Annex A (Informative)

Sample Laser Welding Equipment Qualification Record (EQR)

This annex is not part of this standard but is included for informational purposes only.

Record No.:	
Cal. Date:	
Next Cal. Date:	
Calibration performed by (name):	

Laser Make and Model		**Serial No.**	
Workstation Make and Model		**Serial No.**	
Process performed on this workstation		**Product:**	

Item	**Parameters**			
	Units	Specs	Actual	Comments
Power verification				
Device used to measure power	descr.			
Last calibration date of the device	date			
Power setting @ laser control panel	watts			At the weld process power
Power reading @ just outside of laser head	watts			At the weld process power
Power measured past focus point	watts			At the weld process power
Loss of power (from laser to focus)	%			At the weld process power
Difference between contr. panel and actual reading	%			At the weld process power
Energy per pulse setting @ laser control panel	joules			At the weld process power

Energy per pulse reading @ just outside of laser head	joules			At the weld process power
Energy per pulse past focus point	joules			At the weld process power
Loss of energy per pulse (from laser to focus)	%			At the weld process power
Stability of the laser power	%			At the weld process power
Stability of the laser power over 20 minutes	%			At the weld process power
Stability of the laser power over 8 hours	%			At the weld process power

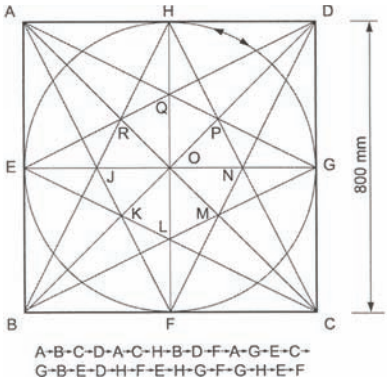
Spatial profile verification				
Device used to make measurement	descr.			
Last calibration date of the device	date			
Spatial profile @ just outside of laser head	image			At the weld process power
Spatial profile at the focal point	image			At the weld process power
Asymmetry and/or astigmatism	descr.			At the weld process power
Correlation factor	number			At the weld process power
Image of spatial profile at laser head, full power		Image of spatial profile at focal point at full power		

Temporal Profile (pulse shape) verification	**Units**	**Specs**	**Actual**	
Device used to make measurement	descr.			
Last calibration date of the device	date			
Energy per pulse for this test	joules			
Pulse rate for this test	pps			
Average power for this test	watts			
Pulse width (as programmed, total width)	sec			add computer screen images
Sector 1 (width, demand height)	sec, %D			add computer screen images
Sector 2 (width, demand height)	sec, %D			add computer screen images
Sector 3 (width, demand height)	sec, %D			add computer screen images
Pulse width (as measured independently)	sec			add computer screen images
Sector 1 (width, energy)	sec			add computer screen images
Sector 2 (width, energy)	sec			add computer screen images
Sector 3 (width, energy)	sec			add computer screen images
Risetime at 10% of full energy setting	microsec			add computer screen images
Risetime at 100% of full energy setting	microsec			add computer screen images

Pulse rate	pps			add computer screen images
Ramp setting—at the start of the weld	# of pulses			
Ramp setting—at the end of the weld	# of pulses			
Image of pulse shape as programmed		Image of actual pulse shape		

Hardware details	**Units**	**Specs**	**Actual**	
Device used to measure the focused spot size	descr.			
Last calibration date of the device	date			
Diameter of focused spot—computed	mm			At the weld process power
Diameter of focused spot—actual	mm			At the weld process power
Difference between computed and measured spot dia	%-age			At the weld process power
Focal length on final focus optics as measured	Inch [mm]			At the weld process power
Weld shielding gas type	descr.			
Weld shielding gas purity	%			
Weld shielding gas flow rate—coax nozzle	liters per min			
Weld shielding gas flow rate—aux. nozzle	liters per min			
Flow gage and calibration date—coax nozzle	descr.			
Flow gage and calibration date aux. nozzle	descr.			
Weld shielding gas nozzle diameter—coax nozzle	Inch [mm]			
Weld shielding gas nozzle diameter—aux. nozzle	Inch [mm]			
Coax weld assist gas nozzle alignment	descr.			
Photo and or diagram of coax gas deliver nozzle		Photo and or diagram of aux gas deliver nozzle		

Positioning system, incl. Remote Weld, Robotics, PFO, etc.	**Units**	**Specs**	**Actual**	
Positioning system, incl. Remote Weld, Robotics, PFO, etc.	descr.			
Device used to make measurement	descr.			
Last calibration date of this device	Date			

				
Description of trajectory per ISO 22827-2		Image of the actual trajectory		
Positioning accuracy of X axis	Inch [mm]			
Positioning accuracy of Y axis	Inch [mm]			
Positioning accuracy of Z axis	Inch [mm]			
Straightness of the X axis	Inch [mm]			
Straightness of the Y axis	Inch [mm]			
Meandering of trajectory	Inch [mm]			
Linear speed of X axis	Inch per mm [mm per min]			
Linear speed of Y axis	Inch per mm [mm per min]			
Linear speed of Z axis	Inch per mm [mm per min]			
Seam Tracker—installed (yes/no)—Specify Brand/Model	select	Descrip-tion		
Resolution	Inch per mm [mm per min]			
Dead-band	Inch per mm [mm per min]			
Index table—verification of rotational speed	rpm			

Weld test results, using laser parameters used in production	**Units**	**Specs**	**Actual**	
Material used to make the weld test	descr.			
Heat sinking provided	descr.			
Material thickness	Inch [mm]			
Average power	watts			
Amount of defocus (+ means above the surface)	Inch [mm]			
Feed rate of welding	Inch per mm [mm per min]			

Shielding gas (type)	descr.			
Shielding gas flow rate	liters per min			
Length of the weld bead	Inch [mm]			
Bead width (as measured on the surface of material)	Inch [mm]			
Weld penetration (as measured in the cross section)	Inch [mm]			
Root width	Inch [mm]			
Color/soot on top of the weld	select			

Real-Time Weld Monitoring Subsystem				
Make/Model				
Software Version				
Type of Sensors				
Monitoring Location Relative to Laser/Material Interaction Point				
Calibration Date				
Calibration Due Date				
Spatial and Temporary Accuracy Checks				

Other parameters				

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of AWS C7.4/C7.4M:2017.

Signed:		Date:	

Title:	