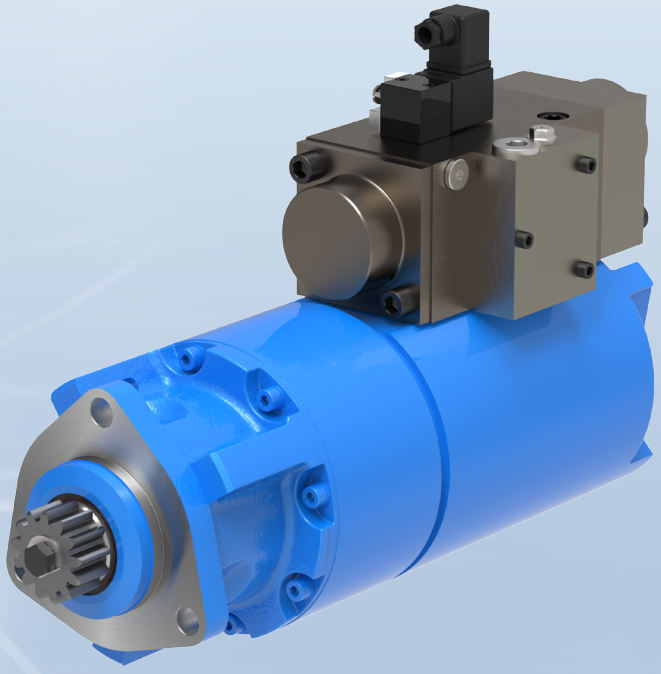
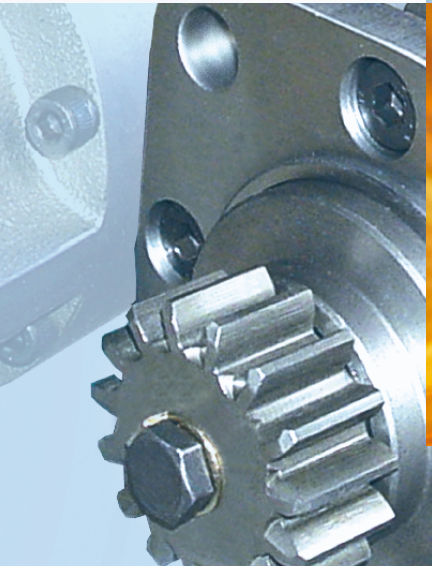
DÜSTERLOH Fluidtechnik

Pneumatic starter



Pneumatic starter

Catalogue



LS1-001 EN Edition 2022.06 / 02

General information

DÜSTERLOH pneumatic starters are used to start up diesel engines and turbines.
The DÜSTERLOH pneumatic starter mainly comprises a gear motor, a reduction gear unit, a free-wheel and a valve combination.
As the gear motor produces its highest torque at breakaway, it is particularly suitable for starting diesel engines.
The available series is able to start diesel engines up to 3300 kW with an operating pressure of 10 bar. For higher starting powers, 2 starters can be operated in parallel.
A safety circuit is available which only allows the diesel engine to be started when the pinions of both starters are fully meshed with the gear ring of the diesel engine.
The dependable operating behaviour of the drive motor ensures that the diesel engine starts reliably, even under extreme ambient conditions. It is used in the Arctic, off-shore as well as in desert regions.

Starting procedure

PS series

The starting procedure is performed by gradually opening a self-closing valve or main valve, which is usually mounted directly on the starter. The pressure acting on the engaging piston causes axial displacement of the pinion towards the flywheel gear ring while at the same time rotating it slowly.
After engagement of the pinion, the actual starting procedure begins, which has to be stopped by closing the self-closing/main valve after the ignition speed has been reached. To ensure that the starter does not rotate at excessively high speeds when overtaken by the diesel engine, it is protected by an integrated multi-plate clutch.

PS.....HY series

With this series, a start impulse (manual, by remote pneumatic control, electrically or in emergency operating mode) is all that is required. The starting procedure is then performed automatically. A specially designed timing system retracts the pinion at a ‚tooth before tooth' position to prevent damage to the gear ring, turns the pinion further and engages it again.
After the engagement, the starting procedure is performed automatically and must be stopped as soon as the ignition speed is reached. This can take place manually or automatically by means of a speed monitor. The pinion is then withdrawn from the gear ring by spring force. Power is transmitted from the motor drive to the pinion via a free-wheel, which at the same time protects the starter from potential damage when overtaken by the diesel engine.
Owing to the patented operating principle, the starters of this series do not need bevelling on the front of the pinion and gear ring.

Slow-turning

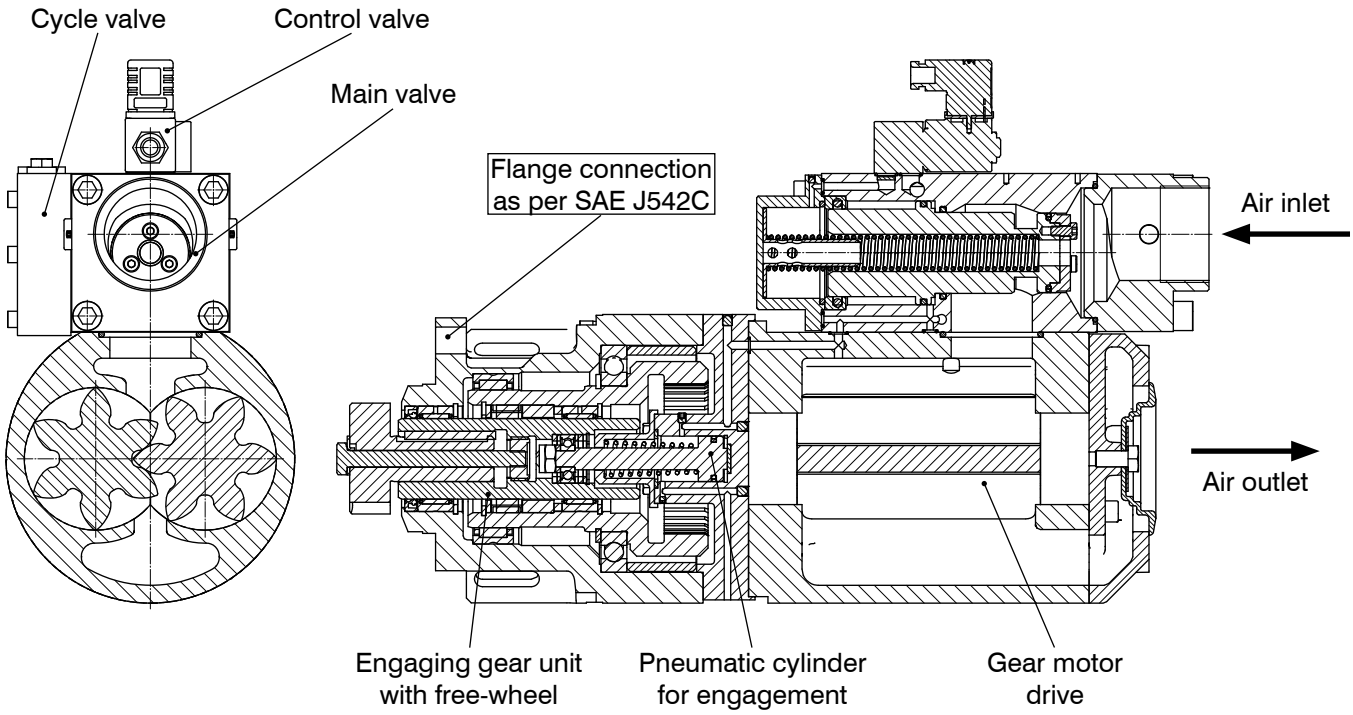
A turning valve installed in the control block means that the starter can also be used for ‚slow-turning', i.e. for removing water from the pistons (prevents vapour shock). On large diesel engines, the piston position required during repair work can be approached precisely with the help of the turning device.

Advantages of these starters

- Extremely high breakaway torques
- High starter powers with low air consumption
- Suitable for remote and manual operation
- Long service life No maintenance required
- Explosion protection
- Operation even under extreme climatic conditions
- Interchangeable with electric starters
- Air and gas operation
- Independence from electrical energy storage devices
- Slow-turning device
- No oilers required
- No maintenance unit (oil lubrication) required
- Connection dimensions as per SAE J 542 C
- Steel and bronze pinions
- Starter with integrated free-wheel

Technical layout of pneumatic starter

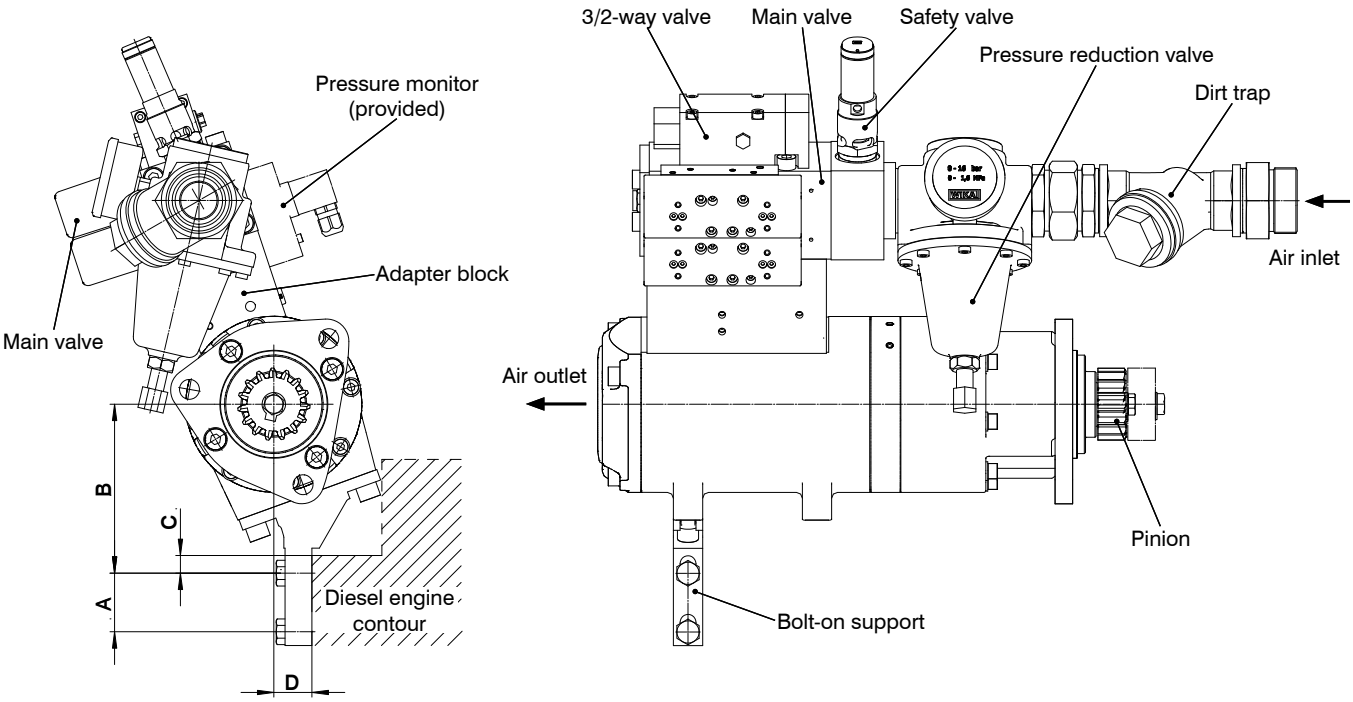
The starters have a modular design and comprise the following components: motor drive, engaging drive and control peripherals, which consist of the main valve and cycle valve. They can be actuated either electrically, pneumatically or manually.
The maintenance-free operation of the system is achieved by lifetime lubrication of the motor rotors and bearings, making an oiler in the air feed unnecessary.
If the starter pinion is retracted too late (overspeed), the free-wheel lifts off the engaging spindle and the pinions together with the engaging spindle run free without suffering any damage.



Installing the pneumatic starter

When a starter is attached to a diesel engine, it is essential to ensure that the dimensions for centre distance and spacing between the pinion and gear ring as specified in the brochures as well as the parallel alignment of the gearing are observed. Similarly, the cable cross-sections must not be below those prescribed, otherwise the specified performance values will not be achieved.
In order to prevent damage to the gearing following an unsuccessful start, the starting procedure may only be repeated when the starter and combustion engine have come to a standstill.
The PS starter is maintenance-free, i.e. it does not require an upstream oiler or relubrication of the bearings.
Use of a sound absorber reduces the noise level by approx. 12 dBA. Furthermore, noise can be decreased significantly by attaching an approx. 2 m exhaust hose. Fully automatic starting is achieved by installing a speed control unit, i.e. the starting procedure is stopped automatically when the ignition speed is reached.

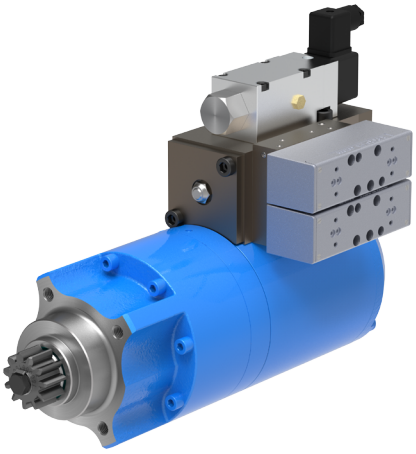
Layout of a complete pneumatic starting system



A - D = Customer specifications

If required and in consultation with the user, a complete starting system, like the one shown above, can be delivered instead of the starter.
The pneumatic starting system additionally features a compressed-air reservoir (not included in the items supplied by DÜSTERLOH GmbH) and a ball valve to prevent pressure loss caused by leakage.
The dirt trap should always be installed between the compressed-air reservoir and pressure reduction valve in order to protect the electro-pneumatic valves against dirt penetration.
The dirt trap therefore increases operational dependability and the reliability of the overall system.

Pneumatic starter						
Typ	Permissible operating pressure	Starting torque at	p_{max} and n = 2000 rpm		Connection width nominal width	Weight
	p_{max}	p_{max}	Power	Air consumption		
	[bar]	[Nm]	[kW]	[Nm³/min]	[Zoll]	[kg]
PS 24/20	12	145	22	25	G 1 1/2“	35
PS 32/20	12	220	28	30	G 1 1/2“	38
PS 61/20 HY	12	415	52,5	52	G 2“	52
PS 2360 HY	15	510	70	62	G 2“	52

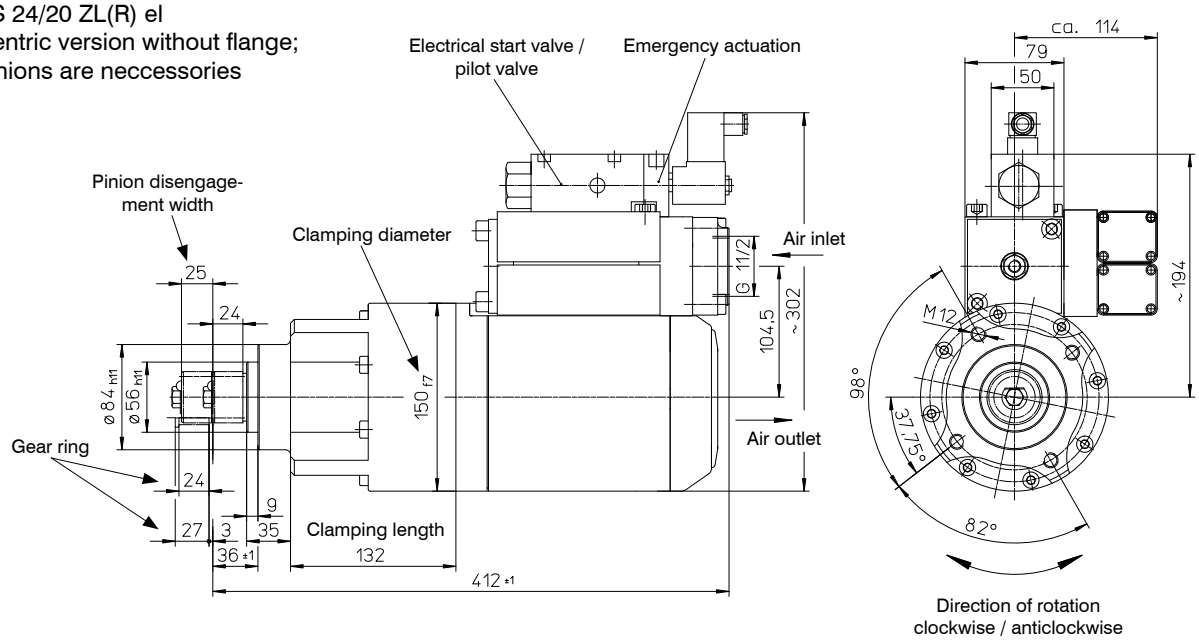


PS 24/20 ZL(R) el

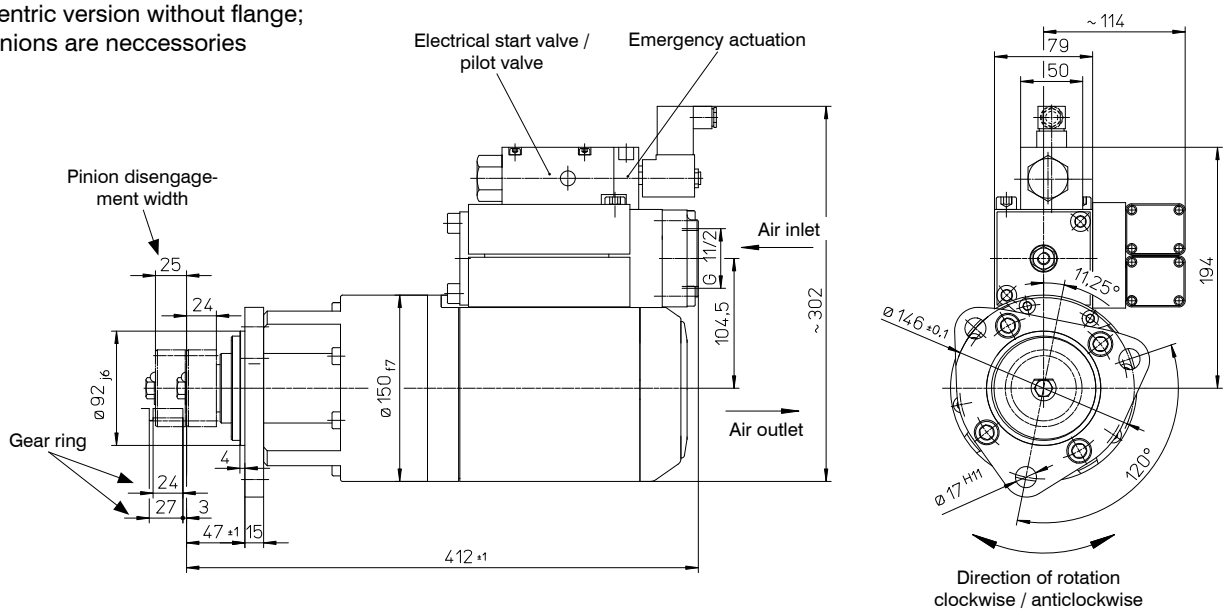
Pneumatic characteristics

Max. starting pressure	10	bar
Max. starting torque	145	Nm
Max. power (where n = 2500 rpm)	22	kW
Max. starting speed	3000	rpm
Direction of rotation (specify when ordering)	Clockwise or anticlockwise	
Weight	35	kg

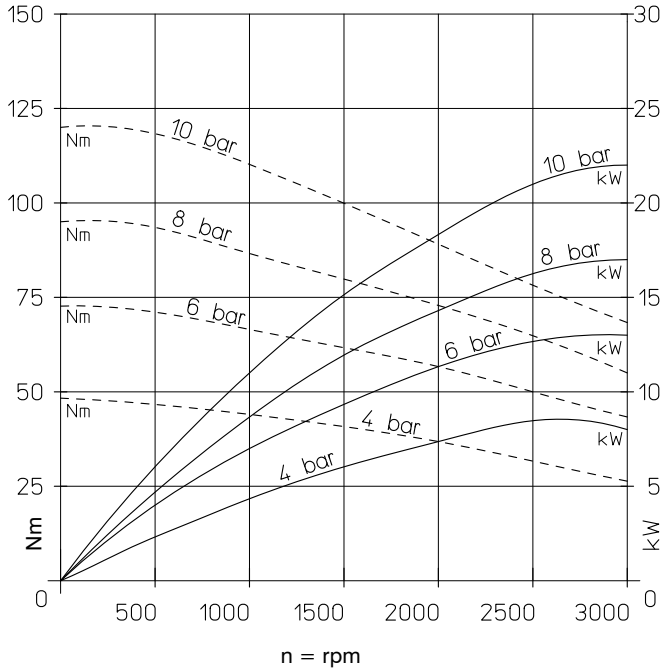
PS 24/20 ZL(R) el
Centric version without flange;
pinions are neccessories



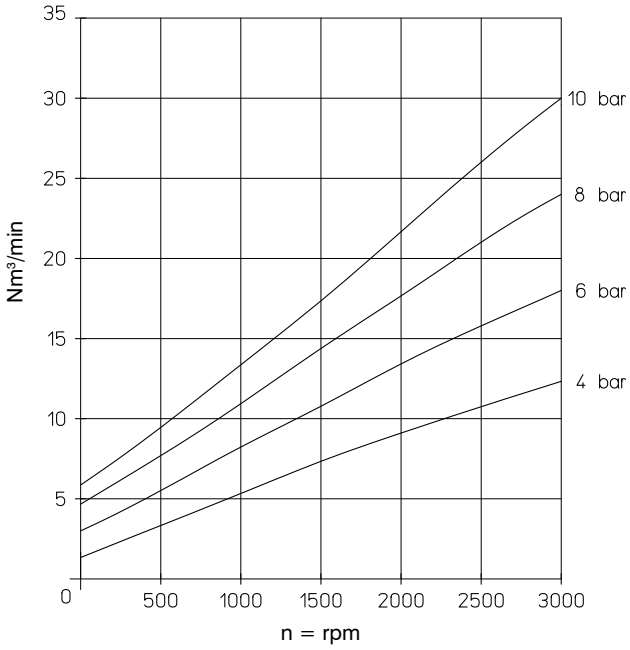
PS 24/20 FZL(R) el
Centric version without flange;
pinions are neccessories



Torque Power



Air consumption Operating pressure



Approximate calculation of air consumption for a starting operation

Duration of starting procedure	3	sec.
Starter pinion speed	1500	rpm , at ignition speed of motor
Operating pressure at starter p_e	6	bar
Air consumption of starter at 1500 rpm and p_e 6 bar	10,3	m^3/min , (diagram)

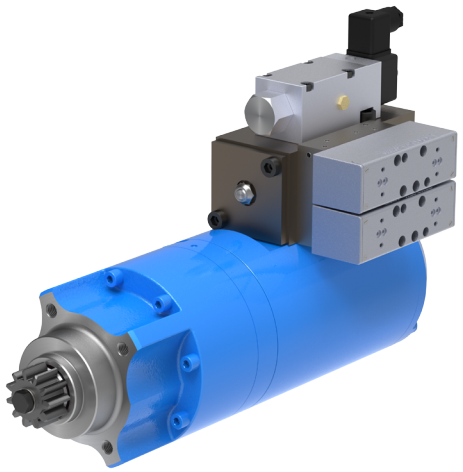
Air consumption per start

$$\Delta V = \frac{10{,}3 * 3}{60} = 0{,}52\ m^3$$

Since a constant speed of 1500 rpm over 3 sec. was expected, savings in compressed air for the run-up phase from 0 to 1500 rpm is not taken into consideration.

Approximate determination of size of air reservoir

Number of starting procedures	3	
Pressure in reservoir (assumed)	30	bar
Usable pressure drop	24	bar
Total air consumption	1,56	Nm^3
Size of air reservoir	0,065	m^3

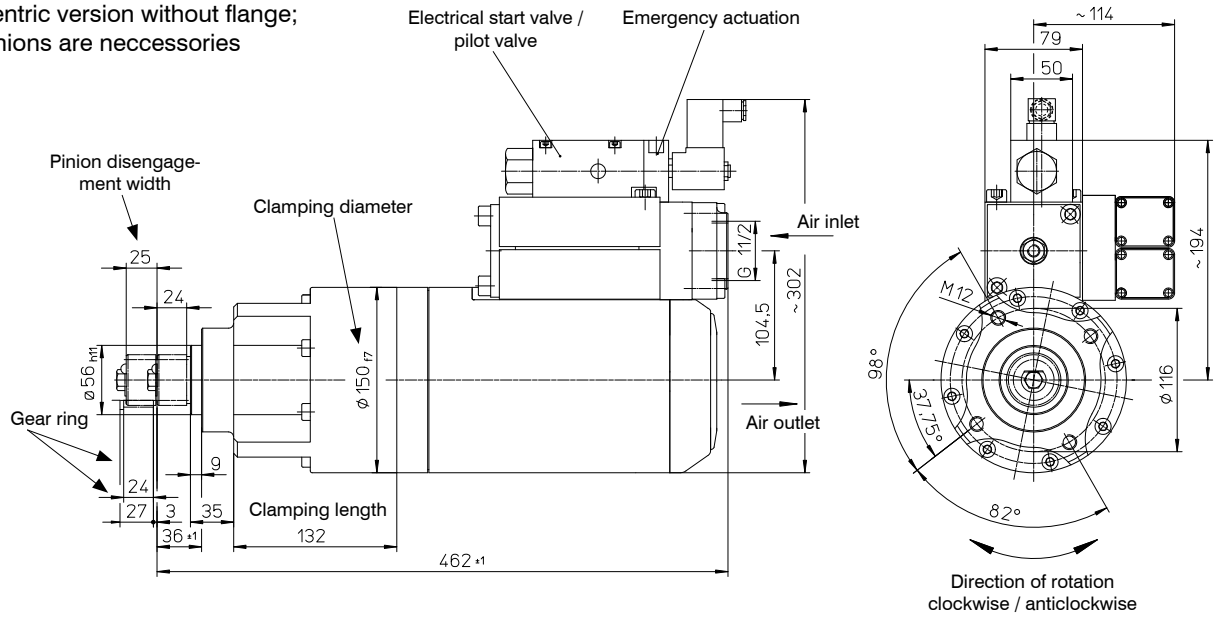


PS 32/20 ZL(R) el

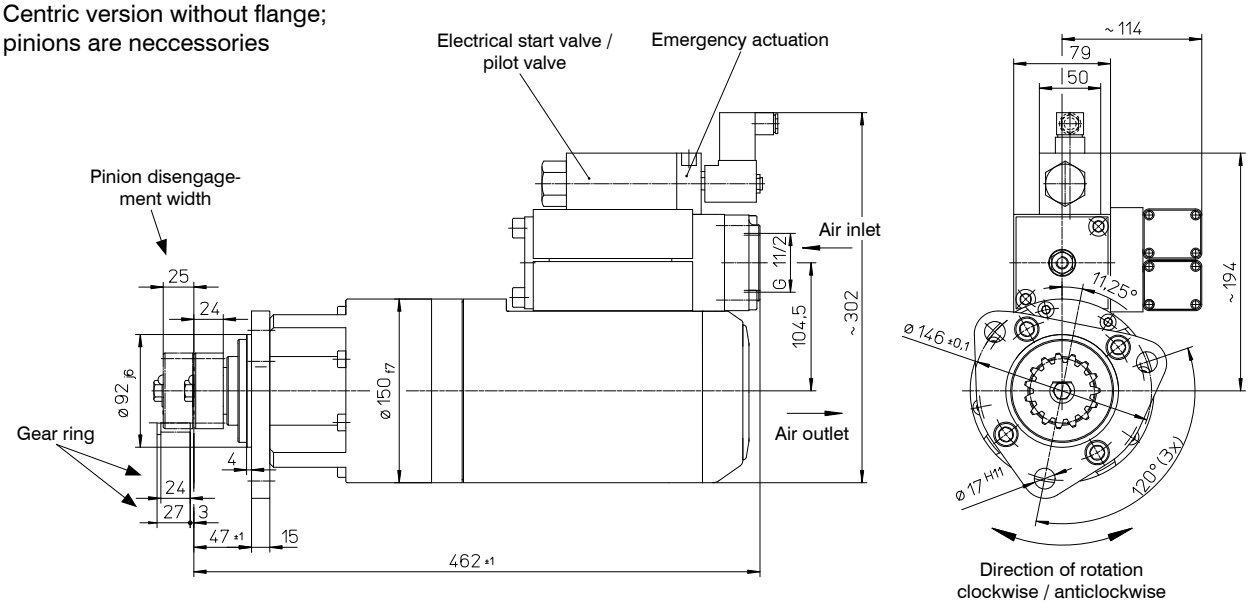
Pneumatic characteristics

Max. starting pressure	10	bar
Max. starting torque	220	Nm
Max. power (where n = 2500 rpm)	28	kW
Max. starting speed	3000	rpm
Direction of rotation (specify when ordering)	Clockwise or anticlockwise	
Weight	38	kg

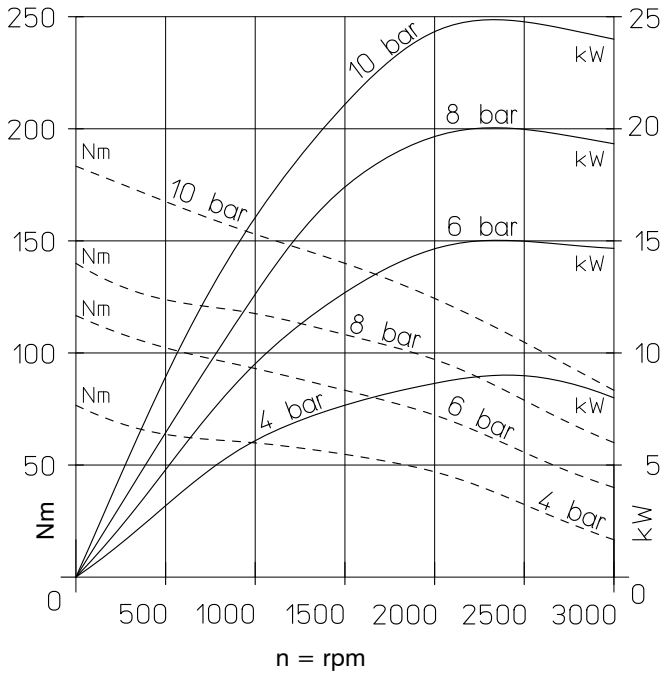
PS 32/20 ZL(R) el
Centric version without flange;
pinions are neccessories



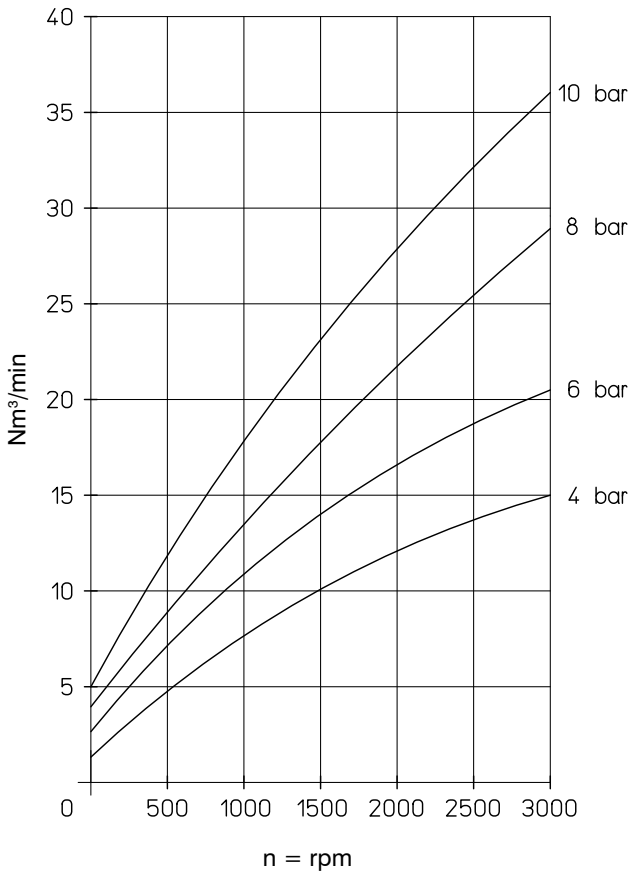
PS 32/20 FZL(R) el
Centric version without flange;
pinions are neccessories



Torque Power



Air consumption Operating pressure



Approximate calculation of air consumption for a starting operation

Duration of starting procedure	3	sec.
Starter pinion speed	1500	rpm , at ignition speed of motor
Operating pressure at starter p_e	6	bar
Air consumption of starter at 1500 rpm and p_e 6 bar	14,0	m^3/min , (diagram)

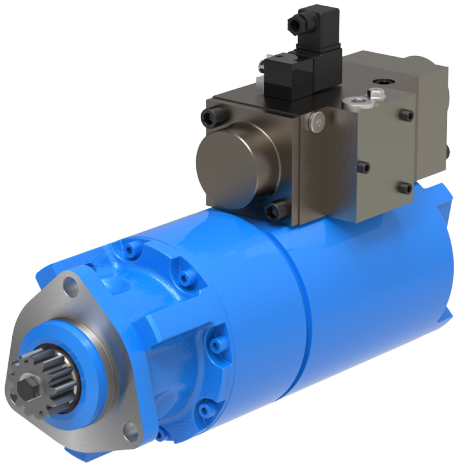
Air consumption per start

$$\Delta V = \frac{14 * 3}{60} = 0{,}7\ m^3$$

Since a constant speed of 1500 rpm over 3 sec. was expected, savings in compressed air for the run-up phase from 0 to 1500 rpm is not taken into consideration.

Approximate determination of size of air reservoir

Number of starting procedures	3	
Pressure in reservoir (assumed)	30	bar
Usable pressure drop	24	bar
Total air consumption	2,1	Nm^3
Size of air reservoir	0,088	m^3

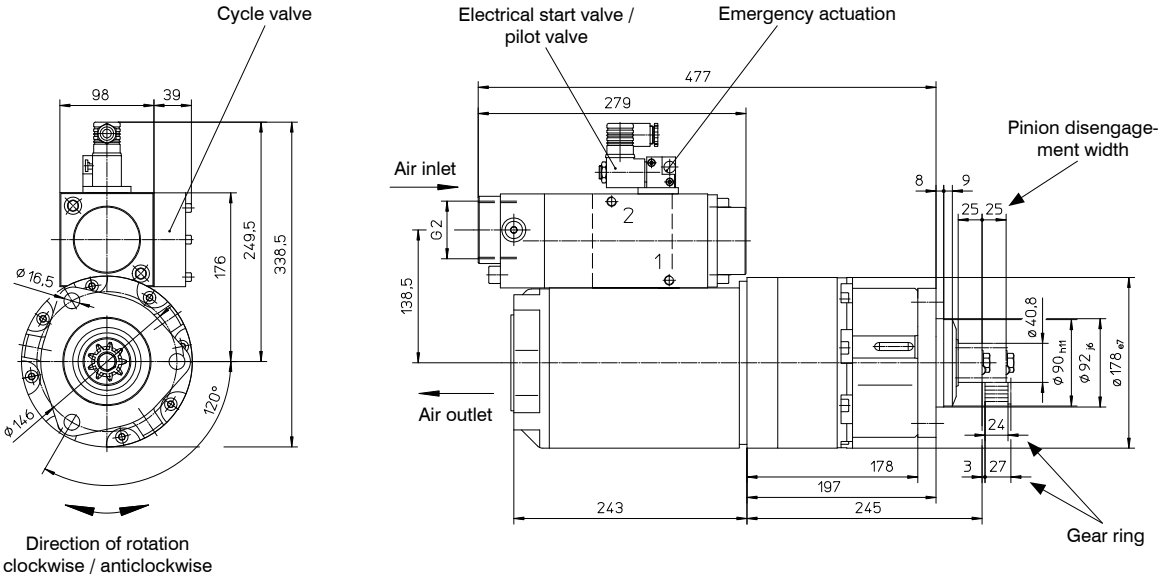


PS 61/20HY FZL(R) el

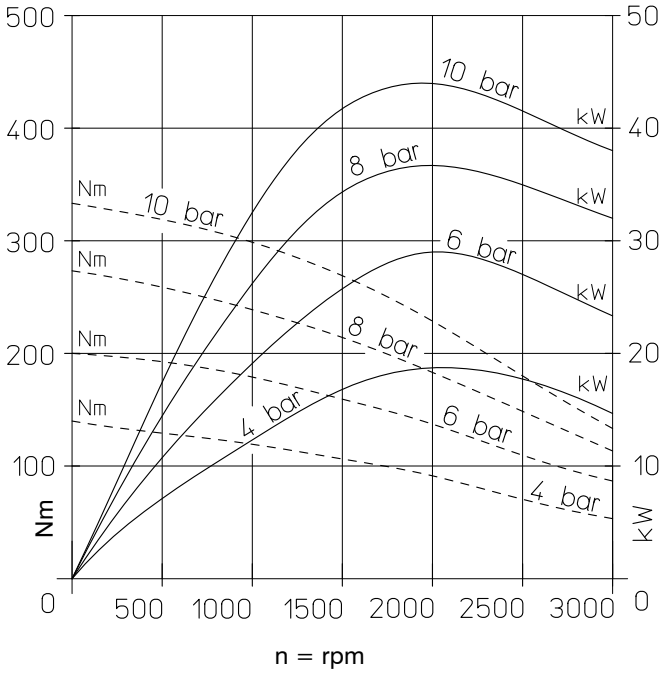
Pneumatic characteristics

Max. starting pressure	10	bar
Max. starting torque	415	Nm
Max. power (where n = 2500 rpm)	52,5	kW
Max. starting speed	3000	rpm
Direction of rotation (specify when ordering)	Clockwise or anticlockwise	
Weight	52	kg

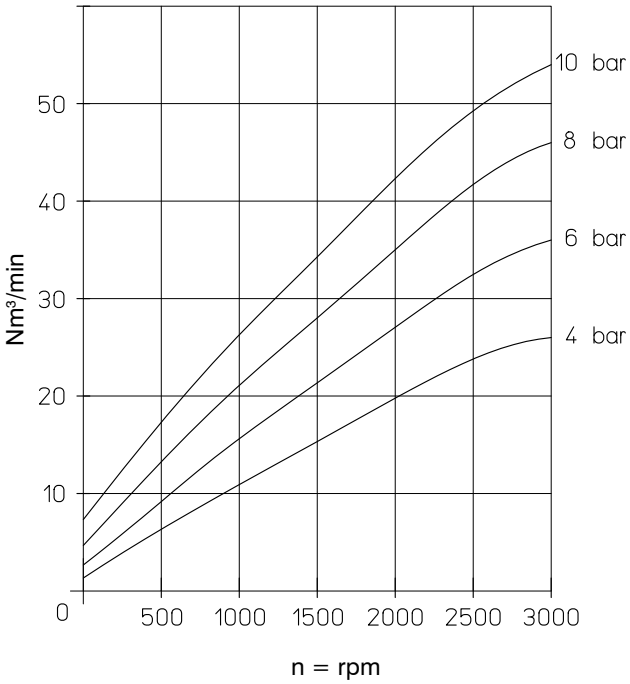
PS 61/20HY FZL(R) el
Centric version only with flange;
pinions are neccessories



Torque Power



Air consumption Operating pressure



Approximate calculation of air consumption for a starting operation

Duration of starting procedure	3	sec.
Starter pinion speed	1500	rpm , at ignition speed of motor
Operating pressure at starter p_e	6	bar
Air consumption of starter at 1500 rpm and p_e 6 bar	21,5	m^3/min , (diagram)

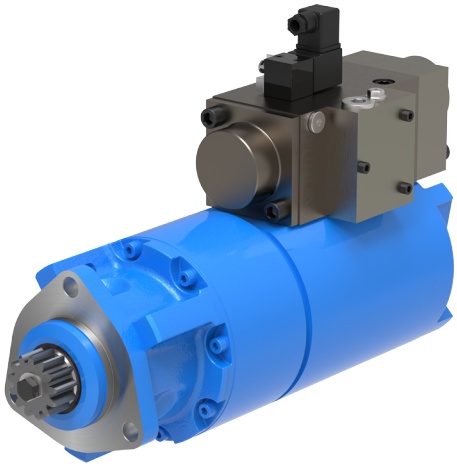
Air consumption per start

$$\Delta V = \frac{21{,}5 * 3}{60} = 1{,}08\ m^3$$

Since a constant speed of 1500 rpm over 3 sec. was expected, savings in compressed air for the run-up phase from 0 to 1500 rpm is not taken into consideration.

Approximate determination of size of air reservoir

Number of starting procedures	3	
Pressure in reservoir (assumed)	30	bar
Usable pressure drop	24	bar
Total air consumption	3,24	Nm^3
Size of air reservoir	0,135	m^3

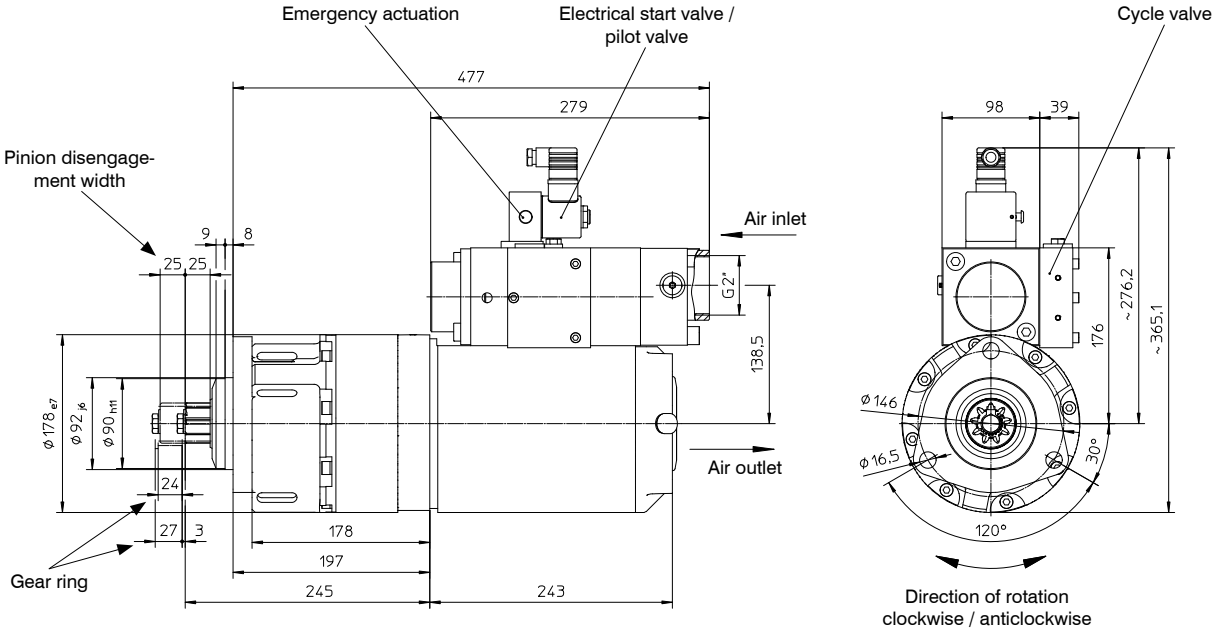


PS 61/20HY FZL(R) el

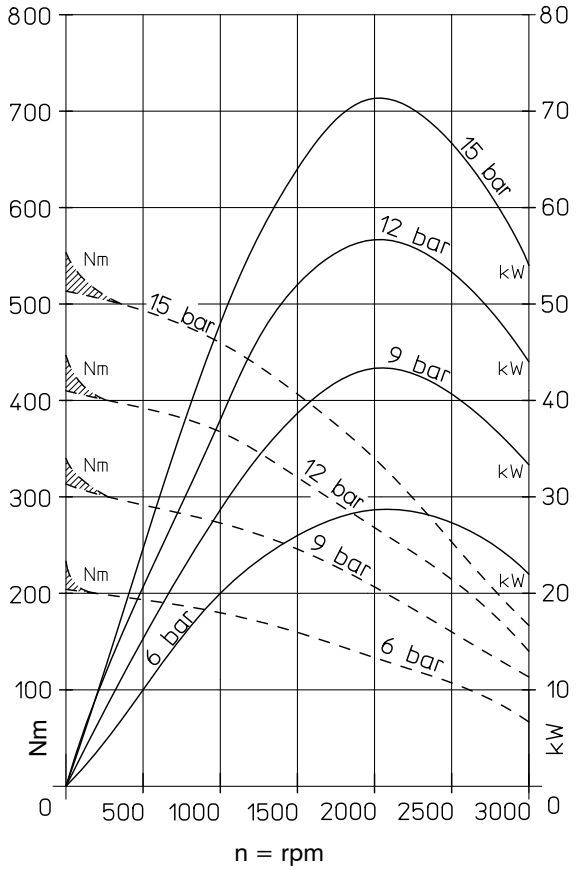
Pneumatic characteristics

Max. starting pressure	10	bar
Max. starting torque	510	Nm
Max. power (where n = 2500 rpm)	70	kW
Max. starting speed	3000	rpm
Direction of rotation (specify when ordering)	Clockwise or anticlockwise	
Weight	52	kg

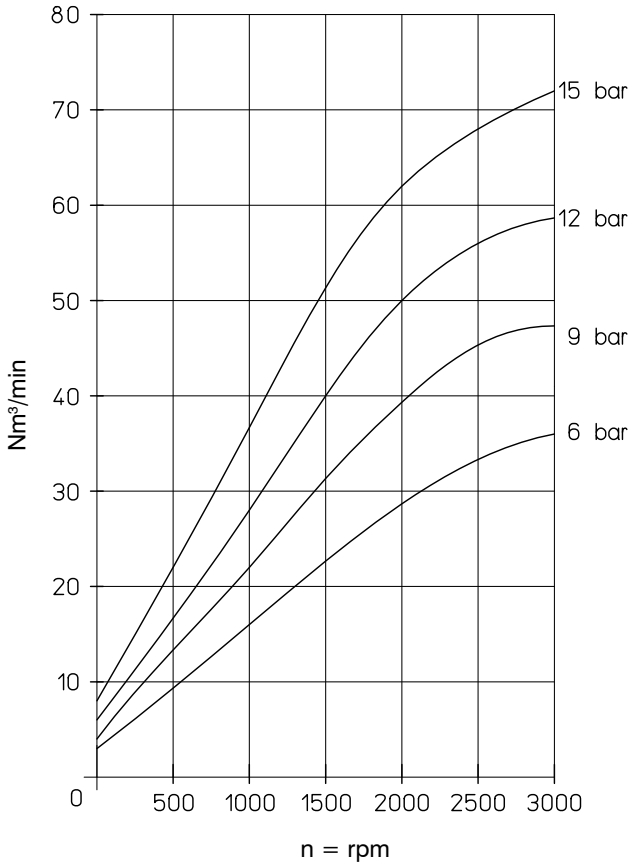
PS 61/20HY FZL(R) el
Centric version only with flange;
pinions are neccessories



Torque / Power



Air consumption / Operating pressure



Approximate calculation of air consumption for a starting operation

Duration of starting procedure	3	sec.
Starter pinion speed	1500	rpm , at ignition speed of motor
Operating pressure at starter p_e	6	bar
Air consumption of starter at 1500 rpm and p_e 6 bar	22,7	m^3/min , (diagram)

Air consumption per start

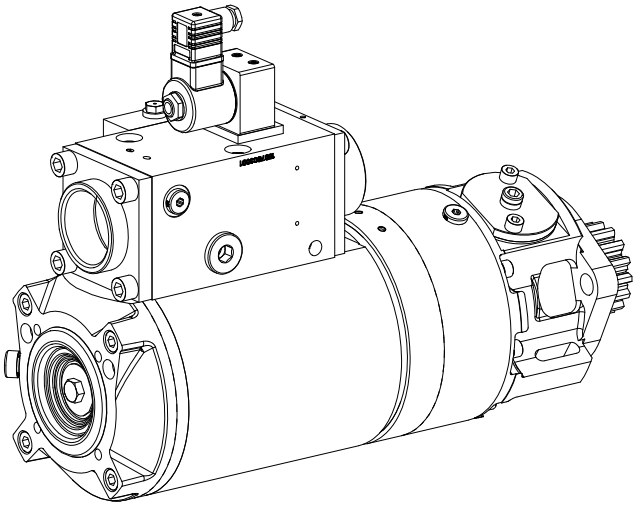
$$\Delta V = \frac{22{,}7 * 3}{60} = 1{,}15\ m^3$$

Since a constant speed of 1500 rpm over 3 sec. was expected, savings in compressed air for the run-up phase from 0 to 1500 rpm is not taken into consideration.

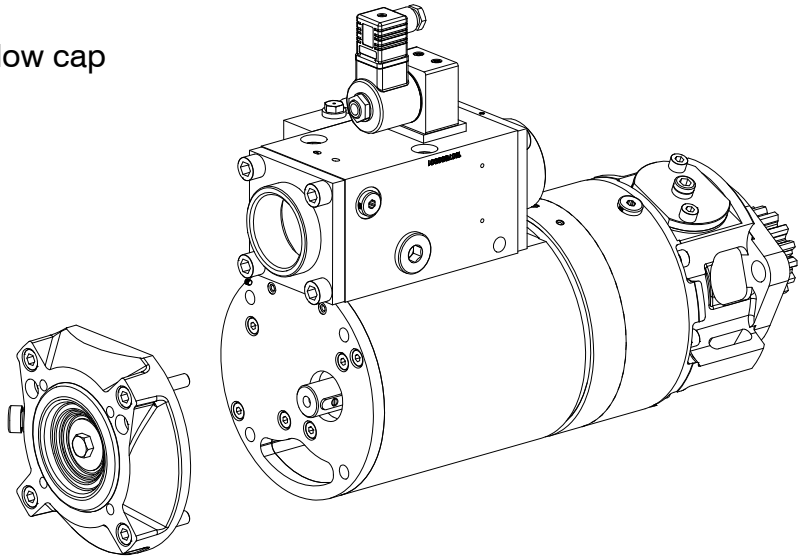
Approximate determination of size of air reservoir

Number of starting procedures	3	
Pressure in reservoir (assumed)	30	bar
Usable pressure drop	24	bar
Total air consumption	3,45	Nm^3
Size of air reservoir	0,144	m^3

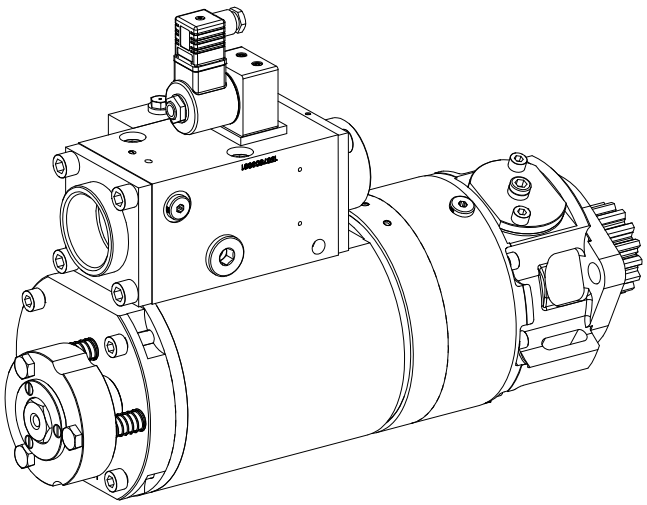
Pneumatic starter
PS 2360HY for turning



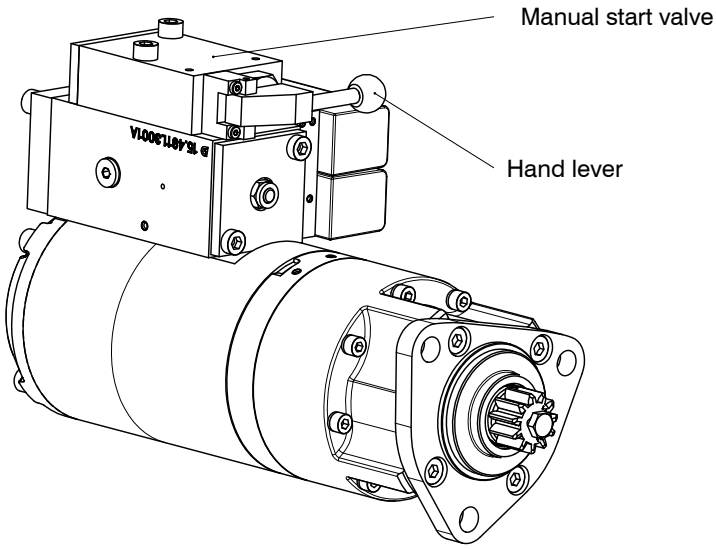
Pneumatic starter
PS 2360HY with outflow cap removed



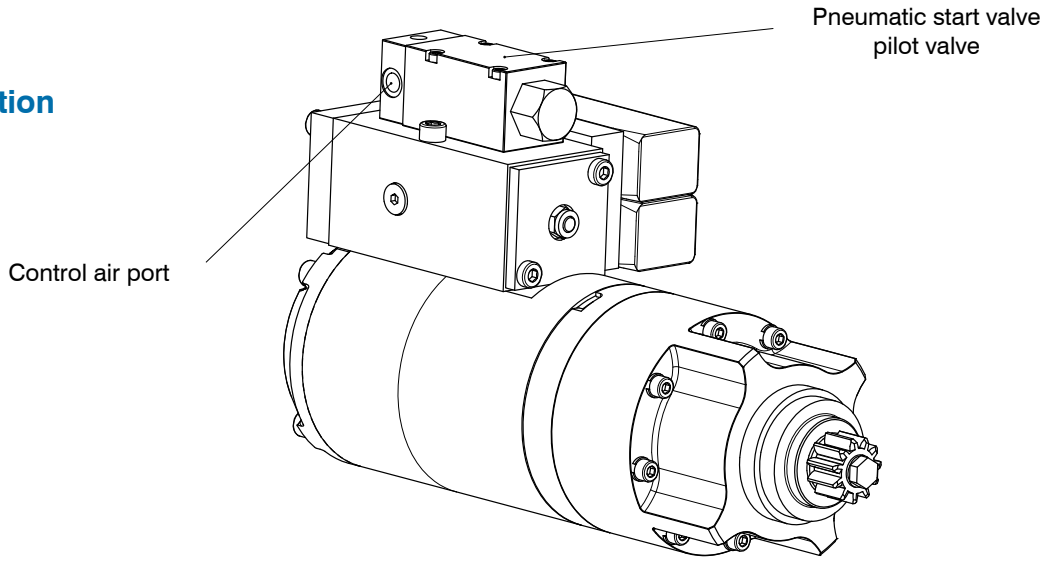
Pneumatic starter
PS 2360HY with turning cap attached



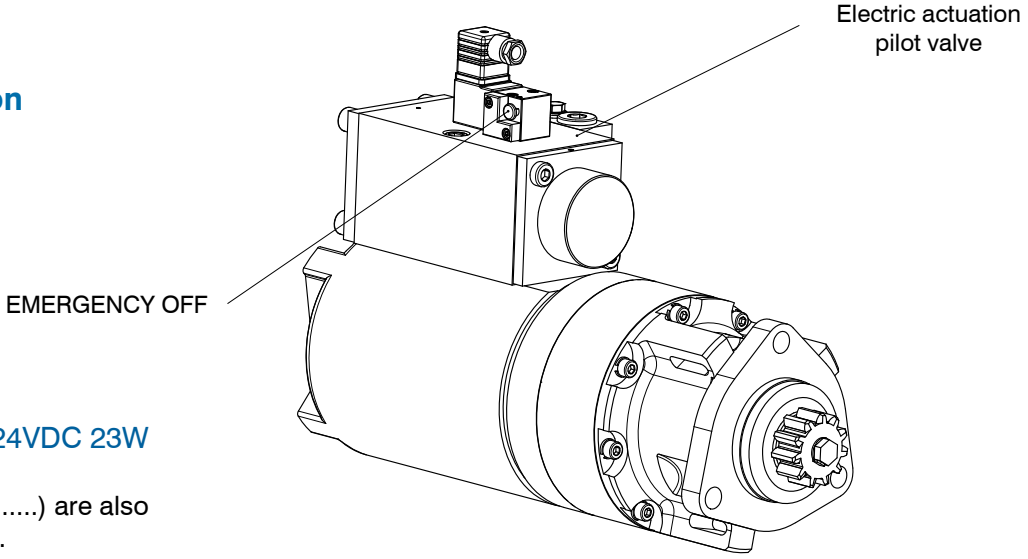
Actuation by hand lever



Pneumatic actuation



Electric actuation



Standard version 24VDC 23W

Other versions (12V .....) are also available on request.

DUESTERLOH has been developing fluid technology products for more than 100 years.
The drives, controls and hydraulic power units from Hattingen are appreciated throughout the world for their complete reliability; including under extreme conditions. The owner-managed company´s own development and construction department and the wide range of products cater for distinctive flexibility and customer-orientation.

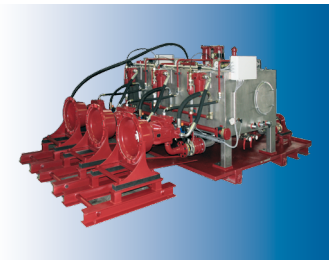
Products

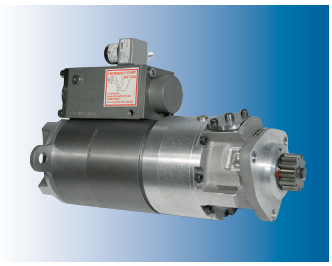
- Hydraulic radial piston motors
- Hydraulic axial piston motors
- Hydraulic high precision motors
- Pneumatic motors
- Pneumatic starters
- Hydraulic and pneumatic controls
- Hydraulic power units

Designing controls and hydraulic power units specific to the customer is our company´s major strength. Vast product diversity is also available for standardized products.

Industrial areas of application

- Machine tools
- Smelting and rolling mill equipment
- Foundry machines
- Testing machines
- Shipbuilding (diesel engines)
- Offshore technology
- Printing and paper technology
- Vehicle construction
- Manipulators
- Environmental technology
- Mining equipment
- Materials handling equipment





Düsterloh Fluidtechnik GmbH
Im Vogelsang 105
D-45527 Hattingen

Tel.: +49 2324 709-0
Fax: +49 2324 709-110

e-mail: info@duesterloh.de
Internet: www.duesterloh.de

DÜSTERLOH Fluidtechnik

Certified acc. to ISO 9001