Reineke

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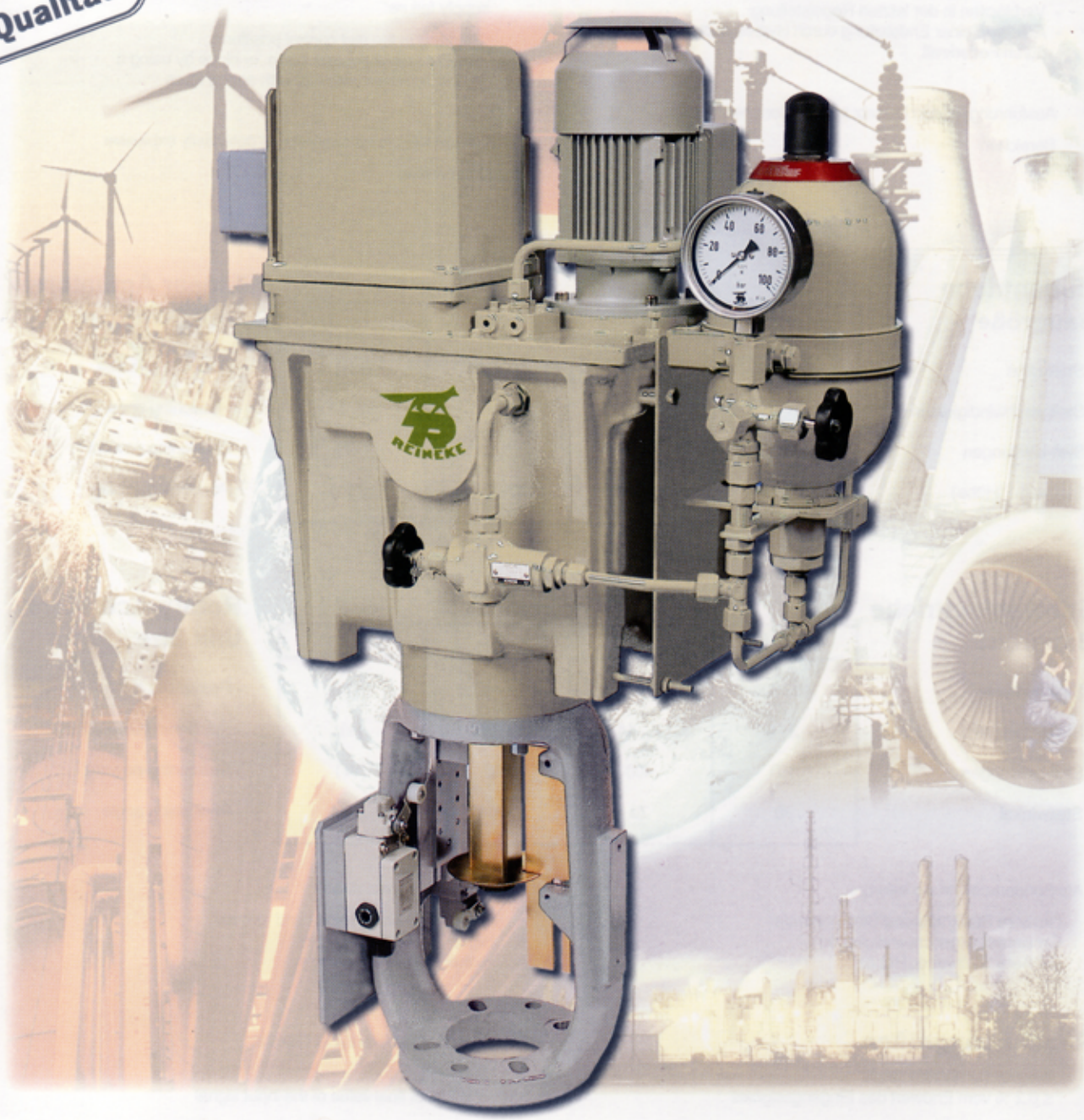
Hydraulischer Hubantrieb
Hydraulic linear actuator

ISO 9001
Qualität



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ELECTRO HYDRAULIC ACTUATOR
TYPE: RKA

Content

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1 General

The hydraulic actuator type **RKA "REINEKE KOMPAKT ANTRIEB"** is the latest edition of the famous self contained actuator series with the mechanical "Reineke Servo Valve".

1.1 Application

The RKA actuators are used for linear control valves (RKA-H) and large butterfly valves (RKA-D). The robust construction proved over more than four decades guarantees to be free of trouble and long life operation not only in high temperature, corrosive and abrasive industrial areas as in boiler houses for power stations (fossil and nuclear) and steam utilities, chemical and steel plants, but also in arctic, tropical, desert and on/off shore conditions.

These high quality Reineke hydraulic actuators are designed for operating control valves (with linear actuators) and butterfly valves (with rotary actuators) on those special demands regarding to dynamic regulation, thrust/torque and fail safe action in the event of power or signal failure. Typical users are power plants, steel industry, chemical industry, pipeline industry, mining, research establishments, environmentalism etc.

1.2 Codes and Standards

RKA actuators are suitable in accordance of all international codes and standards for weather and explosion proof conditions (DIN, ATEX) as well as earthquake approved.

2 Design

The Reineke RKA electro-hydraulic actuator is a self contained actuator type. All relevant components as motor-pump unit, piston, servo valve or proportional control valve, mechanical feedback, filters, check valves, relief valves, pressure gauges, pressure, level and temperature alarm sensors are mounted inside and on the bonnet of the container. All pipings between those components are inside the container and therefore a total sealed system. A junction box for electric power and signal cables is also mounted on the bonnet of the container.
The RKA electro-hydraulic actuator has two main features; as Linear Actuator (RKA-H) and as Rotary Actuator (RKA-D). The RKA actuators are available in three sizes of containers depending on the output force.

<u>Standard</u>

- Oil container
- Motor pump unit (single or three phase)
- Pressure filter unit
- Pressure relief valve
- Reineke servo valve (4-20 mA) with integral locking device
- Hydraulic cylinder (piston and rod)

Options

- Nitrogen filled bladder accumulator type with add. filling and safety valve for two selectable functions: (a) to move in case of emergency the control valve in a fail safe position or (b) to hold supplemental power to supply the specified number of valve strokes. In both cases the fail mode actions caused by motor power or input signal failure and / or an override remote signal from the control room.
- Motor pump unit with a two stage gear pump
- Explosion proof design
- Open – closed function
- Input signal monitoring device for add. fail mode functions ("fail fix" in last position)
- Position transmitter for the feedback signal to the control room
- Disc spring pile for spring return function

Accessories

- Yoke / lever
- Manual pump with manual selector
- Throttle valve to adjust the piston rod speed
- Sun or rain shelter
- Limit switches (mechanical or inductive)
- Oil cooler or heater

2.1 Technical features

Technical Features	
Oil Flow at delta P = 10 bar (145 PSI) and input signal alteration delta I> 3mA	12 l/min (3,17 US gallon/ min)
Sensitivity	< = 0.2% of full scale
Hysteresis	< = 0.4 % of full scale
Linearity	< = 0.2% of max. input signal
Max. operation pressure	60 bar (870 PSI)
Temperature effect	< = 0.05 % / ° of ambient temperature
Input signal	0 – 20 / 4 –20 mA DC
Inductance of coil	3.24 H at 60 Hz (Cs)
Position feedback from cylinder	mechanical with feedback rod

2.2 Forces

Linear Actuator RKA - H			
Cont. Size	**Output Forces**	**Stroke**	**Speed**
1	1,5 – 15 kN	20 – 80 mm	5 – 40 mm /sec
	337 – 3 372 lbf	¾" – 3"	0.20 – 1.57"/s
2	12 – 50 kN	20 – 100 mm	4 – 12 mm / sec
	2697–11 240 lbf	¾" – 4"	0.157 – 0.472"/s
3	40 – 200 kN	20 - 260 mm	2 – 6 mm/ sec
	8 992 - 44 960 lbf	¾" – 10"	0.078 – 0.236"/s
Available on request: larger force , longer stroke, higher speed			

2.3 Torque

Rotary Actuator RKA - D			
Cont. Size	**Output Torque**	**Max. Angle**	**Speed**
1	40 – 300 Nm	70 °	2 – 6 sec over 70 °
	29 502 – 221 268 lbf-ft		
2	250 – 1500 Nm	70 °	4 – 14 sec over 70 °
	184 390 – 1 106 342 lbf-ft		
3	900 – 4500 Nm	70 °	2 – 6 sec over 70 °
	663 804 – 3 319 025 lbf-ft		
Available on request : larger torque, higher speed			

2.4 Construction details

The linear and rotary actuators are produced in standard sizes 1 to 3. They differ fundamently with regard to function, thrust/torque, stroking time and stroke. According to this size, hydraulic aggregate and cylinder size will be chosen.

The tank is covered with a mounting plate. The power cylinder to produce the required linear or rotary motion is attached to the bottom of the tank. An oil level sight glass is fitted in the sidewall of the tank, as well as the cover for filter change and oil filling.

The following items are attached to the mounting plate and connected with hydraulic tubes which are inside the tank:

- Hydraulic aggregate (motor, coupling, pump or double pump)
- Pressure filter
- Pressure relief valve, or combined pressure relief valve and pressure shut-off valve
- Control unit with double check valve
- Manual pump (optional)

When fitted, accumulators are attached to the side of the actuator together with the TÜV safety valve, shut-off valve and test gauge. The hydraulic release device (standard) is mounted inside the tank. Electrical release (optional) is mounted externally.

2.5 Dimensions

The attached layout drawings (4MA-31-001 & 4MA-31-002) show the main dimensions and all relevant connection points for the mechanical adaption of the actuator and corresponding valve. Even the weight for each actuator size (size 1-3) and type (linear or rotary-type) is mentioned according to the relevant execution.

(Dimensions, weights and oil quantity / approx. values)

tank size linear actuator	tank size rotary actuator	appr. weight in kg without accumulator	add. weight in kg with accumulator	oil filling in kg	add. oil filling in kg for accumulator
1	1	55	NG 1 => 7 NG 4 => 14	7	NG 1 => 1 NG 4 => 2
2	2	110	NG 6 => 17 NG10 => 30	20	NG 6 => 3 NG10 => 4
	3	170	NG10 => 30 NG20 => 45	35	NG10 => 4 NG20 => 5
3		220		40	

2.6 Select the correct Reineke Hydraulic Actuator

Especially for accurate continuous modulating control operation the electro-hydraulic actuator type is the right choise. The main performance attributes are shown below.

Table 1: Factors Influencing Actuator Selection

Performance attribute	Pneumatic actuator	Reineke Hydraulic actuator
Thrust	meets thrust requirements only for balanced plug seat valves or small valves which required lower actuator forces	meets thrust requirements even for unbalanced valves, with continuous high force over the full stroke
Stroke speed	fast, less than 1 second for trip mode appr. 10 seconds for modulation	very fast, less than 0,5 seconds for trip and less than 5 seconds for modulation
Resolution	good, less than 1 % deviation from nominal value	very good, less than 0,1 % even by small variations of the nominal value
Positioning	medium stability, sensitivity against pressure shocks out of the process media	high stability, caused by incompressible hydraulic fluid
Availability	medium fault liability and durability => medium availability	very low fault liability and robust, autarc design => best availability
Procurement cost	inexpensive, but air supply devices required at site	higher costs, incl. complete, autarc actuator
Installation cost	inexpensive, if air supply devices required at site are available	inexpensive for tested Reineke self contained actuators
Maintenance	shorter intervals, with medium skills	longer intervals require higher skills for maintenance, but less average maintenance

To realize the fail mode (refer to chapter 3) we fit most of our actuators with a bladder accumulator. The main advantages are:

- direction of „fail mode“ (open/close) can be free selected via hand valve
- even rotary actuators can be easy fit with an accumulator
- after fail release over the full stroke the actuator can be operated again and accumulator can be recharged by hand pump (without motor power)

3 Mode of operation

Exemplary for the mode of action of the hydraulic actuator type RKA the two main functional principles of the „Reineke Servo Valve“ and one example for a hydraulic diagram of an actuator are described in the following chapters. It is one of the multitude of possible versions.

3.1 Hydraulic linear actuator

The functional principle for the linear hydraulic actuator with analogous input signal (figure 1) is shown below. The oil pump (3.1) driven by motor (2.1) which delivers oil under pressure via filter (10.1) and servo valve (6.1/9) to the cylinder (5.1). When the actual control position is reached excess oil will be returned through the adjustable relief valve (7.1) back to the tank.

The DC input signal from the controller goes to the coil (6.1/7) of the electro-hydraulic servo valve. The system exerts a force on the pivoted armature (6.1/6) which is thus deflected from its central position. The flapper (6.1/14) attached to the armature, is therefore unequally disposed between the nozzles (6.1/13) which are supplied with oil via restrictors (6.1/9). This results in a pressure difference across the pilot piston which is accordingly displaced from its central position, and thereby enabling oil to flow to and from the power cylinder (5.1). The movement of the power piston is transmitted to the final control element, and also via the feedback rod (6.1/27) back to the servo valve. The feedback spring (6.1/2a) is thereby tensioned to a greater or less extent, and exerts a force on the armature which is opposite in effect to that generated by the input signal.

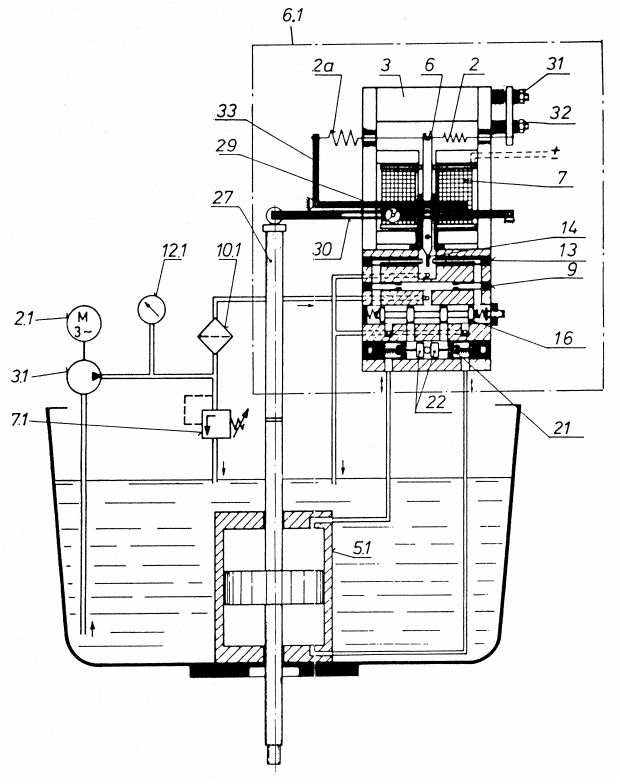


Figure 1: (linear actuator)

3.2 Hydraulic rotary actuator

For the rotary hydraulic actuator with analogous input signal the servo valve details (figure 2) are described as follows.

The oil supply is similar to the linear actuator acc. to point 3.1. The movement of the power piston inside the servo valve is transmitted via a lever to a drive shaft which is led out of the tank lateral.

The DC input signal from the controller goes to the coil (6.1/2) of the electro-hydraulic servo valve. The system exerts a force on the pivoted armature (6.1/3) which is thus deflected from its central position. Effected by the feedback band (6.1/28) and linkage system (6.1/29) the feedback spring (6.1/2a) is tensioned to a greater or less degree, and exerts a force on the armature (6.1/3) which is opposite in effect to that generated by the input signal.

If both forces are in equilibrium, the movement of the piston rod and the final control element, ceases. The actuators operate with proportional action with respect to the input signal.

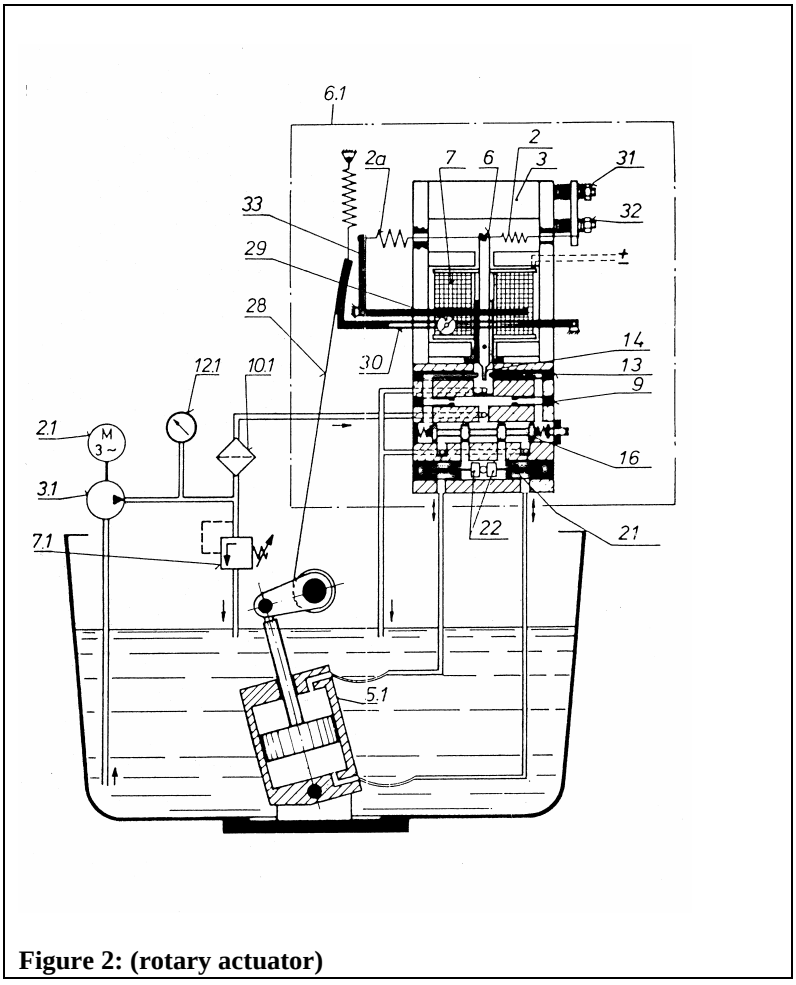


Figure 2: (rotary actuator)

3.3 Example of a hydraulic diagramm

Functional scheme of hydraulic actuator with electro-hydraulic servo valve, double pump and accumulator for fail safe position (figure 3).

Motor (2.1) drives both pumps (3.1+3.2) which deliver hydraulic oil under pressure via delivery-side filter (10.1) to the servo valve (6.1) and finally to the power cylinder (5.1). Pump 3.2 delivers oil to the servo valve and, under conditions of small control deviations, also to power cylinder. Pump 3.1, under conditions of small control diviations, switch to circulate, by means of shut-off valve (7.1) which is combined with pressure relief valve (6.4).

Under conditions requiring large movements of the actuator, pump 3.1 also delivers oil to the power cylinder (5.1). This combination ensures that, on one hand, sufficient pumping capacity is available to move the piston at the required speed under conditions of large control deviations, and on the other hand, ensuring that only the required amount of oil is pumped to meet the demand. Unnecessary heating of the actuator is thus avoided.

Pressure gauge (12.1) monitors the pump pressure, and gauge (12.2) the pressuration of the accumulator (4.1). Pressure relief valve (7.2) is a TÜV approved safety valve which controls the maximum accumulator pressure. The stroking speed of the cylinder (5.1) can be controlled in each direction by means of double restrictor-check valve (9.1+9.2). In the event of loss of oil pressure, hydraulic changeover valve (6.3) operates, so that the accumulator (4.1) delivers its pressurized oil directly to the power cylinder (5.1). The power cylinder can be operated manually in both direction by means of hand pump (3.3) and manual operation valve (6.2) in the event of loss of electrical power. At the special request, a pump pressure monitor (12.1) and accumulator pressure monitor (12.2) can be fitted.

3.3.1 Action in event of motor power failure

In standard version the servo valve is fitted with a double check valve.
In the event of oil pressure failure (motor power failure) the connection between servo-valve (6.1) and power cylinder (5.1) is hydraulically locked. So the piston is also locked in the last obtained position. Actuators equiped with accumulators for fail safe position drive in its preselected end position.

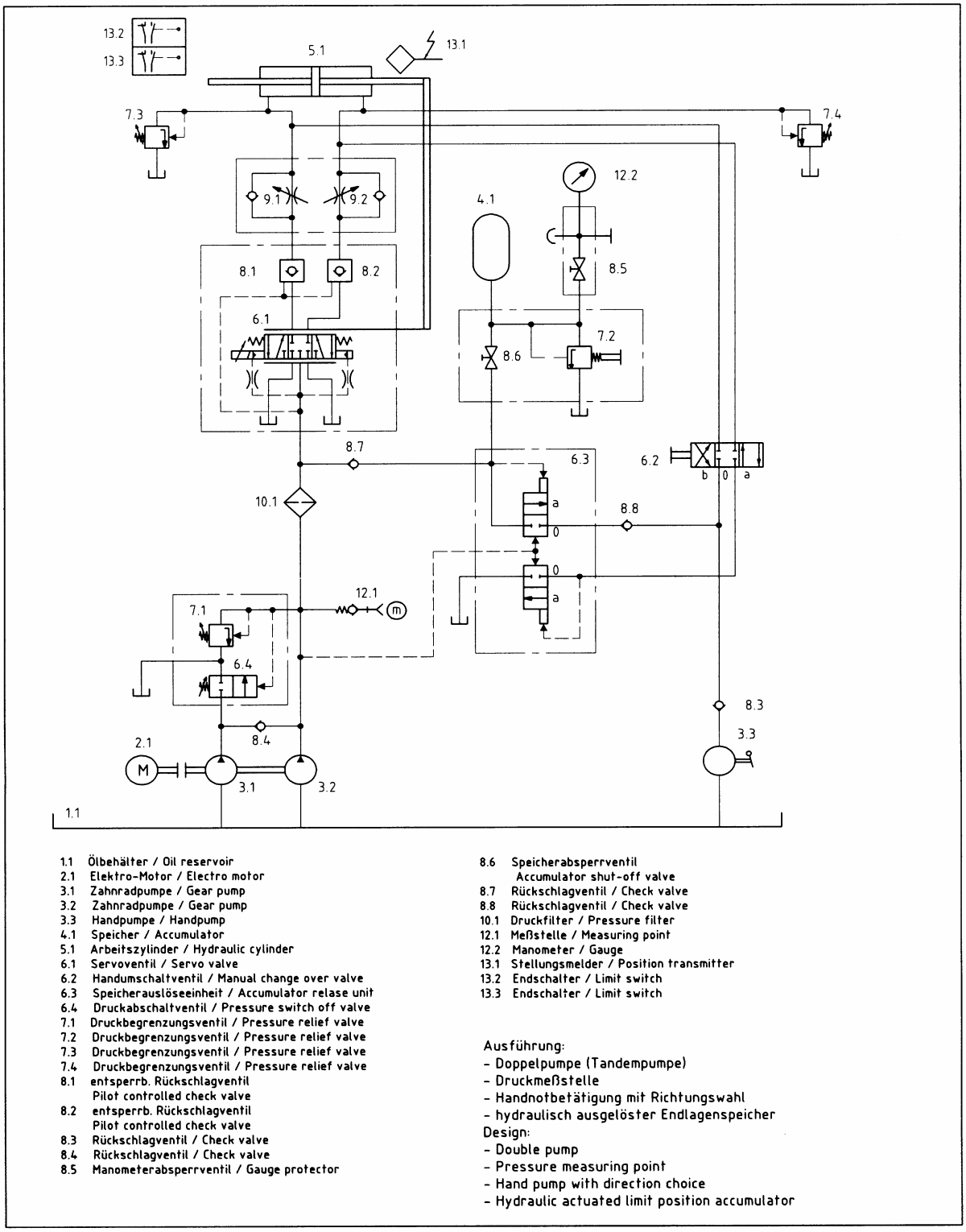
Extra version:

Beside the use of an accumulator, actuators also could drive towards (safety-) end position when they are fitted with springs.

3.3.2 Action in event of input signal failure

In the event of loss of input signal, the piston moves towards the position corresponding to 0 mA or 4 mA.

In standard version the servo valve is fitted with a double check valve. By monitoring the input signal it is possible to swicht on/off the motor and so the „fail fix“ position (last control position) can be even realized.



1.1 Ölbehälter / Oil reservoir
2.1 Elektro-Motor / Electro motor
3.1 Zahnradpumpe / Gear pump
3.2 Zahnradpumpe / Gear pump
3.3 Handpumpe / Handpump
4.1 Speicher / Accumulator
5.1 Arbeitszylinder / Hydraulic cylinder
6.1 Servoventil / Servo valve
6.2 Handumschaltventil / Manual change over valve
6.3 Speicherauslöseeinheit / Accumulator relase unit
6.4 Druckabschaltventil / Pressure switch off valve
7.1 Druckbegrenzungsventil / Pressure relief valve
7.2 Druckbegrenzungsventil / Pressure relief valve
7.3 Druckbegrenzungsventil / Pressure relief valve
7.4 Druckbegrenzungsventil / Pressure relief valve
8.1 entsperrb. Rückschlagventil
Pilot controlled check valve
8.2 entsperrb. Rückschlagventil
Pilot controlled check valve
8.3 Rückschlagventil / Check valve
8.4 Rückschlagventil / Check valve
8.5 Manometerabsperrventil / Gauge protector
8.6 Speicherabsperrventil
Accumulator shut-off valve
8.7 Rückschlagventil / Check valve
8.8 Rückschlagventil / Check valve
10.1 Druckfilter / Pressure filter
12.1 Meßstelle / Measuring point
12.2 Manometer / Gauge
13.1 Stellungsmelder / Position transmitter
13.2 Endschalter / Limit switch
13.3 Endschalter / Limit switch

Ausführung:
- Doppelpumpe (Tandempumpe)
- Druckmeßstelle
- Handnotbetätigung mit Richtungswahl
- hydraulisch ausgelöster Endlagenspeicher

Design:
- Double pump
- Pressure measuring point
- Hand pump with direction choice
- Hydraulic actuated limit position accumulator

Figure 3: Hydraulic diagram of hydraulic actuator with electro-hydraulic servo-valve, double pump and accumulator for fail safe position

3.4 Control units

The following control units can be selected acc. to the client´s individual requirements:

servo-valve	U 11	electrical, constantly input signal and mechanical feedback
solenoid valve	U 21	electrical input signal as impulse from the step control
solenoid valve	U 22	electrical input signal for open-close function

3.4.1 Electrical input signals

In accordance to the selected control unit type the corresponding electrical input signal is as shown below:

direct current, analogous constantly control with servo valve	0-20 mA or 4-20 mA, input resistor appr. 235 Ohm (other signal ranges on request)
direct current, binary step control or open-close function via solenoid valves	24 V DC, approx. 30 W (other voltages on request)

3.4.2 Protection classes for control unit

Servo valve for DC signal

IP 54	standard
EEx m II T5	price supplement

Solenoid valves for binary signals

U 21 and U 22 IP 67	standard
U 22 IP 54	standard
EEx e II T5	price supplement

3.5 Motor information

The actuators are equiped with 3-phase AC motors to DIN 42677 suitable for 230/400 V, 50Hz. Other voltages and frequencies are available on request. Protection class: IP 55 standard, explosion proof versions subject to price supplement. Construction type: V 1 with protection roof. Conventional circuit breaker should be fitted in the supply circuit to the motors.
The classes for the explosion proof design are available according to DIN (EEx e Ii T4 / EEx de II CT4) and ATEX standard.

4 Determination of operation direction codes

The following code shut help to define the adaption parameter between valve and actuator! The corresponding sketch is attached (4MA-31-003).

4.1 Linear Actuator (Control Valves)

Starting position is the closed valve. The piston rod of the actuator is coupled with the valve stem and presses the valve cone against the seat in accordance with the adjusted oil pressure.

Fig. a: The valve opens upwards by lifting the cone conform to the adjusted stroke up to the upper stop of the piston in the cylinder:

with decreasing signal	code no. W 1
with increasing signal	code no. W 2

Fig. b: The valve opens downwards by sinking the cone conform to the adjusted stroke till to the lower stop of the piston in the cylinder:

with decreasing signal	code no. W 3
with increasing signal	code no. W 4

Note: There is no safety device for turning of the stem within the actuator. If it is necessary the securing should be fixed on the armature.

„A“ = Necessary overlength of the valve stem corresponding to the stroke range of the yoke. Measure „A“ => look special drawings of yokes.

„B“ = Stroke of the valve

„C“ = Spare stroke (minimum 2 mm); „B“ + „C“ = max. stroke

4.2 Rotary Actuator (Butterfly Valves)

The maximum angular movement is 70° for a stop to stop travel of the piston in the cylinder. The direction of action is ment as viewed on drive shaft.

Fig. c: The shaft turns counter-clockwise (to the left):

with increasing signal	code no. W 5
with decreasing signal	code no. W 6

Fig. d: The shaft turns clockwise (to the right):

with increasing signal	code no. W 7
with decreasing signal	code no. W 8

4.3 Direction of action in the event of accumulator release

The code numbers W 1 to W 8 refer to oil pump operation. For the operation with surpressed oil in the accumulator, without pump driving, are the code numbers for the safety position as follows:

valve closes:	W ... / W 9
valve opens:	W .../ W10
shaft counter-clockwise	W .../ W 9
shaft clockwise	W .../ W10

The code number for accumulator operation is to be stated behind the code number for pump operation p. ex. W2 / W10.

4.4 Direction of action in the event of current failure or loss of input signal

In the event of loss of input signal, the actuator piston always moves towards the position corresponding to 0 mA or 0 bar signal. Should this not be desirable, a signal range with suppressed zero must be selected, so that in the event of signal failure, the motor pump unit is also switched off or the flow of oil is shut off by a 3/2-way solenoid valve. The input signal has therefore to be monitored by an electronic or pneumatic relay.

With actuators fitted with double check valve (standard version), the piston is locked in the last obtained position in the event of electrical power failure, that means, the piston is hydraulically locked in position.

Actuators equiped with accumulators, the movement to the end position selected by manual valve or moveable plate. Initiation of the accumulator is

- hydraulical in the event of failure of motor-pump unit
- electrical by means for remote impulse (normally energized or de-energized) at the same time switching off the power supply to the motor or the oil flow by means of 4/2-way valve during motor operation.

4.5 Direction of action for „open-close-operation“

Actuators with 4/2-way solenoid spool valve U 22.

Solenoid energized:	W1, W3 resp. W5, W7
Solenoid de-energized:	W2, W4 resp. W6, W8

5 Hydraulic oil recommendation

While handling the hydraulic oils, especially while using the fluid, please consider the existing regulations concerning pollution control and the rules for the correct disposal of consumed production facilities, oil binding compounds and cleaning rags.

We recommend the use of HLP Hydraulic oils in our hydraulic equipment as stipulated in DIN 51524, part 2 or the use of HVLP Hydraulic oils as stipulated in DIN 51524 part 3 according to the viscosity range DIN 51519 (see the table on sheet 2 „Oil Recommendation“)

- **You have to use only one of the permitted oils, mentioned in the table on sheet 2** Before using other hydraulic oils, a previous permission of Reineke must be required.
- **Do not mix hydraulic oils of various manufacturers** (loss of quality).
- **You have to use only filtered hydraulic oil** (filter mesh size of 3 µm ($ß_3 \geq 75$ in accordance with ISO 4572).
- **The hydraulic oils must be filled into the oil reservoir using an inlet filter, having a min. filter mesh size of 3 µm ($ß_3 \geq 75$** in accordance with ISO 4572). Please use, if necessary, a separate superfine filter gear.
- **Please change the viscosity range only in consideration of the inherent heat and the ambient temperature** (according to the following information).

Selection of viscosity range

The selection of the viscositiy range can be taken from the data sheet. The selection depends on the permissible oil temperatures and on the minimum and maximum ambient temperatures.

The oil temperature results from the ambient temperature and the inherent heat of the oil. The inherent heat for hydraulic oil actuator systems usually lies between 10 °C and 30 °C.

The viscosity lies between	**15 cSt and 100 cSt** for the continuous operation
A viscosity of	10 cSt corresponds to the permissible limit of guaranteed lubrication
A viscosity of	800 cSt corresponds to the lower temperature limit at which the suction capacity of the pumps is still guaranteed

The data table on sheet 2 shows the permissible oil temperatures or rather oil viscosities for each type of oil.

Stability of the seals

The standard seals used in the hydraulic devices are suitable for the hydraulic oils and temperatures shown overleaf. Special seals must be used, however, at lower or higher storage or operating temperatures.

5.1 Oil recommendation / Oil temperature range

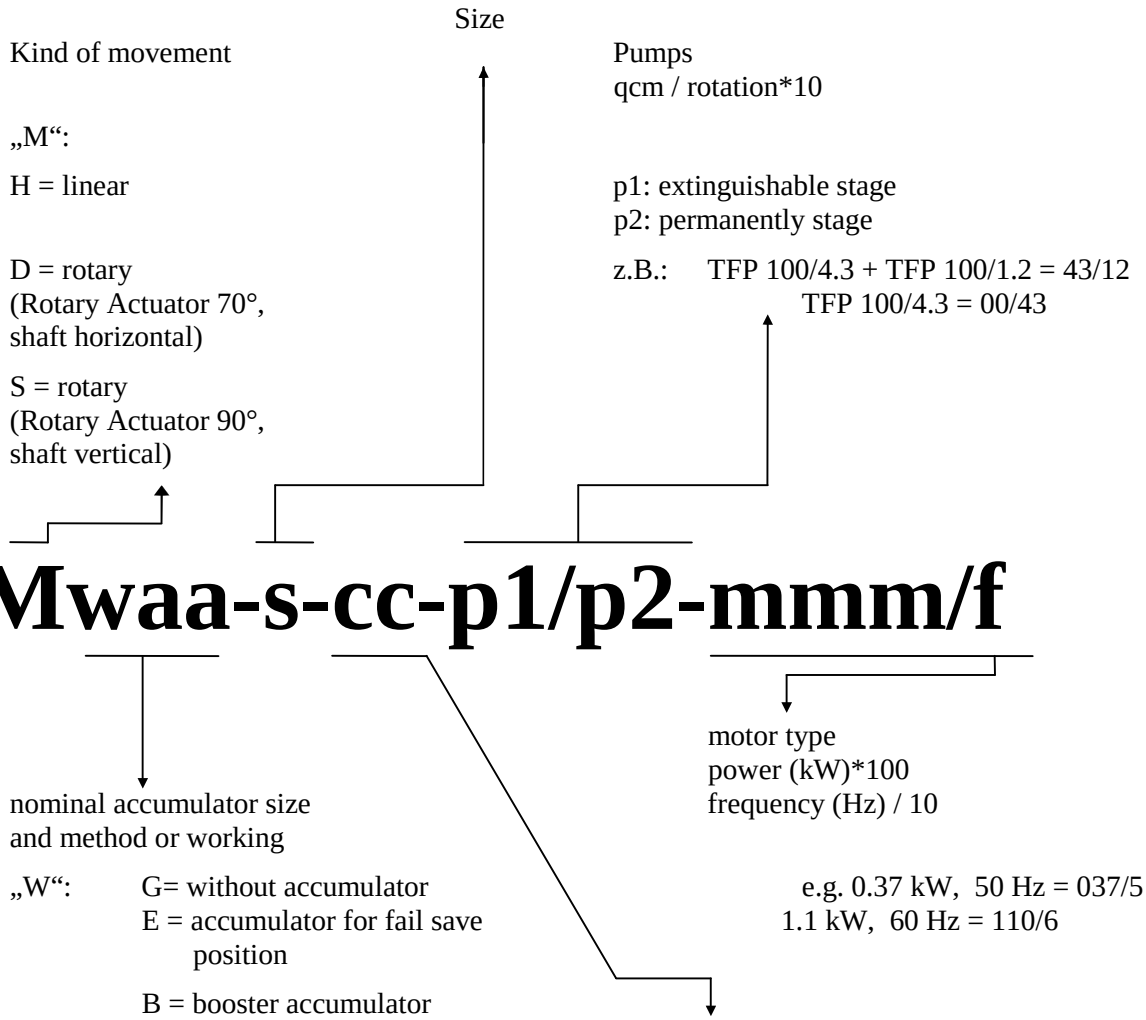
The succession ot the selection doesn't represent a rating of quality

Manufacturer / Supplier	Oil for hydraulic actuators and systems ...							
	... operation inside of buildings				... operation outside on open air			
Oil type HLP DIN 51 524	HLP 22	HLP 32	HLP 46	HLP 68	HVLP 15	HVLP 32	HVLP 46	HVLP 68
Viscosity grade ISO VG - DIN 51 519	ISO VG 22	ISO VG 32	ISO VG 46	ISO VG 68	ISO VG 15	ISO VG 32	ISO VG 46	ISO VG 68
Aral Vitam	GF 22	GF 32	GF 46	GF 68		HF 32	HF 46	
BP Energol HLP	22	32	46	68				
BP Bartran HV						32	46	68
Esso Nuto H	22	32	46	68				
Mobil D.T.E.	22	24	25	26	11	13	15	16
Shell Tellus Öl	22	32	46	68		T 32	T 46	T 68
Viscosity range (mm²/s or. cSt)	min./max.Oil temperature range (°C)							
At starting pump operation max. 800 cSt	-18	-10	-5	+2	-25	-16	-8	-2
recommended operation range 100 cSt - 15 cSt	+8 / +50	+15 / +60	+22 / +68	+30 / +75	-2 / +40	+13 / +60	+20 / +70	+30 / +75
Max. temperature for short time (min. 10 cSt)	+62	+72	+80 (+82)	+80 (+93)	+55	+80	+80 (+90)	+80 (+105)

The data wich are theoretical temperatures (but inadmissible) with a viscosity range of 10 cSt. The data given regarding the lowest ambient temperature in winter and the highest temperature (in the shade) in summer is necessary for selecting the proper oil.

If the hydraulic equipment is to be installed in outdoor sites, it must be protected against direct sunshine, rain and snow.

6 Type code for Reineke Compact Actuator RKA



Example 1:

linear actuator without accumulator for fail save position

Size	3
Cylinder	125/32/32*100 mm Hub
Pumps	TFP 100/4.3 + TFP 100/1.2 SC031
Motor	1.1 kW, 50 Hz

⇒ **Type HG00-3-12-43/12-110/5**

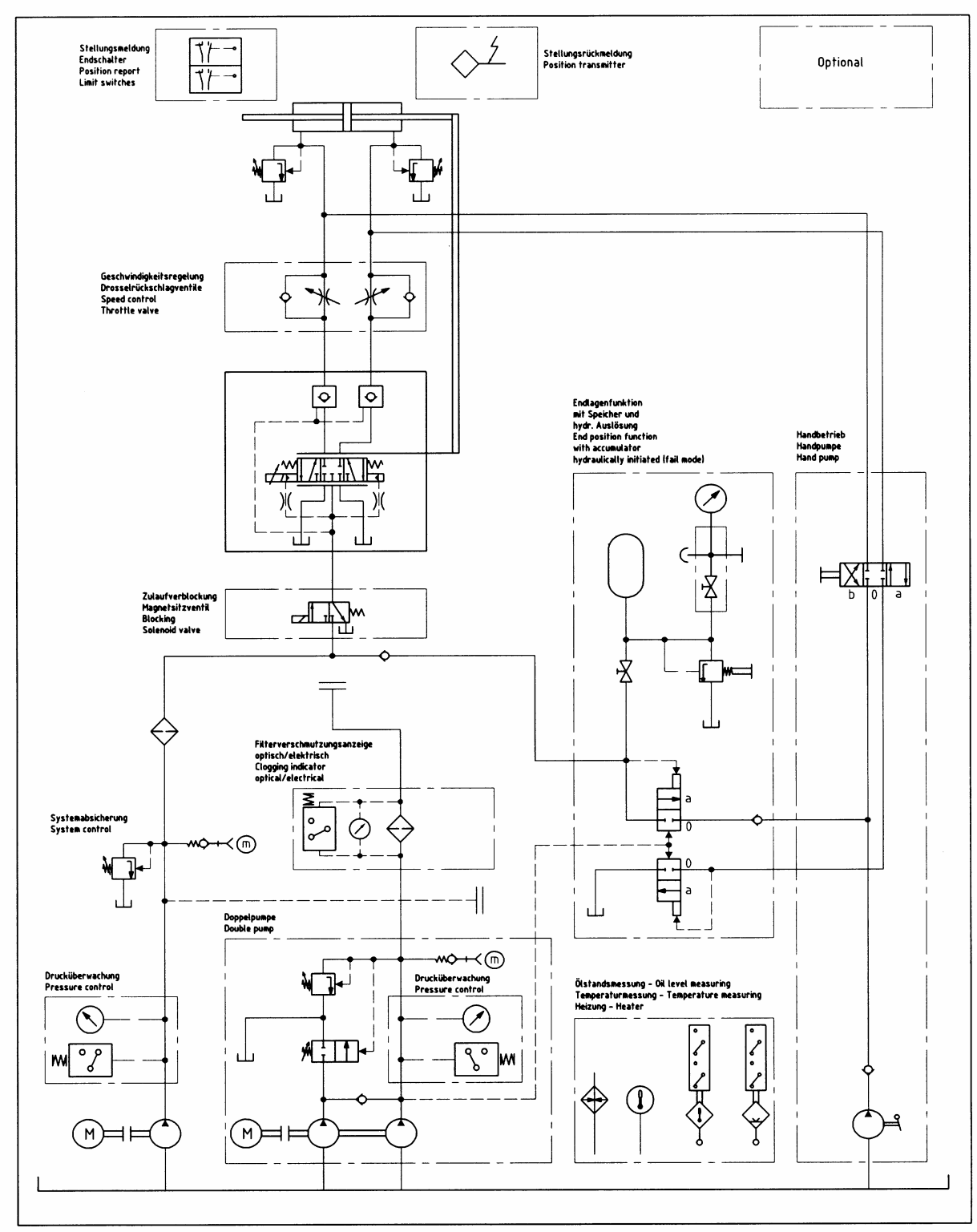
Example 2:

rotary actuator with accumulator for fail save position 4 l

Size	1
Cylinder	60/16 + 50 mm Hub
Pumps	TFP 100/1.7 SC001
Motor	0.25 kW, 60 Hz

⇒ **Type DE04-1-06-00/17-025/6**

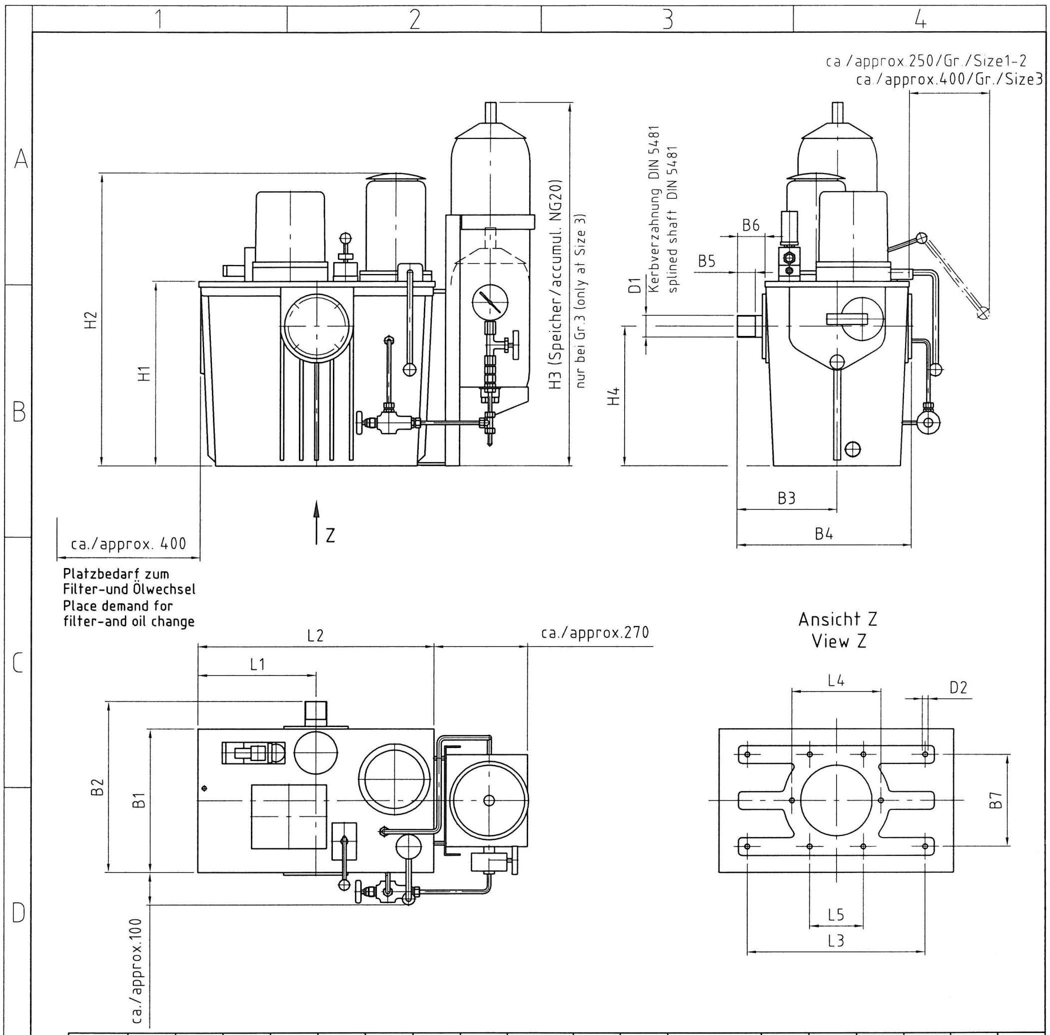
7 Hydraulic diagram to select your options



8 Actuator data sheet

Customer					
Address					
Contact person			**Phone**		
Project			**Fax**		
Application			**Date**		
Actuator type	⎍ Linear ⎍ Rotary		**Quantity**		
INSTALLATION					
Mounting location	⎍ Indoor ⎍ Outdoor		Ambient Temperature	°C	
Atmosphere	⎍ Normal ⎍ corrosive ⎍ dusty ⎍ highly humid				
VALVE DATA					
Linear actuator			Rotary actuator		
Piston rod direction with increasing input signal	⎍ Up (Valve open)		Lever direction with increasing input signal (see from drive shaft end)	⎍ Clockwise	
	⎍ Down (Valve close)			⎍ Counter- clockwise	
Thrust		N	Torque		Nm
Stroke		mm	Angle of actuation		(max 70°)
Stroking time		sec.	Time of actuation		Sec.
CONTROLLING					
Input signal			Modulating / Step control / Open-close		
Modulating signal range					
Quick action			Yes/No		
Travel time for quick action			Sec.		
Protection class of actuator					
POWER SUPPLY			**CONTROL SUPPLY**		
V	Hz		V	DC/AC	
FAIL SAFE FUNCTION					
On loss of electric power					
On loss of input signal					
On loss of hydraulic pressure					
Direction of actuator driven by accumulator (as seen from drive shaft end)			Upwards / Downwards Clockwise / Counterclockwise		
ACCESSORIES					
Yoke with coupling			Lever arm		
Manual pump			Position feedback		
Filter clogging Indicator			Oil pressure switch		
1 or 2 limit switches			Oil level switch		
Heating system			Protection hood		
Hydraulic oil			Corrosion painting		
DOCUMENTATION					
Operational Manual	English				
Remark					

9 Electro-hydraulic rotary actuators Size 1-3



RKAD	B1	B2	B3	B4	B5	B6	B7	D1	D2	H1	H2	H3 ca./approx.	H4	L1	L2	L3	L4	L5
1	285	322.5	180	320	30	40	170	26x30	M12x25	330	600	-	235	205	410	290	-	-
2	360	415	235	420	35	50	220	40x44	M16x35	435	720	-	340	285	555	400	-	-
3	405	482.5	280	490	50	70	260	55x60	M16x35	515	-	1000	390	330	660	500	250	150

zul. Abw. ISO 2768
Maßstab %
Werkstoff

	Datum	Name
Bearb.	15.01.2003	M. Büssem
Gepr.		
Norm		

Elektro-hydraulische Drehantriebe Gr.1-3
Electro-rotary actuators Size 1-3

Reineke
Meß- und Regeltechnik GmbH
Bochum

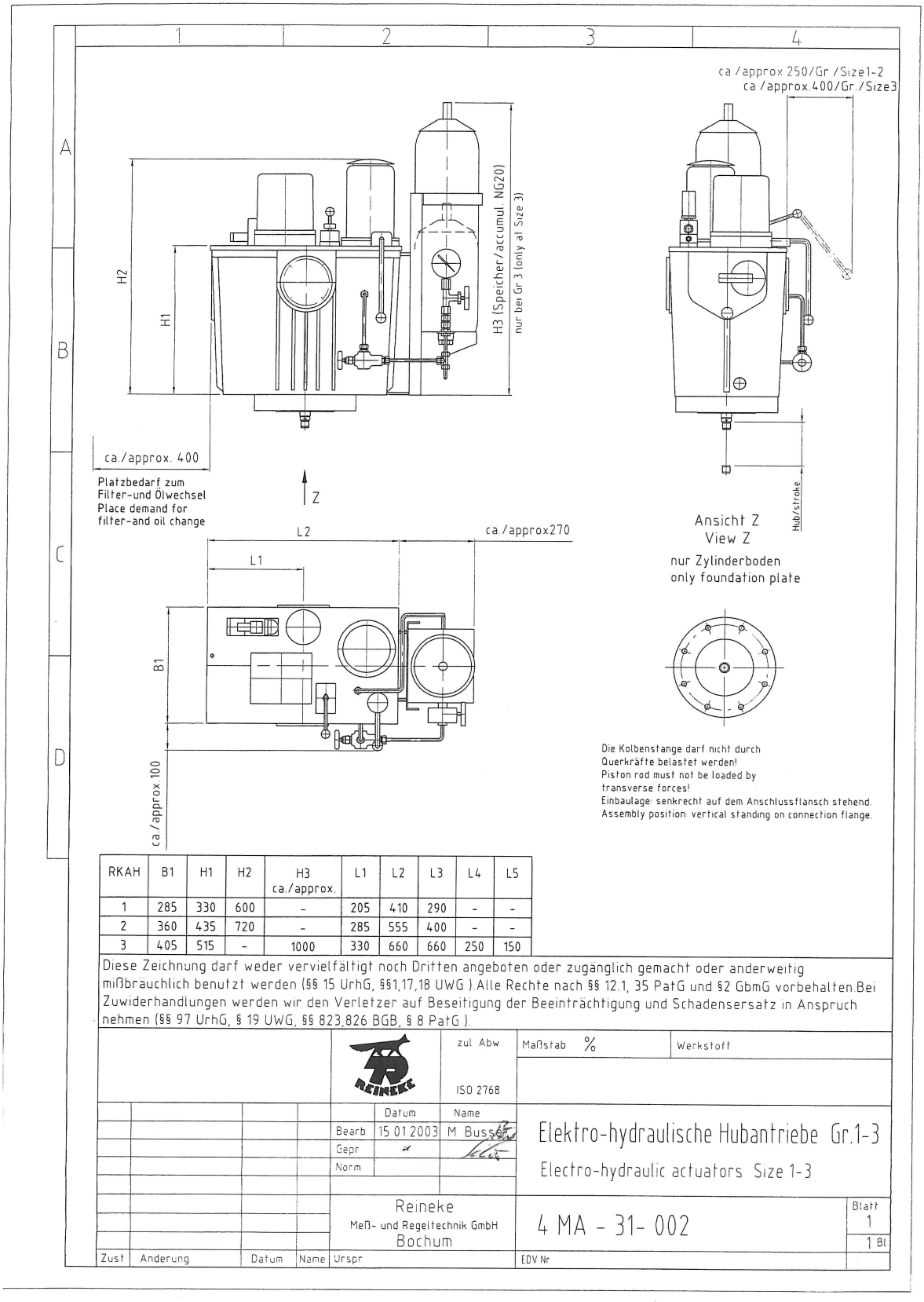
4 MA - 31- 001

Blatt 1
1 Bl

Zust.	Änderung	Datum	Name
a	Maß L3 Gr.3	28.01.04	Krä

Urspr.
EDV Nr.

10 Electro-hydraulic actuators Size 1-3



RKAH	B1	H1	H2	H3 ca./approx.	L1	L2	L3	L4	L5
1	285	330	600	-	205	410	290	-	-
2	360	435	720	-	285	555	400	-	-
3	405	515	-	1000	330	660	660	250	150

zul. Abw ISO 2768	Maßstab %	Werkstoff	
Bearb: 15.01.2003 M. Buss	Elektro-hydraulische Hubantriebe Gr.1-3		
Gepr	Electro-hydraulic actuators Size 1-3		
Norm			
Reineke Meß- und Regeltechnik GmbH Bochum	4 MA - 31- 002	Blatt 1	1 Bl
Zust / Änderung / Datum / Name / Urspr	EDV Nr		

11 Code of movement direction