Bayer Industry Services

Validation Study on the Determination of Halogen and Sulphur in Waste

Evaluation of the validation study on

prEN 14582

organised by CEN/TC 292 / WG 5

sponsored by

German Federal States Program

“Water, Soil, Waste”

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Contents

1 Scope

Standard prEN 14582 describes determination of halogens and sulphur in waste materials. It includes two different methods for sample preparation.

Part A of this standard deals with sample combustion using a calorimetric bomb, part B describes an oxygen flask combustion according to Schoeniger. In both cases, organic or inorganic bound halogens and sulphur will be transferred into free halogenide or sulphate anions respectively. The anions are quantified e.g. by ion chromatography, volumetric titration or Mass Spectrometry/Inductively coupled plasma (ICP-MS).

The present report describes a collaborative interlaboratory experiment which was performed in order to provide basic data concerning reproducibility and repeatability of pr EN 14582.

2 Summary

An overview of the most important data (relative reproducibility and relative repeatability standard deviation) is given in the table below. In case of Schoeniger combustion, not enough data are available in order to validate this method.

	Sample	mean [% w/w]	relative reproducibility standard deviation (%)	relative repeatability standard deviation (%)
Fluorine	Control mixture	0,499	13,72	4,74
	Solid waste	0,771	34,81	7,70
	Mixed liquid waste	1,393	11,23	8,46
	Waste solvent	0,802	14,46	5,73
Chlorine	Control mixture	0,608	11,82	3,21
	Waste wood	0,933	5,17	4,76
	Solid recovered fuel	2,504	22,98	6,63
	Solid waste	1,154	21,28	13,52
	Mixed liquid waste	0,911	38,80	13,19
	Waste solvent	8,574	58,73	6,08
	Liquid recovered fuel	0,578	73,55	22,18
Bromine	Control mixture	0,553	5,93	2,09
	Solid waste	0,737	7,62	4,38
	Mixed liquid waste	0,846	47,87	6,58
	Waste solvent	0,977	8,36	9,01
Iodine	Control mixture	0,434	15,53	10,41
	Solid waste	0,878	34,72	3,66
	Mixed liquid waste	3,183	34,40	13,62
	Waste solvent	0,658	32,99	14,99
Sulfur	Control mixture	0,502	11,84	5,33
	Waste wood	0,933	5,17	4,46
	Solid recovered fuel	1,378	8,78	8,07
	Solid waste	1,805	39,00	19,34
	Mixed liquid waste	0,762	9,03	3,66
	Waste solvent	1,119	26,92	4,45
	Liquid recovered fuel	0,737	10,22	11,10

3 Organisation

- Sponsor:
  German federal states program „water, soil, waste“
  (Länderfinanzierungsprogramm “Wasser, Boden Abfall”)

- Project coordinator:
  Dr. Klaus Furtmann, Landesumweltamt Nordrhein-Westfalen,
  Düsseldorf/Germany

- Contractor:
  Bayer Industry Services GmbH, Leverkusen/Germany

- Sample materials:
  Members of CEN/TC 292 WG 5

4 Participants

The number of participating laboratories is given in the table below. They represent seven EU member states:

Country	No. of participating labs (bomb combustion)	No. of participating labs (Schoeniger combustion)
A	3	0
B	1	0
D	9	7
DK	2	0
F	11	0
NL	1	0
FIN	2	0
Total	29	7

For details of the participating laboratories see table 1.

5 Chemicals and Samples

5.1 Chemicals

Cellulose (Aldrich No. 31,069-7) was used for preparing the control mixture. 2,4,6-trichlorophenol (Merck No. 821158), thiourea (Aldrich T8656-50G), 4-fluorobenzoic acid (Aldrich No. 12,838-4), 4-chlorobenzoic acid (Aldrich No. 13,558-5G), 4-bromobenzoic acid (Aldrich No. 10,851-0), 4-iodobenzoic acid (Aldrich No. 17675-25G) and sulfanilic acid (Aldrich No. 251917-25G) were used for preparing the control mixture and for spiking some of the real samples.

5.2 Samples

5.2.1 Control mixture

18,819 g of Cellulose powder and the following substances were mixed and homogenized using a planetary ball mill:

4-fluorobenzoic acid	3,6704 g
4-chlorobenzoic acid	2,9529 g
4-bromobenzoic acid	1,4696 g
4-iodobenzoic acid	0,8965 g
Sulfanilic acid	2,7042 g

5.2.2 Liquid recovered fuel

This sample was a liquid waste material (originally from a metallurgic process) used as derived fuel at a combined heat and power plant. The material consisted mainly from medium to high boiling hydrocarbons. The material was spiked with defined amounts of compounds containing chlorine and sulphur.

5.2.3 Mixed liquid waste

This sample was a liquid waste material from a chemical factory intended for incineration in a waste incineration plant. The material consisted mainly from low boiling solvents such as acetone and contained chlorine, bromine and iodine. In order to achieve relevant concentrations of all analytes, the material was spiked with defined amounts of compounds containing fluorine and sulphur.

5.2.4 Solid recovered fuel

This sample was a mixture of solid waste material used as derived fuel at a combined heat and power plant. In order to achieve relevant concentrations of the analytes, the material was spiked with defined amounts of compounds containing chlorine and sulphur. The substances used for spiking were dissolved in acetone. The resulting solution was added to the solid fuel batch.

The material was dried at room temperature in a laboratory hood and homogenized.

5.2.5 Solid waste

This sample was a solid waste material from a metallurgic process intended for waste disposal in a landfill. It contained chlorine and sulphur. In order to achieve relevant concentrations of the analytes, the material was spiked with defined amounts of compounds containing fluorine, bromine and iodine. The substances used for spiking were dissolved in acetone. The resulting solution was added to the solid waste batch. The material was dried at room temperature in a laboratory hood and homogenized.

5.2.6 Waste wood

Waste wood pieces were collected at a municipal waste treatment site. Pieces of about 3 x 3 cm were grinded using a cutting mill (Retsch SM-2000). In order to achieve relevant concentrations of the analytes, the material was spiked with defined amounts of compounds containing chlorine and sulphur. The substances used for spiking were dissolved in acetone. The resulting solution was added to the solid fuel batch. The material was dried at room temperature in a laboratory hood and homogenized.

5.2.7 Waste solvent

A mixture of liquid organic solvents was from an industrial process. This sample was a liquid waste material from a chemical factory intended for incineration in a waste incineration plant. The material consisted mainly from low boiling solvents such as acetone, ethanol, methanol and toluene and contained chlorine, bromine and iodine. In order to achieve relevant concentrations of all analytes, the material was spiked with defined amounts of compounds containing fluorine and sulphur.

6 Homogeneity and stability

Homogeneity of samples was investigated by 8 repeated analyses from different sample containers. Data from homogeneity testing are given in table 2.

Stability and in-bottle homogeneity of samples were tested by 3 to 8 repeated analyses from one sample container. Additional analyses were performed during the experimental phase of the study. Results showed that all analytes were stable.

7 Shipping of samples

After homogenisation, samples were filled into 40 ml glass bottles with screw cap. Typically, each glass bottle contained about 15 g of sample except in the case of control mixture, which was delivered in about 1.5 g portions. Samples were shipped to the laboratories by truck or by air mail. Shipping started at Nov. 9th 2005. The latest sample shipping was finished at Dec 2nd 2005.

8 Analysis of samples

The samples were intended for analysis according to both, bomb combustion and Schoeniger combustion. In waste wood, solid recovered fuel and liquid recovered fuel, only chlorine and sulphur should be analysed.

	Fluorine	**Chlorine**	**Bromine**	**Iodine**	**Sulfur**
Control mixture	**X**	**X**	**X**	**X**	**X**
Waste wood		**X**			**X**
Solid recovered fuel		**X**			**X**
Solid waste	**X**	**X**	**X**	**X**	**X**
Mixed liquid waste	**X**	**X**	**X**	**X**	**X**
Waste solvent	**X**	**X**	**X**	**X**	**X**
Liquid recovered fuel		**X**			**X**

9 Data Evaluation

Original laboratory results were evaluated according to DIN ISO 5725-2:2002-12. A commercial software package (ProLab/QuoData) was used for calculations and graphical data presentation. We thank Dr. Furtmann (Landesumweltamt Nordrhein-Westfalen/Düsseldorf/Germany) for technical assistance.

10 Results

10.1 Laboratory Data

Complete data delivered by participating laboratories are listed in table 3.

10.2 Summary of results

Performance characteristics of prEN 14582 A and prEN 14528 B are given in Tables 4 a and 4 b.

11 Annex

Table 1: Participating laboratories

Institution/Organisation	City	City code
Watco Ecoservice	Ammeville	F-57361
Bayer Industry Services SUA PUA 1	Leverkusen	D-51368
Staatliches Umweltamt	Bonn	D-53113
ECN	Petten	NL-1755
Staatliches Umweltamt	Münster	D-48147
Landeslabor Brandenburg FB 03	Potsdam	D-14467
SCORI	Airvault	F-79600
Clariant GmbH Werk Gendorf	Burgkirchen	D-84504
SCORI	St. Pierre la Cour	F-53410
BASF Pigment GmbH	Besigheim	D-74349
SCORI	Barlin	F-62620
IMAT-UVE GmbH	Mönchengladbach	D-41066
Österreichisches Forschungsinstitut	Wien	A-1110
SCORI	Montalieu	F-38390
SITA FD	Nanterre	F-92758
Bayer Industry Services SUA PUA 2	Krefeld	D-47812
SCORI	Frontignan	F-34110
UCL Umwelt Control Labor GmbH	Lünen	D-44536
Staatliches Umweltamt	Düsseldorf	D-40549
Consulting Engineers Paavo Ristola	Hollola	FIN-15870
Kommunekemi a/s	Nyborg	DK-5800
Bayer Industry Services SUA PUA 2	Dormagen	D-41538
Lenzing AG ZB Umweltschutz	Lenzing	A-4860
Ekokem Oy Ab	Riihimäki	FIN-11101
Labo Services	Givors	F-69702
TU Dresden Institute of Waste Management	Pirna	D-01796
Dr. Weßling Laboratorien GmbH	Bochum	D-44793
SGS Institut Fresenius GmbH	Berlin	D-10245
SCORI	Givors	F-69701
Chemcon GmbH	Wien	A-1020
VITO	Mol	B-2400
RTR Süd-Ouest	Oriolles	F-16480
Force Technology	Brondby	DK-2605
SCORI	Xeuilley	F-54990

Table 2: Results of homogeneity testing

Sample material		chlorine	fluorine	sulphur	bromine	iodine
control mixture	mean (%)	0,812	0,580	0,438	0,510	0,396698
	standard deviation	0,0517	0,0269	0,0121	0,0617	0,0261
	relative standard deviation (%)	6,4	4,6	2,8	12,1	6,6
scondary recoverd fuel	mean (%)	2,330	n.d.	1,369	n.d.	n.d.
	standard deviation	0,1644	n.d.	0,0363	n.d.	n.d.
	relative standard deviation (%)	7,1	n.d.	2,6	n.d.	n.d.
waste wood	mean (%)	1,783	n.d.	0,927	n.d.	n.d.
	standard deviation	0,0610	n.d.	0,0215	n.d.	n.d.
	relative standard deviation (%)	3,4	n.d.	2,3	n.d.	n.d.
solid waste	mean (%)	1,229	0,945	3,039	0,719	0,726
	standard deviation	0,0812	0,0861	0,4046	0,0270	0,0220
	relative standard deviation (%)	6,6	9,1	13,3	3,8	3,0
liquid recoverd fuel	mean (%)	0,843	n.d.	0,698	n.d.	n.d.
	standard deviation	0,0171	n.d.	0,0135	n.d.	n.d.
	relative standard deviation (%)	2,0	n.d.	1,9	n.d.	n.d.
waste solvent	mean (%)	13,349	0,794	0,880	0,893	0,559
	standard deviation	0,7226	0,0583	0,0430	0,0463	0,0636
	relative standard deviation (%)	5,4	7,3	4,9	5,2	11,4
mixed liquid waste	mean (%)	1,339	1,573	0,736	0,616	2,980
	standard deviation	0,0888	0,0551	0,0259	0,0205	0,1704
	relative standard deviation (%)	6,6	3,5	3,5	3,3	5,7

n.d. not determined

Table 3a: prEN 14582 Part A Bomb Combustion - Detailed laboratory results

	Control mixture prEN 14582 Part A					**Waste wood** prEN 14582 Part A		**Solid recovered fuel** prEN 14582 Part A	
Lab. No.	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Chlorine**	**Sulphur**	**Chlorine**	**Sulphur**
2	0,18	0,38	0,39	0,22		1,20		1,90	
	0,19	0,35	0,4	0,18		1,10		1,90	
	0,2	0,39	0,35	0,18		0,95		2,00	
3		0,581	0,49		0,454	1,50	0,80	1,98	1,14
		0,57	0,375		0,383	1,56	0,80	1,96	1,07
		0,554	0,482		0,428	1,59	0,79	2,00	1,14
4	0,43	0,65	0,405		0,437	1,82	0,917	2,342	1,33
	0,43	0,642	0,413		0,346	1,91	0,897	2,217	1,177
	0,43	0,645	0,431		0,376	2	0,841	2,655	1,203
10	0,35	0,53	0,41		0,43	1,63	0,85	2,13	1,36
	0,44	0,61	0,43		0,45	1,60	0,90	2,14	1,34
	0,4	0,56	0,45		0,45	1,68	0,90	2,18	1,34
12	0,61	0,86	0,56	0,39	0,41	1,81	0,93	2,78	1,40
	0,56	0,71	0,66	0,48	0,44	1,84	0,90	2,00	1,30
	0,44	0,69	0,63	0,46	0,46	1,92	0,95	2,23	1,42
13	0,37	0,15	0,66	0,60	0,46	1,67	0,85	2,48	1,24
	0,38	0,23	0,50	0,45	0,46	1,79	0,94	2,66	1,30
	0,38	0,22	0,34	0,31	0,43	1,71	0,82	2,42	1,26
17	0,38	0,68	0,52	0,78	0,46	1,65	0,82	2,29	1,23
	0,32	0,75	0,50	0,41	0,54	1,85	1,02	2,41	1,29
	0,29	0,60	0,43	0,87	0,53	1,91	0,95	2,58	1,36
18	0,37	0,53	0,63	0,23	0,43	1,59	0,84	2,12	1,36
	0,35	0,54	0,60	0,17	0,37	1,46	0,86	2,21	1,32
	0,33	0,51	0,60	0,18	0,34	1,58	0,73	2,28	1,36
20	0,47	0,65	0,49	0,23	0,48	1,76	0,96	2,49	1,42
	0,44	0,64	0,49	0,20	0,48	1,78	0,95	2,38	1,35
	0,46	0,64	0,49	0,21	0,48	1,77	0,96	2,39	1,33
21	0,42	0,60	0,42	0,17	0,34	1,10	0,65	1,47	0,87
	0,22	0,54	0,19	0,25	0,43	1,24	0,70	1,54	0,91
	0,35	0,52	0,32	0,13	0,39	0,99	0,61	1,38	0,76
23	0,37	0,66	0,47	0,38	0,39	1,92	0,97	2,60	1,28
	0,40	0,66	0,49	0,41	0,43	1,76	0,91	2,85	1,27
	0,45	0,65	0,49	0,40	0,47	1,90	0,95	2,45	1,15

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	Control mixture prEN 14582 Part A					**Waste wood** prEN 14582 Part A		**Solid recovered fuel** prEN 14582 Part A	
Lab. No.	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Chlorine**	**Sulphur**	**Chlorine**	**Sulphur**
24		0,61			0,47	1,83	1,03	2,48	1,41
		0,60			0,47	1,88	1,06	2,50	1,45
		0,62			0,46	1,91	1,06	2,46	1,42
25	0,41	0,60	0,36	0,14	0,37	1,74	0,58	2,24	0,98
	0,42	0,53	0,36	0,15	0,36	1,61	0,67	2,39	0,99
	0,39	0,51	0,37	0,16	0,37	1,65	0,63	1,67	0,80
30	0,38	0,85			0,50	1,43	0,76	2,27	1,36
	0,34	0,83			0,50	1,68	0,97	2,32	1,36
	0,39	0,89			0,50	1,70	0,97	2,43	1,39
31	0,46	0,61	0,64	0,34	0,35	1,88	0,85	2,82	1,50
	0,47	0,64	0,63	0,45	0,39	1,93	0,93	2,60	1,43
	0,39	0,62	0,63	0,36	0,33	1,83	0,84	2,92	1,33
32		0,58	0,40	0,40		1,70		2,42	
						1,68		2,42	
						1,73		2,42	
33	0,33	0,64	0,47		0,64	1,68	1,12	2,60	1,88
	0,31	0,56	0,35		0,57	1,52	1,04	2,04	0,96
	0,32	0,62	0,42		0,71	1,30	0,92	2,20	1,44
34	0,36	0,59				1,74		2,21	
	0,35	0,59				1,75		2,42	
	0,36	0,63				1,70		2,31	
36		0,64				1,61		2,40	
		0,63				1,53		2,16	
		0,65				1,51		2,28	
37						1,90		2,53	
						1,88		2,25	
						1,88		2,33	
38	0,44	0,59	0,61	0,32	0,72	1,71	1,40	2,54	1,77
	0,42	0,65	0,63	0,46	0,64	1,50	1,15	2,64	1,89
	0,42	0,58	0,72	0,39	0,79	1,52	1,17	2,51	1,76
39		0,69	0,62	0,36		1,83		2,57	
		0,67	0,65	0,34		1,87		2,59	
		0,64	0,56	0,40		1,90		2,48	

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	Control mixture prEN 14582 Part A					**Waste wood** prEN 14582 Part A		**Solid recovered fuel** prEN 14582 Part A	
Lab. No.	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Chlorine**	**Sulphur**	**Chlorine**	**Sulphur**
41		0,47	0,52	0,29		1,60		2,33	
		0,51	0,52	0,26		1,59		2,35	
		0,49	0,50	0,24		1,59		2,31	
42	0,38	0,61							
	0,35	0,58							
	0,41	0,62							
44	0,41	0,63	0,69	0,32	0,59	1,50	1,40	2,53	2,00
	0,40	0,79	0,67	0,25	0,50	1,80	1,80	2,28	1,73
	0,44	0,66	0,58	0,29	0,54	1,70	1,70	2,32	2,00
46						1,56		1,95	0,66
						1,42		1,88	0,68
47	0,34	0,57	0,49		0,47	1,77	0,97	2,26	1,39
	0,56	1,46	0,93		0,76	1,77	0,97	2,28	1,43
	0,38	0,69	0,52		0,38	1,77	0,95	2,34	1,36
48	0,26	0,39	0,33		0,21	1,70	0,85	1,78	0,92
	0,26	0,41	0,33		0,20	1,73	0,73	1,76	0,93
	0,27	0,43	0,35		0,19	1,56	0,73	1,90	1,07
49	0,40	0,58	0,47	0,28	0,44	1,51	0,88	2,16	1,32
	0,42	0,59	0,47	0,31	0,48	1,64	0,97	2,11	1,33
	0,44	0,60	0,51	0,26	0,47	1,60	0,95	2,29	1,35

	Solid waste prEN 14582 Part A					**Mixed liquid waste from chemical industry** prEN 14582 Part A				
Lab. No.	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**
2	0,26	0,43	0,29	0,48		0,75	0,55	0,32	1,80	
	0,27	0,45	0,3	0,48		0,71	0,61	0,33	1,90	
	0,28	0,48	0,22	0,43		0,74	0,67	0,31	1,80	
3		0,881	0,537		3,18		0,76	0,57		0,60
		1,187	0,613		3,42		0,51	0,61		0,60
		1,073	0,496		3,38		0,22	0,57		0,61
4	0,816	0,778	0,451		3,33	1,492	1,232	0,488		0,675
	0,716	1,102	0,529		3,51	1,351	1,112	0,462		0,576
		0,936	0,49		3,24	1,453	1,141	0,508		0,613
10	0,66	1,05	0,57		3,37	1,46	1,08	0,66		0,80
	0,81	1,09	0,54		3,62	1,49	0,97	0,66		0,81
	0,73	1,16	0,59		4,04	1,51	0,98	0,70		0,83
12	0,933	1,229	0,692	0,70	3,03	0,93	1,40	0,68	0,70	3,62
	1,027	1,405	0,746	0,69	2,18	1,07	1,41	0,75	0,69	2,08
	0,8	1,242	0,682	0,76	3,55	0,80	1,04	0,73	0,76	3,03
13	0,44	1,08	0,49	0,73	3,16	1,20	1,11	0,57	3,32	0,77
	0,43	0,89	0,53	0,73	2,92	0,71	0,73	0,54	3,17	0,47
	0,54	1,02	0,52	0,73	3,10	1,15	1,06	0,58	3,51	0,75
17	13,70	1,33	0,75	0,57	3,67	1,24	1,09	0,61	3,15	0,69
	10,50	1,32	0,72	0,60	3,74	1,28	1,10	0,72	3,21	0,74
	13,60	1,40	0,74	0,40	3,30	1,14	1,02	0,67	3,18	0,67
18	0,51	0,91	0,69	0,31	2,90	1,64	1,30	1,21	1,67	0,57
	0,49	0,81	0,68	0,32	2,73	1,13	0,94	0,75	1,18	0,56
	0,58	0,92	0,71	0,31		1,29	1,03	0,83	1,72	0,54
20	0,76	1,12	0,59	0,57	3,89	1,31	1,15	0,65	2,10	0,74
	0,65	0,97	0,55	0,54	3,49	1,26	1,15	0,69	2,50	0,69
	0,77	1,10	0,60	0,62	4,07	1,34	1,13	0,70	2,70	0,74
21	0,63	0,50	0,27	0,18	2,53	1,23	1,32	0,36	2,20	0,49
	0,43	0,61	0,42	0,25	2,11	1,36	1,50	0,67	2,29	0,66
	0,32	0,47	0,39	0,19	2,22	1,29	1,47	0,60	2,28	0,67
23	0,71	1,14	0,65	0,74	2,77	1,00	0,50	0,67	3,78	0,59
	0,56	1,01	0,68	0,78	2,29	1,51	0,81	0,66	3,68	0,78
	0,61	1,07	0,67	0,72	2,70	1,25	0,70	0,70	3,76	0,66

	Solid waste prEN 14582 Part A					**Mixed liquid waste from chemical industry** prEN 14582 Part A				
Lab. No.	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**
24		0,89			3,25		1,06			0,70
		0,89			3,34		1,09			0,68
		0,89			3,25		1,08			0,66
25	0,47	1,15	0,48	0,21	3,15	1,04	0,57	0,36	1,26	0,37
	0,42	1,04	0,50	0,23	3,15	1,22	0,52	0,44	1,43	0,46
	0,41	1,00	0,52	0,23	3,42	1,25	0,45	0,42	1,35	0,48
30	0,31	1,04			3,49	1,23	1,98			0,63
	0,22	1,46			3,80	1,04	1,66			0,79
	0,23	1,26			3,71	1,09	1,64			0,78
31	0,62	1,04	0,84	0,73	1,92	1,50	0,84	0,78	3,37	0,58
	0,64	0,95	0,78	0,74	2,24	1,68	0,58	0,73	3,47	0,63
	0,61	1,01	0,84	0,74	1,90	1,53	0,60	0,71	3,35	0,61
32	0,58	0,85	0,53	0,52		1,28	1,21	0,75	2,44	
	0,49	0,84	0,50	0,47		1,39	1,23	0,73	2,68	
	0,59	0,86	0,57	0,57		1,37	0,95	0,62	2,43	
33	0,72	1,02	0,56		5,90	1,30	1,40	1,00		0,80
	0,72	1,39	0,80		4,90	0,90	1,20	0,70		0,90
	0,70	1,19	0,60		5,10	0,90	1,10	0,70		0,80
34	0,45	0,85				1,31	0,41			
	0,46	0,93				1,34	0,47			
	0,45	0,92				1,34	0,51			
36		0,98					0,94			
		0,90					0,88			
		0,95					0,94			
37	0,48	0,94	0,70	0,71		1,26	0,97	0,86	3,03	
	0,47	0,95	0,70	0,68		1,39	0,98	0,91	3,26	
	0,48	0,90	0,71	0,69		1,25	1,03	0,93	3,47	
38	0,72	1,03	0,72	0,50	3,97	1,17	1,08	1,11	2,36	1,08
	0,62	1,40	0,62	0,56	4,36	1,10	1,08	1,10	2,54	1,11
	0,72	1,12	0,73	0,56	3,76	1,19	0,95	1,04	3,01	1,08
39		1,07	0,83	0,72			1,14	0,78	2,91	
		1,11	0,74	0,70			1,17	0,70	2,96	
		1,08	0,76	0,68			1,15	0,71	3,03	
41		1,12	0,80	0,65			1,04	0,58	2,49	
		1,14	0,74	0,59			1,04	0,62	2,43	
		1,15	0,70	0,65			0,96	0,62	2,38	

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	Solid waste prEN 14582 Part A					Mixed liquid waste from chemical industry prEN 14582 Part A				
Lab. No.	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**
42	1,00					0,90				
	1,30					0,80				
	1,40					0,95				
44	0,97	1,87	0,66	0,61	4,60	1,30	1,13	0,66	2,94	0,76
	0,74	2,21	0,76	0,67	4,70	1,01	1,17	0,69	3,28	0,79
	0,67	1,99	0,80	0,53	4,60	1,07	1,01	0,65	2,87	0,71
46	0,82	0,98	<0,05	<0,05	2,22	1,03	1,21	<0,05	<0,05	0,42
	0,88	1,01	<0,05	<0,05	2,18	0,96	1,25	<0,05	<0,05	0,40
47	0,35	0,61	0,51		4,13	1,25	0,89	0,67	3,23	0,80
	0,37	0,70	0,56		4,30	1,22	0,88	0,63	3,24	0,77
	0,36	0,71	0,57		4,47	1,11	0,75	0,63	3,49	0,82
48	0,38	0,70	0,38		3,00	0,77	0,82	0,61		0,24
	0,40	0,85	0,46		3,23	0,83	1,21	0,70		0,37
	0,39	0,72	0,41		2,87	0,96	1,10	0,53		0,32
49	0,52	0,91	0,57	0,45	3,04	1,26	1,02	0,67	1,88	0,77
	0,57	0,99	0,60	0,45	3,33	1,18	1,02	0,66	2,31	0,69
	0,60	1,06	0,65	0,59	3,53	1,29	1,02	0,70	2,23	0,78

	Waste solvent prEN 14582 Part A					**Liquid recovered fuel** prEN 14582 Part A	
Lab. No.	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Chlorine**	**Sulphur**
2	0,35	6,80	0,66	0,52		0,67	
	0,35	6,60	0,44	0,52		0,63	
	0,34	8,10	0,42	0,66		0,61	
3		7,95	0,45		0,56	0,79	0,62
		10,98	0,82		0,72	0,67	0,61
		11,21	0,89		0,79	0,39	0,59
4	0,739	12,77	0,776		0,877	0,978	0,87
	0,694	12,74	0,847		0,74	0,876	0,71
	0,692	12,47	0,793		0,648	1,025	0,68
10	0,73	12,36	0,91		0,98	0,86	0,66
	0,70	12,04	-		0,90	0,84	0,64
	0,78	12,90	0,93		0,96	0,84	0,70
12	0,77	12,71	0,89	0,58	0,83	0,84	0,69
	0,78	13,17	0,95	0,69	0,95	0,84	0,69
	0,79	13,33	0,94	0,62	0,94	0,84	0,69
13	0,32	10,67	0,70	0,68	0,81	1,07	0,68
	0,26	5,69	0,79	0,68	0,42	0,89	0,65
	0,34	10,86	0,87	0,63	0,82	1,05	0,70
17	0,51	13,40	0,55	0,70	2,20	0,85	0,71
	0,47	13,70	0,79	0,71	2,40	0,81	0,79
	0,49	13,57	0,84	0,58	2,34	0,82	0,64
18	0,57	9,95	0,95	0,59	0,51	0,66	0,64
	0,59	10,40	1,12	0,63	0,60	0,61	0,59
	0,52	9,74	1,12	0,53	0,49	0,53	0,57
20	0,57	12,60	0,90	0,69	0,96	0,90	0,68
	0,65	12,90	0,93	0,70	1,00	0,88	0,65
	0,64	13,10	0,98	0,72	1,06	0,88	0,63
21	0,85	13,60	0,90	< 0,02 %	1,03	0,76	0,54
	0,41	9,30	0,53	< 0,02 %	0,64	0,95	0,63
	0,60	11,00	0,69	< 0,02 %	0,74	0,86	0,61
23	0,58	10,55	0,97	0,83	0,94	0,69	0,56
	0,61	10,93	1,02	0,88	0,92	0,71	0,61
	0,68	11,05	0,95	0,87	0,91	0,63	0,56
24		11,82	0,00	0,00	0,90	0,86	0,65
		12,11	0,00	0,00	0,92	0,85	0,68
		11,52	0,00	0,00	0,81	0,85	0,66
25	0,87	11,11	0,84	0,35	0,55	0,86	0,50
	0,73	10,30	0,80	0,29	0,57	0,72	0,52
	0,63	9,43	0,79	0,29	0,60	0,66	0,51
30	0,16	9,51			0,49	0,79	0,75
						0,74	0,76
						0,71	0,73
31	0,94	11,50	1,12	0,93	0,81	0,71	0,57
	0,88	11,80	1,16	0,80	0,78	0,72	0,60
	0,88	11,80	1,13	0,85	0,85	0,69	0,64

	Waste solvent prEN 14582 Part A					**Liquid recovered fuel** prEN 14582 Part A	
Lab. No.	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Chlorine**	**Sulphur**
32	0,65	11,67	0,83	0,61		0,87	
	0,60	10,41	0,52	0,36		0,87	
	0,72	12,28	0,78	0,46		0,87	
33	0,50	12,50	0,80		1,00	0,64	0,76
	0,40	12,20	0,90		0,90	0,80	0,56
	0,50	12,10	1,00		1,10	0,84	0,76
34	0,58	12,20				0,81	
	0,58	12,20				0,81	
	0,56	12,20				0,79	
36		9,24				0,96	
		9,83				0,96	
		9,59				0,96	
37	0,58	11,40	0,95	0,32		0,89	
	0,57	11,60	0,97	0,36		0,90	
	0,40	11,20	0,97	0,33		0,91	
38	0,61	10,23	1,49	0,36	1,20	0,87	0,78
	0,60	10,55	1,53	0,37	1,15	0,86	0,78
	0,59	10,40	1,46	0,36	1,18	0,85	0,78
39		11,50	1,95	0,45		0,87	
		11,40	2,30	0,50		0,86	
		11,80	1,80	0,60		0,88	
41		12,02	1,31			0,82	
		11,91	1,24			0,83	
		11,77	1,29			0,82	
42	0,86						
	0,65						
	0,60						
44	0,31	12,86	0,57		0,81	0,88	0,51
	0,51	11,59	0,32	0,37	0,74	0,89	0,72
		11,53	0,67	0,49	0,86	0,83	0,60
46	0,50	10,37	<0,05	<0,05	0,35	0,96	0,58
	0,47	9,33	<0,05	<0,05	0,32	0,98	0,62
47	0,47	1,03	0,90	0,66	0,77	0,54	0,88
	0,84	1,19	1,02	0,60	0,92	0,51	0,74
	0,66	1,17	0,91	0,63	0,89	0,41	0,67
48	0,49	10,10	0,61		0,45	0,90	0,48
	0,55	11,20	0,70		0,49	0,62	0,41
	0,54	9,57	0,60		0,51	0,57	0,41
49	0,65	10,81	0,74	0,50	0,89	0,80	0,63
	0,72	12,02	0,94	0,54	0,97	0,78	0,69
	0,71	11,27	0,90	0,61	0,93	0,77	0,68

Table 3b: prEN 14582 Part B (Schoeniger combustion) - Detailed results

	Control mixture					Waste wood		Solid recovered fuel	
	prEN 14582 B					prEN 14582 B		prEN 14582 B	
Lab-Code	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Chlorine**	**Sulphur**	**Chlorine**	**Sulphur**
11		0,52	0,21			2,87		3,56	
		0,48	0,19			2,50		3,48	
						0,00		0,00	
12	0,64	1,13	0,55	0,38	0,49	2,38	0,96	1,08	1,44
	0,61	1,05	0,56	0,34	0,51	2,40	1,02	2,58	1,27
	0,59	0,81	0,56	0,34	0,53	2,03	1,30	2,60	1,42
14	0,47	0,66	0,59	0,40	0,54	1,78	1,01	2,32	1,18
	0,45	0,64	0,60	0,40	0,48	1,76	0,91	2,40	1,30
	0,45	0,69	0,59	0,40	0,49	1,83	0,93	2,52	1,33
16	0,52	0,68	0,49	0,46	0,54	2,20	0,94	2,53	1,21
	0,49	0,71	0,50	0,42	0,50	1,98	0,94	2,61	1,32
	0,56	0,69	0,50	0,59	0,57	2,17	0,94	2,42	1,39
25	0,45	0,55	0,54	0,44	0,41	1,46	0,84	1,71	1,37
	0,47	0,59	0,55	0,48	0,41	1,48	0,91	1,95	1,51
	0,49	0,60	0,58	0,50	0,45	1,46	0,93	1,72	1,28
27	0,50	0,64	0,57	0,47	0,44	1,81	0,98	2,08	1,48
	0,51	0,63	0,56	0,47	0,46	1,74	0,97	2,14	1,45
	0,51	0,62	0,56	0,42	0,48	1,76	0,97	2,36	1,41
29	0,46	0,55	0,57		0,61	1,75	0,95	2,83	1,38
	0,42	0,55	0,55		0,57	1,64	0,95	2,68	1,36
	0,40	0,54	0,54		0,56	1,93	0,83	3,26	1,70

	Solid waste prEN 14582 B					Mixed liquid waste from chemical industry prEN 14582 B				
Lab-Code	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**
11		0,73	1,54				0,51	1,72		
		0,71	1,57				0,71	1,64		
							0,00	0,00		
12	0,75	1,17	0,78	1,43	0,71	1,34	1,26	0,78	3,55	0,79
	0,78	1,53	0,78	1,39	1,28	1,37	1,44	0,79	4,61	0,70
	0,77	1,20	0,79	1,40	0,84	1,41	1,42	0,80	3,42	0,74
14	0,52	1,44	0,80	0,77	1,84					
	0,43	1,45	0,83	0,79	1,35					
	0,53	1,39	0,81	0,80	1,97					
16	1,15	1,14	0,68	0,68	2,74					
	1,12	1,35	0,72	0,73	3,01					
	1,25	1,16	0,72	0,80	2,42					
25	0,79	1,22	0,63	0,66	1,42	1,43	n.n.	0,59	2,34	0,88
	0,93	1,28	0,75	0,64	2,24	1,12	n.n.	0,46	1,62	0,83
	0,80	1,06	0,68	0,61	2,33	1,16	n.n.	0,48	2,01	0,86
27	1,13	1,41	0,74	0,82	4,28	1,41	0,78	0,71	3,69	0,72
	0,64	0,88	0,69	0,81	1,68	1,44	0,71	0,70	3,77	0,72
	0,60	0,90	0,71	0,84	1,64	1,43	0,67	0,69	3,65	0,69
29	0,64	1,00	0,74	n.b.	1,89	1,37	0,65	0,74	n.b.	0,73
	0,59	1,04	0,68	n.b.	1,68	1,69	0,96	0,91	n.b.	0,73
	0,52	1,01	0,74	n.b.	1,35	1,54	0,91	0,83	n.b.	0,75

	Waste solvent prEN 14582 B					Liquid recovered fuel prEN 14582 B	
Lab-Code	**Fluorine**	**Chlorine**	**Bromine**	**Iodine**	**Sulphur**	**Chlorine**	**Sulphur**
11		0,18	1,72			0,08	
		0,19	1,79			0,11	
		0,00	0,00			0,00	
12	0,63	12,09	0,95	0,97	1,03	1,10	0,64
	0,62	12,23	0,93	0,68	1,05	1,15	0,73
	0,74	11,91	1,07	0,74	0,99	1,33	0,91
25	0,95	5,30	0,92	0,40	1,63	0,48	3,69
	0,88	4,54	0,99	0,50	1,53	0,04	0,93
	0,87	3,92	0,95	0,38	1,51	0,32	3,21
	0,90	4,59	0,96	0,43	1,56	0,28	2,61
27	0,77	11,13	0,93	0,75	0,90	0,45	0,71
	0,78	12,53	0,99	0,79	0,88	0,48	0,69
	0,75	11,16	0,91	0,71	0,87	0,61	0,69
	0,77	11,61	0,94	0,75	0,88	0,51	0,70
29	0,86	11,30	0,97	n.b.	0,96	0,70	0,79
	0,93	11,83	1,20	n.b.	1,09	0,63	0,73
	0,85	11,72	0,92	n.b.	0,99	0,61	0,74

Table 4a: Performance characteristics of prEN 14528 A (Bomb combustion)

	Sample	O %	p	N	Outliers	m [% w/w]	sR	SR	sr	Sr
Fluorine	Control	0	21	63	0	0,381	0,082	21,43	0,046	11,95
	Solid	4	24	70	3	0,597	0,236	39,48	0,081	13,51
	Mixed	0	24	71	0	1,184	0,232	19,62	0,128	10,85
	Waste	0	24	68	0	0,595	0,165	27,80	0,085	14,26
Chlorine	Control	4	27	79	3	0,589	0,133	22,63	0,040	6,81
	Waste	0	81	81	0	1,656	0,217	13,10	0,088	5,34
	Solid	0	28	83	0	2,128	0,578	27,18	0,143	6,71
	Solid	4	28	83	3	0,984	0,225	22,92	0,095	9,68
	Mixed	0	28	83	0	1,002	0,306	30,55	0,123	12,30
	Waste	15	28	81	12	11,328	1,469	12,97	0,478	4,22
	Liquid	0	28	83	0	0,799	0,140	17,54	0,077	9,68
Bromine	Control	14	22	64	9	0,499	0,108	21,61	0,036	7,28
	Solid	4	23	71	3	0,601	0,146	24,31	0,041	6,88
	Mixed	8	23	71	6	0,664	0,165	24,81	0,053	8,01
	Waste	0	23	70	0	0,928	0,344	37,00	0,118	12,70
Iodine	Control	13	16	46	6	0,291	0,103	35,54	0,039	13,43
	Solid	0	17	53	0	0,554	0,177	31,94	0,045	8,20
	Mixed	5	18	56	3	2,667	0,177	26,59	0,179	6,70
	Waste	0	16	52	0	0,574	0,172	29,94	0,059	10,32
Sulfur	Control	5	20	60	3	0,453	0,115	25,32	0,037	8,24
	Waste	5	20	60	3	0,897	0,147	16,42	0,065	7,29
	Solid	5	21	62	3	1,196	0,370	30,89	0,066	5,55
	Solid	0	21	62	0	3,236	1,037	32,03	0,270	8,34
	Mixed	5	21	62	3	0,675	0,172	25,45	0,051	7,60
	Waste	5	21	60	3	0,797	0,214	26,87	0,093	11,71
	Liquid	0	21	62	0	0,649	0,097	14,93	0,057	8,72

p Number of laboratories after elimination of outliers

N Number of observed values

O Percentage of outliers

m General mean

sR Estimate of the reproducibility standard deviation

sr Estimate of the repeatability standard deviation

SR Estimate of the relative reproducibility standard deviation

Sr Estimate of the relative repeatability standard deviation

Table 4b: Performance Characteristics Performance characteristics of pr EN 14528 A (Schoeniger combustion)

	Sample	O %	p	N	Outliers	m [% w/w]	sR	SR	sr	Sr
Fluorine	Control mixture	0	6	18	0	0,499	0,068	13,72	0,024	4,74
	Solid waste	17	6	18	3	0,771	0,269	34,81	0,059	7,70
	Mixed liquid waste	0	4	12	0	1,393	0,156	11,23	0,118	8,46
	Waste solvent	0	4	12	0	0,802	0,116	14,46	0,046	5,73
Chlorine	Control mixture	14	7	21	3	0,608	0,072	11,82	0,020	3,21
	Waste wood	0	7	21	0	0,933	0,048	5,17	0,044	4,76
	Solid recovered fuel	14	7	21	3	2,504	0,575	22,98	0,166	6,63
	Solid waste	0	7	21	0	1,154	0,245	21,28	0,156	13,52
	Mixed liquid waste	0	4	12	0	0,911	0,353	38,80	0,120	13,19
	Waste solvent	0	5	15	0	8,574	5,036	58,73	0,521	6,08
	Liquid recovered fuel	0	5	15	0	0,578	0,425	73,55	0,128	22,18
Bromine	Control mixture	14	7	21	3	0,553	0,033	5,93	0,012	2,09
	Solid waste	14	7	21	3	0,737	0,056	7,62	0,032	4,38
	Mixed liquid waste	0	5	15		0,846	0,405	47,87	0,056	6,58
	Waste solvent	20	5	15	3	0,977	0,082	8,36	0,088	9,01
Iodine	Control mixture	0	5	15	0	0,434	0,067	15,53	0,045	10,41
	Solid waste	0	5	15	0	0,878	0,305	34,72	0,032	3,66
	Mixed liquid waste	0	3	9	0	3,183	1,095	34,40	0,434	13,62
	Waste solvent	0	3	9	0	0,658	0,217	32,99	0,099	14,99
Sulfur	Control mixture	0	6	18	0	0,502	0,059	11,84	0,027	5,33
	Waste wood	0	4	12	0	0,933	0,048	5,17	0,044	4,46
	Solid recovered fuel	0	6	18	0	1,378	0,121	8,78	0,111	8,07
	Solid waste	17	6	18	3	1,805	0,704	39,00	0,349	19,34
	Mixed liquid waste	0	4	12	0	0,762	0,069	9,03	0,028	3,66
	Waste solvent	0	4	12	0	1,119		26,92	0,050	4,45
	Liquid recovered fuel	25	4	12	3	0,737	0,075	10,22	0,082	11,10

p Number of laboratories after elimination of outliers

N Number of observed values

O Percentage of outliers

m General mean

sR Estimate of the reproducibility standard deviation

sr Estimate of the repeatability standard deviation

SR Estimate of the relative reproducibility standard deviation

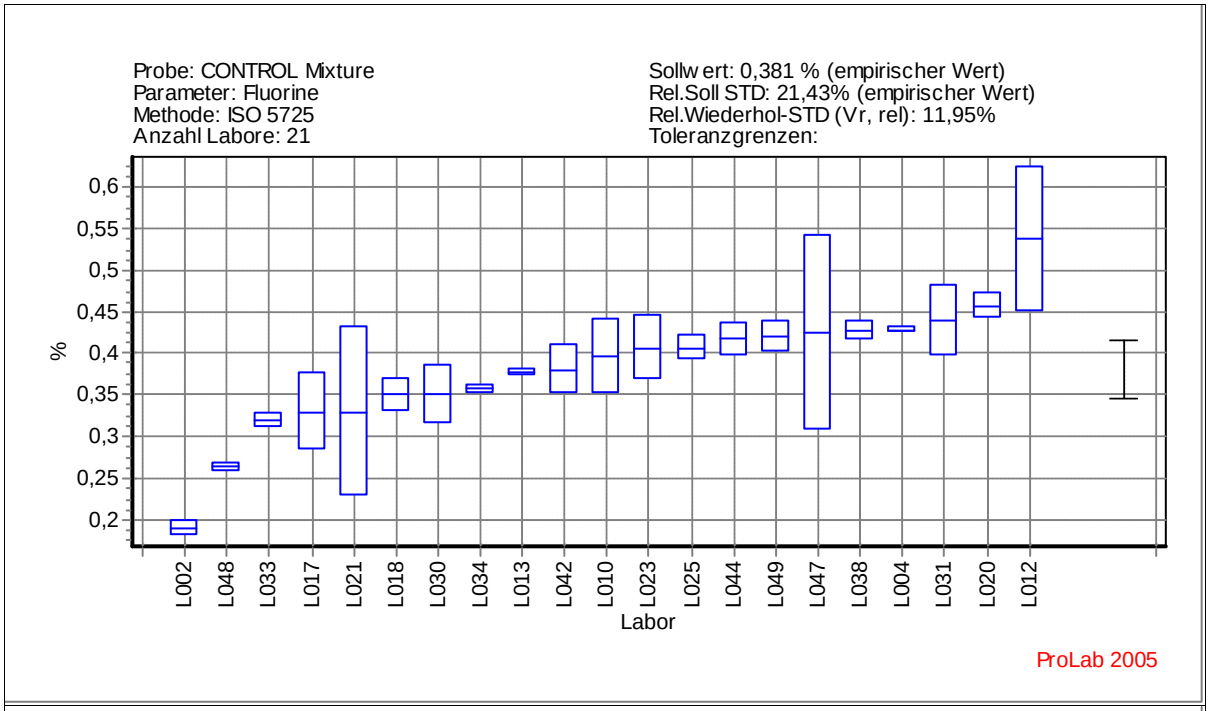
Sr Estimate of the relative repeatability standard deviation

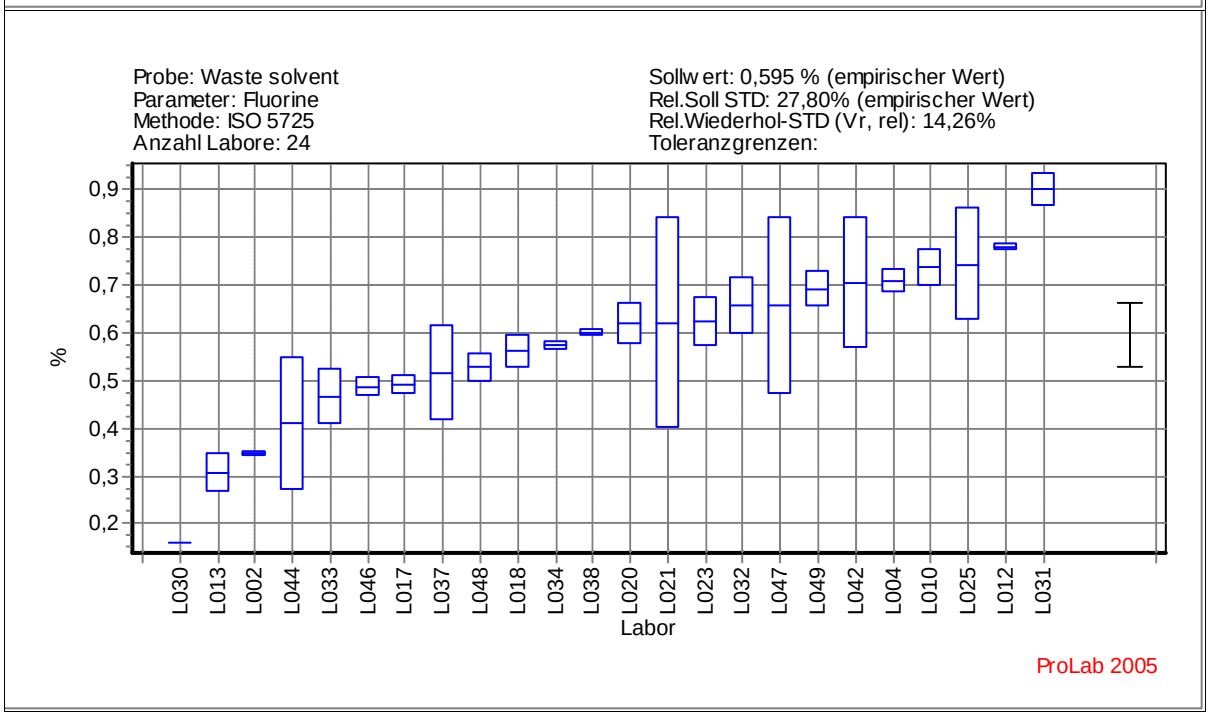
Graphical data presentation

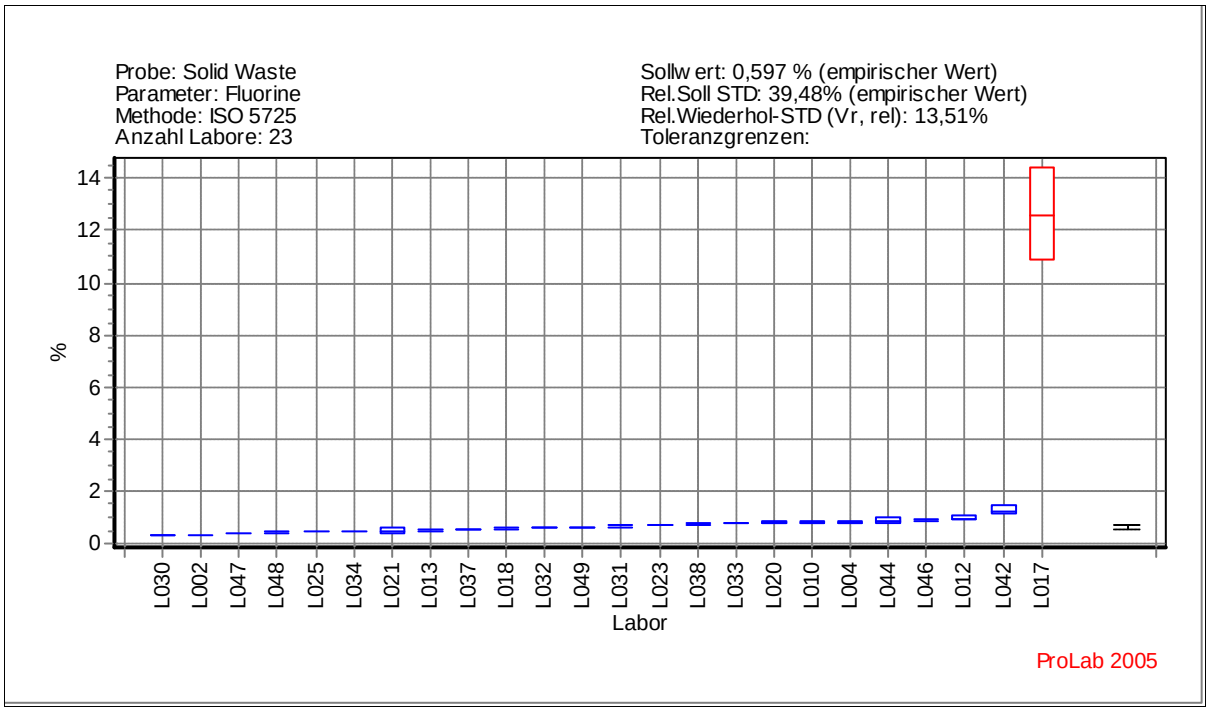
Translations: Probe (sample)
Anzahl Labore (number of laboratories)
Sollwert (mean value)
Rel. Soll-Std. (relative reproducibility standard deviation)
Rel. Wiederhol-STD (relative repeatability standard deviation)

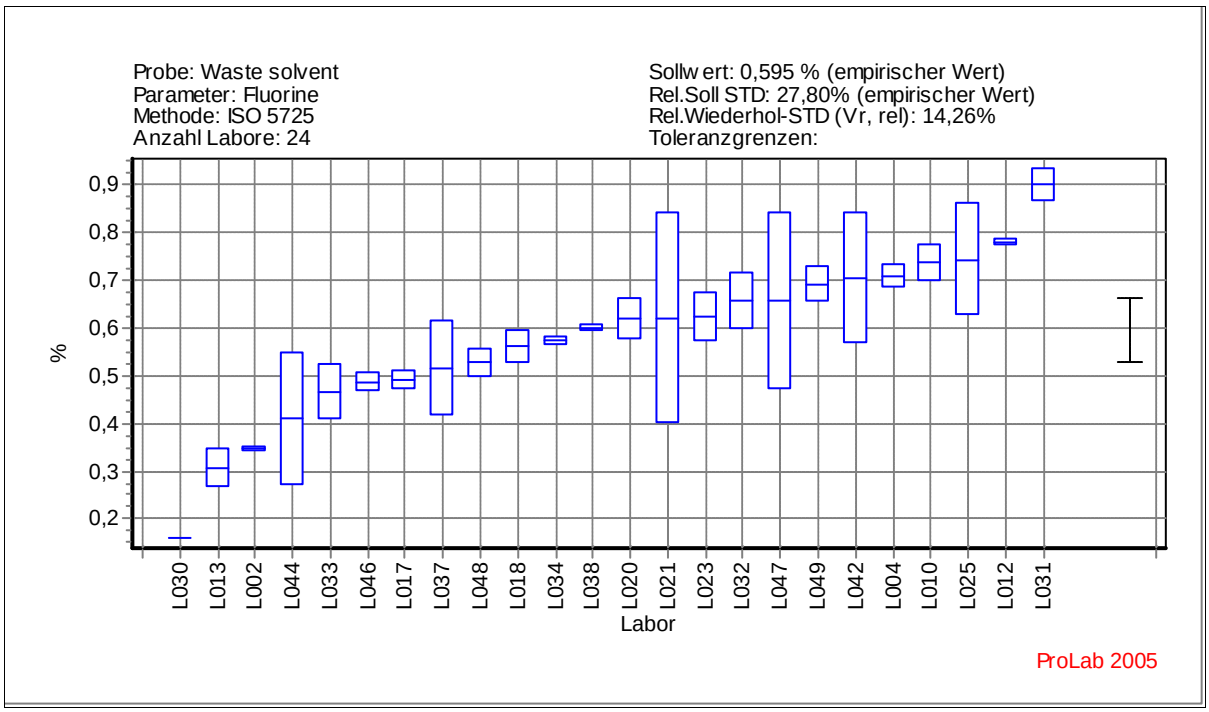
Bomb combustion

Fluorine

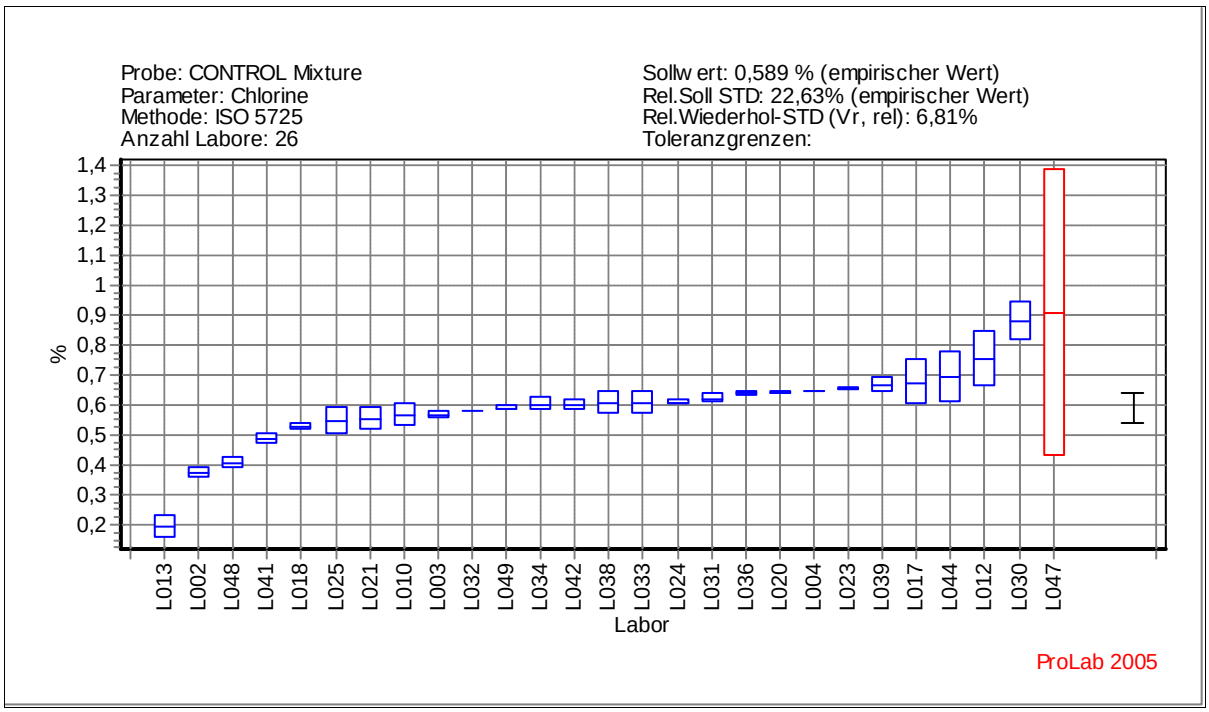


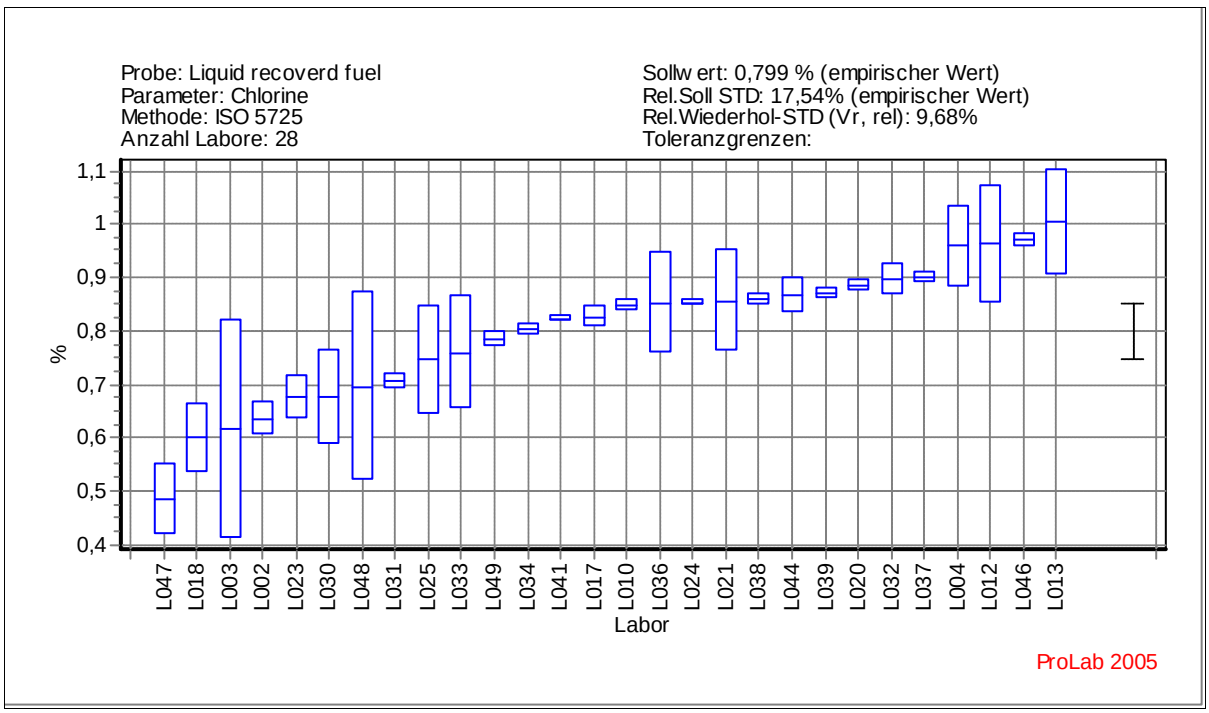


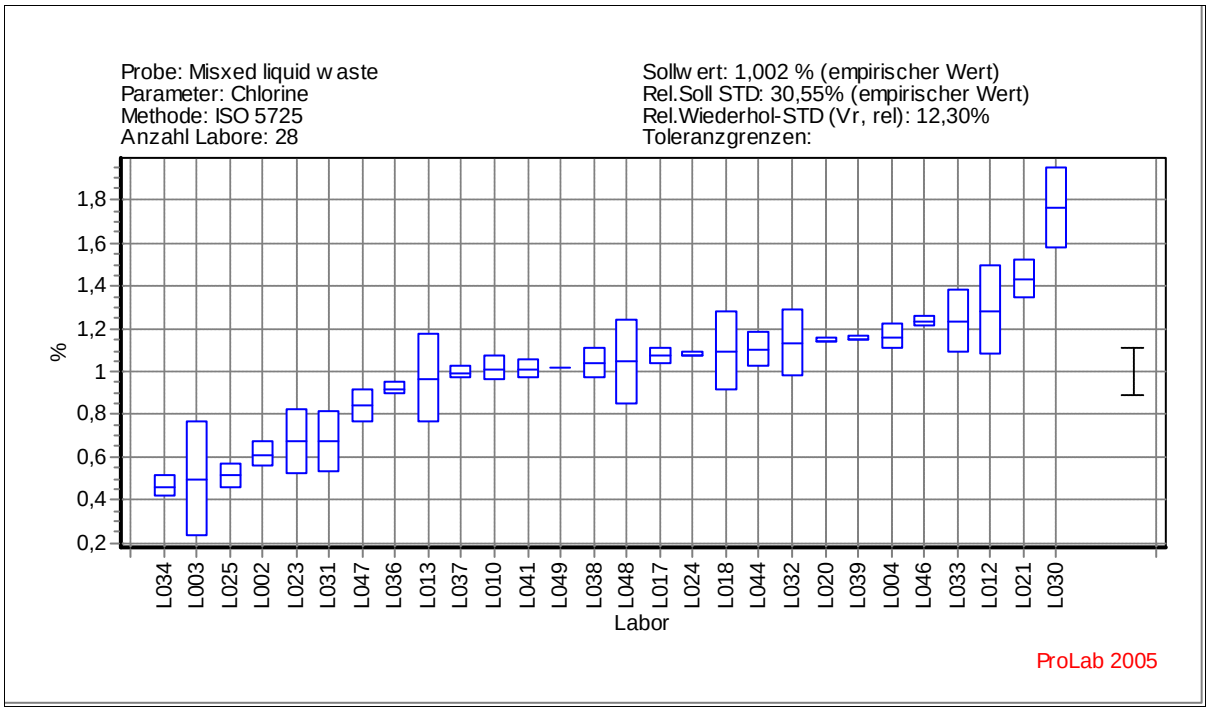

Probe: Solid Waste
Parameter: Fluorine
Methode: ISO 5725
Anzahl Labore: 23
Sollwert: 0,597 % (empirischer Wert)
Rel.Soll STD: 39,48% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 13,51%
Toleranzgrenzen:
%
0
2
4
6
8
10
12
14
L030 L002 L047 L048 L025 L034 L021 L013 L037 L018 L032 L049 L031 L023 L038 L033 L020 L010 L004 L044 L046 L012 L042 L017
Labor
ProLab 2005

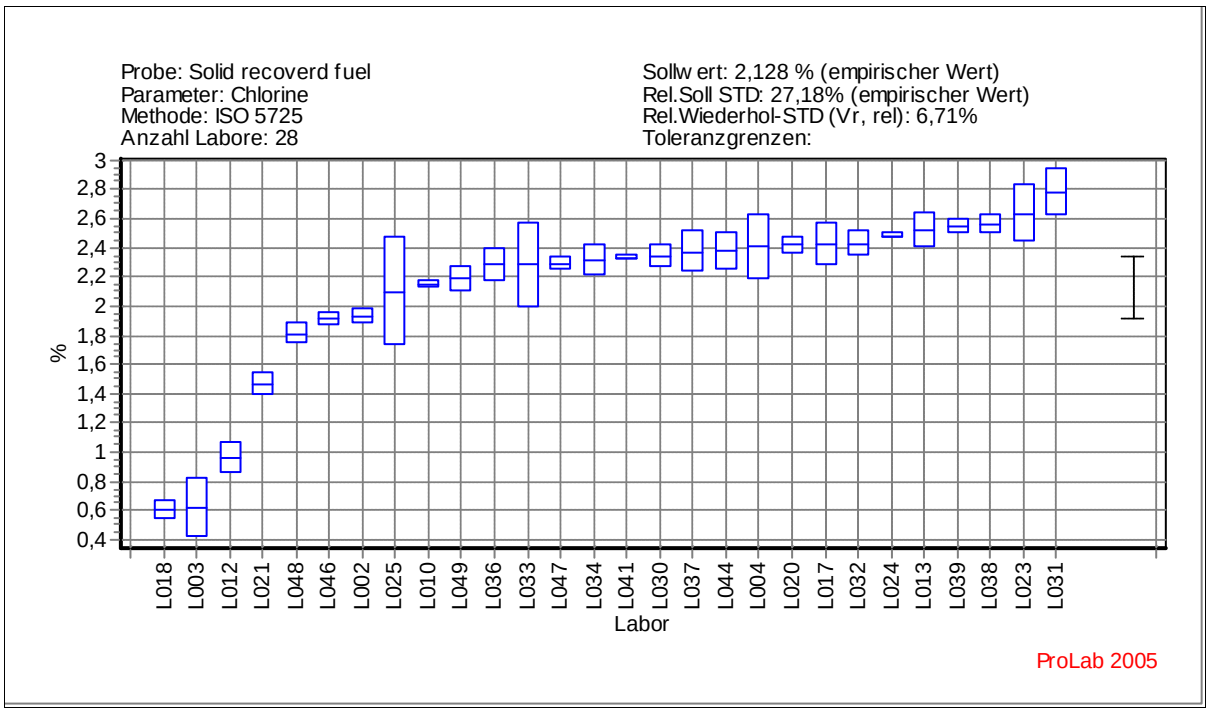

Probe: Waste solvent
Parameter: Fluorine
Methode: ISO 5725
Anzahl Labore: 24
Sollwert: 0,595 % (empirischer Wert)
Rel.Soll STD: 27,80% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 14,26%
Toleranzgrenzen:
%
0,2
0,3
0,4
0,5
0,6
0,7
0,8
0,9
L030 L013 L002 L044 L033 L046 L017 L037 L048 L018 L034 L038 L020 L021 L023 L032 L047 L049 L042 L004 L010 L025 L012 L031
Labor
ProLab 2005

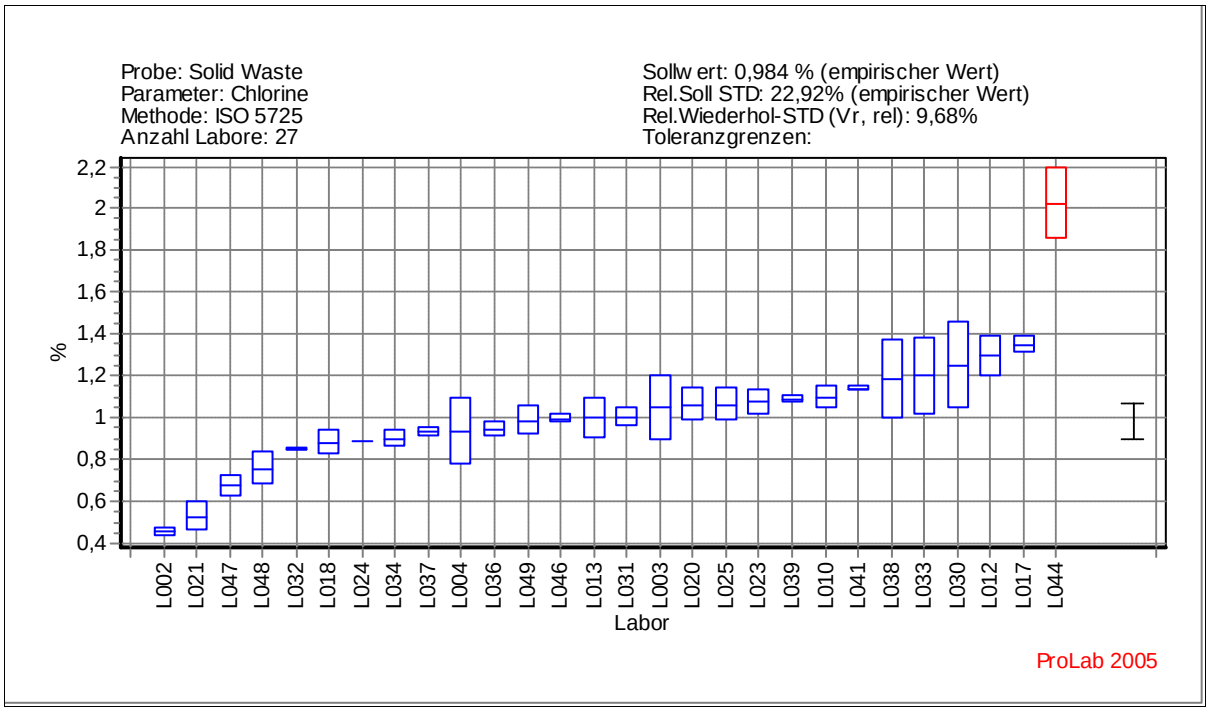
Bomb combustion: Chlorine

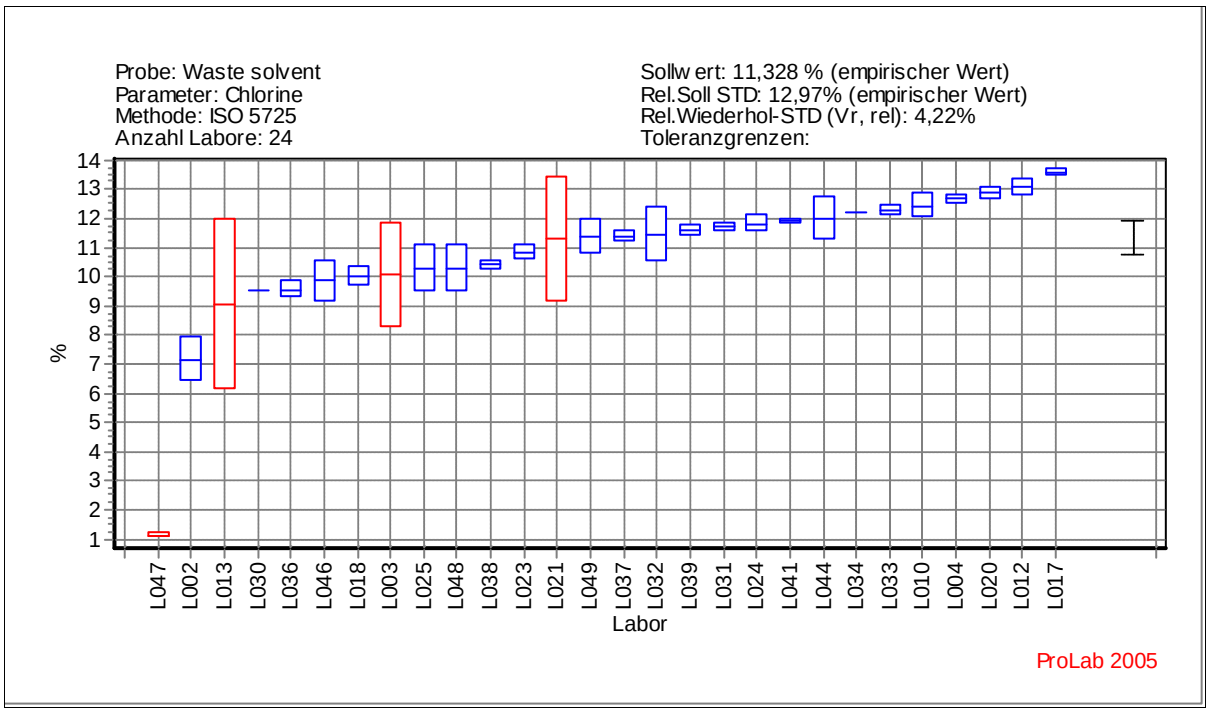


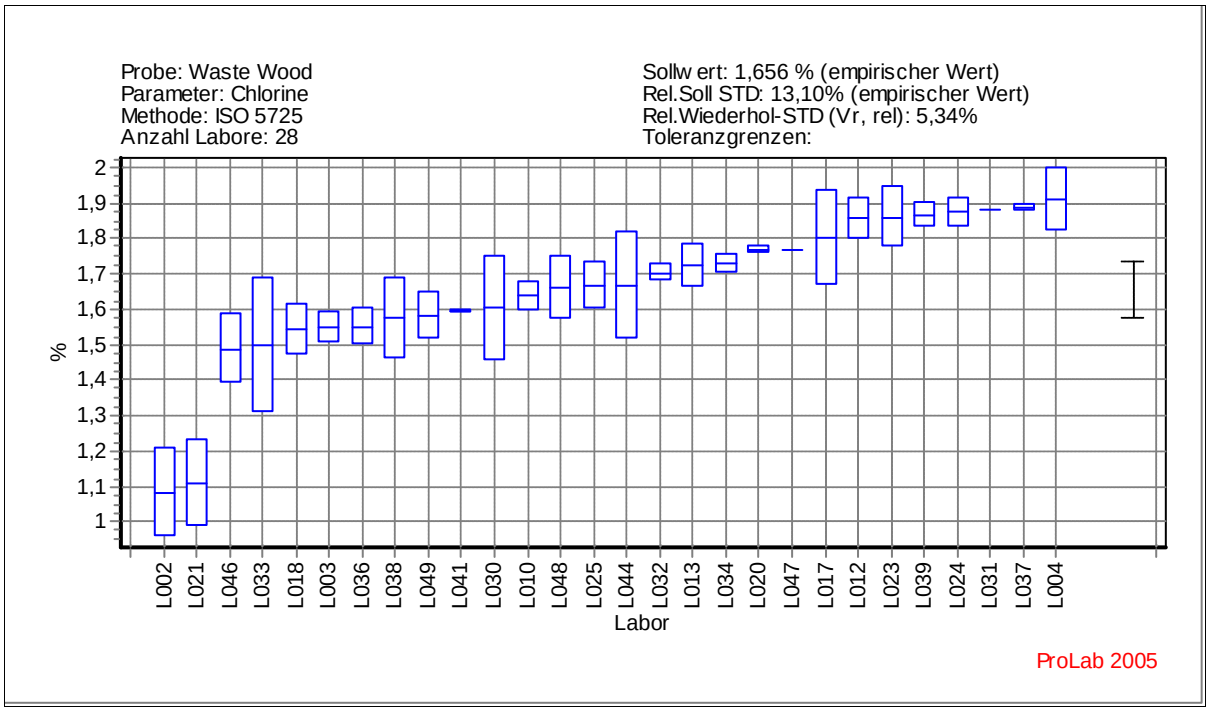



Probe: Misxed liquid w aste
Parameter: Chlorine
Methode: ISO 5725
Anzahl Labore: 28
Sollw ert: 1,002 % (empirischer Wert)
Rel.Soll STD: 30,55% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 12,30%
Toleranzgrenzen:
%
0,2
0,4
0,6
0,8
1
1,2
1,4
1,6
1,8
L034 L003 L025 L002 L023 L031 L047 L036 L013 L037 L010 L041 L049 L038 L048 L017 L024 L018 L044 L032 L020 L039 L004 L046 L033 L012 L021 L030
Labor
ProLab 2005

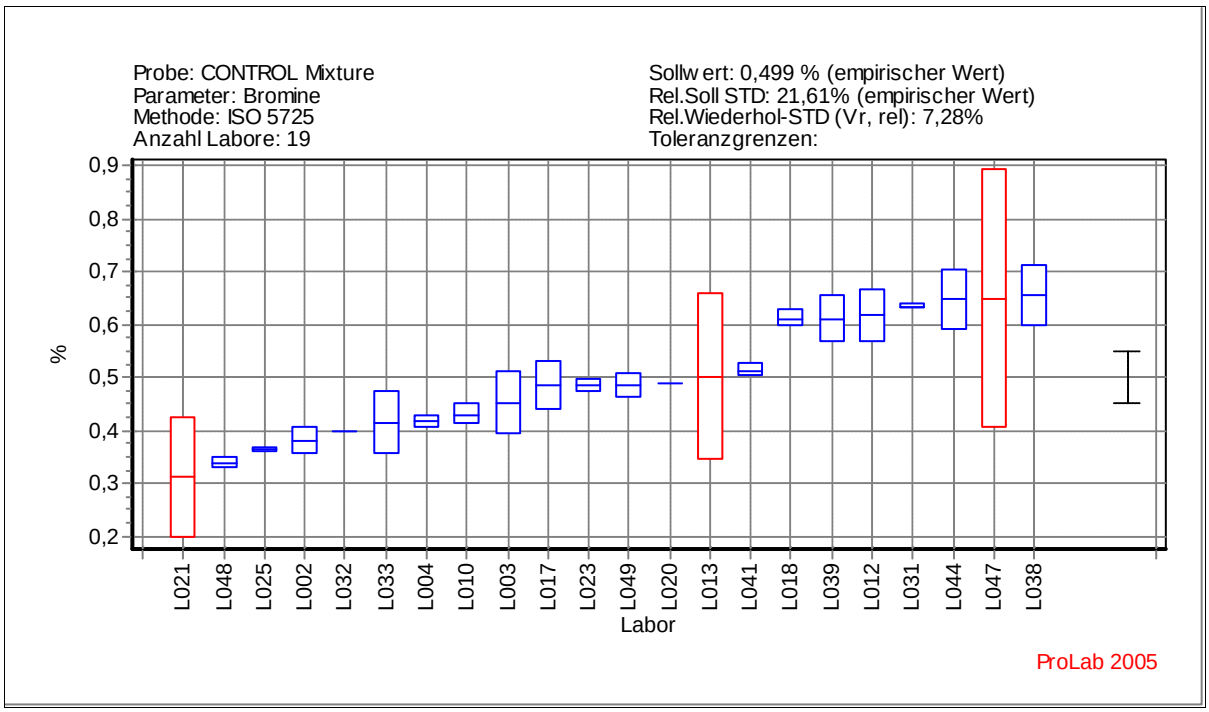

Probe: Solid recoverd fuel
Parameter: Chlorine
Methode: ISO 5725
Anzahl Labore: 28
Sollw ert: 2,128 % (empirischer Wert)
Rel.Soll STD: 27,18% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 6,71%
Toleranzgrenzen:
%
0,4
0,6
0,8
1
1,2
1,4
1,6
1,8
2
2,2
2,4
2,6
2,8
3
L018 L003 L012 L021 L048 L046 L002 L025 L010 L049 L036 L033 L047 L034 L041 L030 L037 L044 L004 L020 L017 L032 L024 L013 L039 L038 L023 L031
Labor
ProLab 2005

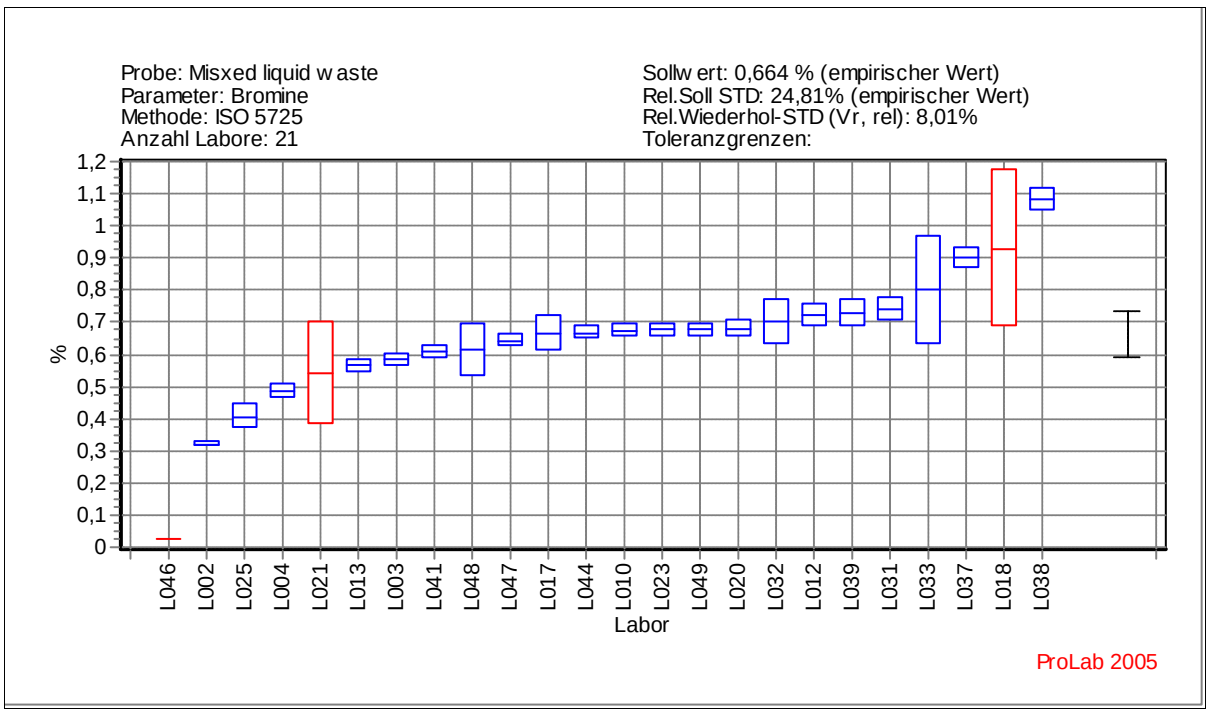

Probe: Solid Waste
Parameter: Chlorine
Methode: ISO 5725
Anzahl Labore: 27
Sollw ert: 0,984 % (empirischer Wert)
Rel.Soll STD: 22,92% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 9,68%
Toleranzgrenzen:
%
2,2
2
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
L002 L021 L047 L048 L032 L018 L024 L034 L037 L004 L036 L049 L046 L013 L031 L003 L020 L025 L023 L039 L010 L041 L038 L033 L030 L012 L017 L044
Labor
ProLab 2005

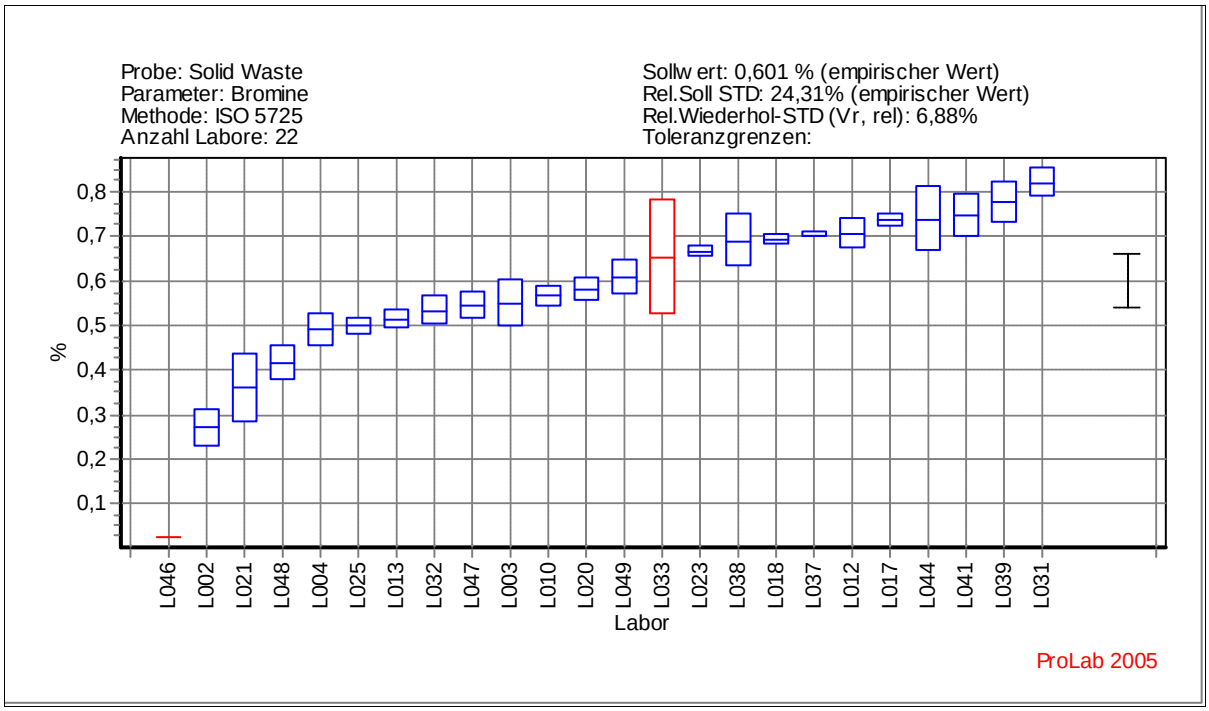

Probe: Waste solvent
Parameter: Chlorine
Methode: ISO 5725
Anzahl Labore: 24
Sollw ert: 11,328 % (empirischer Wert)
Rel.Soll STD: 12,97% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 4,22%
Toleranzgrenzen:
%
14
13
12
11
10
9
8
7
6
5
4
3
2
1
L047 L002 L013 L030 L036 L046 L018 L003 L025 L048 L038 L023 L021 L049 L037 L032 L039 L031 L024 L041 L044 L034 L033 L010 L004 L020 L012 L017
Labor
ProLab 2005

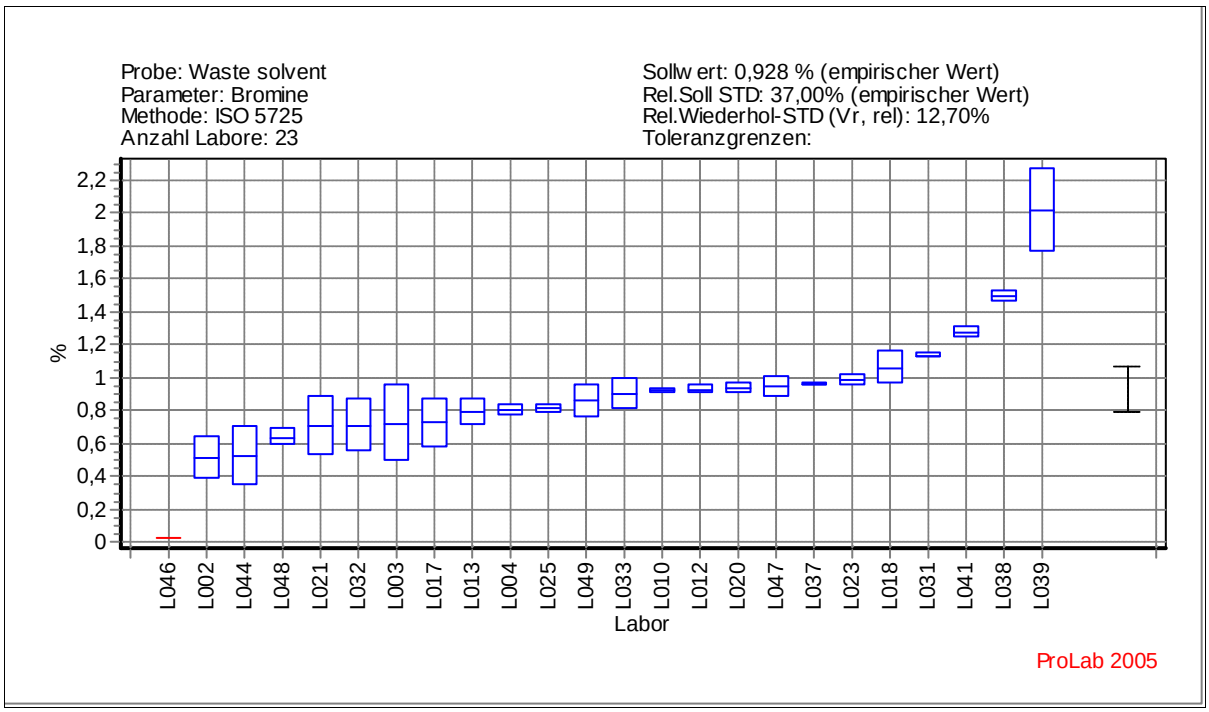

Probe: Waste Wood
Parameter: Chlorine
Methode: ISO 5725
Anzahl Labore: 28
Sollw ert: 1,656 % (empirischer Wert)
Rel.Soll STD: 13,10% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 5,34%
Toleranzgrenzen:
%
2
1,9
1,8
1,7
1,6
1,5
1,4
1,3
1,2
1,1
1
L002 L021 L046 L033 L018 L003 L036 L038 L049 L041 L030 L010 L048 L025 L044 L032 L013 L034 L020 L047 L017 L012 L023 L039 L024 L031 L037 L004
Labor
ProLab 2005

Bomb combustion: Bromine

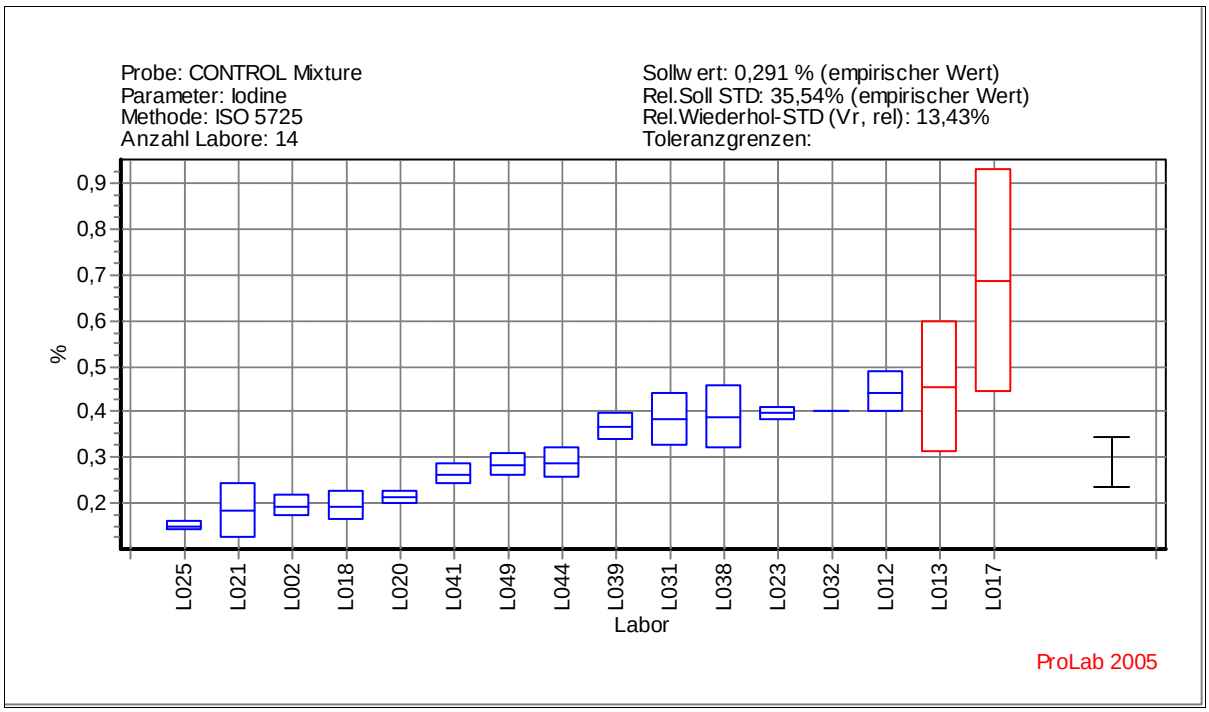


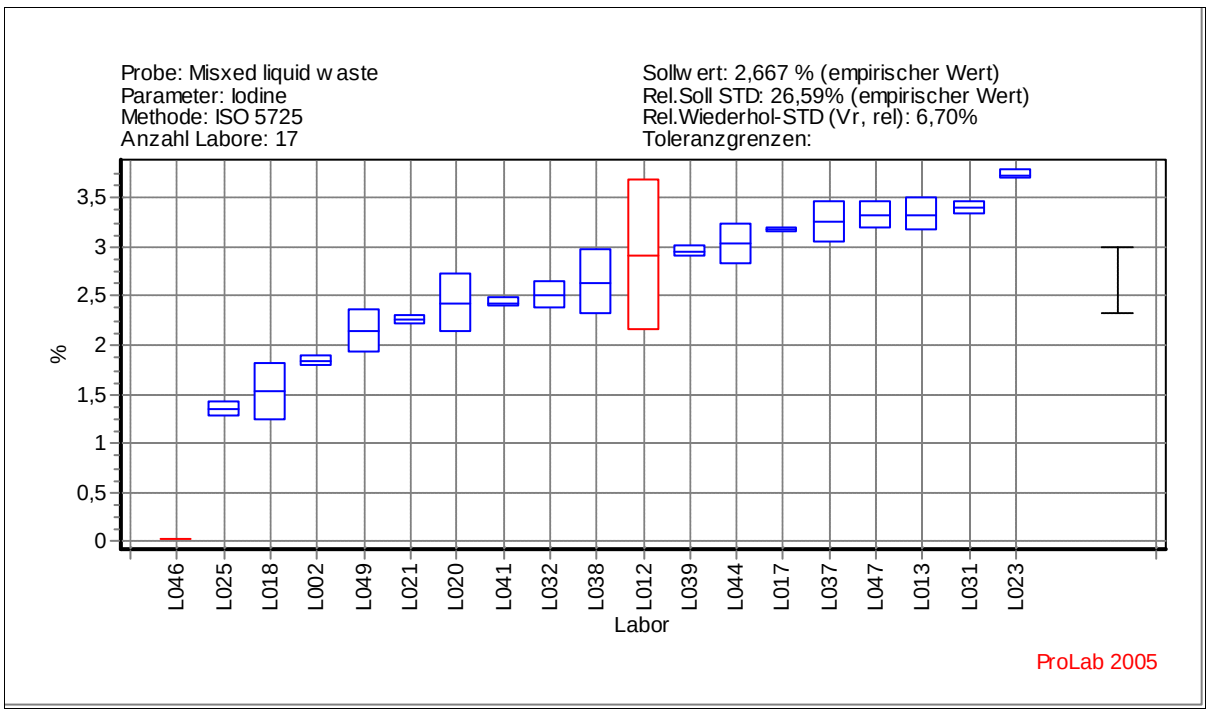


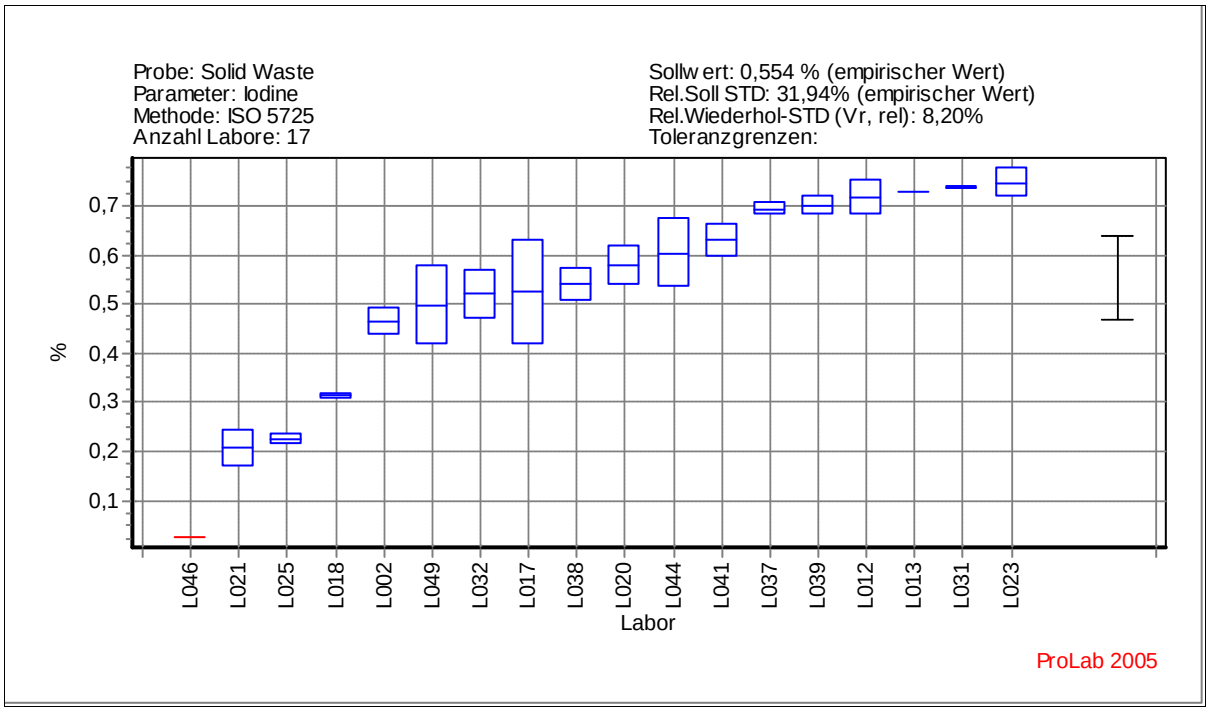

Probe: Solid Waste
Parameter: Bromine
Methode: ISO 5725
Anzahl Labore: 22
Sollw ert: 0,601 % (empirischer Wert)
Rel.Soll STD: 24,31% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 6,88%
Toleranzgrenzen:
%
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
L046 L002 L021 L048 L004 L025 L013 L032 L047 L003 L010 L020 L049 L033 L023 L038 L018 L037 L012 L017 L044 L041 L039 L031
Labor
ProLab 2005

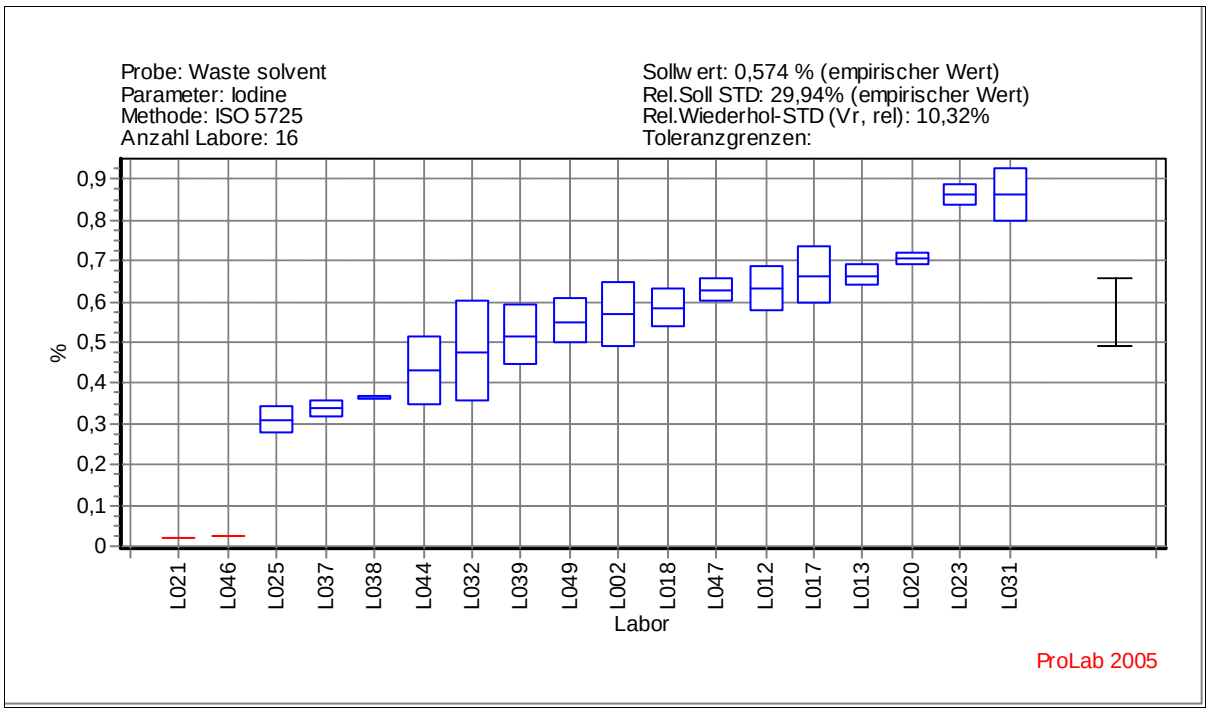

Probe: Waste solvent
Parameter: Bromine
Methode: ISO 5725
Anzahl Labore: 23
Sollw ert: 0,928 % (empirischer Wert)
Rel.Soll STD: 37,00% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 12,70%
Toleranzgrenzen:
%
2,2
2
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
L046 L002 L044 L048 L021 L032 L003 L017 L013 L004 L025 L049 L033 L010 L012 L020 L047 L037 L023 L018 L031 L041 L038 L039
Labor
ProLab 2005

Bomb combustion: Iodine

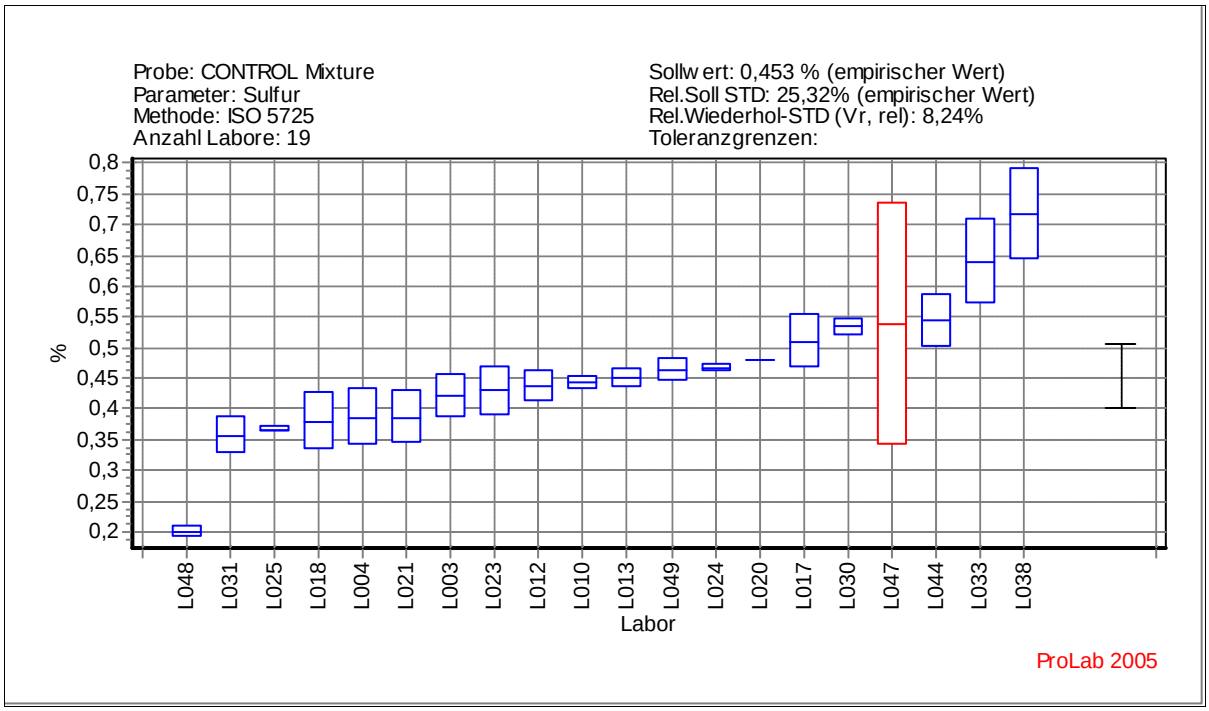


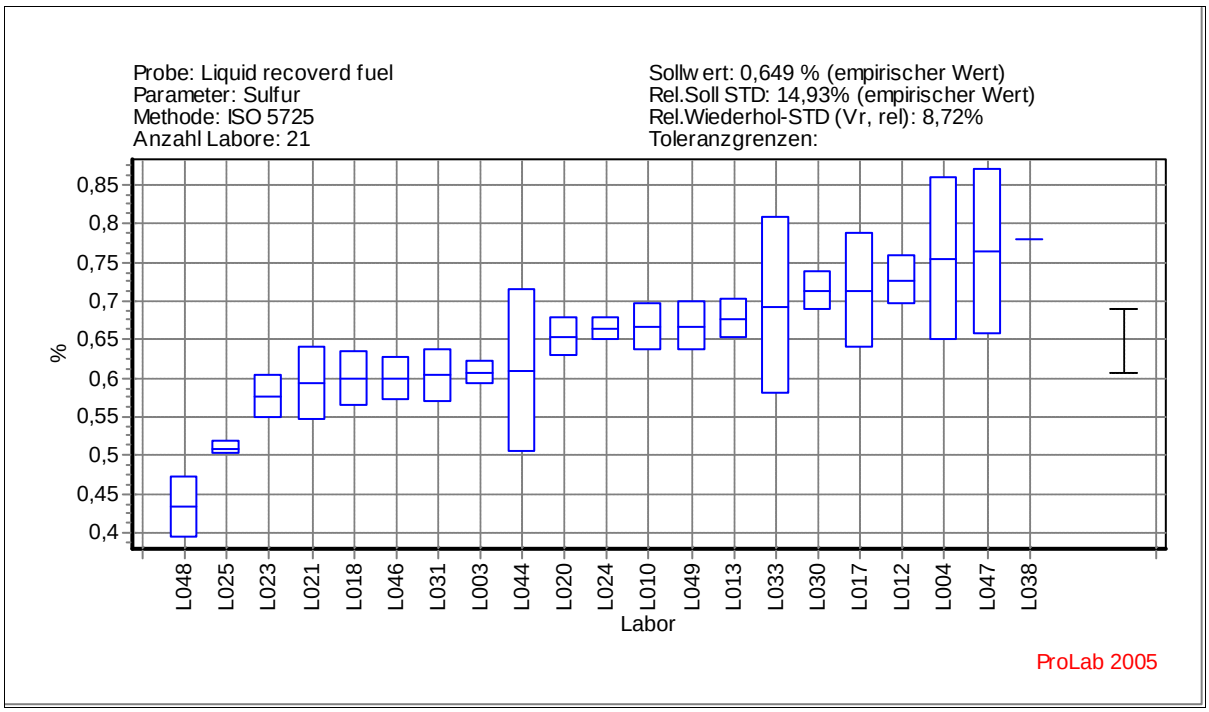


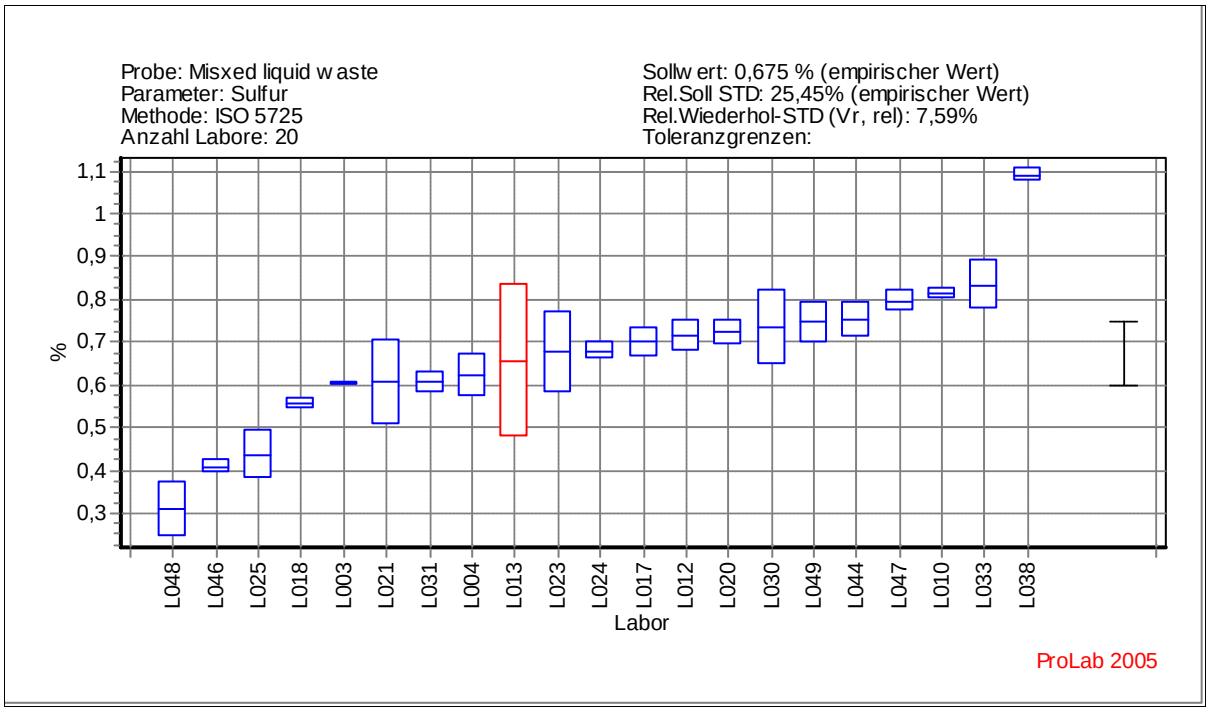

Probe: Solid Waste
Parameter: Iodine
Methode: ISO 5725
Anzahl Labore: 17
Sollwert: 0,554 % (empirischer Wert)
Rel.Soll STD: 31,94% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 8,20%
Toleranzgrenzen:
%
0,1
0,2
0,3
0,4
0,5
0,6
0,7
L046
L021
L025
L018
L002
L049
L032
L017
L038
L020
L044
L041
L037
L039
L012
L013
L031
L023
Labor
ProLab 2005

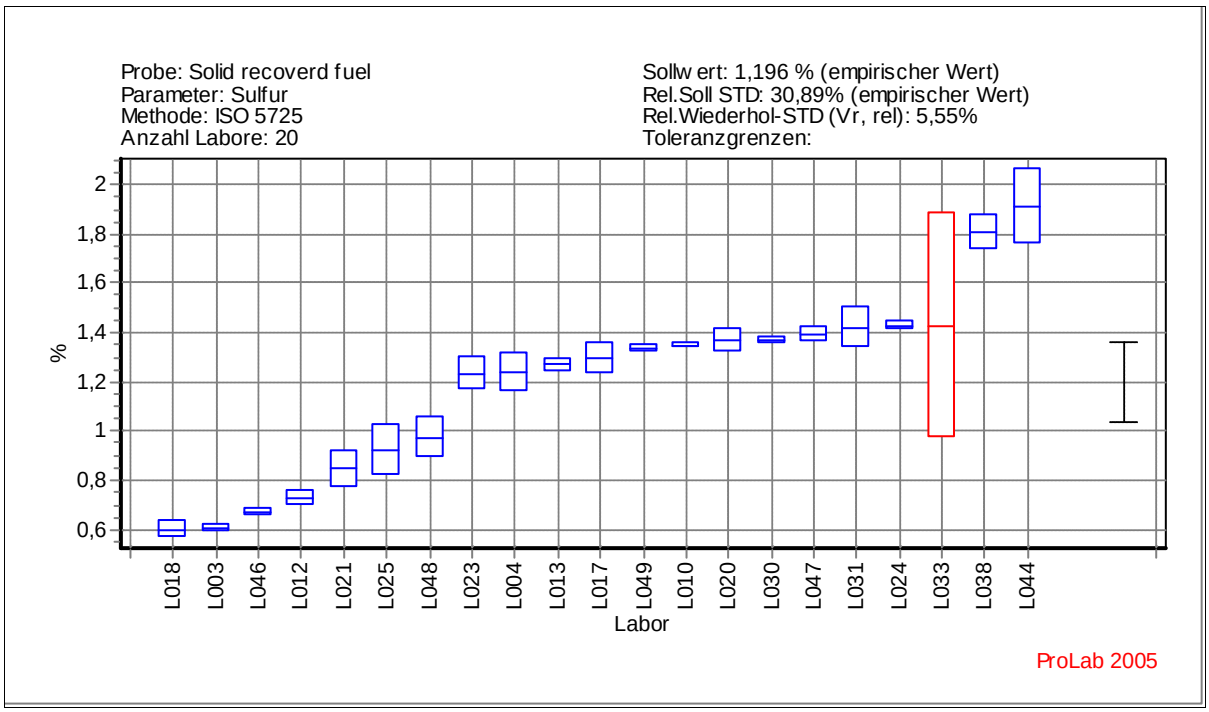

Probe: Waste solvent
Parameter: Iodine
Methode: ISO 5725
Anzahl Labore: 16
Sollwert: 0,574 % (empirischer Wert)
Rel.Soll STD: 29,94% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 10,32%
Toleranzgrenzen:
%
0
0,1
0,2
0,3
0,4
0,5
0,6
0,7
0,8
0,9
L021
L046
L025
L037
L038
L044
L032
L039
L049
L002
L018
L047
L012
L017
L013
L020
L023
L031
Labor
ProLab 2005

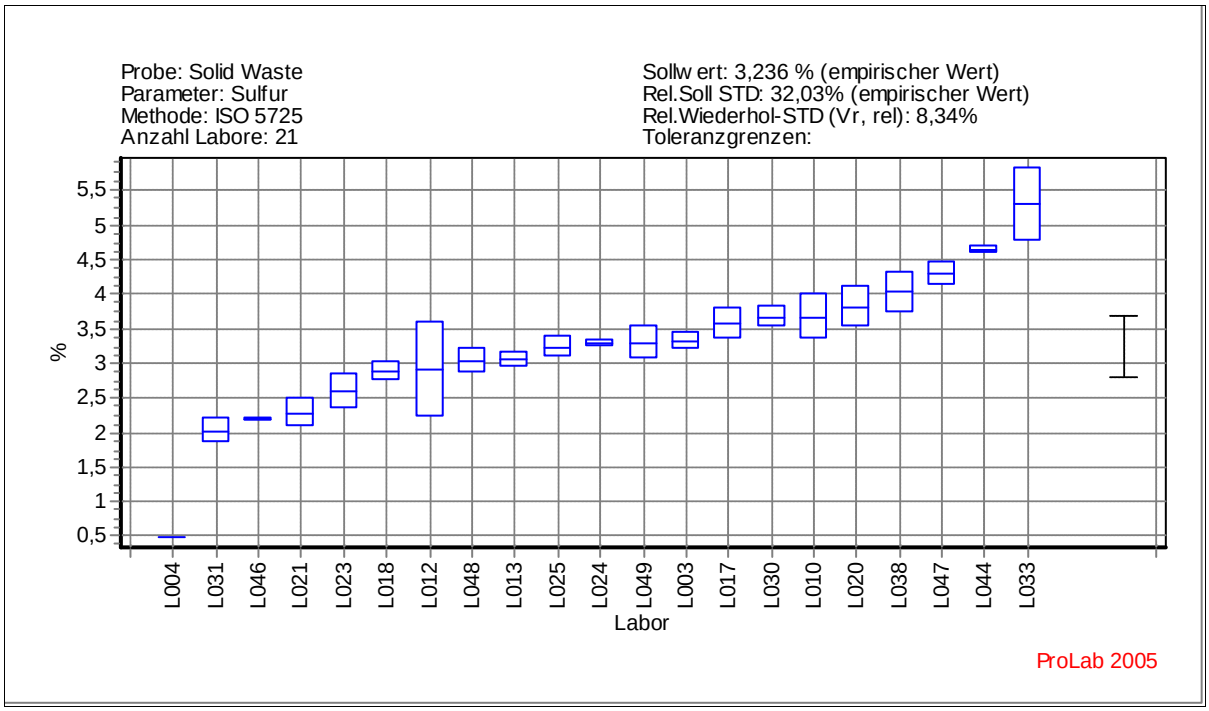
Bomb combustion: Sulfur

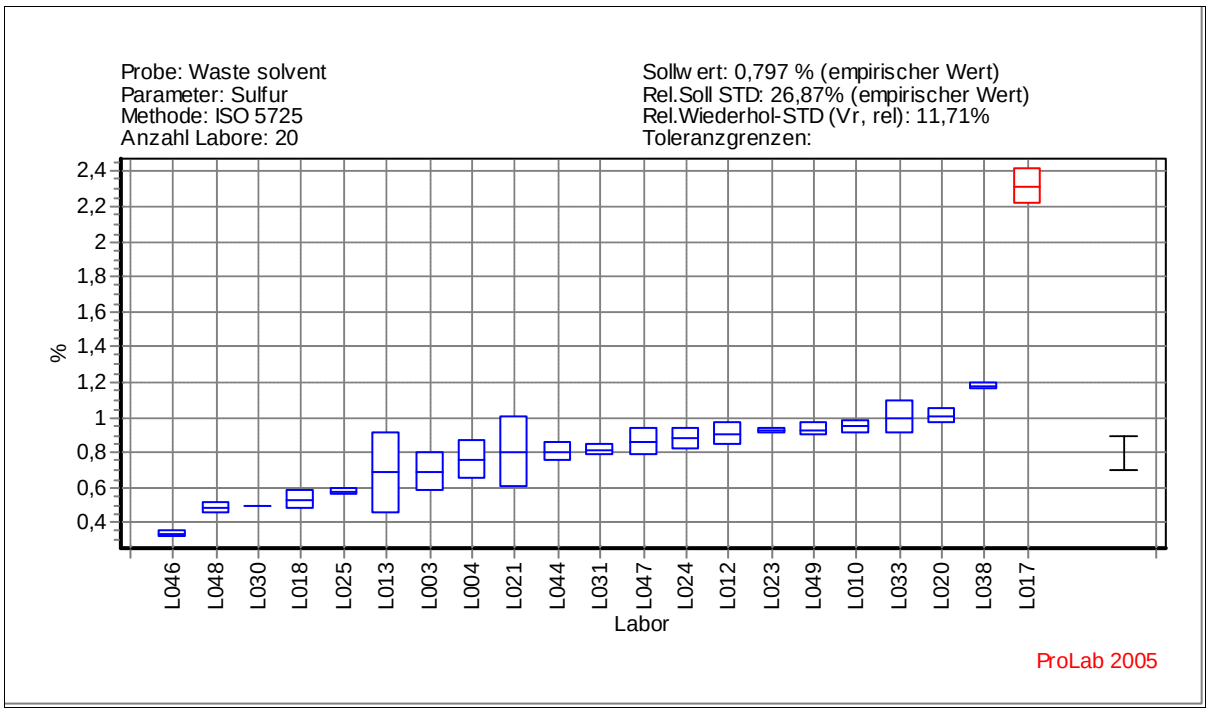


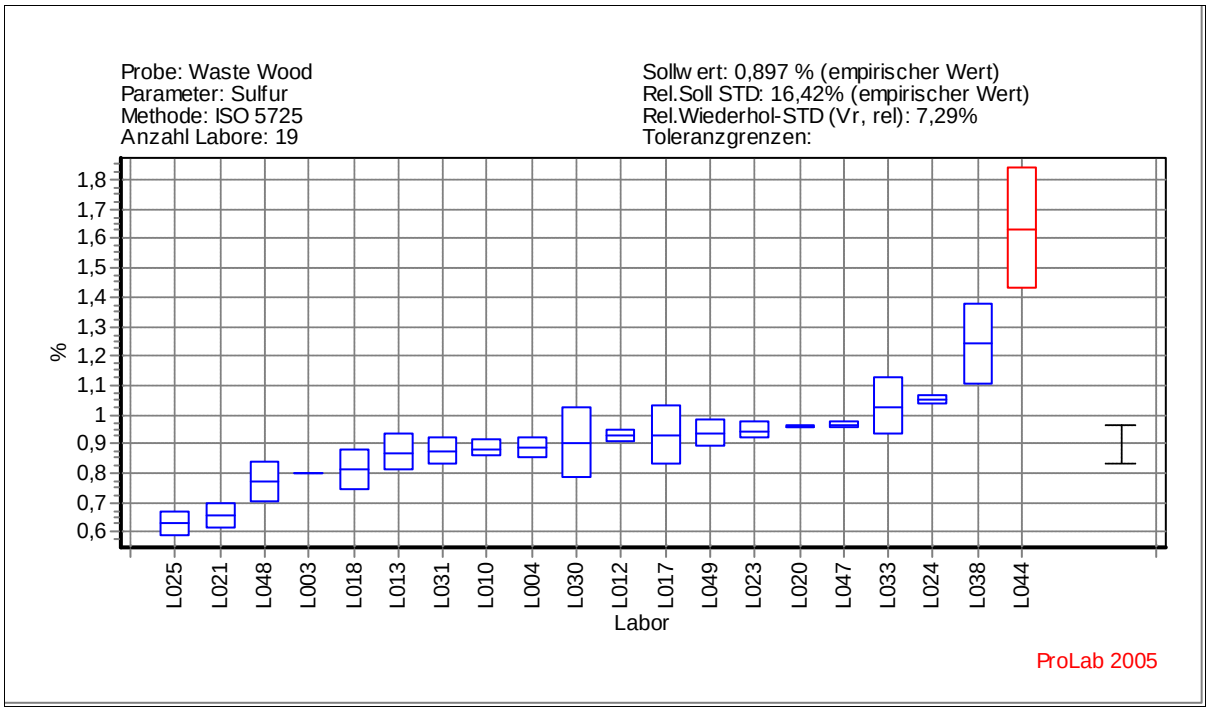



Probe: Misxed liquid w aste
Parameter: Sulfur
Methode: ISO 5725
Anzahl Labore: 20
Sollw ert: 0,675 % (empirischer Wert)
Rel.Soll STD: 25,45% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 7,59%
Toleranzgrenzen:
%
1,1
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
L048 L046 L025 L018 L003 L021 L031 L004 L013 L023 L024 L017 L012 L020 L030 L049 L044 L047 L010 L033 L038
Labor
ProLab 2005


Probe: Solid recoverd fuel
Parameter: Sulfur
Methode: ISO 5725
Anzahl Labore: 20
Sollw ert: 1,196 % (empirischer Wert)
Rel.Soll STD: 30,89% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 5,55%
Toleranzgrenzen:
%
2
1,8
1,6
1,4
1,2
1
0,8
0,6
L018 L003 L046 L012 L021 L025 L048 L023 L004 L013 L017 L049 L010 L020 L030 L047 L031 L024 L033 L038 L044
Labor
ProLab 2005


Probe: Solid Waste
Parameter: Sulfur
Methode: ISO 5725
Anzahl Labore: 21
Sollw ert: 3,236 % (empirischer Wert)
Rel.Soll STD: 32,03% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 8,34%
Toleranzgrenzen:
%
5,5
5
4,5
4
3,5
3
2,5
2
1,5
1
0,5
L004 L031 L046 L021 L023 L018 L012 L048 L013 L025 L024 L049 L003 L017 L030 L010 L020 L038 L047 L044 L033
Labor
ProLab 2005

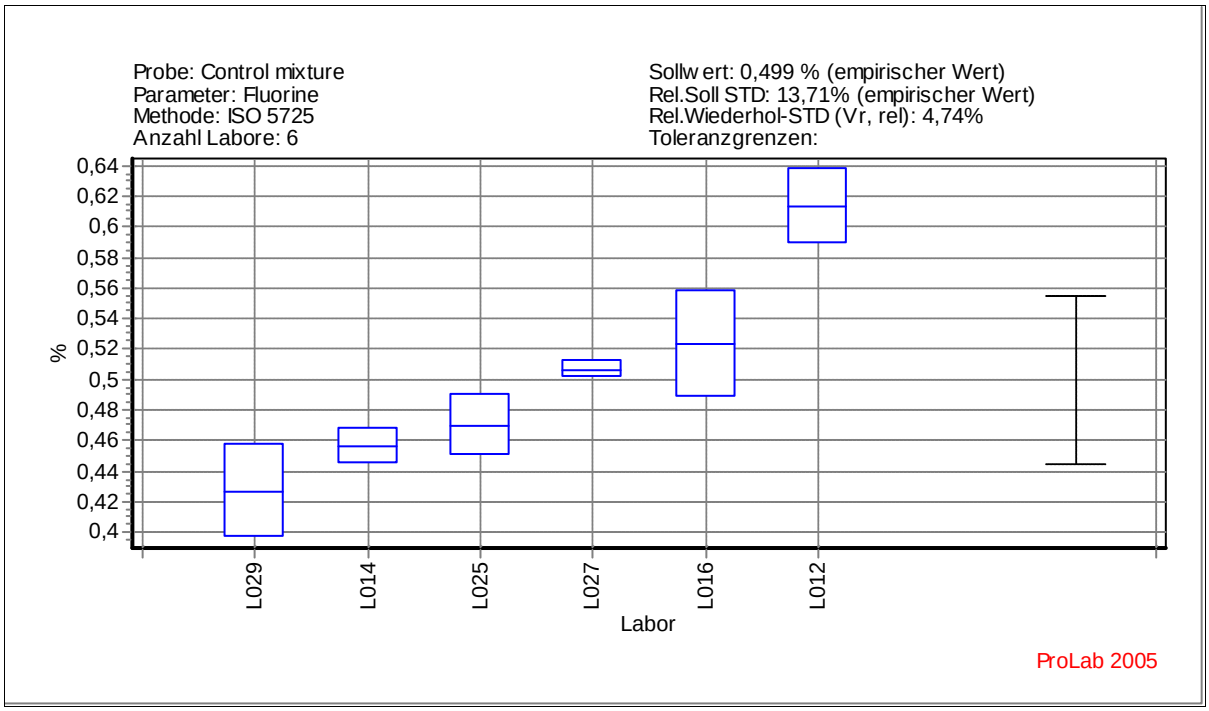

Probe: Waste solvent
Parameter: Sulfur
Methode: ISO 5725
Anzahl Labore: 20
Sollw ert: 0,797 % (empirischer Wert)
Rel.Soll STD: 26,87% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 11,71%
Toleranzgrenzen:
%
2,4
2,2
2
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
L046 L048 L030 L018 L025 L013 L003 L004 L021 L044 L031 L047 L024 L012 L023 L049 L010 L033 L020 L038 L017
Labor
ProLab 2005

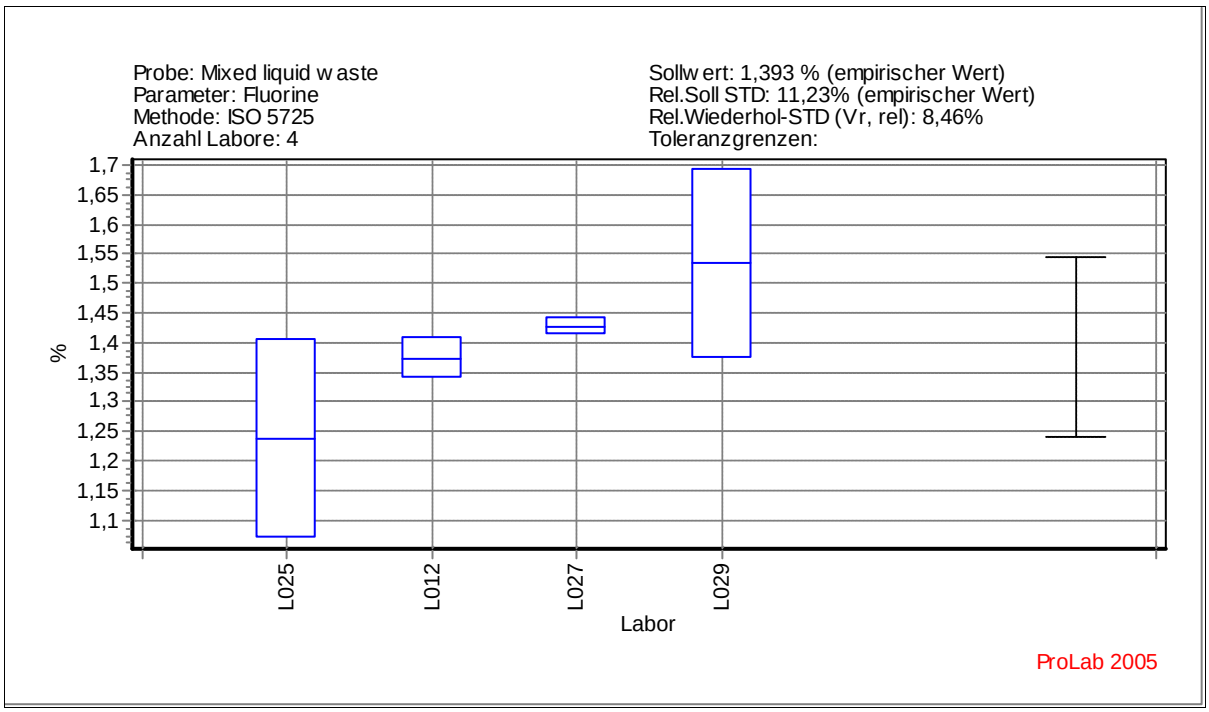

Probe: Waste Wood
Parameter: Sulfur
Methode: ISO 5725
Anzahl Labore: 19
Sollw ert: 0,897 % (empirischer Wert)
Rel.Soll STD: 16,42% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 7,29%
Toleranzgrenzen:
%
1,8
1,7
1,6
1,5
1,4
1,3
1,2
1,1
1
0,9
0,8
0,7
0,6
L025
L021
L048
L003
L018
L013
L031
L010
L004
L030
L012
L017
L049
L023
L020
L047
L033
L024
L038
L044
Labor
ProLab 2005

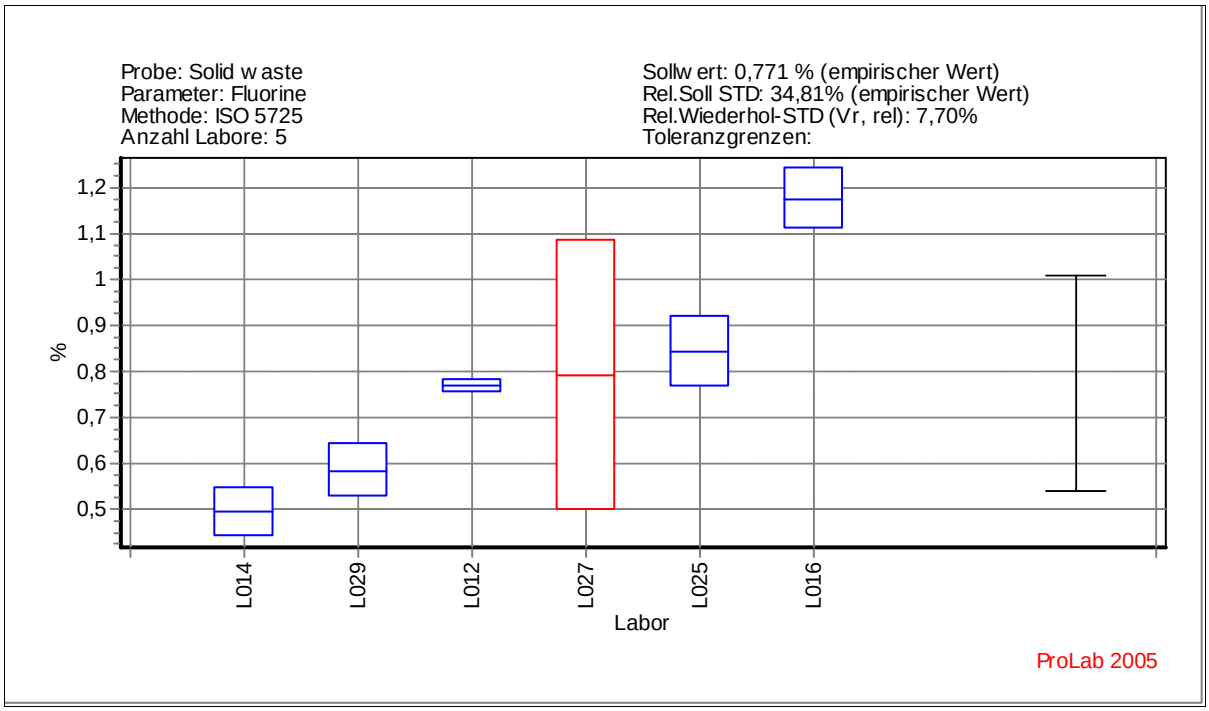
Validation study prEN 14582

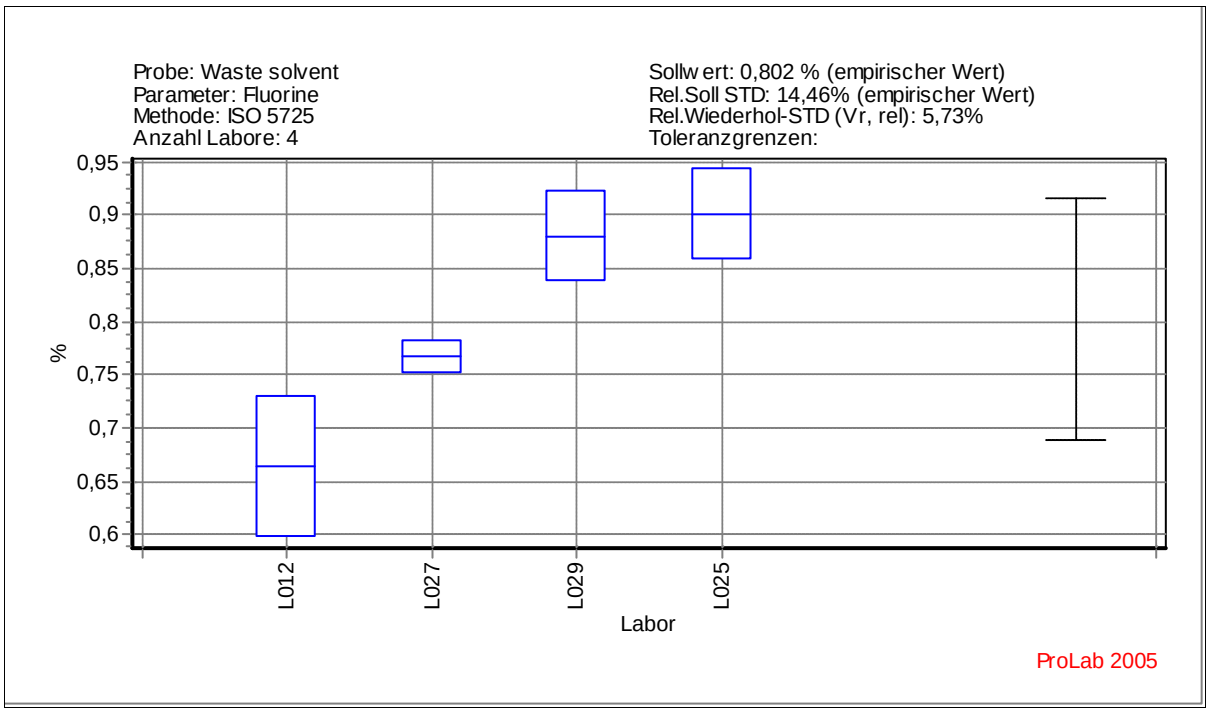
Schoeniger combustion

Fluorine

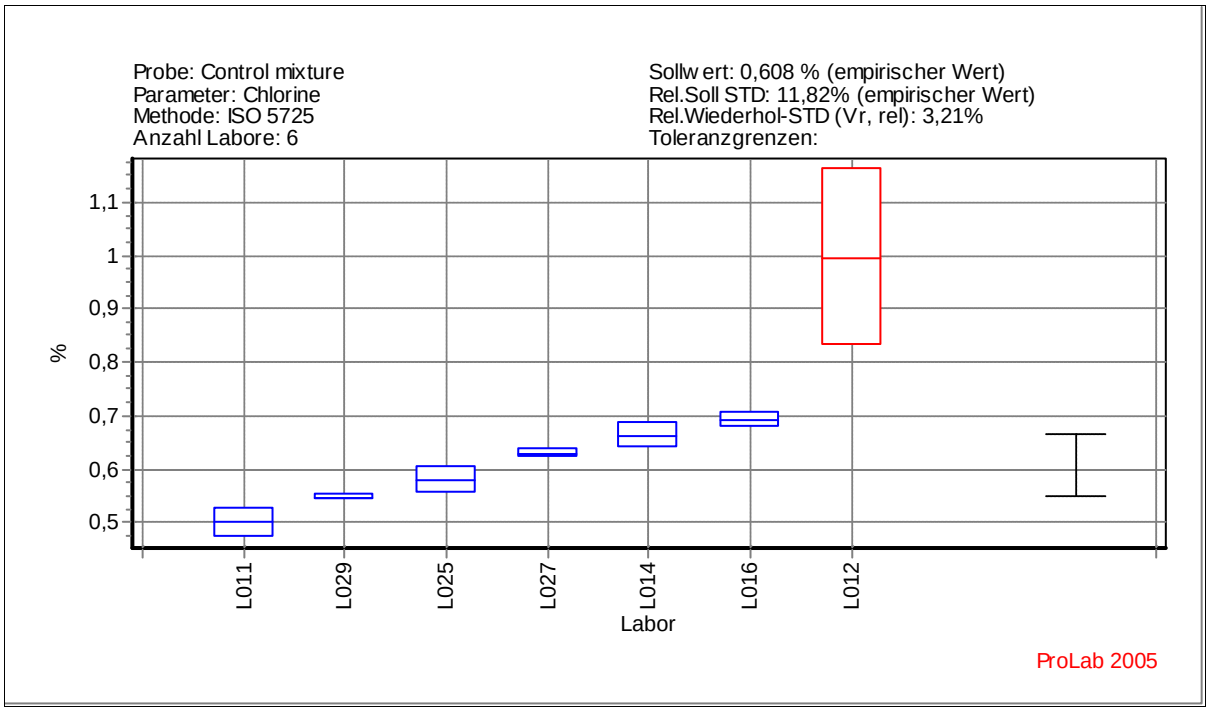


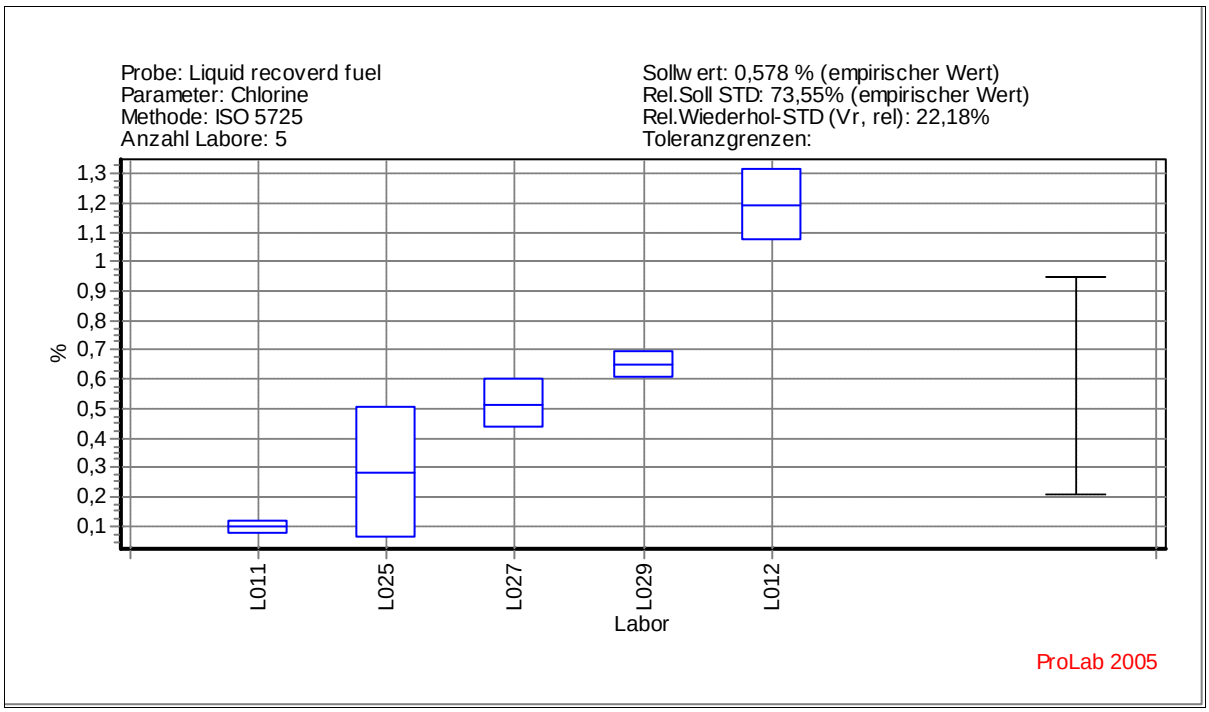


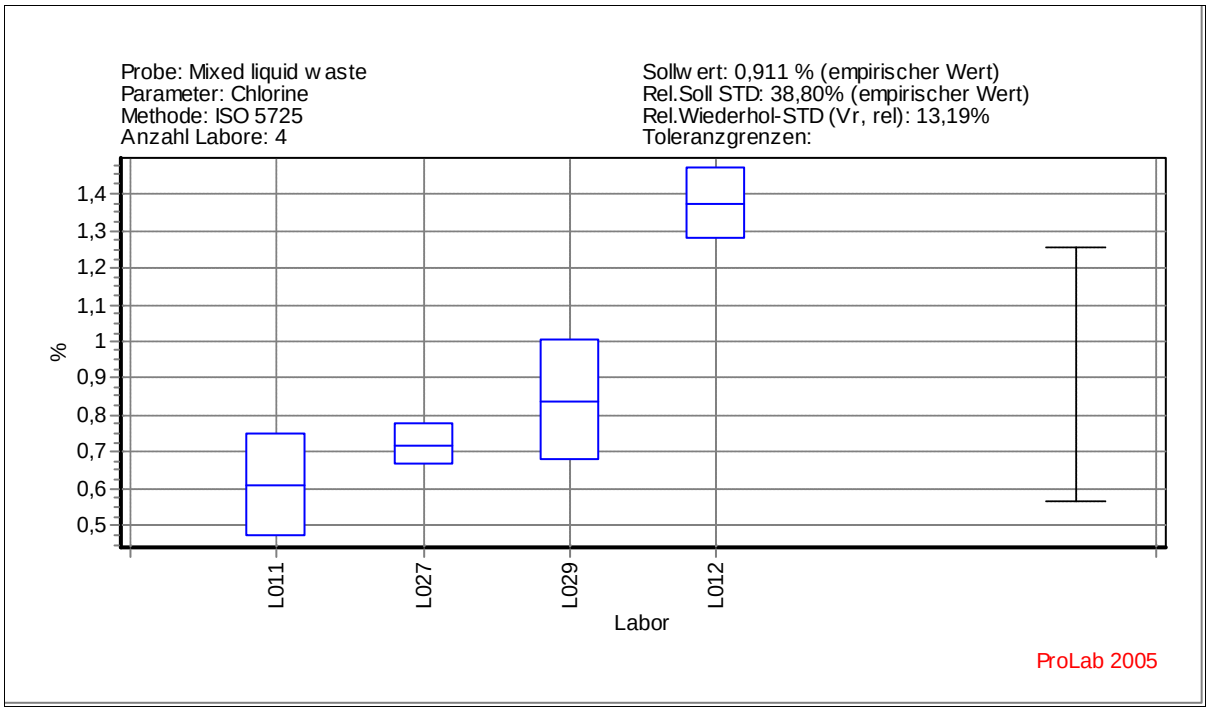

Probe: Solid w aste
Parameter: Fluorine
Methode: ISO 5725
Anzahl Labore: 5
Sollw ert: 0,771 % (empirischer Wert)
Rel.Soll STD: 34,81% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 7,70%
Toleranzgrenzen:
1,2
1,1
1
0,9
0,8
0,7
0,6
0,5
%
L014
L029
L012
L027
L025
L016
Labor
ProLab 2005

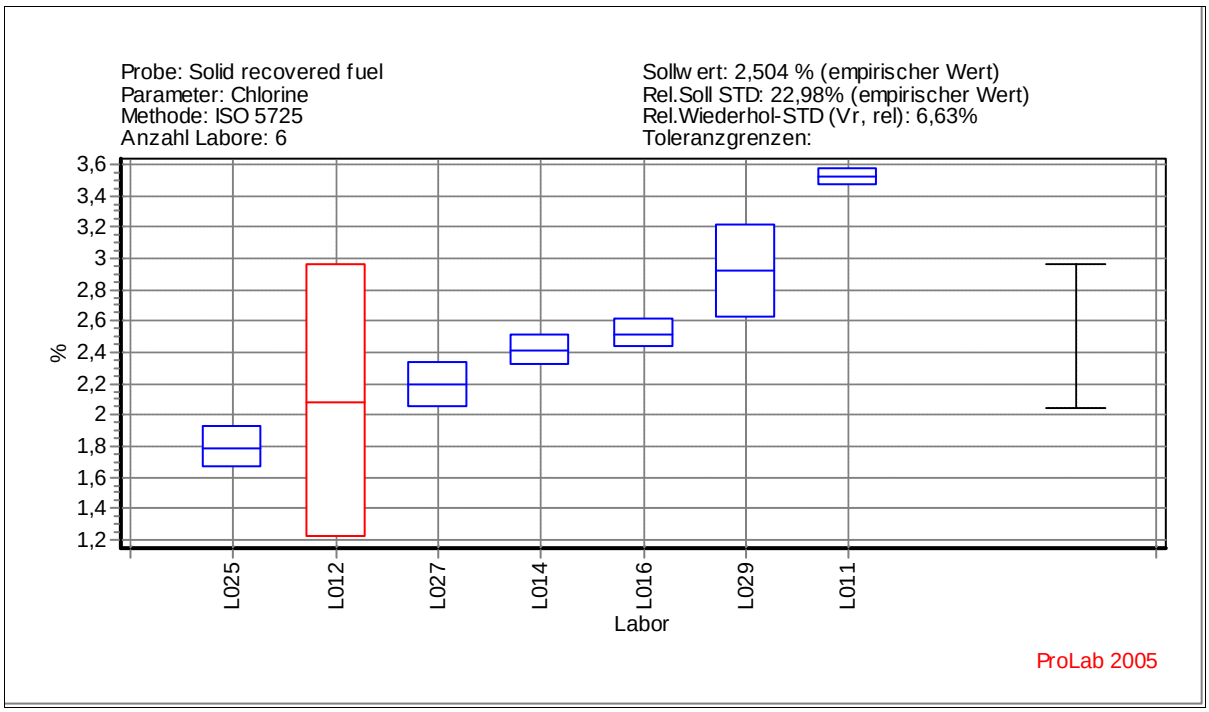

Probe: Waste solvent
Parameter: Fluorine
Methode: ISO 5725
Anzahl Labore: 4
Sollw ert: 0,802 % (empirischer Wert)
Rel.Soll STD: 14,46% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 5,73%
Toleranzgrenzen:
0,95
0,9
0,85
0,8
0,75
0,7
0,65
0,6
%
L012
L027
L029
L025
Labor
ProLab 2005

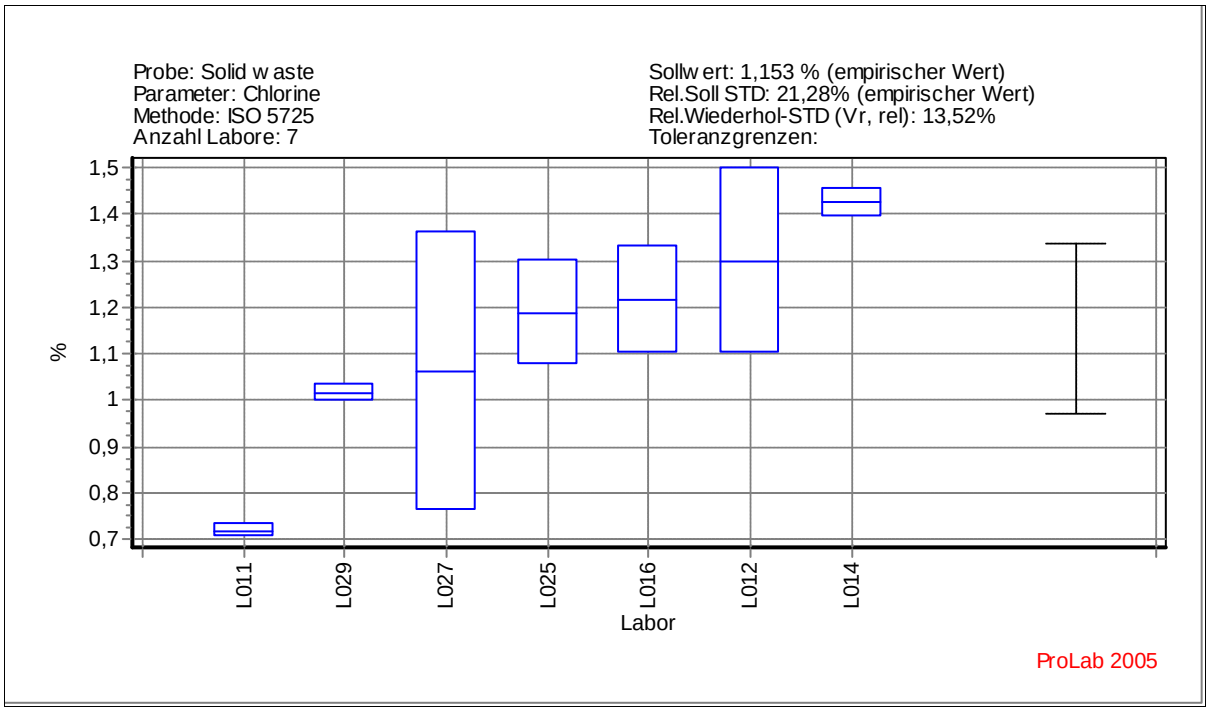
Schoeniger combustion: Chlorine

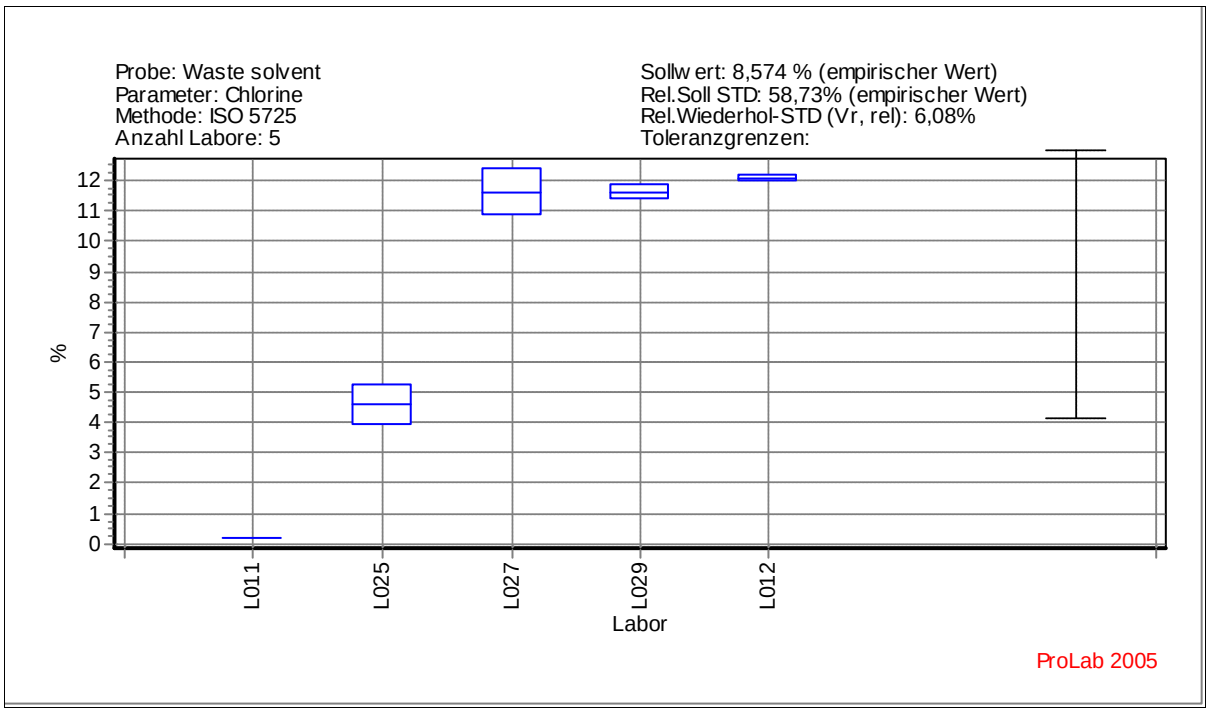


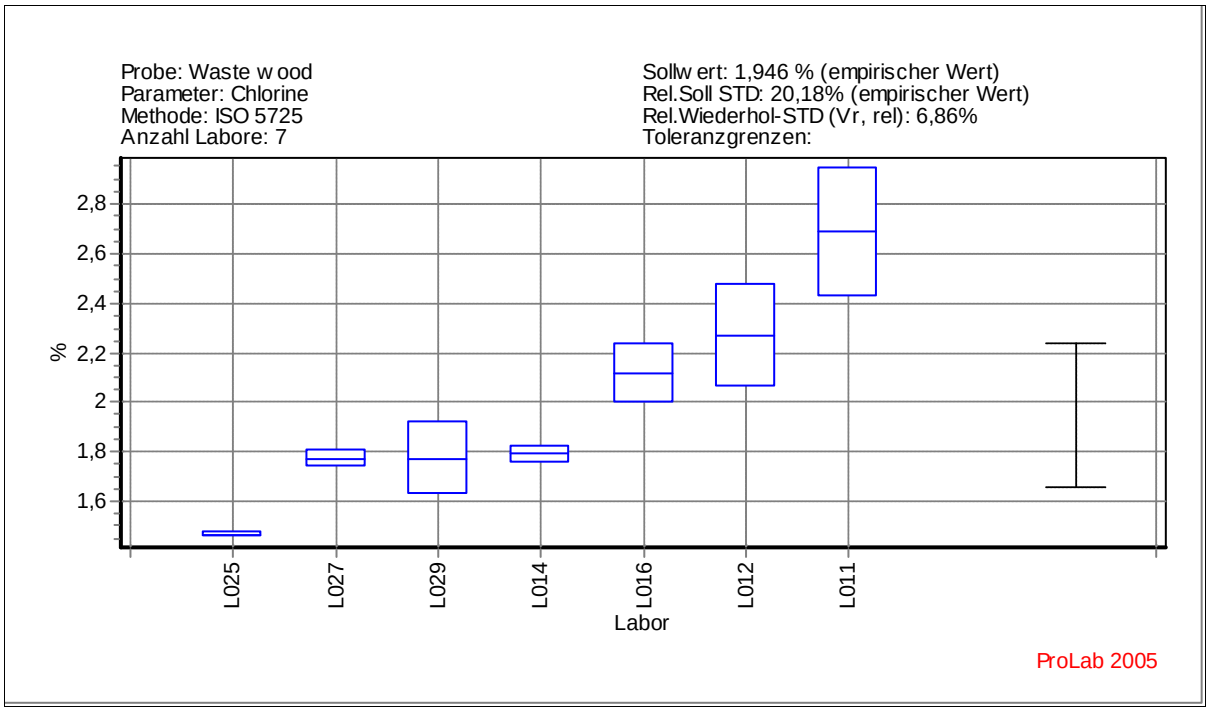



Probe: Mixed liquid w aste
Parameter: Chlorine
Methode: ISO 5725
Anzahl Labore: 4
Sollw ert: 0,911 % (empirischer Wert)
Rel.Soll STD: 38,80% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 13,19%
Toleranzgrenzen:
1,4
1,3
1,2
1,1
1
0,9
0,8
0,7
0,6
0,5
%
L011
L027
L029
L012
Labor
ProLab 2005

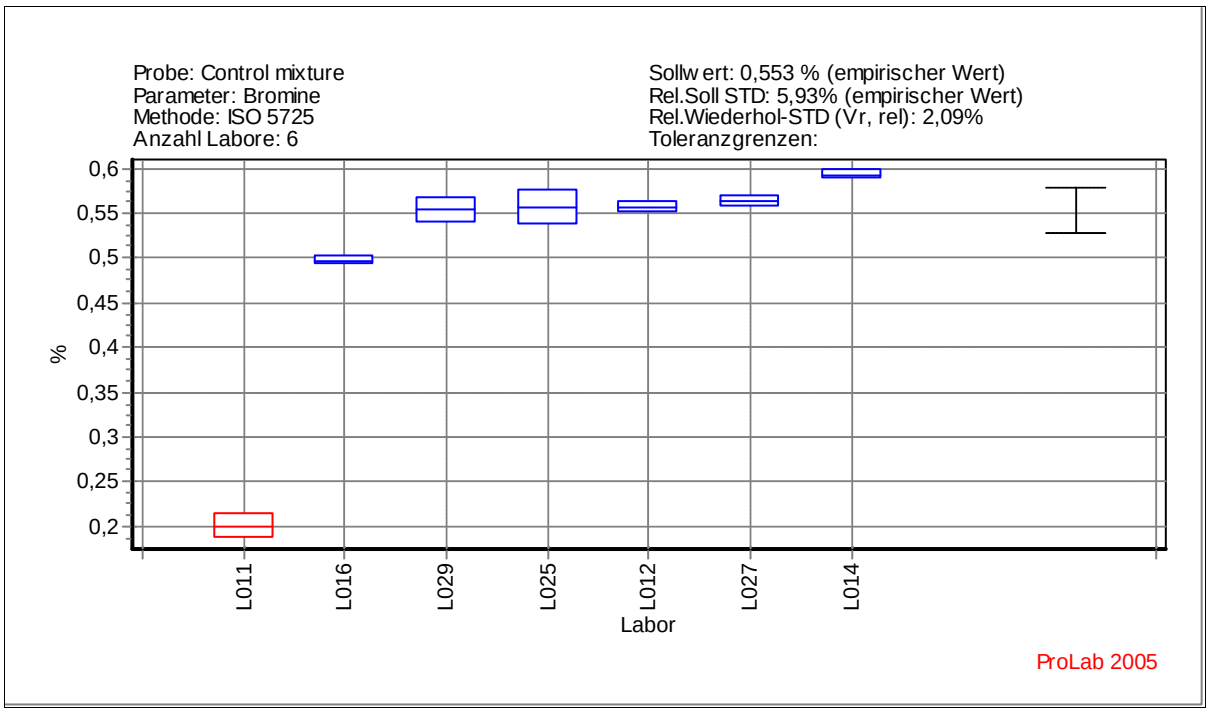

Probe: Solid recovered fuel
Parameter: Chlorine
Methode: ISO 5725
Anzahl Labore: 6
Sollw ert: 2,504 % (empirischer Wert)
Rel.Soll STD: 22,98% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 6,63%
Toleranzgrenzen:
3,6
3,4
3,2
3
2,8
2,6
2,4
2,2
2
1,8
1,6
1,4
1,2
%
L025
L012
L027
L014
L016
L029
L011
Labor
ProLab 2005

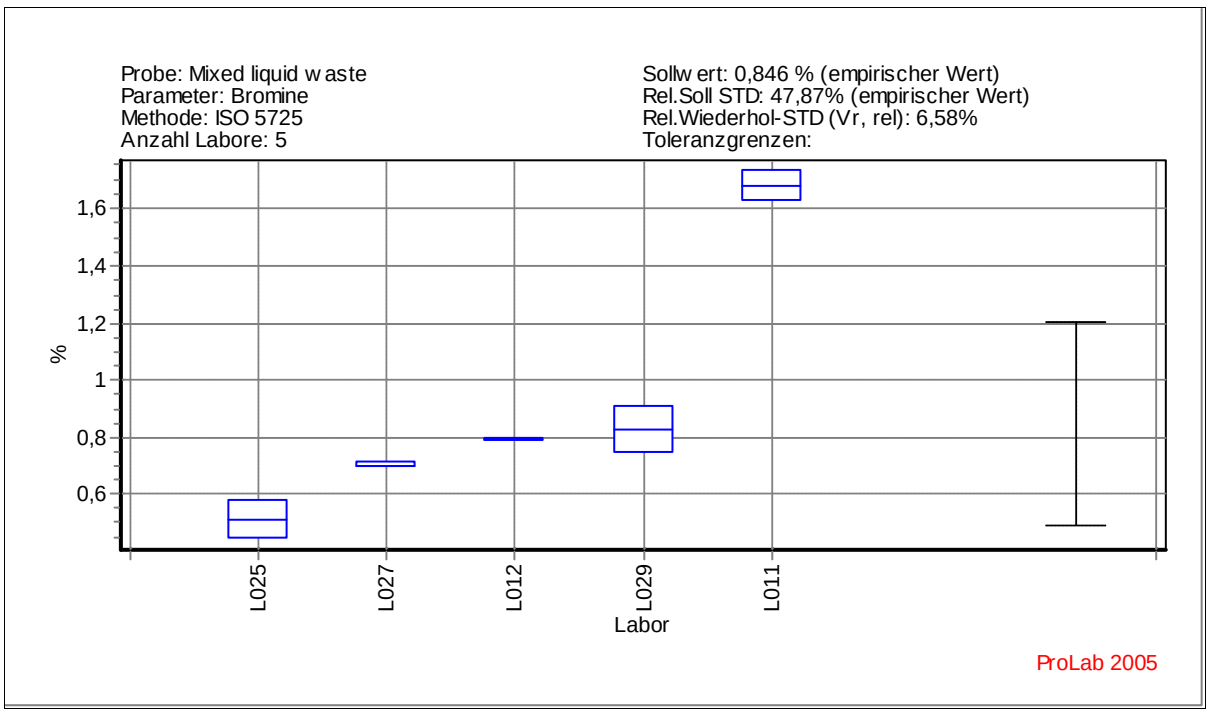

Probe: Solid w aste
Parameter: Chlorine
Methode: ISO 5725
Anzahl Labore: 7
Sollw ert: 1,153 % (empirischer Wert)
Rel.Soll STD: 21,28% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 13,52%
Toleranzgrenzen:
%
1,5
1,4
1,3
1,2
1,1
1
0,9
0,8
0,7
L011
L029
L027
L025
L016
L012
L014
Labor
ProLab 2005

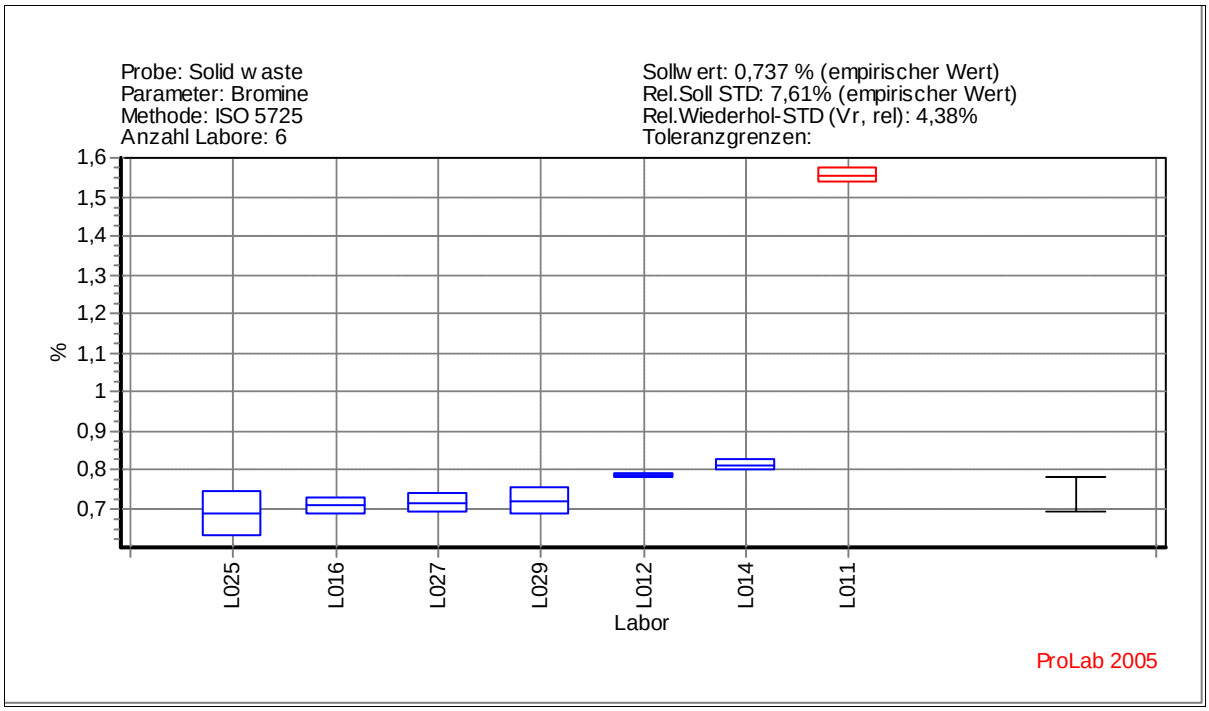

Probe: Waste solvent
Parameter: Chlorine
Methode: ISO 5725
Anzahl Labore: 5
Sollw ert: 8,574 % (empirischer Wert)
Rel.Soll STD: 58,73% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 6,08%
Toleranzgrenzen:
%
12
11
10
9
8
7
6
5
4
3
2
1
0
L011
L025
L027
L029
L012
Labor
ProLab 2005

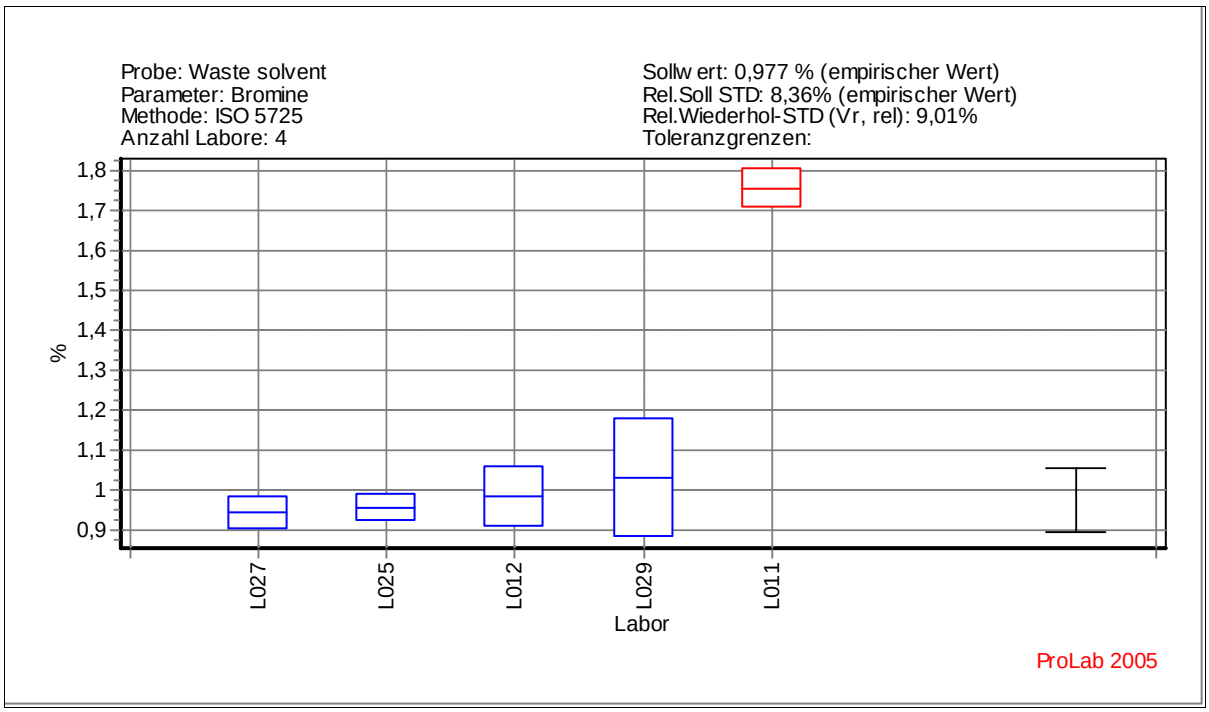

Probe: Waste w ood
Parameter: Chlorine
Methode: ISO 5725
Anzahl Labore: 7
Sollw ert: 1,946 % (empirischer Wert)
Rel.Soll STD: 20,18% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 6,86%
Toleranzgrenzen:
%
2,8
2,6
2,4
2,2
2
1,8
1,6
L025
L027
L029
L014
L016
L012
L011
Labor
ProLab 2005

Schoeniger combustion: Bromine

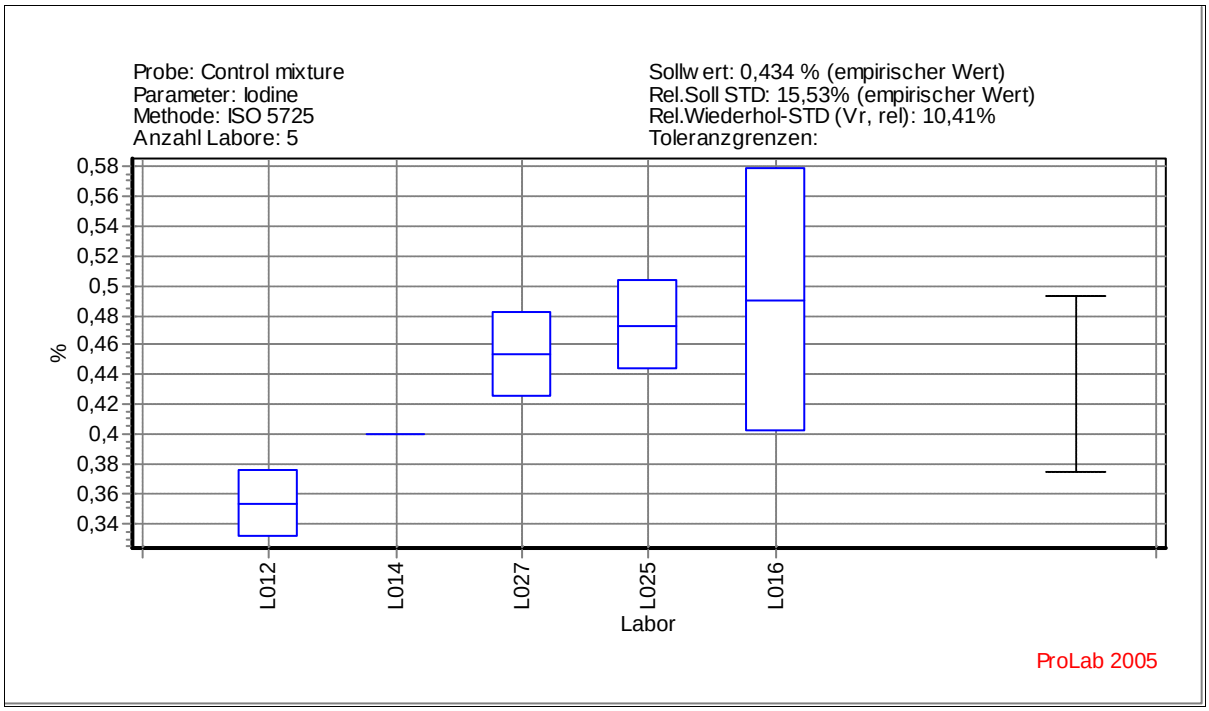


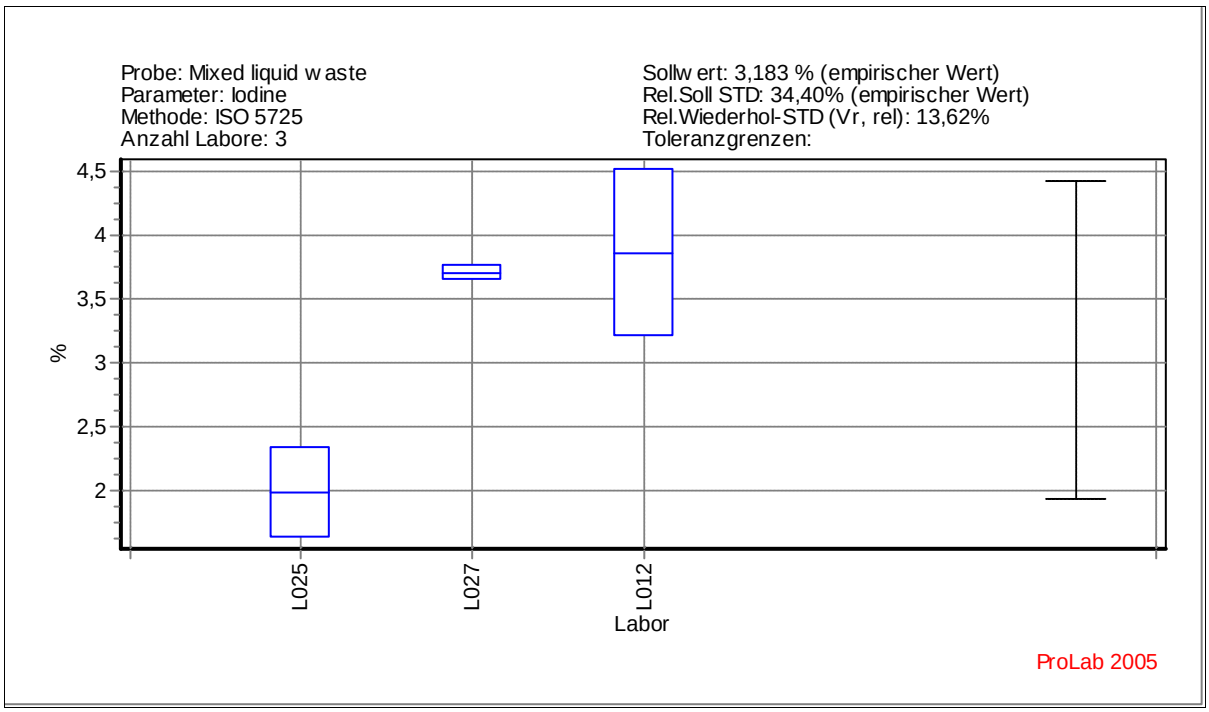


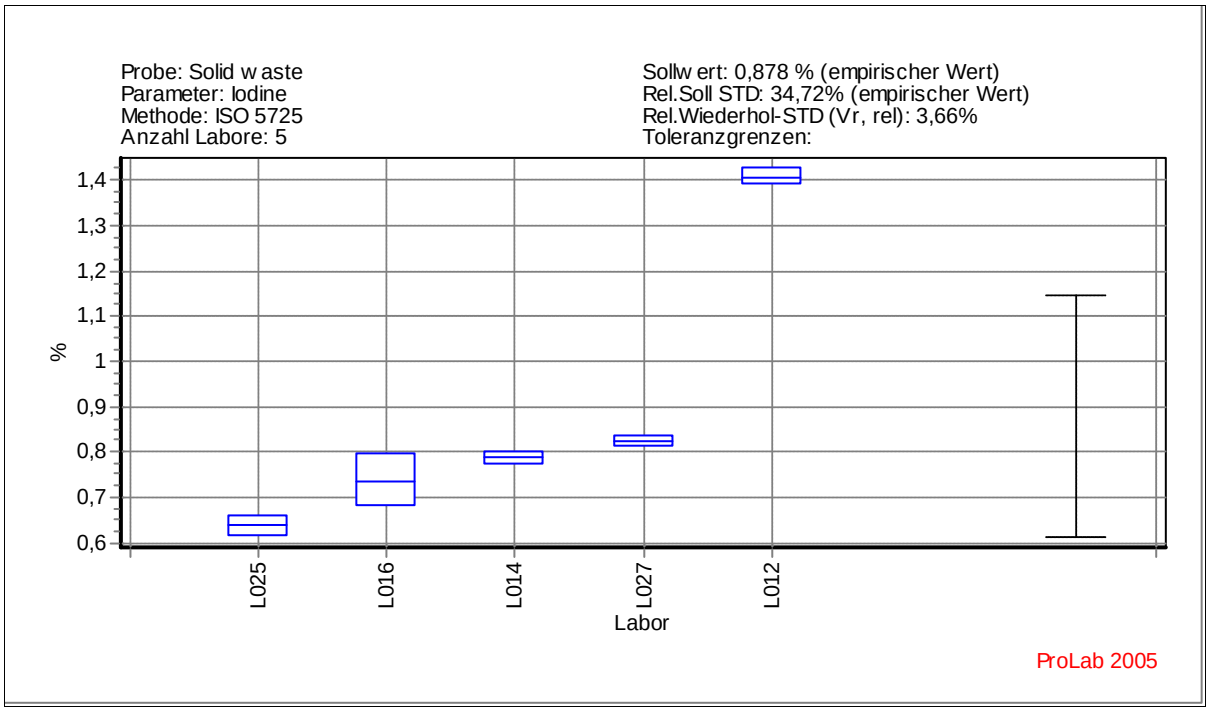

Probe: Solid w aste
Parameter: Bromine
Methode: ISO 5725
Anzahl Labore: 6
Sollw ert: 0,737 % (empirischer Wert)
Rel.Soll STD: 7,61% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 4,38%
Toleranzgrenzen:
%
1,6
1,5
1,4
1,3
1,2
1,1
1
0,9
0,8
0,7
L025
L016
L027
L029
L012
L014
L011
Labor
ProLab 2005

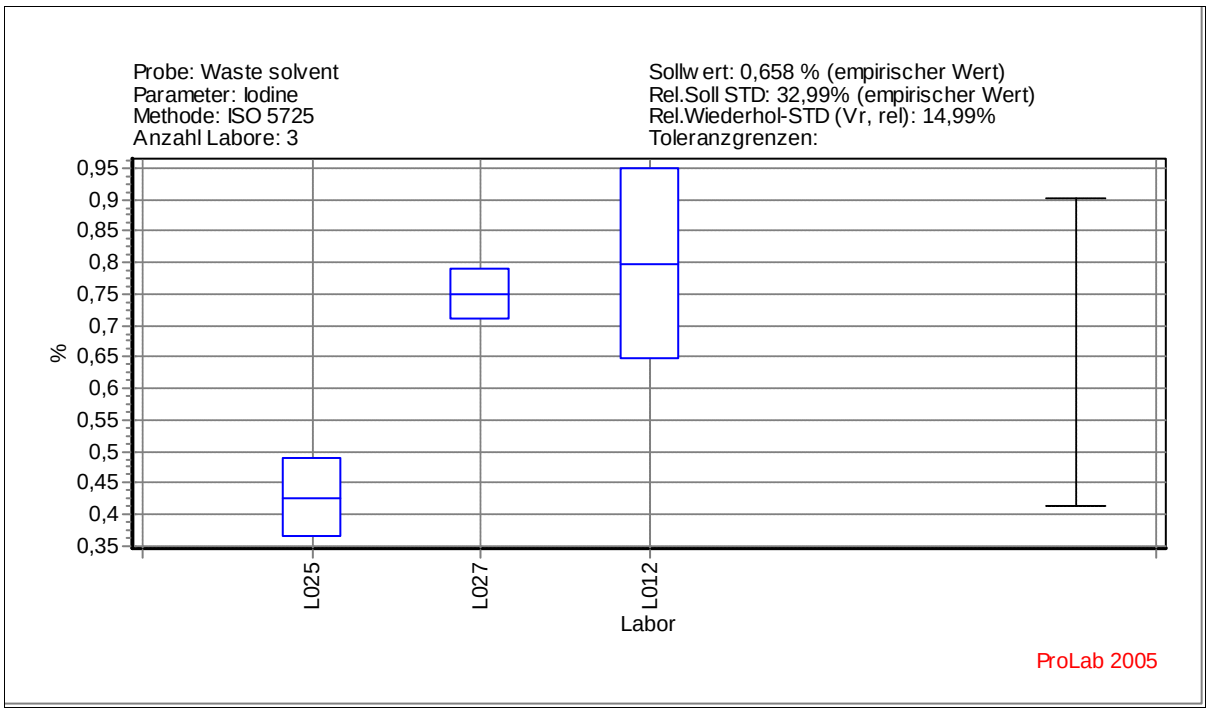

Probe: Waste solvent
Parameter: Bromine
Methode: ISO 5725
Anzahl Labore: 4
Sollw ert: 0,977 % (empirischer Wert)
Rel.Soll STD: 8,36% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 9,01%
Toleranzgrenzen:
%
1,8
1,7
1,6
1,5
1,4
1,3
1,2
1,1
1
0,9
L027
L025
L012
L029
L011
Labor
ProLab 2005

Schoeniger combustion: Iodine

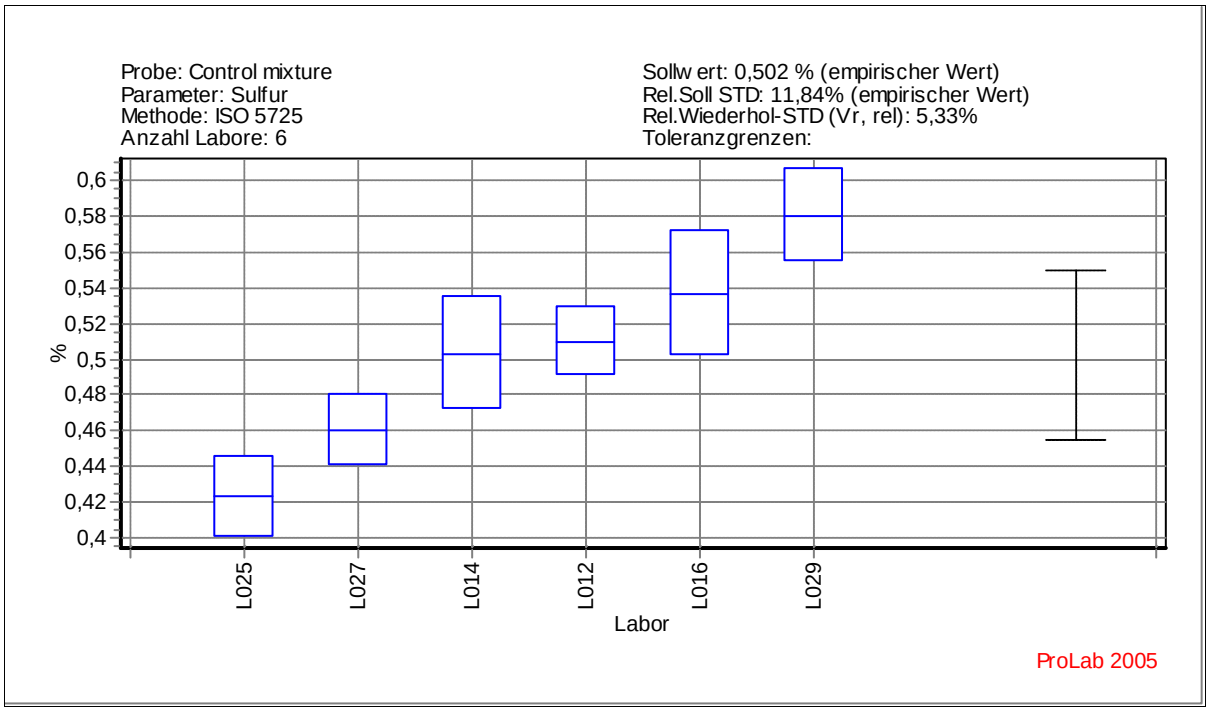


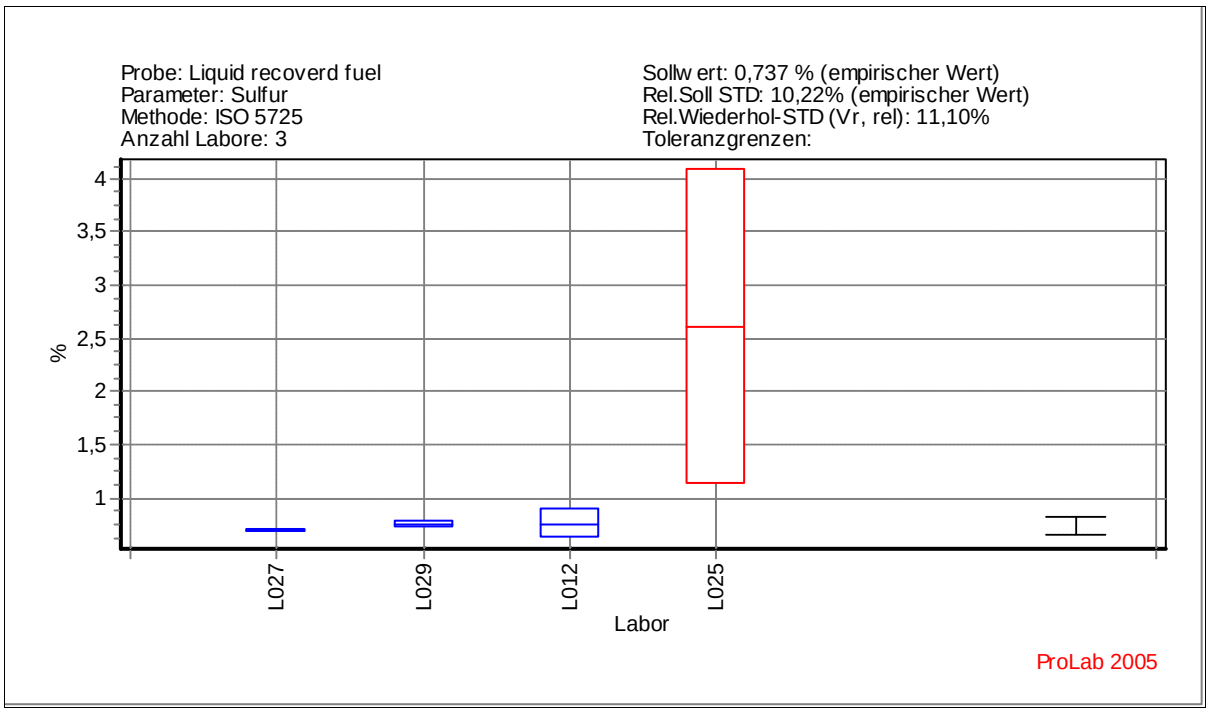


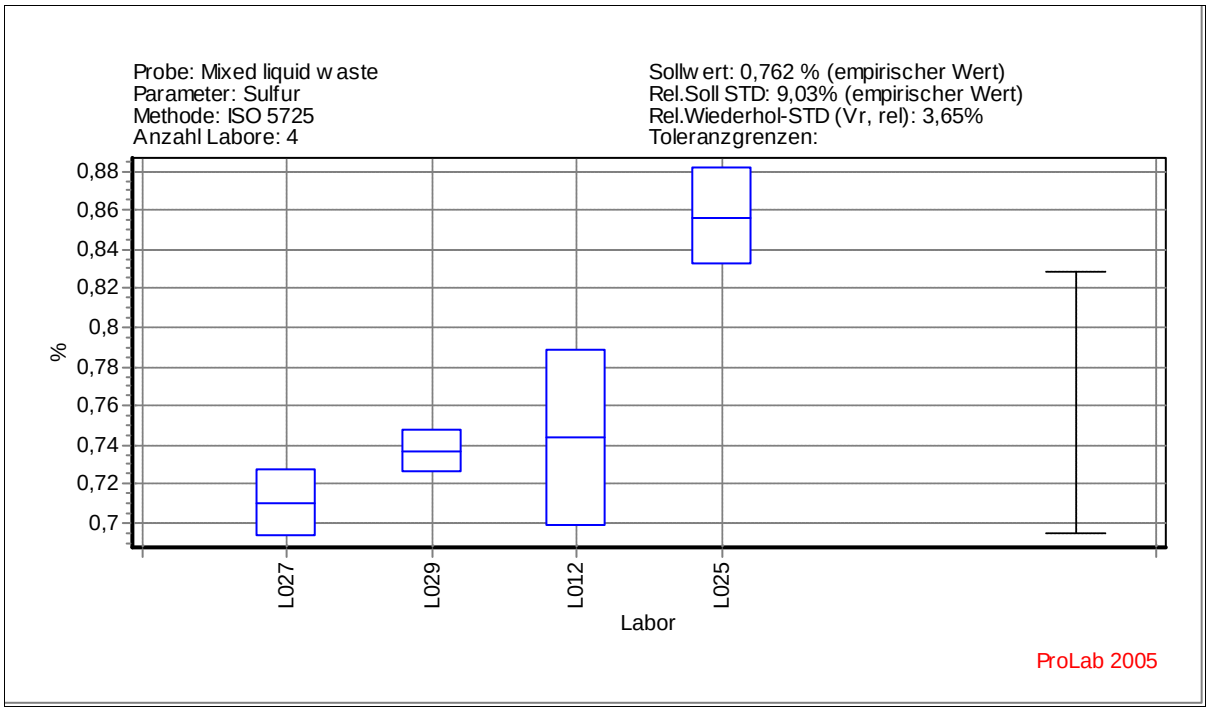

Probe: Solid w aste
Parameter: Iodine
Methode: ISO 5725
Anzahl Labore: 5
Sollw ert: 0,878 % (empirischer Wert)
Rel.Soll STD: 34,72% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 3,66%
Toleranzgrenzen:
1,4
1,3
1,2
1,1
1
0,9
0,8
0,7
0,6
%
L025
L016
L014
L027
L012
Labor
ProLab 2005

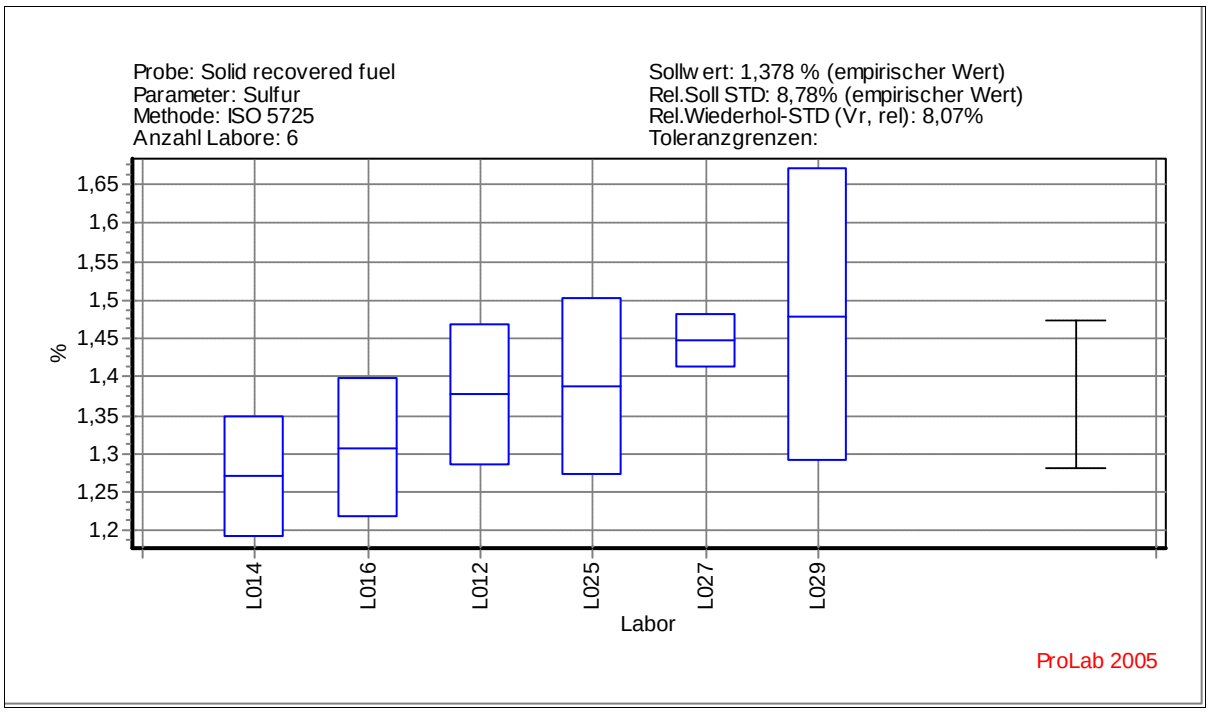

Probe: Waste solvent
Parameter: Iodine
Methode: ISO 5725
Anzahl Labore: 3
Sollw ert: 0,658 % (empirischer Wert)
Rel.Soll STD: 32,99% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 14,99%
Toleranzgrenzen:
0,95
0,9
0,85
0,8
0,75
0,7
0,65
0,6
0,55
0,5
0,45
0,4
0,35
%
L025
L027
L012
Labor
ProLab 2005

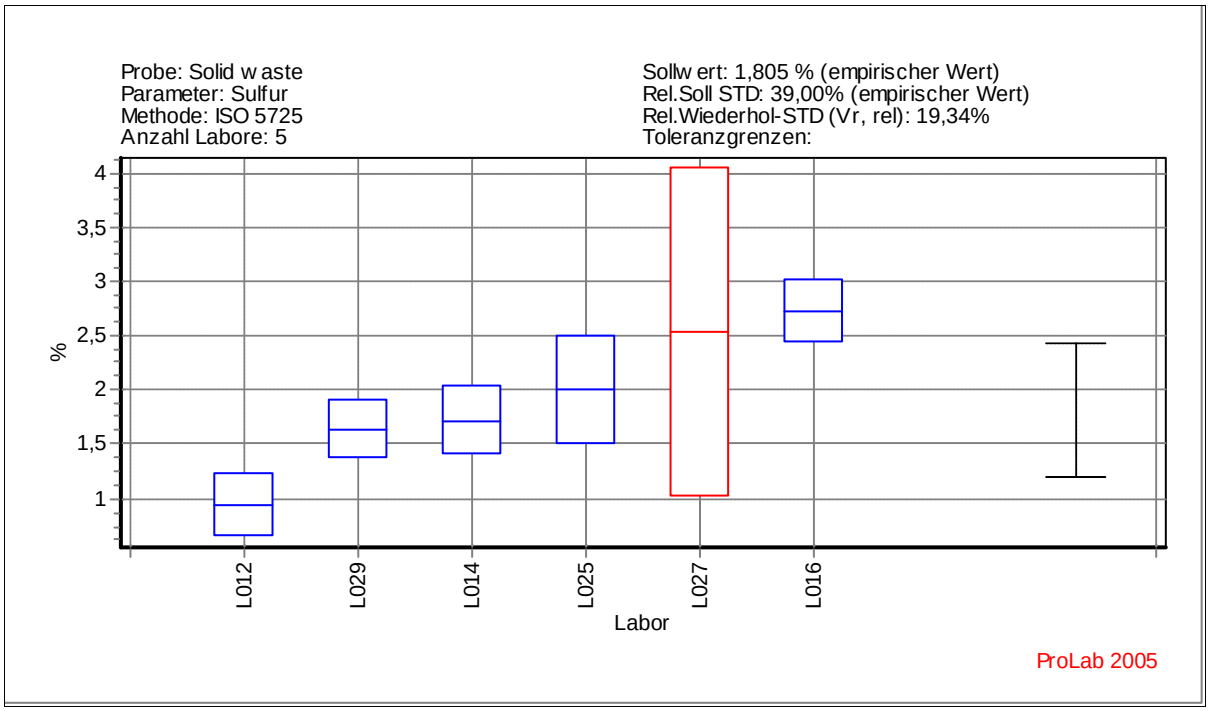
Schoeniger combustion: Sulfur

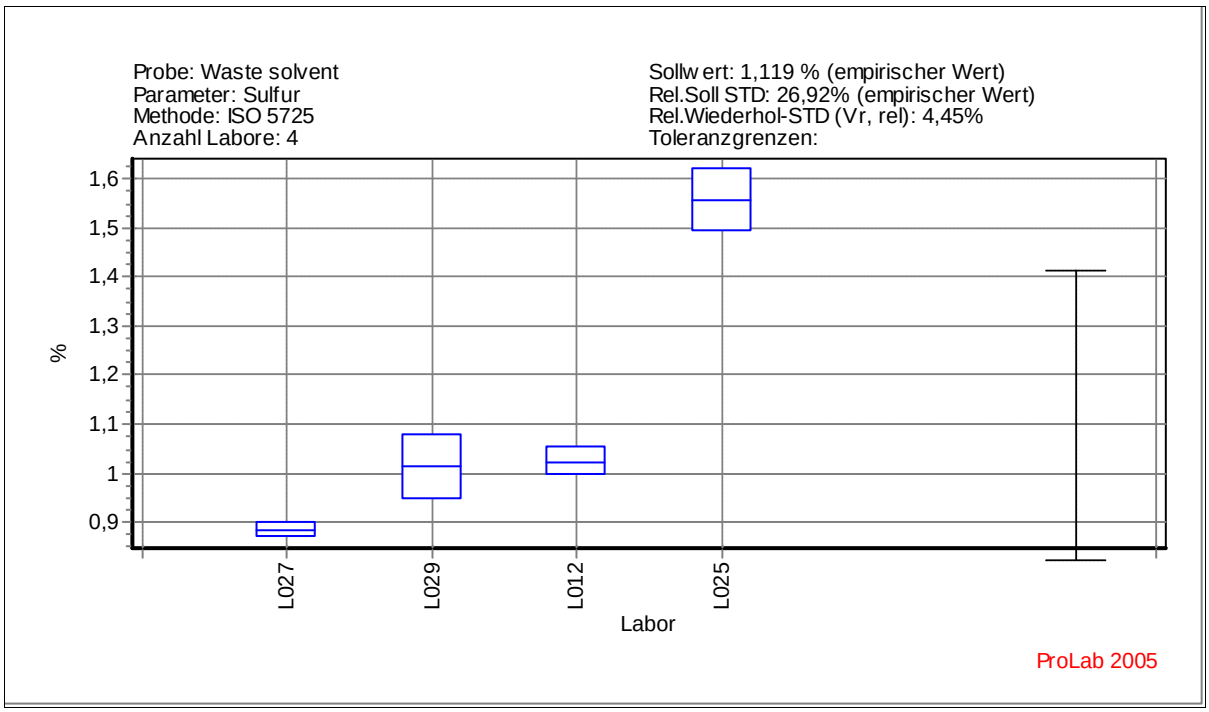


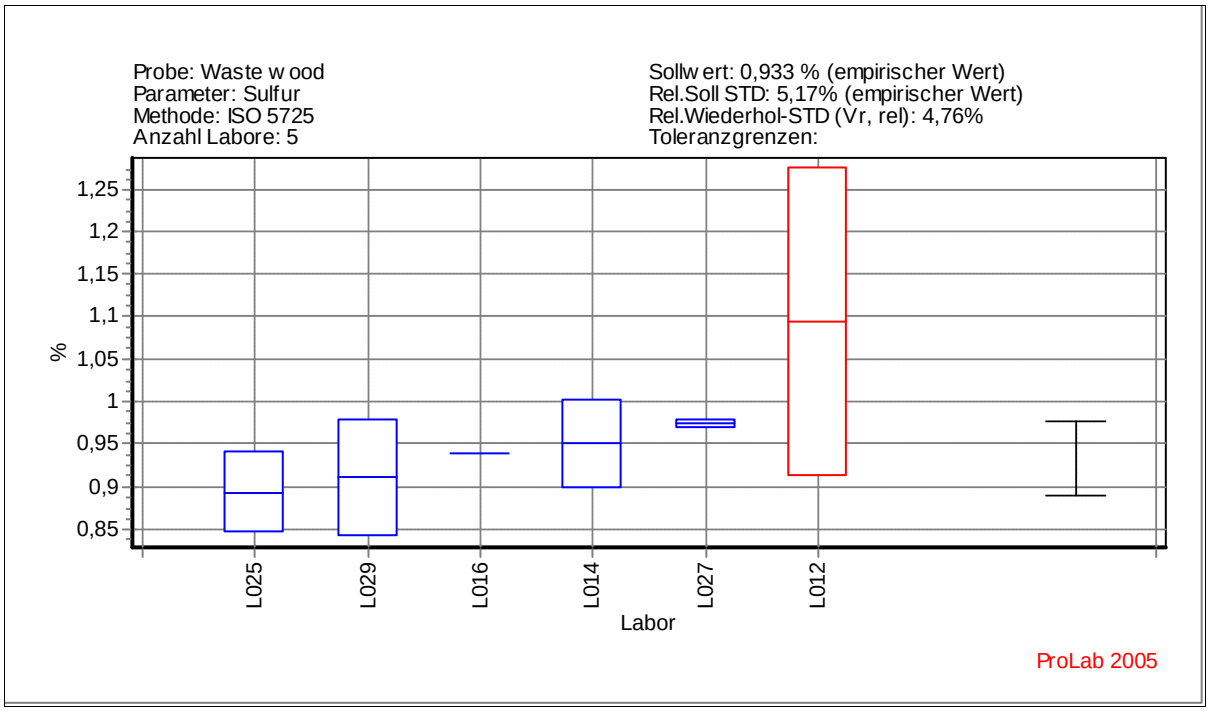



Probe: Mixed liquid waste
Parameter: Sulfur
Methode: ISO 5725
Anzahl Labore: 4
Sollwert: 0,762 % (empirischer Wert)
Rel.Soll STD: 9,03% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 3,65%
Toleranzgrenzen:
0,88
0,86
0,84
0,82
0,8
0,78
0,76
0,74
0,72
0,7
%
L027
L029
L012
L025
Labor
ProLab 2005


Probe: Solid recovered fuel
Parameter: Sulfur
Methode: ISO 5725
Anzahl Labore: 6
Sollwert: 1,378 % (empirischer Wert)
Rel.Soll STD: 8,78% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 8,07%
Toleranzgrenzen:
1,65
1,6
1,55
1,5
1,45
1,4
1,35
1,3
1,25
1,2
%
L014
L016
L012
L025
L027
L029
Labor
ProLab 2005


Probe: Solid w aste
Parameter: Sulfur
Methode: ISO 5725
Anzahl Labore: 5
Sollw ert: 1,805 % (empirischer Wert)
Rel.Soll STD: 39,00% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 19,34%
Toleranzgrenzen:
%
4
3,5
3
2,5
2
1,5
1
L012
L029
L014
L025
L027
L016
Labor
ProLab 2005


Probe: Waste solvent
Parameter: Sulfur
Methode: ISO 5725
Anzahl Labore: 4
Sollw ert: 1,119 % (empirischer Wert)
Rel.Soll STD: 26,92% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 4,45%
Toleranzgrenzen:
%
1,6
1,5
1,4
1,3
1,2
1,1
1
0,9
L027
L029
L012
L025
Labor
ProLab 2005


Probe: Waste w ood
Parameter: Sulfur
Methode: ISO 5725
Anzahl Labore: 5
Sollw ert: 0,933 % (empirischer Wert)
Rel.Soll STD: 5,17% (empirischer Wert)
Rel.Wiederhol-STD (Vr, rel): 4,76%
Toleranzgrenzen:
%
1,25
1,2
1,15
1,1
1,05
1
0,95
0,9
0,85
L025
L029
L016
L014
L027
L012
Labor
ProLab 2005