

  
PRÜFSYSTEME

 **DYNA-MESS**  
PRÜFSYSTEME

**JFM**

## Medical Testing Machine

### DYNAdent 14801

: Testing machine for "Dynamic fatigue test for dental implants"  
according to ISO 14801

#### Types

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#### Details

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- Designed for the fatigue test ISO 14801
- Complete range of accessories
  - Reservoir for test in a solution tempered to 37 °C
  - Sliding joint to eliminate the lateral forces
  - Positioning device
  - Special fixture
- Easy to install and operate
- Real-time display of measured values
- Data recording
- Comprehensive library of tests
- Cost efficient
- Compact design
- Electrically driven – no hydraulic system, no compressed air

## Technical specifications

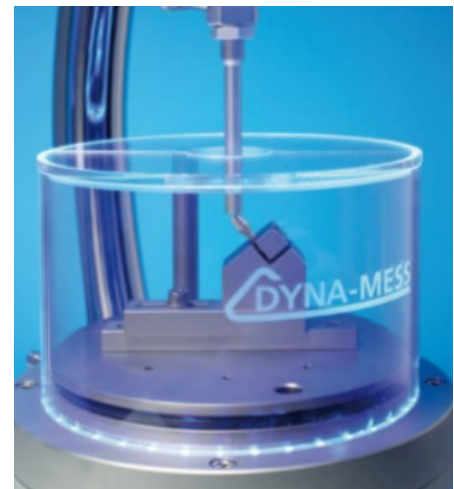
<b>Force max. (with integrated cooling)</b>	Dynamic up to 600N
<b>Displacement</b>	+/- 4 mm
<b>Frequency</b>	2 Hz and 15 Hz
<b>Curve form</b>	Sinus
<b>Dimensions (LxWxD)</b>	ca. 360 mm x 260 mm x 620 mm

## Examples of application

### Fatigue test

according to DIN EN ISO 14801

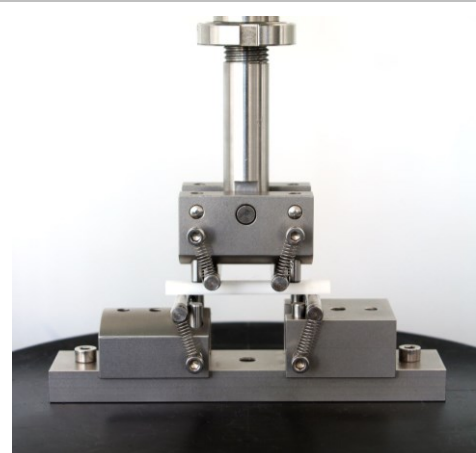
- Loading of the implant as specified in the standard
- Suitable for implants with synthetic resin embedded abutments
- Sliding joint for a loading free of lateral forces
- Clamping device to mount the implants at different angles
- Interchangeable fixtures



### Bending test

according to DIN EN ISO 6872

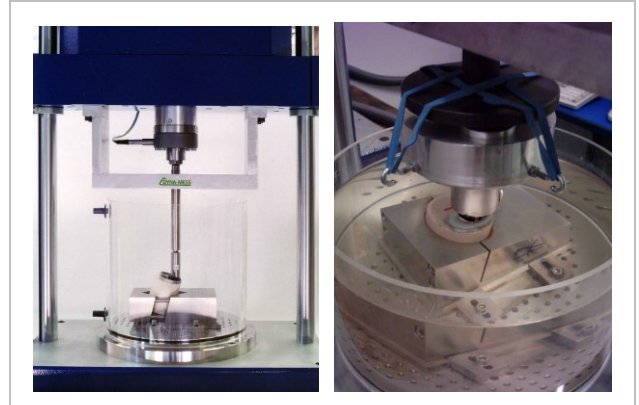
- Accessories especially adapted for this standard test procedure
- Suitable for high frequency loading
- Accessories made of stainless materials
- Support rollers can be easily replaced
- Automatic compensation of the angular displacement
- Specimen loaded with a pulsating load



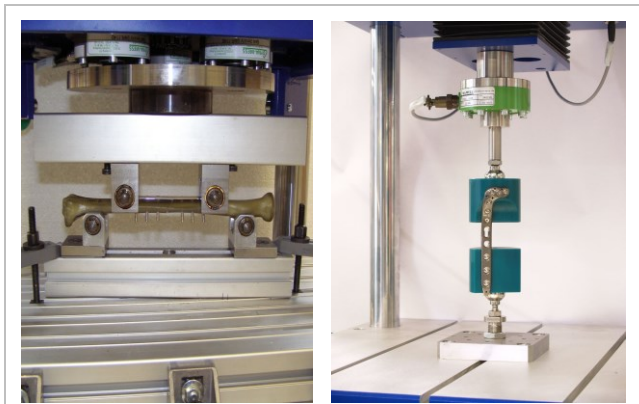
## Medical Testing Machine



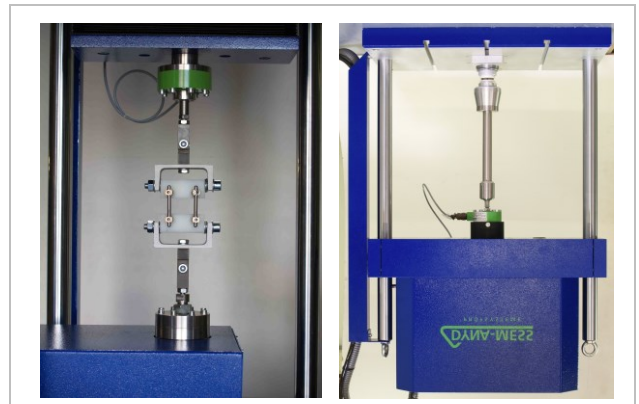
Hip



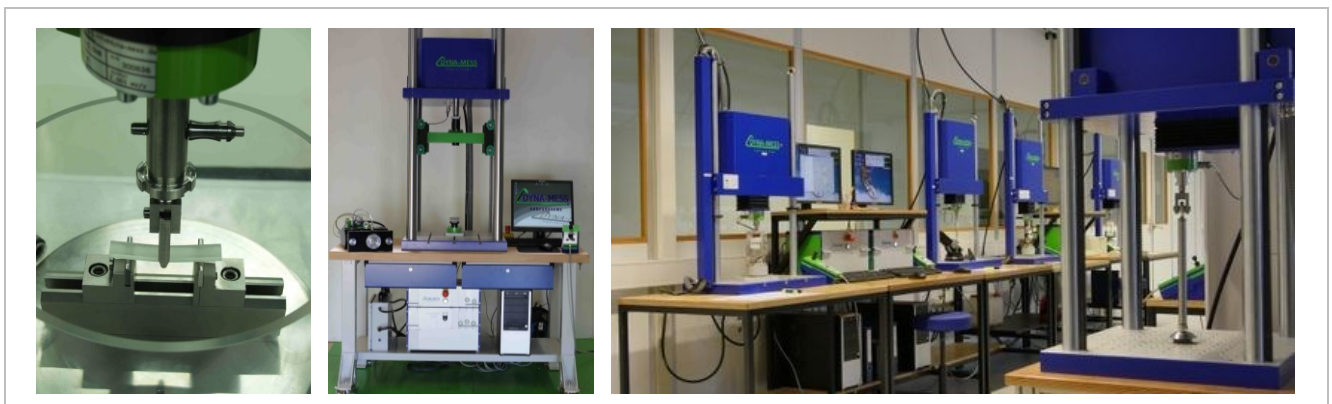
Knee



Osteosynthesis



Spine



Others

## Servopneumatic Actuator

### SPIAx/P

: ServoPositioned Integrated Actuator / Pneumatic

#### Types



#### **SPIAx/P ... LCF**

Piston type  $\Rightarrow$  long stroke, reduced frequency



#### **SPIAx/P ... HF**

Membrane type  $\Rightarrow$  short stroke, high frequency

## Applications

- Used by customers to set up test rigs for component testing
  - Frame / set up / rig often designed and manufactured by customer himself
  - Dynamic and cyclic testing on components (fatigue testing)
    - Type LCF : max. 10 Hz
    - Type HF : max. 35 Hz
    - Dynamic amplitudes by request  
(have to be calculated based on size of actuator and servovalve, testing force)
- Typical dynamic amplitudes  
(has to be confirmed by DYNA-MESS after clarification of application because values depend on load and other parameters!) :

<b>SPIAx/P 1 LCF</b>	± 50 mm @ 1 Hz, ± 20 mm @ 10 Hz
<b>SPIAx/P 2,5 LCF</b>	± 50 mm @ 1 Hz, ± 10 mm @ 10 Hz
<b>SPIAx/P 4,5 LCF</b>	± 50 mm @ 1 Hz, ± 5 mm @ 10 Hz
<b>SPIAx/P 10 LCF</b>	± 50 mm @ 1 Hz, ± 3 mm @ 10 Hz
<b>SPIAx/P 20 LCF</b>	± 5 mm @ 1 Hz, ± 0,5 mm @ 10 Hz
<b>SPIAx/P 5 HF</b>	± 10 mm @ 1 Hz, ± 5 mm @ 10 Hz, ± 0,15 mm @ 35 Hz
<b>SPIAx/P 10 HF</b>	On request

- Examples :
  - Seats (automotive, home furniture)
  - Foams
  - Lever for handbrake
  - Furnitures
  - Pedals
  - Plastics
  - Handlebars for bicycles
  - Steering wheels

## Availability

Type	Nominal capacity (kN)	Stroke (mm)
SPIAx/P 1 LCF	1	200 (± 100)*
SPIAx/P 2,5 LCF	2,5	200 (± 100)*
SPIAx/P 4,5 LCF	4,5	200 (± 100)*
SPIAx/P 10 LCF	10	200 (± 100)*
SPIAx/P 20 LCF	20	200 (± 100)*
SPIAx/P 5 HF	5	12 (± 6)
SPIAx/P 10 HF	10	12 (± 6)

\*alternative strokes 50 ... 300 mm on request

## Unique points

- Comparison of drive technologies for dynamic machines

Type	Servo-pneumatic	Servo-electric	Servo-hydraulic
<b>Max. force</b>	20 kN	10 kN	10,000 kN
<b>Max. frequency</b>	10 / 35 Hz	50 / 100 Hz	10 / 100 / 500 Hz
<b>Installation</b>	+ -	+	- ... - -
<b>Maintenance</b>	+	++	--
<b>Noise</b>	+ -	+	--
<b>Cleanliness</b>	+	++	--
<b>Price</b>	Low	Normal	High

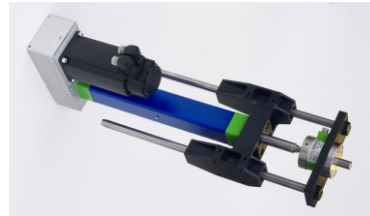
- For dynamic testing alternatives are
  - Servohydraulic ⇒ expensive, oily, noisy
  - Mechanical (e.g.excenter) ⇒ no closed loop control, no force control
- Compared to hydraulics
  - Cheaper
  - More energy-efficient
  - Easier in maintenance
  - Clean
  - Easy to install (one pneumatic hose only. In hydraulics: pressure line, return line, leakage line in stiff hoses)
  - Lightweight ⇒ easy to mount in customer's set up
  - Pressure supply (compressed air) usually already given  
⇒ no hydraulic power unit needed
- Compared to standard pneumatics:
  - Closed loop control with displacement control mode and force control mode
  - Waveforms(sinus, ...) possible
  - Setting of speed and load by servovalve (standard pneumatic has to set up pressure by pressure relief valve and speed by orifice)
  - Continuous monitoring of loads and displacements by software DYNA-TCC



## Alternatives

### SPIAx/E

Electric driven  
⇒ slow motion, static, cyclic ramp



	SPIAx/E 0,5 LCF	SPIAx/E 1 LCF	SPIAx/E 1 HD	SPIAx/E 2,5 LCF	SPIAx/E 5 LCF	SPIAx/E 5 HF	SPIAx/E 10 LCF	SPIAx/E 10 HF
	SPIAx/E 0,5 HF	SPIAx/E 1 HF		SPIAx/E 2,5 HF				
<b>Nominal power (kN)</b>	0,5	1	1	2,5	5	5	10	10
<b>Stroke (mm)</b>	200	200	200	200	200	200	200	200
<b>Max. speed (mm/s)</b>	250 1000	250 1000	250	250 1000	250	1000	250	1000

### SPIAx/H

Hydraulic driven ⇒ high frequency, high load, on request

### Custom-tailored machine

⇒ complete set up by DYNA-MESS



	HCF SPIAx/						LCF SPIAx/				
	H 5	H 10	H 20	H 50	H 100	H 200	H 20	H 50	H 100	H 200	H 500
<b>Nominal power (kN)</b>	5	10	20	50	100	200	20	50	100	200	500
<b>Stroke (mm)</b>	100 (± 50)	100 (± 50)	100 (± 50)	100 (± 50)	100 (± 50)	100 (± 50)	200 (± 100)	200 (± 100)	200 (± 100)	200 (± 100)	200 (± 100)

\*alternative capacity on request

## Table-top testing machine

Servopneumatic

### TP

: Table-top Pneumatic

### Types

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**TP ... LCF** : Piston type cylinder inside  $\Rightarrow$  long stroke, reduced frequency  
**TP ... HF** : membrane type cylinder inside  $\Rightarrow$  short stroke, high frequency

### Details

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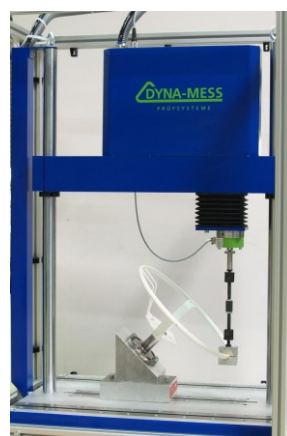
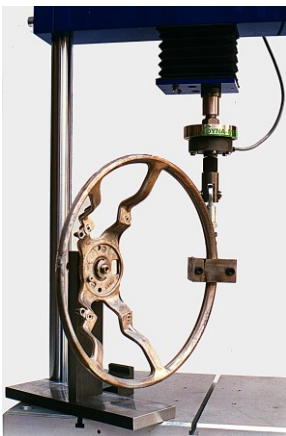
- Testing machine for static and dynamic testing
- Driven by servopneumatics
- Stiff frame with actuator on top
- 1 ... 5 kN : 2 column frame / 10...20 kN : 4 column frame
- Crosshead moveable to adapt to specimen's dimensions
- Displacement sensor integrated
- Load cell integrated
- DYNA-MESS electronics for closed loop control
- DYNA-MESS testing software DYNA-TCC
- Safety housing available
- Tables with integrated electronics available
- Pressure supply 6 (7) bar necessary for nominal force

## Applications

- Static and dynamic testing
- Materials testing : tension / compression / bending
- Component testing : cyclic testing
  
- Dynamic and cyclic testing (fatigue testing)
  - Type LCF : max. 10 Hz
  - Type HF : max. 35 Hz
  - Dynamic amplitudes by request  
(have to be calculated based on size of actuator and servovalve, testing force)
  - Typical dynamic amplitudes  
(has to be confirmed by DYNA-MESS after clarification of application because values depend on load and other parameters!) :

<b>TP 1 LCF</b>	± 50 mm @ 1 Hz, ± 20 mm @ 10 Hz
<b>TP 2,5 LCF</b>	± 35 mm @ 1 Hz, ± 5 mm @ 10 Hz
<b>TP 20 LCF</b>	± 5 mm @ 1 Hz, ± 0,5 mm @ 10 Hz
<b>TP 5 HF</b>	± 2,5 mm @ 10 Hz, ± 0,3 mm @ 35 Hz
<b>TP 20 HF</b>	± 1,4 mm @ 10 Hz, ± 0,6 mm @ 25 Hz

- Examples :
  - Materials testing on metal and non-metal specimen
  - Fatigue testing, stress cycle testing, woehler diagram
  - Springs
  - Rubber
  - Hydro bears, hydraulic rubber mounts
  - Steering wheels
  - Implants
  - foams
  - Plastics



## Availability

Type	Nominal capacity (kN)**	Stroke (mm)
TP 1 LCF	1	100 ( $\pm 50$ )*
TP 2,5 LCF	2,5	100 ( $\pm 50$ )*
TP 5 LCF	5	100 ( $\pm 50$ )*
TP 10 LCF	10	300 ( $\pm 150$ )*
TP 20 LCF	20	300 ( $\pm 150$ )*
TP 5 HF	5	12 ( $\pm 6$ )
TP 10 HF	10	12 ( $\pm 6$ )
TP 20 HF	20	12 ( $\pm 6$ )

\*alternative strokes 50 ... 300 mm on request

## Unique points

- For dynamic testing alternatives are
  - Servohydraulic  $\Rightarrow$  expensive, oily, noisy
  - Mechanical (e.g.excenter)  $\Rightarrow$  no closed loop control, no fence control
  
- Compared to hydraulics
  - Cheaper
  - More energy-efficient
  - Easier in maintenance
  - Clean
  - Easy to install (one pneumatic hose only. In hydraulics: pressure line, return line, leakage line in stiff hoses)
  - Pressure supply (compressed air) usually already given  
 $\Rightarrow$  no hydraulic power unit needed
  
- Compared to standard pneumatics:
  - Closed loop control with displacement control mode and force control mode
  - Waveforms(sinus, ...) possible
  - Setting of speed and load by servovalve (standard pneumatic has to set up pressure by pressure relief valve and speed by orifice)
  - Continuous monitoring of loads and displacements by software DYNA-TCC

## Table-top testing machine

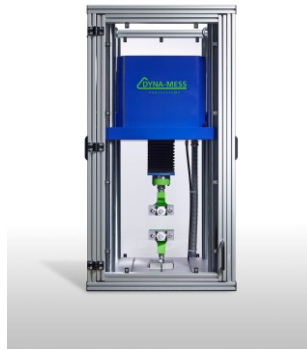
Servoelectric

### TE

: Table-top Electric

### Types

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**TE ... HCF** : servo-electric cylinder inside  $\Rightarrow$  long stroke, high frequency

### Details

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- Testing machine for static and dynamic testing
- Driven by servoelectric
- Stiff frame with actuator on top
- 2,5 kN : 2 column frame / 7 kN : 4 column frame / 10 kN : 4 column frame
- Crosshead moveable to adapt to specimen's dimensions
- Displacement sensor integrated
- Load cell integrated
- DYNA-MESS electronics for closed loop control
- DYNA-MESS testing software DYNA-TCC
- Safety housing available
- Tables with integrated electronics available

## Applications

- Static and dynamic testing
- Materials testing : tension / compression / bending
- Component testing : cyclic testing
- Dynamic and cyclic testing (fatigue testing)
  - Type HCF : max. 100 Hz (2,5 / 7 kN), 50Hz (10 kN)
  - Dynamic amplitudes by request  
(have to be calculated based on size of actuator and servovalve, testing force)
  - Typical dynamic amplitudes  
(has to be confirmed by DYNA-MESS after clarification of application because values depend on load and other parameters!)

<b>TE 2,5 HCF</b>	± 50 mm @ 1 Hz, ± 20 mm @ 100 Hz
<b>TE 7 HCF</b>	± 35 mm @ 1 Hz, ± 5 mm @ 100 Hz
<b>TE 10 HCF</b>	-

- Examples :
  - Materials testing on metal and non-metal specimen
  - Fatigue testing, stress cycle testing, woehler diagram
  - Springs
  - Rubber
  - Hydro bears, hydraulic rubber mounts
  - Steering wheels
  - Implants
  - foams
  - Plastics

## Availability

Type	Nominal capacity (kN)**	Stroke (mm)
TE 2,5 HCF	2,5	100 (± 50)*
TE 7 HCF	7	150 (± 75)*
TE 10 HCF	10	300 (± 150)*

\*alternative strokes 100 ... 150 mm on request

## Unique points

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- For dynamic testing alternatives are
  - Servohydraulic ⇒ expensive, oily, noisy
  - Mechanical (e.g.excenter) ⇒ no closed loop control, no fence control
- Compared to hydraulics
  - Cheaper
  - More energy-efficient
  - Easier in maintenance
  - Clean
  - Easy to install (one pneumatic hose only. In hydraulics: pressure line, return line, leakage line in stiff hoses)
  - Pressure supply (compressed air) usually already given  
⇒ no hydraulic power unit needed
- Compared to standard pnerumatics:
  - Closed loop control with displacement control mode and force control mode
  - Waveforms(sinus, ...) possible
  - Setting of speed and load by servovalve (standard pneumatic has to set up pressure by pressure relief valve and speed by orifice)
  - Continuous monitoring of loads and displacements by software DYNA-TCC

## Vertical testing machine

Servohydraulic

# VH

: Vertical Hydraulic

### Types

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- V2H ...** : 2 column frame, cylinder in base frame
- V4H ...** : 4 column frame, cylinder on top
- V ... H ... LCF** : Servo cylinder inside  $\Rightarrow$  reduced frequency
- V ... H ... HCF** : Hydrostatic cylinder inside  $\Rightarrow$  high frequency
- V ... H ... STAT** : For quasi-static testing only
- V2H 10 HCF+** : Hydrostatic cylinder inside  $\Rightarrow$  enhanced frequency

### Details

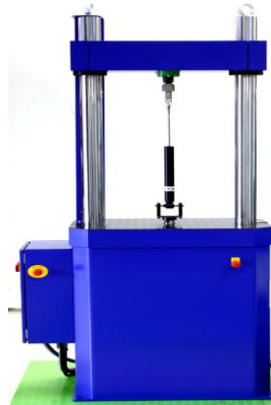
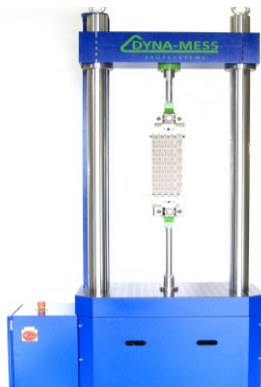
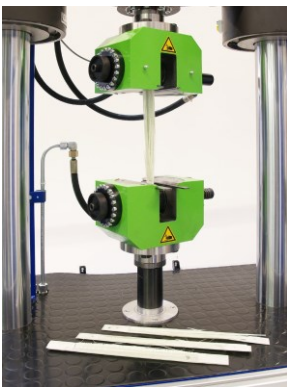
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- Testing machine for static and dynamic testing
- Driven by servohydraulics
- Stiff frame with actuator in base frame (V2H) or on top (V4H)
- Crosshead moveable to adapt to specimen's dimensions
- Displacement sensor and load cell integrated
- Hydraulic power unit integrated in base frame or separately
- DYNA-MESS electronics for closed loop control
- DYNA-MESS testing software DYNA-TCC
- Safety housing available



## Applications

- Static and dynamic testing
- Materials testing : tension / compression / bending
- Component testing : cyclic testing
- Dynamic and cyclic testing (fatigue testing)
  - Type V 2/4 H ... LCF : max. 10 Hz
  - Type V 2/4 H ... HCF : max. 100 ... 200 Hz
  - Type V2H 10 HCF+ : max. 400 ... 500 Hz
  - Dynamic amplitudes by request  
(Depend on size of hydraulic power unit. Size of hydraulic power unit will be customized.)
- Examples :
  - Materials testing on metal and non-metal specimen
  - Fatigue testing, stress cycle testing
  - Springs
  - Implants
  - Rubber
  - Shock absorber
  - Hydro bears, hydraulic rubber mounts
  - ...



## Availability

Type	Nominal capacity (kN)**	Stroke (mm)
V2H 20 LCF, V4H 20 LCF***	20	200 (± 100)*
V2H 50 LCF, V4H 50 LCF***	50	200 (± 100)*
V2H 100 LCF, V4H 100 LCF***	100	200 (± 100)*
V2H 200 LCF, V4H 200 LCF***	200	200 (± 100)*
V2H 500 LCF, V4H 500 LCF***	500	300 (± 150)*
V2H 1000 LCF, V4H 1000 LCF***	1000	300 (± 150)*
:	:	:
V2H 10000 LCF, V4H 10000 LCF***	10000	300 (± 150)*
V2H 5 HCF, V4H 5 HCF	5	100 (± 50)
V2H 10 HCF, V4H 10 HCF	10	100 (± 50)
V2H 20 HCF, V4H 20 HCF	20	100 (± 50)
V2H 50 HCF, V4H 50 HCF	50	100 (± 50)
V2H 100 HCF, V4H 100 HCF	100	100 (± 50)
V2H 200 HCF, V4H 200 HCF	250	100 (± 50)
V2H 10 HCF+	10	20 (± 10)

\*alternative strokes 50 ... 300 mm on request

\*\*alternative capacities on request

\*\*\*also available for static testing only (type V...H...STAT)

## Unique points

- For dynamic testing alternatives are
  - Servohydraulic ⇒ limited in capacity and frequency
  - Mechanical ⇒ no closed loop control, no fence control
- V4H : 4 column frame with cylinder on top  
⇒ T-slot table for flexible fixing of specimen (component, ...)

## Torsion Testing Machine

### Tors/H 2000 HCF

: Testing machine for cyclic testing on materials and components

#### Types



**Tors/H 2000 HCF**

#### Technical specifications

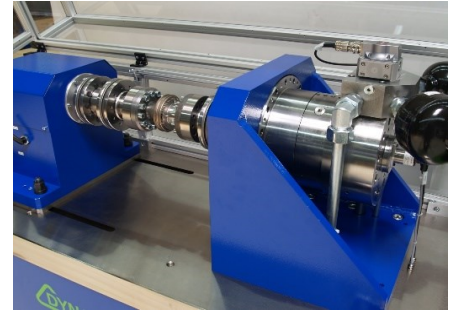
<b>Max. torque (static torque)</b>	2000 Nm
<b>Max. torque (dynamic torque)</b>	+/- 1400 Nm
<b>Max. angle of rotary (dynamic stroke @ 0 Hz)</b>	+/- 60 °
<b>Max. test frequency</b>	400 Hz
<b>Max. amplitude @ 400Hz</b>	+/- 0,1 °

## Details

### Load fram and actuator

Very stiff setup with horizontally placed rotary actuator and base frame.

- Dimensions(WxDxH)  
: Approx. 2900 x 1000 x 1600 mm
- Horizontally placed rotaty actuator and counter bearing
- Slideable in T-slot table
- Totary drive with hydrostatic bearing in radial and axial direction for dynamic operation



### Hydraulic power supply

For digital servo control (hydraulic)

- Flow of pump : 40 l/min (40 lpm)
- Pressure : 280 bar (28 Mpa)
- Flow rate  
: 40 l/min @ 280 bar (40lpm at 28 Mpa)
- Reservoir : 300 l
- Hosing for HPU
- Electric control 30 kW



### Sensors

- Torque measurement
  - sensor 2 kNm (torque transducer)
- Angle measurement
  - Contactless angle sensor (angle transducer)
- Acceleration measurement
  - Accelarerometer (Acceleration transducer)
- Additional measuring channels
  - 4 additional measuring channels (without amplifirer)
  - Integration in testing software DYNA-TCC

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## Testing software DYNA-TCC

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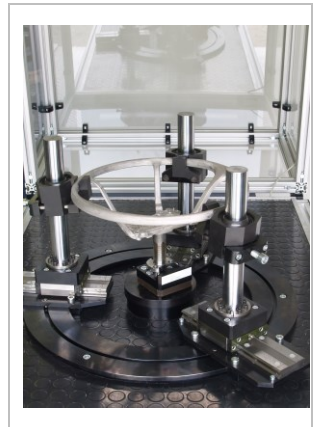
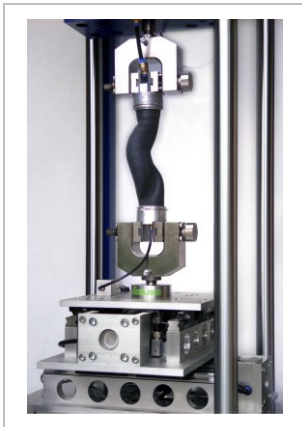
### Testing modules

- Manual testing
  - quasi-static loading in angle control with constant speed by using the joystick on the remote control
- Multistep cyclic testing
  - tests dynamic mode in torque/angle control up to 10 blocks
  - waveform : sine, triangle, square, customized
- Sweep testing
  - evaluation of dynamic values using variation of frequency or amplitude
  - dynamic testing in stepped sine mode including calculation of characteristic dynamic values (loss angle, dynamic stiffness, loss energy damping, tandleta,..)
- Elastomer testing
  - characterization on viscoelastic components
  - static testing including analysis of curve (static stiffness, points of interest)
  - the dynamic characterization application measures:  
(Phase angle, Stiffness, loss energy, Damping, Tan Delata)

### Software-AddOn

- Equation editor
  - calculation of up to 3 time-based values based on sensor data  
\*optional more than 3
  - visualization and storage of calculated time-based results
- Cycle-based values
  - for cyclic testing and multistep cyclic testing
  - visualization and storage of dynamic values  
(dynamic stiffness, loss angle, loss energy, Damping, Tan Delata)
- Testing parameters online
  - for cyclic testing and multistep cyclic testing
  - online set up of frequency, amplitude, pre-load resp. middle-position
  - parameterizable rate for changing of parameter
  - Iterativ Amplitude- and Middel-Position/Load control (Peak Value Control)

## Special Machines



 **DYNA-MESS**  
PRÜFSYSTEME

**JFM**



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