

# Metallurgical Software

## A. Hardware

### A.1 Digital Color Camera (5 Megapixel)

#### Features :

- USB 2.0 interface (up to 480 Mbit/s)

Sr. No.	Description	Technical Specification
1	Image Sensor	1/ 2.5" type CMOS
2	Effective picture elements	2592 x 1944 (H x V)
3	Maximum Frame Rate	15 at high resolution
4	Pixel Size	2.2 X 2.2

## B. Software

### Image Processing

1. True Colors representation – Special feature to offer true colors of sample on your screen, without any alteration due to camera properties

#### B.1 Grain size analysis : Measurement by 2 methods

##### a. Intercept Method (Manual / Automatic mode) as per E 112, E 930, E1382

- Facility to select number and orientation of linear test lines
- Facility to select concentric test circles
- Facility to select minimum number of intercept lines depending upon number of intercepts found
- Facility to find intercept length and ASTM Grain No. for individual grains

##### b. Planimetric Method

- Facility for selection of region of interest for planimetric method
- Color coding of grains as per ASTM size number
- Grain size distribution with graphical plot and identification of largest grain available

- Auto grain boundary tracing, enhancing and grain cleaning feature for automatic analysis

- Pop-up alert for insufficient intercepts or grains in test region

#### B.2 Phase Analysis as per ASTM E562

- Automatic thresholding of the image
- 12 No. of phases can be determined simultaneously
- Histogram, Color coding for independent phases
- Facility for selection of region of interest

#### B.3 Inclusion Analysis as per ASTM E45, E1122, DIN 50602, JIS G 0555

- Separation and rating as per ASTM E45, E1122, DIN 50602, JIS G 0555
- Showcase windows for all the separated and rated inclusions for cross verification
- Separation of superimposed inclusions (Sulphides superimposed over oxides) and rating them independently
- Facility for edit and rectify manually on any single image after complete batch processing, and results shall be revised accordingly

- Provision to compile results for number of fields of view as per various standards

#### B.4 Cast Iron Analysis

##### a. Nodular Cast Iron as per ASTM E 2567-11 (latest standard for Image Analyzer)

- Nodularity and nodule count as per As per ASTM E 2567-11
- Size classification as per standard ASTM A 247 and estimation of percentage of each class
- Size threshold facility to filtrate non-graphite particles
- Phase analysis with facility to omit or consider graphite nodules

##### b. Gray Cast Iron by ASTM A247

- Class separation (A, B, C & D type) of flakes as per ASTM A 247 and estimation of percentage of each class
- Size classification as per ASTM A247
- Identification of largest flake in the field of view and reporting the respective size class

#### B.6 Porosity Measurement

- Separate identification of Intergranular and Intragranular pores, pore size measurement and estimation of area percentage of the same
- Distribution of pores as per size/area
- Porosity can be classified depending upon area, size, major axis, minor axis etc.

#### B.7 Banding Analysis as per ASTM E1268

- Anisotropy Index and Degree of Orientation estimation
- Thickness of banding and inter-band spacing measurement

#### B.8 Decarburization depth Analysis

- Facility for tracing decarb interface and selection of number of readings for better averaging

#### B.9 2D analysis of features of interest as per following

- Object counting
- Distance between any two points
- Angle between any two edges
- Area Measurement, regular and Irregular shapes.

#### B.12 Batch Run

- Swift Batch Run (processing batch of images in one go) for effective and faster processing of large number of images captured
- This module can be effectively used in Grain Size Analysis, Phase Analysis, Inclusion Analysis, Nodularity and graphite Flake Analysis.

#### B.15 Additional features

- All the results can be reported in units like micron, mm, cm, inch etc.
- Quick Calibration attachment system with freedom for adding additional magnifications

#### B.16 Report generation in MS-Excel format