Crystallization Screens
Crystallization Optimization
Cryo Screens
Phasing
Jena Bioscience was founded in 1998 by scientists who wanted to share their ideas and experience with the life science community. Over the years, Jena Bioscience has developed from a local start-up company into an established business with a global distribution network. We deliver products and services to leading industrial players and universities in more than 40 countries.

Our macromolecular crystallography product portfolio comprises an extensive assortment of tools for protein crystallization. High quality reagents and excellent customer service help the researcher to find tailor-made solutions in the areas of crystal screening, crystallization optimization, cryo-crystallography and phasing.
Crystallization Screens

Despite intensive research, the crystallization of biological macromolecules remains a process of trial and error. Nucleation and crystal growth are influenced by the interaction of many variables, such as temperature, pH, precipitant and salt concentration. Testing all possible combinations would be too time consuming and would require enormous amounts of sample. Our JBScreen products are designed for efficient and flexible screening of crystallization conditions for proteins, peptides, nucleic acids, macromolecular complexes and water-soluble small molecules.

JBScreen Classic

JBScreen Classic covers 240 unique conditions. Their composition results from data mining of several thousands of successfully crystallized proteins. The ten individual JBScreen Classic kits (bulk and ampoules) represent specific precipitant classes, organized by precipitant type and concentration. This systematic arrangement grants easy access to all relevant information and is already a first step to a refinement of the crystallization conditions: Once you get a hit, you immediately see the effects caused by the composition of adjoining reagents. This simplifies the development of rational strategies for further improvement of crystal quality. Numerous proteins have been successfully crystallized using JBScreen Classic, for examples see [1–7].

JBScreen Basic

JBScreen Basic has been formulated to comply with our customers’ continuous interest in this particular sparse-matrix screen. The method involves screening with an intentional bias towards conditions that were proven successful in the crystallization of biological macromolecules. The reagents of JBScreen Basic have been selected based upon the protocol of Jancarik & Kim [8] and others [9]. Visit our website to read more about the improvements we have made, such as the elimination of cacodylate.

The JBScreen Basic kits 1–4 are designed to fit the 24-well plate format for screening a large range of pH, salts and precipitants. Each condition of the 96 unique reagents is supplied in 10 ml quantities. For high-throughput users, we offer all 96 conditions in a pre-filled deep well block.
**JBScreen Membrane**

The JBScreen Membrane screens 1–3 cover 72 of the most promising reagents for crystallization of membrane proteins. Their composition was devised by an exhaustive analysis of crystallization conditions of successfully determined membrane protein structures.

The JBScreen Membrane crystallization buffers are organized by type and concentration of the precipitant to facilitate the refinement of successful crystallization conditions. Each kit contains 24 sterile solutions, supplied in 10 ml volumes. All reagents are also available in a pre-filled deep well block.

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**Crystallization Optimization**

Our crystallization optimization product line accompanies the researcher throughout the entire crystallization procedure.

Effective solutions are offered for each stage of the process, e.g. optimization of the buffer composition to confine protein aggregation prior to the crystallization setup, modification of protein surface residues to enhance crystallization or efficient refinement of initial crystallization conditions.

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**JBS Solubility Kit**

The JBS Solubility Kit is a pre-crystallization screen to improve the composition of the initial protein buffer solution prior to performing crystallization setups [10]. Since the highly complex properties of proteins are dependent on their environment, buffer solutions play an important role, i.e. influencing the solubility and the aggregation behavior of the protein sample. Studies have shown that aggregation of the protein may inhibit nucleation and crystal growth. Therefore, the JBS Solubility Kit has been developed to investigate protein samples towards their homogeneity and monodispersity prior to crystallization trials, employing hanging drop vapor diffusion experiments combined with dynamic light scattering.

The JBS Solubility Kit contains 24 buffer solutions at different pH-values for setting up hanging drop vapor diffusion experiments in order to monitor the aggregation and precipitation of the protein sample and 14 additives used for further optimization employing dynamic light scattering.

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**JBS Methylation Kit**

Surface engineering of biological macromolecules provides a powerful technique to deal with proteins which are reluctant to crystallize or which yield poorly diffracting crystals [11,12]. The JBS Methylation Kit offers a straightforward tool for the selective methylation of lysine residues. The method does not require laborious cloning/expression/purification, but chemically substitutes the protons of the amino group of lysine residues with methyl groups. The result is a surface-engineered protein within 24 hours, ready for crystallization.

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**JBScreen Plus**

JBScreen Plus solutions are most useful in the optimization of preliminary crystallization conditions, where specific interactions between the additives and the biological macromolecule may assist in the initial crystallization of the sample and may help to
improve the size and diffraction quality of the crystals. **JBScreen Plus** comprises 5 kits, including kosmotropic (structure-stabilizing) and chaotropic (structure-disturbing) additives, salts, volatile and non-volatile organics and other compounds. Each kit contains 24 different additives, supplied as ready-to-use, sterile filtered aliquots with adjusted concentration.

**JBScreen Detergents**

The **JBScreen Detergents** kits 1 and 2 cover a great variety of detergents that have been successfully used for the crystallization of membrane proteins. Each kit contains 12 detergents, supplied as stock solutions at 5 or 10 times the reported CMC (Critical Micellar Concentration), with 100 or 200 µl per compound. **JBScreen Detergents** is an ideal supplement to the **JBScreen Membrane** screens.

**Auxiliary Products**

Furthermore, **JBScreen Buffer Kits** containing ready-made buffer solutions with preset pH-values and **JBScreen Single Stocks** – individual stock solutions of the **JBScreen** components – can be purchased for the convenient reproduction and optimization of crystallization conditions.

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**Cryo Screens**

The employment of cryotechniques is not only used to carefully preserve and store crystals for later analysis but also to reduce radiation damage, caused by intense x-ray sources, since the diffusion of active radicals is decelerated. Therefore, cryocooling prolongs crystal lifetime and facilitates straightforward data collection [13]. However, the use of cryoprotectants is crucial to prevent crystals from cracking and to protect them from the damaging effects of ice formation during the cryocooling process. The appropriate cryoprotectant will guarantee that the thin layer of mother liquor, which surrounds the protein, will form an amorphous glass without the formation of water ice. Thus, x-ray data, free of “ice rings”, can be collected.

**JBScreen Cryo**

**JBScreen Cryo** is designed for efficient crystal screening in cryo conditions. The unique formulations of the **JBScreen Cryo** reagents are based on an extensive data base search [14] and contain sufficiently large concentrations of cryoprotectants so that crystals can be directly transferred into liquid nitrogen. **JBScreen Cryo** includes 4 kits, offering 96 different crystallization conditions in total (24 each), available in the standard 10 ml bulk format. For high-throughput users, the **JBScreen Cryo HTS** contains all 96 conditions in a pre-filled deep well block.

**JBScreen Cryo Pro**

**JBScreen Cryo Pro** is the most convenient and most material-saving tool on the market for producing effective cryoprotectants from your crystallization reservoir solution, while utilizing just a minimum amount of your precious crystals. The kit contains 12 different compounds, divided into sugar/amino acid based cryoprotectants, alcohol based cryoprotectants, and an oil based cryoprotectant.
Three pre-dispensed samples of each solid and 50 µl of each liquid formulation are ready to be diluted with the reservoir solution. Crystals soaked in this reservoir-solution/cryoprotectant mixture can be transferred to a liquid nitrogen bath or cryogenic gas stream.

**Phasing**

In contrast to the amplitude, the phase of scattered x-rays cannot be measured directly. Phase determination is one of the most difficult tasks in macromolecular crystallography and known as the “phase problem”. Multiple isomorphous replacement (MIR), multiple wavelength anomalous dispersion (MAD) and single wavelength anomalous dispersion (SAD) are powerful techniques for initial phase determination of novel macromolecular crystal structures. These methods require the incorporation of heavy atoms into the crystal lattice.

**JBScreen Heavy**

The search for suitable heavy-atom derivatives is often a tedious process and usually requires screening of a broad range of heavy atoms. **JBScreen Heavy** will shorten this process: It contains a collection of 24 of the most successful heavy-atom compounds, selected from data mining of heavy-atom derivatized protein crystals, which have been successfully employed in structure determination of biological macromolecules. Each of the 24 heavy-atom compounds is supplied in three identical solid aliquots – enough material for the preparation of 3x100 µl of a 100 mM stock solution. This will avoid tedious calculating and weighing – simply add 100 µl of water or buffer (or more, for a more diluted solution) to the individual aliquot, and you are ready to prepare your setups.

**JBS Halo Kits**

The search for suitable heavy-atom derivatives by conventional trial-and-error approaches can be quite cumbersome and binding of heavy atoms often results in disrupting the crystal lattice. Halogenated ATP and GTP analogs however, provide an alternative method that allows rational incorporation of heavy atoms into a large number of physiologically relevant enzymes, exploiting the natural affinity of the protein to these nucleotides [15,16].

The **JBS Halo-ATP Kit** contains 12 halogenated adenosine nucleotides and the **JBS Halo-GTP Kit** contains 6 halogenated guanosine nucleotides in form of lyophilized sodium salts. Moreover, a large selection of halogenated nucleotides, e.g. non-hydrolyzable analogs, can be found on our website.
References


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