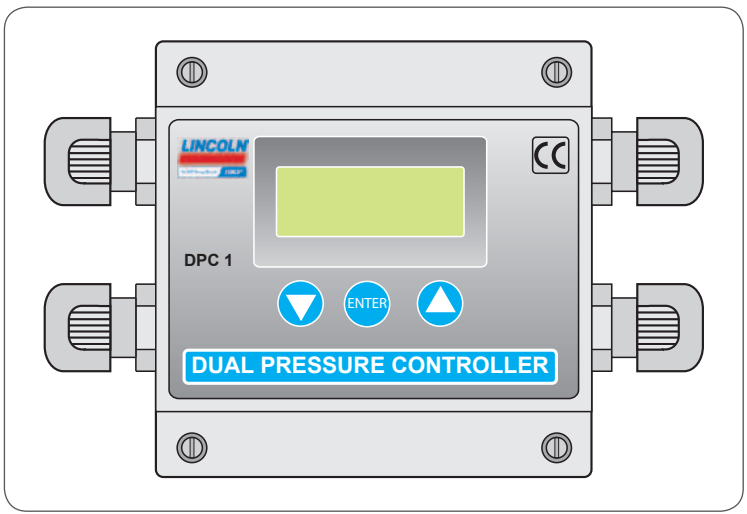
Intelligent End-of-line Pressure Switch Unit DPC1 for DuoFlex Dual-line Systems

Operating Instructions

EN



951-181-004-EN
2019/03/13
Version 05

LINCOLN

SKF

EU Declaration of conformity following EMC directive 2014/30/EU, annex IV

The manufacturer, SKF Lubrication Systems Germany GmbH, Walldorf Facilities, Heinrich-Hertz-Str. 2-8, DE - 69190 Walldorf hereby declares under sole responsibility that the electrical equipment

Designation: Intelligent End-of-line Pressure Switch Unit/Dual Pressure Controller 24 VDC (with and without ADD-ON control pcb)
Type: DPC-1
Part number: 234-xxxxx-x/532-xxxxx-x
Year of construction: See type identification plate

complies with all relevant European Union harmonisation prescriptions at the time when first being launched in the market.

Furthermore, the following directives and harmonized standards were applied in the respective applicable areas:
2011/65/EU RoHS II

Standard	Edition	Standard	Edition	Standard	Edition
EN 61000-6-2	2007-10	EN 61000-6-3	2006-03	EN 50581	2013-02

Walldorf, December 20, 2018

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Legal disclosure

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Training courses
In order to provide a maximum of safety and economic viability, SKF carries out detailed training courses. It is recommended that the training courses are attended. For more information please contact the respective SKF Service address.

Copyright

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

Service address North America
SKF Lubrication Business Unit
Lincoln Industrial
5148 North Hanley Road, St. Louis,
MO. 63134 USA

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

Non appropriate use
faulty assembly, operation, setting, maintenance, repair or accidents

Use of inappropriate lubricants

Improper or late response to malfunctions

Unauthorized modifications of the product

Intent or negligence

Use of non-original SKF spare parts.

Faulty planning or layout of the centralized lubrication system

Liability for loss or damage resulting from the use of our products is limited to the maximum purchase price. Liability for consequential damages of whatever kind is excluded.

Table of contents

Explanation of symbols, signs and abbreviations

The following abbreviations may be used within these instructions. Symbols within safety notes mark the kind and source of the hazard.

General warning	Dangerous electrical voltage	Risk of falling	Hot surfaces
Unintentional intake	Crushing hazard	Pressure injection	Suspended load
Electrostatically sensitive components	Potentially explosive atmosphere		
Wear personal protective equipment (goggles)	Wear personal protective equipment (face shield)	Wear personal protective equipment (gloves)	Wear personal protective equipment (protective clothes)
Wear personal protective equipment (safety shoes)	Disconnect product from mains	General obligation	
Keep unauthorized persons away	Protective earth	Safety extra-low voltage (SELV)	Safe galvanic isolation (SELV)
CE marking	Disposal, recycling	Disposal of waste electrical and electronic equipment	EAC marking

	Warning level	Consequence	Probability
	DANGER	Death, serious injury	imminent
	WARNING	Death, serious injury	possible
	CAUTION	Minor injury	possible
	NOTICE	Property damage	possible

Symbol	Meaning
●	Chronological guidelines
○	Lists
☞	Refers to other facts, causes, or consequences

Fig. 1 Abbreviations and conversion factors

re.	regarding	°C	degrees Celsius	°F	degrees Fahrenheit
approx.	approximately	K	Kelvin	Oz.	ounce
i.e.	that is	N	Newton	fl. oz.	fluid ounce
etc.	et cetera	h	hour	in.	inch
poss.	possibly	s	second	psi	pounds per square inch
if appl.	if applicable	d	day	sq.in.	square inch
a.a.r.	as a rule	Nm	Newtonmeter	cu. in.	cubic inch
incl.	including	ml	millilitre	mph	miles per hour
min.	minimum	ml/d	millilitre per day	rpm	revolutions per minute
max.	maximum	cc	cubic centimetre	gal.	gallon
min.	minute	mm	millimetre	lb.	pound
etc.	et cetera	l	litre	hp	horse power
e.g.	for example	dB (A)	sound pressure level	kp	kilopond
kW	kilowatt	>	greater than	fpsec	feet per second
U	Voltage	<	less than	Conversion factors	
R	resistance	±	plus/minus	Length	1 mm = 0.03937 in.
I	current	Ø	diametre	Area	1 cm^2 = 0.155 sq.in
V	volt	kg	kilogram	Volume	1 ml = 0.0352 fl.oz.
W	watt	rh	relative humidity		1 l = 2.11416 pints (US)
AC	alternating current	≈	approximately	Mass	1 kg = 2.205 lbs
DC	direct current	=	equal to		1 g = 0.03527 oz.
A	ampere	%	per cent	Density	1 kg/cc = 8.3454 lb./gal(US)
Ah	ampere hour	‰	per mille		1 kg/cc = 0.03613 lb./cu.in.
Hz	frequency [Hertz]	≥	greater than	Force	1 N = 0.10197 kp
nc	normally closed contact	≤	less than	Pressure	1 bar = 14.5 psi
no	normally open contact	mm^2	square millimetre	Temperature	°C = (°F-32) x 5/9
N/A	not applicable	rpm	revolutions per minute	Output	1 kW = 1.34109 hp
cu.in	cubic inch	↑	Increases a value	Acceleration	1 m/s^2 = 3.28084 $ft./s^2$
		↓	Reduces a value	Speed	1 m/s = 3.28084 fpsec.
					1 m/s = 2.23694 mph

1. Safety instructions

1.1 General safety instructions

- The owner must ensure that safety information has been read 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. It is prohibited to commission or operate the products prior to reading the instructions
- These instructions must be kept for further use
- The described products were manufactured according to the state of the art. Risks may, however, arise from a usage not according to the intended purpose 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 for accident prevention and environmental protection must be observed

1.2 General behaviour when handling the product

- The product may be used only in awareness of the potential dangers, in proper technical condition, and according to the information in these instructions
- Familiarize yourself 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
- Keep unauthorized persons away
- Wear personal protective equipment always
- 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 safety equipment must not be removed, modified or affected otherwise in its function and is 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 be checked for correct function
- Remedy occurring faults in the frame of responsibilities. Immediately inform your superior in the case of faults beyond your competence
- Never use parts of the centralized lubrication system or of the machine as standing or climbing aids

1.3 Intended use

The intelligent end-of-line pressure switch unit DPC1 serves to control and monitor DuoFlex dual-line systems with non-automatic change-over devices in industrial systems.

- DPC1 24 VDC
  Part number 234-10723-3

- DPC1 24 VDC + ADD-ON
  Part number 532-60519-1

	DPC1	DPC1 + ADD-ON
EMU-2	●	●
EMU-3		●
MP	●	
MA	●	

Detailed information on the use, see chapter 3.1 “Functions of the end-of-line pressure switch unit DPC1“

1.4 Foreseeable misuse

Any usage differing from the one stated in these Instructions is strictly prohibited, particularly a usage:

- outside the indicated temperature range
- in an explosion protection zone
- in combination with automatic change-over devices

1.5 Modifications of the product

Unauthorized conversions or modifications may result in unforeseeable impacts on safety. Therefore, any unauthorized conversions or modifications are expressly prohibited.

1.6 Prohibition of certain activities

Due to potential sources of faults that may not be visible or due to legal regulations the following activities may be carried out by manufacturer specialists or authorized persons only:

- Changes to the control pcb/ the ADD-ON pcb of the DPC1

1.7 Painting of plastic parts

Painting of any plastic parts or seals of the described products is expressly prohibited. Remove or tape plastic parts completely before painting the superior machine

1.8 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

1.9 Inspections prior to delivery

The following inspections were carried out prior to delivery:

- Safety and functional tests

1.10 Other applicable documents

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

- Operational instructions and approval rules
- Safety data sheet of the lubricant used

Where appropriate:

- Project planning documents
- Additional information on special versions. You will find these in the special system documentation
- Any documents of other components required to set up the centralized lubrication system

1.11 Markings on the product

Further to the findings of the workplace risk evaluation the operating company has to attach additional markings (e. g. warnings, signs giving orders, prohibition signs or labelling as specified by GHS), where appropriate.

1.12 Notes related to the type identification plate

The type identification plate states important characteristics such as type designation, order number, and regulatory characteristics.

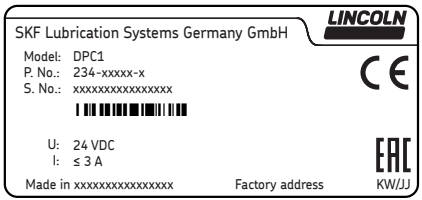
To ensure that the loss of data due to an illegible type identification plate is avoided, the characteristics should be entered in the Instructions.

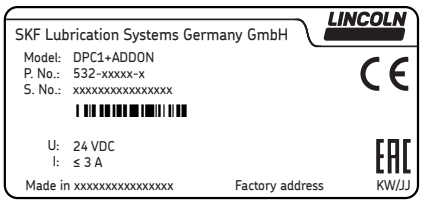
Model: _____

P. No. _____

S. No. _____

(CW/YY) _____
Calendar week/year of construction





1.13 Persons authorized to operate the pump

1.13.1 Operator

A person who is qualified by training, knowledge and experience to carry out the functions and activities related to normal operation. This includes avoiding possible hazards that may arise during operation.

1.13.2 Specialist in mechanics

Person with appropriate professional education, knowledge and experience to detect and avoid the hazards that may arise during transport, installation, start-up, operation, maintenance, repair and disassembly.

1.13.3 Specialist in electrics

Person with appropriate professional education, knowledge and experience to detect and avoid the hazards that may arise from electricity.

1.14 Briefing of external technicians

Prior to commencing the activities, external technicians must be informed by the operator of the company safety provisions, the applicable accident prevention regulations to be maintained, and the functions of the superordinate machine and its protective devices.

1.15 Provision of personal protective equipment

The operator must provide suitable personal protective equipment for the respective location of operation and the purpose of operation.

1.16 Operation

The following must be observed during commissioning and operation:

- Any information within this manual and the information within the referenced documents
- All laws and regulations to be complied with by the user

1.17 Emergency stopping

In case of an emergency stop the pump station by:

- Interrupting the power supply
- Where appropriate, using measures determined by the operator, such as actuating the emergency stop switch of the superior machine

1.18 Transport, installation, maintenance, malfunctions, repair, shutdown, disposal

- All relevant persons must be informed of the activity prior to starting any work. Observe the precautionary operational measures and work instructions
- Prior to performing work, the product and the machine, into which the product will be integrated, must be depressurized and secured against unauthorized activation
- 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. Other units of the machine or vehicle must not be damaged or impaired in their function by the installation
- Dry or cover wet, slippery surfaces accordingly
- Cover hot or cold surfaces accordingly
- Work on electrical components must be carried out by electrical specialists only. Observe any waiting periods for discharging, if necessary
- Carry out works on electrical components only while the system is depressurized and use voltage isolated tools suitable for electrical works only
- Carry out electrical connections only according to the information in the valid wiring diagram and taking the relevant regulations and the local connection conditions into account
- Do not touch cables or electrical components with wet or damp hands
- Fuses must not be bypassed Replace defective fuses always by fuses of the same type
- Ensure proper grounding of the product
- Adhere to any protective measures, e. g. connection of protective conductor, type of protection, safety distances
- Undertake drilling at non-critical, non-load bearing parts only. Use any available boreholes. Do not damage lines and cables when drilling
- Observe possible abrasion points. Protect the parts accordingly

- All components used must be designed according to the maximum operating pressure and the maximum respectively minimum operating temperature
- No parts of the centralized lubrication system may be subjected to torsion, shear, or bending
- Check all parts prior to their usage for contamination and clean, if necessary
- Observe the specified tightening torques. When tightening, use a calibrated torque wrench
- Avoid mixing up or wrong assembly of dismantled parts. Mark these parts accordingly

1.19 Initial commissioning / daily start-up

Ensure that:

- All safety devices are completely available and functional
- All connections are correctly connected
- All parts are correctly installed
- All warning labels on the product are present completely, highly visible and undamaged
- Illegible or missing warning labels are to be replaced without delay

1.20 Cleaning

- Risk of fire and explosion when using inflammable cleaning agents Only use non-flammable cleaning agents suitable for the purpose
- Do not use aggressive cleaning agents
- Thoroughly remove residues of cleaning agents from the product
- Do not use steam jet and high pressure cleaners. Electrical components may be damaged. Observe degree of protection
- Cleaning work may not be carried out on energized components
- Mark damp areas accordingly

1.21 Residual risks

Residual risk	Possible in life cycle									Prevention/ remedy
Personal injury/ material damage due to falling of raised parts	A	B	C				G	H	K	Keep unauthorized persons away. No people may remain under suspended loads. Lift parts with adequate lifting devices.
Personal injury/ damage to material due to spilled or leaked lubricant		B	C	D		F	G	H	K	Be careful when filling the reservoir and when connecting or disconnecting lubricant feed lines. Always use suitable hydraulic screw connections and lubrication lines for the stated pressures. Do not mount lubrication lines to moving parts or friction points. If this cannot be avoided, use spring coils respectively protective conduits.
Loss of electrical protective function due to faulty installation/connection.							G			After installation/connection carry out an electrical safety test according to ISO/ EN 60204-1.

Life phases:
A = transport, B = installation, C = initial start-up, D = operation, E = cleaning, F = maintenance, G = fault, repair, H = shutdown, K = Disposal

2. Lubricants

2.1 General information

Lubricants are used specifically for certain application purposes. In order to fulfil their tasks, lubricants must fulfil various requirements.

The most important requirements for lubricants are:

- Reduction of abrasion and wear
- Corrosion protection
- Noise minimisation
- protection against contamination or penetration of foreign objects
- Cooling (primarily with oils)
- longevity (physical/ chemical stability)
- economic and ecological aspects

Only lubricants specified for the product (see chapter Technical data) may be used. Unsuitable lubricants may lead to a failure of the product.

Preferably do not mix lubricants. This may have unforeseeable effects on the usability and therefore on the function of the centralized lubrication system.

When handling lubricants the relevant safety data sheets and hazard designations, if any, on the packaging have to be observed.

Due to the multitude of possible additives, individual lubricants, which according to the manufacturer's data sheets fulfil the necessary specification, may not, in fact, be suitable for use in centralized lubrication systems (e. g. incompatibility between synthetic lubricants and materials). In order to avoid this, always use lubricants tested by SKF.

2.2 Selection of lubricants

Lubricants are an element of system design. A suitable lubricant is selected already when designing the machine and forms the basis for the planning of a centralized lubrication system.

The selection is made by the manufacturer or operator of the machine, preferably together with the lubricant supplier based on the requirement profile defined.

Should you have little or no experience with the selection of lubricants for centralized lubrication systems, please contact SKF.

If required we will be glad to support customers to select suitable components for feeding the selected lubricant and to plan and design their centralized lubrication system.

You will avoid possible downtimes due to a damage to your machine or damage to the centralized lubrication system.

2.3 Material compatibility

Lubricants must generally be compatible with the following materials:

- steel, grey iron, brass, copper, aluminium
- NBR, FPM, ABS, PA, PUR

2.4 Temperature characteristics

The lubricant used must be suitable for the specific ambient temperature of the product. The consistency/ viscosity suitable for proper operation of the product must be adhered to and must not be exceeded in case of low temperatures nor fall below specification in case of high temperatures. For information see chapter Technical data.

2.5 Ageing of lubricants

After a prolonged downtime of the machine, the lubricant must be inspected prior to re-commissioning as to whether it is still suitable for use due to chemical or physical ageing. We recommend that you undertake this inspection already after a machine downtime of 1 week.

If doubts arise as to a further suitability of the lubricant, please replace it prior to re-commissioning and, if necessary, undertake initial lubrication by hand.

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").

Please contact SKF. if you have further questions regarding lubricants.

2.6 Solid lubricants in lubrication greases

With regard to the different solid lubricants, please observe the following:

Graphite
max. graphite content 8 %
max. particle size 25 µm
(possibly in in lamellar structure)

MoS_2
max. MoS_2 content 5 %
max. particle size 15 µm

Copper
Chisel pastes containing copper are likely to result in a layer formation on pistons, bores and mating surfaces. This may cause blockages in the centralized lubrication system.

Calcium carbonate
Chisel pastes containing calcium carbonate are likely to cause a very strong wear on pistons, bores and mating surfaces.

Calcium hydroxide
Chisel pastes containing calcium hydroxide are likely to harden strongly, what may result in a downtime of the centralized lubrication system

PTFE, zinc and aluminium
Due to the findings and practical experiences gained so far, no limit values can be set for these solid lubricants yet.

2.6.1 Chisel pastes

NOTICE

Damage to the superior machine
Chisel pastes must not be used as a lubricant for bearings.

NOTICE

Damage of the centralized lubrication system
Chisel pastes may be supplied by pump element C only. Hereby the maximum operating pressure must not exceed 200 bar, as otherwise the solid lubricants contained in the chisel paste may cause increased wear.

3. Overview, functional description

2 Display
Display of parameters and fault messages. Display is switched on by pressing a pushbutton and is switched off 30 seconds after the last pressing of a pushbutton. The display disposes of a background light.

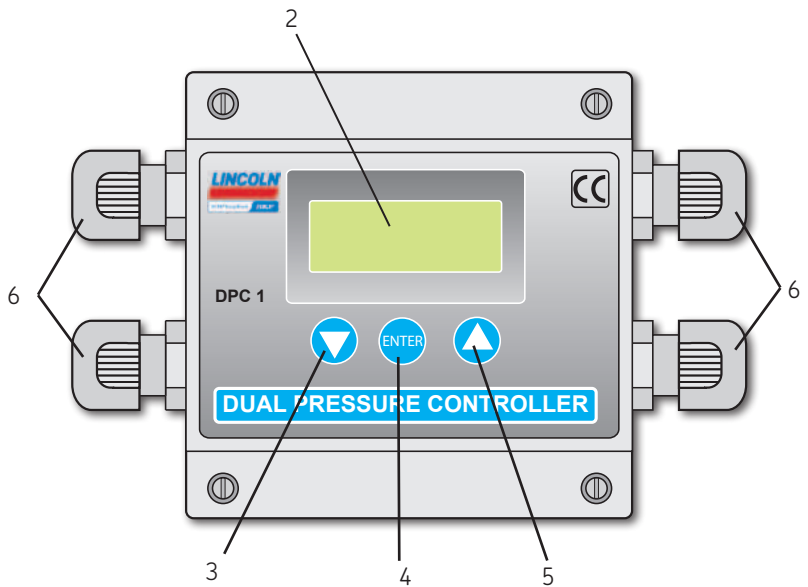
3 Down key
Serves to change the count value.
Brief pressing: Count value - 1
Press and hold: Fast forward

4 Enter key
Serves to confirm an entry.

5 Up key
Serves to change the count value.
Brief pressing: Count value + 1
Press and hold: Fast forward

6 Cable glands
Connection of the pressure/learning sensors and the power supply.

Fig. 2 Overview, functional description



3.1 Functions of the end-of-line pressure switch unit DPC1

The intelligent end-of-line pressure switch unit DPC1 determines the optimum absolute and differential pressures for DuoFlex dual-line systems and adjusts them automatically within the authorised operating limits.

A pressure sensor must be installed in each pressure line to determine the pressures.

The change-over device located in the dual-line system can be controlled directly by the output signal of the DPC1. A superior control unit is not required, but may be connected for expanded functionalities.

Thanks to its high shock resistance and IP type of protection the DPC1 is preferably used for applications in harsh environments, such as paper, steel, beverage and heavy industries.

Further advantages of the DPC1 are its increased efficiency and the reduced operating costs, as the pump motor runs only as long as actually needed for system pressurization. This saves time, power and, in case of pneumatically operated pumps, compressed air.

3.1.1 Functions of the end-of-line pressure switch unit DPC1 with ADD-ON pcb

In case of DPC1 with integrated ADD-ON pcb, the additional functionality allows to activate the middle position (M) of the change-over device EM-U3.

Creation of the external pressure is delayed by respectively 5 seconds after activating positions A and B.

3.2 Operating modes of the end-of-line pressure switch unit DPC1

The intelligent end-of-line pressure switch unit DPC1 determines the optimum absolute and differential pressures for DuoFlex dual-line systems and adjusts them automatically within the authorised operating limits. The DPC1 can be operated in the following operating modes.

PU:0 PX:0
as analysis and evaluation device for absolute pressure and differential pressure, e.g. for the control of dual-line systems by means of a superior control unit (see schematic 3.2).

PU:0 PX:1
as an intelligent analysis and evaluation device, e.g. for the control of dual-line systems by means of a superior control unit in combination with a learning sensor on a critical lubricant metering device (see schematic 3.3).

PU:1 PX:0
as a control unit for cycle time, monitoring time and holding time in dual-line systems for:

- direct control of the pneumatic and hydraulic pumps and the corresponding change-over devices.
- indirect control of the three-phase pump with motor starter and the corresponding change-over devices. (see schematic 3.4).

PU:1 PX:1
as a control unit for cycle time, monitoring time and holding time in dual-line systems for:

- direct control of the pneumatic and hydraulic pumps and the corresponding change-over devices.
- indirect control of the three-phase pump with motor starter and the corresponding change-over devices.
- in combination with a learning sensor on a critical lubricant metering device. (See schematic 3.5).

3.3 Schematic of a DuoFlex dual-line system with intelligent end-of-line pressure switch unit DPC1 in the operating mode PU:0 PX:0

9 Pump of the dual-line system

10 Change-over device

11 External control unit

1 DPC1

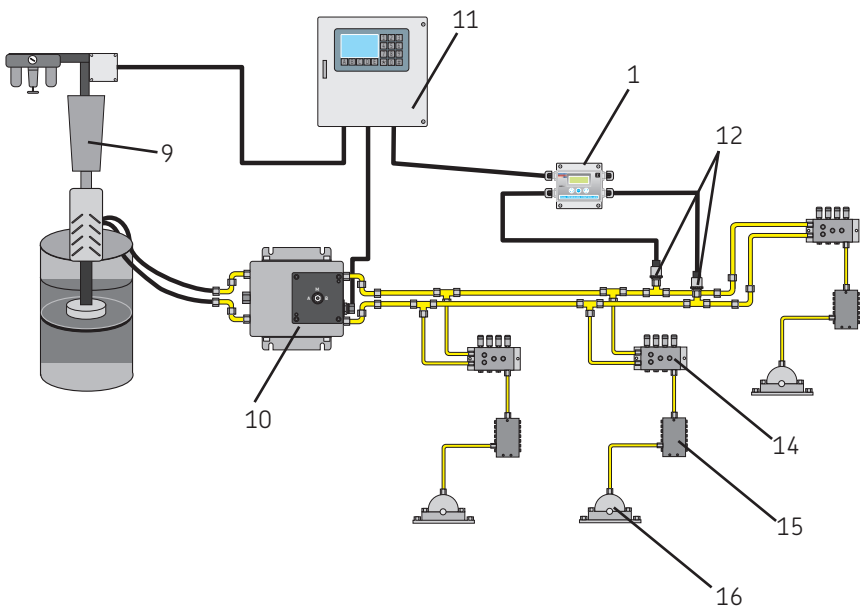
12 Pressure sensor

14 Main metering device

15 Secondary metering device

16 Lubrication point

Fig. 3 Overview, functional description



3.4 Schematic of a DuoFlex dual-line system with intelligent end-of-line pressure switch unit DPC1 in the operating mode PU:0 PX:1

9 Pump of the dual-line system

10 Change-over device

11 External control unit (option)

1 DPC1

12 Pressure sensor

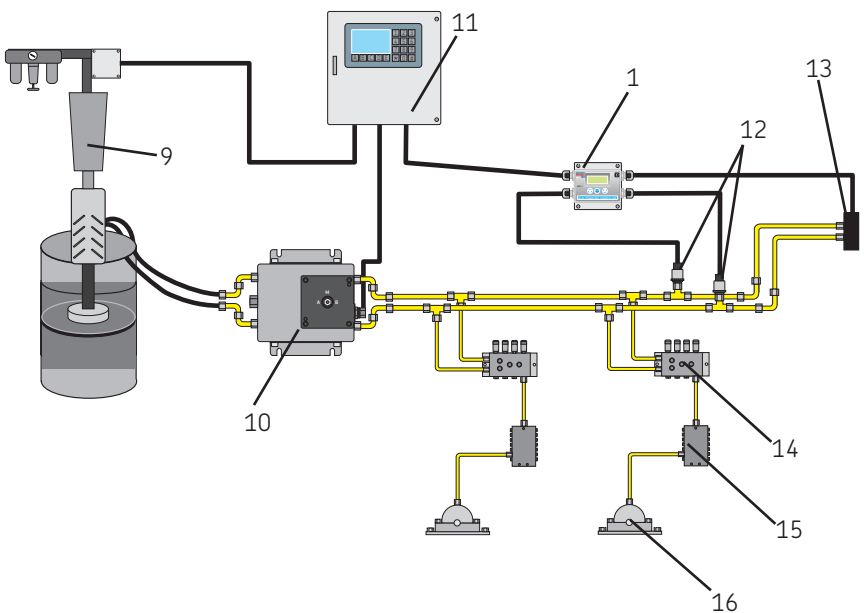
13 Sensor (proximity switch)

14 Main metering device

15 Secondary metering device

16 Lubrication point

Fig. 4 Overview, functional description



3.5 Schematic of a DuoFlex dual-line system with intelligent end-of-line pressure switch unit DPC1 in the operating mode PU:1 PX:0

9 Pump of the dual-line system

10 Change-over device

1 DPC1

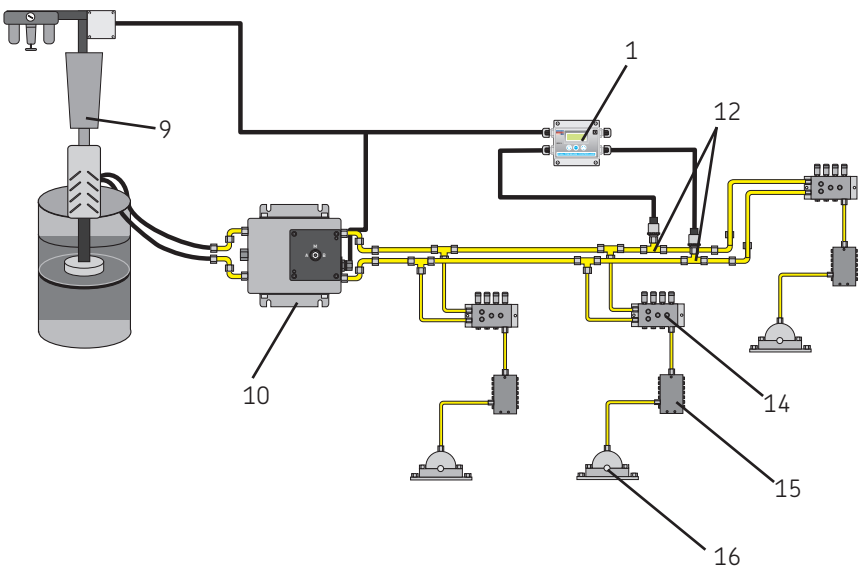
12 Pressure sensor

14 Main metering device

15 Secondary metering device

16 Lubrication point

Fig. 5 Overview, functional description



3.6 Schematic of a DuoFlex dual-line system with intelligent end-of-line pressure switch unit DPC1 in the operating mode PU:1 PX:1

9 Pump of the dual-line system

10 Change-over device

1 DPC1

12 Pressure sensor

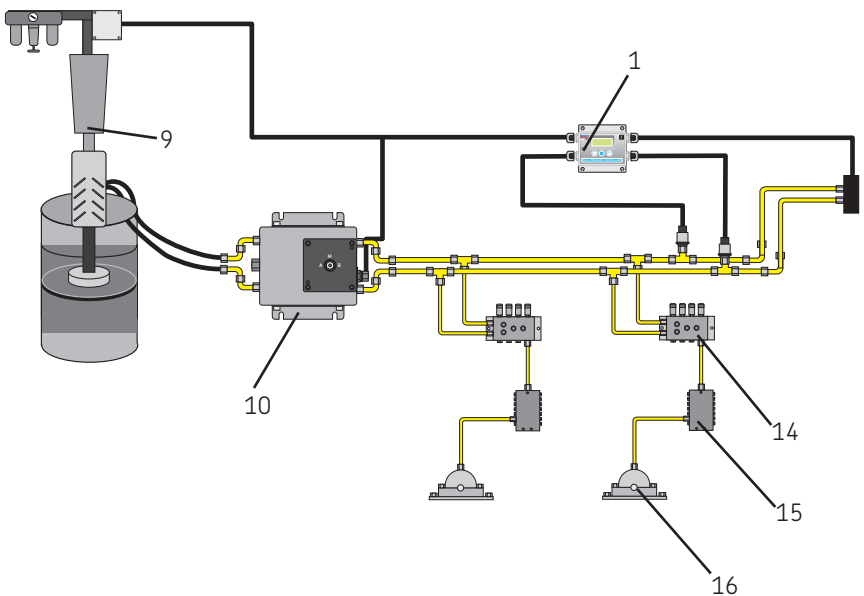
13 Sensor (proximity switch)

14 Main metering device

15 Secondary metering device

16 Lubrication point

Fig. 6 Overview, functional description



4. Technical data

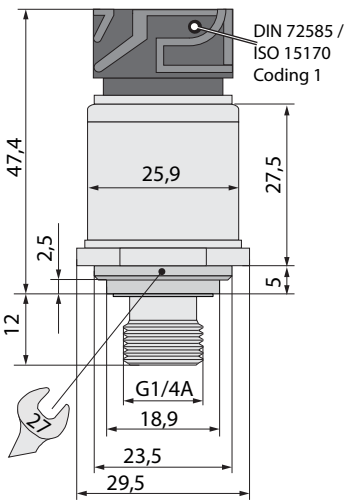
4.1 DPC1

	DPC1 24 VDC
Supply voltage	24 VDC (± 20 %)
Residual ripple	±5 %
Max. overload protection	40 V
Max. power consumption	≤ 3 A
Protection class	SELV, PELV, FELV
Degree of protection	IP 65
Display	LED with background light
Cycle time	min. 1 min | max. 99 hours 59 min
Monitoring time	min. 1 s | max. 99 min 59 s
Inputs	protected against reverse polarity, short circuit proof, non-isolated
Output SW	24 VDC non-isolated
Output PU	24 VDC non-isolated
Output Error	Changeover contact non-isolated
Outputs ADD-ON pcb	floating
Range of operating temperatures	-25 °C to +70 °C
Operating pressure:	400 bar max.
Differential pressure	400 bar max.
Installation position	any; display and operating elements must be visible and accessible
Shock (IEC 60068-2-27)	50 g/11ms
Vibration (IEC 60068-2-6)	20 g/10-500 Hz

4.2 Pressure sensor

Measuring range	400 bar
Overload range	800 bar
Burst pressure	2000 bar
Output signal	10-90 UV (0.5 - 4.5 VDC)
Repeatability	≤ 0.1 %
Rise time	≤ 2ms
Long-term drift	≤ ± 0.3 %
Characteristic curve deviation	≥ ± 0.5 % typ. | ≥ ± 1.0 max.
Shock (IEC 60068-2-37)	500 g (1ms)
Vibration (IEC 60068-2-6)	≤ 25 g/5-2000 Hz
Service life	> 10 million load changes
Materials	Stainless steel, FPM (seal)
Tightening torque	20 Nm
Weight	55 g
Nominal temperature	-25 °C to +85 °C
Lubricant temperature	-40 °C to +125 °C
Ambient/bearing temperature	-40 °C to +100 °C
Max. temperature compensation	≤ ± 0.025 %
Zero point/range	≤ ± 0.025 % | ≤ ± 0.025 %
Supply voltage Ub	5 VDC ≤ ± 10 %
Residual ripple	≤ 5 %
Degree of protection	IP 67

Dimensions



Pin assignment:

Pin	
1	+Ub
2	Signal
3	0 V

5. Delivery, returns, and storage

5.1 Delivery

After receipt of the shipment, check the shipment for damage and completeness according to the shipping documents. Immediately report any transport damages to the forwarding agent.

Keep the packaging material until any discrepancies are resolved. During in-house transport ensure safe handling.

5.2 Returns

Clean all parts and pack them properly (i.e. following the regulations of the recipient country) 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.

5.3 Storage

SKF products are subject to the following storage conditions:

- dry, dust- and vibration-free in closed premises
- no corrosive, aggressive materials at the place of storage (e. g. UV rays, ozone)
- protected against pests and animals (insects, rodents, etc.)
- possibly in the original product packaging
- shielded from nearby sources of heat and coldness
- in case of high temperature fluctuations or high humidity take adequate measures (e. g. heater) to prevent the formation of condensation water

Before application inspect the products with regard to possible damages occurred during their storage. This particularly applies for parts made out of plastic and rubber (embrittlement).

5.4 Storage temperature range

min. - 25 °C

max. +70 °C

6. Installation

6.1 General information

Only qualified technical personnel may install the products described in these Instructions.

During assembly 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
- Observe the product's IP degree of protection
- Adhere to safety distances and legal prescriptions on assembly and prevention of accidents
- Possibly existing visual monitoring devices, e.g. pressure gauges, MIN/MAX markings or piston detectors, must be clearly visible
- Observe prescriptions in chapter 4 regarding the installation position

6.2 Place of installation

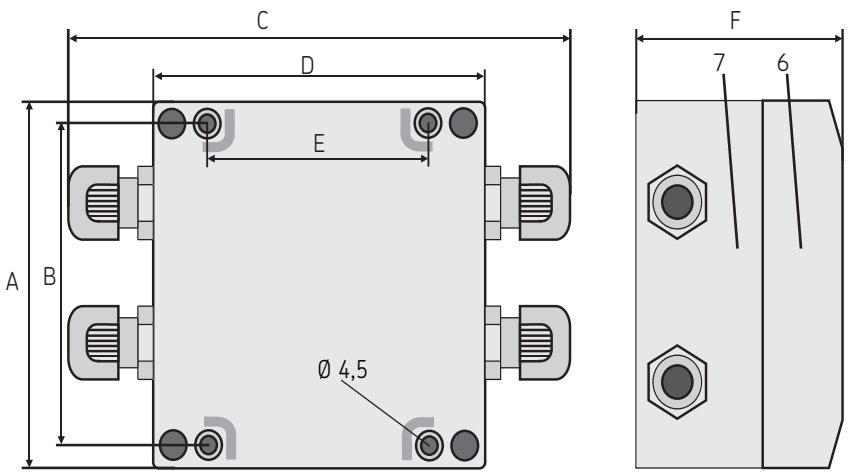
Protect the product against humidity, dust and vibrations and install it in an easily accessible position to facilitate other installation and maintenance works.

6.3 Installation dimensions and mechanical assembly

- Unscrew cover (6).
- Use pen to mark drilling pattern at the place of assembly or follow the side information to mark it at the place of assembly.
- Drill mounting holes (D 4.0 mm).
- Screw housing (7).

A = 100 mm
B = 85 mm
C = 150 mm
D = 100 mm
E = 63 mm
F = 62 mm

Fig. 7 Installation dimensions



6.4 Electrical connection

WARNING

Electric shock
The electrical connection may be carried out only by qualified electricians commissioned by the operator. 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).

Details regarding the electrical characteristics, see chapter 4 Technical data.

- Connect supply lines and pressure transducers to the device (see corresponding wiring diagrams in these instructions).
- Reinstall the cover of the DPC1. Make sure that no contaminations, e.g. drilling chips, enter the device.
- The DPC1 can now be used with the factory settings or can be adapted individually by changing the operating mode/the parameters (see 6.6 - 6.9).

6.5 Wiring diagrams DPC1

Fig. 8 DPC1 234-10723-3

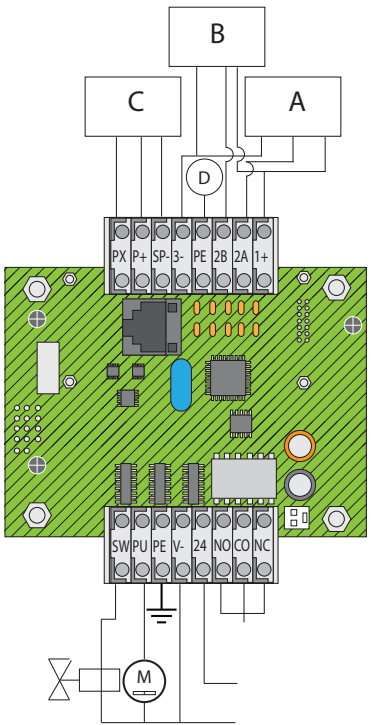
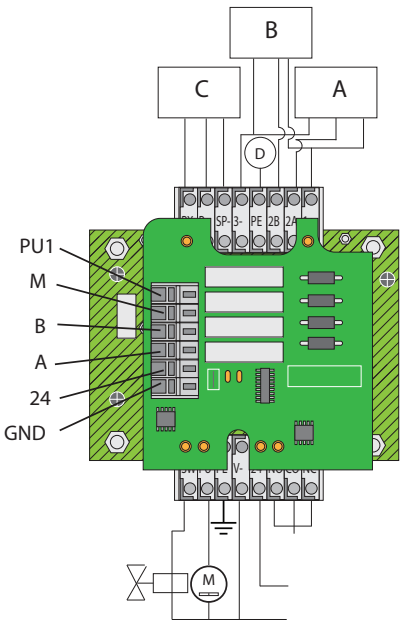


Fig. 9 DPC1 + ADD-ON 532-60519-1

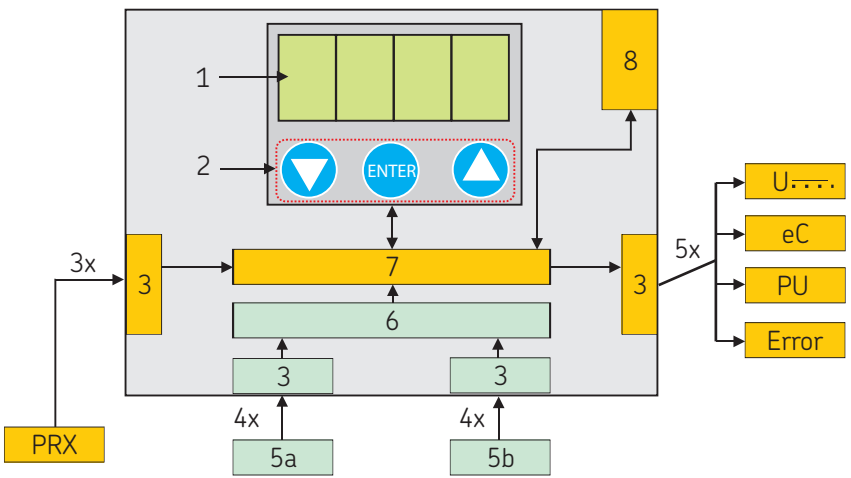


Legend DPC1	
C	Learning sensor
B	Pressure sensor B
A	Pressure sensor A
PX	Signal learning sensor
P+	Power supply learning sensor
SP-	GND learning sensor
3-	GND pressure sensors A + B
PE	GND pressure sensors A + B
2B	Signal pressure sensor B
2 A	Signal pressure sensor A
1+	Power supply pressure sensors A + B
SW	Signal to change-over device
PU	Signal to pump
PE	Protective conductor DPC1
V-	Ground (GND)
24	Power supply DPC1
NO	Normally open contact
CO	Common
NC	Normally closed contact
Legend ADD-ON pcb	
PU1	Converted signal (PU) to pump
M	Activation of middle position
B	Activation of position B
A	Activation of position A
24	Power supply for change-over device
GND	Ground for change-over device

6.6 Block wiring diagram

1 Display
2 Operator panel
3 Cable glands
3x cable, 3-core
5x cable, 4-core
5x cable, 5-core
5a Pressure sensor line A
5b Pressure sensor line B
6 Signal processing
7 Processor
8 Base for wireless (option)
U Input voltage 24 VDC
eC Change-over device
PU Pump
Error Fault message
PRX Proximity switchr

Fig. 10 Block wiring diagram



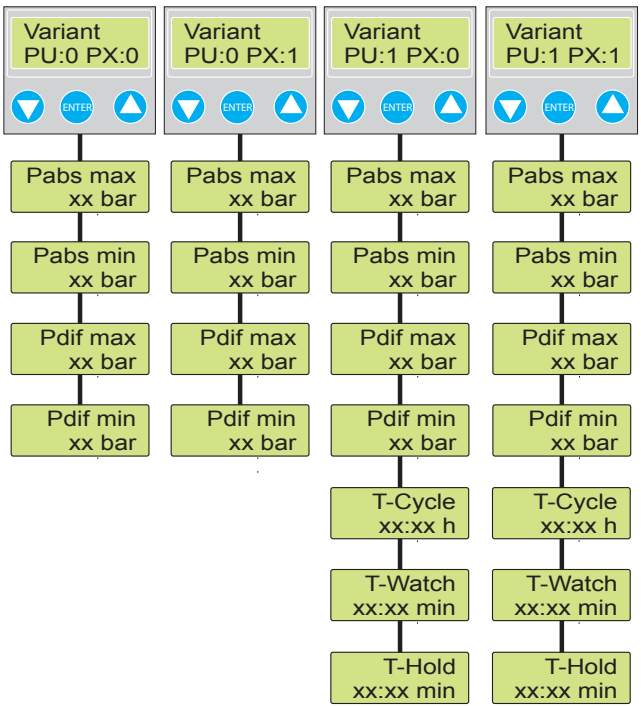
6.7 Display indications

Fig. 11 Display indications

PU	Pump
PX	Learning sensor
:0	without
:1	with
Pabs	Absolute pressure
Pdif	Differential pressure
S1	Sensor 1
S2	Sensor 2
T-Cycle	Cycle time
T-Watch	Monitoring time
T-Hold	Holding time
A-xx	Absolute pressure
D-xx	Differential pressure
A/B	Active line A or B
ERROR	Fault
WARNING	Warning
WAIT	Pause mode

6.8 Overview of parameters

Fig. 12 Overview of parameters



6.9 Display parameter

To display the parameters of the adjusted operating mode, proceed as follows:

- Press key ▼ or key ▲.
- In the display the next parameter will be displayed.
- Repeat pressing key ▼ or key ▲ until all parameters have been displayed (continuous display).

6.10 Change password

To change an existing password, proceed as follows:

- Press ENTER.
- Enter the current password by pressing ▼ or ▲ and confirm by pressing ENTER.
- The display changes to a parameter.
- Press ▼ or ▲ until the password appears in the display again.
- Press ENTER.
- In the display there appear Edit and the adjusted value of the password.
- Change the password by pressing ▼ or ▲.
- Confirm change by pressing ENTER.
- Change the display by pressing ▼ or ▲.
- Note: Entering 0000 means that no password has been assigned.

6.11 Change the parameter

To display the parameters of the adjusted operating mode, proceed as follows:

- Press ENTER.
- Enter the password and confirm it by pressing ENTER.
- Press ▼ or ▲ until the parameter to be changed appears in the display.
- Press ENTER.
- In the display there appear Edit and the adjusted value of the parameter.
- Press ▼ or ▲ to change the value of the parameter.
- Press ENTER to confirm the changed value.
- In the display the next parameter will be displayed.

6.12 Change operating mode

To change the existing operating mode, proceed as follows:

- Press ENTER.
- Enter the password and confirm it by pressing ENTER.
- Press ▼ or ▲ until the current operating mode appears in the display.
- Press ENTER.
- In the display there appear Edit and the adjusted operating mode.
- Press ▼ or ▲ to change the operating mode.
- Press ENTER to confirm the displayed operating mode.
- The adjusted operating mode will be displayed shortly, then INIT will be displayed shortly.

To confirm the changes, **ENTER** must be pressed within 30 seconds.

7. Initial start-up

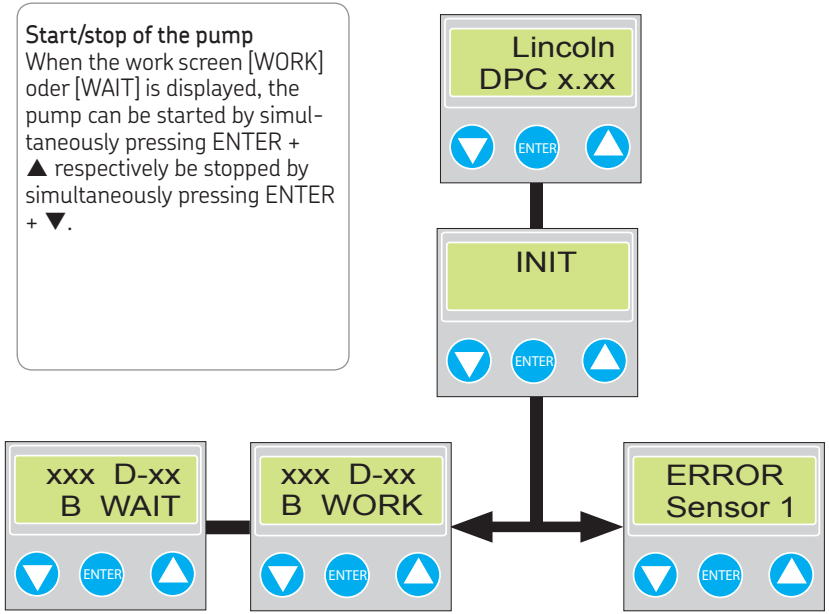
7.1 General information

After the installation the DPC1 is started up by connecting it to the operator's network respectively to the power supply of the superior machine. After its correct electrical connection and switching on the superior machine, the DPC1 is ready for operation.

In the display the following displays appear shortly one after the other:
- Version number [DPC.x.xx]
- Initialization [INIT]
- Work screen [WORK] or
- Work screen [WAIT]

If during initialization there arose an error, a fault message will be displayed instead of the work screen [WORK] or [WAIT]. Possible fault messages and troubleshooting, see chapter 10.

Fig. 13 Displays during the initial start-up



8. Operation

8.1 Operation

After correct electrical connection and adjustment, the DPC1 is ready for operation. Start-up respectively shutdown is effected by switching the superior machine on or off.

8.2 Temporary shutdown

Temporarily shut the system down by:

- Switching off the superior machine
- Disconnecting the product from the power supply

8.3 Final shutdown and disassembly

The final shutdown and disassembly of the product must be planned and carried out by the operator in a professional manner and in compliance with all regulations to be observed.

9. Cleaning

WARNING

Electric shock

Carry out cleaning works only on depressurized products that have been disconnected from the power supply. Do not touch cables or electrical components with wet or damp hands.

Use steam-jet cleaners or high-pressure cleaners only in accordance with the degree of protection of the pump. Otherwise electrical components may be damaged.

Performance of cleaning, required personal protective equipment, cleaning agents and devices following the valid operational regulations of the operator.

9.1 Cleaning agents

Cleaning agents compatible with the material may be used only. (Materials, see chapter 2.3)

Thoroughly remove residues of cleaning agents from the product and rinse off with clear water.

9.2 Exterior cleaning

- Mark and secure wet areas
- Keep unauthorized persons away
- Thorough cleaning of all outer surfaces with a damp cloth

9.3 Interior cleaning

Normally, interior cleaning is not required.

10. Maintenance and repairs

There are no parts to be maintained or repaired by the operator.

11. Troubleshooting

11.1 Faults

Fault signal	Possible cause	Remedy	Reset
Supply	○ Over- or under-voltage	○ Disconnect consumers and sensors ○ Disconnect sensor evaluation ○ Measure the supply voltage on the DPC1 and correct it, if necessary.	Press **ENTER** until fault message disappears.
SNS Power	○ Current of the sensor is too high	○ Check and, if necessary, correct current of sensor	
Sensor A Sensor B	○ Sensor A/B outside of admissible range of values Sensor A/B missing or defective	○ Check and, if necessary, correct sensor A/B	
Pump	○ Current of the pump is too high	○ Check the pump and, if necessary, the motor starter	
Switch	○ Current of the change-over device is too high	○ Check change-over device and replace, if necessary.	
PxSwitch	○ Current of the learning sensor ○ is too high	○ Check learning sensor and replace, if necessary.	

Fault signal	Possible cause	Remedy	Reset
PDif exc	○ Max. differential pressure exceeded	○ Continue changeover/operating cycle	Press **ENTER** until fault message disappears.
Pabs exc	○ Max. absolute pressure exceeded	○ Continue changeover/operating cycle	
Time-out	○ Monitoring time lapsed	○ Switch off the pump/stop the operating cycle	
Blockade	○ Changeover is carried out within 5 seconds	○ Stop the operating cycle	

12. Shutdown and disposal

12.1 Temporary shutdown

Temporarily shut the system down by:

- Switching off the superior machine
- Disconnecting the product from the power supply

12.2 Final shutdown and disassembly

The final shutdown and disassembly of the product must be planned and carried out by the operator in a professional manner and in compliance with all regulations to be observed.

12.3 Disposal

Countries within the European Union
Disposal should be avoided or minimized wherever possible. Disposal of products contaminated with lubricant must be effected via licensed waste disposal contractor in accordance with environmental requirements and waste disposal regulations as well as local authority requirements.

The specific classification of the waste is in the waste producer's responsibility, as the European Waste Catalogue provides different waste disposal codes for the same type of waste but of different origin.

Electrical components
have to be disposed of or recycled following WEEE directive 2012/19/EU.

Plastic or metal parts
can be disposed of with the commercial waste.

Countries outside the European Union
The disposal has to be done according to the valid national regulations and laws of the country where the product is used.

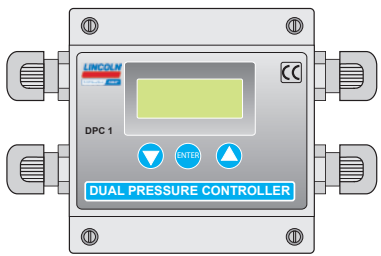
13. Spare parts

The spare parts may be used exclusively for replacement of identical defective parts. Modifications with spare parts on existing products are not allowed. Exceptions to this are the pump elements and the optional filling connection.

13.1 End-of-line pressure switch unit DPC1

Designation	Qty.	Part number
DPC1 (24 VDC/0-400 bar)	1	234-10723-3
DPC1 with ADD-ON pcb for EM-U3 (24 VDC/0-400 bar)	1	532-60425-1

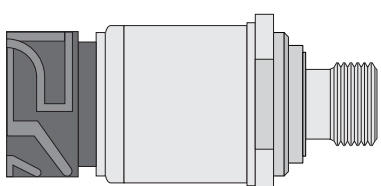
Fig. 14 DPC1



Pressure sensor

Designation	Qty.	Part number
Pressure sensor (without cable)	1	234-10663-7

Fig. 15 Pressure sensor



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951-181-004-EN
2019/03/13
Version 05