

SWEDISH METROLOGY AND QUALITY IN SWEDEN

Experience from Calibration Intercomparisons performed in different fields

ISO/IEC 17025

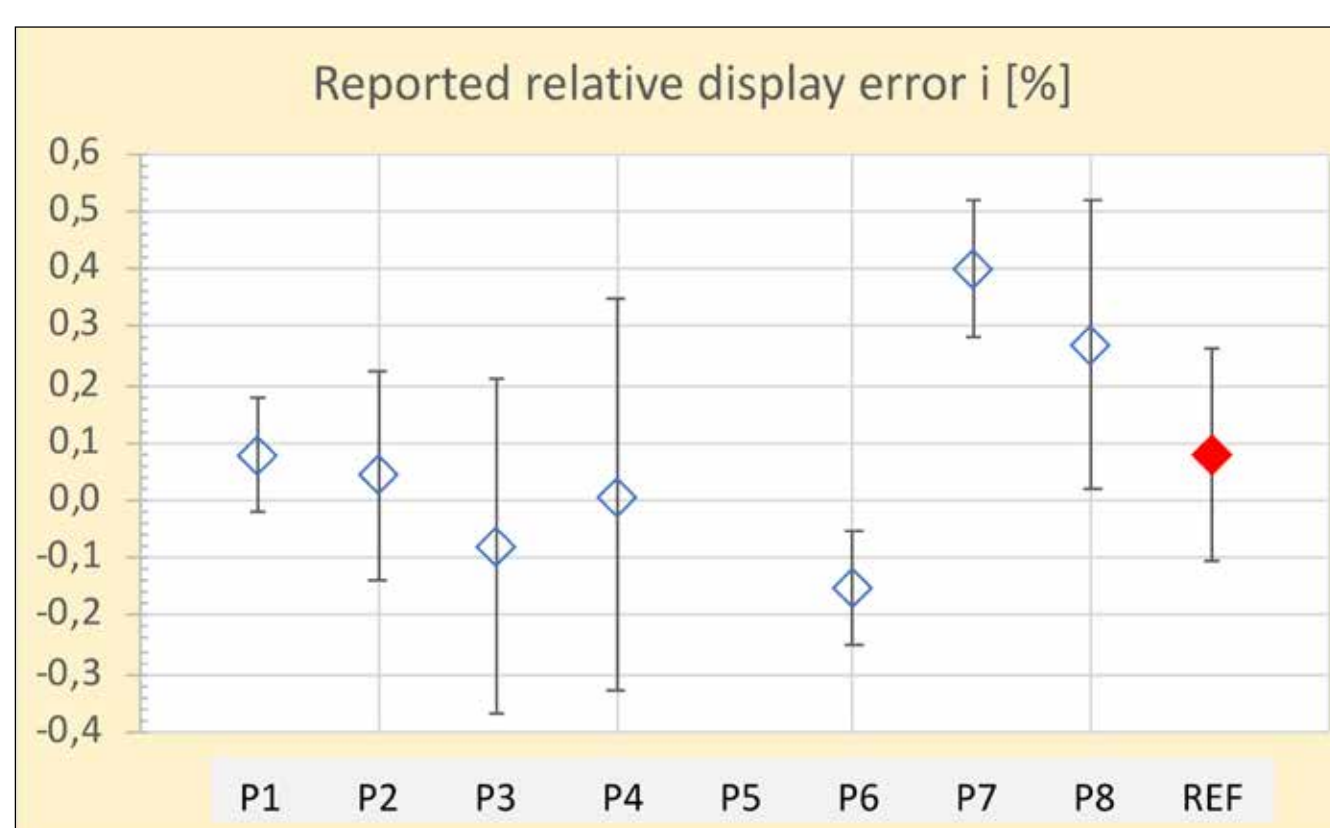
✓ The new ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories put emphasis on Inter Laboratory Comparisons/ILC and specifically for calibrations. ILCs are an efficient way to monitor the quality of calibration work of laboratories. They serve to demonstrate the competence of participants for the Accreditation bodies all over the world. The ILC principle may also be used internally for laboratories to compare results from different calibration references or different staff.

4 different principles

- ✓ 1a. A calibration object with assigned reference value(s) (from a laboratory on a higher metrological level) is circulated among participants.
- 1b. A calibration object without prior reference value(s) is circulated. Consensus value(s) based on the reported calibration results are used as reference value(s).
- 2a. The object for a calibration inter-comparison cannot be circulated. The participants need to perform their calibration at a certain place. However, it is possible to establish independent reference values at place.
- 2b. The object cannot be transported and a priori reference values cannot be established (for example by a laboratory on a higher metrological level).

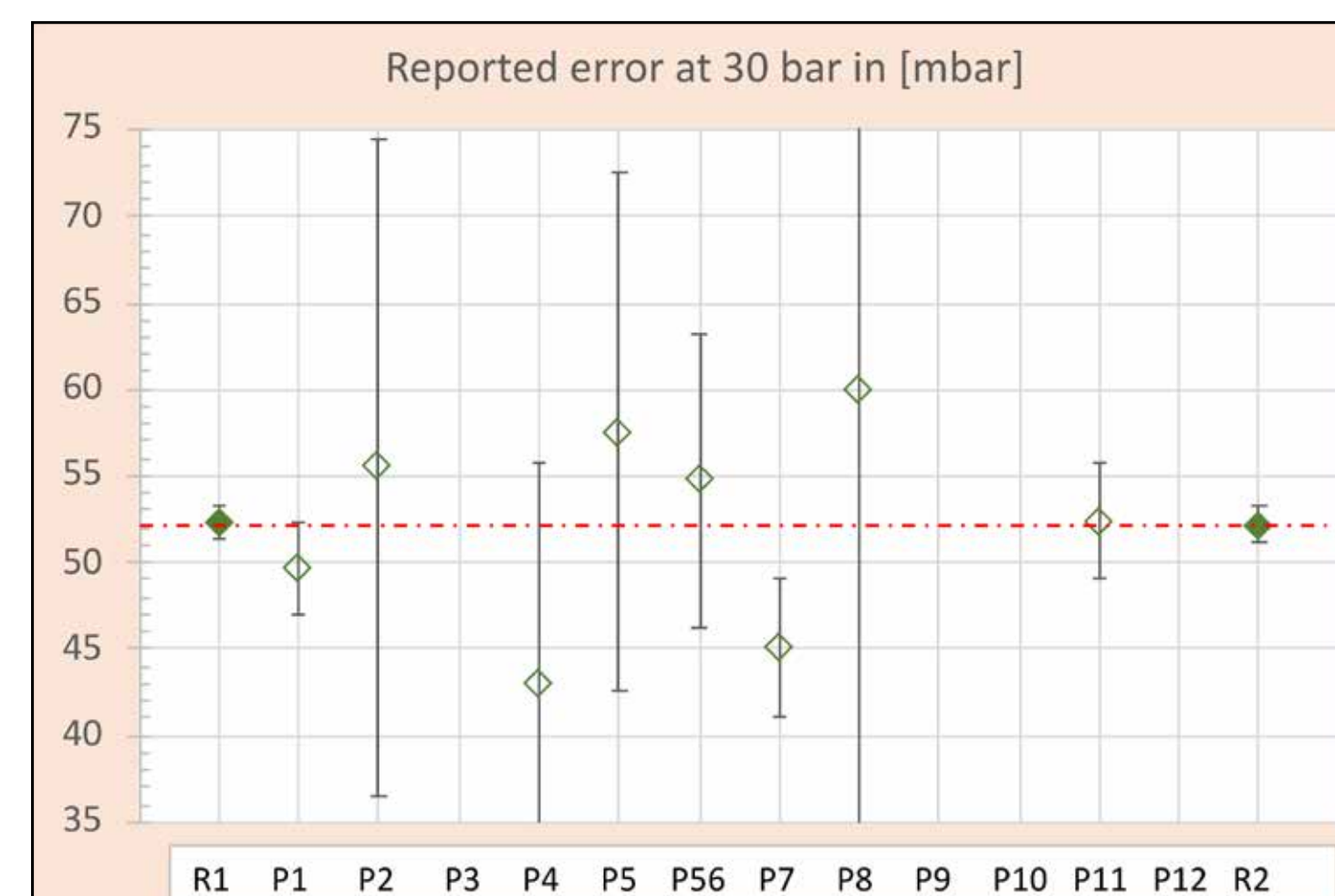
Results - Example of reporting using consensus value

✓ **Table 5 Reported error at 50 N – compression force.**
Large variation between results at low compression level



Participant	Reference pressure [N]	Displayed value [N]	Reported error [%]	Specified uncertainty [%]	En-value
P1	49,96	50,00	0,08	0,10	-0,01
P2	50,14	50,16	0,04	0,18	-0,15
P3	50,04	50,00	-0,08	0,29	-0,47
P4	50,00	50,00	0,01	0,34	-0,19
P5					
P6	-50,76	-50,85	-0,150	0,10	-1,11
P7	-49,79	-50,00	0,400	0,12	1,45
P8	-50,00	-49,86	0,270	0,25	0,61
REF			0,082	0,18	

✓ **Table 13 Example of reporting using reference value**
Measurement point 6 at 30 bars. More examples can be found www.smquality.se



Participant	Reference pressure [bar]	Displayed value [bar]	Reported error [mbar]	Specified uncertainty [mbar]
R1	30,031	30,084	52,30	1,0
P1	30,020	30,070	49,59	2,66
P2	30,206	30,261	55,50	19
P3				
P4	30,000	30,054	43,00	13
P5	30,004	30,062	57,50	15
P6	30,000	30,055	54,75	8,48
P7	29,999	30,044	45,00	4,0
P8	30,010	30,070	60,00	60
P9				
P10				
P11				
P12	30,000	30,052	52,37	3,29
R2	30,031	30,084	52,20	1,0
R1&R2			52,25	1,05

Typical on site objects

- ✓ Static weighing instruments (laboratory scales, truck scales)
- Dynamic weighing instrument (check weighers)
- Tensile testing machine
- Exhaust gas meters and opacimeters

Logistic circulation if ILC

- ✓ Retardation meters
- Laser distance meters
- Pressure gauges
- Temperature sensors
- Torque gauges
- Load cells
- Weights
- Gauge blocks
- Micrometers
- Volume (pipettes, water meters)

Equipment calibrated

Gauge pressure 0-30 bar for circulation



Example of a big force calibration machine 8 MN calibrated on site



Example of a gauge block 2 mm for circulation

Objectives for ILC

- ✓ Quality in calibrations
- Based on standards ISO/IEC 17043 and ISO 13528
- Required by accreditation bodies worldwide

Conclusion

- ✓ The reports on ILCs demonstrate clearly which laboratory to use for calibrations
- ✓ Users of equipment
- Results in ILC give help to users of instruments on how to decide which laboratory to use for calibrations.