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# TEST PUMPS AND DIGITAL GAUGES

Sika







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# **Test pumps**

Pressure is one of the most commonly measured quantities in engineering, which is why exact and reliable pressure measurement is especially important.

However, the characteristics of the even best sensor or transducer can be altered by a wide variety of factors. This drift cannot be prevented, and it leads to incorrect readings.

Calibration allows these deviations to be measured and documented in a certificate. All pressure measuring devices that significantly affect processes or activities should be calibrated before being used.

## **Requirements for pressure sources**

The essential requirements for manual pressure generation are:

- Easy connection to test samples
- Simple and easy pressure generation
- Maintenance free operation

These aspects have been taken into account and implemented in the design of our test pumps.

#### Good reasons for proper and reliable calibration

- Maintaining consistently high product quality
- Fulfilling industrial requirements
- Fulfilling quality assurance requirements
- Process optimisation
- Increasing productivity
- Avoiding unexpected production downtimes
- Employee and customer safety
- Environmental requirements / ecological aspects
- Profit optimisation / economic aspects

SIKA's mobile test and calibration devices are effective aids for performing the necessary test and calibration tasks quickly.





#### **OEM** version and full version

Depending on the model a matching pressure hose is part of the basic configuration of the OEM version of the test pump. The hydraulic hoses are fitted with a self-sealing quick coupling. Inch, conical or metric adapters for all commonly used connection threads are available in the full version. A matching seal kit is also included with the pump. All of the equipment is held in a carrying case with a foam-rubber insert.

## Full version / P 1000.2



#### Standard adapter kit

G1⁄8	G1/4	G3⁄8	G1⁄2	1/8 NPT	1/4 NPT	1⁄2 NPT	M12 x 1.5	M20 x 1.5	G1⁄8 A	G1⁄4 A
									40	<u>و</u> ب

#### Mobile and independent

Test pumps are ideal for mobile use. Their low weight and compact design make them easy to transport directly to the measurement site. The instruments can be used immediately and do not require an additional power supply. There is no need to take along nitrogen bottles or connect the equipment to a compressed air network. Manual pressure generation is simple and easy, regardless of ambient temperature and orientation.

## Possible areas of application

Test pumps can be used everywhere, including on site in workshops, test and measurement rooms as well as laboratories. They cover a broad spectrum of industries with diverse applications.

- Assembly and commissioning
- Manufacturing and production
- Maintenance and service
- Quality assurance and test equipment monitoring
- Repair

They are suitable for testing, adjusting and calibrating pressure sensors, pressure gauges, pressure switches, safety valves and all types of pressure devices. They are optimised in their function and use and assist in the performance of specific tests and inspections.



# Hand test pumps

#### Hydraulic or pneumatic

Air, water and oil are used as pressure media. Especially in application areas in which wetting of the test sample is not allowed or the use of aggressive or ionising substances must be avoided, air is the ideal test medium.

SIKA's pneumatic test pump fulfils requirements that in many cases can only be covered by several pumps from other suppliers.

• Manual pressure generation in the medium pressure range up to 60 bar using a handle is unique – no other pump can do this.

2 Integrated negative pressure capability enables operating with vacuum down to -950 mbar. A changeover valve enables switching from positive pressure to negative pressure with no need for special tools.

3 A large-volume pressure regulator with ultrafine thread pitch is used for precise pressure adjustment in the low mbar range, enabling accurate settings in the low pressure region.

The easily operated hydraulic test pumps are specifically designed for the medium to high pressure range. They have a built-in reservoir for the hydraulic fluid. Pressures up to 700 bar or 1000 bar can be generated, depending on the model.





## Practical

The test pumps are designed to enable the direct connection of all pressure systems to be tested using adapters. The test sample is easily connected using the rugged industrial hose with integrated quick coupling and supplied adapters. The reference is fitted directly at the top of the pump using a positioning adapter.

The required test pressure is initially generated using the handles and then adjusted precisely with the fine adjustment valve. As a result, the pressure on both instruments is the same.

The pressure relief valve allows continuous pressure reduction and ensures accurate and easy testing, even with decreasing pressure.

In the simplest case, the pressure is indicated by an analogue test gauge. An easy to read digital pressure gauge or handheld instrument can also be used. The accuracy or adjustment of the pressure measuring device being tested can be checked by comparing the indicated reference value with the measured value for the device under test.



# **Comparison test pumps**

The latest generation of comparison test pumps combines precision - even at high pressures- with a high build quality. All wetted parts are made of stainless steel, whereby a wear-free operation is ensured.

The sophisticated design of these comparison test pumps facilitates the installation of test samples, even with large nominal diameters, without sacrificing the handiness. The built-in adapters on the pressure connections also allow the free alignment of the reference pressure gauge and test sample. In this way, almost any test situation can be taken into account. Depending on model distilled water and hydraulic oil can be used as test medium. Distilled water is an excellent calibration medium, since it can be removed without problem and without residue. Thereby, sensors can be tested which may not be contaminated by oil,

for example. For test pressures above 1000 bar, hydraulic oil is recommended, since it allows an easier test pressure generation because of its higher viscosity.

The filling of the pressure body and test pressure generation are easily done via a rotatable spindle. Large volumes can be easily loaded via the pressure medium reservoir which is built on the test pump. Pressure fluctuations caused by air and gas components in the filling liquid, compensation of thermodynamic effects and precise adjustment of the required test pressure are done via the fine adjustment (optional).

Overview pressure generation							
Function	Туре	Pressure range		Air	Oil	Water	
Hand test pump	P 4	-0.34 bar	-4.3558 psi	$\checkmark$			
	P 40.2	-0.9540 bar	-13.78580 psi	$\checkmark$			
	P 60	-0.9560 bar	-13.78870 psi	$\checkmark$			
	P 700.3	0700 bar	010 152 psi		$\checkmark$	$\checkmark$	
	P 1000.2	01000 bar	014 503 psi		$\checkmark$	$\checkmark$	
Comparison test pump	P 700.G2	0700 bar	010 152 psi		$\checkmark$		
	P 700.GW	0700 bar	010 152 psi			$\checkmark$	
	P 1000.GW	01000 bar	014 503 psi			$\checkmark$	
	P 1400.G	01400 bar	020 305 psi		$\checkmark$		





# **Pressure calibrators**

Pressure calibration is the comparison between the indicated values of a pressure measuring device with the indicated values of a pressure standard with a known accuracy.

In many cases, the device to be tested cannot be removed from the active process. Calibration is performed on site to avoid lengthy downtimes. Portable pressure calibrators are especially suitable for this purpose.

In order to perform a specified functional test or accuracy check, the test sample is often connected to the calibration device with a pressure hose. Digital pressure gauges with sufficient precision can be used as compact reference instruments.

Hand test pumps or comparison test pumps are used for simple pressure generation.

SIKA offers a complete range of pressure calibrators for a wide variety of applications to allow specified test and calibration tasks to be performed.

Routine on-site calibrations can be performed very quickly and economically with the right combination of test pump and reference. This ensures that the indicated pressure values are correct and reliable and that all specified requirements are fulfilled.



# Pneumatic hand test pumps



Туре	P 4				
Pressure ranges					
Negative pressure	-0.3 bar (depending on test sample / reference)	-4.35 psi (depending on test sample / reference)			
Positive pressure	4 bar	58 psi			
OEM version					
Pressure medium	Air				
Dimensions	Approx. 225 x Ø 55 mm	Approx. 8.86 x Ø 2.17 in.			
Weight	Арргох. 980 д	Approx. 2.16 lbs.			
Connections					
Reference	G¼ with Quick-Snap Y-plug-connection	G¼ with Quick-Snap Y-plug-connection			
	with PA hose (2 x 1 m)	with PA hose (2 x 39,37 in.)			
Test sample	G¼ with quick coupling and pressure hose (1 m)	G¼ with quick coupling and pressure hose (39,37 in)			
Full version					
Adapter kit	Chrome-plated brass				
Gasket kit	PA Seals and O-rings				
Dimensions	Approx. 450 x 370 x 110 mm	Approx. 17.72 x 14.57 x 4.33 in.			
Weight	Approx. 4.2 kg	Approx. 9.26 lbs.			





Туре	P 40.2		P 60			
Pressure ranges						
Negative pressure	-0.95 bar	-14 psi	-0.95 bar	-14 psi		
Positive pressure	40 bar	580 psi	60 bar	870 psi		
OEM version						
Pressure medium	edium Air					
Dimensions	Approx. 240 x 170 x 50 mm / Approx. 9.45 x 6.69 x 1.97 in					
Weight	ght Approx. 1.1 kg / Approx. 2.43 lbs.					
Connections						
Reference	G1/4					
Test sample	G¼ with quick coupling and	d pressure hose (1 m) /				
	G¼ with quick coupling and	d pressure hose (39.37 in.)				
Full version						
Adapter kit	Chrome-plated brass					
Gasket kit	PA Seals and O-rings					
Dimensions	Approx. 450 x 370 x 110 mm / Approx. 17.72 x 14.57 x 4.33 in.					
Weight	Approx. 4.2 kg / Approx. 9.26 lbs.					

# Hydraulic hand test pumps



Туре	P 700.3				
Pressure ranges					
With destilled water	0700 bar	010 152 psi			
With hydraulic fluid	0700 bar	010 152 psi			
OEM version					
Pressure medium Distilled water or hydraulic fluid					
Dimensions	Approx. 255 x 225 x 85 mm	Approx. 10.04 x 8.86 x 3.35 in.			
Weight	Approx. 1.7 kg Approx. 3.75 lbs.				
Connections					
Reference	G1⁄4				
Test sample	G¼ with quick coupling and pressure hose (1 m)	G¼ with quick coupling and pressure hose (39.37 in.)			
Full version					
Adapter kit	Stainless steel				
Gasket kit	PA Seals and O-rings				
Dimensions	Approx. 450 x 370 x 125 mm	Approx. 17.72 x 14.57 x 4.92 in.			
Weight	Approx. 4.8 kg	Approx. 10.58 lbs.			



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Туре	P 1000.2					
Pressure ranges						
With destilled water	01000 bar	014 503 psi				
With hydraulic fluid	01000 bar	014 503 psi				
OEM version	OEM version					
Pressure medium Distilled water or hydraulic fluid						
Dimensions	Approx. 255 x 225 x 85 mm Approx. 10.04 x 8.86 x 3.35 in.					
Weight	Approx. 1.9 kg Approx. 4.19 lbs.					
Connections						
Reference	G1/4					
Test sample	G¼ with quick coupling and high pressure hose (1 m), 1000 bar	G¼ with quick coupling and high pressure hose (39.37 in.), 14 503 psi				
Full version						
Adapter kit	Stainless steel					
Gasket kit	PA Seals and O-rings					
Dimensions	Approx. 450 x 370 x 125 mm	Approx. 17.72 x 14.57 x 4.92 in.				
Weight	Approx. 5 kg	Approx. 11 lbs.				

# Hydraulic comparison test pump



Туре	P 700.G2		P 700. GW		P 1000.GW		P1400.G	
Pressure ranges								
With distilled water			0700 bar	010 000 psi	01000 bar	015 000 psi		
With hydraulic fluid	0700 bar	010 000 psi					01400 bar	020 000 psi
OEM version								
Pressure medium	Pressure medium Hydraulic fluid			ed water	Demineralis	ed water	Hydraulic fluid	
Dimensions	Approx. 340 x 225 x 130 mm / Approx. 13.39 x 8.86 x 5.12 in.							
Weight	Approx. 9.9 k	g / Approx. 21	.8 lbs.					
Connections								
Reference	G¾ A left, G1	/4, G <sup>1</sup> /2						
Test sample	G¾ A left, G1	/4, G3/8, G1/8						
Full version								
Adapter kit	Stainless ste	el						
Gasket kit	PA Seals and O-rings							
Dimensions	Approx. 450 :	Approx. 450 x 370 x 150 mm / Approx. 17.71 x 14.57 x 5.91 in.						
Weight	Approx. 12.6	kg / Approx. 2	7.7 lbs.					



# **Digital pressure gauges**

Digital pressure gauges are particularly suitable for both stationary and mobile measurement and display of pressure. They can be used as reference pressure gauges to simplify the checking, adjustment and calibration of other pressure measurement devices directly on site.

High accuracy in signal acquisition is achieved by using highperformance measuring cells with electronic linearisation of the characteristic curve. Suitable instruments are available for a wide variety of measurement tasks.

Ease of use is assured by innovative design and advanced technology. All essential functions for everyday use can be selected conveniently at the press of a button. Excellent protection against dust and moisture is provided by a membrane keypad or rubber buttons.Integrated supplementary functions make our digital pressure gauges true all-rounders.



### Advantages at a glance

- Exact and reliable measurement
- High operational readiness
- Easy and clear readout
- Well suited to difficult on-site tasks
- Easy to assemble and use
- Supplementary functions for extra value
- EX-version availiabe on request

#### Negative / Positive / and Differential Pressure

Measuring ranges from -1 bar negative pressure to 2500 bar positive pressure with high overpressure protection are available. Very small differential pressures in the millibar range can also be measured. Differential pressure measuring cells or two independent measuring inputs are used for this purpose.

## **Resolution / Accuracy**

It is often necessary to use several mechanical pressure gauges when measurements must be made over a wide pressure range with sufficient accuracy. Digital pressure gauges with high resolution and precision can handle this task with just one instrument.

An indicating accuracy of 0.5% to 0.01% covers the entire spectrum of requirements. This precision is often found only in sensitive laboratory instruments, whereas SIKA digital pressure gauges are designed for use in harsh industrial environments.

#### Tare / Zero

User-defined zero point setting at the push of a button makes offset adjustment easy and eliminates the need for tedious mechanical adjustment. Single-point adjustment allows the linear characteristic curve to be shifted in positive or negative direction over the entire measuring range.

#### Linearisation

Multi-point adjustment can be performed if it is necessary to adjust the indicated values at different test points. Two-point adjustment is available for setting the zero point and slope of the measuring cell curve. Some digital pressure gauges allow up to six offset values to be programmed in order to shift the characteristic curve to meet the most stringent customer expectations.

#### **Battery operation / Auto-Off**

Power is supplied by long-life batteries (ordinary or rechargeable). An external AC adapter can also be used. To increase battery operating time, a programmable Auto-Off function switches off the power to the instrument after prolonged inactivity. The electronics are designed for extremely low power consumption, which enables a battery life of significantly more than 1000 hours.



#### Display

The large illuminated digital local display shows the measured pressure and indicates the current status of the digital pressure gauge, even under poor lighting conditions. This eliminates the difficult task of reading a dial gauge and avoiding parallax errors. Needle jitter due to vibration or pressure fluctuations is eliminated. Display damping or averaging can be configured directly using display filters. This ensures easy, tireless readout.

#### Selectable pressure units

Another feature is the large selection of pressure units. Up to 13 different units are possible – far more than any complicated dual-scale or multi-scale gauge can offer.

The required display unit is selected directly on the digital pressure gauge and is clearly indicated on the display. No conversion necessary; the desired value can be read directly.



#### Area of application

The right measuring system is available for every measuring task. For simple applications with air or non-corrosive and nonionising substances, low-cost unenclosed pressure sensors are used. In difficult applications with water or other aggressive media, high-quality stainless steel versions are used.

Once the intended use has been determined and the pressure range has been specified, a digital pressure gauge with an internal measuring cell is preferably used. For frequently changing application conditions, plug-in pressure sensors for various pressure ranges and applications can be fitted using adapters. Automatic sensor recognition using standard DIN connectors offers a simple Plug-&-Play solution.

#### Electronics / Pressure measuring cell

The measuring cells and electronics used in the gauges are temperature compensated, so that the effect of temperature on the readings is negligible. Liquid entry into the measuring system is not necessary, which eliminates the risk of damage from media residues. Another unbeatable feature of the electronic measuring cells is their immunity to pressure surges.

#### Min / Max Displays and Peak function

Experience shows that excess pressure and pressure peaks significantly higher than normal operating pressure occur at some measuring points. Min / max displays and fast peak value measurement cycles in digital pressure gauges assist in system analysis and allow peak values to be determined. This allows incorrect readings and violations of range limits to be detected and helps avoid damage to pressure systems. Preventive service is often less expensive than repairing or replacing defective instruments.

#### **Protection class**

High IP protection classes are available to minimise dust and water sensitivity. Rugged, impact-resistant digital pressure gauges are fitted with rubber caps for protection during transport and field use.



#### Direct mounting, built-in version and hand-held instrument

The compact, handy design proves its worth in everyday use. It puts an end to large-diameter gauges with sizes up to 250 mm, as is common with precision pressure gauges. The small size simplifies direct mounting. If necessary, built-in versions are available for switchgear cabinet or control panel mounting. Hand-held digital pressure gauges are especially suitable for applications where short-term pressure measurements are desired instead of continuous measurement.

#### **Data memory**

The logger function for local data storage can be used to record pressure curves automatically and perform leak tests. The integrated data memory in digital pressure gauges allows a variety of data sets to be recorded directly. The time interval between samples is programmable and the maximum recording interval is configurable. The stored values can be displayed on a PC. Data import at the press of a button is also possible. In this case the data is shown directly on the display. In this process the values are automatically annotated with the date and time of day using an integrated real-time clock.

#### $\rightarrow$ Reference type J, MH 3181, MH 3151 and MH 3156



#### Analogue output

An electrical output signal enables remote display on a control console or in a control room as well as the connection of external recorders and indicating instruments.

#### $\rightarrow$ Reference type Q

#### Relay output / Alarm signalling

Digital pressure gauges allow limit contacts to be closed even at low pressures. There is no need for high actuation forces for magnetic spring or inductive contacts, which makes it easier to signal critical equipment conditions and perform supplementary control tasks. A built-in buzzer generates an alarm when the pressure exceeds the range of the programmed minimum and maximum pressure levels.

#### $\rightarrow$ Reference type Q, MH 3181, MH 3151 and MH 3156

#### **Temperature display**

Temperature measurement is often required in addition to pressure measurement. For this purpose, a temperature sensor is integrated in the measuring cell to detect the temperature of the medium. The process temperature can be displayed at the press of a button. This allows two quantities to be measured at a single measuring point, which saves costs.

→ Reference type J, P

#### **Explosion protection**

Explosion-proof versions are also available for use in potentially explosive locations, e.g. oil refineries, chemical plants and drilling platforms.

#### → Reference types E-Ex, D-Ex, L

#### **Example applications**

- Continuous or temporary checking of a wide variety of system pressures
- Air density measurement in building shells for the detection and elimination of problem areas and avoiding structural damage
- Monitoring the degree of soiling of filter units in ventilation or air conditioning systems
- Recording pressure drops for the determination of leakage rates in leak tests
- Measurement of barometric air pressure for the determination of weather conditions
- Reference pressure gauge for calibration tasks



# Hand-held pressure instruments

	BASIC	SOLID	BASIC	SOLID	PREMIUM
	MH 3161	MH 3181	MH 3111	MH 3151	MH 3156
Accuracy (full scale)	0.2 %	0.2 %	0.2 %	0.2 %	0.2 %
Pressure range					
			-22.5 mbar		
	-1 25 mbar		-20 25 mbar		
			0 100 mbar		
			0. 250 mbar		
	10 250		0200 mbai		
	-1030 mbar		-200300 mbar		
			0400 mbar		
			01 bar		
	01300 bar		01.3 bar		
			-11.5 bar		
	-1002000 mbar		-12 bar		
			02.5 bar		
			-13 bar		
			0 4 bar		
			0		
			0 (han		
			1 10 h		
			-110 bar		
			U16 bar		
			025 bar		
			040 bar		
			060 bar		
			0100 bar		
			0160 bar		
			0 250 har		
			0200 bai		
			0 (00 bar		
			0400 bai		
			0 (00)		
			0600 bar		
			0 1000 h = =		
			01000 bar		
		I		1	I
Multi-point adjustment	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Changeable measuring cell			$\checkmark$	$\checkmark$	$\checkmark$
PC connection	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Data memory		$\checkmark$		$\checkmark$	$\checkmark$
Analogue output		$\checkmark$		$\checkmark$	$\checkmark$
Second measuring input					$\checkmark$
Ex version	0	0	0	0	0
Version free of oil and grease					

# Digital pressure gauges

	BASIC					
	E-Ex	E2	D-Ex	D2		
Accuracy (full scale)	0.5 %	0.5 %	0.1 %	0.1 %		
Pressure range						
		-13 bar	-13 bar	-13 bar		
	-130 bar		-130 bar			
		-140 bar		-140 bar		
		-160 bar	-160 bar	-160 bar		
	0300 bar	0 (00)	0300 bar			
		0400 bar		U400 bar		
		0 700 bar	0 700 bar	0 700 bar		
		0 1000 bar		0 1000 bar		
Multi-point adjustment		✓ (via adapter)		✓ (via adapter)		
PC connection						
Data memory						
Relais output						
Analogue output						
Temperature indication						
Built-in version						
Ex version	$\checkmark$		$\checkmark$			
Oil and grease free	0		0			

 $\circ$  = optionally available



SOLID			PREMIUM
J	P	Q	L
0.2 %	0.5 %	0.2 %	0.05 %
	0.2 %		0.025 %
	0.05 %		0.01 %
	0.025 %		
·	·	·	
0100 mbar			
0250 mbar			
0500 mbar	0500 mbar		
-11 bar	-11 bar	-11 bar	
			-12 bar
-12.5 bar	-12.5 bar	-12.5 bar	
1 Ehre	1 5 6	1 Ebaa	
-15 Dar	-15 bar	- I5 bar	
-110 bar	-110 bar	-110 bar	-110 bar
-120 bar	-120 bar	-120 bar	-120 bar
-140 bar	-140 bar	-140 bar	
-160 bar	-160 bar	-160 bar	
0100 bar	0100 bar	0100 bar	0100 bar
			0. 200 har
0. 250 har	0. 250 har	0. 250 har	0200 bar
0250 bar	0250 bar	0250 bar	
0300 bar	0350 bar	050 bar	0 (00 bar
0 500 bar	0 500 bar	0 500 bar	0400 Ddi
0JUU Dal	0	000 bai	
0700 bar	0700 bar	0700 bar	0700 bar
01000 bar	01000 bar	01000 bar	01000 bar
01500 bar	01500 bar	01500 bar	
02000 bar	02000 bar	02000 bar	
	02500 bar		
$\checkmark$	$\checkmark$	$\checkmark$	
$\checkmark$	0	0	$\checkmark$
$\checkmark$			
		$\checkmark$	
		0	
$\checkmark$	✓		
0	0	0	
			0
			0

# **Digital pressure gauges**





## Type E-Ex

0.5 %
Resolution
10 mbar 100 mbar

## Type D-Ex

	0.1 %		
	Resolution		
-14.543.5 psi	1 mbar	0.1 psi	
-14.5435.1 psi	10 mbar	0.1 psi	
-14.5870.2 psi	10 mbar	0.1 psi	
04351 psi	100 mbar	1 psi	
09999 psi	200 mbar	1 psi	
	-14.543.5 psi -14.5435.1 psi -14.5870.2 psi 04351 psi 09999 psi	0.1 %       Resolution       -14.543.5 psi     1 mbar       -14.5435.1 psi     10 mbar       -14.5870.2 psi     10 mbar       04351 psi     200 mbar	



Functions							
Туре	E-Ex	D-Ex					
Adjustment options							
Tare / Zero	$\checkmark$						
Selectable units							
Pressure	bar	bar, mbar, hPa, kPa, MPa, PSI, kp/cm²					
Features							
Measuring inputs	1 x direct						
Explosion protection	Ex II 1G EEx ia II C T5/T6						
Version free of oil and grease (optional)	✓ (< 200 bar)						
Display / Representation							
Multi-functional LCD	4 digit						
Min / max value	$\checkmark$						
Measuring rate							
Standard	500 ms						
Process connection							
Connection options	G1⁄4 / H16 UNF						
Material	1.0718 zinc-plated / 1.4435						
Medium temperature	050 °C	32122 °F					
For aggressive media	✓						
Housing	1						
Degree of protection	IP65 (front) / IP65						
Dimension	Ø 70 mm T=30 mm H=100 mm						
Material	ABS plastic						
Operating temperature	050 °C	32122 °F					
Weight	130 g 0.29 lbs.						
Power	1						
Auto-off function	$\checkmark$						
Battery type	1 x 3V CR						
Battery operation	1000 h						
Certificates (optional)							
DAkkS certificate							
SIKA works certificate							



## Type E2 / D2

Accuracy (full scale)		E2 0.5 %		D2 0.1 %	
Pressure range		Resolution			
-13 bar	-1443.5 psi	1 mbar	0.1 psi	1 mbar	0.1 psi
-140 bar	-14580 psi	10 mbar	1 psi	10 mbar	1 psi
-160 bar	-14870 psi	10 mbar	1 psi	10 mbar	1 psi
0400 bar	05800 psi	100 mbar	1 psi	100 mbar	1 psi
0700 bar	010 000 psi	100 mbar	1 psi	100 mbar	1 psi
01000 bar	014 500 psi	100 mbar	1 psi	100 mbar	1 psi



TypeE2 / D2Adjustment optionsLinearisationvia adapterTare / Zerovia adapterTare / ZerovSelectable unitsPressurebar, mbar, kPa, MPa, PSI, kg/cm², mH₂0, inH₂0FacturesFacturesMeasuring inputs1 x directDisplay / RepresentationAddigitBargraph4 ½ digitBargraph4Viel / Maxoulu-Display filterMeasuring rateStandard Peak / Fast10 ms 10 ms 10 msPrecess connectionConnection optionsG¼ Ad 1.4404Metarial1.4404 1.4404-Mean many materConnection optionsG¼ Ad 1.4404Metarial1.4404 -4176 °F
Adjustment optionsLinearisationvia adapterTare / Zero~Selectable units-Pressurebar, mbar, kPa, MPa, PSI, kg/cm², mH₂0, inH₂OFeatures-Measuring inputs1 x directDisplay / Representation-Multi-functional LCD4 ½ digitBargraph-V-Jisplay filter-Multi-functional LCD-Multi-functional LCD-Adapting filter-Standard10 msIn max value-Process connection-Forceston options6¼Material1.4404Material1.4404Meterial-Aduption <tr< th=""></tr<>
Linearisation   via adapter     Tare / Zero   ✓     Selectable units   Fersure     Pressure   bar, mbar, kPa, MPa, PSI, kg/cm², mH₂0, inH₂0     Features   It a direct     Features   It a direct     Display / Representation   It a direct     Multi-functional LCD   4 ½ digit     Bargraph   ✓     V   Illumination     Visplay filter   ✓     Min / max value   ✓     Precess connection   I     Process connection   Gi%     Material   1,4040     Medium temperature   -2080 °C
Tare / Zero   ✓     Selectable units   bar, mbar, kPa, MPa, PSI, kg/cm², mH₂0, inH₂0     Pressure   bar, mbar, kPa, MPa, PSI, kg/cm², mH₂0, inH₂0     Features   1 x direct     Measuring inputs   1 x direct     Display / Representation   4 ½ digit     Multi-functional LCD   4 ½ digit     Bargraph   ✓     Illumination   ✓     Display filter   ✓     Min / max value   ✓     Peak / Fast   10 ms     Pacesconnection   10 ms     Process connection   5¼     Material   1.4404     Medium temperature   2080 °C     -4176 °F   5
Selectable units     Pressure   bar, mbar, kPa, MPa, PSI, kg/cm², mH₂0, inH₂0     Features     Masuring inputs   1 x direct     Display / Representation   1 x direct     Multi-functional LCD   4 ½ digit     Bargraph   ✓     Illumination   ✓     Display filter   ✓     Min / max value   ✓     Peak / Fast   10 ms     Process connection   Gi/A     Process connection   Gi/A     Material   1.4404     Meterial   1.4404     Meterial   1.4004     Meterial   0.400
Pressure   bar, mbar, kPa, MPa, PSI, kg/cm², mH₂0, inH₂0     Features     Measuring inputs   1 x direct     Display / Representation   4 ½ digit     Bargraph   4 ½ digit     Illumination   -     Display filter   -     Min / max value   -     Standard   10 ms     Peak / Fast   10 ms     Process connection   -     Connection options   6¼     Material   1.4404     Medium temperature   -2080 °C
FeaturesMeasuring inputs1 x directDisplay / Representation4 ½ digitBargraph4 ½ digitIllumination-Oisplay filter-Min / max value-Measuring rate-Standard10 msPeak / Fast10 msProcess connectionConnection optionsG¼Material1.4404Medium temperature-2080 °CConnection optionsG¼Addum temperature-2080 °CConnection options-4176 °F
Measuring inputs   1 x direct     Display / Representation   Multi-functional LCD     Multi-functional LCD   4 ½ digit     Bargraph   ✓     Bargraph   ✓     Illumination   ✓     Display filter   ✓     Min / max value   ✓     Measuring rate   ✓     Standard   10 ms     Peak / Fast   10 ms     Process connection   Gí¼     Material   1.4404     Medium temperature   -2080 °C     -2080 °C   -4176 °F
Display / Representation   4 ½ digit     Multi-functional LCD   4 ½ digit     Bargraph   ✓     Illumination   ✓     Display filter   ✓     Min / max value   ✓     Measuring rate   ✓     Standard   10 ms     Peak / Fast   10 ms     Process connection   G¼     Material   1.4404     Medium temperature   -4176 °F
Multi-functional LCD4 ½ digitBargraphBargraphIlluminationVDisplay filterMin / max valueVMeasuring rateStandard10 msPeak / Fast10 msProcess connectionConnection optionsG¼Material1.4404Medium temperature-2080 °CConnection options
Bargraph✓Illumination✓Display filter✓Min / max value✓Measuring rate✓Standard10 msPeak / Fast10 msProcess connection✓Connection optionsG¼Material1.4404Medium temperature-2080 °CConnection media✓
Illumination✓Display filter✓Min / max value✓Measuring rateStandard10 msPeak / Fast10 msProcess connectionਓ/4Connection optionsG¼Material1.4404Medium temperature-2080 °CConnection media-4176 °F
Display filter✓Min / max value✓Measuring rateStandard10 msPeak / Fast10 msProcess connection✓Connection optionsG¼Material1.4404Medium temperature-2080 °CConnection options✓
Min / max value   ✓     Measuring rate      Standard   10 ms     Peak / Fast   10 ms     Process connection      Connection options   G¼      Material   1.4404      Medium temperature   -2080 °C   -4176 °F
Measuring rate     Standard   10 ms     Peak / Fast   10 ms     Process connection   0 ms     Connection options   6¼     Material   1.4404     Medium temperature   -2080 °C     -2080 °C   -4176 °F
Standard 10 ms   Peak / Fast 10 ms   Process connection Connection options G¼   Material 1.4404 -2080 °C   Forcess connection -4176 °F
Peak / Fast 10 ms   Process connection 6¼   Connection options 6¼   Material 1.4404   Medium temperature -2080 °C   -4176 °F
Process connection   Connection options G¼   Material 1.4404   Medium temperature -2080 °C   -4176 °F
Connection optionsG¼Material1.4404Medium temperature-2080 °C-4176 °F
Material     1.4404       Medium temperature     -2080 °C       -4176 °F
Medium temperature -2080 °C -4176 °F
For aggressive media v
Housing
Degree of protection IP67 (front) / IP67
Dimension Ø 80 mm
T=30 mm H=100 mm
Material Zinc casting
Uperating temperature U50 °C 32122 °F
weight 540 g 1.2 lbs.
Power Auto off function
Auto-off function V
Battery operation 1500 b
Contificatos (ontional)
SIKA works certificate



## Type J

Accuracy (full scale)		0.2 %		
Pressure range*		Resolution		
0100 mbar	01.450 psi	0.1 mbar	0.001 psi	
0250 mbar	03.626 psi	0.1 mbar	0.001 psi	
0500 mbar	07.252 psi	0.1 mbar	0.001 psi	
-11 bar	-14.514.50 psi	1 mbar	0.01 psi	
-12.5 bar	-14.536.26 psi	1 mbar	0.01 psi	
-15 bar	-14.572.52 psi	1 mbar	0.01 psi	
-110 bar	-14.5145.0 psi	10 mbar	0.1 psi	
-120 bar	-14.5290.1 psi	10 mbar	0.1 psi	
-140 bar	-14.5580.2 psi	10 mbar	0.1 psi	
-160 bar	-14.5870.2 psi	10 mbar	0.1 psi	
0100 bar	01450psi	100 mbar	1 psi	
0250 bar	03626 psi	100 mbar	1 psi	
0350 bar	05076psi	100 mbar	1 psi	
0500 bar	07252 psi	100 mbar	1 psi	
0700 bar	010 153 psi	100 mbar	1 psi	
01000 bar	014 504 psi	1 bar	10 psi	
01500 bar	021 756 psi	1 bar	10 psi	
02000 bar	029 008 psi	1 bar	10 psi	

\* Other measuring ranges on request.



Functions					
Туре	J				
Adjustment options					
Linearisation	6 points				
Tare / Zero	$\checkmark$				
Selectable units					
Pressure	bar, mbar, hPa, kPa, MPa, PSI, mmHg,	inHg, cmH <sub>2</sub> O, mH <sub>2</sub> O, inH <sub>2</sub> O, kg/cm <sup>2</sup>			
Temperature	°C, °F				
Features					
Measuring inputs	1 x direct				
PC connection	USB (B)				
Built-in version (optional)	$\checkmark$				
Data memory					
Number of memory	60 000 values (auto)				
Recording interval	1 s10 h				
Recording duration	1 min1000 h				
Data sets	Pressure / Temperature				
Display / Representation					
Multi-functional LCD	5 digit				
Bargraph	$\checkmark$				
Illumination	$\checkmark$				
Display filter	$\checkmark$				
Min/max value	$\checkmark$				
Measuring rate					
Standard	100 ms				
Process connection					
Connection options	G1/2				
Material	1.4542				
Medium temperature	-1070 °C	14158 °F			
For aggressive media	$\checkmark$				
Housing					
Degree of protection	IP65 (front) / IP40				
Dimension	86 x 86 mm				
	T=40 mm H=135 mm				
Material	Aluminium				
Operating temperature	-1070 °C 14158 °F				
Weight	900 g	1.98 lbs.			
Power					
Auto-off function	$\checkmark$				
Battery type	internal accu				
Ext. power	USB				
Battery operation	2000 h				
Certificates (optional)					
DAkkS certificate					
SIKA works certificate					



## Type P

Accuracy (full sca	ull scale) 0.5 %		0.2 %		0.05 %		0.025 %		
Pressure range*		Resolution	Resolution						
0500 mbar	07.25 psi	1 mbar	0.01 psi	0.1 mbar	0.01 psi	0.1 mbar	0.01 psi		
-11 bar	-14.514.5 psi	1 mbar	0.01 psi	1 mbar	0.01 psi	0.1 mbar	0.01 psi		
-12.5 bar	-14.536.26 psi	1 mbar	0.01 psi	1 mbar	0.01 psi	0.5 mbar	0.01 psi		
-15 bar	-14.572.52 psi	1 mbar	0.01 psi	1 mbar	0.01 psi	0.5 mbar	0.01 psi		
-110 bar	-14.5145.0 psi	10 mbar	0.1 psi	10 mbar	0.1 psi	1 mbar	0.1 psi	1 mbar	0.1 psi
-120 bar	-14.5290.0 psi	10 mbar	0.1 psi	10 mbar	0.1 psi	2 mbar	0.1 psi	2 mbar	0.1 psi
-140 bar	-14.5580.1 psi	10 mbar	0.1 psi	10 mbar	0.1 psi	5 mbar	0.1 psi	5 mbar	0.1 psi
-160 bar	-14.5870.2 psi	10 mbar	0.1 psi	10 mbar	0.1 psi	5 mbar	0.1 psi	5 mbar	0.1 psi
0100 bar	01450 psi	100 mbar	1 psi	100 mbar	1 psi	10 mbar	1 psi	10 mbar	1 psi
0250 bar	03626 psi	100 mbar	1 psi	100 mbar	1 psi	20 mbar	1 psi	20 mbar	1 psi
0350 bar	05076 psi	100 mbar	1 psi	100 mbar	1 psi	50 mbar	1 psi	50 mbar	1 psi
0500 bar	07252 psi	100 mbar	1 psi	100 mbar	1 psi	50 mbar	1 psi	50 mbar	1 psi
0700 bar	010 153 psi	100 mbar	1 psi	100 mbar	1 psi	50 mbar	1 psi	50 mbar	1 psi
01000 bar	014 504 psi	1 bar	10 psi	1 bar	10 psi	100 mbar	10 psi	100 mbar	10 psi
01500 bar	021 756 psi	1 bar	10 psi	1 bar	10 psi	200 mbar	10 psi		
02000 bar	029 008 psi	1 bar	10 psi	1 bar	10 psi	500 mbar	10 psi		
02500 bar	036 259 psi	1 bar	10 psi	1 bar	10 psi				

\* Other measuring ranges on request.



Functions					
Туре	Р				
Adjustment options					
Linearisation	6 points				
Tare / Zero	$\checkmark$				
Selectable units					
Pressure	bar, mbar, kPa, MPa, PSI				
Features					
Measuring inputs	1 x direct				
PC connection (optional)	RS232				
Built-in version (optional)	$\checkmark$				
Display / Representation					
Multi-functional LCD	4 digit (0.5 % / 0.2 %), 5 digit (0.05 % / 0	0.025 %)			
Bargraph	$\checkmark$				
Display filter	$\checkmark$				
Min/max value	$\checkmark$				
Measuring rate					
Standard 100 ms					
Process connection					
Connection options	G1/2				
Material	1.4542				
Medium temperature	050 °C	32122 °F			
For aggressive media	$\checkmark$				
Housing					
Degree of protection	IP65 (front) / IP40				
Dimension	86 x 86 mm				
	T=40 mm H=135 mm				
Material	Aluminium				
Operating temperature	050 °C	32122 °F			
Weight	900 g	1.98 lbs.			
Power					
Auto-off function	$\checkmark$				
Battery type	2x 1.5 V AAA				
Ext. power (optional)	24 VDC				
Battery operation	8000 h				
Certificates (optional)					
DAkkS certificate					
SIKA works certificate					





## Type Q

Accuracy (full scale)	0.2 %
Pressure range**	Resolution
-11 bar	1 mbar
-12.5 bar	1 mbar
-15 bar	1 mbar
-110 bar	10 mbar
-120 bar	10 mbar
-140 bar	10 mbar
-160 bar	10 mbar
0100 bar	100 mbar
0250 bar	100 mbar
0350 bar	100 mbar
0500 bar	100 mbar
0700 bar	100 mbar
01000 bar	1 bar
01500 bar	1 bar
02000 bar	1 bar

## Type L

71							
Accuracy (full sca	ale)	0.05 %		0.025 %*		0.01 %*	
Pressure range		Resolution					
-12 bar	-14.529.00 psi	0.1 mbar	0.01 psi				
-110 bar	-14.5145.0 psi	1 mbar	0.1 psi				
-120 bar	-14.5290.1 psi	1 mbar	0.1 psi	1 mbar	0.1 psi	1 mbar	0.1 psi
0200 bar	02901 psi	10 mbar	1 psi	10 mbar	1 psi	10 mbar	1 psi
0400 bar	05802 psi	50 mbar	1 psi	50 mbar	1 psi	50 mbar	1 psi
0700 bar	010 153 psi	100 mbar	1 psi	100 mbar	1 psi	100 mbar	1 psi
01000 bar	014 504 psi	100 mbar	10 psi	100 mbar	10 psi	100 mbar	10 psi

\* Precision declaration

\*\* Other measuring ranges on request.



Functions					
Туре	Q		L		
Adjustment options					
Linearisation	6 points				
Tare / Zero	$\checkmark$		$\checkmark$		
Selectable units					
Pressure	bar		bar, mbar, hPa, kPa, MPa, PSI, mmHg, inHg,		
Fosturos					
Moscuring inputs	1 v diract		1 x direct		
PC connection	RS232 (ontional)		RS /85		
Analogue output (optional)	n(3232)(optional) n(4) = 20mA / 0 = 10 V		113 403		
Relay output	2 x 24 VDC/1A				
Built-in version (optional)	$\checkmark$				
Explosion protection (optional)			Ex II 2G Ex ia II C T6		
Display / Representation					
Multi-functional LCD/LED	4 digit, 7-segment LED		5 digit		
Illumination	red LED				
Display filter	$\checkmark$				
Min/max value	$\checkmark$		$\checkmark$		
Measuring rate			·		
Standard	16 ms		500 ms		
Process connection					
Connection options	G1/2		G1/4		
Material	1.4542		1.4435		
Medium temperature	050 °C	32122 °F	050 °C	32122 °F	
For aggressive media	$\checkmark$		$\checkmark$		
Housing					
Degree of protection	IP65 (front) / IP40		IP65 (front) / IP54		
Dimension	86 x 86 mm		Ø 80 mm		
	T=40 mm H=135 mm		T=40 mm H=120 mm		
Material	Aluminium		ABS plastic		
Operating temperature	050 °C	32122 °F	050 °C	32122 °F	
Weight	900 g	1.98 lbs.	210 g	U.46 lbs.	
Power					
Auto-off function	$\checkmark$				
Battery type			IX3VCR		
Ext. power	Z4 VDC		2000 b		
Cortificatos (ontional)			2000 11		
DAkkS cortificato					
SIKA works cortificato					
SINA WORKS CERTIFICATE					

# Hand-held pressure instruments





#### Туре МН 3161 / МН 3181

Accuracy (full scale)	0.2 %					
Pressure range			Resolution			
MH 3161-01 / MH 3181-01	-1.0025 mbar	-0.010.363 psi	0.01 mbar	0.001 psi		
MH 3161-07 / MH 3181-07	-10.0350 mbar	-0.155.076 psi	0.1 mbar	0.001 psi		
MH 3161-12 / MH 3181-12	01300 mbar (abs.)	018.85 psi	1 mbar	0.01 psi		
MH 3161-13 / MH 3181-13	-1002000 mbar	-1.4529.00 psi	1 mbar	0.01 psi		

## Type MH 3161 / MH 3181

Accuracy (full scale)	0.2 %	
Pressure range		Resolution
	Depending on the external procedure concor MSE	J

Depending on the external pressure sensor MSD





EX-Version (EEx ib IIC T4 - 03ATEX0136X)



Functions								
Туре	MH 3161	MH 3181	MH 3111	MH 3151	MH 3156			
Adjustment options								
Linearisation	2 points							
Tare / Zero	$\checkmark$							
Selectable units								
Pressure	bar, mbar, kPa, MPa,	PSI, mmHg, mH20						
Features								
Measuring inputs	2 x direct	2 x direct	1 x changeable	1 x changeable	1 x changeable			
PC connection	USB	USB	USB	USB	USB			
Analogue output		01 V		01 V	01 V			
Explosion protection	Ex II 2G Ex ia II C T6	Ex II 2G Ex ia II C T6	Ex II 2G Ex ia II C T6	Ex II 2G Ex ia II C T6	Ex II 2G Ex ia II C T6			
Data memory								
Number of memory		10 000 values (Auto)		10 000 values (Auto)	4000 values (Auto)			
Recording interval		13600 s		13600 s	13600 s			
Data sets		pressure		pressure	pressure			
Display / Representation								
Multi-functional LCD	4 ½ digit	4 ½ digit	4 ½ digit	4 ½ digit	4 ½ digit			
Display filter		$\checkmark$		$\checkmark$	$\checkmark$			
Min / max value	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	✓			
Measuring rate								
Standard	250 msec.	250 ms	250 ms	250 ms	250 ms			
Peak / Fast		1 ms		1 ms	1 ms			
Process connection								
Connection options	nipple Ø 6	nipple Ø 6	MSD pressure sensors					
Material	copper 2.0380	copper 2.0380						
Medium temperature	-1050 °C /	-1050 °C /						
	14122 °F	14122 °F						
Housing								
Degree of protection	IP65 (front) / IP40							
Dimension	140 x 70 x 30 mm / 5.51 x 2.76 x 1.18 in.							
Material	ABS plastic							
Operating temperature								
<b>Neight</b> 200 g / 0.44 lbs.								
Power								
Auto-off function								
Battery type	Y V DLOCK							
Ext. power Battery operation								
Contificators (ontional)								
DAKKS certificate								

SIKA works certificate

# **Pressure sensors MSD**

## Nylon type

Piezoresistive pressure sensor for air as well as non-corrosive / ionizing gases and fluids with integrated sensor memory

- Inputs 2 x nipple Ø 6
- Accurcy\* ±0.2 % full scale
- PVC cable (1 m / 39.37 in.) with mini-DIN-plug
- Housing Robust ABS plastic, IP65
- Dimensions 70 x 30 x 15 mm / 2.76 x 1.18 x 0.59 (H x D x W)
- Weight Approx. 75 g / Approx. 0.16 lbs.

#### Stainless steel type

Piezoresistive pressure sensor for aggressive media, water, gases, and fluids, with internal sensor memory

- Inputs G1/2
- Accuracy\* ±0.2 % full scale
- PVC cable (1 m) with mini-DIN-plug (not part of delivery)
- Housing Stainless steel, IP65
- Dimensions Approx. 23 x 85 mm / 0.90 x 3.35 (Ø x L)
- Weight Approx. 175 g / 0.39 lbs.

Pressure range							
Type (nylon)			Resolution				
MSD 2.5 MR	-22.5 mbar	-0.030.04 psi	0.001 mbar	0.001 psi			
MSD 25 MR	-2025 mbar	-0.290.36 psi	0.01 mbar	0.001 psi			
MSD 350 MR	-200350 mbar	2.95.08 psi	0.1 mbar	0.001 psi			
MSD 1.3 BA	01.3 bar (abs.)	018.85 psi (abs.)	1 mbar	0.01 psi			
MSD 2 BA	02 bar (abs.)	029 psi	1 mbar	0.01 psi			
MSD 2 BR	-12 bar	-14.529 psi	1 mbar	0.01 psi			
MSD 7 BA	07 bar (abs.)	0101.53 psi (abs.)	10 mbar	0.1 psi			
MSD 10 BR	-110 bar	-14.5145.04 psi	10 mbar	0.1 psi			
Type (stainless steel)			Resolution				
MSD 100 MRE	0100 mbar	01.45 psi	0.1 mbar	0.001 psi			
MSD 250 MRE	0250 mbar	03.63 psi	0.1 mbar	0.001 psi			
MSD 400 MRE	0400 mbar	05.8 psi	0.1 mbar	0.001 psi			
MSD 1 BAE	01 bar (abs.)	014.5 psi (abs.)	1 mbar	0.01 psi			
MSD 1 BRE	01 bar	014.5 psi	1 mbar	0.01 psi			
MSD -1 / 1.5 BRE	-11.5 bar	-14.521.76 psi	1 mbar	0.01 psi			
MSD -1 / 3 BRE	-13 bar	-14.543.51 psi	1 mbar	0.01 psi			
MSD 2.5 BAE	02.5 bar (abs.)	036.26 psi (abs.)	1 mbar	0.01 psi			
MSD 2.5 BRE	02.5 bar	036.26 psi	1 mbar	0.01 psi			
MSD 4 BAE	04 bar (abs.)	058.02 psi (abs.)	1 mbar	0.01 psi			
MSD 4 BRE	04 bar	058.02 psi (abs.)	1 mbar	0.01 psi			
MSD 6 BAE	06 bar (abs.)	087.2 psi (abs.)	1 mbar	0.01 psi			
MSD 6 BRE	06 bar	087.2 psi	1 mbar	0.01 psi			
MSD 10 BAE	010 bar (abs.)	0145.03 psi (abs.)	10 mbar	0.1 psi			
MSD 10 BRE	010 bar	0145.03 psi	10 mbar	0.1 psi			
MSD 16 BAE	016 bar (abs.)	0232.06 psi (abs.)	10 mbar	0.1 psi			
MSD 25 BAE	025 bar (abs.)	0362 (abs.)	10 mbar	0.1 psi			
MSD 25 BRE	025 bar	0362 psi	10 mbar	0.1 psi			
MSD 40 BRE	040 bar	0580 psi	10 mbar	0.1 psi			
MSD 60 BRE	060 bar	0870 psi	10 mbar	0.1 psi			
MSD 100 BRE	0100 bar	01450 psi	0.1 bar	0.1 psi			
MSD 160 BRE	0160 bar	02320 psi	0.1 bar	1 psi			
MSD 250 BRE	0250 bar	03625 psi	0.1 bar	1 psi			
MSD 400 BRE	0400 bar	05801 psi	0.1 bar	1 psi			
MSD 600 BRE	0600 bar	08702 psi	0.1 bar	1 psi			
MSD 1000 BRE	01000 bar	014 503 psi	1 bar	10 psi			

\* Optional: Higher accuracy sensor (available from 350 mbar)

# Accessories



## PC connection and software

Many digital pressure gauges have a serial interface port to allow measurement values and stored data to be transferred directly to a PC and documented. An inexpensive measurement data acquisition system can easily be assembled with suitable software and an interface converter. Processes can be readily monitored and analysed using the recorded and visualised measurements and all data can be exported using standard programs such as Microsoft Excel. Remote control is also possible. Various software packages with extensive recording and display functions, logger and alarm evaluation as well as for calibration are available.

Software package								
Function	AnalyserLight	DEMO	PressKAL	CCS30	EBS20M	S0FT3050		
Memory management → PC download / delete / export → Storage interval setting → Graphics function	$\checkmark$ $\checkmark$					√ √ √		
Display management → Remote indication → Real time data recording → Storage interval setting → Export function		√ √ √		$\checkmark$ $\checkmark$ $\checkmark$	✓ ✓ ✓ ✓			
Calibration management → Remote indication → Set up calibration routines → Set up calibration certificates			✓ ✓ ✓					
References								
	R J	P R Q	P R J	L	MH series	MH 3181 MH 3151 MH 3158		

