

Fiber Specification

FIBER TYPES Technical Data

ec- Fiber Class	Fiber E9/125		Fiber G50/1253				Fiber G62,5/125		
	OS1 ¹⁾		OM2 ¹⁾	OM2+	OM3 ¹⁾	OM3+	OM1 ¹⁾	OM2 ¹⁾	
	G.652C/D	G.655	Standard	HiBand	MaxBand	MaxBand	Standard	P	
	B	D	F	G	I	J	O	P	
Optical data									
Attenuation [db/Km]	850 nm			<=2,5	<=2,5	<=2,5	<=2,5	<=3,1	<=3,1
	1300 nm			<=0,7	<=0,7	<=0,7	<=0,7	<=0,9	<=0,9
	1310 nm	<=0.34	<=0.40						
	1385 nm	<=0.31	<=0.40						
	1550 nm	<=0.21	<=0.22						
	1625 nm	<=0.24	<=0.25						
Numerical Aperture				0,200+-0,015			0,275+-0,015		
Overfilled Modal Bandwith [MHz x km]	850 nm			>500	>600	>1500	>3500	>200	>500
	1300 nm			>500	>1200	>500	>500	>500	>500
Effective Modal Bandwith laser launch [MHz x km]				not specified	not specified	>2000	>4700	not specified	not specified
	850 nm								
Gigabit Ethernet 1000 Base	-SX 850 nm			550 m	750 m	1000 m	1100 m	275 m	550 m
	-LX 1300 nm			550 m	2000 m	550 m	550 m	550 m	550 m
10 Gigabit Ethernet 10G Base	-SX 850 nm						550 m		
	-LX4 1310 nm WDM						550 m		
Chromatic dispersion [ps/nm x km]	1385 - 1330 nm	<=3,0	-						
	1550 nm	<=18,0	-						
	1530 - 1665 nm	-	2,6-6,0						
	1565 - 1625 nm	-	4,0-8,9						
Mode field diameter [µm]	1310 nm	9,2+-0,4	-						
	1550 nm	10,4+-0,5	8,4+-0,6						
Fiber Cutoff wavelength [nm]				<=1260	<=1260				
PMD Poraization mode dispersion [ps/ km ²]		<=0,1	<=0,1						
Zero dispersion wavelength [nm]		1302-1322	<1450						
Zero dispersion slope [ps/nm ² x km]		<=0,090	<=0,045						
Group Index of Refraction Typical	850 nm	-	-			1,482		1,496	
	1300 nm	-	-			1,477		1,491	
	1310 nm	1,466	1,471						
	1550 nm	1,467	1,470						
	1625 nm	-	1,470						
Geometrical data									
Core diameter ϕ [µm]				50+-2,5			62,5+-2,5		
Cladding diameter ϕ [µm]	125+-1	125+-0,7		125 +-2			125 +-1		
Primary coating diameter ϕ (uncooled) [µm]	245+-10	245+-5		242+-7			242+-7		
Non -circularity cladding [%]	<=1,0	<=1,0		<=2,0			<=2,0		
Non -circularity core [%]	<=6,0	<=6,0		<=6,0			<=6,0		
Concentricity error core/cladding [µm]	<=0,6	<=0,5		<=3,0			<=3,0		
Concentricity error cladding/coating [µm]	<=12,5	<=12,0							
Mechanical data									
Tensile proof test (Fiber elongation <=1%)	>=8,8 N (100Kpsi)			8,8N (100Kpsi)			8,8N (100Kpsi)		
Approvals									
Standards	- ITU G.652-D - IEC60793-2-50 type B1.3 - DIN VDE 0888 Part 3	- ITU G.655 - IE60793-2-50 type B4		- ITU G.651 - IEC 60793-2-10 type A.1a + A1a.2 DIN VDE 0888 part 3			- ITU G.651 - IEC 60793-2-10 Type A.1b		

¹⁾ Standard, Other fibres upon request

Fiber Specification

Applications

With the required channel length and the specific application, the minimal fiber type can be taken from the table below. The order from the minimal required fiber type is OM1, OM2, OM3 and OS1, OS1 is a conventional mode fiber.

Application IEE 802.3		Maximal channel length		
		300 m	500 m	2000 m
10MbE	10BASE-	OM1	OM1	OM1
100MbE	100BASE-	OM1	OM1	OM1 ¹⁾ /OM2
1GbE	1000BASE-	OM1 ²⁾ OM2	OM1 ¹⁾²⁾ /OM2 ²⁾	OM2+/OS1
10GbE	10GBASE-	OM3 ³⁾	OS1/OM3+	OS1

¹⁾ OMI only with large wavelength (1300 nm) ²⁾ Mode offset launch patchcord recommended ³⁾ Only with small wavelength (850 nm)

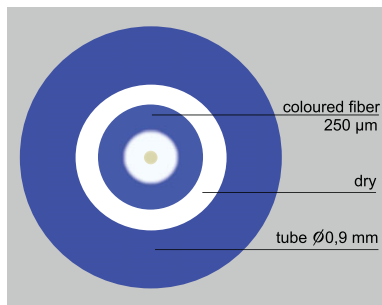
Channel length

The optical fiber channel definition according to standard ISO/IEC 11801 - 2nd edition

Channel	OF-300	OF-500	OF-2000
Maximum Channel length	300 m	500 m	2000 m
Application	collapsed backbone	building backbone	horizontal cabling + building + campus backbone

Terms und Definitions

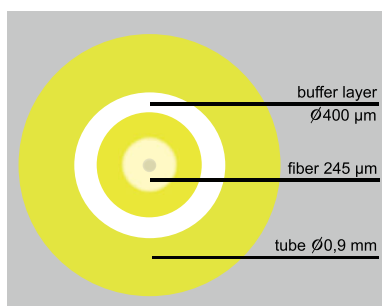
Semi tight buffered fiber core



For splicing as pigtail

- As connection cables in equipment and distribution cabinets
- high flexibility
- non buckling, good kink resistance
- stripping approx. 100 cm in one step
- wide temperature range
- available in 12 different colors accord. IEC60794-2/DIN VDE0888 part 3
- same color for 250µm and 900µm coating

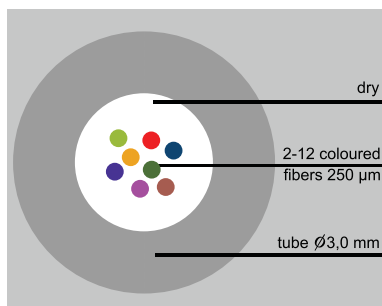
Tight buffered fiber core



- In equipment and distributor cabinets as two sides ready assembled splicing assembled cable

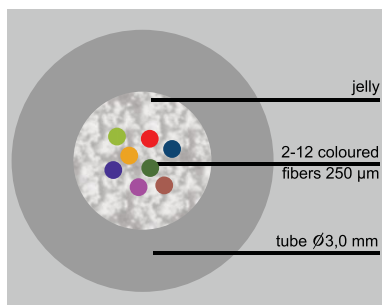
- resistant against temperature fluctuations
- wide temperature range
- available in 12 different colors accord. IEC60794-2/DIN VDE0888 part 3
- stripping approx. 5 cm
- non buckling, high resistance against external mechanical loads
- no gel filling

Multi fiber loose tube dry



- for jellyfree cable
- various tube diameters
- 2-12/24 colored fibers 250µm

Multi fiber loose tube jelly -filled



- various tube diameters
- 2-12/24 colored fibers 250µm

Cable jacket material

SUMMARY TABLE OF THE PROPERTIES of MATERIALS EMPLOYED in CABLE SHEATS

Designation	LD - PE Polyethylen	LSZH compound with 0 Halogen	PVC Poliviniilchlorid	PUR Polyurethane	PA Polyamide	NBR Natural rubber with PVC	ETFE Ethylene Vinylacetat
DIN/VDE	2Y	H	Y	11Y	4Y	8G	7Y

MECHANICAL PROPERTIES

Abrasion resistance	Medium	Low	High	Very High	Very High	Very High	Excellent
Flexibility	Medium	Medium	High	Very High	Low	Excellent	High
Tensile strengths	Medium	Medium	High	Very High	Excellent	Medium	Excellent
Crushing strengths	Medium	Medium	High	Very High	Very High	Very High	Excellent
Compression/ impact Strengths	Medium	Medium	High	Very High	Very High	High	Excellent

CHEMICAL AND ENVIROMENTAL PROPERTIES

Stability against Oil and hydrocarbon	Medium	Medium	Good	Excellent	Very Good	Excellent	Excellent
Stability against acid	Good	Good	Good	Medium	Low	Very Good	Excellent
Stability in presence of alkalis	Good	Good	Good	Low	Very Good	Very Good	Excellent
Resistance against ozone	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
UV-light resistance¹⁾	Good	Good	Good	Good	Low	Excellent	Excellent
Resistance against water	Excellent	Average	Average	Acceptable	Acceptable	Good	Excellent

THERMAL PROPERTIES

Halogen free	Yes	Yes	No	Yes	Yes		
Flame retardant	No	Yes	Yes	No	No		
Smoke emission	Medium	Low	Strong	Strong	Strong		
Expansion & shrinkage	Medium	Medium	High	Very High	Excellent	Medium	Excellent
Ageing due to heat and cold tempe- rature changes	Medium	Medium	High	Very High	Very High	Very High	Excellent
Fragility at low temperatures	Medium	Medium	High	Very High	Very High	High	Excellent

¹⁾ The UV resistance depends mainly on the plastic color, black color offers the best resistance.

All above information are based on plastic material used for cable jackets. Properties and resistance for cables cannot be derived from it.

FO Cables - Fiber Specification

Color codes

Color codes for fiber according to the different standards

Number	DIN ¹⁾	ISO	IEC ²⁾
1	red	blue	blue
2	green	orange	yellow
3	blue	green	red
4	yellow	red	white
5	white	grey	green
6	grey	yellow	violet
7	brown	brown	orange
8	violet	violet	grey
9	turquoise	white	turquoise
10	black	black	black
11	orange	pink	brown
12	pink	turquoise	pink

¹⁾ DIN VDE 0888 part 3

²⁾ IEC60794-2

ec Semi tight buffer 0,9 mm color standard¹⁾

E9/125 all types	yellow
G50/125 OM2, OM2+	green
G62,5/125 OM1, OM2	blue
G50/125OM3, OM3+	turquoise

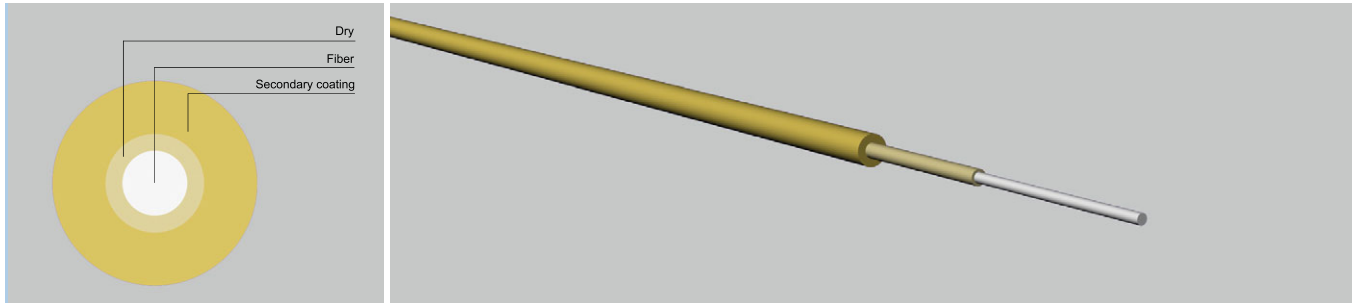
¹⁾ unless otherwise specified

ec Single fiber cable standard¹⁾

E9/125 all types	yellow
G50/125 OM2, OM2+	orange
G62,5/125 OM1, OM2	grey
G50/125OM3, OM3+	turquoise



Semi tight buffer I-VY 1...

**Standardizations:**

DIN VDE 0888, Part 4 and
IEC 60 794-1-2

Construction

- Semi tight buffered fiber
- Buffer material either PVC (standard) or on request LSZH (I-VH 1 ...)

Properties/Applications

- Can be terminated directly with connectors (Fiber Pigtails)
- Jelly free, dry core
- Can be stripped up to 1m in one step
- Tight bending radius
- Same color for 250µm primary and 900µm secondary coating
- Available as 12 color sets according to IEC60794-2 or DIN VDE 0888 part 3
- High Flexibility
- Pigtail Assemblies within distribution and termination boxes

Specification:

Buffer ϕ [mm]		0,9	
Approx. weight [kg/km]		0,70	
Min. bending radius [mm]		30	IEC 60794-1-2 E11
Max pull force long term [N]	long term	5	IEC 60794-1-2 E1
Max crush resistance [N/cm]	long term	100	IEC 60794-1-2 E3
Temperature range [°C]	storage	-25 to +50	
	installation	-5 to +40	IEC 61300-2-22
	Operation	-10 to +60	

Ordering Information:

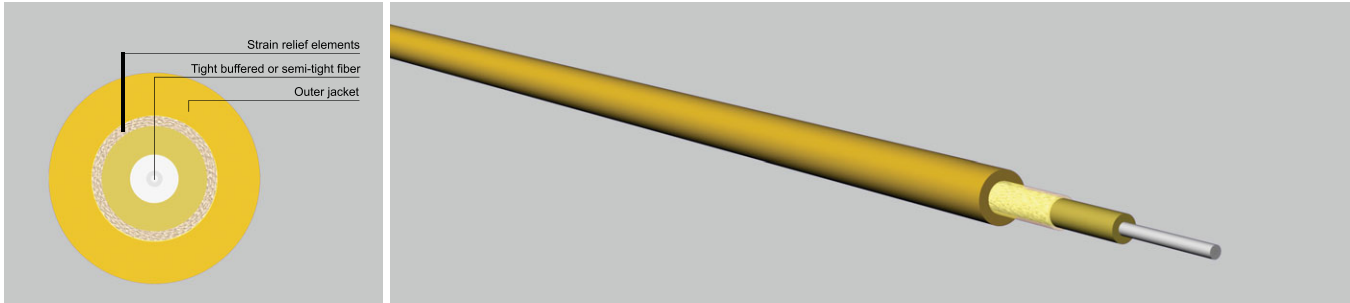
Jacket ϕ [mm]	Fiber Type	Color (Standard) ¹⁾	Type	Article Nr.:
0,9	E9/125 class B	yellow		EC04.200 . ²⁾ A1.22 . ³⁾
	E9/125 class D	yellow		EC04.200 . ²⁾ A1.22 . ³⁾
	G50/125 OM2 class F	green		EC04.200 . ²⁾ A1.22 . ³⁾
	G50/125 OM2+ class G	green		EC04.200 . ²⁾ A1.22 . ³⁾
	G50/125 OM3 class I	turquoise/aqua		EC04.200 . ²⁾ A1.22 . ³⁾
	G50/125 OM3+ class J	turquoise/aqua		EC04.200 . ²⁾ A1.22 . ³⁾
	G62,5/125 class O	blue		EC04.200 . ²⁾ A1.22 . ³⁾
	G62,5/125 class P	blue		EC04.200 . ²⁾ A1.22 . ³⁾

¹⁾ Any other color according to the color code on special request

²⁾ Insert "1" for PVC and "2" for LSZH buffer coating material

³⁾ Insert "0" for single colored (standard color) buffer and "1" for a set with 12 single buffers with different colours according colour standards

Simplex cable I-V(ZN)H 1...



Standardizations:

DIN VDE 0888, Part 4 and IEC 60 794-1-2

Construction

- Tight buffered fiber
- Aramid strenght members
- Halogenfree and flame retardant material

Properties/Applications

- Can be terminated directly
- Flexible and resilient
- Tight bending radius
- Excellent mechanical resistance

Specification:

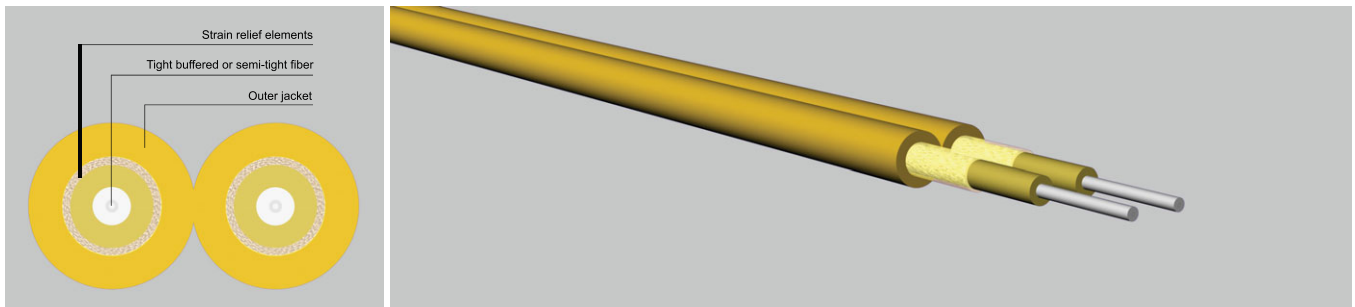
Simplex				
Jacket ϕ [mm]		1,8	2,1	2,8
Fiber core ϕ [mm]		0,9	0,9	0,9
Approx. weight [kg/km]		4,0	5,7	10,0
Max. allowable tensile load [N]	long term	200	300	400
Min. bending radius [mm]		50	50	50
Max pull force long term [N]	long term	100	150	300
Temperature range [°C]	storage	-25 to +50	-25 to +50	-25 to +50
	installation	-5 to +50	-5 to +50	-5 to +50
	Operation	-20 to +70	-20 to +70	-20 to +70
Fire load [MJ/m]		0,07	0,10	0,18
Fire propagation		IEC60332-1 and IEC 60332-3 Cat.A		
Smoke density		IEC 61034		
Halogen-free		IEC 60754-2		

Ordering Information:

Jacket ϕ [mm]	Fiber Type	Color (Standard) ¹⁾	Type	Article Nr.:
1,8	E9/125	yellow		EC04.3012A1.240
	G50/125 OM2	orange		EC04.3012A1.640
	G50/125 OM3	turquoise/aqua		EC04.3012A1.840
2,1	G62,5/125	grey		EC04.3012A1.A40
	E9/125	yellow		EC04.3012A1.250
	G50/125 OM2	orange		EC04.3012A1.650
	G50/125 OM3	turquoise/aqua		EC04.3012A1.850
2,8	G62,5/125	grey		EC04.3012A1.A50
	E9/125	yellow		EC04.3012A1.290
	G50/125 OM2	orange		EC04.3012A1.690
	G50/125 OM3	turquoise/aqua		EC04.3012A1.890
	G62,5/125	grey		EC04.3012A1.A90

¹⁾ Any other color according to the color code on special request

Duplex cable I-V(ZN)H 2x1 ... "Figure 8", Zipcord; Mini -Zipcord



Standardizations:

DIN VDE 0888, Part 4 and
IEC 60 794-2

Construction

- Tight buffered fiber
- Aramid strength members
- Halogenfree and flame- retardant material

Properties

- Can be terminated directly
- Flexible and resilient
- Tight bending radius (flat side)
- Excellent mechanical resistance
- Figure "8" easy to divide

Specification:

Simplex		Mini-Zipcord	Mini-Zipcord	Zipcord
Jacket ϕ [mm]		1,8x3,7	2,1x4,3	2,8x5,7
Cable core ϕ [mm]		0,6 ¹⁾	0,9	0,9
Approx. weight [kg/km]		7,4	10,2	15,8
Max. allowable tensile load [N]	long term	200	200	500
Min. bending radius [mm]		30	30	40
Max pull force long term [N]	long term	50	100	100
Temperature range [°C]	storage	-25 to +50	-25 to +50	-25 to +50
	installation	-5 to +50	-5 to +50	-5 to +50
	operation	-20 to +50	-20 to +50	-20 to +50
Fire load [MJ/m]		0,12	0,20	0,30
Fire propagation		IEC60332-1 and IEC 60332-3 Cat.A		
Smoke density		IEC 61034		
Halogen-free		IEC 60754-2		

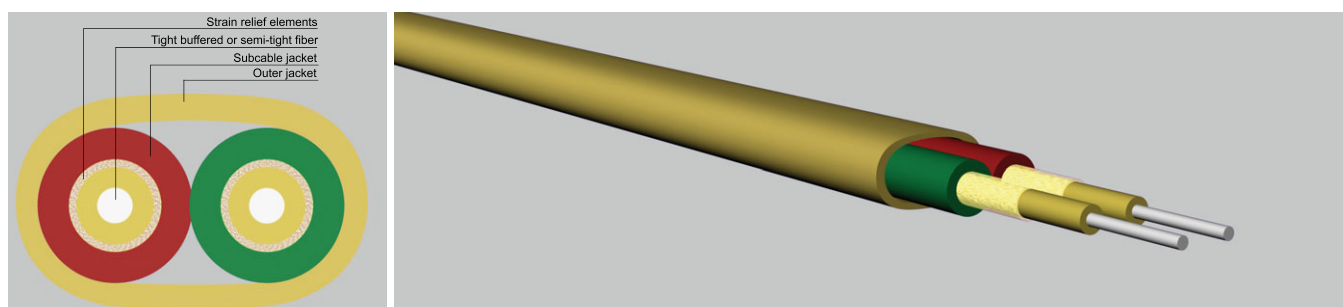
Ordering Information:

Jacket ϕ [mm]	Fiber Type	Color (Standard) ²⁾	Type	Article Nr.:
1,8 x 3,7	E9/125	yellow		EC04.3012A2.240
	G50/125 OM2	orange		EC04.3012A2.640
	G50/125 OM3	turquoise/aqua		EC04.3012A2.840
2,1 x 4,3	G62,5/125	grey		EC04.3012A2.A40
	E9/125	yellow		EC04.3012A2.260
	G50/125 OM2	orange		EC04.3012A2.660
2,8 x 5,7	G50/125 OM3	turquoise/aqua		EC04.3012A2.860
	G62,5/125	grey		EC04.3012A2.A60
	E9/125	yellow		EC04.3012A2.290
	G50/125 OM2	orange		EC04.3012A2.690
	G50/125 OM3	turquoise/aqua		EC04.3012A2.890
	G62,5/125	grey		EC04.3012A2.A90

¹⁾ For MT-RJ connector termination

²⁾ Any other color according to the color code on special request

Duplex cable I-V(ZN)HH 2x1 ... "Figure 0", Flat



Standardizations:

DIN VDE 0888, Part 4 and
IEC 60 794-2

Construction

- Two single fiber cables (tight buffered fiber) lying parallel to one another with strain relief elements (aramid) and halogen-free, flame-retardant jacket

Properties

- Can be terminated directly
- Flexible and resilient
- Tight bending radius (flat side)
- Excellent mechanical resistance

Specification:

Duplex "Figure 0"		Sub cable 1,8mm	Sub cable 2,1mm	Sub cable 2,8mm
Jacket ϕ [mm]		2,9x4,7	3,1x5,2	4,0x6,8
Cable core ϕ [mm]		0,6 ¹⁾	0,9	0,9
Approx. weight [kg/km]		17,5	19,0	32,0
Max. allowable tensile load [N]	long -term	400	500	500
Min. bending radius [mm]	static	40	40	40
Max pull force long term [N]	long term	100	100	200
Temperature range [°C]	storage	-25 to +50	-25 to +50	-25 to +50
	installation	-5 to +50	-5 to +50	-5 to +50
	operation	-20 to +50	-20 to +50	-20 to +50
Fire load [MJ/m]		0,12	0,20	0,30
Fire propagation		IEC60332-1 and IEC 60332-3 Cat.A		
Smoke density		IEC 61034		
Halogen-free		IEC 60754-2		

Ordering Information:

Jacket ϕ [mm]	Fiber Type	Color jacket (Std) ¹⁾	Color sub cable (Std) ¹⁾	Type	Article Nr.:
2,9 x 4,7	E9/125	yellow	red / green		EC04.3013A2.240
	G50/125 OM2	orange	red / green		EC04.3013A2.640
	G50/125 OM3	turquoise/aqua	red / green		EC04.3013A2.840
3,1 x 5,2	G62,5/125	grey	red / green		EC04.3013A2.A40
	E9/125	yellow	red / green		EC04.3013A2.260
	G50/125 OM2	orange	red / green		EC04.3013A2.660
4,0 x 6,8	G50/125 OM3	turquoise/aqua	red / green		EC04.3013A2.860
	G62,5/125	grey	red / green		EC04.3013A2.A60
	E9/125	yellow	red / green		EC04.3013A2.290
4,0 x 6,8	G50/125 OM2	orange	red / green		EC04.3013A2.690
	G50/125 OM3	turquoise/aqua	red / green		EC04.3013A2.890
	G62,5/125	grey	red / green		EC04.3013A2.A90

¹⁾ For MT-RJ connector termination

²⁾ Any other color according to the color code on special request