

## Service manual for OptoPalm FRA 3803 T/N (Addendum to Description DC 761.)

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## 1. Instructions

This manual is designed as an aid to clear simple malfunctions or incorrect operation. Your E+L service technicians supply full support for all problems.

## 2. Assembly

We suggest the installation of the electrical and mechanical components following the wiring diagram and under consideration of the surrounding conditions in the paper machine.

Electrical lines should be laid in protective piping.

The guide must be fixed in its centre position.

The electrical equipment must be mounted free of electrical power, and the wiring must be checked with appropriate means after installation.

**! The maximum cable length between the edge sensor FR 3811 and the digital control unit DC 7... must not exceed 50 m/54,68 yards. This cabling must be done with special low capacity cable, pair-twisted and shielded.**

## 3. Start-up

### 3.1 Mounting of FE 0752 stroke sensor

Stop the paper machine. Position the guide in the centre of its stroke. Mount the FE 0752 stroke sensor. Adjust the stroke sensor in its centre position. Connect the connection rod to the bearing support. Fix the control lever. Check guide stroke and turn angle of stroke sensor and fix all screws.

### 3.2 Mounting of FR 3811 optical edge sensor

The FR 3811 optical edge sensor should be mounted behind the guide roll, before the next following roll.

If tail threading support will be activated, the optical sensor must be mounted on tending side.

To avoid dirt alarms, mount the edge sensor in an area, where no direct water, stock or dirt projections are thrown on the lenses of the optical sensor.

Mount the FR 3811 optical edge sensor on sensor support with sensor distance of 115 mm/4.52" ( $\pm 5$  mm/0.19") to the edge of the clothing, absolute visual range 115 mm/4.52" ( $\pm 15$  mm/0.59").

The centre of the optical sensor must be centered to the edge of clothing.

### 3.3 Mounting of SH 9002 electro-mechanical edge sensor

Mount the SH 9002 edge sensor on the same machine side as the FR 3811 optical edge sensor.

The space should be roughly 40 mm/1.75" away from the edge of the clothing. Consider uneven edges of the clothing.

<b>3.4 Mounting of FE 0721 mechanical edge sensor</b>	Mount the FE 0721 run-off alarm on the machine side opposite to optical FR 3811 optical sensor and SH 9002 Hall sensor. The space should be roughly 40 mm/1.75" away from the edge of the clothing. Consider uneven edges of the clothing.
<b>3.5 Mounting of solenoid valve in DP pneumatic switching unit</b>	<p>Switch off air supply, reduce pressure to 0 bar/0 psi.</p> <p>Connect air piping (air supply) to solenoid valve.</p> <p>Connect air piping from solenoid valve to servo-cylinder (guide).</p> <p>Adjust air pressure and check for leaks.</p> <p>Switch solenoid valve manually to left and right side. Check if guide is moving to its final position.</p>
<b>3.6 Commissioning of DC 761. digital control unit</b>	<p>Disconnect power supply (clamp 1 and 2 on NK 3501).</p> <p>Commission following DC 761. operation manual.</p> <p>Following a program routine, the solenoid will be switched and the guide will move to both ends of its stroke.</p>
<b>3.7 Commissioning of entire system</b>	<p>Switch paper machine to crawl speed (&lt;30 m/min / 100 fpm).</p> <p>Check action of the guide (increase step by step the machine speed).</p> <p>If required, adjust the following parameters:</p> <ul style="list-style-type: none"> <li>- switching delay</li> <li>- control optimization</li> <li>- optimization degree</li> <li>- dead zone</li> <li>- amplification</li> <li>- guide actuating path</li> <li>- infrared actuating path.</li> </ul>
<b>4. Change of felt or wire</b>	<p>Switch off power supply of DC 761. digital control unit.</p> <p>Take care of not damaging sensors and wiring when changing the clothing.</p> <p>After putting the new clothing in the machine, position the clothing in the centre of the paper machine following the clothing supplier's instruction.</p> <p>Check the position of FR 3811 optical edge sensor.</p> <p>Position the SH 9002 Hall sensor roughly 40 mm/1.75" away from clothing edge. Consider an uneven position of clothing edge.</p> <p>Position the FE 0721 mechanical edge sensor roughly 40 mm/1.75" away from clothing edge. Consider an uneven position of clothing edge.</p> <p>Switch on DC 761. digital control unit.</p>

Check function during machine crawl.  
When speeding up, adjust control parameters if required.

## 5. Change of software

Switch off DC 761. digital control unit.  
Change EEPROM chip on control board RK 4202 on back side of display unit.  
Switch on DC 761. digital control unit.

## 6. Change of digital control unit

All parameters have been saved in EEPROM.  
Read and note all programmed parameters of existing DC 761. control unit.  
Switch off power.  
Disconnect cable between keyboard unit and NK 3501 connector board.  
Exchange control unit.  
Take off EEPROM of old control unit and plug it into new control unit.  
Plug in cable between NK 3501 and control unit.  
Switch on power.

## 7. Change of solenoid valves

### 7.1 3/2 directional valve

Switch off power supply of DC 761. digital control unit.  
Switch off air or water for IR-sensor optical cleaning system.  
Disconnect cable on solenoid valve and exchange valve.  
Connect cable on new valve on previous position.  
Switch on power and air or water.

### 7.2 5/3 directional valve

Switch off power supply of DC 761. digital control unit.  
Switch off air of guiding system.  
Disconnect cables on solenoid valve and exchange valve.  
Connect cables on the new valve on previous position.  
Switch on power and air for guide.

## 8. Change of pneumatic guide

Switch off power supply of DC 761. digital control unit.

Switch off air of guiding system.

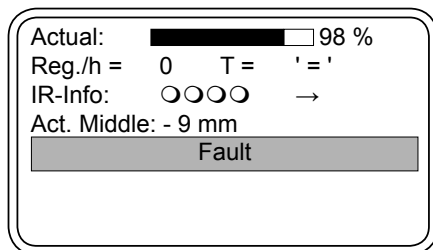
Disconnect air piping to the guide.

Exchange guide and connect air piping to the guide on previous position.

Adjust air pressure and check for leaks.

Switch on power and check guiding.

## 9. Alarm displays



Faults of the systems are displayed in the 5<sup>th</sup> line of the display of the digital control unit DC 761. At the same time the red alarm LED is flashing, and the alarm output is switched on (terminal NK 3501, clamp 32).

The respective alarm is erased when the causes of the alarm have been cleared.

### 9.1 Line fault FE 0752

The output signal of the FE 0752 stroke sensor is out of range registered during initialization.

Minimal output voltage: 3.5 V DC,  $\pm 0.1$  V

Maximum output voltage: 6.5 V DC,  $\pm 0.1$  V

#### 9.1.1 Possible causes for alarms

- The power supply (10 V DC) of FE 0752 stroke sensor has failed.
  - check input signal of FE 0752 stroke sensor
    - NK 3501 in DC 761.: terminal X1, clamp 15 (10 V DC) and 16 (GND).
    - DP 1005/DP 1006: terminal X1, clamp 6, 9 (10 V DC) and 4, 7 (GND).
    - The signal must be 10 V DC,  $\pm 0.1$  V DC
- The line between FE 0752 stroke sensor and DC 761. control unit is damaged or troubled
  - check output signal of stroke sensor
    - NK 3501 in DC 761.: terminal X1, clamp 38 (output signal voltage) and clamp 16 (GND).
    - DP 1005/DP 1006: terminal X1, clamp 8 (output signal voltage) and clamp 4, 7 (GND).
    - The signal must be as following:
      - FE 0752 right position: 3.5 V,  $\pm 0.1$  V
      - FE 0752 center position: 5.0 V,  $\pm 0.2$  V
      - FE 0752 left position: 6.5 V,  $\pm 0.1$  V

- No mechanical link between FE 0752 stroke sensor and guide.
  - ➔ check if FE 0752 stroke sensor is linked by connection rod to the bearing support of guide
- Mechanical clamp of control lever of FE 0752 stroke sensor is loose.
  - ➔ check if the mechanical clamp is tightly linked to the stroke sensor.
- Stroke sensor is defect and must be changed.

**Effects on guiding:**

The control unit will perform with standard parameters without electronic feedback. Guiding is possible, but the clothing will run less stable. The number of guiding movements will raise.

**9.2 Line fault SH 9002**

Either one of the output signals is out of the range registered during initialization.

**9.2.1 Possible causes for alarms**

- The power supply of the SH 9002 Hall sensor has failed
  - ➔ check input signal of Hall sensor SH 9002  
NK 3501 in DC 761.: terminal X1, clamp 5 (10 V DC) and 6 (GND).  
SZ 2204: terminal X1, clamp 13 (10 V DC) and 14 (GND).  
The signal must be 10 V DC,  $\pm 0.1$  V DC
- The line between SH 9002 Hall sensor and DC 761. control unit is damaged or troubled
  - ➔ check that the feeler paddle is not activated  
The output signal of microswitch must be 3.5 V DC,  $\pm 0.3$  V  
NK 3501 in DC 761.: terminal X1, clamp 39 (micro) and clamp 6 (GND)  
SZ 2204: terminal X1, clamp 16 (micro) and clamp 14 (GND)  
The output signal of SH 9002 must be 6.4 V,  $\pm 0.3$  V.  
NK 3501 in DC 761.: terminal X1, clamp 17 (signal) and clamp 6 (GND).  
SZ 2204: terminal X1, clamp 15 (signal) and clamp 14 (GND).
  - ➔ check the signal voltage while the paddle is in center position (fix paddle manually)  
The output signal of microswitch must be 7.0 V DC,  $\pm 0.3$  V  
NK 3501 in DC 761.: terminal X1, clamp 39 (micro) and clamp 6 (GND).  
SZ 2204: terminal X1, clamp 16 (micro) and clamp 14 (GND)

The output signal of SH 9002 must be 5.3 V,  $\pm 0.3$  V  
NK 3501 in DC 761.: Terminal X1, clamp 17 (signal) and  
clamp 6 (GND)

SZ 2204: Terminal X1, clamp 15 (signal) and  
clamp 14 (GND).

- check the position of fully activated feeler paddle  
(lead paddle manually)

The output signal of microswitch must be 7.0 V DC,  $\pm 0.3$  V  
NK 3501 in DC 761.: Terminal X1, clamp 39 (micro) and  
clamp 6 (GND)

SZ 2204: Terminal X1, clamp 16 (micro) and  
clamp 14 (GND).

The output signal of SH 9002 must be 4.0 V,  $\pm 0.3$  V  
NK 3501 in DC 761.: Terminal X1, clamp 17 (signal) and  
clamp 6 (GND)

SZ 2204: Terminal X1, clamp 15 (signal) and  
clamp 14 (GND).

- SH 9002 Hall sensor is defect and must be changed.

#### **Effects on guiding:**

The control unit is able to perform only in the optical edge detection mode. The back-up mode is switched off. Tail threading support is not possible and will be deactivated.

### **9.3 Back-up mode**

Guiding is performed either by SH 9002 Hall sensor or by FE 0721 run-off alarm because of optic failure.

#### **9.3.1 Possible causes for alarms**

- No power supply from DC 761. digital control unit to FR 3811 optical edge sensor
  - check the input signal of FR 3811 optical edge sensor  
NK 3501 in DC 761.: terminal X1, clamp 41 (+5 V DC) and  
clamp 36 (GND)
  - SZ 2204: terminal X1, clamp 2, 3, 4 (+5 V DC)  
and clamp 1 (GND)
  - The signal must be 5 V DC,  $\pm 0.1$  V.
- Damage of line between FR 3811 optical edge sensor and DC 761. digital control unit (transmitter)
  - check the transmitter signal of FR 3811 optical edge sensor  
NK 3501 in DC 761.: terminal X1, clamp 37, 40, 42, 43  
(transmitter signal) and 36 (GND)
  - SZ 2204: terminal X1, clamp 9, 10, 11, 12  
(transmitter signal) and 1 (GND)
- Damage of line between FR 3811 optical edge sensor and DC 761. digital control unit (receiver).
  - check the signal level of SH 9002 Hall sensor (see point 9.2)

- check the receiver signal of FR 3811 optical edge sensor.  
The distance of clothing to sensor lenses should be 115 mm/ 4.56" ( $\pm 5$  mm/0.19"). (For optimal reflexion put a white paper on clothing).  
NK 3501 in DC 761.: terminal X1, clamp 44, 45, 46, 48 (receiver signal) and 36 (GND)  
SZ 2204: terminal X1, clamp 5, 6, 7, 8, (receiver signal) and 1 (GND)
- FR 3811 optical edge sensor is too much contaminated
  - check and clean
- Mounting distance between FR 3811 optical edge sensor and clothing is not correct (must be 115 mm/4.56",  $\pm 5$  mm/0.19")
  - check and adjust
- Paper has wrapped around the sensor
  - check and clean
- SH 9002 Hall sensor or FE 0721 run-off alarm are too close to the edge of the clothing (distance should be roughly 40 mm/1.75", depending on edge variation)
  - check and adjust

**Effects on guiding:**

The DC 761. control unit is no more operating in optical mode. The edge sensing and guiding is performed by the SH 9002 Hall sensor.

**! The edge position is offset to the position of the optical sensor when performing with Hall sensor.**

## 9.4 Failure optics

The optic has failed or is hidden. Guiding is performed by FE 0701 run-off alarm.

### 9.4.1 Possible causes for alarms

- Paper has wrapped around the sensor
    - check and take away paper
  - FE 0721 run-off alarm too close to the clothing's edge
    - check and position in correct distance (normally 40 mm/ 1.75"). Watch for uneven edges.
- If alarm remains:
- Check receiver signal of FR 3811 (see point "Back-up mode")

**Effects on guiding:**

The DC 761. control unit is not operating in optical edge sensing mode. The control is performed by FE 0721 run-off alarm.

**! A clothing run-off towards the opposite side of FR 3811 can't be detected when optics are hidden.**



**9.5 Failure SH 9002**

The FE 0721 run-off alarm has been contacted at the same time as the SH 9002 Hall sensor.

**9.5.1 Possible causes for alarms**

- Spring of SH 9002 is broken, lengthened or loose, i.e. the spring don't place the feeler paddle to the starting position.  
→ check and replace or fix
- SH 9002 Hall sensor or FE 0721 run-off alarm too close to edge of clothing  
→ check and position in correct distance (normally 40 mm/ 1.75"). Watch for uneven edges
- Felt or wire tension is too low, guiding is not possible, clothing runs less stable:  
→ check tensioning.
- SH 9002 Hall sensor is damaged  
→ check: see point "Line fault SH 9002".

**Effects on guiding:**

The control unit is not operating in optical edge sensing mode. The control is performed by FE 0721 run-off alarm.

**9.6 Failure FE 0721**

The FE 0721 run-off alarm is switched even though the FR 3811 optical sensor is working correctly.

**9.6.1 Possible causes for alarms**

- Spring of FE 0721 run-off alarm is broken, lengthened or loose, i.e. the spring don't place the feeler paddle to the starting position.  
→ check and replace or fix
- Feeler paddle of FE 0721 run-off alarm is jammed or its mounting is extremely dirty.  
→ check and move, clean if required
- Feeler paddle of FE 0721 run-off alarm is positioned too close to the clothing's edge.  
→ check and position in correct distance (normally 40 mm/ 1.75"). Watch for uneven edges.
- Inductive switch of FE 0721 run-off alarm is defect  
→ check the signals  
 NK 3501 in DC 761.: Terminal X1, clamp 24 (24 V DC), 22 (GND), 8 (signal) and 22 (GND)  
 terminal box: clamp 1 (24 V DC), 2 (GND), 4 (signal) and 2 (GND)  
 Power signal: 21...26 V DC  
 Signal not contacted: <1 V DC  
 Signal contacted: 21...26 V DC

**Effects on guiding:**

Edge sensing and guiding is done in optical mode. The back-up system is working (electro-mechanical edge sensor SH 9002). Tail threading assistance is available.

## 9.7 Movements/h

The number of solenoid valve pulses for guiding is out of range of the programmed threshold.

### 9.7.1 Possible causes for alarms

- The programmed value is too low
  - a value of 600 movements/h should be standard.  
For short wires at high speed machines a value up to 3000 movements/h may be programmed as standard value.
- Air leakage on the guide or piping
  - check and repair.
- Dead zone too small.
  - adjust to 6 mm/0.24",  $\pm 3$  mm/0.12"  
(In case a smaller dead zone than 6 mm/0.24" is required, start reducing it by steps of 1 mm/0.039" to the desired value).  
After each adjustment wait 2 to 4 minutes to evaluate performance.
- Switching delay is too short (f. e. if wire edge is very uneven).
  - adjust switching delay to standard value of 0.2 - 0.4 sec.
- Optimization switched off or optimization level insufficient
  - increase optimization level to 10, switch on optimization
- Gain level too high.  
The guide makes a big step forward and almost immediately a smaller step backwards:
  - reduce gain level, standard value 0.50
- Gain level too small  
The guide makes several small steps in the same directions, all almost immediately one after the other:
  - increase gain level, standard value 0.50

#### Effects on guiding:

The guiding is performed without objections. The felt or wire may oscillate.

**! If the number of oscillations is extremely high (well above 5000), please check real movements of guide. If this number is very high too and the stroke too big, there's danger of long-term damage of the clothing (abrasion).**

## 9.8 Contamination alarm

The actual value of reflection is out of range of programmed value.

### 9.8.1 Possible causes for alarms

- The programmed limit is too high
  - check and adjust
- Mounting distance between FR 3811 optical edge sensor and clothing is not correct
  - the mounting distance must be 115 mm/4.56" ( $\pm 5$  mm/0.19")

- Optics contaminated
  - check and clean
- FR 3811 optical edge sensor defect
  - check signal level

**Effects on guiding:**

None, guiding is done perfectly.

## 10. Spare parts

Part no.	Description
305188	FR 3811 T optical edge sensor for dry application
326565	FE 0752 U electronic stroke sensor
326494	SH 9002 U edge sensor Hall, for infrared sensing
328427	FE 0721 U alarm device with 1 switching point
303550	DC 7610 digital control unit
304312	Solenoid valve 5/3 way directional, G 1/4" connection
307350	Solenoid valve 3/2 way directional, G 1/4" connection

**Technical data are subject to modification.**

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