

Brakes -

Specifications for the construction of various brake parts - Wheel Slide Protection device (WSP)

Appendix F

WSPs approved for international traffic

Appendix F (points F1 to F4) replaces the previous appendices K, L, M and N of the 2nd edition of the Leaflet

The tables given in this appendix:

- are updated regularly,
- correspond to the above date of update.



Appendix F1 - WSPs accepted in international traffic for vehicles built between 01.01.1974 and 31.12.1986

Manufacturer	Type	Period of approvals testing	
		Block brakes	Disc brakes
I – Mechanical types			
OERLIKON	Inertia 4 GS1 et GSA	November 1968	
KNORR	MW	October 1975	October 1975
KNORR	MWX	October 1975	October 1975
II - Electronic types			
WESTINGHOUSE	D1	June 1970	November 1969
WESTINGHOUSE	WG		October 1973
WESTINGHOUSE	WGK	Autumn 1973	
GIRLING	SP		June 1970
OERLIKON	GSE 100	October 1972	October 1972
PARIZZI	289	November 1967	
PARIZZI	447	-	May 1973
KNORR	GR	-	June 1970
KNORR	GR	October 1973	
KOVOLIS	DAKO	October 1977	
	DAKO	-	November 1977
KRAUSS-MAFFEI	K Micro	June 1979	June 1979
OERLIKON	GSE 200 with pulse sensors	March 1980	March 1980
KNORR	MGS 1	-	April 1981
WABCO-WESTINGHOUSE	WGMC 19	-	March 1982
FAIVELEY	AEF 83 C	-	September 1983
OERLIKON	GSE 201	-	April 1984
OERLIKON	GSE 202	-	April 1984
FAIVELEY	AEF 83 P.1	-	October 1984
FAIVELEY	AEF 83 P.2	October 1984	-

Appendix F2 (page 1/2) - WSPs accepted in international traffic for vehicles built after 01.01.1987 ^(a)

Manufacturer	Type	Period of approvals testing		Remarks
		Block brakes	Disc brakes	
I – Mechanical types for speeds up to 160 km/h				
OERLIKON	Inertia 4 GS1 and GSA	November 1968		Preferably only for use on wagons without their own power supply
KNORR	MWX	October 1975	October 1975	
II – Electronic types				
WESTINGHOUSE	D1	June 1970	November 1969	b)
WESTINGHOUSE	WG	-	October 1973	b)
WESTINGHOUSE	WGK	Autumn 1973	-	b)
GIRLING	SP	-	June 1970	b)
OERLIKON	GSE 100	October 1972	October 1972	b)
PARIZZI	447	-	May 1973	b)
KNORR	GR	-	June 1970	b)
KNORR	GR	October 1973	-	b)
KOVOLIS	DAKO	October 1977	-	b)
	DAKO	-	November 1977	b)
KRAUSS-MAFFEI	K-Micro	June 1979	June 1979	
OERLIKON	GSE 200	March 1980	March 1980	
KNORR	MGS 1	-	April 1981	g), h)
WABCO- WESTINGHOUSE	WGMC 19	-	March 1982	g), h)

- a) Also approved for vehicles built previously
 b) These types are no longer to be used for newly-built vehicles
 c) From 01.01.1997, approval is valid also when using the SKF LS 1639 speed sensor
 d) Approvals testing was conducted on a passenger coach without adhesion-independent brakes (e.g. magnetic brakes)
 e) From 01.07.2002, approval is valid also when using the IMG3xx pulse sensors
 f) Passenger coaches with combined block/disc braking
 g) From 01.02.2005, certification is valid also when using the KB FSxx pulse sensors
 h) From 01.04.2011, certification is valid also when using the pulse sensors Lenord & Bauer GEL 247x

Appendix F2 (2/2) - WSPs accepted in international traffic for vehicles built after 01.01.1987 (a)

Manufacturer	Type	Period of approvals testing		Remarks
		Block brakes	Disc brakes	
FAIVELEY	AEF 83 C	-	September 1983	
OERLIKON	GSE 201	-	April 1984	
OERLIKON	GSE 202	-	April 1984	
FAIVELEY	AEF 83 p. 1	-	October 1984	
FAIVELEY	AEF 83 p. 2	October 1984	-	
OERLIKON	OMG 202	-	March 1986	e)
PARIZZI	WUPAR 83	-	October 1986	c)
WABCO- WESTINGHOUSE	WGMC 19/I	-	October 1987	c), g)
FAIVELEY	AEF 91 P1 AEF 91 P2	- September 1992 ^(f)	September 1992	
MANNESMANN REXROTH PNEUMATIK GmbH	MRP-GMC 29	-	October 1993	g), h)
KES Keschwari Electronic Systems GmbH & Co.KG (previously SAB WABCO KP GmbH)	SWKP AS20 R	-	October 1997	Change of designation of Manufacturer in January 2013
KES Keschwari Electronic Systems GmbH & Co.KG (previously SAB WABCO KP GmbH)	SWKP AS20 C	-	None	Confirmed in January 1998: General properties identical with those of AS 20R Changes of Manufacturer's name of the SWKP AS20 R/C
Knorr-Bremse	MGS 2	-	April 1997	g), i)
DAKO	PE 94 MSV	-	September 1998	(d)

a) Also approved for vehicles built previously
 b) These types are no longer to be used for newly-built vehicles
 c) From 01.01.1997, approval is valid also when using the SKF LS 1639 speed sensor
 d) Approvals testing was conducted on a passenger coach without adhesion-independent brakes (e.g. magnetic brakes)
 e) From 01.07.2002, approval is valid also when using the IMG3xx pulse sensors
 f) Passenger coaches with combined block/disc braking
 g) From 01.02.2005, certification is valid also when using the FSxx pulse sensors
 h) From 01.04.2011, certification is valid also when using the pulse sensors Lenord & Bauer GEL 247x
 i) From 01.04.2011, certification is valid also when using the pulse sensors Lenord & Bauer GEL 247x. From 01.02.2019, certification is valid also when using the pulse sensors Lenord & Bauer GEL 247x with Hall sensor iC-MZI

Appendix F3 (page 1/3) - WSPs accepted in international traffic for vehicles built after 01.01.2004 (Leaflet 541-05, 2nd edition)

Manufacturer	Type designation	Control unit	Type		Vehicle category a)	Application		Approved from:
			Speed sensor	WSP valve		Types of brakes b)	Maximum speed	
Alstom	μWUPAR	μWUPAR 4A4C-2H; 4A2C-2H; 4A4C-HS	ALSTOM GF-1PSV oder SKF LS 1639	ALSTOM μEV-SR or Alstom OSR-SR	High speed trains, passenger coaches, multiple units	Disc brakes, magnetic brakes	200 km/h (4A4C-2H; 4A2C-2H); 250 km/h (4A4C-HS)	01.07.2004
KES	SWKP	ASM20R/C	MFIG 20	MV 20	Passenger coaches	Disc brakes, magnetic brakes,	200 km/h	01.07.2007
			IG 20 FSG 20		Locomotives, multiple units, high speed trains	Friction brakes, dynamic brakes	364 km/h	01.01.2012
KNORR- Bremse Sfs GmbH	MGS2	ESRA	GI5 GI6	GV 12 GV 21	Passenger coaches, Locomotives, multiple units, high speed trains	Friction brakes, Dynamic brakes, Magnetic brakes	405 km/h	22.01.2009
			FS01x SKFxx-KB	GV 221				01.07.2011
				ASV1				01.03.2017
KNORR- Bremse Sfs GmbH	MGS EP Compact	ESRA: GU + CU0xy or GCU0xy	FSxx SKF-KB	GVxx	Passenger coaches, Locomotives, multiple units, high speed trains	Friction brakes, Dynamic brakes, Magnetic brakes	405 km/h	01.02.2010
				ASV1				01.03.2017
KNORR- BREMSE Sfs GmbH	MGS3 ¹	ESRA: MB0x GU + CU0xy or GCU0xy	FSxx SKF-KB	ASV1 GV12 mit DG10-S	Passenger coaches	Friction brakes magnetic brakes	200 km/h	01.02.2018

- a) - Passenger coaches,
 - Freight wagons,
 - Locomotives / multiple units,
 - High speed trains

- b) - Disc brakes,
 - Block brakes,
 - Combined disc/block brakes,
 - Dynamic brakes,
 - Adhesion-independent brakes,
 - Magnetic brakes,
 - Friction brakes

¹ Certification according to UIC Leaflet 541-05, 2nd Edition

Appendix F3 (page 2/3) - WSPs accepted in international traffic for vehicles built after 01.01.2004 (Leaflet 541-05, 2nd edition)

Manu- facturer	Type designation	Control unit	Type		Application			Approved from:
			Speed sensor	WSP valve	Vehicle category a)	Types of brakes b)	Maximum speed	
Faiveley Transport	AEF G2	1/8011xx (Motorola 375) or 1/8012xx (Motorola CF)	FYGEN, inductive power sensor (axle bearing cover or gearbox casing) or: Faiveley S-Vel or SVEL 2 (active power or current sensor) or: active current sensor integrated in bearing, produced by SKF or FAG	EVPM2, EVPM5, EVPM6, DV1, DV12 or MV20 IBU DV17 DV17HP	Passenger coaches, Locomotives, multiple units, high speed trains	Friction brakes, dynamic brakes, magnetic brakes	400 km/h	01.02.2010 01.02.2015 (S-Vel 2) 01.10.2017 (IBU) 31.01.2019 (DV17HP) 03.07.2019 (DV17)
Faiveley Transport	WSP-SA	1 / 459 920	Faiveley FYGEN, inductive power sensor (axle bearing cover or gearbox casing) or: Faiveley S-Vel or S-Vel2 (active power or current sensor) or: active current sensor integrated in bearing, produced by SKF or FAG	EVPM2, EVPM5, EVPM6, DV1, DV12, MV20 IBU DV17 DV17HP	passenger train cars, locomotives, multiple unit trains, high-speed trains	friction brake, dynamic brake, magnetic track brake	400 km/h	01.10.2015 01.10.2017 (IBU) 31.01.2019 (DV17HP) 03.07.2019 (DV17)
Poli- Wabtec	ATHENA	UCF xxxx-yy	SSHE xxxx-yy SKF speed sensor FS715B FS725A	DVWSP xxxx-yy Parizzi dump valve Type 46251	Passenger coaches, Locomotives, multiple units	Friction brakes, dynamic brakes, magnetic brakes	200 km/h	01.02.2010 01.02.2011

- a) - Passenger coaches,
- Freight wagons,
- Locomotives / multiple units,
- High speed trains

- b) - Disc brakes,
- Block brakes,
- Combined disc/block brakes,
- Dynamic brakes,
- Adhesion-independent brakes,
- Magnetic brakes,
- Friction brakes

Appendix F3 (page 3/3) - WSPs accepted in international traffic for vehicles built after 01.01.2004 (Leaflet 541-05, 2nd Edition)

Manu- facturer	Type designation	Control unit	Type		Application			Approved from:
			Speed sensor	WSP valve	Vehicle category a)	Types of brakes b)	Maximum speed	
Selectron	WSP 800	Selectron MAS Traffic	Baumer 58L1624K/ 10600689 Lenord & Bauer GEL247x UIC Certifikate no. B-004/ 2011-04	Knorr GV12 (max. 1A, 24/36V)	passenger train cars, locomotives, multiple unit trains	friction brake, dynamic brake, magnetic track brake	200 km/h	01.07.2013
Siemens	SIBAS®GS	BSG 2	GEL2475 Lenord & Bauer ^{c)}	DAKO N8	Coach, Locomotiven, Tractive units, HS train sets	Wheel brakes, Magnetic track brakes, Friction brakes, dynamic brakes	454 km/h	01.09.2013
Siemens	SIBAS®GS kompakt	BSG 3	Lenord & Bauer: GEL247x ^{c)} , GEL348x SKF AV BT2	DAKO N8 DAKO N8.1 Poli DVWSP	Coaches, Locomotives, Tractive units, HS train sets	Wheel brakes, Magnetic track brakes, Friction brakes, dynamic brakes	454 km/h	10.06.2014

- a) - Passenger coaches,
 - Freight wagons,
 - Locomotives / multiple units,
 - High speed trains

- b) - Disc brakes,
 - Block brakes,
 - Combined disc/block brakes,
 - Dynamic brakes,
 - Adhesion-independent brakes,
 - Magnetic brakes,
 - Friction brakes

- c) - speed sensors Lenord & Bauer GEL247x with Hall sensor iC-MZI are excepted from the certification

Appendix F4: WSPs accepted in international traffic for vehicles built after 01.04.2016 (Leaflet 541-05, 3rd Edition)

Tested functions / Caractéristiques testées / Geprüfte Funktionen			Entry / Entrée / Eintrag	Approved / Autorisé / Genehmigt
DAKO-CZ DAKO PE06- MSV	Core functions	Fonctions de base	Grundfunktionen	
	Algorithm	Algorithme	Algorithmus	00060.00060.v.10.00.00 00060.00698.v.10.00.00
	Electronic hardware platform	Plate-forme électronique (hardware)	Hardware Plattform	ASS06.11
	Braking force actuators	Actuateurs effort de freinage	Bremskraftaktuator	DAKO N8.1
	Axle speed acquisition	Acquisition de la vitesse de l'essieu	Achsgeschwindigkeits-erfassung	DAKO FE1.4 L&B GEL2474, 2475
	Diagnostics	Diagnostic	Diagnose	Integral part of ASS06.11
	Working speed thresholds	Seuils de vitesse de fonctionnement	Ein-Ausschaltsschwellen	On Start: $v_F > 5$ km/h; On Stop: $v_F > 3$ km/h
	Watchdog	Chien de garde	Sicherheitszeit	EV = 10 s; HV = 5 s
	Performance limits	Caractéristiques fonctionnelles	Leistungsmerkmale	
	Maximum vehicle speed	Vitesse maximale du véhicule	Höchstgeschwindigkeit	200 km/h
	Max speed input frequency	Fréquence d'entrée / Vitesse maximale	Maximale Eingangsfrequenz	10 kHz 4,314 kHz
	Axle inertia (range)	Inertie de l'essieu (plage)	Trägheitsmoment der Achsen (Bandbreite)	Rotating mass 450 kg ... 2400 kg
	Number of controlled axles	Nombre d'essieux contrôlés	Anzahl kontrollierter Achsen	4
	Deceleration value	Valeur de décélération	Verzögerungswert	2,3 m/s ² max.
	Adhesion demanded by vehicle value	Utilisation de l'adhérence par le véhicule	Kraftschluss-ausnutzung des Fahrzeugs	Coach 0,17 ... 0,21 Locomotive 0,17 ... 0,21
	Range of axle load	Charge d'essieu minimale	Bereich der Radsatzlast	9000 kg ... 22500 kg
	Number of axles controlled by single actuator	Nombre d'essieux contrôlés par un seul actuateur	Anzahl Achse pro Bremskraftaktuator	1
	Optional fonctions	Fonctions optionnelles	Optionale Funktionen	
	WRM	WRM	Rollüberwachung	No
	Additional brakes (adhesion-independent)	Freins additionnels (indépendants de l'adhérence)	Zusätzliche Bremsen (Kraftschluss unabhängig)	Magnetic track brakes
Combined braking of pneumatic and dynamic brake (combination / interaction)	Freinage combiné (freins dynamique et pneumatique) (Conjugaison / Interaction)	Kombiniertes Bremsen von pneumatischer und dynamischer Bremse (Blending / Zusammenwirken)	No	
Output speed signals (digital or analogue)	Signaux de vitesse de sortie (numériques ou analogiques)	Geschwindigkeitsausgangssignal (digital oder analog)	Digital	

	Tested functions	Entry	Approved date
	Core functions		
WABTEC (FAIVELEY TRANSPORT) Adaptive-WSP system (A-WSP) comprising of: Algorithm (A-WSP), Electronics (Gemini 2, Gemini Stand Alone), Speed sensors (S-VEL, NORIS) and Dump Valves (DV12, DV12DC, IBU, EVPM5 DV1)	Algorithm	1.02	23.01.2025
	Electronic hardware platform	G2 (FT0027800-xxx), WSP-SA (FT0022811-xxx)	
	Braking force actuators	DV12, DV12 DC, IBU, EVPM5, DV1	
	Axle speed acquisition	S-VEL (ACSC, ACDC, AVSC, AVDC), NORIS (ACSC, ACDC)	
	Diagnostics	Standard modules of the G2 software platform	
	Working speed thresholds	On-line on start: 6 km/h Parametrizable (tested): Active: 0.5–3 (3) km/h Self-test abort: 0.5–3 (3) km/h	
	Watchdog	Parametrizable (tested): vent: ≤ 10 (10) s, hold: ≤ 30 (10) s	
	Performance limits		
	Maximum vehicle speed	400 km/h	23.01.2025
	Max speed input frequency	nominal, R8 tested: 3.5 kHz T04/T09 tested: 3.197 kHz	
	Axle inertia (range)	Rotating mass 360 kg ... 3300 kg	
	Number of controlled axles	4	
	Deceleration value	2.5 m/s ²	
	Adhesion demanded by vehicle value	0.19	
	Range of axle load	9000 kg ... 22500 kg	
	Number of axles controlled by single actuator	1 (wheelset control), 2 (bogie control)	
	Optional functions		
	WRM	Implemented on 2 nd G2 control unit	23.01.2025
Additional brakes (adhesion-independent)	Magnetic track brakes		
Combined braking of pneumatic and dynamic brake (combination / interaction)	Yes		
Output speed signals (digital or analogue)	Digital with parametrizable on/off speed limits, analogue		
Redundancy	All hardware components		

Details of updates

Date of update:	Body:	Decision:
07.04.2004	CTR Steering Committee	Creation of a UIC website listing components with UIC approval; Deletion of the corresponding appendices in UIC Leaflets
01.10.2004	SC Braking and Running Gear; July 2004 meeting	Publication of Leaflet 541-05 1st edition, Appendices K, L and M on the website, including updates of the tables extracted from the leaflet; <u>Appendix L:</u> <ul style="list-style-type: none"> New entry, the IMG3xx pulse sensor, approved as of 1.7.2002 <u>Appendix M</u> <ul style="list-style-type: none"> 1st publication of the new Appendix M New entry of the μWuparWSP
01.03.2005	SC Braking and Running Gear; Tagung Januar 2005	<u>Appendix L:</u> <ul style="list-style-type: none"> New entry of the Knorr Type FSxx pulse sensor, certified as of 1.2.2005 Modification of footnote concerning FAIVELEY build type, from "2" to "F" Replacement of digits with letters in footnotes <u>Appendix M</u> <ul style="list-style-type: none"> Addition of the word "... also..." in the table title
01.07.2007	SG 5 „Braking and Running Gear“ June 2007 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> New entry of the SWKP - ASM20R/C WSP
01.04.2009	SET 7 „Braking“ January 2009 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> New entry of the KB Sfs – MGS2 WSP
10.02.2010	SET 7 „Braking“ January 2010 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> New entry of the WSP Faiveley Transport – AEF G2 New entry of the WSP Knorr Bremse Sfs – MGS EP Compact New entry of the WSP Poli Wabtec –Athena
12.03.2010	SET 7 „Braking“ January 2010 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> Changes at the WSP Poli Wabtec –Athena
21.01.2011	SET 7 „Braking“ January 2011 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> Extension of the WSP Poli Wabtec –Athena
06.04.2011	SET 7 „Braking“ Email survey 2011-03	<u>Appendix M</u> <ul style="list-style-type: none"> New entry of GEL 247x pulse sensor, approved as of 2011-04-01
01.07.2011	SET 7 „Braking“ June 2011 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> Extension of the KB Sfs – MGS2 WSP, introduction of GV 221 dump valve
05.02.2012	SET 7 „Braking“ January 2012 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> Changes at the WSP KES ASM 20 R/C
05.07.2013	SET 7 „Braking“ June 2013 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> New entry of the Selectron WSP 800
01.09.2013	SET 7 „Braking“ June 2013 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> New entry of the WSP Siemens SIBAS[®] (BSG2)
10.06.2014	SET 7 „Braking“ January 2014 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> New entry of the WSP Siemens SIBAS[®] kompakt (BSG3)
22.01.2015	SET 7 „Braking“ January 2015 meeting	<u>Appendix M</u> <ul style="list-style-type: none"> Extension of the WSP FT AEF G2 with the speed sensor SVEL2
March 2017	UIC General Direction	Publication of the 3 rd edition of the Leaflet and renumbering of the Appendices
22.05.2017	SET 7 „Braking“ January 2017 meeting	<u>Appendix F3</u> <ul style="list-style-type: none"> Extension of the WSP KB MGS 2 with the dump valve ASV1 Extension of the WSP KB MGS EP Compact with the dump valve ASV1

Date of update:	Body:	Decision:
01.10.2017	SET 7 „Braking“ e-mail inquiry from 30 August 2017	<u>Appendix F3</u> <ul style="list-style-type: none"> Extension of the WSP FT AEF G2 with the integrated dump valve IBU
01.02.2018	SET 7 „Braking“ January 2018 meeting	<u>Appendix F3</u> <ul style="list-style-type: none"> New entry of the WSP Knorr-Bremse MGS3
01.10.2018	SET 7 „Braking“ June 2018 meeting	Several general editorial changes, <u>Appendix F2</u> <ul style="list-style-type: none"> <u>Correction of the designation of the Wheel Slide Protection device SWKP AS20 R/C</u>
01.02.2019	SET 7 „Braking“ January 2019 meeting	<u>Appendix F2 & F3</u> <ul style="list-style-type: none"> New entry of the Lenord & Bauer speed sensor family GEL 247x with Hall sensor New entry of the DV17 HP WSP valve of the Faiveley Transport AEF G2 WSP and WSP-SA
03.07.2019	SET 7 „Braking“ July 2019 meeting	<u>Appendix F3</u> <ul style="list-style-type: none"> New entry of the DV17 WSP valve of the Faiveley Transport AEF G2 WSP and WSP-SA
19.10.2020	SET 7 „Braking“ e-mail inquiry from 23 July 2020	<u>Appendix F4</u> <ul style="list-style-type: none"> New entry of the DAKO PE06-MSV WSP of Dako-CZ
24.01.2025	SET7 “braking” - session #249, 22- 23.01.2025	<u>Appendix F4</u> <ul style="list-style-type: none"> New entry for the WABTEC (formerly Faiveley Transport) Adaptive-WSP system (A-WSP)