



# From crime scene to closure

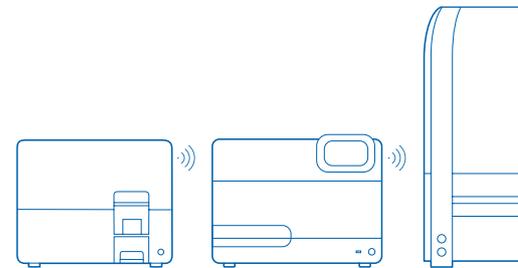
Human Identification and Forensics: Advanced Workflow Solutions

Sample to Insight

# Streamline your workflow – get more information faster with

Forensic and paternity laboratories are often faced with increasing workloads, due to growing demand for DNA testing. To reduce costs and increase efficiency, productivity and quality of laboratory operations, forensic facilities like yours are required to optimize their workflows. This is why

QIAGEN has developed high-quality automation, sample collection and preparation consumables, as well as assay solutions designed to meet your needs, whether you belong to a smaller lab or a higher-throughput facility.



## Sample collection

## Pretreatment

## Sample preparation

### Recommended instruments and tools

- UniCore Puncher
- Hamilton easyPunch STARlet (Hamilton)
- BSD Puncher (Microelectronic Systems Pty Ltd)

### Consumables

- OmniSwab Sterile
- QIAcard® FTA® formats
- EasiCollect® Plus
- EasiCollect Buccal Collection Kit
- QIAcard FTA Elute Buffer

### Instruments

- Tissuelyser II

### Kits

- Investigator Lyse&Spin Basket Kit
- Investigator Casework GO! Kit

### Instruments

- QIAcube® Connect
- EZ2® Connect Fx
- QIASymphony® SP

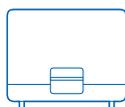
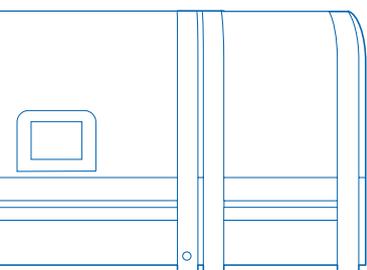
### Kits

- QIAamp® DNA Investigator Kit
- EZ1 & 2™ Investigator Kit
- QIASymphony DNA Investigator Kit
- Investigator STAR Lyse&Prep Kit

# QIAGEN® solutions for human identity and forensic testing

All Investigator® products have been validated according to recommendations of the European Network of Forensic Science Institutes (ENFSI) and the Revised Validation Guidelines of the Scientific Working Group on DNA Analysis Methods

(SWGDM). QIAGEN can help your forensic laboratory standardize sample processing, and enable you to achieve consistent high-quality results – from Sample to Insight!



## Assay setup

## Quantification

## STR analysis

### Instruments

- QIAAsymphony AS
- QIAgility®

### Instruments

- Rotor-Gene® Q

### Kits

- Investigator Quantiplex Pro Kit
- Investigator Quantiplex® Pro RGQ Kit

### Instruments

- QIAamplifier® 96

### Human autosomal STR kits

- Investigator 24plex QS and GO! Kits
- Investigator 26plex QS Kit
- Investigator ESSplex SE QS Kit
- Investigator IDplex Plus Kit

### Supplementary human autosomal STR kits

- Investigator HDplex Kit
- Investigator Triplex AFS QS Kit

### Human gonosomal STR kits

- Investigator Argus Y-28 QS Kit
- Investigator X-12 QS Kit

# Responsibility from the start

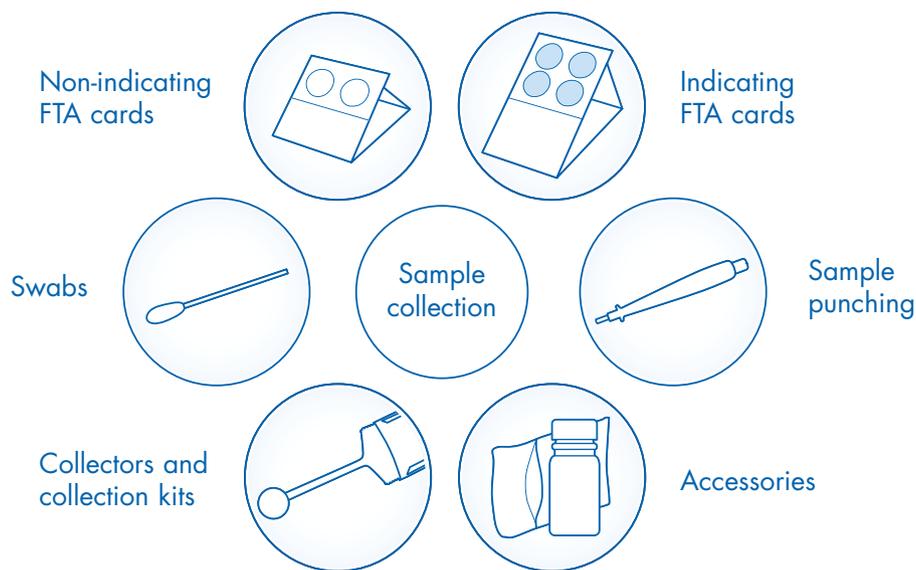
Reliable QIAcard FTA technology and EasiCollect solutions for safe storage and high-quality DNA processing.

Dried samples are an excellent solution for long-term stabilization at room temperature. You can collect, transport, store and analyze your samples with relative ease. This simplifies handling and reduces cost.

Whether you're performing reference or casework sample collection, looking to store and protect the integrity of your precious samples under all conditions, or even considering customized kits for your workflow, we have a solution for you.

## FTA = Flinders Technology Associates

QIAcard FTA is a chemically coated cellulose matrix with impregnated chemistry capable of lysing cells upon contact and denaturing proteins. Indicating card formats change from colored to white upon sample application. Released DNA is trapped on the card and protected from degradation. This smart storage technology allows you to store your samples at room temperature for decades. The QIAcard FTA Elute formats are moreover designed for room temperature shipment, preservation and subsequent elution of released nucleic acids from biological samples.



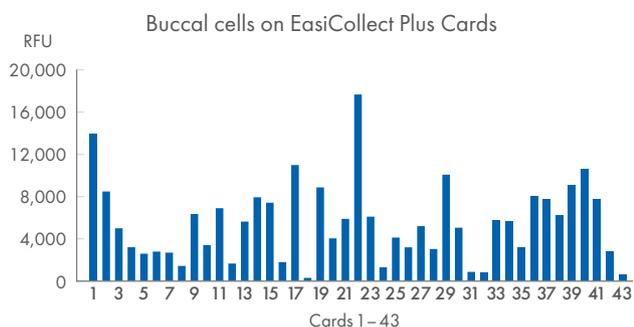
## The sample collection portfolio offers:

- Collectors and collection kits – For simple, reliable and standardized sample collection
- Indicating FTA cards – For collection, stabilization, processing, transport and archiving of buccal and saliva samples
- Non-indicating FTA cards – For collection, stabilization, processing, transport and archiving of blood samples
- Sample punching – For precise sample disc removal from FTA cards
- Swabs – Foam swabs and OmniSwabs with ejectable head for buccal and saliva samples
- Accessories – For contamination-free collection, storage, transport and processing of DNA samples
- Custom solutions – For creating optimized solutions that fit into your workflow

## EasiCollect and QIAcard FTA

The EasiCollect Plus is an all-in-one single-use product designed specifically for the collection and storage of buccal samples (mouth cells) for genetic analysis. This product allows cells to be uniformly captured on a foam applicator by swabbing the inside of both cheeks and then transferred to an integral Indicating FTA card. Subsequent analysis of sample material on QIAcard FTA formats or EasiCollect (with FTA inside) devices can be processed via direct PCR.

A direct PCR with the punched paper disc included in the PCR mix can be streamlined with tailored ready-to-go kits. For example, use QIAGEN's Investigator 24plex GO! in combination with the Investigator STR GO! Punch Buffer to overcome potential inhibition.



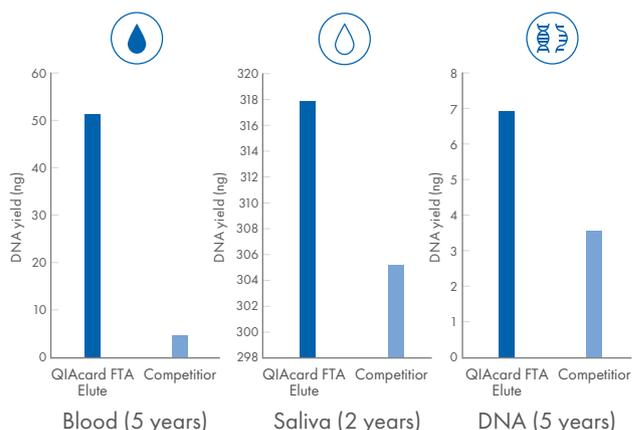
**Figure 1. Relative peak heights of all 43 samples processed – all 43 samples gave full, balanced profiles.**

Significant variation in peak heights between samples is typical of buccal samples and can be heavily influenced by sample collection and DNA availability from the subject.



## QIAcard FTA Elute

QIAcard FTA Elute formats are designed for room temperature shipment, preservation and subsequent elution of released nucleic acids from biological samples. For purification of previously applied DNA or RNA to the FTA Elute cards, the use of QIAcard FTA Elute Buffer is sufficient. The recovery of nucleic acids from biological fluids requires the addition of Proteinase K and a QIAshredder basket.



**Figure 2. Recovery of sample material compared with competitor product.**

Different sample material such as blood, saliva and purified human gDNA were applied to QIAcard FTA Elute formats and accelerated aging studies showed significant differences in comparison to the competitor product. Full STR profiles were obtained from DNA stored on QIAcard FTA Elute formats for all sample materials (data not shown).

**Customization:** In addition to our catalog kits, we can create customized kits fitting your application and workflow. Your kit can include any of our QIAcard FTA products or other sample collection products and accessories including customized card artwork.



For more information and a full list of products, go to [www.qiagen.com/forensic-sample-collection](http://www.qiagen.com/forensic-sample-collection)

# Sample pretreatment for best results

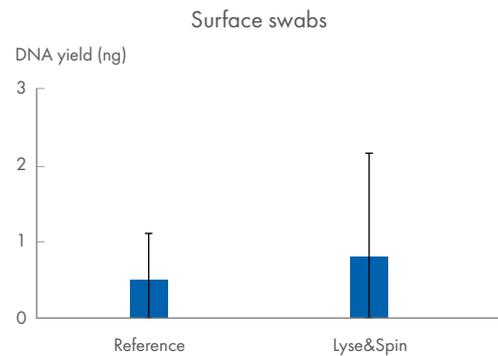
## Investigator Lyse&Spin Basket Kit

### Reduced sample handling and complete nucleic acid recovery

The Investigator Lyse&Spin Basket Kit is used for pretreatment of forensic samples, in combination with manual and automated extraction kits, such as the QIAamp DNA Investigator Kit, the EZ1&2 DNA Investigator Kit, the QIASymphony DNA Investigator Kit and Investigator STAR Lyse&Prep Kit. This kit enables you to perform sample lysis and separation of solid sample substrates at the same time (for example, swabs, pieces of fabric or leather, paper, cigarette butts, chewing gum, small tapes or other sample types), in one simple procedure (Figure 3).

- A streamlined front-end solution for pretreatment of forensic samples
- Lysis at 56 °C for up to 16 hours without leaking

- Filtration of lysates and retention of particle >10 µm
- EO-treated bulk or single blistered kit configurations



**Figure 3. Higher DNA yield.**

Comparison data with standard lysis and filtration using the QIAshredder (Reference), and lysis and filtration using the Investigator Lyse&Spin Basket Kit (Lyse&Spin). The Casework 500 ADV protocol was used on the QIASymphony SP for DNA purification, and the Investigator Quantiplex Kit for human DNA quantification (n=12).

## TissueLyser II

### Convenient sample disruption of bone or teeth samples

As a molecular forensic investigator or archaeologist, you know better than anyone else that DNA purification from bones or teeth can be a very challenging task.

The TissueLyser II (Figure 4) bead mill is capable of grinding a bone or tooth sample to a fine powder in just a few minutes, using liquid nitrogen for the grinding jar set of the instrument.

- Bead mill for grinding bones or teeth until pulverized
- Convenient and secure disruption process
- Reproducible results with difficult-to-lyse tissues

- Adapter sets optimized for high-throughput disruption
- Front-end solution for QIAGEN sample preparation



**Figure 4. TissueLyser II.**

# QIAcube Connect – the all-in-one instrument

## Simple automated DNA purification from forensic samples

The QIAcube Connect uses advanced technology to process QIAGEN spin columns, enabling you to seamlessly integrate automated, low-throughput sample prep into your laboratory workflow. The proven silica membrane technology of the QIAamp

DNA Investigator Kit provides you with high-quality DNA suitable for direct use in downstream analysis or storage for later use. Pretreatment protocols are available for various typical casework or reference sample types.

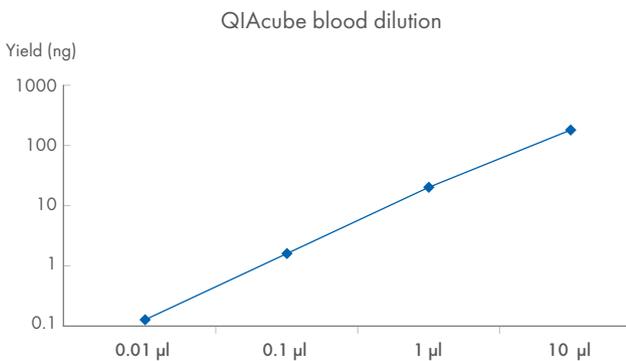


Figure 5. Linear correlation of input sample amount and purified DNA (left), performed on a QIAcube Connect instrument (right).

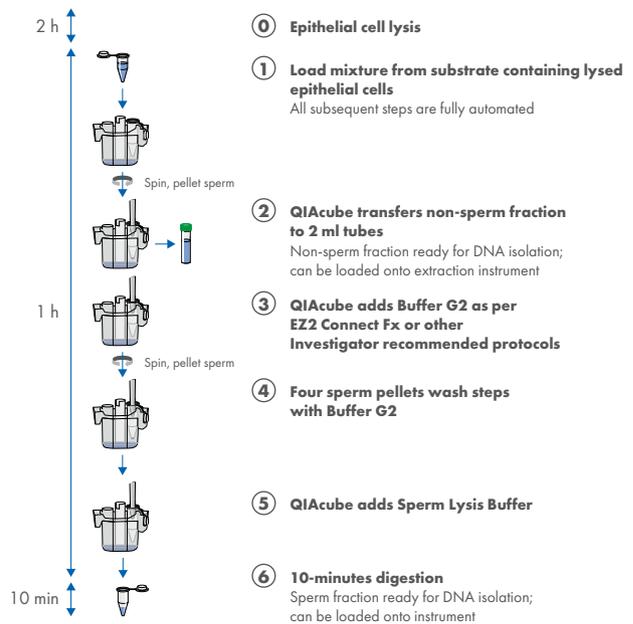


## Convenient automation of sexual assault samples

But sample prep is not all. The QIAcube Connect also offers specially designed differential wash protocols for effective lysis and careful separation of the sperm and epithelial fractions from sexual assault samples. This procedure is essential for you to achieve the best possible results in downstream STR analysis.

- Automated wash steps and sperm pellet lysis for up to 6 samples in 60 minutes, or up to 2 samples in 90 minutes
- Standardized procedures reducing run-to-run variability
- Increased efficiency due to less hands-on time

### Differential wash and lysis protocol



Start to standardize sexual assault analysis. Learn more from:

**Sexual assault casework | Sexual assault sample analysis | QIAGEN**

# Get high-quality nucleic acids in just 20 minutes

Simplicity. Safety. Speed.

## Fast and efficient workflow

- Purify high-quality DNA and RNA in under 20 minutes
- Increase lab throughput by processing up to 24 samples in parallel and 288 samples per day – with just one instrument

## Maximum process safety

- Achieve reproducibility and convenience with prefilled, ready-to-use forensic grade reagent cartridges
- Have confidence in your sample processing with an internal camera to scan and check for proper loading of samples and consumables
- Recover DNA from samples in the event of an error or aborted run using easy-to-follow instructions for sample recovery capabilities
- Full worktable decontamination in one easy step with high emission UV-LED

Meet your lab's need for increased throughput, reproducibility and flexibility with the EZ2 Connect Fx. This benchtop instrument automates processing of up to 24 samples at a time in around 20 minutes using the EZ1 Advanced XL magnetic-bead purification technology. Isolate high-quality DNA from a wide range of sample types, such as cigarette butts, saliva, blood, touch samples, bone and semen.

## Trusted chemistry

- Benefit from the EZ1® Advanced XL magnetic-bead purification technology you know and trust
- Easily access a variety of dedicated human ID and forensics protocols at the push of a button
- Prepare a wide range of sample types for various downstream forensics applications



Figure 6. EZ2 Connect Fx

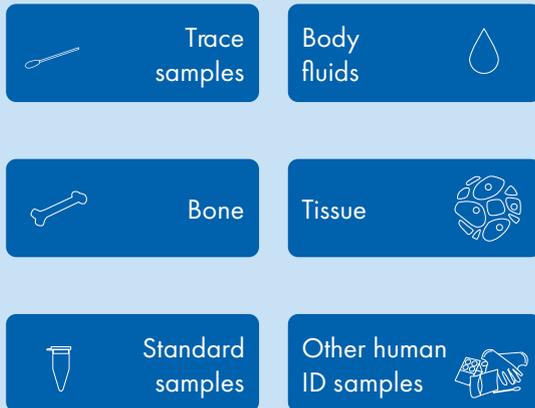
Benefit from the flexibility of the EZ2 Connect Fx in sample input and elution volumes. Protocols allow for up to 2 ml of input lysate and for a range of elution volumes from 20 µl – 200 µl. Plus, with its remote connectivity feature, you can monitor your runs and manage your instrument even from outside the lab.



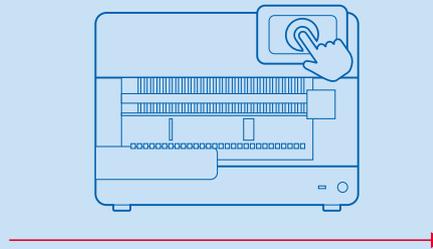
Learn more and watch our webinar: *Step up with the EZ2 Connect Fx: Unrivaled ease of use, confidence, and convenience are now within your reach* at [www.qiagen.com](http://www.qiagen.com)

# with the EZ2 Connect Fx

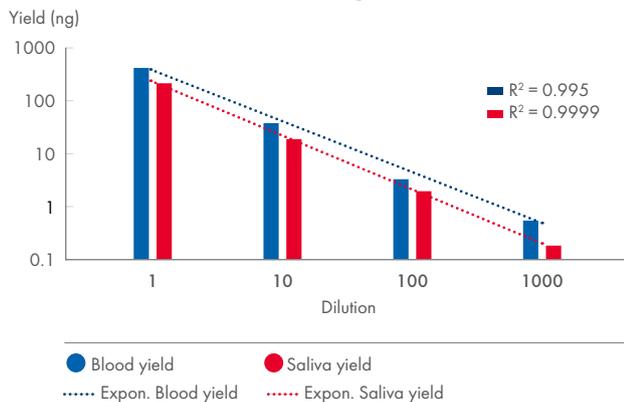
## Many sample types



## Many applications



## Linearity



**Figure 7. Linearity.**

Blood and saliva dilutions were extracted in triplicates on the EZ2 Connect Fx. The dilution series corresponds to 10, 1, 0.1, and 0.01 µl blood or saliva sample.

Read these application notes to learn how the EZ2 Connect Fx performs against other forensic DNA extraction platforms

Comparison of two DNA extraction platforms for use in forensic casework applications:  
EZ2 Connect Fx versus AutoMate Express

Comparison of two DNA extraction platforms for use in forensic casework applications:  
EZ2 Connect Fx versus Maxwell FSC Instrument

# QIAasymphony SP/AS – in tune with your DNA

## Sample purification and assay set up with one versatile instrument

The QIAasymphony SP/AS offers you unequalled quality in medium- to high-throughput DNA sample purification (SP) and assay setup (AS) for human identity and forensic analyses (Figure 8). Latest software and protocol developments have improved handling of difficult sample and subsequent assay setup options. This innovative, easy-to-use modular system with built-in touchscreen offers you excellent performance, traceability and LIMS compatibility.

- Maximum process safety with prefilled, sealed reagent cartridges of the QIAasymphony DNA Investigator Kit
- Continuous loading in batches of up to 24 samples including internal controls with bar code reading
- Option to assign different protocols to each batch
- Different protocol options to ensure maximum DNA recovery, yield and quality, free from inhibitors
- Automated transfer of eluates from the SP to the AS module for assay setup

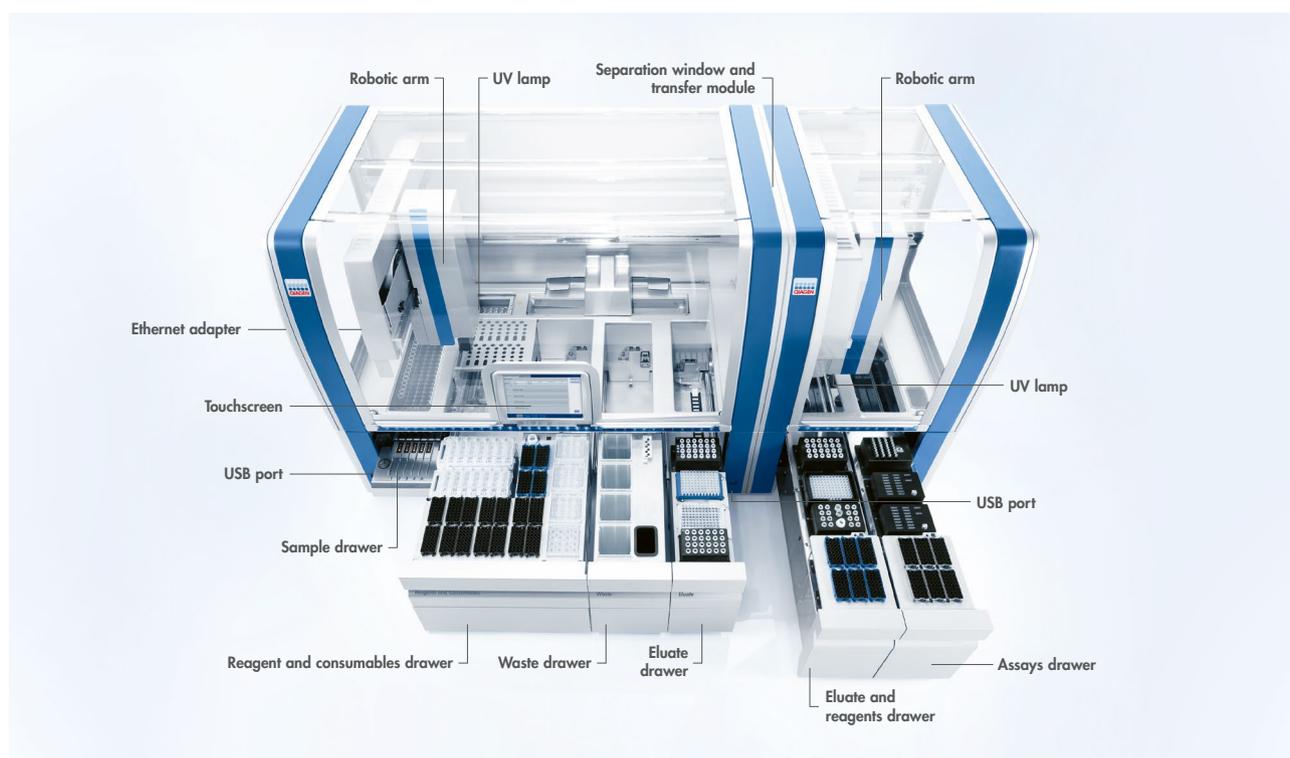


Figure 8. The QIAasymphony instrument with the SP and AS module.



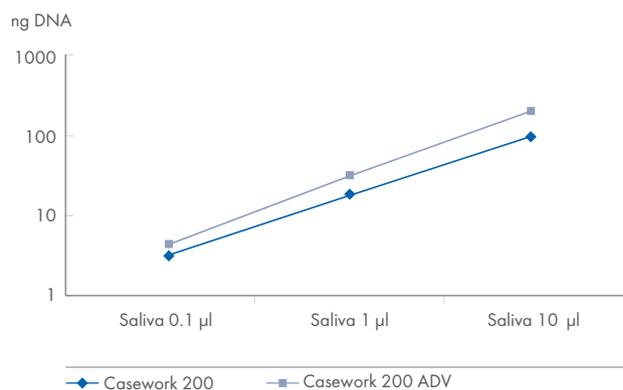
For further information on sample preparation with the QIAasymphony DNA Investigator Kit on QIAasymphony SP, watch our webinar: *Successfully overcoming challenges in forensic sample preparation* at [www.qiagen.com/forensics-webinar](http://www.qiagen.com/forensics-webinar)

Interested in using the QIAAsymphony chemistry on open liquid handling platforms? Use Investigator Lyse&Prep Kit!

## Fast and efficient automated sample DNA purification

To meet the specific challenges of your forensic samples, we have developed sample preparation protocols that ensure the highest possible first-pass success rates. Advanced protocols (ADV) use a heated binding step and increased binding time to maximize yields of pure DNA from the most difficult samples (Figure 9).

High-Efficiency (HE) protocols address the challenge of recovering sufficient DNA from touch samples and other low-template samples. TopElute Fluid maximizes sensitivity for these difficult samples (data not shown). The full range of high-efficiency forensic protocols available for different reference and casework samples is described in Table 1.



**Figure 9. Improved DNA yields using the Casework Advanced protocol.** Series of saliva dilutions (4 replicates each) were purified using the Advanced protocol (Casework 200 ADV), which includes a heated and prolonged binding step, or the standard protocol (Casework 200). The Investigator Quantiplex Kit was used for DNA quantification.

**Table 1. High-efficiency forensic protocols for the QIAAsymphony**

| Protocol        | Lysis volume options | Enhanced binding | Eluate volume | TopElute Fluid |
|-----------------|----------------------|------------------|---------------|----------------|
| Reference       | 200, 500 µl          | No               | 100–400 µl    | No             |
| Casework        | 200, 500, 1000 µl    | No               | 100–200 µl    | No             |
| Casework ADV    | 200, 500, 1000 µl    | Yes              | 100–200 µl    | No             |
| Casework HE     | 200, 500, 1000 µl    | No               | 30–80 µl      | Yes            |
| Casework HE ADV | 200, 500, 1000 µl    | Yes              | 30–80 µl      | Yes            |

## Forensic workflow integration and user-friendly assay setup

The QIAAsymphony AS extends the capabilities of the QIAAsymphony SP by integrating automated PCR assay setup, for both real-time quantification and traditional STR assays. If your laboratory is already operating a QIAAsymphony SP, you can easily upgrade your system onsite with a QIAAsymphony AS module and use the module as an independent or integrated liquid handler.

- Automated serial dilution of quantification standards
- Import of concentration data from various frequently used real-time cyclers
- Normalization of samples for subsequent STR assay setup
- User-defined target amount, minimum and maximum

# High-precision, reproducible reaction and plate setup

## QIAgility

The flexible benchtop liquid handler for automated assay and capillary electrophoresis (CE) plate setup.

The QIAgility is a compact benchtop instrument that helps you save time by enabling rapid, high-precision PCR and CE setup, and providing standardization, traceability and highly accurate pipetting (Figure 10). The unmatched versatility of the QIAgility means that almost all tube and plate formats are supported, as well as Rotor-Discs® for the Rotor-Gene Q.

For PCR success at the first attempt, you can use verified prewritten and ready-to-run Q Protocols for PCR setup in combination with QIAGEN PCR kits for end-point and real-time PCR.

- Assay setup for quantitative real-time PCR and STR analysis
- Normalize up to 64 DNA samples in a single run
- Import sample IDs and concentration data directly from the normalization protocol
- Automatic addition of DNA extract at the recommended template input

Manually setting up 96-well plates for CE to obtain STR profiling results is time-consuming and prone to error. The QIAgility can set up a 96-well plate for CE in just 34 minutes, including dispensation of Hi-Di™ Formamide/size standard mix, samples and allelic ladders.

- Prewritten protocols for CE plate setup with fixed or user-defined ladder positions
- High accuracy by sensing the meniscus during pipetting and retracting the tip while dispensing to prevent bubbles in the Hi-Di Formamide/PCR product mixture that could result in failed injections

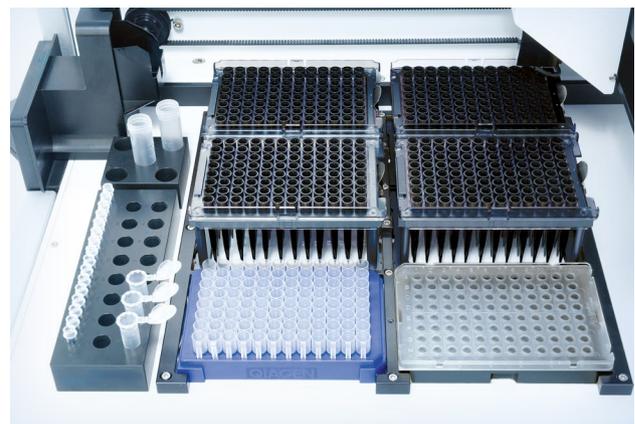


Figure 10. QIAgility instrument and deck layout.

# Quantification – More insight for confident decisions

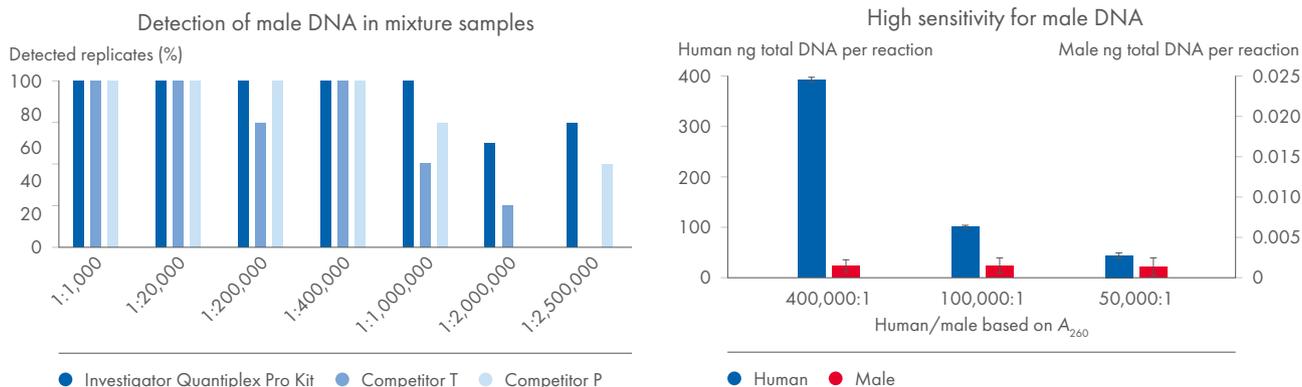
## Investigator Quantiplex Pro and Investigator Quantiplex Pro RGQ Kits

With our quantification portfolio we support you to choose the best downstream analysis path for a critical forensic sample. Arm yourself with the tools you need for a confident decision. You can count on the Investigator Quantiplex Pro Kits to maximize information through consistent, accurate, reliable screening. Make the right choice. Triage your samples with the Investigator Quantiplex Pro Kits.

- Simple reaction set up
- Broad dynamic range
- Accurate quantification of low-level DNA
- Sensitive detection of male DNA in high female background
- Effective detection of inhibition and human and male\* degradation
- Easy integration into your high throughput, automated workflows

## High sensitivity and accurate male/female ratio

### Outperforming other kits detecting male DNA in high female background



**Figure 11. Highly accurate and sensitive results for male DNA.**

Different mixture sets were tested. Each set contains a total of 1 pg of male DNA, while the amount of female DNA was increased. Left: Investigator Quantiplex Pro outperforms competitor products in quantification accuracy, and provides more precise results even with low DNA inputs. Right: The Investigator Quantiplex Pro Kit accurately quantified the increasing amount of female DNA, whereas the amount of male DNA was consistently quantified at approximately 1 pg in total.



Learn more about our quantification solutions for human identity and forensic testing at: [www.qiagen.com/QuantiplexKits](http://www.qiagen.com/QuantiplexKits)

\* Investigator Quantiplex Pro RGQ only

# STR analysis – have confidence in your evidence

## Investigator Human Identification STR Kits

### Accelerated DNA profiling with unique features

When preparing to give evidence in court, you need to have an STR profile you can trust. QIAGEN offers a broad portfolio of multiplex PCR kits for human identification and paternity testing that allow you to do just that – trust in your evidence.

Sometimes, standard autosomal kits are not sufficient to resolve a case and further genetic markers are needed. Conversely, there are situations where you need only a few, highly discriminating markers. We offer a broad range of unique solutions for complex deficiency cases, ChrX or ChrY analysis, as well as prescreening solutions with triplex subsets.

- International compatibility with CODIS core, ESS or Chinese loci
- Compatibility for direct amplification and challenging casework samples after DNA purification

- Combinatorial kits with non-standard markers or triplex applications
- Very high sensitivity and inhibitor resistance
- Accelerated PCR speed for fast results
- Smart primer design for minimal allelic overlap, reducing the risk of misinterpretation

PCR for all QIAGEN's DNA profiling assays, and any other of your laboratory's end-point PCR needs, can be achieved using the **QIAamplifier 96** high performance thermocycler.



Figure 12. QIAamplifier 96.

#### Autosomal standard STR

- Investigator 24plex QS and GO! Kits
- Investigator 26plex QS Kit
- Investigator ESSplex SE QS Kit
- Investigator IDplex Plus Kit

#### Suppl. autosomal STR

- Investigator HDplex Kit
- Investigator Triplex AFS QS Kit

#### Genosomal STR

- Investigator Argus Y-28 QS Kit
- Investigator Argus X-12 QS Kit



➔ Watch out [www.fbi.gov](http://www.fbi.gov) to learn more about CODIS and NDIS.

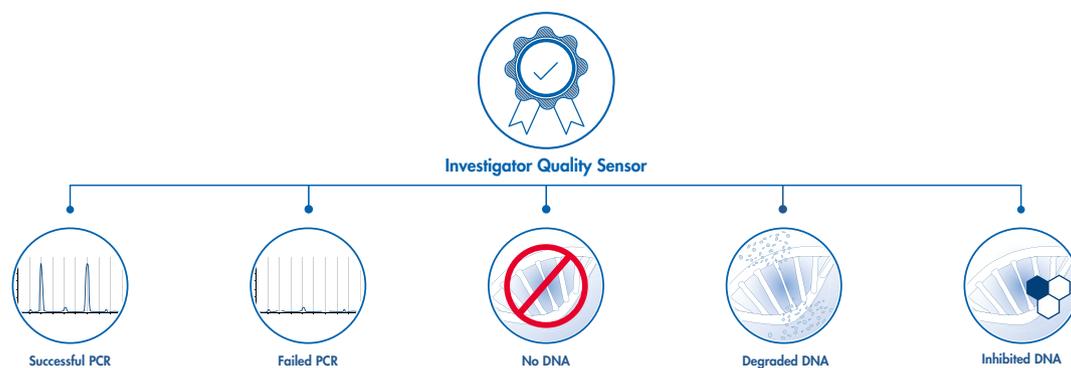
# Better quality control checks for your STR analyses

## Investigator Quality Sensor

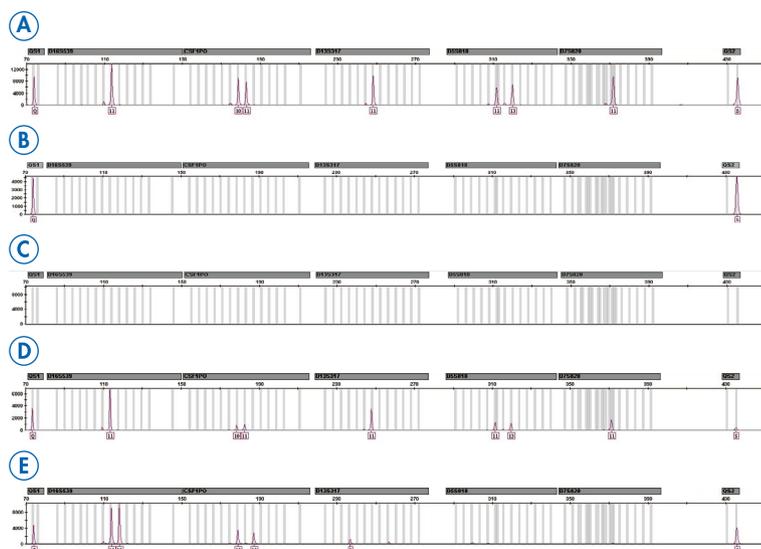
### Advanced STR analysis with an innovative and unique internal performance control

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 to give you more information about your sample quality.

The innovative Quality Sensor (QS) allows you to generate additional, valuable information for your quality control and performance checks (Figure 13). The QS is amplified simultaneously with the DNA, therefore no extra steps are needed and time is saved. Suboptimal profiles can now be interpreted for the correct action to minimize unnecessary PCR reruns. Let the QS redefine the way you think about casework analysis.



For better quality control in your STR analysis, see [www.qiagen.com/qualitysensor](http://www.qiagen.com/qualitysensor).



**Figure 13. Quality Sensor explained.**

**A** Successful run. 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 with 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.

# The right STR kit for the right sample

## Autosomal STR analysis that meets national and international standard

You know better than anyone else that small traces of DNA, which are often present as a DNA mixture, may be challenging for casework sample analysis. In such situations, a clean baseline and high sensitivity of the STR assays is crucial for a successful STR profile. The QIAGEN Investigator STR products offer the sensitivity and robustness you need, as well as the Quality Sensor, which shows you the quality of your sample and how best to proceed (Figure 14). This allows you to reduce costs and increase process efficiency.

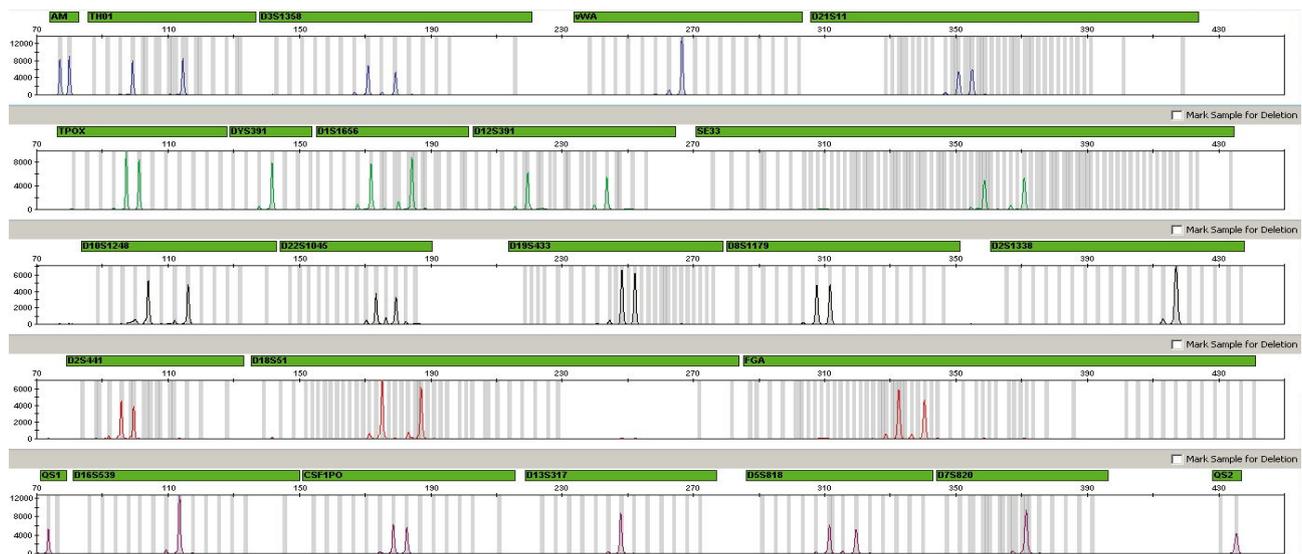
The following kit options are available:

- **Investigator 24plex QS Kit** – for analysis of the CODIS expansion marker set, with Quality Sensor
- **Investigator 26plex QS Kit** – for analysis of all Chinese, CODIS and ESS markers, with Quality Sensor

- **Investigator ESSplex SE QS Kit** – for analysis of the ESS standard set including SE33, with Quality Sensor
- **Investigator IDplex Plus Kit** – for analysis of the CODIS marker set

These kits offer the following features:

- Fast results with a PCR speed of around 60 minutes
- Highest pass rate for the most challenging samples due to high sensitivity and inhibitor resistance
- Added information and better decision, when the Quality Sensor is present
- Compatible with Investigator Casework GO! to maximize recovery of DNA from trace or touch samples



**Figure 14. Electropherogram of control DNA 9948 analyzed with the Investigator 24plex QS Kit.**

The sample was amplified in the presence of 500  $\mu$ M hematin, which did not interfere with amplification, meaning that a high-quality profile was obtained. This can be seen as the Quality Sensor fragments QS1 (lowest panel on the left) and QS2 (lowest panel on the right) were not adversely affected, indicating a successful run.

## Gonosomal STR assays for ChrX and ChrY analysis in casework and kinship analysis

### Argus X–12 QS Kit

ChrX genotyping can complement the analysis of autosomal and ChrY markers very efficiently, especially in complex cases of kinship testing or in paternity cases involving close blood-relatives as putative fathers. Here, the exclusion power of STRs is considerably reduced and ChrX STRs may be superior to autosomal markers. For example, if two alleged fathers are father and son, they would not share any X–chromosomal alleles identical by descent, and hence ChrX markers would be more efficient than AS markers. Besides kinship and paternity testing, the kit is also highly suitable for forensic stain analysis, such as female traces on a male background. The 12 X–chromosomal STR markers are clustered into four linkage groups (Table 2), and thus, each set of three markers is handled as a haplotype for genotyping.

### Argus Y–28 QS Kit

The Investigator Argus Y–28 QS Kit is designed to process highly challenging Y–STR casework and database samples. It is optimized to help improve resolution of trace evidence and sexual assault mixtures that contain small quantities of male DNA in a large background of female DNA and offers laboratories both the power of discrimination and the performance to enable accurate results in less time from challenging samples – For sure it contains the Quality Sensor and it is compatible with Investigator Casework GO!.

The most useful applications for the Investigator Argus X–12 QS Kit include:

- Paternity with related putative fathers (superiority of ChrX-markers if father/son)
- Paternity testing for daughters (only ChrX of males is transmitted to all females)
- Motherhood (Verification of mother/son)
- Sisterhood (identical paternal ChrX-haplotype)
- Deficiency cases with missing putative father (reconstruction of family trees)

**Table 2. Linkage groups of Investigator Argus X-12 QS Kit**

| Linkage group |                               |
|---------------|-------------------------------|
| 1 (Xp22)      | DXS8378 – DXS10135 – DXS10148 |
| 2 (Xp11)      | DXS7132 – DXS10074 – DXS10079 |
| 3 (Xp26)      | HPRTB – DXS10101 – DXS10103   |
| 4 (Xp28)      | DXS7423 – DXS10134 – DXS10146 |

The features of the Investigator Argus Y–28 QS Kit include:

- Co-amplification of 27 Y–chromosomal loci incl. 17 of the most commonly used markers
- An integrated Quality Sensor for better decision making and data interpretation
- Best in class performance with degraded samples and PCR inhibitors
- Dedicated for casework samples with high female input

# Whatever your throughput of reference samples is -

## Direct amplification of reference samples

Direct amplification can dramatically increase your lab's throughput and simultaneously decrease the complexity of your STR analysis processes. This reduces costs and minimizes the potential for errors. Our assays offer specific optimized direct protocols without the need for sample purification, for blood

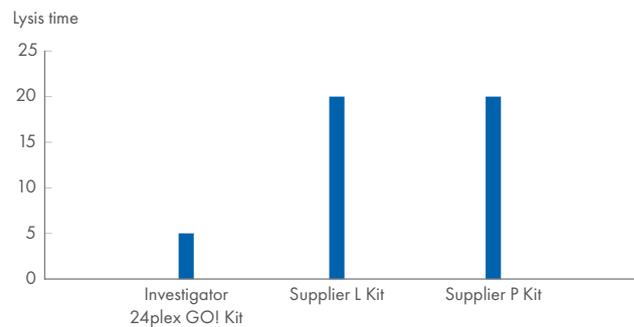
or saliva on FTA papers or buccal swabs. The Quality Sensor lets you see whether there is a lack of DNA or an unsuccessful PCR. This streamlines your decision-making process and lets you focus your resources optimally. The following kit or protocol options are available:

**Table 3. Overview of QIAGEN's Investigator STR PCR portfolio of reference samples.**

| Kit                            | Quality Sensor | Marker set         | Number of STR markers | Direct amplification from paper or swabs | Amplification from purified DNA |
|--------------------------------|----------------|--------------------|-----------------------|--|---------------------------------|
| Investigator 26plex QS Kit     | ●              | Autosomal standard | 24                    | Supplementary protocol                   | ●                               |
| Investigator 24plex QS Kit     | ●              | Autosomal standard | 22                    | Supplementary protocol                   | ●                               |
| Investigator 24plex GO! Kit    | ●              | Autosomal standard | 22                    | ●  | ●                               |
| Investigator IDplex Plus Kit   |                | Autosomal standard | 15                    |  | ●                               |
| Investigator Argus X-12 QS Kit | ●              | XChr/autosomal     | 12/1                  | Supplementary protocol                   | ●                               |
| Investigator Argus Y-28 QS Kit | ●              | YChr               | 28                    | Supplementary protocol                   | ●                               |

These kits offer the following features:

- Ideal for reference samples from buccal cells or blood on FTA paper or buccal swabs
- Swab lysis in just 5 minutes (see Figure 15)
- Validated protocols for automated sample punching and reaction setup



**Figure 15. Quicker swab lysis for direct amplification.**

The effective swab lysis time of the Investigator STR GO! Lysis Buffer for the Investigator 24plex GO! Kit protocol, and swab lysis times for other suppliers, are shown.



To see what our Investigator STR kits can do for you, watch our webinar *The New Approach to Global STR Analysis: Avoid False Negatives with Quality Sensor or Direct Amplification of Reference Samples Using Investigator STR GO! Kits* at [www.qiagen.com/forensics-webinar](http://www.qiagen.com/forensics-webinar)

# – we have the right assays and tools to support you

## Low throughput/manual sample handling

Use the **UniCore Punch system with Cutting Mat** as an easy, cost-effective manual punch system for precise sample disc removal from FTA cards. The cutting mat ensures clean sample cuts from FTA/FTA Elute Cards and extends the life of the cutting tip.

## Medium throughput/semi-automated sample handling

The **BSD600 Ascent A2** is the fourth generation of BSD punchers and suitable for medium to higher punching throughput and more complicated test sequences. Multiple punching is assisted by the light targeting and pattern punching. The instrument provides a two-plate-capacity with dual punch sizes and is compatible with 96 standard and deep-well plates or PCR tube racks. For more information and support on BSD instruments please contact our partner BSD Robotics Pty Ltd: [bsd@bsdrobotics.com](mailto:bsd@bsdrobotics.com)

## High throughput/fully automated sample handling

Fully Automated FTA Card Punching and Sample Analysis Hamilton optimized the **easyPunch STARlet** assay ready workstation to streamline pre-PCR workflow steps from a variety of evidentiary and DNA databasing biological samples collected via FTA cards. Samples are collected onto barcoded indicating or non-indicating FTA cards, where cellular DNA is released, and safely transported or stored for long time periods at ambient temperature. The cards are loaded onto the easyPunch for automated sample imaging, punching and processing.

For more information and support on using QIAGEN chemistry on Hamilton instruments please contact our Tech Service department.

(A)



(B)



(C)



**Figure 16. Reference sample processing.**

**A** Unicore Punch system, **B** BSD Puncher, **C** easyPunch STARlet

# QIAGEN Forensic DNA Grade quality

## High-quality Investigator solutions

### Trust in your results with QIAGEN Forensic Grade products

In criminal investigation, the introduction of foreign DNA to a crime scene sample, either at the scene itself or during laboratory analysis, can have devastating consequences for the examination. As a manufacturer of consumables used to collect and analyze samples from crime scene or reference materials, QIAGEN has a broad range of quality measures in place to guarantee highest product quality and safety. Our Investigator branding and Forensic Grade labels (Figure 17) demonstrate compliance with industry-leading quality control systems, and exacting manufacturing standards which includes:

- ISO 9001:2008
- Production in clean-room compliant to ISO 14644 standard and EU guidelines on GMP for Medicinal Products for Human and Veterinary Applications
- Risk analysis of manufacturing processes for potential exogenous human DNA
- Cleaning and environmental monitoring procedures
- Automated manufacturing and EO treatment whenever feasible
- Testing for absence of human DNA post-production before batch release
- Contamination Exclusion Database service

As part of the stringent and process oriented quality management system, all Investigator kits are manufactured in ISO-certified facilities. This ensures that they comply with the applicable regulatory requirements. To further ensure consistent high quality, each kit lot is tested against pre-determined specifications and for absence of human DNA post production.



**Figure 17. ISO 18385 Forensic DNA Grade.**

Investigator products that undergo an EO treatment are labeled accordingly.

With these measures, QIAGEN's entire Investigator product portfolio and corresponding manufacturing sites are ISO 18385 certified by external authorities and compliant with the ISO 18385 forensic manufacturing standard to minimize the risk of human DNA contamination in products used to collect, store and analyze biological material for forensic purposes.



For more Forensic Grade quality, see [www.qiagen.com/forensicgrade](http://www.qiagen.com/forensicgrade).

## Ordering Information

| Product                                 | Contents  | Cat. no. |
|---|---|----------|
| <b>Sample collection</b>                |   |          |
| QIAcard FTA Elute Buffer                | For improved recovery and integrity of nucleic acids from QIAcard FTA Elute formats 40ml bottle for 200 preps of, e.g., 4 x 3 mm (Ø) punches  | WB120100 |
| QIAcard FTA Elute Micro (100)           | 100 cards for sample preservation and transport at room temperature. Designed for elution of nucleic acids in combination with the QIAcard FTA Elute Buffer   | WB120410 |
| Sterile Foam Applicators (100)          | 100 swabs for easy collection of buccal cells and saliva and transfer to e.g. QIAcard FTA card formats  | WB100032 |
| OmniSwab Sterile (100)                  | 100 sterile collection swabs with ejectable brush-like head used for buccal and saliva samples  | WB100035 |
| EasiCollect Plus (50)                   | 50 buccal sample collection devices: Includes a foam applicator for direct sample transfer to an integral QIAcard FTA Indicating.   | WB120472 |
| EasiCollect Buccal Collection Kit (50)  | 50 buccal sample collection kits: Includes EasiCollect (incl. barcode), return mailing envelop, multi-barrier pouch, nitrile gloves, tamper evident tape and desiccant  | WB120237 |
| Uni-Core Punch 1.2 mm                   | Manual punch for precise sample disc removal from FTA cards   | WB100028 |
| <b>Pretreatment</b>                     |   |          |
| Investigator Lyse&Spin Basket Kit (50)* | 50 pouches with 50 baskets and 100 collection tubes   | 19597    |
| Tissuelyser II                          | Bead mill, 100–120/220–240 V, 50/60 Hz, requires the Tissuelyser Adapter Set 2 x 24 or Tissuelyser Adapter Set 2 x 96 (available separately)  | 85300    |
| Investigator Casework GO! Kit           | Casework GO! Lysis Buffer, Proteinase K Solution and nuclease-free water  | 386546   |
| <b>DNA purification and assay setup</b> |   |          |
| QIAcube Connect                         | Instrument, connectivity package, 1-year warranty on parts and labor  | Inquire  |
| Starter Pack, QIAcube                   | Reagent bottle racks (3), 200 µl filter-tips (1024), 1000 µl filter-tips (1024), 30 ml reagent bottles (12), rotor adapters (240), rotor adapter holder   | 990395   |
| EZ2 Connect Fx System                   | Benchtrop instrument for automated isolation of nucleic acids from up to 24 samples in parallel, using sealed prefilled cartridges; includes 2x EZ2 Connect racks (EZ2 Connect Fx Tip Rack and the EZ2 Conect Fx Tip Rack – Flip Cap Tubes), EZ2 Connect Fx Cartridge Rack and 1-year warranty on parts and labor | 9003220  |

\* Larger kit sizes available; please inquire.

† Not available in all countries; please inquire.

## Ordering Information

| Product  | Contents  | Cat. no. |
|--|---|----------|
| <b>DNA purification and assay setup (cont)</b> |   |          |
| EZ1&2 DNA Investigator Kit (48)                | For 48 preps: Reagent Cartridges (DNA Investigator), Disposable Filter-Tips, Disposable Tip-Holders, Sample Tubes (2 ml), Elution Tubes (1.5 ml), Buffer G2, Proteinase K, Carrier RNA  | 952034   |
| QIASymphony SP                                 | QIASymphony sample prep module, 1-year warranty on parts and labor  | 9001297  |
| QIASymphony AS                                 | QIASymphony assay setup module, 1-year warranty on parts and labor  | 9001301  |
| QIASymphony DNA Investigator Kit (192)         | For 192 preps of 200 µl each from case-work and reference samples: Includes 2 re-agent cartridges and enzyme racks and accessories  | 931436   |
| Investigator STAR Lyse&Prep Kit (400)          | For 400 preps: Buffer ATL, Buffer QSL3, Buffer QSW1, Buffer QSW2, Bead Suspension G, Buffer ATE, Proteinase K, Carrier RNA, Q-Card, Hand-book   | 931447   |
| QIAGility System HEPA/UV (incl. PC)            | Robotic workstation for automated PCR set-up (with UV light and HEPA filter); including notebook computer, QIAGility Software, installation and training, 1-year warranty on parts and labor  | 931436   |
| <b>Quantification</b>                          |   |          |
| Investigator Quantiplex Pro Kit (200)          | For use on Applied Biosystems Real-Time Systems: Reaction Mix, Primer Mix, Control DNA M1, QuantiTect Nucleic Acid  | 387216   |
| Investigator Quantiplex Pro RGQ Kit (200)      | For use on QIAGEN RotorGene Q Real-Time Systems: Reaction Mix, Primer Mix, Control DNA M1, QuantiTect Nucleic Acid  | 387316   |
| Investigator Quantiplex Pro Calibration Kit    | For use on Applied Biosystems 7500 Real-Time Systems: Calibration Standard FAM (60 µl), Calibration Standard JOE (60 µl), Calibration Standard ATTO 550 (60 µl), Calibration Standard ROX (60 µl), Calibration Standard ATTO 647N (60 µl), Quanti-plex Pro Calibration Buffer (30 ml) | 387416   |
| Rotor-Gene Q 5plex HRM Platform                | Real-time PCR cycler and High Resolution Melt analyzer with 5 channels (green, yellow, orange, red, crimson) plus HRM channel, laptop computer, software, accessories, 1-year warranty on parts and labor, installation and training not included                                     | 9001532  |

\* Larger kit sizes available; please inquire.

## Ordering Information

| Product   | Contents  | Cat. no. |
|---|---|----------|
| <b>Investigator Human Identification PCR Instruments and Kits</b> |   |          |
| QIAmplifier 96 (230 V)  | Fast cycling, high performance thermocycler with a 96-well block and a color touchscreen interface for end-point PCR requirements | 9002991  |
| Investigator 24plex QS Kit (100)*                                 | Primer Mix, Fast Reaction Mix 2.0, Control DNA, Allelic Ladder, DNA Size Standard, Nuclease-Free Water                            | 382415   |
| Investigator 24plex GO! Kit (200)*                                | Primer Mix, Fast Reaction Mix 2.0, Control DNA, Allelic Ladder, DNA Size Standard   | 382426   |
| Investigator 26plex QS Kit (100)*                                 | Primer Mix, Fast Reaction Mix 3.0, Control DNA, Allelic Ladder, Nuclease-Free Water   | 382615   |
| Investigator ESSplex SE QS Kit (100)*                             | Primer Mix, Fast Reaction Mix 2.0, Control DNA, Allelic Ladder, DNA Size Standard, Nuclease-Free Water                            | 381575   |
| Investigator IDplex Plus (100)*                                   | Primer Mix, Fast Reaction Mix, Control DNA, Allelic Ladder, DNA Size Standard, Nuclease-Free Water                                | 381625   |
| Investigator Triplex AFS QS Kit (400)                             | Primer Mix, Reaction Mix, DNA Polymerase, Control DNA, Allelic Ladder, DNA Size Standard, Nuclease-Free Water                     | 380317   |
| Investigator HDplex Kit (100)                                     | Primer Mix, Reaction Mix, DNA Polymerase, Control DNA, Allelic Ladder, DNA Size Standard, Nuclease-Free Water                     | 381215   |
| Investigator Argus X-12 QS Kit (25)*                              | Primer Mix, Fast Reaction Mix 2.0, Control DNA, Allelic Ladder, DNA Size Standard, Nuclease-Free Water                            | 383223   |
| Investigator Argus Y-28 QS Kit (100)*                             | Primer Mix, Fast Reaction Mix 3.0, Control DNA, Allelic Ladder, DNA Size Standard, Nuclease-free Water                            | 383625   |

\* Larger kit sizes available; please inquire.



Learn more about our human identity and forensic testing solutions for confidence in your evidence at [www.qiagen.com/human-id-solutions](https://www.qiagen.com/human-id-solutions)

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Investigator Kits meet ISO18385 requirements.

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