

# PIGMENTS FOR INDUSTRIAL PAINT MIXING SYSTEMS





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# ALTERNATIVE METHODS OF PAINT PRODUCTION



The conventional method of paint production consists of dispersing the pigment contained in a given formulation in part of the binder, reducing them and then adjusting them to the final shade. This method may prove viable in future too, e.g. if a particular shade has to be produced in very large quantities or if the product range comprises only a few shades. The large number of shades now required has recently brought into increasing prominence another production method, which employs standardized

semi-finished products. Semi-finished products in this context are defined as binder-containing pigment pastes so that each incorporate only one pigment. Since the pigment is already in dispersed form, the desired shade can be produced by simply mixing the pastes in a given ratio, hence the term mixing system.



# ADVANTAGES OF MIXING SYSTEMS

The introduction of a mixing system into paint manufacture necessitates considerable preliminary work in the laboratory, specifically in connection with the choice of pigment, paint formulation and standardization. This effort however seems justified in most cases if the achievable results are compared. Technically the most complicated and cost-intensive production stage in paint manufacture is dispersing the pigment.

The paste concept offers the following advantages:

- Since the pigment pastes each contain only one pigment, optimum adaptation of mill base formulation and dispersing conditions to this pigment is possible.
- The pigment pastes are produced on the basis of a medium-term consumption-oriented plan independent of day-to-day operations. In this way the best possible use of the available dispersing capacity can be made, and cleaning time and production losses due to cleaning can be reduced to a minimum.

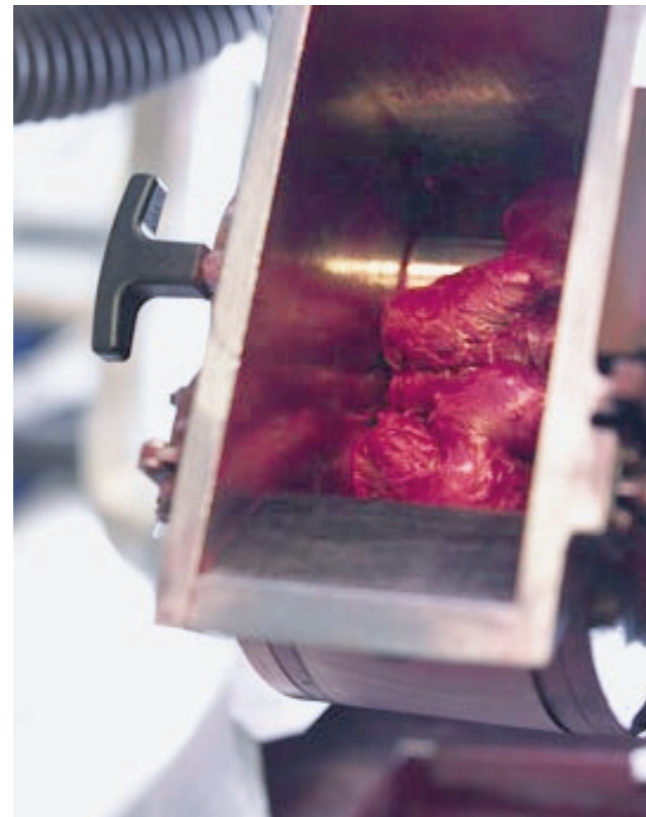
Pigment dispersion is also a very time-consuming production stage. Since the use of pigment pastes obviates the need for this operation, output can be adapted to a large extent to the daily orders received.

The result is:

- Increased readiness to deliver, even small quantities.
- Shorter delivery times.

Other major advantages derived from standardization of the pigment pastes are:

- Owing to standardization of the coloristic properties the desired shade is generally obtained by mixing the pastes in the prescribed ratio. If necessary, the shade can be adjusted highly effectively by colorimetric means, thus largely preventing surplus quantities being produced.
- Optimum use can be made of the possibilities afforded by colorimetric formulation calculation. Even shades outside the standard range can be produced quickly and economically.
- Standardization of rheological properties within a specific tolerance range enables modern automatic metering equipment to be used.



# GENERAL SELECTION CRITERIA FOR PIGMENTS

The efficiency of a mixing system is determined by the choice of pigments. This involves examining a whole range of technological and fastness properties as well as the coloristic properties.

As is generally the case, these properties are governed by the composition of the paint systems in question and by the requirements of the painted end product.

Special importance is given to the flocculation stability of the pigments, firstly in view of the flow properties of the pastes and secondly in view of the reproducibility of the shades.

A further prerequisite for good reproducibility of shades is satisfactory recrystallization stability of the pigments. The solvent composition must, therefore, be considered as an important factor.

Coloristically, the pigments used should have the highest possible chroma so that the entire range of shades can be largely covered by combination of the selected pigments.

In the yellow-orange-red range, the opacity of the pigments is also important.

If an industrial paint tinting system is required to be able to produce all shades marketed commercially, a fairly high number of pigment pastes is needed. This raises doubts as to the cost-effectiveness of the production method. It may therefore prove advisable to reduce the number of pastes and in the future to produce the few shades not achievable by this method by dispersing the powder pigments together. In this respect the conventional production method and the mixing system can reasonably complement one another.



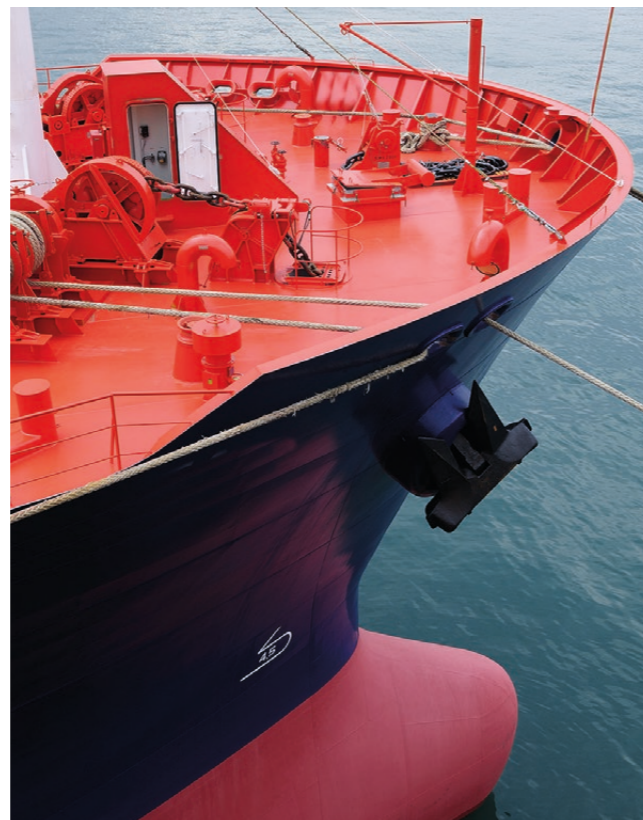
# PAINT MIXING SYSTEMS

The mixing system concept can be implemented in a very simple manner by using the main binder of the particular product line as the binder for the pastes.

In selecting the pigment concentration the different binder requirements of the individual pigments must be taken into account. Firstly, the highest possible pigment concentration is an advantage; secondly, sufficient binder must be incorporated to ensure flowability and storage stability of the pastes.

Pastes formulated in this way can be mixed together – depending on the formulation – in any ratio. The paint is then finished by adding further amounts of binder or binder components. In its final composition and consequently in its properties it is comparable with a paint produced by the conventional method. Paint mixing systems can therefore be of advantage if very high or very specific demands are made on the quality of the paint.

As already mentioned, the pigment selection for paint mixing systems is governed by the properties of the binder system and the end use of the paint. We are, therefore, presenting two recommendations that differ substantially in terms of the yellow, orange and red pigments. For obvious reasons, there are no alternatives to the phthalocyanine and inorganic pigments.












## RECOMMENDATION <sup>1</sup>

applies to high-quality industrial paints (e.g. alkyd/melamine baking enamels or 2-component acrylic paints). The pigments have good resistance to polar solvents coupled with high light and weather fastness, are heat-stable and fast to overcoating.

## RECOMMENDATION <sup>2</sup>

applies to industrial paints and decorative paints (e.g. oxidatively drying alkyd resin paints). Consequently the selection contains pigments that are not suitable for baking enamels, are not fast to overcoating and should be used only in the presence of low-aromatic non-polar solvent mixtures.

SHADE RANGE	RECOMMENDATION <sup>1</sup>	RECOMMENDATION <sup>2</sup>
 Green shade yellow	Hostaperm <sup>®1</sup> Yellow H6G <sup>1</sup>	Hansa <sup>®</sup> Yellow 10G Hansa Yellow 10G 41 gran.
 Medium shade yellow	Hostaperm Yellow H3G Hostaperm Yellow H4G / H4G 70 <sup>1</sup> Novoperm <sup>®</sup> Yellow F2G Novoperm Yellow 5GD 71	Hansa Brilliant Yellow 2GX 70-S
 Red shade yellow	Novoperm Yellow HR 70 Novoperm Yellow M2R 70 Novoperm Orange H5G 70	Novoperm Yellow HR 70
 Orange and scarlet	Novoperm Orange HL 70 Novoperm Red HF3S 70 Hostaperm Scarlet GO	Hansa Red GG Permanent Orange 2RLD 71 Permanent Orange RL 70
 Medium and blue shade red	Hostaperm Red D3G 70 Hostaperm Red D2G 71/72 Novoperm Red F2RK 70 Novoperm Red F3RK 70 Hostaperm Red E2B 70 <sup>1</sup>	Permanent Red FGR Permanent Red FGR 70 Novoperm Red F5RK Novoperm Red BLS 02 <sup>2</sup>
 Magenta and red violet	Hostaperm Pink E Hostaperm Pink EB transp. <sup>1</sup> Hostaperm Red Violet ER 02	
 Violet	Hostaperm Violet RL spec. 01	
 Blue	Hostaperm Blue A4R / B2G 03 / BT-617-D / BT-627-D	
 Green	Hostaperm Green GNX	
Inorganic pigments	Hostaperm Oxide Yellow BV 02 (Bismuth vanadate) Iron oxide yellow Chrome titanium yellow Nickel titanium yellow Iron oxide red Titanium dioxide Carbon black	

<sup>1</sup> = Suitability in water-based systems should be checked prior to use

<sup>2</sup> = Not recommended for water-based systems

NF: Pigments with surface treatment for high solid systems



# UNIVERSAL MIXING SYSTEMS

The advantages of employing paint mixing systems can be further realized by introducing a universal mixing system. The idea behind this is that the entire product range can be pigmented with a single series of pastes.

The key to a universal mixing system is therefore the binder used for the pigment pastes. This binder should be compatible with all binder systems represented in the product range and should if possible not influence the paint properties of these binder systems.

This extremely high demand is virtually impossible to meet. It is therefore conceded from the outset that the pigment pastes may be added only in limited amount to a particular binder system. In this way problems of compatibility and effect on properties are reduced.

But this in turn raises a fresh problem. By adding limited amounts of paste it is virtually impossible in many cases to obtain the required level of pigmentation in the paint.

There are two remedies for this:

- The pigment concentration in the pigment pastes is raised to the highest possible level, if necessary by incorporating suitable additives.

- In addition to the universal pigment pastes, colored base paints are used which already contain a large proportion of the required pigments. These colored base paints must be held in stock for each product line, i. e. in all binder systems of the product range.

Thus, for example, several standard whites that differ in titanium dioxide content or colored base paints especially in the yellow-orange-red range are used. These colored base paints are important for achieving acceptable opacity in full shade.










By tinting the colored base paints with the universal pastes, a large number of shades can be obtained, though some influence on the paint properties must be accepted. If very high demands are made on the quality of the paint, universal mixing systems are suitable only with restrictions.

With a broad-based product range, it is often not possible to develop a universal mixing system that meets all requirements. In such cases an acceptable technical and economic compromise can be reached by restricting choice to a "universal" mixing system that covers only a limited number of product lines with similar properties instead of the entire product range.

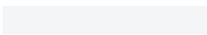


As far as pigment selection for pastes is concerned, a high fastness level must be specified because of their universal use. The pigments for the colored base paints, on the other hand, can be adapted to the requirements of the particular product line.

The following table can be used for selection of pigments for a universal mixing system.

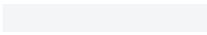


## HIGHLY CONCENTRATED PASTES

SHADE RANGE		SUGGESTED PIGMENT
	Green shade yellow	Hostaperm Yellow H6G <sup>1</sup>
	Medium shade yellow	Hostaperm Yellow H3G Novoperm Yellow 5GD 71
	Red shade yellow	Novoperm Yellow HR 70 Novoperm Yellow M2R 70
	Orange and scarlet	Novoperm Orange HL 70 Novoperm Red HF3S 70 Hostaperm Scarlet G0
	Medium and blue shade red	Hostaperm Red D3G 70 Hostaperm Red D2G 71/72 Hostaperm Red E2B 70
	Magenta and red violet	Hostaperm Pink E Hostaperm Red Violet ER 02
	Violet	Hostaperm Violet RL spec. 01
	Blue	Hostaperm Blue A4R / B2G 03 / BT-617-D / BT-627-D
	Green	Hostaperm Green GNX
	Inorganic pigments	Hostaperm Oxide Yellow BV 02 (Bismuth vanadate) Iron oxide yellow Chrome titanium yellow Nickel titanium yellow Iron oxide red Carbon black

## COLORED BASE PAINTS FOR HIGH-QUALITY INDUSTRIAL PAINTS



	White	Titanium dioxide
	Yellow	Novoperm Yellow 5GD 71 Hostaperm Yellow H4G / H4G 70
	Red	Novoperm Red F2RK 70 / F3RK 70 Hostaperm Red D3G 70

## COLORED BASE PAINTS FOR SIMPLE INDUSTRIAL PAINTS





	White	Titanium dioxide
	Yellow	Hansa Brilliant Yellow 2GX 70-S
	Red	Permanent Red FGR 70

# BRIEF CHARACTERISTICS OF PIGMENTS RECOMMENDED FOR HIGH-QUALITY INDUSTRIAL PAINTS



## GREEN SHADE YELLOW PIGMENTS

	Hostaperm Yellow H6G P.Y. 175	Clean greenish monoazo yellow of the benzimidazolone series with very good light and weathering fastness even in reduced shades. Its main use is in the lead-free matching of greenish yellow shades.
	Hostaperm Oxide Yellow BV 02 P.Y. 184	Lead-free inorganic bismuth vanadate pigment with a brilliant greenish yellow shade, good opacity and excellent fastness to weathering. Ideally suitable in combination with strong organic pigment for producing brilliant and highly opaque green, yellow, orange and red shades.





## MEDIUM SHADE YELLOW PIGMENTS

	Hostaperm Yellow H3G P.Y. 154	Medium yellow pigment of the benzimidazolone series with excellent weathering fastness. Its range of application covers the production of highly saturated yellow shades to the adjustment of pastel colors.
	Hostaperm Yellow H4G P.Y. 151	Somewhat greener than Hostaperm Yellow H3G, but offering distinctly better opacity. The weathering fastness is very good in the near full-shade range but decreases somewhat in white reductions. It must be pointed out that the resistance to very strong alkalis is unsatisfactory.
	Novoperm Yellow F2G P.Y. 194	A high strength yellow pigment with good rheological properties and color shade similar but slightly inferior weather fastness properties to Hostaperm Yellow H4G. Primarily suitable for economical shade matchings of yellow, orange and green color ranges in the industrial paints area.
	Novoperm Yellow 5GD 71 P.Y. 155	Somewhat redder than Novoperm Yellow F2G with better opacity, very high tinting strength and good rheological properties. Mainly for high quality industrial paints in the yellow, orange and green shade area.






## RED SHADE YELLOW PIGMENTS

	Novoperm Yellow HR 70 P.Y. 83	Reddish, highly opaque yellow pigment with good flow properties and very good weather fastness in deep shades. It is used mainly for the formulation of lead-free reddish yellow shades or orange shades.
	Novoperm Yellow M2R 70 P.Y. 139	Redder, noticeably more opaque than Novoperm Yellow HR 70 with excellent fastness to weathering, especially in deep shades, very good flow and can be used at high pigment concentrations (25–30% pigment relative to solid binder) without affecting the gloss. These application characteristics make it well suited for producing bright, opaque reddish yellow shades for lead-free formulations. To note, however, is that the resistance to very strong alkalis in some binder systems is unsatisfactory.



## ORANGE AND SCARLET PIGMENTS

	Novoperm Orange H5G 70 P.O. 62	Distinctly redder than Novoperm Yellow HR 70 and Novoperm M2R 70, it therefore, offers an intermediate shade between yellow and orange. It has excellent opacity and very good flow properties. In the orange range, more brilliant shades can be produced than with Novoperm Yellow HR 70. This pigment is not completely fast to overcoating at baking temperatures (above 130 °C).
	Novoperm Orange HL 70 P.O. 36	A reddish, highly opaque orange pigment with excellent weathering fastness even in reduced shades. As it has very good flow properties in paints, it can also be used at high pigment concentrations (25–30% pigment relative to solid binder) without affecting the gloss. Standard pigment for replacing molybdate red pigments.
	Novoperm Red HF3S 70 P.R. 188	Bluer, considerably more brilliant but less opaque than Novoperm Orange HL 70. Nevertheless shades of comparable opacity can be produced because higher amounts of iron oxide pigments can be incorporated. The weathering fastness is somewhat lower than that of Novoperm Orange HL 70.
	Hostaperm Scarlet GO P.R. 168	Coloristically similar to but more transparent than Novoperm Red HF3S 70. In terms of weathering fastness, Hostaperm Scarlet GO is suitable for the adjustment of very pastel shades and is thus the first choice for this color range. To note however, is its considerably higher price than the previously named alternative.


## MEDIUM AND BLUE SHADE RED PIGMENTS

	Hostaperm Red D3G 70 P.R. 254	A clean medium red shade pigment with good hiding power, high color strength, good flow properties and very good weather fastness in full shade and white reduction. This DPP pigment is the economical version of Hostaperm Red D2G 70 for high quality industrial coating systems.
	Hostaperm Red D2G 71/72 P.R. 254	This DPP pigment is slightly bluer and more durable when compared to Hostaperm Red D3G 70. It is particularly suitable for use in automotive OEM and re-finish paint systems.
	Novoperm Red F2RK 70 P.R. 170	Medium, highly opaque, very brilliant red pigment. The weathering fastness is good in the near-full-shade range, but decreases somewhat in white reductions. Novoperm Red F2RK 70 is not completely fast to overcoating at very high stoving temperatures (above 130 °C). Highly suitable for brilliant saturated red shades.
	Novoperm Red F3RK 70 P.R. 170	Novoperm Red F3RK 70 is coloristically very similar to and therefore an economic alternative to Novoperm Red F2RK 70 though its weathering fastness is somewhat lower. Novoperm Red F3RK 70 is likewise not completely fast to overcoating at high stoving temperatures. Its uses is similar to that of Novoperm Red F2RK 70.
	Hostaperm Red E2B 70 P.V. 19	Distinctly more bluish, less saturated and more transparent than the four preceding pigments. Hostaperm Red E2B 70 is a quinacridone red pigment and therefore has very good weathering fastness in all concentrations. Used mainly in high-quality paint systems as the base pigment for bluish red shades for lead-free automotive or industrial paints.




## MAGENTA AND RED VIOLET PIGMENTS

	Hostaperm Pink E P.R. 122	Brilliant, fairly transparent Quinacridone magenta with excellent weather fastness in both deep and pastel shades. Durable bluish red shades can be produced using this pigment in combination with opaque orange and red pigments. It is also suitable for adjusting blue shades.
	Hostaperm Red Violet ER 02 P.V. 19	A Quinacridone red violet pigment with very good weather fastness. It finds application as a combination pigment in deep maroon and bordeaux shades. Hostaperm Red Violet ER 02 is often a more economic alternative to Hostaperm Pink E for the formulation of bluish red shades.


## VIOLET PIGMENTS

	Hostaperm Violet RL spec. 01 P.V. 23	Hostaperm Violet RL spec. is primarily used to adjust blue shades because of its excellent weather fastness. This carbazole violet represents the standard pigment for all violet shades.
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## BLUE PIGMENTS



	Hostaperm Blue A4R P.B. 15:1	Reddish alpha-phthalocyanine blue pigment stable to aromatic solvents with the outstanding fastness properties of this group of pigments.
	Hostaperm Blue BT-627-D P.B. 15:2	Reddish alpha-phthalocyanine blue pigment stable to aromatic solvents and stabilized against flocculation with the outstanding fastness properties of this group of pigments. This pigment can be used in solid and metallic colors in a very wide range of concentrations.
	Hostaperm Blue B2G 03 P.B. 15:3	Greenish beta-phthalocyanine blue pigment stable to aromatic solvents with the outstanding fastness properties of this group of pigments.
	Hostaperm Blue BT-617-D P.B. 15:4	Greenish beta-phthalocyanine blue pigment stabilized against flocculation with the outstanding fastness properties of this group of pigments. This pigment can be used in solid and metallic colors in a very wide range of concentrations.

## GREEN PIGMENTS


	Hostaperm Green GNX P.G. 7	Phthalocyanine green pigment stable to aromatic solvents with the outstanding fastness properties of this group of pigments.
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# BRIEF CHARACTERISTICS OF PIGMENTS RECOMMENDED FOR ECONOMICAL QUALITY INDUSTRIAL PAINTS


## GREEN SHADE YELLOW PIGMENTS

	Hansa Yellow 10G P.Y. 3	A brilliant greenish yellow pigment with very good weather fastness when used to formulate saturated shades. Coloristically, it is a highly suitable lead-free replacement for greenish chrome yellow grades. This chemistry is not recommended for baking systems (risk of blooming) and not adequately stable to recrystallization in systems with aromatic or polar solvents.
	Hansa Yellow 10G 41 gran. P.Y. 3	Very readily dispersible variant of Hansa Yellow 10G with slightly poorer weathering fastness owing to its higher tinctorial strength. Its other fastness properties are comparable with those of Hansa Yellow 10G.



## MEDIUM SHADE YELLOW PIGMENTS

	Hansa Brilliant Yellow 2GX 70-S P.Y. 74	A highly opaque brilliant yellow pigment for air-drying paints with good fastness to light and weathering in the near full shade range. Because of its good rheological properties, it can be used even at high pigment concentrations without any effect on gloss. Coloristically highly suitable for replacing medium chrome yellow grades for lead-free pigmentations. Improved dispersion stability/recrystallization stability in systems with aromatic or polar solvents.
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## RED SHADE YELLOW PIGMENTS

	Novoperm Yellow HR 70 P.Y. 83	Reddish, highly opaque yellow pigment with good flow properties and very good weather fastness in deep shades. It is used mainly for the formulation of lead-free reddish yellow shades or orange shades.
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## ORANGE AND SCARLET PIGMENTS


	Hansa Red GG P.O. 5	A brilliant, opaque orange pigment with good light fastness in the near-full-shade range being less suitable in white reductions because of the marked decrease in durability. This chemistry is not recommended for baking systems (risk of blooming) and not adequately stable to recrystallization in systems with aromatic or polar solvents.
	Permanent Orange RL 70 P.O. 34	Reddish orange pigment with very good hiding power. As it has very good flow properties in paints, it can be used even at high pigment concentrations without affecting the gloss. Coloristically, it represent the best alternative for replacing molybdate red pigments. The weather fastness is no more than good in the nearfull-shade range. Permanent Orange RL 70 is suitable for air-drying and baking systems.

## MEDIUM AND BLUE SHADE RED PIGMENTS


	Permanent Red FGR P.R. 112	A brilliant red pigment with good light and weathering fastness in deep shades and medium reductions. It is used mainly for air-drying systems, being only suitable for baking systems at higher concentrations (risk of blooming).
	Permanent Red FGR 70 P.R. 112	Variant of Permanent Red FGR with higher opacity and better rheological properties at higher pigment concentrations and therefore of particular interest for opaque brilliant saturated red shades.
	Novoperm Red F5RK P.R. 170	Slightly bluish red pigment with good opacity and good weather fastness in the near-full-shade range. The pigment is suitable for air-drying systems and baking systems, where it is an important component pigment for the production of lead-free, deep red shades.







## MAGENTA AND RED VIOLET PIGMENTS

	Permanent Bordeaux FRR P.R. 14	Deep, bright bordeaux red mainly for air-drying paints. Because of the risk of blooming at low and medium concentrations, it should be used in stoving enamels only for full shades at higher concentrations after preliminary trials. If it is exposed to aggressive solvents, especially ketones, or in the presence of talcum, the crystal modification can change, causing a severe change in shade.
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## VIOLET PIGMENTS

	Hostaperm Violet RL spec. 01 P.V. 23	Hostaperm Violet RL spec. is primarily used to adjust blue shades because of its excellent weather fastness. This carbazole violet represents the standard pigment for all violet shades.
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## BLUE PIGMENTS

	Hostaperm Blue A4R P.B. 15:1	Reddish alpha-phthalocyanine blue pigment stable to aromatic solvents with the outstanding fastness properties of this group of pigments.
	Hostaperm Blue BT-627-D P.B. 15:2	Reddish alpha-phthalocyanine blue pigment stable to aromatic solvents and stabilized against flocculation with the outstanding fastness properties of this group of pigments. This pigment can be used in solid and metallic colors in a very wide range of concentrations.
	Hostaperm Blue B2G 03 P.B. 15:3	Greenish beta-phthalocyanine blue pigment stable to aromatic solvents with the outstanding fastness properties of this group of pigments.
	Hostaperm Blue BT-617-D P.B. 15:4	Greenish beta-phthalocyanine blue pigment stabilized against flocculation with the outstanding fastness properties of this group of pigments. This pigment can be used in solid and metallic colors in a very wide range of concentrations.

## GREEN PIGMENTS

	Hostaperm Green GNX P.G. 7	Phthalocyanine green pigment stable to aromatic solvents with the outstanding fastness properties of this group of pigments.
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# SUMMARY OF FASTNESS PROPERTIES OF PIGMENTS RECOMMENDED FOR HIGH-QUALITY INDUSTRIAL PAINTS

PIGMENT	C. I. NAME	REDUCTION RATIO	WEATHER FASTNESS 12 MONTHS CENTRAL EUROPE			HEAT STABILITY °C	OVERSPRAY FASTNESS 30-120 °C	ACID FASTNESS	ALKALI FASTNESS
			1/3 SD	FULL SHADE	DEEP SHADE				
Hostaperm Yellow H6G	P. Y. 175	1:2.0 TiO <sub>2</sub>	5	4-5	4-5	180	5	5	5
Hostaperm Oxide Yellow BV 02	P. Y. 184	1:0.6 TiO <sub>2</sub>	4-5d	4-5	4-5	200	5	5	5
Novoperm Yellow F2G	P. Y. 194	1:4.7 TiO <sub>2</sub>	4-5	4	4	200	5	5	5
Hostaperm Yellow H3G	P. Y. 154	1:2.0 TiO <sub>2</sub>	5	5	5	160	5	5	5
Hostaperm Yellow H4G	P. Y. 151	1:3.4 TiO <sub>2</sub>	5	5	4-5	200	5	5	3
Hostaperm Yellow H4G 70	P. Y. 151	1:3.5 TiO <sub>2</sub>	5	5	4-5	200	5	5	3
Novoperm Yellow 5GD 71	P. Y. 155	1:4.9 TiO <sub>2</sub>	4-5	4-5	4	180	5	5	5
Novoperm Yellow HR 70	P. Y. 83	1:3.9 TiO <sub>2</sub>	4d	4d	4	200	5	5	5
Novoperm Yellow M2R 70	P. Y. 139	1:3.6 TiO <sub>2</sub>	5d	5	5	200	5	5	5
Novoperm Orange H5G 70	P. O. 62	1:1.5 TiO <sub>2</sub>	5	4-5	4-5	180	5	5	5
Novoperm Orange HL 70	P. O. 36	1:2.2 TiO <sub>2</sub>	5	5	4-5	160	5	5	5
Novoperm Red HF3S 70	P. R. 188	1:2.5 TiO <sub>2</sub>	4-5d	4-5	4	200	5	5	5
Hostaperm Scarlet GO	P. R. 168	1:2.7 TiO <sub>2</sub>	5	5	5	180	4-5	5	5
Hostaperm Red D3G 70	P. R. 254	1:5.5 TiO <sub>2</sub>	4-5	4	4	200	5	5	5
Hostaperm Red D2G 71/72	P. R. 254	1:4.5 TiO <sub>2</sub>	5	5	4-5	200	5	5	5
Novoperm Red F2RK 70	P. R. 170	1:5.0 TiO <sub>2</sub>	4d	4	3	160	4	5	5
Novoperm Red F3RK 70	P. R. 170	1:4.5 TiO <sub>2</sub>	3-4d	3-4	2-3	160	4	5	5
Hostaperm Red E2B 70	P. V. 19	1:3.3 TiO <sub>2</sub>	4d	4d	4-5	200	5	5	5
Hostaperm Pink E	P. R. 122	1:5.0 TiO <sub>2</sub>	4d	4-5	4-5	200	5	5	5
Hostaperm Red Violet ER 02	P. V. 119	1:6.2 TiO <sub>2</sub>	4d	4d	4	200	5	5	5
Hostaperm Violet RL spec. 01	P. V. 23	1:19.1 TiO <sub>2</sub>	5	4-5	4	160	5	5	5
Hostaperm Blue A4R	P. B. 15:1	1:12.6 TiO <sub>2</sub>	5	5	5	200	5	5	5
Hostaperm Blue BT-627-D	P. B. 15:2	1:13.4 TiO <sub>2</sub>	5	5	5	200	5	5	5
Hostaperm Blue B2G 03	P. B. 15:3	1:8.7 TiO <sub>2</sub>	5	5	5	200	5	5	5
Hostaperm Blue BT-617-D	P. B. 15:4	1:9.2 TiO <sub>2</sub>	5	5	5	200	5	5	5
Hostaperm Green GNX	P. G. 7	1:5.3 TiO <sub>2</sub>	5	5	5	200	5	5	5

**Note:**  
The reduction ratio indicates how many parts TiO<sub>2</sub> are required to reduce 1 part colored pigment to 1/3 standard depth (SD) shade. These data must be regarded as guide values which may be influenced by the binder used and the dispersing conditions.

# SUMMARY OF FASTNESS PROPERTIES OF PIGMENTS RECOMMENDED FOR ECONOMICAL QUALITY INDUSTRIAL PAINTS

PIGMENT	C. I. NAME	REDUCTION RATIO	WEATHER FASTNESS 12 MONTHS CENTRAL EUROPE			HEAT STABILITY °C	OVERSPRAY FASTNESS NC	ACID FASTNESS	ALKALI FASTNESS
			1/3 SD	FULL SHADE	DEEP SHADE				
Hansa Yellow 10G	P. Y. 3	1:2.0 TiO <sub>2</sub>	4-5	4	4	-	3-4	5	5
Hansa Yellow 10G 41 gran.	P. Y. 3	1:3.2 TiO <sub>2</sub>	4	4	3-4	-	3-4	5	5
Hansa Brilliant Yellow 2GX 70-S	P. Y. 74	1:4.6 TiO <sub>2</sub>	4-5	4	3-4	-	3	5	5
Novoperm Yellow HR 70	P. Y. 83	1:3.9 TiO <sub>2</sub>	4d	4d	4	200	5	5	5
Hansa Red GG	P. O. 5	1:3.2 TiO <sub>2</sub>	3d	2-3	2	160	3	5	5
Permanent Orange RL 70	P. O. 34	1:4.2 TiO <sub>2</sub>	3-4d	2-3	2	200	5	5	5
Permanent Red FGR	P. R. 112	1:6.1 TiO <sub>2</sub>	4-5	3-4	-	180	3	5	5
Permanent Red FGR 70	P. R. 112	1:4.4 TiO <sub>2</sub>	4-5	4	-	180	3	5	5
Novoperm Red F5RK	P. R. 170	1:6.6 TiO <sub>2</sub>	3d	-	-	160	5	5	5
Permanent Bordeaux FRR	P. R. 12	1:8.6 TiO <sub>2</sub>	2-3d	2	-	180	5	5	5
Hostaperm Violet RL spec. 01	P. V. 23	1:19.1 TiO <sub>2</sub>	5	4-5	4	160	5	5	5
Hostaperm Blue A4R	P. B. 15:1	1:12.6 TiO <sub>2</sub>	5	5	5	200	5	5	5
Hostaperm Blue BT-627-D	P. B. 15:2	1:13.4 TiO <sub>2</sub>	5	5	5	200	5	5	5
Hostaperm Blue B2G 03	P. B. 15:3	1:8.7 TiO <sub>2</sub>	5	5	5	200	5	5	5
Hostaperm Blue BT-617-D	P. B. 15:4	1:9.2 TiO <sub>2</sub>	5	5	5	200	5	5	5
Hostaperm Green GNX	P. G. 7	1:5.3 TiO <sub>2</sub>	5	5	5	200	5	5	5

**Note:**  
The reduction ratio indicates how many parts TiO<sub>2</sub> are required to reduce 1 part colored pigment to 1/3 standard depth (SD) shade. These data must be regarded as guide values which may be influenced by the binder used and the dispersing conditions.  
NC = Tests were done in a nitrocellulose combination lacquer (NC)

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