BRNO UNIVERSITY OF TECHNOLOGY

FACULTY OF CIVIL ENGINEERING
institute of building testing

Z 7008

PROFICIENCY TESTING PLAN

ZVP 2026/1 – Mechanical Properties of Plastics
(ZVP 527-1, 527-2, 178, 179-1, 868, 306, 75-1, 75-2, 1183-1, 11357-1, 11357-3, 1133-1, 1628-1, 1628-5, 11358-1, 3795)

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1 Basic Information about the Proficiency Testing Program

The aim of the Proficiency Testing Program (PTP) is to compare and evaluate the results of tests conducted on plastics in compliance with selected parts of ISO 527-1 [1], ISO 527-2 [2], ISO 178 [3], ISO 179-1 [4], ISO 868 [5], ISO 306 [6], ISO 75-1 [7], ISO 75-2 [8], ISO 1183-1 [9], ISO 11357-1 [10], ISO 11357-3 [11], ISO 1133-1 [12], ISO 1628-1 [13], ISO 1628-5 [14], ISO 11358-1 [15] and ISO 3795 [16]. The testing method according to ISO 3795 [16] is out of the range of accreditaion of Z7008.

The program strives to provide objective information about the measuring skills of PTP participants. This PT program is running in cooperation with ORLEN Unipetrol RPA s.r.o. - POLYMER INSTITUTE BRNO, odštěpný závod. POLYMER INSTITUTE BRNO will prepare two types of test specimens with label Sample A and Sample B. Test specimens for ISO 3795 will be prepared via compression-moulding with label Sample C.

The basic criterion for participation is timely registration for the program, and the prerequisites for obtaining the Certificate of Participation and the Final Report on the Results of Interlaboratory Comparison are timely payment of the fee and adherence to the schedule.

Important dates:

Registration deadline:	**May 30, 2026**
Distribution of samples:	**June 22 – June 26, 2026**
Realization/initiation of testing:	**June 29, 2026**
Results sent to the organizer:	**July 31, 2026**
Evaluation/presentation of Certificate of Participation:	**August 31, 2026**

Submission of test results – exclusively via http://ptprovider.cz/OutcomesCode. To log in, it is necessary to enter the participant's code, which is automatically sent when registering in PTP.

2 Implementation of the Proficiency Testing Program

2.1 Specifications and Characteristics

Testing laboratories and other institutions interested can register for the PTP. The minimum number of participants in every part of PT program is 5. If the number of participants is close to the minimum, the coordinator will consider the evaluation of PTP results using Horn's procedure to determine the asigned values and the standard deviation. In that case, the participants will be told before PTP materials are distributed. The maximum number of participants is 40.

If the minimum number of participants is not reached, the PT Provider reserves the right to cancel the PTP. This takes place according to Chapter 3 of the "Cancellation and Complaint Proceedings" instructions available on http://ptprovider.cz/?lang=en. The program is usually implemented in order to specify the characteristics of plastics – see Table 1.

Table 1: Specifications and characteristics of testing plastics

No.	Specification	Measured property	Unit	NoD[1]	Price (CZK)
1	ISO 527-1, -2	Tensile modulus	MPa	5	3000
2	ISO 527-1, -2	Stress at yield	MPa	5	3000
		Strain at yield	%	5	
3	ISO 527-1, -2	Stress at yield	MPa	5	3000
4	ISO 178	Flexural modulus	MPa	5	3000
5	ISO 178	Flexural strength	MPa	5	3000
		Flexural strain at flexural strength	%	5	
6	ISO 179-1	Charpy unnotched impact strength	kJ/m^2	10	3000
7	ISO 179-1	Charpy notched impact strength (note: notch made by distributor)	kJ/m^2	10	3000
8	ISO 179-1	Charpy notched impact strength (note: notch made by laboratory)	kJ/m^2	10	3000
9	ISO 868	Shore hardness D	°	5	3000
10	ISO 306	Vicat softening temperature VST/A/50	°C	3	3000
11	ISO 306	Vicat softening temperature VST/B/50	°C	3	3000
12	ISO 75-1, -2	Temperature of deflection under load, method A	°C	3	3000
13	ISO 75-1, -2	Temperature of deflection under load, method B	°C	3	3000
14	ISO 1183-1	Density	kg/m^3	3	3000
15	ISO 11357-1, -3	Melting temperature T_{m1}	°C	3	3000
		Enthalpy of fusion ΔH_{m1}	J/g	3	
16	ISO 1133-1	Melt mass-flow rate	g/10min	3	3000
17	ISO 1628-1, -5	Viscosity	ml/g	3	3000
18	ISO 11358-1	Filler content	%	3	3000
19	ISO 3795	Burning Rate	mm/min	5	3000

2.2 Notes

1. **Tensile modulus**: Test specimen type 1A; test speed v = 1 mm/min; contact or optical extensometer.
2. **Stress at yield, strain at yield**: Test specimen type 1A; test speed v = 50 mm/min; contact or optical extensometer; limit deformation 20 %.
3. **Stress at yield**: Test specimen type 1A; test speed v = 50 mm/min; without extensometer; up to nominal deformation 20 %.
4. **Flexural modulus**: Middle part of test specimen type 1A (80x10x4) mm; test speed v = 2 mm/min, span between the specimen supports L = 64 mm.
5. **Flexural strength, flexural strain at flexural strength**: Middle part of test specimen type 1A (80x10x4) mm; test speed v = 2 mm/min, to measure up to deflection 12 mm, span between the specimen supports L = 64 mm.

[1] NoD – Number of determinations

6. **Charpy unnotched impact strength**: Test specimen type 1 (80x10x4) mm; without notch; preferentially use pendulum with energy 2 J (alternatively 1 J or 4 J); edgewise; span between the specimen supports L = 62 mm.
7. **Charpy notched impact strength** (note: notch made by distributor): Test specimen type 1 (80x10x4) mm; notch type A (notch tip radius 0.25 mm, remaining width at notch tip 8 mm); preferentially use pendulum with energy 1 J (alternatively 0.5 J or 2 J); edgewise; span between the specimen supports L = 62 mm.
8. **Charpy notched impact strength** (note: notch made by laboratory): Test specimen type 1 (80x10x4) mm; distributed without notch - notch will make laboratory: notch type A (notch tip radius 0.25 mm, remaining width at notch tip 8 mm); preferentially use pendulum with energy 1 J (alternatively 0.5 J or 2 J); edgewise; span between the specimen supports L = 62 mm, send 1 notched and not tested specimen to POLYMER INSTITUTE BRNO for checking quality of notching.
9. **Shore hardness** *D*: Test specimen (20x20) mm; time-interval 15 s.
10. **Vicat softening temperature VST/A/50**: Test specimen (20x20) mm; load 10 N; temperature uniform rate 50 °C/h; temperature of the heating equipment shall not be higher 40 °C at the start of each test.
11. **Vicat softening temperature VST/B/50**: Test specimen (20x20) mm; load 50 N; temperature uniform rate 50 °C/h; temperature of the heating equipment shall not be higher 40 °C at the start of each test.
12. **Temperature of deflection under load, method A**: Narrow central part of the multipurpose test specimen 1A (80x10x4) mm; flexural stress at the test-specimen surface 1.80 MPa; start temperature of heating equipment shall be 25 °C; temperature uniform rate 120 °C/h; edgewise; span between lines of contact of the test specimen and the specimen supports L = 64 mm.
13. **Temperature of deflection under load, method B**: Narrow central part of the multipurpose test specimen 1A (80x10x4) mm; flexural stress at the test-specimen surface 0.45 MPa; start temperature of heating equipment shall be 25 °C; temperature uniform rate 120 °C/h; edgewise; span between lines of contact of the test specimen and the specimen supports L = 64 mm.
14. **Density**: Test specimen (30x10x4) mm; method A-immersion method; recommended immersion liquid - ethanol; temperature 23.0 °C.
15. **Melting temperature** T_m**, enthalpy of fusion** ΔH_m: Compression molded film (thickness 0.4 mm); purge gas - nitrogen; heat from 50 °C to 180 °C at rate 10 °C/min; crucible closed with lid;baseline: from 60°C till 150°C.
16. **Melt mass-flow rate**: Granules; nominal load 2.16 kg; test temperature 230 °C; time of measurement from 5 s up to 10 s.
17. **Viscosity**: PET granules; solvent is mixture of phenol/1,2-dichlorobenzene (weight out 1 part by mass of phenol (analytical grade) and dissolve in 1 part by mass of 1,2-dichlorobenzene(analytical grade). Work to an accuracy of 1 % or better in the weightings.); warming and dissolving at temperature 70°C; measure viscosity at temperature 25°C.
18. **Filler content**: Central part of test specimen type 1A; material: PP + glass fibers. Procedure:
    - purge gas - nitrogen, heat from 23 °C to 520 °C at rate 40 °C/min,
    - purge gas - change nitrogen to air at 520 °C; heat from 520 °C to 750 °C at rate 20 °C/min
    - purge gas - air: heat from 750 °C to 850 °C at rate 10 °C/min.
19. **Flammability** (out of range of accreditation): Compression-moulded test specimens (5 test specimens, dimensions: (230 × 70 × 3) mm); material: PP + filler. Procedure:
    - Bunsen Burner (diameter 9.5 mm, temperature 843°C), marks on each test specimen in distance 40 mm and 140 mm of any edge of test specimen,
    - burning rate (mm/min),
    - horizontal orientation of test specimens.

2.3 Ensuring Homogeneity and Stability

PT Provider employees and any suppliers whose services they may utilize are aware of the significance of the homogeneity and stability of test specimens for the results of the Proficiency Testing Program. Proficiency test items are provided in cooperation with ORLEN Unipetrol RPA s.r.o. - POLYMER INSTITUTE BRNO, branch plant, Tkalcovská 36/2, 602 00 BRNO. The homogeneity and stability of specimens is ensured in the following ways:

1. the material used for the production of samples is always taken from the same production and is of the same production date; and/or
2. by dividing the specimens produced in different batches in order to ensure specimen homogeneity during testing of physical-mechanical and durability properties,
3. using a single type of mold-release preparation,
4. using a single type of compression frame for one type of test specimens,
5. storing all specimens together under identical conditions,
6. checking all specimens before dispatching to participants.

2.4 Instructions for Eliminating Major Sources of Errors and Risks

PTP participants have the obligation:

- testing specimens will be conditioned according to EN ISO 11403-1,
- to handle the proficiency testing materials in the same way they handle the majority of routinely tested samples,
- to follow the instructions of the PT Provider employee responsible for the PTP, especially regarding the type of testing carried out, the number of result determinations and the PT schedule,
- to state measurement uncertainties in accordance with their documented procedures, including the corresponding expansion coefficient. Participants will use expansion coefficient 2, which approximately represents the 95% reliability level, unless stated otherwise,
- adhere to the rules and principles of ethical behavior, avoiding unfair practices that could negatively impact the evaluation of the PT program,
- follow occupational health and safety and fire protection regulations, using only electrical equipment and instruments with valid inspections,
- to send the test results obtained during proficiency testing, including measurement uncertainties, to the PT Provider by the set deadline the participant received in the confirmation e-mail.

3 Procedures used in the Statistical Analysis of Laboratory Results

Procedures used in the statistical analysis of proficiency testing programs can be found here: http://ptprovider.cz/?lang=en.

4 Certificate of Participation and the Final Report on the Results of Interlaboratory Comparison

The PT Provider gives expert commentary on participant efficiency evaluation in the Final Report as part of training courses the PT Provider organises. The Final Report preserves the anonymity of the PTP participants. Each participant, or the participant's test results, is represented by an ID number. The Certificate of Participation in the PT programme is part of the Final Report. The Certificate is unique to each participant and includes the participant's ID number.

5 Safeguards for Confidentiality

The identity of PTP participants is confidential and only known to persons/subjects involved with the PTP. All participant information is considered confidential by the PT Provider. The participant may renounce this confidentiality for the purposes of discussion and mutual assistance until the PTP results are obtained. The PT Provider reveals the proficiency testing results to no third party with the sole exception of a written request by a regulatory authority submitted prior to the commencement of the PTP and which has been granted a written consent by the PTP participants.

6 Related Documents

- Quality Handbook of the PT Provider at the SZK FAST
- Cancellation and Complaint Proceedings available at http://ptprovider.cz/?lang=en [17]
- MPA 20 – 01 - . . for application of EN ISO/IEC 17043 Concordance Assessment – General Requirements for Proficiency Testing in the Accreditation System of the Czech Republic.

References

[1] EN ISO 527-1. *Plastics - Determination of tensile properties - Part 1: General principles*. 2019.

[2] EN ISO 527-2. *Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics*. 2012.

[3] EN ISO 178. *Plastics - Determination of flexural properties*. 2019.

[4] EN ISO 179-1. *Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test*. 2010.

[5] EN ISO 868. *Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness)*. 2003.

[6] EN ISO 306. *Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST)*. 2014.

[7] EN ISO 75-1. *Plastics - Determination of temperature of deflection under load - Part 1: General test method*. 2013.

[8] EN ISO 75-2. *Plastics - Determination of temperature of deflection under load - Part 2: Plastics and ebonite*. 2013.

[9] EN ISO 1183-1. *Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pyknometer method and titration method*. 2019.

[10] EN ISO 11357-1. *Plastics - Differential scanning calorimetry (DSC) - Part 1: General principles*. 2017.

[11] EN ISO 11357-3. *Plastics - Differential scanning calorimetry (DSC) - Part 3: Determination of temperature and enthalpy of melting and crystallization*. 2018.

[12] EN ISO 1133-1. *Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics - Part 1: Standard method*. 2012.

[13] EN ISO 1628-1. *Plastics - Determination of the viscosity of polymers in dilute solution using capillary viscometers - Part 1: General principles*. 2009.

[14] EN ISO 1628-5. *Plastics - Determination of the viscosity of polymers in dilute solution using capillary viscometers - Part 5: Thermoplastic polyester (TP) homopolymers and copolymers*. 2015.

[15] EN ISO 11358-1. *Plastics - Thermogravimetry (TG) of polymers - Part 1: General principles*. 2014.

[16] ISO 3795. *Road vehicles and tractors and machinery for agriculture and foresty. Determination of burning behaviour of interior materials*. 1994.

[17] *Cancellation and Complaint Proceedings – available at www.ptprovider.cz*.