

# CHOOSE THE RIGHT CONFIGURATION

## POSSIBLE CONFIGURATIONS OF ANALOG PASSIVE LOAD CELLS AND INDICATORS

### INTRODUCTION

The EN 45501:2015 and OIML R 76 (2006) describes the modular evaluation of load cells and indicators. The calculation of the compatibility of load cells and indicators is well documented (in annex F), but the recommendation does not describe the actual configurations in detail. Only in clause C.1.7 there is some information:

“Only indicators employing six-wire technology with remote sensing (of the load cell excitation voltage) shall be used if the load cell cable has to be lengthened or if several load cells are connected by means of a separate load cell junction box.”

This information is by far complete and therefore leads to confusion and misinterpretation. This white paper intends to fill in this information.

The approach in this white paper is based on generic technical implementations and is applicable for most weighing indicators. It is independent from the information in the certificates of load cells and indicators.

#### Notes:

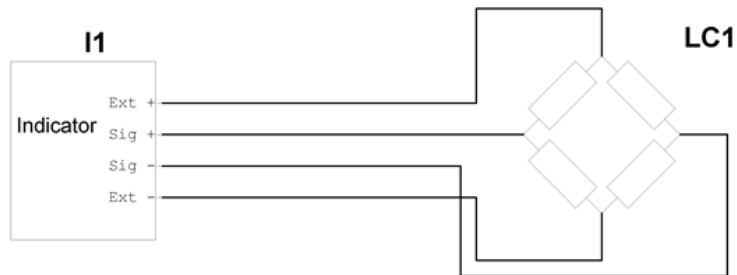
1. The EN 45501:2015 is identical to R 76 (2006) on this issue and therefore has the same interpretation problems.
2. Previous versions of EN 45501 and R 76 did not address this issue at all, and certificates based on these older versions may have information that does not match this white paper.
3. In this white paper the “indicators employing six-wire technology with remote sensing” are called 6-wire indicators. Indicators without this technology are called 4-wire indicators.
4. In this white paper the load cells supporting the “six-wire technology with remote sensing” are called 6-wire load cells. The load cells that do not support this technology are called 4-wire load cells.
5. If 4 wire load cells are used the cable length shall not be shortened. This applies to all configurations below.



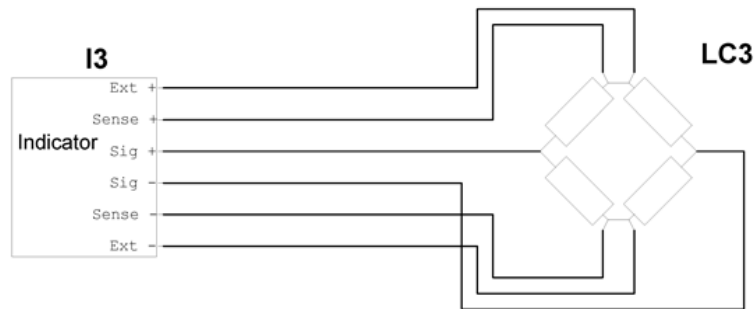
1. SINGLE LOAD CELL APPLICATIONS

For single load cell applications there are 3 basic configurations:

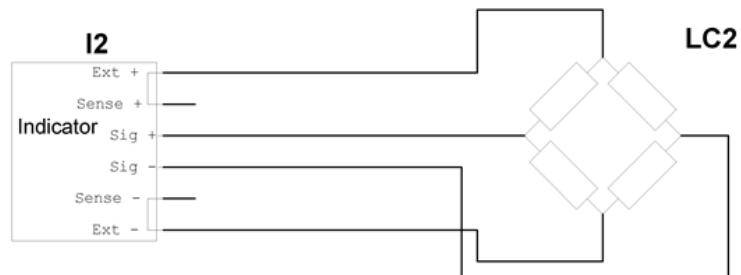
1. **4-wire indicator with 4-wire load cell**



2. **6-wire indicator with 6-wire load cell**



3. **6-wire indicator with 4-wire load cell**



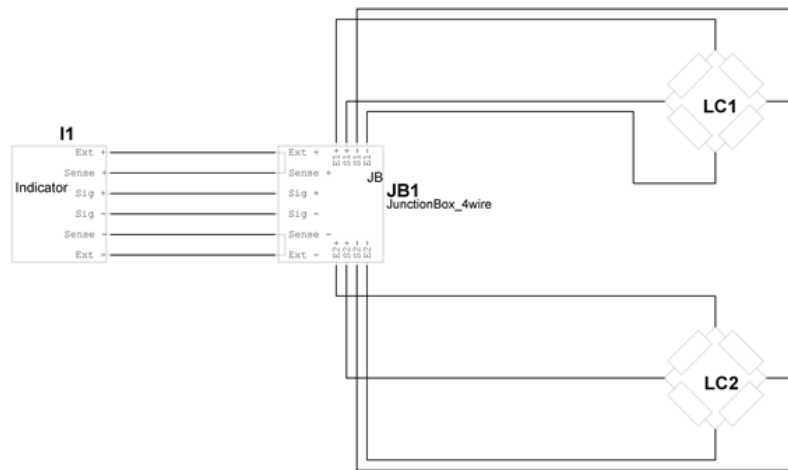
Notes:

1. These configurations do not cater for an extension of the load cell cable. If an extension is necessary, the configurations for "multiple load cell applications using sense do apply.
2. In the third configuration ("6-wire indicator with 4-wire load cell") the excitation voltage and the sense lines shall be connected to each other. Several indicators have support for this, using jumpers on the PCB. In all cases this connection can be made with shortening wire on the load cell connector.
3. The third configuration is allowed even if the certificate of the indicators only list the 6-wire connection.

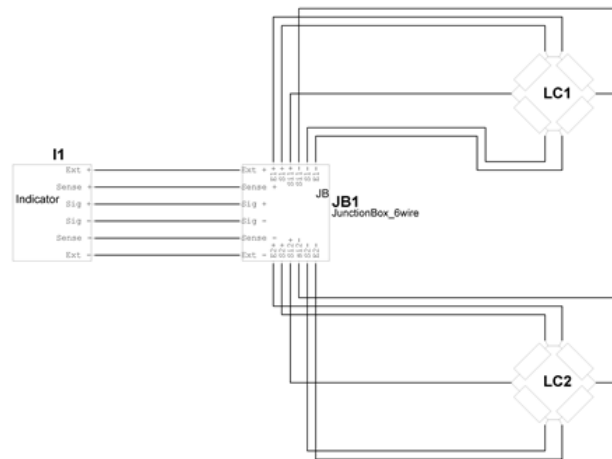
## 2. MULTI LOAD CELL APPLICATIONS USING SENSE

For multi load cell applications there are 2 basic configurations:

### 1. 6-wire indicator with 4-wire load cells



### 2. 6-wire indicator with 6-wire load cells



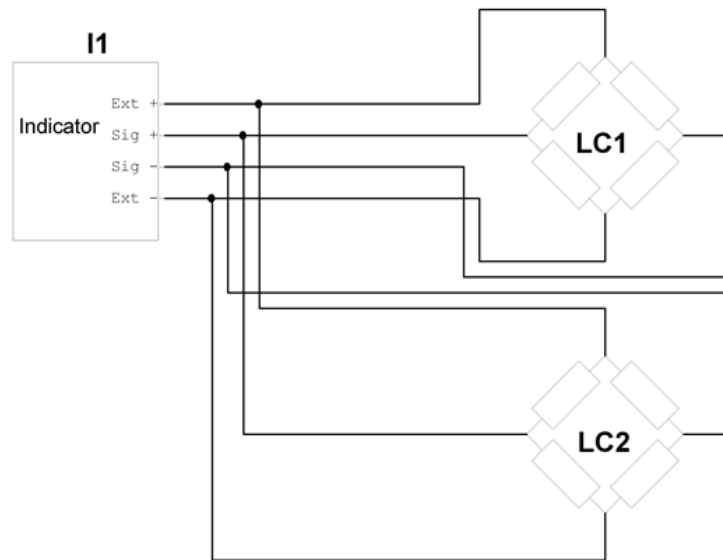
#### Notes:

1. The certificate of the indicator shall have specifications regarding the maximum length of the cable between the indicator and the junction box. The format of this specification may differ in between certificates. NMi uses a specification in m/mm<sup>2</sup> to cater for longer cable lengths using thicker wires.
2. These configurations are also applicable for single load cell applications where the load cell cable needs to be extended. The extension cable must support the "six-wire technology with remote sensing". This is the exact meaning of R 76 (2006) clause C.1.7.
3. The first configuration is the most common version. This is the proper implementation of the sense technology. The excitation voltage and sense lines shall be connected to each other inside the junction box
4. The second configuration is extending the sense technology all the way to the individual load cells. This has never been the intention of the sense technology. However, evaluations have shown that this configuration behaves very similar to the first configuration.

3. MULTI LOAD CELL APPLICATIONS WITHOUT SENSE

It is possible to use a 4-wire indicator with multiple load cells using this configuration:

**4-wire indicator with 4-wire load cells**



Notes:

1. This configuration is only possible without an extension cable between the indicator and the load cells. Therefore a junction box cannot be used and all the load cables shall be connected directly to the indicator. In most cases the mechanical construction of the indicator or the load cell connector is not suitable for more than one load cell cable. In those situations this configuration cannot be achieved in the right way and therefore cannot be used.



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