**SUPPLEMENTARY MATERIALS**

**Table S1 List of experiments and acceptance criteria per assay**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Assay** | **Within-run precision** | **Intermediate / within-lab precision** | **Reproducibility** | **Method comparison vs reference** | **Reagent lot-to-lot variability** |
| PT Rec | CV ≤3.0% | CV ≤5.0% | Lot-to-lot: CV ≤20.0%Site-to-site: CV ≤20.0%Total: CV ≤25.0% | Correlation (Pearson): ≥0.900 Intercept: not applicableSlope (Deming): 1.00±0.10 Bias at INR=1: ≤0.15 | Correlation (Pearson): ≥0.975 Intercept: not applicableSlope (Passing–Bablok): 1.00±0.10 |
| Fibrinogen | 60–400 mg/dl: CV ≤4.0% 400–600 mg/dl: CV ≤6.0%>600 mg/dl: CV ≤10.0% | 60–400 mg/dl: CV ≤5.0% 400-600 mg/dl: CV ≤8.0%>600 mg/dl: CV ≤15.0% | Lot-to-lot:60–400 mg/dl: CV ≤20.0% 400–600 mg/dl: CV ≤20.0% >600 mg/dl: CV ≤20.0%Site-to-site:60–400 mg/dl: CV ≤20.0% 400–600 mg/dl: CV ≤20.0% >600 mg/dl: CV ≤20.0%Total:60–400 mg/dl: CV ≤25.0% 400–600 mg/dl: CV ≤25.0% >600 mg/dl: CV ≤25.0% | Correlation (Pearson): ≥0.900Intercept ±25.0 mg/dl Slope (Deming): 1.00±0.10 | Correlation (Pearson): ≥0.975 Intercept: ±20.0 mg/dlSlope (Passing–Bablok): 1.00±0.10 |
| PT-derived Fibrinogen | CV ≤5.0% | CV ≤7.0% | Lot-to-lot: CV ≤20.0%Site-to-site: CV ≤20.0%Total: CV ≤25.0% | Samples: normal samples (clotting time <12 seconds)Correlation (Pearson): ≥0.850 Intercept: not applicableSlope (Passing–Bablok): 1.00±0.15 Bias: ±20 mg/dl at 200 mg/dl | Correlation (Pearson): ≥0.900 Intercept: not applicableSlope (Passing–Bablok): 1.00±0.10 Bias: ±20 mg/dl at 200 mg/dl |
| Thrombin Time | Normal sampleCV ≤4.0% Pathological sampleCV ≤6.0% | Normal sampleCV ≤5.0% Pathological sample CV ≤8.0% | Lot-to-lot: CV ≤20.0%Site-to-site: CV ≤20.0%Total: CV ≤25.0% | Samples: samples shall cover a range of 14 - max. 120 sec; ≥30% of samples ≤24 sec30%–50% of samples 25–55 seconds ≥10% of samples >55 secondsCorrelation (Pearson): not applicableIntercept: not applicable (uncalibrated test) Slope (Deming): test and report | Correlation (Pearson): not applicable Intercept: not applicableSlope (Passing–Bablok): not applicable |
| Antithrombin | ≤80.0%: SD ≤2.4% (absolute) >80.0%: CV ≤3.0% | ≤80.0%: SD ≤4.0% (absolute) >80.0%: CV ≤5.0% | Lot-to-lot: CV ≤20.0%Site-to-site: CV ≤20.0%Total: CV ≤25.0% | Correlation (Pearson): ≥0.900Intercept: not specifiedSlope (Deming): 1.00±0.10Absolute bias at 50% activity ≤10% (absolute) | Correlation (Pearson): ≥0.975Intercept: not specifiedSlope (Passing–Bablok): 1.000±0.050Absolute bias at 50% AT activity: ≤10% (absolute) |
| D-dimer | <0.56 μg FEU/ml: SD ≤0.02 μg FEU/ml 0.56–1.7 μg FEU/ml: CV ≤3.5%>1.7 μg FEU/ml: CV ≤3% | <0.56 μg FEU/ml: SD ≤0.034 μg FEU/ml 0.56-1.7 μg FEU/ml: CV ≤6% >1.7 μg FEU/ml: CV ≤4% | Lot-to-lot: CV ≤20.0%Site-to-site: CV ≤20.0%Total: CV ≤25.0% | Correlation (Pearson): ≥0.950 Intercept: ≤ ±0.20 μg FEU/mlSlope (Deming): 1.000±0.100 | Correlation (Pearson): ≥0.975 Intercept: ≤0.1 μg FEU/mlSlope (Passing–Bablok): 1.000±0.100 |
| aPTT | CV ≤4.0% | CV ≤5.0% | Lot-to-lot: CV ≤20.0%Site-to-site: CV ≤20.0%Total: CV ≤25.0% | Correlation (Pearson): ≥0.85Intercept: not applicable (uncalibrated test) Slope (Deming): 0.65–1.35 | Correlation (Pearson): ≥0.975 Intercept: not applicable (uncalibrated test) Slope (Deming): 1.00±0.10 |
| aPTT Screen | CV ≤4.0% | CV ≤5.0% | Lot-to-lot: CV ≤20.0%Site-to-site: CV ≤20.0%Total: CV ≤25.0% | Correlation (Pearson): ≥0.85Intercept: not applicable (uncalibrated test) Slope (Deming): 0.65–1.35 | Correlation (Pearson): ≥0.975 Intercept: not applicable (uncalibrated test) Slope (Deming): 1.00±0.10 |
| aPTT Lupus | CV ≤4.0% | CV ≤5.0% | Lot-to-lot: CV ≤20.0%Site-to-site: CV ≤20.0%Total: CV ≤25.0% | Comparison method/instrument: Actin FSL or equivalent competitor reagent/systemCorrelation (Pearson): ≥0.85Intercept: not applicable (uncalibrated test) Slope (Deming): 0.65–1.35 | Correlation (Pearson): ≥0.975 Intercept: not applicable (uncalibrated test) Slope (Deming): 1.00 ± 0.10 |
| PT Owren | CV ≤3.0% | CV ≤5.0% | Lot-to-lot: CV ≤20.0%Site-to-site: CV ≤20.0%Total: CV ≤25.0% | Correlation (Pearson): ≥0.90 Intercept: not applicable Slope (Deming): 1.00±0.10 Bias at INR=1: ≤0.15 | Correlation (Pearson): ≥0.95 Intercept: not applicableSlope (Passing–Bablok): 1.00±0.10 Bias at INR=1: ≤0.10 |

aPTT, activated partial thromboplastin time; AT, antithrombin time; CV, coefficient of variation; FEU, fibrinogen-equivalent units; INR, international normalized ratio; PT, prothrombin time ; Rec, recombinant human thromboplastin reagent; SD, standard deviation.

**Table S2 Scenarios and outcomes for the routine simulation download**

|  |  |  |
| --- | --- | --- |
| **Scenario** | **Purpose** | **Special conditions** |
| A1 | Determine time required for all sample measurements to be performed on t 711. | None – default process and rack configuration used. |
| A2 | Determine time required for all sample measurements to be performed on t 711. | QC status time out (every application). QC status time out on bottle change. |
| A3 | Determine time required for all sample measurements to be performed on t 711/t 511. | Optimization of rack release times. |
| B | Determine time required for all sample measurements to be performed on t 711. | Same as A2/A3, except PT Owren is used instead of PT Rec. |
| C | Determine time required for all sample measurements to be performed on t 711/t 511 if HIL is on. | Same as A3, except automatic HIL testing is turned on. |
| D | Perform provocations and report on machine reporting/effects. | At least five provocations. |
| E | Determine walkaway time. | t 511: load as many racks as possible at a single time (no planned connection to a pre-analytical instrument).t 711: load as many racks with samples as possible and keep re-supplied via sample loader unit. Run instrument until it is forced to go into “Error”, “Pause” or “Standby” state, due to any auxiliary running out or a waste container filling up. |

HIL, haemolysis, icterus, lipaemia; PT, prothrombin time; QC, quality control; Rec, recombinant human thromboplastin reagent.

**Table S3** **List of the domains and features included in the practicability and usability questionnaire†**

|  |  |
| --- | --- |
| **Domain** | **Feature** |
| 1. **General**
 | Space requirements for analyzer |
| Noise level |
| Appeal of industrial design of the instrument |
| System weight (470 kg) |
| System dimensions (L x W x H: 175 cm x 104 cm x 140 cm) |
| Location of power switch |
| Throughput |
| Time to first result |
| Elapsed time until analyzer is in standby after power on |
| Easiness to get trained on the system for novice customers |
| Usability of system fluid and liquid waste |
| Convenience of loading/unloading liquid waste container |
| Convenience of loading/unloading solid waste container |
| Handling of the sample/calibrator rack |
| Access to all relevant system parts for manual handling |
| Safety of the user ensured enough |
| Time required to start up the instrument |
| Usability of input devices (e.g., keyboard, touchscreen, mouse) |
| Completeness and comprehensibility of operator manual |
| Auditability (loudness) of acoustic alarm |
| Reliability and robustness of the system  |
| 1. **General Aspects of Software**
 | Ease of use of the software |
| Navigation in menus  |
| Presentation of information on the screen |
| Ability to locate the requested functions in the software |
| Behavior of the system in case of operational errors |
| Clearness of alarm and error messages |
| Availability of login and logoff function |
| Result presentation |
| Usability of graphical results presentation  |
| Usability of the user interface workflows |
| Display and tracking of rack status in the software |
| Size of buttons and table rows |
| Readability in terms of font size |
| Completeness of information displayed in results menu |
| Ease to print results |
| Responsiveness of the software in general |
| Ability to locate the requested functions in the software |
| Organization of windows/screens |
| Clearness of abbreviations and symbols |
| Ability to configure the system to fit laboratory demands |
| 1. **Processing of Samples**
 | Continuous loading of samples |
| Removal of samples |
| Handling of sample racks  |
| Clearness of sample status  |
| Fault tolerance of damaged/misaligned barcodes  |
| Handling of barcode read error samples |
| Possibility to use different tube types |
| Time from sample loading to result |
| Time to stop/abort a run  |
| Handling of STAT samples |
| Walk-away time |
| Manual requesting of samples |
| Ease of adding tests manually to existing samples |
| Number of racks that can be loaded at one time |
| 1. **Test Reagents**
 | Bottle size in cassette (number of tests) |
| Cassette size (number of tests) |
| Cassette size (storage) |
| Usability of reagent loading |
| Display of reagent information on the screen |
| Notification of missing reagent |
| Notification of low reagent |
| Time required for reagent preparation |
| Convenience of storing reagents in on-board fridge |
| Convenience of automatic reconstitution of reagents |
| 1. **Calibration**
 | Ease of calibration procedure |
| Time consumption for calibration |
| Recommended calibration frequency |
| Number of calibrators required |
| Ease of requesting calibrations |
| Presentation of calibration results  |
| Quality and completeness of calibration reports |
| Completeness and clearness of result flags for calibration results |
| Notification of missing calibrators |
| Notification of calibration failures |
| 1. **Quality Control**
 | Ease to perform a QC |
| Usability of control rack |
| Presentation of QC results  |
| Quality and completeness of QC reports |
| Completeness and clearness of result flags for control results |
| Notification of control failures |
| 1. **Maintenance**
 | Access to all relevant system parts for maintenance |
|  | Tracking of maintenance actions in software |
|  | Frequency of maintenance actions |
|  | Time required for daily maintenance |
|  | Time required for weekly maintenance |
|  | Complexity and efforts for maintenance actions |
|  | Material required for maintenance |

†Operators were asked to rate analyzers according to each feature from 1 to 10 (best: 10, worst: 1) and to prioritize each feature (A=very important; B=important; C=not important; D=not relevant)

QC, quality control; STAT, short turn around testing

**Table S4 System throughput in routine simulation download experiment for each scenario tested on the cobas t 711 and cobas t 511 analyzers**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Scenario A1** | **Scenario A2** | **Scenario A3** | **Scenario B** | **Scenario C** | **Scenario D** | **Scenario E** |
| Site 1 (cobas t 711) |  |  |  |  |  |  |  |
| Workload, n samples (n results) | 458 (690) | 527 (880) | 527 (880) | 458 (882) | 527 (1408) | 527 (870) | 666 (1181) |
| Samples, n results/h | 113 | 141 | 163 | 75 | 84 | 165 | 138 |
| Measured average throughput, n results/h | 170 | 235 | 271 | 125 | 225 | 273 | 245 |
| Calculated maximum throughput, n results/h | 252 | 231 | 304 | 126 | 237 | 289 | 291 |
| Median sample processing time, min | 12.02 | 11.04 | 15.17 | 34.57 | 31.47 | 14.01 | 31.47 |
| Site 2 (cobas t 711) |  |  |  |  |  |  |  |
| Workload, n samples (n results) | 243 (441) | – | 252 (465) | 252 (463) | 252 (715) | 252 (464) | – |
| Samples, n results/h | 90 | – | 105 | 51 | 46 | 46 | – |
| Measured average throughput, n results/h | 163 | – | 195 | 94 | 130 | 84 | – |
| Calculated maximum throughput, n results/h | 342 | – | 198 | 125 | 212 | 224 | – |
| Median sample processing time, min | 28.31 | – | 20.22 | 30.39 | 28.44 | 14.42 | – |
| Site 3 (cobas t 711) |  |  |  |  |  |  |  |
| Workload, n samples (n results) | 249 (531) | 254 (545) | 254 (379) | 254 (633) | – | – | – |
| Samples, n results/h | 104 | 91 | 149 | 79 | – | – | – |
| Measured average throughput, n results/h | 223 | 195 | 223 | 197 | – | – | – |
| Calculated maximum throughput, n results/h | 366 | 396 | 364 | 249 | – | – | – |
| Median sample processing time, min | 12.49 | 19.27 | 16.33 | 37.32 | – | – | – |
| Site 3 (cobas t 511) |  |  |  |  |  |  |  |
| Workload, n samples (n results) | – | – | 254 (379) | – | 254 (789) | – | 93 (152) |
| Samples, n results/h | – | – | 80 | – | 50 | – | 81 |
| Measured average throughput, n results/h | – | – | 119 | – | 148 | – | 133 |
| Calculated maximum throughput, n results/hour | – | – | 168 | – | 175 | – | 189 |
| Median sample processing time, min | – | – | 22.26 | – | 04.23 | – | 40.50 |

**Fig. S1**  Routine simulation series correlation graphs – site 1 (cobas t 711)

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aPTT, activated partial thromboplastin time; D-DI, D-dimer; INR, international normalized ratio; PT, prothrombin time; Rec, recombinant human thromboplastin reagent.

**Fig. S2** Routine simulation series correlation graphs – site 2 (cobas t 711)

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aPTT, activated partial thromboplastin time; D-DI, D-dimer; FIBR, Fibrinogen; INR, international normalized ratio; PT, prothrombin time; Rec, recombinant human thromboplastin reagent.

**Fig. S3** Routine simulation series correlation graphs – site 3 (cobas t 711)







aPTT, activated partial thromboplastin time; AT, Antithrombin Time; D-DI, D-dimer; FIBR, Fibrinogen; PT, prothrombin time; Rec, recombinant human thromboplastin reagent.

**Fig. S4** Routine simulation series correlation graphs – site 3 (cobas t 511)

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aPTT, activated partial thromboplastin time; AT, Antithrombin Time; D-DI, D-dimer; FIBR, Fibrinogen; PT, prothrombin time; Rec, recombinant human thromboplastin reagent.