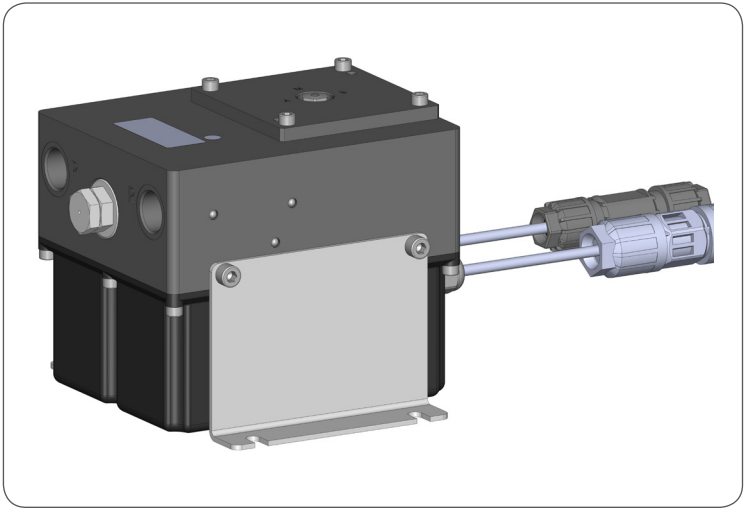
Installation instructions
following machinery directive 2006/42/EC

EN

Electromotive change-over device/ Electromotive way valve Series EM-U3/ WS-E



Version 03

LINCOLN

SKF

EC Declaration of incorporation following machinery directive 2006/42/EC, annex II, part 1 B

The manufacturer, SKF Lubrication Systems Germany GmbH, Walldorf Facilities, Heinrich-Hertz-Str. 2-8, DE - 69190 Walldorf, hereby declares that the partly completed machinery

Designation: Electromotive change-over device/ electromotive way valve
Type: EM-U3 / WS-E
Part number: EM-U3-XXXXX-X / WS-E-XXXXX-X
Year of construction: See type identification plate
complies with the following basic safety and health requirements of the EC machinery directive 2006/42/EC at the time when first being launched in the market.

1.1.2, 1.1.3, 1.3.2, 1.3.4, 1.5.1,·1.5.6, 1.5.8, 1.5.9, 1.6.1, 1.7.1, 1.7.3, 1.7.4

The special technical documents were prepared following Annex VII part B of this directive. Upon justifiable request, these special technical documents can be forwarded electronically to the respective national authorities. The person empowered to assemble the technical documentation on behalf of the manufacturer is the head of standardization, See manufacturer's address.

Furthermore, the following directives and harmonized standards were applied in the respective applicable areas:
2011/65/EU RoHS II
2014/30/EU Electromagnetic compatibility | Industry

Standard	Edition	Standard	Edition	Standard	Edition	Standard	Edition
DIN EN ISO 12100	2011	DIN EN 60947-5-1	2010	DIN EN 61000-6-2	2006	DIN EN 61000-6-4	2011
DIN EN ISO 809	2012	DIN EN 61131-2	2008	Amendment	2011		
DIN EN 60204-1	2007	Amendment	2009	DIN EN 61000-6-3	2011		
Amendment	2010	DIN EN 60034-1	2015	Amendment	2012		
DIN EN ISO 50581	2013	DIN EN 61000-6-1	2007				

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the previsions of machinery directive 2006/42/EC and any other applicable directives.
Walldorf, 2016/04/20

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Legal disclosure

The instructions following machinery directive 2006/42/EC are part of the described products and must be kept at an accessible location for further use.

Warranty

The instructions do not contain any information on the warranty. This can be found in our general terms and conditions.

Copyright

Manufacturer

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Table of contents

Explanation of symbols and signs

You will find these symbols, which warn of specific dangers to persons, material assets, or the environment, next to all safety instructions in these operating instructions. Please read these instructions thoroughly and heed the warning and safety notes. Please observe the warning and safety notes and exercise particular caution in these cases. Inform also other users accordingly.

Warning level		Consequence	Probability
	DANGER	Death/ serious injury	imminent
	WARNING	Serious injury	possible
	CAUTION	Minor injury	possible
	ATTENTION	Property damage	possible

Symbol	Meaning
●	Prompts an action
○	Used for itemizing
☞	Refers to other facts, causes, or consequences
→	Provides additional information within procedures

Symbols	
Symbol	Meaning
	General warning
	Electrical component hazard Electrical shock hazard
	Slipping hazard
	Hazard from hot surfaces
	Hazard from unintentional intake
	Crushing hazard
	Pressure injection hazard
	Wear personal protective equipment (goggles)
	Note
	Environmentally sound disposal recycling
	Environmentally sound disposal of waste electrical and electronic equipment

Abbreviations and conversion factors

Abbreviations

re.	regarding	oz.	Ounce
approx.	approx.	psi	pounds per square inch
°C	degrees Celsius	rh	relative humidity
cu.in	cubic inch	s	second
dB (A)	sound pressure level	sq.in.	square inch
i.e.	that is	etc.	et cetera
etc.	et cetera	e.g.	for example
poss.	possibly	>	greater than
°F	degrees Fahrenheit	<	less than
fl.ou	fluid once	±	plus or minus
fpsec	feet per second	Ø	diametre
gal.	gallon	mph	miles per hour
if appl.	if applicable	rpm	revolutions per minute
hp	horse power		
a.a.r.	as a rule		
in.	inch	Conversion factors	
incl.	including	Length	1 mm = 0.03937 in.
K	Kelvin	Area	1 cm^2 = 0.155 sq.in
kg	kilogram	Volume	1 ml = 0.0352 fl.oz.
kp	kilopond		1 l = 2.11416 pints (US)
kW	kilowatt	Mass	1 kg = 2.205 lbs
l	litre		1 g = 0.03527 oz.
lb.	pound	Density	1 kg/cm^3 = 8.3454 lb./gal(US)
max.	maximum		1 kg/cm^3 = 0.03613 lb./cu.in.
min.	minimum	Force	1 N = 0.10197 kp
min	minute	Speed	1 m/s = 3.28084 fpsec.
ml	millilitre		1 m/s = 2.23694 mph
ml/d	millilitre per day	Acceleration	1 m/s^2 = 3.28084 ft./s^2
mm	millimetre	Pressure	1 bar = 14.5 psi
N	Newton	Temperature	°C = (°F-32) x 5/9
Nm	Newtonmeter	Output	1 kW = 1.34109 hp

1. Safety instructions

1.1 General safety instructions

Safety information is to be read and observed by any persons entrusted with works on the product or by those persons who supervise or instruct the before-mentioned group of persons. In addition, the owner must also ensure that the relevant personnel are fully familiar with and have understood the contents of the Instructions.
The Instructions must be kept at hand together with the product for future reference. The Instructions are part of the product and must accompany the product when selling it.
The described products were manufactured according to the state of the art.
Risks may, however, arise from its usage and may result in harm to persons or damage to material assets.
Any malfunctions which may affect safety must be remedied immediately. In addition to these Instructions, general statutory regulations and other regulations for accident prevention and environmental protection must be observed.

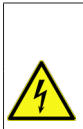
1.2 General behaviour when handling the product

- The product may only be used in awareness of the potential dangers, in proper technical condition, and according to the information in these instructions.
- Technical personnel must familiarize themselves with the functions and operation of the product. The specified assembly and operating steps and their sequences must be observed.
- Any unclear points regarding proper condition or correct assembly/ operation must be clarified. Operation is prohibited until issues have been clarified.
- Unauthorized persons must be kept away.
- Precautionary operational measures and instructions for the respective work must be observed.
- Responsibilities for different activities must be clearly defined and observed. Uncertainty seriously endangers safety.
- Safety-related protective and emergency devices must not be removed, modified or affected otherwise in their function and are to be checked at regular intervals for completeness and function.
- If protective and safety equipment has to be dismantled, it must be reassembled immediately after finishing the work, and then checked for correct function.
- Remedy occurring faults in the frame of the responsibilities. Immediately inform your superior in the case of faults beyond your competence.
- Wear personal protective equipment always.
- When handling lubricants, adhere to the respective safety data sheets.

1.3 Qualified technical personnel

Only qualified technical personnel may install, operate, maintain, and repair the products described in this document.
Qualified technical personnel are persons who have been trained, assigned, and instructed by the operator of the final product. Such persons are familiar with the relevant standards, rules, accident prevention regulations, and assembly conditions as a result of their training, experience, and instruction. They are qualified to carry out the required activities and in doing so recognize and avoid any potential hazards. The definition of qualified personnel and the prohibition against employing non-qualified personnel are laid down in DIN VDE 0105 and IEC 364.
Relevant country-specific definitions of qualified technical personnel apply for countries outside the scope of DIN VDE 0105 or IEC 364.
The core principles of these country-specific qualification requirements for technical personnel cannot be below those of the two standards mentioned above.
The operator of the final product is responsible for assigning tasks and areas of responsibility and for the responsibility and monitoring of the personnel. These areas must be precisely specified by the operator.
The personnel must be trained and instructed if they do not possess the required knowledge.
Product training can also be performed by SKF in exchange for costs incurred.

1.4 Electric current hazard



WARNING

Electric shock

Working on products not disconnected from the power supply may cause personal injury and damage to property.

Assembly, maintenance, and repair works may be performed by qualified and authorized personnel only on products previously disconnected from the power supply.

Electrical connection may be carried out only by a qualified electrician authorized by the operator under consideration of the local connection conditions and legal prescriptions (e.g. VDE/ IEC).

1.5 System pressure hazard

WARNING

System pressure

The product is pressurized during operation. It must be depressurized before starting assembly, maintenance, or repair works.

1.6 Operation

The following must be observed during commissioning and operation.

- All information within this manual and the information within the referenced documents.
- All laws and regulations that the operator must observe.
- The instructions of the superior machine.
- All further relevant documentation on safe operation.

1.7 Assembly, maintenance, malfunctions, shutdown, disposal

- All relevant persons (e.g., operating personnel, supervisors) must be informed of the activity prior to starting any work. Precautionary operational measures and work instructions must be observed.
- Ensure through suitable measures that movable or detached parts are immobilized during the work and that no limbs can be caught in between by inadvertent movements.
- Assemble the product only outside of the operating range of moving parts, at an adequate distance from sources of heat or cold.
- Prior to performing work, the product and the machine or system in which the product is or will be integrated must be depressurized and secured against unauthorized activation.
- Carry out all works on electrical components using voltage insulated tools only.
- Ensure proper grounding of the product.
- Undertake drilling at non-critical, non-load bearing parts only.
- Fuses must not be bypassed. Always replace fuses by such of the same type.
- Other units of the superior machine must not be damaged or impaired in their function by the installation of the product.
- No parts of the centralized lubrication system may be subjected to torsion, shear, or bending.
- Use adequate lifting devices when working with heavy components.
- Avoid mixing up or wrong assembly of disassembled parts. Mark these parts accordingly.

1.8 Intended use

EM-U3
The electromotive change-over device EM-U3 has been designed for changing over SKF Duoflex dual-line systems by keeping to the technical data and conditions stated in these Instructions.
WS-E
The electromotive way valve EM-U3 has been designed as a shut-off and way valve for SKF Duoflex dual-line systems by keeping to the technical data and conditions stated in these Instructions.

1.9 Foreseeable misuse

Any usage of the product differing from the aforementioned conditions and stated purpose is strictly prohibited. Particularly prohibited are:

- Use in an explosive atmosphere
- Use to feed, forward, or store hazardous substances and mixtures in accordance with annex I part 2-5 of the CLP regulation (EC 1272/2008)
- Use to feed, forward, or store gases, liquefied gases, dissolved gases, vapours, or fluids whose vapour pressure exceeds normal atmospheric pressure (1013 mbar) by more than 0.5 bar at the maximum permissible operating temperature.

1.10 Disclaimer of liability

The manufacturer shall not be held responsible for damages caused by:

- inappropriate usage
- wrong or improper assembly, electrical connection
- wrong control by the operator's PLC controller
- contaminated or unsuitable lubricants
- improper or late response to malfunctions
- unauthorized modification of system components
- the installation of non-original components or spare parts

1.11 Referenced documents

In addition to these Instructions, the following documents must be observed by the respective target group:

- Operational instructions and approval rules
- Instructions of the end-of-line pressure switch unit
- Safety data sheet (MSDS) of the lubricant or material used
- If applicable, project planning documents and other relevant documents

The operator must supplement these documents with the relevant applicable national regulations of the country of use. When selling or forwarding the product, make sure to attache these Instructions to it.

1.12 Residual risks

Residual risks	Remedy
Life cycle — transport, assembly, start-up, operation, malfunction, troubleshooting, repair, maintenance, shutdown, disposal	
Dropping of lifted parts or tools	○ No people may remain under suspended loads. Keep unauthorized persons away. Secure suspended loads using suitable hoisting equipment (e.g. tapes, belts, ropes, etc.).
Falling of parts through insufficient fixing to the machine	○ Fix parts only to machine parts with sufficient load capacity. Observe the weight. Observe the stated tightening torques. If no tightening torques are stated, the tightening torques are to be applied to the screw size for 8.8 screws. Literature, see screw manufacturer.
Electrical shock due to defective connection cable	○ Check connection cable for damages.
People slipping due to floor contamination with spilled or leaked lubricant	○ Be careful when connecting or disconnecting hydraulic connections ○ Promptly apply suitable binding agents to remove the leaked or spilled lubricant ○ Follow the operational instructions for handling lubricants and contaminated parts
Tearing or damaging of lines when installed on moving machine parts	○ If possible, do not install on moving parts. If this cannot be avoided, use flexible hose lines
Ripping out/ damage to lines at chafing points or due to assembly with too little bending radius	○ Use protective pipes or spring coils
Lubricant spraying out due to faulty component fitting or line connection	○ Use suitable hydraulic screw connections and lines for the stated pressures. Check these prior to commissioning for correct connection and damage.
Loss of electrical protective functions due to faulty installation of the control pcb	○ After the installation carry out a safety check following DIN EN 60204-1 (conduct and scope of test, see Service instructions 951-151-000)

2. Lubricants

2.1 General information

ATTENTION

All products may be used only for their intended purpose and in accordance with the Instructions.

Intended use is the use of the products to lubricate bearings and friction points with lubricants within the physical limits that can be found in the relevant product documentation, e.g. operating instructions and product descriptions, e.g. technical drawings and catalogues.
Particular attention is called to the fact that hazardous materials of any kind, especially those materials classified as hazardous byCLP Regulation EC 1272/2008 annex I, part 2-5 may only be filled into SKF centralized lubrication systems and components and delivered and/ or distributed with such systems and components after consulting with and obtaining written approval from SKF.

All products manufactured by SKF are not admitted for use in combination with gases, liquefied gases, dissolved gases, vapours, or fluids whose vapour pressure exceeds normal atmospheric pressure (1013 mbar) by more than 0.5 bar at the maximum permissible operating temperature.
Other material which is neither lubricant nor hazardous substance may be fed only after consultation with and written approval by SKF.
SKF considers lubricants to be an element of system design that must always be factored when selecting components and designing a centralized lubrication system. The lubricating properties of the lubricants are critically important when making these selections.

2.2 Selection of lubricants

ATTENTION

Observe the instructions from the machine manufacturer regarding the lubricants to be used.
The amount of lubricant required at the lube point is specified by the bearing or machine manufacturer. It must be ensured that the required lubricant volume is provided to the lubrication point. Otherwise the lubrication point may not receive adequate lubrication, which can lead to damage and failure of the bearing.

Selection of a lubricant suitable for the lubrication task is made by the machine or system manufacturer and/or the operator of the machine or system in cooperation with the lubricant supplier.
When selecting a lubricant, the type of bearings or friction points, the expected load during operation, and the anticipated ambient conditions must be taken into account. All economic and environmental aspects must also be considered.

2.3 Approved lubricants

ATTENTION

If required SKF can help customers to select suitable components for feeding the selected lubricant and to plan and design their centralized lubrication system.

Please contact SKF if you have further questions regarding lubricants. It is possible for lubricants to be tested in the company's laboratory for their suitability for being pumped in centralized lubrication systems (e.g. "bleeding").
You can request an overview of the lubricant tests offered by SKF from the company's service department.

ATTENTION

Only lubricants approved for the product may be used. Unsuitable lubricants can lead to failure of the product and to property damage.

ATTENTION

Different lubricants must not be mixed. Doing so may cause damage and require costly and complicated cleaning of the product or lubrication system. It is recommended that an indication of the lubricant in use be attached to the lubricant reservoir in order to prevent accidental mixing of lubricants.

The product described here can be operated using lubricants that meet the specifications in the technical data. Depending on the product design, these lubricants may be oils, fluid greases, or greases.
Mineral, synthetic, and/or rapidly biodegradable oils and base oils can be used. Consistency agents and additives may be added depending on the operating conditions.
Note that in rare cases there may be lubricants whose properties are within permissible limit values but whose other characteristics render them unsuitable for use in centralized lubrication systems. For example, synthetic lubricants may be incompatible with elastomers.

2.4 Lubricants and the environment

ATTENTION

Lubricants may pollute ground and waters. Lubricants have to be handled and disposed of properly. Observe the instructions from the machine manufacturer regarding the lubricants to be used.

It is important to note that lubricants are environmentally hazardous, flammable substances that require special precautionary measures during transport, storage, and processing. Consult the safety data sheet from the lubricant manufacturer for information regarding transport, storage, processing, and environmental hazards of the lubricant that will be used.
The safety data sheet of a lubricant may be requested from the lubricant manufacturer.

2.5 Lubricant hazard

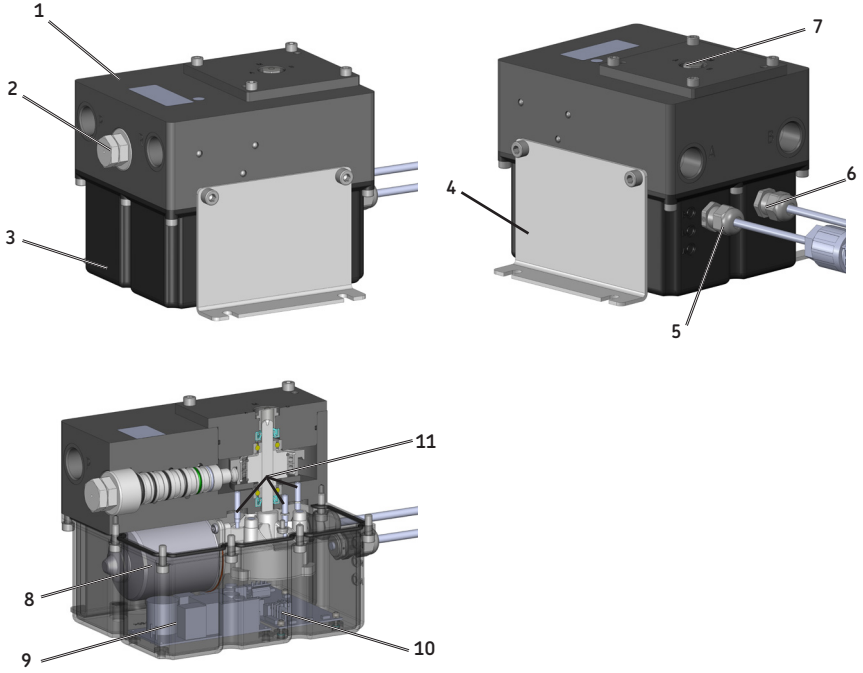
WARNING

Risk of slipping and injury
Leaking lubricant is hazardous due to the risk of slipping and injury. Seal leaks without delay and remove spilled or leaked lubricant.

3. Overview, functional description

1	Change-over housing
2	Change-over cartridge with oil bleed bore
3	Housing cover
4	Retaining plate, right and left side
5	Electrical input
6	Electrical output
7	Position indicator of change-over cartridge (below protective cap)
8	Motor
9	Power supply board (only 230 V AC)
10	Control printed circuit board
11	Magnetic sensors for monitoring of the three switch positions of the change-over cartridge

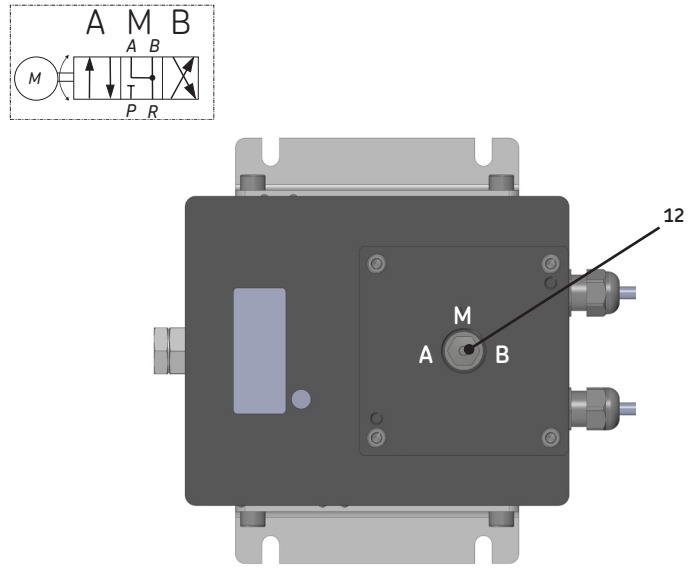
Overview Fig. 1



3.1 Brief description EM-U3

The EM-U3 is compact powerful. electro-motive
change-over device for SKF DuoFlex dual-line systems.
Each of the 3 possible switch positions A, M and B is detected precisely by its own magnetic sensor. In the middle position M lines A and B can be relieved from pressure during the pause time via return line R. This increases the lubrication system's compo-nents' life thanks to lower pressure load and reduces the bleeding of the lubricant.
The current position of the change-over cartridge is indicated by the position of the notch (12) on the axis of the eccentric. To be able to see the display, first of all the plastic protection screw must be screwed off. There are available two versions, a 24 V DC and a 230 V AC version.
Furthermore, a WS-E version is available as a shut-off and way valve.

Change-over cartridge in position M Fig. 2



3.2 Brief description WS-E

Due to the factory-set closure of certain outlet ports, the WS-E can be used as a reliable and powerful shut-off and way valve. Here the middle position M cannot be used.

Fig. 7a
3/2 way valve
Port B closed

Fig. 7b
3/2 way valve
Port R closed

Fig. 7c
2/2 way valve
Ports B and R closed

Brief description WS_E Fig. 3

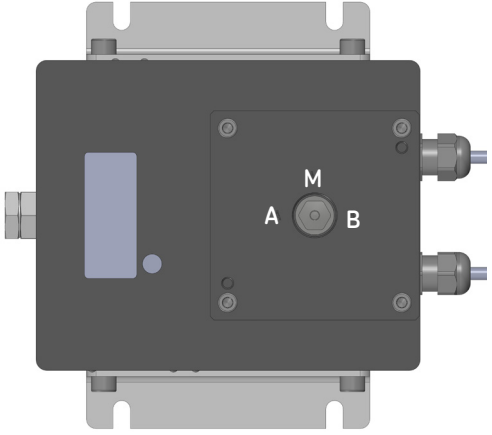


Fig. 7a

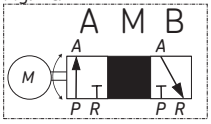


Fig. 7b

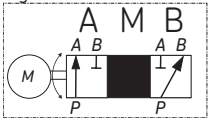
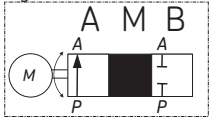


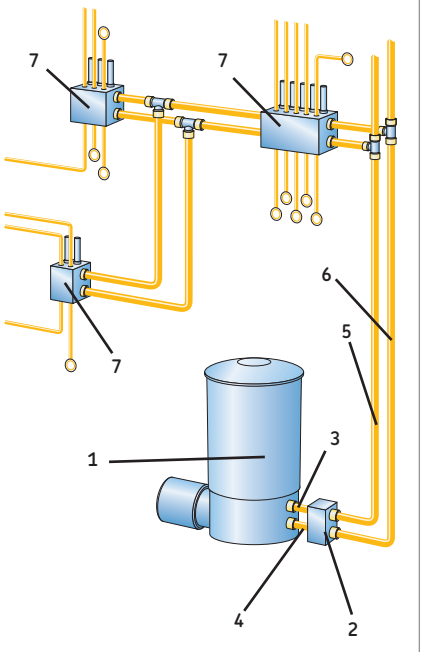
Fig. 7c



3.3 General system description

Normally, an SKF Duoflex dual-line system consists of the following components: pump unit (1) with pressure reducing valve, electromotive change-over device (2) EM-U3 resp. way valve WS-E to connect pressure line P (3), relief line R (4) and the two main lines A (5) and B (6).
Downstream SKF Duoflex metering devices (7) are integrated in the main lines for distribution/ metering of the flow rate.

System description Fig. 4



3.4 EM-U3 as a replacement of EM-U2

If EM-U3 shall be used as a replacement of EM-U2, observe the following points:

- If the PLC controller is not adapted to the extended scope of functions of the EM-U3, the EM-U3 can be operated with the scope of functions of the EM-U2 only. Then the function of the middle position M for pressure relief of lines A and B is not available.
- The hydraulic connections must be modified due to the changed connection diameters and the positions of the connections on the EM-U3.
- Electrical connections must be provided following the connection diagrams in these instructions.

For assembly of the EM-U3 as a replacement of an EM-U2 proceed as follows:

- De-pressurize and de-energize the superior machine/system and protect it against unauthorized connection, e.g. by means of a padlock.
- Mark work area accordingly and keep unauthorized persons away.
- Disconnect electrical connections of the EM-U2 on the device.
- Disconnect hydraulic connections of the EM-U2 on the device.
- Disassemble and remove the EM-U2.
- If applicable, prepare the mounting place of the EM-U3, e.g. clean it.
- Provide fastening bores for assembly of the EM-U3. Make sure not to damage existing lines and components, when doing so.
- Position the EM-U3 and fix it by screws. (see connection dimensions).
- Modify hydraulic connection lines accordingly and connect the EM-U3 hydraulically.
- Connect the EM-U3 electrically. (see connection diagrams).
- Put superior machine into operation again.
- Carry out the function control of the EM-U3 as described in these instructions.
- Dispose of the EM-U2 in an environmentally sound manner.

4. Technical data

4.1 General technical data

Admissible operating temperature	-20 °C to +70 °C
Operating pressure	400 bar max.
Flow rate	400 l/h max.
Line connections	4 x G3/4
Installation position	any
Change-over time	5 sec max.
Minimum distance between 2 switching pulses	2 sec min.
Sound pressure level	< 70 dB (A)
Weight	24 V DC approx. 12 kg 230 V AC approx. 13 kg
Lubricants	NLGI I and NLGI III grease

A small amount of lubricant leaking from the leak bore of the change-over cartridge is normal and does not represent a defect of the product.

4.2 Electrics

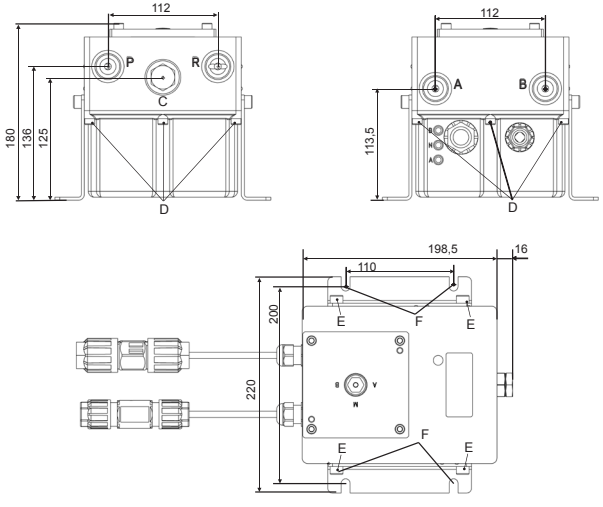
	24 V DC	230 V AC
Operating voltage	24 V DC ± 10 %	230 V AC ± 10 %
Current consumption	2.1 A max.	0.23 A max.
Power consumption	50 W max.	50 W max.
External fuse protection	6 A (T)	None, protected internally with 2 A (T)
IP type of protection	65	
Protection classes	SELV, PELV, FELV	
Inputs	protected against reverse polarity, short circuit proof, non-isolated	
Power consumption	20 W	20 W
Length of connection cable (with cable cross section 1.0 mm^2)	14 m	35 m
Length of connection cable (with cable cross section 1.5 mm^2)	20 m	50 m
Length of connection cable (with cable cross section 2.0 mm^2)	28 m	70 m
Length of connection cable (with cable cross section 2.5 mm^2)	35 m	100 m
Cable cross sections	min. 1.0 mm^2 up to max. 2.5 mm^2	
Connecting plug	Bayonet plug ISO 15170-1	

4.3 Tightening torques and connection dimensions

Adhere to the following tightening torques when installing or repairing the pump.			
Supply lines (A, B, P, R)	120 Nm	±	5 Nm
Lower part of housing with housing (5)	3 Nm	±	0.3 Nm
Fastening lug with housing (E)	15 Nm	±	2 Nm
Control cartridge with housing (C)	20 Nm	±	2 Nm

According to the type of installation (machine or base plate), the EM-U3/ WS-E is fastened by suitable means (e.g. screws, dowels) on the four F points. In case of through holes screws have to be tightened with 25 Nm ± 2 Nm.

Tightening torques and connecting dimensions Fig. 5



4.4 Notes related to the type identification plate

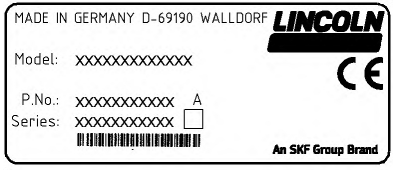
The type identification plate states important characteristics such as type designation, order number, etc.
To ensure that the loss of data due to an illegible type identification plate is avoided, the characteristics should be entered in the Instructions.

Model _____

P. No. _____

Series No. _____

Type identification plate Fig. 6



4.5 Notes related to the CE marking

CE marking is effected following the requirements of the applied directives:

- 2014/30/EU Electromagnetic compatibility
- 2011/65/EU (RoHS II) Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment

Reference on Low Voltage Directive 2014/35/EU
The protective regulations of Low Voltage Directive 2014/35/EU are fulfilled according to annex I (1.5.1) of Machinery Directive 2006/42/EC.

Reference on Pressure Equipment Directive 2014/68/EU
Because of its performance data the product does not achieve the limit values defined in Article 4 (1) (a) (i) and is therefore excluded from the scope of application of Pressure Equipment Directive 2014/68/EU following Article 4 (3).

5. Delivery, returns, and storage

5.1 Delivery

The products are packaged following the standard commercial practice according to the regulations of the recipient's country. During transport safe handling must be ensured.
After receipt of the shipment, the product(s) must be inspected for damage and for completeness according to the shipping documents. Keep the packaging material until any discrepancies are resolved.

5.2 Delivery

Clean all parts and pack them properly before returning them. Protect the product against mechanical influences such as impacts. There are no restrictions for land, sea or air transport. Mark returns on the packaging as follows.

Marking of returns Fig. 7

5.3 Storage

SKF products are subject to the following storage conditions:

- dry and dust-free surroundings, storage in well ventilated dry area
- storage time: 24 months max.
- permissible humidity: < 65% (rh)
- Permissible humidity:
  min. - 25 °C/ max. + 70 °C
- avoid direct sun or UV exposure
- shield product from nearby sources of heat and coldness.

Note

- The product(s) can be wrapped in plastic film to provide low-dust storage.
- Protection against ground moisture by storing on a shelf or wooden pallet.

6. Assembly

6.1 General information

Only qualified technical personnel may install, operate, maintain, and repair the products described in these Instructions.
Qualified technical personnel are persons who have been trained, assigned, and instructed by the operator of the final product, into which the described product shall be integrated.
Such persons are familiar with the relevant standards, rules, accident prevention regulations, and operating conditions as a result of their training, experience, and instruction. They are qualified to carry out the required activities and in doing so recognize and avoid any potential hazards.
Before assembling the product, the packaging material as well as possible transport locking devices must be removed.
Keep the packaging material until any discrepancies are resolved.

Note
Technical data (see chapter 4).

6.2 Attachment

Protect the product against humidity and vibration and install it in an easily accessible position to ensure all other installations can be carried out without any problem. For indications on the maximum admissible ambient temperature see the technical data.
During assembly and during any drilling work always pay attention to the following:

- Other units must not be damaged by the assembly.
- The product must not be installed within the range of moving parts.
- The product must be installed at an adequate distance from sources of heat and coldness.
- Adhere to safety distances and legal prescriptions on assembly and prevention of accidents.

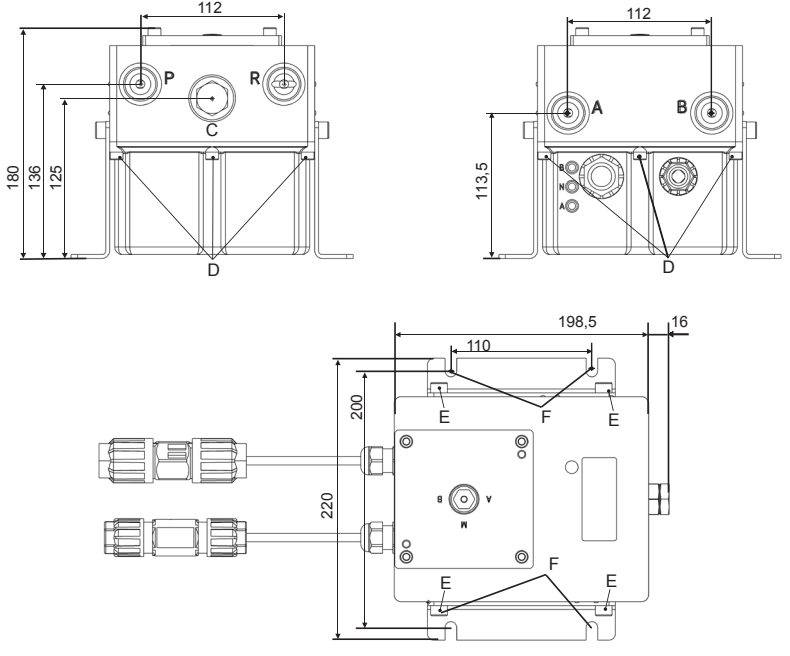
CAUTION

Electric shock
Make sure to disconnect the product from the power supply before carrying out works on any part of it.
Connection of the 24 V DC version must be provided by a safe galvanic isolation (PELV) always.

6.3 Minimum assembly dimensions

Ensure sufficient space for maintenance work or for a possible disassembly of the product by leaving a free space of at least 50 mm into each direction in addition to the stated dimensions.

Minimum assembly dimensions Fig. 8



6.4 Electrical connection

WARNING

Electric shock

The electrical connection may be carried out by commissioned and qualified electricians only and in accordance with the connection diagram. Thereby the local connection conditions and legal prescriptions (e.g. DIN, VDE) have to be observed.

Electrical connections must be done in such way that no forces are transferred to the product (tension-free connection).

NOTE

Observe the electrical characteristics (see chapter 4).

6.5 Assignment of the power supply

Assignment of the power supply Fig. 9

1 = M-IN
2 = B-IN
3 = A-IN
N = Ground
= PE

The required cross section depends on the length of the connection cable and must be:

min.: 1.0 mm^2
max.: 2.5 mm^2

6.6 Assignment of the power supply

Assignment of the control line Fig. 10

1 = Power supply (230 V AC)
(Ground optional 24 V DC)
2 = OUT A
3 = OUT B
4 = OUT M

The two bayonet plugs for the power supply and the control line must correspond to ISO 15170-1.

6.7 How to lay the lubrication lines

When laying the lubrication lines, observe the following information in order to warrant trouble-free function of the entire centralized lubrication system.

Dimension the lubrication line according to the maximum pressure and the output volume of the pump unit used. Starting from the pump unit the main lubrication line should be laid preferably rising with a possibility to vent it at the highest point of the lubrication line system.

Mount the lubricant metering devices at the end of the main lubrication line in such way that the outlets of the lubricant metering devices show upwards. If lubricant metering devices have to be mounted below the main lubrication line, then this should not be done at the end of the main lubrication line.

The tube lines, hoses, shut-off and way valves, fittings, etc. have to be laid out according to the maximum operating pressure of the annular gear unit, the admissible temperatures and the lubricants to be supplied. Furthermore, the lubrication line system must be protected against inadmissibly high pressure.

Before the assembly thoroughly clean all components of the lubrication line system like tube lines, hoses, shut-off and way valves, fittings, etc. In the lubrication line system no seals should protrude towards the inside, as the lubricant flow could be impeded and contaminations could enter the lubrication line system.

Lubrication lines shall generally be laid in such way that there can never be created air pockets at any point. Avoid changing the cross sections of the lubrication line from smaller to larger cross sections in the lubricant flow direction. Design cross section transitions as smooth as possible.

The lubricant flow in the lubrication lines should not be impeded by the installation of sharp elbows, angle valves and check valves. Provide unavoidable changes of the cross sections in the lubrication lines with as smooth transitions as possible. Avoid sudden changes of direction, if possible.

7. Start-up

After correct electrical connection of the control and power supply lines as well as the correct connection of the tube lines commissioning of the EM-U3/WS-E shall be carried out by qualified personnel following the start-up prescriptions of the overall system.

8. Operation, shutdown and disposal

8.1 Operation

The EM-U3/ WS-E operates automatically.

8.2 Temporary shutdown

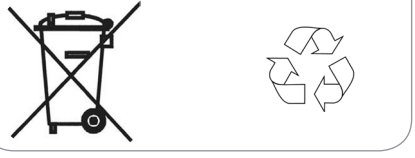
A temporary shutdown of the described products is done following the prescriptions of the overall system by disconnecting the electrical and hydraulic supply connections.

8.3 Shutdown and disposal

In case of final shutdown follow the applicable rules and regulations on disposal. The product can also be returned to the manufacturer for proper disposal, in which case the customer is responsible for reimbursing the costs incurred. The parts are recyclable.
Main materials of the EM-U3:

- Black anodized steel
- Black anodized aluminium
- Plastic, PAMXD-GF50
- Electrical components such as pcb and cables.

Disposal Fig. 11



9. Maintenance, cleaning

9.1 General information

Liability is excluded for any damage or faults arising from inappropriate maintenance, repair or cleaning.

9.2 Maintenance

The EM-U3/ WS-E change-over device is mainly maintenance-free. Still the operator has to determine suitable intervals to check the device for proper function and damages depending on the actual conditions of application.

9.3 Cleaning

Thorough cleaning of all outer surfaces. Do not use aggressive cleaning agents. Interior cleaning is required only in case of accidental use of contaminated lubricant.

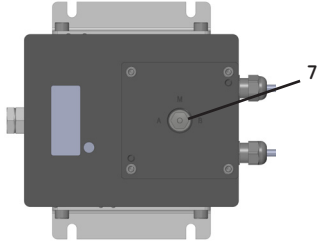
9.4 Check for proper function

- Remove protective screw.
- Trigger control pulse on the PLC controller. The position indication (7) of the change-over cartridge changes correspondingly to the new position.
- Screw in protective screw again.

9.5 Check for damages

- Damages to the housing
- Damages to cables and plugs
- Damages to hydraulic connections and lines.

Position indication Fig. 12



10. Troubleshooting

Mechanical faults on pumps with and without controller

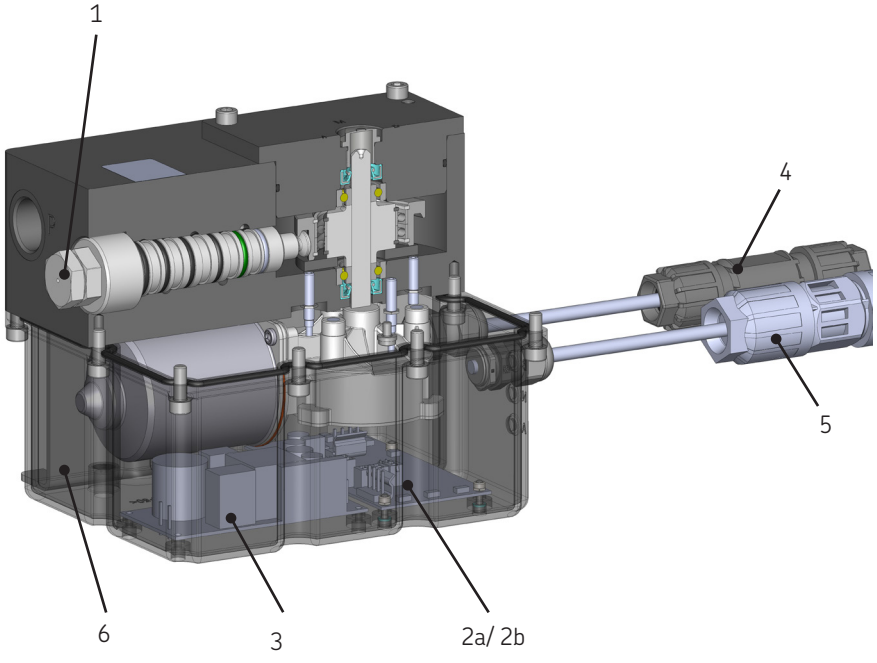
Fault	Possible causes of the fault/ visible	Remedy
No pressurization/ too slow pressurization	Wear on the piston of the change-over cartridge	Grease leaking from the leak grease bore of the change-over cartridge. Replace change-over cartridge.
	Leakage of the line system or of the metering device	Check and replace any defective parts.
No change-over procedure is triggered.	Interruption of the control line	Check electrical lines to and from the EM-U3/ WS-E.
	End-of-line pressure switch does not give any signal	Check end-of-line pressure switch.
Change-over devices runs permanently.	PLC controls the EM-U3/ WS-E wrongly. (more than 1 signal)	Check whether there is more than 1 signal from the PLC pending, if so, correct it.
	Defective position switch of the EM-U3/WS-E	Remove the EM-U3/ WS-E and send it to the manufacturer.

If the fault cannot be determined and remedied, please contact our Customer Service.

11. Spare parts

The spare parts assemblies may be used exclusively for replacement of identical defective parts.
Modifications with spare parts on existing products are not allowed.

Spare parts Fig. 13



1: Change-over cartridge assy.
Part no.: 518-34960-1

2a: Control pcb (24 V DC)
Part no.: 518-34960-2
or
2b: Control pcb (230 V AC)
Part no.: 518-34960-3

3: Power supply board 230 V AC
Part no.: 518-34960-7

4: 5-pole (black) device connection
Part no.: 664-85052-1 (24 V DC)
664-85052-2 (230 V AC)

5: 4-pole (grey) device connection
Part no.: 664-85052-3

6: Plastic housing cover assy.
Part no.: 518-34960-4

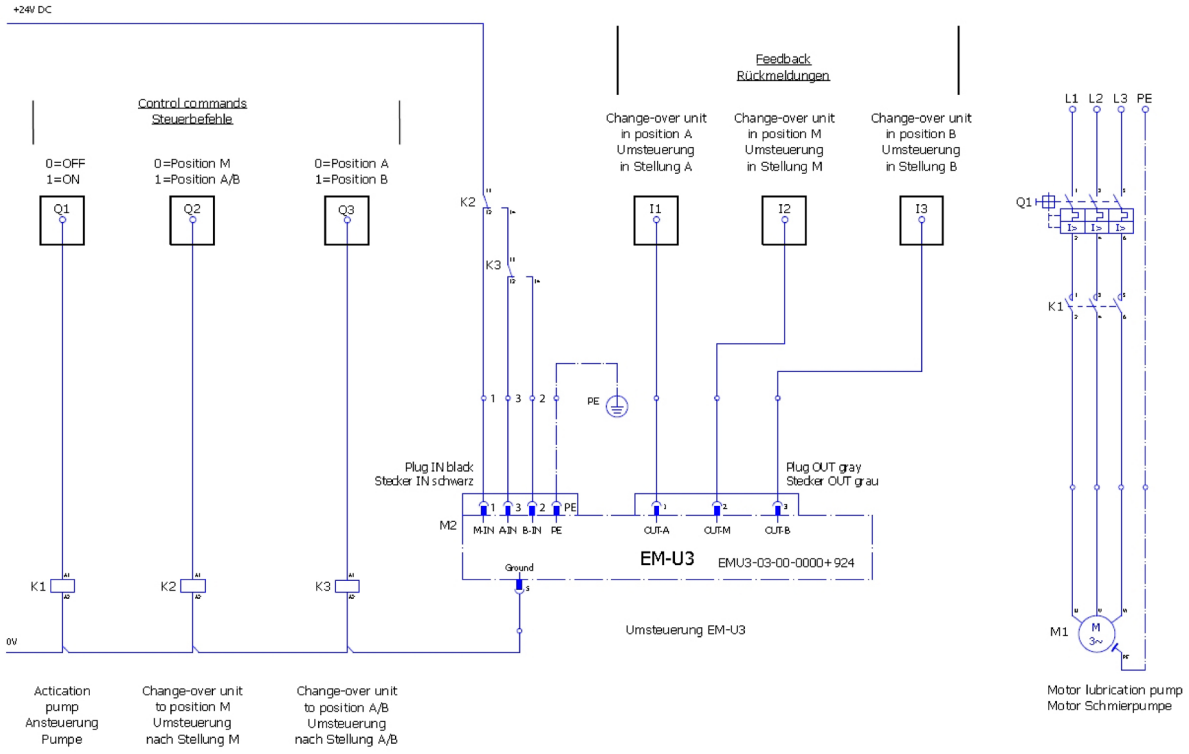
7: Short-time relay
Part no.: 236-13864-2

Order number:	Product description		Hydraulic connections
EMU-03-00-0000+924	EM-U3	24 V DC version	No closed connections
EMU-03-00-0000+1KF	EM-U3	230 V AC version	No closed connections
EMU-22-66-0000+924	WS-E	2/2 way valve 24 V DC version	Connections B and R closed
EMU-22-66-0000+1KF	WS-E	2/2 way valve 230 V AC version	Connections B and R closed
EMU-32-06-0000+924	WS-E	3/2 way valve 24 V DC version	Connection R closed
EMU-32-06-0000+1KF	WS-E	3/2 way valve 230 V AC version	Connection R closed
EMU-32-60-0000+924	WS-E	3/2 way valve 24 V DC version	Connection B closed
EMU-32-60-0000+1KF	WS-E	3/2 way valve 230 V AC version	Connection B closed

12. Circuit diagrams

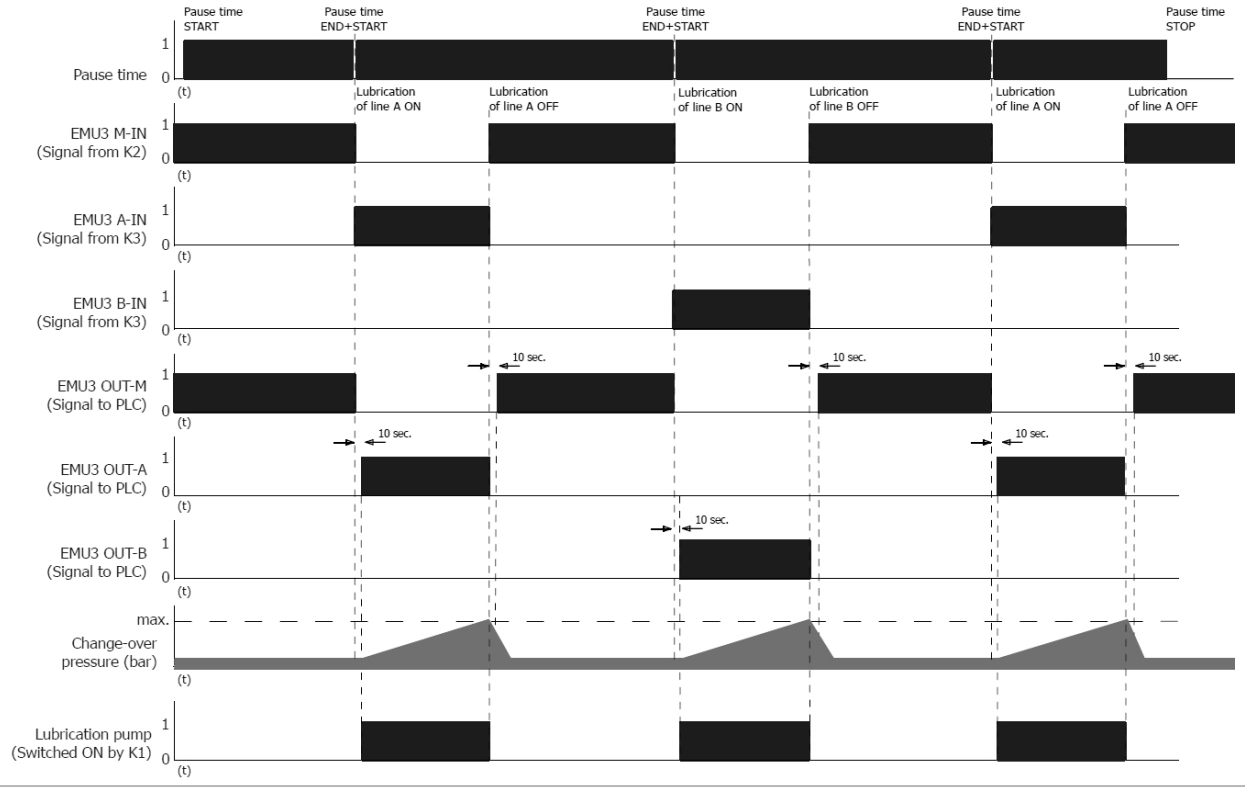
12.1 Circuit diagram EM-U3 24 V DC

Circuit diagram 24 V DC Abb. 14



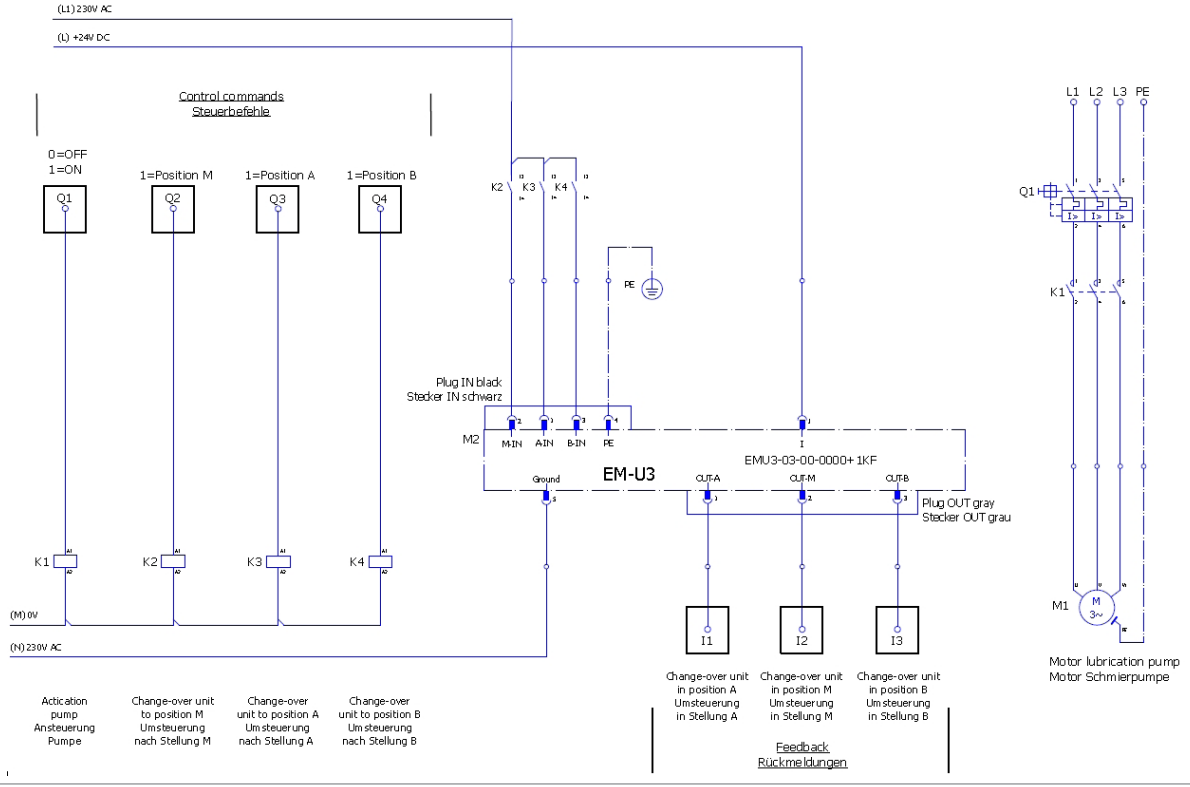
12.2 Flow diagram EM-U3 24 V DC

Signals EM-U3 24 V DC Fig. 15



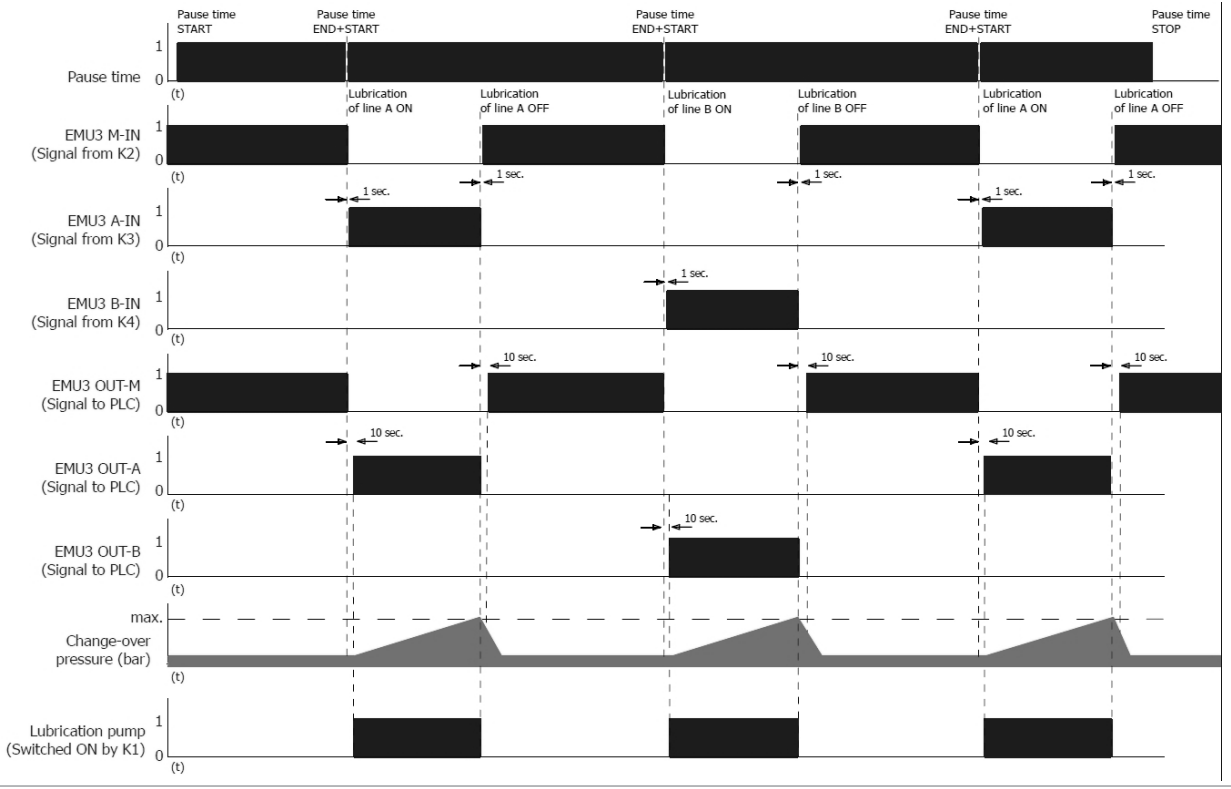
12.3 Circuit diagram EM-U3 230 V AC

Circuit diagram 230 V AC Fig. 16

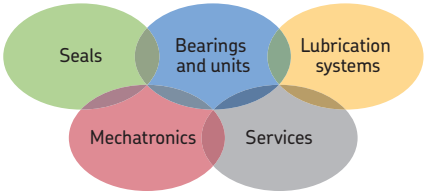


12.4 Flow diagram EM-U3 230 V AC

Signals EM-U3 230 V AC Fig. 17



Notes



The Power of Knowledge Engineering

Drawing on five areas of competence and application-specific expertise amassed over more than 100 years, SKF brings innovative solutions to OEMs and production facilities in every major industry worldwide. These five competence areas include bearings and units, seals, lubrication systems, mechatronics (combining mechanics and electronics into intelligent systems), and a wide range of services, from 3-D computer modelling to advanced condition monitoring and reliability and asset management systems. A global presence provides SKF customers uniform quality standards and worldwide product availability.

Important information on product usage

All products from SKF may be used only for their intended purpose as described in this brochure and in any instructions. If operating instructions are supplied with the products, they must be read and followed.

Not all lubricants are suitable for use in centralized lubrication systems. SKF does offer an inspection service to test customer supplied lubricant to determine if it can be used in a centralized system. SKF 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.

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