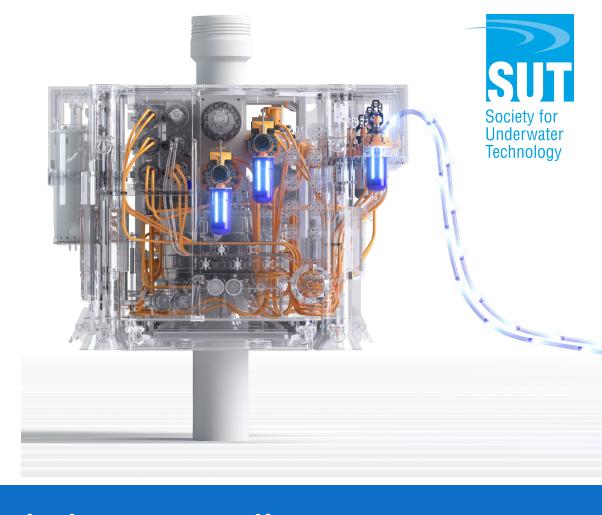




Jon Turner
Diamould Product Champion



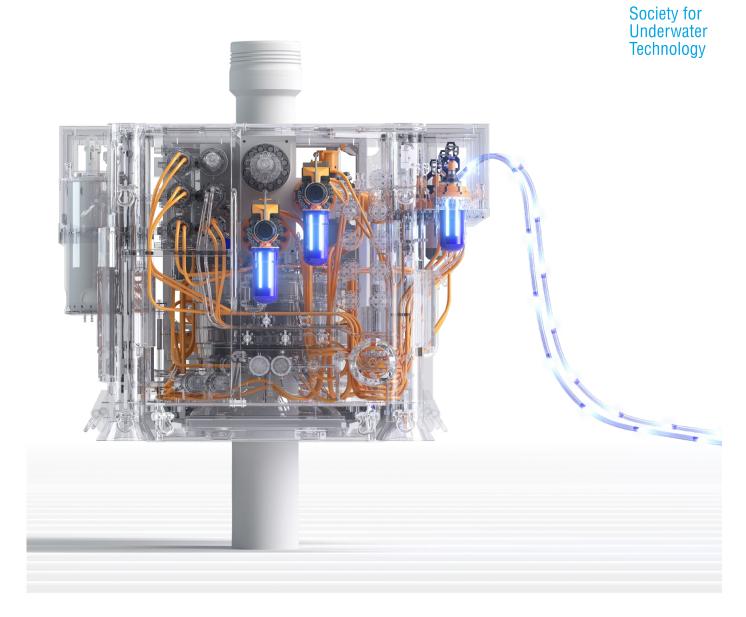
## OneSubsea Diamould Electrical Flying Lead's (EFL's)



## Hose, cable and termination management

Key to long term reliability







## Agenda

Introduction and company overview

Subsea systems – A typical scope

Key EFL components

Hose assemblies – Potential failure modes

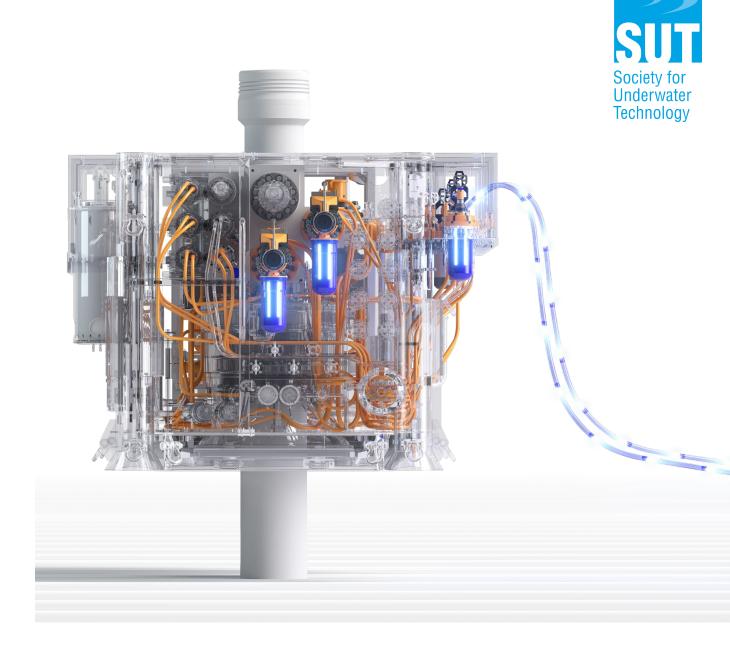
– Advanced reliability by process

Cable terminations – Potential failure modes

– Advanced reliability by design

Demonstrating technical robustness

Questions





## Introduction

#### OneSubsea Diamould





SLB & OneSubsea centre of excellence for connectors

Celebrating 25 years in the industry

Northwest, United Kingdom

Electrical and optical connectors

Subsea and downhole applications

In-house design and manufacture



## Reliability is key

## Society for Underwater **Technology**

XT B SCM

CIMV

0 0 0

MM

XT A SCM

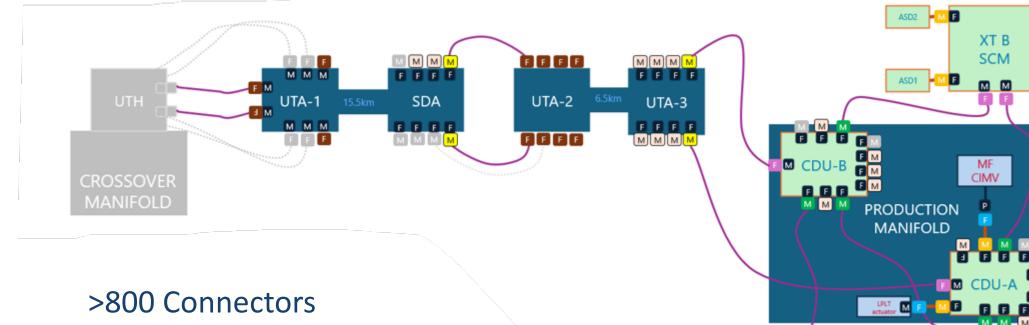
ASD1 MF

**™** CDU-A

XT D

SCM

#### Typical subsea system



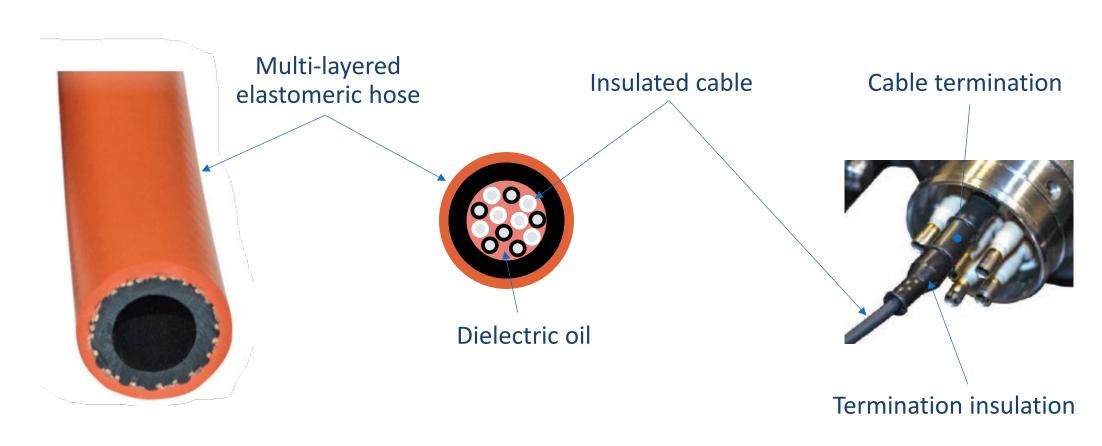
>200 EFL's (7km!) EFL's



## EFL technology

Key EFL components







## Addressing failures – Potential failure modes



## Multi-layered elastomeric hose (Dielectric oil filled)

- Chemical contamination
  - Processing chemicals
  - Sebaceous fluid (sweaty hands)
  - | SEM MAG: 42 x | WD: 20.23 mm | VEGA3 TESCAN | View field: 13.2 mm | Det: SE | 2 mm | SEM MAG: 42 x | Date(m/d/y): 02/04/21 | Extractly

- Particulate contamination
  - Polymeric particles
  - General airborne particles

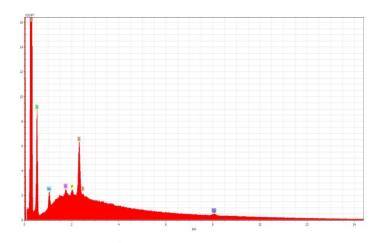
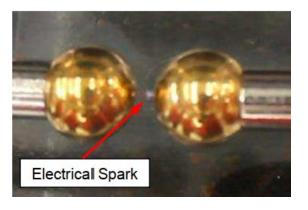


Figure 2 CLEAN SAMPLE REDA No.5 ID: 36333

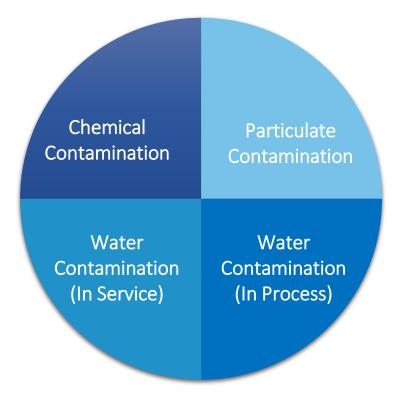
- Water contamination
  - Environmental humidity
  - Water absorption in oil
  - Water ingress in service

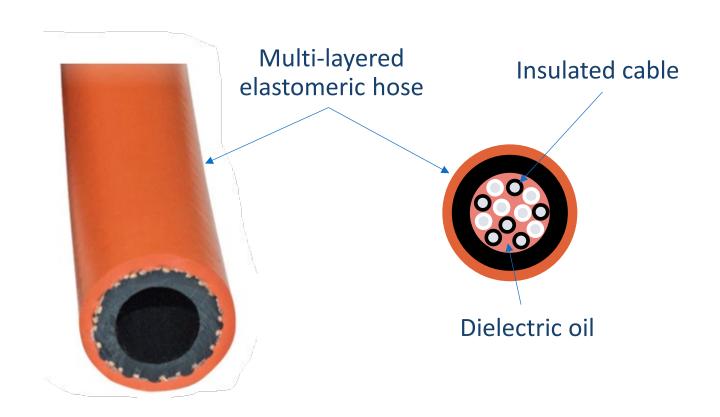






Multi-layered elastomeric hose (Dielectric oil filled)







Multi-layered elastomeric hose (Dielectric oil filled)



#### Dielectric breakdown strength

Chemical Contamination

Particulate Contamination

water
Contamination
(In Service)

Water
Contamination
(In Process)





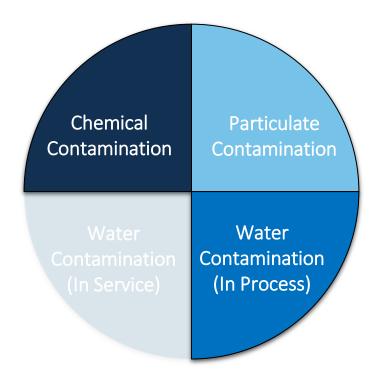




Multi-layered elastomeric hose (Dielectric

oil filled)

#### Dielectric breakdown strength



CT IC Sample	Raw Oil (from Barrell)	hours at 9x10 <sup>-2</sup> Torr
	(Holli Barrell)	Hours at 5x10 Torr
Data of counts	2/7/10	0/7/10
Date of sample	2/7/19	8/7/19
Date of Testing	9/7/19	9/7/19
Gas Content (vpm)		
Hydrogen	9.8	0.5
Oxygen	24711	2357
Nitrogen	52575	4612
Carbon Monoxide	13	0.1
Methane	10	0.2
Carbon Dioxide	247	24
Ethylene	27	<0.1
Ethane	5.2	<0.1
Acetylene	10	<0.1
	-	
Particle Count (µ / 100mL)		
2-5	24000	6000
5 – 15	12000	3000
15 – 25	3000	750
25 – 50	0	
50 - 100	0	
> 100	0	
Moisture (mg/kg)	8	8
(0101	-	
Electric Breakdown (kV)	39	57
Electric witnstanu 1445 4 11111		1 433
The state of the s		
Notes	Gas contents higher than	Gas content is low
	expected	Oil quality is good
	Breakdown lower than	Particle count is low
	expected	Good breakdown strength
		and a secondaria

	Breakdowr	- 61-3-55
orrec	Kroskanuur	* * * * * * * * * * * * * * * * * * * *
	DICANUOWI	
		**

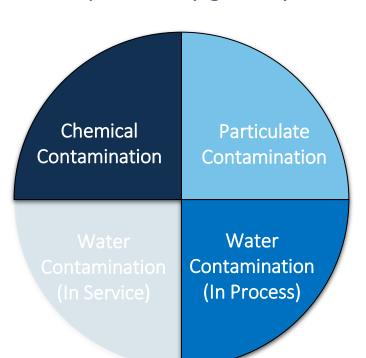
39





Multi-layered elastomeric hose (Dielectric oil filled)

#### Repeatability globally



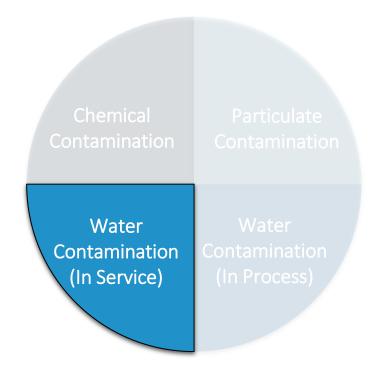








Multi-layered elastomeric hose (Dielectric oil filled)





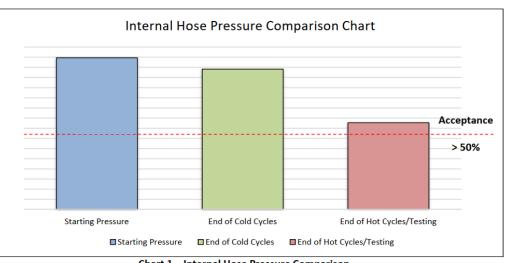


Chart 1 – Internal Hose Pressure Comparison





Multi-layered elastomeric hose (Dielectric oil filled)



Chemical Contamination

Particulate Contamination

Water
Contamination
(In Service)

Water Contamination (In Process)





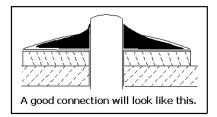


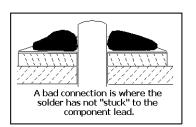
## Addressing failures – Potential failure modes

# Society for Underwater Technology

#### Cable termination & insulation

- Solder joint
  - Conductive media for joint cleaning
  - Solder spikes
  - Dry joints
  - Dendrite formation





- Chemical contamination
  - Processing chemicals
  - Sebaceous fluid (sweaty hands)



- Moisture contamination
  - Environmental humidity

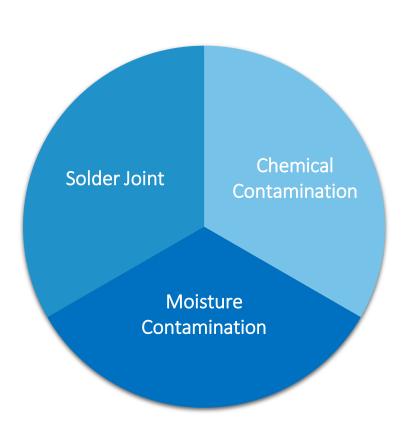




## Advanced reliability by design

#### Cable termination & insulation









1. Crimp pin introduced to crimp socket



Crimp pin pushed into and engaged in to crimp socket



3. Latch boot termination sleeve pushed onto crimp joint



## Advanced reliability by design

Cable termination & insulation



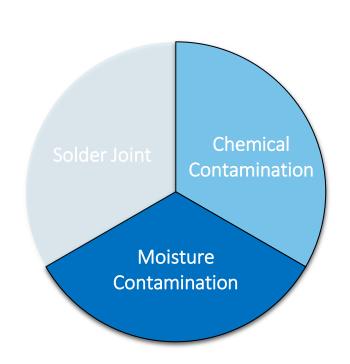


1. Crimp pin introduced to crimp socket





3. Latch boot termination sleeve pushed onto crimp joint





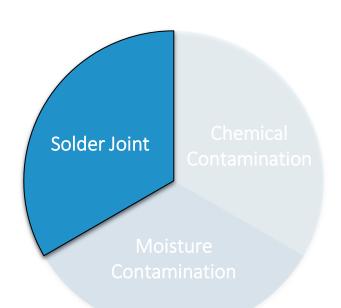


## Advanced reliability by design

#### Cable termination & insulation



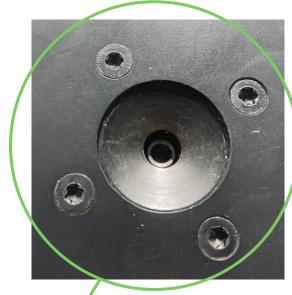
#### Removing the human factor!













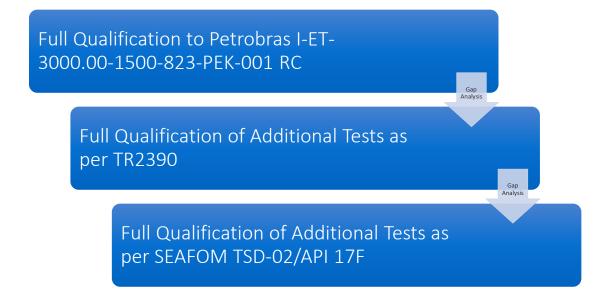




#### Alignment to standards

#### Designed in accordance with specifications

- Petrobras I-ET-3000.00-1500-823-PEK-001
- Statoil TR2390 Rev 1-2
- API 17F\*
- SEAFOM TSD-02



<sup>\*</sup>Ongoing gap closure to 5<sup>th</sup> edition

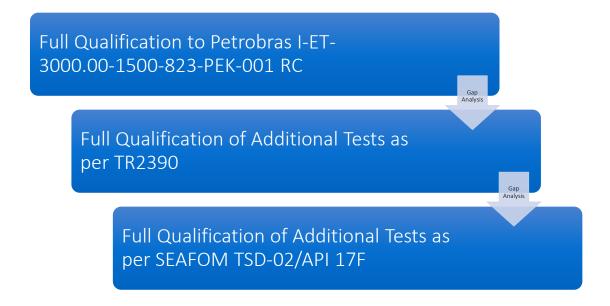




#### Alignment to standards

#### Designed in accordance with specifications

- Petrobras I-ET-3000.00-1500-823-PEK-001
- Statoil TR2390 Rev 1-2
- API 17F\*
- SEAFOM TSD-02







#### Alignment to standards

#### Designed in accordance with specifications

- Petrobras I-ET-3000.00-1500-823-PEK-001
- Statoil TR2390 Rev 1-2
- API 17F\*
- SEAFOM TSD-02

Plus additional product specific qualification

7-Way Alternative Gender ROV Connectors	<ul> <li>Additional Mechanical Tests as per SEAFOM TSD-02</li> <li>Additional Mechanical Tests as per Petrobras I-ET-3000.00-1500-823- PEK-001 RC</li> </ul>
7-Way Bulkhead Mounted ROV Connectors	<ul> <li>Additional Mechanical Tests as per SEAFOM TSD-02</li> <li>Additional Mechanical Tests as per Petrobras I-ET-3000.00-1500-823- PEK-001 RC</li> </ul>
7-Way Stab Connectors	<ul> <li>Additional Mechanical Tests as per OneSubsea X-065408-01-95</li> <li>Additional Environmental Tests as per OneSubsea X-065408-01-95</li> </ul>
7-Way Diver Connectors	<ul> <li>Additional Mechanical Tests as per OneSubsea Standard for Pressure Retaining Equipment (Internal Specification)</li> </ul>
12-Way ROV Connectors	<ul> <li>Additional Mechanical Tests as per SEAFOM TSD-02</li> <li>Additional Electrical Tests as per SEAFOM TSD-02</li> <li>Additional Environmental Tests as per SEAFOM TSD-02</li> </ul>
12-Way alternative gender ROV Connectors	<ul> <li>Additional Mechanical Tests as per SEAFOM TSD-02</li> <li>Additional Mechanical Tests as per Petrobras I-ET-3000.00-1500-823- PEK-001 RC</li> </ul>
12-Way Stab Connectors	<ul> <li>Additional Mechanical Tests as per OneSubsea X-065408-01-95</li> <li>Additional Environmental Tests as per OneSubsea X-065408-01-95</li> </ul>
12-Way Diver Connectors	<ul> <li>Additional Mechanical Tests as per OneSubsea Standard for Pressure Retaining Equipment (Internal Specification)</li> </ul>
Bespoke Connectors	<ul> <li>Additional Mechanical Tests as per SEAFOM TSD-02</li> <li>Additional Mechanical Tests as per Petrobras I-ET-3000.00-1500-823-PEK-001 RC</li> </ul>





#### Alignment to standards

#### Designed in accordance with specifications

- Petrobras I-ET-3000.00-1500-823-PEK-001
- Statoil TR2390 Rev 1-2
- API 17F\*
- SEAFOM TSD-02

Plus additional product specific qualification

With ongoing gap closures to API17F 5<sup>th</sup> edition

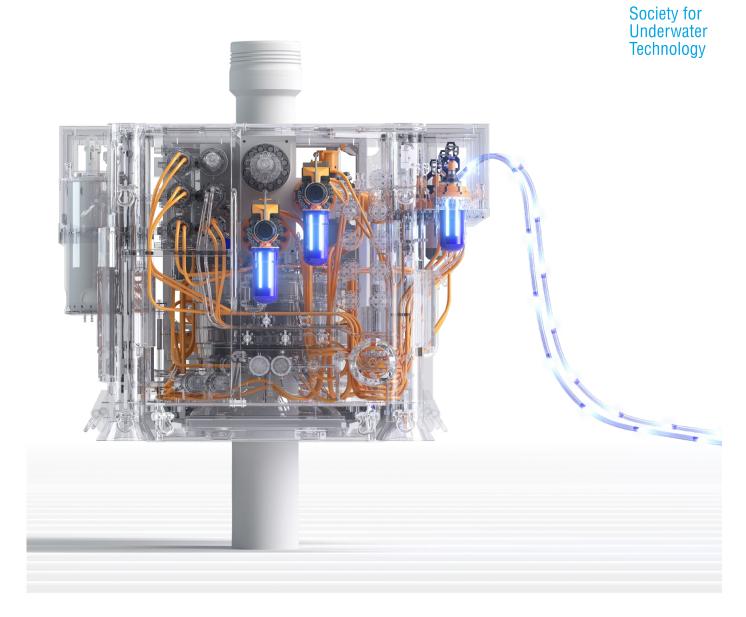
Compliance Matrix With API 17F, 5 <sup>th</sup> Edition, April 2023 Annex B  Controls and Communications Connectors (CCC)							
			,				
Services No.	AA AA Cardi Ride Bare Nony Bassa Wilber	Nation 2) Committees are complicate with the requirements of unitions E.J., E.Z. S. E.S. 2) PAIRs a quality requirements for API 377 and may be performed out of unique of Cham					
Chested	Graff Maire Marre Menry	[2] PUBLS a spulling requirement for API 177 and may be performed out of suspend Clare	mile's standard provides.				
Section	Specification Criteria	Requirement	Compliance	COS Comments			
		8.1 - General - See Note 1					
E.3 - Augustranesis - Lee Teatre 1  E.4 - Table 17 - Reformance Parameters							
	Croign Me Stater depth	To be defined by the manufacturer To be defined by the manufacturer	Yes Yes	10 Years 1000m EF. S. Humanson / Single commission qualified in 2000m			
	Water depth. Minimum external DF		Tes .				
	Minimum reterral DP Distincts in a pressure for components assembly to 2P1137 Distincts less acreases for and accesses harden components	Assembling to sprallful union depth Assembling to residental hydrochatic less personne as per \$3.5.5.5.8 Assembling to \$45.00 and \$49.65.	Tes NA	Miller historial Li deign pressure  CCC are not seed to a self-to-de-confession			
	The saled college between conductors for which the equipment is designed. For						
	Minimum Irai ammano Iler and ammano ha dei sammanoshi. Der utder diship between samtisation her belahi hir anglupmen in dishipteri. Iwa El valley, the dishiption is assemption to the EC 600001 [EV college] have, on another laten users taken to? I the delity is appeared with own and have, on another laten users taken for I the delity is appeared with own and Eadi, 2) the probability of militages 20°C and of place, and II that underschaufeld engineered dealth is designed and higher engine that engineered and interpretable and anythered dealth is designed and higher engine that engineered and engineered.	1900 VDC, 1000 VBC RNB, 1600 VBC RNB	_	Commenter rated to SEC 60800-1 Up/U (Umq = 0,0/L (U,7)LV High-vallage sating, 1,0/L (U,0) has been added to the Sth St and is not valid			
	Each, 2) the providing of unliages 200° and of phase, and 2) that subserviousled regularized should be designed with higher margins than impaintenanced			Andread and Andread and the American Company of Company			
	an app			Committee valued in IEC 60503-1 IL/IV (Dav) = 0,4/1 (1,2/0v Pigh-vellage nating, 1,1/1 (1,1) has been salded in the Bih Id and is not valid for CCC			
	The saled salitage between conductor and earth or metallic samen for which the equipment is designed. For AC salitage, the definition corresponds to LCD in DC ADSO-1.	TAGO VOC, AGO VAC MAIR, TAGO VAC MAIR	Tes	High voltage rating, 1,4/1 (1,4) has been added to the 5th 5d and is not valid			
	MRED in the second of the "highest spates callage" for which the equipment may be used perceptualing to Un to IEC 60000-Q. This solure access for shoulden where two 1000 ME MM adjusted pairs or 100" and of plants. Auditors are discussed approximated enlarge for successions with variously provided adjust to this.			Nor-CCC About qualified rating 1800 VDC (2000 VBC RANK) Commisser valued in RC 60002-1 UQU (Early -CAPT-(1,7)to High-ratings rating, 1,1/17 (I/U) has been added to the lish fid and is not valid.			
	The maximum value of the "highest system values" for which the equipment may	1200 VISC MAR, 1000 VISC MAR	Yes	Commenter rated to ISC 60803-1 UQFU (3mg + QAF1 (1,2 pto High vellage rating, 1,4/1 (1,4) has been added to the Sife Sid and is not valid			
	shore two 1200 VAC RMS adjusted pairs are 180° and of phase.			Name CCC.  And an additional continues COCC VIAC STATE.			
	Maximum sentiment operational voltage for sententies with reduced proof	sevoc	Yes	NO VIDE			
6	Make/berak of weirmake under passer	Nati a required feature, but concequence to be described by supplier/manufacturer	N/A	Net advisable to make f domate white energised. The pseudolity of damaging south and electrical services arms and insulation is a risk.			
i	Vasimum samilmum apmaillenal surreni	Assembling to manufacturer's spooffinations, based on tests. Amperage on single/multiple/sid pion to be spooffed	Yes	seah and electrical contact area and insulation is a risk. §77 Way -15 Emp / 32 Way - 20 Emp			
ž.	Market brooks and	deployment purposes to be specified	Yes No.	67 Way -15 Amp / 13 Vay - 20 Amp Committee hour not from evaluated for this food of involvement.			
9		Asserting to Table (L1 > 3000) 3000	Tes				
-	semilarian/sin Imulation makkanar—Bying Insal assembly Commeter body to semilarian/yin Combation (sin is semilarian/sin	Assembly to Table I.1 > 1000> 1000	Yes				
2	Conductor foin to conductor him.  Out had communication near risingly bingle-model	IM an and Alban	N/A				
8	Controllation of the section of the sec	110 pm and 1100 pm	- IA				
- 4		0.5 dl single-made 1 dl multimade	N/A				
F	Maximum inscriben bess per fusion spiker (as measured or estimated by fusion spiker)	COT 4T	N/A				
	salters! Maximum applical arms talk between Bons Spitial power handling superBilly Maximum applical orders has the shaplemande Slindman sumfor all motivyliamatic spitis, for softwarte summerbille Slindman marrier of motivyliamatic spitis, for softwarte summerbiles	444	N/A				
	Spirital power handing suppliedly Manimum applical return lass for single-maste	300 <del> </del>	198				
	Ultrimum number of mate/de-mate spales for untroute connectors	10 Bert A/100 Opts	Yes	Electric and y 1800 day or 750 day believed by 250 wet			
	Connected following that assumed maximum forming their which that the connected	3100 N	Tes				
	Thing lead assembly minimum breaking strength—Bying lead to connector	1000 N	Yes				
	Maximum BOV main/demain hour maximal for narroll assession Maximum applied BOV boxe (damage)	TNQ N 1000 N	Yes No				
	Third had minimum lend collect	la la defend la manufation	Tes	National to destruction 13mm Jane MSE 115mm / 15mm Jane MSE 175mm			
	Claire lead minimum lend railles Connection Phing had assembly design test temperature Temperature railings	To be defined to manufacturer -08 °C to 80 °C pc3 °C to 122 °C) Assembly to Table 1	Yes Yes				
	Molecum requirement is maximum making spreaf under operating conditions.	03 =/L[14 N/4	Tes	Confereix advised to allow shoul approximent the latch slip indicator			
	Minimum requirement for maximum alremating speed under operating conditions.	1 m/s (0.1 m/s)	Yes	Confere is advised to allow wheat operation of the latch elly indicator			
	conserv subsection of several countries dress described on open	s advetices adult	18				
	Maximum maling and dirmailing speed in dry condition at temperatures below operating conditions;	To be defined by the manufacturer	Ten.	(2m/nex)s advised to allow stood agreement of the latch elly indicator. Mate Atomatic net recommended below 129°C			
	Maximum maling and dimmating spend in dry sandillen at temperatures believ spending sandilleng pelorenar is madr is test immpessiones in Table 1		Tes	12m/sex is advised to allien wheat agencies of the talah slip indicator. Water Memoirs not resonanceated below 12PC			
MAI MAI	per nome per nement per la constitución de la constitución de la Company de la constitución de la constituci	8.4 - Design Requirements		Corplants additional to allow should approxime of the faith slip indicator. Mode Momento not recommended before CIPC			
	per nome per nement per la constitución de la constitución de la Company de la constitución de la constituci		Yes Yes	Cimplem is address to allow should approxime at the total ally indicator. Mate Atomatic net i recommended before GIPC			
MAI MAI	opte zog untersteren printersen in nader ha tred temperaturen in Table 1 Demond Confige Temperaturen, har belanyanska Confige Temperaturen in den belanyanska Daphad Ther Temperaturen	E.4 - Design Requirements  for operfloater levi  for operfloater levi  for sombitate levi  Ele sombitate levi  El.5 - Materials Requirements	Yes Yes Yes Nylk	Complexe is advised to a discussion agree value of the latch sky indicate. Male Menute set resonmented before CIPC			
MAI MAI	per nome per nement per la constitución de la constitución de la Company de la constitución de la constituci	8.4 - Design Requirements	Yes Yes				
MAI MAI	opte zog untersteren printersen in nader ha tred temperaturen in Table 1 Demond Confige Temperaturen, har belanyanska Confige Temperaturen in den belanyanska Daphad Ther Temperaturen	E.4 - Design Requirements  for operfloater levi  for operfloater levi  for sombitate levi  Ele sombitate levi  El.5 - Materials Requirements	Yes Yes Yes Nylk	Materials and other of sells Type 3.1 19 1286.			
LLI	general unitaries  Serveri de la constitución de la	B. C Design Requirements  - Learning Committee and Comm	Yes Yes Yes Nylk	Materials and other of sells Type 3.1 19 1286.			
LLI	opte zog untersteren printersen in nader ha tred temperaturen in Table 1 Demond Confige Temperaturen, har belanyanska Confige Temperaturen in den belanyanska Daphad Ther Temperaturen	E.4 - Design Requirements  for operfloater levi  for operfloater levi  for sombitate levi  Ele sombitate levi  El.5 - Materials Requirements	Yes Yes Yes Nylk	Material and deficient with Type S. 1 TO 1820.  Had all the large any or prosperate accordance of anisot of parts such as sormay and the recognition of the large and the large and the large and the large and the large anisotropy anisotropy and the large anisotropy and the large anisotropy and th			
LLI	general unitaries  Serveri de la constitución de la	B. C Design Requirements  - Learning Committee and Comm	Yes Yes Yes Nylk	Material and deficient with Type S. 1 TO 1820.  Had all the large any or prosperate accordance of anisot of parts such as sormay and the recognition of the large and the large and the large and the large and the large anisotropy anisotropy and the large anisotropy and the large anisotropy and th			
LLI	general unitaries  Serveri de la constitución de la	B. C Design Requirements  - Learning Committee and Comm	Yes Yes Yes Nylk	Material and deficient with Type 3.1 TO 18204.  Had all the first party components considered of saided parts such as screen, and the recognition of the first party components.			
LLI	general unitaries  Serveri de la constitución de la	B. C Design Requirements  - Learning Committee and Comm	Yes Yes Yes Nylk	Manufacture delibered with Type 1.1 TO 1200.  For all the two processors the condition of studied path tools as severa, but a contract the condition of the con			
LLI	general unitaries  Serveri de la constitución de la	B. C Design Requirements  - Learning Committee and Comm	Yes Yes Yes Nylk	Manufature delivered with Type \$1.00,1004.  Was difficulty to compare this control of distuded gath such as severe, not because the control of distuded gath such as severe, not be control or the control of control of control o			
M.	general unitaries  Serveri de la constitución de la	B. C Design Requirements  - Learning Committee and Comm	Yes Yes Yes Nylk	Manufature delivered with Type 1.1 TO 1.200.  Had difficulty to compare the control of stander grade used in a severe, and the control of the			
	Actives to an interpretation to Table 1.  The real actives to the control of the	All: The high Propriessoration for a production and all the production and for approximation to all the production to all	Yes Yes Yes Nylk	Manufature delivered with Type 1.1 TO 1.200.  Had difficulty to compare the control of stander grade used in a severe, and the control of the			
u.	general unitaries  Serveri de la constitución de la	B. C Design Requirements  - Learning Committee and Comm	Yes Yes Yes Nylk	Manufacture delibered with Type 1.1 TO 1200.  For all the two processors the condition of studied path tools as severa, but a contract the condition of the con			
u.	Actives to an interpretation to Table 1.  The real actives to the control of the	All: The high Propriessoration for a production and all the production and for approximation to all the production to all	Yes Yes Yes Nylk	All attrictions deliberated with Type LL 19 1200.  Has off in the cyte compares the considered of a standar gath which as increasing the compares the considered of a standar gath which as increasing the cyte of the condition of the cyte of the condition of the condition of the condition of the condition of the cyte of the condition of the condition of the cyte of the condition of the cyte of the condition of the cyte of the cy			
u.	Actives to an interpretation to Table 1.  The real actives to the control of the	All: The high Propriessoration for a production and all the production and for approximation to all the production to all	Yes Yes Yes Nylk	Ad attriction delivered with Type LL 19 1200.  Has off index you compared to considered or desired gath with an among an amount of the confidence of the control of the confidence or the control of the			
u.	Actives to an interpretation to Table 1.  The real actives to the control of the	All: The high Propriessoration for a production and all the production and for approximation to all the production to all	Yes Yes Yes Nylk	Ad attriction definent with Type 1.1 To 1000.  He of the beginning or compared to consider of a studied gath with an arrange of the cold and the studied by the compared to consider the studied and the studied by the consideration of the cold and the cold and the studied by the consideration because on against the studied by the consideration because on against the studied with a Type 2.1 and the total of the consideration and the cold and the studied by the consideration because on a studied by the consideration because of the cold and the cold			
u.	Actives to an interpretation to Table 1.  The real actives to the control of the	All: The high Propriessoration for a production and all the production and for approximation to all the production to all	Yes Yes Yes Nylk	Ad attriction delivered with Type LL 19 1200.  Has off index you compared to considered or desired gath with an among an amount of the confidence of the control of the confidence or the control of the			
u.	And the second of the second o	All - Design benginements be open finder to all the committee of the commi	Yes Yes Yes Nylk	Manufacture defined with Type 3.1 RS 1004.  Note of the best percentage on the control of state of a pain to set as strong, not been also set of the control			
<u>u</u>	And the second of the second o	A.1: The physician control to a special control to the population to the population to the population to the particular	To all naryless	Ad attriction delivered with Type LL 19 1200.  Has off index you compared to considered or desired gath with an among an amount of the confidence of the control of the confidence or the control of the			
<u>u</u>	And the second of the second o	All - Design Programments  to specification and all  the specification and all  the specification and all  All - Martial Regularizations  All - Martial Regularizations  for specification to all  for specifications to all  for specification to all  for specifications to all specifications to all  for specifications to all specification	To all naryless	Manufacture defined with Type 3.1 RS 1004.  Note of the best percentage on the control of state of a pain to set as strong, not been also set of the control			
	And the second of the second o	A.1 - The production to the company of the company	To add nearphon  To add nearphon  To add nearphon	Manufacture defined with Type 3.1 RS 1004.  Note of the best percentage on the control of state of a pain to set as strong, not been also set of the control			
	And the second of the second o	All - Design Programments  to specification and all  the specification and all  the specification and all  All - Martial Regularizations  All - Martial Regularizations  for specification to all  for specifications to all  for specification to all  for specifications to all specifications to all  for specifications to all specification	To all naryless	Manufacture defined with Type 3.1 RS 1004.  Note of the best percentage on the control of state of a pain to set as strong, not been also set of the control			
	And the second of the second o	B. I. Stephenson and the second secon	To add nearphon  To add nearphon  To add nearphon	Manufacture defined with Type 3.1 RS 1286.  Had did that you to compare the contribution of standard grade to set as strong, to the contribution of the contribution o			
	And the second of the second o	B. I. Stephenson and the second secon	To add nearphon	Manufacture defined with Type 3.1 RS 1286.  Had did that you to compare the contribution of standard grade to set as strong, to the contribution of the contribution o			
MAI	And the state of the second of	But supplied and s	To adh marylam  To adh marylam  To adh marylam  To adh marylam	Manufacture defined with Type 3.1 (5) 1250.  What of their ways assumed to consider of parts used as strong, and was strong and the same of the same o			
	Advantage of the Control of the Cont	All the high the injuries and the second of	To all anythin	Manufacture defined with Type 3.1 RS 1286.  Had did that you to compare the contribution of standard grade to set as strong, to the contribution of the contribution o			
MAIN MAIN MAIN MAIN MAIN MAIN MAIN MAIN	And the state of t	B. S. Hough Regularization  The committee of the committe	To adh marylam  To adh marylam  To adh marylam  To adh marylam	Manufacture defined with Type 3.1 (5) 1250.  What of their ways assumed to consider of parts used as strong, and was strong and the same of the same o			
MALE STATE OF THE	And the second of the second o	All - Design Requirements to expendent to an	To add nearplane	Manufacture defined with Type 1.1 to 1.20%.  What did that you supposed to consider the standard gasts used as it was a form of the standard gasts used as it was a form of the standard gasts used as it was a form of the standard gasts used as it was a form of the standard gasts used as it was a form of the standard gasts used as it was a form of the standard gasts and the standard gasts as it was a form of the standard gasts and the			
MALE STATE OF THE	And the second of the second o	But the proper through the contract of the con	To add narylan	Manufacture defined with Type 1.1 to 1.20%.  What did that you supposed to consider the standard gasts used as it was a form of the standard gasts used as it was a form of the standard gasts used as it was a form of the standard gasts used as it was a form of the standard gasts used as it was a form of the standard gasts used as it was a form of the standard gasts and the standard gasts as it was a form of the standard gasts and the			
MANAGEMENT OF THE PARTY OF THE	And the second of the second o	But the proper through the contract of the con	To add nearphon  To add	Manufacture defined with Type 3.1 (5) 1250.  What of their ways assumed to consider of parts used as strong, and was strong and the same of the same o			
MAI	And the second of the second o	All - Design Requirements to expendent to an	To add nearplane	Manufacture deficient and Type 2.1 TO 1286.  What of the law yet semporarise to reminde a facility of path used in strong, and a seminary and			
MAI	And the state of the second of the state of the second of the state of the second of t	All 1 miles the region of the control of the contro	To add nearplans	Manufacture administration Type 3.1 To 1986.  All the last of the control of the control of the last o			
SALAL	And the state of t	But a see Section 1 to 1	To add nearplane	Manufacture definement with Type 3.1 TO 1288.  The distribution of the control of			
SALE SALE SALE SALE SALE SALE SALE SALE	And the second of the second o	All 1 miles the region of the control of the contro	To adh morphus	Manufacture administration Type 3.1 The 1986.  As the last for the company of the control of dealer gaths has it is more, and the control of the control of the control of dealer gaths has it is more, and the control of the three control of the three control of the control of the control of the control of the three control of the control of the control of the control of the three control of the control of the control of the control of the three control of the control of the control of the control of the three control of the control of the control of the control of the three control of the control of the control of the control of the three control of the control of the control of the control three control of the control of the control of the control three control of the control of the control of the control three control of the control of the control of the control three control of the control of the control of the control three control of the control of the control of the control three control of the control of the control of the control of the three control of the control of the control of the control of the three control of the			
MAI	And the state of the second of the state of the second of the state of the second of t	All 1 miles the region of the control of the contro	To add nearplans	Manufacture definement with Type 3.1 TO 1288.  The distribution of the control of			



## Hose, cable and termination management

Key to long term reliability







## Acknowledgements



The author would like to thank all those within the OneSubsea and wider SLB organisations who have supported the controls connector portfolio developments



Jon Turner

Diamould Product Champion

JTurner12@slb.com

+44 1229 848323

### Contact us



Rossa Miller

CCC Engineering Manager

RMiller42@slb.com

+44 1229 848366