

DATA MANAGEMENT

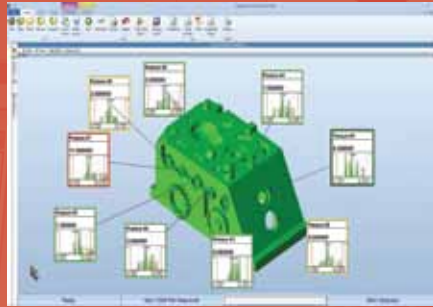
A



A

Data Management

MeasurLink 7



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Data Management

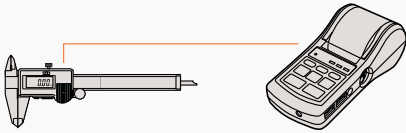
Example of Data Management System Design

A typical example of a system for recording and analysing measurement results from various Mitutoyo measuring instruments for quality assurance purposes.

Implementation Step 1

Recording measurement results

Eliminate handwriting



Measurement data can be printed easily. Data can be output to a PC for statistics calculations.

DP-1VR see page A-19

Direct data input to a PC

Connecting-cable-integrated USB-ITN.



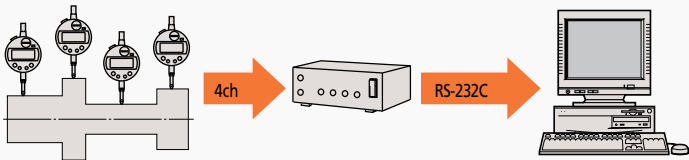
USB Input Tool Series see page A-12

A choice of three models with different output specifications IT-012U/IT-005D/IT-007R.



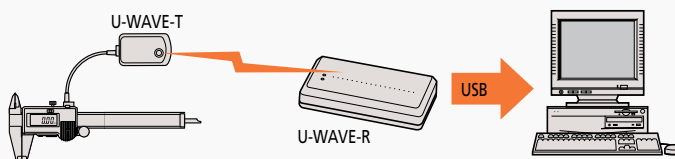
Input Tool Series see page A-15

Connectable to an RS-232C interface PC via a 4-channel multiplexer.



Multiplexers see page A-16

Wireless data input to a PC



U-WAVE see page A-13

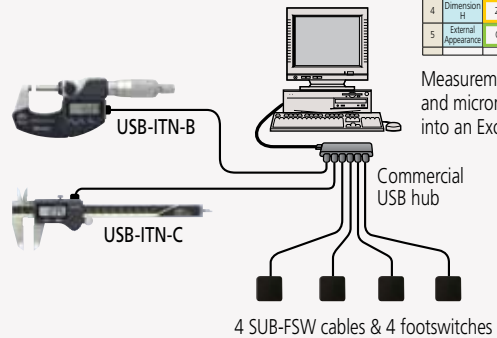
Implementation Step 2

Software dedicated to inspection and quality control

Inspection certificate creation

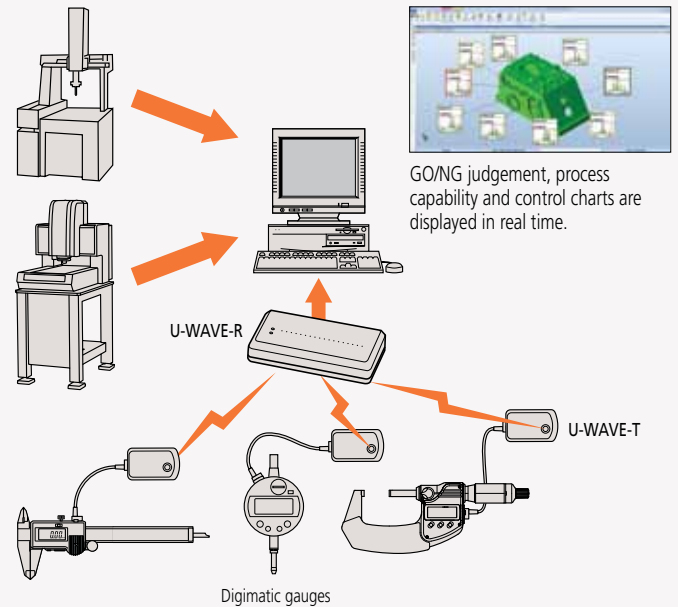
	A	B	C	D	E	F
1	Setting	1	2	3	4	5
2	Dimension X	10.025	10.033	9.964	10.031	10.046
3	Dimension Y	9.982	10.017	10.008	9.996	10.027
4	Dimension H	29.97	30.02	30.07	29.96	30.04
5	External Appearance	OK	OK	NG		

Measurement data from calipers and micrometers are imported into an Excel spreadsheet.



USB-ITPAK see page A-10

Statistical Process Control



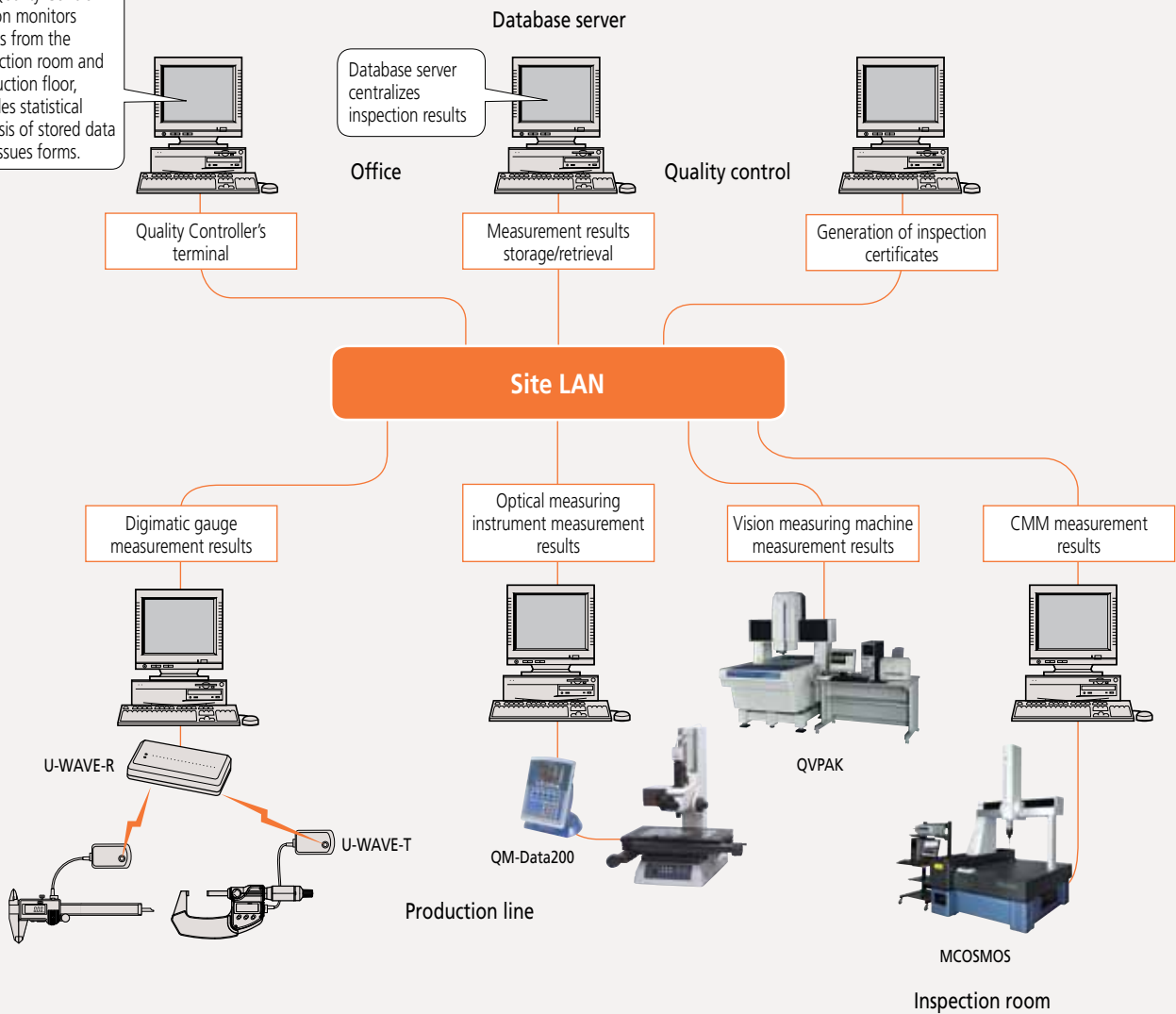
MeasurLink see page A-5

Implementation Step 3

Creating a quality control network covering a wide area on site

Unify management of the quality test using the network

The Quality Control section monitors results from the inspection room and production floor, handles statistical analysis of stored data and issues forms.



MeasurLink see page A-5

Data Management

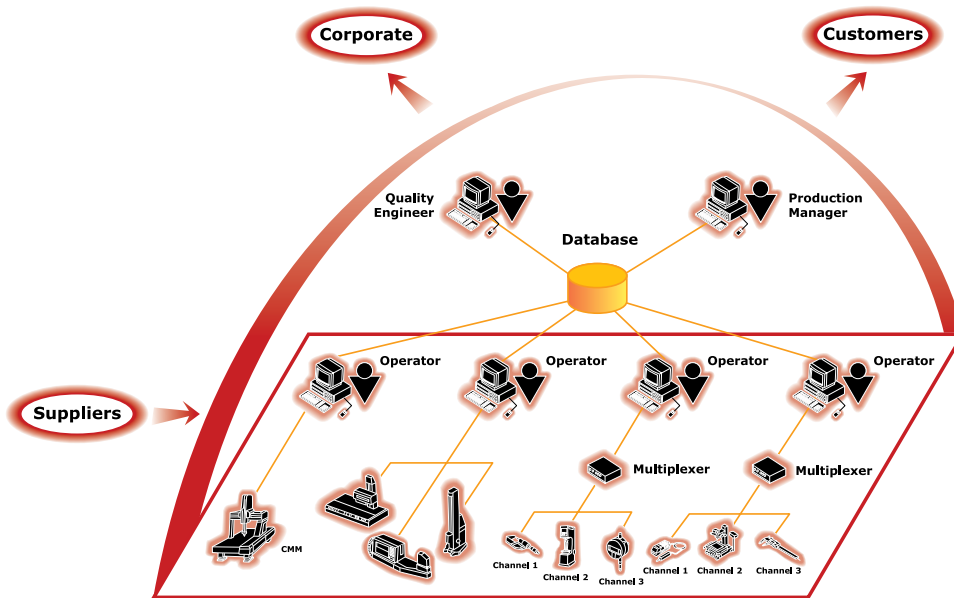
MeasurLink 7 Software

Most of Mitutoyo's electronic instruments can output data via optional data cables or wireless transmitters and receivers in the form of Digimatic code. The Digimatic code can also be converted into RS-232C format by any of several available gauge multiplexers. In this way, digital data can be sent to PCs for data acquisition and advanced statistical analysis.

As a client/server application, MeasurLink gives you the performance you need through distributed processing. Combined with a multi-user relational database, MeasurLink delivers a safe and organized data warehousing system making quality data available for viewing and analysis by any member of the production, engineering, and managerial staff throughout your company. Inspection in the factory produces data for analysis, corrective action, and various reporting needs. As the backbone of your quality efforts, MeasurLink is guaranteed to reduce your production costs and increase profits.

Scalable Network

MeasurLink is capable of linking and managing multiple 'islands' of inspection into a common database of part information, statistical data, gauge information, processes, etc. Information is shared across an entire manufacturing facility.



MeasurLink Suite of Software

MeasurLink is an easy-to-use, Windows-based family of quality data management software that combines real-time data acquisition, on-line statistical analysis, integrated networking, and quality information sharing into a comprehensive data management solution.

- **Real-Time:** On-line real-time data collection
- **Process Analyzer:** Analysis of all data
- **Process Manager:** Network monitoring
- **Gauge R&R:** Gauge repeatability and reproducibility
- **Gauge Management:** Gauge inventory and calibration control

Note: Upgrade packages are also available.
Please contact our sales department for details.

Technical Data

Database Management System (DBMS) Requirements
MeasurLink 7 ships with a copy of Microsoft® SQL Server Express Edition 2008 R2, this can be for a standalone or a workgroup installation. MeasurLink 7 also supports Microsoft® SQL Server 2005 all editions or newer.

Operating System Requirements

All MeasurLink 7 products are supported on the following Microsoft® Windows Operating System versions:

- All Windows® XP SP3 versions
- All Windows® Vista SP2 versions
- All Windows® 7 versions
- Both 32-bit and 64-bit operating systems supported



User-friendly

Click a gauge button and watch the charts update in real-time. This helps the operator stay in control of the process. Begin collecting data in minutes with the newly designed Inspection Wizard.

Data acquisition

Collects data from digital micrometers, calipers, indicators, bore gauges, etc. Keyboard entry is quick and easy. Collect data for one or a million parts.

Comprehensive SPC

Easy to use Control Charts, Histograms, Capability, Detailed statistics, Assignable Causes, Corrective Actions, and Traceability all make this software 'best in class'.

Variable data

Collect dimensional data (length, width, height, outside diameter, inside diameter, weight, etc.). Supports derived features (calculations for run out, volume, true position, etc.).

Attribute data

Collect data from visual inspections (burrs, cracks, dents, missing holes, etc.) to determine the fitness of a part. Track failures using a go/no-go style or count the defects on a characteristic to determine if a part is defective. There is complete flexibility to study characteristics individually or in groups.

Engineering specifications

Attach drawings to parts, routines or individual characteristics for viewing. Most file formats are supported as an attachment (e.g. Word, PDF, CAD).

Multimedia aids

Attach movies (AVI, MOV, MPG), sound (WAV) and images (BMP, JPG, TIF) to parts, routines or individual characteristics as instructional aides for an operator.

Revision history

Track specification adjustments and preserve historical data.

Mathematically derived features

Fully functioning real-time calculator with standard functions including square root, exponential, trigonometric, sum, average, max, min.

Part pictures

View scanned blueprints and digital photographs at a glance. On-screen guided sequencing keeps the operator moving to the right feature.

Data tests

Full support of Western Electric and Nelson Tests for pattern recognition in control charts (e.g. extreme point, trend, stratification, oscillation, etc.) along with various alerts for each failed test.

Forced assignable cause

Forces Assignable Cause Tags on Inspector during collection if process is out of control. Empowers operator to build on existing pick list.

Corrective action plans

Operators choose corrective action as applied to the part or process. Multiple corrective actions can be applied to any subgroup. Empowers operator to build on existing Corrective Action list.

Sequenced and random gauge input

Flexible data input. Collect data by feature, by part or randomly. Guided sequencing minimizes inspection errors.

Time stamped data

All observation data is marked with the date and time from the computer clock.

Flexible reporting

Build report templates with company logos and free form text. Select and position chart types to customer specification.

Mixed variable/attribute data

Mix your dimensions and nonconformances in the same Inspection Routine. Track defects and defectives along with your dimensional data.

Crystal Reports

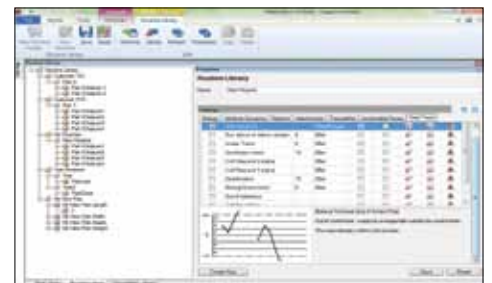
Create your own customized Crystal Reports for use with Part or Run data.

FDA 21CFR Part II support

Provides support for medical and pharmaceutical manufacturers electronic records, including audit trails, e-signatures (Process Analyzer Professional only) and advanced security.

Inspection wizard

Begin collecting data in 60 seconds with a 'Quick Run' by defining features, tolerances and input method.



Easy-to-use

MeasurLink provides the most intuitive interface with complete SPC functionality to help you monitor and manage your manufacturing processes. With MeasurLink, you can easily manage the quality levels of parts, identify problem areas and apply corrective action to areas in need of attention.

Data Management

MeasurLink 7 Real-Time Standard Edition

MeasurLink Real-Time performs as a data acquisition clearing house by enabling you to connect and acquire data from virtually any measuring device. It supports the full range of metrology technology, including calipers, micrometers, indicators, CMMs, vision systems and more. Select the edition to fit the device and the needs.

Designed for customers who want to acquire and analyze data in real-time and check variable and attribute inspection to maximize production and minimize defects. It has views to allow the user to create Parts, Characteristics with nominal and tolerance and Traceability lists. The data collection interface provides real-time graphics for Run charts, Control charts, Histograms and Statistics. Standard views include Datasheet (observations and charts), Classic View (chart windows), and 2D view (part images with callouts that include charts and statistical data) along with an especially customizable Info View and additional Manager views. Full reporting template functionality is also provided.

Supported data sources: keyboard, RS232 and USB devices.

SPECIFICATIONS

Code No.	Description
64AAB177R	MeasurLink 7 Real-Time Standard Edition

MeasurLink 7 Real-Time Professional Edition

Enables customers to connect and acquire data from Mitutoyo Coordinate Measuring Machines, Vision and Form Measuring Systems via native integration (DDE). ASCII and QMD (xml-based) file import are also supported. In addition to all of the features supported by MeasurLink 7 Real-Time Standard Edition, this application also supports data filters. Full reporting functionality with templates is also provided.

Supported data sources: keyboard, RS232 and USB devices, native Mitutoyo integration (DDE), ASCII and QMD (xml-based) file import.

• Import templates

Easily create an import template that maps data in a text file to MeasurLink information. Templates are saved to the database for everyone to use and can be added as data sources to data collection stations. An import template can be verified against the source file without adding data to the system.

• Direct data transfer

Collect data into MeasurLink from Mitutoyo capital equipment running Mitutoyo Software that is MeasurLink enabled. This provides a tighter and more robust interface than importing data from files.

• Filter data

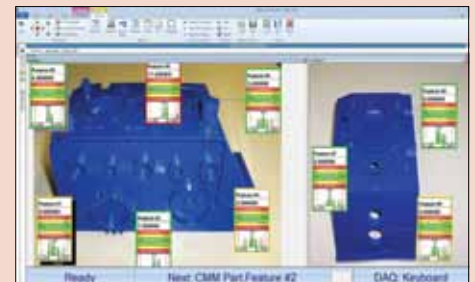
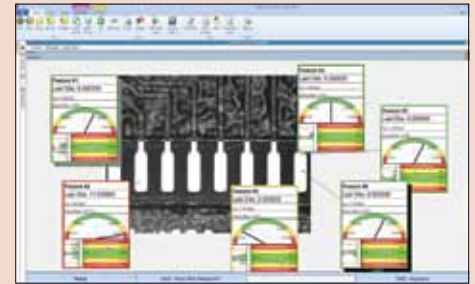
All data collected within a Real-Time run is related. Often, especially for runs containing a large volume of subgroups, requests are made for subsets of data that are further related from the entire run's population. MeasurLink provides robust filtering capabilities to comply with these requests.

• Import data

When set up as a data source, import templates are readily available to the operator, or periodic imports can be executed.

SPECIFICATIONS

Code No.	Description
64AAB178R	MeasurLink 7 Real-Time Professional Edition



MeasurLink 7 Real-Time Professional 3D Edition

Designed for customers who wish to collect data using the Hoops 3D graphics view, in addition to all features offered by MeasurLink 7 Real-Time Professional Edition. Hoops 3D files can be exported from most CAD systems and provides the operator with a real view of the part. Camera angle and position can be saved for each characteristic providing for an intuitive prompted guided sequencing for the inspector.

Supported data sources: keyboard, RS232 and USB devices, native Mitutoyo integration (DDE), ASCII and QMD (xml-based) file import.

- **3D view**

True three-dimensional model support with Hoops streaming files (.HSF). Export your part's model from Catia, Solidworks or other CAD software and place callouts in the 3D space.

- **Flexible callout design**

Callouts provide part acceptability at a glance. You can design them the same way as for the two-dimensional view to include charts or statistical information with the ability to size any element inside the callout.

- **Guided sequence**

The display can automatically change during data collection to show the next or last observation point, providing a simple guided sequence for the inspection procedure. By saving a different view for each characteristic to be inspected, you can have the model rotate, pan or zoom to show the operator details of the part.

SPECIFICATIONS

Code No.	Description
64AAB179R	MeasurLink 7 Real-Time Professional 3D Edition

MeasurLink 7 Process Analyzer Professional Edition

Process Analyzer is an invaluable tool for your quality team. It gives you the flexibility to analyze your processes, identify problem areas and take corrective action to improve your product's quality. Inspection runs can be sorted by Inspection Station, Routine or Part, and are displayed with the look and feel of Windows Explorer. Inspection data can be merged, filtered, grouped, charted and printed in the way you want it.

Designed for offline viewing of real-time data in a networked environment. All views that are available in Real-Time Standard Edition are supported, with the exception of the Manager Views. Full reporting template functionality is also provided. It enables Quality Engineering to slice and dice data in meaningful ways that contribute to quality control initiatives. For larger installations that use different databases, the ability to switch the connection allows an engineer to analyze data from all sources.

- **Group, Search and Sort data**

View data by part, routine, station, year, month, day. Apply saved filters to data and search for specific traceability or serial number criteria.

- **Merge Data**

Combine 'lot based' or 'just in time' collected data to get a bigger picture of process variation and production quality.

- **Scatter Plots**

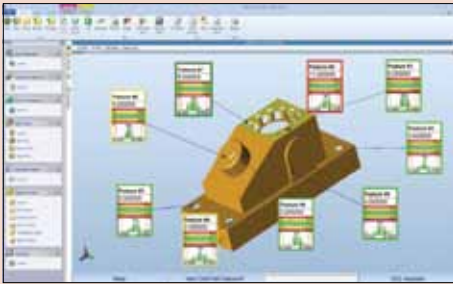
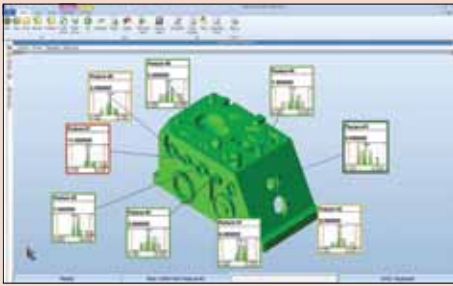
Perform correlation studies to identify process interactions.

- **Electronic Signatures**

The e-signatures can be applied to runs only in Process Analyzer Professional. When combined with Audit Trails available in Real-Time, and security is implemented, then MeasurLink provides support for FDA requirements for Medical and Pharmaceutical Manufacturers.

SPECIFICATIONS

Code No.	Description
64AAB181R	MeasurLink 7 Process Analyzer Professional Edition



Data Management

MeasurLink 7 Process Manager Standard Edition

Real-time monitoring of data as it is collected. Provides the QC/Production Manager with the perfect tool to organize and maintain a shop-wide quality program at a glance.

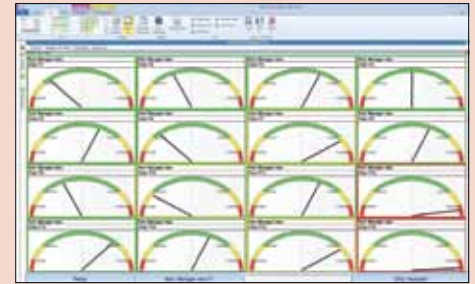
Process Manager provides a method for auditing the entire shop floor inspection activity from a single PC. Easily see process information without walking from one inspection area to another by viewing current production across all machines. Show clients your quality operation for the entire facility.

Quality Control personnel can choose to display only specific stations, parts, routines or even critical characteristics that they are responsible for. Establish Cpk thresholds for acceptability. Drill down for details on certain traceability, assignable cause, failed tests or serial numbers.

Various alerts are provided to recognize and stay up-to-the-minute on production problems. Display the easy-to-read charts and detailed statistics.

• MeasurLink Process Manager

Displays snapshot windows of characteristics that are currently being collected in MeasurLink Real-Time. The data can be sorted by Station, Process, Capability or Timestamp.



SPECIFICATIONS

Code No.	Description
64AAB182R	MeasurLink 7 Process Manager Standard Edition

MeasurLink Gauge R&R

Measurement Systems Analysis

Designed according to standard ISO/TS 16949, Gauge R&R allows you to use the AIAG methods of study:

- Range
- Average and Range
- Average and Range including part variation
- Variance analysis
- Short method for attribute gauges
- Bias study
- Linearity study
- Stability study

Features :

Graphical analysis tools :

- Xbar/R chart
- Part by appraiser plot

SPECIFICATIONS

Code No.	Description
64AAS941D	MeasurLink Gauge R&R

MeasurLink Gauge Management

Gauge Inventory and Calibration Control

MeasurLink Gauge Management allows customers to build a complete gauge and fixture inventory. Calibration is made simple by supporting digital gauges for both, variable and attributive features. Achieve optimal calibration frequencies – set-up individual calendars with:

- Gauge in-service dates
- Calibration recall dates
- Gauge R&R dates

Features:

- Vendor contact lists
- User lists
- Print and archive calibration certificates
- Incremental response methods
- Customized gauge label printing

SPECIFICATIONS

Code No.	Description
64AAS007D	MeasurLink Gauge Management

Technical Data

OS compatibility: Windows® 2000 Professional (≥SP4), Windows® XP Professional (≥SP2), Windows® XP Home Edition (≥SP2), Windows Vista®/7 (32bit,64bit), Windows® 8

Applicable MS Excel version: Microsoft® Excel® 2000/2002/2003/2007/2010

Functions:

- setting of Microsoft® Excel® input (workbook, worksheet, cell range a.s.o.)
- data collection: USB Direct Input Tool, wireless communication system U-WAVE
- selection of measuring input (sequential, simultaneous, individual)
- control of data input (mouse, footswitch, keyboard)
- character string input by footswitch
- timer function
- measurement time input

Language for display: English, German, French, Italian, Spanish, Turkish, Czech, Polish, Hungarian, Swedish, Russian, Japanese, Korean, Simplified Chinese, Traditional Chinese

Supplied with USB dongle



SERIES 06AEN – USB-ITPAK Measurement Data Collection Software

- USB-ITPAK is a setting and data collection program for collecting data from measuring instruments with Digimatic output for entry to Microsoft® Excel®.
- A USB Direct Input Tool, U-WAVE Wireless communication system and USB Footswitch adapter can be used to send the data to a Microsoft® Excel® worksheet.

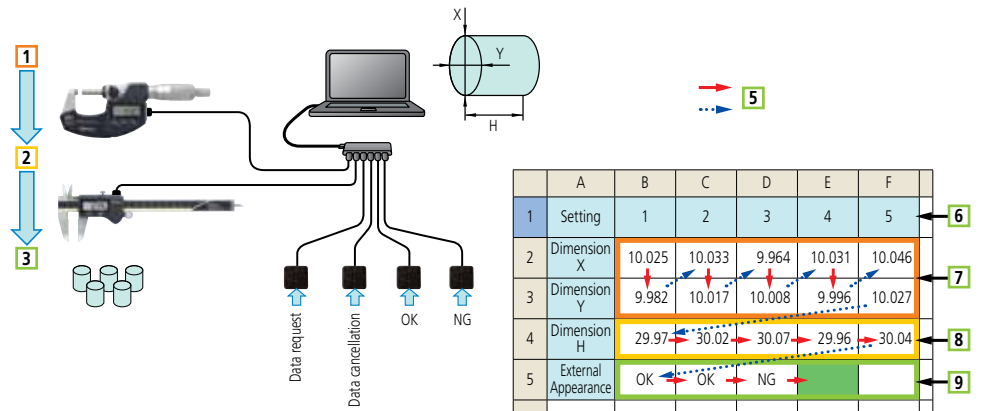
USB-ITPAK



USB dongle (supplied)

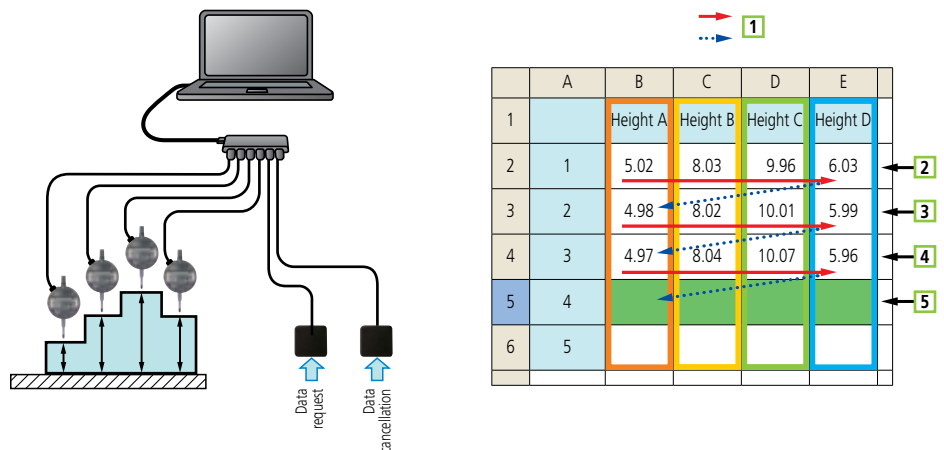
SPECIFICATIONS

Code No.	Description	Price
06AEN846	Software USB-ITPAK with dongle	£210.00



Sequential Measurement

1: Micrometer for diameters X and Y; 2: Caliper for height measurement H; 3: Inspection by attributes OK/NG with footswitch, e.g. scratches on the surface; 4: standard USB-Hub; 5: Measurement direction; 6: Workpiece No. 7: Measuring result X/Y; 8: Measuring result H; 9: OK/NG judgement (e.g. scratches)



Simultaneous Measurement

1: Measurement direction; 2: First measurement: press footswitch once = 4 complete data batches; 3: Second measurement: press footswitch once = 4 complete data batches; 4: Third measurement: press footswitch once = 4 complete data batches; 5: Is waiting for the next batch measurement

Data Management

Digimatic Signal Cables

- These cables are used to connect Mitutoyo measuring instruments that feature a Digimatic interface.
- Mitutoyo's Digimatic interface not only allows connection of numerous additional devices such as printers, counters and the like, but also enables connection of one or more Digimatic measuring instruments to a PC by using a Mitutoyo transmitter and an RS-232C signal cable.



05CZA662

Technical Data

Digimatic measuring instruments require one of the following for initiating data transmission:

1. Footswitch
2. Data pushbutton on the instrument (if present)
3. Data request from the PC
4. Signal cables with data pushbutton (if connectable to the measuring instrument)

SPECIFICATIONS

Code No. and Price		For use with	Measuring instrument plugs	
1 m	2 m		Remarks	Image
05CZA624 £58.50	05CZA625 £70.40	IP65/66/67 ABSOLUTE Digimatic Thickness Gauge (Series 547) IP65/66/67 ABSOLUTE Digimatic Caliper (Series 500, 550, 551, 573) IP65/66/67 ABSOLUTE Digimatic Scale (Series 572) IP65/66/67 ABSOLUTE Depth Gauge (Series 571)	With data pushbutton and screws	
905338 £32.90	905409 £36.80	ABSOLUTE Digimatic Indicator IDS/IDC (Series 543) ABSOLUTE Digimatic Indicator IDU (Series 575) ABSOLUTE Digimatic Thickness Gauge (Series 547)	Straight	
905689 £32.90	905690 £45.20	Digimatic Workshop Caliper (Series 552) ABSOLUTE Digimatic Caliper (Series 500 except IP65/66/67 models) ABSOLUTE Digimatic Caliper (Series 550, 551, 573)	Back side	
905691 £32.90	905692 £45.20	Digimatic Height Gauge (Series 192, 570) ABSOLUTE Digimatic Depth Gauge (Series 547)	Right	
905693 £32.90	905694 £45.20	Portable Hardness Tester (Series 811) ABSOLUTE Digimatic Bore Gauge (Series 511) ABSOLUTE Digimatic Depth Gauge (Series 571 except IP65/66/67 models)	Left	
959149 £34.60	959150 £39.40	ABSOLUTE Digimatic Scale (Series 572 except IP65/66/67 models) ABSOLUTE Digimatic Micrometer Head (Series 164)	With data key	
05CZA662 £58.50	05CZA663 £70.40	Digimatic Micrometer IP65 (Series 293, 331, 340, 342, 695) Three-Point Inside Micrometer Digimatic Holtest (Series 468)	With data key and screws	
937387 £32.90	965013 £39.10	ABSOLUTE Digimatic Quick Micrometer (Series 227, 293) ABSOLUTE Digimatic Micrometer (Series 293, 314, 317, 323, 324, 326, 331, 340, 342, 343, 369, 389, 395, 406, 422) Digimatic Micrometer Head (Series 164, 350) Digimatic Standard Micrometer (Series 121) Digimatic Depth Micrometer (Series 329) Digimatic Inside Micrometer with jaws (Series 345) Digimatic Inside Micrometer (Series 337, 339) ABSOLUTE Digimatic Borematic (Series 568) Height Micrometer Heightmaster (Series 515) Hardness Tester Wizhard (Series 810) Hardness Tester Micro Vickers (Series 810)	6 pin	
936937 £32.90	965014 £39.10	ABSOLUTE Digimatic Indicator ID-F/ID-H (Series 543) Portable Surface Roughness Tester SJ-210/301/401/402 (Series 178) Profile Projector PJ-Series (Series 303) Profile Projector PH-Series (Series 172) Height Micrometer CERA Heightmaster (Series 515) Linear Height and Height Gauge QM-Series (Series 518) Linear Gauge Counter (Series 542) LSM-6000 Counter for Laser Scan Micrometer (Series 544) Laser Scan Micrometer LSM-9506 (Series 544) Digimatic Multi-Unit (Series 572) MVK-H Hardness Tester (Series 810) Digimatic Port for Linear-Scale Counter	Identical connectors on both ends	
21EAA194 £40.00	21EAA190 £45.00	ABSOLUTE Digimatic Indicator ID-N/ID-B (Series 543)	—	
21EAA210 £102.00	21EAA211 £115.00	ABSOLUTE Digimatic Indicator ID-N/ID-B (Series 543) with zero-setting terminal	—	

Technical Data

Cable length:	2 m
Output:	USB (HID/VCP)
OS compatibility:	Windows® 2000 Professional (≥SP4), Windows® XP Professional (≥SP2), Windows® XP Home Edition (≥SP2), Windows Vista®/7 (32bit,64bit)
Max. connectable devices	
Windows® XP/2000:	108 devices (18 hubs with 7 ports and 1 software Dongle)
Windows Vista®/7:	20 devices

Optional Accessories

937179T:	Footswitch £45.30
06ADV386:	Software USB-ITPAK with Dongle £213.00



SERIES 06ADV – USB Input Tool Direct (Digimatic USB cable)

- This input tool allows you to directly connect Digimatic measuring devices to a USB interface, without needing additional software.
- Measurement data is converted into keyboard codes, enabling interaction with any program working with keyboard entries.
- You can also connect to a USB with fixed COM assignment in Microsoft® Windows® as channel identification (VCP).
- The USB-ITPAK software lets you easily create Microsoft® Excel® worksheets.
- Multi-channel input for measurement values, Microsoft® Excel®.
- Cables can be cascaded via a standard USB hub.



06ADV380C

SPECIFICATIONS

Code No.	Model	Description	Price
06ADV380A	A	IP USB Input Tool Direct Cable Straight With Data Pushbutton (2 m) e.g. for IP67 Caliper	£106.00
06ADV380B	B	IP USB Input Tool Direct Cable Back Side With Data Pushbutton (2 m) e.g. for IP65 Micrometer	£106.00
06ADV380C	C	USB Input Tool Direct Cable Straight With Data Pushbutton (2 m) e.g. for Standard ABSOLUTE Caliper	£90.80
06ADV380D	D	USB Input Tool Direct Cable Plain (2 m) e.g. for IDH/IDF Indicator	£90.80
06ADV380E	E	USB Input Tool Direct Cable Round (2 m) e.g. for Quick Micrometer	£90.80
06ADV380F	F	USB Input Tool Direct Cable Straight (2 m) e.g. for IDC/IDS Indicator	£90.80
06ADV380G	G	IP USB Input Tool Direct Cable IDN/IDB (2 m)	£90.80

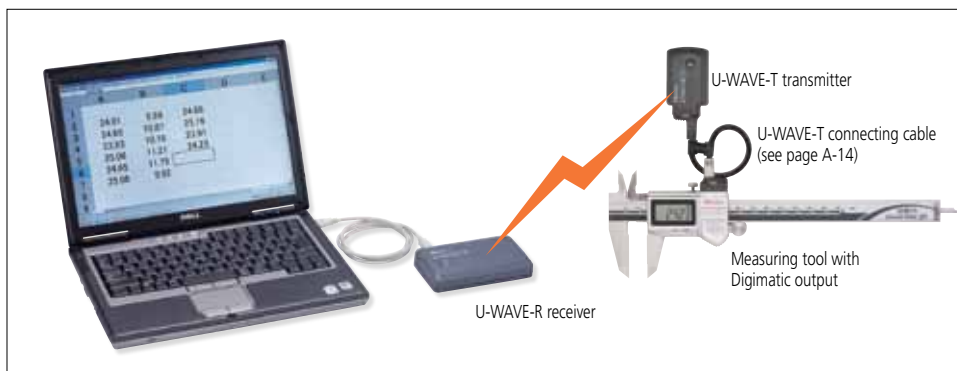
Advantages of the new Digimatic USB connections

Application	Situation	Software USB-ITPAK	Data format	Remarks
Arbitrary software which expects a keyboard code	Only a USB Input tools signal cable required	Software is not needed.	Measured value as keyboard format (HID = Human Interface Device)	Footswitch cannot be connected
Commercial statistics software, such as Mitutoyo's MeasurLink	A USB input tools signal cable and the software USB ITPAK are required	For each measuring instrument (cable) a fixedly assigned virtual COM-Port is generated once; afterwards Software USB IT PAK becomes inactive.	MUX-10 Specification (e.g. 01A+138.626) with fixed COM assignment as channel identification	—
Arbitrary software, which expects a keyboard code, e.g. Word, txt-format	—	- Connected measuring instruments and footswitches are selected and assigned. - Terminator is determined. - Procedure is registered as a part program	Transmission of a measured value in text format (VCP = as virtual COM port)	—
Microsoft® Excel®	—	- Connected measuring instruments and footswitches are selected and assigned. - Performs organization of the Microsoft® Excel®-table, i.e. the transferred measured values are written into the predefined cells	Measuring report Microsoft® Excel®-format and character sequence of max. 31 characters (e.g. text input)	—

Data Management

SERIES 02AZD – U-WAVE Wireless Communication System

- This wireless communication system transfers data directly from a Digimatic measuring instrument to a PC, thus avoiding the need for long cable runs.
- 20 metre communication distance (line of sight).
- Allows easy data export straight to Microsoft® Excel® or other applications, using the bundled data interface software.
- Data transfer is confirmed by the transmitter through a buzzer or LED.
- An IP67-rated transmitter is available.
- Up to 400,000 data transmissions with a single battery.
- By using special software the system will also support a data request from a PC (Event Drive mode). This is ideal if there is no one operating the measuring tool, or if it is installed in an inaccessible site.



SPECIFICATIONS for U-WAVE-R Receiver

Code No.	02AZD810D
Items included	U-WAVE-R + software
Software	U-WAVE PAK
Number of U-WAVE-R units that can be connected to a PC	Up to 16
Number of U-WAVE-T units that can be connected	Up to 100
USB cable length	1 m
Power supply	USB bus power system
Dimensions (W x D x H)	140 x 80 x 31.6 mm
Mass	130 g
Price	£278.00

SPECIFICATIONS for U-WAVE-T Transmitter

Code No.	02AZD730D	02AZD880D
Data reception indication	LED	LED and buzzer
Remarks	IP67 model	Standard model
Power supply	Battery CR2032	
Battery life	400,000 transmissions	
Dimensions (W x D x H)	44 x 29.6 x 18.5 mm	
Mass	23 g	
U-WAVE cable included*	✓	✓
Price	£162.00	£162.00

* Required cable type needs to be specified at time of purchase.

Technical Data

Wireless communication	
protocol:	IEEE 802.15.4
Modulation method:	DS-SS (Direct Sequence Spread Spectrum)
Communication	
Distance:	Approx. 20 m line of sight
Speed:	250 kbps
Frequency:	2.4 GHz (ISM: universal frequency band)
User band:	15 channels (2.405 to 2.475 GHz at intervals of 5 MHz)
OS compatibility:	Windows® 2000 Professional (≥SP4), Windows® XP Professional (≥SP2), Windows® XP Home Edition (≥SP2), Windows Vista®, Windows® 7 (32 bit, 64 bit)

Standard Accessory for U-WAVE-T

Supplied with a U-WAVE cable (required type needs to be specified at time of purchase).

Optional Accessories

937179T:	Footswitch £45.30
02AZE200:	Holder for U-WAVE T. Contents: support plate, fixing pads, screws £17.90

Consumable Spare

05SAA217:	Lithium battery CR-2032 £2.90
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SERIES 02AZD/02AZE – U-WAVE-T Connecting Cables

- This is a short cable that connects a measuring tool to its U-WAVE T unit. Choose the appropriate cable for your measuring tool from the seven types below, A to G.



SuperCaliper with
02AZD790A cable



QuantuMike with
02AZD790B cable



Standard ABSOLUTE Caliper
with **02AZD790C** cable



Digimatic Indicator ID-H with
02AZD790D cable



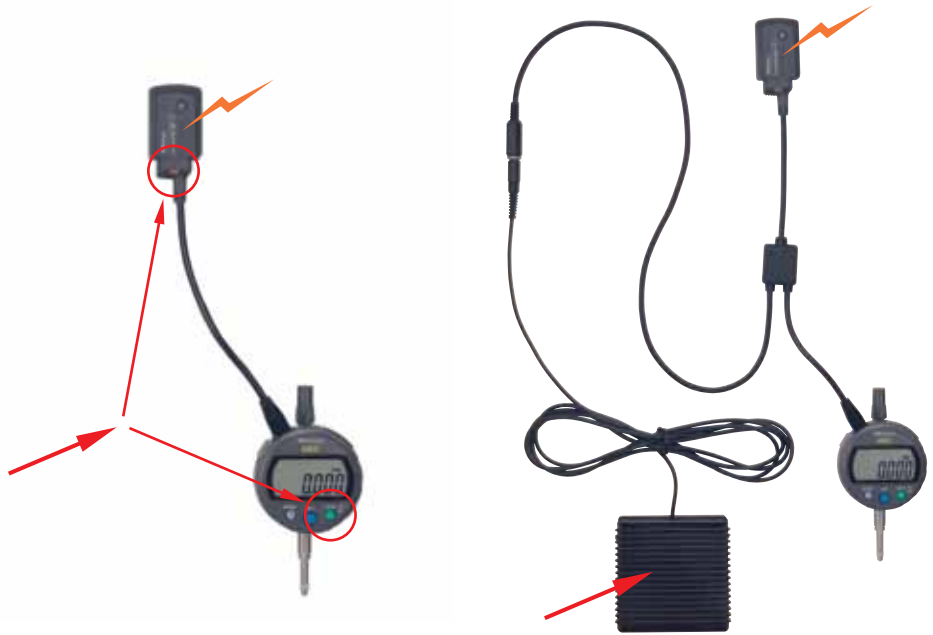
Quick Micrometer with
02AZD790E cable



Digimatic Height Gauge with
02AZD790F cable



ABSOLUTE Digimatic
Indicator ID-N with
02AZD790G cable



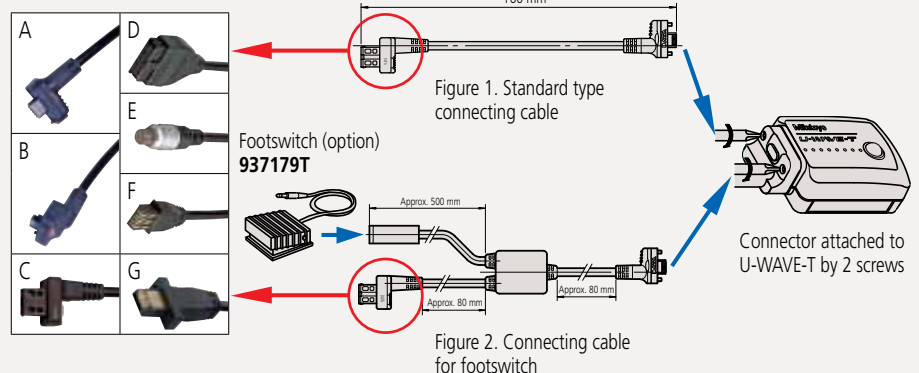
Cable without footswitch connection

Cable with footswitch connection

SPECIFICATIONS

Code No.	Model	Description	Price
Without footswitch connection			
02AZD790A	A	IP U-WAVE Data Cable, straight with pushbutton e.g. for IP67 Caliper	£52.20
02AZD790B	B	IP U-WAVE Data Cable, rear mounting with pushbutton e.g. for IP65 Micrometer	£52.20
02AZD790C	C	U-WAVE Data Cable, straight with pushbutton e.g. for Standard ABSOLUTE Caliper	£52.20
02AZD790D	D	U-WAVE Data Cable, plain e.g. for IDH/IDF Indicator	£52.20
02AZD790E	E	U-WAVE Data Cable, round e.g. for Quick Micrometer	£52.20
02AZD790F	F	U-WAVE Data Cable, straight e.g. for IDC/IDS Indicator	£52.20
02AZD790G	G	IP U-WAVE Data Cable, e.g. for IDN/IDB Indicator	£52.20
With footswitch connection			
02AZE140A	A	IP U-WAVE Data Cable, straight with pushbutton/footswitch e.g. for IP67 Caliper	£119.00
02AZE140B	B	IP U-WAVE Data Cable, rear mounting with pushbutton/footswitch e.g. for IP65 Micrometer	£119.00
02AZE140C	C	U-WAVE Data Cable, straight with pushbutton/footswitch e.g. for Standard ABSOLUTE Caliper	£107.00
02AZE140D	D	U-WAVE Data Cable, plain with footswitch e.g. for IDH/IDF Indicator	£107.00
02AZE140E	E	U-WAVE Data Cable, round with footswitch e.g. for Quick Micrometer	£107.00
02AZE140F	F	U-WAVE Data Cable, straight with footswitch e.g. for IDC/IDS Indicator	£107.00
02AZE140G	G	IP U-WAVE Data Cable with footswitch e.g. for IDN/IDB Indicator	£107.00

7 types of connector



Data Management

SERIES 264 – Digimatic Input Tools

- An input tool is an interface enabling you to easily input measurement data from a Mitutoyo gauge, equipped with the Digimatic output feature, to your PC. USB and RS-232C compatible types are available.
- This USB input tool is a keyboard Interface for transmitting data from measuring instruments equipped with Digimatic interfaces to a PC. Measurement data is converted into keyboard codes, allowing easy transfer to any program working with keyboard entries, regardless of the operating system. The USB and data conversation interfaces also allow you to directly input measurement data into a spreadsheet.
- The RS-232C communication type IT-007R allows serial communication control with a PC (data request command from PC).



264-012-10



264-007

SPECIFICATIONS

Code No.	Data input	Data output	Output decimal mark	Footswitch connector	Power supply	Price
264-012-10	1 x Digimatic	USB keyboard signal (HID)	Point	Yes	5V from USB cable	£191.00
264-007		RS-232C			12V from PC bus	£233.00

Technical Data

Cable length: 0.9 m
 Dimensions (WxDxH): 72 x 44 x 23.5 mm
 OS compatibility: Microsoft® Windows® 98, 2000, XP, Windows Vista®, 7 (32 bit), Pocket PC 2002

Optional Accessory

937179T: Footswitch
 £45.30



Optional Accessory

264-000-271: Footswitch
£56.70

SERIES 264 – Digimatic Multiplexers

- Digimatic Multiplexers are used to concentrate streams of measurement data from several instruments into a single stream feeding into a dedicated processor or PC for storage and processing.
- Models are available for handling 4 or 8 inputs.
- Supplied with 9 pin D-type output cable.



264-000-269



264-000-270

SPECIFICATIONS

Code No.	Type	Data output	Number of input channels	Price
264-000-269	MUX-4	RS-232C	4	£490.00
264-000-270	MUX-8		8	£798.00

Data Management

SERIES 542 – EC Counter, Low-Cost Modular Display Unit

- A Display Unit of the single-function type for connection to Digimatic measuring instruments.
- Employs DIN size (96 x 48 mm) panel-mount configuration to facilitate system integration.
- Able to produce tolerance judgement and Digimatic measurement data output.



542-007E



Technical Data

Functions: Preset, GO/±NG judgement
 Output (selectable)
 Tolerance judgement: -NG, OK, +NG (open collector)
 Data: Digimatic code
 External control signal
 input: Preset, data hold
 Power supply: Via AC adapter

Optional Accessories

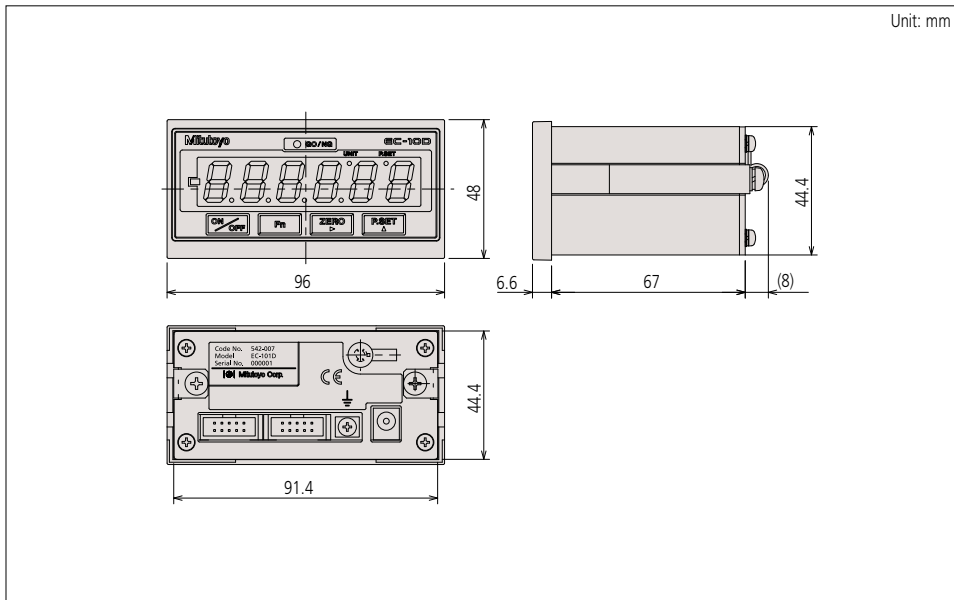
- 936937: SPC data cable (1 m) £32.90
 965014: SPC data cable (2 m) £39.10
 214938: DC plug PJ-2 £3.80
 C162-155: I/O cable £39.10



SPECIFICATIONS

Code No.	542-007E
Applicable input	Digimatic code (SPC)
Number of gauge inputs	1
Resolution	0.01, 0.001 mm (automatically set depending on the gauge)
Display	6-digit and a negative [-] sign LED (amber, green, red)
Price	£216.00

DIMENSIONS



Technical Data

Communications interface:	USB 2.0 compatible
Power supply:	Internal Li-ion 3.6 V battery
Battery charging:	Via USB port
Charge time:	8 hours
Data retention:	Indefinite (EEPROM)

Optional Accessory

264-000-277: USB hardware dongle
£300.00

SERIES 264 – DigiStore Remote Data Collection Device

- Reads and stores measurement data from a Mitutoyo Digimatic instrument for subsequent processing.
- Ideal for collecting measurement data at a remote location.
- Robust construction and very compact, easily fits in a pocket.
- Easy upload of data to a Windows-based PC via USB and the DigiStore PC software.*
- Simple operator interface.
- Long term data retention (non-volatile).
- Battery powered — recharges via USB connection.
- Extra DigiStores can be used with one PC.
- Extra Dongles allow one DigiStore to be shared by more than one PC, or a number of DigiStores to be shared by a number of PCs (one Dongle required per PC).

* USB hardware dongle (264-000-277) is required.



264-000-272



SPECIFICATIONS

Code No.	264-000-272
Interface to measuring device	Mitutoyo Digimatic
Storage capacity	More than 1000 measurements (including timestamp)
Timestamp	Measurement date/timestamp uses internal real time clock
Recording	Pushbutton initiated on DigiStore or via a program timed interval
Uploading	Via the DigiStorePC data collection software (in Dongle) that outputs data directly to a PC running Mitutoyo's MeasurLink, or as a CSV file.
Indicators (LED)	When connected to a Digimatic measuring instrument Green: measurement taken and stored Red: reading not taken, memory nearly full
	When connected to a PC Green: battery is charging Red: data transfer in progress
Price	£430.00

Data Management

SERIES 264 – DP-1VR Digimatic Mini-Processor

- Mitutoyo's DP-1VR is so compact it fits right in your palm. But with this powerful little device you can print data from calipers, micrometers and any other measuring devices equipped with a Digimatic port, and even perform statistical evaluations.
- Printing speed is excellent, it prints from a one-touch start and with the built-in thermal printer there's almost no noise. The thermosensitive paper has outstanding durability and chemical resistance for long-term storage.
- The DP-1VR even lets you transmit the data to a computer using an RS-232C connecting cable.
- Easy printing function.
- Excellent readability due to large character print.
- Clock function for loading measurement data.
- Processing capacity for up to 9,999 data groups.

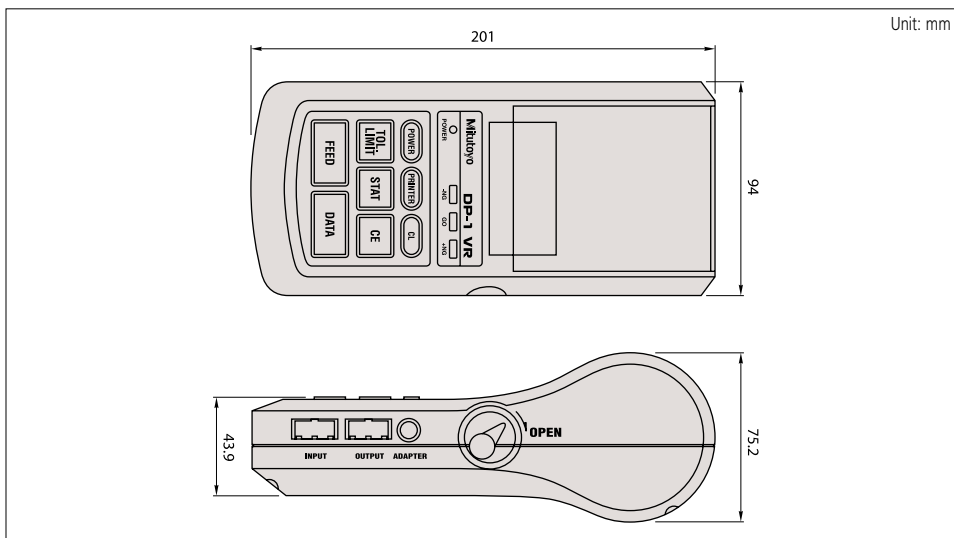


264-504-5E

SPECIFICATIONS

Code No.	Description	Price
264-504-5E	DP-1VR	£342.00

DIMENSIONS



Technical Data

Printer type:	Thermal line printer
Printing method:	384 dot (8 dot / mm)
Print speed:	6.5 mm/s (using AC adapter)
Printing paper:	48 m per roll
Capacity:	ca. 6,500 lines for large characters, 12,000 lines for normal characters
Processing capacity:	Modes 1/2/3: 9,999 data subgroups Mode 0: 100,000 data subgroups
Printable data:	Measurement data, GO / ±NO GO judgement, number of data, maximum/minimum value, range, average, standard deviation, number of defective, fraction defective, process capability index, histogram, D-chart, control chart generation for Xd-bar and control limit data, date and time
Output function:	Outputs the measurement data (RS-232C) or GO / ±NO GO judgement
Input timer:	0.25 s; 1 s; 5 s; 30 s; 1 min; 30 min; 60 min (0.25 s only statistical function)
Power:	AC adapter, Battery LR6 x 4 (alkaline), NiMH (rechargeable, battery is not charged in the device)



Optional Accessories

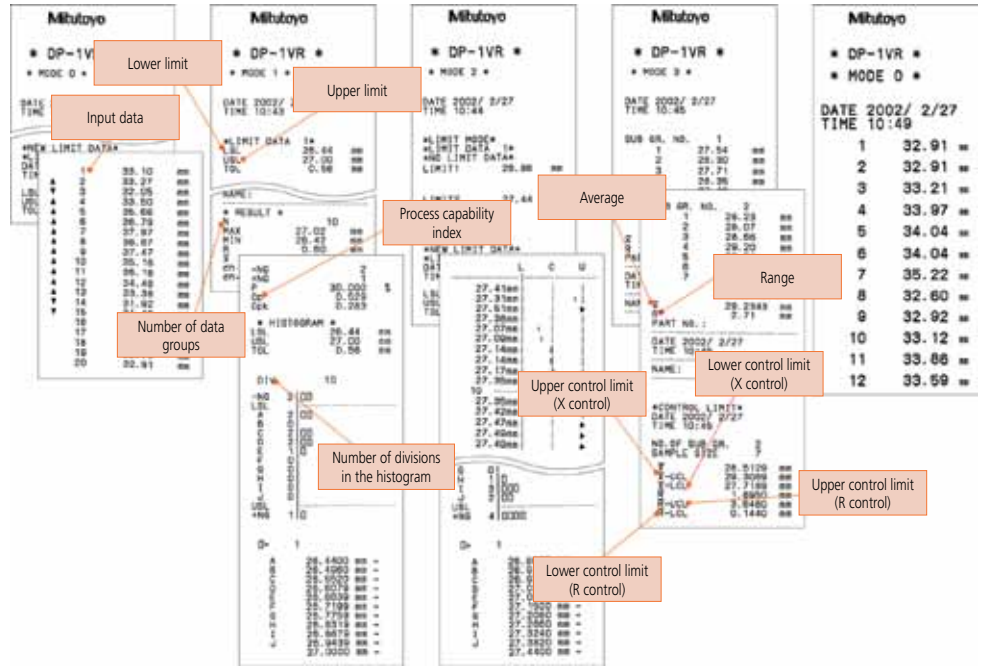
- 937179T:** Footswitch
£45.30
- 09EAA084:** RS-232C signal cable 1 m (9 pin) for connecting DP-1VR to a PC
£174.00
- 965516:** GO / ±NO GO cable
£43.80



937179T

Consumable Spare

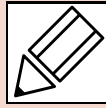
- 09EAA069:** Printer paper (1 roll)
£8.10



Key Functions

	Mode 0	Mode 1, 2
PRINTER ON/OFF		
CL	Only measurement data clear. Press before setting limit	
CE	Cancel the previous measurement data	
TOL. LIMIT	Press before entering or finish the upper/lower measurement mode. Cancel measurement mode.	
STAT	Do not operate	Making histogram to printout the calculation result via statistical analysis.
FEED	Printer paper is fed when this key is pressed	
DATA	Enter data via measuring devices	
PRINTER ON/OFF	Controls the printer's ON/OFF status	
POWER	Power ON/OFF	
	Mode 3	
PRINTER ON/OFF	Subgroup in measurement	Subgroup after measurement
CL	Re-entering from data No. 1	Only clear measurement data
CE	Cancel previous measurement data	Cancel previous subgroup
TOL. LIMIT	Exit the measurement	Go to next subgroup measurement
STAT	Finish the subgroup measurement printout the X-R calculation result.	Print out and calculate the control limit value from each subgroup to complete.
FEED	Printer paper is fed when this key is pressed	
DATA	Enter data via measuring devices	
PRINTER ON/OFF	Controls the printer's ON/OFF status	
POWER	Power ON/OFF	

Quick Guide to Precision Measuring Instruments



Quality Control

Quality Control (QC)

A system for economically producing products or services of a quality that meets customer requirements.

Process Quality Control

Activities to reduce variation in product output by a process and keep this variation low. Process improvement and standardization as well as technology accumulation are promoted through these activities.

Statistical Process Control (SPC)

Process quality control through statistical methods.

Population

A group of all items that have characteristics to be considered for improving and controlling processes and quality of product. A group which is treated based on samples is usually the population represented by the samples.

Lot

Collection of product produced under the same conditions.

Sample

An item of product (or items) taken out of the population to investigate its characteristics.

Sample Size

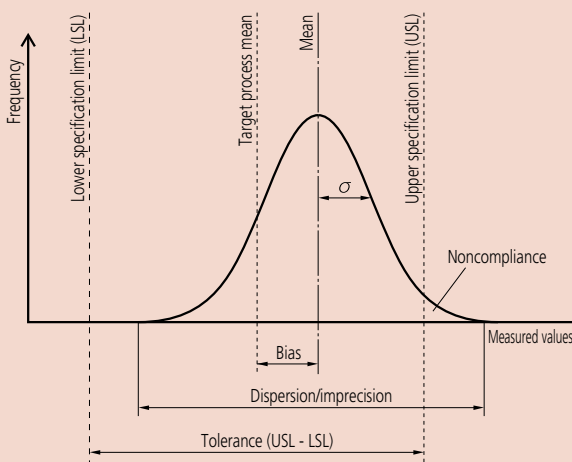
Number of product items in the sample.

Bias

Value calculated by subtracting the true value from the mean of measured values when multiple measurements are performed.

Dispersion

Variation in the values of a target characteristic in relation to the mean value. Standard deviation is usually used to represent the dispersion of values around the mean.



Histogram

A diagram that divides the range between the maximum and the minimum measured values into several divisions and shows the number of values (appearance frequency) in each division in the form of a bar graph. This makes it easier to understand the rough average or the approximate extent of dispersion. A bell-shaped symmetric distribution is called the normal distribution and is much used in theoretical examples on account of its easily calculable characteristics. However, caution should be observed because many real processes do not conform to the normal distribution, and error will result if it is assumed that they do.

Process Capability

Process-specific performance demonstrated when the process is sufficiently standardized, any causes of malfunctions are eliminated, and the process is in a state of statistical control. The process capability is represented by mean $\pm 3\sigma$ or 6σ when the quality characteristic output from the process shows normal distribution. σ (sigma) indicates standard deviation.

Process Capability Index (PCI or Cp)

A measure of how well the process can operate within the tolerance limits of the target characteristic. It should always be significantly greater than one. The index value is calculated by dividing the tolerance of a target characteristic by the process capability (6σ). The value calculated by dividing the difference between the mean (\bar{X}) and the standard value by 3σ may be used to represent this index in cases of a unilateral tolerance. The process capability index assumes that a characteristic follows the normal distribution.

Notes: If a characteristic follows the normal distribution, 99.74% data is within the range $\pm 3\sigma$ from the mean.

Bilateral tolerance

$$C_p = \frac{USL - LSL}{6\sigma} \quad \begin{array}{l} USL: \text{Upper specification limit} \\ LSL: \text{Lower specification limit} \end{array}$$

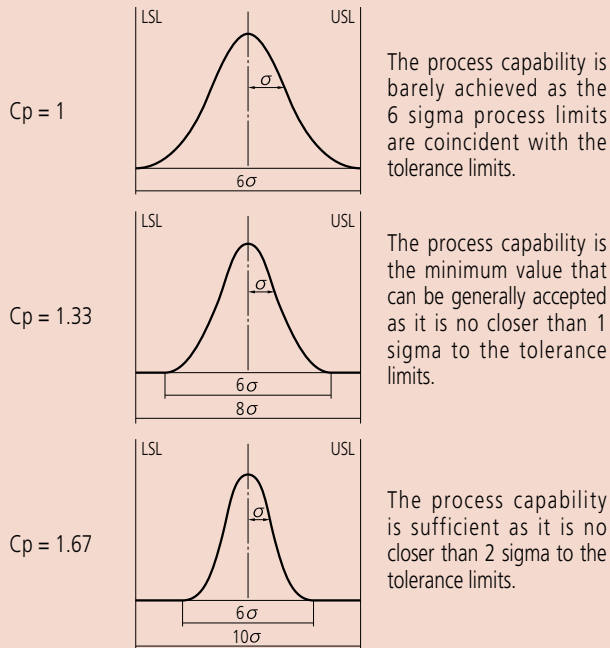
Unilateral tolerance ... If only the upper limit is stipulated

$$C_p = \frac{USL - \bar{X}}{3\sigma}$$

Unilateral tolerance ... If only the lower limit is stipulated

$$C_p = \frac{\bar{X} - LSL}{3\sigma}$$

Specific examples of a process capability index (Cp) (bilateral tolerance)

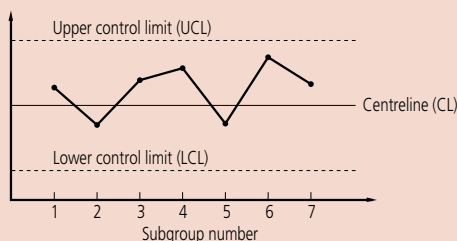


Note that Cp only represents the relationship between the tolerance limits and the process dispersion and does not consider the position of the process mean.

Notes: A process capability index that takes the difference between the process mean from the target process mean into consideration is generally called Cpk, which is the upper tolerance (USL minus the mean) divided by 3σ (half of process capability) or the lower tolerance (the mean value minus LSL) divided by 3σ , whichever is smaller.

Control Chart

Used to control the process by separating the process variation into that due to chance causes and that due to a malfunction. The control chart consists of one centreline (CL) and the control limit lines rationally determined above and below it (UCL and LCL). It can be said that the process is in a state of statistical control if all points are within the upper and lower control limit lines without notable trends when the characteristic values that represent the process output are plotted. The control chart is a useful tool for controlling process output, and therefore quality.



Chance Causes

These causes of variation are of relatively low importance. Chance causes are technologically or economically impossible to eliminate even if they can be identified.

\bar{X} -R Control Chart

A control chart used for process control that provides the most information on the process. The \bar{X} -R control chart consists of the \bar{X} control chart that uses the mean of each subgroup for control to monitor abnormal bias of the process mean and the R control chart that uses the range for control to monitor abnormal variation. Usually, both charts are used together.

How to Read the Control Chart

Typical trends of successive point position in the control chart that are considered undesirable are shown below. These trends are taken to mean that a 'special cause' is affecting the process output and that action from the process operator is required to remedy the situation. These determination rules only provide a guideline. Take the process-specific variation into consideration when actually making determination rules. Assuming that the upper and the lower control limits are 3σ away from the centreline, divide the control chart into six regions at intervals of 1σ to apply the following rules. These rules are applicable to the \bar{X} control chart and the \bar{X} control chart. Note that these 'trend rules for action' were formulated assuming a normal distribution. Rules can be formulated to suit any other distribution.



Note: This part of 'Quick Guide to Quality Control' (A-21 to A-22) has been written by Mitutoyo based on its own interpretation of the JIS Quality Control Handbook published by the Japanese Standards Association.

References

- JIS Quality Control Handbook (Japanese Standards Association)

- Z 8101: 1981
- Z 8101-1: 1999
- Z 8101-2: 1999
- Z 9020: 1999
- Z 9021: 1998