

Process Characterization Kit

PROCESS CHROMATOGRAPHY

The Process Characterization Kit (Fig 1) is a tool for gaining deeper process understanding. The kit consists of three bottles of the same chromatography resin. Each bottle has a defined ligand density level (high, average, low), which enables studies of the potential impact that this critical material attribute (CMA) might have on the process outcome.

With the increased molecular diversity and drive for higher productivity, the challenge of getting deeper understanding for sources of variability and set mitigation strategies grows. Studying the potential impact of ligand density variability provides invaluable information for developing strategies to ensure robust process performance.

Access deeper process understanding

- Study the potential impact of resin ligand density on product quality and process performance.
- Get critical insights on resin variation within a ligand density specification interval.
- Develop a solid control strategy to obtain a robust, and scalable downstream chromatography process.

The growing need for deeper process understanding

Over the past decade, using a quality by design (QbD) approach to biopharmaceutical process development has helped ensure patient safety and drug efficacy. QbD incorporates the identification of critical quality attributes (CQAs) and links to critical process parameters (CPPs) and CMAs.

Chromatography resin properties are sometimes suggested as critical raw material attributes that potentially could impact CQAs. The properties are also considered important parameters for consistent downstream chromatography process performance. The Process Characterization Kit helps provide deeper understanding of the potential impact of ligand density on the process outcome.



Fig 1. The Process Characterization Kit provides deeper process understanding.

Study resin variation in one dimension

Chromatography resins are always produced against a specification interval. The Process Characterization Kit is designed to display this variation in one dimension, such as ligand density, ionic capacity, or hydrophobicity. The kit can be used to investigate whether the inherent variation interplays with other critical process settings and if it has an impact on process outcomes such as yield or productivity.

Detailed insights and recommendations for developing robust purification processes for biopharmaceuticals can be found in the white paper *Quality by design in biotherapeutics purification: understanding and addressing sources of process variability*.

Process Characterization Kit overview

A Process Characterization Kit consists of three bottles with 25 mL of the same resin. Each bottle has a different ligand density, representing a low, average, and high value in the manufacturing envelope. For ion exchange chromatography (IEX) resins, ligand density is measured as ionic capacity. For hydrophobic interaction chromatography (HIC) resins, it is measured as retention time for a model protein.

Process Characterization Kits are available for nine different resins. The resins cover four chromatography techniques (Table 1). For resin-specific information, please refer to the corresponding product data file.

Table 1. Available Process Characterization Kits and typical applications

| Chromatography technique | Resin | Typical application |
|----------------------------------|---|---|
| Cation exchange (CIEX) | Capto™ S ImpAct | High-resolution separations <i>For example, aggregate removal and charge variant separation in mAb purifications</i> |
| | Capto SP ImpRes | |
| Multimodal CIEX | Capto MMC | Capture/intermediate purification <i>For example, aggregate and host cell protein (HCP) clearance in mAb purifications</i> |
| | Capto MMC ImpRes | Intermediate polishing <i>For example, aggregate and HCP clearance in mAb purifications</i> |
| Multimodal anion exchange (AIEX) | Capto adhere | Capture/intermediate purification <i>For example, aggregate clearance in mAb purifications</i> |
| | Capto adhere ImpRes | Intermediate polishing <i>For example, aggregate clearance in mAb purifications</i> |
| HIC | Capto Phenyl (high sub) | Capture/intermediate purification <i>For example, aggregate removal in mAb purification</i> |
| | Capto Phenyl ImpRes Capto Butyl ImpRes | Intermediate polishing <i>For example, aggregate removal in mAb purification</i> |

Each separation is unique and conclusions from one chromatography step using one resin is not always valid for a similar step using the same resin. Therefore, risk assessment is an important step in the workflow of process characterization.

Table 2 outlines a risk assessment support matrix based on the experience collected during resin development and collaborations with biopharma companies. The table shows that even though parameters derived from, for example, base matrix can have an effect in some cases, ligand density is a resin attribute that is important to study. This is because ligand density potentially could impact process outcome, especially for challenging chromatography separations. For that reason, the Process Characterization Kit is a useful tool for process characterization studies.

Table 2. Risk assessment support matrix

| Chromatography technique | Mode | Process parameters | Resin ligand density ¹ | Resin base matrix properties |
|--------------------------|------|------------------------------------|-----------------------------------|------------------------------|
| AIEX | B/E | ■ | ■ | ■ |
| | FT | ■ | ■ | ■ |
| CIEX | B/E | ■ | ■ | ■ |
| | FT | <i>Not applicable/not assessed</i> | | |
| HIC | B/E | ■ | ■ | ■ |
| | FT | ■ | ■ | ■ |
| Multimodal CIEX | B/E | ■ | ■ | ■ |
| | FT | <i>Not applicable/not assessed</i> | | |
| Multimodal AIEX | B/E | ■ | ■ | ■ |
| | FT | ■ | ■ | ■ |
| Protein A affinity | B/E | ■ | ■ | ■ |
| | FT | <i>Not applicable/not assessed</i> | | |

¹ Ligand density is typically represented by model protein retention for HIC resins
B/E = bind/elute, FT = flow-through

- Considered robust
- Characterization to be considered
- Characterization recommended

Technical characteristics

A chromatography resin is made of a base matrix (porous particle) with a specific ligand added at a desired concentration to achieve its intended function. As the Process Characterization Kit is intended to provide variation in ligand density, the resin in the kits is synthesized on carefully selected base matrix lots. The lots have the two main characteristics (accessible pore fraction and average particle size) close to the center of the base matrix manufacturing envelope (Fig 2).

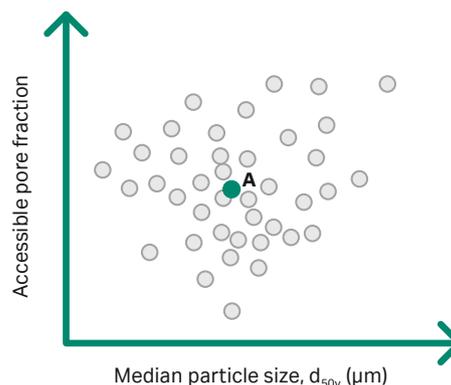


Fig 2. Graphical representation of the selection of a representative base matrix A in the manufacturing envelope described by accessible pore fraction and median particle size of the cumulative volume distribution (d_{50v}).

The three ligand density levels of the Process Characterization Kit cover the manufacturing envelope. In most cases the levels will be similar to the specification window (Fig 3).

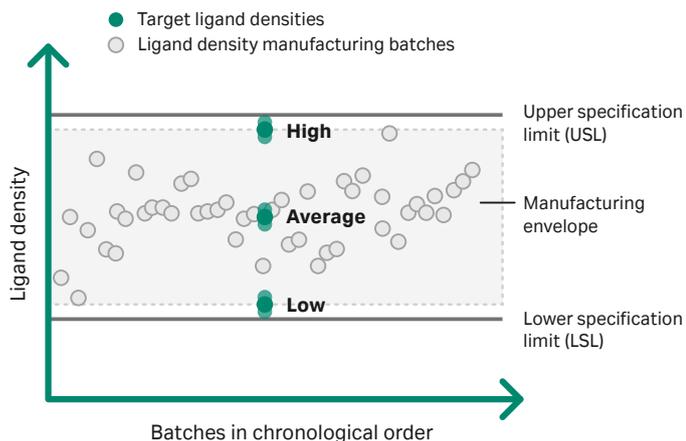


Fig 3. The target ligand densities in a Process Characterization Kit printed over the manufacturing envelope.

The resin specifications, for which Process Characterization Kits are offered, are listed in Table 3. Additional resin-specific characteristics can be found in the corresponding product data file.

Table 3. Specification limits for resins available as Process Characterization Kits

| Resin | Ligand density type | Specification limits |
|-------------------------|---|---|
| Capto MMC | Ionic capacity ¹ | 0.07–0.09 mmol H ⁺ /mL packed resin |
| Capto adhere | Ionic capacity ¹ | 0.09–0.12 mmol Cl ⁻ /mL packed resin |
| Capto adhere ImpRes | Ionic capacity ¹ | 0.080–0.110 mmol Cl ⁻ /mL resin |
| Capto SP ImpRes | Ionic capacity ¹ | 0.13–0.16 mmol H ⁺ /mL packed resin |
| Capto S ImpAct | Ionic capacity ¹ | 41–60 μmol H ⁺ /mL resin |
| Capto MMC ImpRes | Ligand density | 25–39 μmol MMC/mL resin |
| Capto Phenyl (high sub) | Retention time ¹ of lysozyme | 56–61 min |
| Capto Phenyl ImpRes | Retention time ¹ of lysozyme | 45–50 min |
| Capto Butyl ImpRes | Retention time ¹ of α-Chymotrypsinogen | 52–58 min |

¹Ion capacity and retention time are indirect measures of ligand density.

A Process Characterization Kit is produced at small scale under controlled conditions to ensure that the three ligand density values are relevant for a process characterization study. Figures 4 and 5 show that the separation results correspond well with results when resin lots produced in large scale are used.

Column: Tricorn™ 5/100, bed height 10 cm
 Sample: 8 mg/mL mAb spiked with Fc (66% mAb and 33% Fc)
 Sample load: 8 mg/mL resin
 Starting condition: 20 mM citrate, 20 mM phosphate, pH 7.8
 End condition/elution: 20 mM citrate, 20 mM phosphate, pH 4
 Gradient: 0%–100% elution buffer in 20 column volumes (CV)
 Residence time: 4 min
 System: ÄKTA™ system

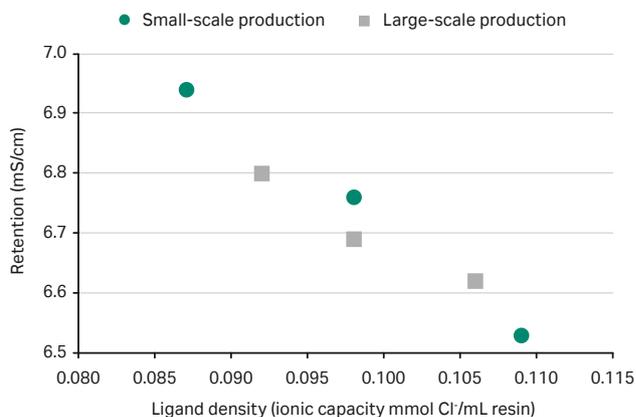


Fig 4. Results from the Capto adhere ImpRes selectivity study, where the impact of ligand density of batches produced at small and large scale was evaluated with a model system of Fc and mAb.

Column: Tricorn 5/100, bed height 10 cm
 Sample: mAb 3 mg/mL
 Starting condition: 20 mM citrate/phosphate, pH 7.8
 Residence time: 4 min
 System: ÄKTA system

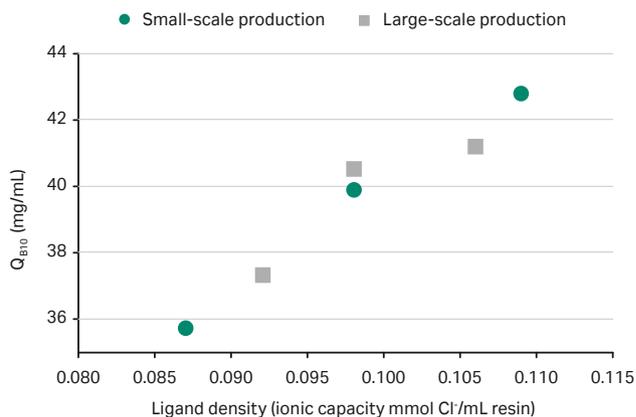


Fig 5. Results from the capacity study for Capto adhere ImpRes. Frontal analysis was performed on Tricorn columns packed with Capto adhere ImpRes with different ligand densities. The graph shows dynamic binding capacity at 10% breakthrough (Q_{B10}) for Capto adhere ImpRes as a function of resin ligand density.

Consideration for studying the impact of resin variability

Resin variability and its impact on the process can be studied at various stages during process development. Some examples are:

- in the first resin screening, where robustness could be used as one of the resin selection criteria.
- in the development activities for the unit operation and to potentially design a process that is inherently robust towards resin variability.
- include resin attributes as potential critical raw material attributes based on risk assessment during the process characterization phase.
- retrospectively look back at an existing process or platform and perform resin variability studies to increase process understanding.

Experimental design

Process Characterization Kits are designed to enable the studies of the interplay between process parameters and one resin attribute: the ligand density. Assessing the process step via a risk-based approach is recommended to choose the right variables and design of experiments and to reduce the experimental workload.

Importance of high-quality column packing

As conclusions regarding resin performance are highly dependent on the column efficiency, it is important to have control over column packing and have as little variability as possible between the columns in the study. Otherwise it can be hard to separate resin impact from column efficiency impact. Please refer to the packing recommendations for each resin or column, or to the guide *Packing HiScale, XK, and Tricorn chromatography columns with Capto and MabSelect™ resins*.

Ligand density variability: impact is case dependent

The ligand density variability will impact the chromatographic performance differently depending on resin type, separation challenge, and process settings. This was exemplified in selectivity and capacity studies. In the selectivity studies, a mixture of Fab and mAb was separated on Capto Phenyl ImpRes (Fig 6) and Capto S ImpAct (Fig 7) resins. Three different ligand densities were used for each resin. In the capacity studies, a frontal analysis of a mAb was performed on the same resin (Fig 8 and 9 and Table 4).

Selectivity study

Resin: Capto Phenyl ImpRes
 Column: Tricorn 5/100, bed height 10 cm
 Sample: mAb 10 g/L resin + Fab 1 g/L resin
 Starting condition: 25 mM citrate + 1 M ammonium sulphate, pH 8
 End condition: 25 mM citrate, pH 5
 Gradient: 0%–100% end condition in 20 CV
 Residence time: 4 min

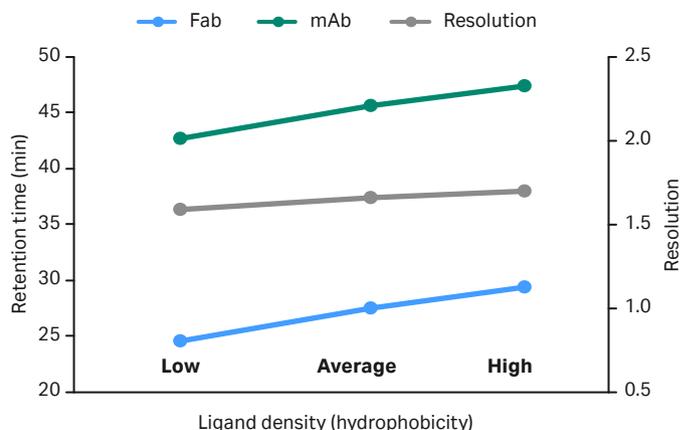


Fig 6. The mAb and Fab sample was separated with a gradient on three columns packed with Capto Phenyl ImpRes with different ligand densities (low, average, and high hydrophobicity). The retention time of each protein was measured, and the resolution calculated. Only retention is dependent on resin hydrophobicity.

Resin: Capto S ImpAct
 Column: Tricorn 5/100, bed height 10 cm
 Sample: mAb 10 g/L resin + Fab 1 g/L resin
 Starting condition: 50 mM sodium acetate, pH 5.0
 End condition: 50 mM sodium acetate + 500 mM NaCl, pH 5.0
 Gradient: 0%–100% in 20 CV
 Residence time: 4 min

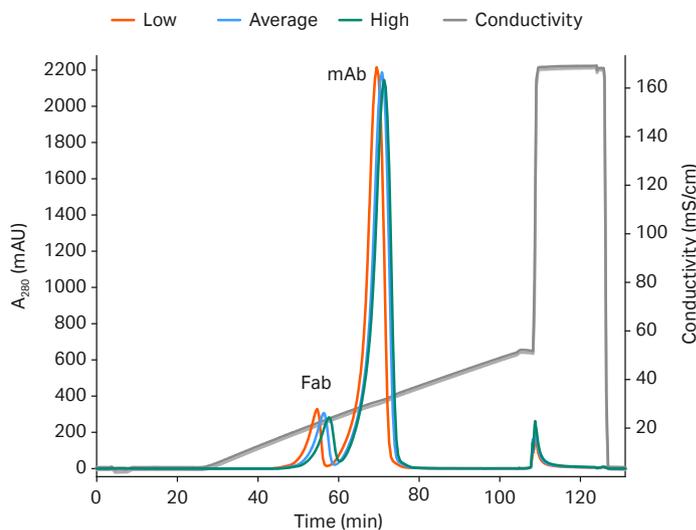


Fig 7. The mAb and Fab sample was separated with a gradient. Only minor differences in separation of Fab and mAb on three different columns packed with Capto S ImpAct with different ionic capacities were observed.

Capacity study

Resin: Capto Phenyl ImpRes
 Column: Tricorn 5/100, bed height 10 cm
 Sample: mAb 3 mg/mL
 Starting condition: 25 mM sodium acetate + 1 M ammonium sulphate, pH 5.0
 Residence time: 4 min

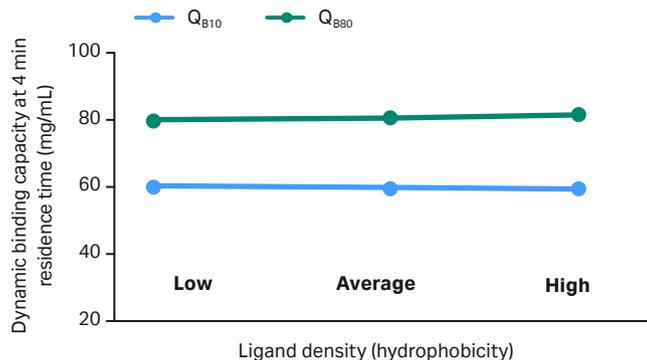


Fig 8. No correlation could be found for Q_{B10} or Q_{B80} for Capto Phenyl ImpRes of different hydrophobicities.

Resin: Capto S ImpAct
 Column: Tricorn 5/100, bed height 10 cm
 Sample: mAb 3 mg/mL
 Starting condition: 50 mM sodium acetate + 50 mM sodium chloride, pH 5.0
 End condition: 50 mM sodium acetate + 500 mM sodium chloride, pH 5.0
 Residence time: 4 min

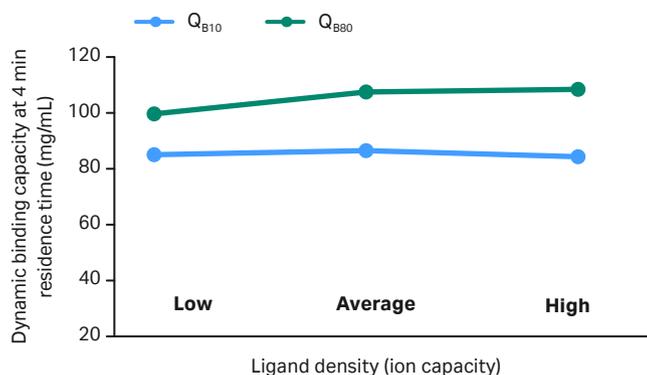


Fig 9. Q_{B10} for Capto S ImpAct had a linear correlation with resin ionic capacity. However, no correlation could be found for Q_{B80}.

Table 4. Q_{B10} for Capto S ImpAct resin at different buffer conditions

| Buffer | Ionic capacity (μmol/mL) | Q _{B10} (mg/mL) |
|--|--------------------------|--------------------------|
| 25 mM sodium phosphate, pH 7.0 | 51 | 95 |
| 50 mM sodium acetate, pH 5.0 | 51 | 74 |
| 50 mM sodium acetate + 50 mM sodium chloride, pH 5.0 | 51 | 92 |

Column: Tricorn 5/100, bed height 10 cm, sample: mAb 3 mg/mL, residence time: 4 min

Summary of the selectivity and capacity studies

These examples highlight that ligand density can impact both separation and/or capacity performance, and that there is no general rule that can predict the effect for all types of resins. Table 4 shows that the impact of running conditions (in this case buffer conditions) was of greater magnitude than the impact of

ligand density on dynamic binding capacity shown in Figure 9. These results show that in some cases, conditions are more important to study than ligand density variations in the resin.

It is important to remember that each separation is unique, and general conclusions on the impact of ligand density, or any other parameter, should be made with care.

Storage

Store the Process Characterization Kit at between 4°C and 30°C.

Support on how and when to use the kits

Fast Trak™ services offers a comprehensive portfolio of services including process development, clinical manufacturing, and training. The available process robustness services aim at improving process understanding regarding resin variability and developing robust downstream processes. One of the services is focused on how to use the Process Characterization Kits during different stages of product development, ranging from early to late stage of development (Table 5). Our Fast Trak team can either execute the studies in our facilities or support with consultation on study design, execution, and interpretation of obtained results. Process Characterization Kits for resins not included in the standard offering can also be ordered through Fast Trak as custom design kits.

In addition, Fast Trak offers data analysis services. These provide further understanding on how resin properties, including base matrix properties and ligand density, might impact process performance. Some examples of the type of information that can be obtained through the data analysis service are:

- Information about extended raw material properties (e.g., accessible pore fraction and average particle size)
- Access to summary statistics/charts representing the manufacturing envelope compared to resin lots used
- Multivariate data analysis of combined process and resin data

Table 5. Fast Trak process robustness services

Offering

| | |
|---|--|
| Design of Experiments (DoE) studies using the Process Characterization Kits | Consultancy and/or performing studies for different stages of product lifecycle: <ol style="list-style-type: none"> 1. Process development 2. Process characterization 3. Process investigation |
| Customized Process Characterization Kits | Development of customized Process Characterization Kits, though Custom Design Media (CDM), for resins outside of standard kits. |
| Data analysis services | Data providing extended information (e.g., base matrix properties) on resins Troubleshooting process challenges using your data together with our resin data |

Packing services

Process Characterization Kits can be supplied in prepacked columns (such as Tricorn Validation columns) on-demand via the Custom Product Team. Please contact your sales representative if you are interested in this service.

Ordering information

Process Characterization Kits

| Product | Pack size | Product code |
|---|-----------|--------------|
| Process Characterization Kit Capto adhere | 3 × 25 mL | 17544470 |
| Process Characterization Kit Capto MMC ImpRes | 3 × 25 mL | 17371670 |
| Process Characterization Kit Capto MMC | 3 × 25 mL | 17531770 |
| Process Characterization Kit Capto adhere ImpRes | 3 × 25 mL | 17371570 |
| Process Characterization Kit Capto S ImpAct | 3 × 25 mL | 17371770 |
| Process Characterization Kit Capto SP ImpRes | 3 × 25 mL | 17546870 |
| Process Characterization Kit Capto Phenyl (high sub) | 3 × 25 mL | 17545170 |
| Process Characterization Kit Capto Phenyl ImpRes | 3 × 25 mL | 17548470 |
| Process Characterization Kit Capto Butyl ImpRes | 3 × 25 mL | 17371970 |

Process Characterization Kits supplied in prepacked columns¹

| Product | Pack size | Product code |
|--|-----------|--------------|
| Tricorn 10/200, 20–21 cm Process Characterization Kit, Capto Phenyl ImpRes | 3 columns | 29496552 |
| Tricorn 10/200, 20–21 cm Process Characterization Kit, Capto Butyl ImpRes | 3 columns | 29496553 |

¹This list is not exhaustive. Our Custom Product Team can pack the column of your choice on-demand.

IEX resins, columns, and plates

Capto SP ImpRes

| Product | Pack size | Product code |
|--|---------------------------|--------------|
| Capto SP ImpRes | 25 mL | 17546810 |
| Capto SP ImpRes | 100 mL | 17546802 |
| Capto SP ImpRes | 1 L | 17546803 |
| Capto SP ImpRes | 5 L | 17546804 |
| Capto SP ImpRes | 10 L | 17546805 |
| HiTrap™ Capto SP ImpRes | 5 × 1 mL | 17546851 |
| HiTrap Capto SP ImpRes | 5 × 5 mL | 17546855 |
| HiScreen™ Capto SP ImpRes | 1 × 4.7 mL | 17546815 |
| PreDictor™ Capto SP ImpRes, 6 µL | 4 × 96-well filter plates | 17546816 |
| PreDictor Capto SP ImpRes, 20 µL | 4 × 96-well filter plates | 17546817 |
| PreDictor RoboColumn™ Capto SP ImpRes, 200 µL | 8 columns in a row | 28997449 |
| PreDictor RoboColumn Capto SP ImpRes, 600 µL | 8 columns in a row | 28997450 |
| Capto SP ImpRes Validation column | 1 column | 29315186 |

Capto S ImpAct

| Product | Pack size | Product code |
|--|---------------------------|--------------|
| Capto S ImpAct | 25 mL | 17371701 |
| Capto S ImpAct | 100 mL | 17371702 |
| Capto S ImpAct | 1 L | 17371703 |
| Capto S ImpAct | 5 L | 17371704 |
| Capto S ImpAct | 10 L | 17371705 |
| Capto S ImpAct | 60 L | 17371760 |
| HiTrap Capto S ImpAct | 5 × 1 mL | 17371751 |
| HiTrap Capto S ImpAct | 5 × 5 mL | 17371755 |
| HiScreen Capto S ImpAct | 1 × 4.7 mL | 17371747 |
| PreDictor Capto S ImpAct, 2 µL | 4 × 96-well filter plates | 17371716 |
| PreDictor Capto S ImpAct, 20 µL | 4 × 96-well filter plates | 17371717 |
| PreDictor RoboColumn Capto S ImpAct, 200 µL | 8 columns in a row | 17371771 |
| PreDictor RoboColumn Capto S ImpAct, 600 µL | 8 columns in a row | 17371772 |
| Capto S ImpAct Validation column | 1 column | 29321910 |

Screening kits

| Product | Pack size | Product code |
|--|---------------------------|--------------|
| PreDictor Capto CIEX screening, 2 µL/6 µL | 4 × 96-well filter plates | 29095568 |
| PreDictor Capto CIEX screening, 20 µL | 4 × 96-well filter plates | 29095567 |

HIC resins, columns, and plates

Capto Phenyl ImpRes

| Product | Pack size | Product code |
|---|--------------------|--------------|
| Capto Phenyl ImpRes | 25 mL | 17548401 |
| Capto Phenyl ImpRes | 100 mL | 17548402 |
| Capto Phenyl ImpRes | 1 L | 17548403 |
| Capto Phenyl ImpRes | 5 L | 17548404 |
| HiScreen Capto Phenyl ImpRes | 4.7 mL | 17548410 |
| HiTrap Capto Phenyl ImpRes | 5 × 1 mL | 17548411 |
| HiTrap Capto Phenyl ImpRes | 5 × 5 mL | 17548412 |
| PreDictor RoboColumn Capto Phenyl ImpRes, 600 µL | 8 columns in a row | 17548441 |

Capto Butyl ImpRes

| Product | Pack size | Product code |
|--|--------------------|--------------|
| Capto Butyl ImpRes | 25 mL | 17371901 |
| Capto Butyl ImpRes | 100 mL | 17371902 |
| Capto Butyl ImpRes | 1 L | 17371903 |
| Capto Butyl ImpRes | 5 L | 17371904 |
| HiScreen Capto Butyl ImpRes | 4.7 mL | 17371910 |
| HiTrap Capto Butyl ImpRes | 5 × 1 mL | 17371911 |
| HiTrap Capto Butyl ImpRes | 5 × 5 mL | 17371912 |
| PreDictor RoboColumn Capto Butyl ImpRes, 600 µL | 8 columns in a row | 17371941 |

Capto Phenyl

| Product | Pack size | Product code |
|---|---------------------------|--------------|
| Capto Phenyl (high sub) | 25 mL | 17545101 |
| Capto Phenyl (high sub) | 100 mL | 17545102 |
| Capto Phenyl (high sub) | 1 L | 17545103 |
| Capto Phenyl (high sub) | 5 L | 17545104 |
| Capto Phenyl (high sub) | 10 L | 17545105 |
| PreDicator Capto Phenyl (high sub), 6 µL | 4 × 96-well filter plates | 17545116 |
| PreDicator Capto Phenyl (high sub), 50 µL | 4 × 96-well filter plates | 17545117 |
| PreDicator RoboColumn Capto Phenyl (high sub), 200 µL | 8 columns in a row | 28986088 |
| PreDicator RoboColumn Capto Phenyl (high sub), 600 µL | 8 columns in a row | 28986182 |

Multimodal chromatography resins, columns, and plates

Capto adhere

| Product | Pack size | Product code |
|--|---------------------------|--------------|
| Capto adhere | 25 mL | 17544410 |
| Capto adhere | 100 mL | 17544401 |
| Capto adhere | 1 L | 17544403 |
| Capto adhere | 5 L | 17544404 |
| Capto adhere | 10 L | 17544405 |
| HiTrap Capto adhere | 5 × 1 mL | 28405844 |
| HiTrap Capto adhere | 5 × 5 mL | 28405846 |
| PreDicator ALEX screening plate, 20 µL | 4 × 96-well filter plates | 28943289 |
| PreDicator ALEX screening plate, 2 µL/6 µL | 4 × 96-well filter plates | 28943288 |
| PreDicator Capto adhere, 6 µL | 4 × 96-well filter plates | 28925817 |
| PreDicator Capto adhere, 20 µL | 4 × 96-well filter plates | 28925818 |
| PreDicator Capto adhere, 50 µL | 4 × 96-well filter plates | 28925819 |
| PreDicator RoboColumn Capto adhere, 200 µL | 8 columns in a row | 28986085 |
| PreDicator RoboColumn Capto adhere, 600 µL | 8 columns in a row | 28986179 |
| HiScreen Capto adhere | 1 × 4.7 mL | 28926981 |
| ReadyToProcess™ Capto adhere | 1 L | 28951109 |
| ReadyToProcess Capto adhere | 2.5 L | 28901714 |
| ReadyToProcess Capto adhere | 10 L | 28901715 |
| ReadyToProcess Capto adhere | 20 L | 28901716 |
| Capto adhere Validation column | 1 column | 29315195 |

Capto adhere ImpRes

| Product | Pack size | Product code |
|---|---------------------------|--------------|
| Capto adhere ImpRes | 25 mL | 17371501 |
| Capto adhere ImpRes | 100 mL | 17371502 |
| Capto adhere ImpRes | 1 L | 17371503 |
| Capto adhere ImpRes | 5 L | 17371504 |
| Capto adhere ImpRes | 10 L | 17371505 |
| PreDicator Capto adhere ImpRes, 6 µL | 4 × 96-well filter plates | 17371530 |
| PreDicator Capto adhere ImpRes, 20 µL | 4 × 96-well filter plates | 17371531 |
| PreDicator RoboColumn Capto adhere ImpRes, 200 µL | 8 columns in a row | 17371540 |
| PreDicator RoboColumn Capto adhere ImpRes, 600 µL | 8 columns in a row | 17371541 |
| HiTrap Capto adhere ImpRes | 5 × 1 mL | 17371510 |
| HiScreen Capto adhere ImpRes | 1 × 4.7 mL | 17371520 |

Capto MMC

| Product | Pack size | Product code |
|--|---------------------------|--------------|
| Capto MMC | 25 mL | 17531710 |
| Capto MMC | 100 mL | 17531702 |
| Capto MMC | 1 L | 17531703 |
| Capto MMC | 5 L | 17531704 |
| Capto MMC | 10 L | 17531705 |
| HiTrap Capto MMC | 5 × 1 mL | 11003273 |
| HiTrap Capto MMC | 5 × 5 mL | 11003275 |
| PreDicator CIEX screening plate, 20 µL | 4 × 96-well filter plates | 28943291 |
| PreDicator CIEX screening plate, 2 µL/6 µL | 4 × 96-well filter plates | 28943290 |
| PreDicator Capto MMC 50 µL | 4 × 96-well filter plates | 28925816 |
| PreDicator Capto MMC 20 µL | 4 × 96-well filter plates | 28925815 |
| PreDicator Capto MMC 6 µL | 4 × 96-well filter plates | 28925814 |
| PreDicator Capto MMC Isotherm | 4 × 96-well filter plates | 28943281 |
| PreDicator RoboColumn Capto MMC, 200 µL | 8 columns in a row | 28986084 |
| PreDicator RoboColumn Capto MMC, 600 µL | 8 columns in a row | 28986178 |
| HiScreen Capto MMC | 1 × 4.7 mL | 28926980 |
| ReadyToProcess Capto MMC | 1 L | 28951118 |
| ReadyToProcess Capto MMC | 2.5 L | 28929120 |
| ReadyToProcess Capto MMC | 10 L | 28929121 |
| ReadyToProcess Capto MMC | 20 L | 28929122 |

Capto MMC ImpRes

| Product | Pack size | Product code |
|--|---------------------------|--------------|
| Capto MMC ImpRes | 25 mL | 17371601 |
| Capto MMC ImpRes | 100 mL | 17371602 |
| Capto MMC ImpRes | 1 L | 17371603 |
| Capto MMC ImpRes | 5 L | 17371604 |
| Capto MMC ImpRes | 10 L | 17371605 |
| PreDicator Capto MMC ImpRes, 6 µL | 4 × 96-well filter plates | 17371630 |
| PreDicator Capto MMC ImpRes, 20 µL | 4 × 96-well filter plates | 17371631 |
| PreDicator RoboColumn Capto MMC ImpRes, 200 µL | 8 columns in a row | 17371640 |
| PreDicator RoboColumn Capto MMC ImpRes, 600 µL | 8 columns in a row | 17371641 |
| HiTrap Capto MMC ImpRes | 5 × 1 mL | 17371610 |
| HiScreen Capto MMC ImpRes | 1 × 4.7 mL | 17371620 |

Empty columns

| Product | Pack size | Product code |
|----------------|-----------|--------------|
| Tricorn 5/100 | 1 | 28406410 |
| Tricorn 10/100 | 1 | 28406415 |
| HiScale 16/20 | 1 | 28964441 |

Related literature

| Data files | Product code |
|-------------------------|--------------|
| Capto adhere | CY11848 |
| Capto adhere ImpRes | CY11775 |
| Capto MMC | CY13468 |
| Capto MMC ImpRes | CY13699 |
| Capto S ImpAct | CY11840 |
| Capto SP ImpRes | CY12674 |
| Capto Phenyl ImpRes | CY13700 |
| Capto Butyl ImpRes | CY13700 |
| Capto Phenyl (high sub) | CY13568 |
| HiScale columns | CY13664 |
| Tricorn empty columns | 18114736 |

| Packing guide | Product code |
|---|--------------|
| Packing HiScale, XK, and Tricorn chromatography columns with Capto and MabSelect resins | CY14043 |

| White paper | Product code |
|--|--------------|
| Quality by design in biotherapeutics purification: understanding and addressing sources of process variability | KA8045 |

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