ARE X - Technical Data

X-ray generator	Maximum output power	3 kW
	Output stability	< 0.01 % (for 10% power supply fluctuation)
	Max. output voltage	60 kV
	Max. output current	60 mA
	Voltage step width	0.1 kV
	Current step width	0.1 mA
	Ripple	0.03% rms < 1kHz, 0.75% rms > 1kHz
	Preheat and ramp	Automatic preheat and ramp control circuit
	Input voltage	230 Vac +/- 10%, 50 or 60 Hz, single phase
X-ray tube	Type	Glass (option: ceramic), Mo anode, fine focus (options: other models upon request)
	Focus	0.4 x 8 mm FF (options: 0.4 x 12 mm LFF; 1 x 10 mm NF)
	Collimation	Monocapillary collimator: diameter 1-2 mm
	Max. output	3.0 kW
Geometry	Configurations	Vertical geometry
	Scanning angular range	27° < 2 theta < 40°
	Angular accuracy	± 0.001°
Sample holder	Dimensions	110 mm x 150 mm
Detector	Type	High resolution X-ray digital camera with direct coupled (micro) fibre-optic input and cooled CCD
Case	Dimensions	Width 658 mm, heigh 1059 mm, depth 762 mm
	Leakage X-rays	< 1 mSv/Year (full safety shielding according to the international guidelines)
Processing unit	Computer type	Personal Computer, state of the art PC at the time of delivery
	Items controlled	X-ray generator, detector, counting chain
	Basic data processing	Creation of calibration curves. Retained Austenite quantification

ARE X RETAINED AUSTENITE ANALYSER

ARE X RETAINED AUSTENITE ANALYSER

INSTALLATION REQUIREMENTS

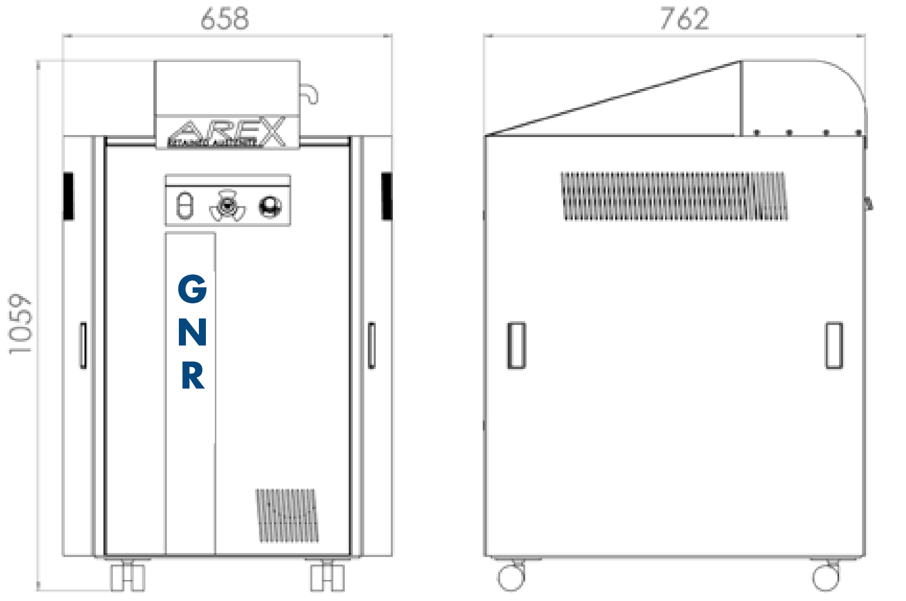
Electrical system
Power connection: 230 Vac +/- 10%, 50 or 60 Hz, single phase
Maximum mains current: 40 A
Main fuse: 32 A
Maximum power consumption: 5 kVA
Ground terminal: 6 mm^2

Power supply voltage fluctuation must not exceed 10%

Cooling water
Minimum flow rate: 4 l/min
Maximum pressure: 6 bars
Maximum inlet temperature: 35° C (minimum depends on dew point)

If the flow rate is lower than 4 l/min, the safety circuit for protection of the X-ray tube is activated, disabling the X-ray generating circuit. When minimum conditions of flow-rate cannot be fulfilled, use the water chiller, available as an optional extra.

EXTERNAL DIMENSIONS



Total weight: 100 Kg

GNR ANALYTICAL INSTRUMENTS GROUP
Sales Office:
G.N.R. S.r.l. - Via Torino, 7
28010 Agrate Conturbia (NO) - Italy
Tel. +39 0322 882911
Fax +39 0322 882930
E-mail: gnrcomm@gnr.it - gnrtech@gnr.it - www.gnr.it

Local Agent

NEW

ARE X RETAINED AUSTENITE ANALYSER

GNR OPTICA

ANALYTICAL INSTRUMENTS GROUP

25 years of technology

Accurate measurement of the retained austenite levels is important in the development and control of a heat treatment process.

X-ray diffraction (XRD) is the only method available that can accurately determine % retained austenite levels down to 0.5%.

Retained Austenite measurement according to ASTM E 975 - 03

ARE X RETAINED AUSTENITE ANALYSER

Retained Austenite

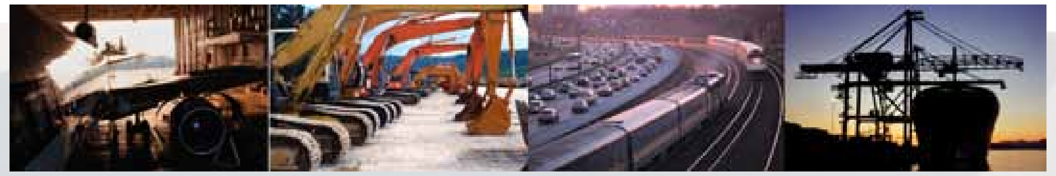
Hardening of steels requires heating to an austenitic phase and quenching to room temperature to produce a hard martensitic phase.
Austenite is a face centered cubic (FCC) phase present in steel at high temperature. Upon cooling, most of the steel is transformed into ferrite - a body centered cubic (BCC) phase, or into martensite - a body centered tetragonal (BCT) phase. Depending on the rate of cooling some percentage of the steel (typically 0-40%) will remain as austenite. Hence the term “retained austenite”.
The volume of the austenitic unit cell is greater than either the martensitic or ferritic unit cells. Therefore, if the austenite transformation is not 100%, the retained austenite that remains after heat treating can further transform during the service life of the product into other phases, providing the potential for changes in the dimension of the part. In addition, other physical properties, such as hardness and strength, vary with the different phases, so that if the part is transformed during service, these physical properties may also change.

Sample preparation

Standard metallographic wet-grinding and polishing methods.

Surface polishing: 600 to 80 grit by silicon carbide or alumina sandpaper.

Surface lapping: 6 to 0.2 µm by diamond or alumina paste.

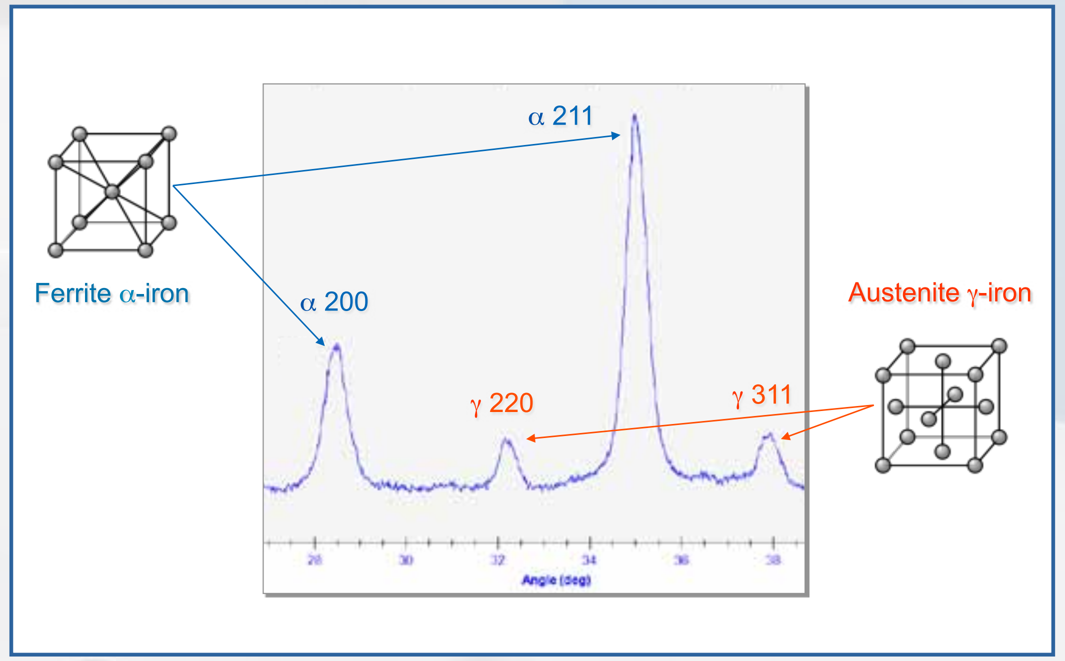


Determination of Volume Percent Retained Austenite by X-Ray Diffraction

Quantitative determination of retained austenite content in heat-treated steels by x-ray diffraction has provided a reliable means of controlling properties and ensuring quality.

X-ray diffraction is considered to be the most accurate method of determining the amount of retained austenite in steels.
Using “ASTM E 975-03 Standard Practice for X-ray Determination of Retained Austenite in Steel with Near Random Crystallographic Orientation” along with the ARE X, retained austenite issues can be easily monitored and controlled.
Austenite, due to its structural difference from other phases in steel, produces a diffraction peak at different locations than ferrite and martensite. The amount of a phase in steel is proportional to the integrated intensity of its diffraction peak. In simple terms, the amount of retained austenite can be correlated to the ratio of the integrated intensity of the austenite peak to the integrated intensity of peaks associated with the other phases.
To characterize the concentration of retained austenite using XRD four diffraction peaks are collected by the X-ray diffractometer, two for the ferrite/martensite phase and two for the austenite phase. A comparison of the intensities of the 4 peaks yields the volume percent concentration of retained austenite in the sample.

The integrated intensities of the austenite (220) and (311), and the ferrite (200) and (211) diffraction peaks are measured on the ARE X diffractometer, providing four austenite/ferrite peak intensity ratios. The use of multiple diffraction peaks minimizes the effects of preferred orientation and allows interference from carbides to be detected.



Features

In compliance with ASTM E 975 - 03

High stability X-ray generator through precision feedback control circuits

Automatic ramp of the high voltage and emission current to preset values

High power and brilliant glass and ceramic Mo X-ray tubes: 60 kV

High focussing mono-capillary collimator

2 Theta range: 27 to 40°

Sample holder: 110 x 150 mm

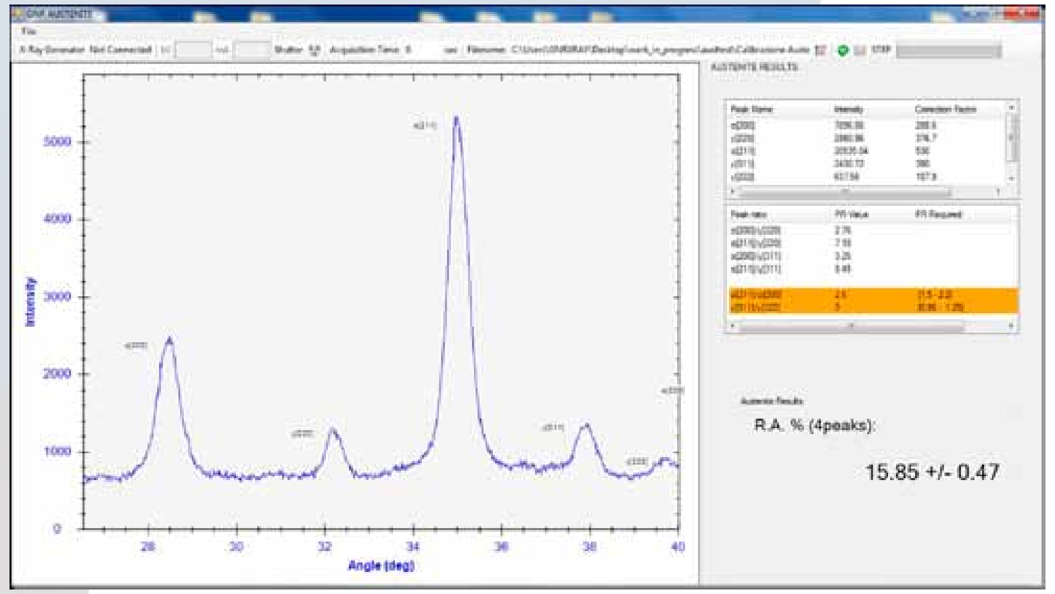
High resolution CCD speed detector

Acquisition time < 5 min

Radiation enclosure with double safety circuit

Calibration included

From sample to result just in one click



ARE X RETAINED AUSTENITE ANALYSER