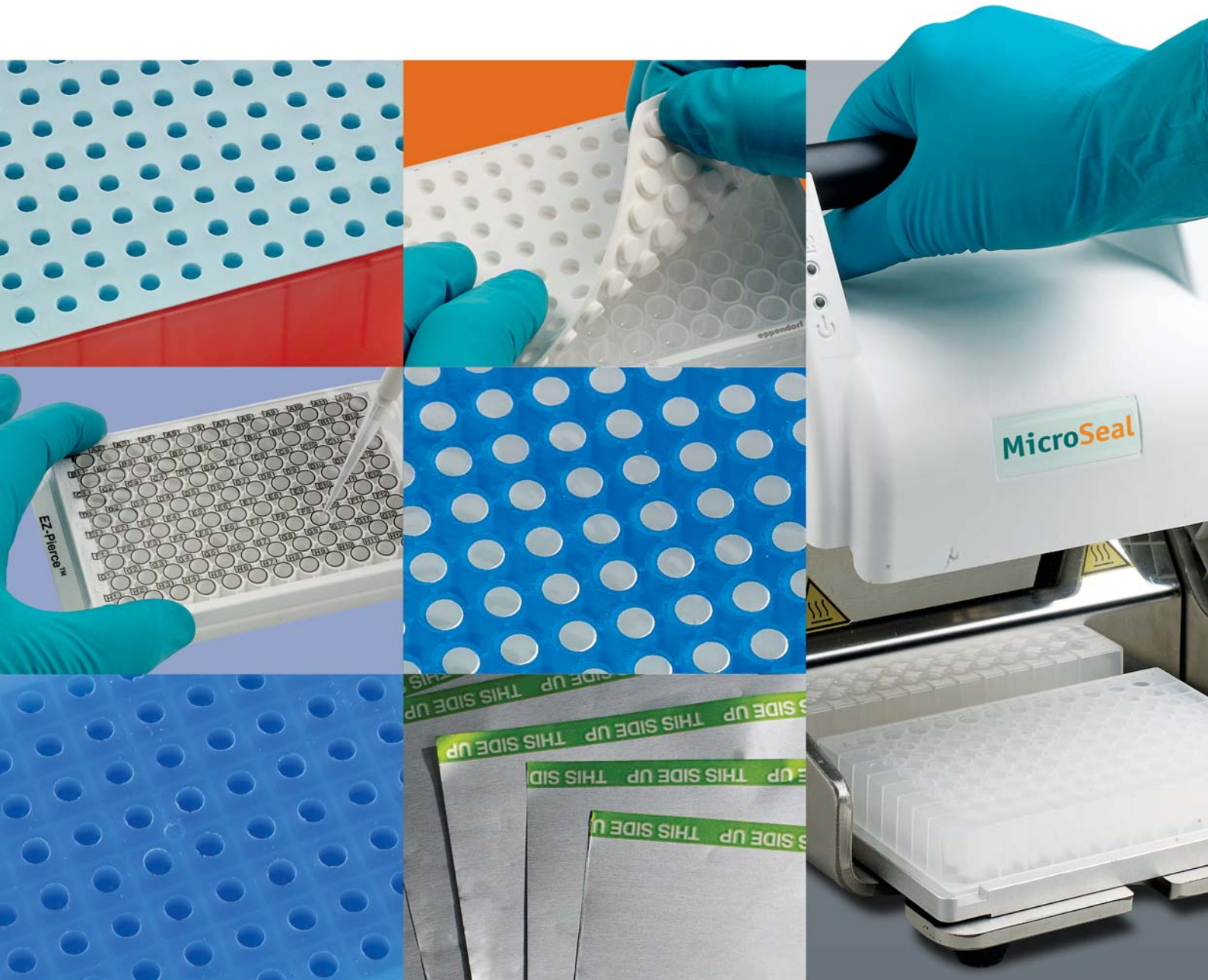
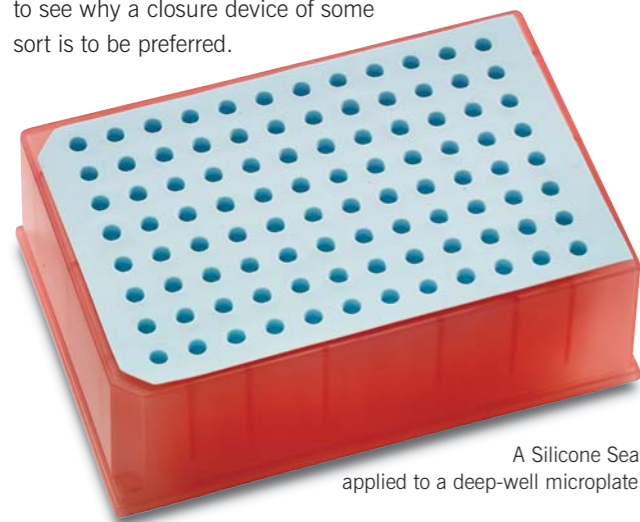


A GUIDE TO MICROPLATE CLOSURE AND SEALING



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Choosing the correct combination of microplate closure for each type of microplate is important to achieving best laboratory practice and to avoid unnecessary work further downstream. Microplates are a convenient method for storing, transporting and handling compounds and samples, but they have common problems associated with them. Evaporation can occur from the wells of the plate which can affect concentration readings. Contamination from dust, spores or other atmospheric detritus may occur and spillage is a constant danger whenever microplates are used for transport. Add to this the general risks of cross-contamination in the denser formats such as 96- and 384-well plates and it is easy to see why a closure device of some sort is to be preferred.



A Silicone Seal applied to a deep-well microplate.

Microplates can be closed in a number of ways. The most common groups of closures are:

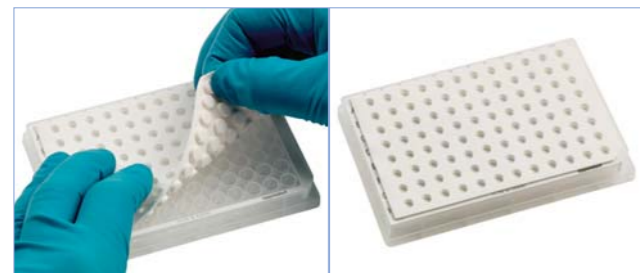
Reusable closures

- Rigid Lids
- Friction seals or Cap Mats

Single-use closures

- Thermal seals
- Adhesive seals

Each group has its advantages and drawbacks. This guide aims to set out the most popular combinations for the common applications.



Rigid lids are normally transparent and may, in fact be optically clear in the visible region allowing spectroscopic measurements to be taken through the lid. Lids are normally made of clear crystal styrene and may have “anti-condensation” rings on the underside. These raised rings interact with the round wells of assay plates to prevent condensate from travelling along the underside of the lid to any adjacent well where it could cause contamination. Condensation is normally a problem in live cell assays, so plates with anti-condensation lids should always be used for this work. In some cases, a black styrene or polypropylene lid may be used, normally where it is desired to protect samples from visible light. Whilst lids have an important role to play and are easily removed by, for example, automated equipment, they do not form a tight anti-evaporation seal and do not seal individual wells.



Applying a clear adhesive film.

Friction seals, or cap mats as they are sometimes called, form a physical barrier in the top of each well, thereby preventing leakage and evaporation. They are usually made from a soft pliable polymer such as EVA or silicone to allow them to be forced down into the well. They may be pierceable and some are pre-scored to ease the progress of the needle or tip through the cap mat and into the well. Some types act as septa and will re-seal after the tip is withdrawn. They can be re-used several times if suitably decontaminated, but are more expensive initially than disposable seals.



EZ-Pierce film is pre-scored to aid needle penetration.

Thermal seals are, as the name implies, heat-welded onto the upper surface of the plate to form a very strong and often permanent barrier. The plate material must be compatible with heat-sealing as it will melt during the process. In addition, thin raised rims or walls are needed to ensure a tight and complete seal around the well. Thus, heat seals are not suitable for rimless plates. They tend to work best with polypropylene due to its lower melt point, but can also work with most polystyrene plates. Aluminium foil is used for storage of samples in plates and various grades are available varying from extremely robust for deep cold-storage to rather thin, easily pierced foil suitable for robotic applications. One difficulty with thermal seals is that even those designed to be “Peelable” require considerable force to remove them. Re-sealing over the top of the foil is not possible either, it must first be removed entirely. Clear thermal film is used on assay plates to prevent evaporation whilst allowing reading on a microplate reader.



30 m blue foil can be pierced or peeled away.

Adhesive seals are polymer or aluminium foil sheets coated with adhesives that will adhere to the upper plate surface. These are cheap, easy to use and easy to remove. However, many assays are not suitable for adhesive seals because no adhesive must come into contact with the sample. The pattern-printed adhesive seal gets over this by having no applied adhesive in the well area. Adhesives are not normally suitable for aggressive solvents either as these may dissolve the glue layer. Just like other seals, adhesive seals can be supplied pre-scored for easy piercing by a pipette. Adhesive seals can be applied over the top of an existing seal, so plate re-sealing is easy. Adhesive seals are available in aluminium, clear and black finish, or pattern-printed PTFE, to suit the application.



Pattern-printed films have no adhesive over the well (BST-9790).

Porvair Sciences manufactures a range of deep well polypropylene plates for compound handling, transport and storage. These blocks are designed for sealing by any of the above methods. The popular 2ml square deep well block (219009) will accept a simple clear styrene Universal Lid (229225) which is a snug fit but can be removed easily with a gloved hand. The thin well walls of the 2ml square plate and the raised rims of the 2ml round (219020), 1ml round (219002) and 1ml round black (219412) plates lend themselves to sealing with a thermal sealer, such as Porvair Sciences MiniSeal 2 heat sealer (500090).

A special rimless version of the 1ml round well block (219037) has been designed to accept either lids or adhesive seals. A range of Friction Seals can also be used to close these deep well blocks, some of which are available sterile and include some pre-scored pierceable types. The most popular types, made from EVA which is durable and easy to apply, are for 96-square wells (219004) and 96-round well (219036). These mats also fit Corning and Waters round well blocks, while the square cap mat fits Axygen, Labnet, VWR, Phenomenex and Thermo Nunc blocks.

To facilitate easy application of the cap mats or friction seals and to reduce the risk of repetitive strain and tiredness in the operator, a special cap mat applicator is available from Porvair Sciences in two forms, a fully manual version, the Mat Capper (229078) and a semi-automatic electric version, the Autocapper (500246). These are recommended where there are large numbers of plates requiring closure with rigid cap mats.

All Porvair assay plates feature the “chimney well” design where individual wells are held in a thin lattice to reduce cross-talk. This ensures that anti-condensation rings on the lids of these plates re-direct any condensate back into the correct chimney well, minimising cross-contamination. For a more permanent seal, these polystyrene assay plates will also accept a thermal welded seal such as the clear seal (500090) or aluminium peelable seal (229573) which is just 38um thick and can therefore be pierced, as well as peeled, away.



Optically clear film prevents evaporation in assay microplates.

MICROPLATE CAPPERS

Mat Capper

For laboratories having to seal medium numbers of microplates the Mat Capper offers an affordable solution. Compact and portable, the Mat Capper is very easy to use, requiring only one operation of the system to produce an accurate and tight seal on a wide range of both collection and shallow well microplates. The seals used are EVA or silicone mats, which work by friction fit and are re-usable with care.

The Mat Capper can also be used with 2D bar-coded tube racks and their closure mats, including racks containing glass tubes, thanks to the clever design of the mechanism which will not crush one end of the rack but applies even pressure across the plate or rack.

- Caps shallow and deep well polypropylene plates
- Needs minimal pressure for capping, reducing fatigue and RSI
- Powder coated to resist chemical spillage
- Universal plate 'shuttle' to take shallow or deep well plates
- Fixing holes for securing to bench
- Works with glass tube racks



Shown with cap mat 229093

Mat Capper

Description	Qty/pack	Cat. no.
Mat Capper, applicator for storage and assay plates	1	229078

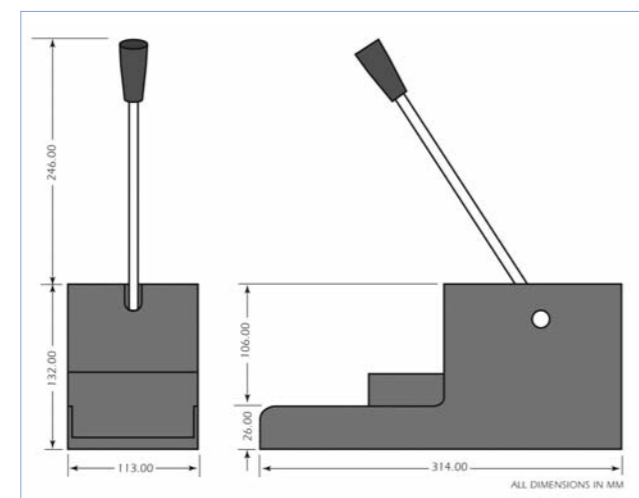
AutoCapper electrically operated mat capper

Description	Qty/pack	Cat. no.
AutoCapper electrically operated mat capper for storage plates and vial racks 110/220V	1	500246

AutoCapper

The new AutoCapper from Porvair Sciences has been designed to take the strain out of applying friction sealing caps to deep well plates and tube racks. Simply place your rack or plate with its attendant cap mat in the drawer and push it firmly shut. The sophisticated electronics take over, applying reproducible and even pressure every time to force the cap mat down into each tube or well. Time after time, the AutoCapper does the hard work for you. It's more reproducible, quicker and less likely to cause a strain injury than trying to do this by hand. The compact unit requires only a 110v or 220v power supply to operate and is small enough to sit on most lab benches.

- Automated application of friction sealing caps
- Reproducible, even pressure every time
- Speeds up the general workflow
- Small footprint for laboratory benches



THERMAL PLATE SEALERS

MiniSeal II semi-automatic heat sealer

The new MiniSeal II semi-automatic plate sealer builds on the reputation of our earlier Minseal design for robustness and an ability to seal most types of plate. For users who need a tight seal on deep well plates, conventional sealers may not offer sufficient down force to guarantee a good seal.

With powerful stepper motor control and a mighty 450 watts of heating power available, the new MiniSeal II copes effortlessly with PCR, filter-bottomed, assay and deep well plates, EVEN if the plate itself is distorted or bowed. Easy to set up with simple up/down programming for both sealing time and sealing temperature, the MiniSeal II also boasts a robust drawer design that ensures excellent conformance to health & safety regulations.

With so much available power, sealing times for most polypropylene plates with Porvair seals are less than 3 seconds each. Sealed plates are automatically ejected from the MiniSeal II. With a footprint smaller than a sheet of A4 paper and weighing just 6kgs, this electrically-driven sealer is ideal for small bench spaces.

MiniSeal II semi-automatic single plate sealer

Description	Qty/pack	Cat. no.
MiniSeal II semi-automatic single plate heat sealer 110V / 220V	1	500090
Supplied complete with two plate adaptor blocks, plate weight and line cord		
Skirtless plate adaptor 96-well	1	500083
Plate adaptor flat top 384 PCR plate	1	500084

MicroSeal Manual Thermal Plate Sealer

The MicroSeal is designed to be compact, easy to use and ergonomic. Heat sealing a wide range of plates is quick and simple. Heat sealing protects precious samples from evaporation and contamination when performing PCR or during storage. A built-in thermostat prevents overheating of the MicroSeal and with its small footprint and ease of use, the new MicroSeal is the obvious choice for manual sealing of PCR plates and microplates. With a pre-set temperature of 170°C, ideal for most common sealing applications, and dual LED status display for power and heating, the MicroSeal is

MicroSeal plate sealer

Description	Qty/pack	Cat. no.
MicroSeal plate sealer 110/230v	1	229751
Plate adaptor for ANSI/SLAS deep-well plates	1	229752
Plate adaptor for rimless 96-well PCR plates	1	229753
Plate adaptor for ANSI/SLAS standard 14mm plates	1	229754
Plate adaptor block 384 deep well plates 30.2mm high	1	500014

Unlike some other manufacturer's products, MiniSeal II comes complete with plate adaptors for standard SBS microplates, deep well microplates and PCR plates. The unused adaptors are ingeniously designed to stack on top of the unit when not in use. Also included is a brass plate weight to keep your foils and seals flat during sealing.



- Desktop semi-automatic Heat Applied Plate Sealing System
- Seal SBS format micro well plates and tubes
- Seals plates of any height from 9 - 48mm
- Temperature range from ambient to 200°C
- Seal time from 0.1 - 9.9 seconds
- Simple slide operation
- Combined temperature and seal time display
- Light weight system, only 6kgs (14lbs)
- 110V / 220V 50/60 Hz compatible
- No compressed air required

safe and easy to use. An ergonomic pull down action allows single action sealing of most common plate types. Additional adaptors are available for specific plates.

- Fast warm up time
- Consistent, single action sealing
- Pre-set temperature for ease of use
- Sealing Temperature 170°C
- Warm up time < 10 minutes

CAP AND SEALING MATS

The following list shows all the mats currently available from Porvair Sciences. This includes some which have been omitted from the accompanying selection charts for clarity.

Friction seals (cap mats)

Cat. No.	Description	Qty/Pack
500179	Silicone cap mat piercable, round well with double O-ring to fit 219020/021 common wall plate	50
500182	Silicone cap mat piercable, square well with double O-ring to fit 219009/027 storage block	50
380001	Silicone sealing cap to fit 384 well plates, 219040 and 219041	50
219004	EVA sealing cap, 96 square well to fit 219030, 219031, 219009, DNase/ RNase free, inner of 1	50
219019	EVA sterile sealing cap, 96 square fit 219025, 219026 & 219027, DN/ RNase free, inner of 1	50
219036	EVA sealing cap, round well to fit 219002 DNase/ RNase free, inner pack of 1	50
219042	EVA sterile sealing cap, round well to fit 219012, DNase/ RNase free, inner pack of 1	50
219044	Piercable Santoprene, 96 square well to fit 219002, DNase/ RNase free, inner pack of 1	50
500018	EVA sealing strip, 8 square well to fit 219006, 219008 & 219009, DNase/ RNase free.	300
500243	TPE cap mat piercable, round well with double O-ring to fit 219020/021 common wall plate	50
360098	Silicone 48 well solid plate seal, 7.5ml, 5ml	100
360010	Piercable Santoprene, 96 square well sealing cap to fit 219006, 219008 & 219009	100
360014	Piercable Santoprene 24 well sealing cap to fit 360013	100
360006	Piercable Santoprene 48 well sealing cap for 360002 /360004	100
219033	Friction sealing cap mat polypropylene square well for 219030/031	50
219251	Friction seal thermoplastic elastomer for low-profile deep well 1.1ml plate	100

Moulded sealing mats for standard 96 round well plates

Cat. No.	Description	Qty/Pack
996050MR-96	Round well moulded grey PTFE/silicone mat for standard 96 round well plates	5
996075MR-96	Round well prescored moulded grey PTFE/silicone mat for standard 96 round well plates	5
997005MR-96	Round well moulded green silicone mat for standard 96 round well plates	5
997075MR-96	Round well prescored moulded green silicone mat for standard 96 round well plates	5

Moulded sealing mats for standard 96 square well plates

Cat. No.	Description	Qty/Pack
996050SW-96	Square well moulded grey PTFE/silicone mat for standard 96 square well plates	5
996075SW-96	Square well prescored moulded grey PTFE/silicone mat for standard 96 square well plates	5
997005SW-96	Square well moulded green silicone mat for standard 96 square well plates	5
997075SW-96	Square well prescored moulded green silicone mat for standard 96 square well plates	5

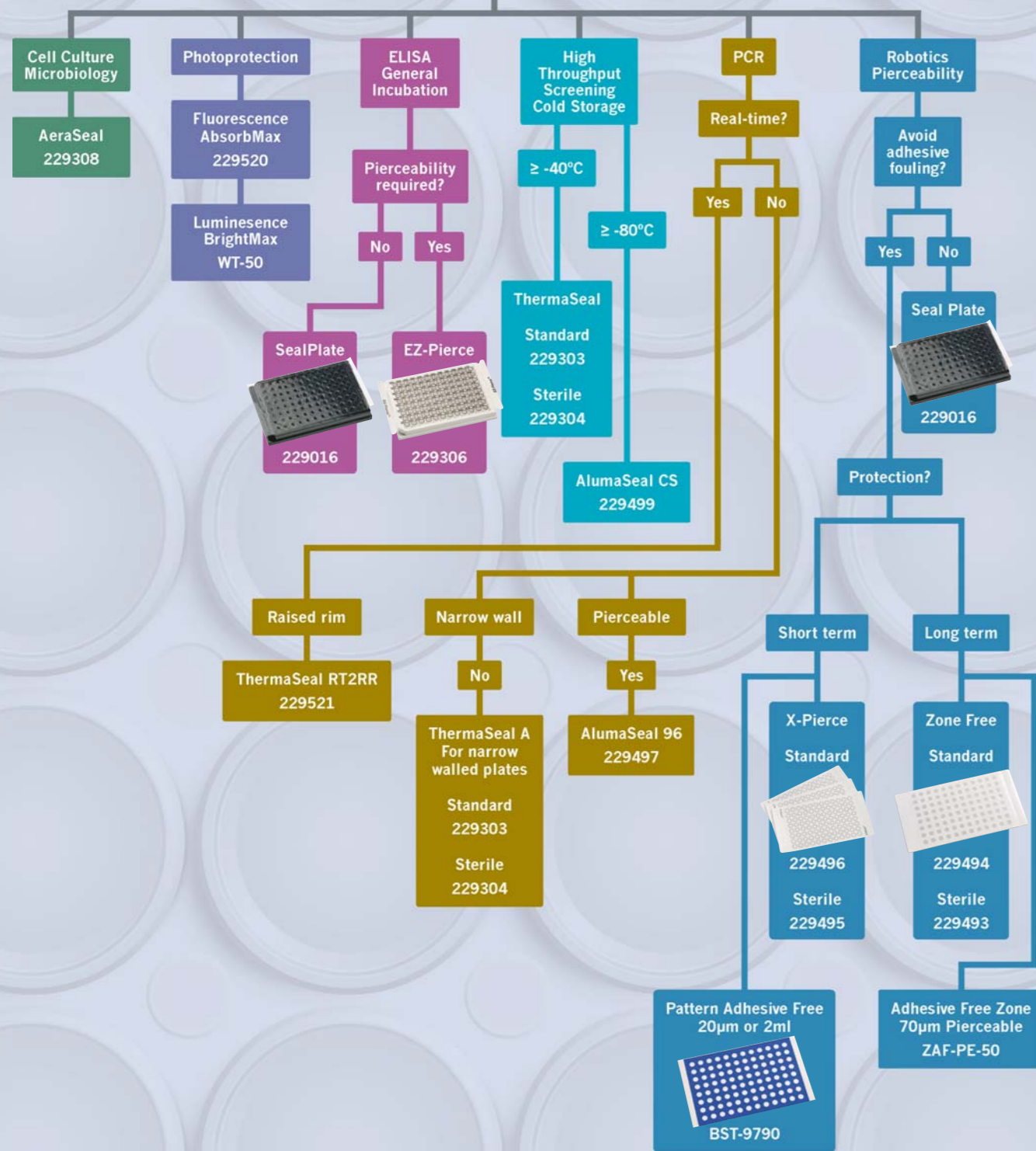
Sealing mats with PTFE spray coating for 96 round well plates

Cat. No.	Description	Qty/Pack
9760507MR-96	96 round well (7mm diameter plug) clear sealing mat with spray coated PTFE/premium silicone	5
9760757MR-96	96 round well Pre-Slit (7mm diameter plug) clear sealing mat with spray coated PTFE/premium silicone	5
9762507MR-96	96 round well Ultra Low Bleed (7mm diameter plug) clear sealing mat with spray coated PTFE/premium silicone	5
9762757MR-96	96 round well Pre-Slit Ultra Low Bleed (7mm diameter plug) clear sealing mat with spray coated PTFE/premium silicone	5
9760508MR-96	96 round well (8mm diameter plug) clear sealing mat with spray coated PTFE/premium silicone	5
9760758MR-96	96 round well Pre-Slit (8mm diameter plug) clear sealing mat with spray coated PTFE/premium silicone	5
9762508MR-96	96 round well Ultra Low Bleed (8mm diameter plug) clear sealing mat with spray coated PTFE/premium silicone	5
9762758MR-96	96 round well Pre-Slit Ultra Low Bleed (8mm diameter plug) clear mat with spray coated PTFE/premium silicone	5
9764508MR-96	96 round well (8mm diameter & short plug) clear sealing mat with spray coated PTFE/premium silicone	5
9764758MR-96	96 round well Pre-Slit (8mm diameter & short plug) clear sealing mat with spray coated PTFE/premium silicone	5

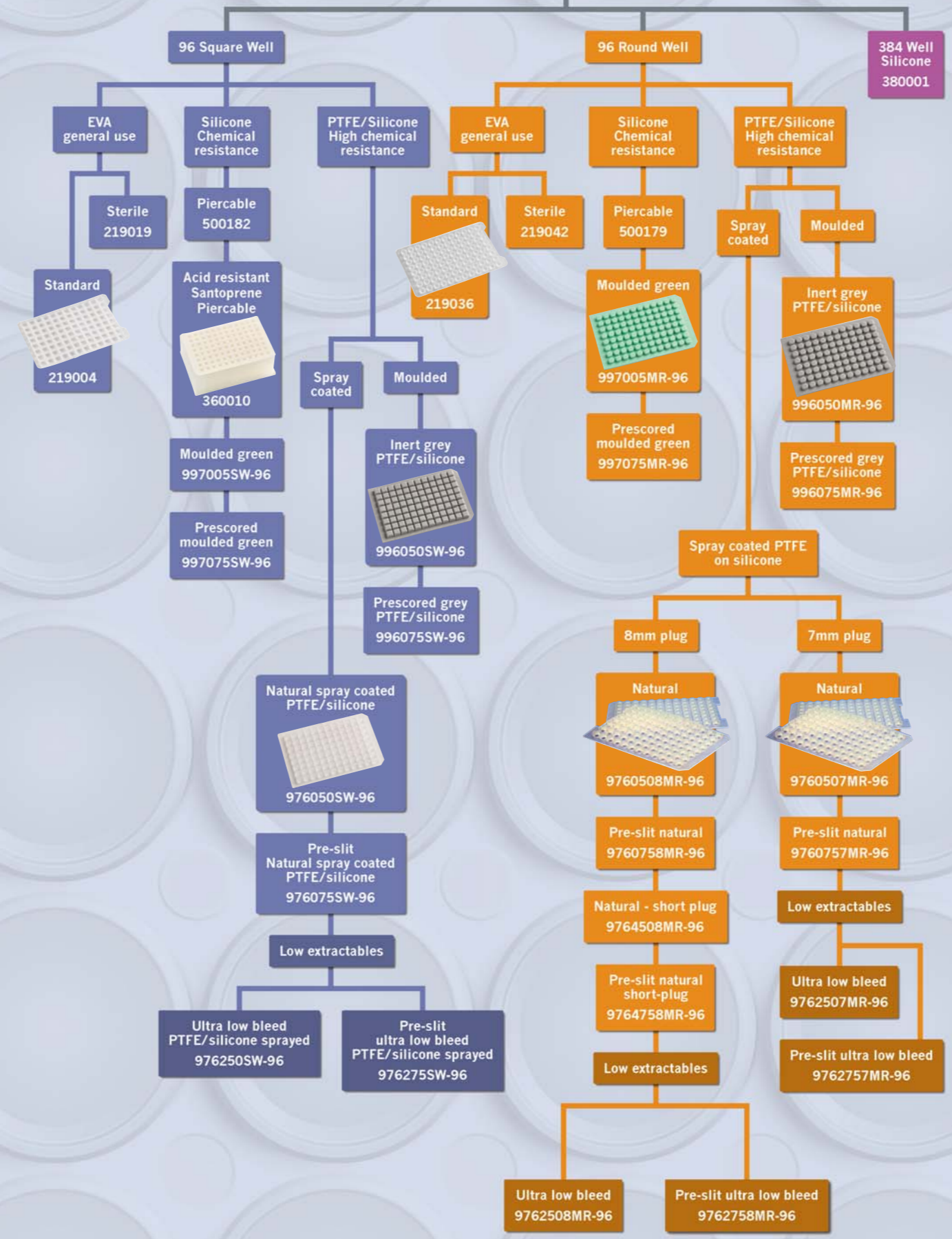
Sealing mats with PTFE spray coating for 96 square well plates

Cat. No.	Description	Qty/Pack
976050SW-96	96 square well clear sealing mat with spray coated PTFE/premium silicone	5
976075SW-96	96 square well pre-slit clear sealing mat with spray coated PTFE/premium silicone	5
976250SW-96	96 square well ultra low bleed clear sealing mat with spray coated PTFE/premium silicone	5
976275SW-96	96 square well pre-slit ultra low bleed clear sealing mat with spray coated PTFE/premium silicone	5

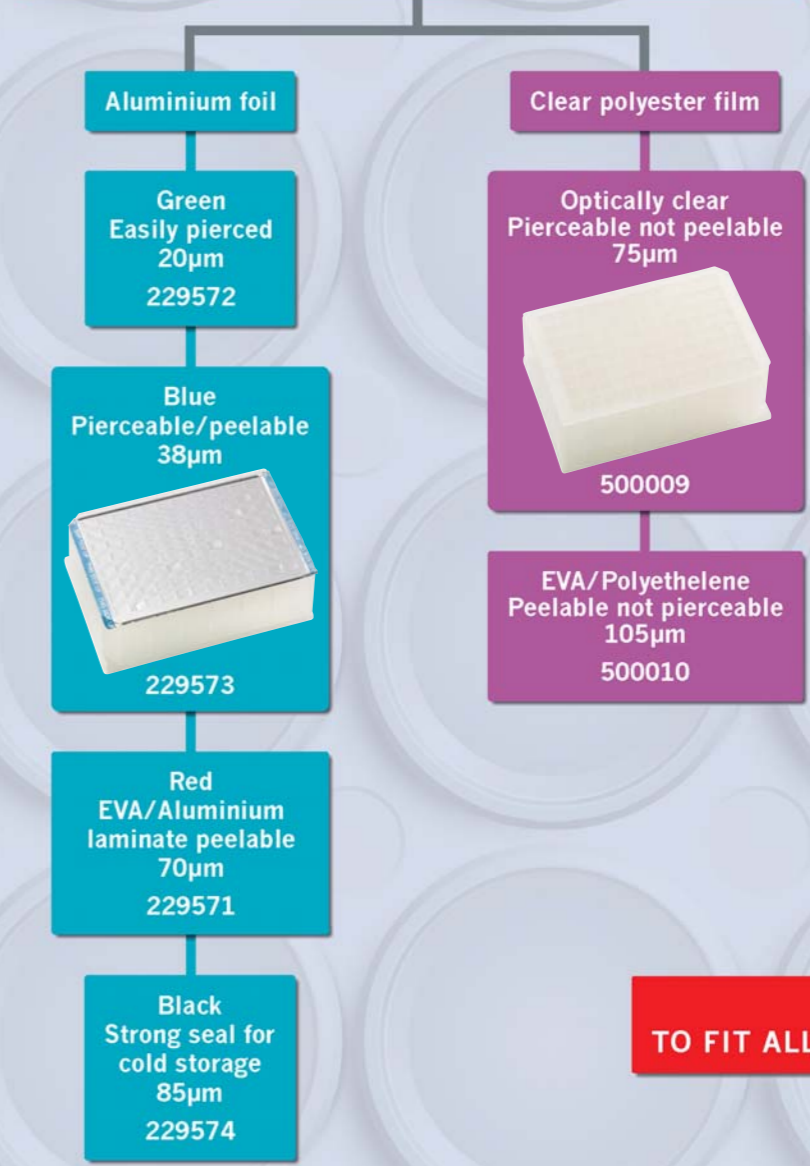
ADHESIVE SEAL APPLICATION



FRICTION SEALS (CAP MATS)



HEAT SEALS (THERMAL SEALS) FOR USE IN THERMAL HEAT SEALING MACHINES



UNIVERSAL LIDS TO FIT ALL SLAS/ANSI FORMAT MICROPLATES



Microplate seals, mats and lids selection guide

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