Committed to Sustainability.
At DyStar, our products and services help customers worldwide reduce costs, shorten lead times and meet stringent quality and ecological specifications.

Information and our technical advice - whether verbal, in writing or by way of trials - are given in good faith but without warranty, and this also applies where proprietary rights of third parties are involved. Our advice does not release you from the obligation to check its validity and to test our products as to their suitability for the intended processes and uses. The application, use and processing of our products and the products manufactured by you on the basis of our technical advice are beyond our control and, therefore, entirely your own responsibility. Our products are sold in accordance with our General Conditions of Sale and Delivery.

02.10/30/07.12/11

DyStar®

econfidence® from DyStar®

DyStar®

Dianix®
Always on the right track

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econfidence®
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Meet the Dianix team

Dianix XF/SF/CW-SF

Dianix AM/HLA

Dianix CC

Dianix Luminous/Brilliant

Dianix UN-SE

Dianix AC-E

Dianix PLUS

Dianix S

Dianix Micro Liquids

Dianix Favorites

Since the integration of the market-leading disperse dye ranges of DyStar under the Dianix brand name, the range has been further strengthened by the addition of many high-performance products to meet changing market needs. Product developments have been driven by

- **Color Confidence®** – colour fastness performance to meet the most demanding market specifications in textiles
- **Controlled Coloration®** – reliable dyeing processes for highest productivity

From top-quality, economical standard dyes to innovative problem-solving products, you can rely on the full package of benefits from DyStar

- The world's most complete dye range
- Highest standards of product quality, safety and environmental protection worldwide
- Experienced and technically-competent representatives in all leading markets
- Ongoing commitment to innovation, through R&D in new dyes and application technologies

DyStar

Dianix®

Dyeing properties and applications

1/1 standard depth as illustrated
Fastness to light 1/1 SD Xenon
Fastness to light 1/3 SD Xenon
Sublimation 180 °C 30 sec.
Level uptake
Barré coverage
pH stability
Thermofixation (optimum temperature °C)
PES yarn, tops
PES piece
PES/Cell. yarn
PES/Cell. piece
PES/WO 105 °C
PES/WO 120 °C
Printing HTS fixation
Printing PS fixation
Wash fastness C4A (50 °C)
Alkaline dyeing
Home furnishings
Automotive textiles
Acetate (CA)
Triacetate (CTA)

Explanations
Wash (C4A): Staining of PA in C4A wash test after heat setting 30 sec. at 180 °C
+++ suitable
++ suitable up to medium depths
+ limited suitability

All other suitabilities
++ suitable
+ suitable with restrictions, e.g. depth of shade, technical requirements
– not suitable

Level uptake
1 = poor
2 = medium to good
3 = very good

Home furnishings
Fastness to light ≥ 6

Alkaline dyeing
1 = soft alkaline for jet with 1% Diaserver® AD-95
2 = hard alkaline for jet, yarn, beam with 2 – 4% Diaserver AD-95

DyStar

Dianix® CC

Compatible range of economical, medium-energy dyes for rapid, reliable exhaust and continuous dyeing of polyester and its blends with other fibers

- Controlled Coloration®; excellent Right-First-Time performance through compatibility of dyes
- Excellent build-up and economical dye recipes
- High productivity in exhaust dyeing through optimized rapid dyeing
- Good all-round color fastness

Full application details and a wider range of product data can be found in ColorXPT

Sustainability is our responsibility

Dianix® CC

Yellow CC	Yellow Brown CC	Scarlet CC	Red CC	Rubine CC	Royal Blue CC	Blue CC	Green CC	Navy CC
0.30	0.70	0.83	0.66	0.56	0.50	0.50	1.30	N 1.10
7	6-7	5-6	5-6	6-7	6	6	4-5	5-6
6-7	6	5	5-6	6	6	6	4-5	5
3-4	4	4-5	4	4	4	4	4-5	3-4
3	3	2	3	3	3	3	2	3
excellent	excellent	moderate	moderate	good	very good	good	moderate	good
3.0-6.0	3.0-8.0	3.0-10.0	3.0-9.0	3.0-9.0	3.0-7.0	3.0-8.0	3.0-6.5	3.0-9.0
200 °C	210 °C	210 °C	210 °C	210 °C	210 °C	210 °C	210 °C	210 °C
+	+	++	+	+	+	+	++	+
++	++	++	++	++	++	++	++	++
+	+	++	+	+	+	+	++	+
++	++	++	++	++	++	++	++	++
++	+	+	+	++	+	+	+	+
++	+	+	++	++	+	++	+	++
-	+	++	+	-	+	+	++	+
++	++	+	++	++	++	++	++	++
++	++	+	+	+	+	+	+	+
-	2	2	2	2	-	-	-	2
++	++	-	-	++	+	+	-	-
-	-	-	-	-	-	-	-	-
+	++	-	+	++	++	+	-	-
++	++	+	++	++	++	++	+	-

Black CC-R	Black CC-G	Black CC-3R 01						
B 2.60	B 2.60	B 2.20						
6	6	6						
4-5	4-5	4-5						
3-4	3-4	3						
3	3	3						
-	-	-						
3.0-9.0	3.0-9.0	3.0-7.0						
210 °C	210 °C	210 °C						
+	+	+						
++	++	++						
+	+	+						
++	++	++						
+	+	+						
++	++	++						
-	-	-						
+	++	++						
+	+	+						
2	2	-						
-	-	-						
-	-	-						
-	-	-						
-	-	-						

Contents

1 General

Dianix® dyes are disperse dyes for dyeing polyester fibers. They are designed for efficiency, reliability in dyeing and production of high-quality dyeings.

Polyester fibers are dyed with Dianix dyes by

- high-temperature exhaust dyeing process (15-60 min at 130-135 °C)

  or by the

- continuous thermofixation process (30-90 sec. at 190-220 °C)

Many Dianix dyes can also be dyed at the boil with the aid of a carrier. This procedure, however, has lost much of its previous importance because of the cost, quality and ecological advantages of dyeing at high temperatures.

Selected Dianix dyes can also be used for dyeing acetate, triacetate, polyamide, PBT, PTT, polyacrylonitrile and PLA fibers.

2 Commercial forms and dispersing of Dianix dyes

Dianix dyes are supplied in the form of low-dusting powders and as stabilised liquids. Dianix liquid dyes are of particular interest for continuous dyeing, printing processes and for dyehouses using automatic dosing systems.

Before they are added to the dyebath or to the pad liquor, Dianix powder dyes are dispersed by stirring them into 10-15 times their amount of water at 30-50 °C. This is best carried out with a high-speed stirrer at approx. 1000 rpm.

Dianix liquid products are readily pourable dye dispersions, which only need to be diluted with cold water before they are added to the dyebaths or pad liquors. Due to their higher relative density, the dye particles in the liquid preparations are liable to settle in the drums on prolonged storage. Therefore the drum contents should be homogenized before product is taken out. A uniform dye dispersion is best achieved by high-speed stirring (1000 rpm). The drums should always be properly resealed after dye has been taken out to avoid drying-out.

Dianix liquid dyes are particularly convenient to handle in larger containers, e. g. 1 t capacity. In these containers, sedimentation can be prevented by constant stirring (approx. 50 rpm). This does not impair the fine dispersion of the dye.

After dispersion or dilution, the dye dispersion is added to the dyebath or the pad liquor through a fine-mesh sieve.

3 Pre-treatment

3.1 Polyester fibers

3.1.1 Tow, loose stock, slubbing and yarn

3.1.1.1 Pre-shrinkage

In the dyeing of polyester staple fiber and filament yarns, attention must be paid to the shrinkage of the material. Excessive shrinkage can lead to an uneven liquor throughput and thus to unlevel dyeings. With soft packages, wound on flexible tubes, a shrinkage of up to 6% can be absorbed. On rigid tubes, however, polyester fibres should not shrink more than 3%. Yarns that are liable to shrink excessively are pre-treated on cops in autoclaves, e.g. 2 x 15 min at 125-135 °C with intermediate vacuum extraction.

Polyester filament yarns are normally pre-shrunk by the fiber manufacturers and supplied in the form of packages, ready for dyeing.

Polyester sewing threads should have the least possible residual shrinkage. If the fibers have not already been stabilized by the fiber manufacturer, the yarn should be heat set on rigid tubes, e.g. 60 min at 180-190 °C in hot air.

3.1.1.2 Pre-scouring

In most cases, the fiber material contains self-emulsifying spin finishes or winding oils, and can therefore be dyed without pre-scouring.

These products must also remain in a finely emulsified state at 130 °C. If the emulsion is not sufficiently stable under the dyeing conditions, it is likely to be responsible for patchy dyeings. In cases of doubt, it is advisable to even wash out self- emulsifying products at 60 °C prior to dyeing. Heavy contamination and spin finishes or winding oils that are not self- emulsifying are washed out at 60- 70 °C with

1-2 g/l Sera® Wash C-NEC (nonionic detergent)
1-2 g/l soda ash

3.1.2 Woven and knitted fabrics

3.1.2.1 Pre-scouring

For the pre-scouring, the same recommendations apply as given in

3.1.1.2.
Qualities in which running creases tend to become fixed should be washed in open-width washers.

4 Pre-setting

With goods that are to be dyed in beam dyeing equipment, excessive shrinkage can lead to an uneven liquor circulation and to the formation of moiré effects. For this dyeing procedure, the fabric is therefore preset, e. g. 30 s at 190 °C. The exceptions to this rule are qualities that are to be raised after dyeing. These qualities are not preset, because this would have an adverse effect on the raising treatment.

Fabrics that are dyed in tubular or rope form tend to show running creases if they have not been heat set prior to dyeing. Whether or not preliminary heat setting is necessary for this dyeing procedure depends on the particular fabric quality and on the dyeing conditions (type of machine, fabric tension, crease displacement) and can only be determined by plant trials.

5 Dyeing

5.1 Standard for textile dye house water supply

The following lists the minimum standards which a textile dye house water supply should meet. To achieve these levels it may be necessary to pre-treat the water in house before it is used for wet processing or dyeing.

• Water hardness total max.:	5 °	-	German
	6.25 °	-	U.K.
	5.2 °	-	U.S.A.
	8.95 °	-	French
• Suspended solids		-	< 1 mg/l
• Organic load (KMnO4 absorption)		-	< 20 mg/l
• Solid residues		-	< 50 mg/l
• Iron (Fe)		-	< 0.1 mg/l
• Manganese (Mn)		-	< 0.05 mg/l
• Copper (Cu)		-	< 0.01 mg/l
• Nitrate		-	< 50 mg/l
• Nitrite		-	< 5 mg/l
• Inorganic salts		-	< 500 mg/l

- pH should be in the range 7-8
- The water should be both odorless and colorless
- The water should be free of carbonic acid (CO_2), as its presence can lead to long term machine corrosion

5.2 Exhaust dyeing methods (batchwise processes)

Dianix® dyes are dispersed or diluted before addition to the dyebath. The auxiliaries and the dye dispersion are normally added to the bath at 50-70 °C and afterwards the pH is adjusted as necessary.

5.2.1 Auxiliary recommendation

5.2.1.1 Auxiliary recommendation for dyeing and aftertreatment

Washing agents	Sera® Wash C-NEC	Sera Wash M-OWS	Sera Wash M-EL	Sera Wash M-VFN
Dispersing agents	Sera Sperse M-IS/M-IS liq	Sera Sperse M-CE dispersing and levelling agent		
Lubricants	Sera Lube M-CF	Sera Lube Neo	Sera Lube M-UFC/ M-UFC conc decrease frictions	
Levelling agents	Sera Gal P-BMO carrier type leveller	Sera Gal P-LP/P-LP conc basic leveller	Sera Gal P-DEG	
Diffusion accelerators	Sera Gal P-EW			
Process control auxiliaries	Sera Con M-TC buffering agent	Sera Con P-NR anti reducing agent	Sera Con P-NU oligomer remover	Sera Con P-DIS oligomer dispersant
	Sera Con P-ACT neutral-acid red. agent	Sera Con M-FAS multifunctional red.agent	Sera Con P-RCN liquid reducing agent	
Deaerator	Sera Air M-TOP silicone free deaerator	Sera Air M-WD silicone deaerator		
Defoamer	Sera Foam M-58K silicone defoamer	Sera Foam M-SMK silicone and mineral oil free	Sera Foam M-HTS mineral oil, HT stable	Sera Foam M-EO mineral oil defoamer
Sequestering agents	Sera Quest Neo	Sera Quest C-PX		
UV-Absober	Sera Fast P-APS new	Sera Fast P-SLR		

For scour/dyeing processes a use of a low foaming washing detergent (e.g. Sera Wash M-OWS) is required.

Dispersing agents (e.g. Sera Sperse M-IS) increase the stability of the dye dispersion.

Lubricants (e.g. Sera Lube M-CF)) are necessary to prevent running problems during processing of sensitive woven and knitted fabrics.

Levelling agents (e.g. Sera® Gal P-LP, Sera Gal P-BMO) increase the stability of the dispersion and improve the level uptake of the dyes and the dye migration during the HT stage. The amount used depends on the depth of shade and on the dyeing conditions.

An addition of diffusion accelerators (e.g. Sera Gal P-EW) is only necessary for dyeings carried out at lower dyeing temperature or to improve build-up of dyes on high tenacity polyester fibers.

Process control auxiliaries are used for many purposes:
For pH adjustment multifunctional auxiliaries (e.g. Sera Con M-TC) which show also buffering properties can be used. Of course it is also possible to use acetic acid in combination with 1-2 g/ sodium acetate to produce buffering actions. Due to their lower buffering action, we do not advise the use of acids that dissociate more strongly, e.g. sulfuric acid or formic acid.

An addition of an anti reducing agent (e.g. Sera Con P-NR) is only necessary for dyes which are liable to produce a different shade or lighter dyeings in the presence of reducing potential in the dyebath

An addition of oligomer removers (e.g. Sera Con P-NU) during alkaline reduction clearing leads to increased saponification of oligomers and improves running properties of loose stock material and yarns in further processing steps. In addition Sera Con P-NU can be used for machinery cleaning with high efficiency in removal of oligomers.

Aftertreatment of polyester is normally carried out under alkaline conditions (e.g. Sera Con M-FAS) or acid conditions (e.g. Sera Con P-ACT).

An addition of deaerator (e.g. Sera Air M-TOP) prevents unlevelness caused by inclusion of air during dyeing.

An addition of defoamer (e.g. Sera Foam M-HTS) is only necessary where disturbing foaming is caused by high fabric speed, turbulent liquor circulation or by auxiliaries.

An addition of sequestering agent (e.g. Sera Quest C-PX) is only necessary for dyes which are liable to produce a different shade or lighter dyeings in the presence of ions of heavy metals.

An addition of UV-absorber (e.g. Sera Fast P-APS new) is only necessary for dyeings with highest requirements on light fastness.

Full application details and a wider range of product data for Sera auxiliaries can be found in ColorXPT.

5.2.2 Temperature/time programme

The starting temperature, the heating-up rate and the circulation time

at dyeing temperature depend on the dyes, concentration of the dyes in use, the type of fiber, on the circulation of the liquor or goods (ends/min) and on the auxiliaries in use.

The Optidye® PES program takes all these important dyeing parameters into account and is highly recommended for calculation of an optimized dyeing process on polyester.

For the determination of the dyeability of the polyester fiber (so called V-value), laboratory dyeings are carried out at 105 °C for 20 min with 0.33% Dianix® Red CC and the bath exhaustion is done at 130 °C for 60 min.

Afterwards both dyeings are reduction cleared at 80 °C for 20 min. Dyeing and bath exhaustion are compared against a scale (V-scale).

After entering all data the Optidye PES program automatically calculates the optimised dyeing cycle for the selected dyeing recipe.

5.2.3 Aftertreatment

Depending on fastness requirements dyeings in light and medium

shades are rinsed only. Dark shades are normally reduction cleared at 80 °C for 15-20 min.

Alkaline reduction clearing:

4-8 ml/l caustic soda 38 °Bé
0.5-1 g/l Sera® Con M-FAS
0.5-1 g/l Sera Wash M-VFN (washing agent)

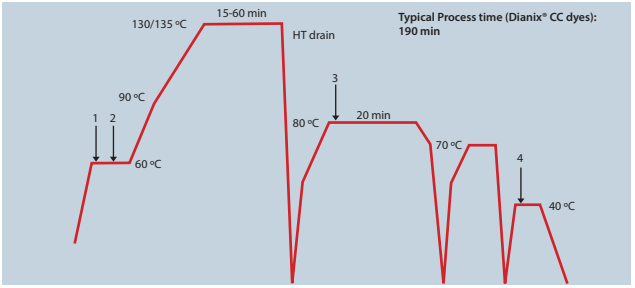
Acid reduction clearing:

1-2 gl/l Sera Con P-ACT
pH 3.5-4

5.2.4 Exhaust dyeing of tow, loose stock, slubbing and yarn by HT process

Polyester package dyeing

Use of the Optidye® PES software package is recommended to optimize the process for specific fibers/fabrics/conditions

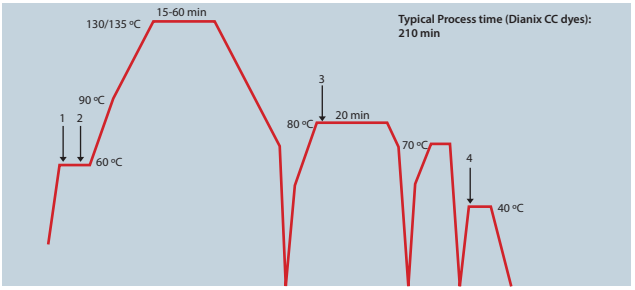


1. 1.0-2.0 % Sera® Gal P-LP
   pH 4.5 Sera Con M-TC
2. Dianix® dyes
3. Reduction clear
   5 ml/l caustic soda 38° Bé
   1 g/l Sera Con M-FAS
   1.0 g/l Sera Con P-NU
4. Acetic acid to neutralize

5.2.5 Exhaust dyeing of woven and knitted fabrics by HT process

Polyester piece dyeing

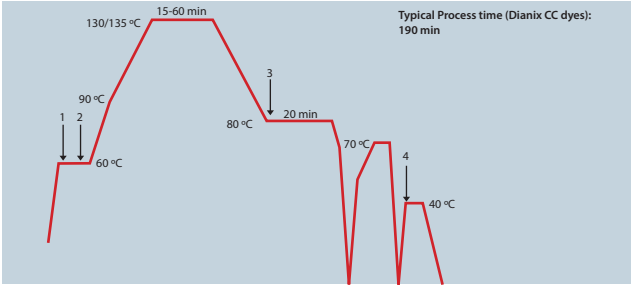
Use of the Optidye PES software package is recommended to optimize the process for specific fabrics/conditions



1. 1.0-2.0 % Sera® Gal P-LP
   1.0-2.0 % Sera® Gal P-LP
   pH 4.5 Sera Con M-TC
2. Dianix® dyes
3. Reduction clear
   5 ml/l caustic soda 38° Bé
   0.5-1.0 g/l Sera Con M-FAS
   0.5-1.0 g/l Sera Wash M-VFN
4. Acetic acid to neutralize

Polyester piece dyeing

Use of the Optidye PES software package is recommended to optimize the process for specific fabrics/conditions



1. 1.0-2.0 % Sera® Gal P-LP
   1.0-2.0 % Sera® Lube M-CF
   pH 4.5 Sera Con M-TC
2. Dianix® dyes
3. Reduction clear
   1-2 gl/l Sera Con P-ACT
   pH 3.5-4
4. Acetic acid to neutralize

5.3 Continuous thermofixation process

Dianix® dyes preferred for this method are the Dianix liquid types, which are easier to handle during preparation of the pad liquor.

Recipe and procedure

x g/l	Dianix dye
10-20 g/l	Sera® Gal M-IP (antimigration agent)
1-2 g/l	Sera Wet C-UD (wetting and deaerating agent)
pH 5-6	adjusted with acetic acid

Pad liquor temperature:	20-40 °C
Liquor pick-up:	40-60 %
Pre-drying:	to 25-30 % residual moisture
Pre-drying:	100 °C
Drying temperature:	100 –120 °C
Thermofixation temperature:	190-220 °C
Thermofixation time:	30-90 s (depending on equipment, depth of shade and fabric weight)

The dyes are dispersed or diluted as described under point No. 2, and added to the pad liquor through a fine-mesh sieve. The auxiliaries, diluted with water, are then added and the pH adjusted to 5- 6 with acetic acid.

A better fabric appearance is obtained with Sera Gal M-IP than with conventional thickening agents (alginates, bean gum ethers etc.). Sera Wet C-UD facilitates wetting of the polyester fibers and prevents marking of the material by hydrophobic substances. The use of wetting agent ensures that protruding fibers are uniformly wetted. The occurrence of "frostiness" depends on the nature of the material. A combination of wetting agent, antimigrant and special padding auxiliary e.g. Sera Lube M-CF prevents this.

Since disperse dyes migrate much more readily during an intermediate drying on polyester fabrics than on polyester/cellulosic blends, it is much more difficult to achieve perfect levelness on these fabrics. Migration during intermediate drying must be restricted as far as possible by

- a high squeezing effect in padding,
- the addition of antimigration agents
- uniform heat transfer during drying

Drying is carried out in hot flues at 100 °C with a very weak and uniform air circulation.

To prevent a harsh touch on 100 % polyester fabric the thermofixation temperature should be as low as possible. The temperature and time of the thermofixation treatment depends on the Dianix dyes used.

5.3.1 Aftertreatment

see 5.2.3 or continuous aftertreatment

Continuous alkaline reduction clearing
10-20 ml/l caustic soda 38 °Bé
2-5 g/l Sera® Con M-FAS
1-2 g/l Sera Sperse M-CE or Sera Sperse M-DEW
at 80 °C

6 Correction of unlevel dyeings

The best effects are obtained by working with the longest possible

liquor ratio. Sometimes this may not be feasible (e.g. in processing on a beam dyeing machine) and effects are then inadequate. In such cases the treatment should be repeated in a fresh liquor.

6.1 Levelling*

Unlevel dyeings on polyester fibres can be improved by treating the dyeings at as high temperature as possible with an addition of Sera Gal P-BMO or Sera Gal P-EW.

Guide recipe

1 g/l	Sera Sperse M-IS (dispersing agent)
1-2%	Sera Gal P-BMO or Sera Gal P-EW
10-20%	of the original amount of dye used
pH 4.5	with acetic acid
	60-120 minutes at 130-135 °C

6.2 Stripping*

Depending on the type of dyestuff, either reduction or oxidative treatment is recommended for stripping or significantly lightening. Optimum stripping effects are usually obtained by using a combination of these two methods, but this can badly damage the fibres. So it is advisable to carry out preliminary tests in the laboratory.

Guideline recipe for reduction stripping or partial stripping

3-5 g/l	caustic soda 38 °Bé
1-2 g/l	Sera Con M-FAS
3-5 g/l	Sera Gal P-BMO or Sera Gal P-EW
	60 minutes at 130 °C

Subsequently the material is then rinsed thoroughly, hot, and re-dyed in a fresh bath.

Guideline recipe for oxidative stripping or partial stripping

3 g/l	sodium chlorite 50 %
3-5 g/l	Sera® Gal P-BMO or Sera Gal P-EW
2 g/l	sodium nitrate
pH 3.5	with formic acid
	60 minutes at 120 °C

Subsequently the material is then rinsed thoroughly, hot, and re-dyed in a fresh bath.

** Before aftertreating larger lots, it is advisable to first check whether the treatment is likely to change the technological properties of the polyester fibers.*

Guideline recipe for continuous stripping or partial stripping (PES/CO)

200 - 300 g/l Sera Sperse M-CE or Sera Sperse M-DEW
Pick-up: 60%
60-90 s at 220 °C

Subsequently the material is then rinsed thoroughly, hot and cold.