

Turning Power into Motion.  
Product catalogue hydraulic drive  
technology.

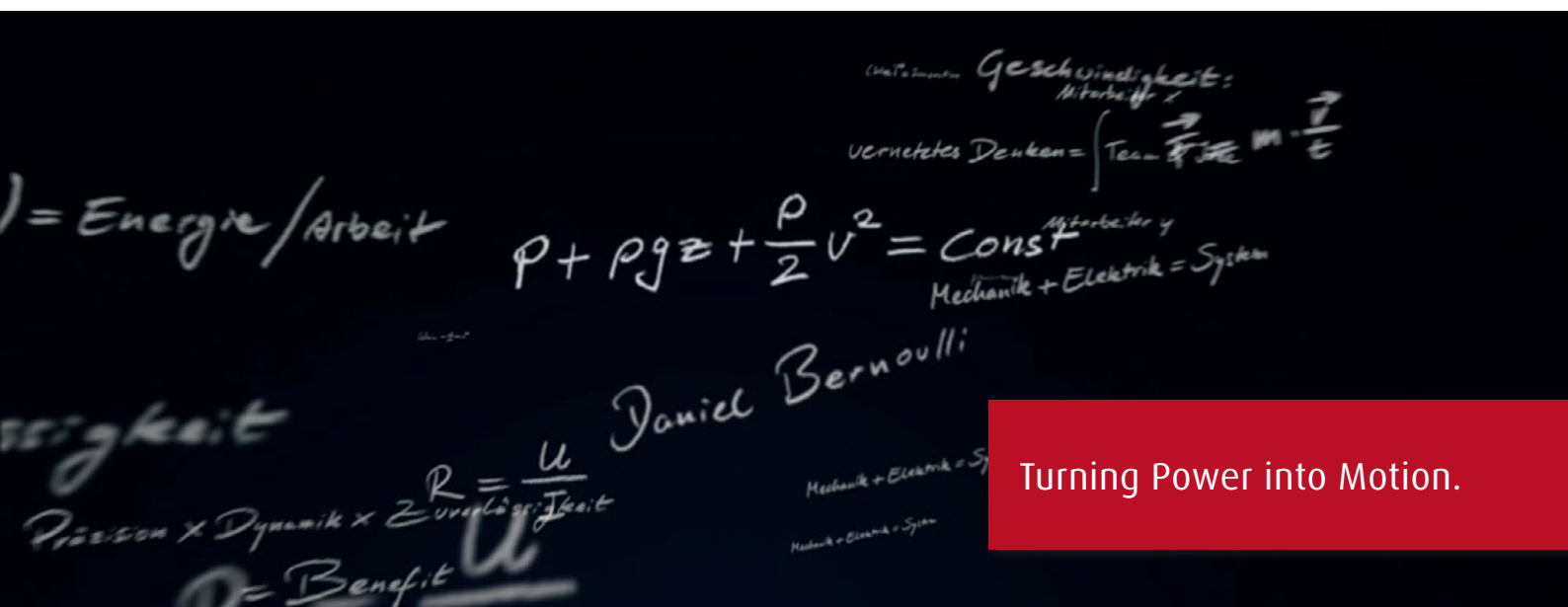
Linde Hydraulics

*Linde*



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A formula that remains valid for the future.

The world is characterised by change, an increase in task volumes and new challenges. We are rising to the challenges posed by these global issues, and are actively shaping the associated changes. Our business activities are governed by the issues of reducing CO2 and saving fuel.

We have always had a passion for converting power into motion, and this passion is driven by customer care, a thirst for knowledge and a love of innovation.

We combine components into a single system and create efficient overall solutions thanks to our intelligent blend of hydraulics, electrical engineering, electronics and mechanics. Our aspiration can be summed up by one simple concept:

We insure added value for our customers which is tailored to the customer and can be maintained over the long term. Experience, system expertise and the pursuit of perfection form the basis for our joint success.

Linde Hydraulics makes all of this possible thanks to a combination of partnership, overall responsibility and the highest level of commitment. We power ideas, machines and markets, both today and in the future.

This explains our formula: Turning Power into Motion.  
Linde Hydraulics.



## Partnership. Common success counts.

We are there for you. From initial contact to project engineering and product development all the way through to prototype commissioning and series production. You can rely on our customized solutions for your success.

Partnership is for us an important, indispensable part of product development and quality assurance of Linde Hydraulics.

Therefore, we bring in our knowledge, our experience and our international market position in all phases of customer care. We provide our clients with solutions and accompany them from the initial product idea to the technical release of machines into production. Moreover we give comprehensive training to our customers' personnel, to provide the best transfer of product and system knowledge.

### Your advantages

- worldwide project support
- common product development
- specific customer seminars
- motivated staff training
- customized project coaching
- system training for specific applications



The dialogue between client and Linde Hydraulics is the focal point of attention: whether on customer seminars, staff training for our customers or project coaching on Linde hydraulic components and LinTronic – experts on both sides exchange their views. Together for more market-success.





The Linde Hydraulics Service Center offers their customers reliable remanufacturing and rebuilding service worldwide. Warranty in Linde Quality.

## Service Center. Reliability counts.

Your Reman and Rebuild service. Customer service by Linde Hydraulics. This service program points the way. In providing quick and competent support. Our experienced team of engineers is by your side any time. Best service counts.

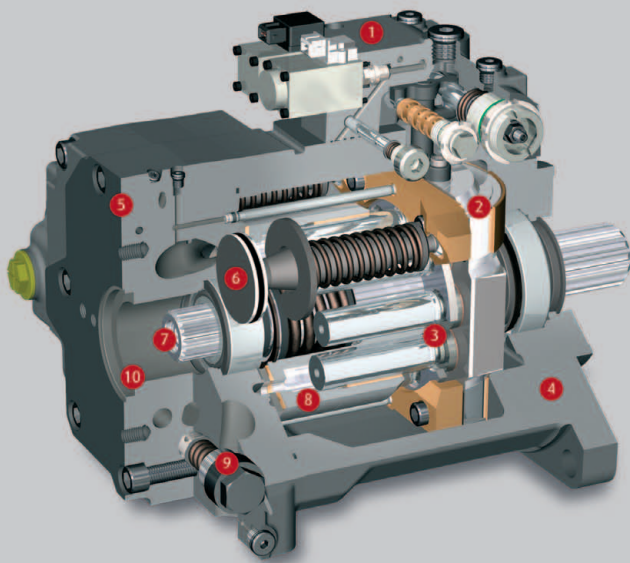
By the term customer orientation we, at Linde Hydraulics, understand in particular the service to be available for our customers: worldwide, at any place. With daughter companies in Europe, USA, South America and China, our strategic distribution partner for USA and Asia Pacific, Eaton Hydraulics, together with international representatives we guarantee you reliable competent customer service.

Our sales organization is connected on-line with the central spare parts warehouse in Germany. So you can get original Linde spare parts quickly and simply worldwide.

### Our Service

- parts availability in Europe within 24 hours
- repair service
- remanufacturing with “as new” warranty





#### Design characteristics Series 02

1	Control device	modular design, precise and load-independent
2	Swash plate	hydrostatic bearing
3	Piston-slipper assembly	21° swash angle
4	Housing	monoshell for high rigidity
5	Valve plate housing	highly integrated
6	Two control piston	hydraulically captured control piston
7	Through shaft	for additional pumps
8	Cylinder barrel	compact due to 21° technology
9	High pressure relief valves	integrated feeding function
10	Optional PTO	pumps and motors are available with this torque transmission

## Series 02-Features.

The multiple applications of Linde's Series 02 units are due to its modular design: the combination of a basic unit with the desired control element and interface option allows for an optimum design of your hydraulic system.

Linde's through drive technology for both pumps and motors allows a flexibility of design in a multitude of applications.



The advanced design of the piston-slipper assembly makes the large swash angle of 21° possible. Compact build size and long service life are immediate advantages of this 21° technology.

## 21° Technology.

### Our base for compact peak performance.

#### High longevity

The hydrostatic bearing of the rotating group compensates for the axial forces. This significantly increases the life expectancy of the unit. The unique material combination of steel on steel assures a high wear resistant piston-slipper assembly hence reliable operation of our long-life units. The swash plate design tolerates high radial accelerations.

#### Compact design with high power density

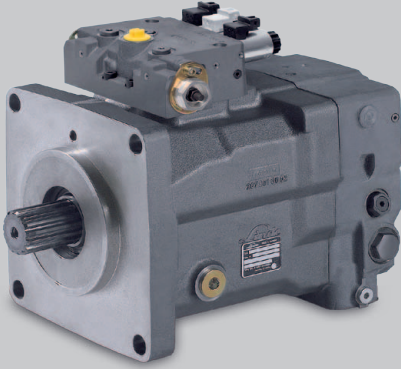
All the Series 02 units are based on the 21° technology. The increased piston stroke together with the optimized flow paths give increased efficiency of our rotating groups which transmit more power through smaller build size. Design of rotating group and integrated controlling, regulating and safety functions lead to compact units with a high degree of integration.

#### Noise reduction

All design features having to do with noise emission, like hydrostatic bearing, commutation, canalling, interfaces and housing shape have been optimized in the Series 02 with regard to pulsation and noise transmission. This helps quite considerably to cut costly noise dampening measures afterwards.

#### Direct machine control

The machine operator's signals are precisely followed up due to load independent control elements and exact controlling behaviour of the swashplate. Drive commands are carried out on the spot; this makes the machine work responsively and efficiently. Due to the optimized swashplate concept, together with its high level of production quality, smooth starting and jerk-free operation are even possible at low rpm with high torque.



HPV-02		55	75	105	135	165	210	280
Max. displacement	cc/rev	54.7	75.9	105	135.6	165.6	210	281.9
Permissible speed	rpm	3300	3100	2900	2700	2500	2300	2000
Max. speed (intermittent)	rpm	3700	3500	3200	2900	2700	2500	2200
Nominal pressure	bar	420	420	420	420	420	420	420
Peak pressure (intermittent)	bar	500	500	500	500	500	500	500
Continuous input torque	Nm	220	305	420	540	660	840	1115
Max. input torque	Nm	350	485	670	870	1100	1400	1785
Continuous power	kW	75	98	127	153	173	201	235
Max. power	kW	122	159	206	247	279	326	381
Weight w/ M1 control (approx.)	kg	42	47	58	72	95	132	158

## HPV-02.

### Variable pumps for closed loop operation.

#### Design characteristics

- axial piston pump in swashplate design for high pressure closed loop systems
- clockwise or counter clockwise rotation
- exact and rugged servo control devices (mechanical, hydraulic, electro-hydraulic)
- integrated high pressure relief valves with make-up function
- integrated low pressure relief valves for boost, control and cooler circuits
- replaceable cartridge filter
- SAE high pressure ports
- SAE mounting flange with ANSI or SAE spline shaft
- through shaft SAE A, B, B-B and C
- boost pressure pumps for internal and external suction, integrated cold start relief valve optional
- optional tandem and multiple pumps

#### Controls

- M1 mechanical-hydraulic
- H1 hydraulic
- E1 electro-hydraulic
- E2 electro-hydraulic, with switch-off function
- E5 electro-hydraulic, 3 position
- CA speed related hydraulic mechanical with torque-/ power limiter

#### Control options

- power limiter
- pressure cut-off

#### Product advantages

- compact design
- high power density
- dynamic response
- high reliability
- long service life
- noise-optimized
- precise and load-independent





## Controls.

### Machine control with instinctive feel.

All the controls used in the Series 02 are based on a load-independent control mechanism. No matter which control is used: identical commands always call for the same response in the machine. The sensitive and precise machine control makes work easier and increases productivity. Various customer system options for mechanical, hydraulic and electric input solutions are available. Further special regulating features like torque control and pressure cut-off are also available. The reliable control of the pump can easily be integrated into any kind of vehicle management control system. The electronic input signals for dynamic driving behaviour control the pump independent of pump load condition.

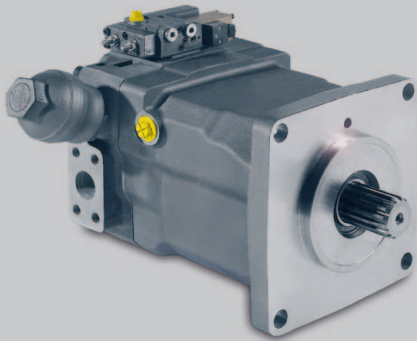
#### **E2 with switch-off function**

Prompt response and steady flow are also characteristic for the E2 control with additional switch-off function. In this context the electronic control unit compares the travel command to other machine signals. In case of a system fault the electronic control unit will deactivate the „watchdog“-solenoid. Upon this the pump is brought to neutral under full control which ensures that the vehicle is brought to rest in a smooth jerk-free manner, without endangering the driver.

#### **Product advantages of E2**

- fulfils the high requirements of road traffic admission
- minimized susceptibility to interference
- with HMF-02: defined swashing back of pump for controlled deceleration and stop in case of system fault
- with HMV-02: diesel overspeed protection by fast swashing back of pump





HPR-02		55	75	105	135	165	210	105D	280	165D
Max. displacement	cc/rev	54.7	75.9	105	135.6	165.6	210	210	281.9	331.2
Continuous rated speed w/o pressurizing	rpm	2700	2500	2350	2300	2100	2000	2350	1800	2100
Max. oil flow	l/min	147.7	189.8	246.8	311.9	347.8	420.0	493.5	507.4	695.5
Nominal pressure	bar	420	420	420	420	420	420	420	420	420
Peak pressure (intermittent)	bar	500	500	500	500	500	500	500	500	500
Continuous input torque	Nm	220	305	420	540	660	836	650	210	1318
Max. input torque	Nm	368	508	702	907	1106	1404	1090	1872	2214
Continuous power	kW	61.5	79.1	102.8	130.0	144.9	175.0	205.6	211.4	289.8
Max. power	kW	103.4	132.8	172.7	218.3	243.4	294.0	345.5	355.2	486.9
Weight (approx.)	kg	39	39	50	65	89	116	107	165	197

## HPR-02.

### Self-regulating pumps for open loop operation.

#### Design characteristics

- axial piston pump in swashplate design for high pressure open loop systems
- clockwise or counter clockwise rotation
- self-priming at high nominal speed
- tank pressurization or swash angle reduction for high speed applications
- adaptive noise optimization SPU
- decompression fluid is discharged via pump housing to keep suction side calm
- exact and rugged load sensing controls

#### Regulator types

- LP load sensing with pressure cut-off
- H1L load sensing with hydraulic  $\Delta pLS$  – override
- E1L load sensing with electrical  $\Delta pLS$  – override
- LEP load sensing with electric stroke limiter and pressure cut-off
- ETP electro-proportional with hyperbolic power-limiter and pressure cut-off
- TL2 load sensing with hyperbolic power limiter

#### Product advantages

- optimum interaction with Linde LSC control valves and LinTronic
- energy saving operation by 'flow on demand'-control
- dynamic response
- excellent suction up to rated speed
- noise optimization over the whole range of operation
- compact design
- high power density
- high reliability
- long working life



Noise optimization by Linde Hydraulics. Obvious advantage for driver and environment: Less noise not only relieves the driver in the cabin, but also construction workers and residents.

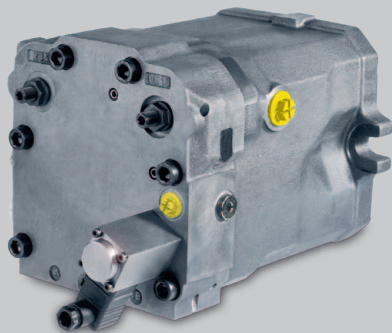
## SPU. Noise optimization by commutation.

Legal emission regulations force manufacturers of mobile machinery to optimize the noise emission of their products. Since secondary measures tend to be expensive and less efficient Linde prefers to fight the noise where it is generated:

by optimally connecting an additional volume directly next to the commutation of the HPR-02 pump, Linde Hydraulics invented the SPU silencer. The adaptive SPU reduces flow and pressure pulsations in the regulating pump over the entire range of operation – without loss of power. Compared to a customary variable pump, an HPR-02 with SPU reduces pulsation level by up to 70 %, independently of pressure, speed and temperature! The pulsations transmitted to system components and machine structure are significantly less, making the machine quieter.

### Product advantages

- low noise level inside the cabin and outside: obvious relief for driver and environment
- self-adapting wide scale reduction of pulsation over the whole range of operation: independent of pressure, speed and temperature
- no need of costly measures for additional noise dampening
- significantly reduced noise peaks
- no effect on function and performance
- minor increase of weight and mounting space
- simple and robust design
- immediately usable, maintenance-free



HMV-02		55	75	105	135	165	210	280
Max. displacement	cc/rev	54.8	75.9	105	135.6	165	210	280
Max. operating speed at $V_{\max}$	rpm	4100	3800	3500	3200	3100	2700	2700
Max. speed (intermittent) at $V_{\min}$	rpm	5300	5000	4700	4000	3900	3500	3200
Nominal pressure	bar	420	420	420	420	420	420	420
Peak pressure (intermittent)	bar	500	500	500	500	500	500	500
Continuous output torque	Nm	218	302	418	540	657	836	1114
Max. output torque	Nm	366	508	702	907	1104	1404	1872
Continuous power	kW	94	120	153	181	213	236	280
Max. power	kW	157	202	257	304	358	397	470
Weight with M1 Control (approx.)	kg	28	32	42	56	76	101	146

## HMV-02.

Variable displacement motors for closed and open loop operation.

### Design characteristics

- axial piston motor in swashplate design for high pressure closed and open loop systems
- optimized starting and low speed behaviour
- purge valves for circuit and case flushing optional
- stepless or 2-position control
- electric or hydraulic controls
- superposed pressure control optional
- brake pressure shut off optional
- swashing to 0 cc/rev
- high pressure relief valves available
- through shaft with free shaft end or with coupling flange
- SAE high pressure ports radial or axial
- SAE mounting flange with ANSI or SAE spline shaft
- plug-in version optional
- speed sensor optional
- double and tandem motor available

### Controls

- H1 hydraulic stepless
- H2 hydraulic 2-position
- H4 hydraulic stepless  $V_{\min} = 0$  cc/rev
- E1 electro-hydraulic stepless
- E2 electro hydraulic 2-position
- E4 electro hydraulic stepless electro hydraulic stepless  $V_{\min} = 0$  cc/rev
- E6 as E4 with inverted shifting
- EH1P-CA hydraulic stepless with pressure override and electric pressure selection

### Product advantages

- jerk-free low speed
- high starting torque
- large conversion range
- zero angle possible
- dynamic response
- PTO through-drive motor
- compact design
- high power density
- high reliability
- long service life



Hydraulic motors by Linde Hydraulics with optimized low speed properties make it possible to apply a smooth and uninterrupted road cover. Linde technology provided on a smooth level.

## Low Speed Concept. Precision by innovative drive system.

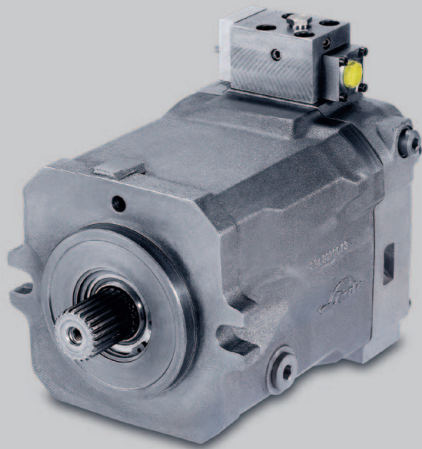
Standard hydraulic motors at low speeds in their starting phase cannot generate the necessary torque. Therefore, the power of the fast spinning hydraulic motors has to be reduced by means of several step gearboxes down to the speed needed on the wheel. Somewhat higher windage losses and poorer mechanical efficiency are benevolently accepted in this context.

Quite the opposite holds true for the motors by Linde Hydraulics: The motors of the Series 02 are capable of transmitting the required torque even at low speed and make it possible to start smoothly and sensitively. Therefore, additional gear ratios for rpm reduction are not necessary.

### Product advantages

- jerk-free and steady low speed behaviour
- fuel saving in all operating situations
- elimination of mechanical gearboxes
- quieter through speed reduction
- less maintenance because of simplified drive concept
- increased service life of the transmission





HMR-02		55	75	105	135	165	210
Max. displacement	cc/rev	54.8	75.9	105	135.6	165	210
Max. operating speed at $V_{max}$	rpm	4100	3800	3500	3200	3100	2700
Max. speed (intermittent) at $V_{min}$	rpm	5300	5000	4700	4000	3900	3500
Nominal pressure	bar	420	420	420	420	420	420
Peak pressure (intermittent)	bar	500	500	500	500	500	500
Continuous output torque	Nm	218	302	418	540	657	836
Max. output torque	Nm	366	508	702	907	1104	1404
Continuous power	kW	94	120	153	181	213	236
Max. power	kW	157	202	257	304	358	397
Weight (approx.)	kg	28	32	42	56	76	101

## HMR-02.

Variable motors for open and closed loop operation.

### Design characteristics

- axial piston motor in swash plate design for high pressure open and closed loop systems
- optimized starting and low speed behaviour
- purge valves for circuit and case flushing in closed loop optional
- internal system pressure control, no external piping required
- brake pressure shut off for closed loop
- high pressure relief valves available
- through shaft with free shaft end or with coupling flange
- SAE high pressure connection ports radial or axial
- SAE mounting flange with ANSI or SAE spline shaft
- plug-in version optional
- speed sensor optional
- counter balance valve optional

### Maximum displacement override

- pneumatic
- hydraulic (high and low pressure)
- electric

### Product advantages

- steady low speed behaviour
- high starting torque
- large conversion range
- PTO through-drive motor
- compact design
- high power density
- high reliability
- long service life
- dynamic response





Compact machines call for compact drive solutions. Less is more. The new PTO Through-Drive Motor. The compact drive solution for more installation space and increased efficiency.

## PTO Through-Drive Motors. Breakthrough in drive system design.

In conventional drives the torque of the hydraulic motor can be transmitted to the cardan shaft only by means of a dropbox. For further optimization of the drive train Linde Hydraulics developed the PTO Through-Drive Motor. Based on the standard hydraulic motor of the Series 02 with just one shaft end, the PTO Through-Drive Motor offers two shaft ends to transmit the torque.

Hence the machine designer can conceive the hydraulic motor to fit directly and immediately into the drive train thus saving mounting space. The dropbox usually needed in a conventional propulsion drive can be saved. This reduces both noise emission and fabrication cost of the entire vehicle while overall efficiency increases.

### Product advantages

- dropbox eliminated
- more installation space
- optimized drive concept
- low maintenance transmission
- reduced noise
- increased drawbar pull
- fuel saving
- ideal drive solution for municipal vehicles, wheeled loaders, telescopic handlers and forest machines



HMF-02		28	35	50	75	105	135
Max. displacement	cc/rev	28.6	35.6	51.3	75.9	105	135.6
Max. operating speed	rpm	4500	4500	4100	3800	3500	3200
Max. speed (intermittent)	rpm	4800	4800	4400	4100	3800	3500
Nominal pressure	bar	420	420	420	420	420	420
Peak pressure (intermittent)	bar	500	500	500	500	500	500
Continuous output torque	Nm	112	139	204	298	418	537
Max. output torque	Nm	187	234	327	502	702	903
Continuous power	kW	54	67	88	120	153	181
Max. power	kW	96	120	141	202	257	304
Weight (approx.)	kg	16	16	19	26	33	39

## HMF-02.

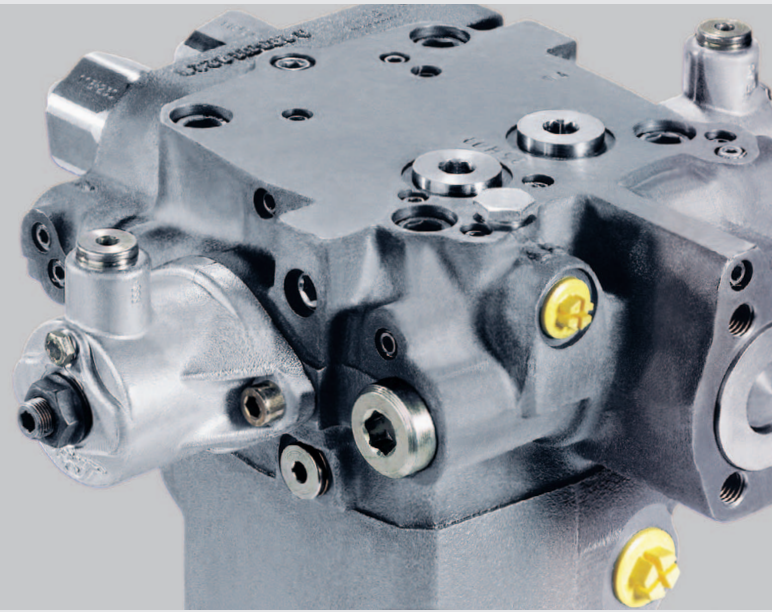
Fixed displacement motors for open and closed loop operation.

### Design characteristics

- axial piston motor in swashplate design for high pressure open and closed loop systems
- optimized starting and low speed behaviour
- purge valves for circuit and case flushing optional
- high pressure relief valves set fixed or variable optional
- SAE high pressure ports radial or axial
- SAE mounting flange with ANSI or SAE spline shaft

### Product advantages

- steady low speed
- high starting torque
- compact design
- high power density
- high reliability
- long service life



## HMF-02 P.

Fixed displacement motors with integrated swing drive functions.

### Design characteristics

- directional control valve function swing
- torque control-function
- high pressure relief valves with controllable characteristic
- priority function
- secondary relief combined with make up function
- anti-reaction function
- discharge function
- anti-shock valve

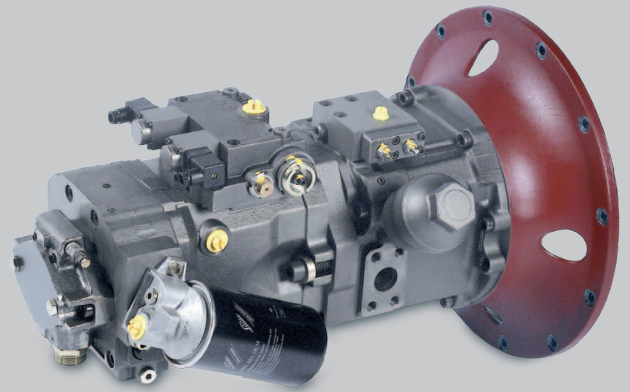
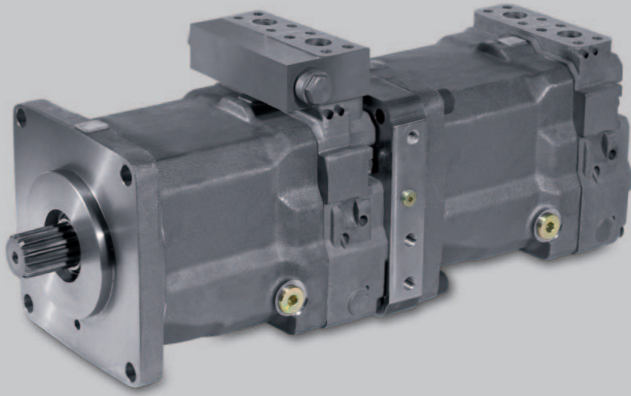
### Product advantages

- smooth low-speed operation
- high starting torque
- torque and speed control
- controllable counter-rotation
- compact design
- high power density
- high reliability
- long service life

### Alternative solution

- swing drive function in closed loop design with standard fixed displacement motor HMF-02 and high pressure pump HPV-02 with special torque-control





## Multiple units. For open and closed loop operation.

Double, tandem and multiple pumps can be obtained by combining our variable and regulating pumps, thereby providing either larger flows or supplying different circuits.

Double pumps: two pumps of identical nominal size fitted back-to-back on one common port plate housing to supply one circuit. Tandem and multiple pumps: two or more pumps fitted in series to ensure that even different circuits can be fed. Nominal size and type for open or closed loop are variable in this context. The crucial factor for the sequence is the maximum transmittable torque. Thanks to the PTO capacity of the series 02 motors from Linde, these motors can also be combined to form multiple units. With the HMV D-02 double motor, two variable motors are arranged back-to-back and have common ports for high pressure, charge pressure and pilot pressure. Both motors can be swivelled to 0 cc/rev and can be controlled either together or separately as required. With the HMV T-02 tandem motor, two variable motors are connected back-to-back by one tandem flange. The variable motors have their own high pressure and charge pressure connections, a separate controller for each and can therefore be actuated individually. Both motors can be swivelled to 0 cc/rev.

### Product advantages of double, tandem and multiple pumps

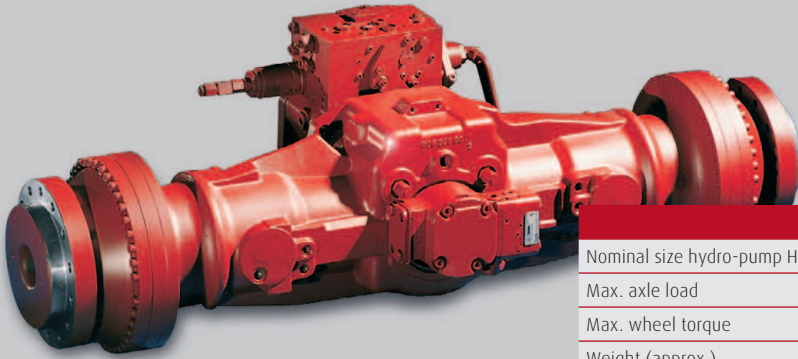
- only one drive shaft required
- no splitter box required for the pumps
- compact design
- individual control of each single pump
- no adverse influence on functionality of the single rotating groups
- advantages such as high dynamics and precise control remain in full

### Product advantages of double motors

- high conversion range for smooth acceleration
- simplified drive train
- high tractive effort and high final speed
- fast control response and high starting torque

### Product advantages of tandem motors

- double torque with the same gearbox interface
- direct installation in the drive train, gearbox can be omitted
- increased rotating speed and narrower dimensions than for single motors of the same nominal size in swash plate or bent axis design



		AK 30-02	AH20	AH45
Nominal size hydro-pump HPV-02	cc/rev	105		
Max. axle load	kg	7400	4786	9600
Max. wheel torque	Nm	3300	1744	5532
Weight (approx.)	kg	282	178	336

## AK-02 / AH.

### Compact axle AK-02. Hydraulic axles AH.

#### Design characteristics

- rigid self-contained hydraulic axle

#### On both sides

- fixed displacement motor HMF-02
- multiple disc brake, hydraulically released
- subsequent mechanical reduction gear
- wheel bearing

The compact axle AK 30-02 has integrated the variable pump HPV 105-02, boost and working pump as well as the drive control.

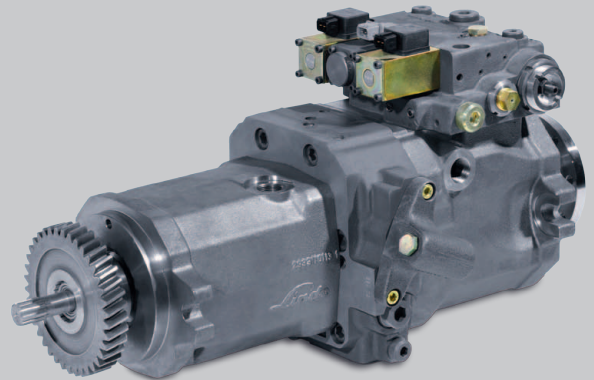
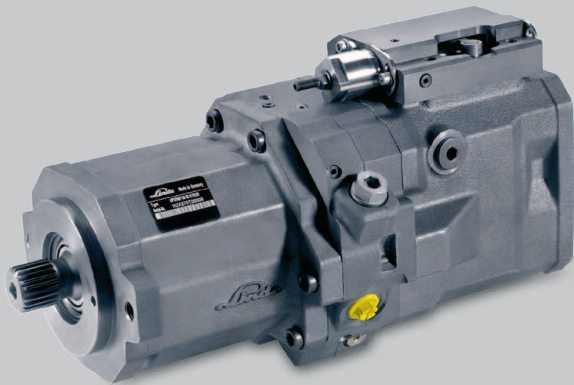
#### Product advantages

- high starting torque
- steady low speed behaviour
- torsional stiffness
- high power density
- high reliability
- long service life

#### Product advantages AK 30-02

- compact design
- high degree of integration
- short response time
- precise control





## K-02 units.

Together with the customer Linde Hydraulics defines new standards in technology. Advanced modular drive technology, realised in hydrostatic variators for variable speed transmission, form the core of power split gearboxes. Compact units with a hollow shaft are available for mounting to conventional gearboxes in smaller machines. These compact units are used as fully hydrostatic systems with PTO drive. With customer-specific developments, Linde Hydraulics supports the change from power shift to continuous variable transmission technology.



Precise transmission control for simple operation without interrupting tractive effort. From stand still to maximum speed. Stepless.

## K-02 units. Stepless for optimum performance.

### Design characteristics

- variable displacement pump HPV-02 and fixed displacement motor HMF-02 back-to-back in one common housing
- inline-configuration
- integrated high pressure relief valves with boost and discharge function
- external boost
- electric or hydraulic pump control

### Version for gearbox installation

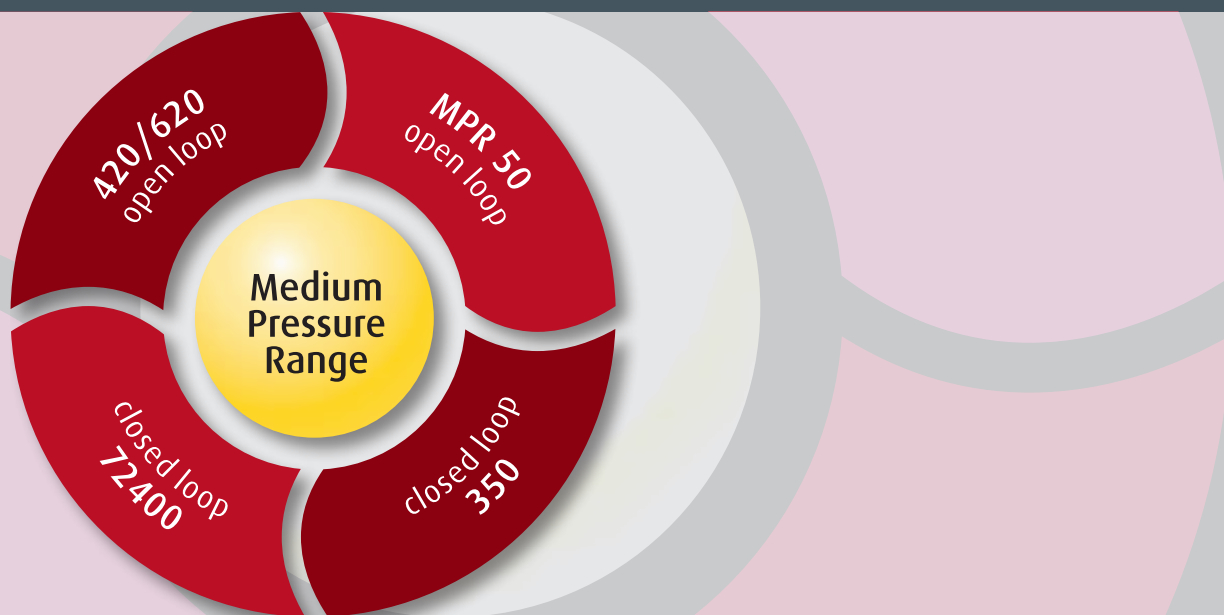
- optimized for power split transmissions
- customized enclosure geometry
- engine power 120 - 165 kW

### Version for gearbox extension

- fully hydrostatic unit for mounting on conventional gearbox
- PTO version with power take-off
- engine power up to 45 kW

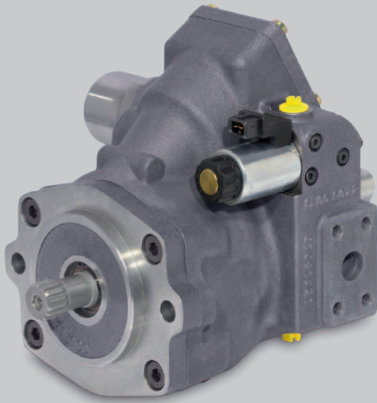
### Product advantages

- accurate control of gear box
- exact gear shift without interrupting tractive effort
- dynamic response
- stand-by control
- sensitive start-up
- precise crawling speed
- high efficiency
- low fuel consumption over entire operating range
- compact design
- high reliability
- long service life



## Medium pressure range.

In addition to the 02 high pressure series, Linde Hydraulics offers a selection of medium pressure pumps for a variety of purposes. Demand-based supply of the actuators to make the overall system as efficient as possible is also the centrepiece of these units. With having identical service intervals, heavy duty medium pressure pumps are the perfect supplement to the 02 series of hydrostatic systems in more powerful machines for tougher applications. Thanks to their high power density, medium duty pumps impress, in particular, in auxiliary drives in open circuits. For machines with propel system on a medium pressure level, we offer pumps for single and dual circuit systems in closed loop applications.



MPR 50		50	+ IGP
Max. displacement	cc/rev	50	16
Max. speed (at 1 bar abs.)	rpm	3100	
Max. speed (at <35 cc)	rpm	3600	
Nominal pressure	bar	280	80
Peak pressure	bar	315	110
Max. power (at rated pressure and maximum speed)	kW	72.3	6.6
Weight incl. IGP (approx.)	kg	26	

## MPR 50. Open loop.

### Design characteristics

- electro-hydraulic position feedback control
- mechanical feedback
- spring support for swivelling back
- pulsation damping
- fail-safe  $V_{\min}$
- no cold start valve necessary
- integrated charge pump with common suction port

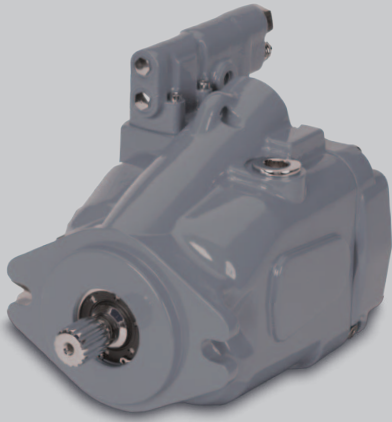
### Charge pump IGP

- integrated, 16 cc/rev displacement
- common suction port with MPR
- pressure-proof, suitable for fan drive

### Product advantages

- very short design
- low pulsation and low noise
- good cold start behaviour
- integrated charge pump
- pump position at standstill:  $V = V_{\min}$
- suitable for rough application conditions
- integration in electronic machine management





X 20		49	62	80	98
Max. displacement	cc/rev	49.2	62.3	80.0	98.0
Max. speed (at 1 bar abs.)	rpm	2650	2600	2200	2200
Max. speed (standby)	rpm	3600	3600	3600	3000
Nominal pressure	bar	280	280	210	280
Peak pressure	bar	320	320	230	320
Max. power (theoretically)	kW	60.8	75.6	61.7	100.0
Weight (approx.)	kg	22.9	23.8	24.2	41.5

## X 20. Open loop.

### Design characteristics

- two-part housing
- compact dimensions
- SAE B flange/SAE C flange
- radial or axial connections
- 280 bar nominal pressure
- 10,000 hours B10 storage service life

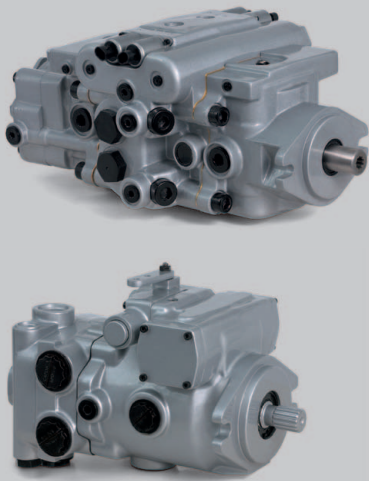
### Controls

- load sensing
- torque control

### Product advantages

- compact dimensions for narrow installation situations
- high performance through high rated pressure level
- high handling performance
- long service life
- over 65,000 pumps currently in use
- high operating reliability





350 Dual		41	49	62
Max. displacement	cc/rev	41	49	62
Max. speed (standby)	rpm	3600	3600	3600
Nominal pressure	bar	280	280	280
Peak pressure	bar	380	380	380
Max. power (theoretically)	kW	69	82	104
Weight (approx.)	kg	81.8	81.8	81.8

72400		41	49
Max. displacement	cc/rev	40.6	49.2
Max. speed	rpm	3600	3600
Nominal pressure	bar	210	210
Peak pressure	bar	379	379
Max. power (theoretically)	kW	51	61.7
Weight (approx.)	kg	27	27

## 350 Dual/72400. Closed loop.

### Design characteristics 350 Dual

- dual circuit pump for closed loop applications
- mechanical or hydraulic controls without swashplate position feedback
- electro-proportional control with or without swashplate position feedback
- integrated charge pump
- non-contact hall effect sensors for swashplate position
- speed sensor

### Product advantages 350 Dual

- compact design
- minimized hosing effort
- precise, real-time pump control
- short reaction time
- low hysteresis of the electro-hydraulic control
- high PTO-capability

### Design characteristics 72400

- wide range of controls
- low charge pressure level

### Product advantages 72400

- low weight
- low parasitic losses
- smooth operation



LSC stands for high handling performance due to load-independent and sensitive machine conduct. Fast and direct.



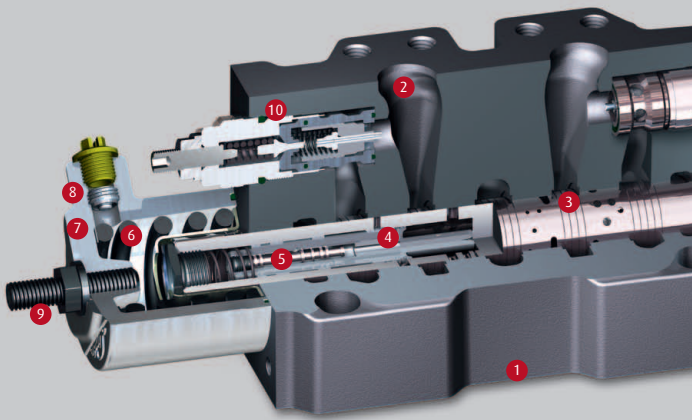
## LSC Linde Synchron Control – System. Intelligent distribution of fluid.

As a pioneer of load sensing technology, Linde has more than 25 years of experience in challenging applications in open circuits. Compared to other systems, LSC enhances fuel economy up to 10 %. On-demand flow control of the regulating pump and elimination of bypass flow losses due to the “closed centre” design of the directional control valves prevent wasting energy and fuel. Sensitive controllability that can be accurately reproduced and the compensation for load influences ensure that the machine is intuitive to operate, making readjustments unnecessary. Even at system saturation, normal handling is ensured thanks to proportional flow distribution. This saves time and increases efficiency.

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### Product advantages

- system can be individually adapted to customer specifications
- supply to additional actuators is optional
- simple system control
- electronic override of the LS signal is feasible
- simultaneous motion of several actuators without reciprocal or with defined influence
- intuitive, sensitive operation
- low fatigue working



Design characteristics control valves		
1	Load Sensing directional control valve	shown as sub plate mounted valve, alternatively available as sandwich valve
2	Cross-sections	thoroughly dimensioned in several nominal sizes
3	Valve control spool	with integrated compensators and pressure copiers
4	Compensator	downstream, for compensation, 1 per side
5	Pressure copier	integrated in compensator, 1 per side
6	Centring spring	in 2 versions for 2 pilot pressure ranges
7	Shim	independently adjustable start of function on each side
8	Throttle check valve	in pilot pressure port, adjusting valve dynamics
9	Mechanical stroke limiter	independent flow limitation on each side
10	Pilot-operated pressure relief valves	with flat flow-pressure characteristic, make-up function optional

## LSC valve technology. Basis of individual machine characteristics.

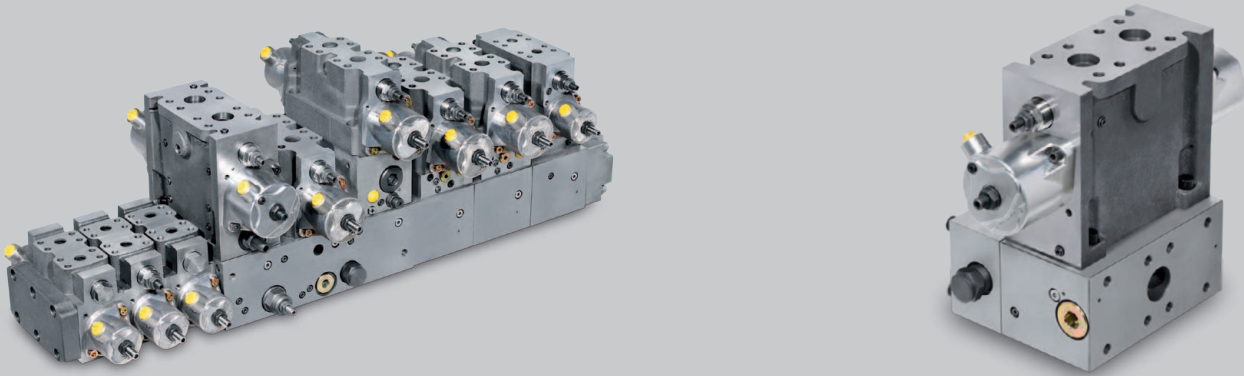
The directional control valves are at the core of every manifold plate in LSC technology. Compared to other load sensing directional control valves, LSC directional control valves stand apart, in particular, thanks to the integrated downstream pressure compensators and pressure copiers. This arrangement prevents the actuator from lowering when the function starts. This has the advantage that the oil flow only needs to pass through the valve once and not several times. This ensures optimized flow passages in the directional control valve. Due to the high-precision production of the directional control valves, there is only minimal leakage even at high load.

### Design characteristics

- closed centre load sensing directional control valves in piston design
- valve control spool with integrated compensators and pressure copiers
- optimized flow paths
- side-selective configurable function start
- side-selective flow restriction
- prioritization of individual actuators
- hydraulic or electric proportional control
- can be electrified subsequently via external pilot valve bar VD7S

### Product advantages

- no lowering at start of function
- no separate load holding valve necessary
- horizontal or vertical installation
- quick-reacting pressure cut-off
- simple functional enhancement



## VT modular.

More power and more flexibility from a quantity of one.

Manifold valve plates of series VT modular are made up of individual components of a modular building block system. This is why manifold valve plates can be configured to optimally match any application with one up to twelve actuators and are readily available from quantities of 1.

### Design characteristics

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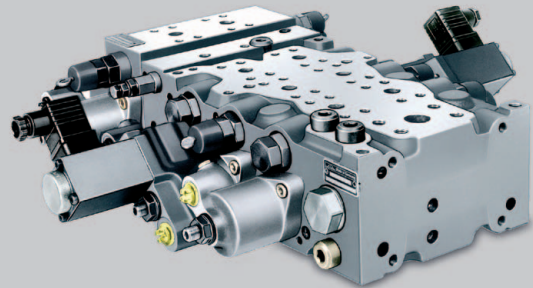
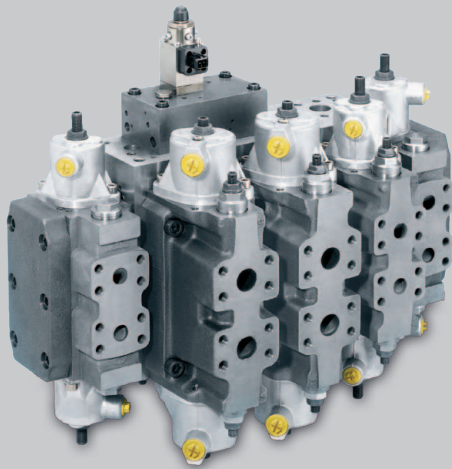
- directional control valves available as sub plate mounted valves and sandwich valves
- designed for the Linde Synchron Control (LSC) – Load Sensing System
- nominal sizes 18, 25 and 30
- flows up to 600 l/min (size30)
- downstream compensators (Post-Compensated LS system)
- individual characteristic due to separate compensators and pressure copiers for sides A and B
- proportional flow distribution in case of system saturation
- modular design for the configuration of control plates for 1-12 functions
- functionality can be modified via intermediate plates
- optionally with hydraulic or electric piloting

### Product advantages

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- approved quality since LSC-introduction in 1984
- highest flow in Load Sensing Systems in the market
- fast machine response & low hysteresis
- intuitive machine operation through compensating for load effects – also during multi-functioning
- maintains flow relations, even during system saturation all functions remain active
- high handling performance
- low energy consumption
- high system efficiency
- easily adaptable to applications
- quick availability even for quantity 1





## VT integrated. Compact function.

Manifold valve plates of series VT integrated are available in various designs. Functions like pressure relief of the LSC system and a preloading function for cooler or tank paths are already integrated in the basic valve block.

The different basic valve blocks supply 2 to 8 directional control mounting valves with identical or different cross-sections. Both position and nominal size of the directional control mounting valves are in this case predetermined by their compact design. This provides a compact manifold valve plate for a large number of applications. There are sandwich valves or cover plates for mounted valve ports available to allow different variations of a machine to be equipped with the same manifold valve plate.

### Product advantages

- compact design for predetermined configuration
- flows of up to 600 l/min for individual actuators
- series approved variations for a large number of applications
- scope of function can be extended using sandwich valves
- electrifiable via pilot valve bar

## Monoblock. Specific design.

The monoblock design integrates e.g. three directional control valves and one pressure relief module in a common housing. This results in the most compact package. Specially developed for an application, they are ideal for machines manufactured with identical configuration in high quantities. Despite this fact the monoblock provides a certain degree of flexibility with the option to attach sandwich valves to its front face.

### Product advantages

- most compact package
- customized for a specific application
- electrifiable via pilot valve bar



## LinTronic.

Linde controllers from the LINC series are characterised by high mechanical and electrical stability. The core of the components is formed by a function and safety controller. LINC control units are used on their own or in combination with one another, both for hydraulic and electric drives and combinations of both drive types. In addition to the drive components joysticks, pedals and the combustion engine can be integrated into the regulation concept. Thanks to efficient mode selection and an increase of user-friendliness, they achieve enhanced power utilisation and thus also reduce pollutant and noise emissions.



LINC Series	LINC 1	LINC 2
Digital inputs	4 x Pull-up	12 x Pull-up
Digital inputs	6 x Pull-down	12 x Pull-down
Analogue inputs	6 x 0-5 V	20 x 0-5 V
Frequency inputs	3 x 0-10 kHz	9 x 0-10 kHz
PWM outputs	7 x max. 2.0 A	32 x max. 2.0 A
Low-Side outputs	4 x max. 0.5 A	8 x max. 1.0 A
External power supply	1 x 5 V	2 x 5 V
Communication	1 x CAN Bus	2 x CAN Bus
Dimensions (approx.)	147 x 140 x 50 mm	230 x 157 x 58 mm

# Electronic Controls.

## For open and closed loop applications.

### Design characteristics

- redundant safety concept with function and safety controller
- preconfigured setup
- operating voltage 8-32 VDC
- protected against reverse polarity
- protection against short-circuits, all inputs protected against operating voltage and earth
- freely definable switching and proportional outputs
- communication via CAN bus
- conforms to EU directive 2004/108/EC
- resistant against vehicle electrical system impulses in accordance with ISO 7637-2
- robust and leak proof housing for mobile application
- protection class IP67 as per EN 60529
- resistant against salt spray, hydraulic oil, diesel, UV radiation, fertiliser

### Product advantages

- management of the entire machine drive via just one electronic control unit
- optimum interaction of hydraulic and electric drive components from Linde
- high availability and reliability
- can guarantee safety functions up to performance level d in accordance with DIN EN ISO 13849-1
- can be used in applications in the scope of the German Regulations Authorising the Use of Vehicles for Road Traffic (StVZO)
- can be configured to input peripherals customary in the market
- machine behaviour can be configured on individual basis
- simple parametrising process and diagnostics with LinDiag®
- suitable for open and closed loop applications and combinations of both



1



2



3



4

## LinTronic. Peripheral equipment.

### 1. Joystick, electronic CEH 80

2-way/ 4-way electronic control stick, transverse axis spring centred, brake optional, additional switch function in handle, this product is suited for console mounting.

### 2. Joystick LLC

Potentiometer joystick, stabilized voltage supply 5 V - 15 V, spring-centred, suitable for armrest mounting, various versions, e.g. single lever, 4-way version available

### 3. Throttle / inch pedal CEH 20

Drive pedal or inch pedal for reduction of reference value, stabilized supply voltage 5 V - 15 V, robust die cast console.

### 4. F-N-B travel direction switch CEH-25

3 latching positions for forward, neutral and backward propelling, ergonomic actuator, switching voltage up to 70 V.





5



6



7



8

## LinTronic. Peripheral equipment.

### 5. Solenoid CEA-2x

37 mm-type solenoid in proportional or on/off version. For electro-mechanical valve control of pumps, motors, proportional valves and directional control valves. Magnetic force up to 55 N.

### 6. Swash angle sensor CEH 07

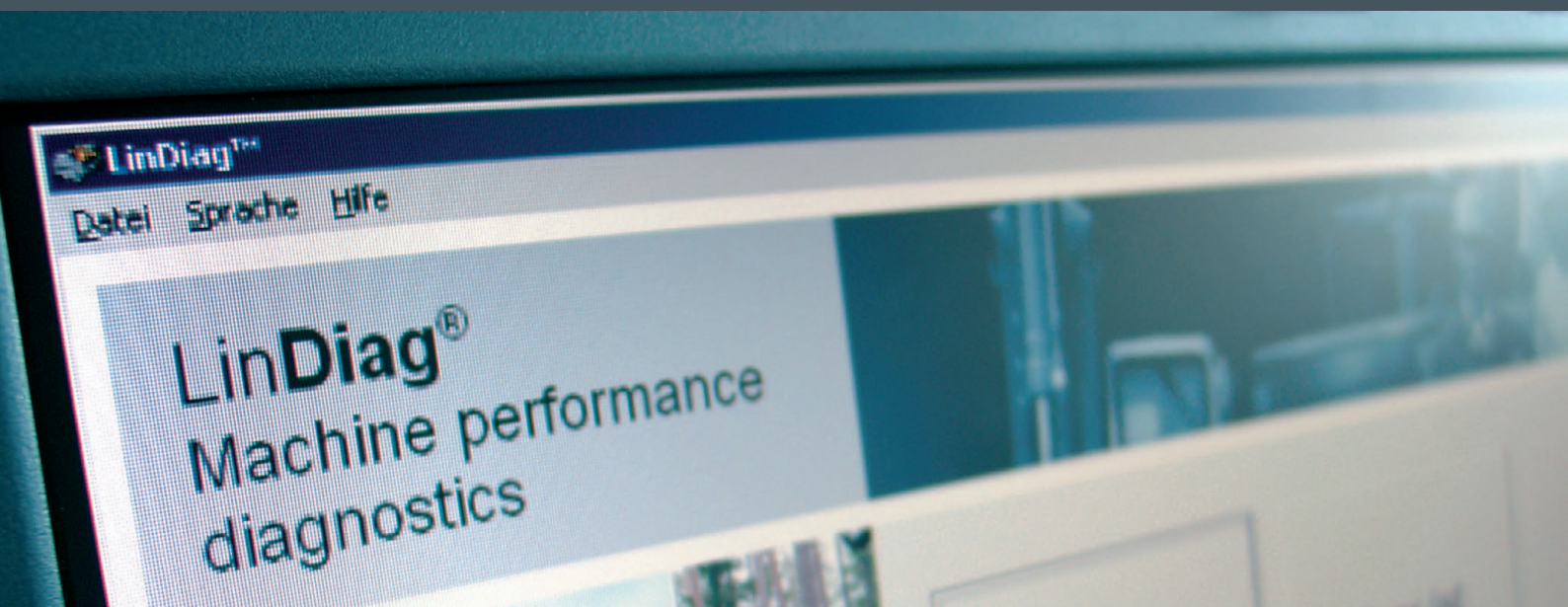
Linear Hall-effect angle sensor with spring reset force for HPV-02.

### 7. Speed sensor CEH 10

Speed sensor for hydraulic motor or gear. Two channels for detection of rotational direction. Hall-sensor up to 15 kHz, pressure resistant to 5 bar static.

### 8. Pressure sensor CEH 50

For high pressure detection, various types with pressure ranges of 40, 60 and 600 bar, analogue output signal 0.5 V - 4.5 V, stabilized supply voltage 5 V or 10 V - 32 V.



## LinDiag®

### Software for set up and diagnostics.

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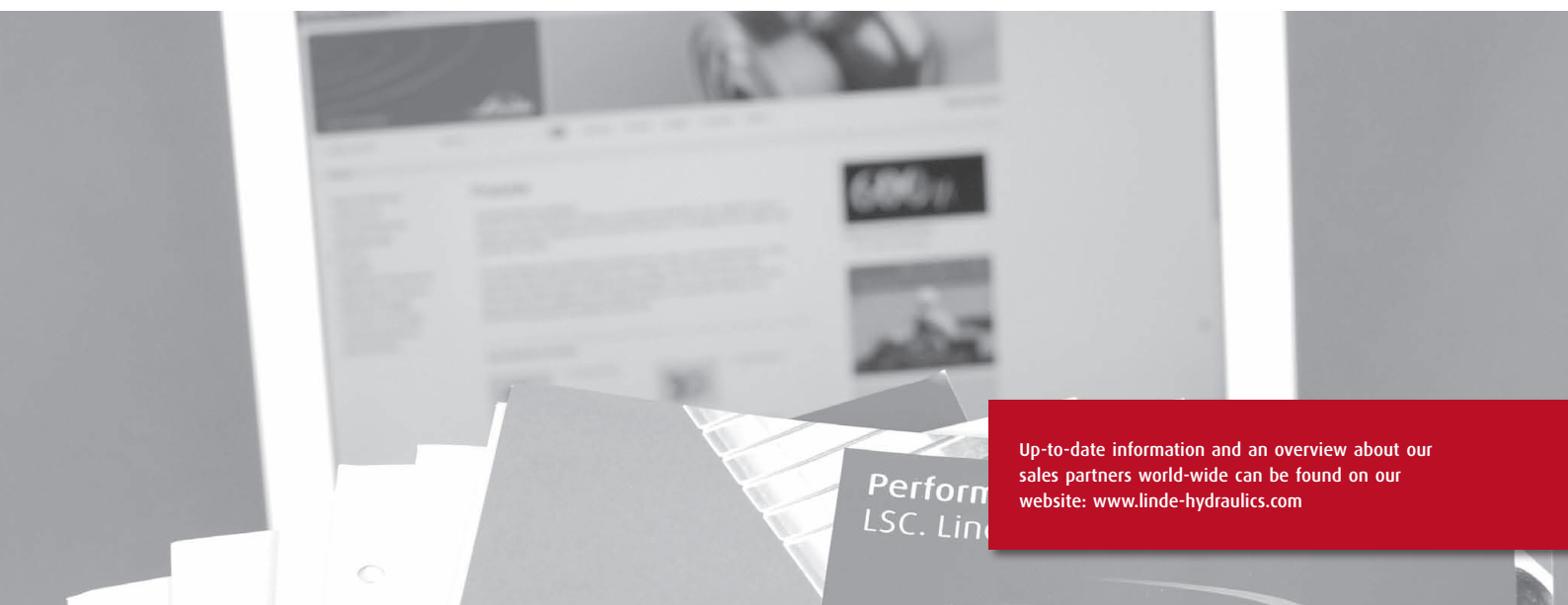
#### Characteristics

- compatible with Linde Hydraulics electronic controls
- suited for PC /laptop with Windows operating system with serial or USB interface
- operated by mouse, key or pad
- diagnostics
- documentation and reporting
- harness checking
- parameterization
- "Teach in" of components
- data logger
- electronic box restorable to factory setting

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#### Product advantages

- optimum system usage by teach-in function
- error prevention through continual comparison and documentation of the variance
- user-friendly software up-dating ("flashing")
- easy usage by self-explanatory user surface
- large letters and buttons offer optimum use even with the machine running
- self-adapting screen size
- multi-lingual, up to 10 languages can be programmed
- documentation exportable into MS Office
- practical-minded partition of control elements by functional groups
- modular set-up: individual functions can be added optionally later



Up-to-date information and an overview about our sales partners world-wide can be found on our website: [www.linde-hydraulics.com](http://www.linde-hydraulics.com)

## Well-informed. Our current print media at a glance.

### Product Catalogues

- Hydraulic drive technology
- Electric drive technology

### Brochures

- **LinDrive.** The unbeatable driving experience.
- **Hydrostatic drives in agricultural machines.** Optimum power. Maximum yield
- **HPV-CA.** Unbeatable driving experience for applications with engine speed control
- **LSC Linde Synchron Control.** Performance and flexibility
- **eMotion.** Electric drives and systems

### Datasheets

- **Model Code.** Configuration of the series 02
- **HMF/A/V/R-02.** Hydraulic motors for closed and open loop operation
- **HPR-02.** Self-regulating pumps for open loop operation
- **HPV-02.** Variable pumps for closed loop operation
- **VT modular.** Modular system for LSC manifold valve plates
- **VD7S.** Pilot valve bar for electric piloting
- **Electric Drives.** Electric motors and axles
- **LINC 1.** Universal electronic drive control
- **LINC 2.** Universal electronic drive control
- **Linde pressure definitions.** According to DIN 24312
- **Mineral-oil-based hydraulic fluids**

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Turning Power into Motion.

