

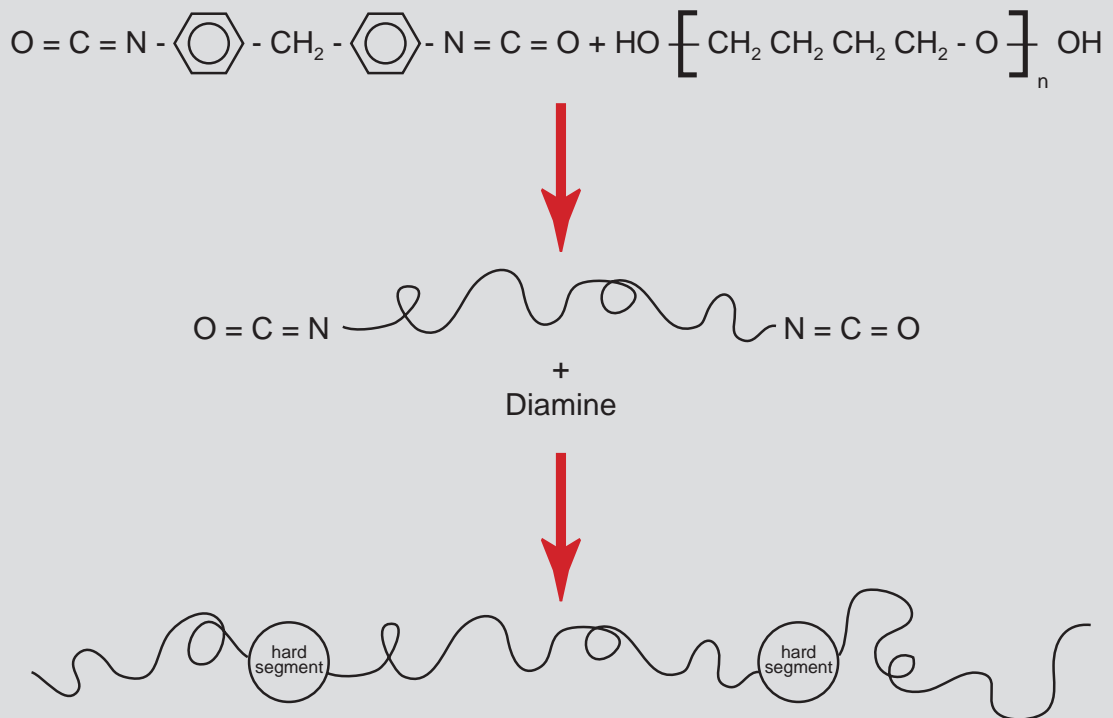
# Successful dyeing of polyester/elastane blends with Dispersol® and Palanil® dyes

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**brilliant**  
SOLUTIONS



Successful dyeing of  
polyester/elastane blends  
with Dispersol and Palanil dyes



## Elastane fibres are:

- widely used to improve fit and comfort of underwear, sportswear and outerwear
- formed from a synthetic polymer containing at least 85% by weight of segmented polyurethane
- generally based on polyether soft segments
- hydrophobic and open-structured with high affinity for disperse dyes

# Polyester/Elastane Dyeing Problems



Dyeing polyester/elastane at 130 °C



Permanent drawing of elastane fibre

Loss of stretch recovery power



Elastane fibres have higher affinity for disperse dyes than do polyester fibres



Heavy staining of elastane fibres

Poor colour fastness of dyed polyester/elastane fabrics

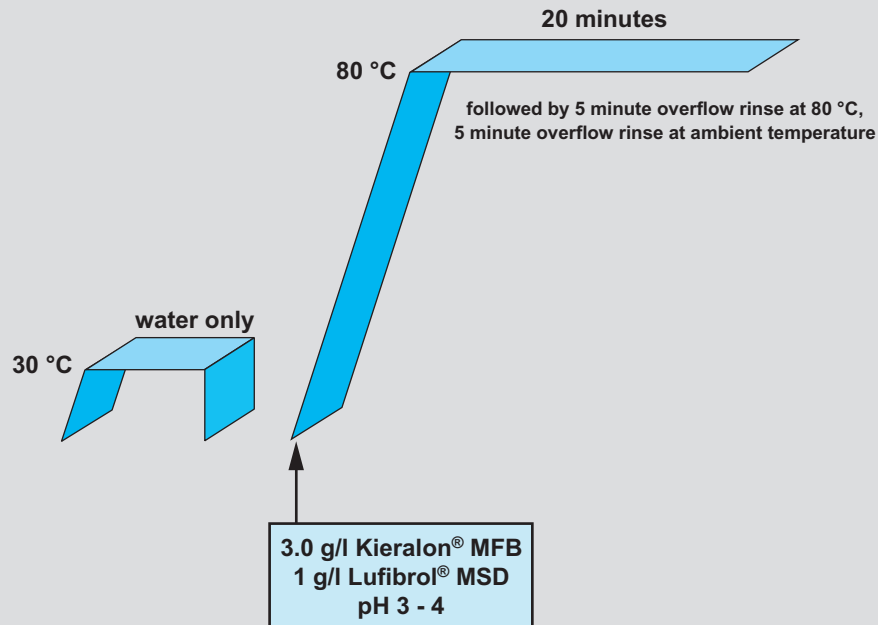


Careful choice of

- preparation chemicals
- dyes
- dyeing process
- machinery with minimum tension

is essential for producing high quality dyed fabrics

## Polyester/Elastane Fabrics – Batchwise Preparation



Lufibrol MSD can be omitted if soft water is used

Stability of removed silicone oils emulsion is highest at pH 3-4

Elastane yarns are lubricated with a protective film of 2-5% silicone oil for efficient fabric construction

Efficient removal of silicone oils before dyeing is important to:

- reduce disperse dye stain on elastane fibres
- reduce risk of spotting and staining during dyeing
- reduce smoking during finishing
- reduce migration of disperse dyes during storage of dyed fabrics
- Kieralon MFB, used at acid pH, is an efficient scouring system for oil removal

Disperse dyes dyed on polyester/elastane blends will.....

..... preferentially dye the elastane fibre



- disperse dyes build-up preferentially on elastane in a dyebath containing both polyester and elastane fibres

..... migrate slowly from elastane to polyester



- very little dye migrates from elastane to polyester after 30 minutes at 130 °C in blank dyebath

..... stain heavily in washing tests

M&S C4A (50 °C), rinsed only dyeings




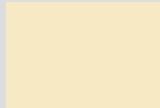


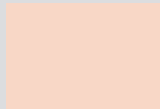

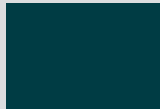
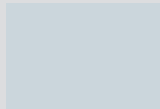
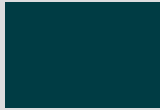
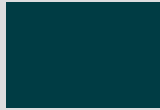
- disperse dyes on elastane have poor wet fastness

# Disperse Dye Stain on Elastane Fibres

**Reduction clearing** of dyed polyester/elastane fabrics under alkaline conditions is essential to:

- optimise the wet fastness
- improve the storage fastness
- optimise the shade stability to post heat setting

**Disperse dyes** vary greatly in ease of removal from elastane

	Before reduction clearing	After reduction clearing
Dispersol Yellow C-VS 300		
Palanil Yellow E-3G 200		
Dispersol Crimson SF		
Dispersol Red C-VS 300		
Dispersol Blue XF		
Palanil Dark Blue 3RT-CF		

## Reduction Clear

3-4 g/l	Hydrosulfite Conc. BASF
4-8 ml/l	caustic soda 38° Bé
0.5 g/l	Cyclanon® PE-Jet
	20 minutes at 80 °C

**Dye Selection** should aim to produce, after reduction clearing:

- little or no disperse dye on elastane (ideal)
- disperse dye stain on-tone with polyester dyeing (second best)

**Dyeing temperature** should take into account:

- source and stability of elastane yarns
- construction of the fabric
- dyeing machinery available
- colour fastness needed

**Dyeing polyester/elastane fabrics** *at reduced dyeing temperatures* (e.g. 115 °C) will minimise loss of stretch recovery power, but will result in:

- reduced colour fastness
- reduced shade reproducibility and more shading additions
- poor coverage of polyester yarn variations (increased barré)
- reduced colour yield
- danger of shade change on post heat setting

Dyeing temperature for polyester/elastane is often a compromise



## 1. Dyeing at 115 °C

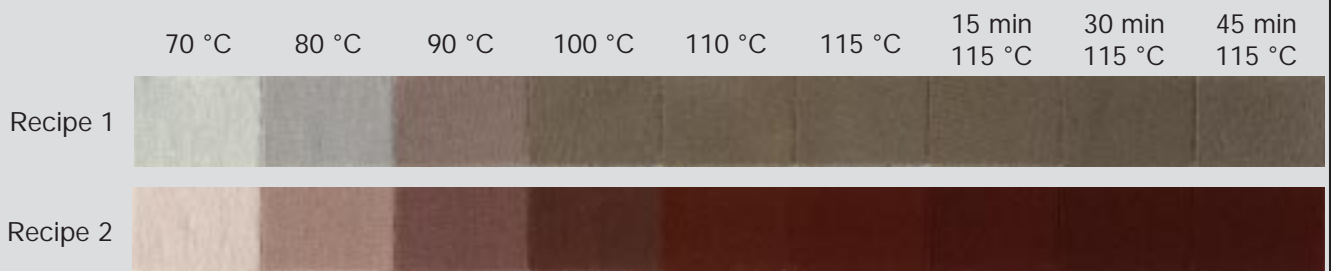
Controlled Coloration of polyester/elastane blends with good shade reproducibility at 115 °C is possible with:

Palanil E dyes ➤ pale to medium shades

Dispersol C-VS dyes ➤ medium to heavy shades

### 1.1 Controlled Coloration

On-tone build-up .....



#### Recipe 1

0.11 % Palanil Yellow E-3G 200  
0.11 % Palanil Red E-BF 200  
0.08 % Palanil Blue E-R 150

#### Recipe 2

1.69 % Dispersol Yellow Brown C-VSE  
0.21 % Dispersol Red C-VS 300  
0.67 % Palanil Dark Blue 3RT-CF

..... and stability to heat setting .....

$\Delta E$	0.9	$\Delta E$	0.2
Strength	113%	Strength	102%
Hue	0.5 redder	Hue	0.2 yellower

• colour measurements on the above dyeings

..... all lead to:



**Best achievable Right-First-Time performance**

## 1.2 Colour fastness

Good washing to 50 °C washing and to perspiration can be achieved by efficient reduction clearing of all shades after dyeing (see pages 10 and 11 for full application details)

### C06/B2S (50 °C)

	S.D.C. MULTIFIBRE TEST FABRIC					
	Secondary cellulose acetate (Dicel)	Bleached unmercerised cotton	Nylon 6.6	Polyester (Terylene)	Acrylic (Courtelle)	Wool worsted
Olive						
Navy						
Black						
Cherry						

### Alkaline Perspiration (E04)

	S.D.C. MULTIFIBRE TEST FABRIC					
	Secondary cellulose acetate (Dicel)	Bleached unmercerised cotton	Nylon 6.6	Polyester (Terylene)	Acrylic (Courtelle)	Wool worsted
Olive						
Navy						
Black						
Cherry						

#### Olive

0.23 % Palanil Yellow E-3G 200  
0.12 % Palanil Red E-BF 200  
0.10 % Palanil Blue E-R 150

#### Navy

0.02 % Dispersol Yellow C-VS 300  
0.29 % Dispersol Yellow Brown C-VSE  
1.38 % Palanil Dark Blue 3RT-CF

#### Black

0.06 % Dispersol Yellow Brown C-VSE  
2.16 % Dispersol Black C-VSE

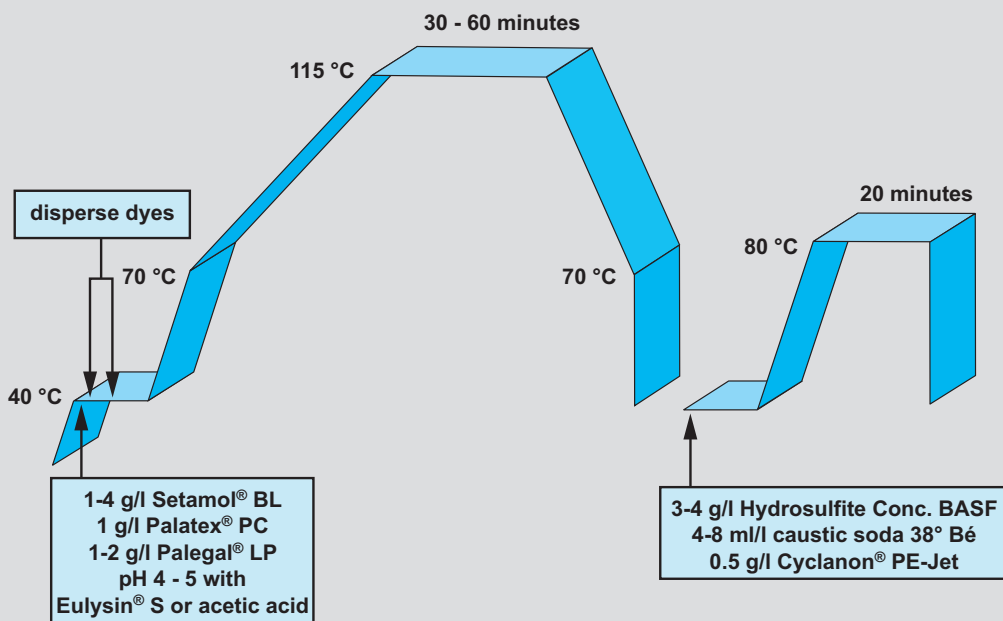
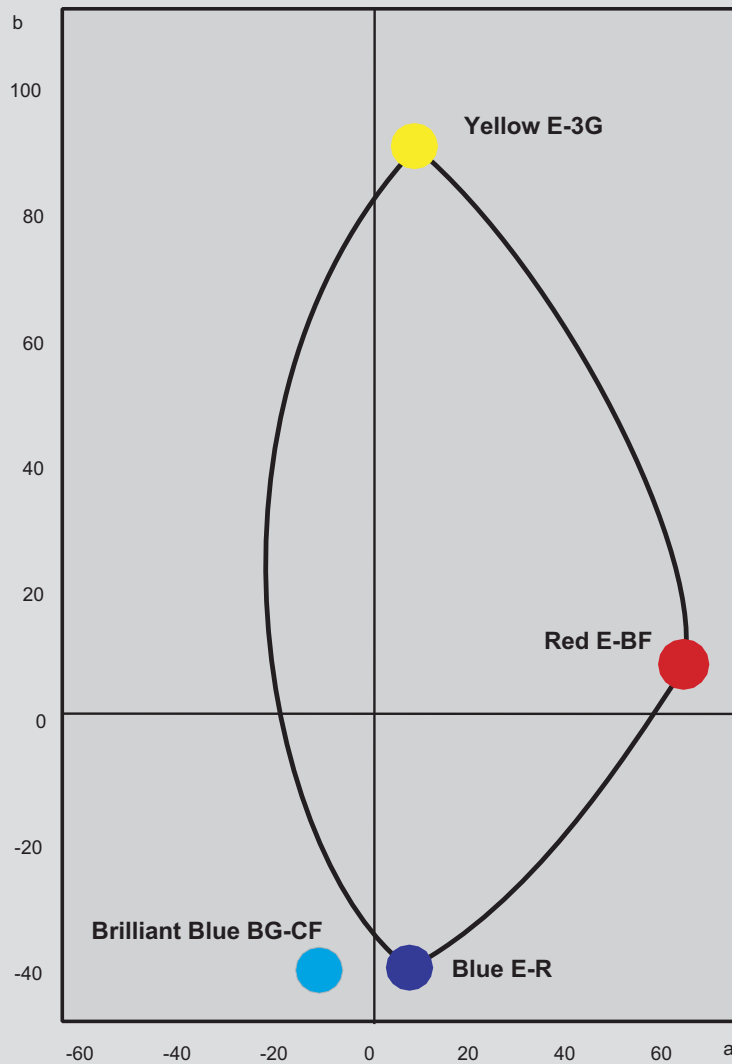
#### Cherry

0.47 % Dispersol Yellow Brown C-VSE  
0.39 % Dispersol Red C-VS 300  
0.02 % Palanil Dark Blue 3RT-CF

All dyeings heat-set at 190 °C for 30 seconds after reduction clearing

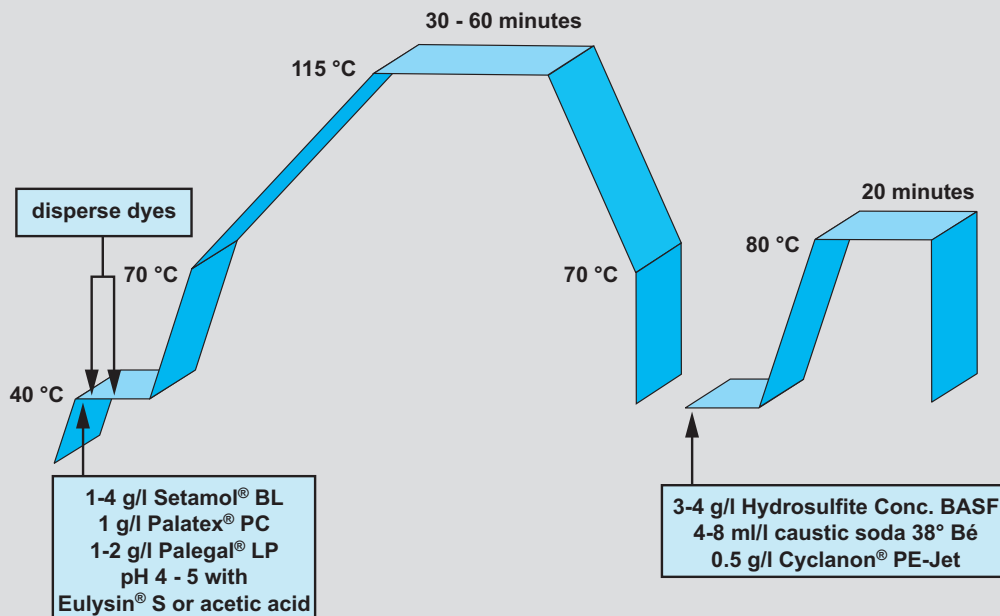
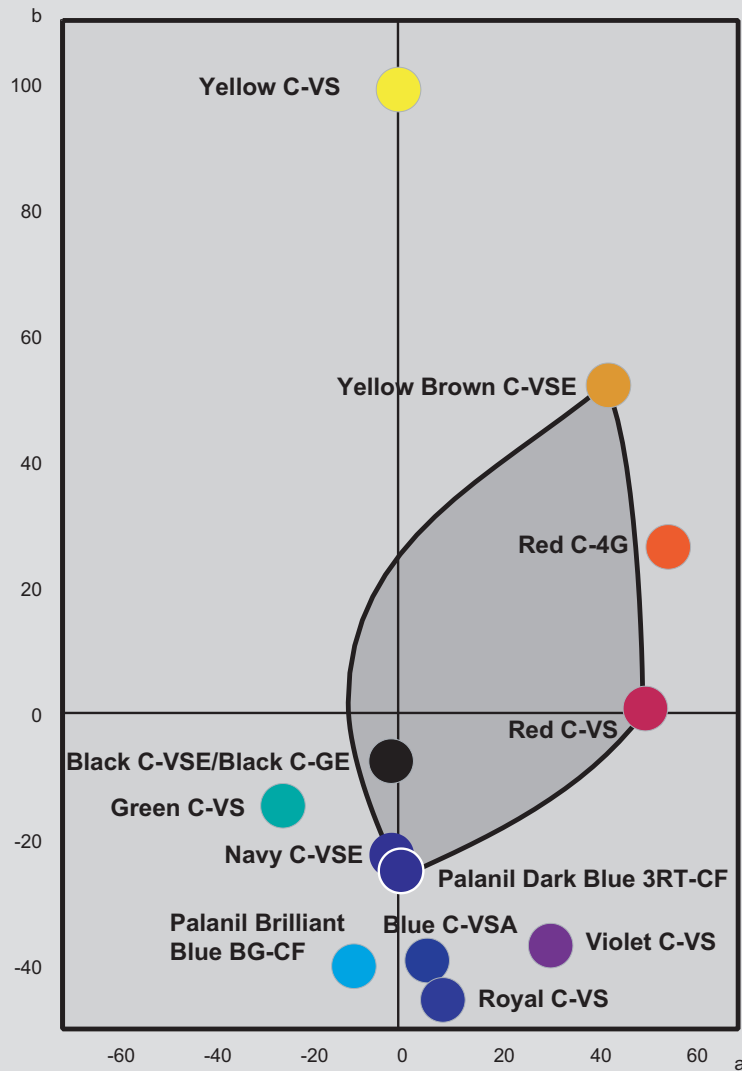
## 1.3 Dyeing/clearing Processes

Pale/medium shades ➤ Palanil E dyes



# Compact Elastane - Dyeing at 115 °C

Medium/heavy shades > Dispersol C-VS dyes



## 2. Dyeing at 125-130 °C

Controlled Coloration of polyester/elastane blends with good shade reproducibility and optimum wet fastness at 125-130 °C with:

Palanil E > pale shades

Dispersol C-VS > medium/heavy shades

Dispersol XF, SF > heavy shades with highest wash fastness

### 2.1 Controlled Coloration

On-tone build-up .....

	70 °C	80 °C	90 °C	100 °C	110 °C	120 °C	130 °C	15 min 130 °C	30 min 130 °C
Recipe 1									
Recipe 2									
Recipe 3									

#### Recipe 1

0.11 % Palanil Yellow E-3G 200  
0.11 % Palanil Red E-BF 200  
0.08 % Palanil Blue E-R 150

#### Recipe 2

1.69 % Dispersol Yellow Brown C-VSE  
0.21 % Dispersol Red C-VS 300  
0.67 % Palanil Dark Blue 3RT-CF

#### Recipe 3

3.43 % Dispersol Yellow Brown XF  
0.54 % Dispersol Rubine XFN  
0.77 % Dispersol Navy XF

# Compact Elastane - Dyeing at 125-130 °C

..... with good time/temperature robustness .....

## Recipe 1

	15 minutes	30 minutes	45 minutes
125 °C	98% 0.9 yellower	99% 0.4 yellower	100% 0.3 redder
130 °C	100% 0.5 yellower	Control	103% 0.1 redder
135 °C	103% 0.3 yellower	108% 0.5 redder	112% 0.4 redder

## Recipe 2

	15 minutes	30 minutes	45 minutes
125 °C	91% 0.4 yellower	95% 0.01 redder	97% 0.04 redder
130 °C	94% 0.2 yellower	Control	100% 0.02 yellower
135 °C	102% 0.4 redder	101% 0.02 redder	103% 0.3 redder

## Recipe 3

	15 minutes	30 minutes	45 minutes
125 °C	92% 1.1 redder	99% 0.3 redder	100% 0.2 redder
130 °C	96% 0.6 redder	Control	104% 0.2 yellower
135 °C	103% 0.3 redder	109% 0.2 yellower	113% 0.4 yellower

..... and stability to heat setting .....

$\Delta E$  1.0  
 Strength 114%  
 Hue 0.3 yellower

$\Delta E$  0.5  
 Strength 101%  
 Hue 0.1 yellower

$\Delta E$  0.3  
 Strength 103%  
 Hue 0.1 yellower

..... all lead to:



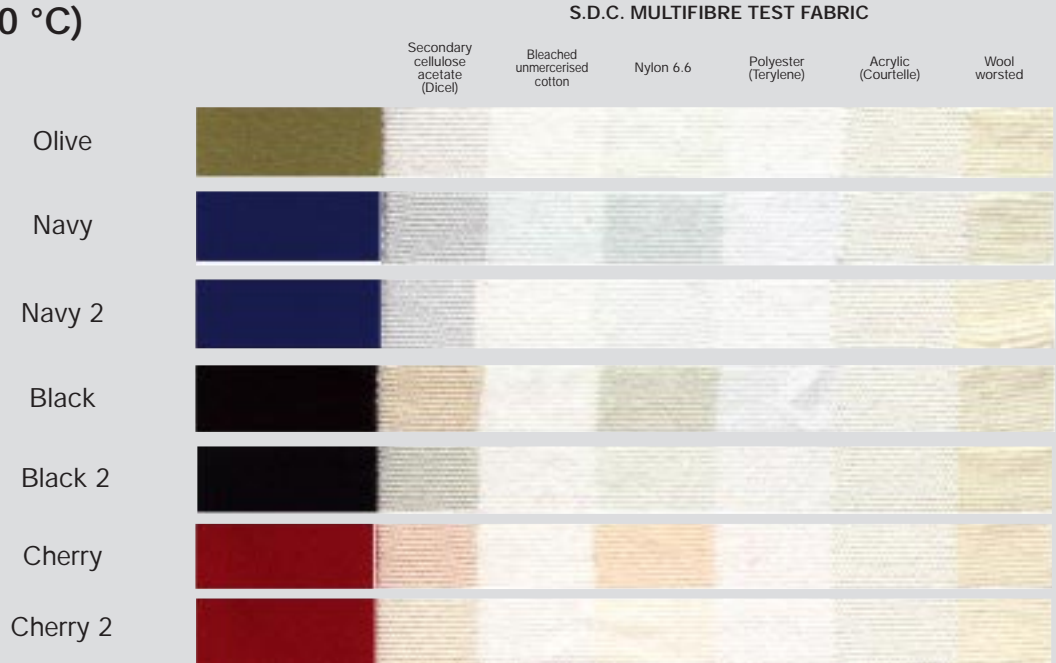
**Best achievable Right-First-Time performance**

# Compact Elastane - Dyeing at 125-130 °C

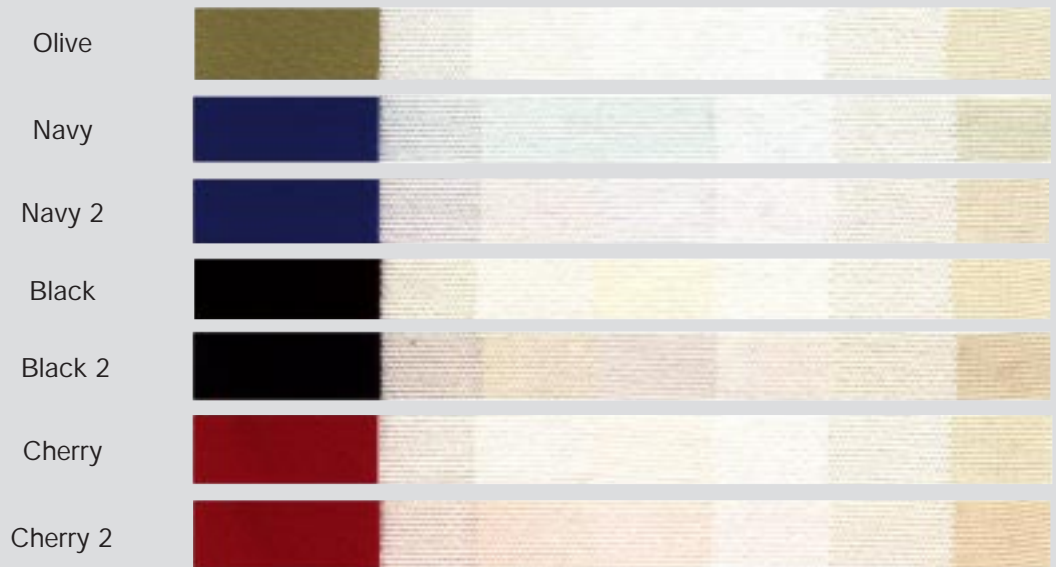
## 2.2 Colour Fastness

Optimum wet fastness can be achieved by efficient reduction clearing of all shades after dyeing (see pages 15, 16 and 17 for full application details)

### C06/B2S (50 °C)



### Alkaline Perspiration (E04)



#### Olive

0.23 % Palanil Yellow E-3G 200  
0.12 % Palanil Red E-BF 200  
0.10 % Palanil Blue E-R 150

#### Navy

0.02 % Dispersol Yellow C-VS 300  
0.29 % Dispersol Yellow Brown C-VSE  
1.38 % Palanil Dark Blue 3RT-CF

#### Navy 2

0.30 % Dispersol Yellow Brown XF  
0.14 % Dispersol Rubine XFN  
1.54 % Dispersol Navy XF

#### Black

0.06 % Dispersol Yellow Brown C-VSE  
2.16 % Dispersol Black C-VSE

#### Black 2

0.15 % Dispersol Yellow Brown XF  
0.10 % Dispersol Rubine XFN  
3.43 % Dispersol Black XF

#### Cherry

0.47 % Dispersol Yellow Brown C-VSE  
0.39 % Dispersol Red C-VS 300  
0.02 % Palanil Dark Blue 3RT-CF

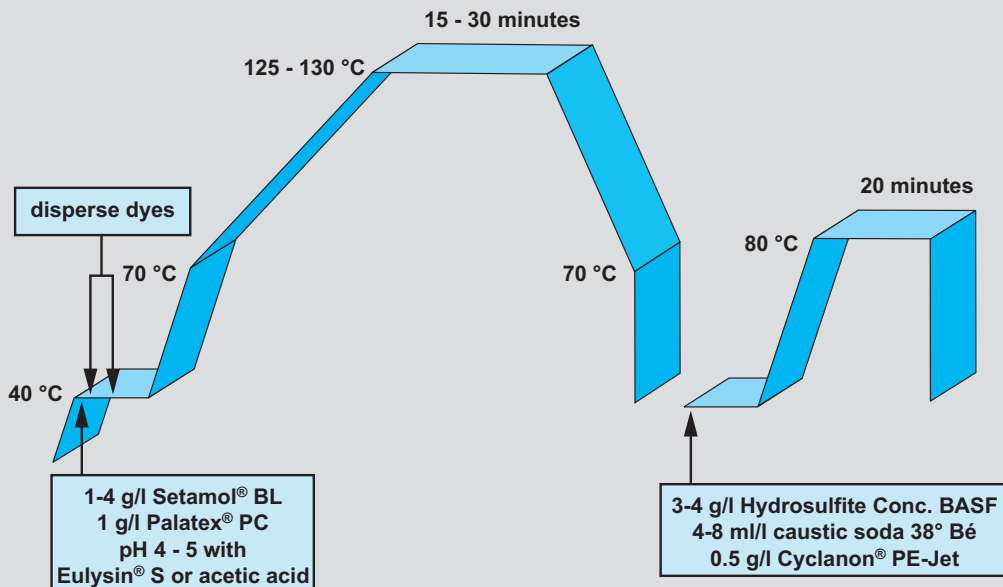
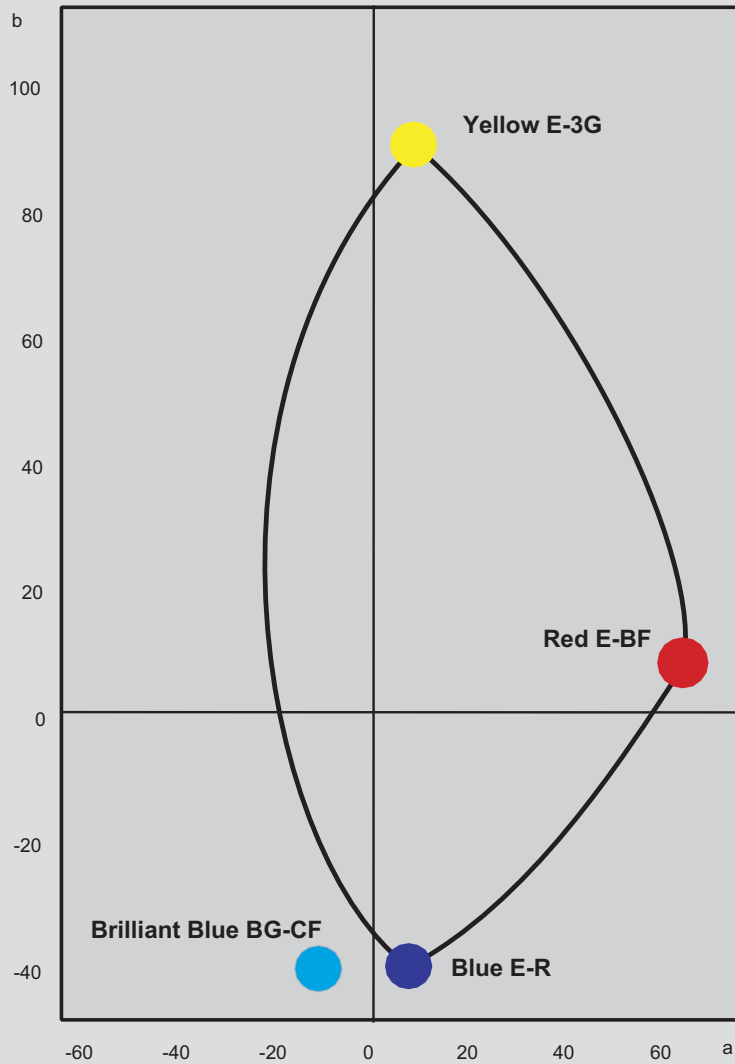
#### Cherry 2

0.92 % Dispersol Yellow Brown XF  
0.54 % Dispersol Rubine XFN  
0.16 % Dispersol Crimson SF

All dyeings heat-set at 190 °C for 30 seconds after reduction clearing

## 2.3 Dyeing/clearing procedures

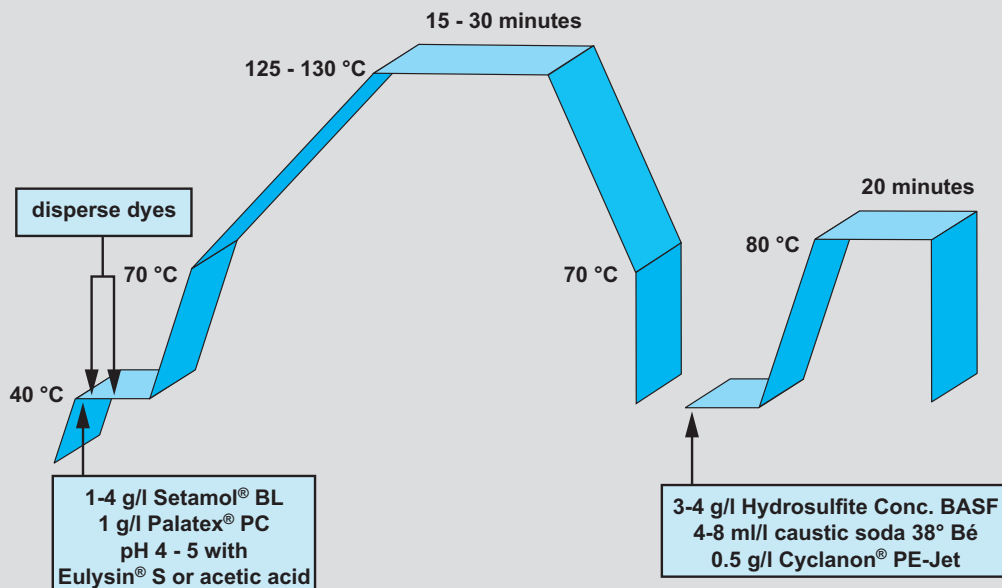
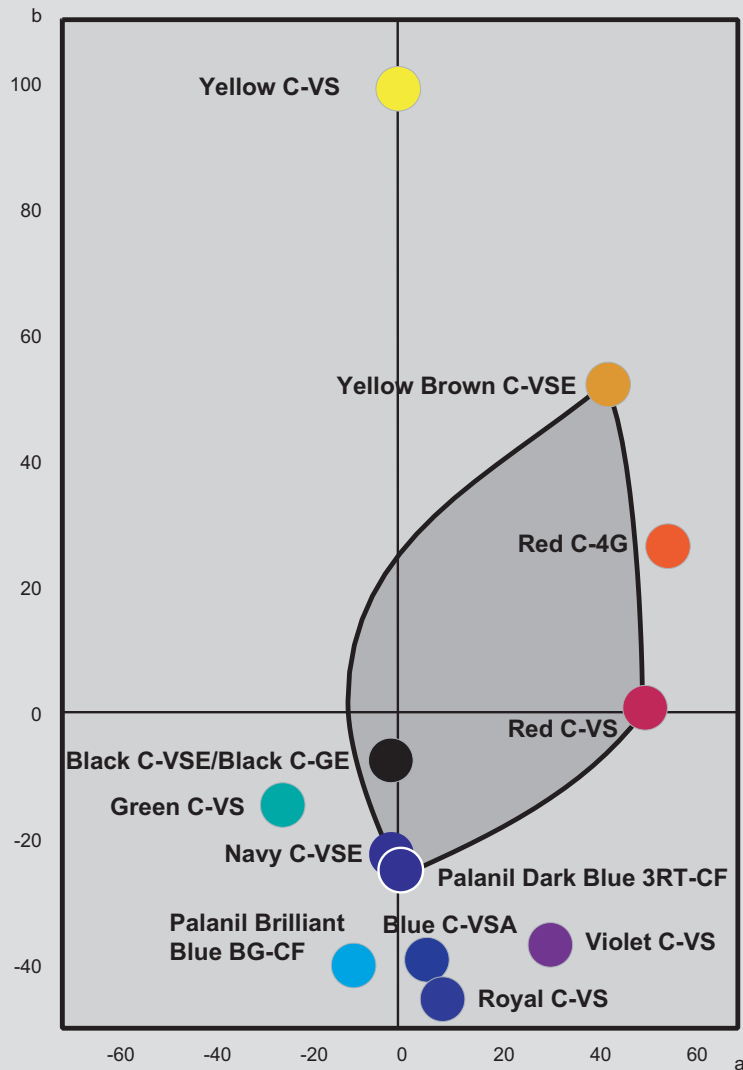
Pale shades ➤ Palanil E dyes





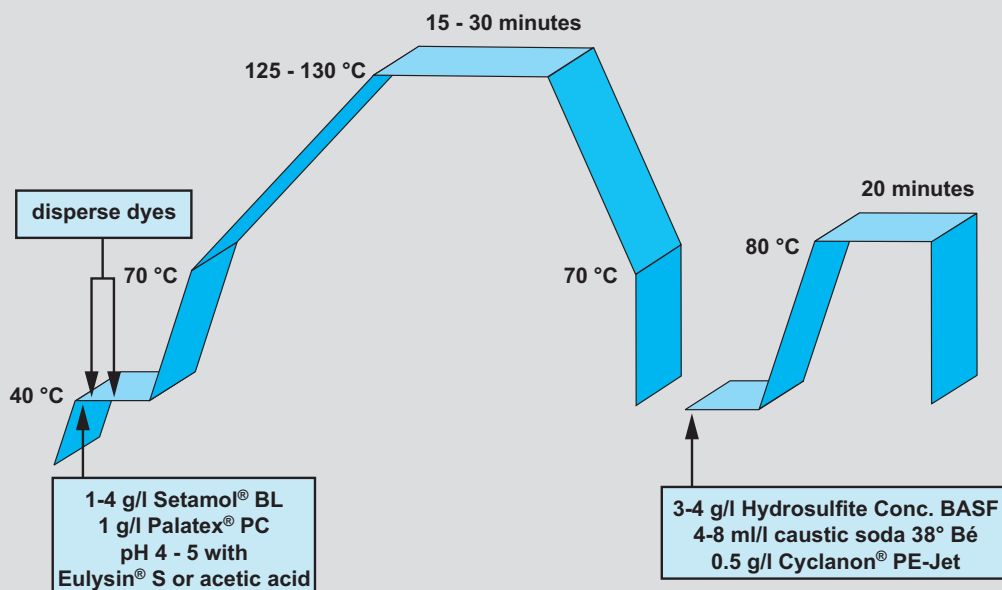
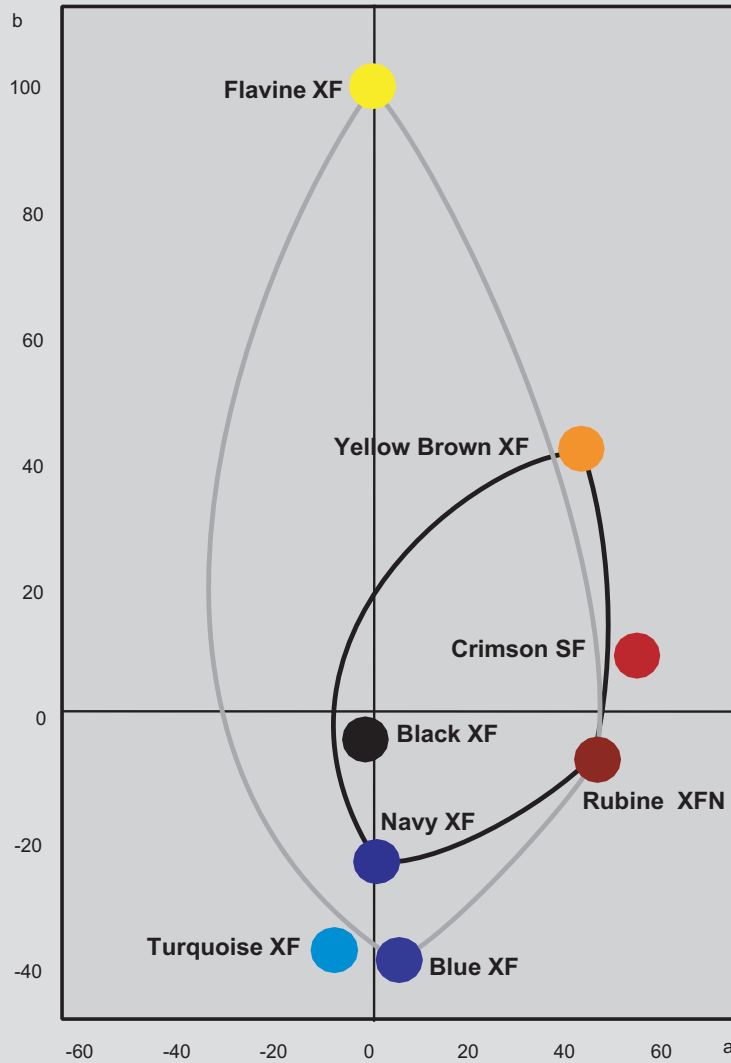
# Compact Elastane - Dyeing at 125-130 °C

Medium/heavy shades > Dispersol C-VS dyes



# Compact Elastane - Dyeing at 125-130 °C

Heavy shades with highest wash fastness > Dispersol XF, SF dyes



### For successful dyeing of polyester/elastane fabrics

- lowest dyeing temperature which produces level, well penetrated dyeings
- low tension dyeing machinery
- select dyes and chemicals for Controlled Coloration
- efficient pre-scouring to remove silicone oils
- efficient reduction clearing
- lowest post heat-setting temperature which produces stable fabrics

