DFA SERIES
Digital Force Gauge

The CHATILLON® DFA Series features an integral loadcell with a force measurement accuracy of±0.15% of full scale ± LSC. The DFA feature RS232 serial data communications and an internal sampling rate of 10,000 Hz. The DFA Series is ideal for critical applications where capturing precise peak readings are required. Other features include the ability to store as many as 1000 test readings in as many as 99 batches. programmable high and low setpoints, pushbutton calibration and an analog output for graphing the force curve. All gauges feature user-selectable force units (oz, lbs, g, kg, N). A large, easy-to-read LCD display indicates current and peak values, gauge settings and gauge status. A selectable auto shutoff feature helps to preserve battery life. Gauges come with accessories, battery charger and carrying case.

FEATURES

- Integral Loadcell
  - 100 lbf (500 N)
- Simple Pushbutton Operation
- Rugged All-Metal Housing
- 10,000Hz Sampling Rate
- Memory: 1000 Readings in 99 Batches
- RS232 Serial Data Communications
- Overload Capacity- 110% of Rated Capacity
- Hand-held or Test Stand Applications

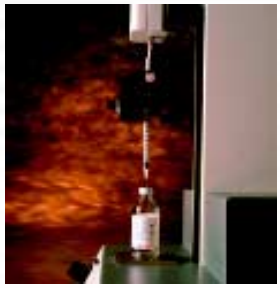
SPECIFICATIONS

Accuracy:	±0.15% of Full Scale ±1 LSC
Selectable Units:	oz, g, lb, kg, N
Overload Capacity:	110% of rated capacity
Display:	LCD, 4-1/2 characters
Sampling:	10,000Hz
Outputs:	RS232. Mitutoyo
Power:	AC Adapter, NiCd Battery Pack
Accessories:	Carrying Case, Attachments Extension Rod, Battery Charger
Weight:	2 lbs (0.9 kg)
Warranty:	1 Years

SPECIFICATION
SS-FM-3114-1101
November 2001

Pharmaceuticals

Electronics



Medical Device

INTERNET
www.force-gauge.net

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PRODUCT FEATURES

Intelligent Displays
The DFA Series features a large, easy-to-read LCD display with a 32 x 122 pixel matrix. The display's contrast may be adjusted by the user to counter the effects of high ambient light conditions or viewing angle. Symbols are used to depict instrument status including battery levels and automatic shut-down feature enabled. The characters "C" or "+" are used to represent compression, while "T" or "-" represent tension. The upper left portion of the display shows the instrument's operational mode (Normal, Tension-Peak or Compression-Peak). The bottom right portion of the display indicates the units of measure (lb, Kg, N, oz, g). Force measurement is shown in large characters that are viewable from a distance. The display updates every 250ms when force is applied to the load cell.

The DFA Series also features a reversible housing that allows the user to change the instrument's display orientation, depending on the gauge's requirement application.

Digital Filtering
The DFA Series lets the user select the sampling rate for four different streams of data. For each stream, the user may filter the data rate to match the application requirements. The following table shows the data streams and sampling rates (Hz) that may be configured.

Digital Filter Sample Rates (Hz)	
Normal	0.5 / 1 / 2 / 5 / 10 / 20
Peak	1 / 2 / 5 / 10 / 20 / 50 / 100 / 200 / 500 / 1000 / 2000 5000 / 10000
Data Transmit	0.5 / 1 / 2 / 5 / 10 / 20 / 50 / 100 / 200
Analog	0.5 / 1 / 2 / 5 / 10 / 20 / 50 / 100 / 200

Remote Communications
All DFA Series gauges feature RS-232 serial data communications for transmitting data to remote equipment and for receiving commands. A special menu allows users to specify parity and bit length or to select baud rates up to 115K. The gauges also support transmission of data to MITUTOYO data collectors. An analog output lets users transmit data for graphing force curves on ancillary devices.

System Integration
The DFA Series can be mounted to the following CHATILLON Test Stands providing the user with an extremely powerful and precise measurement system.

- Models TCM 201
- Models TCD 200
- Models TCM 500
- Models LTS/LTC/HTC

The DFA Series, using its RS-232 serial data communications, can transmit data to a personal computer for analysis and sophisticated reporting. When used in cooperation with our NEXYGEN® and AUTOTEST Series Software, users can select from predefined tests and be provided with analysis reports in preformatted or customer layouts. Programmable HIGH and LOW setpoints allow the user to control test stand motion at predetermined capacities, or cycle between the setpoints.

Simplified Maintenance
The DFA Series includes services menus that allow the user to calibrate the gauge using standard weights. This same menu is used to take the user through a series of "self-tests" that verify load cell performance and instrument functionality.

Multiple Load Cell Configurations
The DFA Series may be specified with an integral load cell; with a dedicate remote load cell; or with a non-dedicated, interchangeable load cell. All models are equipped with RS-232 serial data communications and peripheral gauge control.

Data Archiving
The DFA Series allows the user to save up to 1,000 test readings organized into as many as 99 different batches. Each data set has:

- Batch Number
- Sample Number
- Tension Peak Value
- Compression Peak Value
- Indicated Normal Value with Engineering Unit
- Date
- Time

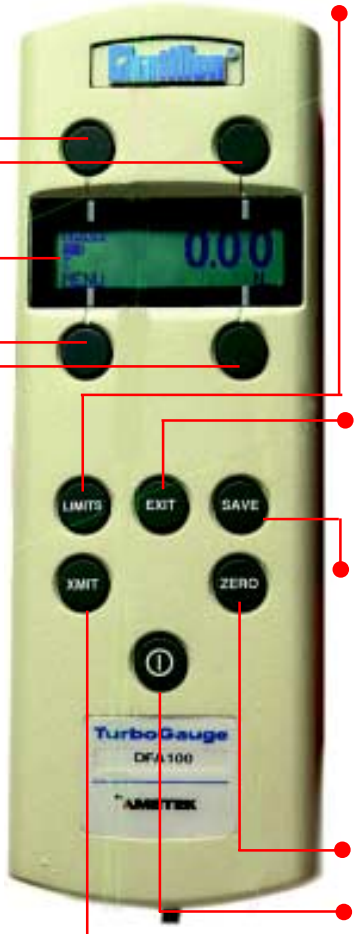
The user can organize data in up to 99 custom batches. A batch may hold up to 999 data sets. The total number of data sets is limited to 1000. Data is stored in non-volatile memory and is retained even if battery power is removed or the gauge is turned OFF.

You can review and print data on demand. Data may be printed in 1-, 2- or 7-column format.

EASY-TO-USE INTERFACE

DFA Series Gauges put a powerful INTEL® microprocessor in your palm, allowing you to collect up to 1,000 reviewable data readings in memory, then download them via the gauge's RS-232 serial data communications. You follow a simple hierarchy of menu displays to filter data and configure gauge settings, including data transmission. You may even calibrate and test the gauge automatically. The gauges modular architecture allows you to evolve as technology evolves. Using a personal computer, you may download new features and functionality as they are introduced.

FUNCTION keys at each of the four corners of display work with menus to select options, as well as to go to "downstream" menus.



TRANSMIT...	BUZZER...
HI LIM...	LO LIM...

LIMITS button allows you to transmit signals to control test stand motion (F1). Key F2 allows you to activate or deactivate the limits buzzer, which sounds when the force exceeds the limits set. Both high and low limits may be set (F3, F4), allowing you to stop test stand motion at predetermined loads or to cycle between set points (CHATILLON® Model TCD test stands only). Limits guard against load cell damage.

EXIT button moves you back to prior screen in menu.

NORM...		
MENU...	0.1256	LB

NORMAL DISPLAY starts up after the gauge is turned on. F1 key toggles between the standard force measurement setting or settings which capture peak tension or compression force. Indicators below shows portion of battery charge remaining, time remaining until auto shutdown, and whether the high or low force levels are being exceeded. F4 key allows you to toggle display reading between pounds, kilograms, and Newtons, or ounces, grams, and Newtons.

NORM...	BATCH 01 #001	NB...
REVIEW...	00%	LB

SAVE button takes you to "Data Save" mode, where you can save a reading to current batch or open a new batch (F2). Once data is saved, the F3 key allows you to review your saved data. The F4 key lets you change reading units to lb, Kg, N, oz and g. Up to 1,000 different time-stamped readings may be saved, in as many as 99 batches.

ZERO button returns current data reading in window to "0".

ON/OFF key saves all gauge setting each time the gauge is turned off.

Press F3

FILTERS...	SERVICE...
SETUP...	COMM...

XMIT button transmits current reading or batch via the gauge's RS-232 port or sends it to a Mitutoyo data collector.

Press F1

NORMAL...	PEAK...
TRANSMIT...	ANALOG...

FILTERS MENU lets you set the sampling rate for four different streams of data -- normal force reading, peak force reading, RS-232 transmission and analog output. (See table on opposite page.) With each stream, you can regulate and change the data rate to match your needs. The resulting data flow is averaged from all of the data points taken at the the gauge's inherent sampling rate of 10,000 samples per second. The result is a distillation of data that still reflects the extraordinarily high collection rate of the gauge.

EXAMPLE SUBSCREEN
(for peak filter rate)

PEAK:	INCREASE
0.1256	

Press F3

MEMORY...	CAPACITY...
OPTIONS..	UNITS...

SETUP MENU allows you to set the time and date under "Memory" (F1) and to activate various options (F3), such as auto shutdown, sign, and print options. The capacity menu (F2) is only available for the Remote Non-Dedicated Gauges and allows the gauge to be set for proper maximum load. The Units menu (F4) allows you to "lock in" the desired units of measurement, keeping them from being changed accidentally.

Press F4

DEVICE:	
MITUTOYO	RS-232.

COMMUNICATIONS MENU is for selecting Mitutoyo or RS-232 output. This menu lets you quickly and easily set the parameters for RS-232 communications, such as from the gauge to a digital test stand or to a remote computer. Settings include stop bit length, baud rate, and parity, as well as whether units are to be included with the transmission.

EXAMPLE SUBSCREEN
(for baud rate):

BAUD	INCREASE
0.1256	
OK 19200	DECREASE

Press F2

DISPLAY...	
CALIBRATE...	SELF-TEST...

SERVICE MENU allows you to adjust the display contrast (F1) lighter or darker for display angle and light conditions. You can also calibrate the gauge (F3) using standard weights, as well as troubleshoot gauge problems with a self-test setting (F4). The latter is a highly useful tool for AMETEK service technicians, allowing them to work with you over the telephone to check out your gauge. It includes tests for proper keypad function and possible load cell damage.

SPECIFICATIONS

Accuracies
±0.15% of Full Scale

Data Storage
Stores up to 1000 data values in as many as 99 different user-defined batches

Sampling Rate
10,000 samples per second
User-adjustable Filters

Deflection
0.010-inch (0.254mm) maximum for full load

Safe Overload
Gauge will display "OVERLOAD" when the force applied exceeds 116% of the gauge capacity.

Maximum Overload
150% of gauge capacity. Load cell deformation may occur when overload exceeds 150%. Note: Gauge reading will not exceed 121%. If you feel the gauge may have exceeded the gauge capacity, contact your local AMETEK Representative.

Tare Capacity
10% in order to utilize full scale (in lb Mode); can tare more than 10%, however, user may not have the use of gauge's full scale capacity during testing

Analog Output
0 to ±2.0Vdc full scale, accurate to ±0.015V

Digital Input/Output
+5V signal when High or Low setpoint is reached

Display
32 x 122 pixel LCD dot matrix
Adjustable contrast

Display Refresh
250mS refresh in Normal and Peak modes

Keypad
Six dedicated function keys with labels: LIMITS, EXIT, SAVE, XMIT, ZERO and ON/OFF.

Four dynamic function keys which change based on display context.

Keys feature audible and tactile feedback.

Data Collect Mode
100 samples per second

Communications
Bi-directional RS-232 serial data communications, transmits up to 100 data points per second. User-selectable baud rates from 300 to 115,200. MITUTOYO output.

Power
Rechargeable 8-hour NiCad battery, or continuous AC operation using battery charger supplied (110Vac or 220Vac)

Battery Life
8-10 hours of continuous operation between charges

ORDERING INFORMATION
Integral Loadcell Models

Model	Capacity
DFA250G	8 ozf x 0.004 ozf 250 gf x 0.1 gf 2.5 N x 0.001 N
DFA2	2 lbf x 0.0002 lbf 1 kgf x 0.0001 kgf 10 N x 0.001 N 32 ozf x 0.004 ozf 1000 gf x 0.1 gf
DFA10	10 lbf x 0.001 lbf 5 kgf x 0.0005 kgf 50 N x 0.005 N 160 ozf x 0.02 ozf 5000 gf x 0.5 gf
DFA50	50 lbf x 0.005 lbf 20 kgf x 0.002 kgf 250 N x 0.2 N 800 ozf x 0.1 ozf 20000 gf x 2 gf
DFA100	100 lbf x 0.01 lbf 50 kgf x 0.005 kgf 500 N x 0.05 N 1600 ozf x 0.2 ozf 50000 gf x 5 gf

Add "-220V" after the model number if you require 220V operation, e.g. DFA2-220V.

Temperature Range
40° to 110°F (5° to 45°C)

Temperature Stability
0.03% per °F

GAUGE ADAPTERS

Adapters	Capacity	Availability	Part No.	Notes
Chisel Point	100 lbf (500 N)	Standard	SPK-FMG-008A	
Point Adapter	100 lbf (500 N)	Standard	SPK-FMG-009A	
Notch Adapter	100 lbf (500 N)	Standard	SPK-FMG-010A	
Flat Adapter	100 lbf (500 N)	Standard	SPK-FMG-011A	
Hook, #10-32	50 lbf (225 N)	Standard	SPK-FMG-012A	DFA250G thru DFAS10
Hook, #10-32	100 lbf (500 N)	Standard	SPK-FMG-012B	DFA50 thru DFA100
Hook, Swivel, #10-32	20 lbf (112 N)	Optional	ML3867	
Hook, Swivel, #10-32	100 lbf (500 N)	Optional	ML3850	
Hook, with Clasp, 5/16-18	500 lbf (2.5 kN)	Optional	NC002500	
Hook, Swivel, 5/16-18	500 lbf (2.5 kN)	Optional	ML3868	
Flat Disc, 5/16-18		Optional	NC000751-1	3.25 x 0.5 inch (83 x 12mm)
Flat Disc, 5/16-18		Optional	NC000751-2	3.35 x 0.25 inch (83 x 6mm)
Rectangular Fixture, 5/16-18		Optional	NC000730-1	3.5 inch (89mm) diameter
Rectangular Fixture, 5/16-18		Optional	NC000738-1	0.75 inch (19mm) diameter
Extension Rod, #10-32		Standard	SPK-FMG-013A	
Adapter, #10-32F to 5/16-18M		Optional	P-10020	Required for 5/16 Fixtures
Coupling, #10-32 to 6M		Optional	NC002652	For metric probes/grips

Chisel Point

Point Adapter

Notch Adapter
(Only one included with gauge)

Flat Adapter

Hook
(Only one included with gauge)

STANDARD ACCESSORIES

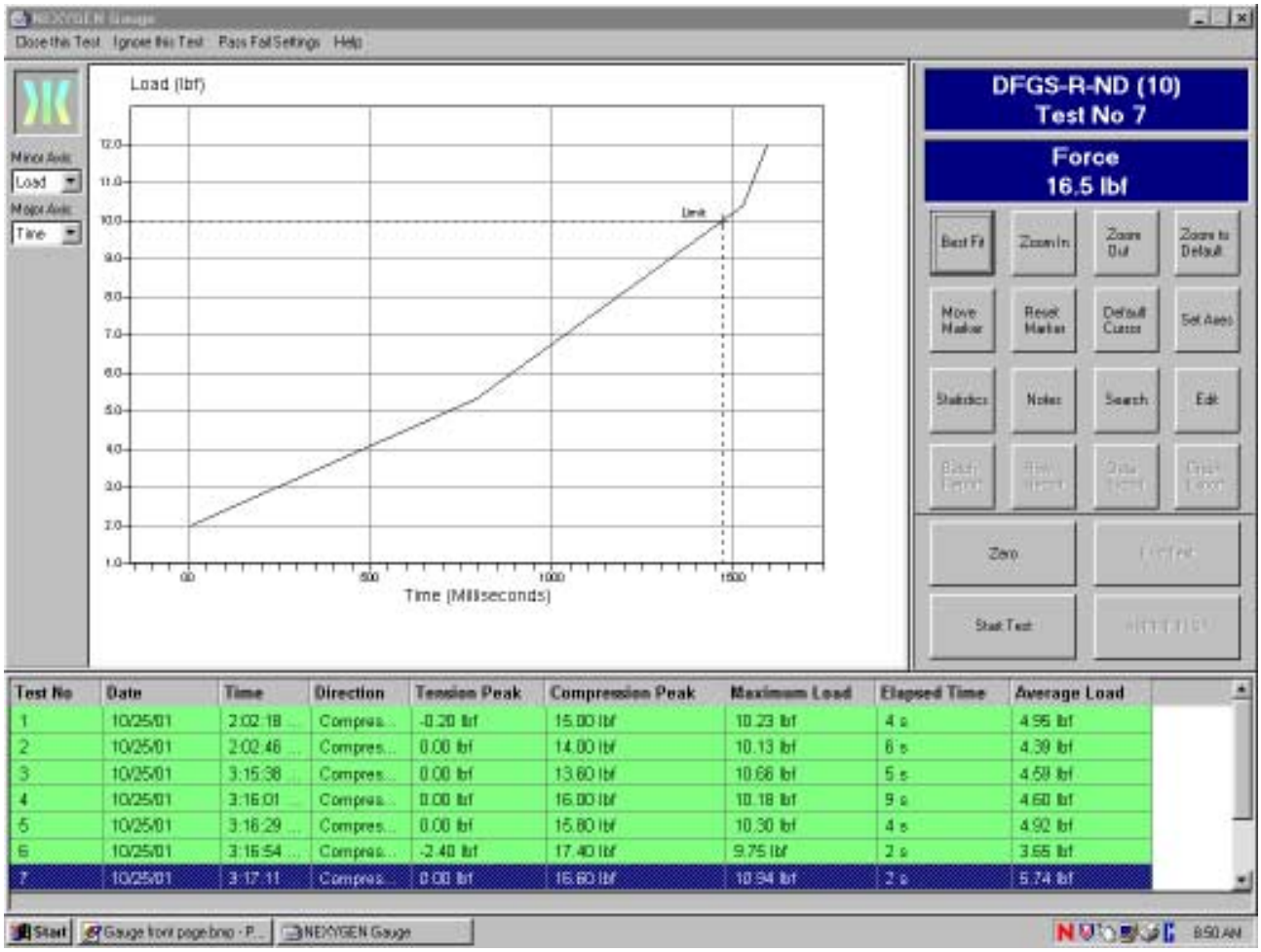
Accessories	Availability	Part No.	Notes
Protective Carrying Case	Standard	SPK-FMG-073	
Battery Charger, 115V	Standard	SPK-FMG-069A	Standard with 115V models
Battery Charger, 220V	Standard	SPK-FMG-069B	Standard with 220V models
Hex Key, 7/64-inch	Standard	SPK-FMG-015	
Operators' Manual	Standard	SPK-DFA-081	
Flash Memory Upgrade Kit	Optional	E80-715	

TEST STAND GAUGE ADAPTER KITS

Test Stand Type	Availability	Part No.	Notes
LTS Series	N/A	N/A	Cannot Mount to Test Stand
LTC Series	N/A	N/A	Cannot Mount to Test Stand
HTC Series	N/A	N/A	Cannot Mount to Test Stand
TT Tester	Optional	NC002582	
LTCM-6 Series	Optional	SPK-FM200-019	Standard with Test Stand
TCM201 Series	Optional	SPK-FM200-019	Standard with Test Stand
TCD200 Series	Optional	SPK-FM200-019	Standard with Test Stand
LFPLUS Series	Optional	SPK/LFM/0003	
LRX Series	N/A	N/A	Not Compatible
LRXPLUS Series	N/A	N/A	Not Compatible
LR5KPLUS Series	N/A	N/A	Not Compatible

GAUGE APPLICATION SOFTWARE

Software	Availability	Part No.	Notes
NEXYGEN GAUGE Software (Single User)	Optional	40/0739	Single User License
NEXYGEN GAUGE Software (5 Pack)	Optional	40/0739/5	5 User License
NEXYGEN GAUGE Software (10 Pack)	Optional	40/0739/10	10 User License

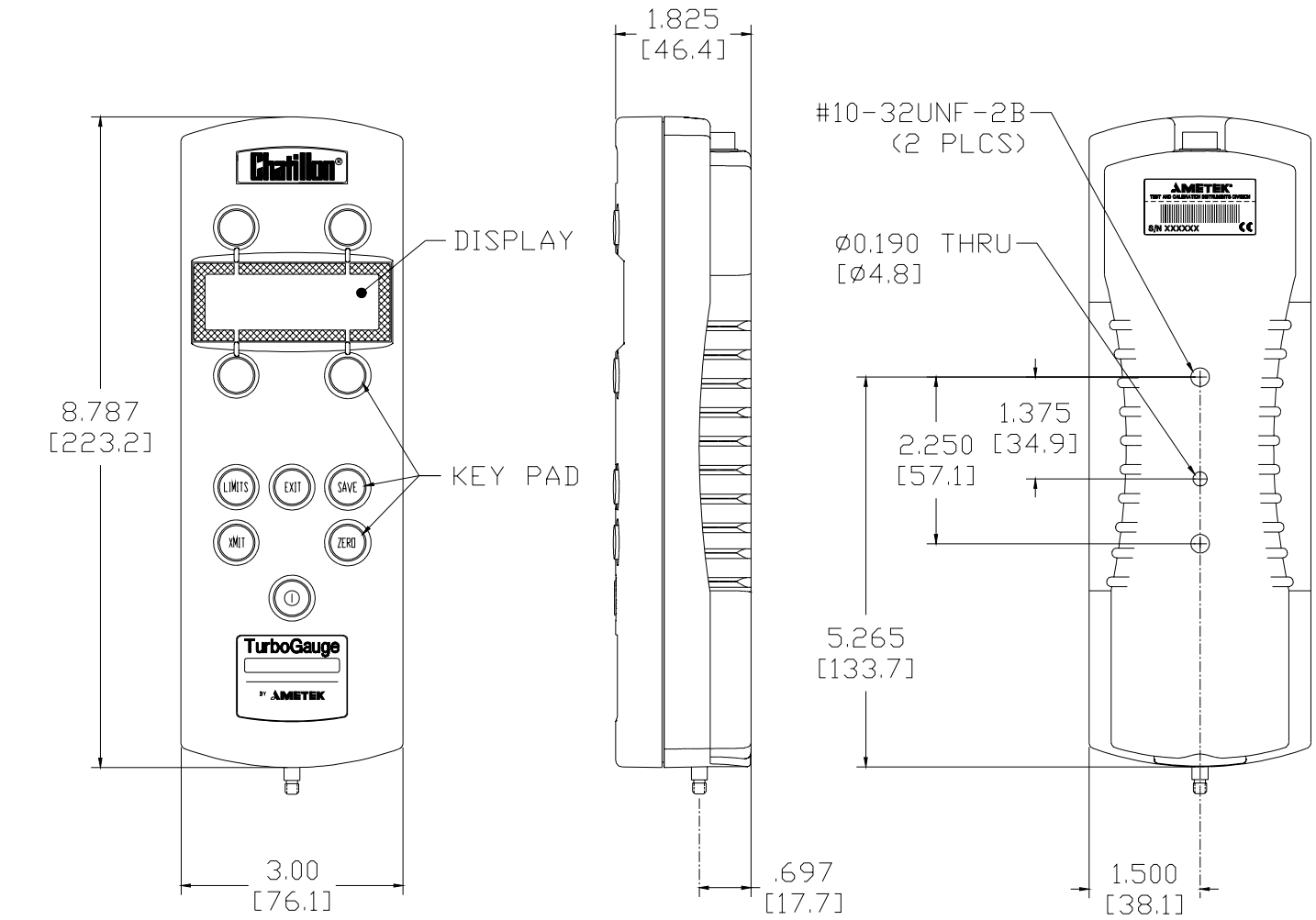


NEXYGEN GAUGE software allows you to collect load measurements from your force gauge and display and analyze results information in both tabular and graphical formats. You can automatically created reports in WORD or EXCEL and define pass/fail conditions. You can change the size of your graph, overlay graphs, add notations, etc.

INTERFACE CABLES

Interface Cables	Availability	Part No.	Notes
Personal Computer, 25-pin D, 6ft (2m)	Optional	NC000652	
Personal Computer, 25-pin D, 10ft (3m)	Optional	NC000652-1	
Personal Computer, 25-pin D, 20ft (7m)	Optional	NC000652-3	
Personal Computer, 9-pin D, 6ft (2m)	Optional	NC000850-1	Require when using NEXYGEN
Personal Computer, 9-pin D,10ft (3m)	Optional	NC000850-2	Require when using NEXYGEN
MITUTOYO, 10-pin	Optional	NC000654	
MITUTOYO, RS232	Optional	NC000697	
TCM201, 9-pin D	Optional	ENC0125	
TCD200, 9-pin D	Optional	NC000647	

DFA Schematic



E96-188

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