

# DELTA Handheld XRF

## Limits of Detection (LODs) for Geochemical Analyzers



Olympus recommends four DELTA X-ray Fluorescence (XRF) analyzer configurations for the mineral exploration, geochemistry and mining industry. These are the:

- DELTA Premium (DP-6000) – Highest sensitivity with superior light element (Ag, Al, Si) performance.
- DELTA Professional (DPO-2000) – Mid-range XRF analyzer with good light element performance and excellent all-around capabilities.
- DELTA Classic (DCC-6000) – Value-leading XRF analyzer when light element detection is not required.
- DELTA Premium-50 (DP-4050) – 50 kV XRF analyzer for improved performance in heavy metals (Ag, Cd, Sn, Sb, Te and Ba) and rare earth elements (REE: Y, La, Ce, Pr and Nd).

LODs for Soil and GeoChem Modes (PPM)

	DP-6000	DPO-2000	DCC-6000	DP-4050
X-ray Tube	Rh	Rh	Ta / Au	Ta / Au
Mg*	3000-10000	5000-16500	-	-
Al*	450-1400	650-2200	-	1800-5500
Si*	250-800	300-1000	-	830-2500
P*	40-120	50-175	10000-50000	120-375
S*	50-150	60-200	1000-5000	100-350
Cl	-	-	500-1000	40-100
K	20-50	35-70	150-250	25-80
Ca	10-35	30-50	150-250	15-45
Ti	5-10	5-10	20-50	4-10
V	4-10	4-10	10-30	4-10
Cr	2-9	3-10	10-30	4-10
Mn	3-7	5-8	10-30	4-10
Fe	5-20	10-20	10-30	5-15
Ni	4-10	5-10	20-40	5-15
Cu	2-6	5-8	15-30	4-8
Zn	1-3	3-5	10-15	1-3
W	4-10	5-10	15-30	3-9
Hg	2-5	2-4	10-15	1-4
Au	2-4	3-5	8-15	2-4
As	1-3	2-4	4-8	1-3
Se	1-2	1-2	4-8	1-2
Pb	1-4	3-5	5-10	2-4
Rb	1-2	1-2	3-5	1-2
U	1-6	3-7	5-15	1-6
Sr	1-2	1-2	3-5	1-2
Y	1-2	1-2	5-10	1-2
Zr	1-2	2-4	3-5	1-2
Nb	1	2-4	3-5	1-2
Th	2-6	4-8	7-15	1-4
Mo	1-2	2-4	3-5	1-2
Ag	5-12	7-12	20-30	3-5
Cd	5-9	12-15	20-30	2-3
Sn	9-14	15-25	30-40	5-8
Sb	10-13	17-25	30-40	5-7
Ba	-	-	40-60	20-25
La	-	-	-	30-50
Ce	-	-	-	45-60
Pr	-	-	-	65-100
Nd	-	-	-	75-350

\*GeoChem Mode

The Limits of Detection (LODs) Table (reverse) gives an indication of the performance of each DELTA model across a consistent element suite and set of Certified Standards. Notes on these LOD values:

- LODs were developed testing a variety of certified reference materials or standards.
- LODs are dependent on testing time, sample heterogeneity, the presence/absence of interfering elements (causing spectral overlaps), level of statistical confidence (99.7%) and the XRF beam conditions used (kV,  $\mu$ A, and filter settings of the X-ray tube).
- The lower number in the range of the LODs is the lowest quantity of an element that can be distinguished in an interference-free silica blank.
- The upper end of the range represents samples with more challenging compositions and likely to be more representative of real-world conditions. These values can be used as a guide, but LODs could be higher than those listed here in other sample types.
- Real-world samples may contain interfering elements There are

many commonly known inter-element interferences (e.g. Fe on Cr, Ti on Ba, Pb on As). Please contact your nearest Olympus representative for more information.

- All values are determined using Soil Mode except where Geochem Mode is noted, using multiple beam conditions (optimized voltage, current and filter).
- Analysis time is 120 seconds per beam condition.
- Only the common elements are listed – many other elements are possible but need to be examined for interferences before being added.
- Additional information regarding Gold (Au) analysis:
  - Gold naturally forms clumps or “nuggets” and is not evenly distributed in the sample. Reported values will be high when a nugget is in the X-ray beam and low if the nugget is missed.
  - Au has multiple inter-element interferences including As, Zn, W and Se. Subsequently, Au results can often be either over-reported (false-positives) or under-reported (not-detected) when these elements are present.
  - The use of pathfinder elements is recommended for gold exploration when these elements are present.



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