Electronic control system

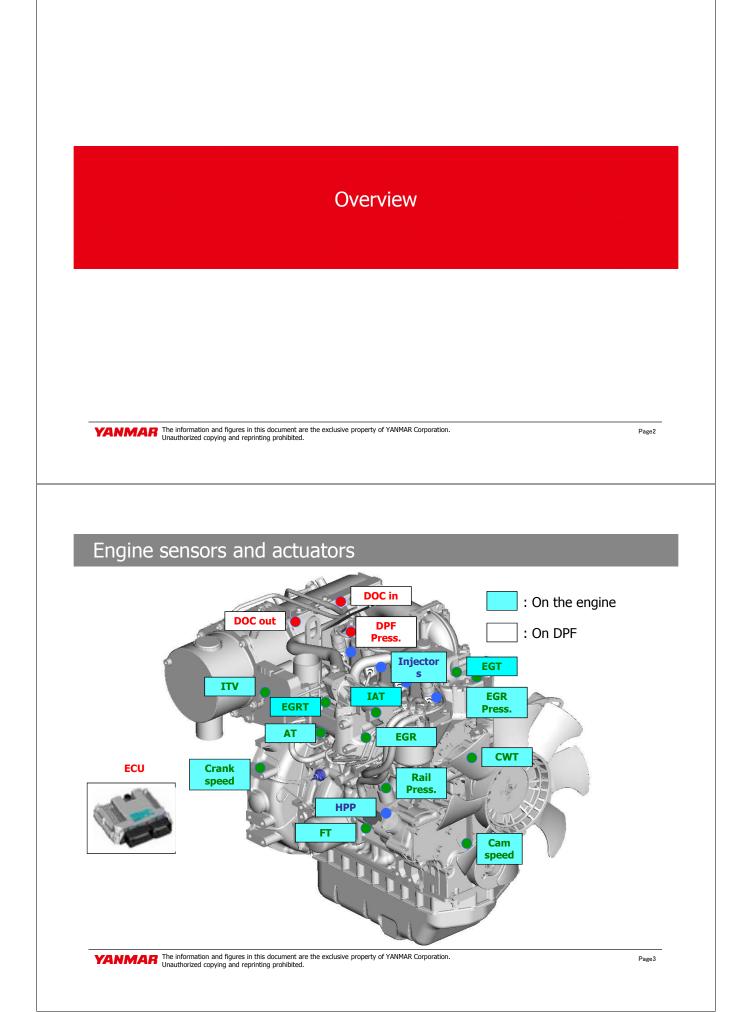
Date 28 March 2013

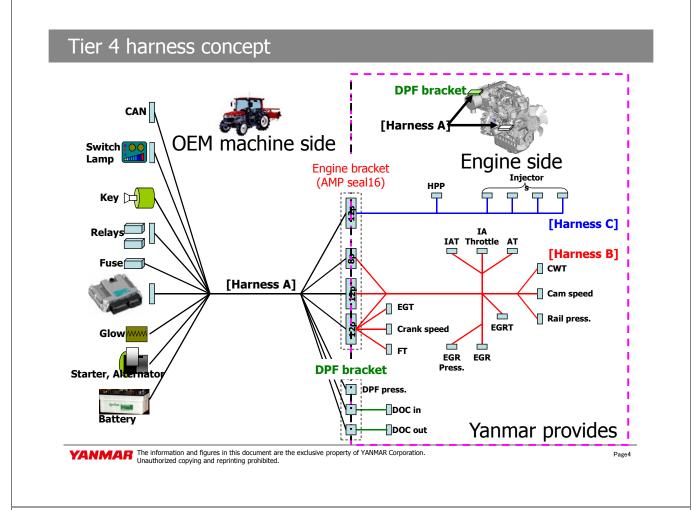
Vico de Bres Customer Service Department Yanmar Europe B.V.

Content

- 1. Overview
- 2. ECU connections
- 3. Sensors

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Supply policy of harness

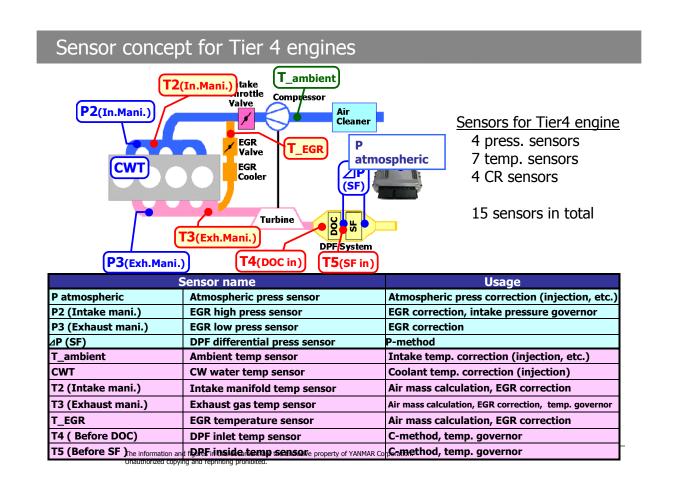
Harness	Monitor Engine	Sample Engine	Mass-Production
Harness A	Supply	Supply (Only the first engine)	Not-Supply
Harness B	Supply	Supply	Supply
Harness C	Supply	Supply	Supply

[Harness A]

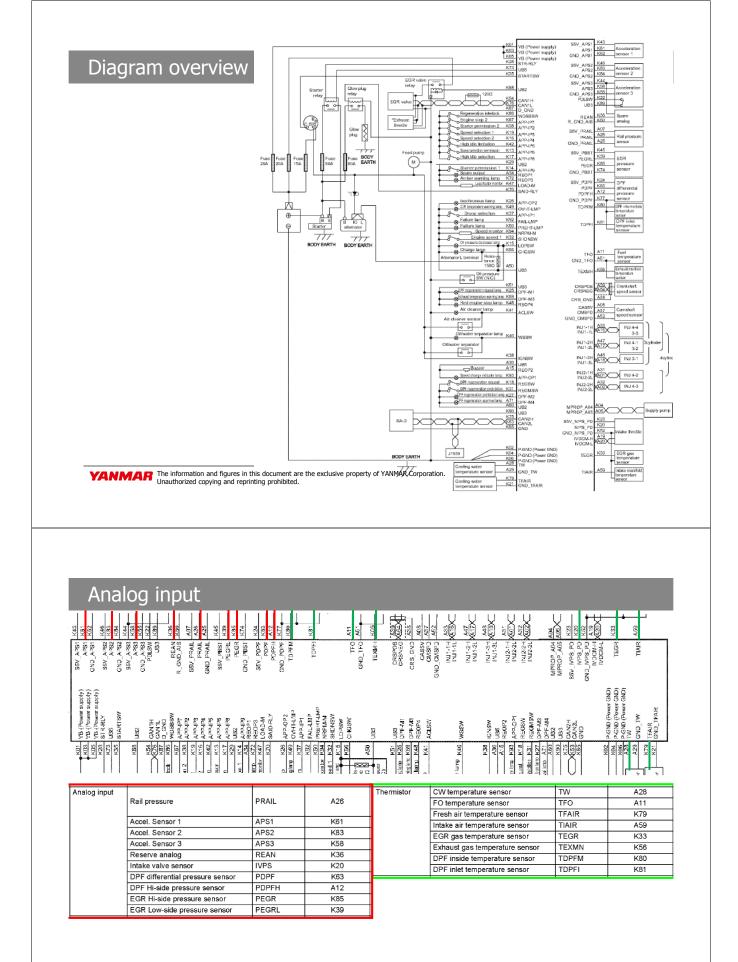
- Harness A is prepared by the customer because it is affected by machine layout.
- Harness A will be supplied with the first sample engine for troubleshooting of the harness the customer prepared.

[Harness B,C]

• Harness B and C is supplied by Yanmar in order to guarantee quality of engine performance and electronic devices.



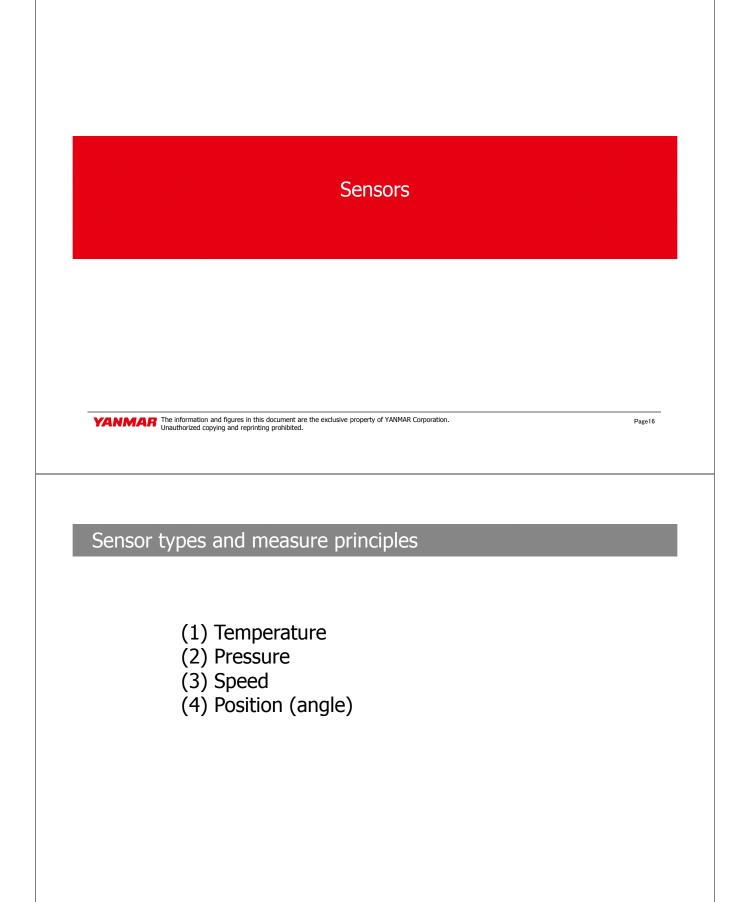
ECU connections



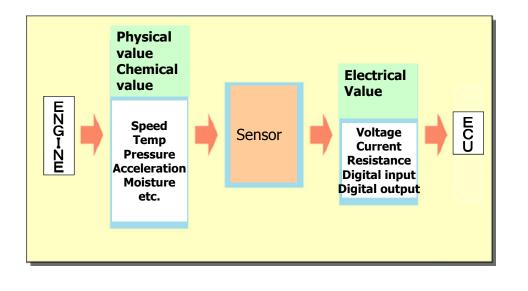
550, APS1 (65) APS1 (65) GND_APS1 (66) S50, APS2 (68) APS2 (68) APS2 (68) APS2 (68)	SVL-25 SVL-25 A53 CU2 A53 CU2		TDPFI	TEXMH KGR CRSPOS CRSPOS CRSNEG CRS.CON KGE CRS.CN MGS CASSV MGS		MPR.OP_A04 404 MPR.OP_A05 A05 S5V_NPS_PD_K20 S5V_NPS_PD_K20 MS2 GN_NPS_PD_K20 GN_NPS_PD_K319 MS20	TECR K33
K01 VB (Power supply) K02 VB (Power supply) K03 STR-RLY K73 UB K35 STR-RLY	K68 Uraz K64 Uraz K64 Uraz K64 D. Sayl K67 D. Sayl K67 D. Sayl K67 Annary K73 Annary K73 Annary K73 Annary L K42 Manary Manary L K42 Annary Manary	11 K44 Apression 20 K22 ReOP 20 K22 REOP 20 K20 SMD-RLY 20 K26 App-QP2 20 K26 App-QP2 20 K27 App-Pr		P 450 751 8 8 9 451 8 8 9 451 8 8 9 451 8 9 100000000000000000000000000000000000	imp K46 VSSW imp K46 VSSW A32 CNSW A32 CNSW A32 CNSW A32 CNSW A32 CNSW A32 CNSW A32 CNS A32 CNSW adm K13 R 20MSW adm K12 R 20MSW adm K12 R 20MSW		(CMR) Traver) CUR2 P (2004) (CMR) Traver) CUR2 P (2004) (CMR) Traver) CUR2 P (2004) (CMR) Traver) CUR2 P (2004) (CMR) T (2004)
Low-side output	Key switch on	IGNSW	K88	Low-side output	Starter permission 1	APP-IP9	K14
	Key switch start	STARTSW	K35	-	Accel. Pedal	PDLSW	K22
	Engine stop 1	SHUDNSW	K32	-	Air cleaner sensor	ACLSW	K41
	DPF regeneration request	REGSW	K18	+	Water separator sensor	wssw	K40
	DPF regeneration inhibit	REGMSW	K31	+1 ,	ECU VB	_	
	Droop	APP-IP1	K37	-	\$1.2k		
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	h side digital		e the exclusive propert		ation.		K33 K33
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	Instantion feed oppying and instanting and instantion feed oppying and instantion feed oppy		FAL-MP PRE-FIL-MP NPER-FIL-MP SHETNESW SHETNESW SHETNESW CH-DS-MP	P Active Lisson Lisson Image: Figure 1 Figure 1 KdB KdB KdB Image: Figure 1 Figure 1 KdB KdB KdB KdB Image: Figure 1 Figure 1 KdB KdB KdB KdB KdB KdB Image: Figure 1 KdB	ation. (300-2007)		TEGR K33
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- VB (Power supply) VB (Power supply) - VB (Power supply) STR-RLY - U65 - STR-TSW		REOPI REOP3 REOP3 SAID-RLY SAID-RLY APP-DP2 OVHT-LMP APP-IP1			ACLSW WSSW	I GNSW UBB REOP2 App.CP1 REONSW REONSW REONSW DPF.M2 DPF.M4	UB2 UB3 CAN2H GND GND	P.GND (Power GND) P.GND (Power GND) P.GND (Power GND) TV GND_TRAIR GND_TRAIR GND_TRAIR
K01 K05 K73 K73 K73	K68 K67 Book K867 K67 K67 K667 K667 K667 K667 K667 K6	amp K-23 montion K47 K-70 K-70 g tamp K49 n K49 n K37	K50 864 1 K33 864 1 K33 875 875 875 875 875 875 875 875 875 875		r lamp K40	K38 A16 A16 A16 A16 A16 A16 A16 A16 A16 A17 A17 A17 A17 A17 A17 A17 A17 A17 A17		233 2336 2336 2336 236 24 23 23 23 24 24 24 25 25 25 25 26 25 26 25 26 26 26 26 26 26 26 26 26 26 26 26 26
Relay	Starter relay	STR-RLY	K28	Lamp	DPF regenerati	ion inhibit lamp	DPF-M2	K27
	Starting aid relay	SAID-RLY	K70		EGT lamp		DPF-M3	K69
Lamp	Failure lamp	FAIL-LMP	К92		DPF regenerati	ion acknowledge lamp	DPF-M4	K71
	Pre-heat lamp	PREHT-LMP	K50	•	Reserve		REOP1	A34
	CWT warning lamp	OVHT-LMP	К49		Buzzer		REOP2	A15
	Speed selection lamp	APP-OP1	К93	·	Amber warning ECU	i lamp	REOP3 ECU	K72
	Iso-chronous lamp	APP-OP2	K26		gh side	Batt. 12V		VB
	DPF regeneration request	DPF-M1	K25	- ou	tput		Contact	E
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	mon rail sys	K85 K74 K24 K12 K17 K80 K80	A11 A31 KG6		A38 XA16X A47 XA17X A48	XA 18 X A31 XA01 X A32 XA02 X	A04 A05X K23 K52	A 19 A 50 A 50 A 50
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Solenoid	Injector H	INJH1 - 4	A33, A47, A31, A32, A48	1				
	Injector L	INJL1 - 4	A16, A17, A01, A02, A18					
	SCV H SCV L	MPROP-H HPPSOL	A04 A05	1				
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Sensor outline figure



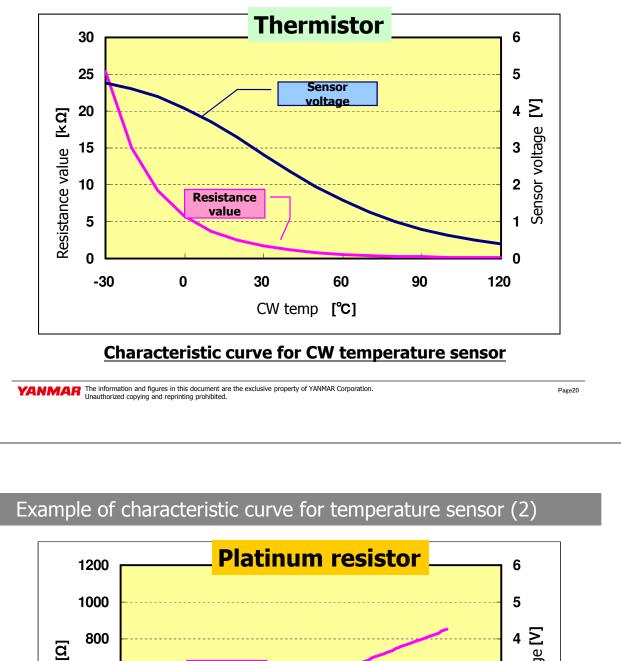
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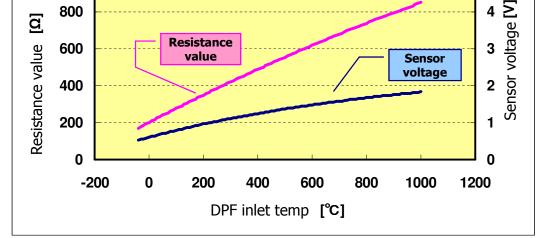
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Temperature sensor types and sensing principles

Sensor name	Usable temp. range [°C]	Sensing principle
Fuel temp. sensor	-40 to 150	s ↑ \
CW temp. sensor	-30 to 120	Thermistor
Ambient temp. sensor	-40 to 150	Thermistor
Intake mani. temp. sensor	-40 to 200	Temperature
EGR gas temp. sensor	-40 to 325	<u>Temp.: High → Resistance value:</u> Small
DPF inlet temp. sensor	-40 to 1000	a 🕇
	(diag≧700)	Platinum
DPF inside temp. sensor	-40 to 1000	
	(diag≧700)	Platinum 🖉
Ex. gas temp. sensor	-40 to 1000	Temperature
		<u>Temp.: High \rightarrow Resistance value: High</u>

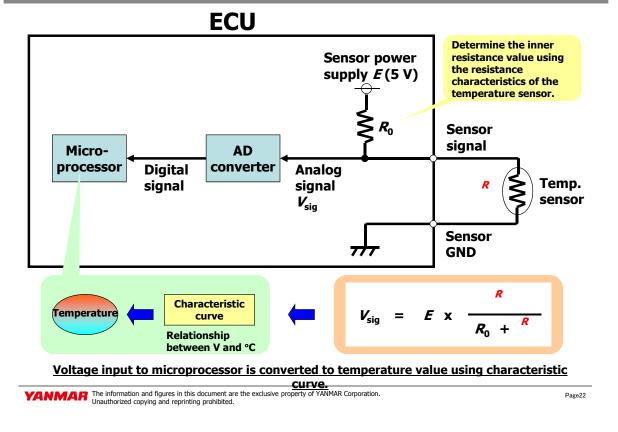
Example of characteristic curve for temperature sensor (1)





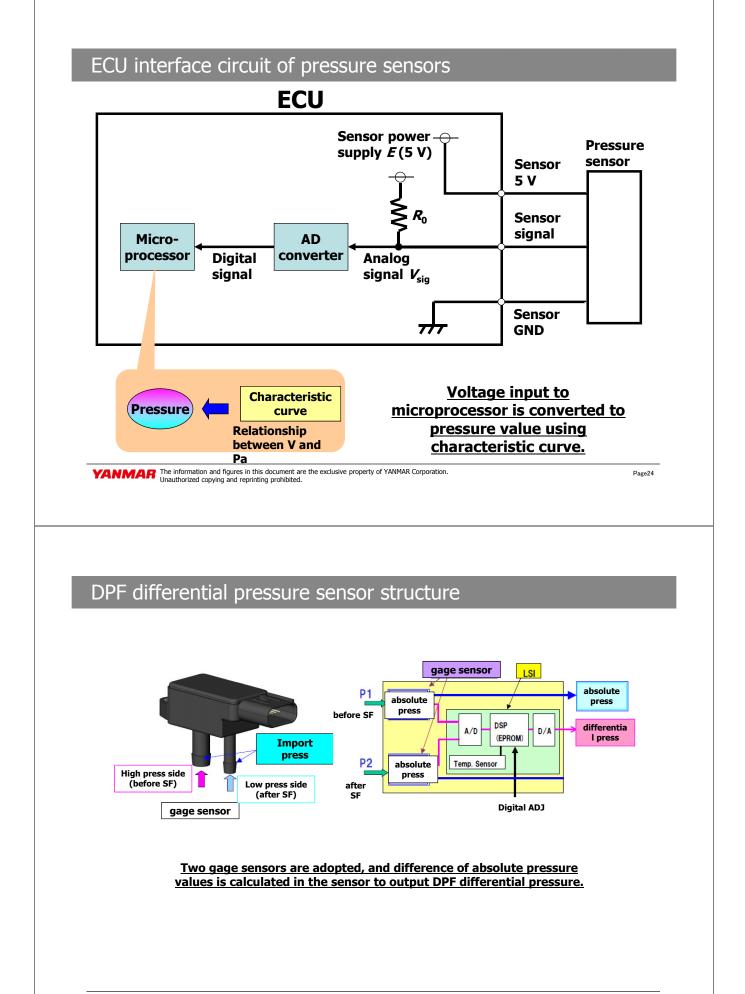
Characteristic curve for DPF inlet temperature sensor

ECU interface circuit of temperature sensor



Pressure sensor types and sensing principles

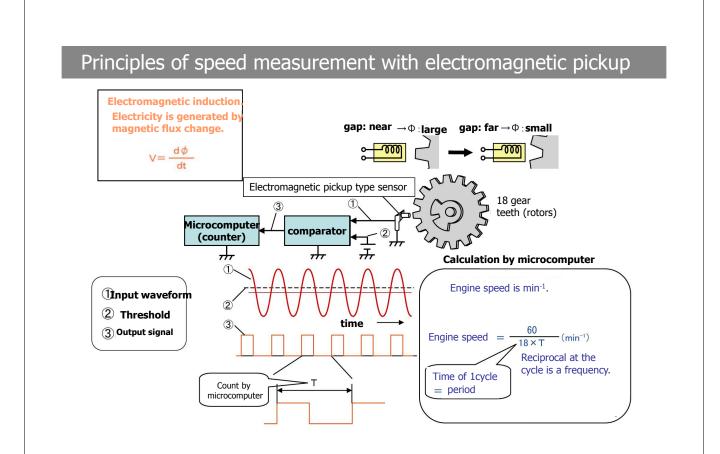
Senso	or name	Detected pressure range	Sensing principle
Rail pressu	ire sensor	0 to 1,800,000 hPa	
DPF differe		0 to 50 kPa	Strain gage \rightarrow Change in electrical
EGR pressure	EGR high-press. side (ex. mani. pressure)	40 to 300 kPa abs	resistance value caused when the resistor is deformed by external force
sensor	EGR low-press. side (in. mani. pressure)	40 to 300 kPa abs	(pressure)
Ambient pr sensor	ressure	40 to 110 kPa abs	



Speed sensor types and their sensing principle

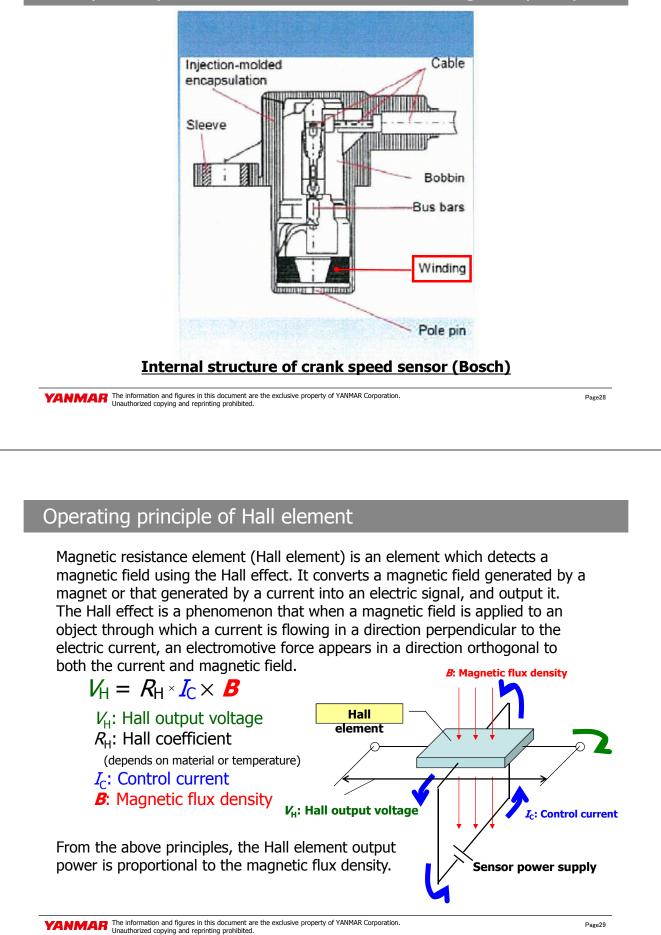
Sensor name	Sensing principle
Crank speed sensor	Electromagnetic pickup
Cam speed sensor	Magnetic resistance element (Hall element)

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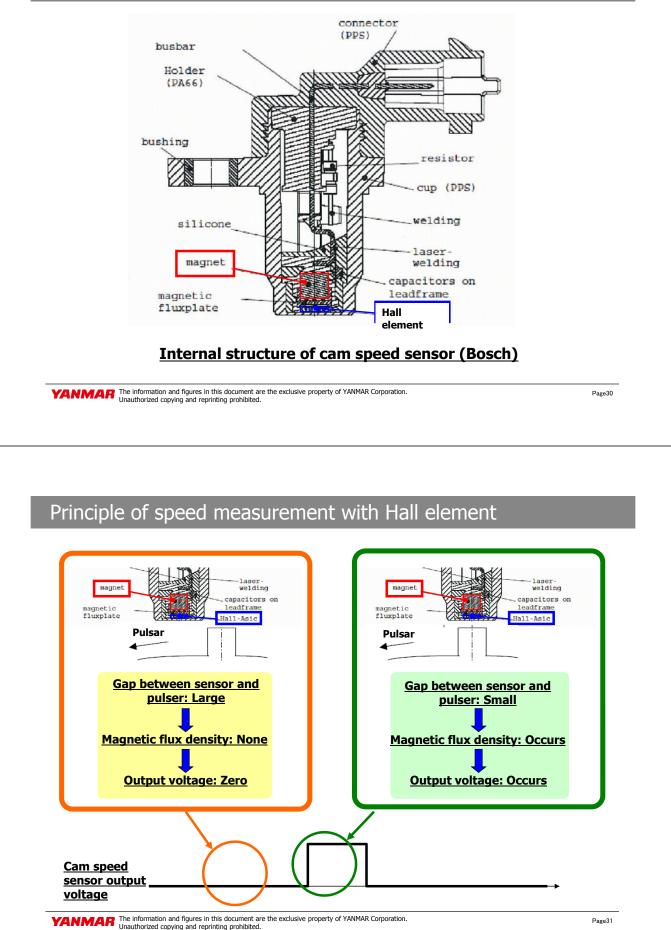


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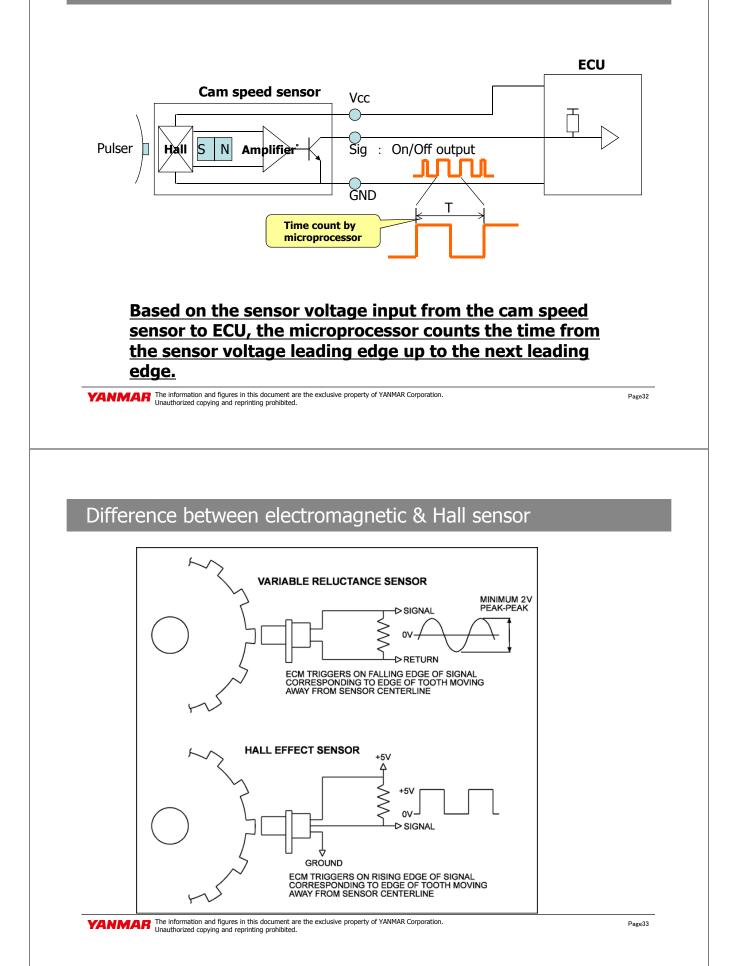
Principle of speed measurement with electromagnetic pickup

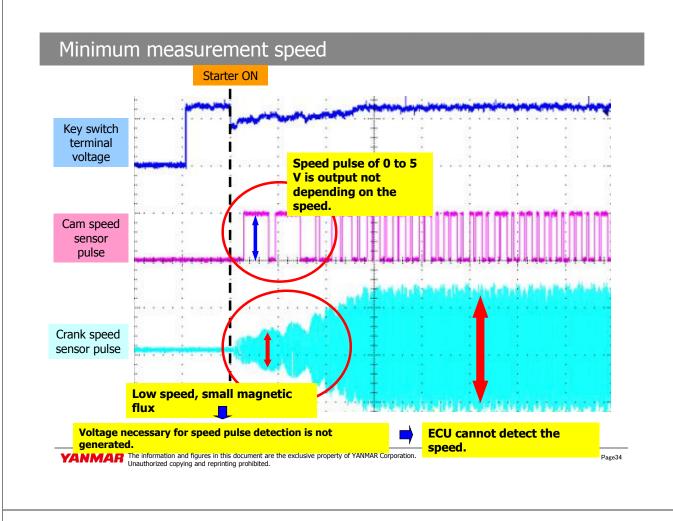






Principle of speed measurement with Hall element





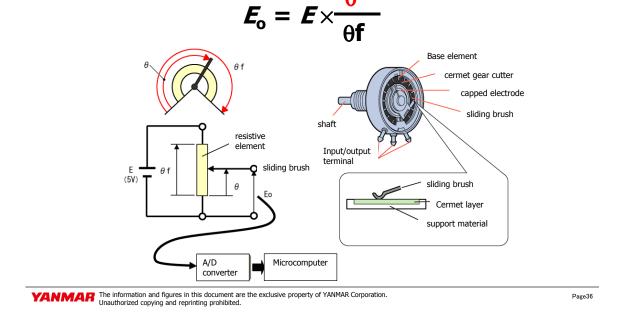
Position sensor types and their sensing principle

Sensor name	Sensing principle
Accelerator sensor	Potentiometer (sliding resistance)Contact type
Intake throttle position sensor	 Magnetic resistance element (Hall element) Non-contact type
Exhaust throttle position sensor	

Principle of position measurement with potentiometer

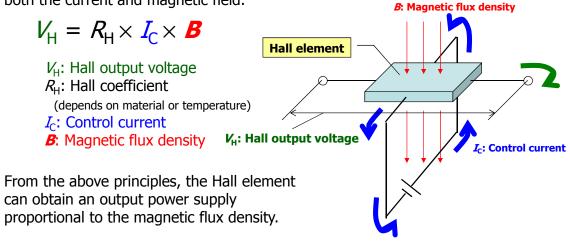
A sliding brush moves on a resistor, and rotation amount is considered as a change in the resistance value.

Assuming that the total angle of the resistor is θf , the output voltage Eo when the rotational axis turns by θ is

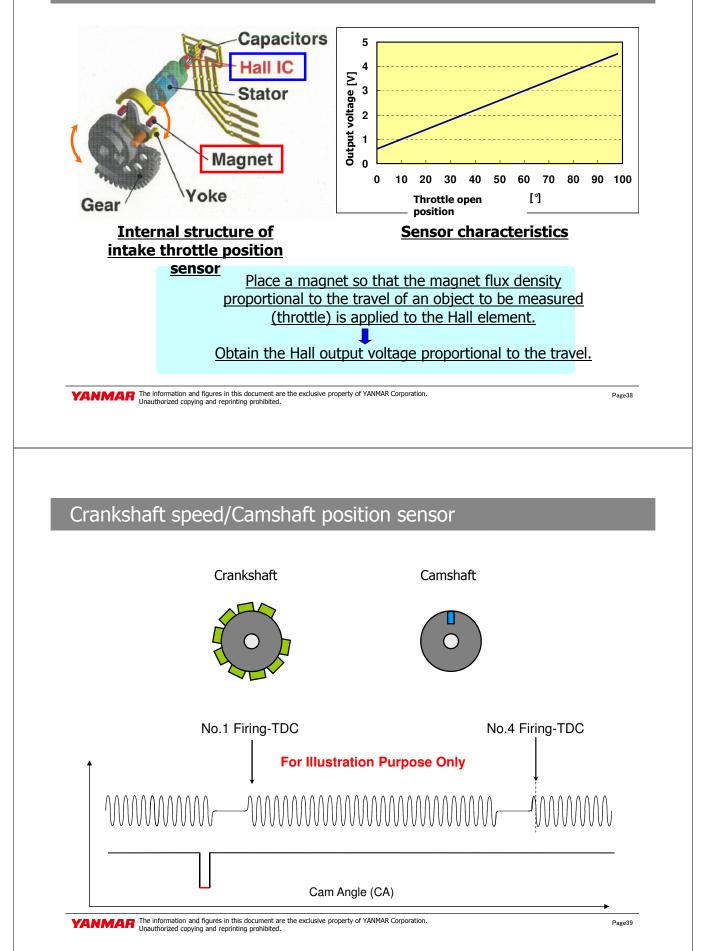


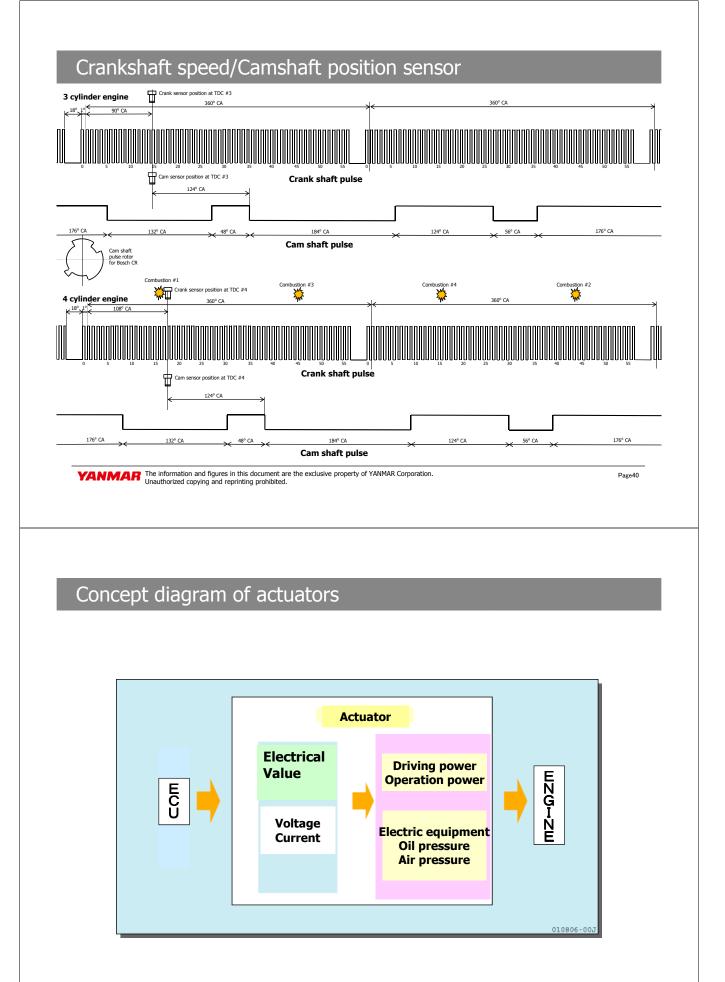
Operating principle of Hall element

Magnetic resistance element (Hall element) is an element which detects a magnetic field using the Hall effect. It converts a magnetic field generated by a magnet or that generated by a current into an electric signal, and output it. The Hall effect is a phenomenon that when a magnetic field is applied to an object through which a current is flowing in a direction perpendicular to the electric current, an electromotive force appears in a direction orthogonal to both the current and magnetic field.



Operating principle of Hall element

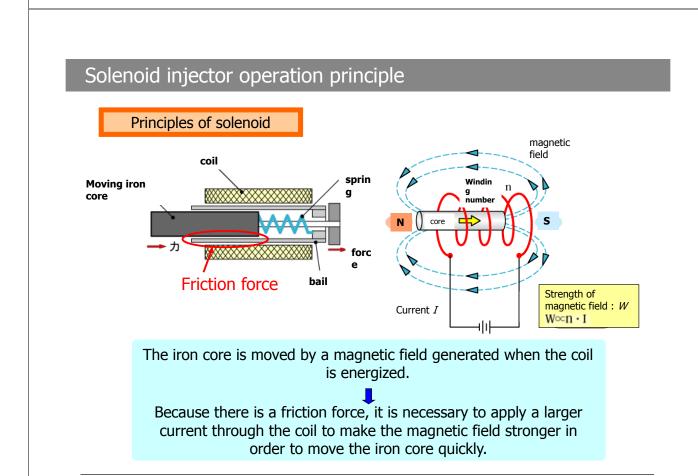




Actuator types and operating principles

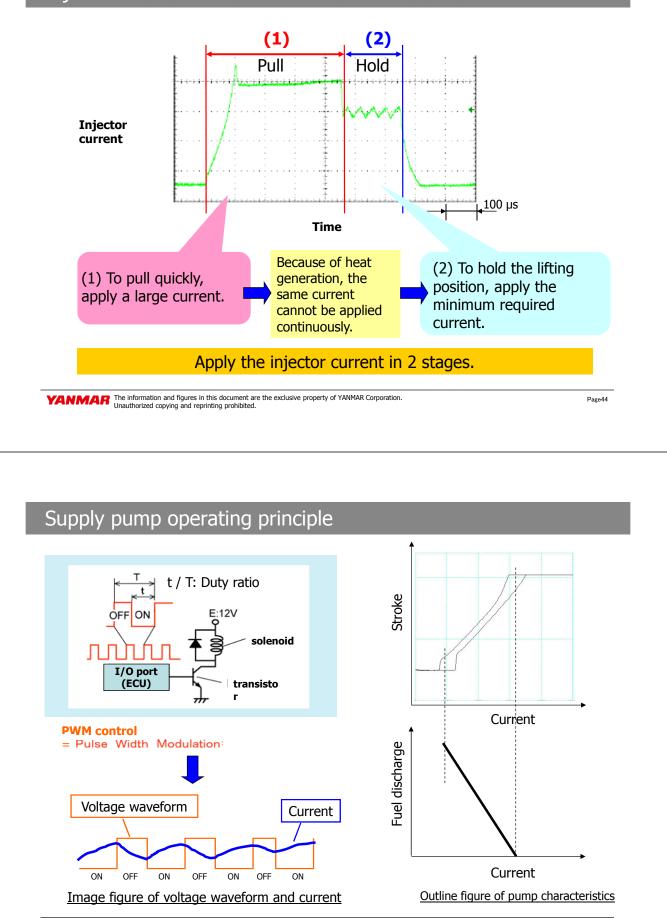
Sensor name	Operating principle
Injector	Solenoid control (Pull, Hold)
Supply pump	PWM control (Duty ratio)
Intake throttle	DC motor (with brush) control
Exhaust throttle (optional part)	
EGR valve	DC brushless motor control

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Intake Throttle

Special features

- Non-contact type position sensor is integrated.

 \rightarrow Durability is ensured.

-The value is fully opened by the integrated spring when non-energized. $_{dry \ bearing} \rightarrow$ Failsafe is considered

-The energizing time etc. are calculated and controlled from the present valve position and the target valve position to the motor.

 \rightarrow ECU controls intake throttle.

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EGR valve

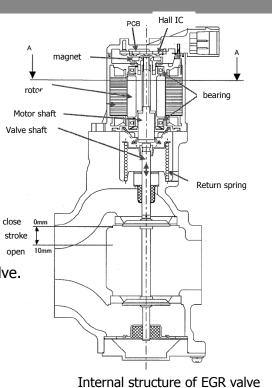
Special features

- The motor has no brushes.
- \rightarrow No risk of sticking of brush contact point

- Valve position is fed back by non-contact sensor.

 \rightarrow No loss of synchronization. Quicker response speed

-EGR value is controlled by the ECU based or stroke a target position as instructed by the ECU. Open \rightarrow ECU send target value position to EGR value. ECU controls EGR value only by CAN communication.



ball

eal

0

DC motor

function

bearing has

spring

gasket

Internal structure of intake throttle

Non-contact

type Position sensor

Motor and

connector

Page46

sensor

is integrated

Bore size

76mm

associated to

THANK YOU FOR YOUR ATTENTION.

