FLUO DX preliminary User Manual

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The FLUO DX invisible ink colorimeter

The FLUO DX Invisible ink colorimeter is the ideal Device to control the use of invisible and phosphorescent inks in the press room. The FLUO DX is equipped with two UV LEDs, at 365nm and 256nm and measures the Fluorescent Intensity, the Colorimetric parameters XYZ, xy, Lab, LCh and the Phosphorescent characteristics of an ink.

Important: This manual describes the current version of the FLUO DX hardware and software. Future enhancements or modifications are reserved.



Safety Instructions

For safety reasons, it is absolutely necessary to read the entire user's guide and all of the instructions it contains. If the safety recommendations and instructions in this User Guide are not complied with, measurement errors or data loss or physical injury or property damage may result.

The FLUO DX is not intrinsically safe. Therefore, the device cannot be used in an environment with explosive vapors where there is a risk of spark ignition or in an area with strong electromagnetic fields. It should be protected against chemicals, corrosive vapors, strong mechanical vibrations and impacts

The FLUO DX is equipped with UV LEDs. Never Ever look directly into the Aperture of the device while on UV LED is turned on! UV Light might hurt your eyes!

Use the FLUO DX in ambient temperatures between 20°C(68°F) and 25°C (77°F), and do not expose the device to direct sun light.

The FLUO DX should never be opened as there are no user-serviceable parts inside. Doing so voids the guarantee. Contact your authorized dealer if repairs are necessary.

To avoid incorrect handling, the FLUO DX should only be used by trained personnel.

Use original PERET spare parts and accessories only.

Use the original packaging exclusively when transporting.

DECLARATION OF CONFORMITY

The undersigned representing the following manufacturer: PERET GmbH/S.r.L, Forch Str. 6, 39042 Vahrn, ITALY herewith declares that the product FLUO DX is in conformity with the provisions of the following CE directives including all applicable amendments:

77/23/EEC Electrical equipment for use within specified voltage limits.

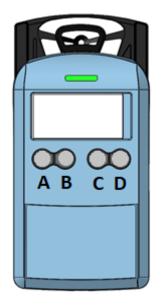
89/336/EEC Electromagnetic compatibility and the standards and technical specifications referenced overleaf have been applied.

Vahrn, December 2017



Konrad Silbernagl, COO of PERET GmbH/Srl

This Manual



The manual describes the functions of the Device using a A,B,C,D labelling of the keys. A is the left most key, D the right most key.

HARDWARE RESET of the DEVICE

On the bottom of the device you can find the RESET key. Press this key to perform a Hardware RESET.



After a Hardware Reset the FLUO DX will show the key information about the device such as Serial Number, Firmware version, Device ID.



Key B: Transfer measurement data via IR-Interface to the Host PC.

Key C: Perform a Function test of the device.



Key D: Next screen

Device Status information

Whenever appropriate the device status information will be displayed on the right top corner:

↔USB is connected.

Data memory used, empty to full.

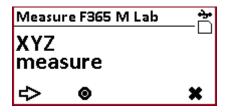
Battery empty, change Batteries.

Battery nearly empty. Change battery at the end of the measurement sequence.

Battery still ok.

Positioning LED

Whenever the device is in measurement mode you can use the positioning LED in front of the device to find the measurement position on the invisible ink. Press and hold Key B. The positioning LED will go off upon release of Key B or after 20 seconds.



Never ever look directly into the UV positioning LED as this might hurt your eyes. The device display shows a proper warning.



In order to turn the positioning LED on, the following conditions have to be met;

- Device is in the flat position.
- Device is not in the measurement position but in parking position.
- After 20 seconds on, the UV positioning LED turns off. In order to switch it on again release and press Key B. Release Key B to switch the positioning LED off.

Start Display

After the reset display or when returning from any other mode, the Start display is shown.



Key A: Measure the intensity of the Fluorescence or Phosphorescence signal.

Key B: Laboratory functions (Colorimetric measurements, Phosphorescence curve)

Key C: Special Functions (Delta E measurement)

Key D: Measure references for Intensity Measurements.

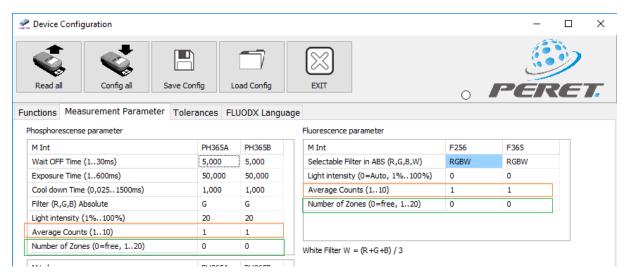
M Int Intensity measurement Mode

The MInt Intensity measurement Modes are used in the press room to collect production quality data in a simply, well defined manner.

The intensity measurements are organized by zones (Patches, Fields, Features). Up to 20 Zones can be collected and saved referenced by a Mark. The Mark is set automatically and can be used to identify the sheet, where the readings have been taken. Take a note of the Mark on the sheet.

Inside any single Zone there can be taken up to 5 individual readings. Those readings are averaged automatically and the average numbers are saved permanently as the Zone value.

The FLUODX can be configured properly using the FLUODXConnect Software Device configuration function



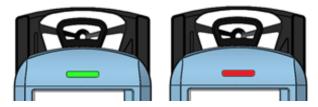
The number of Zones (green frame) can be fixed (configuration 1..20) or variable (configuration = 0). The Number of individual readings inside a zone can be 1 to 5 (red frame).

Measure References

New reference			
M Int	M Int	M Int	
F256	F365	P365A	

References for Fluorescence with 256nm or 365nm and two Phosphorescence reference sets with different timing settings can be measured.

In relative measurement modes, the current measurement is compared to the reference in real time. If the difference is within tolerances, the status LED of the FLUODX will be flashing green. It will be flashing red if the difference is out of tolerance.



Tolerances can be configured using the FLUODXConnect Software

🥐 Device	2 Device Configuration							
Read	► all	Config all	Save Config	Load Config	EXIT			
Functions	Mea	surement Parame	eter Tolerance	s FLUODX La	nguage			
Functio	'n		- Value [%]	+ Value [%]				
M Int F	256 (5.	. 50)	15	5				
M Int F	365 (5.	. 50)	15	5				
M Int P	M Int P365A (550)		15	5				
M Int P	365B (5	550)	15	5				

Fluorescence Intensity Reference (F256 or F365)

New reference F365			_ *
Refer	ence		
[R1]	[R2]	R3	R4



Up to 4 references can be stored in the device. If a reference is available, the proper number is displayed with brackets []. Select the reference number you would like to measure.

New re	ferenc	:e F365	<u>*</u>
meas	sure		
R1= R	(R,G,B,	W,A)	
Filter	۲	Ō	×

Key A: Select the Filter. You can choose one of the physical filters R, G or B. You can also select the black Filter W which is defined as W=(R+G+B)/3. Finally the A (Automatic filter selection) will automatically select the filter with the highest Signal response on the very first reference measurement.

Key B: Switch the positioning LED on.

Key C: Delete previously stored reference values.

Key D: Exit

Measure the reference. Up to 20 measurements can be taken. The average will be calculated at the end.

New reference F365 🛛 🛉			
measure	100%(n:	5)	
R3= B			
۲	. €	×	

Press Key C to save the Reference.

Phosphorescence Reference

New reference	P365A] †
measure		
R1= R (R,G,B) Filter 💿	亩	×

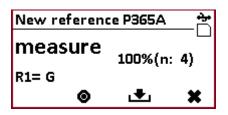
Key A: Select the Filter.

Key B: Switch the positioning LED on.

Key C: Delete the current values.

Key D: Exit

Measure the reference. Up to 10 measurements can be taken. The average will be calculated at the end.



Press Key C to save the reference.

Measure relative Intensity

Press Key A on the start screen.

Measu	ire		— D
M Int	M Int	M Int	
F256	F365	P365A	

Measure Fluorescent Intensity

Press Key A or Key B to measure Fluorescent intensity against a reference.

Mea:	ure F365 M li	ז ר א
Refe	rence	
R1	R2	

Select one of the references available by pressing the key below the reference number.

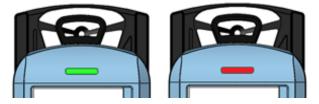
Measu	ire F365 M Int	` *
Refere	ence R1 Filter G	
mea	sure	
-1	۲	×

Measure up to 20 samples.

Measu	re F36	5 M Int	ب	Measu	re F36!	5 M Int	*
Refere	nce R	1 Filter G		Refere	nce R	1 Filter G	
Value		101.9%		Value		102.2%	
			n: 1				n:10
-1	۲	Mark	×	-1	۲	Mark	×

The pigmentation in relation to the reference is displayed. The screen on the left shows that 102.2% of the pigmentation has been achieved.

If the Value is in tolerance, the green status LED will be flashing for a short period of time. If it is out of tolerance, the red status LED will be flashing for a short period of time.



Key A: Delete the most recent reading.

Key B: Positioning LED on

Key C: Terminate the measurement process and save data permanently using an Identification mark.

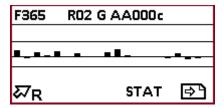
Key D: Exit

Hidden function: Press and hold Key A, click Key D, release Key A : go back to the <select Reference screen> without saving measurement data.

Once 20 measurements have been taken on the next measure attempt the device will display n=max. No more readings can be taken on the current sheet. Set a mark.

Measu	re F365	5 M Int	े र
Refere	nce R2	2 Filter G	
		n =	max
-1	۲	Mark	×

If you save the measurement data, the statistics will be displayed.



The current mark is displayed on the top line. Use this to Identify the sheet on which the measurements have been taken. Take a not of the Mark on the sheet.

Key A: Select next reference

Key C: Statistics

Key D: Start to measure next sheet

F365 RC	12 G AA000c 🛛 😁
Average	= 100.4%
Max	= 106.6% < 115%
Min	= 96.2% > 90%
ୟ R	l ⇒ 1

The Tolerance is configured using the Software FLUODXConnect.

Key A: Select next reference

Key D: Start to measure next sheet



The FLUODX can be configured using the FLUODXConnect Software to ask for a set of readings within every single zone.

In this case the operator has to take that number of readings before measuring the next zone.

Measu	ት	
Refere	ence R1 Filter G	
Value	101.4%	1/3
		n: 0
-1	۲	×

The operator in above example taken one reading out of three readings is has to take in the first zone.

Measu	<u>ት</u>		
Refere	nce R	1 Filter G	—U
Value		101.5%	3/3
			n: 1
-1	۲	Mark	×

Now the operator has taken three readings in the first zone and could create a Mark or proceed with the next zone. The average of the performed readings will be automatically saved as measurement value for that zone.

In order to proceed on the same sheet measuring the next zone, the operator simply continues to measure without pressing any key.

Measure F365 M Int 🛛 😁					
Reference R1 Filter G					
Value		101.6%	3/3		
			n: 2		
-1	۲	Mark	×		

The second zone has been measured. The operator now can continue measuring the third zone.

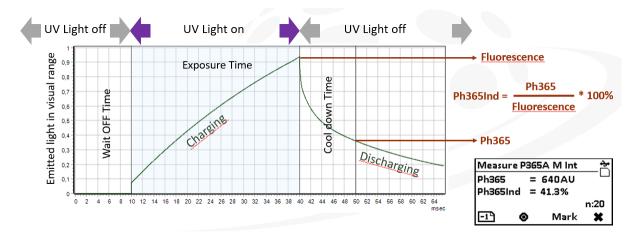
Measure Phosphorescence Intensity

The Phosphorescence is measured based on three time frames:

- 1. Wait OFF Time: Before switching on the UV light, the FLUO DX measures the base Fluorescence Intensity of the sample. If the sample is not phosphorescent, the Intensity will basically be the dark current. If the sample is phosphorescent and it has been exposed to UV light before the measurement process starts, there can be a residual Fluorescent Intensity that at needs to be taken into consideration.
- 2. Exposure Time: During the exposure time the sample is illuminated by a 365nm UV light of a pre-defined power. The sample is charging. At the end of the Exposure Time the Fluorescence is measured.



3. Cool Down Time: The UV light is switched off and the FLUO DX waits the Cool Down Time before measuring the Phosphorescence. If the measured signal is zero, no phosphorescence can be measured.



The time frames are configured using the FLUODXConnect Software.

Ś.	Ś				\boxtimes			2
Read all	Config all	Save Con	fig L	oad Config	EXIT	0	PER	57
ctions Mea	asurement Parame	eter Toler	ances El	UODX Langu	309	0		
		TUER		UUUN Langu				
osphorescens	se parameter				Fluorescence parameter			_
4 Int			PH365A	PH365B	M Int	F256	F365	
Vait OFF Time	e (130ms)		5,000	5,000	Selectable Filter in ABS (R,G,B,W)	RGBW	RGBW	
Exposure Time	e (1600ms)		50,000	50,000	Light intensity (0=Auto, 1%100%)	0	0	
Cool down Tim	ne (0,0251500ms)		1,000	1,000	Average Counts (110)	1	1	
ilter (R,G,B)	Absolute		G	G	Number of Zones (0=free, 120)	0	0	
ight intensity	(1%100%)		20	20				
	nts (110)		1	1				
Verage Coun								_

Measure P365A M Int						
Refe	rence					
R1	R2	R3	R4			

Select a reference by pressing the key below the reference number.

Measure P365A M Int				
Reference	2 R1 Filter G	— U		
measu	re			
-1 (9	×		

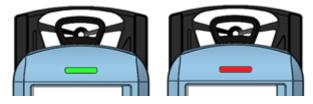


Measure a sample. There can be measured up to 20 zones on one single sheet. Once 20 readings have been taken, n=max will be displayed. No more readings can be taken without setting a Mark.

Measur	e P36!	5A M Int	}+	Measu	re P365	A M Int] ት
Ph365	=	97.0%					
Ph365In	d =	55.9%					
			n:19			n =	max
-1	۲	Mark	×	-1	۲	Mark	×

The PH365 Value is the Phosphorescence measured after the Cool Down Time in relation to the reference. The Ph365Ind is the ratio between Phosphorescence and Fluorescence.

If the PH365 Value is in tolerance, the green status LED will be flashing for a short period of time. If it is out of tolerance, the red status LED will be flashing for a short period of time.



The FLUODXConfig Software can be used to configure a number of readings, that should be taken inside one zone to obtain an average value.

On the right hand it is displayed, that the first measurement out of 5 measurements to take has been taken (1/5). Continue to measure in the same area until 5 measurements have been taken.

Measure P365A M Int	<u>م</u> ب	Measure P365A M Int	<u>م</u>
Ph365 = 98.4%		Ph365 = 102.4%	
Ph365Ind = 25.7%	1/5	Ph365Ind = 26.6%	3/5
	n: 1		n: 1
-1° 💿	×	-1 💿	×

The current measurement values are displayed. Once all 5 measurements have been taken, the average measurement of PH365 is displayed in the bottom line.

Measure P	ት		
Ph365	=	96.4%	— U
Ph365Ind	=	25.4%	5/5
Average	=	98.2%	n: 2
-14		Mark	×

The average will be stored permanently in the device for future upload purpose. It is also displayed in the bar diagram.

If the average counter is set to 1, no average will be displayed and the current reading is saved.



Key A: Delete the most recent reading. If the reading is one to calculate the average, the average measurement is restarted from its beginning. If no averaging measurement has yet been taken (0/5), the most recent sample measurement is deleted (n:1)

Key B: Positioning LED on

Key C: Terminate the measurement process and save data permanently using an Identification mark.

Key D: Exit to main menu

P365A	R01 G AA000d	
_		
ଅ _R	STAT	₽

Key A: Select next reference

Key C: Display the statistics.

Key D: Next sheet

P365A R0	1 G AA000d 🛛 😤
Average	= 97.6%
Max	= 98.8% < 110%
Min	= 96.0% > 90%
ଅ _R	⇒

Key A: Select next reference

Key D: Next sheet

MInt Measure absolute Intensity

Use the PRESTOConnect Software to set the FLUODX to absolute measurement mode.

🧟 Device	2 Device Configuration								
Read a		Config all	Sav	ve Config	Load	Config		EXIT	
Functions	Mea	surement Paran	neter	Tolerances	FLUO	DX Lang	uage		
FLUO D	K v02	2.03 sn0002	20 AA	D	evice]	ID (2 (Chara	acters)	AA
M Labor M Specia Phospho Modify R Function	 ✓ UV256 availabel ✓ M Labor active(M Lab F256, F365, P365A, P365B) ✓ M Special active(M Spez dE F256, dE F365, Ph/Fl, Ph/Ph) ✓ Phosphorescence measurement active ✓ Modify References ✓ Functional Test enabled 								
MIntF: sl MIntP: hi Display P Instanta Ph IC* (a	how xy ide Ph3 Ph365F niously alignem	ement M Int rather if filter W is select 365Ind value instead of Ph365 i send Measuremen ent to 3rd party de nent Data when dio	ed n MIntP3 t data w evice)	365 Mode hen clicking M			eferenc	re 🖓	

In ABS Mode there cannot be measured references.

M = N	leasure	apz	. □
M Int	M Lab	M Spez	

Click key A to select the measurement mode

Measure 😁				
M Int F256	M Int F365		M Int P365B	

MInt Measure absolute Fluorescence Intensity

Click Key A to measure absolute Fluorescence Intensity using 256nm Illumination, click key B to measure absolute Fluorescence Intensity using 365nm Illumination.

Measure F365 M Int 🛛 😤			<u>م</u> ب
Filte	r		
R	G	В	w

Use the FLUODXConnect Software to restrict the set of available filters.



💒 Device Configuratio	'n					— C) X
Read all C	onfig all S	ave Config	Load Config	EXIT	۲	PER) = T.
unctions Measurem	ent Parameter	Tolerances	FLUODX Langu	age			
Phosphorescense paran	neter			Fluorescence parameter			
M Int		PH365	A PH365B	M Int	F256	E365	
Wait OFF Time (130r	ns)	5,000	5,000	Selectable Filter in ABS (R,G,B,W)	RGBW	GB	
Exposure Time (1600	Oms)	50,000	50,000	Light intensity (0=Auto, 1%100%)	0	0	
Cool down Time (0,02	51500ms)	1,000	1,000	Average Counts (110)	1	1	
Filter (R,G,B) Absolute	2	G	G	Number of Zones (0=free, 120)	0	0	
Light intensity (1%1	00%)	20	20				
Average Counts (11	0)	1	1				
Number of Zones (0=	free, 120)	0	0	White Filter W = (R+G+B) / 3			
Vleasure F365 Tilter	5 M Int						
G	В						

Select the Filter you would like to use to measure the absolute fluorescence Intensity by clicking key below the Filter character.

Measu	re F365 M	Int	_ *
Filter		В	
mea	sure		
-1	۲		×

Measure samples. There can be measured up to 20 zones per sheet

Measure F365 M Int			
Filter		В	
Value		2774.0 AU	
			n: 4
-1	۲	Mark	×

Key A: Delete the most recent reading.

Key B: Positioning LED on

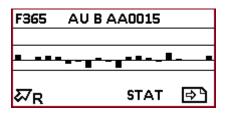
Key C: Terminate the measurement process and save data permanently using an Identification mark.

Key D: Exit

Hidden function: Press and hold Key A, click Key D, release Key A : go back to the <select Filter screen> without saving measurement data.

Click Mark to display the bar diagram





Key A: Select next Filter

Key C: Display the statistics.

Key D: Next sheet

F365 AU	J B AA0015	*
Average	= 2669.0 AU	
Max	= 2843.6 AU	
Min	= 2421.8 AU	
ୟ R	6	Σ

Key A: Select next Filter

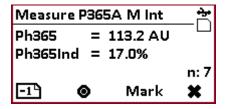
Key D: Next sheet

MInt Measure absolute Phosphore Intensity

Select P365A or P365B. The settings can be configured using the FLUODXConnect software.

Measu	re P365A	M Int	ب ه
Filter		G	
mea	sure		
-1	۲		×

Up to 20 individual zones can be measured on one single sheet before setting a Mark.



Key A: Delete the most recent reading.

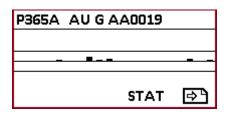
Key B: Positioning LED on

Key C: Terminate the measurement process and save data permanently using an Identification mark.

Key D: Exit

After pressing key B the bar diagram is displayed.





Key C: Display the statistics.

Key D: Next sheet

P365A AU	G AA0019	*
Average	= 111.4 AU	
Max	= 115.6 AU	
Min	= 109.0 AU	
	Ē	\mathbf{S}

Key D: Next sheet

MLab Laboratory function

Measu	re		<u>ት</u>
M Lab	M Lab	M Lab	M Lab
F256	F365	P365A	P365B

In this mode colorimetric analysis for fluorescent inks and phosphorescent analysis for phosphorescent inks can be made.

Fluorescent MLab function

Measu	ire F256 M L	ab 추
XYZ mea	sure	
₽	۲	×

Measure a sample. You can measure several times and take the average value.

Meas	ure F256	M Lab	<u>ት</u>	Meas	ure F256	M Lab	<u>م</u>
x =	2.0			x =	2.1		
Y =	2.0			Y =	2.1		AVG
Z =	0.4		n: 1	z =	0.4		n: 2
⇔	۲	÷	×	⇔	۲	.	×

Key A: Next display

Key B: Positioning LED on



Key C: Save measurement

Key D: Exit

Measure F256 M Lab			<u>*</u>	Measure F256 M Lab			÷	
х =	0.46			У		L =	16.1	
y =	0.46		AVG	•	R	a =	0.1	AVG
yellov	v		n: 2	6		b =	21.8	n: 2
⇔	۲	÷	×	₽	B 🔘		.	×
Measure F256 M Lab 🛛 🔶			<u>*</u>	Meas	sure F2	256 N	1 Lab	<u>ج</u>
۲	L	.= 16.1		Ratio) F256/	/365	= 49	% □
†	R (21.8	AVG	Hue	=	89 O	/ 266 '	PAVG
6		n = 89 °	n: 2	yello	w/blu	e		n: 2
l ⊂> ₀	۲	. ●	×		0		. •	×

Bi-Fluorescent Analysis is available only in F256 Mode. Any measurement in F256 Mode is based on two readings, one with UV 256nm illumination and the second one with 365nm illumination. The Bi-Fluorescent Analysis screen shows the following values:

- Ratio F256/365 is the ratio between the Fluorescent signals measured. The above example shows that the 256nm Fluorescence is only 4% compared to 365nm Fluorescence.
- Hue: if the sample is exposed to 256nm UV light, the fluorescent color Hue is 89° (yellow) while when exposed to 365nm UV light, the fluorescent color Hue is 266° (blue).

M Lab Phosphorescence



Measure a sample.

Measure P365A M Lab 🔄 😁				
		ЕΤ	30.00) m s 🗀
\checkmark		DT	10.00) ms
	┝┯┯		16.0%	6E
₽	۲		.	×

The graph shows the charging and discharging behavior of the sample. The ET (exposure time) is configured as 30ms, the DT (Cool down time) is 10ms. The exposure energy E is 16%.

Key A: Next display

Key B: Positioning LED on

Key C: Save measurement

Key D: Exit



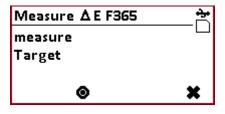
Measure P365A M Lab 🛛 😤				
Int Ph	Filte	r B	21.29	6
chg/do	:hg >(53.9/	19.0	ms
Phi 50/	20:	0.4/	6.6	ms
⇔	۲	L	€.	×

The sample has been measured using the B (blue) filter. The Phosphorescence (emitted light intensity) measured after the Cool down time is 21.2% of the Fluorescence, measured after the Exposure Time before switching the light source off. The charging time is estimated to be at least 63.9ms to reach saturation. The discharging time is estimated to be 19ms. After 0.4ms the Phosphorescence decays below 50% of the Fluorescence. After 6.6ms the Phosphorescence decays below 20%.

MSpez function

Meas	ure	<u>ት</u>
	_	
∆ E F256	ΔE F365	
FZ30	F363	

In this mode you can measure the delta E between two samples



Measure the Target several times. The Average is taken as reference.

Meas	Measure 🛆 E F365 🛛 👌				
L =	62.6				
a =	-1.5	Target			
b =	-34.1	AVG n: 1			
⇔	۲	×			

Key A: Switch to sample measurement

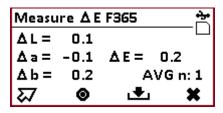
Key B: Positioning LED on

Key D: Exit

Measu	ure 🛆 E F365	<u>ب</u>				
measu	ire					
Samp	Sample					
-						
ম	۲	×				

Measure the sample several times. The Average is calculated.





Key A: New reference

Key B: Positioning LED on

Key C: Save measurement

Key D: exit