- **Instruments with 3-channel, 4-channel and 6-channel technology**
- **Easy operation due to automatic sensor recognition**
- **PC connection**
- **Powered by rechargeable battery**
- **Rugged design**

The **Service Master** is a multi-channel hand meter for the simultaneous measuring of important hydraulic values:

All hydraulic parameters such as pressure, differential pressure, flow and hydraulic power can be measured, displayed, stored and processed.

To meet the requirements of both modern industrial hydraulics and complex mobile hydraulics, we offer a range of different models:

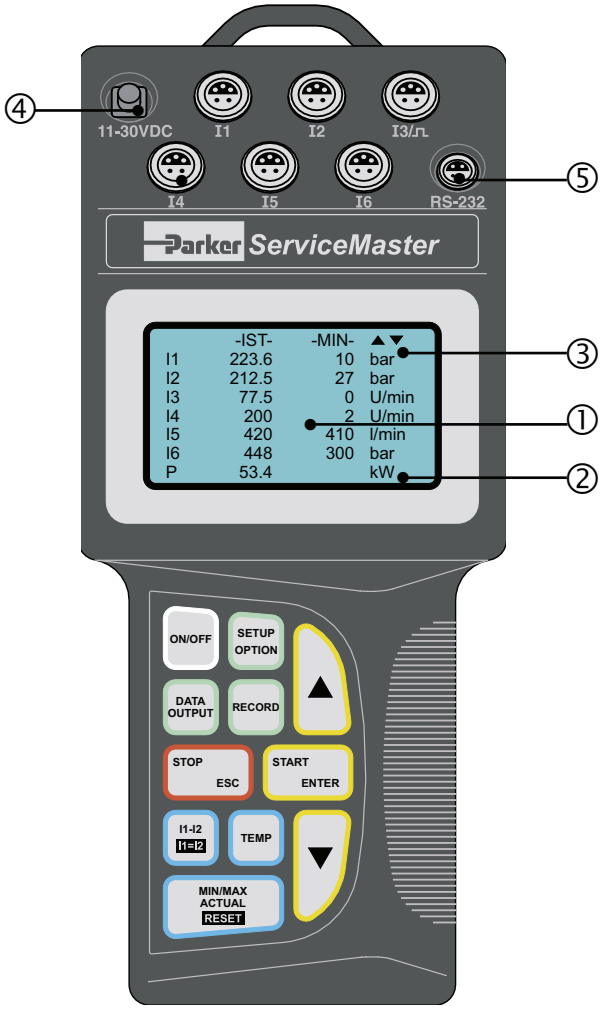
Service Master SCM-250 (3 inputs/channels)
Memory capacity = 60,000 MIN and MAX points Max. 60 single graphs storable (1-channel operation) Max. 20 different measurements storable (3-channel operation)

Service Master SCM-400 (6 inputs/channels)
Frequency measurement (I3) Memory capacity = 125,000 MIN and MAX points Max. 120 single graphs storable (1-channel operation) Max. 20 different measurements storable (6-channel operation)

Service Master SCM-360 (4 inputs/channels)
Frequency measurement (I3) Memory capacity = 125,000 MIN and MAX points Max. 120 single graphs storable (1-channel operation) Max. 30 different measurements storable (3-channel operation)

Service Master SCM-450 (6 inputs/channels)
Frequency measurement (I3) Memory capacity = 250,000 MIN and MAX points Max. 240 single graphs storable (1-channel operation) Max. 40 different measurements storable (6-channel operation)

	SCM	250	360	400	450
Input	Sensor inputs	3	4	6	6
	With sensor recognition (p/T/Q/n) Adaptor for external sensors with SCMA-VADC Plug-in connection: 5-pin, push-pull Sample rate: ≥ 1 ms = 1,00 measurement values/sec. Resolution: 12 bit + sign = 4,096 steps	●	●	●	●
	Frequency input via input socket I3 for flow turbine or tachometer Frequency range: 0.5 Hz … 30 kHz Signal input: depends on frequency 5 V_{PP} (max)		●	●	●
Display	Graphic LC Resolution: 128 x 64 pixels Visible area: 72 x 40 mm Automatic adjustment of digit size Digit size: 4.2 mm (for 8 line display) Accuracy of display: < 0,25 % of Full Scale Range	●	●	●	●
	Graphic curve representation	●	●	●	●
Operation	Via 11-key membrane keyboard With mechanical tactile touch and embossed edges	●	●	●	●
Interface	RS232C (4-pin, push-pull) optional with a standard RS232/USB PC adaptor Baud rate: 1,200 … 38,400.8 data bits, 1 stop bit Online data transmission to the PC Transferring recorded data to PC with SensoWin®	●	●	●	●
Functions	I1-I2 indication of differential values Indication of MIN/MAX/ACTUAL values Indication of TEMP values (SCPT/SCT) Auto power off/battery level control Hydraulic power/outflow volume	●	●	●	●
Measured value memory	Memory capacity (60,000 MIN and MAX points)	●			
	Memory capacity (125,000 MIN and MAX points)		●	●	
	Memory capacity (250,000 MIN and MAX points)				●
	Variable storage interval (e.g. = 10 ms) Number of points per channel (e. g. 4,000 Min-Max) Variable recording time (2 s … 100 h) Trigger: slope/manual/external/time Pre trigger External trigger with additional device SCMA-TR	●	●	●	●
Ambient conditions	Temperature range: 0 … +50 °C Storage temperature: -25 … +60 °C Temperature error: < 0.02 %/ °C Rel. humidity: < 80 % Protection according to DIN 40050: IP 54 (water spray/ oil)	●	●	●	●
Power supply	Internal: NiCd-battery 7.2 V/700 mAh Battery charging circuit Battey service capacity: 5 h approx. External: with SCSN-450 (220/100 VDC) Automotive cable adaptor as equipment (12/24 VDC)	●	●	●	●
Housing	Material: glass ball-reinforced polyamide Dimensions: 235 x 106 x 53 mm (L/W/H) Weight: approx. 530 g	●	●	●	●



I1 – I6 Sensor inputs with automatic sensor recognition (p/T/Q/n).
External sensors with SCMA-VADC-250
V/A Measuring voltage/current with SCMA-VADC-400

I3/⎍ Frequency input

① Graphic LC Display: shows measured values, operation menus and graphs

② Additional line:
Indication of hydraulic power or outflow volume

③ Status line: shows the actual, min and max values and menu settings

④ External power supply via power unit SCSN-450 or automotive cable adaptor

⑤ PC interface: RS232
External trigger module with SCMA-TR-250

ON/OFF — Switches the instrument on and off

SETUP OPTION — System settings, date/ time, storage operation

Menu

START ENTER — Start measurements

STOP ESC — Stop measurements

I1-I2 I1=I2 — Differential function I1-I2
Zero point equalisation (Tara-Function) I1=I2

TEMP — SCPT temperature measuring sensors

DATA OUTPUT — Data output to PC or graphic display
On-line test (200 ms)

RECORD — Recording and saving of measurements (program or start/Stop)

MIN/MAX ACTUAL RESET — ACT-, MIN- und MAX-display
RESET deletes MIN/MAX-values

Order code

Service Master

(Delivery includes SCSN-450 power unit)

Number of measuring channels	Frequency measuring	MIN and MAX value memory	SCM-XXX-1-01
3	—	60.000 points	250
4	●	125.000 points	360
6	●	125.000 points	400
6	●	250.000 points	450

Automotive cable adaptor 12/24 VDC — SCK-318-05-21

SensoWin® PC Software-Kit — SCSW-KIT-400

The Service Master can be used as a measuring instrument in three different versions:

1. Measuring and readout

Through automatic sensor recognition all measured values are shown immediately on the display. Each input can be used as required. The display switches automatically to the appropriate line size.

- **Peak pressure measurement (MIN/ MAX display)**
  The scanning rate of 1,000 measurement values/s captures rapidly occurring pressure peaks within the space of a millisecond.

- **Differential pressure measurement**
  Exact Δp measurement is achieved by means of the Δp adjustment. Under operating pressure the deviation of the pressure sensors relative to each other is corrected. For load sensing control the exact Δp setting is a prerequisite for trouble-free functioning of the hydraulics. A combination of Δp (bar) and flow Q (l/ min) is displayed as hydraulic power P (kW).

- **External sensors**
  Analogue signals such as those from a force or stroke sensor (external sensor) can also be measured and evaluated with the Service Master. The measurement of electrical currents or voltages (for example proportional valves) up to 1.5 ADC or 48 VDC. External modules make the Service-Master a multifunctional measuring instrument.

SCMA-VADC-250	Signals (0...20 mA or 0...10 VDC)
SCMA-VADC-400	V/A measurement (1,5 ADC or 48 VDC)
SCMA-TR-250	external trigger signal

3. Online Operation

In On-line operation all measurement values are transferred directly from the Service Master to a PC and subsequently stored. The current graphic display in SensoWin® allows the hydraulics to be set (valve position or pressure load) whilst the test is running.

With the SCMA-AO-400 the measurement values are documented as analogue signals (0…20 mA) on an external device (for example, graphic recorder or oscilloscope). The sensor signals can be processed directly by an external A/D converter or PLC control unit.

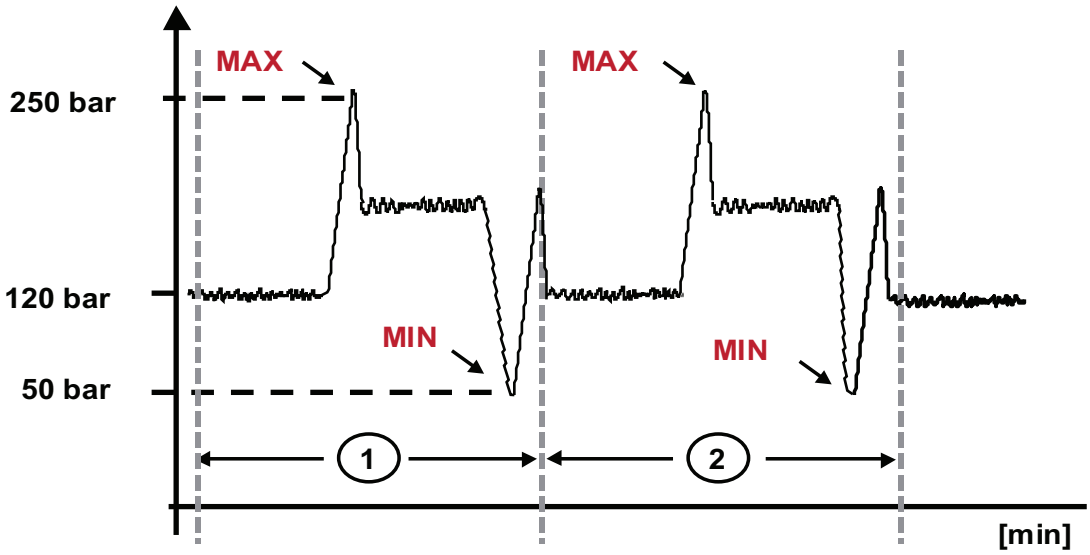
2. Data logging and recording

The recording (storage) of measurements provides documentation of settings and the actual condition of the hydraulics.
Measurements can be printed or further processed on a PC with SensoWin® software. This is ideal for customer care or service since the measurements can be called up at any time.
With the special storage technology of the Service-Master, all pressure peaks in the hydraulic system can be captured independently of the set measurement time (storage time). The storage interval (time interval between storage points) is automatically adapted within the base setting of the Service Master. Within each storage interval one min. and one max. value is stored. The user has only to pre-select the measuring time (storage time = 100 h. max.).
Individual setting of the storage interval is likewise available (for example, 10 ms).

- **Start-stop function**
  The start and finish of measurements are controlled by the start/stop key only

- **Program-controlled recording**
  Four programs may be selected:
  - Flank trigger
    Recording starts by pressure increase (60 bar, increasing slope)
  - Manual
    Start by pressing enter key
  - External trigger
    Starts recording by external signal (e.g. rely contact)
  - Clock time
    Start at e.g. 14.25 h

  In each programme the recording time (2s…100 h) and the corresponding start function are selected. All the connected channels (sensors) are measured and stored. Program-controlled storage is particularly advantageous during the search for faults in hydraulic machinery. The point when the cause of damage occurs (for example, pressure peak or pressure drop) is not as a rule foreseeable.
  With the help of SensoWin® the recording can be subsequently analysed exactly.

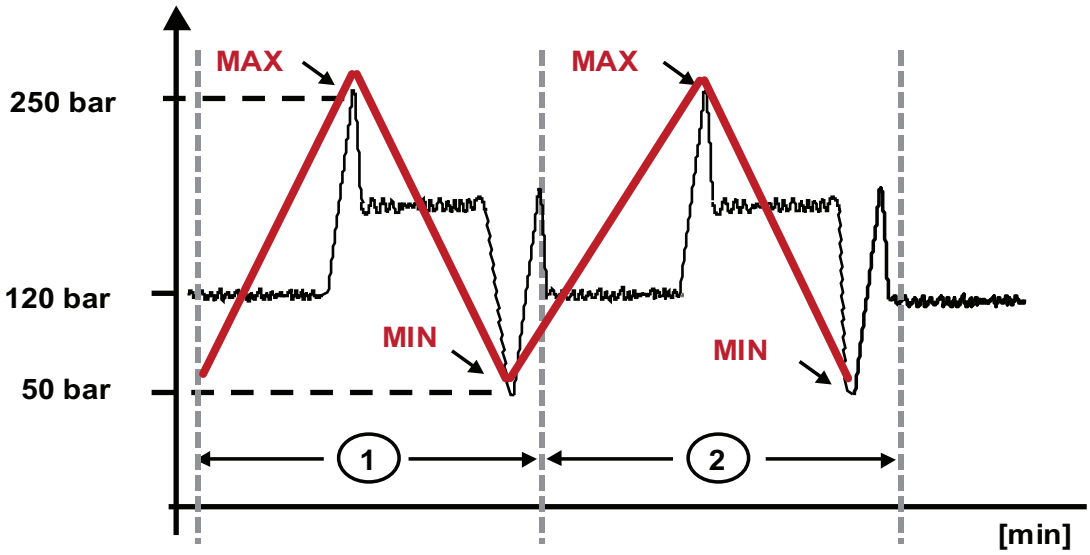


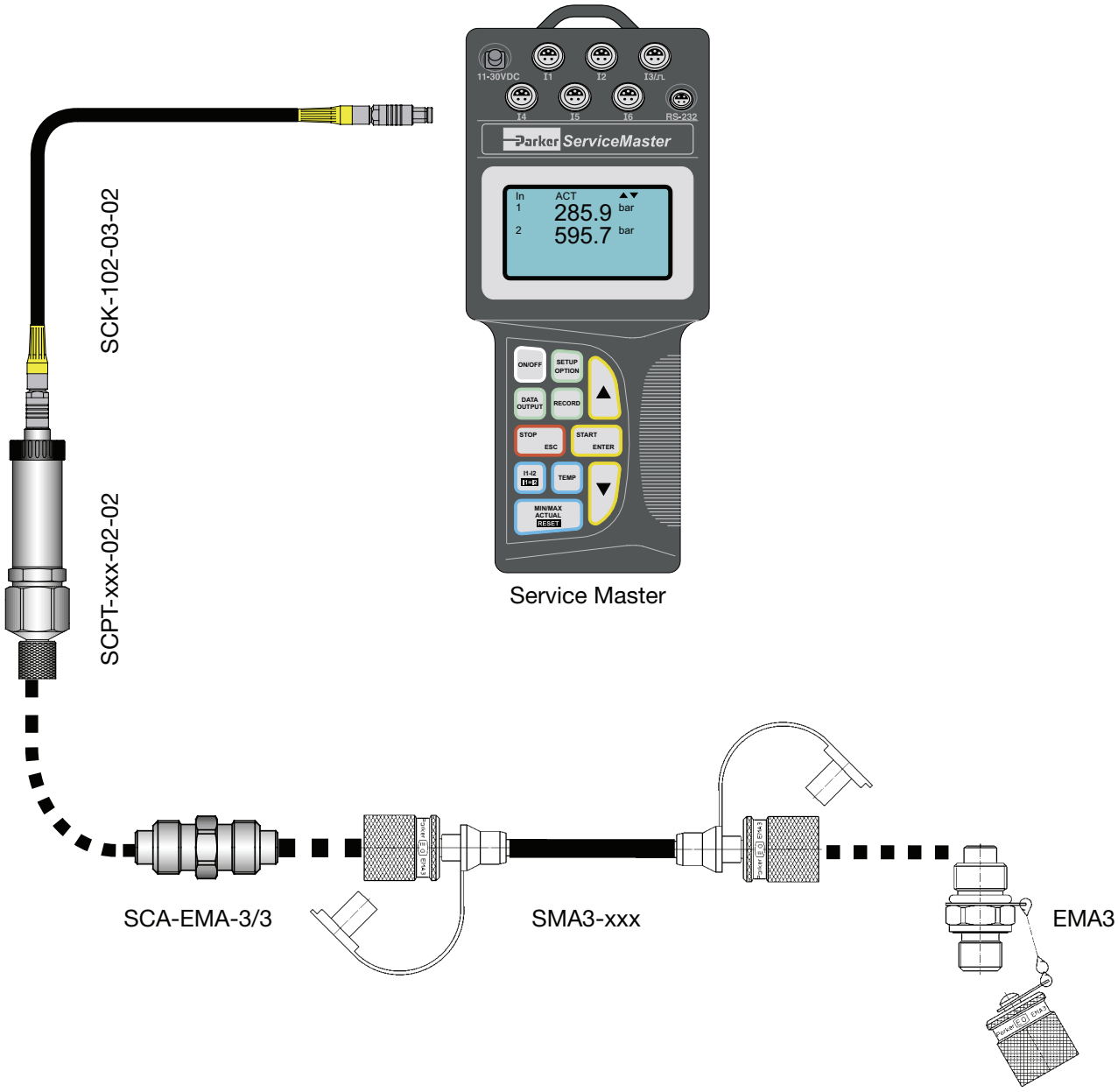
With the Service Master up to 6 sensors can be measured, displayed and recorded simultaneously. Each sensor (channel) enables up to 4,000 memory intervals to be created. Each memory interval will save a pair of data points. The pair consists of one MIN and one MAX reading.

In a recording session of 10 min and 4,000 intervals, the length of each storage interval is 150 ms.

Running a constant scanning rate of 1,000 readings/s this will correspond to 150 readings (interval).

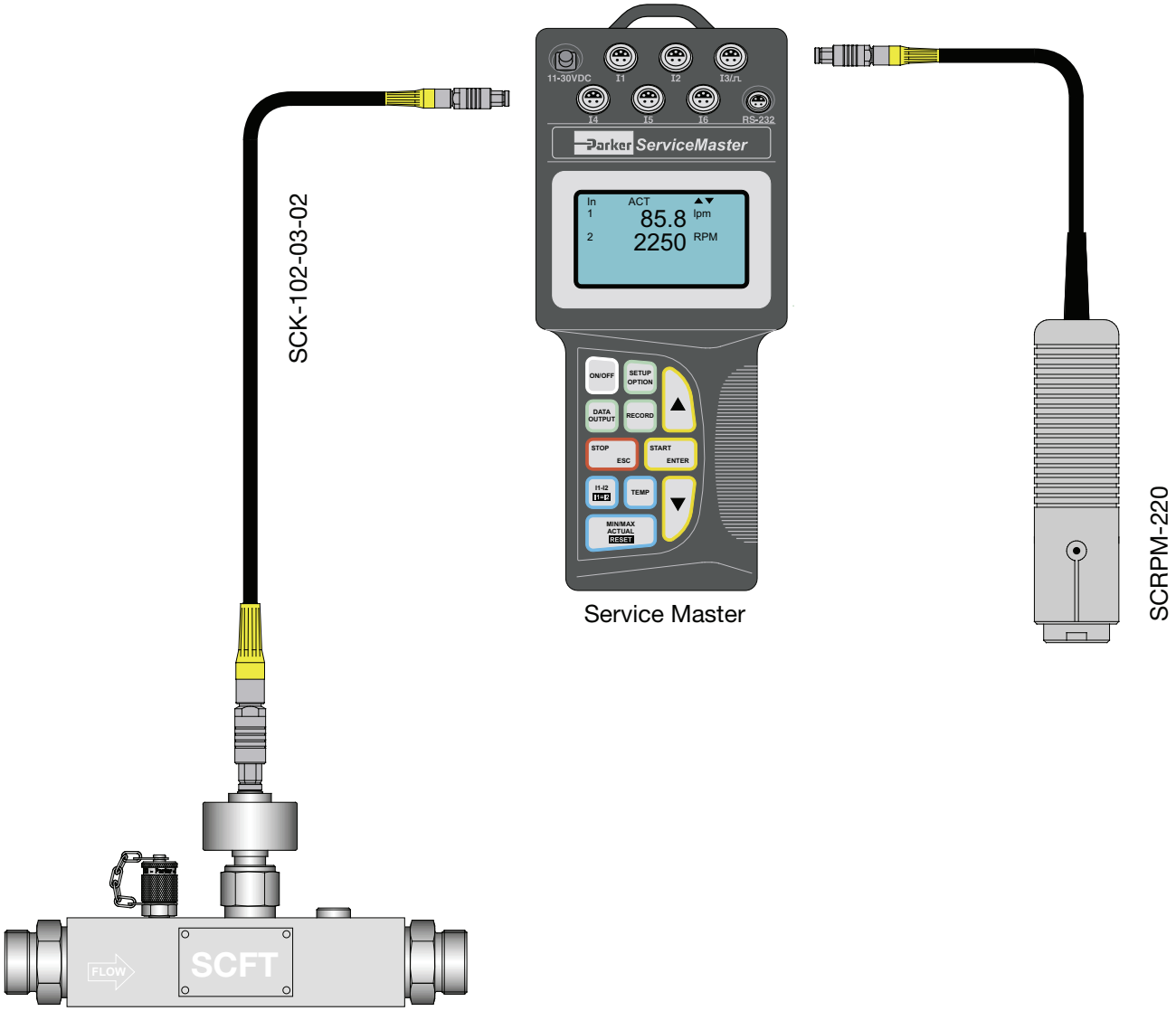
The highest (max) and lowest (min) will be carried to the measurements memory. The connection of these data points creates a measured graph and guarantees the capture of pressure peaks.





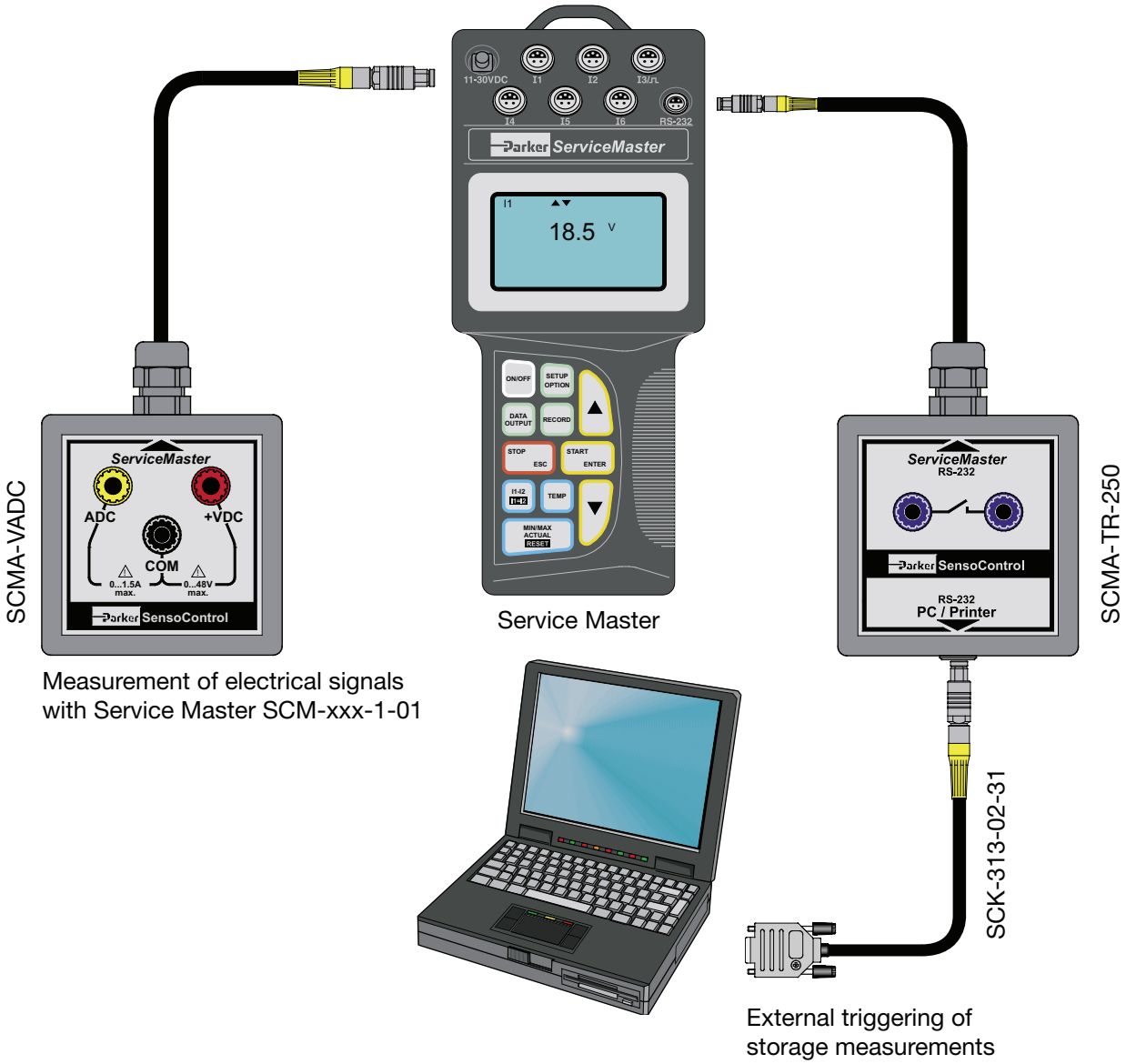
Pressure/Temperature measurement SCPT
There is a selection of various measuring ranges for the measuring of pressures. Sensors can be used for pneumatic applications and also for measuring pressure peaks up to 1000 bar. The pressure/temperature sensors of the SCPT series have a temperature channel which is retrieved via the TEMP key.

Diagnostic adaptors
All pressure sensors in a measurement case (kit) are provided with a factory-assembled SCA-1/2-EMA-3 diagnostic adaptor. The pressure sensors can be adapted to all standard measuring connections with the help of diagnostic couplings supplied.
They are perfectly suitable for a quick and flexible diagnoses in hydraulic applications.



Service Master

SCFT-xxx-02-02



Measurement of electrical signals with Service Master SCM-xxx-1-01

External triggering of storage measurements

■ Measurement of external signals SCMA-VADC-250

Signals such as 0/4…20 mA or 0…10 V from external sensors, for example, for torque, power or stroke, are connected to the Service Master.
Typical applications:

- Power/stroke graphs
- Torque/flow volume nominal lines

■ Current/voltage measurement SCMA-VADC-400

Electric currents up to 1,5 ADC and voltages up to 48 VDC can be measured with this module.
Applications:

- Current consumption of a proportional valve
- Measurement of switch status in motors/pumps

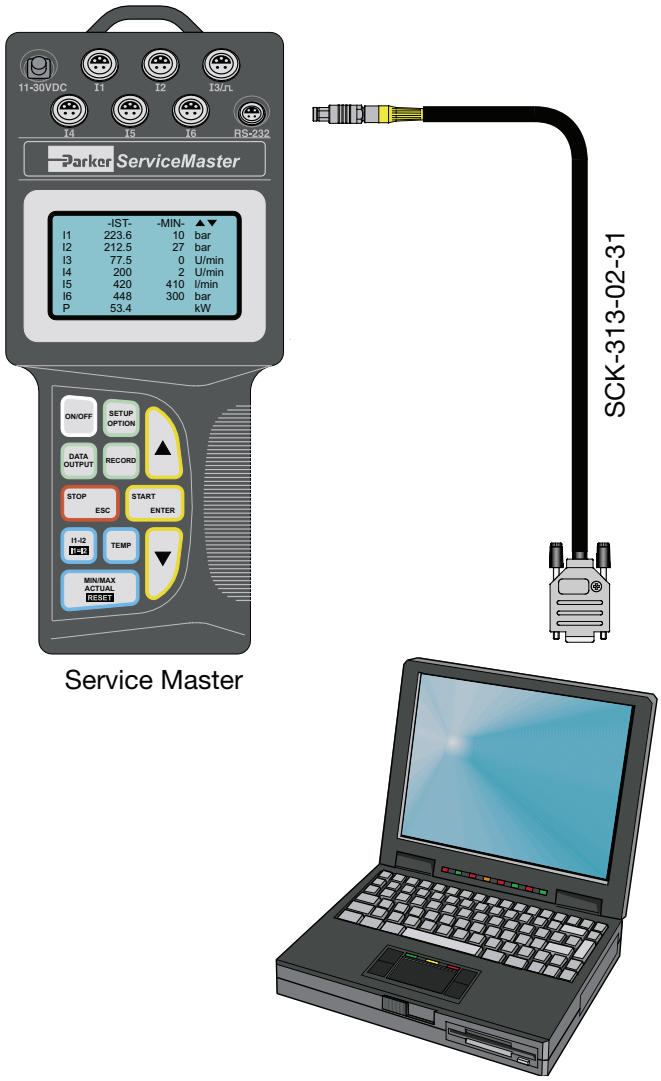
■ SCMA-TR-250

External signals such as relay contacts, for example, can be used as starting signals for measurement recording (storage). The measurement recording begins with the opening of a valve or the start-up of a pump. In order that during on-line measurement the external relay triggering is working, the SCMA-TR-250 is connected directly to the PC.

■ Analogue Output 0...20mA

With the SCMA-AO-400 (not shown) the measurement signals are emitted as analogue signals to external devices. The measurement value is graphically registered on a graphic recorder. The analogue signal can be processed in the hydraulic control as an actual value signal.

- **Easy operation**
- **Windows® 95/98/2000/NT/XP**
- **Simultaneous representation of 16 curves**
- **Zoom functions**
- **Linking of measuring curves**
- **Tabular listing of measured values**
- **Calculation of extreme value**
- **Curve shifting function**
- **Free selection of units and measuring ranges**
- **Cursor functions**
- **Transmission of set-up parameters from the Service Master**



Service Master

General

The **SensoWin®** software is an easy to operate software package for reading and processing the measured curves recorded by the **Service Master**.
Documentation and certificates can be created easily and at low cost as **SensoWin®** can make use of all Windows facilities and advantages.

Functions

Up to 16 different curves can be represented in a diagram. The curve shifting function allows exact hydraulics analysis. A power performance curve can be created to evaluate a pump.
Leaks and pressure losses can be detected with the help of the generation of a Δp function. With the cursor, an hydraulic procedure can be examined time-dependent.

For each curve, extensive information is provided, i.e. the **Service Master** measurements can be reproduced at any time. The change of the ranges and units allows later adjustment for presentation in a diagram.
Tabular presentation of MIN and MAX values, smoothing of the measurement curve and mathematical links are important functions in the analysis of the hydraulic system.
Date and time are documented with each measurement. This considerably facilitates later allocation of values.
Direct transmission of measured values from the **Service Master** to the PC is also possible.
Current events (pressure peaks, etc.) are visible while the process is running (on-line function).