

Telecom subsystems

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Foreword

The NORSOK standards are developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness for petroleum industry developments and operations. Furthermore, NORSOK standards are, as far as possible, intended to replace oil company specifications and serve as references in the authorities' regulations.

The NORSOK standards are normally based on recognised international standards, adding the provisions deemed necessary to fill the broad needs of the Norwegian petroleum industry. Where relevant, NORSOK standards will be used to provide the Norwegian industry input to the international standardisation process. Subject to development and publication of international standards, the relevant NORSOK standard will be withdrawn.

The NORSOK standards are developed according to the consensus principle generally applicable for most standards work and according to established procedures defined in NORSOK A-001.

The NORSOK standards are prepared and published with support by The Norwegian Oil Industry Association (OLF), The Federation of Norwegian Industry, Norwegian Shipowners' Association and The Petroleum Safety Authority Norway.

NORSOK standards are administered and published by Standards Norway.

Annex A is informative and Annex B is normative.

Introduction

The main objective of this NORSOK standard is to contribute to an optimum and cost effective design of telecommunication subsystems based on experience and general practice in the industry.

Edition 4 of this NORSOK standard has undergone an editorial change from edition 3 to make it consistent with the general technical development within telecommunication.

- Clause 1 to clause 4 are updated
- System 11 – Public address and general alarm (PAGA): Technical and editorial updates. The abbreviation is changed to PAGA. The annexes are removed
- System 12 – Drillers intercom: Editorial updates
- System 24 – Office data and telephone cabling network: Technical and editorial updates. The number of cables and requirements for cable type is changed
- System 41 – General radio: Technical and editorial updates. Annex (B) is updated.
- System 42 – UHF radio and paging: Technical and editorial updates
- System 43 – Audio and video entertainment: Technical and editorial updates. Standard for digital system is included
- System 51 – Closed circuit television (CCTV): Technical and editorial updates
- System 52 – Meteorological observation: Technical and editorial updates to confirm with new authority requirements
- System 53 – Marine radar and automatic identification system (AIS): Technical and editorial updates. AIS has been included
- System 81 – Main distribution frame (MDF): Technical and editorial updates
- System 82 – Telecom power supply: Technical and editorial updates
- System 83 – Real time clock: Technical and editorial updates
- System 84 – Telecommunication management system: Technical and editorial updates

1 Scope

This NORSOK standard specifies the subsystems given revision status in the table below.

Subsystem	Title	Revision status
86-00	General	Edition 4 of February 2010
86-11	Public address and general alarm (PAGA)	Edition 4 of February 2010
86-12	Driller's intercom	Edition 4 of February 2010
86-21	Telephone system (PABX)	
86-22	Multiplexer	
86-23	Office data network equipment	
86-24	Office data and telephone cabling network	Edition 4 of February 2010
86-31	Radio links	
86-35	Satellite links	
86-36	Wireless broadband access network	
86-37	Vessel network (coastal VHF and mobile telephone base stations)	
86-39	Fibre optic cable links	
86-41	General radio	Edition 4 of February 2010
86-42	UHF radio and paging	Edition 4 of February 2010
86-43	Audio and video entertainment	Edition 4 of February 2010
86-45	Personnel tracking	
86-51	Closed circuit television (CCTV)	Edition 4 of February 2010
86-52	Meteorological observation	Edition 4 of February 2010
86-53	Marine radar and automatic identification system (AIS)	Edition 4 of February 2010
86-54	Aviation radar	
86-55	Communication recorder	
86-61	Shuttle tanker loading telemetry	
86-62	Work over telemetry	
86-63	Pipeline telemetry	
86-70	Navigational aids	
86-71	Distance measuring instrument	
86-72	ATIS/AFTN for aviation	
86-73	Positioning	
86-81	Main distribution frame (MDF)	Edition 4 of February 2010
86-82	Telecom power supply	Edition 4 of February 2010
86-83	Real time clock (RTC)	Edition 4 of February 2010
86-84	Telecommunication management system	Edition 4 of February 2010

NOTE The telecommunication subsystems given subsystem number, but no revision status, are normally specified by Company.

Requirements for telecommunication systems are specified in NORSOK T-001.

2 Normative and informative references

The following standards include provisions and guidelines which, through reference in this text, constitute provisions and guidelines of this NORSOK standard. Latest issue of the references shall be used unless otherwise agreed. Other recognized standards may be used provided it can be shown that they meet the requirements of the referenced standards.

2.1 Normative references

ANSI S 3.5,	Methods for the calculation of the articulation index.
IEC 60268-16,	Sound system equipment Part 16: Objective rating of speech intelligibility by speech transmission index
BSL D 5-1,	CAA-N: "Forskrift om kontinentalsokkelflyging - ervervsmessig luftfart til og fra helikopterdekk på fartøy og innretninger til havs" (in Norwegian only)
BSL G 7-1,	CAA-N: "Forskrift om flyværtjeneste" (in Norwegian only)

CENELEC CLC/TR 50427,	Assessment of inadvertent ignition of flammable atmospheres by radio-frequency radiation - Guide
G.703,	Physical/electrical characteristics of hierarchical digital interfaces (ITU-T recommendation)
G.652,	Characteristics of a single-mode optical fibre and cable (ITU-T recommendation)
G.811,	Timing characteristics of primary reference clocks (ITU-T recommendation)
G.812,	Timing requirements of slave clocks suitable for use as node clocks in synchronization networks (ITU-T recommendation)
IEC 60849,	Sound systems for emergency purposes
NEK TS 606,	Cables for offshore installations, halogen-free and/or mud resistant.
NEK EN 50083-7,	Cable distribution systems for television and sound signals – Part 7: System functionality.
NEK EN 50173- (all parts),	Information technology - Generic cabling systems – (all parts)
	NOTE For amendments not included in NEK EN 50173 series, see ISO/IEC 11801.
NEK EN 50174- (all parts),	Information technology - Cabling installation – (all parts)
NEK EN 55022,	Limits and methods of measurement of radio disturbance characteristics of information technology equipment
NMEA 0183,	National Marine Electronics Association (USA) – Standard for interfacing marine electronic devices
NORSOK N-002,	Collection of metocean data
NORSOK T-001,	Telecom systems
OLF Helideck Manual,	OLF Helideck Manual
RS 232,	Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange.
RS 422,	Electrical Characteristics of Balanced Voltage Digital Interface Circuits
V.11,	Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbit/s (ITU-T recommendation)
V.24,	List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) (ITU-T recommendation)
V.28,	Electrical characteristics for unbalanced double-current interchange circuits (ITU-T recommendation)
2/4 wire E&M,	Industry standard for DC signalling for analogue voice circuits

2.2 Informative references

ISO/IEC 11801,	Information technology – Generic cabling for customer premises (for amendments not included in NEK EN 50173 series)
IEC 60268-16,	Sound system equipment – Part 16: Objective rating of speech intelligibility by speech transmission index

3 Terms, definitions and abbreviations

For the purposes of this NORSOK standard, the following terms, definitions and abbreviations apply.

3.1 Terms and definitions

3.1.1

can

verbal form used for statements of possibility and capability, whether material, physical or casual

3.1.2

category

specification for cables defined in NEK EN 50173

3.1.3

Company

contractual responsible company

3.1.4**link class**

link classification defined in NEK EN 50173

3.1.5**may**

verbal form used to indicate a course of action permissible within the limits of this NORSOK standard

3.1.6**shall**

verbal form used to indicate requirements strictly to be followed in order to conform to this NORSOK standard and from which no deviation is permitted, unless accepted by all involved parties

3.1.7**should**

verbal form used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required

3.2 Abbreviations

AC	alternating current
AFTN	aeronautical fixed telecommunications network
AGC	automatic gain control
AIS	automatic identification system
ALC	automatic level control
AM	amplitude modulation
ANSI	American National standards Institute
ARPA	automatic radar plotting aid
ATEX	ATmosphères EXplosibles, (EU Directive covering "Equipment intended for use in potentially explosive atmosphere")
ATIS	automatic terminal information service
APS	abandon platform shutdown
Auto-METAR	auto aviation routine weather report
BSL	Bestemmelser for sivil luftfart
CAA-N	Civil Aviation Authority – Norway ("Luftfartstilsynet")
CCR	central control room
CCTV	closed circuit television
CD	compact disc
CENELEC	European Committee for Electrotechnical Standardisation
COMSAR	radiocommunications and search and rescue
DC	direct current
DSC	digital selective calling
DVB	digital video broadcast
DVD	digital video disc
E&M	telephone channel signalling interface
EN	European Standard
EPIRB	emergency position indicating radio beacon
ETSI	European Telecommunication Standard Institute
ESD	emergency shut down
F&G	fire and gas
FM	frequency modulation
GMDSS	global maritime distress and safety system
HD	high definition
HDMI	high definition media interface
HF	high frequency
GPS	global positioning system
IEC	International Electrotechnical Commission
IEEE	Institute for Electrical and Electronic Engineers
IDC	insulation displacement connection
IMO	International Maritime Organization
IP	internet protocol
IRE	Institute of Radio Engineers

ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ITU	International Telecommunication Union
LAN	local area network
MAN	metropolitan area network
MDF	main distribution frame
METAR	aviation routine weather report
metocean	meteorological and oceanographic
Met.no	Meteorologisk institutt (Norwegian meteorological institute)
MF	medium frequency
MPEG	moving picture expert group
MRU	motion reference unit
NAVTEX	Navigational and Meteorological Warning Broadcasting Service
NDB	non-directional beacon
NEK	Norsk Elektroteknisk Komite
NMEA	National Marine Electronics Association
NMD	Norwegian Marine Directorate ("Sjøfartsdirektoratet")
NTP	network time protocol
OLF	Oljeindustriens Landsforbund
OPC	OLE for Process Control, where OLE stands for "object linking and embedding"
PA	public address
PAGA	public address and general alarm
PABX	private automatic branch exchange
PAL	phase alternating line
PC	personal computer
PMS	position mooring system
pps	puls per second
PSA	Petroleum Safety Authority Norway ("PTIL – Petroleumstilsynet")
PTT	push to talk
RASTI	rapid speech transmission index
RF	radio frequency
RJ	registered jack
RMS	root mean square
RTC	real time clock
RFID	radio frequency identification
SAS	safety and automation system
SART	search and rescue transponder
SIF	standard interface format
SINAD	signal-plus-noise-plus-distortion to noise-plus-distortion ratio
SMS	short message system
SNMP	simple network management protocol
SOIL	secure oil information link (oil and gas industry network)
SOLAS	safety of life at sea
STI	speech transmission index
STIPA	speech transmission index public address
STP	shielded twisted pair
SWR	standing wave ratio
TCP	transmission control protocol
TDMA	time division multiple access
TETRA	terrestrial trunked radio
TIU	telecommunication interface unit
TMS	telecommunication management system
TV	television
UHF	ultra high frequency
UPS	uninterruptable power supply
UTC	coordinated universal time
UTP	unshielded twisted pair
VHF	very high frequency
VU	volume unit
WAN	wide area network

4 General functional requirements

4.1 General

The requirements in this clause are common to all subsystems, in addition to what is described for each subsystem.

4.2 Reliability

Telecommunication systems shall have a modular design for high reliability and easy replacement of faulty modules/units. Each module/unit shall be designed for high reliability.

To avoid total loss of functionality for a subsystem, if a module fails, the following apply:

- emergency communication systems (according to NORSOK T-001) or critical modules in these systems shall be redundant;
- critical modules in systems that are important for operation or for support during an emergency situation according to Company requirements shall be redundant.

4.3 Process/ambient conditions

Equipment shall be designed to operate at environmental conditions according to project requirements.

4.4 Operational requirements

All subsystems shall be arranged for easy, safe and reliable operation. Equipment control panels should have text in the operator's national language, or unambiguous symbolic marking, explaining the operation of all controls.

4.5 Maintenance requirements

Design shall allow for maintenance of equipment, or parts of equipment, quickly and with minimum disruption of service.

4.6 Commissioning requirements

Design shall allow for testing and commissioning of subsystems and individual equipment with minimum disruption of normal operation.

4.7 Isolation and sectioning

Some subsystems will lose mains power or DC power in a shutdown situation. Other subsystems may need the inclusion of shutdown relays or contactors. See clauses for individual subsystems for details.

4.8 General interface requirements

Standard interfaces should be used between equipment and between sub-systems and systems.

Preferred interface standards are

- LAN/WAN according to IEEE standards and Company requirements,
- G.703,
- 2/4 wire E&M,
- V.11 (RS 422),
- V.24/V.28 (RS 232) for short distances, i.e. in the same room.

4.9 Alarm interfaces

For subsystems the following alarms shall be provided (if applicable):

- major subsystem alarm: Alarm to be sent to CCR (via interface to SAS) in addition to presentation at a TMS client;
- minor subsystem alarm: Alarm information to be presented at a TMS client only.

The number of alarm interfaces per subsystems shall be sufficient to differentiate between relevant alarm situations and according to Company operational requirements.

Preferred interface standards are

- ON/OFF outputs. Voltage and earth free changeover relay contacts in equipment,
- SNMP.

4.10 Telecommunication management

In addition to alarm interfaces, the subsystems should (if applicable) have interfaces for remote diagnostics, configuration etc. Interface should be via LAN/WAN.

4.11 PCs and servers

PCs and servers that are used as part of the telecommunication subsystems shall comply with Company requirements.

5 SYSTEM 11 - Public address and general alarm (PAGA)

5.1 General

This clause defines the requirements for the PAGA system on offshore installations, see Figure 1.

The PAGA system shall distribute alarm tones, emergency and routine messages to all or selected areas of the installation. In areas with a high acoustical noise level alarm tones and emergency messages shall be complemented by yellow flashing lights.

The PAGA system shall give audio coverage in all areas where personnel might be present without special entrance permissions.

5.2 Equipment/schematic

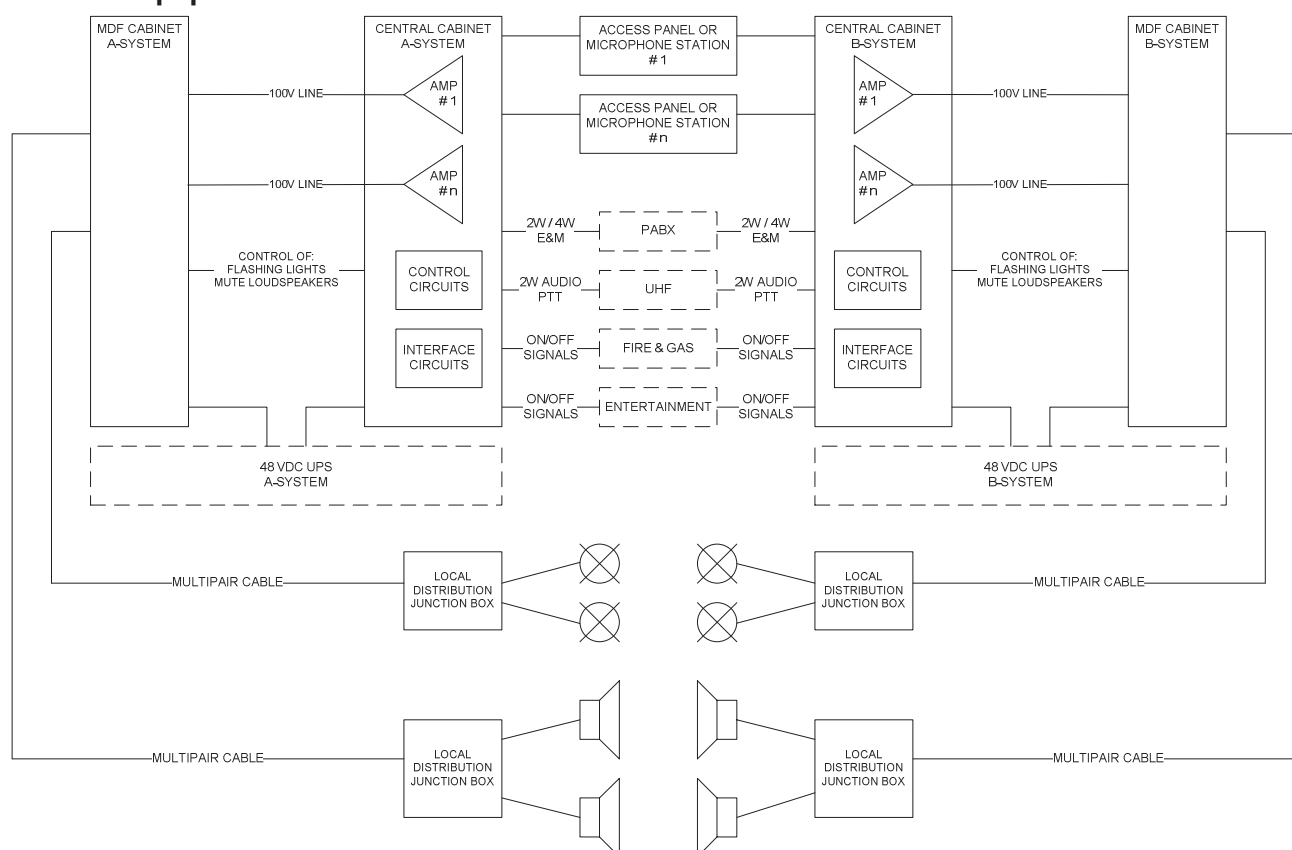


Figure 1 - PAGA system

5.3 Performance

5.3.1 Start up

The PAGA system shall start up automatically and instantly in idle mode after power is regained or system is switched on.

5.3.2 Speech signal conditions

Frequency response: 300 Hz to 7 000 Hz with adjustable frequency shaping

ALC: Slow time constant, adjustable threshold level.

Dynamic range compression: Quick time constant syllabic compressor, adjustable threshold level, to boost average speech power to at least 50 % of peak speech power.

5.3.3 Alarm tone signals

'Muster alarm': Uninterrupted tone with sweeping sinusoidal frequency from 1200 Hz to 500 Hz with sweep period 1 s.

'General alarm': Sinusoidal tone 1 000 Hz, 1 s on, 1 s off.

'Toxic gas alarm': (Only if this alarm is applicable): Sinusoidal tone 1 000 Hz, 0,1 s on, 0,1 s off, in bursts of duration 1 s, alternating with 1 s silence.

5.3.4 Attention signals

Emergency message: Combined signal of 450 Hz and 1 000 Hz unfiltered square wave tones of 1 s duration (gong) to precede speech messages.

Normal message: Sequenced signal of 554 Hz and 440 Hz sinusoidal tones of 1 s duration (ding-dong) to precede speech messages.

5.3.5 Test signal

Test tone: Low level audio signal, e.g. tick tone, for testing of loudspeakers.

Test flashing light: Nominal floating 48 V DC (+20... - 10%)

5.3.6 Amplifier output

Output voltage: Nominal line voltage should be 100 V.

Output idle noise: At standby the A-weighted noise voltage across any loudspeaker shall be at least 70 dB below the nominal line voltage.

5.3.7 Audio coverage with the system in normal operation

Method of calculation: Predicted articulation index for speech shall be according to ANSI S3.5 or equivalent.

Speech in low noise areas: RASTI, STI or STIPA equal to 0,7 or better. Applicable in recreation areas, offices, and similar

Speech in noisy areas: RASTI, STI or STIPA equal to 0,35 or better. Applicable in noisy areas with noise levels from 65 dBA up to 85 dBA.

Speech in high noise areas: For areas with noise level of 85 dBA or more, the system design shall be as if the main noise sources are shut off.

Alarm tones: The input level from the tone generator shall be adjusted such that full power (100V rms) is used for the alarm tones.
Audio levels in cabins should be approximately 75 dBA .

5.3.8 Flashing lights

Actual areas: In areas with background noise level of 85 dBA or more, alarm signals and emergency messages shall be complemented by flashing yellow lights. The flashing lights shall be powered from the same source as the PAGA system.

Option: If toxic gas alarm is used, this alarm shall be complemented by red flashing lights.

5.3.9 Ex-requirements for loudspeakers and flashing lights

All loudspeakers and flashing lights shall comply with ATEX requirements for Zone 1 or Zone 2.

Zone 1 loudspeakers and flashing lights shall be used for Zone 1, Zone 2 and non-hazardous naturally ventilated areas.

Zone 2 loudspeakers may be used in non-hazardous mechanically ventilated areas.

5.4 Regularity

5.4.1 Overall design

Design shall be such that neither single failure in systems, equipment or cabling networks nor any single external event shall cause significant reduction of audio and flashing light coverage in any area. A failure in a microphone station, an access panel or an interface for the PABX may leave that particular part of the system inoperable.

PAGA system A and system B and power supplies for the respective systems should be installed in separate rooms where dimensional accidents in one room shall not impact the other room.

If the A and B systems are installed in the same room, necessary mitigations shall be implemented to minimize risk that a single incident affecting one system will have impact on both systems. Such mitigation could be physical separation of each system to the extent possible.

5.4.2 Power requirement

The PAGA system shall be operative during critical situations and both A and B systems shall be supplied individually from a dedicated DC UPS.

5.5 Operational requirements

5.5.1 Acoustical feedback

Microphones: Means shall be provided to counteract acoustical feedback from operator's microphones and microphone stations.

Telephones: A record/replay facility shall be included to avoid acoustical feedback when telephones are used to access the system.

5.5.2 Muting

Alarm tones: Alarm tones shall be fully muted for the duration of speech messages.

Control rooms and other operational rooms should have possibility to mute alarm broadcasting internally in the room by a manual mute push button in the access panel. If such muting is enabled, it shall not be possible to mute any emergency speech from other originators and the muting shall be reset by timer or when the alarm condition is reset.

Entertainment system: When alarms and emergency messages are broadcast, the PAGA system shall provide a muting signal to the entertainment system (to silence all entertainment audio).

5.5.3 Priorities

Priority programming: The relative priority for the following items shall be easily programmable with full flexibility:

- alarm types (input sources);
- speech modes (alarm and message types).

Cancelling: Cancelling of initiated alarms shall only be possible from access panels, regardless of where the alarm was initiated. This also applies to alarms set automatically by the F&G systems. Only access panel as per Company requirements (e.g. CCR) shall have alarm cancel functionality.

5.5.4 Bypass of alarm

For testing purposes: The central equipment should be provided with a bypass switch key for disable of alarm initiation signals. Upon disable mode, a status signal shall be available for SAS system

5.5.5 Private automatic branch exchange (PABX) interface

Acknowledge: When calling into the PAGA system via the PABX the user shall receive an acknowledge signal before the speech path is made available.

5.5.6 Fire and gas (F&G) interface

The system A and system B shall have individual interfaces for automatic initiation of alarms from the F&G system. Number of interfaces will be according to Company requirements. Any alarm initiation shall be fully operational within 3 s after initiation.

5.5.7 Access panel

Microphone: Goose neck, near field, noise cancelling, insensitive to electromagnetic fields (see electromagnetic compatibility requirements).
Optional: Socket for hand-held microphone with PTT button.

Functionalities: Access panels shall have operator possibility to initiate alarms, cancel alarms, select speech zones and provide emergency and normal messages.

Means shall be provided to avoid unintentionally initiation of alarms. Status of operation mode should be clearly visualized.

If touch-screen type access panel is provided, the monitoring of appurtenant microprocessors and associated software shall as a minimum be according to IEC 60849.

Other facilities: Speech level indicator (VU meter) should be provided.

5.5.8 Microphone stations

Microphone: Handheld, near field, noise cancelling, fitted with PTT button.

Functionalities: Microphone stations shall provide emergency messages to all zones. Microphone stations located in noisy areas (more than 65 dBA) shall be protected by an acoustic hood.

5.6 Maintenance requirements

5.6.1 Supervision

Audio circuits for alarm tones and speech shall be supervised up to and including power amplifiers.

The loudspeaker and flashing lights distribution system shall be supervised for open/short circuit and earth fault. Supervision of high and low load of loudspeaker lines within set limits should be included.

Option: Intelligent surveillance of individual loudspeakers may be implemented according to Company requirements.

5.6.2 Test panel

Central equipment shall have a test panel. In addition to the same function as access panels, the test panel shall include facilities for test of flashing lights, loudspeakers and alarm oscillators. The panel shall also include connection for RASTI, STI or STIPA test instruments.

There shall be a function to test microphone stations without addressing "all zones".

5.7 Interface requirements

From the PABX: 2/4 wire E&M, 600 ohm audio

From a test generator etc:	Balanced audio input, 600 ohm
To the UHF mobile radio:	2/4 wire E&M, 600 ohm audio A voltage free relay contact for transmitter key
From the F&G system:	Input according to the F&G output requirements (normally 24 V DC). The F&G will provide monitoring of the (24 V DC) input. The interface shall be fail safe. If F&G is designed according to SIL, the relay controlled by F&G shall be SIL certified.
To the entertainment system:	Muting shall be a voltage free relay contact. The muting signal shall silence all audio from any entertainment source.
Alarms to TMS:	Major and minor alarms according to the installations alarm handling philosophy.

5.8 Commissioning requirements

In addition to general requirements, the commissioning activities shall include loudspeaker coverage test to ensure that the required intelligibility is met. The method of coverage test should follow IEC 60268-16, preferably by using the STIPA method or the RASTI method.

5.9 Remote operation

For integrated operations where control room at another location need to operate the PAGA system, special interfaces via LAN/WAN may be used. Access panels in such locations shall comply with access panel requirements in this NORSOK standard. Communication with both A systems and B systems shall be redundant.

When access panels are located for remote operation, the sound from the PAGA system shall be available at the same position, regardless of zone selected.

6 SYSTEM 12 - Driller's intercom

6.1 General

This clause defines the requirements for the driller's intercom subsystem on offshore installations.

The system shall provide two way voice communication in drilling related areas, between the driller and drilling personnel, see Figure 2.

A dedicated driller's intercom system may be replaced by radio channels "UHF radio and paging" system (system 42).

6.2 Equipment/schematic

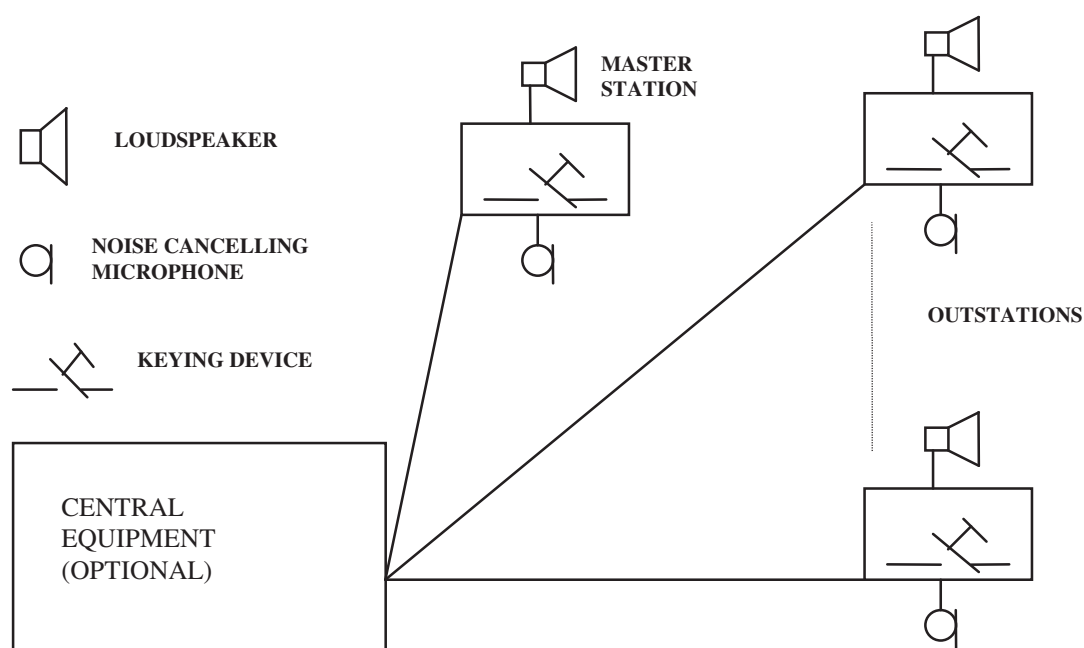


Figure 2 - Drillers intercom system

6.3 Performance

6.3.1 System

Number of speech paths: One.

6.3.2 Speech signal conditioning

Frequency response: 300 Hz to 7 000 Hz with adjustable frequency shaping.

ALC: Slow time constant, adjustable threshold level.

Dynamic range compression: Quick time constant syllabic compressor, adjustable threshold level to boost average speech power to at least 50 % of peak speech power.

6.4 Operational requirements

The operational mode shall be free access, PTT, one-to-all broadcast in a single network that includes a master station and a number of outstations. All stations shall operate in the same way, the only functional difference between the master station and the outstations being that the master station shall have access priority. Microphones shall be noise cancelling near field type.