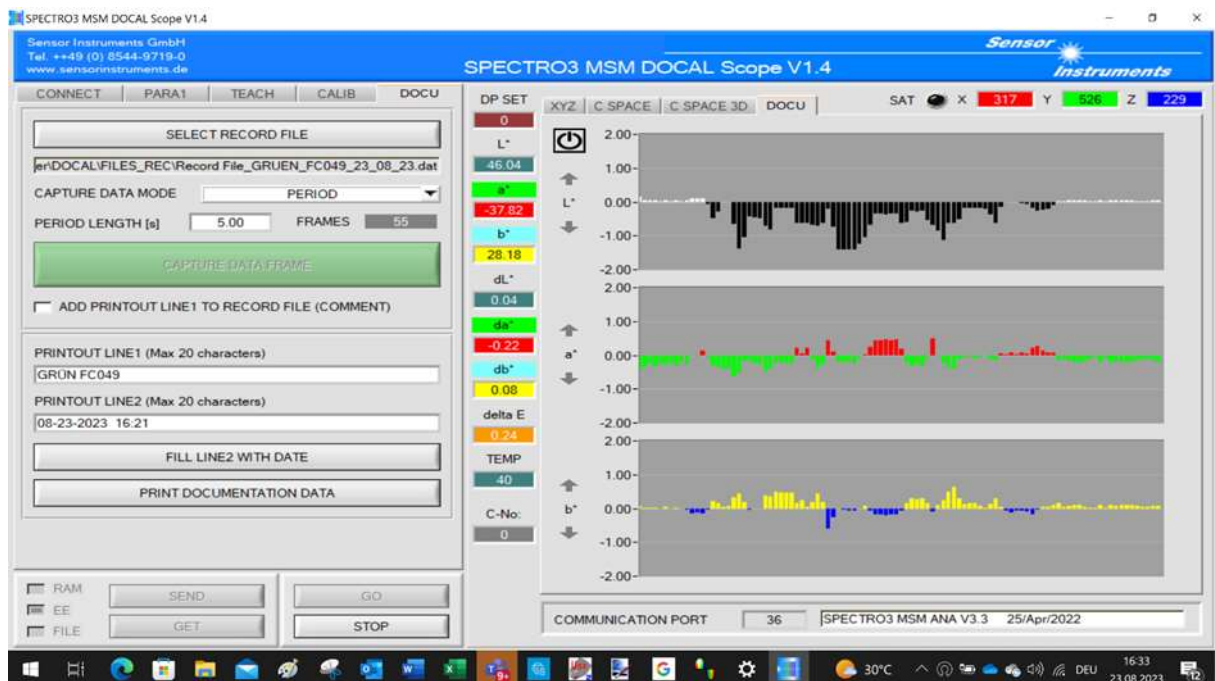
The inline systems must perform a **USER CALIBRATION** to ensure that the color values from the inline measurements match those from the measurement of the plastic plates using the portable measuring devices. This can easily be performed using the **DOCAL Scope V1.4 PC software** included in the scope of delivery: the operator is guided through the calibration process in a practical fashion. After completion of the calibration procedure, given identical material, the inline measurement system displays the same **L*a*b*** values determined by the portable measuring device for the plastic plates. **You could say that the inline measurement systems follow the**



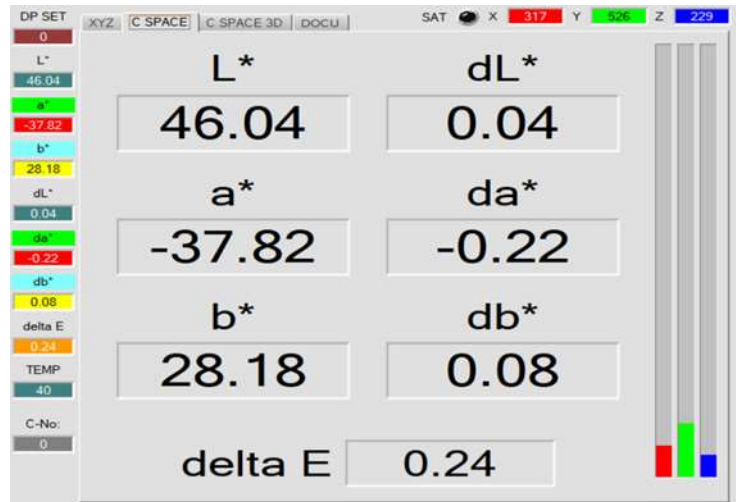
L*a*b* values of the portable measuring devices. The **DOCAL Scope V1.4** software also does a good job of displaying and storing the measured values. The on-site operator will be pleased with both the trend display and the tolerance display. Should anything "get out of hand", the operator can react quickly to prevent worse.

The deviations in L^* , a^* and b^* from the $L^*a^*b^*$ targets are displayed graphically and numerically on the **DOCU** interface of the **DOCAL Scope V1.4** PC software on the right-hand side of the screen.

The **C SPACE** surface on the other hand, provides a numerical display of the current $L^*a^*b^*$ values, the $L^*a^*b^*$ values averaged over the specified time period and their deviations from the specified target. Should one of the specified tolerances be exceeded or undercut, this excess or

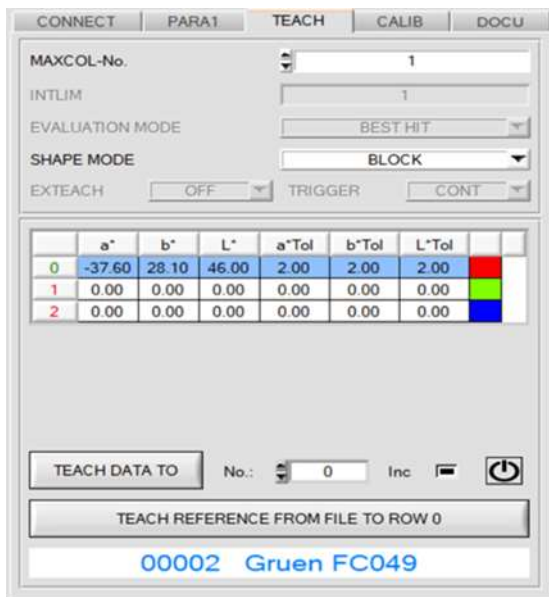


shortfall will be displayed accordingly: an insufficient L* value causes a black border, whilst too high an L* value causes a white border. An insufficient a* value falls causes a green border, whilst too high an a* value causes a red border. An insufficient b* value causes a blue border, whilst too high a b* value causes a yellow border. The stored color values can be displayed using EXCEL®.



DATE	TIME	X	Y	Z	L*	a*	b*	delta E	delta L*	delta a*	delta b*	COLOR	TEMPs
08-23-2023	16:22:29	308	513	220	45.511	-37.672	28.330	0.545	-0.489	-0.072	0.230	0	40
08-23-2023	16:22:35	308	513	220	45.506	-37.594	28.313	0.539	-0.494	0.006	0.213	0	40
08-23-2023	16:22:40	307	512	219	45.473	-37.742	28.319	0.589	-0.527	-0.142	0.219	0	40
08-23-2023	16:22:45	299	501	214	45.017	-37.709	28.204	0.994	-0.983	-0.109	0.104	0	40
08-23-2023	16:22:50	299	500	214	44.990	-37.689	28.151	1.015	-1.010	-0.089	0.051	0	40
08-23-2023	16:22:55	299	501	214	45.031	-37.697	28.145	0.975	-0.969	-0.097	0.045	0	40
08-23-2023	16:23:00	297	498	212	44.919	-37.744	28.160	1.092	-1.081	-0.144	0.060	0	40
08-23-2023	16:23:06	298	499	213	44.950	-37.700	28.151	1.056	-1.050	-0.100	0.051	0	40
08-23-2023	16:23:11	298	500	212	44.998	-37.921	28.384	1.090	-1.002	-0.321	0.284	0	40
08-23-2023	16:23:16	302	505	215	45.188	-37.796	28.329	0.866	-0.812	-0.196	0.229	0	40
08-23-2023	16:23:21	298	501	213	45.013	-37.848	28.291	1.035	-0.987	-0.248	0.191	0	40
08-23-2023	16:23:26	300	501	214	45.054	-37.702	28.180	0.955	-0.946	-0.102	0.080	0	40
08-23-2023	16:23:31	309	513	224	45.521	-37.355	27.859	0.589	-0.479	0.245	-0.241	0	40
08-23-2023	16:23:37	314	519	229	45.766	-37.349	27.645	0.570	-0.234	0.251	-0.455	0	40
08-23-2023	16:23:42	314	519	229	45.763	-37.293	27.650	0.595	-0.237	0.307	-0.450	0	40
08-23-2023	16:23:47	314	519	229	45.760	-37.313	27.663	0.576	-0.240	0.287	-0.437	0	40
08-23-2023	16:23:52	308	513	224	45.505	-37.478	27.803	0.590	-0.495	0.122	-0.297	0	40
08-23-2023	16:23:57	302	505	217	45.182	-37.694	28.036	0.826	-0.818	-0.094	-0.064	0	40
08-23-2023	16:24:02	300	501	214	45.049	-37.710	28.197	0.962	-0.951	-0.110	0.097	0	40
08-23-2023	16:24:08	309	515	222	45.601	-37.871	28.221	0.497	-0.399	-0.271	0.121	0	40
08-23-2023	16:24:13	318	529	231	46.151	-37.804	28.139	0.257	0.151	-0.204	0.039	0	40
08-23-2023	16:24:18	318	529	231	46.130	-37.930	28.125	0.355	0.130	-0.330	0.025	0	40
08-23-2023	16:24:23	318	529	230	46.152	-38.000	28.183	0.436	0.152	-0.400	0.083	0	40
08-23-2023	16:24:28	316	526	229	46.035	-37.948	28.121	0.350	0.035	-0.348	0.021	0	40
08-23-2023	16:24:34	316	526	229	46.035	-37.838	28.120	0.241	0.035	-0.238	0.020	0	40
08-23-2023	16:24:39	316	526	229	46.035	-37.949	28.125	0.352	0.035	-0.349	0.025	0	40
08-23-2023	16:24:44	316	526	229	46.016	-37.867	28.098	0.268	0.016	-0.267	-0.002	0	40
08-23-2023	16:24:49	316	526	229	46.038	-37.872	28.139	0.277	0.038	-0.272	0.039	0	40
08-23-2023	16:24:54	316	526	229	46.014	-37.842	28.080	0.243	0.014	-0.242	-0.020	0	40
08-23-2023	16:24:59	316	526	229	46.032	-37.924	28.111	0.326	0.032	-0.324	0.011	0	40

EXCEL® file with the L*a*b* and the dL*, da*, db* and dE values, the tristimulus values X, Y and Z, and the time and date.

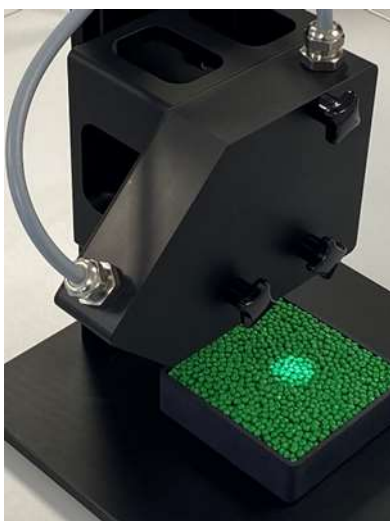


The L*a*b* target can be entered via a file in which the L*a*b* color values of the corresponding plastic plates and their designation are stored. The plastic plates are selected by a 5-digit number. After entering the 5-digit number, the L*a*b* target of the plastic plate is entered in the TEACH table, and the name of the plastic plate is displayed in the DOCAL Scope V1.4 PC software on the TEACH page. The tolerances for dL*, da* and db* can be set individually in BLOCK mode. There is also the CYL mode with a common tolerance for a*b* and a separate tolerance for the L* value, and the SPHERE mode where only the dE value has to be entered.

Laboratory and mobile color measurement systems from Sensor Instruments



Sensor Instruments also provides laboratory-based and mobile color measurement systems. Portable meters can also be used in conjunction with these devices. This minimizes the need for plastic plates, as color measurement can be carried out directly on the recycle using both the laboratory measurement systems and the mobile measurement systems.



If only a small amount of recycle is available for laboratory-based color measurement, it can be performed using the compact SPECTRO-3-0°/45°-MSM-CMU using only 0.15 litres of recycle. The measurement is performed through a sight glass and corresponds exactly with the method used on the inline systems if a sight glass is required at the site of use. If on the other hand, sufficient recycle is available for color measurement (up to 10 litres), the SPECTRO-3-0°/45°-MSM-LAB-DIG-LF color measurement system can be used. This system also uses a sight glass, so that the same measurement setup is used as for inline applications.



A laboratory version of the SPECTRO-3-FIO-MSM-DIG-DL used in conjunction with the KL-D-0°/45°-85-1200-D-S-A3.0

optomechanical front end is the SPECTRO-3-0°/45°-MST. The optomechanical front ends of the two color measurement systems are positioned at a distance of 85mm with the optical axis of the transmitter perpendicular to the material surface of the recycle. With the inline, a deflector plate

ensures constant recycle spacing; with the laboratory system, the correct spacing can be set on the stand. The DOCAL Scope V1.4 PC software can be used with both the inline and laboratory systems.

The requirement to receive the color measured values faster, but without working with inline sensors acted as the trigger to the development of a mobile device: independent from the 220V mains, equipped with a panel PC and optionally a printer to document samples for the laboratory. The unit is placed on a compact table with castors. The funnel also has a capacity of c. 10 litres. After activating the measuring process via the DOCAL Scope V1.4 PC software and opening the slider, the measurement starts and ends automatically after the recycle has passed through.

We at Sensor Instruments would be very pleased if as many companies as possible would follow our advice.



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