# Reliable safety in explosive environments

SKF CircOil EEX Portfolio for use in gas- and dust-Ex-atmospheres

# Cooling, lubricating and particle removal with one system

**SKF CircOil systems circulate oil to lubricate and cool bearings in many industrial applications. They also efficiently remove dirt, water and air particles. This cooling effect becomes especially important in explosive atmospheres.**

**Friction, wear and contamination can lead to overheating and bearing failures. This creates a potential ignition source and risc zone.**

**This is why SKF offers a range of CircOil EEX components and systems that help to ensure reliable safety in your operations. All products were designed to provide a high degrees of safety in gas- and dust-Ex-atmospheres.**

## Reliable operation in challenging environments

Combustible gases, mists, vapours or dusts in the air can create explosive atmospheres. Combined with an ignition source such as an overheated bearing can lead to disastrous explosions with significant damages, injuries or even loss of life.

The European ATEX Directive 2014/34/EU specifies product requirements and intended use to assure safe operations in potentially explosive atmospheres. To comply entirely with the European Directive SKF products are specifically designed, analysed for potential ignition sources and undergo extensive testing.

### Application areas with explosive gas or dust:

- Oil and gas industry
- Energy generation
- Chemical and pharmaceutical industries
- Food and beverage
- Agriculture
- Wastewater
- Marine
- Heavy industry
- Machine tool industry
- Wood industry

## Modular lubrication system to meet customer requirements

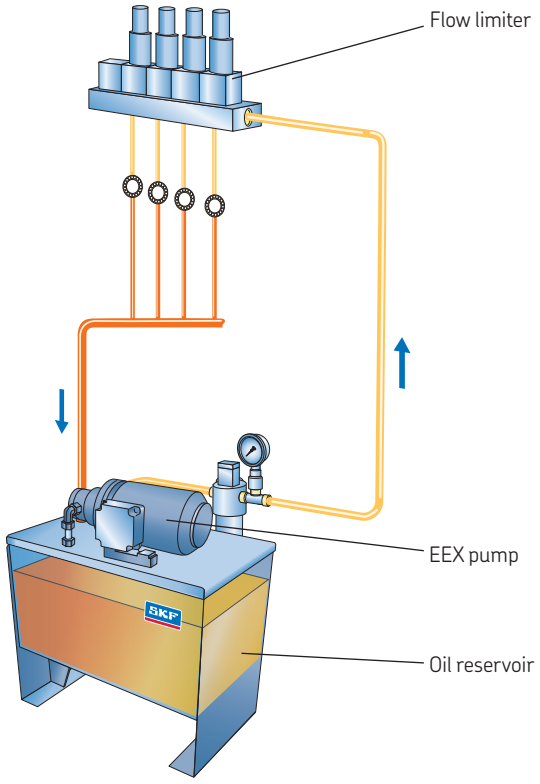
The SKF CircOil lubrication solutions provide new opportunities to increase profitability by reducing costs to operate machinery, improving reliability and safety, extending service intervals and optimizing manpower resources.

SKF CircOil EEX systems include a wide range of customized and turnkey solutions for flow rates from 0,1–3 000 l/min. They are simple to service and feature a modular design that can be easily expanded. Our patented tank design with the SKF plate separator technology increases operating efficiency to up to 90%. Flow rates can be controlled visually or electronically. Monitoring systems are available for a predictive maintenance approach.

## Benefits:

- Safe operation in explosive environments
- Efficient cooling and lubrication
- Increased machine reliability and reduced downtime
- Many customizable solutions available
- Demand-based distribution of lubricant
- Effective visual and electronic monitoring options
- Prolonged oil life thanks to patented air-removal design
- Reduced oil purchasing, handling and disposal costs

**Typical layout of an oil-circulation system**



# Proofed for use in explosive atmospheres

## Global engineering support

SKF CircOil EEX systems provide lubrication and cooling capabilities. They can be tailor-made and comply with local safety regulations and environmental contraints.

The design is done by our SKF Application Engineers, providing you with the knowledge of a market leader. Decades of experience in oil circulation systems and ATEX solutions assure you safe operation of your machinery. Our engineers design products that solve real, every-day customer problems. As a result, we understand the challenges of your industry and advice you on the right lubrication solution. With this we help you to make processes safer and increase operating efficiency.

## Full range of lubrication services

- SKF Lubrication Management
- Audits and lubrication consulting
- Lubricant analysis and testing
- Return-on-investment (ROI) calculations
- Application and system engineering
- System installation, supervision and start-up
- Service of existing SKF automatic lubrication systems
- Training

ATEX

SKF has developed many of our products specifically for use in potentially explosive atmospheres. We meet requirements including the European Union Directive 2014/34/EU. To comply with this so-called "ATEX"-Directive, we follow both the requirements for electrical and non-electrical equipment according to the related EN standards. Furthermore, we can provide some products in which all electrical parts have IECEx certification.

Most products are available for explosion group IIC/IIIC (flammable vapors and gases) and equipment protection level (EPL) Gb/Db (see IEC / EN 60079-0).

**ATEX code** II 2 G c IIB T5 Gb

**European Explosion Protection Mark ATEX**

**Equipment group**

**II** = Non-mining

**Equipment category**

**2** = High protection
**3**= Normal protection

**Gas or Dust**

**G** = Gas; Zones 0; 1; 2
**D** = Dust; Zones 20; 21; 22

**Protection method**

**c** = constructional safety (EN13463-5)

**Gas / Dust group**

**Gas: I** = Methane; **IIA** = Propane; **IIB** = Ethylene; **IIC** = Hydrogen
**Dust: IIIA** = combustible flyings; **IIIB** = non-conductive dust; **IIIC** = conductive dust

**Temperature class***

**T1** = 450 °C; **T2** = 300 °C; **T3** = 200 °C; **T4** = 135 °C; **T5** = 100 °C; **T6** = 85 °C;
**TX** = maximum surface temperature depends on operating conditions (e.g. oil temperature)

**Equipment Protection Level (EPL)**

**Gb** = high protection for zones 1 + 2; **Gc** = normal protection zone 2
**Db** = high protection for zones 21 + 22; **Dc** = normal protection zone 22

**Example:**
**II 2G c IIB T5 Gb**

- Non-mining
- High protection
- Gas
- Constructional safety
- Ethylene
- Temperature 100 °C
- High protection for zones 1 + 2

* maximum surface temperature

# Gerotor pump series 143 EEX

The 143 EEX product series has been specifically designed for centralized lubrication systems in explosive environments. It offers a high degree of protection in a gas or dust explosive atmosphere.

The 143 EEX series is a complete pumping unit solution including pump, motor, coupling and sealing all according to ATEX requirements. It is based on the well-proven and established SKF 143 gerotor pump series.

The 143 EEX is a self-priming positive-displacement pump with high efficiency. It feeds the lubricating oil from a reservoir into the pipe system of an oil lubrication system.

## Features and benefits:

- Reliable and safe operation in explosive environments (Zone 1, 2, 21, 22)
- Low volumetric flow pulsation allows very smooth running
- Gerotor with a cycloid contour provides optimum suction characteristics
- Low noise during operation
- Large viscosity range for standard mineral and synthetic lubricating and hydraulic oils
- Compact design with pump, motor, coupling and seal
- Customizable solution
- Durable and rugged gerotor pump unit designed and manufactured in Germany

## Explosion protection:

ATEX

- **ATEX II 2G c IIC T4 Gb**
- **ATEX II 2D c IIIC T120°C Db**

IECEx (motor only)

- **Ex de IIC T4 Gb**
- **Ex tb IIIC T120°C Db**

**Table 1**

**Technical data**

| | | |
|---|---|---|
| Lubricant | standard mineral, synthetic lubricating and hydraulic oils | |
| Viscosity | 20–1000 mm²/s | |
| Flow range | 0,85–50 l/min | *0.22–13 gal/min* |
| Operating pressure | up to 50 bar | *up to 725 psi* |
| Operating temperature | 0 to +40 °C | *+32 to 104 °F* |
| Lubricant temperature | 0 to +60 °C | *+32 to 140 °F* |
| ATEX classification for gas | II 2G c IIC T4 Gb | |
| ATEX classification for dust | II 2D c IIIC T120°C Db | |

**Further information**

| | |
|---|---|
| Brochure | **17345 EN** |
| Assembly instructions | **951-180-074** |

You can download the publications as PDF file from the SKF website **skf.com/143**

Online configurable under **skf-lubrication.partcommunity.com**

**Order code** 1 4 3 – 2 _ F _ _ _ _ – _ E + _ _ _

**Product series 143EEX**

**Model design**
**1** = Motor in foot design (IMB34)
**2** = Motor in flange design (IMB14)

**Seal design**
**F** = FKM

**Code for pump design**
(→ **table 2**)

**Terminal box position** as seen from shaft extension of drive side
**R** = Right (standard); **O** = Top;
**X** = On motor in flange design (IMB14), terminal box position on suction port side of pump

**Motor certification**
**E** = ATEX; IECEx

**Voltage code**
(→ **table 3**)

**Table 2**

**Code for pump design**

| Code | Nominal delivery rate | | Back pressure max. | | Motor drive power | Permissible operating viscosity | Frame size | Number of poles |
|---|---|---|---|---|---|---|---|---|
| – | l/min | *gal/min* | bar | *psi* | kW | mm²/s | – | – |
| **B03D** | 0,85 | *0.22* | 30 | *435* | 0,25 | 20–1000 | 71 | 4 |
| **D03E** | 1,70 | *0.45* | 30 | *435* | 0,37 | 20–1000 | 71 | 2 |
| **F02D** | 2,50 | *0.66* | 20 | *290* | 0,25 | 20–1000 | 71 | 4 |
| **F05F** | 2,50 | *0.66* | 50 | *725* | 0,55 | 20–1000 | 80 | 4 |
| **H02F** | 5,25 | *1.39* | 20 | *290* | 0,55 | 20–1000 | 80 | 4 |
| **H05J** | 5,25 | *1.39* | 50 | *725* | 1,10 | 20–1000 | 90 | 4 |
| **K02H** | 9,00 | *2.38* | 20 | *290* | 0,75 | 20–1000 | 80 | 4 |
| **K05K** | 9,00 | *2.38* | 50 | *725* | 1,50 | 20–1000 | 90 | 4 |
| **M02H** | 12,50 | *3.30* | 20 | *290* | 0,75 | 20–1000 | 80 | 4 |
| **M05L** | 12,50 | *3.30* | 50 | *725* | 2,20 | 20–1000 | 100 | 4 |
| **P02L** | 19,00 | *5.02* | 20 | *290* | 2,20 | 20–1000 | 100 | 4 |
| **R02M** | 30,00 | *7.93* | 20 | *290* | 3,00 | 20–1000 | 100 | 2 |
| **R03M** | 30,00 | *7.93* | 30 | *435* | 3,00 | 20–750 | 100 | 2 |
| **R03N** | 30,00 | *7.93* | 30 | *435* | 4,00 | 20–1000 | 112 | 2 |
| **T02M** | 40,00 | *10.57* | 20 | *290* | 3,00 | 20–750 | 100 | 2 |
| **T03N** | 40,00 | *10.57* | 30 | *435* | 4,00 | 20–1000 | 112 | 2 |
| **V02N** | 50,00 | *13.21* | 20 | *290* | 4,00 | 20–1000 | 112 | 2 |
| **V03N** | 50,00 | *13.21* | 30 | *435* | 4,00 | 20–750 | 112 | 2 |
| **V03P** | 50,00 | *13.21* | 30 | *435* | 5,50 | 20–1000 | 132 | 2 |

**Table 3**

**Voltage code**

| Code | Motor power |
|---|---|
| **+1GP** | 220 / 380 V, 50Hz ; 255 / 440 V, 60 Hz |
| **+1GD** | 230 / 400 V, 50 Hz; 265 / 460 V, 60 Hz |
| **+1GQ** | 240 / 415 V, 50 Hz; 280 / 480 V, 60 Hz |
| **+1HQ** | 290 / 500 V, 50 Hz; 330 / 575 V, 60 Hz |
| **+1GH** [1)] | 380 / 660 V, 50 Hz; 440 V, 60 Hz |
| **+1GK** [1)] | 400 / 690 V, 50 Hz; 460 V, 60 Hz |
| **+1GL** [1)] | 415 V, 50 Hz, Δ; 480 V, 60 Hz, Δ |
| **+1KG** [1)] | 400 V, 50 Hz, Δ; 460 V, 60 Hz, Δ |
| **+1GF** | 200 / 345 V, 50 Hz |
| **+1GG** | 200 / 345 V, 60 Hz |
| **+MDP** | 220 / 380 V, 60 Hz |
| **+1GR** | 230 / 400 V, 60 Hz |

1 Motor power P ≥ 5,5 kW

# SKF CircOil EEX – Metering devices

## Flow limiters, product series SP/SMB

Flow limiters EEX are designed for use in oil circulation lubrication systems in explosive atmospheres. The task of a flow limiter is to divide the volumetric flow of the main line into parallel individual quantities, to "limit" these according to the required volumes and to keep the flow constant.

The volumetric flow generated is independent of the system pressure and nearly independent of viscosity. Temperature or pressure changes therefore do not effect the cooling capabilities of the system. The required volumes are always delivered to the lubrication points.

SKF flow limiters feature a simple and compact construction using interchangeable plug-in nozzles to change the volumes. This also makes subsequent adjustments possible. The volumetric flow in explosive environments can be monitored with a static signal transmitter or visually and electrically with a rotary gear indicator.

### Features and benefits:

- Reliable and high degree of safety
- For gas and dust Ex atmospheres
- Self-adjusting metering, stable flows
- Effective monitoring of flow
- Wide range of operation up to 100 l/min
- System pressures 5–200 bar
- Visual and electronic monitoring options
- Mounting plate and filter options
- Wide viscosity range
- Virtually independent of temperature and viscosity
- Pressure compensated
- Easy system design and start-up
- Space-saving layout
- Many customization options

### Explosion protection:

- **ATEX II 3c II C T6**
- **ATEX II 2G c T4 Gb**
- **ATEX II 2G c TX Gb**
- **ATEX II 2D c TX Db**

**Further information**

Assembly instructions **951-180-072**

You can download the publications as PDF file from the SKF website
**skf.com/flowlimiters**

**Table 4**

**Overview flow limiters**

| Product | Flow rate | | Pressure range | | ATEX class | Monitoring options | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Signal transmitter | Rotary gear indicator | Base plate option |
| | l/min | *gal/min* | bar | *psi* | – | | | |
| **SP/SMB 3** | 6–38 | *1.58–10.04* | 5–200 | *72.5–2 900* | II 3 c II C T6 | • | | |
| **SP/SMB 6** | 25–100 | *6.6–26.42* | 5–200 | *72.5–2 900* | II 3 c II C T6 | • | | |
| **SP/SMB 8** | 0,1–8 | *0.02–2.11* | 5–200 | *72.5–2 900* | II 3 c II C T6 | • | | • |
| **SP/SMB 10** | 0,1–8 | *0.02–2.11* | 7–50 | *101–725* | II 2 G c T4 Gb | | • | • |
| **SP/SMB 9** | 0,1–8 | *0.02–2.11* | 6–50 | *87–725* | II 2 D c TX Db<br>II 2G c TX Gb | | • | • |
| **SP/SMB 13** | 6–38 | *1.58–10.04* | 6–50 | *87–725* | II 2 D c TX Db<br>II 2G c TX Gb | | • | |
| **SP/SMB 14** | 25–100 | *6.6–26.42* | 6–50 | *87–725* | II 2 D c TX Db<br>II 2G c TX Gb | | • | |

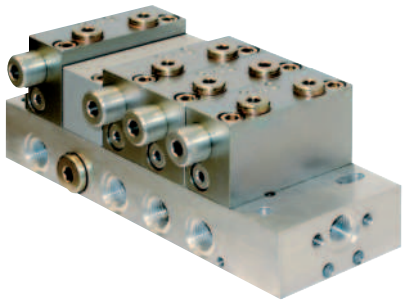
# Progressive metering devices

SKF progressive metering devices can be used individually or in combination with SKF flow limiters. They are used to meter the correct amount of oil in oil-circulation systems. In combination with SKF flow limiters, progressive metering devices dispense a precise, metered amount of oil to up to 150 lubrication points over distances of over 100 m *(109 yd)*.

SKF has adapted the well-proven designs of VPB, VPK, VP and PSG product series for use in explosive atmospheres.

## Features and benefits:

- Block or modular divider options
- Up to 20 outlets per metering block
- Internal and external crossporting of outlets possible
- Visual or electric monitoring options
- Expandable by attaching flow limiters, gear type flow indicators, inductive proximity switches
- Reliable and safe operation in explosive atmospheres
- Easy system design
- Large product offering from robust, cost-effective to many customizable options



## Explosion protection:

- **ATEX II 2G c IIC T4 Gb**
- **ATEX II 2D c IIIC T135°C Db**

**Further information**

Catalogue **16964**

You can download this and other publications as PDF file from the SKF website
**skf.com/progressive-metering**

**Table 5**

**Overview progressive metering devices**

| Product | Design | Metering quantity | | Number of outlets | Max. operating pressure | | ATEX class[1] | Monitoring options | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Indicator pin | Proximity switch | Signal transmitter | Rotary gear indicator |
| | | $cm^3$/stroke | *$in^3$/stroke* | – | bar | *psi* | – | | | | |
| **VPB** | block | 0,2 | *0.01* | 6–20 | 300 | *4 350* | II 2G c IIC T4 Gb[1]<br>II 2D c IIIC T135°C Db[1] | • | • | | |
| **VPK** | modular | 0,05–0,6 | *0.003–0.037* | 6–20 | 300 | *4 350* | | • | • | | |
| **VP** | modular | 0,10–1,2 | *0.006–0.073* | 6–20 | 300 | *4 350* | | • | • | | |
| **PSG1** | modular | 0,05–0,25 | *0.003–0.015* | 6–20 | 200 | *2 900* | | • | • | | |
| **PSG2** | modular | 0,06–0,84 | *0.003–0.051* | 6–20 | 200 | *2 900* | | • | • | • | • |
| **PSG3** | modular | 0,80–3,20 | *0.049–0.195* | 6–20 | 200 | *2 900* | | • | • | • | • |

1) applicable for all progressive metering devices

**Important information on product usage**
SKF and Lincoln lubrication systems or their components are not approved for use with gases, liquefied gases, pressurized gases in solution and fluids with a vapor pressure exceeding normal atmospheric pressure (1 013 mbar) by more than 0,5 bar at their maximum permissible temperature.

**skf.com | skf.com/lubrication**



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