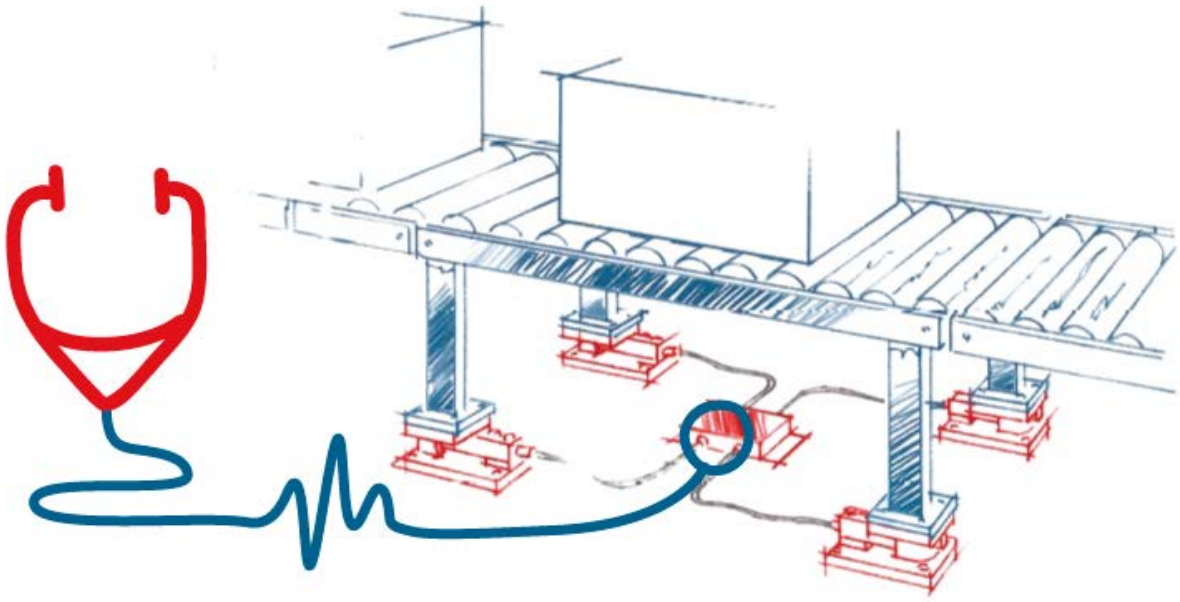
Technical Notes

Checking of weighing chain



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1. Requirements

This document will help you to diagnose if one or many elements of your weighing system are faulty.

First of all, it is important to identify all the components of the weighing system:

- Transmitter;
- Link cable between transmitter and junction box;
- Junction box (if there's one);
- Load cells.

To carry out the tests, you will need the following tools:

- Small flat screwdriver;
- Cross-headed screwdriver;
- Multimeter with Ohmmeter option.

You will also need the datasheets or control certificates of the load cells to check their input/output value resistance.

2. Tests to perform

There are three tests to do in order to check the weighing system:

- Continuity test of the link cable;
- Function and continuity test of the junction box;
- Load cells test.

3. Link cable test

In some cases, multi-cells chain is used for massive system as silos our weighing-bridge. In this case, a junction box could be used to link the cells between each other and issue the signal through one electric cable to the transmitter.

In this context, it is important to check the health of the cable. Sometimes the cable can be cut inside the sheath, so a short circuit has occurred. It is therefore necessary to carry out a compliance test on this electric cable.

You will need to unplug all the wires, then to twist wires pairs between each other:

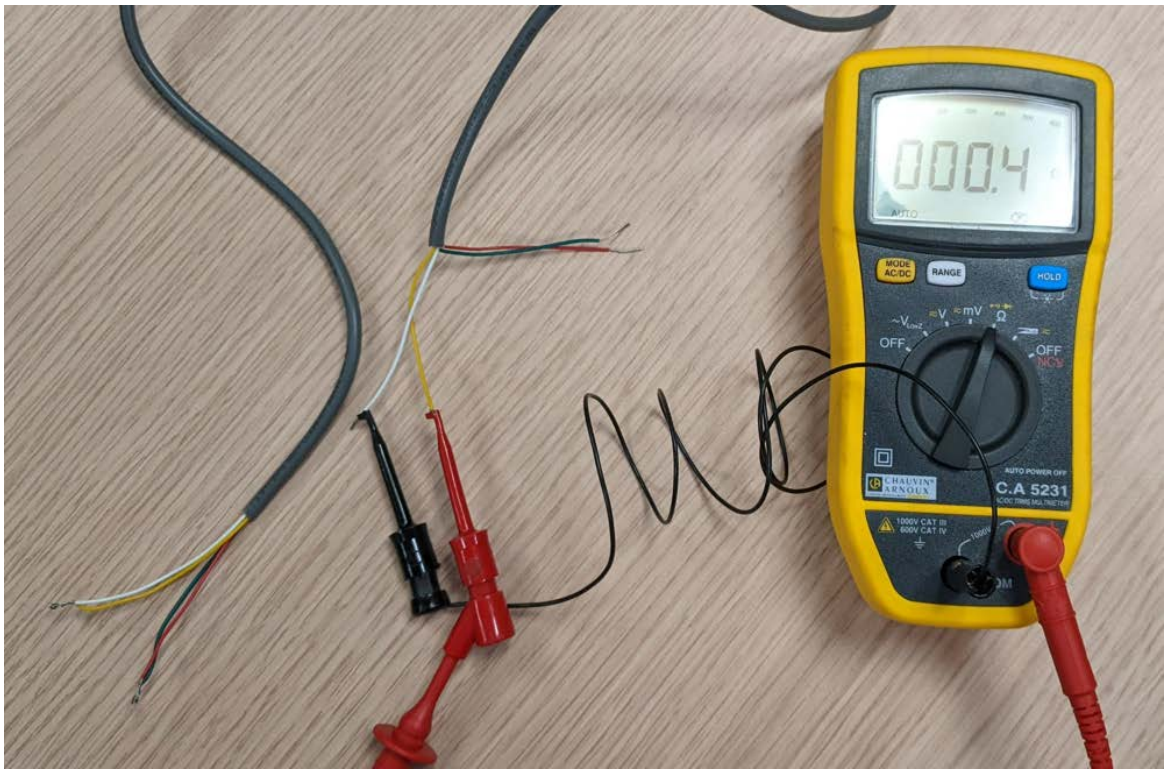
- Wires EXC+ / EXC-
- Wires SIG+ / SIG-
- Wires SEN+ / SEN- (if it's a 6 wires load cell/weighing chain)

Plug then, at the end the multimeter in Voltmeter, each pair twisted.

Example: If EXC+ is red and EXC- is black, then twist them together and plug the multimeter on each wire at the opposite side. Use the multimeter in impedance mode and read the value. Repeat this test for each pair.

This value shouldn't be equal to 0 or over 10Ω.

If it's not the case, the cable is potentially damage and needs to be replace.



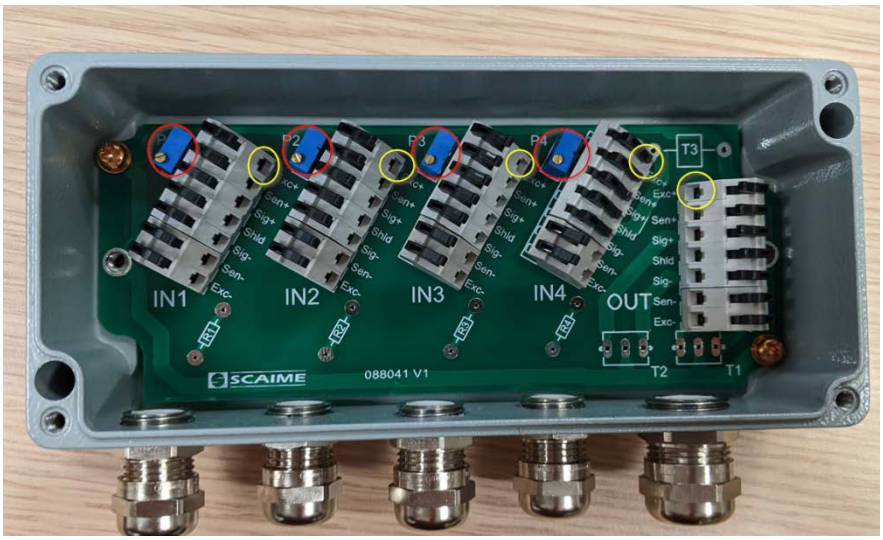
Pic 1. Continuity measurement test on an electric cable

4. Junction box test

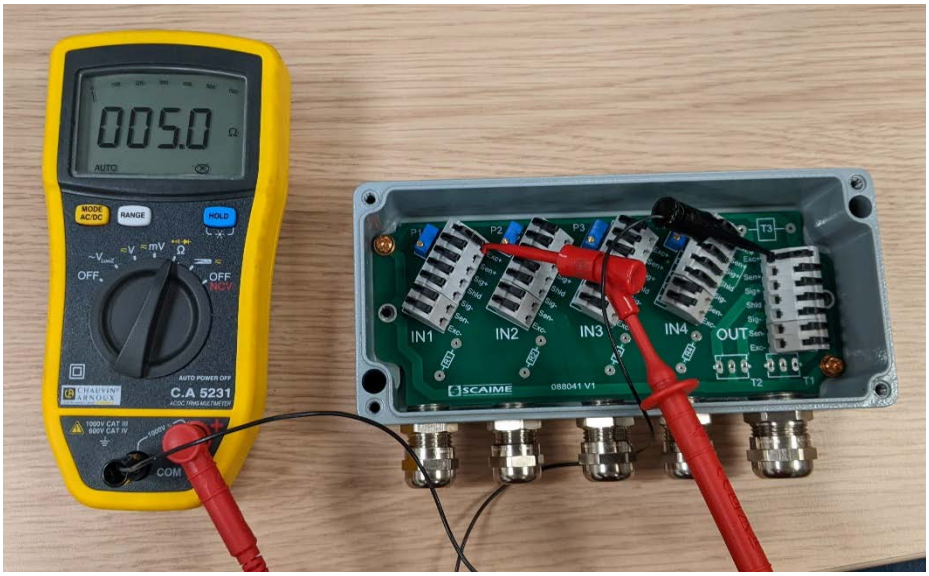
This step consists to check the impedance through measurement supply circuit. For this, you will need to unplug wires of each load cell from terminal blocks of the junction box.

You need then to plug the wires of the multimeter. One of them needs to be plugged in **« Exc + »** block from **« OUT »** terminal (wire going to transmitter). Second one needs to be plugged in **« EXC+ »** block of **« IN »** block, each after each (Pic.3 below).

The value to be displayed must be 5Ω. To obtain this value, turn the potentiometer until it is reached.



Pic 2. Junction box, terminal block and potentiometer circled



Pic 3. Impedance test of the junction box

If the chain was factory calibrated at SCAIME, potentiometer must have red varnish on them. This means that there were already adjusted. If the value is not 5Ω, you can adjust them.

In case of value of 0Ω or "Over" is displayed, it is possible that there is a short circuit and the circuit board needs to be changed.

5. Load cells test

To carry out cells test, it will be necessary to knowthe theorical or measured impedance value of the cells used.
These values can be found on the datasheet for the theorical value,on our website (Scaime - load cells, testing, measurement & industrial control), or on the cells certificates for the measured value (Pic 4 and 5).

Caractéristiques - *Specifications*

MÉTROLOGIQUES	*METROLOGICAL*	C3 10e	C6 10e	
Capacité nominale (Cn)	*Rated capacity (Cn)*	10, 20, 50, 100, 200, 300, 500		kg
Erreur combinée	*Combined error*	±0.017	±0.008	%Cn
Effet de la temp. sur le zéro	*Temperature effect on zero*	±0.0014	±0.0014	%Cn/°C
Effet de la temp. sur la sensibilité	*Temperature effect on sensitivity*	±0.0014	±0.0007	%Cn/°C
Fluage (30 min.)	*Creep error (30 min.)*	±0.025	±0.012	%Cn
Taille de plateau maximum	*Maximum platform size*	-	-	mm
MÉTROLOGIE LÉGALE OIML R60	***LEGAL METROLOGY OIML R60***			
Classe de précision	*Accuracy class*	C3	C6	
Capacité maximale (Emax)	*Maximum capacity (Emax)*	10, 20, 50, 100, 200, 300, 500		kg
Nombre max. d'échelons (nmax)	*Max. number of LC intervals (nmax)*	3 000	6 000	d OIML
Échelon de vérification min. (vmin)	*Minimum verification interval (vmin)*	Emax/10 000	Emax/10 000	kg
Z=Emax/(2xDR)	*Z=Emax/(2xDR)*	3 000	6 000	
ÉLECTRIQUES	***ELECTRICAL***			
Plage de tension d'alimentation	*Nominal range of excitation voltage*	1 ... 15		V
Sensibilité nominale à Cn	*Rated output at Cn*	2 ±1% (option ±0.05 %)		mV/V
Plage de zéro initial	*Zero balance*	±2.5		%Cn
Résistance d'entrée/sortie	*Input/output resistance*	385 ±20 / 350 ±5		Ω
Résistance d'isolement	*Insulation resistance*	5 000		MΩ/50V

Pic 4. Extract from cells datasheet, downloaded from SCAIME website on product dedicated rubric

CERTIFICAT DE CONTROLE FINAL
CONTROL CERTIFICATE

Contrôleur - *Inspector:*	e200006
Date - *Date:*	29 Dec 2021
Modèle - *Model:*	F60X 100 C3 10e 6-W TR
Référence - *Reference:*	402570
SN:	956966

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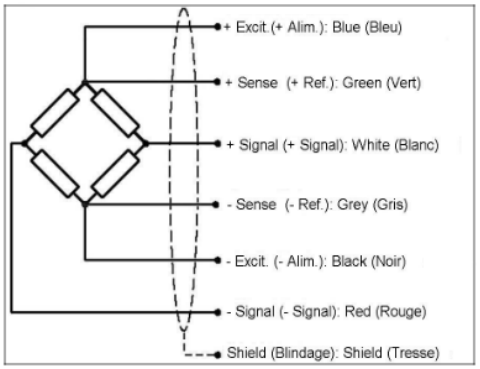
Capacité nominale - *Rated capacity:* (kg)	100
Sensibilité nominale,à Cn - *Rated output,at Cn:* (mV/V)	2.0004
Zéro initial - *Zero balance:* (uV/V)	-1
Résistance d'entrée - *Input resistance:* (Ω)	383.4
Résistance de sortie - *Output resistance:* (Ω)	350.0
Résistance d'isolement- *Insulation resistance:* (GΩ/50V)	> 5
Plage de temp.compensée - *Compensated temp. range:* (°C)	-10/+40
Degré de protection - *Protection class:*	IP 68
Durée garantie - *Warranty period:* (an/year)	3

Informations complémentaires - ***Additional information***

Schema de câblage - *Wiring color code*



Caractéristiques métrologiques du certificat d'essai - ***Test certificate***

Pic 5. Extract from control certificate of a load cell, delivered with it

You can also find dedicated information about wires and their colors on these documents.

With this information, you will need to do a 6-step impedance measurement for 4 wires products or 7-step for products that has 6 wires:

- Between EXC+ and EXC- : Input impedance;
- Between SIG+ and SIG- : Output impedance;
- Between SEN+ and SEN- : Input impedance (test for 6-wires cells);
- Between EXC+ and SIG +;
- Between EXC- and SIG-;
- Between EXC+ and SIG-;
- Between EXC- and SIG+.

The values between EXC and SIG are not reported into datasheet or certificates. But the values need to be equal with a 0,5Ω tolerance.
In case of suspect measurement, please contact SCAIME Support team.

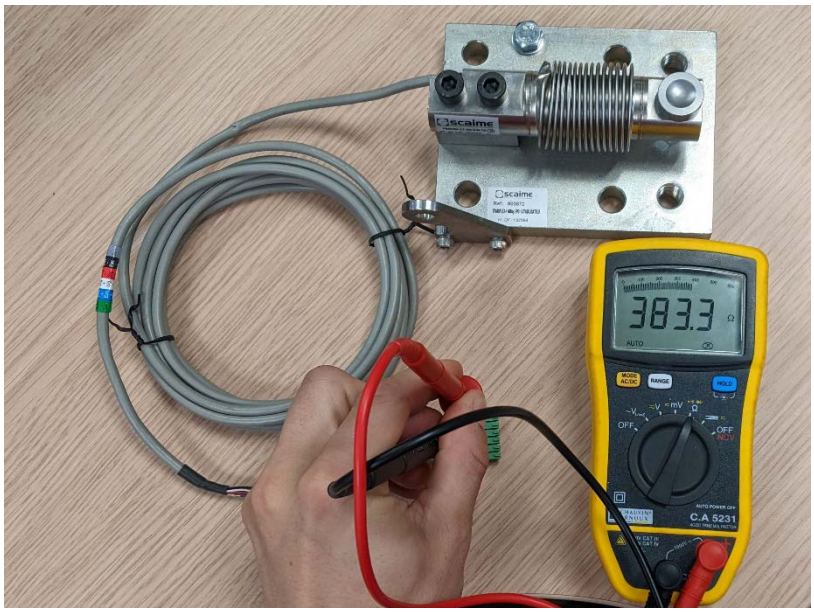
You can report the measurements in a table similar to the one below (it could be used as many as cells are used onto the chain).

Cells type	SK30X 2T C3 10e		
Input resistance	385 Ω	Tol (+/- Ω)	20 Ω
Output resistance	350 Ω	Tol (+/- Ω)	5 Ω
Sensitivity	2 mV/V		

		Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
EXC +	EXC -	383,5	383,8	382,8	382,3	383	383,3
SIG +	SIG -	350,4	350,6	350,4	350,6	350,4	350,2
SEN +	SEN -	383,5	383,8	382,8	382,3	383	383,3
EXC +	SIG +	293	291,4	291,3	291,4	291,5	291,3
EXC -	SIG -	291,6	291,2	291,6	291,5	291,3	291,4
EXC +	SIG -	291,4	291,5	291,2	291,3	291,4	291,2
EXC -	SIG +	291,6	291,3	291,4	291,6	291,2	291,5

Pic 6. Report table for cells test (SK30X example)

Obtained values must be into admissible tolerances. If one is out-of-tolerance, the cell must be defective.



Pic 7. Example of impedance test on a cell

Clear sheet to fill

Cells type			
Input resistance	Ω	Tol (+/- Ω)	Ω
Output resistance	Ω	Tol (+/- Ω)	Ω
Sensitivity	mV/V		

		Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
EXC +	EXC -						
SIG +	SIG -						
SEN +	SEN -						

EXC +	SIG +						
EXC -	SIG -						
EXC +	SIG -						
EXC -	SIG +						

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