




University of
Stavanger

Faculty of Science and Technology

MASTER'S THESIS

Study program/ Specialization: Offshore technology / Industrial Asset Management	Spring semester, 2013 Open
Writer: Eng. Carlos Villoria	 (Writer's signature)
Faculty supervisor: J.P. Liyanage External supervisor(s):	
Title of thesis: Propose an alternative method to generate Alarm Management KPI utilizing IMS in Offshore Platforms	
Credits (ECTS): 30	
Key words: Alarm Management Alarm Performance Key Performance Indicator (KPI) Information Management System (IMS) EEMUA 191 ANSI / ISA - 18.2 - 2009 NORSOK I-002 NORSOK I-005	Pages: 90 + enclosure: 1 Stavanger, 10/06/2013

CONTENTS

Acknowledgements.....	5
Abstract	6
1. CHAPTER 1	9
1.1 State of art.....	9
1.2 Basic Terminology.....	10
1.3 Historical Background	14
1.4 Background: Alarm Management in the Norwegian Continental Shelf	15
2. CHAPTER 2	23
2.1 Investigation regarding Alarm Management (methodology).....	23
2.2 Investigation regarding IMS	24
3. CHAPTER 3	26
3.1 Problem definition.....	26
3.2 Justifying	28
3.3 Scope.....	29
3.4 Objectives	30
3.5 Limitations.....	30
4. CHAPTER 4	32
4.1 AMS regulations in the Norwegian Continental Shelf.....	32
4.2 KPI Comparison and Selection.....	37
4.3 Information Managemet System; norms and description	41
4.4 NORSOK I-002	41
4.5 ConocoPhillips 6249 Safety and Automation Systems (SAS)	43
4.6 Data characterization for IMS alarm reporting.	43
4.7 IMS current alarm data model and NORSOK I-005	45

4.8 MA template as Data Model	48
4.9 Alarms in System Control Class 2	50
5. CHAPTER 5	53
5.1 Conclusions.....	53
5.2 Recomendations	56
5.3 Examples of KPI generation based on IMS	57
5.4 Example of IMS alarm data analysis.....	58
6 APPENDIX A	60
REFERENCES	90

LIST OF TABLES:

Table 1: OD Report list of installations.....	17
Table 2: KPIs from OD Report.....	22
Table 3: Standards identification and selection criteria.....	33
Table 4: ANSI/ISA – EEMUA Standards comparison.....	35
Table 5: Statoil TR1494 Alarms KPIs	37
Table 6: ANSI/ISA 18.1 Alarms KPI summary.....	38
Table 7: More appropriate KPIs (MA_KPI)	39
Table 8: MRAM Data Model	46
Table 9: MA Output Terminals (Current Data Model).	49
Table 10: Derivates average KPIs	58

LIST OF FIGURES:

Figure 1: ANSI/ISA 18.1 Alarm Management Lifecycle.....	27
Figure 2: Standardization bodies	32
Figure 3: Conceptual SAS topology: from NORSOK I-002	42
Figure 4: Data flow in SAS Alarm Model.....	51
Figure 5: Data flow in foreign alarm model	51
Figure 6: KPI 3a from dummy system	57
Figure 7: Alarm data analysis using Excel	59

Acknowledgements

Sea bendito el nombre de Dios desde la eternidad hasta la eternidad; porque suya es la sabiduría y el poder. Y Él cambia los tiempos y las sazones; quita reyes, y pone reyes; da la sabiduría a los sabios, y la ciencia a los entendidos. Él revela lo profundo y lo escondido; conoce lo que está en tinieblas, y con Él mora la luz. A ti, oh Dios de mis padres, te doy gracias y te alabo....

Libro de Daniel

To my wife Susana..

El hombre que halla esposa encuentra un tesoro, y recibe la bendición del Señor Jehová.

Proverbios 18:22

Thanks to Mr Håkon Tysse from Statoil whom gave me the valuable report from Petroleum Directorate. It was very useful in understanding of the current situation of Alarm Management in the Norwegian Continental Shelf. He also was patient enough in responding my e-mails.

Thanks to my friends and supervisors of SIEMENS A.S Akintokunbo Oke and Esven Balze for their authorization in utilizing SIEMENS Automation Laboratories for this job

Thanks to my friends Rafel Haseeb and Yngve Sund for their references and support in reaching people regarding with the realization of this job.

Abstract

Weaknesses regarding alarm management practices have been recognized as partial causes of plant incidents with tragic results, for example the Texas City Oil Refinery explosion in 2005. Necessity in alarm regulation was recognized by industry bodies and norms were created (EEMUA 119, ANSI/ISA 18.2) in order to address this. These norms define a complete alarm management lifecycle, including the definition of an alarm performance monitoring process with the supervision of alarm's key performance indicators (KPI)

Alarm KPI generation in oil installations is a complex technological task and generally includes the integration of alarms coming from different sources in the process plant. The Information Management Systems (IMS) as defined in Norsok I-002 as the natural gathering engine for process data in an offshore installation. The utilization of IMS in Alarm Management Purposes is included in this Norsok standard.

The original driver of this investigation was that Offshore Platforms in the Norwegian Continental Shelf do not utilize IMS for Alarm Management KPI generation, despite their intense utilization of IMS for other purposes. Technical reasons for this practice are not known.

In order to evaluate the current capacity of IMS in alarm KPI generation, a minimum required set of KPIs was established although different standards show variations between KPIs. The data structure gathered inside IMS in related to alarms (alarms metadata) was compared against the established set of KPIs. The main study finding conclude that data contained whiting the IMS structure is currently not enough for generate the priority- related KPIs, mainly because alarm priority is not included in current IMS.

In general terms; IMS data structure is not defined by NORSOK and even when included in some industry related regulations (as Statoil TR2258) Alarm Priority is not considered to be part of Alarm metadata.

The above finding points to an easy solution and raises questions regarding lack of “data priority” in the IMS data structure. This comes from a lack of regulation in IMS Implementation, mainly because of NORSOK standards.

During this job, some other important questions arose and were included in our conclusion. The correct integration of alarms coming from Control System Class 2 is a very important technological issue. NORSOK alarms related statements are included as part of regulation regarding SAS (I-003) and SCD (I-005); for this reason the integration of SAS generated

alarms are extensively treated but this “foreign alarms” and not completely addressed and, in some aspects, forgotten.

This job pretends to be a contribution for more safe and robust control systems in the Norwegian Continental Shelf. Even when this thesis was wrote to be understood under NORSOK and Norwegian regulations; Information Management Systems¹ are extensive utilized in oil installations around the world, up and down stream, when the same concerns regarding Alarm Management, Alarm KPI Generation and Alarm Performance Management are still present. For this reason is expected that this thesis can be also from interest not only in the Norwegian Continental Shelf but also in oil installations abroad.

¹ IMS; stand for Information Management System is a name defined in NORSOK I-002 and consequently is a Norwegian term. However systems with the same capabilities are widely utilized in oil installations worldwide. Description and utilization of IMS will be in other chapters.

1. CHAPTER 1

1.1 State of art

Since alarm management has been a subject of concern for the industry in recent years, a high amount of research around it have been conducted.

Research regarding human factors had been mainly focused in capacity of human operators for responding to process alarms under stress conditions. Numbers of alarms per minute; effectiveness of alarms and ergonomics factors in alarm design have been some of the basic research in this area. This basic research had been carried out in general for universities, and a lot of pertinent information is available.

Other direction in research effort had been conducted for Industry Users Organization (i.e. EEMUA); Normative Organization (ISA; IEC) and country industry authorities (i.e. OD) to produce a series of technical regulations to be following for process industries' operators worldwide.

Definition of Alarm Management lifecycle as is presented in both EEMUA 191 and ANSI/ISA-18.2-2009 opening the necessity for more detailed, process oriented guidelines and engineering practices. These guidelines have been normally developed for companies for its internal use showing a high detailed level of implementation's requirements, as for example Statoil Technical Requirement TR1494.

All the norms and regulations mentioned above, deals on *what* to do in order to accomplish the required goals. In the case of Alarm Performance Management (that is just a small piece on the entire Alarm Management Lifecycle) the implementation, tools and procedures for accomplish that

goals had been let to decision of users. In that sense, the utilization of Information Management Systems had been assessed (at least partially) by oil companies in the NCS during their process of choosing Alarm Performance Management's tools. This option looks the first logical choice because IMS is a powerful tool normally utilized in old installations and, by sure, a system to be implemented in new developments. As far as we know, IMS had been considered not able to generate Alarm Management KPIs according accepted standards and decision have been taken in the use of specific tools available in the market that, however, could be expensive and difficult to implement. The rational of this decision have not been available for this investigation.

1.2 Basic Terminology

Alarm	An audible and/or visible means of indicating to the operator an equipment malfunction, process deviation or abnormal situation requiring a response (from ANSI/ISA-18.2)
Alarm flood	A condition in wich the number of alarms reaching the control room is greater that the operator can effectivelly manage.
Alarm Management	Application of human factors along with instrumentation engineering and systems thinking to manage the design of an alarm system to increase its usability (taken from Wykipedia)
Alarm Performance Indicators	Indicators of behavior and statuses os alarm systems. Necessary to avoid the tendency of alarms systems to decay in time.

Alarm Philosophy	A document that stabilised the basic definitions, principles and process to design, implement and maintain an alarm system.
ANSI	The American National Standards Institute
DCS	Distributed Control Systems.
EEMUA	Engineering Equipment & Materials Users' Association (EEMUA) in the UK
Foreign alarms	Alarms generated in systems other than SAS but that have to be integrated into SAS HMI.
Function Block (FB)	Logical piece of software represented as a block with inputs and outputs according IEC 61131-3
Function template	In NORSOK I-005 standard (SCD) the defined logic functionality, with input terminals (receiving actions from other functions) and output terminals (initiating actions towards other functions) is called function templates. (See I005 Rev 3 anex A)
HMI	Human Machine Interface
IEC	International Electrotechnical Comitee
ISA	International Society of Automation
ISO	International Standards Organization

IMS	Information Management System; system in charge of operational data collection in process plants. IMS is defined in NORSOK I-002 but systems with the same purposes and functions are widely utilized worldwide in oil installations. Other definitions of IMS are also widely utilized in different context but are not of interest for this job
KPI	Key Performance Indicators; refers to alarm indicators in this job
MA_KPI	More appropriate KPIs
Metadata	Data regarding data; in this job the name is utilized when describing data models for Alarm KPI
MRAM	Minimum Required Alarm Metadata.
MODBUS	Serial communication protocol from Modicom (1979) originally designed to be utilized in PLC communications. Nowadays is the de-facto standard for systems`s communication in the automation industry.
NCS	Norwegian Continental Shelf
NORSOK	Norwegian standars developed for oil industries and supported by Norwegian Oil Industry Asociation and the Federation of Norwegian Manufacturing Industries.
OD	Norwegian Petroleum Directoraty

OPC	OLE fro Process Control.
PSA	Petroleum Sagfety Authority from Norway
SAS	Safety and AutomatiOS Systems. DCS designed according NORSOK I-002 specifications
SAS alarms	Alarms generated and displayed at SAS.
SCD	System Control Diagrams defined in NORSOK I-005
SQL	Structured Query Language, high level programming code utilized for Data Base consulting.
tag	Basic identificator for data records, instruments, signals and functions in industrial automation.

1.3 Historical Background

The operation of highly complex industrial process is not possible without the utilization of computerized control system. IT and electronic technologies applied to process instrumentation have lead to the development of powerful Control Systems that are able to operate complex Oil Platform under safe and profitable conditions.

Legacy control systems were originally made by “wired-logic” whit relays as the main constructive block. Legacy HMI`s were based on “mimic panels” with lights, buttons and gauges to indicate operators the statuses of process variables. Alarm Generation in those legacy systems was limited mainly because mimic panels could only; by practical reasons; display a limited numbers of alarms.

Practical limitations in alarm`s generation were overcome by the introduction of computer based control systems, where practically every change in any process variable could be addressees to the Control Room and displayed in a computer based HMI. Under such conditions, the indiscriminate creation of unnecessary alarms and the lack on Alarm Management strategies led to undesired and potentially dangerous situations as for example the existence of forgotten unacknowledged alarms (Stale alarms) or the generation of a large numbers of alarms in a short period of time, generally when an unexpected process condition is reached (alarm flow).

According the Health and Safety Executive of the United Kingdom (see <http://www.hse.gov.uk/humanfactors/topics/alarm-management.htm>)

“There is a great deal of evidence relating to the role of poorly design alarm systems in major incidents, for example the staff at Milford Haven

Refinery were faced with a barrage of alarms for five hours preceding the incident.”

These and other undesired conditions were finally recognized and addressed in an organized manner with the EEMUA² Publication 191 “Alarms Systems - A Guide to Design, Management and Procurement “ released in 1999 (a second edition released in 2007) that became rapidly the de-facto standard for alarm management in the industry . In 2009 the American National Standard Institute released the ANSI/ISA-18.2-2009 “Management of Alarms for the Process Industries” that is expected to become into the international standard IEC 62682.

EEMUA 191 first time introduces considerations of Human Factors into Alarm Management in several aspects (e.g. rationalization, risk assessments and graphic designs). One of the main questions introduced is the number of alarms that can be effectively managed for a human operator in a short period of time (generally 10 min. or less) Also, remarks that, during normal plant operation an Alarm Performance Monitoring System is necessary to avoid the operation’s process decay into undesired conditions related to alarms. For those important purposes EEMUA 191 also introduces the definition of basic KPIs for continuous Alarm Performance Monitoring. These KPIs are more extensively defined in ANSI/ISA-18.2-2009.

1.4 Background: Alarm Management in the Norwegian Continental Shelf.

Concerns regarding the situation of Alarm Managements in the Norwegian Continental Shelf arose in the early 2000 after EEMUA-191 focus the worldwide attention to dangerous situations hidden into alarm system’s oil facilities.

² EEMUA: Engineering equipments and materials users association

In February 2001 The Norwegian Petroleum Directory (OD for short) releases the YA -711 the “Principles for Alarm Basis Design” (YA-710 in Norwegian). This document is strongly based in EEMUA-191 which is considered a “Best Practice standard for development and operation of alarm systems for the British petroleum industry.”

NORSOK I-002 Rev 2 (Safety and Automation, SAS, Systems) was also released in 2001 and, contains valuable guidelines regarding alarms design and management (See chapter 4.4.5). NORSOK I-002 also gives Alarm and Event specific definition.

Also between August 2000 and September 2002 The Norwegian Oil Directorate carried out a complete assessment regarding the state of Alarm Management Systems for several offshore platforms in the North Sea; the assessment’s report was published in Jun 2003 under the title of:

”Oppsummering etter gjennomført tilsyn med alarmsystemer på produksjonsinnretninger på norsk sokkel I perioden august 2000 til september 2002”

The report (“OD Report” for short) is available from the website of the Norwegian Petroleum Safety Authority: and even when limited, was considered to be “representative on the status of the Alarm Management Systems for other installations in the NCS at the date of been issued”

For the elaboration of the OD Report; the following installations were evaluated (see Table 1):

Innretning	Type	Tidspunkt for Tilsyn	Operatør	SAS leveradør
Draugen	Fast	16.08-18.08-2000 (9)	Shell	ABB
Oseberg A	Fast	30.10-1.11-2000 (8)	Hydro	Siemens
Jotun A	FPSO	13.11-15.11-2000 (7)	ExxonMobil	Honeywell
Heidrun	TLP	17.4-19.4-2001 (8)	Statoil	Simrad
Visund	Flyter	12.11-14.11-2001 (8)	Hydro	Siemens
Ula	Fast	15.07-17.07-2002 (5)	BP	Honeywell
Ekofisk	Fast	17.09-19.09-2002 (13)	ConocoPhillips	ABB

Table 1: OD Report list of installations

According OD Report; "...Deficiencies related to the control and alarm systems have contributed to process deviations. Disruptions have been developed into adverse events. Deficiencies in the system make it further difficult for control room's operators the early detection of process deviations, so that appropriate mitigating actions can be taken to maintain the process in safe and stable operation..."

The main results for completed inspection are summarized in the OD Report as follows:

1. Alarm systems and functionality has not been designed based on a proven and available alarm philosophy applicable to the company

and the specific facility. Systems on the individual facility bear partial evidence of being designed by different suppliers, without a common integrated system philosophy. Configuration and alarm presentation has been largely controlled by the SAS provider, based on vendor standard solutions.

2. No companies had established procedures and / or undertook systematic research mapping system quality as an important safety barrier element and operator aid. It was not established performance requirements for alarm. General little is done from the controller side to identify and improve weaknesses alarm system. Problem areas and weaknesses of alarm systems are made visible in small degree through the formal reporting procedures established for the facility to detect and monitor adverse events, conditions and circumstances.
3. It is generated and presented too many alarms during normal operations and especially by disturbed operation / shutdown.
4. For large proportion of alarms that are presented have little or no benefit to operator. This adds an additional and unnecessary burden on personnel.
5. Inadequate alarm texts and lack of uniform abbreviations allows it to be difficult to understand the alarm messages.
6. For many system alarms present in the control. Many alarms are unintelligible to the control room operators who are not familiar to the criticality of these and how it should respond to these.

7. The experienced inconsistencies in the way the alarms are presented on the various systems in the CCR (b. ex SAS, fiscal metering systems and marine control systems). This may apply symbols, colors and abbreviations. Such conditions can lead to misinterpretations and mistakes in stressful situations.
8. It recorded many standing alarms when the unit is in normal operation. It was observed up to a few hundred standing alarms at some facilities. This reduces the operator's ability to make a fast and secure overview of the alarms that demand attention.
9. Alarms are not prioritized so that operators assisted in identifying and acting on those alarms that require the most attention in various operational situations.
10. Absence of alarm suppression mechanisms allow personnel are charged with many unnecessary alarms from equipment that is not working or stopped, either by the operator or from normal shutdown logic.
11. Safety critical alarms are not explicitly identified and presented in a uniform and consistent way. This means that such alarms may be ignored by the operators, as they can easily drown in amount of other less important alarms during periods of many incoming alarms.
12. It could not be documented, is that the systematic training / retraining aimed at understanding the alarm system and the handling of abnormal deviations and incidents (Training in crisis management).

13. It is identified varying quality guidelines for decoupling security, and practices for information about such disconnections transferred between different shifts. It is further observed varying quality where being able to quickly obtain an overview of the status of such disconnections, i.e. how to visualize information for potential users.

The results above can be grouped in four categories as general concerns and observations from OD:

- No unified norms for Alarms Management's development and maintenance
- Bad integration of alarms generated by several systems
- Incorrect alarm definition/rationalization
- Incorrect or inexistent Alarm Performance Management System

After publishing of the OD Report; several follow-up audits have been realized to assess the implementation of recommended improvements to Oil Operators. The following available results of these audits show as the lack or deficiency in Alarm Performance Management is still a concern in Offshore Installations:

Audit of Conoco Phillips; Follow-up of Alarm Managements: The Norwegian Petroleum Safety Authority (PSA) 22-11-2006:

“Deviations from the regulations' requirements to establish measurable performance requirements for some of the alarm systems on the oldest facilities and deviations related to compliance with internal company routines for deviation identification and handling on some facilities were uncovered.”

Audit of Gassco; Follow-up of Alarm Managements: The Norwegian Petroleum Safety Authority (PSA) 16-08-2006:

“During the audit we found non-conformities with the regulations related to lacking establishment of measurable performance requirements for the alarm systems”

Audit of human-machine interface and information presentation - Alvheim FPSO: The Norwegian Petroleum Safety Authority (PSA) 20-04-2010:

“A suitable alarm analysis tool to identify any weaknesses in the alarm system and to verify the alarm system in relation to specified performance requirements is lacking.”

It's then obvious that existence and use of Alarm Performance Management tools is still a concern since the OD Report release's date in 2003. KPI assessed during the executing of the OD Report can be considered the minimum requirements in order to know the current status of an Offshore Installation in the Norwegian Continental Shelf and are of special interest in the current analysis. These KPIs are show in the Table 2

KPI #:	Name	Rational	Based on
1	Significant rate of alarm generation in a normal shift	Average number of alarms on 10 minutes during shifts when the installation keeps in stable operation.	EEMUA -191
2	Significant rate of alarm generation during a trip.	Total number of alarms during the first minute when the installation was in a trip.	EEMUA -191
3	Alarms percentage categorization	Percentage distribution of the alarms in the various categories of “usefulness” and the percentage of the total number of alarms come on one or more occasions during the period (repeating alarms).	None: valid for assessment but not as standard KPI <u>in the form as was calculated.</u> Intents to be an alarm’s priority classification.

Table 2: KPIs from OD Report

2. CHAPTER 2

The utilized methodology is explained in the present chapter. Procedure is divided into investigation regarding AM and investigation regarding IMS. Conclusions will be given as result of investigations. The focus of the entire investigations is related to KPI and their generation accordingly the objectives of the present job. The most relevant local and international norms were utilized.

2.1 Investigation regarding Alarm Management (methodology)

The detailed methodology is explained as follow.

Chosing and study a set of internationals norms regarding Alarm Management. As natural selection the two most relevant international norms were utilized (EEMUA 119 and ANSI/ISA 18.2-2009). These norms are considered to be equivalentents in general contents, but ANSI/ISA 18.2-2009 was preferred for two main reasons:

- ANSI is an international organization meanwhile EEMUA is a user association. For this reason EEMUA has less influence in international normative organizations
- KPI's descriptions in ANSI/ISA 18.2-2009 are more extenses and detailed, for this reason are also more apropiate for the present evaluation.

Chosing and study a set of local norms regarding AM. In this case is relevant that NORSOK does not have a norm regarding AM. OD YA-711 is a philosophic guideline with no direct mentions of Alarm Performance or

Alarm KPI generation. In this case Norsok I-002 (SAS Systems) and Norsok I-005 (SCDs) are utilized because of their important references to alarm definition and management. Statoil TR1494 was also consulted in this stage.

From the studying of the norms above, conclude with the proposition of a set of the most representative Alarm Management's KPI (MA_KPI) to be utilized in offshore installations at the NCS. The KPIs are proposed considering the following:

- Maximum compliance with selected norms. The most exigent and complete set of KPIs shall be selected.
- Enough level of detail for allowing KPI calculation. Generalizations and philosophical enunciations were avoided looking for precision on calculations.
- Special characteristics for offshore oil industries in the NCS shall be reflected.

From the previously obtained MA_KPI, identify the minimum necessary data (MRAM) to be collected in order to allow the generation of MA_KPI for an automatic information system.

2.2 Investigation regarding IMS

Choosing and study the available local norms and technical descriptions regarding IMS. Norsok does not have any norms regarding IMS implementation but again I-002 include basic requirement for IMS system. TR2258 from Statoil was also included, but utilization of Norsok I-003 specially in regarding of Function Templates was preferred. Conclusions of

the present job regarding MRAM and NORSOK I-003 are fully applicable to Statoil TR2258

Verify if IMS, as estated in the available regulations, is able to generatate the fully set of MA_KPI. Verify type of data to be included in current norms to fullfil the generation of MA_KPI utilizing IMS.

Reccomendations to current standars: How to improve the current standars to allow IMS the generation of MA_KPI?

Examples of KPI`s generation using real IMS. The purposes of the example in show current IMS and its capabilities to KPI generation even when (possibly) not all the MA_KPIs could be generated. Basic SQL statements and resulted raw data are provided. IMS has normally extensive functions for data presentation, web acces, etc. but showing these formating capabilities is not scope of the current job. Result is presented in the more basic form utilizing Microsoft Excel tools and csv text files.

3. CHAPTER 3

3.1 Problem definition

ANSI /ISA 18.2 (pag.22) definition of Alarm Management Lifecycle is showed in Figure 1. ANSI /ISA 18.2 (pag.25) also provide the definition of “Monitoring and Assessment” in the following way:

“In the monitoring and assessment stage, the overall performances of the alarm system and individual alarms *are continuously monitored against the performance goals stated in the alarm philosophy*. Monitoring and assessment of the data from the operation stage may trigger maintenance work or identify the need for changes to the alarm system or operating procedures. *Monitoring and assessment* of the data from the maintenance stage provides an indication of the maintenance efficiency. The overall performance of the alarm system is also monitored and assessed against the goals in the alarm philosophy. Without monitoring an alarm system is likely to degrade”.

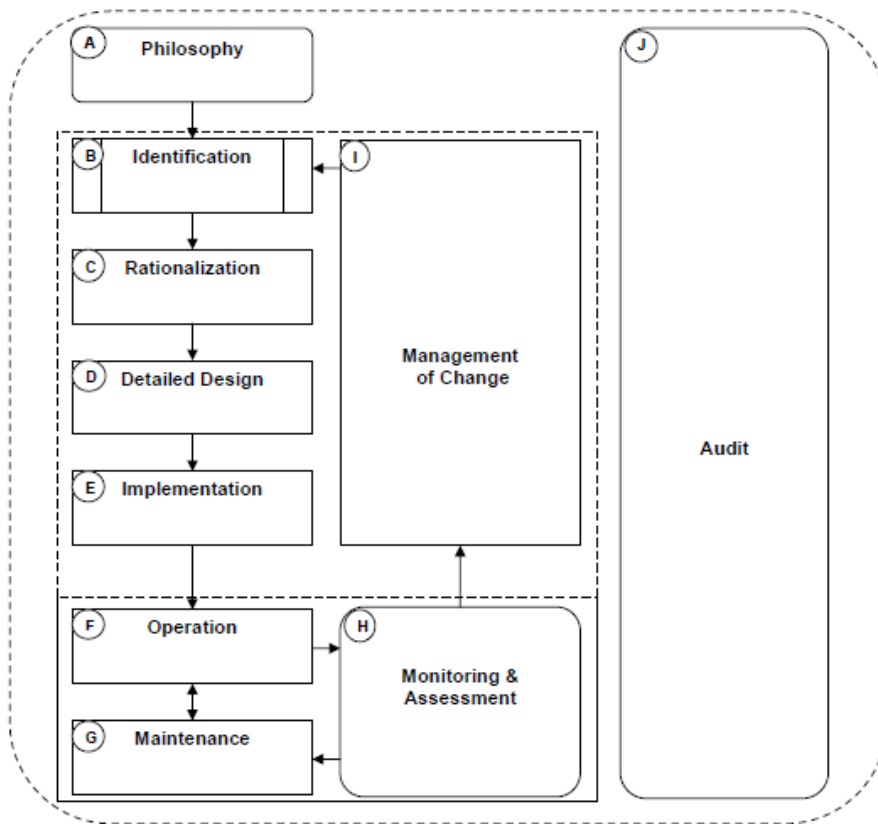


Figure 1: ANSI/ISA 18.1 Alarm Management Lifecycle

This definition is basically shared by other important norms like EEMUA 191 and state the necessity of fulfill two important requirements for safe plant operation:

- Defining performance goals for the assessment of the complete Alarm System
- Provide necessary tools and procedures in order to obtain the current values of the Performance Goals Indicators (Key Performance Indicators or KPIs)

Alarm Performance Measurement is a labor of integrating different systems, processing their information and show unified KPIs for the complete installation. There are no related norms or regulations for such procedures and real time generation of Alarm Management KPIs had generally been considered unnecessary. The frequent realization of the KPI calculations and the consequent generation of alarm reports could be a heavy labor depending on the quality and completeness of the system implemented. In some cases alarms status collection could be done manually and integrated into others manual reports in conjunction with data coming from SAS, in other cases specialized systems with such purposes are implemented creating a new layer in a every time more complex system architecture surrounding the SAS and other systems.

3.2 Justifying

Information Management System (IMS as defined in NORSOK I-002) can be a suitable, fast and inexpensive tool to implement Alarm Performance Management .Key Performance Indicators could be generated from IMS in demand, utilizing standard tools presents in the system. The generation of KPIs could be done in a simple way and no special knowledge is required.

Reports could be created for that purpose in order to simplify the display of information in the same way as is done for other purposes into IMS.

IMS utilizes standard query tools based on universally accepted SQL language; a basic knowledge of SQL and tag structures into IMS is enough to generate KPIs for Alarm Performance (in fact this is all the required to extract and process any kind of historical information from IMS) in few minutes.

IMS is a standard tool in offshore platforms, for this reason the calculation of Alarm Management's KPI generation wouldn't be a special cost's overhead in any case. Cost for development SQL statements or even IMS reports are negligible in comparison with other software's tools implementations.

Evaluation of technical requirements and regulations for IMS design, and further comparison with recommended KPIs will determine if the system is capable of storing all the necessary data for their generation. In this respects, special concern regarding specific alarm's priorities KPI will be clarified. If the current design of IMS does not allow the generation of specific KPI, recommendations will be make to improve norms, technical regulations and IMS implementations to allow future generation of KPIs.

3.3 Scope

The main objective of the present work is to propose an alternative way for the generation of Alarm Performance KPIs utilizing standard systems already presents in offshore platforms at the Norwegian Continental Shelf: The Information Management System (IMS). NORSOK only includes a short and general description for IMS with mention to Alarm Management and Alarm Performance Generation; however is not clear if IMS, in the way as has been implemented so far, is managing all the required

information and tools for generate KPIs according international standards, especially ANSI/ISA-18.2-2009.

3.4 Objectives

1. Evaluate the existing norms regarding Alarm Performance Measurement and identify the set of more recommendable KPIs (MR_KPI) to be utilized for Offshore Platforms in the NCS. Because the existence of diferent norms regarding Alarm Management, a comparative revision between them is necessary in order to understand differences, equivalences and validity in proposed KPIs.
2. Evaluate the current capability of IMS, according existing norms, to generate the identified KPIs and made suggestions for improvement in existing regulations regarding Control Systems and IMS.
3. Examples of KPIs generated from dummy data from SIEMENS A.S. Laboratories in Stavanger will be presented. SIEMENS has complete IMS Historic Database from executed projects in the Norwegian Continental Shelf. The data utilized for this purpose is not coming for any specific offshore installation but is considered to be good enough to show the capability of KPI generation within real IMS systems.

3.5 Limitations

At the moment of realization of this job; no real platforms were available in order to implement the calculated KPIs from operative IMS systems in a real environment. This could be easily done with no operational impact neither risk utilizing the SQL scrip's from this work as starting point.

The results of this thesis are “vendor independent”. All the practical KPIs presented in this job were, however, generated from SIEMENS IMS system but could also be obtained from other commercial systems that utilize SQL as query language in IMS databases.

The scope of this thesis is related to Control and Alarm Systems as utilized for Offshore Platforms in the Norwegian Continental Shelf. However result could be from interest for any oil installations were IMS or similar system is utilized.

Vendor’s commercial competence allows access to diverse sources of information but also introduce distortions, especially in the use of terms that have been trademarked. In order to keep independence, vendor trademark terms have been avoided the most possible.

Diverse norms related to Alarm Management locals and international may originate confusion in the selection of the best KPIs for Offshore Platforms. Specific Statoil and Conoco Phillips norms are also been consulted as part of this thesis.

Language had also been a limitation. Most of the audit report and technical documents from the Norwegian Oil Directorate relative to Alarm Management had been published in Norwegian. This is an obvious difficulty from persons with limited proficiency in Norwegian language.

4. CHAPTER 4

4.1 AMS regulations in the Norwegian Continental Shelf

In the following

Figure 2 relations between standardization bodies is presented in a hierarchical structure with the higher level of international recognition at the top and the lowest levels (industries) at the bottom. Between top and bottom, five levels of recognition can be identified: International, Regional, National, Associations and Industries.

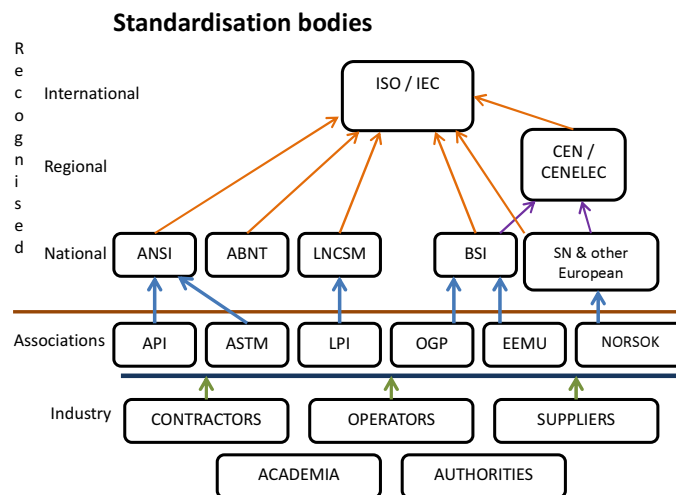


Figure taken from course MOK 120 "Offshore field development" UiS.

Figure 2: Standardization bodies

The set of norms chosen for evaluation and the selection criteria is shown in Table 3. The same level "national" had been given to the YA-711 and to ANSI/ISA-18.2-2009.

NORM IDENTIFICATION		SELECTION CRITERIA			
NORMS	Organization	Recognition Level	Geographical Scope	Compulsive level	Level of KPI description
EEMUA 191	EEMUA	Association	International	Reference	Basic
ANSI/ISA-18.2-2009	ANSI/ISA	National (USA)	International	Reference	Extends
YA-711	OD	National (Norway)	National oil sector	Mandatory NCS	None
NORSOK I-002	NORSOK	Association	National oil sector	Mandatory NCS	None
Statoil TR1494	Statoil	Industry	Industry specific	Mandatory company level	Detailed

Table 3: Standards identification and selection criteria

The specific focus of NORSOK I-002 is description of SAS (although enough attention is given to issues regarding Alarm Management). Both NORSOK I-002 and YA-711 could be considered mandatory's in the NCS, however none of them define any relevant KPIs for Alarm Performance Measurements. For this reason will not further be considered for KPI elections even when utilized for SAS and IMS discussion in following chapters.

As remarkable fact, EEMUA-191 had become the de facto standard for Alarm management with a global acceptance mostly because was the first regulation known worldwide: almost all the following regulation has had EEMUA-191 as model and reference.

ANSI/ISA-18.2-2009 is being considered to become the international standard IEC 62682; giving to this norm higher recognition's ranking (see (<http://www.isa.org/InTechTemplate.cfm?template=/ContentManagement/ContentDisplay.cfm&ContentID=91315>) and fulfilling the necessity of globally recognized A.M. standard. ANSI/ISA-18.2-2009 is competing with EEMUA-191 and is being more utilized for new developments. Good comparison is given in the Advanced Solution; Whitepaper by Honeywell: "Alarm Management Standards; are you taking them seriously" pag.9: "EEMUA 191 and ISA 18.2 complement each other. In summary EEMUA describes in detail the tools and techniques for various aspects of alarm management (e.g. rationalization, risk assessments, graphics design) and ISA 18.2 clearly defines the required performance KPIs and the overall lifecycle approach to alarm management. The performance KPIs for both documents are similar, although they are more clearly defined in Table 14 of ISA 18.2. "

Comparison between both is also taken for Advanced Solution Whitepaper in Table 4

EEMUA 191 Key features	ANS/ISA 18.2 Key Features
<ul style="list-style-type: none"> • Good detail on alarm design, including different risk assessment approaches. • Written in an easily readable text-book format – excellent worked examples. • New section on Alerts. • Philosophy, principles of alarm system design, implementation issues. • Measuring performance and managing an improvement program • Specifications for alarm systems. • Design of field sensors. • Design of alarm displays. • Performance metrics and useful questionnaires. • Alarm suppression hazard study. • Sample risk assessments and determining priority – enhanced. • New section on alarm management in Batch Plants. • New section on alarm system improvement process. • Complementary to ANSI/ISA 18.2. 	<ul style="list-style-type: none"> • Large focus on an alarm system lifecycle. • Very clear alarm system performance KPIs. • Written like other similar standards – eg IEC AS 61511. • Section on compliance. • Alarm Philosophy – what must be included in table format.. • Alarm System requirements specification. • Identification and rationalization. • Basic alarm design, HMI design, and enhanced and advanced methods. • Implementation, operation, and maintenance. • Monitoring and assessment, management of change, and auditing. • Fewer examples are given. • Complementary to EEMUA 191.

Table 4: ANSI/ISA – EEMUA Standards comparison

For evaluation purposes regarding KPI; decision is taken in not further considering EEMUA-191 in the present job even its importance influence in the rest of the regulation considered. Reasons for that are the following:

- ANSI/ISA 18.2 is considered to be a higher hierarchy norm than EEMUA 191.
- Been more recent and updated, is considered that important factors regulated for EEMUA-191 have been taken into consideration in ANSI/ISA 18.2 preparation.
- Alarm management KPIs is much more explicit in ANSI/ISA 18.2 than in EEMUA 191.

In a more detailed revision of all mentioned regulations, become clear that “Alarm Priority” as factor for KPI generation start to be taking more consideration in ANSI/ISA 18.2 and is a very important factors (developed in more detailed) in implementation-orientated industry specific norms. This is totally clear when checking the KPIs indicated in the Statoil TR1494 and for these reason this regulation is keep for further analysis.

As result of the discussion above; the following norms will be considered for further KPI comparison and evaluation:

- ANSI/ISA-18.2-2009 “Management of Alarms for the Process Industries
- ” Statoil TR1494 “Alarm System”

4.2 KPI Comparison and Selection

Statoil TR1494 considers alarm priority when defines the following targets for KPI indicators (for 4 priority alarm levels; see table Table 5):

Statoil TR1494 Alarm Management Indicators			
1) Average alarms rate during normal operation (alarms/10.min)	Alarms target	Alarms requirements	
	< 2	< 4	
2) Average alarms rate during operation disturbance (alarms/10.min)	Alarm requirement		
	Number of priority 2 alarms less or equals to 10 alarms /10 min		
3) Standing alarms	Priority	Target	Requirement
	1	0	0
	2	max 2	max 5
	3	max 5	max 10
	4	max 20	max 80
	Systems where alarms are not prioritized	max 10	max 40
4) Analyzing alarm data capabilities	4.1) Alarm rate trend (alarms/10 minutes)		
	4.2) Alarm rate count/average		
	4.3) Top 10 alarms		
	4.4) Priority distribution		
	4.5) Combined trending of alarms and process values		

Table 5: Statoil TR1494 Alarms KPIs

ANSI/ISA 18.2 provides the KPI summary displayed in Table 6 :

ALARM PERFORMANCE METRICS BASED UPON AT LEAST 30 DAYS OF DATA		
Metric	Target Value	
1) Annunciated Alarms per Time:	Target Value: Very Likely to be Acceptable	Target Value: Maximum Manageable
1.1) Annunciated Alarms Per Day per Operating Position	~150 alarms per day	~300 alarms per day
1.2) Annunciated Alarms Per Hour per Operating Position	~6 (average)	~12 (average)
1.3) Annunciated Alarms Per 10 Minutes per Operating Position	~1 (average)	~2 (average)
Metric	Target Value	
2) Percentage of hours containing more than 30 alarms	~<1%	
3) Percentage of 10-minute periods containing more than 10 alarms	~<1%	
4) Maximum number of alarms in a 10 minute period	≤10	
5) Percentage of time the alarm system is in a flood condition	~<1%	
6) Percentage contribution of the top 10 most frequent alarms to the overall alarm load	~<1% to 5% maximum, with action plans to address deficiencies.	
7) Quantity of chattering and fleeting alarms	Zero, action plans to correct any that occur.	
8) Stale Alarms	Less than 5 present on any day, with action plans to address	
9) Annunciated Priority Distribution	3 priorities: ~80% Low, ~15% Medium, ~5% High or 4 priorities: ~80% Low, ~15% Medium, ~5% High, ~<1% "highest" Other special-purpose priorities excluded from the calculation	
10) Unauthorized Alarm Suppression	Zero alarms suppressed outside of controlled or approved methodologies	
11) Unauthorized Alarm Attribute changes	Zero alarm attribute changes outside of approved methodologies or MOC	

Table 6: ANSI/ISA 18.1 Alarms KPI summary.

After comparison of two sets of KPIs above, the following KPIs are recommended as the more appropriate KPIs for NCS offshore platforms (see Table 7):

MORE APPROPRIATE KPIs (MA_KPI)		
KPI type	KPI name	KPI comment
1) Alarm rates KPIs:	a) Annunciated Alarms per day per Operating Position	From ANSI/ISA 18.2
	b) Annunciated Alarms per hour per Operating Position	From ANSI/ISA 18.2
	c) Annunciated Alarms per 10 Minutes per Operating Position	From ANSI/ISA 18.2
2) Alarms flow related KPIs:	a) Average alarms rate during operation disturbance (alarms/10.min).	From Statoil TR1494
	b) Percentage of hours containing more than 30 alarms	From ANSI/ISA 18.2
	c) Percentage of 10-minute periods containing more than 10 alarms	From ANSI/ISA 18.2
	d) Percentage of time the alarm system is in a flood condition	From ANSI/ISA 18.2
3) Data analysis related KPI	a) Top 10 alarms	From ANSI/ISA 18.2 and Statoil TR1494
	b) Stale Alarms	From ANSI/ISA 18.2
	c) Annunciated Priority Distribution	From ANSI/ISA 18.2 and Statoil TR1494
	d) Quantity of chattering and fleeting alarms.	From ANSI/ISA 18.2
	e) Annunciated categories distribution (action, warning fault).	NORSOK I-002 § 3.1 NORSOK I-005 (Rev 3) §4.5

Table 7: More appropriate KPIs (MA_KPI)

We are choosing “metrics KPIs” that is values that can be calculated from the historical data of the system and no “procedures KPI” like 10) and 11) from ANSI/ISA table.

Note than more of the choose KPIs are from ANS/ISA 18.4 but including two from Statoil TR1494. The selection of these indicators is made in the most inclusive way, the complete set of considered norms in the present thesis are represented in these indicators. These indicators are also the more exigent (and detailed) in their kind.

KPI 3.e) could be considered a special case and is only applicable in the Norwegian Continental Shelf to include the traditional alarms definition by categories (Action Alarm, Warning Alarm and Fault Alarm)

4.3 Information Management System; norms and description

NORSOK's considerations include integration between IMS and SAS. General description of SAS is included in NORSOK I-002. Statoil TR3034 and ConocoPhillips 6156 are also related to SAS description and will be briefly considered in this analysis.

4.4 NORSOK I-002

The fundamental regulatory norm regarding Safety and Automation System (SAS) in the Norwegian Continental Shelf is NORSOK I-002. In this norm IMS is also defined as part of the SAS Network as is shown in Figure 3. NORSOK I-002 §4.2.8 defines IMS "functionality" as the core of the plant information system with links to almost all the other "external systems" in as for example:

- Fiscal metering
- Mooring and positioning system
- Ballast system
- Environmental and platform monitoring system
- Corrosion monitoring system
- Condition monitoring system
- Fuel & flare gas metering
- Oil storage and off-loading system
- Pipeline monitoring

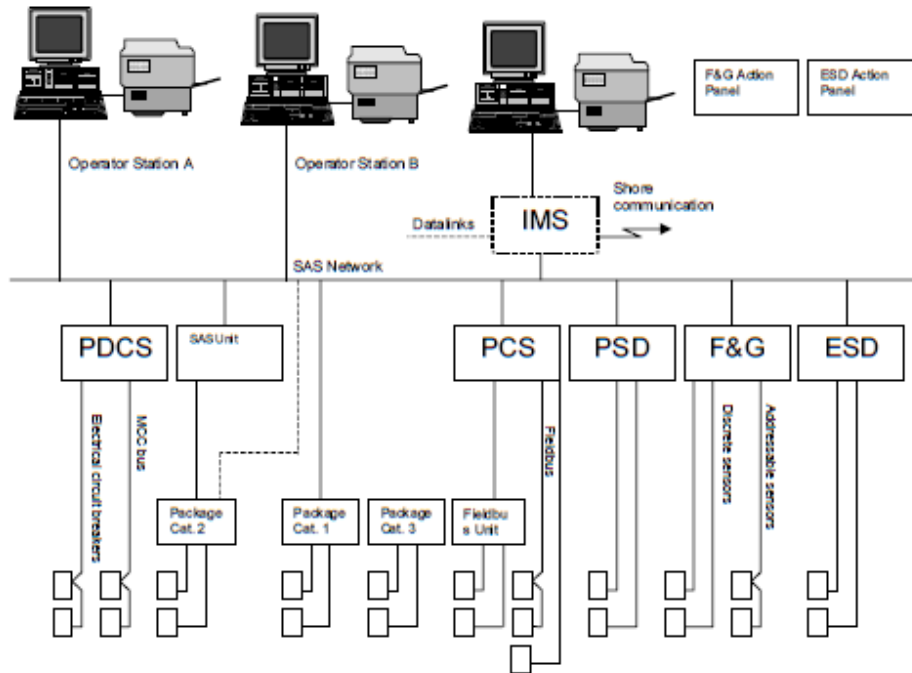


Figure 3: Conceptual SAS topology: from Norsok I-002

IMS functionality regarding alarms is also defined in Norsok I-002 §4.2.8 in the following way: “The IMS shall have programming tools that make it easy to create historical reports for blockings, production data, operational logging, maintenance data, alarm system with searching and sorting facilities etc.”

The long term storage of alarms and events and the alarm analysis capability is also defined in Norsok I-002 §4.2.8 as a typical functionality of IMS.

4.5 ConocoPhillips 6249 Safety and Automation Systems (SAS)

ConocoPhillips functional requirement 6249 is an additional requirement to NORSOK I-002. In reference to IMS, 6249 states (see § 4.2.8) “An integrated tool for alarm management and analysis (PM) shall be implemented. The purpose of the analysis is to satisfy the regulations and company alarm spec TCD 6156. Change control to compare the alarm database with the current SAS system shall be implemented.”

Specs TCD 6156 refer to specific KPIs equivalents to those included in Table 7: More appropriate KPIs (MA_KPI)”. From 6249 the most relevant conclusions is that integration of Alarm Management into IMS as a technical requirement.

4.6 Data characterization for IMS alarm reporting.

Analyzing the “More Appropriate KPIs” as shown in Table 7 it is possible to establish the minimum alarm’s metadata to be collected in order to KPI generation into IMS. The Minimum Required Alarm Metadata or (MRAM) is then the following:

- 1) Alarm basic description; as tag name, condition (HH, LL, etc.)³
- 2) Alarm conditions (active/no active)
- 3) Alarm state (as per ANSI/ISA-18.2-2009 § 11.3.2)
- 4) Time stamp for each occurrence.
- 5) Alarm Priority.
- 6) Alarm Categories (action, warning, fault)

³ International norms agree in that alarm basic description’s details shall be established in Alarm Philosophies

Alarm description shall include tag, service, condition (hh, ll, h, and l) and any other useful information for the operator (like the current value and limits)

An alarm condition is just an indication on whether the alarm is active or not disregarding its status (corresponding to status normal in ANSI/ISA 18.2-2009; see below).

Alarm state as indicated in ANSI/ISA 18.2-2009 § 11.3.2 includes nine different statuses as follows:

- a. Unacknowledge alarms
- b. Acknowledge alarms
- c. Return to normal status unacknowledge alarms
- d. Latched Unacknowledge alarms
- e. Latched Acknowledge alarms
- f. Shelved Alarms (suppress in NORSOK I-002)
- g. Suppressed by Design Alarms (suppress in NORSOK I-002)
- h. Out-of-Service Alarms (suppress in NORSOK I-002)
- i. Blocking (from NORSOK I-002)

Where state i) is being included to be consistent with NORSOK I-002 definition.

The time stamp in each alarm condition is an IMS requirement according to NORSOK I-002 § 4.4.7. It is necessary for time analysis, trending and reporting. Ensure data quality imposes the necessity of synchronization for all the systems and subsystems capable of alarm generation. Moreover, this will be considered later when speaking regarding difficulties of Control class 2 system's integration.

Alarm Priority shall be included in order to display the KPI 3.c) “Annunciated priority Distribution” from table Table 7

Alarm categories are necessary to generate KPI 3.e) and could be considered a special case only applicable in the Norwegian Continental Shelf.

The mentioned data shall be available to IMS not only from SAS generated alarms, but for equipment packages whose control is poorly integrate (or not) into SAS.

MRAM data model is summarized in Table 8

4.7 IMS current alarm data model and NORSOK I-005

NORSOK I-005 is related to System Control Diagrams (SCDs). Alarm Management is briefly considered in the new edition of NORSOK I-005 (Rev. 3; March 2013; § 4.5).

NORSOK I-005, recognize the necessity of assigning priorities to alarms and consider the existence of classic alarm’s categories: action, warning and fault. Also states that “priority-setting of an alarm should be possible to do independently of the alarm category” (see I-005 §4.5 and I-002 § 3.1).

Data Field #	Data Field description	Possible Values
1	Alarm basic description	Tag/Service. More description depending on particular alarm philosophi.
2	Alarm conditions	<ul style="list-style-type: none"> • Active • No active
3	Alarm state	<ul style="list-style-type: none"> • Unacknowledge alarms • Acknowledge alarms • Return to normal status unacknowledge alarms • Latched Unacknowledge alarms • Latched Acknowledge alarms • Shelved Alarms (supress in NORSOK I-002) • Suppressed by Design Alarms (supress in NORSOK I-002) • Out-of-Service Alarms (supress in NORSOK I-002) • Blocking (from NORSOK I-002)
4	Time stamp for each occurrence.	
5	Alarm Priority.	<ul style="list-style-type: none"> • 1 to 3 or • 1 to 4
6	Alarm Categories	<ul style="list-style-type: none"> • Action • Warning • Fault

Table 8: MRAM Data Model

NORSOK I-005 contains important information in its normative “Annex A”. Detailed modeling of the data is defined in the “function templates”. The level of compliance regarding these data models is left to be defined in individual projects, but even with this “openness” the minimum amount of information with respect to alarms is defined in the function templates.

Information defined in function templates is not originally designed for IMS purposes; it is more oriented to logic functions and defined as inputs/output terminals on logic blocks. Function templates are, however, the only source of alarms related metadata in NORSOK. Moreover, Statoil TR2258 includes specific IMS data models similar to the defined in the NORSOK I-005 Rev 3 templates. The lack of specific model of IMS data is also considered a weakness in NORSOK regulations.

Functions Templates utilize the definitions of alarms categories (Action Alarm, Warning Alarm and Fault Alarm) and do not include the alarm priority. This is also considered to be a weakness of the standard because makes especially difficult the calculation of KPI 3.e) using this model as base.

Indispensable alarms time stamp is missed in the Function Templates⁴. However time tagging is considered in NORSOK I-002 § 4.4.7 and § 4.2.8 when describing alarms capabilities of SAS and historical capabilities of IMS.

⁴ Even when new MAS block has been defined in NORSOK I-005 Rev 3 for including third party systems alarms, the external time stamping was not considered in the description

4.8 MA template as Data Model

The function template MA is the basic analog-processing and alarm-generation block. For that reason MA data model include the most complete description regarding alarms metadata available in NORSOK.

MA outputs terminals are showed in Table 9 and can be compared with MRAM definition (see Table 8): MRAM is the required data model and in contrast, MA is the current data model for KPI generation in IMS. MA outputs terminals describe 6 different alarms for each MA (analog input) tag: AHH, BHH, WH, WL, ALL and BLL.

From this comparison is clear that both models are having different structures and major differences are as follow:

- Current model is based in Alarm categories (action, warning, and fault)
- Alarm Priority and state are missing of current model
- Time stamp is missing of current model but considered in IMS definition, so time stamp should mainly be calculated and is not coming from generated data.

Terminal code	Signal type	Terminal name	Supplementary description
Y	Normal function output	Normal function output	Analogue output signal from function template
YF	Binary output	Function failed	YF = 1 if XF = 1 or if an internal error has been detected in the template or if an error is detected on the input X.
AHH	Binary output	Action alarm HH	True, when X*-value >AHH limit. Subjected to blocking and suppression.
BHH	Binary output	Status alarm HH	Status alarm annunciation (HH) without blocking logic. Subjected to suppression.
WH	Binary output	Warning alarm – WH.	True, when X*-value >WH limit. Subjected to suppression. Should not be used for downstream logic.
WL	Binary output	Warning alarm – WL	True, when X*-value <WL limit. Subjected to suppression. Should not be used for downstream logic.
ALL	Binary output	Action alarm LL	True, when X*-value <ALL limit. Subjected to blocking and suppression.
BLL	Binary output	Status alarm LL	Status alarm annunciation (LL) without blocking logic. Subjected to suppression.
BBHH	Binary output	Action alarm HH is blocked	True if FBHH or OS blocking is active.
BBLL	Binary output	Action alarm LL is blocked	True if FBLL or OS blocking is active.
BU	Binary output	Status suppressed	True if the template is in suppressed mode (any of the process output function is suppressed).
BB	Binary output	Status blocked	True if the template is in blocked mode (any of the process output functions are blocked).
BXHH	Binary output	Status event HH	True, when X*-value > Event high-high limit .No Alarm annunciation, event only
BXH	Binary output	Status event H	True, when X-value > Event high limit. No Alarm annunciation, event only
BXL	Binary output	Status event L	True, when X-value < Event low limit No Alarm annunciation, event only
BXLL	Binary output	Status event LL	True, when X-value < Event low-low limit. No alarm annunciation, event only

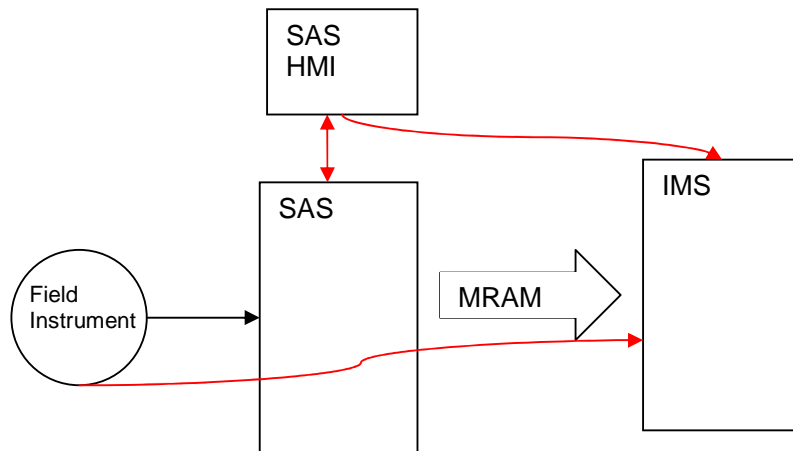
Table 9: MA Output Terminals (Current Data Model).

4.9 Alarms in System Control Class 2

NORSOK regulations only consider alarms generated in SAS. Alarms generated in other systems have been getting a reduced attention.

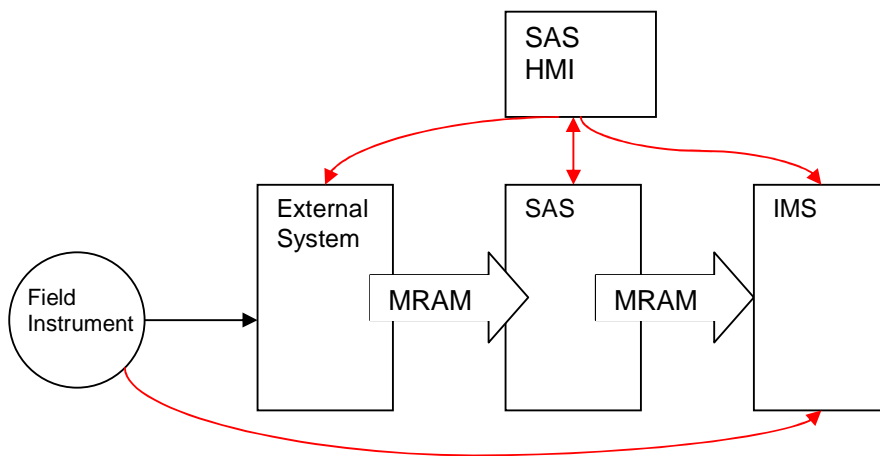
System Control Class 2 are independent control packages directly connected to SAS usually with the utilization of specific communications protocols like MODBUS or others. These kinds of units are very common for turbine, generators, compressors, etc. When considering alarm generated in these systems the MA model utilized for our data comparison is not totally valid. Alarms are generated outside SAS but utilization of SAS HMI for visualization of these kinds of “foreign alarms” originate other difficulties when, for example, their need to be shelved or suppressed for operators.

Figure 4 is showing a model of SAS alarms flow data. Alarms are originally generated from the variation of a condition in the field, received in SAS, displayed in SAS HMI and passed through IMS for historic archiving and KPI generation. In this model the complete set of MRAM shall be updated from SAS to IMS with every change on data, including not only alarm generation properly but other variations like suppressions or shelving originated into SAS HMI. The flow of information is shown with red arrows and it is unidirectional.



red flags shows direction of information`s flow

Figure 4: Data flow in SAS Alarm Model



red flags shows direction of information`s flow

Figure 5: Data flow in foreign alarm model

Figure 5 is showing a model of foreign alarms flow data. Alarms are normally generated from the variation of a condition in the field, but in this case gathered in the external system, passed to SAS, displayed in SAS

HMI, and passed again to IMS for historizing and KPI generation. In this model the complet set of MRAM shall be updated two times and the external system shall be capable of generating, updating a passing the data.

Another remarcable diference can be observed in the data flow when variations coming from operations accions (from SAS HMI) should be updated back in the external system. Also inportant is the consideration that time stamp is originally generated in the external system and should be sincronized with SAS as guarantee of data integrity.

As result of the situations described above the status (or configuration) of foreign alarms may decay into undetected inconsistencies with SAS, jeopardizing the integrity of the plant. Lacks of regulation regarding the integration of foreign alarms to SAS contribute to the risk.

These situations should be completely adressed and regulated, and the development of an "Alarm Protocol" between SAS and external systems should be regulated.

5. CHAPTER 5

5.1 Conclusions

According to NOR-SOK I-002, the Alarm KPI generation shall be carried out in the Information Management System; but the description of IMS is incomplete and inefficient in NOR-SOK regulations. For this reason, Information Management Systems as normally implemented at offshore installations in the Norwegian Continental Shelf are not capable to generate the entire set of MA_KPI as described in Table 7.

NOR-SOK does not have a formal data model for Alarm Management KPI generation. The data model included in NOR-SOK I-005 for MA Function Template is considered the only current reference data model and has been utilized for IMS descriptions before (at least in Statoil TR2258). This current model does not include time stamp; alarm priority, alarm state or alarm categories.

The lack of time stamp is considered a pitfall of the current data model, but is compensated with the requirements in NOR-SOK I-003 regarding time stamps in IMS. This is a clear inconsistency; for solving that IMS itself shall be capable of generating time stamps for received alarms, losing exactitude in time recording due to the elapsed time between alarm generation and the alarm time recording.

Generation of Alarm Rates KPIs (type 1) and Alarm Flow Related KPIs (type 2) is however possible due to time-analysis capabilities of IMS and the time stamp associated with every alarms occurrence. Data Analysis KPIs 3a (top ten alarms), 3b (stale alarms) and 3d (chattering & fleeting) can be obtained because their generation is also based on alarm condition and time stamp.

Data Analysis KPIs 3c (Priority distribution) can not be generated because the Alarm Priority is not part of the current data model; KPI 3c is a requirement of ANSI/ISA 18.2 and is considered to be essential for correct Alarm Performance Management.

Data Analysis KPIs 3e (Categories distribution) can not be generated because the Alarm Category is not part of the current data model. KPI 3e is included to be consistent with Norsok I-002 and Norsok I-005 but may be disregarded when classical Norsok alarm categories (action, warning and fault) are not utilized.

To generate the complete set of MA_KPI using Information Management Systems⁵ and for increasing capabilities of data processing; all the data contained in the MRAM model shall be available to IMS (or to any other

⁵ In fact these data shall be available for any system (not only IMS) in charge of the generation of MA_KPI

system to be in charge of KPI generation). The MRAM data model was introduced in § 4.6 and is summarized in Table 8

MRAM model can be considered exigent in terms of data requirements because alarm state and alarm categories are not including into MA_KPI set. These factors have been included in MRAM for improving the Alarm Analysis required in Norsok I-002 and can be dismissed. Then a reduced MRAM (R-MRAM) set is obtained including mandatory considerations regarding time stamp and alarm priorities.

Norsok show some pitfalls in regarding Alarm Management regulations. The no existence of a necessary Norsok standard dedicated to Alarm Management could be partially compensated with utilization of international regulations, but will still be necessary for clarification of differences between international and local practices as for example traditional alarms classifications and international classifications based on alarm priority.

The inclusion of extensive regulations concerning Alarm Management in Norsok standards related to SAS (Norsok I-002) and SCDs (Norsok I-005) increase the possibility of confusion and generate other challenges, like the incomplete integration of alarms originated in Control Class 2 systems (foreign alarms). These kinds of alarms deserve special considerations because their likelihood of degradation (differences

between configuration in the original system and SAS) and latent risks situations generation`s capabilities.

5.2 Recommendations

NORSOK Independent standard for Alarm Management should be created in order to combine all the relative alarm management regulations spread in NORSOK I-002, NORSOK I-005, OD YA-711 and include ANSI/ISA 18.2-2009.

Regulation regarding Alarm Management shall include not only SAS related alarms but also Control Class 2 systems. NORSOK I-005 needs to update Function Templates to include the hand over of MRAM to IMS.

The proposed more appropriate KPIs regarding Alarm Performance to be utilized in the NCS are shown in Table 7. Note that KPI 3.e) from table () is proposed in order to consider the traditional NORSOK alarm`s categories` differentiation (action, warnings and fault).

Standardizing the utilization of IMS appears to be necessary not only for alarm KPI generation. A specific NORSOK IMS regulation should be created. MRAM should be considered the minimum data model to be managed by IMS. In fact any other systems in charge of Alarm Management KPI generation need to get access to MRAM data model in order to carry out the complete calculation of MA_KPI.

Special attention to foreign alarms including assesment of their data integrity should be carried out. Configuration values for foreign alarms shall be compared between the alarm originated system and SAS. Communication protocols for updating alarms configuration in case of foreign alarms shall be defined.

5.3 Examples of KPI generation based on IMS

Working at SIEMENS lab at Stavanger, KPI 3a (top ten alarms) was generated from standard IMS system. In this system not priorities neither categories are stored as part of the alarm definition. The result is displayed in Figure 6.

The period for selecting the KPI was one month between Jul 1st. and August 1st. 2010. The dates were randomly chosen.

The standard SQL scrip necessary to generate the KPI was the following:

```
SELECT name as "TAG", "Tag Description" as "Service",  
COUNT(AI) as Alarms FROM FB001AIBDef where AI>0 and  
alTime >'01-JUL-10' and alTime <'01-AUG-10' group by name,  
"Tag Description";
```

The result was taken to Excel when the following chart was generated:

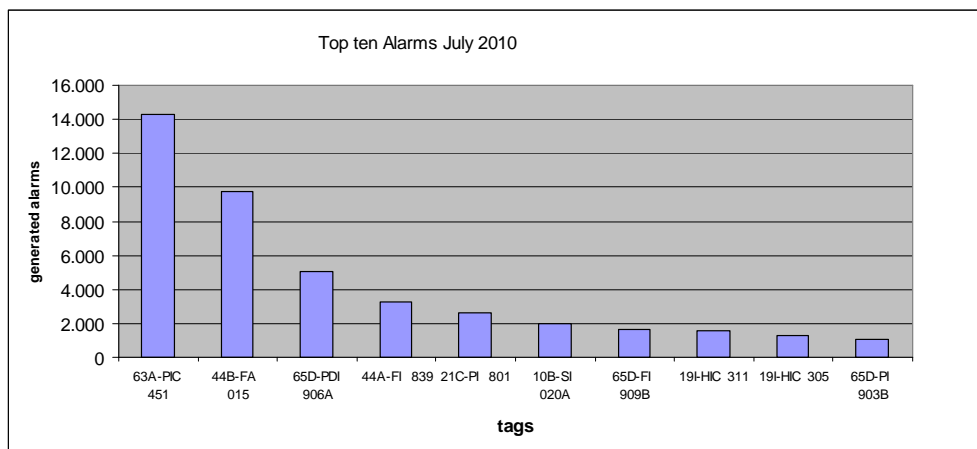


Figure 6: KPI 3a from dummy system

The raw data originally obtained after running the scrip is completely presented in APPENDIX A. Note the “most nuisance alarm” is coming from the tag 63A-PIC 451; and was generated 14.267 times during the period in consideration

The following other average indicators could allso be easily calculated.

Total alarms:	69368
Total alarms top ten	42449
% alarms top ten	61,19
Average alarms per 10 min. period	16,06
Average alarms per 10 min. period (top ten)	9,83
Average alarms per hour. period	96,34
Average alarms per hour (top ten)	58,96

Table 10: Derivates average KPIs

5.4 Example of IMS alarm data analysis

Each single alarm generated between Jul 1st. 2010 and August 1. 2010 was generated and the data was analized using single Excel tools. The raw data file retrieved was too extense to be included. Results are shown above.

SQL Statement:

```
SELECT name "Tag", CAST(AI as integer) "Alarm",alTime  
"time" FROM FB001AIBDef where AI>0 and alTime >'01-JUL-10'  
and alTime <'01-AUG-10' and name= tag;
```

Using Excel to sort by timestamp it was possible to get a basic data analysis on wich alarms are generated in specific dates and times. Example of is show in Figure 7 bellow:

	A	B	C	D	N
1	Tag	Alarm	day	time	
2	11C-LI 252	4	30.jul.10	08:50:27.1	
3	11C-LI 252	4	28.jul.10	13:54:50.0	
4	11C-LI 252	4	27.jul.10	18:54:31.6	
5	11C-LI 252	4	27.jul.10	12:13:53.1	
6	11C-LI 252	4	23.jul.10	14:16:07.7	
7	11C-LI 252	4	21.jul.10	11:54:21.1	
8	11C-LI 252	4	20.jul.10	16:50:32.1	
9	11C-LI 252	4	18.jul.10	16:23:38.7	
10	11C-LI 252	4	18.jul.10	16:06:45.1	
11	11C-LI 252	4	18.jul.10	13:35:29.3	
12	11C-LI 252	4	18.jul.10	17:41:12.1	
13	11C-LI 252	4	16.jul.10	15:21:46.9	
14	11C-LI 252	4	16.jul.10	15:21:46.9	
15	11C-LI 252	4	11.jul.10	16:56:53.0	
16	11C-LI 252	4	11.jul.10	16:46:52.8	
17	11C-LI 252	4	11.jul.10	16:04:47.9	
18	11C-LI 252	4	11.jul.10	14:44:47.1	
19	11C-LI 252	4	07.jul.10	14:18:20.3	
20	11C-LI 252	4	07.jul.10	11:46:31.5	
21	16A-AI 004	2	22.jul.10	14:14:12.6	
22	16D-PI 007	8	31.jul.10	14:27:07.7	
23	16D-PI 007	8	18.jul.10	16:31:41.9	
24	16D-PI 007	8	18.jul.10	16:06:45.2	
25	16D-PI 008	4	31.jul.10	16:42:37.7	
26	16D-PI 008	12	31.jul.10	14:27:57.7	
27	16D-PI 008	4	31.jul.10	14:27:09.7	
28	16D-PI 065	4	18.jul.10	04:44:57.5	
29	16D-PI 065	4	18.jul.10	04:41:21.7	
30	16D-PI 065	4	18.jul.10	04:26:38.4	
31	16D-PI 065	4	18.jul.10	04:22:41.3	
32	16D-PI 065	4	18.jul.10	03:53:12.4	
33	16D-PI 065	4	18.jul.10	03:38:58.9	
34	16D-PI 065	4	18.jul.10	03:31:20.7	
35	16D-PI 065	4	18.jul.10	03:05:59.5	
36	16D-PI 065	4	18.jul.10	02:47:39.7	
37	16D-PI 065	4	18.jul.10	02:43:47.6	
38	16D-PI 065	4	18.jul.10	02:32:43.3	
39	16D-PI 065	4	18.jul.10	02:21:56.3	
40	16D-PI 065	4	18.jul.10	02:14:53.3	

Figure 7: Alarm data analysis using Excel

6 APPENDIX A

TOTAL ALARMS BETWEEN Jul 1st. AND AUGUST 1st. 2010: raw data

TAG	Service	Alarms
63A-PIC 451	S TRYKK BAK ETTERFILTER LUFTT.	14.267
44B-FA 015	S UTLØP AVGASS.TANK A PRODVANN	9.720
65D-PDI 906A	V FILTER 65D-CA6XA	5.044
44A-FI 839	V EPCON, 44A-VX 61B, UTLØP	3.264
21C-PI 801	V OLJEEKSPORT RISER	2.634
10B-SI 020A	B HEISESP. HASTIGHET	1.965
65D-FI 909B	V LAVTRYKKSFORSYNING B	1.654
19I-HIC 311	T NPU,MANIFOLD, MAN SETP.	1.591
19I-HIC 305	T NPU,MANIFOLD, MAN SETP.	1.270
65D-PI 903B	V ETTER PCV LINJE B	1.040
44A-PDI 920A	V PRODVANN HYDROSYKLONER	910
44A-PDI 058	S HYDROSYKLONER TESTSEP.	901
51C-LZI 022	S OKS.FJ. DUMPEVENTIL POSISJON	886
20C-TI 836	V FLOW COMPENSATION	840
65D-PDI 906B	V FILTER 65D-CA6XB	806
12F-LI 008A	B KOMPL.V, LAGERTANK B	697
44B-LI 817	V PRODVANN AVGASSTANK OLJETRAU	612
27A-FI 104	S EKSP.KOMPR. B, INNLØP	470
27A-LI 469B	S EKSP.KOMPR. A, VÆSKEUTSKILLER	468
56A-LIC 803	B □.AVL, SUMP, SLAMRETUR, EX	410
56A-LIC 801	B Å.AVL, SLAM, EX.	374
44C-LI 817	V REJECT PUMPE B,KJØLEV. TANK	372
51C-AI 926	V OKSYGEN INNHOLD INJ.VANN	354
65D-PI 903A	V ETTER PCV LINJE A	340
24A-LI 019	S KOND.NIVÅ GASSTØRKE	336
20A-FA 001A	S GASSMÅLING TESTSEPARATOR	320
20A-FA 021	S OLJEUTLØP TESTSEPARATOR	304
42E-FI 009	S EMULSJ.BR. TIL 1.TR. SEP.	282
19I-FI 308	T NPU,MANIFOLD, UTL□P	270
44A-PDI 001	S HYDROSYKLONER 1 TRINN SEP.	244
44A-PDI 920B	V PRODVANN HYDROSYKLONER	228
11B-LI 157A	B SLAMBEH., H.HAST. SUGETANK	205

TAG	Service	Alarms
11B-LQI 292	B BORING, AKT.VOL, □KN/RED.	187
19I-PI 802	T NPU,PMP B, SM□REOLJE	183
17B-FA 320	S VANNINJEKSJONSRATE BRØNN 32	182
26A-FI 064	S INJ.KOMPR. KJØLEGASSTILF.DE	181
42E-FI 805	V EMUL.BR. NEDSTR. 1 TR. SEP.	163
26A-FI 227	S INJ.KOMPR. MOTOR SPYLELUFT	162
19G-PI 114B	S LT-RETURTRYKK, MKM2, MAKS	147
26A-FI 067	S INJ.KOMPR. KJØLEGASSTILF. NDE	144
51C-FZI 003	S OKS.FJERNING INNLØP	132
58B-FI 801	V BIOCIDETIL DEOKSYNERING	131
17B-PI 122	S RINGROMSTRYKK BRØNN 12	130
42F-PI 913	V FLOKKULANT HYDROSYKL.	130
20A-LI 008	S OLJE TESTSEP.	128
16A-PI 045	S TRYKK MELLOM W & M BRØNN 04	125
12E-FI 059B	B SEMENT, TRIPLEKSPUMPER	111
20C-LI 812	V 2 TRINN SEPARATOR. OLJE	110
27A-PI 052	S FAKKELTANK EKSP.KOMPR.A	99
26A-FI 009	S INJ.KOMPR. INNLØP	94
19I-PDI 213B	T NPU,19I-XV213 DIFFTRYKK	93
19G-FI 580B	S HT-TILFØRSEL KONTROLLKABEL 1	88
42A-PI 327	S METANOL 42A-PD02B UTLØP	84
16A-PI 189	S TRYKK MEL. CH & MANIF.BR. 18	83
11C-FY 401	M SEMENT, BOREVANN -MÅLETANKER	83
51D-FI 981	V WIM B MOTOR KJØLEVANN	81
44A-FI 840	V EPCON, 44A-VX 60B, UTLØP	80
10B-WI 117N	B HYDR.SYL, MOMENT	79
50C-PI 803A	V SJØVANNSLØFTEPUMPE UTLØP	79
27A-FI 004	S EKSP.KOMPR. A, INNLØP	72
11B-LI 034	B SIRK., SAMLE	71
19I-PI 613	S NPU LEDNING ETTER CHOKE	70
42A-PI 387	S METANOL 42A-PD02A UTLØP	65
12E-PI 148B	M SEMENT, TRIPLEKSPUMPE B	65
21C-PI 002	S OLJEINNLØP STATFJORD A	60
57B-PI 021	S UTLØP SPILLOLJEPUMPER	60
27C-FIT 4002	S SNORRE B, GASSEKSPORT FLOW	59
43A-LI 056B	S SUMP VÆSKEUTSK. HT-FAKKEL	59
12C-PI 006A	B BORING, BR□NNDREPINGSMANIF.	57
12E-PI 147B	M SEMENT, TRIPLEKSPUMPE A	55
24C-LI 089	S GLYKOLUTJEVNINGSTANK.	54
11B-LI 039C	B SIRK., RES. 2	54
12F-LI 006A	B KOMPL.V, LAGERTANK A	52
50C-FT 801	M FORDEL, BORE-/SJØV. - TANKER	51

TAG	Service	Alarms
16A-PI 049	S TRYKK MEL. CH & MANIF.BR. 04	51
53C-LI 012	S DRIKKEVANNSTANK B	51
12F-LI 002A	B KOMPL.V, ARBEIDSTANK	50
17B-PI 242	S RINGROMSTRYKK BRØNN 24	50
51C-FI 003C	S OKS.FJ.,RET. OVERSK. VANN	50
19C-TI 918	V NEDIHULL TEMP., BRØNN C4	50
42L-FI 010	S H2S SCAVENGER TIL 1.TR. SEP.	50
10B-SI 114A	B ROT.BORD, OMDR.	50
44A-PDI 005B	S HYDROSYKLON, 1.TR. SEPARATOR	49
24C-FI 005B	S UTLØP GLYKOLUTJEVNINGSTANK	48
16A-PI 356	S TRYKK MELLOM W & CH BRØNN 35	48
26A-FI 065	S INJ.KOMPR. T.GASS TILF. DE	48
19I-PI 801	T NPU,PMP A, SMØREOLJE	48
27A-PI 012	S UTLØP EKSPORTKOMPRESSOR A	48
26A-FI 066	S INJ.KOMPR. T.GASS TILF. NDE	48
26B-PI 012	S INJ.GASS VÆSKEUTSKILLER	48
80D-EH01 I6	P 11kV GENERERT REAKTIV EFFEKT	47
23B-PI 817	V UTLØP LT KONDENSAT PUMPE A	47
17B-PI 355	S TRYKK MELLOM W & M BRØNN 35	46
44A-FI 838	V EPCON, 44A-VX 61D, UTLØP	46
16A-PI 046	S TRYKK MELLOM W & CH BRØNN 04	46
10B-WI 117J	B NOKK A, MOMENT	46
10B-PI 185A	B HEISESPILL	45
20A-LI 009	S TESTSEPARATOR GRENSESJIKT	42
53C-LI 002	S DRIKKEVANNSTANK A	41
11B-LI 035C	B SIRK., DRIFT 1	40
51E-PDI 007	S ESV SANDJETING	39
27A-PI 101A	S EKSP.KOMPR. B, INNLØPSTRYKK	38
17B-PI 185	S TRYKK MELLOM W & M BRØNN 18	38
23A-FI 003	S REKOMPR. INNLØP	38
19I-TI 806	T NPU,PMP B, SMØREOLJE	36
16A-PI 346	S TRYKK MELLOM W & CH BRØNN 34	35
27A-FI 862	V INJ.KOMP INTERMED SEALGAS SS	35
16A-PI 042	S RINGROMSTRYKK BRØNN 04	35
11A-PI 017	M SEM., BULK B	35
19G-PI 054	S LT-TILFØRSEL BKM 5	34
19G-FI 530B	S LT-TILFØRSELKONTROLLKABEL 1	34
56B-FA 004	S VANNUTLØP ÅPEN AVLØP NORD	34
27A-PDI 645	S EKSP.KOMPR. B, T.GASS - REF.G.	34
23A-PI 430	S REKOMPR. SM.OLJEMANIFOLD	34
11A-PI 008	M SEM., BULK A	34
62A-PI 361	S UTLØP FILTER UBEH. DIESEL	33

TAG	Service	Alarms
19G-FI 590B	S HT-TILFØRSEL KONTROLLKABEL 2	33
27A-PI 054	S FAKKELTANK EKSP.KOMPR.B	32
26B-PDI 830	S DIFF.TRYKK INNL. KJØLER INJ. K	32
11A-PI 026	M SEM., BULK C	32
23A-PI 413	S REKOMPR. SM.OLJEPUMPE UTLØP	31
23A-PDI 447	S REKOMPR. BUFFERGASS DE	31
42E-PI 908	V EMUL.BRYTER 1 TRINN SEP.	31
27A-PDI 653	S EKSP.KOMPR. B, T.GASS PRIM. DE	31
23A-PDI 445	S REKOMPR. T.GASS - REF.GASS	31
23A-PI 020A	S REKOMPR. INNLØP	31
71A-FI 008	S STRØMNING TESTLINJE	31
65B-PI 113	S HPU SØR LP SYSTEM	30
65D-PDI 907	V FILTER 65D-CA6XX	30
11B-LI 037C	B SIRK., DRIFT 2	30
20A-PI 005	S TESTSEPARATOR	30
65D-LI 908	V NIV+ TILFØRSELSTANK 65D-TB63	30
27A-PI 106	S INNLØP EKSPORTKOMPRESSOR B	30
17B-PI 375	S TRYKK MELLOM W & M BRØNN 37	29
71A-SI 117	S OMDREINING DIESEL MOTOR	29
71A-SI 094	S OMDREINING TURBO A	29
71A-SI 095	S OMDREINING TURBO B	29
26A-PI 068	S INJ.KOMPR. KJØLEGASS	29
26B-TI 002	S INNL.SCRUBBER INJ.KOMP	29
71A-PI 007	S TRYKK UTJEVEN TANK	29
27A-PI 001A	S EKSP.KOMPR. A, INNLØPSTRYKK	28
11B-SQI 294A	B BORING, TOTALE SPM	28
17D-PI 202	S RINGROMSTRYKK BRØNN 20	28
11B-FI 294	B BOREPUMPER, TOTALT VOLUM	28
27A-LI 669B	S EKSP.KOMPR. B, VÆSKEUTSKILLER	28
11B-PI 111	B SIRK., BOREPUMPE B, UTLØP	28
23A-TI 501	S REKOMPR. MOTOR VIKL. U	28
65B-PI 115	S HPU SØR HP SYSTEM	27
19G-PI 119	S LT-TILFØRSEL MKM 1	27
57B-LI 001	S SPILLOLJEPUMPE A	27
65B-PI 213	S HPU NORD LP SYSTEM	27
10B-WI 113A	B ROT.BORD, MOMENT	26
65D-PI 901A	V ETTER FILTER LINJE A	26
53B-PI 015	S UTLØP FERSKVANNSPUMPE A	26
51E-PI 806	V JETVANN TIL PROSESS	25
19I-PDI 213A	T NPU,19I-XV213 DIFFTRYKK	25
26A-PI 245	S INJ.KOMPR. BALANSESTEMPEL	25
51C-PI 901	V OKS.FJ. N2-KOMPR.A SMØREOLJE	25

TAG	Service	Alarms
27A-PI 006	S INNLØP EKSPORTKOMPRESSOR A	25
13F-PI 221T1	S BRØNN 22,DHP INJ.R. SONE 1	24
19G-FI 540B	S LT-TILFØRSELKONTROLLKABEL 2	24
23A-PDI 453	S REKOMPR. BUFFERGASS NDE	24
19C-PDI 918	V DIFF.TR. NEDIHULL / BR.HODE C4	24
62A-PI 016	S UTLØP OVERF.P. A UBEH DIESEL	24
19I-PI 614	S NPU LEDNING FØR CHOKE	23
11B-SI 119B	B BORING, BOREPUMPE C	23
17B-PI 445	S TRYKK MELLOM W & M BRØNN 44	23
11G-LI 025C	B □.AVL, BL□TANK	23
13F-PI 221T5	S BRØNN 22,DHP INJ.R. SONE 5	23
17B-PI 219	S TRYKK MELLOM W & CH BRØNN 21	23
17B-PI 339	S TRYKK MELLOM W & CH BRØNN 33	23
17B-PI 169	S TRYKK MELLOM W & CH BRØNN 16	23
19G-PI 053	S RINGROMSAVTAPPING BRØNN 5	23
11B-FI 119	B BOREPUMPE C, VOLUM	23
11B-PI 117	B SIRK., BOREPUMPE C, UTL□P	23
13F-PI 221A5	S BRØNN 22,DHP RINGROM SONE 5	23
11B-LI 041D	B SIRK., RES.4, SLAVE	23
11B-SI 107B	B BORING, BOREPUMPE A	22
17B-PI 245	S TRYKK MELLOM W & M BRØNN 24	22
27A-PI 766	S EKSP.KOMPR. B, MOTOR SPYLETRYK	22
51C-LI 923	V STRIPPE GASS KOLONNE WI	22
17B-PI 369	S TRYKK MELLOM W & CH BRØNN 36	22
23A-PI 005	S INNLØP GASSKOMPRESSOR	22
19G-PI 207A	S HJELPELINJE 2	22
11B-FI 107	B BOREPUMPE A, VOLUM	22
23A-TI 500	S REKOMPR. MOTOR VIKL. U	22
11B-FI 120	B BOREPMP, TOT. VOL. K&C-PANEL	22
21A-FI 977	V OLJE BOOSTER PMP B KJØLEVANN	21
42F-PI 001	S FLOKKULANT, UTLØP PUMPE A	21
42F-PI 002	S FLOKKULANT, UTLØP PUMPE B	21
27B-LI 025A	S SCRUBBER EKSPORTKOMP B	21
16A-PI 326	S TRYKK MELLOM W & CH BRØNN 32	21
13F-TI 292E	S BRØNN 29,DHT,INJ.R.	21
16A-PI 249	S TRYKK MEL. CH & MANIF.BR. 24	21
13F-PI 291A	S BRØNN 29,DHP,RINGROM SONE 1	21
13F-PI 291B	S BRØNN 29,DHP,RINGROM SONE 2	21
13F-TI 292D	S BRØNN 29,DHT,RINGROM SONE 4	21
16D-PI 065	S FOR CHOKE STIGERØR 2 R. A	21
42A-PI 011	S METANOL PMP.A INJ.KOMP	21
19C-PI 918	V NEDIHULL TRYKK, BRØNN C4	21

TAG	Service	Alarms
17B-PI 325	S TRYKK MELLOM W & M BRØNN 32	20
20B-PI 802	V GASSUTLØP 1 TRINN SEP.	20
44B-PI 814	V PRODVANN AVGASSTANK	20
27A-PDI 445	S EKSP.KOMPR. A, T.GASS - REF.G.	20
16A-PI 336	S TRYKK MELLOM W & CH BRØNN 33	20
13F-PI 291E	S BRØNN 29,DHP,INJ.R.	20
23A-TI 407	S REKOMPR. SM.OLJE TANK	20
13F-PI 291D	S BRØNN 29,DHP,RINGROM SONE 4	20
13F-TI 292C	S BRØNN 29,DHT,RINGROM SONE 3	20
11C-LI 252	S BOREVANNSTANK B	19
23A-PI 820	V GASSUTLØP REKOMP	19
11B-LI 038C	B SIRK., RES. 1	19
58D-PI 907	V SKUMDEMPER NR.2 TIL DEOKSYNERI	19
17B-PI 359	S TRYKK MELLOM W & CH BRØNN 35	19
17B-PI 372	S RINGROMSTRYKK BRØNN 37	19
13F-PI 291C	S BRØNN 29,DHP,RINGROM SONE 3	19
27A-PI 112	S UTLØP EKSPORTKOMPRESSOR B	19
27A-PDI 647	S EKSP.KOMPR. B, T.GASS PRIM. ND	19
13F-PI 221A4	S BRØNN 22,DHP RINGROM SONE 4	19
11B-LI 038D	B SIRK., RES. 1, SLAVE	19
56B-LI 055	S ÅPEN DRAIN TANK SØR	19
19G-PI 121	S METANOLTILFØRSEL 1, MKM 1	18
19G-PI 211	S METANOLTILFØRSEL 1, MKM 2	18
19G-PI 229	S METANOLTILFØRSEL 2, MKM 2	18
27A-PI 566	S EKSP.KOMPR. A, MOTOR SPYLETRYK	18
17B-PI 165	S TRYKK MELLOM W & M BRØNN 16	18
17B-PI 275	S TRYKK MELLOM W & M BRØNN 27	18
19G-PI 034	S LT-TILFØRSEL BKM 3	18
11B-LI 035D	B SIRK., DRIFT 1, SLAVE	18
13F-PI 221T3	S BRØNN 22,DHP INJ.R. SONE 3	18
13F-PI 221T4	S BRØNN 22,DHP INJ.R. SONE 4	18
23A-FI 875	V LT REKOMP MOTOR PURGING	18
50A-FI 106	S HJELPESJØVANNSPUMPE B	18
17B-PI 229	S TRYKK MELLOM W & CH BRØNN 22	18
17B-PI 212	S RINGROMSTRYKK BRØNN 21	18
17B-PI 082	S RINGROMSTRYKK BRØNN 08	18
16A-PI 349	S TRYKK MEL. CH & MANIF.BR. 34	18
27A-II 001A	S EFFEKT NIVÅ EKSPORTKOMP. A	18
63A-PDI 511	S ETTERFILTER LUFTTØRKE	18
42A-PI 012	S METANOL PMP.B INJ.KOMP	18
65B-PI 215	S HPU NORD HP SYSTEM	18
16A-TI 440	S TEMPERATUR BRØNN P44	18

TAG	Service	Alarms
62A-LI 033	S LAGERTANK B UBEHANDL.DIESEL	17
11B-LI 040C	B SIRK., RES. 3	17
11B-LI 041C	B SIRK., RES. 4	17
19G-PI 129	S METANOLTILFØRSEL 2, MKM 1	17
40A-PI 108	S TETNING, KJØLEVÆESKE PUMPE A	17
40A-PI 208	S TETNING, KJØLEVÆESKE PUMPE C	17
27B-PDI 061	S EKSPORTKOMP.A UTLØPS VENTIL	17
23A-PI 008	S UTLØP GASSKOMPRESSOR	17
12A-PI 003A	B BORING, BORESLEM TIL BRØNN	17
42E-PI 052	S EMULSJ.BR. TIL TEST SEP.	17
50A-FI 101	S HJELPESJØVANNSPUMPE A	17
19G-PI 063	S RINGROMSAVTAPPING BRØNN 6	17
13F-TI 042	S BRØNN 04,DHT,PROD.R.	17
11F-WI 006F	M TILSET, STASJON 4, NETTO	17
19G-PI 206A	S HJELPELINJE 1	17
42L-PI 013	S H ₂ S SCAVENGER PUMPE B UTLØP	17
51D-PI 152	S V.INJ.P.A,INNØP	17
20C-LI 810S	V 2.TRINN SEP. GRENSESJIKT	17
16A-TI 350	S TEMPERATUR BRØNN P35	17
27A-PI 656	S EKSP.KOMPR. B, T.GASS PR. DE	17
53B-PI 065	S UTLØP FERSKVANNSPUMPE B	16
62A-LI 003	S LAGERTANK B UBEHANDL DIESEL	16
11F-SI 001E	M TILSET, STASJON 1, UTMATER	16
19I-FI 205	S STRØMNING NPU PUMPER	16
16G-FI 002B	S 3-FASEMÅLER TESTM.SØR,VANN	16
27A-PI 613	S EKSP.KOMPR. B, SM.OLJE PUMPE	16
20C-PI 853	V X-OVER TRYKK	16
12F-FI 023A	B KOMPL.V, TIL BOREPUMPER	16
11F-FI 001C	M TILSET, STASJON 1, MATEHAST.	16
17B-PI 329	S TRYKK MELLOM W & CH BRØNN 32	16
11F-FI 006C	M TILSET, STASJON 4, MATEHAST.	16
27A-PI 674	S EKSP.KOMPR. B, T.GASS N ₂ TILF.	16
26B-LI 812	V INJ.KOMPRESSOR SCRUBBER	16
27A-FI 863	V INJ.KOMP BUFFER GASS FORS.TS	16
13F-PI 041	S BRØNN 04,DHP,PROD.R.	16
17B-PI 399	S TRYKK MELLOM W & CH BRØNN 39	16
19C-PDI 915	V DIFF.TR. NEDIHULL / BR.HODE C1	16
16A-PI 302	S RINGROMSTRYKK BRØNN 30	16
12F-LI 020A	B KOMPL.V, BLANDETANK A	16
13F-TI 422	S BRØNN 42,DHT,PROD.R.	16
11F-WI 005F	M TILSET, STASJON 3, NETTO	16
65D-LI 909	V NIVÅ SIRKULASJONSTANK 65D-TB61	16

TAG	Service	Alarms
17B-PI 322	S RINGROMSTRYKK BRØNN 32	16
13F-TI 192	S BRØNN 19,DHT,PROD.R.	16
62A-PI 021	S DIESELTRANSFER PUMPE B SØR	16
16A-PI 382	S RINGROMSTRYKK BRØNN 38	16
44D-LI 021	S OLJE CTOUR 44D-VA01	16
13F-TI 302A	S BRØNN 30,DHT,RINGROM SONE 1	16
11B-FI 113	B BOREPUMPE B, VOLUM	16
58K-PI 001	S FAWAG, OPPSTRØMS INJ. PUMPE	16
23A-TI 503	S REKOMPR. MOTOR VIKL. V	16
16A-TI 010	S TEMPERATUR BRØNN P01	16
21A-FI 950	V EKSPORT PMP B KJØLE VANN	16
16A-TI 030	S TEMPERATUR BRØNN P03	16
16A-TI 040	S TEMPERATUR BRØNN P04	16
11B-SQI 294B	B BORING, TOTALE PUMPESLAG	16
16G-FI 001A	S 3-FASEMÅLER TESTM.NORD,OLJE	16
16G-FI 003A	S 3-FASEMÅLER TESTM.NORD,OLJE	16
16A-TI 190	S TEMPERATUR BRØNN P19	16
16G-FI 001C	S 3-FASEMÅLER TESTM.NORD,GASS	16
16G-FI 003C	S 3-FASEMÅLER TESTM.NORD,GASS	16
27A-TI 607	S EKSP.KOMPR. B, SM.OLJE TANK	16
51C-PI 029	S OKS.FJ.,2.TR. GASS/VANN SEP.	16
16G-FI 002D	S 3-FASEMÅLER TESTM.SØR,TOT	15
21A-FI 967	V OLJE BOOSTER PMP A KJØLEVANN	15
10B-SI 112A	B TØRNBOR, OMDR.	15
62A-LI 005	S DIESEL EJEKTORTANK 62A-TB03A	15
11F-SI 006E	M TILSET, STASJON 4, UTMATER	15
11B-SI 113B	B BORING, BOREPUMPE B	15
20A-PI 031	S TESTSEPARATOR GASSUTLØP	15
16G-FI 002A	S 3-FASEMÅLER TESTM.SØR,OLJE	15
16G-FI 002C	S 3-FASEMÅLER TESTM.SØR,GASS	15
16G-FI 004B	S 3-FASEMÅLER TESTM.SØR,VANN	15
11F-WI 006G	M TILSET, STASJON 4, REST	15
11F-WI 007G	M TILSET, STASJON 5, REST	15
11A-SI 090	M BENT/BAR, MATETANK, MATEHAST	15
40A-PI 158	S TETNING, KJØLEVÆSKE PUMPE B	15
12E-DI 062B	B SEMENT, SEMENT, HODE	15
11A-DS 090A	M BENT/BAR, MX11, MATERIALVALG	15
23A-PI 466	S REKOMPR. T.GASS TILFØRSEL	15
16G-PI 001	S 3-FASEMÅLER TESTM.NORD	15
16G-TI 003	S 3-FASEMÅLER TESTM.NORD	15
11F-FI 002C	M TILSET, STASJON 2, MATEHAST.	15
11F-FI 005C	M TILSET, STASJON 3, MATEHAST.	15

TAG	Service	Alarms
16A-PI 366	S TRYKK MELLOM W & CH BRØNN 36	15
17B-PI 349	S TRYKK MELLOM W & CH BRØNN 34	15
51D-PI 155	S V.INJ.P.A,UTLØP	15
11F-SI 001D	M TILSET, STASJON 1, PUMPE	15
17B-PI 199	S TRYKK MELLOM W & CH BRØNN 19	15
13F-PI 431T	S BRØNN 43,DHP,PROD.R. SONE 1	15
13F-PI 161T	S BRØNN 16,DHP,PROD.R. SONE 1	15
13F-TI 302T	S BRØNN 30,DHT,PROD.R. SONE 1	15
19C-PDI 912	V DIFF.TR. NEDIHULL / BR.HODE B2	15
13F-PI 421	S BRØNN 42,DHP,PROD.R.	15
11F-SI 005D	M TILSET, STASJON 3, PUMPE	15
19C-PDI 914	V DIFF.TR. NEDIHULL / BR.HODE B4	15
11A-PI 047	M BARYTT, BULK B	15
19C-PDI 916	V DIFF.TR. NEDIHULL / BR.HODE C2	15
11A-PI 056	M BARYTT, BULK C	15
13F-TI 432T	S BRØNN 43,DHT,PROD.R. SONE 1	15
11B-FI 139A	B BORING, RETUR FRA BRØNN	15
13F-PI 191	S BRØNN 19,DHP,PROD.R.	15
17B-PI 142	S RINGROMSTRYKK BRØNN 14	15
16A-PI 342	S RINGROMSTRYKK BRØNN 34	15
11B-LI 292B	B BORING, TOTALT AKTIVT VOLUM	15
17A-FA 001	S VANNINJEKSJON RAMME A	15
13F-PI 301A	S BRØNN 30,DHP,RINGROM SONE 1	15
44D-LI 007	S OLJE CTOUR 44D-VA01	15
44D-PI 029	S OLJE CTOUR PUMPE UTL.	15
23B-PI 043	S UTLØP KONDENSATPUMPE A	15
13F-PI 161A	S BRØNN 16,DHP,RINGROM SONE 1	15
13B-UI 301	B BORING, STIGERØR, VINKEL	15
23B-PI 046	S UTLØP KONDENSATPUMPE B	15
16G-TI 002	S 3-FASEMÅLER TESTM.SØR	15
45A-LI 824	V BRENNGASSFILTER A	15
13F-TI 432A	S BRØNN 43,DHT,RINGROM SONE 1	15
17A-TI 926	V NEDIHULL TEMP., BRØNN E2	15
19I-TI 915	T NPU,PMP A, DC-MTR, VIKLING	15
17A-TI 946	V NEDIHULL TEMP., BRØNN E4	15
11B-PI 105	B SIRK., BOREPUMPE A, UTLØP	15
16G-FI 003D	S 3-FASEMÅLER TESTM.NORD,TOT	15
11B-DI 203A	B BORING, STANDRØR	15
10B-WI 117L	B NOKK B, MOMENT	15
12C-PI 005A	B BORING, BRØNNRETINGSMANIF.	15
16A-TI 410	S TEMPERATUR BRØNN P41	15
16A-TI 140	S TEMPERATUR BRØNN P14	15

TAG	Service	Alarms
16A-TI 240	S TEMPERATUR BRØNN P24	15
17A-PI 801	V VANNINJEKSJON ETTER CHOKE	15
16A-TI 390	S TEMPERATUR BRØNN P39	15
16G-FI 001B	S 3-FASEMÅLER TESTM.NORD,VANN	15
16G-FI 003B	S 3-FASEMÅLER TESTM.NORD,VANN	15
10B-WI 117K	B NOKK B, INSTILLING	15
51D-PI 801	V INNLØP WI PUMPE A	14
11A-WIB 085B	M BARYTT, MENGDE DOSERT	14
16G-FI 004D	S 3-FASEMÅLER TESTM.SØR,TOT	14
11F-SI 002E	M TILSET, STASJON 2, UTMATER	14
10B-WI 122C	B BORING, BOREKRONE VEKT	14
11F-SI 005E	M TILSET, STASJON 3, UTMATER	14
12F-FI 024A	B KOMPL.V, ARBEIDSTANK, INNLØP	14
11F-SI 007E	M TILSET, STASJON 5, UTMATER	14
11A-WI 085G	M BARYTT, MATETANK, REST	14
12E-FI 063B	B SEMENT, STRUPE & DREPELEDN.	14
27A-FI 894	V INJ.KOMPR.KJØLEGASS INNL.NDE	14
17B-PI 125	S TRYKK MELLOM W & M BRØNN 12	14
44A-PDI 042	S HYDROSYKLONER 2 TRINN SEP.	14
16G-FI 004A	S 3-FASEMÅLER TESTM.SØR,OLJE	14
11F-WI 002G	M TILSET, STASJON 2, REST	14
16G-FI 004C	S 3-FASEMÅLER TESTM.SØR,GASS	14
71A-PI 005	S TRYKK TESTLINJE	14
19H-QI 983B	V METAL LOSS RATE, BRØNN C4	14
50A-II 001C	S LAST SJØVANNSLØFTEPUMPE C	14
27D-ZI 047	S PIG DETEKT. GASSRISER SNO-B	14
19G-TI 071A	S BOR1, BRØNN A-07, RØR	14
45B-PI 803	V BRENNGASS ETTER FILTERE	14
23A-PI 813	V REKROMPRESSOR INNLØP	14
16G-PI 003	S 3-FASEMÅLER TESTM.NORD	14
16G-TI 001	S 3-FASEMÅLER TESTM.NORD	14
16A-PI 406	S TRYKK MELLOM W & CH BRØNN 40	14
50C-FT 811	M SEMENT, SJØVANN - MÅLETANKER	14
11A-FI 085	M BARYTT, MATETANK, UTLØP	14
17D-PI 329	S TRYKK MELLOM W & CH BRØNN 32	14
13F-PI 301T	S BRØNN 30,DHP,PROD.R. SONE 1	14
11F-FI 007C	M TILSET, STASJON 5, MATEHAST.	14
11B-LI 154A	B SLAMBEH., SILTUTSKILLER	14
19G-PI 023	S RINGROMSAVTAPPING BRØNN 2	14
16A-PI 376	S TRYKK MELLOM W & CH BRØNN 37	14
17B-PI 459	S TRYKK MELLOM W & CH BRØNN 45	14
11F-SI 002D	M TILSET, STASJON 2, PUMPE	14

TAG	Service	Alarms
19C-PDI 911	V DIFF.TR. NEDIHULL / BR.HODE B1	14
11B-DI 138A	B BORING, RETUR FRA BRØNN	14
11A-PI 038	M BARYTT, BULK A	14
11F-WI 001F	M TILSET, STASJON 1, NETTO	14
17A-PDI 927	V DIFF.TR. NEDIHULL / BR.HODE E2	14
11A-PI 065	M BARYTT, BULK D	14
19C-PDI 917	V DIFF.TR. NEDIHULL / BR.HODE C3	14
17A-PDI 947	V DIFF.TR. NEDIHULL / BR.HODE E4	14
10B-WI 111A	B TØRNBOR, MOMENT	14
17D-PI 022	S RINGROMSTRYKK BRØNN 02	14
23A-PDI 015A	S REKOMPR. INNLØP - UTLØP	14
11F-WI 007F	M TILSET, STASJON 5, NETTO	14
26A-PI 812	V INNJEKSJON KOMPRESSOR INNL.	14
12F-LI 019A	B KOMPL.V, BLANDETANK B	14
71A-DIS 099	S DIESEL ALARM KODE	14
11C-LI 203C	B B.VANN, FELLES VOLUME	14
13F-PI 431A	S BRØNN 43,DHP,RINGROM SONE 1	14
16G-PI 002	S 3-FASEMÅLER TESTM.SØR	14
16G-PI 004	S 3-FASEMÅLER TESTM.SØR	14
45A-LI 830	V BRENNGASSFILTER B	14
58B-PI 027	S BIOCID, 58B-PD01	14
19C-TI 912	V NEDIHULL TEMP., BRØNN B2	14
16G-TI 004	S 3-FASEMÅLER TESTM.SØR	14
58K-PI 002	S FAWAG, NEDSTRØMS INJ. PUMPE	14
11C-FY 016	B B.VANN, TIL FORBRUKERE	14
51C-PI 210	S OKS.FJ.,N2-KOMPR. C SM.OLJE	14
11B-DI 203B	B BORING, STANDRØR	14
11A-FI 090	M BENT/BAR, MATETANK, UTLØP	14
51D-PI 802	V UTLØP WI PUMPE A	14
19G-PI 051	S BRØNNHODE STRENG 1 BRØNN 5	14
19G-PI 206B	S MAKS. TRYKK HJELPELINJE 1	14
19G-PI 207B	S MAKS. TRYKK HJELPELINJE 2	14
11C-PI 275	M B.VANN, OVERF.PMP B,UTLØP	14
13F-TI 102T	S BRØNN 10,DHT,PROD.R.	14
45A-PDI 825	V BRENNGASSFILTER A	14
27A-FI 893	V INJ.KOMPR.KJØLEGASS INNL.DE	14
19C-PI 915	V NEDIHULL TRYKK, BRØNN C1	14
11C-PI 265	M B.VANN, PUMPE B, UTLØP	14
17A-PI 926	V NEDIHULL TRYKK, BRØNN E2	14
17A-PI 946	V NEDIHULL TRYKK, BRØNN E4	14
11A-PI 077	M BENT/BAR, BULK E	14
11D-FY 409	M FORDEL, B.OLJE - TANKER, SEM	14

TAG	Service	Alarms
16A-TI 330	S TEMPERATUR BRØNN P33	14
16A-TI 070	S TEMPERATUR BRØNN P07	14
11B-LI 040D	B SIRK., RES. 3, SLAVE	14
45A-PI 118	S UTLØP BRENNGASSFILTER B	14
19G-PI 210	S LT-TILFØRSEL 2 FILTERENHET 2	14
16G-FI 001D	S 3-FASEMÅLER TESTM.NORD,TOT.	14
16A-TI 380	S TEMPERATUR BRØNN P38	14
11A-SI 085	M BARYTT, MATETANK, MATEHAST	14
19H-QI 983C	V TEMP STRØMN.LINJE BR.C4	14
23B-PI 838	V UTLØP KONDENSAT PUMPE B	14
19G-TI 071B	S BOR1, BRØNN A-07, OLJE	14
11F-DS 007A	M TILSET, MX02, MATERIALVALG	14
11A-DS 085A	M BARYTT, MX10, MATERIALVALG	14
11C-PI 215	M B.VANN, PUMPE A, UTLØP,	13
42B-FI 811	V AVLEIR.HEMMER TIL EPCON	13
51D-FI 931	V WIM A MOTOR KJØLEVANN	13
19H-QI 913B	V METAL LOSS RATE, BRØNN B1	13
19H-QI 923B	V METAL LOSS RATE, BRØNN B2	13
19H-QI 933B	V METAL LOSS RATE, BRØNN B3	13
19H-QI 953B	V METAL LOSS RATE, BRØNN C1	13
19H-QI 943B	V METAL LOSS RATE, BRØNN B4	13
42I-PI 903	V VOKSHEMMER TIL BOOSTER PMP	13
19H-QI 963B	V METAL LOSS RATE, BRØNN C2	13
19H-QI 973B	V METAL LOSS RATE, BRØNN C3	13
19G-PI 064	S LT-TILFØRSEL BKM 6	13
19H-QI 913D	V TRYKK STRØMN.LINJE BR.B1	13
13F-PI 221T2	S BRØNN 22,DHP INJ.R. SONE 2	13
19H-QI 923D	V TRYKK STRØMN.LINJE BR.B2	13
19H-QI 933D	V TRYKK STRØMN.LINJE BR.B3	13
19H-QI 953D	V TRYKK STRØMN.LINJE BR.C1	13
19H-QI 943D	V TRYKK STRØMN.LINJE BR.B4	13
71A-PI 072	S TRYKK OPPSTROMS FILTER	13
42B-PI 905	V AVLEIR.HEMMER 3 STIGERØR 1	13
19H-QI 983D	V TRYKK STRØMN.LINJE BR.C4	13
42C-FI 805	V KORR.HEMMER 2 TIL UPA	13
16A-PI 216	S TRYKK MELLOM W & CH BRØNN 21	13
23A-PDI 021	S UTLØP GASSKOMPRESSOR	13
17B-PI 389	S TRYKK MELLOM W & CH BRØNN 38	13
11F-SI 006D	M TILSET, STASJON 4, PUMPE	13
11C-LI 253B	B B.VANN, TANK B	13
45A-TDI 846	V DIFF.TEMP BRENNGASS HEATER A	13
17B-PI 402	S RINGROMSTRYKK BRØNN 40	13

TAG	Service	Alarms
58K-FI 005	S FAWAG INJEKSJONSRATE	13
16A-PI 129	S TRYKK MEL. CH & MANIF.BR. 12	13
44C-LI 811	V REJECT PUMPE A,KJØLEV. TANK	13
13F-TI 012A	S BRØNN 01,DHT,RINGROM SONE 1	13
19C-TI 911	V NEDIHULL TEMP., BRØNN B1	13
19C-TI 915	V NEDIHULL TEMP., BRØNN C1	13
19C-TI 914	V NEDIHULL TEMP., BRØNN B4	13
19C-TI 916	V NEDIHULL TEMP., BRØNN C2	13
44C-LI 009	S AVGASSINGSTANK OLJEEKSTRAKT	13
19C-TI 917	V NEDIHULL TEMP., BRØNN C3	13
44C-PI 025	S AVGASSINGSTANK OLJEEKSTRAKT	13
23A-PI 566	S REKOMPR. MOTOR SPYLELUFT	13
13F-PI 101T	S BRØNN 10,DHP,PROD.R.	13
11C-PI 225	M B.VANN, OVERF.PMP A,UTLØP	13
11B-LI 155A	B SLAMBEH., L.HAST. SUGETANK	13
71A-PI 116	S TRYKK KJØLEVANN PUMPE	13
19I-TI 805	T NPU,PMP A, SMØREOLJE	13
19I-LI 822	T NPU,PMP B, SUMP	13
42A-PI 900	V METANOL PUMPER	13
19H-QI 913C	V TEMP STRØMN.LINJE BR.B1	13
19H-QI 923C	V TEMP STRØMN.LINJE BR.B2	13
50A-PI 302	S UTLØP SJØVANNSLØFTEPUMPER	13
19H-QI 933C	V TEMP STRØMN.LINJE BR.B3	13
19H-QI 953C	V TEMP STRØMN.LINJE BR.C1	13
19H-QI 943C	V TEMP STRØMN.LINJE BR.B4	13
71J-FI 002	S STRØMNING TESTLINJE	13
27A-PI 905	V REKOMP BALANSELINJE TRYKK	13
19G-PI 115B	S LT-RETURTRYKK, MKM1, MAKS	13
26A-PI 282	S INJ.KOMPR. SM.OLJE MANIFOLD	12
71A-PI 070	S TRYKK DRIVSTOFF FILTER	12
42B-PI 808	V AVLEIR.HEMMER TIL EPCON	12
17D-PI 275	S TRYKK MELLOM W & M BRØNN 27	12
27A-PI 650	S EKSP.KOMPR. B, T.GASS PR. NDE	12
23A-PDI 419	S REKOMPR. SM.OLJE FILTER	12
27B-PDI 091	S EKSPORTKOMP.B UTLØPS VENTIL	12
17B-PI 209	S TRYKK MELLOM W & CH BRØNN 20	12
19G-PI 013	S RINGROMSAVTAPPING BRØNN 1	12
16A-PI 276	S TRYKK MELLOM W & CH BRØNN 27	12
17D-PI 069	S TRYKK MELLOM W & CH BRØNN 06	12
19G-PI 033	S RINGROMSAVTAPPING BRØNN 3	12
17B-PI 222	S RINGROMSTRYKK BRØNN 22	12
16A-PI 219	S TRYKK MEL. CH & MANIF.BR. 21	12

TAG	Service	Alarms
58H-PI 907	V OKSYGENFJERNER TIL DEOKSYN.	12
17D-PI 172	S RINGROMSTRYKK BRØNN 17	12
50A-PI 303	S SJØVANNSLØFTEPUMPE UTLØP	12
17A-PI 004	S VANNINJEKSJON RAMME A	12
27A-PI 919	V INJ.KOMP BALANSELINJE TR.	12
13F-TI 292A	S BRØNN 29,DHT,RINGROM SONE 1	12
27A-TI 713	S EKSP.KOMPR. B, GEAR AKSIALLAGE	12
13F-TI 292B	S BRØNN 29,DHT,RINGROM SONE 2	12
13F-PI 221A3	S BRØNN 22,DHP RINGROM SONE 3	12
23A-TI 505	S REKOMPR. MOTOR VIKL. W	12
19C-PI 917	V NEDIHULL TRYKK, BRØNN C3	12
16A-TI 400	S TEMPERATUR BRØNN P40	12
26A-FI 256	S INJ.KOMPR. BUFF.G. INNL. NDE	12
71A-PI 067	S TRYKK LADELUFT KJOLES.	12
71A-PI 068	S TRYKK NEDS. OLJEFILTER	12
27A-TI 703	S EKSP.KOMPR. B, MOTORVIKL. V	11
16A-PI 415	S TRYKK MELLOM W & M BRØNN 41	11
17D-PI 155	S TRYKK MELLOM W & M BRØNN 15	11
27A-FI 850	V REKOMP SEAL GASS TRYKK SIDE	11
17D-PI 165	S TRYKK MELLOM W & M BRØNN 16	11
11B-LI 037D	B SIRK., DRIFT 2, SLAVE	11
71J-PI 009	S TRYKK AFFP PUMPE	11
27A-FI 851	V REKOMP SEAL GAS SUGESIDE	11
23A-TI 518	S REKOMPR. AKSIALLAGER	11
51D-PI 165	S V.INJ.P.B,UTLØP	11
17D-PI 299	S TRYKK MELLOM W & CH BRØNN 29	11
19G-PI 083	S RINGROMSAVTAPPING BRØNN 8	11
58D-FI 001	S VANNINJ. SKUMDEMPER 2	11
16A-PI 062	S RINGROMSTRYKK BRØNN 06	11
10B-WI 155F	B T□RNBOR, MOMENT	11
16A-PI 282	S RINGROMSTRYKK BRØNN 28	11
23A-PI 915	V LT REKOMP SM.O.TR.AUX	11
27A-TI 716	S EKSP.KOMPR. B, RADIALLAGER	11
23A-TI 502	S REKOMPR. MOTOR VIKL. V	11
21A-FI 922	V EKSPORT PMP A KJØLE VANN	11
27A-TI 243	V TURBIN POWER TURBINE TEMP	11
23B-PI 839	V UTLØP KONDENSAT PUMPE A	11
56B-LI 056	S ÅPEN DRAIN TANK SØR	11
45A-PI 853	V BRENGGASS SCRUBBER	10
51D-PI 813	V INNLØP WI PUMPE B	10
27A-TI 701	S EKSP.KOMPR. B, MOTORVIKL. U	10
27A-TI 702	S EKSP.KOMPR. B, MOTORVIKL. V	10

TAG	Service	Alarms
27A-TI 704	S EKSP.KOMPR. B, MOTORVIKL. W	10
27A-TI 753	S EKSP.KOMPR. B, MOTOR KJØLEVÆSK	10
19G-PI 543	S LT-TILFØRSELKONTROLLKABEL 2	10
17B-PI 415	S TRYKK MELLOM W & M BRØNN 41	10
17D-PI 345	S TRYKK MELLOM W & M BRØNN 34	10
17D-PI 085	S TRYKK MELLOM W & M BRØNN 08	10
17B-PI 095	S TRYKK MELLOM W & M BRØNN 09	10
17D-PI 295	S TRYKK MELLOM W & M BRØNN 29	10
51C-PDI 201	S OKS.FJ.,N2-KOMPR. C INNLØP	10
50A-II 001B	S LAST SJØVANNSLØFTEPUMPE B	10
13F-PI 321D	S BRØNN 32,DHP,PROD.R. SONE 1	10
13F-PI 321C	S BRØNN 32,DHP,PROD.R. SONE 2	10
16A-PI 416	S TRYKK MELLOM W & CH BRØNN 41	10
62C-PI 042	S DIESEL TIL HOVEDGENERATORER	10
17D-PI 259	S TRYKK MELLOM W & CH BRØNN 25	10
19G-PI 043	S RINGROMSAVTAPPING BRØNN 4	10
16A-PI 012	S RINGROMSTRYKK BRØNN 01	10
17B-PI 092	S RINGROMSTRYKK BRØNN 09	10
16A-PI 439	S TRYKK MEL. CH & MANIF.BR. 43	10
16A-PI 372	S RINGROMSTRYKK BRØNN 37	10
16A-PI 192	S RINGROMSTRYKK BRØNN 19	10
17D-PI 182	S RINGROMSTRYKK BRØNN 18	10
16A-PI 179	S TRYKK MEL. CH & MANIF.BR. 17	10
23A-TI 512	S REKOMPR. GEAR AKSIALLAGER	10
45A-PI 823	V BRENNGASSFILTER A	10
45A-PI 829	V BRENNGASSFILTER B	10
27A-PI 630	S EKSP.KOMPR. B, SM.OLJE MANIFOL	10
27A-TI 717	S EKSP.KOMPR. B, RADIALLAGER	10
19G-PI 071	S BRØNNHODE STRENG 1 BRØNN 7	10
20D-LI 806	V 3 TRINN SEPARATOR OLJE	10
23A-TI 504	S REKOMPR. MOTOR VIKL. W	10
44C-PI 801	V UTLØP OLJE EKSTRAKT PUMPE B	10
27A-PI 812	V PIPELINE KOMPRESSOR INNLØP	10
16A-TI 090	S TEMPERATUR BRØNN P09	10
27A-TI 707	S EKSP.KOMPR. B, MOTORRADIALLAGE	9
27A-TI 708	S EKSP.KOMPR. B, MOTORRADIALLAGE	9
27A-TI 709	S EKSP.KOMPR. B, MOTORRADIALLAGE	9
23A-TI 509	S REKOMPR. MOTOR RADIALLAGER	9
27A-PI 804	V GASSUTLØP PIPEL.KOMP	9
17D-PI 415	S TRYKK MELLOM W & M BRØNN 41	9
16A-PI 175	S TRYKK MELLOM W & M BRØNN 17	9
42A-FI 013	S METANOL SNORRE INJ. KOMP	9

TAG	Service	Alarms
23A-TI 418	S REKOMPR. SM.OLJE ETTER KJØLER	9
26A-PI 277	S INJ.KOMPR. SM.OLJE PUMPE	9
17D-PI 219	S TRYKK MELLOM W & CH BRØNN 21	9
17D-PI 159	S TRYKK MELLOM W & CH BRØNN 15	9
17B-PI 259	S TRYKK MELLOM W & CH BRØNN 25	9
17D-PI 169	S TRYKK MELLOM W & CH BRØNN 16	9
19I-FI 207	T NPU,PMP B, UTLØP	9
17B-PI 279	S TRYKK MELLOM W & CH BRØNN 27	9
17B-PI 299	S TRYKK MELLOM W & CH BRØNN 29	9
11F-WI 002F	M TILSET, STASJON 2, NETTO	9
16A-PI 432	S RINGROMSTRYKK BRØNN 43	9
16A-PI 262	S RINGROMSTRYKK BRØNN 26	9
17D-PI 342	S RINGROMSTRYKK BRØNN 34	9
16A-PI 452	S RINGROMSTRYKK BRØNN 45	9
16A-PI 369	S TRYKK MEL. CH & MANIF.BR. 36	9
27A-PDI 114A	S EKSP.KOMPR. B, INLØP - UTLØP	9
13F-PI 321A	S BRØNN 32,DHP,RINGROM SONE 2	9
27A-TI 618	S EKSP.KOMPR. B, SM.OLJE	9
27A-TI 720	S EKSP.KOMPR. B, AKSIALLAGER	9
27A-TI 719	S EKSP.KOMPR. B, AKSIALLAGER	9
19G-PI 072	S BRØNNHODE STRENG 2 BRØNN 7	9
51C-PI 902	V OKS.FJ. N2-KOMPR.B SMØREOLJE	9
65A-LI 778	B HYDRAULIKKTANK	9
27A-TI 706	S EKSP.KOMPR. B, MOTORRADIALLAG	8
11A-WI 030B	M SEM., BULK C	8
27A-TI 700	S EKSP.KOMPR. B, MOTORVIKL. U	8
27A-TI 705	S EKSP.KOMPR. B, MOTORVIKL. W	8
16A-PI 015	S TRYKK MELLOM W & M BRØNN 01	8
17D-PI 015	S TRYKK MELLOM W & M BRØNN 01	8
16A-PI 225	S TRYKK MELLOM W & M BRØNN 22	8
58D-PI 904	V SKUMDEMPER NR.2 TIL DEOKSYNERI	8
17D-PI 385	S TRYKK MELLOM W & M BRØNN 38	8
19G-PI 209	S LT-TILFØRSEL MKM 2	8
44B-LI 804	V PRODVANN AVGASSTANK	8
53B-LI 052	S FERSKVANNSTANK B	8
23A-TI 521	S REKOMPR. AKSIALLAGER	8
17D-PI 339	S TRYKK MELLOM W & CH BRØNN 33	8
16A-PI 286	S TRYKK MELLOM W & CH BRØNN 28	8
20A-FA 001B	S GASSMÅLING TESTSEPARATOR	8
17D-PI 389	S TRYKK MELLOM W & CH BRØNN 38	8
44B-PDI 024	S ESV FOR JETVANNSINLØP	8
16A-PI 122	S RINGROMSTRYKK BRØNN 12	8

TAG	Service	Alarms
16A-PI 412	S RINGROMSTRYKK BRØNN 41	8
17B-PI 412	S RINGROMSTRYKK BRØNN 41	8
16A-PI 422	S RINGROMSTRYKK BRØNN 42	8
17B-PI 342	S RINGROMSTRYKK BRØNN 34	8
17D-PI 442	S RINGROMSTRYKK BRØNN 44	8
16A-PI 099	S TRYKK MEL. CH & MANIF.BR. 09	8
27A-TI 711	S EKSP.KOMPR. B, GEAR AKSIALLAGE	8
27A-TI 712	S EKSP.KOMPR. B, GEAR AKSIALLAGE	8
11C-PI 017	B B.VANN, TILFØRSEL	8
24A-AIT 0013	S SNORRE B, GASS DUGGPUNKT	8
42L-PI 003	S H2S SCAV. TIL GAS TEST SEP.	8
27A-TI 714	S EKSP.KOMPR. B, RADIALLAGER	8
27A-TI 721	S EKSP.KOMPR. B, AKSIALLAGER	8
51D-PI 814	V UTLØP WI PUMPE B	8
27A-TI 718	S EKSP.KOMPR. B, AKSIALLAGER	8
45A-TI 050	S UTLØP BRENNGASSVARMERE	8
44C-PI 804	V UTLØP OLJE EKSTRAKT PUMPE A	8
27A-PI 111A	S EKSP.KOMPR. B, UTLØPSTRYKK	8
10B-WI 117I	B NOKK A, INSTILLING	8
23A-PI 819	V GASSUTLØP REKOMPRESSOR	8
23A-PDI 442	S REKOMPR. T.GASS FILTER	7
17B-PI 215	S TRYKK MELLOM W & M BRØNN 21	7
17B-PI 265	S TRYKK MELLOM W & M BRØNN 26	7
17B-PI 455	S TRYKK MELLOM W & M BRØNN 45	7
17B-PI 365	S TRYKK MELLOM W & M BRØNN 36	7
17B-PI 195	S TRYKK MELLOM W & M BRØNN 19	7
19G-PI 044	S LT-TILFØRSEL BKM 4	7
23A-PI 919	V LT REKOMP SM.OLJE HEADER	7
27A-FI 864	V INJ.KOMP BUFFERGASS FORS.SS	7
19G-PI 204	S KRYSSLØP MANIFOLD	7
27A-PDI 642	S EKSP.KOMPR. B, T.GASS FILTER	7
23A-TI 514	S REKOMPR. RADIALLAGER	7
23A-TI 520	S REKOMPR. AKSIALLAGER	7
16D-PI 808	V STRØMN.RØR 1 FØR CHOKE	7
57B-LI 017	S SPILLOLJEPUMPE B	7
17B-PI 249	S TRYKK MELLOM W & CH BRØNN 24	7
65D-PI 901B	V ETTER FILTER LINJE B	7
45A-TDI 850	V DIFF.TEMP BRENNGASS HEATER B	7
23A-PI 807	V UTLØP LT REKOMPRESSOR	7
17B-PI 262	S RINGROMSTRYKK BRØNN 26	7
16A-PI 339	S TRYKK MEL. CH & MANIF.BR. 33	7
51E-PI 804	V JETVANN TIL 2 & 3 TRINN SEP	7

TAG	Service	Alarms
27A-II 001B	S EFFEKT NIVÅ EKSPORTKOMP. B	7
23A-TI 510	S REKOMPR. GEAR AKSIALLAGER	7
56B-LI 005	S ÅPEN DRAIN TANK NORD	7
27A-ZI 086	S ANTISURGEVALVE POSITION	7
27A-TI 710	S EKSP.KOMPR. B, GEAR AKSIALLAGE	7
19I-PI 300	T NPU,MANIFOLD, INNLØP	7
51D-PI 182	S V.INJ.P.C,INNLØP	7
43A-FI 085	S BEREGNET TILGJ.GASSKAPASITET	7
23A-PI 809	V INNLØP LT REKOMPRESSOR	7
19G-PI 052	S BRØNNHODE STRENG 2 BRØNN 5	7
51D-LI 977	V WIM B MOT ØVR LAGER OLJENIV.	7
16A-TI 100	S TEMPERATUR BRØNN P10	7
16A-TI 110	S TEMPERATUR BRØNN P11	7
23A-PDI 015	S DIFF. PRESSURE RECOMP.	7
23A-TI 553	S REKOMPR. MOTOR KJØLEVÆSKE	7
11A-WI 012B	M SEM., BULK A	6
19G-PI 533	S LT-TILFØRSELKONTROLLKABEL 1	6
23A-TI 506	S REKOMPR. MOTOR RADIALLAGER	6
23A-TI 507	S REKOMPR. MOTOR RADIALLAGER	6
23A-TI 508	S REKOMPR. MOTOR RADIALLAGER	6
23A-PI 456	S REKOMPR. T.GASS LEKK. DE	6
19G-PI 014	S LT-TILFØRSEL BKM 1	6
17D-PI 285	S TRYKK MELLOM W & M BRØNN 28	6
17B-PI 385	S TRYKK MELLOM W & M BRØNN 38	6
17B-PI 395	S TRYKK MELLOM W & M BRØNN 39	6
51C-PI 922	V STRIPPE GASS KOLONNE WI	6
19G-TI 451	S UPA HPU, SIRKULASJONSPUMPE	6
23A-PI 450	S REKOMPR. T.GASS LEKK. NDE	6
71A-TI 073	S TEMP. SMØREOLJEFILTER	6
23A-TI 515	S REKOMPR. RADIALLAGER	6
19G-PI 104	S LT-TILFØRSEL BKM 10	6
23A-TI 516	S REKOMPR. RADIALLAGER	6
23A-TI 517	S REKOMPR. RADIALLAGER	6
17D-PI 209	S TRYKK MELLOM W & CH BRØNN 20	6
23A-TI 519	S REKOMPR. AKSIALLAGER	6
16E-PI 809	V NPU MOT STRØMNINGSRØR 1	6
16D-PI 820	V STRØMN.RØR 2 ETTER CHOKE	6
16D-PI 804	V STRØMN.RØR 1 ETTER CHOKE	6
19G-PI 113	S VANNINJEKSJONSMAN. (TRYKK A)	6
42C-FI 804	V KORR.HEMMER 2 TIL UPA	6
23A-PI 901	V LT REKOMP LAGER BUFF GASS	6
17B-PI 162	S RINGROMSTRYKK BRØNN 16	6

TAG	Service	Alarms
58D-PI 027	S SKUMDEMPER 2, 58D-PD01A	6
16A-PI 092	S RINGROMSTRYKK BRØNN 09	6
13F-PI 011A	S BRØNN 01,DHP,RINGROM SONE 1	6
17D-PI 292	S RINGROMSTRYKK BRØNN 29	6
23A-TI 511	S REKOMPR. GEAR AKSIALLAGER	6
23A-TI 513	S REKOMPR. GEAR AKSIALLAGER	6
27A-PDI 619	S EKSP.KOMPR. B, SM.OLJE FILTER	6
51D-PI 162	S V.INJ.P.B,INNLØP	6
51D-PI 142	S V.INJ.P.E,INNLØP	6
51D-PI 192	S V.INJ.P.D,INNLØP	6
23A-PI 812	V LP REKOMPRESSOR INNLØP	6
27A-TI 715	S EKSP.KOMPR. B, RADIALLAGER	6
13F-PI 271A1	S BRØNN 27,DHP RINGROM SONE 1	6
45A-TI 848	V BRENNGASS HEATER B	6
19G-PI 062	S BRØNNHODE STRENG 2 BRØNN 6	6
19G-PI 091	S BRØNNHODE STRENG 1 BRØNN 9	6
19G-PI 092	S BRØNNHODE STRENG 2 BRØNN 9	6
13F-TI 272A1	S BRØNN 27,DHT RINGROM SONE 1	6
27A-PI 666	S EKSP.KOMPR. B, T.GASS TILF.	6
16A-TI 210	S TEMPERATUR BRØNN P21	6
11B-LI 133L	B ETTERF., TANK NIV□, SLAVE	6
27A-PI 430	S EKSP.KOMPR. A, SM.OLJEMANIFOLD	6
42A-PI 901	V METANOL PUMPER	6
11C-FI 001	B B.V.TANK 11C-TB03 UTLØP	6
11A-WI 021B	M SEM., BULK B	5
42B-PI 001	S AVL. HEM. NO.3 PMP. A UTLØP	5
42A-PI 306	S OVERTRYKK METANOLTANK	5
19G-PI 583	S HT-TILFØRSELKONTROLLKABEL 1	5
17B-PI 105	S TRYKK MELLOM W & M BRØNN 10	5
13F-SPFB1Q	SPARE FB1 DHPT	5
13F-SPFB1R	SPARE FB1 DHPT	5
16A-PI 305	S TRYKK MELLOM W & M BRØNN 30	5
13F-SPFB1S	SPARE FB1 DHPT	5
51D-PI 205	S V.INJ.FELLES UTLØPSLINJE	5
13F-SPFB1T	SPARE FB1 DHPT	5
13F-SPFB1U	SPARE FB1 DHPT	5
13F-SPFB1V	SPARE FB1 DHPT	5
13F-SPFB1W	SPARE FB1 DHPT	5
13F-SPFB1X	SPARE FB1 DHPT	5
17B-PI 145	S TRYKK MELLOM W & M BRØNN 14	5
13F-SPFB1Y	SPARE FB1 DHPT	5
13F-SPFB1Z	SPARE FB1 DHPT	5

TAG	Service	Alarms
17D-PI 355	S TRYKK MELLOM W & M BRØNN 35	5
20C-PDI 024	S ESV FOR JETING 2.TR.SEP.	5
17B-PI 295	S TRYKK MELLOM W & M BRØNN 29	5
19G-PI 095	S HT-TILFØRSEL BKM 9	5
50A-II 001A	S LAST SJØVANNSLØFTEPUMPE A	5
42I-PI 012	S VOKSHEMMER MANIFOLD	5
16A-PI 016	S TRYKK MELLOM W & CH BRØNN 01	5
16A-PI 076	S TRYKK MELLOM W & CH BRØNN 07	5
11D-PI 003	B B.OLJE, TIL BORING	5
16A-PI 396	S TRYKK MELLOM W & CH BRØNN 39	5
17D-PI 369	S TRYKK MELLOM W & CH BRØNN 36	5
16A-PI 213	S PROD.RØR FØR CHOKE BRØNN 21	5
51D-PI 145	S V.INJ.P.E,UTLØP	5
19G-PI 093	S RINGROMSAVTAPPING BRØNN 9	5
19G-PI 205	S VANNINJEKSJONSMAN. (TRYKK B)	5
27D-PI 033	S GASSEKSPORT/IMPORT SNORRE B	5
17B-PI 392	S RINGROMSTRYKK BRØNN 39	5
23A-PI 010A	S REKOMPR. UTLØP	5
23A-ZI 011	S ANTISURGEVALVE POSITION	5
44A-LI 848	V EPCON,NIVÅ 44A-VX 60B	5
56B-LI 006	S ÅPEN DRAIN TANK NORD	5
23A-PI 806	V GASSUTLØP LT REKOMPRESSOR	5
13F-PI 221A2	S BRØNN 22,DHP RINGROM SONE 2	5
19G-PI 042	S BRØNNHODE STRENG 2 BRØNN 4	5
23B-LI 813	V LT. REKOMP. INNLØP VÆSKEUTSK.	5
21A-FI 952	V EKSPORT PMP B KJØLE VANN	5
16A-TI 320	S TEMPERATUR BRØNN P32	5
16A-TI 230	S TEMPERATUR BRØNN P23	5
16A-TI 430	S TEMPERATUR BRØNN P43	5
58H-PI 027	S SCAVENGER, 58H-PD01A	5
27A-PI 111	S KOMPRESSOR UTLØPSTRYKK	4
27A-PDI 453	S EKSP.KOMPR. A, T.GASS PR. DE	4
19G-PI 593	S HT-TILFØRSELKONTROLLKABEL 2	4
17B-PI 115	S TRYKK MELLOM W & M BRØNN 11	4
16A-PI 215	S TRYKK MELLOM W & M BRØNN 21	4
17D-PI 125	S TRYKK MELLOM W & M BRØNN 12	4
17B-PI 405	S TRYKK MELLOM W & M BRØNN 40	4
17D-PI 145	S TRYKK MELLOM W & M BRØNN 14	4
17B-PI 335	S TRYKK MELLOM W & M BRØNN 33	4
19G-PI 015	S HT-TILFØRSEL BKM 1	4
19I-TI 002	S NPU STIGERØR 2 RAMME A	4
17D-PI 245	S TRYKK MELLOM W & M BRØNN 24	4

TAG	Service	Alarms
17D-PI 065	S TRYKK MELLOM W & M BRØNN 06	4
19G-PI 025	S HT-TILFØRSEL BKM 2	4
19G-PI 024	S LT-TILFØRSEL BKM 2	4
19G-PI 045	S HT-TILFØRSEL BKM 4	4
19G-PI 021	S BRØNNHODE STRENG 1 BRØNN 2	4
19G-PI 085	S HT-TILFØRSEL BKM 8	4
27A-FI 845	V INJ.KOMPR.TETN.GASS INNL.DE	4
42B-PI 906	V AVLEIR.HEMMER 3 STIGERØR 2	4
64A-PI 915	V NØYTRALGASS PAKKE	4
19G-PI 523	S UPA HPU, LAVTRYKKS LINJE	4
27A-PDI 447	S EKSP.KOMPR. A, T.GASS PR. NDE	4
16A-PI 226	S TRYKK MELLOM W & CH BRØNN 22	4
27B-TI 829	V GASSKJØLER	4
16A-PI 166	S TRYKK MELLOM W & CH BRØNN 16	4
17D-PI 409	S TRYKK MELLOM W & CH BRØNN 40	4
17D-PI 419	S TRYKK MELLOM W & CH BRØNN 41	4
17D-PI 349	S TRYKK MELLOM W & CH BRØNN 34	4
16A-PI 386	S TRYKK MELLOM W & CH BRØNN 38	4
17D-PI 179	S TRYKK MELLOM W & CH BRØNN 17	4
17B-PI 379	S TRYKK MELLOM W & CH BRØNN 37	4
19G-PI 073	S RINGROMSAVTAPPING BRØNN 7	4
17D-PI 399	S TRYKK MELLOM W & CH BRØNN 39	4
16A-PI 202	S RINGROMSTRYKK BRØNN 20	4
16A-PI 132	S RINGROMSTRYKK BRØNN 13	4
16A-PI 232	S RINGROMSTRYKK BRØNN 23	4
51C-FI 003D	S OKS.FJ., INNLØP	4
16A-PI 242	S RINGROMSTRYKK BRØNN 24	4
16A-PI 152	S RINGROMSTRYKK BRØNN 15	4
51E-PDI 807	V ESV FOR JETTING PR.VANN SEP.	4
16A-PI 352	S RINGROMSTRYKK BRØNN 35	4
16A-PI 082	S RINGROMSTRYKK BRØNN 08	4
51E-PI 002	S 2.TRINN SEPARATOR	4
17B-PI 172	S RINGROMSTRYKK BRØNN 17	4
17B-PI 182	S RINGROMSTRYKK BRØNN 18	4
26A-PI 807	V GASSUTLØP INJ.KOMP	4
16A-PI 379	S TRYKK MEL. CH & MANIF.BR. 37	4
16A-PI 399	S TRYKK MEL. CH & MANIF.BR. 39	4
44A-LI 849	V EPCON,NIVÅ 44A-VX 61A	4
44B-FI 018	S SPYLEVANN FRA PRODUSERTVANN	4
19G-PI 031	S BRØNNHODE STRENG 1 BRØNN 3	4
19G-PI 022	S BRØNNHODE STRENG 2 BRØNN 2	4
27A-PI 943	V KOMP TOG SMØREOLJE TEST TR.	4

TAG	Service	Alarms
27A-TI 151	S EKSP.KOMPR. B, T.GASS FORVARME	4
16A-TI 150	S TEMPERATUR BRØNN P15	4
23A-FI 851	V LT REKOMP BUFFER GASS FLOW	4
16A-TI 080	S TEMPERATUR BRØNN P08	4
16A-TI 180	S TEMPERATUR BRØNN P18	4
17A-FI 950	V BRØNN E4, INJEKSJONS RATE	4
19G-PI 101	S BRØNNHODE STRENG 1 BRØNN 10	4
19G-PI 102	S BRØNNHODE STRENG 2 BRØNN 10	4
19G-PI 201	S PRODUKSJONSMAN. 1 (TRYKK B)	3
44A-PDI 866	V EPCON,DIFFTRYKK GASS/VANN	3
51C-TI 087	S OKS.FJ.,O2-FJERNER, UTLØP	3
27A-PDI 104	S KOMPRESSOR B FLOW, TTO	3
50A-FI 301	S SJØVANN TIL GROVFILTERENHET	3
16A-PI 125	S TRYKK MELLOM W & M BRØNN 12	3
27A-PI 805	V GASSUTLØP PIPELINE KOMP.	3
56B-FA 054	S UTLØP ÅPEN DRAIN TANK SØR	3
21A-PI 017	S OLJEEKSP. B, TETNING SYSTEM	3
21A-PI 029	S OLJEEKSP. B, TETNING SYSTEM	3
16A-PI 335	S TRYKK MELLOM W & M BRØNN 33	3
17B-PI 155	S TRYKK MELLOM W & M BRØNN 15	3
17B-PI 065	S TRYKK MELLOM W & M BRØNN 06	3
16A-PI 075	S TRYKK MELLOM W & M BRØNN 07	3
17B-PI 075	S TRYKK MELLOM W & M BRØNN 07	3
17D-PI 075	S TRYKK MELLOM W & M BRØNN 07	3
17B-PI 175	S TRYKK MELLOM W & M BRØNN 17	3
16A-PI 275	S TRYKK MELLOM W & M BRØNN 27	3
19G-PI 035	S HT-TILFØRSEL BKM 3	3
20B-LI 012	S OLJE 1.TRINN SEP.	3
53C-PI 101	S TETNING DRIKKEVANNSPUMPE A	3
27A-PI 450	S EKSP.KOMPR. A, T.GASS PR. NDE	3
26A-TI 010	S INJ.KOMPRESSOR UTLØP	3
17B-PI 285	S TRYKK MELLOM W & M BRØNN 28	3
20C-LI 013	S 2.TRINN SEP. OLJE	3
53C-PI 201	S TETNING DRIKKEVANNSPUMPE C	3
51C-PDI 101	S OKS.FJ.,N2-KOMPR. A INNLØP	3
17D-PI 375	S TRYKK MELLOM W & M BRØNN 37	3
17D-PI 195	S TRYKK MELLOM W & M BRØNN 19	3
56B-TI 051	S VARMEEL.ÅPEN DRAIN TANK SØR	3
19G-PI 065	S HT-TILFØRSEL BKM 6	3
53C-PI 021	S UTLØP DRIKKEVANNSPUMPE A	3
23A-PDI 003	S REKOMPRESSOR FLOW, TTO	3
53C-PI 151	S TETNING DRIKKEVANNSPUMPE B	3

TAG	Service	Alarms
19G-PI 573B	S UPA HPU, HØYTRYKKSLINJE	3
19G-PI 075	S HT-TILFØRSEL BKM 7	3
64A-AI 910	V NØYTRALGASS PAKKE	3
53C-PI 031	S UTLØP DRIKKEVANNSPUMPE C	3
16D-PI 008	S FØR CHOKE STIGERØR 1 R. A	3
51C-PDI 151	S OKS.FJ.,N2-KOMPR. B INNLØP	3
53C-PI 026	S UTLØP DRIKKEVANNSPUMPE B	3
19G-PI 084	S LT-TILFØRSEL BKM 8	3
56A-LI 005	S ÅPEN DRAIN TANK EX.	3
56A-LI 006	S ÅPEN DRAIN TANK EX.	3
20B-LI 809	V OLJE 1.TRINN SEP.	3
27A-FI 855	V REKOMP BUFFER GASS SUGESIDE	3
16D-PI 007	S ETTER CHOKE STIGERØR 1 R. A	3
51D-FI 201A	S UTLØP VANNINJEKSJONSPUMPER	3
19G-PI 105	S HT-TILFØRSEL BKM 10	3
20A-PDI 024	S ESV FOR JETING TEST SEP.	3
53B-LI 053	S FERSKVANNSTANK B	3
17B-PI 109	S TRYKK MELLOM W & CH BRØNN 10	3
16A-PI 236	S TRYKK MELLOM W & CH BRØNN 23	3
16A-PI 246	S TRYKK MELLOM W & CH BRØNN 24	3
13F-PI 011T	S BRØNN 01,DHP,PROD.R. SONE 1	3
16A-PI 436	S TRYKK MELLOM W & CH BRØNN 43	3
17B-PI 239	S TRYKK MELLOM W & CH BRØNN 23	3
16A-PI 446	S TRYKK MELLOM W & CH BRØNN 44	3
71A-TI 080	S TEMP. H.T. KJØLING B	3
16A-PI 456	S TRYKK MELLOM W & CH BRØNN 45	3
16A-PI 196	S TRYKK MELLOM W & CH BRØNN 19	3
13F-TI 012T	S BRØNN 01,DHT,PROD.R. SONE 1	3
26A-TI 049	S INJ.KOMPR. T.GASS	3
51D-PI 185	S V.INJ.P.C,UTLØP	3
17B-PI 012	S RINGROMSTRYKK BRØNN 01	3
17D-PI 102	S RINGROMSTRYKK BRØNN 10	3
17B-PI 202	S RINGROMSTRYKK BRØNN 20	3
17B-PI 112	S RINGROMSTRYKK BRØNN 11	3
16A-PI 222	S RINGROMSTRYKK BRØNN 22	3
16A-PI 019	S TRYKK MEL. CH & MANIF.BR. 01	3
16A-PI 309	S TRYKK MEL. CH & MANIF.BR. 30	3
27A-FI 843	V INJ.KOMPR.TETN.GASS INNL.NDE	3
51C-PDI 040	S OKS.FJ.,GASS/VANN	3
16A-PI 162	S RINGROMSTRYKK BRØNN 16	3
16A-PI 072	S RINGROMSTRYKK BRØNN 07	3
53C-FI 042	S UTLØP UV-STERILISERINGSENHET	3

TAG	Service	Alarms
16A-PI 442	S RINGROMSTRYKK BRØNN 44	3
16A-PI 239	S TRYKK MEL. CH & MANIF.BR. 23	3
16A-PI 429	S TRYKK MEL. CH & MANIF.BR. 42	3
16A-PI 169	S TRYKK MEL. CH & MANIF.BR. 16	3
17B-PI 382	S RINGROMSTRYKK BRØNN 38	3
16A-PI 279	S TRYKK MEL. CH & MANIF.BR. 27	3
27A-PI 918	V KOMPTOG LAGER BUFFERGASS	3
16A-PI 389	S TRYKK MEL. CH & MANIF.BR. 38	3
65A-PI 905	V HYDR. HT., UTLØP	3
19G-PI 523A	S UPA HPU, LAVTRYKKS LINJE	3
19G-PI 523B	S UPA HPU, LAVTRYKKS LINJE	3
50A-TI 265	S MOTORVIKL SJØVANNSLØFTEP. B	3
27A-TI 514	S EKSP.KOMPR. A, RADIALLAGER	3
27A-PDI 114	S DIFF. PRESSURE EXPORT COMP. B	3
27A-TI 515	S EKSP.KOMPR. A, RADIALLAGER	3
27A-TDI 969	V HP KOMPR. THRUSTTEMP DEV	3
23A-FI 852	V LT REKOMP BUFFERGASS FLOW	3
50B-PDI 901	V SJØVANN GROVFILTER	3
17D-FI 220	S INJEKSJONGASS P22	3
19G-PI 082	S BRØNNHODE STRENG 2 BRØNN 8	3
27A-PI 101	S KOMPRESSOR SUGETRYKK	3
26A-PI 809	V GASSINNLØP INJ.KOMP	3
44B-LI 005	S OLJE PROD. VANN	3
27B-TI 821	V PIPELINE KOMPR ETTERKJØLER	3
16A-TI 300	S TEMPERATUR BRØNN P30	3
44B-LI 803	V OLJE PROD. VANN	3
16A-TI 420	S TEMPERATUR BRØNN P42	3
42B-FI 806	V AVLEIR.HEMMER 3 TIL UPA	3
20B-PI 011	S 1.TRINN SEP.	3
27A-PI 456	S EKSP.KOMPR. A, T.GASS PR. DE	3
19G-PI 573	S UPA HPU, HØYTRYKKS LINJE	3
65A-PI 906	V HYDR. HT., N2	2
42B-PI 002	S AVL. HEM. NO.3 PMP. B UTLØP	2
26A-TI 314	S INJ.KOMPR. SM.OLJE TANK	2
23A-PI 010	S KOMPRESSOR UTLØPSTRYKK	2
21A-PI 016	S OLJEEKSP. A, TETNING SYSTEM	2
17D-PI 205	S TRYKK MELLOM W & M BRØNN 20	2
17D-PI 025	S TRYKK MELLOM W & M BRØNN 02	2
16A-PI 405	S TRYKK MELLOM W & M BRØNN 40	2
21A-PI 019	S OLJEEKSP. A, TETNING SYSTEM	2
17B-PI 225	S TRYKK MELLOM W & M BRØNN 22	2
17D-PI 405	S TRYKK MELLOM W & M BRØNN 40	2

TAG	Service	Alarms
16A-PI 255	S TRYKK MELLOM W & M BRØNN 25	2
17D-PI 335	S TRYKK MELLOM W & M BRØNN 33	2
16A-PI 365	S TRYKK MELLOM W & M BRØNN 36	2
16A-PI 095	S TRYKK MELLOM W & M BRØNN 09	2
17D-PI 445	S TRYKK MELLOM W & M BRØNN 44	2
17D-PI 365	S TRYKK MELLOM W & M BRØNN 36	2
17D-PI 095	S TRYKK MELLOM W & M BRØNN 09	2
19G-PI 573A	S UPA HPU, HØYTRYKKSLINJE	2
19G-TI 401	S UPA HPU, FYLLE- / RENSEPUMPE	2
27A-PI 413	S EKSP.KOMPR. A, SM.OLJE PUMPE	2
19G-PI 074	S LT-TILFØRSEL BKM 7	2
19G-PI 094	S LT-TILFØRSEL BKM 9	2
26A-TI 317	S INJ.KOMPR. SM.OLJE ETTER KJ.	2
20C-LI 833	V 2.TRINN SEP. OLJE	2
11B-LI 156A	B SLAMBEH., UTLØP	2
16A-PI 106	S TRYKK MELLOM W & CH BRØNN 10	2
71A-TI 077	S TEMP. HYDR. OLJE TANK	2
51D-TI 718	S V.INJ.P.E,MOTOR KJ.LUFT 1	2
17B-PI 129	S TRYKK MELLOM W & CH BRØNN 12	2
17B-PI 409	S TRYKK MELLOM W & CH BRØNN 40	2
17D-PI 229	S TRYKK MELLOM W & CH BRØNN 22	2
16A-PI 086	S TRYKK MELLOM W & CH BRØNN 08	2
16A-PI 096	S TRYKK MELLOM W & CH BRØNN 09	2
27A-PI 474	S EKSP.KOMPR. A, T.GASS N2 TILF.	2
17B-PI 079	S TRYKK MELLOM W & CH BRØNN 07	2
20A-FI 013A	S VANNRATE TESTSEPARATOR	2
16A-PI 296	S TRYKK MELLOM W & CH BRØNN 29	2
17B-PI 289	S TRYKK MELLOM W & CH BRØNN 28	2
58E-PI 801	V AVLEIRHEMMER 2 TIL WI PUMPER	2
17D-PI 199	S TRYKK MELLOM W & CH BRØNN 19	2
27A-FI 861	V INJ.KOMP INTERMED SEALGAS TS	2
19I-PI 208	T NPU,PMP B, UTLØP	2
16A-PI 212	S RINGROMSTRYKK BRØNN 21	2
16A-PI 402	S RINGROMSTRYKK BRØNN 40	2
27A-PDI 942	V KOMP TOG SMØREOLJE FILTER	2
16A-PI 142	S RINGROMSTRYKK BRØNN 14	2
17D-PI 222	S RINGROMSTRYKK BRØNN 22	2
17B-PI 232	S RINGROMSTRYKK BRØNN 23	2
16A-PI 332	S RINGROMSTRYKK BRØNN 33	2
17D-PI 232	S RINGROMSTRYKK BRØNN 23	2
17B-PI 332	S RINGROMSTRYKK BRØNN 33	2
16A-PI 409	S TRYKK MEL. CH & MANIF.BR. 40	2

TAG	Service	Alarms
17B-PI 352	S RINGROMSTRYKK BRØNN 35	2
16A-PI 362	S RINGROMSTRYKK BRØNN 36	2
16A-PI 272	S RINGROMSTRYKK BRØNN 27	2
20D-TI 807	V 3 TRINN SEPARATOR	2
17D-PI 262	S RINGROMSTRYKK BRØNN 26	2
17D-PI 082	S RINGROMSTRYKK BRØNN 08	2
17B-PI 452	S RINGROMSTRYKK BRØNN 45	2
17B-PI 362	S RINGROMSTRYKK BRØNN 36	2
16A-PI 259	S TRYKK MEL. CH & MANIF.BR. 25	2
17D-PI 452	S RINGROMSTRYKK BRØNN 45	2
16A-PI 359	S TRYKK MEL. CH & MANIF.BR. 35	2
17D-PI 372	S RINGROMSTRYKK BRØNN 37	2
16A-PI 392	S RINGROMSTRYKK BRØNN 39	2
17D-PI 382	S RINGROMSTRYKK BRØNN 38	2
44A-LI 851	V EPCON,NIVÅ 44A-VX 61C	2
44A-LI 847	V EPCON,NIVÅ 44A-VX 60A	2
19G-PI 103	S RINGROMSAVTAPPING BRØNN 10	2
50A-TI 266	S MOTORVIKL SJØVANNSLØFTEP. B	2
40A-LI 037A	S EKSPANSJONSTANK KJØLEVÆSKE	2
13F-PI 221A1	S BRØNN 22,DHP RINGROM SONE 1	2
19G-PI 041	S BRØNNHODE STRENG 1 BRØNN 4	2
19G-PI 032	S BRØNNHODE STRENG 2 BRØNN 3	2
19G-PI 061	S BRØNNHODE STRENG 1 BRØNN 6	2
45A-TDI 856	V D. TEMP OUT FUEL GAS FILT/SEP.	2
26A-FI 204	S INJ.KOMPR.KJØLEGASS UTL. DE	2
23A-PI 020	S KOMPRESSOR SUGETRYKK	2
42B-FI 807	V AVLEIR.HEMMER 3 TIL UPA	2
23A-TI 929	V LT REKOMP SM.OLJE BAK KJØLER	2
26A-FI 203	S INJ.KOMPR.KJØLEGASS UTL. NDE	2
19G-PI 111	S PRODUKSJONSMAN. 1 (TRYKK A)	1
17D-FI 290	S INJEKSJONGASS, P29	1
27A-PDI 004	S KOMPRESSOR A FLOW, TTO	1
16A-AI 004	S SAND DETEKSJON BRØNNOMRÅDE NOR	1
63C-PI 001	S INSTRUMENT LUFT FORSYNING	1
17D-PI 215	S TRYKK MELLOM W & M BRØNN 21	1
16A-PI 235	S TRYKK MELLOM W & M BRØNN 23	1
43D-PI 001	S FAKKEL PILOT GASS TRYKK	1
17D-PI 235	S TRYKK MELLOM W & M BRØNN 23	1
16A-PI 435	S TRYKK MELLOM W & M BRØNN 43	1
16A-PI 165	S TRYKK MELLOM W & M BRØNN 16	1
62A-LI 002	S LAGERTANK A UBEHANDL. DIESEL	1
17B-PI 085	S TRYKK MELLOM W & M BRØNN 08	1

TAG	Service	Alarms
27D-PI 019	S EKSPORTGASS	1
17D-PI 175	S TRYKK MELLOM W & M BRØNN 17	1
16A-PI 285	S TRYKK MELLOM W & M BRØNN 28	1
17D-PI 455	S TRYKK MELLOM W & M BRØNN 45	1
17D-PI 185	S TRYKK MELLOM W & M BRØNN 18	1
19G-PI 055	S HT-TILFØRSEL BKM 5	1
16A-PI 395	S TRYKK MELLOM W & M BRØNN 39	1
17D-PI 395	S TRYKK MELLOM W & M BRØNN 39	1
13F-PI 101T1	S BRØNN 10,DHP INJ.R. SONE 1	1
13F-PI 101T2	S BRØNN 10,DHP INJ.R. SONE 2	1
13F-PI 101T3	S BRØNN 10,DHP INJ.R. SONE 3	1
13F-PI 101T4	S BRØNN 10,DHP INJ.R. SONE 4	1
13F-TI 102T1	S BRØNN 10,DHT INJ.R. SONE 1	1
13F-TI 102T2	S BRØNN 10,DHT INJ.R. SONE 2	1
27A-PI 945	V KOMP TOG SMØREOLJE HEADER	1
13F-TI 102T3	S BRØNN 10,DHT INJ.R. SONE 3	1
27B-LI 005A	S SCRUBBER EKSPORTKOMP A	1
13F-TI 222T1	S BRØNN 22,DHT INJ.R. SONE 1	1
13F-TI 102T4	S BRØNN 10,DHT INJ.R. SONE 4	1
13F-PI 271T1	S BRØNN 27,DHP INJ.R. SONE 1	1
13F-TI 222T2	S BRØNN 22,DHT INJ.R. SONE 2	1
13F-PI 271T2	S BRØNN 27,DHP INJ.R. SONE 2	1
13F-TI 222T3	S BRØNN 22,DHT INJ.R. SONE 3	1
51D-TI 789	S V.INJ.P.E,MOTOR KJ.2 KALD	1
13F-PI 271T3	S BRØNN 27,DHP INJ.R. SONE 3	1
13F-TI 222T4	S BRØNN 22,DHT INJ.R. SONE 4	1
13F-PI 271T4	S BRØNN 27,DHP INJ.R. SONE 4	1
56B-LIC 801	B Å.AVL, SLAM,IKKE-EX	1
64A-TI 906	V NØYTRALGASS PAKKE	1
42E-FI 806	V EMULSJONSBRYTER LINJE 1	1
13F-TI 222T5	S BRØNN 22,DHT INJ.R. SONE 5	1
42E-FI 807	V EMULSJONSBRYTER LINJE 2	1
13F-TI 272T1	S BRØNN 27,DHT INJ.R. SONE 1	1
23A-TI 938	V LT REKOMP LAGER TEMP	1
13F-TI 272T2	S BRØNN 27,DHT INJ.R. SONE 2	1
13F-TI 272T3	S BRØNN 27,DHT INJ.R. SONE 3	1
27A-TI 969	V KOMPTOG M.AKSLING THR.LAGER	1
13F-TI 272T4	S BRØNN 27,DHT INJ.R. SONE 4	1
53B-LI 002	S FERSKVANNSTANK A	1
21C-PI 016	S OLJEEKSPORT TIL STATFJORD A	1
16A-PI 206	S TRYKK MELLOM W & CH BRØNN 20	1
16A-PI 126	S TRYKK MELLOM W & CH BRØNN 12	1

TAG	Service	Alarms
17B-PI 019	S TRYKK MELLOM W & CH BRØNN 01	1
16A-PI 146	S TRYKK MELLOM W & CH BRØNN 14	1
13F-PI 261D	S BRØNN 26,DHP,PROD.R. SONE 1	1
17D-PI 029	S TRYKK MELLOM W & CH BRØNN 02	1
21A-PI 372	V GFA OLJE INNLØP	1
13F-TI 322C	S BRØNN 32,DHT,PROD.R. SONE 2	1
13F-TI 322D	S BRØNN 32,DHT,PROD.R. SONE 1	1
13F-PI 021T	S BRØNN 02,DHP,PROD.R. SONE 1	1
16A-PI 266	S TRYKK MELLOM W & CH BRØNN 26	1
17B-PI 069	S TRYKK MELLOM W & CH BRØNN 06	1
13F-TI 262D	S BRØNN 26,DHT,PROD.R. SONE 1	1
17B-PI 179	S TRYKK MELLOM W & CH BRØNN 17	1
17B-PI 089	S TRYKK MELLOM W & CH BRØNN 08	1
13F-PI 151T	S BRØNN 15,DHP,PROD.R. SONE 1	1
17D-PI 449	S TRYKK MELLOM W & CH BRØNN 44	1
71A-TI 079	S TEMP. H.T. KJØLING A	1
13F-TI 022T	S BRØNN 02,DHT,PROD.R. SONE 1	1
17D-PI 459	S TRYKK MELLOM W & CH BRØNN 45	1
17D-PI 189	S TRYKK MELLOM W & CH BRØNN 18	1
13F-PI 411	S BRØNN 41,DHP,PROD.R.	1
13F-PI 141	S BRØNN 14,DHP,PROD.R.	1
42F-PI 004	S FLOKKULANT, NEDSTR. TEST	1
51D-PI 195	S V.INJ.P.D,UTLØP	1
13F-TI 152T	S BRØNN 15,DHT,PROD.R. SONE 1	1
51C-AI 041	S OKS.FJ.,2.TR. UTLØP, O2-ANAL.	1
13F-TI 162T	S BRØNN 16,DHT,PROD.R. SONE 1	1
17B-PI 102	S RINGROMSTRYKK BRØNN 10	1
13F-TI 412	S BRØNN 41,DHT,PROD.R.	1
13F-TI 142	S BRØNN 14,DHT,PROD.R.	1
17D-PI 012	S RINGROMSTRYKK BRØNN 01	1
44B-PDI 014	S ESV FOR JETING PROD.VANN	1
17D-PI 402	S RINGROMSTRYKK BRØNN 40	1
20B-PI 808	V 1 TRINN SEPARATOR	1
58H-PI 904	V OKSYGENFJERNER TIL DEOKSYN.	1
17D-PI 142	S RINGROMSTRYKK BRØNN 14	1
17B-PI 152	S RINGROMSTRYKK BRØNN 15	1
16A-PI 252	S RINGROMSTRYKK BRØNN 25	1
16A-PI 139	S TRYKK MEL. CH & MANIF.BR. 13	1
51C-AI 042	S OKS.FJ.,2.TR. UTLØP, CL-ANAL.	1
17B-PI 072	S RINGROMSTRYKK BRØNN 07	1
16A-PI 419	S TRYKK MEL. CH & MANIF.BR. 41	1
16A-PI 172	S RINGROMSTRYKK BRØNN 17	1

TAG	Service	Alarms
23B-PI 818	V UTLØP LT KONDENSAT PUMPE B	1
16A-PI 182	S RINGROMSTRYKK BRØNN 18	1
16A-PI 069	S TRYKK MEL. CH & MANIF.BR. 06	1
58D-PI 028	S SKUMDEMPER 2, 58D-PD01B	1
17B-PI 272	S RINGROMSTRYKK BRØNN 27	1
17D-PI 362	S RINGROMSTRYKK BRØNN 36	1
16A-PI 269	S TRYKK MEL. CH & MANIF.BR. 26	1
13F-PI 021A	S BRØNN 02,DHP,RINGROM SONE 1	1
17B-PI 292	S RINGROMSTRYKK BRØNN 29	1
16A-PI 459	S TRYKK MEL. CH & MANIF.BR. 45	1
16A-PI 199	S TRYKK MEL. CH & MANIF.BR. 19	1
17D-PI 392	S RINGROMSTRYKK BRØNN 39	1
13F-PI 031D	S BRØNN 03,DHP,RINGROM SONE 1	1
13F-PI 321B	S BRØNN 32,DHP,RINGROM SONE 1	1
13F-PI 151A	S BRØNN 15,DHP,RINGROM SONE 1	1
50C-AI 001	S KLORINN. SJØVANN FRA GROVFILTE	1
13F-TI 022A	S BRØNN 02,DHT,RINGROM SONE 1	1
13F-PI 261C	S BRØNN 26,DHP,RINGROM SONE 1	1
13F-PI 261B	S BRØNN 26,DHP,RINGROM SONE 2	1
50A-TI 267	S MOTORVIKL SJØVANNSLØFTEP. B	1
13F-TI 032A	S BRØNN 03,DHT,RINGROM SONE 4	1
13F-TI 032B	S BRØNN 03,DHT,RINGROM SONE 3	1
13F-TI 032C	S BRØNN 03,DHT,RINGROM SONE 2	1
13F-TI 032D	S BRØNN 03,DHT,RINGROM SONE 1	1
13F-TI 322A	S BRØNN 32,DHT,RINGROM SONE 2	1
13F-TI 322B	S BRØNN 32,DHT,RINGROM SONE 1	1
13F-PI 261A	S BRØNN 26,DHP,RINGROM SONE 5	1
13F-TI 152A	S BRØNN 15,DHT,RINGROM SONE 1	1
13F-PI 031A	S BRØNN 03,DHP,RINGROM, SONE 4	1
13F-PI 031B	S BRØNN 03,DHP,RINGROM, SONE 3	1
13F-PI 031C	S BRØNN 03,DHP,RINGROM, SONE 2	1
13F-TI 162A	S BRØNN 16,DHT,RINGROM SONE 1	1
42L-PI 012	S H2S SCAVENGER PUMPE A UTLØP	1
13F-TI 262C	S BRØNN 26,DHT,RINGROM SONE 1	1
13F-TI 262B	S BRØNN 26,DHT,RINGROM SONE 2	1
13F-TI 262A	S BRØNN 26,DHT,RINGROM SONE 5	1
45A-TI 901	V BRENNGASSVARMER A	1
51C-PI 110	S OKS.FJ.,N2-KOMPR. A SM.OLJE	1
26A-TI 292	S INJ.KOMPR. T.GASS UTLØP	1
13F-PI 101A1	S BRØNN 10,DHP RINGROM SONE 1	1
51C-PI 160	S OKS.FJ.,N2-KOMPR. B SM.OLJE	1
13F-PI 101A2	S BRØNN 10,DHP RINGROM SONE 2	1

TAG	Service	Alarms
13F-PI 101A3	S BRØNN 10,DHP RINGROM SONE 3	1
13F-PI 101A4	S BRØNN 10,DHP RINGROM SONE 4	1
13F-TI 102A1	S BRØNN 10,DHT RINGROM SONE 1	1
13F-TI 102A2	S BRØNN 10,DHT RINGROM SONE 2	1
13F-TI 102A3	S BRØNN 10,DHT RINGROM SONE 3	1
21A-PI 816_ol	d V UTLØP EKSPORTPUMPE A	1
13F-TI 222A1	S BRØNN 22,DHT RINGROM SONE 1	1
13F-TI 102A4	S BRØNN 10,DHT RINGROM SONE 4	1
21A-PI 817_ol	d V UTLØP EKSPORTPUMPE B	1
13F-TI 222A2	S BRØNN 22,DHT RINGROM SONE 2	1
13F-PI 271A2	S BRØNN 27,DHP RINGROM SONE 2	1
13F-TI 222A3	S BRØNN 22,DHT RINGROM SONE 3	1
13F-PI 271A3	S BRØNN 27,DHP RINGROM SONE 3	1
13F-TI 222A4	S BRØNN 22,DHT RINGROM SONE 4	1
45A-PDI 831	V BRENNGASSFILTER B	1
13F-PI 271A4	S BRØNN 27,DHP RINGROM SONE 4	1
13F-TI 222A5	S BRØNN 22,DHT RINGROM SONE 5	1
13F-TI 272A2	S BRØNN 27,DHT RINGROM SONE 2	1
13F-TI 272A3	S BRØNN 27,DHT RINGROM SONE 3	1
42F-PI 003	S FLOKKULANT, NEDSTR. 1.TRIN	1
13F-TI 272A4	S BRØNN 27,DHT RINGROM SONE 4	1
19C-PI 916	V NEDIHULL TRYKK, BRØNN C2	1
16D-PI 813	V OLJE SIRK FRA SNO EKSP.PMP	1
16A-TI 130	S TEMPERATUR BRØNN P13	1
21A-PI 011	S UTLØP OLJERØRLEDNINGSPUMPER	1
45A-PI 108	S UTLØP BRENNGASSFILTER A	1
16A-TI 260	S TEMPERATUR BRØNN P26	1
19G-PI 208	S HT-TILFØRSEL 2 FILTERENHET 2	1
26A-TI 060	S INJ.KOMPR. T.GASS SCRUBBER	1
21A-FI 014	S MIN.STRØMNING OLJEEKSP.PMP.	1
58H-PI 028	S SCAVENGER, 58H-PD01B	1
27A-FI 854	V REKOMP BUFFER GASS TR.SIDE	1
42B-PI 915	V AVLEIR.HEMMER 3 TIL UPA	1
42B-PI 925	V AVLEIR.HEMMER 3 TIL UPA	1
26A-PI 264	S INJ.KOMPR. TETNINGSLUFT LAGER	1
17D-FI 200	S INJEKSJONSGASS, P20	1
42L-PI 005	S H2S SCAVENGER TIL 1.TR. SEP.	1

REFERENCES

Alarm Management Standards. Are you taking them seriously? Advance Solutions Whitepaper; Honeywell Process Solutions Houston, TX 77042; available at internet at:

<https://www.honeywellprocess.com/library/marketing/whitepapers/honeywell-alarm-manager-alarm-management-standards-taken-seriously-wp817.pdf>

ANSI/ISA 18.2-2009; 23 June 2009; Management of Alarm Systems for the Process Industries;

EEMUA Publication 191 Rev 1; 1999; "ALARM SYSTEMS- A guide to design, Management and Procurement"

NORSOK Standard I-002 Rev. 2; 05-01-2001; Safety and Automation Systems (SAS); Norwegian Technology Centre, Oslo, Norway

NORSOK Standard I-003 Rev. 5; 03-03-2013; System Control Diagram; Standards Norway; Lysaker, Norway

The Norwegian Petroleum Directorate; 30-06-2003; "Oppsummering etter gjennomført tilsyn med alarmsystemer på produksjonsinnretninger på norsk sokkel I perioden august 2000 til september 2002"

The Norwegian Petroleum Directorate; February 2001; YA-711 "Principles for alarm system design"

Petroleum Safety Authority Norway; 16-10-2003; "Audit of design of control room and alarm systems"; Stavanger, Norway

Petroleum Safety Authority Norway; 16-8-2006; "Audit of gassco's follow-up of alarm systems"; Stavanger, Norway

Petroleum Safety Authority Norway; 20-04-2010; "Audit of human-machine interface and information presentation - Alvheim FPSO"; Stavanger, Norway

Petroleum Safety Authority Norway; 22-11-2006; "Audit of conocophillips - follow-up of alarm systems"; Stavanger, Norway