INSTRON®

The difference is measurable®

Solutions for Reinforcement Bar Testing

The average annual growth rates for the construction industry are expected to increase for much of the world for the next 10 years. High-growth regions, such as Russia, China, India, United States, Middle East, Canada, Australia, Africa, and other emerging countries mean new construction of bridges, roadways, dams, tunnels, mass transit systems, water and sewage systems, airports, hotels, and stadiums. Reinforcement bar (rebar) manufacturers may see an increase in volumes, strength and size requirements, use of stainless steel grades, as well as additional needs for mechanical couplers. All of these can affect their current testing programs. Instron systems are designed to meet these developing challenges.

The Challenge

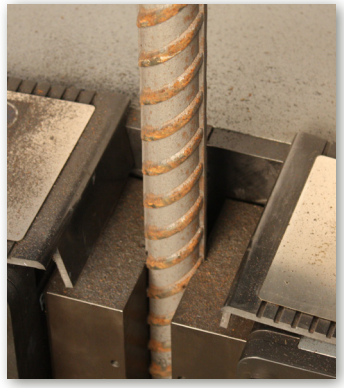
Rebar's Irregular Surface and Bent Specimens

- Irregular surface geometry and scaling during elongation present several gripping challenges.
- Rebar specimens are often cut from coiled material and must be straightened prior to tensile testing. As a result, specimens are not always perfectly straight.

Our Solution

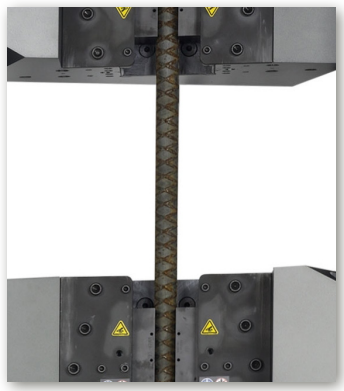
Gripping Irregular Surface

- Application-specific jaw faces effectively prevent slippage and jaw breaks while still allowing for safe and easy removal of broken test pieces.
- Internal components are shielded from falling scale – produced during rebar elongation – that reduces system maintenance costs and possible down time.



Gripping Bent Specimens

- Grips accommodate slightly bent specimens and will overcome small side-loads while still maintaining axial specimen alignment.
- Grips jaws do not need to be reset (re-centered) between tests, which improves testing throughput.



The Challenge

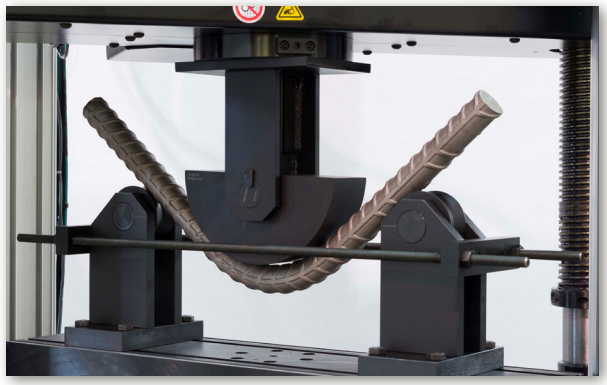
Bend Testing

- Rebar is frequently bent for use in concrete applications.
- Test standards require a bend test to determine if cracks form on the outside of the bend.

Our Solution

Bend Testing

- System testing stroke is long enough to perform the entire bend on the largest diameters, eliminating the need for a separate bend tester.
- Dual test space systems allow bend fixtures to remain in the machine during tensile testing which reduces setup time and operator fatigue from moving heavy fixtures.



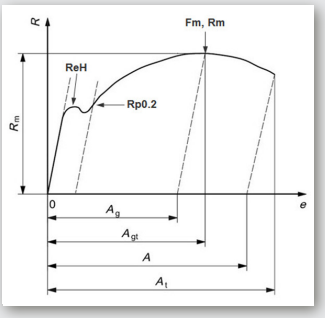
The Challenge

Automatic Test Results

Common test results for rebar include:

- ReH (Upper Yield, Halt of Force, Drop of Beam)
- Rp0.2 (0.2% Proof Strength, Offset Yield)
- Fm (Maximum Force, Peak Load)
- Rm (Tensile Strength, Ultimate Strength)
- Ag. Agt (Elongation at Maximum Force, Uniform Elongation)
- A (Percent Elongation after Fracture)

Historically, many of these results required manual identification (ReH), measurement (A), or calculation (Ag).



Our Solution

Automatic Capture of Test Results

All calculation results can be performed automatically by the materials testing software, saving time and reducing operator and system variability.

The Challenge

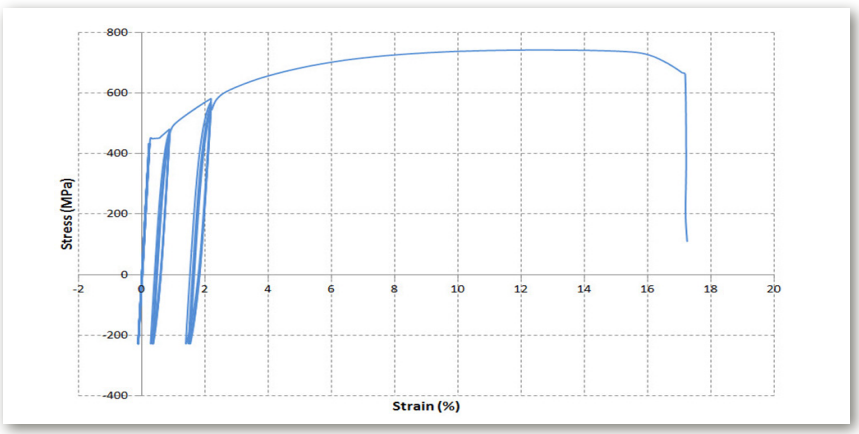
Coupler Testing

- Seismic testing of couplers for slippage requires cycling the specimen.
- Comprised of two pieces of rebar joined by a coupler.
- Tests can be tension-tension cycling only or demand through-zero cycling like the requirements of AC133, CS2, or ISO 15835.

Our Solution

Cycle Testing Mechanical Couplers

- High-pressure, side-acting grips provide a positive clamping force to allow loading in both tensile and compressive directions.
- Testing software allows strain at yield stress to be recorded on initial cycle so it can automatically determine reversal points for remaining test cycles.



Reinforcement Bar Testing Challenges and the Instron® Solution

The Challenge

Suitable Strain Measurement

- Non-machined rebar specimens require extensometers with long gauge lengths.
- Extensometers must be able to attach to the uneven surface of rebar and maintain contact during elongation.
- Automatic elongation results require instruments to remain attached beyond maximum force or even failure.

Our Solution

Manual Strain Measurement

- Clip-on extensometers securely clamp to the irregular specimen preventing strain errors due to slippage or undesired movement on the uneven surface.
- Instruments are uniquely identified by testing software that prevents accidental use of the incorrect instrument or gauge length.

Automatic Strain Measurement

- Adjustable gauge length accommodates a wide range of specimen diameters and gauge lengths with a single instrument.
- Automatic clamping and release improves operator safety and reduces variability between operators.
- Can remain attached through failure allowing for automatic recording of Ag, Agt, and A (Elongation after Fracture).

The Challenge

Violent Fractures

- Rebar specimens exhibit violent failures with significant recoil (up to 60G of acceleration), which can lead to increased system wear.

Our Solution

Absorbing High-Energy Release

- Robust hydraulic grips and load frames effectively absorb released energy preventing unwanted damage to the testing system.
- Standard system capacities ranging from 300 - 3500 kN (67,500 - 800,000 lbf) easily accommodate any size and grade of rebar.

For further information, support, or application expertise, please contact your local Instron office. We also encourage you to visit the Testing Solutions section of our website at www.instron.com

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