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Belt weighers

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently, JIS B 7606 : 1991 (former edition) is replaced with this Standard. JIS B 7606 : 1997 contains Annex as under :

Annex Test chains.

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Belt weighers

1 Scope This Japanese Industrial Standard specifies the belt weighers with a maximum instantaneous load of not less than 15 kg which detect electrically the mass of various kinds of bulk materials and products being transported continuously by a belt conveyor and the belt speed and measure the transported quantity on the basis of both values. Belt weighers attached with controller which supply a fixed quantity, are excluded.

Remarks : The following Standards are normative references to this Standard :

JIS Z 8103 *Glossary of terms used in instrumentation*

JIS Z 8306 *General rules for scale of industrial instruments*

2 Definitions For the purposes of this Standard, the definitions given in **JIS Z 8103** and the following definitions apply :

- (1) **measuring roller** A roller mounted in contact with the belt for transmitting the mass of measured material to the load detector.
- (2) **load receiving stand** The frame which attaches the measuring roller.
- (3) **measuring capacity** The mass of measured material per unit hour which can be measured and transported satisfying the performance. The upper limit is called the maximum measuring capacity and the lower limit is done so the minimum measuring capacity.
- (4) **measuring range** The range of use of the belt weighers indicated by the maximum measuring capacity and the minimum measuring capacity.
- (5) **working length** The part of belt and its effective length on which the material to be measured equivalent to the mass to be transmitted to the load detector is loaded.

The effective length shall be as follows according to the number of measuring rollers:

- (a) case of single roller

$\frac{1}{2}$ of the sum of the distances between the axis of measuring roller and the axes of carrying rollers adjacent to the both ends of it.

- (b) case of plural rollers

The length of the distance between the axes of measuring rollers at both ends to which $\frac{1}{2}$ of the sum of the distances between the axes of these measuring rollers and the axes of the carrier rollers adjacent thereto is added.

- (6) **instantaneous load** The material being measured which lies on the working length instantaneously during the measurement and transportation. The material being measured at the time of the maximum measuring capacity is called the maximum instantaneous load.

- (7) **speed detecting device** A device which detects the transported quantity on a belt or the transporting speed.
- (8) **integrating indication device** A device which indicates the mass transported by belt conveyor by integrating.
- (9) **test chain** An instrument used in testing for the error of integrated value to which rotary weights are connected in a chain link form to have the specific mass per unit length.

3 Classification Belt weighers shall be classified according to the structure into the following two types.

- (1) **Integrated type** Belt weighers with integrated belt conveyor, load detecting device, and speed detecting device.
- (2) **Attached type** Belt weighers for which the load detecting device and speed detecting device are attached to the belt conveyor installed on site.

4 Grade Belt weighers shall, according to the performance, be divided into six grades of grade R0.5, grade R1.0, grade R2.0, grade F0.5, grade F1.0 and grade F2.0.

5 Performance

5.1 Measuring range The measuring range shall be according to the type, as follows :

- (1) **Integrated type** 20 % to 100 % of the maximum measuring capacity.
- (2) **Attached type** 35 % to 100 % of the maximum measuring capacity.

5.2 Error of the integrated value The error of the integrated value shall, in each grade, not exceed the value shown in Table 1.

Table 1 Tolerance on the error of integrated values

Grade	Tolerance ⁽¹⁾
Grade R0.5	±0.5 % of transported mass
Grade R1.0	±1.0 % of transported mass
Grade R2.0	±2.0 % of transported mass
Grade F0.5	±0.5 % of reference value ⁽²⁾ at the maximum measuring capacity
Grade F1.0	±1.0 % of reference value ⁽²⁾ at the maximum measuring capacity
Grade F2.0	±2.0 % of reference value ⁽²⁾ at the maximum measuring capacity

Notes (1) The tolerance shall be the value nearest the calculated value and the integer multiple of the scale interval of integrating indication device.

(2) The mass of the material to be measured transported during the same time at the maximum measuring capacity and obtained by the following formula :

$$S = \frac{M \times Q_M}{Q} = Q_M \times t \times \frac{1\,000}{3\,600}$$

where, S : reference value (kg)
 Q : measuring capacity at the time of operating (t/h)
 M : mass of measured material which was transported (kg)
 Q_M : maximum measuring capacity (t/h)
 t : time required for transportation (s)

5.3 Error of zero point When operating with no load, the error of integrated value shall not exceed the value given in Table 2 in each grade and type.

Table 2 Tolerance on the error of zero point

Grade	Tolerance ⁽¹⁾	
	Integrated type	Attached type
Grade R0.5	±0.05 % of reference value ⁽²⁾ at the maximum measuring capacity	±0.075 % of reference value ⁽²⁾ at the maximum measuring capacity
Grade R1.0	±0.1 % of reference value ⁽²⁾ at the maximum measuring capacity	±0.15 % of reference value ⁽²⁾ at the maximum measuring capacity
Grade R2.0	±0.2 % of reference value ⁽²⁾ at the maximum measuring capacity	±0.3 % of reference value ⁽²⁾ at the maximum measuring capacity
Grade F0.5	±0.15 % of reference value ⁽²⁾ at the maximum measuring capacity	±0.25 % of reference value ⁽²⁾ at the maximum measuring capacity
Grade F1.0	±0.3 % of reference value ⁽²⁾ at the maximum measuring capacity	±0.45 % of reference value ⁽²⁾ at the maximum measuring capacity
Grade F2.0	±0.6 % of reference value ⁽²⁾ at the maximum measuring capacity	±0.9 % of reference value ⁽²⁾ at the maximum measuring capacity

5.4 Measuring properties

5.4.1 Stability of zero point When operating for three minutes with no load, the error of integrated value shall not exceed the value given in Table 3 in each grade.

Table 3 Tolerance on the stability of zero point

Grade	Tolerance ⁽¹⁾
Grade R0.5 and Grade F0.5	0.001 3 % of the mass transported when operating for one hour at the maximum measuring capacity.
Grade R1.0 and Grade F1.0	0.002 5 % of the mass transported when operating for one hour at the maximum measuring capacity.
Grade R2.0 and Grade F2.0	0.005 % of the mass transported when operating for one hour at the maximum measuring capacity.

5.4.2 Sensitivity There shall be an error between the integrated values of two cases where operating without load and where operating with a load of mass equivalent to the value given in Table 4 in each grade.

Table 4 Mass of load applied

Grade	Mass of load applied
Grade R0.5 and Grade F0.5	0.05 % of the mass of the maximum instantaneous load
Grade R1.0 and Grade F1.0	0.1 % of the mass of the maximum instantaneous load
Grade R2.0 and Grade F2.0	0.2 % of the mass of the maximum instantaneous load

5.5 Shift error The error of integrated value caused by shift of load shall not exceed the values given in Table 5.

Table 5 Tolerance on shift error and on environmental resistance

Grade	Tolerance ⁽¹⁾
Grade R0.5 and Grade F0.5	±0.18 % of the mass transported
Grade R1.0 and Grade F1.0	±0.35 % of the mass transported
Grade R2.0 and Grade F2.0	±0.7 % of the mass transported

5.6 Environmental resistance

5.6.1 Temperature In the temperature circumstance where the operating temperature range is indicated (if not indicated, -10 °C to +40 °C), the error of integrated value shall not exceed the tolerance in Table 5.

The indicated operating temperature range shall be of the difference of 30 °C or more between the upper limit and the lower limit.

5.6.2 Humidity In the environment of 20 °C in temperature and 50 % in relative humidity ; and the environment of the upper limit of the indicated operating temperature range (+40°C if not indicated) and the relative humidity of 85 %, the error of integrated value shall not exceed the values given in Table 5.

5.6.3 Fluctuation of power source voltage When operating at the voltage between 85 % and 110 % of the rated voltage indicated, the error of integrated value shall not exceed the values given in Table 5.

5.6.4 Instantaneous power interruption The difference between the integrated value in a state where the power source voltage stops or drops instantly and the one in normal state shall not exceed the values given in Table 5.

5.6.5 Burst The difference between the integrated value in a state where burst is applied to the main power source and the one in a state of no burst is applied shall not exceed the values given in Table 5.

5.6.6 Static electricity discharge The difference between the integrated value in a state where aerial discharge of static electricity is given to a part of belt weigher (except belt conveyor) and the one in a state of no aerial discharge shall not exceed the values given in Table 5.

5.6.7 Electromagnetic wave sensitivity The difference between the integrated value in a state of being exposed within electromagnetic field and the one in a state of not being exposed shall not exceed the values given in Table 5.

6 Composition, structure and function

6.1 Composition The belt weigher shall be composed of belt conveyor, load detecting device, speed detecting device, auxiliary device and integrating device; suitable for using condition intended and material to be measured; and designed so that actual machine test is possible in a state of being installed.

6.2 Structure and function The structure and function of belt weighers shall be as follows :

6.2.1 Belt conveyor The belt conveyor shall be able to transport smoothly the material to be measured with a measuring capacity within measuring range and to transmit correctly the mass of measured material to the measuring roller via the belt.

6.2.2 Load detecting device The load detecting device shall be as follows :

- (1) The measuring roller shall have a concentricity of a degree not affecting the performance of belt weigher and able to rotate smoothly and be fixed firmly on the load receiving table so as not to shift toward the moving direction of belt during the operation of belt conveyor.
- (2) The load receiving table shall be fixed firmly so as not to shift toward the moving direction of belt during the operation of belt conveyor.
- (3) The load transmission part shall be able to transmit certainly the load placed on the load receiving table to the load detecting device.
- (4) The load detecting device shall be mounted so as not to be affected by offset load.

In addition, in the load detecting device which can, with the test of its single unit, check simply the performance of belt weigher, there shall be no difference of the direction of the force working on the load detecting device between at the time of simple check and at the time of operation of the belt weigher.

6.2.3 Speed detecting device The speed detecting device shall be able to transmit accurately the transported amount of belt or the signal in proportion to transporting speed to the related device.

6.2.4 Auxiliary device The auxiliary device shall not affect the measuring performance.