

Investigator[®] Quality Sensor

An internal PCR amplification control for optimized, high quality forensic workflow analysis

Nowadays, forensic and paternity laboratories are often faced with increasing workloads. To reduce costs and increase efficiency, productivity and quality of laboratory operations, forensic facilities are required to optimize their workflow.

One cost- and labor-intensive part of forensic workflows is the process of repeating STR analyses on DNA samples that showed poor results or failed quality criteria, due to degradation, inhibition or absence of DNA. As part of our dedication to improving forensic workflows, we have developed a new feature for our latest STR assays to provide you with more information about your sample quality (Figure 2). The innovative Quality Sensor (QS) allows generation of additional, valuable data for your quality control and performance checks, without affecting PCR performance, even in the case of low DNA content samples. This internal performance control is already part of our STR assays, and is amplified simultaneously with the DNA in your sample, to show you if you are dealing with:

- Successful PCR amplification
- Failed PCR amplification
- Absence of DNA
- Inhibited DNA
- Degraded DNA

The new Quality Sensor is integrated in the following Investigator STR PCR amplification kits (Figure 1):

- **Investigator 24plex QS Kit**, for amplification of the new CODIS core and ESS marker set from casework samples
- **Investigator 24plex GO! Kit**, for direct amplification of the new CODIS core and ESS marker set from reference samples
- **Investigator ESSplex SE QS Kit**, for amplification of the ESS marker set
- **Investigator Argus X-12 QS Kit**, for amplification of 12 X-chromosomal STR markers plus D21S11



Figure 1. Investigator STR Assays containing the unique Quality Sensor.

Innovative Quality Sensor for additional information and better results

What do you do when your PCR amplification run does not produce optimal profiles? In the absence of QS, repeating a failed PCR run is the usual course of action. With QS, you will always know when repeating the run will not yield better results, and how to adjust your PCR setup to get the most out of your precious samples. This performance control allows you to focus your resources on the most promising of your DNA samples. QS enables you to examine whether the absence of DNA (Figure 2B) or handling errors (2C) were the cause of your failed PCR run. Additionally, it informs you whether sample dilution could yield better results by eliminating PCR inhibition (Figure 2D). Furthermore, when using QS, you will be able to determine the presence of degraded DNA in your sample, which would not improve with sample dilution (Figure 2E).

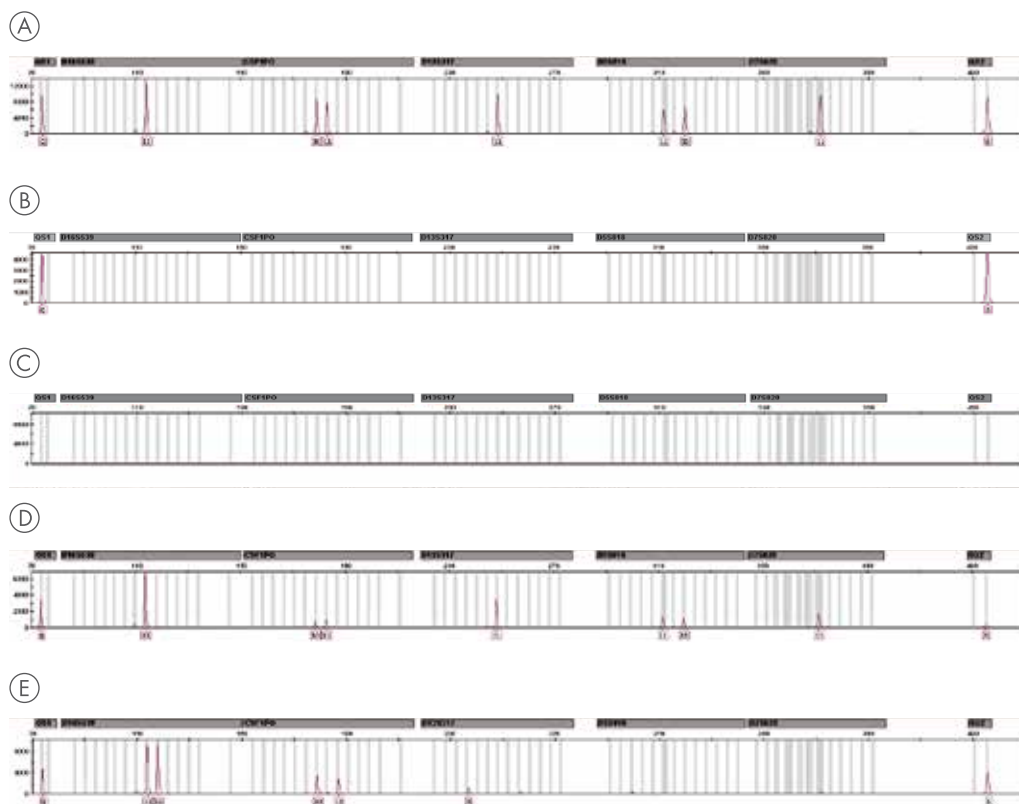


Figure 2. A Confirmed successful PCR amplification. Small amplicon Quality Sensor peak (QS1) and large amplicon Quality Sensor peak (QS2) appear at similar heights. Sample allele peaks have balanced height across the profile. **B Confirmed successful PCR amplification but absence of DNA.** QS1 and QS2 appear at similar heights. No sample allele peaks appear. **C Failed PCR amplification.** Lack of QS1 and QS2. No sample allele peaks appear. **D Inhibited DNA.** QS1 with normal peak height and QS2 with decreased peak height can be seen if inhibitors are affecting PCR. Sample allele peaks for the markers show decreasing height towards the larger markers. **E Degraded DNA.** QS1 and QS2 appear at similar heights. Sample shows allele peaks for the STR loci with decreasing height towards the larger STR loci. The analysis was performed on a GeneAmp® PCR System 9700 Thermal Cycler and Applied Biosystems® 3500 Genetic Analyzer using the Investigator 24plex QS Kit.

Profile appearances and their meanings

The peak heights of QS1 and QS2 may vary slightly between experiments. A slight peak height scattering is normal, and is not dependent on inhibitor influence. During the validation, evaluation of the usual variation spectrum in relation to certain samples types should be performed, and a regular peak height range for both QS1 and QS2 should be defined. A drop in the QS2 signal below 20% of the QS1 signal, indicates inhibition of the PCR run.

Allele Peaks	QS1	QS2	Interpretation
Present	Present	Present	Successful profile
Absent	Present	Present	No DNA
Absent	Absent	Absent	Failed PCR
Ski-slope profile	Present	Dropdown	Inhibitors present
Ski-slope profile	Present	Present	Degraded DNA

Quality Sensor explained

The new Quality Sensor consists of a plasmid template and appropriate primers, designed to amplify two PCR products of 74 bp (QS1) and 435 bp (QS2, Figure 3). The Investigator Argus X-12 QS Kit contains only the small amplicon, QS1. To address the risk of sequence similarity and the possibility of non-specific binding, synthetic DNA templates were designed using a random algorithm, followed by a subsequent BLAST search that excludes non-specific binding in the context of a multiplex PCR amplification reaction.

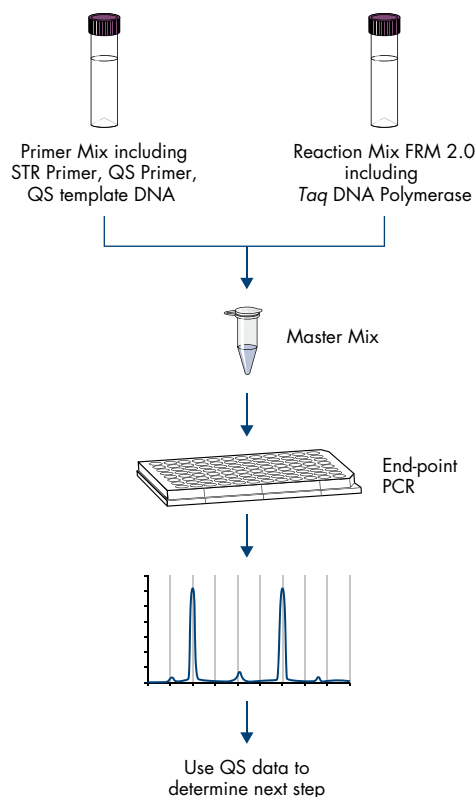


Figure 3. Investigator Quality Sensor pipetting scheme. The Quality Sensor primers and the artificial DNA are already in the kit's Primer Mix, so no additional preparation steps are required. Just combine the Primer Mix with the Reaction Mix, add the DNA sample and perform the PCR. Looking at the amplification results tells you everything you need to know about sample quality.

Ordering Information

Product	Contents	Cat. no.
Investigator 24plex QS Kit (100)*†	Primer Mix, Fast Reaction Mix 2.0 including <i>Taq</i> DNA Polymerase, Control DNA, Allelic Ladder 24plex, DNA Size Standard 550 (BTO), Nuclease-Free Water	382415
Investigator 24plex GO! Kit (200)*†	Primer Mix, Fast Reaction Mix 2.0 including <i>Taq</i> DNA Polymerase, Control DNA, Allelic Ladder 24plex, DNA Size Standard 550 (BTO)	382426
Investigator ESSplex SE QS Kit (100)*	Primer Mix, Fast Reaction Mix 2.0 including <i>Taq</i> DNA Polymerase, Control DNA, Allelic Ladder ESSplex SE QS, DNA Size Standard 550 (BTO), Nuclease-Free Water	381575
Investigator Argus X-12 QS Kit (25)*	Primer Mix, Fast Reaction Mix 2.0 including <i>Taq</i> DNA Polymerase, Control DNA, Allelic Ladder Argus X-12 QS, DNA Size Standard 550 (BTO), Nuclease-Free Water	383223

* Larger package sizes available; see www.qiagen.com.

† Not available in all countries.

For up-to-date licensing information and product-specific disclaimers, see the respective QIAGEN kit handbook or user manual. QIAGEN kit handbooks and user manuals are available at www.qiagen.com or can be requested from QIAGEN Technical Services or your local distributor.

Once you've tried it, you'll always insist on Quality Sensor! Visit www.qiagen.com/Investigator.

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