

## manugraphy® measurement cylinder

and the palm of the hand, it is possible to accurately indicate the gripping force and its temporal variation.

In this way, the user can evaluate functional limitations of the hand and therapeutic improvements in hand functions.

With the help of simultaneous videostreams, the movements of the different fingers can be optically displayed and documented.



manugraphy® system

### Technical data of manugraphy® measurement cylinder

|  |             |
|--|-------------|
| size of one sensor element (mm <sup>2</sup> )      | 7.07 x 7.07 |
| number of sensors/cm <sup>2</sup>                  | 2           |
| dimension of usable sensor area (mm <sup>2</sup> ) | 198 x 226   |
| pressure range (kPa)                               | 10 - 600    |
| diameter (mm)                                      | 67 or 50    |

## manugraphy® measurement device



manugraphy® system

### Technical data of the manugraphy® system

|                      |                        |
|----------------------|------------------------|
| number of sensors    | up to 1024             |
| sampling rate        | 20 pictures/sec.       |
| Windows PC interface | USB                    |
| power supply         | external power adapter |
| operating system     | Windows                |

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All systems from novel operate with high quality, calibrated sensors and provide reliable and reproducible long term measurements. manugraphy® and the novel logo (coloured foot) are the registered trademarks of novel gmbh © 1992-2013

manugraphy® hand diagnostics

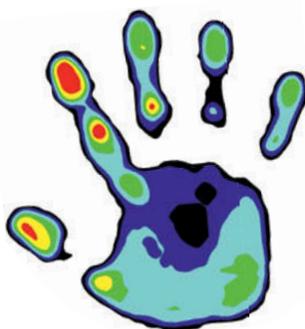
art science®



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novel's manugraphy® system is an accurate and reliable system to measure the hand forces while gripping. Up to now, functional hand diagnostics could only quantify the total force, for example with a dynamometer.



Isobar picture of a hand (flat position)

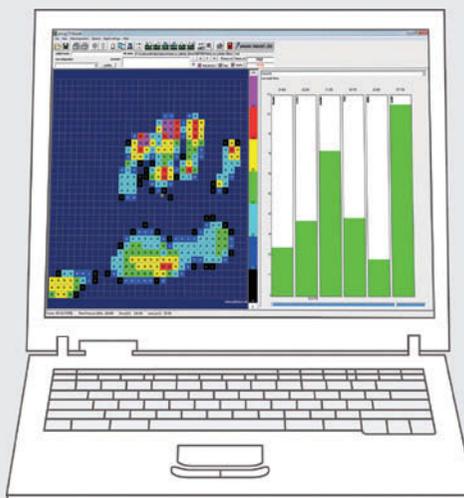
The manugraphy® system newly developed by novel offers a key advantage over the conventional systems: It is able to determine the force of each single finger and even the phalanges. The individual force contributed by each part of the hand – the finger, phalanx, or palm – is measured separately. These detailed information enable to achieve a truly objective biomechanical analysis of the hand.

In order to measure the local forces underneath the hand, 896 highly accurate force sensors are applied to the surface of two cylinders of different diameters, suitable for different hand sizes. Each single sensor is sampled 20 times per second by the manugraphy® analyser, and the measured forces are allocated to the respective fingers, phalanges, ball of the hand, and thumb. In a dynamic measuring mode, it is possible to identify the current local forces as well as the average forces per gripping sequence. Subsequently, the whole measuring process in its dynamic course can be reproduced.

The data are displayed in 2D, 3D and in isobars, showing the absolute force of each sensor element. An acoustic

signal that tells the subject when to grip and release allows for a standardised test procedure. With these detailed and objective functional analyses of the different hand areas, the user is able to compare the patient's hand function before and after surgery. Progress in rehabilitation can be better evaluated.

The manugraphy® system and its special audio feedback system can also be used in physiotherapy. The patient is able to carry out different gripping exercises independently, and therapy results can be objectified. Manugraphy® measurement data provide important information for the physicians asked to give a medical report on the traumatic or degenerative alteration of a patient's hand. These reports may be used to decide over a person's working capacity, change of job, or even early retirement.



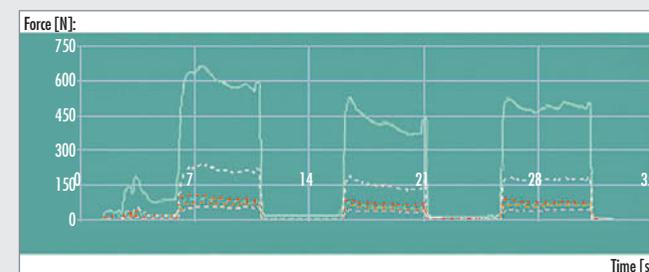
Force distribution while gripping a cylinder

The manugraphy® software provides the user with a fast and extensive analysis of the patient's hand function. A special database stores and organises the patients' master data as well as the individual measurements, and makes a direct comparison before and after medical treatment possible.

The manugraphy® measurement software facilitates the configuration and selection of different measuring modes, for bigger and for smaller cylinders, for case-specific analyses, and for biofeedback training. Audio instructions lead the patient through the gripping process, and give information on the gripping force. A standardised testing is guaranteed.

The measurement data are displayed online on the PC. With a 2D or 3D view of the local forces, the user is able to carry out an accurate functional analysis of both hand and fingers.

The contribution of each single finger and thumb to the total force is the most relevant information. By partitioning the measurement area into subareas for each finger



Force-time curves of each finger