

# Dr. Gottlob Testing

## Test of back and torso machines from *Cybex, Gym 80, Life Fitness, Nautilus, Schnell* and *Technogym*



During the summer of last year Jean-Pierre L. Schupp approached me with an idea for publishing fitness equipment tests. The tests were to take the form of a true comparison and be based only on relevant criteria with a completely impartial evaluation of the results. Quite a challenge! After careful consideration, my institute accepted the challenge and I would at this point like to express my thanks for entrusting me with this task.

Naturally an evaluation published by third parties has the potential to become a controversial issue. Some manufacturers may feel “at our mercy,” whilst others may suspect that favouritism may be at work. The question of impartiality and competence of the testing centre is therefore highly relevant. My father and I felt these same concerns back at the initial launch of our equipment manufacturing business; “what would happen if someone decided to evaluate our equipment and that someone did not have the necessary expert knowledge or may even have another agenda altogether?”

At this point I can assure you that, within the scope of these tests, I have no connection to any manufacturer, I undertake to maintain full neutrality and shall be governed only by the test criteria that have been painstakingly established and which will be further described in the course of this article.

Of course a test entails documenting both the strengths and weaknesses of a product, highlighting any shortcomings and formulating evaluation criteria. Purchasers should have access to

Fitness Tribune has exclusively commissioned the Dr. Gottlob INSTITUT to carry out regular equipment tests (to be published in 3 issues each year).

There has always been a wide range of tests available in the fitness industry but these have never really delved into greater depth than listings of catalogue information and the obvious technical details. Our requirement stipulates a “true comparison” that includes all the components of a real test, i.e. assessment criteria, further neutral information, points of criticism, assistance in making purchasing decisions and most importantly, a test rating.

These requirements do however conceal two rather tricky issues. First, a true and honest test means that there are bound to be losers. The problem here is that we risk alienating potential advertisers in the case of an “unfavourable” result. Second is the question of the right “tester”. The qualities we are looking for here include a reputation for integrity and commercial neutrality together with a combination of expert knowledge in a wide range of specialist subject areas.

We are pleased to have found a partner for this highly challenging task in Dr. Axel Gottlob; one of Germany’s leading strength training experts for many

information that will help them reach a buying decision. Instructors and gym users should be provided with details on the use of such machines and other useful hints. Furthermore, manufacturers – and the industry as a whole – should be given additional impetus to push the quality threshold even higher.

In times when increasing numbers of fitness clubs are being established and managed by qualified experts and where design, marketing and discounts have become important purchasing criteria, globalisation is now also raising its head in the fitness market in the form of cheap imports. In such times a true equipment test will provide a useful and necessary tool.

How long will it be before equipment that is already imported from countries like the Ukraine, Russia, Korea, Japan, Taiwan, and China catches up in terms of manufacturing technology and

years now. Dr Gottlob’s reputation and straightforwardness is well known in many circles and as a qualified mechanical engineer, graduate sports scientist and biomechanics expert he is certainly the best person to whom we can entrust this complex subject with all of its wide-ranging facets. He was not only a successful strength training athlete himself (German Champion, 1982) and gym owner, but is also associate professor of biomechanics and strength training at the University of Heidelberg. In his family business “Galaxy Sport” he spent over 12 years developing strength training equipment together with his father, Peter Gottlob. The firm patented several designs and had become market leader in Germany by the time it was sold in 1992. Last but not least, we should highlight the training offered at his Gottlob INSTITUT – courses here rate among the absolute top for instructors and therapists.

We therefore look forward to this new joint venture and to the important stimulus it will bring for the fitness industry.

Jean-Pierre L. Schupp

achieves a comparable level of functionality? They will not have only a price advantage then. If there is one thing that our Asian competitors have proven it is their complete lack of respect for patents and copyrights and their ability to react rapidly. Competition is also increasing in the American and European equipment markets and this means that only around 50% of the manufacturers will eventually survive. The others will either be swallowed up by the competition, downsize to serve specialist market segments or vanish completely. For this reason, the continuous improvement of products must become top priority.

### Choice of Manufacturer

The six manufacturers that appear in the first test were put forward by Fitness Tribune; three well-known European and three well known American equipment manufacturers. Naturally, as

## Company Chart

Listed here and in the following tables in alphabetical order

	<b>Cybox</b>	<b>Gym 80</b>	<b>Life Fitness</b>
Brief company history	Established in 1969; Focus: Isokinetics. Began with strength training equipment in 1983 through the purchase of Eagle Strength Systems	Founded in 1980 by Peter Förster and Walter Herden. Now known as Gym 80 International. Focus: strength training equipment	Founded 1968 by Keene P. Dimick. Focus: cardiovascular training equipment. Began in 1987 with strength training equipment
Main office	Massachusetts, USA	Gelsenkirchen, Germany	Chicago, USA
Production location*	USA	Germany	USA and Hungary
Strength training range	Cybox Eagle VR VR2 VR3 Plate loaded	Sygnum Line Medical Line Dual Plate loaded	Signature Series Pro2 Series Cable Motion MTS Hammer Strength
Address	LMT Loctec AG Daimlerstr. 10/1 78665 Frittlingen www.lmt.ch Phone: 07426 – 600 40	Gym 80 International Vertriebsgesellschaft mbH Wiesmannstr. 46 45881 Gelsenkirchen www.gym80.de Phone: 0209-970 640	Life Fitness Europe GmbH Siemensstr. 3 85716 Unterschleissheim www.lifefitness.de Phone: 089-3177 510
Guarantee*	2 years parts and labour (with the exception of wear parts)	Five years on frame Two years on all mechanical parts One year on seat padding	10 years on frame 5 years on weights, guide rails 1 year on bearings, cables, handles 6 months on seat padding, belts, springs, labour, shipping
Certification*	EN-957 certified	EN-957 certified	EN-957 certified
Delivery*	Machines are delivered using own vehicle fleet, packaged and assembled	Delivery: 95% assembled With the option of full plastic wrapping with edge protectors	Shipped disassembled in crates and is assembled ready for use by Life Fitness upon delivery
Lead time*	8 – 9 weeks	4 – 6 weeks (Sygnum)	8 – 12 weeks

	<b>Nautilus</b>	<b>Schnell</b>	<b>Technogym</b>
Brief company history	Founded in 1970 by Arthur Jones Focus: strength training equipment. Sold by Jones in 1986. Nautilus Group Inc. since 2004	Founded in 1957 by Joseph Schnell. Focus: strength training equipment. Inherited by Klaus and Achim Schnell in 1992	Founded in 1983 by Nerio Alessandri. Focus: strength training equipment Today known as Technogym-The Wellness Company
Main office	Vancouver, Washington, USA	Peutenhausen, Germany	Gambettola, Italy
Production location*	USA and Asia	Germany	Italy
Strength training range	Nitro Nitro Plus Steel Free Weights	Series 8 Medical training equipment Plate loaded machines Junior-Line	Personal Selection Isotonic Biostrength Kinesis Element
Address	Nautilus Germany GmbH Vürfelser Kaule 53 51427 Bergisch Gladbach www.nautilus.com Phone 02204-610 27	Schnell Trainingsgeräte GmbH Sportweg 9 86565 Peutenhausen www.schnell-online.de Phone: 08252-88 550	Technogym Wellness & Biomedical GmbH Im Geisbaum 10 63329 Egelsbach www.technogym.com Phone: 06103-201 240
Guarantee*	1 year full warranty 3 years on parts	5 year warranty, excepting wear parts	2 years on machines 1 year labour
Certification*	Meets requirements of EN-957, however not actually certified	EN-957 certified	EN-957 certified
Delivery*	Delivered fully assembled, in full plastic wrapping on pallets	Delivered fully assembled and partially packaged on pallet (own delivery fleet) or fully packaged (when sent by courier)	Packed in crates and on pallets, the machines are delivered fully assembled
Lead time*	From immediate up to a maximum of 8-10 weeks	6 weeks	4 weeks

\*All details according to manufacturers' or company representatives' statements .

testing expands the selection will not be restricted to only these six. In the German-speaking world alone there are at least fifty manufacturers and importers who all should be given the benefit of an impartial analysis. We wanted to carry out these tests openly and not in secret and, for this reason, contacted these companies directly. We were generally greeted with a positive and co-operative response to our enquiries.

The primary product line of each manufacturer was selected for evaluation:

- **Eagle** from *Cybex*
- **Sygnum** from *Gym 80*
- **Signature** from *Life Fitness*
- **Nitro** from *Nautilus*
- **Serie 8** from *Schnell*
- **Personal Selection** from *Technogym*



## The Test

The following strength training equipment for spine and back was evaluated from the above mentioned manufacturers (see tables on the following pages):

- Abdominal machines
- Back extension machines
- Rotary torso machines
- Abdominal benches
- Back extension benches
- Latpull machines
- Seated rowing machines

The Doctor Gottlob Institute did not make the test easy for itself! After looking over the brochures, datasheets and other manufacturers' documentation we first prepared a matrix containing a range of quality criteria. Each of the forty-two machines under test were then subjected to exhaustive on-the-spot analysis, were measured, tried out in a practical test and motion studies were carried out. Every detail was examined

and everything was documented in pictures and words. Unfortunately it was not possible for the equipment to be brought together in the same location for testing which meant that there were many miles and many days between the tests of the different manufacturers' machines. This meant that great care was required to achieve a direct comparison.

Only two of the German manufacturers had showrooms available so the other equipment was tested at fitness centres recommended by the respective manufacturer. We would like to express our thanks to all of the fitness centres that offered their hospitality for over ten hours, making this analysis possible: *Mapet* in Rottenburg, *move* in Stuttgart, *Fitness Company III* in Munich, *Schnell Showroom* in Peutenhausen, *Amon aktiv* in Karlsruhe, *Via Vital.med* in Schwetzingen and *Robinson WellFit* in Bad Homburg.

## Test Criteria

What differentiates a good piece of fitness equipment from a lesser one? The machine's function is by far the primary factor here. A piece of fitness equipment must deliver the type of training for which it was created. It can be of top quality construction, it can be beautiful, it can be comfortable and it can exceed the most stringent safety standards. But if it doesn't provide the training function for which it is intended then the other advantages are of little value! A car may well have a large boot, comfortable seats, air conditioning and a classy design. However, if the brakes are not powerful enough, the engine starts unreliably or if the car becomes uncontrollable on a wet road surface, then all of the other qualities are of little interest. If you find this comparison between fitness machines and cars a little far fetched please remember that, in terms of functionality, the quality of fitness machines nowhere near approaches that of cars. As far as the equipment world is concerned then, this comparison between cars and fitness equipment is fully justified.

It is sometimes said that the performance of various machines is almost identical. The reason for this frequently stems simply from ignorance or sometimes company policy which reduces points for comparing the machine's functionality to a limited set of points such as the basic movement, range of possible adjustments or to the eccentric. A serious mistake! It's only the total score of approximately 40 parameters,

**Dr. Gottlob  
Institut**

### Machine / Type

### Ergonomics and Comfort

Anthropometric contact points

Weights and weight increments

Suitable for both smaller/larger users

Adjustment mechanism ergonomics

Adjustable while seated (in exercise position)

**Test weighting 25%**

### Biomechanics

Movement kinematics

Pivot axis

ROM [range of motion]

Risk of constrained posture

Load dissipation

Target muscles (inc. lateral abdominal muscles)

Required adjustments

Resistance curve

Inertial resistance

Friction coefficient minimisation

**Test weighting 75%**

### Maschine design<sup>1</sup>

### Safety features<sup>1, 2</sup>

Pinch, cut, trip or impact hazards

### Technical details<sup>1</sup>

Dimensions (L x W x H) [cm]

Gross weight<sup>3</sup>

Price<sup>3</sup> [Euro exc. VAT]

### Overall rating

### Equipment Test Table - Abdominal Machines

					
<b>Cybex</b> Eagle abdominal	<b>Gym 80</b> Sygnum abdominal machine special (Pelvic support not illustrated)	<b>Life Fitness</b> Signature Crunch	<b>Nautilus</b> Nitro Abdominal	<b>Schnell</b> 4back abdominal machine	<b>Technogym</b> Personal Selection Abdominal Crunch
☆☆ Pelvic/back padding hard	☆☆☆	☆☆ Arm padding a little hard	☆☆☆	☆☆ Kneepad cuts in slightly	☆☆ Shoulder support rather hard
☆☆☆ Beginner ☆☆☆ Advanced 5 to 138 kg in 2.3 kg increments (3 integrated adapter weights)	☆☆☆ Beginner ☆☆☆ Advanced 5kg to 105kg in 5kg increments	☆☆☆ Beginner ☆☆ Advanced 5 to 102.5 kg in 2.5kg increments (3 integrated adapter weights)	☆☆☆ Beginner ☆☆ Advanced 9 to 95kg in 2.3kg increments (2 integrated adapter weights)	☆☆☆ Beginner ☆☆ Advanced 5 to 75kg in 2.5kg increments (with optional adapter weights)	☆☆☆ Beginner ☆☆ Advanced 2.5 to 67.5kg in 2.5kg increments (1 integrated adapter weight)
☆☆☆	☆☆☆	☆☆☆	☆☆ Slightly limited for smaller users	☆☆☆	☆☆☆
☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆ (Start angle)	☆☆☆
Possible for all machine settings	Possible for all machine settings	Possible for all machine settings	Possible for all machine settings	Kneepad and weights yes; back roll and start angle no	Weights, yes
<b>Very good (1,3)</b>	<b>Very good (1,4)</b>	<b>Very good (1,4)</b>	<b>Very good (1,5)</b>	<b>Good (1,7)</b>	<b>Very good (1,3)</b>
Pushing movement very good, various rectus abdominis compartments accessed dynamically. When the grip is moved far forwards (full ROM) a thrusting action is applied to the lumbar portion of the spine that cannot be dissipated via the facet joints; moving the grip far backwards causes high dorsal compression of the intervertebral discs.	Movement is good. Requires a good amount of physical control from the person training or instructor supervision, however. Pressing down of the weight has the effect of an isolated crunch. The latissimus functions as a stabiliser. With higher weights positioning becomes difficult.	The crunch movement occurs with stabilisation of the hip flexor. A minimal wandering of the pivot axis allows a slight increase in flexion. The use of the arm supports causes the Latissimus muscle chain to be worked harder with higher weights.	Good crunch movement with stabilisation of the hip flexor. A slight wandering of the pivot axis allows a certain increase in flexion which compensates somewhat for the less than ideally positioned pivot axis. The arm supports cause the latissimus muscle chain to be worked harder with higher weights.	Good movement: Seat position and chest pad allow a high degree of isolation of the abdominal muscles. Rolling on the curved seat pad is not recommended (pressure on the spine). At heavier weights stabilisation is difficult! Proper use or instruction is necessary	Good movement; with the adaptable support and hip extension a quick start is possible. Pelvic stabilisation is difficult when working with heavier weights! An awkward roll-off of the kinked back pad is hindered by the early contact of the support arm against its stop.
☆☆	☆☆	☆☆	☆☆	☆☆☆	☆☆☆
☆☆☆ All 3 rectus compartments	☆☆☆ For the rectus compartment selected	☆☆☆ For the rectus compartment selected	☆☆☆ For the rectus compartment selected	☆☆☆ For the 3 <sup>rd</sup> rectus compartment	☆☆☆ For the 3 <sup>rd</sup> rectus compartment
●● Unfortunately, high risk	☆☆☆	☆☆	☆☆	☆☆ Depending on start angle and support position	☆☆☆ Arm brakes early
☆☆☆ Knee and hip extension stabilisation	☆☆☆ Hip flexor muscle stabilisation	☆☆☆ Hip flexor muscle stabilisation	☆☆☆ Hip flexor muscle stabilisation	☆☆ Hamstring stabilisation (limited)	☆☆☆ Knee and hip extension stabilisation
☆☆☆ All 3 rectus abdominis compartments	☆☆ Depending on the setting. 1 <sup>st</sup> to 3 <sup>rd</sup> rectus abdominis compartments	☆☆ Depending on the setting. 1 <sup>st</sup> to 3 <sup>rd</sup> rectus abdominis compartments	☆☆ Depending on the setting. 1 <sup>st</sup> to 3 <sup>rd</sup> rectus abdominis compartments	☆☆☆ 3 <sup>rd</sup> rectus abdominis compartment	☆☆☆ 3 <sup>rd</sup> rectus abdominis compartment
☆☆ (Urgently required – start limit missing)	☆☆ (Seat height super, start limit is missing)	☆☆ (Seat height super, start limit is missing)	☆☆ (Seat height super, start limit is missing)	☆☆ (Start limit and shoulder pads are super. Seat height adjustment is missing)	☆☆ Unfortunately there are no limits on the seat height adjustment and start position. The shoulder support is flexible however
☆☆	☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆
☆☆	☆☆	☆☆☆	☆☆	☆☆☆	☆☆☆
☆☆ (Adapter increases friction!)	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
<b>Satisfactory (3,5);</b> for a light load and reduced ROM good (1,8)	<b>Good (2,1)</b>	<b>Satisfactory (2,6)</b>	<b>Good (2,3)</b>	<b>Good (1,7)</b>	<b>Good (1,8)</b>
<b>Good (1,6)</b>	<b>Very good (1,5)</b>	<b>Good (1,7)</b>	<b>Very good (1,5)</b>	<b>Good (1,9)</b>	<b>Very good (1,0)</b>
No objections	No objections	No objections	Potential pinch hazard: on frame and weight plates	Possibility of bumping into lever arm	Machine stability somewhat limited
150 x 112 x 147 [cm]	109 x 92 x 157 [cm]	132 x 119 x 162 [cm]	107 x 104 x 137 [cm]	124 x 100 x 176 [cm]	128 x 105 x 148,5 [cm]
243kg	290kg	216kg	234kg	259kg	207kg
4.790,- Euro	3.490,- Euro	3.399,- Euro	3.595,- Euro	4.400,- € + adapter weights	3.480,- Euro
<b>Satisfactory (2,9);</b> for a light load and reduced ROM good (1,7)	<b>Good (1,9)</b>	<b>Good (2,3)</b>	<b>Good (2,1)</b>	<b>Good (1,7)</b> with the additional weight plates	<b>Good (1,7)</b>

Equipment Test Table – Back Extension Machines

					
<b>Cybex</b> Eagle Back extension	<b>Gym 80</b> Sygnum back extension machine	<b>Life Fitness</b> Signature back extension machine	<b>Nautilus</b> Nitro Lower Back	<b>Schnell</b> 4back back extension machine	<b>Technogym</b> Personal Selection Lower Back
⊗ (Back padding and support are not ideal)	⊗ (Back roll and backrest are not ideal)	⊗ (Back roll, padding and footrest are not ideal)	⊗⊗⊗	⊗⊗ (Back roll and padding are not ideal)	⊗⊗ (Back roll not ideal)
⊗⊗⊗ Beginner ⊗⊗⊗ Advanced 5 to 138kg in 2.3kg increments (3 integrated adapter weights)	⊗⊗ Beginner ⊗⊗⊗ Advanced 5 to 105kg in 5kg increments	⊗⊗⊗ Beginner ⊗⊗⊗ Advanced 5 to 152.5 kg in 2.5kg increments (3 integrated adapter weights)	⊗⊗⊗ Beginner ⊗⊗⊗ Advanced 9 to 95kg in 2.3kg increments (2 integrated adapter weights)	⊗⊗⊗ Beginner ⊗⊗⊗ Advanced 5 to 100kg in 2.5kg increments (with optional adapter weights)	⊗⊗⊗ Beginner ⊗⊗⊗ Advanced 2.5 to 67.5kg in 2.5kg increments (1 integrated adapter weight)
⊗⊗ Limited for smaller users	⊗⊗⊗	⊗⊗ Somewhat limited for taller users	⊗⊗⊗	⊗⊗⊗	⊗⊗⊗
⊗⊗⊗	⊗⊗⊗	⊗⊗⊗	⊗⊗⊗	⊗⊗ (Start angle)	⊗⊗⊗
Possible for all machine settings	Possible for all machine settings	Possible for all machine settings	Possible for all machine settings	Footrest + weights; yes Padded roll + start angle; no	Start angle and weights, yes; padding roll tending to no
<b>Good (1,9)</b>	<b>Good (1,7)</b>	<b>Good (2,0)</b>	<b>Very good (1,1)</b>	<b>Good (1,8)</b>	<b>Very good (1,4)</b>
Movement OK but only suitable for the lumbar spine (lower lumbar regions); curved back padding not recommended for "rolling-on". End limit allows auxotonic training. Stabilisation at high weights becomes impossible.	Movement OK; nice seat position The high backrest unfortunately limits the stretching movement. High weights are very difficult to stabilise.	Movement designed as a dynamic hip extension machine! The machine can only be used for static back extension exercises and an erect posture must be ensured so that the resulting high shear forces are properly dissipated! Stabilisation at high weights becomes impossible.	Very good movement quality; the erector spinae can be isolated and worked in groups. The pelvis should be tilted to the front for optimum ROM and positioning and the avoidance of physical constraints. Is not possible however, to stabilise high weights.	Well isolated lumbar back extension movement. Curved backrest to "roll-on" is not recommended. High weights are very difficult to stabilise.	Very good movement process. Angled back support not used. Stabilisation at high weights becomes impossible.
⊗	●	●●	⊗⊗⊗	⊗⊗	⊗⊗⊗
⊗⊗ Only the lower section of the spine (lumbar vertebrae)	⊗ Limited due to the high backrest	● (Only applies to hip extension)	⊗⊗⊗	⊗⊗⊗	⊗⊗⊗ Lower lumbar region
⊗⊗⊗ (Start position)	⊗⊗⊗ (Start position)	⊗⊗⊗ (Start position)	⊗⊗	⊗⊗⊗ (Start position)	⊗⊗⊗ (Start position)
⊗ Knee and hip extension stabilisation; the pelvis is not stabilised at higher weights	⊗ Knee and hip extension stabilisation; the pelvis is not stabilised at higher weights	● Stabilisation purely via bodyweight; unstable at higher weights	⊗⊗ Knee and hip extension stabilisation; the pelvis is not stabilised at higher weights (the illustrated pelvic belt is unfortunately missing!)	⊗⊗ Knee and hip extension stabilisation; the pelvis is not stabilised at higher weights	⊗⊗ Knee and hip extension stabilisation; the pelvis is not stabilised at higher weights
⊗⊗	⊗⊗	● Only measured for static use	⊗⊗⊗	⊗⊗⊗	⊗⊗⊗
⊗ (Start/end position and foot rest good. Seat adj. and back padding are missing)	⊗⊗ (Start position and back padding are missing)	⊗ (Start position and footrests good, seat height and backrest padding are missing)	⊗⊗ (Seat height and footrests are good, start position and pelvic belt are missing)	⊗⊗ (Start angle, backrest padding and footrest good, seat height adj. is missing)	⊗⊗ (Start angle and backrest padding good, seat height adjustment is missing)
⊗⊗⊗	⊗⊗	⊗⊗	⊗⊗⊗	⊗⊗⊗	⊗⊗⊗
⊗⊗⊗	⊗	⊗⊗⊗	⊗⊗⊗	⊗⊗⊗	⊗⊗⊗
⊗⊗⊗	⊗⊗⊗	⊗⊗⊗	⊗⊗⊗	⊗⊗⊗	⊗⊗⊗
<b>Satisfactory (2,6)</b>	<b>Satisfactory (3,1)</b>	<b>Fair (3,6)</b>	<b>Very good (1,5)</b>	<b>Good (2,1)</b>	<b>Good (1,7)</b>
<b>Good (2,2)</b>	<b>Very good (1,4)</b>	<b>Very good (1,4)</b>	<b>Good (1,8)</b>	<b>Good (1,9)</b>	<b>Very good (1,0)</b>
Potential impact hazard; footrest	Potential tripping hazard; footrest	Potential tripping hazard; footrest	Potential pinch hazard: lever arm on the backrest	Potential impact hazard: sharp-edged footrest, rotary grip	Machine stability somewhat limited
137 x 119 x 147 [cm]	136 x 103 x 157 [cm]	135 x 112 x 163 [cm]	142 x 97 x 137 [cm]	124 x 98 x 176 [cm]	121 x 103 x 148,5 [cm]
279kg	380kg	270kg	260kg	285kg	212kg
5.490,- Euro	3.590,- Euro	3.449,- Euro	3.595,- Euro	4.400,- € + adapter weights	3.480,- Euro
<b>Good (2,4)</b>	<b>Satisfactory (2,7)</b>	<b>Satisfactory (3,2)</b>	<b>Very good (1,4)</b>	<b>Good (2,0)</b>	<b>Good (1,6)</b>

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<b>Machine / Type</b>
<b>Ergonomics and Comfort</b>
Anthropometric contact points
Weights and weight increments
Suitable for both smaller/larger users
Adjustment mechanism ergonomics
Adjustable while seated (in exercise position)
<b>Test weighting 25%</b>
<b>Biomechanics</b>
Movement kinematics
Pivot axis
ROM [range of motion]
Risk of constrained posture
Load dissipation
Target muscles (inc. lateral abdominal muscles)
Required adjustments
Resistance curve
Inertial resistance
Friction coefficient minimisation
<b>Test weighting 75%</b>
<b>Maschine design<sup>1</sup></b>
<b>Safety features<sup>1,2</sup></b>
Pinch, cut, trip or impact hazards
<b>Technical details<sup>1</sup></b>
Dimensions (L x W x H)3 [cm]
Gross weight <sup>3</sup>
Price <sup>3</sup> [Euro exc. VAT]
<b>Overall rating</b>

the most important of which are listed in the tables, that can provide an adequate assessment of the performance and functionality of a particular piece of equipment. The core criteria here are ergonomics and biomechanical considerations.

With light weights, many machines exhibit very good performance. The biomechanical properties of the more sophisticated models only become apparent however, when higher weights are applied. When an athlete needs to call on his or her full reserves of energy to overcome the load then he or she is no longer in a position to cope with awkward axes, adverse resistance behaviour and generally poor positioning of the machine. In the case of smaller training loads, it requires great experience in movement analysis in order to detect biomechanical weaknesses. At higher weights, far more athletes and instructors will be able to recognise the machine's limitations.

In our tests we are dealing with highly professional equipment manufacturers. They haven't successfully maintained their presence in the market over many years by doing nothing! None of the tested equipment scored so little to earn a grade of "poor" or "unsatisfactory". Nevertheless clear differences repeatedly became apparent during the tests and a differentiation between "very good" and "satisfactory" was therefore warranted.

Aside from functionality the following points were also taken into account as important evaluation criteria: "Safety", "comfort in use", "ease of maintenance", "durability", "design", "quality of construction and materials" and of course "price".

The factors "materials used" and "construction and manufacturing quality" were generally dealt with under manufacturers. These are not included in the equipment tables because they must be considered as manufacturer-specific and not equipment-specific issues.

### A brief introduction to the important features of strength training equipment

In the first instance the machine must exhibit proper movement kinematics. This means the actual movement must complement the user's joint movement. For example, during the course of controlled strength training movements under load, if a joint is being exercised that is only intended to flex or extend, then that joint should not be subjected

to thrusting action or rotational forces. The position of the machine's pivot points and/or the movement tracks of the levers/carriages is very important. The muscle that is being trained should be correctly exercised and no unphysiological strains should be exerted. This means that joints that are not being exercised should either not be subjected to forces or they should be stabilised. The stabilised system should correctly channel away the forces generated in the body. Effective muscle training often requires a high degree of joint isolation and of course, a properly co-ordinated training program/cycle.

Ideally, muscles should be trained across their full contractile range in order to avoid issues such as muscle shortening, reduced joint protection and only partial strengthening of the articular cartilage. This range is expressed as ROM (range of motion). There is a risk that



physical constraints may limit the maximum available ROM which may occur if joints or tendomuscular structures are subjected to unphysiological peak forces.

Various independent studies carried out during the 1990s indicated that a resistance curve artificially set by a machine and intended to simulate the body's own performance curve for the purpose of muscle development, is not automatically the most effective. A resistance curve does however make sense if it enables peak forces to be reduced in relation to the movement path or position of the joint.

During strength training weights aren't just simply lifted and then lowered again, they also move at different speeds over the machine's range. Aside from the lifting effort alone kinetic energy is therefore also expended because pulleys, cams, and levers are also being moved. The more weights that are being moved and the faster they travel, the greater the inertia of the system. When the inertia of a system increases then the



peak forces required for each repeated movement and for each training session are also correspondingly greater. High **inertial resistance** limits the machine's spectrum of use and reduces the range of resistances available for training.

The following **equipment comparison tables** set out a number of important criteria that are significant in terms of effectiveness and comparability. For space reasons it has not been possible to list all of the aspects taken into consideration during the tests. Some of these issues will however be discussed later in this report in the section dealing with the respective machine and in further test reports as part of this series.

### Resistance

The capacity of the weight stack on a strength training machine should be designed so that training can commence at relatively low weights with increases possible in gentle increments. This allows even advanced athletes a challenging workout with room for increasing the effort required. A useful feature making gentle increments possible are integrated adapter weights. In this respect *Life Fitness* provides the most effective solution. A triple adapter weight with ergonomic pivoting handles that can be in use in seconds. Fantastic! All manufacturers with the exception of *Gym 80* provide integrated adapter weights or provides them as accessories, as in the case of *Schnell*. In some cases

the rails for the adapter weights or fitting the weights at an angle also cause an increase in friction (see test results table).

It should be mentioned that the weights listed (in kg) should always be taken in context. Only when considered in combination with the disc carrier, eccentrics and lever lengths can the actual weight of the stack fitted be assessed in comparison to the other machines. Our approach to this: practical trials!

### Adjustment of Handles and Pads

The range of possible adjustment methods for seats, chest pads, levers etc, will be examined for each individual machine. Gas struts, snap pins with perforated rails, toothed racks, lever locks and rack and pinion design are used among others. Highly user-friendly to open are the adjusters offered by *Technogym*, *Cybex*, and *Nautilus*. The snap pins for selecting the weights are ergonomically well-placed and are of generally similar design on all of the machines. The *Life Fitness* design could however, be somewhat more practical.

All of the grips on the cable machines tested should be thinner. Grips that are too thick require a greater effort to hold and that effort is even greater when pulling. Padding should have anthropomorphic qualities when under pressure, i.e. it should conform to the body's contours in order to avoid pressure points occurring (see table for results).

### Friction

In the area of friction characteristics all of the manufacturers achieved excellent results. The travel of the weights, friction in the transfer systems such as pulleys, eccentrics etc. has truly been kept to a minimum. There were only very few cases where the friction test exhibited somewhat increased values.

### Scales

On almost all of the machines there were proper marked scales to allow adjustments such as seat height, initial angle or other positions to be clearly noted. This enables users to easily and quickly take up the correct training position when commencing the next training session. Of less importance for advanced users, these aids are however extremely helpful for beginners. All of the manufacturers provided such clear instructions for

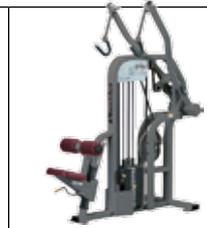


<b>Machine / Type</b>	
<b>Ergonomics and Comfort</b>	
Anthropometric contact points	
Weights and weight increments	
Suitable for both smaller/larger users	
Adjustment mechanism ergonomics	
Adjustable while seated (in exercise position)	
<b>Test weighting 25%</b>	
<b>Biomechanics</b>	
Movement kinematics	
Pivot axis	
ROM [range of motion]	
Risk of constrained posture	
Load dissipation	
Target muscles (inc. lateral abdominal muscles)	
Required adjustments	
Resistance curve	
Inertial resistance	
Friction coefficient minimisation	
<b>Test weighting 75%</b>	
<b>Maschine design<sup>1</sup></b>	
<b>Safety features<sup>1,2</sup></b>	
Pinch, cut, trip or impact hazards	
<b>Technical details<sup>1</sup></b>	
Dimensions (L x W x H) <sup>3</sup> [cm]	
Gross weight <sup>3</sup>	
Price <sup>3</sup> [Euro exc. VAT]	
<b>Overall rating</b>	

### Equipment Test Table – Rotary Torso Machines

					
<b>Cybex</b> Eagle Rotary Torso	<b>Gym 80</b> Sygnum Twister Maschine	<b>Life Fitness</b> Signature Twister	<b>Nautilus</b> Nitro Rotary Torso	<b>Schnell</b> 4back Rotary Torso Machines	<b>Technogym</b> Personal Selection Rotary Torso
○○○	○○ Arm rolls	○○○	○○○	○○○	○○ Shoulder support hard
○○○ Beginner ○○○ Advanced 5 to 138kg in 2.3kg increments (3 integrated adapter weights)	○○ Beginner ○○○ Advanced 5 to 25kg in 2.5kg increments and up to 85kg in 5kg increments	○○○ Beginner ○○○ Advanced 5 to 102.5kg in 2.5 kg increments (3 integrated adapter weights)	○○○ Beginner ○○○ Advanced 9 to 95 kg in 2.3kg increments (2 integrated adapter weights)	○○○ Beginner ○○○ Advanced 5 to 75kg in 2.5kg increments (with optional adapter weights)	○○○ Beginner ○○○ Advanced 2.5kg to 67.5 kg in 2.5 kg incr. (1 integrated adapter weight)
○○○	○○ Somewhat limited for taller users	○○ Somewhat limited for taller users	○○○	○○○	○○○
○○○	○○○	○○○	○○○	○○○	○○ Starting position tight
Possible for all machine settings; mounting the machine is difficult	Possible for all machine settings	Chest pads yes, start angle no	Possible for all machine settings	Possible for all machine settings	Possible for all machine settings
<b>Very good (1,2)</b>	<b>Very good (1,5)</b>	<b>Very good (1,3)</b>	<b>Very good (1,1)</b>	<b>Very good (1,2)</b>	<b>Good (1,7)</b>
The rotational movement is effected by load application through the shoulder girdle. Erect posture and good contact with the chest pad are essential; high degree of back extension required. Due to a relatively high degree of inertia and a diverging pivot point the movement is slightly limited.	The load application is effected either through just the shoulder girdle with use of the chest/shoulder muscles (risk of improper use) or by way of the lower thoracic vertebrae through the low cut back rest (shorter spinal segment). Good leg lock due to the abd/add supports. Diverging pivot point limits rotation.	Load application through the thighs and pelvic area. Through an erect posture (i.e. rotation without moving the hips) a position close to an everyday situation is created. Nevertheless, instruction is required for avoiding unhealthy alignment. Smooth movements and close contact with the chest padding are essential!	The load application is effected through the shoulder girdle with use of the chest/shoulder muscles. Good spinal rotation with little inertia. The shoulder joints are subjected to increased strain and it is difficult to stabilise the pelvis and shoulder girdle.	Almost perfect rotational movement. The load is applied without using accessory muscles via the shoulder girdle. Somewhat increased pressure from the chest pad with high weights. Pelvic stabilisation limited.	Load is applied through the shoulder girdle by means of the hand-held shoulder bar. The existing pivot point and high inertia cause not only reduced range of movement and useable weight, but sadly also take away any fun one might have had during the work out.
○	●	○○○	○○○	○○○	●●
○○ Slightly limited due to the pivot point	○○ Slightly limited due to the pivot point	○○○	○○○	○○○	● Limited by the pivot point
○○○	○○○	○○ (Start angle adjusts only to a limited degree)	○○○	○○○	○○○
○ Via hip adductors and high degree of back extension	○ Via the hip adductors/abductors and chest/shoulder/arm extension	○○ Via hip abductors and back extension	○ Via the hip adductors and chest/shoulder/arm extension	○○ Via hip adductors; the upper body is fixed in adjustable positions	○○ Via the hip adductors and back extension via the shoulder bar
○○	○○	○○○	○○○	○○○	○○
○○○	○○	○○ (Possible, although reach is somewhat limited)	○○	○○○	○○
○○○	○○○	○○○	○○○	○○○	○○○
○	○○○	○○	○○○	○○○	○
○○○	○○○	○○○	○○○	○○○	○○
<b>Satisfactory (3,0)</b>	<b>Satisfactory (3,3)</b>	<b>Good (1,6)</b>	<b>Good (2,0)</b>	<b>Very good (1,3)</b>	<b>Fair (4,1)</b>
<b>Good (2,2)</b>	<b>Very good (1,4)</b>	<b>Good (1,6)</b>	<b>Very good (1,4)</b>	<b>Good (2,0)</b>	<b>Very good (1,3)</b>
Impact hazard: head, potential contact with lever suspension	No objections	No objections	○○ (Only the weight stack)	No objections	tripping hazard; footrest
122 x 119 x 193 [cm]	140 x 85 x 127 [cm]	122 x 91 x 163 [cm]	112 x 91 x 145 [cm]	94 x 86 x 210 [cm]	118,5 x 112 x 148,5 [cm]
314kg	325kg	236kg	241kg	258kg	197kg
5.690,- Euro	3.690,- Euro	3.699,- Euro	3.795,- Euro	4.350,- Euro + Adapter	3.480,- Euro
<b>Good (2,5)</b>	<b>Satisfactory (2,8)</b>	<b>Very good (1,5)</b>	<b>Good (1,8)</b>	<b>Very good (1,3)</b>	<b>Satisfactory (3,5)</b>

Equipment Test Table – Lat Pulldown Machines

					
<b>Cybex</b> Eagle Lat Pulldown	<b>Gym 80</b> Sygnum Back Extension Machine	<b>Life Fitness</b> Signature Lat Pulldown	<b>Nautilus</b> Nitro Lat Pulldown	<b>Schnell</b> 3D Lat Pulldown Machine	<b>Technogym</b> Personal Selection Pulldown
☆☆☆	☆☆ Oval metal thigh support ok, but rather hard	☆☆☆	☆☆☆	☆☆ Wide area thigh pads good however rather hard	☆☆☆
☆☆ Grips clearly too thick	☆☆ Should be thinner	☆☆ Somewhat too thick and the rubber grips slipped	☆☆☆ Could be a slightly thinner	☆☆ Relatively thick and not ideal in terms of positioning	☆☆ Should be thinner
☆☆☆ Beginner ☆☆☆ Advanced 5 to 138kg in 2.3 kg increments (3 integrated adapter weights)	☆☆☆ Beginner ☆☆☆ Advanced 5 to 55kg in 5kg increments and up to 135 in 8kg increments	☆☆☆ Beginner ☆☆☆ Advanced 5 to 152.5kg in 2.5kg increments (3 adapter weights)[Top!]	☆☆☆ Beginner ☆☆☆ Advanced 9 to 115kg in 2.3kg increments (2 integrated adapter weights)	☆☆☆ Beginner ☆☆ Advanced 5 to 75kg in 2.5 increments (with optional adapter weights)	☆☆☆ Beginner ☆☆ Advanced 2.5 kg to 102.5kg in 2.5kg increments (1 integrated adapter weight)
☆☆☆	☆☆ For smaller users this machine is biomechanically limited	☆☆☆	☆☆☆	☆☆☆	☆☆☆ For taller users height of stroke is limited
☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
Possible for all machine settings	Seat height yes, weight no	Possible for all machine settings	Possible for all machine settings	Seat and thigh pads yes, weights only barely	Possible for all machine settings
<b>Very good (1,3)</b>	<b>Good (1,7)</b>	<b>Very good (1,5)</b>	<b>Very good (1,2)</b>	<b>Good (2,0)</b>	<b>Very good (1,3)</b>
Very good lat pulldown with separately moveable levers and grips with ideal divergence. From a forward lean the pull is carried out directly towards the middle of the body. It is better not to use the folding function of the levers because there is a risk of increased strain on the joints!	Good lat pulldown with separately moveable levers and grips with ideal divergence and range of movement. Increased inertia at low weights is a negative factor. Pivot axis position of the levers reduces effectiveness at the end of the movement.	Good lat pulldown with permanently coupled levers. Grips are fixed and diverge far outwards when pulled downwards. Very good seat position. Pivot axis of the lever reduces effectiveness at the end of the movement.	A very pleasant lat pulldown with grips that can be pulled directly along the longitudinal axis of the body. The rotating grips that can be moved in opposition to one another allow for a great freedom of movement even though the levers are permanently coupled.	Proper lat pulldown with diverging grips. Grips are permanently coupled and have only limited twisting movement. Movements are slightly limited through the position of the handles and their linear divergence.	Good lat pulldown with separately moveable levers. The movement range diverges straight away and remains so over a wide grip range. Unfortunately only one fixed grip shape is available.
☆☆☆	☆☆	☆☆	☆☆	☆☆	☆☆
☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆
☆☆☆ Via body weight and braced seat/leg pad arrangement	☆☆ Via body weight and finally hip flexor extension against the pad rolls	☆☆ Via body weight and finally hip flexor extension against the pad rolls	☆☆☆ Via body weight and braced seat/leg pad arrangement	☆☆☆ Via body weight and braced seat/leg pad arrangement	☆☆ Via body weight and finally hip flexor extension against the pad rolls
☆☆☆ Seat and thigh pads are good	☆☆ Seat is good but a thigh support is missing	☆☆ Seat is good but a thigh support is missing	☆☆☆ Seat and thigh support good	☆☆☆ Seat and thigh pads (height and width good)	☆☆ Seat is good but a thigh support is missing
☆☆	☆☆☆	☆☆	☆☆	☆☆	☆☆
☆☆☆	☆☆	☆☆☆	☆☆☆	☆☆	☆☆☆
☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆	☆☆☆
<b>Very good (1,5)</b>	<b>Good (2,0)</b> However only from the 4 <sup>th</sup> weight plate	<b>Good (2,1)</b>	<b>Very good (1,5)</b>	<b>Satisfactory (2,7)</b>	<b>Good (2,1)</b>
<b>Good (2,5)</b>	<b>Good (2,0)</b>	<b>Very good (1,4)</b>	<b>Good (2,0)</b>	<b>Good (2,0)</b>	<b>Very good (1,4)</b>
No objections	No objections	No objections	No objections	No objections	No objections
172 x 119 x 190 [cm]	145 x 135 x 225 [cm]	137 x 132 x 198 [cm]	185 x 76 x 217 [cm]	170 x 79 x 204 [cm]	129,5 x 95 x 188,5 [cm]
320kg	420kg	259kg	268kg	262kg	290kg
5.890,- Euro	4.490,- Euro	3.599,- Euro	3.595,- Euro	4.200,- Euro + adapter weights	3.630,- Euro
<b>Very good (1,4)</b>	<b>Good (1,9)</b> However only from the 4 <sup>th</sup> weight plate	<b>Good (1,9)</b>	<b>Very good (1,4)</b>	<b>Good (2,5)</b>	<b>Good (1,9)</b>

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Rating: ☆☆☆ very good, ☆☆ good, ☆ satisfactory, ● fair, ●● unsatisfactory

The categories, with the percentage score stated, are incorporated into the calculation of the overall score.

<sup>1</sup> Evaluations/results were not used in calculating the overall score.

<sup>2</sup> In terms of safety, only problems that could be visually detected by users were taken into consideration. Equipment was for example, not tested for load capacity, nor was compliance with binding European Standard EN 957, concerning the safety of stationary training equipment, checked.

<sup>3</sup> According to manufacturer's information

All machine tests were carried out impartially and in good faith, however no guarantees of any type are given or implied.



<b>Machine / Type</b>
<b>Ergonomics and Comfort</b>
Anthropometric contact points
Grips
Weights and weight increments
Suitable for both smaller/larger users
Adjustment mechanism ergonomics
Adjustable while seated (in exercise position)
<b>Test weighting 25%</b>
<b>Biomechanics</b>
Movement kinematics
Pivot axis
ROM [range of motion]
Load dissipation
Required adjustments
Resistance curve
Inertial resistance
Friction coefficient minimisation
<b>Test weighting 75%</b>
<b>Maschine design<sup>1</sup></b>
<b>Safety features<sup>1,2</sup></b>
Pinch, cut, trip or impact hazards
<b>Technical details<sup>1</sup></b>
Dimensions (L x W x H)³ [cm]
Gross weight²
Price <sup>3</sup> [Euro exc. VAT]
<b>Overall rating</b>

positioning we decided to omit this from the equipment test table.

### Instructions for Use

All of the manufacturers not only provided instructions for using the equipment itself, but also safety warnings concerning possible dangers should the machine be used without supervision. For the most part instructional diagrams, written directions, adjustment instructions as well as an indication of the muscle group to be worked were included. The instructions supplied by *Cybox* were the most professional in terms of clarity of diagrams and layout. Instructions from the other manufacturers were also however, perfectly acceptable. *Gym 80* would be well advised to enhance its written directions and safety warnings. For a market of one hundred million German speaking people *Nautilus* would also do well to translate its user instructions into German (we only found German instructions for one machine!)

The clarity of detailed instructions for individual exercises should be checked and improved upon by all of the manufacturers.

### Build Quality

All six manufacturers clearly produce top of the line equipment. Practically all of the materials used are of high quality. Whether it's the bearings, guide rods, adjustment levers, and padding; all of the machines boasted durable, maintenance-friendly materials suitable for easy movement and usage. The manufacturers clearly deserve to earn a good reputation in this area. Individual machines showed slight but tolerable asymmetry in some of the welded parts. All of the machines have a powder coated surface. This high temperature process achieves a highly durable finish that is far superior to painting. In terms of durability, *Gym 80* and *Schnell* proved to be slightly above the other test candidates but the others still remain in the front line.

### Linkages

All of the manufacturers also employ the best quality materials for the components used for lifting the selected weight plates and transmitting the resistance for the exercise being worked. *Life Fitness*, *Technogym* and in part *Cybox* use steel ropes encased in nylon which originate in aircraft manufacture and have a tensile strength of 1.8t. *Gym 80* uses steel bands with a 2t capacity, *Nautilus* and in part *Cybox* use kevlar belts with



a tensile strength of 1.5t to 3t (depending on the thickness) and *Schnell* uses highly flexible safety belt material (as used in motor vehicles) with a very high a tensile strength of over 2t. Even if the safety belts exhibit an advantage due to the bending frequency, all of the manufacturers were awarded a rating of very good.

### Safety

In the late 1980s a binding DIN standard was introduced for fixed training equipment and in 1990 my father and I participated in the formulation and enactment of this standard. The current European Standard DIN ES 957 is derived from this. The standard governs technical safety issues relating to training equipment e.g., the required continuous-load capability, how cables are to be routed or how weight stacks should be covered.

During our equipment tests safety features such as continuous load testing were not assessed. According to manufacturer statements all of the tested equipment complies with the requirements of DIN ES 957. With the exception of *Nautilus* all of the manufacturers are actually certified to ES 957. Our cursory visual examination revealed practically no non-conformities – minor points are noted under the corresponding equipment section. Overall, the manufacturers can all be complimented here. With regard to the Nitro range of equipment from *Nautilus*, only the Nitro

Plus range comprising the Abdominal, Lower Back and Rotary Torso machines should be offered as only those have weight stack covers of sufficient height.

### Design

Of course form and colour are a matter of personal taste and customers will have their own opinions on this matter. Nevertheless, a few observations on form and design would not be amiss here. *Technogym* is head and shoulders above the rest in the design department.

Looking at their design, one immediately realises that it is well worth employing true experts. *Technogym* has been able to break away from the earlier “tin can” image of its Isotonic Line and, by using top designers, achieve a quantum leap in the styling of its Selection Line. This equipment is clearly all from the same mould. Others as well, for example *Gym 80* and *Life Fitness* produce taste-



fully designed equipment. Overall, all of the tested equipment exhibits a high standard of design. None of the manufacturers loses points in this category and therefore the scores are rather close.

Nevertheless customers should still remember that seat coverings and frame colours are important aspects in the overall visual impression. For this test the range of choices available to the customer were not factored in. The result of some rather unfortunate choices of seat and frame colours is all too apparent in certain fitness centres. More helpful tips and advice for selecting pleasing colour combinations – as offered by *Technogym* – would certainly be welcome here.

### Purchase Costs

If we take the expected service life of strength training equipment into consideration and then factor in the number of hours a machine will be used in daily service at a fitness centre, it becomes clear that the purchase price alone should not be the single deciding fac-

tor when buying a machine. Its features and build quality are far more important here.

## The Individual Machines Under Test

### Abdominal Machines

For all of these abdominal machines the weight of the person training is thankfully no longer a consideration. This means that an effective abdominal workout is possible for all users, including weaker or heavier ones.

Unfortunately some manufacturers still continue the bad habit of making abdominal and back extension machines with lordotically contoured hip/back-rest pads over which the athlete is supposed to roll on and off. Such movement would be physiologically beneficial in terms of spinal mechanics, but not on equipment that has a fixed axis of rotation! With increasing distance between the machine’s fixed axis and the lumbar discs that are being bent or stretched, additional lateral forces are created that must be absorbed unnecessarily by the spinal segments! Training other spinal segments can be carried out step-by-step by altering the seat height and another force direction altogether is required for full stretching of the abdominal muscles.

*Schnell* and *Technogym* lead the test pack here. One limitation on the *Schnell* machine however, is that the curved backrest cannot be used due to the start angle setting. The other manufacturers are close on the heels of these leaders. A very good form of movement is provided by *Cybex* through its use of the multi-segmental method.

*Cybex* would lead the pack but unfortunately the method they have employed for force application causes shear forces and disc compression that can only be poorly compensated for. For smaller amplitudes of movement however, they are advantageous to training.

### Back Extension Machines

This is where the greatest difference in the results became apparent. *Nautilus* is clearly the winner with an excellent machine indeed. Hopefully the seat belts that were removed by the factory will be permanently reintroduced on production machines and the starting angle re-worked. *Technogym* also have a good product and land themselves in close second place with a very good score. *Life Fitness* can only garner a weak “satisfactory” because it does not offer a back extension machine, just a hip extension



<b>Machine / Type</b>	
<b>Ergonomics and Comfort</b>	
Anthropometric contact points	
Grips	
Weights and weight increments	
Suitable for both smaller/larger users	
Adjustment mechanism ergonomics	
Adjustable while seated (in exercise position)	
<b>Test weighting 25%</b>	
<b>Biomechanics</b>	
Movement kinematics	
Pivot axis	
ROM [range of motion]	
Load dissipation	
Required adjustments	
Resistance curve	
Inertial resistance	
Friction coefficient minimisation	
<b>Test weighting 75%</b>	

<b>Maschine design<sup>1</sup></b>	
<b>Safety features<sup>1, 2</sup></b>	
Pinch, cut, trip or impact hazards	
<b>Technical details<sup>1</sup></b>	
Dimensions (L x W x H) [cm]	
Gross weight <sup>3</sup>	
Price <sup>3</sup> [Euro exc. VAT]	
<b>Overall rating</b>	

### Equipment Test Table – Seated Rowing Machines

					
<b>Cybex</b> Eagle Row	<b>Gym 80</b> Sygnum Rowing Machine	<b>Life Fitness</b> Signature Rower	<b>Nautilus</b> Nitro Compound Row	<b>Schnell</b> 3D Rowing Maschine	<b>Technogym</b> Personal Selection Low Row
☉☉☉	☉☉ Chest pad could be softer	☉☉☉	☉☉☉ Only the seat surface	☉☉ Chest pad could be slightly softer	☉☉ Chest pad very small
☉☉ Grips are too thick	☉☉ Grips are too thick	☉☉☉ Should be thinner with a more firmly affixed rubber grip! The grips are positioned rather low	☉☉☉ Could be slightly thinner	☉☉☉ Should be thinner and the outer grips should be angled	☉☉☉ Grips are too thick
☉☉☉ Beginner ☉☉☉ Advanced 5 to 138kg in 2.3 kg increments (3 integrated adapter weights)	☉☉☉ Beginner ☉☉☉ Advanced 5 to 135kg in 5kg increments	☉☉☉ Beginner ☉☉☉ Advanced 5 to 152kg in 2.5kg increments (3 integrated adapter weights)	☉☉☉ Beginner ☉☉☉ Advanced 9 to 115kg in 2.3kg increments (2 integrated adapter weights)	☉☉☉ Beginner ☉☉☉ Advanced 5 to 75 kg in 2.5Kg increments (with optional adapter weights)	☉☉☉ Beginner ☉☉☉ Advanced 2.5 to 97.5 kg in 2.5Kg increments (1 integrated adapter weight)
☉☉☉ For larger users the chest padding and adjustment could be broader	☉☉☉	☉☉☉ Somewhat limited for taller users	☉☉☉	☉☉☉	☉☉☉ Somewhat limited for taller users
☉☉☉	☉☉☉	☉☉☉	☉☉☉	☉☉☉	☉☉☉
Possible for all machine settings	Seat and chest support yes, weights no	Possible for all machine settings	Weights no, others not possible	Seat and chest support yes, weights no	Possible for all machine settings
<b>Very good (1,3)</b>	<b>Good (1,6)</b>	<b>Good (1,6)</b>	<b>Very good (1,4)</b>	<b>Very good (1,5)</b>	<b>Good (1,8)</b>
Very good rowing motion with independent lever suspension. The angled overhead pivot axis provides an optimum movement path with wide ranging ROM and ideal arm geometry.	Good rowing motion with independent lever suspension. The diverging grips are ideal but effectiveness is unfortunately sacrificed due to the pivot axis of the lever. The integrated machine mounting step makes starting the workout easier.	Proper diverging rowing movement with permanently coupled grips that can be moved in opposition to one another. The position of the pivot axis does however reduce effectiveness towards the end of the movement. The exercise should be carried out seated lower and as far forward as possible.	Good controlled rowing motion without torso support. The permanently coupled grips that can be moved in opposition to one another together with the favourable resistance curve allow full back extension. High lever inertia requires however, that at least 4 weight plates are used to provide resistance.	Good back extension exercise during which the movement path of the grips simulates the structure of the shoulder girdle very well. The levers are permanently coupled and the grips fixed.	Comfortable rowing machine with free individual lever suspension individual and low inertia. The position of the pivot axis does however reduce effectiveness towards the end of the movement. The exercise should be carried out seated lower and as far forward as possible.
☉☉☉	☉	☉	☉☉☉	☉☉	☉
☉☉☉	☉☉☉	☉☉☉	☉☉☉ ☉ With 1-2 weights	☉☉☉	☉☉☉
☉☉☉ Via the chest pad	☉☉☉ Via the chest pad	☉☉☉ Via the chest pad	☉☉☉ Via the knee and hip muscles against the large footrest	☉☉☉ Via the chest pad	☉☉☉ Via the chest pads (high pressure point) or via the footrest (unfavourable ISJ-protection)
☉☉☉ Possible for seat and chest pads	☉☉☉ Possible for seat and chest pads	☉☉☉ Possible for seat and chest pads	No relevant adjustment needed	☉☉☉ Possible for seat and chest pads	☉☉☉ Possible for seat and chest pads
☉☉☉	☉☉☉	☉☉☉	☉☉☉ Higher loads ☉☉☉ Lower loads	☉☉☉	☉☉☉
☉☉☉	☉☉☉	☉☉☉	☉☉☉	☉☉☉	☉☉☉
<b>Very good (1,5)</b>	<b>Good (1,9)</b>	<b>Satisfactory (2,8)</b>	<b>Very good (1,5)</b> but only with 4 weight plates or more	<b>Good (1,8)</b>	<b>Good (2,2)</b>
<b>Good (2,4)</b>	<b>Very good (1,1)</b>	<b>Very good (1,3)</b>	<b>Good (1,9)</b>	<b>Very good (1,5)</b>	<b>Very good (1,1)</b>
No objections	No objections	No objections	No objections	No objections	No objections
165 x 102 x 198 [cm]	180 x 130 x 157 [cm]	152 x 142 x 162 [cm]	191 x 89 x 170 [cm]	166 x 82 x 168 [cm]	120,5 x 113,5 x 149 [cm]
309kg	415kg	264kg	240kg	240kg	268kg
5.890,- Euro	4.490,- Euro	3.449,- Euro	3.595,- Euro	4.200,- Euro + Ad. weights	3.480,- Euro
<b>Very good (1,4)</b>	<b>Good (1,8)</b>	<b>Good (2,5)</b>	<b>Very good (1,5)</b> however no chest support and only with 4 weight plates or more	<b>Good (1,7)</b>	<b>Good (2,1)</b>

Rating: ☉☉☉ very good, ☉☉ good, ☉ satisfactory, ● fair, ●● unsatisfactory  
 The categories, with the percentage score stated, are incorporated into the calculation of the overall score.  
 1 Evaluations/results were not used in calculating the overall score.  
 2 In terms of safety, only problems that could be visually detected by users were taken into consideration. Equipment was for example, not tested for load capacity, nor was compliance with binding European Standard EN 957, concerning the safety of stationary training equipment, checked.  
 3 According to manufacturer's information  
 All machine tests were carried out impartially and in good faith, however no guarantees of any type are given or implied.

					
<b>Cybex</b> Bent-leg Abdominal Board	<b>Gym 80</b> Sygnum Abdominal Bench	<b>Life Fitness</b> Hammer Strength Abdominal board	<b>Nautilus</b> Free Weight Adjustable Abdominal Bench	<b>Schnell</b> Abdominal Bench	<b>Technogym</b> Personal Selection Anatomic Bank
☼☼☼	☼☼☼	☼☼ Good except for the pad bend at the knee	☼☼☼	☼☼☼ Pelvis depression very good, knee pad ok	☼☼☼
☼☼☼	☼ Only possible through heel pull	☼☼ Ideal only for medium height users	● Foot/leg pads	☼☼ Good except for the lumbar support	☼☼☼
☼☼☼	☼☼☼	☼ Limited for smaller and taller users	☼ Not suitable for shorter users	☼☼☼	☼☼☼
☼☼	☼☼☼	None	☼☼	☼☼☼	☼☼☼
Both crunches and sit-ups can be carried out during which a constant hip flexor extension is applied. The first 3 rectus abdominis compartments can be worked.	When simply placing the legs on the leg rest, only the first rectus compartment is worked. Only by pulling at the edge of the pad with ones heels is a complete crunch for the first 3 rectus compartments possible.	Designed as a sit up bench for advanced users. Fast mounting possible. The first 3 rectus abdominis compartments can be worked.	Due to the impractical leg position/stabilisation only a barely satisfying crunch exercise is possible. Working of the first 3 rectus compartments possible.	Isolated crunch movement without the risk of arching the back. Where possible avoid excessive lordotic curvature (set the backrest to the vertical position). The first 3 rectus compartments can be worked.	Good crunch movement with hip flexor stabilisation (foot roll); it is required here that the user avoids an arched back posture. The second possible exercise with the feet on the roll is rather unstable. This works the first 3 rectus compartments.
No, as long as a arched back posture is not adopted	No	Possible for all users who cannot complete sit ups	Possible for all users who cannot complete a crunch	No, but only when a lordotic curvature posture is not adopted	No, but only when a lordotic curvature posture is not adopted
By stabilising the calf (hip flexor)	Via the pelvis and lumbar region. Through heel pulls via the hamstrings	By stabilising the calf (hip flexor)	Via calf roll (hip flexor)	Via the knee pad (leg flexor muscles); sufficient knee bending ability is essential here	Via the foot rolls (hip flexors)
Calf pads and angle from 10° to -30°	Calf pad height adjustable	No adjustment possible	Angle of recline from 0° to -20°, foot and leg pad adjustment are unfortunately missing	Knee pad and backrest angle (should however, always be set to vertical!)	Feet/leg pads and an angle of recline from +15° to -15°
<b>Good (2,5)</b>	<b>Satisfactory (3,2)</b> With heel pull <b>Good (2,3)</b>	<b>Satisfactory (2,8)</b>	<b>Satisfactory (3,5)</b>	<b>Good (2,1)</b>	<b>Good (1,9)</b>

<b>Good (1,7)</b>	<b>Very good (1,5)</b>	<b>Good (2,4)</b>	<b>Very good (1,5)</b>	<b>Good (1,9)</b>	<b>Very good (1,3)</b>
Potential pinch hazard: height adjustment lever	No objections	No objections	No objections	Potential pinch hazard: the height adjustment lever (according to the manufacturer however, this has been resolved in production machines)	No objections
143 x 59 x 115 [cm]	140 x 80 x 90 [cm]	170 x 60 x 88 [cm]	160 x 61 x 96 [cm]	113 x 70 x 87/117 [cm]	144 x 66 x 85 [cm]
58kg	80kg	38kg	49kg	44kg	44kg
1.980,- Euro	690,- Euro	899,- Euro	835,- Euro	750,- Euro	1.170,- Euro

					
<b>Cybex</b> Eagle 45° Back Extension	<b>Gym 80</b> Sygnum 45° Back Extension	<b>Life Fitness</b> Hammer Strength Back extension	<b>Nautilus</b> Free Weight Adjustable Hip Extension	<b>Schnell</b> 45° Back Station	<b>Technogym</b> Personal Selection Lower Back Bank
☼☼☼	☼☼ Thigh pad somewhat hard	☼☼☼	☼☼☼	● Thigh and calf pads too hard. Footrest too small	☼☼☼
☼ Alignment and user positioning could be improved	☼ Alignment and user positioning could be improved	☼☼ Alignment and user positioning good	☼☼ Alignment and user positioning good	● Alignment and user positioning could be improved	☼☼☼ Alignment and user positioning very good
Height adjustment satisfactory	Height adjustment somewhat cumbersome (angle adjustment could not be tested)	Height adjustment somewhat cumbersome	Height adjustment satisfactory; angle adjustment ok	Height adjustment good	Height adjustment very good
Back extension possible. For a bent knee position one should rotate the hip outwards	Back extension possible. For a bent knee position one should rotate the hip outwards	Both back extension and hip extension exercises possible	Both back extension and hip extension exercises possible	Back extension exercises possible. For a bent knee position one should rotate the hip outwards	Both back extension and hip extension exercises possible
Possible for the knee area	Possible for the knee area	Barely possible	Barely possible	Fully possible in the knee area	Not possible
Height adjustment possible Angle of inclination 45°	Height adjustment plus recline angle from 30° to 50°	Height adjustment possible Angle of recline 50°	Height adjustment plus angle of recline from 40° to 60°	Height adjustment possible Angle of recline 45°	Height adjustment possible Angle of recline 45°
<b>Good (2,2)</b>	<b>Good (2,5)</b>	<b>Good (1,9)</b>	<b>Good (1,7)</b>	<b>Fair (3,7)</b>	<b>Very good (1,1)</b>
<b>Good (1,6)</b>	<b>Good (1,8)</b>	<b>Good (2,0)</b>	<b>Good (1,9)</b>	<b>Satisfactory (2,6)</b>	<b>Very good (1,1)</b>
Potential cuts hazard: the height adjustment lever	Potential cut hazard at the height adjustment lever and tripping hazard at the floor outrigger	Potential tripping hazard: floor outrigger	Potential cut hazard: the height adjustment lever	No objections	No objections
147 x 69 x 109 [cm]	143 x 65 x 90 [cm]	150 x 72 x 108 [cm]	142 x 76 x 81 [cm]	115 x 80 x 74/87 [cm]	121,5 x 66 x 72 [cm]
53kg	59kg	61kg	42kg	31kg	ca. 30kg
1.480,- Euro	790,- Euro	749,- Euro	835,- Euro	470,- Euro	940,- Euro



### Equipment Test Table Abdominal Benches

<b>Machine / Type</b>
Anthropometric contact points
Pads position
Suitable for both smaller/larger users
Adjustment mechanism ergonomics
Possible exercise kinematics
Risk of constrained posture
Load dissipation
Required adjustments
<b>Overall rating</b>
<b>Maschine design<sup>1</sup></b>
<b>Safety features<sup>1,2</sup></b> Pinch, cut, trip or impact hazards
Dimensions (L x W x H) <sup>3</sup> [cm]
Gross weight <sup>3</sup>
Price <sup>3</sup> [Euro exc. VAT]

### Equipment Test Table Back Extension Benches

<b>Machine / Type</b>
Anthropometric contact points
Pads position
Adjustment mechanism ergonomics
Possible exercise kinematics
Risk of constrained posture
Required adjustments
<b>Overall rating</b>
<b>Maschine design<sup>1</sup></b>
<b>Safety features<sup>1,2</sup></b> Pinch, cut, trip or impact hazards
Dimensions (L x W x H) <sup>3</sup> [cm]
Gross weight <sup>3</sup>
Price <sup>3</sup> [Euro exc. VAT]

machine and this has rather weak hip stabilisation. The other manufacturers are firmly ranked in the middle. *Gym 80* however should re-evaluate its pivot point.

#### Rotary Torso Machines

During vertebral rotation there is a difference if the machine introduces the load from above or from below. One method is not necessarily better than the other – they are just a little different! Introducing the load from below simulates the process in which high hip joint loads are generated in order to generate high arm/shoulder accelerations (as in throwing, rebound sports and the martial arts). Introducing the load from above on the other hand, simulates normal daily movements with vertebral rotation.

*Schnell* clearly takes pole position. There was a slight deviation from the ideal middle position of the two shoulder pads on the machine tested, but the movement, adjustments, biomechanics and ergonomics were otherwise excellent. Only a few more weights, possibly an adjustment scale, and the corresponding adduction support pads would make this machine perfect. Unfortunately *Technogym* comes last here – this machine belongs back on the drawing board. *Life Fitness* is the only one of our line-up to offer a machine that applies a load through the pelvic area and this excellent machine takes second place in our ranking.

#### Seated Rowing Machines

*Nautilus* unfortunately doesn't offer a seated rowing machine with a chest support. There used to be a good machine in the "2<sup>st</sup>" range but strangely there is no longer an equivalent in the Nitro range. For this reason we had to evaluate the compound rowing machine although this machine is more like a compromise between a stand-alone rowing machine and a free long pulley exercise machine.

Seated rowing machines, like latpull machines, can be used with both permanently coupled and independently suspended levers. Both systems have their plus points. With independently suspended levers both sides of the body are subjected to identical loads and resistances and over the long term there is much to say in favour of the independent lever design. At least one such

machine should have its place in every gym's equipment pool. The diverging grips are a welcome feature.

In this category the *Cybex* machine offers the best performance. An excellent lever arrangement, individual lever suspension, good grip positions and substantial pad supports are convincing arguments. But the other manufacturers are not far behind! *Nautilus*, *Schnell*, *Gym 80* and *Technogym* all follow hard on each other's heels.

#### Latpull Machines

Except for *Schnell* all the manufacturers earn above average test scores. A super outcome! *Cybex* and *Nautilus* lead the field. Separately adjustable thigh and seat pads like those of *Nautilus*, *Schnell* and *Cybex* are a definite advantage in terms of adjusting the machine's range of movement.

#### Back Extension Benches

All six manufacturers offer angled back extension benches and all the machines are suitable for larger or smaller users. Absolute top in this category is *Technogym*; the best machine on the market – it's truly superb. Positioning, pad shape and adjustments – everything is perfect. *Nautilus* and *Life Fitness* also offer good systems with a good range of positions. *Cybex* and *Gym 80* follow and *Schnell* brings up the rear with a rather spartan design that is in need of a rethink.

#### Abdominal Benches

The abdominal benches don't really impress. There is great room for improvement in this category. *Technogym* leads the field, but an athlete's legs shouldn't be positioned as shown in the instruction manual rather with the instep under the second pulley. In the design as announced, *Schnell* provides a usable machine (see table) and on the *Gym 80* machine a heel pull should be fitted. The *Nautilus* machine borders on being useless. A visit to the development department would be a good investment here too.

All of the test results were arrived at in good faith, however no responsibility is accepted for the correctness of this information.

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