Clutchsensor, 22mm PLCD, passive
For Valeo

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REVISIONS HISTORY

Revision	Description of changing	Name	Date
56	**Validationplan added**	M. Wolf	**07.09.00**
57	Accomondation to Tyco forms Impedance primary coil 293 Ohm DC- Resistance primary coil 57 Ohm	M. Wolf	02.03.01
58	Impedance primary coil 275 Ohm DC- Resistance primary coil 55 Ohm	M. Wolf	17.04.01
59	Tensile strength of the Cable exit 50 N rectangular to Sensor surface 25 N parallel to Sensors surface	M. Wolf	05.06.01
60	B3 & C-Sample added Valeo reference added Material of Housing was PA6.6T GF25 Material of Pressfit sockets added Specification of coil wires added Sensitivity was -1,98 mV/(mm mA) Sensitivity tolerance was +/- 5% Maximum error of linearity was < 3% error of center position was ± 3% of L_N Specification of DCR & Impedance Reference drawing added Frequently requalification added	M. Wolf	12.10.01
A1	series	M. Wolf	08.01.02
A2	Impedance of secondary coil was 36 Ω ± 15% new 42 Ω ± 15%	M. Wolf	23.04.02
A3	Impedance of sec was 42 Ω ± 15% Sensitivity was -1,98 mV/(mm mA) DC Resitancs sec was 22 Ω	M. Wolf	25.08.04

1. SCOPE

1.1 Content

This Specification covers the performance, test and quality requirements for the clutchsensor, 22mm PLCD, passive for Valeo.

This document is released by the sign on the first page and all changing are listed in the revision history with the relating revision number.

1.2 Qualification

When test are performed the following specified documents and standards shall be used. All inspections shall be performed using the relating inspection plan and product drawing.

2. APPLICABLE DOCUMENTS

The following documents from a part of this specification are to the extent specified herein. In case of conflict between the requirements of this specification and the product drawing or other revered documents, this specification shall take precedence.

	B3 - Sample	C – Sample
Customer drawing Sensor	C 0-1412125-1	C 7-1468843-6
Customer drawing Magnet	C 0-1393087-1	
Valeo Reference	none	477561U0

Doc. No.	Title	Index
IEC 60068-2-1	Environmental testing - Part 2: Tests. Tests A: Cold	(1990-05)
IEC 60068-2-2	Environmental testing - Part 2: Tests. Tests B: Dry heat	(1993-01)
IEC 60068-2-3	Environmental testing - Part 2: Tests. Test Ca: Damp heat, steady state	(1969-01)
IEC 60068-2-14	Environmental testing - Part 2: Tests. Test N: Change of temperature	(1984-01)
IEC 60068-2-6	Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)	(1995-03)
IEC 60068-2-32	Environmental testing. Part 2: Tests. Test Ed: Free fall (Procedure 1)	(1990-02)
IEC 60068-2-21	Environmental testing - Part 2-21: Tests - Test U: Robustness of terminations and integral mounting devices	(1999-01)
IEC 60529	Degrees of protection provided by enclosures (IP Code)	(1989-11)
Fiat 9.90110	Dispoitivi elettrici ed elettronici per autoveicoli	(1999)

3. REQUIRMENTS

3.1 Components and Materials

	B3 - Sample	C – Sample
Tyco PN	0-1412125-1	7-1468843-6
Valeo Reference	none	477561U0
Housing and bobbin	PA 6.6 T GF30	
Press-fit socket	CuZn39Pb3F43 or CuZn37F37	
Sensor cable	single wires inside a protection sheet	
Connector	AMP Superseal PN: 0282106-1	
Coil wire	CuL 0,08mm P180	CuL 0,10mm P180
Driving magnet:	VX 170 10 x 5 x 6 mm (Vacuumschmelze Hanau)	

3.2 Operating conditions

Tyco PN	0-1412125-1	7-1468843-6
nominal measurement range	L_N = 22 mm	
Ambient temperature (Sensor):	T = –40…+140°C	
Ambient temperature (Connector):	T = –40…+125°C	
Frequency:	f = 1…6 kHz	
Primary current:	I_{eff} = 5 mA…20 mA (I_{DC} = 0)	
Distance between magnet and sensor:	See drawing	
Maximum allowed side-shift of magnet:	± 4 mm	
Maximum allowed side-shift of magnet:	± 2°	
Minimum bending radius of the cable:	r_{min} = 5 x diameter of the cable for single bending r_{min} = 15 x diameter of the cable for multiple bending	
Protection class (IEC 60529)	IP X5 (plugged into mating connector)	

3.3 Limits of operation

Tyco PN	0-1412125-1	7-1468843-6
Ambient temperature (sensor):	160°C (maximum 2.5h over lifetime)	
Ambient temperature (connector):	125°C maximum	
maximum primary current:	$I_{max,eff}$ = 20 mA	

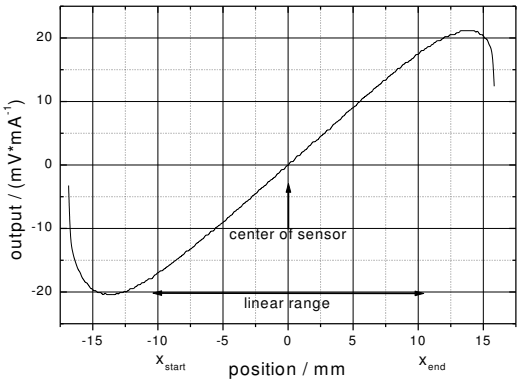
3.4 Conditions of end of line test

Tyco PN	0-1412125-1	7-1468843-6
Nominal measurement range	L_N = 22 mm	
Ambient temperature	T = 20 °C (± 3 °C)	
Driving magnet	VX 170 10 x 5 x 6 mm (Vacuumschmelze Hanau)	
Distance between magnet and sensor	1,55 mm (± 0,2 mm)	
Primary current	I_{eff} = 5 mA (sine)(I_{DC} = 0)	
Frequency of primary current	f = 3,3 kHz (sine)	

3.5 Test data and tolerances

3.5.1 Definition of sensor parameter

Typical graph of sensor output



Sensitivity $$S = \frac{1}{i_{eff}} \frac{du^{fit}(x)}{dx}$$

Error of linearity $$LF = \frac{\left|u^{fit}(x) - u^{meas}(x)\right|_{\max}}{\left|u^{fit}(x_{end}) - u^{fit}(x_{start})\right|} \times 100\,\%$$

Center of sensor $$M = x\,(u^{fit} = 0)$$

$$\Delta X_c = \frac{\left|M - M_{target}\right|}{L_N} \times 100\%$$

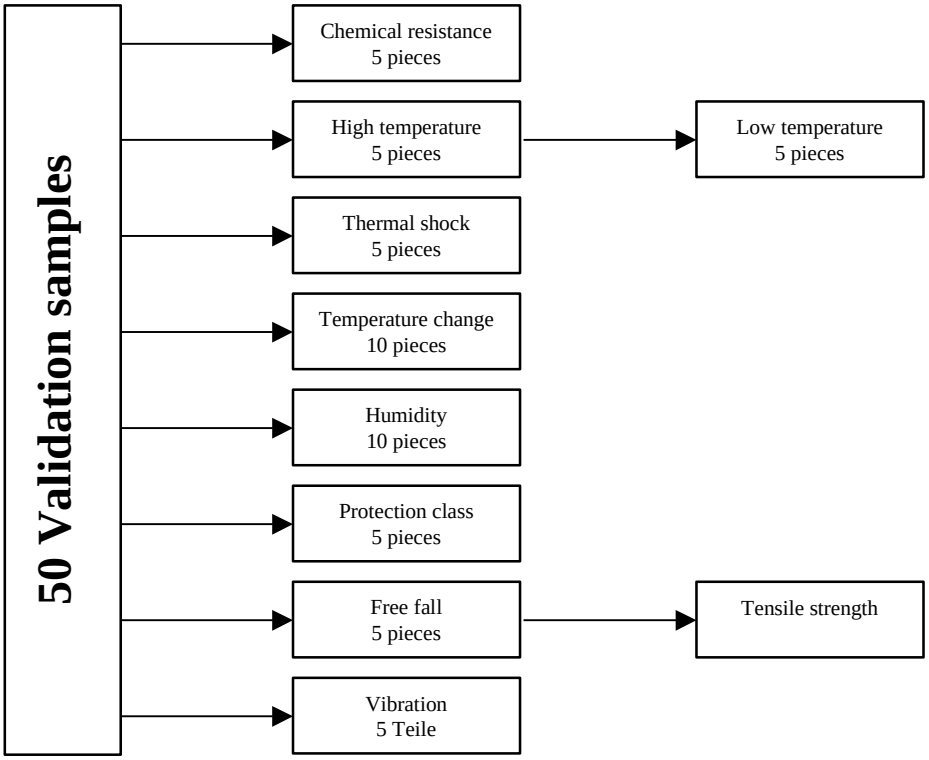
Hysteresis $$F_{hyst} = \frac{\left|u^{meas}_{forth}(x) - u^{meas}_{back}(x)\right|}{u^{meas}(x_{end}) - u^{meas}(x_{start})}$$

3.5.2 Sensor parameters and tolerances

Tyco PN	0-1412125-1	7-1468843-6
Sensitivity *1)	S_N = - 1,98 mV/(mm mA) +/- 5% @ condition of 3.4 max +5% -13% @ worst case tolerance & temperature	S_N = - 1,90 mV/(mm mA) +/- 5% @ condition of 3.4 max +5% -13% @ worst case tolerance & temperature
Maximum error of linearity *1)	F_L < 3 % @ condition of 3.4 max 5% @ worst case tolerance & temperature	
Maximum error of center position *1)	ΔX_c = ± 0,66mm	
Hysteresis	F_{hyst} < 0,2%	
DC resistance of primary coil (R_{prim})	55 Ω +/- 15%	35 Ω +/- 15%
DC resistance of secondary coil (R_{sek})	33 Ω +/- 15%	21 Ω +/- 15%
Impedance of primary coil *2) ($\|Z_{prim}\|$)	275 Ω ± 15%	260 Ω ± 15%
Impedance of secondary coil *2) ($\|Z_{sek}\|$)	42 Ω ± 15%	38 Ω ± 15%
Resistance between prim & sec coil *2)	≥ 50 MΩ at U_{dc} = 500 V over 2 s	
Maximum tensile force between cable and sensor	50N max in 1 direction of cable exit (for 1 min) 25N max in 4 direction 90° to cable exit (for 1 min)	

*1) *These sensor parameters will be 100 % tested during end of line test*
*2) *These sensor parameters will be tested of all production batches (charge)*

3.6 Qualification



No.	Test	1-5	6-10	6-10	11-16	16-25	26-35	36-40	41-45	46-50
3.6.1	Chemical Resistance	1 (1)								
3.6.2	High temperature constant		2 (2)							
3.6.3	Low temperature constant			3 (2)						
3.6.4	Temperature shock				4					
3.6.5	Temperature change					5				
3.6.6	Humidity test						6 (3)			
3.6.7	Protection class							7		
3.6.8	Free Fall test								8	
3.6.9	Tensile strength								9	
3.6.10	Vibration test									10
3.7.1	Functional test	x	x	x	X	x	x	x	X	x
3.7.2	Insulation test	x	x	x	X	x	x	x	X	x
3.7.3	Visual test	x	x	x	X	x	x	x	X	x
3.7.4	Outline dimension			6, 8	12	18	32			

x - Test to be done for all Sensors before and after the test

(1),(2),(3) - 5 Magnets to be tested parallel, no effects to specifiyed Parameters acc. drawing C-1393087-1

3.6.1 Chemical Resistance

Chemicals:

fuel	(unleaded)
engine oil	(SAW15w40)
hydraulic oil	(Pentosin)
transmission fluid	(AFL)
brake fluid	(DOT 4)

Procedure:

All sensor surfaces penetrated (dipped into or brushed onto) with the test substances for 5 s (Connector and Pins excepted) . Then the DUT are drying at RT in air for 1h and stored at max operating temperature 140°C for 16h.

The parts must not show any changes that influence their mechanical and electrical properties negatively. All measurement have to be within the specified tolerances.

3.6.2 High Temperature (constant)

IEC 60068-2-2 (1993-01) Environmental testing - Part 2: Tests. Tests B: Dry heat

Testtemperature 1:	T_{P1} = +140 ± 3 °C
Testtemperature 2:	T_{P2} = +160 ± 3 °C
Roomtemperature:	T_R = +25 ± 3 °C
Duration:	t_1 = 16h (T_{P1})
	t_2 = 2,5h (T_{P2})

3.6.3 Low Temperature (constant)

IEC 60068-2-1 (1990-05) Environmental testing - Part 2: Tests. Tests A: Cold

Testtemperature:	T_P = -40 ± 3 °C
Duration:	t = 16 h
Roomtemperature:	T_R = +25 ± 3 °C

3.6.4 Temperature shock

IEC 60068-2-14 (1984-01) Environmental testing - Part 2: Tests. Test N: Change of temperature

Test temperature TA:	T_A = -40 ± 3 °C
Test temperatur TB:	T_B = +140 ± 3 °C
Room temperature TR:	T_R = +25 ± 3 °C
Duration:	t_1 = 30 minutes
	t_2 = < 3 minutes
Number of cycles	N = 6

3.6.5 Temperature change with defined rate of change

IEC 60068-2-14 (1984-01) Environmental testing - Part 2: Tests. Test N: Change of temperature

Test temperature TA:	T_A = -40 ±3 °C
Test temperatur TB:	T_B = +140 ±3 °C
Room temperature TR:	T_R = +25 ±3 °C
Rate of change:	k = 1±0,2 °C/min
Dwell time:	t (T_A) = t (T_B) = 30 minutes
Number of cycles:	N = 10

3.6.6 Humidity

IEC 60068-2-3 (1969-01) Environmental testing - Part 2: Tests. Test Ca: Damp heat, steady state

Humidity:	$93\%^{+2\%}_{-3\%}$
Temperature:	T= 40 ±2 °C
Duration:	96 h

3.6.7 Protection class

IEC 60529 (1989-11) Degrees of protection provided by enclosures (IP Code)

Protection class:	IPX5

3.6.8 Free fall

IEC 60068-2-32 (1990-02) Environmental testing. Part 2: Tests. Test Ed: Free fall (Procedure 1)

Dropping height:	1 m
Test surface:	concrete
Number of falls:	6 directions, 2 tests / DUT

3.6.9 Tensile strength

IEC 60068-2-21 (1999-01) Environmental testing - Part 2-21: Tests - Test U: Robustness of terminations and integral mounting devices

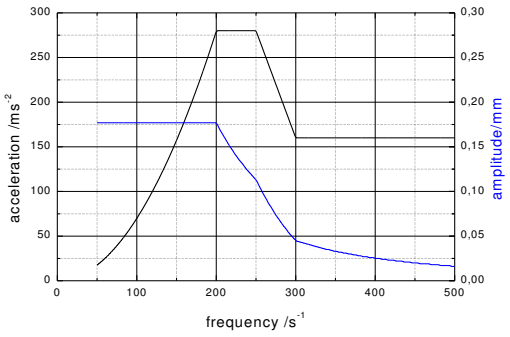
Test procedure: Ua1	
Force to be applied:	50 N rectangular to surface 25 N parallel to surface
Time of application:	1 minute

3.6.10 Vibrations

IEC 60068-2-6 (1995-03) Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)

Test level comparable to Fiat Auto normatzione 9.90110 (1999) - Dispoitivi elettrici ed elettronici per autoveicoli.

Frequency range	55 ... 500 Hz	(6,4 octaves)
Number of cycle:	10 / axis	
Sweep cycle:	1 oct / min	
Duration:	1h / axis	(approximated)



3.7 Standard Tests

3.7.1 Functional Test

All sensor parameter are tested according 4 Conditions of end of line test

Linearity error:	LF = ≤ 3%
Sensitivity error:	ΔS_N = ± 5 %
Centre position:	ΔX_c = ± 3% von L_N

3.7.2 Insulation test

High-voltage test between primary and secondary coil

Resistance:	≥ 50MΩ
Testvoltage:	U_{dc} = 500 V
Duration:	t = 2 s

3.7.3 Visual Test

Visual inspection of surfaces and finishes. None acceptable quality:

deformation and defects of the Housing
leakage and defects of cable exit
corrosion of mechanical terminals
loosing or defects of terminal inserts
surface contamination with adhesive or filling compound
dissolve of plastics

3.7.4 Outline dimensions

All specified dimensions and tolerances according drawing C-1412125-1 or C7-1468843-6

4. QUALITY ASSURANCE PROVISIONS

4.1 Qualification Testing

The samples are prepared in accordance with product drawings. They are selected from current production. Qualification inspection are verified by testing samples as specified in Para. 3.6.

4.2 Requalification Testing

If changes significantly affecting form, fit, or function are made to the product or to the manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality, and reliability engineering. In terms of a product audit the requalification shall be repeated frequently.

4.3 Acceptance

Acceptance is based on verification that the product meets the requirements of Para. 3.6. Failures attributed to equipment, test setup, or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmitted.

4.4 Quality Conformance Inspection

The applicable AMP quality inspection plan will specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification