

USER MANUAL

**Installation, Maintenance and Operation
for
Electro Hydraulic Actuator
Type: KTC-LA..... und KTC-LA.....x
„Linear Actuator“**

Actuators for Industrial Valves

With integrated hydraulic power pack

Safety position by spring return or accumulator solution (Fail Safe)

On/Off or Modulating

ATEX suitable Zone 1 or 2 (Type LA.....x)

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1 Safety Instructions

1.1 Basics





From development to assembly of our KTC actuators, we are conform to international norms and directives. A confirmation according to directive 2006/95/EG is part of our delivery.

All personnel, working with this device must be familiar with the safety and warning instructions mentioned in this manual and observe the instructions given. Safety instructions and warning signs on the device must be observed to avoid personal injury or material damage.

1.2 Concept of Warnings

To avoid personnel injury and material damage, it is necessary to observe the indications mentioned in this manual.

Please see detailed table of indications below.

	Indicates an imminently hazardous situation with a high level of risk. Failure to observe this warning could result in death or serious injury.
	Indicates a potentially hazardous situation with a medium level of risk. Failure to observe this warning could result in death or serious injury.
	Indicates a potentially hazardous situation with a low level of risk. Failure to observe this warning may result in minor or moderate injury. May also be used with property damage.
	Potentially hazardous situation. Failure to observe this warning may result in property damage. Is not used for personal injury.

1.3 Personal requirements

Maintenance and user personal has to be qualified as follows:

- Skills and experience in hydraulic.
- Understanding of the complete system of the electro hydraulic actuator electrically and hydraulically as well as knowledge in reading schematic hydraulic and electric diagrams.
- Maintenance works on electric system and components by qualified staff only.

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1.4 Intended use

The Actuator shall be used for purposes as described in this manual only.

The Actuator is designed for use on industrial valves only.

The intended use includes the observance of this operating manual, as well as other relevant documents (schematic diagrams, additional manuals of components of actuator)

Utilization beside the described intended use, may induce critical situations and personnel injury or material damage.



Danger on incorrect use

Misuse of Actuators may induce personnel injury or material damage.

Please take care to avoid following miss use:

- Operation of Actuator beside the described intended use
- Operation of non Ex proof Actuators in potential explosive atmosphere. Please observe name late of actuator to check suitability.

1.4.1 Predictable misuse

Persons which are not conform to the requested requirements in knowledge and experience, are not allowed to use or work on the actuator. Also observe following misdemeanor

- Use of non-approved spare parts (please see applicable part list)
- Change of adjustment of pressure relieve valves
- Change of power supply voltage or signals
- Non-observance of operating manual and attendant documents.
- Non-observance of appropriate safety instructions
- Installation, operation, maintenance and repair of actuator of personnel without the requested technical competence.
- Removing or dis connection of safety equipment.

Any claims of personnel injury or material damages, due to incorrect use, are excluded.

The end user is responsible and liable for all damages, happen due to incorrect use.

2 Description of Application

The KTC Actuator is used for the adjustment of control and safety valves. High control precision, high control force and speed are the characteristics of KTC Actuators. The fields of application are electric power stations, chemical industry and pipelines.

3 Related documents



Related documents in addition to this manual are,

- hydraulic diagram,
- electrical diagram,
- part lists,
- overview drawing and
- Project related actuator description with technical data.
- Declaration of conformity acc. to 2006/42/EG
- Declaration of conformity acc. to 201/34/EU (area with potentially explosive atmosphere only)

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4 Labelling

The name plate of every actuator as below.

KTC Systemtechnik GmbH – Krähenweg 11 - 22459 Hamburg	
Typ / Type:	LA x
Ident. No.:	10004-265/1
Bj. / Year:	2012
Anschluß / Connection:	400V 50Hz; 3 phs. / 24VDC
Pmax / max. pressure:	150bar
Spule /coil	U= 24V
 II 3G c k IIC	T4-20°C ≤ Ta ≤ 60°C
	

Tabel 1: sample of type and name plate of ex proof suitable actuator

4.1 Identification number

Every actuator is marked with its own identification number.

4.2 CE marking

The KTC actuators are (according to the European directive 2006/42/EG) an incomplete machine. In this case, a CE marking is prohibited.

Except for actuators, suitable for use in potentially explosive atmosphere. For those actuators, the CE marking is mandatory.

5 Transportation and storage

KTC Actuators are packed according to transportation requirements. Please unpack and repack with care.



- Never stay under hovering weights.
- Never raise the actuator on its lifting points together adapted valve.
- Use correct and soft belts only.
- Do not fix the belts on actuator components

5.1 Storage

To avoid material damage, please follow the recommended list below.

NOTICE

- The actuator shall be clean and dry prior to placement in storage
- Protect the actuator against humidity, high or low temperature dust and dirt.
- Protect the actuator of mechanical damages.

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5.2 Long term storage

For storage above the period of 6 months, screws and nuts as well as non-varnished parts of actuator shall be protected with suitable, non-corrosive grease.

Please check the conditions of the actuator and its protection every 6 months

6 Installation

Installation shall be carried out as described in this manual. This manual does not cover all KTC electro hydraulic actuators in detail, always refer to the job specific documents also. These documents always indicated with a project number which is also mentioned on actuator name plate.

Installation works shall be carried out by experienced persons only.

It is recommended, before installation, to read the job specific hydraulic and electric diagrams. Please observe the job specific control requirements.

6.1 Installation in potential explosive areas



Please read following instruction before installation in potential explosive areas.

- Only experts and experienced personnel shall be in charge with the installation of an actuator.
- The actuator must be suitable for potential explosive areas. Please check type plate.
- Temperature range and gas group has to be in accordance with the conditions on site.
- The job specific control devices (if applicable: motor control, temperature- and pressure control, limit switches) are connected and in function.
- Please make sure the proper grounding of the actuator.

6.2 Mechanical connection onto valve.

Check both sides, actuator and valve flange dimension, before lifting onto valve.



Carefully connect the actuator onto valve, it may a risk of injury.

If an adjustment of the piston necessary, please use hand pump if exist.

Make sure, that after installation onto valve, there is no risk of injury from moving parts. Protect with solid mechanical provision.

- Pay attention to correct position of actuator onto valve (open and close)
- Raising of actuator at defined positions only. Never raise valve via actuator.
- Watch correct position of piston rod.
- Make sure that the flange is clean.
- Use non corrosive grease at mechanical parts (flange, screws, rod, thread) as antirust protection.
- Pay attention to correct torque of screws
- If possible, start with a manual test of actuator after mounting onto valve.

6.3 Adjustment of the stroke

Usually, the stroke adjustment is factory made. A change of stroke is possible with modulating actuators only. Please keep in mind to re-adjust position transmitter accordingly.

Please contact KTC Systemtechnik for further queries.

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6.4 Hydraulic connection

We recommend that, any hydraulic tube works in case of external hydraulic pressure supply, or in case of separate location of power pack and cylinder, shall be carried out by experienced persons only. Locally safety instructions shall be observed.

6.5 Hydraulic System Precautions



- Release hydraulic pressure before working on hydraulic system.
- Always wear appropriate safety clothing and safety glasses
- Read hydraulic schematic diagrams of actuator or hydraulic system.
- Read hydraulic oil safety instructions
- Tighten the hydraulic connections to avoid leakage



- If hydraulic oil is pressurized, it can pierce the skin and may go into blood stream.

6.6 Electrical Connection

Always refer to actuator specific wiring diagram which is part of the actuators documentation. The electrical connection shall be executed by professionals only. Locally safety instructions and standards of practice shall be observed. Make sure that power supply is switched off and protect against accidental activation while connection works.



Incorrect connection may cause injury or damage.

6.7 Electric Precautions

- Never work on electric system while the actuator is under voltage
- Always refer to KTC job specific electric diagram
- Observe voltage and current limits
- Ensure the correct distance between signal cable and power cable.
- Close all cable glands which are not in use

6.7.1 Electric Motor Connection

Ensure that the power supply correspond with data at motor type plate. Verify the correct turning direction of the electric motor to avoid damages on hydraulic system. The correct turning direction is marked on motor housing (arrow).

6.7.2 How to verify correct motor turning direction

You can see the motor air cooling fan, verify with marking (arrow)
You can observe pressure gauge. After few seconds, the pressure shall rise.

- In case of bi-directional motor and hydraulic pump, there is no danger of damage.

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6.8 Checklist Commissioning / 1st start of actuator

Please ensure the following list can be confirmed:

- No persons stay in area of risk.
- A steady position of actuator and . Due to high force the actuator masses may move.
- Correct electrical connection according to KTC wiring diagram.
- Correct hydraulic connection according to KTC hydraulic schematic.
- Correct hydraulic oil filling (see section 10.2).
- Correct position of actuator and valve.
- Control and safety functions by external process control are realized (i.e. motor stop at limit switch "open" or at pmax switch etc.). Read the job specific actuator description with logic table.

7 Description of Actuator operation and control

Always refer to job specific actuator description.

7.1 General description of electro hydraulic actuator

The actuator consist of hydraulic power pack (motor, Pump, oil container) a valve block (solenoid valves, pressure sensor, accumulator, pressure relieve valves) and hydraulic cylinder.

The runtime of electric motor and the pressure of hydraulic system shall be under automatic control always. Optional the actuator is equipped with oil temperature and oil level switches.

Pease observe the job specific description, wiring diagram and hydraulic schematic.

7.2 On / Off Actuator

The on/off duty actuator is made for valves with two positions only (open / close). On/off actuator with more than two positions also available on request.

7.2.1 On/ Off Single Acting Spring Return/Fail Safe

A running electric motor makes the hydraulic system pressure rising until, in the pressure relieve valve adjusted pressure (pmax) has reached. The pressure moves the cylinder piston rod, against the spring force, towards open or close position of the valve. The piston remains in this position until the solenoid valve is deactivated and release the pressure from cylinder to oil container. The spring will move the piston in its opposite position.

7.2.2 On / Off Double Acting

Pressure supply as described at 7.2.1

A solenoid valve guides the oil flow to one of the cylinder chambers. Change the power supply at the solenoid valve changes moving direction of piston rod.

To keep oil pressure always quickly available, a pressure accumulator can be installed also and it can realize a safe function as well.

7.3 Modulating Actuator

The modulating duty actuator is developed for control valves.

A analog control signal, created by the process control, determine the position of the control valve (i.e. 4mA = 0% ; 20mA = 100%). The 4-20mA signal is received by the electronic position controller, will be amplified and send to the proportional control valve. A feedback position transmitter, also connected to the position controller, closes the loop.

Usually, our modulating actuators always equipped with pressure accumulator to store the hydraulic system pressure. The electric motor operates until the hydraulic pressure "pmax" has reached, and it will start again after low pressure switch "pmin" gives a signal. Internal or external control software/hardware switches the motor accordingly.

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7.3.1 Fail Safe Function at modulating actuator

Also modulating actuators are available with fail safe function (fail open/fail close). There are both possible to realize fail safe function, spring return or pressure accumulator. Similar to the on/off actuator, we use a solenoid valve to, either release the pressure from cylinder chamber that makes the spring expanding, or, release the system pressure from accumulator into a cylinder chamber and release the opposite chamber to oil container.

7.4 Manual operation

As an option, the actuator can be operated manually with local push buttons on the control box. Make sure the power supply is available.

To open the valve: Press reset open.

To close the valve: press reset close



Make sure there is no person in area of risk while operating manually.

7.5 Speed Adjustment

The travelling speed for modulating and/or fails safe function is adjustable on request.

Depending on requirements we equip the actuator with throttle valves for manual speed adjustment.

Control speed may be adjusted by controller software.

Please see hydraulic schematic for throttle valves and electrical manuals of position controller.



The throttle valve, in case of closing it, may set the fail safe function and/or modulating function out of order.

7.6 Oil temperature control

If actuator is equipped with temperature switch, the signal is connected to actuator control box and/or to PCS (Process Control System). Actuators for operation in hazardous areas are usually equipped with temperature switch.

8 Spare Parts

In case of spare parts requirements, please observe part list and supply the identification number of the actuator.

Please note: Utilize only original KTC spare parts

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9 Maintenance

9.1 Maintenance plan

Inspection	Recommendation	
	Modulating Actuator	On/Off Actuator
Change Oil after	Two years of operation	Four years of operation
Visually check leakage	1x/Month	1x/Month
Visually check oil level	1x/Month	1x/Month
Visually check oil conditions	1x/ half-year	1x/ half-year
Stroke test fail safe function	According to operators specification, Min. 1x/Year	
Bladder-pressure control accumulator	1x /Year	1x /Year
Exchange of flexible hydraulic tube	After six years of operation	
Check for unusual sounds	1x/Month	

NOTICE

In the event of above-average stress, the servicing intervals and replacement intervals must be shortened accordingly.

9.2 Inspection of Hydraulic Oil Level

According to actuator type please check oil level as follows

- Oil sight glass: always fully covered
- Oil dip stick: level between min and max marking.
- Visual check by opening the oil filling screw.

9.3 Change of hydraulic oil

Release oil drain plug, or use an oil suction device.

Please make a visual check of the hydraulic oil. In case of pollution, disassemble the oil container and clean it separately. Refill up to 10mm lower than top edge of oil tank.

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9.4 Choice of Hydraulic Oil

Use hydraulic oil according to DIN 51524-2 and/or DIN ISO 15380:2012-03, for biodegradable oils. The viscosity shall be at 10 to 46mm²/s at 40°C . Please use pre-filtered hydraulic oil only to avoid damages.

9.5 Change of hydraulic oil filter

All modulating actuators are equipped with oil filters. On/Off actuators only if required. Please check with hydraulic diagram. See also drawing for location of filter. Change hydraulic oil filter always together with oil change or if the clogging indicator gives signal.

The filter will be equipped with an electrical or mechanical clogging indicator.

Change of oil filter only if actuator is not in operation and safe against re-start. Actuator hydraulic system must be without pressure.

Tools and equipment required: Spanner 46mm and cleaning cloth.

Remove connector from electrical indicator, remove the filter unit with spanner 46mm. Be aware of leaking oil.

Exchange the filter and replace the filter unit.

New filters are available from KTC. Please keep actuators Id no on hands.

9.6 Adjustment of pressure switches.

Please refer to user manual of specific pressure switch.

9.7 Working on pressure system

Before working on the hydraulic pressure system, release pressure. Always check hydraulic diagram first.

9.7.1 Release pressure from accumulator



Only qualified persons with experienced in hydraulic systems shall perform any works on hydraulic pressure system.

Disregard of this instruction may cause bodily injury.

- Cut off the Actuator from power supply and prevent an accidental start
- Release system pressure and accumulator pressure with the pressure relief valve (covered with black plastic cap) by using a spanner (size 17mm)
- Open the valve until the system pressure is zero
- The pressure gauge shows the system pressure.
- Do not work on hydraulic system unless the pressure is at 0bar



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9.7.2 Release pressure from spring return actuator



Only qualified persons with experienced in hydraulic systems shall perform any works on hydraulic pressure system. Disregard of this instruction may cause bodily injury.

Spring return actuators are equipped with solenoid seat valves. To release the pressure in the hydraulic system with spring return cylinder, the solenoid valves has to switched off.

- Cut off the Actuator from power supply and prevent an accidental start
- The pressure gauge shows the system pressure.
- Do not work on hydraulic system unless the pressure is at 0bar

9.8 Work on Spring



Spring under heavy preload!

Follow the instruction below to avoid personal injury or material damage.

- Assembly and dis-assembly of disc spring shall be executed by KTC staff only.
- Opening of spring housing only without hydraulic pressure and spring released situation.

9.9 Technical Problems

Please contact KTC Systemtechnik in case of uncertainties and technical problems to avoid material damage.

9.10 General instruction for maintenance

KTC Systemtechnik recommend to consult qualified staff for any maintenance work at KTC Actuators only.



- Before start working on hydraulic system, the oil pressure of the actuator has to be released completely. Please observe pressure gauge.
- Protect the actuator for unintended activation.
- Before opening of spring housing refer to related KTC instructions. The spring has to be in released position. Please note that the spring is preloaded.
- Non-observance of above instructions may lead to injuries.

9.11 Maintenance works at KTC Actuator during guarantee period

In case of needful maintenance work at KTC actuators during the period of guarantee, please contact and inform KTC Systemtechnik in advance. The guarantee period may end or set out.

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10 Errors and Malfunctions at Actuator

Pos	Error description	Possible reasons	Solving the problem
1	No movement at all, no pressure at pressure gauge	<ul style="list-style-type: none"> - Fail Safe Valve or bypass valve open - Motor protection activated - Motor fault - Hydraulic oil level low - Pressure switch fault - Hydraulic oil polluted 	<ul style="list-style-type: none"> - Observe main switch - Close fail safe valves - Activate motor protection - Motor check - Check Oil level, refill if necessary. - Visual check of oil leakage - Check pressure switch - Change oil, clean oil container,
2	No movement, system pressure available	<ul style="list-style-type: none"> - Fail safe activated - 24 VDC supply interrupted - Electronic controller fault - Control signal in/out interrupted - Mechanic problem at piston or valve 	<ul style="list-style-type: none"> - Check reason for fail safe - Activate 24VDC supply - Check controller - Check wiring - Mechanical check
3	Motor does not stop after arriving max. pressure	<ul style="list-style-type: none"> - Pressure switch fault - Electrical fault (relay) - Control software error 	<ul style="list-style-type: none"> - Check Pressure switch - Check wiring - Check control software
4	Motor does not switch of after arriving limit switch	<ul style="list-style-type: none"> - Limit switch fault - Electrical fault (relay) - Control software error 	<ul style="list-style-type: none"> - Check limit switch - Check wiring - Check control software

NOTICE

To be able to understand errors it is essential to read and understand this operating manual, relating manuals of components from sub-supplier as well as hydraulic schematic and wiring diagram. In case of any doubts and queries please contact KTC Systemtechnik.

11 Certificates and declaration

According to the European directive 2006/42/EG, Actuators for valves are incomplete machines. Part of the documentation of any KTC Actuator is the declaration of incorporation. A CE marking for incomplete machines are prohibited.

All Actuators suitable for installation and operation in potentially explosive atmosphere are in conformance to the European directive 2014/34/EU. Part of documentation is the relevant declaration of conformity. Actuators for operation in hazardous areas are CE marked.

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