

# Safety Equipment Reliability Handbook

*Second Edition*

Sample



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serh sample

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EQUIPMENT ITEM				Generic Flow Transmitter - Coriolis Meter				ITEM NO.		1.4.2	
GENERAL INFORMATION											
MANUFACTURER		Generic Equipment									
MODEL		~~~									
MEASUREMENT TYPE		Flow - Mass: Coriolis									
ANALOG / DIGITAL		Analog				HARDWARE FAULT TOLERANCE		0			
ARCHITECTURE TYPE		B				CERTIFIED FOR USE UP TO SIL		N/A			
ASSESSMENT		N/A				BY	N/A				
DATA SOURCE		exida Comprehensive Analysis									
REMARKS		None									
FAILURE RATE DATA				PER 10 <sup>9</sup> HOURS [FITS]							
FAIL LOW		500									
FAIL HIGH		100									
FAIL DETECTED		800									
FAIL DANGEROUS DETECTED											
FAIL DANGEROUS UNDETECTED		900									
FAIL SAFE DETECTED											
FAIL SAFE UNDETECTED											
FAIL ANNUNCIATION DETECTED											
FAIL ANNUNCIATION UNDETECTED											
FAIL NO EFFECT		200									
SFF [%]		64.0									
APPLICATION EXAMPLE											
PLC DETECTION BEHAVIOR			APPLICATION		$\lambda^{SD}$	$\lambda^{SU}$	$\lambda^{DD}$	$\lambda^{DU}$	SFF [%]		
RANGE CHECKING	INPUT FILTERING	TRIP POINT	ALARM POINT								
ON	ON	HIGH	HIGH			1400	900	64.0			
ON	ON	HIGH	LOW			1400	900	64.0			
ON	OFF	HIGH	HIGH	900		500	900	64.0			
ON	OFF	HIGH	LOW	100		1300	900	64.0			
OFF	OFF	HIGH	HIGH		900		1400	44.0			
OFF	OFF	HIGH	LOW		100		2200	12.0			



EQUIPMENT ITEM				Endress+Hauser Levelflex M FMP4*				ITEM NO.		1.5.7	
<b>GENERAL INFORMATION</b>											
MANUFACTURER		Endress+Hauser GmbH+Co. KG									
MODEL		Levelflex M FMP4* 4-20mA output									
MEASUREMENT TYPE		Level - Guided Wave Radar									
ANALOG / DIGITAL		Analog				HARDWARE FAULT TOLERANCE				0	
ARCHITECTURE TYPE		B				CERTIFIED FOR USE UP TO SIL				N/A	
ASSESSMENT		exida Proven In Use				BY		exida			
DATA SOURCE		FMEDA by exida									
REMARKS		Versions FMP 40, FMP 41C and FMP 45: overspill protection.									
<b>FAILURE RATE DATA</b>				PER 10 <sup>9</sup> HOURS [FITS]							
				2-WIRE				4-WIRE			
				OVERFILL / HIGH LEVEL		DRY-RUN / LOW LEVEL		OVERFILL / HIGH LEVEL		DRY-RUN / LOW LEVEL	
FAIL LOW				324				447			
FAIL HIGH				397				386			
FAIL DETECTED				602				658			
FAIL DANGEROUS DETECTED											
FAIL DANGEROUS UNDETECTED				743				323			
FAIL SAFE DETECTED											
FAIL SAFE UNDETECTED											
FAIL ANNUNCIATION DETECTED											
FAIL ANNUNCIATION UNDETECTED				2				1			
FAIL NO EFFECT				643				677			
SFF [%]				72.6				87.0			
<b>APPLICATION EXAMPLE – OVERFILL, 2-WIRE</b>											
PLC DETECTION BEHAVIOR		APPLICATION		$\lambda^{SD}$	$\lambda^{SU}$	$\lambda^{DD}$	$\lambda^{DU}$	SFF [%]			
RANGE CHECKING	INPUT FILTERING	TRIP POINT	ALARM POINT								
ON	ON	HIGH	HIGH			1323	743	72.6			
ON	ON	HIGH	LOW			1323	743	72.6			
ON	OFF	HIGH	HIGH	999		324	743	72.6			
ON	OFF	HIGH	LOW	397		926	743	72.6			
OFF	OFF	HIGH	HIGH		999		1067	60.6			
OFF	OFF	HIGH	LOW		397		1669	38.4			

EQUIPMENT ITEM				Rosemount 3051S SIS				ITEM NO.		1.6.18							
<b>GENERAL INFORMATION</b>																	
MANUFACTURER		Rosemount Inc.															
MODEL		3051S SIS, 3051S_C / 3051S_T															
MEASUREMENT TYPE		Pressure															
ANALOG / DIGITAL		Analog				HARDWARE FAULT TOLERANCE		0									
ARCHITECTURE TYPE		B				CERTIFIED FOR USE UP TO SIL		2 / 3									
ASSESSMENT		IEC 61508 Certification				BY		exida / RWTÜV Systems GmbH									
DATA SOURCE		FMEDA by exida															
REMARKS		None															
<b>FAILURE RATE DATA</b>				PER 10 <sup>9</sup> HOURS [FITS]													
				COPLANAR VERSION		IN-LINE VERSION											
FAIL LOW				277		280											
FAIL HIGH				62		59											
FAIL DETECTED				500		470											
FAIL DANGEROUS DETECTED																	
FAIL DANGEROUS UNDETECTED				73		68											
FAIL SAFE DETECTED																	
FAIL SAFE UNDETECTED																	
FAIL ANNUNCIATION DETECTED																	
FAIL ANNUNCIATION UNDETECTED				39		31											
FAIL NO EFFECT				409		437											
SFF [%]				94.6		94.9											
<b>APPLICATION EXAMPLE – COPLANAR VERSION</b>																	
PLC DETECTION BEHAVIOR				APPLICATION				$\lambda^{SD}$		$\lambda^{SU}$		$\lambda^{DD}$		$\lambda^{DU}$		SFF [%]	
RANGE CHECKING		INPUT FILTERING		TRIP POINT		ALARM POINT											
ON		ON		HIGH		HIGH				839		73		94.6			
ON		ON		HIGH		LOW				839		73		94.6			
ON		OFF		HIGH		HIGH		562		277		73		94.6			
ON		OFF		HIGH		LOW		62		777		73		94.6			
OFF		OFF		HIGH		HIGH				562		350		74.3			
OFF		OFF		HIGH		LOW				62		850		37.5			

EQUIPMENT ITEM			Pepperl+Fuchs EG2-R / EG4-R		ITEM NO.		2.18	
GENERAL INFORMATION								
MANUFACTURER		Pepperl+Fuchs GmbH						
MODEL		Transformer Isolated Amplifier EG2-R / EG4-R						
INTERFACE TYPE		Transformer Isolated Switch Amplifier						
ANALOG / DIGITAL		Digital			HARDWARE FAULT TOLERANCE		0	
ARCHITECTURE TYPE		A			CERTIFIED FOR USE UP TO SIL		N/A	
ASSESSMENT		exida Proven In Use			BY	exida		
DATA SOURCE		FMEDA by exida						
REMARKS		None						
FAILURE RATE DATA				PER 10 <sup>9</sup> HOURS [FITS]				
				EG2-R		EG4-R		
FAIL LOW								
FAIL HIGH								
FAIL DETECTED								
FAIL DANGEROUS DETECTED				14		14		
FAIL DANGEROUS UNDETECTED				19		22		
FAIL SAFE DETECTED								
FAIL SAFE UNDETECTED				37		40		
FAIL ANNUNCIATION DETECTED								
FAIL ANNUNCIATION UNDETECTED				6		7		
FAIL NO EFFECT				50		50		
SFF [%]				84.9		83.8		



EQUIPMENT ITEM		Generic 3-way Solenoid		ITEM NO.	6.1.2
<b>GENERAL INFORMATION</b>					
MANUFACTURER	Generic Equipment				
MODEL	~~~				
INTERFACE TYPE	Solenoid, 3-way				
ANALOG / DIGITAL	Digital	HARDWARE FAULT TOLERANCE		0	
ARCHITECTURE TYPE	A	CERTIFIED FOR USE UP TO SIL		N/A	
ASSESSMENT	N/A	BY	N/A		
DATA SOURCE	exida Comprehensive Analysis				
REMARKS	None				
<b>FAILURE RATE DATA</b>					
		PER 10 <sup>9</sup> HOURS [FITS]			
	NORMAL	PVST			
FAIL DANGEROUS DETECTED		579			
FAIL DANGEROUS UNDETECTED	585	6			
FAIL SAFE DETECTED		1010			
FAIL SAFE UNDETECTED	1010				
FAIL ANNUNCIATION DETECTED					
FAIL ANNUNCIATION UNDETECTED					
FAIL NO EFFECT	500	500			
SFF [%]	72.1	99.7			

### 6.6.3 Actuators

The following equipment items are listed in the Actuators subsection.

- 6.3.1 Generic Pneumatic Diaphragm Actuator, Linear
- 6.3.2 Generic Pneumatic Diaphragm Actuator, Quarter Turn
- 6.3.3 Generic Pneumatic Piston Actuator
- 6.3.4 Generic Pneumatic Rack & Pinion Actuator
- 6.3.5 Generic Pneumatic Scotch Yoke Actuator
- 6.3.6 Bettis CB-Series
- 6.3.7 Bettis D-Series
- 6.3.8 Bettis G-Series
- 6.3.9 EI-O-Matic E-Series, Spring-Return
- 6.3.10 EI-O-Matic P-Series, Spring-Return
- 6.3.11 Emerson FieldQ, Spring-Return
- 6.3.12 Hytork XL, Spring-Return

Sample

EQUIPMENT ITEM					Generic Air Operated Globe Valve		ITEM NO.		6.5.5	
<b>GENERAL INFORMATION</b>										
MANUFACTURER		Generic Equipment								
MODEL		~~~								
ACTUATOR TYPE		Pneumatic, Spring Return								
VALVE TYPE		Globe, Air-To-Open			HARDWARE FAULT TOLERANCE		0			
ARCHITECTURE TYPE		A			CERTIFIED FOR USE UP TO SIL		N/A			
ASSESSMENT		N/A			BY		N/A			
DATA SOURCE		exida Comprehensive Analysis								
REMARKS		None								
<b>FAILURE RATE DATA</b>										
PER 10 <sup>9</sup> HOURS [FITS]										
CLEAN SERVICE		CLOSE ON TRIP				OPEN ON TRIP				
		FULL STROKE		TIGHT SHUTOFF						
		NORMAL	PVST	NORMAL	PVST	NORMAL	PVST	NORMAL	PVST	
FAIL DANGEROUS DETECTED			630		630				630	
FAIL DANGEROUS UNDETECTED		1270	640	2710	2080	1090	460			
FAIL SAFE DETECTED			500		500				500	
FAIL SAFE UNDETECTED		500		500		500				
FAIL ANNUNCIATION DETECTED										
FAIL ANNUNCIATION UNDETECTED										
FAIL NO EFFECT										
SFF [%]		28.2	63.8	15.6	35.2	31.4	71.1			
<b>SEVERE SERVICE</b>										
SEVERE SERVICE		CLOSE ON TRIP				OPEN ON TRIP				
		FULL STROKE		TIGHT SHUTOFF						
		NORMAL	PVST	NORMAL	PVST	NORMAL	PVST	NORMAL	PVST	
FAIL DANGEROUS DETECTED			980		980				980	
FAIL DANGEROUS UNDETECTED		1580	600	3960	2980	1560	580			
FAIL SAFE DETECTED			500		500				500	
FAIL SAFE UNDETECTED		500		500		500				
FAIL ANNUNCIATION DETECTED										
FAIL ANNUNCIATION UNDETECTED										
FAIL NO EFFECT										
SFF [%]		24.0	71.2	11.2	33.2	24.3	71.8			

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