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INTERPLANT STANDARD — STEEL INDUSTRY

IPSS

SPECIFICATION FOR POSITION SWITCHES, MEASUREMENTS OF SURFACE FINISH OF FLAT ROLLED MATERIALS

CORRESPONDING INDIAN STANDARD DOES NOT EXIST

IPSS : 2-07-051-88

0. Foreword

0.1 Interplant standardization activity in steel industry is being pursued under the aegis of the Bureau of Indian Standards (BIS) and the Steel Authority of India Limited (SAIL). This Interplant Standard prepared by the Standards Committee on Computerization and Automation, IPSS 2 : 7, was adopted by the Approval Committee on Design Parameters, IPSS 2, on 25 October 1988.

0.2 Interplant Standards on design parameters primarily aim at achieving nationalization and unification of parts and assemblies of process and auxiliary equipment used in steel plants and these are intended to provide guidance to the steel plant engineers, consultants and manufacturers in their design activities.

0.3 Measurements of surface finish of rolled product become necessary to determine whether the products remain within marketable tolerances. These data also are required to be fed to control system in the upstream for regulation purposes. Measurements should be accomplished to provide an average numerical value. This is achieved by load cell based instrument comprising of a measuring roll, signal processing unit and a video display unit.

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1. Scope — This Interplant Standard applies to the sensors for measurements of surface finish of flat rolled products which require high degree of precision, accuracy and resolution, and robust housing to give long term reliable service in normal steel plant atmosphere.

2. Accuracy of Measurement — Accuracy of the measurement shall be better than 0·5 percent.

3. Environmental Temperature and Humidity — The sensor shall function satisfactorily in the maximum temperature of 150°C and maximum humidity of 100 percent. The electronic modules will function satisfactorily in maximum temperature of 70°C and maximum humidity of 100 percent.

4. Casing — The modules shall be housed in dustproof casings suitable for industrial environment.

5. Stability — The sensor output shall not change by more than 0·1 percent by 10 percent change of power supply or 50°C change of temperature.

6. Output — Following shall be available outputs:

a) Video output for extra display unit,

b) Output for flatness profile recording 4-20 mA,

c) Output to control roll bending system 4-20 mA,

d) Output to other computer:

Series transmission — 7 or 8 bit datawords EZA standard RS—232 C

9 600 be vd with 200 m cable length, and

e) *Alarm output* — Potential free contact.

7. Material of the Housing — Material of the housing of all units shall be suitable for use in corrosive and dusty atmosphere.

8. Design Features

8.1 The measuring roll shall be divided into a number of measuring zones. When a strip would run over the roll, the measuring zones shall be subjected to a radial force proportional to the strip stress. Sensitive load cells shall convert the material force into electrical signals. The signals from the measuring roll shall be processed in a dedicated microcomputer. The result shall be displayed on a Videomonitor in the form of a flatness profile. The flatness curve shall be recorded on a recorder. Microcomputer also shall calculate the average as well as maximum deviation of the surface profile from a reference axis. The output shall be given in mm.

Amendments Issued (*to be filled up by the user department*):

No.	Date of Issue	No.	Date of Issue
1		3	
2		4	

UDC 681·586 : 669-122

8.2 The measuring roll shall have a steel core with four axial grooves in which the transducers shall be located by screws. The measuring roll shall be divided into zones of 52 mm wide with four transducers in each zone.

8.3 Hardened steel rings shall be shrunk on to the steel core to protect the transducers and prevent marks appearing on the rolled strip. The surface shall be hard and wear-resistant, but sufficiently elastic to transmit forces from the strip.

8.4 All the connections from transducers shall be brought out to a multiple-pole connector at one of the journals. A slipring unit shall be used to transfer the supply voltage and measuring signals between the transducers and signal processing unit.

8.5 The signal processing unit shall have microcomputer together with power supply, having facilities for simulation, testing and calibration It shall have switching section to connect and disconnect various functions.

8.6 The signal from each measuring zone shall consist of an amplitude-modulated carrier wave. The modulation shall be obtained whenever any transducer is subjected to loading from the strip. The signals from each measuring zone shall be processed in individual measuring channels in the signal processing equipment.

8.7 A 12 inches video display unit for industrial use shall be supplied together with a protective cover to enable it to be used in rolling mill environment.

8.8 There shall be software driven connections for strip temperature, grade of steel, edge transducers etc.

8.9 The data shall be provided for recording purpose once every 30 seconds during rolling. Video display for flatness shall be provided every 10 seconds during rolling.

8.10 The system shall be capable of working with:

a) *Strip speed* — 3 000 m/min, *Max*;
b) *Strip width* — 2 184 m, *Max*;
c) *Strip thickness* — 0·1-5 mm;
d) *Strip stress* — 10-500/N/mm; and
e) *Strip tension* — 750 kN, *Max*.

8.11 Measuring roll shall satisfy the following:

a) *Diameter* — 315 mm approximate,
b) *Bearing* — Cylindrical or spherical roller bearings in steel bearing housings or cartidge, and
c) *Ability to withstand load* — 170 kN.

8.12 *Power Supply* — Mains voltage 220 V, 50 Hz, approximate power : 1 000 VA.

9. Specification of Measuring Roll

9.1 The following shall consist the specifications of measuring rolls:

a) Outside diameter : 315 mm approximate,
b) Minimum permitted outside diameter (after grinding) : 307 mm,
c) Length including journals : $n \times 52 + 550$ mm approximate (n = number of measuring zones),
d) Weight including bearings and slipring unit : $n \times 30 + 200$ kg,
e) Maximum torque on standard shaft extension for drive motor : 900 Nm,
f) Roll surface (hardened hot steel) : hardness 54 HRC,
g) Dynamic balancing : 16 g m/kg at 1 400 r/min,
h) Maximum wrap angle : 70°,
j) Measuring zone width : 52 mm approximate,
k) Number of measuring zones : upto 42,
m) Measuring range per zone : 50-12 000 N,
n) Measurable change of force per zone : 3 N,
p) Maximum loads:
   i) Instantaneous overload per zone : 25 000 N without recalibration, and
   ii) Continuous radial load on measuring rolls : 17×10^4 N,
q) Instantaneous radial overload on measuring rolls : 15×10^5 N,
r) Minimum radial load per zone to retain guaranteed accuracy : 50 N,
s) Maximum temperature to be borne by measuring roll surface : 175 °C,
t) Maximum temperature to be borne by bearings : 130 °C,
u) Bearing life : at least 10 000 hours, and
w) Maximum speed for:
   i) Spherical roller bearings : 2 200 r/min, and
   ii) Cylindrical roller bearings : 3 000 r/min.

9.2 One measuring roll shall include bearings, bearing housings and 46-channel slip-ring unit with protective cover.

10. Output Recording — UV-Recorder shall be provided for recording output profile curve.

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