Equipment:

- 1 000 ml glass beaker;
- magnetic stirrer;
- vacuum pump with trap;
- 3 Piece Glass Buchner funnel 9 cm diameter;
- 500 ml Pyrex side arm conical flask;
- knitted black cotton filter fabric circles, 9 cm diameter (e.g. fabric style EW-442 supplied by wfk Testmaterials or Swissatest Testmaterialen AG, see Annex N; EW-442 is 100 % cotton, swiss pique knit, circular, yarn count 37 tex; dyed direct black 22).

Procedure:

Carry out 3 replications and record the results as an average of the 3 replicates.

Fill beaker with 800 ml of deionized water and allow the temperature to equilibrate to 20 °C. Place beaker on the magnetic stirrer and set stirrer speed to 200 rpm. Sample IEC-A* base detergent to approximately 10 g and accurately weigh out 2 g. Add the product to the beaker, start stopwatch and stir for the specified time (2 min or 5 min, see solubility specifications below). Connect vacuum pump to conical flask and switch on vacuum pump.

Weigh the black fabric circle. Place black fabric into Buchner funnel smooth side up. Pour solution from the beaker onto the black fabric, and leave until all the solution has been sucked through the fabric and the residue remains. Remove black fabric from Buchner funnel, place on a sheet of paper and label sample.

Repeat for the remaining 2 replicates.

Allow black fabric to dry at ambient for 24 h. Re-weigh dried black fabric circles and record the % residue.

Annex C
(normative)

Specifications for base load – Cotton/synthetics base loads

The Cotton/ synthetics/blends **base load** shall consist of 3 sizes: Small, medium and large sheets conforming to the specifications given in Table C.1 (measured at (20 ± 2) °C, (65 ± 5) % relative humidity and certified by the supplier):

Table C.1 – Specification of the cotton/synthetics base loads

Criteria for conditioned new items	**Size1 (Small sheet)**	**Size 2 (Medium sheet)**	**Size 3 (Large sheet)**
Substrate	(50 ± 1) % polyester (50 ± 1) % cotton (extra long staple)		
Yarn	ring spun		
Yarn twist (T/m) Warp Weft	610 ± 20 (Z-twisting) 610 ± 20 (Z-twisting)		
Weave type	twill (3/1 S-twill)		
Pick count (pick/cm) Warp Weft	48 ± 2 32 ± 2		
Mass per unit area (g/m^2)	245 ± 10		
Dimensions, unwashed (mm) Length Width	620 ± 20 (warp) 610 ± 20 (weft)	1 240 ± 20 (warp) 910 ± 20 (weft)	1 870 ± 20 (warp) 1 410 ± 20 (weft)
Mass per piece (g)	110 ± 5	315 ± 10	720 ± 20
Finish	Singeing, desizing, boiling off, bleaching without resin		
Water uptake [a] in %	Not tested yet	Not tested yet	Not tested yet
Shrinkage [b], [c] **warp** in % After 5th **test run** as compared to new item After 25th **test run** as compared to after 5th **test run**	 3,5 ± 1,0 3,5 ± 1,0	 3,5 ± 1,0 3,5 ± 1,0	 3,5 ± 1,0 3,5 ± 1,0
Shrinkage [b, c] **weft** in % After 5th **test run** as compared to new item After 25th **test run** as compared to after 5th **test run**	 0 ± 1,0 0 ± 1,0	 0 ± 1,0 0 ± 1,0	 0 ± 1,0 0 ± 1,0
All 4 edges are double hemmed, hem size 10 mm. Sewing material polyester cotton, single lock stitch, distance of seam on edges is 7 mm, stitch length 3 mm.			
Description of preparation of seams and yarns:			

Small, medium and large sheets: All 4 edges are double hemmed, hem size is 10 mm. Sewing material is polyester, single seam, lock stitch, distance of seam from edge is 7 mm, stitch length 3 mm.
[a] The procedure used (DIN 53923) is established for the determination of water absorption capacity of textiles with high water absorption capacity. Water absorption capacity is the amount of water that a textile fabric, conditioned at (20 ± 2) °C / (65 ± 2) % relative humidity, takes up during storage in water of 20 °C for 60 s. The sample with the conditioned mass, *mc*, is fixed on a sieve of stainless steel and dipped into a flat dish with 20 °C water. After 60 s the sample is taken out of the water, drop dried for 120 s and then weighed again (m60). The water absorption capacity *wac* is (m60 – *mc*) × 100: *mc*. The data are measured after 25 **test runs** as specified in [b]. [b] In order to qualify the suitability of the textiles for use in this PAS, the manufacturer of the textiles should carry out **test runs** on samples from the production batch in the **reference machine**. The following wash **test runs** should be carried out in the **reference machine**: – **Test runs** 1 to 5: pre-treatment according to 6.4.2; – **Test runs** 6 to 25: perform **test runs** according to 8.1 in **reference machine** using the 60 °C cotton reference **programme** (without prewash but including rinsing and spinning) but without any normalization between **test runs**. [c] Determination of shrinkage according to EN ISO 3759 after the washing process as defined in [b].

Annex D
(normative)

Reference machine specification – Specification of the reference washing machines and method of use

D.1 General

Reference **washing machine** “Wascator FOM 71CLS” is equipped with a control system designed to measure very small tolerances on measured parameters. See Table D.1 for specifications.

D.2 Further Information

Procedures and programming information for the **reference machine** can be found in Annex E.

D.3 Reference machine: method of use

D.3.1 Installation of the reference machine

– Ensure that there is an air gap between the drain hose and the laboratory drainage system.

– Ensure that the machine is properly connected to the laboratory’s mains system (supply voltage) according to the manufacturer’s instruction.

– Calibrate the level control and perform a zero calibration of the weighing scale according to instructions in the manufacturer’s installation manual.

– Ensure that the laboratory water supply system can deliver (15 ± 2) l of water per min into the **reference machine**.

D.3.2 Regular maintenance

Once a year, calibrate the machine according to certified procedures or the manufacturer’s calibration instructions. Once a year midway between two calibrations make a maintenance check according to Maintenance and programming manual for **reference machines**.

NOTE Maintenance and programming manual for **reference machines** can be obtained from the manufacturer or via the manufacturer’s website (see Annex N).

Table D.1 – Description of the reference washing machine and method of use

Front loading horizontal rotating machine		Wascator FOM 71 CLS	
Inner drum	Diameter		(520 ± 1) mm
	Depth		(315 ± 1) mm
	Volume		61 l
	Lifting vanes	Number	3
		Height	(50 ± 1) mm
		Length	Extended the depth of the inner drum
		Spacing	120°
	Perforation	Diameter	5 mm
	Material		18/8 stainless steel
Outer drum	Diameter		(554 ± 1) mm
	Material		18/8 stainless steel
Timer			Programmable
Drum speed	Wash speed	Range	Programmable (20–59) rpm, step size 1 rpm
		Tolerance at test load 5 kg, 26 l of water	±1rpm
	Water extraction (spin)	Range	Programmable 200 – 1 100 rpm
		Tolerance	±20 rpm
Heating system	Heating power		5,4 kW ± 2 %
	Thermostat	Range	(4 – 97) °C
		Accuracy at switch off temperature	±1 °C
		Switch on temperature	≤ 4 °C below switch-off temperature
Reversing rhythm	Normal/Gentle ON Normal/Gentle OFF	Programmable	(0 – 250) s (0 – 250) s
		Step size	1 s
Water system	Cold water supply	At water pressure 240 kPa	(20 ± 2) litre/min
	Level sensing	Step size	≤ 3 mm
		Repeatability	±5 mm (±1 l)
	Mass sensing		Standard (Mass)
		Step size	0,1 kg
		Dosing accuracy	±0,2 kg
		Weighing accuracy	±0,1 kg
	Drain system	Drain valve	> 30 l/min

D.3.3 Before test series

Perform a **test run** on the reference **programme** without **test load**.

If the measured values for temperature, fill volume and total water quantity are outside the prescribed range in Table E.2 perform a new calibration or maintenance check.

NOTE Maintenance and programming manual for **reference machines** can be obtained from the manufacturer or via the manufacturer's website (see Annex N).

Perform a mass check in accordance with the maintenance and programming manual for **reference machines** and if it is out of machine specification recalibrate the scale.

D.3.4 During a test series

Be sure not to lean or place or change any items on the machine during the weighing sequence (filling sequence) as this will influence the accurate weighing system within the **reference machine**.

After each **test run** verify that the **reference machine** complies with all requirements specified in Table E.2.

Annex E
(normative)

Reference machine programme definitions

E.1 General

This annex describes the reference **programme** for the **reference machine**. The **programme** is described in Table E.1.

E.2 Programming instructions

Ready-made memory cards containing the reference program can be obtained from the manufacturer of the **reference machine**. These cards are locked and the content cannot be exchanged or altered.

E.3 Tolerances

Some process parameters related to the **reference machine** parameters have prescribed tolerance limits. These limits are shown in Table E.2.

E.4 Start-up programme

In order to normalize the conditions within the **reference machine** prior to each **test run**, a special start-up **programme** shall be run (refer to 6.2.2) if the **reference machine** has not been in use for more than 2 h (from the end of the last **programme** to the start of the next **test run**). All **reference machines** have a factory installed start-up programme. The start-up **programme** takes about 8 min to complete and is always run without load and without detergent.

The start-up **programme** consists of:

– 1: 1st cold rinse at a water level of 130 mm for 2 min;

– 2: drain;

– 3: 2nd cold rinse at a water level of 200 mm for 2 min;

– 4: drain;

– 5: extraction 500 RPM for 30 s.

Table E.1 – Specification of reference washing programme

Programme sequence	Water supply [a]	On/off action during heating	On/Off action during wash	Heating Yes /No	Temp	Time at temp.	Rinse/Drain /Spin time
	litres				°C	Min	Min
Main wash 1	6			N			
Main wash 2 [b]	20	12 s on/3 s off	12 s on/3 s off	Y	20	2:00	
Main wash 3		12 s on/3 s off	12 s on/3 s off	Y	39	0:10	
Main wash 4		240 s on/0 s off [c]	12 s on/3 s off	Y	40	0:10	
Main wash 5			12 s on/3 s off	N		4:40	
Main wash 6		12 s on/3 s off	12 s on/3 s off	Y	59	0:10	
Main wash 7		240 s on/0 s off [c]	12 s on/3 s off	Y	60	0:10	
Main wash 8			12 s on/3 s off	N		4:40	
Drain1			12 s on/3 s off				1:00
Rinse 1	18		12 s on/3 s off				3:00
Drain2			12 s on/3 s off				1:00
Rinse 2	18		12 s on/3 s off				3:00
Drain3			12 s on/3 s off				1:00
Rinse 3	18		12 s on/3 s off				2:00
Drain4			12 s on/3 s off				1:00
Rinse 4	18		12 s on/3 s off				2:00
Drain5			12 s on/3 s off				1:00
Spin 1							5:00

[a] All fillings are static

[b] Flushing of detergent is made in Main wash 2 after a pre-fill of 6litre of water into the drum.

[c] The On/Off action of 240 s on/0 s off is made to ensure that a drum rotation exists when the heating elements are switched off. This will increase the accuracy of the water max temperature.

Table E.2 – Tolerances given for some procedure parameters

Procedure	Temperature tolerance at set temperature ° C	Water quantity tolerance per fill for each operation litre/fill	Total water quantity and tolerance litre
Reference programme	±1	±0,5	98 ± 2,5

NOTE 1 The tolerances given in the table for temperature and water are valid both for full and empty **reference machines**.

Specified supply flow rate for the **reference machines** is (15 ± 2) l per min. For the **reference machines** this flow rate corresponds to a filling time for first fill of 127 ± 14 s.

NOTE 2 The first filling time is defined as time from start of **operation** (press of start button) until end of filling in detergent compartment 4.

Annex F
(normative)

The bone-dry method of conditioning

F.1 General

This annex sets out the specification for the tumble dryer and the method when the bone dry method of conditioning is used under 6.4.5.3.

When using the bone dry method, there are specified limits regarding the maximum load that can be conditioned in a dryer. When the bone dry method is the usual method used, a large capacity dryer with manual or timer control is generally recommended. Dryers with electronic controls or that have auto-sensing capability may cut the power input before load has reached a fully bone dry state and can be difficult to control, so are not recommended for this purpose.

F.2 Tumble dryer specifications

The tumble dryer used to determine the bone-dry mass shall comply with the following requirements:

The nominal bone-dry mass of the items being dried as a single load shall not be more than 1 kg for each 20 l of measured rated drum volume. The mass of the load in kg shall be less than 3,3 times the heating element rating of the tumble dryer (expressed in kW).

The above describes the limit case. If faster drying times are desired, the use of larger element to mass ratios, or reversing tumble dryers, or both, are recommended.

An electric tumble dryer used shall be equipped with a temperature sensor able to read the temperature of the outlet air. The average temperature reading during the last step is recorded as $T_{\text{outletair}}$. Electric dryers used to bring a load to the bone dry condition shall have an average temperature of the outlet air during the final 10 min of **operation** of not less than 65 °C.

Gas dryers are permitted, but special rules regarding their calibration are set out in F.4.

F.3 Bone dry procedure – Electric dryers

If necessary, the **base load** shall be divided into portions and the procedure below applied separately to each portion.

If possible, the **base load** should be brought to the bone-dry condition as one portion and not divided.

The procedure is as follows:

a) Place the dry items in the tumble dryer and operate on the hottest temperature/ **programme** for at least 30 min.

b) Every 10 min the items shall be manually reshuffled and checked to ensure that no item has rolled up or rolled inside another, thus trapping moisture. This process, including opening and closing the door, shall be completed in as quick as possible.

c) After 30 min, stop the tumble dryer and determine the mass of the items before it cools down. If the items have to be removed from the tumble dryer to determine the mass, this shall be done as quickly as possible.