Railway Hose Brochure

# High-performance railway hose meets R22/R23 test requirements for hazard levels 3 and 3

EATON

Powering Business Worldwide

The challenge facing the rail industry is to make rail travel as reliable, efficient, safe and comfortable as possible. Power is fundamental to keeping rail networks moving--whether managing power in a centralized depot, in the rolling stock or in helping ensure sufficient power reaches remote stations.

Driven by regulations and increased globalization, train builders and railway operators must find ways to reduce downtime, increase productivity and enhance safety and security to drive profitability and make the industry more sustainable.

Eaton understands the need for power solutions that work. Powering the rail industry means helping our customers build better and safer trains, while enabling railway operators to operate competitively with products designed for maximum reliability. Our focus on energy efficiency and safety means our customers can rest assured that they'll be able to meet stringent regulations and drive the industry towards a sustainable future. With technical expertise and project management capabilities, plus a broad portfolio of electrical and hydraulic solutions, Eaton can help you minimize risk and secure your rail projects.

# Upgrade to a railway hose that meets inside and outside requirements

EN 45545-2 is the single standard for hose assembly fire behavior (toxicity, smoke density and oxygen-depletion), now adopted by all EU nations. Over the next few years EN45545-2 will replace the country-by-country standards formerly in place.

The Eaton Railway Hose series of hoses conforms to the EN45545-2 standard and is now available for use on a variety of railway uses. In fact, the Railway series of hoses also meet up to R22/HL3 and R23/HL3 requirements for our 1SN, 2SN. The Railway series of hoses are available with R22/HL2 and R23/HL3 in 1SC, 2SC and 2TE models. Market availability for the following railway hoses will follow shortly: the 3TE 2SC with -20/-24/-32 as options.

Further hose types are tested to cover additional applications with R22/HL1 and R23/HL2.

## Eaton is offering leading products that guarantee the highest levels of safety and performance for all areas within the conveyance systems used.

### Tested conformance to EN45545-2

The advent of a single standard for hose assembly fire behavior (EN 45545-2) has been adopted by and is replacing country by country standards. Eaton supplies hoses that conform to every part of the standard. But Eaton hoses actually elevate the product offering to HL3 compatible parts

**Table 1**
**EN45545-2 conformance tests by country**

| Country | Standard | Test Item |
|---|---|---|
| **France** | **French standard NF F 16-101**<br>Tests fire behavior, fire effluents and toxicity of the hose | Smallest, medium and largest width of a specific hose type:<br>• Flame resistance class I3<br>• Smoke generation and toxicity class F3 |
| **Germany** | **German standard DIN 5510 part 2 (05/2009)**<br>Tests fire behavior, fire effluents and toxicity of the hose | Smallest and largest nominal width of a specific hose type:<br>• Flammability class S3 • Droplet class ST2<br>• Smoke generation class SR2 • Toxicity FED (t zul.) < 1 |
| **Great Britain** | **British standard BS 6853**<br>Tests fire behavior and fire effluents of the hose cover material | Rubber hose cover material<br>Smoke behavior<br>Release of toxins meets the limit value: category Ib, II |
| **Italy** | **Italian standard UNI CEI 11170-3**<br>Tests fire behavior and fire effluents of hose material | The smallest and largest nominal width of a specific hose type:<br>• Smoke generation • Fire resistance<br>• Toxicity • Overall class: LR4 |

### Meets and exceeds hazard requirements

Most manufacturers have yet to meet the stringent requirement sets for R22 and R23. Eaton Railway hoses are certified to conform to the EN45545-2 standards.

| Requirement set used for | Test Method & Reference | Testing for (unit) | Minimum / Maximum | Thresholds HL1 | HL2 | HL3 | Eaton Railway Hoses |
|---|---|---|---|---|---|---|---|
| **Inside uses R22** (IN16; EL2; EL6A; EL7A; M2) | T01<br>EN ISO 4589-2: OI | Oxygen Content (%) | Minimum | 28 | 28 | **32** | Meets and/or exceeds HL3 minimum threshold |
| | T10.03<br>EN ISO 5659-3<br>25kWm$^{-2}$ | Smoke Density ($D_S$ max. dimensionless) | Maximum | 600 | 300 | **150** | Meets and/or exceeds HL3 maximum threshold |
| | T12<br>NF X70-100-1 and -2, 600° C | Smoke Toxicity ($CIT_{NLP}$ dimensionless) | Maximum | 1.2 | 0.9 | **0.75** | Meets and/or exceeds HL3 maximum threshold |
| **Outside uses R23** (EX12; EL2; EL5 EL6B; EL7B; M3) | T01<br>EN ISO 4589-2: OI | Oxygen Content (%) | Minimum | 28 | 28 | **32** | Meets and/or exceeds HL3 minimum threshold |
| | T10.03<br>EN ISO 5659-3<br>25kWm$^{-2}$ | Smoke Density ($D_S$ max. dimensionless) | Maximum | - | 600 | **300** | Meets and/or exceeds HL3 maximum threshold |
| | T12<br>NF X70-100-1 and -2, 600° C | Smoke Toxicity ($CIT_{NLP}$ dimensionless) | Maximum | - | 1.8 | **1.5** | Meets and/or exceeds HL3 maximum threshold |

| Hose type | Hose spec | R22 (internal) | R23 (external) | Size | Comment |
|---|---|---|---|---|---|
| EC112 (1SC) | EN857 | HL2 | HL3 | -4 up to -16 | ISO 15540 |
| EC212 (2SC) | EN857 | HL2 | HL3 | -4 up to -32 | ISO 15540 |
| EC109 (1SN) | EN853 | HL3 | HL3 | -4 up to -16 | |
| EC209 (2SN) | EN853 | HL3 | HL3 | -4 up to -16 | |
| EC045 (2TE) | EN854 | HL2 | HL3 | -3 up to -16 | |
| EC045 (2TE) | EN854 | HL3 | HL3 | -5 and -10 | |
| 2755 | 4SP | HL1 | HL2 | -6 up to -16 | |
| GH506 | 4SH | HL1 | HL2 | -12 up to -32 | |
| GH466 | 6SP/SAE100R15 | HL1 | HL2 | -20 up to -32 | |
| EC850 | 500BAR | HL1 | HL2 | -10 up to -20 | |
| EC525 AQP | 4SP AQP | HL1 | HL2 | -12 up to -32 | |
| FC800+624 | Air conditioning | HL2 | HL3 | -12 up to -24 | Fire sleeve 624 required to achieve HL |
| 2781 (2ST) | EN853 | HL1 | HL2 | -4 up to -32 | |
| FC350-624 | AQP - Fuel | HL2 | HL3 | -4 up to -24 | Fire sleeve 624 required to achieve HL |
| FC510 | SAE100R2 AQP | HL1 | HL2 | -10 up to -20 | no HL for smaller sizes |

# EN45545-2 conforming railway hose

### 1 wire braid, synthetic rubber cover (EN853 type 1SN / EN45545-2)

| Part Number | DN | Hose I.D. | | W.B.O.D. max. | | O.D. max. | | Max. OP | Proof | Burst | Bend Radius | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in | bar | bar | bar | mm | kg/m |
| EC109-04 | 6 | 6,4 | 0.25 | 11,6 | 0.46 | 14,1 | 0.55 | 225 | 450 | 900 | 100 | 0,22 |
| EC109-05 | 8 | 7,9 | 0.31 | 13,1 | 0.52 | 15,7 | 0.62 | 215 | 430 | 860 | 115 | 0,26 |
| EC109-06 | 10 | 9,5 | 0.38 | 15,5 | 0.61 | 18,1 | 0.71 | 180 | 360 | 720 | 130 | 0,33 |
| EC109-08 | 12 | 12,7 | 0.50 | 18,6 | 0.73 | 21,4 | 0.84 | 160 | 320 | 640 | 180 | 0,41 |
| EC109-10 | 16 | 15,9 | 0.63 | 21,7 | 0.85 | 24,5 | 0.96 | 130 | 260 | 520 | 200 | 0,47 |
| EC109-12 | 19 | 19,0 | 0.75 | 25,7 | 1.00 | 28,5 | 1.12 | 105 | 210 | 420 | 240 | 0,59 |
| EC109-16 | 25 | 25,4 | 1.00 | 33,6 | 1.32 | 36,6 | 1.44 | 88 | 176 | 352 | 300 | 0,87 |

### 2 wire braid, synthetic rubber cover (EN853 type 2SN / EN45545-2)

| Part Number | DN | Hose I.D. | | W.B.O.D. max. | | O.D. max. | | Max. OP | Proof | Burst | Bend Radius | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in | bar | bar | bar | mm | kg/m |
| EC209-04 | 6 | 6,4 | 0.25 | 13,3 | 0.52 | 15,7 | 0.62 | 400 | 800 | 1600 | 100 | 0,38 |
| EC209-05 | 8 | 7,9 | 0.31 | 14,8 | 0.58 | 17,3 | 0.68 | 350 | 700 | 1400 | 115 | 0,43 |
| EC209-06 | 10 | 9,5 | 0.38 | 17,2 | 0.68 | 19,7 | 0.78 | 330 | 660 | 1320 | 130 | 0,54 |
| EC209-08 | 12 | 12,7 | 0.50 | 20,3 | 0.80 | 23,0 | 0.91 | 275 | 550 | 1100 | 180 | 0,64 |
| EC209-10 | 16 | 15,9 | 0.63 | 23,4 | 0.92 | 26,2 | 1.03 | 250 | 500 | 1000 | 200 | 0,75 |
| EC209-12 | 19 | 19,0 | 0.75 | 27,4 | 1.08 | 30,1 | 1.19 | 215 | 430 | 860 | 240 | 0,93 |
| EC209-16 | 25 | 25,4 | 1.00 | 35,2 | 1.39 | 38,9 | 1.53 | 165 | 330 | 660 | 300 | 1,29 |

### High-performance railway hose meets R22/R23 test requirements for hazard levels 2 and 3

| Requirement set used for | Test Method & Reference | Testing for (unit) | Minimum / Maximum | Thresholds HL1 | HL2 | HL3 | Eaton Railway Hoses |
|---|---|---|---|---|---|---|---|
| **Inside uses R22** (IN16; EL2; EL6A; EL7A; M2) | T01 EN ISO 4589-2: OI | Oxygen Content (%) | Minimum | 28 | **28** | 32 | Meets and/or exceeds HL2 minimum threshold |
| | T10.03 EN ISO 5659-3 25kWm$^{-2}$ | Smoke Density ($D_S$ max. dimensionless) | Maximum | 600 | **300** | 150 | Meets and/or exceeds HL2 maximum threshold |
| | T12 NF X70-100-1 and -2, 600° C | Smoke Toxicity ($CIT_{NLP}$ dimensionless) | Maximum | 1.2 | **0.9** | 0.75 | Meets and/or exceeds HL2 maximum threshold |
| **Outside uses R23** (EX12; EL2; EL5 EL6B; EL7B; M3) | T01 EN ISO 4589-2: OI | Oxygen Content (%) | Minimum | 28 | 28 | **32** | Meets and/or exceeds HL3 minimum threshold |
| | T10.03 EN ISO 5659-3 25kWm$^{-2}$ | Smoke Density ($D_S$ max. dimensionless) | Maximum | - | 600 | **300** | Meets and/or exceeds HL3 maximum threshold |
| | T12 NF X70-100-1 and -2, 600° C | Smoke Toxicity ($CIT_{NLP}$ dimensionless) | Maximum | - | 1.8 | **1.5** | Meets and/or exceeds HL3 maximum threshold |

# EN45545-2 conforming railway hose

### 1 wire braid, synthetic rubber cover (EN857 type 1SC / EN45545-2)

| Part Number | DN | Hose I.D. | | W.B.O.D. max. | | O.D. max. | | Max. OP | Proof | Burst | Bend Radius | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in | bar | bar | bar | mm | kg/m |
| EC112-4 | 6 | 6,4 | 0.25 | 10,8 | 0.43 | 13,5 | 0.53 | 225 | 450 | 900 | 50 | 0,18 |
| EC112-5 | 8 | 7,9 | 0.31 | 12,1 | 0.48 | 14,5 | 0.57 | 215 | 430 | 860 | 55 | 0,21 |
| EC112-6 | 10 | 9,5 | 0.38 | 14,5 | 0.57 | 16,9 | 0.67 | 180 | 360 | 720 | 65 | 0,26 |
| EC112-8 | 12 | 12,7 | 0.50 | 18,1 | 0.71 | 20,4 | 0.80 | 160 | 320 | 640 | 90 | 0,35 |
| EC112-10 | 16 | 15,9 | 0.63 | 21,0 | 0.83 | 23,0 | 0.91 | 130 | 260 | 520 | 100 | 0,43 |
| EC112-12 | 19 | 19,0 | 0.75 | 24,4 | 0.96 | 26,7 | 1.05 | 105 | 210 | 420 | 120 | 0,50 |
| EC112-16 | 25 | 25,4 | 1.00 | 31,9 | 1.26 | 34,9 | 1.37 | 88 | 176 | 352 | 150 | 0,74 |

* Exceeds EN857 bend radius requirement, allowing increased flexibility with smaller bends and easier installation.

### 2 wire braid, synthetic rubber cover (EN857 type 2SC / EN45545-2)

| Part Number | DN | Hose I.D. | | W.B.O.D. max. | | O.D. max. | | Max. OP | Proof | Burst | Bend Radius | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in | bar | bar | bar | mm | kg/m |
| EC212-4 | 6 | 6,4 | 0.25 | 11,7 | 0.46 | 14,2 | 0.56 | 400 | 800 | 1600 | 50 | 0,29 |
| EC212-5 | 8 | 7,9 | 0.31 | 13,3 | 0.52 | 16,0 | 0.63 | 350 | 700 | 1400 | 55 | 0,33 |
| EC212-6 | 10 | 9,5 | 0.38 | 15,6 | 0.61 | 18,3 | 0.72 | 330 | 660 | 1320 | 65 | 0,41 |
| EC212-8 | 12 | 12,7 | 0.50 | 19,1 | 0.75 | 21,5 | 0.85 | 275 | 550 | 1100 | 90 | 0,58 |
| EC212-10 | 16 | 15,9 | 0.63 | 22,3 | 0.88 | 24,7 | 0.97 | 250 | 500 | 1000 | 100 | 0,69 |
| EC212-12 | 19 | 19,0 | 0.75 | 26,4 | 1.04 | 28,6 | 1.13 | 215 | 430 | 860 | 120 | 0,81 |
| EC212-16 | 25 | 25,4 | 1.00 | 34,3 | 1.35 | 36,6 | 1.44 | 165 | 330 | 660 | 150 | 1,17 |
| EC212-20 | 31 | 31,8 | 1.25 | 41,6 | 1.64 | 44,4 | 1.75 | 125 | 250 | 500 | 210 | 1,53 |
| EC212-24 | 38 | 38,1 | 1.50 | 48,5 | 1.90 | 51,5 | 2.03 | 100 | 200 | 400 | 250 | 1,89 |
| EC212-32 | 51 | 50,8 | 2.00 | 61,2 | 2.41 | 64,2 | 2.53 | 90 | 180 | 360 | 315 | 2,42 |

* Exceeds EN857 bend radius requirement, allowing increased flexibility with smaller bends and easier installation.

### 1 textile braid, synthetic rubber cover (EN854 type 2TE / EN45545-2)

| Part Number | DN | Hose I.D. | | W.B.O.D. max. | | O.D. max. | | Max. OP* | Proof | Burst | Bend Radius | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in | bar | bar | bar | mm | kg/m |
| EC045-3 | 5 | 4,8 | 0.19 | - | - | 12,6 | 0.50 | 80 | 160 | 320 | 35 | 0,12 |
| EC045-4 | 6 | 6,4 | 0.25 | - | - | 14,2 | 0.56 | 75 | 150 | 300 | 40 | 0,15 |
| EC045-5 | 8 | 7,9 | 0.31 | - | - | 15,7 | 0.62 | 68 | 136 | 270 | 50 | 0,17 |
| EC045-6 | 10 | 9,5 | 0.38 | - | - | 17,3 | 0.68 | 63 | 126 | 250 | 60 | 0,20 |
| EC045-8 | 12 | 12,7 | 0.50 | - | - | 20,7 | 0.81 | 58 | 116 | 230 | 70 | 0,24 |
| EC045-10 | 16 | 15,9 | 0.63 | - | - | 24,9 | 0.98 | 50 | 100 | 200 | 90 | 0,33 |
| EC045-12 | 19 | 19,0 | 0.75 | - | - | 28,0 | 1.10 | 45 | 90 | 180 | 110 | 0,38 |
| EC045-16 | 25 | 25,4 | 1.00 | - | - | 35,9 | 1.41 | 40 | 80 | 160 | 150 | 0,55 |

Max OP i.a.w. EN 854: Use Eaton global braided fitting (IS..) and new 2T-socket
Max 25 bar OP: Use standard Eaton OTC fittings for all sizes/toolbar proof.

# EN45545-2 conforming railway hose

### Railway hose technical data

| EN45545-Conforming Hose | Image | Construction | Operating Temperatures | Application |
|---|---|---|---|---|
| EC112 (1SC) |  | • Synthetic rubber tube<br>• Single wire braid reinforcement<br>• Black fire retardant synthetic rubber cover | -40°c to + 125°C (-40°F to +250°F)<br>Air max. +75°C max.: + 165°F<br>Water max.:+85°C max.: + 185°F | Hydraulic Railway Systems with Petroleum and Water-Glycol Base Fluids, for Lubricating oils and water |
| EC212 (2SC) |  | • Synthetic rubber tube<br>• Two wire braid reinforcement<br>• Black fire retardant synthetic rubber cover | | |
| EC045-2TE |  | • Synthetic rubber tube<br>• Single textile braid Reinforcement<br>• Black fire retardant synthetic rubber cover | | |
| EC109-1SN |  | • Synthetic rubber tube<br>• Single wire braid reinforcement<br>• Black fire retardant synthetic rubber cover | | |
| EC209-2SN |  | • Synthetic rubber tube<br>• Two wire braid reinforcement<br>• Black fire retardant synthetic rubber cover | | |

### Further certificate

EN ISO-15540 (EN45545-4)

The EC112 and EC212 have passed the 15 min. fire flame test (800°C) and follow 2 min. proof pressure without any additional fire sleeve.

RAPPORTO DI PROVA / *TEST REPORT*
NO. 1145-1147.1ISO055/15

METODO DI PROVA: *Test method* — ISO 15540: 1999/Cor 1: 1999 Come richiamato da / *as recalled by* : EN 50553: 2012

RICHIEDENTE: *Sponsor* — Eaton Corporation Polimer Kauçuk San.Paz.A.Ş Çerkezköy Organize Sanayi Bölgesi Karaağaç Mah. 6.sok No:3 Kapaklı/TEKIRDAG/TURKEY

DENOMINAZIONE DEL MATERIALE: EC212 EN857 2SC / EN45545 *Denomination of the material*

MISURA DEI CAMPIONI INVIATI: *Size of the samples sent* — Size da / *from* -04 a / *to* 16 DN da / *from* 6 a / *to* 25

DESCRIZIONE DEL MATERIALE: *Description of the material* — Tubo flessibile in gomma di colore nero con rinforzo (inserto) metallico. *Flexible black rubber hose with metal reinforcement (insert).*

☐ Questo documento fa riferimento ai Rapporti di Prova elencati nella tabella seguente: *This document refers to the Test Reports listed in the following table:*

| Rif. Lab. *Lab. Re.* | Prova effettuata *Test effected* | Risultato *Result* | Estremi del Rapporto di Prova *Test Report identification* |
|---|---|---|---|
| 1145/15 DN 6 | ISO 15540: 1999/Cor 1: 1999 come richiamata da / *as recalled by* : EN 50553: 2012 | PASSA *PASS* | 1145.0ISO110/15 |
| 1147/15 DN 25 | ISO 15540: 1999/Cor 1: 1999 come richiamata da / *as recalled by* : EN 50553: 2012 | PASSA *PASS* | 1147.0ISO110/15 |

VALUTAZIONE / *JUDGEMENT*

Sulla base dei risultati contenuti nei suddetti Rapporti di Prova, il materiale denominato EC212 EN857 2SC / EN45545, nella gamma di diametri identificata da DN da 6 a 25 - Taglia da 04 a 16 (estremi inclusi) E' CONFORME a quanto richiesto da EN 50553: 2012

*On the basis of the results container in the above test reports, the material denominated EC212 EN857 2SC / EN45545, in the diameter range identified by DN from 6 to 25 - Size from 04 to 16 (extremes included) COMPLIES with the requirements of EN 50553: 2012.*

Prato, 28/07/2015 — Valid until: 27/07/2018

Il Responsabile Certificazione / *The Certification Manager* Dr. Massimo Bonini

Il Direttore del Laboratorio / *The Director of the Laboratory* Dr. Luca Emmi

RAPPORTO DI PROVA / *TEST REPORT*
NO. 1144-1146.1ISO055/15

METODO DI PROVA: *Test method* — ISO 15540: 1999/Cor 1: 1999 Come richiamato da / *as recalled by* : EN 50553: 2012

RICHIEDENTE: *Sponsor* — Eaton Corporation Polimer Kauçuk San.Paz.A.Ş Çerkezköy Organize Sanayi Bölgesi Karaağaç Mah. 6.sok No:3 Kapaklı/TEKIRDAG/TURKEY

DENOMINAZIONE DEL MATERIALE: EC112 EN857 1SC / EN45545 *Denomination of the material*

MISURA DEI CAMPIONI INVIATI: *Size of the samples sent* — Size da / *from* -04 a / *to* 16 DN da / *from* 6 a / *to* 25

DESCRIZIONE DEL MATERIALE: *Description of the material* — Tubo flessibile in gomma di colore nero con rinforzo (inserto) metallico. *Flexible black rubber hose with metal reinforcement (insert).*

☐ Questo documento fa riferimento ai Rapporti di Prova elencati nella tabella seguente: *This document refers to the Test Reports listed in the following table:*

| Rif. Lab. *Lab. Re.* | Prova effettuata *Test effected* | Risultato *Result* | Estremi del Rapporto di Prova *Test Report identification* |
|---|---|---|---|
| 1144/15 DN 6 | ISO 15540: 1999/Cor 1: 1999 come richiamata da / *as recalled by* : EN 50553: 2012 | PASSA *PASS* | 1144.0ISO110/15 |
| 1146/15 DN 25 | ISO 15540: 1999/Cor 1: 1999 come richiamata da / *as recalled by* : EN 50553: 2012 | PASSA *PASS* | 1146.0ISO110/15 |

VALUTAZIONE / *JUDGEMENT*

Sulla base dei risultati contenuti nei suddetti Rapporti di Prova, il materiale denominato EC112 EN857 1SC / EN45545, nella gamma di diametri identificata da DN da 6 a 25 - Taglia da 04 a 16 (estremi inclusi) E' CONFORME a quanto richiesto da EN 50553: 2012

*On the basis of the results container in the above test reports, the material denominated EC112 EN857 1SC / EN45545, in the diameter range identified by DN from 6 to 25 - Size from 04 to 16 (extremes included) COMPLIES with the requirements of EN 50553: 2012.*

Prato, 28/07/2015 — Valid until: 27/07/2018

Il Responsabile Certificazione / *The Certification Manager* Dr. Massimo Bonini

Il Direttore del Laboratorio / *The Director of the Laboratory* Dr. Luca Emmi

# Eaton: your single-source supplier

Not only is Eaton the first manufacturer to carry an EN45545-2-conforming railway hose, but this hose also meets HL3 requirements for outside use. And beyond that, Eaton also carries a full range of hoses, couplings and PMC.

The high performance high pressure hose GH466 combines the 2 Mil flex impulse cycle capabilities with R22/HL1 and R23/HL2 performance. In combination with the Eaton Internal Skive fittings 1W, leakage class 0 can be guaranteed up to 2 Mil impulse cycles.

**Spiral hose specifications r22/r23 test requirements for hazard levels 1 and 2**

| Requirement set used for | Test Method & Reference | Testing for (unit) | Minimum / Maximum | Thresholds HL1 | HL2 | HL3 | Eaton Railway Hoses |
|---|---|---|---|---|---|---|---|
| **Inside uses R22** (IN16; EL2; EL6A; EL7A; M2) | T01 EN ISO 4589-2: OI | Oxygen Content (%) | Minimum | **28** | 28 | 32 | Meets and/or exceeds HL1 minimum threshold |
| | T10.03 EN ISO 5659-3 25kWm$^{-2}$ | Smoke Density ($D_S$ max. dimensionless) | Maximum | **600** | 300 | 150 | Meets and/or exceeds HL1 maximum threshold |
| | T12 NF X70-100-1 and -2, 600° C | Smoke Toxicity ($CIT_{NLP}$ dimensionless) | Maximum | **1.2** | 0.9 | 0.75 | Meets and/or exceeds HL1 maximum threshold |
| **Outside uses R23** (EX12; EL2; EL5 EL6B; EL7B; M3) | T01 EN ISO 4589-2: OI | Oxygen Content (%) | Minimum | 28 | **28** | 32 | Meets and/or exceeds HL2 minimum threshold |
| | T10.03 EN ISO 5659-3 25kWm$^{-2}$ | Smoke Density ($D_S$ max. dimensionless) | Maximum | - | **600** | 300 | Meets and/or exceeds HL2 maximum threshold |
| | T12 NF X70-100-1 and -2, 600° C | Smoke Toxicity ($CIT_{NLP}$ dimensionless) | Maximum | - | **1.8** | 1.5 | Meets and/or exceeds HL2 maximum threshold |

# High performance spiral hydraulic hose

### Dynamax EC850

| Part Number | DN | Hose I.D. | | Hose O.D. | | Max. Operating Pressure | | Burst Pressure | | Min. Bend Radius | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | bar | psi | bar | psi | mm | in | kg/m | lbs/ft |
| EC850-10 | 16 | 15,9 | 0.63 | 29,0 | 1.14 | 500 | 7250 | 2000 | 29000 | 200,0 | 7.87 | 1,23 | 0.82 |
| EC850-12 | 19 | 19,1 | 0.75 | 33,3 | 1.31 | 500 | 7250 | 2000 | 29000 | 215,0 | 8.46 | 1,52 | 1.01 |
| EC850-16 | 25 | 25,4 | 1.00 | 40,4 | 1.59 | 500 | 7250 | 2000 | 29000 | 270,0 | 10.63 | 2,31 | 1.54 |
| EC850-20 | 31 | 31,8 | 1.25 | 50,9 | 2.00 | 500 | 7250 | 2000 | 29000 | 380,0 | 14.96 | 4,01 | 2.69 |

### GH466 6SP
### (Type SAE100R15/EN 45545-2 super high pressure hydraulic hose)

| Part Number | DN | Hose Size 1/16" | Hose I.D. | | Hose O.D. | | Max. Operating Pressure | | Burst Pressure | | Min. Bend Radius | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mm | in | mm | in | bar | psi | bar | psi | mm | in | kg/m | lbs/ft |
| GH466-20 | - | -20 | 31,8 | 1.25 | 49,4 | 1.94 | 420 | 6100 | 1680 | 24,400 | 420 | 16.54 | 3,5 | 2.35 |
| GH466-24 | 38 | -24 | 38,1 | 1.50 | 57,3 | 2.26 | 420 | 6100 | 1680 | 24,400 | 500 | 19.69 | 4,6 | 3.09 |
| GH466-32 | 51 | -32 | 51,4 | 2.02 | 71,7 | 2.82 | 420 | 6100 | 1680 | 24,400 | 630 | 24.80 | 6,7 | 4.50 |

### GH506 high pressure hydraulic hose
### (EN856 4SH/EN 45545-2 super high pressure hydraulic hose)

| Part Number | DN | Hose Size 1/16" | Hose I.D. | | Hose O.D. | | Max. Operating Pressure | | Burst Pressure | | Min. Bend Radius | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mm | in | mm | in | bar | psi | bar | psi | mm | in | kg/m | lbs/ft |
| GH506-12 | 19 | -12 | 19,0 | 0.75 | 32,2 | 1.27 | 420 | 6100 | 1680 | 24,400 | 280 | 11.02 | 1,62 | 1.09 |
| GH506-16 | 25 | -16 | 25,4 | 1.00 | 38,3 | 1.51 | 420 | 6100 | 1680 | 24,400 | 340 | 13.39 | 2,00 | 1.34 |
| GH506-20 | 31 | -20 | 31,8 | 1.25 | 45,5 | 1.79 | 350 | 5075 | 1400 | 20,300 | 460 | 18.11 | 2,50 | 1.68 |
| GH506-24 | 38 | -24 | 38,1 | 1.50 | 53,5 | 2.11 | 300 | 4350 | 1200 | 17,400 | 560 | 22.05 | 3,30 | 2.22 |
| GH506-32 | 51 | -32 | 50,8 | 2.00 | 68,1 | 2.68 | 250 | 3625 | 1000 | 14,500 | 700 | 27.56 | 4,70 | 3.16 |

### EC 525 AQP™ PLUS hi-temp 4-spiral hose

| Part Number | DN | Hose I.D. | | Hose O.D. | | Max. Operating Pressure | | Burst Pressure | | Min. Bend Radius | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | bar | psi | bar | psi | mm | in | kg/m | lbs/ft |
| EC525-12 | 19 | 19,1 | 0.75 | 31,5 | 1.24 | 345 | 5000 | 1380 | 20000 | 241,3 | 9.50 | 1,28 | 0.86 |
| EC525-16 | 25 | 25,4 | 1.00 | 38,5 | 1.52 | 345 | 5000 | 1380 | 20000 | 304,8 | 12.00 | 1,73 | 1.16 |
| EC525-20 | 31 | 31,8 | 1.25 | 47,5 | 1.87 | 240 | 3500 | 960 | 14000 | 419,1 | 16.50 | 2,30 | 1.55 |
| EC525-24 | 38 | 38,1 | 1.50 | 54,9 | 2.16 | 240 | 3500 | 960 | 14000 | 508,0 | 20.00 | 2,95 | 1.98 |
| EC525-32 | 51 | 50,8 | 2.00 | 68,5 | 2.70 | 225 | 3250 | 900 | 13000 | 635,0 | 25.00 | 4,40 | 2.96 |

### 2755 4SP

| Part Number | DN | Hose Size 1/16" | Hose I.D. | | Hose O.D. | | Max. Operating Pressure | | Burst Pressure | | Min. Bend Radius | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mm | in | mm | in | bar | psi | bar | psi | mm | in | kg/m | lbs/ft |
| 2755-6 | 10 | -6 | 9,5 | 0.37 | 21,4 | 0.84 | 490 | 7100 | 1960 | 28,400 | 180 | 7.09 | 0,80 | 0.58 |
| 2755-8 | 12 | -8 | 12,7 | 0.50 | 24,6 | 0.97 | 420 | 6100 | 1680 | 24,400 | 230 | 9.06 | 0,92 | 0.62 |
| 2755-10 | 16 | -10 | 15,9 | 0.63 | 28,2 | 1.11 | 420 | 6100 | 1680 | 24,400 | 250 | 9.84 | 1,00 | 0.67 |
| 2755-12 | 19 | -12 | 19,0 | 0.75 | 32,2 | 1.27 | 380 | 5500 | 1520 | 22,000 | 300 | 11.81 | 1,50 | 1.08 |
| 2755-16 | 25 | -16 | 25,4 | 1.00 | 39,7 | 1.56 | 320 | 4640 | 1280 | 18,560 | 340 | 13.39 | 2,15 | 1.44 |

# High performance spiral hydraulic hose

## Spiral hose technical data

| EN45545-Conforming Hose | Image | Construction | Operating Temperatures | Application |
|---|---|---|---|---|
| EC850 |  | • Synthetic rubber tube, multiple heavy spiral wire (4-spiral wire in -10, -12, -16), (6-spiral wire in -20),<br>• Highly abrasion resistant<br>• DURA-TUFF rubber cover | -40°c to + 100°C (-40°F to + 212°F) | • High pressure hydraulic systems with petroleum based fluids<br>• Highly demanding applications: hydrostatic drive systems, high pressure direct steering and extremely high pressure hydraulic applications<br>• Critical applications in forestry, construction, agriculture, snow removal and other off-highway equipment |
| GH466 |  | • Synthetic NBR rubber tube, 6 high tensile spiral wire reinforcement<br>• Synthetic CR rubber cover | -40°c to + 120°C (-40°F to + 250°F) | • High pressure hydraulic systems with constant high working pressure for use with petroleum based fluids.<br>• Applications like construction equipment, earth-moving machines, agriculture machines, presses, injection molding machines, mining<br>• Super high performance product<br>• Qualified with 2 million flex impulse cycles with leakage class 0 according to SAE J1176<br>• Extremely long life<br>• Qualified with the high performance designed ISC fittings |
| GH506 |  | • Synthetic NBR rubber tube, 4 high tensile spiral wire reinforcement<br>• Synthetic CR rubber cover | -40°C to + 100°C (-40°F to + 212°F)<br>Short term<br>-40°C to + 120°C (-40°F to + 250°F) | • High pressure hydraulic systems with petroleum based fluid. Challenging applications like construction equipment, agriculture machines, stationary applications<br>• Qualified with 2 million flex impulse cycles with leakage class 0 according to SAE J1176<br>• Extremely long life<br>• Qualified with the high performance designed ISC fittings |
| EC525-AQP Plus |  | • AQP elastomer tube and cover<br>• 4-spiral wire hose construction | -40°c to + 150°C (-40°F to + 302°F) | • Hydraulic system service with petroleum fire-resistant and water-based fluids<br>• Fuel and lubricating systems<br>• For additional approved hydraulics fluids reference the fluid compatibility charts shown in Eaton catalogs |
| 2755 |  | • Synthetic NBR rubber tube, 4-spiral wire reinforcement,<br>• Synthetic CR rubber cover | -40°c to + 100°C (-40°F to +212°F) | • High pressure hydraulic systems with petroleum and lubricating oils<br>• Applications such as construction equipment and fork lifts (hydrostatic drive)<br>• Exceeds DIN EN856/4SP performance specifications<br>• Qualified based on a min. of 500,000 impulse cycles. |

# High performance braided hydraulic hose

**2781 (2ST EN853)**
**EN853/2ST exceeds SAE 100R2A**

| # Part Number | DN | Hose Size 1/16" | Hose I.D. | | Hose O.D. | Max. Operating Pressure | Burst Pressure | Min. Bend Radius | Weight |
|---|---|---|---|---|---|---|---|---|---|
| | | | mm | in | mm | bar | bar | mm | kg/m |
| 2781-4 | 6 | -4 | 6,4 | 0.25 | 17,5 | 400 | 1600 | 100 | 0,45 |
| 2781-5 | 8 | -5 | 7,9 | 0.31 | 19,1 | 350 | 1400 | 115 | 0,54 |
| 2781-6 | 10 | -6 | 9,5 | 0.38 | 21,4 | 345 | 1380 | 130 | 0,60 |
| 2781-8 | 12 | -8 | 12,7 | 0.50 | 24,6 | 295 | 1180 | 180 | 0,75 |
| 2781-10 | 16 | -10 | 15,9 | 0.62 | 27,8 | 250 | 1000 | 200 | 0,85 |
| 2781-12 | 19 | -12 | 19,0 | 0.75 | 31,8 | 215 | 860 | 240 | 1,10 |
| 2781-16 | 25 | -16 | 25,4 | 1.00 | 39,7 | 175 | 700 | 300 | 1,50 |
| 2781-20 | 31 | -20 | 31,8 | 1.15 | 50,8 | 155 | 620 | 420 | 2,40 |
| 2781-24 | 38 | -24 | 38,1 | 1.50 | 57,2 | 125 | 500 | 500 | 3,00 |
| 2781-32 | 51 | -32 | 50,8 | 2.00 | 69,8 | 90 | 360 | 630 | 4,55 |

**FC510 (AQP hose, hi-pac)**
**Exceeds SAE 100R2**

| # Part Number | DN | Hose Size 1/16" | Hose I.D. | | Hose O.D. | Max. Operating Pressure | Burst Pressure | Min. Bend Radius | Weight |
|---|---|---|---|---|---|---|---|---|---|
| | | | mm | in | mm | bar | bar | mm | kg/m |
| FC510–10 | 16 | -10 | 15,9 | 0.62 | 23,6 | 190 | 760 | 150 | 0,66 |
| FC510–12 | 19 | -12 | 19,0 | 0.75 | 27,4 | 155 | 620 | 180 | 0,77 |
| FC510–16 | 25 | -16 | 25,4 | 1.00 | 34,4 | 138 | 560 | 230 | 1,05 |
| FC510–20 | 31 | -20 | 31,8 | 1.25 | 43,0 | 112 | 450 | 280 | 1,61 |

# High performance special hose with fire sleeve

**FC350 (AQP engine & airbrake)**
**FMVSS106**

| Part Number | Hose Size 1/16" | Hose I.D. | | Hose O.D. | | Max. Operating Pressure | | Burst Pressure | | Min. Bend Radius | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | bar | psi | bar | psi | mm | in | kg/m | lbs/ft |
| FC350-04 | -4 | 4,8 | 0.19 | 13,2 | 0.52 | 140,0 | 2000 | 560,0 | 8000 | 19,1 | 0.75 | 0,22 | 0.13 |
| FC350-05 | -5 | 6,4 | 0.25 | 14,7 | 0.58 | 105,0 | 1500 | 420,0 | 6000 | 25,4 | 1.00 | 0,34 | 0.16 |
| FC350-06 | -6 | 7,9 | 0.31 | 17,3 | 0.68 | 105,0 | 1500 | 420,0 | 6000 | 31,8 | 1.25 | 0,35 | 0.20 |
| FC350-08 | -8 | 10,4 | 0.41 | 19,6 | 0.77 | 87,0 | 1250 | 350,0 | 5000 | 44,5 | 1.75 | 0,43 | 0.23 |
| FC350-10 | -10 | 12,7 | 0.50 | 23,9 | 0.94 | 87,0 | 1250 | 350,0 | 5000 | 57,2 | 2.25 | 0,59 | 0.33 |
| FC350-12 | -12 | 16,0 | 0.63 | 27,4 | 1.08 | 52,0 | 750 | 210,0 | 3000 | 69,9 | 2.75 | 0,68 | 0.39 |
| FC350-16 | -16 | 22,4 | 0.88 | 31,2 | 1.23 | 28,0 | 400 | 112,0 | 1600 | 88,9 | 3.50 | 0,74 | 0.50 |
| FC350-20 | -20 | 28,4 | 1.12 | 38,1 | 1.50 | 21,0 | 300 | 84,0 | 1200 | 114,3 | 4.50 | 0,87 | 0.56 |
| FC350-24 | -24 | 35,1 | 1.38 | 44,5 | 1.75 | 17,0 | 250 | 70,0 | 1000 | 139,7 | 5.50 | 1,02 | 0.63 |

**FC800**

| Part Number | DN | Hose Size 1/16" | Hose I.D. | | Hose O.D. | | Max. Operating Pressure | | Burst Pressure | | Min. Bend Radius | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mm | in | mm | in | bar | psi | bar | psi | mm | in | kg/m | lbs/ft |
| FC800-12 | 19 | -12 | 16,4 | 0.65 | 27.2 | 1.071 | 35 | 500 | 140 | 2000 | 70 | 3.0 | 0.67 | 0.45 |
| FC800-16 | 25 | -16 | 22,8 | 0.90 | 31.5 | 1.24 | 35 | 500 | 140 | 2000 | 80 | 3.5 | 0.71 | 0.48 |
| FC800-20 | 31 | -20 | 29,3 | 1.15 | 38.6 | 1.52 | 35 | 500 | 140 | 2000 | 100 | 4.0 | 0.92 | 0.62 |
| FC800-24 | 38 | -24 | 35,5 | 1.40 | 45.6 | 1.80 | 35 | 500 | 140 | 2000 | 160 | 6.5 | 1.16 | 0.78 |

# Quick disconnect couplings

Eaton operates efficiently and meets requirements in a wide variety of markets at the forefront of technology, including aerospace, chemical, automotive, military, and the gas industries. Eaton's proven know-how in the railway industry enables a large range of couplings which are used in a variety of primary applications (Table 2). Table 3 shows commonly used quick-disconnect couplings. Figure 1 shows the three types of Walterscheid tube connectors.

**Table 2**
**Eaton leadership across sectors and industries**

| Sector | Industry | Applications |
|---|---|---|
| **Rolling Stock**  | Train - Locomotive  | • Compressed air circuit<br>• Air conditioning<br>• Braking system<br>• Hydraulic<br>• On-board electronic cooling<br>• Fill & drain reservoirs |
| | Tram - Underground  | |
| **Infrastructure**  | Hydraulic Tools  | |

**Table 3**
**Commonly used quick-disconnect couplings**

| Series | Type/ Application | Image | Materials | Sizes (in) | Work Pressure (bar) |
|---|---|---|---|---|---|
| R-4000 | Pneumatic arc blowing system |  | Brass, NBR | 1/8 | 20 |
| 5400 | Air conditioning |  | Steel Guardian Seal™ plating for excellent corrosion resistance, Chloropren | -4<br>-8<br>-12<br>-16 | 48 to 207 |
| FF | Hydraulic circuit |  | Steel, NBR, FKM, EPDM | 1/4 to 2 | 300 to 350 |
| HW-15000 | Fill and drain reservoirs for engine cooling (diesel loco) |  | Stainless steel, HNBR | 1 | 5 |
| RW | • On-board electronic cooling<br>• Fill reservoir<br>• Braking system |  | Stainless steel, brass, FKM | 6mm<br>6mm | 160 |

# Aluminum railway cooling coupling

## Value proposition sheet

**Propose an adapted version of the Aluminum 4DB to fit Railway water glycol cooling applications**

- Enhanced  for vibration resistance and tested according EN 61373
- Designed to avoid dust contamination (dust proof)
- Longer guidance between plug and socket to improve vibration and easy to connect
- Propose integrated Elbow end connection to gain space

This new coupling can be used in all water glycol cooling applications with stringent environnemental requirements

**Also bring all advantages from A4DB range**

- Aluminium for light weight and corrosion resistance
- EPDM seals
- Flat face to avoid air intrusion and fluid loss
- Maintain very good flow performances

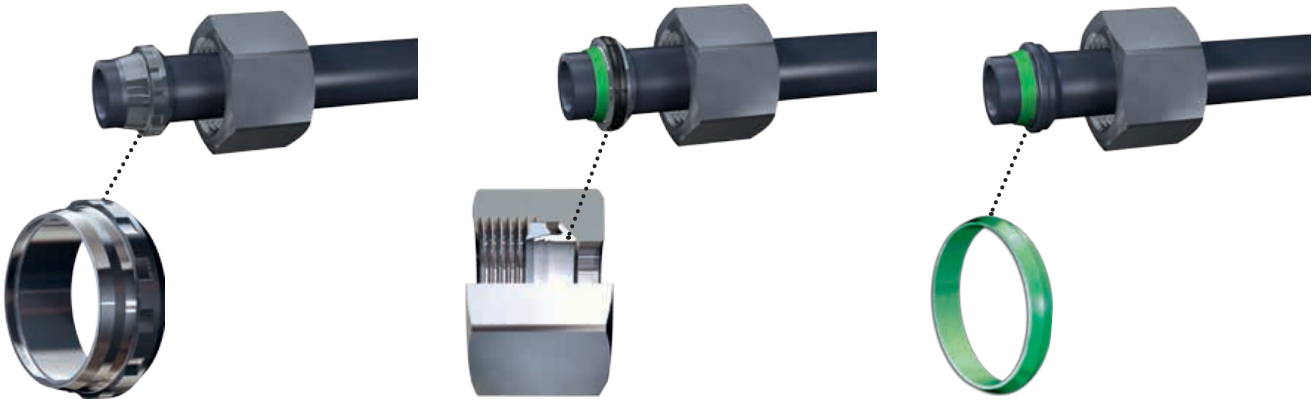
# Walterscheid tube connectors and adapters

The Eaton Walterscheid Trilogy is engineered to deliver premium performance along with ease of installation. Walterscheid tube connectors (Figure 1) provide a number of benefits:

- Highest pressure performance
- Easy and safe assembling
- Highest assembly security
- Machine protect from failures
- Standard Viton soft seal – others materials available (NBR, EPDM)
- Most successful and first forming system with captive seal on the market
- Available in stainless steel for hash environments

Furthermore, Eaton offers a wide range of adapters either in combination with the Walterscheid tube connectors or as individual components in tube and pipe works.

**Figure 1**
**Three types of Walterscheid tube connectors**



| WALPRO™ | WALRING™ | WALFORM*plus*™ |
|---|---|---|
| **Technology** | | |
| Two-edge cutting ring (profile ring), controlled final assembly | Two-edge cutting ring with captive seal, machine assembly | Cold reshaping of the tube end with captive seal |
| **System features** | | |
| Force closure, combined sealing and retaining functions | Force closure, separate sealing and retaining functions | Form closure, separate sealing and retaining functions |
| **Sealing principle** | | |
| Metal-on-metal | Elastomeric + Metal-on-metal | Elastomeric + Metal-on-metal |
| **Prefabrication** | | |
| Assembly machine | Assembly machine | Reshaping machine |
| **Tightening travel for final in service assembly** | | |
| 30°–60° after controlled final assembly | 30°–60° after machine assembly | Up to the point of resistance |
| **Torque reduction** | | |
| ≈ 25% compared to manual assembly | ≈ 25% compared to manual assembly of a cutting ring | > 25% compared to manual assembly of a cutting ring |
| **Risk of assembly related failures** | | |
| Minimal with controlled final assembly machine | Minimal with machine pre-assembly | Minimal |

### Guardian Seal™ coating

Guardian Seal is a special, zinc-based surface treatment that is applied by electroplating. The zinc layer is passivized by a special process, resulting in an open-pored structure. Organic micro-particles are then impregnated into this structure in an optimized emersion process adapted to the chemical system. The cross-linked polymerization of the top layer is then completed via a unique curing process.

- Nickel-free corrosion protection – durable and health-friendly
- Corrosion protection up to 360 hrs. to white corrosion / 720 hrs. to red corrosion according to VDMA 24576, K5 (exceeding SAE J514 / 96 hrs. to red corrosion)
- Guardian Seal surface plating not only guarantees excellent, durable corrosion protection, but also provides a convincing answer from the point of view of health protection and environmental compatibility.

### Eaton power units smooth the way for high speed trains in Switzerland

High speed trains at speeds can get passengers to their destinations in comfort and safety, but for train operators, the cost of installing dedicated high speed track, with gentle curves and gradients, is prohibitive for all but the most profitable routes.

Using hydraulics solutions from Eaton, Switzerland's national railway company, SBB CFF FFS, is now operating high speed trains on conventional track and delivering improved customer service and comfort.

In the case of Switzerland, with its numerous mountains and lakes that crisscross the major rail routes, building a dedicated high-speed rail infrastructure is impractical. The answer is the latest generation of tilting trains which can optimize their behavior around bends in the track and minimize wheel forces. The level of tilt is controlled by onboard computers that send messages to the bogie (wheel chassis) of each carriage.

SBB ordered 19 Pendolino trains, manufactured by Alstom. Each one comprises seven carriages that can accommodate up to 430 passengers and travel at speeds up to 250kph (155mph) on regular rail routes.

From its factory in Pessano, Italy, Eaton provided the powerful Hydraulic Power Units for each bogie. The power units contain PVM piston pumps, slip-in cartridge valves, servo valves and Eaton's filtration products.

"Our experience and high reputation on high speed trains, together with our competency to deliver a total hydraulic solution to meet stringent regulatory and performance parameters were instrumental in our selection as a partner for these trains," explained Mauro Mezzina, Eaton regional sales manager for Italy and the Middle East.

Following homologation runs in Germany, as well as acceptance runs in Switzerland and Italy, the first three trains were delivered in 2014 with the next delivery due to be handed over to SBB by the middle of 2015.

### Certificates of conformance to EN45545-2

RAPPORTO DI PROVA / *TEST REPORT*
NO. 629-630/15

| | |
|---|---|
| METODO DI PROVA: *Test method* | EN 45545-2: 2013 |
| DENOMINAZIONE DELLA PROVA: *Description of the standard* | Requisiti di comportamento al fuoco di materiali e componenti / Requirements for fire behaviour of materials and components |
| RICHIEDENTE: *Sponsor* | Eaton Corporation Polimer Kauçuk San.Paz.A.Ş Çerkezköy Organize Sanayi Bölgesi, Karaağaç Mah. 6 sok No:3 Kapaklı / TEKIRDAG, TURKEY |
| DENOMINAZIONE DEI MATERIALI: *Denomination of the materials* | RAILWAY EN857 1SC / EN45545 Diameter from 6.4 mm to 25.4 mm |
| GAMMA DIAMETRI NOM. DEI CAMPIONI: *Nom. diameter range of the samples* | 6÷25 mm (inc from 1/4" to 1") (Thick. wall hose: from 4,2 mm to 4,25 mm) |
| DESCRIZIONE DEL MATERIALE: *Description of the material* | Tubo in gomma di colore nero con rinforzo metallico. *Black rubber hose with a metallic reinforcement.* |

Questo documento fa riferimento ai Rapporti di Prova no. 629-630.0/S0030/15, no. 629-630.1/S0030/15 e no. 629-630.1/S0050/15 emessi da questo Laboratorio.
*This certificate refers to the Test Reports no. 629-630.0/S0030/15, no. 629-630.1/S0030/15 and no. 629-630.1/S0050/15 issued by this Laboratory.*

| Prodotto / *Product* | NLP (Non Listed Products) | | | | |
|---|---|---|---|---|---|
| Requisiti / *Requirements* | R22 - R23 | | | | |
| Prove richieste / *Tests required* | EN ISO 4589-2 | EN ISO 5659-2 | | NF X 70-100-1/-2 | |
| Parametro / *Parameter* | LOI (%) | (25 kW/m² - Flaming) Ds max | | $CIT_{NLP}$ | |
| Valori trovati / *Values found* (3/16" - Rif. Lab. 630/15) | 37.2 | 206 | | 0.15 | |
| Valori trovati / *Values found* (1" - Rif. Lab. 629/15) | 36.4 | 287 | | 0.15 | |
| | Per / For | Per / For | | Per / For | |
| Limiti di accettazione / *Acceptance limits* | R22 - R23 | R22 | R23 | R22 | R23 |
| | HL1: ≥ 28%<br>HL2: ≥ 28%<br>HL3: ≥ 32% | HL1: ≤ 600<br>HL2: ≤ 300<br>HL3: ≤ 150 | HL1: ---<br>HL2: ≤ 600<br>HL3: ≤ 300 | HL1: ≤ 1.2<br>HL2: ≤ 0.9<br>HL3: ≤ 0.75 | HL1: ---<br>HL2: ≤ 1.8<br>HL3: ≤ 1.5 |

Legenda
--- Nessun requisito / *No requirement*

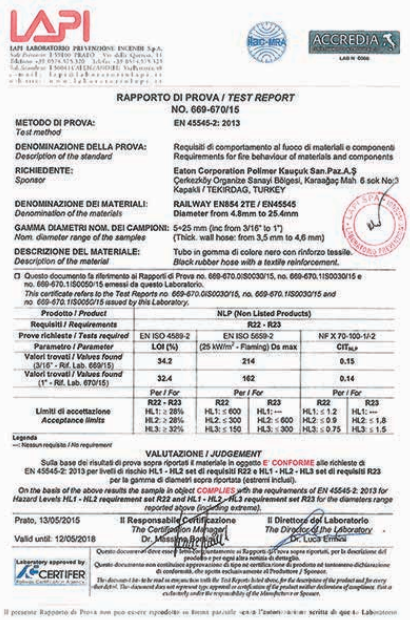
VALUTAZIONE / *JUDGEMENT*

Sulla base dei risultati di prova sopra riportati il materiale in oggetto E' CONFORME alle richieste di EN 45545-2: 2013 per livelli di rischio HL1 - HL2 set di requisiti R22 e HL1 - HL2 - HL3 set di requisiti R23 per la gamma di diametri sopra riportata (estremi inclusi).
*On the basis of the above results the sample in object COMPLIES with the requirements of EN 45545-2: 2013 for Hazard Levels HL1 - HL2 requirement set R22 and HL1 - HL2 - HL3 requirement set R23 for the diameters range reported above (including extreme).*

Prato, 05/05/2015 — Il Responsabile Certificazione / *The Certification Manager* Dr. Massimo Bonini — Il Direttore del Laboratorio / *The Director of the Laboratory* Dr. Luca Emmi

Valid until: 04/05/2018

Laboratory approved by CERTIFER



RAPPORTO DI PROVA / *TEST REPORT*
NO. 669-670/15

| | |
|---|---|
| METODO DI PROVA: *Test method* | EN 45545-2: 2013 |
| DENOMINAZIONE DELLA PROVA: *Description of the standard* | Requisiti di comportamento al fuoco di materiali e componenti / Requirements for fire behaviour of materials and components |
| RICHIEDENTE: *Sponsor* | Eaton Corporation Polimer Kauçuk San.Paz.A.Ş Çerkezköy Organize Sanayi Bölgesi, Karaağaç Mah. 6 sok No:3 Kapaklı / TEKIRDAG, TURKEY |
| DENOMINAZIONE DEI MATERIALI: *Denomination of the materials* | RAILWAY EN854 2TE / EN45545 Diameter from 4.8mm to 25.4mm |
| GAMMA DIAMETRI NOM. DEI CAMPIONI: *Nom. diameter range of the samples* | 5÷25 mm (inc from 3/16" to 1") (Thick. wall hose: from 3,5 mm to 4,6 mm) |
| DESCRIZIONE DEL MATERIALE: *Description of the material* | Tubo in gomma di colore nero con rinforzo tessile. *Black rubber hose with a textile reinforcement.* |

Questo documento fa riferimento ai Rapporti di Prova no. 669-670.0/S0030/15, no. 669-670.1/S0030/15 e no. 669-670.1/S0050/15 emessi da questo Laboratorio.
*This certificate refers to the Test Reports no. 669-670.0/S0030/15, no. 669-670.1/S0030/15 and no. 669-670.1/S0050/15 issued by this Laboratory.*

| Prodotto / *Product* | NLP (Non Listed Products) | | | | |
|---|---|---|---|---|---|
| Requisiti / *Requirements* | R22 - R23 | | | | |
| Prove richieste / *Tests required* | EN ISO 4589-2 | EN ISO 5659-2 | | NF X 70-100-1/-2 | |
| Parametro / *Parameter* | LOI (%) | (25 kW/m² - Flaming) Ds max | | $CIT_{NLP}$ | |
| Valori trovati / *Values found* (3/16" - Rif. Lab. 670/15) | 34.2 | 214 | | 0.15 | |
| Valori trovati / *Values found* (1" - Rif. Lab. 670/15) | 32.4 | 162 | | 0.14 | |
| | Per / For | Per / For | | Per / For | |
| Limiti di accettazione / *Acceptance limits* | R22 - R23 | R22 | R23 | R22 | R23 |
| | HL1: ≥ 28%<br>HL2: ≥ 28%<br>HL3: ≥ 32% | HL1: ≤ 600<br>HL2: ≤ 300<br>HL3: ≤ 150 | HL1: ---<br>HL2: ≤ 600<br>HL3: ≤ 300 | HL1: ≤ 1.2<br>HL2: ≤ 0.9<br>HL3: ≤ 0.75 | HL1: ---<br>HL2: ≤ 1.8<br>HL3: ≤ 1.5 |

Legenda
--- Nessun requisito / *No requirement*

VALUTAZIONE / *JUDGEMENT*

Sulla base dei risultati di prova sopra riportati il materiale in oggetto E' CONFORME alle richieste di EN 45545-2: 2013 per livelli di rischio HL1 - HL2 set di requisiti R22 e HL1 - HL2 - HL3 set di requisiti R23 per la gamma di diametri sopra riportata (estremi inclusi).
*On the basis of the above results the sample in object COMPLIES with the requirements of EN 45545-2: 2013 for Hazard Levels HL1 - HL2 requirement set R22 and HL1 - HL2 - HL3 requirement set R23 for the diameters range reported above (including extreme).*

Prato, 13/05/2015 — Il Responsabile Certificazione / *The Certification Manager* Dr. Massimo Bonini — Il Direttore del Laboratorio / *The Director of the Laboratory* Dr. Luca Emmi

Valid until: 12/05/2018

Laboratory approved by CERTIFER

RAPPORTO DI PROVA / *TEST REPORT*
NO. 628-631/15

| | |
|---|---|
| METODO DI PROVA: *Test method* | EN 45545-2: 2013 |
| DENOMINAZIONE DELLA PROVA: *Description of the standard* | Requisiti di comportamento al fuoco di materiali e componenti / Requirements for fire behaviour of materials and components |
| RICHIEDENTE: *Sponsor* | Eaton Corporation Polimer Kauçuk San.Paz.A.Ş Çerkezköy Organize Sanayi Bölgesi, Karaağaç Mah. 6 sok No:3 Kapaklı / TEKIRDAG, TURKEY |
| DENOMINAZIONE DEI MATERIALI: *Denomination of the materials* | RAILWAY EN857 2SC / EN45545 Diameter from 6.4 mm to 25.4 mm |
| GAMMA DIAMETRI NOM. DEI CAMPIONI: *Nom. diameter range of the samples* | 6÷25 mm (inc from 1/4" to 1") (Thick. wall hose: from 4.4 mm to 4.8 mm) |
| DESCRIZIONE DEL MATERIALE: *Description of the material* | Tubo in gomma di colore nero con rinforzo metallico. *Black rubber hose with a metallic reinforcement.* |

Questo documento fa riferimento ai Rapporti di Prova no. 628-631.0/S0030/15, no. 628-631.1/S0030/15 e no. 628-631.1/S0050/15 emessi da questo Laboratorio.
*This certificate refers to the Test Reports no. 628-631.0/S0030/15, no. 628-631.1/S0030/15 and no. 628-631.1/S0050/15 issued by this Laboratory.*

| Prodotto / *Product* | NLP (Non Listed Products) | | | | |
|---|---|---|---|---|---|
| Requisiti / *Requirements* | R22 - R23 | | | | |
| Prove richieste / *Tests required* | EN ISO 4589-2 | EN ISO 5659-2 | | NF X 70-100-1/-2 | |
| Parametro / *Parameter* | LOI (%) | (25 kW/m² - Flaming) Ds max | | $CIT_{NLP}$ | |
| Valori trovati / *Values found* (1/4" - Rif. Lab. 631/15) | 38.2 | 181 | | 0.14 | |
| Valori trovati / *Values found* (1" - Rif. Lab. 628/15) | 34.2 | 266 | | 0.13 | |
| | Per / For | Per / For | | Per / For | |
| Limiti di accettazione / *Acceptance limits* | R22 - R23 | R22 | R23 | R22 | R23 |
| | HL1: ≥ 28%<br>HL2: ≥ 28%<br>HL3: ≥ 32% | HL1: ≤ 600<br>HL2: ≤ 300<br>HL3: ≤ 150 | HL1: ---<br>HL2: ≤ 600<br>HL3: ≤ 300 | HL1: ≤ 1.2<br>HL2: ≤ 0.9<br>HL3: ≤ 0.75 | HL1: ---<br>HL2: ≤ 1.8<br>HL3: ≤ 1.5 |

Legenda
--- Nessun requisito / *No requirement*

VALUTAZIONE / *JUDGEMENT*

Sulla base dei risultati di prova sopra riportati il materiale in oggetto E' CONFORME alle richieste di EN 45545-2: 2013 per livelli di rischio HL1 - HL2 set di requisiti R22 e HL1 - HL2 - HL3 set di requisiti R23 per la gamma di diametri sopra riportata (estremi inclusi).
*On the basis of the above results the sample in object COMPLIES with the requirements of EN 45545-2: 2013 for Hazard Levels HL1 - HL2 requirement set R22 and HL1 - HL2 - HL3 requirement set R23 for the diameters range reported above (including extreme).*

Prato, 05/05/2015 — Il Responsabile Certificazione / *The Certification Manager* Dr. Massimo Bonini — Il Direttore del Laboratorio / *The Director of the Laboratory* Dr. Luca Emmi

Valid until: 04/05/2018

Laboratory approved by CERTIFER

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