

8 Instrumentation

The instrumentation on the diesel engine can be roughly divided into:

- Local instruments, i.e. thermometers, pressure gauges and tachometers
- Control devices, i.e. position switches and solenoid valves
- Analog sensors for Alarm, Slow Down and remote indication of temperatures and pressures
- Binary sensors, i.e. thermo switches and pressure switches for Shut Down etc.

All instruments are identified by a combination of symbols as shown in Fig. 8.01 and a position number which appears from the instrumentation lists in this chapter.

Local Instruments

The basic local instrumentation on the engine comprises thermometers and pressure gauges located on the piping or mounted on panels on the engine, and an engine tachometer located at the engine side control panel.

These are listed in Fig. 8.02 and their location on the engine is shown in Fig. 8.04.

Additional local instruments, if required, can be ordered as option: 4 70 129.

Control Devices

The control devices mainly include the position switches, called ZS, incorporated in the manoeuvring system, and the solenoid valves (EV), which are listed in Fig. 8.05 and positioned as shown in Fig. 8.04.

Sensors for Remote Indication Instruments

Analog sensors for remote indication can be ordered as options 4 75 127, 4 75 128 or for CoCoS as 4 75 129, see Fig. 8.03. These sensors can also be used for Alarm or Slow Down simultaneously.

Alarm, Slow Down and Shut Down Sensors

It is required that the system for shut down is electrically separated from the other systems.

This can be accomplished by using independent sensors, or sensors with galvanically separated electrical circuits, i.e. one sensor with two sets of electrically independent terminals.

The International Association of Classification Societies (IACS) have agreed that a common sensor can be used for Alarm, Slow Down and remote indication. References are stated in the lists if a common sensor can be used.

A general outline of the electrical system is shown in Fig. 8.07.

The extent of sensors for a specific plant is the sum of requirements of the classification society, the yard, the owner and MAN B&W's minimum requirements.

Figs. 8.08, 8.09 and 8.10 show the classification societies' requirements for UMS and MAN B&W's minimum requirements for Alarm, Slow Down and Shut Down as well as IACS's recommendations, respectively. Only MAN B&W's minimum requirements for Alarm and Shut Down are included in the basic scope of supply (4 75 124).

For the event that further signal equipment is required, the piping on the engine has additional sockets.

Fuel oil leakage detection

Oil leaking oil from the high pressure fuel oil pipes is collected in a drain box (Fig. 8.11a), which is equipped with a level alarm, LSA 301, option 4 35 105.

Slow down system

The slow down functions are designed to safeguard the engine components against overloading during normal service conditions and, at the same time, to keep the ship manoeuvrable, in the event that fault conditions occur.

The slow down sequence has to be adapted to the plant (FPP/PPP, with/without shaft generator, etc.) and the required operating mode.

For further information please contact the engine supplier.

Attended Machinery Spaces (AMS)

The basic alarm and safety system for an MAN B&W engine is designed for Attended Machinery Spaces and comprises the temperature switches (thermostats) and pressure switches (pressurestats) that are specified in the “MAN B&W” column for alarm and for shut down in Figs. 8.08 and 8.10, respectively. The sensors for shut down are included in the basic scope of supply (4 75 124), see Fig. 8.10.

Additional digital sensors can be ordered as option: 4 75 128.

Unattended Machinery Spaces (UMS)

The “Standard Extent of Delivery for MAN B&W Diesel A/S” engines includes the temperature switches, pressure switches and analog sensors stated in the “MAN B&W” column for alarm, slow down and shut down in Figs. 8.08, 8.09 and 8.10.

The shut down and slow down panel can be ordered as option: 4 75 610, 4 75 611 or 4 75 613, whereas the alarm panel is a yard’s supply, as it has to include several other alarms than those of the main engine.

The location of the pressure gauges and pressure switches in the piping system on the engine is shown schematically in Fig. 8.06.

For practical reasons, the sensors to be applied are normally delivered from the engine supplier, so that they can be wired to terminal boxes on the engine. The number and position of the terminal boxes depends on the degree of dismantling specified for the forwarding of the engine, see “Dispatch Pattern” in Chapter 9.

Oil Mist Detector and Bearing Monitoring Systems

Based on our experience, the basic scope of supply for all plants for attended as well as for unattended machinery spaces (AMS and UMS) includes an oil mist detector, Fig. 8.12.

- Make: Kidde Fire Protection, Graviner
- Type: MK 5. 4 75 161
- or
- Make: Schaller
- Type: Visatron VN 215 4 75 163

The combination of an oil mist detector and a bearing temperature monitoring system with deviation from average alarm (option 4 75 133, 4 75 134 or 4 75 135) will in any case provide the optimum safety.

Electrical Wiring on Engine to Terminal Boxes, option: 4 78 115

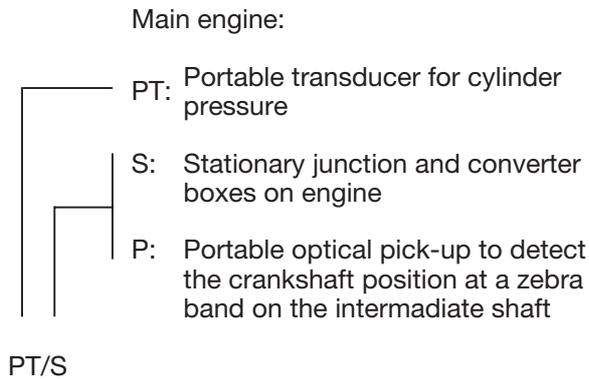
If the electrical wiring is ordered, the engine will be fitted with terminal boxes whose location will depend on the dismantling to be done for the dispatch pattern in question.

Fig. 8.13 shows an example of the positioning of the terminal box No. 2 with its corresponding wiring diagram indicating the reference symbols of the sensors. Similar wiring diagrams will be forwarded for the other electrical equipment mounted on the engine such as the auxiliary blower, part of the wiring diagram is shown on Fig. 8.14.

PMI Calculating Systems

The PMI systems permit the measuring and monitoring of the engine’s main parameters, such as cylinder pressure, fuel oil injection pressure, scavenge air pressure, engine speed, etc., which enable the en-gineer to run the diesel engine at its optimum performance.

The designation of the different types are:



The following alternative types can be applied:

- MAN B&W Diesel, PMI system type **PT/S** option:4 75 208

The cylinder pressure monitoring system is based on a **Portable Transducer**, **Stationary junction and converter boxes**.
Power supply: 24 V DC

- MAN B&W Diesel, PMI system, type **PT/P** option:4 75 207

The cylinder pressure monitoring system is based on a **Portable Transducer**, and **Portable pick-up**.

Power supply: 24 V DC

CoCoS

The **Computer Controlled Surveillance** system is the family name of the software application products from the MAN B&W Diesel group.

CoCoS comprises four individual software application products:

CoCoS-EDS:

Engine Diagnostics System, option: 4 09 660. CoCoS-EDS assists in the engine performance evaluation through diagnostics. Key features are: on-line data logging, monitoring, diagnostics and trends.

CoCoS-MPS:

Maintenance Planning System, option: 4 09 661. CoCoS-MPS assists in the planning and initiating of preventive maintenance. Key features are: scheduling of inspections and overhaul, forecasting and budgeting of spare part requirements, estimating of the amount of work hours needed, work procedures, and logging of maintenance history.

CoCoS-SPC:

Spare Part Catalogue, option: 4 09 662. CoCoS-SPC assists in the identification of spare part. Key features are: multilevel part lists, spare part information, and graphics.

CoCoS-SPO:

Stock Handling and Spare Part Ordering, option: 4 09 663. CoCoS-SPO assists in managing the procurement and control of the spare part stock. Key features are: available stock, store location, planned receipts and issues, minimum stock, safety stock, suppliers, prices and statistics.

CoCoS Suite:

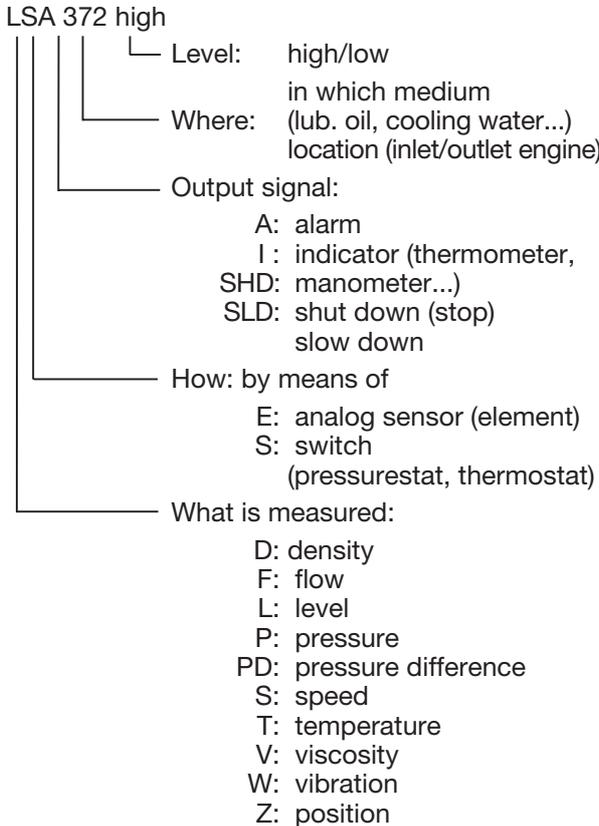
Is the package including the four above-mentioned systems: 4 09 660+661+662+663.

CoCoS MPS, SPC, and SPO can communicate with one another, or they can be used as separate stand-alone system. These three applications can also handle non-MAN B&W Diesel technical equipment; for instance pumps and separators.

Fig. 8.03 shows the maximum extent of additional sensors recommended to enable on-line diagnostics if CoCoS-EDS is ordered.

Identification of instruments

The measuring instruments are identified by a combination of letters and a position number:



Functions

- DSA Density switch for alarm (oil mist)
- DS - SLD Density switch for slow down
- E Electric devices
- EV Solenoid valve
- ESA Electrical switch for alarm
- FSA Flow switch for alarm
- FS - SLD Flow switch for slow down
- LSA Level switch for alarm
- PDEI Pressure difference sensor for remote indication (analog)
- PDI Pressure difference indicator
- PDSA Pressure difference switch for alarm
- PDE Pressure difference sensor (analog)
- PI Pressure indicator
- PS Pressure switch
- PS - SHD Pressure switch for shut down

- PS - SLD Pressure switch for slow down
- PSA Pressure switch for alarm
- PSC Pressure switch for control
- PE Pressure sensor (analog)
- PEA Pressure sensor for alarm (analog)
- PEI Pressure sensor for remote indication (analog)
- PE - SLD Pressure sensor for slow down (analog)
- SE Speed sensor (analog)
- SEA Speed sensor for alarm (analog)
- SSA Speed switch for alarm
- SS - SHD Speed switch for shut down
- TI Temperature indicator
- TSA Temperature switch for alarm
- TSC Temperature switch for control
- TS - SHD Temperature switch for shut down
- TS - SLD Temperature switch for slow down
- TE Temperature sensor (analog)
- TEA Temperature sensor for alarm (analog)
- TEI Temperature sensor for remote indication (analog)
- TE - SLD Temperature sensor for slow down (analog)
- VE Viscosity sensor (analog)
- VEI Viscosity sensor for remote indication (analog)
- VI Viscosity indicator
- ZE Position sensor
- ZS Position switch
- WEA Vibration signal for alarm (analog)
- WI Vibration indicator
- WS - SLD Vibration switch for slow down

The symbols are shown in a circle indicating

-  Instrument locally mounted
-  Instrument mounted in panel on engine
-  Control panel mounted instrument

Fig. 8.01: Identification of instruments

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Description

Thermometer stem type	Use sensor for remote indication	Point of location
		Fuel oil
TI 302	TE 302	Fuel oil, inlet engine
		Lubricating oil
TI 311	TE 311	Lubricating oil inlet to main bearings, thrust bearing, axial vibration damper, piston cooling oil, camshaft lub. oil, exhaust valve actuators and turbochargers
TI 317	TE 317	Piston cooling oil outlet/cylinder
TI 349	TE 349	Thrust bearing segment
TI 369	TE 369	Lubricating oil outlet from turbocharger/turbocharger (depends on turbocharger design)
		Low temperature cooling water: seawater or freshwater for central cooling
TI 375	TE 375	Cooling water inlet, air cooler
TI 379	TE 379	Cooling water outlet, air cooler/air cooler
		High temperature jacket cooling water
TI 385	TE 385	Jacket cooling water inlet
TI 387A	TE 387A	Jacket cooling water outlet, cylinder cover/cylinder
TI 393		Jacket cooling water outlet/turbocharger
		Scavenge air
TI 411	TE 411	Scavenge air before air cooler/air cooler
TI 412	TE 412	Scavenge air after air cooler/air cooler
TI 413	TE 413	Scavenge air receiver
		Exhaust gas
TI 425	TE 425	Exhaust gas inlet turbocharger/turbocharger
TI 426	TE 426	Exhaust gas after exhaust valves/cylinder
Thermometers dial type		

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Fig. 8.02a: Local standard thermometers on engine (4 75 124) and option: 4 75 127 remote indication sensors sensors

Pressure gauges (manometers)	Use sensor for remote indication	Point of location
		Fuel oil
PI 305	PE 305	Fuel oil , inlet engine
		Lubricating oil
PI 326	PE 326	Piston cooling and camshaft oil inlet
PI 330	PE 330	Lubricating oil inlet to main bearings thrust bearing and axial vibration damper
PI 357	PE 357	Lubricating oil inlet to exhaust valve actuators
PI 371	PE 371	Lubricating oil inlet to turbochager with slide bearings/turbocharger
		Low temperature cooling water:
PI 382	PE 382	Cooling water inlet, air cooler
		High temperature jacket cooling water
PI 386	PE 386	Jacket cooling water inlet
		Starting and control air
PI 401	PE 401	Starting air inlet main starting valve
PI 403	PE 403	Control air inlet
PI 405		Safety air inlet
		Scavenge air
PI 417	PE 417	Scavenge air receiver
		Exhaust gas
PI 424		Exhaust gas receiver
PI 435A		Air inlet for dry cleaning of turbocharger
PI 435B		Water inlet for cleaning of turbocharger
		Differential pressure gauges
PDI 420		Pressure drop across air cooler/air cooler
PDI 422		Pressure drop across blower filter of turbocharger (For ABB turbochargers only)
		Tacho- meters
SI 438	SE 438	Engine speed
SI 439		Turbocharger speed/turbocharger

178 41 29-3.0

Fig. 8.02b: Local standard manometers and tachometers on engine (4 75 124) and option: 4 75 127 remote indication

Use sensor	Point of location
Fuel oil system	
TE 302	Fuel oil, inlet fuel pumps
VE 303	Fuel oil viscosity, inlet engine (yard's supply)
PE 305	Fuel oil, inlet engine
PDE 308	Pressure drop across fuel oil filter (yard's supply)
Lubricating oil system	
TE 311	Lubricating oil inlet, to main bearings, thrust bearing, axial vibration damper, piston cooling oil, camshaft lub. oil, exhaust valve actuators and turbochargers
TE 317	Piston cooling oil outlet/cylinder
PE 326	Piston cooling and camshaft oil inlet
PE 330	Lubricating oil inlet to main bearings and thrust bearing and axial vibration damper
TE 349	Thrust bearing segment
TE 355	Lubricating oil inlet to camshaft and exhaust valve actuators
PE 357	Lubricating oil inlet to exhaust valve actuators
TE 369	Lubricating oil outlet from turbocharger/turbocharger (Depending on turbocharger design)
PE 371	Lubricating oil inlet to turbocharger with slide bearing/turbocharger

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Fig 8.03a: List of sensors for CoCoS, option: 4 75 129

Use sensor

Point of location

Cooling water system

TE 375	Cooling water inlet air cooler/air cooler
PE 382	Cooling water inlet air cooler
TE 379	Cooling water outlet air cooler/air cooler
TE 385	Jacket cooling water inlet
PE 386	Jacket cooling water inlet
TE 387A	Jacket cooling water outlet/cylinder
PDSA 391	Jacket cooling water across engine
TE 393	Jacket cooling water outlet turbocharger/turbocharger (Depending on turbocharger design)
PDE 398	Pressure drop of cooling water across air cooler/air cooler

Scavenge air system

TE 336	Engine room air inlet turbocharger/turbocharger
PE 337	Compressor spiral housing pressure at outer diameter/turbocharger (Depending on turbocharger design)
PDE 338	Differential pressure across compressor spiral housing/turbocharger (Depending on turbocharger design)
TE 411	Scavenge air before air cooler/air cooler
TE 412	Scavenge air after air cooler/air cooler
TE 412A	Scavenge air inlet cylinder/cylinder
TE 413	Scavenge air reciever
PE 417	Scavenge air reciever
PDE 420	Pressure drop of air across air cooler/air cooler
PDE 422	Pressure drop air across blower filter of compressor/turbocharger
ZS 669	Auxiliary blower on/off signal from control panel (yard's supply)

178 41 31-5.0

Fig. 8.03b: List of sensors for CoCoS, option: 4 75 129

Use sensor

Point of location

Exhaust gas system

TE 363	Exhaust gas receiver
ZE 364	Exhaust gas blow-off, on/off or valve angle position/turbocharger
PE 424	Exhaust gas receiver
TE 425A	Exhaust gas inlet turbocharger/turbocharger
TE 426	Exhaust gas after exhaust valve/cylinder
TE 432	Exhaust gas outlet turbocharger/turbocharger
PE 433A	Exhaust gas outlet turbocharger/turbocharger (Back pressure at transition piece related to ambient)
SE 439	Turbocharger speed/turbocharger
PDE 441	Pressure drop across exhaust gas boiler (yard's supply)

General data

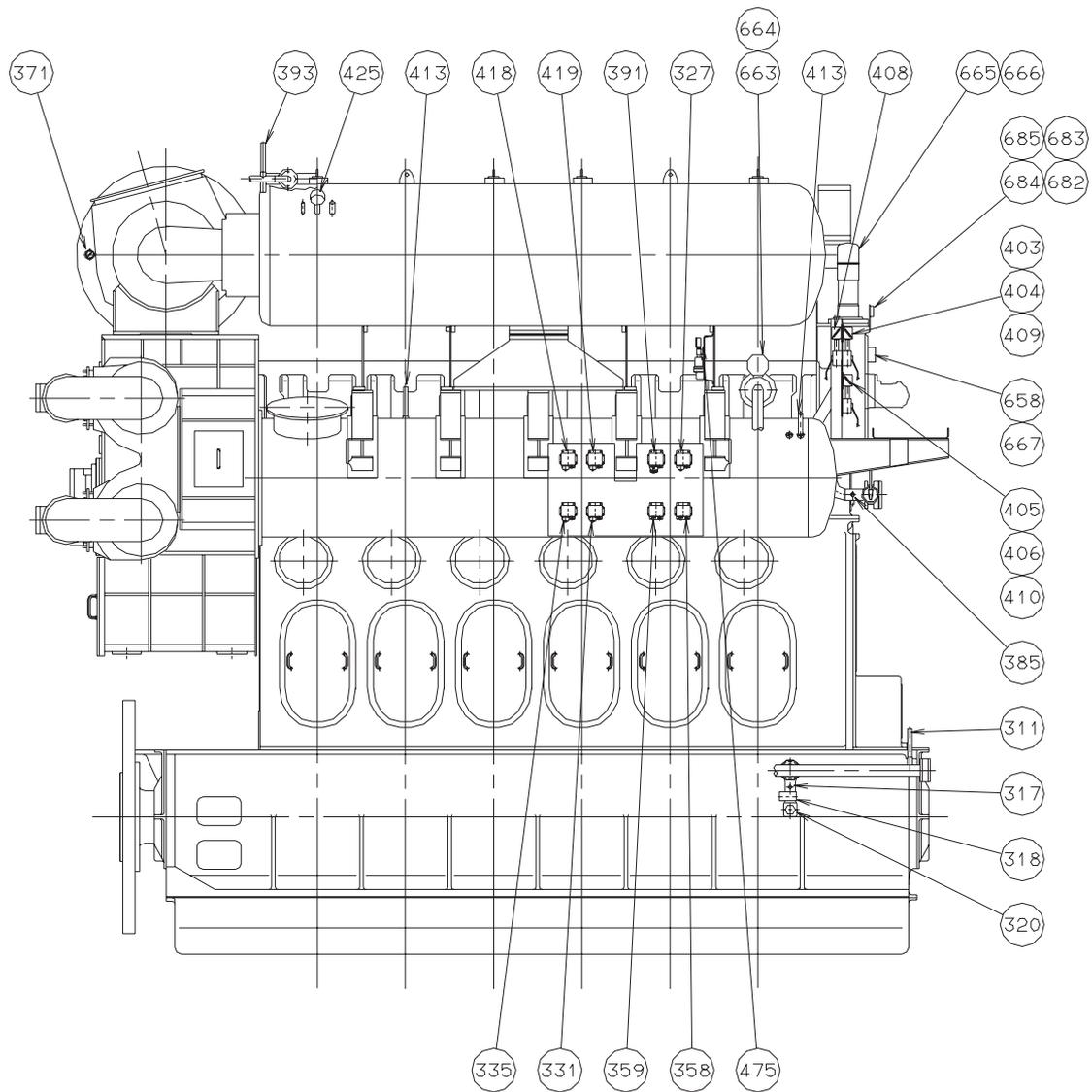
N	Time and data
N	Counter of running hours
PE 325	Ambient pressure (Engine room)
SE 438	Engine speed
N	P_{\max} set point
ZE 477	Fuel pump index/cylinder
ZE 479	Governor index
E 480	Engine torque
N	Mean indicated pressure (mep)
N	Maximum pressure (P_{\max})
N	Compression pressure (P_{comp})

N Numerical input

- 1) Originated by alarm/monitoring system
- 2) Manual input can alternatively be used
- 3) Yard's supply

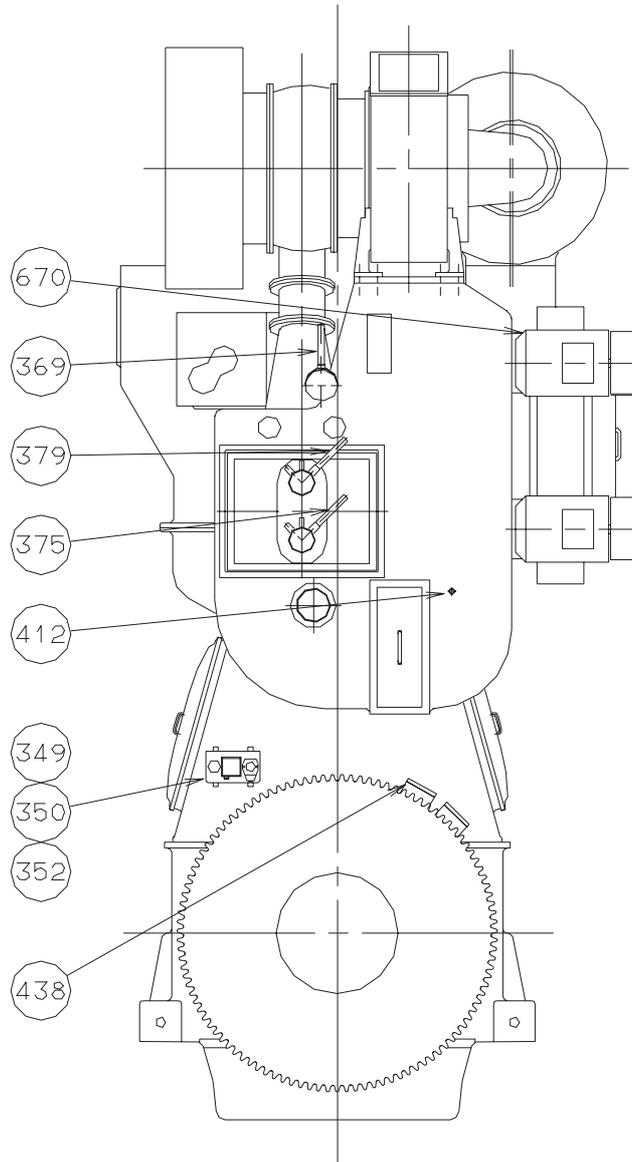
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Fig. 8.03c: List of sensors for CoCoS, option: 4 75 129



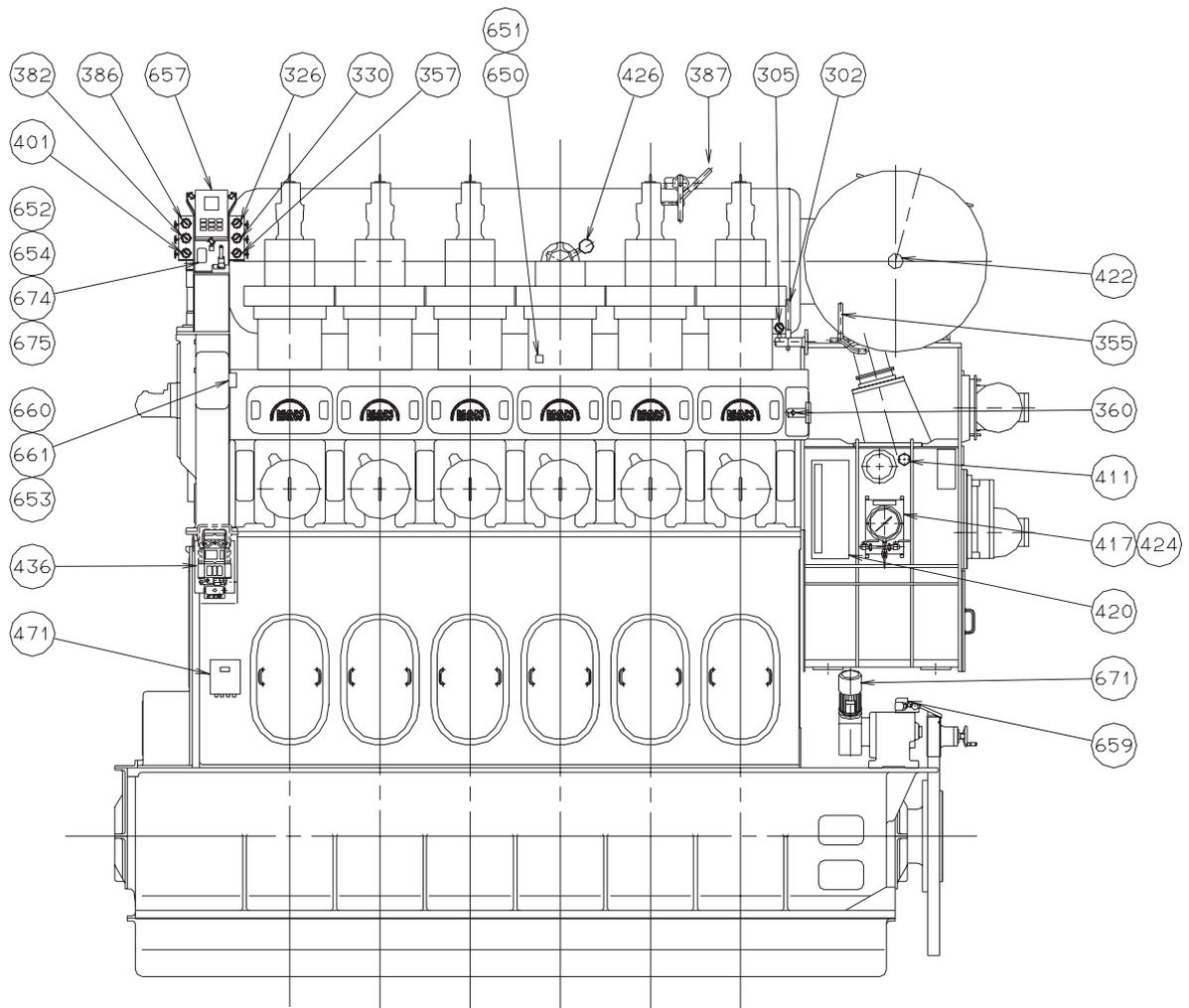
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Fig. 8.04a: Location of basic measuring points on engine for Attended Machinery Space (AMS)



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Fig. 8.04b: Location of basic measuring points on engine for Attended Machinery Space (AMS)



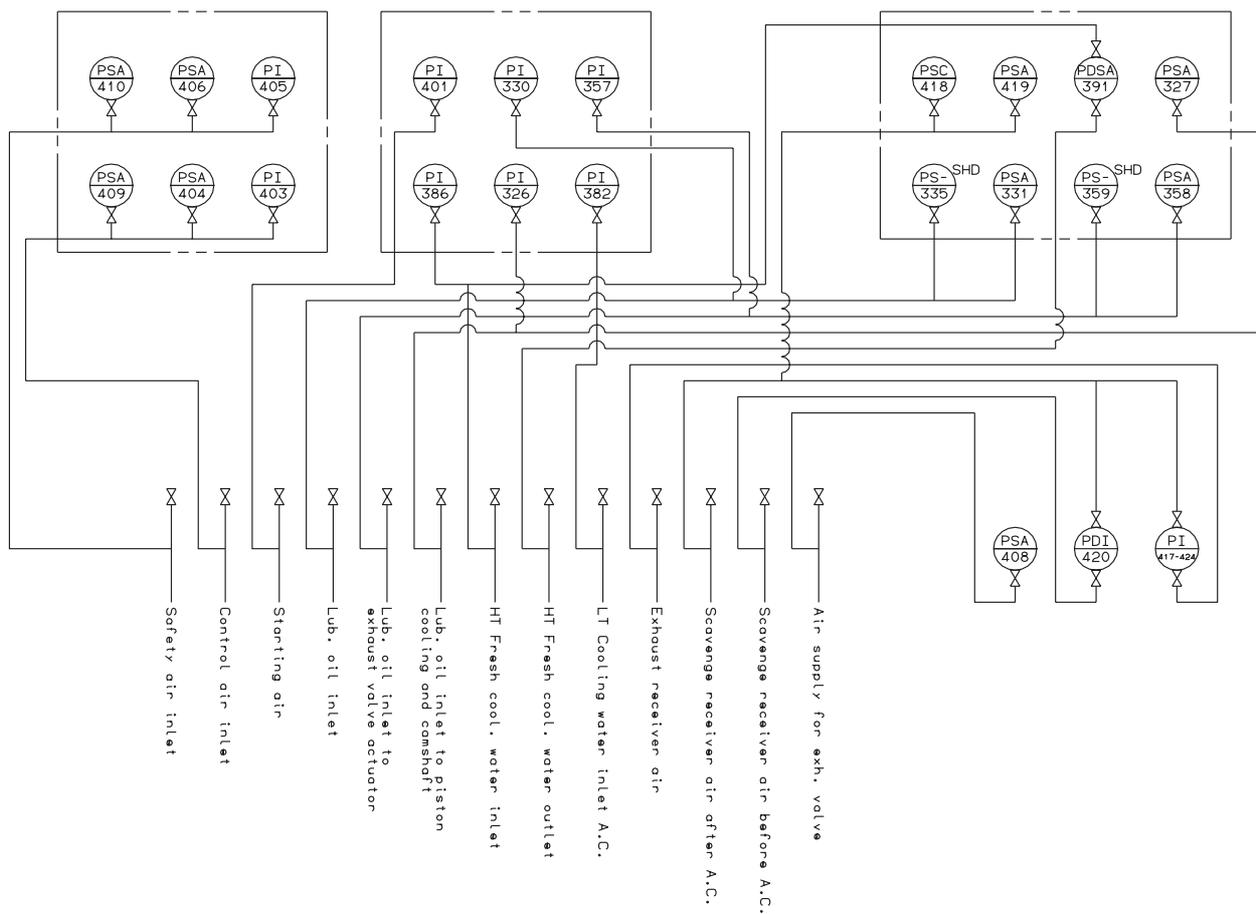
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Fig. 8.04c: Location of basic measuring points on engine for Attended Machinery Space (AMS)

Description	Symbol/Position	
Scavenge air system		
Scavenge air receiver auxiliary blower control	PSC	418
Manoeuvring system		
Engine speed detector	E	438
Reversing Astern/cylinder	ZS	650
Reversing Ahead/cylinder	ZS	651
Resets shut down function during engine side control	ZS	652
Gives signal when change-over mechanism is in Remote Control mode	ZS	653
Gives signal to manoeuvring system when on engine side control	PSC	654
Solenoid valve for stop and shut down	EV	658
Turning gear engaged indication	ZS	659
Fuel rack transmitter, if required, option: 4 70 150	E	660
Main starting valve – Blocked	ZS	663
Main starting valve – In Service	ZS	664
Air supply starting air distributor, Open – Closed	ZS	666/667
Electric motor, Auxiliary blower	E	670
Electric motor, turning gear	E	671
Actuator for electronic governor, if applicable	E	672
Gives signal to manoeuvring system when remote control ON	PSC	674
Cancel of tacho alarm from safety system, when “Stop” is ordered	PSC	675
Gives signal Bridge Control active	PSC	680
Solenoid valve for Stop	EV	682
Solenoid valve for Ahead	EV	683
Solenoid valve for Start	EV	684
Solenoid valve for Astern	EV	685

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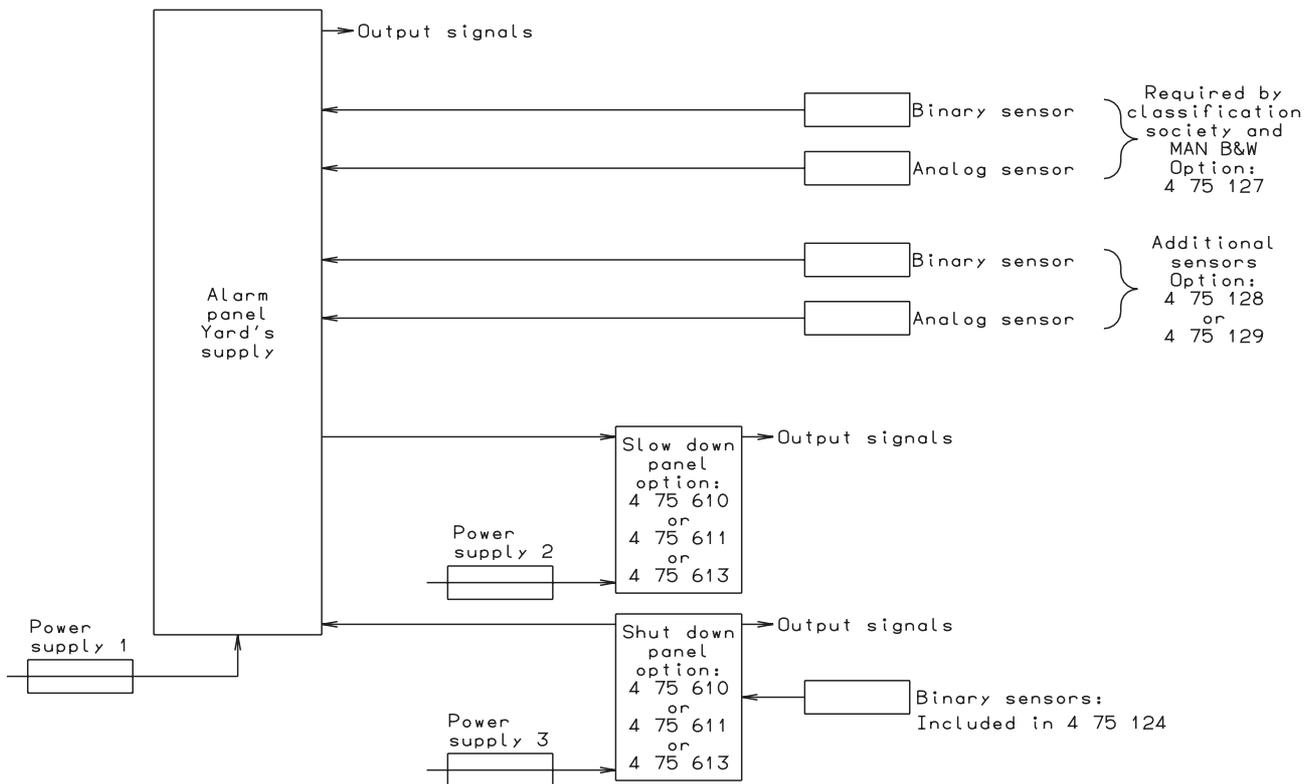
Fig. 8.05: Control devices on engine



The panels shown are mounted on the engine
 The pos. numbers refer to "List of instruments"

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Fig. 8.06: Pipes on engine for basic pressure gauges and pressure switches



General outline of the electrical system:

The figure shows the concept approved by all classification societies
 The shut down panel and slow down panel can be combined for some makers

The classification societies permit to have common sensors for slow down, alarm and remote indication
 One common power supply might be used, instead of the three indicated, if the systems are equipped with separate fuses

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Fig. 8.07: Panels and sensors for alarm and safety systems

Class requirements for UMS

ABS	BV	DnVC	GL	LR	NKK	RiNa	RS	IACS	MAN B&W	Function	Use sensor	Point of location
									1*	LSA 301 high		Leakage from high pressure pipes
1	1	1	1	1	1	1	1	1	A*	PEA 306 low	PE 305	Fuel oil, inlet engine
Fuel oil system												
Lubricating oil system												
1		1	1	1	1	1	1	1	A*	TEA 312 high	TE 311	} Lubricating oil inlet to main bearings, thrust bearing and axial vibration damper
	1									TEA 313 low	TE 311	
1	1	1	1	1	1	1	1	1	A*	TEA 318 high	TE 317	Piston cooling oil outlet/cylinder
1	1	1	1	1		1	1	1	1*	FSA 320 low		Piston cooling oil outlet/cylinder
1	1	1	1	1	1	1	1	1	A*	PEA 327 low	PE 326	Piston cooling, crosshead and camshaft lube oil inlet
1	1	1	1	1	1	1	1	1	A*	PEA 331 low	PE 330	Lubricating oil inlet to main bearings, thrust bearing, axial vibration damper
1		1	1	1	1	1	1	1	A*	TEA 350 high	TE 349	Thrust bearing segment
1			1	1		1	1	1	A*	TEA 356 high	TE 311	Lubricating oil inlet to exhaust valve actuators
1	1	1	1	1	1	1	1	1	A*	PEA 358 low	PE 357	Lubricating oil inlet to exhaust valve actuators
									1*	LSA 365 low		Cylinder lubricators (built-in switches)
1	▽	1		1	1	1	1	1	1*	FSA 366 low		Cylinder lubricators (built-in switches)
1	1	1	1			1	1	1		TSA 370 high		Turbocharger lubricating oil outlet from turbocharger/turbocharger a)
1	1	1	1	1		1	1	1	A*	PEA 372 low	PE 371	Lubricating oil inlet to turbocharger/turboch. a)
				1						TEA 373 high	TE 311	Lubricating oil inlet to turbocharger/turboch. a)
1	1	1	1	1	1	1	1	1	1*	DSA 436 high		Oil mist in crankcase/cylinder and chain drive
										WEA 472 high	WE 471	Axial vibration monitor Required for 5+6 cylinder engines and for engines with PTO on fore end.

a) For turbochargers with slide bearings

▽ For Bureau Veritas, at least two per lubricator, or minimum one per cylinder, whichever is the greater number

□ Or alarm for overheating of main, crank, cross- head and chain drive bearings, option: 4 75 134

Fig. 8.08a: List of sensors for alarm

Class requirements for UMS

ABS	BV	DnVC	GL	LR	NKK	RINa	RS	IACS	MAN B&W	Function	Use sensor	Point of location
			1							TEA 376 high	TE 375	Cooling water system Cooling water inlet air cooler/air cooler (for central cooling only)
1	1	1	1	1	1	1	1	1	A*	PEA 378 low	PE 382	Cooling water inlet air cooler
1	1	1	1	1	1	1	1	1	A*	PEA 383 low	PE 386	Jacket cooling water inlet
			1						A*	TEA 385A low	TE 385	Jacket cooling water inlet
1	1	1	1	1	1	1	1	1	A*	TEA 388 high	TE 387	Jacket cooling water outlet/cylinder
									1*	PDSA 391 low		Jacket cooling water across engine
												Air system
1	1	1	1	1	1	1	1	1	A*	PEA 402 low	PE 401	Starting air inlet
1	1	1	1	1	1	1	1	1	A*	PEA 404 low	PE 403	Control air inlet
1	1	1	1	1	1	1	1	1	1*	PSA 406 low		Safety air inlet
									1*	PSA 408 low		Air inlet to air cylinder for exhaust valve
									1*	PSA 409 high		Control air inlet, finished with engine
									1*	PSA 410 high		Safety air inlet, finished with engine
												Scavenge air system
			1		1					TEA 414 high	TE 413	Scavenge air reciever
1	1	1		1		1			A*	TEA 415 high		Scavenge air – fire /cylinder
							1		1*	PSA 419 low		Scavenge air, auxiliary blower, failure
1			1			1		1	1*	LSA 434 high		Scavenge air – water level

178 41 42-3.0

Fig. 8.08b: List of sensors for alarm

Class requirements for UMS

ABS	BV	DnVC	GL	LR	NKK	RINa	RS	IACS	MAN B&W	Function	Use sensor	Point of location
Exhaust gas system												
1			1	[1	1	1	1			TEA 425A high	TE 425A	Exhaust gas inlet turbocharger/turbocharger
1		1			1	1	1	1	A*	TEA 427 high	TE 426	Exhaust gas after cylinder/cylinder
1	1	1	1	1		1	1			TEA 429/30 high	TE 426	Exhaust gas after cylinder, deviation from average
1		1	1	1		1				TEA 433 high	TE 432	Exhaust gas outlet turbocharger/turbocharger
Manoeuvring system												
1	1	1	1	1	1	1	1	1	1*	ESA low		Safety system, power failure, low voltage
1	1	1	1	1	1	1	1	1	1*	ESA low		Tacho system, power failure, low voltage
									1*	ESA		Safety system, cable failure
1	1	1	1	1	1	1	1		1*	ESA		Safety system, group alarm, shut down
								1	1*	ESA		Wrong way (for reversible engine only)
1	①	1	1	1	1	1	1	1	A*		SE 438	Engine speed
								1		SEA 439	SE 439	Turbocharger speed

IACS: International Association of Classification Societies
 The members of IACS have agreed that the stated sensors are their common **recommendation**, apart from each class' requirements

The members of IACS are:

- ABS America Bureau of Shipping
- BV Bureau Veritas
- CCS Chinese Register of Shipping
- DnVC Det norske Veritas Classification
- GL Germanischer Lloyd
- KRS Korean Register of Shipping
- LR Lloyd's Register of Shipping
- NKK Nippon Kaiji Kyokai
- RINa Registro Italiano Navale
- RS Russian Maritime Register of Shipping

and the associated members are:

- KRS Croatian Register of Shipping
- IRS Indian Register of Shipping
- PRS Polski Rejestr Statkow

1 Indicates that a binary (on-off) sensor/signal is required

A Indicates that an analogue sensor is required for alarm, slow down and remote indication

1*, A* These alarm sensors are MAN B&W Diesel's minimum requirements for Unattended Machinery Space (UMS), option: 4 75 127

① For disengageable engine or with CPP

[Select one of the alternatives

△ Or alarm for overheating of main, crank, crosshead and chain drive bearings, option: 4 75 134

178 41 42-3.0

Fig. 8.08c: List of sensors for alarm

Class requirements for slow down

ABS	BV	DnVC	GL	LR	NKK	RINa	RS	IACS	MAN B&W	Function	Use sensor	Point of Location
			1	1						TE SLD 314 high	TE 311	Lubricating oil inlet, system oil
1	1	1	1	1		1	1	1		TE SLD 319 high	TE 317	Piston cooling oil outlet/cylinder
1	1	1	1	1	1	1	1	1	1*	FS SLD 321 low	FS 320	Piston cooling oil outlet/cylinder
1	1	1	1	1	1	1				PE SLD 328 low	PE 326	Piston cooling, crosshead and camshaft lube oil inlet
1		1		1				1	A*	PE SLD 334 low	PE 330	Lubricating oil to main and thrust bearing
1		1	1	1		1		1	A*	TE SLD 351 high	TE 349	Thrust bearing segment
1		1	1	1		1	1	1		FS SLD 366A low		Cylinder lubricators (built-in switches)
1	△	1		△	△	1	△	1	1*	PS SLD 368 low	PS 368d)	Lubricating oil inlet turbocharger main pipe
1	1	1	1	1		1	1	1		PE SLD 384 low	PE 386	Jacket cooling water inlet
1	1	1	1	1		1	1	1		TE SLD 389 high	TE 387A	Jacket cooling water outlet/cylinder
1		1						1		TE SLD 414A high	TE 413	Scavenge air receiver
1		1	1	1	1			1	1*	TS SLD 416 high	TS 415	Scavenge air fire/cylinder
										LS SLD 434 high	LS 434	Scavenge air receiver water level
								1		TE SLD 425B high	TE 425A	Exhaust gas inlet turbocharger/turbocharger
1	1	1		1			1	1		TE SLD 428 high	TE 426	Exhaust gas outlet after cylinder/cylinder
			1	1		1				TE SLD 431	TE 426	Exhaust gas after cylinder, deviation from average
1	1	1	1	1	1	1	1	1	1*	DS SLD 437 high		Oil mist in crankcase/cylinder
									1*	WS SLD 473 high	WE 471	Axial vibration monitor Required for 5+6 cylinder engines and for engines with PTO on fore end

- 1 Indicates that a binary sensor (on-off) is required
- A Indicates that a common analogue sensor can be used for alarm/slow down/remote indication
- 1*, A* These analogue sensors are MAN B&W Diesel's minimum requirements for Unattended Machinery Spaces (UMS), option: 4 75 127
- d) PE 371 can be used if only one turbocharger is applied

- Select one of the alternatives
- △ Or alarm for low flow
- Or alarm for overheating of main, crank, cross-head and chain drive bearings, option: 4 75 134

The tables are liable to change without notice, and are subject to latest class requirements.

Fig. 8.09: Slow down functions for UMS, option: 4 75 127

Class requirements for shut down

ABS	BV	DnVC	GL	LR	NKK	RINa	RS	IACS	MAN B&W	Function	Use sensor	Point of location
						1	1	1		PS SHD	329 low	Piston cooling oil, crosshead and camshaft lube oil inlet
1	1	1	1	1	1	1	1	1	1*	PS SHD	335 low	335 Lubricating oil to main bearings and thrust bearing
1	1	1				1		1	1*	TS SHD	352 high	352 Thrust bearing segment
1	1	1	1	1	1	1	1	1	1*	PS SHD	359 low	359 Lubricating oil inlet to exhaust valve actuator
									1*	PS SHD	374 low	Lubricating oil inlet to turbocharger main pipe
			1							PS SHD	384B low	Jacket cooling water inlet
1	1	1	1	1	1	1	1	1	1*	SE SHD	438 high	438 Engine overspeed

1 Indicates that a binary sensor (on-off) is required

1* These binary sensors for shut down are included in the basic scope of supply (4 75 124)

The tables are liable to change without notice, and are subject to latest class requirements.

Fig. 8.10: Shut down functions for AMS and UMS

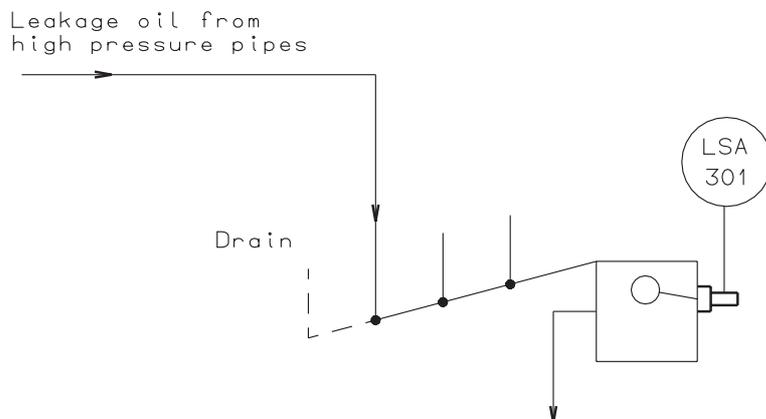


Fig. 8.11: Drain box with fuel oil leakage, alarm, option: 4 35 105

178 34 34-2.0

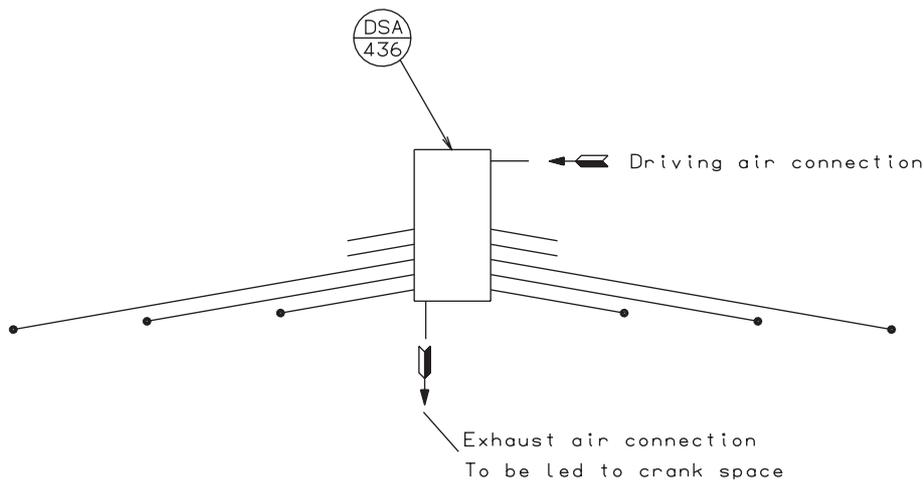


Fig. 8.12a: Oil mist detector pipes on engine, from Kidde Fire Protection, Graviner, type MK 5 (4 75 161)

178 30 18-5.0

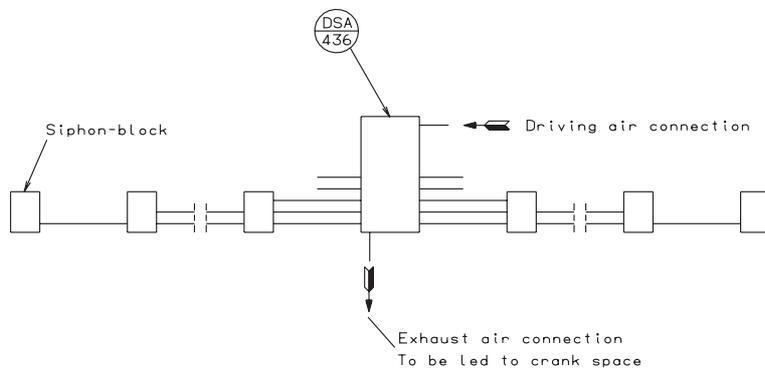
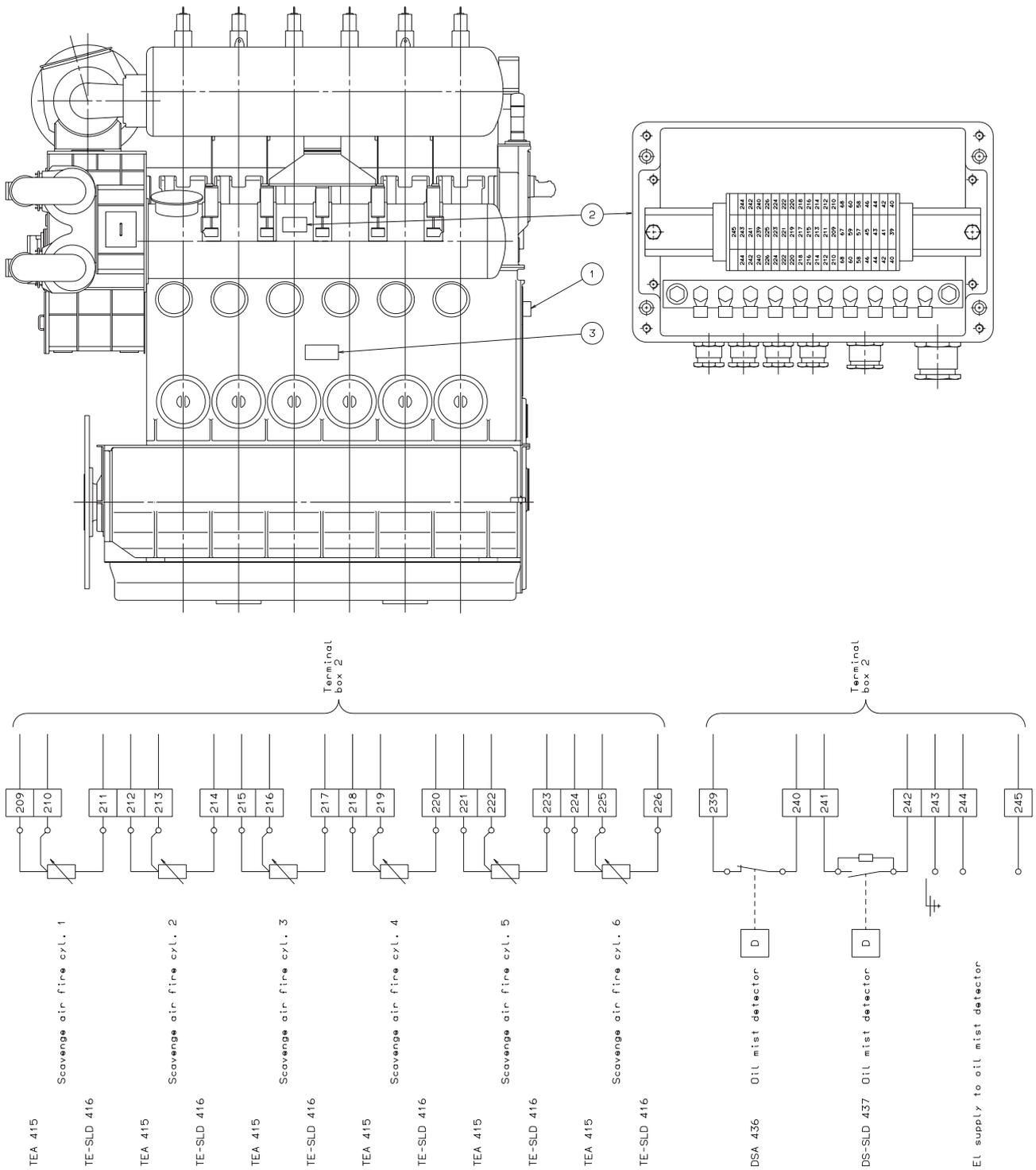


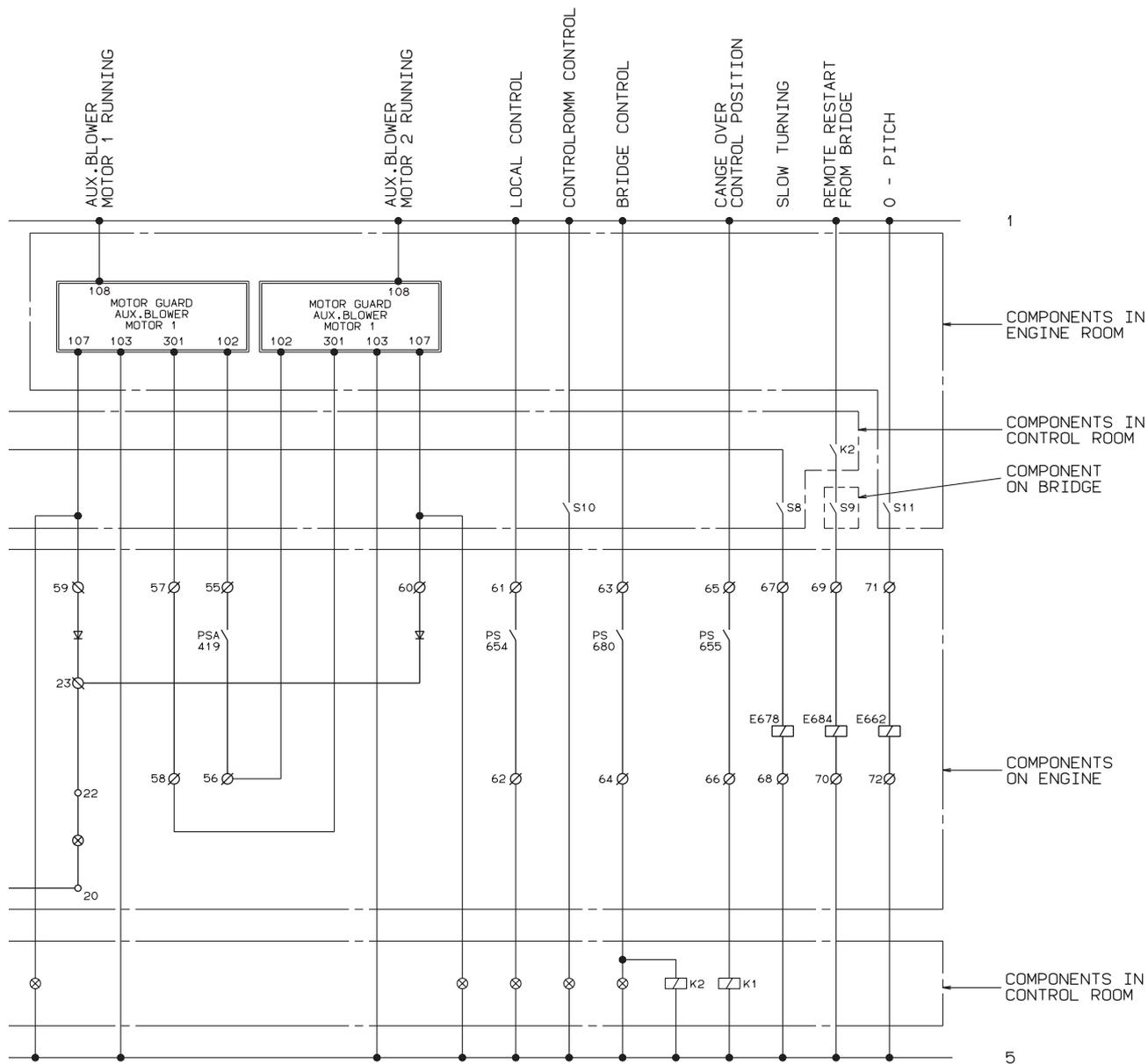
Fig. 8.12b: Oil mist detector pipes on engine, from Schaller, type Visatron VN215 (4 75 163)

178 30 19-7.0



178 10 80-6.0

Fig. 8.13: Example of terminal box



178 10 81-8.0

Fig. 8.14: Example of wiring diagram