



# Non-Calibrated High Pressure Sensor

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Sensors & Actuators Plant Trutnov

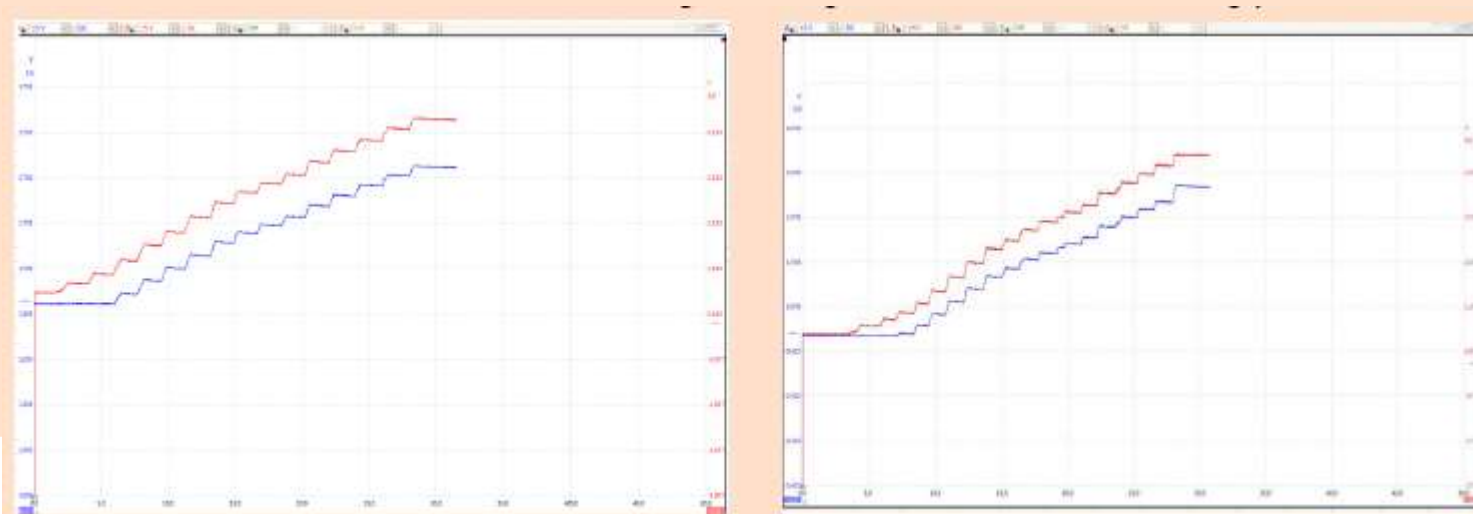
## Basic information:

Affected project - HPS: All analog and digital Projects

Affected amount of parts: 110 pcs of HPS total OEM1 World Wide / 212 Sensors out of TRU Plant

### Known behavior of parts which are not calibrated:

- Output of the sensor signal could be out of specification (see pictures below on this page)
- Effect of the wrong sensor's output could be:
  - Lower or higher power of the engine (depends on offset from specification limits).  
Acc. to IP results, there is very low risk of overpressure of the system.
  - Influence of engine emission (environmental issue).
  - There will be not the error message coming from sensor about wrong pressure in rail.



Red line – master part; blue line – not calibrated part

## Problem description

Parts were not calibrated because of mishandling with parts before calibration at Continental S&A Trutnov Location before being provided to Continental Newport News, Pisa and Changchun for assembly into SGE FCA as described herein. This was not able to be detected after FCA assembly as FCA plants check for electrical function and lack of calibration is detected when parts are pressurized in system.

Parts were switched in position in tray used for calibration which caused that one part has data belongs to second part. It means first part was scrapped on code verification and the second part sent to calibration few hours later has in traceability data from previous part and was not calibrated (because traceability has data, that the part was already calibrated).

The manual handling with part was done because of project fixtures change in hot temperature chamber (we have to cool down the chamber, change the fixtures, heat up the chamber) but previous processes can not be stopped. Therefore we have to move parts to small stock in front of calibration. Parts are stored in KLTs.

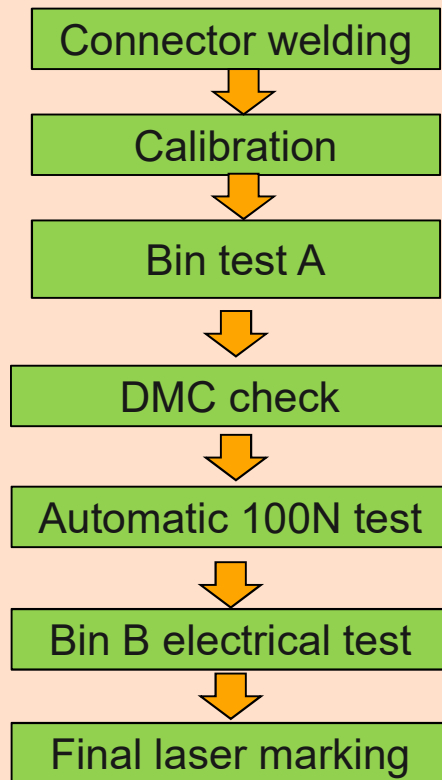
When calibration is running, we have to move the parts back to trays – physically and also in traceability. This movement is done by operator.

## What happened at Trutnov S&A...

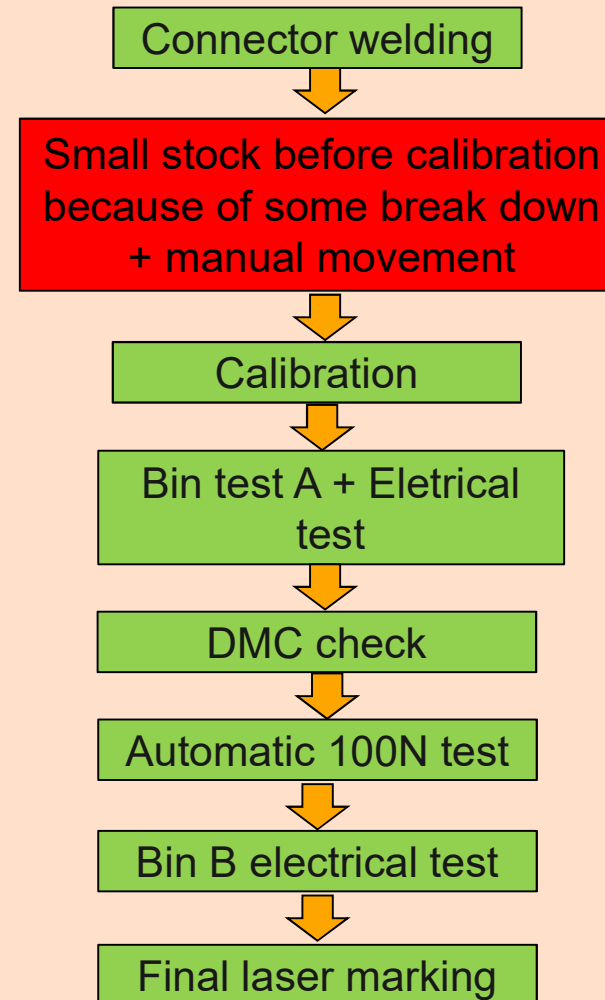
- 1) One (first) part was scanned into tray 1, physically moved back to blister because of any issue occurs during scanning and into the tray placed different part – *this is the operator mistake*.
- 2) Different part was sent through the line and was scrapped on DMX reader because system found that this part is not matching the position in the tray.
- 3) After few hours the first part was scanned again into the tray (*this is the operator mistake*) and sent through the line but:
  - a) Part has information about calibration from the different part – therefore our first part was not calibrated again
  - b) Part has information about Bin test A from the different part – therefore our first part was not Bin A tested.
  - c) DMX reader check if our part match the position in tray and it was correct.
- 4) Part was sent to next operation (100 N automatic test) because system has correct information about previous processes.
- 5) Part was correctly processed through all station next stations, packed into the customer blisters and sent to customers.

## Visualization of root cause – basic overview

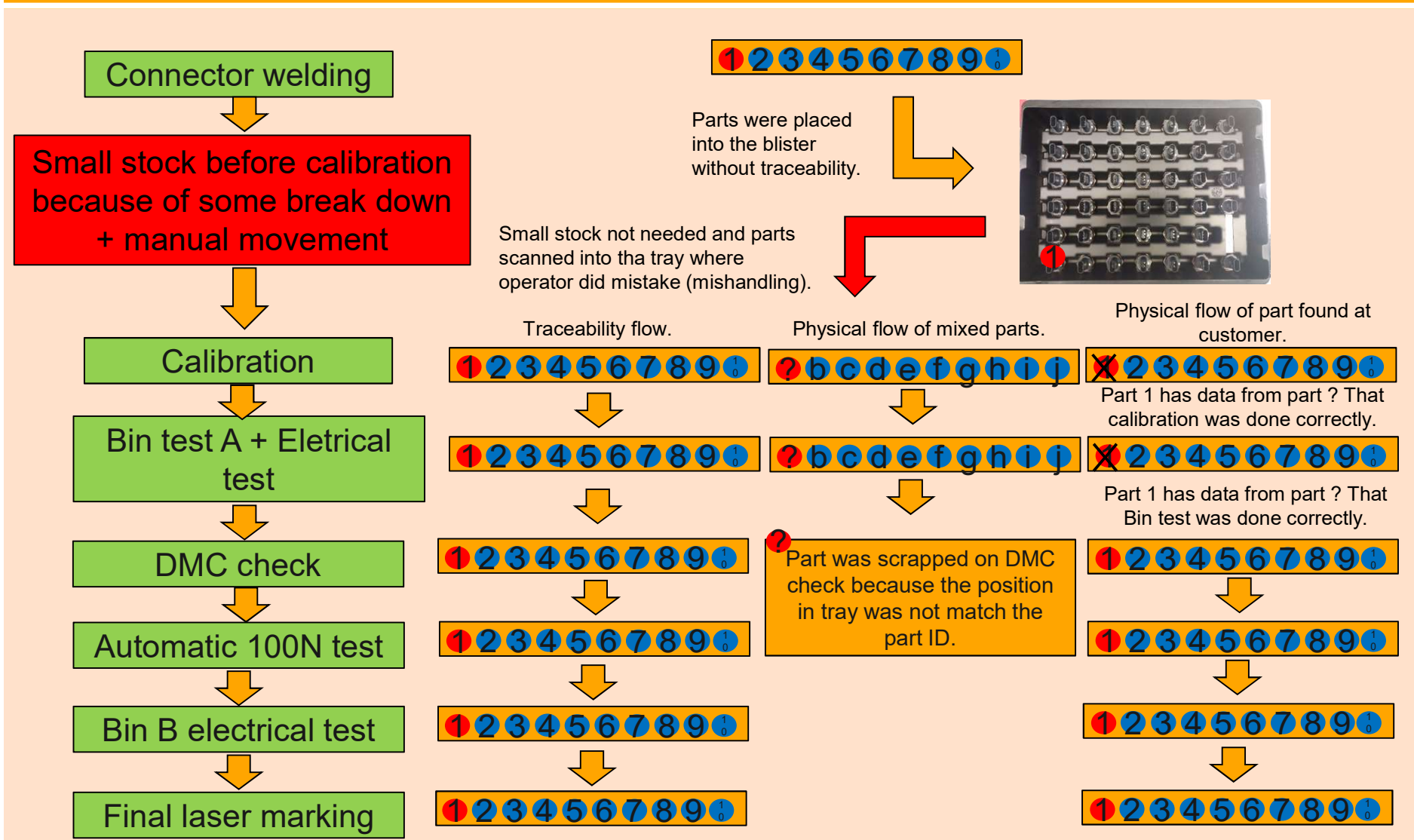
### Standard flow without failure:



### Flow caused the failure:



# Visualization of failed part flow



## Failure reproduction – the same condition as before all corrective actions implemented.

Steps of failure reproduction:

1. Scan 3 parts into the tray and replace them with another parts.
  - a) Parts sent through calibration – OK result.
  - b) Parts sent through Bin test A – OK result.
  - c) Parts sent to DMC reader – NOK result – ID of parts doesn't match the position in tray.
  - d) Parts were automatically scrapped.
2. Scan 3 original parts again into the tray.
  - a) Parts correctly scanned into the tray
  - b) Parts sent through calibration – calibration not done because traceability has information about OK result from other/swapped part.
  - c) Parts sent through Bin test A – Bin test A not done because traceability has information about OK result from other/swapped part.
  - d) Parts sent to DMC reader – OK result – the data in traceability were „refreshed“ and the status of part was OK.
  - e) Next proces steps OK without any issue.

**Failure reproduction was successful and confirm our root cause. We are able to switch ON and OFF the failure.**

Traceability information – part received from Customer

Traceability of part used for failure reproduction

|            |          |          |    |      |                            |                     |                     |    |
|------------|----------|----------|----|------|----------------------------|---------------------|---------------------|----|
| B0181148A5 | HPSG3_ID | 11925661 | 8  | 1380 | 1380 Part Calibration Room | progress            | 26.04.2018 11:46:20 | -- |
| B0181148A5 | HPSG3_ID | 11925661 | 9  | 1382 | 1382 Part Calibration Hot  | progress            | 26.04.2018 11:59:59 | -- |
| B0181148A5 | HPSG3_ID | 11925661 | 12 | 1388 | 1388 part testing BIN A    | progress            | 26.04.2018 13:00:47 | -- |
| B0181148A5 | HPSG3_ID | 11925661 | 13 | 1389 | 1389 100N automatic test   | checkin             | 26.04.2018 13:06:27 | -- |
| B0181148A5 | HPSG3_ID | 11925661 | 13 | 1389 | 1389 100N automatic test   | checkin_checkout    | 26.04.2018 13:06:27 | -- |
| B0181148A5 | HPSG3_ID | 11925661 | 13 | 1389 | 1389 100N automatic test   | checkin_fail;repeat | 26.04.2018 19:32:16 | -- |
| B0181148A5 | HPSG3_ID | 11925661 | 13 | 1389 | 1389 100N automatic test   | checkin_checkout    | 26.04.2018 19:32:16 | -- |
| B0181148A5 | HPSG3_ID | 11925661 | 15 | 1395 | 1395 CO2 final cleaning    | checkin             | 26.04.2018 19:32:36 | -- |
| B0181148A5 | HPSG3_ID | 11925661 | 15 | 1395 | 1395 CO2 final cleaning    | checkin_checkout    | 26.04.2018 19:32:36 | -- |
| B0181148A5 | HPSG3_ID | 11925661 | 17 | 1410 | 1410 part testing BIN B    | progress            | 26.04.2018 19:33:22 | -- |

|            |          |          |    |      |                           |                     |                     |    |
|------------|----------|----------|----|------|---------------------------|---------------------|---------------------|----|
| B2181924YQ | HPSG3_ID | 17488815 | 9  | 1382 | 1382 Part Calibration Hot | progress            | 12.07.2018 16:13:05 | -- |
| B2181924YQ | HPSG3_ID | 17488815 | 12 | 1388 | 1388 part testing BIN A   | progress            | 18.07.2018 09:15:54 | -- |
| B2181924YQ | HPSG3_ID | 17488815 | 13 | 1389 | 1389 100N automatic test  | checkin             | 18.07.2018 09:16:57 | -- |
| B2181924YQ | HPSG3_ID | 17488815 | 13 | 1389 | 1389 100N automatic test  | checkin_checkout    | 18.07.2018 09:16:57 | -- |
| B2181924YQ | HPSG3_ID | 17488815 | 13 | 1389 | 1389 100N automatic test  | checkin_fail;repeat | 19.07.2018 08:28:17 | -- |
| B2181924YQ | HPSG3_ID | 17488815 | 13 | 1389 | 1389 100N automatic test  | checkin_checkout    | 19.07.2018 08:28:17 | -- |
| B2181924YQ | HPSG3_ID | 17488815 | 15 | 1395 | 1395 CO2 final cleaning   | checkin             | 19.07.2018 08:28:36 | -- |
| B2181924YQ | HPSG3_ID | 17488815 | 15 | 1395 | 1395 CO2 final cleaning   | checkin_checkout    | 19.07.2018 08:28:36 | -- |
| B2181924YQ | HPSG3_ID | 17488815 | 17 | 1410 | 1410 part testing BIN B   | progress            | 19.07.2018 08:29:27 | -- |

The same failure message in traceability system found – „checkin\_fail; repeat“