Certificate No:
TAA00000T3

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Engine Safety, Control and Alarm System

with type designation(s)
Engine, gearbox and propulsion Local Control, Monitoring and Safety System for use with engine series BR 2000, 4000, 8000, 396, 595 and 1163-03,

Issued to
MTU Friedrichshafen GmbH
FRIEDRICHSHAFEN, Germany

is found to comply with
Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards

Application :

To be used for engines series BR 2000, 4000, 8000, 396, 595 and 1163-03 with/without gear/clutch.
Location classes can be found on pages from 2 to 5.

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Location classes can be found on pages from 2 to 5
.
This Certificate is valid until **2018-11-29**.

Issued at **Hamburg** on **2016-11-30**

for **DNV GL**

DNV GL local station: **Augsburg**

Approval Engineer: **Marco Rinkel**

Duy Nam Le
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

© DNV GL 2014. DNV GL and the Horizon Graphic are trademarks of DNV GL AS.

Job Id:
Certificate No: **TAA00000T3**

Product description

MTU automation systems for:

1. Engine, gearbox and propulsion (Controllable Pitch propeller, Voith Schneider propeller and Waterjet applications) Control, Monitoring and Safety System for **engine series 1600, 2000, 4000 and 1163-04.**
2. Engine, gearbox and propulsion (Controllable Pitch propeller, Voith Schneider propeller and Waterjet applications) Control, Monitoring and Safety System (including Splash-Oil System) for **engines series 8000.**
3. Engine, gearbox and propulsion (Controllable Pitch Propeller, Voith Schneider propeller and Waterjet applications) Control, Monitoring and Safety System for **engines series 396, 595 and 1163-03.**

Systems main configurations:

1. Basic – when delivery include only LOP, EMU, ECU units and assiociated sensors for engine series 1600, 2000, 4000, 8000 ans 1163-04
2. ECS/ADEC-Uni – when delivery includes ADEC-Uni, ECS-Uni, LOP-ECS, ETB, CCS units and associated sensors for engine series 396, 595 and 1163-03.
3. Extended – when delivery includes in addition to "Basic" or "ECS/ADEC-Uni" configurations, gearbox Control and Monitoring system, propulsion remote control system, etc.

Hardware systems elements:

System main electronic components location classes:						
Type	**Description**	**Temperature**	**Humidity**	**Vibration**	**EMC**	**Enclosure**
LOP 1	Local Operational Panel (2000, 4000)	A	B	A	A	A/B
LOP 4	Local Operational Panel (8000)	A	B	A	A	A/B
LOP 8	Local Operationg Panel (2000, 4000)	A	B	A	A	A/B
LOP 10	Local Operating Panel (2000, 4000)	B	B	A	A	*
LOP 11	Local Operating Panel (2000, 4000)	A	B	A	A	B
LOP 14	Local Operating Panel (1600, 2000, 4000, 1163-04)	A	B	A	A	*
LOP ECS	Local Operational Panel (396, 595, 1163-03)	D	B	A	A	B
ADEC UNI	Main and back-up Engine Control Unit (396, 595, 1163-03)	D	B	B	A	B
ECS UNI	Main and back-up Engine Control Unit (396, 595, 1163-03)	D	B	B	A	B
EMU 1	Engine Monitoring Unit (2000, 4000)	D	B	B	A	B
EMU 2	Engine Monitoring Unit (8000)	D	B	B	A	B
EMU 7	Engine Monitoring Unit (2000, 4000)	D	B	B	A	B
EMU 8	Engine Monitoring Unit (1600, 2000, 4000, 1163-04)	D	B	B	A	B
ECU 4	Engine Control Unit (2000, 4000, 8000)	D	B	B	A	B
ECU 7	Engine Control Unit (2000, 4000)	D	B	B	A	B
ECU 9	Engine Control Unit (2000, 4000, 1600, 1163-04)	D	B	B	A	B
SAM1	Standard Automation Module – I/O data processing and communication unit (mounted in LOP)	B	B	B	A	*
ETB 2	Engine Terminal Box	D	B	B	A	B
ETB 4	Engine Terminal Box	D	B	B	A	B
CCS	Customer Connection Box	D	B	A	A	B
X010	Connection box					

System main electronic components location classes:						
PPC	Lubrication oil priming pump control	D	B	A	A	B
MEU 1	Monitoring Extension Unit	A	B	A	A	*
SCU1	Systembus Coupling Unit	B	B	A	A	*
EIM 2	Engine Interface Module (2000, 4000)	D	B	B	A	*
GCU 1	Gear Control Unit	C	B	A	A	B
GCU 2	Gear Control Unit	C	B	A	A	B
GCU 3	Gear Control Unit	C	B	A	A	B
GCU 6	Gear Control Unit	C	B	A	A	B
GMU 1	Gear Monitoring Unit	C	B	A	A	B
PCMU	Propeller Control and Monitoring Unit	A	B	A	A	B
*) - Required protection according to the Rules to be provided upon installation on board						

System sensors components location classes:						
Type	**Description**	**Temperature**	**Humidity**	**Vibration**	**EMC**	**Enclosure**
000 535 73 33	Speed sensor	D	B	B	A	B
000 535 74 33	Speed sensor	D	B	B	A	B
000 535 75 33	Speed sensor	D	B	B	A	B
000 535 76 33	Speed sensor	D	B	B	A	B
000 535 77 33	Hall speed sensor	D	B	B	A	B
520 530 40 69	Exh. turbo charger speed sensor	D	B	B	A	B
DM 11	Tachometer	B	B	B	A	C
DM11/A	Tachometer	B	B	B	A	C
DM12	Tachometer	B	B	B	A	C
DM12/A	Tachometer	B	B	B	A	C
DM21	Tachometer	B	B	B	A	C
DM21/A	Tachometer	B	B	B	A	C
DM22	Tachometer	B	B	B	A	C
DM 22/A	Tachometer	B	B	B	A	C
DM 31	Tachometer	D	B	B	A	B
002 535 37 31	Pressure sensor 0-50 bar	D	B	B	A	B
003 535 32 31	Pressure sensor 0-40 bar	D	B	B	A	B
003 535 22 31	Pressure sensor ± 70 mbar	D	B	B	A	B
003 535 31 31	Pressure sensor 0-200 mbar	D	B	B	A	B
003 535 23 31	Pressure sensor 0-4 bar	D	B	B	A	B
003 535 24 31	Pressure sensor 0-6 bar	D	B	B	A	B
003 535 25 31	Pressure sensor	D	B	B	A	B

System sensors components location classes:						
	0-10 bar					
003 535 26 31	Pressure sensor 0-15 bar	D	B	B	A	B
003 535 30 31	Pressure sensor 0-15 bar	D	B	B	A	B
003 535 27 31	Pressure sensor 0.5-4.5 bar (abs)	D	B	B	A	B
003 535 28 31	Pressure sensor 0-1600 bar	D	B	B	A	B
003 535 39 31	Pressure sensor 0-1600 bar	D	B	B	A	B
003 535 29 31	Pressure sensor 0-2000 bar	D	B	B	A	B
001 535 96 02	Differential pressure switch 2.2 bar	D	B	B	A	B
003 535 09 31	Crankcase Pressure transmitter range -100-100mbar	D	B	B	A	C
000 535 64 30	Temperature sensor (PT1000)	D	B	B	A	B
000 535 66 30	Bearing temp. sensor (PT1000)	D	B	B	A	B
000 535 57 30	Exhaust temp. sensor (PT100)	D	B	B	A	B
000 535 59 30	Exhaust temp. sensor (PT100)	D	B	B	A	B
000 535 72 60	Exhaust temp. sensor (NiCrNi)	D	B	B	A	B
000 535 99 60	Exhaust temp. sensor (NiCrNi)	D	B	B	A	B
000 535 00 60	Thermocouples	B	B	B	N/A	C
000 535 25 20	Temperature sensor PT100 and PT1000 (single elements)	B	B	B	N/A	C
000 535 25 30	Temperature sensor (PT100 and PT1000) (two elements)	B	B	B	N/A	C
000 535 40 03	Level sensor	D	B	B	A	B
000 535 41 03	Level sensor	D	B	B	A	B
000 535 42 03	Level sensor	D	B	B	A	B
000 535 43 03	Level sensor	D	B	B	A	B
000 535 44 03	Oil level sensor	D	B	B	A	B
R081	Actuator (final control element)	D	B	B	A	B
R082	Actuator (final control element)	D	B	B	A	B
R082-D	Actuator (final control element)	D	B	B	A	B
R082-M	Actuator (final control element)	D	B	B	A	B
R085	Actuator (final control element)	D	B	B	A	B

System sensors components location classes:						
FA -26/B	Control Rack travel Sensor	D	B	B	A	B
INS-P1A	Inductive Proximity Switch	D	B	B	A	B
INS-N1A	Inductive Proximity Switch	D	B	B	A	B

System injectors location classes:						
Type	**Component description**	**Temperature**	**Humidity**	**Vibration**	**EMC**	**Enclosure**
PLD-Injector	Injector for engine series 2000	D	B	B**	A	C***
CR-Injector	Injector for engine series 4000	D	B	B**	A	C***
) - tested to: 2.25 mm 5-30 Hz, 8 G 30-300 Hz. *) - electrical part						

Software elements for system main units:

1) Firmware
2) Loadable application software
3) Bootloader
4) Main System software
5) Backup system software
6) Baisi Software
7) System Software

Engine control Unit (ECU) software versions				
Hardware platform used	**Engine series**	**Class**	**Software version**	**Software-ID (CCS-ID*)**
ECU4	2000/4000/8000	1)	ECU_4_01\Bootloader\Var_3	Not available
ECU4	2000	2)	ECU_4_01\Var_1\ed_2_08	Not available
ECU4	2000	2)	ECU_4_04\Var_1\ed_3_03	Not available
ECU4	2000	2)	ECU_4_04\Var_1\ed_3_04	Not available
ECU4	4000	2)	ECU_4_04\Var_11\ed_3_03	Not available
ECU4	8000	2)	ECU_4_04\Var_21\ed_2.12	Not available
ECU7	2000/4000	3)	ECU_7\Urlader\ed_2_00	Not available
ECU7	2000/4000	1)	ECU_7\Firmware\ed_1_05	2_10_4_1_5_0
ECU7	2000/4000	1)	ECU_7\Firmware\ed_1_06	2_10_4_1_6_0
ECU7	2000/4000	1)	ECU_7\Firmware\ed_1_07	2_10_4_1_7_0
ECU7	2000/4000	2)	ECU_7\Motor\Var_1\ed_1_22	2_1_1_1_22_2
ECU7	2000/4000	2)	ECU_7\All_In_One\Var_33\ed_1_13	2_2_33_1_13_2
ECU7	2000/4000	2)	ECU_7\Motor\Var_1\ed_1_21	2_1_1_1_21_0
ECU7	2000/4000	2)	ECU_7\All_In_One\Var_33\ed_1_12	2_2_33_1_12_0
ECU7	2000/4000	2)	ECU_7\Motor\Var_1\ed_1_20	2_1_1_1_20_3
ECU7	2000/4000	2)	ECU_7\All_In_One\Var_33\ed_1_11	2_2_33_1_11_3
ECU7	2000/4000	2)	ECU_7\Motor\Var_1\ed_1_17	2_1_1_1_17_10
ECU7	2000/4000	2)	ECU_7\All_In_One\Var_33\ed_1_08	2_2_33_1_8_10
ECU7	2000/4000	2)	ECU_7\Motor\Var_1\ed_1_14	2_1_1_1_14_6
ECU7	2000/4000	2)	ECU_7\All_In_One\Var_33\ed_1_04	2_2_33_1_4_8
ECU9	1600/2000/1163	3)	ECU_9\Bootlader\ed_2_00	Not available
ECU9	1600/2000/1163	1)	ECU_9\Firmware\ed_1_03	2_910_2_1_3_1
ECU9	1600	2)	ECU_9\FSW\Var_1\ed_1_8	2_907_1_1_8_4
ECU9	1163	2)	ECU_9\FSW\Var_1\ed_1_9	2_907_1_1_9_5
ECU9	2000, 1163	2)	ECU_9\FSW\Var_1\ed_2_1	2_907_1_2_1_24
*) not available for legacy software				

Engine Control System (ECS-Uni, ADEC-Uni) software versions				
Hardware platform used	**Engine series**	**Class**	**Software version MTU-Part-Number**	**Software-ID (CCS-ID*)**
ECS-Uni	396	4)	M010003.396 5275380380/S0013	Not available
ECS-Uni	396	5)	B010003.396 5275380380/S0013	Not available
ECS-Uni	595	4)	M011333.595 X00E50209690	Not available
ECS-Uni	595	5)	B011333.595	Not available

Engine Control System (ECS-Uni, ADEC-Uni) software versions				
			X00E50209691	
ECS-Uni	595	4)	M012001.595 5275380580/S0018	Not available
ECS-Uni	595	5)	B012001.595 5275380880/S0018	Not available
ECS-Uni	956	4)	M011003.956 5275381383/S0003	Not available
ECS-Uni	956	5)	B011003.956 5275381483/S0003	Not available
ECS-Uni	1163	4)	M011001.116 5275380680/S0021	Not available
ECS-Uni	1163	5)	B011001.116 5275380980/S0021	Not available
ADEC-Uni	396/595/1163	3)	F421-10-ADEC-UNI-Bootloader-Var_1_Ed_1_01 X00E50203936/S0001	Not available
ADEC-Uni	396/595/1163	1)	F420-10-ADEC-UNI-Firmare-Var_1_Ed_1_04 X00E50203936/S0004	Not available
ADEC-Uni	396/595/1163	1)	F420-10-ADEC-UNI-Firmare-Var_1_Ed_1_05 X00E50203936/S0005	Not available
ADEC-Uni	396/595/1163	1)	F420-10-ADEC-UNI-Firmare-Var_1_Ed_1_06 X00E50203936/S0006	Not available
ADEC-Uni	396	2)	bADUNaf020003 X00E50206719	Not available
ADEC-Uni	396	2)	bADUNaf003005 X00E50205026	Not available
ADEC-Uni	396	2)	bADUNaf005003 X00E50205025	Not available
ADEC-Uni	396	2)	bADUNaf007002 X00E50205461	Not available
ADEC-Uni	396	2)	bADUNaf020004 X00E50210256	Not available
ADEC-Uni	595	2)	cADUNaf020002 X00E50206992	Not available
ADEC-Uni	595	2)	cADUNaf011333 X00E50209715	Not available
ADEC-Uni	956	2)	dADUNaf020002 X00E50210258	Not available
ADEC-Uni	1163	2)	dADUNaf020004 X00E50206989	Not available
ADEC-Uni	1163	2)	dADUNaf020005 X00E50210259	Not available
*) not available for legacy software				

Engine Interface Module (EIM) software versions				
Hardware platform used	**Engine series**	**Class**	**Software version**	**Software-ID (CCS-ID*)**
EIM2/EIM3	1600/2000/4000/ 1163	3)	EIM_BOOT\Var_1\ed_1_02	Not available
EIM2	1600/2000/4000/ 1163	1)	EIM_FW\Var_1\ed_1_01	2_1010_1_1_1_0

Engine Interface Module (EIM) software versions				
EIM3	1600/2000/4000/ 1163	1)	EIM_FW\Var_1\ed_2_00	2_1010_1_2_0_0
EIM2	2000/4000	2)	EIM_FSW\Var_10\ED_2_3_0	2_1007_10_2_3_0
EIM3	2000/4000	2)	EIM_FSW\Var_10\ED_3_0_0	2_1007_10_3_0_0
EIM2	1163	2)	EIM_FSW\Var_20\ED_1_01	2_1007_20_1_1_0
EIM2	1600/2000	2)	EIM_FSW\Var_30\ED_1_01	2_1007_30_1_1_2
*) not available for legacy software				

Engine Monitoring Unit (EMU) software versions				
Hardware platform used	**Engine series**	**Class**	**Software version**	**Software-ID (CCS-ID*)**
EMU1	2000	3)	EMU_DWLD\Var_2\Ed_1_01	Not available
EMU1	2000	2)	EMU\VAR_1\ED_1_08	Not available
EMU2	8000	3)	EMU_Mdwl\VAR_1\ED_1_02	Not available
EMU2	8000	2)		Not available
EMU2	8000	2)		Not available
EMU7		3)		Not available
EMU7		2)		Not available
EMU8	1600/2000/4000/ 1163	3)	EIM_BOOT\Var_1\ed_1_02	Not available
EMU8		1)	EMU8_UR\VAR_1\ED_1_00	2_210_1_1_0_0
EMU8	2000/4000	2)	**	2_207_2_1_2_0
EMU8	2000/4000	1)	**	2_207_2_1_3_0
EMU8	1600/2000/4000	2)		2_207_2_1_4_2
EMU8	1600	2)	**	2_207_102_1_1_0
EMU8	1163	2)	**	2_207_3_1_0_2
EMU9	1600/2000/4000/ 1163	1)	EXU1\FIRMARE\\ED_2_00	2_310_1_2_0_0
EMU9	4000	2)	EMU9\VAR_1\ED_1_00	2_407_1_1_0_4
EMU9	4000	2)	EMU9\VAR_1\ED_1_01	2_407_1_1_1_4
*) not available for legacy software; **) Software version substituted by Software-ID (CCS-ID)				

Local Operation Panel (LOP) software versions				
Hardware platform used	**Engine series**	**Class**	**Software version**	**Software-ID (CCS-ID*)**
LOP4	1600/2000/4000/ 8000/1163	1)	EA_DWNLD\VAR_1\ed_1_02	Not available
LOP4	1600/2000/4000/ 8000/1163	2)	EA_MCS5\VAR_1\Ed_3_52	Not available
LOP8	1600/2000/4000/ 8000/1163	1)	MPU29_UR\VAR_1\ed_1_03	Not available
LOP8	1600/2000/4000/ 8000/1163	2)	MPU29\Var_2\Ed_1_18	Not available
LOP10	1600/2000/4000/ 8000/1163	1)	SAM_FW\Var_1\Ed_4_00	Not available
LOP10	1600/2000/4000/ 8000/1163	2)	SAM_SW\Var_1\Ed_1_92	Not available
LOP11	1600/2000/4000/ 8000/1163	1)	MPU29_UR\VAR_1\ed_1_03	Not available
LOP11	1600/2000/4000/ 8000/1163	2)	MPU29\Var_2\Ed_1_18	Not available
LOP14-SPU	1600/2000/4000/	3)	SPU\Bootloader\VAR_1\ed_1_00	Not available

Local Operation Panel (LOP) software versions				
	1163		ed1_1_04 ed1_1_06 ed1_1_08	
LOP14-SPU	1600/2000/4000/ 1163	2)	SPU\FSW\VAR_1\ed_1_03 ed_1_04 ed_1_05 ed_1_07 ed_1_09 ed_1_11 ed_1_13 ed_1_18	Not available
LOP14-LOS	1600/2000/4000/ 1163	3)	DIS\BASIS\VAR_1\ed_8_02	Not available
LOP14-LOS	1600/2000/4000/ 1163	6)	DIS\BASIS\VAR_1\ed_6_23	Not available
LOP14-LOS	1163	2)	LOS\BR1163- 04_5003_A1_B00E51000235\ S_A1114	Not available
LOP14-LOS	1600/2000/4000/	2)	BVNG_5001_A2_B00E51000232S_A 1209 BVNG_5001_A2_B00E51000245\ S_A1213	Not available
LOP ECS	396/595/956/1163	7)	mpu16_v1.2T3	Not available
*) not available for legacy software				

Multi Function Display (MFD) software versions				
Hardware platform used	**Engine series**	**Class**	**Software version**	**Software-ID (CCS-ID*)**
MFD	all	1)	MFD\Firmware\Var_1\ Ed_3_01 Ed_3_02	Not available
MFD	all	2)	MFD\MFD_SW\Var_1\ BVNG_5002_A4_B00E51000212\ Ed_1_06 BVNG_5002_A4_B00E51000241\ Ed_1_07 BVNG_5002_A4_B00E51000255\ Ed_1_09	Not available
*) not available for legacy software				

Propeller Control Unit PCMU - software versions				
Hardware platform used	**Engine series**	**Class**	**Software version**	**Software-ID (CCS-ID*)**
PCMU	Controllable Pitch Propellers	1)	MPU27_UR\Var_1\Ed_1_04	Not available
PCMU	Controllable Pitch Propellers	2)	MPU27\Var_2\Ed_2_50	Not available
PCMU	Voith-Schneider	1)	MPU27_UR\Var_1\Ed_1_04	Not available
PCMU	Voith-Schneider	2)	MPU27\Var_2\Ed_2_50	Not available
*) not available for legacy software				

Gear Control Unit (GCU), Gear Monitoring Unit (GMU), Monitoring Extension Unit (MEU)				
Hardware platform used	**Engine series**	**Class**	**Software version**	**Software-ID (CCS-ID*)**
GCU/GMU1	all	1)	EA_DWNLD\VAR_1\ed_1_02	Not available
GCU/GMU1	all	2)	EA_MCS5\VAR_1\Ed_3_52	Not available
GCU2,3,6	all	1)	MPU29_UR\VAR_1\ed_1_03	Not available
GCU2,3,6	all	2)	MPU29\Var_2\Ed_1_18	Not available
MEU	all	1)	SAM_FIRM\VAR_1\Ed_4_02	Not available
MEU	all	2)	SAM_SW\VAR_1\Ed_1_98	Not available
*) not available for legacy software				

Others - software versions				
Hardware platform used	**Engine series**	**Class**	**Software version**	**Software-ID (CCS-ID*)**
SAM1	Service and Automation Module	1)	SAM_FIRM\VAR_1\Ed_4_02	Not available
SAM1	Service and Automation Module	2)	SAM_SW\VAR_1\Ed_2_12	Not available
PPC1, PPC2, PPC3, PPC4	Priming pump control	1)	EA_DWNLD\VAR_1\Ed_1_02	Not available
PPC1, PPC2, PPC3, PPC4	Priming pump control	2)	EA_MCS5\VAR_1\Ed_3_43	Not available
SMU	Shaft Speed Monitoring Unit	1)	MPU27_UR\Var_1\Ed_1_04	Not available
SMU	Shaft Speed Monitoring Unit	2)	MPU27\Var_2\Ed_2_50	Not available
FCU	Flap Control Unit	1)	MPU27_UR\Var_1\Ed_1_04	Not available
FCU	Flap Control Unit	2)	MPU27\Var_2\Ed_2_50	Not available
*) not available for legacy software				

Place of manufacture

MTU Friedrichshafen GmbH
Maybachplatz 1
88045 Friedrichshafen
Federal Republic of Germany

Application/Limitation

This certificate is valid only for systems made by MTU Friedrichshafen GmbH, Friedrichshafen, Federal Republic of Germany, for engines series **1600, 2000, 4000, 8000 and 396, 595, 1163-03, 1163-04** provided they hold a valid DNV GL Type Approval Certificate.

1. System is suitable to be used as engine safety, control and monitoring system for emergency, auxiliary purposes and for propulsion engines in multi-engine propulsion plants.
2. Due to system high level of self-check functions, redundancy in engine mounted sensors, alternative sensor testing procedures (based on system self-check functions) are considered to fulfill requirements stated in DNV GL Rules for Ships.
3. System is suitable to be used as gearbox and propulsion (Controllable Pitch propeller, Voith Schneider propeller and Waterjet applications) safety, control and monitoring system for propulsion engines in multi-engine propulsion plants.
4. Monitoring of turbocharger speed alarm high and turbochargers lubrication oil pressure alarm low are in line with DNV GL requirements.
5. List of control & monitored points (including alarms, shutdowns, set points, etc.) shall be according to the engine's intended function (propulsion, auxiliary genset, emergency genset, etc.) and shall comply with the vessel's main class requirements in DNV GL Rules for Ships.
   If the vessel has electric propulsion the requirements in Pt.4 Ch.8 shall also be taken into consideration.
6. For "Basic" configuration in multi-engine plants and gensets applications, power supply arrangement shall be like shown in document number E532784/00E, page 15, figure 5 "EIM power distribution".
7. For "ECS/ADEC-Uni" configuration in multiengine plants and gensets applications, power supply arrangement shall be like shown in document "Wiring Diagram in Engine Room", page 5 or 7 (doc. no. 5275395601, Rev. T0165/03, dated 2003-03-07).
8. In case of differences between listed below documentation required for approval of "Basic" or "ECS/ADEC-Uni" configuration and documents submitted for approval will be found, the system documentation needs to be case-by-case approved and system certification may be required.
9. If, during approval or onboard survey, differences will be found between actual delivery setup (difference in alarms and safety actions, firmware versions, sensors setup, monitoring functions, etc.) and setup required for "Basic" or "ECS/ADEC-Uni" configuration by this Type Approval certificate for specific vessel notations and main class, then the system needs to be case-by-case approved and system certification may be required..

Approval conditions for "Basic" and "ECS/ADEC-Uni" configuration

The Type Approval covers system design principles and software listed under Product description.

<u>The following documentation of the actual application is to be submitted for approval in each case:</u>

- Reference to this type approval certificate
- Information about engine type and intended use (propulsion, auxiliary, emergency, etc.)
- Software versions (firmware, Loadable Application Software, etc.) used in specific delivery
- System block diagram showing overall system layout
- Confirmation that List of control & monitored points is like stated in Application/Limitation point 5
- Confirmation that power supply arrangement is like stated in Application/Limitation point 6 or 7

<u>Product certificate</u>

As long as the units are covered by this Type Approval, a product certificate according to Pt.4 Ch.9 Sec.1 **will not be** required for system applications made and delivered with accordance to requirements (applicable for multiengine plant and genset applications) listed under Application/Limitation (including approval documentation submittal requirements). Correct configuration and set up for each delivery to be tested during commissioning after installation.

When the type approved software is revised (affecting all future deliveries) DNV GL is to be informed by forwarding updated software version documentation. If the changes are judged to affect functionality for which rule requirements apply a new functional type test may be required and the certificate may have to be renewed to identify the new software version.

Clause for application software control
All changes in software are to be recorded as long as the system is in use on board. The records of all changes are to be forwarded to DNV GL for evaluation and approval.
Major changes in the software are to be approved before being installed in the computer.
A Certification of Application Functions may be required for the particular vessel.

Approval conditions for "Extended" configuration

The Type Approval covers system design principles and software listed under Product description.

The following documentation of the actual application is to be submitted for approval in each case:

- Reference to this type approval certificate
- Information about engine type and intended use (propulsion, auxiliary, emergency, etc.)
- Software versions (firmware, Loadable Application Software, etc.) used in specific delivery
- System block diagram showing overall system layout
- List of Control and Monitored Points (with defined alarm, load reduction and shutdowns, including identification of which automatic safety actions can be overridden) for all systems included in "Extended" configuration"
- Power supply arrangement
- Test program for certification

Product certificate
Each delivery of the application system **is to be certified** according to Pt.4 Ch.9 Sec.1. The certification test is to be performed at the manufacturer of the application system, preferably at the engine/system application maker integrating control, monitoring and safety system, before the system is shipped to the yard.

When the type approved software is revised (affecting all future deliveries) DNV GL is to be informed by forwarding updated software version documentation. If the changes are judged to affect functionality for which rule requirements apply a new functional type test may be required and the certificate may have to be renewed to identify the new software version.

Clause for application software control
All changes in software are to be recorded as long as the system is in use on board. The records of all changes are to be forwarded to DNV GL for evaluation and approval.
Major changes in the software are to be approved before being installed in the computer.
A Certification of Application Functions may be required for the particular vessel.

Tests carried out

Applicable tests according to Class Guideline DNVGL-CG-0339, Edition November 2015.

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the type are complied with, and that no alterations are made to the product design or choice of systems, software versions, components and/or materials.

The main elements of the assessment are:

- Ensure that type approved documentation is available
- Inspection of factory samples, selected at random from the production line (where practicable)
- Review of production and inspection routines, including test records from product sample tests and control routines
- Ensuring that systems, software versions, components and/or materials used comply with type approved documents and/or referenced system, software, component and material specifications
- Review of possible changes in design of systems, software versions, components, materials and/or performance, and make sure that such changes do not affect the type approval given
- Ensuring traceability between manufacturer's product type marking and the type approval certificate

Periodical assessment is to be performed at least every second year and at renewal of this certificate.

END OF CERTIFICATE