

IEC/PAS 80005-3:2014-08 (E)

Utility connections in port - Part 3: Low Voltage Shore Connection (LVSC) Systems - General requirements

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references.....	9
3 Terms and definitions	10
4 General requirements	12
4.1 System description.....	12
4.2 Distribution system.....	13
4.2.1 General	13
4.2.2 Equipotential bonding.....	13
4.3 Compatibility assessment before connection.....	14
4.4 LVSC system design and operation	14
4.4.1 System design	14
4.4.2 System operation	14
4.5 Personnel safety	15
4.6 Design requirements	15
4.6.1 General	15
4.6.2 Protection against moisture and condensation	15
4.6.3 Location and construction.....	15
4.6.4 Electrical equipment in hazardous areas.....	15
4.7 Electrical requirements.....	16
4.8 System study and calculations.....	16
4.9 Emergency shutdown including emergency-stop facilities	17
5 LV shore supply system requirements	18
5.1 Voltages and frequencies	18
5.2 Quality of LV shore supply.....	19
6 Shore-side installation	20
6.1 General.....	20
6.2 System component requirements.....	20
6.2.1 Circuit-breaker and disconnector	20
6.2.2 Transformer	20
6.2.3 Neutral earthing resistor	20
6.2.4 Equipment earthing conductor bonding	21
6.3 Shore-to-ship electrical protection system.....	21
6.4 LV interlocking	22
6.4.1 General	22
6.4.2 Operating of the low-voltage (LV) circuit-breakers and disconnectors	22

6.5	Shore connection convertor equipment	22
6.5.1	General	22
6.5.2	Degree of protection	23
6.5.3	Cooling	23
6.5.4	Protection	23
7	Ship-to-shore connection and interface equipment	23
7.1	General.....	23
7.2	Cable management system	24
7.2.1	General	24
7.2.2	Monitoring of cable tension.....	24
7.2.3	Monitoring of the cable length	25
7.2.4	Connection conductor current unbalance protection	25
7.3	Plugs and socket-outlets	25
7.3.1	General	25
7.3.2	Pilot contacts	28
7.3.3	Earth contact	28
7.4	Ship-to-shore connection cable	28
7.5	Independent control and monitoring cable.....	28
7.6	Storage.....	28
8	Ship requirements	29
8.1	General.....	29
8.2	Ship electrical distribution system protection.....	29
8.2.1	Short-circuit protection	29
8.2.2	Earth fault protection, monitoring and alarm.....	29
8.3	Shore connection switchboard	29
8.3.1	General	29
8.3.2	Circuit-breaker and disconnectors	29
8.3.3	Instrumentation and protection	30
8.4	On-board transformer.....	30
8.5	On-board receiving switchboard connection point.....	30
8.5.1	General	30
8.5.2	Circuit-breaker	30
8.5.3	Instrumentation	31
8.5.4	Protection	31
8.5.5	Operation of the circuit-breaker	32
8.6	Ship power restoration	33
9	LVSC system control and monitoring.....	33
9.1	General requirements.....	33
9.2	Load transfer via blackout	33
9.3	Load transfer via automatic synchronization.....	33
9.3.1	General	33
9.3.2	Protection requirements	34
10	Verification and testing	34
10.1	General.....	34
10.2	Initial tests of shore-side installation	35
10.2.1	General	35
10.2.2	Tests	35
10.3	Initial tests of ship-side installation	35
10.3.1	General	35
10.3.2	Tests	35
10.4	Tests at the first call at a shore supply point	36
10.4.1	General	36
10.4.2	Tests	36

11	Periodic tests and maintenance	36
11.1	General.....	36
11.2	Tests at repeated calls of a shore supply point.....	36
11.2.1	General	36
11.2.2	Verification	36
12	Documentation	37
12.1	General.....	37
12.2	System description.....	37
Annex A	(normative) Ship-to-shore connection cable	38
A.1	Rated voltage.....	38
A.2	Rated section / type	38
A.3	General design.....	38
A.3.1	General	38
A.3.2	Conductors	38
A.3.3	Earth conductors.....	39
A.3.4	Pilot conductors	39
A.3.5	Cabling	39
Annex B	(normative) Ship-to-shore connection plugs, socket-outlets, ship connectors and ship inlets	40
B.1	Rated voltage.....	40
B.2	Rated type	40
B.3	General design.....	40
B.3.1	General	40
B.3.2	Configuration	41
Annex C	(normative) Additional requirements for Offshore Supply, Service and Working Ships	42
C.1	Scope	42
Annex D	(normative) Additional requirements for Container Ships.....	44
D.1	Scope	44
Annex E	(normative) Additional requirements for Tankers	46
E.1	Scope	46
Annex F	(normative) General operating procedures	49
Bibliography		50
Figure 1	– Block diagram of a typical LVSC system	13
Figure 2	– Phase sequence rotation – Positive direction	18
Figure 3	– Balanced three-phase variables in time domain.....	19
Figure 4	– Safety loop circuit for one feeder (a) or three feeders (b), for LVSC system.	27
Figure 5	– Diagram showing the use of accessories.....	37
Figure B.1	– Connection with mobile cable reel	41
Figure B.2	– Connection with fixed cable reel	41
Figure C.1	– Example for general system layout	42
Figure C.2	– Power plug and socket-outlet contact assignment	43
Figure D.1	– Example for general system layout	44
Figure D.2	– Power plug and socket-outlet contact assignment	45
Figure E.1	– Example for general system layout	46

Figure E.2 – Power plug and socket pin assignment	47
Figure E.3 – IS Barrier and cable properties (to be developed)	48
Figure E.4 – Safety loop circuit for LVSC system in tankers (to be developed)	48
Figure F.1 – LVSC general operating procedures for connection a) and disconnection b)	49
Table B.1 – Number of feeders function of power demand and voltage.....	41