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Part must comply with Restricted Substance Management Standard Q/JL J160001			

Technical Regulation

技术规范

<<SYSTEM/COMPONENT>>

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 2 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Contents 目录

1.	General 综述.....	5
1.1	Purpose of this TR 这个 TR 的目的.....	5
1.2	Revision history 修改历史	5
1.3	Requisite documents 必要文档	5
1.3.1	Engineer standards and documents 工程标准和文档	5
1.3.2	National standards and specifications 国家标准和规范	5
1.3.3	International standards and specifications 国际标准和规范	5
1.3.4	Legal requirements 法律法规要求	5
2.	Functional environment 功能环境	6
2.1	REQ-001406/2 COOLING SYSTEM, GENERAL AGEING REQUIREMENTS 冷却系统，常规老化要求 6	
2.2	General component requirement 常规零部件要求	7
3.	Property requirements 性能要求	8
3.1	PREREQUISITES FOR TESTING 测试前提条件	8
3.1.1	Test flow chart 测试流程图.....	8
3.2.1	Material reference design, and manufacturing process	8
3.2.10	Adhesion between inner and outer layer	8
3.2.2	Determination of solvent extract	8
3.2.8	Compression set	8
3.2.6	Change in hardness.....	8
3.2.7	Change in elongation at break	8
3.2.3	Infra-red spectrometric method	8
3.2.11	Surface properties and cleanliness.....	8
3.2.4	Thermo gravimetric analysis	8
3.2.5	Hardness	8

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 3 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.3.1 Resistance to hose clamps	8
3.3.2 Circumferential swell at over pressure	8
3.3.6 Endurance test.....	8
3.3.2 Circumferential swell at over pressure	8
3.3.4 Burst pressure.....	8
3.3.4 Burst pressure.....	8
3.3.5 Flexibility at.....	8
-40°C 8	
3.3.3 Vacuum test	8
3.3.7 Short Endurance test.....	8
3.3.4 Burst pressure.....	8
3.1.2 Hoses 管路.....	8
3.1.3 Rubber compound 橡胶附件	9
3.1.4 Spigots 接头.....	9
3.1.5 Assembling of clamp and quick connector 卡箍和快插接头的安装.....	9
3.1.6 Test unit 试验单元.....	10
3.1.7 Coolant 冷却液	10
3.1.8 Test temperature 试验温度	10
3.1.9 Pressure 压力	10
3.1.10 Assembly 装配	10
3.1.11 Master hoses 主要管路	11
3.1.12 Testing at the supplier 在供应商的试验	11
3.1.13 Test report and documentation 测试报告和文件	11
3.1.14 Amount of test samples 试验样件数量.....	12
3.2 MATERIAL PROPERTIES 材料特性	12
3.2.1 Material references, design, and manufacturing process 材料参考、设计、制造过程.....	13
3.2.2 Determination of solvent extract 溶剂萃取测定.....	13
3.2.3 Infra-Red spectrometric method 红外光谱测试方法	13
3.2.4 Thermo gravimetric analysis 热重分析	13

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 4 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.2.5	Hardness 硬度	15	
3.2.6	Change in hardness 硬度变化	15	
3.2.7	Change of tensile strength 拉伸长度变化	15	
3.2.8	Change in elongation at break 撕裂伸长变化率	15	
3.2.9	Compression set 压缩永久变形	16	
3.2.10	Resistance to coolant 耐冷却液	17	
3.2.11	Adhesion between inner and outer layer 内外层的附着力	17	
3.2.12	Surface properties and cleanliness 表面质量和清洁	18	
3.2.13	Electrochemical resistance 耐电化学	18	
This requirement applies only to EPDM hoses. Method is according to SAE J1684. Test duration 170h at 100°C. GEELY coolant is used in test.			18
3.3	MECHANICAL PROPERTIES 机械性能	19	
3.3.1	Resistance to hose clamps 对管夹的抵抗	19	
3.3.2	Circumferential swell at over pressure 圆周过压膨胀	19	
3.3.3	Vacuum test 真空度测试	20	
3.3.4	Burst pressure 爆破压力	21	
3.3.5	Flexibility at -40°C -40°C的适应性	21	
3.3.6	Endurance test 耐久测试	21	
3.3.7	Short endurance test 短期耐久实验	27	
3.3.8	Thermal aging test 热老化测试	28	
3.3.9	Flame Retardancy/阻燃性能	28	
3.3.10	Substance use restriction/禁用、限用物质	28	
3.3.11	IP Validation/ 防护性能	28	
3.3.12	Environment, Recycling 环保回收	29	
	Recyclability 环保回收	29	
3.3.13	Prohibited, Restricted substances 禁用、限用物质	29	
3.4	VEHICLES TESTS 整车实验	31	
3.4.1	Burst pressure after vehicle test 整车时候后的爆破压力实验	31	

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 5 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.4.2	Abrasion 磨损	31
3.4.3	Crash test 冲击实验	31
4.	component & material sub-supplier list 零部件及材料分供方清单	32
5.	Property requirements of materials and parts 材料及零部件性能要求	33

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 6 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

1. General 综述

1.1 Purpose of this TR 这个 TR 的目的

This document is mainly a refinement and supplement of DPR content.此文档主要是对DPR内容的细化和补充。

1.2 Revision history 修改历史

Revision 版本	Date 日期	Description 描述	Author (dept, name, phone) 修改人（部门，姓名，电话）

1.3 Requisite documents 必要文档

1.3.1 Engineer standards and documents 工程标准和文档

Reg. No./ID 编号/ID	Document name 文档名称
Q/JLY J7110186D-2018	《乘用车散热器水管技术条件》
Q/JLY J7110335B-2019	《汽车非金属材料阻燃性限值要求及试验方法》
Q/JLY J7110845B-2016	《汽车材料中铅、镉、汞、六价铬、多溴联苯、多溴二苯醚检测方法》
Q/JL J160001-2017	汽车零部件和材料禁用、限用物质要求

1.3.2 National standards and specifications 国家标准和规范

Reg. No./ID 编号/ID	Document name 文档名称
GB/T 4208-2017	外壳防护等级（IP 代码）

1.3.3 International standards and specifications 国际标准和规范

Reg. No./ID 编号/ID	Document name 文档名称
ISO 1407:2011	Rubber - Determination of solvent extract
ISO 4650:2012	Rubber - Identification – Infrared spectrometric method
ISO 9924-1:2016	ubber and rubber products -- Determination of the composition of vulcanizates and uncured compounds by thermogravimetry
SAE J1684	Electrochemical resistance
ISO 23529:2016	Rubber-General procedures for preparing and conditioning test for physical test methods
ISO 37:2017	Rubber,vulcanized or thermoplastic – Determination of tensile stress-strain properties

1.3.4 Legal requirements 法律法规要求

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 7 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Reg. No./ID 编号/ID	Regulation name 法规名称

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 8 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

2. Functional environment 功能环境

The hose distributes coolant between different components in the cooling and heating systems of the engine. The hoses are secured to different components with hose clamps or quick connectors.

管路在发动机冷却和加热循环中分配冷却液。管路连接到不同的部件和快插接头上。

The coolant may consist of any of the coolants available on market, or of water. The temperature of the coolant may vary between -40°C and $+135^{\circ}\text{C}$. Normal operating temperature $100 \pm 10^{\circ}\text{C}$. Engine bay temperatures could be up to 220°C in specific areas.

冷却液有可能包括市面上各种使用的冷却液或者水。冷却液的温度范围在 -40°C 到 135°C 之间。正常的温度在 $100 \pm 10^{\circ}\text{C}$ 。发动机舱的温度在特殊环境下有可能到达 220°C 。

Working pressure in the system could vary from 0kPa to 400kPa. When filling the system in factory, the pressure may range between -97kPa and 180kPa .

系统中的工作压力会从 0kPa 到 400kPa 内变化。当在工厂内加注冷却系统，压力有可能从 -97kPa 到 180kPa 范围内变化。

Some hoses must accommodate movements between the engine and other components in the system. The magnitude of movement may be up to 40mm peak to peak.

一些管路必须适应在发动机和其他零部件之间的运动。这些运动量有可能会达到峰值到峰值为 40mm 的运动量。

The outside of the hose is exposed to splashes of engine oil, fuel, break fluid, washer fluid and ATF oil and may be cleaned with any of the engine washing agents available on the market.

管路的外层有可能会暴露在发动机机油，燃油，制动油，洗涤剂，ATF 油，和任何在市场上有的发动机清洗剂里面。

2.1 REQ-001406/2 COOLING SYSTEM, GENERAL AGEING REQUIREMENTS 冷却系统，常规老化要求

ENGINE COOLING SYSTEM, GENERAL AGEING REQUIREMENTS 发动机冷却液系统，常规的要求

Requirement: 要求

Applications (rubber and plastic hoses, expansion tanks etc.) regarded as "normal" system. The system/components should be designed to resist 4 years and/or 150 000 km of service. After ageing according to General ageing procedure, chassis and engine compartment systems, the mechanical properties related to function are to be measured (resistance to pressure, leakage etc.) For specific requirements, see drawings and Technical Regulations 应用（橡胶和塑料管，膨胀水壶等）为常规系统。系统和零部件要能设计到满足 10 年或者 24 万公里的售后。根据一般老化过程后，底盘和发动机系统，与功能相关的机械特性将被测量（抗压，腐蚀等等）。特殊要求情况下，参看图纸和 TR。

Method:方法

Unless otherwise stated: The polymer material for each application, shall withstand thermal ageing in the relevant chemical and physical environment corresponding to:

除非特殊表明：高分子材料应该能耐热老化和相关的物理和化学环境相关于

1. "normal" system/component: 10 years of service or 240 000km.

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 9 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Ageing temperature is calculated for each system/part with respect to 95 percentile of worst case regarding drive pattern, ambient conditions and market/s, referring to dept. 91740 "Heat Management/Thermodynamics".

常规系统/零部件：售后 10 年或者 24 万公里。根据每个系统/零件 95%最糟糕的驾驶情况，气候条件和市场相关于标准 91740 “热管理/热力学来计算热老化温度。

2. Safety related system/component: 15 years of service or 300 000km.
Ageing temperature is calculated for each system/part with respect to 99 percentile of worst case regarding drive pattern, ambient conditions and market/s, referring to dept. 91740 "Heat Management/Thermodynamics".

安全件：售后 15 年或者 30 万公里

常规系统/零部件：售后 10 年或者 24 万公里。根据每个系统/零件 99%最糟糕的驾驶情况，气候条件和市场相关于标准 91740 “热管理/热力学来计算热老化温度。

Thermal ageing procedure (time and Td/Tp) is established by department 91740 .热老化温度程序（时间和 Td/Tp）是由部门 91740 部门进行估算。

The ageing is carried out at two different temperatures: 热老化是在两个不同温度下进行

Td = measured mean temperature during 98% of service time.测量在 98%的工作环境下的平均温度。

Tp = measured mean temperature representing the 2% time at the highest part of the temperature interval.

测量在最高温度范围的 2%的平均温度

In order to decrease testing time, it is recommended to follow the Arrhenius relation if possible (after discussion with dept. 91580 at the "Material centre").

为了降低试验时间，在可能的情况下建议遵循 Arrhenius 关系。（在材料中心与 91580 部门协商后）

2.2 General component requirement 常规零部件要求

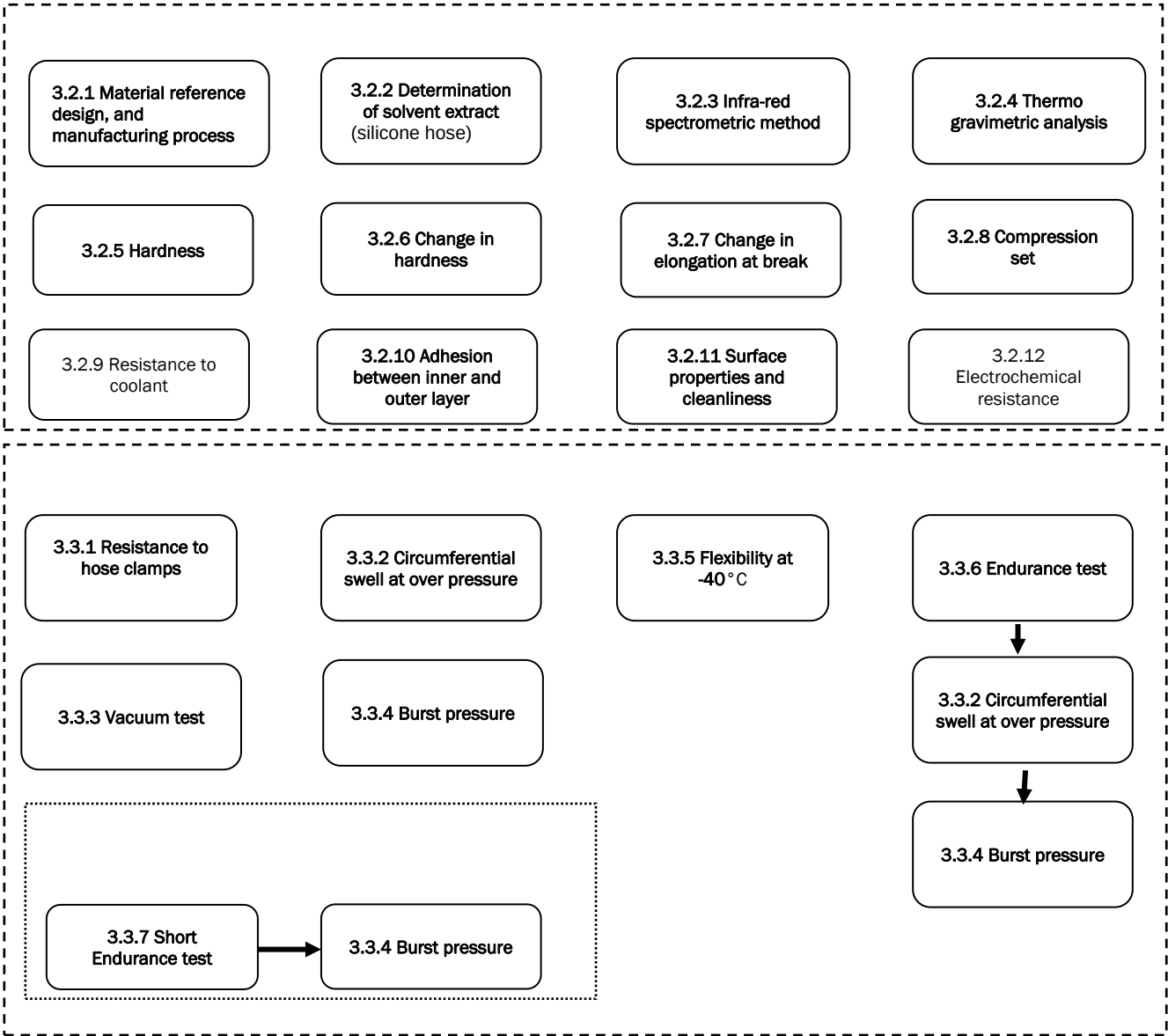
All components shall withstand the environment which they may be exposed to in a Geely vehicle. The component shall be capable to withstand Geely's vehicle sign-off tests such vehicle durability (e.g. VPT1 and VPT2) and vehicle corrosion (CORCAR previously called LPK) and not cause functional problems within the vehicle. 所有的零部件必须能够容忍在他们所在的吉利车辆中暴露的环境中。所有的零部件必须能够保证在签发的整车试验例如耐久性试验和腐蚀性试验后不产生任何影响功能问题。

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 10 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3. Property requirements 性能要求

3.1 PREREQUISITES FOR TESTING 测试前提条件

3.1.1 Test flow chart 测试流程图



	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 11 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.1.2 Hoses 管路

The hoses that are tested and documented according to this TR must be made of the same materials, with the same construction and dimensions, and produced according to the same manufacturing methods as intended for future serial production, that is, they must fully correspond to regular production items. The hoses must not be older than 6 months.
管路根据这个 TR 和试验文件必须是量产的件。

3.1.3 Rubber compound 橡胶附件

Some tests in this TR are made on the rubber compound. The test pieces are then taken from specially moulded standard sheets as per ISO 4661-1. The thickness of the test piece is selected from the recommended values in ISO 4661-1.
在这个 TR 里面一些测试是在橡胶化合物里面做的。试验样件是来自特殊的铸造标准像 per ISO 4661-1. 试验样件的厚度来自标准 ISO 4661-1 里面推荐的值。
The cure, vulcanisation time, temperature and pressure must be as close as possible to the corresponding hose manufacturing process parameters for the concerned hose. The compound is analysed in the tests at least 72h after manufacture, being stored at 23 ±3 °C and 50 ±5 % relative humidity.
橡胶硫化，硫化时间和压力必须尽可能跟正式生产过程中的状态接近。试验样件必须在生产后的 72 小时后，储存在 50%相对湿度，23℃的环境中储存。

3.1.4 Spigots 接头

Spigots must be shaped and with the material, dimensions and surface treatment as in production. Contact GEELY for status of spigot. The spigots are to be fitted to the test rig in such a way that the hose is positioned correctly in accordance with the drawing.
接头必须与生产中的形状，材料和尺寸及表面处理一样。按照图纸中正确的状态安装。
If hose include spigot, supplier must insure compatibility with the quick connector. This should be done by addition of quick connector part numbers on the spigot drawing.
如果管路包括接头，供应商必须保证与快插接头的兼容性。这个应该在接头的图纸中添加快插接头部件。
Spigot design for spring band clamp and screw clamp could be according to DIN 3021-3.
接头弹簧卡箍和涡轮蜗杆卡箍的设计可以依据标准 DIN 3021-3 来设计。

3.1.5 Assembling of clamp and quick connector 卡箍和快插接头的安装

Production status of spigots, hoses, clamps and quick connectors must be used in testing. If there are reasons not to use production status (PPAP phase 1) component in testing, contact GEELY. Deviations of component status must be noted in test report.
在测试中必须使用生产状态的接头，管路，卡箍和快插接头。如果有原因导致不能再试验中使用 phase 1 状态的产品，联系 GEELY。零部件状态的差异必须在报告中标明。

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 12 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Table 1. The table describe assembling of worm screw clamps in testing.

	Assembling with “High band tension”	Assembling with “Low band tension”
Torque (Nm)	Recommended torque + 0,4Nm	Recommended torque - 0,4Nm
Torque speed (rpm)	35 rpm	500 rpm
Assembly tool	Electrical tool	Electrical tool

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 13 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

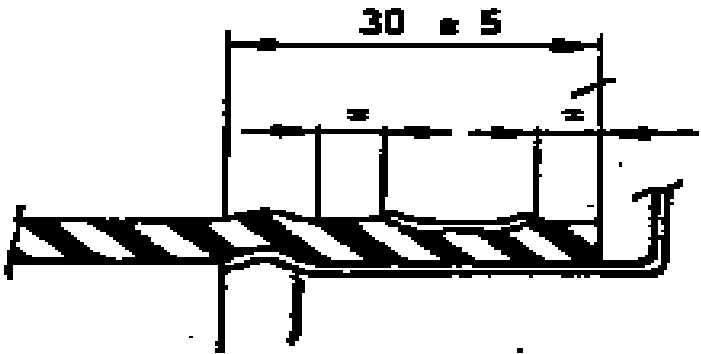


Figure 1. The figure describe were to put worm screw clamp on spigot.

Spring Band Clamps (SBC) should be positioned according to drawing. If SBC is glued on hose, clamp should also be glued on hose in testing.

弹簧卡箍应该根据图纸装配。如果弹簧卡箍是黏贴在管路上面，那么试验过程中也应该黏贴在管路上。

Quick connectors are fitted to spigot when the spring has locked on the spigot.

快插接头安装在接头上，当弹簧已经锁定接头。

3.1.6 Test unit 试验单元

Test unit = A hose assembled and secured with clamps or quick connectors onto spigots that are easily disconnected from /connected to the test equipment.

试验单元=一个管路安装好冰鞋用卡箍或者快插接头固定在接头上，能够轻易的从设备上拆除。

A test unit may be moved from one test equipment to another but the hose must never be removed from the spigots and the clamped joint must not be retightened or affected in any other way during the test.

一个试验单元可能凶一个试验设别移动到另外一个试验设备，但是在实验过程中管路绝对不能从接头上拆除和卡箍接头 必须不能被松开或者以其他的方式影响。

3.1.7 Coolant 冷却液

. GEELY uses a coolant mixture of 53% ethylene glycol and 3.2% additives and 50% distilled water (% by volume) consists of ethylene glycol, the cooling pipes test should be conducted in the PMA used coolant environment .

吉利使用 53%的乙二醇、3.2%添加剂和 48%去离子水配比的冷却液，管路的相关试验应在 PMA 专用的冷却液环境中进行。

3.1.8 Test temperature 试验温度

If other not stated the testing is carried out at RT (room temperature, 23 ±3°C). Tolerances for temperatures must be within ±3°C from nominal value

如果没有特殊要求，试验要在室温下进行（室温，23±3℃）。温度偏差必须在±3℃。

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 14 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.1.9 Pressure 压力

If other not stated pressure values given in this TR are gauge pressures and the tolerances must be within $\pm 5\text{kPa}$ from nominal value.
如果在这个 TR 里面没有标明别的压力值，压力误差必须在 $\pm 5\text{kPa}$ 。

3.1.10 Assembly 装配

It shall be possible, without difficulty, to mount the hose onto a spigot as in vehicle installation. Allowable means when assembly the hose in production are:
Glycerol
Water
Propylene glycol
If other assembly liquid are desired the responsible designer has to be contacted for consultation.
在整车装配过程中管路应该无困难的安装到接头上。润滑剂在安装过程中管路的接受条件为：
丙三醇
水
丙二醇
如果需要用到别的润滑剂，那么需要在设计员进行讨论。

3.1.11 Master hoses 主要管路

A master hose is a representative hose for one or several hoses. The purpose with master hoses is to reduce the amount of testing without jeopardising the quality and durability of the product in its application.
主要管路在在一个或者几个管路中的主要管路。使用主要管路的目的是在不影响质量和使用过程中的可靠性的情况下减少试验数量。
Which hose that will be used as a master hose is determined by the GEELY design department on a case-by-case basis. The supplier is requested to contact the design department for approval on which master hose to use. The hose that is considered to be exposed to the toughest conditions in the hose category is selected as the master hose by GEELY design department. Hoses that take up a relative movement, shows direction with an arrow on the drawing.
由 GEELY 设计部门在一个 case by case 会议上决定哪个管路做为主要管路。供应商应该联系 GEELY 设计部门申请哪个管路做为主要管路的许可。GEELY 设计部门将选用所有管子中使用环境最为恶劣的管路做为主要管路。管路有相对运动的，需要在图纸中指示箭头。
For running length hoses the master hose is selected as max inner diameter for the hose category. Length $400\pm 3\text{ mm}$. The direction of movement is perpendicular to the hose axis when installed straight.
选用最大内径的管路做为主要管路。长度 $400\pm 3\text{mm}$ 。当直接安装时移动方向与管路轴线垂直。
A master hose may be exchanged as new hoses are introduced at the supplier. This judgement is made by GEELY design department. The new hose could in such case become the new master hose for future reference.
主要管路可以更换为一个在供应商引进的新管路。这由 GEELY 设计部门进行评估。新管路在这种情况下因为主要管路的参考。

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 15 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.1.12 Testing at the supplier 在供应商的试验

It is strongly recommended that the TR is reviewed in detail together with the responsible design/testing department at GEELY at an early stage in order to clarify any doubts before initiating any tests.

强烈建议在项目早期相关部门和人员对 TR 进行进一步回顾以确保在试验之前解决任何疑问。

The supplier must show evidence to GEELY design department that it has the appropriate test equipment and evaluation methods in order to meet GEELY requirements. The same applies if the supplier decides to make tests at a third party.

供应商必须出具证据给 GEELY 设计部门证明有适当的设备和评估方法来满足 GEELY 的要求。同样适用于供应商决定在第三方试验的情况。

An assessment of the suppliers testing capabilities is recommended to be made by means of a TR review according to above and a visit to the supplier by GEELY.

GEELY 应该去供应商进行试验能力评估。

3.1.13 Test report and documentation 测试报告和文件

The documentation should be so complete that it would be possible to repeat the tests and evaluations at any time in the same way and at the same conditions.

文件应该是完整到能够在任何时间用相同的方法和条件进行重复相同的试验。

The TR test report is only for use within the GEELY. What shall be reported is described in connection with each test below and in the concerned standards and serves as a minimum specification of what the TR test report must include.

TR 试验报告仅适用于在 GEELY 内部。报告中应该有什么事根据下面的每个试验决定的，TR 里面描述的是最低限度的报告中应该拥有的。

The report must also include the following items:

每个试验的可重复性是很重要的。然而下面的必须在这个 TR 中表明。

TR number and issue 数量和故障

Supplier number and supplier's designation 设备

Test object: Hose part number and issue 相关的管路数量和故障或者等同物。

Reason for TR test (example: new supplier, new construction of the hose. 零件号和管路故障

TR reviewed together with GEELY (date+reference/No) 与 GEELY 一起审核 TR

Assessment of test equipment and evaluation methods by GEELY (date+reference/No)

GEELY 评估测试设备和评估方法

Main test laboratory 主要测试实验室

Signature, clarification of signature, and date 签名和日期

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 16 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

The following must also be documented for each test in this TR:

TR 中每种测试必须中以下证明文件

- * test equipment.测试设备
 - * test object references (Hose clamp, spigots ends) - when applicable.测试参考对象（管夹、阀），如使用
 - * test method.测试方法
 - * test laboratory if other than main test laboratory (acc. to above).除主要实验室外的其他实验室
 - * date of the test, and any other pertinent details of the entire test and any relevant comments and observation.
测试日期，整个测试的其他相关细节以及相关的评论和观察。
- Test report should be sent to GEELY design department for documentation.
测试报告应发给 GEELY 的文档设计部门。

3.1.14 Amount of test samples 试验样件数量

A minimum of tree hoses/test pieces are tested in each test in chapter 3.2 Material properties.
A minimum of six hoses are tested in each test in chapter 3.3 Mechanical properties.
在 3.3 机械性能测试中，至少测试 6 根胶管。

3.2 MATERIAL PROPERTIES 材料特性

The supplier selects a composition, materials, and a manufacturing method of the hose, which ensures the function of the part during its lifetime in its installation based on the functional environment and the performance requirements in this TR. The material specification and the construction of the hose will be reported as detailed as possible, see below.

在此 TR 中，供应商选择管路材料、制造工艺，以使其满足声明周期内的环境及性能要求。材料列表及管路结构应报告的尽可能详细。

3.2.1 Material references, design, and manufacturing process 材料参考、设计、制造过程

Describe the manufacturing method as detailed as possible and document design of hose.
管路的制造工艺及设计文档应尽可能的详细描述。

Test report: 测试报告

Inner rubber tube: material designation, nominal thickness, and supplier's reference.

内层胶：材料名称、公称厚度、供应商介绍

Reinforcement: type of reinforcement fibre, knit pattern, yarn thickness, twist, number of needles, the number of stitches per decimetre.

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 17 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

加强层：增强纤维、针织、纱线粗细、弯角、最多针数、每分米的针数。
Outer rubber cover: material designation, nominal thickness, and supplier's reference.
外成交：材料名称、公称厚度、供应商介绍
Nominal wall thickness (T) in mm for actual hose.实物壁厚。
Manufacturing method and a description of the control plan for process parameters.
制造工艺及过程参数的控制计划描述。

3.2.2 Determination of solvent extract 溶剂萃取测定

This test is only performed on outer layer from silicone hoses. See SS-ISO 1407:1992, method A, for test method.
此测试仅在外层硅胶管上进行，参见 SS-ISO 1407:1992，方法 A

Acceptance criteria:认可标准
Max amount of extract must be 9%.萃取的最大值为 9%。

Test report: 测试报告
Note amount of extract. 记录萃取量

3.2.3 Infra-Red spectrometric method 红外光谱测试方法

See ISO 4650:1984 for test method.参见 ISO 4650:1984 的方法

Test report:测试报告
Spectra of solvent extract.萃取物的光谱。
Spectra of polymer.聚合物光谱。

3.2.4 Thermo gravimetric analysis 热重分析

See ISO 9924:2000. The element in the ash is then determined with for example SEM-EDS or XRF.
参见 ISO 9924:2000

Test report:测试报告
Carbon black content 碳含量。
Polymer content.聚合物含量

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 18 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Ash content. 灰分含量
Element in ash.灰分中元素
TGA spectrum.热重分析光谱

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 19 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.2.5 Hardness 硬度

The hardness is measured in accordance with Q/JLY J7110186D-2018. The measurement must be performed on pieces cut from hose and on both the inside and the outside surface.
硬度测量需与 Q/JLY J7110186D-2018 保持一致。测量必须在内表面和外表面的切片上进行。

Acceptance criteria:认可标准
The hardness of the hose is: 63-73 IRHD.
管路硬度为 63-73 IRHD。

Test report:测试报告
Note 3 measurements on each outer and inner layer.
内外层各记录 3 组测量数据。

3.2.6 Change in hardness 硬度变化

The change of hardness is measured in accordance with Q/JLY J7110186D-2018. The measurement must be performed on pieces cut from hose and on both the inside and the outside surface.
硬度变化测量需与 Q/JLY J7110186D-2018 一致。测量必须在内表面和外表面的切片上进行。

Acceptance criteria:认可标准
The change of hardness of the hose is for: EPDM max 10 IRHD. (125°C/1000h).
" EPDM max 10 IRHD. (150°C/168h).
" Silicone max 5 IRHD. (175°C/1000h).
" Silicone max 10 IRHD. (220°C/168h).
胶管硬度变化为
EPDM max 10 IRHD. (125°C/1000h).
" EPDM max 10 IRHD. (150°C/168h).
" Silicone max 5 IRHD. (175°C/1000h).
" Silicone max 10 IRHD. (220°C/168h).

Test report:测试报告
Note measurements on each outer and inner layer.
内层外层记录数据

3.2.7 Change of tensile strength 拉伸长度变化

See BS ISO 37:2005.

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 20 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

参见 BS ISO 37:2005.

3.2.8 Change in elongation at break 撕裂伸长变化率

The elongation at break is measured in accordance with Q/JLY J7110186D-2018. The measurement must be performed on pieces cut from hose and on both the inside and the outside surface.
撕裂伸长变化率测量与 Q/JLY J7110186D-2018 一致。测量必须在内表面和外表面的切片上进行。

Acceptance criteria:认可标准

Change in elongation at break is for: EPDM max reduction of 50%. (125°C / 1000h).
" EPDM max reduction of 50%. (150°C / 168h).
" Silicone max reduction of 50%. (175°C / 1000h).
" Silicone max reduction of 50%. (220°C / 168h).

撕裂伸长变化率：

- EPDM max reduction of 50%. (125°C / 1000h).
- " EPDM max reduction of 50%. (150°C / 168h).
- " Silicone max reduction of 50%. (175°C / 1000h).
- " Silicone max reduction of 50%. (220°C / 168h).

Test report: 测试报告:

Note elongation at break result.记录撕裂伸长变化率结果
Test temperature.测试温度

3.2.9 Compression set 压缩永久变形

The compression set is measured in accordance with Q/JLY J7110186D-2018. The measurement must be performed on pieces cut from hose. Test is performed at 130°C/72h and 115°C/1500h.
压缩永久变形与 Q/JLY J7110186D-2018 一致，测试须在胶管切片上进行。测试条件为 130°C/72h 和 115°C/1500h。

After heat ageing, the test pieces shall be allowed to cool down to room temperature, 23 ± 2°C (to be checked), in the test equipment. They shall then be decompressed. The time to cool down to room temperature shall be at least 4h in room temperature before test piece is decompressed from test fixture. Measurement of compression set is then made after 30 sec after decompression and then after another 30 minutes.
热老化后，试片需在测试设备中冷却至室温 23 ± 2°C（需检查）。然后试片减压。试片在测试夹具上减压之前，冷却至室温的时间需至少 4 个小时。压缩永久变形测试在减压后 30 分钟后，在等 30s 进行。

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 21 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Acceptance criteria:认可标准

Compression set for 130°C/72h: max 55% (30 minutes after decompression).
130°C/72h 压缩永久变形：最大 55%（减压后 30 分钟）
Compression set for 115°C/1500h: max 75% (30 minutes after decompression).
115°C/1500h 压缩永久变形：最大 75%（减压后 30 分钟）

Test report: 测试报告:

Note compression set value for 130°C/72h.
记录 130°C/72h.下压缩永久变形量
Note compression set in a plot until 115°C/1500h.
记录 115°C/1500h.下压缩永久变形量
Note value after 30 seconds and 30 minutes.
记录 30 分钟又 30 秒后的值

3.2.10 Resistance to coolant 耐冷却液

The measurement must be performed on pieces cut from inside layer of hose. Pieces of the inner layer are boiled in GEELY coolant (50/50, G/W), respectively, for 30 days. The temperature is to be kept at boiling temperature of the liquids. Before and after boiling, the hardness is measured in accordance with Q/JLY J7110186D-2018, and the volume in accordance with Q/JLY J7110186D-2018.
测试必须在管路内层胶切片上进行。内层胶切片需各自在 GEELY 冷却液（50/50,丙三醇/水）中煮 30 天。温度要保持在冷却液沸腾温度。煮沸前后，切片硬度需满足 Q/JLY J7110186D-2018，体积需满足 Q/JLY J7110186D-2018.

Acceptance criteria:认可标准

Max change of hardness: 10 IRHD.
最大硬度变化：10 IRHD.
Max volume change: EPDM 10 %.
Silicone 5 %.
最大体积变化率：EPDM 10%；硅胶 5%

Test report: 测试报告:

Note change of hardness in a graph (hardness/time).
使用图表（硬度/时间）记录硬度变化
Note volume change for coolant in a graph (volume change/time).
使用图表（体积变化/时间）记录体积变化
Size and date of manufacture of test sample(s).
测试样本的尺寸和日期

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 22 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Vulcanisation time, temperature and pressure when producing the test sample(s).

生产测试样本时的硫化时间/温度和压力

Note coolant.记录冷却液

3.2.11 Adhesion between inner and outer layer 内外层的附着力

For hose with an inner diameter <50mm the test pieces are taken as a strip, of width 25±0,5mm, and for hoses with an inner diameter > 50mm as a ring, with a height of 25±0,5mm. Test piece is taken from straight part of hose. The displacement velocity is to be 100±10 mm/minute.

对于内径小于 50mm 的胶管，测试切片应做成一个宽度为 25±0.5 的样条。对于内径大于 50mm 的胶管，试片应为重量高度为 25±0.5mm 的环管。试片应从胶管直线段获取。位移速度为 100±10 mm/min

Acceptance criteria:认可标准

Min adhesion strength for EPDM is to be 2 KN/m width.

EODM 最小附着力为 2 KN/m

Min adhesion strength for silicone is to be 1 KN/m width.

硅胶最小附着力为 1 KN/m

Test report: 测试报告

Document tested samples by means of photo(s) so that the correct test piece size and position of extraction from the hose can be confirmed.

测试报告有试样的照片，以此来确定试片的尺寸无误，从胶管获取的位置无误

Note values for each tested piece.

记录每一个试片的测试值

3.2.12 Surface properties and cleanliness 表面质量和清洁

After manufacturing, the hose has to be washed in order to remove loosely adhering remains of release agent or other process aids. Testing is performed by visual inspection.

制造后，胶管必须进行清洗以去掉残留的脱模剂或其他残留。测试用目视进行

Acceptance criteria:认可标准

There must be no folds, cracks or blisters on the hose. The inner surface of the hose must be smooth.

胶管上不允许有褶皱 龟裂 气泡。胶管内壁应光滑。

3.2.13 Electrochemical resistance 耐电化学

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 23 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

This requirement applies only to EPDM hoses. Method is according to SAE J1684. Test duration 170h at 100°C. GEELY coolant is used in test.

此需求仅适用于 EPDM 胶管。测试方法依据 SAE J1684。测试条件 170h/100°C。GEELY 冷却液在此测试中使用

Acceptance criteria:认可标准

No failures are present at the completion of the electrochemical resistance test.

在耐电化学测试结果中无故障（不符合项）。

Test report: 测试报告:

Note with photographs if any failures occurs.

若任何故障出现需配图

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 24 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.3 MECHANICAL PROPERTIES 机械性能

3.3.1 Resistance to hose clamps 对管夹的抵抗

Measure spigot diameter and wall thickness of hose before assembly. The hose shall be mounted on spigot with production status. Contact GEELY design department for choice of spigot. The hose shall be provided with the appropriate hose clamp.
装配前接口直径和测试胶管的壁厚。胶管应按产品状态安装在接口上。联系 GEELY 设计部门沟通接口的选择。胶管应提供合适的管夹。

- * Assemble worm screw clamps according to table 1, "High band tension".
- * Oetiker clamps are assembled with it's lower tolerance of "gap" distance to get max compression of hose. 装配的欧梯克环箍需在开口最小公差，以使管路达到最大的夹紧。

Hose with mounted hose clamp shall be placed in an oven at 120±3°C for 24 h. Before the test object is put in oven, wait at least 15minutes in RT. After oven, wait for at least 4 hours in RT before removing the clamp.
安有环箍的胶管需放置在 120±3°C 的烤箱中 24h。在放进烤箱之前，须在室温下至少等待 15min。烘烤之后，在移除环箍之前需在室温下至少 4h。

Disassemble hose sealing and investigate hose under clamp. Measure spigot diameter after condition in oven, if plastic spigot.
拆卸管路密封，分析环箍下的胶管。如果是塑料接头，需测量烘烤后的接头直径。

Acceptance criteria:认可标准

The hose must not be damaged when the hose clamp is tightened. Fracture or crushing of the rubber and/or reinforcement must not occur.
环箍夹紧状态下，管路不能被损坏。橡胶的破裂和破碎不应出现。
Change of spigot diameter, before and after 24h in 120°C, may not exceed 2%. Measurement is made at least 4 times uniformed distributed on the spigot with help of a vernier gauge.
120°C/24h 前后，接头直径的变化，不能超过 2%。借助游标卡尺，测量应均匀分布在接头上且进行 4 次。

Test report: 测试报告:

- Note material specification and hardness of hose. 记录胶管材料规格和硬度
- Note material specification of spigot. 记录接头材料规格
- Document with photographs if fracture/crushing of hose. Note length and depth of any fracture. 如果胶管破裂/破碎，报告中附图，且记录任何破裂的长度和深度
- Note max change of spigot diameter. 记录接头直径的最大变化
- Note spigot diameter and wall thickness of hose. 记录接头直径和胶管壁厚

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 25 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.3.2 Circumferential swell at over pressure 圆周过压膨胀

Fit hose to spigots. Pressurise with GEELY coolant (50/50, G/W) or water at RT with 5kPa and measure the circumference of the hose. Increase the coolant temperature to 95°C and pressurise to pressure stated on the drawing. The pressure is held during 5 minutes and then the circumference is measured at the thickest part of the hose. Calculate the percentage increase in diameter.
安装胶管到接头。压力 5kPa，GEELY 冷却液（50/50，丙三醇/水）室温，测量胶管周长。冷却液温度升至 95℃，压力加压到胶管图纸要求。保压 5 分钟，测量胶管最厚部分的周长，计算直径增加百分比。

Acceptance criteria:认可标准

The increase in diameter may be max 12%.
直径增加率应最大 12%

Test report: 测试报告:

Note max increase change in %.
用百分比记录最大变化率
Note where max increase change were measured on hose.
记录测量胶管最大变化率的部分

3.3.3 Vacuum test 真空度测试

This test is preferably made at lower radiator hose. The hose is equipped with hose clamps or quick connectors, and fitted to spigots. Seal one end and connect the other end to a vacuum pump. Let the hose collapse 3 times at -95 kPa, 1 minute each time, before the weakest area has been found. Then measure thickness of weakest area, see figure 2.
此测试更适用于低温散热器胶管。胶管需有环箍或快插接头，连接到接口上。密封一端，连接另一端到真空泵。在最弱部分发现之前，使胶管在-95kPa 下塌瘪 3 次，每次持续一分钟。测试最弱部分的厚度，参见图 2

Test pressure:测试压力 -95 kPa.
Pressure medium:压力介质 Air.空气
Test temperature:测试温度温度 RT.室温
Duration at test pressure before measurement:保压时间 1 minute.

Acceptance criteria:认可标准

The hose may collapse, but the dimension in figure 2 must be at least 3 times the nominal wall thickness of the hose according to the drawing.
胶管可能塌瘪，但图 2 中的尺寸应至少为图纸中胶管壁厚的 3 倍。

GEELY	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 26 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Test report: 测试报告:

Note min dimension at under pressure.
记录在压力下的最小尺寸
Note where min dimension was measured on hose.
记录最小尺寸在胶管的位置

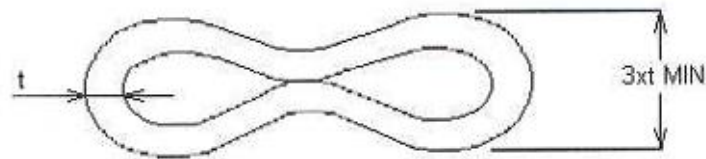


Figure 2. Thickness in figure must be at least 3 times the nominal wall thickness (t) of the hose according to the drawing.

3.3.4 Burst pressure 爆破压力

Assemble the hose onto appropriately formed spigot, but with one hose end plugged and free to move while the other hose end is kept fixed and connected to the pressure test equipment. Insert pressure medium near the fixed hose end. Fill the hose completely with the fluid and make sure all air in the hose is escaped. Increase fluid pressure until hose failure. The burst pressure is defined by the maximum obtained pressure value at the test.

安装管路到合适的成型接头，一头堵塞，一头保持固定，且连接压力测试设备。固定的一头通入压力介质。把胶管充满液体确保空气全部排除。增加液体压力知道胶管破坏。爆破压力定义为在测试中获得的最大压力。

Pressure medium:压力介质 Water or coolant. 水或冷却液
Rate of pressure increase:压力增长率 60 ±10 bar/minute.
Test temperature:测试温度 RT.室温

Acceptance criteria:认可标准

The burst pressure is to be at least 4 times the pressure specified on the drawing. Valid for new hoses.
爆破压力至少为图纸中规定压力的 4 倍。适用于新品胶管

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 27 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Test report: 测试报告:

Note burst pressure for all tested hoses.
记录所有测试胶管的爆破压力

3.3.5 Flexibility at -40°C -40°C的适应性

Cooling hose is placed in a climate chamber at -40°C. A mandrel, 10 times the nominal inner diameter is also placed in the chamber for 4 hours. After cooling, the hose is bent 80 degrees around a mandrel. The bending movement is to be completed 5 + seconds and then held in place for 5 hours. Test should be performed on straight part
冷却管路在-40°C的环模仓中。10倍于基本内径的芯轴，放置在仓中4小时。冷却后，胶管需绕芯轴弯曲80°，且弯曲鱼洞在±5s内完成，然后放置5小时。测试应在胶管直线段进行。

Acceptance criteria: 认可标准
There is to be no visible damage of the hose
胶管无可见损坏

Test report:
Note failed or OK
记录失败或ok
If failed note with photo(s) failure.
如果失败，附图

3.3.6 Endurance test 耐久测试

The hoses must withstand a combined pressure pulsation and linear axle movement test or pressure pulsation test. The requirement to resist a combined pressure pulsation and one axle movement test applies to those hoses which are subjected to relative movements in the vehicle. In such cases the drawing is provided with an arrow at one of the hose ends, indicating the direction of movement.
胶管须满足组合压力脉冲，线性轴向运动测试或压力脉冲测试。组合压力脉冲测试和轴向运动测试应用于在整车商有相对运动的胶管。在此种情况，图纸应在胶管一端提供箭头，以指示运动方向。

The hose is fitted to spigots according to vehicle installation in a rig so that it obtains its theoretically correct position. The rig is to be designed in such a way that the end of the hose with an arrow on the drawing can be moved in the directions of the arrow.
胶管根据整车安装情况在台架上匹配到接头上，以使其有理论正确位置。工装应设计的能使图纸上含有箭头的胶管一端能够按照箭头方向移动。

The hose is fitted with appropriate hose clamps / quick connectors.
胶管匹配合适的环箍和快插接头

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 28 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

The hose is connected to test equipment capable to circulate heated and pressurised coolant. The flow rate must be high enough so that the temperature difference between the inlet and the outlet of the rig is max 3°C.
 胶管连接到能收流通高温高压冷却液的实验设备上。流速应足够高以使台架进口和出口温差最大为 3°C

The test is divided into different phases with pressures and temperatures according to tables, depending on type of hose.
 根据胶管类型，按图标中的温度和压力分为不同的阶段。

After test, test rig with hoses and coolant is left to cool to room temperature and then the hoses are tested for leakage during five minutes. The leakage test is performed with coolant and the pressure is to be pressure stated on drawing.
 测试结束后，测试台架和管路及冷却液冷却至室温，然后在 5min 内测试管路泄露量。泄露量测试用冷却液进行，且其压力应与图纸规定相同。

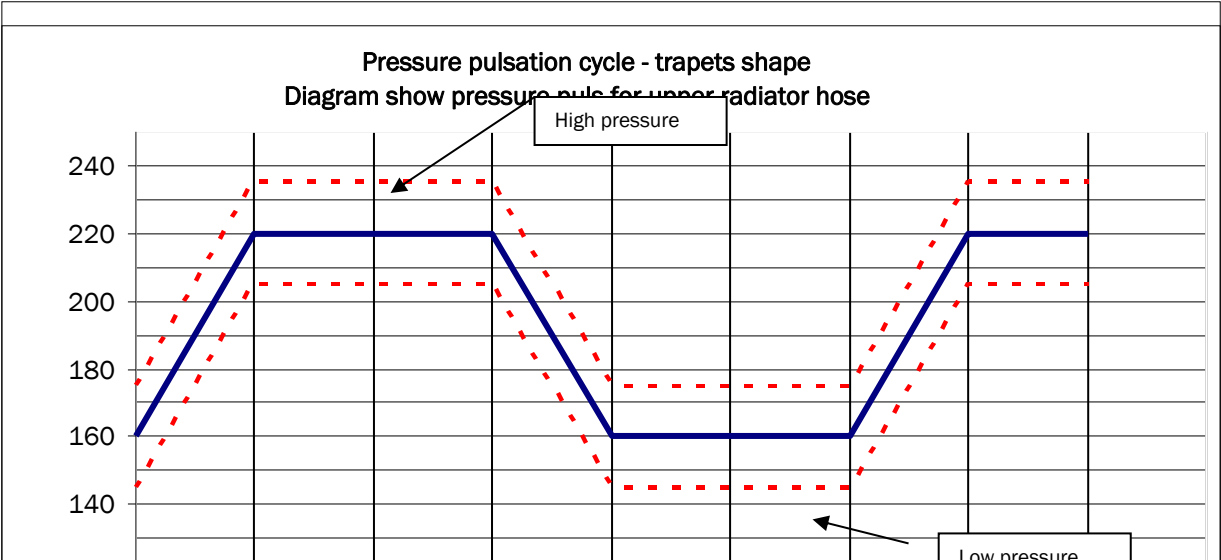
Pressure 压力

Table 2. Show gauge pressures stated on drawing. Pressures are "high pressure" part in pressure pulsation. When perform testing with high pressure: 160kPa, "low pressure" should be 100kPa.
 展示图纸中给定压力。压力为高压在压力脉冲中，如果执行测试时使用高压 160kPa，低压应为 100kPa

	Mechanical Water Pump (MWP)	Electrical Water Pump (EWP)
Hose	Pressure stated on drawing	Pressure stated on drawing
Inlet heater hose EGR hose Bypass hose	400 kPa	220 kPa
Upper radiator hose	220 kPa	220 kPa
Outlet heater hose Outlet engine oil cooling hose Degas bottle hose Outlet EGR	200 kPa	160 kPa
Lower radiator hose	160 kPa	160 kPa
Turbo hoses		220 kPa
Electric drivetrain, SPA 515A	N/A	220 kPa
Battery cooling, SPA 515A	N/A	70 kPa

GEELY	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 29 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Inlet gauge pressure



	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 30 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Figure 3. Pressure cycle is total 6 seconds. Pressure curve should be trapets shape. Tolerance of pressure is $\pm 0,15\text{bar}$ (see dashed line for tolerances in diagram).

Vibration 振动

The frequency of vibration is to be 20 Hz. The amplitude of vibration is to be 2mm, peak to peak linear vibration. One hose end will be moved. The drawing will show with an arrow direction of movement.

振动频率为 20Hz，振幅 2mm。管路一端将会移动，图纸会显示箭头指示移动方向。

Temperature 温度

Coolant temperature should be 125°C in endurance test. Choice of reinforcement (knitting) material is made out of temperature measurements (water temperatures and hose surface temperature) in GEELY wind tunnel (PVT) at FKB driving conditions (Hill climbing with trailer, Top speed ...). GEELY design department will decide used ambient temperature in test, out of temperatures in FKB test.

耐久试验中冷却液温度为 125°C。加强层的选择取决于在 GEELY 风洞里在 FKB 工况（爬坡 最高速...）测试的温度（水温管路表面温度）。GEELY 设计部门决定在 FKB 测试中的环境温度。

Tables 3. Show what ambient temperature that should be chosen in test depending on temperature measurement in GEELY wind tunnel (PVT).

环境温度在测试中的温度选择取决于在 GEELY 风洞中的温度测试。

Measured/calculated PEAK temperature of reinforcement in wind tunnel. 计算在风洞中的加强层最大温度	
PEAK temp in PVT	Ambient test temp
> 130°C	125°C
< 130°C	95°C
Measured/calculated CONTINUOUS temperature of reinforcement in wind tunnel. 测量计算在风洞中的加强层的连续温度	
CONTINUOUS temp in PVT	Ambient test temp
> 110°C	125°C
< 110°C	95°C

If peak temperature or continuous temperature state 125°C as "Ambient test temp", the ambient test temperature should be 125°C.

如果最大温度或者连续温度状态 125°C 作为环境温度，环境测试温度应为 125°C。

Engine to chassie mounted hoses 发动机到底盘管路

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 31 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Table 4. Upper radiator hose, degas bottle hose (MWP), inlet heater hose (MWP), outlet heater hose (MWP), outlet EOC hose (MWP).

上水管, 溢流管, 换热器进水管, 换热器出水管

Pressure pulsation: 压力脉冲	Low pressure 低压: 160 kPa High pressure 高压: see table 2 (pressure stated on drawing)参见表 2 (图纸压力)
Coolant temp: 冷却液温度	125°C
Ambient temp: 环境温度	125°C or 95°C (GEELY design dep. will decide test temp out of FKB test in wind tunnel GEELY 设计部门决定在风洞测试中的测试温度.)
Vibration: 振动	20Hz, peak to peak 2mm.
Duration: 持续时间	700h

Table 5. Lower radiator hose, degas bottle hose (EWP), inlet heater hose (EWP), outlet heater hose (EWP), outlet EOC hose (EWP).

Pressure pulsation:	Low pressure: 100 kPa High pressure: see table 2 (pressure stated on drawing)
Coolant temp:	125°C
Ambient temp:	125°C or 95°C (GEELY design dep. will decide test temp out of FKB test in wind tunnel.)
Vibration:	20Hz, peak to peak 2mm.
Duration:	700h

Engine to engine mounted hoses 发动机到发动机管路

Table 6. EGR cooling hose and bypass hose.废气再循环及旁支管路

Pressure pulsation:	Low pressure: 160 kPa High pressure: see table 2 (pressure stated on drawing)
Coolant temp:	125°C
Ambient temp:	125°C or 95°C (GEELY design dep. will decide test temp out of FKB test in wind tunnel.)
Vibration:	N/A.
Duration:	700h

Table 7. Turbo cooling hoses, silicone hoses 增压管, 硅胶管

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 32 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

	Phase 1	Phase 2
Pressure pulsation:	Low pressure: 100 kPa High pressure: see table 2 (pressure stated on drawing)	Low pressure: 100 kPa High pressure: see table 2 (pressure stated on drawing)
Coolant temp (°C)	115	115
Surface temperature of hose in test (°C)	220 (if other not stated)	150
Vibration:	N/A.	N/A.
Duration (h)	48	652

Electrical drivetrain Hybrid 电子传动系统

Table 8. Hoses for Electric drivetrain, 电子传动系统管路

Pressure pulsation:	Low pressure: 110 kPa High pressure: see table 2 (pressure stated on drawing)
Coolant temp:	100°C
Ambient temp:	100°C.
Vibration:	20Hz, peak to peak 2mm. (GEELY design dep. decide if vibration should be done)
Duration:	700h

Battery cooling

Table 9. Hoses for Battery cooling,

Pressure pulsation:	Low pressure: 35 kPa High pressure: see table 2 (pressure stated on drawing)
Coolant temp:	100°C
Ambient temp:	100°C.
Vibration:	20Hz, peak to peak 2mm. (GEELY design dep. decide if vibration should be done).
Duration:	700h

After test the hoses should be tested in sequence:

测试后，管路的以下项应该被测试

- 1) 3.3.2 Circumferential swell at over pressure.圆周过压膨胀
- 2) 3.3.4 Burst test 爆破实验

Acceptance criteria:认可标准

There should not be any visible damage of the hose. Both inner and outer layer.
胶管内外层不允许有可见损坏

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 33 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

No leakage.
无泄露
Meet acceptance criteria in 3.3.2 Circumferential swell at over pressure.
满足 3.3.2 圆周过压膨胀认可标准
Burst pressure, 3 x pressure stated on drawing, after passing the endurance test.
耐久测试后，爆破压力为图纸规定的三倍。

Test report: 测试报告:
Note failed or OK after endurance test.
在耐久实验后记录失败或 ok
If failed note with photo(s) failure.
如果失败，附图
Add photograph of hoses mounted in test rig.
添加管路装到台架上的照片
Note result from circumferential swell at over pressure test.
记录圆周过压膨胀实验结果
Note burst pressure for each individual hose after passing endurance test.
记录通过耐久实验后的每一个管路的爆破压力
Examine inner surface of hose.
检查管路内表面
Add photograph of temperature sensor adapted on hose surface.
添加装在管路表面的温度传感器照片
Add chart from endurance testing showing:
添加显示以下参数的图表

- * Pressure cycles 压力循环
- * Temperature of circulating coolant 循环冷却液温度
- * Temperature of heat chamber 热室温度
- * Temperature of surface temperature 表面温度

3.3.7 Short endurance test 短期耐久实验

Short endurance test is a process verification test and is not needed for design verification. Test rig for this test are the same as in Endurance test 3.3.6. Tables below shows test data for different hoses. After test the hoses should be tested 3.3.4 burst pressure test.
短期耐久测试为过程验证测试，非设计验证测试。测试台架与耐久 3.3.6 实验一致。下表显示不同管路的测试条件。测试后，管路需进行 3.3.4 爆破压力实验。

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 34 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

Table 10. Outer diameter of hose > 35 mm (radiator hoses).

外径 > 35mm 的管路 (散热器胶管)

Pressure pulsation: 压力循环	Low pressure: 10 kPa High pressure: 200 kPa
Coolant temp (°C) 冷却液温度	110
Ambient temp (°C) 环境温度	110
Vibration 振动	N/A
Duration (h)持续时间	24

Table 11. Outer diameter of hose < 35 mm (heater hoses, degas bottle hose & EGR-hose...).

外径 < 35mm 的管路 (换热器胶管, 溢流管, EGR 管...)

Pressure pulsation:	Low pressure: 160 kPa High pressure: 400kPa
Coolant temp (°C)	110
Ambient temp (°C)	110
Vibration	N/A
duration (h)	24

Table 12 .Turbo cooling hoses.增压器管路

Pressure pulsation:	Low pressure: 10 kPa High pressure: 200 kPa
Coolant temp (°C)	110
Ambient temp (°C)	110
Vibration:	N/A.
duration (h)	24

After test the hoses should be tested in:测试之后, 胶管应进行以下实验:

3.3.4 Burst pressure 爆破压力实验

Acceptance criteria:认可标准

There should not be any visible damage of the hose. Both inner and outer layer.

胶管内外径无可见损坏

No leakage.

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 35 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

无泄漏
Burst pressure, 3 x pressure stated on drawing, after passing the short endurance test.
通过短期耐久实验后，爆破压力应为图纸规定的 3 倍

Test report: 测试报告:
Note failed or OK after endurance test.
在耐久实验后记录失败或 ok

If failed note with photo(s) failure.
如果失败，附图
Add photograph of hoses mounted in test rig.
添加管路装到台架上的照片
Note burst pressure for each individual hose after passing short endurance test.
通过短期耐久实验后，记录每个管路的爆破压力
Examine inner surface of hose.
检查管路内表面
Add chart from short endurance testing showing:
添加显示以下短期耐久实验参数的图表

- * Pressure cycles 压力循环
- * Temperature of circulating coolant 循环冷却液温度
- * Temperature of heat chamber 热室温度
- * Temperature of surface temperature 表面温度

3.3.8 Thermal aging test 热老化测试

Acc. to Q/JLY J7110483D-2017
参照标准 Q/JLY J7110483D-2017

3.3.9 Flame Retardancy/阻燃性能

The nonmetal part must be accord with the requirement about flame retardancy in Q/JLY J7110335B-2019
Target: ≤60mm/min
冷却管路的非金属零件的阻燃性需满足标准 Q/JLY J7110335B-2019 《汽车非金属材料阻燃性限值要求及试验方法》的规定
目标值: ≤60mm/min

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 36 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.3.10 Substance use restriction/禁用、限用物质

Acc. to Q/JLY J7110845B-2016 and Q/JLY J 7110808B-2016, The requirements acc. to Q/JL J160001-2017
禁用限用物质检测按 Q/JLY J7110845B-2016 和 Q/JLY J7110808B-2016 得规定执行，禁用、限用物质需满足 Q/JL J160001-2017 要求。

3.3.11 IP Validation/ 防护性能

Acc. To GB/T 4208-2017.
Requirement: IPX6/IPX7
参照 GB/T 4208-2017 外壳防护等级，同时满足 IPX6 和 IPX7 的要求

3.3.12 Environment, Recycling 环保回收

Recyclability 环保回收

Parts recycling shall meet the foolowing: 零部件回收需满足：

- a) Decree of the State Council 551 „Management Regulations for Waste Electrical and Electronic product Recycling and Processing “ 务院令 551 “废弃电器电子产品回收处理管理条例”。
- b) 2008/689/EC about the Attachment Order of Technical Instructions for Automobile Scrap .
2008/689/EC 关于汽车报废技术指令的附属指令。
- c) 2005/64/EC about the Instructions for Reusability and Recyclability of Motor Vehicles. 2005/64/EC
关于机动车可再利用性可再使用性和可回收性的指令。

Recycling requirements 回收再利用要求：

RQMT TITLE RQMT 标题	Items 条目	Unit 单位	Requirement 要求
ENV CV RECYCLABILITY ENV CV 可回收性	Recyclability rate 可再利用率	%	≥85
	Recoverability rate 可再利用率	%	≥95

3.3.13 Prohibited, Restricted substances 禁用、限用物质

1) Requirements 要求

Cooling module prohibited and restricted substances shall meet the Q/JL J160001-2017 requirements, with details as follows: 冷却管路禁用、限用物质需满足 Q/JL J160001-2017 的要求，具体要求如下：
List the detail prohibited and restricted substances, e.t 列出具体的禁限用物质要求，例如：

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 37 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

序号 No.	物质种类 Category		限值 Limit value
1.1 (1*)	铅 (Pb)		≤1000mg/kg (0.1%)
	汞 (Hg)		≤1000mg/kg (0.1%)
	镉 (Cd)		≤100mg/kg (0.01%)
	六价铬 Cr VI (Cr ⁶⁺)		金属涂/镀层<0.10 μg/cm ² (3*)
			非金属零部件及材料≤1000mg/kg (0.1%)
	多溴联苯 (PBBs)		≤1000mg/kg (0.1%)
	多溴二苯醚 (PBDEs)		≤1000mg/kg (0.1%)
1.2 (4*)	石棉纤维 (Asbestos)	阳起石 (77536-66-4)	禁用 Prohibited
		铁石棉 (12172-73-5)	
		直闪石 anthophyllite (77536-67-5)	
		温石棉 chrysotile (12001-29-5)	
		青石棉 Crocidolite in Ironstone (12001-28-4)	
		透闪石 tremolite (77536-68-6)	

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 38 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

3.4 VEHICLES TESTS 整车实验

GEELY design department together with testing departments will decide, based on application, new- or re-design, which vehicle tests that have to be performed prior to start of production. The tests in this chapter are more a sort of guide line what tests that could be done after vehicles tests. This will give us fact about conditions between rig tests and vehicle tests.

GEELY 设计部门和实验部门一起决定，基于应用，新或重新设计，整车实验必须在产品开始之前执行。本章的测试主要为简短的需要整车实验后的需进行的实验的指导。此将展示在整车和台架实验之间的实际测试条件

3.4.1 Burst pressure after vehicle test 整车时候后的爆破压力实验

After completed vehicle test from 100% VPT on Hällered and other long mileage tests, hoses should be investigated regarding burst test.

在 100%VPT（在 Hällered ）和其他的长英里整车试验后，胶管应被调查分析其爆破压力实验

3.4.2 Abrasion 磨损

After completed VPT on Hällered vehicle test the hose is analysed regarding abrasion. Any abrasions that may arise should be documented with photographs.

在 VPT 整车实验完成之后，胶管应被分析其磨损情况。任何磨损的出现应附图添加在文档中。

Acceptance criteria:认可标准

Max abrasion in hose: 0,5mm.

管路最大磨损：0.5mm

3.4.3 Crash test 冲击实验

The hose shall fulfil low speed crash without failure.

胶管应进行低速冲击实验，而不会损坏

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	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 39 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

4. component & material sub-supplier list 零部件及材料分供方清单

零部件及材料分供方清单 component & material sub-supplier list												供应商负责人 Supplier			电话 Tel		日期 date					
												吉利产品设计工程师 Geely PD			汪利彬		电话 Tel		日期 date			
												吉利材料工程师 Geely material engnieer					电话 Tel		日期 date			
												吉利 SQE Geely SQE					电话 Tel		日期 date			
总成零件号 Part No.	总成零件名称 Part Name	分零件名称 Sub-Part Name	零件重量(g) Weight(g)	零件用量(个) Quantity	可视图 Picture	材料信息 Material Information						制造信息 Manufacture Information										CAMDS 申报完成日期 CAMDS reporting date/EA、MAD 认可信息
						材料类型 material type	材料标识/牌号 material brand	配方号/规格 material specification/for mula	材料执行标准+强度等级/类型 material standard/grade/type	材料供应商名称和生产地点 material supplier name & location	材料认可方式 material accept type	制造工艺 manufacture process	制造供应商名称和生产地点 manufacture supplier name & location	表面处理处理方式 Surface treatment	颜色/纹理代码 color/appearance	是否通过供应商气味管控能力评审 odor capability audit	表面处理线体供应商名称/线体号/生产地点 surface treatment supplier name & location	表面处理线体供应商认可编号 Surface treatment authorized No.	热处理方式 Heat treatment	热处理供应商名称和生产地点 heat treatment supplier name & location		

填表说明: Formfilling explanation:
1.所有零件需提供拆解至最小零件的《零部件及材料分供方清单》，不需要填的信息统一填“/”。 All parts and dismantling is required to provide to the smallest parts of the component & material sub-supplier list , do not need to fill in the information unified fill in “/” .
2.零件重量：填写各总成零件、分零件的重量，总成件的重量应为各分零件重量之和。Part weight: The weight of each assembly part and sub-assembly part. The weight of each assembly part must be equal to the sum of the sub-assembly parts.
3.零件用量：各总成零件在整车中的应用数量或各分零件在总成零件中的应用数量。Part quantity: The quantity of the assembly part which used in the vehicle , or the quantity of the sub- assembly part which used in the assembly part.
4.可视图：各总成零件或分零件的图片。The Visibility Graph: It needs to be affixed except for patent parts.
5.材料类型：合金钢棒、冷轧钢管、热轧钢棒、热轧钢板、冷轧钢板、球铁、铸铝、变形铝合金、铜合金、锌合金、镁合金、不锈钢、弹簧钢、热塑性塑料、热固性塑料、热塑性弹性体、橡胶、织物、无纺布、仿皮、真皮、涂料、玻璃、陶瓷、GMT、LWRT、SMC、PHC、溶剂胶、热熔胶、水性胶、A 焊缝密封胶、车底抗石击涂料、增强贴片、折边胶、结构胶、点焊胶、减震胶、玻璃胶、丁基胶条、螺纹锁固胶、脱模剂、防锈剂、防水剂、清洗剂、油漆、粉末、镀锌添加剂、镀锌镍添加剂、镀铜添加剂、镀镍添加剂、镀铬添加剂、镀锡锌添加剂、钝化剂、封闭剂、锌铝涂覆材料、磷化液、阳极氧化添加剂、其他。The type of material: Alloy steel rods、Cold rolled steel、Hot rolled steel bar、hot rolled sheet、cold rolled sheet、ductile iron、cast aluminium、Deformed aluminium alloy、 copper alloy、zinc alloy、magnesium alloy、 stainless steel、spring steels、thermoplastic plastics、thermosetting plastic、TPE、rubber、fabric、non-woven fabrics、PVC、dermis、painting、glasses、ceramic、GMT、LWRT、SMC、PHC、glue、Hot melt glue、water-base cement、Weld sealant、Base rock resistant paint、Strengthen patch、Folding plastic、structural adhesive、Spot welding adhesive、Damping glue、glass cement、Butyl strip、Thread locking adhesive、release agent、antirust agent、water-proofing agent、cleaning agent、powder、zinc-plating additive、Copper plating additive、Nickel plating additive、hromium plating additive、Tin zinc plating additive、passivator、sealants、Zinc - aluminum coating material、phosphating solution、Anodizing additive、and so on.
6.材料标识/牌号：金属材料是指金属的牌号如 DC01,20#;如果该材料为供应商自有或特有材料则可填写供应商自有材料的牌号；非金属材料按照对应标准材料标识填写，例如 PP、ABS、EPDM、NR 等。Material identification/grades: Metal materials refers to the brand such as DC01 、 20 steel; If the material for the supplier or special material can fill in the supplier has its own brand; Non-metallic materials in accordance with the corresponding standard fill in material identification, such as PP, ABS, EPDM, NR, etc.
7.配方号/规格：金属材料是指金属的牌号和厚度、直径，管径（外径*壁厚）等如板材 0.8mm,管材 φ32mm*2mm，棒材或线材 φ10mm 等；紧固件填写螺纹规格，如螺栓 M8*1.25，螺母 M10*1.5，自攻螺钉 ST4.2 等；非金属材料填写供应商自有材料的配方号/牌号，如 PC-AL2447，PMMA-VH001，NR517A1CFG 等；胶黏剂、油漆、表面处理添加剂填写对应的配方号。Formula/specifications: Metal material refers to the brand and metal thickness, diameter, diameter * wall thickness, such as 0.8 mm, φ32mm*2mm, φ10mm, etc; Fasteners, fill out the thread specifications, such as bolt M8 * 1.25, nut M10 * 1.5, Self tapping screw ST4.2, etc.; Nonmetallic material fill in the supplier has its own recipe/brands, suxh as PC-AL2447, PMMA-VH001, NR517A1CFG,etc.; Adhesive, paint, surface treatment additives to fill in the corresponding formula.
8.材料执行标准及强度等级和类型：金属材料填写该材料牌号的执行标准和供货状态或强度级别，如 20#/φ32mm*2mm 的执行标准填写方法为 GB/T3639-2009 +C；紧固件填写原材料化学成分的执行标准+紧固件性能执行标准，例如材料为 35CrMo 的螺栓，其填写方法为 GB/T3077-2015(材料)、GB/T3098.1-2010（紧固件标准）,10.9 级（螺栓强度级别）；非金属材料填写材料执行标准和材料类别。例如：ABS A 类材料的填写方法为 Q/JL J124011-2015（A 类）；油漆标准可填写对应的内饰件/外饰件油漆标准。Material standard/grade/type:For Metal: it can be the material standard and supplied state or material standard and strength level. For example: 20#/φ32mm*2mm, material standard GB/T3639-2009, supplied state +C, 35CrMo/M8*1.25 material standard GB/T3077-2015, fastener standard GB/T3098.1-2010, 10.9 strength level; For Non-metal: it is the metarial standard. For exampale: thermal plastic PP+EPDM-TD20, material standard Q/JL J124011-2015.
9.材料认可方式：需要开展试验验证的材料，认可方式为“试验认可”，填写“TA”；吉利材料认可数据库中的材料，认可方式为“库内认可”，填写“MAD”；满足精益验证视同原则的材料，认可方式为“视同认可”，填写“EA”；满足精益验证原则不需要做试验的材料，认可方式为“豁免认可”，填写“N/A”。Material approval ways : Materials which need to do the material test , the approval way is "test approval", fill in "TA"; Materials which in the MAD(Materials Approval Database) , the approval way is MAD approval, fill in "MAD"; Materials which meet the lean verification of Equivalent approval , the approval way is Equivalent approval, fill in "EA"; Materials which meet the lean validation principles don't need to do the material test, the approval way is "No test approval", fill in "NA"
9、制造工艺：组装、冲压、碾压、铸造、锻造、机加、模压、注塑、低压注塑、双色注塑、水辅成型、挤出成型、吹塑、其他。Manufacturing process: Assemble, Pressing, rolling, casting, forging, machining, mold, injection molding, Low pressure injection molding, double-short molding, water assisted molding,extrusion molding, blow molding, and so on.
10、表面处理或热处理方式：表面处理方式包括阳极氧化、喷涂、滚涂、钝化、磷化、发黑、电镀、挂镀、滚镀、PVD、电泳、高光、皮纹腐蚀、激光雕刻皮纹、IMD/INS/TOM、水转印等；热处理方式包括渗碳淬火、碳氮共渗、高频淬火、淬火+回火、正火、退火、其他。Surface treatment and heat treatment: Surface treatment including anodic oxidation, spraying, roller coating, passivation, phosphating, black, electroplating, plating, barrel plating, PVD, electrophoresis, highlight, skin grain corrosion, laser engraving, IMD/INS/TOM, water transfer printing, etc; Heat treatment including carburizing and quenching, carbonitriding, high frequency quenching, quenching + tempering, normalizing, annealing and other.

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
	Document No 文档编号	Issue 发布	Volume No 卷号 错误!未知的文档属性名称	Page No 页码 40 (47)
Document Name 文档名称 RUBBER HOSES 冷却胶管				

5. Property requirements of materials and parts 材料及零部件性能要求

Design/Production Verification Plan 设计/产品验证计划和报告 D/PVP																									
项目名称： Project			买方设计工程师： Buyer Design Engineer	汪利彬	邮箱及电话： Email and Tel		卖方名称： Supplier Name																		
零件名称： Part Name			买方试验工程师： Buyer Validation		邮箱及电话： Email and Tel		卖方代码： Supplier Code																		
零件号 Part Number:			买方材料工程师： Buyer Material Engineer		邮箱及电话： Email and Tel		卖方试验室负责人： Supplier Lab. Leader																		
			买方质量工程师： Buyer SQE		邮箱及电话： Email and Tel		卖方联系人/邮箱/电话： Supplier contact																		
Property requirements of materials 材料性能验证							报告计划提交时间 Report Plan Submit Timing			项目 FDJ 节点 Project FDJ Timing															
序号 No.	试验项目 Test Name	试验标准号及名称 Test Spec.	目标要求（评定依据） Test Criteria	试验类型 Test Type	样品数量 Quantity	试验地点 Test Site （须得到买方认可）	计划开始时间 Plan Start Timing	计划结束时间 Plan Comp.Timing	试验周期 Test Duration	样件状态 Sample Status	认可型式 Approval Mode	认可说明 Remarks	备注 Notes												
Property requirements of parts DV/ECV 性能验证							报告计划提交时间 Report Plan Submit Timing			项目 LR/TTO 节点 Project LR/TTO Timing															
序号 No.	试验项目 Test Name	试验标准号及名称 Test Spec.	目标要求（评定依据） Test Criteria	试验类型 Test Type	样品数量 Quantity	试验地点 Test Site （须得到买方认可）	计划开始时间 Plan Start Timing	计划结束时间 Plan Comp.Timing	试验周期 Test Duration	样件状态 Sample Status	认可型式 Approval Mode	认可说明 Remarks	试验完成是否需要 拆解 Tearing down needed once test finished												
DV 试验阶段																									
试验矩阵 1	外观	Q/JLY J7110186D-2018《乘用车散热器水管技术条件》中 3.6.1 执行，应符合 HG/T 2185 的规定	在自然光下目视检查，应符合 HG/T 2185 的规定	DV	3	表 2·长度公差																			
	尺寸及偏差	Q/JLY J7110186C-2018 《乘用车散热器水管技术条件》 中 3.2.2 执行；	1) 水管内径≤25mm ，内径极限偏差 -0.5 ~ -1 mm ，壁厚及偏差 3.5±0.3 mm ； 2) 水管长度的极限偏差按表 2 规定：	DV	3	<table><tr><td>名称</td><td colspan="3">尺寸范围</td></tr><tr><td>长度L, mm</td><td>L≤400</td><td>400<L≤1000</td><td>L>1000</td></tr><tr><td>公差, mm</td><td>±5</td><td>±8</td><td>±15</td></tr></table>			名称	尺寸范围			长度L, mm	L≤400	400<L≤1000	L>1000	公差, mm	±5	±8	±15					
	名称	尺寸范围																							
长度L, mm	L≤400	400<L≤1000	L>1000																						
公差, mm	±5	±8	±15																						
内壁清洁度	Q/JLY J7110186C-2018 《乘用车散热器水管技术条件》 中 3.3 执行；准备 8 μm 的滤膜并烘干至恒重，滤膜重量计为 T1。用不少于 5 倍管路总成内部容积的无水乙醇反复冲洗管总成内部 3 次以上，然后使用滤膜过滤杂质，将滤膜连同杂质一起烘干至恒重，称重计为 T2，（T2-T1）即为杂质总量。用千分尺或其他工具对最大颗粒的最大直径进行测量。	水管总成内壁杂质总量≤300mg/m2 ，最大颗粒直径不大于 500 μm	DV	3																					
试验矩阵 2	拔脱力需求（橡胶管路）	Q/JLY J7110186C-2018 《乘用车散热器水管技术条件》 中 3.5 执行；按照实车的装配方式，在室温环境下进行拔脱试验，抽出速度为（100±10）mm/min	快插接头之间≥400N，快插接头与胶管连接处≥187N，胶管与对接件带环箍≥200N	DV	3																				

序 号	特 性	单 位	要 求		试 验 方 法
			纯 橡 胶 管	带增强层橡胶软管	
1	爆破压力	MPa	大于等于图纸中规定工作压力的 4 倍		4.5.1
			>	>1.2	
			—	>0.9	
	图纸中有工作压力需求的				
	无压力需求				
	直径<20mm				
	20mm<直径<40mm				

	爆破试验 (尼龙管)	测试用完整的塑料冷却管进行。测试是用预处理部件进行的。 爆破试验前对未老化部件的预处理是根据下面的方法进行的: 环境温度 90±3° C 循环冷却液温度 90±3° C 冷却液混合物: PMA 冷却液 压力 100±5kPa 时间 96h 预处理的管路在爆破试验前现在室温环境下放置 2± 1 小时, 试验使用完整的塑料冷却管路 介质: PMA 冷却液 介质温度 RT 室温 压力增长速度 30 - 50 bar/min 环境温度 RT 室温	本矩阵试验完成后, 尼龙管爆破压力要求≥ 660Kpa	ECV	3								
试验矩阵 35	禁用、限用物质	按照 Q/JLY J7110845B-2016 规定	Q/JL J160003-2018	ECV	3								
试验矩阵 36	盐雾试验 (金属管) Salt mist test	取样: 选择金属管路的测试样本 测试: 参照 Q/JL J130006-2017 对样本进行 6 周试验	依据 Q/JLY J7111351A-2019 评价, 2 周无白锈, 6 周无红锈 连接处铝合金无点蚀及明显白锈 Test after 6 weeks, evaluation acc. to Q/JLY J7111351A-2019 No white-rusting for 2 weeks No red-rusting for 6 weeks,and no white-rusting at the connection place of AL plate	ECV	3								
Production Validation PV 性能验证								报告计划提交时间 Report Plan Submit Timing			项目 PP 节点 Project PP Timing		
序号 No.	试验项目 Test Name	试验标准号及名称 Test Spec.	目标要求 (评定依据) Test Criteria	试验类型 Test Type	样品数量 Quantity	试验地点 Test Site (须得到买方认可)	计划开始时间 Plan Start Timing	计划结束时间 Plan Comp.Timing	试验周期 Test Duration	样件状态 Sample Status	认可型式 Approval Mode	认可说明 Remarks	试验完成是否需要拆解 Tearing down needed once test finished
1.2	内壁清洁度	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.3 要求	内壁杂质总量≤ 300mg/m², 最大颗粒直径不大于 500 μ m		3								
2.2	拔脱力需求试验	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.5 执行	快插接头之间≥ 400N, 快插接头与胶管连接处≥187N, 胶管与对接件带环箍连接≥200N		3								
3.2	胶管爆破压力试验	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.1 执行	图纸中有工作压力需求的大于等于图纸中规定工作压力的 4 倍 MPa 无压力需求的, 直径 ≤20, 纯橡胶软管≥ 0.2MPa, 带增强层橡胶软管≥1.2MPa 无压力需求的, 20mm <直径≤40mm, 带增强层橡胶软管≥ 0.9MPa 无压力需求的, 直径		5								

			>40mm，带增强层橡胶软管≥0.5MPa										
4.2	胶管粘合强度试验	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.2 执行	选用宽度为（25±0.5）mm 条状物，速度（100±10）mm/min≥2kN/m		3								
5.2	胶管耐真空试验	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.3 执行	不得小于 3 倍壁厚		3								
6.2	胶管耐温压缩变形试验	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.4 执行	耐低温-30℃/24h<90% 耐高温 130° C/72h<55% 耐高温 115° C/1500h<75%		3								
7.2	胶管耐膨胀性试验	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.5 执行	最大膨胀量<12%		3								
8.2	胶管机械疲劳强度试验	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.6 执行	700h 胶管内外层不得有明显的损伤，不得有泄漏 疲劳试验后进行粘合强度≥1.25kN/m 疲劳试验后进行耐膨胀性<12% 疲劳试验后进行爆破压力大于 75%原试验值或大于图纸中规定的 3 倍 MPa		3								
9.2	胶管低温曲挠试验	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.8 执行	不能有可见损伤		3								
10.2	胶管耐润滑油试验	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.9 执行 GB/T 18948-2009 《内燃机冷却系统用橡胶软管和纯胶管规范》中附录 B 执行	≥1.25kN/m		3								
11.2	胶管耐电化学降解试验	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.10 执行 SAE J1684-2005 《Test Method for Evaluating the Electrochemical Resistance of Coolant System Hoses and Materials》中方法 1 执行	无龟裂、无“条痕”		3								
12.2	胶管抗夹紧性能	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.11 执行	软管不能有任何损坏 硬管直径变化不超过 2%		3								
13.2	胶管密封性	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.12 执行	不得有泄漏		3								
14.2	胶管低温冲击	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.13 执行	不允许有裂纹		3								
15.2	胶管静态压力	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.14 执行	无泄漏		3								
16.2	胶管压力冲击	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.15 执行	试验后，密封性测试，在 680kPa 无泄漏		3								
17.2	胶管压力振动温度性能	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.6.16 执行	无泄漏		3								
19.2	阻燃性能	Q/JLY J7110186D-2018 《乘用车散热器水管技术条件》中 4.4 执行	燃烧速率≤60mm/min		5								

	Document Type 文档类型 错误!未知的文档属性名称	Document Release Status 文档发布状态		
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Document Name 文档名称 RUBBER HOSES 冷却胶管				

		Q/JLY J7110335B-2019 《汽车非金属材料阻燃性限值要求及试验方法》中 5.1 执行											
20.2	EPDM 材料性能要求	Q/JL J125010-2010 《汽车用三元乙丙橡胶（EPDM）材料》中 5 要求	Q/JL J125010-2010 《汽车用三元乙丙橡胶（EPDM）材料》中 4 要求		1								
21.2	PA66+GF30 材料性能要求	Q/JL J124010-2016① 《聚酰胺（PA）材料技术要求》中 4 要求（其中耐水解项按照备注执行）	Q/JL J124010-2016① 《聚酰胺（PA）材料技术要求》中 3.3 表 2 要求		1								
22.2	卡箍、压环中性盐雾试验	Q/JLY J7110606B-2014 《汽车零部件覆盖层盐雾试验规范》，试验前存放条件（120℃×24h）	中性盐雾试验 480h 后，无红锈，涂层无起包、脱落、开裂等现象		3								
23.2	三通支架防腐性能	Q/JLY J7110606B-2014 《汽车零部件覆盖层盐雾试验规范》，试验前存放条件（120℃×24h）	中性盐雾试验 480h 后，无红锈，涂层无起包、脱落、开裂等现象		3								

只能在这一行之上添加任务。

填表说明：Formfilling explanation：
材料/DV/ECV/PV 性能验证填表说明：material/DV/ECV/PV performance verification form filling explanation：

1. 报告计划提交时间：Report Plan Submit Timing：xxxx/xx/xx
2. 项目 FDJ/ LR/TT0 /PP 节点：Project FDJ/ LR/TT0/ PP Timing：xxxx/xx/xx
3. 序号:No.:DV 试验阶段：x.1；ECV 试验阶段：x.2 ,其他 1.2.3... DV testing stage:x.1；ECV testing stage: x.2, others 1.2.3...
4. 试验项目:Test Name:试验项名，例如高温存储试验 Test Name, such as high temperature storage test
5. 试验标准号及名称：Test Spec.: 填写具体的标准号、方法条款及方法内容等 Fill in the specific standard number, method clause and method content, etc
6. 目标要求（评定依据）：Test Criteria: 填写具体的标准号、要求条款及要求内容等 Fill in specific standard number, requirements clause and requirements content, etc
7. 试验类型：Test Type: 选填 DV、DV-M、ECV、ECV-VP、PV Fill in DV、DV-M、ECV、ECV-VP、PV
8. 样品数量：Quantity: 填写具体所需的样本数，阿拉伯数字 Fill in the required number of samples, Arabic numerals
9. 试验地点：Test Site（须得到买方认可）:DV/ECV 阶段填写试验实际执行的地点,PV 阶段供应商被认可的项目填供应商名称，未被认可的项目填吉利 Fill in the actual location of the test for DV/ECV; Fill in supplier name for approved items and geely for unapproved items for PV
10. 计划开始时间：Plan Start Timing：xxxx/xx/xx
11. 计划结束时间:Plan Comp. Timing:xxxx/xx/xx
12. 试验周期:Test Duration:以天为单位，阿拉伯数字 In days, Arabic numerals
13. 认可型式：Approval Mode: 选填试验认可、视同认可、豁免认可、库内认可，试验认可代表需开展试验；视同认可代表不做试验，通过视同认可；豁免认可代表不做试验，试验项不适用；在吉利认可数据库中的，认可方式为“库内认可” Fill in test approval, equivalent approval, exemption approval. Test approval representative shall conduct the test, equivalent and exemption approval representatives do not conduct tests;.
14. 认可说明：Remarks: 须对视同认可及豁免认可进行说明，保证认可型式可溯源，例如视同某项目某件某试验报告，报告编号 xxx Equivalent and exemption approval should be explained .The approved type shall be traceable. For example, the approved type shall be regarded as a test report of a certain project, a certain item, and the report number is XXX.
15. 试验完成是否要拆解：Tearing down needed once test finished: 选填是、否 Fill in Y or N