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Engine Peak Meter

Type 2516B1/B10

Cylinder Pressure Measuring Instrument for Gas and Diesel Engines

The Egine Peak Meter Typ 2516B... is a rugged measuring instrument for monitoring engines with a speed of up to 4 000 min^{-1}. The software for data evaluation contained in the included accessories allows changes in peak pressure to be shown graphically and recorded.

- Immediate on-site data evaluation
- Rechargeable battery
- Software for data evaluation included
- Easy to operate

Description

The battery-operated measuring instrument measures between 1 and 100 pressure cycles from which it calculates the arithmetic average values of the peak pressure, standard deviation, maximum gradient of the pressure curve as well as the average pressure curve. The numeric data are shown on the LC display and can be saved as required. The average pressure curve plotted can be analyzed with the software for data evaluation contained in the included accessories. Since long indicator pipe cause gas oscillations which falsify the measuring signal, the cylinder pressure signal can be smoothed with an adjustable low-pass filter. The measurement data can be stored in two areas of the memory, each of which holds 20 records ("As found"/"As left"). This enhanced functionality makes the new engine peak meter ideal for balancing the cylinders of gas and diesel engines.

An additional measuring function allows the peak pressure to be displayed without time limitation and sending the analog sensor signal at the monitor output.

Application

For indicator valve measurements, the sensor Type 7613C is installed in adapter Type 7513A. This very precise sensor has proved to be ideal in industrial applications. The sensor Type 7613C is contained in the measuring set (in a case) Type 2516B10.

Technical Data

Measuring range Type 2516B1	bar	0 ... 250
Input voltage range Type 2516B1	V	1 ... 15
Sensor sensitivity (adjustable)	mV/bar	7 ... 40
Accuracy of the pressure value display	%	≤±0,5
Resolution	bar	0,1
Range of engine speed	min^{-1}	50 ... 4 000
Operating temperature range	°C	0 ... 50
Number of pressure cycles (adjustable)	–	1 ... 100
Low-pass filter (5th order Butterworth)	Hz	300, 500, 1 500, 5 000
Number of data memories		2
Memory capacity per memory	Data record[1)]	20
Sampling rate per revolution	–	720
LCD graphic display	Dots	128x64
Monitor output	–	BNC neg.
Output (Monitor)	V	5
USB interface	–	2,0
Dimensions Type 2516B1	mm	183x92x45
Dimensions Type 2516B10 (case)	mm	452x327x100
Weight	g	350
Battery	Type 3	9 V/EC6LR61
Operating time	h	>4
Charging time	h	<4

[1)] A data record consists of numerical measurands, curve trace, number, date and time of the memory location

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Measuring Functions

p_{max}	Maximum peak pressure
p_{min}	Minimum peak pressure
p_{av}	Average peak pressure
S_{dev}	Standard deviation of the peak pressure
dp/ca	Maximum gradient of the pressure curve
r/min	Speed
p_{peak}	Current peak-pressure; measuring function unlimited in time

Auxiliary Function

p_{av} Average cylinder peak pressure value p_{av} of the engine This value is calculated from p_{av} stored in the memory block 1. The calculated value is displayed and instantly updated as new data is entered.

Pressure Curve

Average pressure curve with a resolution of 720 measuring points per revolution, which can be printed out via the RS-232C interface (ASCII file).

Software

These pressure curves can be displayed graphically by means of Windows® Software contained in the included accessories. The pressure curves of all cylinders can be overlapped – a feature for verifying the cylinder balancing of the engine.

Auxiliary Functions

Setting of all measuring parameters with keyboard via LCD menu.

Monitoring Functions

Battery display with symbol; the Engine Peak Meter switches off automatically 2 minutes after the last button actuation unless this function is deactivated.

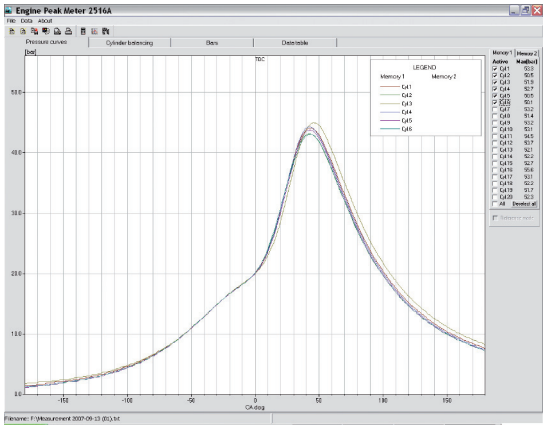

Fig. 1: Cylinder pressure curves of a 6-cylinder gas engine, before and after the maintenance work ("as found"/"as left")

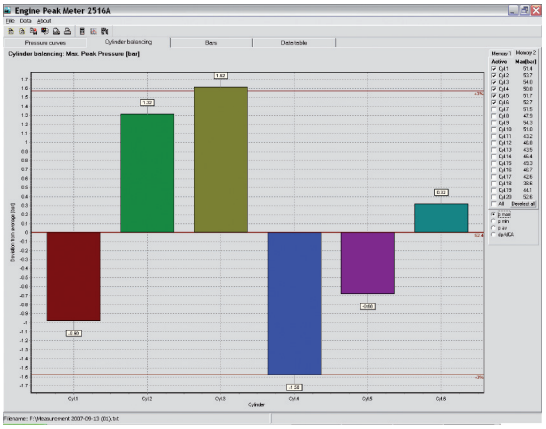

Fig. 3: Cylinder peak pressure deviation p_{av} of each individual cylinder compared to the calculated average peak pressure of the engine, before and after the maintenance work ("as found"/"as left")

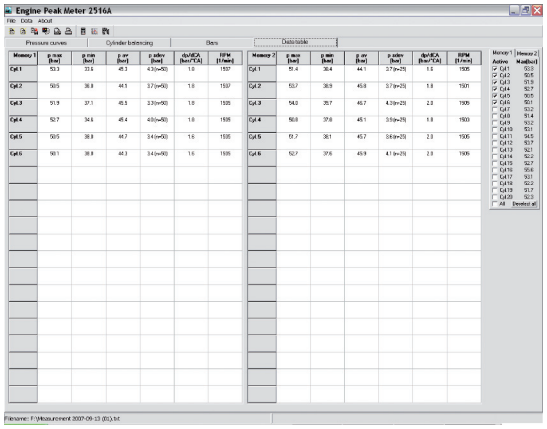

Fig. 2: Data table with the numeric values, before and after the maintenance work ("as found"/"as left")

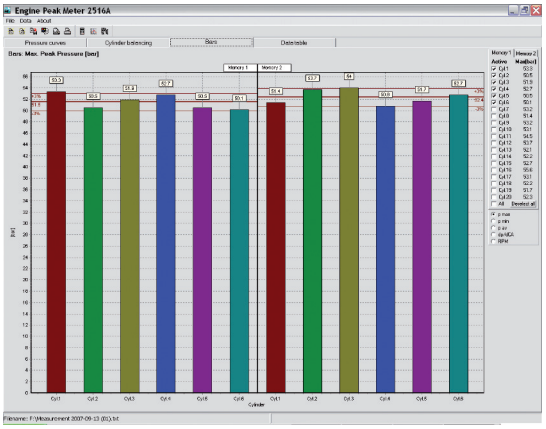

Fig. 4: Bar diagram

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Ordering Code and Accessories Included	Type/Art.No.
Engine Peak Meter Type 2516B1	
(without sensor and measuring set in case)	
• Software for data evaluation	7.642.025
Engine Peak Meter Type 2516B10	
(with sensor and measuring set in case)	
• Cylinder pressure sensor with Piezotron® amplifier	7613C
• Adapter for connection to indicator valve	7513A
• Tubular socket wrench	1377
• Battery charger	5.510.293
• Case	3.070.219

Fig. 5: Scope of delivery Type 2516A10

Description Type 7613C

Precision sensor for periodic measurement at the indicator valve. Very good thermodynamic behavior.

- High measuring accuracy
- High temperature stability
- Robust design

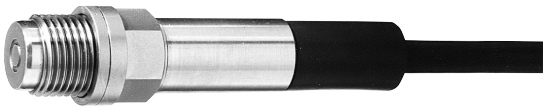

Fig. 6: Sensor Type 7613C

Technical Data

Range	bar	0 ... 250
Overload	bar	300
Sensitivity ±1 %	mV/bar	20
Natural frequency	kHz	≈90
Linearity, all ranges	%FSO	≤±0,5
Operating temperature range		
Front part of sensor	°C	–50 ... 350
Hex-nut to connector	°C	–50 ... 150
Electronics in the plug	°C	–50 ... 90
Time constant at 350 °C	s	>100
Connector		Type Fischer SE 103 pos.

Further technical data and information see data sheet Dok. No. 7613C_000-054.

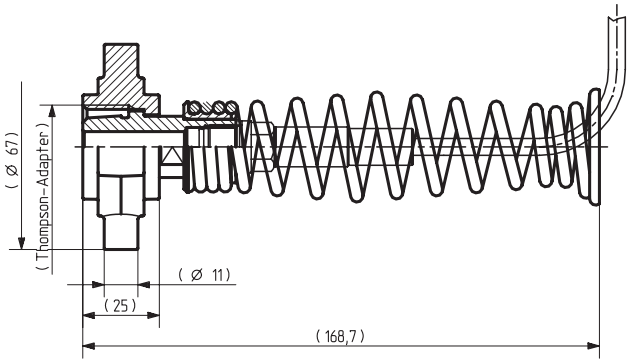

Fig. 7: Sensor mounting in Thompson-Adapter Type 7513A

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Piezotron® Quartz Pressure Sensor

Type 7613C

for Engine Diagnostics

Industrial sensor for measuring cylinder pressures in internal combustion engines. Sensor and cable together form an oil- and splash-proof unit.
Suitable for long-time measurements and arduous duties. Impedance converter with low impedance voltage output.

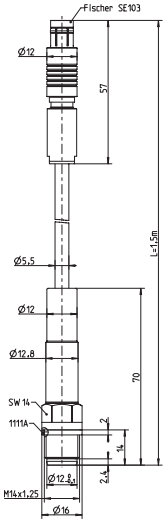
- Viton® cabel, rugged
- Linearity excellent

Description

The use of polystable quartz elements assures security from twinning even under high mechanical stressing. As a result, the sensitivity remains largely constant between –50 ... 350 °C.

Application

Measuring in combustion chambers under severe conditions of fouling, moisture etc. Special design makes the sensor largely insensitive to combustion residues, and therefore suitable for arduous duties as well as longtime measurements.



Technical Data

Range	bar	0 ... 250
Overload	bar	300
Sensitivity	mV/bar	–20
Natural frequency	kHz	≈70
Linearity, all ranges	%FSO	≤±0,5
Acceleration sensitivity		
axial	bar/g	<0,002
transverse	bar/g	<0,001
Operating temperature range		
Front part of sensor	°C	–50 ... 350
Hex-nut to connector	°C	–50 ... 150
Electronics in plug	°C	–50 ... 90
Sensitivity shift		
200 ... ±150 °C	%	≤±3
200±50 °C	%	≈1
Thermal shock		
at 1 500 1/min, IMEP = 9 bar		
Δp	bar	≤±0,3
ΔIMEP	%	≤±2
Supply current	mA	4
Output bias	VDC	9 ... 14
Time constant at 20 °C	s	1 800
Output impedance	Ω	<100
Shock resistance	g	2 000
Tightening torque	N·m	25
Weight	g	160
Plug	Type	Fischer SE 103 pos.

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Mounting

Can be fitted without adapter into an indicator hole (ø18 mm, thread M14x1,25). Due to its low impedance voltage output the sensor is insensitive to interferences and can be used with economical electronics.

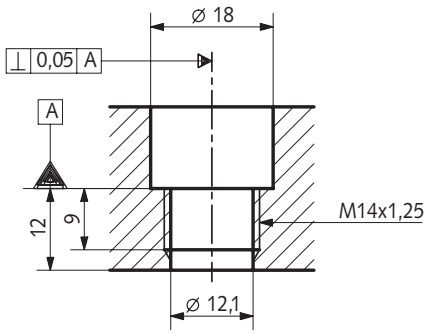

Fig. 1: Fitted into combustion chamber with hole ø18 mm, seal Type 1111A, diaphragm flush mounted with the combustion chamber

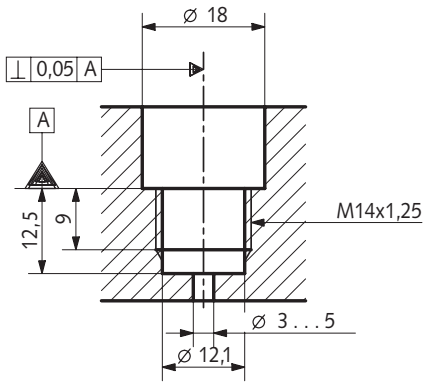

Fig. 2: As fig.1, with set-back diaphragm

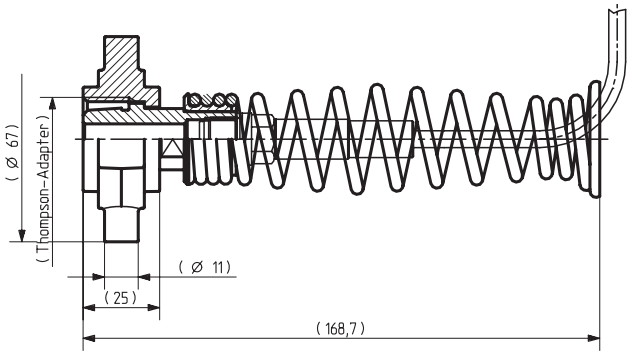

Fig. 3: Fitted in Thompson adapter Type 7513A on indicator valve

Accessories	Type
• Nickel seal	1111A
• Thompson adapter	7513A
• Connecting cable Fischer KE103 neg. – BNC pos.	1673A2/A5
• Engine Peak Meter	2516A...

Mounting Accessories	Type
• Torque wrench 8 ... 40 N·m	1300A11
• Fork wrench hex. 18 mm for torque wrench	1300A15
• Tubular socket wrench hex. 14 mm for ø18 mm fitting hole	1377
• Special key for Thompson adapter 7513A	1300A1

Ordering Key

Type 7613C ☐

Pressure sensor	–
Pressure sensor mounted in Thompson adapter Type 7513A	**A**

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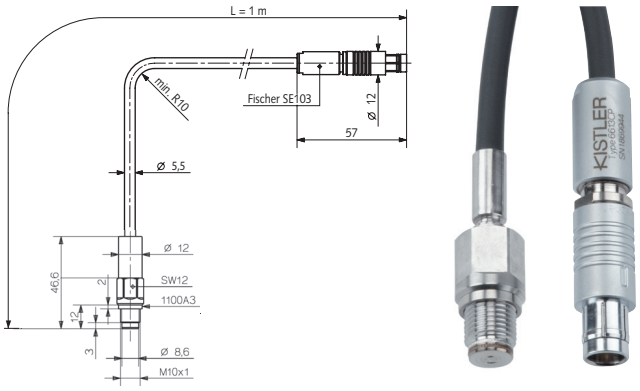
Piezotron® Quartz Pressure Sensor

Type 6613CP

for Engine Diagnostics

Sensor designed with optimum service life for continuous cylinder pressure monitoring in diesel and gas engines. Because of its low thermal shock and high stability over the long term, this sensor is suitable for demanding monitoring and control tasks.

- Small thermal shock
- Long life
- Insensitive to integral mounting



Description

The quartz measuring element and the Piezotron® incorporated in the plug are interconnected by an integral cable. As a result of its patented "antistrain" design, the measuring element is insensitive to integral mounting, and largely insensitive to dirt and contamination. The rugged diaphragm permits the sensor to be used for knock detection.

The life expectancy of the sensor has been designed so that a life of several thousand operating hours can be achieved in a diesel and gas engine running. With heavy-oil operation, the service life depends very much on the corrosion occurring, while extreme contamination can reduce measuring accuracy.

Application

Type 6613CP has been specially developed for the monitoring and control of diesel and gas engines. Cylinder pressure measurements can be made with high precision because of its very good thermodynamic characteristics.

Technical Data

Range	bar	0 ... 250
Overload	bar	300
Sensitivity	mV/bar	–20
Natural frequency	kHz	≈90
Linearity, all ranges	%FSO	≤±1
Acceleration sensitivity		
axial	bar/g	<0,002
transverse	bar/g	<0,001
Operating temperature range		
Front part of sensor	°C	–50 ... 350
Hex-nut to connector	°C	–50 ... 150
Electronics in plug	°C	–50 ... 90
Sensitivity shift		
200 ... ±150 °C	%	3,5
200±50 °C	%	≈1
Thermal shock		
at 1 500 1/min, IMEP = 9 bar		
Δp	bar	≤±0,5
ΔIMEP	%	≤±2
Supply current	mA	4
Output bias	VDC	9 ... 14
Time constant at 20 °C	s	800
Time constant at 350 °C	s	>10
Output impedance	Ω	<100
Shock resistance	g	2 000
Tightening torque	N·m	15
Weight	g	160
Plug	Type	Fischer SE 103 pos.

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Mounting

In order to minimize thermal stress on the sensor, it should be located so that good heat dissipation to colder components is possible. This can normally be achieved by a set-back location. Optimum sensor life is achieved at an average temperature of 200 ... 300 °C in the sensor body. An angled gas channel can also reduce the effect of flame on the diaphragm, and thereby minimize the short term drift of the sensor. In order to prevent singing oscillations, the lengths of the gas channel should not exceed 30 mm. Strong gas oscillations occur when the gas column between sensor and combustion chamber resonates. Superimposed on the cylinder pressure, these pressure oscillations impose an additional load on the sensor, resulting in reduced life of the sensor.

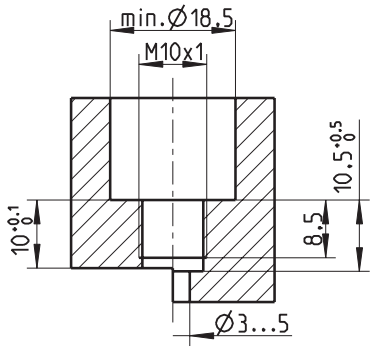

Fig. 1: Sensor bore

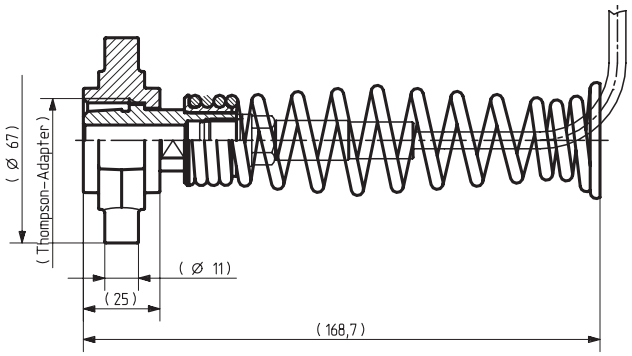

Fig. 2: Fitted in Thompson adapter Type 6513A on indicator valve

Accessories	Type
• Nickel seal	1100A3
• Thompson adapter	6513A
• Connecting cable Fischer KE103 neg. – BNC pos.	1673A2/A5
• Engine Peak Meter	2516A1

Mounting Accessories	Type
• Torque wrench 8 ... 40 N·m	1300A11
• Fork wrench hex. 18 mm for torque wrench	1300A13
• Tubular socket wrench hex. 14 mm for ø18 mm fitting hole	1300B6
• Special key for Thompson adapter 7513A	1300A1

Ordering Code

• Piezotron® Quartz Pressure Sensor for engine diagnostics	**Type 6613CP**

6613CP_000-895e-03.14

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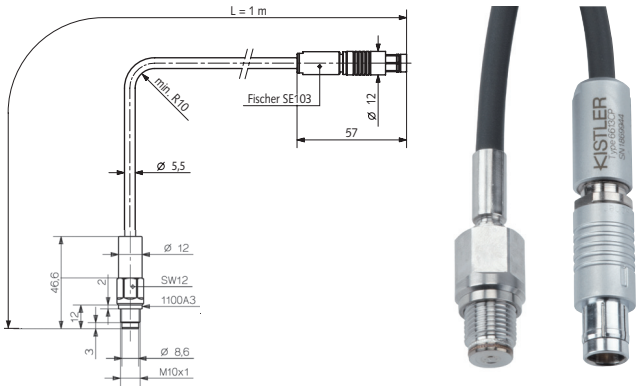
PiezoSmart® Pressure Sensor

Type 6013CSF/CSFA

for Engine Diagnostics

Sensor for cylinder pressure in diesel and gas engines. The automatic sensor identification PiezoSmart® dispenses manual adjustment of the Type 2516B3.

- Reliable data quality by using PiezoSmart
- No manual adjustment
- High accuracy



Description

The PiezoSmart automatic sensor identification is an active system. The main element is an Transducer Electronic Datasheet (TEDS) which contains all relevant sensor data. The chip is integrated in the fischer connector of the sensor Type 6013CSF. The engine peak meter Type 2516B3 is automatically set by exchanging data with th TEDS of Type 6013CSF. PiezoSmart minimizes the set up and rules out operating errors.

Application

The PiezoSmart sensor Type 6013CSF is particular suitable for cylinder pressure measurement in combination with the engine peak meter Type 2516B3 (see datasheet 003-022).
For periodic cylinder-pressure measurement at the indicator vales for medium speed and low speed engines.

Technical Data

Range	bar	0 ... 250
Overload	bar	300
Sensitivity	bar	–20
Natural frequency	kHz	≈90
Linearity, all ranges	%FSO	≤±1
Acceleration sensitivity		
axial	bar/g	<0,002
Operating temperature range		
Front part of sensor	°C	–50 ... 350
Hex-nut to connector	°C	–50 ... 150
Electronics in plug	°C	–50 ... 90
Sensitivity shift		
200 ... ±150 °C	%	3,5
200 ±50 °C	%	≈1
Thermal shock		
at 1 500 1/min, IMEP = 9 bar		
Δp	bar	≤±0,5
Output impedance	Ω	<100
Shock resistance	g	2 000
Tightening torque	N·m	15
Weight	g	160
Plug	Type	Fischer 103

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Mounting

For most application the sensor is mounted into a so called Thompson.
Adapter Type 6513A for installation on indicator valve.

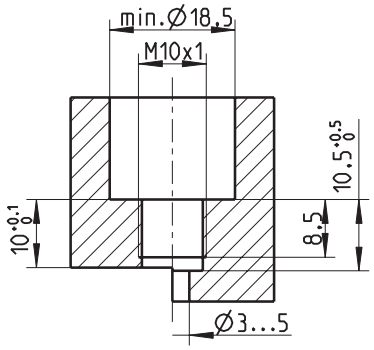

Fig. 1: Sensor bore

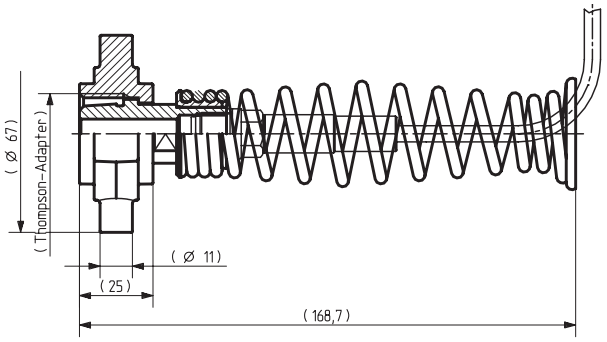

Fig. 2: Fitted in Thompson adapter Type 6513A

Accessories	Type
• Nickel seal	1100A3
• Thompson adapter	6513A
• Engine Peak Meter	2516B3

Mounting Accessories	Type
• Torque wrench 8 ... 40 N·m	1300A11
• Fork wrench hex. 18 mm for torque wrench	1300A13
• Tubular socket wrench hex. 14 mm for ø18 mm fitting hole	1300B6
• Special key for Thompson adapter Type 6513A	1300A1

Ordering Code	
• PiezoSmart Pressure Sensor	6013CSF
• PiezoSmart Pressure Sensor mounted in Tompson-Adapter	6013CSFA

6013C_003-024e-03.14

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Valves

Type 1715 long
Maximal Working Pressure 250 Bar
- Divided spindle
- ¾" connection for SKL engine
- Option with thread cup
- Height: 148 mm

Type 1715
Maximal Working Pressure 250 Bar
- With divided spindle
- All connection thread customer wish
- Option with thread cup
- Height: 128 mm
- Angle: 45°

Type 1715/1
Maximal Working Pressure 250 Bar
- Swinging, divided spindle
- All connection thread customer wish
- Option with thread cup
- Height: 128 mm
- Angle: 45°

Type 1720
Maximal Working Pressure 250 Bar
- Divided spindle
- Corner valve
- All connection thread customer wish
- Option with thread cup
- Height: 116 mm

Type 1720/S
Maximal Working Pressure 250 Bar
- Shifted corner valve
- Divided spindle
- Hexagon handle 17 mm
- Mounting thread M24x1,5
- Option with thread cup

Type 1725
Maximal Working Pressure 250 Bar
- All connection thread customer wish
- Option with thread cup
- Height: 110 mm

Type 1750
Maximal Working Pressure 300 Bar
- Discharge pressure 300 bar
- Other versions on request

All valves Made in Germany!

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