

FRÄNKISCHE

INDUSTRIAL PIPES

FIPCOOLING

Thermal management for industrial applications

CHARGING
STATIONS

SERVER
SOLUTIONS

ENERGY
STORAGE
SYSTEMS

BATTERY
and HYBRID
VEHICLES

TRUCKS /
BUSES



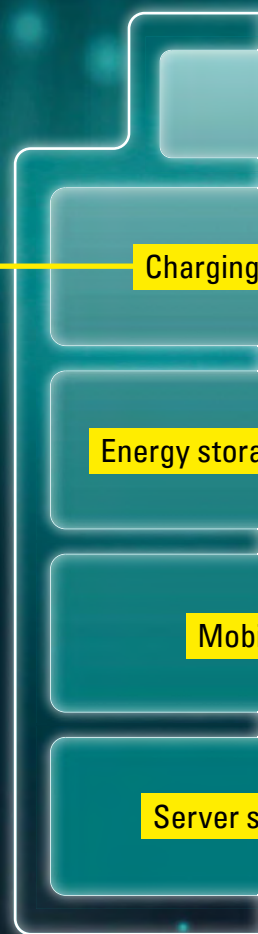
Liquid cooling – the best solution to develop the most effective system

The **Lithium-ion batteries**, used in electro mobility, boast an efficiency below 90 % – the rest is emitted as heat. Those highly sensitive batteries do not tolerate very high or low temperatures. The life cycle of batteries is dependent on constant temperature with minimal fluctuation. Therefore the operating temperature should be between **15°C to 35°C**. This makes thermo management essential for any energy application working with batteries and heat exchanging components. Besides maintaining the cell temperatures the challenges for cooling systems lie in removing the heat from the energy storage system. To remove substantial amounts of heat with relatively **low flow rates**, using a liquid cooling system will be the right choice.

FRÄNKISCHE Industrial Pipes develops **tailor-made thermal solutions**. The installation-friendly systems in individual designs and with integrated sensors, can be used in **charging stations, battery and hybrid cars, trucks and buses** as well as in **energy storage systems** for the industrial sector. The wide product range comprises complex systems made of **corrugated and smooth tubing systems, space-saving connectors, blow-molded connecting elements** and **various plug systems** with integrated sensors.

The **weight-saving solutions** from FRÄNKISCHE Industrial Pipes are made up of lightweight components and use the available space optimally. Users also benefit from integrated additional functions. Special materials ensure high mechanical characteristics, resistance against a number of chemical substances and a lower sensitivity to hydrolysis. Our portfolio completes your thermal system and ensures a reduced number of components at the same time.

Our Thermal Management systems ensure a **long maintenance-free service life** of the individual components and minimize downtime for charging and storage stations, always ideally tailored to the installation situation and the respective customer requirements.



FIPCOOLING



stations

ge systems

ility

solutions

CONNECT 6:

Our 6 components for your individual thermal management system

Our wide range of products for charging stations, server systems, energy storage systems, battery and hybrid cars, and trucks and buses can be individually composed of the following 6 components:

1

FIPCOOL

Powerful corrugated and smooth tubes

2

FIPCOOLSC

Space-optimized connectors
with special features

3

FIPCOOLCONTROL

Function-integrated plug systems
with integrated sensors

CONN

FIPCOOLING

4

FIPCOOLCONNECT

Form-fitting connecting elements

5

FIPCOOLFIX

Securely lockable fixing elements

6

FIPCOOLPROTECT

Protection sleeves and pads

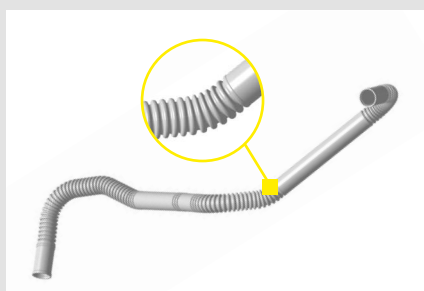
ECT 6

1 Powerful corrugated and smooth tubes

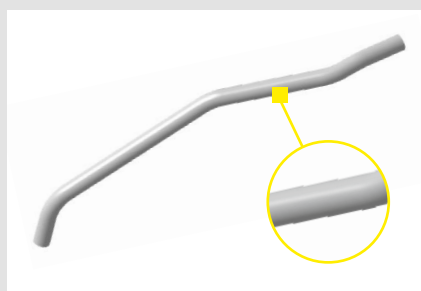
Complete systems from one provider: Our connectors are designed for corrugated tube standards, of which we also offer a wide product portfolio. We provide corrugated and smooth tubing solutions out of different materials. Tube dimensions from NW 8 – 37 have been proven to be the most common choice for our customers product requirements. Not only mono and multi layers but also customized shapes and profiles belong to our core competences. Furthermore tubes with an exact adjusted ratio between flexibility and stiffness characterize us.

Please contact us for your individual solution.

Different tube styles



Corrugated tube



Smooth tube

Outstanding solutions

- different lengths, diameters and profiles within one tube
- variable cuff diameters
- various designs of assembly ribs
- stiff expansion bodies with different shapes (round, oval, angular)
- different sections for fixation and clipping segments
- modern assembly technology
➔ significantly extended lifetime
- peak value 10 bar
- material chosen by specialists for each application
- abrasion- and temperature-resistant thanks to the choice of design and materials

Product overview corrugated tubes

NW size	ID convolute	OD convolute	bending radius	weight per meter
mm	mm	mm	mm	g/m
8	7.5	12.4	30	28.0
10	7.2	12.7	30	41.7
12	10.8	16.0	40	42.4
16	16.5	21.7	55	72.0
18	18.2	23.8	60	75.0
20	20.0	26.5	65	108.0
22	22.4	28.0	70	114.0
37	38.4	43.8	90	147.0

Product overview smooth tubes

NW size	ID	OD	bending radius	weight per meter
mm	mm	mm	mm	g/m
6×1	4.0	6	20	16.0
8×1	6.0	8	25	22.5
10×1	8.0	10	30	28.8
12×1	10.0	12	35	35.3
12×1.5	9.0	12	35	50.5
14×1	12.0	14	40	41.7
16×1.25	13.5	16	50	59.1
18×1.5	15.0	18	55	79.3
19×1.5	16.0	19	55	84.1
21×1.5	18.0	21	65	93.7
25×1.5	22.0	25	75	113.0

2 Space-optimized connectors with special features

Quick connectors guarantee the simple and secure connection of tube systems in thermal applications, tailored to a long service life.

The products of FRÄNKISCHE Industrial Pipes save both space and time during assembly and therefore provide cost benefits to our valued customers. With additional integrated functions, such as sensors or anti rotation, the standard connectors are individually tailored to the needs of FIP customers and tailored to the respective tubes. The new developed standard connectors for thermal management convince with high connection reliability.

Nevertheless, they are easily removable and reusable. In the majority of cases connectors in the field of cooling are temperature resistant between -40°C and $+80^{\circ}\text{C}$.

Outstanding solutions

- many available dimensions
- raw materials can be combined
- higher inner-diameter in connection area → better flow rate
- one or two sealing rings in different materials available
- "safety lock" click confirmation, increasing quality and safety
- tool-free assembly

Different QC styles



FIPSC SAE

Smart connector with SAE standard



FIPSC MC

Smart connector with metal clamp, VDA standard




FIPSC SPECIALS

Smart connector with special features

FIPCOOL SC


Product overview

FIPSC SAE

FIPSC SAE 180°	Connection interface	NW	Cat. no.
	7,89	6	FIPSC-SAE-F-7,89-180-6
		8	FIPSC-SAE-F-7,89-180-8
	9,49	6	FIPSC-SAE-F-9,49-180-6
		8	FIPSC-SAE-F-9,49-180-8
	9,89	6	FIPSC-SAE-F-9,89-180-6
		8	FIPSC-SAE-F-9,89-180-8
	11,8	8	FIPSC-SAE-F-11,8-180-8
		10	FIPSC-SAE-F-11,8-180-10
	12,61	10	FIPSC-SAE-F-12,61-180-10
		12	FIPSC-SAE-F-12,61-180-12
	15,82	10	FIPSC-SAE-F-15,82-180-10
		13	FIPSC-SAE-F-15,82-180-13
		13,5	FIPSC-SAE-F-15,82-180-13,5
		15	FIPSC-SAE-F-15,82-180-15

Characteristics FIPSC SAE


- only one interface
➔ optimized leakage rate
- two sealing rings in different materials according to the SAE standard
- available with one or two buttons
- male part opens the way for clamp, once it reached end position
- closing clamp is locked without an assembled male part
- edged clamp dives into rounded QC in closed condition obvious appreciable


FIPSC SAE 90°	Connection interface	NW	Cat. no.
	7,89	6	FIPSC-SAE-F-7,89-90-6
		8	FIPSC-SAE-F-7,89-90-8
	9,49	6	FIPSC-SAE-F-9,49-90-6
		8	FIPSC-SAE-F-9,49-90-8
	9,89	6	FIPSC-SAE-F-9,89-90-6
		8	FIPSC-SAE-F-9,89-90-8
	11,8	8	FIPSC-SAE-F-11,8-90-8
		10	FIPSC-SAE-F-11,8-90-10
	12,61	10	FIPSC-SAE-F-12,61-90-10
		12	FIPSC-SAE-F-12,61-90-12
	15,82	10	FIPSC-SAE-F-15,82-90-10
		13	FIPSC-SAE-F-15,82-90-13
		13,5	FIPSC-SAE-F-15,82-90-13,5
		15	FIPSC-SAE-F-15,82-90-15


FIPCOOL SC

Product overview

FIPSC MC


FIPSC MC 180°	NW	Cat. no.
	6	FIP-SC-MC-F-180-6
	8	FIP-SC-MC-F-180-8
	10	FIP-SC-MC-F-180-10
	12	FIP-SC-MC-F-180-12
	14	FIP-SC-MC-F-180-14
	16	FIP-SC-MC-F-180-16
	18	FIP-SC-MC-F-180-18
	20	FIP-SC-MC-F-180-20
	22	FIP-SC-MC-F-180-22
	24	FIP-SC-MC-F-180-24
	26	FIP-SC-MC-F-180-26
	32	FIP-SC-MC-F-180-32
	37	FIP-SC-MC-F-180-37


FIPSC MC 90°	NW	Cat. no.
	6	FIP-SC-MC-F-90-6
	8	FIP-SC-MC-F-90-8
	10	FIP-SC-MC-F-90-10
	12	FIP-SC-MC-F-90-12
	14	FIP-SC-MC-F-90-14
	16	FIP-SC-MC-F-90-16
	18	FIP-SC-MC-F-90-18
	20	FIP-SC-MC-F-90-20
	22	FIP-SC-MC-F-90-22
	24	FIP-SC-MC-F-90-24
	26	FIP-SC-MC-F-90-26
	32	FIP-SC-MC-F-90-32
	37	FIP-SC-MC-F-90-37

FIPSC MC 135°	NW	Cat. no.
	6	FIP-SC-MC-F-135-6
	8	FIP-SC-MC-F-135-8
	10	FIP-SC-MC-F-135-10
	12	FIP-SC-MC-F-135-12
	14	FIP-SC-MC-F-135-14
	16	FIP-SC-MC-F-135-16
	18	FIP-SC-MC-F-135-18
	20	FIP-SC-MC-F-135-20
	22	FIP-SC-MC-F-135-22
	24	FIP-SC-MC-F-135-24
	26	FIP-SC-MC-F-135-26
	32	FIP-SC-MC-F-135-32

Characteristics FIPSC MC

- only one interface
 - ➔ optimized leakage rate
- connection case is exchangeable
- anti-rotation features – Poka Yoke
- increased wall thickness

FIPSC MC 120°	NW	Cat. no.
	12	FIP-SC-MC-F-120-12
	18	FIP-SC-MC-F-120-18
	22	FIP-SC-MC-F-120-22

FIPSC MC 145°	NW	Cat. no.
	16	FIP-SC-MC-F-145-16



Product overview

FIPSC SPECIALS

FIPSC Low Profile	Angle	NW	Cat. no.
	180°	6	FIPSC-LP-F-180-6
		22	FIPSC-LP-F-180-22
	90°	6	FIPSC-LP-F-90-6
		12	FIPSC-LP-F-90-12
		18	FIPSC-LP-F-90-18
	135°	6	FIPSC-LP-F-135-6
	85°	12	FIPSC-LP-F-85-12
	93°	12	FIPSC-LP-F-93-12
	123°	16	FIPSC-LP-F-123-12
	125°	16	FIPSC-LP-F-125-12

Characteristics FIPSC SPECIALS

- special features for each application such as Dry-Disconnect (Shut-off) for improved maintenance management
- anti-rotation features – Poka Yoke
- low profile connectors for limited space applications
- cooling plate interface

FIPSC VDA Dry-disconnect	Angle	NW	Cat. no.
	180°	8	FIPSC-SO-F-180-8
		12	FIPSC-SO-F-180-12
		18	FIPSC-SO-F-180-18
	90°	8	FIPSC-SO-F-90-8
		12	FIPSC-SO-F-90-12
		18	FIPSC-SO-F-90-18

FIPCOOLCONTROL

3 Function-integrated plug systems with integrated sensors

FIP acknowledges the customers need for integrated sensor technologies with wire connections to automatically alert and control the temperature of the liquid passing through our tubing solutions.

Our FIPSC MC connector system with integrated sensors are used across all application fields and are highly customizable depending on the systems environmental requirements.

Outstanding solutions

- integrated sensor technology
- efficient interaction
- intelligent functions
- mechanical foolproof
- easy assembly

Different ways for connection with sensors



FIPSC MC with sensor integrated



Connection piece
with sensor integrated

FIPCOOLCONNECT

4 Form-fitting connection elements

Different customized connecting pieces



T-interconnection piece



Pass trough

Outstanding solutions

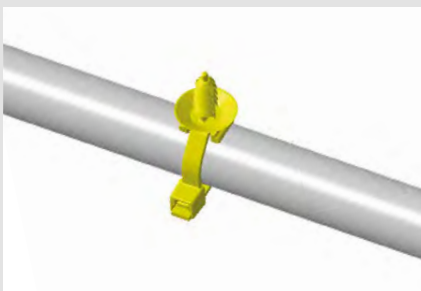
- compact design
- long service life
- various dimensions
- mechanical foolproof
- easy assembly
 - + Y / T / K- interconnections
- customized solutions



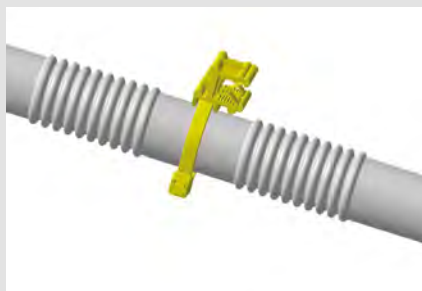
Y-interconnection pieces

5 Securely lockable fixing elements

Different ways of fixing



Fir tree clip



Fixing plate zip tie

Outstanding solutions

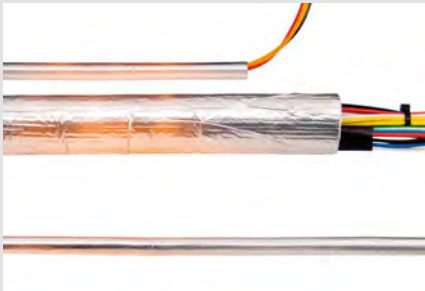
- easy handling
- compact design
- tailored to the system specifications
- cost-effective

FIPCOOLFIX

FIPCOOLPROTECT

6 Protective sleeves and pads

Different applications



Heat reflection

e. g. FAP



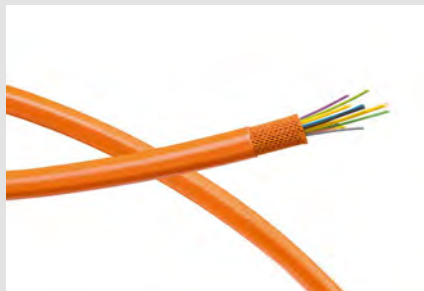
Heat protection

e. g. G0S



Abrasion protection

e. g. FS 2 Million / Pad



Crash protection

e. g. GA6



Special solutions

e. g. Isocorr S

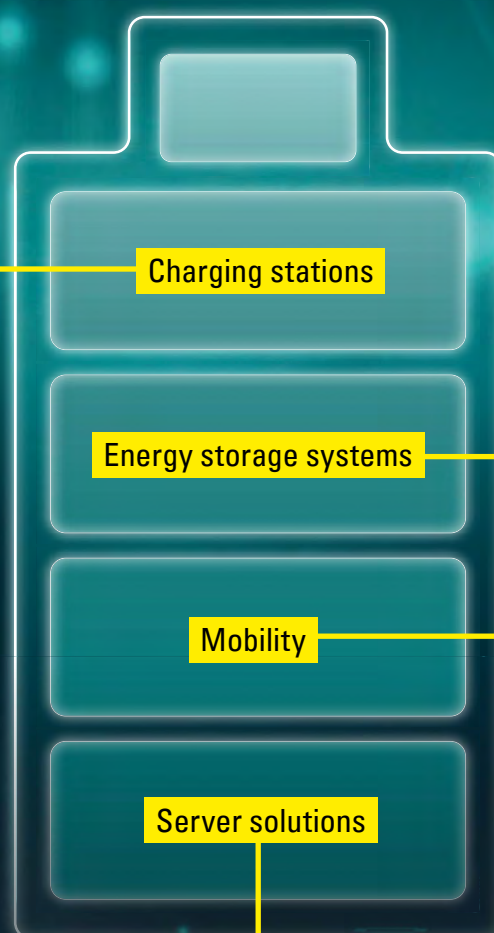
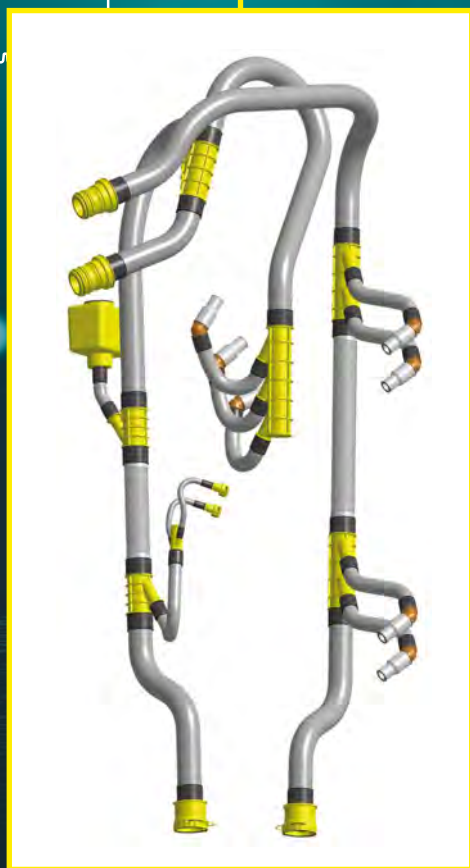
Outstanding solutions

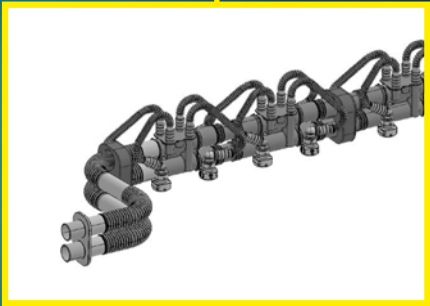
- reliable cable protection
- chemical-resistant to all media used in cars (fuels, engine oils, etc.)
- highly flexible, narrow bending radii possible
- wide range of diameters
- fast assembly
- corrosion resistant
- 100% recyclable
- UV resistant
- high temperature protection
- partially retrofit installation possible

For more information about our protective products, please visit our website at www.fraenkische-ip.com or see our main catalogue „Protection systems – Protective sleeves and pads“.

FIPCOOLING

The best solution for each application

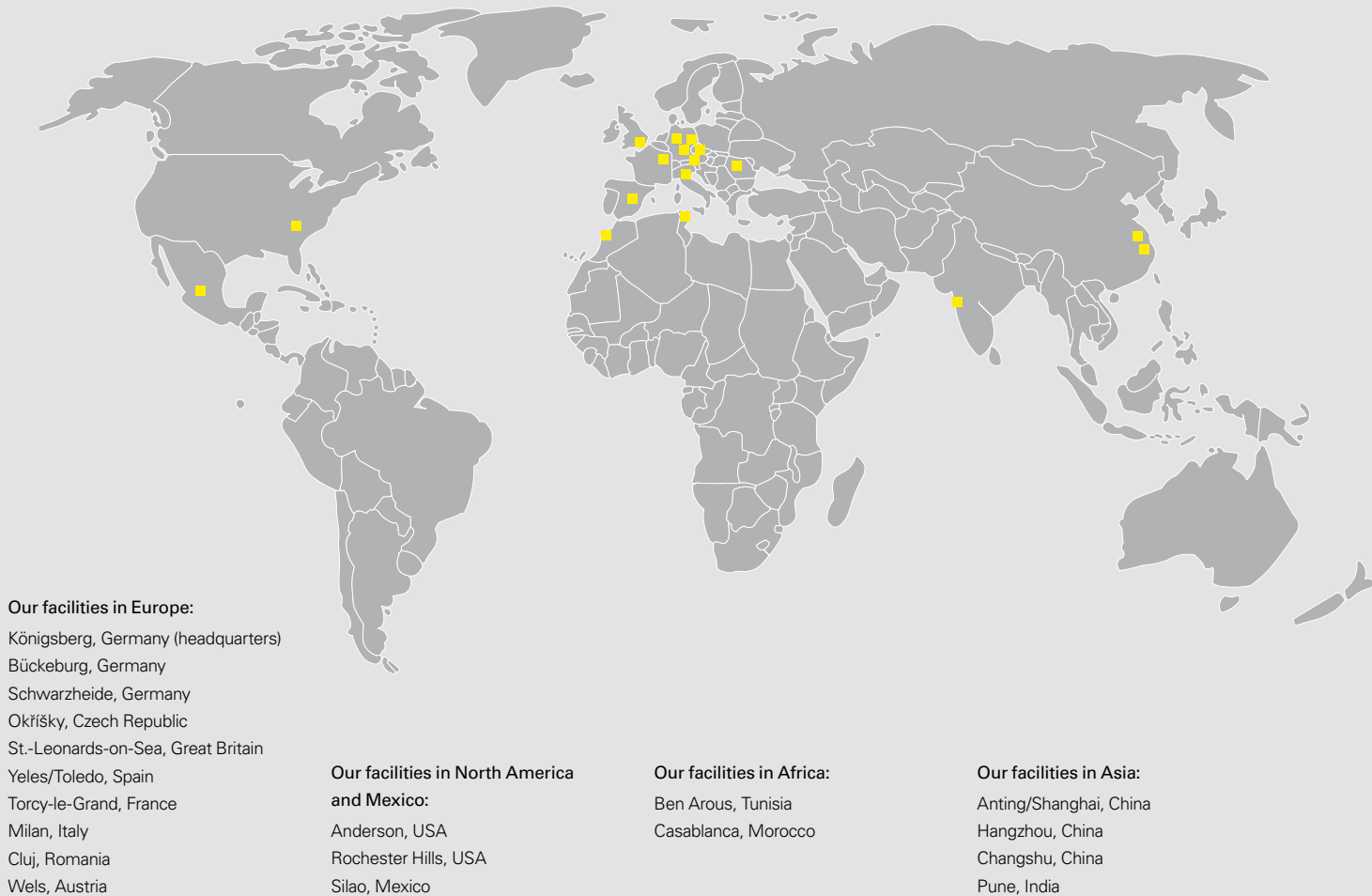




FRÄNKISCHE

INDUSTRIAL PIPES

Rooted in Königsberg – globally successful!



FRÄNKISCHE is an industry leader in the design, manufacturing and marketing of technically superior pipe systems, shafts and system components made of plastic and metal, and offers solutions for building construction, civil engineering, automotive and industrial applications.

Founded in 1906, the company is a third-generation family-owned business with around 5,000 employees working at production and sales facilities around the globe.