

Li Lithium 6.941	Be Beryllium 9.012	B Boron 10.811	C Carbon 12.011	N Nitrogen 14.007	O Oxygen 15.999	F Fluorine 18.998	Ne Neon 20.180										
Na Sodium 22.990	Mg Magnesium 24.305	Al Aluminum 26.982	Si Silicon 28.086	P Phosphorus 30.974	S Sulfur 32.06	Cl Chlorine 35.45	Ar Argon 39.948										
K Potassium 39.098	Ca Calcium 40.078	Sc Scandium 44.956	Ti Titanium 47.88	V Vanadium 50.942	Cr Chromium 51.996	Mn Manganese 54.938	Fe Iron 55.845	Co Cobalt 58.933	Ni Nickel 58.693	Cu Copper 63.546	Zn Zinc 65.38	Ga Gallium 69.723	Ge Germanium 72.64	As Arsenic 74.922	Se Selenium 78.96	Br Bromine 79.904	Kr Krypton 83.796
Rb Rubidium 85.468	Sr Strontium 87.62	Y Yttrium 88.906	Zr Zirconium 91.224	Nb Niobium 92.906	Mo Molybdenum 95.94	Tc Technetium 98	Ru Ruthenium 101.07	Rh Rhodium 101.07	Pd Palladium 106.42	Ag Silver 107.868	Cd Cadmium 112.411	In Indium 114.818	Sn Tin 118.71	Sb Antimony 121.757	Te Tellurium 127.6	I Iodine 126.905	Xe Xenon 131.29

LEADING WITH INNOVATION



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Analytical Devices

## APPLICATION NOTE

# POSITIVE MATERIAL IDENTIFICATION (PMI) OF METAL ALLOYS USING HANDHELD LIBS

Today, alloy component traceability is more critical than ever. From petrochemical to power generation to aerospace, positive material identification (PMI) and verification programs can eliminate alloy mix-ups, improve product quality, and prevent injuries. PMI ensures that the specified alloy is used for every component, whether it has already been used in service or is just being introduced into service, is of the correct material. Parts made of the wrong alloy can corrode or wear more rapidly than expected when placed in service.

In many fields, the use of portable and handheld analyzers is considered standard practice. The Rigaku KT-100S laser induced breakdown spectroscopy (LIBS) analyzer offers a new handheld solution that answers many of the issues and concerns presented by current technology. The KT-100S provides industry-leading features and accurate analysis wherever needed. Now, metal alloys can be tested quickly and accurately in a ruggedized package without the use of an open beam device. The included alloy grade library includes most common grades used in refineries and other production environments. Recognized by the American Petroleum Institute (API), LIBS is an acceptable technology used in the Recommended Practice 578 (**API RP 578**), 3rd edition, which provides guidelines for quality assurance in the oil and gas industry.



The KT-100S handheld LIBS analyzer offers:

### Quick decisions

- Results in seconds
- Real-time certificate of verification

### Application-optimized

- Oil & gas industry
- Power generation industry
- Aerospace industry

### Flexible communications

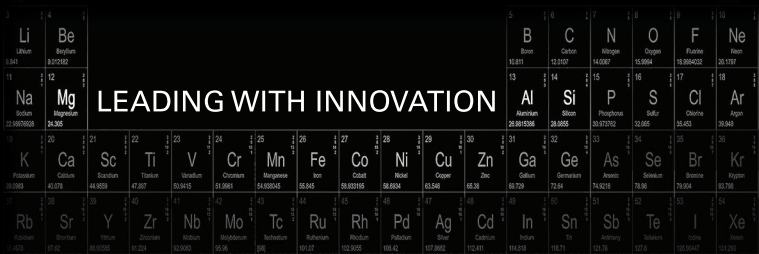
- WiFi
- USB ports

### Designed for any environment

- Lightweight and compact design
- Color, touchscreen, flip-up display
- Oversized keypad for operation with gloved hand
- Handle-mounted "quick keys" for one-hand operation
- Drop-proof, rugged design (U.S. MIL SPEC 810G)
- Dust and water-resistant (IP-54)
- Battery lasts up to 6 hours on single charge
- Integrated macro camera

### Accurate analysis on a variety of materials

- Rods and wire strands
- Finished welds and weld beads
- Bolts, rivets and other fasteners
- Valves and flanges
- Complete reaction vessels



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## APPLICATION NOTE

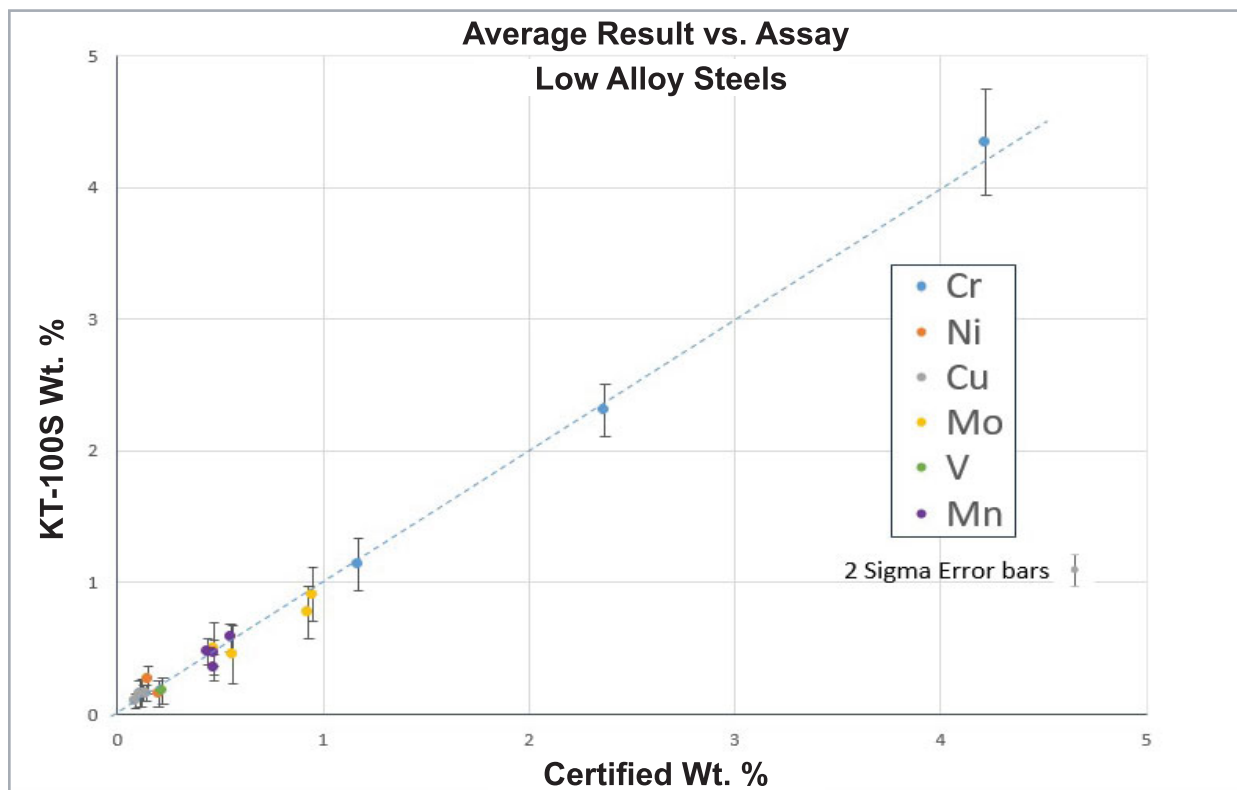
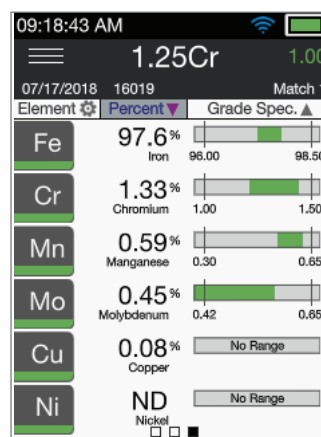
This application presents precision data for 14 common alloys found in petro-chemical and power plants. Data generated is the average of 5 repeats of certified reference standards from five Rigaku KT-100S analyzers. Metal alloys were chosen to test the analyzer's capability across multiple matrices and alloy types.

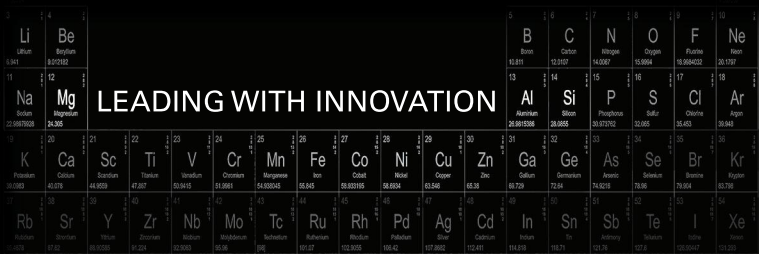
Data was obtained using the analyzer's "Light Drill Down" for surface preparation.

### Low Alloy Steels (Common Refinery Alloys)

1 ¼ Cr, 2 ¼ Cr, 5 Cr and 9 Cr

Element	Range	Average +/-
V	0.15-0.25%	0.05
Cr	1.0-10%	0.15
Mn	0.4-0.6%	0.05
Ni	0.1-0.25%	0.05
Cu	0.05-0.15%	0.14
Mo	0.4-1.0%	0.10



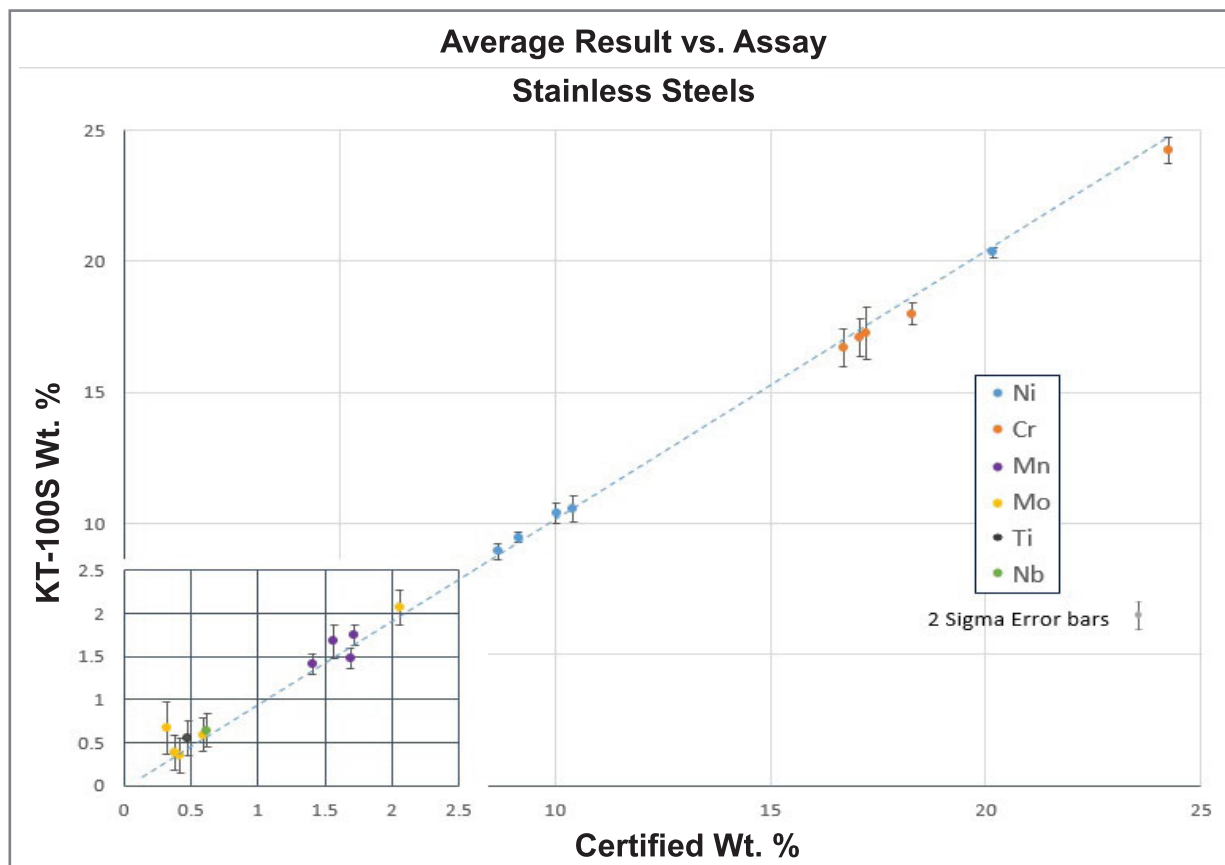
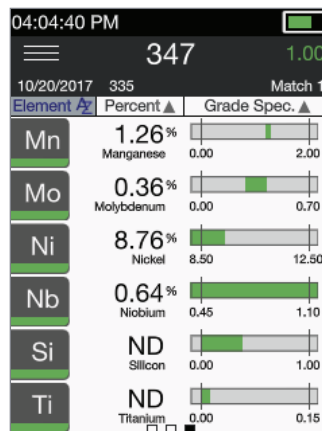


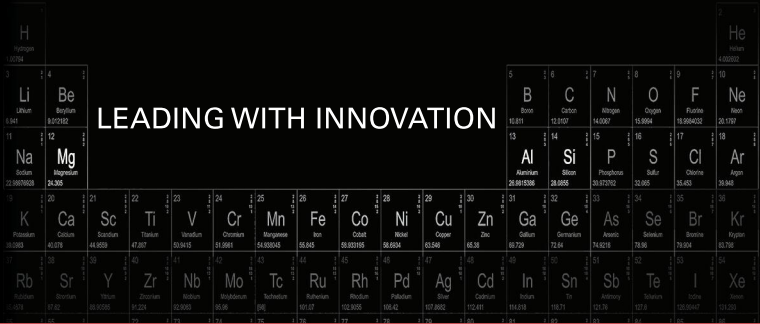
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APPLICATION NOTE

**Stainless Steels for high temperature and corrosion  
304, 310, 316, 321 and 347**

Element	Range	Average +/-
Ti	0.2-0.5%	0.10
Cr	16-25%	0.33
Ni	8-20%	0.16
Mn	1-2%	0.07
Mo	0.3-2.1%	0.11
Nb	0.4-1.0%	0.10





## APPLICATION NOTE

### Ti Alloys for heat exchangers

#### CPTi



### Duplex alloys for high temp and corrosion

#### 2205 SS



### Cr Stainless for blades and veins: 410

Element	Grade Spec (410/420)	Average +/-
Cr	11.0 - 14.0%	0.33
Mn	0 - 1.0%	0.03
Ni	0 - 1.0%	0.03
Cu	0 - 0.75%	0.02

### Ni Alloys and High Temperature Alloys Carpenter 20Cb3

Element	Grade Spec	Average +/-
Cr	19 - 21%	0.20
Mn	0 - 2.0%	0.05
Ni	32 - 38%	0.40
Cu	3.0 - 4.0%	0.05

### Copper alloys and Cupro Nickel Alloys High temp and velocity applications 70/30 Cu-Ni

Element	Grade Spec	Average +/-
Mn	0 - 1.0%	0.03
Ni	27.0 - 33.0%	0.60
Cu	60.0 - 73.0%	0.60