



**AQ INDUCTIVE COMPONENTS
FOR RAILWAY APPLICATION**



AQ Inductive Components

aq

AQ Group business is organized in two segments: System and Component. System includes our business areas Electric Cabinets and System Products. Component includes our business areas Injection Molding, Inductive Components, Wiring Systems and Sheet Metal Processing.

Activities are organized in these specialized business areas with operating companies, which offer cost effective solutions for our customers. The consolidated knowledge in the **AQ Group**, along with a global presence offer unique benefits to customers around the world. Quality is central to everything we are involved in and is something we are constantly working to develop. In our world, quality and efficiency go hand in hand.

AQ Group has since its inception in 1994 shown a steady and fast growth with good profitability. The Group has approximately 6000 employees, including 75% in growth countries outside Sweden. The annual turnover is approximately €400 Million. The company is listed on Nasdaq Stockholm's main market in Sweden and has the highest credit rating of AAA since 1999 and has been awarded the AAA Gold diploma.



The AQ Business concept is to develop, manufacture and assemble components and systems for demanding industrial customers and leverage our commitment to Total Quality to ensure our customers become long-term business partners.

We target customers who are world leading in their respective niches, such as road and off-road vehicles, railroads, power transmission, telecommunication, food, etc. To be a world leading company, they have to work with world leading suppliers! AQ aims to be a world leader in cost effectiveness, quality, on time delivery, alertness and service. In one word: reliable. The AQ Group has grown constantly at a steady pace all from the start 1994 to today's position as a true global actor.

Our finances are strong and we will continue our growth, both organically and by acquisitions.

WeAreReliable

- CUSTOMER FOCUS
- SIMPLICITY
- ENTREPRENEURIAL BUSINESS
- COST EFFICIENCY
- COURAGE AND RESPECT



Claes Mellgren
CEO



CUSTOMER FOCUS

The AQ magnetic components for railways application

The Business Area Inductive components of AQ Group has a long experience in design and production of component installed on railway and assimilated vehicles (subways, trams, trolley buses).

The largest part of our products is designed by our R&D offices in Sweden and Italy (supported by the Engineering departments of the production units) on the basis of performance specifications received by the customers. Production facilities are located in Bulgaria, China, India.

Our products are dry insulated transformers (also with built-in inductances) and inductors, for the whole range of wounded components that are present in the propulsion and auxiliary systems of the vehicles. We largely supply, furthermore, the inductors and auxiliary transformers integrated inside the oil tanks of the main step-down transformers.

We offer several technologies suitable to the different functions, voltage level and environmental installation of the components. Direct and indirect water cooling are also covered by our experience.

We manufacture also special products according to the constructive design of our customers.

MCM Inductor 1T478245R1



TYPE OF COMPONENT	Motor Control Module inductor - AF
MAIN ELECTRICAL DATA	5 mH / 5 10A - 1500V
COOLING	AF
WEIGHT	290 Kg
INSTALLATION	Inside converter cabinet
PROJECT	Subways for several Chinese towns
N. OF PIECES MANUFACTURED	More than 1000
YEARS OF MANUFACTURING	2004 - in progress
AQ TRAF0 TOP DRAWING	1T478245R1

Inductor Assembly 478309S1



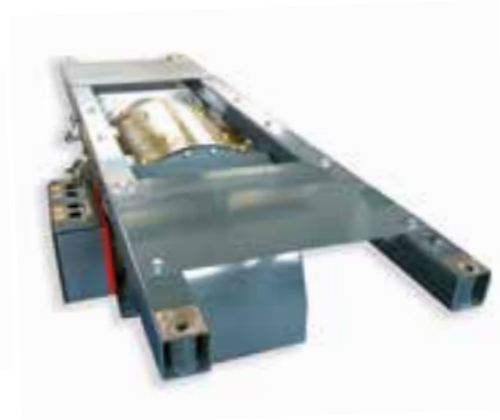
TYPE OF COMPONENT	Assembly of 2 DC line filter inductor, iron core
SYSTEM VOLTAGE	0,75 kV, DC
MAIN ELECTRICAL DATA	2x4 mH at 725 A
MAX SURGE CURRENT	4 kA
COOLING	AF 2m/s horizontal air stream around the inductor
WEIGHT	660 Kg
INSTALLATION	Under the carbody, suspended
PROJECT	Teheran Metro
N. OF PIECES IN THE CONTRACT	88 pcs
YEARS OF MANUFACTURING	2005 - september 2006
AQ TOP DRAWING	478309S1

Line Filter Inductor 11T478245AB1



TYPE OF COMPONENT	Line filter inductor - Traction drive
MAIN ELECTRICAL DATA	4 mH / 310 A
SYSTEM VOLTAGE	750 V DC
COOLING	AN
WEIGHT	142 Kg
INSTALLATION	In the vehicle underframe
PROJECT	Metro Genova - Metro Napoli
N. OF PIECES MANUFACTURED	24
YEARS OF MANUFACTURING	2013 - 2014
AQ TOP DRAWING	11T478245AB1

Line Filter Inductor 1T478245AB4



TYPE OF COMPONENT	DC Line Filter Inductor - Air-cored semishielded - Traction
MAIN ELECTRICAL DATA	5 mH, 510 A/525 A, 1500 Vdc
COOLING	AF - fan integrated in AQ Scope of Supply
WEIGHT	400 Kg
INSTALLATION	Under the car body
PROJECT	Shanghai Line 2&5 and successive metro projects in China
N. OF PIECES PRODUCED	> 200 (inclusive of products with different article numbers but same electrical data and constructive design)
YEARS OF MANUFACTURING	2013 - in progress
AQ TOP DRAWING	1T478245AB4

Line Filter Inductor 1T478245AC1



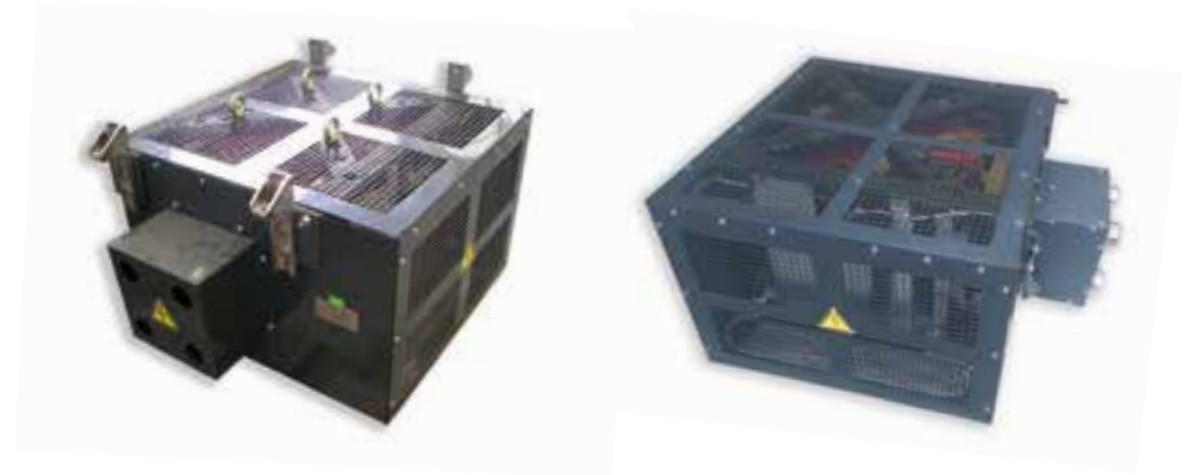
TYPE OF COMPONENT	DC Line Filter Inductor - Air-cored semishielded - Traction
MAIN ELECTRICAL DATA	25 mH, 400 A/800 A, 3000 Vdc
COOLING	AF - fan integrated in AQ Scope of Supply
WEIGHT	655 Kg
INSTALLATION	Over the train roof
PROJECT	EMUs for Russia
N. OF PIECES PRODUCED	30 + 93 in order (July 2018)
YEARS OF MANUFACTURING	2014 - in progress
AQ TOP DRAWING	1T478245AC1

Line Filter Inductor 1IT478245AC2



TYPE OF COMPONENT	DC Line Filter Inductor - Traction
MAIN ELECTRICAL DATA	1,5 mH, 965 A/2050 A, 750 Vdc - Required air-core inductance 80%
COOLING	AF
WEIGHT	372 Kg
INSTALLATION	Inside the converter box
PROJECT	Metro Riyadh
N. OF PIECES PRODUCED	160
YEARS OF MANUFACTURING	2014 - 2018
AQ TRAF0 TOP DRAWING	1IT478245AC2

Line Filter Inductor 1IT478245S5



TYPE OF COMPONENT	DC line filter inductor, iron core (rod type) semishielded - Built in damping resistors
SYSTEM VOLTAGE	1,5 kV, DC
MAIN ELECTRICAL DATA	2,5 mH, 350/920 A
MAX SURGE CURRENT	20 kA (tested in CESI)
COOLING	AN
WEIGHT	295 Kg
INSTALLATION	Under the carbody, suspended
PROJECT	Barcelona Line 9/10 - Santo Domingo/Panama/Lima/ Guadalajara Underground (with additional tropicalisation)
N. OF PIECES IN THE CONTRACT	More than 600
YEARS OF MANUFACTURING	2005 - 2009
AQ TRAF0 TOP DRAWING	1IT478245S4/S5/U2/U3/AD7/AD8
SHOCK AND VIBRATION TEST	Performed in TELEMA laboratory

Line Filter Inductor 478219N3



TYPE OF COMPONENT	DC Line filter inductor semishielded
SYSTEM VOLTAGE	1,5 kV, DC
MAIN ELECTRICAL DATA	6 mH, 600 A
COOLING	AF
WEIGHT	285 Kg
INSTALLATION	In the vehicle underfloor
PROJECT	AGC trains for France
N. OF PIECES IN THE CONTRACT	706
YEARS OF MANUFACTURING	2002 - 2013

Line Filter Inductor 478232H1-H2



TYPE OF COMPONENT	Assembly of air core DC inductors
SYSTEM VOLTAGE	0,75 kV DC
MAIN ELECTRICAL DATA	2 x 3,3 mH, 120 A, Aluminium or Copper
COOLING	AF
WEIGHT	32 Kg Al / 88 Kg Cu
INSTALLATION	Under the car body
PROJECT	Cu version: Karlsruhe and Chemnitz tram Al version: several trams projects worldwide
N. OF PIECES MANUFACTURED	> 1200
YEARS OF MANUFACTURING	1997 - in progress
AQ TRAF0 TOP DRAWING	478232H1 (Al) - 478232H2 (Cu)

Line Filter Inductor 478245AE2



TYPE OF COMPONENT	DC Line Filter Inductor - Traction
MAIN ELECTRICAL DATA	2,8 mH, 687 A/1321 A, 750 Vdc - Required air-core inductance 2,24 mH
COOLING	AN
WEIGHT	790 Kg
INSTALLATION	Under the vehicle carbody
PROJECT	MP14 (Paris)
N. OF PIECES PRODUCED	17 (status July 2019), 250 ordered
YEARS OF MANUFACTURING	2017 - in progress
AQ TRAFO TOP DRAWING	478245AE2

Line Filter Inductor 478315N1



TYPE OF COMPONENT	Air-core DC Line filter inductor
MAIN ELECTRICAL DATA	1,6 mH, 380 A, 750 V
COOLING	Motion wind
WEIGHT	85 Kg
INSTALLATION	In the vehicle underfloor
PROJECT	C21 (Stockholm Lokaltrafik)
N. OF PIECES MANUFACTURED	310
YEARS OF MANUFACTURING	2002 - 2018

Line Filter Inductor 11T478245AA7



TYPE OF COMPONENT	Semi-shielded DC Line filter inductor
MAIN ELECTRICAL DATA	4 mH, 400/570 A, 750 V
COOLING	AN
WEIGHT	300 Kg
INSTALLATION	In the vehicle underfloor
PROJECT	Copenhagen Cityringen - Thessaloniki and Milano underground Line 4
N. OF PIECES ORDERED	379
YEARS OF MANUFACTURING	2013 - in progress
AQ TOP DRAWING	11T478245AA7

Line Filter Inductor 478211U9

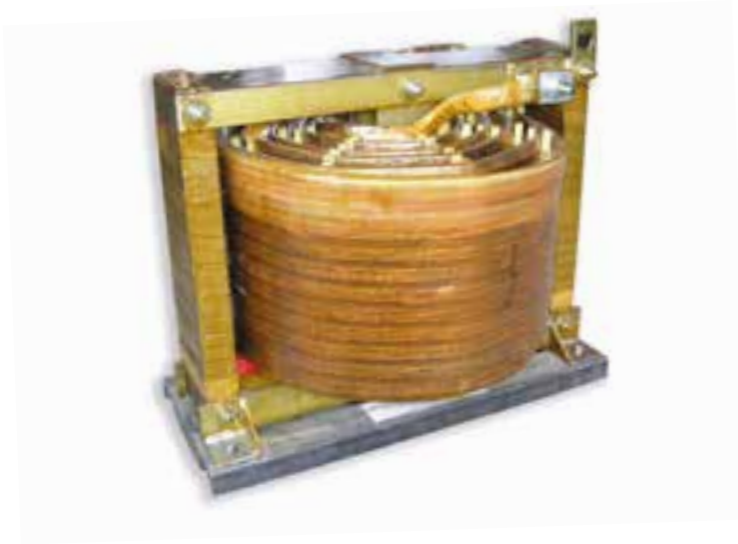


TYPE OF COMPONENT	DC Line filter inductor
SYSTEM VOLTAGE	1,5 kV, DC
MAIN ELECTRICAL DATA	8,5 mH up to 740 A, 6,3 mH up to 990 A
COOLING	AF
WEIGHT	500 Kg
INSTALLATION	In the roof of the vehicle
PROJECT	NAT (France)
N. OF PIECES IN THE CONTRACTS	> 470
YEARS OF MANUFACTURING	2008 - in progress
AQ TOP DRAWING	478211U9



SIMPLICITY

Line Filter Inductor 11T478241V1



TYPE OF COMPONENT	Line filter inductor Inductor
MAIN ELECTRICAL DATA	2 mH / 210/350 A
SYSTEM VOLTAGE	750 V DC
COOLING	AF
WEIGHT	57 Kg
INSTALLATION	Inside the converter box
PROJECT	TTNG (France)
N. OF PIECES MANUFACTURED	256
YEARS OF MANUFACTURING	2008 - 2017
AQ TRAF0 TOP DRAWING	11T478241V1

Line Filter Inductor 11T478241V4



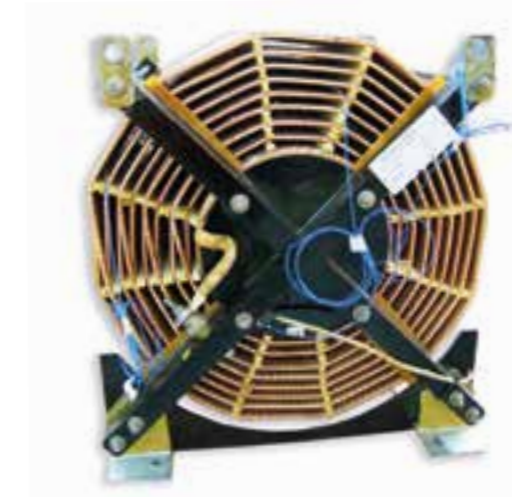
TYPE OF COMPONENT	Line filter inductor for Aux converter - intermediate tap
MAIN ELECTRICAL DATA	33,0-33,1 mH, 46/53 A
SYSTEM VOLTAGE	750 V DC
COOLING	AN
WEIGHT	56 Kg
INSTALLATION	In the vehicle underframe
PROJECT	Automatic Metro cars in Brescia, Milano, Thessaloniki
N. OF PIECES MANUFACTURED	164
YEARS OF MANUFACTURING	2008 - in progress
AQ TOP DRAWING	11T478241V4

Line Filter Inductor 1T478245S1



TYPE OF COMPONENT	DC line filter inductor, iron core (rod type), shielded
SYSTEM VOLTAGE	3 kV, DC
MAIN ELECTRICAL DATA	52,0 mH, 40/220 A
COOLING	AN
WEIGHT	142 Kg
INSTALLATION	In the locomotive technical room, laying
PROJECT	Aux converter rewamping
N. OF PIECES IN THE CONTRACT	27
YEARS OF MANUFACTURING	2005 - 2011
AQ TRAF0 TOP DRAWING	1T478245S1

Line Filter Inductor 1T478245Y4



TYPE OF COMPONENT	DC line filter inductor (for Aux. converter)
SYSTEM VOLTAGE	1,5 kV, DC
MAIN ELECTRICAL DATA	15 mH, 186 A
COOLING	AF
WEIGHT	155 Kg
INSTALLATION	Inside a converter box
PROJECT	Chongqing Metro (China)
N. OF PIECES IN THE CONTRACT	59
YEARS OF MANUFACTURING	2011 - 2013
AQ TRAF0 TOP DRAWING	1T478245Y4



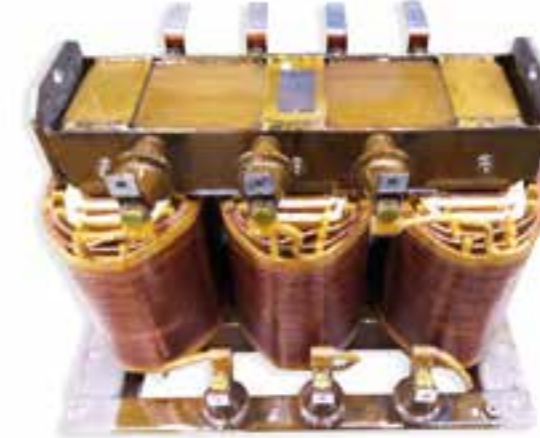
ENTREPRENEURIAL BUSINESS

Insulation Transformer 1T478143AB3



TYPE OF COMPONENT	3-phase transformer with built-in inductance for Aux. Converter
MAIN ELECTRICAL DATA	300/400/92 V, 86 kVA
REQUIRED S.C. VOLTAGE	= 22,7%
COOLING	AN
WEIGHT	344 Kg
INSTALLATION	Inside the converter box
PROJECT	C30 (Stockholm Metro)
N. OF PIECES IN THE CONTRACT	17 + 29
YEARS OF MANUFACTURING	2013 - in progress

Insulation Transformer 1T478143AE8



TYPE OF COMPONENT	3-phase transformer for Aux. Converter
MAIN ELECTRICAL DATA	1034/400 V, 111 kVA
REQUIRED S.C. VOLTAGE	13%
COOLING	AN
WEIGHT	403 Kg
INSTALLATION	Inside a technical cubicle
PROJECT	M7 trains (SNCB - Belgium)
N. OF PIECES IN THE CONTRACT	6 (status July 2019) - 179 ordered
YEARS OF MANUFACTURING	2017 - in progress

Insulation Transformer 1T478143T1



TYPE OF COMPONENT	3-phase transformer for Aux. Converter
MAIN ELECTRICAL DATA	1000/400 V, 230 kVA
COOLING	AN
WEIGHT	780 Kg
INSTALLATION	In the vehicle roof
SPECIAL REQUIREMENTS	Severe environmental conditions - dielectric tests with immersion in water
PROJECT	TSR for Ferrovie Nord Milano (Italy)
N. OF PIECES MANUFACTURED	136
YEARS OF MANUFACTURING	2006 - 2017

Insulation Transformer 1T478143Y3



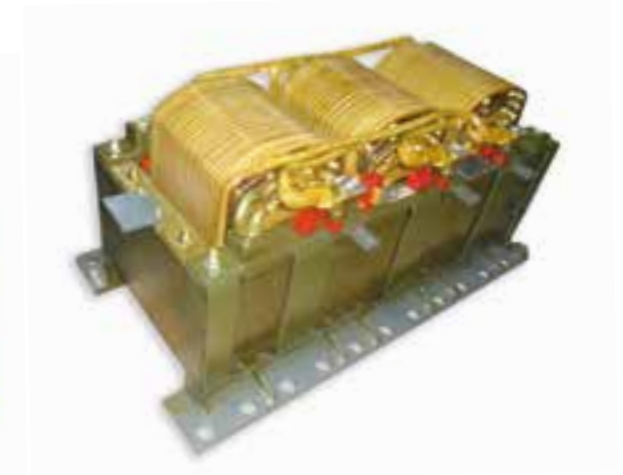
TYPE OF COMPONENT	3-phase transformer with built-in inductance for Subway cars auxiliary Converter
MAIN ELECTRICAL DATA	640/380 V, 170 kVA
REQUIRED S.C. VOLTAGE	9%
COOLING	AF
WEIGHT	430 Kg
INSTALLATION	Inside the converter box
PROJECT	Shanghai L12 and further metro projects in China
N. OF PIECES IN THE CONTRACT	More than 1500
YEARS OF MANUFACTURING	2010 - in progress
AQ TOP DRAWING	1T478143Y3

Auxiliary Transformer 1T478143U1



TYPE OF COMPONENT	3-phase transformer with built - in inductance for Aux. Converter
MAIN ELECTRICAL DATA	275/400/92,4 V, 120+30 kVA
REQUIRED S.C. VOLTAGE	18% primary to sec 1
COOLING	AF in transversal direction
WEIGHT	626 Kg
INSTALLATION	Inside the converter box
PROJECT	SSL (UK)
N. OF PIECES MANUFACTURED	720
YEARS OF MANUFACTURING	2007 - 2015

Auxiliary Transformer 1T478143AA6



TYPE OF COMPONENT	3 phase insulating transformer for Aux. Converter
MAIN ELECTRICAL DATA	645/400 V, 265 kVA , Xcc=7%
COOLING	AF 1,66 m3/s
WEIGHT	600 Kg
INSTALLATION	In a open ventilated enclosure under the car body
PROJECT	PHD (France)
N. OF PIECES MANUFACTURED	More than 450
YEARS OF MANUFACTURING	2012 - in progress
AQ TRAF0 TOP DRAWING	1T478143AA6



COST EFFICIENCY

Oil Insulated Inductor Assembly 1IT478020AD2



TYPE OF COMPONENT	Assembly of 2 resonant filter inductors (33,33 Hz)
MAIN ELECTRICAL DATA	3,78 mH - 300/874 A - 33,33 Hz
SYSTEM VOLTAGE	15 kV, 16,67 Hz
COOLING	ON (KFF)
WEIGHT	300 Kg
INSTALLATION	Inside the Step-Down transformer box
PROJECT	RRX (Germany)
N. OF PIECES MANUFACTURED	51 (status July 2018) - further 109 ordered
YEARS OF MANUFACTURING	2015 - in progress
AQ TOP DRAWING	1IT478020AD2 (2 x 1IT478241AD4)

Oil Insulated Reactors Assembly 478020AE3



TYPE OF COMPONENT	Assembly of 2 resonant filter inductors
MAIN ELECTRICAL DATA	3,26 mH - 422/669 A - 33,33 Hz
SYSTEM VOLTAGE	15 kV, 16,67 Hz
COOLING	ON (KDAF)
WEIGHT	410 Kg
INSTALLATION	Inside the Step-Down transformer box
PROJECT	Oslo Suburban EMUs (Norway)
N. OF PIECES MANUFACTURED	17
YEARS OF MANUFACTURING	2017
AQ TOP DRAWING	478020AE3 (2 x 478211AE6)

Oil Insulated Components Assembly 478020AE7



TYPE OF COMPONENT	Assembly of 1 resonant filter inductor (100 Hz) and 1 Auxiliary 3 ph insulation transformer
SYSTEM VOLTAGE	25 kV, 50 Hz
INDUCTOR MAIN ELECTRICAL DATA	0,266 mH - 1800/3000 A - 100 Hz 3,3 kV
TRANSFORMER MAIN ELECTRICAL DATA	960/400 V, 830 kVA, 50 Hz
SHORT CIRCUIT VOLTAGE	33%
GROUP	Dyn5
COOLING	ON (Ester oil)
WEIGHT	1600 Kg
INSTALLATION	Inside the Step-Down transformer box
PROJECT	Loco for Israel Railway
N. OF PIECES MANUFACTURED	13 (status July 2018) + 47 ordered
YEARS OF MANUFACTURING	2016 - in progress
AQ TOP DRAWING	478020AE7

Oil Insulated Transformer 478143AF3



SYSTEM VOLTAGE	25 kV, 50 Hz
TRANSFORMER MAIN ELECTRICAL DATA	1080/415 V, 180 kVA, 50 Hz
SHORT CIRCUIT VOLTAGE	12,5 %
GROUP	Dyn11
COOLING	ON (Mineral oil)
WEIGHT	525 Kg
INSTALLATION	Inside the Step-Down transformer box
PROJECT	Locomotive for India (Madhepura)
N. OF PIECES MANUFACTURED	8 + 5 in order
YEARS OF MANUFACTURING	2017 - in progress
AQ TOP DRAWING	478143AF3

A black and white photograph of a high-speed train in motion at a station platform. The train is blurred, conveying a sense of speed. The platform is visible on the left, and the station's glass and steel structure is in the background. The text "COURAGE AND RESPECT" is overlaid in the center in a large, white, sans-serif font.

COURAGE AND RESPECT

Kit of Components for Battery Charger 478020T1



TYPE OF COMPONENT	Group of magnetic component for battery charger
COOLING	AN
WEIGHT	38 Kg
INSTALLATION	Inside the battery charger cubicle
PROJECT	Several vehicles for 3 kV DC system
N. OF PIECES IN THE CONTRACT	305
YEARS OF MANUFACTURING	2006 - 2017
AQ TOP DRAWING	478020T1

Kit of Components for Auxiliary Converter



TYPE OF COMPONENTS:	Each kit includes: 2 LFR 50 mH, 74/98 A 1 transformer 72 kVA, 476/444 V 3 inductors 1,7 mH, 50 A
SYSTEM VOLTAGE	3 kV, DC
COOLING	AN
WEIGHT	2x157/282/3x13 Kg
INSTALLATION	Inside the converter box
PROJECT	FS locomotive, aux. services revamping
N. OF KITS IN THE CONTRACT	44
YEARS OF MANUFACTURING	2004 - 2006
AQ TOP DRAWING	478211P1, 478105P5, 478211P2

Quality and testing

100% electrical, mechanical and visual control is applied. Equipment to carry out tests required by IEC standard is available.

Special testing is performed in collaboration with accredited external laboratories. Typical in-house tests:

- No load test
- Short circuit test
- Inductance measurement
- Resistance measurement
- BIL impulse test up to 100 kV
- Heat-run test
- DC measurement up to 3000A with AC superimposed current
- Dielectric test in AC up to 100 kV
- Partial discharge test
- Water leakage test

All design and manufacturing processes are certified according to the following standards:

- EN ISO 9001/2008
- ISO/TS 22163 (IRIS)
- EN 15085-2 CL1
- EN 3834-2
- EN ISO 14001

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CUSTOMER
FOCUS

SIMPLICITY

ENTREPRENEURIAL
BUSINESS

COST
EFFICIENCY

**WeAre
Reliable**

COURAGE
AND RESPECT



Additional contact information at:
www.aqg.se