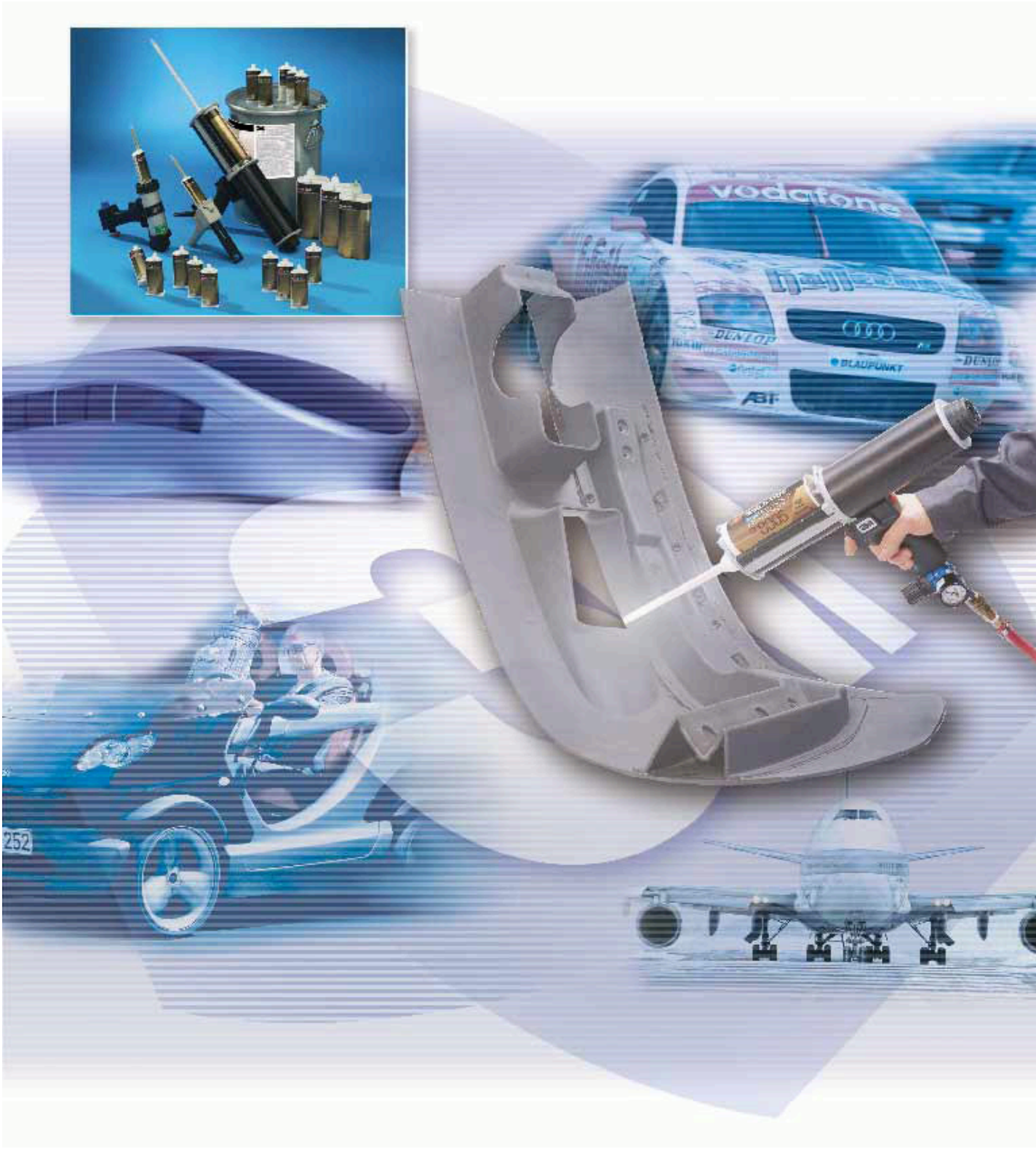
3M™ Scotch-Weld™ EPX

Two-component structural adhesives and applicator guns



3M *Innovation*

What is a structural adhesive?

3M's high-strength structural adhesives are fundamentally load-bearing formulations. Bond strength is often as strong as, or stronger than the materials joined.

Even a bonded area of 10 cm^2 (like in this picture) is sufficient to lift an average family car off the ground! In general, these structural adhesives have enough cohesive strength and creep resistance to permanently bond high-strength materials and they have the potential to replace mechanical and fusion fastening in many applications.

The aircraft industry is one of the pioneers in use of structural adhesives. Many other industries have also been taking advantage of 3M's advanced formulations and innovative dispensing.

The 3M™ EPX application system for 2-component structural adhesives provides quick, economic, clean, precise processing and quick set-up times. It consists of:

- EPX manual applicators or EPX air-powered applicators
- Two-component adhesives in double cartridges
- Static mixing nozzles

The adhesive can be applied at selected points or in a continuous bead. Dosing, mixing and application are all achieved in one action, delivering constant, defined quality. These 3M structural adhesives achieve permanent high strength bonds with many materials such as metals, glass, ceramics, wood, technical plastics and rubbers etc.

Specifications

Product no. *Adhesive type*	Description
EPOXY formulations	
DP 100 *rigid*	For metals, glass, ceramics and other materials. High shear strength for static loads. Excellent flow behaviour, therefore also well suited for potting. UL-listed.
DP 105 *highly flexible*	Particularly for materials with different, high expansion factors. High strength. Very good flow behaviour, therefore also very well suited for potting.
DP 110 *thoughened*	Especially good for bonding metal and plastic, for static and dynamic loads.
DP 125 *flexible*	Especially good for bonding plastic and for metals, where flexibility and peel strength are required. As DP 190, but with quicker time to handling strength.
DP 190 *flexible*	Especially good for bonding plastic and some types of rubber, as well as for metals, when flexibility and peel strength are required. UL-listed.
DP 270 *fluid*	Especially good for electronics. For potting, protection and sealing. No corrosion on copper, minimal exothermal reaction (heat development) and shrinkage (therefore also for bonding optical parts, e.g. lenses). UL-listed.
DP 410 *thoughened*	Outstanding stability under static and dynamic loads. High resistance to impact. Very good strength and excellent ageing characteristics.
DP 460 *thoughened*	As DP 410, but longer work life. UL-listed.
DP 490 *thoughened*	As DP 410, but with high temperature resistance (120°C). Thixotropic formulation, non-sag properties enable easy application to vertical surfaces.
DP 760 *rigid*	Especially for applications that require very high temperature resistance (230°C).
POLYURETHANE formulations	
DP 609 *flexible*	Especially for plastics and wood. Good peel strength, viscosity and flexibility. Minimal flow.
DP 610 *flexible*	As DP609, but transparent, non-yellowing UV-resistant characteristics make it ideal for applications that require long term transparency and good visual effect. Good flow behaviour.
ACRYLIC formulations	
DP 801 *thoughened*	Very good for plastics, elastomers and metals. Good resistance to impact. For static and dynamic loads. Short work life results in a fast development to handling strength.
DP 810 *thoughened*	As DP 801, but longer work life. Significantly less odour that most acrylic adhesives.
DP 8005 *thoughened*	New, innovative product especially for bonding Low Surface Energy plastics (like PE or PP) together or with other materials, without surface pre-treatment.
DP 8010 *thoughened*	As above, longer work life of 10 minutes.

Critical adhesive characteristics

Rigid adhesive types for applications with static loading and high shear strength (DP 100, DP 270, DP 760)
Flexible adhesive types for dynamic and shock loads (DP 105, DP 125, DP 190, DP 609, DP 610)
Toughened adhesive types which combine the advantages of hard and flexible types, i.e. with good peel strength, high shear strength and good impact resistance (DP 110, DP 410, DP 460, DP 490, DP 801, DP 810)

Useful adhesive terminology

Structural Adhesive = Practical bond strength is at least 7 MPa in overlap shear at 24° C.
Handling strength = the time it takes assembled parts to reach a strength where further handling and processing can take place. Time will be dependant on the surface to be bonded, temperature and humidity.

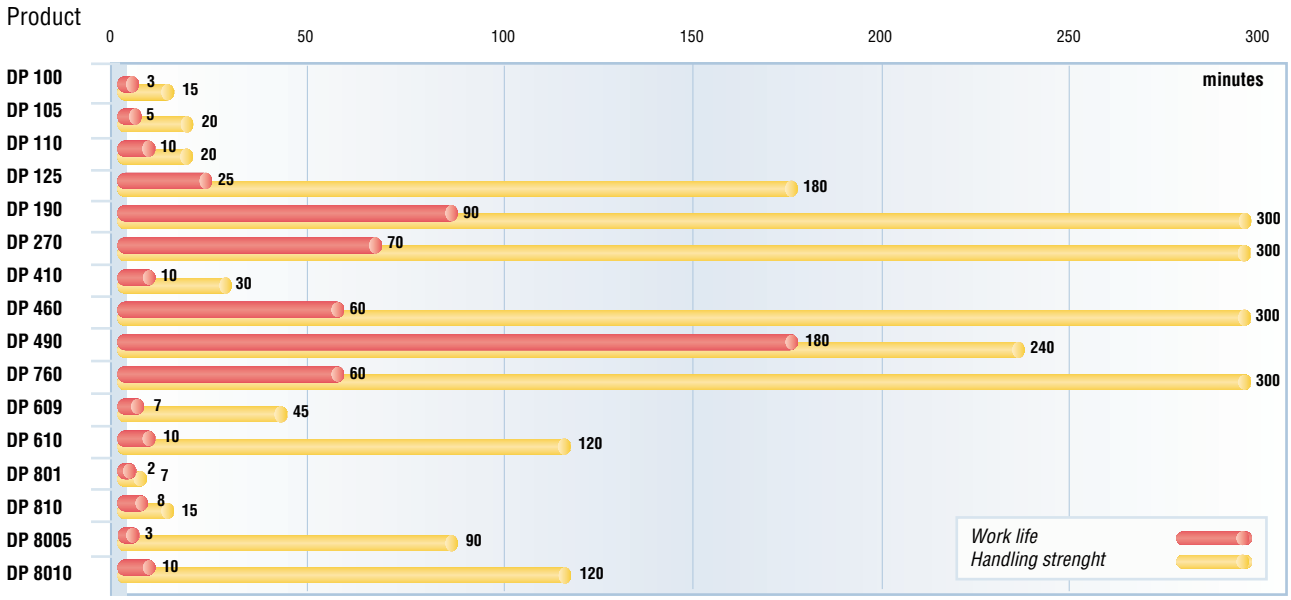
Work life = the time during which an adhesive is liquid enough to adequately wet-out on a substrate.
MPa = 1 MPa = 1 N/mm^2 = 145 psi
N/cm = Newton / 1 cm width.

Product No.	Colour	Mix ratio (B:A)	Work life (minutes)	Time to handling strength	Viscosity	Shear strength (Aluminium, MPa) -55°C	+23°C	+80°C	Peel strength (Aluminium, N/cm)	Temperature
EPOXY formulations										
DP 100	transparent	1:1	3 to 5 min.	15 min.	fluid	6	9	2	4	-50 to 80°C
DP 105	transparent	1:1	4 to 5 min.	20 min.	fluid	24	14	2	62	-50 to 80°C
DP 110	translucent or grey	1:1	8 to 10 min.	20 min	controlled flow	14	18	1	35	-50 to 80°C
DP 125	grey	1:1	25 min.	2 to 3 hrs	controlled flow	24	24	3	62	-50 to 80°C
DP 190	grey	1:1	90 min.	4 to 6 hrs	controlled flow	11	18	3	21	-50 to 80°C
DP 270	transparent or black	1:1	60 to 70 min.	4 to 6 hrs	fluid	8	17	2	<4	-50 to 80°C
DP 410	off white	2:1	8 to 10 min.	30 min.	thixotropic	29	34	8	100	-50 to 80°C
DP 460	off white	2:1	60 min.	4 to 6 hrs	controlled flow	31	31	5	107	-50 to 80°C
DP 490	black	2:1	180 min.	4 hrs	thixotropic	24	30	12	92	-50 to 120°C
DP 760	white	2:1	45 to 60 min.	4 to 6 hrs	thixotropic	20	29	24	60	-50 to 230°C
POLYURETHANE formulations										
DP 609	off white	1:1	7 min.	45 min.	low	17	14	2	70	-50 to 80°C
DP 610	clear	1:1	10 min.	2 hrs	fluid	34	23	3	78	-50 to 80°C
ACRYLIC formulations										
DP 801	green	1:1	1 to 2 min.	7 min.	controlled flow	19	13	2	24	-50 to 80°C
DP 810	green	1:1	8 min.	10 to 15 min.	controlled flow	8	30	3	52	-50 to 80°C
DP 8005	white	10:1	2 to 3 min.	90 min.	thixotropic low	12*	6*	2*	28**	-50 to 80°C
DP 8010	white	10:1	10 min.	120 min.	thixotropic	6*	10*	2*	28**	-50 to 80°C

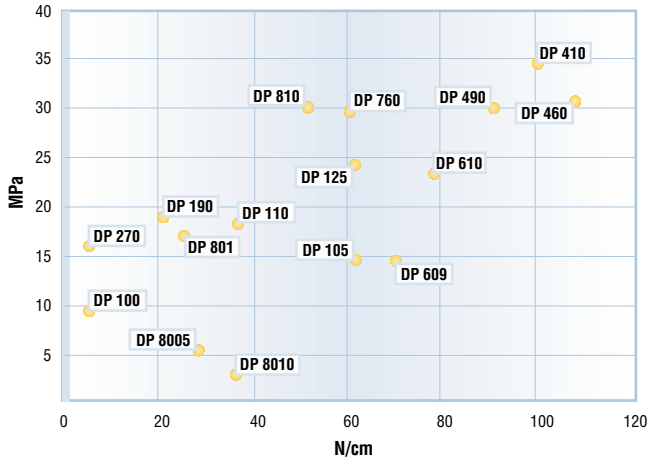
* PP/PP ** HDPE

EPX Adhesives Preselection

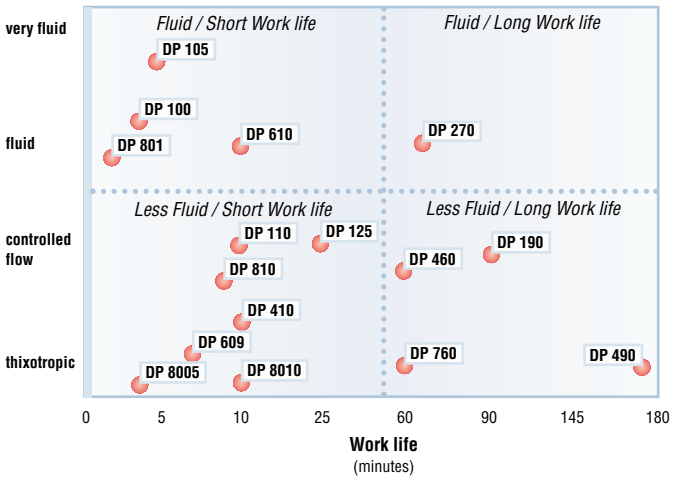
Work life vs. Handling strength



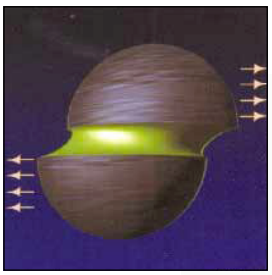
Sheer vs. Peel Strength on etched aluminium



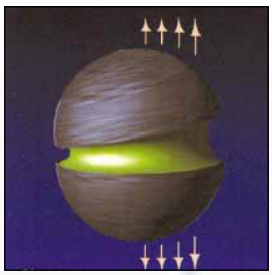
Viscosity vs. Worklife



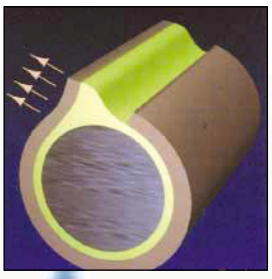
Tensile



Shear



Cleavage



Peel

Tensile stress is exerted equally over the entire joint and away from the adhesive bond.
Shear stress is across the adhesive bond. The bonded materials are forced to slide over each other.
Cleavage stress is concentrated at one edge and exerts a prying force on the bond.
Peel stress is concentrated along a thin line at the bond's edge. One surface is flexible.
Most applications are subject to a combination of stresses.

Applications and benefits

The 3M™ Scotch-Weld™ EPX structural adhesives range is widely used in product assembly where high mechanical performance is required, and also for sealing and potting in electrical / electronic applications.

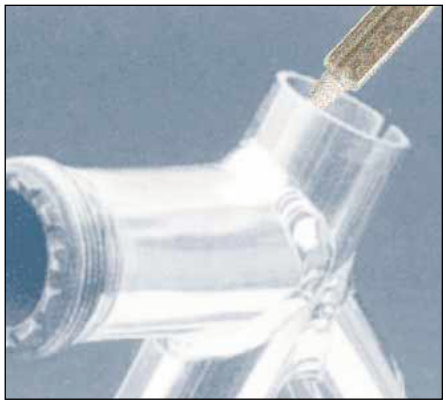
The EPX structural adhesives offer significant advantages – at a low investment cost:

- Reducing costs for combining different materials for the same or better performance;
- Eliminating secondary sealing or finishing operations, saving time and money;
- Achieving stronger and stiffer structures by improving stress distribution;
- Joining a wide variety of materials that are unable to be assembled by traditional methods of fastening.

Bonding a golf club head to shaft.
3M Scotch-Weld DP 810

Bonding a seat cover to the ABS moulding
3M Scotch-Weld DP 190

Bonding a magnet to a steel rotor
3M Scotch-Weld DP 460



Bonding tubular joints for high impact applications
3M Scotch-Weld DP 490

Encapsulating memory chips to protect against hacking of a digital set-top box
3M Scotch-Weld DP 760

Bonding automotive interior parts (PU) to the dash-board (PP)
3M Scotch-Weld DP 8005

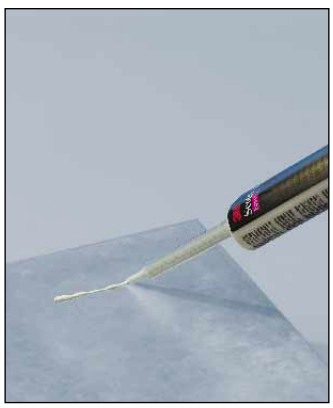
Operation Instructions

The EPX system of controlled two-component structural adhesives enables bonding operations to be carried out quickly, with precision and in four simple steps:

Slip the cartridge into the dispenser and close the dispenser's lock.

Unscrew the tip of the cartridge and fix the nozzle on the cartridge.

Pull the trigger for exact dispensing, the two components are mixed and applied at once.



The result is a clean and precise application without the user coming into contact with the adhesive.

Equipment

The 3M™ Scotch-Weld™ EPX adhesive system includes:

Applicators

All the applicators are ergonomically designed to minimise fatigue and ensure the maximum ease of use, particularly in “hard to get at” applications. There are manual and air-powered guns for 50 ml cartridges and an air-powered gun for the 400 ml cartridges. The selection of a manual or air-powered gun and the 50 ml or 400 ml cartridge depends upon the production requirement(s) for the application.

Air-powered applicator

The use of a compressed air feed enables operators to apply precisely the quantity of product required without interruption.

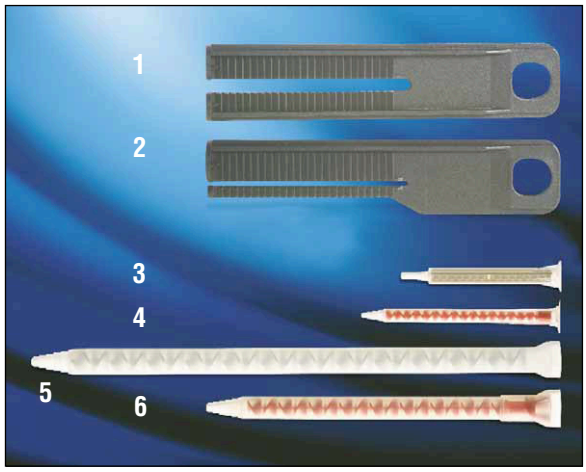
Manual applicator

The manual applicator is a light, reliable tool, which requires no special maintenance; it is particularly well suited to smaller scale use at multiple work- stations.

Mixing Nozzles

The adhesive is extruded through a static mixing nozzle, which ensures that the two components are mixed together thoroughly every time. The mixing nozzle can be adapted to extrude different bead diameters by cutting the tip.

The EPX applicators



The EPX accessoires

1. **EPX manual applicator**
   complete with plunger 1:1/2:1 - suitable for 50 ml cartridges.
   Note: for 38 ml 10:1 cartridges (DP 8005, DP8010), a 10:1 plunger is also required
2. **EPX air-powered applicator**
   for 1:1 and 2:1 50 ml cartridges
3. **EPX air-powered applicator 8501**
   for 1:1 and 2:1 400 ml cartridges
   EPX air-powered applicator (not shown)
   for DP 8005, DP 8010, 265 ml cartridges

Supply form: Duo pack cartridges
1:1 and 2:1 mix ratio = 50 ml and 400 ml
10:1 mix ratio = 38 ml and 265 ml
Bulk versions on request

EPX plunger for EPX manual applicator:

1. Type 1:1/2:1 for all 50 ml cartridges
2. Type 10:1 for 38 ml cartridge (DP 8005, DP 8010)

EPX mixing nozzles for cartridges:

3. Quadro nozzle for 50 ml cartridges (except DP 8005, DP 8010)
4. 17 Element nozzle for DP 8005, DP 8010, 38 ml

EPX mixing nozzles for large cartridges:

5. 24 Element nozzle for all 400 ml cartridges
6. 18 Element nozzle for DP 8005, DP 8010, 265 ml cartridge

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