TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

Teledyne Update

Motor-Operated Valve Users' Group
Annual Meeting

January 7-10,2007
Sheraton Sand Key Resort
Clearwater Beach, Florida

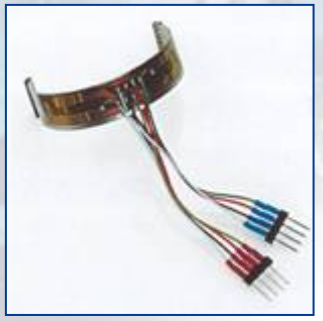
Rev: 030405

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

- Location
  - Marion, Massachusetts
- Business Focus: Technical Services and Strain Gages Based Sensors for Critical Mechanical Systems.
  - Valve Testing Systems & Services
  - Torque Sensors
  - Load Cells
  - Signal Conditioning & Data Acquisition
- Markets
  - Power Generation Plants
  - Industrial Process Control
  - Automotive R & D Testing
  - Manufacturing & Assembly Tools

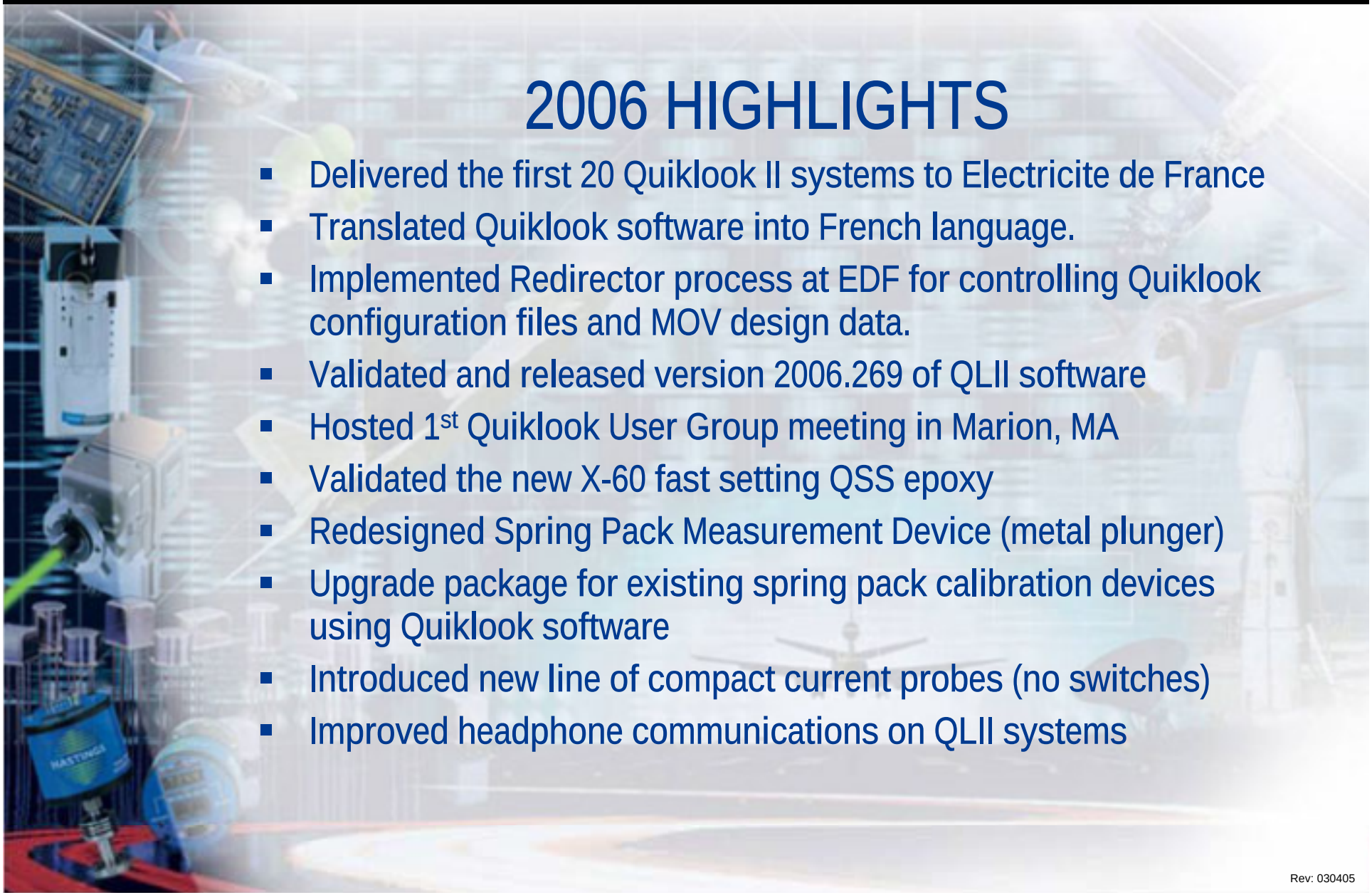




Rev: 030405

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company



2006 HIGHLIGHTS

- Delivered the first 20 Quiklook II systems to Electricite de France
- Translated Quiklook software into French language.
- Implemented Redirector process at EDF for controlling Quiklook configuration files and MOV design data.
- Validated and released version 2006.269 of QLII software
- Hosted 1st Quiklook User Group meeting in Marion, MA
- Validated the new X-60 fast setting QSS epoxy
- Redesigned Spring Pack Measurement Device (metal plunger)
- Upgrade package for existing spring pack calibration devices using Quiklook software
- Introduced new line of compact current probes (no switches)
- Improved headphone communications on QLII systems

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

2006 HIGHLIGHTS

Design/Test Software Improvements

- Added Stem Nut Wear Methodology
- Added ComED Voltage Drop Methodology
- Added Pressure Locking Methodology for Flex Wedge Gate Valves. Similar to ComED methodology implemented in WOG Software “Preslok”
- Modifications to existing BWROG/DC Methodology
  - Added Short Stroke Capability
  - Added Functional Actuator Capability (FAC) Iteration
- Added What-If Capability to margin analysis

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

2007 PREVIEWS

- Enhanced web site: www.valvetest.com
- Customer training sessions to be held in Marion , MA
- Provide built in WIFI for Quiklook II
- QLII software enhancements and validated release
- Quiklook user group meeting (2 full days) to be held in August
- AOV version for EDF
- Refinement of Redirector process at EDF
- Design Software Improvement – SQL Server Database
- Design Software Improvement - Margin Reconciliation
- Design Software Improvement – Standardization
- Software V&V Documentation Standardization

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

SOFTWARE UPDATE

Michael Richard

Rev: 030405

QUIKLOOK

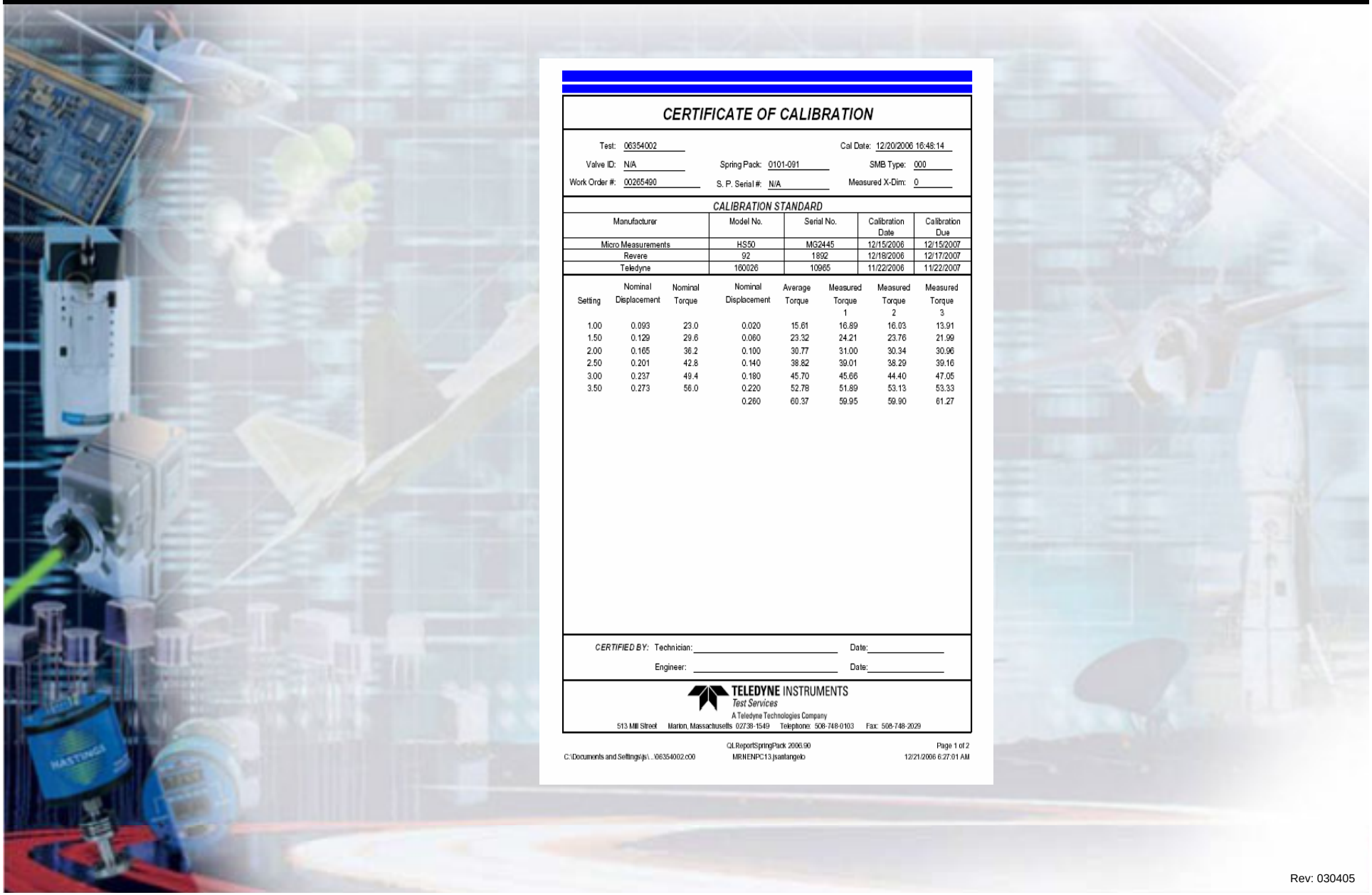
- Version 2006.269
  - Released September 2006
  - Spring Pack Calibration Report
  - Default Setup is customizable by the user
  - Added Motor Power Calculation using Line voltages

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

Spring Pack Calibration

- Hardware
  - Utilizes Existing Spring Pack Test Equipment
  - Adapter Cables supplied to connect existing load cells to QUIKLOOK
  - Replacement LVDT and cable
- Software
  - Add in Report to QUIKLOOK
  - Uses QUIKLOOK to Acquire Test Data
  - Report output includes
    - Calibration Certificate
    - Plot of Generic and Calibration Data
    - Sensitivity Equation

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company



CERTIFICATE OF CALIBRATION

Test: 06354002 Cal Date: 12/20/2006 16:48:14
Valve ID: N/A Spring Pack: 0101-091 SMB Type: 000
Work Order #: 00265490 S. P. Serial #: N/A Measured X-Dim: 0

CALIBRATION STANDARD

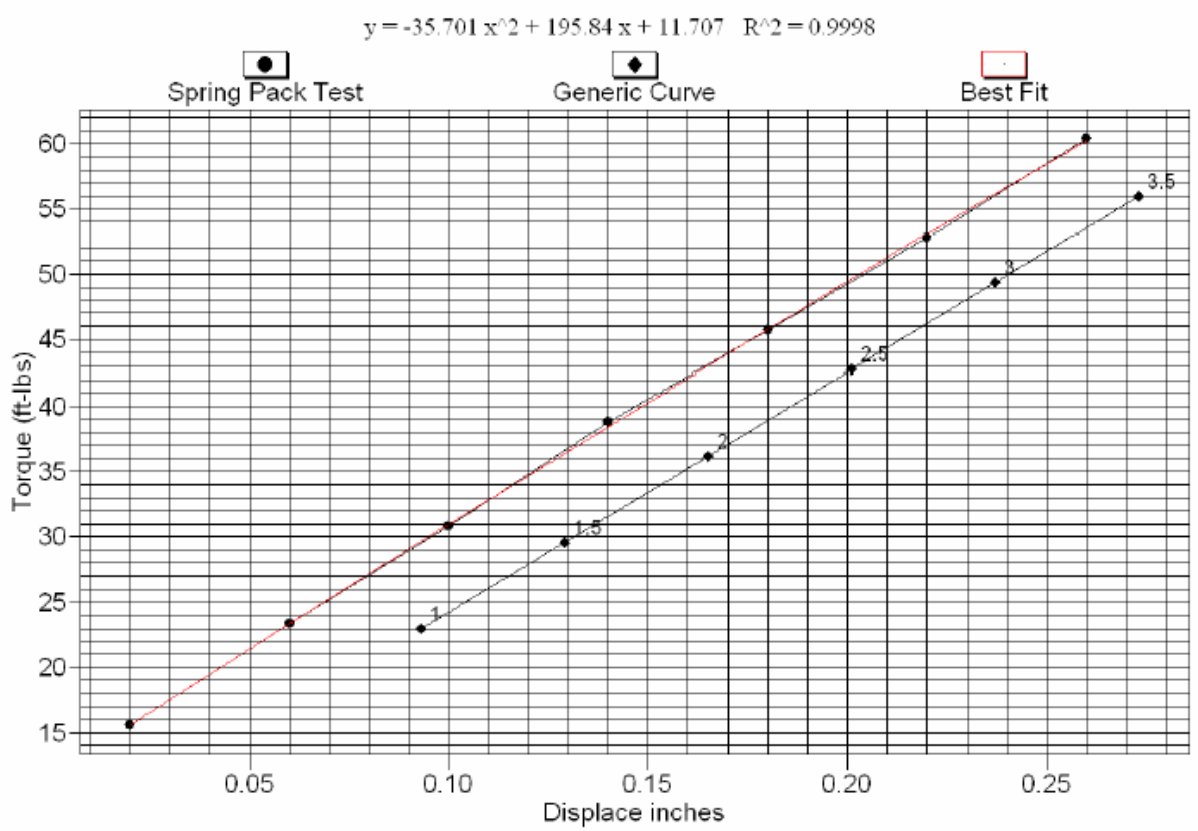
Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due
Micro Measurements	HS50	MG2445	12/15/2006	12/15/2007
Revere	92	1892	12/18/2006	12/17/2007
Teledyne	160026	10965	11/22/2006	11/22/2007

Setting	Nominal Displacement	Nominal Torque	Nominal Displacement	Average Torque	Measured Torque 1	Measured Torque 2	Measured Torque 3
1.00	0.093	23.0	0.020	15.61	16.89	16.03	13.91
1.50	0.129	29.6	0.060	23.32	24.21	23.76	21.99
2.00	0.165	36.2	0.100	30.77	31.00	30.34	30.96
2.50	0.201	42.8	0.140	38.82	39.01	38.29	39.16
3.00	0.237	49.4	0.180	45.70	45.66	44.40	47.05
3.50	0.273	56.0	0.220	52.78	51.89	53.13	53.33
			0.260	60.37	59.95	59.90	61.27

CERTIFIED BY: Technician: _____ Date: _____
Engineer: _____ Date: _____

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company
513 Mill Street Marion, Massachusetts 02738-1549 Telephone: 508-748-0103 Fax: 508-748-2029

Valve ID: N/A Spring Pack: 0101-091 S. P. Serial #: N/A Cal Date: 12/20/2006 16:48:14



TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

Spring Pack Calibration

- Demonstration
  - We will be doing demos in our booth using a converted Spring Pack Test System

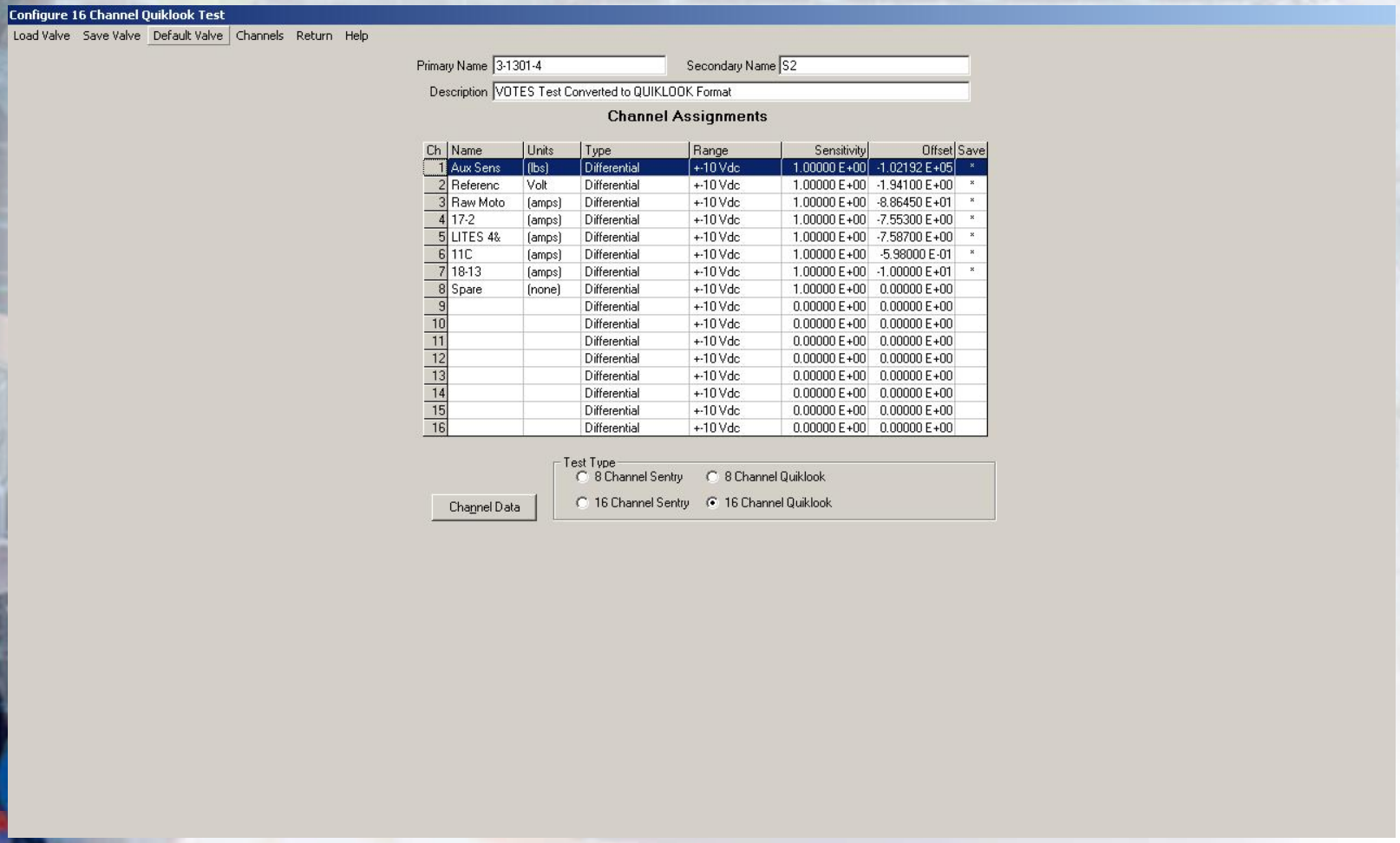
QUIKLOOK Default Setup

- Default Configuration Setup is customizable by the user

  User may customize the Default Setup used to configure QUIKLOOK for acquisition by saving a Default.Tag file with the desired settings.

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

QUIKLOOK Default Setup

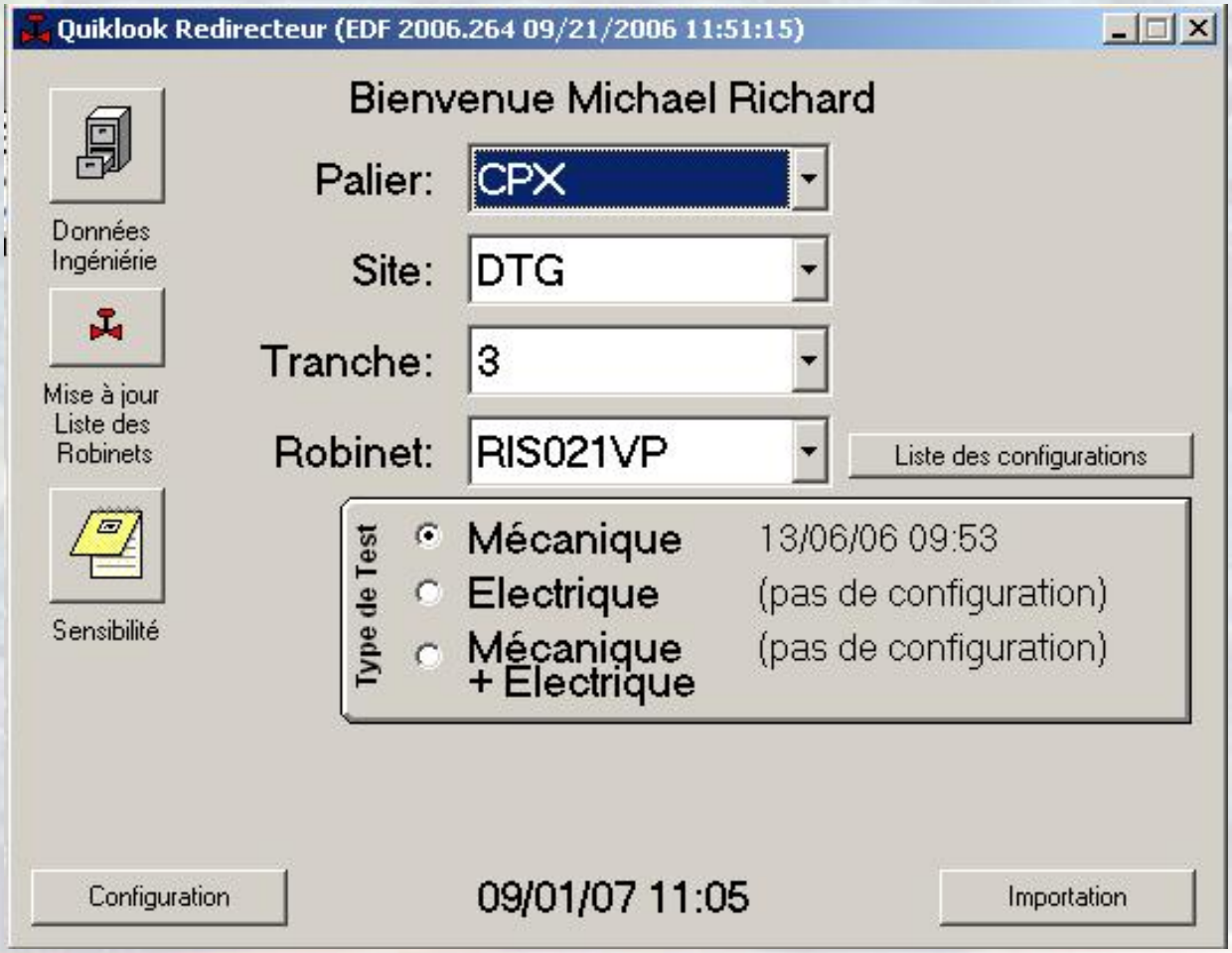


Motor Power

- QUIKLOOK can calculate electrical power based on either measured line voltages or measured phase voltages, as follows:
  - Phase Voltages – Channels Va, Ia, Vb, Ib, Vc, Ic are recorded. The power calculations are performed using the phase voltages and currents. The phase voltages are measured referenced to ground.
  - Line Voltages – Channels Vab, Ia, Vbc, Ib, Vca, Ic are recorded. The power calculations are performed using the phase voltages and currents. The line voltages are a phase-to-phase measurement.

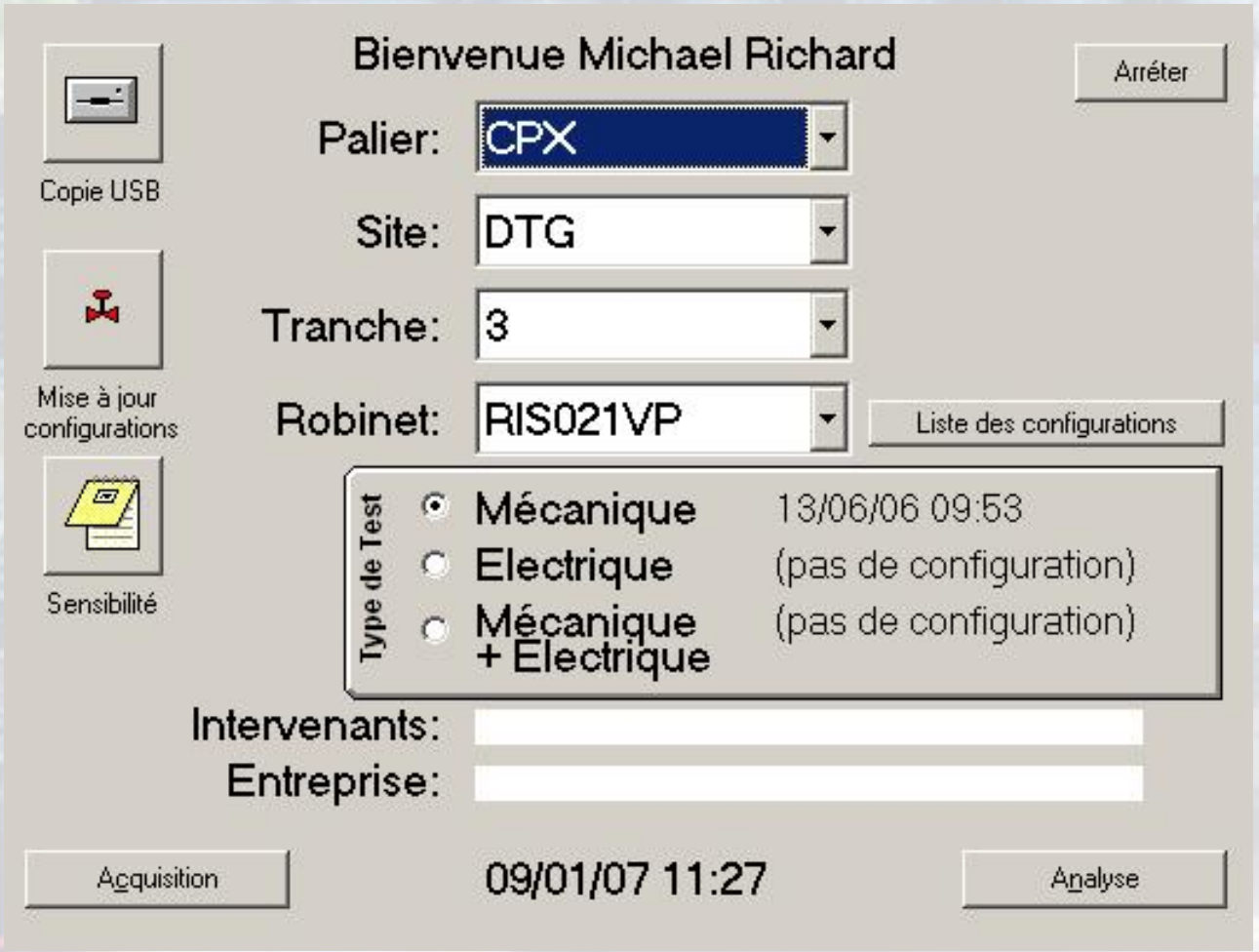
TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

EDF Redirector – Analysis Mode



TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

EDF Redirector – Acquisition Mode



Stem Nut Wear Implementation

Existing Design Inputs:

- Stem Geometry (Diameter, Pitch, Lead, Thread Type, Thread Angle)
- Stem Speed (Motor RPM, Overall Gear Ratio)
- Stem Travel

Additional Design Inputs:

- Stem Nut Safety Factor
- Stem Nut Engagement Length
- Stem Nut Total Thrust
- Stem Nut Material Yield Strength
- Stem Nut Backlash
- Operator Strokes / Year

Stem Nut Wear Implementation

Design Outputs:

- Maximum Stem Thread Transition Time
- Stem Revolutions / Stroke
- Stem Revolutions / Year

Test Inputs:

- Actual Stem Thread Transition Time

Test Outputs:

- Available Safety Factor
- Stem Thread Transition Time Flag

ComED Voltage Drop Implementation

Existing Design Inputs:

- Cable Resistance
- Cable Reactance
- Thermal Overload Heater Resistance
- Voltages at MCC (close/open)
- Motor Curve

Additional Lookup Parameters:

- ComED Power Factor
- ComED Correlation Coefficient Slope
- ComED Correlation Coefficient Intercept

ComED Voltage Drop Implementation

Temporary Calculation Parameters:

- Phase Angle (Theta)
- Motor Terminal Phase Voltages using:
  - Alpha
  - Beta
  - Gamma

Design Outputs:

- Voltages at Motor (close/open)
- Voltage Ratios (Voltage at Motor / Voltage Rated)

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

Pressure Locking Implementation

Flex Wedge Gate Valves

Existing Design Inputs:

- Stem Diameter at packing
- Mean Seat Diameter
- Open Valve Factor
- Gate Wedge Angle
- Pullout Thrust Measurement Uncertainty (%Reading)

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

Pressure Locking Implementation
Flex Wedge Gate Valves

Additional Design Inputs:

- Calculation Flag
- Bonnet Pressure
- Upstream Pressure
- Downstream Pressure
- Disc Thickness
- Effective Hub Radius
- Hub Length
- Disc Material Modulus of Elasticity
- Disc Material Poisson's Ratio
- Pullout Thrust
- Recommended Margin

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

Pressure Locking Implementation
Flex Wedge Gate Valves

Design Outputs:

- Pressure Locking Thrust
- Pressure Locking Required Thrust Margin
- Pressure Locking Available Thrust Margin
- Pressure Locking Margin Flag

TELEDYNE INSTRUMENTS
Test Services
A Teledyne Technologies Company

Margin Analysis: What-If Capability

What-If Margin Analysis for MO-3-44A-3201B

Exit

Current PVT				Calculated PVT	
Schedule	Risk	Interval		Max Interval	Margin
Outage	L	10 (years)	<	10 (years)	17.7 %

Safety Function: CLOSE **Close Control: TORQUE**

Eq.	Parameter	Close	Open
S1	S1: Thrust @TST Setup Margin (close)	17.7	--
S2	S2: Max Thrust Setup Margin (close)	26.4	--
S3	S3: Torque @TST Setup Margin (close)	32.6	--
S4	S4: Max Torque Setup Margin (close)	16.9	--
S5	S5: MLAT Pullout Torque Margin (open)	--	97.2
S6	S6: Pullout Thrust Margin (open)	--	96.1
S7	S7: Running Load Margin (close)	54	--
S8	S8: Running Load Margin (open)	--	55.5
S9	S9: Torque Setup Margin (close)	-1.6	--
S10	S10: MLAT Max Thrust Setup Margin (close)	9	--
S21	S21: EPRI Open Unseating Margin	--	30

Test Data	New	Original	
Torque @TST	62	62	(ft-lbs)
Total Torque	74	74	(ft-lbs)
Pullout Torque	34	34	(ft-lbs)
Run Torque (C)	14	14	(ft-lbs)
Run Torque (O)	9	9	(ft-lbs)
Thrust @TST	4506	4506	(lbs)
Total Thrust	5595	5595	(lbs)
Pullout Thrust	2663	2663	(lbs)
Run Thrust (C)	690	690	(lbs)
Run Thrust (O)	668	668	(lbs)

Parameters	Close	Open
Valve Factor Capability	0.505	N/A
Current As-Left COF	0.129	0.111
MAX Design COF	0.291	0.545
OverThrust COF	0.053	(Threshold)
UnderThrust COF	0.171	(Threshold)
MLAT OverTorque COF	0.244	(Threshold)
Structural OverTorque COF	0.166	(Threshold)
Allowable COF Increase	0.037	
Allowable COF Decrease	0.076	