References OIML R 76-1:

F.1 Weighing instruments

The following metrological and technical data of the weighing instrument are necessary for the compatibility check:

Accuracy class of the weighing instrument.

Max	(g, kg, t)	Maximum capacity of weighing instrument according to T.3.1.1 (Max_1, Max_2, …, Max in the case of a multi-interval weighing instrument and Max_1, Max_2, …, Max_r in the case of a multiple range weighing instrument).
e	(g, kg)	Verification scale interval according to T.3.2.3. (e_1, e_2, e_3) (in the case of a multi-interval or multiple range weighing instrument, where $e_1 = e_{min}$).
n		Number of verification scale intervals according to T.3.2.5: $n = Max / e$ (n_1, n_2, n_3) (in the case of a multi-interval or multiple range weighing instrument, where $n_i = Max_i / e_i$).
R		Reduction ratio, e.g. of a lever work according to T.3.3, is the ratio (Force on the load cell) / (Force on the load receptor).
N		Number of load cells
IZSR	(g, kg)	Initial zero setting range, according to T.2.7.2.4: the indication is automatically set to zero when the weighing instrument is switched on, before any weighing.
NUD	(g, kg)	Correction for non-uniform distributed load**.
DL	(g, kg)	Dead load of load receptor: mass of the load receptor itself resting upon the load cells and any additional construction mounted on the load receptor.
T^+	(g, kg, t)	Additive tare.
T_{min}	(°C)	Lower limit of temperature range.
T_{max}	(°C)	Upper limit of temperature range.

CH, NH, SH — Symbol of humidity test performed.

Connecting system, 6-wire-system:

L	(m)	Length of connecting cable.
A	(mm²)	Cross section of wire.
Q		Correction factor. The correction factor, $Q > 1$ considers the possible effects of eccentric loading (non uniform distribution of the load), dead load of the load receptor, initial zero setting range and additive tare in the following form:

$$Q = (Max + DL + IZSR + NUD + T^+) / Max$$

** The values for the non uniform distribution of the load generally might be assumed for typical constructions of weighing instruments when no other estimations are presented.

- Weighing instruments (WIs) with lever work and one load cell, or WIs with load receptors which allow only minimal eccentric load application, or WIs with one single point load cell: 0 % of Max
  e.g. hopper or funnel hopper with a symmetric arrangement of the load cells, but without shaker for material flow on the load receptor
- Other conventional WIs: 20 % of Max
- Fork lift scales, over head track scales and weighbridges: 50 % of Max
- Multi-platform weighing machine:
  fixed combination: 50 % of Max_{total}
  variable selection or combined: 50 % of $Max_{single\ bridge}$

F.2.4 Maximum capacity of the load cell

The maximum capacity of the load cell shall satisfy the condition:

$$E_{max} \geq Q \times Max \times R / N$$

F.2.5 Minimum dead load of the load cell

The minimum load caused by the load receptor must equal or exceed the minimum dead load of a load cell (a lot of load cells have $E_{min} = 0$):

$$E_{min} \leq DL \times R / N$$

Weighing Instrument type	Max	DL	IZSR	NUD	T+	N	Minimum Failsafe factor used to calculate individual load cell capacity by multiplying final value
Single point load cell up to 1000 kg	Maximum scale capacity	Actual dead load acting on the load cell	Set value of the Initial zero 2 % to 4 % including 2 % and 4 %	0 %	T+ value if set or zero for all T-values	1	1
Four load cell up to 5000 kg	Maximum scale capacity	Actual dead load acting on the all load cells	Set value of the Initial zero 2 % to 4 % including 2 % and 4 %	20 %	T+ value if set or zero for all T-values	4	2
Truck scales (Weighbridges) up to 100000 kg	Maximum scale capacity	Actual dead load acting on the all load cells	Set value of the Initial zero 2 % to 4 % including 2 % and 4 %	50 %	Not applicable taken as zero for calculation	4 or 6 or 8	1

Q= (Max+DL+IZSR+NUD+T^+)/Max

load cell capacity required E max >=(Q x Max/N)

However selected load cell shall not exceed 2 times the actual load cell capacity required

For the actual design considering the failure modes it is safe to calculate load cell capacities considering the failure modes for durability and prevent failures.

load cell capacity required considering the failure modes >=E max x fail safe factor

Specific calculations of the load cell capacities based on the design of the weighing scale

Example calculations

1) Weighing scale with single point loadcell (Up to 1000 kg-platform size does not exceed the load cell's specifications)

Ex: 1000 kg weighing scale with 100 kg Dead load, IZSR=4%, NUD=0%, with negative tare

Q= (Max+DL+IZSR+NUD+T^{+})/Max

Q=(1000+100+1000x4/100+1000 x 0/100+0)/1000

=(1000+100+40+0+0)/1000

=1.14

load cell capacity required E max >=(Q x Max/N)

capacity of load cell >=(1.14x1000/1)

>=1140 kg

Fail safe factor=1

The nearest available higher capacity load cell shall be selected; 1200 kg is a suitable load cell capacity

2) Weighing scale with four load cells (Up to 5000 kg)

Ex: 1000 kg weighing scale with 100 kg Dead load, IZSR=4%, NUD=20% , negative tare

Q= (Max+DL+IZSR+NUD+T^{+})/Max

Q=(1000+100+1000x4/100+1000 x 20/100+0)/1000

=(1000+100+40+200+0)/1000

=1.34

load cell capacity required E max >=(Q x Max/N)

>= (1.34x 1000/4)

>=335 kg

However it is possible to touch only two legs of the scale if the perfect leveling is not done, considering this failure mode, we can consider two load cells instead of four load cells.

load cell capacity required considering the failure modes >=E max x fail safe factor

Fail safe factor= 2

>=335 kg x 2

>=670 kg

The nearest available higher capacity load cell shall be selected; 800 kg is a suitable load cell capacity

3) Truck scales (Weighbridges) (Up to 100000 kg)

Ex: 20000 kg truck scale with 4 load cells, 2000 kg Dead load, IZSR=4 %, NUD=50 % No tare function is permitted

Q= (Max+DL+IZSR+NUD+T^+)/Max

Q=(20000+2000+(20000x4/100)+(20000x50/100)+0)/20000

=(20000+2000+800+10000+0)/20000

=1.64

Required load cell capacity>= (QxMax/N)

>=(1.64*20000/4)

>=8200 kg

If the weighbridge is properly balanced to distribute the load;

Fail safe factor=1

The nearest available higher capacity load cell shall be selected; 10000 kg is a suitable load cell capacity