INTERPLANT STANDARD - STEEL INDUSTRY		
IPSS	**SPECIFICATION FOR** **CORIOLIS TYPE MASS FLOWMETER**	**IPSS: 2-07-103-15**
	No Corresponding IS Exists	Formerly-: *(New Standard)*

0. Foreword

0.1 Interplant standardization activity in steel industry is being pursued under the aegis of Steel Authority of India Limited (SAIL). This interplant Standard has been prepared by the Standards committee on Computerization and Automation IPSS 2:7, with the active participation of representatives from the steel plants, other concernd organizations and established manufacturers in the field, and was adopted on May, 2015.

0.2 Interplant Standards on design parameters primarily aim at achieving rationalization 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, consultantants and manufacturers in their design activities.

0.3 Objective:

Objective of this standard on specification of coriolis type mass flow meter is to give an idea for accurate mass flow measurement of fluids and to help selection of coriolis flow meter in steel plant application.

1.0 Scope

This standard covers different parameters which are to be given attentions while selection of **coriolis type flow meters** for its application in steel plants.

2.0 Definitions

2.1 Mass flow measurement means actual mass of the fluid, irrespective of its pressure, volume or temperature, flowing through a pipeline.

2.2 Coriolis type mass flow meter is considered as direct type or inertial type mass flow meter.

3.0 Principle of measurement:

3.1 Coriolis force, named after French mathematician Gustava Coriolis (1792-1843), is generated whenever a mass in a rotating body moves relative to that body, in a direction toward and away from the axis of rotation.

3.2 Coriolis flow meter often contain one or more vibrating measuring tubes in the form of “U” or straight tube design. The tubes are forced to resonate at a specific frequency that is altered by the coriolis forces of a flowing medium. The fluid to be measured flows through the tubes and accelerates as it reaches the excitation driver, or maximum vibration point.

Upon leaving that point, it decreases, causing the tubes to twist. The amount of twisting is detected by electromechanical pick up coils and is directly proportional to the flow.
As mass flow rate increases through the tubes, so does the degree of twisting. By monitoring the amplitude of this twisting motion we may infer the mass flow rate of the fluid thru the tube.

3.3 A parallel U-tube next to each other used to eliminate external vibration and the amount of vibration generated by the coriolis flow meter. U-tubes are shaken in complementary fashion and in opposite to each other direction. Tube twist is measured as relative motion from one tube to the next. This ideally eliminates the effect of any common mode vibration of the inferred flow measurement.

4.0 Specifications:

4.1 i) **Type** of Flow meter: Coriolis mass flow meter

ii) Process media type : Liquid, gas, Steam, suspended solids/Slurry

iii) Fluid's composition and characteristic as given below should be charted.

Pressure :	Min._____	Max._____	Normal:_____
Temperature :	Min._____	Max._____	Normal:_____
Viscosity :	Min._____	Max._____	Normal:_____
Flow rate :	Min._____	Max._____	Normal:_____
Density:	Min._____	Max._____	Normal:_____

iv) Aggressive/Corrosive process media : For aggressive/corrosive media. Suitable material for wetted part shall be selected.

v**) Pipe Diameter** : Diameter of process pipe with pipe schedule need to be considered.

vi) Suitable for high Viscous fluid.

4.2 **Measurement Items**: Mass flow, density, temperature.
Derived values like concentration, volume flow, net flow etc.

4.3 **Mass flow measurement**:
Range: 0.04 to 600 t/hr

4.4 **Pressure class**: ANSI # 150, #300,#600,#900 etc.
type of flange should be mentioned.

5.5 **Accuracy of mass flow** :
Liquid: Approx. ±0.1% of flow rate, or better
Gas : Approx. ±0.5% of flow rate, or better
Zero Stability : 0.003 to 25 kg/hr
Static Pressure Effects: 0.000 to 0.0074 % of rate per Bar.

5.6 **Supply voltage**:
AC supply : 90 V to 260 V, 50 Hz
DC supply: 20 v to 28 v dc
Power consumption: 10 W/ 25 VA
Install a circuit breaker of rating 5A/250V.

5.7 **Signal Output** :

DC 4-20 mA superimposed HART (Latest Version)
Foundation Field Bus/ Profibus PA

5.8 **Local Display**: Local LCD display in engg. unit.

5.9 **Features (Optional):**

i) Measures density, temperature additionally.
ii) Audio/Visual Alarm
iii) Controller function – receives sensor input and provide control (Limit, PID, Logic etc.) output signal
IV) Ethernet Communication

5.10 **Differential Pressure requirement**:
Pressure drop across the meter should be considered for specific applications.

5.11 **Calibration:**
Certificate: Certificate traceable to national/international standard need to be specified.
Zero Adjustment for the meter should be available. FCRI Certification for (Non Condensing) Custody transfer meter.

5.12 Ambient humidity range: 0-95% RH
Ambient Temperature range : 0 – 65˚C
Process Temperature Range : - 0 - 150˚C, may be up to 350˚C.

5.13 Gas content limit for liquid/gas mixture may need to be considered.

6.0 Mechanical Requirements:

6.1 Protection Class : IP 66

6.2 Process Connection:
End Fittings: Clamp, Compression, Flanged, Threaded etc.

6.3 Integral or remote Unit :
Distance from remote unit to flow meter to be considered.

7.**0 Programmable :**

- Built in microprocessor, they can be adjusted electronically for different materials, ranges, outputs etc.
- Compatible with universal HART or Field Bus communicator.
- Recorder/Totalizer Function: Totalize the amount of materials, media or process variable. A recorder function like data logger that logs system or process variable may be available.

8.**0 General Guidelines**

8.1 Advantages and Disadvantages of Coriolis flow meter:

8.2 **Advantages:**

i) There is essentially no moving parts.
ii) They provide a density output also.
iii) Uncertainty level are in the 0.1% range for mass flow of liquid, 0.5% of natural gases.
iv) Repeatability is generally 0.05%
v) Fast becoming one of the most popular metering technology. Almost standard for custody transfer applications.

8.3 **Disadvantages and limitations**:

i) Capital cost generally higher than other metering technologies.

ii) Depending on the manufacturer, they are limited to 6" line sizes. Large majorities are used in line sizes of 2"or less.

iii) More pressure drop than other technologies. Increased pumping costs to accommodate pressure drop can add up over time.

iv) Manufacturers publish 100:1 turn down ratios, but as with most metering technologies, performance does degrade at the low end of the meter factor curve limiting to a more realistic 20:1 to maintain custody transfer accuracy. A meter's performance can broadly be determined by its turn down ratio. It is the effective dynamic or operating range of flow meter.

v) Dynamic response of coriolis meters has been proven to be slow compared to other technologies due to the signal processing and physical characteristic of the meter itself. This can be an issue for process control where a fast response time may be necessary.