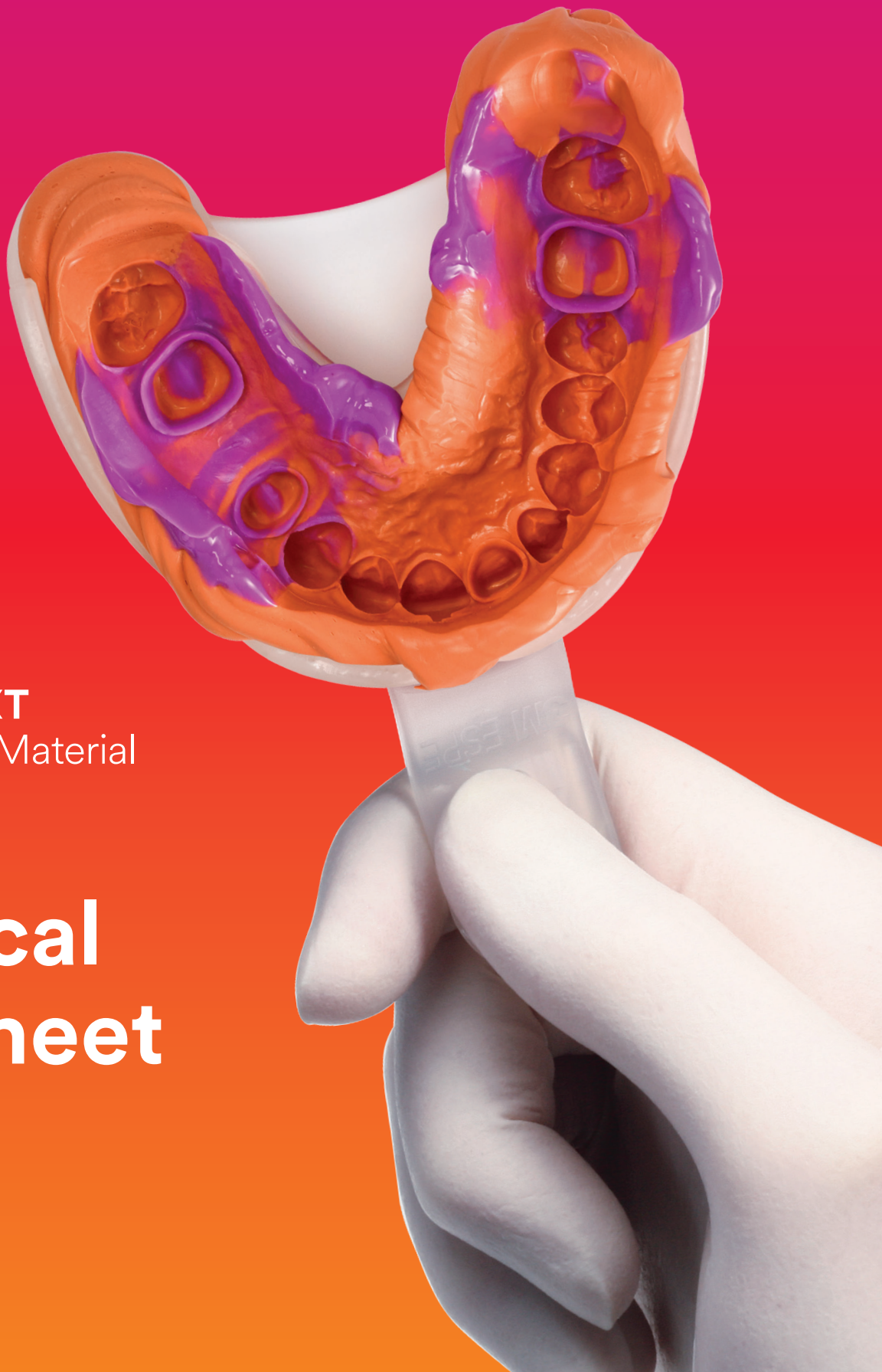
Science.
Applied to Life.™



3M™ Express™ XT
VPS Impression Material

Technical Data Sheet

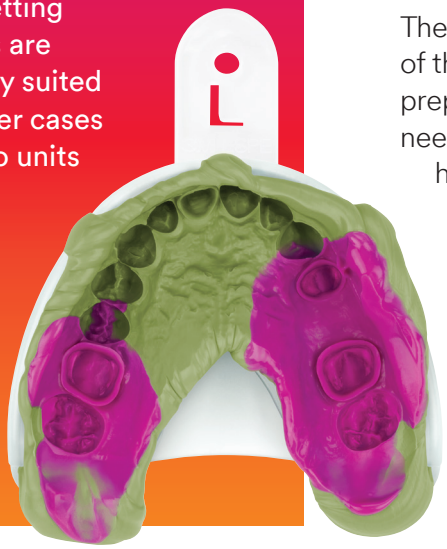
Introduction to 3M™ Express™ XT VPS Impression Material

3M is one of the leading manufacturers of impression material and is renowned for its ongoing innovations in this space. Since the introduction of the first impression material decades ago, 3M has continuously improved and expanded its portfolio of VPS and polyether impression materials to serve virtually all customer needs and impression indications, techniques and delivery choices.

When 3M™ Express™ XT VPS Impression Material was introduced, the product set the stage for uncompromising impression accuracy and quality, the prerequisites for excellent fitting restorations. The combination of features result in impression materials that offer an excellent balance of clinically relevant properties.

Indications

- Indicated for all kinds of precision impressions
- Quick-setting products are especially suited for smaller cases up to two units



Clinically relevant properties of 3M™ Express™ XT VPS Wash Materials

The overall goal of an impression is to create an exact copy of the dentition, especially the detailed reproduction of the preparation margins. To capture the margin, an impression material needs to have excellent properties in the unset stage, especially hydrophilicity and flowability. To avoid any kind of permanent deformation when the impression is removed from the mouth, an impression material also needs extraordinary properties in the set stage. Express XT VPS impression materials meet these requirements. When Express XT wash materials were developed, special focus was paid to developing materials that can withstand the forces that impressions are exposed to during mouth removal. This strongly reduces the risk of distortions and results in the potential for more accurate fitting restorations.

1 | Capture the margin through strong hydrophilicity and very good flowability

Hydrophilicity: The hydrophilicity of an impression material can contribute to the successful reproduction of detail in the moist intra-oral environment. The method most often used to determine the hydrophilicity of an impression material is the contact angle measurement. In this test a drop of water is placed on the surface of the impression material and the spreading of the drop across the surface is observed. The spreading of a drop of water on 3M™ Express™ XT VPS Impression Materials is extremely rapid. Fig. 1 shows that Express XT VPS Impression Materials show a much lower contact angle than the other VPS materials shown. Clinically, this reflects the potential for better wettability of the preparation surfaces and better performance in the oral environment. Impressions made with Express XT VPS Material show very good detail reproduction, even under challenging clinical conditions.

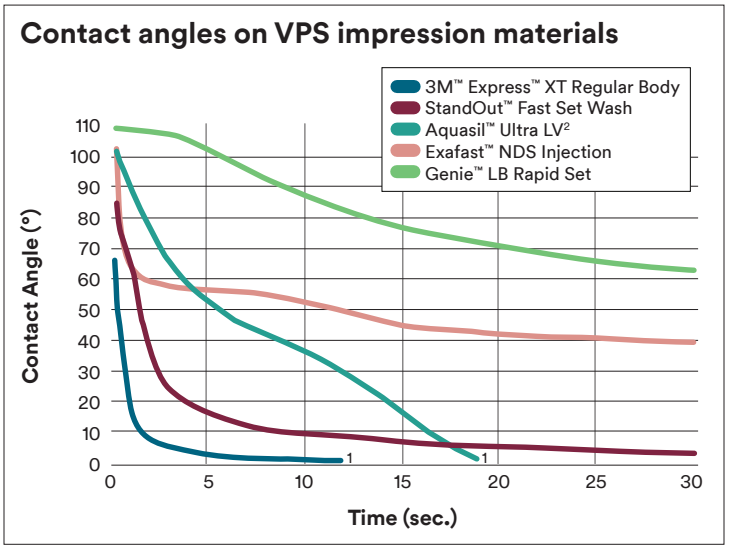


Fig. 1: More hydrophilic: 3M™ Express™ XT Regular Body VPS Impression Material has one of the lowest contact angles tested on set VPS impression materials. Source: 3M internal data.

Flow Properties: In addition to hydrophilicity, impression materials also require special rheological properties in order to ensure optimal wetting of the preparation surface areas after syringing around the preparation. Fig. 2 shows the flow around the tooth preparation of Express XT Light Body Quick Wash Material (Express XT VPS Wash Materials are also available in a slightly thicker, regular body viscosity).

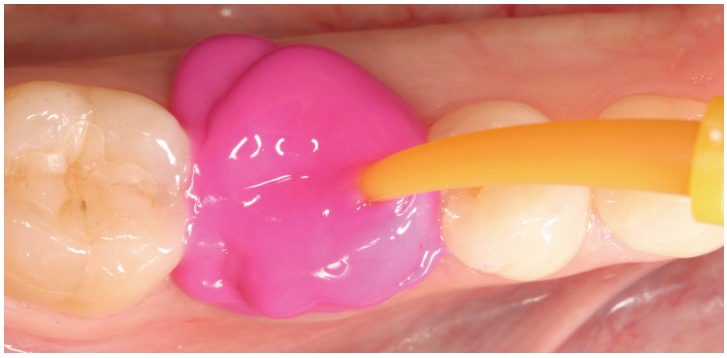


Fig. 2: Flow to tooth and gingiva of 3M™ Express™ XT Light Body Quick Wash Material.

[1] Test detection limit
[2] Based on mathematical model representing the measured data

2 | Reproduce the margin accurately through distortion-free mouth removal

When an impression is removed from the mouth, it is exposed to two principal forces, elongation and compression. 3M™ Express™ XT VPS Impression Material has a unique ability to withstand these forces.

Impression material characteristics that are necessary to withstand mouth removal are:

Ability to elongate and compress	→	Elongation and compression potential
Ability to avoid tearing	→	High tensile strength
Ability to recover from elongation and compression	→	Recovery from deformation

Toughness: In order to avoid tearing, an impression material not only has to have a high tensile strength, but also a high elongation potential that allows the material to stretch upon removal. The combination of these two parameters is described as toughness. It is defined as the total amount of energy an impression material can absorb until it tears. Toughness is the best measure of an impression material's ability to withstand the forces it is exposed to during mouth removal without tearing.

Express XT Material shows high toughness because of its combination of high tensile strength and elongation potential. Therefore Express XT impressions are less likely to tear upon mouth removal compared to materials with lower toughness values.

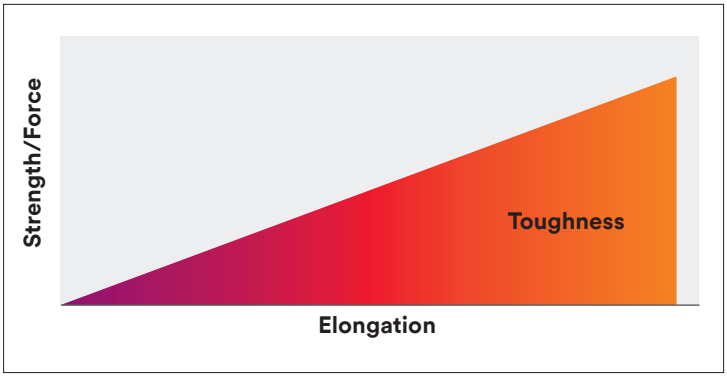


Fig. 3: Toughness, the combination of tensile strength and elongation potential. Source: 3M internal data.

Recovery from deformation and elongation (memory): While Express XT VPS Materials have high potential to resist tearing, this alone is not enough to reproduce an impression free of distortion. To achieve this, an impression material must show excellent recovery from the compressive and elongation forces it experiences upon mouth removal.

Although all modern VPS impression materials fulfill sufficient recovery from compression (ISO test), **they may lack in an adequate recovery from elongation**. High recovery from elongation is important for the areas around the preparation margin, especially a deep sulcus, undercuts, and interproximal spaces. In these places, the impression material is exposed to strong elongation forces upon mouth removal.

3M™ Express™ XT Wash Materials show almost perfect elastic recovery from stretching. This can be demonstrated using a sophisticated method for analyzing the recovery from elongation — the Memory Test.

In this test, paddle-shaped specimens of different VPS materials were cured at mouth temperature for the manufacturer's recommended setting time, stretched by 150%, and then allowed to recover. After two hours, the samples were measured for recovery from elongation. Fig. 4 shows that Express XT VPS Impression Materials have excellent memory.

Clinically this means that even under strong elongation forces, Express XT VPS Impression Materials can maintain their original dimensions. In this test, the other leading VPS impression materials exhibit a permanent deformation of up to 5%, increasing the chance of distorted and potentially poor fitting restorations. The nearly 100% memory for the Express XT VPS Impression Materials is also a benefit for the dental technician when removing the cast from the impression.

Memory Test

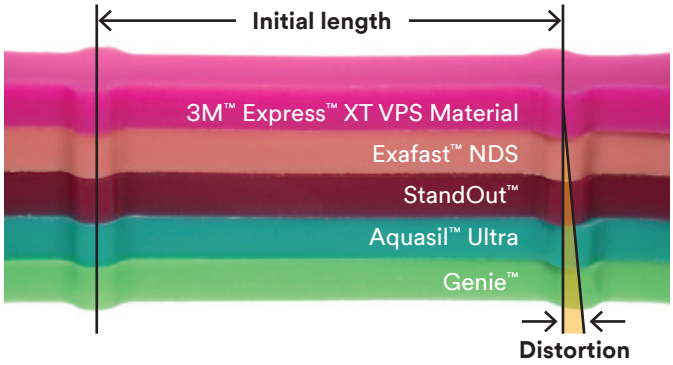
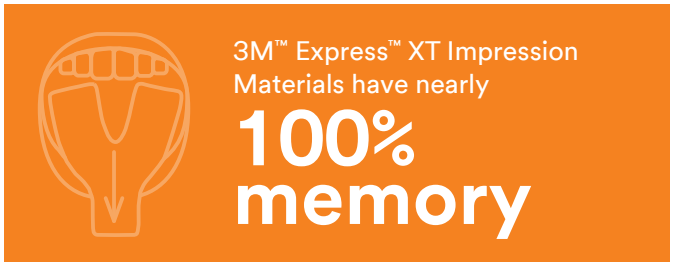


Fig. 4: Lab tests prove 3M™ Express™ XT Light Body Quick VPS Impression Material is less likely to distort upon removal.
Source: 3M internal data.



3 Get the best balance of clinically relevant properties

The combination of all clinically relevant properties are summarized in a diamond chart (Fig. 5).

From a clinical perspective Express XT Impression Material offers extraordinary potential for accurate impressions and better-fitting restorations — a benefit for dentist, patient and the dental technician.

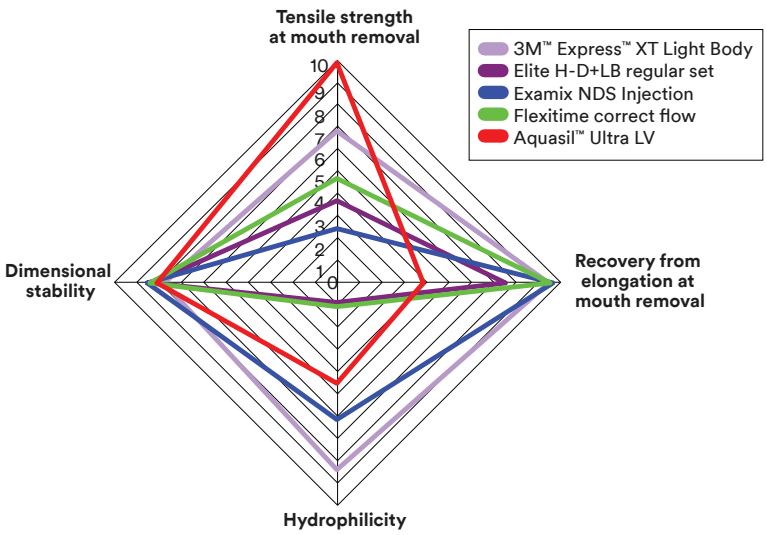


Fig. 5: Compilation of four clinically important impression material parameters: tensile strength, recovery from elongation (memory), hydrophilicity (2 sec. values on set memory, dimensional stability). Shown are 3M™ Express™ XT VPS Impression Material and other leading VPS impression materials. Values for each parameter are given in a scale from 1 to 10 in which 1 = poor and 10 = excellent.
Source: 3M internal data.

Working and setting times

Product	Dispensing System	Viscosity low – high	Working Time at 23°C/74°F min:sec	Intra-oral Syringe Time min:sec	Intra-oral Setting Time min:sec
Tray Materials					
3M™ Express™ XT Penta™ Putty			1:30		3:00
3M™ Express™ XT Penta™ H			2:00		3:30
3M™ Express™ XT Penta™ H Quick			1:30		2:30
3M™ Express™ XT Putty Soft			2:00		3:30
3M™ Express™ XT Putty Quick			1:30		2:30
Wash Materials					
3M™ Express™ XT Regular Body				1:00	3:30*
3M™ Express™ XT Regular Body Quick				0:40	2:30
3M™ Express™ XT Light Body				1:00	3:30*
3M™ Express™ XT Light Body Quick				0:40	2:30

*Intra-oral setting time is 3:00 min. when used in combination with 3M™ Express™ XT Penta™ Putty.

Product characteristics of 3M™ Express™ XT Penta™ Putty Material

Some dentists continue to appreciate hand-mixed putty as a tray material because of the seating resistance and high compressive forces. Due to their high viscosity levels, these materials are typically dosed and mixed by hand, with the associated disadvantages such as non-homogeneity and presence of voids in the mix. This, along with inhibition problems associated with latex gloves and infection control concerns associated with de-gloving, have led many dentists to abandon hand-mixed putties. The mixing of an impression material with real putty consistency in the 3M™ Pentamix™ 3 Automatic Mixing Unit[1] and superior mixing qualities compared to hand-mixed putties (Fig. 6a and 6b) was achieved with a unique combination of reactive polysiloxanes and fillers. This innovative approach enabled the use of high-viscosity pastes in the Pentamix Mixing Unit without having to forfeit any of the customary putty characteristics.

Fig. 6a: Superior mixing quality of 3M™ Express™ XT Penta™ Putty Material with the 3M™ Pentamix™ 3 Automatic Mixing Unit.

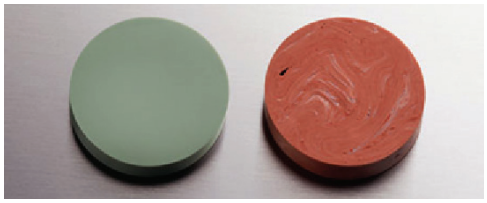


Fig. 6b: Superior mixing quality of 3M™ Express™ XT Penta™ Putty Material automatically mixed with the 3M™ Pentamix™ 3 Mixing Unit (left) compared with a hand-mixed putty (right, 3M™ Express™ STD Putty).

Thermally active properties: In contrast to other tray impression materials, 3M™ Express™ XT Penta™ Putty Impression Material offers a unique benefit: it accelerates the intra-oral setting time of any VPS wash material combined with it.[2] This thermally active behavior results from the fact that Express XT Penta Putty Material exits the 3M™ Pentamix™ 3 Automatic Mixing Unit at about mouth temperature. Because the putty is already warm when the tray is seated in the mouth, the wash material warms up faster than with other impression materials. Polymerization of the VPS wash material — which is strongly temperature-dependent — is accelerated. As a result, the intra-oral wash setting time is shortened while the working time remains unchanged. This is demonstrated in Fig. 7 in which the intra-oral setting time of Express XT Light Body Wash Material is compared when combined with Express XT Penta Putty Material (thermally active) and Express XT Penta H Material (not thermally active). With Express XT Penta Putty as tray material, the intra-oral setting time for Express XT Light Body Wash Material is reduced by 30 seconds.

Express XT Penta Putty Material is designed to be used with regular-setting wash materials and combines the clinical benefit of having a long wash syringing time (1 minute intra-oral) with the increased productivity and patient comfort from faster mouth removal of the impression.

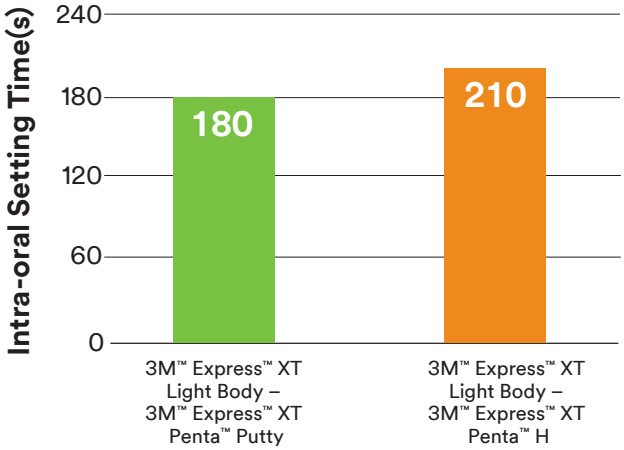


Fig. 7: Comparison intra-oral setting time of 3M™ Express™ XT Light Body Wash Material when combined with 3M™ Express™ XT Penta™ Putty and 3M™ Express™ XT Penta™ H Materials. When combined with the thermally active 3M™ Express™ XT Penta™ Putty, the intra-oral setting time for the wash material is reduced by 30 seconds. Source: 3M internal data.

With 3M™ Express™ XT Penta™ Putty as tray material, the intra-oral setting time for 3M™ Express™ XT Light Body Wash Material is reduced by

30 seconds

Benefits of 3M™ Express™ XT Penta™ Putty VPS Impression Material

Material properties

- Putty consistency and insertion force when seating tray
- High final rigidity
- Easy carving of initial impression for 2-step technique
- Thermally active properties

3M™ Pentamix™ 3 Automatic Mixing Unit
Standardized, consistently homogeneous mixing quality as well as absence of streaks and voids (Figs. 6a, 6b)
Hygiene and cleanliness of mixing process
Precise dosing
Long-term storage of pastes due to hermetic air seal in extremely airtight foil bags

[1] 3M™ Express™ XT Penta™ Putty Material should only be mixed in the 3M™ Pentamix™ 3 Automatic Mixing Unit with a metal cartridge
[2] Simultaneous (1-step) impression technique only

Physical/technical data

		Tray materials					Wash materials			
Property	**Unit**	**3M™ Express™ XT Penta™ Putty**	**3M™ Express™ XT Penta™ H**	**3M™ Express™ XT Penta™ H Quick**	**3M™ Express™ XT Putty Quick**	**3M™ Express™ XT Putty Soft**	**3M™ Express™ XT Light Body**	**3M™ Express™ XT Light Body Quick**	**3M™ Express™ XT Regular Body**	**3M™ Express™ XT Regular Body Quick**
Consistency A+B (ISO 4823:2000)	mm	34	30	33	30*	30*	40	39	38	39
Linear dimensional change (ISO 4823:2000)	%	-0.3	-0.2	-0.2	-0.2	-0.2	-0.3	-0.4	-0.4	-0.4
Recovery from deformation (ISO 4823:2000)	%	99.4	99.6	99.6	99.4	99.1	99.7	99.7	99.7	99.7
Strain in compression (ISO 4823:2000)	%	2.0	2.7	2.4	1.4	1.9	4.0	3.8	4.1	4.3
Tensile strength at mouth removal (3M internal)	MPa						4.81	4.59	4.43	4.11
Recovery from elongation at mouth removal (3M internal)	%						0.25	0.33	0.33	0.29
Shore hardness after 10 min. (DIN 53504)	—	73	56	70	68	61	51	51	49	49
Shore hardness after 24 hrs. (DIN 53504)	—	78	63	76	76	67	56	57	56	55
Contact angle after 2 sec., cured (3M internal)	°						18	19	29	36

Compatibility with gypsum (ISO 4823:2000) and reproduction of detail (ISO 4823:2000) are fulfilled for all tray and wash materials.
NOTE: The data do not represent ranges of values but are individual values, each relating to a specific production batch.

* For handmix putty materials, only constistency of component B; no significant difference between component A and B

Bibliography

"Klinisch erreichbare Abformgenauigkeit von A-Silikonen" Deutsche Zahnärztliche Zeitschrift 59 (2004). T. Noack, M. Balkenhol, P.Ferger and B. Wöstmann

"Gingival Sulcus Simulation Model for Evaluating the Penetration Characteristics of Elastomeric Impression Materials" Int J Prosthodont (July–Aug. 2003) 16(4):385-9. Aimjirakul P., Masuda T., Takahashi H. and Miura H.

"Dimensional Accuracy and Surface Detail Reproduction of Two Hydrophilic Vinyl Polysiloxane Impression Materials Tested Under Dry, Moist, and Wet Conditions" J Prosthet Dent (2003) 90, 365-72. C.S. Petrie, M.P. Walker, A.M. O'Mahony and P. Spencer

"Abformgenauigkeit von Doppelmischabformungen vs. Korrekturabformungen — eine 3D-Scan In-vitro-Studie" Dtsch Zahnärztl Z 59 (2004) 10. A. Siemer, M. Balkenhol, M. Trost, P. Ferger and B. Wöstmann

"Selected Characteristics of a New Polyvinyl Siloxane Impression Material — A Randomized Clinical Trial" Quintessence Int. (Feb. 2005) 36:2, 97-104. M.B. Blatz, A. Sadan, J.O. Burgess, D. Mercante and S. Hoist

"Factors Affecting the Accuracy of Elastometric Impression Materials" J Dent. (Nov. 2004) 32:8, 603-9. S.Y. Chen, W.M. Liang and F.N. Chen

"Elastic Recovery After Elongation of VPS Impression Materials" Poster presentation at AADR 2006, Orlando J. Zech, H. Hoffmann and S. Hader

"Toughness of Different VPS Impression Materials" Poster presentation at CED 2005, Amsterdam J. Zech, H. Hoffmann and S. Hader

"Hydrophilicity of Fast Setting VPS Precision Impression Materials" Poster Presentation at CED 2005, Amsterdam C. Wiedig, J. Zech and F. Strauss

"Intra-oral Insertion Forces of VPS Tray Materials — Part I: Method" Poster presentation at CED 2005, Amsterdam B. Gangnus, J. Fetz, M. Harre, E.-M. Popp and J. Zech

"Intra-oral Insertion Forces of VPS Tray Materials — Part II: Comparisons" Poster Presentation at CED 2005, Amsterdam V. Porsfeld, C. Wiedig, J. Fetz, J. Zech and E.-M. Popp

3M Oral Care
2510 Conway Avenue
St. Paul, MN 55144-1000 USA

Phone 1-800-634-2249
Web 3M.com/dental

Warranty
3M warrants this product will be free from defects in material and manufacture at the time of purchase. 3M MAKES NO OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. User is responsible for determining the suitability of the product for users application. If this product is defective within the warranty period, your exclusive remedy and 3Ms sole obligation shall be repair or replacement of the 3M product.

Limitation of Liability
Except where prohibited by law, 3M will not be liable for any loss or damage arising from this product, whether direct, indirect, special, incidental or consequential, regardless of the theory asserted, including warranty, contract, negligence or strict liability.