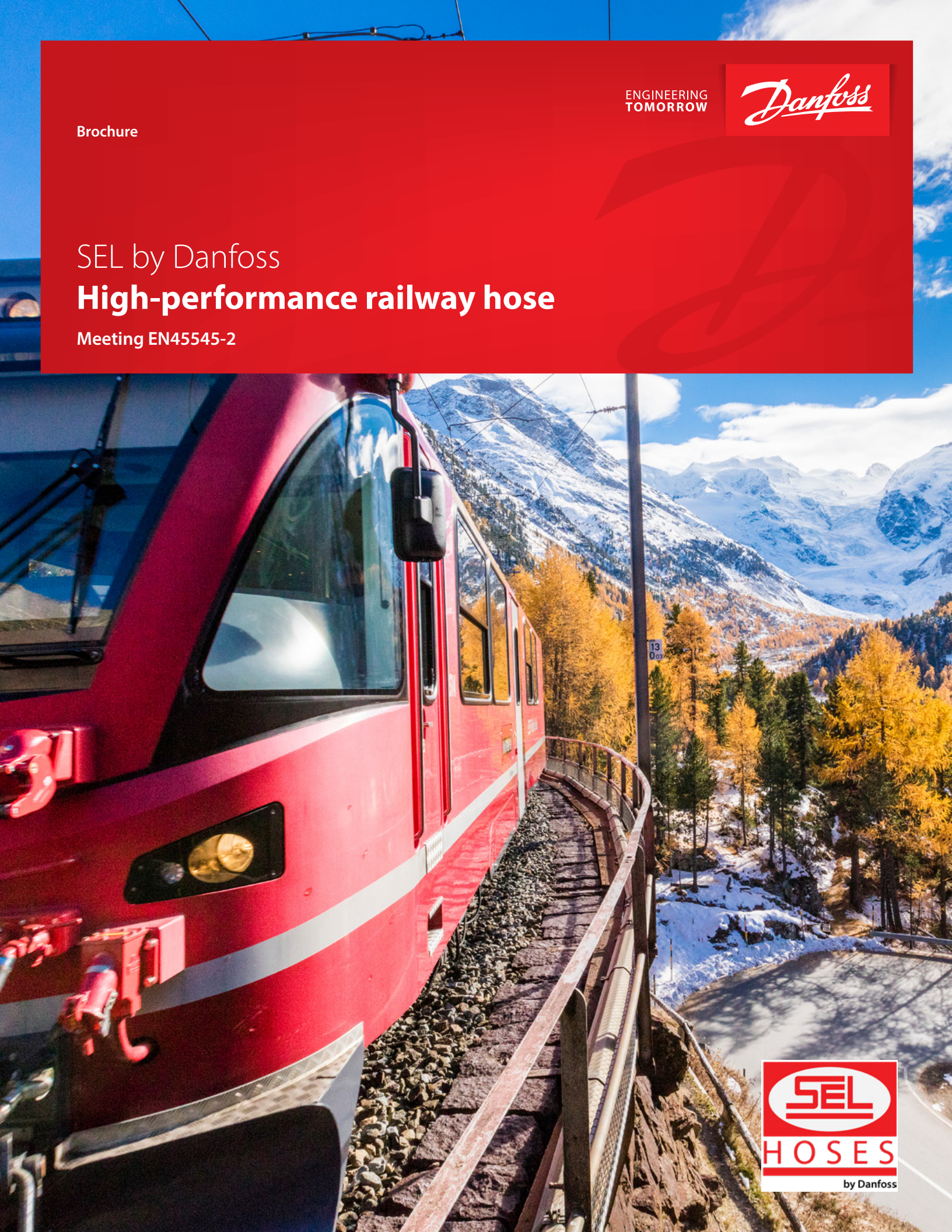
ENGINEERING
TOMORROW

Brochure

SEL by Danfoss

High-performance railway hose

Meeting EN45545-2



SEL HOSES by Danfoss

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

The railway industry is one of the growing sectors with improving technology and changing national and international regulations to be able to offer faster, lower cost, and more environmental service. Danfoss is aware of the sector needs with its vision focus on energy efficiency, safety, and productivity. 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.

Danfoss 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 will be able to meet stringent regulations and drive the industry towards a sustainable future.

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 SEL by Danfoss Railway Hose series 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, 3TE. The Railway series of hoses are available with R22/HL2 and R23/HL3 in 1SC, 2SC, and 2TE models. The railway series of hoses are available with R22/HL2 and R23/HL2 in R4 model.

SEL by Danfoss offers 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. SEL supplies hoses that conform to every part of the standard. But SEL hoses elevate the product offering to HL3 compatible parts.

Meets and exceeds hazard requirements

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

Requirement set used for	Test Method and Reference	Testing for (unit)	Minimum/ Maximum	Thresholds HL1	HL2	HL3	Danfoss 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 HL3 minimum threshold
	T10.03 EN ISO 5659-3 25kWm^{-2}	Smoke Density (D_S max. dimensionless)	Maximum	600	300	**150**	Meets and/or exceeds HL3 minimum 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 HL3 minimum 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 minimum 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 minimum threshold

Hose type	Hose spec	R22 (internal)	R23 (external)	Size
SEL Railway 1SC	EN 857	HL3	HL3	¼" to 1"
SEL Railway 2SC	EN 857	HL3	HL3	¼" to 2"
SEL Railway 1SN	EN 853	HL3	HL3	¼" to 1"
SEL Railway 2SN	EN 853	HL2	HL3	¼" to 1"
SEL Railway 2TE	EN 854	HL2	HL3	3/16" to 1"
SEL Railway 3TE	EN 854	HL3	HL3	¼" to 1"
SEL Railway R4	SAE 100 R4	HL2	HL2	¾" to 3"
SEL Railway Airbrake (UIC830-1)	SAE 100 R4	HL1	HL2	½" to 1 ⅜"

Railway 1SC

EN857 type 1SC / EN45545-2

DN	Hose I.D.		Hose O.D. (max.)		Working Pressure	Min. Burst Pressure	Min. Bend Radius	Weight
	mm	in	mm	in	bar	bar	mm	kg/m
6	6.4	0.25	13.5	0.53	225	900	50	0.18
8	7.9	0.31	14.5	0.57	215	860	55	0.21
10	9.5	0.38	16.9	0.67	180	720	65	0.26
12	12.7	0.5	20.4	0.8	160	640	90	0.35
16	15.9	0.63	23	0.91	130	520	100	0.43
19	19	0.75	26.7	1.05	105	420	120	0.5
25	25.4	1	34.9	1.37	88	352	150	0.74

Inner tube
Synthetic rubber tube

Reinforcement
One steel braid

Cover
Black fire-retardant synthetic rubber cover

Typical application
Hydraulic system service with petroleum and water based fluids for general industrial service

Additional certificates
EN45545-2
ISO15540

Temp. range
-40 °C to +125 °C
Air max +75 °C
Water max +85 °C

Railway 2SC

EN857 type 2SC / EN45545-2

DN	Hose I.D.		Hose O.D. (max.)		Working Pressure	Min. Burst Pressure	Min. Bend Radius	Weight
	mm	in	mm	in	bar	bar	mm	kg/m
6	6.4	0.25	14.2	0.56	400	1600	50	0.29
8	7.9	0.31	16.0	0.63	350	1400	55	0.33
10	9.5	0.38	18.3	0.72	330	1320	65	0.41
12	12.7	0.5	21.5	0.85	275	1100	90	0.58
16	15.9	0.63	24.7	0.97	250	1000	100	0.69
19	19	0.75	28.6	1.13	215	860	120	0.81
25	25.4	1	36.6	1.44	165	660	150	1.17
31	31.8	1.25	44.4	1.75	125	500	210	1.53
38	38.1	1.5	51.5	2.03	100	400	250	1.89
51	50.8	2	64.2	2.53	90	360	315	2.42

Inner tube
Synthetic rubber tube

Reinforcement
Two steel braids

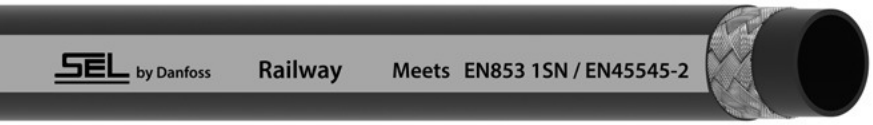
Cover
Black fire-retardant synthetic rubber cover

Typical application
Hydraulic system service with petroleum and water based fluids for general industrial service

Additional certificates
EN45545-2
ISO15540

Temp. range
-40 °C to +125 °C
Air max +75 °C
Water max +85 °C

Railway 1SN



EN853 type 1SN / EN45545-2

DN	Hose I.D.		Hose O.D. (max.)		Working Pressure	Min. Burst Pressure	Min. Bend Radius	Weight
	mm	in	mm	in	bar	bar	mm	kg/m
6	6.4	0.25	14.1	0.55	225	900	100	0.22
8	7.9	0.31	15.7	0.62	215	860	115	0.26
10	9.5	0.38	18.1	0.71	180	720	130	0.33
12	12.7	0.5	21.4	0.84	160	640	180	0.41
16	15.9	0.63	24.5	0.96	130	520	200	0.47
19	19	0.75	28.5	1.12	105	420	240	0.59
25	25.4	1	36.6	1.44	88	352	300	0.87

Inner tube
Synthetic rubber tube

Reinforcement
One steel braid

Cover
Black fire-retardant synthetic rubber cover

Typical application
Hydraulic system service with petroleum and water based fluids for general industrial service

Additional certificates
EN45545-2

Temp. range
-40 °C to +125 °C
Air max +75 °C
Water max +85 °C

Railway 2SN

EN853 type 2SN / EN45545-2

DN	Hose I.D.		Hose O.D. (max.)		Working Pressure	Min. Burst Pressure	Min. Bend Radius	Weight
	mm	in	mm	in	bar	bar	mm	kg/m
6	6.4	0.25	15.7	0.62	400	1600	100	0.38
8	7.9	0.31	17.3	0.68	350	1400	115	0.43
10	9.5	0.38	19.7	0.78	330	1320	130	0.54
12	12.7	0.5	23.0	0.91	275	1100	180	0.64
16	15.9	0.63	26.2	1.03	250	1000	200	0.75
19	19	0.75	30.1	1.19	215	860	240	0.93
25	25.4	1	38.9	1.53	165	660	300	1.29

Inner tube
Synthetic rubber tube

Reinforcement
Two steel braids

Cover
Black fire-retardant synthetic rubber cover

Typical application
Hydraulic system service with petroleum and water based fluids for general industrial service

Additional certificates
EN45545-2

Temp. range
-40 °C to +125 °C
Air max +75 °C
Water max +85 °C

Railway 2TE

EN854 type 2TE / EN45545-2

DN	Hose I.D.		Hose O.D. (max.)		Working Pressure	Min. Burst Pressure	Min. Bend Radius	Weight
	mm	in	mm	in	bar	bar	mm	kg/m
5	4.8	0.19	12.6	0.5	80	320	35	0.12
6	6.4	0.25	14.2	0.56	75	300	40	0.15
8	7.9	0.31	15.7	0.62	68	270	50	0.17
10	9.5	0.38	17.3	0.68	63	250	60	0.20
12	12.7	0.5	20.7	0.81	58	230	70	0.24
16	15.9	0.63	24.9	0.98	50	200	90	0.33
19	19	0.75	28.0	1.10	45	180	110	0.38
25	25.4	1	35.9	1.41	40	160	150	0.55

Inner tube
Synthetic rubber tube

Reinforcement
One textile braid

Cover
Black fire-retardant synthetic rubber cover

Typical application
Hydraulic system service with petroleum, water based fluids, and compressed air

Additional certificates
EN45545-2

Temp. range
-40 °C to +125 °C
Air max +75 °C
Water max +85 °C

Railway 3TE

EN854 type 3TE / EN45545-2

DN	Hose I.D.		Hose O.D. (max.)		Working Pressure	Min. Burst Pressure	Min. Bend Radius	Weight
	mm	in	mm	in	bar	bar	mm	kg/m
6	6.4	0.25	15.2	0.60	145	580	45	0.17
8	7.9	0.31	17.7	0.69	130	520	55	0.24
10	9.5	0.38	19.3	0.76	110	440	70	0.27
12	12.7	0.5	22.7	0.89	93	372	85	0.34
16	15.9	0.63	26.9	1.05	80	320	105	0.48
19	19	0.75	30.0	1.18	70	280	130	0.49
25	25.4	1	37.4	1.47	55	220	150	0.69

Inner tube
Synthetic rubber tube

Reinforcement
Two textile braids

Cover
Black fire-retardant synthetic rubber cover

Typical application
Hydraulic system service with petroleum, water based fluids, and compressed air

Additional certificates
EN45545-2

Temp. range
-40 °C to +125 °C
Air max +75 °C
Water max +85 °C

Railway R4

SAE 100 R4 / EN45545-2

DN	Hose I.D.		Hose O.D. (max.)		Working Pressure	Min. Burst Pressure	Min. Bend Radius	Vacuum	Weight
	mm	in	mm	in	bar	bar	mm	bar	kg/m
19	19	0.75	32.6	1.28	21	84	40	-0.80	0.83
25	25.4	1	38.2	1.50	17	68	45	-0.80	0.97
31	32	1.26	46.0	1.81	14	56	60	-0.80	1.29
38	38	1.5	52.4	2.06	10	40	65	-0.80	1.65
51	50.8	2	66.0	2.60	7	28	100	-0.80	2.37
63	63.5	2.5	79.1	3.11	4	16	140	-0.80	2.92
80	76.2	3	95.0	3.74	4	16	180	-0.80	4.18

Inner tube
Synthetic rubber tube

Reinforcement
High tensile synthetic textile, steel helix wire, and anti-static copper strand

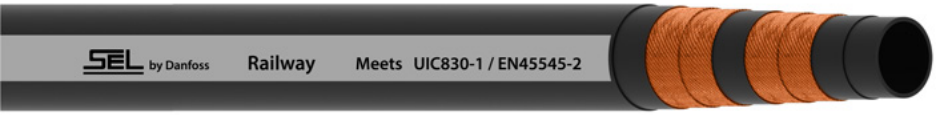
Cover
High tensile synthetic textile rubber cover

Typical application
Suction applications with petroleum, lubricating oils, fuels, gasoline, air, water, and water glycol

Additional certificates
EN45545-2

Temp. range
-40 °C to +125 °C
Air max +75 °C
Water max +85 °C

Railway Airbrake (UIC830-1)



DN	Hose I.D.		Hose O.D. (max.)		Working Pressure	Min. Burst Pressure	Min. Bend Radius	Weight
	mm	in	mm	in	bar	bar	mm	kg/m
13	13	0.51	25	0.98	10	70	70	0.49
16	16	0.63	28	1.10	10	70	90	0.58
22	22	0.87	36	1.42	10	70	120	0.85
28	28	1.10	43	1.69	10	70	150	1.14
35	35	1.38	53	2.09	10	70	170	1.55

Inner tube
Synthetic rubber tube

Reinforcement
Four textile cord

Cover
Black fire-retardant synthetic rubber cover

Typical application
For use in railway air brake systems to connect carriages by means of half couplings according to DIN15807

Additional certificates
EN45545-2
UIC830-1
EN15807

Temp. range
-40 °C to +70 °C

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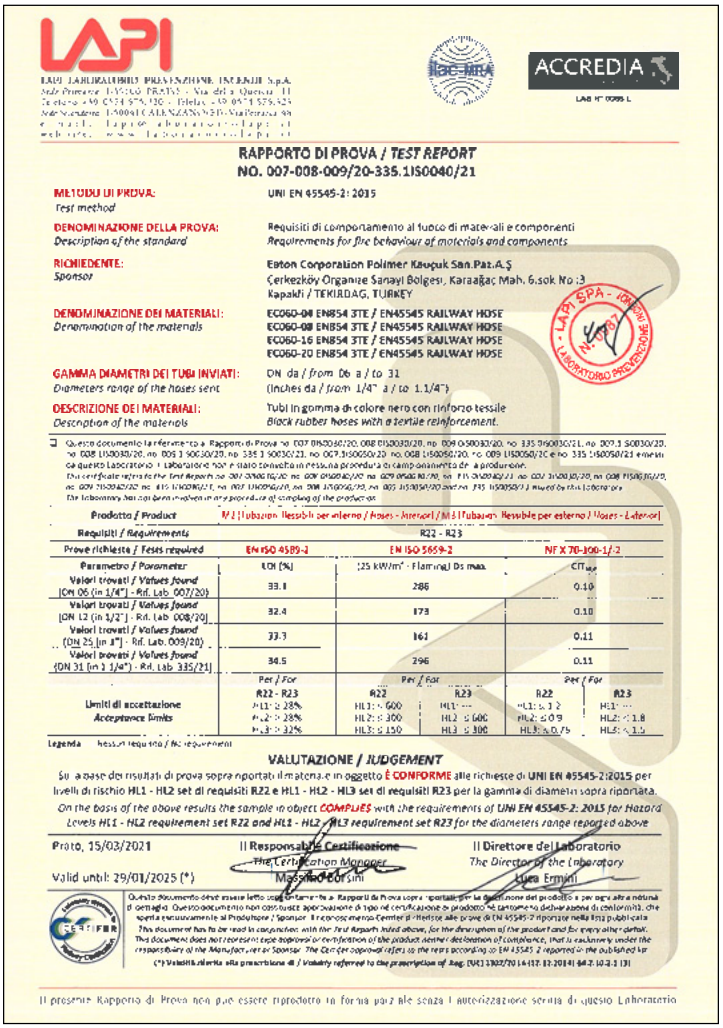
Certificates of **conformance to EN45545-2**



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ACCREDIA
LAB N° 0068 L

RAPPORTO DI PROVA / *TEST REPORT*
NO. 007-008-009/20-335.1ISO040/21

METODO DI PROVA: *Test method*	UNI EN 45545-2: 2015
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 Bolgesi, Karaağaç Mah. 6.sok No :3 Kapaklı / TEKIRDAG, TURKEY
DENOMINAZIONE DEI MATERIALI: *Denomination of the materials*	EC060-08 EN854 3TE / EN45545 RAILWAY HOSE EC060-08 EN854 3TE / EN45545 RAILWAY HOSE EC060-16 EN854 3TE / EN45545 RAILWAY HOSE EC060-20 EN854 3TE / EN45545 RAILWAY HOSE
GAMMA DIAMETRI DEI TUBI INVIATI: *Diameters range of the hoses sent*	DN da / *from* 06 a / *to* 31 (Inches da / *from* 1/4" a / *to* 1.1/4")
DESCRIZIONE DEI MATERIALI: *Description of the materials*	Tubi in gomma di colore nero con rinforzo tessile *Black rubber hoses with a textile reinforcement.*

LAPI S.P.A. - PRATO - LABORATORIO PREVENZIONE INCENDI

☐ Questo documento fa riferimento ai Rapporti di Prova n. 007.1ISO040/20, 008.1ISO040/20, no. 009.1ISO040/20, no. 335.1ISO040/21, no. 007.1 SO040/20, no 008.1ISO040/20, no. 009.1 SO040/20, no. 335.1 SO040/21, no. 007.1ISO050/20, no. 008.1ISO050/20, no. 009.1ISO050/20 e no. 335.1ISO050/21 emessi da questo Laboratorio. / *Laboratorio Non è stato coinvolto in nessuna procedura di campionamento e di produzione.*
This certificate refers to the Test Reports no. 007.1ISO040/20, no. 008.1ISO040/20, no. 009.1ISO040/20, no. 335.1ISO040/21, no. 007.1 SO040/20, no. 008.1ISO040/20, no. 009.1 SO040/20, no. 335.1ISO040/21, no. 007.1ISO050/20, no. 008.1ISO050/20, no. 009.1ISO050/20 and no. 335.1ISO050/21 issued by this Laboratory.
The laboratory has not been involved in any procedure of sampling of the product or.

Prodotto / *Product*	M2 (Tubazioni flessibili per interno / *Hoses – Interior*) M3 (Tubazioni flessibile per esterno / *Hoses – Exterior*)				
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.		$CIT_{MJ/g}$	
Valori trovati / *Values found* (DN 06 (in 1/4") - Rif. Lab. 007/20)	33.1	286		0.10	
Valori trovati / *Values found* (DN 12 (in 1/2") - Rif. Lab. 008/20)	32.4	173		0.10	
Valori trovati / *Values found* (DN 25 (in 1") - Rif. Lab. 009/20)	33.3	161		0.11	
Valori trovati / *Values found* (DN 31 (in 1 1/4") - Rif. Lab. 335/21)	34.5	296		0.11	
	Per / *For*	Per / *For*		Per / *For*	
	R22 - R23	R22	R23	R22	R23
Limiti di accettazione / *Acceptance limits*	HL1: ≥ 28% HL2: ≥ 28% HL3: ≥ 32%	HL1: --- HL2: ≤ 300 HL3: ≤ 150	HL1: --- HL2: ≤ 600 HL3: ≤ 300	HL1: ≤ 1.2 HL2: ≤ 0.9 HL3: ≤ 0.75	HL1: --- HL2: ≤ 1.8 HL3: ≤ 1.5

Legenda — / *Nessun requisito / No requirement*

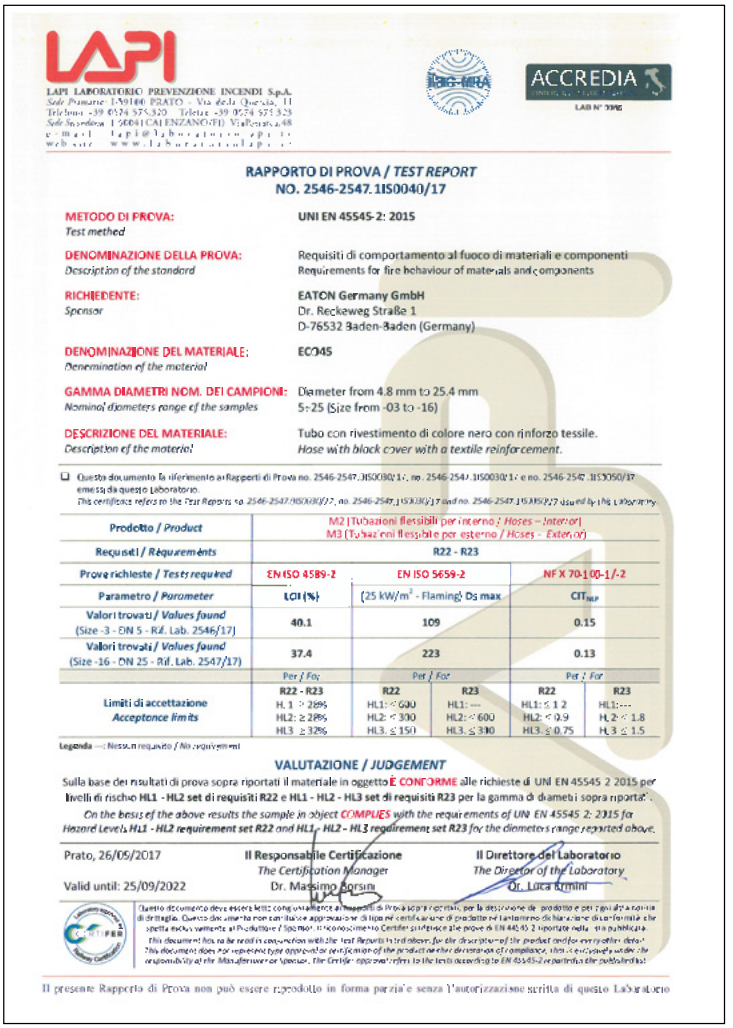
VALUTAZIONE / *JUDGEMENT*

Su base dei risultati di prova sopra riportati il materiale in oggetto **È CONFORME** alle richieste di **UNI EN 45545-2:2015** 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.
*On the basis of the above results the sample in object **COMPLIES** with the requirements of **UNI EN 45545-2: 2015** for Hazard Levels **HL1 - HL2 requirement set R22 and HL1 - HL2 - HL3 requirement set R23** for the diameters range reported above*

Prato, 15/03/2021 — Il Responsabile Certificazione / *The Certification Manager* — Massimo Borsini — Il Direttore del Laboratorio / *The Director of the Laboratory* — Luca Ermini
Valid until: 29/01/2025 (*)

Questo documento deve essere letto congiuntamente ai Rapporti di Prova sopra riportati per la descrizione del prodotto e per ogni altro minimo dettaglio. Questo documento non costituisce approvazione di tipo né certificazione di prodotto né tantomeno dichiarazione di conformità, che spetta esclusivamente al Produttore / Sponsor. Il riconoscimento Centro di Prova abilitato alle prove di EN 45545-2 riportate nella lista pubblicata
This document has to be read in conjunction with the Test Reports listed above, for the description of the product and for every other detail. This document does not represent type approval or certification of the product neither declaration of compliance, that is exclusively under the responsibility of the Manufacturer or Sponsor. The Certificate approval refers to the tests according to EN 45545-2 reported in the published list
(*) Validità riferita alla prescrizione di / *Validity referred to the prescription of* Reg. (UE) 1302/2014 (GU 12.12.2014) §4.2.10.2.1 (3)

Il presente Rapporto di Prova non può essere riprodotto in forma parziale senza l'autorizzazione scritta di questo Laboratorio



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ACCREDIA
LAB N° 0068

RAPPORTO DI PROVA / *TEST REPORT*
NO. 2546-2547.1ISO040/17

METODO DI PROVA: *Test method*	UNI EN 45545-2: 2015
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 Germany GmbH Dr. Reckeweg Straße 1 D-76532 Baden-Baden (Germany)
DENOMINAZIONE DEL MATERIALE: *Denomination of the material*	EC045
GAMMA DIAMETRI NOM. DEI CAMPIONI: *Nominal diameters range of the samples*	Diameter from 4.8 mm to 25.4 mm 5-25 (Size from -03 to -16)
DESCRIZIONE DEL MATERIALE: *Description of the material*	Tubo con rivestimento di colore nero con rinforzo tessile. *Hose with black cover with a textile reinforcement.*

☐ Questo documento fa riferimento ai Rapporti di Prova no. 2546-2547.1ISO030/17, no. 2546-2547.1ISO030/17 e no. 2546-2547.1ISO050/17 emessi da questo Laboratorio.
This certificate refers to the Test Reports no. 2546-2547.1ISO030/17, no. 2546-2547.1ISO030/17 and no. 2546-2547.1ISO050/17 issued by this Laboratory.

Prodotto / *Product*	M2 (Tubazioni flessibili per interno / *Hoses – Interior*) M3 (Tubazioni flessibile per esterno / *Hoses – Exterior*)				
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.		$CIT_{MJ/g}$	
Valori trovati / *Values found* (Size -3 - DN 5 - Rif. Lab. 2546/17)	40.1	109		0.15	
Valori trovati / *Values found* (Size -16 - DN 25 - Rif. Lab. 2547/17)	37.4	223		0.13	
	Per / *For*	Per / *For*		Per / *For*	
	R22 - R23	R22	R23	R22	R23
Limiti di accettazione / *Acceptance limits*	HL1: ≥ 28% HL2: ≥ 28% HL3: ≥ 32%	HL1: ≤ 600 HL2: ≤ 300 HL3: ≤ 150	HL1: --- HL2: ≤ 600 HL3: ≤ 300	HL1: ≤ 1.2 HL2: ≤ 0.9 HL3: ≤ 0.75	HL1: --- HL2: ≤ 1.8 HL3: ≤ 1.5

Legenda — / *Nessun requisito / No requirement*

VALUTAZIONE / *JUDGEMENT*

Sulla base dei risultati di prova sopra riportati il materiale in oggetto **È CONFORME** alle richieste di UNI EN 45545 2 2015 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.
*On the basis of the above results the sample in object **COMPLIES** with the requirements of UNI EN 45545 2: 2015 for Hazard Levels **HL1 - HL2 requirement set R22 and HL1 - HL2 - HL3 requirement set R23** for the diameters range reported above.*

Prato, 26/05/2017 — Il Responsabile Certificazione / *The Certification Manager* — Dr. Massimo Borsini — Il Direttore del Laboratorio / *The Director of the Laboratory* — Dr. Luca Ermini
Valid until: 25/09/2022

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