

## Scope of Supply

**Ingeteam Industry** is responsible for the complete turnkey electrical project:

Power installed: 12,250 KVA

- Project management
- Basic and detail engineering
- Supply of electrical equipment, drives and automation:
  - Low-voltage distribution centre
  - Main motors - manufactured by **INDAR**
  - Main DC drives - MOTOCON DC\*
  - Auxiliary equipment - MOTOCON DC
  - AC motor control centre
  - Peripheral devices
  - Process control PLC systems - SIEMENS-S5
  - Eccentricity
  - Operation and monitoring systems (HMIs) OPERATOR MT
- Erection supervision
- Commissioning
- In addition to the above, the following systems are also supplied:
  - AGC system (First Control)
  - Flatness roll and control (Sundwig)
  - TCS sensors (pressure, distance and thickness gauges) by MHI

MOTOCON DC and the OPERATOR MT is equipment designed and manufactured by Ingeteam Technology, S.A.



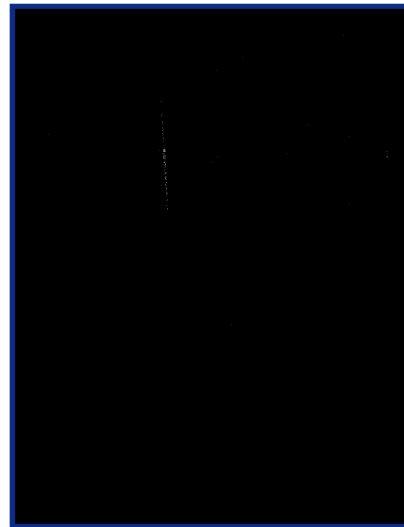
Main Control Pulpit



Pendant Panel



Tandem Arrangement Motors (Right Tension Reel)



Automatic Gage Control (X-Ray)

## After-Sales Services

- Hotline
- Spare parts in 24 hours
- Direct line with our technical staff
- Remote communication from our offices to the factory automation network

Ingeteam Industry

# Ingeteam

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# Ingeteam

## 12 High Cluster Type Cold Reversing Mill

### AVESTA Sheffield Langshyttan (Sweden)



**Ingeteam**  
**industry**

## Mill Description

During the second half of 1997, Mitsubishi Heavy Industries throughout its subsidiary in Europe, commissioned Ingelectric Team (currently Ingeteam Industry, S.A.) to design, supply and install the state-of-the-art electrical and automation equipment for a 12 High Cold Reversing Mill of stainless steel, Cluster type. This mill was assigned for Avesta Sheffield in Langshyttan (Sweden) and developed together with our german subsidiary Ingeteam GmbH.

The mill which is designed for the reduction and elongation of the steel strip, in order to reach the required coil quality, size and thickness, comprises a stand, Cluster type, with twelve working rolls of 65 mm size, a pay-off-reel and two reversing tension reels. Additionally is foreseen an electrical equipment for the coils' drainage composed of a pay-off-reel, a shear and a tension reel.

The main drives' electrical equipment is composed of DC motors and thyristor converters with digital control. The line is automated using PLCs: 1 PLC as master control system, 1 PLC for the auxiliary drivers and cylinders change and 1 PLC for eccentricity control. The final user has subcontracted the AGC system for the gauge automatic and thickness control to First Control company. The AFC system for the flatness control was supplied by Sundwig, including the control and the flatness roll and the thickness and measurement gauges by Mitsubishi.

The mill also includes HMIs (Human Machines Interfaces) in control pulpit, as shown in drawing, which make easy to the user the mill adjustment, control and tracking. These systems are based on PLCs and incorporate the operation and monitoring software.

## Technical Features

**Mill Type:** 12 High Cold Reversing Mill, Cluster type

**Mechanical Supply:** MITSUBISHI HEAVY INDUSTRIES

**Base Material:** Stainless steel

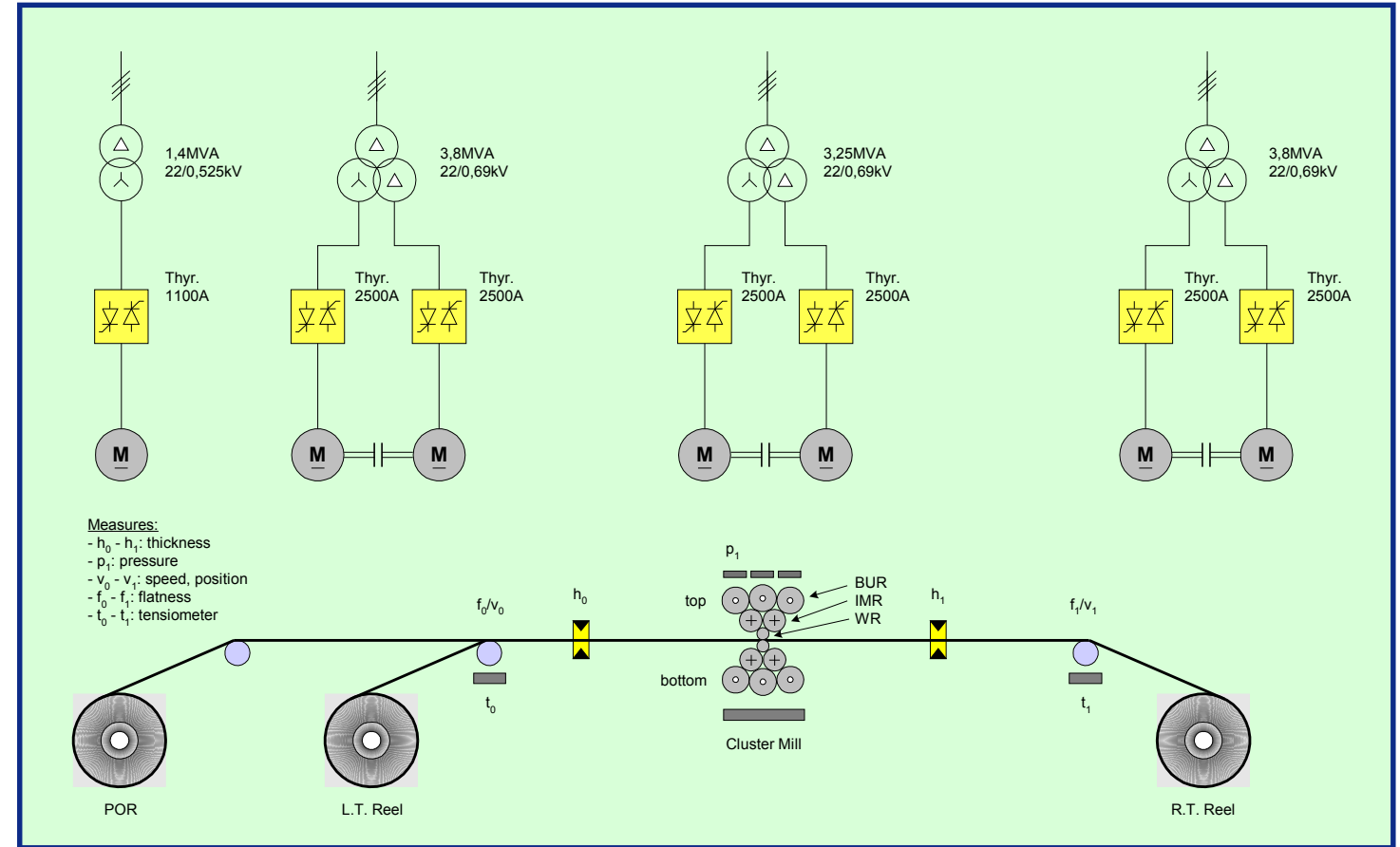
**Operation:**

Reduction: 15% per pass maximum  
 Working rolls size: 65 mm  
 Rolling mill Max. speed: 800 m/min  
 Strip tension: Max. 297 kN  
 Min. 8 kN

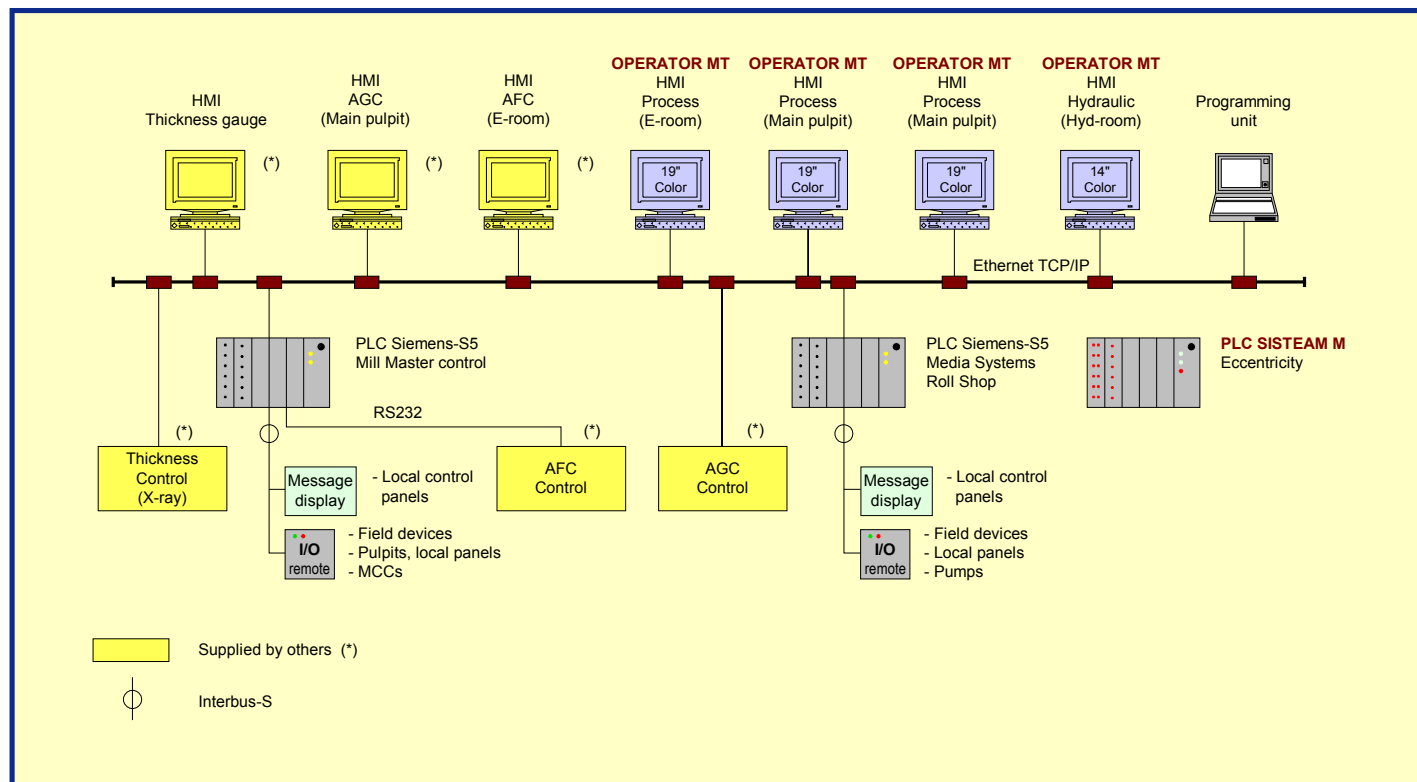
**Coil characteristics:**

Coil width: 400-900 mm  
 Entry thickness: 0.1 - 3.2 mm  
 Exit thickness: Min. 0.05 mm  
 Inside diameter: 500 mm  
 Outside diameter: 2200 mm  
 Maximum weight: Max. 13 Ton

## Mill Lay-out



## Automation Control Diagram



	pay-off-reel	left tension reel	mill drive	right tension reel
<b>Pn (KW)</b>	0-250-250-250	0-750-750-750	0-950-950-950	0-750-750-750
<b>rpm</b>	0-260-432-1200	0-260-467-1200	0-420-527-1333	0-260-467-1200
<b>Un (V)</b>	0-355-550-550	0-428-725-725	0-590-725-725	0-428-725-725
<b>In (A)</b>	0-800-486-486	0-1943-1088-1088	0-1735-1388-1388	0-1943-1088-1088
<b>Mn (Nm)</b>	9180-5500-2000	27500-15300-6000	21600-17200-6800	27500-15300-6000
<b>c</b>	5,6	6,05/2,29	1,28	6,05/2,29
<b>V<sub>L</sub> (m/min)</b>	300	300-800	800	300-800

The DC motors are controlled by modular MOTOCON DC equipment, designed and manufactured by Ingeteam Industry. This equipment consists of three-phase rectifiers based on four-quadrant thyristor equipment with currents between 1000 A and 3400 A for 400 Vac to 690 Vac incoming voltages.

**Main features:**

Type: MOTOCON DC  
 Power: Up to 3400 A  
 Voltage: 400 Vac to 690 Vac  
 Rectifier: Thyristors (anti-parallel)



DC Motor Control Center