

# SOFTWARE FOR FEEDING AND INGATING TECHNIQUES FOR STEELCASTINGS

## Introduction

We have developed a computer program for feeding- and ingating calculation of steel castings.

Our feeding- and ingating technology is based on the publication of R. Wlodawer. Further the shape factor of the different simple sections as J. Jamar are considered, which have been proved in practice through our customers. The computer calculates the solidification modulus and not only the geometrical modulus ( $M = \frac{V}{SA}$ ).

## Conditions for Use of the Software, Qualification of Computer Operator

Condition for using our computer program for riser-, feeding- and ingate calculation is to know how to read a casting drawing and the basic of solidification of steel.

## Required Foundry Data

After handover, our software to the foundry it must be completed by:

### Steel qualities

Based on the input the computer calculates the values of the steel analysis C, Si, Mn, P, S, Cr, Ni, Mo, Al, Ti, the liquid's temperature (°C) and the percentage of the solidification shrinkage. On input of the internal steel definition these values will be stored.

### Ladle data

- Quantity of ladles
- Diameter
- Height
- Quantity of nozzles per ladle
- Diameter of nozzles

## Refractory running system (if desired)

Diameter and length of:

- Tube
- L - pieces
- T - pieces
- X - pieces

## ISOTHERM "Z"-Material for feeder linings ISO-CHAIN MATERIAL

Also, all other feeder sleeves or materials with different insulation factors.

## System of The Software Program

### Input of general data

- Black casting weight and machining additions
- Date
- Time
- Name of user

### Modulus calculation

#### Section of numbers (SN)

As with manual modulus calculation the casting must be divided in easy geometrical parts and marked with SN-numbers. Our computer is programmed with the following simple geometrical shapes.

- Cube
- Bar (endless)
- Cylinder
- Ring
- Plate
- Tube (endless)

## Correction of solidification

### *Junctions*

The junction of two or more crossing sections will reduce or enlarge the modulus. Through input of the simple section modulus and the radius between the particular simple sections, the solidification modulus through junctions will automatically be calculated and considered in the further calculations.

### *Modulus enlargement through preheating of cores*

On modulus calculation, e.g. of rings or tubes and eventual sand preheating of the core is considered in our computer program.

### *Chill Casting*

The modulus reduction in certain zones through direct chilling or below sand is also considered by the computer.

### *Insulating Pads*

To prevent expensive cutting of leading pads, the modulus of certain zones can be enlarged through direct insulation.

The modulus enlargement is calculated by the computer.

## **Solidification control**

Depending of quality specification (ASTM-standard) and filling direction the length of the feeding and end zone will be determined. Extending the feeding- and end zone length the computer indicates that the need and size of pads.

For a sound casting operator, you can also select between:

- Enlargement of number of risers
- Feeding shoulders
- Solidification control through chills of insulating pads

## **Riser calculation**

The dimension of the risers considers the solidification modulus and the feeding volume.

The riser dimensions can be calculated as sand riser or insulated riser. The pre-programmed dimensions of insulating material allow the calculation of quantity and costs of insulating (exo.) materials.

## Pouring system

Through consideration of the quantity of molds to be casted simultaneously, the correct ladle, the nozzle diameter etc. will be selected from the dates of the ladles as per 3.2. Individual corrections are possible.

Depending of liquid weight, quality class and maximum solidification modulus

- the desired pouring time
- the effective pouring time
- the diameter of the running system
- the diameter of the ingates
- the minimum downgate - height and fountain effect
- if necessary the critical rising speed in the mold

are calculated. On simultaneous pouring of several molds with on ladle the particular filling time from the first to the last mold will be indicated.