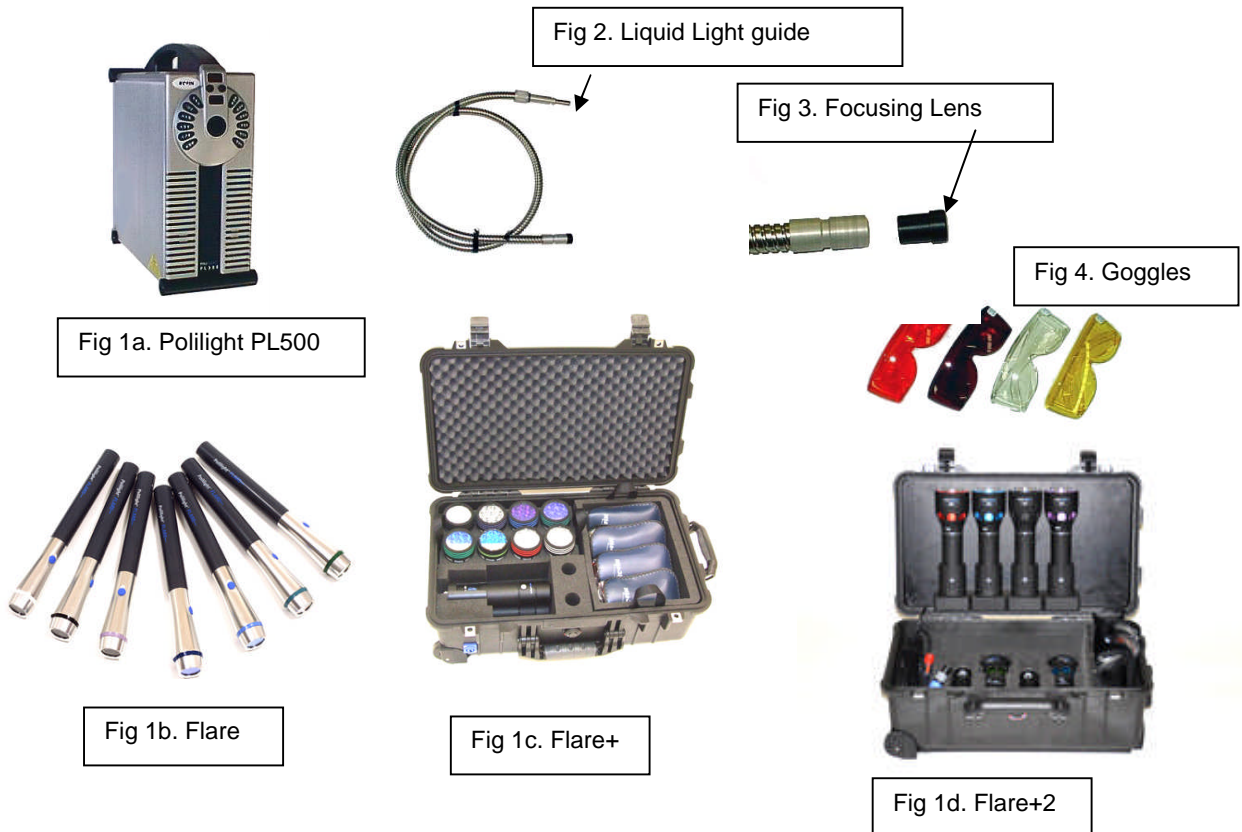


Light Source Field Optical and Calibration Test (Polilight PL500, SC, Flare, Flare+ Flare+2)

1. Application

This document describes a set of tests to be performed in the field by Rofin Light Source users. The tests are designed to check the optical system is performing to specification and that the unit is suitable for use. This is a calibration and performance check.

This test is applicable to Polilight PL500 Models POL.0003, POL.0004, (also can be applied to PL400 Models POL.0010 and POL.0011) Flare and Flare+ kits.




2. Safety Instruction

At no time should the operator, or any person in the vicinity, directly view the output of the Polilight. Eye protection goggles should be worn appropriately when performing optical power tests.

3. Material and Equipment

- | | |
|---|------------------------|
| 1 x Polilight PL500 (or PL500 SC version), Flare or Flare + | Ref Fig 1a, 1b, 1c, 1d |
| 1 x Liquid light guide (with focusing lens) | Ref Fig 2 & 3 |
| 4 x Goggles (Clear, yellow, orange, red) | Ref Fig 4 |

Prepared by: Alex Bennett	Approved by: Alex Bennett	Version: 05
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	ISO 9001 Calibration Method	Document No. MTC Light Source Field Optical and Calibration Test
Light Source Field Optical and Calibration Test (Polilight PL500, SC, Flare, Flare+ Flare+2)		

4. Attachments and Related Records


Test Certificate (Appendix 1), Example Certificates (Appendix 2)

Document Revision History

Revision	Approval date of previous version	Section(s) revised and brief description	Change Control Reference #
01	NA	Original	
02	12/11/2011	Revise wording in section 5.3.15. and update 1.	DMRN # 080
03	2/4/2011	Fix typo's and new Calibration Sheet layout.	Customer Feedback
04	3/4/2013	Allow for Flare's of all types. ISO:9001 format.	Customer Feedback
05	02/04/2013	Allow for 440 filter version units (Australia)	Customer Feedback

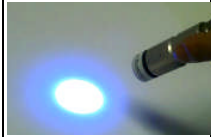

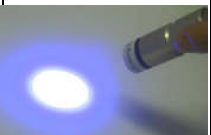

5. Procedure

Photocopy the Test Certificate page (Appendix 1 of this document), fill in the information fields and record results of the following tests. When completed this page becomes your test record.

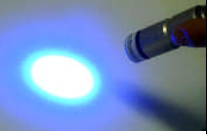
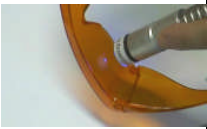


Step #	Procedure and Test Plans	Diagrams and Records	Results
5.1	<p>Liquid light guide integrity check. – Only for Polilight</p> <p>All Polilights use a liquid light guide for UV and Visible light bands. (Optional Infra Red light guide is a glass fibre bundle)</p> <p>Note: All Polilight light guides are designed to use a quartz focusing lens which inserts into the output end of the light guide. This lens provides an even illumination output beam. This lens is often lost or forgotten about by users. We recommend its use for best results.</p> <ol style="list-style-type: none"> 1. Remove the liquid light guide from Polilight and remove focusing lens from the light guide. 2. Holding each end of the light with both hands, point one end towards a light (over head light or a window) and examine the other end. Repeat for both ends. Ref pictures here. 3. If the light guide has been physically damaged in some way, the likely effect will be bubbles appearing in the liquid. Any bubbles in the guide are easy to see inside the quartz end tips at either end of the light guide. Bubbles will significantly reduce the output intensity of the Polilight. 	<p>Ref Fig 3.</p> 	<p>Record result on test certificate at 5.1</p>

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Light Source Field Optical and Calibration Test (Polilight PL500, SC, Flare, Flare+ Flare+2)

Step #	Procedure and Test Plans	Diagrams and Records	Results
5.2	<p>Self test mechanical. – Only for Polilight</p> <p>The Polilight PL500 and PL500SC units all perform an internal mechanical self check when first turned on.</p> <ol style="list-style-type: none"> 1. Insert the light guide (insert and twist lock into position. If the light guide is not inserted properly the Polilight will not turn on.) 2. Turn on the power to the unit. (PL500 rear switch, SC unit rear switch & front panel standby switch). 3. The Polilight will automatically perform a number of internal filter wheel and motor checks. 4. If all internal checks are OK then the internal lamp will ignite and the 450 (blue) band will automatically be selected and blue output band will come on. 		<p>Record result on test certificate 5.2.</p> <p>If 450 (blue) comes on and no error reported on front panel = Pass</p>
5.3	<p>Optical Filter check – Polilight, Flare, Flare+</p> <p>The internal optical filters within a Polilight are all “interference” type optical filters. They can not change their optical characteristics unless they are physically damaged. Physical damage (broken) will likely result in more light being emitted above the filter band. This test is designed to check for light leakage above the nominated filter band, using the safety goggles supplied with the Polilight. With Flares LED’s can not simply change wavelength characteristics, however perhaps some sort of physical damage has possibly occurred.</p> <ol style="list-style-type: none"> 1. Insert the light guide (with focusing lens) into the Polilight and turn the unit on. The unit should start and illuminate with the 450 (blue) band. 2. Select the UV output band and direct onto a white piece of paper (ie normal A4). You should see bluish fluorescence. 3. Place the clear safety goggles between the light guide and the paper and the fluorescence should disappear (do not look directly into UV beam without clear safety goggles on.) NOTE Goggles can melt if held too close to light guide for too long. 4. Select the Polilight 415 band. This should appear as a purple colour on the paper. 5. Inserting the yellow goggles after the light guide should make all colour disappear. 	<p>Flare</p> <p>Use UV, 415, (440 use 450 test),470, 505, 530, 555,620 tests.</p>    	<p>Flare+</p> <p>Use UV, 415, 450, 505, 530, 555,620 tests.</p> <p>Record result on test certificate 5.3.2.</p> <p>Record result on test certificate 5.3.3.</p> <p>Record result on certificate 5.3.4</p>

Light Source Field Optical and Calibration Test (Polilight PL500, SC, Flare, Flare+ Flare+2)

Step #	Procedure and Test Plans	Diagrams and Records	Results
	<p>Note: Some PL500's sold in Australia have a 440 band before the 450 band. (This band replaces either the 650 or the 470 band (optional)).</p>	Use technique as bellow.	Record 440 result on certificate 5.3.5 if applicable.
	6. Select the 450 band . This should appear as a blue colour on the paper.		
	7. Inserting the orange goggles after the light guide should make all colour disappear.		Record result on certificate 5.3.6
	8. Select the 470 band (or 440) . This should appear as a light blue colour (or purple-blue) on white paper.	Use technique as above	
	9. Inserting the orange goggles after the light guide should make all colour disappear.	Use technique as above	Record result on certificate 5.3.8. (If 440 cross out 470 and write 440).
	10. Select the 490 band . This should appear as a light blue colour on white paper.		
	11. Inserting the orange goggles after the light guide should make all colour disappear.	Use technique as above	Record result on certificate 5.3.10
	12. Select the 505 band . This should appear as an aqua blue colour on white paper.		
	13. Inserting the orange goggles after the light guide should make all colour disappear.	Use technique as above	Record result on certificate 5.3.12
	14. Select the 530 band . This should appear as a light green colour on white paper.		
	15. Inserting the orange goggles between the light guide, colour should still appear .		Record result on certificate 5.3.14.
	(Polilights only) Down tuning the filter to T30 should make all colour disappear. (Note: The Polilight by default is in Power mode. To change to Tune mode hold down the 530 button and display will change from P:7 to t:0). Tune to t:30 using up down buttons. At t:30 all light should be blocked or at least be significantly diminished.		Record result on certificate 5.3.15
	(Flares have no tuning and so above test is n/a)		
	16. Select the 555 band . This should appear as a green colour.		
	17. Inserting the red goggles between the light guide and paper and the colour should disappear.		Record result on certificate 5.3.16

Light Source Field Optical and Calibration Test (Polilight PL500, SC, Flare, Flare+ Flare+2)




Step #	Procedure and Test Plans	Diagrams and Records	Results
	<p>Note 1 : With the following bands the goggles will not block the light bands. These light bands are designed for illumination and to reduce background. Not for fluorescence with required goggles. They are often tuned to obtain better matching.</p> <p>Note 2 : The following colours may not reproduce exactly on colour printers. Also colour monitors produce differing effects. Essentially the colours are yellow, orange and red.</p> <p>18. Select the 590 band. This should appear as a yellow colour ^{Note 2}. Shining the light on the colour patch here should make the colour patch disappear into the background.</p> <p>19. Select the 620 band. This should appear as a light orange colour ^{Note 2}. Shining the light on the colour patch here should make the colour patch disappear into the background. (Note: Flares may reduce yellow patch also (maybe better) as the Flare band shape before the peak of 620 has a much broader slope than the Polilight 620 band which has steep slopes).</p> <p>20. Select the 650 band (if applicable). This should appear as a light red colour ^{Note 2}. Shining the light on the colour patch here should make the colour patch disappear into the background.</p>	  	<p>Record result on certificate 5.3.18.</p> <p>Record result on certificate 5.3.19.</p> <p>Record result on certificate 5.3.20.</p>
5.4	<p>Review test certificate sheet. If all tests are "Pass", then the unit is fit for use. Sign and date certificate and file. Update any instrument logs and calibration labels.</p> <p>Any problems, issues or questions can be reported to Rofin using service@rofin.com.au email.</p> <p>End of Test</p>		

Appendix 1. Following Page

Light Source Field Optical and Calibration Test (Polilight PL500, SC, Flare, Flare+ Flare+2)

Date		Test performed by:	
Polilight Type		Serial Number	




Test Results		Result - Pass / Fail		Comments		
5.1	Liquid Light Guide Integrity Check					
5.2	Self Test Mechanical					
5.3	Internal Optical Filter Check					
Start up check						
1	Wavelength	Light Colour	Result	Comments		
	450					
UV Check						
2	nm	Colour of light on white paper	Goggles	Colour Blocked Yes / No	Result Pass / Fail	Comments
	350		Clear			
Wavelength Check						
	nm	Colour of light on white paper	Goggles	Colour Blocked Yes / No	Result Pass / Fail	Comments
4	415		Yellow			
5	440 If app		Orange			
6	450		Orange			
8	470 If app					
10	490					
12	505					
14	530					
15	530	Tuning of filter from 0 – 30				
16	555		Red			

5.3 Back Ground Colour Check					
Wavelength	Colour	Test Colour Patch	Results Pass/Fail- Comment		
18	590	Yellow			
19	620	Orange			
20	650 (if applicable)	Red			




Unit Result Pass / Fail		Verified by:		Date:	
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Light Source Field Optical and Calibration Test (Polilight PL500, SC, Flare, Flare+ Flare+2)

Appendix 2 Example Calibration Test Sheets for Polilight PL500 and Polilight Flare+.

Date	21 SEPT 2015		Test performed by:	ALEX BENNETT		
Polilight Type	PL500		Serial Number	1234		
Test Results		Result - Pass / Fail		Comments		
5.1	Liquid Light Guide Integrity Check		PASS			
5.2	Self Test Mechanical		PASS			
5.3	Internal Optical Filter Check					
Start up check						
1	Wavelength		Light Colour		Result	Comments
	450		BLUE		PASS	
UV Check						
2	nm	Colour of light on white paper	Goggles	Colour Blocked Yes / No	Result Pass / Fail	Comments
	350	BLUE	Clear	YES	PASS	
Wavelength Check						
	nm	Colour of light on white paper	Goggles	Colour Blocked Yes / No	Result Pass / Fail	Comments
4	415	PURPLE	Yellow	YES	PASS	
5	440 if app	N/A	Orange	N/A	N/A	
6	450	BLUE	Orange	YES	PASS	
8	470 if app	LIGHT BLUE		YES	PASS	
10	490	LIGHT BLUE		YES	PASS	
12	505	AQUA BLUE		YES	PASS	
14	530	LIGHT GREEN		NO	PASS	
15	530	Tuning of filter from 0 - 30		T-30	PASS	BLOCKED BY T-30
16	555	GREEN	Red	YES	PASS	
Back Ground Colour Check						
5.3	Wavelength	Colour	Test Colour Patch	Results Pass/Fail- Comment		
18	590	Yellow		PASS		
19	620	Orange		PASS (SLIGHTY SEE)		
20	650 (if applicable)	Red		PASS		
Unit Result Pass / Fail	PASS		Verified by:	ALEX BENNETT	Date:	21/9/2015

Light Source Field Optical and Calibration Test (Polilight PL500, SC, Flare, Flare+ Flare+2)

Date	21 SEPT 2015		Test performed by:	ALEX BROWN		
Polilight Type	FLARE + 2		Serial Number	KIT #3 (OUR REF)		
Test Results		Result - Pass / Fail		Comments		
5.1	Liquid Light Guide Integrity Check		N/A		N/A	
5.2	Self Test Mechanical		N/A		N/A	
5.3	Internal Optical Filter Check					
Start up check						
1	Wavelength	Light Colour		Result	Comments	
	450				N/A	
UV Check						
2	nm	Colour of light on white paper	Goggles	Colour Blocked Yes / No	Result Pass / Fail	Comments
	350	BLUSH	Clear	YES	PASS	OV FLARE
Wavelength Check						
	nm	Colour of light on white paper	Goggles	Colour Blocked Yes / No	Result Pass / Fail	Comments
4	415	PURPLE	Yellow	YES	PASS	
5	440 if app	N/A	Orange			N/A
6	450	BLUE	Orange	YES	PASS	
8	470 if app	LIGHT BLUE		YES	PASS	
10	490	N/A				N/A
12	505	AQUA BLUE		YES	PASS	
14	530	LIGHT GREEN		NO	PASS	
15	530	Tuning of filter from 0 - 30				N/A
16	555	GREEN	Red	YES	PASS	
Back Ground Colour Check						
5.3	Wavelength	Colour	Test Colour Patch	Results Pass/Fail- Comment		
18	590	Yellow		N/A		
19	620	Orange		PASS		
20	650 (if applicable)	Red		N/A		
Unit Result Pass / Fail	PASS		Verified by:	ALEX BROWN		Date: 21/9/15.