

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 3, Czech Hydrometeorological Institute, Praha (Czech Republic)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.315	0.32	0.313	0.012	0.197	S
G2		0.321	0.337	0.326	0.013	-0.339	S
G3		0.345	0.343	0.334	0.013	0.892	S
G4		0.3	0.305	0.298	0.012	0.208	S
G1	NH ₄ ⁺ mg N/l	0.105	0.086	0.086	0.009	2.192	Q
G2		0.106	0.086	0.086	0.011	1.766	Q
G3		0.102	0.112	0.107	0.013	-0.351	S
G4		0.155	0.147	0.144	0.014	0.752	S
G1	NO ₃ ⁻ mg N/l	0.193	0.194	0.187	0.01	0.588	S
G2		0.313	0.313	0.3	0.013	0.956	S
G3		0.25	0.255	0.247	0.01	0.342	S
G4		0.328	0.334	0.326	0.022	0.109	S
G1	Na ⁺ mg/l	0.845	0.891	0.855	0.049	-0.21	S
G2		0.93	0.966	0.933	0.058	-0.055	S
G3		1.418	1.4	1.354	0.096	0.666	S
G4		1.408	1.37	1.311	0.08	1.203	S
G1	Mg ²⁺ mg/l	0.106	0.108	0.107	0.005	-0.285	S
G2		0.112	0.113	0.111	0.007	0.078	S
G3		0.101	0.1	0.1	0.007	0.106	S
G4		0.087	0.091	0.091	0.006	-0.601	S
G1	Cl ⁻ mg/l	1.232	1.2	1.18	0.052	1.002	S
G2		1.146	1.12	1.097	0.055	0.894	S
G3		1.982	1.93	1.9	0.064	1.279	S
G4		1.814	1.81	1.781	0.054	0.615	S
G1	Ca ²⁺ mg/l	0.14	0.134	0.137	0.022	0.133	S
G2		0.131	0.139	0.139	0.019	-0.421	S
G3		0.118	0.124	0.124	0.017	-0.354	S
G4		0.121	0.112	0.112	0.013	0.662	S
G1	K ⁺ mg/l	0.106	0.109	0.107	0.013	-0.103	S
G2		0.23	0.227	0.219	0.018	0.626	S
G3		0.149	0.143	0.14	0.015	0.578	S
G4		0.186	0.187	0.182	0.015	0.234	S
G1	pH pH units	5.737	5.28	5.311	0.126	3.385	U
G2		5.615	5.26	5.261	0.127	2.776	U
G3		5.418	5.14	5.146	0.154	1.763	U
G4		5.586	5.17	5.166	0.136	3.079	U
G1	Cond µS/cm	10.31	10.13	10.423	0.492	-0.23	S
G2		11.33	11.24	11.402	0.537	-0.135	S
G3		14.67	14.32	14.281	0.894	0.435	S
G4		13.69	14.04	14.292	1.126	-0.535	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 4, Aarhus University, Department of Environmental Science
(Denmark)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.33	0.32	0.313	0.012	1.486	S
G2		0.35	0.337	0.326	0.013	1.813	S
G3		0.35	0.343	0.334	0.013	1.284	S
G4		0.32	0.305	0.298	0.012	1.898	S
G1	NH ₄ ⁺ mg N/l	0.09	0.086	0.086	0.009	0.467	S
G2		0.09	0.086	0.086	0.011	0.328	S
G3		0.11	0.112	0.107	0.013	0.243	S
G4		0.14	0.147	0.144	0.014	-0.298	S
G1	NO ₃ ⁻ mg N/l	0.19	0.194	0.187	0.01	0.3	S
G2		0.31	0.313	0.3	0.013	0.728	S
G3		0.25	0.255	0.247	0.01	0.342	S
G4		0.33	0.334	0.326	0.022	0.199	S
G1	Na ⁺ mg/l	0.85	0.891	0.855	0.049	-0.109	S
G2		0.93	0.966	0.933	0.058	-0.055	S
G3		1.36	1.4	1.354	0.096	0.059	S
G4		1.34	1.37	1.311	0.08	0.356	S
G1	Mg ²⁺ mg/l	0.1	0.108	0.107	0.005	-1.423	S
G2		0.1	0.113	0.111	0.007	-1.766	S
G3		0.09	0.1	0.1	0.007	-1.549	S
G4		0.08	0.091	0.091	0.006	-1.754	S
G1	Cl ⁻ mg/l	1.2	1.2	1.18	0.052	0.389	S
G2		1.12	1.12	1.097	0.055	0.418	S
G3		1.94	1.93	1.9	0.064	0.623	S
G4		1.82	1.81	1.781	0.054	0.727	S
G1	Ca ²⁺ mg/l	0.11	0.134	0.137	0.022	-1.228	Q
G2		0.12	0.139	0.139	0.019	-1.007	S
G3		0.11	0.124	0.124	0.017	-0.83	S
G4		0.1	0.112	0.112	0.013	-0.954	S
G1	K ⁺ mg/l	0.12	0.109	0.107	0.013	0.989	S
G2		0.2	0.227	0.219	0.018	-1.05	S
G3		0.14	0.143	0.14	0.015	-0.03	S
G4		0.17	0.187	0.182	0.015	-0.833	S
G1	pH pH units	5.27	5.28	5.311	0.126	-0.326	S
G2		5.24	5.26	5.261	0.127	-0.166	S
G3		5.1	5.14	5.146	0.154	-0.299	S
G4		5.16	5.17	5.166	0.136	-0.042	S
G1	Cond µS/cm	-999	10.13	10.423	0.492		B
G2		-999	11.24	11.402	0.537		B
G3		-999	14.32	14.281	0.894		B
G4		-999	14.04	14.292	1.126		B

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

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S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- , between ± 15 - 25% of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and more than ± 0.2 pH-units for pH

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Laboratory 5, Finnish Meteorological Institute, Atmospheric Composition, Air Quality (Finland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.314	0.32	0.313	0.012	0.137	S
G2		0.329	0.337	0.326	0.013	0.269	S
G3		0.336	0.343	0.334	0.013	0.148	S
G4		0.295	0.305	0.298	0.012	-0.181	S
G1	NH ₄ ⁺ mg N/l	0.089	0.086	0.086	0.009	0.363	S
G2		0.09	0.086	0.086	0.011	0.328	S
G3		0.119	0.112	0.107	0.013	0.905	S
G4		0.168	0.147	0.144	0.014	1.656	S
G1	NO ₃ ⁻ mg N/l	0.187	0.194	0.187	0.01	0.051	S
G2		0.302	0.313	0.3	0.013	0.158	S
G3		0.246	0.255	0.247	0.01	-0.031	S
G4		0.444	0.334	0.326	0.022	5.357	U
G1	Na ⁺ mg/l	0.867	0.891	0.855	0.049	0.241	S
G2		0.949	0.966	0.933	0.058	0.265	S
G3		1.379	1.4	1.354	0.096	0.263	S
G4		1.34	1.37	1.311	0.08	0.357	S
G1	Mg ²⁺ mg/l	0.11	0.108	0.107	0.005	0.417	S
G2		0.115	0.113	0.111	0.007	0.493	S
G3		0.101	0.1	0.1	0.007	0.121	S
G4		0.094	0.091	0.091	0.006	0.602	S
G1	Cl ⁻ mg/l	1.182	1.2	1.18	0.052	0.046	S
G2		1.105	1.12	1.097	0.055	0.14	S
G3		1.92	1.93	1.9	0.064	0.305	S
G4		1.79	1.81	1.781	0.054	0.173	S
G1	Ca ²⁺ mg/l	0.131	0.134	0.137	0.022	-0.298	S
G2		0.137	0.139	0.139	0.019	-0.081	S
G3		0.119	0.124	0.124	0.017	-0.306	S
G4		0.123	0.112	0.112	0.013	0.831	S
G1	K ⁺ mg/l	0.106	0.109	0.107	0.013	-0.135	S
G2		0.225	0.227	0.219	0.018	0.319	S
G3		0.142	0.143	0.14	0.015	0.126	S
G4		0.191	0.187	0.182	0.015	0.588	S
G1	pH pH units	5.28	5.28	5.311	0.126	-0.246	S
G2		5.22	5.26	5.261	0.127	-0.323	S
G3		5.17	5.14	5.146	0.154	0.155	S
G4		4.86	5.17	5.166	0.136	-2.24	U
G1	Cond µS/cm	10.81	10.13	10.423	0.492	0.786	S
G2		11.85	11.24	11.402	0.537	0.834	S
G3		14.99	14.32	14.281	0.894	0.793	S
G4		17.62	14.04	14.292	1.126	2.955	U

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- , between ± 15 - 25% of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

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Laboratory 6, SGS France - EHS (France)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.307	0.32	0.313	0.012	-0.491	S
G2		0.316	0.337	0.326	0.013	-0.733	S
G3		0.322	0.343	0.334	0.013	-0.885	S
G4		0.285	0.305	0.298	0.012	-1.051	S
G1	NH ₄ ⁺ mg N/l	0.083	0.086	0.086	0.009	-0.304	S
G2		0.083	0.086	0.086	0.011	-0.293	S
G3		0.106	0.112	0.107	0.013	-0.031	S
G4		0.14	0.147	0.144	0.014	-0.298	S
G1	NO ₃ ⁻ mg N/l	0.193	0.194	0.187	0.01	0.588	S
G2		0.315	0.313	0.3	0.013	1.078	S
G3		0.257	0.255	0.247	0.01	1.036	S
G4		0.339	0.334	0.326	0.022	0.585	S
G1	Na ⁺ mg/l	0.9	0.891	0.855	0.049	0.917	S
G2		0.976	0.966	0.933	0.058	0.746	S
G3		1.421	1.4	1.354	0.096	0.696	S
G4		1.377	1.37	1.311	0.08	0.816	S
G1	Mg ²⁺ mg/l	0.104	0.108	0.107	0.005	-0.626	S
G2		0.107	0.113	0.111	0.007	-0.613	S
G3		0.096	0.1	0.1	0.007	-0.692	S
G4		0.085	0.091	0.091	0.006	-0.963	S
G1	Cl ⁻ mg/l	1.12	1.2	1.18	0.052	-1.135	S
G2		1.047	1.12	1.097	0.055	-0.916	S
G3		1.868	1.93	1.9	0.064	-0.502	S
G4		1.714	1.81	1.781	0.054	-1.241	S
G1	Ca ²⁺ mg/l	0.124	0.134	0.137	0.022	-0.574	S
G2		0.13	0.139	0.139	0.019	-0.453	S
G3		0.118	0.124	0.124	0.017	-0.342	S
G4		0.102	0.112	0.112	0.013	-0.769	S
G1	K ⁺ mg/l	0.106	0.109	0.107	0.013	-0.111	S
G2		0.217	0.227	0.219	0.018	-0.072	S
G3		0.137	0.143	0.14	0.015	-0.266	S
G4		0.178	0.187	0.182	0.015	-0.273	S
G1	pH pH units	5.3	5.28	5.311	0.126	-0.087	S
G2		5.23	5.26	5.261	0.127	-0.244	S
G3		5.05	5.14	5.146	0.154	-0.624	S
G4		5.01	5.17	5.166	0.136	-1.141	Q
G1	Cond µS/cm	10.4	10.13	10.423	0.492	-0.047	S
G2		11.8	11.24	11.402	0.537	0.741	S
G3		14.69	14.32	14.281	0.894	0.458	S
G4		14.56	14.04	14.292	1.126	0.238	S

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* Z score is unitless

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Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

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Laboratory 8, Umweltbundesamt, Langen (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm [†]
G1	SO ₄ ²⁻ mg S/l	0.314	0.32	0.313	0.012	0.111	S
G2		0.332	0.337	0.326	0.013	0.477	S
G3		0.337	0.343	0.334	0.013	0.266	S
G4		0.299	0.305	0.298	0.012	0.124	S
G1	NH ₄ ⁺ mg N/l	0.083	0.086	0.086	0.009	-0.338	S
G2		0.083	0.086	0.086	0.011	-0.302	S
G3		0.11	0.112	0.107	0.013	0.243	S
G4		0.146	0.147	0.144	0.014	0.122	S
G1	NO ₃ ⁻ mg N/l	0.185	0.194	0.187	0.01	-0.179	S
G2		0.306	0.313	0.3	0.013	0.424	S
G3		0.247	0.255	0.247	0.01	0.031	S
G4		0.326	0.334	0.326	0.022	0.018	S
G1	Na ⁺ mg/l	0.867	0.891	0.855	0.049	0.237	S
G2		0.944	0.966	0.933	0.058	0.187	S
G3		1.38	1.4	1.354	0.096	0.268	S
G4		1.338	1.37	1.311	0.08	0.331	S
G1	Mg ²⁺ mg/l	0.106	0.108	0.107	0.005	-0.285	S
G2		0.11	0.113	0.111	0.007	-0.229	S
G3		0.099	0.1	0.1	0.007	-0.195	S
G4		0.089	0.091	0.091	0.006	-0.271	S
G1	Cl ⁻ mg/l	1.162	1.2	1.18	0.052	-0.338	S
G2		1.087	1.12	1.097	0.055	-0.186	S
G3		1.896	1.93	1.9	0.064	-0.065	S
G4		1.766	1.81	1.781	0.054	-0.277	S
G1	Ca ²⁺ mg/l	0.139	0.134	0.137	0.022	0.088	S
G2		0.145	0.139	0.139	0.019	0.324	S
G3		0.127	0.124	0.124	0.017	0.183	S
G4		0.117	0.112	0.112	0.013	0.354	S
G1	K ⁺ mg/l	0.1	0.109	0.107	0.013	-0.572	S
G2		0.218	0.227	0.219	0.018	-0.044	S
G3		0.133	0.143	0.14	0.015	-0.503	S
G4		0.176	0.187	0.182	0.015	-0.433	S
G1	pH pH units	5.265	5.28	5.311	0.126	-0.365	S
G2		5.245	5.26	5.261	0.127	-0.127	S
G3		5.133	5.14	5.146	0.154	-0.085	S
G4		5.178	5.17	5.166	0.136	0.09	S
G1	Cond µS/cm	10.7	10.13	10.423	0.492	0.563	S
G2		11.6	11.24	11.402	0.537	0.368	S
G3		14.5	14.32	14.281	0.894	0.245	S
G4		14.3	14.04	14.292	1.126	0.007	S

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* Z score is unitless

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

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<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 10, Air Quality Reference Centre (Hungary)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.306	0.32	0.313	0.012	-0.577	S
G2		0.324	0.337	0.326	0.013	-0.117	S
G3		0.329	0.343	0.334	0.013	-0.361	S
G4		0.297	0.305	0.298	0.012	-0.045	S
G1	NH ₄ ⁺ mg N/l	0.061	0.086	0.086	0.009	-2.869	U
G2		0.057	0.086	0.086	0.011	-2.639	U
G3		0.084	0.112	0.107	0.013	-1.688	Q
G4		0.115	0.147	0.144	0.014	-2.049	Q
G1	NO ₃ ⁻ mg N/l	0.178	0.194	0.187	0.01	-0.85	S
G2		0.288	0.313	0.3	0.013	-0.945	S
G3		0.234	0.255	0.247	0.01	-1.315	S
G4		0.304	0.334	0.326	0.022	-0.981	S
G1	Na ⁺ mg/l	0.895	0.891	0.855	0.049	0.807	S
G2		0.972	0.966	0.933	0.058	0.671	S
G3		1.492	1.4	1.354	0.096	1.439	S
G4		1.398	1.37	1.311	0.08	1.079	S
G1	Mg ²⁺ mg/l	0.1	0.108	0.107	0.005	-1.423	S
G2		0.103	0.113	0.111	0.007	-1.305	S
G3		0.092	0.1	0.1	0.007	-1.248	S
G4		0.081	0.091	0.091	0.006	-1.589	S
G1	Cl ⁻ mg/l	1.239	1.2	1.18	0.052	1.136	S
G2		1.142	1.12	1.097	0.055	0.821	S
G3		1.935	1.93	1.9	0.064	0.544	S
G4		1.815	1.81	1.781	0.054	0.634	S
G1	Ca ²⁺ mg/l	0.128	0.134	0.137	0.022	-0.411	S
G2		0.134	0.139	0.139	0.019	-0.262	S
G3		0.124	0.124	0.124	0.017	0.004	S
G4		0.093	0.112	0.112	0.013	-1.492	Q
G1	K ⁺ mg/l	0.1	0.109	0.107	0.013	-0.572	S
G2		0.216	0.227	0.219	0.018	-0.156	S
G3		0.142	0.143	0.14	0.015	0.105	S
G4		0.182	0.187	0.182	0.015	-0.033	S
G1	pH pH units	6.386	5.28	5.311	0.126	8.541	U
G2		5.598	5.26	5.261	0.127	2.643	U
G3		5.292	5.14	5.146	0.154	0.946	Q
G4		5.183	5.17	5.166	0.136	0.126	S
G1	Cond µS/cm	11.259	10.13	10.423	0.492	1.699	S
G2		12.266	11.24	11.402	0.537	1.609	S
G3		15.28	14.32	14.281	0.894	1.118	S
G4		15.125	14.04	14.292	1.126	0.74	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 12, Met Eireann, Dublin (Ireland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.31	0.32	0.313	0.012	-0.233	S
G2		0.33	0.337	0.326	0.013	0.329	S
G3		0.33	0.343	0.334	0.013	-0.282	S
G4		0.3	0.305	0.298	0.012	0.208	S
G1	NH ₄ ⁺ mg N/l	0.09	0.086	0.086	0.009	0.467	S
G2		0.09	0.086	0.086	0.011	0.328	S
G3		0.11	0.112	0.107	0.013	0.243	S
G4		0.15	0.147	0.144	0.014	0.402	S
G1	NO ₃ ⁻ mg N/l	0.18	0.194	0.187	0.01	-0.658	S
G2		0.31	0.313	0.3	0.013	0.728	S
G3		0.25	0.255	0.247	0.01	0.342	S
G4		0.33	0.334	0.326	0.022	0.199	S
G1	Na ⁺ mg/l	0.82	0.891	0.855	0.049	-0.719	S
G2		0.91	0.966	0.933	0.058	-0.4	S
G3		1.3	1.4	1.354	0.096	-0.568	S
G4		1.28	1.37	1.311	0.08	-0.392	S
G1	Mg ²⁺ mg/l	0.096	0.108	0.107	0.005	-2.182	S
G2		0.102	0.113	0.111	0.007	-1.458	S
G3		0.098	0.1	0.1	0.007	-0.345	S
G4		0.089	0.091	0.091	0.006	-0.271	S
G1	Cl ⁻ mg/l	1.1	1.2	1.18	0.052	-1.525	S
G2		1.05	1.12	1.097	0.055	-0.864	S
G3		1.81	1.93	1.9	0.064	-1.408	S
G4		1.7	1.81	1.781	0.054	-1.503	S
G1	Ca ²⁺ mg/l	0.12	0.134	0.137	0.022	-0.774	S
G2		0.13	0.139	0.139	0.019	-0.475	S
G3		0.11	0.124	0.124	0.017	-0.83	S
G4		0.1	0.112	0.112	0.013	-0.954	S
G1	K ⁺ mg/l	0.12	0.109	0.107	0.013	0.989	S
G2		0.22	0.227	0.219	0.018	0.067	S
G3		0.15	0.143	0.14	0.015	0.646	S
G4		0.18	0.187	0.182	0.015	-0.166	S
G1	pH pH units	5.21	5.28	5.311	0.126	-0.802	S
G2		5.2	5.26	5.261	0.127	-0.48	S
G3		5.1	5.14	5.146	0.154	-0.299	S
G4		5.11	5.17	5.166	0.136	-0.409	S
G1	Cond µS/cm	10.5	10.13	10.423	0.492	0.156	S
G2		11.3	11.24	11.402	0.537	-0.191	S
G3		14.4	14.32	14.281	0.894	0.133	S
G4		14.3	14.04	14.292	1.126	0.007	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 13, C.N.R. Istituto Inquinamento Atmosferico (Italy)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.312	0.32	0.313	0.012	-0.061	S
G2		0.318	0.337	0.326	0.013	-0.562	S
G3		0.337	0.343	0.334	0.013	0.266	S
G4		0.321	0.305	0.298	0.012	1.982	S
G1	NH ₄ ⁺ mg N/l	0.083	0.086	0.086	0.009	-0.338	S
G2		0.082	0.086	0.086	0.011	-0.392	S
G3		0.107	0.112	0.107	0.013	0.021	S
G4		0.142	0.147	0.144	0.014	-0.158	S
G1	NO ₃ ⁻ mg N/l	0.19	0.194	0.187	0.01	0.3	S
G2		0.305	0.313	0.3	0.013	0.348	S
G3		0.246	0.255	0.247	0.01	-0.072	S
G4		0.055	0.334	0.326	0.022	-12.286	U
G1	Na ⁺ mg/l	0.876	0.891	0.855	0.049	0.42	S
G2		0.952	0.966	0.933	0.058	0.326	S
G3		1.404	1.4	1.354	0.096	0.519	S
G4		1.356	1.37	1.311	0.08	0.555	S
G1	Mg ²⁺ mg/l	0.107	0.108	0.107	0.005	-0.095	S
G2		0.105	0.113	0.111	0.007	-0.997	S
G3		0.094	0.1	0.1	0.007	-0.947	S
G4		0.088	0.091	0.091	0.006	-0.436	S
G1	Cl ⁻ mg/l	1.218	1.2	1.18	0.052	0.734	S
G2		1.139	1.12	1.097	0.055	0.766	S
G3		2.059	1.93	1.9	0.064	2.482	S
G4		1.235	1.81	1.781	0.054	-10.145	U
G1	Ca ²⁺ mg/l	0.172	0.134	0.137	0.022	1.584	U
G2		0.169	0.139	0.139	0.019	1.602	Q
G3		0.154	0.124	0.124	0.017	1.792	Q
G4		0.146	0.112	0.112	0.013	2.586	U
G1	K ⁺ mg/l	0.1	0.109	0.107	0.013	-0.572	S
G2		0.213	0.227	0.219	0.018	-0.324	S
G3		0.132	0.143	0.14	0.015	-0.57	S
G4		0.165	0.187	0.182	0.015	-1.167	S
G1	pH pH units	7.51	5.28	5.311	0.126	17.472	U
G2		7.51	5.26	5.261	0.127	17.642	U
G3		7.45	5.14	5.146	0.154	14.942	U
G4		7.94	5.17	5.166	0.136	20.325	U
G1	Cond µS/cm	20.7	10.13	10.423	0.492	20.896	U
G2		21.5	11.24	11.402	0.537	18.809	U
G3		16.2	14.32	14.281	0.894	2.147	S
G4		17.3	14.04	14.292	1.126	2.671	Q

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 15, NILU (Norway)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.32	0.32	0.313	0.012	0.627	S
G2		0.338	0.337	0.326	0.013	0.923	S
G3		0.339	0.343	0.334	0.013	0.423	S
G4		0.309	0.305	0.298	0.012	0.968	S
G1	NH ₄ ⁺ mg N/l	0.093	0.086	0.086	0.009	0.812	S
G2		0.093	0.086	0.086	0.011	0.597	S
G3		0.12	0.112	0.107	0.013	0.986	S
G4		0.166	0.147	0.144	0.014	1.523	S
G1	NO ₃ ⁻ mg N/l	0.189	0.194	0.187	0.01	0.204	S
G2		0.308	0.313	0.3	0.013	0.576	S
G3		0.253	0.255	0.247	0.01	0.653	S
G4		0.38	0.334	0.326	0.022	2.47	S
G1	Na ⁺ mg/l	0.898	0.891	0.855	0.049	0.868	S
G2		0.962	0.966	0.933	0.058	0.498	S
G3		1.425	1.4	1.354	0.096	0.739	S
G4		1.37	1.37	1.311	0.08	0.73	S
G1	Mg ²⁺ mg/l	0.1	0.108	0.107	0.005	-1.423	S
G2		0.11	0.113	0.111	0.007	-0.229	S
G3		0.104	0.1	0.1	0.007	0.557	S
G4		0.093	0.091	0.091	0.006	0.388	S
G1	Cl ⁻ mg/l	1.181	1.2	1.18	0.052	0.025	S
G2		1.111	1.12	1.097	0.055	0.253	S
G3		1.96	1.93	1.9	0.064	0.935	S
G4		1.799	1.81	1.781	0.054	0.336	S
G1	Ca ²⁺ mg/l	0.132	0.134	0.137	0.022	-0.23	S
G2		0.131	0.139	0.139	0.019	-0.421	S
G3		0.121	0.124	0.124	0.017	-0.175	S
G4		0.11	0.112	0.112	0.013	-0.184	S
G1	K ⁺ mg/l	0.088	0.109	0.107	0.013	-1.508	Q
G2		0.217	0.227	0.219	0.018	-0.1	S
G3		0.155	0.143	0.14	0.015	0.983	S
G4		0.199	0.187	0.182	0.015	1.101	S
G1	pH pH units	5.263	5.28	5.311	0.126	-0.381	S
G2		5.243	5.26	5.261	0.127	-0.142	S
G3		5.117	5.14	5.146	0.154	-0.189	S
G4		5.027	5.17	5.166	0.136	-1.017	Q
G1	Cond µS/cm	10.4	10.13	10.423	0.492	-0.047	S
G2		10.8	11.24	11.402	0.537	-1.122	S
G3		14.133	14.32	14.281	0.894	-0.166	S
G4		14.533	14.04	14.292	1.126	0.214	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 16, Institute of Meteorology and Water Management, Warsaw
Poland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.317	0.32	0.313	0.012	0.369	S
G2		0.332	0.337	0.326	0.013	0.477	S
G3		0.341	0.343	0.334	0.013	0.579	S
G4		0.302	0.305	0.298	0.012	0.377	S
G1	NH ₄ ⁺ mg N/l	0.084	0.086	0.086	0.009	-0.223	S
G2		0.08	0.086	0.086	0.011	-0.571	S
G3		0.105	0.112	0.107	0.013	-0.128	S
G4		0.138	0.147	0.144	0.014	-0.438	S
G1	NO ₃ ⁻ mg N/l	0.187	0.194	0.187	0.01	0.013	S
G2		0.298	0.313	0.3	0.013	-0.184	S
G3		0.239	0.255	0.247	0.01	-0.797	S
G4		0.315	0.334	0.326	0.022	-0.482	S
G1	Na ⁺ mg/l	0.886	0.891	0.855	0.049	0.624	S
G2		0.996	0.966	0.933	0.058	1.086	S
G3		1.398	1.4	1.354	0.096	0.457	S
G4		1.381	1.37	1.311	0.08	0.867	S
G1	Mg ²⁺ mg/l	0.109	0.108	0.107	0.005	0.285	S
G2		0.111	0.113	0.111	0.007	-0.076	S
G3		0.098	0.1	0.1	0.007	-0.345	S
G4		0.089	0.091	0.091	0.006	-0.271	S
G1	Cl ⁻ mg/l	1.137	1.2	1.18	0.052	-0.817	S
G2		1.073	1.12	1.097	0.055	-0.443	S
G3		1.856	1.93	1.9	0.064	-0.69	S
G4		1.735	1.81	1.781	0.054	-0.853	S
G1	Ca ²⁺ mg/l	0.131	0.134	0.137	0.022	-0.275	S
G2		0.141	0.139	0.139	0.019	0.111	S
G3		0.124	0.124	0.124	0.017	0.004	S
G4		0.115	0.112	0.112	0.013	0.2	S
G1	K ⁺ mg/l	0.106	0.109	0.107	0.013	-0.103	S
G2		0.216	0.227	0.219	0.018	-0.156	S
G3		0.137	0.143	0.14	0.015	-0.232	S
G4		0.178	0.187	0.182	0.015	-0.299	S
G1	pH pH units	5.22	5.28	5.311	0.126	-0.723	S
G2		5.18	5.26	5.261	0.127	-0.637	S
G3		5.12	5.14	5.146	0.154	-0.17	S
G4		5.11	5.17	5.166	0.136	-0.409	S
G1	Cond µS/cm	10.47	10.13	10.423	0.492	0.095	S
G2		11.68	11.24	11.402	0.537	0.517	S
G3		14.48	14.32	14.281	0.894	0.223	S
G4		14.52	14.04	14.292	1.126	0.202	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✕ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- , between ± 15 - 25% of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 19, Centro Nacional de Sanidad Ambiental (Spain)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.333	0.32	0.313	0.012	1.744	S
G2		0.333	0.337	0.326	0.013	0.551	S
G3		0.34	0.343	0.334	0.013	0.501	S
G4		0.303	0.305	0.298	0.012	0.461	S
G1	NH ₄ ⁺ mg N/l	< 0.120	0.086	0.086	0.009		B
G2		< 0.120	0.086	0.086	0.011		B
G3		< 0.120	0.112	0.107	0.013		B
G4		< 0.120	0.147	0.144	0.014	-5.901	U
G1	NO ₃ ⁻ mg N/l	0.212	0.194	0.187	0.01	2.408	S
G2		0.294	0.313	0.3	0.013	-0.489	S
G3		0.246	0.255	0.247	0.01	-0.072	S
G4		0.307	0.334	0.326	0.022	-0.845	S
G1	Na ⁺ mg/l	0.79	0.891	0.855	0.049	-1.329	S
G2		0.857	0.966	0.933	0.058	-1.317	S
G3		1.267	1.4	1.354	0.096	-0.913	S
G4		1.238	1.37	1.311	0.08	-0.916	S
G1	Mg ²⁺ mg/l	0.103	0.108	0.107	0.005	-0.854	S
G2		0.107	0.113	0.111	0.007	-0.69	S
G3		0.095	0.1	0.1	0.007	-0.797	S
G4		0.086	0.091	0.091	0.006	-0.765	S
G1	Cl ⁻ mg/l	1.16	1.2	1.18	0.052	-0.377	S
G2		1.1	1.12	1.097	0.055	0.052	S
G3		1.81	1.93	1.9	0.064	-1.408	S
G4		1.71	1.81	1.781	0.054	-1.318	S
G1	Ca ²⁺ mg/l	0.121	0.134	0.137	0.022	-0.729	S
G2		0.125	0.139	0.139	0.019	-0.741	S
G3		0.114	0.124	0.124	0.017	-0.592	S
G4		0.102	0.112	0.112	0.013	-0.8	S
G1	K ⁺ mg/l	0.092	0.109	0.107	0.013	-1.196	Q
G2		0.193	0.227	0.219	0.018	-1.441	S
G3		0.123	0.143	0.14	0.015	-1.178	S
G4		0.16	0.187	0.182	0.015	-1.5	S
G1	pH pH units	5.218	5.28	5.311	0.126	-0.739	S
G2		5.202	5.26	5.261	0.127	-0.464	S
G3		5.093	5.14	5.146	0.154	-0.345	S
G4		5.112	5.17	5.166	0.136	-0.394	S
G1	Cond µS/cm	10.97	10.13	10.423	0.492	1.112	S
G2		12.05	11.24	11.402	0.537	1.206	S
G3		14.96	14.32	14.281	0.894	0.76	S
G4		14.86	14.04	14.292	1.126	0.504	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 20, Swedish Environmental Research Institute IVL, Gothenburg (Sweden)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm [ⓧ]
G1	SO ₄ ²⁻ mg S/l	0.321	0.32	0.313	0.012	0.713	S
G2		0.337	0.337	0.326	0.013	0.848	S
G3		0.34	0.343	0.334	0.013	0.501	S
G4		0.304	0.305	0.298	0.012	0.546	S
G1	NH ₄ ⁺ mg N/l	0.087	0.086	0.086	0.009	0.122	S
G2		0.088	0.086	0.086	0.011	0.148	S
G3		0.11	0.112	0.107	0.013	0.243	S
G4		0.141	0.147	0.144	0.014	-0.228	S
G1	NO ₃ ⁻ mg N/l	0.198	0.194	0.187	0.01	1.067	S
G2		0.311	0.313	0.3	0.013	0.804	S
G3		0.256	0.255	0.247	0.01	0.963	S
G4		0.337	0.334	0.326	0.022	0.517	S
G1	Na ⁺ mg/l	0.818	0.891	0.855	0.049	-0.76	S
G2		0.906	0.966	0.933	0.058	-0.47	S
G3		1.22	1.4	1.354	0.096	-1.404	S
G4		1.22	1.37	1.311	0.08	-1.141	S
G1	Mg ²⁺ mg/l	0.107	0.108	0.107	0.005	-0.095	S
G2		0.111	0.113	0.111	0.007	-0.076	S
G3		0.095	0.1	0.1	0.007	-0.797	S
G4		0.087	0.091	0.091	0.006	-0.601	S
G1	Cl ⁻ mg/l	1.21	1.2	1.18	0.052	0.581	S
G2		1.13	1.12	1.097	0.055	0.601	S
G3		1.95	1.93	1.9	0.064	0.779	S
G4		1.82	1.81	1.781	0.054	0.727	S
G1	Ca ²⁺ mg/l	0.133	0.134	0.137	0.022	-0.184	S
G2		0.137	0.139	0.139	0.019	-0.102	S
G3		0.116	0.124	0.124	0.017	-0.473	S
G4		0.109	0.112	0.112	0.013	-0.261	S
G1	K ⁺ mg/l	0.104	0.109	0.107	0.013	-0.259	S
G2		0.219	0.227	0.219	0.018	0.011	S
G3		0.135	0.143	0.14	0.015	-0.368	S
G4		0.181	0.187	0.182	0.015	-0.099	S
G1	pH pH units	5.27	5.28	5.311	0.126	-0.326	S
G2		5.24	5.26	5.261	0.127	-0.166	S
G3		5.12	5.14	5.146	0.154	-0.17	S
G4		5.13	5.17	5.166	0.136	-0.262	S
G1	Cond µS/cm	10.7	10.13	10.423	0.492	0.563	S
G2		11.8	11.24	11.402	0.537	0.741	S
G3		14.6	14.32	14.281	0.894	0.357	S
G4		14.6	14.04	14.292	1.126	0.273	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

☒ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- , between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 21, EMPA, Swiss Federal Laboratories for Materials Science and Technology (Switzerland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm [⋈]
G1	SO ₄ ²⁻ mg S/l	0.333	0.32	0.313	0.012	1.744	S
G2		0.349	0.337	0.326	0.013	1.739	S
G3		0.356	0.343	0.334	0.013	1.754	S
G4		0.319	0.305	0.298	0.012	1.813	S
G1	NH ₄ ⁺ mg N/l	0.088	0.086	0.086	0.009	0.237	S
G2		0.088	0.086	0.086	0.011	0.148	S
G3		0.112	0.112	0.107	0.013	0.392	S
G4		0.147	0.147	0.144	0.014	0.192	S
G1	NO ₃ ⁻ mg N/l	0.19	0.194	0.187	0.01	0.3	S
G2		0.307	0.313	0.3	0.013	0.5	S
G3		0.252	0.255	0.247	0.01	0.549	S
G4		0.339	0.334	0.326	0.022	0.608	S
G1	Na ⁺ mg/l	0.889	0.891	0.855	0.049	0.685	S
G2		0.985	0.966	0.933	0.058	0.896	S
G3		1.429	1.4	1.354	0.096	0.781	S
G4		1.392	1.37	1.311	0.08	1.004	S
G1	Mg ²⁺ mg/l	0.112	0.108	0.107	0.005	0.854	S
G2		0.116	0.113	0.111	0.007	0.693	S
G3		0.103	0.1	0.1	0.007	0.407	S
G4		0.093	0.091	0.091	0.006	0.388	S
G1	Cl ⁻ mg/l	1.175	1.2	1.18	0.052	-0.089	S
G2		1.104	1.12	1.097	0.055	0.125	S
G3		1.908	1.93	1.9	0.064	0.123	S
G4		1.782	1.81	1.781	0.054	0.02	S
G1	Ca ²⁺ mg/l	0.134	0.134	0.137	0.022	-0.139	S
G2		0.14	0.139	0.139	0.019	0.058	S
G3		0.125	0.124	0.124	0.017	0.063	S
G4		0.116	0.112	0.112	0.013	0.277	S
G1	K ⁺ mg/l	0.105	0.109	0.107	0.013	-0.181	S
G2		0.223	0.227	0.219	0.018	0.235	S
G3		0.139	0.143	0.14	0.015	-0.097	S
G4		0.185	0.187	0.182	0.015	0.168	S
G1	pH pH units	5.25	5.28	5.311	0.126	-0.484	S
G2		5.22	5.26	5.261	0.127	-0.323	S
G3		5.11	5.14	5.146	0.154	-0.234	S
G4		5.15	5.17	5.166	0.136	-0.116	S
G1	Cond µS/cm	10.46	10.13	10.423	0.492	0.075	S
G2		11.55	11.24	11.402	0.537	0.275	S
G3		14.36	14.32	14.281	0.894	0.088	S
G4		14.24	14.04	14.292	1.126	-0.046	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✕ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- , between ± 15 - 25% of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 22, Institute of Global Climate and Ecology (Russian Federation)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.34	0.32	0.313	0.012	2.346	S
G2		0.329	0.337	0.326	0.013	0.254	S
G3		0.341	0.343	0.334	0.013	0.579	S
G4		0.306	0.305	0.298	0.012	0.715	S
G1	NH ₄ ⁺ mg N/l	0.103	0.086	0.086	0.009	1.962	Q
G2		0.095	0.086	0.086	0.011	0.777	S
G3		0.133	0.112	0.107	0.013	1.952	Q
G4		0.169	0.147	0.144	0.014	1.733	S
G1	NO ₃ ⁻ mg N/l	0.252	0.194	0.187	0.01	6.241	U
G2		0.371	0.313	0.3	0.013	5.367	Q
G3		0.295	0.255	0.247	0.01	5.002	Q
G4		0.413	0.334	0.326	0.022	3.968	Q
G1	Na ⁺ mg/l	0.97	0.891	0.855	0.049	2.333	S
G2		1.062	0.966	0.933	0.058	2.227	S
G3		1.524	1.4	1.354	0.096	1.773	S
G4		1.432	1.37	1.311	0.08	1.503	S
G1	Mg ²⁺ mg/l	0.12	0.108	0.107	0.005	2.372	S
G2		0.126	0.113	0.111	0.007	2.229	S
G3		0.111	0.1	0.1	0.007	1.611	S
G4		0.094	0.091	0.091	0.006	0.553	S
G1	Cl ⁻ mg/l	1.199	1.2	1.18	0.052	0.37	S
G2		1.125	1.12	1.097	0.055	0.51	S
G3		1.95	1.93	1.9	0.064	0.779	S
G4		1.836	1.81	1.781	0.054	1.024	S
G1	Ca ²⁺ mg/l	0.218	0.134	0.137	0.022	3.671	U
G2		0.2	0.139	0.139	0.019	3.253	U
G3		0.172	0.124	0.124	0.017	2.864	U
G4		0.179	0.112	0.112	0.013	5.125	U
G1	K ⁺ mg/l	0.102	0.109	0.107	0.013	-0.415	S
G2		0.238	0.227	0.219	0.018	1.072	S
G3		0.135	0.143	0.14	0.015	-0.368	S
G4		0.183	0.187	0.182	0.015	0.034	S
G1	pH pH units	5.43	5.28	5.311	0.126	0.946	Q
G2		5.11	5.26	5.261	0.127	-1.186	Q
G3		5.2	5.14	5.146	0.154	0.349	S
G4		5.28	5.17	5.166	0.136	0.837	Q
G1	Cond µS/cm	10.2	10.13	10.423	0.492	-0.454	S
G2		10.57	11.24	11.402	0.537	-1.55	S
G3		14.97	14.32	14.281	0.894	0.771	S
G4		18.42	14.04	14.292	1.126	3.666	U

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 23, Ricardo-AEA Limited (United Kingdom)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.291	0.32	0.313	0.012	-1.866	S
G2		0.305	0.337	0.326	0.013	-1.527	S
G3		0.313	0.343	0.334	0.013	-1.613	S
G4		0.276	0.305	0.298	0.012	-1.819	S
G1	NH ₄ ⁺ mg N/l	0.072	0.086	0.086	0.009	-1.615	Q
G2		0.057	0.086	0.086	0.011	-2.666	U
G3		0.085	0.112	0.107	0.013	-1.584	Q
G4		0.123	0.147	0.144	0.014	-1.489	Q
G1	NO ₃ ⁻ mg N/l	0.174	0.194	0.187	0.01	-1.233	S
G2		0.282	0.313	0.3	0.013	-1.401	S
G3		0.231	0.255	0.247	0.01	-1.626	S
G4		0.303	0.334	0.326	0.022	-1.026	S
G1	Na ⁺ mg/l	0.819	0.891	0.855	0.049	-0.739	S
G2		0.91	0.966	0.933	0.058	-0.4	S
G3		1.31	1.4	1.354	0.096	-0.463	S
G4		1.29	1.37	1.311	0.08	-0.268	S
G1	Mg ²⁺ mg/l	0.092	0.108	0.107	0.005	-3.017	Q
G2		0.097	0.113	0.111	0.007	-2.227	S
G3		0.086	0.1	0.1	0.007	-2.196	S
G4		0.077	0.091	0.091	0.006	-2.314	Q
G1	Cl ⁻ mg/l	1.26	1.2	1.18	0.052	1.538	S
G2		1.14	1.12	1.097	0.055	0.785	S
G3		1.85	1.93	1.9	0.064	-0.783	S
G4		1.75	1.81	1.781	0.054	-0.574	S
G1	Ca ²⁺ mg/l	0.13	0.134	0.137	0.022	-0.32	S
G2		0.138	0.139	0.139	0.019	-0.049	S
G3		0.124	0.124	0.124	0.017	0.004	S
G4		0.111	0.112	0.112	0.013	-0.107	S
G1	K ⁺ mg/l	0.243	0.109	0.107	0.013	10.588	U
G2		0.319	0.227	0.219	0.018	5.596	U
G3		0.166	0.143	0.14	0.015	1.726	Q
G4		0.209	0.187	0.182	0.015	1.769	S
G1	pH pH units	5.28	5.28	5.311	0.126	-0.246	S
G2		5.26	5.26	5.261	0.127	-0.009	S
G3		5.13	5.14	5.146	0.154	-0.105	S
G4		5.17	5.17	5.166	0.136	0.031	S
G1	Cond µS/cm	10.58	10.13	10.423	0.492	0.319	S
G2		11.59	11.24	11.402	0.537	0.35	S
G3		14.39	14.32	14.281	0.894	0.122	S
G4		14.28	14.04	14.292	1.126	-0.011	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 24, Serbian Environmental Protection Agency (Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.32	0.32	0.313	0.012	0.627	S
G2		0.327	0.337	0.326	0.013	0.106	S
G3		0.345	0.343	0.334	0.013	0.892	S
G4		0.305	0.305	0.298	0.012	0.63	S
G1	NH ₄ ⁺ mg N/l	0.082	0.086	0.086	0.009	-0.453	S
G2		0.082	0.086	0.086	0.011	-0.392	S
G3		0.085	0.112	0.107	0.013	-1.614	Q
G4		0.143	0.147	0.144	0.014	-0.088	S
G1	NO ₃ ⁻ mg N/l	0.192	0.194	0.187	0.01	0.492	S
G2		0.298	0.313	0.3	0.013	-0.184	S
G3		0.245	0.255	0.247	0.01	-0.176	S
G4		0.319	0.334	0.326	0.022	-0.3	S
G1	Na ⁺ mg/l	0.89	0.891	0.855	0.049	0.705	S
G2		0.948	0.966	0.933	0.058	0.256	S
G3		1.401	1.4	1.354	0.096	0.488	S
G4		1.358	1.37	1.311	0.08	0.58	S
G1	Mg ²⁺ mg/l	0.105	0.108	0.107	0.005	-0.474	S
G2		0.11	0.113	0.111	0.007	-0.229	S
G3		0.091	0.1	0.1	0.007	-1.399	S
G4		0.085	0.091	0.091	0.006	-0.93	S
G1	Cl ⁻ mg/l	1.205	1.2	1.18	0.052	0.485	S
G2		1.13	1.12	1.097	0.055	0.601	S
G3		1.975	1.93	1.9	0.064	1.169	S
G4		1.796	1.81	1.781	0.054	0.281	S
G1	Ca ²⁺ mg/l	0.158	0.134	0.137	0.022	0.949	Q
G2		0.129	0.139	0.139	0.019	-0.528	S
G3		0.131	0.124	0.124	0.017	0.421	S
G4		0.102	0.112	0.112	0.013	-0.8	S
G1	K ⁺ mg/l	0.103	0.109	0.107	0.013	-0.337	S
G2		0.21	0.227	0.219	0.018	-0.491	S
G3		0.14	0.143	0.14	0.015	-0.03	S
G4		0.175	0.187	0.182	0.015	-0.5	S
G1	pH pH units	5.37	5.28	5.311	0.126	0.469	S
G2		5.38	5.26	5.261	0.127	0.932	Q
G3		5.3	5.14	5.146	0.154	0.998	Q
G4		5.35	5.17	5.166	0.136	1.35	Q
G1	Cond µS/cm	10.55	10.13	10.423	0.492	0.258	S
G2		11.5	11.24	11.402	0.537	0.182	S
G3		14.49	14.32	14.281	0.894	0.234	S
G4		13.7	14.04	14.292	1.126	-0.526	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 26, Environment and Climate Change Canada (Canada)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.32	0.32	0.313	0.012	0.627	S
G2		0.335	0.337	0.326	0.013	0.7	S
G3		0.34	0.343	0.334	0.013	0.501	S
G4		0.302	0.305	0.298	0.012	0.377	S
G1	NH ₄ ⁺ mg N/l	0.086	0.086	0.086	0.009	0.007	S
G2		0.085	0.086	0.086	0.011	-0.122	S
G3		0.088	0.112	0.107	0.013	-1.391	Q
G4		0.147	0.147	0.144	0.014	0.192	S
G1	NO ₃ ⁻ mg N/l	0.189	0.194	0.187	0.01	0.204	S
G2		0.31	0.313	0.3	0.013	0.728	S
G3		0.251	0.255	0.247	0.01	0.445	S
G4		0.329	0.334	0.326	0.022	0.154	S
G1	Na ⁺ mg/l	0.887	0.891	0.855	0.049	0.644	S
G2		0.962	0.966	0.933	0.058	0.498	S
G3		1.392	1.4	1.354	0.096	0.394	S
G4		1.351	1.37	1.311	0.08	0.493	S
G1	Mg ²⁺ mg/l	0.109	0.108	0.107	0.005	0.285	S
G2		0.113	0.113	0.111	0.007	0.232	S
G3		0.1	0.1	0.1	0.007	-0.045	S
G4		0.091	0.091	0.091	0.006	0.059	S
G1	Cl ⁻ mg/l	1.179	1.2	1.18	0.052	-0.013	S
G2		1.107	1.12	1.097	0.055	0.18	S
G3		1.911	1.93	1.9	0.064	0.17	S
G4		1.784	1.81	1.781	0.054	0.058	S
G1	Ca ²⁺ mg/l	0.132	0.134	0.137	0.022	-0.23	S
G2		0.138	0.139	0.139	0.019	-0.049	S
G3		0.126	0.124	0.124	0.017	0.123	S
G4		0.11	0.112	0.112	0.013	-0.184	S
G1	K ⁺ mg/l	0.11	0.109	0.107	0.013	0.209	S
G2		0.226	0.227	0.219	0.018	0.402	S
G3		0.14	0.143	0.14	0.015	-0.03	S
G4		0.181	0.187	0.182	0.015	-0.099	S
G1	pH pH units	5.29	5.28	5.311	0.126	-0.167	S
G2		5.27	5.26	5.261	0.127	0.069	S
G3		5.07	5.14	5.146	0.154	-0.494	S
G4		5.2	5.17	5.166	0.136	0.251	S
G1	Cond µS/cm	-999	10.13	10.423	0.492		B
G2		-999	11.24	11.402	0.537		B
G3		-999	14.32	14.281	0.894		B
G4		-999	14.04	14.292	1.126		B

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 27, Illinois State Water Survey (United States of America)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.327	0.32	0.313	0.012	1.228	S
G2		0.343	0.337	0.326	0.013	1.294	S
G3		0.349	0.343	0.334	0.013	1.206	S
G4		0.311	0.305	0.298	0.012	1.137	S
G1	NH ₄ ⁺ mg N/l	0.086	0.086	0.086	0.009	0.007	S
G2		0.087	0.086	0.086	0.011	0.058	S
G3		0.114	0.112	0.107	0.013	0.541	S
G4		0.15	0.147	0.144	0.014	0.402	S
G1	NO ₃ ⁻ mg N/l	0.201	0.194	0.187	0.01	1.354	S
G2		0.327	0.313	0.3	0.013	2.021	S
G3		0.266	0.255	0.247	0.01	1.999	S
G4		0.349	0.334	0.326	0.022	1.062	S
G1	Na ⁺ mg/l	0.83	0.891	0.855	0.049	-0.515	S
G2		0.877	0.966	0.933	0.058	-0.971	S
G3		1.29	1.4	1.354	0.096	-0.672	S
G4		1.22	1.37	1.311	0.08	-1.141	S
G1	Mg ²⁺ mg/l	0.107	0.108	0.107	0.005	-0.095	S
G2		0.117	0.113	0.111	0.007	0.846	S
G3		0.104	0.1	0.1	0.007	0.557	S
G4		0.094	0.091	0.091	0.006	0.553	S
G1	Cl ⁻ mg/l	1.18	1.2	1.18	0.052	0.006	S
G2		1.1	1.12	1.097	0.055	0.052	S
G3		1.94	1.93	1.9	0.064	0.623	S
G4		1.82	1.81	1.781	0.054	0.727	S
G1	Ca ²⁺ mg/l	0.122	0.134	0.137	0.022	-0.683	S
G2		0.129	0.139	0.139	0.019	-0.528	S
G3		0.118	0.124	0.124	0.017	-0.354	S
G4		0.105	0.112	0.112	0.013	-0.569	S
G1	K ⁺ mg/l	0.103	0.109	0.107	0.013	-0.337	S
G2		0.209	0.227	0.219	0.018	-0.547	S
G3		0.132	0.143	0.14	0.015	-0.57	S
G4		0.17	0.187	0.182	0.015	-0.833	S
G1	pH pH units	5.23	5.28	5.311	0.126	-0.643	S
G2		5.19	5.26	5.261	0.127	-0.558	S
G3		5.08	5.14	5.146	0.154	-0.429	S
G4		5.16	5.17	5.166	0.136	-0.042	S
G1	Cond µS/cm	10.4	10.13	10.423	0.492	-0.047	S
G2		11.5	11.24	11.402	0.537	0.182	S
G3		14.1	14.32	14.281	0.894	-0.202	S
G4		13.9	14.04	14.292	1.126	-0.348	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 30, Joint Research Centre, Ispra (Italy)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm [†]
G1	SO ₄ ²⁻ mg S/l	0.311	0.32	0.313	0.012	-0.147	S
G2		0.327	0.337	0.326	0.013	0.106	S
G3		0.333	0.343	0.334	0.013	-0.047	S
G4		0.3	0.305	0.298	0.012	0.208	S
G1	NH ₄ ⁺ mg N/l	0.088	0.086	0.086	0.009	0.237	S
G2		0.088	0.086	0.086	0.011	0.148	S
G3		0.106	0.112	0.107	0.013	-0.054	S
G4		0.16	0.147	0.144	0.014	1.102	S
G1	NO ₃ ⁻ mg N/l	0.195	0.194	0.187	0.01	0.779	S
G2		0.303	0.313	0.3	0.013	0.196	S
G3		0.256	0.255	0.247	0.01	0.963	S
G4		0.329	0.334	0.326	0.022	0.154	S
G1	Na ⁺ mg/l	0.896	0.891	0.855	0.049	0.827	S
G2		0.975	0.966	0.933	0.058	0.723	S
G3		1.429	1.4	1.354	0.096	0.781	S
G4		1.387	1.37	1.311	0.08	0.942	S
G1	Mg ²⁺ mg/l	0.111	0.108	0.107	0.005	0.664	S
G2		0.117	0.113	0.111	0.007	0.846	S
G3		0.103	0.1	0.1	0.007	0.407	S
G4		0.091	0.091	0.091	0.006	0.059	S
G1	Cl ⁻ mg/l	1.17	1.2	1.18	0.052	-0.185	S
G2		1.086	1.12	1.097	0.055	-0.205	S
G3		1.941	1.93	1.9	0.064	0.638	S
G4		1.807	1.81	1.781	0.054	0.485	S
G1	Ca ²⁺ mg/l	0.138	0.134	0.137	0.022	0.042	S
G2		0.148	0.139	0.139	0.019	0.484	S
G3		0.126	0.124	0.124	0.017	0.123	S
G4		0.109	0.112	0.112	0.013	-0.261	S
G1	K ⁺ mg/l	0.104	0.109	0.107	0.013	-0.259	S
G2		0.232	0.227	0.219	0.018	0.737	S
G3		0.139	0.143	0.14	0.015	-0.097	S
G4		0.186	0.187	0.182	0.015	0.234	S
G1	pH pH units	5.39	5.28	5.311	0.126	0.628	Q
G2		5.34	5.26	5.261	0.127	0.619	S
G3		5.16	5.14	5.146	0.154	0.09	S
G4		5.23	5.17	5.166	0.136	0.47	S
G1	Cond µS/cm	10.59	10.13	10.423	0.492	0.339	S
G2		11.36	11.24	11.402	0.537	-0.079	S
G3		13.94	14.32	14.281	0.894	-0.381	S
G4		13.97	14.04	14.292	1.126	-0.286	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 31, Slovak Hydrometeorological Institute (Slovakia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.322	0.32	0.313	0.012	0.799	S
G2		0.337	0.337	0.326	0.013	0.848	S
G3		0.344	0.343	0.334	0.013	0.814	S
G4		0.301	0.305	0.298	0.012	0.292	S
G1	NH ₄ ⁺ mg N/l	0.094	0.086	0.086	0.009	0.927	S
G2		0.096	0.086	0.086	0.011	0.867	S
G3		0.125	0.112	0.107	0.013	1.358	S
G4		0.164	0.147	0.144	0.014	1.382	S
G1	NO ₃ ⁻ mg N/l	0.195	0.194	0.187	0.01	0.779	S
G2		0.311	0.313	0.3	0.013	0.804	S
G3		0.25	0.255	0.247	0.01	0.342	S
G4		0.322	0.334	0.326	0.022	-0.164	S
G1	Na ⁺ mg/l	0.88	0.891	0.855	0.049	0.502	S
G2		0.948	0.966	0.933	0.058	0.256	S
G3		1.384	1.4	1.354	0.096	0.31	S
G4		1.346	1.37	1.311	0.08	0.43	S
G1	Mg ²⁺ mg/l	0.111	0.108	0.107	0.005	0.664	S
G2		0.114	0.113	0.111	0.007	0.385	S
G3		0.1	0.1	0.1	0.007	-0.045	S
G4		0.092	0.091	0.091	0.006	0.223	S
G1	Cl ⁻ mg/l	1.224	1.2	1.18	0.052	0.849	S
G2		1.128	1.12	1.097	0.055	0.565	S
G3		1.958	1.93	1.9	0.064	0.904	S
G4		1.802	1.81	1.781	0.054	0.392	S
G1	Ca ²⁺ mg/l	0.189	0.134	0.137	0.022	2.356	U
G2		0.142	0.139	0.139	0.019	0.164	S
G3		0.123	0.124	0.124	0.017	-0.056	S
G4		0.118	0.112	0.112	0.013	0.431	S
G1	K ⁺ mg/l	0.11	0.109	0.107	0.013	0.209	S
G2		0.219	0.227	0.219	0.018	0.011	S
G3		0.141	0.143	0.14	0.015	0.038	S
G4		0.191	0.187	0.182	0.015	0.568	S
G1	pH pH units	5.28	5.28	5.311	0.126	-0.246	S
G2		5.26	5.26	5.261	0.127	-0.009	S
G3		4.93	5.14	5.146	0.154	-1.402	U
G4		5.1	5.17	5.166	0.136	-0.482	S
G1	Cond µS/cm	10.78	10.13	10.423	0.492	0.725	S
G2		11.82	11.24	11.402	0.537	0.778	S
G3		15.58	14.32	14.281	0.894	1.453	S
G4		14.79	14.04	14.292	1.126	0.442	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 33, Latvian Environment, Geology and Meteorology Centre (Latvia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.352	0.32	0.313	0.012	3.377	Q
G2		0.327	0.337	0.326	0.013	0.106	S
G3		0.323	0.343	0.334	0.013	-0.83	S
G4		0.29	0.305	0.298	0.012	-0.637	S
G1	NH ₄ ⁺ mg N/l	0.087	0.086	0.086	0.009	0.122	S
G2		0.083	0.086	0.086	0.011	-0.302	S
G3		0.108	0.112	0.107	0.013	0.095	S
G4		0.138	0.147	0.144	0.014	-0.438	S
G1	NO ₃ ⁻ mg N/l	0.205	0.194	0.187	0.01	1.737	S
G2		0.312	0.313	0.3	0.013	0.88	S
G3		0.256	0.255	0.247	0.01	0.963	S
G4		0.341	0.334	0.326	0.022	0.699	S
G1	Na ⁺ mg/l	0.855	0.891	0.855	0.049	-0.007	S
G2		0.944	0.966	0.933	0.058	0.187	S
G3		1.336	1.4	1.354	0.096	-0.191	S
G4		1.292	1.37	1.311	0.08	-0.243	S
G1	Mg ²⁺ mg/l	0.11	0.108	0.107	0.005	0.474	S
G2		0.111	0.113	0.111	0.007	-0.076	S
G3		0.106	0.1	0.1	0.007	0.858	S
G4		0.107	0.091	0.091	0.006	2.695	Q
G1	Cl ⁻ mg/l	1.231	1.2	1.18	0.052	0.983	S
G2		1.063	1.12	1.097	0.055	-0.626	S
G3		1.871	1.93	1.9	0.064	-0.455	S
G4		1.757	1.81	1.781	0.054	-0.444	S
G1	Ca ²⁺ mg/l	0.12	0.134	0.137	0.022	-0.774	S
G2		0.151	0.139	0.139	0.019	0.644	S
G3		0.141	0.124	0.124	0.017	1.017	S
G4		0.142	0.112	0.112	0.013	2.278	U
G1	K ⁺ mg/l	0.124	0.109	0.107	0.013	1.301	S
G2		0.227	0.227	0.219	0.018	0.458	S
G3		0.156	0.143	0.14	0.015	1.051	S
G4		0.194	0.187	0.182	0.015	0.768	S
G1	pH pH units	5.28	5.28	5.311	0.126	-0.246	S
G2		5.26	5.26	5.261	0.127	-0.009	S
G3		5.14	5.14	5.146	0.154	-0.04	S
G4		5.2	5.17	5.166	0.136	0.251	S
G1	Cond µS/cm	10.65	10.13	10.423	0.492	0.461	S
G2		12.16	11.24	11.402	0.537	1.411	S
G3		14.92	14.32	14.281	0.894	0.715	S
G4		14.77	14.04	14.292	1.126	0.424	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 34, Ministry of Environment and Urbanisation (Turkey)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.282	0.32	0.313	0.012	-2.639	Q
G2		0.298	0.337	0.326	0.013	-2.047	Q
G3		0.305	0.343	0.334	0.013	-2.24	Q
G4		0.272	0.305	0.298	0.012	-2.157	Q
G1	NH ₄ ⁺ mg N/l	0.005	0.086	0.086	0.009	-9.311	U
G2		0.008	0.086	0.086	0.011	-7.044	U
G3		0.01	0.112	0.107	0.013	-7.186	U
G4		0.014	0.147	0.144	0.014	-9.123	U
G1	NO ₃ ⁻ mg N/l	0.173	0.194	0.187	0.01	-1.329	S
G2		0.283	0.313	0.3	0.013	-1.325	S
G3		0.231	0.255	0.247	0.01	-1.626	S
G4		0.301	0.334	0.326	0.022	-1.117	S
G1	Na ⁺ mg/l	0.637	0.891	0.855	0.049	-4.442	U
G2		0.682	0.966	0.933	0.058	-4.342	U
G3		1.01	1.4	1.354	0.096	-3.599	U
G4		0.971	1.37	1.311	0.08	-4.245	U
G1	Mg ²⁺ mg/l	0.09	0.108	0.107	0.005	-3.321	Q
G2		0.104	0.113	0.111	0.007	-1.151	S
G3		0.105	0.1	0.1	0.007	0.708	S
G4		0.097	0.091	0.091	0.006	1.047	S
G1	Cl ⁻ mg/l	1.4	1.2	1.18	0.052	4.218	Q
G2		1.299	1.12	1.097	0.055	3.697	Q
G3		1.828	1.93	1.9	0.064	-1.127	S
G4		1.858	1.81	1.781	0.054	1.433	S
G1	Ca ²⁺ mg/l	0.061	0.134	0.137	0.022	-3.45	U
G2		0.087	0.139	0.139	0.019	-2.764	U
G3		0.104	0.124	0.124	0.017	-1.188	Q
G4		0.089	0.112	0.112	0.013	-1.8	Q
G1	K ⁺ mg/l	0.01	0.109	0.107	0.013	-7.595	U
G2		0.023	0.227	0.219	0.018	-10.934	U
G3		0.013	0.143	0.14	0.015	-8.608	U
G4		0.018	0.187	0.182	0.015	-10.973	U
G1	pH pH units	5.38	5.28	5.311	0.126	0.548	S
G2		5.28	5.26	5.261	0.127	0.148	S
G3		5.45	5.14	5.146	0.154	1.971	U
G4		5.14	5.17	5.166	0.136	-0.189	S
G1	Cond µS/cm	35	10.13	10.423	0.492	49.972	U
G2		20.3	11.24	11.402	0.537	16.574	U
G3		43	14.32	14.281	0.894	32.13	U
G4		54	14.04	14.292	1.126	35.264	U

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 35, Meteorological and Hydrological Service of Croatia (Croatia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.309	0.32	0.313	0.012	-0.319	S
G2		0.324	0.337	0.326	0.013	-0.117	S
G3		0.333	0.343	0.334	0.013	-0.047	S
G4		0.295	0.305	0.298	0.012	-0.214	S
G1	NH ₄ ⁺ mg N/l	0.078	0.086	0.086	0.009	-0.914	S
G2		0.077	0.086	0.086	0.011	-0.841	S
G3		0.099	0.112	0.107	0.013	-0.574	S
G4		0.134	0.147	0.144	0.014	-0.719	S
G1	NO ₃ ⁻ mg N/l	0.183	0.194	0.187	0.01	-0.371	S
G2		0.301	0.313	0.3	0.013	0.044	S
G3		0.244	0.255	0.247	0.01	-0.279	S
G4		0.321	0.334	0.326	0.022	-0.209	S
G1	Na ⁺ mg/l	0.88	0.891	0.855	0.049	0.502	S
G2		0.957	0.966	0.933	0.058	0.412	S
G3		1.394	1.4	1.354	0.096	0.415	S
G4		1.353	1.37	1.311	0.08	0.518	S
G1	Mg ²⁺ mg/l	0.108	0.108	0.107	0.005	0.095	S
G2		0.112	0.113	0.111	0.007	0.078	S
G3		0.099	0.1	0.1	0.007	-0.195	S
G4		0.09	0.091	0.091	0.006	-0.106	S
G1	Cl ⁻ mg/l	1.207	1.2	1.18	0.052	0.523	S
G2		1.135	1.12	1.097	0.055	0.693	S
G3		1.859	1.93	1.9	0.064	-0.643	S
G4		1.751	1.81	1.781	0.054	-0.556	S
G1	Ca ²⁺ mg/l	0.127	0.134	0.137	0.022	-0.457	S
G2		0.133	0.139	0.139	0.019	-0.315	S
G3		0.116	0.124	0.124	0.017	-0.473	S
G4		0.106	0.112	0.112	0.013	-0.492	S
G1	K ⁺ mg/l	0.102	0.109	0.107	0.013	-0.415	S
G2		0.22	0.227	0.219	0.018	0.067	S
G3		0.138	0.143	0.14	0.015	-0.165	S
G4		0.182	0.187	0.182	0.015	-0.033	S
G1	pH pH units	5.33	5.28	5.311	0.126	0.151	S
G2		5.19	5.26	5.261	0.127	-0.558	S
G3		5.14	5.14	5.146	0.154	-0.04	S
G4		5.18	5.17	5.166	0.136	0.104	S
G1	Cond µS/cm	11.7	10.13	10.423	0.492	2.596	Q
G2		12	11.24	11.402	0.537	1.113	S
G3		15	14.32	14.281	0.894	0.804	S
G4		14.5	14.04	14.292	1.126	0.185	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 36, Slovenian Environment Agency (Slovenia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.308	0.32	0.313	0.012	-0.405	S
G2		0.326	0.337	0.326	0.013	0.032	S
G3		0.332	0.343	0.334	0.013	-0.126	S
G4		0.295	0.305	0.298	0.012	-0.214	S
G1	NH ₄ ⁺ mg N/l	0.089	0.086	0.086	0.009	0.352	S
G2		0.089	0.086	0.086	0.011	0.238	S
G3		0.117	0.112	0.107	0.013	0.763	S
G4		0.152	0.147	0.144	0.014	0.542	S
G1	NO ₃ ⁻ mg N/l	0.189	0.194	0.187	0.01	0.204	S
G2		0.306	0.313	0.3	0.013	0.424	S
G3		0.25	0.255	0.247	0.01	0.342	S
G4		0.326	0.334	0.326	0.022	0.018	S
G1	Na ⁺ mg/l	0.873	0.891	0.855	0.049	0.359	S
G2		0.951	0.966	0.933	0.058	0.308	S
G3		1.38	1.4	1.354	0.096	0.268	S
G4		1.35	1.37	1.311	0.08	0.48	S
G1	Mg ²⁺ mg/l	0.108	0.108	0.107	0.005	0.095	S
G2		0.113	0.113	0.111	0.007	0.232	S
G3		0.1	0.1	0.1	0.007	-0.045	S
G4		0.091	0.091	0.091	0.006	0.059	S
G1	Cl ⁻ mg/l	1.18	1.2	1.18	0.052	0.006	S
G2		1.1	1.12	1.097	0.055	0.052	S
G3		1.93	1.93	1.9	0.064	0.466	S
G4		1.8	1.81	1.781	0.054	0.355	S
G1	Ca ²⁺ mg/l	0.154	0.134	0.137	0.022	0.768	S
G2		0.141	0.139	0.139	0.019	0.111	S
G3		0.127	0.124	0.124	0.017	0.183	S
G4		0.118	0.112	0.112	0.013	0.431	S
G1	K ⁺ mg/l	0.098	0.109	0.107	0.013	-0.728	S
G2		0.209	0.227	0.219	0.018	-0.547	S
G3		0.14	0.143	0.14	0.015	-0.03	S
G4		0.177	0.187	0.182	0.015	-0.366	S
G1	pH pH units	5.28	5.28	5.311	0.126	-0.246	S
G2		5.28	5.26	5.261	0.127	0.148	S
G3		5.19	5.14	5.146	0.154	0.284	S
G4		5.2	5.17	5.166	0.136	0.251	S
G1	Cond µS/cm	10.4	10.13	10.423	0.492	-0.047	S
G2		11.4	11.24	11.402	0.537	-0.004	S
G3		14.1	14.32	14.281	0.894	-0.202	S
G4		14	14.04	14.292	1.126	-0.259	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 38, Estonian Environmental Research Centre, Tallinn (Estonia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.319	0.32	0.313	0.012	0.541	S
G2		0.338	0.337	0.326	0.013	0.923	S
G3		0.354	0.343	0.334	0.013	1.597	S
G4		0.311	0.305	0.298	0.012	1.137	S
G1	NH ₄ ⁺ mg N/l	0.091	0.086	0.086	0.009	0.582	S
G2		0.09	0.086	0.086	0.011	0.328	S
G3		0.103	0.112	0.107	0.013	-0.277	S
G4		0.145	0.147	0.144	0.014	0.052	S
G1	NO ₃ ⁻ mg N/l	0.194	0.194	0.187	0.01	0.683	S
G2		0.312	0.313	0.3	0.013	0.88	S
G3		0.259	0.255	0.247	0.01	1.274	S
G4		0.334	0.334	0.326	0.022	0.381	S
G1	Na ⁺ mg/l	0.864	0.891	0.855	0.049	0.176	S
G2		0.941	0.966	0.933	0.058	0.135	S
G3		1.363	1.4	1.354	0.096	0.091	S
G4		1.337	1.37	1.311	0.08	0.318	S
G1	Mg ²⁺ mg/l	0.101	0.108	0.107	0.005	-1.233	S
G2		0.13	0.113	0.111	0.007	2.844	Q
G3		0.136	0.1	0.1	0.007	5.372	U
G4		0.105	0.091	0.091	0.006	2.365	Q
G1	Cl ⁻ mg/l	1.204	1.2	1.18	0.052	0.466	S
G2		1.131	1.12	1.097	0.055	0.62	S
G3		1.984	1.93	1.9	0.064	1.31	S
G4		1.826	1.81	1.781	0.054	0.838	S
G1	Ca ²⁺ mg/l	0.205	0.134	0.137	0.022	3.081	U
G2		0.199	0.139	0.139	0.019	3.2	U
G3		0.18	0.124	0.124	0.017	3.341	U
G4		0.113	0.112	0.112	0.013	0.047	S
G1	K ⁺ mg/l	0.103	0.109	0.107	0.013	-0.337	S
G2		0.202	0.227	0.219	0.018	-0.938	S
G3		0.149	0.143	0.14	0.015	0.578	S
G4		0.171	0.187	0.182	0.015	-0.766	S
G1	pH pH units	5.32	5.28	5.311	0.126	0.072	S
G2		5.25	5.26	5.261	0.127	-0.087	S
G3		5.1	5.14	5.146	0.154	-0.299	S
G4		5.29	5.17	5.166	0.136	0.91	Q
G1	Cond µS/cm	10.33	10.13	10.423	0.492	-0.19	S
G2		11.33	11.24	11.402	0.537	-0.135	S
G3		14.65	14.32	14.281	0.894	0.413	S
G4		14.31	14.04	14.292	1.126	0.016	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 39, Central Environmental Analysis Laboratory - CentLab (Poland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.31	0.32	0.313	0.012	-0.233	S
G2		0.33	0.337	0.326	0.013	0.329	S
G3		0.33	0.343	0.334	0.013	-0.282	S
G4		0.29	0.305	0.298	0.012	-0.637	S
G1	NH ₄ ⁺ mg N/l	0.09	0.086	0.086	0.009	0.467	S
G2		0.09	0.086	0.086	0.011	0.328	S
G3		0.12	0.112	0.107	0.013	0.986	S
G4		0.16	0.147	0.144	0.014	1.102	S
G1	NO ₃ ⁻ mg N/l	0.19	0.194	0.187	0.01	0.3	S
G2		0.3	0.313	0.3	0.013	-0.032	S
G3		0.25	0.255	0.247	0.01	0.342	S
G4		0.33	0.334	0.326	0.022	0.199	S
G1	Na ⁺ mg/l	0.823	0.891	0.855	0.049	-0.658	S
G2		0.958	0.966	0.933	0.058	0.429	S
G3		1.277	1.4	1.354	0.096	-0.808	S
G4		1.343	1.37	1.311	0.08	0.393	S
G1	Mg ²⁺ mg/l	0.097	0.108	0.107	0.005	-1.992	S
G2		0.118	0.113	0.111	0.007	1	S
G3		0.103	0.1	0.1	0.007	0.407	S
G4		0.091	0.091	0.091	0.006	0.009	S
G1	Cl ⁻ mg/l	1.17	1.2	1.18	0.052	-0.185	S
G2		1.09	1.12	1.097	0.055	-0.131	S
G3		1.9	1.93	1.9	0.064	-0.002	S
G4		1.77	1.81	1.781	0.054	-0.203	S
G1	Ca ²⁺ mg/l	0.126	0.134	0.137	0.022	-0.502	S
G2		0.146	0.139	0.139	0.019	0.377	S
G3		0.119	0.124	0.124	0.017	-0.294	S
G4		0.103	0.112	0.112	0.013	-0.723	S
G1	K ⁺ mg/l	0.113	0.109	0.107	0.013	0.443	S
G2		0.219	0.227	0.219	0.018	0.011	S
G3		0.145	0.143	0.14	0.015	0.308	S
G4		0.185	0.187	0.182	0.015	0.168	S
G1	pH pH units	5.27	5.28	5.311	0.126	-0.326	S
G2		5.22	5.26	5.261	0.127	-0.323	S
G3		5.17	5.14	5.146	0.154	0.155	S
G4		5.17	5.17	5.166	0.136	0.031	S
G1	Cond µS/cm	9.6	10.13	10.423	0.492	-1.674	S
G2		10.7	11.24	11.402	0.537	-1.308	S
G3		13.3	14.32	14.281	0.894	-1.097	S
G4		12.9	14.04	14.292	1.126	-1.236	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 42, Environment Reference Laboratory, Environment Agency
(Moldova)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm [†]
G1	SO ₄ ²⁻ mg S/l	0.31	0.32	0.313	0.012	-0.233	S
G2		0.269	0.337	0.326	0.013	-4.2	U
G3		0.317	0.343	0.334	0.013	-1.3	S
G4		0.292	0.305	0.298	0.012	-0.468	S
G1	NH ₄ ⁺ mg N/l	-999	0.086	0.086	0.009		B
G2		-999	0.086	0.086	0.011		B
G3		-999	0.112	0.107	0.013		B
G4		-999	0.147	0.144	0.014		B
G1	NO ₃ ⁻ mg N/l	0.18	0.194	0.187	0.01	-0.658	S
G2		0.251	0.313	0.3	0.013	-3.759	Q
G3		0.229	0.255	0.247	0.01	-1.833	S
G4		0.302	0.334	0.326	0.022	-1.072	S
G1	Na ⁺ mg/l	-999	0.891	0.855	0.049		B
G2		-999	0.966	0.933	0.058		B
G3		-999	1.4	1.354	0.096		B
G4		-999	1.37	1.311	0.08		B
G1	Mg ²⁺ mg/l	-999	0.108	0.107	0.005		B
G2		-999	0.113	0.111	0.007		B
G3		-999	0.1	0.1	0.007		B
G4		-999	0.091	0.091	0.006		B
G1	Cl ⁻ mg/l	1.114	1.2	1.18	0.052	-1.257	S
G2		0.926	1.12	1.097	0.055	-3.136	Q
G3		1.751	1.93	1.9	0.064	-2.33	S
G4		1.68	1.81	1.781	0.054	-1.875	S
G1	Ca ²⁺ mg/l	-999	0.134	0.137	0.022		B
G2		-999	0.139	0.139	0.019		B
G3		-999	0.124	0.124	0.017		B
G4		-999	0.112	0.112	0.013		B
G1	K ⁺ mg/l	-999	0.109	0.107	0.013		B
G2		-999	0.227	0.219	0.018		B
G3		-999	0.143	0.14	0.015		B
G4		-999	0.187	0.182	0.015		B
G1	pH pH units	5.27	5.28	5.311	0.126	-0.326	S
G2		5.26	5.26	5.261	0.127	-0.009	S
G3		5.14	5.14	5.146	0.154	-0.04	S
G4		5.17	5.17	5.166	0.136	0.031	S
G1	Cond µS/cm	10.92	10.13	10.423	0.492	1.01	S
G2		12.15	11.24	11.402	0.537	1.393	S
G3		14.03	14.32	14.281	0.894	-0.281	S
G4		13.32	14.04	14.292	1.126	-0.863	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✕ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- , between ± 15 - 25% of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 45, Hydrometeorology and Monitoring Center (Armenia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.319	0.32	0.313	0.012	0.506	S
G2		0.336	0.337	0.326	0.013	0.782	S
G3		0.344	0.343	0.334	0.013	0.806	S
G4		0.307	0.305	0.298	0.012	0.833	S
G1	NH ₄ ⁺ mg N/l	-999	0.086	0.086	0.009		B
G2		-999	0.086	0.086	0.011		B
G3		-999	0.112	0.107	0.013		B
G4		-999	0.147	0.144	0.014		B
G1	NO ₃ ⁻ mg N/l	0.202	0.194	0.187	0.01	1.469	S
G2		0.328	0.313	0.3	0.013	2.074	S
G3		0.266	0.255	0.247	0.01	1.999	S
G4		0.338	0.334	0.326	0.022	0.558	S
G1	Na ⁺ mg/l	0.865	0.891	0.855	0.049	0.199	S
G2		0.957	0.966	0.933	0.058	0.41	S
G3		1.141	1.4	1.354	0.096	-2.233	Q
G4		1.113	1.37	1.311	0.08	-2.476	Q
G1	Mg ²⁺ mg/l	0.104	0.108	0.107	0.005	-0.569	S
G2		0.111	0.113	0.111	0.007	-0.076	S
G3		0.096	0.1	0.1	0.007	-0.586	S
G4		0.087	0.091	0.091	0.006	-0.584	S
G1	Cl ⁻ mg/l	1.216	1.2	1.18	0.052	0.688	S
G2		1.137	1.12	1.097	0.055	0.726	S
G3		1.969	1.93	1.9	0.064	1.076	S
G4		1.84	1.81	1.781	0.054	1.102	S
G1	Ca ²⁺ mg/l	0.133	0.134	0.137	0.022	-0.171	S
G2		0.144	0.139	0.139	0.019	0.255	S
G3		0.127	0.124	0.124	0.017	0.2	S
G4		0.11	0.112	0.112	0.013	-0.223	S
G1	K ⁺ mg/l	0.101	0.109	0.107	0.013	-0.47	S
G2		0.224	0.227	0.219	0.018	0.307	S
G3		0.133	0.143	0.14	0.015	-0.509	S
G4		0.172	0.187	0.182	0.015	-0.7	S
G1	pH pH units	5.01	5.28	5.311	0.126	-2.391	U
G2		4.85	5.26	5.261	0.127	-3.225	U
G3		4.71	5.14	5.146	0.154	-2.829	U
G4		4.76	5.17	5.166	0.136	-2.973	U
G1	Cond µS/cm	10.7	10.13	10.423	0.492	0.563	S
G2		11.8	11.24	11.402	0.537	0.741	S
G3		14.6	14.32	14.281	0.894	0.357	S
G4		14.4	14.04	14.292	1.126	0.096	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 46, Diabla Gora Station (Poland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	-999	0.32	0.313	0.012		B
G2		-999	0.337	0.326	0.013		B
G3		-999	0.343	0.334	0.013		B
G4		-999	0.305	0.298	0.012		B
G1	NH ₄ ⁺ mg N/l	-999	0.086	0.086	0.009		B
G2		-999	0.086	0.086	0.011		B
G3		-999	0.112	0.107	0.013		B
G4		-999	0.147	0.144	0.014		B
G1	NO ₃ ⁻ mg N/l	-999	0.194	0.187	0.01		B
G2		-999	0.313	0.3	0.013		B
G3		-999	0.255	0.247	0.01		B
G4		-999	0.334	0.326	0.022		B
G1	Na ⁺ mg/l	-999	0.891	0.855	0.049		B
G2		-999	0.966	0.933	0.058		B
G3		-999	1.4	1.354	0.096		B
G4		-999	1.37	1.311	0.08		B
G1	Mg ²⁺ mg/l	-999	0.108	0.107	0.005		B
G2		-999	0.113	0.111	0.007		B
G3		-999	0.1	0.1	0.007		B
G4		-999	0.091	0.091	0.006		B
G1	Cl ⁻ mg/l	-999	1.2	1.18	0.052		B
G2		-999	1.12	1.097	0.055		B
G3		-999	1.93	1.9	0.064		B
G4		-999	1.81	1.781	0.054		B
G1	Ca ²⁺ mg/l	-999	0.134	0.137	0.022		B
G2		-999	0.139	0.139	0.019		B
G3		-999	0.124	0.124	0.017		B
G4		-999	0.112	0.112	0.013		B
G1	K ⁺ mg/l	-999	0.109	0.107	0.013		B
G2		-999	0.227	0.219	0.018		B
G3		-999	0.143	0.14	0.015		B
G4		-999	0.187	0.182	0.015		B
G1	pH pH units	5.2	5.28	5.311	0.126	-0.882	S
G2		5.18	5.26	5.261	0.127	-0.637	S
G3		5.08	5.14	5.146	0.154	-0.429	S
G4		5.1	5.17	5.166	0.136	-0.482	S
G1	Cond µS/cm	9.65	10.13	10.423	0.492	-1.572	S
G2		10.97	11.24	11.402	0.537	-0.805	S
G3		14.04	14.32	14.281	0.894	-0.27	S
G4		13.85	14.04	14.292	1.126	-0.393	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 47, Jelenia Gora (Poland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.306	0.32	0.313	0.012	-0.577	S
G2		0.325	0.337	0.326	0.013	-0.043	S
G3		0.333	0.343	0.334	0.013	-0.047	S
G4		0.297	0.305	0.298	0.012	-0.045	S
G1	NH ₄ ⁺ mg N/l	0.094	0.086	0.086	0.009	0.927	S
G2		0.087	0.086	0.086	0.011	0.058	S
G3		0.115	0.112	0.107	0.013	0.615	S
G4		0.133	0.147	0.144	0.014	-0.789	S
G1	NO ₃ ⁻ mg N/l	0.173	0.194	0.187	0.01	-1.329	S
G2		0.284	0.313	0.3	0.013	-1.249	S
G3		0.233	0.255	0.247	0.01	-1.418	S
G4		0.305	0.334	0.326	0.022	-0.936	S
G1	Na ⁺ mg/l	0.85	0.891	0.855	0.049	-0.109	S
G2		0.932	0.966	0.933	0.058	-0.02	S
G3		1.338	1.4	1.354	0.096	-0.171	S
G4		1.302	1.37	1.311	0.08	-0.118	S
G1	Mg ²⁺ mg/l	0.108	0.108	0.107	0.005	0.095	S
G2		0.112	0.113	0.111	0.007	0.078	S
G3		0.099	0.1	0.1	0.007	-0.195	S
G4		0.09	0.091	0.091	0.006	-0.106	S
G1	Cl ⁻ mg/l	1.097	1.2	1.18	0.052	-1.583	S
G2		1.04	1.12	1.097	0.055	-1.047	S
G3		1.867	1.93	1.9	0.064	-0.518	S
G4		1.751	1.81	1.781	0.054	-0.556	S
G1	Ca ²⁺ mg/l	0.122	0.134	0.137	0.022	-0.683	S
G2		0.127	0.139	0.139	0.019	-0.634	S
G3		0.111	0.124	0.124	0.017	-0.771	S
G4		0.101	0.112	0.112	0.013	-0.877	S
G1	K ⁺ mg/l	0.101	0.109	0.107	0.013	-0.494	S
G2		0.213	0.227	0.219	0.018	-0.324	S
G3		0.139	0.143	0.14	0.015	-0.097	S
G4		0.186	0.187	0.182	0.015	0.234	S
G1	pH pH units	5.1	5.28	5.311	0.126	-1.676	Q
G2		5.11	5.26	5.261	0.127	-1.186	Q
G3		5.01	5.14	5.146	0.154	-0.883	Q
G4		5.03	5.17	5.166	0.136	-0.995	Q
G1	Cond µS/cm	10.8	10.13	10.423	0.492	0.766	S
G2		11.9	11.24	11.402	0.537	0.927	S
G3		14.9	14.32	14.281	0.894	0.693	S
G4		14.7	14.04	14.292	1.126	0.362	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

E MEP – 43rd intercomparison of analytical methods - 2025

Laboratory 48, Monitoring waterkwaliteit Labovestiging Gent, VMM (Belgium)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	E MEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.266	0.32	0.313	0.012	-4.014	Q
G2		0.233	0.337	0.326	0.013	-6.873	U
G3		0.282	0.343	0.334	0.013	-4.041	Q
G4		0.216	0.305	0.298	0.012	-6.888	U
G1	NH ₄ ⁺ mg N/l	0.081	0.086	0.086	0.009	-0.568	S
G2		0.084	0.086	0.086	0.011	-0.212	S
G3		0.108	0.112	0.107	0.013	0.095	S
G4		0.141	0.147	0.144	0.014	-0.228	S
G1	NO ₃ ⁻ mg N/l	0.237	0.194	0.187	0.01	4.804	Q
G2		0.36	0.313	0.3	0.013	4.531	Q
G3		0.301	0.255	0.247	0.01	5.623	Q
G4		0.366	0.334	0.326	0.022	1.834	S
G1	Na ⁺ mg/l	0.862	0.891	0.855	0.049	0.136	S
G2		0.946	0.966	0.933	0.058	0.222	S
G3		1.354	1.4	1.354	0.096	-0.003	S
G4		1.328	1.37	1.311	0.08	0.206	S
G1	Mg ²⁺ mg/l	0.114	0.108	0.107	0.005	1.233	S
G2		0.12	0.113	0.111	0.007	1.307	S
G3		0.109	0.1	0.1	0.007	1.31	S
G4		0.097	0.091	0.091	0.006	1.047	S
G1	Cl ⁻ mg/l	2.53	1.2	1.18	0.052	25.85	U
G2		2.38	1.12	1.097	0.055	23.501	U
G3		3.05	1.93	1.9	0.064	17.963	U
G4		2.992	1.81	1.781	0.054	22.506	U
G1	Ca ²⁺ mg/l	0.168	0.134	0.137	0.022	1.403	U
G2		0.118	0.139	0.139	0.019	-1.114	Q
G3		0.105	0.124	0.124	0.017	-1.128	Q
G4		0.134	0.112	0.112	0.013	1.662	Q
G1	K ⁺ mg/l	0.112	0.109	0.107	0.013	0.365	S
G2		0.241	0.227	0.219	0.018	1.24	S
G3		0.147	0.143	0.14	0.015	0.443	S
G4		0.194	0.187	0.182	0.015	0.768	S
G1	pH pH units	5.41	5.28	5.311	0.126	0.787	Q
G2		5.44	5.26	5.261	0.127	1.403	Q
G3		5.62	5.14	5.146	0.154	3.073	U
G4		5.32	5.17	5.166	0.136	1.13	Q
G1	Cond µS/cm	10.03	10.13	10.423	0.492	-0.8	S
G2		10.88	11.24	11.402	0.537	-0.973	S
G3		14.53	14.32	14.281	0.894	0.279	S
G4		13.2	14.04	14.292	1.126	-0.97	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 49, The Cyprus Institute (Cyl) (Cyprus)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.313	0.32	0.313	0.012	0.025	S
G2		0.331	0.337	0.326	0.013	0.403	S
G3		0.337	0.343	0.334	0.013	0.266	S
G4		0.298	0.305	0.298	0.012	0.039	S
G1	NH ₄ ⁺ mg N/l	0.092	0.086	0.086	0.009	0.697	S
G2		0.106	0.086	0.086	0.011	1.766	Q
G3		0.139	0.112	0.107	0.013	2.398	Q
G4		0.165	0.147	0.144	0.014	1.453	S
G1	NO ₃ ⁻ mg N/l	0.189	0.194	0.187	0.01	0.204	S
G2		0.307	0.313	0.3	0.013	0.5	S
G3		0.252	0.255	0.247	0.01	0.549	S
G4		0.328	0.334	0.326	0.022	0.109	S
G1	Na ⁺ mg/l	0.906	0.891	0.855	0.049	1.031	S
G2		0.982	0.966	0.933	0.058	0.844	S
G3		1.433	1.4	1.354	0.096	0.822	S
G4		1.371	1.37	1.311	0.08	0.742	S
G1	Mg ²⁺ mg/l	0.109	0.108	0.107	0.005	0.285	S
G2		0.115	0.113	0.111	0.007	0.539	S
G3		0.101	0.1	0.1	0.007	0.106	S
G4		0.091	0.091	0.091	0.006	0.059	S
G1	Cl ⁻ mg/l	1.188	1.2	1.18	0.052	0.159	S
G2		1.122	1.12	1.097	0.055	0.455	S
G3		1.95	1.93	1.9	0.064	0.779	S
G4		1.826	1.81	1.781	0.054	0.838	S
G1	Ca ²⁺ mg/l	0.133	0.134	0.137	0.022	-0.184	S
G2		0.135	0.139	0.139	0.019	-0.208	S
G3		0.119	0.124	0.124	0.017	-0.294	S
G4		0.107	0.112	0.112	0.013	-0.415	S
G1	K ⁺ mg/l	0.097	0.109	0.107	0.013	-0.806	S
G2		0.186	0.227	0.219	0.018	-1.831	Q
G3		0.134	0.143	0.14	0.015	-0.435	S
G4		0.163	0.187	0.182	0.015	-1.3	S
G1	pH pH units	-999	5.28	5.311	0.126		B
G2		-999	5.26	5.261	0.127		B
G3		-999	5.14	5.146	0.154		B
G4		-999	5.17	5.166	0.136		B
G1	Cond µS/cm	-999	10.13	10.423	0.492		B
G2		-999	11.24	11.402	0.537		B
G3		-999	14.32	14.281	0.894		B
G4		-999	14.04	14.292	1.126		B

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 50, CEA Saclay - Orme des Merisiers (France)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.298	0.32	0.313	0.012	-1.264	S
G2		0.314	0.337	0.326	0.013	-0.859	S
G3		0.32	0.343	0.334	0.013	-1.065	S
G4		0.281	0.305	0.298	0.012	-1.397	S
G1	NH ₄ ⁺ mg N/l	0.095	0.086	0.086	0.009	1.042	S
G2		0.098	0.086	0.086	0.011	1.047	S
G3		0.123	0.112	0.107	0.013	1.209	S
G4		0.167	0.147	0.144	0.014	1.593	S
G1	NO ₃ ⁻ mg N/l	0.181	0.194	0.187	0.01	-0.562	S
G2		0.298	0.313	0.3	0.013	-0.184	S
G3		0.242	0.255	0.247	0.01	-0.486	S
G4		0.319	0.334	0.326	0.022	-0.3	S
G1	Na ⁺ mg/l	0.825	0.891	0.855	0.049	-0.617	S
G2		0.898	0.966	0.933	0.058	-0.608	S
G3		1.326	1.4	1.354	0.096	-0.296	S
G4		1.288	1.37	1.311	0.08	-0.293	S
G1	Mg ²⁺ mg/l	0.102	0.108	0.107	0.005	-1.044	S
G2		0.103	0.113	0.111	0.007	-1.305	S
G3		0.093	0.1	0.1	0.007	-1.098	S
G4		0.083	0.091	0.091	0.006	-1.26	S
G1	Cl ⁻ mg/l	1.182	1.2	1.18	0.052	0.045	S
G2		1.108	1.12	1.097	0.055	0.198	S
G3		1.924	1.93	1.9	0.064	0.373	S
G4		1.79	1.81	1.781	0.054	0.169	S
G1	Ca ²⁺ mg/l	0.116	0.134	0.137	0.022	-0.955	S
G2		0.118	0.139	0.139	0.019	-1.114	Q
G3		0.119	0.124	0.124	0.017	-0.294	S
G4		0.107	0.112	0.112	0.013	-0.415	S
G1	K ⁺ mg/l	0.1	0.109	0.107	0.013	-0.572	S
G2		0.211	0.227	0.219	0.018	-0.435	S
G3		0.136	0.143	0.14	0.015	-0.3	S
G4		0.176	0.187	0.182	0.015	-0.433	S
G1	pH pH units	-999	5.28	5.311	0.126		B
G2		-999	5.26	5.261	0.127		B
G3		-999	5.14	5.146	0.154		B
G4		-999	5.17	5.166	0.136		B
G1	Cond µS/cm	-999	10.13	10.423	0.492		B
G2		-999	11.24	11.402	0.537		B
G3		-999	14.32	14.281	0.894		B
G4		-999	14.04	14.292	1.126		B

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 54, Central Research Laboratory; Division in Lublin (Poland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.305	0.32	0.313	0.012	-0.662	S
G2		0.327	0.337	0.326	0.013	0.106	S
G3		0.342	0.343	0.334	0.013	0.657	S
G4		0.297	0.305	0.298	0.012	-0.045	S
G1	NH ₄ ⁺ mg N/l	0.1	0.086	0.086	0.009	1.617	Q
G2		0.109	0.086	0.086	0.011	2.035	U
G3		0.122	0.112	0.107	0.013	1.135	S
G4		0.153	0.147	0.144	0.014	0.612	S
G1	NO ₃ ⁻ mg N/l	0.186	0.194	0.187	0.01	-0.083	S
G2		0.304	0.313	0.3	0.013	0.272	S
G3		0.252	0.255	0.247	0.01	0.549	S
G4		0.326	0.334	0.326	0.022	0.018	S
G1	Na ⁺ mg/l	0.769	0.891	0.855	0.049	-1.756	S
G2		0.838	0.966	0.933	0.058	-1.645	S
G3		1.245	1.4	1.354	0.096	-1.143	S
G4		1.213	1.37	1.311	0.08	-1.228	S
G1	Mg ²⁺ mg/l	0.105	0.108	0.107	0.005	-0.474	S
G2		0.106	0.113	0.111	0.007	-0.844	S
G3		0.097	0.1	0.1	0.007	-0.496	S
G4		0.088	0.091	0.091	0.006	-0.436	S
G1	Cl ⁻ mg/l	1.136	1.2	1.18	0.052	-0.836	S
G2		1.07	1.12	1.097	0.055	-0.498	S
G3		1.919	1.93	1.9	0.064	0.295	S
G4		1.793	1.81	1.781	0.054	0.225	S
G1	Ca ²⁺ mg/l	0.124	0.134	0.137	0.022	-0.593	S
G2		0.128	0.139	0.139	0.019	-0.581	S
G3		0.115	0.124	0.124	0.017	-0.533	S
G4		0.106	0.112	0.112	0.013	-0.492	S
G1	K ⁺ mg/l	0.094	0.109	0.107	0.013	-1.04	S
G2		0.202	0.227	0.219	0.018	-0.938	S
G3		0.097	0.143	0.14	0.015	-2.934	U
G4		0.169	0.187	0.182	0.015	-0.9	S
G1	pH pH units	5.15	5.28	5.311	0.126	-1.279	Q
G2		5.08	5.26	5.261	0.127	-1.421	Q
G3		4.95	5.14	5.146	0.154	-1.272	Q
G4		4.98	5.17	5.166	0.136	-1.361	Q
G1	Cond µS/cm	10.3	10.13	10.423	0.492	-0.251	S
G2		11.8	11.24	11.402	0.537	0.741	S
G3		14.7	14.32	14.281	0.894	0.469	S
G4		14.4	14.04	14.292	1.126	0.096	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 110, Thüringer Landesamt für Landwirtschaft und ländlichen Raum (TLLLR) (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.311	0.32	0.313	0.012	-0.147	S
G2		0.308	0.337	0.326	0.013	-1.305	S
G3		0.318	0.343	0.334	0.013	-1.222	S
G4		0.283	0.305	0.298	0.012	-1.228	S
G1	NH ₄ ⁺ mg N/l	0.083	0.086	0.086	0.009	-0.338	S
G2		0.085	0.086	0.086	0.011	-0.122	S
G3		0.099	0.112	0.107	0.013	-0.574	S
G4		0.144	0.147	0.144	0.014	-0.018	S
G1	NO ₃ ⁻ mg N/l	0.182	0.194	0.187	0.01	-0.466	S
G2		0.287	0.313	0.3	0.013	-1.021	S
G3		0.235	0.255	0.247	0.01	-1.211	S
G4		0.31	0.334	0.326	0.022	-0.709	S
G1	Na ⁺ mg/l	0.895	0.891	0.855	0.049	0.807	S
G2		0.979	0.966	0.933	0.058	0.792	S
G3		1.44	1.4	1.354	0.096	0.896	S
G4		1.38	1.37	1.311	0.08	0.854	S
G1	Mg ²⁺ mg/l	0.107	0.108	0.107	0.005	-0.095	S
G2		0.113	0.113	0.111	0.007	0.232	S
G3		0.101	0.1	0.1	0.007	0.106	S
G4		0.091	0.091	0.091	0.006	0.059	S
G1	Cl ⁻ mg/l	1.11	1.2	1.18	0.052	-1.334	S
G2		0.985	1.12	1.097	0.055	-2.055	S
G3		1.74	1.93	1.9	0.064	-2.502	S
G4		1.63	1.81	1.781	0.054	-2.804	S
G1	Ca ²⁺ mg/l	0.129	0.134	0.137	0.022	-0.366	S
G2		0.134	0.139	0.139	0.019	-0.262	S
G3		0.12	0.124	0.124	0.017	-0.235	S
G4		0.107	0.112	0.112	0.013	-0.415	S
G1	K ⁺ mg/l	0.121	0.109	0.107	0.013	1.067	S
G2		0.246	0.227	0.219	0.018	1.519	S
G3		0.154	0.143	0.14	0.015	0.916	S
G4		0.193	0.187	0.182	0.015	0.701	S
G1	pH pH units	5.58	5.28	5.311	0.126	2.137	U
G2		5.28	5.26	5.261	0.127	0.148	S
G3		4.9	5.14	5.146	0.154	-1.597	U
G4		5.25	5.17	5.166	0.136	0.617	S
G1	Cond µS/cm	9.7	10.13	10.423	0.492	-1.471	S
G2		10.5	11.24	11.402	0.537	-1.681	S
G3		12.9	14.32	14.281	0.894	-1.545	S
G4		13	14.04	14.292	1.126	-1.148	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✕ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- , between ± 15 - 25% of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 112, Nordwestdeutsche Forstliche Versuchsanstalt (NFV) (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.326	0.32	0.313	0.012	1.142	S
G2		0.343	0.337	0.326	0.013	1.294	S
G3		0.35	0.343	0.334	0.013	1.284	S
G4		0.31	0.305	0.298	0.012	1.053	S
G1	NH ₄ ⁺ mg N/l	0.083	0.086	0.086	0.009	-0.373	S
G2		0.082	0.086	0.086	0.011	-0.392	S
G3		0.106	0.112	0.107	0.013	-0.054	S
G4		0.142	0.147	0.144	0.014	-0.137	S
G1	NO ₃ ⁻ mg N/l	0.188	0.194	0.187	0.01	0.08	S
G2		0.298	0.313	0.3	0.013	-0.162	S
G3		0.249	0.255	0.247	0.01	0.207	S
G4		0.317	0.334	0.326	0.022	-0.404	S
G1	Na ⁺ mg/l	0.906	0.891	0.855	0.049	1.025	S
G2		0.987	0.966	0.933	0.058	0.925	S
G3		1.432	1.4	1.354	0.096	0.812	S
G4		1.393	1.37	1.311	0.08	1.013	S
G1	Mg ²⁺ mg/l	0.114	0.108	0.107	0.005	1.214	S
G2		0.118	0.113	0.111	0.007	1.046	S
G3		0.106	0.1	0.1	0.007	0.798	S
G4		0.094	0.091	0.091	0.006	0.586	S
G1	Cl ⁻ mg/l	1.206	1.2	1.18	0.052	0.504	S
G2		1.135	1.12	1.097	0.055	0.687	S
G3		1.917	1.93	1.9	0.064	0.263	S
G4		1.793	1.81	1.781	0.054	0.225	S
G1	Ca ²⁺ mg/l	0.129	0.134	0.137	0.022	-0.366	S
G2		0.134	0.139	0.139	0.019	-0.246	S
G3		0.119	0.124	0.124	0.017	-0.312	S
G4		0.107	0.112	0.112	0.013	-0.384	S
G1	K ⁺ mg/l	0.108	0.109	0.107	0.013	0.053	S
G2		0.225	0.227	0.219	0.018	0.363	S
G3		0.145	0.143	0.14	0.015	0.288	S
G4		0.186	0.187	0.182	0.015	0.214	S
G1	pH pH units	5.38	5.28	5.311	0.126	0.548	S
G2		5.3	5.26	5.261	0.127	0.305	S
G3		5.19	5.14	5.146	0.154	0.284	S
G4		5.14	5.17	5.166	0.136	-0.189	S
G1	Cond µS/cm	9.5	10.13	10.423	0.492	-1.877	S
G2		10.5	11.24	11.402	0.537	-1.681	S
G3		13.4	14.32	14.281	0.894	-0.986	S
G4		13.9	14.04	14.292	1.126	-0.348	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

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S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 114, C.N.R. Institute of Water Research (Italy)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.307	0.32	0.313	0.012	-0.491	S
G2		0.32	0.337	0.326	0.013	-0.414	S
G3		0.327	0.343	0.334	0.013	-0.517	S
G4		0.294	0.305	0.298	0.012	-0.299	S
G1	NH ₄ ⁺ mg N/l	0.084	0.086	0.086	0.009	-0.223	S
G2		0.083	0.086	0.086	0.011	-0.302	S
G3		0.109	0.112	0.107	0.013	0.169	S
G4		0.144	0.147	0.144	0.014	-0.018	S
G1	NO ₃ ⁻ mg N/l	0.187	0.194	0.187	0.01	0.013	S
G2		0.301	0.313	0.3	0.013	0.044	S
G3		0.246	0.255	0.247	0.01	-0.072	S
G4		0.328	0.334	0.326	0.022	0.109	S
G1	Na ⁺ mg/l	0.9	0.891	0.855	0.049	0.909	S
G2		0.98	0.966	0.933	0.058	0.81	S
G3		1.4	1.4	1.354	0.096	0.477	S
G4		1.36	1.37	1.311	0.08	0.605	S
G1	Mg ²⁺ mg/l	0.11	0.108	0.107	0.005	0.474	S
G2		0.1	0.113	0.111	0.007	-1.766	S
G3		0.1	0.1	0.1	0.007	-0.045	S
G4		0.09	0.091	0.091	0.006	-0.106	S
G1	Cl ⁻ mg/l	1.15	1.2	1.18	0.052	-0.568	S
G2		1.09	1.12	1.097	0.055	-0.131	S
G3		1.9	1.93	1.9	0.064	-0.002	S
G4		1.78	1.81	1.781	0.054	-0.017	S
G1	Ca ²⁺ mg/l	0.22	0.134	0.137	0.022	3.762	U
G2		0.24	0.139	0.139	0.019	5.383	U
G3		0.2	0.124	0.124	0.017	4.533	U
G4		0.18	0.112	0.112	0.013	5.202	U
G1	K ⁺ mg/l	0.13	0.109	0.107	0.013	1.77	Q
G2		0.23	0.227	0.219	0.018	0.626	S
G3		0.15	0.143	0.14	0.015	0.646	S
G4		0.19	0.187	0.182	0.015	0.501	S
G1	pH pH units	5.32	5.28	5.311	0.126	0.072	S
G2		5.3	5.26	5.261	0.127	0.305	S
G3		5.15	5.14	5.146	0.154	0.025	S
G4		5.17	5.17	5.166	0.136	0.031	S
G1	Cond µS/cm	10.2	10.13	10.423	0.492	-0.454	S
G2		11.5	11.24	11.402	0.537	0.182	S
G3		15.8	14.32	14.281	0.894	1.7	S
G4		14.4	14.04	14.292	1.126	0.096	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

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S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 115, Bayerische Landesanstalt f. Wald- und Forstwirtschaft (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.286	0.32	0.313	0.012	-2.295	Q
G2		0.3	0.337	0.326	0.013	-1.899	Q
G3		0.31	0.343	0.334	0.013	-1.848	S
G4		0.277	0.305	0.298	0.012	-1.735	S
G1	NH ₄ ⁺ mg N/l	0.089	0.086	0.086	0.009	0.352	S
G2		0.083	0.086	0.086	0.011	-0.302	S
G3		0.109	0.112	0.107	0.013	0.169	S
G4		0.141	0.147	0.144	0.014	-0.228	S
G1	NO ₃ ⁻ mg N/l	0.171	0.194	0.187	0.01	-1.52	S
G2		0.277	0.313	0.3	0.013	-1.781	S
G3		0.229	0.255	0.247	0.01	-1.833	S
G4		0.295	0.334	0.326	0.022	-1.39	S
G1	Na ⁺ mg/l	0.863	0.891	0.855	0.049	0.156	S
G2		0.953	0.966	0.933	0.058	0.343	S
G3		1.354	1.4	1.354	0.096	-0.003	S
G4		1.307	1.37	1.311	0.08	-0.056	S
G1	Mg ²⁺ mg/l	0.101	0.108	0.107	0.005	-1.233	S
G2		0.113	0.113	0.111	0.007	0.232	S
G3		0.089	0.1	0.1	0.007	-1.7	S
G4		0.084	0.091	0.091	0.006	-1.095	S
G1	Cl ⁻ mg/l	1.099	1.2	1.18	0.052	-1.544	S
G2		1.024	1.12	1.097	0.055	-1.341	S
G3		1.841	1.93	1.9	0.064	-0.924	S
G4		1.71	1.81	1.781	0.054	-1.318	S
G1	Ca ²⁺ mg/l	0.12	0.134	0.137	0.022	-0.774	S
G2		0.138	0.139	0.139	0.019	-0.049	S
G3		0.102	0.124	0.124	0.017	-1.307	Q
G4		< 0.100	0.112	0.112	0.013	-4.801	U
G1	K ⁺ mg/l	0.122	0.109	0.107	0.013	1.145	S
G2		0.211	0.227	0.219	0.018	-0.435	S
G3		0.119	0.143	0.14	0.015	-1.448	Q
G4		0.184	0.187	0.182	0.015	0.101	S
G1	pH pH units	5.38	5.28	5.311	0.126	0.548	S
G2		5.3	5.26	5.261	0.127	0.305	S
G3		5.19	5.14	5.146	0.154	0.284	S
G4		5.26	5.17	5.166	0.136	0.69	S
G1	Cond µS/cm	9.7	10.13	10.423	0.492	-1.471	S
G2		10.7	11.24	11.402	0.537	-1.308	S
G3		13.5	14.32	14.281	0.894	-0.874	S
G4		13.2	14.04	14.292	1.126	-0.97	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

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S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 116, Institute for Applied Plant Biology (Switzerland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.302	0.32	0.313	0.012	-0.886	S
G2		0.317	0.337	0.326	0.013	-0.622	S
G3		0.321	0.343	0.334	0.013	-1.018	S
G4		0.283	0.305	0.298	0.012	-1.237	S
G1	NH ₄ ⁺ mg N/l	0.097	0.086	0.086	0.009	1.295	S
G2		0.1	0.086	0.086	0.011	1.19	Q
G3		0.107	0.112	0.107	0.013	-0.009	S
G4		0.156	0.147	0.144	0.014	0.794	S
G1	NO ₃ ⁻ mg N/l	0.161	0.194	0.187	0.01	-2.469	Q
G2		0.267	0.313	0.3	0.013	-2.512	S
G3		0.214	0.255	0.247	0.01	-3.417	Q
G4		0.283	0.334	0.326	0.022	-1.921	Q
G1	Na ⁺ mg/l	0.93	0.891	0.855	0.049	1.519	S
G2		1.04	0.966	0.933	0.058	1.847	S
G3		1.52	1.4	1.354	0.096	1.732	S
G4		1.53	1.37	1.311	0.08	2.724	S
G1	Mg ²⁺ mg/l	0.11	0.108	0.107	0.005	0.474	S
G2		0.12	0.113	0.111	0.007	1.307	S
G3		0.11	0.1	0.1	0.007	1.46	S
G4		0.1	0.091	0.091	0.006	1.542	S
G1	Cl ⁻ mg/l	1.191	1.2	1.18	0.052	0.213	S
G2		1.08	1.12	1.097	0.055	-0.315	S
G3		1.879	1.93	1.9	0.064	-0.323	S
G4		1.75	1.81	1.781	0.054	-0.578	S
G1	Ca ²⁺ mg/l	0.15	0.134	0.137	0.022	0.587	S
G2		0.15	0.139	0.139	0.019	0.59	S
G3		0.15	0.124	0.124	0.017	1.553	Q
G4		0.14	0.112	0.112	0.013	2.124	U
G1	K ⁺ mg/l	0.11	0.109	0.107	0.013	0.209	S
G2		0.24	0.227	0.219	0.018	1.184	S
G3		0.15	0.143	0.14	0.015	0.646	S
G4		0.21	0.187	0.182	0.015	1.835	S
G1	pH pH units	4.44	5.28	5.311	0.126	-6.92	U
G2		5.02	5.26	5.261	0.127	-1.892	U
G3		4.87	5.14	5.146	0.154	-1.791	U
G4		5.05	5.17	5.166	0.136	-0.848	Q
G1	Cond µS/cm	9.4	10.13	10.423	0.492	-2.081	S
G2		10.6	11.24	11.402	0.537	-1.495	S
G3		13.1	14.32	14.281	0.894	-1.321	S
G4		12.6	14.04	14.292	1.126	-1.503	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

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S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

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B – Blank: You reported either no value or the detection limit

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 120, Landwirtschaftliche Untersuchungs- und Forschungsanstalt
LUFA (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.291	0.32	0.313	0.012	-1.866	S
G2		0.297	0.337	0.326	0.013	-2.121	Q
G3		0.309	0.343	0.334	0.013	-1.927	Q
G4		0.272	0.305	0.298	0.012	-2.157	Q
G1	NH ₄ ⁺ mg N/l	0.1	0.086	0.086	0.009	1.617	Q
G2		0.1	0.086	0.086	0.011	1.226	Q
G3		0.12	0.112	0.107	0.013	0.986	S
G4		0.14	0.147	0.144	0.014	-0.298	S
G1	NO ₃ ⁻ mg N/l	0.17	0.194	0.187	0.01	-1.616	S
G2		0.27	0.313	0.3	0.013	-2.314	S
G3		0.23	0.255	0.247	0.01	-1.729	S
G4		0.3	0.334	0.326	0.022	-1.163	S
G1	Na ⁺ mg/l	0.828	0.891	0.855	0.049	-0.556	S
G2		0.895	0.966	0.933	0.058	-0.66	S
G3		1.299	1.4	1.354	0.096	-0.578	S
G4		1.261	1.37	1.311	0.08	-0.629	S
G1	Mg ²⁺ mg/l	0.101	0.108	0.107	0.005	-1.233	S
G2		0.105	0.113	0.111	0.007	-0.997	S
G3		0.091	0.1	0.1	0.007	-1.399	S
G4		0.08	0.091	0.091	0.006	-1.754	S
G1	Cl ⁻ mg/l	1.09	1.2	1.18	0.052	-1.717	S
G2		0.97	1.12	1.097	0.055	-2.33	S
G3		1.77	1.93	1.9	0.064	-2.033	S
G4		1.66	1.81	1.781	0.054	-2.247	S
G1	Ca ²⁺ mg/l	0.121	0.134	0.137	0.022	-0.729	S
G2		0.131	0.139	0.139	0.019	-0.421	S
G3		0.113	0.124	0.124	0.017	-0.652	S
G4		0.103	0.112	0.112	0.013	-0.723	S
G1	K ⁺ mg/l	0.085	0.109	0.107	0.013	-1.742	Q
G2		0.176	0.227	0.219	0.018	-2.39	Q
G3		0.111	0.143	0.14	0.015	-1.989	Q
G4		0.143	0.187	0.182	0.015	-2.634	Q
G1	pH pH units	5.18	5.28	5.311	0.126	-1.041	Q
G2		5.16	5.26	5.261	0.127	-0.794	S
G3		5.14	5.14	5.146	0.154	-0.04	S
G4		5.15	5.17	5.166	0.136	-0.116	S
G1	Cond µS/cm	11.2	10.13	10.423	0.492	1.579	S
G2		11.7	11.24	11.402	0.537	0.554	S
G3		14.4	14.32	14.281	0.894	0.133	S
G4		14.5	14.04	14.292	1.126	0.185	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

⌘ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- , between ± 15 - 25% of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 121, Landeslabor Schleswig-Holstein (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.297	0.32	0.313	0.012	-1.35	S
G2		0.287	0.337	0.326	0.013	-2.864	Q
G3		0.291	0.343	0.334	0.013	-3.336	Q
G4		0.228	0.305	0.298	0.012	-5.874	U
G1	NH ₄ ⁺ mg N/l	0.08	0.086	0.086	0.009	-0.683	S
G2		0.08	0.086	0.086	0.011	-0.571	S
G3		0.104	0.112	0.107	0.013	-0.202	S
G4		0.13	0.147	0.144	0.014	-0.999	S
G1	NO ₃ ⁻ mg N/l	0.192	0.194	0.187	0.01	0.492	S
G2		0.31	0.313	0.3	0.013	0.728	S
G3		0.253	0.255	0.247	0.01	0.653	S
G4		0.329	0.334	0.326	0.022	0.154	S
G1	Na ⁺ mg/l	0.806	0.891	0.855	0.049	-1.004	S
G2		0.884	0.966	0.933	0.058	-0.85	S
G3		1.25	1.4	1.354	0.096	-1.09	S
G4		1.217	1.37	1.311	0.08	-1.178	S
G1	Mg ²⁺ mg/l	0.105	0.108	0.107	0.005	-0.474	S
G2		0.109	0.113	0.111	0.007	-0.383	S
G3		0.097	0.1	0.1	0.007	-0.496	S
G4		0.088	0.091	0.091	0.006	-0.436	S
G1	Cl ⁻ mg/l	1.12	1.2	1.18	0.052	-1.142	S
G2		1.073	1.12	1.097	0.055	-0.443	S
G3		1.895	1.93	1.9	0.064	-0.08	S
G4		1.768	1.81	1.781	0.054	-0.24	S
G1	Ca ²⁺ mg/l	0.13	0.134	0.137	0.022	-0.32	S
G2		0.132	0.139	0.139	0.019	-0.368	S
G3		0.118	0.124	0.124	0.017	-0.354	S
G4		0.109	0.112	0.112	0.013	-0.261	S
G1	K ⁺ mg/l	0.098	0.109	0.107	0.013	-0.728	S
G2		0.204	0.227	0.219	0.018	-0.826	S
G3		0.13	0.143	0.14	0.015	-0.705	S
G4		0.174	0.187	0.182	0.015	-0.566	S
G1	pH pH units	5.51	5.28	5.311	0.126	1.581	U
G2		5.32	5.26	5.261	0.127	0.462	S
G3		5.16	5.14	5.146	0.154	0.09	S
G4		5.21	5.17	5.166	0.136	0.324	S
G1	Cond µS/cm	10.2	10.13	10.423	0.492	-0.454	S
G2		11	11.24	11.402	0.537	-0.749	S
G3		12.9	14.32	14.281	0.894	-1.545	S
G4		12.8	14.04	14.292	1.126	-1.325	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 125, Bayerisches Landesamt für Umwelt (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.314	0.32	0.313	0.012	0.085	S
G2		0.325	0.337	0.326	0.013	-0.02	S
G3		0.336	0.343	0.334	0.013	0.164	S
G4		0.296	0.305	0.298	0.012	-0.13	S
G1	NH ₄ ⁺ mg N/l	0.074	0.086	0.086	0.009	-1.362	S
G2		0.073	0.086	0.086	0.011	-1.201	Q
G3		0.097	0.112	0.107	0.013	-0.715	S
G4		0.13	0.147	0.144	0.014	-0.985	S
G1	NO ₃ ⁻ mg N/l	0.183	0.194	0.187	0.01	-0.361	S
G2		0.297	0.313	0.3	0.013	-0.268	S
G3		0.243	0.255	0.247	0.01	-0.383	S
G4		0.317	0.334	0.326	0.022	-0.377	S
G1	Na ⁺ mg/l	0.809	0.891	0.855	0.049	-0.943	S
G2		0.878	0.966	0.933	0.058	-0.954	S
G3		1.31	1.4	1.354	0.096	-0.463	S
G4		1.27	1.37	1.311	0.08	-0.517	S
G1	Mg ²⁺ mg/l	0.11	0.108	0.107	0.005	0.474	S
G2		0.114	0.113	0.111	0.007	0.385	S
G3		0.102	0.1	0.1	0.007	0.256	S
G4		0.092	0.091	0.091	0.006	0.223	S
G1	Cl ⁻ mg/l	1.151	1.2	1.18	0.052	-0.549	S
G2		1.086	1.12	1.097	0.055	-0.205	S
G3		1.891	1.93	1.9	0.064	-0.143	S
G4		1.761	1.81	1.781	0.054	-0.37	S
G1	Ca ²⁺ mg/l	0.12	0.134	0.137	0.022	-0.774	S
G2		0.126	0.139	0.139	0.019	-0.688	S
G3		0.115	0.124	0.124	0.017	-0.533	S
G4		0.105	0.112	0.112	0.013	-0.569	S
G1	K ⁺ mg/l	0.099	0.109	0.107	0.013	-0.665	S
G2		0.206	0.227	0.219	0.018	-0.715	S
G3		0.13	0.143	0.14	0.015	-0.705	S
G4		0.169	0.187	0.182	0.015	-0.9	S
G1	pH pH units	5.47	5.28	5.311	0.126	1.263	Q
G2		5.33	5.26	5.261	0.127	0.54	S
G3		5.15	5.14	5.146	0.154	0.025	S
G4		5.16	5.17	5.166	0.136	-0.042	S
G1	Cond µS/cm	10.5	10.13	10.423	0.492	0.156	S
G2		11.6	11.24	11.402	0.537	0.368	S
G3		14.4	14.32	14.281	0.894	0.133	S
G4		14.2	14.04	14.292	1.126	-0.082	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 153, Slovenian Forestry Institute, Ljubljana (Slovenia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.299	0.32	0.313	0.012	-1.178	S
G2		0.315	0.337	0.326	0.013	-0.785	S
G3		0.32	0.343	0.334	0.013	-1.065	S
G4		0.284	0.305	0.298	0.012	-1.144	S
G1	NH ₄ ⁺ mg N/l	0.088	0.086	0.086	0.009	0.237	S
G2		0.094	0.086	0.086	0.011	0.687	S
G3		0.113	0.112	0.107	0.013	0.466	S
G4		0.156	0.147	0.144	0.014	0.822	S
G1	NO ₃ ⁻ mg N/l	0.181	0.194	0.187	0.01	-0.562	S
G2		0.295	0.313	0.3	0.013	-0.413	S
G3		0.238	0.255	0.247	0.01	-0.901	S
G4		0.327	0.334	0.326	0.022	0.063	S
G1	Na ⁺ mg/l	0.806	0.891	0.855	0.049	-1.004	S
G2		0.907	0.966	0.933	0.058	-0.452	S
G3		1.324	1.4	1.354	0.096	-0.317	S
G4		1.283	1.37	1.311	0.08	-0.355	S
G1	Mg ²⁺ mg/l	0.123	0.108	0.107	0.005	2.941	S
G2		0.134	0.113	0.111	0.007	3.458	Q
G3		0.11	0.1	0.1	0.007	1.46	S
G4		0.093	0.091	0.091	0.006	0.388	S
G1	Cl ⁻ mg/l	1.128	1.2	1.18	0.052	-0.989	S
G2		1.056	1.12	1.097	0.055	-0.754	S
G3		1.848	1.93	1.9	0.064	-0.815	S
G4		1.719	1.81	1.781	0.054	-1.15	S
G1	Ca ²⁺ mg/l	0.194	0.134	0.137	0.022	2.582	U
G2		0.18	0.139	0.139	0.019	2.188	U
G3		0.17	0.124	0.124	0.017	2.745	U
G4		0.139	0.112	0.112	0.013	2.047	Q
G1	K ⁺ mg/l	0.1	0.109	0.107	0.013	-0.572	S
G2		0.225	0.227	0.219	0.018	0.346	S
G3		0.137	0.143	0.14	0.015	-0.232	S
G4		0.182	0.187	0.182	0.015	-0.033	S
G1	pH pH units	5.4	5.28	5.311	0.126	0.707	Q
G2		5.35	5.26	5.261	0.127	0.697	S
G3		5.2	5.14	5.146	0.154	0.349	S
G4		5.26	5.17	5.166	0.136	0.69	S
G1	Cond µS/cm	9.3	10.13	10.423	0.492	-2.284	S
G2		10.4	11.24	11.402	0.537	-1.867	S
G3		13.3	14.32	14.281	0.894	-1.097	S
G4		13.3	14.04	14.292	1.126	-0.881	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 155, Environmental Research Branch, Farnheim (UK)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.312	0.32	0.313	0.012	-0.061	S
G2		0.33	0.337	0.326	0.013	0.329	S
G3		0.336	0.343	0.334	0.013	0.188	S
G4		0.294	0.305	0.298	0.012	-0.299	S
G1	NH ₄ ⁺ mg N/l	0.08	0.086	0.086	0.009	-0.683	S
G2		0.082	0.086	0.086	0.011	-0.392	S
G3		0.106	0.112	0.107	0.013	-0.054	S
G4		0.139	0.147	0.144	0.014	-0.368	S
G1	NO ₃ ⁻ mg N/l	0.186	0.194	0.187	0.01	-0.083	S
G2		0.308	0.313	0.3	0.013	0.576	S
G3		0.251	0.255	0.247	0.01	0.445	S
G4		0.329	0.334	0.326	0.022	0.154	S
G1	Na ⁺ mg/l	0.876	0.891	0.855	0.049	0.42	S
G2		0.947	0.966	0.933	0.058	0.239	S
G3		1.356	1.4	1.354	0.096	0.018	S
G4		1.345	1.37	1.311	0.08	0.418	S
G1	Mg ²⁺ mg/l	0.11	0.108	0.107	0.005	0.474	S
G2		0.113	0.113	0.111	0.007	0.232	S
G3		0.101	0.1	0.1	0.007	0.106	S
G4		0.092	0.091	0.091	0.006	0.223	S
G1	Cl ⁻ mg/l	1.166	1.2	1.18	0.052	-0.262	S
G2		1.1	1.12	1.097	0.055	0.052	S
G3		1.91	1.93	1.9	0.064	0.154	S
G4		1.775	1.81	1.781	0.054	-0.11	S
G1	Ca ²⁺ mg/l	0.122	0.134	0.137	0.022	-0.683	S
G2		0.135	0.139	0.139	0.019	-0.208	S
G3		0.119	0.124	0.124	0.017	-0.294	S
G4		0.11	0.112	0.112	0.013	-0.184	S
G1	K ⁺ mg/l	0.102	0.109	0.107	0.013	-0.415	S
G2		0.211	0.227	0.219	0.018	-0.435	S
G3		0.134	0.143	0.14	0.015	-0.435	S
G4		0.166	0.187	0.182	0.015	-1.1	S
G1	pH pH units	5.33	5.28	5.311	0.126	0.151	S
G2		5.29	5.26	5.261	0.127	0.226	S
G3		5.19	5.14	5.146	0.154	0.284	S
G4		5.21	5.17	5.166	0.136	0.324	S
G1	Cond µS/cm	10.12	10.13	10.423	0.492	-0.617	S
G2		11.29	11.24	11.402	0.537	-0.209	S
G3		14.13	14.32	14.281	0.894	-0.169	S
G4		14.02	14.04	14.292	1.126	-0.242	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 158, Asia Center for Air Pollution Research (ACAP) (Japan)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.322	0.32	0.313	0.012	0.799	S
G2		0.337	0.337	0.326	0.013	0.848	S
G3		0.345	0.343	0.334	0.013	0.892	S
G4		0.304	0.305	0.298	0.012	0.546	S
G1	NH ₄ ⁺ mg N/l	0.071	0.086	0.086	0.009	-1.719	Q
G2		0.07	0.086	0.086	0.011	-1.47	Q
G3		0.09	0.112	0.107	0.013	-1.242	Q
G4		0.122	0.147	0.144	0.014	-1.559	Q
G1	NO ₃ ⁻ mg N/l	0.19	0.194	0.187	0.01	0.3	S
G2		0.308	0.313	0.3	0.013	0.576	S
G3		0.251	0.255	0.247	0.01	0.445	S
G4		0.327	0.334	0.326	0.022	0.063	S
G1	Na ⁺ mg/l	0.873	0.891	0.855	0.049	0.359	S
G2		0.954	0.966	0.933	0.058	0.36	S
G3		1.39	1.4	1.354	0.096	0.373	S
G4		1.352	1.37	1.311	0.08	0.505	S
G1	Mg ²⁺ mg/l	0.111	0.108	0.107	0.005	0.664	S
G2		0.114	0.113	0.111	0.007	0.385	S
G3		0.103	0.1	0.1	0.007	0.407	S
G4		0.092	0.091	0.091	0.006	0.223	S
G1	Cl ⁻ mg/l	1.209	1.2	1.18	0.052	0.561	S
G2		1.138	1.12	1.097	0.055	0.748	S
G3		2.005	1.93	1.9	0.064	1.638	S
G4		1.865	1.81	1.781	0.054	1.563	S
G1	Ca ²⁺ mg/l	0.133	0.134	0.137	0.022	-0.184	S
G2		0.137	0.139	0.139	0.019	-0.102	S
G3		0.123	0.124	0.124	0.017	-0.056	S
G4		0.114	0.112	0.112	0.013	0.123	S
G1	K ⁺ mg/l	0.103	0.109	0.107	0.013	-0.337	S
G2		0.222	0.227	0.219	0.018	0.179	S
G3		0.136	0.143	0.14	0.015	-0.3	S
G4		0.182	0.187	0.182	0.015	-0.033	S
G1	pH pH units	5.17	5.28	5.311	0.126	-1.12	Q
G2		5.29	5.26	5.261	0.127	0.226	S
G3		5.16	5.14	5.146	0.154	0.09	S
G4		5.03	5.17	5.166	0.136	-0.995	Q
G1	Cond µS/cm	10.3	10.13	10.423	0.492	-0.251	S
G2		10.9	11.24	11.402	0.537	-0.936	S
G3		14.1	14.32	14.281	0.894	-0.202	S
G4		14.3	14.04	14.292	1.126	0.007	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 166, Forest Research Institute, Laboratory of Natural Environment Chemistry (Poland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.298	0.32	0.313	0.012	-1.264	S
G2		0.316	0.337	0.326	0.013	-0.711	S
G3		0.336	0.343	0.334	0.013	0.188	S
G4		0.297	0.305	0.298	0.012	-0.045	S
G1	NH ₄ ⁺ mg N/l	0.073	0.086	0.086	0.009	-1.489	S
G2		0.072	0.086	0.086	0.011	-1.291	Q
G3		0.099	0.112	0.107	0.013	-0.574	S
G4		0.133	0.147	0.144	0.014	-0.789	S
G1	NO ₃ ⁻ mg N/l	0.189	0.194	0.187	0.01	0.204	S
G2		0.304	0.313	0.3	0.013	0.272	S
G3		0.247	0.255	0.247	0.01	0.031	S
G4		0.331	0.334	0.326	0.022	0.245	S
G1	Na ⁺ mg/l	0.87	0.891	0.855	0.049	0.288	S
G2		0.956	0.966	0.933	0.058	0.402	S
G3		1.402	1.4	1.354	0.096	0.498	S
G4		1.371	1.37	1.311	0.08	0.742	S
G1	Mg ²⁺ mg/l	0.11	0.108	0.107	0.005	0.512	S
G2		0.118	0.113	0.111	0.007	0.939	S
G3		0.106	0.1	0.1	0.007	0.858	S
G4		0.097	0.091	0.091	0.006	1.031	S
G1	Cl ⁻ mg/l	1.166	1.2	1.18	0.052	-0.262	S
G2		1.092	1.12	1.097	0.055	-0.095	S
G3		1.898	1.93	1.9	0.064	-0.034	S
G4		1.777	1.81	1.781	0.054	-0.073	S
G1	Ca ²⁺ mg/l	0.134	0.134	0.137	0.022	-0.144	S
G2		0.145	0.139	0.139	0.019	0.324	S
G3		0.13	0.124	0.124	0.017	0.361	S
G4		0.124	0.112	0.112	0.013	0.87	S
G1	K ⁺ mg/l	0.091	0.109	0.107	0.013	-1.274	Q
G2		0.194	0.227	0.219	0.018	-1.413	S
G3		0.128	0.143	0.14	0.015	-0.861	S
G4		0.168	0.187	0.182	0.015	-0.987	S
G1	pH pH units	-999	5.28	5.311	0.126		B
G2		-999	5.26	5.261	0.127		B
G3		-999	5.14	5.146	0.154		B
G4		-999	5.17	5.166	0.136		B
G1	Cond µS/cm	10.89	10.13	10.423	0.492	0.949	S
G2		12.18	11.24	11.402	0.537	1.449	S
G3		14.87	14.32	14.281	0.894	0.659	S
G4		14.47	14.04	14.292	1.126	0.158	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✕ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- , between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 178, Limnological Institute Russian Academy of Sciences (Russian Federation)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.304	0.32	0.313	0.012	-0.748	S
G2		0.261	0.337	0.326	0.013	-4.794	U
G3		0.267	0.343	0.334	0.013	-5.215	U
G4		0.248	0.305	0.298	0.012	-4.185	Q
G1	NH ₄ ⁺ mg N/l	0.079	0.086	0.086	0.009	-0.799	S
G2		0.077	0.086	0.086	0.011	-0.841	S
G3		0.067	0.112	0.107	0.013	-2.951	U
G4		0.126	0.147	0.144	0.014	-1.279	S
G1	NO ₃ ⁻ mg N/l	0.196	0.194	0.187	0.01	0.875	S
G2		0.306	0.313	0.3	0.013	0.424	S
G3		0.227	0.255	0.247	0.01	-2.04	S
G4		0.313	0.334	0.326	0.022	-0.572	S
G1	Na ⁺ mg/l	0.772	0.891	0.855	0.049	-1.695	S
G2		0.82	0.966	0.933	0.058	-1.956	Q
G3		1.553	1.4	1.354	0.096	2.077	S
G4		1.192	1.37	1.311	0.08	-1.49	S
G1	Mg ²⁺ mg/l	0.128	0.108	0.107	0.005	3.89	Q
G2		0.132	0.113	0.111	0.007	3.151	Q
G3		0.143	0.1	0.1	0.007	6.425	U
G4		0.116	0.091	0.091	0.006	4.178	U
G1	Cl ⁻ mg/l	1.234	1.2	1.18	0.052	1.04	S
G2		1.16	1.12	1.097	0.055	1.151	S
G3		1.883	1.93	1.9	0.064	-0.268	S
G4		1.898	1.81	1.781	0.054	2.176	S
G1	Ca ²⁺ mg/l	0.159	0.134	0.137	0.022	0.995	Q
G2		0.159	0.139	0.139	0.019	1.07	S
G3		0.187	0.124	0.124	0.017	3.758	U
G4		0.136	0.112	0.112	0.013	1.816	Q
G1	K ⁺ mg/l	0.186	0.109	0.107	0.013	6.14	U
G2		0.264	0.227	0.219	0.018	2.524	Q
G3		0.43	0.143	0.14	0.015	19.557	U
G4		0.227	0.187	0.182	0.015	2.969	Q
G1	pH pH units	5.27	5.28	5.311	0.126	-0.326	S
G2		5.29	5.26	5.261	0.127	0.226	S
G3		5.06	5.14	5.146	0.154	-0.559	S
G4		5.08	5.17	5.166	0.136	-0.628	S
G1	Cond µS/cm	10.71	10.13	10.423	0.492	0.583	S
G2		11.96	11.24	11.402	0.537	1.039	S
G3		10.98	14.32	14.281	0.894	-3.693	Q
G4		14.65	14.04	14.292	1.126	0.318	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✕ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- , between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 183, Public health institute Uzice (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.333	0.32	0.313	0.012	1.744	S
G2		0.347	0.337	0.326	0.013	1.591	S
G3		0.358	0.343	0.334	0.013	1.91	S
G4		0.318	0.305	0.298	0.012	1.729	S
G1	NH ₄ ⁺ mg N/l	-999	0.086	0.086	0.009		B
G2		-999	0.086	0.086	0.011		B
G3		-999	0.112	0.107	0.013		B
G4		-999	0.147	0.144	0.014		B
G1	NO ₃ ⁻ mg N/l	-999	0.194	0.187	0.01		B
G2		-999	0.313	0.3	0.013		B
G3		-999	0.255	0.247	0.01		B
G4		-999	0.334	0.326	0.022		B
G1	Na ⁺ mg/l	0.863	0.891	0.855	0.049	0.156	S
G2		0.958	0.966	0.933	0.058	0.429	S
G3		1.036	1.4	1.354	0.096	-3.327	U
G4		1	1.37	1.311	0.08	-3.883	U
G1	Mg ²⁺ mg/l	0.116	0.108	0.107	0.005	1.613	S
G2		0.119	0.113	0.111	0.007	1.154	S
G3		0.106	0.1	0.1	0.007	0.858	S
G4		0.096	0.091	0.091	0.006	0.882	S
G1	Cl ⁻ mg/l	-999	1.2	1.18	0.052		B
G2		-999	1.12	1.097	0.055		B
G3		-999	1.93	1.9	0.064		B
G4		-999	1.81	1.781	0.054		B
G1	Ca ²⁺ mg/l	0.144	0.134	0.137	0.022	0.314	S
G2		0.148	0.139	0.139	0.019	0.484	S
G3		0.135	0.124	0.124	0.017	0.659	S
G4		0.124	0.112	0.112	0.013	0.893	S
G1	K ⁺ mg/l	0.127	0.109	0.107	0.013	1.536	Q
G2		0.262	0.227	0.219	0.018	2.413	Q
G3		0.18	0.143	0.14	0.015	2.672	U
G4		0.224	0.187	0.182	0.015	2.769	Q
G1	pH pH units	5.32	5.28	5.311	0.126	0.072	S
G2		5.35	5.26	5.261	0.127	0.697	S
G3		5.27	5.14	5.146	0.154	0.803	Q
G4		5.28	5.17	5.166	0.136	0.837	Q
G1	Cond µS/cm	10.8	10.13	10.423	0.492	0.766	S
G2		10.28	11.24	11.402	0.537	-2.091	S
G3		12.49	14.32	14.281	0.894	-2.004	S
G4		12.53	14.04	14.292	1.126	-1.565	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 187, Public Health Institute - Nis, Department for Sanitary Chemistry
(Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	-999	0.32	0.313	0.012		B
G2		-999	0.337	0.326	0.013		B
G3		-999	0.343	0.334	0.013		B
G4		-999	0.305	0.298	0.012		B
G1	NH ₄ ⁺ mg N/l	0.171	0.086	0.086	0.009	9.785	U
G2		0.165	0.086	0.086	0.011	7.069	U
G3		0.238	0.112	0.107	0.013	9.753	U
G4		0.24	0.147	0.144	0.014	6.705	U
G1	NO ₃ ⁻ mg N/l	0.16	0.194	0.187	0.01	-2.574	Q
G2		0.27	0.313	0.3	0.013	-2.314	S
G3		0.215	0.255	0.247	0.01	-3.282	Q
G4		0.281	0.334	0.326	0.022	-2.025	Q
G1	Na ⁺ mg/l	0.738	0.891	0.855	0.049	-2.387	Q
G2		0.79	0.966	0.933	0.058	-2.475	Q
G3		1.233	1.4	1.354	0.096	-1.268	S
G4		1.235	1.37	1.311	0.08	-0.954	S
G1	Mg ²⁺ mg/l	0.113	0.108	0.107	0.005	1.044	S
G2		0.104	0.113	0.111	0.007	-1.151	S
G3		0.114	0.1	0.1	0.007	2.062	S
G4		0.103	0.091	0.091	0.006	2.036	S
G1	Cl ⁻ mg/l	-999	1.2	1.18	0.052		B
G2		-999	1.12	1.097	0.055		B
G3		-999	1.93	1.9	0.064		B
G4		-999	1.81	1.781	0.054		B
G1	Ca ²⁺ mg/l	0.196	0.134	0.137	0.022	2.673	U
G2		0.24	0.139	0.139	0.019	5.383	U
G3		0.193	0.124	0.124	0.017	4.116	U
G4		0.204	0.112	0.112	0.013	7.048	U
G1	K ⁺ mg/l	0.147	0.109	0.107	0.013	3.135	U
G2		0.225	0.227	0.219	0.018	0.319	S
G3		0.193	0.143	0.14	0.015	3.516	U
G4		0.203	0.187	0.182	0.015	1.402	S
G1	pH pH units	-999	5.28	5.311	0.126		B
G2		-999	5.26	5.261	0.127		B
G3		-999	5.14	5.146	0.154		B
G4		-999	5.17	5.166	0.136		B
G1	Cond µS/cm	-999	10.13	10.423	0.492		B
G2		-999	11.24	11.402	0.537		B
G3		-999	14.32	14.281	0.894		B
G4		-999	14.04	14.292	1.126		B

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✕ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- , between ± 15 - 25% of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na⁺, Mg^{2+} , Ca^{2+} , K⁺ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 189, Institute of Public Health - Kikinda (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	-999	0.32	0.313	0.012		B
G2		-999	0.337	0.326	0.013		B
G3		-999	0.343	0.334	0.013		B
G4		-999	0.305	0.298	0.012		B
G1	NH ₄ ⁺ mg N/l	-999	0.086	0.086	0.009		B
G2		-999	0.086	0.086	0.011		B
G3		-999	0.112	0.107	0.013		B
G4		-999	0.147	0.144	0.014		B
G1	NO ₃ ⁻ mg N/l	-999	0.194	0.187	0.01		B
G2		-999	0.313	0.3	0.013		B
G3		-999	0.255	0.247	0.01		B
G4		-999	0.334	0.326	0.022		B
G1	Na ⁺ mg/l	0.718	0.891	0.855	0.049	-2.802	Q
G2		0.79	0.966	0.933	0.058	-2.482	Q
G3		1.135	1.4	1.354	0.096	-2.294	Q
G4		1.115	1.37	1.311	0.08	-2.451	Q
G1	Mg ²⁺ mg/l	-999	0.108	0.107	0.005		B
G2		-999	0.113	0.111	0.007		B
G3		-999	0.1	0.1	0.007		B
G4		-999	0.091	0.091	0.006		B
G1	Cl ⁻ mg/l	-999	1.2	1.18	0.052		B
G2		-999	1.12	1.097	0.055		B
G3		-999	1.93	1.9	0.064		B
G4		-999	1.81	1.781	0.054		B
G1	Ca ²⁺ mg/l	-999	0.134	0.137	0.022		B
G2		-999	0.139	0.139	0.019		B
G3		-999	0.124	0.124	0.017		B
G4		-999	0.112	0.112	0.013		B
G1	K ⁺ mg/l	0.105	0.109	0.107	0.013	-0.181	S
G2		0.199	0.227	0.219	0.018	-1.106	S
G3		0.138	0.143	0.14	0.015	-0.165	S
G4		0.179	0.187	0.182	0.015	-0.233	S
G1	pH pH units	-999	5.28	5.311	0.126		B
G2		-999	5.26	5.261	0.127		B
G3		-999	5.14	5.146	0.154		B
G4		-999	5.17	5.166	0.136		B
G1	Cond µS/cm	-999	10.13	10.423	0.492		B
G2		-999	11.24	11.402	0.537		B
G3		-999	14.32	14.281	0.894		B
G4		-999	14.04	14.292	1.126		B

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 198, Institute for public health - Sremska Mitrovica (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	-999	0.32	0.313	0.012		B
G2		-999	0.337	0.326	0.013		B
G3		-999	0.343	0.334	0.013		B
G4		-999	0.305	0.298	0.012		B
G1	NH ₄ ⁺ mg N/l	-999	0.086	0.086	0.009		B
G2		-999	0.086	0.086	0.011		B
G3		-999	0.112	0.107	0.013		B
G4		-999	0.147	0.144	0.014		B
G1	NO ₃ ⁻ mg N/l	-999	0.194	0.187	0.01		B
G2		-999	0.313	0.3	0.013		B
G3		-999	0.255	0.247	0.01		B
G4		-999	0.334	0.326	0.022		B
G1	Na ⁺ mg/l	0.752	0.891	0.855	0.049	-2.098	Q
G2		0.817	0.966	0.933	0.058	-2.005	Q
G3		1.126	1.4	1.354	0.096	-2.389	Q
G4		1.104	1.37	1.311	0.08	-2.588	Q
G1	Mg ²⁺ mg/l	-999	0.108	0.107	0.005		B
G2		-999	0.113	0.111	0.007		B
G3		-999	0.1	0.1	0.007		B
G4		-999	0.091	0.091	0.006		B
G1	Cl ⁻ mg/l	-999	1.2	1.18	0.052		B
G2		-999	1.12	1.097	0.055		B
G3		-999	1.93	1.9	0.064		B
G4		-999	1.81	1.781	0.054		B
G1	Ca ²⁺ mg/l	-999	0.134	0.137	0.022		B
G2		-999	0.139	0.139	0.019		B
G3		-999	0.124	0.124	0.017		B
G4		-999	0.112	0.112	0.013		B
G1	K ⁺ mg/l	0.096	0.109	0.107	0.013	-0.876	S
G2		0.203	0.227	0.219	0.018	-0.882	S
G3		0.137	0.143	0.14	0.015	-0.239	S
G4		0.173	0.187	0.182	0.015	-0.646	S
G1	pH pH units	-999	5.28	5.311	0.126		B
G2		-999	5.26	5.261	0.127		B
G3		-999	5.14	5.146	0.154		B
G4		-999	5.17	5.166	0.136		B
G1	Cond µS/cm	-999	10.13	10.423	0.492		B
G2		-999	11.24	11.402	0.537		B
G3		-999	14.32	14.281	0.894		B
G4		-999	14.04	14.292	1.126		B

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✕ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- , less than $\pm 15\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- , between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- , more than $\pm 25\%$ of the expected value for NH_4^+ , Cl, Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 200, FUB AG (Switzerland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm [†]
G1	SO ₄ ²⁻ mg S/l	0.321	0.32	0.313	0.012	0.713	S
G2		0.33	0.337	0.326	0.013	0.329	S
G3		0.342	0.343	0.334	0.013	0.657	S
G4		0.303	0.305	0.298	0.012	0.461	S
G1	NH ₄ ⁺ mg N/l	0.087	0.086	0.086	0.009	0.122	S
G2		0.087	0.086	0.086	0.011	0.058	S
G3		0.112	0.112	0.107	0.013	0.392	S
G4		0.146	0.147	0.144	0.014	0.122	S
G1	NO ₃ ⁻ mg N/l	0.19	0.194	0.187	0.01	0.3	S
G2		0.304	0.313	0.3	0.013	0.272	S
G3		0.254	0.255	0.247	0.01	0.756	S
G4		0.331	0.334	0.326	0.022	0.245	S
G1	Na ⁺ mg/l	0.872	0.891	0.855	0.049	0.339	S
G2		0.948	0.966	0.933	0.058	0.256	S
G3		1.389	1.4	1.354	0.096	0.362	S
G4		1.346	1.37	1.311	0.08	0.43	S
G1	Mg ²⁺ mg/l	0.107	0.108	0.107	0.005	-0.095	S
G2		0.109	0.113	0.111	0.007	-0.383	S
G3		0.092	0.1	0.1	0.007	-1.248	S
G4		0.084	0.091	0.091	0.006	-1.095	S
G1	Cl ⁻ mg/l	1.175	1.2	1.18	0.052	-0.089	S
G2		1.095	1.12	1.097	0.055	-0.04	S
G3		1.912	1.93	1.9	0.064	0.185	S
G4		1.799	1.81	1.781	0.054	0.336	S
G1	Ca ²⁺ mg/l	0.127	0.134	0.137	0.022	-0.457	S
G2		0.134	0.139	0.139	0.019	-0.262	S
G3		0.11	0.124	0.124	0.017	-0.83	S
G4		0.099	0.112	0.112	0.013	-1.031	S
G1	K ⁺ mg/l	0.106	0.109	0.107	0.013	-0.103	S
G2		0.228	0.227	0.219	0.018	0.514	S
G3		0.14	0.143	0.14	0.015	-0.03	S
G4		0.186	0.187	0.182	0.015	0.234	S
G1	pH pH units	-999	5.28	5.311	0.126		B
G2		-999	5.26	5.261	0.127		B
G3		-999	5.14	5.146	0.154		B
G4		-999	5.17	5.166	0.136		B
G1	Cond µS/cm	10.43	10.13	10.423	0.492	0.014	S
G2		11.53	11.24	11.402	0.537	0.238	S
G3		14.41	14.32	14.281	0.894	0.144	S
G4		14.13	14.04	14.292	1.126	-0.144	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>

EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 203, The Public Health Institute Vranje (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	< 1.000	0.32	0.313	0.012		B
G2		< 1.000	0.337	0.326	0.013		B
G3		< 1.000	0.343	0.334	0.013		B
G4		< 1.000	0.305	0.298	0.012		B
G1	NH ₄ ⁺ mg N/l	0.182	0.086	0.086	0.009	11.05	U
G2		0.17	0.086	0.086	0.011	7.519	U
G3		0.237	0.112	0.107	0.013	9.678	U
G4		0.242	0.147	0.144	0.014	6.845	U
G1	NO ₃ ⁻ mg N/l	-999	0.194	0.187	0.01		B
G2		-999	0.313	0.3	0.013		B
G3		-999	0.255	0.247	0.01		B
G4		-999	0.334	0.326	0.022		B
G1	Na ⁺ mg/l	0.724	0.891	0.855	0.049	-2.672	Q
G2		0.764	0.966	0.933	0.058	-2.924	Q
G3		1.21	1.4	1.354	0.096	-1.508	S
G4		1.2	1.37	1.311	0.08	-1.39	S
G1	Mg ²⁺ mg/l	0.118	0.108	0.107	0.005	1.992	S
G2		0.115	0.113	0.111	0.007	0.539	S
G3		0.095	0.1	0.1	0.007	-0.797	S
G4		0.09	0.091	0.091	0.006	-0.106	S
G1	Cl ⁻ mg/l	< 2.000	1.2	1.18	0.052		B
G2		< 2.000	1.12	1.097	0.055		B
G3		< 2.000	1.93	1.9	0.064		B
G4		< 2.000	1.81	1.781	0.054		B
G1	Ca ²⁺ mg/l	0.11	0.134	0.137	0.022	-1.228	Q
G2		0.142	0.139	0.139	0.019	0.164	S
G3		0.11	0.124	0.124	0.017	-0.83	S
G4		0.105	0.112	0.112	0.013	-0.569	S
G1	K ⁺ mg/l	0.121	0.109	0.107	0.013	1.067	S
G2		0.194	0.227	0.219	0.018	-1.385	S
G3		0.127	0.143	0.14	0.015	-0.908	S
G4		0.175	0.187	0.182	0.015	-0.5	S
G1	pH pH units	5.51	5.28	5.311	0.126	1.581	U
G2		5.49	5.26	5.261	0.127	1.795	U
G3		5.5	5.14	5.146	0.154	2.295	U
G4		5.49	5.17	5.166	0.136	2.375	U
G1	Cond µS/cm	10.5	10.13	10.423	0.492	0.156	S
G2		11.5	11.24	11.402	0.537	0.182	S
G3		14.2	14.32	14.281	0.894	-0.091	S
G4		14.3	14.04	14.292	1.126	0.007	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 209, PHIB - Public Health Institute of Belgrade (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.301	0.32	0.313	0.012	-1.006	S
G2		0.321	0.337	0.326	0.013	-0.339	S
G3		0.314	0.343	0.334	0.013	-1.535	S
G4		0.286	0.305	0.298	0.012	-0.975	S
G1	NH ₄ ⁺ mg N/l	0.077	0.086	0.086	0.009	-1.029	S
G2		0.109	0.086	0.086	0.011	2.035	U
G3		0.091	0.112	0.107	0.013	-1.168	Q
G4		0.105	0.147	0.144	0.014	-2.75	U
G1	NO ₃ ⁻ mg N/l	0.172	0.194	0.187	0.01	-1.425	S
G2		0.289	0.313	0.3	0.013	-0.869	S
G3		0.257	0.255	0.247	0.01	1.067	S
G4		0.343	0.334	0.326	0.022	0.79	S
G1	Na ⁺ mg/l	0.7	0.891	0.855	0.049	-3.16	Q
G2		0.821	0.966	0.933	0.058	-1.939	Q
G3		1.21	1.4	1.354	0.096	-1.508	S
G4		1.234	1.37	1.311	0.08	-0.966	S
G1	Mg ²⁺ mg/l	0.104	0.108	0.107	0.005	-0.664	S
G2		0.093	0.113	0.111	0.007	-2.841	Q
G3		0.118	0.1	0.1	0.007	2.664	Q
G4		0.123	0.091	0.091	0.006	5.331	U
G1	Cl ⁻ mg/l	1.179	1.2	1.18	0.052	-0.013	S
G2		1.116	1.12	1.097	0.055	0.345	S
G3		1.806	1.93	1.9	0.064	-1.471	S
G4		1.86	1.81	1.781	0.054	1.47	S
G1	Ca ²⁺ mg/l	0.197	0.134	0.137	0.022	2.718	U
G2		0.282	0.139	0.139	0.019	7.62	U
G3		0.205	0.124	0.124	0.017	4.831	U
G4		0.223	0.112	0.112	0.013	8.51	U
G1	K ⁺ mg/l	0.147	0.109	0.107	0.013	3.096	U
G2		0.254	0.227	0.219	0.018	1.966	S
G3		0.148	0.143	0.14	0.015	0.511	S
G4		0.18	0.187	0.182	0.015	-0.166	S
G1	pH pH units	-999	5.28	5.311	0.126		B
G2		-999	5.26	5.261	0.127		B
G3		-999	5.14	5.146	0.154		B
G4		-999	5.17	5.166	0.136		B
G1	Cond µS/cm	-999	10.13	10.423	0.492		B
G2		-999	11.24	11.402	0.537		B
G3		-999	14.32	14.281	0.894		B
G4		-999	14.04	14.292	1.126		B

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 43rd intercomparison of analytical methods - 2025

Laboratory 211, Eurofins Omegam B.V. (The Netherlands)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
G1	SO ₄ ²⁻ mg S/l	0.315	0.32	0.313	0.012	0.197	S
G2		0.319	0.337	0.326	0.013	-0.488	S
G3		0.322	0.343	0.334	0.013	-0.909	S
G4		0.3	0.305	0.298	0.012	0.208	S
G1	NH ₄ ⁺ mg N/l	0.076	0.086	0.086	0.009	-1.144	S
G2		0.075	0.086	0.086	0.011	-1.021	S
G3		0.089	0.112	0.107	0.013	-1.317	Q
G4		0.13	0.147	0.144	0.014	-0.999	S
G1	NO ₃ ⁻ mg N/l	0.2	0.194	0.187	0.01	1.258	S
G2		0.293	0.313	0.3	0.013	-0.565	S
G3		0.24	0.255	0.247	0.01	-0.694	S
G4		0.329	0.334	0.326	0.022	0.154	S
G1	Na ⁺ mg/l	0.898	0.891	0.855	0.049	0.868	S
G2		0.991	0.966	0.933	0.058	1	S
G3		1.453	1.4	1.354	0.096	1.031	S
G4		1.38	1.37	1.311	0.08	0.854	S
G1	Mg ²⁺ mg/l	0.116	0.108	0.107	0.005	1.613	S
G2		0.128	0.113	0.111	0.007	2.537	S
G3		0.105	0.1	0.1	0.007	0.708	S
G4		0.094	0.091	0.091	0.006	0.553	S
G1	Cl ⁻ mg/l	1.202	1.2	1.18	0.052	0.427	S
G2		1.085	1.12	1.097	0.055	-0.223	S
G3		1.9	1.93	1.9	0.064	-0.002	S
G4		1.829	1.81	1.781	0.054	0.894	S
G1	Ca ²⁺ mg/l	0.12	0.134	0.137	0.022	-0.774	S
G2		0.121	0.139	0.139	0.019	-0.954	S
G3		0.108	0.124	0.124	0.017	-0.95	S
G4		0.103	0.112	0.112	0.013	-0.723	S
G1	K ⁺ mg/l	0.118	0.109	0.107	0.013	0.833	S
G2		0.245	0.227	0.219	0.018	1.463	S
G3		0.156	0.143	0.14	0.015	1.051	S
G4		0.2	0.187	0.182	0.015	1.168	S
G1	pH pH units	5.31	5.28	5.311	0.126	-0.008	S
G2		5.3	5.26	5.261	0.127	0.305	S
G3		5.2	5.14	5.146	0.154	0.349	S
G4		5.24	5.17	5.166	0.136	0.544	S
G1	Cond µS/cm	10.44	10.13	10.423	0.492	0.034	S
G2		11.51	11.24	11.402	0.537	0.201	S
G3		14.54	14.32	14.281	0.894	0.29	S
G4		14.08	14.04	14.292	1.126	-0.188	S

If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value, $\frac{1}{2}$ DL is taken as the reported value in further calculations.

* Z score is unitless

✂ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

<https://emep-ccc.nilu.no/intercomparison>