metkon
Technology behind Specimen

HARDNESS TESTING

DUROLINE LV SERIES

QUARTER CENTURY OF EXPERIENCE

metkon.com

VICKERS & KNOOP

FULLY AUTOMATIC HARDNESS TESTING

DUROLINE LV1/LV2/LV4

Smart hardness testing with smashing performance

- NEW GENERATION -

Main system features

- Versatile micro+macro load range for HV/HK scales from 100gf to 10kgf
- Closed-Loop Controlled load application by load cell technology
- Auto Measurement with Zoom Window for more accurate measurement
- Flexible Windows 10 based hardness test & measurement program METKON *N*-Sure
- Database generating test results and reports
- 22" Full HD Capacitive 10-point Multi-Touch desktop monitor
- Integrated high-res camera 5.0 MP with USB3.0 interface with zoom capability
- Integrated LED light source with controller
- Integrated Windows operated mini-pc, Intel, SSD specs
- Interface network USB (x4), Displayport (x2), LAN (x1) and Wireless LAN
- Very robust opto-mechanical system
- New generation electronics and motors in full system integration ensuring reliable performance
- Service friendly, remote accessability
- Meets latest ISO, ASTM and JIS standards

DESIGN

DUROLINE LV Series are ideal instruments for quality assurance, quality control, research and metallurgical departments to monitor the hardness during fabrication and after heat treatment or welding as well as for the performance analysis on metal parts and new alloys. Typical applications are determining the Vickers micro and macro-hardness of steel alloys and metal components, small precision parts, thin material or wire, coatings and performing case depth determinations (CHD, EHT, NHT) on cross sections both manuall or automatically on this advanced hardness tester system. new alloys. Typical applications are determining the Vickers microhardness of small precision parts, thin material or wire, coatings and performing case depth determinations (CHD, EHT, NHT) on cross sections, both manually or automatic on this advanced hardness tester system.

Recently developed by an international multi-disciplinary team with a wide hardness testing experience, the DUROLINE LV-Series are based on the latest technology available, focused on fast cycle time with high reproduceable accuracy within international standards. The system features a smart and very service-friendly synergy of a robust and proven mechanical construction and integrated electronics system control featured by a fast CANBUS technology and a high-quality Windows based mini-pc. Monitoring the hardness testing process significantly improved by using modern user interfacing technology such as 10-point multi-touch screen operation supported by a fast & secure display connection. Combined with top quality components and a high performance mini-pc, this system guarantees customers a solid and accurate performance over many years to come. In this way, the DUROLINE LV Micro/Macro-Vickers hardness tester offers a highly functional and reliable automated indentation test & measurement system.

Versatile micro+macro load range for HV/HK scales from 100gf to 10kgf

By selecting between 9 loads steps for micro- and macro-hardness testing in Vickers or Knoop, any specimen can be tested and measured within the applicable standards. Fast and easy setting of loads by touch screen monitor menu icon.

DUROLINE LV-Series Microhardness Tester

Robust Mechanical Design

22" Full HD Capacitive 10-point Multi-Touch desktop monitor

Magnification range

Combining the excellent performance of the digital camera, LED illumination and software with a series of available objectives, the DUROLINE LV Series provide correct measurement under any test load within the international standards.

High precision spindle with motorized option

For accurate micro/macro-hardness testing and fast auto-focusing, the elevating speed and backlash of the spindle are critical. By using quality components and design experience, the DUROLINE LV Series spindles guarantee long life without loss of accuracy due to wear and friction, even for automated Z-axis systems.

N-Sure
TEST & MEASUREMENT SOFTWARE

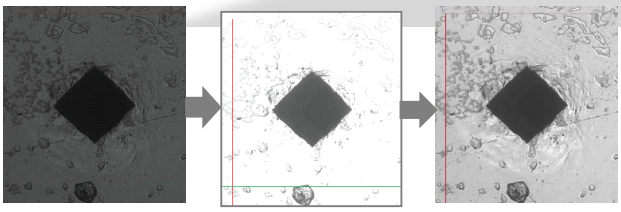
The METKON N-Sure software program features a flexible Windows based user interface that increases productivity and operator efficiency by automating the test & measurement process and optional motor-stage navigation process. Since the application and removal of the test loads and measurement are fully automatic, repeatability is excellent, testing time is reduced and throughput is increased. As a result, costly and time-consuming rework is eliminated.

For high-volume mounted sample testing, multi-sample mount holders are available for automated test applications to further increase the productivity and throughput of samples.

METKON *N*-Sure Advanced User Interface Software

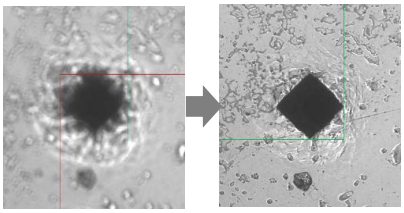
Automatic Light Brightness

The light brightness is automatically adjusted for the best image quality and the most accurate auto measurements.



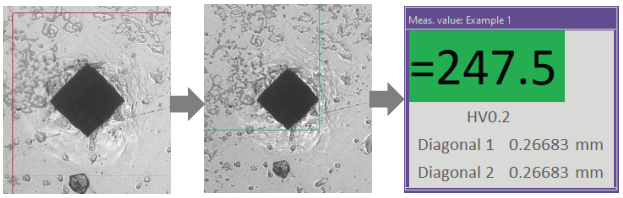
Automatic Focus (Available on LV2/LV4 models)

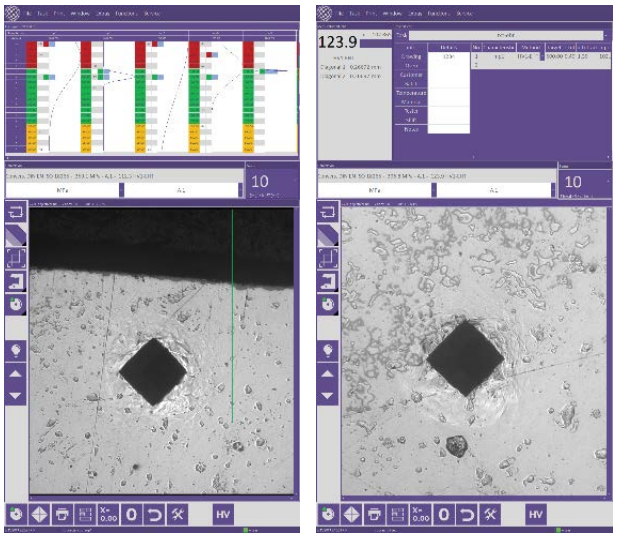
DUROLINE LV2 and LV4 models are equipped with motorized spindle and autofocus software module. It automatically sharpens the image in seconds.



Automatic Evaluation

Diagonals of indentation are measured automatically and hardness value appear on the screen.





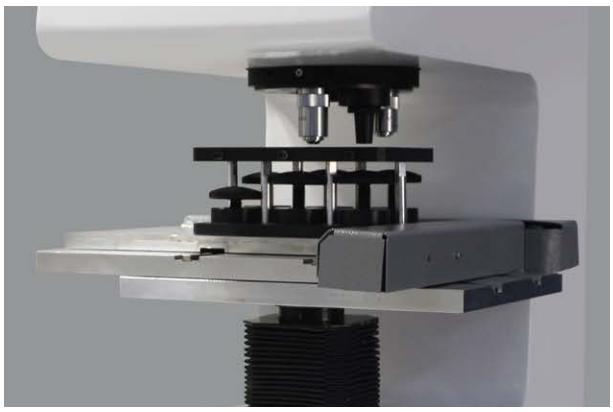
The easy-to-operate test & measurement program, clear images captured by integrated camera and high-resolution display on 22" touch screen monitor provide the lab staff easy access and shared visibility of indent results to analyze and discuss together. Operators are guided by the user-friendly program logic combined with quick system settings such as fast and easy setting of loads by touch screen monitor menu icon. Vickers or Knoop hardness values are automatically generated on screen by use of the standard provided Auto-measurement function.

Database generating test results and reports

METKON N-Sure software program provides advanced database management of test results, report generation and printing fuctions. Saving and retrieving measurement data is an absolute requirement when it comes to testing hardness results of critical components in various industrial segments. The N-Sure program ensures that data is safely stored and presented in standard or customized reporting form.

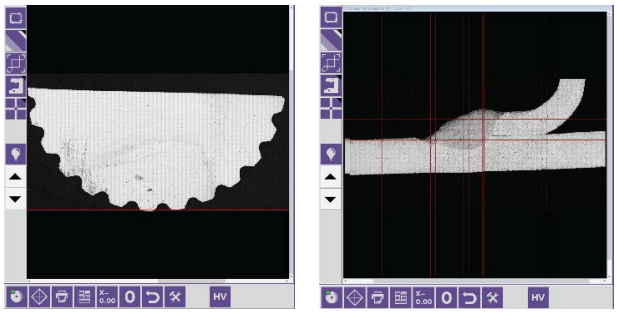
FULLY AUTOMATIC TEST & MEASUREMENT

DUROLINE LV4 is equipped with a high precision motorized XY-stage with 100x150 mm travel range and Autostage software module. It provides multiple tests & measurements fully automatically without operator intervention.



Scanning Overview Image Feature

Mapping function allows overview image of comple sample surface. The test points are easily determined on the sample with pre-defined or user defined patterns.

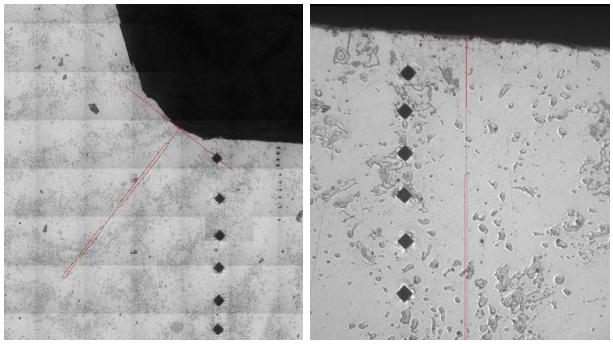


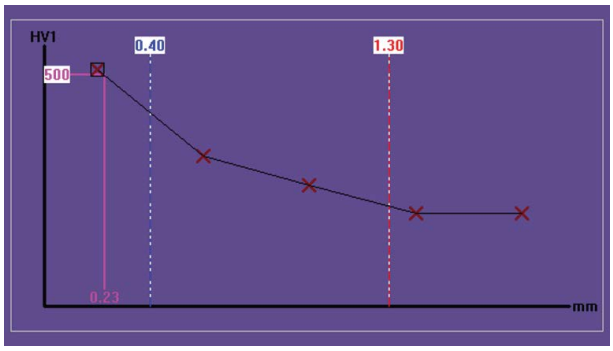
Case Hardening Depth (CHD) Testing

Case Hardening Depth Module is optionally available for all DUROLINE M models.

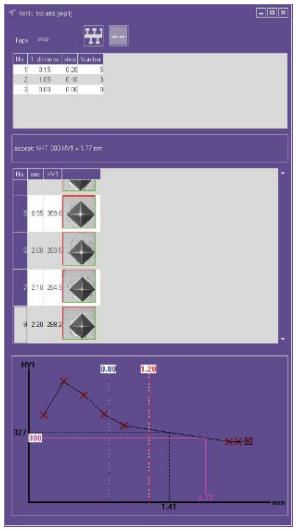
For DUROLINE LV1 and LV2 models, Case Hardening Depth testing is done manually by digital manual XY-Stage.

For DUROLINE LV4, Case Hardening Depth testing is done automatically by motorized XY-Stage.

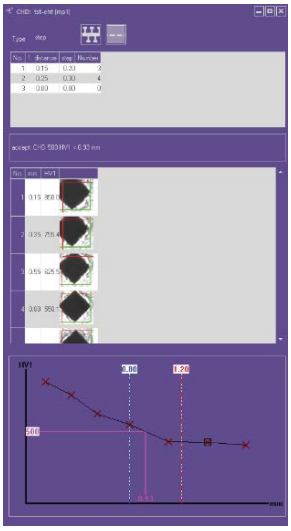




Distance between measurements, distance between edge and number of measurements can be set easily. Zig zag pattern can also be defined. The measurement pattern can be placed easily on the sample and easily alligned according to edge angle. Once operator set testing parameters and place measurement pattern on the sample, DUROLINE will make indents for all testing points and make hardness measurement automatically without operator intervention (LV4 model). If necessary, it is always possible to go any measurement point and make manual measurement. After all measurement is done, it is possible to generate test results in report format.



NHT Testing



CHD Testing

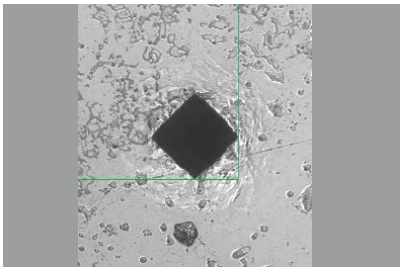
Comes with ISO/DaKKs Certificated Vickers Indenter (Made in Germany)

An ISO/DaKKs Certificated Vickers Diamond Indenter is included as standard for all DUROLINE LV-Series Hardness Testers.

Factory Certificated Direct and Indirect Calibration Report

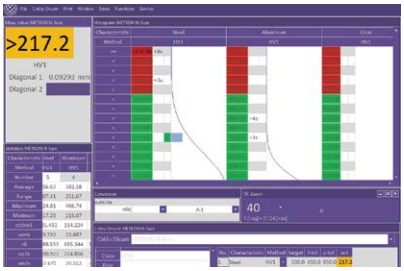
All DUROLINE LV-Series testers are calibrated in Metkon Factory according to DIN EN ISO 6507-2:2018 Vickers hardness test standard.

GENERAL FEATURES HIGHLIGHT



Automatic Test & Measurement

The measurement program provided as standard the Auto-measurement function for fast and repeatable results. This provides extra convenience and time saving. Manual measurement is always possible, as well as re-measurement or deleting single hardness values.



N-Sure Advanced User Interface Software

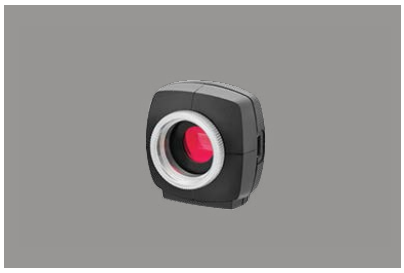
The METKON N-Sure software program features a flexible Windows based user interface that increases productivity and operator efficiency by automating the test & measurement process. The User Interface has an immediate recognition and provides a user-friendly flexibility in settings and daily operation.

22" Full HD Multi-Touch Desktop Monitor

The easy-to-operate test & measurement program, clear images capture by integrated camera and high-resolution display on 22" touch screen monitor provide the lab staff easy access and shared visibility of indent results to analyze and discuss together.

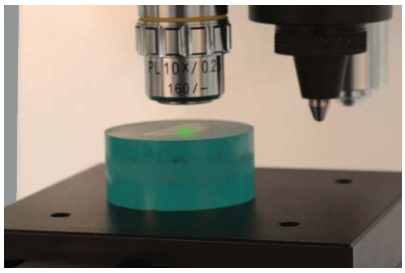
Integrated Windows Operated Mini-PC

A Windows operated industrial mini-pc is hidden inside the hardness tester. Thus, no additional space is required for your laboratory. It is capable to work 24/7 thanks to its compact, robust design. Equipped with powerful Intel processor and SSD drive to provide smooth and fast operation.



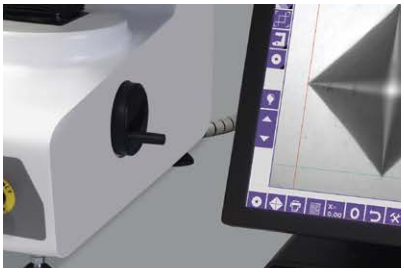
Integrated High Resolution CCD Camera

A high resolution CCD camera is hidden inside the hardness tester. It has 5.0 MP resolution which provides to capture very clear indentation image for accurate auto measurement. It has USB 3.0 interface to transfer image to monitor without any delay. This means; when you move the specimen that under the objective, the image on the monitor also moves very smoothly and quickly at the same time.



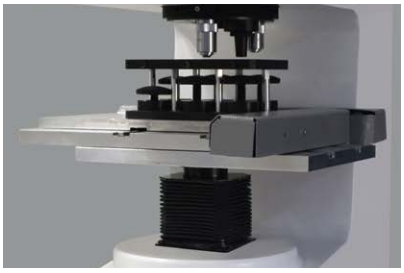
Automatic Light Brightness

The light brightness is automatically adjusted by the user interface software for the best image quality and the most accurate auto measurements. The hardness tester equipped with powerful LED light source and compact optic system to provide excellent image quality.



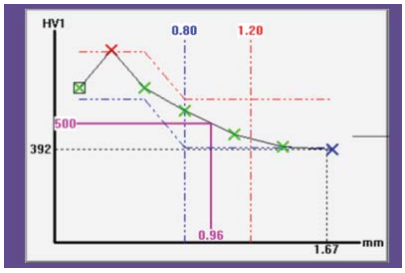
Automatic Focus

(Available on LV2 and LV4 models)
DUROLINE LV2 and LV4 models are equipped with high precision motorized spindle and Autofocus software module. It automatically sharpens the image in seconds. This provides extra convenience, maximum automation and time saving.



Motorized XY-Stage

(Available on LV4 model)
DUROLINE LV4 is equipped with high precision motorized XY-stage with 100x150 mm travel range and Autostage software module. It provides multiple tests & measurements fully automatically without operator intervention. Mapping function allows overview image of comple sample surface. The test points are easily determined on the sample with pre-defined or user defined patterns.



EHT - CHD Testing

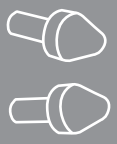
XY-stage with one Slyvac digital micrometer and software module for EHT-CHD testing are optionally available for all DUROLINE LV-Series. Possibility to direct reading of Slyvac micrometer signals by N-Sure software and generate case hardening depth graph.

ACCESSORIES

Object Lenses, 5X/10X/20X/40X

GR 2041
GR 2042
GR 2043
GR 2044

Vickers/Knoop Indenters

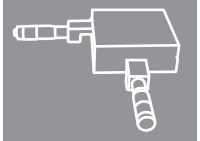


GR 2047
GR 2048

Flat and V-Anvils

GR 2021
GR 2022

Manual XY-Stages

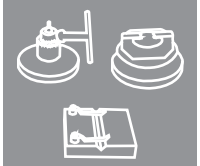


GR 2023
GR 2024

Precision vise (opening 43mm)

GR 2025

Fine specimen holders



GR 2026
GR 2027
GR 2028

Specimen Holder for Mounted Samples Ø25/30/40/50 mm

GR 2031
GR 2032
GR 2033
GR 2034

Multiple Specimen Holder for Multiple Mounted Samples Ø25/30/40 mm

GR 2035
GR 2036
GR 2037

Certificated Standard Test Blocks

GR 2061
...
GR 2069

Certificated calibration scale glass.

GR 2071

Softre Module for EHD, CHD Testing

GR 2081

Test stages

The DUROLINE LV-Series feature various stages and fixtures that fit any application. Starting with the basic manual XY-stage with either mechanical or digital micrometers, the hardness tester can also be equipped with a motorized stage to facilitate single or multi-sample holders. To fix various geometries of specimen that are not mounted, there are several clamping devices available to finish the job quick and precise.

High Precision Manual XY Stages

High Precision Test Anvils

Object Lenses

DUROLINE LV equipped with 10x and 40x high quality German made object lenses for maximum image sharpness. 5x and 20x objectives are also optionally available for all kind of testing needs.

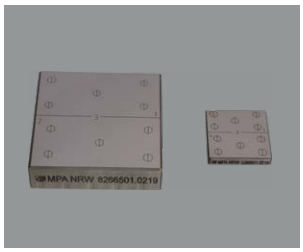
Test Blocks

ISO/DaKKS certificated German made test blocks are optionally available for Indirect verification of tester.

Indenters

ISO/DaKKS certificated German made Vickers and Knoop indenters are optionally available for most accurate and reliable testing.

High Precision Sample Holders



ISO/DaKKs Certificated Test Blocks

ISO/DaKKs Certificated Vickers and Knoop Indenters

High Quality Object Lenses with 5X, 10x, 20x and 40x Magnification

SPECIFICATIONS

ORDER NO		72 05	72 06	72 08
MODEL NO		LV1	LV2	LV4
Hardness Scales	Vickers HV as per ISO 6507, ASTM E384, E92	HV0,1 - HV0,2 - HV0,3 - HV0,5 - HV1 - HV2 - HV3 - HV5 - HV10		
	Knoop HK as per ISO 4545, ASTM E384, E92	HK0,1 - HK0,2 - HK0,3 - HK0,5 - HK1 - HK3		
	Hardness conversions to other scales	As per ISO 18265		
Test Loads	Test Loads (gf)	100gf, 200gf, 300gf, 500gf, 1kgf, 2kgf, 3kgf, 5kgf, 10kgf		
	Test Loads (N)	0,9807N - 1,961N - 2,942N - 4,904N - 9,807N - 19,631N - 29,420N - 49,033N - 98,067N		
	Test Load Accuracy	"10gf - 200gf: +/- 1,5% and > 200gf: +/- 1,0% As per ISO standard (and ASTM E-384, JIS B7725, JIS B7734)"		
	Test Load Dwell Time	"from 5 - 99 sec with 1 sec increments As per ISO standard (and ASTM E-384, JIS B7725, JIS B7734)"		
	Test Load Application Speed	"10gf - 200gf: < 0.070 mm/s and > 200gf: < 0.200 mm/s As per ISO standard (and ASTM E-384, JIS B7725, JIS B7734)"		
	Load Force Application	Motorized force application with closed loop load cell control, Automatic load, dwell, unload		
	Load Selection	By METKON N-Sure test settings		
Turret	Turret Configuration	Motorized 3-mount turret: 1 indenter, 2 objectives Position Auto-indication		
	Indenter	Including 1 Vickers Diamond Indenter (ISO/DaKKs certified, Made in Germany)		
	Objectives	"Standard objectives 10X, 40X, optional 5X, 20X (Made in Germany) Image capture by integrated CCD-camera (no eyepiece)"		
Optic System	Sample Image Capture	By Integrated CCD Camera, 5.0 MP, USB 3.0 (Made in Germany)		
	Indent Measurement Resolution	0,00002 mm (0,02 µm)		
Illumination	Illumination Source	Built-in LED Light Source		
	Automatic Brightness Control	Standard for highest contrast and sharpnes		
Spindle	Z-axis (Spindle Vertical Movement)	Manual	Motorized	Motorized
	Auto-Focus AF	Not Available	Standard	Standard
"Motorized XY-Stage"	Motorized XY-Stage (for Fully Automatic Multiple Test & Measurements)	Not Available	Not Available	Standard
	Travel Distance	Not Available	Not Available	100x150 mm
Controller System	Controller	"Built-in Windows operated mini-PC, communicates the hardness tester electronics by CANBUS Protocol"		
	Interface Network	Interface network USB (x4), Displayport (x2), LAN (x1) and Wireless LAN		
	Auxilliary	Optional Keyboard, Mouse (wireless)		
	Monitor	"External 22" Full HD Capacitive 10-point Multi-Touch Desktop Monitor, IPS Panel, Antistatic Shield, Tiltable, Integrated Power Adaptor"		
User Interface	Operating System	Windows 10		
	User Interface Software	METKON N-Sure		
	Test Settings	Scale, Load Dwell Time , Start, Turret positioning, Hardness Conversion, Illumination, Screen preference settings, Alerts for errors		
	Measurement Settings	Surface Image capture, Indentation capture, Manual measurement and Auto-measurement, Single indents, Manual pattern, Preset pattern, CHD, EHT, NHT, GO/NG judgement, Statistics, Conversion, Cilindrical correction, Language, Database, Test Reports with image analysis data, Data export, User management, Service and Calibration Settings		
Tester Body	Operational Environmental Conditions	"Ambient Operating Temperature Range: 23°C +/- 5°C Ambient Humidity Range: RH 40% to 70% relative humidity, non-condensing"		
	Dimensions, WxDxH	240x560x625 mm		
	Specimen Accommodation	Vertical 185 mm, Horizontal (throat depth) 160mm		
	Weight	65 kgs		
	Mains	100-240 V, 1-phase, 50/60 Hz, autosetting		

ORDER NO	Automatic Test & Measurement	Automatic Light Brightness Control	Motorized Z-Axis Spindle	Automatic Focus	Motorized XY-Stage
DUROLINE LV1	✔	✔	✖	✖	✖
DUROLINE LV2	✔	✔	✔	✔	✖
DUROLINE LV4	✔	✔	✔	✔	✔

SPECIFICATIONS

72 05 — **DUROLINE LV1**

Vickers/Knoop Micro/Macro-Hardness Tester with Test & Measurement software Windows 10 "N-Sure" including Auto-Measurement module closed loop load cell controlled force application
Test Loads: 100gf, 200gf, 300gf, 500gf, 1kgf, 2kgf, 3kgf, 5kgf, 10kgf
HV0,1 - HV0,2 - HV0,3 - HV0,5 - HV1 - HV2 - HV3 - HV5 - HV10
HK0,1 - HK0,2 - HK0,3 - HK0,5 - HK1 - HK3
in compliance with standard ISO 6507 and ASTM E-384. User Interface by 22" full HD 10-point multi-touch desktop monitor, integrated high resolution 5.0 MP, USB 3.0 CCD camera, automatic measurement with zoom capability and automatic light brightness, with automatic test sequence by motorised turret and load motor force control by closed loop load cell system adjustable internal LED illumination, large sample accomodation area, emergency stop. Automatic voltage setting 100-240 V, 1-phase, 50/60 Hz.

Standard delivery includes:
Hardness Tester, Desktop Monitor on solid stand, METKON N-Sure software incl. Auto-Measurement module, ISO/DaKKs Certified Vickers diamond indenter, Objective 10x, Objective 40x, 4 adjustable tester feet, Water level indicator, Indenter protection nose, Dust Cover, Power Cable, Monitor Interface Cable, Factory Test Certificate with ISO/ASTM verifications, solid accessories box.

Note: Select below the additional XY-stage, anvils, sample fixtures and test blocks

72 06 — **DUROLINE LV2**

Vickers/Knoop Micro/Macro-Hardness Tester with Test & Measurement software Windows 10 "N-Sure" including Auto-Measurement module Motorized spindle Z-Axis up/down movement and Auto-Focus module closed loop load cell controlled force application
Test Loads: 100gf, 200gf, 300gf, 500gf, 1kgf, 2kgf, 3kgf, 5kgf, 10kgf
HV0,1 - HV0,2 - HV0,3 - HV0,5 - HV1 - HV2 - HV3 - HV5 - HV10
HK0,1 - HK0,2 - HK0,3 - HK0,5 - HK1 - HK3
in compliance with standard ISO 6507 and ASTM E-384. User Interface by 22" full HD 10-point multi-touch desktop monitor, integrated high resolution 5.0 MP, USB 3.0 CCD camera, automatic motorized Z-axis and autofocus of indentations, auto-measurement with zoom capability and indent image brightness, with automatic test sequence by motorised turret and load motor force control by closed loop load cell system adjustable internal LED illumination, large sample accomodation area, emergency stop. Automatic voltage setting 100-240 V, 1-phase, 50/60 Hz.

Standard delivery includes:
Hardness Tester, Desktop Monitor on solid stand, METKON N-Sure software incl. Auto-Measurement module, Auto-Focus module with motorized Z-axis, ISO/DaKKs Certified Vickers diamond indenter, Objective 10x, Objective 40x, 4 adjustable tester feet, Water level indicator, Indenter protection nose, Dust Cover, Power Cable, Monitor Interface Cable, Factory Test Certificate with ISO/ASTM verifications, solid accessories box.

Note: Select below the additional XY-stage, anvils, sample fixtures and test blocks

72 08 — **DUROLINE M4**

Vickers/Knoop Micro/Macro-Hardness Tester with Test & Measurement software Windows 10 "N-Sure" including Auto-Measurement module, large motorised XY-stage 100x150mm, motorized Z-axis and Auto-focus closed loop load cell controlled force application
Test Loads: 100gf, 200gf, 300gf, 500gf, 1kgf, 2kgf, 3kgf, 5kgf, 10kgf
HV0,1 - HV0,2 - HV0,3 - HV0,5 - HV1 - HV2 - HV3 - HV5 - HV10
HK0,1 - HK0,2 - HK0,3 - HK0,5 - HK1 - HK3
in compliance with standard ISO 6507 and ASTM E-384.User Interface by 22" full HD 10-point multi-touch desktop monitor, integrated high resolution 5.0 MP, USB 3.0 CCD camera, motorized large XY-stage with travel 100x150 mm, automatic motorized Z-axis and autofocus of indentations, auto-measurement with zoom capability and indent image brightness, with automatic test sequence by motorised turret and load motor force control by closed loop load cell system adjustable internal LED illumination, large sample accomodation area, emergency stop. Automatic voltage setting 100-240 V, 1-phase, 50/60 Hz.

Standard delivery includes:
Hardness Tester, Desktop Monitor on solid stand, METKON N-Sure software incl. Auto-Measurement module, large motorized XY-stage, ISO/DaKKs Certified Vickers diamond indenter, Objective 10x, Objective 40x, 4 adjustable tester feet, Water level indicator, Indenter protection nose, Dust Cover, Power Cable, Monitor Interface Cable, Factory Test Certificate with ISO/ASTM verifications, solid accessories box.

Note: Select below for sample fixtures and test blocks

Software Modules for Vickers/Knoop Hardness Testing

GR 2081 — Software Module for CHD Testing (EHT)
(Digital XY-Stage (GR2024) or Motorized stage is required)
(To be ordered simultaneously with the machine order)

Object Lenses for Vickers/Knoop Hardness Testing

GR 2040 — Optical Kit for 3rd Objective Mount
(To be ordered simultaneously with the machine order)
GR 2041 — Object lens 5x
GR 2042 — Object lens 10x
GR 2043 — Object lens 20x
GR 2044 — Object lens 40x

Indenters for Vickers/Knoop Hardness Testing

GR 2047 — ISO/ASTM Certificated Vickers diamond indenter
GR 2048 — ISO/ASTM Certificated Knoop diamond indenter

Anvils and XY-Stages for Vickers/Knoop Hardness Testing

GR 2021 — Flat anvil diameter 80mm
GR 2022 — Flat Anvil with V-groove, diameter 80mm
GR 2023 — Analogue Manual XY-stage 100x100mm, travel 25x25mm, with two analogue micrometers
GR 2024 — Digital Manual XY-stage 100x100mm, travel 25x25mm, with one digital Slyvac micrometer incl. cable and one analogue micrometer
(GR 2081 Software Module is required for CHD/EHT testing)
(To be ordered simultaneously with the machine order)

Specimen Holders for Vickers/Knoop Hardness Testing

GR 2025 — Precision vise (opening 43mm)
GR 2026 — Thin specimen holder
GR 2027 — Fine specimen holder (Horizontal type)
GR 2028 — Fine specimen holder (Vertical type)
GR 2031 — Specimen holder for Ø25 mm specimens
GR 2032 — Specimen holder for Ø30 mm specimens
GR 2033 — Specimen holder for Ø40 mm specimens
GR 2034 — Specimen holder for Ø50 mm specimens
GR 2035 — Multiple specimen holder for 6xØ25 mm specimens
GR 2036 — Multiple specimen holder for 6xØ30 mm specimens
GR 2037 — Multiple specimen holder for 6xØ40 mm specimens

Verification Tools for Vickers/Knoop Hardness Testing

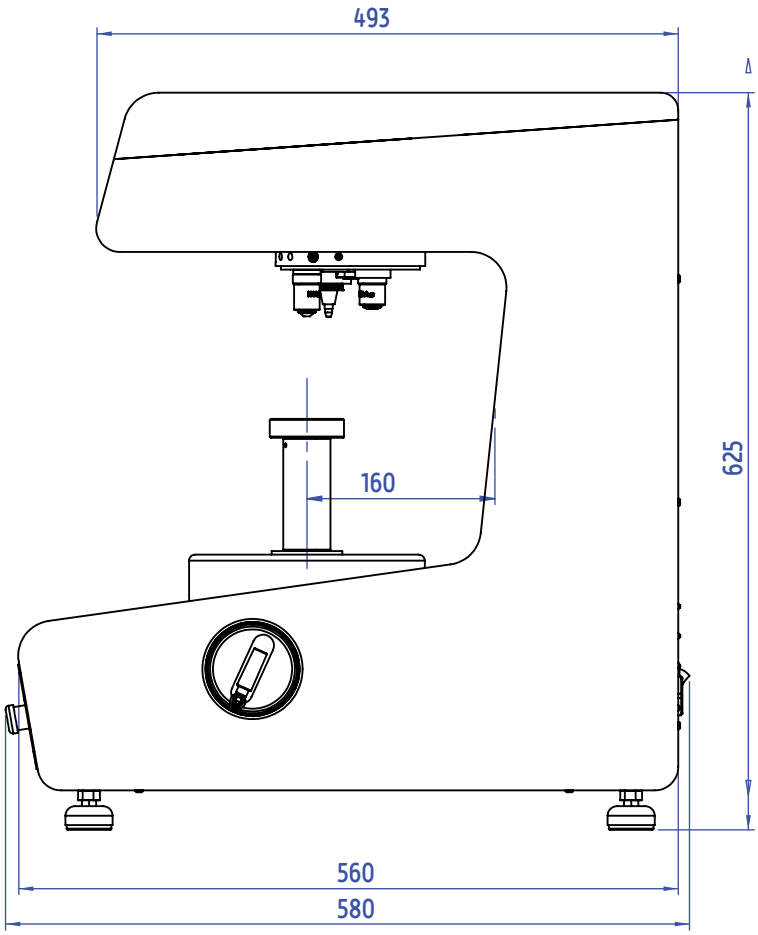
GR 2061 — ISO Dakks Germany Certified standard block 200HV0.3 (30x30mm)
GR 2062 — ISO Dakks Germany Certified standard block 450HV0.3 (30x30mm)
GR 2063 — ISO Dakks Germany Certified standard block 700HV0.3 (30x30mm)
GR 2064 — ISO Dakks Germany Certified standard block 200HV1 (30x30mm)
GR 2065 — ISO Dakks Germany Certified standard block 450HV1 (30x30mm)
GR 2066 — ISO Dakks Germany Certified standard block 700HV1 (30x30mm)
GR 2067 — ISO Dakks Germany Certified standard block 200HV5 (60x60mm)
GR 2068 — ISO Dakks Germany Certified standard block 450HV5 (60x60mm)
GR 2069 — ISO Dakks Germany Certified standard block 700HV5 (60x60mm)
GR 2071 — ISO Certificated calibration scale glass.

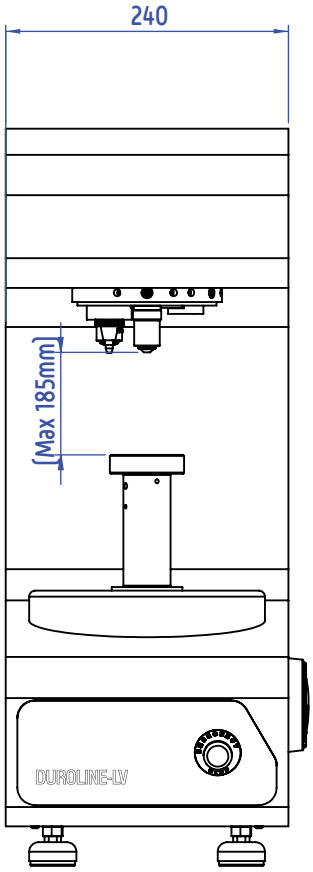
*Other standard test blocks are on request

*** Other voltages and frequencies available upon request. Please state when ordering. All specifications are subject to change without notice.**

DIMENSIONS

metkon
DUROLINE-LV


493
160
625
560
580


240
(Max 185mm)
DUROLINE-LV

metkon
Technology behind Specimen

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EXPERIENCE