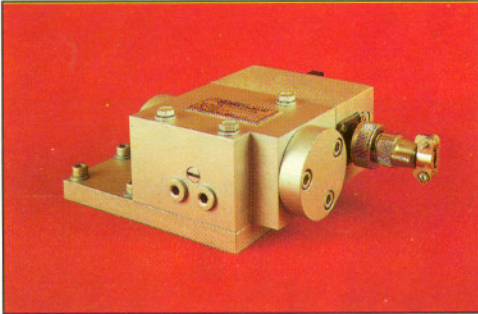


Electrohydraulic Servo-Valve, Two-Stage (33 649)

Rated pressure	200 and 250 bar
Range of operating pressure	20 ... 210 bar and 30 ... 300 bar
Return pressure, max.	100 bar
Rated flow	6.3; 10; 16; 25; 40 and 63 dm ³ /min
Rated control current each coil	50 mA 15 mA
Resistance each coil	22 ohm 200 ohm

- For the electric drive with signal matching, step and ramp determination of set points as well as for the formation of the path-dependent feedback signal electronic modules and components are available.



Electrohydraulic Servo Control Unit (43 333)

Rated pressure	63 bar
Operating pressure, max.	70 bar
Return pressure	≤ 5 bar
Rated flow	10 and 20 dm ³ /min
Rated control current each coil	50 mA
Resistance each coil	22 ± 2 ohm

- With integrated mechanical feedback for the attachment to variable displacement axial piston pumps and motors
- For the continuous low-power variation of the flow rate of axial piston pumps and of the speed of variable displacement axial piston motors
- Building up of energy-saving and cost-saving hydraulic control loops

Servo-Pumps (Radial Piston Pumps)

Rated pressure	160 and 320 bar		
Rated speed	1450 r.p.m.		
Drehzahlbereich	500 to 2000 min ⁻¹		
Nominal sizes = capacity	at 160 bar	Control Volume ¹⁾	Control Time ¹⁾
	32 cm ³ /rev.	8.6 cm ³	≤ 100 ms
	80 cm ³ /rev.	29.5 cm ³	≤ 200 ms
	125 cm ³ /rev.	32.5 cm ³	≤ 200 ms
	at 320 bar		
	12.5 cm ³ /rev.	6.6 cm ³	≤ 100 ms
	32.0 cm ³ /rev.	24.5 cm ³	≤ 200 ms
	80.0 cm ³ /rev.	33.1 cm ³	≤ 200 ms

¹⁾ Double control volume and double control time at above zero control

- Direction of rotation clockwise or anticlockwise
- With foot or flange mounting
- Versatile possibilities of combination with drive bearing, pressure relief valve, intermediate flange with electric motor and servo-valve, two-stage
- For the use in open and closed hydraulic circuits
- Optimum adaptation in systems with oil flow, pressure and power control
- The following electronic devices are available for the drive, for the set point determinations and controls:
 Functional unit HL-AVX 008/1
 Functional unit with power limiting HL-AVX 013/1
 Functional unit with pressure control HL-AVX 015/1

Rotatory Drive Units (33 652)

Rated pressure	63 bar
Operating pressure, max.	80 bar
Nominal sizes = rated capacity	20, 32 and 50 cm ³ /rev.
Speed, max.	530 ... 2000 r.p.m., dependent on nominal size
Speed, min. (in the closed speed control loop and at constant motor load)	1 r.p.m.

- Device combination consisting of axial piston motor (10 857), servo-valve, two-stage (33 649), restrictor valve and motor-tachogenerator
- Flange version
- Drive shaft with feather key
- Drivable with functional unit RB 410 fitted with controller R 401, power supply unit R 604 and test module R 606

Electrohydraulic Servo-Drives, 6.3 MPa**a) Control Sets**

- | | |
|----------------------------|------------------------------------|
| Operating pressure, max. | 80 bar |
| Nominal sizes = flow rates | 1.6; 2.5; 4.0 dm ³ /min |
- Deliverable with additional assemblies such as manual emergency control, hydraulic accumulator, lining, leakage collecting trough

b) Servo-Motor with Feedback, Type L

- | | |
|---------------------------------|------------------------|
| Nominal sizes = piston diameter | 50, 80, 125 mm |
| Correcting strokes | 25, 40, 60, 100 mm |
| Operating forces | 7500, 20 000, 52 500 N |
| Speed of correction | |

(dependent on nominal size) 0.007 to 0.045 m/s

- Available with distance piece as well as couplings for the attachment of fittings
- Other servomotors (rotating or swivelling) usable for special automation tasks

c) Servomotor with Feedback, Type P

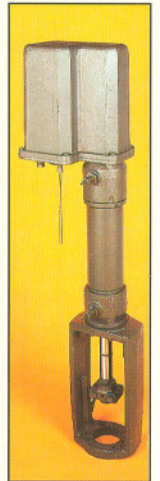
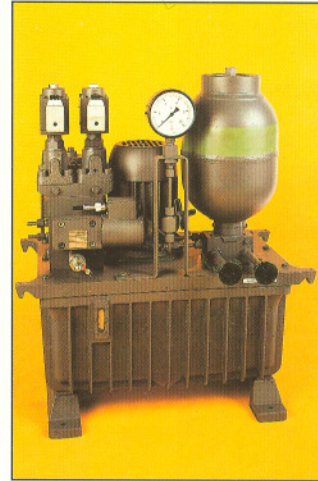
- | | |
|-------------------|--------------|
| Correcting stroke | 12 to 500 mm |
|-------------------|--------------|

d) Electronic Servo Amplifier HL-AVX 005/1

Available as:

- Protected card plug-in units
- Functional unit, without and with additional modules (bridge module, constant current source)
- Housing with functional units, completely wired dependent on the case of application

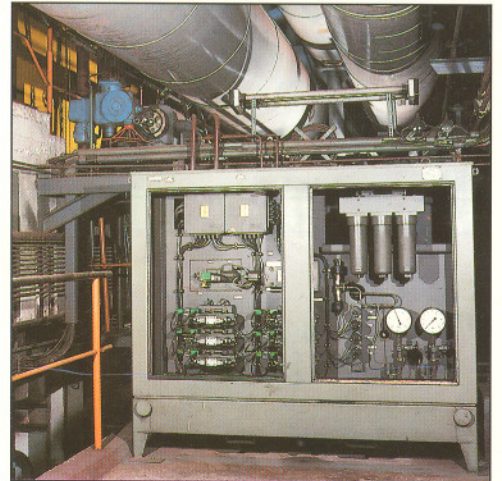
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**Electrohydraulic Power Station Servo Drives**

for the servo-valve control power station cycle processes

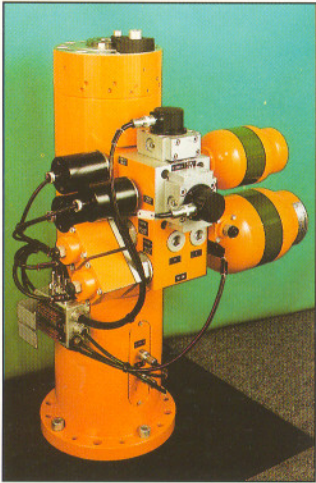
- Rated pressure 160 bar
- High speeds of correction and large operating forces
- Preferably used for the positioning of feed-water control valves, pressure reducing stations, twist controllers at suction draughts and fresh-air fans, among others power station fitting

1

**Electrohydraulic Strip Run Controls**

Complete control equipment for the straight-centre and straight-edge guidance of strips of different materials in winding-on and winding-off or centring within machines and plants. Also for the leading of equipment at constant distances of strip edges or colour separating lines on strips. Non-contacting scanning of the strips by opto-electronic direct or alternating light scanning devices according to the transmitted light or reflection process.

1



Electro-Servo-hydraulic Test Cylinders

Basic product for test and simulation systems for the automatic material, component or product testing with any deterministic or stochastic load cycles.

Rated pressure	210 bar
Size = axial nominal force	10, 25, 63 and 100 kN
Rated stroke	± 10, ± 50 and ± 100 mm
Range of frequency	0 to 200 Hz

Particularities:

- wear-free operation without amplitude distortion and without stick-slip effects, with additional transverse force loadability by hydrostatic support of the piston rod
- Internal bearing flow feedback
- Internal position and pressure measuring system
- Operation in closed control loops
- Position of use as desired
- Optional operation with one or two servo valves

Units of Test Technique

ensure the constant-pressure flow supply required for electro-servo-hydraulic test cylinders even at extreme dynamic test conditions. The control of the constant pressure flow from size 80 on takes electro-servo-hydraulically or servo-hydraulically place, in which case a constantly good control behaviour is achieved.

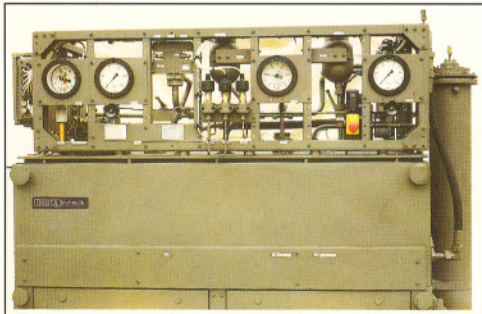
To adapt in an optimum manner the pressure oil generation to the different demand of the particular test tasks, various sizes with rated flows from to 40 to 250 dm³/min are offered. By linking units of the size 250 constant pressure flows of 500 dm³/min and more can be made available.

Type (= Size)		HA 40	HA 80/1	HA 130/1	HA 250	> 250*
Rated flow	(dm ³ /min)	2×20***	80	130	250	250
Rated pressure	(bar)	210	210	210	210**	210**
Reservoir capacity	(dm ³)	400	400	630	630	800
Sound pressure level						
at 1-m distance	(dB[A])	75	74	76	78	80
Filter rating	(µm)	10	10	10	10	10
Flow control		-	electro-servo-hydraulic		servohydraulic	

* By linking of two or several HA 250

** Increase of rated pressure upon particular request

*** Single operation at 20 dm³/min is possible



Electronics for Servo-Pumps and Servo-Valves for the Building-Up of Control Loops 1**Functional Unit HL-AVX 008/1 for Servo-Pumps**

with controller R 401, power supply unit R 604, carrier-frequency measuring amplifier HL-AVT 03a/1 and test module R 606

Functional Unit HL-AVX 013/1 for Servo-Pumps with Power Limitation

with controller R 401, power supply unit R 604, carrier-frequency measuring amplifier HL-AVT 03a/1, power controller HL-ASL 01/1 and test module R 606 as well as functional unit HL-AVX 014/1 with read-only memory HL-ASF 02/1

Functional Unit RB 410 for Servo-Valve, Two-Stage

with controller R 401, power supply unit R 604 and test module R 606

Functional Unit HL-AVX 015/1 for Servo-Pumps with Pressure Control

with controller R 401, power supply unit R 604, amplifier for pressure sensor R 401c, carrier-frequency measuring amplifier HL-AVT 03a/1 and test module R 606

Controller for Servo-Valve R 401, Two-Stage

Power Supply Unit R 604, ± 15 V, 300 mA stabilized

Carrier-Frequency Measuring Equipment HL-AVT 03/1 for Inductive Displacement Pick-Up (upon inquiry, deliverable in Eurocard format)

Power Controller HL-ASL 01/1 for the Power Limitation at Servo-Pumps

Ramp Generator HL-AFR 01/1

Read-Only Memory HL-ASF 02/1 for the Predetermination of Set Points

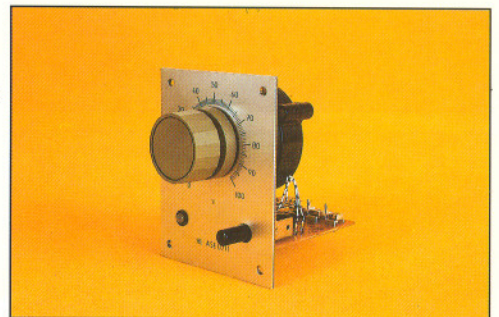
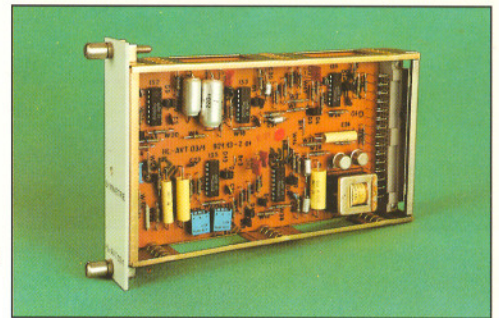
Set Point Memory HL-ASE 02/1 for the Determination of Set Points

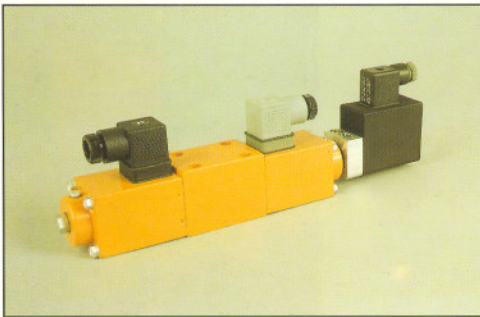
Bridge Module HL-ABB 02a/1 for Balancing Purposes

Test Module R 606

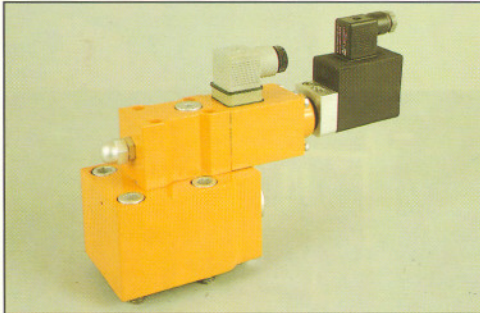
Constant Current Source HL-ZKE 04/1 for Projector Lamps, 700 mA, $R_L \leq 10$ ohm

Relay Module HL-DRB 03/1 for Signal Change-Over

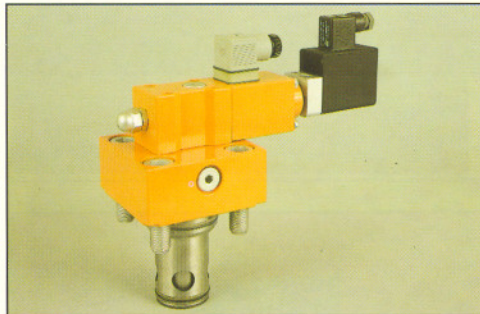




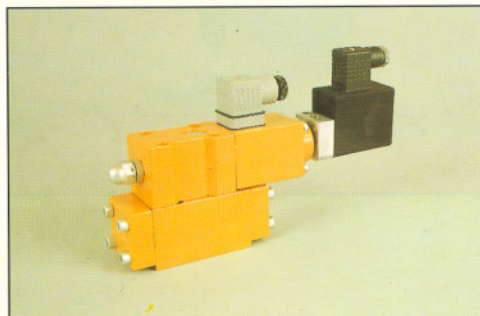
- ▶ **Proportional Directional Control Valves, VWP** 1
- Rated pressure 320 bar
- Sizes 6, 10, 20
- Flow rating 60, 140, 400 dm³/min
- Two- and three-position valves with four control functions and five forms of characteristic lines
- For sub-plate mounting



- ▶ **Proportional Control Valve VRP** 1
- Rated pressure 320 bar
- Size 6
- Flow rating 40 dm³/min
- For sub-plate mounting



- ▶ **Proportional Pressure Relief Valves, Pilot-Controlled, VDP** 1
- Rated pressure 320 bar
- Pressure adjusting range, stepped 6.3 to 320 bar
- Sizes 6, 10, 20
- Flow rating 40, 250, 500 dm³/min
- For sub-plate mounting



- ▶ **Proportional Pressure Relief Valves, Pilot-Controlled, VDP** 1
- Rated pressure 320 bar
- Pressure adjusting range, stepped 2 to 320 bar
- Sizes 16, 25, 32
- Flow rating 250, 500, 1000 dm³/min



- ▶ - Cartridge type valves (two-port cartridge valves)
- Proportional Pressure Regulators, Pilot-Controlled, VMP** 1
- Rated pressure 320 bar
- Pressure adjusting range, stepped 6.3 to 320 bar
- Size 10
- Flow rating 250 dm³/min
- For sub-plate mounting



- ▶ **Proportional Pressure Regulators, Pilot-Controlled, VMP** 1
- Rated pressure 320 bar
- Pressure adjusting range, stepped 6.3 to 320 bar
- Size 16
- Flow rating 250 dm³/min
- Cartridge-type valves (two-port cartridge valves)

- ▶ **Proportional Three-Port Pressure Regulators, 3VMP** 1
- Rated pressure 320 bar
- Pressure adjusting range, stepped 6 to 300 bar
- Size 6
- Flow rating 40 dm³/min
- For sub-plate mounting

- ▶ **Proportional Pressure Regulator – Pressure Relief Valves, VMDP** 1
- Rated pressure 320 bar
- Size 4
- Flow rating 5.5 dm³/min
- Cartridge-type valves

- ▶ **Proportional-Series Flow Control Valves, VSP with Meter-Out Control** 1
- Rated pressure 320 bar
- Sizes 6, 10
- Flow rating 23.5; 60 dm³/min
- For sub-plate mounting
- Design: proportional directional control valve with differential pressure regulator in vertical stacking

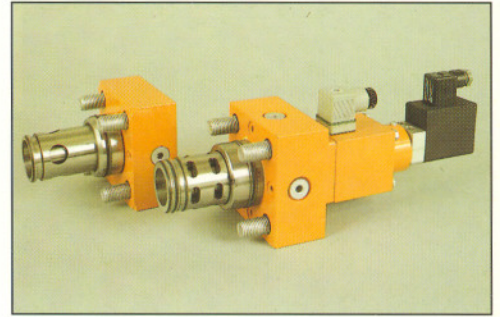
- ▶ **Proportional Restrictor Valve, VDrP** 1
- Rated pressure 320 bar
- Size 32
- Flow rating 1000 dm³/min
- Cartridge-type valve (two-port cartridge valve)

Proportional Pressure-Compensated Flow Control Valves, VSP

Rated pressure	320 bar
Size	32
Flow rating	160, 300, 450 dm ³ /min

– Cartridge-type valves (two-port cartridge valve)

1

**Electronics for the Drive as well as Power Supply Units for Stationary and Mobile Operation**

Functional Unit HL-AVX 020 for one proportional valve, mains-operated with amplifier HL-AVL 12, power supply unit HL-ZKE 07, read only memory HL-ASF 02/1c and test module R 606a

Functional Unit HL-AVX 021 for two proportional valves, mains-operated with two amplifiers HL-AVL 12, one power supply unit HL-ZKE 07, two read-only memories HL-ASF 02/1c and two test modules R 606a

Functional Unit HL-AVX 022 for one proportional valve, battery-operated, 24 V d.c., with amplifier HL-AVL 12, transverter HL-ZKT 03a, read-only memory HL-ASF 02/1c and test module R 606a

Amplifier HL-AVL 12 (1st Generation) for all proportional valve types, for position sensors with voltage signal $-6\text{ V} \dots +6\text{ V}$ in the unified system of casings

Power Supply Unit HL-ZKE 07 for the power supply of the amplifier HL-AVL 12 $\pm 15\text{ V}$, 0.3-A stabilized, 2 x 24 V d.c., 1.6-A instabilized

Transverter HL-ZKT 03a for the power supply of the amplifier HL-AVL 12 from an on-board supply system 24 V d.c., $U_a = \pm 15\text{ V}$, 0.35-A stabilized

Read-Only Memory HL-ASF 02/1c for the making available of four adjustable set points with self-holding via current control by means of internal 26-mA constant current source

Test Module R 606a, test jacks on the front for signals and supply voltages of the functional units HL-AVX 020, HL-AVX 021 and HL-AVX 022

Compact Electronics Amplifier HL-AVL 20 (1st Generation) for all proportional directional control valves of sizes 6 and 10 as well as proportional restrictor valves of size 32 and proportional flow control valves of size 32

- Internal set point predetermination
- Internally, four singly recallable self-selected set point predeterminations
- Internal ramp generator with integration period of appr. 50 ms to appr. 7 s

Module Holder HL-AVY 002 for compact electronics amplifier HL-AVL 20 in case of single mounting

Amplifier HL-AVL 25 (2nd Generation) for all proportional valve types, for position sensors with current signal 4 mA ... 20 mA in the 19-inch system of casings

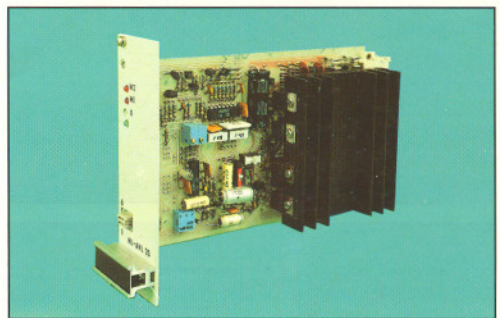
- External, floating set point predetermination
- Internal, four singly recallable self-selected set point predeterminations
- Delivery variants with ramp generator and characteristic shaper

Module Holder HL-AVX 006 for amplifier HL-AVL 25 in case of single mounting

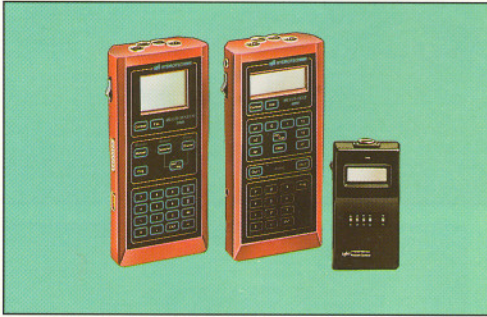
Testing Set HL-PG 003 for Proportional Technique

for the in situ control of proportional valves commissioning and trouble shooting (for all proportional valves of the 1st and 2nd generations)

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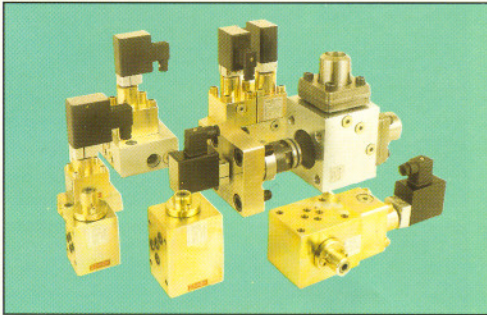


Electronic Measuring Technique for the Determination of the Hydraulic-Specific Parameters (Flow Rate, Pressure and Temperature) at Hydraulic Devices and Systems



Hand-Held Measuring Instruments for Different Measuring Tasks

Measuring channels	1 to 6
Indication	digital
Inputs	0 to 2 mA; Pt 100, 1 to 100 mV (pulses)
Outputs	analogue 0 to 2 V d.c. or digital RS 232
Auxiliary energy	9.6 V cadmium-nickel storage battery, charging circuit



Flow Rate Sensors SV

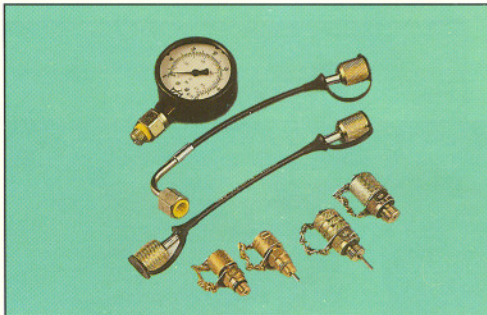
Measuring range, stepped	0 to 500 dm ³ /min
Sizes	size 06; 10; 32
Rated pressure	320 bar
Output signal	4...20; 0...20; 0...2 mA
Measuring error	± 1.5 %
Supply voltage	20 to 30 V d.c., 7 to 30 V d.c.

Single Linking Units EV

Single and angular sub-plates, end plates, rectifier and combination sub-plates for sizes 6 and 10
Mounting housing and combination mounting housing for size 32

Modular Valves (Sandwich Arrangement) HV

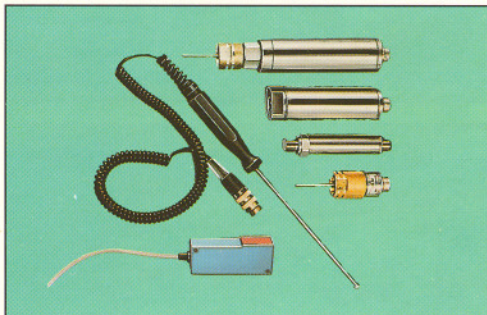
Flow rate measuring blocks, pressure/temperature measuring blocks, pressure measuring plates, fixed restrictor or plates with hole patterns DIN 24 340-A6, A 10; CETOP (servo)
Rated pressure 320 bar



Original MINIMESS Screw Couplings

for Pressure and Temperature Measurements, System Bleedings, Samplings

- Gas couplings
- Hoses
- Pressure gauges and accessory



Sensors for Pressure, Temperature and Speed

Pressure sensor PR 15; MINICHECK	measuring range stepped - 1... 600 bar output signal 0...2 mA; 0...20 mA; 4...20 mA
Combination sensor	
- Pressure	measuring range stepped 0... 600 bar
- Temperature	measuring range - 50 °C... + 200 °C
Temperature sensor (screw-in and surface sensor)	measuring range - 50 °C... + 200 °C
Speed probe DS 04	measuring range 1... 9999 r.p.m.

Mechanical Measuring Technique for the Determination of the Hydraulic-Specific Parameters at Hydraulic Systems

Sludge Index Measuring Set MSI

Measuring set for quality control of hydraulic operating and fresh oils

Measuring range = rated oil viscosity	15 to 75 mm ² /s at 40 °C
Measuring and evaluating time	3 to 15 min