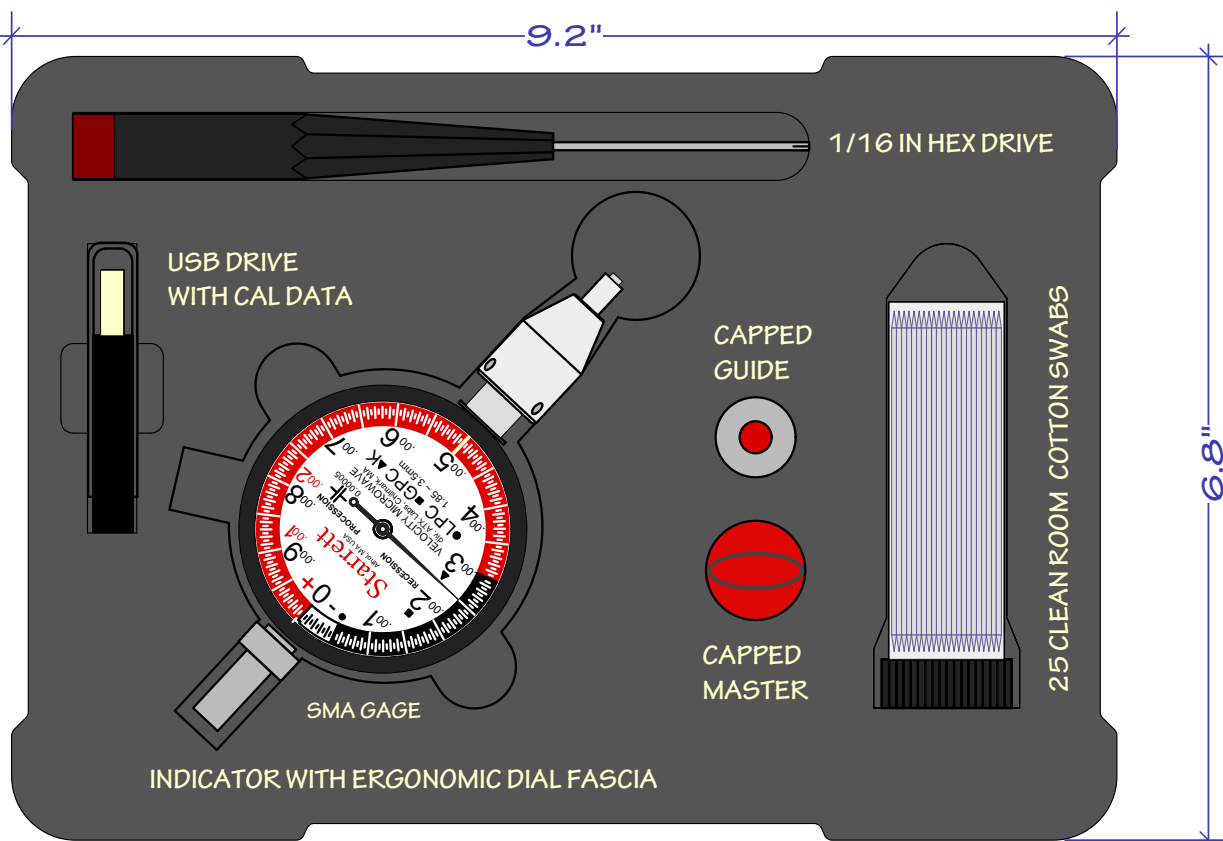


N	
SMA	
3.5	
K	
2.4	X
1.85	X

SMA ERGO
GAGES:
RESOLUTION
0.00005
ACCURACY
+/-0.0001



PAT. PEND. 61986978, 61868548, 61986822

OVERVIEW: PRECISION GAGE KIT FOR THE DIMENSIONAL GAGING OF MALE AND FEMALE MICROWAVE COMPONENTS. THE KIT EMPLOYS A SINGLE SPINDLE AND DISPLAY WITH AN ERGONOMICALLY ADVANTAGED FASCIA TO SIMPLIFY GAGING. THE INSTRUMENT'S DESIGN ELIMINATES THE REQUIREMENT FOR A SECOND GAGE AND/OR BUSHING ORDER TO ACCOMODATE THE OPPOSITE GENDER. ADVANTAGEOUSLY, ONE MASTER GAGE IS USED FOR ALL STANDARDS INCLUDING MIL-STD-348, MIL-C-39012 AND IEEE287, THEREBY ELIMINATING THE PROCUREMENT REQUIREMENT OF MULTIPLE MASTERS.

BENEFITS:

- ~ GUIDED BUSHING DESIGN ELIMINATES TORQUE REQUIREMENT AND ASSOCIATED TORQUE UNCERTAINTY;
- ~ HIGH PERFORMANCE ANALOG AND DIGITAL STARRETT METERS WITH 0.00005 INCH RESOLUTION;
- ~ CERTIFIED ACCURACY OF 0.00012 INCHES (DIGITAL) AND 0.0001 (ANALOG);
- ~ SINGLE FLAT SURFACE MASTER GAGE FOR THE ELIMINATION OF FEATURE SIZE UNCERTAINTY;
- ~ EXPEDITED GAGING OF BOTH 1.85mm AND 2.4mm MALE AND FEMALE CONNECTORS;
- ~ INCLUDED ISO-17025 TRACEABLE STARRETT CALIBRATION AND CERTIFICATION ;
- ~ INCLUDED USB DRIVE WITH GAGE APPLICATION FOR COMPARING GAGED VALUE TO COMMON STANDARDS;
- ~ INCLUDED 25 SHARP & DENSE POINT, SMALL SIZE, EXTREMELY LOW LINTING, STATIC FREE SWABS;
- ~ INCLUDED CRM72 TOOL STEEL HEX DRIVER WITH ROCKWELL 50-61 HARDNESS & CORROSION FREE FINISH.
- ~ INCLUDED ONE STAINLESS HANDI WRENCH MATCHING COMMON MICROWAVE ADAPTER AF DIMENSIONS;
- ~ INCLUDED ONE MID WARRANTY TRACEABLE CALIBRATION AND CERTIFICATION;
- ~ INSTRUMENT BACKS AND FASCIA WITH STANDARDS REQUIREMENTS AND INTERFACE METRICS.
- ~ INCLUDED ONE WATER PROOF AND CRUSH PROOF NK-7 RESIN CASE WITH STAINLESS STEEL POWER CLAW LATCHING SYSTEM AND VAPOR RELEASE VALVE , 10.2LX7.8WX4.5H INCHES EXTERIOR DIMENSIONS.

GENERAL SPECIFICATION

- ~SURFACE FINISH OF Ra4 - Ra16 ON WORKING SLIDABLE SURFACE; BETTER THAN Ra32 IN REGIONS OF NON-CONTACT.
- ~MASTER GAGE FINISH OF Ra 8 OR BETTER.
- ~PRECISION SWISS TURNED AND MILLED STAINLESS STEEL.
- ~CRITICAL TOLERANCES OF 0.0005.
- ~CERTIFIED DIAL ACCURACY OF +/- 0.0001 ANALOG & DIGITAL
- ~ALL STAINLESS COMPONENTS PASSIVATED PER ASTM-A967.
- ~STAINLESS 6-32 SET SCREWS [X3] WITH ASME B18.3 ROCKWELL C28 HARDNESS.
- ~DIAL FASCIA AND DIAL BACKS WITH STANDARDS DELINATION.

WARRANTY: ALL VM MICROWAVE GAGES CARRY A ONE YEAR WARRANTY ON THE INDICATOR AND A 10 YEAR WARRANTY ON ALL STAINLESS COMPONENTS.

PRECISION GAGE KITS

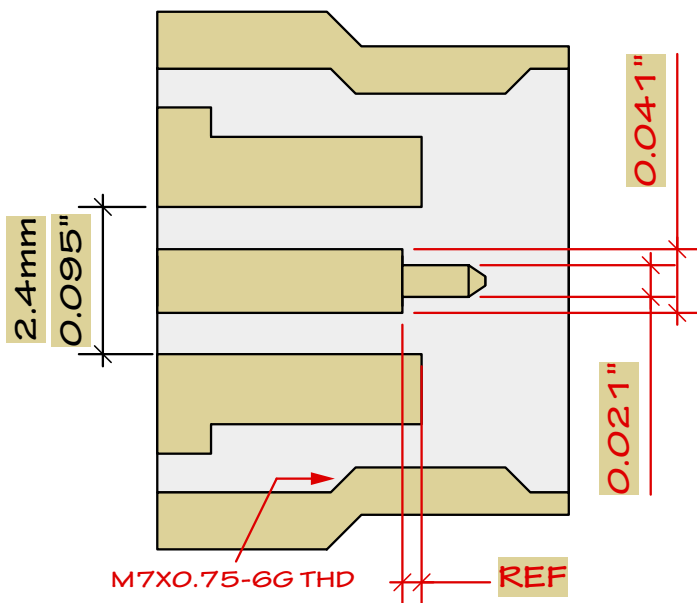
1.85mm & 2.4mm

**ERGON
SERIES**

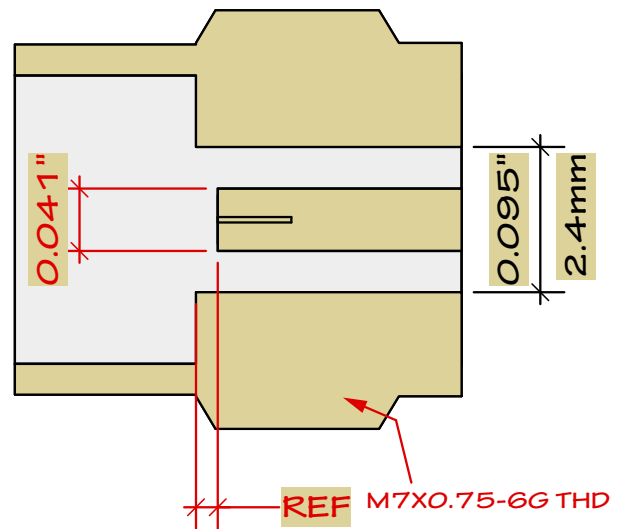
MALE & FEMALE

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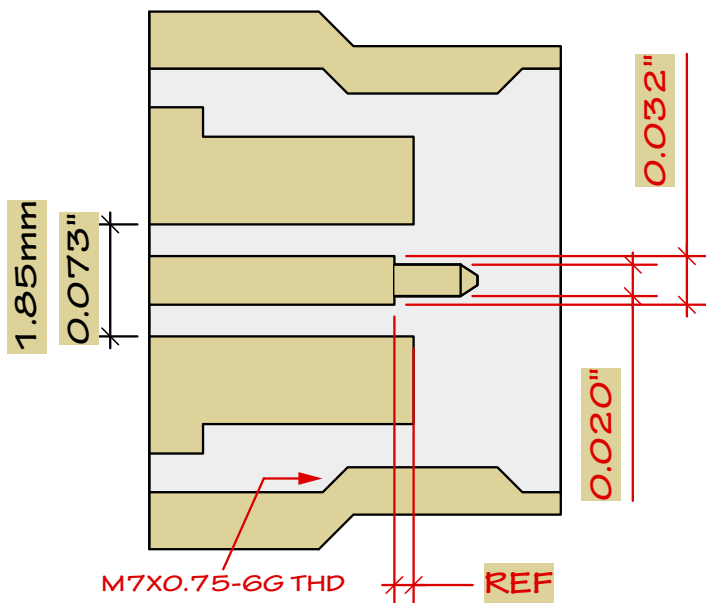
2.4mm MALE



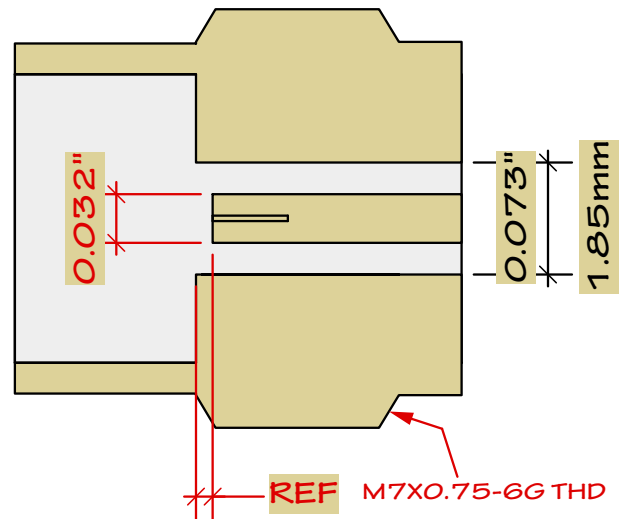
2.4mm FEMALE



1.85mm MALE



1.85mm FEMALE



NOTES:

- [1] ALL PIN TO REFERENCE PLANE DIMENSIONS ARE IN RECESSON;
- [2] MIL-STD-348 CROSSES TO MIL-C-39012;
- [3] PROCESSION IS NONCONFORMING RELATIVE TO ALL STANDARDS.

NOTE: ALL OF THE ABOVE DIMENSIONS ARE NOMINAL; AS MACHINED, EACH WILL HAVE A TOLERANCE PER STANDARD.

COMMON PIN TO REFERENCE PLANE RECESSON

IEEE287LPC: **-0.0005 MAX**

IEEE287GPC: **-0.002 MAX**

MIL-STD-348B²: **-0.005 MAX**

ORDINARY PRECISION: **-0.003 MAX**

GENERAL SPECIFICATION

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- ~DIAL FASCIA AND DIAL BACKS WITH STANDARDS DELINATION.

WARRANTY: ALL VM MICROWAVE GAGES CARRY A TWO YEAR WARRANTY ON THE INDICATOR, A MID WARRANTY TRACEABLE CALIBRATION BY AN A2LA OR ACLASS CORP ACCREDITED LAB, AND A 10 YEAR WARRANTY ON ALL STAINLESS COMPONENTS.

PRECISION GAGE KITS

1.85mm & 2.4mm

**ERGN
SERIES**

MALE & FEMALE

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THE ACT OF "GAGING" A MICROWAVE CONNECTOR IS SIMPLY THE ACT OF DETERMINING THE DIFFERENCE IN GRADE BETWEEN TWO POINTS INSIDE THE CONECTOR: TYPICALLY THE OUTER COAXIAL BODY'S FRONT (MATING) PLANE AND A GEOMETRIC FEATURE ON THE MALE PIN (TYPICALLY SHOULDER) OR FEMALE PIN (TYPICALLY FRONT PLANE). GAGING IS SIMPLE IN BOTH CONCEPT AND EXECUTION.

THE CONVENTIONAL METHOD FOR DETERMINING A GRADE DIFFERENCE IS TO USE A DIAL INDICATOR THAT HAS A FIXED STEM AND A MOVABLE RACK OR SPINDLE. THE SPINDLE COMMUNICATES ITS MOTION TO THE HAND ON THE INDICATOR'S DIAL FACE. THE TRADITIONAL APPROACH IN MICROWAVE GAGING IS TO ATTACH A FIXED BUSHING TO A CONVENTIONAL DIAL INDICATOR'S STEM AND A CONTACT POINT TO THE DIAL INDICATOR'S MOVABLE SPINDLE. WHEN THE BUSHING IS MADE TO REST ON THE OUTER BODY'S MATING PLANE AND THE CONTACT POINT IS MADE TO REST ON THE FEATURE OF INTEREST, LIKE A PIN'S SHOULDER, THE HAND OF THE DIAL SHOWS THE GRADE DIFFERENCE. WHILE THIS TRADITIONAL APPROACH ADDS A BUSHING AND CONTACT POINT, NO CHANGE IS MADE TO THE DIAL INDICATOR'S INDICIA OR FASCIA. IN THIS MANNER, THE "RECESSION" (OR "PROCESSION" IN THE CASE OF NON-COMPLIANCE) OF THE MALE PIN'S SHOULDER OR THE FEMALE PIN'S FRONTAL PLANE RELATIVE TO THE OUTER COAXIAL BODY'S MATING PLANE WOULD BE DETERMINED.

VM'S PATENTED APPROACH

THUS, IN THE MANNER DISCRIBED ABOVE, AND IN THE SIMPLIFIED SECTIONAL IMAGES OF SUBMINIATURE CONNECTORS SHOWN TO THE RIGHT, THE DIFFERENCE R-S WOULD BE COMPARED TO A STANDARD THAT REPRESENTS THE INTERFACE SPECIFICATION THAT THE CONNECTOR IS REQUIRED TO BE IN COMPLIANCE WITH.

TO THIS END, FOR THE LAST HALF CENTURY THE MICROWAVE GAGING OF SUBMINIATURE CONNECTORS HAS TYPICALLY EMPLOYED A SEPARATE GAGE FOR EACH CONNECTOR GENDER - THEREBY INCREASING THE COST OF OWNERSHIP. WITHIN THIS APPROACH A DISTINCTION WAS MADE BETWEEN FREE HAND GAGING, IN WHICH THE USER PLACES THE WORKING END OF THE GAGE ON THE CONNECTOR'S INTERFACE MANUALLY, AND THREADED ENGAGEMENT, WHEREIN THE USER THREADS THE GAGE ON TO THE CONNECTOR IN THE SAME MANNER AS AN ACTUAL MALE/FEMALE CONNECTOR ENGAGEMENT.

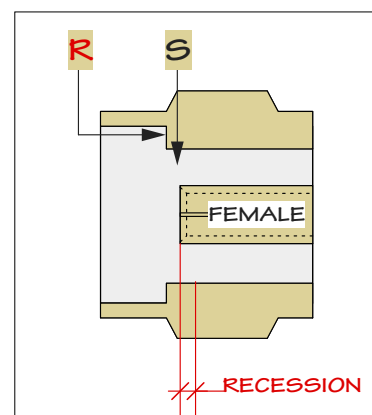
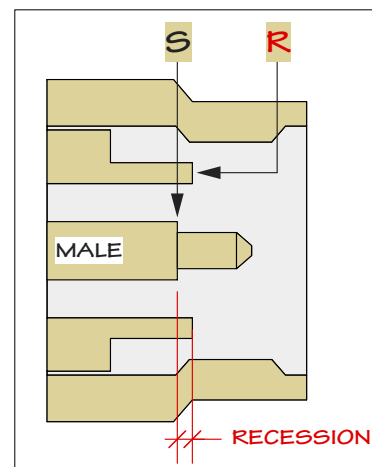
VM'S PATENTED APPROACH TO SUBMINIATURE GAGING IS BASED ON SEVERAL DIFFERENT PRINCIPLES.

[1] A SINGLE GAGE/INDICATOR (AS OPPOSED TO THE CUSTOMARY TWO) IS USED FOR BOTH MALE AND FEMALE GENDERS THEREBY SIMPLIFYING GAGING AND SUBSTANTIALLY REDUCING COST, BUT WITH NO LOSS IN ACCURACY OR PRECISION;

[2] ONLY ONE MASTER GAGE IS USED (AS OPPOSED TO CONVENTIONAL DUAL MASTERS) THAT CONTAINS A PRECISION GROUND, CLOSELY TOLERANCED, *FLAT* STAINLESS STEEL SURFACE - THERBY VIRTUALLY ELIMINATING MASTER GAGE ERROR;

[3] FOR MALE GAGING A SEPARATE THREADED GUIDE IS PROVIDED THAT REQUIRES NO SPECIFIC TORQUE, IS EASIER TO MATE THAN TORQUE SPECIFIC THREADED ENGAGEMENT, AND INTRODUCES NO MEASUREMENT UNCERTAINTY AS A FUNCTION OF AN UNCERTAIN TORQUE WRENCH CALIBRATION OR SETTING;

[4] THE HUMAN INTERFACE IS ENHANCED WITH ADVANCED ERGONOMICS TO PROVIDE INSTANT FEEDBACK RELATIVE TO ALL STANDARDS, AND REAL VALUE INDICIA ARE USED TO SPECIFY TRUE RECESSION AND TRUE PROCESSION - THEREBY SPEEDING GAGING AND ELIMINATING POTENTIAL CONFUSION.



GENERAL SPECIFICATION

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- ~MASTER GAGE FINISH OF Ra 8 OR BETTER.
- ~PRECISION SWISS TURNED AND MILLED STAINLESS STEEL.
- ~CRITICAL TOLERANCES OF 0.0005.
- ~CERTIFIED DIAL ACCURACY OF +/- 0.0001 ANALOG & DIGITAL
- ~ALL STAINLESS COMPONENTS PASSIVATED PER ASTM A967.
- ~STAINLESS 6-32 SET SCREWS [X3] WITH ASME B18.3 ROCKWELL C28 HARDNESS.
- ~DIAL FASCIA AND DIAL BACKS WITH STANDARDS DELINATION.

WARRRANTY

WARRANTY: ALL VM MICROWAVE GAGES CARRY A ONE YEAR WARRANTY ON THE INDICATOR AND A 10 YEAR WARRANTY ON ALL STAINLESS COMPONENTS.

PRECISION GAGE KITS

1.85mm & 2.4mm

ERGN
SERIES

MALE & FEMALE

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GAGE CALIBRATION AND ACCURACY

ALL VM GAGES COME WITH A NIST TRACEABLE ISO 17025 CALIBRATION PERFORMED BY L. C. STARRETT COMPANY (A2LA CERTIFICATION NO. 760.01).

1. **ACCURACY:** THE TRACEABLE ASSURANCE STANDARDS THEY ARE EMPLOYED ARE PROGRESSIVELY MORE ACCURATE IN THE ORDER OF 4:1. FOR MECHANICAL CALIBRATIONS WITH GRADUATIONS OF 0.0001 THE CALIBRATION AND MEASUREMENT CAPABILITY (+/- CMC) IS 26 μ in, FOR GRADUATIONS OF 0.0005 THE CMC IS 42 μ in, FOR DIGITAL CALIBRATIONS WITH 0.0000R RESOLUTION THE CMC IS 35 μ in, AND FOR 0.0001 RESOLUTION THE CMC IS 65 μ in. SEE TABLE BELOW FOR FULL CMC FOR DIAL AND DIGITAL INDICATORS CALIBRATED PER ISO 17025 AND ANSI B89.1.10M. .

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005 & ANSI/NCSL Z540-1-1994			
<u>Indicators –</u>			ANSI B89.1.10M, manufacturer's specifications.
Mechanical	0.00005 in	20 μ in	Final CMC's a function of calibration device error, calibration device uncertainty, repeatability, resolution and thermal effects per ANSI B89.1.10M.
	0.0001 in	26 μ in	
	0.0005 in	42 μ in	
	0.001 in	56 μ in	
	0.005 in	150 μ in	
	0.010 in	250 μ in	
Digital	0.00005 in	35 μ in	L.C.Starrett Co. Certification number: 760.01
	0.0001 in	65 μ in	
	0.00025 in	150 μ in	
	0.0005 in	300 μ in	
	0.001 in	600 μ in	

NOTE: CERTIFIED ACCURACY IS WITH REFERENCE TO 20 DEGREES C (68F)

2. **CONFIDENCE:** THE ESTIMATED UNCERTAINTY REPORTED ON THE LETTER OF CERTIFICATION WILL SPECIFY THE N.I.S.T. TEST NUMBER, THE RELEVANT SPECIFICATION, THE SERIAL NUMBER OR NUMBERS OF THE INSTRUMENTS, AND THE WARRANTED ACCURACY FOR THE FIRST 2.5 REVOLUTIONS AND FOR THE BALANCE OF THE RANGE OF THE DIAL OR DIGITAL INDICATOR. THE CERTIFIED UNCERTAINTY WILL BE STATED WITH A CONFIDENCE LEVEL OF 95%.

3. **SUPPORT:** VM GAGES ARE WARRANTED FOR A PERIOD OF ONE YEAR. ALL STAINLESS STEEL COMPONENTS, BUSHING AND SPINDLE ATTACHMENTS ARE WARRANTED FOR TEN YEARS.

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PRECISION GAGE KITS

1.85mm & 2.4mm

ERGON
SERIES

MALE & FEMALE

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WHY THE VM PRECISION GAGE IS DIFFERENT

1. TAPERED BUSHING DESIGN FOR GREATER FEEL & VISIBILITY.

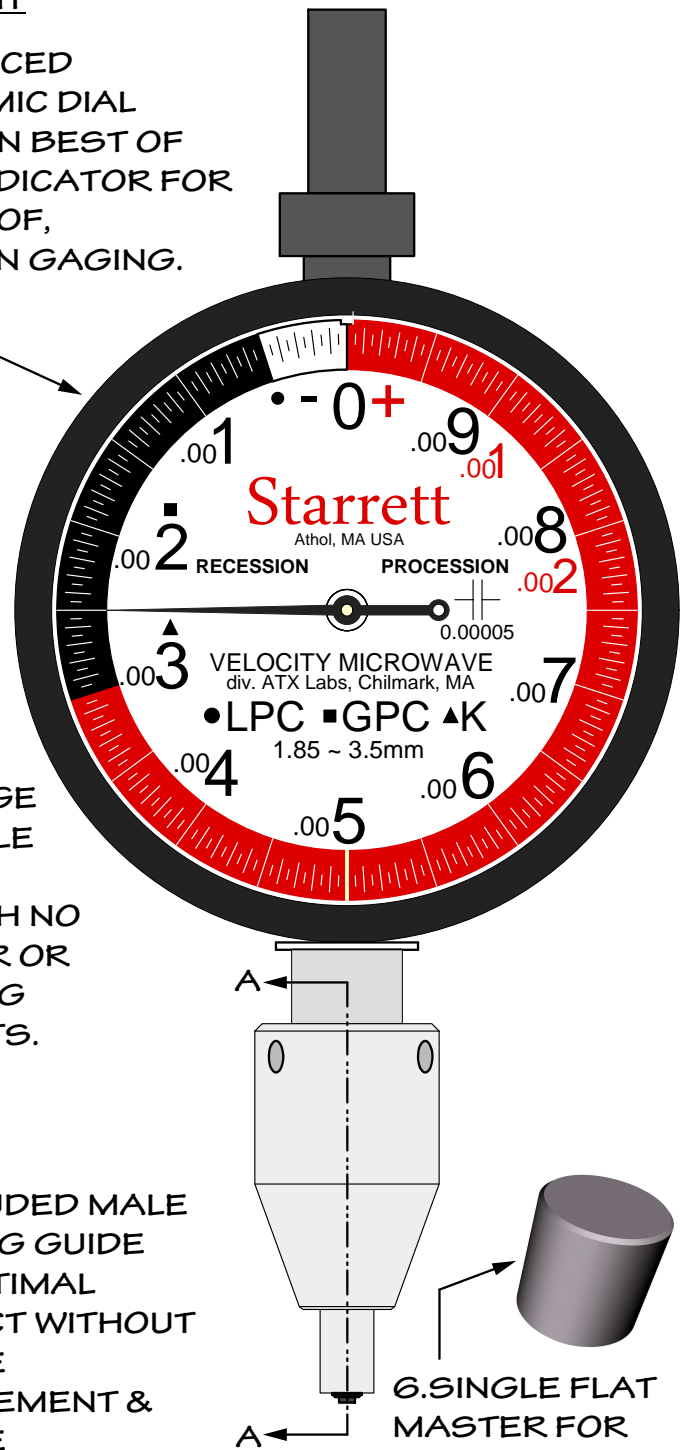
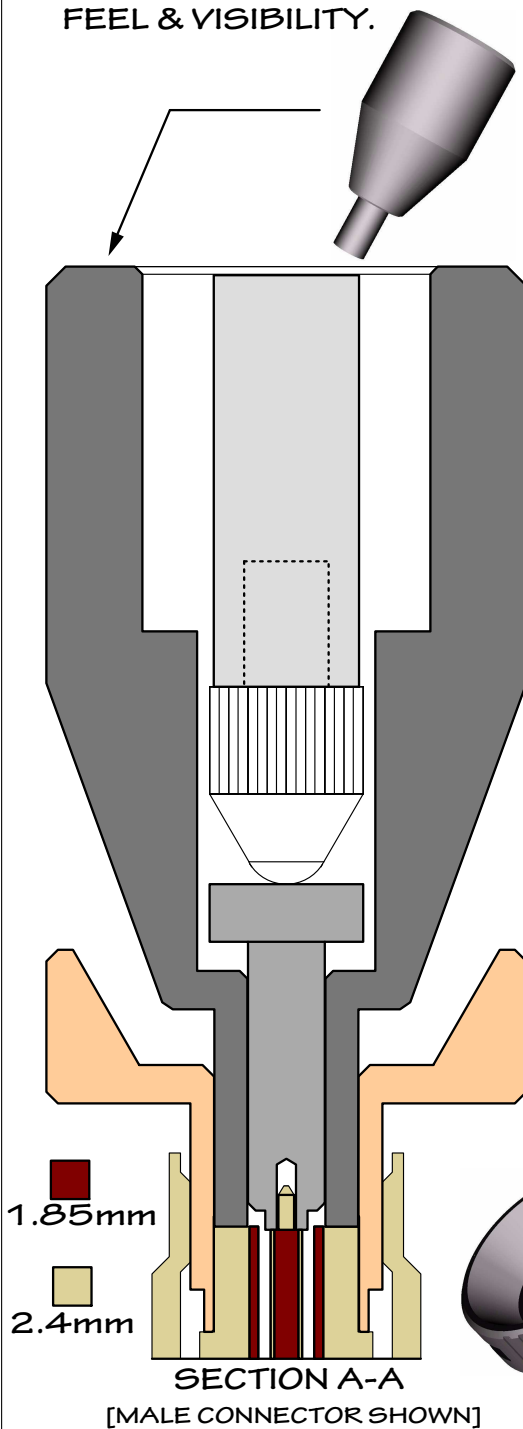
2. ENHANCED ERGONOMIC DIAL FASCIA ON BEST OF BREED INDICATOR FOR FOOLPROOF, PRECISION GAGING.

3. FULL STANDARDS GUIDE ON REAR OF INDICATOR & STANDARDS LEGEND ON FASCIA.

4. SINGLE GAGE FOR BOTH MALE AND FEMALE GENDERS WITH NO CHANGE-OVER OR RE-MASTERING REQUIREMENTS.

5. INCLUDED MALE BUSHING GUIDE FOR OPTIMAL CONTACT WITHOUT TORQUE REQUIREMENT & TORQUE UNCERTAINTY.

6. SINGLE FLAT MASTER FOR ERROR FREE ZERO SETTING.



GENERAL SPECIFICATION

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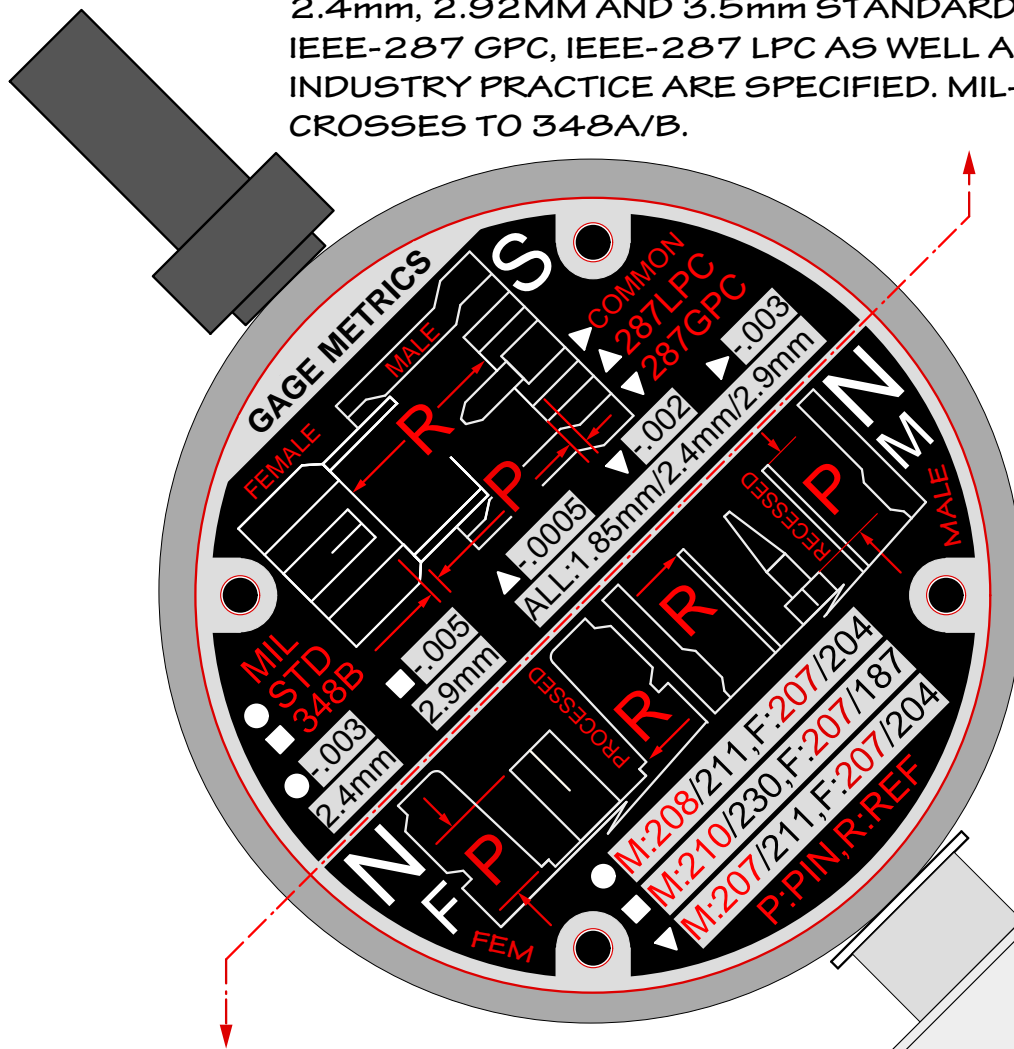
1.85mm & 2.4mm

ERGON
SERIES

MALE & FEMALE

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UPPER HEMISPHERE ON GAGE BACK DENOTES 1.85mm, 2.4mm, 2.92mm AND 3.5mm STANDARDS. MIL-STD-348, IEEE-287 GPC, IEEE-287 LPC AS WELL AS COMMON INDUSTRY PRACTICE ARE SPECIFIED. MIL-C-39012 CROSSES TO 348A/B.



INTERFACE GEOMETRY FOR 1.85mm, 2.4mm, 2.92mm, 3.5mm AND TYPE N IS PROVIDED FOR BOTH GENDERS WITH REFERENCE PLANE CRITERIA CLEARLY MARKED

LOWER HEMISPHERE ON GAGE BACK DENOTES TYPE N STANDARDS FOR BOTH MALE AND FEMALE GENDERS. A SIMPLE LEGEND IS USED TO DISTINGUISH STANDARDS CRITERIA.

TYPE N & 1.85mm/2.4mm/2.92mm 3.5mm GAGE BACK

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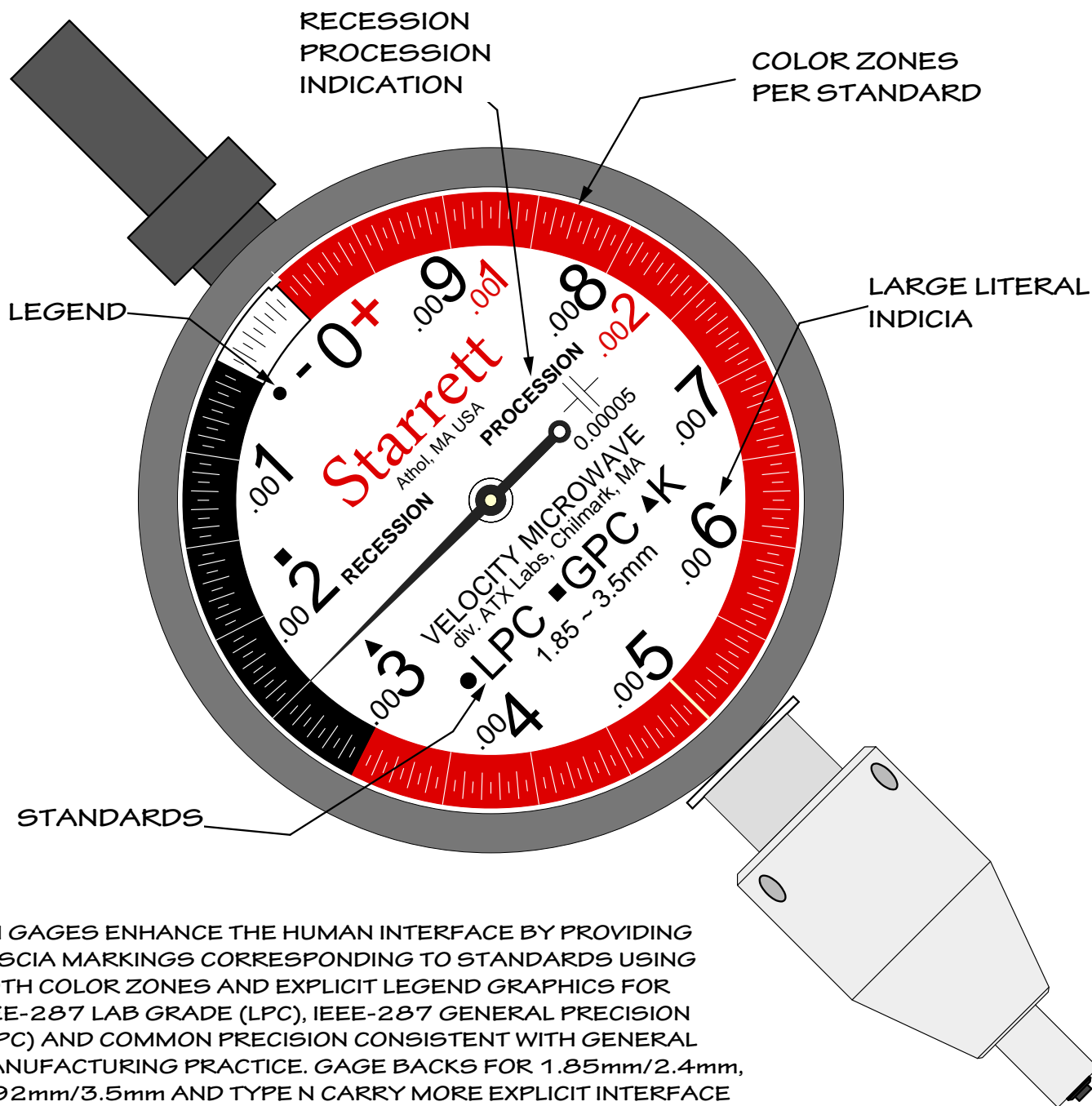
PRECISION GAGE KITS

1.85mm & 2.4mm

ERGON
SERIES

MALE & FEMALE

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VM GAGES ENHANCE THE HUMAN INTERFACE BY PROVIDING FASCIA MARKINGS CORRESPONDING TO STANDARDS USING BOTH COLOR ZONES AND EXPLICIT LEGEND GRAPHICS FOR IEEE-287 LAB GRADE (LPC), IEEE-287 GENERAL PRECISION (GPC) AND COMMON PRECISION CONSISTENT WITH GENERAL MANUFACTURING PRACTICE. GAGE BACKS FOR 1.85mm/2.4mm, 2.92mm/3.5mm AND TYPE N CARRY MORE EXPLICIT INTERFACE REFERENCES AND GEOMETRIC RENDERING FOR CLARITY.

GAGE FRONT

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