INTRINSICALLY SAFE CIRCUIT CALCULATION

E & H LIQUIPHANT FTL 51 WITH FEL 57 INSERT AND FTL 325P NIVOTESTER

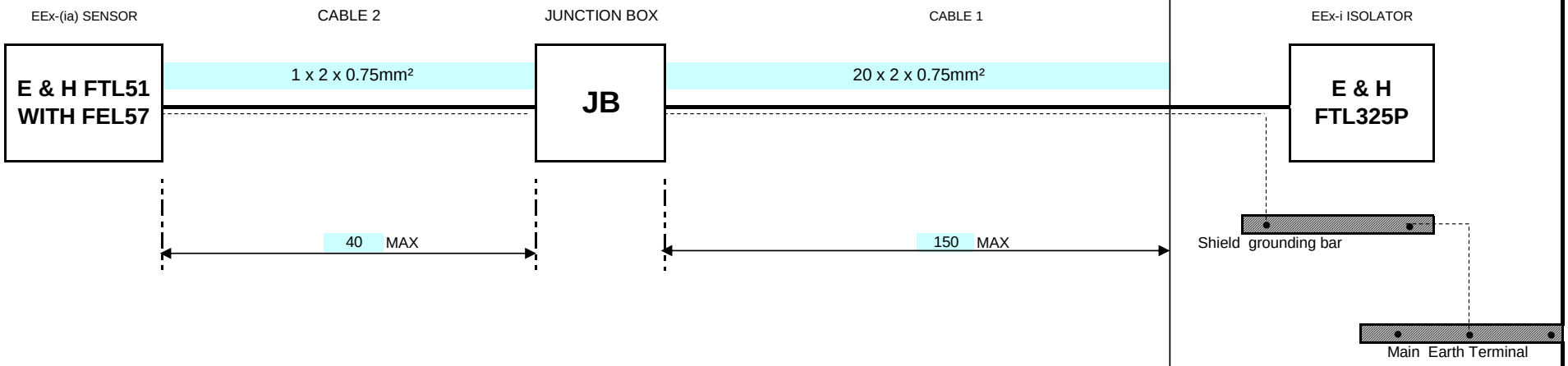
Customer:	ConocoPhillips					
Plant:	Bramhall	A	DBF	DRR	DRR	01/10/08
Project :	SI188	Rev	BY	Check	App	Date
Calculation N° :	SI188001.CAL		Sheet :	1	of	1

Loop Sheet No.

0800/11631/1024
0800/11631/1025
0800/11631/1026
0800/11631/1027
0800/11631/1028
0800/11631/1029
0800/11631/1030
0800/11631/1031

HAZARDOUS AREA | **SAFE AREA**

Zone		Gas Group	Temperature Class
0	1	IIB	T4
Process	Electronics		



	Cable 2	Cable 1	Cable 1 + Cable 2	
Supply by	P&I Design			P&I Design
Specification	SI188001.SPC	BS5308 Part 1 Type 2	BS5308 Part 1 Type 2	SI188001.SPC
Manufacturer	Endress+Hauser			Endress+Hauser
Model	FTL51 with FEL57 Insert			FTL 325P
Description	Vibronics Level Sensor	Single twisted pair - SWA armoured	Multiple twisted pairs - SWA armoured	3 ch Nivotester
Certification	Ex II 1 2 G EEx ia IIC T6			Ex II (1) G D [EEx ia] IIC T6
Certificate No.	KEMA 99 ATEX 0523			DMT 01 ATEX E 052
Voltage	Ui: 16.7 V			Uo: 14.6 V
I current	Ii: 150 mA			Io: 97 mA
Power	Pi: 1.00 W			Po: 0.633 W
Capacitance	Ci: 0.0000 µF	Cc2: 0.115 µF/km => 0.0046 µF	Cc1: 0.115 µF/km => 0.0173 µF	Cct: 0.0219 µF	Co: 0.6400 µF
Inductance	Li: 0.0000 mH	Lc2: 2 x 0.6625 mH/km => 0.0530 mH	Lc1: 2 x 0.6625 mH/km => 0.1988 mH	Lct: 0.2518 mH	Lo: 3.0 mH
L/R		Lc2/Rc2: 0.025 mH/Ω	Lc1/Rc1: 0.025 mH/Ω	Lct/Rct:	
Resistance	Ri: Ω	Rc2: 2 x 26.50 Ω/km => 2.1200 Ω	Rc1: 2 x 26.50 Ω/km => 7.950 Ω	Rct: 10.070 Ω	Ro: 0 Ω

Cable Calculations:
Leq = (Cable mH/km x 2 x Cable Length in m /1000) + Field Instrument mH
Ceq = (Cable µF/km x Cable Length in m /1000) + Field Instrument µF

Verification Checks		Verification Calculations					Final calculation result
Plant Zone Process	≥ Inst. Zone Process	0	≥	0			OK
Plant Zone Elect.	≥ Inst. Zone Elect.	1	≥	1			OK
Plant Gas Group	≤ Inst. Gas Group	IIB	≤	IIC			OK
Plant Temp Class	≤ Inst. Temp Class	T4	≤	T6			OK
Uo	≤ Ui	14.6 V	≤	16.7 V			OK
Io	≤ Ii	97 mA	≤	150 mA			OK
Po	≤ Pi	0.633 W	≤	1.00 W			OK
Co	≥ (Ci+Cct) Ceq	0.6400 µF	≥	0.02185 µF			OK
Lo	≥ (Li+Lct) Leq	3.0 mH	≥	0.25175 mH			OK
Lo/Ro	≥ Lct/Rct	THIS VERIFICATION IS NOT NECESSARY AS THE OTHER RELATIONSHIPS (CAPACITANCE, INDUCTANCE AND RESISTANCE) ARE VERIFIED					OK

VERIFIED