

Instructional Manual for Isometric Tests

EasyForce Performance and ISOplate





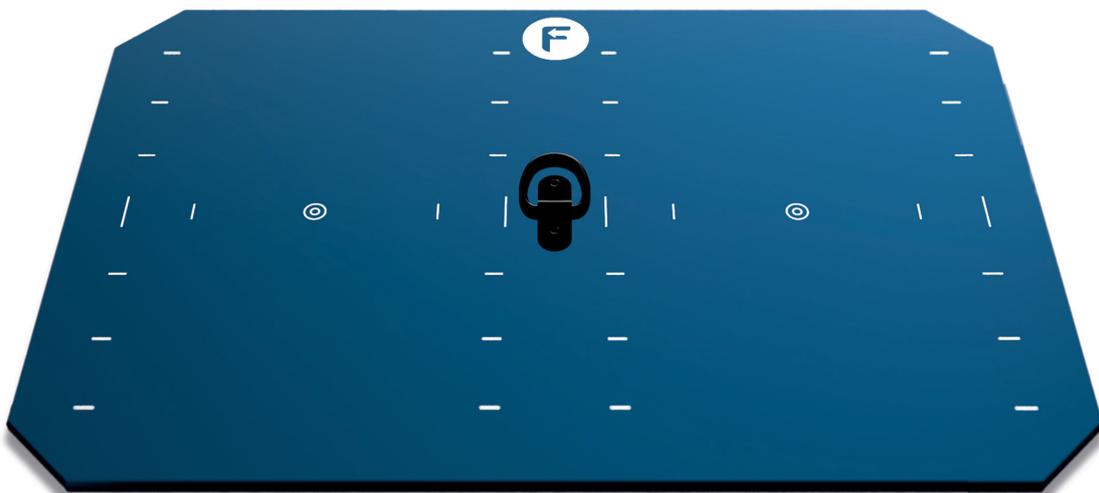
About EasyForce Performance

The EasyForce Performance is a state-of-the-art digital dynamometer featuring a peak force capacity of 300 Kg (2942 N). This pull-type dynamometer is specifically designed to evaluate strength generated in compound, multi-joint movements. It caters to strength and performance coaches, sports physiotherapists, personal trainers, and other movement professionals who strive to enhance strength assessment through objective data. If your daily work revolves around athletic populations,

returning athletes to sports, or improving athletic performance, EasyForce Performance is the ideal tool for you. It enables you to track critical metrics such as peak force, time-to-peak force, and average force without the complexities of data exports or connectivity. The tool provides accurate, simple, and swift access to the data that matters most to you and your clients, making it a valuable asset to your work.

About the ISOplate accessory

ISOplate is a rigid aluminum platform engineered to work in conjunction with the EasyForce Performance Dynamometer. It provides a secure and simple method to evaluate a broad spectrum of isometric tests like the Isometric Thigh Pull, Isometric Deadlift, or Isometric Belt Squat. The platform's laser-engraved top plate visuals assist in foot positioning during each test, thereby ensuring the validity and reliability of the results.



Isometric Mid-thigh Pull (IMTP)

Test description: The IMTP is an assessment of athletic performance and dynamic strength used by strength coaches and clinicians within the sports realm ^(1,2). It requires an athlete to exert a maximal upward (vertical) pull on a fixed barbell, similar to the second phase of a power clean (driving hips forward and extending knees), and can provide insight into maximal lower extremity strength, force generation/development, and effectiveness of interventions ^(1,2,3,4).

Instructions:

After setting up the plate according to the instructions written in the EasyForce Performance manual proceed to following:

- 1 Have athlete stand on the plate shoulder width.
Adjust the chain length at a mid-thigh height, assuming the knee angle is at (125-145) and hip angle (140-150).
- 2 Athlete takes the barbell and warms up by performing several gradually increasing submaximal repetitions.
- 3 To avoid a false force peak, instruct the athlete to gradually increase the pull strength.
- 4 Turn the device on, press the start measurement button and perform the test by attempting a maximal upward pull.
- 5 The assessment can last about 10 seconds while maintaining the maximum pull for at least 3 seconds.
- 6 To end the assessment either press the device blue button or lower the device and the metal bar to the ground.

Considerations for tester during setup:

1. Bar height: Knee angle (125-145) and hip angle (140-150).
2. Hand/Foot placement: Approximately shoulder width or slightly wider.
3. Use of hand straps or chalk.
4. For reliable results perform the test 3 times with at least 2–2.5 minutes rest in between. Upon completion calculate the average result.



Additional reading:

Over the last decade, IMTP has become a leading measure in assessing athletic performance, dynamic strength and peak power.

1. Giles, G., Lutton, G., & Martin, J. (2022). Scoping Review of the Isometric Mid-Thigh Pull Performance Relationship to Dynamic Sport Performance Assessments. *Journal of functional morphology and kinesiology*, 7(4), 114.
<https://doi.org/10.3390/jfmk7040114>

2. Grgic, J., Scapec, B., Mikulic, P., & Pedisic, Z. (2022). Test-retest reliability of isometric mid-thigh pull maximum strength assessment: a systematic review. *Biology of sport*, 39(2), 407–414.
<https://doi.org/10.5114/biolsport.2022.106149>

IMTP has demonstrated reliability when assessing changes in maximum strength and effectiveness of interventions over time.

3. Keogh, C., Collins, D. J., Warrington, G., & Comyns, T. (2020). Intra-Trial Reliability and Usefulness of Isometric Mid-Thigh Pull Testing on Portable Force Plates. *Journal of human kinetics*, 71, 33–45.
<https://doi.org/10.2478/hukin-2019-0094>

It is also said to be a viable alternative to 1RM deadlift – offering clinicians/patients or trainers/clients a more time and energy efficient option to accurately track progress.

4. De Witt, J. K., English, K. L., Crowell, J. B., Kalogera, K. L., Guilliams, M. E., Nieschwitz, B. E., Hanson, A. M., & Ploutz-Snyder, L. L. (2018). Isometric Midthigh Pull Reliability and Relationship to Deadlift One Repetition Maximum. *Journal of strength and conditioning research*, 32(2), 528–533.

Isometric Deadlift (lift-off or knee-passing)

Test description: The isometric deadlift is like the isometric mid-thigh pull, but dissimilar because it is assessed at lift off from the floor and as the bar passes the knee. Research states that this test has been strongly correlated to peak force and maximal strength of a 1RM hexagonal barbell (trap bar) deadlift, which has proven most effective in knee extensor activation and translates to dynamic actions like sprinting^(1,2,3). In addition and depending on the depth of squat required in the athlete's sport, forces at the lift-off and at knee-passing phases could provide similar insight into athletic performance in sports that involve jumping as the isometric mid-thigh pull.



Instructions:

After setting up the plate according to the instructions written in the EasyForce Performance manual proceed to following:

- 1 Athlete stands on the plate with feet placed shoulder width. Adjust the chain at length of 22.54 cm/8.875" (lift-off) or at knee height (knee-passing).
- 2 Athlete takes the barbell with hands shoulder width apart and warms up by performing several submaximal repetitions.
- 3 To avoid a false force peak, instruct the athlete to gradually increase the pull strength.
- 4 Turn the device on and perform the test by attempting a maximal upward pull.
- 5 The assessment can last about 10 seconds while maintaining the max pull for at least 3 seconds.
- 6 To end the assessment either press the device blue button or lower the device and the pulley to the ground.

Considerations for tester during setup:

1. Variations of test: Lift-Off vs. Knee-Passing Phase.
2. Testing of both variations or only those applicable? Which pull or hip/knee angle translates best for the athlete in their sport?
3. Bar height:
Lift-Off: When lifting the bar off ground, there should be no (or very minimal) slack.
Knee-Passing: At the height of the superior aspect of the patella, there should be no (or very minimal) slack.
4. Hand/Foot placement: Approximately shoulder width.
5. Use of hand straps or chalk.
6. For reliable results perform the test 3 times with at least 2-2.5 minutes rest in between. Upon completion calculate the average result.

Additional reading (Research):

Research suggests that peak force assessed when completing isometric pulls at positions similar to the lift off and knee-passing phases of a hexagonal barbell (HBb) deadlift are the best predictors of maximal strength in a 1RM HBb deadlift.

1. Miller, B. A., Arroyo, E., Tagesen, E. C., & Jajtner, A. R. (2021). Relationships Between Hex Bar Deadlift One-Repetition Maximum and Maximal Isometric Pulls. *International journal of exercise science*, 15(4), 45-57.

Utilizing a hexagonal barbell when performing a deadlift may optimize knee extensor activation. Deadlift-based force assessments appear safe and may be useful in the assessment of functional strength in patients with acute, non-specific LBP.

2. Stock, M. S., Boddien, M. E., Bloch, J. M., Starnes, K. L., Rodriguez, G., & Girts, R. M. (2022). Acute, Non-Specific Low Back Pain Does Not Impair Isometric Deadlift Force or Electromyographic Excitation: A Cross-Sectional Study. *Sports (Basel, Switzerland)*, 10(11), 168.
<https://doi.org/10.3390/sports10110168>

The hip extension moment of the deadlift was 42% larger than the back squat, resulting in an exercise that strengthens the lower back and posterior thigh muscles and is easily able to translate to dynamic actions like sprinting.

3. Otsuka, M., Honjo, T., Nagano, A., & Isaka, T. (2021). Kinetics in lumbosacral and lower-limb joints of sprinters during barbell hip thrust compared to deadlift and back squat. *PLoS one*, 16(7), e0251418.
<https://doi.org/10.1371/journal.pone.0251418>

Isometric Belt Squat or Front Squat

Test description: The isometric squat (ISq) has been a tool used to assess maximal force (peak force) and explosive strength (rate of force development) in the clinical and sports performance settings. Like other isometric tests, the ISq has been preferred to dynamic testing, as it requires less skill and is more time and energy efficient, yet still provides insight into dynamic movements ⁽¹⁾. Research suggests that front and belt squats, have been correlated with the anterior chain (knee extensors) and the posterior chain (knee flexors), respectively ^(2,3). However, both play a significant role in sprinting and jumping.



Instructions:

After setting up the plate according to the instructions written in the EasyForce Performance manual proceed to following:

- 1** Athlete stands on the plate, feet placed shoulder width while the setup is the following for:
Front Squat: attach the bar at the height of front rack position while keeping the knee angle (125-145) and hip angle at (140-150).
Belt Squat: attach the belt at the appropriate height while knee angle (125-145) and hip angle (140-150).
- 2** Consider a warm-up by performing several increasing submaximal repetitions, while for:
Front Squat: holding the barbell in front rack position and keeping the elbows and chest high.
Belt Squat: placing the arms on the hips and keeping chest upwards.
- 3** To avoid production of a false force peak, instruct the athlete to gradually increase the pull strength.
- 4** Turn the device on, press the blue button and perform the test by attempting a maximal upward movement.
- 5** The assessment can last about 10 seconds while maintaining the max pull for at least 3 seconds.
- 6** To end the assessment either press the device blue button or lower the device and the bar to the ground.

Considerations for tester during setup:

- 1.** Variation of squat/placement of bar/What are you testing?
Front Squat: Anterior chain dominant (knee extensors).
Belt Squat: Reduces the spinal load during movement.
- 2.** Form: **Front Squat:** Holding bar on anterior delt vs. conventional (wrist extended).
- 3.** Foot placement:
Feet approximately shoulder width.
- 4.** For reliable results perform the test 3 times with at least 2-2.5 minutes rest in between. Upon completion calculate the average result.

Additional reading (Research):

The ISq assesses maximal force and explosive strength in a variety of athletic populations. It is preferred to dynamic testing, as it requires less skill, less time and may lead to less muscular damage. But is still correlated to the dynamic movements required in sport.

1. Moir, G. L., Getz, A., Davis, S. E., Marques, M., & Witmer, C. A. (2019). The Inter-Session Reliability of Isometric Force-Time Variables and the Effects of Filtering and Starting Force. *Journal of human kinetics*, 66, 43–55. <https://doi.org/10.2478/hukin-2018-0049>

Results suggests that the front squat may be preferred to the back squat when assessing knee extensors, whereas back squat may be preferred for knee flexors.

2. Yavuz, H. U., Erdağ, D., Amca, A. M., & Arıtan, S. (2015). Kinematic and EMG activities during front and back squat variations in maximum loads. *Journal of sports sciences*, 33(10), 1058–1066. <https://doi.org/10.1080/02640414.2014.984240>

Belt squats were determined to be a viable alternative for back squats, while still requiring the same muscular demands on all musculature outside of the core, obliques and glutes.

3. Joseph, L., Reilly, J., Sweezey, K., Waugh, R., Carlson, L. A., & Lawrence, M. A. (2020). Activity of Trunk and Lower Extremity Musculature: Comparison Between Parallel Back Squats and Belt Squats. *Journal of human kinetics*, 72, 223–228. <https://doi.org/10.2478/hukin-2019-0126>

Isometric Push Up or Upper Body Isometric

Test description: In comparison to lower extremity assessments, viable upper extremity assessments have been few and far-between. But the isometric push-up (or upper body isometric test {UBIST}) has been proven to possess strong similarities to the 1RM bench press when assessing peak force and time to peak force. These variables correlate with dynamic movements when body positioning is similar and translate to sport-specific movements like those found in American Football and competitive surfing ^(1,2).



Instructions:

After setting up the plate according to the instructions written in the EasyForce Performance manual proceed to following:

- 1 Consider warming up by performing several sets of pushups.
- 2 Athlete can place the belt around the chest with the chain facing forward.
- 3 Have athlete assume mid push-up position, hands placed slightly wider than the shoulder, elbow at 90 degrees and adjust the chain length from chest to ground.
- 4 Before measuring instruct the athlete to gradually increase the push strength to avoid the sudden peak. Turn the device on, and press the blue button.
- 5 Perform the assessment by attempting a maximal push-up. The assessment can last about 7 seconds while maintaining the max pull for at least 3 seconds.
- 6 To end the assessment either press the device blue button or lower the body to the plate.

Considerations for Tester During Setup:

1. Plate placement: Athlete's upper neck/chin should be parallel to the edge of the plate.
2. Hand Placement: 150 % Biacromial Width.
3. Form:
Elbows: Flexed to 90 degrees.
Back: Must remain flat throughout test.
4. Belt/Strap used to secure to ISOplate must be non-elastic.
5. Belt/Strap placement:
Over shoulder and under opposite shoulder.
Around trunk (over bilateral scapula).

Additional reading (Research):

The UBIST is a reliable assessment of upper body strength when compared to the 1RM bench press test and possesses the ability to provide insight into dynamic on-field movements, like those seen in American Football.

1. Bellar, D., Marcus, L., & Judge, L. W. (2015). Validation and Reliability of a Novel Test of Upper Body Isometric Strength. *Journal of human kinetics*, 47, 189–195. <https://doi.org/10.1515/hukin-2015-0074>

Larger values of isometric strength are correlated to increased dynamic strength and translate to increased peak force and quicker times to peak force in competitive surfers

2. Parsonage, J., Secomb, J., Dowse, R., Ferrier, B., Sheppard, J., & Nimphius, S. (2018). The Assessment of Isometric, Dynamic, and Sports-Specific Upper-Body Strength in Male and Female Competitive Surfers. *Sports (Basel, Switzerland)*, 6(2), 53. <https://doi.org/10.3390/sports6020053>





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