

ELECTROHYDRAULIC THRUSTERS



FTC BRAKING SYSTEMS

ELECTROHYDRAULIC THRUSTERS SERIES "ESM"



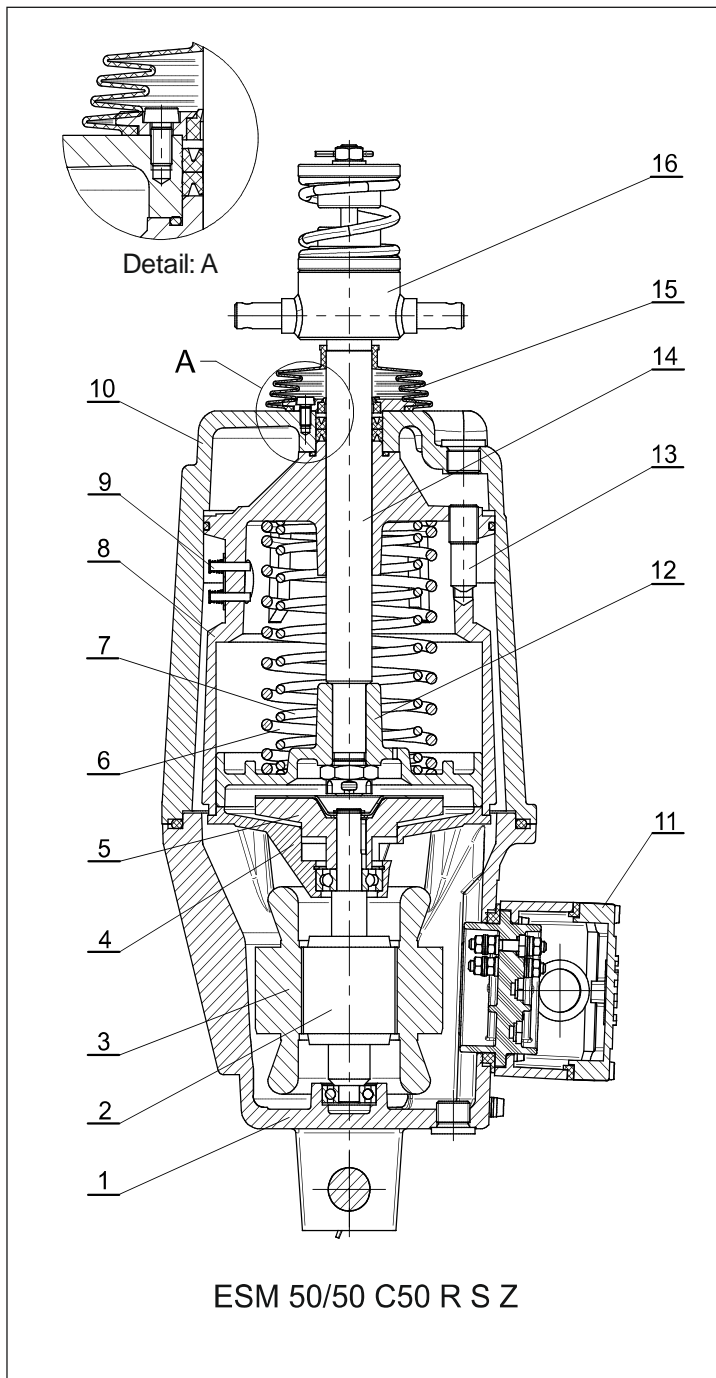
- NOMINAL STROKE 50 - 160 mm
- NOMINAL FORCE 12 - 400 daN
- SWITCHING TIME 0.5 - 14 s
- ROD PROTECTION WIPER
- ROD PROTECTION RUBBER
- EXTERNAL OPERATING INDICATOR
- INTERNAL OPERATING INDICATOR
- ENVIRONMENT TEMPERATURE -45°C ; $+45^{\circ}\text{C}$
- WIDE RANGE OF VOLTAGE AND FREQUENCY OF THE ELECTRIC MOTOR POWER SUPPLY
- NOMINAL MOTOR POWER 150-600W
- SWITCHING FREQUENCY 2000 cycle/hour
- RELATIVE DUTY FACTOR ED 100%

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TECHNICAL DEVICE'S DESCRIPTION

The device can operate in any position from vertical to horizontal. In horizontal or in angular position connecting box should be upside. If the device should work in hanging position, or if, when working diagonally or horizontally, type of installation requires that connecting box be placed on the top or bottom, necessarily consult the manufacturer in order to provide the appropriate variant.



Housing of the motor (1) is constructed with eyelet connection and can be fixed on fundamnt by a bolt. There is also oil drain plug on the housing. Driving motor stator (3) (squirrel cage asynchronous motor) is fitted in the housing. Connecting box for electrical supply (11) is fixed on the housing hermetically separated from the inside of the housing. The rotor (2) is fixed in the housing by its downside, and upside fitted in the turbine bearing (4). The turbine wheel (5) is mounted on the rotor shaft. The guide cylinder (8) with piston (12) and rod (14) is located upper the turbine.

In the guide cylinder is also screw (13) for adjusting speed of the rod. On the upper side the guide cylinder is covered by upper housing (10), which with the motor housing forms a functional entirety. The transformer oil fills interior of the device.

The electric motor drives the turbine, which produce oil pressure downside of the piston. The piston and the rod are forced to move upward. The oil from upside of the piston returns through the holes to the turbine inlet. Hydraulic force is completely independent of the piston position, it depends only of the speed of turbine (current frequency), turbine size, and of the piston diameter. When lifting, motion is uniformly in the range of nominal force, independent of the load. Pushing force gradually increase during 0.1 – 0.15 s, which provide very soft start of the rod. Electric motor has excellent cooling since transformer oil transfers heat to device housing and over the fins is transferred to the environment.

This device construction provides a constant output force, regardless of the position of the piston rod and the possibility of continuous operation without overloading. Switching off the electric motor, outside load caused the backward movement. Due to inertial forces of the rotor and turbine, lowering starts with a delay for 0,2 – 0,3 s.

Oil under the piston is suppressed back through the circuit of the turbine and through the corresponding holes exceeds into the zone above the piston. Oil level in device should be on the down blade of the filling port (device is in the vertical position). In the case of recharge, previously removed regulating screw (13).

Any position of the rod could be chosen for the output position. This is very important for brake releasing application, because thus compensate for brake linings wear. It is recommended that the brake should be adjusted (when it is completely closed) for 1/3 stroke of the rod.

Constructive, all sizes based on the same principle, except ESM-320, which, due required pushing force, have two-stage turbine circuit. Thus was obtained the required pushing force from the device which has the same external dimensions like ESM-250.

According to the customer request, several versions also available:

- Device with return springs C (6,7)

One or two springs are mounted upper the piston. The piston forced back to the start position by the spring, after the motor switching off. There are three versions of the device, depends of the spring force: internal, external and both of them. It should be considered that the spring force reduces the nominal output force. The nominal return spring force is given according to the piston position on the 1/3 stroke. In full extract position of the rod, real return force exceeds nominal value for approximately 20%, in full retract position, pushing force is reduced for 10%.

-Device with shock absorber R (16)

The shock absorber, fixed on the rod, prevents starting and stopping shocks and enables swiveling of the brake mechanism around the rod axe and around the perpendicular axe. This provides gradual increasing of the braking force up to a maximum.

- Device with speed control valve (9)

The speed control valve is build on the cylinder holes and, depends of the type, prevent the one of the flow directions.

There are few types of speed controls valves:

Check valve for the lifting speed control - H

In case of the piston movement to the upper position, check valve is closed so the flow is enabling only through the port beside the adjustment screw (13). Then the speed is determined by the screw position. When the piston moves down, the check valve is opened and speed is maximal. Turning the adjustment screw in clockwise direction produces lower, counter clockwise higher speed. Before the adjusting it is necessary to remove the socket screw for filling.

Check valve for the lowering speed control - S

The function of the valve is opposite as already described, the downward speed is determined by the screw position.

Throttle valve for the speed control in the both directions - D

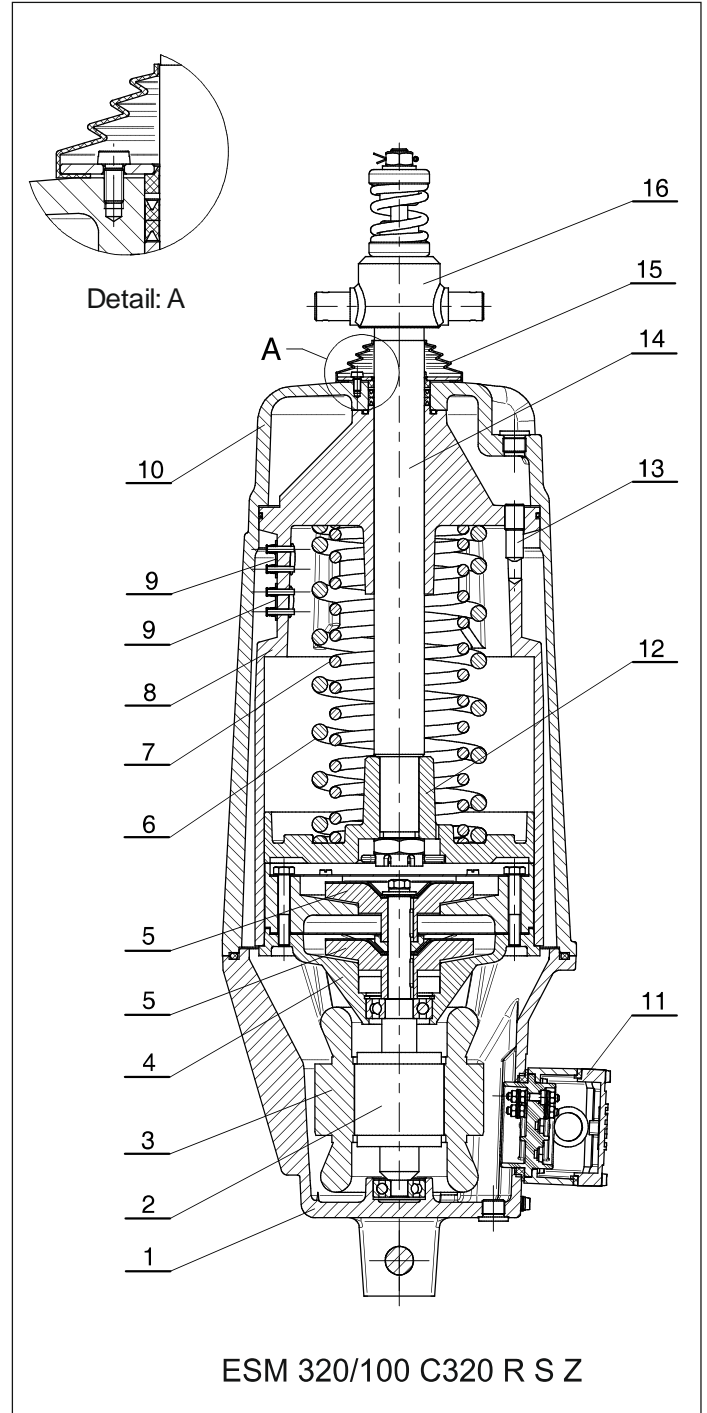
The flow is restricted in the both of the directions and it always depends of the adjustment screw position.

Note:

It should be considered that these valves reduce speed of the device. If the maximum speed is necessary, the valves should not be used.

- Device with cover protection (15)

The cover protects the rod and seal set from dust penetration. It allows long life of the device in heavy operating conditions (surface mining, and cement industry).



We meet the special customer requests for voltage and frequency. For extremely hard operation conditions, such as permanent operation under tropic temperature, or for the periodical operation under extremely low temperature, we used special seals, electric motors and adequate synthetically oils. To choice the best solution, we recommend to contact our experts.

The delivered device is filled with oil and prepared for installation. Device is fixed using a bolt that goes through eyelets of the lower housing and another bolt through rod. If the shock absorber is built on the device, there is the fork for the upper connection. Design of a mechanism to which is connected the device should be such that prevent rod load with lateral forces during operation. Since the turbine is symmetrical, the direction of rotation of electric motors is not important for device function

TECHNICAL DATA

Size	Type	Nominal stroke	Nominal pushing force	Nominal return force	Power	Current	Mass without oil	Oil mass	Lifting time	Lowering time
		mm	N	N	W	A	kg	kg	s	s
1	ESM 20/50 ESM 20/50 C12 ESM 20/50 C20	50	200	0 120 200	150	0.50	8.4	1.7	0.55	0.65
2	ESM 50/50 ESM 50/50 C18 ESM 50/50 C32 ESM 50/50 C50	50	500	0 155 330 485	200	0.55	11.0	2.5	0.55	0.65
2	ESM 50/60 ESM 50/60 C18 ESM 50/60 C32 ESM 50/60 C50	60	500	0 155 330 485	200	0.55	11.0	2.5	0.6	0.65
2.1	ESM 50/100 ESM 50/100 C18 ESM 50/100 C32 ESM 50/100 C50	100	500	0 130 290 420	200	0.55	12.5	3	0.8	0.7
3	ESM 80/60 ESM 80/60 C45 ESM 80/60 C80	60	800	0 400 780	350	0.60	16.4	4.1	0.55	0.6
3.1	ESM 80/160 ESM 80/160 C45 ESM 80/160 C80	160	800	0 300 520	350	0.60	18.8	5.7	1.2	1.1
3	ESM 125/60 ESM 125/60 C45 ESM 125/60 C80 ESM 125/60 C125	60	1250	0 400 780 1180	400	0.65	16.4	4.1	0.65	0.6
3.1	ESM 125/160 ESM 125/160 C45 ESM 125/160 C80 ESM 125/160 C125	160	1250	0 300 520 820	400	0.65	18.8	5.7	1.2	1.1
3	ESM 150/60 ESM 150/60 C45 ESM 150/60 C80 ESM 150/60 C125	60	1500	0 400 780 1180	450	0.70	16.4	4.1	0.7	0.6
3.1	ESM 150/160 ESM 150/160 C45 ESM 150/160 C80 ESM 150/160 C125	160	1500	0 300 520 820	450	0.70	18.8	5.7	1.3	1.1
4	ESM 250/60 ESM 250/60 C70 ESM 250/60 C130 ESM 250/60 C200	60	2500	0 700 1300 2000	500	0.70	26.0	8.5	0.7	0.6
5	ESM 250/160 ESM 250/160 C70 ESM 250/160 C130 ESM 250/160 C200	160	2500	0 510 850 1360	500	0.70	32.5	10.0	1.5	1.1
5	ESM 320/100 ESM 320/100 C70 ESM 320/100 C250* ESM 320/100 C320*	100	3200	0 610 2190 2800	600	0.90	34.5	9.0	1.4	0.9

* For the devices ESM 320/100 C250 and ESM 320/100 C320 nominal stroke of piston rod is limited to 60mm.

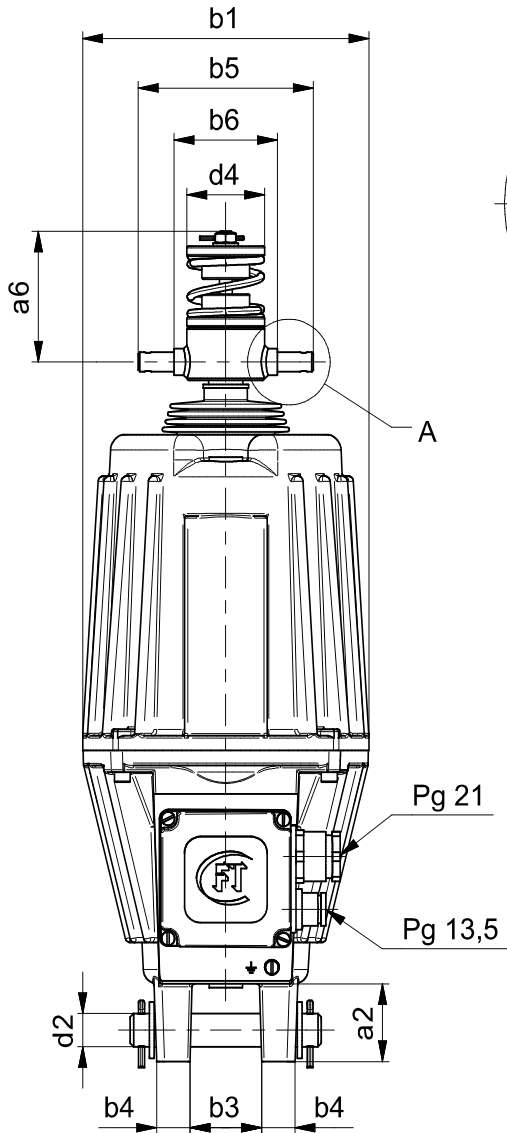
TECHNICAL DEVICES CHARACTERISTICS

		Standard variant	For tropic conditions	For low temperature	
Symbol		-	T	L	
Environment temperature	maximum	+40 ⁰ C	+45 ⁰ C	+40 ⁰ C	
	minimum	-25 ⁰ C	-25 ⁰ C	-45 ⁰ C	
Hydraulic fluid - oil type		Isulation oil SHELL DIALA OIL DX DRIED	Isulation oil SHELL DIALA OIL DX DRIED	AEROSHELL FLUID 41	
Voltage and motor frequency		3 x 400V 50Hz			
Duty of the device		2.000 cik/h ili ED100%			
Connecting box insulation		IP 56			
Variant on customer's request	voltage of motor		from 200V to 660V		
	frequency		from 42Hz to 60Hz		
	Connecting box insulation		IP 66		
	Work control	mechanical switch	Im	external mechanical control sensor signals that the brake is raised (open)	voltage 24...250V AC/DC; current 2,5A; external IP65
			Im1	external mechanical control sensor signals that the brake is raised (open) and brake lining are worn	
			MP	internal mechanical control sensor signals that the brake is raised (open)	
	inductive switch	In	external inductive control sensor signals that the brake is raised (open)	voltage 12...24V DC 200mA NO PNP	
		In1	external inductive control sensor signals that the brake is raised (open) and brake lining are worn		
	magnetic-inductive switch	Lk2	internal control sensor signals that the brake is raised (open)	voltage 24...250V AC/DC; current 0,5A	
		Lk4	internal control sensor signals that the brake is raised (open) and brake lining are worn		

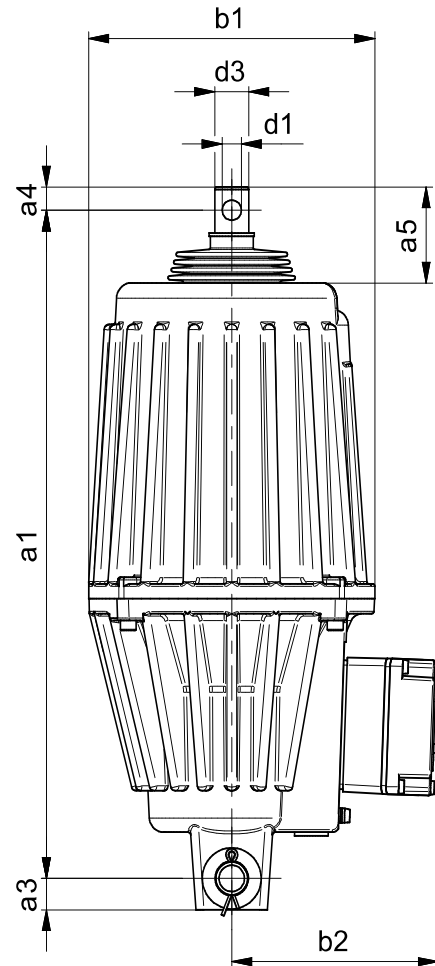
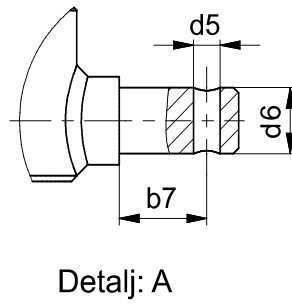
NOTE:

- Nominal pushing force for the device without a spring, is a declared force on the piston rod in the output direction. Maximum pushing force is ~ 50% higher. In devices with spring it is reduced by force springs.
- Nominal return force is a force of the spring for returning the piston rod and this information related to the **1/3 piston rod stroke**. Tolerance is +10%.
- The weight of the device and oil are approximate (depending on additional equipment).
- Time of lifting and lowering is related to a variant of the device without irreversible valve with built-in springs, i.e. with the corresponding external load. Tolerance is +10%. In devices with built-in non-return valve min. lifting and lowering time is greater for ~ 25%, while by the wring screw (13) can be continuously adjusted up to a maximum of 3-5s for a stroke rate 50-60mm, 8-12s for the stroke rate 100 mm and 10-15s for the stroke rate 160mm.
- Nominal power and current refer to the hot operating condition. Lowering temperature causes an increase in oil viscosity, in which case the nominal value of the power and current are growing and can be up to 50% higher.

BUILT-IN DRAWING



VERSION WITH SHOCK ABSORBER - R



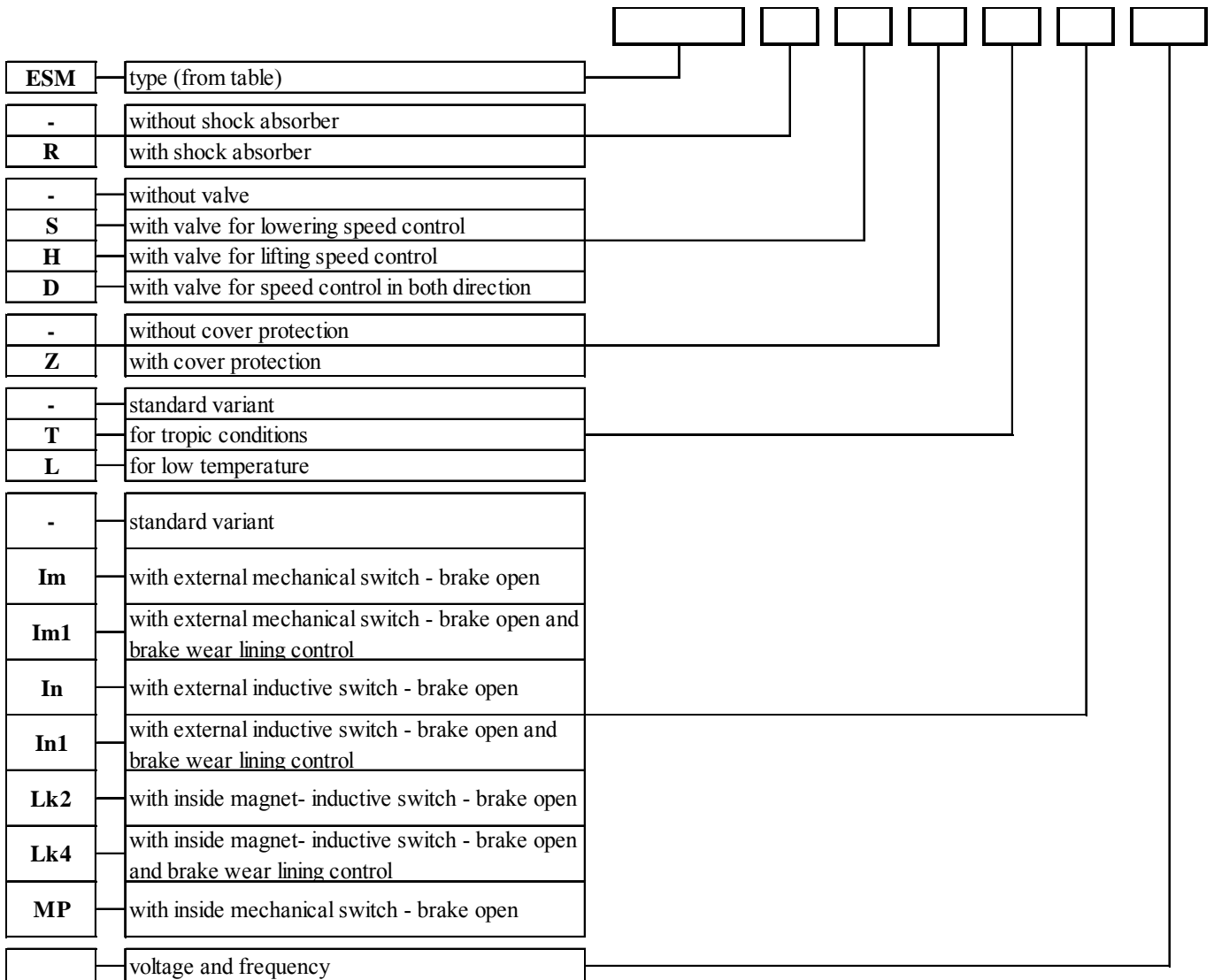
VERSION WITHOUT SHOCK ABSORBER - R

MEASURES FOR INSTALLATION

SIZE	DIMENS.																			
	a1 ^{±1}	a2 ^{±1}	a3 ⁺¹	a4 ^{+0,2}	a5	a6 ^{+0,2}	b1 ^{±1}	b2 ^{±1}	b3 ⁺¹	b4 ⁺¹	b5	b6 ^{+0,2}	b7 ^{+0,2}	d1 ^{F9}	d2 ^{h11}	d3 ^{e8}	d4	d5	d6 ^{e8}	
1	380	50	20	14	54	85	152	125	40	21	110	65	16,5	12	20	21,5	49	5	12	
2	400	50	20	14	58	85	182	130	40	26	110	65	16,5	12	20	21,5	49	5	12	
2.1	452	50	20	14	58	85	182	130	40	26	110	65	16,5	12	20	21,5	49	5	12	
3	458	55	25	20	56	110	210	140	40	26	110	65	16,5	16	20	27,5	49	5	16	
3.1	573	55	25	20	66	110	210	140	40	26	110	65	16,5	16	20	27,5	49	5	16	
4	549	55	25	24	69	114	255	150	40	26	121	70	17,5	20	20	35,5	58	5	20	
5	660	55	25	24	77	114	255	150	40	26	121	70	17,5	20	20	35,5	58	5	20	

The devices are homologated by INSTITUTE FOR QUALITY 1. MAJ – Nis, registered number is 03-3322/2 from 25.12.1996. and they are produced in accordance with the EC-safety requirements. The CERTIFICATE OF SAFETY and CERTIFICATE OF TESTING are available for each device.

ORDERING CODE:



NOTE:

Stroke indicators Im, In, Lk2 and MP indicate maximum ejection of the rod (brake open).

Stroke indicators Im1, In1 and Lk4 indicate maximum ejection of the rod (brake open) and that the brake linings are worn (used-up).

Internal indicator is build inside of device. Current supply for indicator is provided from connecting box used cable gland Pg 13,5.

Standard execution of devices is with protection against corrosion, due to the working conditions, such as surface mines, ironworks, cement works etc. If devices are used in extremely difficult conditions (presence of acids, bases, sea water), the special variants are produced.

EXAMPLES

Electrohydraulic thruster with pushing force 1250N, stroke 60mm, with return spring 780N, shock absorber and valve for lowering speed control, voltage 400V 50Hz is marked:

ESM 125/60 C80 R S 400V 50Hz

Electrohydraulic thruster with pushing force 500N, stroke 50 mm, with return spring 485N, valve for lowering speed control, cover protection, for tropic conditions, with inside sensor for control device check voltage 500V 50Hz is marked:

ESM 50/50 C50 S Z T MP 500V 50Hz

Electrohydraulic thruster with pushing force 2500N, stroke 160mm, without return spring, with valve for lifting speed control, for low temperature, voltage 400V 50Hz is marked:

ESM 250/160 H L 400V 50Hz

ELECTROHYDRAULIC THRUSTERS
SERIJE *ESM* ACCORDING TO NORMS DIN 15430

TECHNICAL DATA

Size	Type	Nominal stroke	Nominal pushing force	Nominal return force	Power	Current	Mass without oil	Oil mass	Lifting time	Lowering time
		mm	N	N	W	A	kg	kg	s	s
1	ESM 300-50 ESM 300-50 C120 ESM 300-50 C200 ESM 300-50 C270	50	300	0 120 200 270	150	0.50	8,4	1.7	0,50	0,55
2	ESM 500-60 ESM 500-60 C180 ESM 500-60 C320 ESM 500-60 C500	60	500	0 180 320 500	200	0.55	11,0	2.5	0,50	0,55
2.1	ESM 500-120 ESM 500-120 C180 ESM 500-120 C320 ESM 500-120 C500	120	500	0 130 290 420	200	0.55	12,5	3	0,80	0,70
3	ESM 800-60 ESM 800-60 C450 ESM 800-60 C800	60	800	0 450 800	350	0.60	16,4	4.1	0,45	0,50
3.1	ESM 800-120 ESM 800-120 C450 ESM 800-120 C800	120	800	0 300 520	350	0.60	18,8	5.7	0,8	0,65
3.2	ESM 1250-60 ESM 1250-60 C450 ESM 1250-60 C800 ESM 1250-60 C1250	60	1250	0 450 800 1250	400	0.65	16,4	4.1	0,55	0,50
3.3	ESM 1250-120 ESM 1250-120 C450 ESM 1250-120 C800 ESM 1250-120 C1250	120	1250	0 300 520 820	400	0.65	18,8	5.7	1,05	0,70
4	ESM 2000-60 ESM 2000-60 C700 ESM 2000-60 C1300 ESM 2000-60 C2000	60	2000	0 700 1300 2000	500	0.70	26,0	8,5	0,65	0,55
5.1	ESM 2000-120 ESM 2000-120 C700 ESM 2000-120 C1300 ESM 2000-120 C2000	120	2000	0 510 850 1360	500	0.70	32,5	10,0	1,20	0,70
5.1	ESM 2500-160 ESM 2500-160 C700 ESM 2500-160 C1300 ESM 2500-160 C2000	160	2500	0 510 850 1360	500	0.70	32,5	10,0	1,30	0,80
5	ESM 3000-60 ESM 3000-60 C700 ESM 3000-60 C2500 ESM 3000-60 C3200	60	3000	0 680 2250 2900	600	0.90	34,5	9,0	0,75	0,60
5.1	ESM 3000-120	120	3000	0	600	0.90	34,5	9,0	1,20	0,75
5.1	ESM 3000-100 ESM 3000-100 C700 ESM 3000-100 C2500* ESM 3000-100 C3200*	100	3200	0 680 2250 2900	600	0.90	34,5	9,0	1,15	0,70

* For the devices ESM 3000/100 C2500 and ESM 3000/100 C3200 nominal stroke of piston rod is limited to 60mm.

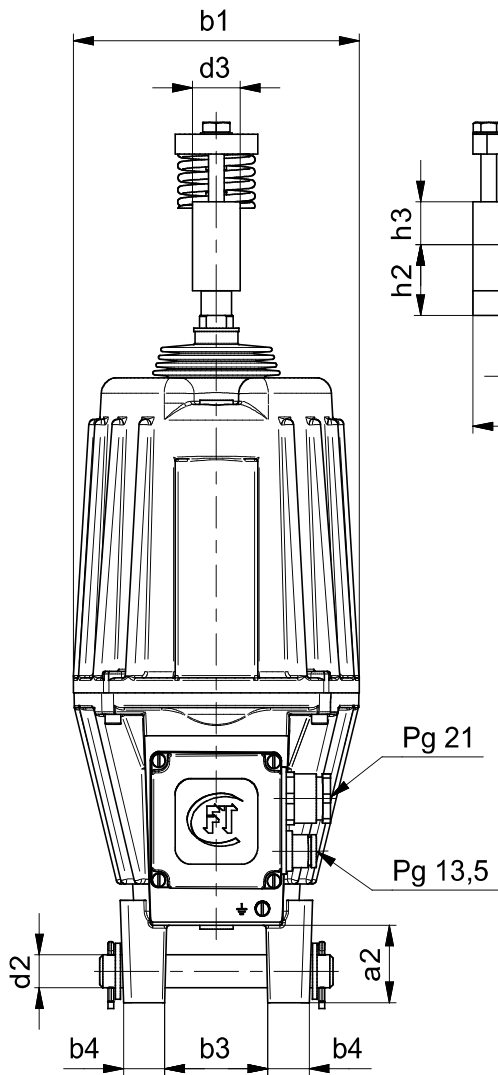
TECHNICAL DEVICE CHARACTERISTICS

		Standard variant	For tropic conditions	For low temperature	
Symbol		-	T	L	
Environment temperature	maximum	+40 ⁰ C	+45 ⁰ C	+40 ⁰ C	
	minimum	-25 ⁰ C	-25 ⁰ C	-45 ⁰ C	
Hydraulic fluid - oil type		Isulation oil SHELL DIALA OIL DX DRIED	Isulation oil SHELL DIALA OIL DX DRIED	AEROSHELL FLUID 41	
Voltage and motor frequency		3 x 400V 50Hz			
Duty of the device		2.000 cikl/h ili ED100%			
Connecting box insulation		IP 56			
Variant on customer's request	voltage of motor		from 200V to 660V		
	frequency		from 42Hz to 60Hz		
	Connecting box insulation		IP 66		
	Work control	mechanical switch	Im	external mechanical control sensor signals that the brake is raised (open)	voltage 24...250V AC/DC; current 2,5A; external IP65
			Im1	external mechanical control sensor signals that the brake is raised (open) and brake lining are worn	
			MP	internal mechanical control sensor signals that the brake is raised (open)	
		inductive switch	In	external inductive control sensor signals that the brake is raised (open)	voltage 12...24V DC 200mA NO PNP
			In1	external inductive control sensor signals that the brake is raised (open) and brake lining are worn	
		magnetic-inductive switch	Lk2	internal control sensor signals that the brake is raised (open)	voltage 24...250V AC/DC; current 0,5A
	Lk4		internal control sensor signals that the brake is raised (open) and brake lining are worn		

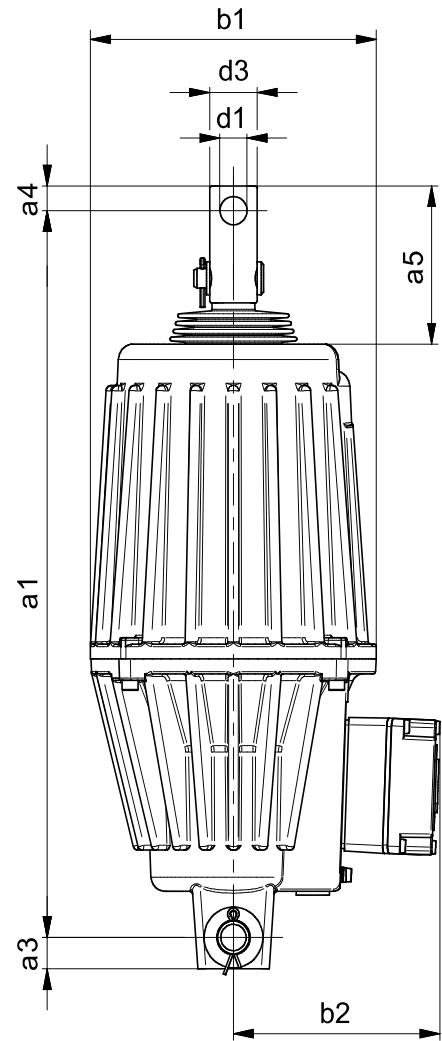
NOTE:

- Nominal pushing force for the device without a spring, is a declared force on the piston rod in the output direction. Maximum pushing force is ~ 50% higher. In devices with spring it is reduced by force springs.
- Nominal return force is a force of the spring for returning the piston rod and this information related to the **1/3 piston rod stroke**. Tolerance is +10%.
- The weight of the device and oil are approximate (depending on additional equipment).
- Time of lifting and lowering is related to a variant of the device without irreversible valve with built-in springs, i.e. with the corresponding external load. Tolerance is +10%. In devices with built-in non-return valve min. lifting and lowering time is greater for ~ 25%, while by the wing screw (13) can be continuously adjusted up to a maximum of 3-5s for a stroke rate 50-60mm, 8-12s for the stroke rate 100 mm and 10-15s for the stroke rate 160mm.
- Nominal power and current refer to the hot operating condition. Lowering temperature causes an increase in oil viscosity, in which case the nominal value of the power and current are growing and can be up to 50% higher.

BUILT-IN DRAWING



VERSION WITH SHOCK ABSORBER - R



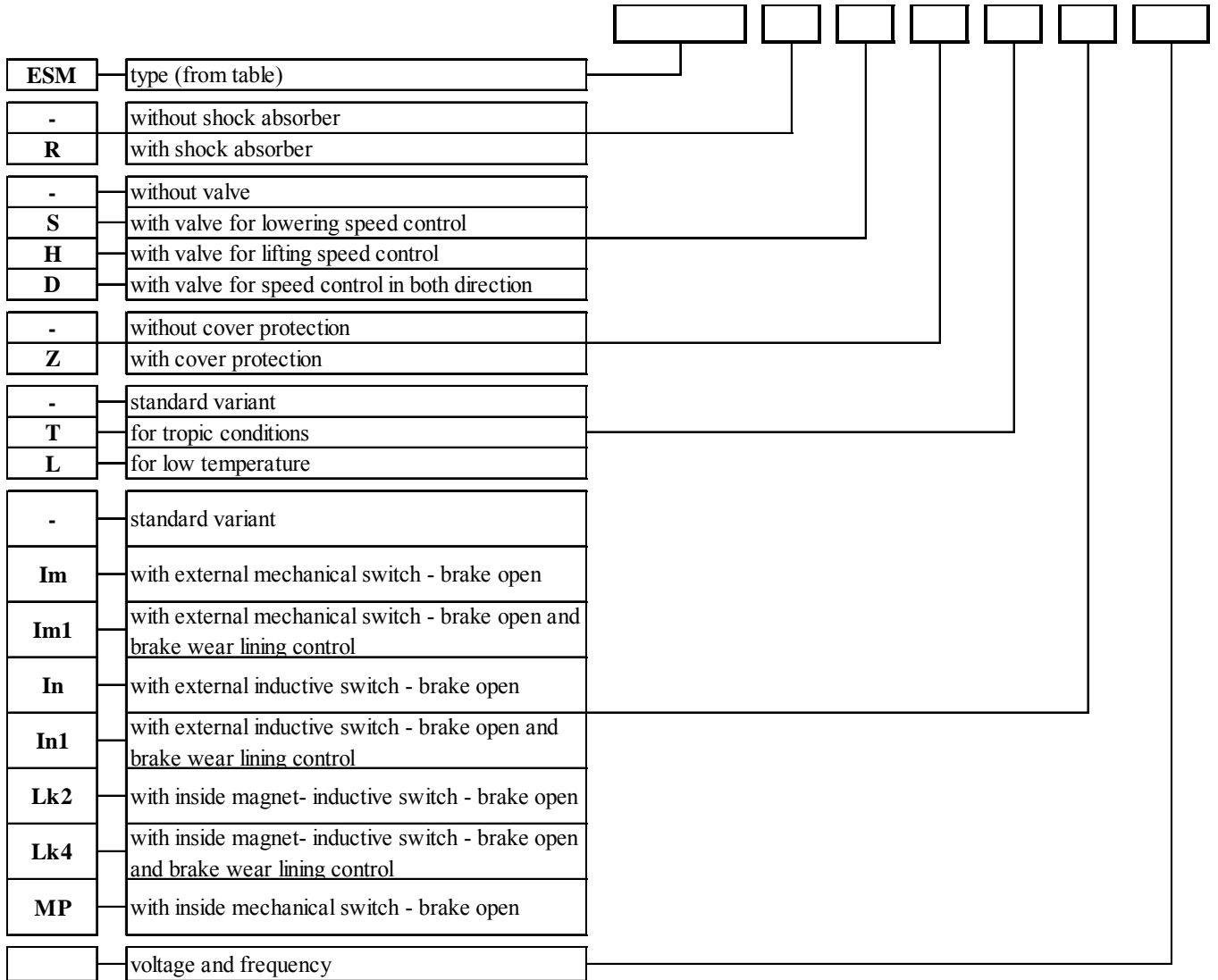
VERSION WITHOUT SHOCK ABSORBER - R

MEASURES FOR INSTALLATION

DIMENS. SIZE	a1 ^{±1}	a2 ⁺¹	a3 ⁺¹	a4 ^{+0,2}	a5	b1 ^{±1}	b2 ^{±1}	b3 ⁺²	b4 ^{+0,5}	b5	b6	h1	h2	h3	h4	d1 ^{h11}	d2 ^{+0,1}	Ød3 ^{-0,1}
	1	370	35	16	15	49	152	125	40	20	78	68	15	35	20	125	16	16
2	435	50	20	18	98	182	130	60	30	78	68	20	35	20	125	20	20	30
2.1	515	50	20	18	117	182	130	60	30	78	68	20	35	20	125	20	20	30
3	458	45	22	18	56	210	140	60	30	78	68	20	35	20	125	20	20	30
3.1	530	50	22	18	63	210	140	60	30	78	68	20	35	20	125	20	20	30
3.2	645	55	25	25	243	210	140	40	25	116	110	20	40	35	175	25	25	40
3.3	705	55	25	25	200	210	140	40	25	116	110	20	40	35	175	25	25	40
4	645	55	25	25	165	255	150	40	25	116	110	20	40	35	175	25	25	40
5	660	55	25	25	68	255	150	40	25	116	110	20	40	35	175	25	25	40
5.1	705	55	25	25	112	255	150	40	25	116	110	20	40	35	175	25	25	40

The devices are homologated by INSTITUTE FOR QUALITY 1. MAJ – Nis, registered number is 03-3322/2 from 25.12.1996. and they are produced in accordance with the EC-safety requirements. The CERTIFICATE OF SAFETY and CERTIFICATE OF TESTING are available for each device.

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Stroke indicators Im1, In1 and Lk4 indicate maximum ejection of the rod (brake open) and that the brake linings are worn (used-up).

Internal indicator is build inside of device. Current supply for indicator is provided from connecting box used cable gland Pg 13,5.

Standard execution of devices is with protection against corrosion, due to the working conditions, such as surface mines, ironworks, cement works etc. If devices are used in extremely difficult conditions (presence of acids, bases, sea water), the special variants are produced.

EXAMPLES

Electrohydraulic thruster with pushing force 1250N, stroke 60mm, with return spring 800N, shock absorber and valve for lowering speed control, voltage 400V 50Hz is marked:

ESM 1250-60 C800 R S 400V 50Hz

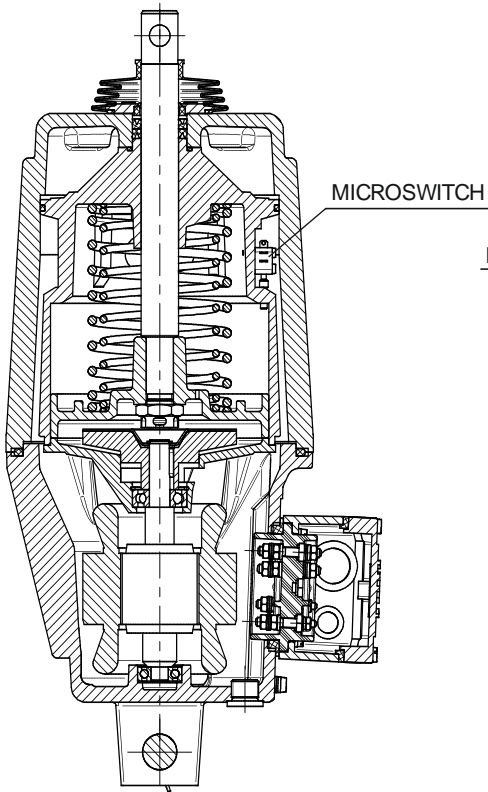
Electrohydraulic thruster with pushing force 500N, stroke 60 mm, with return spring 500N, valve for lowering speed control, cover protection, for tropic conditions, with inside sensor for control device check voltage 500V 50Hz is marked:

ESM 500-60 C500 S Z T MP 500V 50Hz

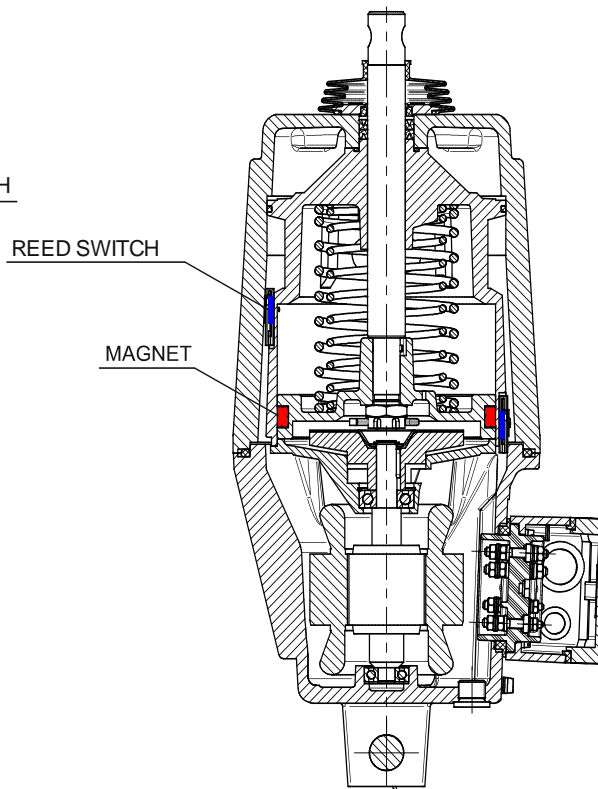
Electrohydraulic thruster with pushing force 2000N, stroke 120mm, without return spring, with valve for lifting speed control, for low temperature, voltage 400V 50Hz is marked:

ESM 2000-120 H L 400V 50Hz

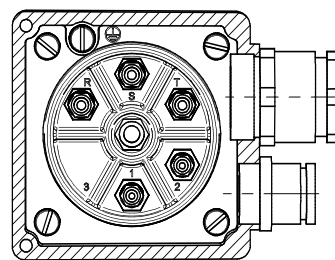
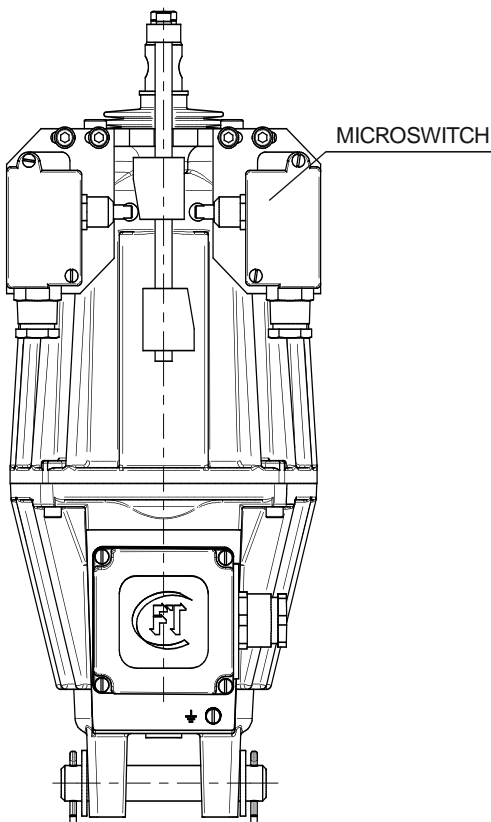
DEVICE WITH INTERNAL MECHANICAL SWITCH „MP“



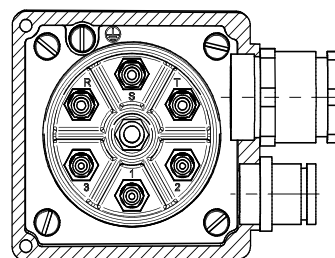
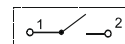
DEVICE WITH INTERNAL MAGNETIC-INDUCTIVE SWITCH „Lk4“



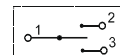
DEVICE WITH EXTERNAL MECHANICAL SWITCH „lm1“



CONNECTING BOX FOR DEVICE VARIANT „MP“ i „Lk2“



CONNECTING BOX FOR DEVICE VARIANT „Lk4“



Microswitch is build on the outside of cylinder. It is activate when the piston is in the top position. In a magnetic inductive switch, switches are also built on the outside of the cylinder and activates them a permanent magnet built in the piston. The advantage of this solution is that the switches are fully protected from external influences and in this way are very reliable in the work. Linkage is done in connecting box.

ELECTROHYDRAULIC THRUSTERS Type F-EB

TECHNICAL DEVICE'S CHARACTERISTICS

- Voltage and frequency..... 3 x 400V 50Hz, duty 2.000 cikl/h ED 100%.
Connecting box insulation IP 56, on request IP 66
- Device charging (fluid) Isulation oil SHELL DIALA OIL DX DRIED
(L variant oil AEROSHELL FLUID 41)
- Environment temperature -25 do +40°C (L variant -45 to +40°C, T variant -25 to +45°C)
- Oil temperature max. 90°C (T variant max. 100°C)

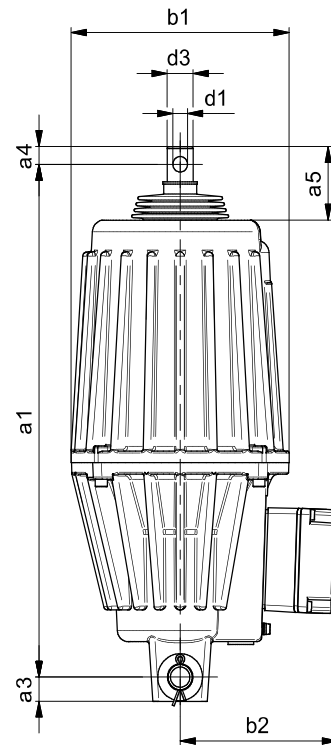
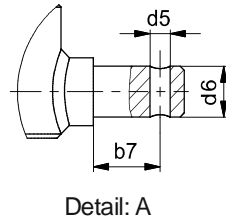
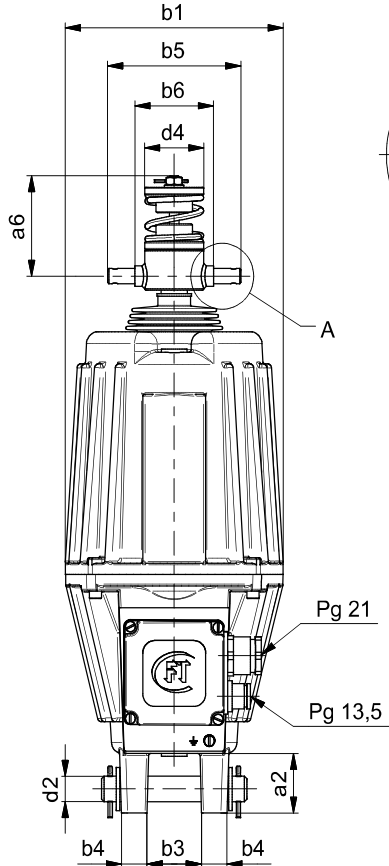
Size	Type	Nominal stroke	Nominal pushing force	Nominal return force	Power	mass	Lifting time	Lowering time
		mm	N	N	W	kg	s	s
1	F-EB 20/50	50	200	0	150	10.1	0.55	0.65
	F-EB 20/50 C12			130				
	F-EB 20/50 C20			200				
2	F-EB 50/50	50	500	0	200	13.5	0.55	0.65
	F-EB 50/50 C18			155				
	F-EB 50/50 C32			330				
	F-EB 50/50 C50			485				
2	F-EB 50/60	60	500	0	200	13.5	0.6	0.65
	F-EB 50/60 C18			155				
	F-EB 50/60 C32			330				
	F-EB 50/60 C50			485				
2.1	F-EB 50/100	100	500	0	200	15.5	0.8	0.7
	F-EB 50/100 C18			130				
	F-EB 50/100 C32			290				
	F-EB 50/100 C50			420				
3	F-EB 80/60	60	800	0	350	20.5	0.55	0.6
	F-EB 80/60 C45			400				
	F-EB 80/60 C80			780				
3.1	F-EB 80/160	160	800	0	350	24.5	1.2	1.1
	F-EB 80/160 C45			300				
	F-EB 80/160 C80			520				
3	F-EB 125/60	60	1250	0	400	20.5	0.65	0.6
	F-EB 125/60 C45			400				
	F-EB 125/60 C80			780				
	F-EB 125/60 C125			1180				
3	F-EB 150/60	60	1500	0	450	16.4	0.65	0.7
	F-EB 150/60 C45			400				
	F-EB 150/60 C80			780				
	F-EB 150/60 C125			1180				
3.1	F-EB 125/160	160	1250	0	400	24.5	1.2	1.1
	F-EB 125/160 C45			300				
	F-EB 125/160 C80			520				
	F-EB 125/160 C125			820				
4	F-EB 250/60	60	2500	0	500	34.5	0.7	0.6
	F-EB 250/60 C70			700				
	F-EB 250/60 C130			1300				
	F-EB 250/60 C200			2000				
5	F-EB 250/160	160	2500	0	500	42.5	1.5	1.1
	F-EB 250/160 C70			510				
	F-EB 250/160 C130			850				
	F-EB 250/160 C200			1360				
5	F-EB 320/100	100	3200	0	600	43.5	1.4	0.9
	F-EB 320/100 C70			610				
	F-EB 320/100 C250*			2190				
	F-EB 320/100 C320*			2800				

* For the devices F-EB 320/100 C250 and F-EB 320/100 C320 nominal stroke of piston rod is limited to 60mm

MEASURES FOR INSTALLATION

SIZE	DIMENS.																		
	a1 ^{±1}	a2 ^{±1}	a3 ^{±1}	a4 ^{+0.2}	a5	a6 ^{+0.2}	b1 ^{±1}	b2 ^{±1}	b3 ^{±1}	b4 ^{±1}	b5	b6 ^{+0.2}	b7 ^{+0.2}	d1 ^{F9}	d2 ^{h11}	d3 ^{e8}	d4	d5	d6 ^{e8}
1	380	50	20	14	54	85	152	125	40	21	110	65	16,5	12	20	21,5	49	5	12
2	400	50	20	14	58	85	182	130	40	26	110	65	16,5	12	20	21,5	49	5	12
2.1	452	50	20	14	58	85	182	130	40	26	110	65	16,5	12	20	21,5	49	5	12
3	458	55	25	20	56	110	210	140	40	26	110	65	16,5	16	20	27,5	49	5	16
3.1	573	55	25	20	66	110	210	140	40	26	110	65	16,5	16	20	27,5	49	5	16
4	549	55	25	24	69	114	255	150	40	26	121	70	17,5	20	20	35,5	58	5	20
5	660	55	25	24	74	114	250	150	40	26	121	70	17,5	20	20	35,5	58	5	20

BUILT-IN DRAWING



VERSION WITH SHOCK ABSORBER - R

VERSION WITHOUT SHOCK ABSORBER - R

ORDERING CODE

F-EB	type (from table)	
-	without shock absorber	
R	with shock absorber	
-	without valve	
S	with valve for lowering speed control	
H	with valve for lifting speed control	
D	with valve for speed control in both direction	
-	without cover protection	
Z	with cover protection	
-	standard variant	
T	for tropic conditions	
L	for low temperature	
-	standard variant	
Im	with external mechanical switch - brake open	
Im1	with external mechanical switch - brake open and brake wear lining control	
In	with external inductive switch - brake open	
In1	with external inductive switch - brake open and brake wear lining control	
Lk2	with inside magnet- inductive switch - brake open	
Lk4	with inside magnet- inductive switch - brake open and brake wear lining control	
MP	with inside mechanical switch - brake open	
	voltage and frequency	

**ELECTROHYDRAULIC THRUSTERS F-EB
DIN 15430**

TECHNICAL DEVICE'S CHARACTERISTICS

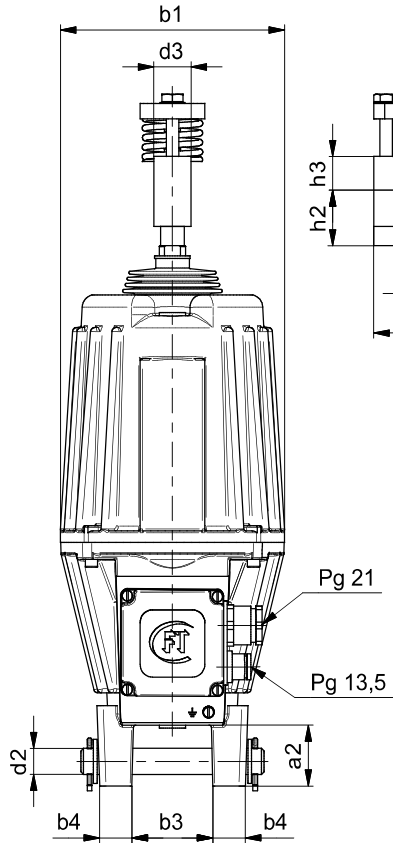
- Voltage and frequency..... 3 x 400V 50Hz, duty 2.000 cikl/h ED 100%.
Connecting box insulation IP 56, on request IP 66
- Device charging (fluid) Isulation oil SHELL DIALA OIL DX DRIED
(L variant oil AEROSHELL FLUID 41)
- Environment temperature -25 do +40°C (L variant -45 to +40°C, T variant -25 to +45°C)
- Oil temperature max. 90°C (T variant max. 100°C)

Size	Type F-EB DIN 15430	Nominal stroke	Nominal pushing force	Nominal return force	Power	mass	Lifting time	Lowering time
		mm	N	N	W	kg	s	s
1	F-EB 300-50	50	300	0	150	10,1	0,50	0,55
	F-EB 300-50 C120			120				
	F-EB 300-50 C200			200				
	F-EB 300-50 C270			270				
2	F-EB 500-60	60	500	0	200	13,5	0,50	0,55
	F-EB 500-60 C180			180				
	F-EB 500-60 C320			320				
	F-EB 500-60 C500			500				
2.1	F-EB 500-120	120	500	0	200	15,5	0,80	0,70
	F-EB 500-120 C180			130				
	F-EB 500-120 C320			290				
	F-EB 500-120 C500			420				
3	F-EB 800-60	60	800	0	350	20,5	0,45	0,50
	F-EB 800-60 C450			450				
	F-EB 800-60 C800			800				
3.1	F-EB 800-120	120	800	0	350	24,5	0,8	0,65
	F-EB 800-120 C450			300				
	F-EB 800-120 C800			520				
3.2	F-EB 1250-60	60	1250	0	400	20,5	0,55	0,50
	F-EB 1250-60 C450			450				
	F-EB 1250-60 C800			800				
	F-EB 1250-60 C1250			1250				
3.3	F-EB 1250-120	120	1250	0	400	24,5	1,05	0,70
	F-EB 1250-120 C450			300				
	F-EB 1250-120 C800			520				
	F-EB 1250-120 C1250			820				
4	F-EB 2000-60	60	2000	0	500	34,5	0,65	0,55
	F-EB 2000-60 C700			700				
	F-EB 2000-60 C1300			1300				
	F-EB 2000-60 C2000			2000				
5.1	F-EB 2000-120	120	2000	0	500	42,5	1,20	0,70
	F-EB 2000-120 C700			510				
	F-EB 2000-120 C1300			850				
	F-EB 2000-120 C2000			1360				
5.1	F-EB 2500-160	160	2500	0	500	42,5	1,30	0,80
	F-EB 2500-160 C700			510				
	F-EB 2500-160 C1300			850				
	F-EB 2500-160 C2000			1360				
5	F-EB 3000-60	60	3000	0	600	43,5	0,75	0,60
	F-EB 3000-60 C700			700				
	F-EB 3000-60 C2500			2300				
	F-EB 3000-60 C3200			2950				
5.1	F-EB 3000-120	120	3000	0	600	43,5	1,20	0,75
5.1	F-EB 3200	100	3200	0	600	43,5	1,15	0,70

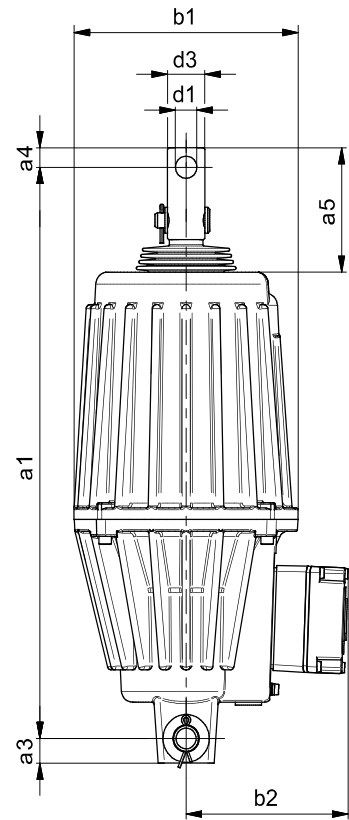
MEASURES FOR INSTALLATION

DIMENS. SIZE	a1±1	a2±1	a3±1	a4+0,2	a5	b1±1	b2±1	b3+2	b4+0,5	b5	b6	h1	h2	h3	h4	d1 ^{F9}	d2 ^{h11}	Ød3 ^{0,1}
	1	370	35	16	15	49	152	125	40	20	78	68	15	35	20	125	16	16
2	435	50	20	18	98	182	130	60	30	78	68	20	35	20	125	20	20	30
2.1	515	50	20	18	117	182	130	60	30	78	68	20	35	20	125	20	20	30
3	458	45	22	18	56	210	140	60	30	78	68	20	35	20	125	20	20	30
3.1	530	50	22	18	63	210	140	60	30	78	68	20	35	20	125	20	20	30
3.2	645	55	25	25	243	210	140	40	25	116	110	20	40	35	175	25	25	40
3.3	705	55	25	25	200	210	140	40	25	116	110	20	40	35	175	25	25	40
4	645	55	25	25	165	255	150	40	25	116	110	20	40	35	175	25	25	40
5	660	55	25	25	68	255	150	40	25	116	110	20	40	35	175	25	25	40
5.1	705	55	25	25	112	255	150	40	25	116	110	20	40	35	175	25	25	40

BUILT-IN DRAWING

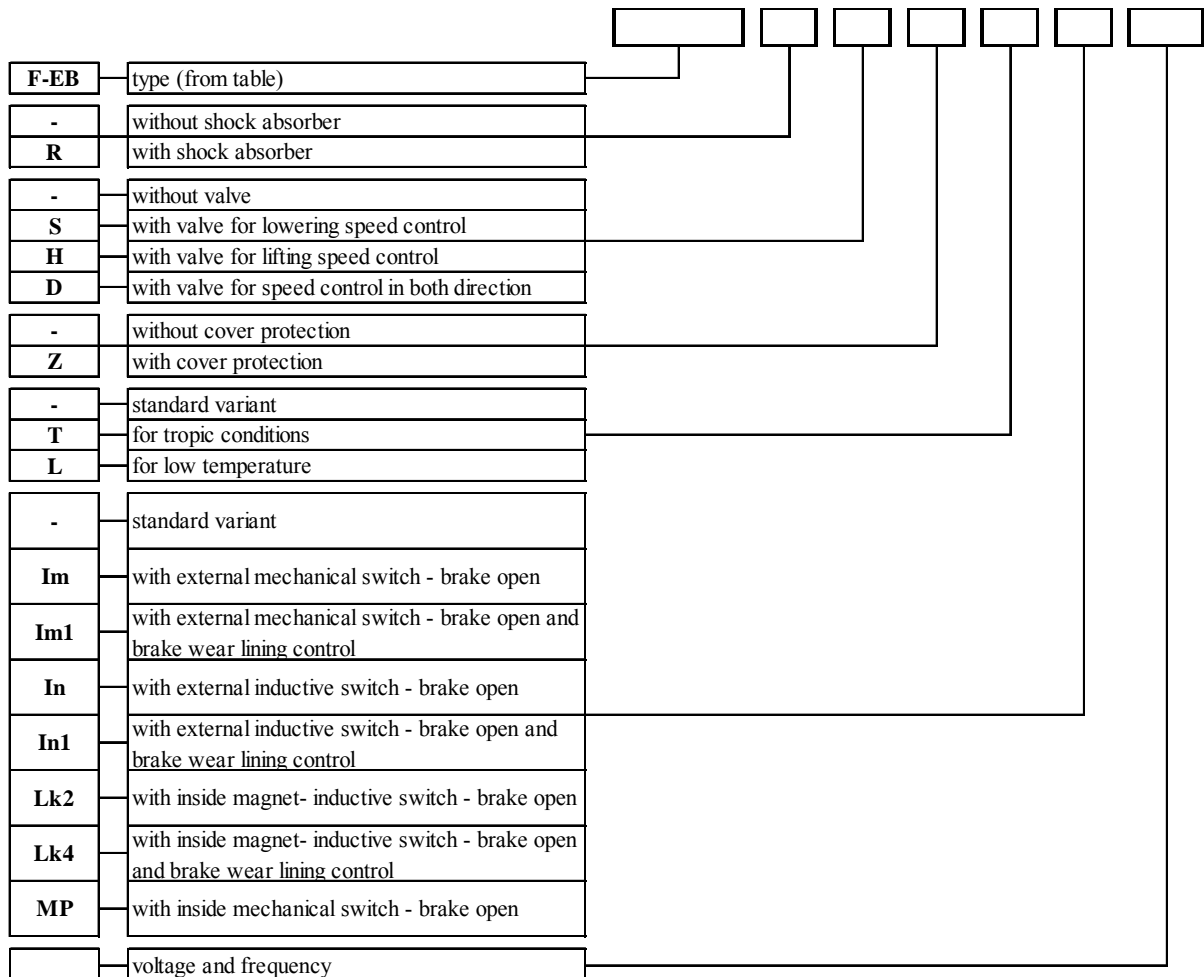


VERSION WITH SHOCK ABSORBER - R



VERSION WITHOUT SHOCK ABSORBER - R

ORDERING CODE



ELECTROHYDRAULIC THRUSTERS

Type F-BL

TECHNICAL DEVICE'S CHARACTERISTICS

- Voltage and frequency..... 3 x 400V 50Hz, duty 2.000 cikl/h ED 100%.
Connecting box insulation IP 56, on request IP 66
- Device charging (fluid) Insulation oil SHELL DIALA OIL DX DRIED
(L variant oil AEROSHELL FLUID 41)
- Environment temperature -25 do +40°C (L variant -45 to +40°C, T variant -25 to +45°C)
- Oil temperature max. 90°C (T variant max. 100°C)

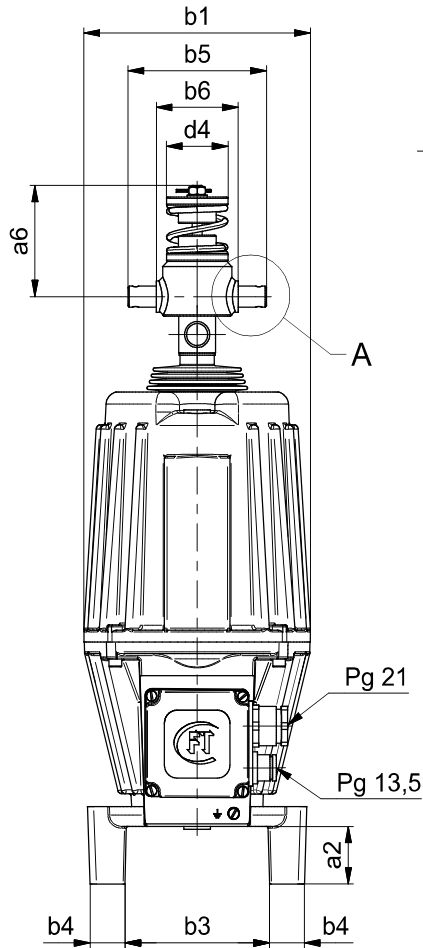
Size	Type	Nominal stroke	Nominal pushing force	Nominal return force	Power	mass	Lifting time	Lowering time
		mm	N	N	W	kg	s	s
1	F-BL-12	50	200	0	150	10.2	0.55	0.65
	F-BL-12 SV			0				
	F-BL-12 C			120				
	F-BL-12 C SV			120				
1	F-BL-20	50	200	0	150	10.2	0.55	0.65
	F-BL-20 SV			0				
	F-BL-20 C			180				
	F-BL-20 C SV			180				
2	F-BL-32	50	500	0	200	13,5	0,55	0,65
	F-BL-32 SV			0				
	F-BL-32 C			330				
	F-BL-32 C SV			330				
2	F-BL-50	50	500	0	200	13.5	0.55	0.65
	F-BL-50 SV			0				
	F-BL-50 C			485				
	F-BL-50 C SV			485				
3	F-BL-80	60	1250	0	350	21.0	0.55	0.6
	F-BL-80 SV			0				
	F-BL-80 C			775				
	F-BL-80 C SV			775				
3-1	F-BL-80/16 F-BL-80/16 SV	160	1250	0	350	24.5	1.2	1.1
3	F-BL-125	60	1250	0	400	21.0	0.65	0.6
	F-BL-125 SV			0				
	F-BL-125 C			1290				
	F-BL-125 C SV			1290				
3-1	F-BL-125/16 F-BL-125/16 SV	160	1250	0	400	24.5	1.2	1.1
4	F-BL-200	60	2500	0	500	34.5	0.7	0.6
	F-BL-200 SV			0				
	F-BL-200 C			1910				
	F-BL-200 C SV			1910				
5	F-BL-200/16	160	2000	0	500	42.5	1.5	1.1
	F-BL-200/16 SV	160	2000		500	42.5	1.5	1.1
	F-BL-250/16	160	2500		500	42.5	1.5	1.1
	F-BL-250/16 SV	160	2500		500	42.5	1.5	1.1
	F-BL-320	100	3200		600	43.5	1.4	0.9
	F-BL-320 SV	100	3200		600	43.5	1.4	0.9

- SV device with valve for lowering speed control
- C device with return springs

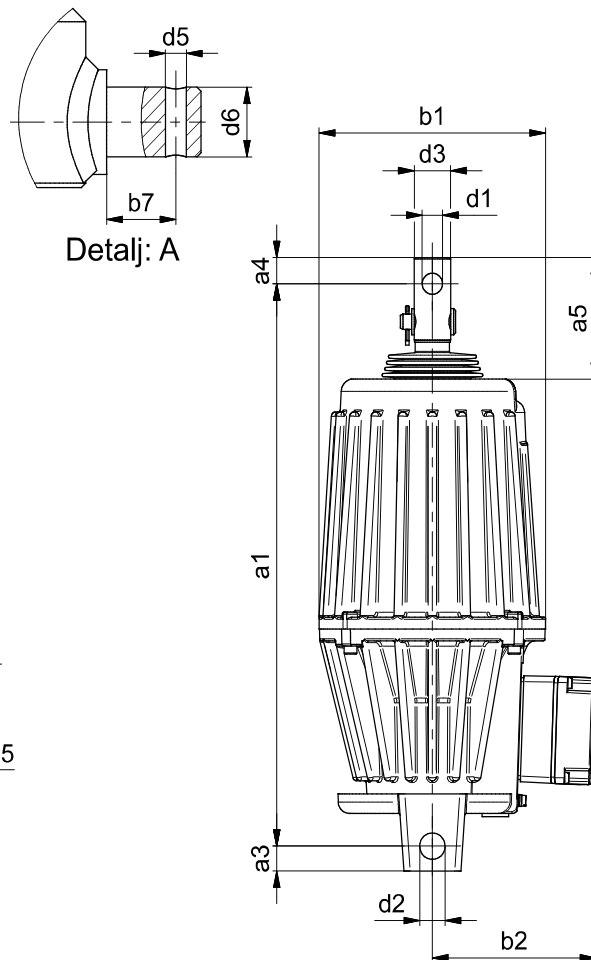
MEASURES FOR INSTALLATION

SIZE	DIMENS.																		
	a1±1	a2+1	a3+1	a4±0.2	a5~	a6±1	b1±1	b2±1	b3±1	b4±1	b5	b6+0.2	b7+0.2	d1 F9	d2 h11	d3	d4	d5	d6-0.1
1	405	50	23	16	81	42	152	125	88	23	110	65	16,5	16	20	24	49	5	16
2	430	50	23	20	93	57	182	130	110	32	110	65	16,5	16	20	29	49	5	16
3	513	55	25	25	112	52	210	140	116	38	110	65	16,5	20	20	34	49	5	16
3.1	613	55	25	25	106	52	210	140	116	38	110	65	16,5	20	20	34	49	5	16
4	605	55	25	30	131	63	255	150	126	38	121	70	17,5	25	20	40	58	5	20
5	705	55	25	30	118	63	255	150	126	38	121	70	17,5	25	20	40	58	5	20

BUILT-IN DRAWING



VERSION WITH SHOCK ABSORBER - R



VERSION WITHOUT SHOCK ABSORBER - R

ORDERING CODE

F-BL	type (from table)	_____
-	without shock absorber	_____
R	with shock absorber	_____
-	without cover protection	_____
Z	with cover protection	_____
-	standard variant	_____
T	for tropic conditions	_____
L	for low temperature	_____
-	standard variant	_____
Im	with external mechanical switch - brake open	_____
Im1	with external mechanical switch - brake open and brake wear lining control	_____
In	with external inductive switch - brake open	_____
In1	with external inductive switch - brake open and brake wear lining control	_____
Lk2	with inside magnet- inductive switch - brake open	_____
Lk4	with inside magnet- inductive switch - brake open and brake wear lining control	_____
MP	with inside mechanical switch - brake open	_____
	voltage and frequency	_____

ELECTROHYDRAULIC THRUSTERS

F- EHT 12.5 to 250-60

TECHNICAL DEVICE'S CHARACTERISTICS

- Voltage and frequency..... 3 x 400V 50Hz, duty 2.000 cikl/h ED 100%.
Connecting box insulation IP 56, on request IP 66
- Device charging (fluid) Isulation oil SHELL DIALA OIL DX DRIED
(L variant oil AEROSHELL FLUID 41)
- Environment temperature -25 do +40°C (L variant -45 to +40°C, T variant -25 to +45°C)
- Oil temperature max. 90°C (T variant max. 100°C)

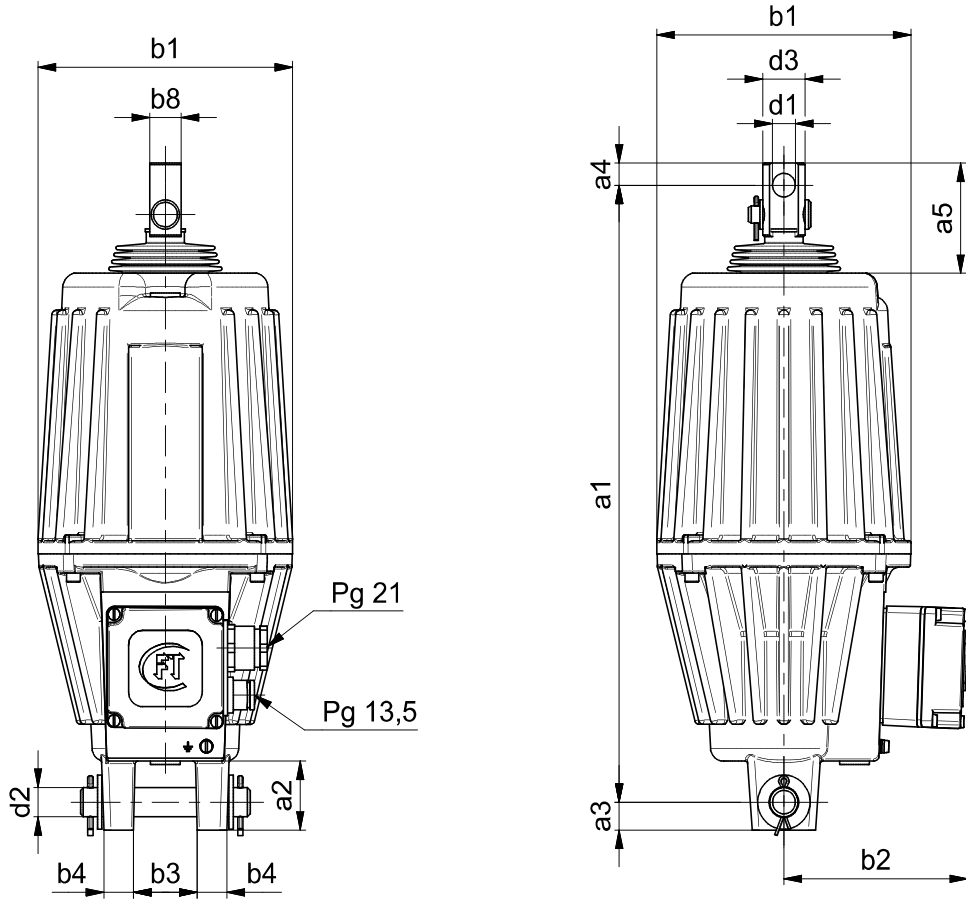
Size	Type	Nominal stroke	Nominal pushing force	Nominal return force	Power	mass	Lifting time	Lowering time
		mm	N	N				
1	F-EHT 12.5-50	50	200	0	150	10.2	0.55	0.65
	F-EHT 12.5-50V			0				
	F-EHT 12.5-50F			130				
	F-EHT 12.5-50FV			130				
1	F-EHT 20-50	50	200	0	150	10.2	0.55	0.65
	F-EHT 20-50V			0				
	F-EHT 20-50F			200				
	F-EHT 20-50FV			200				
2	F-EHT 32-50	50	500	0	200	13.5	0.55	0.65
	F-EHT 32-50V			0				
	F-EHT 32-50F			330				
	F-EHT 32-50FV			330				
2	F-EHT 50-50	50	500	0	200	13.5	0.55	0.65
	F-EHT 50-50V			0				
	F-EHT 50-50F			485				
	F-EHT 50-50FV			485				
3	F-EHT 80-60	60	1250	0	350	21.0	0.55	0.6
	F-EHT 80-60V			0				
	F-EHT 80-60F			775				
	F-EHT 80-60FV			775				
3.1	F-EHT 125-60	60	1250	0	400	21.0	0.65	0.6
	F-EHT 125-60V			0				
	F-EHT 125-60F			1290				
	F-EHT 125-60FV			1290				
4	F-EHT 200-60	60	2500	0	500	34.5	0.7	0.6
	F-EHT 200-60V			0				
	F-EHT 200-60F			1910				
	F-EHT 200-60FV			1910				
4	F-EHT 250-60	60	2800	0	500	34.5	0.75	0.65
	F-EHT 250-60V			0				
	F-EHT 250-60F			2000				
	F-EHT 250-60FV			2000				

- V device with valve for lowering speed control
- F device with return springs

MEASURES FOR INSTALLATION

DIMENS. SIZE	a1 ^{±1}	a2 ⁺¹	a3 ⁺¹	a4 ^{+0.2}	a5 ⁻	b1 ^{±1}	b2 ^{±1}	b3 ^{±1}	b4 ^{±1}	b8 ^{-0.2}	d1 ^{F9}	d2 ^{h11}	d3 ^{±0.2}
	1	400	50	20	15	75	152	125	40	15	22	16	20
2	420	50	20	15	75	182	130	40	15	22	16	20	30
3	557	55	25	19	153	210	140	40	20	25	20	25	35
3.1	582	55	25	19	178	210	140	40	20	25	20	25	35
4	582	55	25	19	92	255	150	40	20	25	20	25	35

BUILT-IN DRAWING



ORDERING CODE

F-EHT	type (from table)	_____
-	without cover protection	_____
Z	with cover protection	_____
-	standard variant	_____
T	for tropic conditions	_____
L	for low temperature	_____
-	standard variant	_____
Im	with external mechanical switch - brake open	_____
Im1	with external mechanical switch - brake open and brake wear lining control	_____
In	with external inductive switch - brake open	_____
In1	with external inductive switch - brake open and brake wear lining control	_____
Lk2	with inside magnet- inductive switch - brake open	_____
Lk4	with inside magnet- inductive switch - brake open and brake wear lining control	_____
MP	with inside mechanical switch - brake open	_____
	voltage and frequency	_____

ELEKTROHYDRAULIC THRUSTERS

F- EHT 338 to 2960

TECHNICAL DEVICE'S CHARACTERISTICS

- Voltage and frequency..... 3 x 400V 50Hz, duty 2.000 cikl/h ED 100%.
Connecting box insulation IP 56, on request IP 66
- Device charging (fluid) Isulation oil SHELL DIALA OIL DX DRIED
(L version oil AEROSHELL FLUID 41)
- Environment temperature -25 do +40°C (L version -45 to +40°C, T version -25 to +45°C)
- Oil temperature max. 90°C (T version max. 100°C)

Size	Type	Nominal stroke	Nominal pushing force	Nominal return force	Power	mass	Lifting time	Lowering time
		mm	N	N	W	kg	s	s
3	F-EHT 338	75	450	0	350	21.0	0.6	0.7
3-F	F-EHT 338 F	50	450	420			0.6	0.7
3	F-EHT 375	50	750	0			0.5	0.55
3-F	F-EHT 375 F	50	750	700			0.5	0.55
3.1	F-EHT 900	120	750	0	350	21.0	1	0.7
4	F-EHT 1100	60	1850	0	500	34.5	0.8	0.6
4-F	F-EHT 1100-F	60	1850	1750	500	34.5	0.8	0.6
5	F-EHT 2960	160	1850	0	500	42.5	1.8	1.1

- F device with return springs

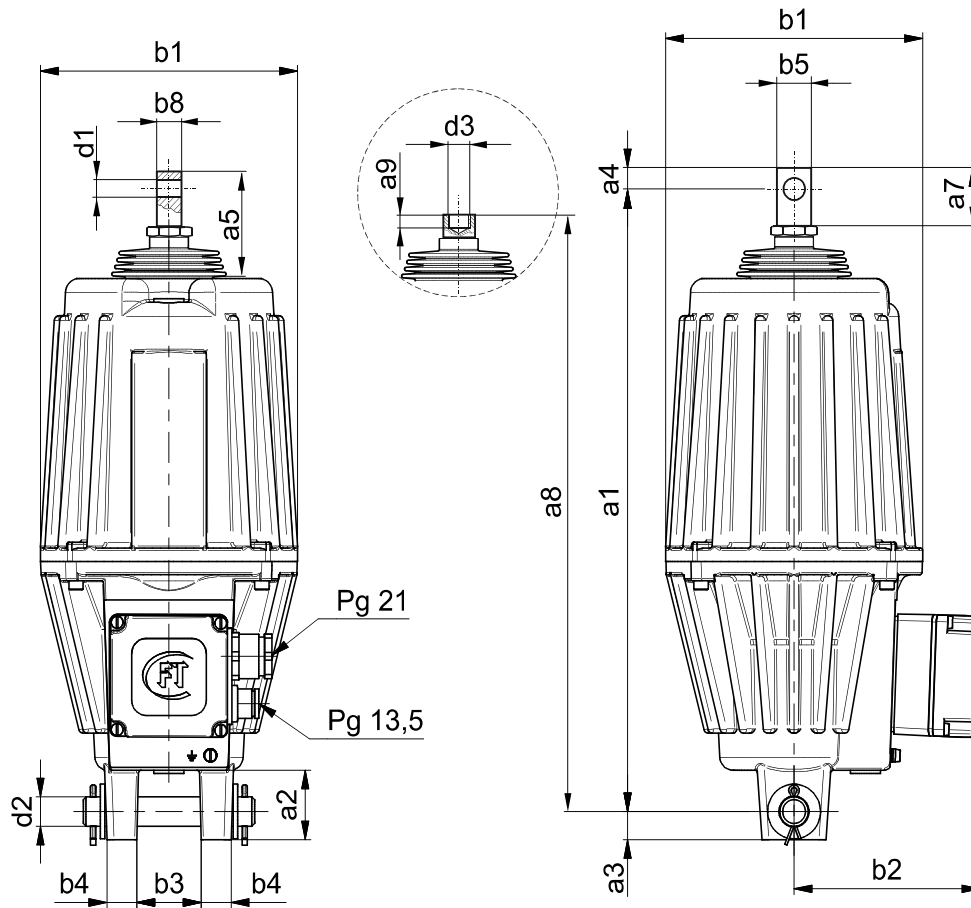
MEASURES FOR INSTALLATION

DIMENS. SIZE	a1	a2 ⁺¹	a3 ⁺¹	a4 ^{±0.2}	a5	a7 ^{±0.2}	a8 ^{±1}	a9 ^{±0.2}	b1 ^{±1}	b2 ^{±1}	b3 ^{±1}	b4 ^{±1}	b5 ^{±0.2}	b8 ^{-0.2}	d1 ^{F9}	d2 ^{h11}	d3
	3	509	50	22	14	100	30			210	140	60	30	34	22	16	24
3.1	609	50	22	15	96	57			210	140	60	30	34	25	16	24	
4	600	60	24	23	113	70			250	150	80	32	40	40	25	27	
5	700	60	24	23	105	70			255	150	80	32	40	40	25	27	
3-F		50	22				480	30	210	140	60	25				24	M16x1,5
4-F		60	24				568	30	255	150	80	32				27	M16x1,5

NOTE:

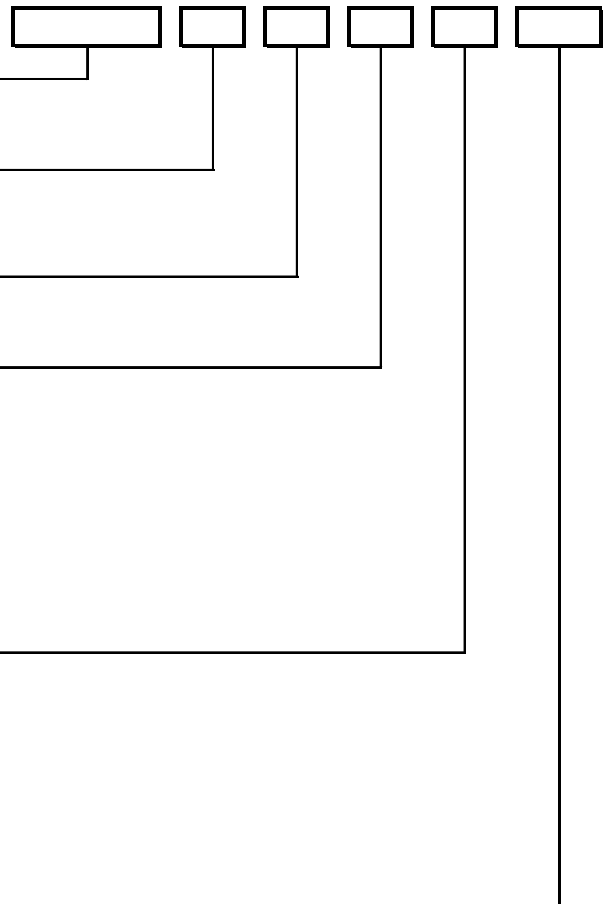
- Nominal pushing force for the device without a spring, is a declared force on the piston rod in the output direction. Maximum pushing force is ~ 50% higher. In devices with spring it is reduced by force springs.
- Nominal return force is a force of the spring for returning the piston rod and this information related to the **1/3 piston rod stroke**. Tolerance is +10%.
- The weight of the device and oil are approximate (depending on additional equipment).
- Time of lifting and lowering is related to a variant of the device without irreversible valve with built-in springs, i.e. with the corresponding external load. Tolerance is +10%. In devices with built-in non-return valve min. lifting and lowering time is greater for ~ 25%, while by the wing screw (13) can be continuously adjusted up to a maximum of 3-5s for a stroke rate 50-60mm, 8-12s for the stroke rate 100 mm and 10-15s for the stroke rate 160mm.
- Nominal power and current refer to the hot operating condition. Lowering temperature causes an increase in oil viscosity, in which case the nominal value of the power and current are growing and can be up to 50% higher.

BUILT-IN DRAWING



ORDERING CODE:

F-EHT	type (from table)
-	without valve
S	with valve for lowering speed control
H	with valve for lifting speed control
D	with valve for speed control in both direction
-	without cover protection
Z	with cover protection
-	standard variant
T	for tropic conditions
L	for low temperature
-	standard variant
Im	with external mechanical switch - brake open
Im1	with external mechanical switch - brake open and brake wear lining control
In	with external inductive switch - brake open
In1	with external inductive switch - brake open and brake wear lining control
Lk2	with inside magnet- inductive switch - brake open
Lk4	with inside magnet- inductive switch - brake open and brake wear lining control
MP	with inside mechanical switch - brake open
	voltage and frequency



ELEKTROHYDRAULIC THRUSTERS
Type F- SZH-45 and F-SZH-185

TECHNICAL DEVICE'S CHARACTERISTICS

- Voltage and frequency..... 3 x 400V 50Hz, duty 2.000 cikl/h ED 100%.
Connecting box insulation IP 56, on request IP 66
- Device charging (fluid) Isulation oil SHELL DIALA OIL DX DRIED
(L execution oil AEROSHELL FLUID 41)
- Environment temperature -25 do +40°C (L execution -45 to +40°C, T execution -25 to +45°C)
- Oil temperature max. 90°C (T execution max. 100°C)

Size	Type	Nominal stroke	Nominal pushing force	Nominal return force	Power	mass	Lifting time	Lowering time
		mm	N	N	W	kg	s	s
3	F-SZH 45/50	60	800	0	350	21.0	0.5	0.55
4	F-SZH 185/60	60	2500	0	500	34.5	0.7	0.6
5	F-SZH 185/120	120	2500	0	500	42.5	1.4	0.9

MEASURES FOR INSTALLATION

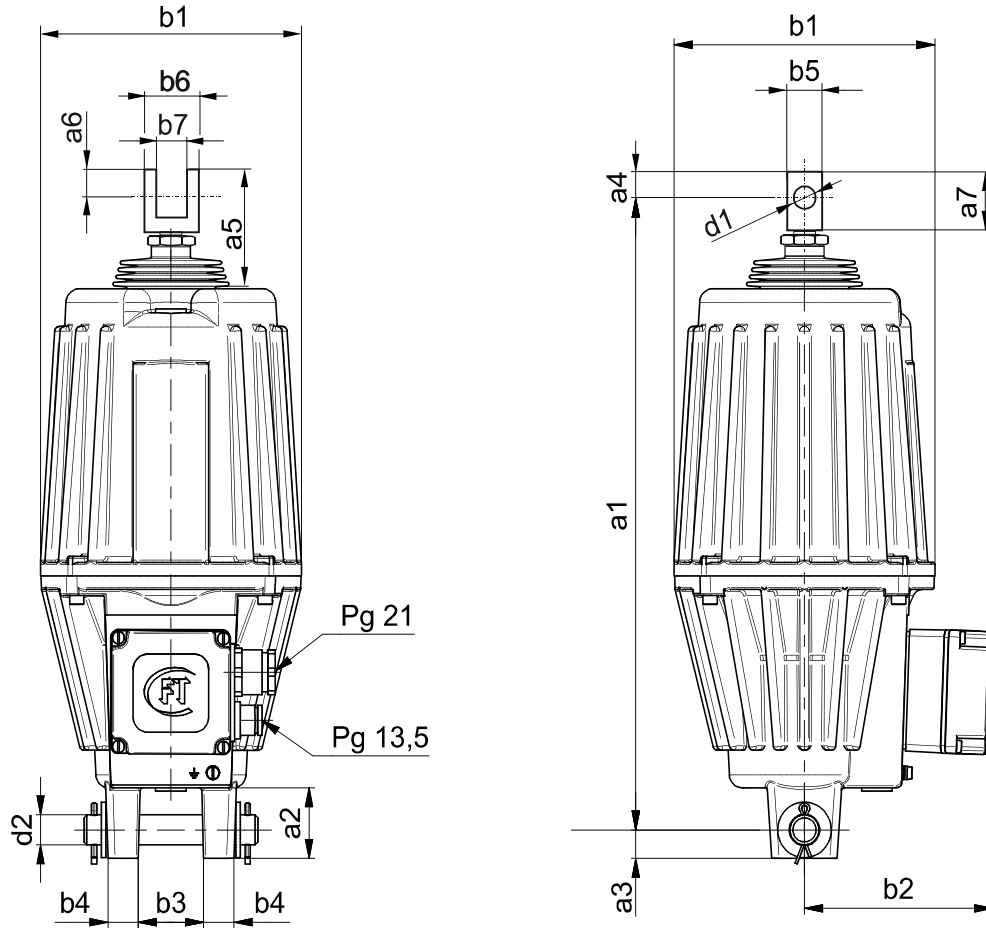
DIMENS. SIZE	a1*	a2 ⁺¹	a3 ⁺¹	a4 ^{±0.2}	a5*	a6 ^{±0.2}	a7 ^{±0.2}	b1 ^{±1}	b2 ^{±1}	b3 ^{±1}	b4 ^{±1}	b5 ^{±0.2}	b6 ^{±0.2}	b7 ^{+0.2}	d1 ^{F9}	d2 ^{h11}
	3	509	50	22	15	97	32	57	210	140	60	25	34	39	21	16
4	757	60	24	23	358	34	70	255	150	84	31	40	60	36	22	24
5	757	60	24	23	160	34	70	255	150	84	31	40	60	36	22	24

* Adjust the range ± 10 mm

NOTE:

- Nominal pushing force for the device without a spring, is a declared force on the piston rod in the output direction. Maximum pushing force is ~ 50% higher. In devices with spring it is reduced by force springs.
- Nominal return force is the force that spring returns the piston rod and this information related to the 1/3 piston rod stroke. Tolerance is +10%.
- The weight of the device and oil are approximate.
- Time of lifting and lowering is related to a variant of the device without irreversible valve with built-in springs, i.e. with the corresponding external load. Tolerance is +10%. In devices with built-in non-return valve min. lifting and lowering time is greater for ~ 25%, while by the wring screw (13) can be continuously adjusted up to a maximum of 3-5s for a stroke rate 50-60mm, 8-12s for the stroke rate 100 mm and 10-15s for the stroke rate 160mm.
- Nominal power and current refer to the hot operating condition. Lowering temperature causes an increase in oil viscosity, in which case the nominal value of the power and current are growing and can be up to 50% higher.

BUILT-IN DRAWING



ORDERING CODE:

F-SZH	type (from table)	
-	device without return springs	
F	device with return springs	
-	without valve	
S	with valve for lowering speed control	
H	with valve for lifting speed control	
D	with valve for speed control in both direction	
-	without cover protection	
Z	with cover protection	
-	standard variant	
T	for tropic conditions	
L	for low temperature	
-	standard variant	
Im	with external mechanical switch - brake open	
Im1	with external mechanical switch - brake open and brake wear lining control	
In	with external inductive switch - brake open	
In1	with external inductive switch - brake open and brake wear lining control	
Lk2	with inside magnet- inductive switch - brake open	
Lk4	with inside magnet- inductive switch - brake open and brake wear lining control	
MP	with inside mechanical switch - brake open	
	voltage and frequency	

ELECTROHYDRAULIC THRUSTERS F-TGM

TECHNICAL DEVICE'S CHARACTERISTICS

- Voltage and frequency..... 3 x 400V 50Hz, duty 2.000 cikl/h ED 100%.
Connecting box insulation IP 56, on request IP 66
- Device charging (fluid)..... Isulation oil SHELL DIALA OIL DX DRIED
(L version oil AEROSHELL FLUID 41)
- Environment temperature -25 do +40°C (L version -45 to +40°C, T version -25 to +45°C)
- Oil temperature max. 90°C (T version max. 100°C)

Size	Type FLUIDOTEHNIC	Nominal stroke	Nominal pushing force	Nominal return force	Power	Current	mass	Lifting time	Lowering time
		mm	N	N	W	A	kg	s	s
1	F-TGM 25	32	300	0	150	0,50	10,1	0,35	0,45
2	F-TGM 50	50	500	0	200	0,55	13,5	0,45	0,50

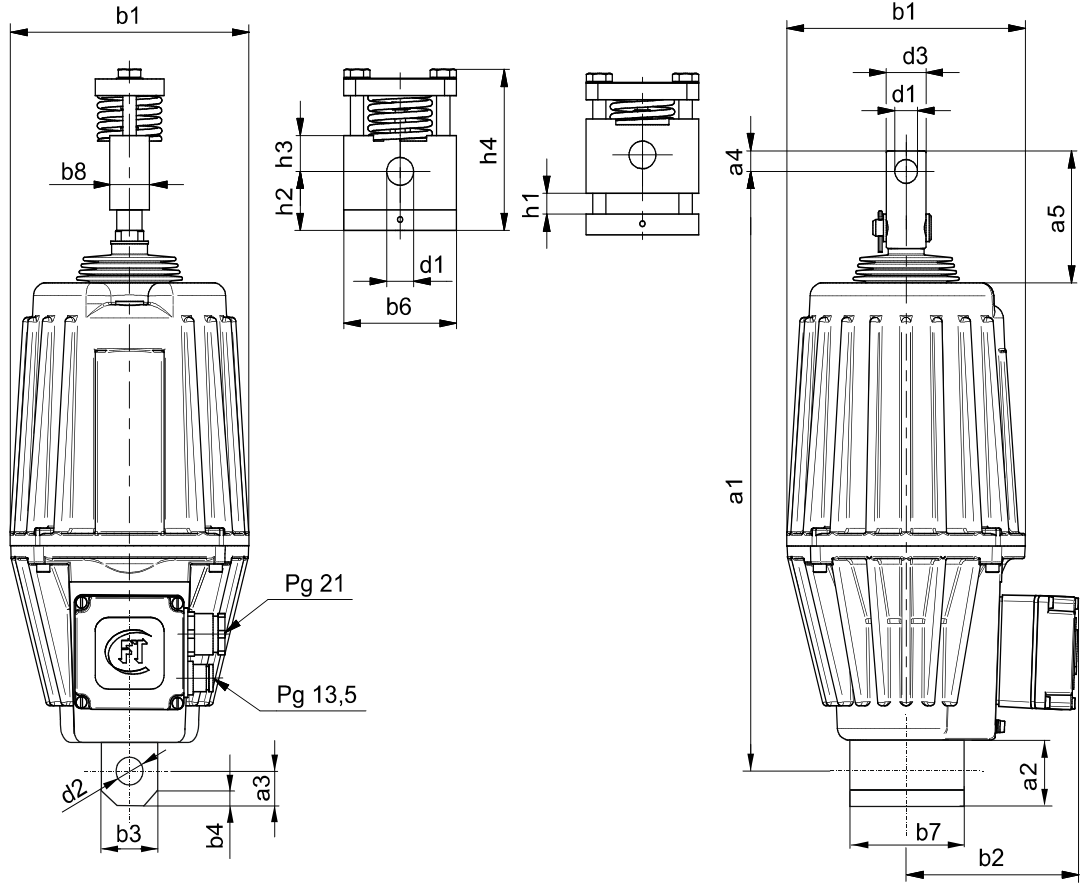
MEASURES FOR INSTALLATION

DIMENS. SIZE	a1 ^{±1}	a2 ⁺¹	a3 ⁺¹	a4 ^{+0,2}	a5	b1 ^{±1}	b2 ^{±1}	b3 ⁺²	b4 ^{+0,5}	b5	b6	b7	b8 ^{-0,2}	h1	h2	h3	h4	d1 ^{F9}	d2 ^{+0,1}	d3 ^{-0,1}
	1	349	39	15	13	32	152	114	30	10			60	16					12	12,2
2	400	47	17	16	60	180	116	35	12	78	68	60	25	20	36	20	100	16	16,2	32

NOTE:

- Nominal pushing force for the device without a spring, is a declared force on the piston rod in the output direction. Maximum pushing force is ~ 50% higher. In devices with spring it is reduced by force springs.
- Nominal return force is a force of the spring for returning the piston rod and this information related to the **1/3 piston rod stroke**. Tolerance is +10%.
- The weight of the device and oil are approximate (depending on additional equipment).
- Time of lifting and lowering is related to a variant of the device without irreversible valve with built-in springs, i.e. with the corresponding external load. Tolerance is +10%. In devices with built-in non-return valve min. lifting and lowering time is greater for ~ 25%, while can be continuously adjusted up to a maximum of 3-5s.
- Nominal power and current refer to the hot operating condition. Lowering temperature causes an increase in oil viscosity, in which case the nominal value of the power and current are growing and can be up to 50% higher.

BUILT-IN DRAWING



VERSION WITH SHOCK ABSORBER - R

VERSION WITHOUT SHOCK ABSORBER - R

ORDERING CODE

F-TGM	type (from table)	□
-	device without return springs	□
F	device with return springs	□
-	without valve	□
S	with valve for lowering speed control	□
H	with valve for lifting speed control	□
D	with valve for speed control in both direction	□
-	without cover protection	□
Z	with cover protection	□
-	standard variant	□
T	for tropic conditions	□
L	for low temperature	□
-	standard variant	□
Im	with external mechanical switch - brake open	□
Im1	with external mechanical switch - brake open and brake wear lining control	□
In	with external inductive switch - brake open	□
In1	with external inductive switch - brake open and brake wear lining control	□
Lk2	with inside magnet- inductive switch - brake open	□
Lk4	with inside magnet- inductive switch - brake open and brake wear lining control	□
MP	with inside mechanical switch - brake open	□
	voltage and frequency	□

ELECTROHYDRAULIC THRUSTERS

Type F-REH and F-R

TECHNICALS DEVICE'S CHARACTERISTICS

- Voltage and frequency..... 3 x 400V 50Hz, duty 2.000 cikl/h ED 100%.
Connecting box insulation IP 56, on request IP 66
- Device charging (fluid) Insulation oil SHELL DIALA OIL DX DRIED
(L variant oil AEROSHELL FLUID 41)
- Environment temperature -25 do +40°C (L variant -45 to +40°C, T variant -25 to +45°C)
- Oil temperature max. 90°C (T variant max. 100°C)

Size	Type FLUIDOTEHNIC	Nominal stroke	Nominal pushing force	Nominal return force	Power	Current	mass	Lifting time	Lowering time
		mm	N	N	W	A	kg	s	s
1	F-R 12/5	50	200	0	150	0,50	10,2	0,55	0,65
	F-R 12/5 c			120					
	F-R 20/5			0					
	F-R 20/5 c			200					
1.1	F-REH 12/50 N5H	50	200	0	150	0,50	10,2	0,55	0,65
	F-REH 12/50 N5C			200					
	F-REH 20/50 N5H			0					
	F-REH 20/50N5 C			200					
2	F-R 32/5	50	500	0	200	0,55	13,5	0,55	0,65
	F-R 32/5 c			330					
	F-R 50/5			0					
	F-R 50/5 c			485					
2.1	F-REH 32/50N5 H	50	500	0	200	0,55	13,5	0,55	0,65
	F-REH 32/50N5 C			330					
	F-REH 50/50 N5H			0					
	F-REH 50/50 N5C			485					
3	F-R 80/6	60	800	0	350	0,60	21,0	0,55	0,60
	F-R 80/6 c			780					
	F-R 125/6		1250	0	400			0,65	0,60
	F-R 125/6 c			1180					
3.1	F-REH 80/60 N5H	60	800	0	350	0,60	21,0	0,55	0,60
	F-REH 80/60 N5C			1180					
3.3	F-REH 80/120 N5H	120	800	0	350	0,6	24,5	0,90	0,80
3.2	F-REH 125/60 N5H	60	1250	0	400	0,60	21,0	0,65	0,60
	F-REH 125/60 N5C			1180					
4	F-REH 200/60 N5H	60	2500	0	500	0,80	34,5	0,70	0,60
	F-REH 200/60 N5C			2000					
5	F-REH 320/60N5 H	60	3200	0	500	0,9	43	0,75	0,65
	F-REH 320/60N5 C			2800					
5.1	F-REH 320/120 N5H	120	3200	0	500	0,9	43	1,1	1,05

N - normal ambient temperature (T – tropical)

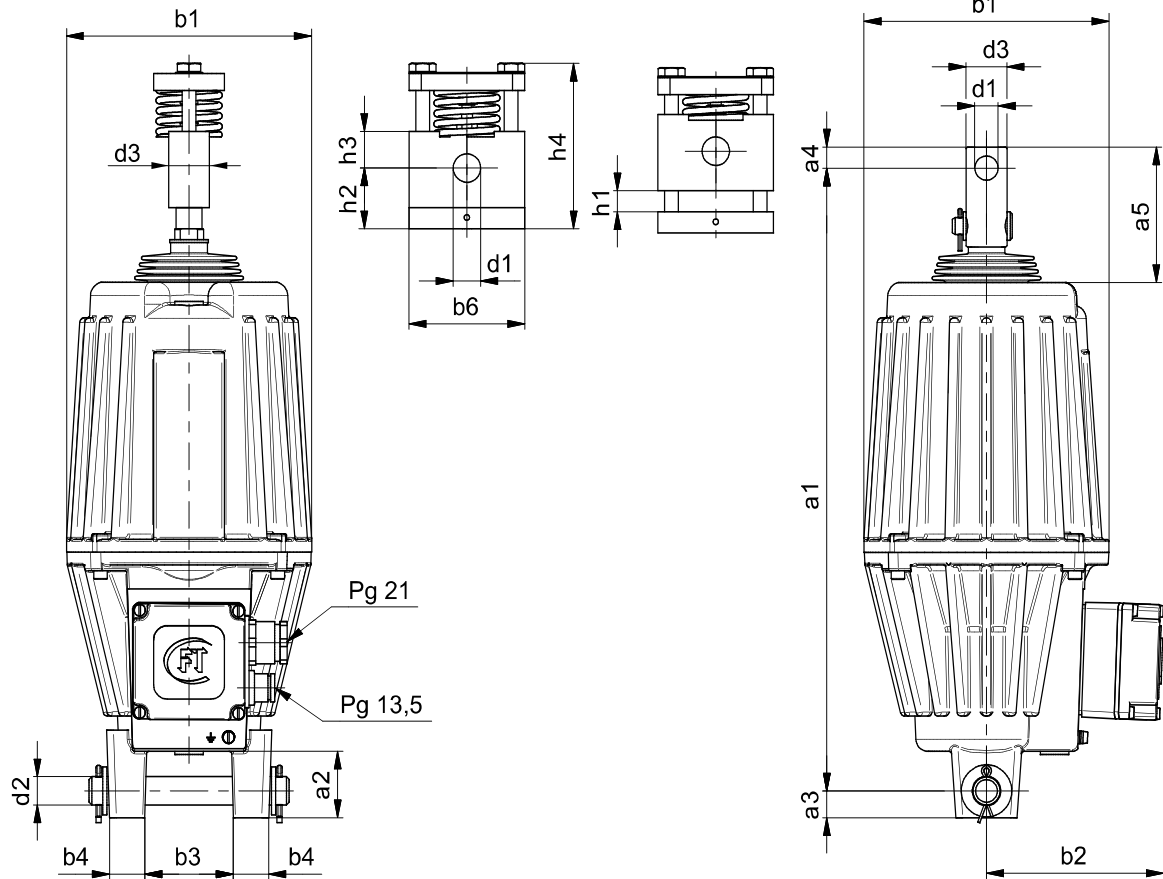
5 - power supply 3x400V 50Hz

H - device without return spring ; C (c) - device with return spring

MEASURES FOR INSTALLATION

DIMENS. SIZE	a1 ^{±1}	a2 ^{±1}	a3 ^{±1}	a4 ^{±0.2}	a5	b1 ^{±1}	b2 ^{±1}	b3 ^{±1}	b4 ^{±1}	b6	h1	h2	h3	h4	d1 ^{F9}	d2 ^{h11}	d3 ^{±0.2}									
	1	416	50	20	18	94	152	125	87	24	68	15	40	20	120	20	18	40								
1.1	370	40	48			32			20	40																
2	428	50	20	16	88	182	130	110	30	68	20	34	25	110	20	25	40									
2.1	450							110	40			25						34	50							
3	515	55	25	25	114	210	140	116	38	110	20	38	35	175	20	25	40									
3.1	450	50			49			40	25									110	20	38	35	175	20	25	50	
3.2	620	55			218																					60
3.3	530	50			63																					
4	620	55	25	25	135	255	150	40	25	110	20	38	35	175	20	25	60									
5	675	55	25	25	80	255	150	40	25	110	20	38	35	175	20	25	60									
5.1	800	55	25	25	205	255	150	40	25	110	20	38	35	175	20	25	60									

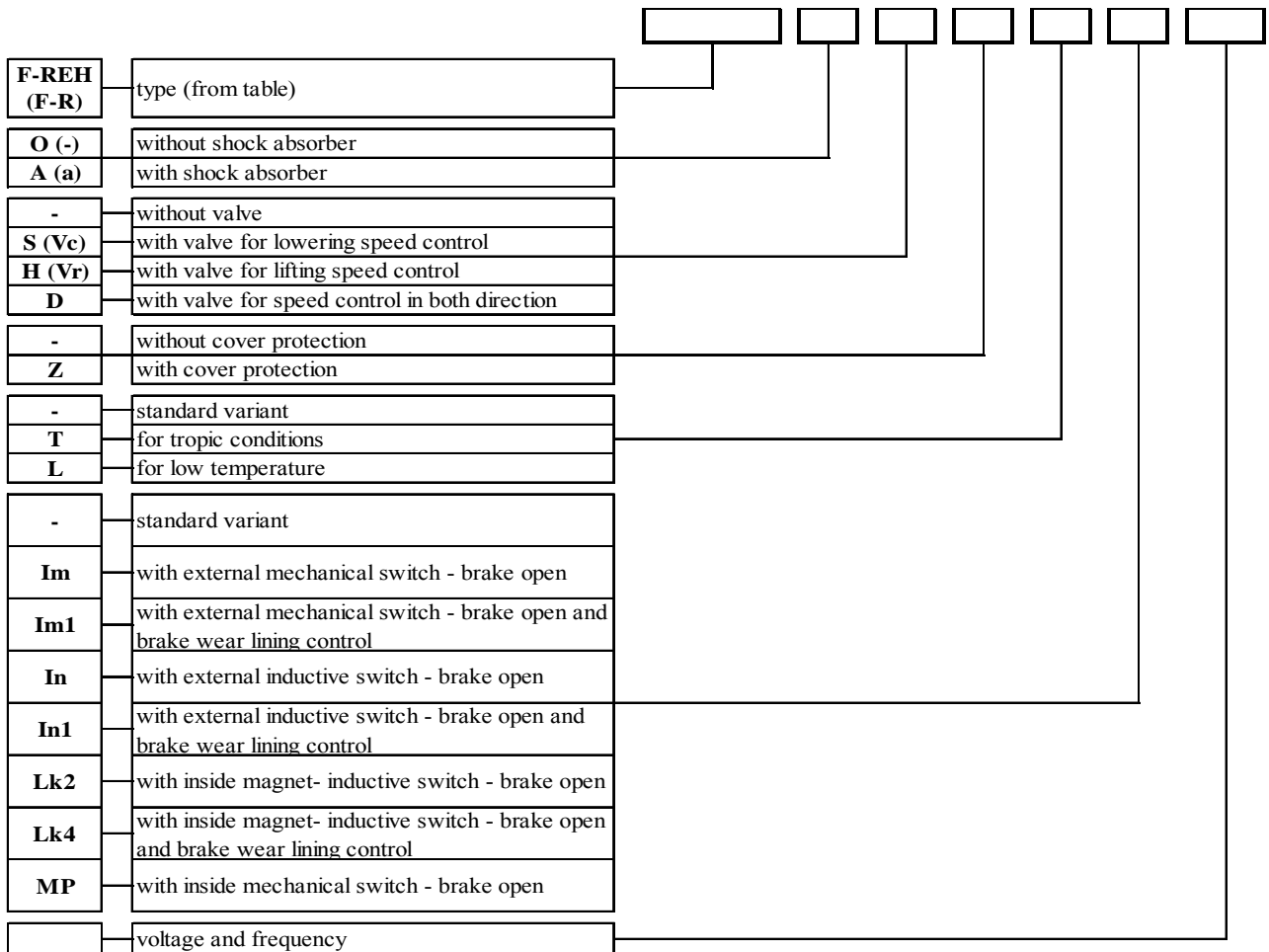
BUILT-IN DRAWING



VERSION WITH SHOCK ABSORBER - R

VERSION WITHOUT SHOCK ABSORBER - R

ORDERING CODE



ELECTROHYDRAULIC THRUSTERS Type F-Ed

TECHNICALS DEVICE'S CHARACTERISTICS

- Voltage and frequency..... 3 x 400V 50Hz, duty 2.000 cikl/h ED 100%.
Connecting box insulation IP 56, on request IP 66
- Device charging (fluid) Isulation oil SHELL DIALA OIL DX DRIED
(L version oil AEROSHELL FLUID 41)
- Environment temperature -25 do +40°C (L version -45 to +40°C, T version -25 to +45°C)
- Oil temperature max. 90°C (T version max. 100°C)

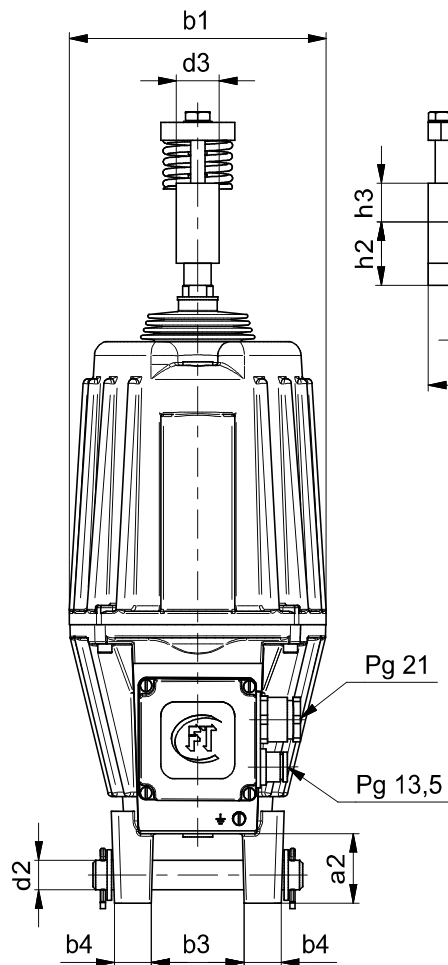
Size	Type	Nominal stroke	Nominal pushing force	Nominal return force	Power	mass	Lifting time	Lowering time
		mm	N	N	W	kg	s	s
1	F-Ed 30/5	50	300	280*	200	10.2	0.55	0.65
1.01	F-Ed 11 F-Ed 30/5.1							
2	F-Ed 50/6 F-Ed 21 F-Ed 50/6.2	55	500	485*	200	13.5	0.55	0.65
2.01	F-Ed 2 F-Ed 50/6.1							
2.1	F-Ed 50/12	120	500	0	200	15.5	0.8	0.7
3	F-Ed 80/6	60	800	780*	350	21.0	0.55	0.6
3.01	F-Ed 3 F-Ed 80/6.1							
3.1	F-Ed 80/12	120	800	0	350	24.5	0.9	0.8
3.1.01	F-Ed 4 F-Ed 80/12.1							
3.2	F-Ed 125/6 F-Ed 121/6	60	1250	1180*	400	21.0	0.65	0.6
3.3	F-Ed 121/12	120	1250	0	400	24.5	0.9	0.8
3.3.01	F-Ed 125/12 F-Ed 121/12.1							
4	F-Ed 5 F-Ed 185/6	60	1850	1900*	500	34,5	0,7	0,6
4.1	F-Ed 6 F-Ed 185/16	155	1850	0	500	34,5	1,4	0,9
4.2	F-Ed 200/6 F-Ed 201/6	60	2500	2000*	500	34.5	0.7	0.6
4.3	F-Ed 201/12	120	2500	0	500	34,5	1,1	0,8
4.3.01	F-Ed 200/12 F-Ed 201/12.1							
5	F-Ed 301/6	60	3200	2700*	600	43.5	1.5	1.1
5.01	F-Ed 300/6 F-Ed 301/6.1							
5.1	F-Ed 301/12	120	3200	0	600	43.5	1.5	1.1
5.1.01	F-Ed 300/12 F-Ed 301/12.1							

*RETURN FORCE IS RELATED TO THE VARIANT "c". IN THE VARIANT WITHOUT SPRING RETURN FORCE IS "0".

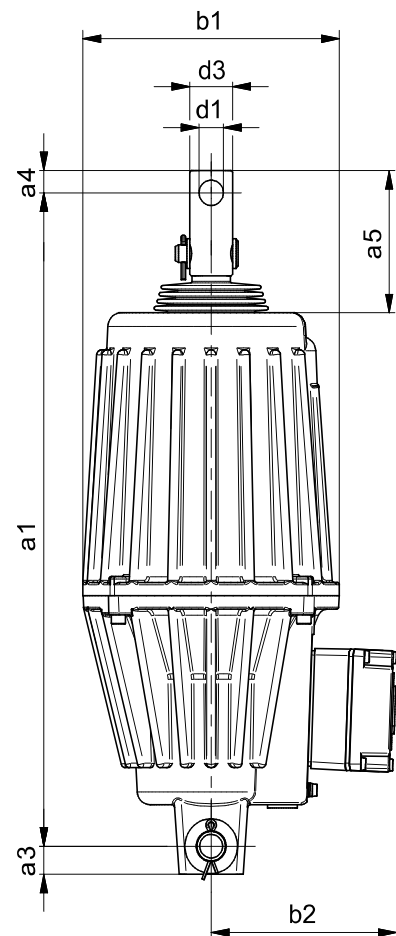
MEASURES FOR INSTALLATION

DIMENS. SIZE	a1 ^{±1}	a2 ⁺¹	a3 ⁺¹	a4 ^{+0.2}	a5	b1 ^{±1}	b2 ^{±1}	b3 ^{±1}	b4 ^{±1}	b5	b6	h1	h2	h3	h4	d1 ^{F9}	d2 ^{h11}	d3 ^{±0.2}
	1	370	50	20	14	49	152	118	40	20	78	68	15	35	20	75	16	16
1.01	433	112																
2	435	50	20	20	93	182	120	60	30	78	68	20	35	20	100	20	20	30
2.01	511				169													
2.1	515	50	22	18	113	182	120	60	30	/	/	/	/	/	/	20	20	30
3	450	55	25	18	52	210	130	60	30	78	68	20	35	20	100	20	20	30
3.01	509				111													
3.1	530	55	25	20	25	210	130	60	30	/	/	/	/	/	/	20	20	30
3.1.01	606				101													
3.2	645	55	25	20	241	210	130	40	25	116	110	20	40	35	175	25	25	40
3.3	705	55	25	20	197	210	130	40	25	/	/	/	/	/	/	25	25	40
3.3.01	765				257													
4	600	65	25	24	120	255	140	80	40	116	110	20	40	35	175	25	27	40
4.1	700	65	25	24	97	255	140	80	40	/	/	/	/	/	/	25	27	40
4.2	645	55	25	24	159	250	140	40	25	116	110	20	40	35	175	25	25	40
4.3	705	55	25	24	122	255	140	40	25	/	/	/	/	/	/	25	25	40
4.3.01	765				182													
5	645	55	25	24	52	255	140	40	25	116	110	20	40	35	175	25	25	40
5.01	680				87													
5.1	705	55	25	24	112	255	140	40	25	/	/	/	/	/	/	25	25	40
5.1.01	800				207													

BUILT-IN DRAWING

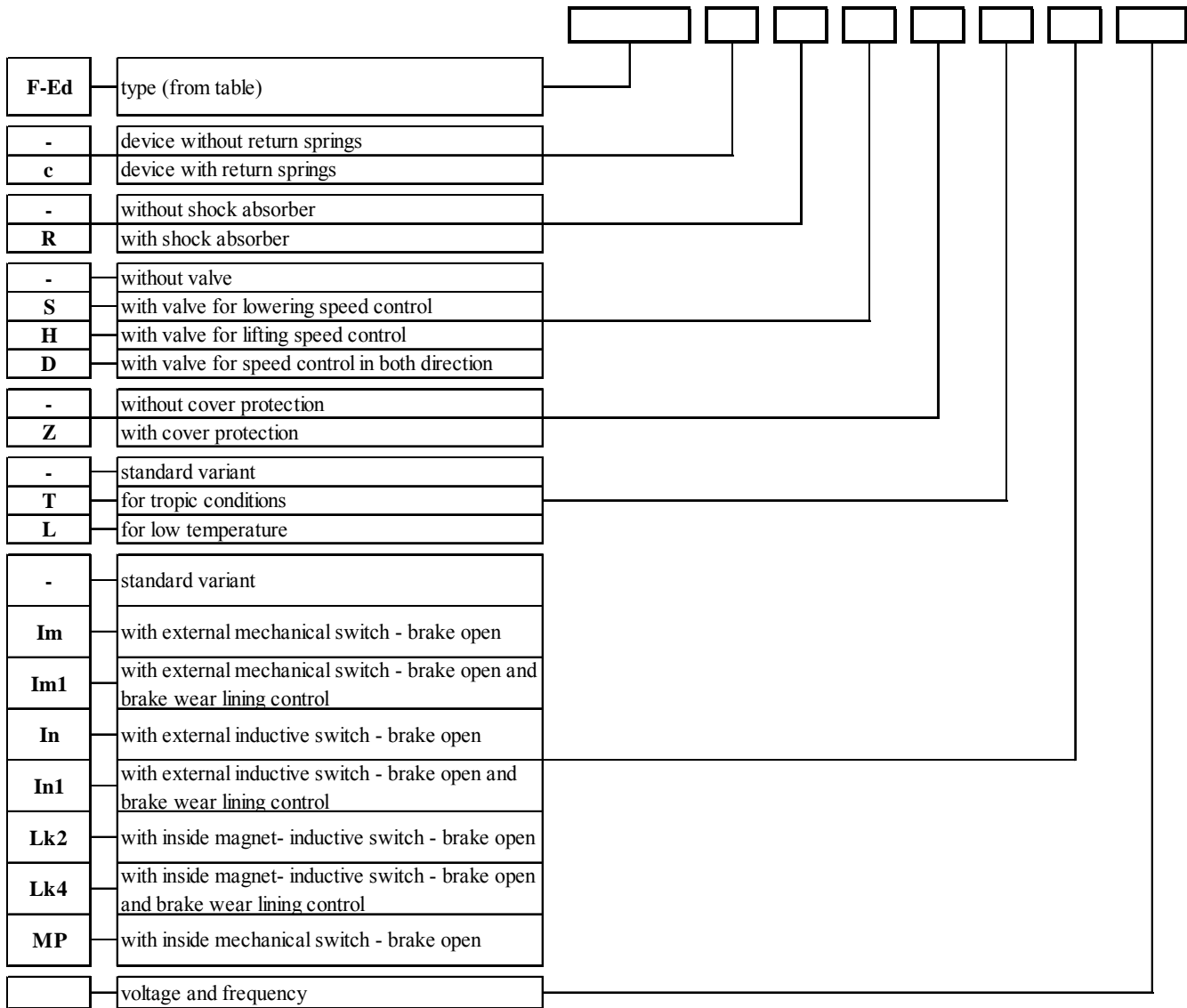


VERSION WITH SHOCK ABSORBER - R



VERSION WITHOUT SHOCK ABSORBER - R

ORDERING CODE





Installation of drive station to Mining plant
KEK KOSOVO Obilic

Installation of the electrohydraulic thruster
in the GOSA FOM Smederevska Palanka,
on Novokuznjeck Siberia RUSSIA



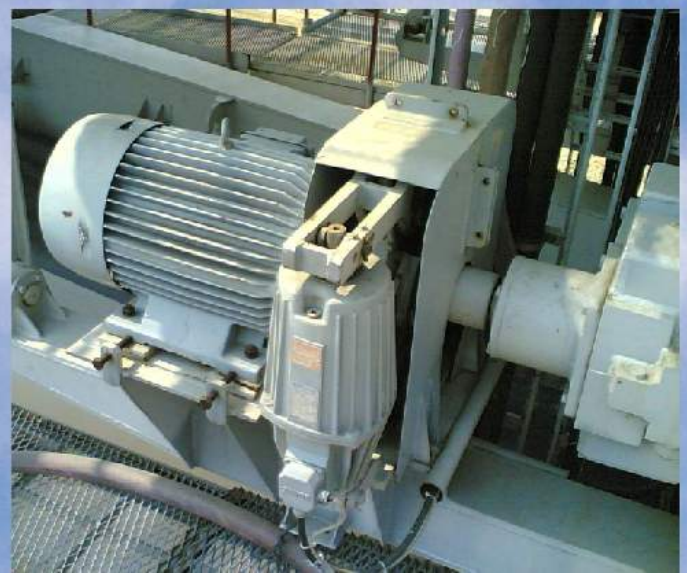
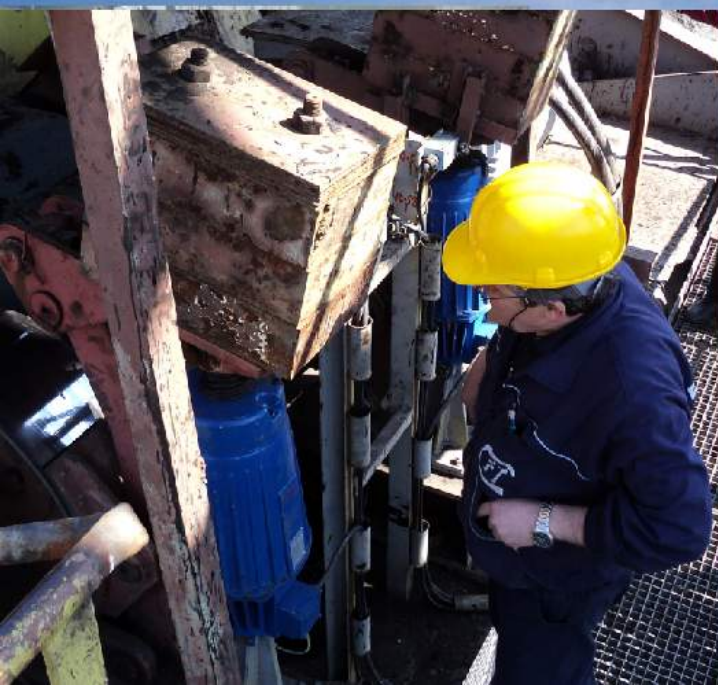
CRANE (Assembling)
Metallurgic plant
Niznij Tagil, Sverdlovsk Area, RUSSIA

Installation of the electrohydraulic thruster
in the draving station on surface mine
Gracanica Gacko, Bosnia and Herzegovina-
REPUBLIKA SRPSKA



Electrohydraulic thruster built-in in excavator
arrows holder drive SRS 2000 on the surface
mine Rovinari - Romania

Electrohydraulic thruster built-in the drive
station on surface mining Drmno, Thermal
Power Station Kostolac





Electrohydraulic thrusters ESM produced in Fluidotchnic are registered by INSTITUTE FOR QUALITY 1. MAJ - Nis. Registered number is 03-3322/2 from 25.12.1996. Devices are designed and produced in accordance with the safety requirements of EC Directives. The CERTIFICATE OF SAFETY and CERTIFICATE OF TESTING are available for each device. **ДВОАДæã * Æ * ç { •** has established Quality management system SRPS ISO:9001:2008 and Environmental management system SRPS ISO 14001:2005.

There are a great number of electrohydraulic thrusters in exploitation from different manufacturers, such as ELDRO, BEL-VEM, EB-VEM, EHT, SZH, REH, TGM. These products are fully replaceable by Fluidotchnic thrusters of special design. Fluidotchnic also produces variants according to DIN 15430. Upon a customer's request we can also produce devices with internal and external stroke indicators.



Microswitches or magnet switches signaled that brake is open, and (if needed) brake lining wear. External indicators may be microswitches or inductive switches.



To meet a very high request of reliability, 100% of manufactured parts are inspected. Standard parts are supplied by renowned manufacturers. After assembling each device is adjusted and tested. The testing results are enclosed to each delivered device.

