SKF Electrical Barrel Pumping Unit SKF ProFlex

Control configuration and operation instructions, progressive system, internal control

(Original operating and maintenance instructions)

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	**Warning** Read and follow the safety precautions and general instructions in this manual and also in the SKF manual *"Safety and general instructions for lubrication systems."* Failure to follow these instructions could result in serious injury or damage to the lubrication system or the equipment that is lubricated.

Note! Incorrect use of the lubrication system or improper settings and adjustments of the system may cause damage to the machine or equipment that is lubricated.

1 General

Note! These instructions apply to progressive, single-channel lubrication systems with internal control.
Type code of the pumping unit: SKF-EPUMP-XX-XXX-24-P.
See also manual *"SKF Electrical Barrel Pumping Unit"*.

Note! All progressive, multi-channel lubrication systems require an external SKF control center.

Figure 1 Pumping unit SKF-EPUMP-XX-XXX-24-P

2 Technical specifications

Operating voltage	20-32 V DC
Power consumption	5A max when the pumping is on 0.1A max when the pumping unit is switched on, pumping is off and heating is off. 2A max when pumping is off and heating is on. Peak current 12A, 100 ms max when pumping starts.
Fuse	Resettable fuse, 4A, on the circuit board
Control input	20-32VDC, 12mA max Galvanic isolation from operating voltage
Lubricant barrel low level switch	2-wire, inductive sensor in ECO models. Mechanical switch in STA models.
Electrical connections	6-pole cable with 0.75mm² wires 3 m in length for connecting power, control input and alarm output. The cable includes a detachable IP67 connector. 4-pole M12 connector for connecting the pressure switch input and the valve output
Display	Yellow LED, 5 pcs, for parameter and status display Green LED, indicates pumping status. Red LED, indicates alarm
Operating buttons	Operation button on pumping unit cover Configuration button on the circuit board inside the cover
Pressure control	Integrated pressure sensor, 0-250 bar. Pressure level is adjustable between 50-240 bars in 25 bar intervals. Switching hysteresis is adjustable between 0-40 bars in 5 bar intervals.
Alarms	Alarm is indicated by red LED and alarm output: - Lubricant barrel low level alarm - Lubrication system alarms - High temperature alarm
Alarm output	Potential free contact, 30V / 0.5A max.
Valve output	20-32VDC /2A. When the pumping is on the valve control can be used to control the pneumatic valve of the spray.
Pulse sensor input	The input is compatible with 2-wire inductive sensor. 16V / 12 mA supply to the sensor. (pulse sensor)
Heater	40W/24V, Heater resistor for pumping elements in ECO models
EMC standards	EN61000-6-4, EN61000-6-2

3 Connections

The pumping unit is delivered with a 3 m, 6-pole cable that has a detachable connector. The cable is connected to the main connector X1 on the circuit board EP-Co.

Wire color 6-pole cable	**Signal**	**Pin of X1 on circuit board**
Black	Supply voltage, +24VDC	**1**
White	Supply voltage, 0V	**2**
Blue	Control input, +24VDC	**3**
Green	Control input, 0V	**4**
Brown	Alarm output	**5**
Yellow	Alarm output	**6**

Wire color M12 cable	**Pin in M12 connector**	**Signal**	**Pin of X7 on circuit board**
White	2	Valve control output +24V	7
Blue	3	Valve control output 0V	8
Brown	1	Pulse sensor input, +	9
Black	4	Pulse sensor input, -	10
		Internal use (heating)	11
		Internal use (heating)	12

The control input of the pumping unit can be used as the interlocking input. When 24V is connected to the interlocking input, lubrication interval counting is prevented.

The alarm output is a relay contact that is closed in normal mode and open in alarm mode. Possible sources of an alarm are lubricant barrel low level alarm, pulse alarm and high temperature alarm.

The pulse sensor input is compatible with 2-wire inductive sensor.

The valve output can be used to control the external pneumatic valve in the spray lubrication system. The output is operational when the pumping is on.

Figure 2 Circuit board, EP-Co

4 Operation modes

4.1 General

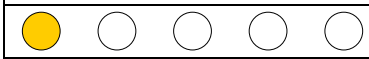
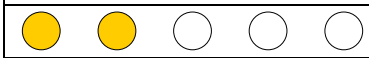
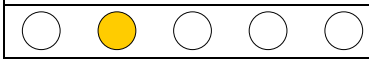
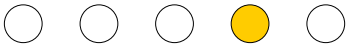
The pumping unit can be configured for different operation modes depending on the application.

The main categories are:

- Operation modes 1 – 2: Pumping unit for automatic lubrication system
- Operation mode 3: Manual lubrication pump
- Operation modes 4 – 7: Stand-alone lubrication unit

The mode is set in factory according to the application. The operation mode can be changed, *see paragraph 7.1, Setting the operation mode.* Yellow LEDs display the selected mode for 2 seconds, when the pumping unit is switched on.

Table 1 Operation mode display at power up

LED display	Selected operation mode
	1: SKF-EPUMP-XX-XXX-24-CC
	2: SKF-EPUMP-XX-XXX-24-CC
	3: SKF-EPUMP-XX-XXX-24-LU
	4: SKF-EPUMP-XX-XXX-24-P
	5: SKF-EPUMP-XX-XXX-24-1
	6: SKF-EPUMP-XX-XXX-24-1
	7: SKF-EPUMP-XX-XXX-24-1

4.2 Operation mode 4: Lubrication system implemented with progressive feeders

4.2.1 General

The pumping unit operates as an independent lubrication unit in a system which is implemented with progressive feeders.

The pumping unit has three settable parameters for the control:

- Lubrication cycle
- Maximum pressurization time
- Pulse count from the external pulse sensor

The parameters can be selected from two parameter tables, G or R. The table is selected according to *paragraph 7.2, Selecting lubrication parameter table.*

The selected table is indicated when the pumping unit is switched on.

- When table **G** is selected, the green LED is lit for about two seconds
- When table **R** is selected, the red LED is lit for about two seconds

The tables below show the values that can be set for the parameters. Each of the three parameters can be set separately.

Table 2 Lubrication parameters, when table **G** is selected

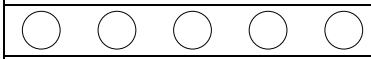
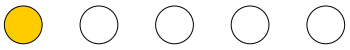
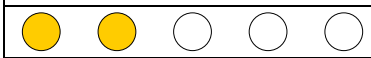
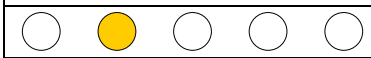
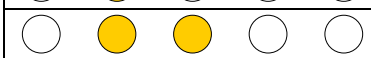
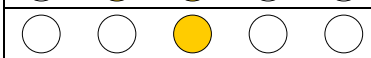
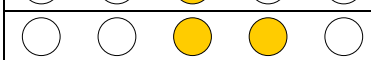
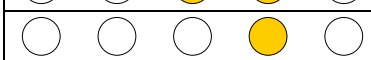
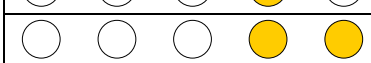
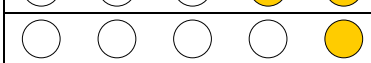
LED display	**Lubrication cycle [min]** 	**Max pressurization time [min]** 	**Pulse count** 
	2	1	0
	5	2	1
	10	3	2
	20	4	4
	30	5	6
	40	6	8
	50	7	10
	60	8	12
	90	9	14
	120	10	16

Table 3 Lubrication parameters, when table **R** is selected

LED display	Lubrication cycle [min]	Max pressurization time [min]	Pulse count
○ ○ ○ ○ ○	30	5	0
● ○ ○ ○ ○	60	10	2
● ● ○ ○ ○	120	20	5
○ ● ○ ○ ○	180	25	10
○ ● ● ○ ○	240	30	15
○ ○ ● ○ ○	300	35	20
○ ○ ● ● ○	360	40	30
○ ○ ○ ● ○	540	45	50
○ ○ ○ ● ●	720	50	100
○ ○ ○ ○ ●	1440	60	200

4.2.2 Setting the parameters

Note! Incorrect use of the lubrication system or improper settings and adjustments of the system may cause damage to the machine or equipment that is lubricated.

Setting the lubrication cycle

Press the operation button until the **green** LED starts to blink (5 s). Select the new value by pressing the operation button. Exit the settings mode by pressing the operation button until the green LED stops blinking (5 s).

Setting the maximum pressurization time

Press the operation button until the **red** LED starts to blink (10 s). Select the new value by pressing the operation button. Exit the settings mode by pressing the operation button until the red LED stops blinking (5 s).

Setting the pulse count

Press the operation button until the **red and green** LEDs start to blink (15 s). Select the new value by pressing the operation button. Exit the settings mode by pressing the operation button until the red and green LEDs stop blinking (5s).

4.2.3 Lubrication operation

Interval counting

The pumping unit pressurizes at intervals that are set using the parameter lubrication cycle. When the interval is counted, the green LED is lit and the yellow LEDs show the elapsed interval time.

For example, if the lubrication cycle is set to 60 min and 30 min (50%) of the interval have elapsed, the display is shown as below:

When the interval is completed, the pumping unit starts pressurizing. The interval counter is reset at the beginning of each pressurization sequence.

An extra pressurization sequence can be started by pressing the operation button. Pressurization will then start immediately and the interval counter is reset.

The counted interval is saved in the memory every 15 minutes. If a power break occurs, the counting of the lubrication interval is resumed from the last saved value.

Pressurization

When pressurization is in progress, the green LED is blinking and the yellow LEDs show the elapsed pressuring time.

For example, if the maximum pressurization time is set to 10 min and 5 min (50%) have elapsed, the display is shown as below:

When the pulse count has been reached the pumping unit stops and the program starts interval counting.

If the pulse count has been set to 0, pressurization stops when the maximum pressurization time has elapsed. Pulse input is not considered.

The pressurization can be interrupted by pressing the operation button.

4.2.4 Alarms

The relay output is open in alarm mode in operation mode 4.

Pulse alarm

If the set pulse count is not reached during the set maximum pressurization time, an alarm is triggered. The red LED starts to blink and the alarm output is activated. The alarm is acknowledged with the operation button or by switching the power OFF and ON again. A new pressurization sequence is started after the acknowledgement.

If the pulse count is set to 0, pulse alarm is no longer possible.

Note!	If the pulse alarm continues despite acknowledgement or if it repeats, it may be because the piping is damaged or the distributor is blocked. In this case the lubrication points get no lubrication.

Low level alarm

If the low level switch of the lubricant barrel is activated during pressurization, a low level alarm is triggered. The red LED is lit and the alarm output is activated. The alarm is acknowledged with the operation button or by switching the power OFF and ON again. A new pressurization sequence is started after the acknowledgement.

High temperature alarm

If a high temperature alarm is triggered, pumping is switched OFF and the alarm output is activated. The red and green LEDs start blinking. The alarm switches off automatically when the temperature drops 5 degrees below the alarm trip temperature.

5 Pressure control

5.1 General

When the pressurization is in progress, the output pressure is controlled by an integrated pressure sensor and a set pressure limit. When the pressure rises above the set limit, pumping stops. Pumping is restarted when the pressure drops below the pressure limit minus the set hysteresis.

5.2 Setting the parameters

Note!	Incorrect use of the lubrication system or improper settings and adjustments of the system may cause damage to the machine or equipment that is lubricated.

There are two parameters that can be set for pressure control:

- pressure limit
- hysteresis

Exceptionally switch on the power of the pumping unit while the unit is open. The pressure settings mode can be accessed by pressing the configuration button on the circuit board. *Refer to Figure 2* **(→ page 4)**.

	**Caution**	The motor may start rotating during configuration and cause injury.

	**Caution**	The surface of the motor might be hot.

Note!	Only the configuration button may be touched to avoid damage to other components on the circuit board.

5.2.1 Displaying and setting pressure limit

Press the configuration button on the circuit board for about 5 seconds. Release the button when the green LED starts to blink fast. The set value is now displayed by pressure LEDs.

A new value can be set by pressing the configuration button. Each time the button is pushed, the set value increases by one step (25 bar). When the maximum value (240 bar) has been reached, the set value resets to the minimum value.

Exit the settings mode by pressing the configuration button until the green LED stops blinking.

5.2.2 Displaying and setting hysteresis

Press the configuration button for about 10 seconds. Release the button when the **red** LED starts to blink fast. The set value is now displayed by pressure LEDs.

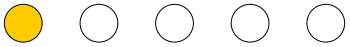
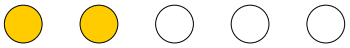
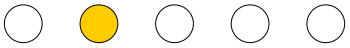
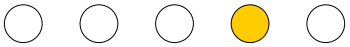
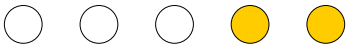
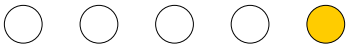
A new value can be set by pressing the configuration button. Each time the button is pushed, the set value increases by one step (5 bar). When the maximum value (40 bar) has been reached, the set value resets to the minimum value.

Exit the settings mode by pressing the configuration button until the red LED stops blinking.

5.2.3 Display in settings mode

The yellow LEDs indicate the parameter values. S*ee the table below.*

Table 4 Pressure settings display

LED display	**Pressure limit [bar]** 	**Hysteresis [bar]** 
	50	0
	75	5
	100	10
	125	15
	150	20
	175	25
	200	30
	225	35
	240	40

5.3 Pressure display

Note!	The output pressure is not displayed in special operation modes 4 - 7.

6 Adjusting run time of the pumping unit

Note!	Incorrect use of the lubrication system or improper settings and adjustments of the system may cause damage to the machine or equipment that is lubricated.

6.1 General

It is possible to drop the pump's rotation speed per minute by setting the parameter *Duty cycle* to less than 100 %. The pump runs 1/4 of a revolution (0.4 s) and stops for a delay that depends on the set parameter. The duty cycle is set as a percent value. The default setting of the parameter is 100 %. In this case, the pumping unit runs continuously when pumping is switched on.

Exceptionally switch on the power of the pumping unit while the unit is open. The duty cycle setting mode can be accessed by pressing the configuration button on the circuit board. *Refer to Figure 2* **(→ page 4)**.

	**Caution** The motor may start rotating during configuration and cause injury.

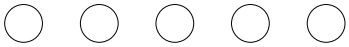
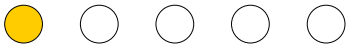
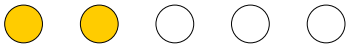
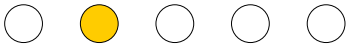
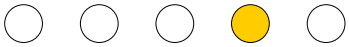
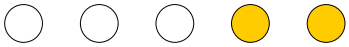
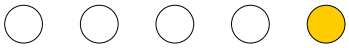
	**Caution** The surface of the motor might be hot.

Note!	Only the configuration button may be touched to avoid damage to other components on the circuit board.

6.2 Displaying and setting duty cycle

Press the configuration button on the circuit board for about 15 seconds. Release the button when the green and red LEDs start to blink fast. The set value is now displayed by the yellow LEDs.

Table 5 Duty cycle display

LED display	Setting
	Setting 10 %: run time 0.4 s, delay 3.6 s
	Setting 20 %: run time 0.4 s, delay 1.6 s
	Setting 30 %: run time 0.4 s, delay 0.9 s
	Setting 40 %: run time 0.4 s, delay 0.6 s
	Setting 50 %: run time 0.4 s, delay 0.4 s
	Setting 60 %: run time 0.4 s, delay 0.3 s
	Setting 70 %: run time 0.4 s, delay 0.2 s
	Setting 80 %: run time 0.4 s, delay 0.1 s
	Setting 90 %: run time 0.4 s, delay 0.04 s
	Setting 100 %: runs continuously

A new value can be set by pressing the configuration button. Each time the button is pushed, the set value increases by one step (10 %). When the maximum value (100 %) has been reached, the set value resets to the minimum value (10 %).

Return from the settings mode by pressing the configuration button until the green and red LEDs stop blinking.

7 Setting the operation configuration

Note!	Incorrect use of the lubrication system or improper settings and adjustments of the system may cause damage to the machine or equipment that is lubricated.

The user can set the operation mode of the pumping unit and the lubrication parameter table. Exceptionally switch on the power of the pumping unit while the unit is open. The configuration settings mode can be accessed by pressing the configuration button on the circuit board. *Refer to Figure 2* **(→ page 4)**.

	**Caution** The motor may start rotating during configuration and cause injury.

	**Caution** The surface of the motor might be hot.

Note!	Only the configuration button may be touched to avoid damage to other components on the circuit board.

7.1 Setting the operation mode

Press the configuration button on the circuit board when the power of the pumping unit is switched ON. Release the button when any of the yellow LEDs is lit.

The yellow LEDs show the selected operation mode. Change the mode by pressing the configuration button. Exit the settings mode by switching the power OFF.

Table 6 Operation mode display

LED display	Selected operation mode
● ○ ○ ○ ○	1: SKF-EPUMP-XX-XXX-24-CC
● ● ○ ○ ○	2: SKF-EPUMP-XX-XXX-24-CC
○ ● ○ ○ ○	3: SKF-EPUMP-XX-XXX-24-LU
○ ● ● ○ ○	4: SKF-EPUMP-XX-XXX-24-P
○ ○ ● ○ ○	5: SKF-EPUMP-XX-XXX-24-1
○ ○ ● ● ○	6: SKF-EPUMP-XX-XXX-24-1
○ ○ ○ ● ○	7: SKF-EPUMP-XX-XXX-24-1

7.2 Selecting the lubrication parameter table

Press the configuration button on the circuit board when the power of the pumping unit is switched ON. Hold the button down and release it only when the red or green LED lights up (5s).

One of two parameter tables can be selected in configuration: **G** or **R**. *See tables in paragraph 4.2 .*

Change the table by pressing the configuration button. The green LED indicates that table G has been selected (**G**reen). The red LED indicates that table R has been selected (**R**ed). Exit the settings mode by switching the power OFF.

7.3 Displaying the configuration

The selected operation mode and parameter table are displayed for 2 seconds when the pumping unit is switched on.

- The yellow LEDs indicate the operation mode, *see*. *Table 6.*
- When parameter table **G** has been selected, the green LED is lit for about two seconds.
- When parameter table **R** has been selected, the red LED is lit for about two seconds.

8 Heating control

A heater resistor is located on the base plate of the pumping element in the ECO models. The heating control and the temperature sensor are located on the circuit board. The heating is on when the pumping is off and the temperature on the circuit board is below 25°C.

9 Factory settings

The pumping unit is delivered with settings customized for the customer or the default factory settings. In the case of customized settings, these are detailed in a separate document delivered with the pumping unit.

Table 7 Pumping unit, type SKF-EPUMP-XX-XXX-24-P, factory settings

Setting	**Default value**
Operation mode	4
Lubrication parameter table	Table G
Pressure level	240 bar
Pressure hysteresis	10 bar
Lubrication cycle	2 min
Maximum pressurization time	1 min
Pulse count	2

10 Contact information

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