Technical Information

Applying Yokogawa Recorders and Controllers to Heat Treatment Applications in the Aerospace Industry

TI 04L51B01-05EN

The contents of this Technical Information are subject to change without notice.

Contents

1. Scope

(1) This document describes how the DXAdvanced, the SMARTDAC+ and the UTAdvanced of Yokogawa can fulfill the requirements from AMS 2750E.

(2) This document refers to the above regulations. The copyright of each regulation belongs to its owner. If the quoted passage is different from the original documentation, the original documents prevail at all times.

2. What are DXAdvanced, SMARTDAC+ and UTAdvanced?

2-1 DXAdvanced: DX1000 & DX2000

(1) DXAdvanced is a paperless recorder; maximum number of directly connected universal measurement inputs is 48.

2-2 SMARTDAC+: GX10, GX20, GP10, GP20 & GM

(1) The GX10, GX20, GP10 and GP20 are paperless recorders with multi-touch display; maximum number of directly connected universal measurement inputs is 100.

(2) The Data Acquisition System GM is a data logger that excels in versatility and expandability; maximum number of directly connected universal measurement inputs is 100.

2-3 DAQStandard for DXAdvanced

(1) DAQStandard is PC based software used for hardware configuration (Online- and Offline-), and historical data analysis and playback.

(2) Users can modify and/or upload and download configuration settings of the DXAdvanced.

2-4 Webserver and Hardware Configurator for SMARTDAC+

(1) The Webserver consist of a realtime monitor function and an on-line configurator.

(2) The Hardware Configurator is PC based software used for off-line hardware configuration.

2-5 Data Viewer software

(1) Users can playback the measurement data using the historical viewer in both trend-graph and digital format. Log information (Alarm log, operation log, …) can be displayed as well. All necessary information can be printed out using standard printers. Data conversion to major spreadsheet formats is also supported.

2-6 UTAdvanced: UT52A, UT55A & UP55A

(1) The UTAdvanced is a digital indicating PID controller with ladder sequence control; UT55A and UP55A have 1/4 DIN external structure and UT52A has 1/8 DIN external structure. Also UP55A is embedded with program pattern control.

3. Detail Description of DXAdvanced/ SMARTDAC+ and UTAdvanced – Operation Securities

3-1 Briefing

(1) AMS2750 requires that access to systems that are used to create, modify, maintain, or retrieve electronic records must be limited to authorized individuals.

(2) Additionally, authority checks are required to assure that authorized individuals accessing the systems are able to perform only tasks for which they have the appropriate level of access and for which they have been properly trained.

(3) DXAdvanced and SMARTDAC+ have a) Log-in security and b) key-lock function as standard.

(4) UTAdvanced has key-lock function and password control for configuration parameters as standard.

3-2 Log-in Security – DXAdvanced and SMARTDAC+

(1) Both can be configured to utilize a combination of user name, and password to limit system access to authorized users. Each user name must be unique. Permissions can be further defined to provide a variety of access levels ranging from view-only access to full administrative and remote communication and configuration rights. DXAdvanced allows the configuration of a maximum of five (5) administrators and up to thirty (30) users. SMARTDAC+ allows the configuration of a maximum of fifty (50) administrators and users in total. Individual users cannot modify their own access levels.

(2) Limiting system access to authorized users and controlling individual levels of access provides effective security for the use of the instrument.

3-3 Access Security – DXAdvanced, SMARTDAC+ and UTAdvanced

(1) DXAdvanced and SMARTDAC+ GX/GP series have physical locking system on its front door, which prevents unauthorized access to the external media and to the power switch.

(2) UTAdvanced has locking function for front operation button and can be used password control for configuration parameters. Both functions prevent unauthorized access and misoperation.

4. Detail Description of DXAdvanced/ SMARTDAC+ – Data Security

4-1 Briefing

(1) AMS 2750 requires that records are protected so that they can be retrieved readily and accurately throughout any required retention period. This requirement applies not only to records at their time of creation but also to archived electronic records for the duration of their storage period.

4-2 Data file Management

(1) DXAdvanced/SMARTDAC+ data files are stored in a proprietary encrypted binary format and as such cannot be modified by ordinary means once they have been created.

(2) Acquired data, such as temperature values, are also stored in a proprietary binary format and cannot be changed once they have been stored. DXAdvanced/SMARTDAC+ maintains records of all alarms, alarm acknowledgements, error messages in the same binary files. These files cannot be changed by users or administrators. An error message will appear the next time anyone attempts to access the data notifying the user that the file is damaged and cannot be viewed.

(3) DAQStandard and Viewer display and print data in human readable form. The files can be easily copied for backups, archiving, inspection, and review.

(4) Neither the DXAdvanced/SMARTDAC+ nor the DAQStandard and Viewer software allow a user to overwrite records, nor do they automatically overwrite records.

4-3 Data Security – Data redundancy using the FTP function

(1) An FTP client mode function allows records created by the DXAdvanced/SMARTDAC+ to be automatically sent to a secure FTP server directory for long-term or short-term storage. The DXAdvanced/SMARTDAC+ has the capability of automatically sending a preconfigured username and password combination, if required, for file upload access to the FTP directory. The SMARTDAC+ can also send the files by using SSL encryption.

(2) Access levels at the FTP server directory can be further controlled through good local network security policy.

(3) Data files are stored sequentially to the DXAdvanced/SMARTDAC+ external archive media and then to the FTP server when this function is used. The data record is always archived even if the network connection to the server is lost. If the connection fails, data will be automatically transferred via FTP as soon as the connection is restored. These records can then be maintained under a company's general electronic records archiving policy.

5. Detail Description of DXAdvanced/ SMARTDAC+ – Batch Header Function

5-1 Briefing

(1) AMS 2750 requires that lots (batches) and sub-lots (sub-batches) of identical parts are to be identified to preclude their mixing and to ensure lot integrity.

5-2 Batch header function of DXAdvanced/SMARTDAC+

(1) DXAdvanced/SMARTDAC+ has a Batch header function as standard. Customers can input a batch name and a lot number for each batch record. The batch name together with the lot number can be used as the file name of the data file.
(2) DXAdvanced/SMARTDAC+ can be operated in either a Batch or Continuous mode for data collection.
(3) For both cases above, batch header information is compiled together with the measurement data.
(4) The Viewer software shows batch header information together with the measurement record.

6. Description Table – AMS 2750E

Please be noted that this table is referring to AMS 2750 revision E, which was originally established by SAE International. If there are any incompatibilities, the original document always prevails.

AMS 2750E Requirements	Comments	
	DXAdvanced/SMARTDAC+	UTAdvanced
Test Instruments, Controlling, Monitoring or Recording Instruments		
6-1 3.2.2 & 3.2.3.1 Minimum Readability	Yokogawa's DXAdvanced/SMARTDAC+ have a readability resolution of 0.1 °F or 0.1 °C.	Yokogawa's UTAdvanced has a readability resolution of 0.1 °F or 0.1 °C.
Test instruments and at least one recording and/or controlling instrument for each zone shall have a minimum readability of 1 °F or 1 °C.		
6-2 3.2.3.2 Recommended Installation	User's Manuals for DXAdvanced/SMARTDAC+ provide information on proper installation.	User's Manuals for UTAdvanced provide information on proper installation.
Installation shall conform to manufacturer's recommendations.		
6-3 3.2.3.3 Sensor Signals	Yokogawa's DXAdvanced/SMARTDAC+ accept all T/C sensor inputs as listed in Table 2. All signals are digitally processed. Please refer to GS for measurement accuracy.	Yokogawa's UTAdvanced accepts all T/C sensor inputs as listed in Table 2. All signals are digitally processed. Please refer to GS for measurement accuracy.
Instruments shall receive an unmodified signal from sensors except for A/D and D/A conversions, or a digitally-processed, error-checked equivalent representation of a direct measured value.		
6-4 3.2.4 Offsets	DXAdvanced has up to 15-segment linearizer for each measurement input channel as a configuration option (/CC1).The approximation method is used for linearization. SMARTDAC+ has up to 11-segment linearizer function for each input channel as standard. Either biasing or approximation method is used for linearization. In addition, SMARTDAC+ has the option (/AH) which allows for T/C offsets to be entered with each set point.	UTAdvanced has up to 10-segment linearizer besides bias function for control input channel as a standaed.Either biasing or approximation method is used for linearization.
If offsets are used, a documented procedure shall exist, describing when and how to perform offsets.		
Instrument Calibration		
6-5 3.2.5.2 Calibration Accuracy	Yokogawa's DXAdvanced/SMARTDAC+ will meet or exceed the calibration requirement in Table 3. Please refer to the tables on page 8.	Yokogawa's UTAdvanced will meet or exceed the calibration requirement in Table 3. Please refer to the table on page 8.
Calibration accuracy and frequency requirements shall be in accordance with Table 3. Field Test Instrument: ±1 °F (±0.6 °C) or ±0.1% of reading, whichever is greater Controlling, Monitoring, or Recording Instrument (Digital instrument) : ±2 °F (±1.1 °C) or 0.2% of reading whichever is greater		

SMARTDAC+ measurement accuracy after adjustment using calibration correction function

Input type		Measurement range	Typical value (Incl. RJC error)
TC	R	500 to 1,760 °C	± 0.6 °C or ± 0.06 % of reading, whichever is greater
	S	500 to 1,760 °C	
	K	0 to 1,370 °C	± 0.3 °C or ± 0.03 % of reading, whichever is greater
	N	0 to 1,300 °C	
	J	0 to 1,100 °C	
	K-H	0 to 500 °C	
	T	0 to 400 °C	

Note: - Under general operating condition mentioned in User's Manuals;
    - This table is applicable to GX90XA-10-U2 only;
    - A/D integration time: 16.67 ms or more;
    - Typical value does not include the error of measuring instruments which is used to gather actual errors.

DXAdvanced measurement accuracy after adjustment using calibration correction function

Input type		Measurement range	Typical value (Incl. RJC error)
TC	R	500 to 1,760 °C	±0.6 °C or ±0.1% of reading , whichever is greater
	S	500 to 1,760 °C	
	K	0 to 1,370 °C	
	N	500 to 1,300 °C	
	J	0 to 1,100 °C	
	T	0 to 400 °C	

Note: - Under general operating condition mentioned in User's Manuals;
    - A/D integration time: 16.67 ms or more;
    - Typical value does not include the error of measuring instruments which is used to gather actual errors.

UTAdvanced measurement accuracy after adjustment both zero and full point of the measurement range.

Input type		Measurement range	Typical value (Incl. RJC error)
TC	K	0 to 1,370 °C	± 2 °F (±1.1 °C) or ± 0.2 % of reading, whichever is greater
	J	0 to 1,200 °C	
	T	0 to 400 °C	
	S	0 to 1,700 °C	
	R	0 to 1,700 °C	
	N	0 to 1,300 °C	

Note: - The accuracy is that in the standard operating conditions: 23±2°C, 55±10 %RH, and power frequency at 50/60 Hz.
    - Zero and full point of measurement range can be adjust using 10-segment linearizer and bias function.
    - Typical value does not include the error of measuring instruments which is used to gather actual errors.

AMS 2750E Requirements	Comments	
	DXAdvanced/SMARTDAC+	UTAdvanced
6-6 3.2.5.3 Sensitivity Sensitivity shall be checked during calibration. See Table 3 footnote 4. Class 3 through 6 instruments shall have a minimum sensitivity of 3°F (2 °C). Class 1 & 2 instruments shall have a minimum sensitivity of 1 °F (1 °C).	Yokogawa's DXAdvanced/SMARTDAC+ have a minimum sensitivity of measurement input channel of 0.1 °F and 0.1 °C.	Yokogawa's UTAdvanced has a minimum sensitivity of control input channel of 0.1 °F and 0.1 °C.
6-7 3.2.5.4 Calibration Calibration of field test instruments shall be performed in accordance with the manufacturer's instructions.	The calibration procedure is clearly described in the User's Manuals for DXAdvanced/SMARTDAC+.	Not applicable
6-8 3.2.5.5.4 Annotation Calibration of controlling, monitoring or recording instruments may be performed with a load in process if the furnace temperature remains within the processing tolerance and the furnace temperature record is appropriately annotated to indicate that a calibration occurred.	Users can easily annotate on the digital charts using Yokogawa's DXAdvanced/SMARTDAC+.	Not applicable
Electronic Data Recording		
6-9 3.2.7.1.1 Electronic Records – Manipulation The system must create electronic records that cannot be altered without detection.	Acquired data are stored in a proprietary binary format and cannot be changed once they have been stored. Should a user attempt to change any data by directly accessing the binary data, the file will become useless to the user. An error message will appear the next time anyone attempts to access the data notifying the user that the data has been changed and the file cannot be viewed.	Not applicable
6-10 3.2.7.1.2 Electronic Records – Playback The system software and playback utilities shall provide a means of examining and/or compiling the record data, but shall not provide any means for altering the source data.	Yokogawa's DXAdvanced/SMARTDAC+ allow for playback in trend-graph format. The viewer software displays and prints data in human readable form using a PC. Such files can be easily copied for backups, archiving, inspection and review.	Not applicable
6-11 3.2.7.1.3 Electronic Records – Data Output The system shall provide the ability to generate accurate and complete copies of records in both human readable and electronic form suitable for inspection, review, and copying.	Yokogawa's DXAdvanced/SMARTDAC+ allow for record generation in both human readable form and electronic form for inspection, review, and copying.	Not applicable
6-12 3.2.7.1.3.1 Electronic Records – Signature The system shall be capable of providing evidence the record was reviewed-such as by recording an electronic review, or a method of printing the record for a physical marking indicating review.	Yokogawa's advanced security function option (/AS1 for DXAdvanced and /AS for SMARTDAC+) allows the user to utilize the viewer software to review sign off on the data electronically. Additionally, users can physically print out the record and sign physically.	Not applicable
6-13 3.2.7.1.4 Electronic Records - Record Retention The system shall support protection, retention and retrieval of accurate records throughout the record retention period. The hardware and/or software shall operate throughout the retention period as specified in section 3.7.	Yokogawa's DXAdvanced supports up to 32GB of external CF card memory. SMARTDAC+ supports up to 32GB of SD card memory.	Not applicable
6-14 3.2.7.1.5 Electronic Records – Data Access The system shall provide methods (e.g., passwords) to limit system access to only individuals whose authorization is documented.	Yokogawa's DXAdvanced/SMARTDAC+ can prevent illegal data access by unauthorized users with log-in authentication and/or software-keylock protection.	Not applicable

7. AMS2750E Compliance Statement

Yokogawa recorders and controllers covered for "Controlling, Monitoring or Recording Instruments" in AMS2750E are as follows:

- SMARTDAC+ GX/GP Series Paperless Recorders and GM Series Data Acquisition System with 11-segment linearizer function;
- Daqstation DXAdvanced Series Paperless Recorders with 15-segment linearizer function;
- UTAdvanced Series Digital Indicating Controllers with 10-segment linearizer function.

These products meet the accuracy requirements of AMS2750E table 3 for "Controlling, Monitoring, or Recording Instrument" and are compliant to "Electronic Records" in AMS2750E clause 3.2.7.

Yokogawa recorders covered for "Field Test Instruments" in AMS2750E are as follows:

- SMARTDAC+ GX/GP Series Paperless Recorders and GM Series Data Acquisition System with 11-segment linearizer function;
- Daqstation DXAdvanced Series Paperless Recorders with 15-segment linearizer function.

These products meet the accuracy requirements of AMS2750E table 3 for "Field Test Instrument" and are compliant to "Electronic Records" in AMS2750E clause 3.2.7.

Revision Information

Title   : Applying Yokogawa Recorders and Controllers to Heat Treatment Applications in the Aerospace Industry

Manual number : TI 04L51B01-05EN

Oct. 2014/1st Edition
Newly published

Sep. 2015/2nd Edition
Addition of the typical value in Description Table

Oct. 2015/3rd Edition
Addition of the input type in Description Table and error correction

Mar. 2016/4th Edition
Review of contents