

Intermodal Transport— System, Standardisation and Handling Technologies

多式联运— 系统、标准及技术

June 27, 2016 – Beijing, China
2016年6月27日—中国北京

SGKV - The German Promotion Centre for Intermodal Transport
德国多式联运研究联合会



About the SGKV

关于SGKV



- SGKV stands for "Research Association for Combined Transport"
SGKV代表“多式联运研究联合会”
- SGKV was funded in 1928 to explore intelligent co-operations and multimodal concepts between the *then* upcoming trucks and rail services
SGKV成立于1928年，旨在探索当时即将成立的卡车和铁路服务机构之间的智能合作和多模式概念
- Currently about 100 members in Germany, Austria, Switzerland and other countries
目前有在德国、奥地利、瑞士和其他国家的约100个成员。
- Connecting network between government, industry and sciences
建立政府、行业和研究之间的联系

SGKV's objectives SGKV的目标:

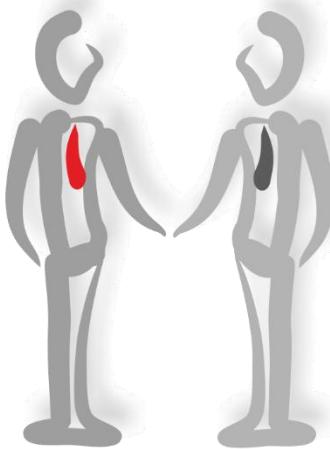
- Research of rational links between national and trans-national transport and cargo handling, both in and out of companies
研究公司内外、本国及跨国运输及货物操作之间的合理衔接
- Dissemination of scientific results to improve and foster the practical, everyday application of intermodal transport in Germany and Europe
推广科研成果，促进和培养德国和欧洲在多式联运方面的实际及日常应用
- 100 % neutral platform to foster and develop intermodality, where applicable and efficient!
在适用及高效的情况下，培养和发展多式联运的100%中立平台！

Selected Members 2016

2016年部分成员



Portfolio 业务介绍



Treffpunkt KV
Meinungsaustausch
Mediation
Expertennetzwerk
B.I.C. NRO

Meeting Point Intermodal Transport
Exchange of Opinions
Mediation
Network of Experts
B.I.C. NRO

多式联运会面点
意见交流
调解
专家网络
B.I.C NRO

Forschung & Wissen
Beratung
Förderberatung
Normung
Politische Beratung
Gutachter Förderanträge D/CH

Research & Knowledge
Consulting
Funding Advisory
Standardisation
Political Advisory
Evaluator for funding applications D/CH

研究与知识
咨询
资助顾问服务
标准化
政策顾问
D/CH资助项目的评估



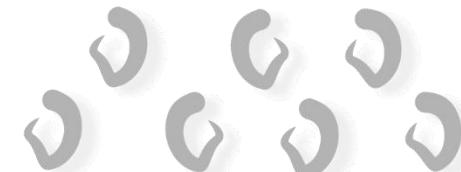
Eine Plattform für den Kombinierten Verkehr
A Platform for Combined Transport
一个多式联运平台

研讨会
Workshops
培训
Qualifications
活动
Events



Wissensvermittlung
Veröffentlichungen
Rundschreiben
Info-Letter
Meinungsumfragen
Forschungsarbeiten

Knowledge Transfer
Publications
Circular Letters
Info letters
Surveys
Studies



Combined Transport (CT)

多式联运 (CT)

“Constitutive” characteristics of combined transport definitions

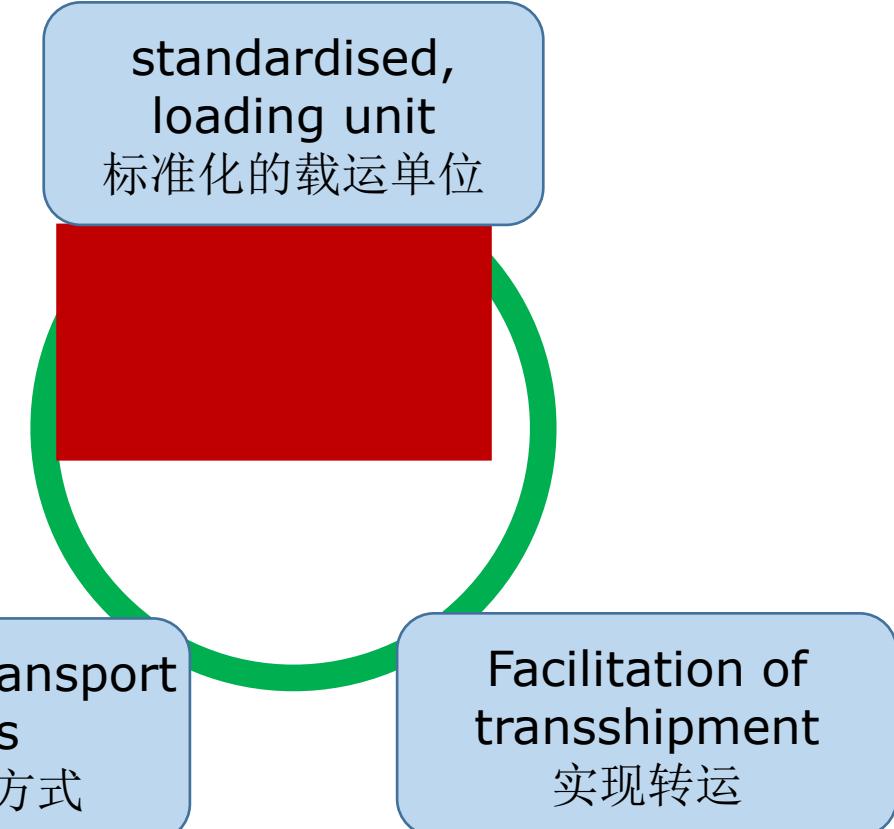
多式联运定义的“基本”特征：

- Presence of 具备
 - a) an intermodal transport chain & 一条多模式运输链条，以及
 - b) a standardised loading unit 一个标准化的载运单位
- Transhipment of loading units between transport modes, such as road, rail or waterway 在公、铁水路等运输方式之间的载运单位的转运
- Systematic facilitation of transhipment by the use of a standardised system (craning)
使用一套标准化系统实现系统化转运

“Intermodal transport where the major part of the European journey is by rail, inland waterways or sea and any initial and/or final legs carried out by road are as short as possible.

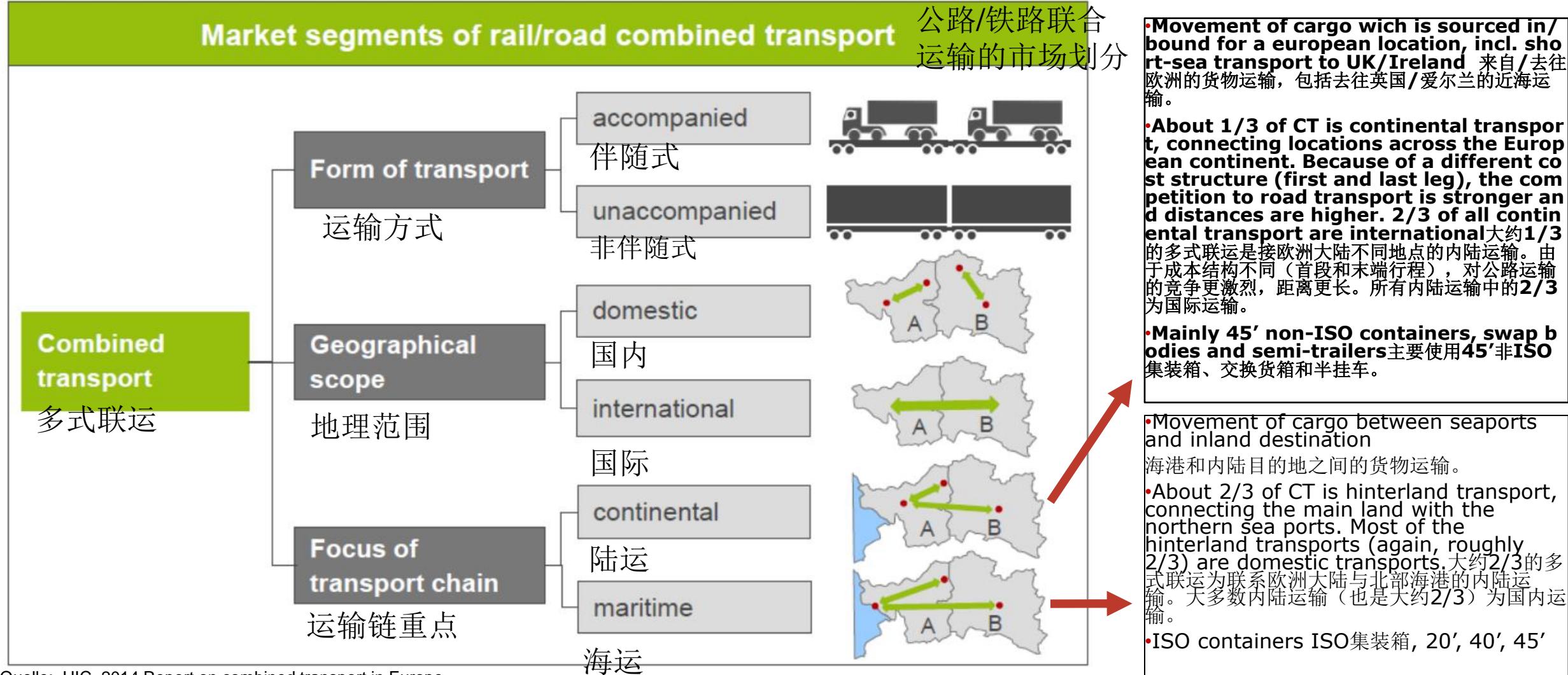
CT 多式联运中 Intermodal Transport 的一种，主要是指是欧洲多式联运的主要路段由铁路、内河航运或海运完成，采用公路的首段和/或末段运输都尽可能的短”

United Nations Economic Commission for Europe 联合国欧洲经济委员会(UNECE)



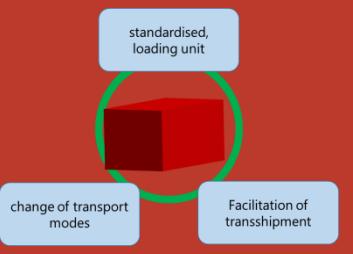
Functionality of CT

多式联运的功能

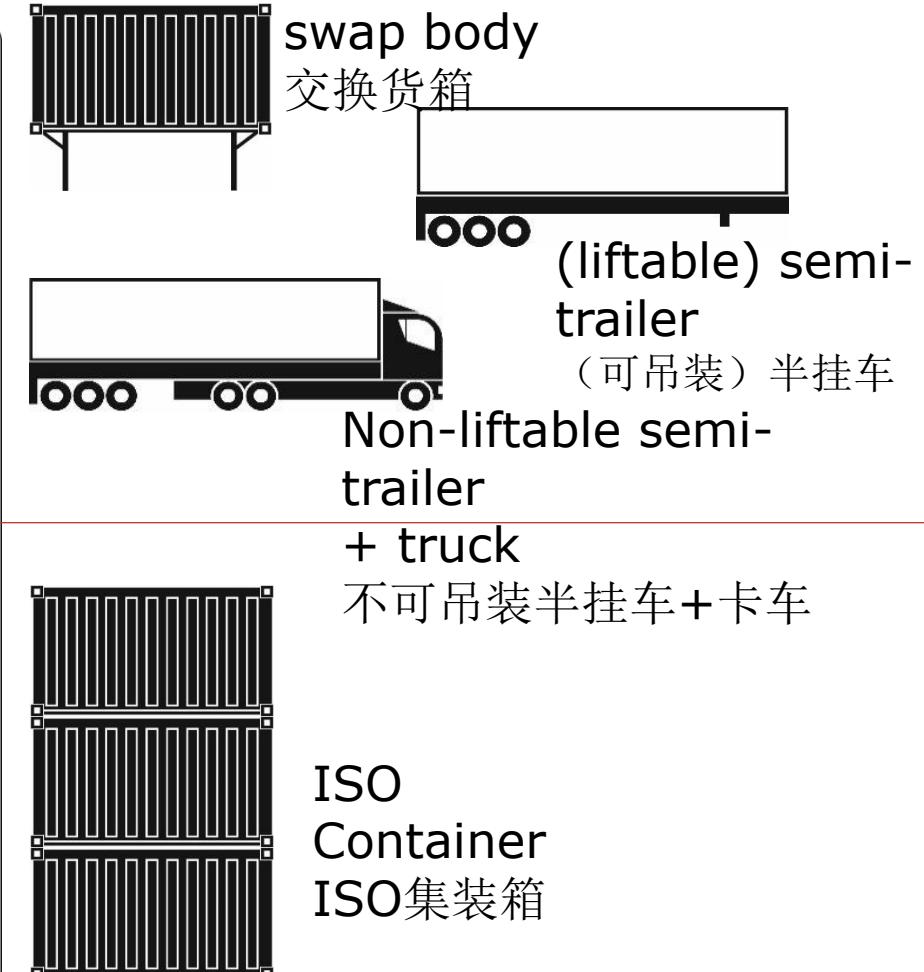
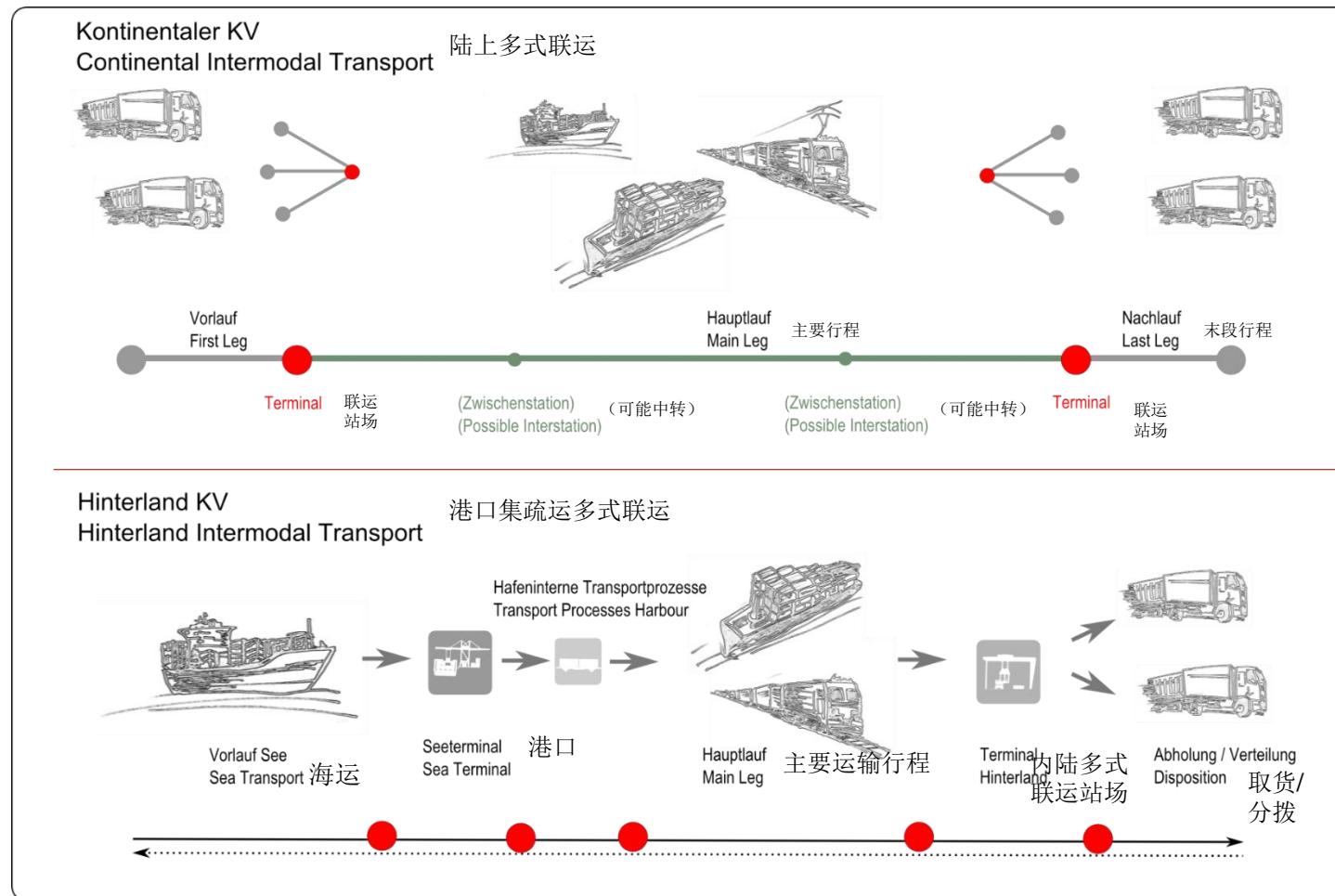


Intermodal loading units I

多式联载运运单元1



INTERMODAL COMPETENCE
SGKV



Intermodal loading units II

多式联运载运单元2



Technical comparison of loading units 载运单元技术比较

	ISO container ISO集装箱	Inland container 内陆集装箱	Swap body 交换装箱
Length 长度	20'/30'/40'/45'	20'/30'/40'/45'/7,82m	7,45m/7,82m/7,85m/13,60m
Width 宽度	2,44m	2,55m / 2,60m	2,55m / 2,60m
Height 高度	2,60m / 2,89m	Not defined 未定	Not defined 未定
Construction 构架	Stability by frame 框架固定	Stability by frame 框架固定	Load-bearing floor 称重底板
Transshipment 转运	Spreader (top lift) 吊具 (顶部吊装)	Spreader (top lift) 吊具 (顶部吊装)	Grappler arms (bottom lift) 抓臂 (底部提升)
Stackable 可叠放	Up to 10 layers 最多10层	2-5 layers (full/empty) 2-5层 (满箱/空箱)	No/yes (empty) 不可/可 (空箱)
Protection on truck/wagon 拖车/货车上保护	Corner fittings acc. ISO 符合 ISO 的角配件	Corner fittings acc. ISO 符合 ISO 的角配件	Corner fittings acc. ISO 符合 ISO 的角配件
Special feature 特点			Legs at 7m Swap bodies 7米的交换装箱装有支架

Standardisation of loading units (selection)装货单位的标准化（节选）

ISO container ISO集装箱

ISO 668 (1995): classification, dimensions, weights 分类、尺寸、重量

ISO 1161 (1984 / 1990): corner castings, requirements 角件、要求

ISO 6346 (1985 & 1995): codification, identification and marking 法典化、识别和标记

Semi-Trailer 半挂车

ISO 337: coupling pin, interchangeability dimensions 联接销、可替换尺寸

96/53/EC: maximum weights and dimensions 最大重量和尺寸

2007/46/EC: approval of motor vehicles and their trailers 机动车辆及其挂车许可

Swap bodies 交换货箱

DIN EN 283: swap bodies, test methods 交换货箱、测试方法

DIN EN 284: non-stackable swap bodies of class C, dimensions and general requirements 不可叠放的C级交换货箱、尺寸和总体要求

DIN EN 452: non-stackable swap bodies of class A, dimensions and general requirements 不可叠放的A级交换货箱、尺寸和总体要求

DIN EN 1432: swap tanks, dimensions, requirements, test methods, operation conditions **non-stackable swap bodies of class A, dimensions, requirements** 交换罐、尺寸、要求、测试方法、操作条件，不可叠放的A级交换货箱、尺寸和总体要求

DIN EN 12406: Swap bodies - Thermal swap bodies of class C, dimensions and general requirements 交换货箱——C级温控交换货箱、尺寸和总体要求

DIN EN 12410: Swap bodies - Thermal swap bodies of class A, dimensions and general requirements 交换货箱——A级温控交换货箱、尺寸和总体要求

DIN EN 12641: Swap bodies and commercial vehicles - Tarpaulins 交换货箱和商业车辆——防水帆布

CEN EN 13044-1: Intermodal Loading Units - Marking - Part 1: Markings for identification 多式联运载运单元—标记—第一部分：识别标记

Container types and standard container dimensions

集装箱类型和尺寸

Container Equipment 集装箱设备



General Purpose Container
普通集装箱



20' 40'
Flat
平底



Reefer Container
冷冻集装箱



40'
General Purpose Container
一般性高集装箱



20' 40'
Platform
平台



40'
Reefer Container
高冷冻集装箱



20' 40'
Hardtop Container
硬顶集装箱



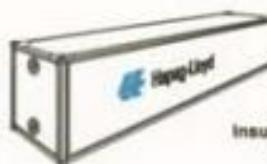
20'
Ventilated Container
通风集装箱



20'
Bulk Container
散货集装箱



20' 40'
Open Top Container
敞口集装箱



20'
Insulated Container
- Porthole Type
隔离式集装箱
舷窗式



20'
Tank Container
罐式集装箱

TYP 类型	Outer dimension 外部尺寸 L/W/H长/ 宽/高	Inner dimension 内部尺寸 L/W/H长/宽/ 高	Volume 容量	Tare weight 皮重	max. payload 最大有效载重	Gross weight (max.) 总重量 (最大)
20'	6,058 m / 2,438 m / 2,591 m	5,910 m / 2,345 m / 2,385 m	33,0 m³	2.250 kg	21.750 kg	24.000 kg
40'	12,192 m / 2,438 m / 2,591 m	12,040 m / 2,345 m / 2,385 m	67,0 m³	3.780 kg	26.700 kg	30.480 kg
40' HC	12,192 m / 2,438 m / 2,890 m	12,040 m / 2,345 m / 2,690 m	76,0 m³	3.900 kg	26.580 kg	30.480 kg
45' HC	13,716 m / 2,438 m / 2,895 m	13,556 m / 2,345 m / 2,695 m	86,0 m³	5.050 kg	27.450 kg	32.500 kg

Source 来源: SGKV



Swap bodies 交换货箱



◆ **flexible carrier designed to be a shutdown platform with braces and specially designed to be transferable between vehicles via a shutdown mode where it rests on the braces at the level of the vehicle.** 具备支架式封闭平台和专门设计用以在不同车辆间在车辆高度的支架上进行封闭式转运的灵活装载容器

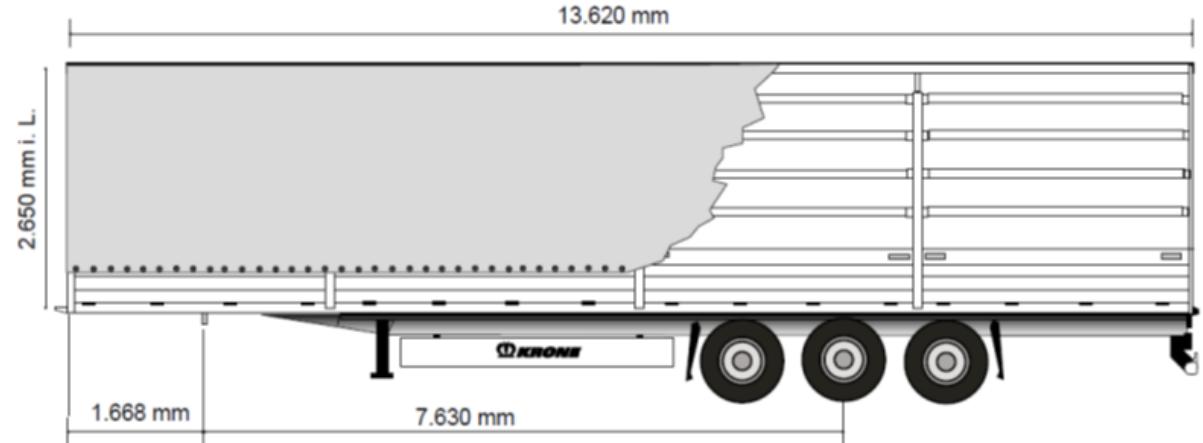
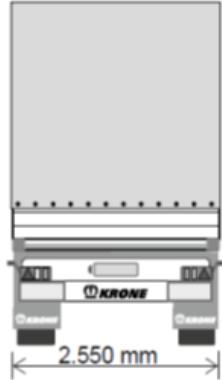
Main differences to ISO-containers 与ISO集装箱的主要区别

◆ **swap body has a mechanical strength calculated on the road, rail and ferry services which may be a difference from the ISO series of containers.** 交换货箱根据公路、铁路和水运计算得出的机械强度可能与ISO系列的集装箱不同。

◆ **The dimensions are usually tailored to maximize the volume of traffic at road (pallet wide)** 尺寸通常调整到公路运输允许的容量的最大值（运货板宽度）

◆ **normally not stackable** 通常不可叠放

Semi-Trailer 半挂车



Source

来源:
http://www.krone-trailer.com/fileadmin/contentmedia/pdf/datenblaetter/Profi_Liner_4-CS_GB.pdf



Cranable 13,60 m standard Semi-trailer (+Megatrailer)

可用起重机处理的**13.60米**标准半挂车（+特大拖车）

Length (inner) 长度 (内部) : 13,62 m

Width (inner) 宽度 (内部) : 2,48 m

Height (inner) 高度 (内部) : 2,70 m (3,00 m)

Tare weight 皮重: 6.770 kg (7200 kg)

Capacity (max.) 容量 (最大) :

Shipped weight (max.) 载重 (最大) :

Loading height 装货高度:

Floor loading (max.) 底部符合 (最大) :

Source 来源: LKW Walter

34 EUR-Paletten

29 Tonnen

2,63 m (3,00 m)

7.000 kg



Why use Semi-Trailer 为何使用半挂车?



Nearly the same
loading capacity
几乎相同的载货容量

45'底板宽度高集装箱
45' High Cube Pallet-wide Container



45' Standard Container 45' 标准集装箱



40' High Cube Pallet-wide Container



40' Standard Container 40' 标准集装箱



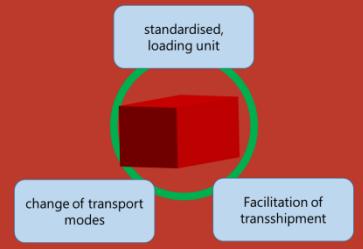
“weapon of choice” of most forwarders (road)

大多数运输公司的首选 (公路)

- **High load capacity** 载货容量大
- **Flexible loading** 装货灵活
- **Flexible use** 使用灵活
- **Useable for perishable goods, cooling units**
可用于易腐败商品、冷冻单元

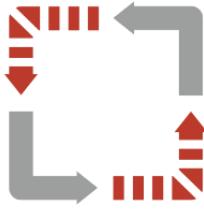
Intermodal terminals

多式联运转运站



INTERMODAL COMPETENCE

SGKV



Basic Function

基本功能

额外功能

Additional Service

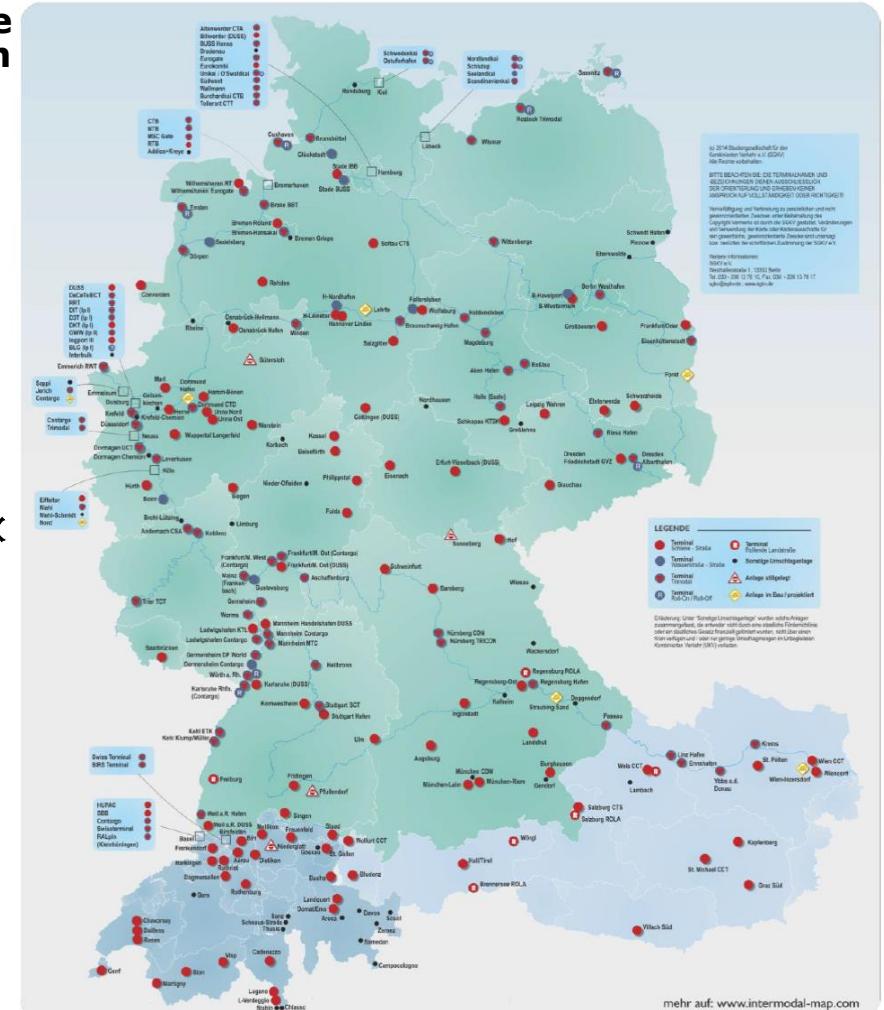
- Transhipment of loading units between different transport modes
Road - Rail - Inland Navigation
- Terminal Handling
 - Check-in/-out
 - Security check
- Intermediate Buffer for loading units / vehicles
- Agency function for railways and operators
- Storage of loading units (Container-Depot)
- Temperature controlled -/ dangerous goods
- Trucking Service
- Container Repair
- Customs Service
- ...

- 不同运输方式之间的载运单元的转运
公路-铁路-内河
- 联运站场操作
 - 驶入/驶出
 - 安检
- 作为载运单元/车辆的中间缓冲
- 为铁路和运营商提供代理
- 储存载运单元（集装箱堆场）
- 控制温度/危险货物
- 货车服务
- 集装箱维修
- 海关服务
-

Source: Kombiconsult / AGORA Project

Political measures- infrastructure (Germany) 政策措施—基础设施 (德国)

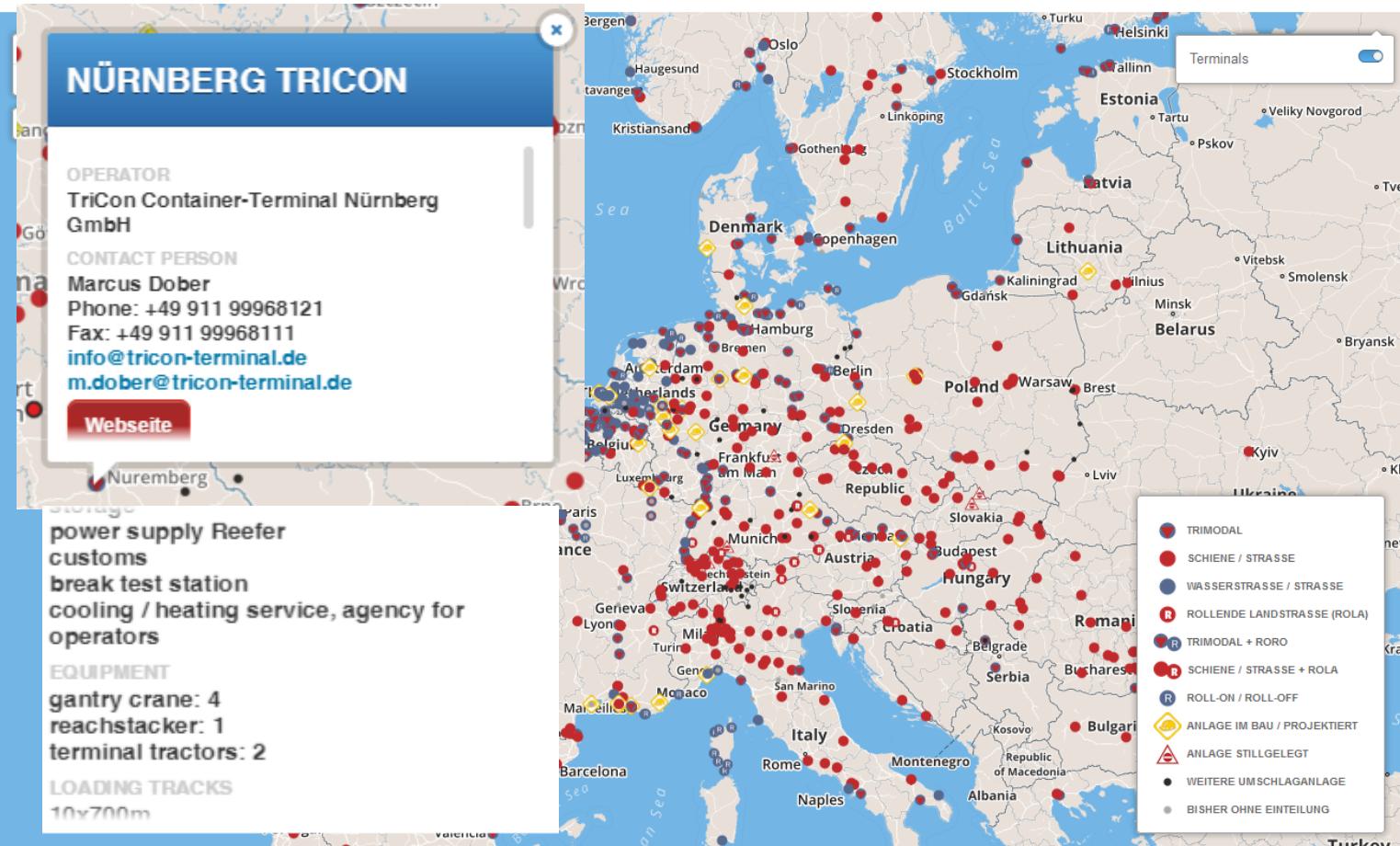
- Funding of terminal infrastructure (next to a funding scheme for private rail infrastructure) is the main approach to foster ecological and sustainable land transportation (combined transport).**
为联运站场基础设施提供资金（在私人铁路基础设施出资计划之后）是培养生态型、可持续陆上运输（多式联运）的主要办法。
- In 2016, 106 Mio. EUR will be made available for terminal construction and upgrades of existing sites**
2016年，将有**1.06亿欧元**用于联运站场建设和现有站点升级。
- Up to 80 % of eligible costs for terminal construction are covered by the German Ministry for Transport** 多达**80%**联运站场建设的资金由德国交通部支付。
- Over 250 Mio. EUR invested by the private sector** 私营部门投资超过**2.5亿欧元**。
- The German government has helped build over 120 terminals since the 1990s, creating one of the most effective terminal landscape in Europe!**
1990年代以来，德国政府帮助修建了超过120个联运站场，形成了欧洲最有效的联运站场网络之一
- 44-tonne regulation 44吨规定
- Exception from motor vehicle tax for towing vehicles 拖车免收机动车税
- Reduced limitations on transport times or cabotage 减少运输时间或运输权限制
- Indirect advantage: cost reduction on road toll (only first and last leg) 间接好处：公路通行费降低（多式联运的首段和末段公路行程）



Terminal landscape Europe

欧洲联运站场情况

Intermodal Map | Wie funktioniert die Karte? | Terminal melden / korrigieren | Konditionen | Login |



INTERMODAL
MAP

Sponsored by

Frankenbach

GO MULTIMODAL Think Multimodal - GO MULTIMODAL

kinz

SUT SCHIFFAHRT HAFEN BAHN UND TECHNIK LOGISTIK+TRANSPORT INTERMODAL www.schiffahrtundtechnik.eu

RAILCARGO ONLINE.COM

The terminal network

联运站场网络:

core of the european intermodal transport

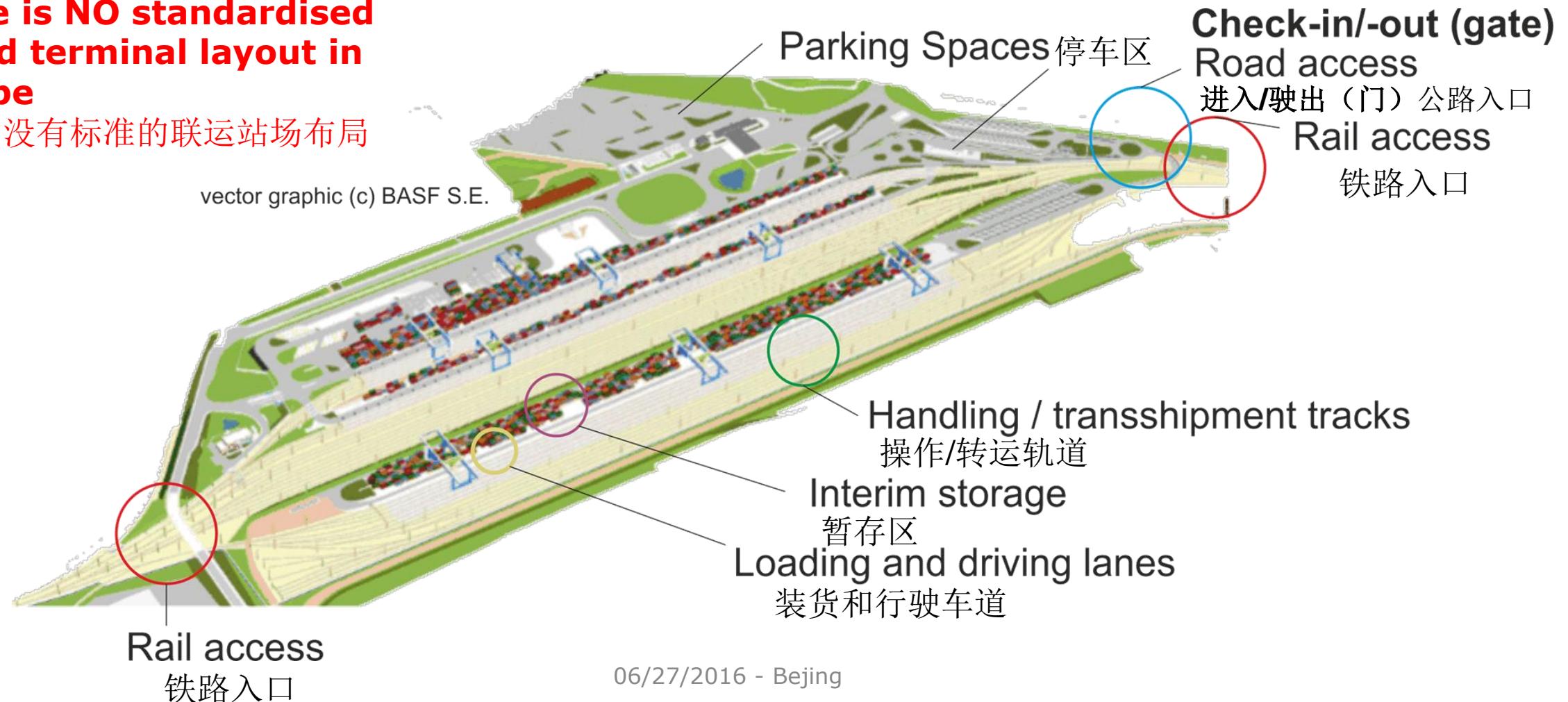
欧洲多式联运的核心

- 1200 + terminals in the European Intermodal Map 欧洲联运地图上有超过1200个转运站
- Concentration along the axis of Netherlands, Germany, Austria/Switzerland and Northern Italy 荷兰、德国、奥地利/瑞士和意大利北部的轴心沿线最为集中
- Still strong focus on hinterland transport 仍高度重视内陆运输
- Terminals are vital access points for the European corridors 联运站场是欧洲通道的重要接入点
- No standardization or basic layout 不存在标准化或基本配置

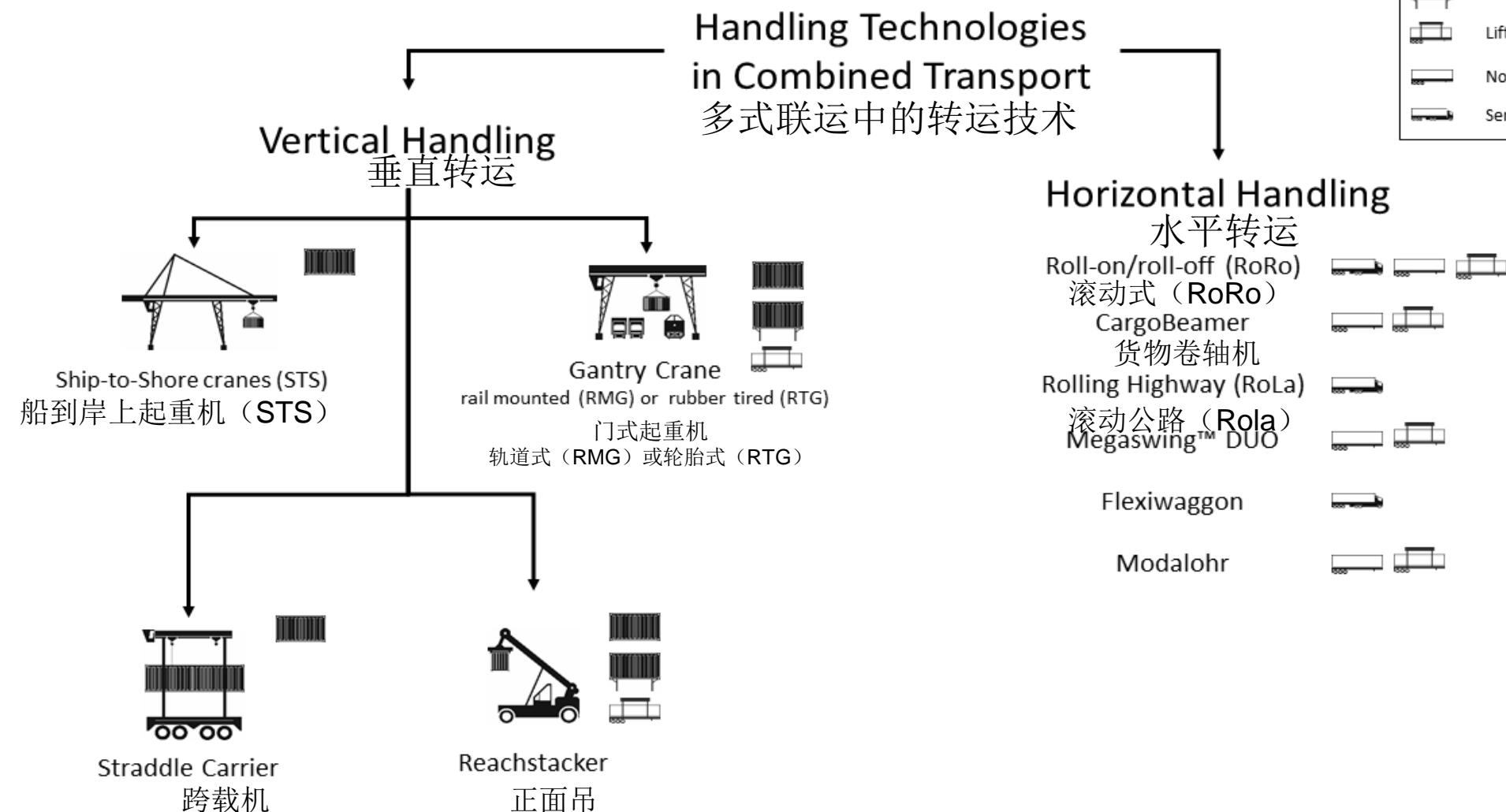
Terminal layout 联运站场布局

There is NO standardised inland terminal layout in Europe

欧洲的没有标准的联运站场布局



Terminal equipment 联运站场设施



Equipment: Gantry Crane

设备：门式起重机

◆ rail mounted container gantry cranes are designed as two-girder bridge, steel construction, the system enables swing-free travel in gantry and trolley direction 轨道式集装箱门式起重机的设计包括双梁桥、钢架结构，整个系统保障货物在不摇晃的情况下沿门座或轨道方向运行

◆ Exception: Rubber Tyre Gantry Crane 例外：橡胶轮胎门座起重机

◆ handling of road, rail and barge volumes 处理公路、铁路和驳船货物

◆ estimated costs between 1,5 und 3 Mio. EUR, not customized

预计成本150-300万欧元，不可定制

◆ much faster than a Reach Stacker, ca. 30 lifts per hour vs. 10-20 lifts per hour 比正面吊快得多，每小时抬举30次vs每小时10-20次



Source: SGKV

Source 来源：

https://www.kuenz.com/fileadmin/assets/content-Bilder/KRANE/575x275_Kuenz_Hafen-Strasbourg-mit-beiden-Kranen.jpg

Example: Gantry Crane

举例：门式起重机

DUSS PKV - Terminal Duisburg 杜伊斯堡联运站场

Technical Data 技术数据

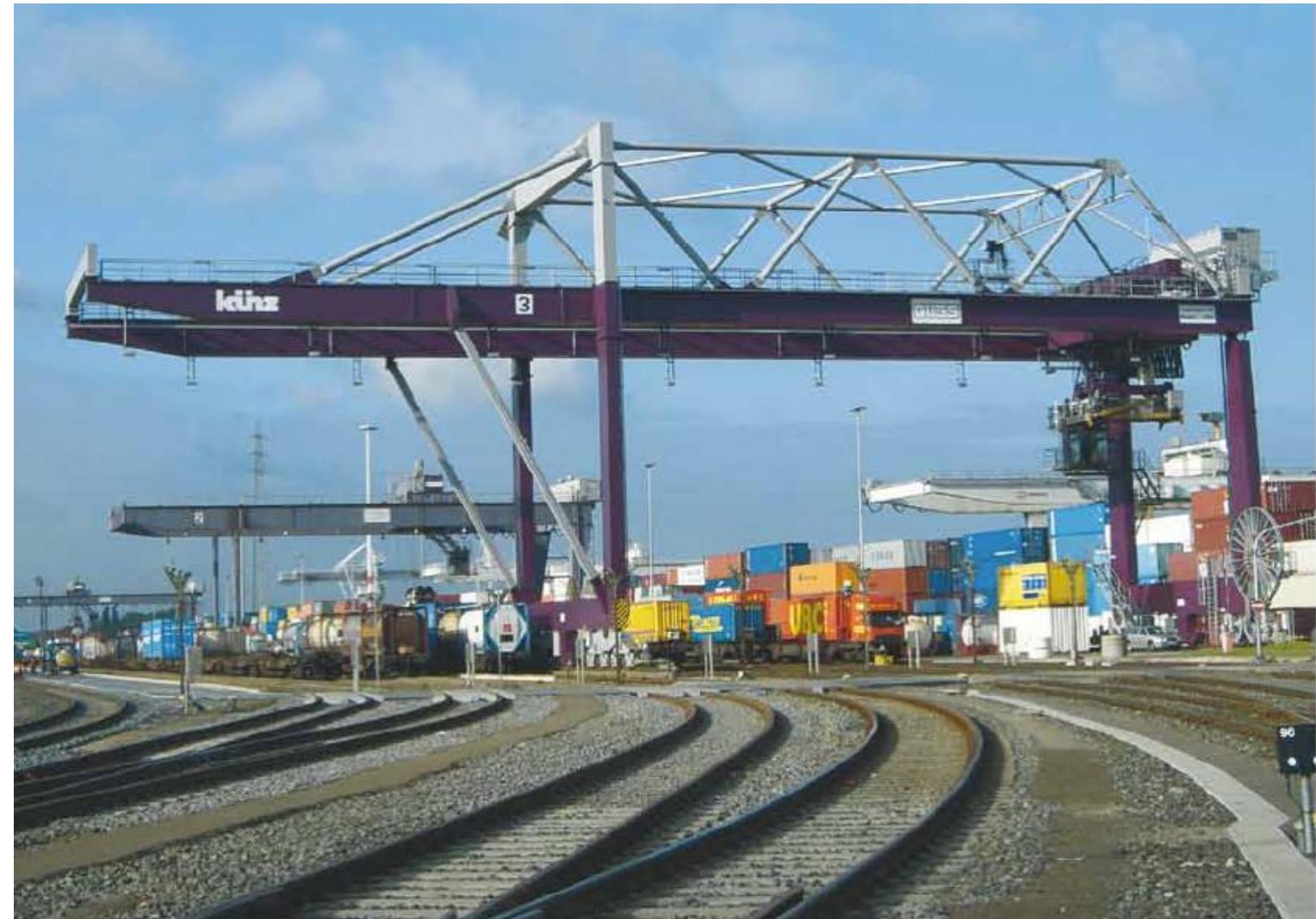
Lifting capacity of Kuenz Spreader	Kuenz吊具的抬举重量	41 t
Rail gauge 轨道标准	:	36 m
Cantilever length 悬臂长度	:	21 m

Working speeds 工作速度

Hoist rated load 提升机额定负重	:	0–15 m/min
Hoist partial load 提升机部分负重	:	0–30 m/min
Gantry drive 门座活动	:	0–120 m/min
Trolley drive 轨道活动	:	0–100 m/min
Slewing 旋转	:	1.6 rpm
Lifting height 抬升高度	:	12.8 m
Length of rail tracks 轨道长度	:	800 m

Power consumption 耗电

Main hoist 主提升机	:	1x180 kW
Gantry drive 门座活动	:	26x13 kW
Trolley drive 轨道活动	:	4x16 kW
Slewing 旋转	:	1x7 kW



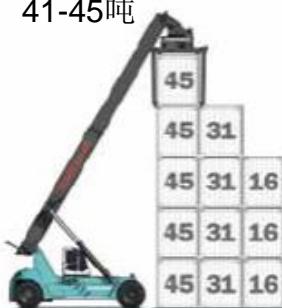
Equipment: Reach stacker

设备：正面吊

- ◆ up to 50 t. lift capacity, around 100 t. Weight
抬升重量不超过50吨，重量约100吨
- ◆ Use as gantry crane support or main handling device in small terminals
用作门式起重机支持设备或小型联运站场的转运设施
- ◆ handling of road, rail and barge volumes
处理公路、铁路和驳船货物
- ◆ estimated costs from ca. 500.000 EUR
预计成本50万欧元起

Reach stackers for intermodal handling, 41 to 45 tons

正面吊，41-45吨



MODEL NAME	CAPACITY	WHEELBASE
SMV 4123 CB5	41-23.9 tons	6400 mm
SMV 4527 CB5	45-27-13 tons	6400 mm
SMV 4531 CB5	45-31-16 tons	6400 mm
SMV 4531 CBX5***	45-33-20 tons	6400 mm
SMV 4533 CB5	45-33-16 tons	6400 mm
SMV 4533 CBX5***	45-37-24 tons	6400 mm

Reach stackers for barge handling, 45 tons

驳船处理用正面吊，45吨



MODEL NAME	型号名称	CAPACITY	载重	WHEELBASE	轴距
SMV 4542 TB4 BH		45-37-23 tons (yard)		7500 mm	
		43-30-18 tons (barge)		7500 mm	
SMV 4542 TBX4 BH**		45-41-31 tons (yard)		7500 mm	
		45-37-26 tons (barge)		7500 mm	
SMV 4545 TB3 BH		45-45-35 tons (yard)		9000 mm	
		45-37-30 tons (barge)		9000 mm	



Source: SGKV

Handling of Intermodal Loading Units – container and RoLa 对多式联运载运单元-集装箱的转运与“滚动的公路”

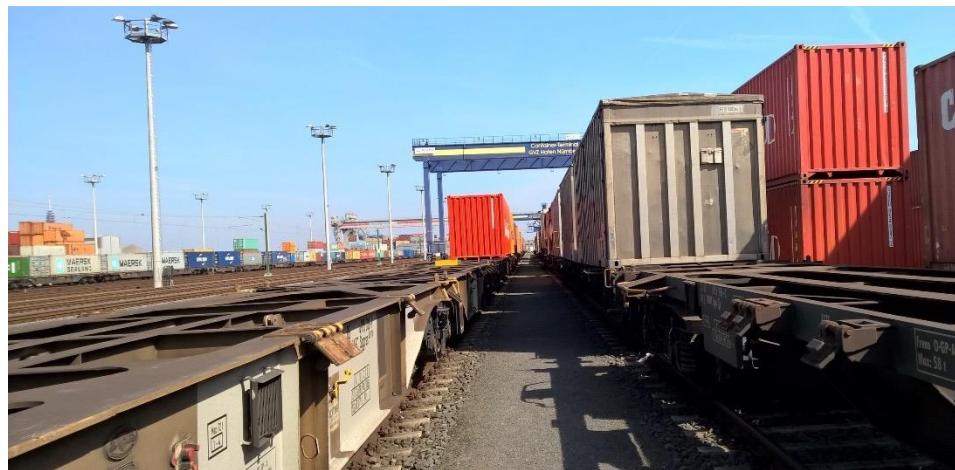


Quelle:
www.kombiverkehr.de

Continental transport with Trucks, RoLa



Quelle:
<http://media4.industriemagazin.net>



Handling of Semi-Trailers /swap bodies

交换货箱的转运

Grappler pocket: swap bodies



Grappler pocket: semi-trailer



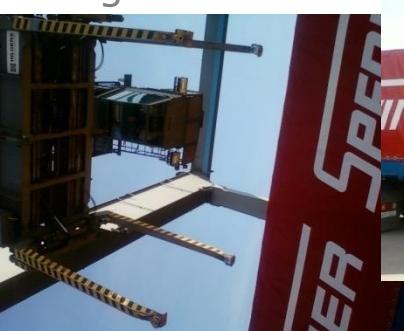
Spreader with piggyback



Source:
https://www.kuenz.com/fileadmin/assets/content-Bilder/KRANE/575_275_Kuenz-Spreader-BASF.jpg

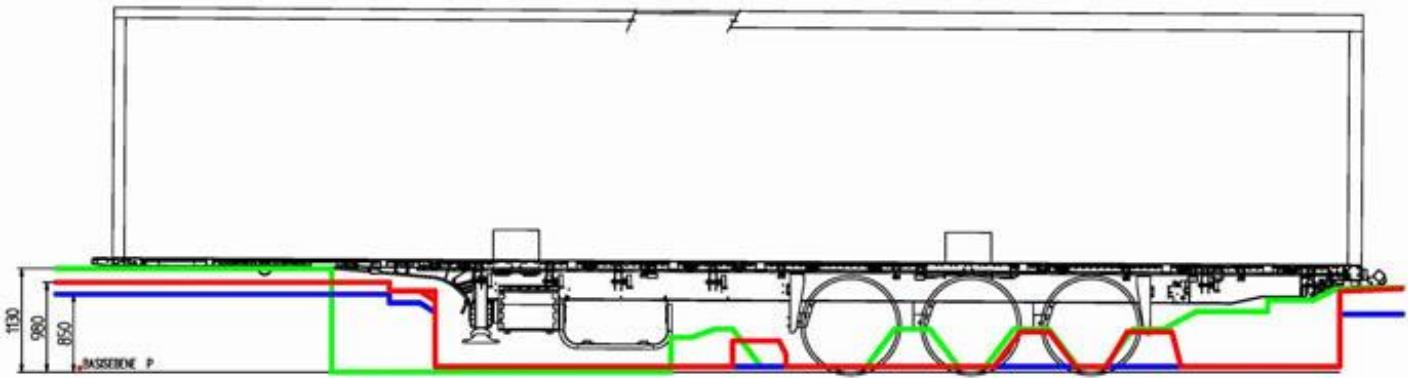
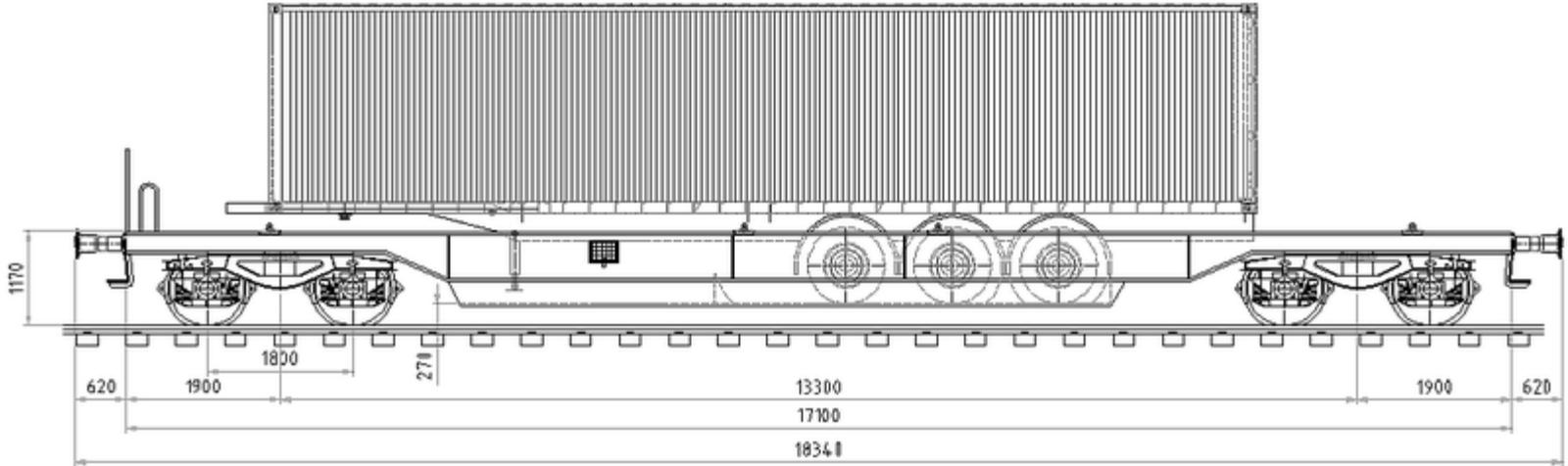
Handling of a semi-trailer, lift into a pocket

wagon



Handling of Semi-Trailers – pocket wagon

半挂车的转运-口袋式火车车厢



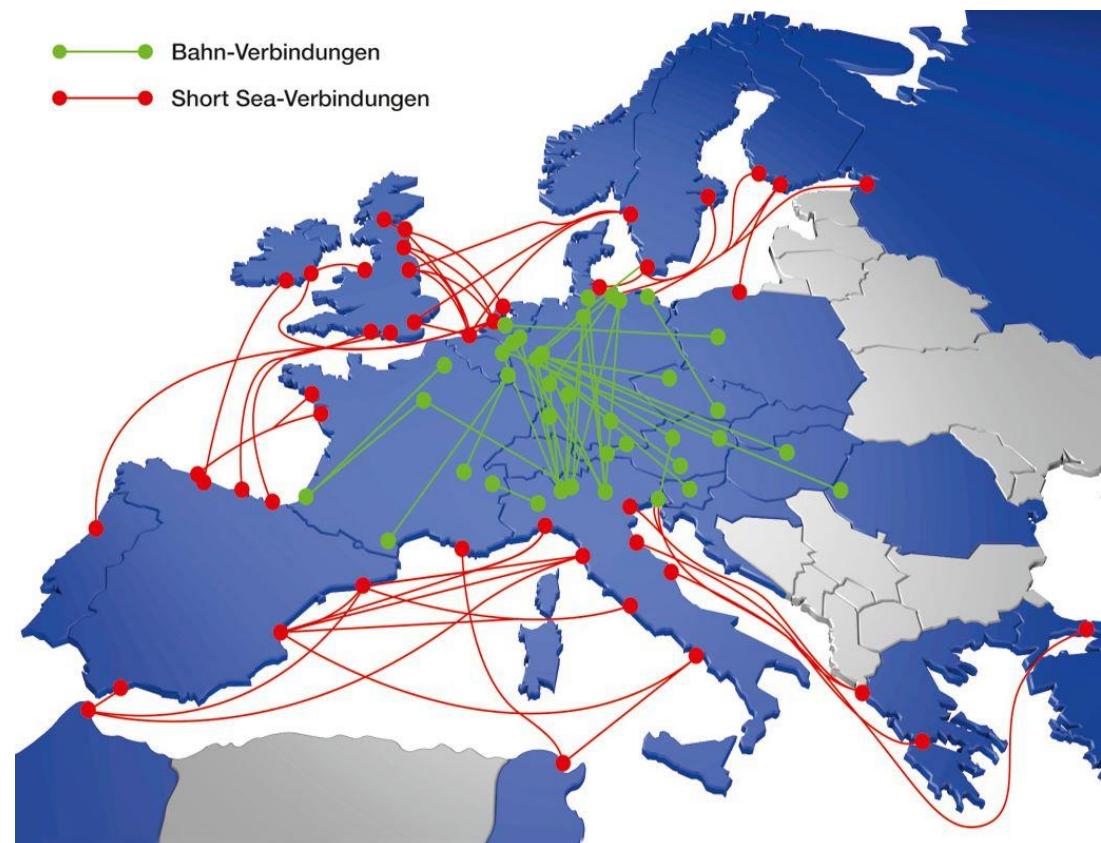
Source: Schmitz Cargobull



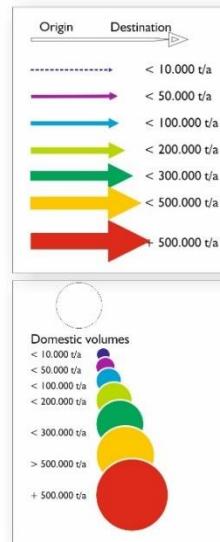
Source: SGKV

Case Example: intermodal transport flows 实例：多式联运链

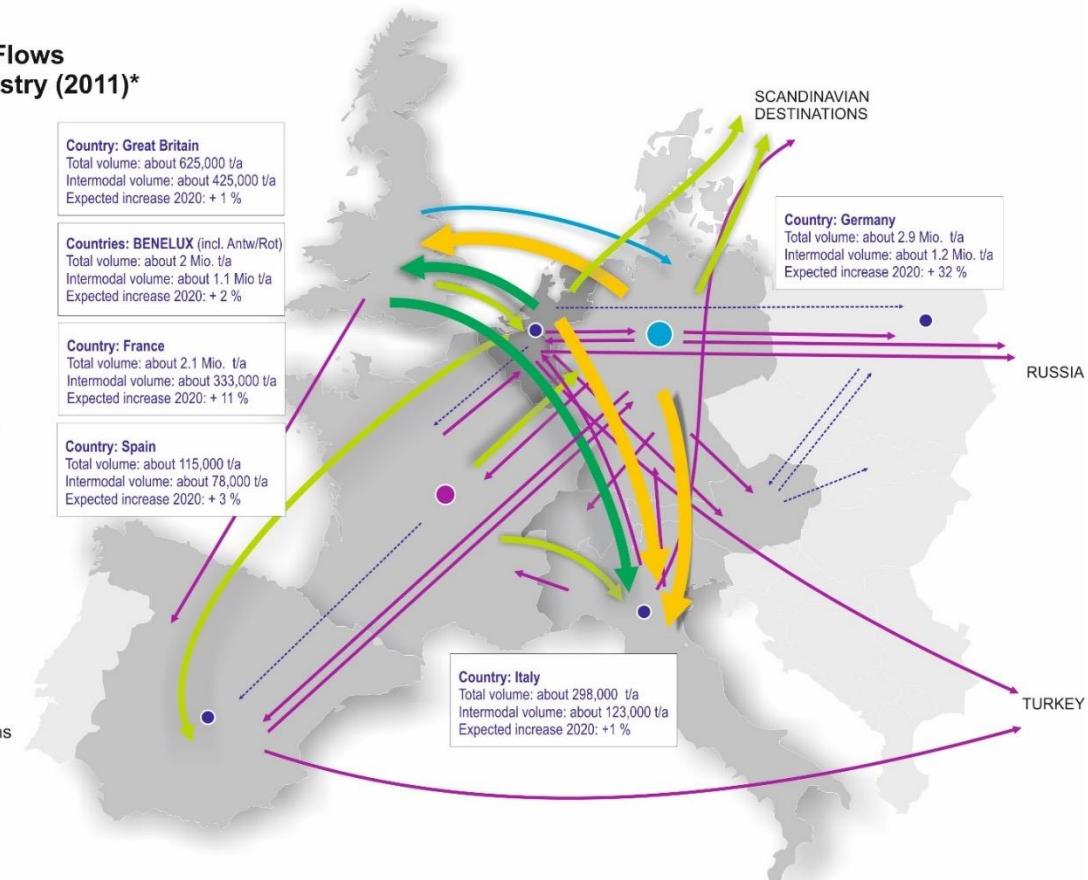
LKW Walter: semi-trailers (more than 200 daily departures, rail and short sea) Walter公司：半挂车（200/天，铁路，近海）



Main INTERMODAL Flows of the Chemical Industry (2011)*



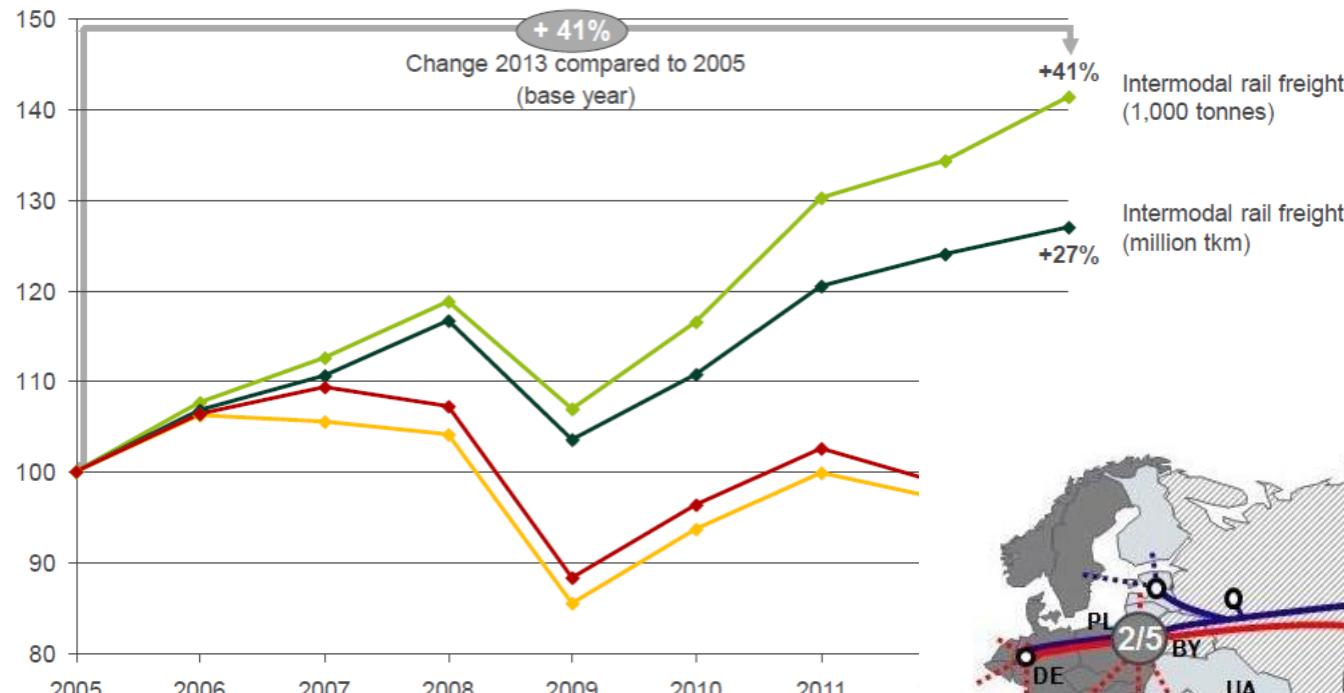
* Volumes are based on the ten most important connections of each participant (chemical industry) of the survey.



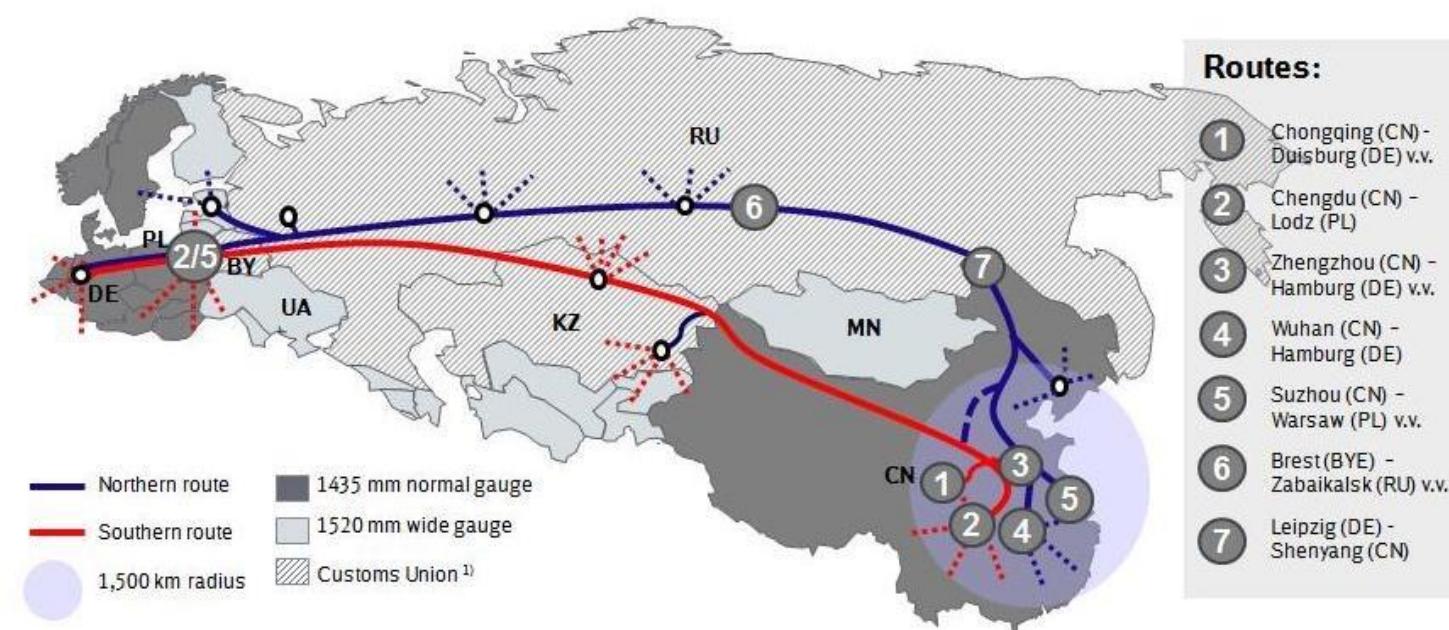
CT development – general outlook

多式联运的发展-整体展望

RAIL MARKET DEVELOPMENT



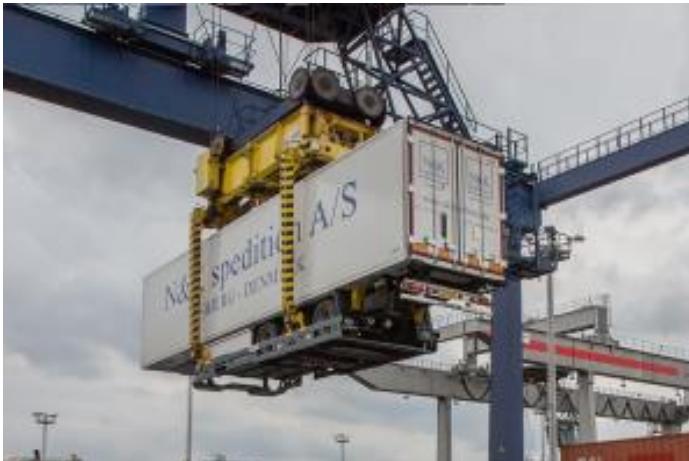
Source: UIC, 2014 Report on combined transport in Europe



CT development – vertical handling of non-liftable semi-trailers

多式联运发展-不可吊装的半挂车的垂直转运

Platform based: ISU and NIKRASA, lift into a pocket wagon



INTERMODAL COMPETENCE
SGKV

TomLift – retrofit semi-trailers for lifting



Source:
<http://www.nikrasa.eu/de/startseite.html>

Source: SGKV



CT development – horizontal handling of non-liftable semi-trailers

多式联运的发展-不可吊装的半挂车的水平转运

INTERMODAL COMPETENCE
SGKV ↗ ↘ ↙ ↚

Modalohr (France)



CargoBeamer (Germany)



CargoBeamer AG

Source:

<http://www.modalohr.com>

Source: SGKV, CargoBeamer



Clemens Bochynek

SGKV e.V.

Westhafenstr. 1, 13353 Berlin, Germany

T +49 30 206 13 76 0

F +49 30 206 13 76 17

www.sgkv.de

www.intermodal-map.com